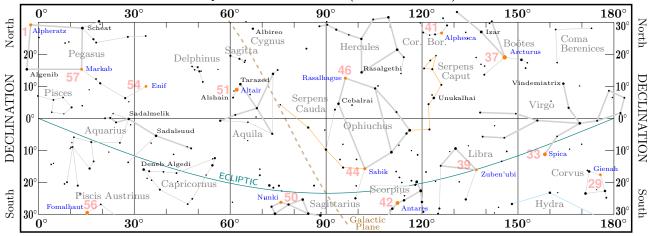
GENERATED USING SKYFIELD

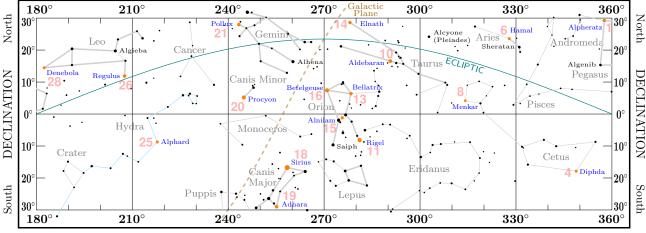
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



SIDEREAL HOUR ANGLE

THE NAUTICAL ALMANAC

2027

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

September 6, 2025

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

Information in the data page footers

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

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

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

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

IERS Earth Orientation data as of dd-mmm-yyyy

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

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

IERS Earth Orientation predictions end dd-mmm-yyyy

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

No IERS EOP prediction data available

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

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

Brief historical overview

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

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

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

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

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

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

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

January 01, 02, 03 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
- Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	100°25.49	228°26.73 \$15°22.03	297°45.33 N10°53.83	311°25.48 N13°34.55	91°48.21 N01°2.80	
1	115° 27.95	243°26.68 22.63	312°47.49 53.80	326°28.09 34.61	106°50.59 2.84	Alpheratz 357°33.11 29°14.58
2	130°30.42	258°26.63 23.22	327°49.65 53.77	341°30.70 34.67	121°52.98 2.89	Ankaa 353°5.57 -42°9.73 Schedar 349°29.13 56°41.46
3	145°32.88	273°26.58 · · 23.82	342°51.82 · · 53.75	356°33.31 · · 34.73	136°55.36 · · 2.94	Diphda 348°45.65 -17°50.37
4	160°35.35	288°26.53 24.42	357°53.99 53.72	11°35.92 34.79	151°57.74 2.98	Achernar 335°18.83 -57°6.21
5	175°37.81	303°26.48 25.02	12°56.15 53.69	26°38.53 34.86	167°0.12 3.03	Hamal 327°49.19 23°35.55
6 7	190° 40.27 205° 42.74	318°26.42 \$15°25.62 333°26.37 26.22	27°58.32 N10°53.67 43°0.49 53.64	41°41.13 N13°34.92 56°43.74 34.98	182°2.50 N01°3.08 197°4.88 3.13	Polaris 312°50.77 89°22.93
8	220° 45.20	348°26.31 26.82	58°2.66 53.62	71°46.35 35.04	212°7.26 3.17	Acamar 315°10.28 -40°11.93
9	235° 47.67	3°26.26 · · 27.41	73°4.83 · · 53.59	86°48.96 · · 35.10	227°9.64 · · 3.22	Menkar 314°4.23 4°11.77
10	250°50.13	18°26.20 28.01	88°7.00 53.57	101°51.57 35.17	242°12.02 3.27	Mirfak 308°25.52 49°57.61 Aldebaran 290°37.42 16°33.83
11	265° 52.59	33°26.14 28.61	103° 9.18 53.54	116°54.18 35.23	257°14.40 3.31	Rigel 281°1.97 -8°10.27
12	280°55.06	48°26.08 \$15°29.21	118°11.35 N10°53.52	131°56.80 N13°35.29	272°16.78 N01°3.36	Capella 280°18.99 46°1.54
13	295° 57.52	63°26.02 29.81 78°25.96 30.40	133°13.53 53.50 148°15.70 53.47	146°59.41 35.35 162°2.02 35.41	287°19.16 3.41 302°21.54 3.46	Bellatrix 278°20.79 6°22.42
14 15	310°59.99 326°2.45	93°25.90 · · 31.00	163°17.88 · · 53.45	162°2.02 35.41 177°4.63 · · 35.48	302°21.54 3.46 317°23.92 · · 3.51	Elnath 277°59.42 28°37.81
16	341°4.92	108°25.83 31.60	178°20.06 53.43	192°7.24 35.54	332°26.30 3.55	Alnilam 275°35.73 -1°11.12
17	356°7.38	123°25.77 32.20	193°22.24 53.41	207° 9.86 35.60	347°28.67 3.60	Betelgeuse 270°49.97 7°24.69
18	11°9.84	138°25.70 \$15°32.79	208°24.42 N10°53.39	222°12.47 N13°35.67	2°31.05 N01°3.65	Canopus 263°51.10 -52°42.61 Sirius 258°24.43 -16°45.24
19	26° 12.31	153°25.64 33.39	223°26.60 53.37	237°15.08 35.73	17°33.43 3.70	Adhara 255°4.18 -29°0.55
20	41°14.77	168°25.57 33.99	238°28.78 53.35	252°17.69 35.79	32°35.81 3.74	Procyon 244°48.79 5°9.26
21 22	56° 17.24 71° 19.70	183°25.50 · · 34.58 198°25.43 35.18	253°30.97 · · 53.33 268°33.15 53.31	267°20.31 · · 35.86 282°22.92 35.92	47°38.19 · · 3.79 62°40.57 3.84	Pollux 243°14.94 27°57.52
23	86°22.16	213°25.36 35.78	283°35.34 53.29	297°25.54 35.98	77°42.94 3.89	Avior 234°13.45 -59°35.66
		-				Suhail 222°44.72 -43°32.41
Mer. _l	pass. 17:15	ν-0.0′ d0.6′ m-4.58	ν2.2' d-0.0' m-0.14	ν2.6' d0.1' m-2.41	ν2.4' d0.0' m0.73	Miaplacidus 221°37.13 -69°49.51 Alphard 217°45.89 -8°46.59
						Alphard 217°45.89 -8°46.59 Regulus 207°32.49 11°49.96
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.75 61°35.96
0	101°24.63	228°25.29 \$15°36.37	298°37.53 N10°53.27	312°28.15 N13°36.05	92°45.32 N01°3.94	Denebola 182°23.20 14°25.09
1	116°27.09	243°25.22 36.97	313°39.72 53.25	327°30.77 36.11	107°47.70 3.99	Gienah 175°41.85 -17°41.50
2	131°29.56 146°32.02	258°25.15 37.57 273°25.07 · · 38.16	328°41.91 53.24 343°44.10 · · 53.22	342°33.38 36.17 357°36.00 · · 36.24	122°50.08 4.03 137°52.45 • 4.08	Acrux 172°58.18 -63°14.69
4	161°34.48	288°25.00 38.76	358°46.29 53.20	12°38.61 36.30	152°54.83 4.13	Gacrux 171°49.76 -57°15.65
5	176° 36.95	303°24.92 39.35	13°48.48 53.19	27°41.23 36.36	167°57.21 4.18	Alioth 166°11.59 55°48.43
6	191°39.41	318°24.85 \$15°39.95	28°50.68 N10°53.17	42°43.85 N13°36.43	182°59.58 N01°4.23	Spica 158°20.63 -11°18.15 Alkaid 152°50.88 49°10.37
7	$206^{\circ}41.88$	333°24.77 40.54	43°52.87 53.16	57°46.46 36.49	198°1.96 4.28	Hadar 148°33.88 -60°29.96
8	221°44.34	348°24.69 41.14	58°55.07 53.14	72°49.08 36.56	213°4.34 4.33	Menkent 147°55.82 -36°30.04
9	236° 46.81	3°24.61 · · 41.73	73°57.27 · · 53.13	87°51.70 · · 36.62	228°6.71 · · 4.38	Arcturus 145°46.56 19°2.32
10 11	251°49.27 266°51.73	18°24.53 42.33 33°24.45 42.92	88°59.46 53.12 104°1.66 53.10	102°54.31 36.69 117°56.93 36.75	243°9.09 4.42 258°11.46 4.47	Rigil Kent. 139°38.33 -60°56.59
12	281°54.20	48°24.37 \$15°43.52	119°3.86 N10°53.09	132°59.55 N13°36.82	273°13.84 N01°4.52	Kochab 137°20.56 74°2.29
13	296° 56.66	63°24.29 44.11	134°6.07 53.08	148°2.17 36.88	288°16.21 4.57	Zuben'ubi 136°54.38 -16°9.22
14	311°59.13	78°24.20 44.71	149°8.27 53.07	163°4.79 36.95	303°18.59 4.62	Alphecca 126°2.62 26°37.25 Antares 112°14.14 -26°29.45
15	$327^{\circ}1.59$	93°24.12 · · 45.30	164°10.47 · · 53.06	178°7.41 · · 37.01	318°20.96 · · 4.67	Atria 107°7.39 -69°4.37
16	342°4.05	108°24.03 45.90	179°12.68 53.05	193°10.03 37.08	333°23.34 4.72	Sabik 102°1.22 -15°45.47
17 18	357°6.52 12°8.98	123°23.94 46.49 138°23.86 \$15°47.08	194°14.89 53.04 209°17.09 N10°53.03	208°12.65 37.14 223°15.27 N13°37.21	348°25.71 4.77 3°28.09 N01°4.82	Shaula 96° 8.55 -37° 7.33
19	27° 11.45	153°23.77 47.68	209°17.09 N10°53.03 224°19.30 53.02	223°15.27 N13°37.21 238°17.89 37.27	3°28.09 N01°4.82 18°30.46 4.87	Rasalhague 95°57.36 12°32.37
20	42° 13.91	168°23.68 48.27	239°21.51 53.01	253°20.51 37.34	33°32.84 4.92	Eltanin 90°41.96 51°29.02
21	57° 16.38	183°23.59 · · 48.86	254°23.72 · · 53.00	268°23.13 · · 37.40	48°35.21 · · 4.97	Kaus Aust. 83°30.75 -34°22.26 Vega 80°32.55 38°48.49
22	72° 18.84	198°23.49 49.46	269°25.93 52.99	283°25.75 37.47	63°37.59 5.02	Nunki 75°46.11 -26°15.77
23	87°21.30	213°23.40 50.05	284°28.15 52.98	298°28.37 37.53	78°39.96 5.07	Altair 61°58.69 8°56.41
Mer.	pass. 17:12	ν-0.1' d0.6' m-4.57	ν2.2' d-0.0' m-0.17	$\nu 2.6' \ d0.1' \ \text{m-}2.42$	ν 2.4′ d 0.0′ m 0.73	Peacock 53°3.73 -56°38.95
	<u> </u>					Deneb 49°25.09 45°22.74
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.42 10°0.01
0	102°23.77	228°23.31 \$15°50.64	299°30.36 N10°52.98	313°30.99 N13°37.60	93°42.33 N01°5.12	Al Na'ir 27°31.19 -46°49.95 Fomalhaut 15°12.89 -29°28.85
1	117°26.23	243°23.21 51.24	314°32.58 52.97	328°33.62 37.67	108°44.71 5.17	Scheat 13°43.76 28°13.95
2	132°28.70	258°23.12 51.83	329° 34.79 52.96	343°36.24 37.73	123°47.08 5.22	Markab 13°28.40 15°21.16
3	147°31.16	273°23.02 · · 52.42	344°37.01 · · 52.96	358°38.86 · · 37.80	138°49.45 · · 5.27	
4 5	162°33.62 177°36.09	288°22.92 53.01 303°22.83 53.61	359°39.23 52.95 14°41.45 52.95	13°41.48 37.87 28°44.11 37.93	153°51.83 5.32 168°54.20 5.37	Jan 01 Fri SHA Mer.pass Venus 128° 1.24 08:46
6	177° 36.09 192° 38.55	318° 22.73 S15° 54.20	29°43.67 N10°52.95	43°46.73 N13°38.00	183°56.57 N01°5.42	Mars 197°19.84 04:08
7	207°41.02	333°22.63 54.79	44°45.89 52.94	58°49.36 38.06	198°58.94 5.47	Jupiter 211°0.00 03:14
8	222°43.48	348°22.53 55.38	59°48.12 52.94	73°51.98 38.13	214°1.32 5.52	Saturn 351°22.72 17:50
9	237° 45.95	3°22.42 · · 55.97	74°50.34 · · 52.94	88°54.60 · · 38.20	229°3.69 · · 5.57	Jan 02 Sat SHA Mer.pass
10	252°48.41	18°22.32 56.56	89°52.57 52.93	103°57.23 38.27	244°6.06 5.62	Venus 127° 0.67 08:46
11	267° 50.87 282° 53.34	33°22.22 57.15 48°22.11 \$15°57.74	104°54.79 52.93 119°57.02 N10°52.93	118°59.85 38.33 134°2.48 N13°38.40	259°8.43 5.67 274°10.80 N01°5.72	Mars 197°12.90 04:05
12 13	282°53.34 297°55.80	63°22.01 58.33	119°57.02 N10°52.93 134°59.25 52.93	134°2.48 N13°38.40 149°5.11 38.47	274°10.80 N01°5.72 289°13.17 5.78	Jupiter 211° 3.52 03:10
14	312°58.27	78°21.90 58.93	150°1.48 52.93	164° 7.73 38.53	304°15.55 5.83	Saturn 351°20.69 17:46
15	328°0.73	93°21.79 15°59.52	165°3.71 · · 52.93	179°10.36 · · 38.60	319°17.92 · · 5.88	Jan 03 Sun SHA Mer.pass
16	343°3.19	$108^{\circ}21.68$ $16^{\circ}0.11$	180° 5.94 52.93	194°12.99 38.67	334°20.29 5.93	Venus 125°59.54 08:47
17	358°5.66	123°21.58 0.70	195° 8.18 52.93	209°15.61 38.74	349°22.66 5.98	Mars 197° 6.59 04:01
18	13°8.12	138°21.47	210°10.41 N10°52.93	224°18.24 N13°38.80	4°25.03 N01°6.03	Jupiter 211°7.23 03:05
19 20	28° 10.59 43° 13.05	153°21.35 1.87 168°21.24 2.46	225°12.65 52.93 240°14.88 52.94	239°20.87 38.87 254°23.50 38.94	19°27.40 6.08 34°29.77 6.13	Saturn 351°18.56 17:42
21	58° 15.52	183°21.13 · · 3.05	255°17.12 · · 52.94	269°26.12 · · 39.01	49°32.14 · · 6.18	Horizontal parallax
22	73° 17.98	198°21.01 3.64	270°19.36 52.94	284°28.75 39.08	64°34.51 6.24	Venus: 0.2
23	88°20.44	213°20.90 4.23	285°21.60 52.95	299°31.38 39.15	79°36.88 6.29	Mars: 0.2
Mer	pass. 17:08	ν-0.1' d0.6' m-4.56	ν2.2' d-0.0' m-0.19	ν2.6' d0.1' m-2.42	ν2.4' d0.1' m0.74	

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 11.94	\$23°2.19	259°22.05	13.8'	S13°49.49	12.9'	55.9'
1 2	194°11.65 209°11.35	1.99 1.79	273°54.86 288°27.64	13.8' 13.8'	14°2.39 14°15.21	12.8' 12.7'	55.9' 55.9'
3	209 11.35 224°11.05	. 1.59	303°0.40	13.7'	14 15.21 14°27.96	12.7'	55.9'
4	239° 10.76	1.39	317°33.13	13.7'	14°40.64	12.6'	55.8'
5	254° 10.46	1.19	332°5.83	13.7'	14°53.24	12.5'	55.8'
6 7	269°10.17 284°9.87	\$23°0.99 0.79	346°38.50 1°11.14	13.6' 13.6'	\$15° 5.76 15° 18.21	12.4' 12.4'	55.8' 55.7'
8	299°9.57	0.79	1 11.14 15°43.75	13.6'	15 16.21 15°30.57	12.4	55.7'
9	314°9.28	• • 0.38	30°16.33	13.5'	15°42.86	12.2'	55.7'
10	329°8.98	0.18	44°48.88	13.5'	15°55.07	12.1'	55.7'
11 12	344°8.69 359°8.39	22°59.97 \$22°59.76	59°21.40 73°53.88	13.5' 13.4'	16°7.20 \$16°19.25	12.0' 12.0'	55.6' 55.6'
13	14°8.10	59.56	88°26.33	13.4'	16°31.22	11.9'	55.6'
14	29°7.80	59.35	$102^{\circ}58.75$	13.4'	$16^{\circ}43.10$	11.8'	55.5'
15	44°7.51 59°7.21	• • 59.14	117°31.13 132°3.47	13.3' 13.3'	16°54.90 17°6.62	11.7' 11.6'	55.5'
16 17	74°6.92	58.93 58.72	132 3.47 146°35.78	13.3'	17 0.02 17°18.25	11.5	55.5' 55.5'
18	89°6.62	S22°58.51	161°8.05	13.2'	S17°29.80	11.5'	55.4'
19	104°6.33	58.30	175°40.28	13.2'	17°41.26	11.4'	55.4'
20 21	119°6.04 134°5.74	58.08 •• 57.87	190°12.47 204°44.63	13.2' 13.1'	17°52.64 18°3.92	11.3' 11.2'	55.4' 55.4'
22	149°5.45	57.66	204 44.03 219°16.74	13.1'	18° 15.12	11.1'	55.3'
23	164°5.16	57.44	233°48.82	13.0'	$18^{\circ}26.23$	11.0'	55.3'
	SD = 16.3'	d = -0.2'		SE	0 = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°4.86	S22°57.22	248°20.86	13.0'	S18°37.25	10.9'	55.3'
1	194°4.57	57.01	262°52.85	13.0'	18°48.18	10.8'	55.3'
2	209°4.27 224°3.98	56.79 •• 56.57	277°24.80 291°56.71	12.9' 12.9'	18°59.01 19°9.76	10.7' 10.7'	55.2' 55.2'
4	239°3.69	56.35	306°28.58	12.8'	19° 20.41	10.6	55.2'
5	254°3.40	56.13	321°0.41	12.8'	$19^{\circ}30.97$	10.5'	55.2'
6	269°3.10	\$22°55.91	335°32.19	12.7'	\$19°41.43	10.4'	55.2'
7 8	284°2.81 299°2.52	55.69 55.47	350°3.93 4°35.63	12.7' 12.7'	19°51.80 20°2.08	10.3' 10.2'	55.1' 55.1'
9	314°2.23	• • 55.24	19°7.28	12.6'	20°12.25	10.1	55.1'
10	329°1.93	55.02	33°38.89	12.6'	20°22.33	10.0'	55.1'
11 12	344°1.64 359°1.35	54.80 \$22°54.57	48°10.45 62°41.97	12.5' 12.5'	20°32.32 \$20°42.20	9.9' 9.8'	55.0' 55.0'
13	14°1.06	54.34	77°13.44	12.4	20°51.98	9.6 9.7'	55.0'
14	29°0.77	54.12	91°44.87	12.4'	21° 1.67	9.6'	55.0'
15	44°0.48	• • 53.89	106°16.25	12.3' 12.3'	21°11.25 21°20.73	9.5'	55.0'
16 17	59°0.18 73°59.89	53.66 53.43	120°47.58 135°18.87	12.3'	21°20.73 21°30.11	9.4' 9.3'	54.9' 54.9'
18	88° 59.60	S22°53.20	149°50.12	12.2'	S21°39.39	9.2	54.9'
19	103°59.31	52.97	164°21.31	12.2'	21°48.56	9.1'	54.9'
20 21	118° 59.02 133° 58.73	52.74 •• 52.50	178°52.47 193°23.57	12.1' 12.1'	21°57.63 22°6.60	9.0' 8.9'	54.9' 54.8'
22	148° 58.44	52.27	207°54.63	12.1	22°15.45	8.8'	54.8
23	163°58.15	52.04	222°25.64	12.0'	$22^{\circ}24.21$	8.6'	54.8'
	SD = 16.3'	d = -0.2'		SE	0 = 15.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 57.86	\$22°51.80	236°56.60	11.9'	S22°32.85	8.5'	54.8'
1	193° 57.57 208° 57.28	51.57 51.33	251°27.52 265°58.39	11.9' 11.8'	22°41.39 22°49.82	8.4' 8.3'	54.8' 54.7'
2	208°57.28 223°56.99	51.33 •• 51.09	265°58.39 280°29.22	11.8'	22°49.82 22°58.14	8.3'	54.7' 54.7'
4	238°56.70	50.85	295°0.00	11.7'	$23^{\circ}6.35$	8.1'	54.7'
5	253°56.41	50.61	309°30.73	11.7'	23°14.45	8.0'	54.7'
6 7	268° 56.12 283° 55.83	\$22°50.37 50.13	324°1.42 338°32.06	11.6' 11.6'	\$23°22.43 23°30.31	7.9' 7.8'	54.7' 54.6'
8	298°55.54	49.89	353° 2.66	11.5'	23°38.08	7.7'	54.6'
9	313°55.26	• 49.65	7°33.21	11.5'	23°45.73	7.5'	54.6'
10 11	328° 54.97 343° 54.68	49.41 49.16	22°3.71 36°34.17	11.5' 11.4'	23°53.26 24°0.69	7.4' 7.3'	54.6' 54.6'
12	343 54.08 358°54.39	49.16 \$22°48.92	51° 4.58	11.4	524° 8.00	7.3 7.2'	54.6
13	13°54.10	48.67	65°34.95	11.3'	$24^{\circ}15.19$	7.1'	54.5'
14	28°53.81	48.43	80°5.28	11.3'	24°22.27	7.0'	54.5'
15 16	43°53.53 58°53.24	•• 48.18 47.93	94°35.56 109°5.80	11.2' 11.2'	24°29.23 24°36.07	6.8' 6.7'	54.5' 54.5'
17	73°52.95	47.93 47.68	109 5.00 123°36.00	11.2'	24° 42.80	6.6'	54.5'
18	88°52.66	S22°47.43	138° 6.15	11.1'	\$24°49.40	6.5'	54.5'
19 20	103°52.38 118°52.09	47.18 46.93	152°36.26 167°6.33	11.1' 11.0'	24°55.89 25°2.26	6.4' 6.2'	54.5' 54.4'
20	118°52.09 133°51.80	46.93	167° 6.33 181° 36.36	11.0'	25° 2.26 25° 8.51	6.2	54.4' 54.4'
22	148°51.52	46.43	196°6.34	10.9'	$25^{\circ}14.63$	6.0'	54.4'
23	163°51.23	46.18	210°36.29	10.9'	25°20.64	5.9'	54.4'
	SD = 16.3'	d = -0.2'		SE	0 = 14.9'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-20%
01	03:12	03:26	12:03	06:55	19:18	
02	03:41	03:55	12:04	07:41	20:05	
03	04.09	04.22	12.04	08:29	20.53	

January 04, 05, 06 UT (Mon., Tue., Wed.)

h	Aries	Venu	ıs	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	103°22.91		S16°4.82	300°23.84	N10°52.95	314°34.01	N13°39.21	94°39.25	N01°6.34			
1	$118^{\circ}25.37$	243°20.67	5.41	$315^{\circ}26.09$	52.96	329°36.64	39.28	109°41.62	6.39	Alpheratz Ankaa	357°33.12 353°5.59	29°14.58 -42°9.73
2	133°27.84	258° 20.55	5.99	330°28.33	52.96	344°39.27	39.35	124°43.99	6.44	Schedar	349°29.14	56°41.46
3	148°30.30	273°20.43	• • 6.58	345°30.57	• • 52.97	359°41.90	39.42	139°46.36	• • 6.49	Diphda	348°45.66	-17°50.37
4	163°32.76	288°20.31	7.17	0°32.82	52.97	14°44.53	39.49	154°48.73	6.55	Achernar	335°18.86	-57°6.21
5 6	178° 35.23 193° 37.69	303°20.19 318°20.07	7.76 \$16°8.34	15°35.07 30°37.32	52.98 N10°52.99	29°47.16 44°49.79	39.56 N13°39.63	169°51.10 184°53.46	6.60 N01°6.65	Hamal	$327^{\circ}49.20$	23°35.55
7	208° 40.16	333° 19.95	8.93	45°39.57	52.99	59°52.42	39.69	199°55.83	6.70	Polaris	312°51.65	89°22.94
8	223°42.62	348° 19.83	9.52	60°41.82	53.00	74°55.05	39.76	214°58.20	6.76	Acamar	315°10.29	-40°11.94
9	238°45.09	3° 19.70	• • 10.11	75°44.07	• • 53.01	89°57.69	• • 39.83	230°0.57	• • 6.81	Menkar Mirfak	314°4.23 308°25.53	4°11.76 49°57.61
10	253° 47.55	18° 19.58	10.69	90°46.32	53.02	105° 0.32	39.90	245°2.94	6.86	Aldebaran	290°37.42	16° 33.83
11	268° 50.01	33° 19.45	11.28	105°48.57	53.03	120°2.95	39.97	260°5.30	6.91	Rigel	281°1.96	-8° 10.28
12 13	283°52.48 298°54.94	48° 19.32 S 63° 19.20	16°11.86 12.45	120°50.83 135°53.09	N10°53.04 53.05	135° 5.58 150° 8.22	N13°40.04 40.11	275°7.67 290°10.04	N01°6.96 7.02	Capella	$280^{\circ}18.99$	$46^{\circ}1.54$
14	313° 57.41	78° 19.07	13.04	150°55.34	53.06	165° 10.85	40.11	305°12.41	7.02	Bellatrix	278°20.78	6°22.42
15	328° 59.87		• • 13.62	165°57.60	• • 53.07	180°13.48	40.25	320°14.77	7.12	Elnath	277°59.41	28° 37.81
16	344°2.34	108° 18.81	14.21	180°59.86	53.08	$195^{\circ}16.12$	40.32	$335^{\circ}17.14$	7.18	Alnilam	275°35.73 270°49.96	-1°11.13 7°24.68
17	359°4.80	123° 18.68	14.79	196°2.12	53.10	210°18.75	40.39	350°19.51	7.23	Betelgeuse Canopus	263°51.10	-52°42.63
18	14°7.26		16°15.38	211°4.38	N10°53.11	225°21.39	N13°40.46	5°21.87	N01°7.28	Sirius	258°24.42	-16° 45.25
19	29°9.73	153° 18.41	15.96	226° 6.65	53.12	240°24.02	40.53	20°24.24	7.33	Adhara	255°4.17	-29°0.56
20 21	44°12.19 59°14.66	168° 18.28 183° 18.14	16.54 •• 17.13	241°8.91 256°11.18	53.14 •• 53.15	255°26.66 270°29.29	40.60 •• 40.67	35°26.61 50°28.97	7.39 • • 7.44	Procyon	244°48.77	$5^{\circ}9.25$
22	74° 17.12	198° 18.01	17.71	271°13.44	53.17	285°31.93	40.74	65°31.34	7.49	Pollux	243°14.92	27°57.52
23	89° 19.58	213° 17.87	18.30	286°15.71	53.18	300°34.56	40.81	80°33.71	7.55	Avior	234°13.43	-59°35.68
Maria	pass. 17:04	ν-0.1' d0.6'	' m 1 55	1,2 2/ 40	0′ m-0.21	1,2 6/ 40	1' m-2.43	ν 2.4′ d0.		Suhail	222°44.70 221°37.09	-43°32.43 -69°49.53
ivier.p	va55. 11:U4	ν-υ.1 αυ.0	111-4.35	ν2.2 a0.	U III-U.ZI	ν2.0° α0.	1 111-2.43	ν2.4° α0.	1110.74	Miaplacidus Alphard	221°37.09 217°45.86	-8°46.61
										Regulus	207°32.46	11°49.95
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.71	61°35.96
0 1	104°22.05 119°24.51	228° 17.73 S 243° 17.59	16°18.88 19.46	301°17.98 316°20.25	N10°53.20 53.21	315°37.20 330°39.84	N13° 40.88 40.95	95°36.07 110°38.44	N01°7.60 7.65	Denebola	$182^{\circ}23.18$	14°25.08
2	134° 26.98	258° 17.46	20.04	331° 20.25	53.21	345°42.47	41.03	125°40.80	7.03	Gienah	175°41.82	-17°41.51
3	149°29.44		• • 20.63	346°24.80	• • 53.25	0°45.11	• • 41.10	140°43.17	• • 7.76	Acrux	172°58.13	-63°14.70
4	164°31.91	288° 17.17	21.21	1°27.07	53.26	15°47.75	41.17	155°45.53	7.81	Gacrux Alioth	171°49.71 166°11.56	-57° 15.66 55° 48.42
5	$179^{\circ}34.37$	303°17.03	21.79	16°29.34	53.28	30°50.38	41.24	170°47.90	7.87	Spica	158°20.61	-11° 18.16
6	194°36.83		16°22.37	31°31.62	N10°53.30	45°53.02	N13°41.31	185°50.26	N01°7.92	Alkaid	152°50.85	49° 10.36
7	209°39.30	333°16.75	22.95	46°33.90	53.32	60°55.66	41.38	200°52.63	7.97	Hadar	148°33.83	-60° 29.96
8 9	224°41.76 239°44.23	348°16.60 3°16.46	23.54 •• 24.12	61°36.18 76°38.46	53.34 •• 53.36	75°58.30 91°0.94	41.45 •• 41.52	215°54.99 230°57.36	8.03 •• 8.08	Menkent	147°55.79	-36° 30.05
10	254° 46.69	18° 16.31	24.12	91°40.74	53.38	106° 3.58	41.60	245°59.72	8.14	Arcturus	145°46.54	19°2.31
11	269° 49.15	33° 16.16	25.28	106°43.02	53.40	121°6.22	41.67	261°2.08	8.19	Rigil Kent. Kochab	139°38.28	-60°56.59
12	284°51.62	48°16.01 S	16°25.86	121°45.30	N10°53.42	136°8.86	N13°41.74	276°4.45	N01°8.24	Zuben'ubi	137°20.51 136°54.36	74°2.28 -16°9.22
13	299°54.08	63° 15.86	26.44	136°47.58	53.44	151°11.50	41.81	291°6.81	8.30	Alphecca	126°2.60	26° 37.23
14	314° 56.55	78° 15.71	27.02	151°49.87	53.47	166°14.14	41.88	306°9.17	8.35	Antares	$112^{\circ}14.11$	-26° 29.45
15 16	329°59.01 345°1.48	93°15.56 108°15.41	· · 27.60 28.18	166°52.16 181°54.44	· · 53.49 53.51	181°16.78 196°19.42	· · 41.96 42.03	321°11.54 336°13.90	· · 8.41	Atria	107°7.34	-69°4.36
17	0°3.94	123° 15.26	28.76	196°56.73	53.54	211°22.06	42.03	351°16.26	8.46 8.52	Sabik	102°1.21	-15°45.48
18	15°6.40		16°29.34	211°59.02	N10°53.56	226°24.70	N13°42.17	6°18.63	N01°8.57	Shaula	96°8.53 95°57.35	-37°7.32 12°32.36
19	30°8.87	$153^{\circ}14.95$	29.92	227°1.31	53.59	241°27.34	42.25	21°20.99	8.62	Rasalhague Eltanin	90°41.95	51° 29.00
20	45° 11.33	168° 14.80	30.49	242°3.61	53.61	256°29.99	42.32	36°23.35	8.68	Kaus Aust.	83°30.74	-34°22.26
21	60°13.80		• • 31.07	257° 5.90	• • 53.64	271°32.63	• • 42.39	51°25.71	• • 8.73	Vega	80°32.54	38°48.48
22 23	75° 16.26 90° 18.73	198° 14.48 213° 14.32	31.65 32.23	272°8.20 287°10.49	53.66 53.69	286°35.27 301°37.91	42.46 42.54	66°28.08 81°30.44	8.79 8.84	Nunki	$75^{\circ}46.10$	-26° 15.77
		-				-				Altair	61°58.68	8°56.40
Mer.p	bass. 17:00	ν -0.1' d 0.6'	m-4.54	$\nu 2.3' d0.$	0′ m-0.24	$\nu 2.6' d0$.1′ m-2.44	ν 2.4′ d0.	1′ m0.74	Peacock Deneb	53°3.72 49°25.10	-56°38.94 45°22.73
										Enif	33°37.43	45 22.73 10°0.00
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.19	-46°49.94
0	105°21.19		16°32.80	302°12.79	N10°53.72	316°40.56	N13° 42.61	96°32.80	N01°8.90	Fomalhaut	$15^{\circ}12.90$	-29°28.85
1	120°23.65	243°14.01	33.38	317°15.09	53.74	331°43.20	42.68	111°35.16	8.95	Scheat	13°43.76	28° 13.95
2 3	135°26.12 150°28.58	258° 13.84 273° 13.68	33.96 •• 34.54	332°17.39 347°19.69	53.77 •• 53.80	346°45.84 1°48.49	42.76 •• 42.83	126°37.52 141°39.88	9.01 •• 9.06	Markab	13°28.40	15°21.16
4	165°31.05	288° 13.52	35.11	2°21.99	53.83	16°51.13	42.03	141 39.00 156°42.25	9.12	Jan 04 Mon	SHA	Mer.pass
5	180°33.51	303°13.36	35.69	17°24.29	53.86	31°53.78	42.98	171°44.61	9.17	Venus	124°57.88	08:47
6	195°35.97	318°13.19 S	16°36.26	32°26.60	N10°53.89	46°56.42	N13°43.05	186°46.97	N01°9.23	Mars	197°0.93	03:58
7	210°38.44	333° 13.03	36.84	47°28.90	53.92	61°59.07	43.13	201°49.33	9.28	Jupiter	211°11.10	03:01
8	225°40.90	348° 12.86	37.41	62°31.21	53.95	77°1.71	43.20	216°51.69	9.34	Saturn	351°16.34	17:39
9 10	240° 43.37 255° 45.83	3° 12.70 18° 12.53	37.99	77°33.51 92°35.82	· · 53.98	92°4.36 107°7.01	· · 43.27	231°54.05 246°56.41	• • 9.40	Jan 05 Tue	SHA	Mer.pass
11	270° 48.30	33°12.36	38.56 39.14	92 35.62 107°38.13	54.02 54.05	107 7.01 122° 9.65	43.35 43.42	240 50.41 261°58.77	9.45 9.51		123°55.68	08:47
12	285°50.76		16°39.71	122°40.45	N10°54.08	137°12.30	N13°43.50	277°1.13	N01° 9.56		196°55.93	03:54
13	300°53.22	63°12.02	40.29	137°42.76	54.12	152°14.95	43.57	292°3.49	9.62	Jupiter Saturn	211°15.15 351°14.02	02:57 17:35
14	315°55.69	78° 11.85	40.86	152°45.07	54.15	167°17.59	43.64	307°5.85	9.67			
15	330°58.15		• • 41.43	167°47.39	• • 54.18	182°20.24	• • 43.72	322°8.21	• • 9.73	Jan 06 Wed	SHA	Mer.pass
16 17	346°0.62 1°3.08	108° 11.50 123° 11.33	42.01 42.58	182°49.70 197°52.02	54.22 54.25	197°22.89 212°25.54	43.79 43.87	337°10.57 352°12.93	9.79 9.84		122°52.98	08:47
17 18	1 3.08 16°5.55		42.58 16°43.15	212°54.34	54.25 N10°54.29	212 25.54 227°28.19	43.87 N13°43.94	7°15.28	9.84 N01° 9.90	1	196°51.60 211°19.37	03:51 02:53
19	31°8.01	153° 10.98	43.72	227°56.66	54.33	242°30.83	44.02	22°17.64	9.95	Saturn	351°11.61	17:31
20	$46^{\circ}10.47$	$168^{\circ}10.80$	44.29	242°58.98	54.36	257°33.48	44.09	37°20.00	10.01			
21	61°12.94		• • 44.87	258° 1.30	• • 54.40	272°36.13	• • 44.17	52°22.36	• • 10.07	Horizor	ntal parallax	0.2
22	76°15.40	198° 10.45	45.44 46.01	273°3.62	54.44	287°38.78 302°41.43	44.24	67°24.72	10.12		Venus: Mars:	0.2 0.2
23	91°17.87	213°10.27	46.01	288° 5.95	54.48		44.32	82°27.08	10.18			V
Mer.p	bass. 16:56	ν-0.2' d0.6'	m-4.53	$\nu 2.3' d0.$	0′ m-0.26	ν 2.6′ d0.	.1′ m-2.44	ν 2.4′ d0.	1′ m0.75			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.94	\$22°45.92	225°6.20	10.9'	S25°26.52	5.8'	54.4'
1	193°50.66	45.67	239°36.07	10.8'	25°32.28	5.6'	54.4'
2	208°50.37	45.41	254°5.90	10.8'	25°37.92	5.5'	54.4'
3 4	223°50.09 238°49.80	· · 45.15 44.90	268°35.69 283°5.44	10.8' 10.7'	25°43.44 25°48.83	5.4' 5.3'	54.3' 54.3'
5	253°49.52	44.64	203 5.44 297°35.16	10.7	25°54.09	5.1'	54.3'
6	268°49.23	S22°44.38	312°4.84	10.6'	S25°59.24	5.0'	54.3'
7	283°48.94	44.12	326°34.49	10.6'	$26^{\circ}4.25$	4.9'	54.3'
8	298°48.66	43.86	341°4.10	10.6'	26°9.14	4.8'	54.3'
9	313°48.38	· · 43.60 43.34	355°33.68	10.5'	26°13.91	4.6'	54.3' 54.3'
10 11	328°48.09 343°47.81	43.34 43.08	10°3.23 24°32.75	10.5' 10.5'	26° 18.54 26° 23.05	4.5' 4.4'	54.3' 54.2'
12	358°47.52	\$22°42.81	39°2.23	10.5	S26°27.44	4.3'	54.2'
13	13°47.24	42.55	53°31.68	10.4'	$26^{\circ}31.69$	4.1'	54.2'
14	28°46.95	42.28	68°1.10	10.4'	26°35.82	4.0'	54.2'
15	43°46.67 58°46.39	• • 42.02	82°30.50 96°59.87	10.4'	26°39.82 26°43.68	3.9' 3.7'	54.2' 54.2'
16 17	73°46.10	41.75 41.48	90 59.87 111°29.21	10.3' 10.3'	26 43.08 26°47.42	3. <i>1</i> 3.6'	54.2'
18	88°45.82	\$22°41.21	125°58.52	10.3	\$26°51.03	3.5'	54.2'
19	103°45.54	40.95	140°27.81	10.3'	$26^{\circ}54.51$	3.3'	54.2'
20	118°45.25	40.68	154° 57.07	10.2'	26°57.86	3.2'	54.1'
21	133°44.97	• • 40.41	169°26.32	10.2'	27°1.08	3.1'	54.1'
22 23	148°44.69 163°44.41	40.13 39.86	183°55.54 198°24.74	10.2' 10.2'	27°4.16 27°7.12	3.0' 2.8'	54.1' 54.1'
23			150 24.14			2.0	J4.1
	SD = 16.3'	d = -0.3'		SD	0 = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.12 193°43.84	\$22°39.59	212°53.92 227°23.08	10.2'	\$27°9.94	2.7'	54.1'
1 2	193°43.84 208°43.56	39.32 39.04	227°23.08 241°52.22	10.1' 10.1'	27°12.63 27°15.19	2.6' 2.4'	54.1' 54.1'
3	223°43.28	38.77	256°21.34	10.1	27° 17.62	2.3'	54.1'
4	238°43.00	38.49	270°50.45	10.1'	27° 19.91	2.2'	54.1'
5	253°42.72	38.21	$285^{\circ}19.55$	10.1'	$27^{\circ}22.07$	2.0'	54.1'
6	268°42.43	\$22°37.94	299°48.63	10.1'	S27°24.10	1.9'	54.1'
7 8	283°42.15 298°41.87	37.66 37.38	314°17.70 328°46.76	10.1' 10.0'	27°26.00 27°27.76	1.8' 1.6'	54.1' 54.0'
9	313°41.59	37.10	343°15.80	10.0'	27°29.39	1.5'	54.0'
10	328°41.31	36.82	357°44.84	10.0'	27°30.88	1.4'	54.0'
11	343°41.03	36.54	12° 13.87	10.0'	$27^{\circ}32.24$	1.2'	54.0'
12	358°40.75	\$22°36.25	26°42.89	10.0'	S27°33.47	1.1'	54.0'
13 14	13°40.47 28°40.19	35.97 35.69	41°11.91 55°40.93	10.0' 10.0'	27°34.56 27°35.52	1.0' 0.8'	54.0' 54.0'
15	43°39 91	35.40	70°9.94	10.0'	27°36.35	0.8	54.0'
16	58°39.63	35.12	84°38.94	10.0'	27°37.04	0.6'	54.0'
17	73°39.36	34.83	99°7.95	10.0'	$27^{\circ}37.59$	0.4'	54.0'
18	88°39.08	\$22°34.55	113°36.96	10.0'	\$27°38.02	0.3'	54.0'
19 20	103°38.80 118°38.52	34.26 33.97	128°5.97 142°34.98	10.0' 10.0'	27°38.31 27°38.46	0.2' 0.0'	54.0' 54.0'
21	133°38.24	• • 33.68	142 34.96 157°4.00	10.0'	27°38.48	-0.1	54.0'
22	148°37.96	33.39	171°33.02	10.0'	27°38.37	-0.2	54.0'
23	163°37.68	33.10	$186^{\circ}2.05$	10.0'	$27^{\circ}38.12$	-0.4'	53.9'
	SD = 16.3'	d = -0.3'		SD	0 = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178°37.41	522°32.81	200°31.08	10.0'	\$27°37.74	-0.5'	53.9'
1	193°37.13	32.52	$215^{\circ}0.12$	10.1'	$27^{\circ}37.22$	-0.6'	53.9'
2	208°36.85	32.22	229°29.18	10.1'	27°36.58	-0.8'	53.9'
3	223°36.58 238°36.30	· · 31.93 31.63	243°58.24 258°27.32	10.1'	27°35.79 27°34.88	-0.9'	53.9'
4 5	238°36.30 253°36.02	31.63 31.34	258°27.32 272°56.41	10.1' 10.1'	27°34.88 27°33.83	-1.0' -1.2'	53.9' 53.9'
6	268°35.74	S22°31.04	287°25.51	10.1	\$27°32.65	-1.3'	53.9'
7	283°35.47	30.75	$301^{\circ}54.63$	10.1'	27°31.33	-1.4'	53.9'
8	298°35.19	30.45	316°23.77	10.2'	27°29.89	-1.6'	53.9'
9 10	313°34.92 328°34.64	· · 30.15 29.85	330°52.92 345°22.10	10.2' 10.2'	27°28.31 27°26.59	-1.7' -1.8'	53.9' 53.9'
10	328 34.64 343°34.37	29.85 29.55	345 22.10 359°51.29	10.2'	27 26.59 27°24.75	-1.8 -2.0'	53.9'
12	358°34.09	S22° 29.25	14° 20.51	10.2'	\$27°22.77	-2.1	53.9'
13	13°33.81	28.95	28°49.75	10.3'	27° 20.67	-2.2'	53.9'
14	28°33.54	28.65	43° 19.01	10.3'	27°18.43	-2.4'	53.9'
15 16	43°33.26 58°32.99	· · 28.34 28.04	57°48.30 72°17.62	10.3' 10.3'	27°16.06 27°13.56	-2.5' -2.6'	53.9'
16 17	58°32.99 73°32.72	28.04 27.73	72°17.62 86°46.96	10.3'	27°13.56 27°10.93	-2.6′ -2.8′	53.9' 53.9'
18	88°32.44	522°27.43	101°16.33	10.4	\$27°8.18	-2.9'	53.9
19	103°32.17	27.12	115°45.72	10.4'	27°5.29	-3.0'	53.9'
20	118°31.89	26.82	130° 15.15	10.5'	27°2.27	-3.1'	53.9'
21	133°31.62	•• 26.51	144°44.61	10.5'	26°59.12	-3.3'	53.9'
22 23	148°31.35 163°31.07	26.20 25.89	159°14.10 173°43.63	10.5' 10.6'	26°55.85 26°52.45	-3.4' -3.5'	53.9' 53.9'
23		_	113 43.03			-3.3	55.9
	SD = 16.3'	d = -0.3'		SD	0 = 14.7'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	13-3%
04	04:36	04:50	12:05	09:18	21:44	
05	05:04	05:17	12:05	10:09	22:35	
06	05:30	05:44	12:06	11:01	23:26	

January 07, 08, 09 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	106° 20.33	228°10.09 \$16°46.58	303°8.27 N10°54.52	317°44.08 N13°44.39	97°29.43 N01°10.24	
1	121°22.79	243°9.91 47.15	318°10.60 54.56	332°46.73 44.47	112°31.79 10.29	Alpheratz 357°33.13 29°14.58
2	136° 25.26	258°9.73 47.72	333°12.93 54.60	347°49.38 44.54	127°34.15 10.35	Ankaa 353°5.60 -42°9.73
3	151° 27.72	273°9.54 · · 48.29	348°15.26 · · 54.64	2°52.03 · · 44.62	142°36.51 · · 10.41	Schedar 349°29.16 56°41.46
4	166°30.19	288°9.36 48.86	3°17.59 54.68	17°54.69 44.70	157°38.86 10.46	Diphda 348°45.66 -17°50.38
5	181°32.65	303°9.18 49.43	18° 19.92 54.72	32°57.34 44.77	172°41.22 10.52	Achernar 335°18.88 -57°6.21 Hamal 327°49.20 23°35.55
6	196° 35.12	318°8.99 \$16°50.00	33°22.25 N10°54.76	47°59.99 N13°44.85	187°43.58 N01°10.58	Polaris 312°52.67 89°22.95
7	211° 37.58	333°8.81 50.56	48°24.58 54.80	63°2.64 44.92	202°45.94 10.63	Acamar 315°10.30 -40°11.95
8	226° 40.04	348°8.62 51.13	63°26.92 54.85	78° 5.29 45.00	217°48.29 10.69	Menkar 314°4.23 4°11.76
9	241° 42.51	3°8.43 · · 51.70	78°29.26 · · 54.89	93°7.95 · · 45.08	232°50.65 · · 10.75	Mirfak 308°25.53 49°57.62
10 11	256° 44.97 271° 47.44	18°8.24 52.27 33°8.05 52.84	93°31.59 54.93 108°33.93 54.98	108°10.60 45.15 123°13.25 45.23	247°53.00 10.80 262°55.36 10.86	Aldebaran 290°37.42 16°33.83
12	286° 49.90	48°7.86 \$16°53.40	123°36.27 N10°55.02	138°15.91 N13°45.30	277°57.72 N01°10.92	Rigel 281°1.96 -8°10.28
13	301°52.37	63°7.67 53.97	138°38.61 55.07	153°18.56 45.38	293°0.07 10.98	Capella 280°18.98 46°1.55
14	316°54.83	78°7.48 54.54	153°40.96 55.11	168°21.21 45.46	308°2.43 11.03	Bellatrix 278°20.78 6°22.41 Elnath 277°59.40 28°37.81
15	331°57.29	93°7.29 · · 55.10	168°43.30 · · 55.16	183°23.87 · · 45.53	323°4.78 · · 11.09	Elnath 277°59.40 28°37.81 Alnilam 275°35.72 -1°11.13
16	346° 59.76	108°7.10 55.67	183°45.64 55.21	198°26.52 45.61	338°7.14 11.15	Betelgeuse 270°49.95 7°24.67
17	2°2.22	123°6.90 56.23	198°47.99 55.25	213°29.18 45.69	353°9.49 11.21	Canopus 263°51.10 -52°42.65
18	17°4.69 32°7.15	138°6.71 S16°56.80 153°6.51 57.36	213°50.34 N10°55.30 228°52.69 55.35	228°31.83 N13°45.77 243°34.49 45.84	8°11.85 N01°11.26 23°14.20 11.32	Sirius 258°24.42 -16°45.26
19 20	47°9.61	168°6.31 57.93	228°52.69 55.35 243°55.04 55.40	243°34.49 45.84 258°37.15 45.92	23°14.20 11.32 38°16.56 11.38	Adhara 255°4.17 -29°0.58
21	62°12.08	183°6.12 · · 58.49	258°57.39 · · 55.45	273°39.80 · · 46.00	53°18.91 · · 11.44	Procyon 244°48.76 5°9.24
22	77° 14.54	198°5.92 59.06	273°59.74 55.50	288°42.46 46.07	68°21.27 11.50	Pollux 243°14.90 27°57.52
23	92°17.01	213°5.72 59.62	289°2.09 55.55	303°45.12 46.15	83°23.62 11.55	Avior 234°13.41 -59°35.70 Suhail 222°44.68 -43°32.45
Meri	pass. 16:52	ν-0.2' d0.6' m-4.51	$\nu 2.3' \ d0.0' \ \text{m-0.28}$	ν2.7' d0.1' m-2.45	ν 2.4' d 0.1' m 0.75	Miaplacidus 221°37.07 -69°49.55
	pass. 10.52	- 0.2 do.0 iii 4.31			- VZ.4 UO.1 1110.75	Alphard 217°45.84 -8°46.62
						Regulus 207°32.44 11°49.94
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.66 61°35.96
0 1	107° 19.47 122° 21.94	228°5.52 \$17°0.18 243°5.32 0.75	304°4.45 N10°55.60 319°6.80 55.65	318°47.77 N13°46.23 333°50.43 46.31	98°25.98 N01°11.61 113°28.33 11.67	Denebola 182°23.15 14°25.07
2	137° 24.40	258°5.11 1.31	334° 9.16 55.70	348°53.09 46.39	128°30.68 11.73	Gienah 175°41.79 -17°41.53
3	152°26.86	273°4.91 · · 1.87	349°11.52 · · 55.75	3°55.75 · · 46.46	143°33.04 · · 11.79	Acrux 172°58.08 -63°14.71
4	167° 29.33	288°4.71 2.43	4°13.88 55.80	18°58.40 46.54	158°35.39 11.84	Gacrux 171°49.67 -57°15.67 Alioth 166°11.52 55°48.41
5	182°31.79	303°4.50 2.99	19° 16.24 55.86	34°1.06 46.62	173°37.74 11.90	Alioth 166°11.52 55°48.41 Spica 158°20.58 -11°18.17
6	197°34.26	318°4.30 S 17°3.55	34°18.60 N10°55.91	49°3.72 N13°46.70	188°40.10 N01°11.96	Alkaid 152°50.81 49°10.35
7	212°36.72	333°4.09 4.12	49°20.96 55.96	64°6.38 46.78	203°42.45 12.02	Hadar 148°33.78 -60°29.97
8	227°39.18	348°3.88 4.68	64°23.32 56.02	79° 9.04 46.85	218°44.80 12.08	Menkent 147°55.75 -36°30.05
9 10	242°41.65 257°44.11	3°3.68 · · 5.24 18°3.47 5.80	79°25.69 · · 56.07 94°28.06 56.13	94°11.70 · · 46.93 109°14.36 47.01	233°47.16 · · 12.14 248°49.51 12.20	Arcturus 145°46.51 19°2.30
11	272° 46.58	33°3.26 6.36	109°30.42 56.19	109 14.30 47.01 124°17.02 47.09	263°51.86 12.25	Rigil Kent. 139°38.23 -60°56.60
12	287° 49.04	48°3.05 \$17°6.91	124°32.79 N10°56.24	139°19.68 N13°47.17	278°54.21 N01°12.31	Kochab 137°20.45 74°2.26
13	302°51.51	63°2.84 7.47	139°35.16 56.30	154°22.34 47.25	293°56.56 12.37	Zuben'ubi 136°54.33 -16°9.23 Alphecca 126°2.57 26°37.22
14	$317^{\circ}53.97$	78°2.62 8.03	154°37.53 56.36	169°25.00 47.33	308°58.92 12.43	Alphecca 126°2.57 26°37.22 Antares 112°14.09 -26°29.45
15	332°56.43	93°2.41 · · 8.59	169°39.91 · · 56.42	184°27.66 · · 47.40	324°1.27 · · 12.49	Atria 107°7.29 -69°4.35
16	347°58.90	108°2.20 9.15	184°42.28 56.47	199°30.32 47.48	339°3.62 12.55	Sabik 102°1.18 -15°45.48
17	3°1.36	123°1.98 9.71	199°44.66 56.53	214°32.98 47.56	354°5.97 12.61	Shaula 96°8.50 -37°7.32
18 19	18°3.83 33°6.29	138°1.77 S17°10.26 153°1.55 10.82	214°47.03 N10°56.59 229°49.41 56.65	229°35.65 N13°47.64 244°38.31 47.72	9°8.32 N01°12.67 24°10.67 12.73	Rasalhague 95°57.33 12°32.35
20	48°8.75	168°1.33 11.38	229°49.41 56.65 244°51.79 56.71	244°38.31 47.72 259°40.97 47.80	39°13.02 12.79	Eltanin 90°41.93 51°28.99
21	63°11.22	183°1.12 · · 11.93	259°54.17 · · 56.77	274°43.63 · · 47.88	54°15.37 · · 12.85	Kaus Aust. 83°30.72 -34°22.25
22	78° 13.68	198°0.90 12.49	274°56.55 56.84	289°46.30 47.96	69°17.73 12.91	Vega 80°32.53 38°48.46 Nunki 75°46.08 -26°15.76
23	93°16.15	213°0.68 13.04	289°58.93 56.90	304°48.96 48.04	84°20.08 12.97	Nunki 75°46.08 -26°15.76 Altair 61°58.67 8°56.40
Meri	pass. 16:48	ν-0.2' d0.6' m-4.50	ν 2.4' d 0.1' m-0.31	$\nu 2.7' \ d0.1' \ \text{m-}2.45$	ν 2.4' d 0.1' m 0.75	Peacock 53°3.72 -56°38.92
- IVICI.	pass. 10.40	ν-0.2 d0.0 iii-4.30				Deneb 49°25.10 45°22.71
_						Enif 33°37.42 10°0.00
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.20 -46°49.93
0 1	108° 18.61 123° 21.08	228°0.46 \$17°13.60 243°0.24 14.15	305°1.32 N10°56.96 320°3.70 57.02	319°51.62 N13°48.12 334°54.29 48.20	99°22.43 N01°13.02 114°24.78 13.08	Fomalhaut 15°12.90 -29°28.85
2	123 21.06 138°23.54	258°0.01 14.71	335°6.09 57.09	349°56.95 48.28	129°27.13 13.14	Scheat 13°43.77 28°13.94
3	153° 26.00	272°59.79 · · 15.26	350°8.47 · · 57.15	4°59.62 · · 48.36	144°29.48 · · 13.20	Markab 13°28.41 15°21.15
4	168°28.47	287°59.57 15.81	5°10.86 57.22	20°2.28 48.44	159°31.83 13.26	Jan 07 Thu SHA Mer.pass
5	183°30.93	302°59.34 16.37	20°13.25 57.28	35°4.95 48.52	174°34.18 13.32	Venus 121°49.76 08:47
6	198°33.40	317°59.12 \$17°16.92	35°15.64 N10°57.35	50°7.61 N13°48.60	189°36.52 N01°13.38	Mars 196°47.94 03:47
7	213°35.86	332°58.89 17.47	50°18.03 57.41	65°10.28 48.68	204°38.87 13.44	Jupiter 211°23.75 02:49
8 9	228° 38.32 243° 40.79	347°58.66 18.02 2°58.43 •• 18.58	65°20.43 57.48 80°22.82 • 57.54	80°12.94 48.76 95°15.61 • 48.84	219°41.22 13.50 234°43.57 · · 13.56	Saturn 351°9.10 17:27
10	258° 43.25	17°58.21 19.13	95°25.22 57.61	110°18.28 48.92	249°45.92 13.62	Jan 08 Fri SHA Mer.pass
11	273° 45.72	32°57.98 19.68	110°27.62 57.68	125°20.94 49.00	264°48.27 13.68	Venus 120°46.05 08:48
12	288° 48.18	47°57.75 \$17°20.23	125°30.01 N10°57.75	140°23.61 N13°49.08	279°50.62 N01°13.75	Mars 196°44.97 03:43
13	303°50.65	62°57.51 20.78	140°32.41 57.82	155°26.28 49.16	294°52.96 13.81	Jupiter 211°28.30 02:44 Saturn 351°6.51 17:24
14	318°53.11	77°57.28 21.33	155°34.81 57.89	170°28.94 49.25	309°55.31 13.87	Jatum 331 0.31 17:24
15	333°55.57	92°57.05 · · 21.88	170°37.22 · · 57.96	185°31.61 · · 49.33	324°57.66 · · 13.93	Jan 09 Sat SHA Mer.pass
16	348° 58.04	107°56.82 22.43	185°39.62 58.03	200°34.28 49.41	340°0.01 13.99	Venus 119°41.84 08:48
17 18	4°0.50 19°2.97	122°56.58 22.98 137°56.35 \$17°23.52	200°42.02 58.10 215°44.43 N10°58.17	215°36.95 49.49 230°39.62 N13°49.57	355°2.36 14.05 10°4.70 N01°14.11	Mars 196° 42.70 03:39
19	34°5.43	152°56.11 24.07	230°46.84 58.24	245°42.29 49.65	25°7.05 14.17	Jupiter 211°33.01 02:40 Saturn 351°3.81 17:20
20	49°7.89	167°55.87 24.62	245°49.25 58.31	260°44.96 49.73	40°9.40 14.23	
21	64° 10.36	182°55.64 · · 25.17	260°51.66 · · 58.39	275°47.63 · · 49.82	55°11.74 · · 14.29	Horizontal parallax
22	79° 12.82	197°55.40 25.71	275°54.07 58.46	290°50.30 49.90	70°14.09 14.35	Venus: 0.2
23	94° 15.29	212°55.16 26.26	290°56.48 58.53	305°52.97 49.98	85°16.44 14.41	Mars: 0.2
Mer.	pass. 16:44	ν-0.2' d0.6' m-4.49	ν2.4' d0.1' m-0.33	ν2.7' d0.1' m-2.46	ν2.4' d0.1' m0.75	

h	Su	n			Moon		
hu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.80	S22°25.58	$188^{\circ}13.19$	10.6'	S26°48.92	-3.7'	53.9
1	193°30.53	25.27	202°42.79	10.6'	26°45.26	-3.8'	53.9
2	208°30.26	24.96	217°12.42	10.7'	26°41.48	-3.9'	53.9
	223°29.98	• • 24.64	231°42.08	10.7'	26°37.57	-4.0'	53.9
	238°29.71	24.33	246°11.79	10.7'	26°33.54	-4.2'	53.9
	253°29.44	24.02	260°41.54	10.8'	26°29.38	-4.3'	53.9
	268°29.17	\$22°23.70	275°11.32	10.8'	\$26°25.10	-4.4'	53.9
	283°28.90	23.39	289°41.15	10.9'	26°20.69	-4.5'	53.9
	298°28.63	23.07	304°11.02	10.9'	26°16.16	-4.7'	53.9
)	313°28.35	• • 22.75	318°40.93	11.0'	26°11.51	-4.8'	53.9
0	328°28.08	22.44	333°10.88	11.0'	26° 6.73	-4.9'	53.9
1	343°27.81	22.12	347°40.88	11.0'	26°1.83	-5.0'	53.9
2	358° 27.54	S22°21.80	2°10.92	11.1'	\$25°56.81	-5.1'	53.9
3	13°27.27	21.48	16°41.01	11.1'	25°51.67	-5.3'	53.9
4	28° 27.00	21.16	31°11.14	11.2'	25°46.42	-5.4'	53.9
5	43°26.73	• • 20.84	45°41.32	11.2'	25°41.04	-5.5'	53.9
5	58° 26.46	20.51	60°11.55	11.3'	25°35.54	-5.6'	53.9
7	73°26.19	20.19	74°41.83	11.3'	25°29.92	-5.7'	53.9
3	88°25.92	\$22°19.87	89°12.15	11.4'	\$25°24.19	-5.8'	53.9
9	103°25.66	19.54	103°42.53	11.4'	25°18.34	-6.0'	53.9
0	118°25.39	19.22	118°12.95	11.5'	25°12.37	-6.1'	53.9
1	133°25.12	• • 18.89	132°43.43	11.5'	25°6.29	-6.2	53.9
2	148°24.85	18.57	147°13.96	11.6'	25° 0.10	-6.3'	53.9
3	163°24.58	18.24	161°44.53	11.6'	24°53.79	-6.4'	53.9
	SD = 16.3'	d = -0.3'		SI	D = 14.7'		
ri	GHA	Dec	GHA	ν	Dec	d	НР
1	178°24.31	S22°17.91	176°15.17	11.7'	\$24°47.36	-6.5'	53.9
	193°24.05	17.58	190°45.85	11.7'	24°40.82	-6.6'	53.9
	208°23.78	17.25	205°16.59	11.8'	24°34.17	-6.8'	53.9
	223°23.51	• • 16.92	219°47.38	11.8'	24°27.41	-6.9'	53.9
	238°23.24	16.59	234°18.23	11.9'	24°20.54	-7.0'	53.9
	253°22.98	16.26	248°49.13	12.0'	24°13.56	-7.1'	53.9
i	268°22.71	S22°15.92	263°20.08	12.0'	\$24°6.47	-7.2'	53.9
	283°22.45	15.59	277°51.09	12.1'	23°59.27	-7.3'	53.9
	298°22.18	15.25	292°22.16	12.1'	23°51.97	-7.4'	53.9
1	313°21.91	• • 14.92	306°53.28	12.2'	23°44.55	-7.5'	53.9
0	328°21.65	14.58	321°24.46	12.2'	23°37.03	-7.6'	53.9
1	343°21.38	14.25	335°55.70	12.3'	23°29.41	-7.7'	53.9
2	358°21.12	522°13.91	350°26.99	12.3'	S23°21.68	-7.8'	53.9
3	13°20.85	13.57	4°58.34	12.4'	23°13.84	-7.9'	53.9
4	28°20.59	13.23	19°29.74	12.5'	23°5.90	-8.0'	53.9
5	43°20.32	• • 12.89	34°1.21	12.5'	22°57.86	-8.1'	53.9
6	58°20.06	12.55	48°32.73	12.6'	22°49.72	-8.2'	53.9
7	73°19.79	12.21	63°4.31	12.6'	22°41.48	-8.3'	53.9
8	88°19.53	S22°11.87	77°35.94	12.7'	\$22°33.14	-8.4'	53.9
9	103°19.27	11.53	92°7.64		22°24.70	-8.5'	53.9
0	118° 19.00	11.18	106°39.39	12.8'	22°16.16	-8.6'	54.0
1	133°18.74	• • 10.84	121°11.20	12.9'	22°7.52	-8.7'	54.0
2	148° 18.48	10.49	135°43.07	12.9'	21°58.78	-8.8'	54.0
3	163°18.22	10.15	150°14.99	13.0'	21°49.95	-8.9'	54.0
	SD = 16.3'	d = -0.3'		51	D = 14.7'		
ıt	GHA	Dec	GHA	ν	Dec	d	HP
1	$178^{\circ}17.95$	S22°9.80	164°46.98	13.0'	S21°41.03	-9.0'	54.0
	193° 17.69	9.45	$179^{\circ}19.02$	13.1'	$21^{\circ}32.01$	-9.1'	54.0
	208° 17.43	9.10	193°51.12	13.2'	21°22.89	-9.2'	54.0
	223°17.17	• • 8.76	208°23.28	13.2'	$21^{\circ}13.69$	-9.3'	54.0
	$238^{\circ}16.91$	8.41	222°55.49	13.3'	21°4.39	-9.4'	54.0
	253°16.64	8.06	237°27.77	13.3'	$20^{\circ}55.00$	-9.5'	54.0
	268° 16.38	\$22°7.70	252°0.10	13.4'	S20°45.52	-9.6'	54.0
	$283^{\circ}16.12$	7.35	266°32.48	13.4'	$20^{\circ}35.95$	-9.7'	54.0
	$298^{\circ}15.86$	7.00	281°4.93	13.5'	20°26.29	-9.7'	54.0
	313° 15.60	• • 6.65	295°37.43	13.6'	20°16.54	-9.8'	54.0
			$310^{\circ}9.99$	13.6'	$20^{\circ}6.71$	-9.9'	54.0
	$328^{\circ}15.34$	6.29					54.0
) 1	343° 15.08	5.94	324°42.60	13.7'	19°56.79	-10.0'	
0 1 2	343° 15.08 358° 14.82	5.94 \$22° 5.58	324°42.60 339°15.27	13.7'	S 19°46.78	-10.1'	54.1
0 1 2 3	343° 15.08 358° 14.82 13° 14.56	5.94 \$22° 5.58 5.23	324°42.60 339°15.27 353°48.00	13.7' 13.8'	\$19°46.78 19°36.69	-10.1' -10.2'	54.1 54.1
0 1 2 3	343° 15.08 358° 14.82 13° 14.56 28° 14.30	5.94 \$22° 5.58 5.23 4.87	324°42.60 339°15.27 353°48.00 8°20.78	13.7' 13.8' 13.8'	\$19°46.78 19°36.69 19°26.52	-10.1' -10.2' -10.3'	54.1 54.1 54.1
0 1 2 3	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04	5.94 \$22° 5.58 5.23 4.87 · · 4.51	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62	13.7' 13.8' 13.8' 13.9'	\$19°46.78 19°36.69 19°26.52 19°16.26	-10.1' -10.2' -10.3' -10.3'	54.1 54.1 54.1 54.1
0 1 2 3 4	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79	5.94 \$22° 5.58 5.23 4.87 • • 4.51 4.15	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51	13.7' 13.8' 13.8'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93	-10.1' -10.2' -10.3'	54.1 54.1 54.1 54.1 54.1
0 1 2 3 4 5	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53	5.94 \$22° 5.58 5.23 4.87 • 4.51 4.15 3.79	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46	13.7' 13.8' 13.8' 13.9'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51	-10.1' -10.2' -10.3' -10.3'	54.1 54.1 54.1 54.1 54.1 54.1
0 1 2 3 4 5 6 7	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27	5.94 \$22° 5.58 5.23 4.87 · · 4.51 4.15 3.79 \$22° 3.43	324° 42.60 339° 15.27 353° 48.00 8° 20.78 22° 53.62 37° 26.51 51° 59.46 66° 32.46	13.7' 13.8' 13.8' 13.9' 14.0' 14.1'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51 \$18°45.00	-10.1' -10.2' -10.3' -10.3' -10.4' -10.5' -10.6'	54.1 54.1 54.1 54.1 54.1 54.1
0 1 1 2 3 4 5 6 7 8	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27 103° 13.01	5.94 \$22° 5.58 5.23 4.87 • 4.51 4.15 3.79	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46	13.7' 13.8' 13.8' 13.9' 13.9' 14.0'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51 \$18°45.00 18°34.42	-10.1' -10.2' -10.3' -10.3' -10.4' -10.5'	54.1 54.1 54.1 54.1 54.1 54.1
0 1 2 3 4 5 6 7 8 9	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27 103° 13.01 118° 12.75	5.94 \$22° 5.58 5.23 4.87 · 4.51 4.15 3.79 \$22° 3.43 3.07 2.71	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46 66°32.46 81°5.51 95°38.62	13.7' 13.8' 13.8' 13.9' 14.0' 14.1' 14.1' 14.2'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51 \$18°45.00 18°34.42 18°23.77	-10.1' -10.2' -10.3' -10.4' -10.5' -10.6' -10.7' -10.7'	54.1 54.1 54.1 54.1 54.1 54.1 54.1 54.1
) 1 2 3 4 5 5 7 7 8 9 9	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27 103° 13.01 118° 12.75 133° 12.50	5.94 \$22° 5.58 5.23 4.87 · 4.51 4.15 3.79 \$22° 3.43 3.07 2.71 · 2.35	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46 66°32.46 81°5.51 95°38.62 110°11.78	13.7' 13.8' 13.9' 13.9' 14.0' 14.1' 14.1' 14.2' 14.2'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51 \$18°45.00 18°34.42 18°23.77 18°13.03	-10.1' -10.2' -10.3' -10.3' -10.4' -10.5' -10.6' -10.7'	54.1 54.1 54.1 54.1 54.1 54.1 54.1 54.1
0 11 22 33 44 55 65 77 70 11 22	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27 103° 13.01 118° 12.75 133° 12.50 148° 12.24	5.94 \$22° 5.58 5.23 4.87 · 4.51 4.15 3.79 \$22° 3.43 3.07 2.71 · 2.35 1.98	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46 66°32.46 81°5.51 95°38.62 110°11.78 124°45.00	13.7' 13.8' 13.8' 13.9' 14.0' 14.1' 14.1' 14.2' 14.2' 14.3'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°54.50 18°34.42 18°23.77 18°13.03 18°2.21	-10.1' -10.2' -10.3' -10.4' -10.5' -10.6' -10.7' -10.7' -10.8' -10.9'	54.1 54.1 54.1 54.1 54.1 54.1 54.1 54.1
) 1 2 3 4 5 5 7 7 8 9 9	343° 15.08 358° 14.82 13° 14.56 28° 14.30 43° 14.04 58° 13.79 73° 13.53 88° 13.27 103° 13.01 118° 12.75 133° 12.50	5.94 \$22° 5.58 5.23 4.87 · 4.51 4.15 3.79 \$22° 3.43 3.07 2.71 · 2.35	324°42.60 339°15.27 353°48.00 8°20.78 22°53.62 37°26.51 51°59.46 66°32.46 81°5.51 95°38.62 110°11.78	13.7' 13.8' 13.9' 13.9' 14.0' 14.1' 14.1' 14.2' 14.2'	\$19°46.78 19°36.69 19°26.52 19°16.26 19°5.93 18°55.51 \$18°45.00 18°34.42 18°23.77 18°13.03	-10.1' -10.2' -10.3' -10.4' -10.5' -10.6' -10.7' -10.7' -10.8'	54.1 54.1 54.1 54.1 54.1 54.1 54.1 54.1

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

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

		Sun			Moon		
Day		Eqn.of Time		Mer.	Mer.	Pass.	Age
	5	00 ^h	12 ^h	Pass	Upper	Lower	0-2
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-1%
	07	05:57	06:10	12:06	11:51	-:-	
	08	06:23	06:36	12:07	12:39	00:15	
	09	06:48	07:01	12:07	13:26	01:03	

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

CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1 147 107	Sun	GHA	GHA Dec	CHA 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							
1 1 1 1 1 1 1 1 1 1							· · ·
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
1	3		272°54.19 · · 28.44	351°6.14 · · 58.84	6°3.65 · · 50.31	145°25.82 · · 14.66	
1							·
7 241-96.00 325-521 3062 51-58.02 99.24 67-14.35 99.24 67-14.35 99.24 67-14.35 99.24 67-14.35 99.24 67-14.35 99.24 91.70							
8 29973.46 34752.97 3.1.66 6618.24 9.22 81.17.01 80.77.2 20073.55 14.07 Adams							
9 24f 395 275 27 317 317 31 30 396 39.0 317 397 30 395 317 325 30 325 396							
11 2974-488 15-522 25-79 117-584 25-79 117-5							1
1.1	10	259°42.39					1
19 19 19 19 19 19 19 19							
14 319 52.25 77 51.47 34.41 16 32.61 39.70 17 33.65 31.22 310 51.62 13.46 13.4							"
15 349/571 107/906 30.60 30.67 30.77 107/997 30.78							Bellatrix 278°20.78 6°22.41
19 19 19 19 19 19 19 19							
17							
1.0	17	4°59.64	122°50.71 36.03	201°40.11 10°59.95	216°41.07 51.47		1 9
39.94.57 100-91.00 37.14 237.44.99 0.10 240.57 10.10 240.56.4.0 1.10 240.57 10.10 2							
19 19 19 19 19 19 19 19							1
22 89°1196							
Mor. pass. 16:40							
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Mon GHA CHA Dec GHA GHA Dec GHA						-	
Mon GIA	ivier.p	Dass. 10:40	ν-0.2 d0.5 m-4.48	ν2.4 αυ.1 m-υ.30	ν2.Γ αυ.1 m-2.40	ν2.3 αυ.1 mυ.70	
Mon GHA GHA CHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec CHA Dec GHA Dec CHA DEC C							
1 12°16.99 22°748.91 \$17°399 306°57.18 \$11°0.54 \$22°9.80 \$13°2.08 \$10°15.06 \$10°15.96 \$22°4.80 \$1.20°10.52 \$24°24.86 \$4.03 \$32°2.07 \$0.72 \$32°5.61 \$5.22 \$113°19.73 \$1.00 \$4.00 \$4.00 \$1.							"
140°2182 25°74839 4086 337°207 0.72 352°516 52.22 131°1974 16.09 6.00 6.015 6.00 6.015 6.00							Denebola 182°23.12 14°25.06
3 155°24.28 272°48.13 · · · · · · · · · · · · · · · · · · ·							
5 185°29.21 302°47.68 0 42.47 22°9.42 0.98 37°1.319 52.47 170°26.76 16.28 5 185°29.22 302°47.68 0 42.47 22°9.42 0.98 37°1.319 52.47 170°26.76 16.28 5 185°29.22 302°47.68 0 42.47 22°9.42 0.98 37°1.319 52.47 170°26.76 16.28 5 195°29.53 11°3.19 52.47 170°26.76 16.28 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 16.40 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 17°5.56 18.40 18.20 5 195°29.53 11°5.55 18.40 18.20 5 195°29.53 11°5.55 18.40 18.20 5 195°29.53 11°5.55 18.40 18.20 5 195°29.53 11°5.55 18.40 18.20 5 195°29.53 11°5.55 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.40 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5 195°29.54 18.20 5							
5 185"29.21 302"47.60 317"47.33 \$17"43.00 37"11.87 \\ \text{118.19} \\ \text{20"} 506 200"31.66 317"47.33 \$17"43.00 37"11.87 \\ \text{118.19} \\ \text{118.19} \\ \text{118.19} \\ \text{215"} 34.14 \\ 322"47.07 48.00 \\ 44.07 \\ \text{118.19} \\ \text{215"} 34.14 \\ 322"47.07 \\ 48.00 \\ 44.07 \\ \text{118.19} \							
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7 215 3414 322 47.07 48.08 44.07 67 16.77 1.25 82 212 35 27.3 22 13.14 5 16.40 69 24 12.25 69 24 20 24 24 24 24 24 24 24 24 24 24 24 24 24							
9 2467'39.07 2"46.57 44.60 82"19.23 1.134 97"23.90 · 52.81 226"361.13 16.53 Arcturus 145"46.4 2 19"2.29 10 20"341.53 17"46.27 45.13 97"21.69 1.44 11.20 52.58 2.00 211"38.17 16.59 (Arcturus 145"46.4 2 145"3.4 20"3.17 16.59 (Arcturus 145"46.4 2 145"3.4 20"3.1 16.70 16.70 17.70							
10 260"41.53 17"46.27 45.13 97"21.68 1.44 112"26.58 52.00 251"38.47 16.59 11 275"44.00 32"46.00 45.67 112"24.14 1.53 127"29.26 52.08 266"40.16 16.66 Kochab 137"20.39 31.9 -00"55.60 12 290"46.66 47"45.73 517"46.20 127"26.60 N11"1.62 142"31.94 N11"53.07 281"43.15 N01"61.67							
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13 305°48.92 62°45.46 46.73 12°29.06 1.71 157°34.62 53.15 296°45.94 16.78 143°29.06 1.71 12°37.36 1.72°37.36 1.72°37.36 11°47.83 16.85 11°47.83 11°20.85 11°47.83 11°							
14 320°51.39	13	$305^{\circ}48.92$					
Attria 107°7.24 66°4.35 107°4.465 48.32 187°36.44 1.99 20°42.67 53.44 344°52.51 1.694 1.697 1.694 1.697 1.698							
18 2124 137*4410 517*49 38 217*4137 N11*218 232*48.03 313*53.58 53.49 17.04 17.10 19.74 10.517*49.03 217*45.35 53.49 316*54.85 17.04 17.10 19.74 10.517*49.03 21.24 137*44.10 517*49.38 21.24 21.2							
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19 36°3.71 152°43.83 49.90 232°43.84 2.28 247°50.71 53.66 26°59.93 17.16 20°51.71 16°743.55 50.43 247°46.31 2.38 262°63.93 53.75 42°1.87 17.23 17.29							
20 51°6.17 167°43.55 50.43 247°46.31 2.38 262°53.39 53.75 42°1.87°1.23 Kaus Mars 27°3.20 - 34°22.25 22°2 81°11.10 197°43.00 51.49 277°51.25 2.57 292°58.76 53.92 72°6.55 17.36 Waus Mars 27°51.25 2.50 12°242.72 52.01 292°53.72 2.67 308°1.44 54.01 8°8°8.89 17.42 Vegs 80°32.52 38°48.44 Naus 17°5°43.05 12°242.72 52.01 292°53.72 2.67 308°1.44 54.01 8°8°8.89 17.42 Vegs 80°32.52 38°48.44 Naus 17°5°43.01 12°6°18.69 12°242.72 52.01 292°53.72 2.67 308°1.44 54.01 8°8°8.89 17.42 Vegs 80°32.52 38°48.44 Naus 17°5°43.01 12°6°18.69 12°242.42 51°55.00 322°58.67 2.67 328°1.57°6 111°11°16.03 227°42.44 517°52.44 307°56.19 N11°2.77 323°4.12 N13°54.09 102°11.23 N01°17.48 11°20.96 257°41.88 53.59 338°1.14 2.97 353°9.49 54.26 132°15.91 17.61 14°25.89 287°41.32 54.64 8°6.10 3.17 23°14.86 54.44 162°20.58 17.74 17°25.89 287°41.32 54.64 8°6.10 3.17 23°14.86 54.44 162°20.58 17.74 13°28.41 15°21.15 18°6.39 11°27°55.69 38°11.06 N11°3.37 53°20.23 N13°54.61 192°25.26 N01°17.87 40.15°1.09 246°38.21 2°39.90 · 57.25 83°18.51 · 3.67 96°28.28 · 54.87 227°29.94 18.00 12°14.04 0.77 17°9.96 15°7.78 98°21.00 3.78 13°30.97 54.04 522°3.29 11°2.15 11°3.00 11°3.0							
21	20	51°6.17					
22 81°11.10 197°43.00 51.49 277°51.25 2.57 292°58.76 53.92 72°6.55 17.36 Mer.pass. 16:36							
Mer.pass. 16:36							
Tue GHA GHA Dec GHA De	23	96°13.56	212°42.72 52.01	292°53.72 2.67	308°1.44 54.01	87°8.89 17.42	
Tue GHA GHA Dec GHA De	Mer.p	pass. 16:36	ν -0.3 $'$ d0.5 $'$ m-4.47	$\nu 2.4' \ d0.1' \ \text{m-}0.38$	$\nu 2.7' \ d0.1' \ \text{m-}2.47$	$ u 2.3' \ d0.1' \ m0.76$	
Tue GHA GHA Dec 01110 16.03 227° 42.44 517° 52.54 307° 56.19 N110 277 323° 41.2 N13° 54.09 1000 11.23 N010 17.48 1 126° 18.49 242° 42.16 53.06 322° 58.67 2.87 338° 6.81 54.18 117° 13.57 17.55							
0 111°16.03 227°42.44 517°52.94 307°56.19 N11°2.77 323°4.12 N13°54.09 102°11.23 N01°17.48 1 126°18.49 242°42.16 53.06 322°58.67 23.87 338°6.15 54.18 117°13.57 17.55 Scheat 13°31.00°17.48 110°10.96 257°41.88 53.59 338°1.14 2.97 353°9.49 54.26 132°15.91 17.61 17.61 315°12.91 28°13.93 156°23.42 272°41.60 · 54.11 353°3.62 · 3.07 8°12.17 · 54.35 147°18.25 · 17.68 1 17°125.89 287°41.32 54.64 8°6.10 3.17 23°14.86 54.44 162°20.58 17.74 162°53.81 332°40.47 55.16 23°8.58 3.27 38°17.54 54.52 177°22.92 17.81	Tue	GHA	GHA Dec	GHA Dec	GHA Dec		
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15 336°52.99 92°38.17 18°0.38 173°33.45 · · 4.30 188°44.40 · · · 55.39 327°46.30 · · 18.45 16 351°55.45 107°37.88 0.90 188°35.94 4.41 203°47.09 55.48 342°48.63 18.52 17 6°57.92 122°37.59 1.41 203°38.44 4.52 218°49.77 55.57 357°50.97 18.58 18 22°0.38 137°37.29 518°1.93 218°40.93 N11°4.62 233°52.46 N13°55.65 12°53.30 N01°18.65 19 37°2.85 152°37.00 2.45 233°43.43 4.73 248°55.15 55.74 27°55.64 18.72 20 52°5.31 167°36.71 2.97 248°45.93 4.84 263°57.84 55.83 42°57.98 18.78 21 67°7.77 182°36.41 · · 3.48 263°48.43 · · 4.95 279°0.52 · · 55.92 58°0.31 · · 18.85 22 82°10.24 197°36.11 4.00 278°50.93 5.06 294°3.21 56.00 73°2.65 18.91 23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Jan 12 Tue SHA Mer.pass Venus 116°26.41 08:49 Nars 196°40.17 03:28 Nars 196°40.11 08:49 Nars 1							
16 351°55.45 107°37.88 0.90 188°35.94 4.41 203°47.09 55.48 342°48.63 18.52							Saturn 300 00.10 17:12
17 6°57.92 122°37.59 1.41 203°38.44 4.52 218°49.77 55.57 357°50.97 18.58 18 22°0.38 137°37.29 \$18°1.93 218°40.93 N11°4.62 233°52.46 N13°55.65 12°53.30 N01°18.65 19 37°2.85 152°37.00 2.45 233°43.43 4.73 248°55.15 55.74 27°55.64 18.72 20 52°5.31 167°36.71 2.97 248°45.93 4.84 263°57.84 55.83 42°57.98 18.78 21 67°7.77 182°36.41 · 3.48 263°48.43 · 4.95 279°0.52 · 55.92 58°0.31 · 18.85 22 82°10.24 197°36.11 4.00 278°50.93 5.06 294°3.21 56.00 73°2.65 18.91 23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Mars 196°40.17 03:28 Jupiter 211°48.09 02:27 Saturn 350°55.20 17:09 Horizontal parallax Venus: 0.2 Mars: 0.2							
18							
19 37°2.85 152°37.00 2.45 233°43.43 4.73 248°55.15 55.74 27°55.64 18.72 20 52°5.31 167°36.71 2.97 248°45.93 4.84 263°57.84 55.83 42°57.98 18.78 21 67°7.77 182°36.41 · · 3.48 263°48.43 · · 4.95 279°0.52 · · 55.92 58°0.31 · · 18.85 22 82°10.24 197°36.11 4.00 278°50.93 5.06 294°3.21 56.00 73°2.65 18.91 23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Saturn 350°55.20 17:09 Horizontal parallax Venus: 0.2 Mars: 0.2							
20 52°5.31 167°36.71 2.97 248°45.93 4.84 263°57.84 55.83 42°57.98 18.78 21 67°7.77 182°36.41 · · 3.48 263°48.43 · · 4.95 279°0.52 · · 55.92 58°0.31 · · 18.85 22 82°10.24 197°36.11 4.00 278°50.93 5.06 294°3.21 56.00 73°2.65 18.91 23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Horizontal parallax Venus: 0.2 Mars: 0.2							
21 67°7.77 182°36.41 · · · 3.48 263°48.43 · · · 4.95 279°0.52 · · 55.92 58°0.31 · · 18.85 Horizontal parallax 22 82°10.24 197°36.11 4.00 278°50.93 5.06 294°3.21 56.00 73°2.65 18.91 Venus: 0.2 23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Mars: 0.2							
23 97°12.70 212°35.82 4.51 293°53.43 5.17 309°5.90 56.09 88°4.98 18.98 Mars: 0.2	21	67°7.77	182°36.41 · · 3.48	263°48.43 · · 4.95	279°0.52 · · 55.92	58°0.31 · · 18.85	
25 37 12.10 212 55.02 1.51 255 55.15 5.11 555 55.05 56.05 66 1.50 15.50							
Mer.pass. 16:32 ν -0.3' d 0.5' m-4.46 ν 2.5' d 0.1' m-0.41 ν 2.7' d 0.1' m-2.48 ν 2.3' d 0.1' m0.76	23	97° 12.70		293~53.43 5.17	309°5.90 56.09	88~4.98 18.98	IVIATS: U.Z
	Mer.p	bass. 16:32	ν -0.3′ d 0.5′ m -4.46	$\nu 2.5'~d0.1'~\text{m-}0.41$	$\nu 2.7' \ d0.1' \ \text{m-}2.48$	$\nu 2.3'~d0.1'~\text{m}0.76$	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°11.73	S22°1.26	$153^{\circ}51.58$	14.4'	S 17°40.36	-11.0'	54.2'
1	193°11.47	0.89	168°24.95	14.4'	17°29.32	-11.1'	54.2'
2	208°11.21 223°10.96	0.52 22°0.16	182°58.37 197°31.84	14.5' 14.5'	17° 18.20 17° 7.02	-11.2' -11.3'	54.2' 54.2'
4	238°10.70	21°59.79	212°5.36	14.6'	16°55.76	-11.3'	54.2'
5	253°10.45	59.42	$226^{\circ}38.93$	14.6'	$16^{\circ}44.43$	-11.4'	54.2'
6	268°10.19	S21°59.05	241°12.55	14.7'	\$16°33.02	-11.5'	54.2'
7 8	283°9.93 298°9.68	58.68 58.31	255°46.22 270°19.93	14.7' 14.8'	16°21.55 16°10.01	-11.5' -11.6'	54.2' 54.2'
9	313°9.43	• • 57.94	284°53.69	14.8'	15°58.40	-11.7'	54.2'
10	328°9.17	57.57	299°27.50	14.9'	$15^{\circ}46.73$	-11.7'	54.3'
11	343°8.92	57.20	314°1.35	14.9'	15°34.98	-11.8'	54.3'
12 13	358°8.66 13°8.41	\$21°56.82 56.45	328°35.25 343°9.19	14.9' 15.0'	\$15°23.18 15°11.30	-11.9' -11.9'	54.3' 54.3'
14	28°8.16	56.07	357° 43.17	15.0'	14°59.37	-11.9	54.3
15	43°7.90	• • 55.70	$12^{\circ}17.20$	15.1'	$14^{\circ}47.37$	-12.1'	54.3'
16	58°7.65	55.32	26°51.27	15.1'	14°35.30	-12.1'	54.3'
17 18	73°7.40 88°7.15	54.94 \$21° 54.57	41°25.39 55°59.54	15.2' 15.2'	14°23.18 \$14°10.99	-12.2' -12.2'	54.3' 54.4'
19	103°6.89	54.19	70°33.73	15.2'	13°58.75	-12.2	54.4
20	118°6.64	53.81	85°7.97	15.3'	13°46.44	-12.4'	54.4'
21	133°6.39	• • 53.43	99° 42.24	15.3'	13° 34.08	-12.4'	54.4'
22	148°6.14	53.05	114° 16.55	15.3'	13°21.66	-12.5'	54.4'
23	163°5.89	52.66	128°50.90	15.4'	13°9.18	-12.5'	54.4'
	SD = 16.3'	d = -0.4'		SI	O = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°5.64	S21°52.28	143°25.28	15.4'	\$12°56.64	-12.6'	54.4'
1	193°5.39	51.90	157° 59.70	15.5'	12°44.05	-12.6'	54.4'
2	208°5.14 223°4.89	51.52 •• 51.13	172°34.16 187°8.65	15.5' 15.5'	12°31.41 12°18.71	-12.7' -12.8'	54.5'
3 4	223 4.89 238°4.64	50.75	201°43.17	15.5' 15.6'	12 18.71 12°5.96	-12.8'	54.5' 54.5'
5	253°4.39	50.36	216° 17.72	15.6'	11°53.16	-12.9'	54.5'
6	268°4.14	S21°49.97	$230^{\circ}52.31$	15.6'	S11°40.30	-12.9'	54.5'
7	283°3.89	49.58	245°26.93	15.6'	11°27.40	-13.0'	54.5'
8 9	298°3.64 313°3.39	49.20 •• 48.81	260°1.57 274°36.25	15.7' 15.7'	11°14.44 11°1.44	-13.0' -13.1'	54.5' 54.6'
10	313 3.39 328°3.14	48.42	289° 10.95	15.7'	10°48.39	-13.1'	54.6'
11	343°2.90	48.03	303°45.69	15.8'	10°35.29	-13.1'	54.6'
12	358°2.65	S21°47.64	318° 20.44	15.8'	S10°22.14	-13.2'	54.6'
13	13°2.40 28°2.15	47.24	332°55.23 347°30.04	15.8' 15.8'	10°8.95 09°55.71	-13.2'	54.6'
14 15	28 2.15 43°1.91	46.85 •• 46.46	2°4.87	15.8 15.9'	09 55.71 09°42.43	-13.3' -13.3'	54.6' 54.7'
16	58°1.66	46.06	16°39.72	15.9'	09°29.10	-13.4	54.7'
17	73°1.42	45.67	$31^{\circ}14.60$	15.9'	$09^{\circ}15.73$	-13.4'	54.7'
18	88°1.17	S21°45.27	45°49.50	15.9'	S09°2.32	-13.5'	54.7'
19 20	103°0.92 118°0.68	44.88 44.48	60°24.42 74°59.35	15.9'	08°48.86 08°35.37	-13.5'	54.7' 54.7'
21	133°0.43	• • 44.08	89°34.31	16.0'	06 35.37 08°21.84	-13.6'	54. <i>1</i> ′
22	148°0.19	43.68	104°9.28	16.0'	08°8.26	-13.6'	54.8'
23	162°59.94	43.28	118° 44.27	16.0'	07°54.65	-13.6'	54.8'
	SD = 16.3'	d = -0.4'		SI	O = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0 0	177°59.70	S21° 42.88	133° 19.27	ν 16.0'	S07°41.00	-13.7'	пР 54.8'
1	192°59.45	42.48	147°54.29	16.0'	$07^{\circ}27.32$	-13.7'	54.8'
2	207°59.21	42.08	162°29.32	16.0'	07° 13.60	-13.8'	54.8'
3 4	222°58.97 237°58.72	· · 41.68 41.27	177°4.36 191°39.41	16.1' 16.1'	06°59.84 06°46.05	-13.8' -13.8'	54.9' 54.9'
4 5	252°58.48	41.27	206°14.48	16.1	06°46.05	-13.8 -13.9'	54.9'
6	267°58.24	S21°40.47	220°49.55	16.1'	S06°18.36	-13.9'	54.9'
7	282°57.99	40.06	235°24.63	16.1'	06°4.47	-13.9'	54.9'
8	297°57.75 312°57.51	39.66	249°59.72 264°34.81	16.1' 16.1'	05°50.55 05°36.60	-14.0'	55.0'
9 10	312°57.51 327°57.27	· · 39.25 38.84	264°34.81 279°9.91	16.1' 16.1'	05°36.60 05°22.61	-14.0' -14.0'	55.0' 55.0'
11	342°57.03	38.43	279 9.91 293°45.01	16.1	05°22.01	-14.0'	55.0'
12	357°56.79	S21°38.02	308°20.11	16.1'	S04° 54.56	-14.1'	55.0'
13	12°56.54	37.61	322°55.22	16.1'	04°40.49	-14.1'	55.1'
14 15	27°56.30 42°56.06	37.20 · · 36.79	337°30.33 352°5.43	16.1' 16.1'	04°26.39 04°12.27	-14.1' -14.1'	55.1' 55.1'
16	57°55.82	36.38	6°40.54	16.1	04 12.27 03°58.12	-14.1 -14.2'	55.1'
17	72°55.58	35.97	21°15.64	16.1	03°43.95	-14.2'	55.1'
18	87°55.34	S21° 35.56	35°50.74	16.1'	S03°29.75	-14.2'	55.2'
19	102°55.10	35.14	50°25.83	16.1'	03°15.53 03°1.29	-14.2'	55.2'
20 21	117°54.87 132°54.63	34.73 •• 34.31	65°0.92 79°36.00	16.1' 16.1'	03°1.29 02°47.03	-14.3' -14.3'	55.2' 55.2'
22	132 54.03 147°54.39	33.90	94°11.07	16.1	02° 47.03 02° 32.74	-14.3'	55.2'
23	162°54.15	33.48	108°46.13	16.1'	02°18.44	-14.3'	55.3'
	SD = 16.3'	d = -0.4'		SI	D = 14.9'		

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

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

Sun			Moon		
Eqn.of Time		Mer.	Mer.Pass.		Age
00 ^h	12 ^h	Pass	Upper	Lower	3-5
mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-15%
07:13	07:25	12:07	14:09	01:48	
07:37	07:49	12:08	14:51	02:31	
08:01	08:13	12:08	15:33	03:12	
	00 ^h mm:ss 07:13 07:37	00 ^h 12 ^h mm:ss mm:ss 07:13 07:25 07:37 07:49	Eqn. of Time 00h Mer. 12h Pass hh:mm 07:13 07:25 12:07 07:37 07:49 12:08	Eqn. of Time 00h Mer. 12h Mer. Pass hh:mm Mer. Upper hh:mm 07:13 07:25 12:07 14:09 07:37 07:49 12:08 14:51	Eqn. of Time 00h Mer. Pass. upper mm:ss 12h mm:ss hh:mm upper hh:mm Lower hh:mm upper hh:mm 12h upper hh:mm 12h upper hi:mm 12h upper hi:mm 14:09 upper hi:mm 12:07 upper hi:mm 14:09 upper hi:mm 14:

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	112° 15.17	227°35.52 \$18°5.03	308°55.94 N11°5.28	324°8.59 N13°56.18	103°7.32 N01°19.04	
1	127° 17.63	242°35.22 5.54	323°58.44 5.39	339°11.28 56.27	118°9.65 19.11	Alpheratz 357°33.15 29°14.56 Ankaa 353°5.62 -42°9.73
2	$142^{\circ}20.09$	257°34.92 6.06	339° 0.95 5.50	354°13.97 56.36	133°11.99 19.17	Ankaa 353°5.62 -42°9.73 Schedar 349°29.21 56°41.45
3	$157^{\circ}22.56$	272°34.62 · · 6.57	354°3.46 · · 5.61	9°16.66 · · 56.44	148°14.32 · · 19.24	Diphda 348°45.69 -17°50.38
4	172°25.02	287°34.32 7.09	9° 5.96 5.72	24°19.35 56.53	163°16.66 19.31	Achernar 335°18.93 -57°6.21
5	187°27.49	302°34.02 7.60	24°8.48 5.84	39°22.04 56.62	178°18.99 19.37	Hamal 327°49.23 23°35.55
6	202°29.95	317°33.72 \$18°8.11	39°10.99 N11°5.95	54°24.73 N13°56.71	193°21.33 N01°19.44	Polaris 312°55.39 89°22.97
7 8	217°32.42 232°34.88	332°33.42 8.62 347°33.12 9.13	54°13.50 6.06 69°16.01 6.18	69°27.42 56.80 84°30.11 56.89	208°23.66 19.50 223°26.00 19.57	Acamar 315°10.33 -40°11.96
9	247°37.34	2°32.81 · · 9.64	84°18.53 · · 6.29	99°32.81 · · 56.97	238°28.33 · · 19.64	Menkar 314°4.25 4°11.75
10	262°39.81	17°32.51 10.16	99°21.05 6.41	114°35.50 57.06	253°30.66 19.70	Mirfak 308°25.56 49°57.63
11	277° 42.27	32°32.20 10.66	114°23.56 6.53	129°38.19 57.15	268°33.00 19.77	Aldebaran 290°37.43 16°33.83
12	292° 44.74	47°31.89 \$18°11.17	129°26.08 N11°6.64	144°40.88 N13°57.24	283°35.33 N01°19.84	Rigel 281°1.97 -8°10.30 Capella 280°18.99 46°1.56
13	307° 47.20	62°31.59 11.68	144°28.60 6.76	159°43.57 57.33	298°37.66 19.90	Bellatrix 278°20.78 6°22.41
14	322°49.66	77°31.28 12.19	159°31.13 6.88	174°46.27 57.42	313°40.00 19.97	Elnath 277°59.41 28°37.82
15	337°52.13	92°30.97 · · 12.70	174°33.65 · · 6.99	189°48.96 · · 57.51	328°42.33 · · 20.04	Alnilam 275°35.72 -1°11.14
16 17	352°54.59 7°57.06	107°30.66 13.21 122°30.35 13.71	189°36.17 7.11 204°38.70 7.23	204°51.65 57.60 219°54.35 57.69	343°44.66 20.10 358°46.99 20.17	Betelgeuse 270°49.95 7°24.67
18	22°59.52	137°30.04 \$18°14.22	219°41.23 N11°7.35	234°57.04 N13°57.78	13°49.33 N01°20.24	Canopus 263°51.11 -52°42.68
19	38°1.98	152°29.73 14.73	234°43.75 7.47	249°59.73 57.86	28°51.66 20.30	Sirius 258°24.41 -16°45.28
20	53°4.45	167°29.42 15.23	249°46.28 7.59	265°2.43 57.95	43°53.99 20.37	Adhara 255°4.16 -29°0.60
21	68°6.91	182°29.10 · · 15.74	264°48.81 · · 7.71	280°5.12 · · 58.04	58°56.32 · · 20.44	Procyon 244°48.74 5°9.23 Pollux 243°14.88 27°57.53
22	83°9.38	197°28.79 16.24	279°51.35 7.83	295°7.82 58.13	73°58.66 20.50	Pollux 243°14.88 27°57.53 Avior 234°13.40 -59°35.73
23	98°11.84	212°28.47 16.75	294°53.88 7.95	310°10.51 58.22	89°0.99 20.57	Suhail 222°44.65 -43°32.48
Mer.r	pass. 16:28	ν-0.3' d0.5' m-4.45	$\nu 2.5' \ d0.1' \ \text{m-0.43}$	ν2.7' d0.1' m-2.48	ν2.3' d0.1' m0.76	Miaplacidus 221°37.03 -69°49.58
						Alphard 217°45.81 -8°46.64
TL	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.40 11°49.93
Thu 0	дна 113°14.30	227°28.16 \$18°17.25	309°56.41 N11°8.08	GHA Dec 325°13.21 N13°58.31	GHA Dec 104°3.32 N01°20.64	Dubhe 193°38.58 61°35.96
1	113 14.30 128° 16.77	242°27.84 17.75	324°58.95 8.20	340°15.90 58.40	119°5.65 20.70	Denebola 182°23.10 14°25.05
2	143° 19.23	257°27.52 18.25	340°1.49 8.32	355°18.60 58.49	134°7.98 20.77	Gienah 175°41.75 -17°41.55
3	158°21.70	272°27.21 · · 18.76	355°4.03 · · 8.45	10°21.29 · · 58.58	149°10.31 · · 20.84	Acrux 172°58.00 -63°14.73
4	173°24.16	287°26.89 19.26	10° 6.57 8.57	25°23.99 58.67	164°12.64 20.91	Gacrux 171°49.60 -57°15.69 Alioth 166°11.44 55°48.40
5	$188^{\circ}26.62$	302°26.57 19.76	25°9.11 8.70	40°26.69 58.76	179°14.97 20.97	Spica 158°20.53 -11°18.20
6	203°29.09	317°26.25 \$18°20.26	40°11.65 N11°8.82	55°29.38 N13°58.85	194°17.31 N01°21.04	Alkaid 152°50.75 49°10.33
7	218°31.55	332°25.93 20.76	55°14.19 8.95	70°32.08 58.94	209°19.64 21.11	Hadar 148°33.70 -60°29.97
8	233°34.02	347°25.61 21.26	70°16.74 9.07	85°34.78 59.03	224°21.97 21.18	Menkent 147°55.70 -36°30.07
9	248°36.48	2°25.28 · · 21.76	85°19.28 · · 9.20	100°37.47 · · 59.12	239°24.30 · · 21.24	Arcturus 145°46.46 19°2.28
10	263°38.95	17°24.96 22.26	100°21.83 9.33	115°40.17 59.21 130°42.87 59.30	254°26.63 21.31	Rigil Kent. 139°38.15 -60°56.60
11 12	278° 41.41 293° 43.87	32°24.64 22.75 47°24.31 \$18°23.25	115°24.38 9.46 130°26.93 N11°9.58	130°42.87 59.30 145°45.57 N13°59.40	269°28.96 21.38 284°31.29 N01°21.45	Kochab 137°20.32 74°2.24
13	308° 46.34	62°23.99 23.75	145°29.48 9.71	160°48.27 59.49	299°33.62 21.52	Zuben'ubi 136°54.28 -16°9.25
14	323° 48.80	77°23.66 24.24	160°32.04 9.84	175°50.96 59.58	314°35.95 21.58	Alphecca 126°2.53 26°37.19
15	338°51.27	92°23.34 · · 24.74	175°34.59 · · 9.97	190°53.66 · · 59.67	329°38.27 · · 21.65	Antares 112°14.04 -26°29.46
16	353°53.73	107°23.01 25.24	190°37.14 10.10	205°56.36 59.76	344°40.60 21.72	Atria 107°7.20 -69°4.34 Sabik 102°1.15 -15°45.49
17	$8^{\circ}56.19$	122°22.68 25.73	205°39.70 10.23	220°59.06 59.85	359°42.93 21.79	Shaula 96°8.46 -37°7.31
18	23°58.66	137°22.35 \$18°26.22	220°42.26 N11°10.37	236°1.76 N13°59.94	14°45.26 N01°21.86	Rasalhague 95°57.30 12°32.33
19	39°1.12	152°22.02 26.72	235°44.82 10.50	251° 4.46 14° 0.03	29°47.59 21.92	Eltanin 90°41.90 51°28.95
20	54°3.59	167°21.69 27.21	250°47.38 10.63	266°7.16 0.12	44°49.92 21.99	Kaus Aust. 83°30.69 -34°22.25
21 22	69°6.05 84°8.51	182°21.36 ··· 27.70 197°21.03 28.20	265°49.94 · · 10.76 280°52.50 10.90	281°9.86 · · 0.21 296°12.56 0.31	59°52.25 · · 22.06 74°54.58	Vega 80°32.51 38°48.43
23	99° 10.98	212°20.69 28.69	295°55.07 11.03	311°15.26 0.40	89°56.90 22.20	Nunki 75°46.06 -26°15.76
						Altair 61°58.67 8°56.38
Mer.p	pass. 16:24	ν-0.3' d0.5' m-4.44	ν2.5' d0.1' m-0.45	ν2.7' d0.1' m-2.49	$\nu 2.3' \ d0.1' \ m0.77$	Peacock 53°3.71 -56°38.90 Deneb 49°25.11 45°22.68
	_	_		_	_	Enif 33°37.43 9°59.98
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.21 -46°49.92
0	114° 13.44	227°20.36 \$18°29.18	310°57.63 N11°11.16	326°17.96 N14°0.49	104°59.23 N01°22.27	Fomalhaut 15°12.92 -29°28.84
1	129° 15.91	242°20.03 29.67	326°0.20 11.30	341°20.67 0.58	120°1.56 22.33	Scheat 13°43.79 28°13.92
2	144° 18.37	257°19.69 30.16	341°2.77 11.43	356°23.37 0.67	135°3.89 22.40	Markab 13°28.43 15°21.14
3 4	159°20.83 174°23.30	272°19.36 · · 30.65 287°19.02 31.14	356°5.34 ·· 11.57 11°7.91 11.71	11°26.07 · · 0.76 26°28.77 0.86	150°6.22 · · 22.47 165°8.54 22.54	Jan 13 Wed SHA Mer.pass
5	189° 25.76	302°18.68 31.63	26°10.48 11.84	41°31.47 0.95	180°10.87 22.61	Venus 115°20.35 08:50
6	204°28.23	317°18.35 \$18°32.12	41°13.06 N11°11.98	56°34.18 N14°1.04	195°13.20 N01°22.68	Mars 196°40.77 03:24
7	219°30.69	332°18.01 32.60	56°15.63 12.12	71°36.88 1.13	210°15.52 22.75	Jupiter 211°53.42 02:23
8	234°33.16	347°17.67 33.09	71°18.21 12.26	86°39.58 1.22	225°17.85 22.82	Saturn 350°52.15 17:05
9	249°35.62	2°17.33 · · · 33.58	86°20.78 · · 12.40	101°42.28 · · 1.32	240°20.18 · · 22.89	Jan 14 Thu SHA Mer.pass
10	264°38.08	17°16.99 34.06	101°23.36 12.53	116°44.99 1.41	255°22.50 22.96	Venus 114°13.85 08:50
11	279° 40.55	32°16.64 34.55	116°25.94 12.67	131°47.69 1.50	270°24.83 23.02	Mars 196°42.11 03:20
12	294°43.01	47°16.30 \$18°35.03	131°28.52 N11°12.81	146°50.39 N14°1.59	285°27.16 N01°23.09	Jupiter 211°58.90 02:19
13 14	309° 45.48 324° 47.94	62°15.96 35.52 77°15.62 36.00	146°31.11 12.96 161°33.69 13.10	161°53.10 1.69 176°55.80 1.78	300°29.48 23.16 315°31.81 23.23	Saturn 350°49.01 17:01
15	339°50.40	92°15.27 · · 36.48	176°36.28 · · 13.24	170 55.80 1.78 191°58.51 · · 1.87	330°34.13 · · 23.30	Jan 15 Fri SHA Mer.pass
16	354°52.87	107°14.93 36.97	191°38.86 13.38	207° 1.21 1.96	345°36.46 23.37	Jan 15 Fri SHA Mer.pass Venus 113°6.92 08:51
17	9°55.33	122°14.58 37.45	206°41.45 13.52	222°3.92 2.06	0°38.78 23.44	Mars 196°44.19 03:16
18	24°57.80	137°14.23 S 18°37.93	221°44.04 N11°13.67	237° 6.62 N14° 2.15	15°41.11 N01°23.51	Jupiter 212°4.52 02:14
19	40°0.26	152°13.89 38.41	236°46.63 13.81	252° 9.33 2.24	30°43.44 23.58	Saturn 350°45.79 16:57
20	55°2.72	167°13.54 38.89	251°49.22 13.95	267°12.03 2.33	45°45.76 23.65	Horizontal navalla:
21	70°5.19	182°13.19 · · 39.37	266°51.81 · · 14.10	282°14.74 · · 2.43	60°48.09 · · 23.72	Horizontal parallax Venus: 0.2
22	85°7.65 100°10.12	197°12.84 39.85	281°54.41 14.24	297°17.45 2.52	75°50.41 23.79	Mars: 0.2
23		212°12.49 40.33	296°57.00 14.39	312°20.15 2.61	90°52.73 23.86	191013. 0.2
Mer.p	pass. 16:20	ν-0.3′ d0.5′ m-4.43	ν2.6' d0.1' m-0.48	ν2.7′ d0.1′ m-2.49	ν2.3′ d0.1′ m0.77	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°53.91	S 21°33.06	123°21.18	16.0'	S02°4.11	-14.3'	55.3'
1 2	192°53.67 207°53.44	32.64 32.22	137°56.22 152°31.24	16.0' 16.0'	01°49.77 01°35.41	-14.4' -14.4'	55.3' 55.3'
3	222°53.20	31.80	167°6.25	16.0'	01°21.03	-14.4'	55.4'
4	237°52.96	31.38	$181^{\circ}41.25$	16.0'	$01^{\circ}6.64$	-14.4'	55.4'
5	252°52.73	30.96	196°16.23	16.0'	00°52.23	-14.4'	55.4'
6 7	267°52.49 282°52.25	\$21°30.54 30.12	210°51.19 225°26.14	15.9' 15.9'	\$00°37.80 00°23.36	-14.4' -14.5'	55.4' 55.5'
8	297°52.02	29.69	240°1.06	15.9'	S00°8.91	-14.5'	55.5'
9	312°51.78	• • 29.27	254°35.96	15.9'	N00°5.55	14.5'	55.5'
10 11	327°51.55 342°51.31	28.85 28.42	269°10.84 283°45.69	15.9' 15.8'	00°20.02 00°34.51	14.5' 14.5'	55.5' 55.6'
12	357°51.08	\$21°27.99	298°20.53	15.8'	N00°49.00	14.5	55.6'
13	12°50.84	27.57	$312^{\circ}55.33$	15.8'	$01^{\circ}3.51$	14.5'	55.6'
14	27°50.61 42°50.38	27.14 •• 26.71	327°30.11 342°4.85	15.7' 15.7'	01°18.02 01°32.54	14.5' 14.5'	55.6' 55.7'
15 16	57°50.14	26.28	356°39.57	15.7'	01°47.06	14.5	55.7'
17	72°49.91	25.85	11°14.26	15.7'	02°1.59	14.5'	55.7'
18	87°49.68	S21°25.42	25°48.92	15.6'	N02°16.13	14.5'	55.7'
19 20	102°49.44 117°49.21	24.99 24.56	40°23.54 54°58.12	15.6' 15.6'	02°30.67 02°45.21	14.5' 14.5'	55.8' 55.8'
21	132°48.98	24.13	69°32.67	15.5'	02°59.76	14.5'	55.8'
22	147°48.75	23.69	84°7.19	15.5'	03°14.30	14.5'	55.8'
23	162°48.52	23.26	98°41.66	15.4'	03°28.85	14.5'	55.9'
	SD = 16.3'	d = -0.4'		SI	D = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°48.29	S21°22.82	113°16.09	15.4'	N03°43.40	14.5'	55.9'
1	192°48.05 207°47.82	22.39	127°50.49	15.4'	03°57.94 04°12.48	14.5'	55.9'
2	207°47.82 222°47.59	21.95 •• 21.52	142°24.84 156°59.14	15.3' 15.3'	04°12.48 04°27.02	14.5' 14.5'	55.9' 56.0'
4	237°47.36	21.08	171°33.41	15.2'	04°41.56	14.5'	56.0'
5	252°47.13	20.64	186°7.62	15.2'	04°56.09	14.5'	56.0'
6 7	267°46.90 282°46.67	\$21°20.20 19.76	200°41.79 215°15.91	15.1' 15.1'	N05°10.61 05°25.13	14.5' 14.5'	56.1' 56.1'
8	282 46.67 297°46.45	19.76	215 15.91 229°49.97	15.1 15.0'	05 25.13 05°39.64	14.5'	56.1
9	312°46.22	• • 18.88	244°23.99	15.0'	05°54.14	14.5'	56.1'
10	327°45.99	18.44	258°57.95	14.9'	06°8.63	14.5'	56.2'
11 12	342°45.76 357°45.53	17.99 \$21°17.55	273°31.86 288°5.71	14.9' 14.8'	06°23.11 N06°37.58	14.5' 14.5'	56.2' 56.2'
13	12°45.31	17.11	302°39.51	14.7'	06°52.04	14.4'	56.3'
14	27°45.08	16.66	$317^{\circ}13.25$	14.7'	$07^{\circ}6.48$	14.4'	56.3'
15 16	42°44.85 57°44.63	· · 16.22 15.77	331°46.93 346°20.54	14.6' 14.6'	07°20.91 07°35.32	14.4' 14.4'	56.3' 56.4'
17	72°44.40	15.77	0°54.10	14.5	07 35.32 07°49.72	14.4	56.4'
18	87°44.17	S21°14.88	15°27.59	14.4'	N08°4.10	14.4'	56.4'
19	102°43.95	14.43	30°1.02	14.4'	08°18.45	14.3'	56.4'
20 21	117°43.72 132°43.50	13.98 •• 13.53	44°34.38 59°7.67	14.3' 14.2'	08°32.79 08°47.11	14.3' 14.3'	56.5' 56.5'
22	147°43.27	13.08	73°40.89	14.2'	09°1.41	14.3'	56.5'
23	162°43.05	12.63	88°14.04	14.1'	09°15.68	14.2'	56.6'
	SD = 16.3'	d = -0.4'		SI	D = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°42.82 192°42.60	\$21°12.18 11.72	102°47.12 117°20.13	14.0' 13.9'	N09°29.93 09°44.16	14.2' 14.2'	56.6' 56.6'
2	192°42.60 207°42.38	11.72	117°20.13 131°53.06	13.9' 13.9'	09°44.16	14.2' 14.2'	56.7
3	222°42.15	• • 10.82	146°25.92	13.8'	10°12.52	14.1'	56.7'
4	237°41.93	10.36	160°58.70	13.7'	10°26.67 10°40.78	14.1'	56.7'
5 6	252°41.71 267°41.48	9.91 S 21°9.45	175°31.40 190°4.03	13.6' 13.5'	10°40.78 N10°54.86	14.1' 14.0'	56.8' 56.8'
7	282°41.26	8.99	204°36.57	13.5'	11°8.91	14.0'	56.8'
8	297°41.04	8.54	219°9.02	13.4'	11°22.92	14.0'	56.9'
9 10	312°40.82 327°40.60	· · 8.08 7.62	233°41.40 248°13.69	13.3' 13.2'	11°36.90 11°50.85	13.9' 13.9'	56.9' 56.9'
11	342°40.38	7.02 7.16	248 13.09 262°45.89	13.2	11 50.85 12°4.75	13.9'	50.9 57.0'
12	357°40.16	\$21°6.70	277°18.00	13.0'	N12°18.62	13.8'	57.0'
13	12°39.94	6.24	291°50.03	12.9'	12°32.45 12°46.24	13.8'	57.0'
14 15	27°39.72 42°39.50	5.78 •• 5.31	306°21.96 320°53.81	12.8' 12.7'	12°46.24 12°59.99	13.7' 13.7'	57.1' 57.1'
16	57°39.28	4.85	335°25.56	12.7'	13°13.69	13.7'	57.1'
17	72°39.06	4.39	349°57.21	12.6'	13°27.35	13.6'	57.2'
18 19	87°38.84 102°38.62	\$21°3.92 3.46	4°28.77 19°0.23	12.5' 12.4'	N13°40.96 13°54.52	13.6' 13.5'	57.2' 57.2'
20	102 38.02 117°38.40	2.99	33°31.59	12.4	13 54.52 14°8.04	13.5'	57.2 57.3'
21	132°38.18	• • 2.52	48°2.86	12.2'	14°21.50	13.4'	57.3'
22	147°37.97 162°37.75	2.06	62°34.02 77°5.08	12.1' 12.0'	14°34.91 14°48.27	13.4'	57.3'
23		1.59	77-5.08			13.3'	57.4'
	SD = 16.3'	d = -0.5'		SI	D = 15.4'		

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

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

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-41%	
13	08:24	08:36	12:09	16:14	03:53		
14	08:47	08:58	12:09	16:56	04:35		
15	09:09	09:19	12:09	17:41	05:18		

h	Aries	Ven	`	,) M	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	115° 12.58		S 18°40.81	311°59.60	N11°14.54	327°22.86	N14°2.71	105°55.06	N01°23.93			
1	130° 15.04	242°11.79	41.29	327°2.20	14.68	342°25.57	2.80	120° 57.38	24.00	Alpheratz	357°33.17	29°14.56
2	145° 17.51	257°11.43	41.76	342°4.80	14.83	357°28.27	2.89	135°59.71	24.07	Ankaa	353°5.64	-42°9.73
3	160° 19.97	272°11.08	• • 42.24	357°7.40	• • 14.98	12°30.98	• • 2.99	151°2.03	• • 24.14	Schedar	349°29.24	56°41.45
4	175°22.44	287°10.73	42.72	12°10.00	15.13	27°33.69	3.08	166°4.35	24.21	Diphda	348°45.70	-17°50.38
5	190°24.90	302°10.37	43.19	27°12.60	15.28	42°36.40	3.17	181°6.68	24.28	Achernar	335°18.96 327°49.24	-57°6.21 23°35.54
6	205°27.37		S18°43.67	42°15.21	N11°15.42	57°39.10	N14°3.27	$196^{\circ}9.00$	N01°24.35	Hamal Polaris	312°56.65	89° 22.98
7	220°29.83	332°9.66	44.14	57°17.82	15.57	72°41.81	3.36	211°11.33	24.42	Acamar	315°10.35	-40° 11.97
8	235° 32.29	347°9.30	44.61	72°20.42	15.72	87°44.52	3.46	226° 13.65	24.49	Menkar	314°4.26	4°11.75
9	250°34.76	2°8.95	• • 45.09	87°23.03	• • 15.88	102°47.23	• • 3.55	241°15.97	• • 24.56	Mirfak	308°25.58	49°57.63
10	265°37.22	17°8.59	45.56	102°25.64	16.03	117°49.94	3.64	256° 18.29	24.63	Aldebaran	290°37.44	16°33.83
11	280°39.69	32°8.23	46.03 \$18°46.50	117°28.25	16.18 N11°16.33	132°52.65	3.74	271°20.62 286°22.94	24.70	Rigel	281°1.97	-8°10.31
12 13	295° 42.15 310° 44.61	47°7.87 62°7.51	46.98	132°30.87 147°33.48	16.48	147°55.36 162°58.07	N14°3.83 3.93	301°25.26	N01°24.77 24.85	Capella	$280^{\circ}19.00$	46°1.57
14	325° 47.08	77°7.15	47.45	162°36.09	16.64	178° 0.78	4.02	316°27.58	24.03	Bellatrix	278°20.79	6°22.40
15	340° 49.54	92°6.79	• • 47.92	177°38.71	16.79	193°3.49	• • 4.11	331°29.91	• • 24.99	Elnath	277°59.41	28° 37.82
16	355°52.01	107°6.42	48.39	192°41.33	16.94	208° 6.20	4.21	346°32.23	25.06	Alnilam	275°35.73	-1°11.15
17	10°54.47	122°6.06	48.85	207°43.95	17.10	223°8.91	4.30	1°34.55	25.13	Betelgeuse	270°49.96	7°24.66
18	25°56.93	137°5.70	S18°49.32	222°46.57	N11°17.25	238°11.62	N14°4.40	16°36.87	N01°25.20	Canopus Sirius	263°51.12 258°24.41	-52° 42.70 -16° 45.30
19	40°59.40	152°5.33	49.79	237°49.19	17.41	253°14.33	4.49	31°39.19	25.27	Adhara	255° 4.16	-29°0.62
20	$56^{\circ}1.86$	167°4.97	50.26	252°51.81	17.57	268°17.04	4.59	46°41.52	25.34	Procyon	244°48.74	5°9.23
21	71°4.33	182°4.60	• • 50.72	267°54.44	• • 17.72	283°19.75	• • 4.68	61°43.84	• • 25.41	Pollux	243°14.88	27°57.53
22	86°6.79	197°4.23	51.19	282°57.06	17.88	298°22.47	4.78	76°46.16	25.49	Avior	234°13.39	-59° 35.75
23	101°9.26	212°3.87	51.65	297°59.69	18.04	313°25.18	4.87	91°48.48	25.56	Suhail	222°44.64	-43°32.50
Mer.r	pass. 16:16	ν -0.4' d0.5	5′ m-4.42	$\nu 2.6' d0.$	1′ m-0.51	ν2.7′ d0.:	1′ m-2.50	$\nu 2.3' \ d0$.1′ m0.77	Miaplacidus	221°37.01	-69°49.60
										Alphard	217°45.80	-8°46.65
c	CHA	CHA	Doo	CHA	Doo	CHA	Dee	CHA	Doo	Regulus	207°32.39	11°49.92
Sun 0	GHA 116° 11.72	GHA 227°3.50	Dec \$18°52.12	GHA 313°2.32	Dec N11°18.20	GHA 328°27.89	Dec N14° 4.97	GHA 106° 50.80	Dec N01°25.63	Dubhe	193°38.55	61°35.97
1	110 11.72 131°14.18	242°3.13	52.58	313 2.32 328° 4.95	18.35	328 27.89 343°30.60	N14 4.97 5.06	106 50.80 121°53.12	25.70	Denebola	182°23.08	14° 25.04
2	146° 16.65	257°2.76	53.05	343°7.58	18.51	358° 33.32	5.16	136°55.44	25.77	Gienah	175°41.73	-17°41.56
3	161° 19.11	272°2.39	• • 53.51	358°10.21	. 18.67	13°36.03	• • 5.25	151°57.76	• • 25.84	Acrux	172°57.95	-63°14.74
4	176°21.58	287°2.02	53.97	13°12.84	18.83	28°38.74	5.35	167°0.08	25.91	Gacrux	171°49.56	-57° 15.70
5	191°24.04	302°1.65	54.43	28°15.48	18.99	43°41.45	5.44	182°2.40	25.99	Alioth	166°11.41 158°20.51	55°48.40 -11°18.20
6	206°26.50	317°1.27	S18°54.90	43°18.12	N11°19.15	58°44.17	N14°5.54	197°4.72	N01°26.06	Spica Alkaid	150° 20.51° 152° 50.72	49° 10.33
7	221°28.97	$332^{\circ}0.90$	55.36	58°20.75	19.32	73°46.88	5.63	212°7.04	26.13	Hadar	148°33.66	-60° 29.98
8	236°31.43	347°0.53	55.82	73°23.39	19.48	88°49.60	5.73	227°9.36	26.20	Menkent	147°55.67	-36° 30.07
9	251°33.90	2°0.15	• • 56.28	88°26.03	• • 19.64	103°52.31	• • 5.82	242°11.68	• • 26.27	Arcturus	145°46.44	19°2.27
10	266°36.36	16°59.78	56.74	103°28.67	19.80	118°55.02	5.92	257°14.00	26.35	Rigil Kent.	139°38.11	-60°56.60
11	281°38.83	31°59.40	57.19	118°31.32	19.97	133°57.74	6.01	272°16.32	26.42	Kochab	137°20.27	74°2.23
12	296°41.29	46°59.02 61°58.65	\$18°57.65	133°33.96 148°36.61	N11°20.13	149° 0.45	N14°6.11	287°18.64	N01°26.49	Zuben'ubi	136°54.26	$-16^{\circ}9.26$
13 14	311° 43.75 326° 46.22	76° 58.27	58.11 58.57	148 30.01 163°39.25	20.30 20.46	164° 3.17 179° 5.88	6.21 6.30	302°20.96 317°23.28	26.56 26.63	Alphecca	$126^{\circ}2.51$	26°37.18
15	341°48.68	91°57.89	• • 59.02	178°41.90	. 20.40	194° 8.60	. 6.40	332°25.60	26.71	Antares	112°14.02	-26°29.46
16	356°51.15	106°57.51	59.48	193°44.55	20.79	209°11.32	6.49	347°27.91	26.78	Atria	107°7.16	-69°4.33
17	11°53.61	121°57.13	18°59.93	208°47.20	20.96	224°14.03	6.59	2°30.23	26.85	Sabik	102°1.13	-15°45.49
18	26° 56.07	136°56.75	S19°0.39	223°49.85	N11°21.13	239°16.75	N14°6.69	17°32.55	N01°26.92	Shaula	96°8.45 95°57.29	-37°7.31 12°32.32
19	41°58.54	151°56.37	0.84	238°52.51	21.29	$254^{\circ}19.47$	6.78	32°34.87	27.00	Rasalhague Eltanin	90°41.89	51° 28.93
20	57°1.00	166°55.98	1.29	253°55.16	21.46	$269^{\circ}22.18$	6.88	47°37.19	27.07	Kaus Aust.	83°30.67	-34° 22.24
21	72°3.47	181°55.60	• • 1.75	268°57.82	• • 21.63	284°24.90	• • 6.97	62°39.50	• • 27.14	Vega	80°32.50	38° 48.41
22	87°5.93	196°55.22	2.20	284°0.47	21.80	299°27.62	7.07	77°41.82	27.21	Nunki	75°46.05	-26° 15.76
23	102°8.40	211°54.83	2.65	299° 3.13	21.97	314°30.33	7.17	92°44.14	27.29	Altair	61°58.66	8°56.37
Mer.p	pass. 16:13	ν -0.4' d0.5	5′ m-4.41	$\nu 2.6' \ d0.$	2′ m-0.53	ν 2.7′ d0.3	1' m-2.50	$\nu 2.3' \ d0$.1' m 0.77	Peacock	53°3.71	-56° 38.89
										Deneb	49°25.11	45°22.67
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°37.44	9°59.98
0	117° 10.86	226°54.45	S19° 3.10		N11°22.14	329°33.05	N14°7.26	107° 46.46	N01°27.36	Al Na'ir	27°31.22	-46°49.91
1	132° 13.32	241°54.06	3.55	329°8.45	22.31	344°35.77	7.36	122°48.77	27.43	Fomalhaut Scheat	15°12.93 13°43.80	-29°28.84
2	147° 15.79	256° 53.68	4.00	344°11.12	22.48	359°38.49	7.46	137°51.09	27.51	Markab	13 43.80 13°28.43	28° 13.91 15° 21.13
3	162° 18.25	271°53.29	• • 4.45	359°13.78	• • 22.65	14°41.20	• • 7.55	$152^{\circ}53.41$	• • 27.58	IVIAIKAD		
4	177° 20.72	286°52.90	4.90	14°16.44	22.82	29°43.92	7.65	167° 55.72	27.65	Jan 16 Sat	SHA	Mer.pass
5	192°23.18	301°52.51	5.34	29°19.11	22.99	44°46.64	7.75	182°58.04	27.73	I	111°59.56	08:51
6	207°25.64	316°52.12	S19°5.79	44°21.78	N11°23.17	59°49.36	N14°7.84	198°0.36	N01°27.80	1	196°47.02	03:11
7	222°28.11	331°51.73	6.24	59°24.45	23.34	74°52.08	7.94	213°2.67	27.87		212°10.28	02:10
8	237°30.57	346°51.34	6.68	74°27.12	23.51	89°54.80	8.04	228°4.99	27.95	Saturn	350°42.48	16:54
9 10	252°33.04 267°35.50	1°50.95	· · 7.13	89°29.79 104°32.46	· · 23.69	104°57.52	· · 8.13	243°7.31 258°9.62	28.02	Jan 17 Sun	SHA	Mer.pass
10 11	267° 35.50 282° 37.97	16°50.56 31°50.17	7.57 8.02	104°32.46 119°35.14	23.86 24.04	120° 0.24 135° 2.96	8.23 8.33	258 9.62 273° 11.94	28.09 28.17	I	$110^{\circ}51.78$	08:52
12	297°40.43	46°49.77	\$19°8.46	134°37.81	N11°24.21	150° 5.68	N14°8.43	273 11.94 288°14.25	N01°28.24		196°50.60	03:07
13	312° 42.89	61°49.38	8.90	149°40.49	24.39	165° 8.40	8.52	303° 16.57	28.31		212°16.17	02:06
14	327° 45.36	76°48.98	9.34	164°43.17	24.57	180°11.12	8.62	318° 18.88	28.39	Saturn	350°39.08	16:50
15	342°47.82	91°48.59	• • 9.79	179°45.85	• • 24.74	195°13.84	• • 8.72	333°21.20	• • 28.46	Jan 18 Mon	SHA	Mer.pass
16	$357^{\circ}50.29$	106°48.19	10.23	194°48.53	24.92	$210^{\circ}16.56$	8.81	$348^{\circ}23.51$	28.53		109°43.59	08:53
17	12° 52.75	121°47.79	10.67	209°51.21	25.10	225°19.28	8.91	3°25.83	28.61	I	$196^{\circ}54.93$	03:03
18	27°55.22		S19°11.11	224°53.89	N11°25.28	240°22.00	N14° 9.01	18°28.14	N01°28.68	Jupiter		02:01
19	42°57.68	151°47.00	11.55	239°56.58	25.46	255°24.73	9.11	33°30.46	28.76	Saturn	350°35.60	16:46
20	58°0.14	166°46.60	11.98	254°59.27	25.64	270°27.45	9.21	48°32.77	28.83	Horizon	ntal parallax	
21	73°2.61 88°5.07	181°46.20	· · 12.42 12.86	270°1.95 285°4.64	· · 25.82 26.00	285°30.17 300°32.89	9.30	63°35.09 78°37.40	28.90	11011201	Venus:	0.2
22 23	88 5.07 103°7.54	196°45.80 211°45.40	13.30	300°7.33	26.00	300 32.89 315°35.62	9.40 9.50	93°39.72	28.98 29.05		Mars:	0.2
Mer.p	pass. 16:09	ν -0.4′ d0.5	b' m-4.40	ν 2. ℓ' d0.	2′ m-0.56	ν 2.7′ d0.3	ı′ m-2.50	$\nu^{2.3'} d0$.1′ m0.77			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°37.53	S21°1.12	$91^{\circ}36.04$	11.9'	$N15^{\circ}1.58$	13.2'	57.4'
1	192°37.32	0.65	106°6.89	11.7'	15°14.83	13.2'	57.5'
2 3	207°37.10 222°36.88	21°0.18 20°59.71	120°37.64 135°8.28	11.6' 11.5'	15°28.02 15°41.15	13.1' 13.1'	57.5' 57.5'
4	237°36.67	59.24	149°38.81	11.4'	15°54.22	13.0'	57.6'
5	252°36.45	58.77	$164^{\circ}9.23$	11.3'	$16^{\circ}7.23$	12.9'	57.6'
6	267°36.24	\$20°58.29	178°39.54	11.2'	N16°20.18 16°33.06	12.9'	57.6'
7 8	282°36.02 297°35.81	57.82 57.35	193°9.74 207°39.83	11.1' 11.0'	16°33.06 16°45.88	12.8' 12.7'	57.7' 57.7'
9	312°35.59	56.87	222°9.80	10.9'	16° 58.62	12.7'	57.7'
10	327°35.38	56.40	$236^{\circ}39.65$	10.7'	$17^{\circ}11.30$	12.6'	57.8'
11	342°35.16	55.92	251°9.39	10.6'	17°23.91	12.5'	57.8'
12 13	357°34.95 12°34.74	\$20°55.44 54.96	265°39.02 280°8.52	10.5' 10.4'	N17°36.44 17°48.90	12.5' 12.4'	57.9' 57.9'
14	27°34.53	54.49	294° 37.90	10.4	18°1.28	12.3'	57.9'
15	42°34.31	•• 54.01	$309^{\circ}7.17$	10.1'	$18^{\circ}13.58$	12.2'	58.0'
16	57°34.10	53.53	323°36.31	10.0'	18°25.81	12.1'	58.0'
17 18	72°33.89 87°33.68	53.05 \$20° 52.57	338°5.33 352°34.23	9.9' 9.8'	18° 37.95 N18° 50.01	12.1' 12.0'	58.0' 58.1'
19	102°33.47	52.08	7°3.00	9.6'	19°1.99	11.9'	58.1'
20	117°33.26	51.60	$21^{\circ}31.65$	9.5'	$19^{\circ}13.87$	11.8'	58.2'
21	132°33.05	• • 51.12	36°0.17	9.4'	19°25.67	11.7'	58.2'
22 23	147°32.83 162°32.62	50.63 50.15	50°28.57 64°56.83	9.3' 9.1'	19°37.38 19°49.00	11.6' 11.5'	58.2' 58.3'
23			- 01.03		0 = 15.7'	11.5	55.5
	SD = 16.3'	d = -0.5'		SL	$\rho = 15.7$		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°32.42	S20°49.67	79°24.97	9.0'	N20°0.53	11.4'	58.3'
1 2	192°32.21 207°32.00	49.18 48.69	93°52.98 108°20.86	8.9' 8.7'	20°11.95 20°23.29	11.3' 11.2'	58.3' 58.4'
3	207°32.00 222°31.79	48.69 •• 48.21	108° 20.86 122° 48.61	8. <i>1</i> ′ 8.6′	20° 23.29 20° 34.52	11.1'	58.4' 58.4'
4	237°31.58	47.72	137° 16.23	8.5'	20°45.65	11.0'	58.4'
5	252°31.37	47.23	151° 43.72	8.4'	20°56.68	10.9'	58.5'
6	267°31.16 282°30.96	\$20°46.74	166°11.07 180°38.29	8.2'	N21°7.60 21°18.42	10.8'	58.5'
7 8	282°30.96 297°30.75	46.25 45.76	180°38.29 195°5.38	8.1' 8.0'	21° 18.42 21° 29.13	10.7' 10.6'	58.6' 58.6'
9	312°30.54	• • 45.27	209°32.34	7.8'	21°39.73	10.5	58.6'
10	327°30.34	44.77	$223^{\circ}59.16$	7.7'	$21^{\circ}50.21$	10.4'	58.7'
11	342°30.13	44.28	238° 25.85	7.6'	22°0.58	10.3'	58.7'
12 13	357°29.92 12°29.72	\$20°43.79 43.29	252°52.40 267°18.82	7.4' 7.3'	N22° 10.84 22° 20.97	10.1' 10.0'	58.7' 58.8'
14	27°29.51	42.80	281°45.10	7.1'	22°30.99	9.9'	58.8'
15	42°29.31	• • 42.30	$296^{\circ}11.25$	7.0'	$22^{\circ}40.89$	9.8'	58.9'
16	57°29.10	41.81	310°37.26	6.9'	22°50.66	9.6'	58.9'
17 18	72°28.90 87°28.70	41.31 \$20°40.81	325°3.14 339°28.88	6.7' 6.6'	23°0.30 N23°9.82	9.5' 9.4'	58.9' 59.0'
19	102°28.49	40.32	353° 54.49	6.5	23° 19.20	9.3'	59.0'
20	117°28.29	39.82	$8^{\circ}19.97$	6.3'	23°28.46	9.1'	59.0'
21	132°28.08	• • 39.32	22°45.31	6.2'	23° 37.58	9.0'	59.1'
22 23	147°27.88 162°27.68	38.82 38.32	37° 10.51 51° 35.58	6.1' 5.9'	23°46.56 23°55.41	8.8' 8.7'	59.1' 59.2'
23			J1 33.30			0.1	J9.2
	SD = 16.3'	d = -0.5'		SL	0 = 15.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°27.48	\$20°37.81	66°0.52	5.8'	N24°4.12	8.6'	59.2'
1 2	192°27.28 207°27.07	37.31 36.81	80°25.32 94°49.99	5.7' 5.5'	24°12.68 24°21.10	8.4' 8.3'	59.2' 59.3'
3	207 27.07 222°26.87	36.31	94 49.99 109°14.53	5.4'	24 21.10 24°29.38	8.1'	59.3'
4	237°26.67	35.80	123°38.94	5.3'	24°37.50	8.0'	59.3'
5	252°26.47	35.30	138°3.22	5.1'	24°45.48	7.8'	59.4'
6 7	267°26.27 282°26.07	\$20°34.79 34.28	152°27.36 166°51.38	5.0' 4.9'	N24°53.30 25°0.97	7.7' 7.5'	59.4' 59.4'
8	297°25.87	33.78	181° 15.27	4.8'	25°8.49	7.3 7.4	59.5
9	312°25.67	• • 33.27	$195^{\circ}39.03$	4.6'	25° 15.85	7.2'	59.5'
10	327°25.47	32.76	210°2.67	4.5'	25°23.05	7.0'	59.6'
11 12	342°25.28 357°25.08	32.25 \$20°31.74	224°26.18 238°49.57	4.4' 4.3'	25°30.08 N25°36.95	6.9' 6.7'	59.6' 59.6'
13	12°24.88	31.23	253° 12.83	4.3 4.1'	25° 43.66	6.5	59.7'
14	27°24.68	30.72	267°35.98	4.0'	25°50.20	6.4'	59.7'
15	42°24.48	30.21	281°59.00	3.9'	25° 56.57	6.2'	59.7'
16 17	57°24.29 72°24.09	29.70 29.18	296°21.90 310°44.69	3.8' 3.7'	26°2.77 26°8.80	6.0' 5.9'	59.8' 59.8'
18	72 24.09 87°23.89	29.18 \$20°28.67	310 44.69 325°7.36	3.6'	N26° 14.65	5.9 5.7'	59.8'
19	102°23.70	28.16	$339^{\circ}29.92$	3.4'	26°20.33	5.5'	59.9'
20	117°23.50	27.64	353°52.37	3.3'	26°25.83	5.3'	59.9'
21 22	132°23.31 147°23.11	· · 27.13 26.61	8°14.70 22°36.93	3.2' 3.1'	26°31.15 26°36.28	5.1' 5.0'	59.9' 60.0'
23	162°22.92	26.09	36° 59.06	3.0'	26° 41.23	5.0 4.8'	60.0
	SD = 16.3'	d = -0.5'		SE	0 = 16.1'		
					10.1		

N 72° 07:56 09:44 ■ 14:37 16:25 N 70° 07:42 09:12 11:46 12:35 15:09 16:39 68° 07:31 08:49 10:25 13:56 15:32 16:50 66° 07:21 08:31 09:47 14:33 15:50 17:00 64° 07:13 08:16 09:21 14:59 16:05 17:00 62° 07:05 08:03 09:01 15:19 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 54° 06:39 07:21 08:09 16:12 16:53 17:38 52° 06:34 07:27 08:09 16:21 17:00 17:42 50° 06:34 07:15 07:51	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 07:42 09:12 11:46 12:35 15:09 16:39 68° 07:31 08:49 10:25 13:56 15:32 16:50 66° 07:21 08:31 09:47 14:33 15:50 17:08 64° 07:13 08:16 09:21 14:59 16:05 17:08 60° 06:59 07:53 08:45 15:36 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 8° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° 07:31 08:49 10:25 13:56 15:32 16:50 66° 07:21 08:31 09:47 14:33 15:50 17:00 64° 07:13 08:16 09:21 14:59 16:05 17:08 62° 07:05 08:03 09:01 15:19 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 30° 06:01 06:31	N 72°	07:56	09:44			14:37	16:25
66° 07:21 08:31 09:47 14:33 15:50 17:00 64° 07:13 08:16 09:21 14:59 16:05 17:08 62° 07:05 08:03 09:01 15:19 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:38 52° 06:39 07:21 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40	N 70°	07:42	09:12	11:46	12:35	15:09	16:39
64° 07:13 08:16 09:21 14:59 16:05 17:08 62° 07:05 08:03 09:01 15:19 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 52° 06:39 07:21 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 20° 05:47 06:14		07:31	08:49	10:25	13:56	15:32	16:50
62° 07:05 08:03 09:01 15:19 16:17 17:15 60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 54° 06:43 07:27 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:06 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14		07:21	08:31	09:47	14:33	15:50	17:00
60° 06:59 07:53 08:45 15:36 16:28 17:22 N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 54° 06:43 07:27 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:02 05:28		07:13	08:16	09:21	14:59	16:05	17:08
N 58° 06:53 07:43 08:31 15:50 16:37 17:27 56° 06:48 07:35 08:19 16:01 16:46 17:33 54° 06:43 07:27 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:66 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:50 07:19 17:01 17:31 18:04 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44							17:15
56° 06:48 07:35 08:19 16:01 16:46 17:33 54° 06:43 07:27 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 \$ 10° 05:02 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10	60°	06:59	07:53	08:45	15:36	16:28	17:22
54° 06:43 07:27 08:09 16:12 16:53 17:38 52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 S 10° 05:02 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10 05:34 18:45 19:09 19:38 30° 04:16 04:48	N 58°	06:53	07:43	08:31	15:50	16:37	17:27
52° 06:39 07:21 08:00 16:21 17:00 17:42 50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 S 10° 05:02 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10 05:34 18:45 19:09 19:31 20:03 30° 04:60	56°	06:48	07:35	08:19	16:01	16:46	17:33
50° 06:34 07:15 07:51 16:29 17:06 17:46 45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 5 10° 05:02 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10 05:34 18:45 19:09 19:33 30° 04:16 04:48 05:15 19:05 19:31 20:03 40° 03:40 04:19	54°	06:43	07:27	08:09	16:12	16:53	17:38
45° 06:25 07:01 07:34 16:47 17:19 17:56 N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 S 10° 05:09 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10 05:34 18:45 19:09 19:38 30° 04:16 04:48 05:15 19:05 19:31 20:03 35° 04:00 04:35 05:04 19:16 19:45 20:20 40° 03:40 04:19	52°	06:39	07:21	08:00	16:21	17:00	17:42
N 40° 06:16 06:50 07:19 17:01 17:31 18:04 35° 06:09 06:40 07:07 17:13 17:41 18:12 30° 06:01 06:31 06:56 17:24 17:50 18:19 20° 05:47 06:14 06:38 17:42 18:06 18:33 N 10° 05:33 05:59 06:22 17:58 18:21 18:47 0° 05:19 05:44 06:06 18:14 18:36 19:01 S 10° 05:02 05:28 05:51 18:29 18:52 19:38 30° 04:42 05:10 05:34 18:45 19:09 19:38 30° 04:16 04:48 05:15 19:05 19:31 20:03 35° 04:00 04:35 05:04 19:16 19:45 20:20 40° 03:40 04:19 04:51 19:29 20:00 20:39 45° 02:38 03:35		06:34	07:15	07:51	16:29	17:06	17:46
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S 10° 05:02 05:28 05:51 18:29 18:52 19:18 20° 04:42 05:10 05:34 18:45 19:09 19:38 30° 04:16 04:48 05:15 19:05 19:31 20:03 35° 04:00 04:35 05:04 19:16 19:45 20:20 40° 03:40 04:19 04:51 19:29 20:00 20:39 45° 03:14 04:00 04:35 19:44 20:19 21:05 \$ 50° 02:38 03:35 04:16 20:03 20:44 21:41 52° 02:18 03:22 04:07 20:12 20:57 22:20 54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02		05:33	05:59	06:22	17:58	18:21	18:47
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40° 03:40 04:19 04:51 19:29 20:00 20:39 45° 03:14 04:00 04:35 19:44 20:19 21:05 \$ 50° 02:38 03:35 04:16 20:03 20:44 21:41 52° 02:18 03:22 04:07 20:12 20:57 22:00 54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02		04:16			19:05		20:03
45° 03:14 04:00 04:35 19:44 20:19 21:05 \$ 50° 02:38 03:35 04:16 20:03 20:44 21:41 52° 02:18 03:22 04:07 20:12 20:57 22:00 54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02		04:00	04:35	05:04	19:16	19:45	20:20
\$50° 02:38 03:35 04:16 20:03 20:44 21:41 52° 02:18 03:22 04:07 20:12 20:57 22:00 54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02		03:40	04:19		19:29		20:39
52° 02:18 03:22 04:07 20:12 20:57 22:00 54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02	45°	03:14	04:00	04:35	19:44	20:19	21:05
54° 01:52 03:08 03:57 20:22 21:11 22:25 56° 01:14 02:51 03:45 20:34 21:27 23:02							21:41
56° 01:14 02:51 03:45 20:34 21:27 23:02					-		22:00
							23:02
	58°	////	02:30	03:32	20:47	21:48	////
S 60° //// 02:02 03:16 21:03 22:15 ////	S 60°	////	02:02	03:16	21:03	22:15	////

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-73%	
16	09:30	09:40	12:10	18:31	06:06		
17	09:50	10:00	12:10	19:25	06:57		
18	10:10	10:20	12:10	20:26	07:55		

January 19, 20, 21 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	118° 10.00	226°45.00 \$19°13		330°38.34 N14°9.60	108°42.03 N01°29.13	
1	133° 12.46		1.17 330°12.72 26.54	345°41.06 9.69	123°44.34 29.20	Alpheratz 357°33.17 29°14.55
2	148° 14.93		4.60 345°15.41 26.72	0°43.78 9.79	138°46.66 29.27	Ankaa 353°5.65 -42°9.72
3	163° 17.39	271°43.79 · · 15		15°46.51 · · 9.89	153°48.97 · · 29.35	Schedar 349°29.25 56°41.44
4	178° 19.86	286°43.38 15	5.47 15°20.80 27.09	30°49.23 9.99	168°51.28 29.42	Diphda 348°45.70 -17°50.38
5	193°22.32	301°42.98	5.90 30°23.50 27.28	45°51.96 10.09	183°53.60 29.50	Achernar 335°18.98 -57°6.21 Hamal 327°49.24 23°35.54
6	208°24.79	316°42.57 \$19°16	5.34 45°26.20 N11°27.46	60°54.68 N14°10.19	198°55.91 N01°29.57	Polaris 312°57.68 89°22.98
7	223°27.25		$6.77 60^{\circ}28.90 27.64$	75°57.40 10.28	213°58.22 29.65	Acamar 315°10.36 -40°11.97
8	238°29.71		7.20 75°31.60 27.83	91°0.13 10.38	229°0.54 29.72	Menkar 314°4.26 4°11.74
9	253°32.18	1°41.35 · · 17		106°2.85 · · 10.48	244°2.85 · · 29.80	Mirfak 308°25.58 49°57.64
10	268°34.64		3.06 105°37.01 28.20	121°5.58 10.58	259°5.16 29.87	Aldebaran 290° 37.43 16° 33.82
11	283°37.11	31°40.53 18 46°40.12 \$19°18	3.49 120°39.72 28.39	136°8.30 10.68	274°7.47 29.95	Rigel 281°1.97 -8°10.31
12 13	298° 39.57 313° 42.04		3.92 135°42.42 N11°28.58 0.34 150°45.13 28.76	151°11.03 N14°10.78 166°13.75 10.88	289°9.78 N01°30.02 304°12.10 30.10	Capella 280°18.99 46°1.57
14	328° 44.50		0.77 165°47.84 28.95	181°16.48 10.97	319°14.41 30.17	Bellatrix 278°20.79 6°22.39
15	343°46.96		$0.20 180^{\circ}50.55 \cdot 29.14$	196°19.21 · · 11.07	334°16.72 · · 30.25	Elnath 277°59.41 28°37.82
16	358°49.43		0.62 195°53.27 29.33	211°21.93 11.17	349°19.03 30.32	Alnilam 275°35.73 -1°11.16
17	13°51.89		05 210°55.98 29.52	226°24.66 11.27	4°21.34 30.40	Betelgeuse 270°49.95 7°24.66
18	28°54.36	136°37.65 \$19°21	47 225°58.70 N11°29.71	241°27.38 N14°11.37	19°23.65 N01°30.47	Canopus 263°51.12 -52°42.72 Sirius 258°24.41 -16°45.31
19	43°56.82		90 241°1.41 29.90	256°30.11 11.47	34°25.97 30.55	Adhara 255°4.16 -29°0.64
20	58°59.29		2.32 256°4.13 30.09	271°32.84 11.57	49°28.28 30.62	Procyon 244°48.73 5°9.22
21	74°1.75	181°36.40 · · 22		286°35.57 · · 11.67	64°30.59 · · 30.70	Pollux 243°14.86 27°57.52
22	89°4.21		3.16 286°9.57 30.48	301°38.29 11.77	79°32.90 30.77	Avior 234°13.38 -59°35.78
23	104°6.68	211°35.57 23	3.59 301°12.29 30.67	316°41.02 11.87	94°35.21 30.85	Suhail 222°44.62 -43°32.52
Mer.p	pass. 16:05	ν-0.4' d0.4' m-4.	39 $\nu 2.7' \ d0.2' \ \text{m-0.58}$	ν2.7' d0.1' m-2.51	$\nu 2.3' \ d0.1' \ m0.78$	Miaplacidus 221°36.99 -69°49.62
						Alphard 217°45.78 -8°46.66
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.37 11°49.91
oved 0	119°9.14	226°35.15 \$19°24		331°43.75 N14°11.97	109°37.52 N01°30.93	Dubhe 193°38.52 61°35.97
1	119 9.14 134° 11.61		1.43 331°17.74 31.06	346°46.48 12.07	109 37.52 NOT 30.93 124°39.83 31.00	Denebola 182°23.06 14°25.03
2	149° 14.07		1.85 346°20.47 31.25	1°49.20 12.17	139°42.14 31.08	Gienah 175°41.70 -17°41.57
3	164° 16.54	271°33.90 · · 25		16°51.93 · · 12.26	154°44.45 · · 31.15	Acrux 172°57.90 -63°14.76
4	179° 19.00		5.68 16°25.92 31.64	31°54.66 12.36	169°46.76 31.23	Gacrux 171°49.52 -57°15.72
5	194°21.46		5.10 31°28.65 31.84	46°57.39 12.46	184°49.07 31.30	Alioth 166°11.37 55°48.39
6	209°23.93	316°32.63 \$19°26		62°0.12 N14°12.56	199°51.38 N01°31.38	Spica 158°20.48 -11°18.21 Alkaid 152°50.69 49°10.32
7	224°26.39	331°32.21 26	5.93 61°34.11 32.23	77° 2.85 12.66	214°53.69 31.46	Hadar 148°33.60 -60°29.98
8	239°28.86		7.35 76°36.85 32.42	92°5.58 12.76	229°56.00 31.53	Menkent 147°55.63 -36°30.08
9	254°31.32	1°31.36 · · 27		107°8.31 · · 12.86	244°58.31 · · 31.61	Arcturus 145°46.41 19°2.26
10	269°33.79		3.18 106°42.32 32.82	122°11.04 12.96	260°0.62 31.68	Rigil Kent. 139°38.05 -60°56.61
11	284°36.25		3.59 121°45.06 33.02	137°13.77 13.06	275°2.93 31.76	Kochab 137°20.21 74°2.23
12	299°38.71	46°30.09 \$19°29		152°16.50 N14°13.16	290°5.23 N01°31.84	Zuben'ubi 136°54.23 -16°9.26
13	314°41.18		0.42 151°50.54 33.42	167°19.23 13.26	305°7.54 31.91	Alphecca 126°2.48 26°37.17
14	329° 43.64 344° 46.11		0.83 166°53.28 33.62 0.24 181°56.02 · 33.82	182°21.96 13.36 197°24.69 · · 13.46	320°9.85 31.99 335°12.16 · · 32.07	Antares 112°13.99 -26°29.46
15 16	344 46.11 359°48.57		0.24 181°56.02 · · 33.82 0.65 196°58.77 34.02	197°24.69 · · 13.46 212°27.42 13.56	335°12.16 · · 32.07 350°14.47 32.14	Atria 107°7.10 -69°4.32
17	14°51.03		06 212°1.51 34.22	212 27.42 13.50 227°30.15 13.67	5°16.78 32.22	Sabik 102°1.11 -15°45.49
18	29°53.50	136°27.52 \$19°31		242°32.88 N14°13.77	20°19.08 N01°32.30	Shaula 96°8.42 -37°7.31
19	44°55.96		88 242°7.01 34.62	257°35.61 13.87	35°21.39 32.37	Rasalhague 95°57.26 12°32.31
20	59°58.43		2.28 257°9.76 34.83	272°38.35 13.97	50°23.70 32.45	Eltanin 90°41.87 51°28.92 Kaus Aust. 83°30.65 -34°22.24
21	75°0.89	181°26.22 · · 32	2.69 272°12.51 · · 35.03	287°41.08 · · 14.07	65°26.01 · · 32.53	Kaus Aust. 83°30.65 -34°22.24 Vega 80°32.48 38°48.40
22	90°3.36	196°25.79 33	3.10 287°15.26 35.23	302°43.81 14.17	80°28.31 32.60	Nunki 75°46.03 -26°15.75
23	105°5.82	211°25.36 33	3.50 302°18.02 35.44	317°46.54 14.27	95°30.62 32.68	Altair 61°58.65 8°56.36
Merr	pass. 16:01	ν-0.4' d0.4' m-4.	38 $\nu 2.7' d0.2' \text{ m-0.61}$	ν2.7' d0.1' m-2.51	$\nu 2.3' \ d0.1' \ m0.78$	Peacock 53°3.69 -56°38.88
	7433. 10.01	ν σ. 4 ασ.4 π 4.				Deneb 49°25.11 45°22.66
						Enif 33°37.43 9°59.97
Thu	GHA	GHA Dec		GHA Dec	GHA Dec	Al Na'ir 27°31.22 -46°49.90
0	120°8.28	226°24.92 \$19°33		332°49.28 N14°14.37 347°52.01 14.47	110°32.93 N01°32.76	Fomalhaut 15°12.93 -29°28.84
1 2	135° 10.75 150° 13.21		332°23.53 35.85 34.71 347°26.28 36.05	347°52.01 14.47 2°54.74 14.57	125°35.23 32.83 140°37.54 32.91	Scheat 13°43.80 28°13.91
3	165° 15.68	250 24.05 32 271°23.62 · · 35		17°57.47 · · 14.67	155°39.85 · · 32.99	Markab 13°28.43 15°21.13
4	180° 18.14		5.52 17°31.80 36.46	33°0.21 14.77	170°42.15 33.06	Jan 19 Tue SHA Mer.pass
5	195°20.61		5.92 32°34.57 36.67	48°2.94 14.87	185°44.46 33.14	Venus 108°35.00 08:53
6	210°23.07	316°22.31 S 19°36		63°5.68 N14°14.98	200°46.77 N01°33.22	Mars 197°0.02 02:59
7	225°25.53	331°21.87 36	$6.72 62^{\circ}40.09 37.09$	78° 8.41 15.08	215°49.07 33.30	Jupiter 212°28.34 01:57
8	240°28.00		7.12 77°42.86 37.30	93°11.14 15.18	230°51.38 33.37	Saturn 350°32.03 16:43
9	255°30.46	1°20.99 · · 37		108°13.88 · · 15.28	245°53.69 · · 33.45	Jan 20 Wed SHA Mer.pass
10	270°32.93		7.92 107°48.39 37.71	123°16.61 15.38	260°55.99 33.53	Venus 107°26.01 08:54
11	285°35.39		37.92 37.92	138°19.35 15.48	275°58.30 33.61	Mars 197°5.87 02:54
12 13	300°37.86 315°40.32	46°19.67 \$19°38		153°22.08 N14°15.58	291°0.60 N01°33.68 306°2.91 33.76	Jupiter 212°34.61 01:53
13 14	315°40.32 330°42.78		0.11 152°56.71 38.34 0.50 167°59.48 38.56	168°24.82 15.69 183°27.55 15.79	306°2.91 33.76 321°5.21 33.84	Saturn 350°28.38 16:39
14 15	345° 45.25	91°18.34 · · 39		198°30.29 · · 15.89	336°7.52 · · 33.92	Jan 21 Thu SHA Mer.pass
16	0° 47.71		0.29 198° 5.03 38.98	213°33.02 15.99	351°9.82 33.99	Jan 21 Thu SHA Mer.pass Venus 106°16.64 08:55
17	15°50.18		0.69 213°7.81 39.19	228°35.76 16.09	6°12.13 34.07	Mars 197°12.49 02:50
18	30°52.64	136°17.01 S19°41		243°38.50 N14°16.19	21°14.43 N01°34.15	Jupiter 212°40.99 01:48
19	45°55.11		47 243°13.37 39.62	258°41.23 16.30	36°16.74 34.23	Saturn 350°24.64 16:35
20	60°57.57	166°16.11 41	86 258°16.15 39.83	273°43.97 16.40	51°19.04 34.31	
21	76°0.03	181°15.66 · · 42		288°46.71 · · 16.50	66°21.34 · · 34.38	Horizontal parallax
22	91°2.50		2.64 288°21.72 40.26	303°49.44 16.60	81°23.65 34.46	Venus: 0.2
23	106°4.96	211°14.77 43	3.03 303°24.50 40.48	318°52.18 16.70	96°25.95 34.54	Mars: 0.2
Mer.p	pass. 15:57	ν-0.4' d0.4' m-4	37 ν2.8' d0.2' m-0.63	ν2.7' d0.1' m-2.52	ν2.3' d0.1' m0.78	
				· 		

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°22.72	S20°25.57	51°21.07	2.9'	N26°46.00	4.6'	60.0'
1	192°22.53	25.06	65° 42.99	2.8'	26°50.58	4.4'	60.1'
2	207°22.33 222°22.14	24.54 •• 24.02	80°4.81 94°26.52	2.7'	26°54.98 26°59.18	4.2' 4.0'	60.1'
3 4	222 22.14 237°21.95	23.50	94 20.52 108°48.15	2.6' 2.5'	20 59.18 27°3.19	4.0 3.8'	60.1' 60.2'
5	252°21.76	22.98	123°9.68	2.4'	27°7.01	3.6'	60.2
6	267°21.56	S20°22.45	137°31.12	2.4'	N27°10.64	3.4'	60.2'
7	282°21.37	21.93	151° 52.47	2.3'	27°14.07	3.2'	60.2'
8	297°21.18	21.41	166° 13.73	2.2'	27°17.30	3.0'	60.3'
9 10	312°20.99 327°20.80	· · 20.88 20.36	180°34.92 194°56.02	2.1' 2.0'	27°20.34 27°23.17	2.8' 2.6'	60.3' 60.3'
11	342°20.61	19.84	209° 17.05	2.0'	27°25.81	2.4	60.4
12	357°20.41	S20°19.31	223°38.00	1.9'	N27°28.24	2.2'	60.4
13	12°20.22	18.78	237°58.88	1.8'	27°30.47	2.0'	60.4'
14	27°20.03	18.26	252° 19.69	1.7'	27°32.49	1.8'	60.4
15 16	42° 19.84 57° 19.66	· · 17.73 17.20	266° 40.43 281° 1.11	1.7' 1.6'	27°34.31 27°35.92	1.6' 1.4'	60.5' 60.5'
17	72°19.47	16.67	295°21.74	1.6'	27°37.32	1.2'	60.5
18	87° 19.28	S20°16.14	309°42.30	1.5'	N27°38.52	1.0'	60.6'
19	102°19.09	15.61	324°2.81	1.5'	$27^{\circ}39.51$	0.8'	60.6'
20	117°18.90	15.08	338°23.27	1.4'	27°40.29	0.6'	60.6
21 22	132° 18.71 147° 18.53	· · 14.55 14.02	352°43.69 7°4.06	1.4' 1.3'	27°40.85 27°41.21	0.4' 0.1'	60.6' 60.7'
23	162° 18.34	13.48	21°24.39	1.3'	27°41.21	-0.1	60.7
	SD = 16.2'	d = -0.5'			D = 16.4'	0.1	
	3D = 10.2	a = -0.5		31	J = 10.4		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177° 18.15 192° 17.97	\$20°12.95 12.42	35°44.68 50°4.94	1.3' 1.2'	N27°41.28 27°40.99	-0.3' -0.5'	60.7' 60.7'
2	207° 17.78	11.88	64°25.16	1.2'	27°40.50	-0.7	60.8
3	222°17.60	• • 11.35	78° 45.36	1.2'	27°39.78	-0.9'	60.8'
4	237° 17.41	10.81	93°5.54	1.2'	27°38.86	-1.1'	60.8'
5	252° 17.23	10.27	107° 25.69	1.1'	27°37.72	-1.4'	60.8'
6 7	267° 17.04 282° 16.86	\$20° 9.73 9.20	121°45.83 136°5.96	1.1' 1.1'	N27°36.36 27°34.79	-1.6' -1.8'	60.8' 60.9'
8	297° 16.67	8.66	150° 26.07	1.1'	27°33.00	-2.0'	60.9
9	312° 16.49	8.12	164°46.18	1.1'	27°31.00	-2.2'	60.9'
10	327°16.30	7.58	179°6.28	1.1'	27°28.78	-2.4'	60.9'
11	342°16.12	7.04	193°26.38	1.1'	27°26.35	-2.6'	60.9'
12 13	357° 15.94 12° 15.76	\$20°6.50 5.95	207°46.49 222°6.60	1.1' 1.1'	N27°23.70 27°20.83	-2.9' -3.1'	61.0' 61.0'
14	27° 15.57	5.41	236°26.73	1.1'	27° 20.03	-3.3	61.0'
15	42°15.39	• • 4.87	250°46.86	1.2'	$27^{\circ}14.46$	-3.5'	61.0'
16	57° 15.21	4.32	265°7.02	1.2'	27°10.95	-3.7'	61.0'
17 18	72°15.03 87°14.85	3.78 \$20°3.23	279°27.19 293°47.39	1.2' 1.2'	27°7.23 N27°3.29	-3.9' -4.1'	61.1' 61.1'
19	102° 14.67	2.69	293 47.39 308°7.61	1.2	26°59.14	-4.1 -4.4'	61.1'
20	117° 14.49	2.14	322°27.87	1.3'	26°54.78	-4.6'	61.1'
21	132°14.31	• • 1.59	$336^{\circ}48.15$	1.3'	$26^{\circ}50.21$	-4.8'	61.1'
22	147° 14.13	1.05	351°8.48	1.4'	26°45.43	-5.0'	61.1'
23	162°13.95	0.50	5°28.84	1.4'	26°40.44	-5.2'	61.1'
	SD = 16.2'	d = -0.5'		SI	O = 16.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 13.77	\$19°59.95	19°49.25	1.5'	N26°35.23	-5.4'	61.2'
1 2	192° 13.59 207° 13.42	59.40 58.85	34°9.70 48°30.20	1.5' 1.6'	26°29.82 26°24.21	-5.6' -5.8'	61.2' 61.2'
3	207 13.42 222°13.24	58.30	48 30.20 62°50.75	1.6'	26° 18.38	-5.8 -6.0'	61.2
4	237° 13.06	57.74	77°11.36	1.7'	26°12.35	-6.2	61.2'
5	252° 12.88	57.19	91°32.03	1.7'	26° 6.12	-6.4'	61.2'
6	267° 12.71	\$19°56.64	105°52.75	1.8'	N25°59.68	-6.6'	61.2'
7 8	282° 12.53 297° 12.35	56.08 55.53	120° 13.54 134° 34.39	1.9' 1.9'	25°53.04 25°46.21	-6.8' -7.0'	61.2' 61.2'
9	312° 12.18	• • 54.98	134 34.39 148°55.32	2.0'	25°39.17	-7.0 -7.2'	61.2'
10	$327^{\circ}12.00$	54.42	$163^{\circ}16.31$	2.1'	25°31.93	-7.4'	61.3'
11	342°11.83	53.86	177°37.38	2.1'	25°24.50	-7.6'	61.3'
12	357°11.65 12°11.48	\$19°53.31	191°58.52	2.2'	N25°16.87 25°9.06	-7.8'	61.3'
13 14	12°11.48 27°11.30	52.75 52.19	206° 19.74 220° 41.05	2.3' 2.4'	25° 9.06 25° 1.04	-8.0' -8.2'	61.3' 61.3'
15	42°11.13	51.63	235°2.43	2.5'	24°52.84	-8.4'	61.3
16	57° 10.96	51.07	249°23.90	2.6'	24°44.45	-8.6'	61.3'
17	72°10.78	50.51	263°45.46	2.6'	24°35.87	-8.8'	61.3'
18	87°10.61	\$19°49.95	278°7.11	2.7'	N24°27.11 24°18.17	-8.9'	61.3'
19 20	102° 10.44 117° 10.27	49.39 48.83	292°28.85 306°50.68	2.8' 2.9'	24°18.17 24°9.04	-9.1' -9.3'	61.3' 61.3'
21	132° 10.09	• • 48.26	300 30.00 321°12.61	3.0'	24° 59.04 23° 59.73	-9.5'	61.3
22	147°9.92	47.70	335°34.64	3.1'	23°50.25	-9.7'	61.3'
23	162°9.75	47.14	349°56.76	3.2'	23°40.59	-9.8'	61.3'
	SD = 16.2'	d = -0.5'		SI	D = 16.7'		
			-				

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

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

January 22, 23, 24 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	121°7.43	226°14.32 \$19°43.		333°54.92 N14°16.81	111°28.26 N01°34.62	
1	136°9.89	241°13.87 43.		348°57.66 16.91	126°30.56 34.70	Alpheratz 357°33.17 29°14.55
2	151° 12.35	256°13.42 44.		4°0.39 17.01	141°32.86 34.78	Ankaa 353°5.66 -42°9.71
3	$166^{\circ}14.82$	271°12.97 · · 44.	.58 3°35.66 ·· 41.34	19° 3.13 · · 17.11	156°35.17 · · 34.85	Schedar 349° 29.26 56° 41.44
4	$181^{\circ}17.28$	286°12.52 44.	.97 18°38.45 41.56	34°5.87 17.22	171°37.47 34.93	Diphda 348°45.71 -17°50.38 Achernar 335°19.00 -57°6.21
5	$196^{\circ}19.75$	301°12.06 45.		49°8.61 17.32	186°39.77 35.01	Hamal 327° 49.25 23° 35.54
6	211° 22.21	316°11.61 \$19°45		64°11.35 N14°17.42	201°42.08 N01°35.09	Polaris 312°58.94 89°22.99
7	226°24.68	331°11.16 46.		79°14.08 17.52	216°44.38 35.17	Acamar 315°10.37 -40°11.97
8	241°27.14	346°10.70 46.		94°16.82 17.63	231°46.68 35.25	Menkar 314°4.27 4°11.74
9 10	256° 29.60 271° 32.07	1°10.25 · · 46. 16°9.79 47.		109°19.56 · · 17.73 124°22.30 17.83	246°48.98 · · 35.33 261°51.29 35.40	Mirfak 308°25.59 49°57.64
11	286°34.53	31°9.34 47.		139°25.04 17.93	261°51.29 35.40 276°53.59 35.48	Aldebaran 290°37.43 16°33.83
12	301°37.00	46°8.88 \$19°48.		154°27.78 N14°18.04	291°55.89 N01°35.56	Rigel 281°1.97 -8°10.32
13	316°39.46	61°8.42 48.		169°30.52 18.14	306°58.19 35.64	Capella 280°18.99 46°1.58
14	331°41.93	76°7.96 48.		184°33.26 18.24	322°0.49 35.72	Bellatrix 278°20.78 6°22.39
15	346°44.39	91°7.50 · · 49	.16 184°9.25 ·· 43.99	199°36.00 · · 18.34	337°2.79 · · 35.80	Elnath 277°59.41 28°37.82 Alnilam 275°35.72 -1°11.16
16	1°46.85	106°7.04 49.		214°38.74 18.45	352°5.10 35.88	Alnilam 275°35.72 -1°11.16 Betelgeuse 270°49.95 7°24.66
17	16°49.32	121°6.58 49.	.92 214°14.87 44.44	229°41.48 18.55	7°7.40 35.96	Canopus 263°51.13 -52°42.73
18	31°51.78	136°6.12 S19°50.		244°44.22 N14°18.65	22°9.70 N01°36.04	Sirius 258°24.40 -16°45.32
19	46° 54.25	151°5.66 50		259°46.96 18.76	37°12.00 36.12	Adhara 255°4.15 -29°0.65
20	61°56.71	166°5.20 51.		274°49.70 18.86	52°14.30 36.20	Procyon 244°48.72 5°9.21
21 22	76° 59.17 92° 1.64	181°4.74 · · · 51. 196°4.27		289°52.45 · · 18.96	67°16.60 · · 36.27	Pollux 243°14.85 27°57.53
23	92 1.04 107°4.10	196° 4.27 51. 211° 3.81 52.		304°55.19 19.07 319°57.93 19.17	82°18.90 36.35 97°21.20 36.43	Avior 234°13.37 -59°35.79
	107 4.10	-		-		Suhail 222°44.61 -43°32.54
Mer.	pass. 15:53	ν -0.4' d 0.4' m-4.3	$\nu 2.8' \ d0.2' \ \text{m-}0.66$	$ u 2.7' \ d0.1' \ \text{m-}2.52$	$ u 2.3' \ d0.1' \ m0.78$	Miaplacidus 221°36.98 -69°49.64
						Alphard 217°45.76 -8°46.68
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.34 11°49.93 Dubhe 193°38.47 61°35.97
0	$122^{\circ}6.57$	226°3.35 \$19°52.	.53 319°34.57 N11°46.02	335°0.67 N14°19.27	112°23.50 N01°36.51	Denebola 182°23.03 14°25.03
1	$137^{\circ}9.03$	241°2.88 52.		350° 3.41 19.38	127°25.80 36.59	Gienah 175°41.67 -17°41.59
2	152°11.50	256°2.42 53.		5° 6.15 19.48	142°28.10 36.67	Acrux 172°57.86 -63°14.77
3	167° 13.96	271°1.95 · · 53.		20°8.90 · · 19.58	157°30.40 · · 36.75	Gacrux 171°49.48 -57°15.73
4 5	182° 16.42 197° 18.89	286°1.48 54. 301°1.02 54.		35°11.64 19.69 50°14.38 19.79	172°32.70 36.83 187°35.00 36.91	Alioth 166°11.33 55°48.39
6	212°21.35	316°0.55 \$19°54.		65°17.12 N14°19.89	202°37.30 N01°36.99	Spica 158°20.44 -11°18.23
7	227°23.82	331°0.08 55	_	80°19.87 20.00	217°39.60 37.07	Alkaid 152°50.65 49°10.31
8	242°26.28	345°59.61 55.	_	95°22.61 20.10	232°41.90 37.15	Hadar 148°33.55 -60°29.99
9	257°28.74	0°59.14 · · 55.		110°25.35 · · 20.21	247°44.20 · · 37.23	Menkent 147°55.60 -36°30.09 Arcturus 145°46.38 19°2.24
10	272°31.21	15°58.67 56.	.21 110°2.84 48.31	125°28.10 20.31	262°46.50 37.31	Rigil Kent. 139°38.00 -60°56.61
11	287°33.67	30°58.20 56.	.57 125°5.67 48.54	140°30.84 20.41	277°48.80 37.39	Kochab 137°20.15 74°2.21
12	302°36.14	45°57.73 \$19°56.		155°33.59 N14°20.52	292°51.10 N01°37.47	Zuben'ubi 136°54.20 -16°9.27
13	317°38.60	60° 57.25 57.		170°36.33 20.62	307°53.40 37.55	Alphecca 126°2.45 26°37.16
14	332°41.06	75°56.78 57.		185°39.07 20.73	322°55.69 37.63	Antares 112°13.96 -26°29.46
15 16	347° 43.53 2° 45.99	90°56.31 · · 58. 105°55.83 58.		200°41.82 · · 20.83 215°44.56 20.93	337°57.99 · · 37.71 353°0.29 37.79	Atria 107°7.03 -69°4.32
17	17° 48.46	120°55.36 58.		230°47.31 21.04	8°2.59 37.87	Sabik 102°1.08 -15°45.50
18	32°50.92	135°54.88 \$19°59.		245°50.05 N14°21.14	23°4.89 N01°37.95	Shaula 96°8.38 -37°7.31 Rasalhague 95°57.24 12°32.30
19	47°53.39	150°54.41 59	.45 245°28.39 50.42	260°52.80 21.25	38°7.19 38.03	Rasalhague 95°57.24 12°32.30 Eltanin 90°41.85 51°28.90
20	$62^{\circ}55.85$	165°53.93 19°59.	.81 260°31.23 50.65	275°55.54 21.35	53°9.48 38.11	Kaus Aust. 83°30.62 -34°22.24
21	77°58.31	180°53.45 20°0.		290°58.29 · · 21.46	68°11.78 · · 38.20	Vega 80°32.47 38°48.38
22	93°0.78		.52 290°36.93 51.13	306°1.04 21.56	83°14.08 38.28	Nunki 75°46.01 -26°15.75
23	108°3.24	210°52.50 0.	.88 305°39.77 51.37	321°3.78 21.67	98°16.38 38.36	Altair 61°58.63 8°56.36
Mer.	pass. 15:49	ν -0.5' d 0.4' m-4.3	$\nu 2.8' \ d0.2' \ \text{m-}0.68$	$\nu 2.7' \ d0.1' \ \text{m-}2.52$	$\nu 2.3' \ d0.1' \ m0.78$	Peacock 53°3.67 -56°38.86
	<u>. </u>					Deneb 49°25.10 45°22.64
Sun	CHV	CHV Doc	CHA Doc	CHA Doc	CHA Dos	Enif 33°37.42 9°59.97
Sun 0	GHA 123°5.71	GHA Dec 225°52.02 S 20°1.		GHA Dec 336°6.53 N14°21.77	GHA Dec 113°18.67 N01°38.44	Al Na'ir 27°31.21 -46°49.89
1	138°8.17		.59 335°45.48 51.84	351°9.27 21.87	128°20.97 38.52	Fomalhaut 15°12.92 -29°28.83
2	153° 10.63		.94 350°48.33 52.08	6°12.02 21.98	143°23.27 38.60	Scheat 13°43.80 28°13.90 Markab 13°28.43 15°21.12
3	168° 13.10	270°50.58 · · 2	.29 5°51.19 · · 52.32	21°14.77 · · 22.08	158°25.56 · · 38.68	IVIAINAU 13 20.43 13 21.12
4	183° 15.56		.64 20°54.04 52.56	36°17.51 22.19	173°27.86 38.76	Jan 22 Fri SHA Mer.pass
5	198° 18.03		.99 35°56.90 52.80	51°20.26 22.29	188°30.16 38.84	Venus 105°6.89 08:55
6	213°20.49	315°49.13 \$20°3.		66°23.01 N14°22.40	203°32.45 N01°38.92	Mars 197°19.86 02:46
7	228°22.95		.69 66°2.62 53.28	81°25.76 22.50	218°34.75 39.00	Jupiter 212° 47.49 01:44
8	243°25.42		.04 81°5.48 53.53	96°28.50 22.61	233°37.04 39.09	Saturn 350° 20.83 16:32
9 10	258° 27.88 273° 30.35	0°47.68 · · · 4. 15°47.19 4.	.38 96°8.34 · · 53.77 .73 111°11.21 54.01	111°31.25 · · 22.71 126°34.00 22.82	248°39.34 · · 39.17 263°41.64 39.25	Jan 23 Sat SHA Mer.pass
11	273 30.35 288°32.81		.08 126°14.07 54.25	126 34.00 22.82 141°36.75 22.92	203 41.04 39.25 278°43.93 39.33	Venus 103° 56.78 08:56
12	303°35.28	45°46.22 \$20°5		156°39.50 N14°23.03	293°46.23 N01°39.41	Mars 197°28.01 02:41
13	318° 37.74		.77 156°19.81 54.74	171°42.24 23.13	308°48.52 39.49	Jupiter 212° 54.10 01:40
14	333°40.20		.11 171°22.68 54.99	186°44.99 23.24	323°50.82 39.57	Saturn 350°16.94 16:28
15	348° 42.67	90°44.76 · · 6.		201°47.74 · · 23.34	338°53.11 · · 39.66	Jan 24 Sun SHA Mer.pass
16	3°45.13		.79 201°28.42 55.48	216°50.49 23.45	353°55.41 39.74	Venus 102°46.31 08:57
17	18° 47.60		14 216°31.29 55.72 48 231°34.17 N11°55.97	231°53.24 23.55	8°57.70 39.82 24°0.00 N01°39.90	Mars 197°36.92 02:37
18 19	33°50.06 48°52.52		.48 231°34.17 N11°55.97 .82 246°37.04 56.21	246°55.99 N14°23.66 261°58.74 23.77	24°0.00 N01°39.90 39°2.29 39.98	Jupiter 213°0.82 01:35 Saturn 350°12.97 16:24
20	63°54.99		.16 261°39.92 56.46	201 30.74 23.77 277°1.49 23.87	54°4.59 40.06	Saturn 350°12.97 16:24
21	78° 57.45	180°41.82 · · 8.		292°4.24 · · 23.98	69°6.88 · · 40.15	Horizontal parallax
22	93°59.92		.83 291°45.68 56.96	307°6.99 24.08	84°9.17 40.23	Venus: 0.2
23	109°2.38	210°40.83 9.	.17 306°48.56 57.21	322°9.74 24.19	99°11.47 40.31	Mars: 0.2
Mer.	pass. 15:45	ν-0.5′ d0.4′ m-4.3	ν 2.9' d 0.2' m -0.71	ν2.7′ d0.1′ m-2.53	ν2.3' d0.1' m0.78	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°9.58	S19°46.57	4°18.98	3.3'	N23°30.76	-10.0'	61.3'
1	192°9.41	46.01	18°41.31	3.4'	23°20.75	-10.2'	61.3'
2	207°9.24 222°9.07	45.44 •• 44.88	33°3.74 47°26.27	3.5' 3.6'	23°10.58 23°0.23	-10.3' -10.5'	61.3' 61.3'
4	237°8.90	44.31	61°48.91	3.7'	23° 49.73	-10.3 -10.7'	61.3'
5	252°8.73	43.74	76°11.66	3.9'	22°39.05	-10.8'	61.3'
6	267°8.56	S19°43.17	90°34.52	4.0'	$N22^{\circ}28.22$	-11.0'	61.3'
7	282°8.39	42.60	104°57.48	4.1'	22°17.23	-11.1'	61.3'
8 9	297°8.23 312°8.06	42.03 •• 41.46	119°20.56 133°43.75	4.2' 4.3'	22°6.08 21°54.77	-11.3' -11.5'	61.3' 61.3'
10	312 6.00 327°7.89	40.89	133 43.75 148°7.05	4.3 4.4'	21°43.32	-11.5 -11.6'	61.3
11	342°7.72	40.32	162°30.47	4.5'	21°31.71	-11.8'	61.2'
12	357°7.56	S19°39.75	176°54.00	4.6'	$N21^{\circ}19.95$	-11.9'	61.2'
13	12°7.39	39.17	191°17.64	4.8'	21°8.05	-12.0'	61.2'
14 15	27°7.22 42°7.06	38.60 •• 38.03	205°41.40 220°5.28	4.9' 5.0'	20°56.01 20°43.82	-12.2' -12.3'	61.2' 61.2'
16	57°6.89	37.45	234°29.27	5.1'	20° 31.49	-12.5'	61.2'
17	72°6.73	36.88	248°53.38	5.2'	20°19.03	-12.6'	61.2'
18	87°6.56	S19°36.30	263° 17.61	5.3'	N20°6.44	-12.7'	61.2'
19	102°6.40	35.72	277°41.96	5.5'	19°53.71	-12.9'	61.2'
20 21	117°6.24 132°6.07	35.15 •• 34.57	292°6.42 306°31.01	5.6' 5.7'	19°40.85 19°27.86	-13.0' -13.1'	61.2' 61.1'
22	132 6.07 147°5.91	33.99	300 31.01 320°55.71	5. <i>1</i> 5.8'	19 27.86 19°14.75	-13.1 -13.2'	61.1
23	162°5.74	33.41	335°20.53	5.9'	19°1.52	-13.4	61.1
	SD = 16.2'	d = -0.6'		SI	D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°5.58 192°5.42	\$19°32.83 32.25	349° 45.47 4° 10.53	6.1' 6.2'	N18°48.17 18°34.69	-13.5' -13.6'	61.1' 61.1'
2	192 5.42 207°5.26	32.25	4 10.53 18°35.71	6.2 6.3'	18 34.09 18°21.11	-13.0 -13.7'	61.1
3	222°5.10	31.09	33°1.01	6.4	18°7.41	-13.8'	61.0'
4	237°4.93	30.51	47°26.42	6.5'	17°53.60	-13.9'	61.0'
5	252° 4.77	29.92	61°51.95	6.7'	17°39.68	-14.0'	61.0'
6	267°4.61 282°4.45	S19°29.34	76° 17.61 90° 43.37	6.8'	N17°25.65 17°11.53	-14.1'	61.0'
7 8	282 4.45 297° 4.29	28.76 28.17	90°43.37 105°9.26	6.9' 7.0'	16°57.30	-14.2' -14.3'	61.0' 61.0'
9	312°4.13	27.58	119°35.26	7.1'	16°42.97	-14.4'	60.9'
10	327°3.97	27.00	134°1.38	7.2'	$16^{\circ}28.54$	-14.5'	60.9'
11	342°3.81	26.41	148°27.62	7.4'	16°14.02	-14.6'	60.9'
12	357°3.65 12°3.50	\$19°25.82 25.24	162°53.97 177°20.44	7.5'	N15°59.41 15°44.71	-14.7' -14.8'	60.9'
13 14	27°3.34	25.24	177 20.44 191°47.02	7.6' 7.7'	15 44.71 15°29.93	-14.8 -14.9'	60.9' 60.8'
15	42°3.18	24.06	206° 13.71	7.8'	15°15.06	-15.0'	60.8'
16	57°3.02	23.47	220°40.52	7.9'	$15^{\circ}0.10$	-15.0'	60.8'
17	72°2.87	22.88	235°7.44	8.0'	14°45.07	-15.1'	60.8'
18 19	87°2.71 102°2.55	\$19°22.29 21.70	249°34.47 264°1.61	8.1' 8.3'	N14°29.95 14°14.77	-15.2' -15.3'	60.7' 60.7'
20	102 2.55 117°2.40	21.70	278° 28.86	6.3 8.4'	14 14.77 13°59.51		60.7
21	132°2.24	20.51	292°56.22	8.5'	13°44.17	-15.4	60.7'
22	147°2.09	19.92	307°23.69	8.6'	$13^{\circ}28.77$	-15.5'	60.6'
23	162°1.93	19.32	321°51.27	8.7'	13°13.31	-15.5'	60.6'
	SD = 16.2'	d = -0.6'		SI	D = 16.7'		
ç	GHA	Dec	GHA		Dec	d	HP
Sun 0	GHA 177°1.78	Dec \$19°18.73	336°18.95	ν 8.8'	Dec N12°57.77	a -15.6'	60.6'
1	192°1.62	18.13	350°46.74	8.9'	12°42.18	-15.7'	60.6'
2	207°1.47	17.54	5°14.63	9.0'	12°26.53	-15.7'	60.5'
3	222°1.31 237°1.16	• • 16.94	19° 42.62 34° 10.72	9.1'	12°10.82	-15.8'	60.5'
4 5	237°1.16 252°1.01	16.34 15.75	34° 10.72 48° 38.92	9.2' 9.3'	11°55.05 11°39.23	-15.8' -15.9'	60.5' 60.4'
6	267°0.85	S19°15.15	63°7.22	9.4'	N11°23.36	-15.9'	60.4
7	282°0.70	14.55	$77^{\circ}35.61$	9.5'	$11^{\circ}7.44$	-16.0'	60.4'
8	297°0.55	13.95	92°4.11	9.6'	10°51.47	-16.0'	60.4'
9 10	312°0.40 327°0.25	· · 13.35 12.75	106°32.70 121°1.39	9.7' 9.8'	10°35.46 10°19.40	-16.1' -16.1'	60.3' 60.3'
11	342° 0.25	12.75	121 1.39 135°30.17	9.8 9.9'	10 19.40 10°3.30	-16.1'	60.3
12	356° 59.94	S19°11.54	149° 59.05	10.0'	N09°47.17	-16.2	60.2
13	11° 59.79	10.94	164°28.01	10.1'	09°31.00	-16.2'	60.2'
14	26°59.64	10.34	178°57.07	10.1'	09°14.79	-16.2'	60.2'
15 16	41°59.49 56°59.35	· · 9.73 9.13	193°26.22 207°55.46	10.2' 10.3'	08°58.55 08°42.28	-16.3' -16.3'	60.1' 60.1'
17	71°59.20	9.13 8.52	207 55.46 222°24.78	10.3	08 42.28 08°25.98	-16.3'	60.1
18	86°59.05	S19°7.92	236°54.19	10.5'	N08° 9.65	-16.4	60.0'
19	101°58.90	7.31	251°23.68	10.6'	07°53.30	-16.4'	60.0'
20	116°58.75	6.70	265°53.26	10.7'	07°36.93	-16.4'	60.0'
21 22	131°58.60 146°58.46	· · 6.10 5.49	280°22.92 294°52.66	10.7' 10.8'	07°20.53 07°4.12	-16.4' -16.4'	59.9' 59.9'
23	161°58.31	4.88	309°22.48	10.0	06°47.68	-16.4	59.9'
	SD = 16.2'	d = -0.6'			D = 16.5'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Day	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%	
22	11:22	11:30	12:11	-:-	12:13		
23	11:38	11:45	12:12	00:43	13:11		
24	11:53	12:00	12:12	01:38	14:04		

January 25, 26, 27 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	124°4.84	225°40.34 \$20°9.50	321°51.44 N11°57.45	337°12.49 N14°24.29	114°13.76 N01°40.39	
1	139°7.31	240°39.84 9.84	336°54.33 57.70	352°15.24 24.40	129°16.06 40.47	Alpheratz 357°33.19 29°14.54
2	$154^{\circ}9.77$	255°39.35 10.17	351°57.21 57.95	7°17.99 24.51	144°18.35 40.56	Ankaa 353°5.67 -42°9.71
3	$169^{\circ}12.24$	270°38.85 · · 10.51	7°0.10 · · 58.20	22°20.74 · · 24.61	159°20.64 · · 40.64	Schedar 349°29.29 56°41.44 Diphda 348°45.72 -17°50.38
4	184° 14.70	285°38.36 10.84	22°2.99 58.45	37°23.49 24.72	174°22.94 40.72	Achernar 335°19.02 -57°6.20
5	199° 17.16	300°37.86 11.17	37°5.87 58.71	52°26.24 24.82	189°25.23 40.80	Hamal 327°49.26 23°35.54
6 7	214° 19.63 229° 22.09	315°37.37 \$20°11.50	52°8.77 N11°58.96	67°28.99 N14°24.93	204°27.52 N01°40.89 219°29.82 40.97	Polaris 313° 0.53 89° 23.00
8	244° 24.56	330°36.87 11.83 345°36.37 12.16	67°11.66 59.21 82°14.55 59.46	82°31.75 25.03 97°34.50 25.14	219°29.82 40.97 234°32.11 41.05	Acamar 315°10.39 -40°11.98
9	259° 27.02	0°35.87 · · 12.49	97°17.44 11°59.71	112°37.25 · · 25.25	249°34.40 · · 41.13	Menkar 314°4.28 4°11.74
10	274°29.49	15°35.37 12.82	112°20.34 11°59.97	127°40.00 25.35	264°36.69 41.22	Mirfak 308°25.61 49°57.64
11	289°31.95	30°34.87 13.15	127°23.24 0.22	142°42.75 25.46	279°38.99 41.30	Aldebaran 290°37.44 16°33.83 Rigel 281°1.98 -8°10.32
12	304°34.41	45°34.37 S 20°13.48	142°26.14 N12°0.48	157°45.51 N14°25.57	294°41.28 N01°41.38	Rigel 281°1.98 -8°10.32 Capella 280°19.00 46°1.59
13	319°36.88	60°33.87 13.80	157°29.04 0.73	172°48.26 25.67	309°43.57 41.46	Bellatrix 278°20.79 6°22.39
14	334°39.34	75°33.37 14.13	172°31.94 0.99	187°51.01 25.78	324°45.86 41.55	Elnath 277°59.41 28°37.82
15 16	349° 41.81 4° 44.27	90°32.87 · · 14.45 105°32.37 14.78	187°34.84 · · 1.24 202°37.74 1.50	202°53.76 ·· 25.88 217°56.52 25.99	339°48.15 · · 41.63 354°50.45 41.71	Alnilam 275°35.73 -1°11.16
17	4 44.27 19°46.73	120°31.86 15.10	202 37.74 1.50 217°40.65 1.75	232°59.27 26.10	9°52.74 41.79	Betelgeuse 270°49.95 7°24.65
18	34° 49.20	135°31.36 S20°15.42	232°43.55 N12°2.01	248°2.02 N14°26.20	24°55.03 N01°41.88	Canopus 263°51.14 -52°42.74
19	49°51.66	150°30.85 15.74	247°46.46 2.27	263°4.78 26.31	39°57.32 41.96	Sirius 258°24.41 -16°45.33
20	64°54.13	165°30.35 16.06	262°49.37 2.52	278° 7.53 26.42	54°59.61 42.04	Adhara 255°4.16 -29°0.66 Procyon 244°48.71 5°9.21
21	79°56.59	180°29.84 · · 16.38	277°52.28 · · 2.78	293°10.28 · · 26.52	70°1.90 · · 42.13	Procyon 244°48.71 5°9.21 Pollux 243°14.85 27°57.53
22	94°59.05	195°29.34 16.70	292°55.19 3.04	308°13.04 26.63	85°4.19 42.21	Avior 234°13.37 -59°35.81
23	110°1.52	210°28.83 17.02	307°58.11 3.30	323°15.79 26.74	100°6.49 42.29	Suhail 222°44.60 -43°32.55
Mer.p	pass. 15:41	ν-0.5' d0.3' m-4.33	ν2.9' d0.2' m-0.74	ν2.8' d0.1' m-2.53	ν2.3' d0.1' m0.78	Miaplacidus 221°36.97 -69°49.66
						Alphard 217°45.76 -8°46.68
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.33 11°49.90
o 0	GHA 125°3.98	225°28.32 \$20°17.34	323°1.02 N12°3.56	338°18.55 N14°26.84	115°8.78 N01°42.38	Dubhe 193°38.44 61°35.98
1	140°6.45	240°27.82 17.65	338°3.94 3.82	353°21.30 26.95	130°11.07 42.46	Denebola 182°23.01 14°25.02
2	155°8.91	255°27.31 17.97	353°6.85 4.08	8°24.05 27.06	145°13.36 42.54	Gienah 175°41.65 -17°41.60 Acrux 172°57.82 -63°14.79
3	$170^{\circ}11.37$	270°26.80 · · 18.28	8°9.77 · · 4.34	23°26.81 · · 27.16	160°15.65 · · 42.63	Gacrux 171°49.45 -57°15.75
4	$185^{\circ}13.84$	285°26.29 18.60	23°12.69 4.60	38°29.56 27.27	175°17.94 42.71	Alioth 166°11.29 55°48.39
5	200°16.30	300°25.78 18.91	38°15.61 4.86	53°32.32 27.38	190°20.23 42.79	Spica 158°20.42 -11°18.24
6	215° 18.77	315°25.27 \$20°19.23	53°18.53 N12°5.13	68°35.08 N14°27.48	205°22.52 N01°42.88	Alkaid 152°50.61 49°10.30
7	230°21.23	330°24.76 19.54	68°21.46 5.39	83°37.83 27.59	220°24.81 42.96	Hadar 148°33.52 -60°30.00
8 9	245°23.69 260°26.16	345°24.25 19.85 0°23.73 · · 20.16	83°24.38 5.65 98°27.31 · · 5.91	98°40.59 27.70 113°43.34 •• 27.81	235°27.10 43.04 250°29.39 · · 43.13	Menkent 147°55.57 -36°30.10
10	275° 28.62	15°23.22 20.47	113°30.24 6.18	128°46.10 27.91	265°31.68 43.21	Arcturus 145°46.35 19°2.24
11	290°31.09	30°22.71 20.78	128°33.17 6.44	143°48.85 28.02	280°33.96 43.30	Rigil Kent. 139°37.96 -60°56.62
12	305°33.55	45°22.19 \$20°21.09	143°36.10 N12°6.71	158°51.61 N14°28.13	295°36.25 N01°43.38	Kochab 137°20.08 74°2.21 Zuben'ubi 136°54.17 -16°9.28
13	$320^{\circ}36.01$	60°21.68 21.39	158°39.03 6.97	173°54.37 28.23	310°38.54 43.46	Alphecca 126°2.43 26°37.15
14	335°38.48	75°21.16 21.70	173°41.96 7.24	188°57.12 28.34	325°40.83 43.55	Antares 112°13.94 -26°29.47
15	350° 40.94	90°20.65 · · 22.00	188°44.89 · · 7.50	203°59.88 · · 28.45	340°43.12 · · 43.63	Atria 107°6.98 -69°4.32
16	5°43.41	105°20.13 22.31	203°47.83 7.77	219° 2.64 28.56	355°45.41 43.72	Sabik 102°1.06 -15°45.51
17 18	20° 45.87 35° 48.34	120°19.62 22.61 135°19.10 \$20°22.92	218°50.77 8.04 233°53.70 N12°8.30	234°5.39 28.66 249°8.15 N14°28.77	10°47.70 43.80 25°49.99 N01°43.88	Shaula 96°8.36 -37°7.31
19	50°50.80	150°18.58 23.22	248°56.64 8.57	264°10.91 28.88	40°52.27 43.97	Rasalhague 95°57.22 12°32.29
20	65°53.26	165°18.06 23.52	263°59.58 8.84	279°13.66 28.99	55°54.56 44.05	Eltanin 90°41.83 51°28.89
21	80°55.73	180°17.54 · · 23.82	279°2.53 · · 9.11	294°16.42 · · 29.09	70°56.85 · · 44.14	Kaus Aust. 83°30.60 -34°22.24 Vega 80°32.45 38°48.37
22	$95^{\circ}58.19$	195°17.02 24.12	294°5.47 9.37	309°19.18 29.20	85°59.14 44.22	Vega 80°32.45 38°48.37 Nunki 75°45.99 -26°15.75
23	$111^{\circ}0.66$	210°16.50 24.42	309°8.41 9.64	324°21.94 29.31	101°1.42 44.31	Altair 61°58.63 8°56.35
Mer r	pass. 15:37	ν-0.5' d0.3' m-4.33	ν2.9' d0.3' m-0.76	ν2.8' d0.1' m-2.53	$\nu 2.3' \ d0.1' \ m0.79$	Peacock 53°3.66 -56°38.85
						Deneb 49°25.10 45°22.63
10/	CUA	CHA	CHA	CUA	CHA	Enif 33°37.43 9°59.96
Wed 0	GHA 126°3.12	GHA Dec 225°15.98 S 20°24.72	GHA Dec 324°11.36 N12°9.91	GHA Dec 339°24.70 N14°29.42	GHA Dec 116°3.71 N01°44.39	Al Na'ir 27°31.21 -46°49.88
1	120 5.12 141°5.58	240°15.46 25.02	339°14.31 10.18	354°27.45 29.52	131°6.00 44.47	Fomalhaut 15°12.93 -29°28.83
2	156°8.05	255°14.94 25.31	354°17.26 10.45	9°30.21 29.63	146°8.29 44.56	Scheat 13°43.81 28°13.89 Markab 13°28.44 15°21.12
3	$171^{\circ}10.51$	270°14.42 · · 25.61	9°20.21 · · 10.73	24°32.97 · · 29.74	161°10.57 · · 44.64	IVIAI KAD 13 28.44 13 21.12
4	186° 12.98	285°13.90 25.91	24°23.16 11.00	39°35.73 29.85	176°12.86 44.73	Jan 25 Mon SHA Mer.pass
5	201°15.44	300°13.37 26.20	39°26.11 11.27	54°38.49 29.95	191°15.15 44.81	Venus 101°35.49 08:58
6	216° 17.90	315°12.85 \$20°26.49	54°29.06 N12°11.54	69°41.25 N14°30.06	206°17.43 N01°44.90	Mars 197°46.60 02:32
7	231°20.37	330°12.33 26.79	69°32.02 11.81	84°44.01 30.17	221°19.72 44.98	Jupiter 213°7.64 01:31 Saturn 350°8.92 16:21
8 9	246°22.83 261°25.30	345°11.80 27.08 0°11.28 · · 27.37	84°34.97 12.09 99°37.93 · · 12.36	99°46.77 30.28 114°49.53 · · 30.39	236°22.01 45.07 251°24.29 • 45.15	Saturn 350°8.92 16:21
10	201 25.30 276°27.76	15°10.75 27.66	114°40.89 12.63	129°52.29 30.49	266°26.58 45.24	Jan 26 Tue SHA Mer.pass
11	291°30.22	30°10.22 27.95	129°43.85 12.91	144°55.04 30.60	281°28.87 45.32	Venus 100°24.34 08:58
12	306° 32.69	45°9.70 \$20°28.24	144°46.81 N12°13.18	159°57.80 N14°30.71	296°31.15 N01°45.41	Mars 197°57.04 02:27
13	321°35.15	$60^{\circ}9.17$ 28.53	159°49.78 13.46	175°0.56 30.82	311°33.44 45.49	Jupiter 213°14.56 01:26 Saturn 350°4.79 16:17
14	336° 37.62	75°8.64 28.81	174°52.74 13.73	190° 3.32 30.93	326°35.72 45.58	
15	351°40.08	90°8.11 · · 29.10	189°55.71 · · 14.01	205°6.09 · · 31.03	341°38.01 · · 45.66	Jan 27 Wed SHA Mer.pass
16	6° 42.54	105°7.58 29.39	204°58.67 14.28	220°8.85 31.14	356°40.29 45.75	Venus 99°12.86 08:59
17	21°45.01	120°7.05 29.67	220°1.64 14.56	235°11.61 31.25	11°42.58 45.83	Mars 198°8.24 02:23
18 19	36° 47.47 51° 49.94	135°6.52 S20°29.95 150°5.99 30.24	235°4.61 N12°14.84 250°7.58 15.12	250°14.37 N14°31.36 265°17.13 31.47	26°44.86 N01°45.92 41°47.15 46.00	Jupiter 213°21.58 01:22
20	66° 52.40	165° 5.46 30.52	265°10.55 15.39	280°19.89 31.58	56°49.43 46.09	Saturn 350°0.59 16:13
21	81°54.86	180°4.93 · · 30.80	280°13.53 · · 15.67	295°22.65 · · 31.68	71°51.72 · · 46.18	Horizontal parallax
22	96°57.33	195°4.40 31.08	295°16.50 15.95	310°25.41 31.79	86°54.00 46.26	Venus: 0.2
23	111°59.79	210°3.86 31.36	310°19.48 16.23	325°28.17 31.90	101°56.29 46.35	Mars: 0.2
Merr	pass. 15:33	ν-0.5' d0.3' m-4.32	ν2.9' d0.3' m-0.79	ν2.8' d0.1' m-2.54	$\nu 2.3' \ d0.1' \ m0.79$	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°58.16	S 19°4.27	323°52.38	11.0'	N06° 31.24	-16.5'	59.8'
1	191°58.02	3.66	338°22.35	11.1'	06° 14.77 05° 58.30	-16.5'	59.8'
2	206°57.87 221°57.72	3.05	352°52.40 7°22.53	11.1' 11.2'	05°58.30 05°41.81	-16.5' -16.5'	59.7' 59.7'
4	236°57.58	1.82	21°52.73	11.3'	05° 25.32	-16.5	59.7'
5	251°57.43	1.21	36°23.00	11.3'	05°8.82	-16.5	59.6'
6	266°57.29	S19°0.60	50° 53.33	11.4'	N04°52.31	-16.5'	59.6'
7	281°57.15 296°57.00	18° 59.99 18° 59.37	65°23.74 79°54.22	11.5'	04°35.80 04°19.29	-16.5'	59.6'
8 9	296 57.00 311°56.86	18 59.37	79°54.22 94°24.76	11.5' 11.6'	04°19.29 04°2.78	-16.5' -16.5'	59.5' 59.5'
10	326°56.71	58.14	108°55.36	11.7'	03°46.27	-16.5	59.5'
11	341°56.57	57.52	123°26.03	11.7'	$03^{\circ}29.76$	-16.5'	59.4'
12	356°56.43	\$18° 56.91	137°56.77	11.8'	N03° 13.25	-16.5'	59.4'
13 14	11°56.29 26°56.14	56.29 55.67	152°27.56 166°58.41	11.9' 11.9'	02°56.76 02°40.27	-16.5' -16.5'	59.3' 59.3'
15	41°56.00	55.05	181°29.32	12.0'	02°40.27 02°23.79	-10.5'	59.3'
16	56°55.86	54.43	196°0.29	12.0'	02°7.32	-16.5'	59.2'
17	71°55.72	53.81	210°31.31	12.1'	01°50.86	-16.4'	59.2'
18	86°55.58	\$18° 53.19 52.57	225°2.38 239°33.51	12.1' 12.2'	N01°34.42	-16.4'	59.1'
19 20	101°55.44 116°55.30	52.57 51.95	239° 33.51 254° 4.69	12.2'	01°17.99 01°1.58	-16.4' -16.4'	59.1' 59.1'
21	131°55.16	51.33	268° 35.92	12.3'	00° 45.19	-16.4	59.0'
22	146°55.02	50.71	283°7.20	12.3'	00°28.81	-16.4'	59.0'
23	161°54.88	50.08	297°38.52	12.4'	00°12.46	-16.3'	58.9'
	SD = 16.2'	d = -0.6'		SI	O = 16.3'		
_							
Tue 0	GHA 176°54.74	Dec \$18°49.46	GHA 312° 9.89	u 12.4'	Dec \$00°3.87	d 16.3'	HP 58.9'
1	191°54.61	48.83	326°41.31	12.5'	00° 20.18	16.3	58.9'
2	206°54.47	48.21	341° 12.77	12.5'	00°36.46	16.3'	58.8'
3	221°54.33	• • 47.58	355° 44.27	12.5'	00°52.71	16.2'	58.8'
4	236°54.19 251°54.06	46.96 46.33	10° 15.81 24° 47.39	12.6' 12.6'	01°8.94 01°25.13	16.2'	58.7'
5 6	251 54.00 266°53.92	40.33 \$18°45.70	39° 19.01	12.7'	501°41.30	16.2' 16.1'	58.7' 58.7'
7	281°53.78	45.07	53°50.67	12.7'	01°57.44	16.1	58.6'
8	296°53.65	44.45	68°22.36	12.7'	$02^{\circ}13.54$	16.1'	58.6'
9	311°53.51	• • 43.82	82°54.08	12.8'	02°29.61	16.0'	58.5'
10 11	326°53.38 341°53.24	43.19 42.56	97°25.84 111°57.63	12.8' 12.8'	02°45.64 03°1.63	16.0' 16.0'	58.5' 58.5'
12	356°53.11	\$18°41.92	111 57.05 126° 29.45	12.8'	S03°17.59	15.9	58.4
13	11°52.97	41.29	141°1.30	12.9'	03°33.51	15.9'	58.4'
14	26°52.84	40.66	155°33.17	12.9'	03°49.39	15.8'	58.3'
15	41°52.71 56°52.57	• • 40.03	170°5.08 184°37.01	12.9'	04°5.22 04°21.02	15.8' 15.7'	58.3'
16 17	50 52.57 71°52.44	39.39 38.76	184 37.01 199°8.96	13.0' 13.0'	04 21.02 04°36.77	15.7'	58.3' 58.2'
18	86°52.31	S18°38.12	213° 40.93	13.0'	S04°52.47	15.7'	58.2'
19	101°52.18	37.49	$228^{\circ}12.93$	13.0'	$05^{\circ}8.13$	15.6'	58.1'
20	116°52.05	36.85	242°44.95	13.0'	05°23.74		58.1'
21 22	131°51.91 146°51.78	· · 36.22 35.58	257°16.98 271°49.04	13.1' 13.1'	05°39.31 05°54.82	15.5' 15.5'	58.0' 58.0'
23	161°51.65	34.94	286°21.11	13.1	06° 10.28	15.4'	58.0'
	SD = 16.2'	d = -0.6'		SI	D = 16.1'		
14/ 1	CUA		CILA		Б.	,	
Wed 0	GHA 176°51.52	Dec \$18°34.30	GHA 300°53.19	u 13.1'	Dec 506° 25.70	d 15.4'	HP 57.9'
1	191°51.39	33.67	315° 25.29	13.1	$06^{\circ}41.06$	15.3'	57.9'
2	206°51.26	33.03	329°57.41	13.1'	06°56.36	15.3'	57.8'
3 4	221°51.13 236°51.00	· · 32.39 31.75	344°29.53 359°1.67	13.1' 13.1'	07°11.61 07°26.81	15.2' 15.1'	57.8' 57.8'
4 5	251°50.88	31.75 31.10	359°1.67 13°33.82	13.1	07°26.81	15.1' 15.1'	57.8° 57.7'
6	266°50.75	\$18° 30.46	28°5.97	13.2'	S07°57.03	15.0'	57.7'
7	281°50.62	29.82	42°38.13	13.2'	08° 12.05	15.0'	57.6'
8	296°50.49	29.18	57° 10.30	13.2'	08°27.01	14.9'	57.6'
9 10	311°50.36 326°50.24	· · 28.53 27.89	71°42.48 86°14.66	13.2' 13.2'	08°41.92 08°56.76	14.8' 14.8'	57.6' 57.5'
11	341°50.11	27.24	100°46.84	13.2'	08° 30.70	14.7	57.5'
12	356°49.98	S18°26.60	115° 19.02	13.2'	S09°26.25	14.7'	57.4'
13	11°49.86	25.95	129°51.21	13.2'	09°40.90	14.6'	57.4'
14 15	26°49.73 41°49.61	25.31 •• 24.66	144°23.39 158°55.58	13.2' 13.2'	09°55.48 10°10.00	14.5' 14.5'	57.4' 57.3'
16	56°49.48	24.00	173° 27.76	13.2'	10 10.00 10°24.45	14.5	57.3'
17	71°49.36	23.36	187°59.93	13.2'	10°38.84	14.3'	57.2'
18	86°49.23	S18°22.72	202°32.11	13.2'	\$10°53.15	14.2'	57.2'
19 20	101°49.11 116°48.99	22.07 21.42	217°4.28 231°36.44	13.2' 13.2'	11°7.40 11°21.57	14.2' 14.1'	57.2' 57.1'
20	116 48.99 131°48.86	20.77	231°36.44 246°8.60	13.1'	11° 21.57 11° 35.67	14.1	57.1'
22	146°48.74	20.11	260° 40.74	13.1'	11° 49.70	14.0'	57.0'
23	161°48.62	19.46	$275^{\circ}12.88$	13.1'	12°3.66	13.9'	57.0'
	SD = 16.2'	d = -0.6'		SI	D = 15.8'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-75%	
25	12:07	12:14	12:12	02:29	14:54		
26	12:21	12:28	12:12	03:18	15:41		
27	12:34	12:40	12:13	04:04	16:27		

January 28, 29, 30 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	127°2.26	225°3.33 \$20°31.64	325°22.45 N12°16.51	340°30.93 N14°32.01	116°58.57 N01°46.43	
1	142°4.72	240°2.80 31.92	340°25.43 16.79	355°33.70 32.12	132°0.86 46.52	Alpheratz 357°33.20 29°14.53 Ankaa 353°5.69 -42°9.71
2	157°7.19	255°2.26 32.20	355°28.41 17.07	10°36.46 32.23	147°3.14 46.60	Ankaa 353°5.69 -42°9.71 Schedar 349°29.31 56°41.43
3	172°9.65	270°1.73 · · 32.47	10°31.39 · · 17.35	25°39.22 · · 32.34	162°5.42 · · 46.69	Diphda 348°45.73 -17°50.38
4	187° 12.11	285°1.19 32.75	25°34.38 17.63	40°41.98 32.44	177°7.71 46.78	Achernar 335°19.05 -57°6.20
5 6	202° 14.58 217° 17.04	300°0.66 33.02 315°0.12 \$20°33.30	40°37.36 17.91 55°40.34 N12°18.19	55°44.75 32.55 70°47.51 N14°32.66	192°9.99 46.86 207°12.28 N01°46.95	Hamal 327°49.27 23°35.53
7	232° 19.51	329°59.58 33.57	70°43.33 18.48	85°50.27 32.77	222°14.56 47.03	Polaris 313°1.97 89°23.00
8	247°21.97	344°59.05 33.84	85°46.32 18.76	100°53.03 32.88	237°16.84 47.12	Acamar 315°10.41 -40°11.98
9	$262^{\circ}24.43$	359°58.51 · · 34.11	100°49.31 · · 19.04	115°55.80 · · 32.99	252°19.13 · · 47.21	Menkar 314°4.29 4°11.74 Mirfak 308°25.63 49°57.64
10	277°26.90	14°57.97 34.38	115°52.30 19.33	130°58.56 33.10	267°21.41 47.29	Aldebaran 290°37.46 16°33.82
11	292°29.36	29° 57.43 34.65	130°55.29 19.61	146° 1.32 33.21	282°23.69 47.38	Rigel 281°1.99 -8°10.33
12 13	307°31.83 322°34.29	44°56.89 \$20°34.92 59°56.35 35.19	145°58.28 N12°19.90 161°1.28 20.18	161° 4.09 N14° 33.31 176° 6.85 33.42	297°25.97 N01°47.47 312°28.26 47.55	Capella 280°19.02 46°1.59
14	337°36.75	74°55.81 35.46	176° 4.27 20.46	191° 9.61 33.53	327°30.54 47.64	Bellatrix 278°20.80 6°22.39
15	352°39.22	89°55.27 · · 35.73	191°7.27 · · 20.75	206°12.38 · · 33.64	342°32.82 · · 47.72	Elnath 277°59.42 28°37.82 Alnilam 275°35.74 -1°11.17
16	7°41.68	104°54.73 35.99	206°10.27 21.04	221°15.14 33.75	357°35.10 47.81	Betelgeuse 270°49.96 7°24.65
17	22°44.15	119°54.19 36.26	221°13.27 21.32	236°17.90 33.86	12°37.39 47.90	Canopus 263°51.16 -52°42.76
18 19	37° 46.61 52° 49.07	134°53.64 \$20°36.52 149°53.10 36.78	236°16.27 N12°21.61 251°19.27 21.90	251°20.67 N14°33.97 266°23.43 34.08	27°39.67 N01°47.98 42°41.95 48.07	Sirius 258°24.41 -16°45.34
20	67°51.54	164° 52.56 37.05	266°22.27 22.18	281°26.20 34.19	57°44.23 48.16	Adhara 255°4.16 -29°0.67
21	82°54.00	179°52.01 · · 37.31	281°25.27 · · 22.47	296°28.96 · · 34.30	72°46.51 · · 48.24	Procyon 244°48.72 5°9.20
22	97°56.47	194°51.47 37.57	296°28.28 22.76	311°31.73 34.41	87°48.80 48.33	Pollux 243°14.85 27°57.53 Avior 234°13.37 -59°35.83
23	112°58.93	209°50.92 37.83	311°31.29 23.05	326°34.49 34.51	102°51.08 48.42	Avior 234°13.37 -59°35.83 Suhail 222°44.59 -43°32.57
Mer.ı	pass. 15:29	ν-0.5' d0.3' m-4.31	ν3.0′ d0.3′ m-0.81	ν2.8' d0.1' m-2.54	ν2.3' d0.1' m0.79	Miaplacidus 221°36.96 -69°49.68
						Alphard 217°45.75 -8°46.69
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.32 11°49.90
0	128°1.40	224°50.38 \$20°38.09	326°34.30 N12°23.34	341°37.26 N14°34.62	117°53.36 N01°48.50	Dubhe 193°38.41 61°35.99
1	143°3.86	239°49.83 38.35	341°37.31 23.63	356°40.02 34.73	132°55.64 48.59	Denebola 182°22.99 14°25.02 Gienah 175°41.63 -17°41.61
2	$158^{\circ}6.32$	254°49.29 38.60	356°40.32 23.92	11°42.79 34.84	147°57.92 48.68	Acrux 172°57.79 -63°14.80
3	173°8.79	269°48.74 · · 38.86	11°43.33 · · 24.21	26°45.55 · · 34.95	163°0.20 · · 48.77	Gacrux 171°49.42 -57°15.76
4	188° 11.25	284°48.19 39.11	26°46.34 24.50	41°48.32 35.06	178°2.48 48.85	Alioth 166°11.26 55°48.39
5 6	203° 13.72 218° 16.18	299° 47.64 39.37 314° 47.09 \$20° 39.62	41°49.36 24.79 56°52.37 N12°25.08	56°51.08 35.17 71°53.85 N14°35.28	193°4.76 48.94 208°7.04 N01°49.03	Spica 158°20.40 -11°18.25
7	233° 18.64	329°46.55 39.88	71°55.39 25.37	86°56.62 35.39	223°9.32 49.11	Alkaid 152°50.59 49°10.30
8	248°21.11	344°46.00 40.13	86°58.41 25.66	101°59.38 35.50	238°11.60 49.20	Hadar 148°33.48 -60°30.01 Menkent 147°55.55 -36°30.11
9	263°23.57	359°45.45 · · 40.38	102°1.43 · · 25.96	117°2.15 · · 35.61	253°13.88 · · 49.29	Arcturus 145°46.33 19°2.23
10	278°26.04	14°44.90 40.63	117° 4.45 26.25	132°4.91 35.72	268°16.16 49.38	Rigil Kent. 139°37.92 -60°56.62
11	293°28.50	29°44.34 40.88 44°43.79 \$20°41.13	132°7.47 26.54	147°7.68 35.83	283°18.44 49.46	Kochab 137°20.02 74°2.20
12 13	308° 30.96 323° 33.43	44°43.79 \$20°41.13 59°43.24 41.38	147°10.49 N12°26.84 162°13.52 27.13	162°10.45 N14°35.94 177°13.21 36.05	298°20.72 N01°49.55 313°23.00 49.64	Zuben'ubi 136°54.15 -16°9.29
14	338° 35.89	74°42.69 41.63	177°16.54 27.43	192°15.98 36.16	328°25.28 49.73	Alphecca 126°2.41 26°37.14
15	353°38.36	89°42.14 · · 41.87	192°19.57 · · 27.72	207°18.75 · · 36.27	343°27.56 · · 49.81	Antares 112°13.92 -26°29.47 Atria 107°6.94 -69°4.31
16	8°40.82	104°41.58 42.12	207°22.60 28.02	222°21.51 36.38	358°29.84 49.90	Sabik 102°1.04 -15°45.51
17	23° 43.29	119°41.03 42.36	222°25.63 28.31	237°24.28 36.49	13°32.12 49.99	Shaula 96°8.34 -37°7.30
18 19	38° 45.75 53° 48.21	134°40.47 \$20°42.61 149°39.92 42.85	237°28.66 N12°28.61 252°31.69 28.90	252°27.05 N14°36.60 267°29.82 36.71	28°34.40 N01°50.08 43°36.68 50.17	Rasalhague 95°57.21 12°32.28
20	68° 50.68	164°39.36 43.09	267°34.73 29.20	282°32.58 36.82	58°38.96 50.25	Eltanin 90°41.81 51°28.87
21	83°53.14	179°38.81 · · 43.33	282°37.76 · · 29.50	297°35.35 · · 36.93	73°41.23 · · 50.34	Kaus Aust. 83°30.59 -34°22.23 Vega 80°32.44 38°48.35
22	98°55.61	194°38.25 43.57	297°40.80 29.79	312°38.12 37.04	88°43.51 50.43	Nunki 75°45.98 -26°15.75
23	113°58.07	209°37.69 43.81	312°43.84 30.09	327°40.89 37.15	103°45.79 50.52	Altair 61°58.62 8°56.34
Mer.	pass. 15:25	ν -0.5' d 0.3' m-4.30	ν 3.0′ d0.3′ m-0.84	$\nu 2.8' \ d0.1' \ \text{m-}2.54$	$\nu 2.3' \ d0.1' \ m0.79$	Peacock 53°3.65 -56°38.84
						Deneb 49°25.10 45°22.61
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.43 9°59.95 Al Na'ir 27°31.22 -46°49.87
0	129°0.53	224°37.14 S 20°44.05	327°46.88 N12°30.39	342°43.66 N14°37.26	118°48.07 N01°50.61	Al Na'ir 27°31.22 -46°49.87 Fomalhaut 15°12.94 -29°28.82
1	144°3.00	239° 36.58 44.29	342°49.92 30.69	357°46.42 37.37	133°50.35 50.69	Scheat 13°43.82 28°13.88
2	159°5.46	254°36.02 44.53	357°52.96 30.99	12°49.19 37.48	148°52.63 50.78	Markab 13°28.45 15°21.11
3 4	174°7.93 189°10.39	269°35.46 · · 44.76 284°34.90 45.00	12°56.00 · · 31.29 27°59.04 31.59	27°51.96 · · 37.59 42°54.73 37.70	163°54.90 · · 50.87 178°57.18 50.96	Jan 28 Thu SHA Mer.pass
5	204° 12.86	299°34.34 45.23	43°2.09 31.89	57°57.50 37.81	193°59.46 51.05	Venus 98°1.07 09:00
6	219° 15.32	314°33.78 S20°45.47	58°5.13 N12°32.19	73°0.27 N14°37.92	209°1.74 N01°51.14	Mars 198°20.20 02:18
7	234°17.78	329°33.22 45.70	73°8.18 32.49	88°3.04 38.03	224°4.01 51.22	Jupiter 213°28.68 01:18
8	249° 20.25	344°32.66 45.93	88°11.23 32.79	103°5.81 38.14	239°6.29 51.31	Saturn 349°56.32 16:10
9	264°22.71	359°32.10 · · 46.16	103°14.28 · · 33.09	118° 8.57 · · 38.25	254°8.57 · · 51.40	Jan 29 Fri SHA Mer.pass
10 11	279°25.18 294°27.64	14°31.54 46.39 29°30.98 46.62	118°17.33 33.39 133°20.38 33.69	133°11.34 38.36 148°14.11 38.47	269°10.84 51.49 284°13.12 51.58	Venus 96°48.98 09:01
12	309°30.10	44°30.41 \$20°46.85	148°23.44 N12°34.00	163°16.88 N14°38.58	299°15.40 N01°51.67	Mars 198°32.90 02:13
13	324° 32.57	59°29.85 47.08	163°26.49 34.30	178°19.65 38.69	314°17.67 51.76	Jupiter 213°35.86 01:13
14	339°35.03	74°29.29 47.30	178°29.55 34.60	193°22.42 38.80	329°19.95 51.84	Saturn 349°51.96 16:06
15	354°37.50	89°28.72 · · 47.53	193°32.61 · · 34.91	208°25.19 · · 38.91	344°22.23 · · 51.93	Jan 30 Sat SHA Mer.pass
16	9°39.96	104°28.16 47.75	208°35.67 35.21	223°27.96 39.02	359°24.50 52.02	Venus 95°36.60 09:02
17 18	24° 42.42 39° 44.89	119°27.59 47.98 134°27.03 \$20°48.20	223°38.73 35.52 238°41.79 N12°35.82	238°30.73 39.13 253°33.50 N14°39.24	14°26.78 52.11 29°29.05 N01°52.20	Mars 198°46.34 02:08
19	54° 47.35	149°26.46 48.42	253°44.85 36.13	268°36.27 39.35	44°31.33 52.29	Jupiter 213°43.12 01:09 Saturn 349°47.53 16:02
20	69°49.82	164°25.89 48.64	268°47.91 36.43	283°39.04 39.46	59°33.61 52.38	
21	84°52.28	179°25.33 · · 48.87	283°50.98 · · 36.74	298°41.82 · · 39.57	74°35.88 · · 52.47	Horizontal parallax
22	99°54.75	194°24.76 49.08	298°54.04 37.04	313°44.59 39.68	89°38.16 52.56	Venus: 0.2 Mars: 0.2
23	114° 57.21	209°24.19 49.30	313°57.11 37.35	328°47.36 39.79	104°40.43 52.65	1VIGIS. U.Z
Mer. _I	pass. 15:21	ν-0.6' d0.2' m-4.29	ν3.0′ d0.3′ m-0.86	ν2.8′ d0.1′ m-2.55	ν2.3' d0.1' m0.79	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	$176^{\circ}48.50$	S18°18.81	$289^{\circ}45.01$	13.1'	S 12°17.54	13.8'	57.0'
1	191° 48.37	18.16	304°17.13	13.1'	12°31.35	13.7'	56.9'
2	206°48.25 221°48.13	17.50 •• 16.85	318°49.23 333°21.33	13.1' 13.1'	12°45.08 12°58.74	13.7' 13.6'	56.9' 56.9'
4	236° 48.01	16.20	347°53.41	13.1'	13°12.31	13.5'	56.8'
5	251° 47.89	15.54	2°25.47	13.0'	$13^{\circ}25.81$	13.4'	56.8'
6	266° 47.77	\$18°14.88	16°57.52	13.0'	\$13°39.23	13.3'	56.7'
7 8	281° 47.65 296° 47.53	14.23 13.57	31°29.55 46°1.57	13.0' 13.0'	13°52.57 14°5.83	13.3' 13.2'	56.7' 56.7'
9	311° 47.41	. 12.91	60°33.57	13.0'	14° 19.01	13.1'	56.6'
10	326° 47.29	12.26	$75^{\circ}5.55$	13.0'	$14^{\circ}32.11$	13.0'	56.6'
11	341°47.17 356°47.06	11.60 \$18°10.94	89°37.51	12.9'	14°45.12	12.9'	56.6'
12 13	356°47.06 11°46.94	10.28	104° 9.45 118° 41.37	12.9' 12.9'	\$14°58.05 15°10.89	12.8' 12.8'	56.5' 56.5'
14	26° 46.82	9.62	133°13.27	12.9'	15°23.65	12.7'	56.4'
15	41°46.70	• • 8.96	147°45.14	12.9'	15°36.32	12.6'	56.4'
16	56° 46.59 71° 46.47	8.30	162°16.99 176°48.82	12.8'	15°48.91 16°1.41	12.5'	56.4'
17 18	86° 46.36	7.63 \$18°6.97	176°48.82 191°20.62	12.8' 12.8'	S16°13.82	12.4' 12.3'	56.3' 56.3'
19	101°46.24	6.31	205°52.40	12.8'	16°26.14	12.2'	56.3'
20	$116^{\circ}46.12$	5.64	$220^{\circ}24.15$	12.7'	$16^{\circ}38.37$	12.1'	56.2'
21	131° 46.01	• • 4.98	234°55.88	12.7'	16°50.51	12.0'	56.2'
22 23	146° 45.90 161° 45.78	4.32 3.65	249°27.57 263°59.24	12.7' 12.6'	17°2.56 17°14.51	12.0' 11.9'	56.2' 56.1'
20	SD = 16.2'	d = -0.7'			0 = 15.5'	11.9	
	3D = 10.2'	u = -0.1)L	- 13.5°		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 45.67	\$18° 2.98	278°30.88	12.6'	\$17°26.38	11.8'	56.1
1 2	191°45.55 206°45.44	2.32 1.65	293°2.50 307°34.08	12.6' 12.6'	17°38.15 17°49.83	11.7' 11.6'	56.1' 56.0'
3	200 45.44 221° 45.33	0.98	322° 5.63	12.5'	18° 1.41	11.5'	56.0'
4	236° 45.22	18° 0.31	336°37.15	12.5'	18°12.89	11.4'	56.0'
5	251° 45.10	17°59.65	351°8.64	12.5'	18°24.28	11.3'	55.9'
6 7	266° 44.99 281° 44.88	\$17°58.98 58.31	5°40.10 20°11.53	12.4' 12.4'	\$18°35.58 18°46.77	11.2' 11.1'	55.9' 55.9'
8	296° 44.77	56.51 57.64	20 11.55 34°42.92	12.4'	18°57.87	11.1	55.8'
9	311° 44.66	• • 56.97	49°14.28	12.3'	19°8.87	10.9'	55.8'
10	326° 44.55	56.29	63°45.61	12.3'	19°19.76	10.8'	55.8'
11 12	341°44.44 356°44.33	55.62 \$17°54.95	78°16.90 92°48.16	12.3' 12.2'	19°30.56 \$19°41.26	10.7' 10.6'	55.7' 55.7'
13	11° 44.22	54.28	92 46.10 107°19.39	12.2'	19°51.85	10.5	55.7'
14	26° 44.11	53.60	121°50.58	12.2'	20° 2.35	10.4'	55.7'
15	41°44.00	• • 52.93	136°21.73	12.1'	20°12.74	10.3'	55.6'
16 17	56° 43.89 71° 43.78	52.25 51.58	150°52.85 165°23.93	12.1' 12.0'	20°23.02 20°33.20	10.2' 10.1'	55.6' 55.6'
18	86° 43.68	51.50 S17°50.90	105 23.93 179°54.98	12.0'	S20°43.28	10.1	55.5'
19	101° 43.57	50.22	194°25.99	12.0'	20°53.25	9.9'	55.5'
20	116° 43.46	49.55	208°56.96		21°3.12	9.8'	55.5'
21 22	131°43.35 146°43.25	· · 48.87 48.19	223°27.89 237°58.79	11.9' 11.9'	21°12.87 21°22.53	9.7' 9.5'	55.4' 55.4'
23	161°43.14	46.19 47.51	251° 56.19 252° 29.65	11.8'	21°22.53 21°32.07	9.5 9.4'	55.4'
	SD = 16.2'	d = -0.7'			0 = 15.3'		
	JD — 10.2	u — -0.1		JL			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 43.04	\$17°46.83	267° 0.48 281° 31.26	11.8'	\$21°41.50 21°50.83	9.3'	55.4'
1 2	191° 42.93 206° 42.83	46.15 45.47	281°31.26 296°2.01	11.7' 11.7'	21°50.83 22°0.04	9.2' 9.1'	55.3' 55.3'
3	221° 42.72	• • 44.79	$310^{\circ}32.72$	11.7'	22°9.14	9.0'	55.3'
4	236° 42.62	44.11	325°3.39	11.6'	22°18.14	8.9'	55.3'
5	251°42.51 266°42.41	43.43 \$17°42.74	339°34.03 354°4.62	11.6' 11.6'	22°27.02 S 22°35.79	8.8' 8.7'	55.2' 55.2'
6 7	266° 42.41 281° 42.31	42.74 42.06	354° 4.62 8° 35.18	11.6	522°35.79 22°44.44	8.7° 8.5'	55.2' 55.2'
8	296° 42.20	41.38	23°5.70	11.5'	22°52.98	8.4'	55.1'
9	311°42.10	• • 40.69	37°36.18	11.4'	23°1.41	8.3'	55.1'
10	326°42.00 341°41.90	40.01	52°6.63 66°37.03	11.4'	23°9.72 23°17.92	8.2'	55.1'
11 12	341°41.90 356°41.80	39.32 \$17°38.64	66°37.03 81°7.40	11.4' 11.3'	23°17.92 \$23°26.00	8.1' 8.0'	55.1' 55.0'
13	11°41.70	37.95	95°37.73	11.3'	23°33.97	7.8'	55.0'
14	26°41.59	37.26	110°8.03	11.3'	23°41.82	7.7'	55.0'
15	41°41.49	• • 36.57	124°38.28	11.2'	23°49.55	7.6'	55.0'
16 17	56°41.39 71°41.29	35.89 35.20	139°8.50 153°38.69	11.2' 11.1'	23°57.17 24°4.66	7.5' 7.4'	55.0' 54.9'
18	86°41.19	\$17°34.51	168°8.83	11.1'	S24°12.04	7.3'	54.9'
19	101°41.10	33.82	182°38.94	11.1'	24°19.29	7.1'	54.9'
20	116°41.00	33.13	197°9.01	11.0'	24°26.43	7.0'	54.9'
21 22	131°40.90 146°40.80	· · 32.44 31.75	211°39.05 226°9.05	11.0' 11.0'	24°33.45 24°40.34	6.9' 6.8'	54.8' 54.8'
23	161°40.70	31.05	240°39.02	10.9'	24°47.12	6.7'	54.8'
	SD = 16.2'	d = -0.7'		SE	0 = 15.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
y	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	65-45%	
28	12:46	12:52	12:13	04:50	17:13		
29	12:57	13:03	12:13	05:37	18:00		
30	13.08	12.12	12.13	06.24	18.40		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	129° 59.67	224°23.62 \$20°49.52	329°0.18 N12°37.66	343°50.13 N14°39.90	119°42.71 N01°52.73	
1	145°2.14	239°23.05 49.74	344°3.25 37.96	358°52.90 40.01	134°44.98 52.82	Alpheratz 357°33.20 29°14.53
2	160°4.60	254°22.48 49.96	359°6.32 38.27	13°55.67 40.12	149°47.26 52.91	Ankaa 353°5.70 -42°9.70
3	175°7.07	269°21.91 · · 50.17	14°9.39 · · 38.58	28°58.44 · · 40.23	164°49.53 · · 53.00	Schedar 349°29.33 56°41.42
4	190°9.53	284°21.34 50.39	29°12.47 38.89	44°1.21 40.35	179°51.81 53.09	Diphda 348°45.74 -17°50.38
5	205°11.99	299°20.77 50.60	44°15.54 39.20	59°3.99 40.46	194°54.08 53.18	Achernar 335°19.08 -57°6.20
6	220° 14.46	314°20.20 \$20°50.81	59°18.62 N12°39.50	74°6.76 N14°40.57	209°56.36 N01°53.27	Hamal 327°49.28 23°35.53
7	235° 16.92	329° 19.63 51.02	74°21.70 39.81	89° 9.53 40.68	224°58.63 53.36	Polaris 313°3.24 89°23.00
8	250° 19.39	344° 19.06 51.23	89°24.78 40.12	104°12.30 40.79	240°0.90 53.45	Acamar 315°10.43 -40°11.98
9	265°21.85	359°18.49 · · 51.44	104°27.86 · · 40.43	119°15.07 · · 40.90	255°3.18 · · 53.54	Menkar 314°4.30 4°11.73
10	280°24.32	14° 17.91 51.65	119°30.94 40.74	134°17.85 41.01	270°5.45 53.63	Mirfak 308°25.65 49°57.64 Aldebaran 290°37.46 16°33.82
11	295°26.78	29°17.34 51.86	134°34.02 41.05	149°20.62 41.12	285°7.73 53.72	1
12	310°29.24	44°16.77 \$20°52.07	149°37.10 N12°41.37	164°23.39 N14°41.23	300°10.00 N01°53.81	Rigel 281°2.00 -8°10.34 Capella 280°19.03 46°1.60
13	325°31.71	59°16.19 52.28	164°40.19 41.68	179°26.16 41.34	315°12.27 53.90	Bellatrix 278°20.80 6°22.38
14	340°34.17	74°15.62 52.48	179°43.27 41.99	194°28.94 41.45	330°14.55 53.99	Elnath 277° 59.43 28° 37.82
15	355°36.64	89°15.04 · · 52.69	194°46.36 · · 42.30	209°31.71 · · 41.56	345°16.82 · · 54.08	Alnilam 275°35.74 -1°11.18
16	10°39.10	104° 14.47 52.89	209°49.45 42.61	224°34.48 41.68	0°19.09 54.17	Betelgeuse 270°49.96 7°24.65
17	25°41.56	119° 13.89 53.09	224°52.54 42.93	239°37.25 41.79	15°21.37 54.26	Canopus 263°51.17 -52°42.78
18	40°44.03	134°13.32	239°55.63 N12°43.24	254°40.03 N14°41.90	30°23.64 N01°54.35	Sirius 258°24.42 -16°45.35
19	55° 46.49	149°12.74 53.50	254°58.72 43.55	269°42.80 42.01	45°25.91 54.44	Adhara 255°4.16 -29°0.69
20	70°48.96	164°12.16 53.70	270°1.82 43.87	284°45.57 42.12	60°28.18 54.53	Procyon 244°48.71 5°9.20
21	85°51.42	179°11.58 · · 53.90	285°4.91 · · 44.18	299°48.35 · · 42.23	75°30.46 · · 54.62	Pollux 243°14.84 27°57.53
22	100°53.89	194°11.01 54.10	300°8.01 44.49	314°51.12 42.34	90°32.73 54.71	Avior 234°13.37 -59°35.85
23	115°56.35	209°10.43 54.29	315°11.10 44.81	329°53.89 42.45	105°35.00 54.80	Suhail 222°44.59 -43°32.59
Mer.p	pass. 15:18	ν -0.6' d 0.2' m-4.28	$ u 3.1' \ d0.3' \ \text{m-}0.89$	$\nu 2.8' \ d0.1' \ \text{m-}2.55$	$ u 2.3' \ d0.1' \ { m m0.79}$	Miaplacidus 221°36.95 -69°49.70
						Alphard 217°45.74 -8°46.71
	CIIA	CUA D	CIIA D	CIIA D	CIIA D	Regulus 207°32.30 11°49.89
Mon	GHA	GHA Dec 224° 9.85 S 20° 54.49	GHA Dec 330°14.20 N12°45.12	GHA Dec 344°56.67 N14°42.56	GHA Dec 120°37.27 N 01°54.89	Dubhe 193°38.38 61°35.99
0	130°58.81					Denebola 182°22.97 14°25.01
1 2	146°1.28 161°3.74	239°9.27 54.69 254°8.69 54.88	345°17.30 45.44 0°20.40 45.76	359°59.44 42.67 15°2.22 42.79	135°39.55 54.98 150°41.82 55.07	Gienah 175°41.61 -17°41.62
3	161 3.74 176°6.21	269°8.11 · · 55.08	15°23.50 · · 46.07	15°2.22 42.79 30°4.99 •• 42.90		Acrux 172°57.74 -63°14.81
3 4	170 0.21 191°8.67	284°7.53 55.27	30°26.61 46.39	45°7.76 43.01	165°44.09 · · 55.16 180°46.36 55.25	Gacrux 171°49.38 -57°15.77
5	206°11.13	299°6.95 55.46	45°29.71 46.70	60°10.54 43.12	195°48.63 55.34	Alioth 166°11.23 55°48.39
6	200 11.13 221°13.60	314°6.36 S20°55.65	60°32.82 N12°47.02	75°13.31 N14°43.23	210°50.90 N01°55.44	Spica 158°20.38 -11°18.25
7	236°16.06	329°5.78 55.84	75°35.92 47.34	90°16.09 43.34	225°53.17 55.53	Alkaid 152° 50.56 49° 10.30
8	251° 18.53	344°5.20 56.03	90°39.03 47.66	105°18.86 43.45	240°55.45 55.62	Hadar 148°33.43 -60°30.02
9	266° 20.99	359°4.62 · · 56.22	105°42.14 · · 47.97	120°21.64 · · 43.56	255°57.72 · · 55.71	Menkent 147°55.52 -36°30.12
10	281°23.46	14°4.03 56.41	120° 45.25 48.29	135°24.41 43.68	270°59.99 55.80	Arcturus 145°46.31 19°2.22
11	296°25.92	29°3.45 56.60	135°48.36 48.61	150°27.19 43.79	286°2.26 55.89	Rigil Kent. 139°37.87 -60°56.63
12	311°28.38	44°2.87 S 20°56.78	150°51.47 N12°48.93	165°29.96 N14°43.90	301°4.53 N01°55.98	Kochab 137°19.96 74°2.20
13	326°30.85	59°2.28 56.97	165°54.59 49.25	180°32.74 44.01	316°6.80 56.07	Zuben'ubi 136°54.12 -16°9.30
14	341°33.31	74°1.70 57.15	180°57.70 49.57	195°35.51 44.12	331°9.07 56.16	Alphecca 126°2.38 26°37.13
15	356°35.78	89°1.11 · · 57.34	196°0.82 · · 49.89	210°38.29 · · 44.23	346°11.34 · · 56.25	Antares 112°13.89 -26°29.47
16	11°38.24	104°0.53 57.52	211°3.94 50.21	225°41.06 44.34	1°13.61 56.34	Atria 107°6.88 -69°4.30 Sabik 102°1.02 -15°45.51
17	26°40.71	118°59.94 57.70	226°7.05 50.53	240°43.84 44.46	16°15.88 56.44	Shaula 96°8.32 -37°7.30
18	41°43.17	133°59.35 \$20°57.88	241°10.17 N12°50.85	255°46.61 N14°44.57	31°18.15 N01°56.53	Rasalhague 95°57.19 12°32.27
19	56° 45.63	148°58.77 58.06	256°13.30 51.17	270°49.39 44.68	46°20.42 56.62	Eltanin 90°41.79 51°28.86
20	71°48.10	163°58.18 58.24	271°16.42 51.49	285°52.17 44.79	61°22.69 56.71	Kaus Aust. 83°30.57 -34°22.23
21	86°50.56	178°57.59 · · 58.42	286°19.54 · · 51.81	300°54.94 · · 44.90	76°24.96 · · 56.80	Vega 80°32.42 38°48.34
22	101°53.03	193°57.00 58.60	301°22.67 52.14	315°57.72 45.01	91°27.23 56.89	Nunki 75°45.96 -26°15.75
23	116°55.49	208°56.41 58.77	316°25.79 52.46	331°0.49 45.13	106°29.50 56.98	Altair 61°58.61 8°56.33
Merr	pass. 15:14	ν-0.6' d0.2' m-4.27	ν3.1' d0.3' m-0.91	$\nu 2.8' \ d0.1' \ \text{m-}2.55$	ν2.3' d0.1' m0.79	Peacock 53°3.64 -56°38.83
	7433. 13.14	- 0.0 do.2 iii 4.27				Deneb 49°25.09 45°22.60
						Enif 33°37.42 9°59.95
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.22 -46°49.86
0	131°57.95	223°55.83 \$20°58.95	331°28.92 N12°52.78	346°3.27 N14°45.24	121°31.77 N01°57.08	Fomalhaut 15°12.94 -29°28.82
1	147°0.42	238°55.24 59.12	346°32.05 53.11	1°6.05 45.35	136°34.04 57.17	Scheat 13°43.82 28°13.88
2	162°2.88	253°54.65 59.30	1°35.18 53.43	16°8.82 45.46	151°36.31 57.26	Markab 13°28.45 15°21.10
3	177°5.35	268° 54.06 · · 59.47	16°38.31 · · 53.75	31°11.60 · · 45.57	166°38.57 · · 57.35	Jan 31 Sun SHA Mer.pass
4	192°7.81 207°10.28	283°53.47 59.64	31°41.44 54.08	46°14.38 45.68	181°40.84 57.44	Venus 94°23.95 09:03
5 6	207° 10.28 222° 12.74	298°52.87 20°59.81 313°52.28 \$20°59.98	46°44.57 54.40 61°47.70 N12°54.72	61°17.15 45.80 76°19.93 N14°45.91	196°43.11 57.53 211°45.38 N01°57.63	Mars 199°0.51 02:04
7	222 12.74 237°15.20	313 52.28 3 20 59.98 328°51.69 0.15	76°50.84 55.05	91°22.71 46.02	211 45.38 NU1 57.03 226°47.65 57.72	Jupiter 213°50.45 01:04
8	252° 17.67	343°51.10 0.32	91°53.98 55.37	106°25.48 46.13	241°49.92 57.81	Saturn 349°43.03 15:59
9	267°20.13	358°50.51 · · 0.49	106°57.11 · · 55.70	121°28.26 · · 46.24	256°52.18 · · 57.90	
10	282°22.60	13°49.91 0.65	122° 0.25 56.03	136°31.04 46.35	271°54.45 57.99	Feb 01 Mon SHA Mer.pass
11	297°25.06	28° 49.32 0.82	137°3.39 56.35	151°33.82 46.47	286°56.72 58.09	Venus 93°11.03 09:04
12	312°27.52	43°48.73 S 21°0.98	152°6.53 N12°56.68	166°36.59 N14°46.58	301°58.99 N01°58.18	Mars 199°15.39 01:59
13	327°29.99	58°48.13 1.15	167° 9.68 57.01	181°39.37 46.69	317°1.26 58.27	Jupiter 213°57.85 01:00
14	342°32.45	73°47.54 1.31	182°12.82 57.33	196°42.15 46.80	332°3.52 58.36	Saturn 349°38.46 15:55
15	357°34.92	88°46.94 · · 1.47	197°15.96 · · 57.66	211°44.93 · · 46.91	347°5.79 · · 58.45	Feb 02 Tue SHA Mer.pass
16	12°37.38	103°46.35 1.63	212°19.11 57.99	226°47.70 47.02	2°8.06 58.55	Venus 91°57.87 09:05
17	27°39.85	118° 45.75 1.79	227°22.26 58.31	241°50.48 47.14	17°10.32 58.64	Mars 199°30.96 01:54
18	42°42.31	133°45.16 S 21°1.95	242°25.40 N12°58.64	256°53.26 N14°47.25	32°12.59 N01°58.73	Jupiter 214°5.32 00:56
19	57° 44.77	148°44.56 2.11	257°28.55 58.97	271°56.04 47.36	47°14.86 58.82	Saturn 349° 33.81 15:51
20	$72^{\circ}47.24$	163°43.96 2.27	272°31.70 59.30	286°58.82 47.47	62°17.13 58.92	
21	87° 49.70	178°43.37 · · 2.42	287°34.85 12°59.63	302° 1.59 · · 47.58	77°19.39 · · 59.01	Horizontal parallax
22	102°52.17	193° 42.77 2.58	302°38.01 12°59.96	317° 4.37 47.70	92°21.66 59.10	Venus: 0.2
23	117°54.63	208°42.17 2.73	317°41.16 0.29	332°7.15 47.81	107°23.93 59.19	Mars: 0.2
Mer.r	pass. 15:10	ν-0.6' d0.2' m-4.26	ν3.1' d0.3' m-0.94	ν2.8' d0.1' m-2.55	ν2.3' d0.1' m0.79	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	176°40.61	S17°30.36	255°8.95	10.9'	S24°53.77	6.5'	54.8'
1	191°40.51	29.67	269°38.84	10.9'	25°0.30	6.4'	54.8'
2 3	206° 40.41 221° 40.32	28.97 •• 28.28	284°8.71 298°38.54	10.8' 10.8'	25°6.70 25°12.99	6.3' 6.2'	54.7'
3 4	221 40.32 236°40.22	27.59	298 38.54 313°8.33	10.8	25 12.99 25°19.15	6.2 6.0'	54.7' 54.7'
5	251° 40.12	26.89	327°38.10	10.7	25°25.18	5.9'	54.7'
6	266° 40.03	S17°26.19	342°7.83	10.7'	S25°31.09	5.8'	54.7'
7	281°39.93	25.50	356° 37.52	10.7'	25°36.88	5.7'	54.6'
8	296°39.84	24.80	11°7.19	10.6'	25°42.54	5.5'	54.6'
9 10	311°39.75 326°39.65	· · 24.10 23.41	25°36.83 40°6.44	10.6' 10.6'	25°48.07 25°53.48	5.4' 5.3'	54.6' 54.6'
11	341°39.56	22.71	54°36.01	10.5'	25°58.76	5.2'	54.6'
12	356°39.46	S17°22.01	69°5.56	10.5'	\$26°3.91	5.0'	54.5'
13	11°39.37	21.31	83°35.08	10.5'	26°8.94	4.9'	54.5'
14	26°39.28 41°39.19	20.61 •• 19.91	98°4.57 112°34.04	10.5' 10.4'	26°13.84 26°18.61	4.8' 4.6'	54.5' 54.5'
15 16	56°39.10	19.91	112 34.04 127°3.48	10.4	26°23.25	4.6 4.5'	54.5'
17	71°39.00	18.50	141°32.89	10.4	26°27.76	4.4'	54.5'
18	86°38.91	S17°17.80	156°2.28	10.4'	S26°32.14	4.3'	54.4'
19	101°38.82	17.10	170°31.64	10.3'	26°36.39	4.1'	54.4'
20 21	116°38.73 131°38.64	16.40 •• 15.69	185°0.98 199°30.30	10.3' 10.3'	26°40.52 26°44.51	4.0' 3.9'	54.4' 54.4'
22	131 36.04 146°38.55	14.99	213° 59.59	10.3	26°48.37	3.9 3.7'	54.4'
23	161°38.46	14.28	228° 28.87	10.3'	26°52.11	3.6'	54.4'
	SD = 16.2'	d = -0.7'		SF	0 = 14.9'		
				JL			
Mon	GHA 176° 38.37	Dec	GHA 242° 58.12	ν 10.2'	Dec	d 3.5'	HP
0 1	176°38.37 191°38.29	\$17°13.58 12.87	242°58.12 257°27.36	10.2' 10.2'	\$26°55.71 26°59.18	3.5	54.3' 54.3'
2	206° 38.20	12.16	271°56.57	10.2'	27°2.52	3.2'	54.3'
3	221°38.11	• • 11.46	$286^{\circ}25.77$	10.2'	$27^{\circ}5.72$	3.1'	54.3'
4	236° 38.02	10.75	300°54.95	10.2'	27°8.80	2.9'	54.3'
5	251° 37.93 266° 37.85	10.04 \$17°9.33	315°24.12 329°53.27	10.2' 10.1'	27°11.74 S 27°14.55	2.8'	54.3' 54.3'
6 7	281°37.85	8.62	344° 22.40	10.1	27°17.23	2.7	54.3'
8	296° 37.67	7.91	358°51.53	10.1	27°19.77	2.4'	54.2'
9	311°37.59	• • 7.20	13°20.64	10.1'	$27^{\circ}22.18$	2.3'	54.2'
10	326° 37.50	6.49	27°49.74	10.1'	27°24.46	2.1'	54.2'
11 12	341°37.42 356°37.33	5.78 \$17°5.07	42°18.82 56°47.90	10.1' 10.1'	27°26.61 S 27°28.62	2.0' 1.9'	54.2' 54.2'
13	11° 37.25	4.36	71° 16.97	10.1	27°30.50	1.7'	54.2'
14	26° 37.16	3.65	85°46.04	10.1'	27°32.24	1.6'	54.2'
15	41°37.08	• • 2.93	100° 15.09	10.1'	27°33.85	1.5'	54.2'
16	56° 37.00	2.22	114°44.15	10.0' 10.0'	27°35.33	1.3' 1.2'	54.1'
17 18	71°36.91 86°36.83	1.50 \$17°0.79	129° 13.19 143° 42.24	10.0'	27°36.68 S 27°37.89	1.1'	54.1' 54.1'
19	101°36.75	17°0.07	158° 11.28	10.0'	27°38.96	0.9'	54.1
20	116°36.67	$16^{\circ}59.36$	$172^{\circ}40.32$	10.0'	27°39.90	0.8'	54.1'
21	131°36.59	• • 58.64	187°9.35	10.0'	27°40.71	0.7'	54.1'
22 23	146°36.50 161°36.42	57.92 57.21	201°38.39 216°7.44	10.0' 10.0'	27°41.39 27°41.93	0.5' 0.4'	54.1' 54.1'
23			210 7.44			0.4	54.1
	SD = 16.2'	d = -0.7'		SL	0 = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.34	\$16°56.49	230°36.48	10.0'	\$27°42.33 27°42.61	0.3'	54.1' 54.1'
1 2	191°36.26 206°36.18	55.77 55.05	245°5.53 259°34.58	10.1' 10.1'	27°42.61 27°42.75	0.1' 0.0'	54.1' 54.1'
3	221°36.10	• • 54.33	274°3.64	10.1	27°42.75	-0.1	54.0'
4	236°36.02	53.61	288°32.70	10.1'	27°42.62	-0.3'	54.0'
5	251°35.94	52.89	303°1.78	10.1'	27°42.36	-0.4'	54.0'
6 7	266° 35.87 281° 35.79	\$16°52.17 51.45	317°30.86 331°59.95	10.1' 10.1'	\$27°41.97 27°41.44	-0.5' -0.7'	54.0' 54.0'
8	296° 35.79	50.72	346° 29.06	10.1	27 41.44 27°40.78	-0. <i>1</i> -0.8'	54.0'
9	311° 35.63	• • 50.00	0°58.18	10.1	27°39.98	-0.9'	54.0'
10	326° 35.56	49.28	15°27.30	10.1'	27°39.05	-1.1'	54.0'
11	341°35.48	48.56	29°56.45	10.2'	27°37.99	-1.2'	54.0'
12 13	356° 35.40 11° 35.33	\$16°47.83 47.11	44° 25.61 58° 54.78	10.2' 10.2'	\$27°36.80 27°35.48	-1.3' -1.5'	54.0' 54.0'
13 14	26° 35.25	47.11	73° 23.98	10.2'	27 35.48 27°34.02	-1.5 -1.6'	54.0'
15	41°35.17	• • 45.65	$87^{\circ}53.19$	10.2'	27°32.43	-1.7'	54.0'
16	56° 35.10	44.93	102°22.42	10.3'	27°30.71	-1.9'	54.0'
17	71°35.02	44.20 \$16°43.47	116°51.67	10.3'	27°28.86 \$27°26.87	-2.0'	54.0'
18 19	86°34.95 101°34.88	\$16°43.47 42.75	131°20.95 145°50.24	10.3' 10.3'	27°26.87 27°24.76	-2.1' -2.2'	54.0' 54.0'
20	116° 34.80	42.73	160° 19.56	10.3'	27°22.51	-2.4'	54.0'
21	131°34.73	• • 41.29	174°48.91	10.4'	$27^{\circ}20.14$	-2.5'	53.9'
22	146°34.66	40.56	189° 18.28	10.4	27°17.63	-2.6'	53.9'
23	161°34.58	39.83	203°47.67	10.4'	27°15.00	-2.8'	53.9'
	SD = 16.2'	d = -0.7'		SE	0 = 14.7'		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	35-18%
31	13:18	13:22	12:13	07:14	19:39	
01	13:27	13:31	12:14	08:05	20:30	
ി റാ	13.35	12.38	12.14	08.56	21.21	

February 03, 04, 05 UT (Wed., Thu., Fri.)

h	Aries	Ver	านร	M	ars	Jug	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
vvea 0	GHA 132°57.09	223°41.57	S21°2.89	332°44.32	N13°0.62	347° 9.93	Dec N14°47.92	122°26.19	N01°59.29			
1	132 57.09 147°59.56	238°40.97	3.04	347°47.47	0.95	2°12.71	48.03	137°28.46	59.38	Alpheratz		29° 14.52
2	163°2.02	253° 40.37	3.19	2°50.63	1.28	17°15.49	48.14	152°30.72	59.47	Ankaa	353°5.71	-42°9.69
3	178°4.49	268°39.77	• • 3.34	17°53.79	• • 1.61	32°18.27	• 48.26	167°32.99	• • 59.57	Schedar Diphda	349°29.34 348°45.74	56°41.41 -17°50.38
4	193°6.95	283°39.17	3.49	32°56.95	1.94	47°21.04	48.37	182°35.26	59.66	Achernar	_	-17 50.38 -57°6.19
5	208°9.42	298°38.57	3.64	48°0.11	2.27	62°23.82	48.48	197°37.52	59.75	Hamal	327°49.29	23°35.53
6 7	223°11.88 238°14.34	313°37.97 328°37.37	\$21°3.79 3.94	63°3.27 78°6.43	N13°2.60 2.93	77°26.60 92°29.38	N14° 48.59	212°39.79 227°42.05	N01°59.84 01°59.94	Polaris	$313^{\circ}4.59$	89°23.01
8	238° 14.34 253° 16.81	328° 37.37 343° 36.77	3.94 4.08	78° 6.43 93° 9.60	2.93 3.27	92°29.38 107°32.16	48.70 48.82	242°44.32	01°59.94 02°0.03	Acamar	315°10.44	-40°11.98
9	268° 19.27	358°36.17	• 4.23	108°12.76	3.60	107 32.10 122°34.94	• 48.93	257°46.58	0.12	Menkar	314°4.31	4°11.73
10	283°21.74	13°35.57	4.37	123°15.93	3.93	137°37.72	49.04	272°48.85	0.22	Mirfak	308°25.66	49°57.65
11	298°24.20	28°34.96	4.52	138°19.09	4.26	152°40.50	49.15	287°51.11	0.31	Aldebaran Rigel	290°37.47 281°2.00	16°33.82 -8°10.34
12	313°26.66	43°34.36	S21° 4.66	153°22.26	N13°4.60	167°43.28	N14°49.26	302°53.38	N02°0.40	Capella	280°19.03	-6 10.34 46°1.60
13	328°29.13	58°33.76	4.80	168°25.43	4.93	182°46.06	49.38	317°55.64	0.50	Bellatrix		6°22.38
14 15	343°31.59 358°34.06	73°33.15 88°32.55	4.94 •• 5.08	183°28.60 198°31.78	5.26 • • 5.60	197°48.84 212°51.62	49.49 •• 49.60	332°57.91 348°0.17	0.59 •• 0.68	Elnath	$277^{\circ}59.43$	28° 37.83
16	13° 36.52	103°31.95	5.22	213°34.95	5.93	227°54.40	49.71	3°2.44	0.78	Alnilam	275°35.75	-1°11.18
17	28° 38.99	118°31.34	5.36	228°38.12	6.27	242°57.18	49.83	18°4.70	0.87	0	270°49.96	7°24.64
18	43°41.45	133°30.74	S21°5.50	243°41.30	N13°6.60	257°59.96	N14°49.94	33°6.96	N02°0.96	Canopus Sirius	263°51.18 258°24.42	-52°42.79 -16°45.36
19	58° 43.91	148°30.13	5.63	258°44.47	6.94	273°2.74	50.05	48°9.23	1.06	Adhara	255°4.17	-10 45.30 -29°0.70
20	73°46.38	163°29.53	5.77	273°47.65	7.27	288° 5.52	50.16	63°11.49	1.15	Procyon	244°48.71	5°9.19
21	88° 48.84 103° 51.31	178°28.92	· · 5.90	288°50.83	7.61	303°8.30	· · 50.27	78°13.76	1.24	Pollux		27°57.53
22 23	103°51.31 118°53.77	193°28.31 208°27.71	6.03 6.17	303°54.01 318°57.19	7.94 8.28	318°11.08 333°13.86	50.39 50.50	93°16.02 108°18.28	1.34 1.43	Avior	234°13.38	-59° 35.87
										Suhail	222°44.58	-43°32.61
Mer.p	pass. 15:06	ν -0.6' d0.2	2′ m-4.26	ν 3.2′ d0.	.3′ m-0.96	$\nu 2.8' d0$.1′ m-2.55	$\nu 2.3' d0$.1′ m0.79	Miaplacidus	221°36.95	-69°49.72
										Alphard Regulus	217°45.73 207°32.29	-8°46.72 11°49.89
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_	207 32.29 193°38.35	61°36.00
0	133°56.23	223°27.10	S21°6.30	334°0.37	N13°8.62	348°16.64	N14°50.61	123°20.55	N02°1.52	Denebola	182°22.95	14°25.00
1	148°58.70	238°26.49	6.43	349°3.56	8.95	3°19.42	50.72	138°22.81	1.62	Gienah	$175^{\circ}41.58$	-17°41.63
2	164°1.16 179°3.63	253°25.88 268°25.27	6.56 •• 6.69	4°6.74 19°9.93	9.29 •• 9.63	18°22.20 33°24.98	50.84 •• 50.95	153°25.07 168°27.34	1.71 · · 1.81		172°57.70	-63°14.83
3 4	179 3.03 194°6.09	208 25.27 283°24.67	6.82	34°13.11	9.96	33 24.98 48°27.76	51.06	183°29.60	1.90	1	171°49.34	-57° 15.79
5	209°8.56	298°24.06	6.94	49°16.30	10.30	63°30.54	51.17	198°31.86	1.99	Alioth		55°48.39
6	224°11.02	313°23.45	S21°7.07	64°19.49	N13°10.64	78°33.32	N14°51.28	213°34.12	N02°2.09	Spica Alkaid	158°20.35 152°50.52	-11° 18.27 49° 10.30
7	239° 13.48	328°22.84	7.19	79°22.68	10.98	93°36.10	51.40	228°36.39	2.18	Hadar	148°33.38	-60° 30.03
8	254° 15.95	343°22.23	7.32	94°25.87	11.32	108°38.89	51.51	243°38.65	2.28		147°55.48	-36°30.13
9	269°18.41	358°21.62	· · 7.44	109°29.06	11.65	123°41.67	• • 51.62	258°40.91	• • 2.37		145°46.28	19°2.21
10 11	284°20.88 299°23.34	13°21.01 28°20.40	7.56 7.68	124°32.25 139°35.45	11.99 12.33	138°44.45 153°47.23	51.73 51.85	273°43.17 288°45.44	2.46 2.56		139°37.83	-60°56.64
12	314° 25.80	43°19.78	521°7.80	159° 35.45 154° 38.64	N13°12.67	168° 50.01	N14°51.96	303°47.70	N02°2.65	1	137°19.89	74°2.20
13	329°28.27	58° 19.17	7.92	169°41.84	13.01	183°52.79	52.07	318°49.96	2.75	Zuben'ubi Alphecca	136°54.09 126°2.35	-16°9.31 26°37.12
14	344°30.73	73°18.56	8.04	184°45.04	13.35	198°55.57	52.18	333°52.22	2.84		120° 2.35 112° 13.86	-26° 29.48
15	359° 33.20	88°17.95	• • 8.16	199°48.23	• • 13.69	213°58.36	• • 52.30	348°54.48	• • 2.94	Atria	107°6.81	-69°4.30
16	14°35.66	103°17.34	8.28	214°51.43	14.03	229°1.14	52.41	3°56.74	3.03	Sabik	102°0.99	-15°45.52
17 18	29°38.13 44°40.59	118° 16.72 133° 16.11	8.39 \$21°8.51	229°54.63 244°57.84	14.37 N13°14.71	244° 3.92 259° 6.70	52.52 N14°52.63	18°59.01 34°1.27	3.12 N02°3.22	Shaula	96°8.28	-37°7.30
18 19	59° 43.05	133° 16.11 148° 15.49	8.62	244 57.84 260° 1.04	N13 14.71 15.05	259° 6.70 274° 9.48	N14 52.63 52.75	49° 3.53	3.31	Rasalhague	95°57.16	12°32.27
20	74° 45.52	163°14.88	8.73	275° 4.24	15.40	289°12.27	52.75	64° 5.79	3.41	Eltanin	90°41.76	51°28.85
21	89° 47.98	178° 14.27	• • 8.85	290°7.45	. 15.74	304°15.05	• • 52.97	79°8.05	• • 3.50	Kaus Aust. Vega	83°30.54 80°32.40	-34°22.22 38°48.33
22	104° 50.45	$193^{\circ}13.65$	8.96	305°10.65	16.08	319°17.83	53.08	94°10.31	3.60	Vega Nunki	75°45.94	-26° 15.75
23	119°52.91	208°13.04	9.07	320°13.86	16.42	334°20.61	53.20	109°12.57	3.69	Altair	61°58.59	8°56.33
Mer.p	pass. 15:02	ν -0.6' d0.1	1' m-4.25	ν 3.2′ d0.	.3′ m-0.99	$\nu 2.8' \ d0.$.1′ m-2.55	$\nu 2.3' \ d0$.1′ m0.79	Peacock	$53^{\circ}3.62$	-56°38.81
										Deneb	49°25.08	45°22.58
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°37.42	9°59.94
0	134° 55.37	223°12.42	S21° 9.18	335°17.07		349°23.39	N14°53.31	124°14.83	N02°3.79	Al Na'ir Fomalhaut	27°31.21 15°12.94	-46°49.85 -29°28.81
1	149°57.84	238°11.81	9.28	350°20.28	17.11	4°26.18	53.42	139°17.09	3.88	Scheat	15 12.94 13°43.82	-29 28.81 28°13.87
2	165°0.30	253°11.19	9.39	5°23.49	17.45	19°28.96	53.53	154°19.35	3.98	Markab	13°28.45	15°21.10
3	180°2.77	268° 10.57	• • 9.50	20°26.70	• • 17.79	34°31.74	• • 53.65	169°21.61	• • 4.07			
4	195°5.23	283°9.96	9.60	35°29.91	18.13	49°34.52	53.76	184°23.87 199°26.13	4.17	Feb 03 Wed Venus	SHA 90°44.48	Mer.pass 09:06
5 6	210°7.70 225°10.16	298°9.34 313°8.72	9.71 \$21° 9.81	50°33.12 65°36.34	18.48 N13°18.82	64°37.31 79°40.09	53.87 N14°53.98	199°26.13 214°28.39	4.26 N02°4.36		90 44.48 199°47.22	09:06
7	240° 12.62	328°8.10	9.91	80°39.55	19.17	94°42.87	54.10	229°30.65	4.45	Jupiter		00:51
8	255° 15.09	343°7.49	10.02	95°42.77	19.51	109°45.65	54.21	244°32.91	4.55	Saturn	349°29.10	15:48
9	270° 17.55	358°6.87	•• 10.12	110°45.99	•• 19.85	124°48.44	• • 54.32	259°35.17	• • 4.64	Feb 04 Thu	SHA	Mer.pass
10	285°20.02	13°6.25	10.22	125°49.21	20.20	139°51.22	54.43	274°37.43	4.74	Venus	89°30.86	09:07
11	300°22.48	28°5.63	10.31	140°52.43	20.54	154°54.00	54.55	289°39.69	4.83	Mars	200°4.14	01:44
12 13	315°24.94 330°27.41	43°5.01 58°4.39	\$21°10.41 10.51	155°55.65 170°58.87	N13°20.89 21.23	169°56.79 184°59.57	N14°54.66 54.77	304°41.95 319°44.21	N02°4.93 5.02	1	$214^{\circ}20.40$	00:47
13 14	345° 29.87	73°3.77	10.51	186°2.09	21.58	200° 2.35	54.77 54.88	334°46.47	5.02	Saturn	349°24.31	15:44
15	0°32.34	88°3.15	. 10.70	201°5.32	. 21.92	215° 5.14	• • 55.00	349°48.73	5.21	Feb 05 Fri	SHA	Mer.pass
16	15°34.80	103°2.53	10.79	216°8.54	22.27	230°7.92	55.11	4°50.98	5.31	Venus	88°17.05	09:08
17	30°37.27	118°1.91	10.89	231°11.77	22.62	245°10.70	55.22	19°53.24	5.40	Mars	$200^{\circ}21.69$	01:39
18	45°39.73		S21°10.98	246°14.99		260°13.49		34°55.50	N02°5.50		214°28.02	00:42
19 20	60° 42.19 75° 44.66	148°0.67 163°0.04	11.07 11.16	261°18.22 276°21.45	23.31	275°16.27 290°19.05	55.45 55.56	49°57.76 65°0.02	5.60 5.60	Saturn	349°19.46	15:41
20 21	75°44.66 90°47.12	163°0.04 177°59.42	11.16 •• 11.25	276 21.45 291°24.68	23.65 •• 24.00	305°21.84	55.56 •• 55.67	80°2.28	5.69 •• 5.79	Horizor	ital parallax	
22	105° 49.59	192°58.80	11.23	306°27.91	24.35	320°24.62	55.78	95°4.53	5.88		Venus:	0.2
23	120°52.05	207°58.18	11.43	321°31.14	24.70	335°27.40	55.90	110°6.79	5.98		Mars:	0.2
Merr	pass. 14:58	ν-0.6′ d0.	1′ m-4.24	ν3.2′ dΩ	.3′ m-1.01	ν2.8′ dΩ	.1′ m-2.55	ν2.3' dΩ	.1′ m0.79			
		- 0.0 40										

10 176°34.51 S16°39.10 218°17.09 10.5 S27°12.23 2.9° 53.5 1 101°34.44 33.7 232°46.55 10.5° 27°0.34 3.0° 53.5 2 206°34.37 37.64 247°16.03 10.5° 27°0.34 3.0° 53.6 2 206°34.37 37.64 247°16.03 10.5° 27°0.34 3.0° 53.6 3 221°34.30 3.617 276°15.08 10.5° 27°3.16 3.3° 53.3 4 236°34.23 36.17 276°15.08 10.6° 26°56.48 3.3° 53.5 5 26°26.34.09 S16°34.71 305°14.65 10.6° 26°56.48 3.3° 53.5 7 281°34.09 S16°34.71 305°14.69 10.6° 26°56.48 3.3° 53.5 8 296°33.95 33.24 334°13.88 10.7° 26°49.29 3.8° 53.5 9 311°33.88 13.77 3°31°34.90 10.7° 26°49.29 3.8° 53.5 9 311°33.83 13.77 3°31°34.0 10.8° 26°41.59 4.0° 53.6 11 341°33.74 31.03 17°42.82 10.8° 26°41.59 4.0° 53.6 11 341°33.60 29.56 46°42.50 10.9° 26°24.69 4.5° 53.3 13 11°33.60 29.56 46°42.50 10.9° 26°24.69 4.5° 53.5 14 26°33.54 28.82 61°12.40 10.9° 26°20.16 4.7° 53.5 15 41°33.47 2.20.88 75°42.34 11.0° 26°10.16 4.7° 53.5 16 56°33.40 27.35 90°12.32 11.0° 26°15.50 4.8° 53.5 18 86°33.27 516°25.87 110°42.35 11.1° 55°8.2 5.0° 5.0° 12.32 11.0° 26°15.50 4.8° 53.5 18 86°33.27 516°25.87 110°42.35 11.1° 55°8.2 5.0° 5.0° 12.32 11.0° 26°15.50 4.8° 53.5 18 86°33.27 516°25.87 110°42.33 11.1° 32°5.56.5 5.3° 53.5° 53.5° 55° 55° 55° 55° 55° 55° 55° 55° 55°	h	Su	n			Moon		
10 101°34.44 383.77 22°2°46.55 10.5° 22°9.34 3.0° 53.5 3.3 22 206°34.37 37.64 247°16.03 10.5° 27°9.34 3.0° 53.5 32 21°34.30 3.60 10 26°1°45.54 10.5° 27°9.16 3.3° 53.5 55 251°34.16 35.44 290°44.65 10.6° 26°56.48 3.5° 35.5 55 251°34.16 35.44 290°44.65 10.6° 26°56.48 3.5° 35.5 7 281°34.02 33.97 319°43.90 10.7° 26°45.50 3.9° 53.5 9 311°33.88 3.32.50 384°13.58 10.7° 26°45.50 3.9° 53.5 10 326°33.81 31.77 3°13.04 10.8° 26°37.55 4.2° 53.9 110 336°33.81 31.77 3°13.04 10.8° 26°37.55 4.2° 53.1 112 340°33.44 28.22 50 382°42.08° 26°37.55 4.2° 53.1 112 356°33.67 516°30.30 17°42.80 10.9° 26°20.10 4.4° 53.1 112 40°33.54 28.82 61°12.40 10.9° 26°20.10 4.4° 53.1 113 11°33.60 29.56 46°42.50 10.9° 26°20.16 4.7° 53.1 114 41°33.47 2.26.61 104°42.35 11.1° 26°58.2 5.0° 53.3 115 41°33.47 2.26.61 104°42.35 11.1° 26°50.00 5.1° 26°10.72 4.9° 33.1 118 86°33.27 516°28.87 119°12.41 11.1° 26°58.2 5.0° 53.3 120 136°33.14 2.39 148°12.67 11.2° 25°55.65 5.3° 53.3 121 136°33.07 2.23.65 102°42.97 11.2° 25°55.05 5.3° 53.3 122 131°33.07 2.23.65 102°42.97 11.2° 25°55.05 5.3° 53.3 101 16°32.88 516°21.42 206°13.72 11.4° 25°22.99 6.0° 53.3 101 16°32.85 516°1.49 200°47.33 11.3° 25°33.88 5.7° 53.5 101 16°32.85 516°1.49 200°47.33 11.3° 25°33.88 5.7° 53.5 101 16°32.85 516°1.49 200°47.33 11.1° 1.2° 25°3.05 5.6° 5.3° 53.3 101°32.80 10.10 1.00 1.00 1.00 1.00 1.00 1.00	Ved							HP
22 206°34.37								53.9
321°34,30 · · 36,91								53.9
236°34.23 36.17 276°15.08 10.6° 26°9.89 3.4° 53.6° 526°34.09 516°34.71 305°14.26 10.6° 26°92.99 3.4° 53.6° 53.6° 34.9° 316° 34.9° 316° 326°32.95 3.3° 339°								53.9
5	3	221°34.30	• • 36.91	261°45.54	10.5'	27°3.16	-3.3'	53.9
26° 34.09	4	236° 34.23	36.17	$276^{\circ}15.08$	10.6'	26°59.89	-3.4'	53.9
281°34 02 33.97 319°43.90 10.7 26°49.29 -3.8° 53.8° 53.8° 53.3° 5	5	251°34.16	35.44	290°44.65	10.6'	26°56.48	-3.5'	53.9
7	6	266° 34.09	S16°34.71	305°14.26	10.6'	S26°52.95	-3.7'	53.9
296°33 95 33.24 334°13.58 10.7 26°45.50 3.9 53.1		281°34 02	33 97	319°43 90	10 7'		-3.8'	
311°33.88								
101 326°33.81 31.77 3°13.04 10.8' 26°37.55 -4.2' 53.8' 11 341°33.74 31.03 17°42.82 10.8' 26°37.55 -4.2' 53.8' 12' 336°33.67 516°30.30 32°12.64 10.9' 526°29.10 -4.4' 53.5 13' 13' 33.60 29.56 46°42.50 10.9' 26°20.16 -4.5' 53.8' 14' 33.47 -2.80.8 75°42.34 11.0' 26°11.50 -4.8' 53.8' 15.56 53.34 28.82 61°12.140 10.9' 26°10.150 -4.8' 53.8' 15.56 53.34 28.82 61°12.22 11.0' 26°11.55 -4.8' 53.8' 17' 71°33.34 26.61 104°42.35 11.1' 26°1.80 -5.1' 53.8' 19' 101°33.21 25.13 133°4.52 11.2' 25°55.66 -5.0' 53.2 18.8 36°33.27 516°25.87 19'*12.41 11.1' 526°1.80 -5.1' 53.8' 12' 131°3.30 -2.256 16°24.22 17' 12.2' 25°55.66 -5.5' 53.5 133°4.22 11.2' 25°55.65 -5.5' 53.5 133°4.25 11.2' 25°55.65 -5.5' 53.5 133°4.25 11.2' 25°55.65 -5.5' 53.5 16°32.95 22.16 191°43.39 11.3' 25°39.50 -5.6' 53.1 191°32.82 20.68 220°41.10 11.4' 25°22.29 -5.0' 53.3 221°32.69 -1.91.9 249°45.00 11.5' 25°0.12 -5.0' 53.3 221°32.69 -1.91.9 249°45.00 11.5' 25°0.12 -5.2' 53.3 221°32.44 16.2' 30°47.33 11.7' 24°41.72 -6.4' 53.8 26°32.38 15.6' 6.96 293°16.71 11.7' 524°51.77 -6.4' 53.8 26°32.38 15.6' 6.96 293°16.71 11.7' 524°51.77 -6.4' 53.8 22°1.31 13°32.22 13.97 351°19.69 11.9' 24°24.40 -7.0' 54.6' 13.97 311°32.23 -1.47.2 336°48.87 11.8' 24°38.06 -6.8' 54.6 13.97 331°19.69 11.9' 24°24.40 -7.0' 54.6 13.97 311°32.23 -1.47.2 336°48.87 11.8' 24°38.06 -6.8' 54.6 13.97 311°32.31 13°31.05 11.8' 24°31.30 -7.2' 54.6 13.97 311°31.07 -1.02' 31.3' 31°3.3' 32°3.33 -7.5' 54.6 14°3.15 -7.2' 31.8' 31.5' 32°3.33 -7.5' 54.6 14°3.55 -7.2' 33.3' -7.5' 54.6 14°3.55 -7.2' 33.3' -7.5' 54.6 14°3.55 -7.2' 33.3' -7.5' 54.6 14°3.55 -7.2' 33.3' -7.5'								
11 341°33.74 31.03 17°42.82 10.8° 26°33.39 4.3° 53.4° 53.1° 516° 30.30 32° 12.64 10.9° \$26° 29.10 4.4.′ 53.5° 31.3° 31.0° 33.6° 33.6° 33.6° 33.6° 32.6° 29.56 46° 42.50 10.9° 26° 26.91.0° 4.5° 53.5° 41.1° 33.47								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
13 11°33.60								
141								
15								
16	14		28.82		10.9'			
17	15	41°33.47	• • 28.08	75°42.34	11.0'	$26^{\circ}15.50$	-4.8'	53.9
188	16	56°33.40	27.35	90°12.32	11.0'	$26^{\circ}10.72$	-4.9'	53.9
101°33.21 25.13 133°42.52 11.2′ 25°55.65 5.3′ 53.5	17	71°33.34	26.61	104°42.35	11.1'	26°5.82	-5.0'	53.9
101°33.21 25.13 133°42.52 11.2′ 25°55.65 5.3′ 53.5	18	86°33.27	S16°25.87	119°12.41	11.1'	S26°0.80	-5.1'	53.9
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1 176° 32.88		SD = 16.2'	d = -0.7'		SI	O = 14.7'		
$ \begin{array}{c} 1 & 191^{\circ}32.82 & 20.68 & 220^{\circ}44.10 & 11.4' & 25^{\circ}22.29 & -6.0' & 53.5 \\ 2 & 206^{\circ}32.76 & 19.93 & 235^{\circ}14.53 & 11.5' & 25^{\circ}16.31 & -6.1' & 53.3 \\ 3 & 221^{\circ}32.69 & \cdots 19.19 & 249^{\circ}45.00 & 11.5' & 25^{\circ}10.22 & -6.2' & 53.3 \\ 4 & 236^{\circ}32.63 & 18.45 & 264^{\circ}15.52 & 11.6' & 25^{\circ}4.02 & -6.3' & 53.5 \\ 5 & 251^{\circ}32.57 & 17.70 & 278^{\circ}46.09 & 11.6' & 24^{\circ}57.70 & -6.4' & 53.5 \\ 6 & 266^{\circ}32.51 & 516^{\circ}16.96 & 293^{\circ}16.71 & 11.7' & 524^{\circ}51.27' & -6.5' & 53.5 \\ 7 & 281^{\circ}32.44 & 16.21 & 307^{\circ}47.38 & 11.7' & 24^{\circ}44.72 & -6.7' & 53.5 \\ 8 & 296^{\circ}32.38 & 15.46 & 322^{\circ}18.10 & 11.8' & 24^{\circ}38.06 & -6.8' & 54.0 \\ 9 & 311^{\circ}32.32 & \cdots 14.72 & 336^{\circ}48.87 & 11.8' & 24^{\circ}31.28 & -6.9' & 54.0 \\ 10 & 326^{\circ}32.26 & 13.97 & 351^{\circ}19.96 & 11.9' & 24^{\circ}1.40 & -7.0' & 54.0 \\ 111 & 341^{\circ}32.20 & 13.22 & 5^{\circ}50.56 & 11.9' & 24^{\circ}1.40 & -7.0' & 54.0 \\ 122 & 356^{\circ}32.14 & 516^{\circ}12.47 & 20^{\circ}21.49 & 12.0' & 524^{\circ}1.30 & -7.2' & 54.0 \\ 133 & 11^{\circ}32.08 & 11.72 & 34^{\circ}52.46 & 12.0' & 24^{\circ}3.08 & -7.3' & 54.0 \\ 144 & 26^{\circ}32.02 & 10.98 & 49^{\circ}23.49 & 12.1' & 23^{\circ}55.76 & -7.4' & 54.0 \\ 56^{\circ}31.91 & 9.48 & 78^{\circ}25.70 & 12.2' & 23^{\circ}43.34 & -7.8' & 54.0 \\ 155 & 41^{\circ}31.97 & \cdots 10.23 & 63^{\circ}54.57 & 12.1' & 23^{\circ}48.33 & -7.5' & 54.0 \\ 16 & 56^{\circ}31.91 & 9.48 & 78^{\circ}25.70 & 12.2' & 23^{\circ}33.14 & -7.8' & 54.0 \\ 19 & 101^{\circ}31.73 & 7.22 & 121^{\circ}59.42 & 12.3' & 23^{\circ}15.53 & -8.0' & 54.0 \\ 20 & 116^{\circ}31.68 & 6.47 & 136^{\circ}30.77 & 12.4' & 23^{\circ}9.57 & -8.1' & 54.0 \\ 21 & 131^{\circ}31.62 & \cdots 5.72 & 151^{\circ}2.17 & 12.5' & 23^{\circ}1.50 & -8.2' & 54.0 \\ 22 & 146^{\circ}31.51 & 4.21 & 180^{\circ}51.3 & 12.6' & 22^{\circ}45.06 & -8.4' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.2' & 22^{\circ}1.69 & -8.5' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.7' & 22^{\circ}28.21 & -8.6' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.7' & 22^{\circ}28.21 & -8.6' & 54.0 \\ 23 & 221^{\circ}31.18 & 15^{\circ}59.68 & 267^{\circ}15.32 & 12.9' & 22^{\circ}15.33 & -8.0' & 54.0 \\ 24 & 236^{\circ}31.23 & 16^{\circ}0.43 & 252^{\circ}43.49 & $	hu	GHA	Dec	GHA	ν	Dec	d	HP
$ \begin{array}{c} 1 & 191^{\circ}32.82 & 20.68 & 220^{\circ}44.10 & 11.4' & 25^{\circ}22.29 & -6.0' & 53.5 \\ 2 & 206^{\circ}32.76 & 19.93 & 235^{\circ}14.53 & 11.5' & 25^{\circ}16.31 & -6.1' & 53.3 \\ 3 & 221^{\circ}32.69 & \cdots 19.19 & 249^{\circ}45.00 & 11.5' & 25^{\circ}10.22 & -6.2' & 53.3 \\ 4 & 236^{\circ}32.63 & 18.45 & 264^{\circ}15.52 & 11.6' & 25^{\circ}4.02 & -6.3' & 53.5 \\ 5 & 251^{\circ}32.57 & 17.70 & 278^{\circ}46.09 & 11.6' & 24^{\circ}57.70 & -6.4' & 53.5 \\ 6 & 266^{\circ}32.51 & 516^{\circ}16.96 & 293^{\circ}16.71 & 11.7' & 524^{\circ}51.27' & -6.5' & 53.5 \\ 7 & 281^{\circ}32.44 & 16.21 & 307^{\circ}47.38 & 11.7' & 24^{\circ}44.72 & -6.7' & 53.5 \\ 8 & 296^{\circ}32.38 & 15.46 & 322^{\circ}18.10 & 11.8' & 24^{\circ}38.06 & -6.8' & 54.0 \\ 9 & 311^{\circ}32.32 & \cdots 14.72 & 336^{\circ}48.87 & 11.8' & 24^{\circ}31.28 & -6.9' & 54.0 \\ 10 & 326^{\circ}32.26 & 13.97 & 351^{\circ}19.96 & 11.9' & 24^{\circ}1.40 & -7.0' & 54.0 \\ 111 & 341^{\circ}32.20 & 13.22 & 5^{\circ}50.56 & 11.9' & 24^{\circ}1.40 & -7.0' & 54.0 \\ 122 & 356^{\circ}32.14 & 516^{\circ}12.47 & 20^{\circ}21.49 & 12.0' & 524^{\circ}1.30 & -7.2' & 54.0 \\ 133 & 11^{\circ}32.08 & 11.72 & 34^{\circ}52.46 & 12.0' & 24^{\circ}3.08 & -7.3' & 54.0 \\ 144 & 26^{\circ}32.02 & 10.98 & 49^{\circ}23.49 & 12.1' & 23^{\circ}55.76 & -7.4' & 54.0 \\ 56^{\circ}31.91 & 9.48 & 78^{\circ}25.70 & 12.2' & 23^{\circ}43.34 & -7.8' & 54.0 \\ 155 & 41^{\circ}31.97 & \cdots 10.23 & 63^{\circ}54.57 & 12.1' & 23^{\circ}48.33 & -7.5' & 54.0 \\ 16 & 56^{\circ}31.91 & 9.48 & 78^{\circ}25.70 & 12.2' & 23^{\circ}33.14 & -7.8' & 54.0 \\ 19 & 101^{\circ}31.73 & 7.22 & 121^{\circ}59.42 & 12.3' & 23^{\circ}15.53 & -8.0' & 54.0 \\ 20 & 116^{\circ}31.68 & 6.47 & 136^{\circ}30.77 & 12.4' & 23^{\circ}9.57 & -8.1' & 54.0 \\ 21 & 131^{\circ}31.62 & \cdots 5.72 & 151^{\circ}2.17 & 12.5' & 23^{\circ}1.50 & -8.2' & 54.0 \\ 22 & 146^{\circ}31.51 & 4.21 & 180^{\circ}51.3 & 12.6' & 22^{\circ}45.06 & -8.4' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.2' & 22^{\circ}1.69 & -8.5' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.7' & 22^{\circ}28.21 & -8.6' & 54.0 \\ 22 & 206^{\circ}31.34 & 1.95 & 223^{\circ}39.98 & 12.7' & 22^{\circ}28.21 & -8.6' & 54.0 \\ 23 & 221^{\circ}31.18 & 15^{\circ}59.68 & 267^{\circ}15.32 & 12.9' & 22^{\circ}15.33 & -8.0' & 54.0 \\ 24 & 236^{\circ}31.23 & 16^{\circ}0.43 & 252^{\circ}43.49 & $	0	176°32.88	S16°21.42	$206^{\circ}13.72$	11.4'	\$25°28.14	-5.9'	53.9
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13	11	341°32.20	13.22	5°50.56	11.9'	24°17.40	-7.1'	54.0
13	12	356°32.14	S16°12.47	20°21.49	12.0'	524°10.30	-7.2'	54.0
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11 341°30.87 55.13 354°27.48 13.2' 20°58.10 -9.5' 54.1 12 356°30.81 S15°54.37 8°59.69 13.3' S20°48.57 -9.6' 54.1 13 11°30.76 53.61 23°31.96 13.3' 20°38.94 -9.7' 54.1 14 26°30.71 52.85 38°4.29 13.4' 20°29.23 -9.8' 54.1 15 41°30.66 · 52.09 52°36.66 13.4' 20°19.42 -9.9' 54.1 16 56°30.61 51.33 67°9.09 13.5' 20°9.53 -10.0' 54.1 17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°39.33 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09								
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13 11°30.76 53.61 23°31.96 13.3' 20°38.94 -9.7' 54.1 14 26°30.71 52.85 38°4.29 13.4' 20°29.23 -9.8' 54.1 15 41°30.66 · 52.09 52°36.66 13.4' 20°19.42 -9.9' 54.1 16 56°30.61 51.33 67°9.09 13.5' 20°9.53 -10.0' 54.1 17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	12							
15 41°30.66 · · · 52.09 52°36.66 13.4' 20°19.42 -9.9' 54.1 16 56°30.61 51.33 67°9.09 13.5' 20°9.53 -10.0' 54.1 17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2								54.1
16 56°30.61 51.33 67°9.09 13.5' 20°9.53 -10.0' 54.1 17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13	26° 30, 71	52.85					54.1
16 56°30.61 51.33 67°9.09 13.5' 20°9.53 -10.0' 54.1 17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13	20 30.71	F2 00	52°36.66	13.4'	20°19.42	-9.9'	54.1
17 71°30.56 50.56 81°41.58 13.5' 19°59.55 -10.1' 54.2 18 86°30.51 S15°49.80 96°14.11 13.6' S19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14		• • 52.09	_	12 5'	20°9.53	-10.0'	54.1
18 86°30.51 \$15°49.80 96°14.11 13.6' \$19°49.48 -10.2' 54.2 19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14 15	41°30.66		67° 9.09	13.5	5.55		54.2
19 101°30.46 49.04 110°46.70 13.6' 19°39.33 -10.2' 54.2 20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14 15 16	41°30.66 56°30.61	51.33			19°59 55	-10.1	
20 116°30.42 48.27 125°19.35 13.7' 19°29.09 -10.3' 54.2 21 131°30.37 · · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14 15 16 17	41°30.66 56°30.61 71°30.56	51.33 50.56	81°41.58	13.5'			54.2
21 131°30.37 · · · 47.51 139°52.04 13.7' 19°18.76 -10.4' 54.2 22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14 15 16 17	41° 30.66 56° 30.61 71° 30.56 86° 30.51	51.33 50.56 \$15°49.80	81°41.58 96°14.11	13.5' 13.6'	S 19°49.48	-10.2'	
22 146°30.32 46.75 154°24.79 13.8' 19°8.35 -10.5' 54.2	13 14 15 16 17 18	41° 30.66 56° 30.61 71° 30.56 86° 30.51 101° 30.46	51.33 50.56 \$15°49.80 49.04	81°41.58 96°14.11 110°46.70	13.5' 13.6' 13.6'	\$19°49.48 19°39.33	-10.2' -10.2'	54.2
	13 14 15 16 17 18 19 20	41° 30.66 56° 30.61 71° 30.56 86° 30.51 101° 30.46 116° 30.42	51.33 50.56 \$15°49.80 49.04 48.27	81°41.58 96°14.11 110°46.70 125°19.35	13.5' 13.6' 13.6' 13.7'	\$19°49.48 19°39.33 19°29.09	-10.2' -10.2' -10.3'	54.2 54.2
23 101°30.27 45.98 108°57.59 13.8′ 18°57.86 -10.6′ 54.2	13 14 15 16 17 18 19 20 21	41° 30.66 56° 30.61 71° 30.56 86° 30.51 101° 30.46 116° 30.42 131° 30.37	51.33 50.56 \$15°49.80 49.04 48.27 •• 47.51	81°41.58 96°14.11 110°46.70 125°19.35 139°52.04	13.5' 13.6' 13.6' 13.7' 13.7'	\$19°49.48 19°39.33 19°29.09 19°18.76	-10.2' -10.2' -10.3' -10.4'	54.2 54.2 54.2 54.2
SD = 16.2' d = -0.8' $SD = 14.7'$	13 14 15 16 17 18 19 20 21	41° 30.66 56° 30.61 71° 30.56 86° 30.51 101° 30.46 116° 30.42 131° 30.37 146° 30.32	51.33 50.56 \$15° 49.80 49.04 48.27 • 47.51 46.75	81°41.58 96°14.11 110°46.70 125°19.35 139°52.04 154°24.79	13.5' 13.6' 13.6' 13.7' 13.7' 13.8'	\$19°49.48 19°39.33 19°29.09 19°18.76 19°8.35	-10.2' -10.2' -10.3' -10.4' -10.5'	54.2 54.2 54.2 54.2

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
uy	00 ^h	12 ^h	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-3%	
03	13:42	13:45	12:14	09:47	22:12		
04	13:48	13:51	12:14	10:36	23:00		
05	13:54	13:57	12:14	11:23	23:46		

February 06, 07, 08 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	135° 54.51	222°57.55 \$21°11.51	336°34.38 N13°25.04	350°30.19 N14°56.01	125°9.05 N02°6.07	
1	150° 56.98	237°56.93 11.60	351°37.61 25.39	5°32.97 56.12	140°11.31 6.17	Al
2	165° 59.44	252°56.31 11.68	6°40.85 25.74	20°35.76 56.23	155°13.57 6.27	
3	181°1.91	267°55.68 · · 11.77	21°44.08 · · 26.09	35°38.54 · · 56.35	170°15.82 · · 6.36	9
4	196°4.37	282°55.06 11.85	36°47.32 26.44	50°41.32 56.46	185°18.08 6.46	
5	211°6.83	297°54.43 11.93	51°50.56 26.78	65°44.11 56.57	200°20.34 6.55	A
6	226°9.30	312°53.81 S21°12.01	66°53.80 N13°27.13	80°46.89 N14°56.68	215°22.59 N02°6.65	
7	241°11.76	327°53.18 12.09	81°57.04 27.48	95°49.68 56.80	230°24.85 6.75	
8	256° 14.23	342°52.56 12.17	97° 0.28 27.83	110°52.46 56.91	245°27.11 6.84	'
9	271°16.69	357°51.93 · · 12.25	112°3.52 · · 28.18	125°55.25 · · 57.02	260°29.36 · · 6.94	
10	286° 19.16	12°51.31 12.32	127°6.76 28.53	140°58.03 57.14	275°31.62 7.03	l
11	301°21.62	27°50.68 12.40	142°10.01 28.88	156° 0.81 57.25	290°33.88 7.13	Ald
12	316°24.08	42°50.05 S 21°12.48	157°13.25 N13°29.23	171°3.60 N14°57.36	305°36.13 N02°7.23	
13	331°26.55	57°49.43 12.55	172°16.50 29.58	186° 6.38 57.47	320°38.39 7.32	
14	346°29.01	72°48.80 12.62	187°19.75 29.93	201° 9.17 57.59	335°40.65 7.42	B
15	1°31.48	87°48.17 · · 12.70	202°22.99 · · 30.28	216°11.95 · · 57.70	350°42.90 · · 7.52	
16	16°33.94	102°47.54 12.77	217°26.24 30.63	231°14.74 57.81	5°45.16 7.61	′
17	31°36.40	117°46.91 12.84	232°29.49 30.98	246°17.52 57.92	20°47.41 7.71	Bet
18	46°38.87	132°46.29 S 21°12.91	247°32.75 N13°31.33	261°20.31 N14°58.04	35°49.67 N02°7.81	
19	61°41.33	147°45.66 12.97	262°36.00 31.68	276°23.09 58.15	50°51.93 7.90	
20	76°43.80	162°45.03 13.04	277°39.25 32.03	291°25.88 58.26	65°54.18 8.00	_
21	91°46.26	177°44.40 · · 13.11	292°42.50 · · 32.38	306°28.66 · · 58.37	80°56.44 · · 8.10	F
22	106°48.72	192°43.77 13.17	307°45.76 32.74	321°31.45 58.49	95°58.69 8.19	
23	121°51.19	207°43.14 13.24	322°49.02 33.09	336°34.23 58.60	111°0.95 8.29	
- A	1454	0.6/ 10.1/ 4.22	2 0/ 10 2/ 1 04	2.0/ 10.1/ 2.56	2.2/ 10.1/ 0.00	
Mer.	pass. 14:54	ν-0.6' d0.1' m-4.23	ν3.2′ d0.3′ m-1.04	ν2.8′ d0.1′ m-2.56	ν2.3' d0.1' m0.80	Miap
						1 .
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	F
0	136° 53.65	222°42.51 S 21°13.30	337°52.27 N13°33.44	351°37.02 N14°58.71	126°3.20 N02°8.39	
1	151°56.12	237°41.88 13.36	352°55.53 33.79	6°39.80 58.82	141°5.46 8.48	De
2	166° 58.58	252°41.25 13.43	7°58.79 34.14	21°42.59 58.94	156°7.71 8.58	
3	182°1.04	267°40.62 · · 13.49	23°2.05 · · 34.50	36°45.37 · · 59.05	171°9.97 · · 8.68	
4	197°3.51	282°39.99 13.55	38°5.31 34.85	51°48.16 59.16	186°12.22 8.77	
5	212°5.97	297°39.36 13.60	53°8.57 35.20	66°50.94 59.27	201°14.48 8.87	
6	227°8.44	312°38.72 S 21°13.66	68°11.83 N13°35.56	81°53.73 N14°59.39	216°16.73 N02°8.97	
7	242° 10.90	327°38.09 13.72	83°15.10 35.91	96°56.51 59.50	231°18.98 9.06	
8	257° 13.37	342°37.46 13.78	98°18.36 36.26	111°59.30 59.61	246°21.24 9.16	
9	272° 15.83	357°36.83 · · 13.83	113°21.63 · · 36.62	127° 2.08 · · 59.73	261°23.49 · · 9.26	l N
10	287° 18.29	12°36.19 13.88	128°24.90 36.97	142°4.87 14°59.84	276°25.75 9.36	L A
11	302°20.76	27°35.56 13.94	143°28.16 37.32	157°7.66 14°59.95	291°28.00 9.45	Rigi
12	317°23.22	42°34.93 S 21°13.99	158°31.43 N13°37.68	172°10.44 N15°0.06	306°30.25 N02°9.55	_'
13	332°25.69	57°34.29 14.04	173°34.70 38.03	187°13.23 0.18	321°32.51 9.65	Zu
14	347°28.15	72°33.66 14.09	188°37.97 38.38	202°16.01 0.29	336°34.76 9.74	A
15	2°30.61	87°33.03 · · 14.14	203°41.24 · · 38.74	217°18.80 · · 0.40	351°37.01 · · 9.84	1 '
16	17°33.08	102°32.39 14.19	218°44.51 39.09	232°21.58 0.51	6°39.27 9.94	
17	32°35.54	117°31.76 14.23	233°47.79 39.45	247°24.37 0.63	21°41.52 10.04	
18	47°38.01	132°31.12 S 21°14.28	248°51.06 N13°39.80	262°27.16 N15°0.74	36°43.77 N02°10.13	Rasa
19	62°40.47	147°30.49 14.33	263°54.34 40.16	277°29.94 0.85	51°46.03 10.23	11/456
20	77°42.93	162°29.85 14.37	278°57.61 40.51	292°32.73 0.96	66°48.28 10.33	Kau
21	92°45.40	177°29.21 · · 14.41	294°0.89 · · 40.87	307°35.51 · · 1.08	81°50.53 · · 10.43	INau
22	107°47.86	192°28.58 14.46	309°4.17 41.22	322°38.30 1.19	96°52.78 10.53	
23	122°50.33	207°27.94 14.50	324°7.45 41.58	337°41.09 1.30	111°55.04 10.62	
More	pass. 14:50	ν-0.6' d0.1' m-4.22	ν3.3' d0.4' m-1.06	ν2.8' d0.1' m-2.56	$\nu 2.3' \ d0.1' \ m0.80$	F
ivier.	pass. 14.50	ν-0.0 d0.1 III-4.22	V3.3 U0.4 III-1.00	V2.8 U0.1 III-2.50	V2.3 U0.1 III0.80	'
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	/
0	$137^{\circ}52.79$	222°27.31 S 21°14.54	339°10.73 N13°41.94	352°43.87 N15°1.41	126°57.29 N02°10.72	Fon
1	152°55.25	237°26.67 14.58	354°14.01 42.29	7°46.66 1.53	141°59.54 10.82	
2	$167^{\circ}57.72$	252°26.03 14.62	9°17.29 42.65	22°49.44 1.64	157°1.79 10.92	
3	183°0.18	267°25.39 · · 14.65	24°20.57 · · 43.00	37°52.23 · · 1.75	172°4.04 · · 11.01	
4	198°2.65	282°24.76 14.69	39°23.85 43.36	52°55.02 1.86	187°6.30 11.11	Feb
5	213°5.11	297°24.12 14.72	54°27.14 43.72	67°57.80 1.98	202°8.55 11.21	
6	228°7.58	312°23.48 S 21°14.76	69°30.42 N13°44.07	83°0.59 N15°2.09	217°10.80 N02°11.31	
7	243° 10.04	327°22.84 14.79	84°33.71 44.43	98° 3.38 2.20	232°13.05 11.41	
8	258° 12.50	342°22.20 14.83	99°37.00 44.79	113° 6.16 2.31	247°15.30 11.50	
9	273° 14.97	357°21.57 · · 14.86	114°40.28 · · 45.14	128° 8.95 · · 2.43	262°17.55 · · 11.60	Feb
10	288° 17.43	12°20.93 14.89	129°43.57 45.50	143°11.74 2.54	277° 19.81 11.70	l en
11	303°19.90	27°20.29 14.92	144°46.86 45.86	158°14.52 2.65	292°22.06 11.80	
12	318° 22.36	42°19.65 S 21°14.95	159°50.15 N13°46.22	173°17.31 N15°2.76	307°24.31 N02°11.90	
13	333° 24.82	57°19.01 14.97	174°53.44 46.57	188°20.09 2.88	322°26.56 12.00	
14	348° 27.29	72°18.37 15.00	189°56.74 46.93	203°22.88 2.99	337°28.81 12.09	
15	3°29.75	87°17.73 · · 15.03	205°0.03 · · 47.29	218°25.67 · · 3.10	352°31.06 · · 12.19	Feb 0
16	18° 32.22	102°17.09 15.05	220°3.32 47.65	233°28.45 3.21	7°33.31 12.29	
17	33° 34.68	117° 16.45 15.08	235°6.62 48.00	248°31.24 3.33	22°35.56 12.39	
18	48° 37.14	132°15.80 S 21°15.10	250°9.91 N13°48.36	263°34.03 N15°3.44	37°37.81 N02°12.49	
19	63°39.61	147° 15.16 15.12	265°13.21 48.72	278°36.81 3.55	52°40.06 12.59	L
20	78°42.07	162°14.52 15.14	280°16.51 49.08	293°39.60 3.66	67°42.31 12.68	
21	93°44.54	177°13.88 · · 15.16	295°19.81 · · 49.44	308°42.39 · · 3.78	82°44.56 · · 12.78	
22	108°47.00	192°13.24 15.18	310°23.11 49.80	323°45.18 3.89	97°46.81 12.88	
23	123°49.46	207°12.60 15.20	325°26.41 50.15	338°47.96 4.00	112°49.06 12.98	
Mer	pass. 14:46	ν-0.6' d0.0' m-4.21	ν3.3' d0.4' m-1.08	ν2.8' d0.1' m-2.56	$\nu 2.3' \ d0.1' \ m0.80$	
				2.0 00.1 111 2.00		

	SHA	Dec							
Alpheratz	357°33.22	29°14.51							
Ankaa	353°5.71	-42° 9.68							
Schedar	349°29.37	56°41.40							
Diphda	348° 45.75	-17°50.38							
Achernar	335°19.12	-57°6.18							
Hamal	327°49.30	23°35.53							
Polaris	313°6.17	89°23.01							
Acamar	315°10.46	-40°11.98 4°11.73							
Menkar	314°4.32 308°25.68	4°11.73 49°57.65							
Mirfak Aldebaran	308° 25.68 290° 37.48	49°57.65 16°33.82							
Rigel	290 37.48 281°2.01	-8°10.35							
Capella	280°19.04	-6 10.33 46°1.61							
Bellatrix	278°20.81	6°22.38							
Elnath	277° 59.44	28°37.83							
Alnilam	275°35.75	-1°11.18							
Betelgeuse	270°49.97	7°24.64							
Canopus	263°51.20	-52°42.80							
Sirius	258°24.42	$-16^{\circ}45.37$							
Adhara	255°4.17	-29°0.71							
Procyon	244°48.71	$5^{\circ}9.19$							
Pollux	243°14.83	27°57.54							
Avior	$234^{\circ}13.38$	-59°35.89							
Suhail	$222^{\circ}44.58$	-43°32.62							
Miaplacidus	$221^{\circ}36.95$	-69°49.74							
Alphard	217°45.72	-8°46.72							
Regulus	207°32.28	11°49.89							
Dubhe	193°38.32	61°36.01							
Denebola	182°22.93	14°25.00							
Gienah	175°41.56	-17°41.64							
Acrux	172°57.67	-63°14.85							
Gacrux	171°49.32	-57°15.81							
Alioth	166°11.16	55°48.39							
Spica	158° 20.33	-11°18.28							
Alkaid	152°50.49	49°10.29							
Hadar Menkent	148° 33.34 147° 55.45	-60°30.04 -36°30.14							
Arcturus	147 55.45 145°46.25	-30 30.14 19°2.21							
Rigil Kent.	139°37.78	-60°56.65							
Kochab	137°19.82	74°2.19							
Zuben'ubi	136°54.07	-16° 9.31							
Alphecca	126°2.32	26°37.11							
Antares	112° 13.83	-26°29.48							
Atria	107°6.75	-69°4.30							
Sabik	102°0.97	$-15^{\circ}45.52$							
Shaula	96°8.26	-37°7.30							
Rasalhague	95°57.14	$12^{\circ}32.26$							
Eltanin	90°41.74	$51^{\circ}28.83$							
Kaus Aust.	83°30.51	-34°22.22							
Vega	$80^{\circ}32.38$	38°48.32							
Nunki	75°45.92	-26°15.75							
Altair	61°58.58	8°56.32							
Peacock	53°3.60	-56°38.80							
Deneb	49°25.08	45°22.57							
Enif	33°37.41	9°59.94							
Al Na'ir	27°31.21 15°12.94	-46°49.84 -29°28.80							
Fomalhaut Scheat	15° 12.94 13° 43.83	-29° 28.80 28° 13.86							
Markab	13 45.65 13°28.45	26 13.60 15°21.09							
Feb 06 Sat	SHA	Mer.pass							
Venus	87°3.04	09:09							
Mars	200°39.86	01:33							
Jupiter Saturn	214°35.67 349°14.54	00:38 15:37							
Feb 07 Sun	SHA 85° 48.86	Mer.pass							
Venus Mars	200° 58.62	09:10 01:28							
Jupiter	200 58.02 214°43.36	01:28							
Saturn	349°9.55	15:33							
Feb 08 Mon	SHA 94° 24 51	Mer.pass							
Venus	84°34.51 201°17.94	09:11							
Mars	201°17.94 214°51.08	01:23 00:29							
lunitar									
Jupiter Saturn	Saturn 349°4.50 15:30								
Saturn	349°4.50	15:30							
Saturn	ıtal parallax								
Saturn		0.2 0.2							

Stars SHA

Dec

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.23	S15°45.21	183°30.44	13.9'	S18°47.28	-10.7'	54.2'
1	191°30.18	44.45	198°3.34	14.0'	18°36.62	-10.7'	54.2'
2	206°30.13	43.68	212°36.29	14.0'	18°25.89	-10.8'	54.2'
3	221°30.09	• • 42.92	227°9.29	14.1'	18°15.07	-10.9'	54.2'
4 5	236°30.04 251°30.00	42.15 41.38	241°42.34 256°15.44	14.1' 14.2'	18°4.17 17°53.19	-11.0' -11.1'	54.3' 54.3'
6	266°29.95	\$15°40.61	270°48.59	14.2'	S17°42.14	-11.1	54.3
7	281°29.91	39.84	285°21.79	14.2'	17°31.01	-11.2'	54.3'
8	296°29.86	39.07	299°55.04	14.3'	17°19.81	-11.3'	54.3'
9	311°29.82	• • 38.30	314°28.34	14.3'	17°8.52	-11.4'	54.3'
10	326°29.77	37.53	329°1.68	14.4'	16°57.17	-11.4'	54.3'
11	341°29.73 356°29.69	36.76 \$15°35.99	343°35.07 358°8.51	14.4' 14.5'	16°45.74 \$16°34.24	-11.5' -11.6'	54.3' 54.3'
12 13	11°29.64	35.22	12°41.99	14.5'	16°22.67	-11.6'	54.3'
14	26°29.60	34.45	27°15.52	14.6'	16°11.03	-11.7	54.4'
15	41°29.56	• • 33.68	41°49.09	14.6'	15°59.31	-11.8'	54.4'
16	56°29.52	32.90	56°22.71	14.7'	15°47.53	-11.9'	54.4'
17	71°29.48	32.13	70°56.37	14.7'	15°35.68	-11.9'	54.4'
18	86°29.44	S15°31.36	85°30.08	14.7'	\$15°23.76	-12.0'	54.4'
19	101°29.40	30.58	100°3.83	14.8'	15°11.78	-12.1'	54.4'
20 21	116°29.36 131°29.32	29.81 •• 29.03	114°37.62 129°11.45	14.8' 14.9'	14°59.72 14°47.61	-12.1' -12.2'	54.4' 54.4'
22	131 29.32 146°29.28	28.26	143°45.32	14.9'	14 47.01 14°35.43	-12.2'	54.4 54.5'
23	161°29.24	27.48	158°19.23	15.0'	14°23.19	-12.3'	54.5'
	SD = 16.2'	d = -0.8'		ÇI	D = 14.8'		
	JD — 10.2	u — -0.0		اد	J — 14.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.20	\$15°26.70	172°53.18 187°27.17	15.0'	\$14°10.88	-12.4'	54.5'
1 2	191°29.16 206°29.12	25.93 25.15	202°1.20	15.0' 15.1'	13°58.51 13°46.09	-12.4' -12.5'	54.5' 54.5'
3	221°29.08	24.37	216°35.27	15.1'	13°33.60	-12.5'	54.5'
4	236°29.05	23.59	231°9.38	15.1'	13°21.05	-12.6'	54.5'
5	251°29.01	22.81	245°43.52	15.2'	13°8.45	-12.7'	54.5'
6	266°28.97	S 15°22.03	260°17.69	15.2'	S12°55.78	-12.7'	54.6'
7	281°28.94 296°28.90	21.25	274°51.90 289°26.15	15.2' 15.3'	12°43.07 12°30.29	-12.8' -12.8'	54.6'
8 9	296 28.90 311°28.86	20.47 •• 19.69	289 20.15 304°0.43	15.3	12 30.29 12°17.46	-12.8 -12.9'	54.6' 54.6'
10	326°28.83	18.91	318°34.74	15.3'	12°4.58	-12.9'	54.6'
11	341°28.79	18.13	333°9.08	15.4'	11°51.64	-13.0'	54.6'
12	356°28.76	S15°17.35	347°43.46	15.4'	S11°38.65	-13.0'	54.6'
13	11°28.73	16.57	2°17.86	15.4'	11°25.61	-13.1'	54.6'
14 15	26°28.69 41°28.66	15.78 •• 15.00	16°52.30 31°26.76	15.5' 15.5'	11°12.52 10°59.38	-13.1' -13.2'	54.7' 54.7'
16	56°28.62	14.22	46°1.25	15.5'	10 59.36 10°46.19	-13.2'	54.7'
17	71°28.59	13.43	60°35.77	15.5'	10°32.95	-13.3'	54.7'
18	86°28.56	S15°12.65	75°10.32	15.6'	S10°19.66	-13.3'	54.7'
19	101°28.53	11.86	89°44.89	15.6'	10°6.33	-13.4'	54.7'
20	116°28.50	11.08	104°19.49	15.6'	09°52.95	-13.4'	54.7'
21 22	131°28.46 146°28.43	· · 10.29 9.50	118°54.11 133°28.75	15.6' 15.7'	09°39.53 09°26.06	-13.5' -13.5'	54.8' 54.8'
23	140 28.43 161°28.40	9.50 8.72	133 26.75 148°3.42	15.7'	09°20.00	-13.5'	54.8'
23	SD = 16.2'	d = -0.8'			D = 14.9'	15.0	31.0
	<u>JD = 10.2</u>	<u>u = -0.6</u>		31	J = 14.9		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.37	\$15°7.93	162°38.11	15.7'	S08°59.00	-13.6'	54.8'
1 2	191°28.34 206°28.31	7.14 6.35	177°12.81 191°47.54	15.7' 15.7'	08°45.41 08°31.78	-13.6' -13.7'	54.8' 54.8'
3	200 28.31 221°28.28	0.35 · · 5.56	206°22.29	15.7 15.8'	08 31.78 08°18.10	-13.7'	54.8 54.9'
4	236°28.25	4.77	220° 57.05	15.8'	08°4.39	-13.8'	54.9'
5	251°28.22	3.98	235°31.84	15.8'	07°50.64	-13.8'	54.9'
6	266°28.20	S15°3.19	250°6.64	15.8'	S07°36.85	-13.8'	54.9'
7	281°28.17	2.40	264°41.45	15.8'	07°23.03	-13.9'	54.9'
8 9	296°28.14 311°28.11	1.61 •• 0.82	279°16.28 293°51.12	15.8' 15.9'	07°9.17 06°55.27	-13.9' -13.9'	54.9' 54.9'
10	311°28.11 326°28.09	15°0.03	293°51.12 308°25.97	15.9'	06°55.27 06°41.34	-13.9 -14.0'	54.9 55.0'
11	341°28.06	14°59.24	323°0.84	15.9'	06°27.38	-14.0'	55.0'
12	356°28.03	S14°58.44	337°35.72	15.9'	S06°13.39	-14.0'	55.0'
13	11°28.01	57.65	352°10.60	15.9'	05°59.36	-14.1'	55.0'
14	26°27.98	56.86	6°45.50	15.9'	05°45.31	-14.1'	55.0'
15 16	41°27.96 56°27.93	· · 56.06 55.27	21°20.40 35°55.31	15.9' 15.9'	05°31.22 05°17.11	-14.1' -14.1'	55.0' 55.1'
16 17	56°27.93 71°27.91	55.27 54.47	50°30.23	15.9' 15.9'	05°17.11	-14.1 -14.2'	55.1' 55.1'
18	86°27.88	\$14°53.68	65°5.15	15.9'	S04°48.80	-14.2'	55.1'
19	101°27.86	52.88	79°40.08	15.9'	04°34.60	-14.2'	55.1'
20	116°27.83	52.09	94°15.01	15.9'	04°20.38	-14.2'	55.1'
21	131°27.81	• • 51.29	108°49.94	15.9'	04°6.14	-14.3'	55.1'
22 23	146°27.79 161°27.77	50.49 49.70	123°24.87 137°59.80	15.9' 15.9'	03°51.87 03°37.58	-14.3' -14.3'	55.2' 55.2'
23						-14.3	33.2
	SD = 16.2'	d = -0.8'		51	D = 14.9'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-2%
06	13:59	14:01	12:14	12:08	-:-	
07	14:03	14:05	12:14	12:51	00:29	
08	14:07	14:08	12:14	13:32	01:11	

February 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
0	138°51.93	222°11.95	340°29.71 N13°50.51	353°50.75 N15°4.11	127°51.31 N02°13.08	
1	153° 54.39	237°11.31 15.23	355°33.01 50.87	8°53.54 4.23	142°53.56 13.18	Alpheratz 357°33.23
2	168° 56.86	252°10.67 15.25	10°36.31 51.23	23°56.32 4.34	157°55.81 13.28	Ankaa 353°5.73
3	183°59.32	267°10.03 · · 15.26	25°39.61 · · 51.59	38°59.11 · · 4.45	172°58.06 · · 13.38	Schedar 349°29.39
4	199°1.78	282°9.38 15.27	40°42.92 51.95	54°1.90 4.56	188°0.31 13.47	Diphda 348°45.76
5	214°4.25	297°8.74 15.29	55°46.22 52.31	69°4.68 4.67	203°2.56 13.57	Achernar 335°19.14
6	229°6.71	312°8.09 S21°15.30	70°49.53 N13°52.67	84°7.47 N15°4.79	218°4.81 N02°13.67	Hamal 327°49.32
7	244°9.18	327°7.45 15.31	85°52.84 53.03	99°10.26 4.90	233°7.06 13.77	Polaris 313°7.85
8	259°11.64	342°6.81 15.32	100°56.15 53.39	114°13.05 5.01	248°9.30 13.87	Acamar 315°10.48
9	274° 14.10	357°6.16 · · 15.32	115°59.45 · · 53.75	129°15.83 · · 5.12	263° 11.55 · · 13.97	Menkar 314°4.33
10	289° 16.57	12°5.52 15.33	131°2.76 54.11	144°18.62 5.24	278° 13.80 14.07	Mirfak 308°25.70
11	304°19.03	27°4.87 15.34	146° 6.07 54.47	159°21.41 5.35	293°16.05 14.17	Aldebaran 290°37.49
12	319°21.50	42°4.23 S 21°15.34	161°9.38 N13°54.83	174°24.19 N15°5.46	308°18.30 N02°14.27	Rigel 281°2.02 Capella 280°19.06
13	334°23.96	57°3.58 15.35	176°12.70 55.19	189°26.98 5.57	323°20.55 14.37	
14	349°26.42	72°2.94 15.35	191°16.01 55.55	204°29.77 5.69	338°22.79 14.47	Bellatrix 278°20.83 Elnath 277°59.45
15	4°28.89	87°2.29 · · 15.35	206°19.32 · · 55.91	219°32.56 · · 5.80	353°25.04 · · 14.57	Elnath 277°59.45 Alnilam 275°35.77
16	19°31.35	102°1.64 15.35	221°22.64 56.27	234°35.34 5.91	8°27.29 14.66	Betelgeuse 270°49.98
17	34°33.82	117°1.00 15.35	236°25.95 56.63	249°38.13 6.02	23°29.54 14.76	Canopus 263°51.22
18	49°36.28	132°0.35 S 21°15.35	251°29.27 N13°56.99	264°40.92 N15°6.13	38°31.79 N02°14.86	Sirius 258°24.43
19	64°38.74	146° 59.71 15.35	266° 32.59 57.35	279°43.71 6.25	53°34.03 14.96	Adhara 255°4.18
20	79°41.21	161°59.06 15.35	281°35.90 57.71	294°46.49 6.36	68°36.28 15.06	Procyon 244°48.71
21	94° 43.67	176°58.41 · · 15.35	296°39.22 · · 58.07	309°49.28 · · 6.47	83°38.53 · · 15.16	Pollux 243°14.84
22	109°46.14	191°57.76 15.34	311°42.54 58.43	324°52.07 6.58	98° 40.78 15.26	Avior 234°13.40
23	124° 48.60	206°57.12 15.34	326°45.86 58.79	339°54.85 6.70	113°43.02 15.36	Suhail 222°44.58
Mer.r	pass. 14:42	ν -0.6' d 0.0' m-4.21	ν 3.3′ d 0.4′ m -1.11	$\nu 2.8' \ d0.1' \ \text{m-}2.56$	$\nu 2.2' \ d0.1' \ m0.80$	Miaplacidus 221°36.96
						Alphard 217°45.72
						Regulus 207°32.27
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.30
0	139°51.07	221°56.47 \$21°15.33	341°49.18 N13°59.15	354°57.64 N15°6.81	128°45.27 N02°15.46	Denebola 182°22.91
1	154°53.53	236°55.82 15.32	356°52.50 59.52	10°0.43 6.92	143° 47.52 15.56	Gienah 175°41.55
2	169°55.99	251°55.17 15.31	11°55.83 13°59.88	25°3.22 7.03	158° 49.76 15.66	Acrux 172°57.65
3	184°58.46	266°54.53 · · 15.30	26°59.15 14°0.24	40°6.00 · · 7.14	173°52.01 · · 15.76	Gacrux 171°49.29
4	200°0.92	281°53.88 15.29	42°2.47 0.60	55°8.79 7.26	188°54.26 15.86	Alioth 166°11.13
5	215°3.39	296°53.23 15.28	57°5.80 0.96	70°11.58 7.37	203°56.50 15.96	Spica 158°20.31
6	230°5.85	311°52.58	72°9.12 N14°1.32	85°14.37 N15°7.48	218°58.75 N02°16.06	Alkaid 152°50.46
7	245°8.31	326°51.93 15.26	87°12.45 1.68	100°17.16 7.59	234°1.00 16.16	Hadar 148°33.31
8 9	260° 10.78 275° 13.24	341°51.28 15.24 356°50.63 · · 15.23	102°15.78 2.05 117°19.11 •• 2.41	115°19.94 7.70 130°22.73 •• 7.82	249°3.24 16.26 264°5.49 •• 16.36	Menkent 147°55.43
	275 13.24 290°15.71		117 19.11 · · 2.41 132°22.43 2.77			Arcturus 145°46.23
10 11	290 15.71 305°18.17	11° 49.98 15.21 26° 49.33 15.19	132 22.43 2.77 147°25.76 3.13	145°25.52 7.93 160°28.31 8.04	279°7.73 16.46 294°9.98 16.56	Rigil Kent. 139°37.75
12	320° 20.63	41°48.68 \$21°15.17	162°29.09 N14°3.49	175°31.09 N15°8.15	309°12.23 N02°16.66	Kochab 137°19.75
13	335°23.10	56°48.03 15.16	177°32.42 3.86	175 31.09 N15 8.15 190°33.88 8.26	324°14.47 16.76	Zuben'ubi 136°54.05
14	350°25.56	71°47.38 15.13	192°35.76 4.22	205°36.67 8.38	339°16.72 16.86	Alphecca 126°2.30
15	5°28.03	86°46.73 · · 15.11	207°39.09 · · 4.58	220°39.46 · · 8.49	354°18.96 · · 16.96	Antares 112°13.81
16	20°30.49	101°46.08 15.09	222°42.42 4.94	235°42.24 8.60	9°21.21 17.06	Atria 107° 6.70
17	35°32.95	116° 45.43 15.07	237°45.76 5.30	250°45.03 8.71	24°23.45 17.16	Sabik 102°0.95
18	50°35.42	131°44.78 S21°15.04	252°49.09 N14°5.67	265°47.82 N15°8.82	39°25.70 N02°17.26	Shaula 96°8.23
19	65°37.88	146°44.13 15.02	267°52.43 6.03	280°50.61 8.94	54°27.94 17.36	Rasalhague 95°57.12
20	80° 40.35	161°43.47 14.99	282°55.76 6.39	295°53.39 9.05	69°30.19 17.46	Eltanin 90°41.71
21	95° 42.81	176°42.82 · · 14.96	297°59.10 · · 6.75	310°56.18 · · 9.16	84°32.43 · · 17.56	Kaus Aust. 83°30.50
22	110°45.27	191°42.17 14.94	313° 2.44 7.12	325°58.97 9.27	99°34.68 17.66	Vega 80°32.37
23	125°47.74	206°41.52 14.91	328° 5.78 7.48	341°1.76 9.38	114°36.92 17.76	Nunki 75°45.90
- N 4						Altair 61°58.57 Peacock 53°3.58
Mer.p	bass. 14:38	ν-0.6' d-0.0' m-4.20	ν3.3′ d0.4′ m-1.13	ν2.8′ d0.1′ m-2.56	ν2.2' d0.1' m0.80	Peacock 53°3.58 Deneb 49°25.07
						Enif 33°37.41
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.21
0	$140^{\circ}50.20$	221°40.87 S 21°14.88	343°9.12 N14°7.84	356°4.55 N15°9.49	129°39.17 N02°17.86	Fomalhaut 15°12.94
1	$155^{\circ}52.67$	236°40.21 14.85	358°12.46 8.20	11°7.33 9.61	144°41.41 17.97	Scheat 13°43.83
2	$170^{\circ}55.13$	251°39.56 14.81	13°15.80 8.57	$26^{\circ}10.12$ 9.72	159°43.66 18.07	Markab 13°28.46
3	185° 57.59	266°38.91 · · 14.78	28°19.14 · · 8.93	41°12.91 · · 9.83	174°45.90 · · 18.17	
4	201°0.06	281°38.25 14.75	43°22.48 9.29	56°15.70 9.94	189°48.14 18.27	Feb 09 Tue SHA
5	216°2.52	296°37.60 14.71	58°25.82 9.65	71°18.48 10.05	204°50.39 18.37	Venus 83°20.03
6	231°4.99	311°36.95 S 21°14.67	73°29.17 N14°10.02	86°21.27 N15°10.16	219°52.63 N02°18.47	Mars 201°37.78
7	246°7.45	326°36.29 14.64	88°32.51 10.38	101°24.06 10.28	234° 54.88 18.57	Jupiter 214°58.82
8	261°9.91	341°35.64 14.60	103°35.86 10.74	116°26.85 10.39	249°57.12 18.67	Saturn 348°59.38
9	276° 12.38	356°34.99 · · 14.56	118°39.20 · · 11.11	131°29.64 · · 10.50	264°59.36 · · 18.77	Feb 10 Wed SHA
10	291°14.84	11°34.33 14.52	133°42.55 11.47	146°32.42 10.61	280°1.61 18.87	Venus 82°5.40
11	306° 17.31	26°33.68 14.48	148°45.90 11.83	161°35.21 10.72	295°3.85 18.97	Mars 201°58.12
12	321°19.77	41°33.02 S 21°14.44	163°49.24 N14°12.20	176°38.00 N15°10.83	310°6.09 N02°19.08	Jupiter 215°6.58
13 14	336°22.24 351°24.70	56°32.37 14.39 71°31.71 14.35	178°52.59 12.56 193°55.94 12.92	191°40.79 10.95 206°43.57 11.06	325°8.34 19.18 340°10.58 19.28	Saturn 348°54.20
14 15	6°27.16	86°31.06 · · 14.30	208°59.29 · · 13.28	206°43.57 11.06 221°46.36 · · 11.17	355°12.82 · · 19.38	Eak 11 This CUA
16	21°29.63	101°30.40 14.26	224°2.64 13.65	236°49.15 11.28	10°15.06 19.48	Feb 11 Thu SHA Venus 80°50.66
17	36°32.09	116° 29.75 14.21	239°5.99 14.01	251°51.94 11.39	25°17.31 19.58	Venus 80°50.66 Mars 202°18.91
18	51°34.56	131°29.09 S21°14.16	254°9.35 N14°14.37	266°54.73 N15°11.50	40°19.55 N02°19.68	Jupiter 215°14.34
19	66°37.02	146°28.44 14.11	269°12.70 14.74	281°57.51 11.61	55°21.79 19.78	Saturn 348°48.96
20	81°39.48	161°27.78 14.06	284°16.05 15.10	297°0.30 11.73	70°24.04 19.88	340 40.90
21	96°41.95	176°27.13 · · 14.01	299°19.41 · · 15.46	312°3.09 · · 11.84	85°26.28 · · 19.99	Horizontal parallax
22	111°44.41	191°26.47 13.96	314°22.76 15.83	327°5.88 11.95	100° 28.52 20.09	Venus:
23	126° 46.88	206°25.81 13.91	329°26.12 16.19	342°8.66 12.06	115°30.76 20.19	Mars:
Mar	pass. 14:34	ν-0.7' d-0.0' m-4.19	ν3.3' d0.4' m-1.15	ν2.8' d0.1' m-2.56	ν2.2' d0.1' m0.80	
ivier.	Jass. 14:54	ν-υ.τ α-υ.υ m-4.19	νσ.σ αυ.4° III-1.15	ν2.0 d0.1 III-2.30	υ2.2 du.1 mu.ου	

Dec 29°14.50 -42°9.68 56° 41.39 -17° 50.38 $\text{-}57^{\circ}6.18$ $23^{\circ}35.52$ 89°23.01 -40°11.98 4°11.73 49°57.65 16°33.82 -8°10.35 $46^{\circ}1.61$ $6^{\circ}22.38$ 28°37.83 -1°11.19 7°24.64 -52°42.81 -16°45.37 -29°0.72 $5^{\circ}9.19$ $27^{\circ}57.54$ -59°35.90 -43°32.64 -69°49.76 -8°46.73 11°49.89 $61^{\circ}36.02$ 14°25.00 $-17^{\circ}41.65$ -63° 14.86 -57° 15.82 55°48.40 -11°18.28 49°10.29 -60°30.05 -36°30.15 19°2.20 -60°56.65 $74^{\circ}2.19$ -16°9.32 $26^{\circ}37.11$ -26°29.49 -69°4.30 -15°45.53 $-37^{\circ}7.30$ $12^{\circ}32.25$ 51°28.82 -34°22.22 38°48.30 -26° 15.75 8° 56.31 -56°38.79 $45^{\circ}22.55$ 9°59.93 -46°49.83 -29°28.80 28° 13.85 15°21.08 Mer.pass 09:12 01:18 00:25 15:26 Mer.pass 09:13 01:12 00:20 15:23 Mer.pass 09:14 01:07 00:16 15:19

0.2

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.74	S14°48.90	152°34.73	15.9'	S03°23.26	-14.3'	55.2'
1	191°27.72	48.10	$167^{\circ}9.66$	15.9'	03°8.93	-14.4'	55.2'
2	206°27.70	47.30	181°44.58	15.9'	02°54.57	-14.4'	55.2'
3	221°27.68	• • 46.50	196°19.51	15.9'	02°40.20	-14.4'	55.2'
4 5	236°27.66 251°27.64	45.70 44.90	210°54.42 225°29.33	15.9' 15.9'	02°25.80 02°11.39	-14.4' -14.4'	55.3' 55.3'
6	266°27.62	\$14°44.10	240°4.24	15.9'	S01°56.97	-14.4'	55.3'
7	281°27.60	43.30	254°39.13	15.9'	01°42.52	-14.5'	55.3'
8	296°27.58	42.50	269°14.02	15.9'	01°28.07	-14.5'	55.3'
9	311°27.56	• • 41.70	283°48.89	15.9'	01°13.59	-14.5'	55.4'
10	326°27.54	40.89	298°23.76	15.9'	00°59.11	-14.5'	55.4'
11	341°27.52	40.09	312°58.61	15.8'	00°44.61 500°30.10	-14.5'	55.4'
12 13	356°27.50 11°27.49	\$14°39.29 38.48	327°33.45 342°8.27	15.8' 15.8'	00°30.10	-14.5' -14.5'	55.4' 55.4'
14	26°27.47	37.68	356°43.08	15.8'	S00°1.05	-14.5'	55.5'
15	41°27.45	36.88	11°17.87	15.8'	N00°13.49	14.5	55.5'
16	56°27.44	36.07	25°52.65	15.8'	00°28.04	14.6'	55.5'
17	71°27.42	35.27	40°27.40	15.7'	00°42.59	14.6'	55.5'
18	86°27.40	S14°34.46	55°2.14	15.7'	N00°57.15	14.6'	55.5'
19	101°27.39	33.65	69°36.85 84°11.55	15.7'	01°11.72	14.6'	55.5'
20 21	116°27.37 131°27.36	32.85 · · 32.04	84°11.55 98°46.21	15.7' 15.6'	01°26.29 01°40.86	14.6' 14.6'	55.6' 55.6'
22	131 27.30 146°27.34	31.23	96 40.21 113°20.86	15.6'	01°40.80	14.6'	55.6'
23	161°27.33	30.43	113 20.60 127°55.48	15.6'	01 55.44 02°10.01	14.6	55.6'
	SD = 16.2'	d = -0.8'			D = 15.1'	•	
	3D = 10.2"	a = -0.8		51	D = 10.1		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.32	\$14°29.62	142°30.07	15.6'	N02°24.59	14.6'	55.6'
1	191°27.30 206°27.29	28.81	157°4.64 171°39.17	15.5'	02°39.17 02°53.75	14.6'	55.7'
2	206°27.29 221°27.28	28.00 •• 27.19	171°39.17 186°13.68	15.5' 15.5'	02°53.75 03°8.32	14.6' 14.6'	55.7' 55.7'
3 4	221 27.28 236°27.26	26.38	200°48.15	15.5 15.4'	03 8.32 03°22.89	14.6	55.7'
5	251°27.25	25.57	215°22.59	15.4	03°37.46	14.6'	55.7'
6	266°27.24	S14°24.76	229°57.00	15.4'	N03°52.02	14.6'	55.8'
7	281°27.23	23.95	244°31.38	15.3'	04°6.58	14.6'	55.8'
8	296°27.22	23.14	259°5.72	15.3'	04°21.13	14.5'	55.8'
9	311°27.21	• • 22.33	273°40.02	15.3'	04°35.67	14.5'	55.8'
10	326°27.19	21.51	288°14.28	15.2'	04°50.20 05°4.73	14.5'	55.9'
11 12	341°27.18 356°27.17	20.70 \$14°19.89	302°48.51 317°22.69	15.2' 15.1'	N05°19.24	14.5' 14.5'	55.9' 55.9'
13	11°27.17	19.07	331°56.84	15.1'	05°33.74	14.5	55.9'
14	26°27.16	18.26	346°30.94	15.1'	05°48.23	14.5	55.9'
15	41°27.15	• • 17.45	1°5.00	15.0'	$06^{\circ}2.71$	14.5'	56.0'
16	56°27.14	16.63	15°39.01	15.0'	06°17.17	14.4'	56.0'
17	71°27.13	15.82	30°12.97	14.9'	06°31.61	14.4'	56.0'
18 19	86°27.12 101°27.12	\$14°15.00 14.18	44°46.89 59°20.76	14.9' 14.8'	N06°46.04 07°0.45	14.4' 14.4'	56.0' 56.0'
20	101 27.12 116°27.11	13.37	73°54.58	14.8	07 0.45 07°14.84	14.4	56.1
21	131°27.10	• • 12.55	88°28.35	14.7'	07°29.21	14.4	56.1'
22	146°27.10	11.73	103°2.07	14.7'	07°43.57	14.3'	56.1'
23	161°27.09	10.92	$117^{\circ}35.74$	14.6'	07°57.90	14.3'	56.1'
	SD = 16.2'	d = -0.8'		SI	D = 15.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.08	S14°10.10	132°9.35	14.6'	N08°12.20	14.3'	56.2'
1	191°27.08	9.28	146°42.90	14.5'	08°26.48	14.3'	56.2'
2	206°27.07	8.46	161°16.40	14.4'	08°40.74	14.2'	56.2'
3	221°27.07 236°27.06	· · 7.64	175°49.84 190°23.22	14.4'	08°54.97	14.2'	56.2'
4 5	236°27.06 251°27.06	6.82 6.00	190°23.22 204°56.54	14.3' 14.3'	09°9.18 09°23.35	14.2' 14.1'	56.3' 56.3'
6	266°27.06	5.00 \$14°5.18	204 50.54 219°29.80	14.3	N09°37.50	14.1	56.3
7	281°27.05	4.36	234°3.00	14.1'	09°51.62	14.1'	56.3
8	296°27.05	3.54	248°36.13	14.1'	10°5.70	14.1'	56.3'
9	311°27.05	• • 2.72	263°9.20	14.0'	10°19.75	14.0'	56.4'
10	326°27.04	1.89	277°42.20	13.9'	10°33.77	14.0'	56.4
11	341°27.04	1.07 \$14°0.25	292°15.14	13.9'	10°47.76	13.9'	56.4'
12 13	356°27.04 11°27.04	\$14°0.25 13°59.43	306°48.00 321°20.80	13.8' 13.7'	N11°1.70 11°15.61	13.9' 13.9'	56.4' 56.5'
14	26°27.04	58.60	335°53.53	13.7'	11 15.01 11°29.48	13.8'	56.5'
15	41°27.04	• • 57.78	350°26.18	13.6'	11°43.32	13.8'	56.5
16	56°27.04	56.95	4°58.76	13.5'	$11^{\circ}57.11$	13.7'	56.5'
17	71°27.04	56.13	19°31.27	13.4'	12°10.86	13.7'	56.6'
18	86°27.04	S13°55.30	34°3.70	13.4'	N12°24.56	13.7'	56.6'
19	101°27.04 116°27.04	54.48 53.65	48°36.05 63°8.33	13.3' 13.2'	12°38.23 12°51.84	13.6'	56.6'
20 21	116°27.04 131°27.04	53.65	63°8.33 77°40.53	13.2	12°51.84 13°5.41	13.6' 13.5'	56.6' 56.7'
22	146°27.04	52.00	92°12.65	13.1	13°18.93	13.5'	56.7'
23	161°27.05	51.17	106°44.68	13.0'	13°32.41	13.4'	56.7'
	SD = 16.2'	d = -0.8'		SI	D = 15.3'		

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

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	08:22	07:51	07:16	20:43	22:49	
N 70°	08:20	07:57	07:31	20:41	22:37	
68°	08:18	08:01	07:43	20:39	22:27	
66°	08:17	08:05	07:53	20:38	22:19	
64°	08:16	08:09	08:01	20:36	22:12	23:54
62°	08:15	08:12	80:80	20:35	22:06	23:42
60°	08:14	08:14	08:15	20:34	22:01	23:33
N 58°	08:13	08:17	08:20	20:33	21:57	23:24
56°	08:13	08:19	08:25	20:33	21:53	23:17
54°	08:12	08:20	08:30	20:32	21:50	23:10
52°	08:11	08:22	08:34	20:31	21:46	23:04
50°	08:11	08:24	08:38	20:31	21:44	22:59
45°	08:10	08:27	08:46	20:30	21:37	22:47
N 40°	08:09	08:30	08:53	20:29	21:32	22:38
35°	08:08	08:32	08:59	20:28	21:28	22:30
30°	08:07	08:35	09:04	20:27	21:24	22:23
20°	08:06	08:39	09:13	20:26	21:17	22:11
N 10°	08:05	08:42	09:21	20:25	21:11	22:00
0°	08:04	08:45	09:29	20:23	21:06	21:50
S 10°	08:03	08:49	09:36	20:22	21:00	21:41
20°	08:01	08:52	09:45	20:21	20:55	21:30
30°	08:00	08:56	09:54	20:20	20:48	21:18
35°	07:59	08:59	10:00	20:19	20:44	21:11
40°	07:59	09:01	10:06	20:18	20:40	21:04
45°	07:58	09:05	10:13	20:17	20:35	20:55
S 50°	07:57	09:08	10:22	20:16	20:29	20:44
52°	07:56	09:10	10:27	20:15	20:26	20:39
54°	07:55	09:12	10:31	20:15	20:23	20:34
56°	07:55	09:14	10:36	20:14	20:20	20:28
58° S 60°	07:54	09:17	10:42	20:13	20:17	20:21
5 60°	07:53	09:19	10:48	20:12	20:13	20:13

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-17%
09	14:09	14:10	12:14	14:14	01:53	
10	14:11	14:11	12:14	14:56	02:34	
11	14:12	14:12	12:14	15:39	03:17	

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	141°49.34	221°25.16	344°29.47 N14°16.55	357°11.45 N15°12.17	130°33.00 N02°20.29	
1	156° 51.80	236°24.50 13.80	359°32.83 16.92	12°14.24 12.28	145°35.25 20.39	Alpheratz 357°33.24 29°14.49
2	171°54.27	251°23.84 13.74	14°36.19 17.28	27°17.03 12.39	160°37.49 20.49	Ankaa 353°5.74 -42°9.67
3	186° 56.73	266°23.19 · · 13.69	29°39.55 ·· 17.64	42°19.82 · · 12.51	175°39.73 · · 20.60	Schedar 349°29.41 56°41.38
4	201°59.20	281°22.53 13.63	44°42.91 18.01	57°22.60 12.62	190°41.97 20.70	Diphda 348°45.77 -17°50.38
5	217°1.66	296°21.87 13.57	59°46.26 18.37	72°25.39 12.73	205°44.21 20.80	Achernar 335°19.17 -57°6.17
6	232°4.12	311°21.22 S 21°13.51	74°49.62 N14°18.73	87°28.18 N15°12.84	220°46.45 N02°20.90	Hamal 327°49.33 23°35.51
7	247°6.59	326°20.56 13.45	89°52.99 19.10	102°30.97 12.95	235°48.69 21.00	Polaris 313°9.33 89°23.01
8	262°9.05	341°19.90 13.39	104°56.35 19.46	117°33.75 13.06	250° 50.94 21.10	Acamar 315°10.50 -40°11.98
9	$277^{\circ}11.52$	356°19.24 · · 13.32	119°59.71 · · 19.82	132°36.54 · · 13.17	265°53.18 · · 21.21	Menkar 314°4.35 4°11.72
10	$292^{\circ}13.98$	11°18.58 13.26	135°3.07 20.19	147°39.33 13.28	280°55.42 21.31	Mirfak 308°25.73 49°57.64 Aldebaran 290°37.51 16°33.82
11	$307^{\circ}16.44$	26°17.93 13.19	150°6.44 20.55	162°42.12 13.40	295° 57.66 21.41	Rigel 281°2.04 -8°10.36
12	$322^{\circ}18.91$	41°17.27 S 21°13.13	165°9.80 N14°20.91	177°44.90 N15°13.51	310°59.90 N02°21.51	Capella 280°19.08 46°1.61
13	$337^{\circ}21.37$	56°16.61 13.06	180°13.16 21.28	192°47.69 13.62	326°2.14 21.61	Bellatrix 278°20.84 6°22.37
14	352° 23.84	71°15.95 12.99	195°16.53 21.64	207°50.48 13.73	341°4.38 21.72	Elnath 277° 59.47 28° 37.83
15	7°26.30	86° 15.29 · · 12.92	210°19.90 · · 22.00	222°53.27 ·· 13.84	356°6.62 · · 21.82	Alnilam 275°35.78 -1°11.19
16	22°28.77	101°14.63 12.85	225°23.26 22.37	237°56.06 13.95	11°8.86 21.92	Betelgeuse 270°49.99 7°24.64
17	37°31.23	116°13.97 12.78	240°26.63 22.73	252°58.84 14.06	26°11.10 22.02	Canopus 263°51.24 -52°42.82
18	52°33.69	131°13.32 S 21°12.71	255°30.00 N14°23.09	268°1.63 N15°14.17	41°13.34 N02°22.12	Sirius 258°24.44 -16°45.38
19	67°36.16	146°12.66 12.64	270°33.37 23.46	283°4.42 14.28	56°15.58 22.23	Adhara 255°4.19 -29°0.73
20	82° 38.62	161°12.00 12.56	285°36.73 23.82	298°7.21 14.39	71°17.82 22.33	Procyon 244°48.72 5°9.18
21	97°41.09	176°11.34 · · 12.49	300°40.10 · · 24.18	313°9.99 · · 14.51 328°12.78 14.62	86°20.06 · · 22.43	Pollux 243°14.85 27°57.54
22 23	112° 43.55 127° 46.01	191°10.68 12.41 206°10.02 12.33	315°43.47 24.55 330°46.85 24.91		101° 22.30 22.53 116° 24.54 22.64	Avior 234°13.40 -59°35.92
23	127 40.01			343°15.57 14.73		Suhail 222°44.58 -43°32.66
Mer.	pass. 14:30	ν -0.7 $'$ d-0.1 $'$ m-4.18	u3.4 $'$ d 0.4 $'$ m-1.17	$ u 2.8' \ d0.1' \ \text{m-}2.56$	$ u 2.2' \ d0.1' \ m0.80$	Miaplacidus 221°36.96 -69°49.78
						Alphard 217°45.71 -8°46.74
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.26 11°49.88
0 0	142° 48.48	221°9.36 S 21°12.26	345°50.22 N14°25.27	358°18.36 N15°14.84	131°26.78 N02°22.74	Dubhe 193°38.28 61°36.03
1	157° 50.94	236°8.70 12.18	0°53.59 25.64	13°21.14 14.95	146°29.02 22.84	Denebola 182°22.90 14°25.00
2	172°53.41	251°8.04 12.10	15°56.96 26.00	28°23.93 15.06	161°31.26 22.94	Gienah 175°41.54 -17°41.66
3	187° 55.87	266°7.38 · · 12.02	31°0.33 · · 26.36	43°26.72 · · 15.17	176°33.50 · · 23.05	Acrux 172°57.62 -63°14.88
4	202°58.33	281°6.72 11.93	46°3.71 26.73	58°29.51 15.28	191°35.74 23.15	Gacrux 171°49.27 -57°15.83
5	218°0.80	296°6.06 11.85	61°7.08 27.09	73°32.29 15.39	206° 37.98 23.25	Alioth 166°11.10 55°48.40
6	233°3.26	311°5.40 S21°11.77	76°10.46 N14°27.45	88°35.08 N15°15.50	221°40.21 N02°23.35	Spica 158°20.29 -11°18.29
7	248°5.73	326°4.73 11.68	91°13.83 27.82	103°37.87 15.61	236° 42.45 23.46	Alkaid 152°50.43 49°10.30
8	263°8.19	341°4.07 11.60	106°17.21 28.18	118°40.66 15.72	251°44.69 23.56	Hadar 148°33.27 -60°30.06
9	278° 10.65	356°3.41 · · 11.51	121°20.59 · · 28.54	133°43.44 · · 15.83	266° 46.93 · · 23.66	Menkent 147°55.41 -36°30.16 Arcturus 145°46.21 19°2.20
10	293°13.12	11°2.75 11.42	136°23.96 28.90	148°46.23 15.95	281°49.17 23.76	Arcturus 145°46.21 19°2.20 Rigil Kent. 139°37.71 -60°56.66
11	$308^{\circ}15.58$	26°2.09 11.33	151°27.34 29.27	163°49.02 16.06	296°51.41 23.87	Kochab 137°19.69 74°2.19
12	323°18.05	41°1.43 S21°11.24	166°30.72 N14°29.63	178°51.81 N15°16.17	311°53.65 N02°23.97	Zuben'ubi 136°54.03 -16°9.33
13	$338^{\circ}20.51$	56°0.77 11.15	181°34.10 29.99	193°54.59 16.28	326°55.88 24.07	Alphecca 126°2.28 26°37.10
14	353°22.98	71°0.10 11.06	196°37.48 30.36	208°57.38 16.39	341°58.12 24.18	Antares 112° 13.79 -26° 29.49
15	8°25.44	85°59.44 · · 10.97	211°40.86 · · 30.72	224°0.17 · · 16.50	357°0.36 · · 24.28	Atria 107°6.65 -69°4.29
16	23°27.90	100°58.78 10.87	226°44.24 31.08	239°2.95 16.61	12°2.60 24.38	Sabik 102°0.93 -15°45.53
17	38° 30.37	115°58.12 10.78	241°47.62 31.44	254°5.74 16.72	27°4.84 24.48	Shaula 96°8.21 -37°7.30
18	53°32.83	130°57.46 S21°10.68	256°51.00 N14°31.81	269°8.53 N15°16.83	42°7.07 N02°24.59	Rasalhague 95°57.11 12°32.24
19	68° 35.30	145°56.79 10.58	271°54.38 32.17	284°11.32 16.94	57°9.31 24.69	Eltanin 90°41.69 51°28.81
20	83° 37.76	160°56.13 10.49	286°57.77 32.53	299°14.10 17.05	72°11.55 24.79	Kaus Aust. 83°30.48 -34°22.22
21	98°40.22	175°55.47 · · 10.39	302°1.15 · · 32.89	314°16.89 · · 17.16	87°13.79 · · 24.90	Vega 80°32.35 38°48.29
22	113°42.69	190°54.81 10.29 205°54.14 10.18	317° 4.54 33.26	329°19.68 17.27	102°16.02 25.00	Nunki 75°45.89 -26°15.74
23	128° 45.15		332°7.92 33.62	344°22.47 17.38	117°18.26 25.10	Altair 61°58.56 8°56.31
Mer.	pass. 14:26	ν -0.7' d -0.1' m-4.18	u3.4′ d 0.4′ m -1.19	$ u 2.8' \ d0.1' \ \text{m-}2.56$	$ u 2.2' \ d0.1' \ m0.80$	Peacock 53°3.57 -56°38.78
						Deneb 49°25.06 45°22.54
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.41 9°59.92
0	143°47.62	220°53.48 S 21°10.08	347°11.30 N14°33.98	359°25.25 N15°17.49	132°20.50 N02°25.21	Al Na'ir 27°31.21 -46°49.82
1	158° 50.08	235°52.82 9.98	2°14.69 34.34	14°28.04 17.60	147°22.73 25.31	Fomalhaut 15°12.94 -29°28.79
2	173° 52.55	250°52.15 9.88	17°18.08 34.71	29°30.83 17.71	162°24.97 25.41	Scheat 13°43.84 28°13.84
3	188° 55.01	265°51.49 · · 9.77	32°21.46 · · 35.07	44°33.61 · · 17.82	177°27.21 · · 25.52	Markab 13°28.46 15°21.08
4	203°57.47	280°50.83 9.66	47°24.85 35.43	59°36.40 17.93	192°29.45 25.62	Feb 12 Fri SHA Mer.pass
5	218° 59.94	295°50.16 9.56	62°28.24 35.79	74°39.19 18.04	207°31.68 25.72	Venus 79°35.82 09:15
6	234°2.40	310°49.50 S 21°9.45	77°31.63 N14°36.16	89°41.97 N15°18.15	222°33.92 N02°25.83	Mars 202°40.13 01:02
7	249°4.87	325°48.84 9.34	92°35.02 36.52	104°44.76 18.26	237°36.15 25.93	Jupiter 215°22.11 00:11
8	264°7.33	340°48.17 9.23	107°38.40 36.88	119°47.55 18.37	252°38.39 26.03	Saturn 348°43.66 15:16
9	279°9.79	355°47.51 · · 9.12	122°41.79 · · 37.24	134°50.33 · · 18.48	267°40.63 · · 26.14	Feb 13 Sat SHA Mer.pass
10	294° 12.26	10°46.84 9.01	137°45.18 37.60	149°53.12 18.59	282°42.86 26.24	Feb 13 Sat SHA Mer.pass Venus 78°20.88 09:16
11	309° 14.72	25°46.18 8.89	152°48.58 37.96	164°55.91 18.70	297°45.10 26.34	Mars 203°1.74 00:56
12	324° 17.19	40°45.52 S 21°8.78	167°51.97 N14°38.33	179°58.70 N15°18.81	312°47.34 N02°26.45	Jupiter 215°29.88 00:07
13	339° 19.65	55°44.85 8.66	182°55.36 38.69	195°1.48 18.92	327°49.57 26.55	Saturn 348°38.30 15:12
14	354°22.12	70°44.19 8.55	197°58.75 39.05	210°4.27 19.03	342°51.81 26.66	
15	9°24.58	85°43.52 · · 8.43	213°2.14 · · 39.41	225°7.06 · · 19.14	357°54.04 · · 26.76	Feb 14 Sun SHA Mer.pass
16	24° 27.04	100°42.86 8.31	228°5.54 39.77	240°9.84 19.25	12°56.28 26.86	Venus 77°5.86 09:17
17	39°29.51	115°42.19 8.19	243°8.93 40.13	255°12.63 19.36	27°58.51 26.97	Mars 203°23.69 00:51
18	54° 31.97	130°41.53	258°12.32 N14°40.50	270°15.42 N15°19.47	43°0.75 N02°27.07 58°2.98 27.18	Jupiter 215° 37.64 00:02
19 20	69° 34.44 84° 36.90	145°40.86 7.95 160°40.20 7.83	273°15.72 40.86 288°19.11 41.22	285°18.20 19.58 300°20.99 19.69	58°2.98 27.18 73°5.22 27.28	Saturn 348° 32.88 15:08
20	99° 39.36	175°39.53 · · 7.71	303°22.51 · · 41.58	315°23.77 · · 19.80	88°7.45 · · 27.38	Horizontal parallax
22	99 39.30 114°41.83	175 39.53 · · 7.71 190°38.87 7.58	318°25.91 41.94	330°26.56 19.91	103°9.69 27.49	Venus: 0.1
23	129° 44.29	205°38.20 7.46	333°29.30 42.30	345°29.35 20.02	118°11.92 27.59	Mars: 0.2
Mer.	pass. 14:22	ν-0.7' d-0.1' m-4.17	ν3.4' d0.4' m-1.21	ν2.8′ d0.1′ m-2.56	ν2.2' d0.1' m0.80	

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.05	S13°50.34	121°16.64	12.9'	N13°45.83	13.4'	56.7'
1 2	191°27.05 206°27.05	49.51 48.69	135°48.51 150°20.29	12.8' 12.7'	13°59.20 14°12.51	13.3' 13.3'	56.8' 56.8'
3	200 27.05 221°27.06	. 47.86	164°52.00	12.7	14 12.51 14°25.78	13.2	56.8'
4	236°27.06	47.03	179°23.61	12.5'	14°38.98	13.2'	56.8'
5	251°27.06	46.20	193°55.14	12.4'	14°52.13	13.1'	56.9'
6	266°27.07 281°27.07	\$13°45.37 44.54	208°26.57 222°57.92	12.3' 12.3'	N15°5.23 15°18.26	13.0' 13.0'	56.9' 56.9'
7 8	281 27.07 296°27.08	44.54	222 57.92 237°29.18	12.3	15 18.20 15°31.23	12.9'	56.9'
9	311°27.08	• • 42.88	252°0.34	12.1'	15°44.14	12.8'	57.0'
10	326°27.09	42.04	266°31.42	12.0'	15°56.99	12.8'	57.0'
11 12	341°27.10 356°27.10	41.21 \$13°40.38	281°2.39 295°33.28	11.9' 11.8'	16°9.77 N16°22.48	12.7' 12.6'	57.0' 57.0'
13	11°27.11	39.55	295 33.28 310°4.06	11.8	16°35.13	12.6	57.0 57.1'
14	26°27.12	38.71	324°34.75	11.6'	16°47.70	12.5'	57.1'
15	41°27.12	• • 37.88	339°5.35	11.5'	17°0.21	12.4'	57.1'
16 17	56°27.13 71°27.14	37.05 36.21	353°35.84 8°6.23	11.4' 11.3'	17°12.65 17°25.01	12.4' 12.3'	57.2' 57.2'
18	86°27.15	\$13°35.38	22°36.52	11.2'	N17°37.30	12.3	57.2'
19	101°27.16	34.54	37°6.71	11.1'	17°49.51	12.1'	57.2'
20	116°27.17	33.71	51°36.80	11.0'	18°1.64	12.1'	57.3'
21 22	131°27.18 146°27.19	· · 32.87 32.03	66°6.79 80°36.67	10.9' 10.8'	18°13.69 18°25.67	12.0' 11.9'	57.3' 57.3'
23	161°27.20	31.20	95°6.44	10.6	18°37.56	11.8'	57.3'
	SD = 16.2'	d = -0.8'			0 = 15.5'		
				JL			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°27.21 191°27.22	\$13°30.36 29.52	109°36.11 124°5.67	10.6' 10.5'	N18°49.37 19°1.09	11.7' 11.6'	57.4' 57.4'
2	206°27.23	29.52	124 5.67 138°35.13	10.5	19 1.09 19°12.72	11.5	57.4 57.4'
3	221°27.24	• • 27.85	153°4.48	10.2'	19°24.27	11.5'	57.5'
4	236°27.25	27.01	167°33.71	10.1'	19°35.73	11.4'	57.5'
5	251°27.26 266°27.28	26.17 \$13°25.33	182°2.84 196°31.86	10.0' 9.9'	19°47.10 N19°58.37	11.3' 11.2'	57.5' 57.5'
6 7	200 27.28 281°27.29	24.49	211°0.77	9.9 9.8'	20°9.55	11.1'	57.5'
8	296°27.30	23.65	225°29.56	9.7'	20°20.64	11.0'	57.6'
9	311°27.31	• • 22.81	239°58.25	9.6'	20°31.62	10.9'	57.6'
10 11	326°27.33 341°27.34	21.97 21.13	254°26.82 268°55.28	9.5' 9.3'	20°42.51 20°53.30	10.8' 10.7'	57.6' 57.7'
12	356°27.36	\$13°20.29	283°23.62	9.3	N21°3.98	10.7	57.7'
13	11°27.37	19.45	297°51.85	9.1'	21°14.56	10.5'	57.7'
14	26°27.39	18.60	312°19.97	9.0'	21°25.04	10.4'	57.8'
15 16	41°27.40 56°27.42	· · 17.76 16.92	326°47.97 341°15.86	8.9' 8.8'	21°35.40 21°45.66	10.3' 10.1'	57.8' 57.8'
17	71°27.43	16.07	355°43.63	8.7'	21°55.81	10.1	57.8'
18	86°27.45	S13°15.23	10°11.28	8.5'	N22°5.85	9.9'	57.9'
19	101°27.47	14.39	24°38.82	8.4'	22°15.77	9.8'	57.9'
20 21	116°27.48 131°27.50	13.54 •• 12.70	39°6.24 53°33.55	8.3' 8.2'	22°25.58 22°35.28	9.7' 9.6'	57.9' 58.0'
22	146°27.52	11.85	68°0.74	8.1'	22°44.85	9.5'	58.0'
23	161°27.54	11.01	82°27.81	8.0'	22°54.30	9.3'	58.0'
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_							
Sun 0	GHA 176°27.56	Dec \$13°10.16	GHA 96°54.77	u 7.8'	Dec N23°3.63	d 9.2'	HP 58.0'
1	176 27.56 191°27.58	9.31	90 54.77 111°21.61	7.8 7.7'	23°12.84	9.2 9.1'	58.1'
2	206°27.59	8.47	125°48.33	7.6'	23°21.92	9.0'	58.1'
3	221°27.61	· · 7.62	140°14.94	7.5'	23°30.88	8.8'	58.1'
4 5	236°27.63 251°27.65	6.77 5.92	154°41.43 169°7.80	7.4' 7.3'	23°39.71 23°48.40	8.7' 8.6'	58.2' 58.2'
6	266°27.67	\$13°5.08	183°34.06	7.1'	N23°56.97	8.4	58.2'
7	281°27.69	4.23	198°0.20	7.0'	24°5.40	8.3'	58.3'
8 9	296°27.72 311°27.74	3.38 •• 2.53	212°26.23 226°52.14	6.9' 6.8'	24°13.70 24°21.86	8.2' 8.0'	58.3' 58.3'
9 10	311°27.74 326°27.76	1.68	226°52.14 241°17.94	6.8	24°21.86 24°29.88	8.0° 7.9'	58.3° 58.3'
11	341°27.78	0.83	255°43.62	6.6'	24°37.76	7.7'	58.4
12	356°27.80	S12°59.98	270°9.19	6.5'	N24°45.50	7.6'	58.4'
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20	101 27.97 116°27.99	53.16	25°29.73	5. <i>1</i> 5.6'	25 35.57 25°42.12	6.4	58.6'
21	131°28.02	• • 52.31	39°54.30	5.5'	25°48.51	6.2'	58.7'
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64°	07:53	07:42	07:25		01:45	03:53
62°	08:05	08:03	08:01		01:26	03:18
60°	08:16	08:20	08:28		01:10	02:52
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52°	11:46	13:09	14:34	20:55	21:16	21:47
54°	11:54	13:20	14:48	20:47	21:05	21:33
56°	12:02	13:33	15:04	20:37	20:52	21:16
58°	12:12	13:47	15:24	20:27	20:37	20:56
S 60°	12:23	14:04	15:49	20:15	20:19	20:30

		Sun		Moon			
Day	Day Eqn.of Tir		Time Mer.		Mer.Pass.		
- "	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	26-46%	
12	14:12	14:12	12:14	16:26	04:03		
13	14:11	14:11	12:14	17:18	04:52		
14	14:10	14:09	12:14	18:14	05:45		

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

h	Aries	Venus	5	M	ars	Jup	oiter	Sat	urn		Stars
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	144° 46.76		21°7.33	348°32.70	N14°42.66	0°32.13	N15°20.13	133°14.16	N02°27.70		
1	159° 49.22	235° 36.87	7.20	3°36.10	43.02	15°34.92	20.24	148° 16.39	27.80	Alpheratz	
2	174°51.69	250°36.21	7.08	18°39.49	43.38	30°37.71	20.35	163°18.63	27.90	Ankaa	353°5.75
3	189°54.15	265°35.54	• • 6.95	33°42.89	• • 43.74	45°40.49	• • 20.46	178°20.86	• • 28.01	Schedar	349°29.42
4	204°56.61	280°34.88	6.82	48°46.29	44.10	60°43.28	20.57	193°23.10	28.11	Diphda	348° 45.77 335° 19.19
5	219°59.08	295°34.21	6.68	63°49.69	44.46	75°46.07	20.68	208°25.33	28.22	Achernar Hamal	327° 49.34
6	235°1.54		21°6.55	78°53.09	N14°44.82	90°48.85	N15°20.79	223°27.56	N02°28.32	Polaris	313° 10.55
7	250°4.01	325°32.88	6.42	93°56.49	45.18	105°51.64	20.89	238°29.80	28.43	Acamar	315° 10.52
8	265°6.47	340°32.21	6.28	108°59.89	45.54	120°54.42	21.00	253°32.03	28.53	Menkar	314°4.36
9	280°8.93		• 6.15	124°3.29	• • 45.90	135°57.21	• • 21.11	268°34.27	• • 28.63	Mirfak	308°25.74
10	295°11.40	10°30.88	6.01	139° 6.69	46.26	151°0.00	21.22	283°36.50	28.74	Aldebaran	290°37.51
11	310° 13.86	25°30.21	5.88	154°10.10	46.62	166°2.78	21.33	298°38.73	28.84	Rigel	281°2.04
12	325°16.33		21°5.74	169°13.50	N14°46.98	181°5.57	N15°21.44	313°40.97	N02°28.95	Capella	$280^{\circ}19.09$
13 14	340° 18.79 355° 21.26	55°28.88 70°28.21	5.60 5.46	184°16.90 199°20.30	47.34 47.70	196°8.35 211°11.14	21.55 21.66	328°43.20 343°45.43	29.05 29.16	Bellatrix	278°20.85
15	10°23.72		. 5.32	214°23.71	• • 48.06	211 11.14 226°13.93	21.77	358° 47.67	. 29.10	Elnath	$277^{\circ}59.47$
16	25°26.18	100°26.88	5.17	229°27.11	48.42	241°16.71	21.88	13°49.90	29.37	Alnilam	275° 35.79
17	40°28.65	115° 26.21	5.03	244°30.51	48.78	256°19.50	21.99	28°52.13	29.47	Betelgeuse	270°50.00
18	55°31.11		21°4.89	259°33.92	N14°49.14	271°22.28	N15°22.10	43°54.37	N02°29.58	Canopus	263°51.26
19	70°33.58	145°24.88	4.74	274°37.32	49.50	286°25.07	22.20	58° 56.60	29.68	Sirius	258° 24.45
20	85°36.04	160°24.21	4.59	289°40.73	49.86	301°27.85	22.31	73°58.83	29.78	Adhara	255°4.20
21	100°38.50	175°23.55	• • 4.45	304°44.14	• • 50.22	316°30.64	• • 22.42	89°1.07	• • 29.89	Procyon	244° 48.72 243° 14.85
22	115°40.97	190°22.88	4.30	319°47.54	50.57	331°33.43	22.53	104°3.30	29.99	Pollux Avior	234° 13.41
23	130°43.43	205°22.21	4.15	334°50.95	50.93	346°36.21	22.64	119°5.53	30.10	Suhail	222° 44.57
Merr	pass. 14:19	ν -0.7' d-0.1'	m_4 16	v3 4' d0	4′ m-1.23	v2 8' d0	1′ m-2.56	v2 2' d0	.1′ m0.80	Miaplacidus	221°36.97
14101.		ν σ.τ u-σ.1			1.23					Alphard	217°45.71
_			_		_		_		_		207°32.25
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°38.26
0	145° 45.90		21°4.00	349°54.36	N14°51.29	1°39.00	N15°22.75	134°7.76	N02°30.20	Denebola	$182^{\circ}22.89$
1	160°48.36	235°20.88	3.85	4°57.76	51.65	16°41.78	22.86	149°9.99	30.31	Gienah	$175^{\circ}41.51$
2	175° 50.83 190° 53.29	250°20.21 265°19.54	3.69	20° 1.17 35° 4.58	52.01	31°44.57	22.97	164° 12.23 179° 14.46	30.41	Acrux	$172^{\circ}57.58$
3 4	190 53.29 205°55.75	280° 18.87	· · 3.54 3.39	50°7.99	· · 52.37 52.72	46°47.35 61°50.14	· · 23.08 23.18	179 14.46 194° 16.69	· · 30.52 30.62	Gacrux	171°49.23
5	200° 58.22	295° 18.21	3.23	65°11.40	53.08	76°52.92	23.10	209° 18.92	30.02	Alioth	166°11.07
6	236°0.68		21°3.07	80°14.81	N14°53.44	91°55.71	N15°23.40	224°21.16	N02°30.83	Spica	158° 20.27
7	251°3.15	325°16.87	2.92	95°18.22	53.80	106°58.49	23.51	239°23.39	30.94	Alkaid	152°50.41
8	266°5.61	340°16.20	2.76	110°21.63	54.15	122°1.28	23.62	254°25.62	31.05	Hadar	148°33.22
9	281°8.08		2.60	125°25.04	• • 54.51	137°4.06	23.73	269° 27.85	· · 31.15		147°55.38
10	296° 10.54	10° 14.87	2.44	140°28.45	54.87	152°6.85	23.84	284°30.08	31.26		145°46.19
11	311° 13.00	25° 14.20	2.28	155°31.86	55.23	167°9.63	23.94	299°32.31	31.36	Rigil Kent. Kochab	139°37.66 137°19.64
12	326° 15.47		21°2.11	170°35.27	N14°55.58	182°12.42	N15°24.05	314°34.54	N02°31.47	Zuben'ubi	137 19.04 136°54.00
13	341°17.93	55°12.86	1.95	185°38.68	55.94	197°15.20	24.16	329°36.78	31.57	Alphecca	126°2.25
14	356° 20.40	70°12.19	1.79	200°42.10	56.30	$212^{\circ}17.99$	24.27	344°39.01	31.68	Antares	112° 13.76
15	11°22.86	85° 11.53	• 1.62	215°45.51	• • 56.65	227°20.77	• • 24.38	359°41.24	• • 31.78	Atria	107°6.58
16	26°25.32	100° 10.86	1.45	230°48.92	57.01	242°23.56	24.49	14°43.47	31.89	Sabik	102°0.90
17	41°27.79	115°10.19	1.29	245°52.33	57.37	257°26.34	24.59	29°45.70	31.99	Shaula	96°8.18
18	56° 30.25		21°1.12	260°55.75	N14°57.72	272°29.13	N15°24.70	44°47.93	N02°32.10	Rasalhague	95°57.08
19	71°32.72	145°8.85	0.95	275°59.16	58.08	287°31.91	24.81	59°50.16	32.20	Eltanin	90°41.66
20 21	86°35.18 101°37.65	160°8.18 175°7.52	0.78 · · 0.61	291°2.58 306°5.99	58.43 •• 58.79	302°34.69 317°37.48	24.92 •• 25.03	74°52.39 89°54.62	32.31 · · 32.42	Kaus Aust.	83°30.45
22	101 37.05 116°40.11	175 7.52 190°6.85	0.43	300 5.99 321° 9.41	59.15	317 37.46 332°40.26	25.14	104° 56.85	32.42	Vega	$80^{\circ}32.32$
23	131° 42.57	205°6.18	0.45	336°12.82	59.50	347°43.05	25.14	119° 59.08	32.63	Nunki	75° 45.86
										Altair	61°58.54
Mer.p	pass. 14:15	ν -0.7' d-0.2'	m-4.15	ν 3.4′ d0.	4′ m-1.25	$\nu 2.8' \ d0.$	1' m-2.55	$\nu 2.2' \ d0$	$.1^\prime$ m0.80	Peacock	53°3.55
										Deneb	49°25.05
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°37.40 27°31.20
0	146° 45.04		21°0.09	351°16.24	N14°59.86	2°45.83	N15° 25.35	135°1.31	N02°32.73	Fomalhaut	27 31.20 15°12.94
1	161°47.50		0°59.91	$6^{\circ}19.65$	$15^{\circ}0.21$	17°48.62	25.46	150°3.54	32.84	Scheat	13° 43.83
2	176° 49.97	250°4.17	59.73	21°23.07	0.57	32°51.40	25.57	165°5.77	32.94	Markab	13°28.46
3	191°52.43		• 59.56	36°26.49	• • 0.92	47°54.18	• • 25.68	180°8.00	• • 33.05		
4	206°54.90	280°2.83	59.38	51°29.90	1.28	62°56.97	25.78	195°10.23	33.16	Feb 15 Mon	SHA
5	221°57.36	295°2.17	59.20	66°33.32	1.63	77°59.75	25.89	210° 12.46	33.26	Venus	75°50.78
6	236°59.82		0°59.02	81°36.74	N15°1.99	93°2.54	N15°26.00	225°14.69	N02°33.37	Jupiter	203°45.94 215°45.38
7	252°2.29	325°0.83	58.83	96°40.15	2.34	108°5.32	26.11	240°16.92	33.47	Saturn	215 45.38 348° 27.40
8 9	267° 4.75 282° 7.22	340°0.16 354°59.49	58.65 • 58.47	111°43.57 126°46.99	2.69 •• 3.05	123°8.10 138°10.89	26.21 •• 26.32	255° 19.15 270° 21.38	33.58 · · 33.69	Saturn	J40 Z1.40
10	282 7.22 297°9.68	9°58.82	58.47	126 46.99 141°50.41	3.40	158 10.89 153°13.67	26.43	270 21.38 285°23.61	33.79	Feb 16 Tue	SHA
11	312° 12.14	24°58.15	58.10	156°53.83	3.76	168°16.46	26.54	300° 25.84	33.79	Venus	74°35.65
12	327° 14.61		0°57.91	171°57.25	N15°4.11	183°19.24	N15°26.65	315°28.07	N02°34.00	Mars	204°8.46
13	342° 17.07	54°56.81	57.72	187° 0.67	4.46	198°22.02	26.75	330°30.29	34.11	Jupiter	215°53.10
14	357° 19.54	69°56.14	57.53	202°4.09	4.82	213°24.81	26.86	345°32.52	34.22	Saturn	348°21.87
15	$12^{\circ}22.00$	84°55.47 •	• 57.34	$217^{\circ}7.51$	• • 5.17	228°27.59	• • 26.97	0°34.75	• • 34.32	Feb 17 Wed	SHA
16	27°24.47	99°54.81	57.15	232°10.93	5.52	243°30.37	27.08	15°36.98	34.43	Venus	73°20.47
17	42° 26.93	114°54.14	56.96	247°14.35	5.87	258°33.16	27.18	30°39.21	34.54	Mars	204°31.20
18	57°29.39		0°56.77	262°17.77	N15°6.23	273°35.94	N15°27.29	45°41.44	N02°34.64	Jupiter	$216^{\circ}0.79$
19	72°31.86	144°52.80	56.57	277°21.19	6.58	288°38.72	27.40	60°43.67	34.75	Saturn	348°16.27
20	87°34.32	159°52.13	56.38	292°24.61	6.93	303°41.51	27.50	75° 45.89	34.85	Horizor	ntal parallax
21 22	102°36.79 117°39.25	174°51.46 • 189°50.79	· 56.18	307°28.03 322°31.45	· · 7.28 7.64	318°44.29 333°47.07	· · 27.61	90°48.12 105°50.35	· · 34.96	11011201	Venus:
22	117° 39.25 132° 41.72	204°50.12	55.99 55.79	322°31.45 337°34.88	7.64 7.99	333°47.07 348°49.85	27.72 27.83	105°50.35 120°52.58	35.07 35.17		Mars:
Mer.p	pass. 14:11	ν-0.7' d-0.2'	m-4.15	ν 3.4′ d0.	4′ m-1.26	$\nu 2.8' \ d0.$.1′ m-2.55	$-\nu^{2.2'} d0$.1′ m0.80		

Dec 29°14.49 -42°9.66 56°41.37 -17°50.37 $\textbf{-57}^{\circ}\,6.16$ $23^{\circ}35.51$ 89°23.01 -40°11.98 4°11.72 49°57.64 16°33.81 -8°10.36 $46^{\circ}\,1.61$ $6^{\circ}22.37$ 28°37.83 -1°11.20 $7^{\circ}24.63$ -52°42.84 -16°45.39 -29°0.74 $5^{\circ}9.18$ $27^{\circ}57.54$ -59°35.94 -43°32.68 -69°49.80 -8°46.75 11°49.88 $61^{\circ}36.04$ 14°24.99 -17°41.68 -63°14.89 -57°15.85 55°48.41 -11°18.30 49°10.30 -60°30.07 -36°30.17 $19^{\circ}2.19$ -60°56.67 $74^{\circ}2.20$ -16°9.33 $26^{\circ}37.10$ -26°29.49 -69°4.29 -15°45.53 $-37^{\circ}7.30$ $12^{\circ}32.24$ 51°28.80 -34°22.21 38°48.28 -26°15.74 8°56.30 -56°38.76 $45^{\circ}22.53$ 9°59.92 -46°49.80 -29°28.78 28°13.83 15°21.07 Mer.pass 09:18 00:46 23:53 15:05 Mer.pass 09:19 00:40 23:49 15:01 Mer.pass 09:20 00:35 23:45 14:58

> 0.1 0.2

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.10	S12°49.75	83°7.41	5.2'	$N26^{\circ}6.73$	5.8'	58.7'
1	191°28.12	48.89	97°31.57	5.1'	26°12.49	5.6'	58.8'
2	206°28.15 221°28.18	48.04 •• 47.18	111°55.63 126°19.60	5.0' 4.9'	26°18.07 26°23.50	5.4' 5.3'	58.8' 58.8'
4	236° 28.20	46.32	140°43.46	4.8'	26°28.75	5.1'	58.9'
5	251°28.23	45.47	155°7.23	4.7'	26°33.84	4.9'	58.9'
6 7	266°28.26 281°28.29	\$12°44.61 43.75	169°30.90 183°54.48	4.6' 4.5'	N26°38.76 26°43.50	4.7' 4.6'	58.9' 58.9'
8	296° 28.32	42.90	198°17.97	4.4	26°48.08	4.4	59.0'
9	311°28.35	• • 42.04	212°41.36	4.3'	$26^{\circ}52.48$	4.2'	59.0'
10	326°28.38 341°28.41	41.18	227°4.67 241°27.89	4.2'	26°56.70 27°0.75	4.0'	59.0'
11 12	341 28.41 356° 28.44	40.32 \$12°39.46	241 27.89 255°51.03	4.1' 4.1'	N27°4.62	3.9' 3.7'	59.1' 59.1'
13	11°28.47	38.60	270°14.08	4.0'	27°8.31	3.5'	59.1'
14	26° 28.50	37.74	284°37.05	3.9'	27°11.83	3.3'	59.1'
15 16	41°28.53 56°28.56	· · 36.88 36.02	298°59.94 313°22.76	3.8' 3.7'	27°15.16 27°18.30	3.1' 3.0'	59.2' 59.2'
17	71° 28.59	35.16	327°45.50	3.7'	27°21.27	2.8'	59.2'
18	86°28.62	S 12°34.30	342°8.17	3.6'	N27°24.05	2.6'	59.3'
19	101°28.66	33.44	356°30.76 10°53.29	3.5'	27°26.64	2.4' 2.2'	59.3' 59.3'
20 21	116°28.69 131°28.72	32.58 •• 31.72	25°15.75	3.5' 3.4'	27°29.05 27°31.26	2.2'	59.3'
22	146° 28.76	30.85	39°38.15	3.3'	27°33.29	1.8'	59.4'
23	161°28.79	29.99	54° 0.48	3.3'	27°35.13	1.6'	59.4'
	SD = 16.2'	d = -0.9'		SI	O = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 28.82	\$12°29.13	68°22.75	3.2'	N27°36.78	1.5'	59.4'
1	191°28.86	28.26	82°44.97	3.2'	27°38.24	1.3'	59.4'
2	206°28.89 221°28.93	27.40 •• 26.54	97°7.14 111°29.25	3.1' 3.1'	27°39.50 27°40.57	1.1' 0.9'	59.5' 59.5'
4	236° 28.96	25.67	125°51.31	3.0'	27°41.45	0.9	59.5'
5	251°29.00	24.81	140°13.32	3.0'	27°42.13	0.5'	59.5'
6	266° 29.03	\$12°23.94	154°35.29	2.9'	N27°42.62	0.3'	59.6'
7 8	281°29.07 296°29.11	23.08 22.21	168°57.22 183°19.11	2.9' 2.9'	27°42.91 27°43.00	0.1' -0.1'	59.6' 59.6'
9	311° 29.14	• • 21.34	197°40.96	2.8'	27°42.89	-0.3	59.6'
10	326°29.18	20.48	212°2.77	2.8'	27°42.59	-0.5'	59.7'
11 12	341°29.22 356°29.26	19.61 \$12°18.74	226°24.56 240°46.32	2.8' 2.7'	27°42.09 N27°41.39	-0.7' -0.9'	59.7' 59.7'
13	11° 29.29	17.87	255° 8.05	2.7'	27°40.49	-1.1'	59.7'
14	26° 29.33	17.01	269°29.76	2.7'	27°39.40	-1.3'	59.8'
15 16	41°29.37 56°29.41	· · 16.14 15.27	283°51.44 298°13.11	2.7' 2.7'	27°38.10 27°36.60	-1.5' -1.7'	59.8' 59.8'
17	71° 29.45	14.40	312°34.77	2.6'	27°34.90	-1.7 -1.9'	59.8'
18	86°29.49	S12°13.53	326°56.41	2.6'	N27°33.01	-2.1'	59.9'
19 20	101°29.53 116°29.57	12.66	341°18.04 355°39.67	2.6' 2.6'	27°30.91	-2.3'	59.9' 59.9'
21	131° 29.61	11.79 •• 10.92	10° 1.29	2.6'	27°26.11	-2.5 -2.7'	59.9'
22	146°29.65	10.05	24°22.91	2.6'	27°23.41	-2.9'	60.0'
23	161°29.69	9.18	38°44.53	2.6'	27°20.51	-3.1'	60.0'
	SD = 16.2'	d = -0.9'		SI	O = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.73	\$12°8.31	53°6.15	2.6'	N27°17.41	-3.3'	60.0'
1 2	191°29.78 206°29.82	7.44 6.57	67°27.79 81°49.43	2.6' 2.7'	27°14.10 27°10.60	-3.5' -3.7'	60.0' 60.0'
3	221°29.86	5.69	96°11.08	2.7'	27°6.90	-3.9'	60.1
4	236°29.90	4.82	110°32.75	2.7'	27°3.00	-4.1'	60.1
5 6	251°29.95 266°29.99	3.95 \$12°3.07	124°54.44 139°16.15	2.7' 2.7'	26°58.90 N26°54.61	-4.3' -4.5'	60.1' 60.1'
7	281°30.03	2.20	159 10.15 153°37.88	2.8'	26°50.11	-4.5 -4.7'	60.1
8	296°30.08	1.33	167°59.63	2.8'	26°45.42	-4.9'	60.2'
9	311°30.12	12°0.45	182°21.42 196°43.23	2.8'	26°40.53	-5.1'	60.2'
10 11	326°30.17 341°30.21	11°59.58 58.70	196°43.23 211°5.08	2.8' 2.9'	26°35.44 26°30.16	-5.3' -5.5'	60.2' 60.2'
12	356°30.26	S 11°57.83	225°26.97	2.9'	N26°24.68	-5.7'	60.2'
13	11°30.30	56.95	239°48.89	3.0'	26°19.01	-5.9'	60.3'
14 15	26°30.35 41°30.39	56.08 •• 55.20	254°10.85 268°32.85	3.0' 3.0'	26°13.14 26°7.08	-6.1' -6.3'	60.3' 60.3'
16	56°30.44	54.32	282°54.90	3.1'	26°0.83	-6.4'	60.3
17	71°30.49	53.45	297°17.00	3.1'	25°54.39	-6.6'	60.3'
18 19	86°30.53 101°30.58	\$11°52.57 51.69	311°39.15 326°1.35	3.2' 3.3'	N25°47.76 25°40.94	-6.8' -7.0'	60.3' 60.4'
20	101 30.58 116°30.63	51.69	340°23.60	3.3'	25° 40.94 25° 33.93	-7.0 -7.2'	60.4 60.4
21	131°30.68	• • 49.94	354°45.91	3.4'	25°26.74	-7.4'	60.4'
22	146°30.73 161°30.77	49.06 48.18	9°8.27 23°30.70	3.4' 3.5'	25°19.36 25°11.79	-7.6'	60.4' 60.4'
23			∠3 30.70			-7.7'	00.4
	SD = 16.2'	d = -0.9'		SL	O = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-79%	
15	14:08	14:06	12:14	19:15	06:44		
16	14:05	14:03	12:14	20:18	07:46		
17	14:01	13:59	12:14	21:22	08:50		

February 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 Dec
0	147°44.18	219°49.45 \$20°55.59	352°38.30 N15°8.34	3°52.64 N15°27.93	135°54.81 N02°35.28	
1	162°46.64	234°48.78 55.39	7°41.72 8.69	18°55.42 28.04	150°57.03 35.39	Alpheratz 357°33.24 29°14.48 Ankaa 353°5.75 -42°9.65
2	177°49.11	249°48.11 55.19	22°45.14 9.04	33°58.20 28.15	165°59.26 35.49	Schedar 349°29.43 56°41.36
3	192°51.57	264°47.44 · · 54.99	37°48.57 · · 9.39	49°0.99 · · 28.25	181°1.49 · · 35.60	Diphda 348°45.77 -17°50.37
4 5	207°54.04 222°56.50	279°46.77 54.78 294°46.10 54.58	52°51.99 9.74 67°55.41 10.09	64°3.77 28.36 79°6.55 28.47	196°3.72 35.71 211°5.94 35.81	Achernar 335°19.21 -57°6.15
6	237° 58.96	309°45.43 \$20°54.38	82°58.84 N15°10.44	94°9.33 N15°28.58	226°8.17 N02°35.92	Hamal 327°49.34 23°35.51
7	253°1.43	324°44.76 54.17	98°2.26 10.79	109°12.12 28.68	241°10.40 36.03	Polaris 313°11.89 89°23.01
8	268°3.89	339°44.09 53.96	113°5.68 11.14	124°14.90 28.79	256°12.63 36.13	Acamar 315°10.53 -40°11.98 Menkar 314°4.36 4°11.72
9	283°6.36	354°43.42 · · 53.75	128° 9.11 · · 11.49	139°17.68 · · 28.90	271°14.85 · · 36.24	Mirfak 308°25.75 49°57.64
10	298°8.82	9° 42.75 53.54	143°12.53 11.84	154°20.46 29.00	286°17.08 36.35	Aldebaran 290°37.52 16°33.81
11 12	313° 11.29 328° 13.75	24°42.08 53.33 39°41.41 \$20°53.12	158°15.96 12.19 173°19.38 N15°12.54	169°23.24 29.11 184°26.03 N15°29.22	301°19.31 36.45 316°21.53 N02°36.56	Rigel 281°2.05 -8°10.36
13	343° 16.21	54° 40.74 52.91	188°22.81 12.89	199°28.81 29.32	331°23.76 36.67	Capella 280°19.10 46°1.62
14	358° 18.68	69°40.07 52.70	203°26.23 13.24	214°31.59 29.43	346°25.99 36.77	Bellatrix 278°20.85 6°22.37
15	13°21.14	84°39.40 · · 52.48	218°29.66 · · 13.59	229°34.37 · · 29.54	1°28.21 · · 36.88	Elnath 277°59.48 28°37.83 Alnilam 275°35.79 -1°11.20
16	28°23.61	99°38.73 52.27	233°33.08 13.94	244°37.15 29.64	16°30.44 36.99	Betelgeuse 270°50.00 7°24.63
17	43°26.07	114°38.06 52.05	248°36.51 14.29	259°39.94 29.75	31°32.67 37.10	Canopus 263°51.28 -52°42.85
18 19	58° 28.53 73° 31.00	129°37.39	263°39.94 N15°14.64 278°43.36 14.98	274°42.72 N15°29.86 289°45.50 29.96	46°34.89 N02°37.20 61°37.12 37.31	Sirius 258°24.45 -16°45.40
20	88° 33.46	159° 36.05 51.40	293°46.79 15.33	304°48.28 30.07	76°39.35 37.42	Adhara 255°4.21 -29°0.75
21	103°35.93	174°35.38 · · 51.18	308°50.22 · · 15.68	319°51.06 · · 30.18	91°41.57 · · 37.52	Procyon 244°48.72 5°9.17
22	118°38.39	189°34.71 50.96	323°53.64 16.03	334°53.84 30.28	106°43.80 37.63	Pollux 243°14.84 27°57.55 Avior 234°13.42 -59°35.96
23	133°40.86	204°34.04 50.74	338°57.07 16.37	349°56.62 30.39	121°46.02 37.74	Avior 234°13.42 -59°35.96 Suhail 222°44.57 -43°32.69
Mer	pass. 14:07	ν-0.7' d-0.2' m-4.14	ν3.4' d0.4' m-1.27	ν2.8' d0.1' m-2.55	$\nu 2.2' \ d0.1' \ m0.79$	Miaplacidus 221°36.98 -69°49.82
						Alphard 217°45.70 -8°46.76
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.24 11°49.87
0	148° 43.32	219°33.37 \$20°50.51	354°0.50 N15°16.72	4°59.41 N15°30.49	136°48.25 N02°37.85	Dubhe 193°38.24 61°36.05
1	163°45.78	234°32.70 50.29	9°3.92 17.07	20°2.19 30.60	151°50.47 37.95	Denebola 182°22.86 14°24.99 Gienah 175°41.49 -17°41.69
2	178°48.25	249°32.03 50.06	24°7.35 17.41	35°4.97 30.71	166°52.70 38.06	Acrux 172°57.54 -63°14.91
3	193°50.71	264°31.36 · · 49.84	39°10.78 · · 17.76	50°7.75 · · 30.81	181°54.93 · · 38.17	Gacrux 171°49.20 -57°15.87
4	208°53.18	279°30.69 49.61	54°14.21 18.11	65°10.53 30.92	196° 57.15 38.27	Alioth 166°11.04 55°48.41
5 6	223°55.64 238°58.10	294°30.02 49.38 309°29.35 \$20°49.15	69°17.64 18.45 84°21.06 N15°18.80	80°13.31 31.02 95°16.09 N15°31.13	211°59.38 38.38 227°1.60 N02°38.49	Spica 158°20.24 -11°18.31
7	254°0.57	324°28.68 48.92	99°24.49 19.14	110°18.87 31.24	242°3.83 38.60	Alkaid 152°50.37 49°10.30
8	269°3.03	339°28.01 48.69	114°27.92 19.49	125°21.65 31.34	257°6.05 38.70	Hadar 148°33.18 -60°30.08 Menkent 147°55.35 -36°30.18
9	284°5.50	354°27.34 · · 48.46	129°31.35 · · 19.84	140°24.43 · · 31.45	272°8.28 · · 38.81	Arcturus 145°46.16 19°2.19
10	299°7.96	9°26.67 48.22	144°34.78 20.18	155°27.21 31.55	287°10.50 38.92	Rigil Kent. 139°37.61 -60°56.68
11	314° 10.43	24°26.00 47.99	159°38.21 20.53	170°29.99 31.66	302°12.73 39.03	Kochab 137°19.57 74°2.20
12 13	329° 12.89 344° 15.35	39°25.33	174°41.64 N15°20.87 189°45.06 21.21	185°32.77 N15°31.77 200°35.56 31.87	317°14.95 N02°39.13 332°17.17 39.24	Zuben'ubi 136°53.97 -16°9.34
14	359° 17.82	69°23.99 47.28	204°48.49 21.56	215°38.34 31.98	347°19.40 39.35	Alphecca 126°2.22 26°37.09
15	14° 20.28	84°23.32 · · 47.04	219°51.92 · · 21.90	230°41.12 · · 32.08	2°21.62 · · 39.46	Antares 112°13.72 -26°29.50 Atria 107°6.51 -69°4.29
16	29°22.75	99°22.65 46.80	234°55.35 22.25	245°43.90 32.19	17°23.85 39.56	Sabik 102°0.87 -15°45.53
17	44°25.21	114°21.98 46.56	249°58.78 22.59	260°46.68 32.29	32°26.07 39.67	Shaula 96°8.14 -37°7.30
18	59°27.67	129°21.31 \$20°46.32	265°2.21 N15°22.93	275°49.46 N15°32.40	47°28.30 N02°39.78	Rasalhague 95° 57.05 12° 32.23
19 20	74°30.14 89°32.60	144°20.64 46.08 159°19.97 45.84	280° 5.64 23.28 295° 9.07 23.62	290°52.24 32.50 305°55.01 32.61	62°30.52 39.89 77°32.74 40.00	Eltanin 90°41.63 51°28.79
21	104° 35.07	174°19.30 · · 45.59	310°12.50 · · 23.96	320°57.79 · · 32.72	92°34.97 · · 40.10	Kaus Aust. 83°30.41 -34°22.21
22	119° 37.53	189° 18.63 45.35	325°15.93 24.30	336°0.57 32.82	107°37.19 40.21	Vega 80°32.30 38°48.27 Nunki 75°45.83 -26°15.74
23	134°39.99	204°17.96 45.10	340°19.36 24.65	351°3.35 32.93	122°39.42 40.32	Altair 61°58.52 8°56.30
Mer	pass. 14:03	ν-0.7' d-0.2' m-4.13	ν3.4' d0.3' m-1.28	ν2.8' d0.1' m-2.55	$\nu 2.2' \ d0.1' \ m0.79$	Peacock 53°3.51 -56°38.75
						Deneb 49°25.03 45°22.52
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.39 9°59.92
0 0	149° 42.46	219°17.29 \$20°44.85	355°22.79 N15°24.99	6°6.13 N15°33.03	137°41.64 N02°40.43	Al Na'ir 27°31.18 -46°49.79 Fomalhaut 15°12.93 -29°28.77
1	164° 44.92	234°16.62 44.60	10°26.22 25.33	21°8.91 33.14	152°43.86 40.54	Scheat 13°43.83 28°13.82
2	179° 47.39	249° 15.95 44.35	25°29.65 25.67	36°11.69 33.24	167°46.09 40.64	Markab 13°28.45 15°21.07
3	194° 49.85	264°15.28 · · 44.10	40°33.08 · · 26.01	51°14.47 · · · 33.35	182°48.31 · · 40.75	
4	209°52.32	279°14.61 43.85	55°36.51 26.35	66°17.25 33.45	197°50.53 40.86	Feb 18 Thu SHA Mer.pass Venus 72°5.27 09:21
5 6	224°54.78 239°57.24	294°13.94 43.60 309°13.27 \$20°43.35	70°39.95 26.69 85°43.38 N15°27.03	81°20.03 33.56 96°22.81 N15°33.66	212°52.76 40.97 227°54.98 N02°41.08	Venus 72°5.27 09:21 Mars 204°54.12 00:29
7	254° 59.71	324°12.60 43.09	100°46.81 27.37	111°25.59 33.77	242°57.20 41.18	Jupiter 216°8.46 23:40
8	270°2.17	339°11.93 42.83	115°50.24 27.71	126°28.37 33.87	257°59.42 41.29	Saturn 348° 10.63 14:54
9	285°4.64	354°11.27 · · 42.58	130°53.67 · · 28.05	141°31.14 · · · 33.98	273°1.65 · · 41.40	Feb 19 Fri SHA Mer.pass
10	300°7.10	9°10.60 42.32	145°57.10 28.39	156°33.92 34.08	288°3.87 41.51	Venus 70°50.05 09:22
11	315°9.56 330°12.03	24°9.93 42.06 39°9.26 \$20°41.80	161°0.53 28.73 176°3.96 N15°29.07	171°36.70 34.19 186°39.48 N15°34.29	303°6.09 41.62 318°8.31 N02°41.72	Mars 205°17.18 00:24
12 13	345° 14.49	54°8.59 41.54	176 3.96 N15 29.07 191°7.39 29.41	201°42.26 34.40	318 8.31 Nu2 41.72 333°10.54 41.83	Jupiter 216°16.09 23:36
14	0° 16.96	69°7.92 41.28	206°10.83 29.75	216°45.04 34.50	348°12.76 41.94	Saturn 348°4.93 14:51
15	15° 19.42	84°7.25 · · 41.02	221°14.26 · · 30.09	231°47.81 · · 34.60	3°14.98 · · 42.05	Feb 20 Sat SHA Mer.pass
16	30°21.88	99°6.58 40.75	236°17.69 30.43	246°50.59 34.71	18°17.20 42.16	Venus 69°34.83 09:23
17	45°24.35	114°5.91 40.49	251°21.12 30.76	261°53.37 34.81	33°19.43 42.27	Mars 205°40.33 00:18
18 19	60°26.81 75°29.28	129°5.24 S20°40.22 144°4.57 39.96	266°24.55 N15°31.10 281°27.98 31.44	276°56.15 N15°34.92 291°58.93 35.02	48°21.65 N02°42.38 63°23.87 42.48	Jupiter 216°23.67 23:31
20	75°29.28 90°31.74	144°4.57 39.96 159°3.90 39.69	281°27.98 31.44 296°31.41 31.78	307°1.70 35.13	63°23.87 42.48 78°26.09 42.59	Saturn 347°59.18 14:47
21	105°34.20	174°3.23 · · 39.42	311°34.85 · · 32.11	322°4.48 · · 35.23	93°28.31 · · 42.70	Horizontal parallax
22	120°36.67	189°2.56 39.15	326°38.28 32.45	337°7.26 35.34	108° 30.54 42.81	Venus: 0.1
23	135°39.13	204°1.89 38.88	341°41.71 32.79	352°10.04 35.44	123°32.76 42.92	Mars: 0.2
Mer	pass. 13:59	ν-0.7' d-0.2' m-4.13	ν3.4' d0.3' m-1.28	ν2.8' d0.1' m-2.55	ν2.2' d0.1' m0.79	

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.82	S11°47.30	$37^{\circ}53.19$	3.6'	N25°4.04	-7.9'	60.4'
1	191°30.87	46.42	52°15.74	3.6'	24°56.11	-8.1'	60.4'
2	206°30.92 221°30.97	45.54 •• 44.66	66°38.36 81°1.05	3.7' 3.8'	24°48.00 24°39.71	-8.3' -8.5'	60.5' 60.5'
4	236°31.02	43.78	95°23.81	3.8'	24°31.24	-8.6'	60.5
5	251°31.07	42.90	109°46.63	3.9'	24°22.59	-8.8'	60.5'
6 7	266°31.12 281°31.18	\$11°42.02 41.14	124°9.53 138°32.51	4.0' 4.1'	N24°13.77 24°4.77	-9.0' -9.2'	60.5' 60.5'
8	296°31.23	40.26	150° 55.56	4.1	23° 55.60	-9.2 -9.3'	60.5
9	311°31.28	• • 39.37	$167^{\circ}18.69$	4.2'	23°46.26	-9.5'	60.5'
10	326°31.33	38.49	181°41.90 196°5.18	4.3'	23°36.75 23°27.07	-9.7'	60.6'
11 12	341°31.38 356°31.44	37.61 \$11°36.73	210°28.55	4.4' 4.5'	N23° 17.23	-9.8' -10.0'	60.6' 60.6'
13	11°31.49	35.84	224°52.01	4.5'	23°7.22	-10.2	60.6
14	26°31.54	34.96	239°15.54	4.6'	22°57.05	-10.3'	60.6'
15 16	41°31.59 56°31.65	· · 34.08 33.19	253°39.16 268°2.87	4.7' 4.8'	22°46.72 22°36.23	-10.5' -10.6'	60.6' 60.6'
17	71°31.70	32.31	282°26.67	4.9'	22° 25.58	-10.8'	60.6
18	86°31.76	S11°31.42	296°50.55	5.0'	N22°14.77	-11.0'	60.6'
19	101°31.81 116°31.87	30.54 29.65	311°14.52 325°38.59	5.1'	22°3.81 21°52.70	-11.1'	60.6'
20 21	116°31.87 131°31.92	29.65 •• 28.77	325°38.59 340°2.74	5.2' 5.2'	21°52.70 21°41.43	-11.3' -11.4'	60.6' 60.6'
22	146°31.98	27.88	354°26.99	5.3'	21°30.02	-11.6'	60.6
23	161°32.03	26.99	8°51.33	5.4'	21°18.46	-11.7'	60.6'
	SD = 16.2'	d = -0.9'		S	D = 16.5'		
Fri	GHA	Dec	GHA		Dec	d	НР
Fri 0	GHA 176°32.09	Dec \$11°26.11	GHA 23°15.76	ν 5.5'	Dec N21°6.76	d -11.8'	нР 60.6'
1	191°32.15	25.22	37°40.28	5.6'	20°54.91	-12.0'	60.6'
2	206°32.20	24.33	52°4.90	5.7'	20°42.93	-12.1'	60.7'
3 4	221°32.26 236°32.32	· · 23.44 22.56	66°29.62 80°54.43	5.8' 5.9'	20°30.80 20°18.53	-12.3' -12.4'	60.7' 60.7'
5	251°32.38	21.67	95°19.33	6.0'	20°6.14	-12.5'	60.7'
6	266°32.43	S11°20.78	109°44.34	6.1'	N19°53.60	-12.7'	60.7'
7 8	281°32.49 296°32.55	19.89 19.00	124°9.43 138°34.63	6.2' 6.3'	19° 40.94 19° 28.15	-12.8' -12.9'	60.7' 60.7'
9	311°32.61	•• 18.11	150 54.05 152°59.92	6.4'	19 20.15 19°15.23	-12.9	60.7
10	326°32.67	17.22	$167^{\circ}25.31$	6.5'	19°2.18	-13.2'	60.7'
11	341°32.73 356°32.79	16.33 \$11°15.44	181°50.79 196°16.37	6.6' 6.7'	18°49.01 N18°35.72	-13.3' -13.4'	60.7'
12 13	356 32.79 11°32.85	14.55	196° 16.37 210° 42.05	6.8'	18° 22.31	-13.4 -13.5'	60.7' 60.7'
14	26°32.91	13.66	225°7.83	6.9'	18°8.79	-13.6'	60.6'
15	41°32.97	• • 12.77	239°33.70	7.0'	17°55.15	-13.8'	60.6'
16 17	56°33.03 71°33.09	11.88 10.99	253°59.67 268°25.74	7.1' 7.2'	17°41.40 17°27.53	-13.9' -14.0'	60.6' 60.6'
18	86°33.15	S11°10.09	282°51.90	7.3'	N17° 13.56	-14.1'	60.6
19	101°33.21	9.20	297°18.16	7.4'	16°59.49	-14.2'	60.6'
20 21	116°33.28 131°33.34	8.31 • • 7.42	311°44.52 326°10.97	7.5' 7.5'	16°45.30 16°31.02	-14.3' -14.4'	60.6' 60.6'
22	146°33.40	6.52	340°37.51	7.6'	16° 16.64	-14.5'	60.6
23	161°33.46	5.63	355°4.16	7.7'	16°2.16	-14.6'	60.6'
	SD = 16.2'	d = -0.9'		S	D = 16.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.53	S11°4.74	9°30.89	7.8'	N15°47.58	-14.7'	60.6'
1 2	191°33.59 206°33.66	3.84 2.95	23°57.72 38°24.64	7.9' 8.0'	15° 32.91 15° 18.15	-14.8' -14.9'	60.6' 60.6'
3	200 33.00 221°33.72	. 2.95	52°51.66	8.1'	15°3.29	-14.9'	60.6
4	236°33.78	1.16	67°18.77	8.2'	14°48.36	-15.0'	60.6'
5 6	251°33.85 266°33.91	11°0.26 \$10°59.37	81°45.97 96°13.26	8.3' 8.4'	14°33.33 N14°18.23	-15.1' -15.2'	60.5' 60.5'
7	200 33.91 281°33.98	58.47	110°40.64	8.5'	14° 3.04	-15.2 -15.3'	60.5
8	296°34.04	57.57	125°8.12	8.6'	$13^{\circ}47.77$	-15.3'	60.5'
9	311°34.11 326°34.18	· · 56.68 55.78	139°35.68 154°3.33	8.7' 8.7'	13°32.43 13°17.01	-15.4' -15.5'	60.5'
10 11	326 34.18 341°34.24	55.78 54.88	154 3.33 168°31.07	8.8'	13 17.01 13°1.53	-15.5' -15.6'	60.5' 60.5'
12	356°34.31	\$10°53.98	182°58.89	8.9'	N12°45.97	-15.6'	60.5
13	11°34.38	53.09	197°26.80	9.0'	12°30.34	-15.7'	60.5
14 15	26°34.44 41°34.51	52.19 •• 51.29	211°54.80 226°22.88	9.1' 9.2'	12° 14.64 11° 58.89	-15.8' -15.8'	60.4' 60.4'
16	56°34.58	50.39	240°51.05	9.2' 9.2'	11° 43.07	-15.6 -15.9'	60.4
17	71°34.65	49.49	$255^{\circ}19.29$	9.3'	11°27.19	-15.9'	60.4'
18	86°34.72	\$10°48.59	269°47.62	9.4'	N11°11.25	-16.0'	60.4
19 20	101°34.79 116°34.85	47.69 46.79	284°16.03 298°44.52	9.5' 9.6'	10°55.26 10°39.21	-16.0' -16.1'	60.4' 60.3'
21	131°34.92	• • 45.89	313°13.09	9.6'	10° 23.12	-16.1	60.3
22	146°34.99	44.99	327°41.74	9.7'	10°6.97	-16.2'	60.3'
23	161°35.06	44.09	342°10.47	9.8'	09°50.77	-16.2'	60.3'
	SD = 16.2'	d = -0.9'		S	D = 16.5'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-99%
18	13:57	13:54	12:14	22:23	09:53	
19	13:52	13:49	12:14	23:20	10:52	
20	13:46	13:43	12:14	-:-	11:48	

February 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	150°41.60	219°1.22 \$20°38.61	356°45.14 N15°33.12	7°12.81 N15°35.54	138°34.98 N02°43.03	
1	165° 44.06	234°0.55 38.33	11°48.57 33.46	22°15.59 35.65	153°37.20 43.14	Alpheratz 357°33.24 29°14.47
2	$180^{\circ}46.53$	248°59.88 38.06	26°52.00 33.79	37°18.37 35.75	168°39.42 43.24	Ankaa 353°5.76 -42°9.64 Schedar 349°29.45 56°41.35
3	195°48.99	263°59.21 · · 37.79	41°55.44 · · 34.13	52°21.14 · · 35.86	183°41.64 · · 43.35	Diphda 348°45.78 -17°50.36
4	210°51.45	278°58.55 37.51	56°58.87 34.46	67°23.92 35.96	198°43.86 43.46	Achernar 335°19.23 -57°6.14
5	225° 53.92	293° 57.88 37.23	72°2.30 34.80	82°26.70 36.06	213°46.08 43.57	Hamal 327° 49.36 23° 35.51
6 7	240° 56.38 255° 58.85	308°57.21 \$20°36.96 323°56.54 36.68	87°5.73 N15°35.13 102°9.16 35.47	97°29.47 N15°36.17 112°32.25 36.27	228°48.31 N02°43.68 243°50.53 43.79	Polaris 313°13.52 89°23.01
8	271°1.31	338°55.87 36.40	117°12.60 35.80	127°35.03 36.38	258° 52.75 43.90	Acamar 315°10.55 -40°11.97
9	286°3.77	353°55.20 · · 36.12	132°16.03 · · 36.14	142°37.80 · · 36.48	273°54.97 · · 44.01	Menkar 314°4.37 4°11.72
10	301°6.24	8°54.53 35.83	147°19.46 36.47	157°40.58 36.58	288° 57.19 44.11	Mirfak 308°25.77 49°57.64 Aldebaran 290°37.53 16°33.81
11	316°8.70	23°53.86 35.55	162°22.89 36.80	172°43.36 36.69	303°59.41 44.22	Rigel 281°2.06 -8°10.36
12	331°11.17	38°53.19 S20°35.27	177°26.32 N15°37.14	187°46.13 N15°36.79	319°1.63 N02°44.33	Capella 280°19.12 46°1.62
13	346° 13.63 1° 16.09	53°52.52 34.98 68°51.86 34.70	192°29.75 37.47 207°33.19 37.80	202°48.91 36.89 217°51.69 37.00	334°3.85 44.44 349°6.07 44.55	Bellatrix 278°20.86 6°22.37
14 15	1 10.09 16° 18.56	68°51.86 34.70 83°51.19 · · 34.41	207°33.19 37.80 222°36.62 · · 38.13	217°51.69 37.00 232°54.46 · · 37.10	349°6.07 44.55 4°8.29 • 44.66	Elnath 277°59.49 28°37.83
16	31°21.02	98°50.52 34.12	237°40.05 38.47	247°57.24 37.20	19°10.51 44.77	Alnilam 275°35.80 -1°11.20
17	46°23.49	113°49.85 33.83	252°43.48 38.80	263°0.01 37.31	34°12.73 44.88	Betelgeuse 270°50.01 7°24.63
18	$61^{\circ}25.95$	128°49.18 S 20°33.54	267°46.91 N15°39.13	278°2.79 N15°37.41	49°14.95 N02°44.99	Canopus 263°51.30 -52°42.85 Sirius 258°24.46 -16°45.40
19	76°28.41	143°48.51 33.25	282°50.34 39.46	293°5.56 37.51	64°17.17 45.10	Adhara 255°4.22 -29°0.76
20	91°30.88	158° 47.84 32.96	297°53.78 39.79	308°8.34 37.62	79°19.39 45.20	Procyon 244°48.72 5°9.17
21 22	106° 33.34 121° 35.81	173° 47.18 · · 32.67 188° 46.51 32.37	312°57.21 · · 40.12 328°0.64 40.45	323°11.12 · · 37.72 338°13.89 37.82	94°21.61 · · 45.31 109°23.83 45.42	Pollux 243°14.85 27°57.55
23	136° 38.27	203°45.84 32.08	343°4.07 40.78	353°16.67 37.93	124° 26.05 45.53	Avior 234°13.44 -59°35.97
						Suhail 222°44.58 -43°32.71
Mer.	pass. 13:55	ν-0.7' d-0.3' m-4.12	ν3.4' d0.3' m-1.27	ν2.8′ d0.1′ m-2.55	ν2.2′ d0.1′ m0.79	Miaplacidus 221°37.00 -69°49.84
						Alphard 217°45.70 -8°46.77 Regulus 207°32.24 11°49.87
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.22 61°36.06
0	151°40.73	218°45.17	358°7.50 N15°41.11	8°19.44 N15°38.03	139°28.27 N02°45.64	Denebola 182°22.85 14°24.99
1	166° 43.20	233°44.50 31.48	13°10.93 41.44	23°22.22 38.13	154°30.49 45.75	Gienah 175°41.48 -17°41.70
2 3	181° 45.66 196° 48.13	248° 43.83 31.19 263° 43.17 · · · 30.89	28°14.36 41.77 43°17.80 • 42.10	38°24.99 38.24 53°27.77 · · 38.34	169°32.71 45.86 184°34.93 • 45.97	Acrux 172°57.52 -63°14.93
4	211°50.59	278° 42.50 30.59	58°21.23 42.43	68°30.54 38.44	199°37.14 46.08	Gacrux 171°49.18 -57°15.89
5	226°53.05	293°41.83 30.29	73°24.66 42.76	83°33.31 38.54	214°39.36 46.19	Alioth 166°11.01 55°48.42
6	241°55.52	308°41.16 S 20°29.98	88°28.09 N15°43.08	98°36.09 N15°38.65	229°41.58 N02°46.30	Spica 158°20.22 -11°18.32 Alkaid 152°50.34 49°10.30
7	$256^{\circ}57.98$	323°40.49 29.68	103°31.52 43.41	113°38.86 38.75	244° 43.80 46.41	Hadar 148°33.15 -60°30.10
8	272°0.45	338°39.83 29.38	118°34.95 43.74	128°41.64 38.85	259°46.02 46.52	Menkent 147°55.32 -36°30.19
9	287°2.91	353°39.16 · · 29.07	133°38.38 · · 44.07	143°44.41 · · 38.95	274°48.24 · · 46.63	Arcturus 145°46.14 19°2.18
10 11	302°5.37 317°7.84	8°38.49 28.77 23°37.82 28.46	148°41.81 44.39 163°45.24 44.72	158°47.19 39.06 173°49.96 39.16	289°50.46 46.74 304°52.68 46.85	Rigil Kent. 139°37.58 -60°56.69
12	332° 10.30	38°37.16 S20°28.15	178°48.67 N15°45.05	188°52.73 N15°39.26	319°54.89 N02°46.96	Kochab 137°19.50 74°2.20
13	347° 12.77	53°36.49 27.84	193°52.10 45.37	203°55.51 39.36	334°57.11 47.07	Zuben'ubi 136°53.95 -16°9.35 Alphecca 126°2.20 26°37.09
14	$2^{\circ}15.23$	68°35.82 27.53	208°55.53 45.70	218°58.28 39.47	349°59.33 47.17	Alphecca 126°2.20 26°37.09 Antares 112°13.70 -26°29.50
15	17° 17.69	83°35.15 · · 27.22	223°58.96 · · 46.02	234°1.05 · · 39.57	5°1.55 · · 47.28	Atria 107°6.46 -69°4.29
16	32°20.16	98°34.49 26.91	239°2.39 46.35	249°3.83 39.67	20°3.77 47.39	Sabik 102°0.85 -15°45.54
17 18	47° 22.62 62° 25.09	113°33.82 26.60 128°33.15 \$20°26.28	254° 5.82 46.67 269° 9.25 N15° 47.00	264°6.60 39.77 279°9.37 N15°39.88	35°5.98 47.50 50°8.20 N02°47.61	Shaula 96°8.12 -37°7.30
19	77° 27.55	143°32.48 25.97	284°12.68 47.32	294°12.15 39.98	65°10.42 47.72	Rasalhague 95°57.03 12°32.22
20	92°30.02	158°31.82 25.65	299°16.11 47.64	309°14.92 40.08	80°12.64 47.83	Eltanin 90°41.60 51°28.78
21	107°32.48	173°31.15 · · 25.33	314°19.54 · · 47.97	324°17.69 · · 40.18	95°14.86 · · 47.94	Kaus Aust. 83°30.39 -34°22.21 Vega 80°32.28 38°48.26
22	$122^{\circ}34.94$	188°30.48 25.01	329°22.97 48.29	339°20.47 40.28	110°17.07 48.05	Nunki 75°45.81 -26°15.74
23	137°37.41	203°29.82 24.70	344°26.40 48.61	354°23.24 40.38	125°19.29 48.16	Altair 61°58.50 8°56.29
Mer.	pass. 13:51	ν-0.7' d-0.3' m-4.11	ν3.4' d0.3' m-1.26	ν2.8' d0.1' m-2.54	$\nu 2.2' \ d0.1' \ m0.79$	Peacock 53°3.49 -56°38.74
	<u> </u>					Deneb 49°25.02 45°22.50
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.38 9°59.91
0	152° 39.87	218°29.15 \$20°24.38	359°29.83 N15°48.94	9°26.01 N15°40.49	140°21.51 N02°48.27	Al Na'ir 27°31.17 -46°49.78 Fomalhaut 15°12.93 -29°28.77
1	167°42.34	233°28.48 24.05	14°33.26 49.26	24°28.78 40.59	155°23.72 48.38	Scheat 13°43.83 28°13.81
2	182°44.80	248° 27.82 23.73	29°36.69 49.58	39°31.56 40.69	170°25.94 48.49	Markab 13°28.45 15°21.06
3	197° 47.26	263°27.15 · · 23.41	44°40.12 · · 49.90	54°34.33 · · 40.79	185°28.16 · · 48.60	
4	212°49.73	278° 26.48 23.08 293° 25.82 22.76	59°43.55 50.23	69°37.10 40.89	200°30.38 48.71	Feb 21 Sun SHA Mer.pass Venus 68°19.62 09:24
5 6	227°52.19 242°54.66	293°25.82 22.76 308°25.15 \$20°22.43	74°46.98 50.55 89°50.40 N15°50.87	84°39.87 40.99 99°42.64 N15°41.10	215°32.59 48.82 230°34.81 N02°48.93	Mars 206°3.54 00:13
7	257°57.12	323°24.48 22.11	104°53.83 51.19	114°45.42 41.20	245°37.03 49.04	Jupiter 216°31.22 23:27
8	272° 59.58	338°23.82 21.78	119°57.26 51.51	129°48.19 41.30	260°39.24 49.15	Saturn 347°53.38 14:43
9	288°2.05	353°23.15 · · 21.45	135°0.69 · · 51.83	144°50.96 · · 41.40	275°41.46 · · 49.26	Feb 22 Mon SHA Mer.pass
10	303°4.51	8°22.49 21.12	150° 4.12 52.15	159°53.73 41.50	290°43.68 49.37	Feb 22 Mon SHA Mer.pass Venus 67°4.44 09:25
11	318°6.98	23°21.82 20.79	165°7.54 52.47	174°56.50 41.60	305°45.89 49.48	Mars 206°26.77 00:07
12 13	333°9.44 348°11.90	38°21.15 S20°20.45 53°20.49 20.12	180°10.97 N15°52.79 195°14.40 53.10	189°59.27 N15°41.70 205°2.05 41.81	320°48.11 N02°49.59 335°50.33 49.71	Jupiter 216° 38.71 23:22
13 14	348°11.90 3°14.37	68°19.82 19.79	195°14.40 53.10 210°17.83 53.42	205 2.05 41.81 220° 4.82 41.91	350°52.54 49.82	Saturn 347°47.53 14:40
15	18° 16.83	83°19.16 · · 19.45	225°21.25 · · 53.74	235°7.59 · · 42.01	5°54.76 · · 49.93	Feb 23 Tue SHA Mer.pass
16	33° 19.30	98°18.49 19.12	240°24.68 54.06	250°10.36 42.11	20°56.97 50.04	Venus 65°49.28 09:26
17	48°21.76	113°17.83 18.78	255°28.11 54.38	265°13.13 42.21	35°59.19 50.15	Mars 206° 49.96 00:02
18	63°24.22	128°17.16 \$20°18.44	270°31.53 N15°54.69	280°15.90 N15°42.31	51°1.41 N02°50.26	Jupiter 216°46.14 23:18
19	78°26.69	143°16.50 18.10	285°34.96 55.01	295°18.67 42.41	66°3.62 50.37	Saturn 347°41.64 14:36
20 21	93°29.15 108°31.62	158°15.83 17.76 173°15.17 · · 17.42	300°38.38 55.33 315°41.81 •• 55.64	310°21.44 42.51 325°24.21 • 42.61	81°5.84 50.48 96°8.05 • 50.59	Horizontal parallax
22	123°34.08	188°14.50 17.08	330°45.24 55.96	340°26.98 42.71	111°10.27 50.70	Venus: 0.1
23	138° 36.54	203°13.84 16.73	345°48.66 56.27	355°29.75 42.81	126° 12.48 50.81	Mars: 0.2
Mar	pass. 13:47	ν-0.7' d-0.3' m-4.11	ν3.4' d0.3' m-1.25	ν2.8' d0.1' m-2.54	ν2.2' d0.1' m0.79	
IVICI.	puss. 15.41	≥ 0.7 U-0.5 III-4.11	νσ.¬ αυ.σ π-1.∠σ	ν Δ.Ο αΟ.1 III-Δ.J4	ν Δ.Δ. UU.1 IIIU.13	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.13	S10°43.19	$356^{\circ}39.27$	9.9'	N09°34.53	-16.3'	60.3'
1	191°35.20	42.29	11°8.14	10.0'	09°18.25	-16.3'	60.2'
2	206°35.27 221°35.35	41.39 •• 40.49	25°37.09 40°6.12	10.0' 10.1'	09°1.93 08°45.56	-16.4' -16.4'	60.2' 60.2'
4	236°35.42	39.58	54° 35.21	10.2	08° 29.16	-16.4	60.2
5	251°35.49	38.68	69°4.38	10.2'	$08^{\circ}12.72$	-16.5'	60.2'
6	266°35.56	\$10°37.78	83°33.61	10.3'	N07°56.25	-16.5	60.1'
7 8	281°35.63 296°35.70	36.88 35.97	98°2.92 112°32.29	10.4' 10.4'	07°39.75 07°23.21	-16.5' -16.6'	60.1' 60.1'
9	311°35.78	35.07	127°1.73	10.5'	07°6.65	-16.6'	60.1
10	326°35.85	34.17	141°31.23	10.6'	06°50.07	-16.6'	60.1'
11	341°35.92 356°36.00	33.26 \$10°32.36	156°0.80 170°30.43	10.6'	06°33.46 N06°16.82	-16.6'	60.0'
12 13	11°36.07	31.45	170 30.43 185°0.12	10.7' 10.8'	06°0.17	-16.7' -16.7'	60.0' 60.0'
14	26°36.14	30.55	199°29.88	10.8'	05°43.50	-16.7	60.0'
15	41°36.22	• • 29.64	213°59.69	10.9'	05°26.81	-16.7'	59.9'
16 17	56°36.29 71°36.37	28.74 27.83	228°29.56 242°59.49	10.9' 11.0'	05°10.11 04°53.39	-16.7' -16.7'	59.9' 59.9'
18	86°36.44	\$10°26.92	257° 29.48	11.0'	N04° 36.67	-16.7	59.9'
19	101°36.52	26.02	271°59.52	11.1'	04°19.93	-16.7'	59.8'
20	116°36.59	25.11	286°29.61	11.1'	04°3.19	-16.7'	59.8'
21 22	131°36.67 146°36.75	· · 24.20 23.30	300°59.76 315°29.96	11.2' 11.2'	03°46.44 03°29.69	-16.8' -16.8'	59.8' 59.7'
23	140 36.75 161°36.82	23.30	315 29.96 330°0.21	11.2	03 29.69 03°12.94	-16.8'	59.7' 59.7'
	SD = 16.2'	d = -0.9'			D = 16.4'		
		<u>u — 0.5</u>		JI			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°36.90 191°36.98	\$10°21.48 20.57	344°30.50 359°0.85	11.3' 11.4'	N02°56.18 02°39.43	-16.8' -16.8'	59.7' 59.7'
2	191 36.98 206°37.05	20.57 19.67	359°0.85 13°31.24	11.4' 11.4'	02° 39.43 02° 22.68	-16.8° -16.7'	59.7° 59.6'
3	221°37.13	• • 18.76	28°1.68	11.5'	02°5.93	-16.7'	59.6'
4	236°37.21	17.85	42°32.16	11.5'	01°49.19	-16.7'	59.6'
5 6	251°37.29 266°37.37	16.94 \$10°16.03	57°2.69 71°33.25	11.6' 11.6'	01°32.46 N01°15.74	-16.7' -16.7'	59.5' 59.5'
7	281°37.44	15.12	86°3.86	11.6'	00°59.03	-16.7'	59.5'
8	296°37.52	14.21	100°34.51	11.7'	00°42.33	-16.7'	59.5'
9	311°37.60	• • 13.30	115°5.19	11.7'	00°25.65	-16.7'	59.4'
10 11	326°37.68 341°37.76	12.39 11.48	129°35.92 144°6.68	11.8' 11.8'	N00°8.98 S00°7.66	-16.6' 16.6'	59.4' 59.4'
12	356°37.84	\$10° 10.57	158° 37.47	11.8'	500° 24.29	16.6	59.3
13	11°37.92	9.66	173°8.30	11.9'	$00^{\circ}40.90$	16.6'	59.3'
14	26°38.00	8.74	187°39.16 202°10.05	11.9' 11.9'	00°57.49 01°14.05	16.6'	59.3'
15 16	41°38.08 56°38.17	· · 7.83 6.92	202°10.05 216°40.97	11.9	01° 14.05 01° 30.58	16.5' 16.5'	59.2' 59.2'
17	71°38.25	6.01	231°11.92	12.0'	01°47.09	16.5	59.2'
18	86°38.33	\$10°5.09	245° 42.90	12.0'	S02°3.57	16.4	59.1'
19 20	101°38.41 116°38.49	4.18 3.27	260° 13.90 274° 44.93	12.0' 12.1'	02°20.02 02°36.44	16.4' 16.4'	59.1' 59.1'
21	131°38.57	• • 2.35	289° 15.99	12.1'	02°52.83	16.4	59.1°
22	146°38.66	1.44	303°47.07	12.1'	03°9.18	16.3'	59.0'
23	161°38.74	0.53	318° 18.17	12.1'	03°25.49	16.3'	59.0'
	SD = 16.2'	d = -0.9'		SI	O = 16.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	176°38.82	S09°59.61	332°49.29	12.1'	S03°41.77	16.2'	58.9'
1	191°38.91	58.70	347°20.43	12.2'	03°58.01	16.2'	58.9'
2	206°38.99 221°39.08	57.78 •• 56.87	1°51.59 16°22.77	12.2' 12.2'	04°14.21 04°30.36	16.2' 16.1'	58.9' 58.8'
3 4	221 39.08 236°39.16	55.95	30°53.96	12.2'	04° 30.36 04° 46.48	16.1	58.8'
5	251°39.24	55.04	$45^{\circ}25.17$	12.2'	$05^{\circ}2.55$	16.0'	58.7'
6	266°39.33	S09°54.12	59°56.39	12.2'	\$05°18.57	16.0'	58.7'
7 8	281°39.41 296°39.50	53.20 52.29	74°27.63 88°58.88	12.2' 12.3'	05°34.55 05°50.48	15.9' 15.9'	58.7' 58.6'
9	311°39.58	51.37	103°30.14	12.3'	05° 50.46	15.8'	58.6'
10	326°39.67	50.45	$118^{\circ}1.41$	12.3'	$06^{\circ}22.19$	15.8'	58.6'
11	341°39.76	49.54	132°32.69	12.3'	06°37.97	15.7'	58.5'
12 13	356°39.84 11°39.93	\$09°48.62 47.70	147°3.98 161°35.27	12.3' 12.3'	\$06°53.69 07°9.36	15.7' 15.6'	58.5' 58.5'
14	26°40.02	46.78	176°6.57	12.3'	07°24.97	15.6'	58.4'
15	41°40.10	• • 45.86	190°37.88	12.3'	07° 40.53	15.5'	58.4'
16	56°40.19 71°40.28	44.95	205°9.18 219°40.50	12.3'	07°56.02 08°11.46	15.4'	58.3'
17 18	71°40.28 86°40.37	44.03 \$09°43.11	219° 40.50 234° 11.81	12.3' 12.3'	08° 11.46 \$08° 26.84	15.4' 15.3'	58.3' 58.3'
19	101°40.46	42.19	248°43.12	12.3'	08°42.16	15.3	58.2
20	116°40.54	41.27	263° 14.44	12.3'	08°57.41	15.2'	58.2'
21 22	131°40.63 146°40.72	· · 40.35 39.43	277° 45.75 292° 17.06	12.3' 12.3'	09°12.60 09°27.72	15.1' 15.1'	58.2' 58.1'
23	146 40.72 161°40.81	39.43	292 17.06 306°48.37	12.3'	09 27.72 09°42.77	15.1 15.0'	58.1'
	SD = 16.2'	d = -0.9'			D = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-94%	
21	13:39	13:36	12:14	00:14	12:39		
22	13:32	13:29	12:13	01:04	13:28		
23	13:25	13:21	12:13	01:52	14:16		

February 24, 25, 26 UT (Wed., Thu., Fri.)

h	Aries	Venu	ıs	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	153°39.01		20°16.39	0°52.09	N15°56.59	10°32.52	N15° 42.91	141°14.70	N02°50.92			
1	168°41.47	233° 12.51	16.04	15°55.51	56.90	25°35.29	43.01	156° 16.92	51.03	Alpheratz	357°33.25	29° 14.46
2	183°43.94	248° 11.84	15.70	30°58.94	57.22	40°38.06	43.11	171°19.13	51.14	Ankaa	353°5.77	-42°9.63
3	198°46.40		• • 15.35	46°2.36	• • 57.53	55°40.83	• • 43.22	186°21.35	• • 51.25	Schedar	349°29.46	56°41.34
4	213°48.86	278° 10.51	15.00	61°5.79	57.84	70°43.60	43.32	201°23.56	51.36	Diphda	348°45.79	-17°50.36
5	228°51.33	293°9.85	14.65	76°9.21	58.16	85°46.37	43.42	216°25.78	51.47	Achernar	335°19.25	-57°6.13
6	243°53.79	308°9.19 S	20°14.30	91°12.63	N15°58.47	100°49.14	N15°43.52	231°27.99	N02°51.58	Hamal	327°49.37 313°15.01	23°35.50 89°23.00
7	258° 56.26	323°8.52	13.95	106°16.06	58.78	$115^{\circ}51.91$	43.62	246°30.21	51.70	Polaris Acamar	315°10.57	-40°11.97
8	273°58.72	338°7.86	13.60	121°19.48	59.10	130°54.67	43.72	261°32.42	51.81	Menkar	314°4.39	4°11.72
9	289°1.18		• • 13.25	136°22.90	• • 59.41	145°57.44	• • 43.82	276°34.63	• • 51.92	Mirfak	308°25.80	49°57.63
10	304°3.65	8°6.53	12.89	151°26.33	15°59.72	161°0.21	43.92	291°36.85	52.03	Aldebaran	290°37.55	16°33.81
11	319°6.11	23°5.87	12.54	166°29.75	16°0.03	176°2.98	44.02	306°39.06	52.14	Rigel	281°2.08	-8° 10.37
12	334°8.58	38°5.20 S 53°4.54	20°12.18	181°33.17	N16°0.34	191°5.75 206°8.52	N15° 44.12	321°41.28 336°43.49	N02°52.25	Capella	$280^{\circ}19.14$	46°1.62
13 14	349° 11.04 4° 13.50	68°3.88	11.82 11.46	196°36.60 211°40.02	0.65 0.96	200 0.52 221°11.29	44.22 44.32	351°45.71	52.36 52.47	Bellatrix	278°20.88	6°22.37
15	19° 15.97		. 11.11	226°43.44	• • 1.27	236°14.05	• • 44.41	6°47.92	• • 52.58	Elnath	277°59.51	28° 37.83
16	34° 18.43	98°2.55	10.74	241°46.86	1.58	251°16.82	44.51	21°50.13	52.69	Alnilam	275°35.82	-1°11.20
17	49°20.90	113°1.89	10.38	256° 50.28	1.89	266°19.59	44.61	36° 52.35	52.80	Betelgeuse	270°50.03	7°24.63
18	64°23.36	128°1.22 S	20°10.02	271°53.70	N16°2.20	281°22.36	N15°44.71	51°54.56	N02°52.92	Canopus	263°51.33	-52°42.86
19	79°25.83	143°0.56	9.66	286°57.13	2.51	296°25.13	44.81	66° 56.78	53.03	Sirius	258°24.48 255°4.23	-16°45.41 -29°0.77
20	94°28.29	157°59.90	9.29	$302^{\circ}0.55$	2.82	311°27.89	44.91	81°58.99	53.14	Adhara Procyon	255 4.25 244°48.74	5°9.17
21	109°30.75	172°59.24	• • 8.93	$317^{\circ}3.97$	• • 3.13	326°30.66	• • 45.01	97°1.20	• • 53.25	Pollux	243°14.86	27° 57.56
22	124°33.22	187° 58.57	8.56	332°7.39	3.43	341°33.43	45.11	112°3.42	53.36	Avior	234°13.46	-59° 35.99
23	139°35.68	202°57.91	8.20	347°10.81	3.74	356°36.19	45.21	127°5.63	53.47	Suhail	222°44.59	-43°32.72
Mer.	pass. 13:43	ν -0.7' d-0.3'	′ m-4.10	ν 3.4' d0.	3′ m-1.23	$\nu 2.8' d0$.1′ m-2.54	$\nu 2.2' \ d0$	1′ m0.79	Miaplacidus	221°37.01	-69°49.86
										Alphard	217°45.70	-8°46.77
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.24	11°49.87
0	154°38.15		S20°7.83	2°14.23	N16°4.05	11°38.96	N15° 45.31	142°7.84	N02°53.58	Dubhe	193°38.21	61°36.07
1	169° 40.61	232°56.59	7.46	17°17.65	4.35	26°41.73	45.41	157° 10.06	53.69	Denebola	182°22.84	14°24.99
2	184°43.07	247°55.92	7.09	32°21.06	4.66	41°44.49	45.51	172°12.27	53.81	Gienah	175°41.47	-17°41.71
3	199° 45.54	262°55.26	• • 6.72	47°24.48	• • 4.97	56°47.26	• • 45.61	187° 14.48	• • 53.92		172°57.50 171°49.17	-63° 14.95 -57° 15.90
4	214°48.00	277°54.60	6.34	62°27.90	5.27	71°50.03	45.71	202°16.70	54.03	Alioth	171 49.17 166°10.99	55°48.43
5	229°50.47	292°53.94	5.97	77°31.32	5.58	86°52.79	45.80	$217^{\circ}18.91$	54.14	Spica	158°20.21	-11°18.33
6	244°52.93		S20°5.60	92°34.74	N16°5.88	101°55.56	N15°45.90	232°21.12	N02°54.25	Alkaid	152°50.32	49° 10.31
7	259°55.39	322°52.62	5.22	107°38.15	6.19	116°58.33	46.00	247°23.34	54.36	Hadar	148°33.11	-60°30.11
8	274° 57.86	337°51.95	4.84	122°41.57	6.49	132°1.09	46.10	262°25.55	54.47		147°55.30	-36°30.20
9	290°0.32	352°51.29	• • 4.47	137°44.99	• • 6.79	147°3.86	• • 46.20	277°27.76	• • 54.59	Arcturus	145°46.12	19°2.18
10	305°2.79	7°50.63	4.09	152°48.41	7.10	162°6.62	46.30	292°29.97	54.70	Rigil Kent.	139°37.54	-60°56.70
11 12	320°5.25 335°7.71	22°49.97 37°49.31	3.71 \$20°3.33	167°51.82 182°55.24	7.40 N16°7.70	177°9.39 192°12.15	46.40 N15°46.49	307°32.19 322°34.40	54.81 N02°54.92	Kochab	137°19.45	74°2.20
13	350° 10.18	52°48.65	2.95	197°58.65	8.01	207°14.92	46.59	337°36.61	55.03	Zuben'ubi	136°53.93	-16°9.36
14	5° 12.64	67° 47.99	2.57	213°2.07	8.31	222°17.69	46.69	352°38.82	55.14	Alphecca	126°2.18	26°37.09
15	20° 15.11	82°47.33	2.18	228° 5.48	8.61	237°20.45	• • 46.79	7°41.04	• • 55.26	Antares	112°13.68	-26°29.51
16	35° 17.57	97°46.67	1.80	243°8.90	8.91	252°23.21	46.89	22°43.25	55.37	Atria Sabik	107°6.40 102°0.83	-69°4.29 -15°45.54
17	50°20.03	$112^{\circ}46.01$	1.41	258°12.31	9.21	267°25.98	46.99	37°45.46	55.48	Shaula	96°8.09	-37°7.30
18	65°22.50		S20°1.03	273°15.73	$N16^{\circ}9.51$	282°28.74	N15°47.08	52°47.67	N02°55.59	Rasalhague	95°57.01	12°32.22
19	80°24.96	142°44.69	0.64	288°19.14	9.81	297°31.51	47.18	67°49.88	55.70	Eltanin	90°41.58	51°28.77
20	95°27.43	157°44.03	20°0.25	303°22.55	10.11	312°34.27	47.28	82°52.10	55.81	Kaus Aust.	83°30.37	-34°22.21
21	110°29.89		19°59.86	318°25.97	. 10.41	327°37.04	• • 47.38	97°54.31	• • 55.93	Vega	80°32.26	38°48.25
22	125°32.36	187° 42.71	59.47	333°29.38	10.71	342°39.80	47.48	112°56.52	56.04	Nunki	75°45.80	-26° 15.73
23	140°34.82	202°42.05	59.08	348°32.79	11.01	357°42.57	47.57	127°58.73	56.15	Altair	61°58.49	8°56.29
Mer.p	pass. 13:39	ν -0.7' d-0.4'	′ m-4.09	ν 3.4′ d0.	3' m-1.21	ν 2.8′ d0.	1' m-2.54	$\nu 2.2' \ d0$.1' m 0.79	Peacock	53°3.47	-56°38.73
										Deneb	49°25.01	45°22.49
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°37.38	9°59.91 -46°49.77
0	155° 37.28	217°41.39 S		3°36.21		12°45.33			N02°56.26	Al Na'ir Fomalhaut	27°31.17 15°12.93	-46 49.77 -29°28.76
1	$170^{\circ}39.75$	232°40.73	58.30	18°39.62	11.60	27°48.09	47.77	158°3.15	56.37	Scheat	13°43.83	28°13.80
2	$185^{\circ}42.21$	247°40.07	57.90	33°43.03	11.90	42°50.86	47.87	173°5.37	56.49	Markab	13°28.45	15°21.06
3	200° 44.68		• • 57.51	48°46.44	• 12.20	57°53.62	• • 47.96	188°7.58	•• 56.60			
4	215°47.14	277° 38.75	57.11	63°49.85	12.49	72°56.38	48.06	203°9.79	56.71	Feb 24 Wed	SHA	Mer.pass
5	230°49.60	292°38.10	56.72	78°53.26	12.79	87°59.15	48.16	218° 12.00	56.82	Venus	64°34.16	09:28
6	245°52.07	307°37.44 S		93°56.67	N16°13.09	103°1.91	N15° 48.26		N02°56.93	Mars Jupiter		23:51
7 8	260° 54.53 275° 57.00	322°36.78 337°36.12	55.92 55.52	109°0.08 124°3.49	13.38 13.68	118°4.67 133°7.44	48.35 48.45	248° 16.42 263° 18.63	57.05 57.16	Saturn	347°35.69	23:14 14:33
9	275 57.00 290°59.46		55.52	124 3.49 139° 6.90	13.08	133 7.44 148°10.20	48.45 •• 48.55	203 18.03 278° 20.84	57.10			17.33
10	306°1.92	7° 34.80	54.72	154°10.31	14.27	163°12.96	48.65	293°23.05	57.38	Feb 25 Thu	SHA	Mer.pass
11	321°4.39	22°34.15	54.31	169°13.71	14.56	178°15.72	48.74	308° 25.27	57.49	Venus	63°19.10	09:29
12	336°6.85		19°53.91	184°17.12	N16°14.85	193°18.48	N15°48.84	323°27.48	N02°57.61	Mars		23:46
13	$351^{\circ}9.32$	52°32.83	53.50	199°20.53	15.15	208°21.25	48.94	338°29.69	57.72	Jupiter Saturn	217°0.82 347°29.70	23:09
14	6°11.78	67° 32.17	53.10	214°23.94	15.44	223°24.01	49.03	353°31.90	57.83	Saturn	341 29.10	14:29
15	21° 14.25		• • 52.69	229°27.34	• • 15.73	238°26.77	• • 49.13	8°34.11	•• 57.94	Feb 26 Fri	SHA	Mer.pass
16	36° 16.71	97°30.86	52.28	244°30.75	16.02	253°29.53	49.23	23°36.32	58.06	Venus	$62^{\circ}4.11$	09:30
17	51° 19.17	112°30.20	51.87	259°34.15	16.32	268°32.29	49.32	38°38.53	58.17	Mars		23:40
18	66°21.64		19°51.46	274°37.56	N16°16.61	283°35.05	N15°49.42	53°40.74	N02°58.28	Jupiter	217°8.05	23:05
19	81°24.10	142°28.89	51.05	289°40.96	16.90	298°37.82	49.52	68° 42.95	58.39	Saturn	347°23.66	14:26
20 21	96° 26.57 111° 29.03	157°28.23 172°27.58	50.64 •• 50.23	304°44.37 319°47.77	17.19 •• 17.48	313°40.58 328°43.34	49.61 •• 49.71	83°45.16 98°47.37	58.50 •• 58.62	Horizor	ntal parallax	
22	111 29.03 126°31.49	187° 26.92	49.81	334°51.18	17.46	343°46.10	49.71	96 47.57 113°49.58	58.73		Venus:	0.1
23	141°33.96	202°26.27	49.40	349°54.58	18.06	358°48.86	49.90	128° 51.79	58.84		Mars:	0.2
		ν -0.7' d-0.4'										
ivier.p	pass. 13:35	ν-υ.τ α-υ.4	111-4.09	νσ.4° α0.	3′ m-1.19	ν2.0° αU.	1′ m-2.53	ν 2.2′ d0	.1 1110.79			

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.90	S09°37.59	$321^{\circ}19.68$	12.3'	S09°57.76	14.9'	58.0'
1	191°40.99	36.67	335°50.98	12.3'	10°12.68	14.8'	58.0'
2	206°41.08 221°41.17	35.75 •• 34.82	350°22.27 4°53.56	12.3' 12.3'	10°27.53 10°42.31	14.8' 14.7'	58.0' 57.9'
4	236°41.26	33.90	19°24.84	12.3'	10° 57.02	14.6'	57.9'
5	251°41.35	32.98	33°56.11	12.3'	11° 11.65	14.6'	57.9'
6	266°41.44	509°32.06	48°27.38	12.3'	S11°26.21	14.5'	57.8'
7	281°41.53 296°41.62	31.14 30.21	62°58.63 77°29.87	12.2' 12.2'	11°40.69 11°55.10	14.4'	57.8'
8 9	296°41.62 311°41.72	29.29	92°1.10	12.2'	11°55.10 12°9.43	14.3' 14.3'	57.7' 57.7'
10	326°41.81	28.37	106°32.32	12.2'	12°23.68	14.2'	57.7'
11	341°41.90	27.44	121°3.53	12.2'	$12^{\circ}37.85$	14.1'	57.6'
12	356°41.99	S09°26.52	135°34.72	12.2'	\$12°51.95	14.0'	57.6'
13 14	11°42.09 26°42.18	25.60 24.67	150°5.90 164°37.06	12.2' 12.1'	13°5.96 13°19.88	13.9' 13.8'	57.6' 57.5'
15	41°42.27	• • 23.75	179°8.20	12.1'	13° 33.73	13.8'	57.5'
16	56°42.37	22.82	193°39.33	12.1'	$13^{\circ}47.49$	13.7'	57.4'
17	71°42.46	21.90	208°10.44	12.1'	14°1.16	13.6'	57.4'
18 19	86°42.55 101°42.65	\$09°20.97 20.05	222°41.53 237°12.60	12.1' 12.1'	\$14° 14.75 14° 28.25	13.5' 13.4'	57.4' 57.3'
20	101 42.05 116°42.74	20.05 19.12	251°43.66	12.1	14 28.25 14°41.66	13.4	57.3'
21	131°42.84	. 18.20	266°14.69	12.0'	14°54.98	13.2'	57.3'
22	146°42.93	17.27	280°45.70	12.0'	15°8.22	13.1'	57.2'
23	161°43.03	16.34	295°16.69	12.0'	15°21.36	13.1'	57.2'
	SD = 16.2'	d = -0.9'		SE	0 = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°43.12	S09°15.42	309°47.66	11.9'	S15°34.41	13.0'	57.1'
1	191°43.22	14.49	324°18.60	11.9'	15°47.37	12.9'	57.1'
2	206°43.32 221°43.41	13.56 •• 12.64	338°49.52 353°20.42	11.9' 11.9'	16° 0.23 16° 13.00	12.8' 12.7'	57.1' 57.0'
4	236°43.51	11.71	7°51.29	11.8'	16°25.68	12.6'	57.0'
5	251°43.60	10.78	22°22.14	11.8'	16°38.25	12.5'	57.0'
6	266°43.70	S09°9.85	36°52.96	11.8'	S16°50.73	12.4'	56.9'
7	281°43.80 296°43.90	8.92 7.99	51°23.76 65°54.53	11.8' 11.7'	17°3.12 17°15.40	12.3' 12.2'	56.9'
8 9	311°43.99	7.99 • • 7.07	80°25.27	11.7'	17 15.40 17°27.59	12.2	56.8' 56.8'
10	326°44.09	6.14	94°55.99	11.7'	17°39.67	12.0'	56.8'
11	341°44.19	5.21	$109^{\circ}26.67$	11.7'	$17^{\circ}51.65$	11.9'	56.7'
12	356°44.29	S09°4.28	123°57.33	11.6'	\$18°3.53	11.8'	56.7'
13 14	11°44.39 26°44.49	3.35 2.42	138°27.96 152°58.56	11.6' 11.6'	18° 15.31 18° 26.99	11.7' 11.6'	56.7' 56.6'
15	41°44.59	. 1.49	167°29.13	11.5'	18°38.56	11.5'	56.6'
16	56°44.69	09°0.56	181°59.67	11.5'	$18^{\circ}50.02$	11.4'	56.6'
17	71°44.78	08°59.63	196°30.19	11.5'	19°1.38	11.3'	56.5'
18 19	86°44.88 101°44.98	\$08° 58.70 57.76	211°0.67 225°31.12	11.5' 11.4'	\$19° 12.64 19° 23.78	11.1' 11.0'	56.5' 56.5'
20	116° 45.09	56.83	240°1.54		19° 34.82		56.4
21	131°45.19	• • 55.90	254°31.92	11.4'	19°45.75	10.8'	56.4
22	146°45.29	54.97	269°2.28	11.3'	19°56.57	10.7'	56.4'
23	161°45.39	54.04	283°32.61	11.3'	20°7.28	10.6'	56.3'
	SD = 16.2'	d = -0.9'		SL	0 = 15.6'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°45.49 191°45.59	\$08°53.10 52.17	298°2.90 312°33.16	11.3' 11.2'	\$20°17.88 20°28.36	10.5'	56.3'
1 2	191°45.59 206°45.69	52.17 51.24	312°33.16 327°3.39	11.2'	20° 28.36 20° 38.74	10.4' 10.3'	56.3' 56.2'
3	221°45.79	50.31	341°33.59	11.2'	20°49.00	10.1	56.2
4	236°45.90	49.37	356°3.75	11.1'	20°59.15	10.0'	56.1'
5	251°46.00	48.44 \$08° 47.51	10°33.88 25°3.98	11.1'	21°9.18 S21°19.10	9.9'	56.1'
6 7	266°46.10 281°46.21	508°47.51 46.57	25°3.98 39°34.05	11.1' 11.0'	21° 28.90	9.8' 9.7'	56.1' 56.1'
8	296°46.31	45.64	54°4.09	11.0'	21°38.59	9.6'	56.0'
9	311°46.41	• • 44.70	68°34.09	11.0'	21°48.16	9.5'	56.0'
10	326°46.52	43.77	83°4.06	10.9'	21°57.61	9.3'	56.0'
11 12	341°46.62 356°46.72	42.83 \$08°41.90	97°34.00 112°3.90	10.9' 10.9'	22°6.95 \$22°16.17	9.2' 9.1'	55.9' 55.9'
13	11°46.83	40.96	112 3.90 126°33.77	10.8	22°25.26	9.0'	55.9'
14	26°46.93	40.03	141°3.61	10.8'	22°34.24	8.9'	55.8'
15	41°47.04	• • 39.09	155°33.42	10.8'	22°43.10	8.7'	55.8'
16 17	56°47.14 71°47.25	38.15 37.22	170°3.20 184°32.94	10.7' 10.7'	22°51.84 23°0.45	8.6' 8.5'	55.8' 55.7'
18	71 47.25 86°47.35	508° 36.28	184 32.94 199°2.65	10.7'	523°8.94	8.4'	55.7'
19	101°47.46	35.34	213°32.33	10.6'	23° 17.31	8.2'	55.7'
20	116°47.57	34.41	228°1.98	10.6'	23°25.56	8.1'	55.6'
21 22	131°47.67 146°47.78	· · 33.47 32.53	242°31.60 257°1.19	10.6' 10.6'	23°33.69 23°41.69	8.0' 7.9'	55.6' 55.6'
23	140 47.78 161°47.89	31.60	271°30.74	10.5	23°49.56	7.9 7.8'	55.6'
	SD = 16.1'	d = -0.9'		SF	0 = 15.4'		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-71%
24	13:16	13:12	12:13	02:40	15:04	
25	13:08	13:03	12:13	03:28	15:52	
26	12:58	12:53	12:13	04:16	16:41	

February 27, 28, 01 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	156° 36.42	217°25.61 \$19°48.98	4°57.98 N16°18.35	13°51.62 N15°50.00	143°54.00 N02°58.95
1	171° 38.89	232°24.95 48.57	20°1.38 18.64	28°54.38 50.10	158° 56.21 59.07
2	186° 41.35	247°24.30 48.15	35°4.79 18.92	43°57.14 50.19	173°58.42 59.18
3	201°43.81	262°23.64 · · 47.73	50°8.19 · · 19.21	58°59.90 · · 50.29	189°0.63 · · 59.29
4	201 45.81 216°46.28	277°22.99 47.31	65°11.59 19.50	74°2.66 50.38	204°2.83 59.40
5	231°48.74	292°22.33 46.89	80°14.99 19.79	89°5.42 50.48	219°5.04 59.52
6	246°51.21	307°21.68 S19°46.47	95°18.39 N16°20.07	104°8.18 N15°50.58	234°7.25 N02°59.63
7	261°53.67	322°21.02 46.05	110°21.79 20.36	119°10.94 50.67	249°9.46 59.74
8	276°56.14	337°20.37 45.62	125°25.19 20.64	134°13.70 50.77	264°11.67 02°59.86
9	291°58.60	352°19.71 · · 45.20	140°28.59 · · 20.93	149°16.46 · · 50.86	279°13.88 02°59.97
10	307°1.06	7° 19.06 44.77	155°31.99 21.21	164°19.22 50.96	294°16.09 0.08
11	322°3.53	22°18.40 44.35	170°35.38 21.50	179°21.98 51.05	309°18.30 0.19
12	337°5.99	37°17.75 \$19°43.92	185°38.78 N16°21.78	194°24.73 N15°51.15	324°20.51 N03°0.31
13	352°8.46	52°17.10 43.49	200°42.18 22.07	209°27.49 51.25	339°22.72 0.42
14	$7^{\circ}10.92$	67°16.44 43.06	215°45.57 22.35	224°30.25 51.34	354°24.92 0.53
15	22° 13.38	82°15.79 · · 42.63	230°48.97 · · 22.63	239°33.01 · · 51.44	9°27.13 · · 0.64
16	37° 15.85	97°15.14 42.20	245°52.37 22.92	254°35.77 51.53	24°29.34 0.76
17	52° 18.31	112°14.48 41.77	260°55.76 23.20	269°38.53 51.63	39°31.55 0.87
18	67°20.78	127°13.83 S 19°41.33	275°59.16 N16°23.48	284°41.28 N15°51.72	54°33.76 N03°0.98
19	82°23.24	142°13.18 40.90	291°2.55 23.76	299°44.04 51.82	69° 35.97 1.10
20	97°25.71	157°12.52 40.46	306°5.94 24.04	314°46.80 51.91	84°38.17 1.21
21	112°28.17	172°11.87 · · 40.03	321°9.34 · · 24.32	329°49.56 · · 52.01	99°40.38 · · 1.32
22	127°30.63	187°11.22 39.59	336°12.73 24.60	344°52.31 52.10	114° 42.59 1.44
23	142°33.10	202°10.57 39.15	351°16.12 24.88	359°55.07 52.20	129°44.80 1.55
Mer.p	pass. 13:31	ν -0.7 $'$ d-0.4 $'$ m-4.08	$ u 3.4' \ d0.3' \ \text{m-}1.17$	$\nu 2.8' \ d0.1' \ \text{m-}2.53$	ν2.2′ d0.1′ m0.79
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
3un 0	157° 35.56	217°9.92 \$19°38.71	6°19.51 N16°25.16	14°57.83 N15°52.29	144°47.01 N03°1.66
1	157 35.50 172°38.03	232°9.26 38.27	21°22.91 25.44	30°0.58 52.39	159°49.21 1.77
2	172 30.03 187°40.49	247°8.61 37.83	36°26.30 25.72	45°3.34 52.48	174°51.42 1.89
3	202° 42.95	262°7.96 · · 37.39	51°29.69 · · 26.00	60°6.10 · · 52.58	189°53.63 · · 2.00
4	217° 45.42	277°7.31 36.95	66°33.08 26.27	75°8.85 52.67	204°55.84 2.11
5	232° 47.88	292°6.66 36.50	81°36.47 26.55	90°11.61 52.76	219°58.04 2.23
6	247°50.35	307°6.01 \$19°36.06	96°39.85 N16°26.83	105°14.37 N15°52.86	235°0.25 N03°2.34
7	262°52.81	322°5.36 35.61	111°43.24 27.10	120°17.12 52.95	250°2.46 2.45
8	277°55.27	337°4.71 35.16	126°46.63 27.38	135°19.88 53.05	265°4.67 2.57
9	292°57.74	352°4.06 · · 34.71	141°50.02 · · 27.66	150°22.63 · · 53.14	280°6.87 · · 2.68
10	308°0.20	7°3.41 34.27	156°53.40 27.93	165°25.39 53.24	295°9.08 2.79
11	323°2.67	22°2.76 33.82	171°56.79 28.21	180°28.14 53.33	310° 11.29 2.91
12	338°5.13	37°2.11 S 19°33.37	187°0.18 N16°28.48	195°30.90 N15°53.42	325°13.49 N03°3.02
13	353°7.60	52°1.46 32.91	202°3.56 28.75	210°33.65 53.52	340°15.70 3.13
14	$8^{\circ}10.06$	67°0.81 32.46	217°6.94 29.03	225°36.41 53.61	355°17.91 3.25
15	$23^{\circ}12.52$	82°0.16 · · 32.01	232°10.33 · · 29.30	240°39.16 · · 53.71	10°20.11 · · 3.36
16	$38^{\circ}14.99$	96°59.51 31.55	247°13.71 29.57	255°41.92 53.80	25°22.32 3.47
17	53° 17.45	111°58.86 31.10	262°17.10 29.84	270°44.67 53.89	40°24.53 3.59
18	68° 19.92	126°58.21 \$19°30.64	277°20.48 N16°30.12	285°47.42 N15°53.99	55°26.73 N03°3.70
19	83°22.38	141°57.56 30.18	292°23.86 30.39	300°50.18 54.08	70°28.94 3.81
20	98°24.84	156°56.91 29.72	307°27.24 30.66	315°52.93 54.17	85°31.15 3.93
21	113°27.31	171°56.26 · · 29.26	322°30.62 · · 30.93	330°55.69 · · 54.27	100°33.35 · · 4.04
22	128° 29.77	186°55.62 28.80	337°34.00 31.20	345°58.44 54.36	115°35.56 4.16
23	143°32.24	201°54.97 28.34	352°37.38 31.47	1°1.19 54.45	130° 37.77 4.27
Mer.p	pass. 13:27	ν -0.7′ d-0.4′ m-4.07	u3.4 $'$ d 0.3 $'$ m-1.15	$ u 2.8' \ d0.1' \ \text{m-}2.53$	$\nu 2.2' \ d0.1' \ \text{m}0.79$
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Mon 0	158° 34.70	216°54.32 S19°27.88	GHA Dec 7°40.76 N16°31.74	16°3.95 N15°54.55	145°39.97 N03°4.38
1	173° 37.17	231°53.67 27.41	22°44.14 32.01	31°6.70 54.64	160°42.18 4.50
2	188° 39.63	246°53.03 26.95	37°47.52 32.27	46° 9.45 54.73	175°44.38 4.61
3	203°42.09	261°52.38 · · 26.48	52°50.89 · · 32.54	61°12.20 · · 54.83	190°46.59 · · 4.72
4	218° 44.56	276°51.73 26.02	67°54.27 32.81	76°14.96 54.92	205°48.80 4.84
5	233° 47.02	291°51.09 25.55	82°57.65 33.08	91°17.71 55.01	220°51.00 4.95
6	248°49.49	306°50.44 S 19°25.08	98°1.02 N16°33.34	106°20.46 N15°55.10	235°53.21 N03°5.07
7	263°51.95	321°49.79 24.61	113°4.40 33.61	121°23.21 55.20	250°55.41 5.18
8	278°54.41	336°49.15 24.14	128°7.77 33.87	136°25.97 55.29	265°57.62 5.29
9	293°56.88	351°48.50 · · 23.67	143°11.14 · · 34.14	151°28.72 · · 55.38	280°59.82 · · 5.41
10	308°59.34	6°47.86 23.20	158°14.52 34.40	166°31.47 55.48	296°2.03 5.52
11	324°1.81	21°47.21 22.73	173°17.89 34.67	181°34.22 55.57	311°4.23 5.63
12	339°4.27	36°46.56 S 19°22.25	188°21.26 N16°34.93	196°36.97 N15°55.66	326°6.44 N03°5.75
13	354°6.74	51°45.92 21.78	203°24.63 35.20	211°39.72 55.75	341°8.64 5.86
14	9°9.20	66° 45.27 21.30	218°28.00 35.46	226°42.47 55.84	356°10.85 5.98 \(\sum_
15	24°11.66	81°44.63 · · 20.82	233°31.37 · · 35.72	241°45.22 · · 55.94	11°13.05 · · 6.09
16	39°14.13	96°43.98 20.35	248°34.74 35.98	256°47.97 56.03	26° 15.26 6.20
17	54°16.59	111°43.34 19.87	263°38.11 36.25	271°50.72 56.12	41°17.46 6.32
18	69°19.06	126°42.70 \$19°19.39	278°41.48 N16°36.51	286°53.47 N15°56.21	56°19.67 N03°6.43
19	84°21.52	141°42.05 18.91	293°44.85 36.77	301°56.22 56.31	71°21.87 6.55
20	99°23.98	156°41.41 18.43	308°48.22 37.03	316°58.97 56.40	86°24.08 6.66
21	114°26.45	171°40.76 · · 17.94	323°51.58 · · 37.29	332°1.72 · · 56.49	101°26.28 · · 6.77
22 23	129°28.91 144°31.38	186° 40.12 17.46 201° 39.48 16.97	338°54.95 37.55 353°58.31 37.81	347°4.47 56.58 2°7.22 56.67	116°28.49 6.89 131°30.69 7.00
Mer.p	bass. 13:23	ν -0.6′ d-0.5′ m-4.07	u3.4′ d 0.3′ m -1.13	ν 2.8′ d 0.1′ m -2.52	$ u 2.2' \ d0.1' \ { m m0.79}$

	Stars	
	SHA	Dec
Alpheratz	357°33.25	29°14.46
Ankaa	353°5.77 349°29.47	-42°9.62
Schedar Diphda	349°29.47 348°45.79	56°41.33 -17°50.36
Achernar	335°19.27	-57°6.12
Hamal	$327^{\circ}49.38$	23° 35.49
Polaris	313°16.23	89°23.00
Acamar Menkar	315°10.58 314°4.40	-40°11.97 4°11.72
Mirfak	308°25.82	49° 57.63
Aldebaran	290°37.56	16°33.81
Rigel	281°2.09	-8°10.37
Capella Bellatrix	280°19.16 278°20.89	46°1.62 6°22.36
Elnath	277°59.52	28° 37.83
Alnilam	275°35.83	-1°11.21
Betelgeuse	270°50.04	7°24.63
Canopus Sirius	263°51.35 258°24.49	-52°42.87 -16°45.41
Adhara	255°4.24	-10 45.41 -29°0.77
Procyon	244°48.74	5°9.17
Pollux	243°14.87	27°57.56
Avior	234°13.47 222°44.59	-59°36.00 -43°32.74
Suhail Miaplacidus	222 44.59 221°37.03	-43 32.74 -69°49.88
Alphard	217°45.70	-8°46.78
Regulus	207°32.23	11°49.87
Dubhe	193°38.20	61°36.08
Denebola Gienah	182°22.83 175°41.46	14°24.99 -17°41.72
Acrux	173° 41.40	-63° 14.96
Gacrux	$171^{\circ}49.14$	-57° 15.92
Alioth	166°10.97	55°48.43
Spica Alkaid	158°20.19 152°50.30	-11°18.33 49°10.31
Hadar	152 50.50 148°33.07	-60° 30.12
Menkent	147°55.28	-36°30.21
Arcturus	145°46.10	19°2.18
Rigil Kent. Kochab	139°37.50 137°19.39	-60°56.71 74°2.21
Zuben'ubi	136°53.91	-16°9.36
Alphecca	126°2.16	26°37.09
Antares	112°13.65	-26°29.51
Atria Sabik	107°6.34 102°0.80	-69°4.29 -15°45.54
Shaula	96°8.06	-37°7.30
Rasalhague	95°56.99	12°32.22
Eltanin	90°41.55	51°28.77
Kaus Aust. Vega	83°30.34 80°32.23	-34°22.20 38°48.25
Vega Nunki	75°45.77	-26°15.73
Altair	61°58.47	8° 56.28
Peacock	53°3.45	-56°38.71
Deneb Enif	49°24.99 33°37.37	45°22.48 9°59.90
Al Na'ir	33 37.37 27°31.16	9 59.90 -46°49.75
Fomalhaut	$15^{\circ}12.93$	-29°28.75
Scheat	13°43.83	28°13.80
Markab	13°28.45	15°21.05
Feb 27 Sat	SHA	Mer.pass
Venus	60°49.19 208°21.56	09:31
Mars Jupiter	208 21.50 217°15.20	23:35 23:00
Saturn	347°17.57	14:22
Feb 28 Sun	SHA	Mer.pass
Venus	59°34.35	09:32
Mars	208°43.95	23:29
Jupiter Saturn	217°22.27 347°11.44	22:56 14:19
Mar 01 Mon Venus	SHA 58°19.62	Mer.pass 09:33
Mars	209°6.06	23:24
Jupiter	$217^{\circ}29.24$	22:52
Saturn	347°5.27	14:15

Horizontal parallax

Venus: Mars: 0.1 0.2

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.99	S08°30.66	286°0.27	10.5'	S23°57.31	7.6'	55.5'
1	191°48.10	29.72	300°29.77	10.5'	24°4.94	7.5'	55.5'
2	206° 48.21 221° 48.32	28.78 •• 27.84	314°59.23 329°28.67	10.4' 10.4'	24°12.43 24°19.81	7.4' 7.2'	55.5' 55.4'
4	236° 48.42	26.90	343°58.08	10.4	24°27.05	7.1	55.4'
5	251°48.53	25.96	358°27.46	10.4'	$24^{\circ}34.17$	7.0'	55.4'
6	266° 48.64	S08°25.03	12°56.82	10.3'	\$24°41.16	6.9'	55.4'
7 8	281° 48.75 296° 48.86	24.09 23.15	27°26.14 41°55.44	10.3' 10.3'	24°48.02 24°54.75	6.7' 6.6'	55.3' 55.3'
9	311° 48.97	. 22.21	56° 24.71	10.2	25°1.36	6.5	55.3'
10	326°49.08	21.27	70°53.96	10.2'	25°7.83	6.3'	55.3'
11	341°49.19 356°49.30	20.33	85°23.18	10.2'	25°14.18	6.2'	55.2'
12 13	356 49.30 11°49.41	\$08°19.39 18.45	99°52.37 114°21.54	10.2' 10.1'	\$25°20.39 25°26.48	6.1' 6.0'	55.2' 55.2'
14	26° 49.52	17.50	128°50.69	10.1	25°32.43	5.8'	55.1'
15	41°49.63	•• 16.56	143° 19.81	10.1'	25°38.25	5.7'	55.1'
16	56° 49.74 71° 49.85	15.62	157°48.91	10.1'	25°43.94 25°49.50	5.6'	55.1'
17 18	71°49.85 86°49.96	14.68 \$08°13.74	172° 17.99 186° 47.05	10.1' 10.0'	25°49.50 S25°54.93	5.4' 5.3'	55.1' 55.0'
19	101°50.07	12.80	201°16.08	10.0'	26° 0.22	5.2'	55.0'
20	116°50.18	11.85	$215^{\circ}45.10$	10.0'	$26^{\circ}5.38$	5.0'	55.0'
21	131°50.29	• • 10.91	230° 14.10	10.0'	26°10.41	4.9'	55.0'
22 23	146°50.41 161°50.52	9.97 9.03	244°43.07 259°12.03	10.0' 9.9'	26°15.31 26°20.07	4.8' 4.6'	55.0' 54.9'
23	SD = 16.1'		259 12.05		0 = 15.1'	7.0	57.5
		d = -0.9'		SL	v = 15.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 50.63	\$08°8.08	273°40.98	9.9'	S 26°24.70	4.5'	54.9'
1	191°50.74 206°50.86	7.14 6.20	288°9.90 302°38.81	9.9' 9.9'	26°29.19 26°33.55	4.4' 4.2'	54.9' 54.9'
2	206°50.86 221°50.97	6.20 • • 5.25	302°38.81 317°7.71	9.9'	26°33.55 26°37.77	4.2'	54.9° 54.8'
4	236° 51.08	4.31	331°36.59	9.9'	26°41.86	4.0'	54.8'
5	251°51.20	3.36	346°5.46	9.9'	26°45.82	3.8'	54.8'
6	266°51.31 281°51.42	508°2.42	0°34.31 15°3.15	9.8'	\$26°49.64 26°53.32	3.7'	54.8'
7 8	281°51.42 296°51.54	1.48 08°0.53	15° 3.15 29° 31.99	9.8' 9.8'	26°53.32 26°56.87	3.5' 3.4'	54.8' 54.7'
9	311°51.65	07°59.59	44°0.81	9.8'	27°0.29	3.3'	54.7'
10	326°51.77	58.64	58°29.62	9.8'	$27^{\circ}3.56$	3.1'	54.7'
11	341°51.88	57.70	72°58.43	9.8'	27° 6.71	3.0'	54.7'
12 13	356°52.00 11°52.11	\$07°56.75 55.80	87°27.22 101°56.02	9.8' 9.8'	\$27°9.71 27°12.58	2.9' 2.7'	54.7' 54.6'
14	26°52.23	54.86	116° 24.80	9.8'	27°15.32	2.6'	54.6'
15	41°52.35	• • 53.91	130°53.58	9.8'	$27^{\circ}17.92$	2.5'	54.6'
16	56° 52.46	52.97	145°22.36	9.8'	27°20.38	2.3'	54.6'
17 18	71°52.58 86°52.69	52.02 \$07°51.07	159°51.13 174°19.90	9.8' 9.8'	27°22.71 \$27°24.90	2.2' 2.1'	54.6' 54.6'
19	101°52.81	50.12	188° 48.68	9.8'	27°26.95	1.9'	54.5
20	116°52.93	49.18	203°17.45	9.8'	27°28.87	1.8'	54.5'
21	131°53.05	• • 48.23	217°46.22	9.8'	27°30.65	1.6'	54.5'
22 23	146°53.16 161°53.28	47.28 46.33	232°14.99 246°43.77	9.8' 9.8'	27°32.29 27°33.80	1.5' 1.4'	54.5' 54.5'
25	SD = 16.1'	d = -0.9'			0 = 15.0'	2	31.3
	3D = 10.1	a = -0.9		- JL	r = 15.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°53.40	S07°45.39	261°12.55	9.8'	\$27°35.18	1.2'	54.5'
1 2	191°53.52 206°53.63	44.44 43.49	275°41.34 290°10.13	9.8' 9.8'	27°36.41 27°37.51	1.1' 1.0'	54.4' 54.4'
3	221°53.75	• • 42.54	304°38.92	9.8'	27°38.48	0.8	54.4
4	236°53.87	41.59	319°7.73	9.8'	27°39.31	0.7'	54.4'
5	251°53.99	40.64	333°36.54	9.8'	27°40.00	0.6'	54.4'
6 7	266°54.11 281°54.23	\$07°39.69 38.75	348°5.37 2°34.20	9.8' 9.8'	\$27°40.56 27°40.98	0.4' 0.3'	54.4' 54.4'
8	296° 54.35	37.80	17°3.05	9.9'	27°41.26	0.3	54.3'
9	311°54.47	• • 36.85	31°31.91	9.9'	27°41.42	0.0'	54.3'
10	326°54.59	35.90	46°0.78	9.9'	27°41.43	-0.1'	54.3'
11 12	341°54.71 356°54.83	34.95 \$07°34.00	60°29.66 74°58.57	9.9' 9.9'	27°41.31 \$27°41.06	-0.3' -0.4'	54.3' 54.3'
13	11° 54.95	33.05	89° 27.49	9.9'	27°40.67	-0.4 -0.5'	54.3'
14	26°55.07	32.09	103°56.42	10.0'	27°40.15	-0.7'	54.3'
15	41°55.19	• • 31.14	118° 25.38	10.0'	27°39.49	-0.8'	54.3'
16 17	56°55.31 71°55.43	30.19 29.24	132°54.35 147°23.34	10.0' 10.0'	27°38.70 27°37.77	-0.9' -1.1'	54.2' 54.2'
18	86° 55.56	507°28.29	147 23.34 161°52.36	10.0'	\$27°36.72	-1.1	54.2'
19	101°55.68	27.34	176°21.39	10.1'	27°35.53	-1.3'	54.2'
20	116°55.80	26.39	190° 50.45	10.1'	27°34.20	-1.5'	54.2'
21 22	131°55.92 146°56.04	· · 25.43 24.48	205° 19.54 219° 48.65	10.1' 10.1'	27°32.74 27°31.16	-1.6' -1.7'	54.2' 54.2'
23	161° 56.17	23.53	219 46.05 234° 17.78	10.1	27°29.44	-1.7 -1.9'	54.2'
	SD = 16.1'	d = -0.9'		SF	0 = 14.9'		
				- 52	1		

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

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°			_			
N 70°						
68°						
66°						
64° 62°	03:40	04.44	06.16	06:23	07.07	07.00
62°	02:57 02:28	04:44 03:58	06:16 05:09	07:07 07:36	07:07 07:53	07:22 08:29
N 58° 56°	02:06 01:48	03:28 03:05	04:34 04:09	07:59 08:17	08:23 08:46	09:04 09:29
54°	01:46	03:05	03:49	08:33	09:05	09:29
52°	01:33	02:40	03:49	08:46	09:03	10:06
50°	01:08	02:17	03:17	08:58	09:34	10:21
45°	00:44	01:50	02:48	09:23	10:03	10:50
N 40°	00:25	01:28	02:25	09:43	10:25	11:13
35°	00:09	01:10	02:06	09:59	10:43	11:32
30°		00:55	01:50	10:13	10:59	11:49
20°		00:28	01:22	10:38	11:26	12:16
N 10° 0°	22.45	00:06	00:59	10:59	11:49	12:40
1	23:45		00:37	11:19	12:10	13:02
S 10° 20°	23:24	02.51	00:15	11:38 12:00	12:32 12:55	13:24
30°	23:02 22:37	23:51 23:24		12:00	12:55	13:47 14:15
35°	22:22	23:08		12:39	13:38	14:31
40°	22:04	22:49	23:41	12:56	13:56	14:50
45°	21:43	22:27	23:19	13:16	14:18	15:12
S 50°	21:17	21:58	22:50	13:42	14:47	15:41
52°	21:04	21:44	22:36	13:54	15:01	15:56
54°	20:50	21:28	22:19	14:09	15:17	16:12
56°	20:33	21:08	22:00	14:25	15:37	16:32
58°	20:12	20:44	21:35	14:45	16:00	16:57
S 60°	19:46	20:12	21:02	15:11	16:32	17:30

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	62-43%
27	12:48	12:43	12:13	05:06	17:32	
28	12:37	12:32	12:13	05:58	18:23	
01	12:26	12:21	12:12	06:49	19:15	

March 02, 03, 04 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	159°33.84	216°38.84 \$19°16.49	9°1.68 N16°38.06	17°9.97 N15°56.76	146°32.90 N03°7.12	SIIA
1	174°36.31	231°38.19 16.00	24°5.04 38.32	32°12.72 56.86	161°35.10 7.23	Alpheratz 357°33.25
2	189°38.77	246°37.55 15.51	39°8.41 38.58	47°15.47 56.95	176° 37.30 7.35	Ankaa 353° 5.78
3	204°41.23	261°36.91 · · 15.03	54°11.77 · · 38.84	62°18.22 · · 57.04	191°39.51 · · 7.46	Schedar 349°29.47
4	219°43.70	276°36.27 14.54	69°15.13 39.09	77°20.97 57.13	206°41.71 7.57	Diphda 348°45.79
5	234°46.16	291°35.62 14.05	84°18.49 39.35	92°23.72 57.22	221°43.92 7.69	Achernar 335°19.29
6	249° 48.63	306°34.98 \$19°13.55	99°21.85 N16°39.61	107°26.46 N15°57.31	236°46.12 N03°7.80	Hamal 327°49.38
7	264°51.09	321°34.34 13.06	114°25.21 39.86	122°29.21 57.40	251°48.32 7.92	Polaris 313°17.47
8	279°53.55	336°33.70 12.57	129°28.57 40.12	137°31.96 57.49	266° 50.53 8.03	Acamar 315°10.60
9	294°56.02	351°33.06 · · 12.07	144°31.93 · · 40.37	152°34.71 · · 57.58	281°52.73 · · 8.15	Menkar 314° 4.41
10	309°58.48	6°32.42 11.58	159°35.29 40.63	167°37.45 57.68	296°54.93 8.26	Mirfak 308°25.83
11	325°0.95	21°31.78 11.08	174°38.65 40.88	182°40.20 57.77	311°57.14 8.37	Aldebaran 290°37.57
12	340°3.41	36°31.14 S 19°10.59	189°42.00 N16°41.13	197°42.95 N15°57.86	326°59.34 N03°8.49	Rigel 281°2.10
13	355°5.88	51°30.50 10.09	204°45.36 41.38	212°45.70 57.95	342°1.55 8.60	Capella 280°19.17
14	10°8.34	66°29.86 9.59	219°48.71 41.64	227°48.44 58.04	357°3.75 8.72	Bellatrix 278°20.90 Elnath 277°59.53
15	$25^{\circ}10.80$	81°29.22 · · 9.09	234°52.07 · · 41.89	242°51.19 · · 58.13	12°5.95 · · 8.83	Alnilam 275°35.84
16	40°13.27	96°28.58 8.59	249°55.42 42.14	257°53.94 58.22	27°8.16 8.95	Betelgeuse 270°50.05
17	55° 15.73	111°27.94 8.09	264°58.78 42.39	272°56.68 58.31	42°10.36 9.06	Canopus 263°51.37
18	70° 18.20	126°27.30 \$19°7.58	280°2.13 N16°42.64	287°59.43 N15°58.40	57°12.56 N03°9.18	Sirius 258°24.50
19	85°20.66	141°26.66 7.08	295° 5.48 42.89	303°2.17 58.49	72°14.76 9.29	Adhara 255° 4.25
20	100°23.12	156°26.02 6.58	310°8.83 43.14	318°4.92 58.58	87° 16.97 9.41	Procyon 244°48.75
21	115°25.59	171°25.38 · · 6.07	325°12.18 · · 43.39	333°7.66 · · 58.67	102°19.17 · · 9.52	Pollux 243°14.87
22	130°28.05	186°24.74 5.56	340°15.53 43.64	348°10.41 58.76	117°21.37 9.63	Avior 234°13.49
23	145°30.52	201°24.11 5.06	355°18.88 43.89	3°13.15 58.85	132°23.58 9.75	Suhail 222°44.59
Mer.	pass. 13:20	ν -0.6' d-0.5' m-4.06	ν 3.4′ d0.3′ m-1.11	$\nu 2.7' \ d0.1' \ \text{m-}2.52$	$\nu 2.2' \ d0.1' \ \text{m}0.78$	Miaplacidus 221°37.05
						Alphard 217°45.70
	6114	G114 B	6114	G.1.4 D	6114	Regulus 207°32.23
Wed	GHA	GHA Dec 216°23.47 S 19°4.55	GHA Dec 10°22.23 N16°44.13	GHA Dec	GHA Dec	Dubhe 193°38.19
0 1	160° 32.98 175° 35.45			18°15.90 N15°58.94 33°18.64 59.03	147°25.78 N03°9.86 162°27.98 9.98	Denebola 182°22.82
2	175 35.45 190°37.91	231°22.83 4.04 246°22.19 3.53	25°25.58 44.38 40°28.92 44.63	33°18.64 59.03 48°21.39 59.12	102 27.96 9.96 177°30.18 10.09	Gienah 175°41.44
3	205° 40.37	261°21.56 · · 3.02	55°32.27 · · 44.87	63°24.13 · · 59.21	192°32.39 · · 10.21	Acrux 172°57.45
4	200° 42.84	276°20.92 2.50	70°35.62 45.12	78°26.88 59.30	207°34.59 10.32	Gacrux 171°49.12
5	235° 45.30	291°20.28 1.99	85°38.96 45.36	93°29.62 59.39	222°36.79 10.44	Alioth 166°10.95
6	250° 47.77	306°19.65 \$19°1.48	100°42.31 N16°45.61	108°32.37 N15°59.48	237°38.99 N03°10.55	Spica 158°20.17
7	265°50.23	321°19.01 0.96	115° 45.65 45.85	123°35.11 59.57	252°41.19 10.67	Alkaid 152°50.27
8	280°52.69	336°18.37 19°0.45	130°48.99 46.10	138°37.85 59.66	267°43.40 10.78	Hadar 148°33.03
9	295°55.16	351°17.74 18°59.93	145°52.33 · · 46.34	153°40.60 · · 59.75	282°45.60 · · 10.90	Menkent 147°55.25
10	310°57.62	6° 17.10 59.41	160°55.68 46.58	168°43.34 59.84	297° 47.80 11.01	Arcturus 145°46.08
11	326°0.09	21°16.47 58.89	175°59.02 46.83	183°46.08 15°59.92	312°50.00 11.13	Rigil Kent. 139°37.46
12	341°2.55	36°15.83 \$18°58.37	191°2.36 N16°47.07	198°48.83 N16°0.01	327°52.20 N03°11.24	Kochab 137°19.34
13	356°5.01	51°15.20 57.85	206°5.70 47.31	213°51.57 0.10	342°54.41 11.36	Zuben'ubi 136°53.88 Alphecca 126°2.13
14	11°7.48	66°14.56 57.33	221°9.03 47.55	228°54.31 0.19	357°56.61 11.47	1 .
15	26°9.94	81°13.93 · · 56.81	236°12.37 · · 47.79	243°57.05 · · 0.28	12°58.81 · · 11.59	Antares 112°13.62 Atria 107°6.27
16	41°12.41	96°13.29 56.28	251°15.71 48.03	258°59.80 0.37	28°1.01 11.70	Sabik 102° 0.77
17	56° 14.87	111°12.66 55.76	266°19.04 48.27	274°2.54 0.46	43°3.21 11.82	Shaula 96°8.03
18	71° 17.34	126°12.03 S 18°55.23	281°22.38 N16°48.51	289°5.28 N16°0.55	58°5.41 N03°11.93	Rasalhague 95°56.97
19	86° 19.80	141°11.39 54.71	296°25.71 48.75	304°8.02 0.64	73°7.61 12.05	Eltanin 90°41.52
20	101°22.26	156° 10.76 54.18	311°29.05 48.99	319°10.76 0.72	88°9.82 12.16	Kaus Aust. 83°30.31
21	116°24.73	171°10.13 · · 53.65	326°32.38 · · 49.23	334°13.50 · · 0.81	103°12.02 · · 12.28	Vega 80°32.21
22	131°27.19	186°9.49 53.12	341°35.71 49.46	349°16.24 0.90	118°14.22 12.39	Nunki 75°45.74
23	146°29.66	201°8.86 52.59	356°39.05 49.70	4°18.98 0.99	133° 16.42 12.51	Altair 61°58.45
Mer.	pass. 13:16	ν -0.6' d-0.5' m-4.06	ν 3.3′ d0.2′ m-1.09	$\nu 2.7' \ d0.1' \ \text{m-}2.51$	$\nu 2.2' \ d0.1' \ \text{m}0.78$	Peacock 53°3.42
						Deneb 49°24.97
						Enif 33°37.35
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.15
0 1	161°32.12 176°34.58	216°8.23 \$18°52.06 231°7.60 51.53	11°42.38 N16°49.94 26°45.71 50.17	19°21.72 N16°1.08 34°24.47 1.16	148°18.62 N03°12.62 163°20.82 12.74	Fomalhaut 15°12.92
2	176 34.58 191°37.05	246°6.96 51.00	41°49.04 50.41	34°24.47 1.16 49°27.21 1.25	178°23.02 12.74	Scheat 13°43.82
3	206°39.51	261°6.33 · · 50.46	56°52.36 · · 50.64	64°29.95 · · 1.34	193°25.22 · · 12.97	Markab 13°28.44
4	200 39.31 221°41.98	276°5.70 49.93	71°55.69 50.88	79°32.69 1.43	208°27.42 13.08	Mar 02 Tue SHA
5	236°44.44	291°5.07 49.39	86°59.02 51.11	94°35.43 1.52	223°29.62 13.20	Venus 57° 4.99
6	251°46.91	306°4.44 \$18°48.85	102°2.34 N16°51.34	109°38.16 N16°1.60	238°31.82 N03°13.31	Mars 209°27.84
7	266° 49.37	321°3.81 48.32	117° 5.67 51.58	124°40.90 1.69	253°34.03 13.43	Jupiter 217°36.13
8	281°51.83	336°3.18 47.78	132° 8.99 51.81	139°43.64 1.78	268° 36.23 13.55	Saturn 346°59.05
9	296° 54.30	351°2.55 · · 47.24	147°12.32 · · 52.04	154°46.38 · · 1.87	283°38.43 · · 13.66	
10	311°56.76	6°1.92 46.70	162°15.64 52.27	169°49.12 1.95	298° 40.63 13.78	Mar 03 Wed SHA
11	$326^{\circ}59.23$	21°1.29 46.16	177°18.96 52.50	184°51.86 2.04	313° 42.83 13.89	Venus 55°50.49 Mars 209°49.25
12	342°1.69	36°0.66 \$18°45.61	192°22.29 N16°52.74	199°54.60 N16°2.13	328°45.03 N03°14.01	Mars 209°49.25 Jupiter 217°42.92
13	357°4.15	51°0.03 45.07	207°25.61 52.97	214°57.34 2.22	343°47.23 14.12	Saturn 346°52.80
14	12°6.62	65°59.40 44.53	222°28.93 53.19	230°0.07 2.30	358°49.43 14.24	
15	27°9.08	80°58.77 · · 43.98	237°32.24 · · 53.42	245°2.81 · · 2.39	13°51.63 · · 14.35	Mar 04 Thu SHA
16	42°11.55	95°58.14 43.44	252°35.56 53.65	260°5.55 2.48	28° 53.83 14.47	Venus 54°36.11
17	57° 14.01	110°57.52 42.89	267°38.88 53.88	275°8.29 2.56	43°56.03 14.58	Mars 210°10.26
18	72°16.47	125°56.89 \$18°42.34	282°42.20 N16°54.11	290°11.02 N16°2.65	58°58.23 N03°14.70	Jupiter 217°49.60
19	87° 18.94	140°56.26 41.79	297°45.51 54.34	305°13.76 2.74	74°0.43 14.82	Saturn 346°46.50
20	102°21.40 117°23.87	155°55.63 41.24 170°55.01 • 40.69	312°48.83 54.56 327°52.14 • 54.79	320°16.50 2.82	89°2.63 14.93 104°4.83 •• 15.05	Horizontal parallax
21 22	117° 23.87 132° 26.33	170°55.01 · · 40.69 185°54.38 40.14	327°52.14 · · 54.79 342°55.46 55.01	335°19.23 · · 2.91 350°21.97 3.00	104°4.83 · · 15.05 119°7.02 15.16	Venus:
23	132 20.33 147°28.80	200°53.75 39.59	357°58.77 55.24	5°24.71 3.08	134°9.22 15.28	Mars:
Mer.p	pass. 13:12	ν -0.6' d-0.5' m-4.05	$ u 3.3' \ d0.2' \ \text{m-}1.06$	$\nu 2.7' \ d0.1' \ \text{m-}2.51$	$ u 2.2' \ d0.1' \ m0.78$	

Dec 29°14.45

-42°9.61

56°41 32

-17°50.35

 $-57^{\circ}6.11$

23°35.49

89°22.99

-40°11.96

49°57.62

16°33.81

 $-8^{\circ}10.37$

 $46^{\circ}1.62$

 $6^{\circ}22.36$

28°37.83

 $-1^{\circ}11.21$

 $7^{\circ}24.62$

-52°42.88

-16°45.42

-29°0.78

 $27^{\circ}57.56$

-59°36.02

-43°32.75

-69°49.89

-8°46.79

11°49.87

 $61^{\circ}36.09$

 $14^{\circ}24.98$

-17°41.73

-63°14.98

-57°15.94

55°48.44

-11°18.34

49°10.32

-60°30.13

-36°30.22

-60°56.73

74°2.21

-16°9.37

26°37.08

-26°29.51

-69°4.29 -15°45.55

-37°7.30

 $12^{\circ}32.21$

51°28.76

-34°22.20

38°48.24

-26°15.73

8°56.28

-56°38.70

45°22.47

-46°49.74

-29°28.74

28°13.79

15°21.05

Mer.pass

09:34

23:19

22:47

14:12

09:35

23:13

22:43

14:08

23:08

22:38

14:05

0.1

0.2

Mer.pass 09:36

Mer.pass

 $9^{\circ}59.90$

 $19^{\circ}2.18$

 $5^{\circ}9.16$

4°11.72

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°56.29	S07°22.58	248°46.94	10.2'	S27°27.58	-2.0'	54.2'
1	191°56.41	21.62	263°16.13	10.2'	27°25.60	-2.1'	54.2'
2	206°56.54 221°56.66	20.67 •• 19.72	277°45.35 292°14.60	10.2' 10.3'	27°23.48 27°21.24	-2.2' -2.4'	54.2' 54.1'
4	236°56.78	18.76	306°43.87	10.3'	27°18.86	-2.5'	54.1'
5	251°56.91	17.81	$321^{\circ}13.18$	10.3'	$27^{\circ}16.36$	-2.6'	54.1'
6	266°57.03	S07°16.86	335°42.52	10.4	\$27°13.72	-2.8'	54.1'
7 8	281°57.16 296°57.28	15.90 14.95	350°11.89 4°41.30	10.4' 10.4'	27°10.96 27°8.06	-2.9' -3.0'	54.1' 54.1'
9	311°57.41	13.99	19°10.74	10.5	27°5.04	-3.1'	54.1'
10	326°57.53	13.04	$33^{\circ}40.21$	10.5'	$27^{\circ}1.89$	-3.3'	54.1'
11	341°57.66	12.09	48°9.72	10.5'	26°58.61	-3.4'	54.1'
12 13	356°57.78 11°57.91	S07°11.13 10.18	62°39.27 77°8.86	10.6' 10.6'	\$26°55.21 26°51.68	-3.5' -3.7'	54.1' 54.1'
14	26°58.03	9.22	91°38.48	10.7	26°48.02	-3.7 -3.8'	54.1'
15	41°58.16	• • 8.27	$106^{\circ}8.14$	10.7'	$26^{\circ}44.24$	-3.9'	54.1'
16	56°58.28	7.31	120°37.84	10.7'	26°40.33	-4.0'	54.1'
17 18	71°58.41 86°58.54	6.35 \$07°5.40	135°7.58 149°37.36	10.8' 10.8'	26°36.30 \$26°32.14	-4.2' -4.3'	54.1' 54.1'
19	101°58.66	4.44	164°7.18	10.0	26°27.86	-4.4'	54.1'
20	116°58.79	3.49	178°37.05	10.9'	26°23.45	-4.5'	54.1'
21	131°58.92	• • 2.53	193°6.96	11.0'	26°18.93	-4.6'	54.1'
22 23	146°59.05 161°59.17	1.57 0.62	207°36.91 222°6.90	11.0' 11.0'	26°14.28 26°9.51	-4.8' -4.9'	54.1' 54.1'
23						-4.9	J4.1
	SD = 16.1'	d = -1.0'		SI	O = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°59.30	S 06°59.66	236°36.94	11.1'	S26°4.61	-5.0'	54.1'
1 2	191°59.43 206°59.56	58.70 57.74	251°7.02 265°37.15	11.1' 11.2'	25°59.60 25°54.47	-5.1' -5.3'	54.1' 54.1'
3	206 59.56 221°59.69	57.74 •• 56.79	280°7.33	11.2'	25°54.47 25°49.22	-5.3° -5.4'	54.1'
4	236°59.82	55.83	294°37.55	11.3'	25°43.84	-5.5'	54.1'
5	251°59.94	54.87	$309^{\circ}7.81$	11.3'	$25^{\circ}38.36$	-5.6'	54.0'
6	267° 0.07	S06°53.91	323°38.13	11.4'	\$25°32.75	-5.7'	54.0'
7 8	282° 0.20 297° 0.33	52.96 52.00	338°8.49 352°38.90	11.4' 11.5'	25°27.02 25°21.18	-5.8' -6.0'	54.1' 54.1'
9	312° 0.46	51.04	7°9.36	11.5'	25°15.22	-6.1'	54.1'
10	327° 0.59	50.08	21°39.87	11.6'	$25^{\circ}9.15$	-6.2'	54.1'
11	342°0.72	49.12	36°10.43	11.6'	25°2.96	-6.3'	54.1'
12 13	357° 0.85 12° 0.98	\$06°48.16 47.20	50°41.04 65°11.70	11.7' 11.7'	\$24°56.66 24°50.25	-6.4' -6.5'	54.1' 54.1'
14	27° 1.11	46.24	79°42.41	11.8'	24°43.72	-6.6'	54.1'
15	42°1.24	• • 45.28	$94^{\circ}13.17$	11.8'	24°37.08	-6.8'	54.1'
16	57° 1.38	44.32	108°43.97	11.9'	24°30.33	-6.9'	54.1'
17 18	72°1.51 87°1.64	43.36 \$06°42.40	123°14.84 137°45.75	11.9' 12.0'	24°23.46 S 24°16.49	-7.0' -7.1'	54.1' 54.1'
19	102° 1.77	41.44	152°16.71	12.0'	24°9.41	-7.1 -7.2'	54.1'
20	117° 1.90	40.48	$166^{\circ}47.73$		24°2.22	-7.3'	54.1'
21	132°2.03	• • 39.52	181°18.80	12.1'	23°54.92	-7.4'	54.1'
22 23	147°2.17 162°2.30	38.56 37.60	195°49.92 210°21.09	12.2' 12.2'	23°47.51 23°39.99	-7.5' -7.6'	54.1' 54.1'
23	SD = 16.1'	d = -1.0'	210 21.09		O = 14.7'	-7.0	J4.1
	$\frac{3D = 10.1}{}$	a = -1.0		31	J = 14.7		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°2.43 192°2.56	\$06°36.64 35.68	224°52.31 239°23.59	12.3' 12.3'	\$23°32.37 23°24.65	-7.7' -7.8'	54.1' 54.1'
2	192° 2.56 207° 2.70	35.68 34.72	239°23.59 253°54.92	12.4	23° 24.65 23° 16.81	-7.8° -7.9'	54.1'
3	222° 2.83	• • 33.76	268°26.30	12.4'	23°8.88	-8.0'	54.1'
4	237° 2.96	32.79	282°57.74	12.5'	23°0.84	-8.1'	54.1'
5	252°3.10 267°3.23	31.83 \$06°30.87	297°29.23 312°0.77	12.5' 12.6'	22°52.69 \$22°44.45	-8.2' -8.3'	54.1' 54.1'
6 7	267° 3.23 282° 3.36	29.91	312°0.77 326°32.36	12.6'	522°44.45 22°36.10	-8.3' -8.4'	54.1' 54.1'
8	297°3.50	28.95	341°4.01	12.7'	22°27.66	-8.5	54.1'
9	312° 3.63	•• 27.98	355°35.71	12.8'	22°19.11	-8.6'	54.1'
10	327° 3.77 342° 3.90	27.02	10°7.46	12.8'	22°10.46 22°1.72	-8.7'	54.1'
11 12	342° 3.90 357° 4.04	26.06 \$06°25.10	24°39.27 39°11.12	12.9' 12.9'	22°1.72 S 21°52.88	-8.8' -8.9'	54.2' 54.2'
13	12° 4.17	24.13	53°43.03	13.0'	21°43.94	-9.0'	54.2'
14	27°4.31	23.17	68°15.00	13.0'	$21^{\circ}34.90$	-9.1'	54.2'
15	42° 4.44	• • 22.21	82°47.01	13.1'	21°25.77	-9.2'	54.2'
16 17	57° 4.58 72° 4.71	21.24 20.28	97°19.08 111°51.19	13.1' 13.2'	21°16.54 21°7.22	-9.3' -9.4'	54.2' 54.2'
18	87°4.85	S06°19.31	126°23.36	13.2'	S20°57.80	-9.5'	54.2'
19	102°4.99	18.35	140°55.59	13.3'	20°48.30	-9.6'	54.2'
20	117°5.12	17.39	155°27.86	13.3'	20°38.70	-9.7'	54.2'
21 22	132° 5.26 147° 5.40	· · 16.42 15.46	170°0.18 184°32.56	13.4' 13.4'	20°29.01 20°19.23	-9.8' -9.9'	54.2' 54.2'
23	162° 5.53	14.49	199°4.98	13.5'	20°9.36	-10.0'	54.3'
	SD = 16.1'	d = -1.0'		SI	D = 14.8'		
					• • •		

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

Lat. Tue Wed Thu Tue Wed Thu N 72° ■
N 70° 1058 66° 107:51 10:58 64° 07:39 07:10 09:30 11:38 62° 06:42 06:43 06:41 08:43 10:25 12:06 60° 05:51 06:10 06:19 09:34 10:58 12:28 N 58° 05:19 05:46 06:01 10:05 11:22 12:45
68° 66° 07:51 10:58 64° 07:39 07:10 09:30 11:38 62° 06:42 06:43 06:41 08:43 10:25 12:06 60° 05:51 06:10 06:19 09:34 10:58 12:28 N 58° 05:19 05:46 06:01 10:05 11:22 12:45
66° Image: Control of the control o
64° 07:39 07:10 09:30 11:38 62° 06:42 06:43 06:41 08:43 10:25 12:06 60° 05:51 06:10 06:19 09:34 10:58 12:28 N 58° 05:19 05:46 06:01 10:05 11:22 12:45
62° 06:42 06:43 06:41 08:43 10:25 12:06 60° 05:51 06:10 06:19 09:34 10:58 12:28 N 58° 05:19 05:46 06:01 10:05 11:22 12:45
60° 05:51 06:10 06:19 09:34 10:58 12:28 N 58° 05:19 05:46 06:01 10:05 11:22 12:45
N 58° 05:19 05:46 06:01 10:05 11:22 12:45
E6° 04.EE 05.26 05.46 10.20 11.41 12.E0
54° 04:36 05:10 05:33 10:48 11:57 13:12
52° 04:20 04:56 05:22 11:04 12:11 13:23
50° 04:06 04:43 05:12 11:18 12:23 13:33
45° 03:37 04:18 04:50 11:46 12:48 13:53
N 40° 03:15 03:57 04:33 12:08 13:08 14:09
35° 02:56 03:40 04:18 12:27 13:24 14:23
30° 02:40 03:26 04:06 12:42 13:38 14:35
20° 02:13 03:01 03:44 13:09 14:02 14:55
N 10° 01:50 02:39 03:25 13:32 14:23 15:13
0° 01:28 02:19 03:07 13:53 14:42 15:29
S 10° 01:07 01:58 02:49 14:14 15:01 15:46
20° 00:43 01:36 02:30 14:37 15:22 16:03
30° 00:16 01:11 02:08 15:03 15:45 16:23
35° 00:00 00:56 01:54 15:18 15:59 16:34
40° ··· 00:39 01:39 15:36 16:15 16:47
45° 00:18 01:21 15:57 16:34 17:03
S 50° 23:51 ··· 00:59 16:24 16:57 17:22
52° 23:38 ···· 00:48 16:38 17:08 17:31
54° 23:23 ···· 00:36 16:53 17:21 17:41
56° 23:06 ··· 00:22 17:10 17:36 17:52
58° 22:45 ··· 00:05 17:32 17:53 18:05
S 60° 22:18 23:45 · · · · 17:59 18:13 18:20

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-17%	
02	12:15	12:09	12:12	07:41	20:06		
03	12:03	11:57	12:12	08:30	20:55		
04	11:50	11:44	12:12	09:18	21:41		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	162°31.26	215°53.13 \$18°39.03	13°2.08 N16°55.46	20°27.44 N16°3.17	149°11.42 N03°15.39	
1	177°33.72	230°52.50 38.48	28°5.39 55.69	35°30.18 3.26	164°13.62 15.51	Alpheratz 357°33.25 29°14.44
2	192°36.19	245°51.87 37.92	43°8.70 55.91	50°32.91 3.34	179°15.82 15.63	Ankaa 353°5.78 -42°9.60
3	207°38.65	260°51.25 · · 37.37	58°12.01 · · 56.14	65°35.65 · · 3.43	194°18.02 · · 15.74	Schedar 349°29.49 56°41.31 Diphda 348°45.80 -17°50.34
4	$222^{\circ}41.12$	275°50.62 36.81	73°15.32 56.36	80°38.38 3.52	209°20.22 15.86	Diphda 348°45.80 -17°50.34 Achernar 335°19.30 -57°6.09
5	237°43.58	290°50.00 36.25	88°18.63 56.58	95°41.12 3.60	224°22.42 15.97	Hamal 327°49.39 23°35.49
6	252° 46.04	305°49.37 \$18°35.69	103°21.93 N16°56.80	110°43.85 N16°3.69	239°24.62 N03°16.09	Polaris 313°18.89 89°22.99
7	267° 48.51	320°48.75 35.13	118°25.24 57.02	125°46.59 3.77	254°26.82 16.20	Acamar 315°10.61 -40°11.95
8	282°50.97	335°48.12 34.57	133°28.54 57.25	140°49.32 3.86	269°29.02 16.32	Menkar 314°4.41 4°11.72
9	297°53.44	350°47.50 · · 34.01	148°31.85 · · 57.47	155°52.06 · · 3.94	284°31.21 · · 16.44	Mirfak 308°25.85 49°57.62
10 11	312°55.90 327°58.36	5°46.88 33.45 20°46.25 32.89	163°35.15 57.69 178°38.45 57.90	170°54.79 4.03 185°57.53 4.12	299°33.41 16.55 314°35.61 16.67	Aldebaran 290°37.58 16°33.81
12	343°0.83	35°45.63 \$18°32.32	193°41.75 N16°58.12	201°0.26 N16°4.20	329°37.81 N03°16.78	Rigel 281°2.11 -8°10.37
13	358°3.29	50°45.00 31.76	208°45.05 58.34	216°2.99 4.29	344°40.01 16.90	Capella 280°19.19 46°1.62
14	13°5.76	65°44.38 31.19	223°48.35 58.56	231°5.73 4.37	359°42.21 17.01	Bellatrix 278°20.91 6°22.36
15	28°8.22	80°43.76 · · 30.62	238°51.65 · · 58.78	246°8.46 · · 4.46	14°44.41 · · 17.13	Elnath 277°59.54 28°37.83
16	43°10.68	95°43.14 30.05	253°54.95 58.99	261°11.19 4.54	29°46.60 17.25	Alnilam 275°35.85 -1°11.21 Betelgeuse 270°50.06 7°24.63
17	58° 13.15	110°42.52 29.48	268°58.25 59.21	276°13.92 4.63	44°48.80 17.36	Betelgeuse 270°50.06 7°24.63 Canopus 263°51.40 -52°42.88
18	73° 15.61	125°41.89 \$18°28.91	284°1.54 N16°59.43	291°16.66 N16°4.71	59°51.00 N03°17.48	Sirius 258°24.51 -16°45.42
19	88° 18.08	140°41.27 28.34	299° 4.84 59.64	306°19.39 4.80	74°53.20 17.59	Adhara 255°4.27 -29°0.79
20	103°20.54	155° 40.65 27.77	314°8.13 16°59.86	321°22.12 4.88	89°55.40 17.71	Procyon 244°48.75 5°9.16
21	118°23.01	170°40.03 · · 27.20	329°11.43 17°0.07	336°24.85 · · 4.97	104°57.60 · · 17.83	Pollux 243°14.88 27°57.56
22	133°25.47	185°39.41 26.63	344°14.72 0.29	351°27.58 5.05	119°59.79 17.94	Avior 234°13.51 -59°36.03
23	148°27.93	200°38.79 26.05	359°18.01 0.50	6°30.32 5.14	135°1.99 18.06	Suhail 222°44.60 -43°32.76
Mer.	pass. 13:08	ν -0.6' d-0.6' m-4.04	$ u 3.3' \ d0.2' \ \text{m-}1.04$	$ u 2.7' \ d0.1' \ \text{m-}2.51$	$\nu 2.2' \ d0.1' \ \text{m}0.78$	Miaplacidus 221°37.07 -69°49.91
			· -			Alphard 217°45.70 -8°46.79
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.22 11°49.87
0	163°30.40	215°38.17 \$18°25.48	14°21.30 N17°0.71	21°33.05 N16°5.22	150°4.19 N03°18.18	Dubhe 193°38.18 61°36.11
1	178°32.86	230°37.55 24.90	29°24.59 0.92	36°35.78 5.30	165°6.39 18.29	Denebola 182°22.81 14°24.98 Gienah 175°41.43 -17°41.74
2	193°35.33	245°36.93 24.32	44°27.88 1.14	51°38.51 5.39	180°8.58 18.41	Gienah 175°41.43 -17°41.74 Acrux 172°57.43 -63°15.00
3	208°37.79	260°36.31 · · 23.74	59°31.17 · · 1.35	66°41.24 · · 5.47	195°10.78 · · 18.52	Gacrux 172 57.43 -03 15.00
4	223°40.25	275°35.69 23.16	74°34.46 1.56	81°43.97 5.56	210°12.98 18.64	Alioth 166°10.92 55°48.45
5	238° 42.72	290°35.07 22.58	89°37.75 1.77	96°46.70 5.64	225°15.18 18.76	Spica 158°20.15 -11°18.35
6	253°45.18	305°34.45 \$18°22.00	104°41.03 N17°1.98	111°49.43 N16°5.73	240°17.37 N03°18.87	Alkaid 152°50.25 49°10.32
7	268° 47.65	320°33.83 21.42	119°44.32 2.19	126°52.16 5.81	255°19.57 18.99	Hadar 148°33.00 -60°30.15
8	283°50.11	335°33.22 20.84	134°47.60 2.40	141°54.89 5.89	270°21.77 19.10	Menkent 147°55.23 -36°30.24
9	298° 52.57	350°32.60 · · 20.25	149°50.88 · · 2.61 164°54.17 2.81	156°57.62 · · 5.98	285°23.97 · · 19.22	Arcturus 145°46.06 19°2.18
10 11	313°55.04 328°57.50	5°31.98 19.67 20°31.36 19.08	164°54.17 2.81 179°57.45 3.02	172°0.35 6.06 187°3.08 6.15	300°26.16 19.34 315°28.36 19.45	Rigil Kent. 139°37.42 -60°56.74
12	343°59.97	35°30.75 \$18°18.50	195°0.73 N17°3.23	202°5.81 N16°6.23	330°30.56 N03°19.57	Kochab 137°19.27 74°2.22
13	359°2.43	50°30.13 17.91	210° 4.01 3.43	217°8.54 6.31	345°32.75 19.69	Zuben'ubi 136°53.86 -16°9.38
14	14°4.89	65°29.51 17.32	225°7.28 3.64	232°11.26 6.40	0°34.95 19.80	Alphecca 126°2.11 26°37.08
15	29°7.36	80°28.90 · · 16.73	240°10.56 · · 3.85	247°13.99 · · 6.48	15°37.15 · · 19.92	Antares 112°13.59 -26°29.52
16	44°9.82	95°28.28 16.14	255°13.84 4.05	262°16.72 6.56	30°39.35 20.04	Atria 107° 6.21 -69° 4.30 Sabik 102° 0.75 -15° 45.55
17	59° 12.29	110°27.67 15.55	270°17.11 4.26	277°19.45 6.65	45°41.54 20.15	Shaula 96°8.00 -37°7.30
18	$74^{\circ}14.75$	125°27.05 \$18°14.96	285°20.39 N17°4.46	292°22.18 N16°6.73	60°43.74 N03°20.27	Rasalhague 95°56.94 12°32.21
19	89° 17.21	140°26.43 14.37	300°23.66 4.66	307°24.90 6.81	75°45.94 20.38	Eltanin 90°41.48 51°28.75
20	104° 19.68	155°25.82 13.77	315°26.94 4.87	322°27.63 6.89	90°48.13 20.50	Kaus Aust. 83°30.28 -34°22.20
21	119°22.14	170°25.21 · · 13.18	330°30.21 · · 5.07	337°30.36 · · 6.98	105°50.33 · · 20.62	Vega 80°32.18 38°48.23
22	134°24.61	185°24.59 12.58 200°23.98 11.99	345°33.48 5.27	352°33.08 7.06	120°52.52 20.73	Nunki 75°45.72 -26°15.73
23	149°27.07	200°23.98 11.99	0°36.75 5.47	7°35.81 7.14	135°54.72 20.85	Altair 61°58.43 8°56.28
Mer.	pass. 13:04	ν -0.6' d-0.6' m-4.04	$ u 3.3' \ d0.2' \ \text{m-}1.02$	$\nu 2.7' \ d0.1' \ \text{m-}2.50$	$ u 2.2' \; d0.1' \; { m m} 0.78$	Peacock 53°3.38 -56°38.69
			·			Deneb 49°24.96 45°22.46
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.34 9°59.90
0	164°29.53	215°23.36 \$18°11.39	15°40.02 N17°5.67	22°38.54 N16°7.23	150°56.92 N03°20.97	Al Na'ir 27°31.13 -46°49.73 Fomalhaut 15°12.91 -29°28.73
1	179°32.00	230°22.75 10.79	30°43.28 5.87	37°41.26 7.31	165°59.11 21.08	Scheat 13°43.82 28°13.78
2	194°34.46	245°22.14 10.19	45°46.55 6.07	52°43.99 7.39	181°1.31 21.20	Markab 13°28.44 15°21.04
3	209°36.93	260°21.52 · · 9.59	60°49.82 · · 6.27	67°46.71 · · 7.47	196° 3.51 · · 21.32	
4	224°39.39	275°20.91 8.99	75°53.08 6.47	82°49.44 7.56	211°5.70 21.43	Mar 05 Fri SHA Mer.pass
5	239°41.86	290°20.30 8.39	90°56.35 6.67	97°52.16 7.64	226°7.90 21.55	Venus 53°21.87 09:37
6	254° 44.32	305°19.69 \$18°7.79	105°59.61 N17°6.87	112°54.89 N16°7.72	241°10.09 N03°21.67	Mars 210°30.82 23:03 Jupiter 217°56.18 22:34
7	269° 46.78	320°19.08 7.18	121°2.87 7.06	127°57.61 7.80	256°12.29 21.78	Jupiter 217°56.18 22:34 Saturn 346°40.16 14:01
8 9	284° 49.25 299° 51.71	335°18.46 6.58 350°17.85 • 5.97	136° 6.13 7.26 151° 9.40 · · 7.46	143°0.34 7.88 158°3.06 · · 7.97	271°14.49 21.90 286°16.68 •• 22.02	Jatum 340 40.10 14:01
10	314° 54.18	5°17.24 5.37	166°12.65 7.65	173°5.79 8.05	301°18.88 22.13	Mar 06 Sat SHA Mer.pass
11	329°56.64	20°16.63 4.76	181°15.91 7.85	188°8.51 8.13	316°21.07 22.25	Venus 52°7.77 09:38
12	344°59.10	35°16.02 \$18°4.15	196°19.17 N17°8.04	203°11.23 N16°8.21	331°23.27 N03°22.37	Mars 210°50.91 22:58
13	0°1.57	50°15.41 3.54	211°22.43 8.24	218°13.96 8.29	346°25.46 22.48	Jupiter 218°2.65 22:30
14	15°4.03	65°14.80 2.93	226°25.68 8.43	233°16.68 8.37	1°27.66 22.60	Saturn 346°33.79 13:58
15	30°6.50	80°14.19 · · 2.32	241°28.94 · · 8.62	248°19.40 · · 8.46	16°29.85 · · 22.72	Mar 07 Sun SHA Mer.pass
16	45°8.96	95°13.58 1.71	256°32.19 8.82	263°22.13 8.54	31°32.05 22.83	Venus 50°53.83 09:39
17	60°11.42	110°12.97 1.10	271°35.44 9.01	278°24.85 8.62	46°34.24 22.95	Mars 211°10.48 22:52
18	75° 13.89	125°12.36 \$18°0.49	286°38.70 N17°9.20	293°27.57 N16°8.70	61°36.44 N03°23.07	Jupiter 218°9.00 22:25
19	90° 16.35 105° 18.82	140°11.76 17°59.87 155°11.15 59.26	301°41.95 9.39	308°30.30 8.78 323°33.02 8.86	76°38.63 23.18 91°40.83 23.30	Saturn 346°27.38 13:54
20 21	105° 18.82 120° 21.28	155°11.15 59.26 170°10.54 · · 58.64	316°45.20 9.58 331°48.44 •• 9.77	323°33.02 8.86 338°35.74 • 8.94	91°40.83 23.30 106°43.03 · · 23.42	Horizontal parallax
22	135°23.74	185°9.93 58.02	346°51.69 9.96	353°38.46 9.02	121°45.22 23.53	Venus: 0.1
23	150°26.21	200°9.33 57.41	1°54.94 10.15	8°41.18 9.10	136°47.41 23.65	Mars: 0.2
	pass. 13:00	ν-0.6' d-0.6' m-4.03	ν3.3' d0.2' m-0.99	ν2.7' d0.1' m-2.50	ν2.2' d0.1' m0.78	
wier.	pass. 13:00	ν-0.0 α-0.0 III-4.03	νσ.σ αυ.∠ III-U.99	ν Δ. ι αυ. ι m-2.30	ν Δ.Δ UU.1 IIIU./O	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°5.67	S06°13.53	213° 37.46	13.5'	S19°59.40	-10.0'	54.3'
1 2	192°5.81 207°5.95	12.56 11.60	228°9.98 242°42.56	13.6' 13.6'	19°49.35 19°39.21	-10.1' -10.2'	54.3' 54.3'
3	207 5.95 222°6.08	. 10.63	257° 15.18	13.7	19 39.21 19°28.99	-10.2	54.3'
4	237°6.22	9.67	271°47.85	13.7'	19°18.68	-10.4'	54.3'
5	252°6.36	8.70	286° 20.58	13.8'	19°8.29	-10.5'	54.3'
6 7	267°6.50 282°6.64	\$06° 7.74 6.77	300°53.35 315°26.16	13.8' 13.9'	\$18°57.81 18°47.25	-10.6' -10.6'	54.3' 54.3'
8	297°6.78	5.80	329°59.03	13.9	18°36.60	-10.0	54.3'
9	312°6.91	• • 4.84	344°31.94	14.0'	18°25.88	-10.8'	54.4'
10	327°7.05	3.87	359°4.90	14.0'	18°15.07	-10.9'	54.4'
11 12	342°7.19 357°7.33	2.91 \$06° 1.94	13°37.91 28°10.96	14.1' 14.1'	18° 4.18 \$17° 53.21	-11.0' -11.0'	54.4' 54.4'
13	12°7.47	0.97	42°44.05	14.1'	17°42.16	-11.1'	54.4'
14	27°7.61	$06^{\circ}0.01$	57° 17.19	14.2'	$17^{\circ}31.04$	-11.2'	54.4'
15	42°7.75 57°7.89	05°59.04	71°50.38 86°23.61	14.2'	17°19.84 17°8.56	-11.3'	54.4'
16 17	72°8.03	58.07 57.10	100°56.88	14.3' 14.3'	17 8.50 16°57.20	-11.4' -11.4'	54.4' 54.5'
18	87°8.17	S05°56.14	115° 30.20	14.4'	S16°45.77	-11.5'	54.5'
19	102°8.31	55.17	130°3.56	14.4'	16°34.26	-11.6'	54.5'
20 21	117°8.45 132°8.60	54.20 •• 53.23	144°36.96 159°10.40	14.4' 14.5'	16°22.68 16°11.03	-11.7' -11.7'	54.5' 54.5'
22	132 8.00 147°8.74	52.27	173° 43.88	14.5	15°59.31	-11. <i>1</i> -11.8'	54.5'
23	162°8.88	51.30	188° 17.40	14.6'	15°47.52	-11.9'	54.5'
	SD = 16.1'	d = -1.0'		SI	O = 14.8'		
_							
Sat 0	GHA 177°9.02	Dec \$05°50.33	GHA 202°50.96	u 14.6'	Dec \$15°35.65	<i>d</i> -11.9′	HP 54.6'
1	177 9.02 192°9.16	49.36	202 50.96 217°24.56	14.6'	15°23.72	-11.9 -12.0'	54.6'
2	207°9.30	48.39	231°58.20	14.7'	15°11.71	-12.1'	54.6'
3	222°9.45	• • 47.42	246°31.88	14.7'	14°59.64	-12.1'	54.6'
4 5	237°9.59 252°9.73	46.45 45.49	261°5.59 275°39.34	14.7' 14.8'	14°47.50 14°35.30	-12.2' -12.3'	54.6' 54.6'
6	267°9.87	S05°44.52	290°13.13	14.8'	\$14°23.03	-12.3'	54.6'
7	282°10.02	43.55	304°46.95	14.9'	14°10.69	-12.4'	54.7'
8	297°10.16	42.58	319°20.80	14.9'	13°58.29	-12.5'	54.7'
9 10	312° 10.30 327° 10.45	• • 41.61 40.64	333°54.69 348°28.61	14.9' 15.0'	13°45.83 13°33.30	-12.5' -12.6'	54.7' 54.7'
11	342° 10.59	39.67	3°2.57	15.0'	13° 20.72	-12.6'	54.7'
12	357° 10.73	S05°38.70	17° 36.55	15.0'	S 13°8.07	-12.7'	54.7'
13 14	12° 10.88 27° 11.02	37.73 36.76	32°10.57 46°44.62	15.0' 15.1'	12°55.36 12°42.59	-12.8' -12.8'	54.7' 54.8'
15	42°11.17	35.79	61°18.69	15.1	12 42.59 12°29.77	-12.6 -12.9'	54.8'
16	57° 11.31	34.82	75°52.80	15.1'	12°16.89	-12.9'	54.8'
17	72°11.45	33.85	90°26.93	15.2'	12°3.95	-13.0'	54.8'
18 19	87° 11.60 102° 11.74	\$05°32.88 31.91	105°1.09 119°35.28	15.2' 15.2'	\$11°50.95 11°37.90	-13.0' -13.1'	54.8' 54.8'
20	117° 11.89	30.93	134°9.49		11°24.80		54.9'
21	132°12.03	• • 29.96	148°43.73	15.3'	$11^{\circ}11.64$	-13.2'	54.9'
22	147°12.18	28.99	163°17.99	15.3'	10°58.43	-13.3'	54.9'
23	162°12.33	28.02	177°52.28	15.3'	10°45.17	-13.3'	54.9'
	SD = 16.1'	d = -1.0'		SI	O = 14.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	$177^{\circ}12.47$	S05°27.05	192°26.59	15.3'	S 10°31.86	-13.4'	54.9'
1 2	192° 12.62 207° 12.76	26.08 25.11	207°0.92 221°35.27	15.4' 15.4'	10°18.50 10°5.08	-13.4' -13.5'	54.9' 55.0'
3	207°12.76 222°12.91	25.11	221°35.27 236°9.64	15.4' 15.4'	10°5.08 09°51.62	-13.5' -13.5'	55.0' 55.0'
4	237° 13.06	23.16	250°44.03	15.4'	09°38.11	-13.6'	55.0'
5	252°13.20	22.19	265°18.44	15.4'	09°24.56	-13.6'	55.0'
6 7	267° 13.35 282° 13.50	S05°21.22 20.25	279°52.87 294°27.31	15.4' 15.5'	\$09°10.96 08°57.31	-13.6' -13.7'	55.0' 55.0'
8	297°13.64	19.27	309°1.77	15.5'	08°43.62	-13.7'	55.1
9	312° 13.79	• • 18.30	323°36.25	15.5'	08°29.89	-13.8'	55.1'
10 11	327°13.94 342°14.09	17.33 16.35	338° 10.74 352° 45.24	15.5' 15.5'	08°16.12 08°2.30	-13.8' -13.9'	55.1' 55.1'
11	342° 14.09 357° 14.24	16.35 \$05°15.38	352°45.24 7°19.76	15.5'	08°2.30 \$07°48.44	-13.9' -13.9'	55.1'
13	12°14.38	14.41	21°54.29	15.5'	$07^{\circ}34.54$	-13.9'	55.2'
14	27°14.53	13.44	36°28.82	15.5'	07°20.61	-14.0'	55.2'
15 16	42° 14.68 57° 14.83	· · 12.46 11.49	51°3.37 65°37.93	15.6' 15.6'	07°6.63 06°52.62	-14.0' -14.0'	55.2' 55.2'
17	72°14.98	10.52	80° 12.49	15.6'	06°38.57	-14.0 -14.1'	55.2'
18	87° 15.13	S05° 9.54	94°47.07	15.6'	S06°24.49	-14.1'	55.2'
19	102° 15.28	8.57	109°21.64	15.6'	06°10.37	-14.2'	55.3'
20 21	117° 15.42 132° 15.57	7.59 •• 6.62	123°56.23 138°30.82	15.6' 15.6'	05°56.22 05°42.03	-14.2' -14.2'	55.3' 55.3'
22	147° 15.72	5.65	153°5.41	15.6'	05°27.81	-14.2'	55.3'
23	162° 15.87	4.67	167°40.00	15.6'	05°13.56	-14.3'	55.3'
	SD = 16.1'	d = -1.0'		SI	D = 15.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-2%	
05	11:37	11:31	12:12	10:04	22:26		
06	11:24	11:17	12:11	10:47	23:09		
07	11:10	11:03	12:11	11:30	23:51		

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	165°28.67	215°8.72 \$17°56.79	16°58.18 N17°10.34	23°43.90 N16°9.18	151°49.61 N03°23.77
1	180°31.14	230°8.11 56.17	32°1.43 10.53	38°46.62 9.27	166°51.80 23.89
2	195°33.60	245°7.51 55.55	47° 4.67 10.72	53°49.34 9.35	181°54.00 24.00
3	210°36.06	260°6.90 · · 54.92	62°7.92 · · 10.90	68°52.07 · · 9.43	196°56.19 · · 24.12
4	225°38.53	275°6.29 54.30	77°11.16 11.09	83°54.79 9.51	211°58.39 24.24
5	240°40.99	290°5.69 53.68	92°14.40 11.27	98°57.51 9.59	227°0.58 24.35
6	255° 43.46	305°5.08 S 17°53.06	107°17.64 N17°11.46	114°0.23 N16°9.67	242°2.78 N03°24.47
7	270°45.92	320°4.48 52.43	122°20.88 11.65	129°2.94 9.75	257°4.97 24.59
8	285°48.38	335°3.87 51.80	137°24.11 11.83	144°5.66 9.83	272°7.17 24.70
9	300° 50.85	350°3.27 · · 51.18	152°27.35 · · 12.01	159°8.38 · · 9.91	287°9.36 · · 24.82
10 11	315°53.31 330°55.78	5°2.67 50.55 20°2.06 49.92	167°30.59 12.20 182°33.82 12.38	174°11.10 9.99 189°13.82 10.07	302°11.55 24.94 317°13.75 25.06
12	345°58.24	35°1.46 \$17°49.29	197°37.06 N17°12.56	204°16.54 N16°10.15	332°15.94 N03°25.17
13	1°0.70	50°0.86 48.66	212°40.29 12.74	219°19.26 10.23	347°18.14 25.29
14	16°3.17	65°0.25 48.03	227°43.52 12.93	234°21.98 10.31	2°20.33 25.41
15	31°5.63	79°59.65 · · 47.40	242°46.75 · · 13.11	249°24.69 · · 10.39	17°22.52 · · 25.52
16	46°8.10	94°59.05 46.77	257°49.98 13.29	264°27.41 10.46	32°24.72 25.64
17	$61^{\circ}10.56$	109°58.45 46.13	272°53.21 13.47	279°30.13 10.54	47°26.91 25.76
18	$76^{\circ}13.02$	124°57.85 S 17°45.50	287°56.44 N17°13.65	294°32.85 N16°10.62	62°29.11 N03°25.88
19	91°15.49	139°57.24 44.86	302°59.66 13.82	309°35.56 10.70	77°31.30 25.99
20	106° 17.95	154°56.64 44.23	318°2.89 14.00	324°38.28 10.78	92°33.49 26.11
21	121°20.42	169° 56.04 · · 43.59	333°6.11 · · 14.18	339°41.00 · · 10.86	107°35.69 · · 26.23
22	136°22.88	184°55.44 42.95	348° 9.33 14.36	354°43.71 10.94	122°37.88 26.34
23	151°25.34	199°54.84 42.31	3°12.56 14.53	9°46.43 11.02	137° 40.07 26.46
Mer.p	bass. 12:56	ν -0.6' d-0.6' m-4.03	u3.2 $'$ d0.2 $'$ m-0.97	$ u 2.7' \ d0.1' \ \text{m-}2.49$	ν2.2′ d0.1′ m0.77
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$166^{\circ}27.81$	214°54.24 \$17°41.67	18°15.78 N17°14.71	24°49.14 N16°11.10	152°42.27 N03°26.58
1	181°30.27	229°53.64 41.03	33°19.00 14.89	39°51.86 11.18	167°44.46 26.70
2	196° 32.74	244°53.04 40.39	48°22.22 15.06	54°54.58 11.25	182°46.65 26.81
3	211°35.20	259°52.44 · · 39.75	63°25.44 · · 15.24	69°57.29 · · 11.33	197°48.85 · · 26.93
4	226° 37.66	274°51.85 39.10	78°28.65 15.41	85°0.01 11.41	212°51.04 27.05
5 6	241°40.13 256°42.59	289°51.25 38.46 304°50.65 \$17°37.81	93°31.87 15.58 108°35.08 N17°15.76	100°2.72 11.49 115°5.43 N16°11.57	227°53.23 27.17 242°55.43 N03°27.28
7	271° 45.06	319°50.05 37.17	123°38.30 15.93	130°8.15 11.65	257°57.62 27.40
8	286° 47.52	334°49.46 36.52	138°41.51 16.10	145°10.86 11.72	272°59.81 27.52
9	301°49.98	349°48.86 · · 35.87	153°44.72 · · 16.27	160°13.58 · · 11.80	288°2.01 · · 27.64
10	316°52.45	4°48.26 35.22	168°47.93 16.44	175°16.29 11.88	303°4.20 27.75
11	$331^{\circ}54.91$	19° 47.66 34.57	183°51.14 16.61	190°19.00 11.96	318°6.39 27.87
12	346° 57.38	34°47.07 \$17°33.92	198°54.35 N17°16.78	205°21.72 N16°12.03	333°8.58 N03°27.99
13	1°59.84	49°46.47 33.27	213°57.56 16.95	220°24.43 12.11	348°10.78 28.11
14	17°2.30	64°45.88 32.62	229° 0.76 17.12 244° 3.97 · · 17.29	235°27.14 12.19	3°12.97 28.22
15 16	32°4.77 47°7.23	79°45.28 · · 31.97 94°44.69	244°3.97 ·· 17.29 259°7.17 17.46	250°29.85 · · 12.27 265°32.57 12.34	18°15.16 · · 28.34 33°17.35 28.46
17	62°9.70	109°44.09 30.66	274°10.38 17.63	280°35.28 12.42	48° 19.55 28.58
18	77°12.16	124°43.50 \$17°30.00	289°13.58 N17°17.79	295°37.99 N16°12.50	63°21.74 N03°28.69
19	92° 14.63	139°42.90 29.35	304°16.78 17.96	310°40.70 12.58	78°23.93 28.81
20	$107^{\circ}17.09$	154° 42.31 28.69	319°19.98 18.12	325°43.41 12.65	93°26.12 28.93
21	$122^{\circ}19.55$	169°41.72 · · 28.03	334°23.18 · · 18.29	340°46.12 · · 12.73	108°28.32 · · 29.05
22	137°22.02	184°41.12 27.37	349°26.38 18.45	355°48.83 12.81	123°30.51 29.16
23	152°24.48	199°40.53 26.71	4°29.57 18.62	10°51.55 12.88	138°32.70 29.28
Mer.p	bass. 12:52	ν-0.6' d-0.6' m-4.02	ν3.2' d0.2' m-0.94	$\nu 2.7' \ d0.1' \ \text{m-}2.49$	$ u 2.2' \ d0.1' \ \text{m}0.77$
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0 0	167° 26.95	214°39.94 \$17°26.05	19°32.77 N17°18.78	25°54.26 N16°12.96	153°34.89 N03°29.40
1	182°29.41	229°39.35 25.39	34°35.96 18.95	40°56.97 13.04	168°37.08 29.52
2	197°31.87	244°38.75 24.73	49°39.16 19.11	55°59.68 13.11	183°39.28 29.63
3	212°34.34	259°38.16 · · 24.06	64°42.35 · · 19.27	71°2.39 · · 13.19	198°41.47 · · 29.75
4	227°36.80	274° 37.57 23.40	79°45.54 19.43	86°5.09 13.27	213°43.66 29.87 N
5	242°39.27	289°36.98 22.73	94°48.73 19.59	101°7.80 13.34	228°45.85 29.99
6	257°41.73	304°36.39 \$17°22.07	109°51.92 N17°19.75	116°10.51 N16°13.42	243°48.04 N03°30.10
7	272°44.19	319°35.80 21.40	124°55.11 19.91	131°13.22 13.49	258° 50.23 30.22
8	287° 46.66	334°35.21 20.73	139°58.29 20.07	146°15.93 13.57	273°52.43 30.34
9 10	302°49.12 317°51.59	349°34.62 · · 20.07 4°34.03 19.40	155°1.48 · · 20.23 170°4.66 20.39	161°18.64 · · 13.65 176°21.35 13.72	288° 54.62 · · · 30.46 303° 56.81
11	317 51.59 332°54.05	19°33.44 18.73	170 4.00 20.59 185° 7.85 20.55	170 21.35 13.72 191°24.05 13.80	318°59.00 30.69
12	347° 56.51	34°32.85 \$17°18.05	200°11.03 N17°20.70	206°26.76 N16°13.87	334°1.19 N03°30.81
13	2°58.98	49°32.27 17.38	215°14.21 20.86	221°29.47 13.95	349°3.38 30.93
14	18°1.44	64°31.68 16.71	230°17.39 21.02	236°32.18 14.02	4°5.57 31.05
15	33°3.91	79°31.09 · · 16.04	245°20.57 · · 21.17	251°34.88 · · 14.10	19°7.77 · · · 31.17 N
16	48°6.37	94°30.50 15.36	260°23.75 21.33	266°37.59 14.17	34°9.96 31.28
17	63°8.83	109°29.92 14.69	275°26.92 21.48	281°40.30 14.25	49°12.15 31.40
18	78° 11.30	124°29.33 \$17°14.01	290°30.10 N17°21.64	296°43.00 N16°14.32	64°14.34 N03°31.52
19	93°13.76	139°28.74 13.33	305°33.27 21.79	311°45.71 14.40	79°16.53 31.64
20 21	108° 16.23 123° 18.69	154°28.16 12.66 169°27.57 · · 11.98	320°36.45 21.94 335°39.62 · · 22.10	326°48.41 14.47 341°51.12 · · 14.55	94°18.72 31.75 109°20.91 · · 31.87
22	138° 21.15	184°26.98 11.30	350°42.79 22.25	356°53.82 14.62	124°23.10 31.99
23	153°23.62	199° 26.40 10.62	5°45.96 22.40	11°56.53 14.70	139°25.29 32.11
Morr	pass. 12:48	ν-0.6' d-0.7' m-4.02	ν3.2' d0.2' m-0.92	ν2.7' d0.1' m-2.48	ν2.2' d0.1' m0.77
- ivier.p	,uss. 14.40	ν-0.0 u-0.1 III-4.02	ν J.Δ UU.Δ III-U.9Δ	νΔ.1 UU.1 III-Δ.40	ν Δ.Ζ. α U.1 IIIU.[[

	Stars	
	SHA	Dec
Alpheratz	357°33.26	29°14.43
Ankaa	353°5.78	-42°9.58
Schedar Diphda	349°29.50 348°45.80	56°41.29 -17°50.34
Achernar	348 45.80 335°19.32	-17 50.34 -57°6.08
Hamal	327°49.40	23°35.48
Polaris	$313^{\circ}20.38$	89°22.98
Acamar	315°10.63	-40°11.95 4°11.72
Menkar Mirfak	314°4.43 308°25.87	4°11.72 49°57.61
Aldebaran	290°37.60	16°33.81
Rigel	281°2.13	-8° 10.37
Capella Bellatrix	280°19.21 278°20.93	46°1.63 6°22.36
Elnath	277°59.56	28°37.83
Alnilam	275°35.87	$-1^{\circ}11.21$
Betelgeuse	270°50.07	7°24.63
Canopus Sirius	263°51.43 258°24.52	-52° 42.89 -16° 45.42
Adhara	255°4.29	-10 45.42 -29°0.79
Procyon	244°48.77	5°9.16
Pollux	243°14.89	27°57.57
Avior Suhail	234°13.54 222°44.61	-59°36.04 -43°32.78
Miaplacidus	222°44.61 221°37.10	-43° 32.78 -69° 49.92
Alphard	$217^{\circ}45.71$	-8°46.80
Regulus	207°32.23	11°49.87
Dubhe	193°38.17 182°22.80	61°36.12 14°24.99
Denebola Gienah	182°22.80 175°41.42	14°24.99 -17°41.75
Acrux	172°57.42	-63° 15.02
Gacrux	$171^{\circ}49.09$	$-57^{\circ}15.97$
Alioth	166°10.91	55°48.46
Spica Alkaid	158°20.14 152°50.23	-11° 18.36 49° 10.33
Hadar	148°32.98	-60°30.16
Menkent	$147^{\circ}55.21$	-36°30.25
Arcturus	145°46.05 139°37.40	19°2.18
Rigil Kent. Kochab	139 37.40 137°19.22	-60°56.75 74°2.23
Zuben'ubi	136°53.84	-16°9.39
Alphecca	126°2.09	26°37.08
Antares	112°13.57 107°6.16	-26°29.52 -69°4.30
Atria Sabik	107 0.10 102°0.73	-09 4.50 -15°45.55
Shaula	96°7.98	-37°7.30
Rasalhague	95°56.92	12°32.20
Eltanin Kaus Aust.	90°41.46 83°30.26	51°28.75 -34°22.20
Vega	80°32.16	38°48.23
Nunki	75°45.70	-26° 15.73
Altair	61°58.42	8°56.27
Peacock Deneb	53°3.36 49°24.94	-56°38.68 45°22.44
Enif	33°37.34	9°59.89
Al Na'ir	$27^{\circ}31.12$	-46°49.72
Fomalhaut	15°12.91	-29°28.73
Scheat Markab	13°43.82 13°28.43	28° 13.77 15° 21.04
Mar 08 Mon Venus	SHA 49°40.05	Mer.pass 09:40
Venus Mars	49°40.05 211°29.51	09:40 22:47
Jupiter	218°15.23	22:21
Saturn	346°20.94	13:51
Mar 09 Tue	SHA	Mer.pass
Venus	48°26.43	09:41
Mars Jupiter	211°47.97 218°21.34	22:42 22:17
Saturn	346°14.46	13:47
Mar 10 Wed Venus	SHA 47°12.99	Mer.pass 09:42
Mars	212°5.82	22:37
Jupiter	218°27.31	22:12
Saturn	346°7.95	13:44
Horizon	ıtal parallax	
	Venus: Mars:	0.1 0.2

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°16.02	S05°3.70	$182^{\circ}14.60$	15.6'	S04°59.29	-14.3'	55.4'
1	192°16.17	2.72	196°49.20	15.6'	04°44.98	-14.3'	55.4'
2 3	207°16.32 222°16.47	1.75 05°0.77	211°23.79 225°58.39	15.6' 15.6'	04°30.64 04°16.28	-14.4' -14.4'	55.4' 55.4'
4	237°16.62	04°59.80	240°32.98	15.6'	04°1.89	-14.4	55.4'
5	252°16.78	58.82	255°7.57	15.6'	03°47.47	-14.4'	55.4'
6	267°16.93	S 04°57.85	269°42.16	15.6'	S03°33.03	-14.5'	55.5'
7	282°17.08 297°17.23	56.87	284° 16.74 298° 51.31	15.6'	03°18.56 03°4.08	-14.5' -14.5'	55.5'
8 9	297°17.23 312°17.38	55.90 •• 54.92	298°51.31 313°25.88	15.6' 15.6'	03°4.08 02°49.57	-14.5' -14.5'	55.5' 55.5'
10	327°17.53	53.95	328°0.44	15.6'	02° 35.03	-14.6'	55.5'
11	342°17.68	52.97	342°34.99	15.5'	$02^{\circ}20.48$	-14.6'	55.6'
12	357°17.84	S04°51.99	357°9.53	15.5'	S02°5.91	-14.6'	55.6'
13 14	12°17.99 27°18.14	51.02 50.04	11° 44.06 26° 18.58	15.5' 15.5'	01°51.32 01°36.72	-14.6' -14.6'	55.6' 55.6'
15	42°18.29	• • 49.07	40°53.09	15.5'	01°30.72	-14.6'	55.6'
16	57°18.44	48.09	55°27.58	15.5'	01°7.46	-14.7'	55.7'
17	72°18.60	47.11	70°2.05	15.5'	00°52.80	-14.7'	55.7'
18	87°18.75	S04°46.14	84°36.51 99°10.96	15.4'	500°38.14	-14.7' -14.7'	55.7'
19 20	102°18.90 117°19.06	45.16 44.18	99°10.96 113°45.38	15.4' 15.4'	00°23.46 \$00°8.77	-14.7' -14.7'	55.7' 55.7'
21	132°19.21	• • 43.21	128° 19.79	15.4'	N00°5.93	14.7'	55.8'
22	147°19.36	42.23	142°54.18	15.4'	00°20.64	14.7'	55.8'
23	162°19.52	41.25	157°28.54	15.3'	00°35.36	14.7'	55.8'
	SD = 16.1'	d = -1.0'		SI	O = 15.1'		
т.	CUA	D	CUA		D	.ı	UP
Tue 0	GHA 177°19.67	Dec \$04° 40.28	GHA 172°2.88	u 15.3'	Dec N00° 50.09	d 14.7'	HP 55.8'
1	192°19.82	39.30	186° 37.20	15.3'	01°4.82	14.7'	55.8'
2	207°19.98	38.32	201°11.50	15.3'	01°19.56	14.7'	55.9'
3	222°20.13	• • 37.35	215° 45.77	15.2'	01°34.31	14.7'	55.9'
4 5	237°20.29 252°20.44	36.37 35.39	230°20.01 244°54.23	15.2' 15.2'	01°49.06 02°3.81	14.8' 14.8'	55.9' 55.9'
6	267°20.60	504°34.41	259°28.42	15.2'	N02° 18.56	14.8	55.9'
7	282°20.75	33.44	274°2.57	15.1'	02°33.31	14.8'	56.0'
8	297°20.91	32.46	288°36.70	15.1'	02°48.06	14.8'	56.0'
9	312°21.06	• • 31.48	303° 10.80	15.1'	03°2.81 03°17.56	14.7'	56.0'
10 11	327°21.22 342°21.37	30.50 29.52	317°44.86 332°18.89	15.0' 15.0'	03 17.50 03°32.31	14.7' 14.7'	56.0' 56.0'
12	357°21.53	S04°28.54	346°52.89	15.0'	N03°47.05	14.7'	56.1'
13	12°21.68	27.57	$1^{\circ}26.85$	14.9'	$04^{\circ}1.78$	14.7'	56.1'
14	27°21.84	26.59	16°0.77	14.9'	04° 16.51	14.7'	56.1'
15 16	42°22.00 57°22.15	· · 25.61 24.63	30°34.66 45°8.50	14.8' 14.8'	04°31.23 04°45.94	14.7' 14.7'	56.1' 56.1'
17	72°22.31	23.65	59° 42.31	14.8'	05°0.64	14.7'	56.2'
18	87°22.47	S04°22.67	74°16.07	14.7'	N05° 15.33	14.7'	56.2'
19	102°22.62	21.69	88°49.79	14.7'	05°30.01	14.7'	56.2'
20 21	117°22.78 132°22.94	20.72 •• 19.74	103° 23.47 117° 57.11	14.6' 14.6'	05° 44.68 05° 59.33	14.7' 14.6'	56.2' 56.2'
22	147°23.09	18.76	132°30.70	14.5	05° 59.55 06° 13.96	14.6'	56.3
23	162°23.25	17.78	147°4.24	14.5'	06°28.58	14.6'	56.3'
	SD = 16.1'	d = -1.0'		SI	O = 15.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°23.41	S04°16.80	161°37.74	14.4'	N06°43.18	14.6'	56.3'
1	192°23.57	15.82	176° 11.18	14.4'	06°57.76	14.6'	56.3'
2	207°23.72 222°23.88	14.84	190° 44.58 205° 17.93	14.3' 14.3'	07°12.33 07°26.87	14.5' 14.5'	56.3' 56.4'
3 4	222°23.88 237°24.04	· · 13.86 12.88	205° 17.93 219° 51.22	14.3' 14.2'	07°26.87 07°41.39	14.5' 14.5'	56.4'
5	252°24.20	11.90	234°24.46	14.2'	07°55.88	14.5'	56.4
6	267°24.36	S04°10.92	248° 57.65	14.1'	N08° 10.35	14.4'	56.4'
7	282°24.52	9.94	263°30.79	14.1'	08°24.80	14.4'	56.4'
8 9	297°24.67 312°24.83	8.96 •• 7.98	278°3.86 292°36.88	14.0' 14.0'	08°39.22 08°53.61	14.4' 14.4'	56.5' 56.5'
10	312 24.63 327°24.99	7.00	307°9.84	13.9'	06 55.01 09°7.97	14.4	56.5'
11	342°25.15	6.02	321°42.75	13.8'	09°22.30	14.3'	56.5'
12	357°25.31	S04°5.04	336° 15.59	13.8'	N09°36.60	14.3'	56.6'
13 14	12°25.47 27°25.63	4.06 3.08	350°48.37 5°21.09	13.7' 13.7'	09°50.86 10°5.10	14.2' 14.2'	56.6' 56.6'
14 15	42°25.79	2.10	19°53.74	13.6'	10°5.10 10°19.29	14.2'	56.6'
16	57°25.95	1.12	34°26.33	13.5'	10°33.45	14.1'	56.6'
17	72°26.11	04°0.13	48° 58.86	13.5'	10°47.57	14.1'	56.7'
18	87°26.27	S03°59.15	63°31.32	13.4'	N11°1.66	14.0'	56.7'
19 20	102°26.43 117°26.59	58.17 57.19	78°3.71 92°36.03	13.3' 13.3'	11°15.70 11°29.70	14.0' 14.0'	56.7' 56.7'
21	132°26.75	. 56.21	92 30.03 107°8.28	13.2'	11° 43.66	13.9'	56.7'
22	147°26.91	55.23	121°40.47	13.1'	11°57.57	13.9'	56.8'
23	162°27.07	54.25	136° 12.58	13.0'	12° 11.44	13.8'	56.8'
	SD = 16.1'	d = -1.0'		SI	O = 15.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-3%	
08	10:56	10:49	12:11	12:12	-:-		
09	10:41	10:34	12:11	12:54	00:33		
10	10:26	10:19	12:10	13:38	01:16		

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

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	turn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	168°26.08	214°25.81	S17°9.94	20°49.13	N17°22.55	26°59.23	$N16^{\circ}14.77$	154°27.48	N03°32.23	Almhauata	357°33.26	29° 14.42
1	$183^{\circ}28.55$	229°25.23	9.25	35°52.30	22.70	42°1.94	14.85	$169^{\circ}29.67$	32.34	Alpheratz	357 33.20 353°5.79	-42°9.57
2	$198^{\circ}31.01$	244°24.65	8.57	50°55.46	22.85	57°4.64	14.92	184°31.86	32.46	Ankaa Schedar	349°29.51	-42 9.57 56°41.28
3	213°33.47	259°24.06	• • 7.89	65°58.63	• • 23.00	72°7.35	• • 15.00	199°34.06	• • 32.58	Diphda	348°45.81	-17°50.34
4	228°35.94	274°23.48	7.20	$81^{\circ}1.79$	23.15	87°10.05	15.07	214°36.25	32.70	Achernar	335°19.34	-57°6.07
5	243°38.40	289°22.89	6.52	96°4.95	23.30	102°12.75	15.14	229°38.44	32.82	Hamal	327°49.42	23°35.47
6	258° 40.87	304°22.31	S 17°5.83	$111^{\circ}8.12$	N17°23.45	117°15.46	N16° 15.22	244°40.63	N03°32.94	Polaris	313°21.66	89°22.97
7	273°43.33	319°21.73	5.14	126°11.28	23.59	132°18.16	15.29	259°42.82	33.05	Acamar	315°10.65	-40°11.94
8	288° 45.79	334°21.15	4.45	141°14.44	23.74	147°20.86	15.37	274°45.01	33.17	Menkar	314°4.44	4°11.71
9	303°48.26	349°20.56	• • 3.77	156° 17.60	• • 23.89	162°23.56	• • 15.44	289°47.20	• • 33.29	Mirfak	308°25.89	49°57.61
10	318° 50.72	4° 19.98	3.08	171°20.75	24.03	177°26.27	15.51	304°49.39	33.41	Aldebaran	290°37.62	16°33.80
11	333°53.19	19°19.40	2.39	186°23.91	24.18	192°28.97	15.59	319°51.58	33.53	Rigel	281°2.15	-8° 10.38
12	348° 55.65	34° 18.82	S17° 1.69	201°27.06	N17°24.32	207°31.67	N16° 15.66	334°53.77	N03°33.64	Capella	280°19.23	46°1.62
13	3°58.11	49°18.24	1.00	216°30.22	24.47	222°34.37	15.73	349°55.96	33.76	Bellatrix	278°20.94	6°22.36
14	19°0.58	64° 17.66	17°0.31	231°33.37	24.61	237°37.07	15.81	4°58.15	33.88	Elnath	277°59.58	28° 37.83
15	34°3.04	79°17.08	16°59.62	246°36.52	• • 24.75	252°39.77	• • 15.88	20°0.34	• • 34.00	Alnilam	275°35.88	$-1^{\circ}11.21$
16	49°5.51	94°16.50	58.92	261°39.67	24.89 25.04	267°42.48 282°45.18	15.95	35°2.53	34.12	Betelgeuse	270°50.09	$7^{\circ}24.62$
17 18	64°7.97 79°10.44	109° 15.92 124° 15.34	58.22 \$16°57.53	276°42.82 291°45.97	N17°25.18	297°47.88	16.03 N16° 16.10	50°4.72 65°6.91	34.23 N03°34.35	Canopus	263°51.45	-52°42.89
19	94° 12.90	139° 14.76	56.83	306°49.12	25.32	312°50.58	16.17	80°9.10	34.47	Sirius	258°24.54	-16°45.43
20	109° 15.36	154° 14.70	56.13	321°52.26	25.46	312 50.58 327°53.28	16.25	95°11.29	34.59	Adhara	255°4.30	-29°0.80
21	124° 17.83	169° 13.61	55.43	336°55.41	25.60	342°55.98	. 16.32	110° 13.48	• • 34.71	Procyon	244°48.78	5°9.16
22	139° 20.29	184° 13.03	54.73	351°58.55	25.74	357°58.68	16.39	125° 15.67	34.83	Pollux	243°14.91	27° 57.57
23	154° 22.76	199° 12.45	54.73	7° 1.69	25.88	13°1.37	16.46	140° 17.86	34.94	Avior	234°13.56	-59°36.06
			_				_	-		Suhail	222°44.63	-43°32.79
Mer.	pass. 12:44	ν -0.6' d-0	.7′ m-4.01	ν 3.2′ d0.	.2′ m-0.89	ν 2.7′ d0.	.1′ m-2.48	$\nu 2.2' \ d0$.1' m 0.77	Miaplacidus	221°37.13	-69°49.94
										Alphard	217°45.71	-8°46.80
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.23	11°49.87
0	169° 25.22	214° 11.87	S16°53.33	22° 4.83	N17°26.02	28°4.07	N16° 16.54	155°20.04	N03°35.06	Dubhe	193°38.18	61°36.14
1	184° 27.68	229°11.30	52.63	37°7.97	26.15	43°6.77	16.61	170°22.23	35.18	Denebola	182°22.80	14°24.99
2	199° 30.15	244°10.72	51.93	52°11.11	26.29	58°9.47	16.68	185°24.42	35.30	Gienah	175°41.42	-17°41.75
3	214° 32.61	259° 10.14	51.22	67°14.25	. 26.43	73°12.17	. 16.75	200°26.61	35.42	Acrux	172°57.40	-63°15.03
4	229° 35.08	274°9.57	50.52	82°17.39	26.56	88°14.87	16.82	215°28.80	35.54	Gacrux		-57° 15.99
5	244°37.54	289°8.99	49.81	97°20.52	26.70	103°17.56	16.90	230°30.99	35.65	Alioth	166°10.90	55°48.47
6	259°40.00	304°8.42	S16°49.11	112°23.66	N17°26.83	118°20.26	N16° 16.97	245°33.18	N03°35.77	Spica	158°20.13	-11°18.36
7	274° 42.47	319°7.84	48.40	127°26.79	26.97	133°22.96	17.04	260°35.37	35.89	Alkaid	152°50.21	49° 10.34
8	289° 44.93	334°7.27	47.69	142°29.92	27.10	148°25.66	17.11	275°37.56	36.01	Hadar	148°32.95	-60°30.17
9	304°47.40	349°6.69	• • 46.98	157°33.05	• • 27.24	163°28.35	• • 17.18	290°39.75	• • 36.13	Menkent		-36°30.26
10	319°49.86	4°6.12	46.27	172°36.18	27.37	178°31.05	17.26	305°41.94	36.25	Arcturus Rigil Kent.	145°46.03 139°37.37	19°2.18 -60°56.76
11	334°52.32	19°5.55	45.56	187°39.31	27.50	193°33.74	17.33	$320^{\circ}44.12$	36.37	Kochab	139 37.37 137°19.17	74°2.24
12	349°54.79	34°4.97	S16°44.85	202°42.44	N17°27.63	208°36.44	N16° 17.40	335°46.31	N03°36.48	Zuben'ubi	136°53.83	-16°9.39
13	4°57.25	49°4.40	44.14	217°45.56	27.76	223°39.14	17.47	350°48.50	36.60	Alphecca	126°2.07	26°37.09
14	$19^{\circ}59.72$	64°3.83	43.43	232°48.69	27.90	238°41.83	17.54	5°50.69	36.72	Antares	112° 13.55	-26°29.52
15	35°2.18	79°3.26	• • 42.71	247°51.81	• • 28.03	253°44.53	• • 17.61	20°52.88	• • 36.84	Atria	107°6.11	-69°4.30
16	50°4.64	94°2.68	42.00	262°54.93	28.16	268°47.22	17.68	35°55.07	36.96	Sabik	102°0.71	-15°45.55
17	65°7.11	109°2.11	41.28	277°58.05	28.28	283°49.92	17.75	50°57.26	37.08	Shaula	96°7.95	-37°7.30
18	80°9.57		S16°40.56	293°1.17	N17°28.41	298°52.61	N16° 17.82	65°59.45	N03°37.20	Rasalhague	95°56.90	12°32.20
19	95° 12.04	139°0.97	39.85	308° 4.29	28.54	313°55.30	17.90	81°1.63	37.31	Eltanin	90°41.43	51°28.75
20	110° 14.50	154°0.40	39.13	323°7.41	28.67	328°58.00	17.97	96°3.82	37.43	Kaus Aust.	83°30.24	-34°22.20
21	125° 16.97	168°59.83	• • 38.41	338°10.52	• • 28.80	344°0.69	• • 18.04	111°6.01	• • 37.55	Vega	80°32.14	38°48.22
22	140° 19.43	183°59.26	37.69	353°13.64	28.92	359°3.39	18.11	126°8.20	37.67	Nunki	75°45.68	-26°15.72
23	155°21.89	198°58.69	36.97	8°16.75	29.05	14°6.08	18.18	141°10.39	37.79	Altair	61°58.40	8°56.27
Mer.	pass. 12:40	ν -0.6' d-0	.7′ m-4.01	ν 3.1' d0.	.1′ m-0.87	$\nu 2.7' d0$.1′ m-2.47	$\nu 2.2' d0$.1′ m0.77	Peacock	53°3.34	-56°38.67
	p									Deneb	49°24.92	45°22.43
_			_		_		_		_	Enif	33°37.33	9°59.89
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.11	-46°49.70
0	170° 24.36	213°58.12		23°19.87	N17°29.17		N16° 18.25	156°12.58	N03°37.91	Fomalhaut	15°12.91	-29°28.72
1	185° 26.82	228° 57.55	35.53	38°22.98	29.30	44°11.46	18.32	171°14.76	38.03	Scheat	13°43.81	28° 13.76
2	200°29.29	243°56.98	34.80	53°26.09	29.42	59°14.16	18.39	186°16.95	38.14	Markab	13°28.43	15°21.03
3 4	215°31.75 230°34.21	258° 56.42 273° 55.85	· · 34.08	68°29.20	· · 29.55	74°16.85 89°19.54	18.46	201°19.14	· · 38.26	Mar 11 Thu	SHA	Mer.pass
4 5	245°36.68	273°55.85 288°55.28	33.36 32.63	83°32.30 98°35.41	29.67 29.79	104°22.23	18.53	216°21.33 231°23.52	38.38 38.50	Venus	5па 45°59.73	09:43
6	260° 39.14	303°54.71	516°31.91	98 35.41 113°38.52	29.79 N17°29.92	104 22.23 119°24.92	18.60 N16° 18.67	231 23.52 246°25.70	N03°38.62	Mars		22:32
7	200 39.14 275°41.61	318° 54.71	31.18	113 38.52 128°41.62	30.04	119 24.92 134°27.61	18.74	240 25.70 261°27.89	38.74	Jupiter		22:08
8	275 41.01 290°44.07	333° 53.58	30.45	143°44.72	30.04	134 27.01 149°30.31	18.81	201 27.89 276°30.08	38.86	Saturn	346°1.40	13:40
9	305° 46.53	348° 53.01	• • 29.72	158° 47.82	30.10	164° 33.00	18.88	270 30.00 291°32.27	• • 38.98			
10	320° 49.00	3°52.45	28.99	173° 50.92	30.40	179°35.69	18.94	306°34.45	39.09	Mar 12 Fri	SHA	Mer.pass
11	335° 51.46	18° 51.88	28.26	173 50.92 188°54.02	30.40	179 33.09 194°38.38	19.01	321°36.64	39.09	Venus	44°46.65	09:44
12	350°53.93	33°51.32	S16°27.53	203°57.12	N17°30.64	209°41.07	N16° 19.08	336°38.83	N03°39.33	!	212°39.61	22:27
13	5° 56.39	48°50.75	26.80	219° 0.22	30.76	224°43.76	19.15	351°41.02	39.45		218°38.85	22:04
14	20° 58.86	63°50.19	26.07	234° 3.31	30.88	239°46.44	19.22	6°43.20	39.57	Saturn	345°54.82	13:37
15	36°1.32	78°49.62	25.33	249° 6.41	30.99	254°49.13	. 19.29	21°45.39	39.69	Mar 13 Sat	SHA	Mer.pass
16	51°3.78	93°49.06	24.60	264° 9.50	31.11	269°51.82	19.36	36°47.58	39.81	Venus	43°33.76	09:44
17	66°6.25	108°48.50	23.86	279°12.59	31.23	284°54.51	19.43	51°49.77	39.93		212°55.51	22:22
18	81°8.71	123°47.93	S16°23.13	294°15.68	N17°31.34	299°57.20	N16° 19.50	66°51.95	N03°40.04	I	212 33.31 218°44.41	21:59
19	96°11.18	138°47.37	22.39	309°18.77	31.46	314°59.89	19.56	81°54.14	40.16		345°48.22	13:33
20	111° 13.64	153°46.81	21.65	324°21.86	31.58	330°2.58	19.63	96° 56.33	40.28			13.33
21	$126^{\circ}16.10$	168°46.24	• • 20.92	339°24.95	• • 31.69	345°5.26	• • 19.70	111°58.52	• • 40.40	Horizoi	ntal parallax	
22	141°18.57	183°45.68	20.18	354°28.03	31.80	0°7.95	19.77	127°0.70	40.52		Venus:	0.1
23	$156^{\circ}21.03$	198°45.12	19.44	9°31.12	31.92	15°10.64	19.84	142°2.89	40.64		Mars:	0.2
Mar	pass. 12:36	ν-0.6′ d-0	7′ m-4 00	1/3 1/ d0	.1′ m-0.84	1/2 7/ 40	.1′ m-2.47	1/2 2/ 40	.1′ m0.77			
	P333. 12.30	- 0.0 u-0	7.00		0.0+	ν 2.1 u0.	4.71					

–	011-016 =	+0.1303 Sec	Δι – ιι	-011	_ \ 05.0551	300	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°27.23	S03°53.27	$150^{\circ}44.62$	13.0'	$N12^{\circ}25.26$	13.8'	56.8'
1	192°27.40	52.28	165°16.58	12.9'	12°39.04	13.7'	56.8'
2	207°27.56 222°27.72	51.30 •• 50.32	179°48.47 194°20.29	12.8' 12.7'	12°52.76 13°6.44	13.7' 13.6'	56.8' 56.9'
3 4	237°27.88	49.34	208°52.02	12.7'	13°20.06	13.6'	56.9'
5	252°28.04	48.36	223°23.68	12.6'	13°33.63	13.5	56.9'
6	267°28.20	S03°47.38	237°55.27	12.5'	N13°47.14	13.5'	56.9'
7	282°28.37	46.39	252°26.77	12.4'	14°0.60	13.4'	56.9'
8 9	297°28.53 312°28.69	45.41 •• 44.43	266°58.19 281°29.54	12.3' 12.3'	14°14.00 14°27.34	13.3' 13.3'	57.0' 57.0'
10	312 28.69 327°28.85	43.45	281 29.54 296°0.80	12.3	14 27.34 14°40.62	13.3	57.0'
11	342°29.02	42.46	310°31.97	12.1'	14°53.85	13.2'	57.0'
12	357°29.18	S03°41.48	325°3.07	12.0'	N15°7.00	13.1'	57.0'
13	12°29.34	40.50	339°34.07	11.9'	15°20.10	13.0'	57.1'
14 15	27°29.50 42°29.67	39.52 •• 38.53	354°5.00 8°35.83	11.8' 11.7'	15°33.13 15°46.09	13.0' 12.9'	57.1' 57.1'
16	57°29.83	37.55	23°6.58	11.7'	15° 58.98	12.8'	57.1'
17	72°29.99	36.57	37°37.24	11.6'	16°11.80	12.8'	57.1'
18	87°30.16	S03°35.59	52°7.82	11.5'	$N16^{\circ}24.55$	12.7'	57.2'
19	102°30.32	34.60	66°38.30	11.4'	16° 37.23	12.6'	57.2'
20 21	117°30.49 132°30.65	33.62 •• 32.64	81°8.69 95°38.99	11.3' 11.2'	16° 49.84 17° 2.37	12.5' 12.5'	57.2' 57.2'
22	147°30.81	31.65	95 36.99 110°9.20	11.1'	17° 14.82	12.4	57.2'
23	162°30.98	30.67	124°39.32	11.0'	17°27.19	12.3'	57.3'
	SD = 16.1'	d = -1.0'		SI	0 = 15.5'		
	35 = 10.1	<u>u = 1.0</u>			7 = 15.5		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°31.14	S03°29.69	139°9.34	10.9'	N17°39.49	12.2'	57.3'
1 2	192°31.31 207°31.47	28.70 27.72	153°39.27 168°9.11	10.8' 10.7'	17°51.70 18°3.83	12.1' 12.0'	57.3' 57.3'
3	207 31.47 222°31.64	26.74	182°38.85	10.7	18° 15.88	12.0'	57.3'
4	237°31.80	25.75	197°8.49	10.5'	18°27.84	11.9'	57.4'
5	252°31.97	24.77	211°38.04	10.5'	$18^{\circ}39.71$	11.8'	57.4'
6	267°32.13	S03°23.79	226°7.49	10.4	N18°51.50	11.7'	57.4'
7 8	282°32.30 297°32.46	22.80 21.82	240°36.85 255°6.10	10.3' 10.2'	19°3.19 19°14.79	11.6' 11.5'	57.4' 57.4'
9	312°32.63	• • 20.83	269°35.26	10.2	19° 14.79	11.4	57.4 57.5'
10	327°32.79	19.85	284°4.32	10.0'	19°37.71	11.3'	57.5'
11	342°32.96	18.87	298°33.28	9.9'	19°49.03	11.2'	57.5'
12	357°33.13	S03°17.88	313°2.14	9.8'	N20°0.25	11.1'	57.5'
13 14	12°33.29 27°33.46	16.90 15.91	327°30.89 341°59.55	9.7' 9.6'	20°11.37 20°22.39	11.0' 10.9'	57.5' 57.6'
15	42°33.63	• • 14.93	356°28.11	9.5	20° 33.31	10.8	57.6'
16	57°33.79	13.95	10°56.57	9.4'	20°44.13	10.7'	57.6'
17	72°33.96	12.96	25°24.92	9.3'	20°54.84	10.6'	57.6'
18 19	87°34.13 102°34.29	\$03°11.98 10.99	39°53.17 54°21.32	9.2' 9.0'	N21°5.44 21°15.93	10.5'	57.6' 57.7'
20	102 34.29 117°34.46	10.99	68°49.37	9.0 8.9'	21° 15.93	10.4	57.7'
21	132°34.63	• • 9.02	83°17.32	8.8'	21°36.59	10.2	57.7'
22	147°34.79	8.04	97°45.16	8.7'	$21^{\circ}46.75$	10.0'	57.7'
23	162°34.96	7.05	112°12.90	8.6'	21°56.79	9.9'	57.7'
	SD = 16.1'	d = -1.0'		SE	0 = 15.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0 0	177°35.13	503°6.07	126°40.54	ν 8.5'	N22°6.72	9.8'	57.8'
1	192°35.30	5.08	141°8.08	8.4	22°16.53	9.7'	57.8'
2	207°35.47	4.10	155°35.51	8.3'	22°26.22	9.6'	57.8'
3	222°35.63	3.11	170°2.85	8.2'	22°35.80	9.4'	57.8'
4 5	237°35.80 252°35.97	2.13 1.14	184°30.08 198°57.20	8.1' 8.0'	22°45.25 22°54.57	9.3' 9.2'	57.8' 57.9'
6	267°36.14	503°0.16	213°24.23	7.9	N23°3.77	9.2	57.9'
7	282°36.31	02°59.17	227°51.15	7.8	23° 12.85	8.9'	57.9'
8	297°36.48	58.19	242°17.98	7.7'	23°21.79	8.8'	57.9'
9	312°36.64	• • 57.20	256°44.70	7.6'	23°30.61	8.7'	57.9'
10 11	327°36.81 342°36.98	56.22 55.23	271°11.32 285°37.84	7.5' 7.4'	23°39.29 23°47.84	8.6' 8.4'	57.9' 58.0'
12	342 36.98 357°37.15	55.23 \$02°54.25	285 37.84 300°4.26	7.4	N23° 56.26	8.3	58.0'
13	12°37.32	53.26	314°30.58	7.2	24°4.54	8.1	58.0'
14	27°37.49	52.27	328°56.80	7.1'	24°12.69	8.0'	58.0'
15	42°37.66	• • 51.29	343°22.92	7.0'	24°20.70	7.9'	58.0'
16 17	57°37.83 72°38.00	50.30 49.32	357°48.95 12°14.88	6.9' 6.8'	24°28.56 24°36.29	7.7' 7.6'	58.1' 58.1'
18	72 38.00 87°38.17	49.32 \$02°48.33	12 14.88 26°40.71	6.7	24 30.29 N24°43.87	7.0 7.4'	58.1
19	102°38.34	47.35	41°6.44	6.6	24°51.31	7.3'	58.1
20	117°38.51	46.36	55°32.08	6.5'	24°58.60	7.1'	58.1'
21	132°38.68	• • 45.37	69°57.63	6.5'	25°5.74	7.0'	58.2'
22 23	147°38.85 162°39.02	44.39 43.40	84°23.08 98°48.44	6.4' 6.3'	25°12.74 25°19.59	6.8' 6.7'	58.2' 58.2'
23			90 48.44			0.7	50.2
	SD = 16.1'	d = -1.0'		SE	0 = 15.8'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	7-22%
11	10:11	10:03	12:10	14:24	02:01	
12	09:55	09:47	12:10	15:15	02:49	
13	09:39	09:31	12:10	16:09	03:41	

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

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	171°23.50	213°44.56 \$16°18.70	24°34.20 N17°32.03	30°13.32 N16°19.91	157°5.08 N03°40.76
1	186° 25.96	228°44.00 17.95	39°37.28 32.14	45°16.01 19.97	172°7.26 40.88
2	201°28.43	243°43.44 17.21	54°40.36 32.25	60°18.70 20.04	187°9.45 41.00
3	216° 30.89	258°42.88 · · 16.47	69°43.44 · · 32.37	75°21.38 · · 20.11	202°11.64 · · 41.11
4	231°33.35	273°42.32 15.73	84°46.52 32.48	90°24.07 20.18	217° 13.82 41.23
5	246°35.82	288°41.76 14.98	99°49.60 32.59	105°26.75 20.25	232° 16.01 41.35
6	261°38.28	303°41.20 S 16°14.24	114°52.67 N17°32.70	120°29.44 N16°20.31	247°18.20 N03°41.47
7	276° 40.75	318°40.64 13.49	129°55.75 32.81	135°32.12 20.38	262°20.38 41.59
8	291°43.21	333°40.08 12.74	144°58.82 32.91	150°34.81 20.45	277°22.57 41.71
9	306°45.67	348°39.52 · · 11.99	160°1.89 · · 33.02	165°37.49 · · 20.51	292°24.76 · · 41.83
10	321°48.14	3°38.97 11.25	175°4.97 33.13	180°40.18 20.58	307°26.94 41.95
11	$336^{\circ}50.60$	18°38.41 10.50	190°8.04 33.24	195°42.86 20.65	322°29.13 42.07
12	351°53.07	33°37.85 S 16°9.75	205°11.10 N17°33.34	210°45.54 N16°20.72	337°31.32 N03°42.19
13	6°55.53	48°37.30 9.00	220°14.17 33.45	225°48.23 20.78	352°33.50 42.31
14	21°58.00	63°36.74 8.24	235°17.24 33.56	240°50.91 20.85	7°35.69 42.42
15	37°0.46	78°36.18 · · 7.49	250°20.30 · · 33.66	255°53.59 · · 20.92	22°37.88 · · 42.54
16	52°2.92	93°35.63 6.74	265°23.36 33.76	270°56.28 20.98	37°40.06 42.66
17	67°5.39	108°35.07 5.98	280°26.43 33.87	285°58.96 21.05	52°42.25 42.78
18	82°7.85	123°34.52 \$16°5.23	295°29.49 N17°33.97	301°1.64 N16°21.12	67°44.43 N03°42.90
19	97° 10.32	138°33.96 4.47	310°32.55 34.08	316°4.32 21.18	82°46.62 43.02
20	112° 12.78	153°33.41 3.72	325°35.61 34.18	331°7.00 21.25	97°48.81 43.14
21	127° 15.24	168°32.85 · · 2.96	340°38.66 · · 34.28	346°9.69 · · 21.31	112°50.99 · · 43.26
22	142°17.71	183°32.30 2.20	355°41.72 34.38	1°12.37 21.38	127°53.18 43.38
23	157°20.17	198°31.75 1.44	10°44.77 34.48	16°15.05 21.45	142°55.36 43.50
Mer.p	pass. 12:32	ν -0.6' d-0.7' m-4.00	$ u 3.1' \ d0.1' \ \text{m-}0.82$	$\nu 2.7' \ d0.1' \ \text{m-}2.46$	ν2.2′ d0.1′ m0.76
N A	CHV	CHA De-	CHV D	CUA D	CHA De-
Mon	GHA 172° 22.64	GHA Dec 213°31.19 \$16°0.68	GHA Dec 25°47.83 N17°34.58	GHA Dec 31°17.73 N16°21.51	GHA Dec 157°57.55 N03°43.62
0	172°22.64 187°25.10	213° 31.19 \$16° 0.68 228° 30.64 15° 59.92			
1 2	202°27.57		40°50.88 34.68 55°53.93 34.78	46°20.41 21.58 61°23.09 21.64	172°59.74 43.73 188°1.92 43.85
3	202 27.57 217°30.03	243°30.09 59.16 258°29.54 •• 58.40	70°56.98 · · 34.88	76°25.77 · · 21.71	203°4.11 · · 43.97
3 4	217 30.03 232°32.49	273°28.99 57.63	86°0.03 34.98	91°28.45 21.77	218° 6.29 44.09
5	232 32.49 247°34.96	288°28.43 56.87	101°3.07 35.08	106°31.13 21.84	233°8.48 44.21
6	262° 37.42	303°27.88 S15°56.11	116°6.12 N17°35.17	121°33.81 N16°21.91	248°10.67 N03°44.33
7	202 37.42 277°39.89	318° 27.33 55.34	131° 9.16 35.27	136°36.48 21.97	263°12.85 44.45
8	211 39.69 292°42.35	333°26.78 54.58	131 9.10 35.27 146°12.21 35.37	150 30.46 21.97 151°39.16 22.04	278° 15.04 44.57
9	307° 44.81	348° 26.23 · · 53.81	161°15.25 · · 35.46	166°41.84 · · 22.10	293°17.22 · · 44.69
10	322° 47.28	3°25.68 53.04	176°18.29 35.56	181°44.52 22.17	308° 19.41 44.81
11	337°49.74	18°25.13 52.27	191°21.33 35.65	196°47.20 22.23	323°21.59 44.93
12	352°52.21	33°24.58 \$15°51.50	206°24.37 N17°35.74	211°49.87 N16°22.30	338°23.78 N03°45.05
13	7°54.67	48°24.04 50.73	221°27.40 35.84	226°52.55 22.36	353°25.96 45.17
14	22°57.14	63°23.49 49.96	236°30.44 35.93	241°55.23 22.42	8°28.15 45.29
15	37°59.60	78°22.94 · · 49.19	251°33.47 · · 36.02	256°57.90 · · 22.49	23°30.33 · · 45.40
16	53°2.06	93°22.39 48.42	266°36.51 36.12	272°0.58 22.55	38°32.52 45.52
17	68°4.53	108°21.84 47.65	281°39.54 36.21	287°3.26 22.62	53°34.70 45.64
18	83°6.99	123°21.30 \$15°46.87	296°42.57 N17°36.30	302°5.93 N16°22.68	68°36.89 N03°45.76
19	98°9.46	138°20.75 46.10	311°45.60 36.39	317°8.61 22.75	83°39.07 45.88
20	113° 11.92	153°20.21 45.32	326°48.63 36.48	332°11.28 22.81	98° 41.26 46.00
21	128° 14.39	168°19.66 • • 44.55	341°51.65 · · 36.57	347°13.96 · · 22.87	113°43.44 · · 46.12
22	143°16.85	183°19.11 43.77	356°54.68 36.66	2°16.63 22.94	128° 45.63 46.24
23	158° 19.31	198°18.57 42.99	11°57.70 36.74	17°19.31 23.00	143°47.81 46.36
Mer.	pass. 12:28	ν -0.6' d-0.8' m-3.99	$\nu 3.1' \ d0.1' \ \text{m-}0.79$	ν2.7' d0.1' m-2.45	ν2.2' d0.1' m0.76
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Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	173°21.78	213°18.02 \$15°42.21	27°0.72 N17°36.83	32°21.98 N16°23.06	158°50.00 N03°46.48
1	188° 24.24 203° 26.71	228°17.48 41.43 243°16.94 40.65	42°3.75 36.92 57°6.77 37.01	47°24.65 23.13 62°27.33 23.19	173°52.18 46.60 188°54.37 46.72
2	203°26.71 218°29.17	243°16.94 40.65 258°16.39 · · 39.87	$57^{\circ}6.77$ 37.01 $72^{\circ}9.79$ · · 37.09	62°27.33 23.19 77°30.00 · · 23.25	188°54.37 46.72 203°56.55 • 46.84
3 4	218° 29.17 233° 31.63	258°16.39 · · 39.87 273°15.85 39.09	87°12.80 37.18	92°32.67 23.32	218°58.74 46.96
4 5	233 31.03 248°34.10	288°15.31 38.31	102°15.82 37.18	92 32.67 23.32 107°35.35 23.38	234°0.92 47.08
6	248° 34.10 263° 36.56	303°14.76 S15°37.53	102°15.82 37.26 117°18.83 N17°37.35	107°35.35 23.38 122°38.02 N16°23.44	249°3.11 N03°47.20
7	203 30.50 278°39.03	318°14.22 36.74	132°21.85 37.43	137°40.69 23.51	264° 5.29 47.32
8	276 39.03 293°41.49	333°13.68 35.96	147°24.86 37.52	152°43.36 23.57	204 5.29 47.32 279°7.48 47.44
9	308° 43.96	348°13.14 · · 35.17	162°27.87 · · 37.60	167°46.04 · · 23.63	294°9 66 · · 47 56
10	323° 46.42	3°12.60 34.39	177°30.88 37.68	182°48.71 23.70	309°11.84 47.67
11	338° 48.88	18°12.05 33.60	192°33.89 37.76	197°51.38 23.76	324°14.03 47.79
12	353°51.35	33°11.51 S15°32.81	207°36.90 N17°37.84	212°54.05 N16°23.82	339°16.21 N03°47.91
13	8°53.81	48°10.97 32.02	222°39.90 37.93	227°56.72 23.88	354°18.40 48.03
14	23°56.28	63°10.43 31.24	237°42.91 38.01	242°59.39 23.95	9° 20.58 48.15
15	38° 58.74	78°9.89 · · 30.45	252°45.91 · · 38.09	258°2.06 · · 24.01	24°22.76 · · 48.27
16	54°1.20	93°9.35 29.66	267°48.91 38.17	273°4.73 24.07	39°24.95 48.39
17	69°3.67	108°8.82 28.86	282°51.92 38.24	288°7.40 24.13	54°27.13 48.51
18	84°6.13	123°8.28 \$15°28.07	297°54.92 N17°38.32	303°10.07 N16°24.19	69°29.32 N03°48.63
19	99°8.60	138°7.74 27.28	312°57.91 38.40	318°12.74 24.26	84°31.50 48.75
20	114°11.06	153°7.20 26.49	328°0.91 38.48	333°15.41 24.32	99° 33.68 48.87
21	129°13.53	168°6.66 · · 25.69	343°3.91 · · 38.56	348°18.08 · · 24.38	114°35.87 · · 48.99
22	144° 15.99	183°6.13 24.90	358° 6.90 38.63	3°20.74 24.44	129°38.05 49.11
23	$159^{\circ}18.45$	198°5.59 24.10	13° 9.89 38.71	18°23.41 24.50	144°40.24 49.23
Mer	pass. 12:25	ν-0.5' d-0.8' m-3.99	ν 3.0' d0.1' m-0.77	ν2.7' d0.1' m-2.45	$\nu 2.2' \ d0.1' \ m0.76$
14161.	-uss. 12.2J	ν σ.σ u-σ.σ III-σ.σσ	ν 3.0 d0.1 iii-0.77	ν Δ.1 UU.1 III-Δ. 1 J	ν 2.2 d0.1 mo.10

7° 33.25 53° 5.79 9° 29.51 8° 45.81 5° 19.35 7° 49.42 3° 22.61 5° 10.66 14° 4.45 8° 25.91 0° 37.63 81° 2.16 0° 19.25 8° 20.95 7° 59.59 5° 35.89 0° 50.10 33° 51.48 8° 24.55 4° 48.79 3° 14.92 4° 13.58 2° 44.63 1° 37.15 7° 45.72 7° 32.23 3° 38.18 2° 22.79 5° 41.41 2° 57.38 1° 49.06 6° 10.88 8° 20.52 7° 55.17 5° 46.01 9° 37.33 7° 19.13 6° 53.80 26° 2.05 2° 13.52 07° 6.04 02° 6.68 0° 41.40	-42°9.56 56°41.27 -17°50.33 -57°6.05 23°35.47 89°22.96 -40°11.93 4°11.71 49°57.60 16°33.80 -8°10.38 46°1.62 6°22.36 28°37.83 -1°11.21 7°24.62 -52°42.90 -16°45.43 -29°0.80 5°9.16 27°57.57 -59°36.07 -43°32.80 -69°49.96 -8°46.81 11°49.87 61°36.15 14°24.99 -17°41.76 -63°15.05 -57°16.00 55°48.49 -11°18.37 49°10.35 -60°30.19 -36°30.27 19°2.19 -60°56.77 74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 -12°32.20
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8° 24.55 55° 4.32 4° 48.79 3° 14.92 4° 13.58 2° 24.63 1° 37.15 7° 45.72 7° 32.23 3° 38.18 2° 22.79 5° 41.41 2° 57.38 1° 49.06 6° 10.88 8° 20.12 2° 50.19 8° 32.92 7° 55.17 5° 46.01 9° 37.33 7° 19.13 6° 53.80 26° 2.05 2° 13.52 07° 6.04 02° 0.05 896° 7.92 5° 56.88	-16° 45.43 -29° 0.80 5° 9.16 27° 57.57 -59° 36.07 -43° 32.80 -6° 49.96 -8° 46.81 11° 49.87 61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.27 74° 22.55 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
55°4.32 4°48.79 3°14.92 4°13.58 2°34.63 1°37.15 7°45.72 7°32.23 3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°47.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92	-29°0.80 5°9.16 27°57.57 -59°36.07 -43°32.80 -69°49.96 -8°46.81 11°49.87 -61°36.15 14°24.99 -17°41.76 -63°15.05 -57°16.00 55°48.49 -11°18.37 49°10.35 -60°30.19 -36°30.27 -74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
4°48.79 3°14.92 4°13.58 2°44.63 1°37.15 7°45.72 7°32.23 3°38.18 2°22.79 5°41.41 2°5-7.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°5-46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	5°9.16 27°57.57 -59°36.07 -43°32.80 -69°49.96 -8°46.81 11°49.87 61°36.15 14°24.99 -17°41.76 -63°15.05 -57°16.00 55°48.49 -11°18.37 49°10.35 -60°30.19 -36°30.27 19°2.19 -60°56.77 74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
3°14.92 4°13.58 2°44.63 1°37.15 7°45.72 7°32.23 3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°54.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 00°0.604 002°0.68	27°57.57 -59°36.07 -43°32.80 -69°49.96 -8°46.81 11°49.87 61°36.15 14°24.99 -17°41.76 -63°15.05 -57°16.00 55°48.49 -11°18.37 49°10.35 -60°30.19 -36°30.27 19°2.19 -60°56.77 74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
4°13.58 2°44.63 1°37.15 7°45.72 7°32.23 3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	-59° 36.07 -43° 32.80 -69° 49.96 -8° 46.81 11° 49.87 61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
2° 44.63 1° 37.15 7° 45.72 7° 32.23 3° 38.18 2° 22.79 5° 41.41 2° 57.38 1° 49.06 6° 10.88 8° 20.12 2° 50.19 8° 32.92 7° 55.17 5° 46.01 9° 37.33 7° 19.13 6° 53.80 26° 2.05 2° 13.52 07° 6.04 02° 0.68 96° 7.92 5° 56.88	-43° 32.80 -69° 49.96 -8° 46.81 11° 49.87 61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
1° 37.15 7° 45.72 7° 32.23 3° 38.18 2° 22.79 5° 41.41 2° 57.38 1° 49.06 6° 10.88 8° 20.12 2° 50.19 8° 32.92 7° 55.17 5° 46.01 9° 37.33 7° 19.13 6° 53.80 26° 2.05 2° 13.52 07° 6.04 02° 0.68 96° 7.92 5° 56.88	-69° 49.96 -8° 46.81 -11° 49.87 -61° 36.15 -14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 -55° 48.49 -11° 18.37 -49° 10.35 -60° 30.27 -19° 2.19 -60° 56.77 -74° 2.25 -16° 9.39 -26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 -12° 32.20
7°45.72 7°32.23 3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 002°0.68	-8° 46.81 11° 49.87 61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.27 74° 22.55 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
7°32.23 3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	11° 49.87 61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
3°38.18 2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 00°0.604 02°0.68	61° 36.15 14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
2°22.79 5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68	14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	14° 24.99 -17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -6° 29.53 -6° 43.0 -15° 45.55 -37° 7.30 12° 32.20
5°41.41 2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	-17° 41.76 -63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
2°57.38 1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 007°6.04 02°0.68	-63° 15.05 -57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
1°49.06 6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92	-57° 16.00 55° 48.49 -11° 18.37 49° 10.35 -60° 30.19 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
6°10.88 8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04	55° 48.49 -11° 18.37 -49° 10.35 -60° 30.19 -36° 30.27 -74° 2.25 -16° 9.39 -26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
8°20.12 2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92	-11° 18.37 49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
2°50.19 8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	49° 10.35 -60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
8°32.92 7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	-60° 30.19 -36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
7°55.17 5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	-36° 30.27 19° 2.19 -60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
5°46.01 9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	19°2.19 -60°56.77 74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
9°37.33 7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	-60° 56.77 74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	74°2.25 -16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
7°19.13 6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	74° 2.25 -16° 9.39 26° 37.09 -26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
6°53.80 26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	-16°9.39 26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
26°2.05 2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	26°37.09 -26°29.53 -69°4.30 -15°45.55 -37°7.30 12°32.20
2°13.52 07°6.04 02°0.68 96°7.92 5°56.88	-26° 29.53 -69° 4.30 -15° 45.55 -37° 7.30 12° 32.20
07°6.04 02°0.68 96°7.92 5°56.88	-69°4.30 -15°45.55 -37°7.30 12°32.20
02°0.68 96°7.92 5°56.88	-15°45.55 -37°7.30 12°32.20
96°7.92 5°56.88	-37°7.30 12°32.20
5°56.88	12°32.20
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3°30.21	
0°32.11	
5°45.65	
1°58.38	
53°3.30	
9°24.90	45°22.43
3°37.31	
7°31.10	
5°12.90	
3°43.80	
3°28.42	
20.42	15 21.05
SHA	Mer.pass
2°21.06	
3°10.70	
- 11.50	15.50
SHA	Mer.pass
41°8.56	09:46
3°25.19	
8°55.09	
5°34.91	
	15.20
SHA	Mer.pass
9°56.25	
3°38.95	
19°0.20	
parallax	
Venus:	
Mars:	0.2
	2°21.06 3°10.70 8°49.83 5°41.58 SHA 41°8.56 3°25.19 8°55.09 5°34.91 SHA 9°56.25 31°3°38.95 19°0.20 parallax

Stars SHA

Dec

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°39.19	S02°42.42	113°13.71	6.2'	N25°26.28	6.5'	58.2'
1 2	192°39.36 207°39.53	41.43 40.44	127°38.89 142°3.98	6.1' 6.0'	25°32.82 25°39.21	6.4' 6.2'	58.2' 58.3'
3	222°39.70	• • 39.46	156°28.98	5.9'	25°45.45	6.1	58.3
4	237° 39.87	38.47	170°53.90	5.8'	25°51.52	5.9'	58.3'
5	252°40.05 267°40.22	37.49	185°18.73 199°43.47	5.7' 5.7'	25°57.44 N26°3.20	5.8'	58.3'
6 7	267 40.22 282°40.39	\$02°36.50 35.51	199 43.47 214°8.13	5. <i>1</i> ′ 5.6′	26°8.80	5.6' 5.4'	58.3' 58.3'
8	297° 40.56	34.53	228°32.71	5.5'	26°14.24	5.3'	58.4'
9	312°40.73	• • 33.54	242°57.21	5.4'	26°19.51	5.1'	58.4'
10 11	327°40.90 342°41.08	32.55 31.57	257°21.63 271°45.97	5.3' 5.3'	26°24.62 26°29.57	4.9' 4.8'	58.4' 58.4'
12	357°41.25	502°30.58	286°10.23	5.2'	N26°34.35	4.6'	58.4
13	12°41.42	29.59	300°34.42	5.1'	26°38.96	4.4'	58.5'
14	27°41.59	28.61	314°58.54 329°22.58	5.0'	26°43.40 26°47.68	4.3'	58.5'
15 16	42°41.77 57°41.94	· · 27.62 26.63	329 22.58 343°46.55	5.0' 4.9'	26°51.78	4.1' 3.9'	58.5' 58.5'
17	72°42.11	25.65	358°10.46	4.8'	26°55.71	3.8'	58.5'
18	87°42.28	S02°24.66	12°34.30	4.8'	N26°59.47	3.6'	58.5'
19 20	102° 42.46 117° 42.63	23.67 22.69	26°58.08 41°21.79	4.7' 4.7'	27°3.06 27°6.47	3.4' 3.2'	58.6' 58.6'
21	132° 42.80	• • 21.70	55°45.44	4.6'	27° 9.70	3.1'	58.6'
22	147°42.98	20.71	70°9.03	4.5'	27°12.76	2.9'	58.6'
23	162°43.15	19.72	84°32.57	4.5'	27°15.64	2.7'	58.6'
	SD = 16.1'	d = -1.0'		SI	O = 15.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	177°43.32	S02°18.74	98°56.04	4.4'	N27°18.34	2.5'	58.7'
1	192°43.50	17.75 16.76	113°19.47	4.4'	27°20.87	2.3' 2.2'	58.7'
2	207°43.67 222°43.84	16.76 •• 15.78	127°42.85 142°6.17	4.3' 4.3'	27°23.21 27°25.37	2.2'	58.7' 58.7'
4	237°44.02	14.79	156°29.45	4.2'	27°27.35	1.8'	58.7'
5	252°44.19	13.80	170°52.68	4.2'	27°29.16	1.6'	58.7'
6 7	267° 44.37 282° 44.54	S02°12.81 11.83	185°15.87 199°39.02	4.1' 4.1'	N27°30.77 27°32.21	1.4' 1.3'	58.8' 58.8'
8	297° 44.71	10.84	214° 2.13	4.1'	27°33.46	1.1'	58.8'
9	312°44.89	• • 9.85	228°25.21	4.0'	27°34.52	0.9'	58.8'
10	327°45.06	8.87	242°48.25	4.0'	27°35.41	0.7'	58.8'
11 12	342°45.24 357°45.41	7.88 \$02°6.89	257°11.26 271°34.24	4.0' 4.0'	27°36.10 N27°36.61	0.5' 0.3'	58.8' 58.9'
13	12° 45.59	5.90	285°57.19	3.9'	27°36.94	0.1	58.9'
14	27° 45.76	4.92	300°20.11	3.9'	27°37.08	-0.0'	58.9'
15 16	42°45.94 57°46.11	· · 3.93 2.94	314°43.02 329°5.90	3.9' 3.9'	27°37.03 27°36.79	-0.2' -0.4'	58.9' 58.9'
17	72°46.29	1.95	343°28.77	3.8'	27°36.37	-0.4	58.9'
18	87°46.46	S02°0.97	357°51.61	3.8'	N27°35.76	-0.8'	59.0'
19	102° 46.64 117° 46.81	01°59.98 01°58.99	12°14.45 26°37.27	3.8' 3.8'	27°34.96 27°33.97	-1.0' -1.2'	59.0'
20 21	117 46.81 132°46.99	·· 58.00	41° 0.09	3.8'	27°32.80	-1.2 -1.4'	59.0' 59.0'
22	147° 47.17	57.01	55°22.90	3.8'	27°31.43	-1.6'	59.0'
23	162°47.34	56.03	69°45.70	3.8'	27°29.88	-1.7'	59.0'
	SD = 16.1'	d = -1.0'		SI	O = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°47.52	S01°55.04	84°8.51	3.8'	N27°28.14	-1.9'	59.1'
1 2	192°47.69 207°47.87	54.05 53.06	98°31.31 112°54.12	3.8' 3.8'	27°26.21 27°24.10	-2.1' -2.3'	59.1' 59.1'
3	207°47.87 222°48.05	53.06	112°54.12 127°16.93	3.8'	27°24.10 27°21.79	-2.5'	59.1' 59.1'
4	237°48.22	51.09	141°39.74	3.8'	27°19.30	-2.7'	59.1'
5	252°48.40	50.10	156° 2.57	3.8'	27°16.62	-2.9'	59.1'
6 7	267°48.58 282°48.75	S01°49.11 48.12	170°25.41 184°48.27	3.9' 3.9'	N27°13.75 27°10.70	-3.1' -3.2'	59.2' 59.2'
8	297° 48.93	47.14	199°11.14	3.9'	27°7.45	-3.4	59.2'
9	312°49.11	• • 46.15	213°34.03	3.9'	27°4.03	-3.6'	59.2'
10 11	327°49.29 342°49.46	45.16 44.17	227°56.94 242°19.87	3.9' 4.0'	27°0.41 26°56.61	-3.8' -4.0'	59.2' 59.2'
12	357°49.64	501°43.18	256°42.83	4.0'	N26°52.62	-4.0 -4.2'	59.2'
13	12°49.82	42.20	271°5.81	4.0'	26°48.45	-4.4'	59.3'
14 15	27°49.99 42°50.17	41.21 •• 40.22	285°28.83 299°51.88	4.0' 4.1'	26°44.10 26°39.56	-4.5' -4.7'	59.3' 59.3'
15 16	42°50.17 57°50.35	39.23	299°51.88 314°14.96	4.1'	26°39.56 26°34.84	-4.7' -4.9'	59.3'
17	72°50.53	38.24	328°38.07	4.2'	26°29.93	-5.1'	59.3'
18	87°50.71	S01°37.26	343°1.23	4.2'	N26°24.84	-5.3'	59.3'
19 20	102°50.88 117°51.06	36.27 35.28	357°24.42 11°47.66	4.2' 4.3'	26°19.57 26°14.12	-5.4' -5.6'	59.3' 59.3'
21	132°51.24	• • 34.29	26°10.93	4.3'	26°8.49	-5.8'	59.4'
22	147°51.42	33.30	40°34.26	4.4'	26°2.69	-6.0'	59.4'
23	162°51.60	32.31	54°57.63	4.4'	25°56.70	-6.2'	59.4'
	SD = 16.1'	d = -1.0'		SI	D = 16.1'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	32-54%
14	09:23	09:15	12:09	17:08	04:38	
15	09:07	08:58	12:09	18:09	05:38	
16	08:50	08:41	12:09	19:11	06:40	

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

h	Aries	Venus	Mars	Jupiter	Saturn	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	174° 20.92	213°5.05 \$15°23.30	28°12.89 N17°38.78	33°26.08 N16°24.56	159°42.42 N03°49.35	1
1	189°23.38	228°4.52 22.51	43°15.88 38.86	48°28.75 24.62	174°44.60 49.47	Alpheratz
2	204°25.85	243°3.98 21.71	58°18.87 38.93	63°31.41 24.69	189°46.79 49.59	Ankaa
3	219°28.31	258°3.45 · · 20.91	73°21.85 · · 39.01	78°34.08 · · 24.75	204°48.97 · · 49.71	Schedar
4	234°30.77	273°2.91 20.11	88°24.84 39.08	93°36.75 24.81	219°51.15 49.83	Diphda Achernar
5	249°33.24	288°2.38 19.31	103°27.83 39.15	108°39.41 24.87	234°53.34 49.95	Hamal
6	264°35.70	303°1.84 S 15°18.51	118°30.81 N17°39.22	123°42.08 N16°24.93	249°55.52 N03°50.07	Polaris
7	279°38.17	318°1.31 17.71	133°33.79 39.30	138°44.74 24.99	264° 57.71 50.19	Acamar
8	294°40.63	333°0.77 16.90	148°36.77 39.37	153°47.41 25.05	279°59.89 50.31	Menkar
9	309°43.10	348°0.24 · · 16.10	163°39.75 · · 39.44	168°50.08 · · 25.11	295°2.07 · · 50.43	Mirfak
10	324°45.56	2°59.71 15.29	178°42.73 39.51	183°52.74 25.17	310°4.26 50.55	Aldebaran
11	339°48.02	17°59.17 14.49	193°45.71 39.58	198°55.40 25.23	325°6.44 50.67	Rigel
12	354°50.49	32°58.64 \$15°13.68	208°48.69 N17°39.65	213°58.07 N16°25.29	340°8.62 N03°50.79	Capella
13	9°52.95	47°58.11 12.88	223°51.66 39.72	229°0.73 25.35	355°10.81 50.91	Bellatrix
14 15	24° 55.42 39° 57.88	62°57.58 12.07 77°57.05 · · 11.26	238°54.63 39.78 253°57.61 · · 39.85	244°3.40 25.41 259°6.06 •• 25.47	10°12.99 51.03 25°15.17 · · 51.14	Elnath
16	55°0.34	92°56.52 10.45	269° 0.58 39.92	274°8.72 25.53	40°17.35 51.26	Alnilam
17	70°2.81	107°55.99 9.64	284° 3.55 39.99	289°11.39 25.59	55°19.54 51.38	Betelgeuse
18	85°5.27	122°55.45 \$15°8.83	299°6.52 N17°40.05	304°14.05 N16°25.65	70°21.72 N03°51.50	Canopus
19	100°7.74	137°54.93 8.02	314° 9.48 40.12	319°16.71 25.71	85°23.90 51.62	Sirius
20	115° 10.20	152°54.40 7.21	329°12.45 40.18	334°19.37 25.77	100° 26.09 51.74	Adhara
21	130° 12.67	167°53.87 · · 6.40	344°15.41 · · 40.25	349°22.04 · · 25.83	115°28.27 · · 51.86	Procyon
22	145° 15.13	182°53.34 5.59	359°18.38 40.31	4°24.70 25.89	130° 30.45 51.98	Pollux
23	160° 17.59	197°52.81 4.77	14°21.34 40.38	19°27.36 25.95	145° 32.64 52.10	Avior
N/au =	12.21	ν-0.5' d-0.8' m-3.98	ν3.0' d0.1' m-0.74	ν2.7' d0.1' m-2.44	$\nu 2.2' \ d0.1' \ m0.76$	Suhail
ivier.p	pass. 12:21	ν-0.5 α-0.6 III-3.96	ν3.0 d0.1 m-0.74	V2.1 d0.1 m-2.44	V2.2 d0.1 m0.76	Miaplacidus Alphard
						Regulus
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe
0	175°20.06	212°52.28 \$15°3.96	29°24.30 N17°40.44	34°30.02 N16°26.01	160°34.82 N03°52.22	Denebola
1	190°22.52	227°51.75 3.14	44°27.26 40.50	49°32.68 26.07	175° 37.00 52.34	Gienah
2	205°24.99	242°51.23 2.33	59°30.22 40.56	64°35.34 26.13	190°39.18 52.46	Acrux
3	220° 27.45	257°50.70 · · 1.51	74°33.17 · · 40.63	79°38.00 · · 26.19	205°41.37 · · 52.58	Gacrux
4	235° 29.91	272°50.17 15°0.69	89°36.13 40.69	94°40.66 26.24	220°43.55 52.70	Alioth
5	250° 32.38	287°49.64 14°59.87	104°39.08 40.75	109°43.32 26.30	235° 45.73 52.82	Spica
6	265° 34.84 280° 37.31	302°49.12 \$14°59.05 317°48.59 58.23	119°42.03 N17°40.81 134°44.99 40.87	124°45.98 N16°26.36 139°48.64 26.42	250°47.91 N03°52.94 265°50.10 53.06	Alkaid
7 8	280 37.31 295°39.77	317°48.59 58.23 332°48.07 57.41	134°44.99 40.87 149°47.94 40.93	139°48.64 26.42 154°51.30 26.48	265°50.10 53.06 280°52.28 53.18	Hadar
9	310°42.24	347°47.54 · · 56.59	164°50.88 · · 40.98	169°53.96 · · 26.54	295°54.46 · · 53.30	Menkent
10	325°44.70	2°47.02 55.77	179°53.83 41.04	184°56.61 26.59	310°56.64 53.42	Arcturus
11	340°47.16	17° 46.49 54.95	194°56.78 41.10	199°59.27 26.65	325°58.83 53.54	Rigil Kent.
12	355°49.63	32°45.97 S 14°54.13	209°59.72 N17°41.16	215°1.93 N16°26.71	341°1.01 N03°53.66	Kochab
13	10°52.09	47°45.45 53.30	225°2.67 41.21	230°4.59 26.77	356°3.19 53.78	Zuben'ubi
14	25°54.56	62°44.92 52.48	240°5.61 41.27	245°7.25 26.83	11°5.37 53.90	Alphecca
15	40°57.02	77°44.40 · · 51.65	255°8.55 · · 41.33	260°9.90 · · 26.88	26°7.55 · · 54.02	Antares Atria
16	55° 59.48	92°43.88 50.82	270°11.49 41.38	275°12.56 26.94	41°9.74 54.14	Sabik
17	$71^{\circ}1.95$	107°43.35 50.00	285°14.43 41.43	290°15.21 27.00	56°11.92 54.26	Shaula
18	86°4.41	122°42.83 \$14°49.17	300°17.36 N17°41.49	305°17.87 N16°27.06	71°14.10 N03°54.38	Rasalhague
19	101°6.88	137° 42.31 48.34	315°20.30 41.54	320°20.53 27.11	86° 16.28 54.50	Eltanin
20	116°9.34	152°41.79 47.51	330°23.23 41.60	335°23.18 27.17	101°18.46 54.62	Kaus Aust.
21	131°11.80	167° 41.27 · · · 46.68	345°26.17 · · 41.65	350°25.84 · · 27.23	116°20.65 · · 54.74	Vega
22	146° 14.27	182°40.75 45.85	0°29.10 41.70 15°32.03 41.75	5°28.49 27.28 20°31.15 27.34	131°22.83 54.86	Nunki
23	161°16.73	197°40.23 45.02			146°25.01 54.98	Altair
Mer.	pass. 12:17	ν -0.5 $'$ <i>d</i> -0.8 $'$ m-3.98	$ u 3.0' \ d0.1' \ { m m-0.72}$	$ u 2.7' \ d0.1' \ \text{m-}2.44$	$ u 2.2' \ d0.1' \ m0.75$	Peacock
						Deneb
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif
0	176° 19.20	212°39.71 \$14°44.19	30°34.96 N17°41.80	35°33.80 N16°27.40	161°27.19 N03°55.10	Al Na'ir
1	191°21.66	227°39.19 43.35	45°37.88 41.85	50°36.46 27.46	176°29.37 55.22	Fomalhaut
2	206°24.13	242°38.67 42.52	60°40.81 41.90	65°39.11 27.51	191°31.56 55.34	Scheat Markab
3	221°26.59	257°38.15 · · 41.69	75°43.74 · · 41.95	80°41.76 · · 27.57	206°33.74 · · 55.46	IVIAIKAD
4	$236^{\circ}29.05$	272°37.63 40.85	90°46.66 42.00	95°44.42 27.63	221°35.92 55.58	Mar 17 Wed
5	251°31.52	287°37.11 40.02	105°49.58 42.05	110°47.07 27.68	236°38.10 55.70	Venus
6	266°33.98	302°36.60 \$14°39.18	120°52.50 N17°42.10	125°49.72 N16°27.74	251°40.28 N03°55.82	Mars
7	281°36.45	317°36.08 38.34	135°55.42 42.15	140°52.37 27.79	266° 42.46 55.94	Jupiter
8	296° 38.91	332°35.56 37.50	150°58.34 42.19	155°55.03 27.85	281°44.65 56.06	Saturn
9	311°41.37	347°35.04 · · 36.67	166°1.26 · · 42.24	170°57.68 · · 27.91	296° 46.83 · · 56.18	Mar 18 Thu
10	326°43.84	2°34.53 35.83	181° 4.17 42.29	186°0.33 27.96	311°49.01 56.30	Venus
11	341°46.30	17°34.01 34.99	196°7.09 42.33	201°2.98 28.02	326°51.19 56.42	Mars
12	356° 48.77 11° 51.23	32°33.50 \$14°34.15 47°32.98 33.30	211°10.00 N17°42.38 226°12.91 42.42	216°5.63 N16°28.07 231°8.28 28.13	341°53.37 N03°56.54 356°55.55 56.66	Jupiter
13 14	26° 53.69	47°32.98 33.30 62°32.47 32.46	226°12.91 42.42 241°15.82 42.46	231°8.28 28.13 246°10.93 28.18	356°55.55 56.66 11°57.73 56.78	Saturn
15	41°56.16	77°31.95 · · 31.62	256°18.73 · · 42.51	261°13.58 · · 28.24	26°59.91 · · 56.90	Mar 19 Fri
16	56° 58.62	92°31.44 30.78	271°21.64 42.55	276°16.23 28.30	42°2.10 57.02	Venus
17	72°1.09	107°30.92 29.93	286°24.55 42.59	291°18.88 28.35	57°4.28 57.14	Mars
18	87°3.55	122°30.41 \$14°29.09	301°27.45 N17°42.64	306°21.53 N16°28.41	72°6.46 N03°57.26	Jupiter
19	102°6.02	137°29.90 28.24	316°30.35 42.68	321°24.18 28.46	87°8.64 57.38	Saturn
20	117°8.48	152°29.38 27.39	331°33.26 42.72	336°26.83 28.52	102°10.82 57.50	
21	$132^{\circ}10.94$	167° 28.87 · · · 26.55	346°36.16 · · 42.76	351°29.48 · · 28.57	117°13.00 · · 57.62	Horizo
22	$147^{\circ}13.41$	182°28.36 25.70	1°39.06 42.80	6°32.13 28.62	132°15.18 57.74	
23	$162^{\circ}15.87$	197°27.85 24.85	16°41.96 42.84	21°34.77 28.68	147°17.36 57.86	
Mer r	pass. 12:13	ν-0.5' d-0.8' m-3.97	ν2.9' d0.1' m-0.69	ν2.7' d0.1' m-2.43	$\nu 2.2' \ d0.1' \ m0.75$	

	Stars	
	SHA	Dec
Alpheratz	357°33.25	29°14.41
Ankaa	353°5.78	-42°9.54
Schedar Diphda	349°29.50 348°45.80	56°41.26 -17°50.32
Achernar	335°19.36	-57°6.04
Hamal	327°49.42	23°35.47
Polaris	313°23.60	89°22.95
Acamar	315°10.67	-40°11.92
Menkar Mirfak	314°4.45 308°25.91	4°11.71 49°57.59
Aldebaran	290°37.63	49 57.59 16°33.80
Rigel	281°2.17	-8°10.38
Capella	280°19.26	46°1.62
Bellatrix	278°20.96	6°22.36
Elnath Alnilam	277°59.60 275°35.90	28°37.83 -1°11.21
Betelgeuse	275 35.90 270°50.11	7°24.62
Canopus	263°51.50	-52°42.90
Sirius	258°24.56	-16°45.44
Adhara	255° 4.33	-29°0.81
Procyon	244°48.79 243°14.92	5°9.16 27°57.57
Pollux Avior	243°14.92 234°13.61	27°57.57 -59°36.08
Suhail	234 13.01 222°44.64	-39 30.06 -43°32.82
Miaplacidus	221°37.18	-69°49.97
Alphard	217°45.72	-8°46.81
Regulus	207°32.23	11°49.87
Dubhe	193°38.17	61°36.16 14°24.99
Denebola Gienah	182°22.78 175°41.39	14°24.99 -17°41.77
Acrux	175 41.39 172°57.36	-17 41.77 -63°15.07
Gacrux	171°49.04	-57°16.02
Alioth	$166^{\circ}10.86$	55°48.49
Spica	158°20.10	-11°18.37
Alkaid	152°50.17	49°10.36
Hadar Menkent	148°32.88 147°55.15	-60°30.21 -36°30.28
Arcturus	147 55.15 145°45.99	-30 30.26 19°2.18
Rigil Kent.	139°37.29	-60°56.79
Kochab	$137^{\circ}19.08$	$74^{\circ}2.26$
Zuben'ubi	136°53.78	-16°9.40
Alphecca	126°2.02 112°13.49	26°37.09 -26°29.53
Antares Atria	112°13.49 107°5.97	-26° 29.53 -69° 4.31
Sabik	102°0.65	-15°45.56
Shaula	96°7.88	-37°7.30
Rasalhague	95°56.85	12°32.20
Eltanin	90°41.36 83°30.18	51°28.75 -34°22.19
Kaus Aust. Vega	83°30.18 80°32.08	-34°22.19 38°48.22
Nunki	75°45.62	-26°15.72
Altair	61°58.35	8°56.27
Peacock	53° 3.26	-56°38.64
Deneb	49°24.87	45°22.42
Enif	33°37.29	9°59.89
Al Na'ir Fomalhaut	27°31.07 15°12.88	-46°49.67 -29°28.69
Scheat	13°43.79	28°13.75
Markab	13°28.41	15°21.03
Mar 17 Wed	SHA	Mer.pass
Venus	38°44.13	09:48
Mars	213°51.97	22:03
Jupiter	219°5.16	21:42
Saturn	345°21.50	13:19
Mar 18 Thu	SHA	Mer.pass
Venus	37°32.22	09:49
Mars	214°4.24	21:58
Jupiter Saturn	219° 9.96 345° 14.76	21:38 13:16
Mar 19 Fri	SHA	Mer.pass
Venus Mars	36°20.51 214°15.76	09:50 21:53
Jupiter	214 15.76 219°14.60	21:33
Saturn	345°7.99	13:12
Horizon	ıtal parallax	
1101120	Venus:	0.1
l	Mars:	0.2

Stars

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.78	S01°31.33	$69^{\circ}21.05$	4.5'	$N25^{\circ}50.53$	-6.3'	59.4'
1	192°51.95	30.34	83°44.52	4.5'	25°44.19	-6.5'	59.4'
2	207°52.13 222°52.31	29.35 •• 28.36	98°8.04 112°31.62	4.6' 4.6'	25°37.68 25°30.99	-6.7' -6.9'	59.4' 59.4'
4	237° 52.49	27.37	126°55.25	4.7'	25°24.12	-7.0'	59.4'
5	252°52.67	26.39	$141^{\circ}18.94$	4.7'	$25^{\circ}17.08$	-7.2'	59.5'
6	267° 52.85	S01°25.40	155°42.69	4.8'	N25°9.87	-7.4'	59.5'
7 8	282°53.03 297°53.21	24.41 23.42	170°6.50 184°30.37	4.9' 4.9'	25°2.49 24°54.95	-7.5' -7.7'	59.5' 59.5'
9	312°53.39	• • 22.43	198°54.31	5.0'	24°47.23	-7.9'	59.5'
10	327° 53.57	21.44	213°18.30	5.1'	24°39.34	-8.1'	59.5'
11 12	342°53.74 357°53.92	20.46 \$01°19.47	227°42.37 242°6.50	5.1' 5.2'	24°31.29 N24°23.08	-8.2' -8.4'	59.5' 59.5'
13	12° 54.10	18.48	242 0.50 256°30.70	5.2 5.3'	24° 14.70	-0.4 -8.5'	59.5'
14	27°54.28	17.49	270°54.97	5.3'	24°6.15	-8.7'	59.6'
15	42°54.46	• • 16.50	285°19.31	5.4'	23°57.45	-8.9'	59.6'
16 17	57° 54.64 72° 54.82	15.51 14.53	299°43.73 314°8.21	5.5' 5.6'	23°48.59 23°39.57	-9.0' -9.2'	59.6' 59.6'
18	87° 55.00	S01°13.54	328°32.77	5.6'	N23°30.39	-9.3	59.6'
19	102°55.18	12.55	$342^{\circ}57.41$	5.7'	$23^{\circ}21.05$	-9.5'	59.6'
20	117°55.36	11.56	357°22.12	5.8'	23°11.57	-9.6'	59.6'
21 22	132°55.55 147°55.73	· · 10.57 9.58	11°46.90 26°11.77	5.9' 5.9'	23°1.92 22°52.13	-9.8' -9.9'	59.6' 59.6'
23	147 55.73 162°55.91	9.58 8.59	40°36.71	5.9 6.0'	22 52.13 22°42.19	-9.9 -10.1'	59.6'
	SD = 16.1'	d = -1.0'			D = 16.2'		
Thu 0	GHA 177° 56.09	Dec S 01°7.61	GHA 55° 1.73	u 6.1'	Dec N22°32.10	d -10.2'	HP 59.6'
1	177 50.09 192°56.27	6.62	69°26.83	6.2	22°21.86	-10.2 -10.4'	59.0 59.7'
2	207°56.45	5.63	83°52.02	6.3'	$22^{\circ}11.47$	-10.5'	59.7'
3	222°56.63	• • 4.64	98°17.28	6.3'	22°0.94	-10.7'	59.7'
4 5	237° 56.81 252° 56.99	3.65 2.66	112°42.62 127°8.05	6.4' 6.5'	21°50.27 21°39.46	-10.8' -11.0'	59.7' 59.7'
6	267° 57.17	S01°1.68	141°33.56	6.6'	N21°28.51	-11.1	59.7
7	282°57.35	01°0.69	155°59.15	6.7'	21°17.42	-11.2'	59.7'
8	297°57.54	00°59.70	170°24.82	6.8'	21°6.19	-11.4'	59.7'
9 10	312°57.72 327°57.90	· · 58.71 57.72	184°50.58 199°16.42	6.8' 6.9'	20°54.83 20°43.33	-11.5' -11.6'	59.7' 59.7'
11	342° 58.08	56.73	213°42.35	7.0'	20°31.71	-11.8'	59.7'
12	357°58.26	S00°55.75	228°8.36	7.1'	N20°19.95	-11.9'	59.7'
13	12°58.44	54.76	242°34.45	7.2'	20°8.07	-12.0'	59.7'
14 15	27°58.63 42°58.81	53.77 •• 52.78	257°0.63 271°26.90	7.3' 7.3'	19°56.06 19°43.92	-12.1' -12.3'	59.7' 59.7'
16	57° 58.99	51.79	285°53.25	7.4'	19°31.66	-12.4'	59.7'
17	72°59.17	50.80	300°19.68	7.5'	19°19.28	-12.5'	59.7'
18	87°59.35 102°59.54	\$00°49.81 48.83	314°46.20 329°12.80	7.6'	N19°6.78 18°54.17	-12.6'	59.7'
19 20	102 59.54 117°59.72	48.83 47.84	343°39.49	7.7' 7.8'	18° 41.43	-12.7' -12.8'	59.7' 59.7'
21	132°59.90	• • 46.85	358° 6.26	7.9'	18°28.58	-13.0'	59.8'
22	148°0.08	45.86	12°33.11	7.9'	18°15.62	-13.1'	59.8'
23	163°0.27	44.87	27°0.05	8.0'	18°2.55	-13.2'	59.8'
	SD = 16.1'	d = -1.0'		S	D = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°0.45	S00°43.88	41°27.07	8.1'	N17°49.37	-13.3'	59.8'
1 2	193°0.63 208°0.81	42.90 41.91	55°54.18 70°21.37	8.2' 8.3'	17°36.08 17°22.68	-13.4' -13.5'	59.8' 59.8'
3	208°0.81 223°1.00	41.91 •• 40.92	70°21.37 84°48.64	8.4	17°22.68 17°9.18	-13.5' -13.6'	59.8'
4	238°1.18	39.93	99°16.00	8.4'	16°55.58	-13.7'	59.8'
5	253°1.36	38.94	113°43.43	8.5'	16°41.88	-13.8'	59.8'
6 7	268°1.55 283°1.73	\$00°37.95 36.97	128°10.95 142°38.55	8.6' 8.7'	N16°28.08 16°14.18	-13.9' -14.0'	59.8' 59.8'
8	203 1.73 298°1.91	35.98	142 36.55 157° 6.23	8.8'	16° 14.16	-14.0 -14.1'	59.8'
9	313°2.10	• • 34.99	171°33.99	8.8'	15°46.10	-14.2'	59.8'
10	328°2.28	34.00	186°1.83	8.9'	15°31.93	-14.3'	59.8'
11 12	343°2.46 358°2.65	33.01 \$00°32.02	200°29.74 214°57.74	9.0' 9.1'	15°17.66 N15°3.30	-14.4' -14.4'	59.8' 59.8'
13	13°2.83	31.04	229°25.81	9.2'	14°48.86	-14.5'	59.7'
14	28°3.01	30.05	243°53.96	9.2'	14°34.33	-14.6'	59.7'
15	43°3.20	• • 29.06	258°22.19	9.3'	14°19.73	-14.7'	59.7'
16 17	58°3.38 73°3.56	28.07 27.08	272°50.49 287°18.87	9.4' 9.5'	14°5.04 13°50.27	-14.8' -14.8'	59.7' 59.7'
18	88°3.75	S00°26.10	301°47.32	9.5'	N13°35.42	-14.9'	59.7'
19	103°3.93	25.11	316°15.85	9.6'	13°20.50	-15.0'	59.7'
20 21	118° 4.12 133° 4.30	24.12 •• 23.13	330°44.45 345°13.12	9.7' 9.7'	13°5.51 12°50.44	-15.1' -15.1'	59.7' 59.7'
21	133°4.30 148°4.48	22.14	345°13.12 359°41.86	9.7° 9.8'	12°50.44 12°35.30	-15.1' -15.2'	59.7' 59.7'
23	163°4.67	21.16	14°10.67	9.9'	12°20.10	-15.3'	59.7'
	SD = 16.1'	d = -1.0'		S	D = 16.3'		

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

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

		Sun			Moon	Age er 9-11		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	9-11		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	65-85%		
17	08:33	08:24	12:08	20:11	07:41			
18	08:16	08:07	12:08	21:08	08:40			
19	07:58	07:49	12:08	22:01	09:35			

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	177° 18.34	212°27.33 \$14°24.00	31°44.85 N17°42.88	36°37.42 N16°28.73	162°19.54 N03°57.98
1	192°20.80	227°26.82 23.15	46°47.75 42.92	51°40.07 28.79	177°21.72 58.10
2	207°23.26	242°26.31 22.30	61°50.64 42.95	66°42.71 28.84	192°23.91 58.22
3	222°25.73	257°25.80 · · 21.45	76°53.54 · · 42.99	81°45.36 · · 28.90	207°26.09 · · 58.34
4	237°28.19	272°25.29 20.60	91°56.43 43.03	96°48.01 28.95	207 20.09 58.34 222°28.27 58.46
5	252° 30.66	287°24.78 19.74	106°59.32 43.07	111°50.65 29.01	237°30.45 58.58
6	267° 33.12	302°24.27 \$14°18.89	122°2.21 N17°43.10	126°53.30 N16°29.06	252°32.63 N03°58.70
7	282°35.58	317°23.76 18.04	137°5.10 43.14	141°55.95 29.11	267°34.81 58.82
8	202 35.50 297° 38.05				
	297 38.05 312°40.51				
9			167°10.87 · · 43.21		
10	327° 42.98	2°22.24 15.47	182°13.75 43.24	187°3.88 29.27	312°41.35 59.19
11	342°45.44	17°21.73 14.61	197°16.63 43.28	202°6.52 29.33	327°43.53 59.31
12	357° 47.90	32°21.22 \$14°13.75	212°19.52 N17°43.31	217°9.17 N16°29.38	342°45.71 N03°59.43
13	12°50.37	47°20.72 12.90	227°22.40 43.34	232°11.81 29.43	357°47.89 59.55
14	27°52.83	62°20.21 12.04	242°25.27 43.37	247°14.46 29.49	12°50.07 59.67
15	42°55.30	77°19.70 · · 11.18	257°28.15 · · 43.41	262°17.10 · · 29.54	27°52.25 · · 59.79
16	57°57.76	92°19.20 10.32	272°31.03 43.44	277°19.74 29.59	42°54.43 03°59.91
17	73°0.22	107°18.69 9.46	287°33.90 43.47	292°22.39 29.65	57°56.61 04°0.03
18	88°2.69	122°18.18 S 14°8.59	302°36.77 N17°43.50	307°25.03 N16°29.70	72°58.79 N04°0.15
19	103°5.15	137°17.68 7.73	317°39.65 43.53	322°27.67 29.75	88°0.97 0.27
20	118°7.62	$152^{\circ}17.18$ 6.87	332°42.52 43.56	337°30.31 29.80	103°3.15 0.39
21	133° 10.08	167°16.67 · · 6.00	347°45.39 · · 43.59	352°32.95 · · 29.86	118°5.33 · · 0.51
22	$148^{\circ}12.54$	182°16.17 5.14	2°48.25 43.61	7°35.59 29.91	133°7.51 0.63
23	$163^{\circ}15.01$	197°15.66 4.27	17°51.12 43.64	22°38.24 29.96	148°9.69 0.75
Merr	pass. 12:09	ν-0.5' d-0.8' m-3.97	ν2.9' d0.0' m-0.66	ν2.6' d0.1' m-2.42	ν2.2' d0.1' m0.75
- IVICI. L		- 0.5 d-0.0 III-3.91	ν Δ.σ αυ.υ III-U.00	ν Δ.Ο αΟ.1 III-Δ.ΨΔ	
-					GUA -
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	178° 17.47	212°15.16	32°53.99 N17°43.67	37°40.88 N16°30.01	163°11.87 N04°0.87
1	193° 19.94	227°14.66 2.54	47°56.85 43.70	52°43.52 30.07	178°14.05 0.99
2	208°22.40	242°14.15 1.67	62°59.71 43.72	67°46.16 30.12	193°16.23 1.11
3	223°24.86	257°13.65 14°0.81	78°2.57 · · 43.75	82°48.80 · · 30.17	208° 18.41 · · 1.23
4	238°27.33	272°13.15 13°59.94	93°5.43 43.77	97°51.44 30.22	223°20.59 1.35
5	253°29.79	287°12.65 59.07	108°8.29 43.80	112°54.08 30.27	238°22.77 1.47
6	268° 32.26	302°12.15 \$13°58.20	123°11.15 N17°43.82	127°56.71 N16°30.32	253°24.95 N04°1.59
7	283°34.72	317°11.65 57.33	138°14.01 43.85	142°59.35 30.38	268°27.13 1.71
8	298°37.18	332°11.15 56.45	153°16.86 43.87	158°1.99 30.43	283°29.31 1.83
9	313°39.65	347°10.64 · · 55.58	168°19.71 · · 43.89	173°4.63 · · 30.48	298°31.49 · · 1.95
10	328° 42.11	2° 10.15 54.71	183°22.57 43.92	188°7.27 30.53	313° 33.67 2.07
11	343°44.58	17°9.65 53.84	198°25.42 43.94	203°9.90 30.58	328° 35.85 2.19
12	358° 47.04	32°9.15 \$13°52.96	213°28.26 N17°43.96	218°12.54 N16°30.63	343°38.03 N04°2.31
13	13°49.50	47°8.65 52.09	228°31.11 43.98	233°15.18 30.68	358°40.21 2.43
14	28°51.97	62°8.15 51.21	243°33.96 44.00	248°17.82 30.73	13°42.39 2.55
15	43°54.43	77°7.65 · · 50.34	258°36.80 · · 44.02	263°20.45 · · 30.79	28° 44.57 · · · 2.67
16	58° 56.90	92°7.15 49.46	273°39.65 44.04	278°23.09 30.84	43°46.75 2.79
17	73°59.36	107°6.66 48.58	288°42.49 44.06	293°25.72 30.89	58°48.93 2.91
18	89°1.82	122°6.16 \$13°47.70	303°45.33 N17°44.08	308°28.36 N16°30.94	73°51.11 N04°3.03
19	104°4.29	137°5.66 46.82	318°48.17 44.10	323°30.99 30.99	88° 53.29 3.15
20	119°6.75	152°5.16 45.94	333°51.01 44.11	338°33.63 31.04	103°55.47 3.27
21	134°9.22	167°4.67 · · 45.06	348°53.85 · · 44.13	353°36.26 · · 31.09	118° 57.65 · · 3.39
22	149°11.68	182°4.17 44.18	3°56.68 44.15	8°38.90 31.14	133°59.83 3.52
23	164° 14.15	197°3.68 43.30	18°59.52 44.16	23°41.53 31.19	149°2.01 3.64
Mer.p	ass. 12:05	ν -0.5′ <i>d</i> -0.9′ m-3.97	$\nu 2.9' \ d0.0' \ \text{m-}0.64$	$ u 2.6' \ d0.1' \ \text{m-}2.42$	$ u 2.2' \ d0.1' \ \text{m}0.75$
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	179° 16.61	212°3.18 \$13°42.42	34°2.35 N17°44.18	38°44.17 N16°31.24	164°4.18 N04°3.76
1	179 10.01 194° 19.07	212 3.16 313 42.42 227°2.69 41.53	49°5.18 44.19	53°46.80 31.29	179°6.36 3.88
2	194 19.07 209° 21.54	242°2.19 40.65	64°8.01 44.21	68°49.43 31.34	179 0.50 5.66 194°8.54 4.00
3	209°21.54 224°24.00	242°2.19 40.65 257°1.70 · · 39.77	79°10.84 · · 44.22	83°52.07 · · 31.39	209° 10.72 · · 4.12
3 4	224 24.00 239° 26.47	272°1.20 38.88	94°13.67 44.24	98°54.70 31.44	209 10.72 · · 4.12 224°12.90 4.24
	254° 28.93	272 1.20 38.88 287°0.71 38.00	109°16.50 44.25	98 54.70 31.44 113°57.33 31.49	239°15.08 4.36
5 6	254°28.93 269°31.39	302°0.22 \$13°37.11	109°16.50 44.25 124°19.32 N17°44.26	113°57.33 31.49 128°59.96 N16°31.53	239°15.08 4.36 254°17.26 N04°4.48
7	284° 33.86	316°59.73 36.22	139°22.15 44.28	144°2.59 31.58	269°19.44 4.60
8	299° 36.32	331°59.23 35.33	154°24.97 44.29	159°5.22 31.63	284°21.62 4.72
9	314° 38.79	346°58.74 · · 34.45	169°27.79 · · 44.30	174°7.86 · · 31.68	299°23.80 · · 4.84
10	329°41.25	1°58.25 33.56	184°30.61 44.31	189°10.49 31.73	314°25.97 4.96
11	344° 43.71	16° 57.76 32.67	199°33.43 44.32	204°13.12 31.78	329°28.15 5.08
12	359° 46.18	31°57.27 \$13°31.78	214°36.25 N17°44.33	219°15.75 N16°31.83	344°30.33 N04°5.20
13	14°48.64	46°56.78 30.89	229°39.06 44.34	234°18.38 31.88	359°32.51 5.32
14	29°51.11	61°56.29 29.99	244°41.88 44.35	249°21.01 31.93	14°34.69 5.44
15	44°53.57	76°55.80 · · 29.10	259°44.69 · · 44.36	264°23.64 · · 31.97	29°36.87 · · 5.56
16	59°56.03	91°55.31 28.21	274°47.50 44.37	279°26.27 32.02	44°39.05 5.68
17	74°58.50	106°54.82 27.31	289°50.31 44.37	294°28.89 32.07	59°41.23 5.80
18	90°0.96	121°54.33 \$13°26.42	304°53.12 N17°44.38	309°31.52 N16°32.12	74°43.40 N04°5.92
19	105°3.43	136°53.84 25.52	319°55.93 44.39	324°34.15 32.17	89°45.58 6.04
20	120°5.89	151°53.35 24.63	334°58.74 44.39	339°36.78 32.21	104°47.76 6.16
21	135°8.35	166°52.86 · · 23.73	350°1.54 · · 44.40	354°39.41 · · 32.26	119°49.94 • • 6.28
22	$150^{\circ}10.82$	181°52.37 22.84	5°4.35 44.40	9°42.03 32.31	134°52.12 6.41
23	$165^{\circ}13.28$	196°51.89 21.94	20°7.15 44.41	24°44.66 32.36	149°54.30 6.53
1/100	12.01	ν-0.5' d-0.9' m-3.96	ν2.8' d0.0' m-0.61	ν2.6' d0.0' m-2.41	ν2.2' d0.1' m0.74
ivier.p	pass. 12:01	ν-υ.5 a-υ.9 m-3.96	ν2.0° αυ.υ° m-υ.υ1	ν2.0 αυ.υ m-2.41	ν2.2° αυ.1° mυ./4

	Stars	
	SHA	Dec
Alpheratz	357°33.24	29° 14.41
Ankaa	353°5.78	-42°9.53
Schedar	349°29.51	56°41.24
Diphda	348°45.80 335°19.37	-17°50.31 -57°6.02
Achernar Hamal	335 19.37 327°49.43	-57 6.02 23°35.46
Polaris	313°24.84	89°22.94
Acamar	315°10.69	-40°11.91
Menkar	$314^{\circ}4.46$	4°11.72
Mirfak	308°25.93	49°57.59
Aldebaran	290°37.64	16°33.80
Rigel Capella	281°2.18 280°19.28	-8°10.37 46°1.62
Bellatrix	278°20.97	6°22.36
Elnath	277°59.62	28° 37.83
Alnilam	275°35.91	-1°11.21
Betelgeuse	$270^{\circ}50.12$	7°24.62
Canopus	263°51.53	-52°42.90
Sirius	258°24.58	-16°45.44
Adhara	255°4.34 244°48.81	-29°0.81 5°9.16
Procyon Pollux	244 48.81 243°14.93	27°57.58
Avior	234° 13.64	-59° 36.09
Suhail	222°44.66	-43° 32.82
Miaplacidus	221°37.22	-69°49.99
Alphard	217°45.72	-8°46.82
Regulus	207°32.23	11°49.87
Dubhe	193°38.17 182°22.78	61°36.17
Denebola Gienah	182°22.78 175°41.39	14°24.99 -17°41.78
Acrux	175°41.39 172°57.36	-17 41.78 -63° 15.09
Gacrux	171°49.03	-57° 16.04
Alioth	166°10.85	55°48.51
Spica	158°20.09	-11° 18.38
Alkaid	152°50.15	49° 10.37
Hadar	148°32.86 147°55.13	-60°30.22 -36°30.29
Menkent Arcturus	147°55.13 145°45.98	-36° 30.29 19° 2.19
Rigil Kent.	139°37.26	-60°56.80
Kochab	137°19.03	74°2.27
Zuben'ubi	$136^{\circ}53.76$	-16°9.41
Alphecca	126°2.00	26°37.09
Antares Atria	112°13.47 107°5.92	-26°29.54 -69°4.32
Sabik	107 5.92 102°0.63	-09 4.32 -15°45.56
Shaula	96°7.86	-37°7.30
Rasalhague	95°56.83	12°32.20
Eltanin	90°41.33	51°28.74
Kaus Aust.	83°30.15	-34°22.19
Vega	80°32.06 75°45.60	38° 48.22 -26° 15.72
Nunki Altair	61°58.34	-26° 15.72 8° 56.27
Peacock	53°3.23	-56°38.64
Deneb	49°24.85	45°22.41
Enif	$33^{\circ}37.28$	9°59.89
Al Na'ir	27°31.06	-46°49.66
Fomalhaut	15°12.87 13°43.78	-29°28.68 28°13.75
Scheat Markab	13°43.78 13°28.40	28° 13.75 15° 21.03
Mar 20 Sat	SHA	Mer.pass
Venus Mars	35°9.00 214°26.52	09:51 21:49
Jupiter	214 20.52 219°19.09	21:49
Saturn	345°1.21	13:09
Mar 21 Sun	SHA	
Venus	33°57.69	Mer.pass 09:51
Mars	214°36.51	21:44
Jupiter	$219^{\circ}23.40$	21:26
Saturn	344°54.40	13:05
Mar 22 Mon	SHA	Mer.pass
Venus	32°46.57	09:52
Mars	$214^{\circ}45.74$	21:40
Jupiter	219°27.56	21:21
Saturn	344°47.58	13:02
Horizon	ıtal parallax	
	Venus:	0.1
	Mars:	0.2

Stars

h	Su	n			Moon		
Sat 0	GHA 178°4.85	Dec \$00° 20.17	GHA 28°39.55	u 9.9'	Dec N12°4.83	d -15.3'	HP 59.7'
1	178 4.85 193°5.04	19.18	43°8.50	10.0'	11° 49.49	-15.3 -15.4'	59.7'
2	208°5.22	18.19	57° 37.51	10.1'	11°34.09	-15.5'	59.7'
3	223°5.41	•• 17.20	72°6.60	10.1'	$11^{\circ}18.63$	-15.5'	59.7'
4	238°5.59	16.21	86°35.75	10.2'	11°3.11	-15.6'	59.7'
5 6	253°5.78 268°5.96	15.23 \$00° 14.24	101°4.96 115°34.24	10.3' 10.3'	10°47.54 N10°31.91	-15.6' -15.7'	59.7' 59.7'
7	283°6.14	13.25	130°3.58	10.5	10° 16.22	-15.7'	59.7'
8	298° 6.33	12.26	144°32.98	10.5'	10°0.48	-15.8'	59.6'
9	313°6.51	• • 11.28	159°2.45	10.5'	09°44.69	-15.8'	59.6'
10	328°6.70	10.29	173°31.97	10.6'	09°28.86	-15.9'	59.6'
11	343°6.88	9.30	188°1.56	10.6'	09° 12.97	-15.9'	59.6'
12 13	358°7.07 13°7.25	\$00°8.31 7.32	202°31.20 217°0.90	10.7' 10.8'	N08° 57.04 08° 41.07	-16.0' -16.0'	59.6' 59.6'
14	28°7.44	6.34	231° 30.65	10.8	08°25.06	-16.1	59.6'
15	43°7.63	• • 5.35	246°0.46	10.9'	08°9.00	-16.1'	59.6'
16	58°7.81	4.36	260°30.33	10.9'	$07^{\circ}52.91$	-16.1'	59.6'
17	73°8.00	3.37	275°0.24	11.0'	07°36.78 N07°20.62	-16.2	59.5'
18 19	88°8.18 103°8.37	S00°2.38 1.40	289°30.21 304°0.23	11.0' 11.1'	07° 4.42	-16.2' -16.2'	59.5' 59.5'
20	105 6.57 118°8.55	500°0.41	318° 30.30	11.1'	06° 48.20	-16.2 -16.3'	59.5'
21	133°8.74	N00°0.58	333°0.42	11.2'	06°31.94	-16.3	59.5'
22	148°8.92	1.57	347°30.58	11.2'	06°15.66	-16.3'	59.5'
23	163°9.11	2.55	2°0.79	11.3'	05°59.35	-16.3'	59.5'
	SD = 16.1'	d = -1.0'		SI	D = 16.3'		
•							
Sun 0	GHA 178° 9.30	Dec N00°3.54	GHA 16°31.05	u 11.3'	Dec N05° 43.01	d -16.4'	HP 59.5'
1	176 9.30 193°9.48	4.53	31°1.35	11.3'	05° 26.66	-16.4'	59.5 59.4'
2	208°9.67	5.52	45°31.70	11.4'	05°10.28	-16.4'	59.4'
3	223°9.85	• • 6.50	60°2.08	11.4'	$04^{\circ}53.88$	-16.4'	59.4'
4	238°10.04	7.49	74°32.51	11.5'	04°37.47	-16.4'	59.4'
5 6	253°10.23 268°10.41	8.48 N00°9.47	89°2.98 103°33.49	11.5' 11.5'	04°21.04 N04°4.59	-16.4' -16.5'	59.4' 59.4'
7	283°10.60	10.45	103 33.49 118°4.03	11.6'	03°48.13	-10.5 -16.5'	59.4' 59.4'
8	298°10.78	11.44	132°34.61	11.6'	03°31.67	-16.5'	59.3'
9	313°10.97	• • 12.43	147°5.23	11.7'	$03^{\circ}15.19$	-16.5'	59.3'
10	328°11.16	13.42	161°35.88	11.7'	02°58.70	-16.5'	59.3'
11	343°11.34 358°11.53	14.40 N00°15.39	176°6.56 190°37.28	11.7' 11.7'	02°42.21 N02°25.72	-16.5'	59.3'
12 13	358°11.53 13°11.72	16.38	205°8.02	11.7	02° 9.22	-16.5' -16.5'	59.3' 59.2'
14	28°11.90	17.36	219°38.80	11.8'	01°52.72	-16.5	59.2'
15	43°12.09	• • 18.35	$234^{\circ}9.61$	11.8'	$01^{\circ}36.22$	-16.5'	59.2'
16	58°12.28	19.34	248°40.44	11.9'	01°19.73	-16.5'	59.2'
17 18	73°12.46 88°12.65	20.33 N00°21.31	263°11.30 277°42.18	11.9' 11.9'	01°3.24 N00°46.75	-16.5' -16.5'	59.2' 59.2'
19	103°12.84	22.30	292° 13.09		00° 30.27		59.2 59.1'
20	118°13.02	23.29	306°44.03	12.0'	N00°13.80	-16.5	59.1'
21	133°13.21	• • 24.27	$321^{\circ}14.98$	12.0'	S00°2.66	16.4'	59.1'
22	148°13.40	25.26	335° 45.96	12.0'	00° 19.11	16.4'	59.1'
23	163°13.58	26.25	350° 16.95	12.0'	00°35.55	16.4'	59.1'
	SD = 16.1'	d = 1.0'		SI	D = 16.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°13.77	N00°27.23	4°47.97	12.0'	S00°51.97	16.4'	59.0'
1	193°13.96	28.22	19° 19.00	12.0'	01°8.38	16.4	59.0'
2	208°14.14	29.21	33°50.05	12.1'	01°24.76	16.4'	59.0'
3 4	223°14.33 238°14.52	· · 30.19 31.18	48°21.11 62°52.19	12.1' 12.1'	01°41.13 01°57.48	16.3' 16.3'	59.0' 58.9'
5	250 14.52 253°14.71	32.17	77°23.28	12.1'	01 57.46 02°13.80	16.3	58.9'
6	268°14.89	N00°33.15	91°54.38	12.1'	S02°30.10	16.3'	58.9'
7	283°15.08	34.14	106°25.50	12.1'	02°46.38	16.2'	58.9'
8	298°15.27	35.13	120°56.62	12.1'	03°2.63	16.2'	58.9'
9 10	313°15.45 328°15.64	· · 36.11 37.10	135°27.76 149°58.90	12.1' 12.1'	03°18.85 03°35.04	16.2' 16.2'	58.8' 58.8'
11	343°15.83	37.10	149 58.90 164°30.05	12.1 12.2'	03°51.20	16.2	58.8'
12	358°16.02	N00° 39.07	179°1.21	12.2'	S04°7.32	16.1	58.8'
13	13°16.20	40.06	193°32.37	12.2'	04°23.42	16.1'	58.7'
14	28°16.39	41.05	208°3.53	12.2'	04°39.47	16.0'	58.7'
15 16	43°16.58	· · 42.03	222°34.70 237°5.87	12.2'	04°55.49 05°11.47	16.0'	58.7'
16 17	58°16.77 73°16.95	43.02 44.00	237°5.87 251°37.04	12.2' 12.2'	05°11.47 05°27.41	15.9' 15.9'	58.7' 58.6'
18	88°17.14	N00° 44.99	266°8.21	12.2'	S05°43.31	15.9'	58.6'
19	103°17.33	45.98	280°39.38	12.2'	05°59.17	15.8'	58.6'
20	118°17.52	46.96	295° 10.55	12.2'	06°14.98	15.8'	58.6'
21	133°17.71	• • 47.95	309°41.71	12.2'	06° 30.75	15.7'	58.5'
22 23	148°17.89 163°18.08	48.93 49.92	324° 12.88 338° 44.03	12.2' 12.2'	06°46.47 07°2.14	15.7' 15.6'	58.5' 58.5'
	100.00	49.92	JJU 44.U3	14.4	01 2.14	15.0	JU.J
23	SD = 16.0'	d = 1.0'		ر ا	D = 16.1'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-100%
20	07:41	07:32	12:08	22:52	10:27	
21	07:23	07:14	12:07	23:40	11:16	
22	07:05	06:56	12:07	-:-	12:04	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	180° 15.75	211°51.40 \$13°21.0		39°47.29 N16°32.40	164°56.48 N04°6.65	
1	195° 18.21	226°50.91 20.3		54°49.91 32.45	179°58.65 6.77	Alpheratz 357°33.24
2	210°20.67	241°50.43 19.3		69°52.54 32.50	195°0.83 6.89	Ankaa 353° 5.78
3	225°23.14	256°49.94 · · 18.3		84°55.17 · · 32.55	210°3.01 · · 7.01	Schedar 349°29.51
4	240°25.60	271°49.46 17.4		99°57.79 32.59	225°5.19 7.13	Diphda 348°45.80
5	255°28.07	286°48.97 16.5		115°0.42 32.64	240°7.37 7.25	Achernar 335°19.38
6	270°30.53	301°48.48 \$13°15.6		130°3.04 N16°32.69	255°9.55 N04°7.37	Hamal 327°49.44
7	285°32.99	316°48.00 14.7		145°5.67 32.73	270°11.72 7.49	Polaris 313°25.95
8	300°35.46	331°47.52 13.8	33 155°32.31 44.43	160°8.29 32.78	285°13.90 7.61	Acamar 315°10.70
9	315°37.92	346°47.03 · · 12.9	02 170°35.10 · · 44.43	175°10.91 · · 32.83	300°16.08 · · 7.73	Menkar 314° 4.47 Mirfak 308° 25.95
10	330°40.39	1°46.55 12.0	02 185°37.89 44.43	190°13.54 32.87	315°18.26 7.85	Mirfak 308°25.95 Aldebaran 290°37.66
11	345°42.85	16°46.06 11.3		205°16.16 32.92	330°20.44 7.97	Rigel 281°2.20
12	0°45.31	31°45.58 \$13°10.2		220°18.78 N16°32.97	345°22.61 N04°8.09	Capella 280°19.30
13	15° 47.78	46°45.10 9.3		235°21.41 33.01	0°24.79 8.21	Bellatrix 278°20.99
14	30°50.24	61°44.62 8.3		250°24.03 33.06	15°26.97 8.33	Elnath 277°59.64
15	45°52.71	76°44.13 · · · 7.4		265°26.65 · · 33.10	30°29.15 · · 8.45	Alnilam 275°35.93
16	60°55.17	91°43.65 6.		280°29.27 33.15	45°31.33 8.57	Betelgeuse 270°50.14
17	75° 57.63	106°43.17 5.0		295°31.90 33.20	60°33.50 8.70	Canopus 263°51.56
18	91°0.10	121°42.69 \$13°4.		310°34.52 N16°33.24	75°35.68 N04°8.82	Sirius 258°24.60
19	106°2.56	136° 42.21 3.8		325°37.14 33.29	90°37.86 8.94	Adhara 255° 4.36
20	121°5.03	151°41.73 2.9		340°39.76 33.33	105° 40.04 9.06	Procyon 244°48.82
21	136°7.49	166°41.25 · · 2.0		355°42.38 · · 33.38	120° 42.21 · · 9.18	Pollux 243°14.95
22	151°9.95	181° 40.77 1.3		10°45.00 33.42	135°44.39 9.30	Avior 234°13.66
23	166° 12.42	196°40.29 0.2	20 21°14.01 44.38	25°47.62 33.47	150°46.57 9.42	Suhail 222°44.67
Mer.p	bass. 11:57	ν -0.5' d-0.9' m-3.9	6 $\nu 2.8' \ d0.0' \ \text{m-0.59}$	$\nu 2.6' \ d0.0' \ \text{m-}2.40$	$ u 2.2' \ d0.1' \ \text{m}0.74$	Miaplacidus 221°37.25
						Alphard 217°45.73
14/ 1	CILA	CUA D	CHA D	CUA D	CUA D	Regulus 207°32.24
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.18
0	181°14.88	211°39.81 \$12°59.3 226°39.33 58.3		40°50.24 N16°33.51	165°48.75 N04°9.54 180°50.92 9.66	Denebola 182°22.78
1	196° 17.35 211° 19.81			55°52.86 33.56		Gienah 175°41.39
2 3	211 19.81 226° 22.27	241°38.86 57.4 256°38.38 · · 56.		70°55.48 33.60	195°53.10 9.78 210°55.28 • 9.90	Acrux 172°57.35
3 4	220 22.27 241°24.74			85°58.10 · · 33.65 101°0.71 33.69		Gacrux 171°49.03
5	241 24.74 256° 27.20	271°37.90 55.0 286°37.42 54.		101°0.71 33.69 116°3.33 33.74	225°57.46 10.02 240°59.64 10.14	Alioth 166°10.84
6	271°29.67	301°36.95 \$12°53.		131°5.95 N16°33.78	256°1.81 N04°10.26	Spica 158°20.08
7	286°32.13	316°36.47 52.8	_	146°8.57 33.83	271°3.99 10.38	Alkaid 152°50.14
8	301°34.60	331°35.99 51.9		161°11.18 33.87	286°6.17 10.50	Hadar 148°32.84
9	316°37.06	346°35.52 · · 51.0		176°13.80 · · 33.92	301°8.34 · · 10.62	Menkent 147°55.12
10	331°39.52	1°35.04 50.3		191°16.42 33.96	316°10.52 10.75	Arcturus 145°45.97
11	346°41.99	16°34.57 49.3		206°19.03 34.00	331° 12.70 10.87	Rigil Kent. 139°37.24
12	1°44.45	31°34.09 \$12°48.2		221°21.65 N16°34.05	346°14.88 N04°10.99	Kochab 137°18.99
13	16°46.92	46°33.62 47.3		236°24.27 34.09	1°17.05 11.11	Zuben'ubi 136°53.75
14	31°49.38	61°33.14 46.4		251°26.88 34.14	16°19.23 11.23	Alphecca 126°1.98
15	46°51.84	76°32.67 · · 45.		266°29.50 · · 34.18	31°21.41 · · 11.35	Antares 112°13.45
16	61°54.31	91°32.19 44.		281°32.11 34.22	46°23.59 11.47	Atria 107° 5.87
17	76° 56.77	106°31.72 43.0		296°34.73 34.27	61°25.76 11.59	Sabik 102° 0.61 Shaula 96° 7.84
18	91°59.24	121°31.25 \$12°42.	'2 307°6.40 N17°44.17	311°37.34 N16°34.31	76°27.94 N04°11.71	Shaula 96°7.84 Rasalhague 95°56.81
19	$107^{\circ}1.70$	136°30.77 41.8	30 322°9.14 44.16	326°39.95 34.35	91°30.12 11.83	Eltanin 90°41.30
20	122°4.16	151°30.30 40.8	37 337°11.88 44.14	341°42.57 34.40	106°32.29 11.95	Kaus Aust. 83°30.13
21	$137^{\circ}6.63$	166°29.83 · · 39.9	94 352°14.62 · · 44.13	356°45.18 · · 34.44	121°34.47 · · 12.07	Vega 80°32.04
22	$152^{\circ}9.09$	181°29.36 39.0	02 7°17.36 44.11	11°47.79 34.48	136° 36.65 12.19	Nunki 75°45.58
23	$167^{\circ}11.56$	196°28.89 38.0	9 22°20.10 44.09	26°50.41 34.52	151° 38.82 12.31	Altair 61°58.32
Merr	pass. 11:53	ν -0.5' d-0.9' m-3.9	ν 2.8' d-0.0' m-0.56	ν 2.6' d0.0' m-2.40	$\nu 2.2' \ d0.1' \ m0.74$	Peacock 53°3.20
	7433. 11.33	ν-0.5 u-0.9 III-5.3				Deneb 49°24.83
						Enif 33°37.27
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.04
0	182° 14.02	211°28.42 \$12°37.		41°53.02 N16°34.57	166°41.00 N04°12.43	Fomalhaut 15°12.86
1	197°16.48	226°27.95 36.2		56°55.63 34.61	181°43.18 12.55	Scheat 13°43.78
2	212° 18.95	241°27.47 35.3		71°58.24 34.65	196° 45.36 12.68	Markab 13°28.40
3	227°21.41	256°27.00 · · 34.3		87°0.85 · · 34.69	211°47.53 · · 12.80	
4	242°23.88	271°26.53 33.4		102°3.47 34.74	226°49.71 12.92	Mar 23 Tue SHA
5	257°26.34	286°26.07 32.5		117°6.08 34.78	241°51.89 13.04	Venus 31°35.65
6	272°28.80	301°25.60 \$12°31.		132°8.69 N16°34.82	256°54.06 N04°13.16	Mars 214°54.20 Jupiter 219°31.54
7	287°31.27	316°25.13 30.0		147°11.30 34.86	271°56.24 13.28	Saturn 344°40.73
8 9	302°33.73 317°36.20	331°24.66 29.7 346°24.19 • 28.7		162°13.91 34.91 177°16.52 · · 34.95	286° 58.42 13.40 302° 0.59 · · 13.52	3aturn 344 40.73
	332°38.66			192°19.13 34.99	317°2.77 13.64	Mar 24 Wed SHA
10 11	347°41.13	1°23.72 27.8 16°23.26 26.9		207°21.73 35.03	332°4.95 13.76	Venus 30°24.93
12	2°43.59	31°22.79 \$12°25.9		207 21.73 35.03 222°24.34 N16°35.07	347°7.12 N04°13.88	Mars 215° 1.90
13	17°46.05	46°22.32 25.0		237°26.95 35.11	2°9.30 14.00	Jupiter 219°35.36
14	32°48.52	61°21.86 24.0		252°29.56 35.15	17°11.48 14.12	Saturn 344°33.86
15	47°50.98	76°21.39 · · 23.3		267°32.17 · · 35.20	32°13.65 · · 14.24	Mar 25 Thu SHA
16	62°53.45	91°20.92 22.2		282°34.78 35.24	47° 15.83 14.37	Venus 29°14.40
17	77°55.91	106°20.46 21.3		297°37.38 35.28	62°18.00 14.49	Mars 215°8.82
18	92°58.37	121°19.99 \$12°20.		312°39.99 N16°35.32	77°20.18 N04°14.61	Jupiter 219°39.00
19	108°0.84	136°19.53 19.3		327°42.60 35.36	92°22.36 14.73	Saturn 344°26.98
20	123°3.30	151°19.06 18.4		342°45.20 35.40	107° 24.53 14.85	
21	138°5.77	166°18.60 · · 17.5		357°47.81 · · 35.44	122°26.71 · · 14.97	Horizontal parallax
22	153°8.23	181° 18.14 16.		12°50.41 35.48	137°28.89 15.09	Venus:
23	168° 10.69	196°17.67 15.0	52 23°25.43 43.53	27°53.02 35.52	152°31.06 15.21	Mars:
Mer.p	pass. 11:49	ν-0.5' d-0.9' m-3.9	$\nu 2.7' \ d$ -0.0' m-0.54	ν2.6' d0.0' m-2.39	ν2.2' d0.1' m0.73	

Dec 29°14.40

-42°9.52

56°41 23

-17°50.31

 $-57^{\circ}6.01$

 $23^{\circ}35.46$

89°22.93

-40°11.91

4°11.71

49°57.58

16°33.80 -8°10.37

 $46^{\circ}1.62$

 $6^{\circ}22.36$

28°37.83

 $-1^{\circ}11.21$

 $7^{\circ}24.62$

-52°42.90 -16°45.44

-29°0.81 $5^{\circ}9.16$

 $27^{\circ}57.58$

-59°36.10

-43°32.83

-69°50.00

-8°46.82 11°49.88

 $61^{\circ}36.19$

 $14^{\circ}25.00$

-17°41.78

-63°15.11

 $-57^{\circ}16.06$

55°48.52

-11°18.38

49°10.38

-60°30.23

-36°30.30

-60°56.82

 $19^{\circ}2.19$

 $74^{\circ}2.28$

-16°9.41

26°37.10 -26°29.54

-69°4.32

-15°45.56

 $-37^{\circ}7.30$

 $12^{\circ}32.20$

51°28.74

-34°22.19

38°48.22

 $-26^{\circ}15.71$

8°56.27

-56°38.63

 $45^{\circ}22.40$

-46°49.65

-29°28.68 28°13.74

15°21.02

Mer.pass

09:53

21:35

21:17

12:58

09:54

21:31

21:13

12:55

09:54

21:27

21:09

12:51

0.1

0.2

Mer.pass

Mer.pass

 $9^{\circ}59.88$

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°18.27	N00°50.91	$353^{\circ}15.18$	12.1'	S 07°17.76	15.6'	58.4'
1	193°18.46	51.89	7°46.32	12.1'	07°33.33	15.5'	58.4'
2	208°18.65 223°18.83	52.88 •• 53.86	22°17.46 36°48.59	12.1' 12.1'	07°48.85 08°4.31	15.5' 15.4'	58.4' 58.4'
4	238°19.02	54.85	51°19.71	12.1'	08° 19.72	15.4	58.3'
5	253°19.21	55.84	$65^{\circ}50.81$	12.1'	08°35.07	15.3'	58.3'
6	268°19.40	N00°56.82	80°21.91	12.1'	S08°50.37	15.2'	58.3'
7 8	283°19.59 298°19.77	57.81 58.79	94°52.99 109°24.07	12.1' 12.1'	09°5.60 09°20.78	15.2' 15.1'	58.3' 58.2'
9	313°19.96	00°59.78	123°55.12	12.0'	09° 35.89	15.1'	58.2'
10	328°20.15	$01^{\circ}0.76$	$138^{\circ}26.17$	12.0'	$09^{\circ}50.95$	15.0'	58.2'
11	343°20.34	1.75	152°57.20	12.0'	10°5.93 \$10°20.85	14.9'	58.1'
12 13	358°20.53 13°20.72	N01°2.73 3.72	167°28.21 181°59.20	12.0' 12.0'	10° 35.71	14.9' 14.8'	58.1' 58.1'
14	28°20.90	4.70	196°30.18	12.0'	10°50.49	14.7'	58.0'
15	43°21.09	• • 5.69	211°1.14	11.9'	11°5.21	14.6'	58.0'
16	58°21.28 73°21.47	6.67	225°32.08 240°3.00	11.9'	11°19.86 11°34.43	14.6'	58.0'
17 18	73°21.47 88°21.66	7.66 N01°8.64	254° 33.89	11.9' 11.9'	S11°48.94	14.5' 14.4'	58.0' 57.9'
19	103°21.85	9.63	269°4.77	11.9'	12°3.36	14.4	57.9'
20	118°22.03	10.61	283°35.63	11.8'	$12^{\circ}17.72$	14.3'	57.9'
21	133°22.22	• • 11.60	298°6.46	11.8'	12°31.99	14.2'	57.8'
22 23	148°22.41 163°22.60	12.58 13.57	312°37.27 327°8.05	11.8' 11.8'	12°46.19 13°0.31	14.1' 14.0'	57.8' 57.8'
23	SD = 16.0'	d = 1.0'	JE1 0.03			17.0	37.0
	שר = 10.0′	$u = 1.0^{\circ}$		5L	0 = 15.9'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.79	N01°14.55	341°38.81	11.7'	\$13° 14.35	14.0'	57.7'
1 2	193°22.98 208°23.17	15.54 16.52	356°9.54 10°40.25	11.7' 11.7'	13°28.31 13°42.19	13.9' 13.8'	57.7' 57.7'
3	206 23.17 223°23.35	10.52	25°10.93	11.7'	13 42.19 13°55.98	13.7	57.7'
4	238°23.54	18.49	39°41.59	11.6'	14°9.69	13.6'	57.6'
5	253°23.73	19.48	54°12.21	11.6'	14°23.31	13.5'	57.6'
6 7	268°23.92 283°24.11	N01°20.46 21.45	68°42.81 83°13.38	11.6' 11.5'	\$14° 36.85 14° 50.30	13.4' 13.4'	57.6' 57.5'
8	298°24.30	22.43	97°43.92	11.5'	14 50.50 15°3.65	13.4	57.5'
9	313°24.49	• • 23.41	112°14.43	11.5'	15° 16.92	13.2'	57.5'
10	328°24.68	24.40	126°44.91	11.4'	15°30.10	13.1'	57.4'
11 12	343°24.86 358°25.05	25.38 N01°26.37	141°15.36 155°45.77	11.4' 11.4'	15° 43.19 \$15° 56.18	13.0' 12.9'	57.4' 57.4'
13	13°25.24	27.35	170°16.16	11.4	16°9.08	12.8'	57.4 57.3'
14	28°25.43	28.33	184°46.51	11.3'	16°21.88	12.7'	57.3'
15	43°25.62	• • 29.32	199°16.84	11.3'	16°34.59	12.6'	57.3'
16 17	58°25.81 73°26.00	30.30 31.29	213°47.12 228°17.38	11.3' 11.2'	16°47.19 16°59.70	12.5' 12.4'	57.2' 57.2'
18	88°26.19	N01°32.27	242°47.60	11.2'	517°12.12	12.4	57.2'
19	103°26.38	33.25	257°17.79	11.2'	17°24.43	12.2'	57.1'
20	118°26.56	34.24	271°47.94		17°36.64		57.1'
21 22	133°26.75 148°26.94	· · 35.22 36.20	286°18.06 300°48.15	11.1' 11.0'	17°48.74 18°0.75	12.0' 11.9'	57.1' 57.1'
23	163°27.13	37.19	315°18.20	11.0'	18° 12.64	11.8'	57.1 57.0'
	SD = 16.0'	d = 1.0'			0 = 15.7'		
	3D = 10.0	<u>u = 1.0</u>		JL	7 — 13.7		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.32 193°27.51	N01°38.17	329°48.21 344°18.19	11.0'	\$18°24.44 18°36.13	11.7'	57.0'
1 2	193°27.51 208°27.70	39.15 40.14	344°18.19 358°48.14	10.9' 10.9'	18° 36.13 18° 47.71	11.6' 11.5'	57.0' 56.9'
3	223°27.89	• 41.12	13°18.04	10.9	18° 59.18	11.4'	56.9
4	238°28.08	42.10	27°47.92	10.8'	19° 10.55	11.3'	56.9'
5 6	253°28.27 268°28.46	43.09 N01°44.07	42°17.75 56°47.55	10.8' 10.8'	19°21.80 \$19°32.94	11.1' 11.0'	56.8' 56.8'
7	268°28.46 283°28.64	45.05	50°47.55 71°17.32	10.8	19° 43.98	10.9'	56.8
8	298°28.83	46.03	85°47.05	10.7'	$19^{\circ}54.90$	10.8'	56.7'
9	313°29.02	• • 47.02	100°16.74	10.7'	20°5.70	10.7'	56.7'
10 11	328°29.21 343°29.40	48.00 48.98	114°46.40 129°16.02	10.6' 10.6'	20° 16.40 20° 26.98	10.6' 10.5'	56.7' 56.6'
11	343°29.40 358°29.59	48.98 N01°49.97	129° 16.02 143° 45.60	10.6	520° 37.44	10.5	56.6
13	13°29.78	50.95	$158^{\circ}15.15$	10.5'	20°47.78	10.2'	56.6'
14	28°29.97	51.93	172°44.67	10.5'	20°58.01	10.1'	56.5'
15 16	43°30.16 58°30.35	· · 52.91 53.89	187°14.14 201°43.58	10.4' 10.4'	21°8.13 21°18.12	10.0' 9.9'	56.5' 56.5'
16 17	58° 30.35 73° 30.54	53.89 54.88	201°43.58 216°12.99	10.4	21° 18.12 21° 27.99	9.9 9.8'	56.5
18	88°30.73	N01°55.86	230°42.36	10.3'	S21°37.74	9.6'	56.4
19	103°30.91	56.84	245°11.70	10.3'	21°47.38	9.5'	56.4'
20 21	118°31.10 133°31.29	57.82 •• 58.81	259°41.00 274°10.26	10.3' 10.2'	21°56.89 22°6.27	9.4' 9.3'	56.4' 56.3'
21	133°31.29 148°31.48	01°59.79	274°10.26 288°39.49	10.2'	22°6.27 22°15.54	9.3'	56.3'
23	163°31.67	02°0.77	303°8.69	10.2'	22°24.68	9.0'	56.3
	SD = 16.0'	d = 1.0'		SF	0 = 15.5'		

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

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

		Sun			Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age			
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17			
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-92%			
23	06:47	06:38	12:07	00:28	12:52				
24	06:29	06:20	12:06	01:16	13:40				
25	06:11	06:02	12:06	02:05	14:30				

Fig. GHA GHA Dec GHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1 187 13.0 21 17.1 18.0	Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1 1991;562 226 1675 13.73 579.04 63.84 5779.23 5.50 162/34.21 16.65 57.04 1991;562 12.67 57.04 67.05 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.67 57.04 1991;562 12.07 57.04 1991;5							
2 22719.08 24719.08 1270 675.04 414.0 575.04 55.04 1279.07 11.07 41.07 11.07 41.07 11	1						1 .
2 2873159 267159 1194 1194 1194 1194 1194 1194 1194 1	2	213° 18.09		68°33.54 43.45	73°0.83 35.64	197°37.59 15.57	
2 2973-91 2971-95 1099 978-94 43.59 1097-90 4 577 2971-91 1099 978-94 2791-12 4 13.50 11099 978-94 279							1
1 2 297 25-0							1
1. 25.77.794	5	258° 25.48					
2 20 20	6						1
1	7	288°30.41	316° 13.98 8.05	143°47.03 43.29		272°48.47 16.18	
9 1875 34 1976 35 25 2875 3875 3775 39	8	303°32.87	331°13.52 7.10		163°16.45 35.88	287°50.65 16.30	
18 18 18 18 18 18 18 18	9	318°35.34	346°13.05 · · 6.15	173°52.42 · · 43.23	178°19.06 · · 35.92	302°52.82 · · 16.42	1
19	10	333°37.80	1°12.59 5.21	188°55.11 43.19	193°21.66 35.96	317°55.00 16.54	
1874-19	11	348°40.26					
13 18* 15.0 66* 11.07 1.0 1.	12	3°42.73	31°11.68	219°0.49 N17°43.13	223°26.86 N16°36.04	347°59.35 N04°16.78	
14 31 37-66 6 110-76 1.40 2497-53 7 4.00 251-32.0 36.12 116-37.0 17.0 2	13	18°45.19	46°11.22 2.35	234°3.18 43.09	238°29.46 36.08		
Maritan Mari	14	33°47.66	61°10.76 1.40		253°32.06 36.12	18°3.70 17.02	1
18	15	48°50.12	76°10.30 12°0.45	264°8.55 · · 43.02	268°34.66 · · 36.16	33°5.88 · · 17.14	
1	16	63°52.58	91°9.84 11°59.49	279°11.24 42.98	283°37.27 36.19	48°8.06 17.26	
100 100	17	78°55.05	106°9.38 58.54	294°13.92 42.95	298°39.86 36.23	63°10.23 17.38	
Adhama 1988	18	93°57.51	121°8.93 S 11°57.59	309°16.60 N17°42.91	313°42.46 N16°36.27	78°12.41 N04°17.50	
20	19	108°59.98	136°8.47 56.63	324°19.28 42.87	328°45.06 36.31	93°14.58 17.63	
The color of the	20	124°2.44		339°21.96 42.84		108° 16.76 17.75	
The color of the	21	$139^{\circ}4.91$	166°7.56 · · 54.72	354°24.64 · · 42.80	358°50.26 · · 36.39	123°18.93 · · 17.87	
19° 8.3 19° 8.3 19° 8.4 1.45	22	154°7.37	181°7.10 53.76	9°27.31 42.76	13°52.86 36.42	138° 21.11 17.99	1
Mar. Pass 11.45	23		196°6.64 52.80	24°29.99 42.72	28°55.46 36.46	153°23.29 18.11	
84 GHA	N 4 c ··	nass 11:4F	1. 0 E/ 4 0 0/ 2 0E	,,2,7/, d,0,0/,,0,51	10 6/ 40 0/ == 0.20		
Second CHA	ivier.p	pass. 11:45	ν-υ.5 <i>α</i> -υ.9 m-3.95	ν2.1 α-υ.υ m-υ.51	ν∠.υ αυ.υ m-2.38	ν2.2 αυ.1 mυ./3	1 .
Sat GHA GHA CHA Dec GHA DEC G							
1 196 197 277 378 319	Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	1
1 199°1476 26°573 50.98 56°3801 34264 99°065 3654 183°2764 18.35 2 21°1973 241°528 4938 69380 693801 34266 73°329 3658 186°2981 18.35 3 22°19769 36°3802 470 518°4801 48.01 98°1805 36.01 213°3199 18.59 4 24°4°215 271°437 48.01 99°43.34 42°52 104°84 48 36.65 228°34.16 18.17 4 24°2215 271°437 48.01 99°43.34 42°52 104°84 48 36.65 228°34.16 18.17 4 24°2215 271°437 48.01 99°43.34 42°52 104°84 48 36.65 228°34.16 18.17 4 24°2215 30°342 45 41.61 19°40.01 42.48 19°11.04 36.69 243°35.34 18.83 5 25°2462 28°322 47.05 114°46.01 42.48 19°11.04 36.69 243°35.34 18.83 5 25°2462 36°322 47.05 114°46.01 42.48 19°11.04 36.69 243°35.34 18.83 5 25°2462 36°322 47.05 114°46.01 42.48 19°11.04 36.69 243°35.34 18.83 5 25°2462 36°322 47.05 114°46.01 42.48 19°11.04 36.69 24.09 19.07 4 24°48.07 19°42.00 18°42.00 18.29 19°42.00 19°42.00 19.07 4 24°48.07 19°42.00 18°42.00 14.127 29°9.93 14.20 18.		184° 12.30	211°6.19 S 11°51.85	39°32.66 N17°42.68		168°25.46 N04°18.23	
2 214°17.23 24°19.28 49.93 69°8.801 42.60 47°8.25 36.58 198°29.81 18.47 Acres 172°57.4 43°15.12 24°12.15 27°14.37 48.01 99°4.31 42.52 104°8.44 36.50 228°34.16 18.71 40.20 49°15.25 25°94.62 286°39.2 47.05 114°46.01 42.45 119°11.04 36.69 228°34.16 18.71 41.46 11 44°1.46 14 42.45 119°11.04 36.69 228°34.16 18.71 41.46 10 42.45 119°11.04 36.69 228°34.16 18.71 41.46 11 44°1.14 42.45 119°11.04 36.69 228°34.16 18.71 41.46 11 44°1.14 42.45 119°11.04 36.69 228°34.16 18.71 41.46 11 44°1.14 42.45 119°11.04 36.69 228°34.28 19.90 40°3.27 40°9.19 40°7.27 40°9	1					183°27.64 18.35	
3 229°19.09 0 26°3.02	2	214° 17.23	241°5.28 49.93	69°38.01 42.60		198°29.81 18.47	1
4 244°2216 2 286°392 4705 114'46.01 42.48 119'110' 36.69 228°3416 18.71 6 274°3708 301°346 511°409 129'4868 N17°42.43 139'1366 N16°36.73 258°3851 N04″1899 7 286°395 316°301 45.12 144'51.34 42.39 149'16.23 30.76 273°40.99 19.07 8 394°3201 45.12 144'51.34 42.39 149'16.23 30.76 24.286 19.20 8 394°3201 31°346 31°256 44.16 159'56.00 42.35 164'18.63 36.80 288°42.86 19.20 Menkett 147'55.10 -36'9.30.11 9 313°340 367 10 -45.20 174'56.63 -42.30 179'2142 38.84 303°45.04 19.52 Menkett 147'55.10 -36'9.30.11 9 313°34 36.00 16°1.20 -42.21 38'51.83 42.22 30'57.02 18.65 13 30'45.04 19.52 Menkett 147'55.10 -36'9.30.11 10 334°36.01 16°1.20 -42.21 38'51.83 42.22 30'57.02 18.65 13 30'45.04 19.52 Menkett 147'55.10 -36'9.30.11 11 34°44.63 44°0.30 33.4 225°20.44 410'12' 242'0.20 18.65 13 31'51.05 40'10.39 19.56 Menkett 147'55.10 -42.21 329'31.80 36.80 38'31.40'3.03 19.56 Menkett 147'55.10 -42.21 329'31.80 36.80 38'31.41 19.80 15 49'49.26 66' 59'9.89 33.47 226'9.95 40.80 254'33.30 37'0.6 33'8.50 90' 20.04 Menkett 147'55.10 -42.21 329'31.80 36.80 38'31.41 19.80 15 49'49.26 66' 59'8.99 36.44 280'15.26 41.99 244'31.93 30' 37'0.6 33'8.50 90' 20.04 Menkett 147'55.10 -42.21 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36'.80 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36' 38'.50 31' 38'.50 90' 20.04 Menkett 147'55.10 -42.22 329'31.80 36' 38'.50 31' 38'.50 90' 20.04 Menkett 147'45.10 -42.22 329'31.80 31' 38'.50 90' 31' 35' 30' 30' 30' 30' 30' 30'	3	229° 19.69	256°4.82 · · 48.97	84°40.68 · · 42.56	89°5.85 · · 36.61		1
5 259°24°C 20 301°340 S11′40°0 114′40°1 42.48 119′11.04 36.69 243°35.41 88.83 Soic 1816′20.07 - 11′18.30 4°2.03 Soil 20°35.51 40°30.52 Soil 316′30.11 41′51.34 42.39 149′16.23 36.76 273°40.69 19.20 Hada 148′23.81 60°30.25 Soil 318′23.22 131′35.50 44.16 159′55.00 42.35 164′18.83 36.80 288′42.86 19.20 Hada 148′23.81 60°30.25 Soil 318′23.22 131′35.50 44.16 159′55.00 42.55 164′18.83 36.80 308′45.04 19.32 Hada 148′23.81 60°30.25 Soil 318′47.22 19.44 Soil 316′47.82 19.44 Soil 316′47.84 Soil 316′47.82 19.44 Soil 316′47.84 So	4		271°4.37 48.01			228°34.16 18.71	1
5 274*27.08 301*3.46 511*46.09 129*48.68 N17*42.43 134*13.64 N16*36.73 258*38.51 N0*18.05* 8 304*32.01 331*2.56 316*46.09 129*48.68 N17*42.43 134*13.64 N16*36.73 258*38.51 N0*18.05* 8 304*32.01 331*2.55 316*18*51.62* 316*76* 273*40.6 19.07 9 319*34.47 349*2.10 43.20 17*3*56.66 42.20 17*2*124* 3.68 43.03**454.6 19.32 10 334*36.94 15*16.5 2.42 21 189*59.33 42.26 194*24.02 36.87 318*47.22 19.44 11 349*39.40 16*12.0 41.27 205*19.98 42.22 29*56.61 36.91 333*49.91 19.56 11 349*39.40 16*12.0 41.27 205*19.98 42.22 29*56.61 36.91 333*49.91 19.56 11 349*39.40 16*12.0 41.27 205*19.95 42.22 29*56.61 36.91 333*49.91 19.56 11 349*39.40 16*12.0 41.27 205*19.95 42.22 29*56.01 36.91 333*49.91 19.56 11 49*49.26 0*59.59 38.37 259*9.95 42.08 254*34.39 37.02 18*55.92 19.92 11 49*49.26 0*59.59 40 37.41 260*12.56 41.99 244*39.58 37.09 49*0.27 20.16 15 49*49.26 0*59.59 36.44 260*15.26 41.99 244*39.58 37.09 49*0.27 20.16 16 49*51.72 105*56.50 35.47 205*17.91 41.44 299*12.17 37.13 40*24.42 20.28 18 94*56.65 10.05*60.5 33.54 205*17.91 41.44 299*12.17 37.13 40*24.42 20.28 18 94*56.65 10.05*60.5 33.54 325*32.14 41.55 36*27.27 24*11.14 20.77 18 94*56.65 10.05*60.5 31.59 355*25.50 41.59 34*47.85 37.72 37.1 24*11.14 20.77 18 94*56.55 10.05*60.5 31.59 355*25.50 41.59 34*47.85 37.72 37.1 24*11.14 20.77 18 94*56.55 200*12.75 10.05*60.5 31.59 355*25.50 41.50 34*47.85 37.31 134*15.40 20.77 18 94*56.55 10.05*50.5 35.51*2.50 40*2.50 41.55 35*2.50 37.42 10.95*2.70 12.15 10.05*60.5 31.30 35*2.85 0.41.80 34*49.95 5.72.4 10.95*8.7 20.44 12 100*13.90 225*49.1 27.71 34.85 329*3.1 134*15.40 12.05*3.1 134*15.1 134*1	5	259°24.62	286°3.92 47.05	114°46.01 42.48	119°11.04 36.69	243°36.34 18.83	
7 289°2955 1316°301 331°256 44.16 199°5400 42.35 164°16.23 36.76 273′40.69 19.07 19.20 19.30 19.31°347 19.20 1331°347 19.20 11.65 42.23 19°5400 42.25 164°18.83 36.80 288°42.80 19.20 19.20 19.3	6	274°27.08	301°3.46 \$11°46.09		134°13.64 N16°36.73	258°38.51 N04°18.95	1
8 304°32.01 331°2.56 4.416 159°54.00 42.35 164°18.83 36.80 288°42.86 19.20 9 319°34.47 346°2.10 43.20 174°56.60 42.30 179°21.42 36.87 318°47.22 19.44 13 436°39.40 1°1.65 42.23 189°59.33 42.26 194°24.02 36.87 318°47.22 19.44 13 13°47.83 16°1.20 41.27 205°1.99 42.22 29°56.61 36.91 333°49.51 19.56 13 15°44.33 46°0.30 39.34 22.64 177°42.17 224°29.20 116°36.95 348°51.57 100°1.96 19.80 14 34°46.80 60°59.85 3.83 255°7.30 42.13 239°1.80 36.80 83°51.57 100°1.96 19.80 15 49°49.26 75°59.40 37.41 260°1.26 41.99 24°39.58 37.00 18°55.92 19.92 20.44 16 64°51.72 90°58.95 36.44 280°1.52.6 41.99 24°39.58 37.00 49°0.27 20.16 54.11 200°1.80 18.11 2	7	289° 29.55	316°3.01 45.12	144°51.34 42.39	149°16.23 36.76	273°40.69 19.07	1
9 319°3447 340°21.0	8	304°32.01	331°2.56 44.16	159°54.00 42.35	164°18.83 36.80	288° 42.86 19.20	1
10 343*3994 1°11.05 44.23 180*99.33 42.26 194*24.02 36.87 318*47.22 19.44 Rigil Rent. 193"37.21 -60*56.83 13 349*39.94 16*10.20 44.187 31*0.75 511*0.30 42.22 20*5*1.80 42.22 20*5*0.5*10.6*36.59 33*49.91.56 Rochab 137*18.96 74*2.29 21.06*56.31 13 194*4.33 46*0.30 39.34 22.23 25*7.30 42.13 23*93.18.0 36.99 3*5*1.57 No4*19.68 Alphecca 126*1.97 26*9.11 14*0.30 25*9.40 137*14 15*0.5*2.10 14*3.4*46.80 60*99.95 38.37 250*9.95 42.08 254*34.39 37.00 18*55.90 20.04 Alphecca 126*1.97 26*9.11 15*1.34*3.26*9.95 42.08 254*34.39 37.00 18*55.90 20.04 Alphecca 126*1.97 26*9.95 15*3.16*0.94 25*9.10*2.16*0.95*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.16*0.15*3.09 20.04 40*0.27 20.05*0.15*3.10*0.15*0.15*3.10*0.20*0.29 41.85*0.29*4.27 20.20*0.25*0.25*0.20*0.25*0.25*0.35*0.35*0.25*0.35*0.25*0.35*0.25*0.35*0.25*0.35*0.25*0.35*0.25*0.25*0.25*0.25*0.25*0.25*0.25*0.2	9	319°34.47		174°56.66 · · 42.30	179°21.42 · · 36.84	303°45.04 · · 19.32	1
11 349"39.40 16"1.20 41.27 205"1.98 42.22 209"26.51 36.91 333"49.39 19.56 Kochab 137"18.96 74"2.22 109"26.51 36.91 333"49.39 19.56 Kochab 137"18.96 74"2.29 19.90 19.56 19.56	10		1°1.65 42.23	189°59.33 42.26	194°24.02 36.87	318° 47.22 19.44	1
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8 298° 42.45 56.60 48°15.45 9.4' 27°25.65 1.3' 54 9 313° 42.64 · · 57.57 62° 43.80 9.4' 27°26.91 1.1' 54 10 328° 42.83 58.55 77°12.17 9.4' 27°28.04 1.0' 54 11 343° 43.02 02°59.53 91°40.55 9.4' 27°29.03 0.8' 54 12 358° 43.21 N03°0.50 106°8.94 9.4' 27°30.59 0.6' 54 13 13°43.39 1.48 120°37.36 9.4' 27°31.16 0.4' 54 14 28°43.58 2.46 135°5.78 9.4' 27°31.16 0.4' 54 15 43°43.77 · 3.43 149°34.23 9.5' 27°31.89 0.2' 54 16 58°43.96 4.41 164°2.70 9.5' 27°31.89 0.2' 54 17 73°44.15 5.39 178°31.19 9.5' 27°32.04 0.0' 54 18 88°44.34 N03°6.36 192°59.69 9.5' 27°31								54.9'
9 313°42.64 ·· 57.57 62°43.80 9.4' 27°26.91 1.1' 54 10 328°42.83 58.55 77°12.17 9.4' 27°28.04 1.0' 54 11 343°43.02 02°59.53 91°40.55 9.4' 27°29.03 0.8' 54 12 358°43.21 N03°0.50 106°8.94 9.4' 527°29.88 0.7' 54 13 13°43.39 1.48 120°37.36 9.4' 27°30.59 0.6' 54 14 28°43.58 2.46 135°5.78 9.4' 27°31.16 0.4' 54 15 43°43.77 ·· 3.43 149°34.23 9.5' 27°31.59 0.3' 54 16 58°43.96 4.41 164°2.70 9.5' 27°31.89 0.2' 54 17 73°44.15 5.39 178°31.19 9.5' 27°32.04 0.0' 54 18 88°44.34 N03°6.36 192°59.69 9.5' \$27°32.06 -0.1' 54 19 103°44.53 7.34 207°28.23 9.6' 27°31.69 -0.4' 54 20 118°44.72 8.31 221°56.78 9.6' 27°31.69 -0.4' 54 21 133°44.90 ·· 9.29 236°25.36 9.6' 27°31.29 -0.5' 54 22 148°45.09 10.26 250°53.97 9.6' 27°30.76 -0.7' 54 23 163°45.28 11.24 265°22.60 9.7' 27°30.10 -0.8' 54								54.8'
10 328° 42.83 58.55 77° 12.17 9.4' 27° 28.04 1.0' 54 11 343° 43.02 02° 59.53 91° 40.55 9.4' 27° 29.03 0.8' 54 12 358° 43.21 N03° 0.50 106° 8.94 9.4' S27° 29.88 0.7' 54 13 13° 43.39 1.48 120° 37.36 9.4' 27° 30.59 0.6' 54 14 28° 43.58 2.46 135° 5.78 9.4' 27° 31.16 0.4' 54 15 43° 43.77 3.43 149° 34.23 9.5' 27° 31.59 0.3' 54 16 58° 43.96 4.41 164° 2.70 9.5' 27° 31.89 0.2' 54 17 73° 44.15 5.39 178° 31.19 9.5' 27° 32.04 0.0' 54 18 88° 44.34 N03° 6.36 192° 59.69 9.5' S27° 32.06 -0.1' 54 20 118° 44.72 8.31 221° 56.78 9.6' 27° 31.69								54.8' 54.8'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.8'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11		$02^{\circ}59.53$		9.4'			54.8'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.7'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.7' 54.7'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.7'
18 88°44.34 N03°6.36 192°59.69 9.5' \$27°32.06 -0.1' 54 19 103°44.53 7.34 207°28.23 9.6' 27°31.94 -0.3' 54 20 118°44.72 8.31 221°56.78 9.6' 27°31.69 -0.4' 54 21 133°44.90 · 9.29 236°25.36 9.6' 27°31.29 -0.5' 54 22 148°45.09 10.26 250°53.97 9.6' 27°30.76 -0.7' 54 23 163°45.28 11.24 265°22.60 9.7' 27°30.10 -0.8' 54	16	58° 43.96	4.41	164°2.70	9.5'	$27^{\circ}31.89$	0.2'	54.7'
19 103°44.53 7.34 207°28.23 9.6' 27°31.94 -0.3' 54 20 118°44.72 8.31 221°56.78 9.6' 27°31.69 -0.4' 54 21 133°44.90 • 9.29 236°25.36 9.6' 27°31.29 -0.5' 54 22 148°45.09 10.26 250°53.97 9.6' 27°30.76 -0.7' 54 23 163°45.28 11.24 265°22.60 9.7' 27°30.10 -0.8' 54								54.7'
20 118° 44.72 8.31 221° 56.78 9.6' 27° 31.69 -0.4' 54 21 133° 44.90 · 9.29 236° 25.36 9.6' 27° 31.29 -0.5' 54 22 148° 45.09 10.26 250° 53.97 9.6' 27° 30.76 -0.7' 54 23 163° 45.28 11.24 265° 22.60 9.7' 27° 30.10 -0.8' 54								54.6' 54.6'
21 133°44.90 · · 9.29 236°25.36 9.6' 27°31.29 -0.5' 54 22 148°45.09 10.26 250°53.97 9.6' 27°30.76 -0.7' 54 23 163°45.28 11.24 265°22.60 9.7' 27°30.10 -0.8' 54								54.6'
23 163°45.28 11.24 265°22.60 9.7' 27°30.10 -0.8' 54								54.6'
								54.6'
SD = 16.0' $d = 1.0'$ $SD = 15.0'$	23			265°22.60			-0.8'	54.6'
		SD = 16.0'	d = 1.0'		SD	0 = 15.0'		

N 72° N 70° 68° 66° 64° 62° 60° N 58°	Twil Naut. 02:31 02:59 03:20 03:36 03:48 03:59 04:08 04:15 04:22	Civil 04:13 04:25 04:34 04:42 04:49 04:54 04:59 05:03	05:24 05:28 05:32 05:35 05:37 05:39 05:41	18:50 18:45 18:41 18:38 18:35 18:33 18:31	Civil 20:02 19:49 19:39 19:31 19:24 19:18	Naut. 21:47 21:17 20:55 20:39 20:25 20:14
N 70° 68° 66° 64° 62° 60°	02:59 03:20 03:36 03:48 03:59 04:08	04:25 04:34 04:42 04:49 04:54 04:59	05:28 05:32 05:35 05:37 05:39	18:45 18:41 18:38 18:35 18:33	19:49 19:39 19:31 19:24 19:18	21:17 20:55 20:39 20:25
68° 66° 64° 62° 60°	03:20 03:36 03:48 03:59 04:08	04:34 04:42 04:49 04:54 04:59	05:32 05:35 05:37 05:39	18:41 18:38 18:35 18:33	19:39 19:31 19:24 19:18	20:55 20:39 20:25
66° 64° 62° 60°	03:36 03:48 03:59 04:08	04:42 04:49 04:54 04:59	05:35 05:37 05:39	18:38 18:35 18:33	19:31 19:24 19:18	20:39 20:25
64° 62° 60°	03:48 03:59 04:08 04:15	04:49 04:54 04:59	05:37 05:39	18:35 18:33	19:24 19:18	20:25
62° 60°	03:59 04:08 04:15	04:54 04:59	05:39	18:33	19:18	
60°	04:08 04:15	04:59				20:14
	04:15		05:41	18.31		
N 58°		02.03		10.51	19:13	20:05
	04:22	05.05	05:43	18:29	19:09	19:57
56°		05:07	05:45	18:27	19:05	19:51
54°	04:28	05:10	05:46	18:26	19:02	19:45
52°	04:33	05:13	05:47	18:25	18:59	19:39
50°	04:37	05:16	05:48	18:24	18:56	19:35
45°	04:47	05:21	05:51	18:21	18:50	19:25
N 40°	04:54	05:26	05:53	18:19	18:46	19:18
35°	04:59	05:29	05:54	18:17	18:42	19:12
30°	05:04	05:32	05:56	18:15	18:39	19:07
20°	05:11	05:36	05:58	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
S 10°	05:19	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:05	18:27	18:52
30°	05:16	05:44	06:07	18:03	18:27	18:54
35°	05:14	05:43	06:09	18:02	18:27	18:56
40°	05:11	05:43	06:10	18:01	18:28	18:59
45°	05:07	05:42	06:11	17:59	18:28	19:02
S 50°	05:02	05:40	06:12	17:58	18:30	19:07
52°	05:00	05:39	06:13	17:57	18:30	19:10
54°	04:57	05:39	06:14	17:56	18:31	19:12
56°	04:54	05:37	06:15	17:55	18:32	19:15
58°	04:50	05:36	06:15	17:54	18:33	19:19
S 60°	04:46	05:35	06:16	17:53	18:34	19:23
		Moonris	e		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun

Lat. Fri Sat Sun Fri	Sat	C
111 321 3211		Sun
N 72°		
N 70°		
68°		
66° 01:40 • 03:58		
64° 00:49 03:32 ••• 04:50	03:55	
62° 00:18 02:06 03:47 05:22	05:22	05:30
60° ··· 01:30 02:51 05:46	05:59	06:26
N 58° ···· 01:04 02:19 06:05	06:25	06:59
56° 00:43 01:54 06:21	06:46	07:23
54° ··· 00:26 01:35 06:35	07:03	07:43
52° ··· 00:12 01:19 06:47	07:18	08:00
50° 23:59 ··· 01:04 06:58	07:31	08:14
45° 23:33 ··· 00:36 07:20	07:57	08:43
N 40° 23:13 ··· 00:13 07:38	08:18	09:05
35° 22:55 23:55 ···· 07:54	08:36	09:24
30° 22:41 23:39 ···· 08:07	08:51	09:40
20° 22:16	09:17	10:07
N 10° 21:55 22:49 23:41 08:49	09:39	10:31
0° 21:35 22:27 23:20 09:08	10:00	10:53
S 10° 21:15 22:06 22:58 09:26	10:21	11:14
20° 20:54 21:43 22:34 09:46	10:43	11:38
30° 20:30 21:16 22:07 10:09	11:09	12:05
35° 20:15 21:01 21:51 10:23	11:24	12:21
40° 19:59 20:42 21:32 10:39	11:42	12:40
45° 19:39 20:20 21:10 10:58	12:04	13:02
S 50° 19:15 19:53 20:41 11:21	12:31	13:31
52° 19:03 19:39 20:27 11:32	12:44	13:45
54° 18:50 19:24 20:10 11:45	13:00	14:02
56° 18:35 19:05 19:51 12:00	13:18	14:21
58° 18:16 18:43 19:26 12:18	13:40	14:46
S 60° 17:54 18:14 18:54 12:40	14:09	15:18

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-69%	
26	05:53	05:43	12:06	02:56	15:21		
27	05:34	05:25	12:05	03:47	16:14		
28	05:16	05:07	12:05	04:40	17:06		

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	186° 10.58	210°44.70 \$11°5.19	41°39.44 N17°40.27	46°2.38 N16°38.20	170°9.86 N04°24.03
1	201°13.04	225°44.26 4.20	56°42.05 40.21	61°4.97 38.23	185°12.04 24.15
2	216° 15.51	240°43.82 3.22	71°44.66 40.15	76°7.55 38.27	200° 14.21 24.27
3	231° 17.97	255°43.38 · · 2.23	86°47.27 · · 40.09	91°10.13 · · 38.30	215°16.38 · · 24.39
4	246°20.43	270°42.94 1.24	101°49.87 40.02	106°12.71 38.33	230°18.56 24.51
5	261°22.90	285°42.50 11°0.25	116°52.47 39.96	121°15.29 38.37	245°20.73 24.63
6	276°25.36	300°42.06 S 10°59.27	131°55.08 N17°39.90	136°17.88 N16°38.40	260°22.91 N04°24.75
7	291°27.83	315°41.63 58.28	146°57.68 39.84	151°20.46 38.43	275°25.08 24.87
8	306°30.29	330°41.19 57.29	162°0.28 39.77	166°23.04 38.46	290° 27.26 24.99
9	321°32.75	345°40.75 · · 56.30	177°2.88 · · 39.71	181°25.62 · · 38.50	305°29.43 · · 25.11
10 11	336°35.22 351°37.68	0°40.31 55.31 15°39.88 54.32	192°5.47 39.64 207°8.07 39.58	196°28.20 38.53 211°30.78 38.56	320°31.60 25.24 335°33.78 25.36
12	6°40.15	30°39.44 \$10°53.32	207 8.07 39.58 222°10.66 N17°39.51	226°33.35 N16°38.59	350°35.95 N04°25.48
13	21° 42.61	45°39.00 52.33	237°13.26 39.45	241°35.93 38.62	5°38.13 25.60
14	36° 45.07	60°38.57 51.34	252°15.85 39.38	256°38.51 38.65	20°40.30 25.72
15	51°47.54	75°38.13 · · 50.35	267°18.44 · · 39.31	271°41.09 · · 38.69	35°42.47 · · 25.84
16	66°50.00	90°37.69 49.35	282°21.03 39.25	286°43.67 38.72	50°44.65 25.96
17	81°52.47	105°37.26 48.36	297°23.62 39.18	301°46.25 38.75	65°46.82 26.08
18	96° 54.93	120°36.82 S 10°47.36	312°26.21 N17°39.11	316°48.82 N16°38.78	80°49.00 N04°26.20
19	111°57.40	135°36.39 46.37	327°28.79 39.04	331°51.40 38.81	95°51.17 26.32
20	126°59.86	150°35.96 45.37	342°31.38 38.97	346°53.98 38.84	110°53.35 26.44
21	142°2.32	165°35.52 · · 44.37	357°33.96 · · 38.91	1°56.55 · · 38.87	125°55.52 · · 26.56
22	157°4.79	180°35.09 43.38	12°36.54 38.84	16°59.13 38.90	140°57.69 26.69
23	172°7.25	195°34.66 42.38	27°39.12 38.77	32°1.70 38.94	155°59.87 26.81
Mer.p	ass. 11:33	u-0.4 $'$ d-1.0 $'$ m-3.93	ν 2.6′ d-0.1′ m-0.44	$\nu 2.6' \ d0.0' \ \text{m-}2.36$	$ u 2.2' \ d0.1' \ m0.72$
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$187^{\circ}9.72$	210°34.22 S 10°41.38	42°41.70 N17°38.69	47°4.28 N16°38.97	171°2.04 N04°26.93
1	$202^{\circ}12.18$	225°33.79 40.38	57°44.28 38.62	62°6.85 39.00	186°4.21 27.05
2	$217^{\circ}14.64$	240°33.36 39.38	72°46.85 38.55	77°9.43 39.03	201°6.39 27.17
3	232°17.11	255°32.92 · · 38.38	87°49.43 · · 38.48	92°12.00 · · 39.06	216°8.56 · · 27.29
4	247° 19.57	270°32.49 37.38	102°52.00 38.41	107°14.58 39.09	231°10.74 27.41
5	262°22.04	285°32.06 36.38	117°54.58 38.34	122°17.15 39.12	246°12.91 27.53
6	277° 24.50	300°31.63 \$10°35.38	132°57.15 N17°38.26	137°19.73 N16°39.15	261°15.08 N04°27.65
7 8	292°26.97 307°29.43	315°31.20 34.38 330°30.77 33.38	147°59.72 38.19 163°2.29 38.12	152°22.30 39.18 167°24.87 39.21	276° 17.26 27.77 291° 19.43 27.89
9	307 29.43 322°31.89	345°30.34 · · 32.38	178° 4.85 · · 38.04	182°27.44 · · 39.24	306°21.61 · · 28.01
10	337°34.36	0°29.91 31.37	193°7.42 37.97	197°30.02 39.27	321°23.78 28.13
11	352°36.82	15°29.48 30.37	208° 9.98 37.89	212°32.59 39.30	336° 25.95 28.26
12	7°39.29	30°29.05 \$10°29.36	223°12.55 N17°37.82	227°35.16 N16°39.33	351°28.13 N04°28.38
13	22°41.75	45°28.62 28.36	238°15.11 37.74	242°37.73 39.36	6°30.30 28.50
14	37° 44.21	60°28.19 27.35	253°17.67 37.66	257°40.30 39.38	21°32.47 28.62
15	52°46.68	75°27.76 · · 26.35	268°20.23 · · 37.59	272°42.87 · · 39.41	36°34.65 · · 28.74
16 17	67° 49.14 82° 51.61	90°27.33 25.34 105°26.91 24.34	283°22.79 37.51 298°25.35 37.43	287°45.44 39.44 302°48.01 39.47	51°36.82 28.86 66°38.99 28.98
18	97°54.07	120°26.48 \$10°23.33	313°27.90 N17°37.35	317°50.58 N16°39.50	81°41.17 N04°29.10
19	112°56.54	135°26.05 22.32	328°30.46 37.28	332°53.15 39.53	96°43.34 29.22
20	127°59.00	150°25.62 21.31	343°33.01 37.20	347°55.72 39.56	111°45.52 29.34
21	143°1.46	165°25.20 · · 20.30	358°35.56 · · 37.12	2°58.29 · · 39.59	126°47.69 · · 29.46
22	158°3.93	180°24.77 19.29	13°38.11 37.04	18°0.86 39.61	141°49.86 29.58
23	173°6.39	195°24.35 18.28	28°40.66 36.96	33°3.43 39.64	156° 52.04 29.70
Mer.r	pass. 11:29	ν-0.4' d-1.0' m-3.93	ν 2.6' d-0.1' m-0.41	ν2.6' d0.0' m-2.35	ν2.2' d0.1' m0.71
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	188°8.86	210°23.92 \$10°17.27	43°43.21 N17°36.88	48°5.99 N16°39.67	171°54.21 N04°29.83
1	203°11.32	225°23.49 16.26	58°45.76 36.80	63°8.56 39.70	186° 56.38 29.95
2	218° 13.78	240°23.07 15.25	73°48.30 36.72	78°11.13 39.73	201°58.56 30.07
3	233° 16.25	255°22.64 · · 14.24	88°50.85 · · 36.63	93°13.69 · · 39.76	217°0.73 · · · 30.19
4	$248^{\circ}18.71$	270°22.22 13.23	103°53.39 36.55	108°16.26 39.78	232°2.90 30.31 N
5	$263^{\circ}21.18$	285°21.79 12.21	118°55.93 36.47	123°18.83 39.81	247°5.08 30.43
6	278° 23.64	300°21.37 S 10°11.20	133°58.47 N17°36.39	138°21.39 N16°39.84	262°7.25 N04°30.55
7	293°26.10	315°20.95 10.18	149°1.01 36.30	153°23.96 39.87	277°9.42 30.67
8	308° 28.57	330°20.52 9.17	164° 3.55 36.22	168°26.52 39.89	292°11.60 30.79
9	323°31.03	345°20.10 · · 8.15	179°6.08 · · 36.13	183°29.09 · · 39.92	307° 13.77 · · · 30.91
10 11	338° 33.50 353° 35.96	0°19.68 7.14 15°19.25 6.12	194°8.62 36.05 209°11.15 35.97	198°31.65 39.95 213°34.22 39.98	322°15.94 31.03 337°18.12 31.15
12	8° 38.43	30°18.83 \$10°5.11	209 11.15 35.97 224°13.69 N17°35.88	213 34.22 39.98 228°36.78 N16°40.00	352°20.29 N04°31.27
13	23° 40.89	45°18.41 4.09	239°16.22 35.79	243°39.35 40.03	7°22.46 31.40
14	38° 43.35	60°17.99 3.07	254°18.75 35.71	258°41.91 40.06	22°24.64 31.52
15	53°45.82	75°17.57 · · 2.05	269°21.28 · · 35.62	273°44.47 · · 40.08	37°26.81 · · 31.64
16	68°48.28	90°17.15 1.04	284°23.80 35.53	288°47.03 40.11	52°28.98 31.76
17	83°50.75	105°16.72 10°0.02	299°26.33 35.45	303°49.60 40.14	67°31.16 31.88
18	98°53.21	120°16.30 \$09°59.00	314°28.85 N17°35.36	318°52.16 N16°40.16	82°33.33 N04°32.00
19	113°55.67	135°15.88 57.98	329°31.38 35.27	333°54.72 40.19	97°35.50 32.12
20	128°58.14	150°15.46 56.96 165°15.04 • 55.94	344°33.90 35.18	348°57.28 40.22	112° 37.67 32.24
21 22	144°0.60 159°3.07	165°15.04 · · 55.94 180°14.62 54.91	359°36.42 · · 35.09 14°38.94 35.00	3°59.84 · · 40.24 19°2.40	127°39.85 · · 32.36 142°42.02 32.48
23	174° 5.53	195°14.21 53.89	29°41.46 34.91	34°4.96 40.29	157°44.19 32.60
Mer.p	bass. 11:26	ν-0.4' d-1.0' m-3.93	ν2.5′ d-0.1′ m-0.39	ν2.6' d0.0' m-2.35	ν2.2' d0.1' m0.71

	Stars	
	SHA	Dec
Alpheratz	357°33.23	29°14.39
Ankaa	353°5.77 349°29.50	-42°9.49 56°41.20
Schedar Diphda	349 29.50 348°45.80	-17° 50.29
Achernar	335°19.40	-57°5.98
Hamal	327°49.44	$23^{\circ}35.45$
Polaris	313°27.45	89°22.90
Acamar Menkar	315°10.72 314°4.48	-40°11.89 4°11.72
Mirfak	308°25.97	49°57.56
Aldebaran	290°37.68	$16^{\circ}33.80$
Rigel	281°2.22 280°19.33	-8° 10.37
Capella Bellatrix	280 19.33 278°21.01	46°1.61 6°22.36
Elnath	277°59.66	28°37.82
Alnilam	275°35.95	-1°11.21
Betelgeuse	270°50.16 263°51.61	7°24.62 -52°42.91
Canopus Sirius	258°24.62	-52 42.91 -16°45.44
Adhara	255°4.39	-29°0.82
Procyon	244°48.84	5°9.16
Pollux	243°14.97 234°13.71	27°57.58 -59°36.12
Avior Suhail	234°13.71 222°44.70	-59°36.12 -43°32.86
Miaplacidus	221°37.32	-69° 50.03
Alphard	217°45.75	-8°46.83
Regulus	207°32.25	11°49.88
Dubhe Denebola	193°38.20 182°22.77	61°36.21 14°25.00
Gienah	175°41.37	-17°41.80
Acrux	$172^{\circ}57.33$	$-63^{\circ}15.14$
Gacrux	171°49.00	-57°16.09
Alioth Spica	166°10.83 158°20.06	55°48.55 -11°18.39
Alkaid	150° 20.00° 152° 50.12	49° 10.40
Hadar	$148^{\circ}32.78$	-60° 30.26
Menkent	147°55.08	-36°30.32
Arcturus Rigil Kent.	145°45.94 139°37.18	19°2.20 -60°56.84
Kochab	137°18.92	74°2.30
Zuben'ubi	$136^{\circ}53.71$	$-16^{\circ}9.42$
Alphecca	126°1.94	26°37.11
Antares Atria	112°13.40 107°5.75	-26°29.54 -69°4.33
Sabik	102°0.56	-15°45.56
Shaula	96°7.77	-37°7.30
Rasalhague	95°56.76 90°41.24	12°32.21
Eltanin Kaus Aust.	90°41.24 83°30.07	51°28.75 -34°22.19
Vega	80°31.98	38°48.22
Nunki	75°45.52	-26° 15.70
Altair	61°58.27	8°56.28
Peacock Deneb	53°3.13 49°24.78	-56° 38.60 45° 22.40
Enif	33°37.23	9°59.89
Al Na'ir	27°31.00	-46°49.62
Fomalhaut	15°12.84	-29°28.65
Scheat Markab	13°43.75 13°28.37	28° 13.73 15° 21.02
Mar 29 Mon	SHA	Mer.pass
Venus	24°34.12	09:57
Mars	$215^{\circ}28.87$	21:10
Jupiter Saturn	219°51.81 343°59.28	20:52 12:38
Mar 30 Tue Venus	SHA 23°24.51	Mer.pass 09:58
Mars	215°31.98	21:06
Jupiter	219°54.56	20:48
Saturn	343°52.32	12:34
Mar 31 Wed Venus	SHA 22°15.06	Mer.pass
Venus Mars	22°15.06 215°34.35	09:59 21:02
Jupiter	219°57.14	20:44
Saturn	343°45.35	12:31
Horizor	ıtal parallax	
	Venus:	0.1
	Mars:	0.2

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 45.47	N03°12.21	279°51.26	9.7'	S27°29.30	-0.9'	54.5'
1	193°45.66	13.19	294°19.94	9.7'	$27^{\circ}28.36$	-1.1'	54.5'
2	208° 45.85	14.17	308° 48.66	9.7'	27°27.29	-1.2'	54.5'
3 4	223°46.03 238°46.22	· · 15.14 16.12	323°17.41 337°46.18	9.8' 9.8'	27°26.08 27°24.74	-1.3' -1.5'	54.5' 54.5'
5	250 40.22 253°46.41	17.09	352° 14.99	9.8'	27°23.26	-1.5 -1.6'	54.5'
6	268° 46.60	N03°18.06	6°43.84	9.9'	S27°21.65	-1.7'	54.5'
7	283°46.79	19.04	21°12.72	9.9'	$27^{\circ}19.91$	-1.9'	54.4'
8	298°46.98	20.01	35°41.63	9.9'	27°18.04	-2.0'	54.4'
9	313°47.16 328°47.35	· · 20.99 21.96	50° 10.58 64° 39.56	10.0' 10.0'	27°16.03 27°13.89	-2.1' -2.3'	54.4' 54.4'
10 11	328 47.35 343°47.54	21.90	79°8.58	10.0	27 13.89 27°11.62	-2.3 -2.4'	54.4' 54.4'
12	358° 47.73	N03°23.91	93°37.64	10.1'	\$27°9.21	-2.5'	54.4'
13	13°47.92	24.88	108°6.74	10.1'	$27^{\circ}6.68$	-2.7'	54.4'
14	28°48.10	25.86	122°35.88	10.2'	27°4.02	-2.8'	54.4'
15 16	43°48.29 58°48.48	· · 26.83 27.81	137°5.06 151°34.29	10.2' 10.3'	27°1.22 26°58.30	-2.9' -3.1'	54.3' 54.3'
17	73°48.67	28.78	166°3.55	10.3	26°55.25	-3.1 -3.2'	54.3'
18	88° 48.86	N03°29.75	180° 32.86	10.4	S26°52.07	-3.3'	54.3'
19	103°49.04	30.73	195°2.21	10.4'	26°48.77	-3.4'	54.3'
20	118°49.23	31.70	209°31.60	10.4'	26°45.33	-3.6'	54.3'
21	133°49.42	• • 32.67	224°1.04	10.5'	26°41.77	-3.7'	54.3'
22 23	148° 49.61 163° 49.80	33.65 34.62	238°30.53 253°0.06	10.5' 10.6'	26°38.09 26°34.28	-3.8' -3.9'	54.3' 54.3'
23						-3.9	J4.J
	SD = 16.0'	d = 1.0'		SD	0 = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.98	N03°35.59	267°29.64	10.6'	S26°30.34	-4.1'	54.3'
1	193°50.17	36.56	281°59.26	10.7'	26°26.28	-4.2'	54.3'
2	208°50.36 223°50.55	37.54	296°28.94 310°58.66	10.7'	26°22.09 26°17.79	-4.3'	54.3'
3 4	223°50.55 238°50.73	· · 38.51 39.48	310°58.66 325°28.43	10.8' 10.8'	26°17.79 26°13.36	-4.4' -4.6'	54.2' 54.2'
5	253° 50.92	40.45	339°58.26	10.0	26°8.80	-4.7'	54.2'
6	268°51.11	N03°41.43	354°28.13	10.9'	S26°4.13	-4.8'	54.2'
7	283°51.30	42.40	8°58.05	11.0'	25°59.34	-4.9'	54.2'
8	298°51.48	43.37	23°28.03	11.0'	25°54.42	-5.0'	54.2'
9 10	313°51.67 328°51.86	•• 44.34 45.31	37°58.05 52°28.13	11.1' 11.1'	25°49.39 25°44.23	-5.2' -5.3'	54.2' 54.2'
11	343°52.05	46.28	66° 58.26	11.1	25 44.23 25°38.96	-5.3 -5.4'	54.2'
12	358° 52.23	N03°47.26	81°28.44	11.2'	S25°33.57	-5.5'	54.2'
13	13°52.42	48.23	95°58.68	11.3'	$25^{\circ}28.07$	-5.6'	54.2'
14	28°52.61 43°52.80	49.20	110°28.97	11.3'	25°22.45	-5.7'	54.2'
15 16	43°52.80 58°52.98	· · 50.17 51.14	124°59.31 139°29.71	11.4' 11.5'	25°16.71 25°10.86	-5.9' -6.0'	54.2' 54.2'
17	73°53.17	52.11	154°0.17	11.5'	25°4.89	-6.1	54.2'
18	88°53.36	N03°53.08	168° 30.67	11.6'	S24°58.81	-6.2'	54.2'
19	103°53.54	54.05	183°1.24	11.6'	24°52.61	-6.3'	54.2'
20	118°53.73 133°53.92	55.02	197°31.85	11.7'	24°46.31 24°39.89	-6.4'	54.2'
21 22	133°53.92 148°54.11	• • 55.99 56.96	212°2.53 226°33.26	11.7' 11.8'	24°39.89 24°33.36	-6.5' -6.6'	54.2' 54.2'
23	163°54.29	57.93	241°4.04	11.8'	24° 35.30	-6.7	54.2'
	SD = 16.0'	d = 1.0'		SE	0 = 14.8'		
	<u> </u>	<u>u = 1.0</u>			7 — 14.0		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.48 193°54.67	N03°58.90 03°59.87	255°34.88 270°5.78	11.9' 12.0'	\$24°19.97 24°13.11	-6.9'	54.2' 54.2'
1 2	193°54.67 208°54.85	03°59.87 04°0.84	270°5.78 284°36.73	12.0'	24°13.11 24°6.14	-7.0' -7.1'	54.2' 54.2'
3	223°55.04	• • 1.81	299°7.74	12.1'	23°59.07	-7.2	54.2'
4	238°55.23	2.78	313°38.81	12.1'	23°51.89	-7.3'	54.2'
5	253°55.41	3.75	328°9.93	12.2'	23°44.60	-7.4'	54.2'
6 7	268°55.60 283°55.79	N04° 4.72 5.69	342°41.11 357°12.34	12.2' 12.3'	\$23°37.20 23°29.70	-7.5' -7.6'	54.2' 54.2'
8	283 55.79 298°55.97	5.69 6.66	357 12.34 11°43.64	12.3'	23 29.70 23°22.10	-7.0 -7.7'	54.2'
9	313°56.16	7.63	26° 14.98	12.4'	23°14.40	-7.8	54.2'
10	328°56.35	8.59	40°46.39	12.5'	$23^{\circ}6.59$	-7.9'	54.2'
11	343°56.53	9.56	55° 17.85	12.5'	22°58.67	-8.0'	54.2'
12 13	358° 56.72 13° 56.90	N04°10.53 11.50	69°49.36 84°20.94	12.6' 12.6'	\$22°50.66 22°42.55	-8.1' -8.2'	54.2' 54.2'
13 14	28° 57.09	11.50 12.47	98° 52.57	12.6	22°42.55 22°34.34	-8.2 -8.3'	54.2' 54.2'
15	43°57.28	• • 13.44	113° 24.25	12.7'	22°26.02	-8.4	54.2'
16	58° 57.46	14.40	127° 55.99	12.8'	22°17.61	-8.5'	54.2'
17	73°57.65	15.37	142°27.79	12.9'	22°9.10	-8.6'	54.2'
18 19	88° 57.84 103° 58.02	N04°16.34 17.31	156°59.64 171°31.54	12.9' 13.0'	\$22°0.50 21°51.79	-8.7' -8.8'	54.2' 54.2'
20	103 58.02 118 58.21	17.31 18.27	171°31.54 186°3.50	13.0'	21°51.79 21°43.00	-8.8' -8.9'	54.2'
21	133°58.39	. 19.24	200° 35.52	13.1'	21°34.10	-9.0'	54.2'
22	148°58.58	20.21	215°7.59	13.1'	21°25.11	-9.1'	54.2'
23	163°58.77	21.17	229° 39.71	13.2'	21°16.03	-9.2'	54.2'
	SD = 16.0'	d = 1.0'		SD	0 = 14.8'		

Naut. Civil Sumset Civil Naut. N 72° 02:03 03:55 05:08 19:04 20:18 22:14 N 70° 02:38 04:09 05:14 18:58 20:03 21:36 68° 03:03 04:21 05:19 18:52 19:51 21:11 66° 03:21 04:30 05:23 18:48 19:42 20:52 64° 03:35 04:38 05:27 18:44 19:34 20:37 62° 03:47 04:44 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 02:38 04:09 05:14 18:58 20:03 21:36 68° 03:03 04:21 05:19 18:52 19:51 21:11 66° 03:21 04:30 05:23 18:48 19:42 20:52 64° 03:35 04:38 05:27 18:44 19:34 20:37 60° 03:57 04:50 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:55 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:37 18:34 19:11 19:58 50° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° 03:03 04:21 05:19 18:52 19:51 21:11 66° 03:21 04:30 05:23 18:48 19:42 20:52 64° 03:35 04:38 05:27 18:44 19:34 20:37 62° 03:47 04:44 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:28 19:01 19:40 45° 04:45 05:21	N 72°	02:03	03:55	05:08	19:04	20:18	22:14
66° 03:21 04:30 05:23 18:48 19:42 20:52 64° 03:35 04:38 05:27 18:44 19:34 20:37 62° 03:47 04:44 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25	N 70°	02:38	04:09	05:14	18:58	20:03	21:36
64° 03:35 04:38 05:27 18:44 19:34 20:37 62° 03:47 04:44 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28							
62° 03:47 04:44 05:30 18:41 19:27 20:24 60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 N 10° 05:13 05:38							
60° 03:57 04:50 05:32 18:38 19:21 20:14 N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 50° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34					1		
N 58° 04:06 04:55 05:35 18:36 19:16 20:05 56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:18 05:41	1						
56° 04:13 04:59 05:37 18:34 19:11 19:58 54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:15 30° 05:00 05:28 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 S 10° 05:18 05:43	60°	03:57	04:50	05:32	18:38	19:21	20:14
54° 04:20 05:03 05:39 18:32 19:08 19:51 52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 S 10° 05:18 05:43 06:04 18:05 18:24 18:50 20° 05:19 05:44		04:06	04:55	05:35	18:36	19:16	20:05
52° 04:25 05:06 05:40 18:30 19:04 19:45 50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:25 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 S 10° 05:18 05:43 06:04 18:05 18:26 18:50 20° 05:19 05:44 06:06 18:02 18:24 18:50 30° 05:18 05:45		04:13			18:34	19:11	
50° 04:30 05:09 05:42 18:28 19:01 19:40 45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 \$ 10° 05:18 05:43 06:04 18:05 18:26 18:50 20° 05:19 05:44 06:06 18:02 18:24 18:50 30° 05:18 05:45 06:09 17:59 18:23 18:51 35° 05:16 05:46							
45° 04:41 05:16 05:45 18:25 18:54 19:30 N 40° 04:49 05:21 05:48 18:22 18:49 19:21 35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 S 10° 05:18 05:43 06:04 18:05 18:26 18:50 20° 05:19 05:44 06:06 18:02 18:24 18:50 30° 05:18 05:45 06:09 17:59 18:23 18:51 35° 05:16 05:46 06:11 17:58 18:23 18:54 45° 05:11 05:45							
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35° 04:55 05:25 05:50 18:19 18:45 19:15 30° 05:00 05:28 05:52 18:17 18:41 19:09 20° 05:08 05:34 05:56 18:14 18:36 19:02 N 10° 05:13 05:38 05:59 18:11 18:32 18:56 0° 05:17 05:41 06:01 18:08 18:28 18:53 S 10° 05:18 05:43 06:04 18:05 18:26 18:50 20° 05:18 05:44 06:06 18:02 18:24 18:50 30° 05:18 05:45 06:09 17:59 18:23 18:51 35° 05:16 05:46 06:11 17:58 18:23 18:54 45° 05:11 05:45 06:15 17:54 18:23 18:57 \$50° 05:07 05:45 06:17 17:51 18:23 19:01 52° 05:05 05:44	"	04:41	05:16	05:45	18:25	18:54	19:30
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S 10° 05:18 05:43 06:04 18:05 18:26 18:50 20° 05:19 05:44 06:06 18:02 18:24 18:50 30° 05:18 05:45 06:09 17:59 18:23 18:51 35° 05:16 05:46 06:11 17:58 18:23 18:52 40° 05:14 05:46 06:13 17:56 18:23 18:54 45° 05:11 05:45 06:15 17:54 18:23 19:01 50° 05:07 05:45 06:17 17:51 18:23 19:03 52° 05:05 05:44 06:18 17:50 18:23 19:03 54° 05:03 05:44 06:19 17:49 18:24 19:05 56° 05:00 05:44 06:21 17:47 18:24 19:07 58° 04:57 05:43 06:22 17:46 18:25 19:10					1		
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
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52° 05:05 05:44 06:18 17:50 18:23 19:03 54° 05:03 05:44 06:19 17:49 18:24 19:05 56° 05:00 05:44 06:21 17:47 18:24 19:07 58° 04:57 05:43 06:22 17:46 18:25 19:10							
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56° 05:00 05:44 06:21 17:47 18:24 19:07 58° 04:57 05:43 06:22 17:46 18:25 19:10							
58° 04:57 05:43 06:22 17:46 18:25 19:10							
3 00 04:53 05:42 06:24 17:44 18:25 19:14							
	5 00°	04:53	05:42	06:24	17:44	18:25	19:14

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-41%	
29	04:58	04:49	12:05	05:32	17:58		
30	04:40	04:31	12:05	06:23	18:48		
31	04:22	04:13	12:04	07:12	19:35		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	189°7.99	210°13.79 S 09°52.87	44°43.98 N17°34.82	49°7.52 N16°40.32	172°46.37 N04°32.72	
1	$204^{\circ}10.46$	225°13.37 51.85	59°46.49 34.73	64°10.08 40.34	187°48.54 32.84	Alpheratz 357°33.22 29°14.38 Ankaa 353°5.77 -42°9.47
2	219° 12.92	240°12.95 50.82	74°49.01 34.64	79°12.64 40.37	202°50.71 32.96	Schedar 349°29.49 56°41.19
3	234° 15.39	255°12.53 · · 49.80	89°51.52 · · 34.55	94°15.20 · · 40.40	217°52.89 · · 33.08	Diphda 348°45.79 -17°50.28
4	249° 17.85	270°12.11 48.77	104°54.03 34.46	109°17.76 40.42	232°55.06 33.21	Achernar 335°19.40 -57°5.96
5 6	264° 20.32 279° 22.78	285°11.70 47.75 300°11.28 \$09°46.72	119°56.54 34.37 134°59.05 N17°34.27	124°20.32 40.45 139°22.88 N16°40.47	247°57.23 33.33 262°59.40 N04°33.45	Hamal 327°49.44 23°35.45
7	294°25.24	315°10.86 45.70	150°1.56 34.18	154°25.44 40.50	278°1.58 33.57	Polaris 313°28.32 89°22.89
8	309°27.71	330°10.45 44.67	165° 4.07 34.09	169°27.99 40.52	293°3.75 33.69	Acamar 315°10.73 -40°11.87
9	324°30.17	345°10.03 · · 43.65	180°6.58 · · 33.99	184°30.55 · · 40.55	308°5.92 · · 33.81	Menkar 314°4.49 4°11.72 Mirfak 308°25.98 49°57.56
10	339°32.64	0°9.61 42.62	195°9.08 33.90	199°33.11 40.57	323°8.10 33.93	Mirfak 308°25.98 49°57.56 Aldebaran 290°37.69 16°33.80
11	354° 35.10	15°9.20 41.59	210°11.58 33.80	214°35.66 40.60	338°10.27 34.05	Rigel 281°2.23 -8°10.37
12	9°37.56	30°8.78 S09°40.56	225°14.09 N17°33.71	229°38.22 N16°40.62	353°12.44 N04°34.17	Capella 280°19.35 46°1.61
13	24° 40.03	45°8.37 39.53	240°16.59 33.61	244°40.78 40.65	8°14.61 34.29	Bellatrix 278°21.02 6°22.36
14 15	39° 42.49 54° 44.96	60°7.95 38.50 75°7.54 · · 37.47	255°19.09 33.52 270°21.58 · · 33.42	259°43.33 40.67 274°45.89 • • 40.69	23°16.79 34.41 38°18.96 · · 34.53	Elnath 277°59.67 28°37.82
16	69° 47.42	90°7.12 36.44	285°24.08 33.32	289°48.44 40.72	53°21.13 34.65	Alnilam 275°35.96 -1°11.21
17	84°49.88	105°6.71 35.41	300°26.58 33.23	304°51.00 40.74	68°23.31 34.77	Betelgeuse 270°50.17 7°24.62
18	99°52.35	120°6.30 S09°34.38	315°29.07 N17°33.13	319°53.55 N16°40.77	83°25.48 N04°34.89	Canopus 263°51.64 -52°42.91
19	$114^{\circ}54.81$	135°5.88 33.35	330°31.56 33.03	334°56.11 40.79	98° 27.65 35.02	Sirius 258°24.63 -16°45.44 Adhara 255°4.41 -29°0.82
20	$129^{\circ}57.28$	150°5.47 32.32	345°34.06 32.93	349°58.66 40.81	113°29.82 35.14	Adhara 255°4.41 -29°0.82 Procyon 244°48.85 5°9.16
21	144°59.74	165°5.06 · · 31.29	0°36.55 · · 32.83	5°1.21 · · 40.84	128°32.00 · · 35.26	Pollux 243°14.99 27°57.59
22	160°2.20	180°4.64 30.25	15°39.04 32.73	20°3.77 40.86	143°34.17 35.38	Avior 234°13.74 -59°36.13
23	175°4.67	195°4.23 29.22	30°41.52 32.63	35°6.32 40.88	158°36.34 35.50	Suhail 222°44.71 -43°32.86
Mer.	pass. 11:22	ν -0.4 $'$ <i>d</i> -1.0 $'$ m-3.92	$\nu 2.5' \ d\text{-}0.1' \ \text{m-}0.36$	$\nu 2.6' \ d0.0' \ \text{m-}2.34$	$\nu 2.2' \ d0.1' \ m0.70$	Miaplacidus 221°37.36 -69°50.04
						Alphard 217°45.75 -8°46.83
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.25 11°49.88
0	190°7.13	210°3.82 \$09°28.19	45°44.01 N17°32.53	50°8.87 N16°40.91	173°38.51 N04°35.62	Dubhe 193°38.20 61°36.22
1	205°9.60	225°3.41 27.15	60°46.50 32.43	65°11.42 40.93	188°40.69 35.74	Denebola 182°22.77 14°25.00 Gienah 175°41.37 -17°41.81
2	$220^{\circ}12.06$	240°3.00 26.12	75°48.98 32.33	80°13.98 40.95	203°42.86 35.86	Gienah 175°41.37 -17°41.81 Acrux 172°57.33 -63°15.16
3	$235^{\circ}14.53$	255°2.59 · · 25.08	90°51.46 · · 32.23	95°16.53 · · 40.98	218°45.03 · · 35.98	Gacrux 171°49.00 -57°16.11
4	250° 16.99	270°2.17 24.04	105°53.95 32.13	110°19.08 41.00	233°47.20 36.10	Alioth 166°10.82 55°48.56
5	265° 19.45	285°1.76 23.01	120°56.43 32.03	125°21.63 41.02	248°49.38 36.22	Spica 158°20.05 -11°18.40
6	280°21.92 295°24.38	300°1.35 \$09°21.97	135°58.90 N17°31.93	140°24.18 N16°41.05 155°26.73 41.07	263°51.55 N04°36.34 278°53.72 36.46	Alkaid 152°50.10 49°10.41
7 8	295 24.38 310°26.85	315°0.94 20.93 330°0.53 19.90	151°1.38 31.82 166°3.86 31.72	155°26.73 41.07 170°29.28 41.09	278°53.72 36.46 293°55.89 36.58	Hadar 148°32.76 -60°30.28
9	325°29.31	345°0.12 · · 18.86	181° 6.33 · · 31.62	185°31.83 · · 41.11	308°58.07 · · 36.70	Menkent 147°55.07 -36°30.33
10	340°31.77	359°59.72 17.82	196° 8.81 31.51	200°34.38 41.14	324°0.24 36.82	Arcturus 145°45.93 19°2.20
11	355°34.24	14°59.31 16.78	211°11.28 31.41	215°36.93 41.16	339°2.41 36.94	Rigil Kent. 139°37.16 -60°56.86 Kochab 137°18.88 74°2.32
12	10°36.70	29°58.90 S09°15.74	226°13.75 N17°31.30	230°39.48 N16°41.18	354°4.58 N04°37.07	Zuben'ubi 136°53.70 -16°9.42
13	25°39.17	44°58.49 14.70	241°16.22 31.20	245°42.02 41.20	9°6.76 37.19	Alphecca 126°1.92 26°37.11
14	40°41.63	59°58.08 13.66	256°18.69 31.09	260°44.57 41.22	24°8.93 37.31	Antares 112°13.38 -26°29.55
15	55° 44.09	74°57.67 · · 12.62	271°21.16 · · 30.99	275°47.12 · · 41.25	39°11.10 · · 37.43	Atria 107°5.69 -69°4.34
16 17	70° 46.56 85° 49.02	89°57.27 11.58 104°56.86 10.54	286°23.63 30.88 301°26.09 30.77	290°49.67 41.27 305°52.21 41.29	54°13.27 37.55 69°15.45 37.67	Sabik 102°0.54 -15°45.56
18	100°51.49	119°56.45 S09°9.49	316°28.56 N17°30.67	320°54.76 N16°41.31	84°17.62 N04°37.79	Shaula 96°7.74 -37°7.31
19	115° 53.95	134°56.04 8.45	331°31.02 30.56	335°57.31 41.33	99°19.79 37.91	Rasalhague 95°56.74 12°32.21
20	130° 56.41	149°55.64 7.41	346°33.48 30.45	350°59.85 41.35	114°21.96 38.03	Eltanin 90°41.21 51°28.75 Kaus Aust. 83°30.04 -34°22.19
21	145°58.88	164°55.23 · · 6.36	1°35.94 · · 30.34	6°2.40 · · 41.37	129°24.14 · · 38.15	Vega 80°31.95 38°48.22
22	161°1.34	179°54.83 5.32	16°38.40 30.23	21°4.94 41.40	144°26.31 38.27	Nunki 75°45.50 -26°15.70
23	176°3.81	194°54.42 4.28	31°40.86 30.13	36°7.49 41.42	159°28.48 38.39	Altair 61°58.25 8°56.28
Mer.	pass. 11:18	ν -0.4' d-1.0' m-3.92	$\nu 2.5' \ d$ -0.1' m-0.34	ν2.6' d0.0' m-2.33	$\nu 2.2' \ d0.1' \ \text{m}0.69$	Peacock 53°3.09 -56°38.60
	·					Deneb 49°24.76 45°22.39
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.21 9°59.89
0 0	191°6.27	209°54.01 S09°3.23	46°43.32 N17°30.02	51°10.03 N16°41.44	174°30.65 N04°38.51	Al Na'ir 27°30.98 -46°49.61
1	206°8.73	224°53.61 2.19	61°45.77 29.91	66°12.58 41.46	189°32.83 38.63	Fomalhaut 15°12.82 -29°28.64 Scheat 13°43.74 28°13.73
2	221°11.20	239°53.20 1.14	76°48.23 29.80	81°15.12 41.48	204°35.00 38.75	Markab 13°28.36 15°21.02
3	236° 13.66	254°52.80 09°0.09	91°50.68 · · 29.69	96°17.67 · · 41.50	219°37.17 · · 38.87	
4	251°16.13	269°52.40 08°59.05	106°53.13 29.57	111°20.21 41.52	234°39.34 38.99	Apr 01 Thu SHA Mer.pass
5	266° 18.59	284°51.99 58.00	121°55.58 29.46	126°22.75 41.54	249°41.51 39.11	Venus 21°5.79 09:59
6	281°21.06	299°51.59 \$08°56.95	136°58.03 N17°29.35	141°25.30 N16°41.56	264°43.69 N04°39.23	Mars 215°35.98 20:58 Jupiter 219°59.53 20:40
7 8	296°23.52 311°25.98	314°51.18 55.90 329°50.78 54.85	152°0.48 29.24 167°2.92 29.13	156°27.84 41.58 171°30.38 41.60	279° 45.86 39.35 294° 48.03 39.48	Saturn 343°38.37 12:27
9	326°28.45	344°50.38 · · 53.81	182°5.37 · · 29.01	186°32.92 · · 41.62	309°50.20 · · 39.60	
10	341°30.91	359°49.98 52.76	197°7.81 28.90	201°35.46 41.64	324°52.37 39.72	Apr 02 Fri SHA Mer.pass
11	356° 33.38	14°49.57 51.71	212°10.26 28.79	216°38.01 41.66	339°54.55 39.84	Venus 19°56.69 10:00
12	11°35.84	29°49.17 S 08°50.66	227°12.70 N17°28.67	231°40.55 N16°41.68	354°56.72 N04°39.96	Mars 215°36.88 20:54 Jupiter 220°1.74 20:36
13	26°38.30	44°48.77 49.60	242°15.14 28.56	246°43.09 41.70	9°58.89 40.08	Saturn 343°31.38 12:24
14	41°40.77	59°48.37 48.55	257°17.58 28.44	261°45.63 41.72	25°1.06 40.20	
15 16	56° 43.23	74°47.97 · · 47.50	272°20.01 · · 28.33	276°48.17 · · 41.74	40°3.24 · · 40.32	Apr 03 Sat SHA Mer.pass
16 17	71° 45.70 86° 48.16	89°47.57 46.45 104°47.16 45.40	287°22.45 28.21 302°24.89 28.10	291°50.71 41.76 306°53.25 41.78	55°5.41 40.44 70°7.58 40.56	Venus 18°47.74 10:01
18	101°50.62	119°46.76 \$08°44.34	317°27.32 N17°27.98	300 53.25 41.78 321°55.78 N16°41.80	85°9.75 N04°40.68	Mars 215°37.04 20:50 Jupiter 220°3.76 20:32
19	116° 53.09	134°46.36 43.29	332°29.75 27.86	336°58.32 41.82	100°11.92 40.80	Saturn 343°24.38 12:20
20	131° 55.55	149°45.96 42.24	347°32.19 27.74	352°0.86 41.83	115°14.10 40.92	
21	146°58.02	164°45.56 · · 41.18	2°34.62 · · 27.63	7°3.40 · · 41.85	130°16.27 · · 41.04	Horizontal parallax
22	162°0.48	179°45.16 40.13	17°37.05 27.51	22°5.94 41.87	145°18.44 41.16	Venus: 0.1
23	177°2.94	194°44.76 39.07	32°39.47 27.39	37°8.47 41.89	160°20.61 41.28	Mars: 0.2
Mer.	pass. 11:14	ν-0.4' d-1.0' m-3.92	ν2.5' d-0.1' m-0.31	ν2.5' d0.0' m-2.33	ν2.2' d0.1' m0.69	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.95	N04°22.14	$244^{\circ}11.89$	13.2'	S 21°6.86	-9.3'	54.2'
1	193°59.14	23.11	258°44.12	13.3'	20°57.59	-9.4'	54.2'
2	208°59.32 223°59.51	24.07 •• 25.04	273°16.41 287°48.75	13.3' 13.4'	20°48.23 20°38.79	-9.4' -9.5'	54.3' 54.3'
4	238°59.69	26.01	302°21.14	13.4	20° 29.25	-9.6'	54.3
5	253°59.88	26.97	316° 53.58	13.5'	20° 19.62	-9.7'	54.3'
6	269°0.06	N04°27.94	331°26.07	13.5'	S 20°9.90	-9.8'	54.3'
7	284°0.25	28.90	345°58.62	13.6'	20°0.10	-9.9'	54.3'
8 9	299°0.44 314°0.62	29.87 · · 30.84	0°31.21 15°3.86	13.6' 13.7'	19°50.21 19°40.23	-10.0' -10.1'	54.3' 54.3'
10	329°0.81	31.80	29° 36.56	13.7'	19° 40.23	-10.1	54.3'
11	344°0.99	32.77	44°9.31	13.8'	19°20.02	-10.2'	54.3'
12	359°1.18	N04°33.73	58° 42.10	13.8'	S19°9.79	-10.3'	54.3'
13	14°1.36	34.70	73° 14.95	13.9'	18°59.47	-10.4'	54.4'
14 15	29°1.55 44°1.73	35.66 •• 36.63	87° 47.84 102° 20.78	13.9' 14.0'	18°49.07 18°38.59	-10.5' -10.6'	54.4' 54.4'
16	59°1.92	37.59	116° 53.77	14.0'	18° 28.03	-10.6'	54.4'
17	74°2.10	38.56	131°26.80	14.1'	$18^{\circ}17.38$	-10.7'	54.4'
18	89°2.29	N04°39.52	145°59.88	14.1'	\$18°6.66	-10.8'	54.4'
19 20	104°2.47 119°2.66	40.48 41.45	160°33.01 175°6.18	14.2' 14.2'	17°55.86 17°44.98	-10.9' -11.0'	54.4' 54.4'
21	119 2.00 134°2.84	. 42.41	175 0.18 189°39.39	14.2	17 44.98 17°34.02	-11.0' -11.0'	54.4'
22	149°3.02	43.38	204° 12.65	14.3'	17°22.98	-11.1'	54.5'
23	164°3.21	44.34	218° 45.96	14.3'	17° 11.87	-11.2'	54.5'
	SD = 16.0'	d = 1.0'		SI	O = 14.8'		
Fri	GHA 179°3.39	Dec N04° 45.30	GHA 233° 19.30	u 14.4'	Dec S 17°0.68	d -11.3'	HP 54.5'
0 1	179° 3.39 194° 3.58	46.27	233° 19.30 247° 52.69	14.4' 14.4'	16°49.42	-11.3'	54.5'
2	209°3.76	47.23	262°26.12	14.5'	16°38.08	-11.4'	54.5'
3	224°3.95	• • 48.19	276° 59.59	14.5'	16°26.67	-11.5'	54.5'
4	239°4.13	49.15	291°33.10	14.5'	16°15.19	-11.6'	54.5'
5 6	254°4.32 269°4.50	50.12 N04° 51.08	306°6.65 320°40.23	14.6' 14.6'	16°3.64 \$15°52.01	-11.6' -11.7'	54.5' 54.6'
7	284°4.68	52.04	335° 13.86	14.7	15° 40.31	-11.7	54.6'
8	299°4.87	53.00	349° 47.52	14.7'	15° 28.55	-11.8'	54.6'
9	314°5.05	• • 53.97	4°21.22	14.7'	$15^{\circ}16.71$	-11.9'	54.6'
10	329°5.24 344°5.42	54.93 55.89	18°54.96 33°28.73	14.8' 14.8'	15°4.81 14°52.84	-12.0'	54.6' 54.6'
11 12	359°5.60	N04° 56.85	48°2.53	14.8	\$14° 40.80	-12.0' -12.1'	54.6
13	14°5.79	57.81	62°36.37	14.9'	14°28.69	-12.2'	54.7'
14	29°5.97	58.77	$77^{\circ}10.24$	14.9'	$14^{\circ}16.52$	-12.2'	54.7'
15	44°6.15	04°59.74	91°44.15	14.9'	14°4.29	-12.3'	54.7'
16 17	59°6.34 74°6.52	05°0.70 1.66	106° 18.08 120° 52.05	15.0' 15.0'	13°51.99 13°39.62	-12.4' -12.4'	54.7' 54.7'
18	89°6.70	N05°2.62	135° 26.05	15.0'	\$13° 27.20	-12.5'	54.7'
19	104°6.89	3.58	150°0.07	15.1'	$13^{\circ}14.71$	-12.5'	54.8'
20	119°7.07	4.54	164°34.13	15.1'	13°2.16		54.8'
21 22	134°7.25 149°7.44	· · 5.50 6.46	179°8.21 193°42.32	15.1' 15.1'	12°49.55 12°36.89	-12.7' -12.7'	54.8' 54.8'
23	149 7.44 164°7.62	7.42	193 42.32 208°16.45	15.1 15.2'	12 36.89 12°24.16	-12.7 -12.8'	54.8'
	SD = 16.0'	d = 1.0'			O = 14.9'		
	3D = 10.0	<u>u = 1.0</u>		- 31	J = 14.9		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°7.80 194°7.99	N05°8.38 9.34	222°50.61 237°24.79	15.2' 15.2'	\$12°11.37 11°58.53	-12.8' -12.9'	54.9' 54.9'
2	194° 7.99 209° 8.17	9.34 10.30	237° 24.79 251° 59.00	15.2' 15.2'	11° 58.53 11° 45.63	-12.9 -13.0'	54.9' 54.9'
3	224°8.35	• • 11.26	266° 33.23	15.3	11°32.68	-13.0'	54.9'
4	239°8.54	12.22	281°7.48	15.3'	11° 19.66	-13.1'	54.9'
5	254°8.72	13.18 N05° 14.13	295°41.75	15.3' 15.3'	11°6.60	-13.1' -13.2'	54.9'
6 7	269°8.90 284°9.08	N05° 14.13 15.09	310°16.05 324°50.36	15.3'	\$10°53.48 10°40.31	-13.2' -13.2'	55.0' 55.0'
8	299°9.27	16.05	339°24.69	15.3'	10° 40.31 10° 27.09	-13.3'	55.0'
9	314°9.45	•• 17.01	353°59.03	15.4'	10°13.81	-13.3'	55.0'
10	329°9.63	17.97	8°33.40	15.4	10°0.49	-13.4'	55.0'
11 12	344°9.81 359°9.99	18.93 N05° 19.88	23°7.78 37°42.17	15.4' 15.4'	09°47.11 \$09°33.69	-13.4' -13.5'	55.1' 55.1'
13	14°10.18	20.84	52°16.58	15.4' 15.4'	09° 20.21	-13.5'	55.1'
14	29°10.36	21.80	$66^{\circ}51.00$	15.4	09°6.69	-13.6'	55.1'
15	44°10.54	• • 22.76	81°25.43	15.4'	08°53.12	-13.6'	55.1'
16	59°10.72	23.71	95°59.87	15.5'	08°39.51	-13.7'	55.2'
17 18	74°10.90 89°11.09	24.67 N05° 25.63	110°34.33 125°8.79	15.5' 15.5'	08°25.85 \$08°12.15	-13.7' -13.7'	55.2' 55.2'
19	104°11.27	26.58	139°43.26	15.5'	07°58.40	-13.8'	55.2'
20	119°11.45	27.54	154° 17.74	15.5'	$07^{\circ}44.61$	-13.8'	55.2'
21	134°11.63	• • 28.50	168° 52.22	15.5'	07°30.78	-13.9'	55.3'
22 23	149°11.81 164°11.99	29.45 30.41	183°26.71 198°1.20	15.5' 15.5'	07°16.91 07°3.00	-13.9' -14.0'	55.3' 55.3'
20	SD = 16.0'	d = 1.0'			D = 15.0'	1 1.0	33.3
	JD — 10.0	<u>u — 1.0</u>		اد	J — 13.U		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	32-16%	
01	04:04	03:55	12:04	07:58	20:20		
02	03:46	03:38	12:04	08:42	21:04		
03	03:29	03:20	12:03	09:25	21:46		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	192°5.41	209°44.37	47°41.90 N17°27.27	52°11.01 N16°41.91	175°22.78 N04°41.40	
1	207°7.87	224°43.97 36.96	62°44.33 27.15	67°13.55 41.93	190°24.96 41.52	Alpheratz 357°33.21 29°14.38
2	$222^{\circ}10.34$	239°43.57 35.90	77°46.75 27.03	82°16.08 41.95	205°27.13 41.64	Ankaa 353°5.76 -42°9.46 Schedar 349°29.49 56°41.18
3	$237^{\circ}12.80$	254°43.17 · · 34.85	92°49.17 · · 26.91	97°18.62 · · 41.96	220°29.30 · · 41.76	Diphda 348°45.79 -17°50.27
4	252° 15.26	269°42.77 33.79	107°51.60 26.79	112°21.16 41.98	235°31.47 41.88	Achernar 335°19.40 -57°5.94
5	267° 17.73	284°42.38 32.73	122°54.02 26.67	127°23.69 42.00	250°33.64 42.00	Hamal 327°49.44 23°35.44
6	282°20.19	299°41.98	137°56.43 N17°26.55	142°26.23 N16°42.02	265°35.82 N04°42.12	Polaris 313°29.25 89°22.88
7	297°22.66	314°41.58 30.62 329°41.18 29.56	152°58.85 26.43 168°1.27 26.31	157°28.76 42.04	280°37.99 42.24 295°40.16 42.36	Acamar 315°10.74 -40°11.86
8 9	312°25.12 327°27.58	329°41.18 29.56 344°40.79 •• 28.50	168°1.27 26.31 183°3.69 · · 26.18	172°31.30 42.05 187°33.83 • 42.07	295°40.16 42.36 310°42.33 · · 42.48	Menkar 314° 4.49 4° 11.72
10	342° 30.05	359°40.39 27.44	198° 6.10 26.06	202°36.36 42.09	325°44.50 42.61	Mirfak 308°26.00 49°57.55
11	357°32.51	14°39.99 26.38	213°8.51 25.94	217°38.90 42.11	340°46.67 42.73	Aldebaran 290°37.70 16°33.80
12	12°34.98	29°39.60 S08°25.32	228°10.93 N17°25.82	232°41.43 N16°42.12	355°48.85 N04°42.85	Rigel 281°2.24 -8°10.37
13	27° 37.44	44°39.20 24.26	243°13.34 25.69	247°43.96 42.14	10°51.02 42.97	Capella 280°19.37 46°1.60
14	42°39.90	59°38.81 23.19	258°15.75 25.57	262°46.50 42.16	25°53.19 43.09	Bellatrix 278°21.04 6°22.36
15	57°42.37	74°38.41 · · 22.13	273°18.15 •• 25.44	277°49.03 · · 42.17	40°55.36 · · 43.21	Elnath 277°59.69 28°37.82
16	72°44.83	89°38.02 21.07	288°20.56 25.32	292°51.56 42.19	55°57.53 43.33	Alnilam 275°35.98 -1°11.21
17	87°47.30	104°37.62 20.01	303°22.97 25.19	307°54.09 42.21	70°59.71 43.45	Betelgeuse 270°50.19 7°24.62
18	102°49.76	119°37.23 S 08°18.94	318°25.37 N17°25.07	322°56.62 N16°42.22	86°1.88 N04°43.57	Canopus 263°51.67 -52°42.90 Sirius 258°24.65 -16°45.44
19	$117^{\circ}52.22$	134°36.84 17.88	333°27.77 24.94	337°59.15 42.24	101°4.05 43.69	Adhara 255°4.43 -29°0.82
20	132°54.69	149°36.44 16.82	348°30.18 24.81	353°1.68 42.26	116°6.22 43.81	Procyon 244°48.87 5°9.16
21	147°57.15	164°36.05 · · 15.75	3°32.58 · · 24.69	8°4.21 · · 42.27	131°8.39 · · 43.93	Pollux 243°15.00 27°57.59
22	162°59.62	179°35.65 14.69	18°34.98 24.56	23°6.74 42.29	146° 10.56 44.05	Avior 234°13.78 -59°36.13
23	178°2.08	194°35.26 13.62	33°37.38 24.43	38°9.27 42.31	161°12.74 44.17	Suhail 222°44.73 -43°32.87
Mer	pass. 11:10	ν-0.4' d-1.1' m-3.92	ν2.4' d-0.1' m-0.29	$\nu 2.5' \ d0.0' \ \text{m-}2.32$	ν2.2' d0.1' m0.68	Miaplacidus 221°37.40 -69°50.05
						Alphard 217°45.76 -8°46.83
	6114	CHA	CUA	CHA	CHA	Regulus 207°32.26 11°49.88
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.21 61°36.24
0	193°4.54 208°7.01	209°34.87 \$08°12.55 224°34.48 11.49	48°39.77 N17°24.30 63°42.17 24.18	53°11.80 N16°42.32 68°14.33 42.34	176°14.91 N04°44.29 191°17.08 44.41	Denebola 182°22.77 14°25.01
1 2			_			Gienah 175°41.37 -17°41.81
3	223°9.47 238°11.94	239°34.08 10.42 254°33.69 • 9.36	78°44.56 24.05 93°46.96 •• 23.92	83°16.86 42.35 98°19.39 • 42.37	206°19.25 44.53 221°21.42 · · 44.65	Acrux 172°57.33 -63°15.18
3 4	250 11.94 253° 14.40	269°33.30 8.29	108°49.35 23.79	113°21.92 42.38	236°23.59 44.77	Gacrux 171°49.00 -57°16.12
5	268° 16.87	284°32.91 7.22	123°51.74 23.66	128°24.44 42.40	251°25.77 44.89	Alioth 166°10.81 55°48.57
6	283° 19.33	299°32.52 \$08°6.15	138°54.13 N17°23.53	143°26.97 N16°42.42	266°27.94 N04°45.01	Spica 158°20.04 -11°18.40
7	298°21.79	314°32.13 5.08	153°56.52 23.40	158°29.50 42.43	281°30.11 45.13	Alkaid 152°50.09 49°10.42
8	313°24.26	329°31.74 4.01	168°58.91 23.27	173°32.02 42.45	296° 32.28 45.25	Hadar 148°32.75 -60°30.30
9	328° 26.72	344°31.35 · · 2.95	184°1.29 · · 23.14	188°34.55 · · 42.46	311°34.45 · · 45.37	Menkent 147°55.06 -36°30.34
10	343°29.19	359°30.96 1.88	199° 3.68 23.00	203°37.08 42.48	326°36.62 45.49	Arcturus 145°45.92 19°2.21 Rigil Kent. 139°37.14 -60°56.87
11	358°31.65	14°30.57 08°0.81	214°6.06 22.87	218°39.60 42.49	341°38.80 45.61	Rigil Kent. 139°37.14 -60°56.87 Kochab 137°18.85 74°2.33
12	13°34.11	29°30.18 S07°59.73	229°8.45 N17°22.74	233°42.13 N16°42.51	356°40.97 N04°45.73	Zuben'ubi 136°53.68 -16°9.43
13	28°36.58	44°29.79 58.66	244°10.83 22.61	248°44.65 42.52	11°43.14 45.85	Alphecca 126°1.91 26°37.12
14	43°39.04	59°29.40 57.59	259°13.21 22.47	263°47.18 42.53	26°45.31 45.97	Antares 112°13.36 -26°29.55
15	58°41.51	74°29.01 · · 56.52	274°15.59 · · 22.34	278°49.70 · · 42.55	41°47.48 · · 46.09	Atria 107°5.64 -69°4.35
16	73°43.97	89°28.62 55.45	289°17.96 22.20	293°52.22 42.56	56°49.65 46.21	Sabik 102°0.52 -15°45.56
17	88°46.43	104°28.23 54.38	304°20.34 22.07	308°54.75 42.58	71°51.83 46.33	Shaula 96°7.72 -37°7.31
18	103°48.90	119°27.84 S07°53.30	319°22.72 N17°21.94	323°57.27 N16°42.59	86°54.00 N04°46.45	Rasalhague 95°56.72 12°32.21
19	118°51.36	134°27.45 52.23	334°25.09 21.80	338°59.80 42.61	101°56.17 46.57	Eltanin 90°41.18 51°28.76
20	133°53.83	149°27.07 51.16 164°26.68 · · 50.08	349°27.46 21.66 4°29.83 · · 21.53	354°2.32 42.62	116° 58.34 46.69	Kaus Aust. 83°30.01 -34°22.19
21 22	148° 56.29 163° 58.75	164°26.68 · · 50.08 179°26.29 49.01	4°29.83 · · 21.53 19°32.21 21.39	9°4.84 · · 42.63 24°7.36 42.65	132°0.51 · · 46.81 147°2.68 46.93	Vega 80°31.93 38°48.22
23	179°1.22	194°25.90 47.93	34°34.57 21.26	39°9.88 42.66	162°4.86 47.05	Nunki 75°45.47 -26°15.70
				-		Altair 61°58.23 8°56.28
Mer.	pass. 11:06	u-0.4 $'$ d-1.1 $'$ m-3.91	ν 2.4′ <i>d</i> -0.1′ m-0.27	$ u 2.5' \ d0.0' \ \text{m-}2.31$	$ u 2.2' \ d0.1' \ m0.67$	Peacock 53°3.06 -56°38.59
						Deneb 49°24.73 45°22.39
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.20 9°59.89
0	194°3.68	209°25.52 S 07°46.86	49°36.94 N17°21.12	54°12.41 N16°42.67	177°7.03 N04°47.17	Al Na'ir 27°30.96 -46°49.59 Fomalhaut 15°12.81 -29°28.63
1	209°6.15	224°25.13 45.78	64°39.31 20.98	69°14.93 42.69	192°9.20 47.29	Scheat 13°43.73 28°13.72
2	224°8.61	239°24.75 44.70	79°41.68 20.84	84°17.45 42.70	207°11.37 47.41	Markab 13°28.35 15°21.02
3	$239^{\circ}11.07$	254°24.36 · · 43.63	94°44.04 · · 20.71	99°19.97 · · 42.71	222°13.54 · · 47.53	
4	254° 13.54	269°23.97 42.55	109°46.40 20.57	114°22.49 42.73	237° 15.71 47.65	Apr 04 Sun SHA Mer.pass
5	269°16.00	284°23.59 41.47	124°48.77 20.43	129°25.01 42.74	252°17.88 47.77	Venus 17°38.96 10:01
6	284° 18.47	299°23.20 S 07°40.40	139°51.13 N17°20.29	144°27.53 N16°42.75	267°20.06 N04°47.89	Mars 215°36.49 20:46
7	299°20.93	314°22.82 39.32	154°53.49 20.15	159°30.05 42.77	282°22.23 48.01	Jupiter 220°5.60 20:28
8	314°23.39	329°22.43 38.24	169°55.84 20.01	174°32.56 42.78	297°24.40 48.13	Saturn 343°17.38 12:17
9	329° 25.86	344°22.05 · · 37.16	184°58.20 · · 19.87	189°35.08 · · 42.79	312°26.57 · · 48.25	Apr 05 Mon SHA Mer.pass
10	344° 28.32	359°21.66 36.08	200° 0.56 19.73	204°37.60 42.80	327°28.74 48.37	Venus 16°30.32 10:02
11	359° 30.79 14° 33.25	14°21.28 35.00 29°20.90 \$07°33.92	215°2.91 19.59 230°5.27 N17°19.45	219°40.12 42.82 234°42.64 N16°42.83	342°30.91 48.49 357°33.08 N04°48.61	Mars 215°35.23 20:42
12 13	14° 33.25 29° 35.71	29°20.90 \$07°33.92 44°20.51 32.84	245°7.62 19.30	234°42.64 N16°42.83 249°45.15 42.84	357°33.08 N04°48.61 12°35.26 48.73	Jupiter 220°7.26 20:24
13 14	29 35.71 44°38.18	59°20.13 31.76	245 7.62 19.30 260° 9.97 19.16	264° 47.67 42.85	12 35.26 48.73 27°37.43 48.85	Saturn 343°10.36 12:13
15	59° 40.64	74°19.75 · · 30.68	275°12.32 · · 19.02	279°50.19 · · 42.86	42°39.60 · · 48.97	Apr 06 Tue SHA Mer.pass
16	74°43.11	89°19.36 29.60	290°14.67 18.88	294°52.70 42.88	57°41.77 49.09	Apr 06 Tue SHA Mer.pass Venus 15°21.84 10:03
17	89° 45.57	104°18.98 28.52	305°17.02 18.73	309°55.22 42.89	72°43.94 49.21	Mars 215°33.26 20:38
18	104°48.03	119°18.60 S07°27.43	320°19.36 N17°18.59	324°57.73 N16°42.90	87°46.11 N04°49.33	Jupiter 220°8.72 20:20
19	119°50.50	134°18.22 26.35	335°21.71 18.44	340°0.25 42.91	102°48.28 49.45	Saturn 343°3.35 12:10
20	134°52.96	149° 17.83 25.27	350°24.05 18.30	355°2.76 42.92	117°50.46 49.57	
21	149°55.43	164° 17.45 · · 24.18	5°26.40 · · 18.15	10°5.28 · · 42.93	132°52.63 · · 49.69	Horizontal parallax
22	164°57.89	179° 17.07 23.10	20°28.74 18.01	25°7.79 42.94	147°54.80 49.81	Venus: 0.1
23	180°0.35	194°16.69 22.02	35°31.08 17.86	40°10.31 42.96	162°56.97 49.93	Mars: 0.2
Mer.	pass. 11:02	ν-0.4' d-1.1' m-3.91	ν2.4' d-0.1' m-0.24	ν2.5' d0.0' m-2.30	ν2.2' d0.1' m0.67	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.18	N05°31.37	$212^{\circ}35.70$	15.5'	S 06°49.04	-14.0'	55.3'
1	194°12.36	32.32	227° 10.20	15.5'	06°35.05	-14.0'	55.4'
2	209°12.54 224°12.72	33.28 · · 34.23	241°44.70 256°19.20	15.5' 15.5'	06°21.02 06°6.95	-14.1' -14.1'	55.4' 55.4'
4	239°12.90	35.19	270° 53.71	15.5'	05°52.85	-14.1'	55.4'
5	254°13.08	36.14	285° 28.20	15.5'	05°38.71	-14.2'	55.4'
6	269°13.26	N05°37.10	300°2.70	15.5'	S05°24.54	-14.2'	55.5'
7	284°13.44	38.05	314° 37.20	15.5'	05°10.33	-14.2'	55.5'
8 9	299°13.62 314°13.80	39.01 •• 39.96	329°11.68 343°46.17	15.5' 15.5'	04°56.09 04°41.82	-14.3' -14.3'	55.5' 55.5'
10	329°13.99	40.92	358° 20.65	15.5'	04° 41.62	-14.3	55.6'
11	344°14.17	41.87	12°55.12	15.5'	$04^{\circ}13.18$	-14.4'	55.6'
12	359°14.35	N05°42.82	27°29.58	15.5'	S03°58.82	-14.4'	55.6'
13 14	14°14.53 29°14.71	43.78 44.73	42°4.03 56°38.47	15.4' 15.4'	03°44.42 03°30.00	-14.4' -14.4'	55.6' 55.7'
14 15	29 14.71 44°14.89	44.73 •• 45.68	50 38.47 71°12.90	15.4 15.4'	03° 15.56	-14.4 -14.5'	55.7'
16	59°15.07	46.64	85° 47.32	15.4	03°1.08	-14.5'	55.7'
17	74°15.25	47.59	$100^{\circ}21.72$	15.4'	$02^{\circ}46.59$	-14.5'	55.7'
18	89°15.43	N05°48.54	114°56.11	15.4'	S02°32.06	-14.5'	55.8'
19 20	104°15.61 119°15.79	49.50 50.45	129°30.48 144°4.84	15.4' 15.3'	02°17.52 02°2.95	-14.6' -14.6'	55.8' 55.8'
21	134°15.79	51.40	158° 39.17	15.3'	02 2.95 01°48.36	-14.6'	55.8'
22	149°16.15	52.35	173° 13.49	15.3'	01°33.75	-14.6'	55.8'
23	164°16.33	53.31	187° 47.79	15.3'	$01^{\circ}19.12$	-14.6'	55.9'
	SD = 16.0'	d = 1.0'		SI	D = 15.1'		
NA	CHV	Daa	CHA		Dec	ال	μn
Mon 0	GHA 179° 16.51	Dec N05°54.26	GHA 202° 22.07	u 15.3'	Dec S 01°4.47	d -14.7'	HP 55.9'
1	194°16.69	55.21	216° 56.33	15.2'	00°49.80	-14.7'	55.9'
2	209°16.87	56.16	231° 30.56	15.2'	00°35.12	-14.7'	55.9'
3	224°17.04	• • 57.11	246°4.77	15.2'	00°20.42	-14.7'	56.0'
4 5	239°17.22 254°17.40	58.06 05°59.01	260°38.95 275°13.11	15.2' 15.1'	\$00°5.71 N00°9.02	-14.7' 14.7'	56.0' 56.0'
6	269°17.58	N05°59.96	289° 47.24	15.1'	N00° 23.76	14.8	56.0'
7	284°17.76	0.91	304°21.34	15.1'	00°38.51	14.8'	56.1'
8	299°17.94	1.86	318° 55.41	15.0'	00°53.28	14.8'	56.1'
9	314°18.12	• • 2.82	333°29.45	15.0'	01°8.05 01°22.83	14.8'	56.1'
10 11	329°18.30 344°18.48	3.77 4.71	348°3.46 2°37.44	15.0' 14.9'	01 22.83 01°37.62	14.8' 14.8'	56.1' 56.2'
12	359°18.65	N06°5.66	17° 11.38	14.9'	N01°52.42	14.8'	56.2'
13	14°18.83	6.61	31°45.29	14.9'	02°7.22	14.8'	56.2'
14 15	29°19.01 44°19.19	7.56 •• 8.51	46° 19.16 60° 52.99	14.8' 14.8'	02°22.03 02°36.84	14.8' 14.8'	56.2' 56.3'
16	59°19.37	9.46	75° 26.79	14.8	02°51.66	14.8	56.3'
17	74°19.55	10.41	90°0.55	14.7'	03°6.47	14.8'	56.3'
18	89°19.72	N06°11.36	104° 34.26	14.7'	N03°21.29	14.8'	56.3'
19	104°19.90	12.31	119°7.94	14.6'	03°36.10	14.8'	56.4
20 21	119°20.08 134°20.26	13.25 •• 14.20	133° 41.57 148° 15.16	14.5	03°50.92 04°5.73	14.8' 14.8'	56.4' 56.4'
22	149°20.44	15.15	162°48.70	14.5'	04° 20.54	14.8'	56.4'
23	164°20.61	16.10	$177^{\circ}22.20$	14.5'	$04^{\circ}35.34$	14.8'	56.5'
	SD = 16.0'	d = 1.0'		SI	D = 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°20.79	N06° 17.05	191°55.65	14.4'	$N04^{\circ}50.13$	14.8'	56.5'
1	194°20.97	17.99	206° 29.05	14.4'	05°4.92	14.8'	56.5'
2 3	209°21.15 224°21.32	18.94 •• 19.89	221°2.41 235°35.71	14.3' 14.3'	05°19.70 05°34.47	14.8' 14.8'	56.5' 56.6'
3 4	239°21.50	20.83	250°8.96	14.3 14.2'	05 34.47 05°49.23	14.8 14.7'	56.6'
5	254°21.68	21.78	$264^{\circ}42.16$	14.1'	$06^{\circ}3.98$	14.7'	56.6'
6	269°21.85	N06°22.73	279° 15.31	14.1'	N06° 18.72	14.7'	56.6'
7 8	284°22.03 299°22.21	23.67 24.62	293°48.40 308°21.43	14.0' 14.0'	06°33.44 06°48.14	14.7' 14.7'	56.7' 56.7'
9	314°22.39	24.62	308°21.43 322°54.41	14.0 13.9'	06°48.14 07°2.83	14.7' 14.7'	56.7'
10	329°22.56	26.51	337°27.33	13.9'	$07^{\circ}17.50$	14.7'	56.7'
11	344°22.74	27.45	352°0.20	13.8'	07°32.15	14.6'	56.8'
12	359°22.91	N06°28.40	6°33.00	13.7'	N07°46.78	14.6'	56.8'
13 14	14°23.09 29°23.27	29.34 30.29	21°5.74 35°38.42	13.7' 13.6'	08°1.39 08°15.98	14.6' 14.6'	56.8' 56.8'
15	44°23.44	31.23	50°11.03	13.6'	08°30.54	14.5	56.9'
16	59°23.62	32.18	64°43.58	13.5'	08°45.07	14.5'	56.9'
17	74°23.80	33.12	79° 16.07	13.4'	08°59.58	14.5'	56.9'
18 19	89°23.97 104°24.15	N06°34.07 35.01	93°48.49 108°20.84	13.4' 13.3'	N09°14.06 09°28.51	14.5' 14.4'	56.9' 57.0'
20	104 24.15 119°24.32	35.01 35.95	108 20.84 122°53.12	13.3	09 28.51 09°42.93	14.4' 14.4'	57.0'
21	134°24.50	• • 36.90	137°25.33	13.1'	$09^{\circ}57.32$	14.4'	57.0'
22	149°24.68	37.84	151°57.48	13.1'	10°11.68	14.3'	57.0'
23	164°24.85	38.78	166°29.55	13.0'	10°26.00	14.3'	57.1'
	SD = 16.0'	d = 0.9'		SI	D = 15.4'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-1%	
04	03:11	03:03	12:03	10:07	22:28		
05	02:54	02:45	12:03	10:49	23:11		
06	02:37	02:28	12:02	11:33	23:56		

h	Aries	` Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	195°2.82	209°16.31 S07°20.93	50°33.42 N17°17.72	55°12.82 N16°42.97	177°59.14 N04°50.05	
1	$210^{\circ}5.28$	224°15.93 19.85	65°35.76 17.57	70°15.33 42.98	193°1.31 50.17	Alpheratz 357°33.21 29°14.37 Ankaa 353°5.76 -42°9.45
2	225°7.75	239° 15.55 18.76	80°38.09 17.42	85°17.85 42.99	208°3.48 50.29	Ankaa 353°5.76 -42°9.45 Schedar 349°29.48 56°41.17
3	240° 10.21	254° 15.17 · · 17.68	95°40.43 · · 17.28	100°20.36 · · 43.00	223°5.66 · · 50.41	Diphda 348°45.79 -17°50.26
4	255° 12.67	269°14.79 16.59	110°42.76 17.13	115°22.87 43.01	238°7.83 50.53	Achernar 335°19.41 -57°5.93
5 6	270° 15.14 285° 17.60	284°14.41 15.50 299°14.03 \$07°14.42	125°45.10 16.98 140°47.43 N17°16.83	130°25.38 43.02 145°27.90 N16°43.03	253°10.00 50.65 268°12.17 N04°50.77	Hamal 327°49.45 23°35.44
7	300°20.07	314°13.65 13.33	155°49.76 16.69	160°30.41 43.04	283°14.34 50.89	Polaris 313°29.95 89°22.86
8	315°22.53	329°13.27 12.24	170°52.09 16.54	175°32.92 43.05	298° 16.51 51.01	Acamar 315°10.75 -40°11.85
9	330°24.99	344°12.89 · · 11.15	185°54.42 · · 16.39	190°35.43 · · 43.06	313° 18.68 · · 51.13	Menkar 314°4.50 4°11.72 Mirfak 308°26.01 49°57.54
10	345° 27.46	359° 12.51 10.07	200°56.75 16.24	205°37.94 43.07	328° 20.86 51.25	Aldebaran 290°37.71 16°33.79
11	0°29.92	14°12.13 8.98	215°59.07 16.09	220°40.45 43.08	343°23.03 51.37	Rigel 281°2.26 -8°10.36
12	15°32.39	29°11.75 S07°7.89 44°11.38 6.80	231°1.40 N17°15.94	235°42.96 N16°43.09	358°25.20 N04°51.49	Capella 280°19.39 46°1.60
13 14	30°34.85 45°37.32	44°11.38 6.80 59°11.00 5.71	246°3.72 15.79 261°6.05 15.64	250°45.47 43.10 265°47.98 43.11	13°27.37 51.61 28°29.54 51.73	Bellatrix 278°21.05 6°22.36
15	60°39.78	74°10.62 · · 4.62	276°8.37 · · 15.48	280°50.48 · · 43.12	43°31.71 · · 51.85	Elnath 277°59.70 28°37.82
16	75° 42.24	89° 10.24 3.53	291°10.69 15.33	295°52.99 43.13	58°33.88 51.97	Alnilam 275°35.99 -1°11.21
17	$90^{\circ}44.71$	104°9.87 2.44	306°13.01 15.18	310°55.50 43.14	73°36.05 52.09	Betelgeuse 270°50.20 7°24.62 Canopus 263°51.69 -52°42.90
18	105°47.17	119°9.49 S 07°1.35	321°15.33 N17°15.03	325°58.01 N16°43.15	88°38.23 N04°52.21	Sirius 258°24.67 -16°45.44
19	120°49.64	134°9.11 07°0.26	336°17.64 14.88	341°0.52 43.16	103° 40.40 52.33	Adhara 255°4.45 -29°0.82
20	135° 52.10 150° 54.56	149°8.74 06°59.16	351°19.96 14.72	356°3.02 43.17 11°5.53 · · 43.17	118° 42.57 52.45	Procyon 244°48.89 5°9.16
21 22	150° 54.56 165° 57.03	164°8.36 · · 58.07 179°7.98 56.98	6°22.27 ·· 14.57 21°24.59 14.41	11°5.53 · · 43.17 26°8.04 43.18	133°44.74 · · 52.57 148°46.91 52.69	Pollux 243°15.02 27°57.59
23	180°59.49	194°7.61 55.89	36°26.90 14.26	41°10.54 43.19	163°49.08 52.81	Avior 234°13.81 -59°36.14
						Suhail 222°44.75 -43°32.88
Mer.	pass. 10:58	ν-0.4' d-1.1' m-3.91	ν2.3' d-0.1' m-0.22	$\nu 2.5' \ d0.0' \ \text{m-}2.30$	$\nu 2.2' \ d0.1' \ \text{m}0.66$	Miaplacidus 221°37.44 -69°50.06 Alphard 217°45.78 -8°46.83
						Regulus 207°32.27 11°49.89
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.23 61°36.25
0	196°1.96	209°7.23 \$06°54.79	51°29.21 N17°14.11	56°13.05 N16°43.20	178°51.25 N04°52.93	Denebola 182°22.78 14°25.01
1 2	211°4.42 226°6.88	224°6.86 53.70	66°31.52 13.95 81°33.83 13.79	71°15.55 43.21 86°18.06 43.22	193°53.43 53.05 208°55.60 53.16	Gienah 175°41.37 -17°41.81
3	241°9.35	239°6.48 52.61 254°6.11 • 51.51	81°33.83 13.79 96°36.14 · · 13.64	86°18.06 43.22 101°20.56 · · 43.23	208°55.60 53.16 223°57.77 · · 53.28	Acrux 172°57.33 -63°15.19
4	256° 11.81	269° 5.73 50.42	111°38.44 13.48	116°23.07 43.23	238°59.94 53.40	Gacrux 171°49.00 -57°16.14
5	271°14.28	284°5.36 49.32	126°40.75 13.33	131°25.57 43.24	254°2.11 53.52	Alioth 166°10.82 55°48.59 Spica 158°20.04 -11°18.40
6	$286^{\circ}16.74$	299°4.98 S 06°48.23	141°43.05 N17°13.17	146°28.08 N16°43.25	269°4.28 N04°53.64	Alkaid 152°50.09 49°10.44
7	301° 19.20	314°4.61 47.13	156°45.36 13.01	161°30.58 43.26	284° 6.45 53.76	Hadar 148°32.74 -60°30.31
8	316°21.67	329°4.24 46.03	171°47.66 12.85	176°33.08 43.27	299°8.62 53.88	Menkent 147°55.05 -36°30.35
9	331°24.13 346°26.60	344°3.86 · · 44.94 359°3.49 43.84	186°49.96 ·· 12.70 201°52.26 12.54	191°35.58 · · 43.27 206°38.09 43.28	314°10.80 · · 54.00 329°12.97 54.12	Arcturus 145°45.91 19°2.22
10 11	1°29.06	359°3.49 43.84 14°3.12 42.74	201°52.26 12.54 216°54.56 12.38	206°38.09 43.28 221°40.59 43.29	344°15.14 54.24	Rigil Kent. 139°37.12 -60°56.88
12	16°31.52	29°2.74 \$06°41.65	231°56.85 N17°12.22	236°43.09 N16°43.29	359°17.31 N04°54.36	Kochab 137°18.82 74°2.35
13	31°33.99	44°2.37 40.55	246°59.15 12.06	251°45.59 43.30	14°19.48 54.48	Zuben'ubi 136°53.68 -16°9.43 Alphecca 126°1.90 26°37.13
14	46°36.45	59°2.00 39.45	262°1.44 11.90	266°48.09 43.31	29°21.65 54.60	Antares 112°13.34 -26°29.55
15	61°38.92	74°1.63 · · 38.35	277°3.74 · · 11.74	281°50.59 · · 43.32	44°23.82 · · 54.72	Atria 107°5.60 -69°4.35
16	76°41.38	89°1.25 37.25	292°6.03 11.58	296°53.09 43.32	59°25.99 54.84	Sabik 102°0.50 -15°45.56
17 18	91° 43.85 106° 46.31	104°0.88 36.16 119°0.51 \$06°35.06	307°8.32 11.42 322°10.61 N17°11.26	311°55.59 43.33 326°58.09 N16°43.34	74°28.17 54.96 89°30.34 N04°55.08	Shaula 96°7.70 -37°7.31
19	100 40.31 121°48.77	134°0.14 33.96	337°12.90 11.10	342°0.59 43.34	104°32.51 55.20	Rasalhague 95°56.70 12°32.21
20	136°51.24	148°59.77 32.86	352°15.19 10.94	357°3.09 43.35	119°34.68 55.32	Eltanin 90°41.15 51°28.76
21	151°53.70	163°59.40 · · 31.76	7°17.47 · · 10.77	12°5.59 · · 43.36	134°36.85 · · 55.44	Kaus Aust. 83°29.99 -34°22.18 Vega 80°31.91 38°48.23
22	166°56.17	178°59.03 30.65	22°19.76 10.61	27°8.09 43.36	149°39.02 55.56	Nunki 75°45.45 -26°15.70
23	181°58.63	193°58.66 29.55	37°22.04 10.45	42°10.59 43.37	164°41.19 55.68	Altair 61°58.21 8°56.28
Mer.	pass. 10:54	ν -0.4 $'$ d-1.1 $'$ m-3.90	$\nu 2.3' \ d$ -0.2' m-0.19	$\nu 2.5' \ d0.0' \ \text{m-}2.29$	$ u 2.2' \ d0.1' \ m0.66$	Peacock 53°3.03 -56°38.58
						Deneb 49°24.71 45°22.39
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.19 9°59.89
0	197°1.09	208°58.29 S06°28.45	52°24.33 N17°10.28	57°13.09 N16°43.37	179°43.36 N04°55.80	Al Na'ir 27°30.94 -46°49.58 Fomalhaut 15°12.80 -29°28.62
1	212°3.56	223°57.92 27.35	67°26.61 10.12	72°15.58 43.38	194° 45.54 55.92	Scheat 13°43.71 28°13.71
2	227°6.02	238° 57.55 26.25	82°28.89 9.96	87°18.08 43.39	209° 47.71 56.04	Markab 13°28.34 15°21.02
3	242°8.49	253°57.18 · · 25.15	97°31.17 · · 9.79	102°20.58 · · 43.39	224°49.88 · · 56.15	Apr 07 Wed SHA Mer.pass
4 5	257° 10.95 272° 13.41	268°56.81 24.04 283°56.44 22.94	112°33.45 9.63 127°35.73 9.46	117°23.07 43.40 132°25.57 43.40	239°52.05 56.27 254°54.22 56.39	Apr 07 Wed SHA Mer.pass Venus 14°13.49 10:03
6	287° 15.88	298°56.07 S06°21.84	142°38.00 N17°9.30	147°28.07 N16°43.41	269° 56.39 N04° 56.51	Mars 215°30.60 20:35
7	302° 18.34	313°55.70 20.73	157°40.28 9.13	162°30.56 43.41	284°58.56 56.63	Jupiter 220°10.00 20:16
8	$317^{\circ}20.81$	328°55.33 19.63	172°42.55 8.97	177°33.06 43.42	300°0.73 56.75	Saturn 342°56.32 12:06
9	332° 23.27	343°54.96 · · 18.52	187°44.83 · · 8.80	192°35.55 · · 43.42	315°2.90 · · 56.87	Apr 08 Thu SHA Mer.pass
10	347°25.74	358°54.59 17.42	202°47.10 8.63	207°38.05 43.43	330°5.08 56.99	Venus 13°5.28 10:04
11	2°28.20	13°54.23 16.31	217°49.37 8.46	222°40.54 43.43	345°7.25 57.11	Mars 215°27.25 20:31
12 13	17°30.66 32°33.13	28°53.86	232°51.64 N17°8.30 247°53.91 8.13	237°43.03 N16°43.44 252°45.53 43.44	0°9.42 N04°57.23 15°11.59 57.35	Jupiter 220°11.09 20:12
14	47°35.59	58°53.12 13.00	262°56.17 7.96	267°48.02 43.45	30°13.76 57.47	Saturn 342°49.30 12:03
15	62°38.06	73°52.76 · · 11.89	277°58.44 · · 7.79	282°50.51 · · 43.45	45°15.93 · · 57.59	Apr 09 Fri SHA Mer.pass
16	77°40.52	88°52.39 10.78	293°0.70 7.62	297°53.01 43.46	60°18.10 57.71	Venus 11°57.19 10:04
17	92° 42.98	103°52.02 9.68	308°2.97 7.45	312°55.50 43.46	75°20.27 57.83	Mars 215°23.23 20:27
18	107° 45.45	118°51.66 \$06°8.57	323°5.23 N17°7.28	327°57.99 N16°43.47	90°22.45 N04°57.95	Jupiter 220°11.99 20:08
19 20	122° 47.91 137° 50.38	133°51.29 7.46 148°50.92 6.35	338°7.49 7.11 353°9.75 6.94	343°0.48 43.47 358°2.97 43.47	105°24.62 58.07 120°26.79 58.19	Saturn 342°42.27 11:59
20	137 50.38 152° 52.84	148°50.92 6.35 163°50.56 · · 5.25	8°12.01 · · 6.77	13°5.47 · · 43.48	135°28.96 · · 58.30	Horizontal parallax
22	167° 55.30	178°50.19 4.14	23°14.27 6.60	28°7.96 43.48	150°31.13 58.42	Venus: 0.1
23	182°57.77	193°49.83 3.03	38°16.53 6.43	43°10.45 43.49	165°33.30 58.54	Mars: 0.2
Mer	pass. 10:50	ν-0.4' d-1.1' m-3.90	ν2.3' d-0.2' m-0.17	ν2.5' d0.0' m-2.28	ν2.2' d0.1' m0.66	

h	Su	n		-011 -	Moon		
Wed	GHA	Dec	GHA	ν 12.0'	Dec	d	HP
0 1	179°25.03 194°25.20	N06°39.73 40.67	181°1.55 195°33.47	12.9' 12.9'	N10°40.28 10°54.53	14.2' 14.2'	57.1' 57.1'
2	209° 25.38	40.67	210° 5.32	12.9	10 54.53 11°8.74	14.2'	57.1'
3	209 25.38 224°25.55	• • 42.55	210 5.32 224°37.10	12.7	11°22.90	14.1	57.1 57.2'
4	239°25.73	43.49	239°8.80	12.6'	11°22.90 11°37.03	14.1	57.2'
5	254°25.90	44.44	253°40.42	12.5'	11°51.11	14.1	57.2'
6	269° 26.08	N06°45.38	268°11.96	12.5'	N12° 5.15	14.0'	57.2'
7	284°26.25	46.32	282°43.42	12.4'	12°19.14	13.9'	57.3'
8	299°26.43	47.26	297°14.80	12.3'	12°33.08	13.9'	57.3'
9	314°26.60	• • 48.20	311°46.10	12.2'	12°46.98	13.8'	57.3'
10	329°26.78	49.14	326°17.32	12.1'	13°0.82	13.8'	57.3'
11	344°26.95	50.08	340°48.46	12.1'	13°14.62	13.7'	57.3'
12	359°27.12	N06°51.02	355°19.51	12.0'	N13°28.36	13.7'	57.4
13	14°27.30	51.96	9°50.47	11.9'	13°42.04	13.6'	57.4'
14	29°27.47	52.90	24°21.35	11.8'	13°55.67	13.6'	57.4'
15	44°27.65	• • 53.84	38°52.15	11.7'	14° 9.24	13.5'	57.4'
16	59° 27.82	54.78	53°22.85	11.6'	14°22.75	13.5'	57.5'
17	74°27.99	55.72	67°53.47	11.5'	14°36.20	13.4'	57.5'
18	89°28.17	N06°56.66	82°24.00	11.4'	N14°49.59	13.3'	57.5'
19	104°28.34	57.60	96°54.43	11.3'	15° 2.92	13.3'	57.5'
20	119°28.51	58.54	111°24.78	11.3'	15°16.18	13.2'	57.6'
21	134°28.69	06°59.48	125°55.04	11.2'	15°29.37	13.1'	57.6'
22	149°28.86	07° 0.42	140°25.20	11.1'	15°42.49	13.1'	57.6'
23	164°29.03	1.35	154°55.27	11.0'	15°55.55	13.0'	57.6'
	SD = 16.0'	d = 0.9'		C	O = 15.6'		
	$SD = 16.0^{\circ}$	$a = 0.9^{\circ}$		SL	$O = 15.0^{\circ}$		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	$179^{\circ}29.21$	N07° 2.29	169°25.24	10.9'	$N16^{\circ}8.53$	12.9'	57.6'
1	194°29.38	3.23	183°55.12	10.8'	16°21.44	12.8'	57.7'
2	209°29.55	4.17	198°24.91	10.7'	16°34.27	12.8'	57.7'
3	224°29.73	• • 5.10	212°54.60	10.6'	16°47.03	12.7'	57.7'
4	239°29.90	6.04	227°24.19	10.5'	$16^{\circ}59.71$	12.6'	57.7'
5	254°30.07	6.98	241°53.69	10.4'	17°12.31	12.5'	57.7'
6	269°30.24	N07°7.91	256°23.09	10.3'	N17°24.83	12.4'	57.8'
7	284°30.42	8.85	270°52.39	10.2'	17°37.26	12.4'	57.8'
8	299°30.59	9.79	285°21.59	10.1'	17°49.61	12.3'	57.8'
9	314°30.76	• • 10.72	299°50.69	10.0'	18° 1.88	12.2'	57.8'
10	329°30.93	11.66	$314^{\circ}19.70$	9.9'	18°14.05	12.1'	57.8'
11	344°31.11	12.59	328°48.60	9.8'	18°26.14	12.0'	57.9'
12	359°31.28	N07°13.53	343°17.40	9.7'	N18°38.14	11.9'	57.9'
13	14°31.45	14.47	357°46.10	9.6'	18°50.04	11.8'	57.9'
14	29°31.62	15.40	12°14.70	9.5'	19° 1.85	11.7'	57.9'
15	44°31.79	• • 16.33	26°43.20	9.4'	19°13.56	11.6'	58.0'
16	59°31.96	17.27	41°11.60	9.3'	19°25.18	11.5'	58.0'
17	74°32.14	18.20	55°39.89	9.2'	19°36.70	11.4'	58.0'
18	89°32.31	N07°19.14	70°8.08	9.1'	N19°48.11	11.3'	58.0'
19	104°32.48	20.07	84°36.17	9.0'	19°59.43		58.0'
20	119°32.65	21.00	99°4.15	8.9'	20°10.63	11.1'	58.0'
21	134°32.82	• • 21.94	113°32.03 127°59.81	8.8'	20°21.74	11.0'	58.1'
22	149°32.99	22.87		8.7'	20°32.73	10.9'	58.1'
23	164°33.16	23.80	142°27.49	8.6'	20°43.62	10.8'	58.1'
	SD = 16.0'	d = 0.9'		SE	0 = 15.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	179°33.33	N07°24.74				10.7'	58.1'
1				ያ ፍ'			
			156°55.06 171°22.53	8.5' 8.4'	N20°54.39		
2	194°33.50	25.67	171°22.53	8.4'	21°5.05	10.5'	58.1'
2	194° 33.50 209° 33.67	25.67 26.60	171°22.53 185°49.89	8.4' 8.3'	21°5.05 21°15.60	10.5' 10.4'	58.1' 58.2'
3	194°33.50 209°33.67 224°33.84	25.67 26.60 · · 27.53	171°22.53 185°49.89 200°17.15	8.4' 8.3' 8.2'	21°5.05 21°15.60 21°26.03	10.5' 10.4' 10.3'	58.1' 58.2' 58.2'
3 4	194° 33.50 209° 33.67	25.67 26.60	171°22.53 185°49.89	8.4' 8.3' 8.2' 8.1'	21°5.05 21°15.60	10.5' 10.4' 10.3' 10.2'	58.1' 58.2' 58.2' 58.2'
3 4 5	194° 33.50 209° 33.67 224° 33.84 239° 34.02	25.67 26.60 •• 27.53 28.47 29.40	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37	8.4' 8.3' 8.2' 8.1' 8.0'	21°5.05 21°15.60 21°26.03 21°36.35	10.5' 10.4' 10.3' 10.2' 10.1'	58.1' 58.2' 58.2' 58.2' 58.2'
3 4	194°33.50 209°33.67 224°33.84 239°34.02 254°34.19	25.67 26.60 •• 27.53 28.47	171°22.53 185°49.89 200°17.15 214°44.31	8.4' 8.3' 8.2' 8.1'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54	10.5' 10.4' 10.3' 10.2'	58.1' 58.2' 58.2' 58.2'
3 4 5 6	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36	25.67 26.60 •• 27.53 28.47 29.40 N07°30.33	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32	8.4' 8.3' 8.2' 8.1' 8.0' 7.9'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62	10.5' 10.4' 10.3' 10.2' 10.1' 10.0'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2'
3 4 5 6 7	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53	25.67 26.60 •• 27.53 28.47 29.40 N07° 30.33 31.26	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.2'
3 4 5 6 7 8	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70	25.67 26.60 •• 27.53 28.47 29.40 N07°30.33 31.26 32.19	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3'
3 4 5 6 7 8 9	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6' 7.5'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40 22° 26.10	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3'
3 4 5 6 7 8 9	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12 34.05	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6' 7.5' 7.4'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40 22° 26.10 22° 35.67	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3'
3 4 5 6 7 8 9 10 11	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.39 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20	25.67 26.60 • 27.53 28.47 29.40 N07°30.33 31.26 32.19 • 33.12 34.05 34.98	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6' 7.5' 7.4'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3'
3 4 5 6 7 8 9 10 11	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37	25.67 26.60 • 27.53 28.47 29.40 N07°30.33 31.26 32.19 • 33.12 34.05 34.98 N07°35.91	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6' 7.5' 7.4' 7.3'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3'
3 4 5 6 7 8 9 10 11 12 13	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54	25.67 26.60 • 27.53 28.47 29.40 N07°30.33 31.26 32.19 • 33.12 34.05 34.98 N07°35.91 36.84	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.6' 7.5' 7.4' 7.3' 7.2' 7.1'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43 23°3.62	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3'
3 4 5 6 7 8 9 10 11 12 13 14	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12 34.05 34.98 N07° 35.91 36.84 37.77	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.6' 7.5' 7.4' 7.3' 7.2' 7.1'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40 22° 35.67 22° 45.12 N22° 54.43 23° 3.62 23° 12.66	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12 34.05 34.98 N07° 35.91 36.84 37.77 • 38.70	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.6' 7.5' 7.4' 7.3' 7.2' 7.1' 7.0' 6.9'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.8'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15 16	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05	25.67 26.60 · 27.53 28.47 29.40 N07° 30.33 31.26 32.19 · 33.12 34.05 34.98 N07° 35.91 36.84 37.77 · 38.70 39.63	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.6' 7.5' 7.4' 7.3' 7.2' 7.1' 7.0' 6.9' 6.8'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°3.035	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.6'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12 34.05 34.98 N07° 35.91 36.84 37.77 • 38.70 39.63 40.56	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.6' 7.5' 7.4' 7.3' 7.2' 7.1' 7.0' 6.9' 6.8' 6.7'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°3.03 23°3.89	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.2' 9.0' 8.9' 8.6' 8.5'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39	25.67 26.60 27.53 28.47 29.40 N07° 30.33 31.26 32.19 33.12 34.05 34.98 N07° 35.91 36.84 37.77 38.70 39.63 40.56 N07° 41.49	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.6' 7.5' 7.4' 7.2' 7.1' 7.0' 6.8' 6.7' 6.7'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°30.35 23°38.99 N23°47.49	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.6' 8.5' 8.4'	58.1' 58.2' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39 104° 36.56	25.67 26.60 · 27.53 28.47 29.40 N07° 30.33 31.26 32.19 · 33.12 34.05 34.98 N07° 35.91 36.84 37.77 · 38.70 39.63 40.56 N07° 41.49 42.42	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86 71°19.52	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.5' 7.4' 7.3' 7.2' 7.1' 7.0' 6.8' 6.7' 6.7'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°26.10 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°3.035 23°38.99 N23°47.49 23°55.85	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.6' 8.5' 8.4' 8.2'	58.1' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4' 58.4'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39 104° 36.56 119° 36.73	25.67 26.60 • 27.53 28.47 29.40 N07° 30.33 31.26 32.19 • 33.12 34.05 34.98 N07° 35.91 36.84 37.77 • 38.70 39.63 40.56 N07° 41.49 42.42 43.35	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86 71°19.52 85°45.07	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.5' 7.4' 7.3' 7.2' 7.1' 7.0' 6.8' 6.7' 6.6' 6.5'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40 22° 35.67 22° 45.12 N22° 54.43 23° 3.62 23° 12.66 23° 21.58 23° 30.35 23° 38.99 N23° 47.49 23° 55.85 24° 4.06	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.2' 9.0' 8.9' 8.6' 8.5' 8.4' 8.2' 8.1'	58.1' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4' 58.4' 58.4' 58.4' 58.5'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39 104° 36.56 119° 36.73 134° 36.89	25.67 26.60 27.53 28.47 29.40 N07°30.33 31.26 32.19 34.05 34.98 N07°35.91 36.84 37.77 38.70 39.63 40.56 N07°41.49 42.42 43.35 44.27	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86 71°19.52 85°45.07 100°10.54 114°35.91	8.4' 8.3' 8.2' 8.1' 8.0' 7.9' 7.7' 7.6' 7.5' 7.4' 7.3' 7.2' 6.8' 6.7' 6.6' 6.5' 6.5' 6.4' 6.3'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°30.35 23°38.99 N23°47.49 23°55.85 24°4.06 24°12.13	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.6' 8.5' 8.4' 8.2' 8.1' 7.9' 7.8'	58.1' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4' 58.5' 58.5'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 35.20 359° 35.37 14° 35.54 29° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39 104° 36.56 119° 36.73 134° 36.89 149° 37.06 164° 37.23	25.67 26.60 · 27.53 28.47 29.40 N07° 30.33 31.26 32.19 · 33.12 34.05 34.98 N07° 35.91 36.84 37.77 · 38.70 39.63 40.56 N07° 41.49 42.42 43.35 · 44.27 45.20 46.13	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86 71°19.52 85°45.07 100°10.54	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.5' 7.4' 7.3' 7.2' 6.9' 6.8' 6.7' 6.6' 6.5' 6.4' 6.3' 6.2'	21° 5.05 21° 15.60 21° 26.03 21° 36.35 21° 46.54 N21° 56.62 22° 6.57 22° 16.40 22° 35.67 22° 45.12 N22° 54.43 23° 3.62 23° 12.66 23° 21.58 23° 30.35 23° 38.99 N23° 47.49 23° 55.85 24° 4.06 24° 12.13 24° 20.05 24° 27.83	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.8' 8.6' 8.5' 8.4' 8.2' 8.1' 7.9'	58.1' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4' 58.4' 58.5' 58.5'
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	194° 33.50 209° 33.67 224° 33.84 239° 34.02 254° 34.19 269° 34.36 284° 34.53 299° 34.70 314° 34.87 329° 35.03 344° 35.20 359° 35.71 44° 35.88 59° 36.05 74° 36.22 89° 36.39 104° 36.56 119° 36.73 134° 36.89 149° 37.06	25.67 26.60 27.53 28.47 29.40 N07°30.33 31.26 32.19 34.05 34.98 N07°35.91 36.84 37.77 38.70 39.63 40.56 N07°41.49 42.42 43.35 44.27	171°22.53 185°49.89 200°17.15 214°44.31 229°11.37 243°38.32 258°5.17 272°31.92 286°58.57 301°25.11 315°51.55 330°17.90 344°44.14 359°10.28 13°36.32 28°2.27 42°28.11 56°53.86 71°19.52 85°45.07 100°10.54 114°35.91	8.4' 8.3' 8.2' 8.1' 8.0' 7.7' 7.5' 7.4' 7.3' 7.2' 6.9' 6.8' 6.7' 6.6' 6.5' 6.4' 6.3' 6.2'	21°5.05 21°15.60 21°26.03 21°36.35 21°46.54 N21°56.62 22°6.57 22°16.40 22°35.67 22°45.12 N22°54.43 23°3.62 23°12.66 23°21.58 23°30.35 23°38.99 N23°47.49 23°55.85 24°4.06 24°12.13 24°20.05	10.5' 10.4' 10.3' 10.2' 10.1' 10.0' 9.8' 9.7' 9.6' 9.4' 9.3' 9.2' 9.0' 8.9' 8.6' 8.5' 8.4' 8.2' 8.1' 7.9' 7.8'	58.1' 58.2' 58.2' 58.2' 58.2' 58.3' 58.3' 58.3' 58.3' 58.4' 58.4' 58.4' 58.4' 58.5' 58.5'

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age 1-3	
,	00 ^h	12 ^h	Pass	Upper	Lower		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-5%	
07	02:20	02:12	12:02	12:19	-:-		
08	02:03	01:55	12:02	13:09	00:44		
09	01:47	01:39	12:02	14:03	01:36		

h	Aries	Ven	ıus	Ma	ars	Jur	oiter	Sat	urn		Stars
			Dec						Dec		
Sat 0	GHA 198°0.23	GHA 208° 49.46	506° 1.92	GHA 53°18.78	Dec N17°6.26	GHA 58°12.94	Dec N16° 43.49	GHA 180°35.47	N04°58.66		SHA
1	213°2.70	208 49.40 223°49.10	06°0.81	68°21.04	6.09	73°15.43	43.49	195°37.64	58.78	Alpheratz	
2	228°5.16	238° 48.73	05°59.70	83°23.29	5.91	88°17.91	43.50	210°39.82	58.90	Ankaa	353°5.75
3	243°7.63	253°48.37	• • 58.59	98°25.54	• • 5.74	103°20.40	• • 43.50	225°41.99	• • 59.02	Schedar Diphda	349°29.47 348°45.78
4	$258^{\circ}10.09$	268°48.00	57.48	113°27.80	5.57	118°22.89	43.50	240°44.16	59.14	Achernar	335°19.41
5	273°12.55	283°47.64	56.37	128°30.05	5.40	133°25.38	43.51	255°46.33	59.26	Hamal	327°49.44
6 7	288° 15.02 303° 17.48	298° 47.27 313° 46.91	\$05°55.26 54.14	143°32.29 158°34.54	N17°5.22 5.05	148°27.87 163°30.36	N16° 43.51 43.51	270°48.50 285°50.67	N04°59.38	Polaris	313°30.29
8	318° 19.95	328° 46.55	53.03	173°36.79	4.87	103 30.30 178°32.84	43.51	300° 52.84	59.50 59.62	Acamar	$315^{\circ}10.76$
9	333°22.41	343°46.18	• • 51.92	188°39.03	• • 4.70	193°35.33	• • 43.52	315°55.01	• • 59.74	Menkar	314°4.50
10	348°24.87	358°45.82	50.81	203°41.28	4.52	208°37.82	43.52	330°57.18	04°59.86	Mirfak	308°26.01
11	3°27.34	13°45.46	49.70	218°43.52	4.35	223°40.30	43.52	345°59.36	04°59.97	Aldebaran Rigel	290°37.72 281°2.27
12	18°29.80		S05°48.58	233°45.77	N17°4.17	238°42.79	N16°43.52	1°1.53	N05°0.09	Capella	280°19.40
13	33°32.27	43°44.73	47.47	248°48.01	4.00	253°45.28	43.53	16°3.70	0.21	Bellatrix	278°21.06
14 15	48° 34.73 63° 37.20	58°44.37 73°44.01	46.36 •• 45.24	263°50.25 278°52.49	3.82 · · 3.64	268°47.76 283°50.25	43.53 •• 43.53	31°5.87 46°8.04	0.33 •• 0.45	Elnath	$277^{\circ}59.71$
16	78° 39.66	88° 43.64	44.13	293°54.72	3.46	298°52.73	43.53	61° 10.21	0.43	Alnilam	275°36.00
17	93°42.12	103°43.28	43.01	308°56.96	3.29	313°55.22	43.53	76° 12.38	0.69	Betelgeuse	270°50.21
18	108°44.59		S05°41.90	323°59.20	N17°3.11	328°57.70	N16°43.54	91°14.55	N05° 0.81	Canopus Sirius	263°51.72 258°24.68
19	123°47.05	133° 42.56	40.78	339°1.43	2.93	344°0.18	43.54	106° 16.72	0.93	Adhara	255°4.46
20	138°49.52	148°42.20	39.67	354°3.66	2.75	359°2.67	43.54	121°18.90	1.05	Procyon	244°48.90
21	153° 51.98 168° 54.44	163°41.84	• • 38.55	9°5.90	• • 2.57	14°5.15	• • 43.54	136°21.07	• • 1.17	Pollux	243°15.03
22 23	108 54.44 183°56.91	178° 41.47 193° 41.11	37.44 36.32	24°8.13 39°10.36	2.39 2.21	29°7.63 44°10.11	43.54 43.54	151°23.24 166°25.41	1.29 1.40	Avior	$234^{\circ}13.83$
-										Suhail	222°44.77
Mer.p	pass. 10:46	ν -0.4' d-1.	1′ m-3.90	$\nu 2.3' \ d-0.$	2′ m-0.15	$\nu^{2.5'} d0.$.0′ m-2.27	$\nu^{2.2'} d0$.1′ m0.67	Miaplacidus	221°37.48
										Alphard Regulus	217°45.79 207°32.28
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.25
0	198°59.37		S05°35.20	54°12.59	N17°2.03	59°12.60	N16°43.54	181°27.58	N05°1.52	Denebola	182°22.78
1	214°1.84	223°40.39	34.09	69°14.81	1.85	74°15.08	43.54	196°29.75	1.64	Gienah	175°41.37
2	229°4.30 244°6.77	238° 40.03 253° 39.67	32.97 · · 31.85	84°17.04 99°19.27	1.67 •• 1.49	89°17.56 104°20.04	43.55 •• 43.55	211°31.92 226°34.09	1.76 •• 1.88		172°57.32
3 4	259°9.23	268°39.31	30.74	114°21.49	1.31	104 20.04 119°22.52	43.55	241°36.27	2.00	1	171°48.99
5	274°11.69	283°38.95	29.62	129°23.71	1.13	134°25.00	43.55	256°38.44	2.12	Alioth	166°10.82
6	289°14.16		S05°28.50	144°25.94	N17°0.95	149°27.48	N16°43.55	271°40.61	N05°2.24	Spica Alkaid	158°20.03 152°50.08
7	$304^{\circ}16.62$	313°38.23	27.38	$159^{\circ}28.16$	0.76	164°29.96	43.55	$286^{\circ}42.78$	2.36	Hadar	148°32.71
8	319° 19.09	328°37.87	26.26	174°30.38	0.58	179°32.44	43.55	301°44.95	2.48		147°55.04
9	334°21.55	343°37.52	• • 25.14	189°32.60	• • 0.40	194°34.92	• • 43.55	316° 47.12	• • 2.59	Arcturus	145°45.90
10 11	349°24.01 4°26.48	358°37.16 13°36.80	24.02 22.90	204°34.82 219°37.03	0.22 17°0.03	209°37.40 224°39.88	43.55 43.55	331°49.29 346°51.46	2.71 2.83	Rigil Kent.	139°37.10
12	19°28.94		S05°21.78	234°39.25	N16°59.85	239°42.36	N16° 43.55	1°53.64	N05° 2.95	Kochab	137°18.81
13	34°31.41	43°36.08	20.66	249°41.46	59.66	254°44.83	43.55	16°55.81	3.07	Zuben'ubi	136°53.66
14	49°33.87	58°35.72	19.54	264°43.68	59.48	269°47.31	43.55	31°57.98	3.19	Alphecca Antares	126°1.88 112°13.32
15	64°36.34	73°35.37	• • 18.42	279°45.89	• • 59.29	284°49.79	• • 43.55	47°0.15	• • 3.31	Atria	112 13.32 107°5.54
16	79°38.80	88°35.01	17.30	294°48.10	59.11	299°52.27	43.55	62°2.32	3.43	Sabik	102°0.48
17 18	94° 41.26 109° 43.73	103°34.65 118°34.29	16.18 \$05°15.06	309°50.31 324°52.52	58.92 N16°58.74	314°54.74 329°57.22	43.55	77°4.49 92°6.66	3.55 N05°3.66	Shaula	96°7.67
19	109 45.75 124°46.19	133°33.94	13.94	339°54.73	58.55	344°59.69	N16° 43.55 43.55	107°8.83	3.78	Rasalhague	95°56.68
20	139°48.66	148°33.58	12.81	354°56.93	58.36	0°2.17	43.55	122°11.01	3.90	Eltanin	90°41.12
21	154°51.12	163°33.22	• • 11.69	9°59.14	• • 58.18	15°4.65	• • 43.54	137° 13.18	• • 4.02	Kaus Aust. Vega	83°29.96 80°31.88
22	$169^{\circ}53.59$	178°32.87	10.57	25°1.34	57.99	30°7.12	43.54	152° 15.35	4.14	Nunki	75°45.43
23	184°56.05	193°32.51	9.44	40°3.55	57.80	45°9.59	43.54	167° 17.52	4.26	Altair	61°58.19
Mer.p	pass. 10:42	ν -0.4′ d-1.	1′ m-3.90	ν 2.2′ d-0.	2′ m-0.13	$\nu 2.5' \ d0.$.0′ m-2.27	$\nu 2.2' \ d0$.1′ m0.67	Peacock	53°2.99
										Deneb	49°24.68
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°37.16
0	199° 58.51	208°32.15	S05°8.32	55° 5.75	N16°57.61	60°12.07		182°19.69	N05°4.38	Al Na'ir Fomalhaut	27°30.92 15°12.78
1	215°0.98	223°31.80	7.20	70°7.95	57.42	75°14.54	43.54	197°21.86	4.50	Scheat	15 12.78 13°43.70
2	230°3.44	238°31.44	6.07	85°10.15	57.24	90°17.02	43.54	212°24.03	4.62	Markab	13°28.32
3	245°5.91	253°31.09	• • 4.95	100°12.35	• • 57.05	105°19.49	• • 43.54	227°26.20	• • 4.73		
4	260°8.37	268°30.73	3.83	115°14.55	56.86 56.67	120°21.96	43.53	242°28.38	4.85	Apr 10 Sat	SHA 10°49.23
5 6	275° 10.83 290° 13.30	283°30.37 298°30.02	2.70 S05°1.58	130°16.75 145°18.94	56.67 N16°56.48	135°24.44 150°26.91	43.53 N16°43.53	257°30.55 272°32.72	4.97 N05°5.09		10 49.23 215°18.55
7	305° 15.76	313°29.66	05°0.45	160°21.14	56.29	165°29.38	43.53	287°34.89	5.21	1	220°12.70
8	320° 18.23	328°29.31	04°59.32	175°23.33	56.10	180°31.85	43.53	302°37.06	5.33		342°35.24
9	$335^{\circ}20.69$	343°28.95	• • 58.20	190°25.52	•• 55.90	195°34.32	• • 43.52	317°39.23	• • 5.45	Apr 11 Sun	SHA
10	350°23.16	358°28.60	57.07	205°27.72	55.71	210°36.79	43.52	332°41.40	5.57	Venus	эпа 9°41.38
11	5°25.62	13°28.25	55.95	220°29.91	55.52	225°39.26	43.52	347° 43.57	5.68		215°13.21
12 13	20°28.08 35°30.55	28°27.89 43°27.54	504°54.82 53.69	235°32.10 250°34.29	N16°55.33 55.14	240°41.73 255°44.20	N16° 43.52 43.51	2°45.75 17°47.92	N05°5.80 5.92	Jupiter	$220^{\circ}13.22$
14	50°33.01	58°27.18	52.57	265°36.47	55.14 54.94	270°46.67	43.51	32°50.09	6.04	Saturn	342°28.21
15	65° 35.48	73°26.83	• • 51.44	280°38.66	• • 54.75	285°49.14	• • 43.51	47°52.26	. 6.16	Apr 12 Mon	SHA
16	80°37.94	88°26.48	50.31	295°40.84	54.56	300°51.61	43.51	62°54.43	6.28	Venus	8°33.64
17	95°40.41	103°26.12	49.18	310°43.03	54.36	315°54.08	43.50	77° 56.60	6.40	Mars	$215^{\circ}7.24$
18	110° 42.87	118°25.77		325°45.21	N16°54.17	330°56.55	N16°43.50	92°58.77	N05° 6.51		220°13.56
19 20	125° 45.33 140° 47.80	133°25.42 148°25.06	46.93 45.80	340°47.39 355°49.57	53.98 53.78	345°59.02 1°1.48	43.50 43.49	108°0.94 123°3.12	6.63 6.75	Saturn	342°21.18
21	155° 50.26	163°24.71	• • 44.67	10°51.75	• • 53.59	16°3.95	· · 43.49	123 3.12 138°5.29	• • 6.87	Horizor	ntal parallax
22	170° 52.73	178°24.36	43.54	25°53.93	53.39	31°6.42	43.49	153°7.46	6.99		Venus:
23	$185^{\circ}55.19$	193°24.01	42.41	40°56.11	53.20	46°8.89	43.48	168°9.63	7.11		Mars:
Mer.r	pass. 10:38	ν -0.4' d-1.	1′ m-3.89	$\nu 2.2' \ d-0.$	2′ m-0.10	$\nu 2.5' \ d-0$.0′ m-2.26	$-\nu$ 2.2' d0	.1′ m0.68		

Dec 29°14.37 -42°9.43 56°41.16 -17°50.25 $\text{-}57^{\circ}5.91$ $23^{\circ}35.43$ 89°22.85 -40°11.84 4°11.72 49°57.53 16°33.79 -8°10.36 $46^{\circ}1.59$ $6^{\circ}22.36$ 28°37.82 -1°11.21 7°24.62 -52°42.90 -16°45.44 -29°0.82 5°9.16 27°57.59 -59°36.15 -43°32.88 -69°50.07 -8°46.84 11°49.89 $61^{\circ}36.26$ $14^{\circ}25.02$ -17°41.82 $-63^{\circ}15.21$ $-57^{\circ}16.15$ 55°48.60 -11°18.40 49°10.45 -60°30.32 -36°30.36 $19^{\circ}2.22$ -60°56.90 $74^{\circ}2.36$ -16°9.43 $26^{\circ}37.14$ -26°29.56 -69°4.36 $\text{-}15^{\circ}45.56$ $\text{-}37^{\circ}7.31$ $12^{\circ}32.22$ 51°28.77 -34°22.18 38°48.23 -26°15.69 8°56.29 -56°38.57 45°22.39 9°59.89 -46°49.57 -29°28.61 28°13.71 15°21.02 Mer.pass 10:05 20:24 20:04 11:56 Mer.pass 10:06 20:20 20:00 11:52 Mer.pass 10:06 20:17 19:56 11:49

0.1

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.40	N07°47.06	143°26.37	6.1'	N24°35.45	7.5'	58.5'
1	194° 37.57	47.98	157°51.46	6.0'	24°42.93	7.3'	58.5'
2	209° 37.73 224° 37.90	48.91 •• 49.84	172°16.46 186°41.38	5.9' 5.8'	24°50.25 24°57.42	7.2' 7.0'	58.5' 58.6'
4	239° 38.07	50.76	201°6.20	5.7'	25°4.44	6.9'	58.6'
5	254° 38.24	51.69	215°30.95	5.7'	25°11.30	6.7'	58.6'
6 7	269°38.41 284°38.57	N07°52.62 53.54	229°55.60 244°20.17	5.6' 5.5'	N25°18.00 25°24.54	6.5' 6.4'	58.6' 58.6'
8	299° 38.74	54.47	258°44.67	5.4'	25°30.92	6.2	58.6
9	314°38.91	• • 55.39	273°9.07	5.3'	25°37.15	6.1'	58.6'
10	329°39.07	56.32	287°33.41	5.3'	25°43.21	5.9'	58.7'
11 12	344°39.24 359°39.41	57.24 N07°58.17	301°57.66 316°21.83	5.2' 5.1'	25°49.10 N25°54.83	5.7' 5.6'	58.7' 58.7'
13	14° 39.57	07°59.09	330°45.94	5.0'	26°0.40	5.4'	58.7'
14	29°39.74	$08^{\circ}0.01$	345° 9.96	5.0'	26°5.79	5.2'	58.7'
15 16	44°39.91 59°40.07	· · 0.94 1.86	359°33.92 13°57.81	4.9' 4.8'	26°11.02 26°16.08	5.1' 4.9'	58.7' 58.7'
17	74° 40.24	2.79	28°21.63	4.8	26°20.97	4.7'	58.7'
18	89°40.41	N08°3.71	42°45.38	4.7'	N26°25.68	4.5'	58.7'
19	104° 40.57	4.63	57°9.07	4.6'	26°30.22	4.4'	58.8'
20 21	119° 40.74 134° 40.90	5.55 •• 6.48	71°32.70 85°56.27	4.6' 4.5'	26°34.59 26°38.79	4.2' 4.0'	58.8' 58.8'
22	149° 41.07	7.40	100°19.77	4.5'	26°42.81	3.8'	58.8'
23	164°41.24	8.32	114°43.23	4.4'	26°46.65	3.7'	58.8'
	SD = 16.0'	d = 0.9'		SI	D = 16.0'		
_							
Sun 0	GHA 179°41.40	Dec N08° 9.24	GHA 129° 6.62	u 4.3'	Dec N26° 50.31	<i>d</i> 3.5'	HP 58.8'
1	194° 41.57	10.16	143°29.97	4.3'	26°53.80	3.3'	58.8'
2	209°41.73	11.09	157°53.26	4.2'	26°57.11	3.1'	58.8'
3 4	224°41.90 239°42.06	· · 12.01 12.93	172°16.51 186°39.71	4.2' 4.2'	27°0.23 27°3.18	2.9' 2.8'	58.8' 58.9'
5	254° 42.23	13.85	201°2.87	4.1'	27°5.95	2.6'	58.9'
6	269°42.39	N08°14.77	215°25.98	4.1'	N27°8.53	2.4'	58.9'
7	284°42.56	15.69	229°49.06	4.0'	27°10.93	2.2'	58.9'
8 9	299° 42.72 314° 42.88	16.61 •• 17.53	244°12.10 258°35.10	4.0' 4.0'	27°13.15 27°15.18	2.0' 1.8'	58.9' 58.9'
10	329° 43.05	18.45	272°58.08	3.9'	27°17.03	1.7'	58.9'
11	344°43.21	19.37	287°21.02	3.9'	27°18.70	1.5'	58.9'
12	359°43.38	N08°20.28	301°43.93	3.9'	N27°20.18 27°21.47	1.3'	58.9'
13 14	14° 43.54 29° 43.70	21.20 22.12	316°6.82 330°29.69	3.9' 3.8'	27°21.47 27°22.58	1.1' 0.9'	58.9' 58.9'
15	44° 43.87	• • 23.04	344°52.53	3.8'	27°23.50	0.7'	59.0'
16	59° 44.03	23.96	359°15.36	3.8'	27°24.23	0.5'	59.0'
17 18	74°44.20 89°44.36	24.87 N08°25.79	13°38.17 28°0.97	3.8' 3.8'	27°24.78 N27°25.14	0.4' 0.2'	59.0' 59.0'
19	104° 44.52	26.71	42°23.75	3.8'	27°25.32	-0.0'	59.0'
20	119° 44.68	27.63	56°46.53	3.8'	27°25.30		59.0'
21 22	134° 44.85 149° 45.01	· · 28.54 29.46	71°9.30 85°32.07	3.8' 3.8'	27°25.10 27°24.71	-0.4' -0.6'	59.0' 59.0'
23	164° 45.17	30.37	99°54.84	3.8'	27°24.71	-0.8	59.0'
	SD = 16.0'	d = 0.9'		SI	0 = 16.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179° 45.34 194° 45.50	N08°31.29 32.21	114°17.60 128°40.37	3.8' 3.8'	N27°23.37 27°22.42	-1.0' -1.1'	59.0' 59.0'
2	209°45.66	33.12	143°3.15	3.8'	$27^{\circ}21.28$	-1.3'	59.0'
3	224° 45.82	• • 34.04	157°25.93	3.8'	27°19.95	-1.5'	59.0'
4 5	239° 45.99 254° 46.15	34.95 35.87	171°48.73 186°11.54	3.8' 3.8'	27°18.44 27°16.74	-1.7' -1.9'	59.0' 59.1'
6	269° 46.31	N08°36.78	200°34.36	3.8'	N27°14.85	-2.1'	59.1
7	284°46.47	37.69	214°57.20	3.9'	27°12.78	-2.3'	59.1'
8 9	299° 46.63 314° 46.79	38.61 •• 39.52	229°20.06 243°42.95	3.9' 3.9'	27°10.52 27°8.07	-2.4' -2.6'	59.1' 59.1'
10	329°46.96	40.44	243 42.95 258° 5.86	3.9'	27°5.44	-2.8'	59.1'
11	344°47.12	41.35	272°28.79	4.0'	27°2.62	-3.0'	59.1'
12	359°47.28	N08°42.26	286°51.76	4.0'	N26°59.62	-3.2'	59.1'
13 14	14° 47.44 29° 47.60	43.17 44.09	301°14.75 315°37.78	4.0' 4.1'	26°56.44 26°53.07	-3.4' -3.6'	59.1' 59.1'
15	44°47.76	• • 45.00	330° 0.84	4.1'	$26^{\circ}49.52$	-3.7'	59.1
16	59°47.92	45.91	344°23.95	4.1'	26°45.79	-3.9'	59.1'
17 18	74° 48.08 89° 48.24	46.82 N08°47.73	358°47.09 13°10.27	4.2' 4.2'	26°41.87 N26°37.78	-4.1' -4.3'	59.1' 59.1'
18	104°48.40	48.64	27°33.50	4.2 4.3'	26°33.50	-4.5'	59.1'
20	119°48.56	49.55	41°56.77	4.3'	$26^{\circ}29.05$	-4.6'	59.1'
21 22	134° 48.72 149° 48.88	· · 50.46 51.37	56°20.09 70°43.47	4.4' 4.4'	26°24.41 26°19.60	-4.8' -5.0'	59.1' 59.1'
22	149°48.88 164°49.04	51.37 52.28	70°43.47 85°6.89	4.4 4.5'	26°19.60 26°14.61	-5.0° -5.2'	59.1' 59.1'
	SD = 16.0'	d = 0.9'			0 = 16.1'	3.2	
	<u> </u>	u — 0.9		JL	_ 10.1		

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

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°						
64°	03:46			01:08		
62°	04:32	04:44	05:40	00:23	02:17	03:31
60°	05:02	05:30	06:30		01:31	02:41
N 58°	05:25	06:00	07:01	•• ••	01:01	02:09
56°	05:44	06:23	07:25		00:38	01:46
54°	05:59	06:42	07:44	••••	00:20	01:27
52° 50°	06:13 06:25	06:58 07:11	08:00 08:14	23:50	00:04	01:10 00:56
45°	06:25	07:11	08:14	23:50		00:56
				-		
N 40°	07:10	08:02	09:04	23:00		00:05
35°	07:27	08:20	09:23	22:42	23:46	
30° 20°	07:41 08:06	08:36 09:03	09:39 10:06	22:27 22:00	23:30 23:03	•• ••
N 10°	08:00	09:03	10:00	21:37	23:03	23:40
0°	08:48	09:48	10:50	21:16	22:18	23:20
S 10°	09:08	10:10	11:12	20:55	21:56	22:59
20°	09:08	10:10	11:12	20:55	21:50	22:59
30°	09.50	11:01	12:02	20:32	21:05	22:30
35°	10:10	11:17	12:18	19:51	20:49	21:55
40°	10:27	11:36	12:36	19:33	20:30	21:37
45°	10:48	11:59	12:58	19:11	20:07	21:15
S 50°	11:15	12:28	13:26	18:44	19:38	20:48
52°	11:28	12:42	13:40	18:30	19:23	20:34
54°	11:43	12:59	13:56	18:15	19:07	20:18
56°	12:01	13:19	14:15	17:57	18:47	20:00
58°	12:22	13:43	14:38	17:36	18:22	19:37
S 60°	12:49	14:17	15:08	17:08	17:49	19:08

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-28%	
10	01:30	01:22	12:01	15:02	02:32		
11	01:14	01:06	12:01	16:03	03:32		
12	00:59	00:51	12:01	17:05	04:34		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	200° 57.65	208°23.65 \$04°41.28	55°58.29 N16°53.00	61°11.35 N16°43.48	183°11.80 N05°7.23	
1	216°0.12	223°23.30 40.15	71°0.46 52.80	76°13.82 43.47	198°13.97 7.34	Alpheratz 357°33.17
2	231°2.58	238°22.95 39.02	86°2.64 52.61	91°16.28 43.47	213°16.14 7.46	Ankaa 353°5.73
3	246°5.05	253°22.60 · · 37.89	101°4.81 · · 52.41	106°18.75 · · 43.47	228°18.32 · · 7.58	Schedar 349°29.45
4	261°7.51	268°22.25 36.76	116° 6.98 52.21	121°21.21 43.46	243°20.49 7.70	Diphda 348°45.76
5	276°9.98	283°21.90 35.63	131°9.16 52.01	136°23.68 43.46	258° 22.66 7.82	Achernar 335°19.41
6	291°12.44	298°21.54 S 04°34.50	146°11.33 N16°51.82	151°26.14 N16°43.45	273°24.83 N05°7.94	Hamal 327°49.43
7	$306^{\circ}14.90$	313°21.19 33.36	161°13.49 51.62	166°28.61 43.45	288°27.00 8.06	Polaris 313°30.61
8	321°17.37	328°20.84 32.23	176°15.66 51.42	181°31.07 43.45	303°29.17 8.17	Acamar 315°10.76
9	$336^{\circ}19.83$	343°20.49 · · 31.10	191°17.83 · · 51.22	196°33.54 · · 43.44	318°31.34 · · 8.29	Menkar 314° 4.50 Mirfak 308° 26.01
10	351°22.30	358°20.14 29.97	206°20.00 51.02	211°36.00 43.44	333°33.52 8.41	Aldebaran 290°37.72
11	6°24.76	13°19.79 28.84	221°22.16 50.82	226°38.46 43.43	348°35.69 8.53	Rigel 281°2.27
12	21°27.22	28°19.44 S 04°27.70	236°24.33 N16°50.62	241°40.92 N16°43.43	3°37.86 N05°8.65	Capella 280°19.41
13	36°29.69	43°19.09 26.57	251°26.49 50.42	256°43.39 43.42	18° 40.03 8.77	Bellatrix 278°21.06
14	51°32.15	58° 18.74 25.44	266°28.65 50.22	271°45.85 43.42	33°42.20 8.88	Elnath 277°59.72
15	66°34.62	73°18.39 · · 24.30	281°30.81 · · 50.02	286°48.31 · · 43.41	48°44.37 · · 9.00	Alnilam 275°36.01
16	81°37.08	88°18.04 23.17	296°32.97 49.82	301°50.77 43.41	63°46.54 9.12	Betelgeuse 270°50.22
17	96°39.55	103°17.69 22.04	311°35.13 49.62	316°53.23 43.40	78°48.72 9.24	Canopus 263°51.74
18	111°42.01	118°17.34 \$04°20.90	326°37.29 N16°49.42	331°55.69 N16°43.39	93°50.89 N05°9.36	Sirius 258°24.69
19	126°44.47	133°16.99 19.77	341°39.44 49.21	346°58.15 43.39	108° 53.06 9.48	Adhara 255°4.47
20	141° 46.94 156° 49.40	148°16.64 18.63 163°16.29 · · 17.50	356°41.60 49.01 11°43.75 · · 48.81	2°0.61 43.38 17°3.07 · · 43.38	123°55.23 9.59 138°57.40 •• 9.71	Procyon 244°48.90
21 22	150 49.40 171°51.87	163°16.29 · · 17.50 178°15.95 16.36	11°43.75 · · 48.81 26°45.91 48.60	17°3.07 · · 43.38 32°5.53 43.37	153° 59.57 9.83	Pollux 243°15.04
23	171 51.87 186° 54.33	193°15.60 15.23	41°48.06 48.40	47°7.99 43.37	169°1.74 9.95	Avior 234°13.86
	100 34.33					Suhail 222°44.78
Mer.p	pass. 10:34	ν -0.4 $'$ d-1.1 $'$ m-3.89	ν 2.2′ <i>d</i> -0.2′ m-0.08	ν 2.5′ <i>d</i> -0.0′ m-2.25	$ u 2.2' \ d0.1' \ m0.68$	Miaplacidus 221°37.52
						Alphard 217°45.79
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.28
0	201°56.79	208°15.25 \$04°14.09	56°50.21 N16°48.20	62°10.45 N16°43.36	184°3.92 N05°10.07	Dubhe 193°38.26
1	216° 59.26	223°14.90 12.96	71°52.36 47.99	77°12.91 43.35	199°6.09 10.18	Denebola 182°22.77
2	232°1.72	238°14.55 11.82	86°54.51 47.79	92°15.36 43.35	214°8.26 10.30	Gienah 175°41.36
3	247°4.19	253°14.20 · · 10.68	101°56.66 · · 47.58	107°17.82 · · 43.34	229°10.43 · · 10.42	Acrux 172°57.32
4	262°6.65	268°13.86 9.55	116°58.81 47.38	122°20.28 43.33	244°12.60 10.54	Gacrux 171°48.99
5	277°9.12	283°13.51 8.41	132°0.95 47.17	137°22.74 43.33	259°14.77 10.66	Alioth 166°10.81
6	292°11.58	298°13.16 S 04°7.27	147°3.10 N16°46.97	152°25.19 N16°43.32	274°16.95 N05°10.78	Spica 158°20.02 Alkaid 152°50.07
7	$307^{\circ}14.04$	313°12.81 6.14	162°5.24 46.76	167°27.65 43.31	289° 19.12 10.89	Hadar 148°32.69
8	$322^{\circ}16.51$	328°12.47 5.00	177°7.38 46.56	182°30.11 43.31	304°21.29 11.01	Menkent 147°55.02
9	$337^{\circ}18.97$	343°12.12 · · 3.86	192° 9.53 · · · 46.35	197°32.56 · · 43.30	319°23.46 · · 11.13	Arcturus 145°45.89
10	$352^{\circ}21.44$	358°11.77 2.72	207°11.67 46.14	212°35.02 43.29	334°25.63 11.25	Rigil Kent. 139°37.07
11	7°23.90	13°11.42 1.58	222°13.81 45.94	227°37.47 43.28	349°27.80 11.37	Kochab 137°18.78
12	22°26.36	28°11.08 S04°0.45	237°15.95 N16°45.73	242°39.93 N16°43.28	4°29.98 N05°11.48	Zuben'ubi 136°53.64
13	37°28.83	43°10.73 03°59.31	252°18.08 45.52	257°42.38 43.27	19° 32.15 11.60	Alphecca 126°1.86
14	52°31.29	58°10.39 58.17	267°20.22 45.31	272°44.83 43.26	34°34.32 11.72	Antares 112°13.29
15	67°33.76	73°10.04 · · 57.03	282°22.36 · · 45.10	287°47.29 · · 43.25	49°36.49 · · 11.84	Atria 107° 5.48
16	82°36.22	88°9.69 55.89	297°24.49 44.89	302°49.74 43.25	64°38.66 11.96	Sabik 102°0.45
17	97°38.69	103°9.35 54.75 118°9.00 \$03°53.61	312°26.63 44.68	317°52.19 43.24	79°40.83 12.07	Shaula 96°7.64
18 19	112°41.15 127°43.61	118°9.00 S03°53.61 133°8.65 52.47	327°28.76 N16°44.48 342°30.89 44.27	332°54.65 N16°43.23 347°57.10 43.22	94°43.01 N05°12.19 109°45.18 12.31	Rasalhague 95°56.66
	142° 46.08	148°8.31 51.33	342°30.89 44.27 357°33.02 44.06	2°59.55 43.22	109° 45.18 12.31 124° 47.35 12.43	Eltanin 90°41.09
20 21	142 40.06 157°48.54	163°7.96 · · 50.19	12°35.15 · · 43.84	18°2.00 · · 43.21	139°49.52 · · 12.55	Kaus Aust. 83°29.93
22	172°51.01	178°7.62 49.05	27°37.28 43.63	33°4.46 43.20	154°51.69 12.66	Vega 80°31.85
23	187°53.47	193°7.27 47.91	42°39.41 43.42	48°6.91 43.19	169°53.86 12.78	Nunki 75°45.39
						Altair 61°58.16
Mer.p	pass. 10:30	ν -0.3' d-1.1' m-3.89	$\nu 2.2' \ d$ -0.2' m-0.06	ν 2.5′ <i>d</i> -0.0′ m-2.24	$ u 2.2' \ d0.1' \ m0.69$	Peacock 53°2.95
						Deneb 49°24.65
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.14 Al Na'ir 27°30.89
0	202°55.93	208°6.93 S 03°46.77	57°41.53 N16°43.21	63°9.36 N16°43.18	184°56.04 N05°12.90	Fomalhaut 15°12.76
1	217°58.40	223°6.58 45.63	72°43.66 43.00	78°11.81 43.17	199°58.21 13.02	Scheat 13°43.67
2	233°0.86	238°6.24 44.49	87°45.78 42.79	93°14.26 43.16	215°0.38 13.13	Markab 13°28.30
3	248°3.33	253°5.89 · · 43.34	102°47.91 · · 42.58	108°16.71 · · 43.16	230°2.55 · · 13.25	
4	263°5.79	268°5.55 42.20	117°50.03 42.36	123°19.16 43.15	245°4.72 13.37	Apr 13 Tue SHA
5	278°8.25	283°5.20 41.06	132°52.15 42.15	138°21.61 43.14	260°6.89 13.49	Venus 7°26.00
6	293° 10.72	298°4.86 \$03°39.92	147°54.27 N16°41.94	153°24.06 N16°43.13	275°9.07 N05°13.61	Mars 215°0.63
7	308° 13.18	313°4.52 38.77	162°56.39 41.72	168°26.50 43.12	290°11.24 13.72	Jupiter 220°13.70
8	323° 15.65	328°4.17 37.63	177°58.51 41.51	183°28.95 43.11	305°13.41 13.84	Saturn 342°14.15
9	338° 18.11	343°3.83 · · 36.49	193°0.63 · · 41.30	198°31.40 · · 43.10	320°15.58 · · 13.96	Apr 14 Wed SHA
10	353°20.58	358°3.48 35.35	208°2.74 41.08	213°33.85 43.09 228°36.29 43.08	335°17.75 14.08	Venus 6°18.45
11	8°23.04	13°3.14 34.20	223° 4.86 40.87		350°19.93 14.19	Mars 214°53.42
12 13	23°25.50 38°27.97	28°2.80	238° 6.97 N16° 40.65 253° 9.09 40.44	243°38.74 N16°43.07 258°41.19 43.06	5°22.10 N05°14.31 20°24.27 14.43	Jupiter 220°13.65
13 14	58° 27.97 53° 30.43	58°2.11 30.77	268°11.20 40.22	273°43.63 43.05	20 24.27 14.43 35°26.44 14.55	Saturn 342°7.12
15	68° 32.90	73°1.77 · · · 29.63	283°13.31 · · 40.00	288°46.08 · · 43.04	50°28.61 · · 14.67	Apr 15 Thu SHA
16	83°35.36	88°1.42 28.48	298°15.42 39.79	303°48.53 43.03	65°30.78 14.78	Venus 5°10.99
17	98°37.82	103°1.08 27.34	313°17.53 39.57	318°50.97 43.02	80°32.96 14.90	Mars 214°45.60
18	113°40.29	118°0.74 S03°26.19	328°19.64 N16°39.35	333°53.42 N16°43.01	95°35.13 N05°15.02	Jupiter 220°13.42
19	128° 42.75	133°0.40 25.05	343°21.75 39.14	348°55.86 43.00	110°37.30 15.14	Saturn 342°0.10
20	143°45.22	148°0.05 23.90	358°23.85 38.92	3°58.31 42.99	125°39.47 15.25	
21	158° 47.68	162°59.71 · · 22.76	13°25.96 · · 38.70	19°0.75 · · 42.98	140°41.64 · · 15.37	Horizontal parallax
22	$173^{\circ}50.14$	177°59.37 21.61	28°28.06 38.48	34°3.19 42.97	155°43.82 15.49	Venus:
23	188°52.61	192°59.03 20.46	43°30.17 38.26	49°5.64 42.96	170°45.99 15.61	Mars:
Mer	pass. 10:27	ν-0.3' d-1.1' m-3.89	ν2.1' d-0.2' m-0.04	ν2.5' d-0.0' m-2.24	$\nu 2.2' \ d0.1' \ m0.69$	
14101.		- 0.5 d 1.1 III-J.09	ν Δ.Ι. U U.Z III-U.U+	ν 2.5 G 0.0 ΠΓ-2.24	UO.1 IIIO.03	

Dec

29°14.37 -42°9.41

56°41.15

-17°50.24

-57°5.89

 $23^{\circ}35.43$

 $89^{\circ}22.83$

-40°11.82

49°57.52 16°33.79

-8°10.36

46°1.59 6°22.36

28° 37.81 -1° 11.21

7°24.62 -52°42.90

-16°45.44 -29°0.82

5°9.16 27°57.59

-59°36.15

-43°32.89 -69°50.08

-8°46.84

11°49.89

 $61^{\circ}36.27$

 $14^{\circ}25.02$

-17°41.83 -63°15.23 -57°16.17

55°48.61 -11°18.41

49°10.46 -60°30.34

-36°30.37

 $19^{\circ}2.23$

74°2.38 -16°9.44

26°37.14 -26°29.56

-69°4.37 -15°45.56

 $\text{-}37^{\circ}7.31$

 $12^{\circ}32.23$

51°28.78

-34°22.18 38°48.24

-26° 15.69 8° 56.29

-56°38.56 45°22.39

 $9^{\circ}59.90$

-46°49.55

-29°28.59

28°13.71 15°21.02

Mer.pass

10:07

20:13

19:52

11:46 Mer.pass

10:07

20:10

19:48

11:42 Mer.pass

10:08

20:06

19:44

11:39

0.1

0.2

-60°56.91

4°11.73

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°49.20	N08°53.19	99°30.37	4.5'	$N26^{\circ}9.45$	-5.3'	59.1'
1	194°49.36	54.10	113°53.90	4.6'	26°4.11	-5.5'	59.1'
2	209°49.52 224°49.68	55.01 •• 55.92	128°17.49 142°41.13	4.6' 4.7'	25°58.60 25°52.91	-5.7' -5.9'	59.1' 59.2'
4	239°49.84	56.83	157°4.84	4.8	25°47.05	-6.0'	59.2'
5	254°50.00	57.74	171°28.61	4.8'	25°41.02	-6.2'	59.2'
6	269°50.16	N08°58.65	$185^{\circ}52.44$	4.9'	N25°34.82	-6.4'	59.2'
7	284°50.31	08°59.55	200°16.34	5.0'	25°28.45	-6.5'	59.2'
8 9	299°50.47 314°50.63	09°0.46 •• 1.37	214°40.31 229°4.34	5.0' 5.1'	25°21.91 25°15.20	-6.7' -6.9'	59.2' 59.2'
10	329°50.79	2.28	243°28.45	5.2'	25°8.33	-0.9 -7.0'	59.2'
11	344°50.95	3.18	257°52.62	5.2'	25°1.29	-7.2'	59.2'
12	359°51.11	N09°4.09	272°16.87	5.3'	N24°54.09	-7.4'	59.2'
13	14°51.26	5.00	286°41.19	5.4'	24°46.73	-7.5'	59.2'
14 15	29°51.42 44°51.58	5.90 · · 6.81	301°5.58 315°30.05	5.5' 5.5'	24°39.21 24°31.53	-7.7' -7.8'	59.2' 59.2'
16	59°51.74	7.71	329°54.60	5.6'	24°23.68	-8.0'	59.2'
17	74°51.89	8.62	$344^{\circ}19.22$	5.7'	24°15.69	-8.2'	59.2'
18	89°52.05	N09°9.52	358°43.93	5.8'	N24°7.53	-8.3'	59.2'
19	104°52.21 119°52.37	10.43 11.33	13°8.71 27°33.58	5.9' 5.9'	23°59.22 23°50.76	-8.5' -8.6'	59.2' 59.2'
20 21	119 52.57 134°52.52	11.33	41°58.53	5.9 6.0'	23°42.14	-8.8'	59.2'
22	149°52.68	13.14	56°23.56	6.1'	23°33.38	-8.9'	59.2'
23	164°52.84	14.04	70°48.67	6.2'	23°24.47	-9.1'	59.2'
	SD = 15.9'	d = 0.9'		SI	O = 16.1'		
Wed	GHA 170° 52.00	Dec N09°14.95	GHA 95°12 97	ν 6 2'	Dec	d -9.2'	HP
0 1	179°52.99 194°53.15	N09°14.95 15.85	85°13.87 99°39.15	6.3' 6.4'	N23°15.40 23°6.20	-9.2° -9.4'	59.2' 59.2'
2	209°53.31	16.75	114°4.52	6.5'	22°56.84	-9.5'	59.2'
3	224°53.46	• • 17.66	$128^{\circ}29.97$	6.5'	22°47.35	-9.6'	59.2'
4	239°53.62	18.56	142°55.51	6.6'	22°37.71	-9.8'	59.2'
5 6	254°53.77 269°53.93	19.46 N09°20.36	157°21.14 171°46.86	6.7' 6.8'	22°27.93 N22°18.01	-9.9' -10.1'	59.2' 59.2'
7	284°54.08	21.26	171 40.60 186°12.66	6.9	22°7.96	-10.1 -10.2'	59.2'
8	299°54.24	22.16	200°38.55	7.0'	21°57.77	-10.3'	59.2'
9	314°54.39	• • 23.06	215°4.53	7.1'	21°47.44	-10.5'	59.2'
10	329°54.55 344°54.70	23.97	229°30.60 243°56.76	7.2' 7.2'	21°36.98 21°26.40	-10.6'	59.2'
11 12	359°54.86	24.87 N09°25.77	243 50.76 258°23.01	7.2	N21°15.68	-10.7' -10.8'	59.2' 59.2'
13	14°55.01	26.67	272°49.34	7.4'	21°4.83	-11.0'	59.2'
14	29°55.17	27.56	$287^{\circ}15.77$	7.5'	$20^{\circ}53.86$	-11.1'	59.2'
15	44°55.32	• • 28.46	301°42.29	7.6'	20°42.76	-11.2'	59.2'
16 17	59°55.48 74°55.63	29.36 30.26	316°8.89 330°35.59	7.7' 7.8'	20°31.53 20°20.19	-11.3' -11.5'	59.2' 59.2'
18	89°55.79	N09°31.16	345°2.37	7.9	N20°8.73	-11.6'	59.2'
19	104°55.94	32.06	359°29.25	8.0'	19°57.14	-11.7'	59.2'
20	119°56.09	32.96	13°56.21	8.1'	19°45.44		59.2'
21	134°56.25 149°56.40	· · 33.85 34.75	28°23.27 42°50.41	8.1' 8.2'	19°33.63 19°21.70	-11.9' -12.0'	59.2'
22 23	149 56.40 164°56.55	34.75 35.65	42 50.41 57°17.64	8.3'	19 21.70 19°9.65	-12.0 -12.2'	59.2' 59.1'
	SD = 15.9'	d = 0.9'		SI	D = 16.1'		
Thu 0	GHA 179°56.71	Dec N09°36.54	GHA 71°44.96	ν 8.4'	Dec N18°57.50	d -12.3'	HP 59.1'
1	179 50.71 194°56.86	37.44	86°12.37	8.5'	18°45.24	-12.3 -12.4'	59.1'
2	209°57.01	38.34	100°39.87	8.6'	18°32.87	-12.5'	59.1'
3	224°57.17	• • 39.23	115°7.45	8.7'	18°20.39	-12.6'	59.1'
4 5	239°57.32 254°57.47	40.13 41.02	129°35.12 144°2.88	8.8' 8.8'	18°7.81 17°55.13	-12.7' -12.8'	59.1' 59.1'
6	254°57.47 269°57.62	41.02 N09°41.92	144 2.88 158° 30.72	8.8'	N17°42.35	-12.8 -12.9'	59.1'
7	284°57.77	42.81	172°58.65	9.0'	17°29.47	-13.0'	59.1
8	299°57.93	43.71	187°26.67	9.1'	17°16.49	-13.1'	59.1'
9	314°58.08	• • 44.60	201°54.76	9.2'	17°3.41	-13.2'	59.1'
10 11	329°58.23 344°58.38	45.50 46.39	216°22.95 230°51.21	9.3' 9.3'	16°50.24 16°36.97	-13.3' -13.4'	59.1' 59.1'
11	344 58.38 359°58.53	46.39 N09°47.28	245°19.56	9.3	N16°23.62	-13.4'	59.1'
13	14°58.68	48.18	259°48.00	9.5'	16°10.17	-13.5'	59.1'
14	29°58.84	49.07	274°16.51	9.6'	15°56.64	-13.6'	59.1'
15	44°58.99	• • 49.96	288°45.10	9.7'	15°43.02	-13.7'	59.1'
16 17	59°59.14 74°59.29	50.85 51.74	303°13.78 317°42.53	9.8' 9.8'	15°29.31 15°15.53	-13.8' -13.9'	59.1' 59.1'
18	89°59.44	N09°52.64	332°11.36	9.9'	N15°1.66	-13.9'	59.1
19	104°59.59	53.53	346°40.27	10.0'	14°47.71	-14.0'	59.1'
20	119°59.74	54.42	1°9.26	10.1'	14°33.68	-14.1'	59.1'
21 22	134°59.89 150°0.04	· · 55.31 56.20	15°38.32 30°7.46	10.1' 10.2'	14°19.57 14°5.39	-14.2' -14.3'	59.0' 59.0'
22	165° 0.19	56.20 57.09	30° 7.46 44° 36.67	10.2	14°5.39 13°51.14	-14.3' -14.3'	59.0° 59.0'
	SD = 15.9'	d = 0.9'			D = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	39-62%	
13	00:43	00:36	12:01	18:05	05:36		
14	00:28	00:21	12:00	19:02	06:34		
15	00:13	00:06	12:00	19:55	07:29		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	203°55.07	207°58.68 \$03°19.32		64°8.08 N16°42.95	185°48.16 N05°15.72	
1	218° 57.54	222°58.34 18.17		79°10.52 42.94	200°50.33 15.84	Alpheratz 357°33.16 29°14.36
2	234°0.00	237°58.00 17.03		94°12.96 42.92	215° 52.50 15.96	Ankaa 353°5.72 -42°9.40
3	249°2.47	252°57.66 · · 15.88		109°15.41 · · 42.91	230°54.68 · · 16.08	Schedar 349°29.44 56°41.14
4	264°4.93	267°57.32 14.73		124°17.85 42.90	245° 56.85 16.19	Diphda 348°45.75 -17°50.23
5	279°7.39	282°56.98 13.59		139°20.29 42.89	260°59.02 16.31	Achernar 335°19.40 -57°5.87
6	294°9.86	297°56.63 \$03°12.44		154°22.73 N16°42.88	276°1.19 N05°16.43	Hamal 327°49.43 23°35.43
7	$309^{\circ}12.32$	312°56.29 11.29		169°25.17 42.87	291°3.36 16.55	Polaris 313°31.16 89°22.82
8	324° 14.79	327°55.95 10.14	4 178°49.05 36.28	184°27.61 42.86	306°5.54 16.66	Acamar 315°10.76 -40°11.81
9	339° 17.25	342°55.61 · · 9.00	193°51.15 · · 36.06	199°30.05 •• 42.84	321°7.71 · · 16.78	Menkar 314°4.50 4°11.73
10	$354^{\circ}19.71$	357°55.27 7.89	5 208°53.24 35.84	214°32.49 42.83	336°9.88 16.90	Mirfak 308°26.02 49°57.51 Aldebaran 290°37.73 16°33.79
11	9°22.18	12°54.93 6.70) 223°55.33 35.62	229°34.93 42.82	351°12.05 17.02	Rigel 281°2.28 -8°10.35
12	24°24.64	27°54.59 S 03°5.59	5 238°57.42 N16°35.40	244°37.37 N16°42.81	6°14.22 N05°17.13	Capella 280°19.42 46°1.58
13	$39^{\circ}27.11$	42°54.25 4.40		259°39.81 42.80	21°16.40 17.25	Bellatrix 278°21.07 6°22.36
14	54° 29.57	57°53.91 3.2		274°42.25 42.78	36° 18.57 17.37	Elnath 277°59.73 28°37.81
15	69°32.03	72°53.57 · · 2.10		289°44.69 · · 42.77	51°20.74 · · 17.48	Alnilam 275°36.02 -1°11.20
16	84°34.50	87°53.23 03°0.96		304°47.12 42.76	66°22.91 17.60	Betelgeuse 270°50.23 7°24.63
17	99°36.96	102°52.89 02°59.83		319°49.56 42.75	81°25.09 17.72	Canopus 263°51.77 -52°42.89
18	114°39.43	117°52.55 S02°58.66		334°52.00 N16°42.73	96°27.26 N05°17.84	Sirius 258°24.70 -16°45.43
19	129°41.89	132°52.21 57.53		349°54.44 42.72	111°29.43 17.95	Adhara 255°4.49 -29°0.81
20	144° 44.35	147°51.87 56.30		4°56.87 42.71	126°31.60 18.07	Procyon 244°48.91 5°9.16
21 22	159° 46.82 174° 49.28	162°51.53 · · 55.23 177°51.19 54.00		19°59.31 · · 42.69 35°1.75 42.68	141°33.77 · · 18.19 156°35.95 18.30	Pollux 243°15.05 27°57.60
23	174 49.26 189°51.75	177 51.19 54.00 192°50.85 52.93		50°4.18 42.67	156°35.95 18.30 171°38.12 18.42	Avior 234°13.89 -59°36.16
23	109 51.75					Suhail 222°44.80 -43°32.89
Mer.	pass. 10:23	ν -0.3 $'$ d-1.1 $'$ m-3.89	$\nu 2.1' \ d$ -0.2' m-0.01	ν 2.4′ <i>d</i> -0.0′ m-2.23	$ u 2.2' \ d0.1' \ { m m0.69}$	Miaplacidus 221°37.56 -69°50.09
		-				Alphard 217°45.80 -8°46.84
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.29 11°49.89
0	204°54.21	207°50.51 \$02°51.76		65°6.62 N16°42.65	186°40.29 N05°18.54	Dubhe 193°38.27 61°36.28
1	219° 56.67	222°50.17 50.60		80°9.05 42.64	201°42.46 18.66	Denebola 182°22.78 14°25.02
2	234° 59.14	237°49.83 49.45		95°11.49 42.63	216° 44.64 18.77	Gienah 175°41.36 -17°41.83
3	250°1.60	252°49.49 · · 48.30		110°13.92 · · 42.61	231°46.81 · · 18.89	Acrux 172°57.33 -63°15.24
4	265°4.07	267° 49.15 47.1!		125°16.35 42.60	246° 48.98 19.01	Gacrux 171°48.99 -57°16.18
5	280°6.53	282°48.81 46.00		140°18.79 42.59	261°51.15 19.12	Alioth 166°10.81 55°48.63
6	295°8.99	297°48.47 S02°44.8		155°21.22 N16°42.57	276°53.32 N05°19.24	Spica 158°20.01 -11°18.41
7	$310^{\circ}11.46$	312°48.14 43.70	_	170°23.66 42.56	291°55.50 19.36	Alkaid 152°50.06 49°10.47 Hadar 148°32.68 -60°30.36
8	325° 13.92	327° 47.80 42.54		185°26.09 42.54	306° 57.67 19.48	Hadar 148°32.68 -60°30.36 Menkent 147°55.01 -36°30.38
9	$340^{\circ}16.39$	342°47.46 · · 41.39		200°28.52 · · 42.53	321°59.84 · · 19.59	Arcturus 145°45.88 19°2.23
10	$355^{\circ}18.85$	357° 47.12 40.24	4 209°43.17 30.42	215°30.95 42.52	337°2.01 19.71	Rigil Kent. 139°37.05 -60°56.93
11	$10^{\circ}21.31$	12°46.78 39.09	9 224°45.23 30.19	230°33.38 42.50	352°4.19 19.83	Kochab 137°18.76 74°2.39
12	25°23.78	27°46.44 S 02°37.93		245°35.82 N16°42.49	7°6.36 N05°19.94	Zuben'ubi 136°53.63 -16°9.44
13	40°26.24	42°46.10 36.78		260°38.25 42.47	22°8.53 20.06	Alphecca 126°1.85 26°37.15
14	55°28.71	57° 45.77 35.63		275°40.68 42.46	37°10.70 20.18	Antares 112°13.27 -26°29.57
15	70°31.17	72°45.43 · · 34.48		290°43.11 · · 42.44	52°12.88 · · 20.29	Atria 107°5.43 -69°4.38
16	85°33.64	87°45.09 33.33		305°45.54 42.43	67°15.05 20.41	Sabik 102°0.43 -15°45.56
17	100°36.10	102°44.75 32.17		320°47.97 42.41	82°17.22 20.53	Shaula 96°7.61 -37°7.32
18	115° 38.56	117°44.42		335°50.40 N16°42.40	97°19.39 N05°20.64	Rasalhague 95°56.64 12°32.23
19	130°41.03	132°44.08 29.86		350°52.83 42.38	112°21.57 20.76	Eltanin 90°41.07 51°28.79
20 21	145°43.49 160°45.96	147°43.74 28.73 162°43.40 •• 27.59		5°55.26 42.37 20°57.69 · · 42.35	$127^{\circ}23.74$ 20.88 $142^{\circ}25.91$ · · · 21.00	Kaus Aust. 83°29.90 -34°22.18
22	175° 48.42	177°43.07 26.40		36°0.11 42.34	157°28.08 21.11	Vega 80°31.83 38°48.24
23	190° 50.88	192°42.73 25.24		51°2.54 42.32	172°30.26 21.23	Nunki 75°45.37 -26°15.69
						Altair 61°58.14 8°56.29
Mer.	pass. 10:19	ν -0.3' d-1.2' m-3.88	$\nu 2.1' \ d$ -0.2' m0.01	ν 2.4′ <i>d</i> -0.0′ m-2.22	$ u 2.2' \ d0.1' \ m0.70$	Peacock 53°2.91 -56°38.56
						Deneb 49°24.62 45°22.39
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.12 9°59.90
0	205° 53.35	207°42.39		66°4.97 N16°42.31	187°32.43 N05°21.35	Al Na'ir 27° 30.86 -46° 49.54
1	220° 55.81	222° 42.05 22.93		81°7.40 42.29	202°34.60 21.46	Fomalhaut 15°12.74 -29°28.58 Scheat 13°43.66 28°13.71
2	235° 58.28	237°41.72 21.78		96°9.82 42.27	217°36.77 21.58	Markab 13°28.28 15°21.02
3	251°0.74	252°41.38 · · 20.62		111°12.25 · · 42.26	232°38.95 · · 21.70	
4	266°3.20	267°41.04 19.4	_	126°14.68 42.24	247°41.12 21.81	Apr 16 Fri SHA Mer.pass
5	281°5.67	282°40.71 18.33		141°17.10 42.23	262°43.29 21.93	Venus 4°3.61 10:08
6	296°8.13	297°40.37 S 02°17.10		156°19.53 N16°42.21	277°45.46 N05°22.05	Mars 214° 37.20 20:03
7	311° 10.60	312°40.03 16.00		171°21.95 42.19	292°47.64 22.16	Jupiter 220°13.01 19:40
8	326° 13.06	327°39.70 14.84		186°24.38 42.18	307°49.81 22.28	Saturn 341°53.09 11:35
9	341°15.52	342°39.36 · · 13.69		201°26.80 · · 42.16	322°51.98 · · 22.40	Apr 17 Sat SHA Mer.pass
10	356° 17.99	357°39.02 12.53		216°29.23 42.14	337°54.16 22.51	Venus 2°56.30 10:09
11	11°20.45	12°38.69 11.38		231°31.65 42.13	352°56.33 22.63	Mars 214°28.22 20:00
12	26°22.92	27°38.35		246°34.08 N16°42.11	7°58.50 N05°22.75	Jupiter 220°12.41 19:36
13	41°25.38	42°38.02 9.00		261°36.50 42.09	23°0.67 22.86	Saturn 341°46.08 11:32
14 15	56°27.84 71°30.31	57°37.68 7.93 72°37.34 · · 6.79		276°38.92 42.08 291°41.35 · · 42.06	38°2.85 22.98	
15 16	71°30.31 86°32.77	87°37.01 5.59		306° 43.77 42.04	53°5.02 · · 23.09 68°7.19 23.21	Apr 18 Sun SHA Mer.pass
10 17	101°35.24	102°36.67 4.43		300 43.77 42.04 321°46.19 42.02	83°9.36 23.33	Venus 1°49.04 10:09
18	101 35.24 116° 37.70	117°36.34 S02°3.28		336°48.61 N16°42.01	98°11.54 N05°23.44	Mars 214°18.69 19:56 Jupiter 220°11.62 19:33
19	131° 40.16	132°36.00 2.12		351°51.03 41.99	113°13.71 23.56	Saturn 341°39.08 11:28
20	146° 42.63	147°35.67 02°0.96		6°53.46 41.97	128° 15.88 23.68	
21	161°45.09	162°35.33 01°59.80		21°55.88 · · 41.95	143°18.06 · · 23.79	Horizontal parallax
22	176° 47.56	177°35.00 58.64	_	36°58.30 41.94	158° 20.23 23.91	Venus: 0.1
23	191°50.02	192°34.66 57.49	9 45°59.05 21.74	52°0.72 41.92	173°22.40 24.03	Mars: 0.2
Mar	pass. 10:15	ν-0.3' d-1.2' m-3.88	$\nu 2.1' \ d$ -0.2' m0.03	ν2.4' d-0.0' m-2.21	ν2.2' d0.1' m0.70	
ivier.	pass. 10.13	ν-0.5 u-1.2 III-3.00	ν Δ.1 u-υ.2 IIIυ.υ3	ν Δ. ¬ U-U.U III-Δ.Ζ1	ν Δ.Ζ. UU.1 IIIU./U	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°0.34	N09°57.98	59°5.95	10.4'	$N13^{\circ}36.81$	-14.4'	59.0'
1	195° 0.49	58.87	73°35.31	10.4	13°22.42	-14.5'	59.0'
2	210° 0.64 225° 0.79	09°59.76 10°0.65	88°4.74 102°34.24	10.5' 10.6'	13°7.95 12°53.42	-14.5' -14.6'	59.0' 59.0'
4	240° 0.94	1.54	117°3.81	10.6'	12°38.82	-14.7'	59.0'
5	255°1.09	2.42	131°33.45	10.7'	$12^{\circ}24.16$	-14.7'	59.0'
6	270°1.23	N10°3.31	146°3.16	10.8'	N12°9.43	-14.8'	59.0'
7 8	285° 1.38 300° 1.53	4.20 5.09	160°32.93 175°2.77	10.8' 10.9'	11°54.65 11°39.80	-14.8' -14.9'	59.0' 59.0'
9	315° 1.68	• • 5.97	189°32.67	11.0'	11°24.90	-15.0'	59.0'
10	330° 1.83	6.86	204°2.64	11.0'	11°9.94	-15.0'	59.0'
11 12	345°1.98 0°2.12	7.75 N10°8.63	218°32.67 233°2.77	11.1' 11.2'	10°54.92 N10°39.85	-15.1' -15.1'	58.9' 58.9'
13	15° 2.27	9.52	233 2.77 247°32.92	11.2'	10°24.73	-15.1 -15.2'	58.9'
14	30° 2.42	10.41	262°3.13	11.3'	10°9.56	-15.2'	58.9'
15	45° 2.57	• • 11.29	276°33.40	11.3'	09°54.34	-15.3'	58.9'
16 17	60°2.71 75°2.86	12.18 13.06	291°3.73 305°34.12	11.4' 11.4'	09°39.08 09°23.77	-15.3' -15.4'	58.9' 58.9'
18	90° 3.01	N10°13.95	320°4.56	11.5'	N09°8.41	-15.4'	58.9'
19	105°3.15	14.83	334°35.05	11.5'	08°53.01	-15.4'	58.9'
20	120°3.30	15.71	349°5.60	11.6'	08°37.57	-15.5'	58.9'
21 22	135° 3.45 150° 3.59	· · 16.60 17.48	3°36.20 18°6.85	11.6' 11.7'	08°22.10 08°6.58	-15.5' -15.6'	58.9' 58.8'
23	165° 3.74	18.36	32°37.55	11.7' 11.7'	08 6.58 07°51.03	-15.6'	58.8'
	SD = 15.9'	d = 0.9'			D = 16.1'		
				JI			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180° 3.89 195° 4.03	N10°19.25 20.13	47°8.30 61°39.09	11.8' 11.8'	N07°35.44 07°19.82	-15.6' -15.7'	58.8' 58.8'
2	210° 4.18	21.01	76°9.93	11.0	07 19.82 07°4.16	-15.7'	58.8'
3	225° 4.32	• • 21.89	90°40.82	11.9'	06°48.48	-15.7'	58.8'
4	240° 4.47	22.78	105°11.75	12.0'	06°32.76	-15.7'	58.8'
5 6	255° 4.61 270° 4.76	23.66 N10°24.54	119°42.72 134°13.74	12.0' 12.1'	06°17.02 N06°1.26	-15.8' -15.8'	58.8' 58.8'
7	285° 4.90	25.42	148°44.79	12.1'	05°45.46	-15.8'	58.7'
8	300° 5.05	26.30	163°15.89	12.1'	05°29.65	-15.8'	58.7'
9	315° 5.19	•• 27.18	177°47.02	12.2'	05°13.81	-15.9'	58.7'
10 11	330° 5.34 345° 5.48	28.06 28.94	192°18.19 206°49.39	12.2' 12.2'	04°57.96 04°42.08	-15.9' -15.9'	58.7' 58.7'
12	0° 5.63	N10°29.82	200 49.39 221°20.63	12.3	N04°26.19	-15.9'	58.7
13	15° 5.77	30.70	235°51.90	12.3'	04°10.28	-15.9'	58.7'
14	30°5.91	31.57	250°23.21	12.3'	03°54.35	-15.9'	58.7'
15 16	45° 6.06 60° 6.20	· · 32.45 33.33	264°54.54 279°25.91	12.4' 12.4'	03°38.42 03°22.47	-15.9' -16.0'	58.6' 58.6'
17	75° 6.34	34.21	293°57.30	12.4	03°6.51	-16.0'	58.6'
18	90°6.49	N10°35.09	308°28.73	12.4'	N02°50.54	-16.0'	58.6'
19	105°6.63	35.96	323°0.17	12.5'	02°34.57	-16.0'	58.6'
20 21	120° 6.77 135° 6.92	36.84 •• 37.72	337°31.65 352°3.14	12.5' 12.5'	02°18.59 02°2.60	-16.0' -16.0'	58.6' 58.6'
22	150°7.06	38.59	6°34.66	12.5'	01°46.62	-16.0'	58.5
23	165°7.20	39.47	21°6.20	12.6'	$01^{\circ}30.63$	-16.0'	58.5'
	SD = 15.9'	d = 0.9'		SI	D = 16.0'		
Sun 0	GHA 180° 7.34	Dec N10°40.34	GHA 35°37.77	u 12.6'	Dec N01°14.64	d -16.0'	HP 58.5'
1	180 7.34 195°7.48	41.22	50°9.35	12.6'	00° 58.65	-16.0'	58.5'
2	210°7.63	42.09	64°40.95	12.6'	$00^{\circ}42.66$	-16.0'	58.5'
3	225°7.77	• • 42.97	79°12.56	12.6'	00°26.68	-16.0'	58.5'
4 5	240°7.91 255°8.05	43.84 44.72	93°44.20 108°15.84	12.6' 12.7'	N00°10.70 S00°5.27	-16.0' 16.0'	58.5' 58.4'
6	270°8.19	N10°45.59	122°47.50	12.7'	S00°21.23	16.0'	58.4
7	285° 8.33	46.46	137°19.18	12.7'	00°37.18	15.9'	58.4'
8	300°8.47 315°8.61	47.34 •• 48.21	151°50.86 166°22.56	12.7' 12.7'	00°53.12 01°9.05	15.9' 15.9'	58.4' 58.4'
9 10	315°8.61 330°8.76	49.08	166°22.56 180°54.26	12.7' 12.7'	01°9.05 01°24.97	15.9'	58.4' 58.4'
11	345°8.90	49.95	195°25.97	12.7'	01°40.87	15.9'	58.3
12	0°9.04	N10°50.83	209°57.69	12.7'	S01°56.76	15.9'	58.3'
13 14	15° 9.18 30° 9.32	51.70 52.57	224°29.41 239°1.14	12.7' 12.7'	02°12.62 02°28.47	15.8' 15.8'	58.3' 58.3'
14 15	30° 9.32 45° 9.46	52.57 •• 53.44	239°1.14 253°32.87	12.7'	02°28.47 02°44.30	15.8'	58.3'
16	60° 9.59	54.31	$268^{\circ}4.61$	12.7'	03°0.11	15.8'	58.3'
17	75°9.73	55.18	282°36.34	12.7'	03°15.89	15.8'	58.2'
18 19	90° 9.87 105° 10.01	N10°56.05 56.92	297°8.08 311°39.82	12.7' 12.7'	\$03°31.65 03°47.38	15.7' 15.7'	58.2' 58.2'
20	105 10.01 120°10.15	50.92 57.79	326°11.55	12.7'	03 47.36 04°3.09	15.7'	58.2'
21	135°10.29	• • 58.66	340°43.28	12.7'	$04^{\circ}18.76$	15.6'	58.2'
22	150°10.43	10°59.53	355°15.01	12.7'	04°34.41	15.6'	58.2'
23	165°10.57	11°0.39	9°46.73	12.7'	04°50.03	15.6'	58.1'
	SD = 15.9'	d = 0.9'		SI	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-90%	
16	00:01	00:08	12:00	20:45	08:21		
17	00:16	00:23	12:00	21:33	09:09		
18	00:29	00:36	11:59	22:20	09:56		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	206° 52.48	207°34.32 S01°56.33	61°1.09 N16°21.50	67°3.14 N16°41.90	188°24.57 N05°24.14	
1	221°54.95	222°33.99 55.17	76°3.12 21.26	82°5.56 41.88	203°26.75 24.26	Alpheratz 357°33.15
2	236° 57.41	237°33.65 54.01	91°5.15 21.02	97°7.98 41.86	218°28.92 24.38	Ankaa 353° 5.71
3	251°59.88	252°33.32 · · 52.85	106°7.18 · · 20.77	112°10.40 · · 41.85	233°31.09 · · 24.49	Schedar 349°29.43
4	267°2.34	267°32.98 51.69	121°9.21 20.53	127°12.81 41.83	248°33.27 24.61	Diphda 348°45.75
5	282°4.80	282°32.65 50.53	136°11.24 20.29	142°15.23 41.81	263°35.44 24.72	Achernar 335°19.40
6	297°7.27	297°32.31 S 01°49.37	151°13.27 N16°20.05	157°17.65 N16°41.79	278°37.61 N05°24.84	Hamal 327°49.43
7	$312^{\circ}9.73$	312°31.98 48.22	166°15.29 19.81	172°20.07 41.77	293°39.79 24.96	Polaris 313°31.61
8	327°12.20	327°31.65 47.06	181°17.32 19.56	187°22.49 41.75	308°41.96 25.07	Acamar 315°10.77
9	342°14.66	342°31.31 · · 45.90	196°19.34 · · 19.32	202°24.90 · · 41.73	323°44.13 · · 25.19	Menkar 314° 4.50 Mirfak 308° 26.03
10	357° 17.12	357°30.98 44.74	211°21.37 19.08	217°27.32 41.71	338°46.31 25.31	Aldebaran 290°37.74
11	12° 19.59	12°30.64 43.58	226°23.39 18.83	232°29.74 41.69	353°48.48 25.42	Rigel 281°2.29
12	27°22.05	27°30.31 S01°42.42	241°25.41 N16°18.59	247°32.15 N16°41.68	8°50.65 N05°25.54	Capella 280°19.44
13	42°24.52	42°29.97 41.26	256°27.43 18.35	262°34.57 41.66	23°52.82 25.65	Bellatrix 278°21.09
14	57°26.98	57°29.64 40.10	271°29.46 18.10	277°36.99 41.64	38°55.00 25.77	Elnath 277°59.74
15	72°29.44	72°29.30 · · 38.94	286°31.47 · · 17.86	292°39.40 · · 41.62	53°57.17 · · 25.89	Alnilam 275°36.03
16	87°31.91 102°34.37	87°28.97 37.77 102°28.64 36.61	301°33.49 17.61 316°35.51 17.37	307°41.82 41.60	68° 59.34 26.00 84° 1.52 26.12	Betelgeuse 270°50.24
17 18	102 34.37 117°36.84	102°28.64 36.61 117°28.30 \$01°35.45	316°35.51 17.37 331°37.53 N16°17.12	322°44.23 41.58 337°46.64 N16°41.56	84°1.52 26.12 99°3.69 N05°26.23	Canopus 263°51.79
19	132°39.30	132°27.97 34.29	346°39.54 16.88	352°49.06 41.54	114°5.86 26.35	Sirius 258°24.72
20	147° 41.77	147°27.63 33.13	1°41.56 16.63	7°51.47 41.52	129°8.04 26.47	Adhara 255° 4.51
21	162°44.23	162°27.30 · · 31.97	16°43.57 · · 16.38	22°53.89 · · 41.50	144°10.21 · · 26.58	Procyon 244°48.93
22	177° 46.69	177°26.97 30.81	31°45.58 16.14	37°56.30 41.48	159°12.38 26.70	Pollux 243°15.07
23	192°49.16	192°26.63 29.65	46°47.60 15.89	52°58.71 41.46	174°14.56 26.81	Avior 234°13.93
_						Suhail 222°44.82
Mer.p	pass. 10:11	ν-0.3' d-1.2' m-3.88	ν2.0′ d-0.2′ m0.05	ν2.4' d-0.0' m-2.21	$\nu 2.2' \ d0.1' \ m0.70$	Miaplacidus 221°37.61
						Alphard 217°45.81
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.30
0	207°51.62	207°26.30 S 01°28.49	61°49.61 N16°15.64	68°1.12 N16°41.44	189°16.73 N05°26.93	Dubhe 193°38.30 Denebola 182°22.78
1	222°54.09	222°25.96 27.32	76°51.62 15.39	83°3.54 41.42	204°18.90 27.05	Gienah 175°41.37
2	237°56.55	237°25.63 26.16	91°53.63 15.15	98°5.95 41.40	219°21.08 27.16	Acrux 172°57.34
3	252°59.01	252°25.30 · · 25.00	106°55.64 · · 14.90	113°8.36 · · 41.38	234°23.25 · · 27.28	Gacrux 171°49.00
4	268°1.48	267°24.96 23.84	121°57.64 14.65	128°10.77 41.35	249°25.42 27.39	Alioth 166°10.82
5	283°3.94	282°24.63 22.68	136°59.65 14.40	143°13.18 41.33	264°27.60 27.51	Spica 158°20.01
6	298°6.41	297°24.30 S 01°21.51	152°1.66 N16°14.15	158°15.59 N16°41.31	279°29.77 N05°27.63	Alkaid 152°50.06
7	313°8.87	312°23.96 20.35	167° 3.66 13.90	173°18.00 41.29	294°31.94 27.74	Hadar 148°32.68
8	328°11.33	327°23.63 19.19	182° 5.66 13.65	188°20.41 41.27	309°34.12 27.86	Menkent 147°55.01
9	343°13.80	342°23.30 · · 18.02	197°7.67 · · 13.40	203°22.82 · · 41.25	324°36.29 · · 27.97	Arcturus 145°45.88
10	358° 16.26	357°22.96 16.86	212° 9.67 13.15	218°25.23 41.23	339°38.46 28.09	Rigil Kent. 139°37.05
11	13° 18.73	12°22.63 15.70 27°22.30 S01°14.54	227°11.67 12.90 242°13.67 N16°12.65	233°27.64 41.21	354°40.64 28.20 9°42.81 N05°28.32	Kochab 137°18.75
12	28°21.19 43°23.65	_		248°30.05 N16°41.18 263°32.46 41.16		Zuben'ubi 136°53.62
13 14	43 23.05 58°26.12	42°21.97 13.37 57°21.63 12.21	257°15.67 12.40 272°17.67 12.15	263°32.46 41.16 278°34.87 41.14	24°44.98 28.44 39°47.16 28.55	Alphecca 126° 1.84
15	73°28.58	72°21.30 · · 11.05	287°19.67 · · 11.90	293°37.27 · · 41.12	54°49.33 · · 28.67	Antares 112°13.26
16	88°31.05	87°20.97 9.88	302°21.66 11.65	308°39.68 41.10	69°51.51 28.78	Atria 107° 5.40
17	103°33.51	102°20.63 8.72	317°23.66 11.40	323°42.09 41.08	84°53.68 28.90	Sabik 102°0.41
18	118°35.97	117°20.30 S01°7.56	332°25.65 N16°11.14	338°44.49 N16°41.05	99°55.85 N05°29.01	Shaula 96°7.59
19	133°38.44	132°19.97 6.39	347°27.65 10.89	353°46.90 41.03	114°58.03 29.13	Rasalhague 95°56.62
20	148°40.90	147°19.63 5.23	2°29.64 10.64	8°49.31 41.01	130°0.20 29.25	Eltanin 90°41.04 Kaus Aust. 83°29.88
21	163°43.37	162°19.30 · · 4.06	17°31.63 · · 10.38	23°51.71 · · 40.99	145°2.37 · · 29.36	Vega 80°31.80
22	178°45.83	177°18.97 2.90	32°33.63 10.13	38°54.12 40.96	160°4.55 29.48	Nunki 75°45.35
23	193°48.29	192°18.64 1.73	47°35.62 9.88	53°56.52 40.94	$175^{\circ}6.72$ 29.59	Altair 61°58.12
Merr	pass. 10:07	ν-0.3' d-1.2' m-3.88	ν2.0' d-0.2' m0.07	ν2.4' d-0.0' m-2.20	$\nu 2.2' \ d0.1' \ m0.70$	Peacock 53°2.87
- IVICI.	7433. 10.07	ν-0.5 d-1.2 III-5.00	72.0 d-0.2 mo.01			Deneb 49°24.60
						Enif 33°37.10
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.84
0	208° 50.76	207°18.30 S01°0.57	62°37.61 N16°9.62	68°58.93 N16°40.92	190°8.89 N05°29.71	Fomalhaut 15°12.73
1	223°53.22	222°17.97 00°59.41	77°39.59 9.37	84°1.33 40.89	205°11.07 29.82	Scheat 13°43.64
2	238°55.69	237°17.64 58.24	92°41.58 9.11	99°3.74 40.87	220°13.24 29.94	Markab 13°28.27
3	253°58.15 269°0.62	252°17.31 · · · 57.08 267°16.97 55.91	107°43.57 · · 8.86 122°45.55 8.60	114°6.14 · · 40.85 129°8.54 40.83	235°15.42 · · · 30.05 250°17.59	Apr 19 Mon SHA
4 5	269°0.62 284°3.08	282°16.64 54.75	122°45.55 8.60 137°47.54 8.35	129°8.54 40.83 144°10.95 40.80	250°17.59 30.17 265°19.76 30.29	Venus 0°41.84
6	284 3.08 299°5.54	282 10.04 54.75 297°16.31 \$00°53.58	152°49.52 N16°8.09	159°13.35 N16°40.78	280°21.94 N05°30.40	Mars 214°8.60
7	314°8.01	312° 15.98 52.42	167°51.51 7.84	174°15.75 N10 40.76	295°24.11 30.52	Jupiter 220°10.65
8	329° 10.47	312 15.96 52.42 327°15.64 51.25	182°53.49 7.58	189°18.16 40.73	310°26.29 30.63	Saturn 341°32.09
9	344° 12.94	342°15.31 · · 50.09	197°55.47 · · 7.32	204°20.56 · · 40.71	325°28.46 · · 30.75	
10	359° 15.40	357°14.98 48.92	212°57.45 7.07	219°22.96 40.68	340°30.63 30.86	Apr 20 Tue SHA
11	14° 17.86	12°14.65 47.75	227°59.43 6.81	234°25.36 40.66	355°32.81 30.98	Venus 359°34.68
12	29°20.33	27°14.32 S 00°46.59	243°1.41 N16°6.55	249°27.76 N16°40.64	10°34.98 N05°31.09	Mars 213°57.99
13	44°22.79	42°13.98 45.42	258°3.39 6.29	264°30.16 40.61	25°37.16 31.21	Jupiter 220° 9.50
14	59°25.26	57°13.65 44.26	273°5.37 6.04	279°32.56 40.59	40°39.33 31.32	Saturn 341°25.11
15	74°27.72	72°13.32 · · 43.09	288°7.34 · · 5.78	294°34.96 · · 40.56	55°41.50 · · 31.44	Apr 21 Wed SHA
16	89°30.18	87°12.99 41.93	303° 9.32 5.52	309°37.36 40.54	70°43.68 31.55	Venus 358°27.55
17	104°32.65	102°12.66 40.76	318°11.29 5.26	324°39.76 40.52	85°45.85 31.67	Mars 213°46.85
18	119°35.11	117°12.32 S00°39.59	333°13.27 N16°5.00	339°42.16 N16°40.49	100°48.03 N05°31.79	Jupiter 220°8.17
19	134° 37.58	132°11.99 38.43	348°15.24 4.74	354°44.56 40.47	115°50.20 31.90	Saturn 341°18.14
20	149° 40.04	147°11.66 37.26	3°17.21 4.48	9°46.96 40.44	130°52.37 32.02	Horizontal parallax
21	164° 42.50	162°11.33 · · 36.09	18°19.18 · · 4.22	24°49.36 · · 40.42	145° 54.55 · · 32.13	Venus:
22 23	179° 44.97 194° 47.43	177°11.00 34.93 192°10.66 33.76	33°21.15 3.96 48°23.12 3.70	39°51.76 40.39 54°54.15 40.37	160° 56.72 32.25 175° 58.90 32.36	Mars:
Mer.p	pass. 10:03	ν-0.3′ d-1.2′ m-3.88	ν2.0′ d-0.3′ m0.09	ν2.4' d-0.0' m-2.19	ν2.2' d0.1' m0.70	

Dec 29°14.36 -42°9.38 56°41.13 -17°50.22 $\textbf{-57}^{\circ}\,5.85$ $23^{\circ}35.43$ 89°22.80 -40°11.79 4°11.73 49°57.50 16°33.79 -8°10.35 $46^{\circ}1.58$ $6^{\circ}22.37$ 28°37.81 -1°11.20 7°24.63 -52°42.88 -16°45.43 -29°0.81 5°9.16 27°57.60 -59°36.16 -43°32.90 -69°50.09 -8°46.84 11°49.90 $61^{\circ}36.30$ $14^{\circ}25.03$ -17°41.83 -63°15.26 -57°16.20 55°48.64 -11°18.41 49°10.49 -60°30.37 -36°30.39 $19^{\circ}2.24$ -60°56.94 $74^{\circ}\,2.41$ -16°9.44 26°37.16 -26°29.57 -69°4.39 -15°45.56 $-37^{\circ}7.32$ $12^{\circ}32.24$ 51°28.80 -34°22.18 38°48.25 -26°15.69 8°56.30 -56°38.55 45°22.39 9°59.90 -46°49.53 -29°28.57 28°13.71 15°21.02 Mer.pass 10:10 19:53 19:29 11:25 Mer.pass 10:10 19:50 19:25 11:21 Mer.pass 10:11 19:47 19:21 11:18

> 0.1 0.1

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.70	N11°1.26	24° 18.44	12.7'	S05°5.61	15.6'	58.1'
1 2	195°10.84 210°10.98	2.13 3.00	38°50.15 53°21.85	12.7' 12.7'	05°21.16 05°36.68	15.5' 15.5'	58.1' 58.1'
3	210 10.96 225°11.12	3.86	67° 53.54	12.7'	05°52.15	15.4	58.1
4	240°11.26	4.73	82°25.22	12.7'	06°7.60	15.4'	58.0'
5	255°11.39	5.60	96° 56.89	12.7'	06°23.00	15.4'	58.0'
6 7	270°11.53 285°11.67	N11°6.46 7.33	111°28.55 126°0.20	12.6' 12.6'	\$06° 38.36 06° 53.68	15.3' 15.3'	58.0' 58.0'
8	300°11.80	8.19	140°31.83	12.6'	00 55.06 07°8.96	15.2'	58.0'
9	315°11.94	• • 9.06	155°3.44	12.6'	$07^{\circ}24.19$	15.2'	57.9'
10	330°12.08	9.92	169°35.04	12.6'	07°39.38	15.1'	57.9'
11 12	345°12.21 0°12.35	10.79 N11°11.65	184°6.63 198°38.19	12.6' 12.5'	07°54.52 \$08°9.61	15.1' 15.0'	57.9' 57.9'
13	15°12.49	12.52	213° 9.74	12.5'	08°24.65	15.0'	57.9'
14	30°12.62	13.38	227°41.27	12.5'	$08^{\circ}39.65$	14.9'	57.8'
15 16	45°12.76 60°12.89	· · 14.24 15.11	242°12.77 256°44.26	12.5' 12.5'	08°54.59 09°9.47	14.9' 14.8'	57.8' 57.8'
17	75°13.03	15.11	271° 15.72	12.4'	09 9.47 09°24.31	14.8	57.8'
18	90°13.16	N11° 16.83	285°47.16	12.4'	S09°39.09	14.7'	57.8'
19	105°13.30	17.69	300° 18.58	12.4'	09°53.81	14.7'	57.7'
20 21	120°13.43 135°13.57	18.56 •• 19.42	314°49.97 329°21.33	12.4' 12.3'	10°8.47 10°23.07	14.6' 14.5'	57.7' 57.7'
22	150°13.70	20.28	343°52.67	12.3'	10°23.61	14.5'	57.7'
23	165°13.83	21.14	358°23.99	12.3'	10°52.09	14.4'	57.7'
	SD = 15.9'	d = 0.9'		SE	0 = 15.9'		
Tue 0	GHA 180°13.97	Dec N11°22.00	GHA 12° 55.27	u 12.3'	Dec \$11°6.51	d 14.4'	HP 57.6'
1	195°14.10	22.86	27° 26.53	12.3	11°20.86	14.4	57.6'
2	210°14.24	23.72	41°57.75	12.2'	$11^{\circ}35.15$	14.2'	57.6'
3	225°14.37	• • 24.58	56°28.95	12.2'	11°49.37	14.2'	57.6'
4 5	240°14.50 255°14.64	25.44 26.30	71°0.12 85°31.25	12.1' 12.1'	12°3.52 12°17.61	14.1' 14.0'	57.5' 57.5'
6	270°14.77	N11°27.15	100°2.35	12.1'	S12°31.62	13.9'	57.5'
7	285°14.90	28.01	114°33.42	12.0'	12°45.56	13.9'	57.5'
8 9	300°15.03 315°15.17	28.87 •• 29.73	129°4.46 143°35.46	12.0'	12°59.43 13°13.22	13.8'	57.5'
10	330°15.30	· · 29.73 30.58	143 35.40 158°6.43	12.0' 11.9'	13 13.22 13°26.94	13.7' 13.6'	57.4' 57.4'
11	345°15.43	31.44	172°37.36	11.9'	13°40.58	13.6'	57.4'
12	0°15.56	N11°32.30	187°8.25	11.9'	\$13°54.14	13.5'	57.4'
13 14	15°15.69 30°15.82	33.15 34.01	201°39.11 216°9.94	11.8' 11.8'	14°7.63 14°21.03	13.4' 13.3'	57.3' 57.3'
15	45°15.96	• • 34.86	230° 40.72	11.7'	14° 34.36	13.2'	57.3'
16	60°16.09	35.72	245° 11.47	11.7'	14°47.60	13.2'	57.3'
17 18	75°16.22 90°16.35	36.57 N11°37.43	259° 42.17 274° 12.84	11.7'	15°0.76 \$15°13.83	13.1'	57.2' 57.2'
18	90 16.35 105°16.48	38.28	274 12.84 288°43.47	11.6' 11.6'	15° 26.82	13.0' 12.9'	57.2'
20	120°16.61	39.14	303°14.06	11.5'	15°39.72		57.2'
21	135°16.74	• • 39.99	317° 44.61	11.5'	15°52.53	12.7'	57.2'
22 23	150°16.87 165°17.00	40.84 41.70	332° 15.12 346° 45.58	11.5' 11.4'	16° 5.25 16° 17.89	12.6' 12.5'	57.1' 57.1'
23	SD = 15.9'	d = 0.9'	340 43.30		0 = 15.7'	12.5	37.1
	$5D = 15.9^{\circ}$	$a = 0.9^{\circ}$		- SL	0 = 15.7		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°17.13	N11° 42.55	1°16.01	11.4'	\$16° 30.43	12.4'	57.1'
1 2	195°17.26 210°17.39	43.40 44.25	15°46.39 30°16.73	11.3' 11.3'	16° 42.88 16° 55.23	12.4' 12.3'	57.1' 57.0'
3	225°17.52	• • 45.10	44° 47.03	11.3'	17°7.49	12.2'	57.0'
4	240°17.64	45.95	59° 17.29	11.2'	17° 19.66	12.1'	57.0'
5 6	255°17.77 270°17.90	46.81 N11°47.66	73°47.50 88°17.67	11.2' 11.1'	17°31.73 \$17°43.70	12.0' 11.9'	57.0' 56.9'
7	285°18.03	48.51	102°47.79	11.1	17°55.57	11.8'	56.9
8	300°18.16	49.36	117° 17.88	11.0'	18°7.34	11.7'	56.9'
9	315°18.29 330°18.41	· · 50.21	131°47.91 146°17.91	11.0' 11.0'	18° 19.01 18° 30.58	11.6' 11.5'	56.9' 56.8'
10 11	330°18.41 345°18.54	51.05 51.90	146°17.91 160°47.86	10.9'	18° 30.58 18° 42.04	11.5	56.8'
12	0°18.67	N11°52.75	175° 17.76	10.9'	S18°53.41	11.3'	56.8'
13	15°18.80	53.60	189° 47.62	10.8'	19°4.66	11.1'	56.8'
14 15	30°18.92 45°19.05	54.45 •• 55.29	204° 17.44 218° 47.21	10.8' 10.7'	19° 15.81 19° 26.85	11.0' 10.9'	56.7' 56.7'
16	45° 19.05 60° 19.18	56.14	233° 16.94	10.7'	19° 20.83 19° 37.79	10.9	56.7'
17	75°19.30	56.99	247°46.63	10.6'	19°48.61	10.7'	56.7'
18	90°19.43 105°19.55	N11°57.84 58.68	262° 16.27 276° 45.86	10.6' 10.6'	\$19°59.33 20°9.93	10.6' 10.5'	56.6'
19 20	105°19.55 120°19.68	58.68 11°59.53	276° 45.86 291° 15.41	10.6	20°9.93 20°20.43	10.5	56.6' 56.6'
21	135°19.81	12°0.37	305°44.92	10.5'	$20^{\circ}30.81$	10.3'	56.6'
22	150°19.93	1.22	320°14.38	10.4	20°41.07	10.2'	56.5
23	165°20.06	2.06	334°43.80	10.4'	20°51.22	10.0'	56.5'
	SD = 15.9'	d = 0.9'		SE	0 = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	13-15 95-100%	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm hh:mm		
19	00:43	00:49	11:59	23:07	10:43		
20	00:56	01:02	11:59	23:55	11:30		
21	01:09	01:15	11:59	-:-	12:19		

h	Aries	•	nus	Mar	·s	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	209°49.90	207°10.33	S00°32.59		N16° 3.44	69°56.55	N16°40.34	191°1.07	N05°32.48			200112
1	224°52.36	222°10.00	31.43	78°27.06	3.18	84°58.95	40.32	206°3.24	32.59		357°33.14	29°14.36
2	239°54.83	237°9.67	30.26	93°29.03	2.92	100°1.35	40.29	221°5.42	32.71	Ankaa	353°5.70	-42°9.37
3	254° 57.29	252°9.34	• • 29.09	108°30.99	• • 2.66	115°3.74	• • 40.27	236°7.59	• • 32.82	Schedar	349°29.40	56°41.12
4	269°59.75	$267^{\circ}9.01$	27.93	123°32.96	2.39	130°6.14	40.24	251°9.77	32.94	Diphda	348°45.74	-17°50.21
5	285°2.22	282°8.67	26.76	138°34.92	2.13	145°8.53	40.22	266°11.94	33.05	l .	335°19.40	-57°5.84
6	300°4.68	297°8.34	S00°25.59	153°36.89	N16° 1.87	160°10.93	N16°40.19	281°14.12	N05°33.17		327°49.43 313°31.71	23°35.42
7	$315^{\circ}7.15$	312°8.01	24.42	168°38.85	1.61	175°13.32	40.16	296°16.29	33.28	Acamar		89°22.79
8	$330^{\circ}9.61$	327°7.68	23.26	183°40.81	1.34	190°15.72	40.14	311°18.46	33.40		315 10.78 314°4.50	-40°11.78 4°11.73
9	$345^{\circ}12.07$	342°7.35	• • 22.09	198°42.77	• • 1.08	205°18.11	• • 40.11	326°20.64	• • 33.51	Menkar	308° 26.03	
10	$0^{\circ}14.54$	357°7.01	20.92	213°44.73	0.82	220°20.51	40.09	341°22.81	33.63	Mirfak		49°57.49 16°33.79
11	$15^{\circ}17.00$	12°6.68	19.75	228°46.69	0.55	235°22.90	40.06	356°24.99	33.74	Aldebaran	290°37.74 281°2.30	
12	$30^{\circ}19.47$	27°6.35	S00°18.59	243°48.65	N16° 0.29	250°25.30	N16°40.03	11°27.16	N05°33.86	Rigel		-8°10.35 46°1.57
13	$45^{\circ}21.93$	42°6.02	17.42	258°50.61	$16^{\circ}0.03$	265°27.69	40.01	26°29.34	33.97	Capella	280°19.45 278°21.09	6°22.37
14	$60^{\circ}24.40$	57°5.69	16.25	273°52.56	15°59.76	280°30.08	39.98	41°31.51	34.09	Bellatrix Elnath	276 21.09 277°59.75	28°37.81
15	75°26.86	72°5.36	• • 15.08	288°54.52	• • 59.50	295°32.47	• • 39.95	56°33.69	• • 34.20	Alnilam	277 59.75 275°36.04	-1°11.20
16	$90^{\circ}29.32$	87°5.03	13.91	303°56.47	59.23	310°34.87	39.93	71°35.86	34.32		270°50.25	7°24.63
17	105°31.79	102°4.69	12.75	318°58.43	58.97	325°37.26	39.90	86°38.04	34.43	Betelgeuse Canopus	263°51.82	-52°42.88
18	120°34.25	117°4.36	S00°11.58	334°0.38	√ 15°58.70	340°39.65	N16°39.87	101°40.21	N05°34.55	Sirius	258°24.73	-16°45.43
19	$135^{\circ}36.72$	132°4.03	10.41	349°2.33	58.43	355°42.04	39.85	116°42.38	34.66	Adhara	255°4.52	-10 45.45 -29°0.81
20	$150^{\circ}39.18$	147°3.70	9.24	4°4.28	58.17	10°44.43	39.82	131°44.56	34.78	Procyon	244°48.94	5°9.16
21	165°41.64	162°3.37	• • 8.07	19°6.23	• • 57.90	25°46.82	• • 39.79	146°46.73	• • 34.89	Pollux	243°15.09	27°57.60
22	$180^{\circ}44.11$	177°3.04	6.91	34°8.18	57.63	40°49.21	39.77	161°48.91	35.01	Avior	243 15.09 234° 13.95	-59°36.16
23	195°46.57	192°2.70	5.74	$49^{\circ}10.13$	57.37	55°51.61	39.74	$176^{\circ}51.08$	35.12	Suhail	234 13.95 222°44.83	-59 30.10 -43°32.90
Mar	pass. 09:59	1/_O 3/ ⊿ 1	2′ m-3.87	$\nu 2.0' \ d$ -0.3	/ m0 11	1/2 A/ d O	.0′ m-2.18	1,2 2/ 40	.1′ m0.70	Miaplacidus	222 44.65 221°37.65	-43 32.90 -69°50.10
ivier.	Pass. 03.33	ν-0.5 u-1	111-3.01	ν2.0 u-0.3	1110.11	ν2. 4 u-0	.0 111-2.10	ν Δ.Ζ. UU	.1110.70		221 37.03 217°45.83	-8°46.84
										Regulus	207°32.31	11°49.90
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°38.32	61°36.31
0	$210^{\circ}49.04$	207°2.37	S00°4.57	64°12.08	√15°57.10	70°53.99	$N16^{\circ}39.71$	191°53.26	N05°35.23	Denebola	193 36.32 182°22.79	14°25.03
1	225°51.50	222°2.04	3.40	79°14.03	56.83	85°56.38	39.68	206°55.43	35.35		175°41.37	-17°41.84
2	240°53.96	237°1.71	2.23	94° 15.97	56.56	100°58.77	39.66	221°57.61	35.46	!	172°57.34	-63°15.27
3	255° 56.43	252°1.38	500°1.06	$109^{\circ}17.92$	• • 56.30	$116^{\circ}1.16$	• • 39.63	236°59.78	• • 35.58		171°49.00	-57°16.21
4	270°58.89	267°1.05	N00°0.11	124° 19.86	56.03	131°3.55	39.60	$252^{\circ}1.96$	35.69	1	166° 10.83	55°48.66
5	$286^{\circ}1.36$	282°0.72	1.28	139°21.81	55.76	146° 5.94	39.57	267°4.13	35.81		158° 20.01	-11°18.41
6	301°3.82	297°0.38	N00° 2.45	154°23.75	√15°55.49	161°8.33	N16°39.54	282°6.31	N05° 35.92	Alkaid	150° 50.01	49°10.50
7	$316^{\circ}6.29$	$312^{\circ}0.05$	3.61	169°25.69	55.22	176°10.72	39.52	297°8.48	36.04	Hadar	148° 32.66	-60°30.38
8	331°8.75	326°59.72	4.78	184°27.64	54.95	191°13.10	39.49	312°10.66	36.15		147°55.00	-36°30.40
9	$346^{\circ}11.21$	341°59.39	• • 5.95	199°29.58	• • 54.68	$206^{\circ}15.49$	• • 39.46	327°12.83	• • 36.27	1	145°45.87	19°2.25
10	1°13.68	356° 59.06	7.12	214°31.52	54.41	221°17.88	39.43	$342^{\circ}15.01$	36.38	1	139°37.03	-60°56.95
11	$16^{\circ}16.14$	11°58.73	8.29	229°33.45	54.14	236°20.26	39.40	357°17.18	36.50		137° 18.74	74°2.42
12	$31^{\circ}18.61$	26°58.40	N00°9.46	244°35.39	√15°53.87	251°22.65	N16°39.37	12°19.36	N05°36.61		136°53.61	-16° 9.44
13	$46^{\circ}21.07$	41°58.06	10.63	259°37.33	53.60	266°25.04	39.35	27°21.53	36.72	Alphecca	126°1.83	26°37.17
14	61°23.53	56°57.73	11.80	274°39.27	53.33	281°27.42	39.32	42°23.71	36.84		112° 13.24	-26°29.57
15	76°26.00	71°57.40	• • 12.97		• • 53.06	$296^{\circ}29.81$	• • 39.29	57°25.88	• • 36.95	Atria	107°5.35	-69° 4.40
16	91°28.46	86°57.07	14.14	304°43.14	52.78	311°32.19	39.26	72°28.06	37.07	Sabik	102°0.39	-15°45.56
17	106° 30.93	101°56.74	15.31	319°45.07	52.51	326°34.58	39.23	87°30.23	37.18	Shaula	96°7.57	-37°7.32
18	121°33.39	116°56.41	N00°16.48		√15°52.24	341°36.96	N16°39.20	102°32.41	N05°37.30	Rasalhague	95°56.60	12°32.24
19	136° 35.86	131°56.08	17.65	349°48.93	51.97	356°39.34	39.17	117°34.58	37.41	Eltanin	90°41.02	51°28.81
20	151°38.32	146°55.74	18.82	4° 50.87	51.70	11°41.73	39.14	132°36.76	37.52	Kaus Aust.	83°29.86	-34°22.18
21	166°40.78	161°55.41	• • 19.99		• • 51.42	26°44.11	• • 39.11	147°38.93	• • 37.64	Vega	80°31.78	38°48.26
22	181°43.25	176°55.08	21.16	34°54.73	51.15	41°46.49	39.08	162°41.11	37.75	Nunki	75°45.33	-26°15.68
23	196°45.71	191°54.75	22.33	49° 56.65	50.88	56°48.88	39.05	177°43.28	37.87	Altair	61°58.10	8°56.31
Mer	pass. 09:55	ν -0.3' d-1	2′ m-3.87	ν 1.9' d-0.3	/ m0 13	ν2 4' d-0	.0′ m-2.18	ν2 2' dΩ	.1′ m0.71	Peacock	53°2.84	-56°38.54
		- 0.5 u-1								Deneb	49°24.57	45°22.39
										Enif	33°37.08	9°59.91
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}30.81$	-46°49.52
0	211°48.18	206°54.42	N00°23.50		V15°50.60	71°51.26	N16°39.02	192°45.46	N05°37.98	Fomalhaut	$15^{\circ}12.71$	-29°28.56
1	226° 50.64	221°54.09	24.67	80°0.51	50.33	86°53.64	39.00	207°47.63	38.10	Scheat	$13^{\circ}43.62$	28°13.71
2	241°53.10	236°53.76	25.84	95°2.44	50.05	101°56.02	38.97	222°49.81	38.21	Markab	$13^{\circ}28.25$	15°21.03
3	256° 55.57	251°53.42	• • 27.01		• • 49.78	116°58.40	• • 38.94	237°51.98	• • 38.32	A 22 =:	611.6	
4	271°58.03	266° 53.09	28.18	125°6.29	49.50	132°0.79	38.91	252°54.16	38.44	Apr 22 Thu	SHA	Mer.pass
5	287°0.50	281°52.76	29.35	140°8.21	49.23	147°3.17	38.87	267°56.33	38.55		357°20.43	10:12
6	302°2.96	296°52.43	N00°30.52		V15°48.95	162°5.55	N16°38.84	282°58.51	N05°38.67		213°35.20	19:44
7	317°5.43	311°52.10	31.69	170° 12.05	48.68	177°7.93	38.81	298°0.68	38.78	Jupiter	220°6.65	19:17
8	332°7.89	326°51.77	32.86	185° 13.98	48.40	192°10.31	38.78	313°2.86	38.90	Saturn	341°11.17	11:14
9	347° 10.35	341°51.43	• • 34.03		• • 48.12	207°12.69	• • 38.75	328°5.04	• • 39.01	Apr 23 Fri	SHA	Mer.pass
10	2°12.82	356°51.10	35.20	215° 17.82	47.85	222°15.07	38.72	343°7.21	39.12		356° 13.34	10:12
11	17° 15.28	11°50.77	36.37	230° 19.74	47.57	237°17.45	38.69	358°9.39	39.24		213°23.04	19:41
12	32° 17.75	26°50.44	N00°37.54		V15°47.29	252°19.82	N16°38.66	13°11.56	N05°39.35	Jupiter	220°4.96	19:13
13	47° 20.21	41°50.11	38.71	260°23.57	47.02	267°22.20	38.63	28°13.74	39.47	Saturn	341°4.22	11:11
14	62°22.67	56°49.78	39.88	275° 25.49	46.74	282°24.58	38.60	43°15.91	39.58			
15	77°25.14	71°49.44	• • 41.05		• • 46.46	297°26.96	• • 38.57	58°18.09	• • 39.69	Apr 24 Sat	SHA	Mer.pass
16	92°27.60	86°49.11	42.22	305° 29.32	46.18	312°29.34	38.54	73°20.26	39.81	Venus	355°6.24	10:13
17	107°30.07	101°48.78	43.39	320°31.23	45.90	327°31.71	38.51	88°22.44	39.92	Mars		19:38
18	122°32.53	116°48.45	N00°44.57		V15°45.63	342°34.09	N16°38.47	103°24.62	N05° 40.04	Jupiter	220°3.08	19:10
19	137° 35.00	131°48.12	45.74 46.01	350° 35.06	45.35	357°36.47	38.44	118°26.79	40.15	Saturn	340°57.28	11:07
20	152° 37.46	146°47.79	46.91	5°36.97	45.07	12°38.84	38.41	133°28.97	40.26	Horizon	ıtal parallax	
21	167° 39.92	161°47.45	48.08		44.79	27°41.22	• • 38.38	148°31.14	• • 40.38	11011201	Venus:	0.1
22 23	182° 42.39 197° 44.85	176°47.12 191°46.79	49.25 50.42	35°40.79 50°42.70	44.51	42°43.59	38.35	163°33.32 178°35.49	40.49 40.60		Mars:	0.1
23	191 44.85		50.42		44.23	57°45.97	38.32					J.1
Mer.	pass. 09:51	ν -0.3′ d1	.2′ m-3.87	ν 1.9′ d-0.3	′ m0.15	ν 2.4′ d-0	.0′ m-2.17	ν2.2′ d0	.1′ m0.71			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 20.18	N12°2.91	349°13.18	10.3'	\$21°1.26	9.9'	56.5'
1 2	195°20.31 210°20.43	3.75 4.59	3°42.51 18°11.80	10.3' 10.2'	21°11.18 21°20.98	9.8' 9.7'	56.5' 56.4'
3	225° 20.55	• • 5.44	32°41.05	10.2'	21°20.98	9.7 9.6'	56.4
4	240°20.68	6.28	$47^{\circ}10.25$	10.2'	21°40.23	9.4'	56.4'
5	255°20.80	7.12	61°39.42	10.1'	21°49.68	9.3'	56.4'
6 7	270°20.93 285°21.05	N12°7.96 8.81	76°8.54 90°37.61	10.1' 10.0'	\$21°59.00 22°8.20	9.2' 9.1'	56.3' 56.3'
8	300°21.17	9.65	105°6.65	10.0'	22°17.28	9.0'	56.3'
9	315°21.30	•• 10.49	119°35.65	10.0'	22°26.24	8.8'	56.3'
10 11	330°21.42 345°21.54	11.33 12.17	134°4.61 148°33.52	9.9' 9.9'	22°35.08 22°43.79	8.7' 8.6'	56.2' 56.2'
12	0°21.67	N12°13.01	163°2.40	9.8'	S22°52.37	8.5'	56.2
13	15°21.79	13.85	177°31.24	9.8'	23°0.83	8.3'	56.2'
14	30°21.91	14.69	192°0.04	9.8'	23°9.16	8.2'	56.1'
15 16	45°22.03 60°22.15	· · 15.53 16.37	206°28.80 220°57.52	9.7' 9.7'	23°17.36 23°25.44	8.1' 7.9'	56.1' 56.1'
17	75°22.28	17.21	235°26.21	9.7'	23°33.39	7.8'	56.1'
18	90°22.40	N12°18.05	249°54.87	9.6'	S23°41.20	7.7'	56.0'
19 20	105°22.52 120°22.64	18.88 19.72	264°23.48 278°52.07	9.6' 9.5'	23°48.89 23°56.45	7.6' 7.4'	56.0' 56.0'
21	120 22.04 135°22.76	. 20.56	278 52.07 293°20.62	9.5' 9.5'	23 50.45 24°3.87	7.4 7.3'	56.0'
22	150° 22.88	21.39	307°49.13	9.5'	24°11.16	7.2'	55.9'
23	165°23.00	22.23	322°17.61	9.5'	24°18.32	7.0'	55.9'
	SD = 15.9'	d = 0.8'		SD	= 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.12	N12°23.07	$336^{\circ}46.07$	9.4'	S24°25.35	6.9'	55.9'
1	195°23.24 210°23.36	23.90 24.74	351°14.49 5°42.88	9.4' 9.4'	24°32.25 24°39.01	6.8' 6.6'	55.9' 55.8'
2	210°23.36 225°23.48	24.74	5°42.88 20°11.24	9.4	24° 39.01 24° 45.63	6.5	55.8'
4	240°23.60	26.41	34°39.57	9.3'	24°52.12	6.4	55.8'
5	255° 23.72	27.24	49°7.88	9.3'	24°58.47	6.2'	55.8'
6 7	270°23.84 285°23.96	N12°28.08 28.91	63°36.16 78°4.41	9.3' 9.2'	\$25°4.69 25°10.77	6.1' 5.9'	55.7' 55.7'
8	300°24.08	29.74	92°32.64	9.2	25°16.71	5.8'	55.7'
9	315°24.20	• • 30.58	$107^{\circ}0.84$	9.2'	25°22.52	5.7'	55.7'
10	330°24.31	31.41	121°29.03	9.2'	25°28.19 25°33.72	5.5'	55.6'
11 12	345°24.43 0°24.55	32.24 N12°33.07	135°57.19 150°25.33	9.1' 9.1'	25°33.72 \$25°39.11	5.4' 5.3'	55.6' 55.6'
13	15° 24.67	33.90	164°53.45	9.1'	25°44.36	5.1'	55.6'
14	30°24.78	34.73	179°21.55	9.1'	25°49.47	5.0'	55.6'
15 16	45°24.90 60°25.02	· · 35.56 36.40	193°49.63 208°17.70	9.1' 9.1'	25°54.45 25°59.28	4.8' 4.7'	55.5' 55.5'
17	75° 25.14	37.23	200° 17.70 222° 45.75	9.0'	26°3.97	4.6'	55.5'
18	90°25.25	N12°38.05	237°13.78	9.0'	S26°8.53	4.4'	55.5'
19	105°25.37 120°25.49	38.88	251°41.81 266°9.82	9.0'	26°12.94 26°17.21	4.3' 4.1'	55.4'
20 21	120°25.49 135°25.60	39.71 •• 40.54	280°37.82	9.0' 9.0'	26°21.34	4.1'	55.4' 55.4'
22	150° 25.72	41.37	295°5.81	9.0'	26°25.32	3.8'	55.4'
23	165°25.83	42.20	309°33.79	9.0'	26°29.17	3.7'	55.4'
	SD = 15.9'	d = 0.8'		SD	= 15.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°25.95	N12°43.03	324°1.76	9.0'	S 26°32.87	3.6'	55.3'
1 2	195°26.06 210°26.18	43.85 44.68	338°29.73 352°57.69	9.0' 9.0'	26°36.44 26°39.86	3.4' 3.3'	55.3' 55.3'
3	210 20.16 225°26.29	· · 45.51	7°25.65	9.0' 9.0'	26°43.14	3.1'	55.3'
4	240°26.41	46.33	21°53.61	9.0'	26°46.27	3.0'	55.2'
5	255° 26.52 270° 26.64	47.16 N12°47.98	36°21.56 50°49.51	9.0'	26°49.27	2.9'	55.2'
6 7	270°26.64 285°26.75	N12°47.98 48.81	65°17.47	9.0' 9.0'	\$26°52.12 26°54.83	2.7' 2.6'	55.2' 55.2'
8	300°26.86	49.63	79°45.42	9.0'	26°57.39	2.4'	55.2'
9	315°26.98	• • 50.46	94°13.38	9.0'	26°59.82	2.3'	55.1'
10 11	330°27.09 345°27.20	51.28 52.10	108°41.35 123°9.32	9.0' 9.0'	27°2.10 27°4.24	2.1' 2.0'	55.1' 55.1'
12	0°27.32	N12°52.93	137°37.29	9.0'	\$27°6.24	1.9'	55.1
13	15°27.43	53.75	152°5.28	9.0'	27°8.09	1.7'	55.1'
14 15	30° 27.54 45° 27.65	54.57 •• 55.39	166°33.27 181°1.28	9.0' 9.0'	27° 9.81 27° 11.38	1.6' 1.4'	55.0' 55.0'
15 16	45°27.65 60°27.77	56.22	181°1.28 195°29.29	9.0' 9.0'	27°11.38 27°12.81	1.4	55.0'
17	75°27.88	57.04	209°57.32	9.0'	27°14.09	1.1'	55.0'
18	90°27.99	N12°57.86	224°25.37	9.1'	\$27°15.24	1.0'	55.0'
19 20	105°28.10 120°28.21	58.68 12°59.50	238°53.43 253°21.50	9.1' 9.1'	27°16.24 27°17.11	0.9' 0.7'	54.9' 54.9'
21	135°28.32	13°0.32	267°49.60	9.1'	$27^{\circ}17.83$	0.6'	54.9'
22	150°28.43	1.14	282°17.71	9.1'	27°18.41	0.4'	54.9'
23	165°28.54	1.96	296°45.85	9.2'	27°18.85	0.3'	54.9'
	SD = 15.9'	d = 0.8'		SD	= 15.1'		

Lat.	Twi	light	Sunrise	Sunset	Twilight		
	Naut.	Civil	Cumico	Cumber	Civil	Naut.	
N 72°	////	////	02:52	21:09	////	////	
N 70°	////	01:32	03:17	20:44	22:33	////	
68°	////	02:14	03:35	20:25	21:48	////	
66°	////	02:41	03:50	20:09	21:19	////	
64°	01:21	03:02	04:02	19:57	20:58	22:44	
62°	01:58	03:19	04:12	19:46	20:41	22:04	
60°	02:23	03:32	04:21	19:37	20:27	21:37	
N 58°	02:43	03:44	04:29	19:29	20:15	21:17	
56°	02:58	03:54	04:36	19:23	20:05	21:01	
54°	03:12	04:02	04:42	19:16	19:56	20:47	
52°	03:23	04:10	04:47	19:11	19:48	20:36	
50°	03:33	04:17	04:52	19:06	19:41	20:26	
45°	03:53	04:31	05:02	18:55	19:27	20:05	
N 40°	04:08	04:43	05:11	18:46	19:15	19:50	
35°	04:20	04:52	05:19	18:39	19:05	19:37	
30°	04:31	05:00	05:25	18:32	18:57	19:27	
20°	04:47	05:14	05:36	18:21	18:43	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	18:48	
S 10°	05:18	05:42	06:04	17:53	18:14	18:39	
20°	05:25	05:51	06:13	17:43	18:06	18:32	
30°	05:31	05:59	06:24	17:33	17:57	18:25	
35°	05:34	06:04	06:30	17:26	17:52	18:22	
40°	05:37	06:09	06:37	17:20	17:47	18:19	
45°	05:40	06:14	06:45	17:11	17:42	18:16	
S 50°	05:43	06:21	06:54	17:02	17:35	18:13	
52°	05:44	06:24	06:58	16:57	17:32	18:12	
54°	05:45	06:27	07:03	16:53	17:29	18:11	
56°	05:46	06:30	07:09	16:47	17:26	18:09	
58°	05:47	06:33	07:15	16:41	17:22	18:08	
S 60°	05:49	06:37	07:21	16:34	17:18	18:07	
Lat.		Moonris	se		Moonset	į.	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat	
N 72°							
N 70°							
68°				01:42			
66°				02:38			
64°		00.11	_	03.12	02.52		

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

		Sun		Moon		
Day Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Duy	00 ^h	12 ^h	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-90%
22	01:21	01:27	11:59	00:45	13:10	
23	01:32	01:38	11:58	01:36	14:03	
24	01.44	01.40	11.58	02.20	14.56	

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	212°47.32	206°46.46 N00°51.59	65°44.61 N15°43.95	72°48.35 N16°38.28	193°37.67 N05°40.72
1	212 47.32 227°49.78	221°46.13 52.76	80°46.51 43.67	87°50.72 38.25	208°39.85 40.83
2	242°52.24	236°45.79 53.93	95°48.42 43.39	102°53.09 38.22	223°42.02 40.95
3	257° 54.71	251°45.46 · · 55.10	110°50.33 ·· 43.11	117°55.47 · · 38.19	238°44.20 · · 41.06
4	272°57.17	266° 45.13 56.27	125°52.23 42.82	132°57.84 38.15	253°46.37 41.17
5	287° 59.64	281°44.80 57.45	140°54.14 42.54	148° 0.22 38.12	268°48.55 41.29
6	303°2.10	296°44.47 N00°58.62	155°56.04 N15°42.26	163°2.59 N16°38.09	283°50.73 N05°41.40
7	318°4.57	311°44.13 00°59.79	170°57.94 41.98	178° 4.96 38.06	298°52.90 41.51
8	333°7.03	326°43.80 01°0.96	185°59.84 41.70	193°7.33 38.02	313°55.08 41.63
9	348°9.49	341°43.47 · · 2.13	201°1.75 · · 41.41	208° 9.71 · · · 37.99	328°57.25 · · 41.74
10	3° 11.96	356° 43.14 3.30	216°3.65 41.13	223°12.08 37.96	343°59.43 41.86
11	18° 14.42	11°42.81 4.47	231°5.54 40.85	238°14.45 37.93	359°1.61 41.97
12	33° 16.89	26°42.47 N01°5.64	246°7.44 N15°40.56	253°16.82 N16°37.89	14°3.78 N05°42.08
13	48° 19.35 63° 21.81	41° 42.14 6.82 56° 41.81 7.99	261°9.34 40.28 276°11.24 40.00	268°19.19 37.86 283°21.56 37.83	29°5.96 42.20 44°8.14 42.31
14 15	78° 24.28	71°41.48 · · 9.16	291°13.13 · · 39.71	283 21.50 37.83 298°23.93 · · 37.79	59°10.31 · · 42.42
16	93° 26.74	86°41.14 10.33	306° 15.03 39.43	313°26.30 37.76	74°12.49 42.54
17	108° 29.21	101°40.81 11.50	321°16.92 39.14	328°28.67 37.73	89°14.66 42.65
18	123°31.67	116°40.48 N01°12.67	336°18.82 N15°38.86	343°31.04 N16°37.69	104°16.84 N05°42.76
19	138° 34.14	131°40.15 13.84	351°20.71 38.57	358°33.41 37.66	119°19.02 42.88
20	153°36.60	146°39.81 15.01	6°22.60 38.29	13°35.78 37.62	134°21.19 42.99
21	168°39.06	161°39.48 · · 16.19	21°24.50 · · 38.00	28°38.15 · · 37.59	149°23.37 · · 43.10
22	$183^{\circ}41.53$	176°39.15 17.36	36°26.39 37.72	43°40.52 37.56	164°25.55 43.22
23	198°43.99	191°38.82 18.53	51°28.28 37.43	58°42.89 37.52	179°27.72 43.33
Merr	pass. 09:47	ν-0.3' d1.2' m-3.87	ν1.9' d-0.3' m0.17	ν2.4' d-0.0' m-2.16	ν2.2' d0.1' m0.71
	9833. 03.41	- 0.5 41.2 11 5.07			
	6114	6114	6114	G.114 B	
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	213° 46.46 228° 48.92	206°38.48 N01°19.70 221°38.15 20.87	66°30.16 N15°37.14 81°32.05 36.86	73°45.25 N16°37.49 88°47.62 37.45	194°29.90 N05°43.44 209°32.07 43.56
1 2	243°51.38	221 38.15 20.87 236°37.82 22.04			
3	243 51.36 258° 53.85	250 37.62 22.04 251°37.49 · · 23.21	96°33.94 36.57 111°35.83 · · 36.28	103°49.99 37.42 118°52.36 · · 37.38	224°34.25 43.67 239°36.43 · · 43.78
4	273° 56.31	266°37.15 24.39	126° 37.71 35.99	133°54.72 37.35	254°38.60 43.90
5	288° 58.78	281°36.82 25.56	141°39.60 35.71	148°57.09 37.31	269°40.78 44.01
6	304°1.24	296°36.49 N01°26.73	156°41.48 N15°35.42	163°59.45 N16°37.28	284°42.96 N05°44.12
7	319°3.71	311°36.15 27.90	171°43.37 35.13	179° 1.82 37.25	299°45.13 44.24
8	334°6.17	326° 35.82 29.07	186° 45.25 34.84	194° 4.18 37.21	314°47.31 44.35
9	349°8.63	341°35.49 · · 30.24	201°47.13 · · 34.55	209°6.55 · · 37.18	329°49.49 · · 44.46
10	$4^{\circ}11.10$	356°35.15 31.41	216°49.01 34.26	224°8.91 37.14	344°51.66 44.58
11	19° 13.56	11°34.82 32.59	231°50.89 33.97	239°11.28 37.10	359°53.84 44.69
12	34° 16.03	26°34.49 N01°33.76	246°52.77 N15°33.68	254°13.64 N16°37.07	14°56.02 N05°44.80
13	49° 18.49	41°34.15 34.93	261°54.65 33.39	269°16.01 37.03	29°58.19 44.91
14	64°20.95	56°33.82 36.10	276° 56.53 33.10	284°18.37 37.00	45°0.37 45.03
15	79° 23.42 94° 25.88	71°33.49 · · 37.27 86°33.15 38.44	291°58.41 · · 32.81 307°0.28 32.52	299°20.73 · · 36.96 314°23.10 36.93	60°2.55 · · 45.14 75°4.73 45.25
16 17	94 25.00 109° 28.35	101°32.82 39.61	322°2.16 32.23	314°23.10 36.93 329°25.46 36.89	75°4.73 45.25 90°6.90 45.37
18	124° 30.81	116°32.49 N01°40.79	337°4.03 N15°31.94	344°27.82 N16°36.85	10E°0 00 NOE°4E 40
19	139° 33.28	131°32.15 41.96	352°5.91 31.65	359°30.18 36.82	120°11.26 45.59
20	154° 35.74	146°31.82 43.13	7°7.78 31.36	14°32.54 36.78	125012 42 45 71
21	169° 38.20	161°31.49 · · 44.30	22°9.65 · · 31.06	29°34.90 · · 36.75	150°15.61 · · 45.82
22	184°40.67	176°31.15 45.47	37°11.53 30.77	44°37.27 36.71	165°17.79 45.93
23	199°43.13	191°30.82 46.64	52°13.40 30.48	59°39.63 36.67	180°19.96 46.04
Merr	pass. 09:43	ν-0.3' d1.2' m-3.87	$\nu 1.9' \ d$ -0.3' m0.19	ν2.4' d-0.0' m-2.15	ν 2.2' d0.1' m0.71
- IVICI.	pass. 09.45	ν-0.5 α1.2 III-5.07	ν1.9 d-0.5 iii0.19	ν2. 4 α-0.0 π-2.15	
_					
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	214° 45.60	206°30.49 N01°47.81	67°15.27 N15°30.19	74°41.99 N16°36.64	195°22.14 N05°46.16
1	229° 48.06 244° 50.52	221°30.15 48.99 236°29.82 50.16	82°17.14 29.89 97°19.01 29.60	89°44.35 36.60 104°46.71 36.56	210°24.32 46.27 225°26.50 46.38
2 3	244 50.52 259° 52.99	251°29.48 · · 51.33	112°20.87 · · 29.31	104°49.07 · · 36.53	225°26.50 46.38 240°28.67 · · 46.49
4	259 52.99 274° 55.45	266°29.15 52.50	112 20.87	134°51.43 36.49	255°30.85 46.61
5	289° 57.92	281°28.82 53.67	142°24.61 28.72	149°53.78 36.45	270°33.03 46.72
6	305°0.38	296°28.48 N01°54.84	157°26.47 N15°28.42	164°56.14 N16°36.42	285°35.20 N05°46.83
7	320°2.85	311°28.15 56.01	172°28.34 28.13	179°58.50 36.38	300°37.38 46.95
8	335°5.31	326°27.81 57.19	187°30.20 27.83	195° 0.86 36.34	315°39.56 47.06
9	350°7.77	341°27.48 · · 58.36	202°32.06 · · 27.54	210°3.22 · · 36.30	330°41.74 · · 47.17
10	5°10.24	$356^{\circ}27.14$ $01^{\circ}59.53$	217°33.93 27.24	225°5.57 36.27	345°43.91 47.28
11	20° 12.70	11°26.81 02°0.70	232°35.79 26.95	240°7.93 36.23	0°46.09 47.40
12	35° 15.17	26°26.48 N02°1.87	247°37.65 N15°26.65	255°10.29 N16°36.19	15°48.27 N05°47.51
13	50° 17.63	41°26.14 3.04	262°39.51 26.36	270°12.64 36.15	30°50.45 47.62
14	65°20.09	56°25.81 4.21	277°41.37 26.06	285°15.00 36.12	45°52.62 47.73
15 16	80°22.56	71°25.47 · · 5.38	292°43.23 · · 25.76	300°17.36 · · 36.08	60°54.80 · · 47.85 /
16 17	95° 25.02 110° 27.49	86°25.14 6.56 101°24.80 7.73	307°45.09 25.47 322°46.94 25.17	315°19.71 36.04 330°22.07 36.00	75°56.98 47.96 90°59.16 48.07
17 18	110°27.49 125°29.95	116°24.47 N02°8.90	322° 46.94 25.17 337° 48.80 N15° 24.87	345°24.42 N16°35.96	106°1.33 N05°48.18
19	140° 32.42	131°24.13 10.07	352°50.66 24.57	0°26.78 35.93	121°3.51 48.30
20	155° 34.88	146°23.80 11.24	7°52.51 24.28	15°29.13 35.89	136°5.69 48.41
21	170° 37.34	161°23.46 · · 12.41	22°54.37 · · 23.98	30°31.48 · · 35.85	151°7.87 · · 48.52
22	$185^{\circ}39.81$	176°23.13 13.58	37°56.22 23.68	45°33.84 35.81	166°10.05 48.63
23	200°42.27	191°22.79 14.75	52°58.07 23.38	60°36.19 35.77	181°12.22 48.74
Merr	pass. 09:39	ν-0.3' d1.2' m-3.87	ν1.9' d-0.3' m0.21	ν2.4' d-0.0' m-2.15	ν2.2' d0.1' m0.71
	Juss. Us.Js	ν 0.5 u1.2 III-3.07	ν1.3 α-0.3 IIIU.21	ν∠.¬ u=0.0 III=2.13	ν Δ.2 α Q.1 IIIQ./1

	Stars	
	SHA	Dec
Alpheratz	357°33.12	29°14.36
Ankaa	353°5.69	-42°9.35
Schedar Diphda	349°29.38 348°45.72	56°41.11 -17°50.20
Achernar	335° 19.39	-57°5.82
Hamal	327°49.41	23°35.42
Polaris	313°31.69	89°22.77 -40°11.77
Acamar Menkar	315°10.78 314°4.50	-40°11.77 4°11.74
Mirfak	308° 26.02	4 11.74 49°57.48
Aldebaran	290°37.74	16°33.79
Rigel	281°2.31	-8°10.34
Capella Bellatrix	280° 19.45 278° 21.10	46°1.56 6°22.37
Elnath	278° 21.10 277° 59.75	6° 22.37 28° 37.80
Alnilam	275°36.04	-1°11.19
Betelgeuse	270°50.25	7°24.63
Canopus	263°51.84	-52°42.87
Sirius	258°24.74 255°4.53	-16°45.42 -29°0.80
Adhara Procyon	255°4.53 244°48.95	-29°0.80 5°9.16
Pollux	243°15.09	27°57.59
Avior	234° 13.98	-59°36.16
Suhail	222°44.85	-43°32.91
Miaplacidus	221°37.69 217°45.83	-69°50.11 -8°46.84
Alphard Regulus	217°45.83 207°32.32	-8°46.84 11°49.90
Dubhe	193°38.34	61°36.31
Denebola	$182^{\circ}22.79$	14°25.04
Gienah	175°41.37	-17°41.84
Acrux	172°57.34	-63°15.29
Gacrux Alioth	171°49.00 166°10.83	-57°16.22 55°48.67
Spica	158° 20.00	-11°18.42
Alkaid	$152^{\circ}50.06$	$49^{\circ}10.52$
Hadar	148° 32.65	-60°30.40
Menkent Arcturus	147°54.99 145°45.86	-36°30.41 19°2.26
Arcturus Rigil Kent.	145°45.86 139°37.01	-60°56.97
Kochab	137° 18.73	74° 2.44
Zuben'ubi	136°53.60	-16° 9.45
Alphecca	126°1.81 112°13.21	26°37.18
Antares Atria	112°13.21 107°5.30	-26°29.57 -69°4.41
Sabik	107 5.30 102°0.37	-15°45.55
Shaula	96°7.54	-37°7.32
Rasalhague	95°56.58	12°32.25
Eltanin Kaus Aust.	90°40.99 83°29.82	51°28.82 -34°22.18
Naus Aust. Vega	83 29.82 80°31.75	-34 22.18 38°48.27
Nunki	75°45.30	-26°15.68
Altair	$61^{\circ}58.07$	$8^{\circ}56.31$
Peacock	53°2.80	-56°38.54
Deneb Enif	49°24.54 33°37.06	45°22.40 9°59.92
Al Na'ir	27°30.78	-46°49.51
Fomalhaut	$15^{\circ}12.68$	-29°28.55
Scheat	13°43.60	28°13.71
Markab	13°28.23	15°21.03
Apr 25 Sun	SHA	Mer.pass
Venus	353°59.14	10:13
Mars Jupiter	212°57.29 220°1.03	19:35 19:06
Saturn	340°50.35	11:04
Apr 26 Mon	SHA	Mer.pass
Venus	352°52.03	10:14
Mars	$212^{\circ}43.71$	19:32
Jupiter	219°58.80	19:02
•	340°43.44	11:00
Saturn		
Saturn Apr 27 Tue	SHA	Mer.pass
Saturn	SHA 351°44.89 212°29.67	Mer.pass 10:14 19:29
Apr 27 Tue Venus Mars Jupiter	SHA 351°44.89 212°29.67 219°56.39	10:14 19:29 18:58
Apr 27 Tue Venus Mars	SHA 351°44.89 212°29.67	10:14 19:29
Apr 27 Tue Venus Mars Jupiter Saturn	SHA 351° 44.89 212° 29.67 219° 56.39 340° 36.55	10:14 19:29 18:58 10:57
Apr 27 Tue Venus Mars Jupiter Saturn	SHA 351°44.89 212°29.67 219°56.39 340°36.55	10:14 19:29 18:58

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h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 28.65	N13°2.78	311°14.00	9.2'	S27°19.16	0.2'	54.8'
1	195°28.76	3.59	$325^{\circ}42.18$	9.2'	$27^{\circ}19.32$	0.0'	54.8'
2	210°28.87	4.41	340°10.39	9.2'	27°19.34	-0.1'	54.8'
3	225°28.98	• • 5.23	354°38.62	9.3'	27°19.22 27°18.96	-0.3'	54.8'
4 5	240°29.09 255°29.20	6.05 6.86	9° 6.87 23° 35.15	9.3' 9.3'	27°18.96 27°18.57	-0.4' -0.5'	54.8' 54.8'
6	270° 29.31	N13° 7.68	23 33.15 38° 3.46	9.3	\$27°18.03	-0.5	54.7
7	285° 29.42	8.50	52°31.80	9.4'	27°17.36	-0.8	54.7'
8	300°29.53	9.31	67° 0.18	9.4'	27°16.55	-0.9'	54.7'
9	315°29.64	• • 10.13	81°28.58	9.4'	$27^{\circ}15.60$	-1.1'	54.7'
10	330° 29.75	10.94	95°57.02	9.5'	27°14.52	-1.2'	54.7'
11	345°29.85	11.76	110°25.49	9.5'	27°13.30	-1.4'	54.7'
12 13	0°29.96 15°30.07	N13°12.57 13.39	124°53.99 139°22.54	9.5' 9.6'	\$27°11.94 27°10.45	-1.5' -1.6'	54.6' 54.6'
13 14	30°30.18	13.39	159 22.54 153°51.12	9.6' 9.6'	27 10.45 27°8.82	-1.6 -1.8'	54.6'
15	45° 30.28	. 15.01	168° 19.73	9.7'	27°7.06	-1.9'	54.6'
16	60°30.39	15.83	182°48.39	9.7'	27°5.17	-2.0'	54.6'
17	75°30.50	16.64	197°17.09	9.7'	$27^{\circ}3.14$	-2.2'	54.6'
18	90°30.60	N13°17.45	211°45.83	9.8'	S27°0.97	-2.3'	54.6'
19	105°30.71	18.26	226°14.61	9.8'	26°58.68	-2.4'	54.5'
20	120°30.82 135°30.92	19.07	240°43.43	9.9'	26°56.25	-2.6'	54.5'
21 22	135° 30.92 150° 31.03	· · 19.88 20.69	255°12.30 269°41.22	9.9' 10.0'	26°53.69 26°51.00	-2.7' -2.8'	54.5' 54.5'
23	165°31.13	20.09	284°10.18	10.0'	26°48.18	-2.6 -3.0'	54.5'
23			201 10.10			5.0	31.3
	SD = 15.9'	d = 0.8'		SL	0 = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°31.24 195°31.34	N13°22.31 23.12	298°39.18 313°8.24	10.1' 10.1'	\$26°45.23 26°42.15	-3.1' -3.2'	54.5' 54.5'
2	210° 31.34	23.12	313 8.24 327°37.34	10.1	26°38.94	-3.2 -3.3'	54.5'
3	210 31.45 225°31.55	23.93	342°6.49	10.2'	26°35.60	-3.5'	54.5 54.4'
4	240°31.66	25.55	356°35.69	10.3'	26°32.14	-3.6'	54.4'
5	255°31.76	26.36	11° 4.94	10.3'	26°28.55	-3.7'	54.4'
6	270°31.86	N13°27.16	25°34.24	10.4'	S26°24.83	-3.8'	54.4'
7	285°31.97	27.97	40°3.60	10.4'	26°20.99	-4.0'	54.4'
8	300°32.07	28.78	54°33.01	10.5'	26°17.02	-4.1'	54.4'
9 10	315°32.17 330°32.28	· · 29.58 30.39	69°2.47 83°31.98	10.5' 10.6'	26°12.93 26°8.71	-4.2' -4.3'	54.4' 54.4'
11	345° 32.38	31.20	98° 1.55	10.6'	26°4.37	-4.5'	54.4'
12	0°32.48	N13°32.00	112°31.18	10.7	S25°59.91	-4.6'	54.4'
13	15°32.59	32.81	127° 0.86	10.7'	25°55.33	-4.7'	54.3'
14	30°32.69	33.61	141°30.59	10.8'	25°50.62	-4.8'	54.3'
15	45°32.79	• • 34.41	156° 0.39	10.9'	25°45.80	-4.9'	54.3'
16	60° 32.89 75° 32.99	35.22	170°30.24 185°0.15	10.9' 11.0'	25°40.85 25°35.79	-5.1'	54.3'
17 18	90° 33.09	36.02 N13°36.82	185 0.15 199°30.11	11.0'	25 35.79 S25°30.61	-5.2' -5.3'	54.3' 54.3'
19	105° 33.19	37.63	214° 0.14	11.1'	25°25.31	-5.4'	54.3'
20	120°33.30	38.43	228°30.22	11.1'	25°19.89	-5.5'	54.3'
21	135°33.40	• • 39.23	243°0.37	11.2'	25°14.36	-5.6'	54.3'
22	150°33.50	40.03	257°30.57	11.3'	25°8.71	-5.8'	54.3'
23	165°33.60	40.83	272°0.84	11.3'	25°2.95	-5.9'	54.3'
	SD = 15.9'	d = 0.8'		SD	0 = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°33.70	N13°41.63	286°31.16	11.4'	\$24°57.08	-6.0'	54.3'
1	195°33.80	42.43	301°1.55	11.4'	24°51.09	-6.1'	54.3'
2	210°33.90 225°33.99	43.23 •• 44.03	315°31.99 330°2.50	11.5'	24°44.99	-6.2' -6.3'	54.2' 54.2'
3 4	225°33.99 240°34.09	· · 44.03 44.83	330°2.50 344°33.07	11.6' 11.6'	24°38.77 24°32.45	-6.3' -6.4'	54.2' 54.2'
5	255° 34.19	44.63 45.63	359° 3.70	11.7	24 32.43 24°26.02	-0.4 -6.5'	54.2'
6	270° 34.29	N13°46.43	13°34.39	11.8'	S24°19.47	-6.7'	54.2'
7	285°34.39	47.23	28°5.14	11.8'	$24^{\circ}12.82$	-6.8'	54.2'
8	300°34.49	48.02	42°35.96	11.9'	24°6.06	-6.9'	54.2'
9	315°34.59	• • 48.82	57° 6.84	11.9'	23°59.19	-7.0'	54.2'
10 11	330° 34.68 345° 34.78	49.62 50.41	71°37.78 86°8.78	12.0' 12.1'	23°52.22 23°45.14	-7.1' -7.2'	54.2' 54.2'
11	345°34.78 0°34.88	50.41 N13°51.21	86°8.78 100°39.85	12.1'	23°45.14 \$23°37.95	-7.2' -7.3'	54.2'
13	15° 34.97	52.00	115° 10.97	12.1	23°30.66	-7.4'	54.2'
14	30° 35.07	52.80	129°42.16	12.3'	23°23.27	-7.5	54.2'
15	45°35.17	• • 53.59	144°13.42	12.3'	$23^{\circ}15.78$	-7.6'	54.2'
16	60°35.26	54.39	158°44.73	12.4'	23°8.18	-7.7'	54.2'
17	75°35.36	55.18	173°16.11	12.4'	23°0.48	-7.8'	54.2'
18 19	90°35.46 105°35.55	N13°55.98 56.77	187°47.55 202°19.05	12.5' 12.6'	\$22°52.68 22°44.78	-7.9' -8.0'	54.2' 54.2'
20	105° 35.55 120° 35.65	56.77 57.56	202°19.05 216°50.61	12.6'	22°44.78 22°36.79	-8.0 -8.1'	54.2'
21	135° 35.74	• • 58.35	231°22.23	12.7'	22°28.69	-8.2	54.2'
22	150°35.84	59.15	245°53.92	12.7'	22°20.50	-8.3'	54.2'
23	165°35.93	59.94	260°25.67	12.8'	22°12.21	-8.4'	54.2'
	SD = 15.9'	d = 0.8'		SD	0 = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.	
	00 ^h	12 ^h	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-67%
25	01:55	02:00	11:58	03:22	15:48	
26	02:05	02:10	11:58	04:14	16:39	
27	02:15	02:20	11:58	05:04	17:28	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	215° 44.74	206°22.46 N02°15.92	67°59.92 N15°23.08	75°38.54 N16°35.73	196°14.40 N05°48.86	
1	230°47.20	221°22.12 17.09	83°1.77 22.78	90°40.90 35.69	211°16.58 48.97	Alpheratz 357°33.10 Ankaa 353°5.67
2	245° 49.66	236°21.78 18.27	98°3.62 22.48	105°43.25 35.66	226°18.76 49.08	Ankaa 353°5.67 Schedar 349°29.36
3	260°52.13	251°21.45 · · 19.44	113°5.47 · · 22.18	120°45.60 · · 35.62 135°47.95 35.58	241°20.93 · · 49.19	Diphda 348°45.71
4 5	275° 54.59 290° 57.06	266°21.11 20.61 281°20.78 21.78	128°7.32 21.88 143°9.17 21.58	135°47.95 35.58 150°50.31 35.54	256°23.11 49.31 271°25.29 49.42	Achernar 335°19.38
6	305° 59.52	296°20.44 N02°22.95	158°11.02 N15°21.28	165°52.66 N16°35.50	286°27.47 N05°49.53	Hamal 327°49.40
7	321°1.98	311°20.11 24.12	173°12.87 20.98	180°55.01 35.46	301°29.65 49.64	Polaris 313°31.80 Acamar 315°10.77
8	336°4.45	326°19.77 25.29	188°14.71 20.68	195°57.36 35.42	316°31.82 49.75	Menkar 314°4.49
9 10	351°6.91 6°9.38	341°19.43 · · 26.46 356°19.10 27.63	203°16.56 · · 20.38 218°18.40 20.08	210°59.71 · · 35.38 226°2.06 35.34	331°34.00 · · 49.87 346°36.18 49.98	Mirfak 308°26.02
11	21°11.84	11°18.76 28.80	233°20.24 19.77	241° 4.41 35.30	1°38.36 50.09	Aldebaran 290°37.75
12	36° 14.31	26°18.43 N02°29.97	248°22.09 N15°19.47	256° 6.76 N16° 35.26	16°40.54 N05°50.20	Rigel 281°2.31 Capella 280°19.46
13	51° 16.77	41°18.09 31.14	263°23.93 19.17	271° 9.11 35.22	31°42.72 50.31	Bellatrix 278°21.10
14	66° 19.23	56°17.75 32.31	278°25.77 18.87	286°11.46 35.18	46°44.89 50.43 61°47.07 · · 50.54	Elnath 277°59.76
15 16	81°21.70 96°24.16	71°17.42 · · 33.48 86°17.08 34.65	293°27.61 · · 18.56 308°29.45 18.26	301°13.80 · · 35.14 316°16.15 35.10	61°47.07 · · 50.54 76°49.25 50.65	Alnilam 275°36.05
17	111°26.63	101°16.74 35.82	323°31.29 17.96	331°18.50 35.06	91°51.43 50.76	Betelgeuse 270°50.26
18	126°29.09	116°16.41 N02°36.99	338°33.13 N15°17.65	346°20.85 N16°35.02	106°53.61 N05°50.87	Canopus 263°51.86 Sirius 258°24.75
19	141°31.55	131°16.07 38.16	353°34.97 17.35	1°23.20 34.98	121°55.79 50.99	Adhara 255°4.54
20 21	156° 34.02 171° 36.48	146°15.73 39.33 161°15.40 •• 40.50	8°36.80 17.05 23°38.64 · · 16.74	16°25.54 34.94 31°27.89 · · 34.90	136°57.96 51.10 152°0.14 · · 51.21	Procyon 244°48.96
22	186°38.95	176°15.06 41.67	38° 40.47 16.44	46°30.24 34.86	167°2.32 51.32	Pollux 243°15.10
23	201°41.41	191°14.72 42.84	53°42.31 16.13	61°32.58 34.82	182°4.50 51.43	Avior 234°14.01 Suhail 222°44.87
Merr	pass. 09:35	ν-0.3' d1.2' m-3.87	ν1.9' d-0.3' m0.23	ν2.4' d-0.0' m-2.14	$\nu 2.2' \ d0.1' \ m0.71$	Suhail 222°44.87 Miaplacidus 221°37.73
	Jass. 05.55	ν 0.5 d1.2 iii 5.07	- V1.5 U 0.5 III0.25			Alphard 217°45.84
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.32
0	216° 43.88	206°14.38 N02°44.01	68°44.14 N15°15.83	76°34.93 N16°34.78	197°6.68 N05°51.54	Dubhe 193°38.35
1	231° 46.34	221°14.05 45.18	83°45.98 15.52	91°37.27 34.73	212°8.86 51.66	Denebola 182°22.79 Gienah 175°41.37
2	246°48.80	236°13.71 46.35	98°47.81 15.22	106°39.62 34.69	227°11.04 51.77	Acrux 172°57.35
3	261°51.27	251°13.37 · · 47.52	113°49.64 · · 14.91	121°41.96 · · 34.65	242°13.21 · · 51.88	Gacrux 171°49.01
4 5	276°53.73 291°56.20	266°13.03 48.69 281°12.70 49.86	128° 51.47 14.60 143° 53.30 14.30	136°44.31 34.61 151°46.65 34.57	257°15.39 51.99 272°17.57 52.10	Alioth 166°10.83
6	306°58.66	296°12.36 N02°51.03	158°55.13 N15°13.99	166°49.00 N16°34.53	287°19.75 N05°52.21	Spica 158°20.00
7	$322^{\circ}1.12$	311°12.02 52.20	173° 56.96 13.69	181°51.34 34.49	302°21.93 52.33	Alkaid 152°50.06 Hadar 148°32.64
8	337°3.59	326°11.68 53.37	188°58.79 13.38	196°53.68 34.44	317°24.11 52.44	Menkent 147°54.98
9 10	352°6.05 7°8.52	341°11.35 · · 54.54 356°11.01 55.71	204°0.62 · · 13.07 219°2.44	211°56.03 · · 34.40 226°58.37 34.36	332°26.29 · · 52.55 347°28.47 52.66	Arcturus 145°45.85
11	22° 10.98	11°10.67 56.88	234°4.27 12.45	242° 0.71 34.32	2°30.64 52.77	Rigil Kent. 139°36.99
12	37° 13.44	26°10.33 N02°58.05	249°6.09 N15°12.15	257°3.06 N16°34.28	17°32.82 N05°52.88	Kochab 137°18.72 Zuben'ubi 136°53.59
13	52° 15.91	41°9.99 02°59.22	264°7.92 11.84	272° 5.40 34.23	32°35.00 52.99	Alphecca 126°1.80
14	67° 18.37	56°9.65 03°0.39	279°9.74 11.53	287°7.74 34.19	47°37.18 53.11	Antares 112°13.19
15 16	82°20.84 97°23.30	71°9.32 · · 1.56 86°8.98 2.73	294°11.56 · · 11.22 309°13.39	302°10.08 · · 34.15 317°12.42 34.11	62°39.36 · · 53.22 77°41.54 53.33	Atria 107°5.25
17	112°25.76	101°8.64 3.90	324° 15.21 10.60	332°14.76 34.06	92°43.72 53.44	Sabik 102°0.35
18	127°28.23	116°8.30 N03°5.06	339°17.03 N15°10.29	347°17.10 N16°34.02	107°45.90 N05°53.55	Shaula 96°7.51 Rasalhague 95°56.56
19	142°30.69	131°7.96 6.23	354°18.85 9.98	2°19.44 33.98	122°48.08 53.66	Eltanin 90°40.96
20 21	157° 33.16 172° 35.62	146°7.62 7.40 161°7.28 · · 8.57	9°20.67 9.67 24°22.49 • 9.36	17°21.78 33.94 32°24.12 · · 33.89	137°50.26 53.77 152°52.44 • 53.89	Kaus Aust. 83°29.80
22	172 33.02 187°38.09	176°6.94 9.74	39°24.30 9.05	47°26.46 33.85	167°54.61 54.00	Vega 80°31.73
23	202° 40.55	191°6.60 10.91	54°26.12 8.74	62°28.80 33.81	182°56.79 54.11	Nunki 75°45.27 Altair 61°58.05
Merr	pass. 09:32	ν-0.3' d1.2' m-3.87	ν1.8' d-0.3' m0.25	ν2.3' d-0.0' m-2.13	$\nu 2.2' \ d0.1' \ m0.71$	Peacock 53°2.75
	05.52	ν 0.5 d1.2 iii 5.07	- V1.0 U 0.5 III0.25			Deneb 49°24.51
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.03
0	217° 43.01	206°6.26 N03°12.08	69°27.94 N15°8.43	77°31.14 N16°33.76	197°58.97 N05°54.22	Al Na'ir 27°30.75 Fomalhaut 15°12.66
1	232° 45.48	221°5.92 13.24	84°29.75 8.12	92°33.48 33.72	213°1.15 54.33	Scheat 13°43.58
2	247° 47.94	236°5.58 14.41	99° 31.57 7.81	107°35.82 33.68	228°3.33 54.44	Markab 13°28.21
3	262°50.41 277°52.87	251°5.24 · · 15.58 266°4.90 16.75	114°33.38 ·· 7.49 129°35.19 7.18	122°38.15 · · 33.63 137°40.49	243°5.51 · · 54.55 258°7.69 54.66	Apr 28 Wed SHA
4 5	292°55.33	266°4.90 16.75 281°4.56 17.92	129° 35.19 7.18 144° 37.01 6.87	137°40.49 33.59 152°42.83 33.55	258°7.69 54.66 273°9.87 54.77	Venus 350°37.72
6	307° 57.80	296°4.22 N03°19.09	159°38.82 N15°6.56	167°45.17 N16°33.50	288°12.05 N05°54.89	Mars 212°15.19
7	323°0.26	311°3.88 20.25	174°40.63 6.24	182°47.50 33.46	303°14.23 55.00	Jupiter 219°53.81
8	338°2.73	326°3.54 21.42	189° 42.44 5.93	197°49.84 33.41	318°16.41 55.11	Saturn 340°29.67
9 10	353°5.19 8°7.65	341°3.20 · · 22.59 356°2.86 23.76	204° 44.25 · · 5.62 219° 46.06 5.30	212°52.17 · · 33.37 227°54.51 33.33	333°18.59 · · 55.22 348°20.77 55.33	Apr 29 Thu SHA
11	23° 10.12	11°2.52 24.93	234° 47.87 4.99	242°56.85 33.28	3°22.95 55.44	Venus 349°30.51
12	$38^{\circ}12.58$	26°2.18 N03°26.09	249°49.68 N15°4.68	257°59.18 N16°33.24	18°25.13 N05°55.55	Mars 212°0.27 Jupiter 219°51.05
13	53° 15.05	41°1.84 27.26	264°51.48 4.36	273°1.52 33.19	33°27.31 55.66	Saturn 340°22.80
14 15	68° 17.51 83° 19.97	56°1.50 28.43 71°1.16 · · 29.60	279°53.29 4.05 294°55.09 · · 3.73	288°3.85 33.15 303°6.18 · · 33.10	48°29.49 55.77 63°31.67 • 55.88	
16	98° 22.44	86°0.82 30.76	309° 56.90 3.42	318° 8.52 33.06	78°33.85 55.99	Apr 30 Fri SHA Venus 348°23.25
17	113°24.90	101°0.48 31.93	324°58.70 3.10	333°10.85 33.01	93°36.03 56.10	Mars 211°44.92
18	128° 27.37	116°0.13 N03°33.10	340°0.51 N15°2.79	348°13.19 N16°32.97	108°38.21 N05°56.22	Jupiter 219°48.13
19 20	143° 29.83 158° 32.30	130°59.79 34.26 145°59.45 35.43	355°2.31 2.47 10°4.11 2.15	3°15.52 32.92 18°17.85 32.88	123°40.39 56.33 138°42.57 56.44	Saturn 340°15.96
20	158 32.30 173°34.76	160°59.11 · · 36.60	25°5.91 · · 1.84	33°20.18 · · 32.83	153°44.75 · · 56.55	Horizontal parallax
22	$188^{\circ}37.22$	175°58.77 37.76	40°7.71 1.52	48°22.52 32.79	168°46.93 56.66	Venus:
23	203°39.69	190°58.42 38.93	55°9.51 1.20	63°24.85 32.74	183°49.11 56.77	Mars:
Mer.p	pass. 09:28	ν-0.3′ d1.2′ m-3.86	ν1.8′ d-0.3′ m0.27	ν2.3' d-0.0' m-2.13	ν2.2′ d0.1′ m0.71	

Dec 29°14.36

-42°9.33

56°41 10

-17°50.19

 $-57^{\circ}5.80$

23°35.42

89°22.76

40°11.75

4°11.74

49°57.48

16°33.79

 $-8^{\circ}10.34$

 $46^{\circ}1.56$

6°22.37

28°37.80

 $-1^{\circ}11.19$

 $7^{\circ}24.63$

-52°42.87

-16°45.42

-29°0.80

 $27^{\circ}57.60$

-59°36.16

-43°32.91

-69°50.11

-8°46.84

11°49.90

61°36.32

 $14^{\circ}25.04$

-17°41.85

-63°15.30

-57°16.24

55°48.68

-11°18.42

49°10.53

-60°30.41

-36°30.42

 $19^{\circ}2.26$

-60°56.98

74°2.45

-16°9.45

26°37.19

-26°29.57

-69°4.42

-15°45.55

-37°7.33

 $12^{\circ}32.26$

51°28.83

-34°22.18

38°48.28

-26°15.68

8°56.32

-56°38.53

45°22.40

9°59.92

-46°49.49

-29°28.53

28°13.71

15°21.04

Mer.pass

10:15

19:26

18:54

10:53

10:15

19:23

18:51

10:50

10:16

19:20

18:47

10:47

0.1

0.1

Mer.pass

Mer.pass

 $5^{\circ}9.17$

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.03	N14°0.73	274°57.47	12.9'	S22°3.83	-8.5'	54.2'
1	195°36.12	1.52	289°29.34	12.9'	21°55.35	-8.6'	54.2'
2	210°36.21 225°36.31	2.31 · · 3.10	304°1.27 318°33.26	13.0' 13.1'	21°46.77 21°38.11	-8.7' -8.8'	54.2' 54.2'
4	240°36.40	3.89	333°5.31	13.1'	21°29.35	-8.9'	54.2'
5	255°36.49	4.68	347°37.42	13.2'	21°20.49	-8.9'	54.2'
6	270°36.59	N14°5.47	$2^{\circ}9.59$	13.2'	S21°11.55	-9.0'	54.2'
7	285°36.68	6.25	16°41.82	13.3'	21°2.52	-9.1'	54.2'
8 9	300°36.77 315°36.87	7.04 • • 7.83	31°14.11 45°46.45	13.3' 13.4'	20°53.39 20°44.18	-9.2' -9.3'	54.2' 54.2'
10	330°36.96	8.62	45 40.45 60°18.86	13.5'	20°34.88	-9.3 -9.4'	54.2'
11	345°37.05	9.40	74°51.32	13.5'	20°25.49	-9.5'	54.2'
12	0°37.14	N14°10.19	89°23.83	13.6'	S20°16.01	-9.6'	54.2'
13	15°37.23	10.98	103°56.41	13.6'	20°6.45	-9.6'	54.2'
14 15	30°37.32 45°37.42	11.76 •• 12.55	118°29.04 133°1.73	13.7' 13.7'	19°56.80 19°47.07	-9.7' -9.8'	54.2' 54.2'
16	60°37.51	13.33	133 1.73 147°34.47	13.8'	19° 47.07 19° 37.26	-9.8 -9.9'	54.2'
17	75°37.60	14.12	162°7.27	13.9'	19°27.36	-10.0'	54.2'
18	90°37.69	N14°14.90	176°40.12	13.9'	S19°17.38	-10.1'	54.3'
19	105°37.78	15.68	191°13.02	14.0'	19°7.31	-10.1'	54.3'
20 21	120°37.87 135°37.96	16.47 •• 17.25	205°45.98 220°18.99	14.0' 14.1'	18°57.17 18°46.95	-10.2' -10.3'	54.3' 54.3'
22	150°38.05	18.03	234°52.05	14.1'	18°36.64	-10.3	54.3
23	165°38.14	18.81	249°25.17	14.2'	18°26.26	-10.5'	54.3'
	SD = 15.9'	d = 0.8'		SI	D = 14.8'		
					10		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°38.22 195°38.31	N14°19.59 20.38	263°58.33 278°31.55	14.2' 14.3'	\$18°15.80 18°5.26	-10.5' -10.6'	54.3' 54.3'
2	210°38.40	20.38	278 31.55 293°4.81	14.3	18 5.26 17°54.65	-10.6 -10.7'	54.3'
3	225°38.49	• • 21.94	307°38.13	14.4'	17°43.96	-10.8'	54.3'
4	240°38.58	22.72	$322^{\circ}11.49$	14.4'	$17^{\circ}33.20$	-10.8'	54.3'
5	255°38.67	23.50	336°44.90	14.5'	17°22.36	-10.9'	54.3'
6	270°38.75 285°38.84	N14°24.27 25.05	351°18.36 5°51.86	14.5' 14.5'	\$17°11.44 17°0.46	-11.0' -11.1'	54.4' 54.4'
7 8	285 38.84 300°38.93	25.05 25.83	5 51.80 20°25.41	14.5 14.6'	17 0.46 16°49.40	-11.1 -11.1'	54.4'
9	315°39.01	26.61	34°59.00	14.6'	16°38.27	-11.2'	54.4'
10	330°39.10	27.39	49°32.64	14.7'	$16^{\circ}27.07$	-11.3'	54.4'
11	345°39.19	28.16	64°6.32	14.7'	16°15.80	-11.3'	54.4'
12 13	0°39.27 15°39.36	N14°28.94 29.72	78°40.05 93°13.81	14.8' 14.8'	\$16°4.45 15°53.05	-11.4' -11.5'	54.4' 54.4'
13 14	30°39.45	30.49	93 13.61 107°47.62	14.8	15°53.05	-11.5'	54.4'
15	45°39.53	· · 31.27	122°21.47	14.9'	15°30.02	-11.6'	54.4'
16	60°39.62	32.04	$136^{\circ}55.36$	14.9'	$15^{\circ}18.41$	-11.7'	54.5'
17	75°39.70	32.82	151°29.28	15.0'	15°6.73	-11.7'	54.5'
18 19	90°39.79 105°39.87	N14°33.59 34.36	166°3.25 180°37.25	15.0' 15.0'	\$14°54.99 14°43.18	-11.8' -11.9'	54.5' 54.5'
20	120°39.95	35.14	195°11.29		14°31.31		
21	135°40.04	35.91	209°45.36	15.1'	14°19.37	-12.0'	54.5'
22	150°40.12	36.68	$224^{\circ}19.47$	15.1'	$14^{\circ}7.37$	-12.1'	54.5'
23	165°40.21	37.45	238°53.61	15.2'	13°55.31	-12.1'	54.6'
	SD = 15.9'	d = 0.8'		SI	O = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
6 0	180°40.29	N14°38.22	253°27.79	ν 15.2'	S13°43.19	a -12.2'	пР 54.6'
1	195°40.37	39.00	268°2.00	15.2'	13°31.01	-12.2'	54.6'
2	210°40.46	39.77	282°36.23	15.3'	13°18.77	-12.3'	54.6'
3	225°40.54	• • 40.54	297°10.50	15.3'	13°6.47 12°54.11	-12.4'	54.6'
4 5	240°40.62 255°40.70	41.31 42.08	311°44.80 326°19.13	15.3' 15.4'	12°54.11 12°41.69	-12.4' -12.5'	54.6' 54.7'
6	270°40.78	N14°42.85	340°53.49	15.4'	\$12°29.22	-12.5'	54.7'
7	285°40.87	43.61	355°27.87	15.4'	$12^{\circ}16.68$	-12.6'	54.7'
8	300°40.95	44.38	10°2.28	15.4'	12°4.10	-12.6'	54.7'
9	315°41.03	· · 45.15	24°36.71	15.5'	11°51.45	-12.7'	54.7'
10 11	330°41.11 345°41.19	45.92 46.68	39°11.17 53°45.65	15.5' 15.5'	11°38.76 11°26.01	-12.8' -12.8'	54.7' 54.8'
12	0°41.27	N14°47.45	68°20.15	15.5'	S11°13.20	-12.9	54.8'
13	15°41.35	48.22	82°54.68	15.5'	11°0.35	-12.9'	54.8'
14	30°41.43	48.98	97°29.22	15.6'	10°47.44	-13.0'	54.8'
15 16	45°41.51 60°41.59	· · 49.75 50.51	112°3.78 126°38.37	15.6' 15.6'	10°34.48 10°21.47	-13.0' -13.1'	54.8' 54.8'
16 17	75°41.67	50.51	126° 38.37 141° 12.97	15.6'	10°21.47 10°8.41	-13.1' -13.1'	54.8 54.9'
18	90°41.75	N14°52.04	155°47.58	15.6'	S09°55.30	-13.2	54.9'
19	105°41.83	52.80	170°22.21	15.6'	09°42.15	-13.2'	54.9'
20	120°41.91	53.57	184°56.86	15.7'	09°28.94	-13.3'	54.9'
21 22	135°41.98 150°42.06	• • 54.33 55.09	199°31.52 214°6.19	15.7' 15.7'	09°15.69 09°2.39	-13.3' -13.3'	54.9' 55.0'
23	165°42.14	55.85	214 0.19 228°40.88	15.7'	09 2.39 08°49.05	-13.4'	55.0'
-	SD = 15.9'	d = 0.8'			O = 14.9'		
		<u> </u>		JI	17.3		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Duy	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-39%	
28	02:24	02:29	11:58	05:51	18:14		
29	02:33	02:37	11:57	06:36	18:57		
30	02:41	02:45	11:57	07:19	19:40		

h	Aries		nus		ars		oiter	Sat	urn
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218° 42.15	205°58.08	N03°40.10	70°11.31	N15° 0.89	78°27.18	N16°32.70	198°51.29	N05°56.88
1	233° 44.62	220°57.74	41.26	85°13.11	0.57	93°29.51	32.65	213°53.47	56.99
2	248°47.08	235°57.40	42.43	100°14.91	15° 0.25	108°31.84	32.61	228°55.65	57.10
3	263°49.54	250° 57.06	• • 43.60	$115^{\circ}16.71$	14°59.93	123°34.17	• • 32.56	243°57.83	• • 57.21
4	278°52.01	265°56.71	44.76	130° 18.50	59.62	138°36.50	32.52	259°0.01	57.32
5	293°54.47	280° 56.37	45.93	145°20.30	59.30	153°38.83	32.47	274°2.19	57.43
6	308° 56.94	295°56.03	N03°47.10	160°22.09	N14°58.98	168°41.16	N16°32.42	289°4.37	N05°57.54
7	323°59.40	310°55.68	48.26	175°23.89	58.66	183°43.49	32.38	304°6.55	57.65
8	339°1.86	325°55.34	49.43	190°25.68	58.34	198°45.82	32.33	319°8.73	57.76
9	354°4.33	340°55.00	50.59	205° 27.47	58.02	213°48.15	32.29	334°10.91	• 57.87
	9°6.79	355° 54.65		220° 29.26	57.70	213 46.13 228°50.48	32.29	349°13.09	
10			51.76						57.98
11	24°9.26	10°54.31	52.92	235°31.06	57.38	243°52.81	32.19	4°15.27	58.09
12	39° 11.72	25°53.97	N03°54.09	250°32.85	N14°57.06	258°55.13	N16°32.15	19°17.45	N05°58.20
13	54° 14.18	40°53.62	55.26	265°34.64	56.74	273°57.46	32.10	34°19.63	58.31
14	69° 16.65	55°53.28	56.42	280°36.43	56.42	288°59.79	32.05	49°21.81	58.42
15	$84^{\circ}19.11$	70°52.94	• • 57.59	295°38.21	· · 56.10	304°2.12	• • 32.01	64°23.99	• • 58.53
16	99°21.58	85°52.59	58.75	310°40.00	55.78	319° 4.44	31.96	79°26.18	58.64
17	114°24.04	100°52.25	03°59.92	325°41.79	55.46	334° 6.77	31.91	94°28.36	58.75
18	129°26.50	115°51.90	N04°1.08	340°43.58	N14°55.14	349°9.10	N16°31.86	109°30.54	N05°58.86
19	144°28.97	130°51.56	2.25	355° 45.36	54.81	4°11.42	31.82	124°32.72	58.97
20	159° 31.43	145°51.21	3.41	10°47.15	54.49	19°13.75	31.62	139°34.90	59.08
		145 51.21 160°50.87		10 47.15 25°48.93		19 13.75 34°16.07			
21	174°33.90		• • 4.57		• • 54.17		•• 31.72	154°37.08	• • 59.20
22	189°36.36	175°50.52	5.74	40°50.72	53.85	49°18.40	31.68	169°39.26	59.31
23	204°38.82	190°50.18	6.90	55°52.50	53.52	64°20.72	31.63	184°41.44	59.42
1/05	pass. 09:24	1, 0 2/ 11	.2′ m-3.86	1/1 Ω ¹ λ Λ	.3′ m0.29	112 31 40	.0′ m-2.12	$\nu 2.2' d0.$	1' m0 71
vict.	Jass. U9:24	ν-0.5 α1	.∠ 111-3.00	ν1.0 <i>u</i> -0	.5 1110.29	ν2.3 u -0	.0 111-2.12	ν ∠.∠ a0.	I 111U./I
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°41.29	205°49.83	N04°8.07	70°54.28	N14°53.20	79°23.05	N16°31.58	199°43.62	N05°59.52
1	219 41.29 234°43.75	205 49.63 220°49.49	9.23	85° 56.06	52.88	94°25.37	31.53	214° 45.80	59.63
2	249°46.22	235°49.14	10.40	100°57.84	52.55	109°27.70	31.48	229°47.99	59.74
3	264°48.68	250°48.80	• • 11.56	115°59.62	• • 52.23	124°30.02	• • 31.44	244°50.17	05°59.85
4	279°51.14	265°48.45	12.72	131°1.40	51.91	139°32.34	31.39	259°52.35	05°59.96
5	294°53.61	280°48.11	13.89	146°3.18	51.58	154°34.67	31.34	274°54.53	0.07
6	309°56.07	295°47.76	N04°15.05	161°4.96	N14°51.26	169°36.99	N16°31.29	289°56.71	N06°0.18
7	324° 58.54	310°47.42	16.21	176°6.74	50.93	184°39.31	31.24	304°58.89	0.29
8	340°1.00	325°47.07	17.38	191°8.51	50.61	199°41.63	31.20	320°1.07	0.40
9	355°3.47	340°46.72	• • 18.54	206° 10.29	50.28	214°43.96	31.15	335°3.25	0.51
10	10°5.93	355°46.38	19.70	221° 12.07	49.96	229°46.28	31.10	350°5.44	0.62
	10 5.93 25°8.39	10° 46.03		221 12.07 236° 13.84		229 46.28 244°48.60		5°7.62	
11			20.87		49.63		31.05		0.73
12	40° 10.86	25°45.68	N04°22.03	251°15.61	N14°49.30	259°50.92	N16°31.00	20°9.80	N06°0.84
13	55° 13.32	40°45.34	23.19	266° 17.39	48.98	274°53.24	30.95	35°11.98	0.95
14	$70^{\circ}15.79$	55°44.99	24.35	281°19.16	48.65	289°55.56	30.90	50°14.16	1.06
15	85° 18.25	70°44.64	• • 25.52	296°20.93	• • 48.32	304°57.88	• • 30.85	65°16.34	• • 1.17
16	100°20.71	85°44.29	26.68	311°22.70	48.00	320°0.20	30.81	80°18.52	1.28
17	115°23.18	100°43.95	27.84	326° 24.47	47.67	335° 2.52	30.76	95°20.71	1.39
18	130°25.64	115°43.60	N04°29.00		N14°47.34	350° 4.84	N16°30.71	110°22.89	N06°1.50
19	145°28.11	130°43.25	30.17	356°28.01	47.02	5°7.16	30.66	125°25.07	1.61
20	160°30.57	145° 42.90	31.33	11° 29.78	46.69	20° 9.48	30.61	140°27.25	1.72
				26°31.55					
21	175°33.03	160° 42.56	• • 32.49		• • 46.36	35°11.79	• • 30.56	155°29.43	. 1.83
22	190°35.50	175°42.21	33.65	41°33.32	46.03	50°14.11	30.51	170°31.62	1.94
23	205°37.96	190°41.86	34.81	56° 35.08	45.70	65°16.43	30.46	185°33.80	2.05
Ver :	pass. 09:20	ν-0 3' d1	.2′ m-3.86	ν1 8' d-0	.3′ m0.30	ν2 3' d-0	.0′ m-2.11	ν2 2' dΩ	.1′ m0.71
+101.		ν-0.5 UI	5.00	ν 1.0 u-0	.5 1110.30	ν 2.5 u-0		ν Δ.Ζ u0.	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°40.43	205°41.51	N04°35.97	71°36.85	N14°45.37	80°18.75	N16°30.41	200°35.98	N06°2.16
1	235° 42.89	220°41.16	37.13	86°38.61	45.04	95°21.07	30.36	215°38.16	2.27
2	250° 45.35	235°40.81	38.30	101°40.38	44.71	110°23.38	30.31	230°40.34	2.27
	250 45.35 265° 47.82	250°40.46	38.30	101 40.38 116°42.14	• • 44.71	110 23.38 125°25.70	30.31	230 40.34 245°42.53	
3									• • 2.48
4	280°50.28	265°40.11	40.62	131°43.91	44.05	140°28.01	30.21	260°44.71	2.59
5	295°52.75	280°39.77	41.78	146° 45.67	43.72	155°30.33	30.16	275°46.89	2.70
6	310°55.21	295°39.42	N04°42.94	161°47.43	N14°43.39	170°32.65	N16°30.11	290°49.07	N06°2.81
7	325°57.67	310°39.07	44.10	176°49.19	43.06	185°34.96	30.06	305°51.25	2.92
8	341°0.14	325°38.72	45.26	191°50.95	42.73	200°37.28	30.01	320°53.44	3.03
9	356°2.60	340°38.37	• • 46.42	206°52.71	• • 42.40	215°39.59	• • 29.96	335°55.62	• • 3.14
10	11°5.07	355°38.02	47.58	221°54.47	42.07	230°41.91	29.91	350°57.80	3.25
11	26°7.53	10°37.67	48.74	236° 56.23	41.74	245°44.22	29.85	5°59.98	3.36
12	41°9.99	25°37.32	N04°49.90	251°57.99	N14°41.41	260°46.53	N16°29.80	21°2.17	N06°3.47
13	56° 12.46	40°36.97	51.06	266° 59.74	41.07	275°48.85	29.75	36°4.35	3.58
		40 36.97 55°36.62		200 59.74 282°1.50					
14	71°14.92		52.22		40.74	290°51.16	29.70	51°6.53	3.68
15	86° 17.39	70°36.27	• • 53.38	297°3.26	• • 40.41	305°53.48	• • 29.65	66°8.71	• • 3.79
16	101° 19.85	85°35.91	54.54	312°5.01	40.08	320°55.79	29.60	81°10.90	3.90
17	116°22.31	100°35.56	55.69	327°6.76	39.74	335°58.10	29.55	96°13.08	4.01
18	131°24.78	115°35.21	N04°56.85	342°8.52	N14°39.41	351° 0.41	N16°29.50	111°15.26	N06°4.12
19	146°27.24	130°34.86	58.01	357° 10.27	39.08	6°2.72	29.44	126°17.44	4.23
20	161°29.71	145°34.51	04°59.17	12° 12.02	38.74	21°5.04	29.39	141°19.63	4.34
	101 29.71 176°32.17	145 34.51 160°34.16	04 59.17 05°0.33	27° 13.78	38.41	36° 7.35	29.34	141 19.03 156°21.81	
	170 3/1/				38.41	51° 9.66		156°21.81 171°23.99	• • 4.45 4.56
21		175022 01			38 07		29.29	171 73 UU	4 56
21 22	191°34.63	175°33.81	1.49	42°15.53					
21		175°33.81 190°33.45	2.65	57° 17.28	37.74	66°11.97	29.24	186°26.18	4.66

357°33.08 353°5.65

349°29 34

348°45.70

335°19.37

 $327^{\circ}49.40$

313°31.98

315°10.77

308°26.02

290°37.75

281°2.32

 $280^{\circ}19.47$

 $278^{\circ}21.11$

277°59.77

275°36.06

 $270^{\circ}50.27$

263°51.88

258°24.76

244°48.97

 $243^{\circ}15.12$

234°14.04

222°44.89

221°37.78

217°45.85

207°32.33

193°38.38

182°22.80

175°41.37

172°57.37

 $171^{\circ}49.02$

166°10.84

158°20.00

152°50.06

148°32.64

 $147^{\circ}54.98$

145°45.85

139°36.99

137°18.72

136°53.58

126°1.79

112°13 18

107°5.22

 $102^{\circ}0.33$

96°7.49

95°56.54

90°40.94

83°29.77

80°31.71

75°45.25

61°58.03

53°2.72

49°24.48

33°37.01

 $27^{\circ}30.72$

15°12.64

13°43.56

13°28.19

SHA

347°15.93

211°29.16

219°45.03

 $340^{\circ}9.14$

SHA

346°8.55

211°12.99

219°41.76

340°2.33

345°1.08

 $210^{\circ}56.42$

 $219^{\circ}38.32$

339°55.55

Venus: Mars:

Horizontal parallax

255°4.56

 $314^{\circ}4.49$

Alpheratz

Ankaa Schedar

Diphda

Hamal

Polaris

Acamar

Menkar

Mirfak

Rigel

Capella

Bellatrix

Elnath

Alnilam

Canopus

Sirius

Adhara

Procyon

Miaplacidus Alphard

Regulus

Dubhe Denebola

Gienah

Acrux

Gacrux

Alioth

Spica Alkaid

Hadar

Menkent

Arcturus

Kochab

Rigil Kent.

Zuben'ubi

Alphecca

Antares Atria

Sabik

Shaula

Eltanin

Nunki

Altair

Deneb

Enif

Peacock

Al Na'ir

Markab

Venus

Jupiter

Saturn May 02 Sun

Venus

Mars

Jupiter

May 03 Mon

Venus

Jupiter

Saturn

Mars

Mars

Fomalhaut Scheat

May 01 Sat

Rasalhague

Kaus Aust. Vega

Pollux

Avior Suhail

Betelgeuse

Aldebaran

Achernar

Dec 29° 14.36

-42°9.32

56°41.09 -17°50.18

-57°5.78

 $23^{\circ}35.42$

89°22.74 -40°11.73

4°11.75

49°57.47

16°33.79

-8°10.33

 $46^{\circ}1.55$

 $6^{\circ}22.37$

28°37.80

 $-1^{\circ}11.18$

 $7^{\circ}24.63$

-52°42.86

-16°45.41

-29°0.79

 $27^{\circ}57.60$

-59°36.16

-43°32.91

-69°50.12

-8°46.84

11°49.91

 $61^{\circ}36.33$

14°25.05

-17°41.85

-63° 15.31

-57° 16.25

55°48.69

-11°18.42

49° 10.54 -60° 30.43

-36°30.42

19°2.27

-60°57.00

 $74^{\circ}2.47$

-16°9.45

26°37.20

-26°29.58

-69°4.43

-15°45.55

-37°7.33

 $12^{\circ}32.26$

51°28.84

-34°22.18

38°48.29

-26° 15.67

8°56.32

-56° 38.53

45°22.40

 $9^{\circ}59.93$

-46°49.48

-29°28.52

28°13.71

15°21.04

Mer.pass

10:16

19:17

18:43

10:43

10:17

19:14

18:40

10:40

10:17

19:11

18:36

10:36

0.1

0.1

Mer.pass

Mer.pass

 $5^{\circ}9.17$

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.22	N14°56.62	243° 15.57	15.7'	S08°35.66	-13.4'	55.0'
1	195°42.30	57.38	$257^{\circ}50.27$	15.7'	08°22.23	-13.5'	55.0'
2	210°42.37	58.14	272°24.98	15.7'	08°8.76	-13.5'	55.1'
3 4	225°42.45 240°42.53	· · 58.90 14°59.66	286°59.70 301°34.43	15.7' 15.7'	07°55.24 07°41.68	-13.6' -13.6'	55.1' 55.1'
5	255°42.60	14 59.00 15°0.42	316°9.16	15.7'	07 41.06 07°28.07	-13.6'	55.1'
6	270°42.68	N15°1.17	330° 43.90	15.7'	S07°14.43	-13.7'	55.1'
7	285°42.76	1.93	345°18.63	15.7'	$07^{\circ}0.75$	-13.7'	55.2'
8	300°42.83	2.69	359°53.37	15.7'	06°47.03	-13.8'	55.2'
9	315°42.91	• • 3.45	14°28.11	15.7'	06°33.27	-13.8'	55.2'
10 11	330°42.98 345°43.06	4.21 4.96	29°2.86 43°37.60	15.7' 15.7'	06° 19.47 06° 5.63	-13.8' -13.9'	55.2' 55.3'
12	0°43.13	N15°5.72	58° 12.33	15.7'	S05°51.76	-13.9	55.3'
13	15°43.21	6.47	72°47.07	15.7'	05° 37.86	-13.9'	55.3'
14	30°43.28	7.23	$87^{\circ}21.80$	15.7'	$05^{\circ}23.91$	-14.0'	55.3'
15	45°43.35	• • 7.98	101°56.52	15.7'	05°9.94	-14.0'	55.4'
16 17	60°43.43 75°43.50	8.74 9.49	116°31.24 131°5.95	15.7' 15.7'	04°55.93 04°41.89	-14.0' -14.1'	55.4' 55.4'
18	90°43.58	N15° 10.25	131 5.95 145° 40.66	15.7'	504° 27.81	-14.1	55.4
19	105°43.65	11.00	160° 15.35	15.7'	04° 13.71	-14.1'	55.5'
20	120°43.72	11.75	174°50.03	15.7'	03°59.57	-14.2'	55.5'
21	135°43.79	• • 12.50	189°24.70	15.7'	03°45.41	-14.2'	55.5'
22	150°43.87	13.26	203°59.36	15.6'	03°31.21	-14.2'	55.5'
23	165°43.94	14.01	218°34.00	15.6'	03°16.99	-14.2'	55.6'
	SD = 15.9'	d = 0.8'		SI	O = 15.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0 0	180°44.01	N15° 14.76	233°8.63	ν 15.6'	503°2.74	-14.3'	55.6'
1	195°44.08	15.51	247°43.24	15.6'	$02^{\circ}48.46$	-14.3'	55.6'
2	210°44.15	16.26	262° 17.83	15.6'	02°34.16	-14.3'	55.6'
3	225°44.22	• • 17.01	276°52.40	15.6'	02°19.84	-14.4'	55.7'
4 5	240°44.30 255°44.37	17.76 18.51	291°26.96 306°1.49	15.5' 15.5'	02°5.49 01°51.11	-14.4' -14.4'	55.7' 55.7'
6	270°44.44	N15° 19.26	320° 36.00	15.5'	501°36.72	-14.4'	55.7'
7	285°44.51	20.00	335° 10.49	15.5'	01°22.30	-14.4	55.8'
8	300°44.58	20.75	349° 44.95	15.4'	$01^{\circ}7.86$	-14.5'	55.8'
9	315°44.65	• • 21.50	4° 19.39	15.4'	00°53.41	-14.5'	55.8'
10	330°44.72 345°44.79	22.25 22.99	18°53.80 33°28.18	15.4'	00°38.93 00°24.43	-14.5'	55.9'
11 12	0°44.85	22.99 N15°23.74	48°2.53	15.4' 15.3'	500°9.92	-14.5' -14.5'	55.9' 55.9'
13	15°44.92	24.48	62°36.85	15.3'	N00°4.61	14.5	55.9'
14	30°44.99	25.23	77° 11.14	15.3'	00° 19.15	14.6'	56.0'
15	45°45.06	• • 25.97	91°45.40	15.2'	$00^{\circ}33.71$	14.6'	56.0'
16	60°45.13	26.72	106° 19.63	15.2'	00°48.28	14.6'	56.0'
17 18	75°45.20 90°45.26	27.46 N15°28.20	120°53.82 135°27.97	15.2' 15.1'	01°2.87 N01°17.46	14.6' 14.6'	56.1' 56.1'
19	105°45.33	28.94	150°2.08	15.1'	01°32.07	14.6'	56.1
20	120°45.40	29.69	164°36.16		01°46.69	14.6'	56.1'
21	135°45.46	• • 30.43	$179^{\circ}10.20$	15.0'	02°1.31	14.6'	56.2'
22	150°45.53	31.17	193°44.19	15.0'	02° 15.95	14.6'	56.2'
23	165°45.60	31.91	208° 18.15	14.9'	02°30.59	14.6'	56.2'
	SD = 15.9'	d = 0.8'		SI	D = 15.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.66	N15° 32.65	222° 52.06	14.9'	N02°45.24	14.7'	56.3'
1	195°45.73 210°45.79	33.39	237°25.92	14.8'	02°59.89 03°14.55	14.7'	56.3'
2	210°45.79 225°45.86	34.13 •• 34.87	251°59.74 266°33.52	14.8' 14.7'	03°14.55 03°29.21	14.7' 14.7'	56.3' 56.4'
3 4	240°45.93	35.61	200 33.32 281°7.24	14.7	03°43.87	14.7	56.4'
5	255°45.99	36.35	295° 40.92	14.6'	03°58.53	14.7'	56.4'
6	270°46.05	N15°37.08	310° 14.54	14.6'	N04° 13.20	14.7'	56.4'
7	285°46.12	37.82	324°48.11	14.5'	04° 27.86	14.7'	56.5'
8	300°46.18 315°46.25	38.56 •• 39.30	339°21.63 353°55.10	14.5' 14.4'	04°42.52 04°57.17	14.7' 14.7'	56.5' 56.5'
9 10	315°46.25 330°46.31	40.03	353°55.10 8°28.51	14.4' 14.4'	04°57.17 05°11.83	14.7° 14.6'	56.6'
11	345°46.37	40.03	23°1.86	14.4	05°26.47	14.6	56.6
12	0°46.44	N15°41.50	37°35.16	14.2'	N05°41.11	14.6'	56.6'
13	15°46.50	42.24	52°8.39	14.2'	05°55.75	14.6'	56.7'
14	30°46.56	42.97	66° 41.57 81° 14.68	14.1'	06° 10.37	14.6'	56.7'
15 16	45°46.63 60°46.69	· · 43.70 44.44	81°14.68 95°47.74	14.1' 14.0'	06°24.99 06°39.59	14.6' 14.6'	56.7' 56.8'
17	75°46.75	44.44 45.17	95 47.74 110°20.72	13.9'	06°54.18	14.6	56.8'
18	90°46.81	N15° 45.90	124° 53.65	13.9'	N07°8.76	14.6'	56.8'
19	105°46.87	46.63	139° 26.50	13.8'	07°23.32	14.5'	56.9'
20	120°46.93	47.37	153°59.29	13.7'	07°37.87	14.5'	56.9'
21 22	135°46.99 150°47.06	· · 48.10 48.83	168°32.01 183°4.66	13.7' 13.6'	07°52.40 08°6.91	14.5' 14.5'	56.9' 56.9'
22	165°47.12	48.83 49.56	183°4.66 197°37.24	13.5'	08° 6.91	14.5'	56.9° 57.0'
23	SD = 15.9'	d = 0.7'			D = 15.3'	11.5	51.0
	3D = 15.9°	<u>u = 0.7</u>		31	J — 15.5°		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
24,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	30-14%	
01	02:49	02:53	11:57	08:00	20:21		
02	02:56	02:59	11:57	08:42	21:03		
03	03:03	03:06	11:57	09:25	21:47		

h	Aries	, Ve	nus	M	ars	Jup	iter	Sat	urn
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°39.56	205°33.10	N05°3.80	72°19.03	N14°37.41	81°14.28	N16°29.18	201°28.36	N06°4.77
1	236°42.03	220°32.75	4.96	87°20.78	37.07	96°16.59	29.13	216°30.54	4.88
2	251°44.49	235°32.40	6.12	102°22.52	36.73	111°18.90	29.08	231°32.72	4.99
3	266° 46.96	250°32.04	7.28	117° 24.27	36.40	126°21.21	29.03	246°34.91	5.10
4	281°49.42	265°31.69	8.43	132°26.02	36.06	141°23.52	28.98	261°37.09	5.21
5	296°51.88	280°31.34	9.59	147° 27.77	35.73	156° 25.83	28.92	276°39.27	5.32
6	311°54.35	200 31.34 295°30.98	9.59 N05°10.75	162° 29.51	35.73 N14°35.39	171°28.14		291°41.46	
							N16°28.87		N06°5.42
7	326° 56.81	310°30.63	11.90	177°31.26	35.05	186°30.45	28.82	306°43.64	5.53
8	341°59.28	325°30.28	13.06	192°33.00	34.72	201°32.75	28.76	321°45.82	5.64
9	357°1.74	340°29.92	• • 14.22	207°34.74	• • 34.38	216°35.06	• • 28.71	336°48.01	• • 5.75
10	12°4.20	355°29.57	15.37	222°36.49	34.04	231°37.37	28.66	351°50.19	5.86
11	27°6.67	10°29.22	16.53	237°38.23	33.71	246°39.68	28.61	6°52.37	5.97
12	42°9.13	25°28.86	N05°17.69	252°39.97	N14°33.37	261°41.98	N16°28.55	21°54.56	N06°6.08
13	$57^{\circ}11.60$	40°28.51	18.84	267°41.71	33.03	276°44.29	28.50	36°56.74	6.18
14	$72^{\circ}14.06$	55°28.15	20.00	282°43.45	32.69	291°46.60	28.45	51°58.92	6.29
15	$87^{\circ}16.52$	70°27.80	• • 21.15	297°45.19	· · 32.35	306°48.90	• • 28.39	$67^{\circ}1.11$	· · 6.40
16	102° 18.99	85°27.44	22.31	312°46.93	32.02	321°51.21	28.34	82°3.29	6.51
17	117°21.45	100°27.09	23.47	327°48.67	31.68	336°53.51	28.29	97°5.47	6.62
18	132°23.92	115°26.73	N05°24.62	342°50.41	N14°31.34	351°55.82	N16°28.23	112°7.66	N06°6.73
19	147°26.38	130°26.38	25.78	357°52.15	31.00	6°58.12	28.18	127°9.84	6.83
20	162°28.84	145° 26.02	26.93	12°53.88	30.66	22°0.43	28.12	142°12.03	6.94
								157° 14.21	
21	177°31.31	160°25.67		27°55.62	• • 30.32	37° 2.73			7.05
22	192°33.77	175°25.31	29.24	42°57.35	29.98	52°5.04	28.02	172°16.39	7.16
23	207°36.24	190°24.95	30.39	57°59.09	29.64	67°7.34	27.96	187°18.58	7.27
Mer.p	pass. 09:12	ν -0.4' d1	.2′ m-3.86	ν 1.7′ d-0	.3′ m0.34	ν2.3′ d-0	.1′ m-2.10	$\nu 2.2' \ d0$.1′ m0.71
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
		205°24.60	N05°31.55	73°0.82	N14°29.30	82° 9.65	N16°27.91	202°20.76	N06°7.37
0	222°38.70 237°41.16	205°24.60 220°24.24		73°0.82 88°2.56		82°9.65 97°11.95		202°20.76 217°22.94	
1			32.70		28.96		27.85		7.48
2	252°43.63	235°23.89	33.86	103°4.29	28.62	112°14.25	27.80	232°25.13	7.59
3	267°46.09	250°23.53	• • 35.01	118°6.02	• • 28.27	127°16.55	• • 27.74	247°27.31	• • 7.70
4	282°48.56	265°23.17	36.16	133°7.75	27.93	142°18.86	27.69	262°29.50	7.81
5	297°51.02	280°22.81	37.32	148°9.48	27.59	157°21.16	27.63	277°31.68	7.91
6	312°53.49	295°22.46	N05°38.47	163°11.21	N14°27.25	172°23.46	$N16^{\circ}27.58$	292°33.87	N06°8.02
7	327°55.95	310°22.10	39.62	178° 12.94	26.91	187°25.76	27.52	307°36.05	8.13
8	342°58.41	325°21.74	40.77	193° 14.67	26.56	202°28.06	27.47	322°38.23	8.24
9	358°0.88	340°21.38	• • 41.93	208° 16.40	26.22	217°30.36	27.41	337°40.42	8.35
10	13°3.34	355°21.03	43.08	223° 18.13	25.88	232°32.67	27.36	352°42.60	8.45
11	28°5.81	10°20.67	44.23	238° 19.85	25.54	247°34.97	27.30	7°44.79	8.56
12	43°8.27	25°20.31	N05°45.38	253° 21.58	N14°25.19	262°37.27	N16°27.25	22°46.97	N06°8.67
	58° 10.73	40° 19.95							
13			46.54	268°23.31	24.85	277°39.57	27.19	37°49.16	8.78
14	73° 13.20	55°19.59	47.69	283°25.03	24.50	292°41.87	27.14	52°51.34	8.88
15	88° 15.66	70°19.23	• • 48.84	298°26.75	• • 24.16	307°44.16	• • 27.08	67°53.53	• • 8.99
16	103° 18.13	85°18.87	49.99	313°28.48	23.82	322°46.46	27.03	82°55.71	9.10
17	118°20.59	100°18.51	51.14	328° 30.20	23.47	337°48.76	26.97	97°57.89	9.21
18	133°23.05	115° 18.16	N05°52.29	343°31.92	N14°23.13	352°51.06	N16°26.91	113°0.08	$N06^{\circ}9.31$
19	148°25.52	130°17.80	53.44	358° 33.65	22.78	7°53.36	26.86	128°2.26	9.42
20	163°27.98	145°17.44	54.59	13°35.37	22.44	22°55.66	26.80	143°4.45	9.53
21	178°30.45	160°17.08	• • 55.74	28°37.09	• • 22.09	37°57.95	• • 26.75	158°6.63	• • 9.64
22	193°32.91	175°16.72	56.89	43°38.81	21.75	53° 0.25	26.69	173°8.82	9.74
23	208°35.38	190°16.35	58.04	58° 40.53	21.40	68° 2.55	26.63	188°11.00	9.85
	pass. 09:08		.2′ m-3.86		0.3' m0.36		.1′ m-2.09		.1′ m0.71
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°37.84	205°15.99	N05°59.19	73°42.24	N14°21.05	83° 4.85	N16°26.58	203°13.19	N06°9.96
1	238° 40.30	220°15.63	06°0.34	88°43.96	20.71	98°7.14	26.52	218°15.37	10.07
2	253° 42.77	235° 15.27	1.49	103°45.68	20.36	113° 9.44	26.46	233°17.56	10.17
3	268° 45.23	250° 14.91	2.64	118° 47.40	• • 20.01	113 9.44 128°11.73	. 26.41	248°19.74	• • 10.17
	208 45.23 283°47.70	265° 14.55						248 19.74 263°21.93	
4			3.79	133°49.11	19.67	143°14.03	26.35		10.39
5	298°50.16	280°14.19	4.94	148°50.83	19.32	158°16.32	26.29	278°24.11	10.50
6		295°13.83	N06°6.09	163°52.54		173°18.62	N16°26.24	293°26.30	N06° 10.60
	313°52.62				10.60				
7	328°55.09	$310^{\circ}13.46$	7.24	178°54.26	18.62	188°20.91	26.18	308°28.48	10.71
8	328° 55.09 343° 57.55	310°13.46 325°13.10	8.38	193°55.97	18.27	203°23.21	26.12	323°30.67	10.82
	328°55.09	$310^{\circ}13.46$							
8	328° 55.09 343° 57.55	310°13.46 325°13.10	8.38	193°55.97	18.27	203°23.21	26.12	323°30.67 338°32.86 353°35.04	10.82
8 9	328°55.09 343°57.55 359°0.02	310°13.46 325°13.10 340°12.74	8.38 •• 9.53	193°55.97 208°57.68	18.27 •• 17.93	203°23.21 218°25.50	26.12 •• 26.06	323°30.67 338°32.86 353°35.04	10.82 · · 10.93
8 9 10 11	328°55.09 343°57.55 359°0.02 14°2.48 29°4.94	310°13.46 325°13.10 340°12.74 355°12.38 10°12.01	8.38 •• 9.53 10.68 11.83	193°55.97 208°57.68 223°59.40 239°1.11	18.27 •• 17.93 17.58 17.23	203°23.21 218°25.50 233°27.80 248°30.09	26.12 •• 26.06 26.01 25.95	323°30.67 338°32.86 353°35.04 8°37.23	10.82 •• 10.93 11.03 11.14
8 9 10 11 12	328°55.09 343°57.55 359°0.02 14°2.48 29°4.94 44°7.41	310°13.46 325°13.10 340°12.74 355°12.38 10°12.01 25°11.65	8.38 •• 9.53 10.68 11.83 N06°12.98	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82	18.27 · · 17.93 17.58 17.23 N14°16.88	203°23.21 218°25.50 233°27.80 248°30.09 263°32.38	26.12 · · 26.06 26.01 25.95 N16° 25.89	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41	10.82 · · 10.93 11.03 11.14 N06° 11.25
8 9 10 11 12 13	328°55.09 343°57.55 359°0.02 14°2.48 29°4.94 44°7.41 59°9.87	310°13.46 325°13.10 340°12.74 355°12.38 10°12.01 25°11.65 40°11.29	8.38 • 9.53 10.68 11.83 N06°12.98 14.12	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53	18.27 • 17.93 17.58 17.23 N14°16.88 16.53	203°23.21 218°25.50 233°27.80 248°30.09 263°32.38 278°34.68	26.12 · · · 26.06 26.01 25.95 N16° 25.89 25.83	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60	10.82 · · 10.93 11.03 11.14 N06° 11.25 11.35
8 9 10 11 12 13 14	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92	8.38 • 9.53 10.68 11.83 N06°12.98 14.12 15.27	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24	18.27 • 17.93 17.58 17.23 N14°16.88 16.53 16.18	203°23.21 218°25.50 233°27.80 248°30.09 263°32.38 278°34.68 293°36.97	26.12 · · · 26.06 26.01 25.95 N16° 25.89 25.83 25.78	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78	10.82 · · 10.93 11.03 11.14 N06° 11.25 11.35 11.46
8 9 10 11 12 13 14 15	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56	8.38 · · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · · 16.42	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95	18.27 · · 17.93 17.58 17.23 N14°16.88 16.53 16.18 · · 15.83	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26	26.12 · · 26.06 26.01 25.95 N16°25.89 25.83 25.78 · · 25.72	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97	10.82 ·· 10.93 11.03 11.14 N06°11.25 11.35 11.46 ·· 11.57
8 9 10 11 12 13 14 15 16	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66	18.27 · · 17.93 17.58 17.23 N14°16.88 16.53 16.18 · · 15.83 15.48	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55	26.12 · · 26.06 26.01 25.95 N16°25.89 25.83 25.78 · · 25.72 25.66	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15	10.82 · · 10.93 11.03 11.14 N06° 11.25 11.35 11.46 · · 11.57 11.67
8 9 10 11 12 13 14 15 16 17	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.83 15.48 15.13	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85	26.12 · · 26.06 26.01 25.95 N16° 25.89 25.83 25.78 · · 25.72 25.66 25.60	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34	10.82 10.93 11.03 11.14 N06° 11.25 11.35 11.46 11.57 11.67 11.78
8 9 10 11 12 13 14 15 16 17	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.83 15.48 15.13 N14°14.78	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85 353° 46.14	26.12 · · 26.06 26.01 25.95 N16°25.89 25.83 25.78 · · 25.72 25.66	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53	10.82 · · 10.93 11.03 11.14 N06° 11.25 11.35 11.46 · · 11.57 11.67
8 9 10 11 12 13 14 15 16 17	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.83 15.48 15.13	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85	26.12 · · 26.06 26.01 25.95 N16° 25.89 25.83 25.78 · · 25.72 25.66 25.60	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34	10.82 10.93 11.03 11.14 N06° 11.25 11.35 11.46 11.57 11.67 11.78
8 9 10 11 12 13 14 15 16 17 18 19	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71 N06°19.86	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.83 15.48 15.13 N14°14.78	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85 353° 46.14	26.12 26.06 26.01 25.95 N16°25.89 25.83 25.78 25.72 25.66 25.60 N16°25.55	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53	10.82 11.03 11.14 N06°11.25 11.35 11.46 11.57 11.67 11.78 N06°11.89 12.00
8 9 10 11 12 13 14 15 16 17 18 19 20	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19 149° 24.66 164° 27.12	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47 130° 9.11 145° 8.74	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71 N06°19.86 21.00 22.15	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07 359° 14.78 14° 16.48	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.48 15.13 N14°14.78 14.43 14.08	203°23.21 218°25.50 233°27.80 248°30.09 263°32.38 278°34.68 293°36.97 308°39.26 323°41.55 338°43.85 353°46.14 8°48.43 23°50.72	26.12 26.06 26.01 25.95 N16°25.89 25.83 25.78 25.72 25.66 25.60 N16°25.55 25.49 25.43	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53 128°54.71 143°56.90	10.82 11.03 11.03 11.14 N06° 11.25 11.46 11.57 11.67 11.78 N06° 11.89 12.00 12.10
8 9 10 11 12 13 14 15 16 17 18 19 20 21	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19 149° 24.66 164° 27.12 179° 29.59	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47 130° 9.11 145° 8.74 160° 8.38	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71 N06°19.86 21.00 22.15 · 23.29	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07 359° 14.78 14° 16.48 29° 18.19	18.27 17.93 17.58 17.23 N14° 16.88 16.53 16.18 15.48 15.13 N14° 14.78 14.43 14.08 13.73	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85 353° 46.14 8° 48.43 23° 50.72 38° 53.01	26.12 26.06 26.01 25.95 N16°25.89 25.78 25.72 25.66 25.60 N16°25.55 25.49 25.43 25.43	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53 128°54.71 143°56.90 158°59.08	10.82 11.03 11.14 N06°11.25 11.46 11.57 11.67 11.78 N06°11.89 12.00 12.10 12.21
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19 149° 24.66 164° 27.12 179° 29.59 194° 32.05	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47 130° 9.11 145° 8.74 160° 8.38 175° 8.01	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71 N06°19.86 21.00 22.15 · 23.29 24.44	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07 359° 14.78 14° 16.48 29° 18.19 44° 19.89	18.27 17.93 17.58 17.23 N14°16.88 16.53 16.18 15.48 15.13 N14°14.78 14.43 14.08 13.73 13.37	203°23.21 218°25.50 233°27.80 248°30.09 263°32.38 278°34.68 293°36.97 308°39.26 323°41.55 338°43.85 353°46.14 8°48.43 23°50.72 38°53.01 53°55.30	26.12 26.06 26.01 25.95 N16°25.89 25.83 25.78 25.72 25.66 25.60 N16°25.55 25.49 25.43 25.37 25.31	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53 128°54.71 143°56.90 158°59.08 174°1.27	10.82 11.03 11.14 N06°11.25 11.35 11.46 11.57 11.67 11.78 N06°11.89 12.00 12.10 12.21 12.32
8 9 10 11 12 13 14 15 16 17 18 19 20 21	328° 55.09 343° 57.55 359° 0.02 14° 2.48 29° 4.94 44° 7.41 59° 9.87 74° 12.34 89° 14.80 104° 17.27 119° 19.73 134° 22.19 149° 24.66 164° 27.12 179° 29.59	310° 13.46 325° 13.10 340° 12.74 355° 12.38 10° 12.01 25° 11.65 40° 11.29 55° 10.92 70° 10.56 85° 10.20 100° 9.83 115° 9.47 130° 9.11 145° 8.74 160° 8.38 175° 8.01 190° 7.65	8.38 · 9.53 10.68 11.83 N06°12.98 14.12 15.27 · 16.42 17.56 18.71 N06°19.86 21.00 22.15 · 23.29	193° 55.97 208° 57.68 223° 59.40 239° 1.11 254° 2.82 269° 4.53 284° 6.24 299° 7.95 314° 9.66 329° 11.36 344° 13.07 359° 14.78 14° 16.48 29° 18.19	18.27 17.93 17.58 17.23 N14° 16.88 16.53 16.18 15.48 15.13 N14° 14.78 14.43 14.08 13.73	203° 23.21 218° 25.50 233° 27.80 248° 30.09 263° 32.38 278° 34.68 293° 36.97 308° 39.26 323° 41.55 338° 43.85 353° 46.14 8° 48.43 23° 50.72 38° 53.01	26.12 26.06 26.01 25.95 N16°25.89 25.78 25.72 25.66 25.60 N16°25.55 25.49 25.43 25.43	323°30.67 338°32.86 353°35.04 8°37.23 23°39.41 38°41.60 53°43.78 68°45.97 83°48.15 98°50.34 113°52.53 128°54.71 143°56.90 158°59.08	10.82 11.03 11.14 N06°11.25 11.46 11.57 11.67 11.78 N06°11.89 12.00 12.10 12.21

Alpheratz		
Aipiiciatz	357°33.07	29°14.35
Ankaa	353° 5.64	-42°9.31
Schedar	349°29.32	$56^{\circ}41.08$
Diphda	348°45.69	-17°50.17
Achernar	335°19.36	-57°5.76
Hamal	327°49.39	23°35.42
Polaris	313°31.96	89°22.72
Acamar	315°10.77	-40°11.72
Menkar	314°4.49	4°11.75
Mirfak	308°26.02	49°57.46
l	290°37.76	
Aldebaran		16°33.79
Rigel	281°2.33	-8°10.32
Capella	280°19.48	46°1.54
Bellatrix	278°21.12	6°22.38
Elnath	277°59.78	28°37.80
Alnilam	275°36.07	$-1^{\circ}11.18$
Betelgeuse	270°50.28	7°24.64
Canopus	263°51.90	-52°42.85
Sirius	258°24.77	-16°45.41
Adhara	255° 4.57	-29°0.78
Procyon	244°48.98	5°9.17
		27°57.60
Pollux	243°15.13	
Avior	234°14.08	-59°36.16
Suhail	222°44.91	-43°32.91
Miaplacidus	221°37.83	-69°50.12
Alphard	$217^{\circ}45.87$	-8°46.83
Regulus	207°32.35	11°49.91
Dubhe	193°38.41	61°36.34
Denebola	182°22.81	14°25.05
Gienah	175°41.38	-17°41.85
Acrux	172°57.38	-63°15.33
Gacrux	171°49.03	-57°16.26
Alioth	166°10.86	55°48.71
Spica	158°20.00	-11°18.42
Alkaid	152°50.07	49°10.56
Hadar	148°32.64	-60°30.44
Menkent	147°54.98	-36°30.43
Arcturus	145°45.85	19°2.28
Rigil Kent.	139°36.99	-60°57.01
Kochab	137°18.72	74°2.49
Zuben'ubi	136°53.58	-16°9.45
l	126° 1.78	
Alphecca		26°37.21
Antares	112°13.17	-26°29.58
i e		
Atria	107°5.19	-69°4.44
Sabik	102°0.32	-15°45.55
Sabik	102°0.32	-15°45.55
Sabik Shaula	102°0.32 96°7.47	-15°45.55 -37°7.33
Sabik Shaula Rasalhague Eltanin	102° 0.32 96° 7.47 95° 56.53	-15°45.55 -37°7.33 12°32.27
Sabik Shaula Rasalhague Eltanin Kaus Aust.	102° 0.32 96° 7.47 95° 56.53 90° 40.92 83° 29.75	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega	102° 0.32 96° 7.47 95° 56.53 90° 40.92 83° 29.75 80° 31.69	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68	-15° 45.55 -37° 7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb	102° 0.32 96° 7.47 95° 56.53 90° 40.92 83° 29.75 80° 31.69 75° 45.23 61° 58.01 53° 2.68 49° 24.46	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 28° 13.71 15° 21.04
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Mars	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn Jupiter	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 28° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Mars	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 28° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Venus	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Mars May 06 Thu Venus Mars	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 28° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Venus	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01	-15°45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Auguster Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 28° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01 339°35.35	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01 339°35.35 tal parallax	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01 339°35.35 Ital parallax Venus:	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 128° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19 19:06
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01 339°35.35 tal parallax	-15° 45.55 -37°7.33 12°32.27 51°28.85 -34°22.18 38°48.30 -26°15.67 8°56.33 -56°38.52 45°22.41 9°59.93 -46°49.47 -29°28.51 28°13.71 15°21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19
Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 04 Tue Venus Mars Jupiter Saturn May 05 Wed Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn May 06 Thu Venus Mars Jupiter Saturn	102°0.32 96°7.47 95°56.53 90°40.92 83°29.75 80°31.69 75°45.23 61°58.01 53°2.68 49°24.46 33°37.00 27°30.70 15°12.62 13°43.54 13°28.18 SHA 343°53.54 210°39.46 219°34.72 339°48.80 SHA 342°45.90 210°22.12 219°30.94 339°42.06 SHA 341°38.16 210°4.41 219°27.01 339°35.35 Ital parallax Venus:	-15° 45.55 -37°7.33 12° 32.27 51° 28.85 -34° 22.18 38° 48.30 -26° 15.67 8° 56.33 -56° 38.52 45° 22.41 9° 59.93 -46° 49.47 -29° 28.51 128° 13.71 15° 21.04 Mer.pass 10:18 19:09 18:32 10:33 Mer.pass 10:19 19:06 18:29 10:29 Mer.pass 10:19 19:06

The CHA Dac 180°4718 Nis°50.29 212°9.75 13.4 No8°35.87 14.4 57.0 2 210°47.30 51.74 2 226°42.19 13.4 No8°35.87 14.4 57.0 2 240°47.30 51.74 255°46.83 13.2 09°14.74 14.4 57.1 4 240°47.41 53.20 270°19.04 13.1 09°33.52 14.4 57.1 3 255°47.47 53.39 238°51.17 13.0 09°33.52 14.3 57.1 57.2 5 255°47.47 53.39 238°51.17 13.0 09°33.52 14.3 57.1 57.2 5 3 30°47.65 56.11 328°27.07 12.8 10°30.73 14.2 57.3 3 30°47.65 56.11 328°27.07 12.8 10°30.73 14.2 57.3 10 330°47.76 57.56 357°30.60 12.6 10°59.14 14.2 57.3 11 345°47.94 15°9.73 341°5.52 12.4 11°13.30 141°5.74 14 30°47.99 16°0.45 55°36.63 12.3 11°55.31 14.0 57.4 15°4.60 15°4.60 18.3 11°2.10 11°2.14 14.1 57.4 15°4.60 15°4.60 18.3 11°2.11 12°2.348 13.9 57.5 18 90°48.22 N16°3.34 113°41.23 11.9 N12°51.26 13.8 57.6 20°48.83 4.78 142°42.97 11.7 13°18.84 13.7 57.6 21°56.84 6.94 6.94 128°12.15 18.8 13°5.06 13.8 57.6 21°56.84 6.94 6.94 128°12.15 18.8 13°5.06 13.8 57.6 21°56.84 6.94 6.94 128°12.15 18.8 13°5.06 13.8 57.6 21°56.84 6.94 6.94 6.94 11°4.43 11.4 13°59.84 13.6 57.7 22°1.15 18.8 13°4.23 11°4.23 11°4.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°1.15 48.66 9.00 22°45.88 11.1 14°40.33 13.5 57.7 22°4.88 22°4.88 22°4.88 22°4.88 22°4.88	h	Su	n	Moon				
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0 180°49.78 N16°24.76 188°24.17 8.7' N19°17.81 11.6' 58.4' 1 195°49.83 25.47 202°51.90 8.6' 19°29.43 11.5' 58.5' 2 210°49.87 26.18 217°19.51 8.5' 19°40.95 11.4' 58.5' 3 225°49.92 ⋅ 26.88 231°47.01 8.4' 19°52.37 11.3' 58.5' 4 240°49.97 27.59 246°14.40 8.3' 20°3.69 11.2' 58.5' 5 255°50.02 28.29 260°41.66 8.2' 20°14.90 11.1' 58.6' 6 270°50.06 N16°29.00 275°8.82 8.0' N20°26.00 11.0' 58.6' 7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 ⋅ 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71 10.0' 58.8' 15 45°50.48 ⋅ 35.32 45°7.99 7.0' 22°0.75 9.9' 58.8' 16 60°50.52 36.02 59°33.99 6.9' 22°10.67 9.8' 58.8' 17 75°50.56 36.71 73°59.87 6.8' 22°20.46 9.7' 58.9' 18 90°50.61 N16°37.41 88°25.65 6.7' N22°30.13 9.5' 58.9' 19 105°50.65 38.11 102°51.31 6.5' 22°39.66 9.4' 58.9' 20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 ⋅ 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'	Thu	GHA	Dec	GHA	ν	Dec	d	HP
2 210°49.87 26.18 217°19.51 8.5' 19°40.95 11.4' 58.5' 3 225°49.92 · · · 26.88 231°47.01 8.4' 19°52.37 11.3' 58.5' 4 240°49.97 27.59 246°14.40 8.3' 20°3.69 11.2' 58.5' 5 255°50.02 28.29 260°41.66 8.2' 20°14.90 11.1' 58.6' 6 270°50.06 N16°29.00 275°8.82 8.0' N20°26.00 11.0' 58.6' 7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.3	0		N16°24.76	188°24.17	8.7'	N19°17.81	11.6'	58.4'
3 225°49.92 · · · 26.88 231°47.01 8.4' 19°52.37 11.3' 58.5' 4 240°49.97 27.59 246°14.40 8.3' 20°3.69 11.2' 58.5' 5 255°50.02 28.29 260°41.66 8.2' 20°14.90 11.1' 58.6' 6 270°50.06 N16°29.00 275°8.82 8.0' N20°26.00 11.0' 58.6' 7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65<								
4 240°49.97 27.59 246°14.40 8.3' 20°3.69 11.2' 58.5' 5 255°50.02 28.29 260°41.66 8.2' 20°14.90 11.1' 58.6' 6 270°50.06 N16°29.00 275°8.82 8.0' N20°26.00 11.0' 58.6' 7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88								
5 255°50.02 28.29 260°41.66 8.2' 20°14.90 11.1' 58.6' 6 270°50.06 N16°29.00 275°8.82 8.0' N20°26.00 11.1' 58.6' 7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71								
7 285°50.11 29.70 289°35.85 7.9' 20°36.99 10.9' 58.6' 8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71 10.0' 58.8' 15 45°50.48 · 35.32 45°7.99 7.0' 22°0.75 9.9' 58.8' 16 60°50.52 36.02 59°33.99 6.9' 22°10.67 9.8' 58.9' 18 90°50.61 N16°37.41 88°25.65		255°50.02	28.29	260°41.66	8.2'	$20^{\circ}14.90$	11.1'	
8 300°50.16 30.40 304°2.78 7.8' 20°47.87 10.8' 58.6' 9 315°50.20 · 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71 10.0' 58.8' 15 45°50.48 · 35.32 45°7.99 7.0' 22°0.75 9.9' 58.8' 16 60°50.52 36.02 59°33.99 6.9' 22°10.67 9.8' 58.8' 17 75°50.56 36.71 73°59.87 6.8' 22°20.46 9.7' 58.9' 18 90°50.61 N16°37.41 88°25.65 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>								
9 315°50.20 ·· 31.11 318°29.58 7.7' 20°58.64 10.7' 58.7' 10 330°50.25 31.81 332°56.27 7.6' 21°9.29 10.5' 58.7' 11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71 10.0' 58.8' 15 45°50.48 ·· 35.32 45°7.99 7.0' 22°0.75 9.9' 58.8' 16 60°50.52 36.02 59°33.99 6.9' 22°10.67 9.8' 58.8' 17 75°50.56 36.71 73°59.87 6.8' 22°20.46 9.7' 58.9' 18 90°50.61 N16°37.41 88°25.65 6.7' N22°30.13 9.5' 58.9' 19 105°50.65 38.11 102°51.31 6.5' 22°39.66 9.4' 58.9' 20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 ·· 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
10 330° 50.25 31.81 332° 56.27 7.6' 21° 9.29 10.5' 58.7' 11 345° 50.30 32.51 347° 22.84 7.5' 21° 19.83 10.4' 58.7' 12 0° 50.34 N16° 33.21 1° 49.30 7.3' N21° 30.24 10.3' 58.7' 13 15° 50.39 33.91 16° 15.65 7.2' 21° 40.53 10.2' 58.8' 14 30° 50.43 34.62 30° 41.88 7.1' 21° 50.71 10.0' 58.8' 15 45° 50.48 35.32 45° 7.99 7.0' 22° 0.75 9.9' 58.8' 16 60° 50.52 36.02 59° 33.99 6.9' 22° 10.67 9.8' 58.8' 17 75° 50.56 36.71 73° 59.87 6.8' 22° 20.46 9.7' 58.9' 18 90° 50.61 N16° 37.41 88° 25.65 6.7' N22° 30.13 9.5' 58.9' 19 105° 50.65 38.11 102° 51.31 6.5' 22° 39.66 9.4' 58.9' 20 120° 50.70 38.81								
11 345°50.30 32.51 347°22.84 7.5' 21°19.83 10.4' 58.7' 12 0°50.34 N16°33.21 1°49.30 7.3' N21°30.24 10.3' 58.7' 13 15°50.39 33.91 16°15.65 7.2' 21°40.53 10.2' 58.8' 14 30°50.43 34.62 30°41.88 7.1' 21°50.71 10.0' 58.8' 15 45°50.48 35.32 45°7.99 7.0' 22°0.75 9.9' 58.8' 16 60°50.52 36.02 59°33.99 6.9' 22°10.67 9.8' 58.8' 17 75°50.56 36.71 73°59.87 6.8' 22°20.46 9.7' 58.9' 18 90°50.61 N16°37.41 88°25.65 6.7' N22°30.13 9.5' 58.9' 19 105°50.65 38.11 102°51.31 6.5' 22°39.66 9.4' 58.9' 20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 39.51 131°42.29								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11	345°50.30	32.51	347°22.84	7.5'	21°19.83	10.4'	58.7'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
18 90°50.61 N16°37.41 88°25.65 6.7' N22°30.13 9.5' 58.9' 19 105°50.65 38.11 102°51.31 6.5' 22°39.66 9.4' 58.9' 20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 · · 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
19 105°50.65 38.11 102°51.31 6.5' 22°39.66 9.4' 58.9' 20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
20 120°50.70 38.81 117°16.85 6.4' 22°49.05 9.3' 58.9' 21 135°50.74 · · 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
21 135°50.74 ·· 39.51 131°42.29 6.3' 22°58.31 9.1' 58.9' 22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
22 150°50.78 40.20 146°7.61 6.2' 23°7.43 9.0' 59.0' 23 165°50.83 40.90 160°32.83 6.1' 23°16.42 8.8' 59.0'								
	22							59.0'
SD = 15.8' d = 0.7' $SD = 15.9'$	23	165°50.83	40.90	160°32.83	6.1'	23°16.42	8.8'	59.0'
		SD = 15.8'	d = 0.7'		SE	0 = 15.9'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	7-0%	
04	03:09	03:12	11:57	10:10	22:34		
05	03:14	03:17	11:57	10:59	23:25		
06	03:19	03:21	11:57	11:52	-:-		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	curn		Stars
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	224°36.98	205°7.28	N06°26.73	74°23.30	N14°12.67	83°59.88	N16°25.19	204°5.64	N06° 12.53		
1	239°39.44	220°6.91	27.87	89°25.00	12.32	99° 2.17	25.14	219°7.83	12.64	Alpheratz	357°33.05
2	254°41.91	235°6.55	29.02	104°26.71	11.97	114° 4.46	25.08	234°10.01	12.74	Ankaa	353°5.62
3	269° 44.37	250°6.18	30.16	119°28.41	. 11.61	129° 6.75	25.02	249°12.20	. 12.85	Schedar	349°29.29
4	284°46.84	265°5.82	31.31	134°30.11	11.26	144° 9.04	24.96	264°14.39	12.96	Diphda	348°45.67
5	299°49.30	280°5.45	32.45	149°31.81	10.91	159°11.33	24.90	279°16.57	13.06	Achernar	335° 19.35
6	314°51.76	295°5.08	N06°33.59	164°33.51	N14°10.55	174°13.62	N16°24.84	294°18.76	N06° 13.17	Hamal	327°49.38
7	329°54.23	310°4.72	34.74	179° 35.21	10.20	189°15.90	24.78	309°20.95	13.28	Polaris	313°31.56
8	344°56.69	325°4.35	35.88	194°36.91	9.85	204°18.19	24.72	324°23.13	13.38	Acamar	315° 10.77
9	359°59.16	340°3.98	37.02	209°38.61	• • 9.49	219°20.48	24.66	339°25.32	. 13.49	Menkar	314°4.48
10	15°1.62	355°3.62	38.17	224°40.30	9.14	234°22.77	24.60	354°27.50	13.60	Mirfak	308°26.01
11	30°4.08	10°3.25	39.31	239°42.00	8.78	249°25.05	24.54	9°29.69	13.70	Aldebaran	290°37.75
12	45°6.55	25°2.88	N06°40.45	254°43.70	N14°8.43	264°27.34	N16°24.48	24°31.88	N06° 13.81	Rigel	$281^{\circ}2.33$
13	60°9.01	40°2.51	41.59	269°45.39	8.07	279°29.62	24.42	39°34.06	13.91	Capella	$280^{\circ}19.48$
14	75° 11.48	55°2.14	42.74	284°47.09	7.72	294°31.91	24.36	54°36.25	14.02	Bellatrix	278°21.12
15	90° 13.94	70°1.77	• • 43.88	299°48.78	7.36	309°34.20	24.30	69°38.44	. 14.13	Elnath	277°59.78
16	105° 16.41	85°1.41	45.02	314°50.47	7.01	324°36.48	24.24	84°40.63	14.13	Alnilam	275°36.07
17	120° 18.87	100°1.04	46.16	329°52.17	6.65	339°38.77	24.18	99°42.81	14.23	Betelgeuse	270°50.28
18	135°21.33	115° 0.67	N06°47.30	344°53.86	N14° 6.30	354°41.05	N16°24.12	114°45.00	N06° 14.45	Canopus	263°51.92
19	150°23.80	130°0.30	48.44	359°55.55	5.94	9°43.34	24.06	129°47.19	14.55	Sirius	258°24.78
20	165°26.26	144°59.93	49.58	14°57.24	5.58	24°45.62	24.00	144°49.37	14.66	Adhara	255°4.58
21	180°28.73	159°59.56	• • 50.72	29°58.93	5.23	39°47.90	• • 23.94	159°51.56	. 14.76	Procyon	244°48.99
22	195°31.19	174°59.19	51.86	45°0.62	4.87	54°50.19	23.88	174°53.75	14.70	Pollux	243°15.14
23	210° 33.65	189° 58.82	53.00	60°2.31	4.51	69°52.47	23.82	189°55.93	14.07	Avior	234°14.10
23	210 33.03	109 30.02	33.00	00 2.31	4.51			109 55.95	14.90	Suhail	222°44.92
Mer.	pass. 09:00	$ u$ -0.4 $^{\prime}$ d1	.1' m-3.86	$\nu 1.7' \ d$ -0	.4′ m0.39	$\nu 2.3' \ d-0$.1′ m-2.08	$\nu 2.2' \ d0$	$.1^\prime$ m0.71	Miaplacidus	221°37.87
										Alphard	217°45.88
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.36
0 0	225°36.12	204° 58.45	N06°54.14	75°4.00	N14° 4.15	84°54.76	N16°23.76	204°58.12	N06° 15.08	Dubhe	193°38.43
1	240°38.58	219° 58.08	55.28	90°5.69	3.80	99°57.04	23.70	220° 0.31	15.19	Denebola	182°22.82
2	255° 41.05	234°57.71	56.42	105°7.38	3.44	114°59.32	23.64	235°2.50		Gienah	175°41.38
3	270°43.51	249° 57.71		105 7.36 120°9.07		130°1.60		250°4.68	15.30	Acrux	172°57.39
3 4	285° 45.98	249 57.34 264° 56.96	•• 57.56	120 9.07 135° 10.75	• • 3.08	130 1.00 145°3.89	• • 23.58	265°6.87	15.40	Gacrux	171°49.03
	205 45.90 300° 48.44	279° 56.59	58.70 06°59.84	150°12.44	2.72	145 3.69 160° 6.17	23.52	280° 9.06	15.51	Alioth	$166^{\circ}10.87$
5 6					2.36		23.46		15.61	Spica	158°20.00
	315°50.90	294°56.22	N07° 0.98	165° 14.12 180° 15.81	N14°2.01	175°8.45 190°10.73	N16°23.39	295°11.25 310°13.43	N06° 15.72	Alkaid	152°50.07
7	330°53.37	309°55.85	2.12	180 15.81 195°17.49	1.65		23.33		15.83	Hadar	148°32.63
8	345°55.83	324°55.48	3.25		1.29 · · 0.93	205°13.01	23.27	325°15.62	15.93	Menkent	$147^{\circ}54.97$
9	0°58.30	339°55.10	• • 4.39	210° 19.17		220°15.29	• • 23.21	340°17.81	• • 16.04	Arcturus	145°45.85
10	16°0.76	354°54.73	5.53	225°20.86	0.57	235°17.57	23.15	355°20.00	16.14	Rigil Kent.	139°36.97
11	31°3.23	9°54.36	6.67	240°22.54	14°0.21	250°19.85	23.09	10°22.18	16.25	Kochab	$137^{\circ}18.73$
12	46°5.69	24°53.99	N07°7.80	255° 24.22	N13°59.85	265°22.13	N16°23.02	25°24.37	N06° 16.35	Zuben'ubi	136°53.57
13	61°8.15	39°53.61 54°53.24	8.94	270°25.90 285°27.58	59.49	280°24.41 295°26.69	22.96	40°26.56 55°28.75	16.46	Alphecca	126°1.78
14	76° 10.62		10.08		59.13		22.90		16.57	Antares	$112^{\circ}13.15$
15	91° 13.08 106° 15.55	69°52.87 84°52.49	11.21	300°29.26 315°30.94	58.76	310°28.97 325°31.25	• • 22.84	70°30.94 85°33.12	· · 16.67	Atria	107°5.14
16 17			12.35		58.40		22.78	05 33.12 100°35.31	16.78	Sabik	102°0.30
	121° 18.01 136° 20.47	99°52.12 114°51.74	13.48	330°32.62	58.04	340°33.53 355°35.80	22.71 N16°22.65	100 35.31 115°37.50	16.88	Shaula	96°7.45
18	150° 20.47 151° 22.94	114 51.74 129°51.37	N07°14.62	345°34.30	N13°57.68			130°39.69	N06° 16.99	Rasalhague	$95^{\circ}56.51$
19		129 51.57 144°50.99	15.75	0°35.98	57.32	10°38.08 25°40.36	22.59		17.09	Eltanin	90°40.90
20	166° 25.40 181° 27.87	159° 50.62	16.89 •• 18.02	15°37.65 30°39.33	56.96 •• 56.59	40°42.64	22.53 •• 22.46	145°41.88 160°44.06	17.20 •• 17.30	Kaus Aust.	83°29.73
21 22	196°30.33		19.16	45°41.01	56.23	55°44.91	22.40	175°46.25		Vega	80°31.66
	211°32.80	174°50.24 189°49.87		60°42.68		70°47.19	22.34	175 40.25 190°48.44	17.41	Nunki	75°45.20
23	211 32.00	109 49.07	20.29	00 42.00	55.87	70 47.19	22.34	190 46.44	17.52	Altair	61°57.98
Mer.	pass. 08:56	ν -0.4 $'$ d1	.1' m-3.86	$\nu 1.7' \ d-0$.4′ m0.41	$\nu 2.3' \ d-0$.1′ m-2.07	$\nu 2.2' \ d0$	$.1^\prime$ m0.71	Peacock	53°2.65
										Deneb	49°24.42
_	CIIA	CIIA	Б.	CILA	Б	CILA	Б	CIIA	Б	Enif	33°36.97
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.67
0	226° 35.26	204°49.49	N07°21.43	75°44.35	N13°55.51	85°49.47 100°51.74	N16°22.28	205°50.63 220°52.82	N06° 17.62	Fomalhaut	15° 12.60
1	241°37.72	219°49.11	22.56	90°46.03	55.14 54.79		22.21		17.73	Scheat	13°43.52
2	256° 40.19 271° 42.65	234°48.74 249°48.36	23.69	105°47.70 120°49.37	54.78 •• 54.42	115°54.02 130°56.30	22.15 •• 22.09	235°55.01 250°57.20	17.83 •• 17.94	Markab	13°28.15
										May 07 Fri	SHA
4 5	286° 45.12 301° 47.58	264°47.99 279°47.61	25.96 27.00	135°51.05 150°52.72	54.05 53.60	145°58.57 161°0.85	22.02	265°59.38 281°1.57	18.04	Venus	
6	301°47.58 316°50.05	279°47.61 294°47.23	27.09 N07°28.22	150° 52.72 165° 54.39	53.69 N13°53.32	161° 0.85 176° 3.12	21.96 N16°21.90	281°1.57 296°3.76	18.15 N06° 18.25	Mars	
	331° 52.51	309°46.85		180° 56.06				311°5.95		Jupiter	
7 8	331 52.51 346° 54.97	309°46.85 324°46.48	29.36 30.49	180°56.06 195°57.73	52.96 52.59	191°5.40 206°7.67	21.83 21.77	311 5.95 326°8.14	18.36 18.46	Saturn	339°28.66
9	340 54.97 1°57.44	324 46.48 339°46.10	31.62	210° 59.40	52.23	200 7.07 221°9.94	21.77	320 8.14 341°10.33	18.46	Jatuill	222 20.00
10	1 57.44 16°59.90	354° 45.72	32.75	210 59.40 226°1.07	51.86	221 9.94 236°12.22	21.64	341 10.33 356°12.52	18.67	May 08 Sat	SHA
11	32°2.37	9°45.34	33.88	241°2.74	51.50	250 12.22 251°14.49	21.58	11°14.71	18.78		$339^{\circ}22.33$
12	47°4.83	24° 44.96	N07°35.01	256°4.40	N13°51.13	266°16.76	N16°21.51	26°16.89	N06° 18.88		209°27.88
13	47 4.83 62°7.30	24 44.96 39°44.58	36.14	250 4.40 271°6.07	50.77	200 10.70 281°19.04	21.45	41°19.08	18.99	Jupiter	$219^{\circ}18.64$
14	77°9.76	59 44.50 54° 44.20	37.27	271 0.07 286°7.74	50.77	201 19.04 296°21.31	21.45	56°21.27	19.09	Saturn	339°22.00
15	92° 12.22	69°43.83	• • 38.40	301°9.40	50.03	311°23.58	. 21.39	71°23.46	. 19.09	May 00 C	CUA
16	92 12.22 107°14.69	84° 43.45	39.53	316°11.07	49.67	326°25.86	21.32	86°25.65	19.30	May 09 Sun	SHA
17	107 14.09 122° 17.15	99°43.07	40.66	331° 12.73	49.07	341°28.13	21.20	101°27.84	19.30		338°14.23 209°9.09
18	137° 19.62		N07°41.79	346°14.40	N13°48.93	356°30.40	N16°21.13		N06° 19.51	Mars Jupiter	
19	152°22.08	129° 42.31	42.92	1°16.06	48.57	11°32.67	21.06	131°32.22	19.62	Saturn	
20	167°24.54	144° 41.92	44.05	16°17.72	48.20	26°34.94	21.00	146°34.41	19.72	Saturn	JJ9 15.51
21	182°27.01	159° 41.54	• 45.18	31°19.38	• • 47.83	41°37.21	. 20.93	161°36.60	19.83	Horizor	ntal parallax
22	197°29.47	174° 41.16	46.31	46°21.05	47.46	56°39.48	20.87	176°38.79	19.03		Venus:
23	212°31.94	189° 40.78	47.44	61°22.71	47.09	71°41.75	20.81	191°40.98	20.04		Mars:
Mer.	pass. 08:52	ν -0.4′ $d1$.1′ m-3.86	ν 1. ℓ' d -0	.4′ m0.43	ν 2.3′ d-0	.1′ m-2.06	$\nu^{2.2'} d0$.1′ m0.71		

Dec

29°14.36

-42°9.29 56°41.08

-17°50.16

 $\textbf{-57}^{\circ}5.75$

23°35.42

89°22.71

-40°11.71 4°11.75

49°57.45

16°33.79 -8°10.32

 $46^{\circ}1.53$

 $6^{\circ}22.38$

28°37.79

 $-1^{\circ}11.18$

 $7^{\circ}24.64$ -52°42.84

-16°45.40

 $-29^{\circ}0.78$ $5^{\circ}9.17$

 $27^{\circ}57.60$

-59°36.16

-43°32.91

-69°50.12

-8°46.83

11°49.91 61°36.35

 $14^{\circ}25.06$

 $-17^{\circ}41.85$

-63°15.34

-57°16.27

55°48.72 -11°18.42

49°10.57

-60°30.45

-36°30.44

19°2.29

-60°57.02

-16°9.45

26°37.23 -26°29.58

-69°4.45

 $-37^{\circ}7.33$

 $12^{\circ}32.28$

51°28.87

-34°22.18

38°48.31

 $-26^{\circ}15.67$

8°56.34

-56°38.52

45°22.42

9°59.94

-46°49.46

-29°28.50

28°13.72

15°21.05

Mer.pass

10:20

19:00

18:21

10:22

10:20

18:58

18:18

10:19

10:21

18:55

18:14

10:15

0.1

0.1

Mer.pass

Mer.pass

-15°45.55

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.87	N16°41.59	174°57.93	6.0'	$N23^{\circ}25.26$	8.7'	59.0'
1	195°50.91	42.29	189°22.93	5.9'	23°33.96	8.6'	59.0'
2	210° 50.95 225° 50.99	42.98 •• 43.68	203°47.81 218°12.59	5.8' 5.7'	23°42.51 23°50.92	8.4' 8.3'	59.1' 59.1'
4	240°51.04	44.37	232°37.27	5.6'	23°59.18	8.1'	59.1'
5	255° 51.08	45.07	247°1.84	5.5'	24°7.29	8.0'	59.1'
6	270°51.12	N16°45.76	261°26.30	5.4'	$N24^{\circ}15.25$	7.8'	59.1'
7	285°51.16	46.45	275°50.67	5.3'	24°23.05	7.7'	59.2'
8	300°51.20	47.14	290°14.93	5.2'	24°30.70	7.5'	59.2'
9 10	315°51.24 330°51.28	· · 47.83 48.53	304°39.09 319°3.16	5.1' 5.0'	24°38.20 24°45.53	7.3' 7.2'	59.2' 59.2'
11	345°51.32	49.22	333°27.12	4.9'	24°52.71	7.0'	59.2'
12	0°51.36	N16°49.91	347°50.99	4.8'	N24°59.72	6.9'	59.2'
13	15°51.40	50.60	2°14.77	4.7'	$25^{\circ}6.57$	6.7'	59.3'
14	30°51.44	51.28	16°38.45	4.6'	25°13.26	6.5'	59.3'
15 16	45°51.48 60°51.52	· · 51.97 52.66	31°2.04 45°25.55	4.5' 4.4'	25°19.78 25°26.14	6.4' 6.2'	59.3' 59.3'
17	75° 51.55	53.35	59°48.96	4.4	25°32.32	6.0'	59.3'
18	90°51.59	N16°54.04	74°12.29	4.2'	N25°38.34	5.8'	59.3'
19	105°51.63	54.72	88°35.53	4.2'	$25^{\circ}44.18$	5.7'	59.4'
20	120°51.67	55.41	102°58.70	4.1'	25°49.85	5.5'	59.4'
21	135°51.70	• • 56.09	117°21.78 131°44.78	4.0'	25°55.34	5.3'	59.4'
22 23	150°51.74 165°51.78	56.78 57.46	131 44.78 146° 7.71	3.9' 3.9'	26°0.66 26°5.81	5.1' 5.0'	59.4' 59.4'
23						5.0	33.4
	SD = 15.8'	d=0.7'		SI	D = 16.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.82	N16°58.15	160°30.57	3.8'	N26°10.77 26°15.56	4.8'	59.4'
1 2	195°51.85 210°51.89	58.83 16°59.51	174°53.35 189°16.06	3.7' 3.6'	26°15.56 26°20.16	4.6' 4.4'	59.4' 59.5'
3	210 51.69 225°51.92	10 59.51 17°0.20	203°38.70	3.6'	26°24.59	4.4	59.5'
4	240°51.96	0.88	218°1.28	3.5'	26°28.83	4.1'	59.5'
5	255°52.00	1.56	232°23.80	3.5'	26°32.88	3.9'	59.5'
6	270°52.03	N17°2.24	246°46.26	3.4'	N26°36.75	3.7'	59.5'
7	285°52.07 300°52.10	2.92	261°8.65 275°31.00	3.3'	26°40.44 26°43.94	3.5'	59.5'
8 9	300°52.10 315°52.14	3.60 •• 4.28	275°31.00 289°53.29	3.3' 3.2'	26°43.94 26°47.25	3.3' 3.1'	59.5' 59.5'
10	330°52.17	4.96	304°15.53	3.2'	26°50.37	2.9'	59.6'
11	345°52.20	5.64	318°37.72	3.1'	26°53.31	2.7'	59.6'
12	0°52.24	N17° 6.32	332°59.86	3.1'	N26°56.05	2.6'	59.6'
13	15° 52.27	7.00	347°21.96	3.1'	26°58.60	2.4'	59.6'
14 15	30°52.30 45°52.34	7.67 •• 8.35	1°44.03 16°6.05	3.0' 3.0'	27°0.96 27°3.13	2.2' 2.0'	59.6' 59.6'
16	60° 52.37	9.02	30°28.04	3.0'	27°5.11	1.8'	59.6'
17	75°52.40	9.70	44°50.00	2.9'	27°6.89	1.6'	59.6'
18	90°52.43	N17°10.38	59°11.93	2.9'	N27°8.48	1.4'	59.6'
19	105°52.47	11.05	73°33.83	2.9'	27°9.87	1.2'	59.6'
20 21	120°52.50 135°52.53	11.72 •• 12.40	87°55.71 102°17.57	2.9' 2.8'	27°11.07 27°12.08	1.0' 0.8'	59.6' 59.6'
22	150°52.56	13.07	116°39.41	2.8'	27°12.89	0.6	59.0 59.7'
23	165°52.59	13.74	131°1.23	2.8'	27°13.50	0.4	59.7'
	SD = 15.8'	d = 0.7'		SI	D = 16.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 52.62	N17°14.42	145°23.04	ν 2.8'	N27°13.92	0.2'	59.7'
1	195°52.65	15.09	159°44.84	2.8'	$27^{\circ}14.14$	0.0'	59.7'
2	210°52.68	15.76	174°6.64	2.8'	27°14.17	-0.2'	59.7'
3	225°52.71	17.10	188°28.43	2.8'	27°14.00	-0.4'	59.7'
4 5	240°52.74 255°52.77	17.10 17.77	202°50.22 217°12.01	2.8' 2.8'	27°13.63 27°13.07	-0.6' -0.8'	59.7' 59.7'
6	255 52.77 270°52.80	17.77 N17°18.44	217 12.01 231°33.81	2.8'	N27°12.31	-0.8	59.7'
7	285° 52.83	19.11	245°55.61	2.8'	27°11.36	-1.2'	59.7'
8	300°52.86	19.77	260°17.43	2.8'	27°10.21	-1.3'	59.7'
9	315°52.89	• • 20.44	274°39.25	2.8'	27°8.86	-1.5'	59.7'
10 11	330° 52.92 345° 52.95	21.11 21.78	289°1.10 303°22.96	2.9' 2.9'	27°7.32 27°5.59	-1.7' -1.9'	59.7' 59.7'
12	0°52.97	21.78 N17°22.44	303 22.96 317°44.84	2.9'	N27°3.65	-1.9	59.7'
13	15°53.00	23.11	332°6.75	2.9'	27°1.53	-2.3	59.7'
14	30°53.03	23.77	346°28.68	3.0'	26°59.21	-2.5'	59.7'
15	45°53.06	• • 24.44	0°50.64	3.0'	26°56.70	-2.7'	59.7'
16 17	60°53.08 75°53.11	25.10 25.76	15°12.64 29°34.67	3.0' 3.1'	26°53.99 26°51.09	-2.9' -3.1'	59.7' 59.7'
17	75°53.11 90°53.14	25.76 N17°26.43	29°34.67 43°56.74	3.1'	26°51.09 N26°48.01	-3.1	59.7' 59.7'
19	105°53.16	27.09	58° 18.84	3.1'	26°44.72	-3.5'	59.7'
20	120°53.19	27.75	72°40.99	3.2'	26°41.25	-3.7'	59.7'
21	135°53.22	• • 28.41	87°3.19	3.2'	26°37.59	-3.8'	59.7'
22	150°53.24	29.07	101°25.43 115°47.72	3.3' 3.3'	26°33.74 26°29.71	-4.0' -4.2'	59.7'
23	165°53.27	29.74	115 47.72			-4.2	59.7'
	SD = 15.8'	d = 0.7'		SI	D = 16.3'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-9%	
07	03:23	03:25	11:57	12:51	00:21		
08	03:27	03:29	11:57	13:53	01:21	(2,230)	
09	03:30	03:32	11:56	14:56	02:25		

h	Aries	, Ve	nus	M	ars	Jupiter		s Mars Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	227°34.40	204°40.40	N07°48.56	76°24.37	N13°46.73	86°44.02	N16°20.74	206°43.17	N06° 20.14		
1	242°36.87	219°40.02	49.69	91°26.03	46.36	101°46.29	20.68	221°45.36	20.25		
2	257°39.33	234°39.64	50.82	106° 27.69	45.99	116°48.56	20.61	236°47.55	20.35		
3	272°41.79	249°39.25	• • 51.94	121°29.35	• • 45.62	131°50.83	• • 20.54	251°49.74	20.45		
4	287° 44.26	264°38.87	53.07	136°31.00	45.25	146°53.10	20.48	266°51.93	20.56		
5	302°46.72	279°38.49	54.20	151°32.66	44.88	161°55.37	20.41	281°54.12	20.66		
6	317°49.19	294°38.10	N07°55.32	166°34.32	N13°44.51	176°57.64	N16°20.35	296°56.31	N06° 20.77		
7	332°51.65	309°37.72	56.45	181°35.98	44.14	191°59.90	20.28	311°58.50	20.87		
8	347°54.12	324°37.34	57.57	196°37.63	43.77	207°2.17	20.22	327°0.69	20.98		
9	2°56.58	339°36.95	• • 58.70	211°39.29	• • 43.40	222° 4.44	. 20.15	342°2.88	• • 21.08		
10	17°59.04	354°36.57	07°59.82	226° 40.94	43.03	237° 6.71	20.09	357°5.07	21.19		
11	33°1.51	9°36.19	08° 0.95	241°42.60	42.66	252° 8.97	20.09	12°7.26	21.19		
12	48°3.97	24°35.80	N08° 2.07	256° 44.25	N13°42.29	267°11.24	N16°19.95	27°9.45	N06°21.39		
	63°6.44	39° 35.42		271°45.90	41.92	282°13.51		42°11.64			
13	78°8.90	54° 35.42	3.20			282 13.51 297°15.77	19.89	42 11.04 57°13.83	21.50		
14			4.32	286°47.56	41.54		19.82		21.60		
15	93°11.36	69°34.65	• • 5.44	301°49.21	• • 41.17	312°18.04	• • 19.76	72°16.02	• • 21.71		
16	108° 13.83	84°34.26	6.57	316°50.86	40.80	327°20.30	19.69	87°18.21	21.81		
17	123° 16.29	99°33.87	7.69	331°52.51	40.43	342°22.57	19.62	102°20.40	21.92		
18	138° 18.76	114°33.49	N08°8.81	346°54.16	N13°40.06	357°24.83	N16°19.56	117°22.59	N06°22.02		
19	153°21.22	129°33.10	9.94	1°55.81	39.68	12°27.10	19.49	132°24.78	22.12		
20	168°23.69	144°32.72	11.06	16°57.46	39.31	27°29.36	19.42	147°26.97	22.23		
21	183°26.15	159°32.33	• • 12.18	31°59.11	• • 38.94	42°31.63	• • 19.36	162°29.16	• • 22.33		
22	$198^{\circ}28.61$	174°31.94	13.30	47°0.76	38.56	57°33.89	19.29	177°31.35	22.44		
23	213°31.08	189°31.55	14.42	62°2.40	38.19	72°36.16	19.22	192°33.54	22.54		
Mer.p	pass. 08:48	ν-0.4' d1	.1′ m-3.86	ν 1.7′ d-0	0.4' m0.44	ν2.3′ d-0	.1′ m-2.06	ν 2.2' d0	.1′ m0.71		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	228°33.54	204°31.17	N08°15.54	77°4.05	N13°37.82	87°38.42	$N16^{\circ}19.15$	207°35.73	N06°22.64		
1	243°36.01	219°30.78	16.66	92°5.70	37.44	102°40.68	19.09	222°37.93	22.75		
2	258°38.47	234°30.39	17.78	107°7.34	37.07	117°42.94	19.02	237°40.12	22.85		
3	273°40.94	249°30.00	• • 18.90	122°8.99	• • 36.69	132°45.21	• • 18.95	252°42.31	• • 22.95		
4	288°43.40	264°29.61	20.02	137° 10.63	36.32	147°47.47	18.89	267°44.50	23.06		
5	303°45.86	279°29.22	21.14	152° 12.28	35.94	162°49.73	18.82	282°46.69	23.16		
6	318° 48.33	294°28.83	N08°22.26	167° 13.92	N13°35.57	177°51.99	N16°18.75	297°48.88	N06° 23.27		
7	333°50.79	309°28.45	23.38	182° 15.56	35.19	192°54.26	18.68	312°51.07	23.37		
8	348°53.26	324°28.06	24.50	197° 17.21	34.82	207°56.52	18.62	327°53.26	23.47		
9	3°55.72	339°27.67	25.62	212° 18.85	• • 34.44	222°58.78	. 18.55	342°55.46	• • 23.58		
10	18°58.18	354°27.28	26.74	227° 20.49	34.07	238°1.04	18.48	357°57.65	23.68		
11	34°0.65	9°26.88	27.85	242°22.13	33.69	253°3.30	18.41	12°59.84	23.78		
12	49°3.11	24°26.49	N08°28.97	257°23.77	N13°33.31	268° 5.56	N16°18.34	28°2.03	N06°23.89		
13	64°5.58	39° 26.10	30.09	272° 25.41	32.94	283° 7.82	18.28	43°4.22	23.99		
	79°8.04	54°25.71		272 25.41 287°27.05		203 7.02 298°10.08		43 4.22 58°6.41			
14			31.21		32.56	298 10.08 313°12.34	18.21		24.09		
15	94° 10.51	69°25.32	• • 32.32	302°28.69	• • 32.18		18.14	73°8.61	• • 24.20		
16	109° 12.97	84°24.93	33.44	317°30.33	31.81	328°14.60	18.07	88°10.80	24.30		
17	124° 15.43	99°24.54	34.55	332°31.96	31.43	343°16.86	18.00	103°12.99	24.40		
18	139° 17.90	114°24.14	N08°35.67	347°33.60	N13°31.05	358°19.11	N16°17.93	118°15.18	N06°24.51		
19	154° 20.36	129°23.75	36.78	2°35.24	30.67	13°21.37	17.86	133°17.37	24.61		
20	169°22.83	144°23.36	37.90	17°36.87	30.29	28°23.63	17.80	148°19.56	24.71		
21	184°25.29	159°22.96	• • 39.01	32°38.51	• • 29.92	43°25.89	• • 17.73	163°21.76	• • 24.82		
22	199°27.75	174°22.57	40.13	47°40.14	29.54	58°28.15	17.66	178°23.95	24.92		
23	214°30.22	189°22.18	41.24	62°41.78	29.16	73°30.40	17.59	193°26.14	25.02		
Mer.p	pass. 08:44	ν -0.4' d1	.1′ m-3.86	ν 1.6′ d-0	0.4′ m0.46	ν 2.3′ d-0	.1′ m-2.05	ν 2.2′ d0	.1′ m0.71		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	229°32.68	204°21.78	N08°42.36	77°43.41		88°32.66		208°28.33	N06°25.13		
1	244°35.15	$219^{\circ}21.39$	43.47	92°45.05	28.40	103°34.92	17.45	223°30.53	25.23		
2	$259^{\circ}37.61$	234°20.99	44.58	$107^{\circ}46.68$	28.02	118°37.17	17.38	238°32.72	25.33		
3	274°40.08	249°20.60	• • 45.69	$122^{\circ}48.31$	• • 27.64	133°39.43	• • 17.31	253°34.91	• • 25.44		
4	289° 42.54	264°20.20	46.81	137°49.94	27.26	148°41.69	17.24	268°37.10	25.54		
5	304°45.00	279° 19.81	47.92	152°51.57	26.88	163°43.94	17.17	283°39.30	25.64		
6	319°47.47	294°19.41	N08°49.03	167°53.20		178°46.20	N16°17.10	298°41.49	N06° 25.75		
7	334°49.93	309°19.02	50.14	182°54.83	26.12	193°48.45	17.03	313°43.68	25.85		
8	349°52.40	324°18.62	51.25	197°56.46	25.74	208°50.71	16.96	328°45.87	25.95		
9	4°54.86	339° 18.22	• • 52.36	212°58.09	25.36	223°52.96	. 16.89	343°48.07	. 26.05		
10	19°57.32	354° 17.83	53.47	227°59.72	24.98	238°55.22	16.82	358°50.26	26.16		
11	34°59.79	9°17.43	54.59	243°1.35	24.60	253°57.47	16.75	13°52.45	26.26		
12	50°2.25	24° 17.43			N13°24.22	268°59.72	N16°16.68	28°54.64			
13	65°4.72	39° 16.63	56.80	273° 4.60	23.83	284° 1.98	16.61	43°56.84	26.47		
14	80°7.18	54° 16.03	57.91	288°6.23	23.65 23.45	204 1.90 299° 4.23	16.51	43 50.64 58°59.03	26.47		
				288 0.23 303°7.85							
15 16	95°9.65	69°15.84	08°59.02		• • 23.07	314° 6.48	16.47	74°1.22	• • 26.67		
16	110°12.11	84°15.44	09°0.13	318°9.48	22.69	329°8.74	16.40	89°3.42	26.77		
17	125° 14.57	99°15.04	1.24	333°11.10	22.30	344°10.99	16.33	104°5.61	26.88		
18	140°17.04	114°14.64	N09°2.35		N13°21.92	359°13.24	N16°16.26	119°7.80	N06° 26.98		
19	155° 19.50	129°14.24	3.46	3° 14.35	21.54	14°15.49	16.19	134°10.00	27.08		
20	170°21.97	144° 13.84	4.56	18° 15.97	21.15	29°17.74	16.12	149°12.19	27.18		
21	185°24.43	159° 13.44	• • 5.67	33°17.60	• • 20.77	44°20.00	•• 16.05	164°14.38	• • 27.29		
22	200°26.89	174° 13.04	6.78	$48^{\circ}19.22$	20.39	59°22.25	15.98	179°16.58	27.39		
		189°12.64	7.88	63°20.84	20.00	74°24.50	15.91	194°18.77	27.49		
23	215°29.36	109 12.04	7.00						_,,,,		
	215°29.36 bass. 08:40		.1′ m-3.86		0.4' m0.48	0.2/	.1′ m-2.04		.1′ m0.71		

	эпа	Dec
Alpheratz	357°33.02	29°14.36
Ankaa	353°5.60	-42°9.27
Schedar	349°29.26	56°41.08
Diphda	348°45.65	-17°50.14 -57°5.73
Achernar Hamal	335°19.33 327°49.36	-57°5.73 23°35.42
Polaris	313°31.09	89°22.69
Acamar	315°10.76	-40°11.69
Menkar	314°4.47	4°11.76
Mirfak	308°25.99	49°57.44
Aldebaran	290°37.75	16°33.79
Rigel	281°2.33	-8°10.31
Capella	280°19.48	$46^{\circ}1.53$
Bellatrix	278°21.11	6°22.38
Elnath	277°59.77	28° 37.79
Alnilam Betelgeuse	275°36.07 270°50.28	-1°11.17 7°24.64
Canopus	263°51.93	-52° 42.83
Sirius	258°24.78	-16° 45.40
Adhara	255°4.59	-29°0.77
Procyon	244°48.99	5°9.17
Pollux	243°15.14	27°57.59
Avior	234°14.13	$-59^{\circ}36.16$
Suhail	222°44.93	-43°32.91
Miaplacidus	221°37.91	-69°50.13
Alphard	217°45.88	-8°46.83
Regulus	207°32.36 193°38.45	11°49.91 61°36.35
Dubhe Denebola	193°38.45 182°22.82	61°36.35 14°25.06
Gienah	182°22.82 175°41.38	-17°41.85
Acrux	173° 41.30	-63° 15.35
Gacrux	171°49.04	-57° 16.28
Alioth	166°10.88	55°48.73
Spica	$158^{\circ}19.99$	-11°18.42
Alkaid	152°50.07	$49^{\circ}10.58$
Hadar	148°32.61	-60°30.47
Menkent	147°54.96	-36° 30.45
Arcturus	145°45.84	19°2.30
Rigil Kent.	139°36.96 137°18.74	-60°57.04 74°2.52
Kochab Zuben'ubi	137°18.74 136°53.55	-16°9.45
Alphecca	130 53.55 126°1.76	26° 37.23
Antares	112° 13.13	-26°29.58
Atria	107°5.09	-69°4.47
Sabik	102°0.28	$-15^{\circ}45.55$
Shaula	96°7.42	-37°7.34
Rasalhague	95°56.49	12°32.29
Eltanin	90°40.87	51°28.88
Kaus Aust.	83°29.70	-34°22.18 38°48.33
Vega Nunki	80°31.64 75°45.17	-26° 15.66
Altair	61°57.96	8° 56.35
Peacock	53°2.60	-56°38.51
Deneb	49°24.39	45° 22.43
Enif	33°36.94	9°59.95
Al Na'ir	$27^{\circ}30.63$	-46°49.45
Fomalhaut	15°12.57	-29°28.49
Scheat	13°43.49	28° 13.73
Markab	13°28.13	15°21.06
May 10 Mon	SHA	Mer.pass
Venus	$337^{\circ}6.00$	10:22
Mars	208°49.97	18:52
Jupiter	219°9.62	18:10
Saturn	339°8.77	10:12
May 11 Tue	SHA	Mer.pass
Venus	335°57.62	10:22
Mars	$208^{\circ}30.51$	18:50
Jupiter	219°4.88	18:07
Saturn	339°2.19	10:08
May 12 Wed	SHA	Mer.pass
Venus	334°49.10	10:23
Mars	$208^{\circ}10.73$	18:47
Jupiter	218°59.98	18:03
Saturn	338°55.65	10:05
Horizon	ıtal parallax	
	Venus:	0.1
	Mars:	0.1
		0.1
		0.1

Stars

SHA

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7 285°54.30 5.90 202°46.51 8.4' 18°23.00 -12.5' 59.3' 8 300°54.31 6.53 217°13.94 8.5' 18°10.52 -12.6' 59.3' 9 315°54.32 · · · 7.16 231°41.46 8.6' 17°57.94 -12.7' 59.3' 10 330°54.33 7.79 246°9.09 8.7' 17°45.27 -12.8' 59.3' 11 345°54.34 8.42 260°36.81 8.8' 17°32.49 -12.9' 59.2' 12 0°54.35 N18°9.04 275°4.63 8.9' N17°19.62 -13.0' 59.2' 13 15°54.36 9.67 289°32.55 9.0' 17°6.66 -13.1' 59.2' 14 30°54.38 10.30 304°0.57 9.1' 16°53.61 -13.1' 59.2' 15 45°54.38 · 10.93 318°28.69 9.2' 16°40.47 -13.2' 59.2' 16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 18 90°54.41 N18°12.80 1°53.								
9 315°54.32 · · · 7.16 231°41.46 8.6' 17°57.94 -12.7' 59.3' 10 330°54.33 7.79 246°9.09 8.7' 17°45.27 -12.8' 59.3' 11 345°54.34 8.42 260°36.81 8.8' 17°32.49 -12.9' 59.2' 12 0°54.35 N18°9.04 275°4.63 8.9' N17°19.62 -13.0' 59.2' 13 15°54.36 9.67 289°32.55 9.0' 17°6.66 -13.1' 59.2' 14 30°54.38 10.30 304°0.57 9.1' 16°53.61 -13.1' 59.2' 15 45°54.38 · 10.93 318°28.69 9.2' 16°40.47 -13.2' 59.2' 16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.05	7	285°54.30		202°46.51	8.4'	18°23.00	-12.5'	59.3'
10 330°54.33 7.79 246°9.09 8.7' 17°45.27 -12.8' 59.3' 11 345°54.34 8.42 260°36.81 8.8' 17°32.49 -12.9' 59.2' 12 0°54.35 N18°9.04 275°4.63 8.9' N17°19.62 -13.0' 59.2' 13 15°54.36 9.67 289°32.55 9.0' 17°6.66 -13.1' 59.2' 14 30°54.38 10.30 304°0.57 9.1' 16°53.61 -13.1' 59.2' 15 45°54.38 10.93 318°28.69 9.2' 16°40.47 -13.2' 59.2' 16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 17 75°54.40 12.18 347°25.20 9.4' 16°13.93 -13.4' 59.2' 18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.05 -13.6' 59.1' 20 120°54.43 14.05 30°50.68 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>								
11 345°54.34 8.42 260°36.81 8.8' 17°32.49 -12.9' 59.2' 12 0°54.35 N18°9.04 275°4.63 8.9' N17°19.62 -13.0' 59.2' 13 15°54.36 9.67 289°32.55 9.0' 17°6.66 -13.1' 59.2' 14 30°54.38 10.30 304°0.57 9.1' 16°53.61 -13.1' 59.2' 15 45°54.38 · 10.93 318°28.69 9.2' 16°40.47 -13.2' 59.2' 16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 17 75°54.40 12.18 347°25.20 9.4' 16°13.93 -13.4' 59.2' 18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.05 -13.6' 59.1' 20 120°54.43 14.05 30°50.68 9.7' 15°33.48 <th></th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			8.42			17°32.49		
14 30°54.38 10.30 304°0.57 9.1' 16°53.61 -13.1' 59.2' 15 45°54.38 · 10.93 318°28.69 9.2' 16°40.47 -13.2' 59.2' 16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 17 75°54.40 12.18 347°25.20 9.4' 16°13.93 -13.4' 59.2' 18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.0° -13.6' 59.1' 20 120°54.43 14.05 30°50.68 9.7' 15°33.48 -13.6' 59.1' 21 135°54.44 · 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 16°54.46 15.92 74°16.99 9.9' 14°52.33 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
16 60°54.39 11.55 332°56.90 9.3' 16°27.24 -13.3' 59.2' 17 75°54.40 12.18 347°25.20 9.4' 16°13.93 -13.4' 59.2' 18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.05 -13.6' 59.1' 20 120°54.43 14.05 30°50.68 9.7' 15°33.48 -13.6' 59.1' 21 135°54.44 • 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'								
18 90°54.41 N18°12.80 1°53.60 9.5' N16°0.53 -13.5' 59.1' 19 105°54.42 13.43 16°22.10 9.6' 15°47.05 -13.6' 59.1' 20 120°54.43 14.05 30°50.68 9.7' 15°33.48 -13.6' 59.1' 21 135°54.44 • 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'		60°54.39	11.55	332°56.90	9.3'	$16^{\circ}27.24$	-13.3'	59.2'
19 105°54.42 13.43 16°22.10 9.6' 15°47.05 -13.6' 59.1' 20 120°54.43 14.05 30°50.68 9.7' 15°33.48 -13.6' 59.1' 21 135°54.44 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'								
20 120°54.43 14.05 30°50.68 9.7' 15°33.48 -13.6' 59.1' 21 135°54.44 • 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'								
21 135°54.44 · · 14.68 45°19.36 9.8' 15°19.84 -13.7' 59.1' 22 150°54.45 15.30 59°48.13 9.9' 15°6.12 -13.8' 59.1' 23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'								
23 165°54.46 15.92 74°16.99 9.9' 14°52.33 -13.9' 59.1'		135°54.44		45°19.36		$15^{\circ}19.84$		
SD = 15.8' d = 0.6' $SD = 16.2'$	23			74°16.99			-13.9'	59.1'
		SD = 15.8'	d = 0.6'		S	D = 16.2'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-37%	
10	03:33	03:34	11:56	15:59	03:28		
11	03:35	03:36	11:56	16:58	04:29		
12	03:37	03:37	11:56	17:52	05:25		

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	230°31.82	204°12.24	N09°8.99	78°22.46	N13°19.62	89°26.75	N16°15.84	209°20.96	N06°27.59	
1	245°34.29	219°11.84	10.09	93°24.08	19.23	104°29.00	15.76	224°23.16	27.70	
2	260°36.75	234°11.44	11.20	108°25.70	18.85	119°31.25	15.69	239°25.35	27.80	
3	275°39.21	249°11.04	12.30	123°27.32	. 18.47	134°33.50	. 15.62	254°27.55	27.90	
4	290°41.68	264°10.63	13.41	138°28.94	18.08	149°35.75	15.55	269°29.74	28.00	
5	305°44.14	279°10.23	14.51	153°30.56	17.69	164°38.00	15.48	284°31.93	28.10	
6	320°46.61	294°9.83	N09°15.62	168°32.18	N13°17.31	179°40.25	N16°15.41	299°34.13	N06°28.21	
7	335°49.07	309°9.43	16.72	183°33.79	16.92	194°42.50	15.34	314°36.32	28.31	
8	350°51.54	324°9.02	17.82	198°35.41	16.54	209°44.74	15.26	329°38.52	28.41	
9	5°54.00	339°8.62	. 18.93	213°37.03	. 16.15	224°46.99	. 15.19	344°40.71	28.51	
10	20° 56.46	354°8.22	20.03	228°38.64	15.77	239°49.24	15.12	359°42.90	28.61	
11	35°58.93	9°7.81	21.13	243°40.26	15.38	254°51.49	15.05	14°45.10	28.72	
12	51°1.39	24°7.41	N09°22.23	258°41.87	N13°14.99	269°53.74	N16°14.98	29°47.29	N06°28.82	
13	66°3.86	39°7.00	23.33	273°43.49	14.60	284°55.98	14.90	44°49.49	28.92	
14	81°6.32	54°6.60	24.44	288°45.10	14.22	299°58.23	14.83	59°51.68	29.02	
15	96°8.78	69°6.19	25.54	303°46.71	13.83	315°0.48	• • 14.76	74°53.88	29.12	
16	111° 11.25	84°5.79	26.64	318°48.32	13.44	330°2.72	14.69	89°56.07	29.23	
17	126° 13.71	99°5.38	27.74	333°49.94	13.06	345° 4.97	14.61	104°58.26	29.33	
18	141°16.18	114°4.98	N09°28.84	348°51.55	N13°12.67	0°7.22	N16°14.54	120°0.46	N06°29.43	
19	156° 18.64	129°4.57	29.94	3°53.16	12.28	15° 9.46	14.47	135°2.65	29.53	
20	171°21.10	144° 4.16	31.04	18° 54.77	11.89	30°11.71	14.47	150°4.85	29.53	
21	186° 23.57	159°3.76	. 32.13	33°56.38	•• 11.50	45°13.95	. 14.32	165°7.04	. 29.73	
22	201°26.03	174° 3.35	33.23	48° 57.99	11.11	60°16.20	14.25	180°9.24	29.73	
23	216° 28.50	189°2.94	34.33	63°59.60	10.72	75°18.44	14.18	195°11.43	29.04	
										4
Mer. _I	pass. 08:36	ν -0.4' d1	.1′ m-3.86	ν 1.6′ d-0	0.4′ m0.49	$\nu 2.3' \ d-0$.1′ m-2.04	$\nu^{2.2'} d0$.1′ m0.71	-
F!	CUA	CIIA	D	CHA	D	CIIA	D	CHA	D	
Fri	GHA	GHA 204°2.53	Dec N09°35.43	GHA 79°1.21	Dec N13°10.33	GHA 90°20.69	Dec N16°14.10	GHA 210°13.63	Dec N06° 30.04	
0	231°30.96							210°13.63		
1	246°33.42	219°2.12	36.53	94°2.81	9.94	105°22.93	14.03	225°15.82	30.14	
2	261°35.89	234°1.72	37.62	109°4.42	9.56	120°25.17	13.96	240°18.02	30.24	
3	276°38.35	249°1.31	• • 38.72	124°6.03	• • 9.17	135°27.42	• • 13.88	255°20.21	• • 30.34	
4	291°40.82	264°0.90	39.82	139°7.63	8.78	150°29.66	13.81	270°22.41	30.45	
5	306° 43.28	279°0.49	40.91	154°9.24	8.38	165°31.90	13.74	285°24.60	30.55	.
6	321°45.75	294°0.08	N09°42.01	169°10.85	N13°7.99	180°34.15	N16°13.66	300°26.80	N06°30.65	
7	336°48.21	308°59.67	43.10	184° 12.45	7.60	195°36.39	13.59	315°29.00	30.75	
8	351°50.67	323°59.26	44.20	199°14.06	7.21	210°38.63	13.52	330°31.19	30.85	
9	6°53.14	338° 58.85	• • 45.29	214°15.66	• • 6.82	225°40.87	• • 13.44	345°33.39	• • 30.95	
10	21°55.60	353°58.44	46.39	229°17.26	6.43	240°43.12	13.37	0°35.58	31.05	
11	36°58.07	8°58.02	47.48	244° 18.87	6.04 N13°5.65	255°45.36	13.29	15°37.78	31.15	4
12	52°0.53	23°57.61	N09°48.57	259°20.47		270°47.60	N16°13.22	30°39.97	N06°31.26	
13	67°2.99	38°57.20	49.67	274°22.07	5.25	285°49.84	13.14	45°42.17	31.36	
14	82°5.46	53°56.79	50.76	289°23.67	4.86	300°52.08	13.07	60°44.37	31.46	
15	97°7.92	68° 56.38	• • 51.85	304°25.27	• • 4.47	315°54.32 330°56.56	• • 13.00	75°46.56 90°48.76	• 31.56	
16	112° 10.39 127° 12.85	83°55.96 98°55.55	52.94	319°26.87 334°28.47	4.08	330°56.56 345°58.80	12.92	90°48.76 105°50.95	31.66	
17			54.04 N09°55.13		3.68 N13° 3.29		12.85 N16°12.77		31.76	
18	142° 15.31	113°55.14 128°54.72		349°30.07 4°31.67		1°1.04 16°3.28		120°53.15 135°55.35	N06°31.86	
19	157° 17.78		56.22	4 31.07 19°33.27	2.90		12.70		31.96	
20	172°20.24 187°22.71	143°54.31 158°53.89	57.31 •• 58.40	19 33.27 34°34.87	2.50 · · 2.11	31°5.52 46°7.76	12.62 •• 12.55	150°57.54 165°59.74	32.06	
21 22	202°25.17	173° 53.48	09°59.49	49°36.46	1.72	61°10.00	12.55	181°1.93	· · 32.16 32.26	
23	202 25.17 217°27.63	173 53.46 188°53.06	10° 0.58	64°38.06	1.72	76°12.24	12.47	196° 4.13	32.20	
		_								-
Mer.	pass. 08:33	ν -0.4' d1	.1′ m-3.86	ν 1.6′ d-0).4′ m0.51	$\nu 2.2' \ d-0$.1′ m-2.03	$\nu^{2.2'} d0$.1′ m0.71	-
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	232°30.10	203°52.65	N10° 1.67	79°39.66	N13°0.93		N16°12.32	211°6.33	N06° 32.47	
1	247°32.56	218°52.23	2.76	94°41.25	0.53	106°16.71	12.25	226°8.52	32.57	
2	262°35.03	233°51.82	3.84	109°42.85	13°0.14	121°18.95	12.17	241°10.72	32.67	
3	277° 37.49	248°51.40	• • 4.93	124°44.44	12°59.74	136°21.19	• • 12.10	256°12.92	• • 32.77	Ε.
4	292°39.95	263°50.98	6.02	139°46.04	59.35	151°23.42	12.02	271°15.11	32.87	ľ
5	307°42.42	278°50.57	7.11	154°47.63	58.95	166°25.66	11.95	286°17.31	32.97	
6	322°44.88	293°50.15	N10°8.19	169°49.22	N12°58.56	181°27.90	N16°11.87	301°19.51	N06° 33.07	
7	337° 47.35	308°49.73	9.28	184°50.82	58.16	196°30.13	11.79	316°21.70	33.17	
8	352°49.81	323°49.31	10.37	199°52.41	57.77	211°32.37	11.72	331°23.90	33.27	L
9	7°52.27	338°48.90	• • 11.45	214°54.00	• • 57.37	226°34.61	• • 11.64	346°26.10	• • 33.37	
10	22°54.74	353°48.48	12.54	229°55.59	56.97	241°36.84	11.57	1°28.29	33.47	
11	37°57.20	8°48.06	13.62	244°57.18	56.58	256°39.08	11.49	16°30.49	33.57	
12	52°59.67	23°47.64	N10°14.71	259°58.77	N12°56.18	271°41.31	N16°11.41	31°32.69	N06°33.67	
13	68°2.13	38° 47.22	15.79	275°0.36	55.78	286°43.55	11.34	46°34.89	33.77	
14	83°4.60	53°46.80	16.88	290°1.95	55.39	301°45.78	11.26	61°37.08	33.87	H
15	98°7.06	68° 46.38	• • 17.96	305°3.54	• • 54.99	316°48.02	• • 11.18	76°39.28	• • 33.97	
16	113°9.52	83°45.96	19.04	320°5.13	54.59	331°50.25	11.11	91°41.48	34.07	
17	128°11.99	98° 45.54	20.12	335°6.72	54.19	346°52.49	11.03	106°43.68	34.17	
18	143°14.45	113°45.12	N10°21.21	350°8.30	N12°53.79	1°54.72	N16°10.95	121°45.87	N06°34.27	
19	158° 16.92	128°44.70	22.29	5°9.89	53.40	16°56.95	10.88	136°48.07	34.37	L
20	173°19.38	143°44.27	23.37	20°11.48	53.00	31°59.19	10.80	151°50.27	34.47	
21	188°21.84	158°43.85	• • 24.45	35°13.06	• • 52.60	47°1.42	• • 10.72	166°52.47	• • 34.57	
22	203°24.31	173°43.43	25.53	50°14.65	52.20	62°3.65	10.65	181°54.66	34.67	
23	218°26.77	188°43.01	26.61	65°16.23	51.80	77°5.88	10.57	196°56.86	34.77	
Mer.ı	pass. 08:29	ν -0.4 $^{\prime}$ d1	.1′ m-3.86	$\nu 1.6' \ d-0$).4′ m0.52	$\nu 2.2' \ d-0$.1′ m-2.02	ν 2.2′ d0	.1′ m0.70	
	-									-

	Julis	
	SHA	Dec
Alpheratz	357°33.00	29° 14.36
Ankaa	353°5.57	-42°9.26
Schedar	349°29.23	56°41.07
Diphda Achernar	348°45.63 335°19.31	-17°50.13 -57°5.71
Hamal	327°49.35	23° 35.42
Polaris	313°30.87	89°22.68
Acamar	315°10.75	-40°11.67
Menkar	314°4.46	4° 11.77
Mirfak	308°25.98	49°57.43
Aldebaran Rigel	290°37.74 281°2.33	16°33.79 -8°10.30
Capella	280° 19.48	46°1.52
Bellatrix	278°21.12	6°22.38
Elnath	277°59.77	28° 37.79
Alnilam	275°36.07	-1°11.17
Betelgeuse	270°50.28 263°51.95	7°24.64 -52°42.82
Canopus Sirius	263 51.95 258°24.79	-52 42.82 -16°45.39
Adhara	255°4.60	-29°0.77
Procyon	244°49.00	5°9.18
Pollux	243°15.15	27° 57.60
Avior	234°14.16	-59°36.15
Suhail	222°44.95	-43°32.91 -69°50.13
Miaplacidus Alphard	221°37.96 217°45.89	-69°50.13 -8°46.83
Regulus	217 45.89 207°32.37	11°49.92
Dubhe	193°38.47	61°36.36
Denebola	$182^{\circ}22.82$	14°25.06
Gienah	175°41.39	-17°41.86
Acrux	172°57.41 171°49.05	-63° 15.36 -57° 16.30
Gacrux Alioth	171 49.05 166°10.88	-57 10.30 55°48.74
Spica	158° 19.99	-11° 18.42
Alkaid	152°50.07	49° 10.59
Hadar	148°32.62	-60°30.48
Menkent	147°54.95	-36°30.46
Arcturus Rigil Kent.	145°45.84 139°36.96	19°2.30 -60°57.05
Kochab	139° 30.90 137° 18.74	74°2.53
Zuben'ubi	136°53.55	-16°9.46
Alphecca	$126^{\circ}1.75$	26° 37.24
Antares	112°13.11	-26° 29.59
Atria Sabik	107°5.06 102°0.26	-69°4.48 -15°45.55
Shaula	96°7.40	-37°7.34
Rasalhague	95°56.47	12°32.30
Eltanin	90°40.85	51°28.89
Kaus Aust.	83°29.67	-34°22.18
Vega	80°31.62 75°45.15	38°48.34 -26°15.66
Nunki Altair	61°57.93	8° 56.36
Peacock	53°2.55	-56°38.51
Deneb	49°24.36	45°22.43
Enif	33°36.92	9°59.96
Al Na'ir	27°30.60	-46°49.44
Fomalhaut Scheat	15°12.54 13°43.46	-29°28.48 28°13.73
Markab	13°28.10	15°21.06
May 13 Thu	SHA	Mer.pass
Venus	333°40.42	10:23
Mars	$207^{\circ}50.64$	18:44
Jupiter	218°54.93	18:00
Saturn	338°49.14	10:01
May 14 Fri	SHA	Mer.pass
Venus Mars	332°31.57 207°30.25	10:24 18:42
Jupiter	207 30.25 218°49.73	17:56
Saturn	338°42.67	09:58
May 15 Sat	SHA	Mer.pass
Venus	$331^{\circ}22.55$	10:25
Mars	207°9.56	18:39
Jupiter	218°44.38	17:52
Saturn	338°36.23	09:54
Horizor	ntal parallax	0.1
	Venus: Mars:	0.1 0.1
ı	iviai3.	U.1

Stars

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.46	${\color{red}N18^{\circ}16.55}$	88°45.94	10.0'	$N14^{\circ}38.46$	-13.9'	59.1'
1	195°54.47	17.17	103°14.98	10.1'	14°24.52	-14.0'	59.0'
2	210°54.48 225°54.49	17.79 •• 18.41	117°44.10 132°13.31	10.2' 10.3'	14° 10.51 13° 56.43	-14.1' -14.1'	59.0' 59.0'
4	240°54.49	19.03	146°42.61	10.4	13°42.28	-14.2'	59.0'
5	255°54.50	19.65	161°11.99	10.5'	13°28.07	-14.3'	59.0'
6	270°54.51	N18° 20.27	175°41.45	10.5'	N13° 13.79	-14.3'	59.0'
7	285°54.51 300°54.52	20.89	190°11.00 204°40.63	10.6'	12° 59.45	-14.4'	58.9'
8 9	300°54.52 315°54.52	21.50 •• 22.12	204° 40.63 219° 10.33	10.7' 10.8'	12°45.05 12°30.58	-14.5' -14.5'	58.9' 58.9'
10	330°54.53	22.74	233°40.12	10.0	12° 16.06	-14.6'	58.9'
11	345°54.53	23.36	248°9.98	10.9'	$12^{\circ}1.49$	-14.6'	58.9'
12	0°54.54	N18°23.97	262°39.93	11.0'	N11°46.86	-14.7'	58.9'
13 14	15°54.54 30°54.55	24.59 25.20	277°9.94 291°40.03	11.1' 11.2'	11°32.17 11°17.44	-14.7' -14.8'	58.8' 58.8'
14 15	45°54.55	25.20	306° 10.20	11.2'	11 17.44 11°2.65	-14.8'	58.8'
16	60°54.56	26.43	320°40.43	11.3'	10°47.82	-14.9'	58.8'
17	75°54.56	27.04	335°10.74	11.4'	$10^{\circ}32.94$	-14.9'	58.8'
18	90°54.56	N18°27.65	349°41.12	11.4'	N10°18.01	-15.0'	58.8'
19 20	105°54.57 120°54.57	28.27 28.88	4°11.57 18°42.08	11.5' 11.6'	10°3.04 09°48.02	-15.0' -15.1'	58.7' 58.7'
21	135°54.57	29.49	33°12.66	11.6'	09° 48.02 09° 32.97	-15.1'	58.7'
22	150°54.57	30.10	47°43.30	11.7'	09° 17.87	-15.1'	58.7'
23	165°54.58	30.71	$62^{\circ}14.01$	11.8'	09°2.74	-15.2'	58.7'
	SD = 15.8'	d = 0.6'		SI	D = 16.1'		
						,	
Fri 0	GHA 180°54.58	Dec N18° 31.32	GHA 76° 44.78	u 11.8'	Dec N08° 47.57	d -15.2'	HP 58.7'
1	195°54.58	31.93	91°15.61	11.9'	08°32.36	-15.2'	58.6'
2	210°54.58	32.53	$105^{\circ}46.51$	12.0'	$08^{\circ}17.12$	-15.3'	58.6'
3	225°54.58	• • 33.14	120° 17.46	12.0'	08°1.85	-15.3'	58.6'
4	240°54.58 255°54.59	33.75 34.36	134°48.46 149°19.53	12.1' 12.1'	07°46.55 07°31.22	-15.3'	58.6'
5 6	255 54.59 270°54.59	34.30 N18°34.96	149 19.53 163° 50.65	12.1	N07°15.85	-15.4' -15.4'	58.6' 58.6'
7	285°54.59	35.57	178°21.82	12.2'	07°0.47	-15.4	58.5'
8	300°54.59	36.17	192°53.05	12.3'	06°45.05	-15.4'	58.5'
9	315°54.59	• • 36.78	207°24.32	12.3'	06°29.62	-15.5'	58.5'
10 11	330°54.59 345°54.59	37.38 37.98	221°55.65 236°27.02	12.4' 12.4'	06°14.16 05°58.68	-15.5' -15.5'	58.5' 58.5'
12	0°54.59	N18° 38.59	250° 58.44	12.5'	N05°43.17	-15.5'	58.4'
13	15°54.58	39.19	$265^{\circ}29.91$	12.5'	$05^{\circ}27.65$	-15.5'	58.4'
14	30°54.58	39.79	280°1.43	12.6'	05°12.12	-15.6'	58.4'
15 16	45°54.58 60°54.58	· · 40.39 40.99	294°32.98 309°4.58	12.6' 12.6'	04°56.56 04°41.00	-15.6' -15.6'	58.4' 58.4'
17	75°54.58	41.59	323°36.22	12.7'	04° 41.00	-15.6'	58.4
18	90°54.58	N18°42.19	338°7.90	12.7'	N04°9.82	-15.6'	58.3'
19	105°54.57	42.79	352°39.62	12.8'	03°54.22	-15.6'	58.3'
20	120°54.57 135°54.57	43.39 •• 43.99	7°11.37 21°43.16	12.8' 12.8'	03°38.61 03°22.98		58.3' 58.3'
21 22	150°54.56	44.58	36°14.98	12.0	03°22.96	-15.6' -15.6'	58.3'
23	165°54.56	45.18	50°46.84	12.9'	02°51.72	-15.6'	58.2'
	SD = 15.8'	d = 0.6'	-	SI	D = 16.0'		
٠.						,	
Sat 0	GHA 180°54.56	Dec N18° 45.77	GHA 65°18.73	u 12.9'	Dec N02° 36.09	d -15.6'	HP 58.2'
1	195°54.55	46.37	79°50.65	12.9'	02°20.45	-15.6'	58.2'
2	210°54.55	46.97	94°22.60	13.0'	02°4.80	-15.6'	58.2'
3	225°54.54	• • 47.56	108°54.58	13.0'	01°49.16	-15.6'	58.2'
4 5	240°54.54 255°54.54	48.15 48.75	123°26.58 137°58.61	13.0' 13.1'	01°33.52 01°17.88	-15.6' -15.6'	58.2' 58.1'
6	270°54.53	N18°49.34	152° 30.67	13.1'	N01°2.25	-15.6'	58.1
7	285°54.52	49.93	167°2.74	13.1'	$00^{\circ}46.61$	-15.6'	58.1'
8	300°54.52	50.52	181°34.84	13.1'	00°30.99	-15.6'	58.1'
9 10	315°54.51 330°54.51	· · 51.11 51.71	196°6.96 210°39.10	13.1' 13.2'	N00°15.37 S00°0.24	-15.6' 15.6'	58.1' 58.0'
10	330 54.51 345°54.50	51.71	210 39.10 225°11.26	13.2'	00° 15.84	15.6'	58.0'
12	0°54.49	N18° 52.88	239°43.43	13.2'	500°31.43	15.6'	58.0'
13	15°54.49	53.47	254°15.62	13.2'	00°47.01	15.6'	58.0'
14	30°54.48	54.06	268° 47.82 283° 20.04	13.2'	01°2.57	15.6'	58.0'
15 16	45°54.47 60°54.47	• • 54.65 55.24	283°20.04 297°52.27	13.2' 13.2'	01°18.12 01°33.66	15.5' 15.5'	57.9' 57.9'
17	75°54.46	55.82	312°24.51	13.2'	01°33.00	15.5'	57.9'
18	90°54.45	N18°56.41	326°56.76	13.3'	S02°4.67	15.5'	57.9'
19	105°54.44	56.99	341°29.02	13.3'	02°20.16	15.5'	57.9'
20 21	120°54.43 135°54.43	57.58	356°1.28 10°33.55	13.3' 13.3'	02°35.62 02°51.05	15.4' 15.4'	57.8'
21 22	135°54.43 150°54.42	•• 58.16 58.75	10°33.55 25°5.82	13.3'	02°51.05 03°6.47	15.4′ 15.4′	57.8' 57.8'
23	165°54.41	59.33	39°38.10	13.3'	03°21.86	15.4'	57.8'
	SD = 15.8'	d = 0.6'		SI	D = 15.9'		
		-	-				

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-70%	
13	03:38	03:38	11:56	18:43	06:18		
14	03:38	03:38	11:56	19:30	07:07		
15	03:38	03:38	11:56	20:16	07:53		

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	233°29.24	203°42.58 N10°27.69	80°17.82 N12°51.40	92°8.12 N16°10.49	211°59.06 N06°34.87
1	248° 31.70	218° 42.16 28.77	95° 19.40 51.00	107°10.35 10.42	227°1.26 34.97
2	263°34.16	233°41.74 29.85	110°20.99 50.60	122°12.58 10.34	242°3.46 35.07
3	278° 36.63	248°41.31 · · 30.93	125° 22.57 · · 50.20	137°14.81 · · 10.26	257° 5.65 · · 35.17
4	293°39.09	263°40.89 32.01	140°24.15 49.80	152°17.04 10.18	272°7.85 35.17
5	308° 41.56	278°40.46 33.09	155°25.73 49.40	167°19.27 10.11	287°10.05 35.27
6	323°44.02	293°40.04 N10°34.16	170°27.31 N12°49.00	182°21.50 N16°10.03	302°12.25 N06°35.47
7	338°46.48	308°39.61 35.24	185°28.90 48.60	197°23.73 9.95	317°14.45 35.57
8	353° 48.95	323°39.19 36.32	200°30.48 48.20	212°25.96 9.87	332°16.65 35.67
9	8°51.41	338°38.76 · · 37.39	215° 32.06 · · 47.80	227°28.19 · · 9.79	347°18.84 · · 35.77
10	23°53.88	353°38.33 38.47	230°33.64 47.40	242°30.42 9.72	2°21.04 35.87
11	38° 56.34	8° 37.91 39.55	245°35.21 47.00	257°32.65 9.64	17°23.24 35.97
12	53° 58.80	23°37.48 N10°40.62	260°36.79 N12°46.59	272°34.88 N16°9.56	32°25.44 N06°36.07
13	69°1.27	38°37.05 41.70	275° 38.37 46.19	287°37.11 9.48	47°27.64 36.17
14	84°3.73	53°36.62 42.77	290°39.95 45.79	302°39.34 9.40	62°29.84 36.27
15	99°6.20	68°36.20 · · 43.84	305°41.53 · · 45.39	317°41.57 · · 9.33	77°32.04 · · 36.37
16	114°8.66	83°35.77 44.92	320°43.10 44.99	332°43.79 9.25	92°34.24 36.47
17	129° 11.12	98°35.34 45.99	335°44.68 44.58	347°46.02 9.17	107°36.43 36.57
18	144° 13.59	113°34.91 N10°47.06	350°46.26 N12°44.18	2°48.25 N16°9.09	122°38.63 N06°36.67
19	159° 16.05	128°34.48 48.14	5° 47.83 43.78	17°50.48 9.01	137°40.83 36.77
20	174° 18.52	143°34.05 49.21	20°49.41 43.37	32°52.70 8.93	152°43.03 36.86
21	174 18.52 189° 20.98	158°33.62 · · 50.28	35°50.98 · · 42.97	47°54.93 · · 8.85	167°45.23 · · 36.96
	204° 23.45				
22 23	204°23.45 219°25.91	173°33.19 51.35 188°32.76 52.42	50° 52.55 42.57 65° 54.13 42.16	62°57.16 8.77 77°59.38 8.70	182°47.43 37.06 197°49.63 37.16
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Mer.	pass. 08:25	ν-0.4' d1.1' m-3.86	ν1.6' d-0.4' m0.54	ν2.2' d-0.1' m-2.02	ν2.2' d0.1' m0.70
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	234° 28.37	203°32.33 N10°53.49	80°55.70 N12°41.76	93°1.61 N16°8.62	212°51.83 N06°37.26
1	249°30.84	218°31.89 54.56	95°57.27 41.35	108° 3.84 8.54	212 51.83 Noo 37.20 227°54.03 37.36
2	264° 33.30	233°31.46 55.63	110° 58.84 40.95	123° 6.06 8.46	242°56.23 37.46
3	279° 35.77	248°31.03 · · 56.70	126°0.42 · · 40.54	138° 8.29 · · 8.38	257°58.43 · · 37.56
4	294° 38.23	263°30.60 57.77	141°1.99 40.14	153°10.51 8.30	273°0.63 37.66
5	309° 40.69	278°30.16 58.84	156°3.56 39.73	168°12.74 8.22	288°2.83 37.76
6	324°43.16	293°29.73 N10°59.91	171°5.13 N12°39.33	183°14.96 N16°8.14	303°5.03 N06°37.85
7	339°45.62	308°29.30 11°0.97	186°6.70 38.92	198°17.19 8.06	318°7.23 37.95
8	354°48.09	323°28.86 2.04	201°8.27 38.52	213°19.41 7.98	333°9.43 38.05
9	9°50.55	338°28.43 · · 3.11	216°9.84 · · 38.11	228°21.63 · · 7.90	348°11.63 · · 38.15
10	24°53.01	353°27.99 4.17	231°11.40 37.70	243°23.86 7.82	3°13.83 38.25
11	39°55.48	8°27.56 5.24	246° 12.97 37.30	258°26.08 7.74	18°16.03 38.35
12	54° 57.94	23°27.12 N11°6.30	261°14.54 N12°36.89	273°28.30 N16°7.66	33°18.23 N06°38.45
13	70°0.41	38°26.69 7.37	276° 16.11 36.48	288°30.53 7.58	48°20.43 38.55
14	85°2.87	53°26.25 8.43	291°17.67 36.08	303°32.75 7.50	63°22.63 38.64
15	100°5.33	68°25.82 · · 9.50	306° 19.24 · · 35.67	318°34.97 · · 7.42	78°24.83 · · 38.74
16	115°7.80	83°25.38 10.56	321°20.80 35.26	333°37.19 7.34	93°27.03 38.84
17	130° 10.26	98°24.94 11.62	336° 22.37 34.85	348°39.42 7.26	108°29.23 38.94
18	145° 12.73	113°24.50 N11°12.69	351°23.93 N12°34.45	3°41.64 N16°7.18	123°31.43 N06°39.04
19	160° 15.19	128°24.07 13.75	6°25.50 34.04	18°43.86 7.10	138°33.63 39.14
20	175° 17.65	143°23.63 14.81	21°27.06 33.63	33°46.08 7.02	153°35.83 39.24
21	190° 20.12	158°23.19 · · 15.87	36°28.62 · · 33.22	48°48.30 · · 6.93	168°38.03 · · 39.33
22	205° 22.58	173°22.75 16.93	51°30.19 32.81	63°50.52 6.85	183°40.23 39.43
23	200° 25.05	188°22.31 17.99	66°31.75 32.40	78°52.74 6.77	198°42.43 39.53
Mer.p	pass. 08:21	ν-0.4' d1.1' m-3.86	ν1.6' d-0.4' m0.56	ν2.2' d-0.1' m-2.01	ν2.2′ d0.1′ m0.70
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Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	235°27.51	203°21.87 N11°19.05	81°33.31 N12°32.00	93°54.96 N16°6.69	213°44.63 N06°39.63
1	250°29.98	218°21.43 20.11	96°34.87 31.59	108°57.18 6.61	228°46.84 39.73
2	265°32.44	233°20.99 21.17	111°36.43 31.18	123°59.40 6.53	243°49.04 39.83
3	280°34.90	248°20.55 · · 22.23	126°37.99 · · 30.77	139°1.62 · · 6.45	258°51.24 · · 39.92
4	295°37.37	263°20.11 23.29	141°39.55 30.36	154° 3.84 6.37	273°53.44 40.02
5	310°39.83	278°19.67 24.35	156°41.11 29.95	169° 6.06 6.28	288°55.64 40.12
6	325°42.30	293°19.22 N11°25.41	171°42.67 N12°29.54	184°8.28 N16°6.20	303°57.84 N06°40.22
7	340°44.76	308°18.78 26.46	186°44.23 29.13	199°10.50 6.12	319°0.04 40.32
8	355°47.22	323°18.34 27.52	201°45.79 28.72	214°12.72 6.04	334°2.24 40.41
9	10°49.69	338°17.90 · · 28.58	216° 47.35 · · 28.31	229°14.93 · · 5.96	349°4.45 · · 40.51
10	25°52.15	353°17.45 29.63	231°48.90 27.89	244°17.15 5.88	4°6.65 40.61
11	40°54.62	8°17.01 30.69	246°50.46 27.48	259°19.37 5.79	19°8.85 40.71
12	55°57.08	23°16.57 N11°31.74	261°52.02 N12°27.07	274°21.59 N16°5.71	34°11.05 N06°40.81
13	70°59.54	38°16.12 32.80	276°53.57 26.66	289°23.80 5.63	49°13.25 40.90
14	86°2.01	53°15.68 33.85	291°55.13 26.25	304°26.02 5.55	64°15.46 41.00 L
15	101°4.47	68°15.23 · · 34.91	306°56.68 · · 25.84	319°28.24 · · 5.46	79°17.66 · · 41.10
16	116°6.94	83°14.79 35.96	321°58.24 25.42	334°30.45 5.38	94°19.86 41.20
17	131°9.40	98°14.34 37.01	336°59.79 25.01	349°32.67 5.30	109°22.06 41.29
18	146°11.87	113°13.89 N11°38.06	352°1.34 N12°24.60	4°34.88 N16°5.22	124°24.26 N06°41.39
19	161°14.33	128°13.45 39.12	7°2.90 24.19	19°37.10 5.13	139°26.47 41.49
20	176° 16.79	143°13.00 40.17	22°4.45 23.77	34°39.31 5.05	154°28.67 41.59
21	191°19.26	158°12.55 · · 41.22	37°6.00 · · 23.36	49°41.53 · · 4.97	169°30.87 · · 41.68
22	206°21.72	173°12.10 42.27 188°11.66 43.32	52°7.55 22.95	64°43.74 4.89	184°33.07 41.78
23	221°24.19	188°11.66 43.32	67°9.10 22.53	79°45.96 4.80	199°35.28 41.88
Mer.	pass. 08:17	$\nu\text{-}0.4'~d1.1'~\text{m-}3.86$	$\nu 1.6' \ d\text{-}0.4' \ \text{m}0.57$	$\nu 2.2' \ d\text{-}0.1' \ \text{m-}2.01$	$\nu 2.2' \ d0.1' \ m0.70$

	SHA	Dec
Alpheratz	357°32.98	29°14.36
Ankaa	353°5.55	-42°9.24
Schedar	$349^{\circ}29.21$	$56^{\circ}41.07$
Diphda	348°45.62	$-17^{\circ}50.12$
Achernar	335°19.30	-57°5.69
Hamal	327°49.34	23°35.42
Polaris	313°30.58	89°22.67
Acamar	315°10.75	-40°11.66
Menkar	314°4.46	$4^{\circ}11.77$
Mirfak	308°25.98	49°57.42
Aldebaran	290°37.75	16°33.79
Rigel	281°2.33	-8°10.30
Capella	280°19.48	46°1.52
Bellatrix	278°21.12	6°22.39
Elnath	277°59.78	28°37.79 -1°11.16
Alnilam	275°36.07	-1°11.16 7°24.65
Betelgeuse	270°50.29	-52° 42.80
Canopus	263°51.97 258°24.80	-52 42.80 -16°45.38
Sirius	258 24.80 255°4.61	-10 45.38 -29°0.76
Adhara	255 4.01 244°49.01	-29 0.76 5°9.18
Procyon Pollux	244 49.01 243°15.17	5 9.18 27°57.60
l	234° 14.19	-59°36.15
Avior Suhail	234°14.19 222°44.97	-59°36.15 -43°32.91
Miaplacidus	222°44.97 221°38.00	-43° 32.91 -69° 50.12
Alphard	221 38.00 217°45.90	-8° 46.83
Regulus	217 45.90 207°32.38	-8 40.83 11°49.92
Dubhe	207 32.36 193°38.50	61°36.36
Denebola	193 36.50 182°22.83	14°25.07
Gienah	175°41.40	-17°41.86
Acrux	175 41.40 172°57.43	-17 41.80 -63° 15.37
Gacrux	172 37.43 171°49.07	-57° 16.30
Alioth	166°10.90	55° 48.75
Spica	158°20.00	-11°18.42
Alkaid	152°50.08	49°10.61
Hadar	148°32.62	-60°30.49
Menkent	147°54.96	-36°30.46
Arcturus	145°45.84	19°2.31
Rigil Kent.	139°36.96	-60° 57.06
Kochab	$137^{\circ}18.75$	74°2.55
Zuben'ubi	136°53.55	$-16^{\circ}9.46$
Alphecca	126°1.75	$26^{\circ}37.26$
Antares	$112^{\circ}13.10$	$-26^{\circ}29.59$
Atria	107°5.04	-69°4.49
Sabik	102°0.25	-15°45.55
Shaula	96°7.38	-37°7.34
Rasalhague	95°56.46	12°32.31
Eltanin	90°40.83	51°28.91
Kaus Aust.	83°29.65	-34°22.18
Vega	80°31.60	38° 48.35
Nunki	75°45.13	-26° 15.66
Altair	61°57.91	8°56.37
Peacock	53°2.52	-56°38.51
Deneb	49°24.34 33°36.90	45°22.44
Enif		9°59.97 -46°49.43
Al Na'ir Fomalhaut	27°30.57 15°12.53	-46° 49.43 -29° 28.47
Scheat	15° 12.53 13° 43.44	-29° 28.47 28° 13.73
Markab	13 43.44 13°28.09	28 13.73 15°21.07
Ividikab	10 20.09	10 41.01
May 16 Sun	SHA	Mer.pass
	330°13.35	10:25
Venus		
Venus Mars	$206^{\circ}48.58$	18:37
Mars Jupiter	218°38.88	17:49
Mars		
Mars Jupiter Saturn	218°38.88	17:49 09:51
Mars Jupiter	218°38.88 338°29.82	17:49
Mars Jupiter Saturn May 17 Mon	218°38.88 338°29.82 SHA	17:49 09:51 Mer.pass
Mars Jupiter Saturn May 17 Mon Venus	218°38.88 338°29.82 SHA 329°3.95	17:49 09:51 Mer.pass 10:26
Mars Jupiter Saturn May 17 Mon Venus Mars	218°38.88 338°29.82 SHA 329°3.95 206°27.33	17:49 09:51 Mer.pass 10:26 18:34
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus	218° 38.88 338° 29.82 SHA 329° 3.95 206° 27.33 218° 33.24 338° 23.46 SHA 327° 54.36	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Mars	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Jupiter	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80 218°27.45	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Mars	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Saturn Mars Mars Jupiter	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80 218°27.45	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42 09:44
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Saturn Mars Mars Jupiter	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80 218°27.45 338°17.12 ttal parallax Venus:	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42 09:44
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Saturn Mars Mars Jupiter	218° 38.88 338° 29.82 SHA 329° 3.95 206° 27.33 218° 33.24 338° 23.46 SHA 327° 54.36 206° 5.80 218° 27.45 338° 17.12	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42 09:44
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Saturn Mars Mars Jupiter	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80 218°27.45 338°17.12 ttal parallax Venus:	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42 09:44
Mars Jupiter Saturn May 17 Mon Venus Mars Jupiter Saturn May 18 Tue Venus Mars Jupiter Saturn Mars Mars Jupiter	218°38.88 338°29.82 SHA 329°3.95 206°27.33 218°33.24 338°23.46 SHA 327°54.36 206°5.80 218°27.45 338°17.12 ttal parallax Venus:	17:49 09:51 Mer.pass 10:26 18:34 17:45 09:47 Mer.pass 10:27 18:32 17:42 09:44

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.40	$N18^{\circ}59.91$	$54^{\circ}10.38$	13.3'	S 03°37.23	15.3'	57.8'
1	195°54.39	19°0.50	68° 42.66	13.3'	03°52.57	15.3'	57.7'
2	210°54.38 225°54.37	1.08 · · 1.66	83°14.95 97°47.23	13.3' 13.3'	04°7.88 04°23.17	15.3' 15.3'	57.7' 57.7'
4	240°54.36	2.24	112° 19.51	13.3'	04°38.42	15.2'	57.7'
5	255°54.35	2.82	$126^{\circ}51.78$	13.3'	$04^{\circ}53.64$	15.2'	57.7'
6	270°54.34	N19°3.40	141°24.05	13.3'	\$05°8.84	15.2'	57.6'
7 8	285°54.33 300°54.31	3.98 4.56	155°56.32 170°28.58	13.3' 13.3'	05°23.99 05°39.12	15.1' 15.1'	57.6' 57.6'
9	315°54.30	5.13	185°0.83	13.2'	05°54.21	15.1'	57.6'
10	330°54.29	5.71	$199^{\circ}33.07$	13.2'	$06^{\circ}9.26$	15.0'	57.6'
11	345°54.28	6.29	214°5.30 228°37.52	13.2'	06°24.27 \$06°39.25	15.0'	57.5'
12 13	0°54.27 15°54.26	N19°6.86 7.44	228° 37.52 243° 9.73	13.2' 13.2'	06° 54.18	14.9' 14.9'	57.5' 57.5'
14	30°54.24	8.01	257°41.92	13.2'	07°9.07	14.9'	57.5'
15	45°54.23	• • 8.59	272°14.11	13.2'	07°23.92	14.8'	57.5'
16	60°54.22	9.16	286°46.27 301°18.42	13.1'	07° 38.73 07° 53.49	14.8'	57.4'
17 18	75°54.20 90°54.19	9.73 N19° 10.31	301° 18.42 315° 50.55	13.1' 13.1'	508°8.21	14.7' 14.7'	57.4' 57.4'
19	105°54.18	10.88	330°22.67	13.1'	08°22.88	14.6'	57.4'
20	120°54.16	11.45	344° 54.76	13.1'	08°37.50	14.6'	57.4'
21	135°54.15	• • 12.02	359°26.84	13.1'	08°52.07	14.5'	57.3'
22 23	150°54.13 165°54.12	12.59 13.16	13°58.89 28°30.92	13.0' 13.0'	09°6.60 09°21.07	14.5' 14.4'	57.3' 57.3'
_5	SD = 15.8'	d = 0.6'			0 = 15.8'		- 7.5
	15.δ'	u = 0.0		3L	ν — 13.δ		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.10	N19° 13.73	43°2.93	13.0'	S09° 35.48	14.4'	57.3'
1 2	195°54.09 210°54.07	14.30 14.87	57°34.92 72°6.88	13.0' 12.9'	09°49.85 10°4.16	14.3' 14.3'	57.3' 57.2'
3	225°54.06	• • 15.44	86°38.81	12.9'	10° 4.10	14.2	57.2'
4	240°54.04	16.00	$101^{\circ}10.72$	12.9'	$10^{\circ}32.61$	14.1'	57.2'
5	255°54.02	16.57	115° 42.60	12.9'	10°46.74	14.1'	57.2'
6 7	270°54.01 285°53.99	N19° 17.13 17.70	130° 14.45 144° 46.27	12.8' 12.8'	\$11°0.82 11°14.84	14.0' 14.0'	57.2' 57.1'
8	300°53.97	18.26	159° 18.06	12.8'	11°28.80	13.9'	57.1'
9	315°53.96	• • 18.83	$173^{\circ}49.82$	12.7'	$11^{\circ}42.69$	13.8'	57.1'
10	330°53.94 345°53.92	19.39	188°21.55 202°53.24	12.7' 12.7'	11°56.52 12°10.29	13.8'	57.1'
11 12	0°53.92	19.95 N19° 20.52	202 53.24 217°24.91	12.7	512°23.99	13.7' 13.6'	57.1' 57.0'
13	15°53.89	21.08	231°56.54	12.6'	12° 37.62	13.6'	57.0'
14	30°53.87	21.64	$246^{\circ}28.13$	12.6'	$12^{\circ}51.18$	13.5'	57.0'
15	45°53.85 60°53.83	• • 22.20	260°59.69 275°31.21	12.5' 12.5'	13°4.68 13°18.10	13.4	57.0'
16 17	75°53.81	22.76 23.32	275 31.21 290°2.69	12.5 12.4'	13 18.10 13°31.45	13.4' 13.3'	57.0' 56.9'
18	90°53.79	N19°23.88	304°34.14	12.4'	S13°44.73	13.2'	56.9'
19	105°53.77	24.44	319°5.55	12.4'	13°57.94	13.1'	56.9'
20 21	120°53.75 135°53.73	25.00 •• 25.55	333°36.92 348°8.25	12.3' 12.3'	14°11.07 14°24.13	13.1' 13.0'	56.9' 56.9'
22	150°53.71	26.11	2°39.54	12.3	14 24.13 14°37.11	12.9'	56.8'
23	165°53.69	26.67	17° 10.78	12.2'	14°50.01	12.8'	56.8'
	SD = 15.8'	d = 0.6'		SE	0 = 15.6'		
Tue	GHA 180°53.67	Dec N19° 27.22	GHA 31°41.99	ν	Dec \$15°2.83	d 12.7'	HP
0 1	180°53.67 195°53.65	N19 27.22 27.78	46°13.16	12.2' 12.1'	15° 15.57	12.7' 12.7'	56.8' 56.8'
2	210°53.63	28.33	60°44.28	12.1'	$15^{\circ}28.23$	12.6'	56.8'
3	225°53.61	• • 28.88	75° 15.36	12.0'	15°40.81	12.5'	56.7'
4 5	240°53.59 255°53.56	29.44 29.99	89°46.39 104°17.38	12.0' 11.9'	15°53.31 16°5.72	12.4' 12.3'	56.7' 56.7'
6	270°53.54	N19° 30.54	118° 48.33	11.9'	\$16° 18.04	12.2'	56.7'
7	285°53.52	31.09	133° 19.23	11.9'	16°30.28	12.2'	56.7'
8 9	300°53.50 315°53.47	31.64 •• 32.19	147°50.09 162°20.90	11.8' 11.8'	16° 42.43 16° 54.50	12.1' 12.0'	56.6' 56.6'
9 10	315°53.47 330°53.45	· · 32.19 32.74	162°20.90 176°51.66	11.8	16°54.50 17°6.47	12.0'	56.6'
11	345°53.43	33.29	191°22.38	11.7'	$17^{\circ}18.35$	11.8'	56.6'
12	0°53.40	N19°33.84	205°53.05	11.6'	S17°30.14	11.7'	56.6'
13 14	15°53.38 30°53.36	34.39 34.94	220°23.68 234°54.25	11.6' 11.5'	17° 41.84 17° 53.45	11.6' 11.5'	56.5' 56.5'
14 15	45°53.33	34.94 •• 35.48	234 54.25 249°24.78	11.5'	17°53.45 18°4.96	11.5	56.5'
16	60°53.31	36.03	263°55.26	11.4'	$18^{\circ}16.37$	11.3'	56.5'
17	75°53.28	36.58	278°25.69	11.4'	18°27.69	11.2'	56.4'
18 19	90°53.26 105°53.23	N19°37.12 37.67	292°56.07 307°26.41	11.3' 11.3'	\$18° 38.91 18° 50.03	11.1' 11.0'	56.4' 56.4'
19 20	105°53.23 120°53.21	37.67 38.21	307°26.41 321°56.69	11.3'	18°50.03 19°1.05	10.9	56.4'
21	135°53.18	38.75	336° 26.93	11.2'	$19^{\circ}11.96$	10.8	56.4
22	150°53.15	39.30	350° 57.12	11.1'	19°22.78	10.7'	56.3'
23	165°53.13	39.84	5°27.26	11.1'	19°33.50	10.6'	56.3'
	SD = 15.8'	d = 0.6'		SE	0 = 15.5'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-93%	
16	03:38	03:37	11:56	21:02	08:39		
17	03:36	03:36	11:56	21:49	09:25		
18	03:35	03:34	11:56	22:37	10:13		

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	236°26.65	203°11.21 N11°44.37	82°10.66 N12°22.12	94°48.17 N16°4.72	214°37.48 N06°41.98
1	251°29.11	218° 10.76 45.42	97°12.21 21.70	109°50.39 4.64	229°39.68 42.07
2	266°31.58	233°10.31 46.47	112° 13.76 21.29	124°52.60 4.55	244°41.88 42.17
3	281°34.04	248°9.86 · · 47.52	127° 15.31 · · 20.88	139°54.81 · · 4.47	259°44.09 · · 42.27
4	296°36.51	263°9.41 48.56	142°16.85 20.46	154°57.03 4.39	274°46.29 42.37
5	311°38.97	278°8.96 49.61	157° 18.40 20.05	169°59.24 4.30	289°48.49 42.46
6	326°41.43	293°8.51 N11°50.66	172°19.95 N12°19.63	185°1.45 N16°4.22	304°50.69 N06°42.56
7	341°43.90	308°8.06 51.71	187°21.50 19.22	200° 3.67 4.14	319°52.90 42.66
8	356° 46.36	323°7.61 52.75	202°23.05 18.80	215°5.88 4.05	334°55.10 42.75
9	11°48.83	338°7.16 · · 53.80	217°24.59 · · 18.39	230°8.09 · · 3.97	349°57.30 · · 42.85
10	26°51.29	353°6.70 54.84	232°26.14 17.97	245°10.30 3.88	4°59.51 42.95
11	41°53.76	8°6.25 55.89	247°27.69 17.55	260°12.51 3.80	20°1.71 43.05
12	56°56.22	23°5.80 N11°56.93	262°29.23 N12°17.14	275°14.73 N16°3.72	35°3.91 N06°43.14
13	71°58.68	38°5.34 57.97	277°30.78 16.72	290°16.94 3.63	50°6.12 43.24
14	87°1.15	53°4.89 11°59.02	292°32.32 16.30	305°19.15 3.55	65°8.32 43.34
15	102°3.61	68°4.44 12°0.06	307°33.86 · · 15.89	320°21.36 · · 3.46	80°10.52 · · 43.43
16	117°6.08	83°3.98 1.10	322°35.41 15.47	335°23.57 3.38	95°12.73 43.53
17	132°8.54	98°3.53 2.15	337°36.95 15.05	350°25.78 3.30	110°14.93 43.63
18	147°11.00	113°3.07 N12°3.19	352°38.49 N12°14.64	5°27.99 N16°3.21	125°17.14 N06°43.72
19	162°13.47	128°2.62 4.23	7°40.04 14.22	20°30.20 3.13	140°19.34 43.82
20	177°15.93	143°2.16 5.27	22°41.58 13.80	35°32.41 3.04	155°21.54 43.92
21	192°18.40	158°1.70 · · 6.31	37°43.12 · · 13.38	50°34.62 · · 2.96	170°23.75 · · 44.01
22	207°20.86	173°1.25 7.35	52°44.66 12.96	65°36.83 2.87	185°25.95 44.11
23	222°23.33	188°0.79 8.39	67°46.20 12.55	80°39.03 2.79	200°28.16 44.21
Mer.p	bass. 08:13	ν-0.4′ d1.0′ m-3.86	ν1.6' d-0.4' m0.59	ν2.2' d-0.1' m-2.00	ν2.2' d0.1' m0.70
	_				
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	237°25.79	203°0.33 N12°9.43	82°47.74 N12°12.13	95°41.24 N16°2.70	215°30.36 N06°44.30
1	252°28.25	217°59.87 10.46	97°49.28 11.71	110°43.45 2.62	230°32.56 44.40
2	267°30.72	232°59.42 11.50	112°50.82 11.29	125°45.66 2.53	245°34.77 44.50
3	282°33.18	247°58.96 · · 12.54	127°52.36 · · 10.87	140°47.87 · · 2.45	260°36.97 · · 44.59
4	297°35.65	262°58.50 13.58	142°53.90 10.45	155°50.07 2.36	275°39.18 44.69
5	312°38.11	277°58.04 14.61	157° 55.44 10.03	170°52.28 2.28	290°41.38 44.79
6	327° 40.57	292°57.58 N12°15.65	172°56.97 N12°9.61	185°54.49 N16°2.19	305°43.59 N06°44.88
7	342°43.04	307°57.12 16.68	187°58.51 9.19	200°56.70 2.10	320°45.79 44.98
8	357°45.50	322°56.66 17.72	203°0.05 8.77	215°58.90 2.02	335°48.00 45.08
9	12°47.97	337°56.20 · · 18.75	218°1.58 · · 8.35	231°1.11 · · 1.93	350°50.20 · · 45.17
10	27°50.43	352°55.74 19.79	233°3.12 7.93	246° 3.31 1.85	5°52.40 45.27
11	42°52.90	7°55.27 20.82	248°4.66 7.51	261°5.52 1.76	20°54.61 45.36
12	57°55.36	22°54.81 N12°21.85	263°6.19 N12°7.09	276°7.73 N16°1.68	35°56.81 N06°45.46
13	72°57.82	37°54.35 22.89	278°7.72 6.67	291°9.93 1.59	50°59.02 45.56
14	88°0.29	52°53.89 23.92	293°9.26 6.25	306°12.14 1.50	66°1.23 45.65
15	103°2.75	67° 53.42 · · · 24.95 82° 52.96	308°10.79 · · 5.83	321°14.34 · · 1.42	81°3.43 · · 45.75
16	118°5.22 133°7.68	82°52.96 25.98 97°52.49 27.01	323°12.33 5.40 338°13.86 4.98	336°16.55 1.33 351°18.75 1.24	96°5.64 45.84 111°7.84 45.94
17 18	135 7.06 148° 10.14	112°52.03 N12°28.04	353°15.39 N12°4.56	351°18.75 1.24 6°20.96 N16°1.16	111°7.84 45.94 126°10.05 N06°46.04
19	163° 12.61		8°16.92 4.14	21°23.16 1.07	
	178° 15.07				
20 21	178 15.07 193° 17.54	142°51.10 30.10 157°50.63 · · 31.13	23°18.45 3.72 38°19.99 · · 3.29	36°25.36 0.98 51°27.57 · · 0.90	156°14.46 46.23 171°16.66 • 46.32
21	193 17.54 208° 20.00	172°50.17 32.16	53°21.52 2.87	66°29.77 0.81	171 10.00 · · 40.32 186°18.87 46.42
23	223° 22.47	187°49.70 33.18	68°23.05 2.45	81°31.97 0.72	201°21.07 46.52
Mer.p	pass. 08:09	ν-0.5′ d1.0′ m-3.86	ν1.5' d-0.4' m0.60	ν2.2' d-0.1' m-1.99	ν2.2' d0.1' m0.70
- .	C	CHA	CIIA -	CUA -	CUA
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	238° 24.93 253° 27.39	202°49.23 N12°34.21	83°24.58 N12°2.02	96°34.18 N16°0.64	216°23.28 N06°46.61
1		217°48.77 35.24	98°26.11 1.60	111°36.38 0.55	231°25.49 46.71 246°27.69 46.80
2	268° 29.86 283° 32.32	232°48.30 36.26 247°47.83 · · · 37.29	113°27.63 1.18 128°29.16 · · 0.75	126°38.58 0.46 141°40.78 · · 0.38	246°27.69 46.80 261°29.90 •• 46.90
3 4	283° 32.32 298° 34.79	247°47.83 · · 37.29 262°47.36 38.31	128°29.16 · 0.75 143°30.69 12°0.33	141°40.78 · · 0.38 156°42.98 0.29	261°29.90 · · 46.90 276°32.10 46.99
4 5	313° 37.25	262°47.36 38.31 277°46.89 39.34	143°30.69 12°0.33 158°32.22 11°59.90	150°42.98 0.29 171°45.19 0.20	276 32.10 46.99 291 34.31 47.09
6	313° 37.25 328° 39.71	292°46.43 N12°40.36	173°33.75 N11°59.48	171°45.19 0.20 186°47.39 N16°0.11	306°36.52 N06°47.18
о 7	328° 39.71 343° 42.18	292°46.43 N12°40.36 307°45.96 41.39	173° 33.75 N11° 59.48 188° 35.27 59.06	201°49.59 N16°0.11	306°36.52 N06°47.18 321°38.72 47.28
8	343°42.18 358°44.64	307°45.96 41.39 322°45.49 42.41	203°36.80 58.63	201°49.59 16°0.03 216°51.79 15°59.94	321°38.72 47.28 336°40.93 47.38
9	13° 47.11	322 45.49 42.41 337°45.02 · · 43.43	218°38.33 · · 58.21	231°53.99 · · 59.85	351°43.14 · · 47.47
10	28° 49.57	352°44.54 44.45	233°39.85 57.78	246°56.19 59.76	6°45.34 47.57
11	43° 52.04	7°44.07 45.48	248°41.38 57.36	261°58.39 59.68	21°47.55 47.66
12	58° 54.50	22°43.60 N12°46.50	263°42.90 N11°56.93	277°0.59 N15°59.59	36°49.76 N06°47.76
13	73° 56.96	37°43.13 47.52	278° 44.42 56.50	292°2.79 59.50	51°51.96 47.85
14	88° 59.43	52°42.66 48.54	293° 45.95 56.08	307° 4.99 59.41	66°54.17 47.95
15	104°1.89	67°42.18 · · 49.56	308° 47.47 · · 55.65	322°7.19 · · 59.32	81°56.38 · · 48.04
16	119°4.36	82°41.71 50.58	323°49.00 55.23	337°9.39 59.24	96°58.58 48.14
17	134°6.82	97°41.24 51.60	338° 50.52 54.80	352°11.59 59.15	112°0.79 48.23
18	149°9.29	112°40.76 N12°52.61	353°52.04 N11°54.37	7°13.78 N15°59.06	127°3.00 N06°48.33
19	164°11.75	127°40.29 53.63	8° 53.56 53.95	22°15.98 58.97	142°5.20 48.42
20	179° 14.21	142°39.81 54.65	23°55.08 53.52	37°18.18 58.88	157°7.41 48.52
21	194° 16.68	157°39.34 · · 55.67	38°56.60 · · 53.09	52°20.38 · · 58.79	172°9.62 · · 48.61
22	209° 19.14	172°38.86 56.68	53°58.12 52.66	67°22.58 58.70	187°11.83 48.71
23	224°21.61	187°38.39 57.70	68°59.64 52.24	82°24.77 58.62	202°14.03 48.80
		-			
Mer.p	bass. 08:05	ν-0.5′ d1.0′ m-3.86	ν1.5′ d-0.4′ m0.61	ν2.2′ d-0.1′ m-1.99	ν2.2' d0.1' m0.70

	Stars	
	SHA	Dec
Alpheratz	357°32.96	29°14.37
Ankaa Schedar	353°5.54 349°29.17	-42°9.23 56°41.06
Diphda	348°45.60	$-17^{\circ}50.11$
Achernar	335°19.29	-57°5.68
Hamal Polaris	327°49.32 313°29.96	23°35.42 89°22.65
Acamar	315°10.74	-40°11.64
Menkar	314°4.45	4°11.78
Mirfak Aldebaran	308°25.97 290°37.74	49°57.41 16°33.79
Rigel	$281^{\circ}2.33$	-8°10.29
Capella	280°19.48	46°1.51
Bellatrix Elnath	278°21.12 277°59.78	6°22.39 28°37.78
Alnilam	275°36.08	$-1^{\circ}11.16$
Betelgeuse	270°50.29 263°51.98	7°24.65
Canopus Sirius	258°24.81	-52°42.80 -16°45.38
Adhara	$255^{\circ}4.62$	-29°0.75
Procyon Pollux	244°49.02 243°15.18	5°9.18 27°57.59
Avior	234° 14.21	-59°36.15
Suhail	222°44.99	-43°32.90
Miaplacidus	221°38.04 217°45.91	-69°50.13 -8°46.83
Alphard Regulus	217 45.91 207°32.39	-8 40.83 11°49.92
Dubhe	193°38.53	61°36.37
Denebola	182°22.84 175°41.40	14°25.07 -17°41.86
Gienah Acrux	175°41.40 172°57.45	-17 41.86 -63°15.38
Gacrux	171°49.08	$\text{-}57^{\circ}16.31$
Alioth	166°10.92 158°20.00	55°48.76 -11°18.42
Spica Alkaid	158° 20.00 152° 50.09	-11 18.42 49°10.62
Hadar	148°32.62	-60°30.50
Menkent	147°54.96	-36°30.46 19°2.32
Arcturus Rigil Kent.	145°45.84 139°36.96	-60°57.07
Kochab	$137^{\circ}18.78$	74°2.57
Zuben'ubi	136°53.54 126°1.75	-16°9.45 26°37.27
Alphecca Antares	120 1.75 112°13.09	-26°29.59
Atria	$107^{\circ}5.01$	-69°4.50
Sabik	102° 0.24 96° 7.36	-15°45.54 -37°7.34
Shaula Rasalhague	90 7.30 95°56.45	12°32.32
Eltanin	90°40.82	51°28.93
Kaus Aust.	83°29.63 80°31.58	-34°22.18 38°48.36
Vega Nunki	75°45.11	-26°15.66
Altair	61°57.89	$8^{\circ}56.38$
Peacock Deneb	53°2.49 49°24.31	-56°38.51 45°22.45
Enif	33°36.88	9°59.98
Al Na'ir	27°30.55	-46°49.42
Fomalhaut Scheat	15°12.50 13°43.42	-29°28.46 28°13.74
Markab	13°28.06	15°21.08
May 19 Wed	SHA	Mer.pass
Venus Mars	326°44.56 205°44.01	10:28 18:29
Jupiter	218°21.52	17:38
Saturn	338°10.83	09:40
May 20 Thu Venus	SHA 325°34.54	Mer.pass 10:28
Mars	$205^{\circ}21.95$	18:27
Jupiter Saturn	218°15.45 338°4.57	17:35 09:37
May 21 Fri	SHA	Mer.pass
Venus	324°24.31	10:29
Mars Jupiter	204°59.65 218°9.25	18:24 17:31
Saturn	337°58.35	09:33
Horizon	tal parallax	
	Venus:	0.1
	Mars:	0.1

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.10	N19°40.38	19°57.35	11.0'	S 19°44.11	10.5'	56.3'
1	195°53.08	40.92	34°27.38	11.0'	19°54.62	10.4	56.3'
2 3	210°53.05 225°53.02	41.46 •• 42.00	48°57.38 63°27.32	10.9' 10.9'	20°5.02 20°15.31	10.3' 10.2'	56.3' 56.2'
4	240°52.99	42.54	77°57.21	10.8'	20°25.50	10.1	56.2'
5	255°52.97	43.08	92°27.05	10.8'	$20^{\circ}35.58$	10.0'	56.2'
6	270°52.94	N19°43.62	106°56.85	10.7'	\$20°45.54	9.9'	56.2'
7 8	285°52.91 300°52.88	44.16 44.69	121°26.59 135°56.29	10.7' 10.6'	20°55.40 21°5.15	9.7' 9.6'	56.2' 56.1'
9	315°52.85	• • 45.23	150°25.93	10.6'	21°14.78	9.5'	56.1
10	330°52.82	45.77	164°55.53	10.6'	$21^{\circ}24.31$	9.4'	56.1'
11	345°52.80	46.30	179°25.08	10.5'	21°33.71	9.3'	56.1
12 13	0°52.77 15°52.74	N19°46.84 47.37	193°54.59 208°24.04	10.5' 10.4'	\$21°43.01 21°52.19	9.2' 9.1'	56.1' 56.0'
14	30°52.71	47.90	222°53.45	10.4	21° 32.19 22° 1.25	8.9'	56.0'
15	45°52.68	• • 48.44	237°22.81	10.3'	$22^{\circ}10.19$	8.8'	56.0'
16	60°52.65	48.97	251°52.12	10.3'	22°19.02	8.7'	56.0'
17 18	75°52.62 90°52.59	49.50 N19°50.03	266°21.39 280°50.61	10.2' 10.2'	22°27.72 \$22°36.31	8.6' 8.5'	56.0' 55.9'
19	105°52.56	50.56	295°19.79	10.1	22°44.78	8.3	55.9'
20	120°52.52	51.09	309°48.92	10.1'	22°53.12	8.2'	55.9'
21	135°52.49	• • 51.62	324°18.01	10.0'	23°1.34	8.1'	55.9'
22 23	150°52.46 165°52.43	52.15 52.68	338°47.05 353°16.05	10.0' 10.0'	23°9.44 23°17.42	8.0' 7.9'	55.9' 55.8'
23						1.9	55.0
	SD = 15.8'	d = 0.5'		SE	0 = 15.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.40	N19°53.21	7°45.01	9.9'	S23°25.27	7.7'	55.8'
1	195°52.37	53.73	22°13.92	9.9'	23°33.00	7.6'	55.8'
2 3	210°52.33 225°52.30	54.26 •• 54.79	36°42.79 51°11.63	9.8' 9.8'	23°40.60 23°48.07	7.5' 7.3'	55.8' 55.8'
3 4	240°52.27	55.31	65°40.42	9.8'	23°55.42	7.3 7.2'	55.7'
5	255°52.23	55.84	80°9.17	9.7'	24°2.64	7.1'	55.7'
6	270°52.20	N19°56.36	94°37.88	9.7'	S24°9.73	7.0'	55.7'
7 8	285°52.17 300°52.13	56.88 57.41	109°6.56 123°35.19	9.6' 9.6'	24°16.69 24°23.52	6.8' 6.7'	55.7' 55.7'
9	315°52.10	57.41	123 35.19 138°3.79	9.6' 9.6'	24 23.52 24°30.22	6.6'	55.6'
10	330°52.06	58.45	152°32.36	9.5'	24°36.79	6.4	55.6'
11	345°52.03	58.97	167°0.89	9.5'	24°43.22	6.3'	55.6'
12 13	0°51.99 15°51.96	N19°59.49 20°0.01	181°29.38 195°57.84	9.5' 9.4'	\$24°49.53 24°55.70	6.2' 6.0'	55.6' 55.6'
13 14	30°51.92	0.53	210°26.27	9.4 9.4'	24 55.70 25°1.74	5.9'	55.5'
15	45°51.89	• • 1.05	224°54.67	9.4'	25°7.65	5.8'	55.5'
16	60°51.85	1.57	239°23.04	9.3'	25°13.42	5.6'	55.5'
17	75°51.82 90°51.78	2.09 N20°2.60	253°51.38 268°19.69	9.3' 9.3'	25°19.05 \$25°24.55	5.5'	55.5'
18 19	90 51.78 105°51.74	3.12	282°47.97	9.3 9.3'	25°29.92	5.4' 5.2'	55.5' 55.4'
20	120°51.71	3.64	297°16.23	9.2'	25°35.15	5.1'	55.4'
21	135°51.67	• • 4.15	311°44.46	9.2'	25°40.24	5.0'	55.4'
22	150°51.63	4.67	326°12.67	9.2'	25°45.19	4.8'	55.4'
23	165°51.60	5.18	340°40.85	9.2'	25°50.01	4.7'	55.4'
	SD = 15.8'	d = 0.5'		SE	0 = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.56	N20°5.69	355°9.01	9.1'	S25°54.69	4.5'	55.3'
1	195°51.52	6.21	9°37.16	9.1'	25°59.23	4.4'	55.3'
2 3	210°51.48 225°51.44	6.72 • • 7.23	24°5.28 38°33.38	9.1' 9.1'	26°3.63 26°7.89	4.3' 4.1'	55.3' 55.3'
3 4	225°51.44 240°51.41	· · 7.23 7.74	38°33.38 53°1.47	9.1'	26°7.89 26°12.02	4.1'	55.3' 55.3'
5	255°51.37	8.25	67°29.54	9.1'	26°16.00	3.8'	55.3'
6	270°51.33	N20°8.76	81°57.59	9.0'	S26°19.85	3.7'	55.2'
7	285°51.29 300°51.25	9.27	96°25.63 110°53.66	9.0' 9.0'	26°23.55 26°27.11	3.6' 3.4'	55.2'
8 9	300°51.25 315°51.21	9.78 •• 10.29	110°53.66 125°21.68	9.0° 9.0°	26°27.11 26°30.54	3.4'	55.2' 55.2'
10	330°51.17	10.29	139°49.68	9.0'	26°33.82	3.1'	55.2'
11	345°51.13	11.30	154°17.68	9.0'	$26^{\circ}36.97$	3.0'	55.1'
12	0°51.09	N20°11.81	168°45.67 183°13.66	9.0'	\$26°39.97 26°42.83	2.9'	55.1'
13 14	15°51.05 30°51.01	12.31 12.82	183°13.66 197°41.64	9.0' 9.0'	26°42.83 26°45.55	2.7' 2.6'	55.1' 55.1'
15	45°50.97	13.32	212°9.62	9.0'	26°48.13	2.4'	55.1'
16	60°50.92	13.83	226°37.59	9.0'	26°50.56	2.3'	55.1'
17	75°50.88	14.33	241°5.56	9.0'	26°52.86	2.2'	55.0'
18 19	90°50.84 105°50.80	N20°14.83 15.34	255°33.54 270°1.51	9.0' 9.0'	\$26°55.01 26°57.02	2.0' 1.9'	55.0' 55.0'
20	120°50.76	15.34	284°29.49	9.0'	26°58.89	1.7'	55.0'
21	135°50.71	•• 16.34	298°57.48	9.0'	$27^{\circ}0.62$	1.6'	55.0'
22	150°50.67	16.84	313°25.47	9.0'	27°2.21	1.4'	55.0'
23	165°50.63	17.34	327°53.46	9.0'	27°3.66	1.3'	54.9'
	SD = 15.8'	d = 0.5'		SE	0 = 15.1'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-100%	
19	03:32	03:31	11:56	23:28	11:02		
20	03:30	03:28	11:57	-:-	11:54		
21	03:26	03:24	11:57	00:20	12:47		

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	239°24.07	202°37.91 N12°58.71	84°1.16 N11°51.81	97°26.97 N15°58.53	217°16.24 N06°48.90
1	254°26.53	217°37.43 12°59.73	99°2.68 51.38	112°29.17 58.44	232°18.45 48.99
2	269°29.00	232°36.96 13°0.74	114°4.20 50.95	127°31.36 58.35	247°20.66 49.09
3	284°31.46	247°36.48 · · 1.75	129°5.72 · · 50.52	142°33.56 · · 58.26	262°22.86 · · 49.18
4	299°33.93	262°36.00 2.77	144°7.24 50.09	157°35.76 58.17	277°25.07 49.28
	299 33.93 314°36.39				I
5					
6	329° 38.86			187°40.15 N15°57.99	
7	344°41.32	307°34.56 5.80	189°11.79 48.81	202°42.34 57.90	322°31.70 49.56
8	359°43.78	322°34.08 6.82	204°13.31 48.38	217°44.54 57.81	337°33.90 49.65
9	14°46.25	337°33.60 · · 7.83	219°14.82 · · 47.95	232°46.73 · · 57.72	352°36.11 · · 49.75
10	29°48.71	352°33.12 8.84	234° 16.34 47.52	247°48.93 57.63	7°38.32 49.84
11	44°51.18	7°32.64 9.85	249° 17.85 47.09	262°51.12 57.55	22°40.53 49.94
12	59°53.64	22°32.16 N13°10.85	264°19.37 N11°46.66	277°53.32 N15°57.46	37°42.74 N06°50.03
13	$74^{\circ}56.10$	37°31.68 11.86	279°20.88 46.23	292°55.51 57.37	52°44.95 50.13
14	89° 58.57	52°31.20 12.87	294°22.40 45.80	307°57.71 57.28	67°47.15 50.22
15	$105^{\circ}1.03$	67°30.71 ·· 13.88	309°23.91 · · 45.37	322°59.90 · · 57.19	82°49.36 · · 50.32
16	120°3.50	82°30.23 14.88	324°25.42 44.94	338° 2.09 57.10	97°51.57 50.41
17	135°5.96	97°29.75 15.89	339°26.93 44.51	353° 4.29 57.01	112°53.78 50.50
18	150°8.43	112°29.26 N13°16.90	354°28.45 N11°44.07	8°6.48 N15°56.92	127°55.99 N06°50.60
19	165° 10.89	127°28.78 17.90	9°29.96 43.64	23°8.67 56.82	142°58.20 50.69
20	180° 13.35	142°28.29 18.91	24°31.47 43.21	38°10.86 56.73	158°0.41 50.79
21	195° 15.82	157°27.81 · · 19.91	39°32.98 · · 42.78	53°13.06 · · 56.64	173°2.62 · · 50.88
22	210° 18.28	172°27.32 20.91	54°34.49 42.35	68°15.25 56.55	188°4.83 50.97
23	210 18.28 225° 20.75	187°26.84 21.92	69°36.00 41.91	83°17.44 56.46	203°7.03 51.07
	pass. 08:01	$\frac{167 \ 20.04}{\nu - 0.5' \ d1.0' \ m-3.86}$	$\frac{09.50.00}{\nu 1.5' \ d-0.4' \ \text{m}0.63}$	$\frac{63 \text{ 17.44}}{\nu 2.2' \text{ d-0.1' m-1.98}}$	$\frac{203 \text{ 7.03}}{\nu 2.2' \text{ d}0.1' \text{ m}0.70}$
ivier.	Dass. 00:01	ν-0.5 d1.0 m-5.60	ν1.5 α-0.4 mo.05	V2.2 d-0.1 m-1.90	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	240°23.21	202°26.35 N13°22.92	84°37.51 N11°41.48	98°19.63 N15°56.37	218°9.24 N06°51.16
1	255° 25.68	202 20.35 N13 22.92 217°25.86 23.92	99°39.02 41.05	113°21.82 56.28	233°11.45 51.26
2	270°28.14		114° 40.53 40.62	128°24.01 56.19	
3	270 28.14 285°30.60				I
4	300°33.07	262°24.40 26.93	144°43.55 39.75	158°28.39 56.01	278°18.08 51.54
5	315°35.53	277°23.91 27.93	159° 45.05 39.32	173°30.59 55.92	293°20.29 51.63
6	330°38.00	292°23.42 N13°28.92	174°46.56 N11°38.88	188°32.78 N15°55.83	308°22.50 N06°51.72
7	345°40.46	307°22.93 29.92	189°48.07 38.45	203°34.97 55.74	323°24.71 51.82
8	0°42.92	322°22.44 30.92	204°49.57 38.02	218°37.15 55.64	338°26.92 51.91
9	15°45.39	337°21.95 · · 31.92	219°51.08 · · 37.58	233°39.34 · · 55.55	353°29.13 · · 52.01
10	30°47.85	352°21.46 32.92	234°52.59 37.15	248°41.53 55.46	8°31.34 52.10
11	45°50.32	7°20.97 33.91	249°54.09 36.71	263°43.72 55.37	23°33.55 52.19
12	60°52.78	22°20.48 N13°34.91	264°55.60 N11°36.28	278°45.91 N15°55.28	38°35.76 N06°52.29
13	75°55.25	37°19.99 35.91	279°57.10 35.84	293°48.10 55.19	53°37.97 52.38
14	90°57.71	52°19.50 36.90	294°58.60 35.41	308°50.29 55.09	68°40.18 52.47
15	106°0.17	67°19.01 · · 37.90	310°0.11 · · 34.97	323°52.48 · · 55.00	83°42.39 · · 52.57
16	121°2.64	82°18.51 38.89	325°1.61 34.54	338°54.66 54.91	98°44.60 52.66
17	136°5.10	97°18.02 39.88	340°3.11 34.10	353°56.85 54.82	113°46.81 52.75
18	151°7.57	112°17.52 N13°40.88	355°4.62 N11°33.67	8°59.04 N15°54.73	128°49.02 N06°52.85
19	166° 10.03	127°17.03 41.87	10°6.12 33.23	24°1.23 54.63	
20	181°12.49	142°16.54 42.86	25°7.62 32.79	39° 3.41 54.54	158°53.44 53.03
21	196° 14.96	157°16.04 · · 43.85	40°9.12 · · 32.36	54°5.60 · · 54.45	173°55.66 · · 53.13
22	211° 17.42	172°15.54 44.84	55° 10.62 31.92	69°7.79 54.36	188°57.87 53.22
23	226° 19.89	187°15.05 45.83	70°12.12 31.48	84° 9.97 54.26	204°0.08 53.31
Mer.p	pass. 07:57	ν-0.5′ d1.0′ m-3.86	ν1.5' d-0.4' m0.64	ν 2.2′ <i>d</i> -0.1′ m-1.98	ν2.2' d0.1' m0.70
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	241°22.35	202°14.55 N13°46.82	85°13.62 N11°31.05	99°12.16 N15°54.17	219°2.29 N06°53.41
1	256°24.82	217°14.05 47.81	100°15.12 30.61	114°14.34 54.08	234°4.50 53.50
2	271°27.28	232°13.56 48.80	115°16.62 30.17	129°16.53 53.99	249°6.71 53.59
3	286°29.74	247°13.06 · · 49.79	130°18.12 · · 29.74	144°18.72 · · 53.89	264°8.92 · · 53.68
4	301°32.21	262°12.56 50.77	145°19.62 29.30	159°20.90 53.80	279°11.13 53.78
5	$316^{\circ}34.67$	277° 12.06 51.76	160°21.12 28.86	174°23.09 53.71	294°13.34 53.87
6	331°37.14	292°11.56 N13°52.75	175°22.61 N11°28.42	189°25.27 N15°53.62	309°15.56 N06°53.96
7	$346^{\circ}39.60$	307°11.06 53.73	190°24.11 27.98	204°27.45 53.52	324°17.77 54.06
8	1°42.07	322°10.56 54.72	205°25.61 27.55	219°29.64 53.43	339°19.98 54.15
9	$16^{\circ}44.53$	337°10.06 · · 55.70	220°27.10 · · 27.11	234°31.82 · · 53.34	354°22.19 · · 54.24
10	31°46.99	352°9.56 56.69	235°28.60 26.67	249°34.01 53.24	9°24.40 54.33
11	46°49.46	7°9.06 57.67	250° 30.10 26.23	264°36.19 53.15	24°26.61 54.43
12	61°51.92	22°8.56 N13°58.65	265°31.59 N11°25.79	279°38.37 N15°53.06	39°28.83 N06°54.52
13	76°54.39	37°8.06 13°59.64	280°33.09 25.35	294°40.56 52.96	54°31.04 54.61
14	91°56.85	52°7.56 14°0.62	295°34.58 24.91	309°42.74 52.87	69°33.25 54.70
15	106°59.31	67°7.05 · · 1.60	310°36.07 · · 24.47	324°44.92 · · 52.77	84°35.46 · · 54.80
16	122°1.78	82°6.55 2.58	325°37.57 24.03	339°47.10 52.68	99°37.67 54.89
	122 1.78 137°4.24		340°39.06 23.59	354°49.29 52.59	114°39.89 54.98
17					
18	152°6.71	112°5.54 N14°4.54	355°40.55 N11°23.15	9°51.47 N15°52.49	129°42.10 N06°55.07
19	167°9.17	127°5.04 5.52	10° 42.05 22.71	24°53.65 52.40	144°44.31 55.17
20	182°11.64	142°4.53 6.50	25° 43.54 22.27	39°55.83 52.30	159° 46.52 55.26
21	197° 14.10	157°4.03 · · 7.47	40°45.03 · · 21.83	54°58.01 · · 52.21	174°48.74 · · 55.35
22	212° 16.56	172°3.52 8.45	55°46.52 21.39	70°0.19 52.12	189°50.95 55.44
23	227° 19.03	187°3.01 9.43	70°48.01 20.95	85°2.37 52.02	204°53.16 55.53
Mer	pass. 07:53	ν-0.5' d1.0' m-3.86	ν 1.5' d-0.4' m0.66	ν2.2' d-0.1' m-1.97	ν 2.2' d 0.1' m 0.70

	SHA	Dec
Alpheratz	357°32.93	29° 14.37
Ankaa	353°5.51	-42°9.21
Schedar	349°29.14 348°45.58	56° 41.06 -17° 50.09
Diphda Achernar	335°19.26	-17 50.09 -57°5.66
Hamal	327°49.30	23° 35.43
Polaris	313°29.19	89°22.64
Acamar	$315^{\circ}10.73$	-40°11.63
Menkar	314°4.43	$4^{\circ}11.78$
Mirfak	308°25.95	49°57.41
Aldebaran	290°37.73	16°33.79
Rigel Capella	281°2.33 280°19.48	-8° 10.29 46° 1.50
Bellatrix	278°21.12	6° 22.39
Elnath	277°59.77	28° 37.78
Alnilam	275°36.07	-1°11.15
Betelgeuse	$270^{\circ}50.29$	$7^{\circ}24.65$
Canopus	263°51.99	-52° 42.78
Sirius	258°24.81	-16°45.37
Adhara	255°4.63	-29°0.74
Procyon Pollux	244°49.02 243°15.18	5°9.18 27°57.59
Avior	234° 14.23	-59°36.14
Suhail	222°45.00	-43° 32.90
Miaplacidus	221°38.08	-69°50.13
Alphard	$217^{\circ}45.92$	-8°46.82
Regulus	207°32.40	11°49.92
Dubhe	193°38.55	61°36.37
Denebola	182°22.85	14° 25.08
Gienah	175°41.40	-17°41.86 -63°15.39
Acrux Gacrux	172°57.46 171°49.08	-63° 15.39 -57° 16.32
Alioth	166°10.93	55° 48.77
Spica	158°20.00	-11° 18.42
Alkaid	152°50.10	49° 10.63
Hadar	148°32.62	-60° 30.52
Menkent	147°54.95	-36° 30.47
Arcturus	145°45.84	19°2.33
Rigil Kent. Kochab	139°36.95 137°18.80	-60°57.09 74°2.58
Zuben'ubi	136°53.54	-16°9.45
Alphecca	126° 1.74	26° 37.28
Antares	112° 13.08	-26° 29.59
Atria	107°4.97	-69°4.51
Sabik	102°0.22	-15°45.54
Shaula	96°7.34	-37°7.35
Rasalhague Eltanin	95°56.43 90°40.80	12°32.33 51°28.94
Kaus Aust.	83°29.61	-34°22.18
Vega	80°31.56	38° 48.38
Nunki	75°45.08	-26° 15.65
Altair	61°57.87	8°56.39
Peacock	53°2.45	-56° 38.51
Deneb	49°24.28	45°22.47
Enif	33°36.85	9°59.99
Al Na'ir Fomalhaut	27°30.51 15°12.47	-46°49.41 -29°28.44
Scheat	15 12.47 13°43.39	-29 28.44 28°13.75
Markab	13°28.04	15°21.09
May 22 Sat Venus	SHA 323°13.84	Mer.pass 10:30
Mars	204°37.09	18:22
Jupiter	218°2.90	17:28
Saturn	337°52.17	09:30
May 23 Sun	SHA	Mer.pass
-	322°3.14	10:31
Venus	204°14.30	18:20
Venus Mars	_00	
	$217^{\circ}56.42$	17:24
Mars		17:24 09:26
Mars Jupiter	$217^{\circ}56.42$	09:26
Mars Jupiter Saturn	217°56.42 337°46.03	
Mars Jupiter Saturn May 24 Mon	217°56.42 337°46.03 SHA 320°52.20 203°51.27	09:26 Mer.pass
Mars Jupiter Saturn May 24 Mon Venus Mars Jupiter	217°56.42 337°46.03 SHA 320°52.20 203°51.27 217°49.81	09:26 Mer.pass 10:31 18:17 17:21
Mars Jupiter Saturn May 24 Mon Venus Mars	217°56.42 337°46.03 SHA 320°52.20 203°51.27	09:26 Mer.pass 10:31 18:17
Mars Jupiter Saturn May 24 Mon Venus Mars Jupiter Saturn	217°56.42 337°46.03 SHA 320°52.20 203°51.27 217°49.81	09:26 Mer.pass 10:31 18:17 17:21
Mars Jupiter Saturn May 24 Mon Venus Mars Jupiter Saturn	217°56.42 337°46.03 SHA 320°52.20 203°51.27 217°49.81 337°39.94 ital parallax Venus:	09:26 Mer.pass 10:31 18:17 17:21 09:22
Mars Jupiter Saturn May 24 Mon Venus Mars Jupiter Saturn	217°56.42 337°46.03 SHA 320°52.20 203°51.27 217°49.81 337°39.94 ttal parallax	09:26 Mer.pass 10:31 18:17 17:21 09:22

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 50.58	N20°17.84	342°21.47	9.0'	S27°4.96	1.2'	54.9'
1	195°50.54	18.34	356°49.48	9.0'	$27^{\circ}6.13$	1.0'	54.9'
2	210°50.50	18.83	11°17.51	9.0'	27°7.15	0.9'	54.9'
3	225°50.45 240°50.41	• • 19.33	25°45.55 40°13.60	9.1'	27°8.03 27°8.78	0.7'	54.9'
4 5	240°50.41 255°50.36	19.83 20.32	40°13.60 54°41.66	9.1' 9.1'	27° 9.38	0.6' 0.5'	54.9' 54.8'
6	270° 50.32	N20°20.82	69° 9.75	9.1'	\$27°9.84	0.3	54.8'
7	285° 50.28	21.32	83°37.85	9.1'	27°10.16	0.2'	54.8'
8	300°50.23	21.81	98° 5.97	9.1'	$27^{\circ}10.34$	0.0'	54.8'
9	315°50.18	• • 22.30	112°34.11	9.2'	27°10.38	-0.1'	54.8'
10 11	330°50.14 345°50.09	22.80 23.29	127°2.27 141°30.46	9.2' 9.2'	27°10.28 27°10.04	-0.2' -0.4'	54.8' 54.7'
12	0° 50.05	N20°23.78	155°58.67	9.2'	\$27°9.66	-0.4	54.7'
13	15°50.00	24.27	170°26.91	9.3'	27°9.15	-0.7'	54.7'
14	30°49.95	24.76	184°55.17	9.3'	27°8.49	-0.8'	54.7'
15	45°49.91	• • 25.25	199°23.46	9.3'	27°7.70	-0.9'	54.7'
16	60° 49.86 75° 49.81	25.74	213°51.78 228°20.13	9.4' 9.4'	27°6.77 27°5.70	-1.1' -1.2'	54.7'
17 18	75°49.81 90°49.77	26.23 N20°26.72	228°20.13 242°48.51	9.4	\$27°4.50	-1.2 -1.3'	54.7' 54.6'
19	105° 49.72	27.21	257°16.93	9.4	27°3.16	-1.5'	54.6'
20	120°49.67	27.69	271°45.37	9.5'	27°1.68	-1.6'	54.6'
21	135°49.62	•• 28.18	286°13.86	9.5'	27°0.07	-1.7'	54.6'
22	150°49.57	28.67	300°42.38	9.6'	26°58.32	-1.9'	54.6'
23	165°49.53	29.15	315°10.94	9.6'	26°56.44	-2.0'	54.6'
	SD = 15.8'	d = 0.5'		SD	0 = 15.0'		
Sun	GHA	Dec	GHA		Dec	d	НР
5 un 0	180°49.48	N20°29.64	329°39.54	ν 9.6'	S26°54.43	-2.1'	пР 54.6'
1	195°49.43	30.12	344°8.17	9.7'	26°52.28	-2.3'	54.5'
2	210°49.38	30.60	358°36.85	9.7'	26°49.99	-2.4'	54.5'
3	225°49.33	• • 31.09	13°5.57	9.8'	26°47.58	-2.5'	54.5'
4	240°49.28	31.57	27°34.33	9.8'	26°45.03	-2.7'	54.5'
5 6	255°49.23 270°49.18	32.05 N20°32.53	42°3.14 56°31.99	9.9' 9.9'	26°42.35 \$26°39.54	-2.8' -2.9'	54.5' 54.5'
7	285°49.13	33.01	71°0.89	9.9'	26°36.60	-3.1'	54.5'
8	300°49.08	33.49	85°29.84	10.0'	26°33.53	-3.2'	54.5'
9	315°49.03	• • 33.97	99°58.83	10.0'	$26^{\circ}30.33$	-3.3'	54.4'
10	330°48.98	34.45	114°27.87	10.1'	26°27.00	-3.5'	54.4'
11 12	345°48.93 0°48.87	34.93 N20°35.40	128°56.96 143°26.11	10.1' 10.2'	26°23.55 \$26°19.96	-3.6' -3.7'	54.4' 54.4'
13	0 48.87 15°48.82	35.88	143 20.11 157°55.30	10.2	26°16.25	-3.1 -3.8'	54.4'
14	30°48.77	36.36	172°24.55	10.2	26°12.42	-4.0'	54.4'
15	45°48.72	• • 36.83	186°53.85	10.4'	26°8.45	-4.1'	54.4'
16	60°48.67	37.31	201°23.20	10.4'	26°4.37	-4.2'	54.4'
17	75°48.61	37.78	215°52.61	10.5'	26°0.16 \$25°55.82	-4.3'	54.4'
18 19	90°48.56 105°48.51	N20°38.26 38.73	230°22.07 244°51.59	10.5' 10.6'	25°55.82 25°51.37	-4.5' -4.6'	54.3' 54.3'
20	120° 48.45	39.20	259°21 17		25°46.79	-4.0 -4.7'	54.3
21	135°48.40	39.67	273°50.80	10.7'	25°42.09	-4.8'	54.3'
22	150°48.35	40.14	288°20.49	10.8'	25°37.27	-4.9'	54.3'
23	165°48.29	40.61	302°50.25	10.8'	25°32.33	-5.1'	54.3'
	SD = 15.8'	d = 0.5'		SD	0 = 14.9'		
N4	CHA	D	CUA		D	.,	LID.
Mon 0	GHA 180° 48.24	Dec N20°41.08	GHA 317°20.06	u 10.9'	Dec \$25°27.27	d -5.2'	HP 54.3'
1	195° 48.18	41.55	331° 49.93	10.9	25°22.09	-5.2 -5.3'	54.3'
2	210°48.13	42.02	$346^{\circ}19.86$	11.0'	$25^{\circ}16.79$	-5.4'	54.3'
3	225° 48.07	• • 42.49	0°49.85	11.1'	25°11.38	-5.5'	54.3'
4	240° 48.02 255° 47.96	42.96 43.42	15°19.90 29°50.02	11.1'	25°5.85 25°0.21	-5.6' -5.8'	54.3' 54.2'
5 6	255°47.96 270°47.91	43.42 N20°43.89	29°50.02 44°20.20	11.2' 11.2'	25°0.21 \$24°54.45	-5.8° -5.9°	54.2'
7	285° 47.85	44.36	58°50.44	11.3'	24°48.58	-6.0'	54.2'
8	300°47.80	44.82	73°20.74	11.4'	24°42.59	-6.1'	54.2'
9	315° 47.74	• • 45.29	87°51.11	11.4'	24°36.50	-6.2'	54.2'
10	330°47.68	45.75 46.21	102°21.54	11.5'	24°30.29	-6.3'	54.2'
11 12	345° 47.63 0° 47.57	46.21 N20°46.68	116°52.03 131°22.59	11.6' 11.6'	24°23.97 \$24°17.54	-6.4' -6.5'	54.2' 54.2'
13	15° 47.51	47.14	131 22.39 145°53.22	11.7	24°11.00	-0.5 -6.6'	54.2'
14	30° 47.46	47.60	160°23.91	11.8'	24°4.36	-6.8	54.2
15	45° 47.40	• • 48.06	174°54.66	11.8'	$23^{\circ}57.60$	-6.9'	54.2'
16	60°47.34	48.52	189°25.48	11.9'	23°50.74	-7.0'	54.2'
17	75° 47.28 90° 47.22	48.98 N20°49.44	203°56.37	12.0'	23°43.78 \$23°36.71	-7.1'	54.2'
18 19	90°47.22 105°47.17	N20°49.44 49.90	218°27.32 232°58.33	12.0' 12.1'	\$23°36.71 23°29.53	-7.2' -7.3'	54.2' 54.2'
20	105 47.17 120° 47.11	50.35	232 36.33 247°29.42	12.1'	23°22.26	-7.4'	54.2'
21	135° 47.05	• • 50.81	262° 0.57	12.2'	23°14.88	-7.5'	54.1'
22	150°46.99	51.27	276°31.78	12.3'	23°7.39	-7.6'	54.1'
23	165°46.93	51.72	291°3.06	12.3'	22°59.81	-7.7'	54.1'
	SD = 15.8'	d = 0.5'		SD	0 = 14.8'		

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

Lat.		Moonris	e	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°							
N 70°							
68°							
66°							
64°			02:01			04:00	
62°	00:11	00:56	01:07	02:14	03:19	04:53	
60°		00:09	00:35	03:05	04:05	05:25	
N 58°	23:39		00:10	03:36	04:35	05:49	
56°	23:16	23:51		04:00	04:58	06:08	
54°	22:58	23:35	•• ••	04:19	05:16	06:24	
52°	22:42	23:21	23:49	04:35	05:32	06:38	
50°	22:28	23:08	23:39	04:49	05:45	06:50	
45°	22:00	22:43	23:17	05:18	06:13	07:14	
N 40°	21:38	22:23	23:00	05:40	06:35	07:34	
35°	21:20	22:06	22:45	05:58	06:53	07:51	
30°	21:04	21:51	22:32	06:14	07:08	08:05	
20° N 10°	20:38	21:26	22:10	06:41	07:35	08:29	
0°	20:15 19:53	21:05 20:45	21:51 21:33	07:04 07:26	07:57 08:18	08:49 09:08	
S 10°	19:32	20:24	21:16	07:47	08:39	09:28	
20° 30°	19:09 18:42	20:03 19:37	20:56 20:34	08:11 08:37	09:02 09:27	09:48 10:11	
35°	18:26	19:37	20:34	08:53	09:27	10:11	
40°	18:08	19:25	20:21	08.53	10:00	10:25	
45°	17:46	18:45	19:48	09:34	10:21	11:00	
S 50°	17:18	18:18	19:25	10:02	10:48	11:23	
52°	17:18	18:18	19:25 19:14	10:02	10:48	11:23	
54°	16:48	17:51	19:14	10:10	11:16	11:47	
56°	16:29	17:34	18:48	10:52	11:33	12:02	
58°	16:06	17:13	18:31	11:14	11:54	12:19	
S 60°	15:35	16:47	18:11	11:45	12:21	12:39	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-88%	
22	03:22	03:20	11:57	01:13	13:40		
23	03:18	03:15	11:57	02:06	14:31		
24	03:13	03:10	11:57	02:57	15:21		

	, _0, _0,	-	,		
h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	242°21.49	202°2.51 N14°10.40	85°49.50 N11°20.51	100°4.55 N15°51.93	219°55.38 N06°55.63
1	257°23.96	217°2.00 11.38	100°50.99 20.06	115° 6.73 51.83	234°57.59 55.72
2	272°26.42	232°1.49 12.36	115°52.48 19.62	130° 8.91 51.74	249°59.80 55.81
3	287° 28.88	247°0.98 · · 13.33	130°53.97 · · 19.18	145°11.09 · · 51.64	265°2.01 · · 55.90
4	302°31.35	262°0.47 14.30	145°55.46 18.74	160°13.27 51.55	280°4.23 55.99
5	317°33.81	276°59.97 15.28	160° 56.95 18.30	175°15.45 51.45	295°6.44 56.09
6	332°36.28	291°59.46 N14°16.25	175°58.44 N11°17.85	190°17.63 N15°51.36	310°8.65 N06°56.18
7	347°38.74	306°58.95 17.22	190°59.93 17.41	205°19.81 51.26	325°10.87 56.27
8	2°41.21	321°58.44 18.19	206°1.41 16.97	220°21.99 51.17	340°13.08 56.36
9	17°43.67	336°57.93 · · 19.16	221°2.90 · · 16.52	235°24.17 · · 51.07	355°15.29 · · 56.45
10	32°46.13	351°57.41 20.13	236°4.39 16.08	250°26.35 50.98	10°17.51 56.54
11	47°48.60	6°56.90 21.10	251°5.87 15.64	265°28.53 50.88	25°19.72 56.64
12	62°51.06	21°56.39 N14°22.07	266°7.36 N11°15.19	280°30.70 N15°50.79	40°21.94 N06°56.73
13	77°53.53	36°55.88 23.04	281°8.84 14.75	295°32.88 50.69	55°24.15 56.82
14	92°55.99	51°55.36 24.01	296° 10.33 14.31	310°35.06 50.60	70°26.36 56.91
15	107°58.45	66°54.85 · · 24.98	311°11.81 · · 13.86	325°37.24 · · 50.50	85°28.58 · · 57.00
16	123°0.92	81°54.34 25.94	326°13.30 13.42	340°39.41 50.41	100°30.79 57.09
17	138°3.38	96°53.82 26.91	341°14.78 12.97	355°41.59 50.31	115°33.01 57.19
18	150° 5.85	111°53.31 N14°27.88	356°16.27 N11°12.53	10°43.77 N15°50.22	130°35.22 N06°57.28
	168°8.31	111 55.51 N14 27.86 126°52.79 28.84			
19					
20	183° 10.77	141°52.28 29.81	26° 19.23 11.64	40°48.12 50.02	160°39.65 57.46
21	198° 13.24	156°51.76 · · · 30.77	41°20.71 · · 11.19	55°50.29 · · 49.93	175°41.86 · · 57.55
22	213° 15.70	171°51.25 31.73	56°22.20 10.75	70°52.47 49.83	190°44.08 57.64
23	228° 18.17	186°50.73 32.70	71°23.68 10.30	85°54.65 49.73	205°46.29 57.73
Mer.p	pass. 07:49	ν-0.5' d1.0' m-3.86	ν1.5' d-0.4' m0.67	ν2.2' d-0.1' m-1.96	ν2.2' d0.1' m0.69
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
vveu 0	243°20.63	201°50.21 N14°33.66	86°25.16 N11°9.86	100°56.82 N15°49.64	220°48.51 N06°57.82
1	243° 20.63 258° 23.10	201°50.21 N14°33.66 216°49.69 34.62	101°26.64 9.41	100°50.82 N15°49.64 115°59.00 49.54	235°50.72 57.92
2	273°25.56	231°49.17 35.58	116°28.12 8.96	131°1.17 49.45	250°52.94 58.01
3	288°28.02	246°48.66 · · 36.54	131°29.60 · · 8.52	146°3.34 · · 49.35	265°55.15 · · 58.10
4	303°30.49	261°48.14 37.50	146°31.08 8.07	161°5.52 49.25	280°57.37 58.19
5	318° 32.95	276° 47.62 38.46	161°32.56 7.62	176°7.69 49.16	295°59.58 58.28
6	333°35.42	291°47.10 N14°39.42	176°34.04 N11°7.18	191°9.87 N15°49.06	311°1.80 N06°58.37
7	348° 37.88	306° 46.58 40.38	191° 35.52 6.73	206°12.04 48.96	326°4.01 58.46
8	3°40.34	321°46.06 41.33	206° 37.00 6.28	221°14.21 48.87	341°6.23 58.55
9	18°42.81	336°45.53 · · 42.29	221°38.47 · · 5.83	236°16.39 · · 48.77	356°8.44 · · 58.64
10	33°45.27	351°45.01 43.25	236°39.95 5.39	251°18.56 48.67	11°10.66 58.73
11	48°47.74	6°44.49 44.20	251°41.43 4.94	266°20.73 48.57	26°12.87 58.82
12	63°50.20	21°43.97 N14°45.16	266°42.90 N11°4.49	281°22.91 N15°48.48	41°15.09 N06°58.92
13	78°52.67	36°43.44 46.11	281°44.38 4.04	296°25.08 48.38	56°17.30 59.01
14	93°55.13	51°42.92 47.06	296°45.86 3.59	311°27.25 48.28	71°19.52 59.10
15	108°57.59	66°42.40 · · 48.02	311°47.33 · · 3.15	326°29.42 · · 48.19	86°21.74 · · 59.19
16	124°0.06	81°41.87 48.97	326°48.81 2.70	341°31.59 48.09	101°23.95 59.28
17	$139^{\circ}2.52$	96°41.35 49.92	341°50.28 2.25	356°33.76 47.99	116°26.17 59.37
18	154°4.99	111°40.82 N14°50.87	356°51.76 N11°1.80	11°35.94 N15°47.89	131°28.38 N06°59.46
19	169°7.45	126° 40.29 51.82	11°53.23 1.35	26°38.11 47.80	146°30.60 59.55
20	184°9.91	141°39.77 52.77	26°54.70 0.90	41°40.28 47.70	161022 02 50.64
21	199° 12.38	156°39.24 · · 53.72	41°56.18 · · 0.45	56°42.45 · · 47.60	176°35.03 · · 59.73
22	214° 14.84	171°38.71 54.67	56°57.65 11°0.00	71°44.62 47.50	191°37.25 59.82
23	229° 17.31	186°38.19 55.62	71°59.12 10°59.55	86°46.79 47.40	206°39.47 59.91
Mer.p	bass. 07:45	ν-0.5′ d1.0′ m-3.86	ν1.5′ d-0.4′ m0.68	$\nu 2.2' \ d$ -0.1' m-1.96	ν2.2' d0.1' m0.69
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	244° 19.77	201°37.66 N14°56.57	87°0.59 N10°59.10	101°48.96 N15°47.31	221°41.68 N07°0.00
1	259°22.23	216°37.13 57.51	102°2.07 58.65	116°51.13 47.21	236°43.90 0.09
2	274° 24.70	231°36.60 58.46	117°3.54 58.20	131°53.30 47.11	251°46.12 0.18
3	274 24.70 289°27.16	246°36.07 14°59.41	132°5.01 · · 57.75	146°55.47 · · 47.01	266°48.33 · · 0.27
3 4	289 27.10 304°29.63	261°35.54 15°0.35	132 5.01 · · 57.75 147°6.48 57.30	161°57.64 46.91	281°50.55 0.36 N
	304 29.03 319°32.09		147 6.48 57.30 162°7.95 56.85		
5					
6	334°34.56	291°34.48 N15°2.24	177°9.42 N10°56.39	192°1.97 N15°46.72	311°54.98 N07°0.54
7	349°37.02	306°33.95 3.18	192°10.89 55.94	207° 4.14 46.62	326°57.20 0.63
8	4°39.48	321°33.42 4.13	207° 12.36 55.49	222°6.31 46.52	341°59.42 0.72
9	19°41.95	336°32.88 · · 5.07	222°13.83 · · 55.04	237°8.48 · · 46.42	357°1.64 · · 0.81 M
10	34°44.41	351°32.35 6.01	237°15.29 54.59	252°10.64 46.32	12 3.85 0.90
11	49°46.88	6°31.82 6.95	252°16.76 54.13	267°12.81 46.22	27°6.07 0.99
12	64°49.34	21°31.29 N15°7.89	267°18.23 N10°53.68	282°14.98 N15°46.12	42°8.29 N07°1.08
13	79°51.80	36°30.75 8.83	282°19.70 53.23	297°17.15 46.02	57°10.51 1.17
14	94° 54.27	51°30.22 9.77	297°21.16 52.78	312°19.31 45.93	72°12.72 1.26
15	109°56.73	66°29.68 · · 10.71	312°22.63 · · 52.32	327°21.48 · · 45.83	87°14.94 · · 1.35 N
16	124°59.20	81°29.15 11.65	327°24.10 51.87	342°23.65 45.73	102°17.16 1.44
17	$140^{\circ}1.66$	96°28.61 12.58	342°25.56 51.42	357°25.81 45.63	117°19.38 1.53
18	155°4.12	111°28.07 N15°13.52	357°27.03 N10°50.96	12°27.98 N15°45.53	132°21.60 N07°1.62
19	170°6.59	126°27.54 14.45	12°28.49 50.51	27°30.14 45.43	147°23.81 1.71
20	185°9.05	141°27.00 15.39	27°29.96 50.06	42°32.31 45.33	162°26.03 1.80
21	200° 11.52	156° 26.46 · · 16.32	42°31.42 · · 49.60	57°34.47 · · 45.23	177°28.25 · · 1.88
22	215° 13.98	171°25.92 17.26	57°32.89 49.15	72°36.64 45.13	192°30.47 1.97
23	230° 16.45	186°25.39 18.19	72°34.35 48.69	87°38.80 45.03	207°32.69 2.06
Mer.p	pass. 07:41	ν-0.5′ d0.9′ m-3.86	ν1.5' d-0.5' m0.70	ν2.2' d-0.1' m-1.95	ν2.2' d0.1' m0.69

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	SHA	Dec
Alpheratz	357°32.90	29°14.38
Ankaa Schedar	353°5.48 349°29.10	-42°9.20 56°41.06
Diphda	348°45.55	-17°50.08
Achernar	335°19.24	-57°5.64
Hamal Polaris	327°49.28 313°28.54	23°35.43 89°22.62
Acamar	315°10.72	-40°11.61
Menkar	$314^{\circ}4.42$	4°11.79
Mirfak	308°25.93 290°37.72	49°57.40 16°33.80
Aldebaran Rigel	290 37.72 281°2.32	-8°10.28
Capella	$280^{\circ}19.47$	46°1.49
Bellatrix	278°21.11	6°22.40 28°37.78
Elnath Alnilam	277°59.77 275°36.07	-1°11.15
Betelgeuse	270°50.29	7°24.65
Canopus	263°52.01	-52°42.77
Sirius Adhara	258°24.81 255°4.63	-16°45.36 -29°0.73
Procyon	244°49.02	5°9.19
Pollux	243°15.18	27°57.59
Avior Suhail	234°14.26 222°45.01	-59°36.14 -43°32.90
Miaplacidus	221°38.12	-43 32.90 -69°50.12
Alphard	217°45.92	-8°46.82
Regulus Dubhe	207°32.40 193°38.57	11°49.93 61°36.37
Denebola	193 38.57 182°22.85	14°25.08
Gienah	$175^{\circ}41.41$	-17°41.86
Acrux	172°57.47	-63°15.40
Gacrux Alioth	171°49.10 166°10.95	-57°16.33 55°48.78
Spica	158°20.00	-11°18.42
Alkaid	152°50.10	49°10.64
Hadar Menkent	148°32.62 147°54.95	-60°30.53 -36°30.48
Arcturus	147 54.95 145°45.84	19°2.33
Rigil Kent.	139°36.95	-60°57.10
Kochab	137°18.81 136°53.53	74°2.59 -16°9.46
Zuben'ubi Alphecca	130 53.53 126°1.73	-16 9.46 26°37.29
Antares	112°13.06	-26°29.59
Atria Sabik	107° 4.94 102° 0.20	-69°4.53 -15°45.54
Shaula	96°7.32	-15 45.54 -37°7.35
Rasalhague	95°56.41	12°32.34
Eltanin	90°40.78	51°28.96
Kaus Aust. Vega	83°29.58 80°31.54	-34°22.18 38°48.39
Nunki	75°45.06	-26°15.65
Altair	61°57.85	8°56.40
Peacock Deneb	53°2.40 49°24.25	-56°38.51 45°22.48
Enif	33°36.82	10°0.00
Al Na'ir	27°30.47	-46°49.41
Fomalhaut Scheat	15°12.45 13°43.36	-29°28.43 28°13.75
Markab	13°28.01	15°21.09
May 25 Tue	SHA	Mer.pass
Venus	$319^{\circ}41.01$	10:32
Mars	203°28.01	18:15
Jupiter Saturn	217°43.06 337°33.88	17:17 09:19
May 26 Wed Venus	SHA 318°29.58	Mer.pass 10:33
Mars	203°4.53	18:13
Jupiter Saturn	217°36.19 337°27.88	17:14 09:15
May 27 Thu Venus	SHA 317°17.89	Mer.pass 10:34
Mars	202°40.82	18:10
Jupiter	217°29.19	17:10
Saturn	337°21.91	09:12
Horizon	ital parallax	0.1
	Venus: Mars:	0.1

Stars

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.87	N20°52.18	305°34.41	12.4'	\$22°52.13	-7.8'	54.1'
1	195°46.81	52.63	$320^{\circ}5.82$	12.5'	22°44.35	-7.9'	54.1'
2	210°46.75	53.09	334°37.30 349°8.84	12.5'	22°36.47	-8.0'	54.1'
3 4	225°46.69 240°46.63	· · 53.54 53.99	349°8.84 3°40.45	12.6' 12.7'	22°28.49 22°20.42	-8.1' -8.2'	54.1' 54.1'
5	255°46.57	54.44	18°12.13	12.7	22°12.24	-8.3'	54.1'
6	270°46.51	N20°54.89	32°43.87	12.8'	S22°3.98	-8.4'	54.1'
7	285°46.45	55.35	47°15.68	12.9'	$21^{\circ}55.62$	-8.5'	54.1'
8	300°46.38	55.80	61°47.55	12.9'	21°47.17	-8.5'	54.1'
9 10	315°46.32 330°46.26	· · 56.25 56.69	76°19.49 90°51.49	13.0' 13.1'	21°38.62 21°29.98	-8.6' -8.7'	54.1' 54.1'
11	345°46.20	57.14	105°23.56	13.1	21°21.26	-8.8'	54.1'
12	0°46.14	N20°57.59	119°55.69	13.2'	S21°12.44	-8.9'	54.1'
13	15°46.07	58.04	134°27.88	13.3'	21°3.53	-9.0'	54.1'
14	30°46.01	58.48	149°0.14	13.3'	20°54.53	-9.1'	54.1'
15 16	45°45.95 60°45.89	· · 58.93 59.37	163°32.47 178°4.85	13.4' 13.4'	20°45.45 20°36.28	-9.2' -9.3'	54.1' 54.1'
17	75°45.82	20°59.82	192°37.30	13.5	20° 27.02	-9.3'	54.1'
18	90°45.76	N21°0.26	207°9.81	13.6'	\$20°17.68	-9.4'	54.1'
19	105°45.70	0.71	221°42.38	13.6'	20°8.25	-9.5'	54.1'
20	120°45.63	1.15	236°15.01	13.7'	19°58.74	-9.6'	54.1'
21 22	135°45.57 150°45.50	· · 1.59 2.03	250°47.71 265°20.47	13.8' 13.8'	19°49.15 19°39.47	-9.7' -9.8'	54.1' 54.1'
23	165°45.44	2.03	279°53.28	13.9	19 39.47 19°29.72	-9.8'	54.1'
-	SD = 15.8'	d = 0.5'			D = 14.8'		
	JD — 13.0	u = 0.5		اد	J — 14.0		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.37	N21°2.91	294°26.16	13.9'	\$19°19.88	-9.9'	54.1'
1 2	195°45.31 210°45.24	3.35 3.79	308°59.09 323°32.08	14.0' 14.1'	19°9.96 18°59.97	-10.0' -10.1'	54.1' 54.1'
3	225°45.18	• • 4.23	338°5.14	14.1	18°49.89	-10.1	54.1'
4	240°45.11	4.67	352°38.25	14.2'	18°39.74	-10.2'	54.1'
5	255°45.05	5.10	7°11.41	14.2'	18°29.51	-10.3'	54.1'
6	270°44.98	N21°5.54	21°44.64	14.3'	\$18°19.21	-10.4'	54.1'
7 8	285°44.91 300°44.85	5.98 6.41	36°17.91 50°51.25	14.3' 14.4'	18°8.83 17°58.38	-10.5' -10.5'	54.1' 54.1'
9	315°44.78	• • 6.84	65°24.64	14.4	17°47.85	-10.5'	54.1'
10	330°44.71	7.28	79°58.08	14.5'	17°37.25	-10.7'	54.2'
11	345°44.64	7.71	94°31.58	14.5'	17°26.58	-10.7'	54.2'
12	0°44.58	N21°8.14	109°5.13	14.6'	\$17°15.84	-10.8'	54.2'
13 14	15°44.51 30°44.44	8.58 9.01	123°38.73 138°12.38	14.7' 14.7'	17°5.02 16°54.14	-10.9' -11.0'	54.2' 54.2'
15	45°44.37	• • 9.44	150° 12.30° 152° 46.08	14.8'	16°43.19	-11.0'	54.2'
16	60°44.30	9.87	167°19.84	14.8'	16°32.17	-11.1'	54.2'
17	75°44.24	10.30	181°53.64	14.9'	16°21.08	-11.2'	54.2'
18	90°44.17	N21°10.73	196°27.49 211°1.39	14.9'	\$16°9.93	-11.2'	54.2' 54.2'
19 20	105°44.10 120°44.03	11.15 11.58	211 1.39 225°35.34	14.9' 15.0'	15°58.71 15°47.42	-11.3'	
21	135°43.96	• • 12.01	240°9.33	15.0'	15°36.07	-11.4'	54.2'
22	150°43.89	12.43	254°43.37	15.1'	15°24.65	-11.5'	54.2'
23	165°43.82	12.86	269°17.46	15.1'	15°13.18	-11.5'	54.2'
	SD = 15.8'	d = 0.4'		SI	O = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.75	N21°13.28	283°51.58	15.2'	\$15°1.64	-11.6'	54.3'
1	195°43.68	13.71	298°25.75	15.2'	14°50.03	-11.7'	54.3'
2	210°43.61	14.13	312°59.97	15.3'	14°38.37	-11.7'	54.3'
3 4	225°43.54 240°43.47	· · 14.56 14.98	327°34.22 342°8.52	15.3' 15.3'	14°26.65 14°14.86	-11.8' -11.8'	54.3' 54.3'
4 5	255°43.40	14.98 15.40	342 8.52 356°42.85	15.3 15.4'	14 14.80 14°3.02	-11.8 -11.9'	54.3'
6	270°43.33	N21°15.82	11°17.23	15.4	\$13°51.12	-12.0'	54.3'
7	285°43.25	16.24	25°51.64	15.4'	13°39.16	-12.0'	54.3'
8	300°43.18	16.66	40°26.09	15.5'	13°27.15	-12.1'	54.3'
9 10	315°43.11 330°43.04	· · 17.08 17.50	55°0.58 69°35.10	15.5' 15.6'	13°15.07 13°2.95	-12.1' -12.2'	54.3' 54.4'
11	345°42.97	17.50	84°9.66	15.6'	13° 2.95 12° 50.77	-12.2'	54.4'
12	0°42.89	N21°18.33	98°44.25	15.6'	S12°38.53	-12.3'	54.4'
13	15°42.82	18.75	113°18.87	15.7'	12°26.24	-12.3'	54.4'
14 15	30°42.75 45°42.67	19.17 •• 19.58	127°53.52 142°28.21	15.7' 15.7'	12°13.90 12°1.50	-12.4' -12.4'	54.4'
15 16	45°42.67 60°42.60	20.00	142°28.21 157°2.93	15.7' 15.7'	12°1.50 11°49.06	-12.4° -12.5'	54.4' 54.4'
17	75°42.53	20.41	171°37.67	15.8'	11°36.56	-12.5'	54.4'
18	90°42.45	N21°20.82	186°12.44	15.8'	S11°24.01	-12.6'	54.5'
19	105°42.38	21.24	200°47.24	15.8'	11°11.42	-12.6'	54.5'
20	120°42.30 135°42.23	21.65 •• 22.06	215°22.07 229°56.92	15.9' 15.9'	10°58.77 10°46.08	-12.7'	54.5' 54.5'
21 22	135°42.23 150°42.15	22.47	229°56.92 244°31.80	15.9' 15.9'	10°46.08 10°33.34	-12.7' -12.8'	54.5' 54.5'
23	165°42.08	22.88	259°6.70	15.9'	10° 33.54 10° 20.55	-12.8'	54.5'
	SD = 15.8'	d = 0.4'		SI	D = 14.8'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	82-65%	
25	03:07	03:05	11:57	03:45	16:08		
26	03:01	02:58	11:57	04:30	16:52		
27	02:55	02:52	11:57	05:14	17:34		

h	Aries	Vei		<i>)</i> M	ars	lui	oiter	Sat	ıırn		Stars	
												D
Fri 0	GHA 245° 18.91	GHA 201°24.85	Dec N15°19.12	GHA 87°35.81	Dec N10°48.24	GHA 102°40.97	Dec N15°44.93	GHA 222°34.91	Dec N07° 2.15		SHA	Dec
1	260°21.37	216°24.31	20.06	102° 37.27	47.78	102 40.97 117°43.13	44.83	237°37.12	2.24	Alpheratz	357°32.88	29°14.38
2	275° 23.84	231°23.77	20.99	117°38.74	47.33	132°45.30	44.73	252°39.34	2.33	Ankaa	353°5.46	-42°9.19
3	290°26.30	246°23.23	• • 21.92	132°40.20	• • 46.87	147°47.46	• • 44.63	267°41.56	• • 2.42	Schedar Diphda	349°29.08 348°45.54	56°41.06 -17°50.07
4	305°28.77	$261^{\circ}22.69$	22.85	$147^{\circ}41.66$	46.42	162°49.63	44.53	282°43.78	2.51	Achernar	335°19.21	-57°5.62
5	320°31.23	276°22.14	23.78	162°43.12	45.96	177°51.79	44.43	297°46.00	2.60	Hamal	327°49.27	23°35.43
6	335°33.69 350°36.16	291°21.60 306°21.06	N15°24.71	177° 44.58 192° 46.04	N10°45.51	192°53.95 207°56.12	N15°44.33	312°48.22 327°50.44	N07°2.69	Polaris	313°28.00	89°22.61
7 8	5°38.62	306 21.06 321°20.52	25.63 26.56	192 46.04 207° 47.50	45.05 44.59	207 50.12 222°58.28	44.23 44.13	342°52.66	2.78 2.86	Acamar	$315^{\circ}10.71$	-40°11.59
9	20°41.09	336° 19.97	27.49	222° 48.96	• • 44.14	238° 0.44	• • 44.03	357°54.88	• • 2.95	Menkar	314°4.41	4°11.80
10	35° 43.55	351°19.43	28.41	237°50.42	43.68	253°2.60	43.93	12°57.10	3.04	Mirfak	308°25.92	49°57.40
11	$50^{\circ}46.01$	6°18.89	29.34	252°51.88	43.22	268° 4.77	43.83	27°59.31	3.13	Aldebaran Rigel	290°37.72 281°2.32	16°33.80 -8°10.27
12	65° 48.48	21°18.34	N15°30.27	267°53.34	N10°42.77	283° 6.93	N15°43.73	43°1.53	$N07^{\circ}3.22$	Capella	280°19.47	46°1.49
13	80° 50.94	36°17.80	31.19	282°54.80	42.31	298° 9.09	43.62	58°3.75	3.31	Bellatrix	278°21.11	6°22.40
14 15	95°53.41 110°55.87	51°17.25 66°16.70	32.11 •• 33.04	297° 56.26 312° 57.72	41.85 •• 41.40	313°11.25 328°13.41	43.52 •• 43.42	73°5.97 88°8.19	3.40 •• 3.49	Elnath	277°59.76	28°37.78
16	125° 58.33	81° 16.16	33.96	327°59.17	40.94	343°15.57	43.32	103°10.41	3.57	Alnilam	275°36.07	-1°11.14
17	141°0.80	96° 15.61	34.88	343°0.63	40.48	358°17.73	43.22	118°12.63	3.66	Betelgeuse	270°50.29	7°24.66
18	156°3.26	111°15.06	N15°35.80	358°2.09	N10°40.02	13°19.90	N15°43.12	133°14.85	N07°3.75	Canopus Sirius	263°52.02 258°24.81	-52°42.76 -16°45.35
19	171°5.73	$126^{\circ}14.52$	36.72	13°3.54	39.57	28°22.06	43.02	148°17.07	3.84	Adhara	255°4.64	-10 45.35 -29°0.72
20	186°8.19	141°13.97	37.64	28°5.00	39.11	43°24.22	42.92	163°19.29	3.93	Procyon	244°49.03	5°9.19
21	201° 10.66	156° 13.42	• • 38.56	43°6.45	• • 38.65	58°26.38	• • 42.81	178°21.51	• • 4.02	Pollux	243°15.19	27°57.59
22 23	216° 13.12 231° 15.58	171° 12.87 186° 12.32	39.48 40.40	58°7.91 73°9.36	38.19 37.73	73°28.54 88°30.70	42.71 42.61	193°23.73 208°25.95	4.10 4.19	Avior	234°14.28	-59°36.13
		_		-		-	-			Suhail	222°45.03	-43°32.89
Mer.	pass. 07:37	ν -0.5' d0.	.9′ m-3.86	ν 1.5' d-0	0.5' m 0.71	$\nu 2.2' \ d-0$	$0.1' \; \text{m-}1.95$	ν 2.2′ d0.	1' m0.69	Miaplacidus	221°38.17	-69°50.12
										Alphard	217°45.94 207°32.41	-8°46.82 11°49.93
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	193°38.60	61°36.38
0	246° 18.05	201°11.77	N15°41.31	88° 10.82	N10°37.27	103°32.86	N15°42.51	223°28.17	N07°4.28	Denebola	182°22.86	14°25.09
1	261°20.51	216°11.22	42.23	103° 12.27	36.81	118°35.01	42.41	238°30.40	4.37	Gienah	175°41.42	-17°41.86
2	276°22.98	231°10.67	43.15	118° 13.73	36.35	133°37.17	42.31	253°32.62	4.46	Acrux	172°57.50	-63°15.41
3 4	291°25.44 306°27.90	246°10.12 261°9.56	•• 44.06 44.98	133° 15.18 148° 16.63	· · 35.89 35.43	148°39.33 163°41.49	· · 42.20 42.10	268°34.84 283°37.06	• • 4.54 4.63	Gacrux	171°49.12	-57°16.34
5	321°30.37	276° 9.01	45.89	163° 18.08	34.97	178°43.65	42.10	298°39.28	4.72	Alioth	166°10.96	55°48.79
6	336° 32.83	291°8.46	N15°46.80	178° 19.54	N10°34.51	193°45.81	N15°41.90	313°41.50	N07°4.81	Spica	158°20.00	-11°18.42 49°10.65
7	351°35.30	306°7.90	47.71	193°20.99	34.05	208°47.97	41.80	328°43.72	4.90	Alkaid Hadar	152°50.11 148°32.63	-60°30.54
8	6°37.76	321°7.35	48.63	208°22.44	33.59	223°50.12	41.69	343°45.94	4.98	Menkent	140° 52.05 147° 54.95	-36°30.48
9	21°40.22	336°6.80	• • 49.54	223°23.89	• • 33.13	238°52.28	• • 41.59	358°48.16	• • 5.07	Arcturus	145°45.84	19°2.34
10	36° 42.69	351°6.24	50.45	238°25.34	32.67	253°54.44	41.49	13°50.38	5.16	Rigil Kent.	139°36.96	-60°57.11
11 12	51° 45.15 66° 47.62	6°5.69 21°5.13	51.36 N15°52.27	253°26.79 268°28.24	32.21 N10°31.75	268° 56.60 283° 58.75	41.39 N15°41.28	28°52.61 43°54.83	5.25 N07°5.34	Kochab	137°18.83	74°2.61
13	81°50.08	36°4.57	53.18	283° 29.69	31.29	299° 0.91	41.18	58°57.05	5.42	Zuben'ubi	136°53.53	-16°9.46
14	96°52.54	51°4.02	54.08	298°31.14	30.83	314° 3.07	41.08	73°59.27	5.51	Alphecca	126°1.73	26°37.30
15	111°55.01	66°3.46	• • 54.99	313°32.59	• • 30.37	329° 5.22	• • 40.98	89°1.49	• • 5.60	Antares Atria	112°13.05 107°4.92	-26°29.60 -69°4.54
16	126° 57.47	81°2.90	55.90	328°34.04	29.90	344°7.38	40.87	104°3.71	5.69	Sabik	107 4.92 102°0.19	-15°45.54
17	141°59.94	96°2.34	56.80	343°35.49	29.44	359° 9.53	40.77	119°5.94	5.77	Shaula	96°7.30	-37°7.36
18 19	157°2.40 172°4.86	111°1.79 126°1.23	N15°57.71	358° 36.94	N10°28.98	14°11.69 29°13.84	N15°40.67	134°8.16 149°10.38	N07°5.86	Rasalhague	95°56.40	12°32.35
20	172 4.80 187°7.33	120 1.23 141°0.67	58.61 15°59.52	13°38.38 28°39.83	28.52 28.05	44°16.00	40.56 40.46	149 10.38 164°12.60	5.95 6.04	Eltanin	90°40.77	51°28.97
21	202°9.79	156°0.11	16° 0.42	43°41.28	27.59	59°18.15	40.36	179°14.82	. 6.12	Kaus Aust.	83°29.56	-34°22.18
22	$217^{\circ}12.26$	170°59.55	1.32	58°42.72	27.13	74°20.31	40.25	194°17.05	6.21	Vega Nunki	80°31.53 75°45.04	38°48.40 -26°15.65
23	$232^{\circ}14.72$	185°58.99	2.22	73°44.17	26.67	89°22.46	40.15	209°19.27	6.30	Altair	61°57.83	8°56.41
Mer	pass. 07:34	ν -0.6' d0	.9′ m-3.86	$\nu 1.5' d-0$).5' m0.72	$\nu^2 2' d-0$.1' m-1.94	$\nu 2.2' \ d0.$	1′ m0 69	Peacock	53°2.37	-56°38.51
										Deneb	49°24.23	45°22.49
c	CHA	CHA	Dee	CHA	Dee	GHA	Dee	CHA	Doo	Enif	33°36.80	10°0.00
Sun 0	GHA 247° 17.19	GHA 200°58.42	Dec N16°3.12	GHA 88° 45.62	Dec N10°26.20		Dec N15°40.05	GHA 224°21.49	Dec N07° 6.38	Al Na'ir	27°30.44	-46°49.40
1	262° 19.65	215°57.86	4.03	103° 47.06	25.74	119°26.77	39.94	239°23.71	6.47	Fomalhaut Scheat	15°12.42 13°43.34	-29°28.42 28°13.76
2	$277^{\circ}22.11$	230°57.30	4.92	118°48.51	25.28	134°28.93	39.84	254°25.94	6.56	Markab	13°27.99	15°21.10
3	292°24.58	245°56.74	• • 5.82	133°49.95	• • 24.81	149°31.08	• • 39.74	269°28.16	• • 6.65			
4	307°27.04	260°56.17	6.72	148°51.39	24.35	164°33.23	39.63	284°30.38	6.73	May 28 Fri	SHA 316° 5.94	Mer.pass 10:35
5 6	322°29.51 337°31.97	275°55.61 290°55.05	7.62 N16°8.52	163°52.84 178°54.28	23.88 N10°23.42	179°35.39 194°37.54	39.53 N15°39.42	299°32.61 314°34.83	6.82 N07°6.91	Venus Mars	202°16.90	18:08
7	352° 34.43	305° 54.48	9.41	176 54.26 193°55.73	22.95	209°39.69	39.32	314 34.63 329°37.05	6.99		202 10.90 217°22.06	17:07
8	7°36.90	320°53.92	10.31	208° 57.17	22.49	224°41.85	39.22	344°39.27	7.08	Saturn	337°16.00	09:08
9	22°39.36	$335^{\circ}53.35$	•• 11.20	223°58.61	• • 22.02	239°44.00	• • 39.11	359°41.50	• • 7.17	May 29 Sat	SHA	Mor nace
10	37°41.83	350° 52.78	12.10	239°0.05	21.56	254°46.15	39.01	14°43.72	7.25		314°53.72	Mer.pass 10:36
11	52° 44.29	5°52.22	12.99	254°1.50	21.09	269°48.30	38.90	29°45.95	7.34	Mars	201°52.77	18:06
12 13	67° 46.75 82° 49.22	20°51.65 35°51.08	N16°13.88 14.78	269°2.94 284°4.38	N10°20.63 20.16	284°50.45 299°52.61	N15°38.80 38.69	44°48.17 59°50.39	N07° 7.43 7.51	Jupiter	$217^{\circ}14.81$	17:03
14	97°51.68	50° 50.52	15.67	204 4.36 299°5.82	19.70	314°54.76	38.59	74°52.62	7.60	Saturn	337°10.13	09:05
15	112°54.15	65° 49.95	. 16.56	314°7.26	. 19.23	329°56.91	• • 38.49	89°54.84	. 7.69	May 30 Sun	SHA	Mer.pass
16	127°56.61	80°49.38	17.45	329°8.70	18.77	344°59.06	38.38	104°57.06	7.77	Venus	313°41.24	10:37
17	142°59.07	95°48.81	18.34	344°10.14	18.30	0°1.21	38.28	119°59.29	7.86	Mars	201°28.43	18:03
18	158°1.54		N16°19.23	359°11.58	N10°17.83	15°3.36	N15°38.17	135°1.51	N07°7.95	Jupiter	217°7.43	17:00
19 20	173°4.00 188°6.47	125°47.67 140°47.10	20.12 21.00	14°13.02 29°14.46	17.37 16.90	30° 5.51 45° 7.66	38.07 37.96	150°3.74 165°5.96	8.03 8.12	Saturn	337°4.31	09:01
21	203°8.93	155° 46.53	• • 21.89	44° 15.90	. 16.43	60° 9.81	•• 37.86	105 5.90 180°8.18	• 8.21	Horizoi	ntal parallax	·
22	218° 11.39	170°45.95	22.78	59° 17.33	15.96	75°11.96	37.75	195°10.41	8.29		Venus:	0.1
23	233°13.86	185°45.38	23.66	74°18.77	15.50	90°14.11	37.65	$210^{\circ}12.63$	8.38		Mars:	0.1
Mer	pass. 07:30	ν -0.6' d0	.9′ m-3.86	ν 1.4' d-0).5′ m0.74	$\nu 2.2' \ d-0$.1′ m-1.94	$\nu 2.2' \ d0.$	1′ m0.69			
	,											

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.00	N21°23.29	273°41.62	15.9'	S 10°7.72	-12.9'	54.6'
1	195°41.93	23.70	288°16.56	16.0'	09°54.84	-12.9'	54.6'
2	210°41.85 225°41.78	24.11	302°51.52 317°26.51	16.0'	09°41.92 09°28.95	-13.0' -13.0'	54.6'
3 4	225 41.78 240°41.70	· · 24.52 24.92	317 20.51 332°1.51	16.0' 16.0'	09 28.95 09°15.94	-13.0 -13.1'	54.6' 54.6'
5	255°41.63	25.33	346°36.52	16.0'	09°13.94	-13.1'	54.6'
6	270°41.55	N21°25.74	1°11.56	16.0'	S08°49.79	-13.1'	54.7'
7	285°41.47	26.14	15°46.61	16.1'	08°36.65	-13.2'	54.7'
8	300°41.40	26.54	30°21.67	16.1'	08°23.47	-13.2'	54.7'
9	315°41.32 330°41.24	• • 26.95	44°56.74 59°31.83	16.1'	08°10.25 07°56.99	-13.3'	54.7'
10 11	330 41.24 345°41.16	27.35 27.75	59 31.83 74°6.93	16.1' 16.1'	07 56.99 07°43.69	-13.3' -13.3'	54.7' 54.7'
12	0°41.09	N21°28.16	88°42.04	16.1	507°30.36	-13.4	54.8'
13	15°41.01	28.56	103°17.16	16.1'	07°16.98	-13.4'	54.8'
14	30°40.93	28.96	$117^{\circ}52.28$	16.1'	07°3.57	-13.4'	54.8'
15	45°40.85	• • 29.36	132°27.41	16.1'	06°50.13	-13.5'	54.8'
16	60°40.77 75°40.70	29.76	147°2.55	16.1'	06°36.64 06°23.13	-13.5'	54.8'
17 18	90°40.62	30.16 N21°30.55	161°37.69 176°12.83	16.1' 16.1'	506°9.58	-13.6' -13.6'	54.9' 54.9'
19	105°40.54	30.95	190°47.98	16.1	05°55.99	-13.6'	54.9'
20	120°40.46	31.35	205°23.13	16.1'	05°42.37	-13.7'	54.9'
21	135°40.38	• • 31.74	219°58.27	16.1'	$05^{\circ}28.72$	-13.7'	54.9'
22	150°40.30	32.14	234°33.42	16.1'	05°15.04	-13.7'	55.0'
23	165°40.22	32.53	249°8.56	16.1'	05°1.33	-13.7'	55.0'
	SD = 15.8'	d = 0.4'		SI	D = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
Sat 0	GHA 180°40.14	Dec N21°32.93	263°43.70	u 16.1'	Dec \$04°47.58	-13.8'	HP 55.0'
1	195°40.06	33.32	278°18.84	16.1	04°33.81	-13.8'	55.0'
2	210°39.98	33.71	292°53.97	16.1'	$04^{\circ}20.01$	-13.8'	55.1'
3	225°39.90	• • 34.11	307°29.09	16.1'	04°6.18	-13.9'	55.1'
4	240°39.82	34.50	322°4.21	16.1'	03°52.32	-13.9'	55.1'
5 6	255°39.73 270°39.65	34.89 N21°35.28	336°39.31 351°14.41	16.1' 16.1'	03°38.43 \$03°24.52	-13.9' -13.9'	55.1' 55.2'
7	285°39.57	35.67	5°49.49	16.1	03°10.59	-13.9 -14.0'	55.2'
8	300°39.49	36.06	20°24.57	16.1'	02°56.63	-14.0'	55.2'
9	315°39.41	• • 36.45	34°59.62	16.0'	02°42.64	-14.0'	55.2'
10	330°39.33	36.83	49°34.67	16.0'	02°28.63	-14.0'	55.3'
11	345°39.24	37.22	64°9.69	16.0'	02°14.60	-14.1'	55.3'
12 13	0°39.16 15°39.08	N21°37.61 37.99	78°44.70 93°19.69	16.0' 16.0'	\$02°0.55 01°46.48	-14.1' -14.1'	55.3' 55.3'
14	30°39.00	38.38	93 19.09 107°54.66	15.9'	01°40.46	-14.1'	55.4'
15	45°38.91	• • 38.76	122°29.61	15.9'	01°18.27	-14.1'	55.4'
16	60°38.83	39.15	137°4.54	15.9'	01°4.13	-14.2'	55.4'
17	75°38.75	39.53	151°39.44	15.9'	00°49.98	-14.2'	55.4'
18	90°38.66	N21°39.91	166°14.32	15.9'	S00°35.81	-14.2'	55.5'
19	105°38.58 120°38.49	40.29	180°49.17 195°24.00	15.8'	00°21.63 \$00°7.42	-14.2' -14.2'	55.5'
20 21	120°38.49 135°38.41	40.67 •• 41.05	195°24.00 209°58.79	15.8' 15.8'	N00° 6.79	-14.2' 14.2'	55.5' 55.5'
22	150°38.33	41.43	224°33.56	15.7'	00°21.02	14.2'	55.6'
23	165°38.24	41.81	239°8.30	15.7'	00°35.27	14.3'	55.6'
	SD = 15.8'	d = 0.4'		SI	D = 15.0'		
_							
Sun	GHA	Dec	GHA	ν 15.7'	Dec	d	HP
0 1	180°38.16 195°38.07	N21°42.19 42.57	253°43.00 268°17.67	15.7' 15.6'	N00°49.53 01°3.80	14.3' 14.3'	55.6' 55.7'
2	210°37.99	42.95	282°52.31	15.6'	01°18.08	14.3'	55.7'
3	225°37.90	• • 43.32	297°26.91	15.6'	01°32.37	14.3'	55.7'
4	240°37.81	43.70	312°1.47	15.5'	01°46.67	14.3'	55.8'
5	255°37.73	44.07	326°36.00	15.5'	02°0.98	14.3'	55.8'
6 7	270°37.64 285°37.56	N21°44.45 44.82	341°10.49 355°44.93	15.4' 15.4'	N02°15.30 02°29.62	14.3' 14.3'	55.8' 55.8'
8	285 37.50 300°37.47	44.82 45.20	10°19.33	15.4' 15.4'	02 29.62 02°43.95	14.3	55.8'
9	315°37.38	· · 45.57	24°53.69	15.4	02° 58.29	14.3'	55.9'
10	330°37.30	45.94	39°28.01	15.3'	03°12.63	14.3'	55.9'
11	345°37.21	46.31	54°2.28	15.2'	03°26.98	14.3'	56.0'
12	0°37.12	N21°46.68	68°36.50	15.2'	N03°41.32	14.3'	56.0'
13 14	15°37.03 30°36.95	47.05 47.42	83°10.67 97°44.79	15.1' 15.1'	03°55.67 04°10.02	14.4' 14.4'	56.0'
14 15	30°36.95 45°36.86	47.42 · · 47.79	97°44.79 112°18.87	15.1° 15.0'	04°10.02 04°24.37	14.4	56.1' 56.1'
16	60°36.77	48.16	126°52.89	15.0'	04°24.37 04°38.72	14.3'	56.1'
17	75°36.68	48.52	141°26.85	14.9'	04°53.07	14.3'	56.2'
18	90°36.59	N21°48.89	156°0.76	14.9'	N05°7.41	14.3'	56.2'
19	105°36.50	49.26	170°34.62	14.8'	05°21.76	14.3'	56.2'
20	120°36.42	49.62	185°8.42	14.7'	05°36.09	14.3'	56.3'
21 22	135°36.33 150°36.24	· · 49.99 50.35	199°42.15 214°15.83	14.7' 14.6'	05°50.42 06°4.74	14.3' 14.3'	56.3' 56.3'
23	165°36.15	50.33	214 15.65 228°49.45	14.6'	06°19.06	14.3'	56.4
	SD = 15.8'	d = 0.4'			D = 15.2'		
	<u> </u>	u — 0.4		ال	_ 13.2		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	56-36%
28	02:48	02:44	11:57	05:55	18:16	
29	02:41	02:37	11:57	06:36	18:57	
30	02:33	02:28	11:58	07:18	19:39	

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	248° 16.32	200°44.81 N16°24.55	89°20.21 N10°15.03	105°16.26 N15°37.54	225°14.86 N07°8.46
1	263° 18.79	215°44.24 25.43	104°21.65 14.56	120°18.41 37.43	240°17.08 8.55
2	278° 21.25	230°43.66 26.31	119°23.08 14.09	135°20.56 37.33	255°19.31 8.64
3	293°23.72	245°43.09 · · 27.20	134°24.52 · · 13.63	150°22.71 · · 37.22	270°21.53 · · 8.72
4	308° 26.18	260°42.51 28.08	149°25.95 13.16	165°24.85 37.12	285°23.76 8.81
5	323°28.64	275°41.94 28.96	164°27.39 12.69	180°27.00 37.01	300°25.98 8.89
6	338°31.11	290°41.36 N16°29.84	179°28.83 N10°12.22	195°29.15 N15°36.91	315°28.21 N07°8.98
7	353°33.57	305°40.79 30.72	194°30.26 11.75	210°31.30 36.80	330°30.43 9.07
8	8°36.04	320°40.21 31.60	209°31.69 11.28	225°33.45 36.70	345°32.66 9.15
9	23°38.50	335°39.63 · · 32.48	224°33.13 · · 10.81	240°35.59 · · 36.59	0°34.88 · · 9.24
10	38°40.96	350°39.06 33.35	239°34.56 10.34	255°37.74 36.48	15°37.11 9.32
11	53°43.43	5°38.48 34.23	254°36.00 9.87	270°39.89 36.38	30°39.33 9.41
12	68°45.89	20°37.90 N16°35.11	269°37.43 N10°9.40	285°42.04 N15°36.27	45°41.56 N07°9.50
13	83°48.36	35°37.32 35.98	284°38.86 8.93	300°44.18 36.16	60°43.79 9.58
14	98°50.82	50°36.74 36.86	299°40.29 8.46	315°46.33 36.06	75°46.01 9.67
15	113°53.28	65°36.16 · · 37.73	314°41.73 · · 7.99	330°48.47 · · 35.95	90°48.24 · · 9.75
16	128°55.75	80°35.58 38.60	329°43.16 7.52	345°50.62 35.85	105°50.46 9.84
17	143°58.21	95°35.00 39.48	344°44.59 7.05	0°52.77 35.74	120°52.69 9.92
18	159°0.68	110°34.42 N16°40.35	359°46.02 N10°6.58	15°54.91 N15°35.63	135°54.92 N07°10.01
19	174°3.14	125°33.84 41.22	14°47.45 6.11	30°57.06 35.53	150°57.14 10.09
20	189°5.60	140°33.25 42.09	29°48.88 5.64	45°59.20 35.42	165°59.37 10.18
21	204°8.07	155°32.67 · · 42.96	44°50.31 · · 5.17	61°1.35 · · 35.31	181°1.59 · · 10.26
22	219° 10.53	170°32.09 43.83	59°51.74 4.70	76° 3.49 35.20	196°3.82 10.35
23	234° 13.00	185°31.51 44.70	74°53.17 4.23	91°5.64 35.10	211°6.05 10.43
Mer.	pass. 07:26	ν-0.6' d0.9' m-3.86	ν1.4' d-0.5' m0.75	ν2.1' d-0.1' m-1.93	ν2.2' d0.1' m0.68
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	249° 15.46	200°30.92 N16°45.56	89°54.60 N10°3.75	106°7.78 N15°34.99	226°8.27 N07°10.52
1	264° 17.92	215°30.34 46.43	104°56.03 3.28	121°9.92 34.88	241°10.50 10.60
2	279°20.39	230°29.75 47.30	119° 57.46 2.81	136°12.07 34.78	256°12.73 10.69
3	294°22.85	245°29.17 · · 48.16	134°58.89 · · 2.34	151°14.21 · · 34.67	271°14.95 · · 10.77
4	309°25.32	260°28.58 49.03	150°0.31 1.87	166°16.36 34.56	286°17.18 10.86
5	324°27.78	275°27.99 49.89	165°1.74 1.39	181°18.50 34.45	301°19.41 10.94
6	339° 30.25	290°27.41 N16°50.76	180°3.17 N10°0.92	196°20.64 N15°34.35	316°21.64 N07°11.03
7	354° 32.71	305°26.82 51.62	195°4.59 0.45	211°22.79 34.24	331°23.86 11.11
8	9°35.17	320°26.23 52.48	210°6.02 09°59.97	226°24.93 34.13	346°26.09 11.20
9	24° 37.64	335°25.64 · · 53.34	225°7.45 09°59.50	241°27.07 · · 34.02	1°28.32 · · 11.28
10	39°40.10	350°25.05 54.20	240°8.87 59.03	256°29.21 33.92	16°30.55 11.37
11	54° 42.57	5°24.46 55.06	255°10.30 58.55	271°31.35 33.81	31°32.77 11.45
12	69°45.03	20°23.87 N16°55.92	270°11.72 N09°58.08	286°33.50 N15°33.70	46°35.00 N07°11.54
13	84°47.49	35°23.28 56.78	285°13.15 57.60	301°35.64 33.59	61°37.23 11.62
14	99°49.96	50°22.69 57.64	300°14.57 57.13	316°37.78 33.48	76°39.46 11.71
15	114°52.42	65°22.10 · · 58.49	315°16.00 · · 56.66	331°39.92 · · 33.38	91°41.69 · · 11.79
16	129°54.89	80°21.51 16°59.35	330°17.42 56.18	346°42.06 33.27	106°43.91 11.88
17	144°57.35	95°20.92 17°0.20	345°18.84 55.71	1°44.20 33.16	121°46.14 11.96
18	159° 59.81	110°20.32 N17°1.06	0°20.27 N09°55.23	16°46.34 N15°33.05	136°48.37 N07°12.04
19	175°2.28	125°19.73 1.91	15°21.69 54.76	31°48.48 32.94	151°50.60 12.13
20	190°4.74	140°19.14 2.76	30°23.11 54.28	46°50.62 32.83	166°52.83 12.21
21	205°7.21	155°18.54 · · 3.62	45°24.53 · · 53.81	61°52.76 · · 32.72	181°55.06 · · 12.30
22	220°9.67	170°17.95 4.47	60°25.95 53.33	76°54.90 32.62	196°57.28 12.38
23	235° 12.14	185°17.35 5.32	75°27.38 52.85	91°57.04 32.51	211°59.51 12.47
Mer.p	pass. 07:22	ν-0.6' d0.9' m-3.87	ν1.4' d-0.5' m0.76	ν2.1′ d-0.1′ m-1.93	ν2.2′ d0.1′ m0.68
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	250° 14.60	200°16.76 N17°6.17	90°28.80 N09°52.38	106°59.18 N15°32.40	227°1.74 N07°12.55
1	265° 17.06	215° 16.16 7.02	105°30.22 51.90	122° 1.32 32.29	242°3.97 12.63
2	280° 19.53	230° 15.56 7.87	120°31.64 51.43	137° 3.46 32.18	257° 6.20 12.72
3	295°21.99	245°14.97 · · 8.72	135°33.06 · · 50.95	152° 5.60 · · 32.07	272°8.43 · · 12.80
4	310°24.46	260° 14.37 9.56	150° 34.48 50.47	167° 7.74 31.96	287°10.66 12.89
5	325°26.92	275° 13.77 10.41	165°35.90 49.99	182° 9.88 31.85	302°12.89 12.97
6	340°29.38	290°13.17 N17°11.26	180°37.31 N09°49.52	197°12.02 N15°31.74	317°15.12 N07°13.05
7	355° 31.85	305° 12.57 12.10	195°38.73 49.04	212°14.15 31.63	332°17.35 13.14
8	10°34.31	320°11.97 12.94	210° 40.15 48.56	227°16.29 31.52	347°19.58 13.22
9	25°36.78	335°11.37 · · 13.79	225°41.57 · · 48.09	242°18.43 · · 31.42	2°21.81 · · 13.31
10	40°39.24	350° 10.77 14.63	240°42.99 47.61	257°20.57 31.31	17°24.03 13.39
11	55°41.70	5° 10.17 15.47	255°44.40 47.13	272°22.70 31.20	32°26.26 13.47
12	70°44.17	20°9.57 N17°16.31	270°45.82 N09°46.65	287°24.84 N15°31.09	47°28.49 N07°13.56
13	85°46.63	35°8.97 17.15	285° 47.24 46.17	302°26.98 30.98	62°30.72 13.64
14	100°49.10	50°8.37 17.99	300°48.65 45.69	317°29.11 30.87	77°32.95 13.72 L
15	115°51.56	65°7.76 · · 18.83	315°50.07 · · 45.22	332°31.25 · · 30.76	92°35.18 · · 13.81
16	130°54.03	80°7.16 19.67	330°51.49 44.74	347°33.39 30.65	107°37.42 13.89
17	145°56.49	95°6.56 20.51	345°52.90 44.26	2°35.52 30.54	122°39.65 13.97
18	160°58.95	110°5.95 N17°21.35	0°54.32 N09°43.78	17°37.66 N15°30.43	137°41.88 N07°14.06
19	176°1.42	125°5.35 22.18	15°55.73 43.30	32°39.79 30.32	152°44.11 14.14
20	191°3.88	140°4.74 23.02	30°57.14 42.82	47°41.93 30.21	167°46.34 14.22
21	206°6.35	155°4.14 · · 23.85	45°58.56 · · 42.34	62°44.06 · · 30.10	182°48.57 · · 14.31
22	221°8.81	170°3.53 24.68	60°59.97 41.86	77°46.20 29.98	197°50.80 14.39
23	236° 11.27	185°2.92 25.52	76°1.38 41.38	92°48.33 29.87	212°53.03 14.47
Merr	pass. 07:18	ν-0.6' d0.8' m-3.87	ν1.4' d-0.5' m0.77	ν2.1' d-0.1' m-1.92	ν2.2' d0.1' m0.68
14161.	Juss. 01.10	ν σ.σ ασ.σ III-3.σ7	ν 1. τ U-U.J IIIU.Π	ν Δ.1 U-U.1 III-1.32	ν Δ.Σ αυ.1 IIIU.00

Alpheratz		
	357°32.86	29°14.38
Ankaa	353°5.44	-42°9.18
Schedar	349°29.05	56°41.05
Diphda	348°45.52	-17°50.06
Achernar	335°19.19	-57°5.61
Hamal	327°49.25	23°35.43
Polaris	$313^{\circ}27.31$	89°22.60
Acamar	$315^{\circ}10.70$	$-40^{\circ}11.58$
Menkar	314°4.40	$4^{\circ}11.80$
Mirfak	308°25.90	49°57.39
Aldebaran	290°37.72	$16^{\circ}33.80$
Rigel	281°2.32	-8°10.26
Capella	$280^{\circ}19.47$	46°1.48
Bellatrix	278°21.11	$6^{\circ}22.41$
Elnath	277°59.77	28° 37.78
Alnilam	275°36.07	$-1^{\circ}11.13$
Betelgeuse	270°50.29	7°24.66
Canopus	263°52.03	-52°42.74
Sirius	258°24.82	-16°45.34
Adhara	255°4.65	-29°0.71
Procyon	244°49.04	5°9.19
Pollux	243°15.20	27°57.59
Avior	234°14.31	-59°36.12
Suhail	222°45.05	-43°32.89
Miaplacidus	222 45.05 221°38.21	-43 32.89 -69°50.11
Alphard	221 38.21 217°45.95	-8°46.81
Regulus	217 45.95 207°32.43	-8 40.81 11°49.94
Dubhe	207 32.43 193°38.63	61°36.38
	193 38.03 182°22.87	14°25.09
Denebola	182°22.87 175°41.43	14°25.09 -17°41.86
Gienah		
Acrux	172°57.52 171°49.14	-63° 15.42
Gacrux		-57°16.34 55°48.80
Alioth	166°10.98	00 .0.00
Spica	158°20.01	-11°18.41
Alkaid	152°50.13	49° 10.67
Hadar	148°32.64	-60° 30.55
Menkent	147°54.96	-36° 30.49
Arcturus	145°45.85	19°2.35
Rigil Kent.	139°36.97	-60°57.12
Kochab	137°18.86	74°2.62
Zuben'ubi	136°53.53	-16°9.46
Alphecca	$126^{\circ}1.73$	$26^{\circ}37.31$
Antares	112°13.05	-26°29.60
Atria	107°4.91	-69°4.55
Sabik	102°0.19	-15°45.54
Shaula	96°7.29	-37°7.36
Rasalhague	95°56.40	$12^{\circ}32.36$
Eltanin	90°40.76	$51^{\circ}28.99$
Kaus Aust.	83°29.55	-34°22.18
Vega	80°31.51	38°48.42
Nunki	75°45.02	-26° 15.65
	61°57.81	
Altair		8°56.42
Altair Peacock	53°2.34	8°56.42 -56°38.51
Peacock	53°2.34	$-56^{\circ}38.51$
Peacock Deneb	53°2.34 49°24.20	-56°38.51 45°22.50
Peacock Deneb Enif	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40	-56°38.51 45°22.50 10°0.01
Peacock Deneb Enif Al Na'ir	53°2.34 49°24.20 33°36.78 27°30.42	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77
Peacock Deneb Enif Al Na'ir Fomalhaut	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97	-56°38.51 45°22.50 10°0.01 -46°49.40 -29°28.41 28°13.77 15°21.11 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49	-56°38.51 45°22.50 10°0.01 -46°49.40 -29°28.41 28°13.77 15°21.11 Mer.pass 10:37
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Mars	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Jupiter	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 16:56 08:58 Mer.pass 10:38 17:59 16:53
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Mars	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 216°52.32 336°52.81 SHA 310°2.16 200°14.20 216°44.58	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass 10:39 17:56 16:50
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Mars	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn Jun 05 Wed Venus Saturn Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20 216°44.58 336°47.14	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass 10:39 17:56 16:50
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn Jun 05 Wed Venus Saturn Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20 216°44.58 336°47.14	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass 10:39 17:56 16:50 08:51
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn Jun 05 Wed Venus Saturn Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20 216°44.58 336°47.14 atal parallax Venus:	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass 10:38 17:59 16:53 08:54
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 31 Mon Venus Mars Jupiter Saturn Jun 01 Tue Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn Jun 02 Wed Venus Mars Jupiter Saturn	53°2.34 49°24.20 33°36.78 27°30.42 15°12.40 13°43.32 13°27.97 SHA 312°28.49 201°3.89 216°59.94 336°58.54 SHA 311°15.46 200°39.14 216°52.32 336°52.81 SHA 310°2.16 200°14.20 216°44.58 336°47.14	-56° 38.51 45° 22.50 10° 0.01 -46° 49.40 -29° 28.41 28° 13.77 15° 21.11 Mer.pass 10:37 18:01 16:56 08:58 Mer.pass 10:38 17:59 16:53 08:54 Mer.pass 10:39 17:56 16:50 08:51

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.06	N21°51.08	243°23.00	14.5'	N06°33.37	14.3'	56.4
1	195°35.97	51.44	257°56.49	14.4	06° 47.66	14.3'	56.4
2	210°35.88	51.80	272°29.92	14.4	07°1.95	14.3'	56.5'
3	225°35.79	52.16	287°3.27	14.3'	07° 16.22	14.3'	56.5'
4	240°35.70	52.52	301°36.56	14.2'	07°30.48	14.2'	56.5'
5	255°35.61	52.88	316°9.78	14.1'	07°44.73	14.2'	56.6'
6	270°35.52	N21°53.24	330°42.93	14.1'	N07°58.96	14.2'	56.6'
7	285°35.43	53.60	$345^{\circ}16.01$	14.0'	08°13.18	14.2'	56.6'
8	300°35.34	53.96	359°49.02	13.9'	08°27.38	14.2'	56.7'
9	315°35.24	• • 54.31	14°21.95	13.9'	08°41.55	14.2'	56.7'
10	330°35.15	54.67	28°54.80	13.8'	08°55.71	14.1'	56.7'
11	345°35.06	55.02	43°27.58	13.7'	09°9.85	14.1'	56.8'
12	0°34.97	N21°55.38	58°0.28	13.6'	N09°23.97	14.1'	56.8'
13	15°34.88	55.73	72°32.90	13.5'	09°38.06	14.1'	56.8'
14	30°34.79	56.09	87°5.43	13.5'	09°52.13	14.0'	56.9'
15	45°34.69	56.44	101°37.89	13.4'	10°6.17 10°20.19	14.0'	56.9'
16	60°34.60 75°34.51	56.79 57.14	116° 10.26 130° 42.55	13.3' 13.2'	10° 20.19 10° 34.18	14.0'	56.9'
17 18	75 34.51 90°34.41	57.14 N21°57.49	130 42.55 145°14.75	13.1'	N10°48.13	14.0' 13.9'	57.0' 57.0'
19	105°34.32	57.84	159° 46.86	13.1	11°2.06	13.9	57.0'
20	105 34.32 120°34.23	57.84 58.19	159 46.86 174°18.89	13.0	11 2.06 11°15.95	13.9	57.0 57.1'
21	135°34.13	58.54	174 10.09 188° 50.82	12.9	11 15.95 11°29.82	13.8'	57.1'
22	150°34.04	58.89	203°22.67	12.8'	11°43.64	13.8'	57.1
23	165°33.95	59.24	217°54.42	12.7'	11°57.43	13.8'	57.2'
_5						_0.0	
	SD = 15.8'	d = 0.4'		SE	0 = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 0	180°33.85	N21°59.58	232°26.08	ν 12.6'	N12°11.19	13.7'	57.2'
1	195°33.76	21°59.93	246° 57.64	12.5'	12°24.90	13.7	57.2°
2	210°33.66	22°0.28	261°29.11	12.4'	12°38.57	13.6'	57.3'
3	225°33.57	. 0.62	276°0.48	12.3'	12°52.20	13.6'	57.3'
4	240°33.48	0.96	290°31.75	12.2'	13°5.79	13.5'	57.4
5	255°33.38	1.31	305°2.93	12.1'	13° 19.34	13.5'	57.4'
6	270°33.28	N22°1.65	319°34.00	12.0'	N13°32.84	13.5'	57.4'
7	285°33.19	1.99	334°4.97	11.9'	13°46.29	13.4'	57.5'
8	300°33.09	2.33	348° 35.83	11.8'	13°59.69	13.4'	57.5'
9	315°33.00	• • 2.67	3°6.60	11.7'	14° 13.04	13.3'	57.6'
10	330°32.90	3.01	17° 37.25	11.6'	14°26.34	13.2'	57.6'
11	345°32.81	3.35	32°7.81	11.4'	14°39.58	13.2'	57.6'
12	0°32.71	N22°3.69	46°38.25	11.3'	N14°52.77	13.1'	57.7'
13	15°32.61	4.03	61°8.58	11.2'	15°5.90	13.1'	57.7'
14	30°32.52	4.37	75°38.81 90°8.92	11.1'	15° 18.98	13.0'	57.7'
15	45°32.42 60°32.32	• • 4.71	90°8.92 104°38.93	11.0'	15°31.99 15°44.95	13.0' 12.9'	57.8'
16 17	75°32.23	5.04 5.38	104 38.93 119°8.82	10.9' 10.8'	15 44.95 15°57.83	12.9	57.8' 57.8'
18	90°32.13	N22°5.71	133°38.59	10.7	N16° 10.66	12.8'	57.9
19	105°32.03	6.05	148°8.25	10.7	16°23.42	12.7'	57.9'
20	120°31.93	6.38	162°37.80	10.4	16°36.11	12.6'	58.0'
21	135°31.84	. 6.71	177°7.23	10.3'	16°48.73	12.5'	58.0'
22	150°31.74	7.04	191°36.54	10.2'	17°1.27	12.5'	58.0'
23	165°31.64	7.38	206°5.74	10.1'	17° 13.75	12.4'	58.1'
	SD = 15.8'	d = 0.3'		SI	0 = 15.6'		
	<u> </u>	<u>u = 0.5</u>			7 — 13.0		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°31.54	N22°7.71	220°34.81	10.0'	$N17^{\circ}26.15$	12.3'	58.1'
1	195°31.44	8.04	235°3.77	9.8'	17°38.47	12.2'	58.1'
2	210°31.34	8.37	249°32.60	9.7'	17°50.71	12.2'	58.2'
3	225°31.25	• • 8.69	264°1.31	9.6'	18°2.88	12.1'	58.2'
4	240°31.15	9.02	278° 29.91	9.5'	18° 14.96	12.0'	58.2'
5	255°31.05	9.35	292°58.37	9.3'	18° 26.95	11.9'	58.3'
6	270°30.95	N22°9.68	307°26.72	9.2'	N18°38.86	11.8'	58.3'
7	285°30.85 300°30.75	10.00	321°54.94 336°23.03	9.1' 9.0'	18°50.69 19°2.42	11.7'	58.4'
8 9	300°30.75 315°30.65	10.33 •• 10.65	336°23.03 350°51.01	9.0° 8.8'	19°2.42 19°14.06	11.6' 11.5'	58.4' 58.4'
10	330°30.55	10.98	5° 18.85	8.7'	19 14.06 19°25.61	11.5	58.5'
11	345°30.45	11.30	19° 46.57	8.6'	19°25.01 19°37.06	11.5	58.5'
12	0°30.35	N22°11.62	34°14.16	8.5'	N19°48.41	11.3	58.5
13	15°30.25	11.94	48° 41.63	8.3'	19°59.67	11.2'	58.6'
14	30°30.15	12.27	63°8.96	8.2'	20° 10.82	11.1'	58.6'
15	45°30.05	• • 12.59	77°36.17	8.1'	20°21.88	10.9'	58.6'
16	60°29.94	12.91	92°3.26	8.0'	20°32.82	10.8'	58.7'
17	75°29.84	13.23	106° 30.21	7.8'	20°43.66	10.7'	58.7'
18	90°29.74	N22°13.54	120°57.03	7.7'	N20°54.39	10.6'	58.7'
19	105°29.64	13.86	135°23.73	7.6'	$21^{\circ}5.01$	10.5'	58.8'
20	120°29.54	14.18	149°50.30	7.4'	$21^{\circ}15.52$	10.4'	58.8'
21	135°29.44	•• 14.50	164° 16.74	7.3'	21°25.91	10.3'	58.8'
22	150°29.33	14.81	178° 43.05	7.2'	21°36.19	10.2'	58.9'
23	165°29.23	15.13	193°9.23	7.1'	21°46.34	10.0'	58.9'
	SD = 15.8'	d = 0.3'	<u>-</u>	SE	0 = 15.8'		

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

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

Sun

12^h

mm:ss

02:20

02:11

02:01

Mer.

Pass

hh:mm

11:58

11:58

11:58

Eqn.of Time 12^h

mm:ss

02:24

02:15

02:06

Day

Moon

Lower

hh:mm

20:23

21:12 22:05 Age 25-27

27-11%

Mer.Pass.

Upper

hh:mm

08:01

08:47

09:38

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	251° 13.74	200°2.32 N17°26.35	91°2.80 N09°40.90	107°50.47 N15°29.76	227°55.26 N07°14.56	
1	266° 16.20	215°1.71 27.18	106°4.21 40.42	122°52.60 29.65	242°57.49 14.64	Alpheratz 357°32.84 29°14.39
2	281°18.67	230°1.10 28.01	121°5.62 39.94	137°54.74 29.54	257°59.72 14.72	Ankaa 353°5.41 -42°9.16
3	$296^{\circ}21.13$	245°0.49 · · 28.84	136°7.03 · · 39.46	152°56.87 · · 29.43	273°1.95 · · 14.80	Schedar 349°29.01 56°41.05 Diphda 348°45.50 -17°50.05
4	$311^{\circ}23.60$	259°59.88 29.67	151°8.45 38.98	167°59.01 29.32	288°4.19 14.89	Achernar 335°19.17 -57°5.59
5	326°26.06	274°59.27 30.50	166°9.86 38.50	183°1.14 29.21	303°6.42 14.97	Hamal 327°49.23 23°35.44
6	341°28.52	289°58.66 N17°31.33	181°11.27 N09°38.02	198°3.27 N15°29.10	318°8.65 N07°15.05	Polaris 313°26.25 89°22.58
7	356° 30.99	304°58.05 32.15	196°12.68 37.53	213° 5.41 28.99	333°10.88 15.14	Acamar 315°10.68 -40°11.56
8	11°33.45	319°57.44 32.98	211°14.09 37.05	228°7.54 28.88	348°13.11 15.22	Menkar 314°4.38 4°11.81
9 10	26°35.92 41°38.38	334°56.83 · · 33.80 349°56.22 34.63	226°15.50 · · 36.57 241°16.91 36.09	243° 9.67 · · 28.76 258° 11.80 28.65	3°15.34 · · 15.30 18°17.58 15.38	Mirfak 308°25.88 49°57.38
11	41 30.30 56° 40.84	4°55.61 35.45	241°16.91 36.09 256°18.32 35.61	258°11.80 28.65 273°13.94 28.54	18°17.58 15.38 33°19.81 15.47	Aldebaran 290°37.71 16°33.80
12	71° 43.31	19°54.99 N17°36.28	271°19.73 N09°35.12	288°16.07 N15°28.43	48°22.04 N07°15.55	Rigel 281°2.32 -8°10.25
13	86° 45.77	34°54.38 37.10	286°21.14 34.64	303°18.20 28.32	63°24.27 15.63	Capella 280°19.46 46°1.47
14	101°48.24	49°53.77 37.92	301°22.54 34.16	318°20.33 28.21	78°26.51 15.71	Bellatrix 278°21.11 6°22.41
15	$116^{\circ}50.70$	64°53.15 · · 38.74	316°23.95 · · 33.68	333°22.46 · · 28.10	93°28.74 · · 15.80	Elnath 277°59.76 28°37.77 Alnilam 275°36.07 -1°11.13
16	131°53.17	79°52.54 39.56	331°25.36 33.19	348°24.60 27.98	108°30.97 15.88	Betelgeuse 270°50.29 7°24.66
17	146°55.63	94°51.92 40.38	346°26.77 32.71	3°26.73 27.87	123°33.20 15.96	Canopus 263°52.04 -52°42.73
18	161°58.09	109°51.31 N17°41.20	1°28.17 N09°32.23	18°28.86 N15°27.76	138°35.44 N07°16.04	Sirius 258°24.82 -16°45.34
19	177°0.56	124°50.69 42.02	16°29.58 31.74	33°30.99 27.65	153°37.67 16.13	Adhara 255°4.65 -29°0.70
20	192°3.02	139°50.07 42.83	31°30.99 31.26	48°33.12 27.54	168°39.90 16.21	Procyon 244°49.04 5°9.20
21	207°5.49	154°49.46 · · 43.65	46°32.39 · · 30.78	63°35.25 · · 27.42	183°42.13 · · 16.29	Pollux 243°15.20 27°57.59
22 23	222°7.95 237°10.42	169°48.84 44.46 184°48.22 45.28	61°33.80 30.29 76°35.20 29.81	78°37.38 27.31 93°39.51 27.20	198°44.37 16.37 213°46.60 16.45	Avior 234°14.33 -59°36.11
						Suhail 222°45.06 -43°32.88
Mer.	pass. 07:14	ν -0.6′ d 0.8′ m -3.87	$ u 1.4' \ d$ -0.5 $' \ {\sf m} 0.79$	$ u 2.1' \ d$ -0.1' m-1.92	$ u 2.2' \; d0.1' \; { m m0.68}$	Miaplacidus 221°38.24 -69°50.11
						Alphard 217°45.95 -8°46.81
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.43 11°49.94 Dubhe 193°38.66 61°36.38
0	$252^{\circ}12.88$	199°47.60 N17°46.09	91°36.61 N09°29.32	108°41.64 N15°27.09	228°48.83 N07°16.54	Dubhe 193°38.66 61°36.38 Denebola 182°22.88 14°25.10
1	$267^{\circ}15.34$	214°46.98 46.91	106°38.01 28.84	123°43.77 26.97	243°51.07 16.62	Gienah 175°41.43 -17°41.85
2	282° 17.81	229°46.36 47.72	121°39.42 28.35	138°45.90 26.86	258°53.30 16.70	Acrux 172°57.54 -63°15.42
3	297°20.27	244°45.74 · · 48.53	136° 40.82 · · 27.87	153°48.03 · · 26.75	273°55.53 · · 16.78	Gacrux 171°49.15 -57°16.35
4	312°22.74	259°45.12 49.34	151°42.23 27.38	168°50.16 26.64	288°57.77 16.86	Alioth 166°11.00 55°48.81
5 6	327°25.20	274°44.50 50.15	166°43.63 26.90	183°52.29 26.52	304°0.00 16.95	Spica 158°20.01 -11°18.41
7	342°27.66 357°30.13	289°43.88 N17°50.96 304°43.26 51.77	181°45.03 N09°26.41 196°46.44 25.93	198°54.41 N15°26.41 213°56.54 26.30	319°2.24 N07°17.03 334°4.47 17.11	Alkaid 152°50.14 49°10.68
8	12° 32.59	319° 42.63 52.57	211° 47.84 25.44	228°58.67 26.19	349°6.70 17.19	Hadar 148°32.65 -60°30.56
9	27° 35.06	334°42.01 · · 53.38	226°49.24 · · 24.96	244°0.80 · · 26.07	4°8.94 · · 17.27	Menkent 147°54.96 -36°30.49
10	42°37.52	349°41.39 54.19	241°50.64 24.47	259° 2.93 25.96	19°11.17 17.35	Arcturus 145°45.85 19°2.36
11	57° 39.99	4°40.76 54.99	256° 52.04 23.98	274° 5.05 25.85	34°13.41 17.44	Rigil Kent. 139°36.97 -60°57.13 Kochab 137°18.90 74°2.64
12	72°42.45	19°40.14 N17°55.80	271°53.45 N09°23.50	289°7.18 N15°25.73	49°15.64 N07°17.52	Zuben'ubi 136°53.53 -16°9.45
13	$87^{\circ}44.91$	34°39.51 56.60	286°54.85 23.01	304°9.31 25.62	64°17.88 17.60	Alphecca 126°1.73 26°37.33
14	102°47.38	49°38.89 57.40	301°56.25 22.52	319°11.44 25.51	79°20.11 17.68	Antares 112°13.04 -26°29.60
15	117° 49.84	64°38.26 · · 58.20	316° 57.65 · · 22.04	334°13.56 · · 25.39	94°22.34 · · 17.76	Atria 107°4.89 -69°4.56
16 17	132°52.31 147°54.77	79°37.64 59.01 94°37.01 17°59.81	331°59.05 21.55 347°0.45 21.06	349°15.69 25.28 4°17.82 25.17	109°24.58 17.84 124°26.81 17.92	Sabik 102° 0.17 -15° 45.53
18	162° 57.24	109°36.38 N18°0.61	2°1.85 N09°20.58	19°19.94 N15°25.05	139°29.05 N07°18.00	Shaula 96°7.28 -37°7.36
19	177°59.70	124°35.75 1.40	17°3.24 20.09	34°22.07 24.94	154°31.28 18.09	Rasalhague 95°56.38 12°32.37
20	193°2.16	139°35.13 2.20	32°4.64 19.60	49°24.19 24.82	169°33.52 18.17	Eltanin 90°40.74 51°29.01
21	208°4.63	154°34.50 · · 3.00	47°6.04 · · 19.11	64°26.32 · · 24.71	184°35.75 · · 18.25	Kaus Aust. 83°29.53 -34°22.18 Vega 80°31.50 38°48.44
22	223°7.09	169° 33.87 3.80	62°7.44 18.62	79°28.45 24.60	199°37.99 18.33	Nunki 75°45.00 -26°15.65
23	238°9.56	184°33.24 4.59	77°8.84 18.14	94°30.57 24.48	214°40.23 18.41	Altair 61°57.79 8°56.43
Mer.	pass. 07:10	ν-0.6' d0.8' m-3.87	ν1.4' d-0.5' m0.80	$\nu 2.1' \ d$ -0.1' m-1.91	$\nu 2.2' \ d0.1' \ m0.68$	Peacock 53°2.30 -56°38.51
	p					Deneb 49°24.18 45°22.51
C-4	CIIA	CHA De-	CHA D	CHA De-	CHA De-	Enif 33°36.76 10°0.03
Sat 0	GHA 253° 12.02	GHA Dec 199° 32.61 N18° 5.39	GHA Dec 92°10.23 N09°17.65	GHA Dec 109°32.70 N15°24.37	GHA Dec 229°42.46 N07°18.49	Al Na'ir 27°30.39 -46°49.39
1	268° 14.49	214°31.98 6.18	107°11.63 17.16	124°34.82 24.25	244°44.70 18.57	Fomalhaut 15°12.37 -29°28.40
2	283° 16.95	229°31.35 6.97	122°13.03 16.67	139°36.95 24.14	259°46.93 18.65	Scheat 13°43.29 28°13.78
3	298° 19.41	244°30.71 · · 7.77	137°14.42 · · 16.18	154°39.07 · · 24.03	274°49.17 · · 18.73	Markab 13°27.94 15°21.12
4	313°21.88	259° 30.08 8.56	152°15.82 15.69	169°41.19 23.91	289°51.40 18.81	Jun 03 Thu SHA Mer.pass
5	328°24.34	274°29.45 9.35	167°17.22 15.20	184°43.32 23.80	304°53.64 18.89	Venus 308°48.58 10:40
6	343°26.81	289°28.82 N18°10.14	182°18.61 N09°14.71	199°45.44 N15°23.68	319°55.88 N07°18.98	Mars 199°49.06 17:54
7	358° 29.27	304°28.18 10.93	197°20.01 14.22	214°47.57 23.57	334°58.11 19.06	Jupiter 216°36.73 16:46
8	13°31.73	319°27.55 11.72	212°21.40 13.73	229°49.69 23.45	350°0.35 19.14	Saturn 336°41.52 08:47
9	28° 34.20	334°26.91 · · 12.50	227°22.80 · · 13.24	244°51.81 · · 23.34	5°2.59 · · 19.22	Jun 04 Fri SHA Mer.pass
10	43°36.66	349°26.28 13.29	242°24.19 12.75	259°53.94 23.22	20°4.82 19.30	Venus 307°34.72 10:41
11 12	58°39.13 73°41.59	4°25.64 14.08 19°25.01 N18°14.86	257° 25.58 12.26 272° 26.98 N09° 11.77	274°56.06 23.11 289°58.18 N15°22.99	35°7.06 19.38 50°9.30 N07°19.46	Mars 199°23.73 17:52
13	73 41.59 88°44.06	34°24.37 15.65	287°28.37 11.28	305° 0.30 22.88	65°11.53 19.54	Jupiter 216°28.76 16:43
14	103° 46.52	49°23.73 16.43	302°29.76 10.79	320°2.43 22.76	80°13.77 19.62	Saturn 336°35.95 08:43
15	118° 48.98	64°23.10 · · 17.21	317°31.16 · · 10.30	335°4.55 · · 22.65	95°16.01 · · 19.70	Jun 05 Sat SHA Mer.pass
16	133°51.45	79°22.46 17.99	332°32.55 9.81	350°6.67 22.53	110°18.24 19.78	Venus 306°20.59 10:42
17	148°53.91	94°21.82 18.78	347°33.94 9.32	5°8.79 22.42	125°20.48 19.86	Mars 198°58.21 17:50
18	163°56.38	109°21.18 N18°19.56	2°35.33 N09°8.83	20°10.92 N15°22.30	140°22.72 N07°19.94	Jupiter 216°20.68 16:39
19	178° 58.84	124°20.54 20.34	17°36.72 8.34	35°13.04 22.19	155°24.96 20.02	Saturn 336°30.44 08:40
20	194°1.31	139°19.90 21.11	32°38.12 7.84	50°15.16 22.07	170°27.19 20.10	Horizontal parallax
21 22	209°3.77 224°6.23	154°19.26 · · 21.89 169°18.62 22.67	47°39.51 · · 7.35 62°40.90 6.86	65°17.28 · · 21.96 80°19.40 21.84	185°29.43 · · 20.18 200°31.67 20.26	Venus: 0.1
23	239°8.70	184°17.98 23.45	77°42.29 6.37	95°21.52 21.73	215°33.91 20.34	Mars: 0.1
		ν-0.6' d0.8' m-3.87	ν 1.4' d-0.5' m0.81	$\nu 2.1' \ d$ -0.1' m-1.91	$\nu 2.2' \ d0.1' \ m0.68$	
ivier.	pass. 07:06	ν-υ.υ αυ.ο III-3.61	ν1. 4 α-0.5 III0.61	ν∠.1 α-υ.1 III-1.91	ν Δ.Δ UU.1 IIIU.U0	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.13	N22°15.44	207°35.28	6.9'	N21°56.38	9.9'	58.9'
1	195°29.03 210°28.92	15.76	222°1.21 236°27.00	6.8'	22°6.29 22°16.08	9.8'	59.0'
2	210 28.92 225°28.82	16.07 •• 16.38	250° 52.67	6.7' 6.5'	22 16.08 22°25.74	9.7' 9.5'	59.0' 59.0'
4	240°28.72	16.69	265°18.21	6.4'	22°35.28	9.4'	59.1'
5	255°28.62	17.01	279°43.63	6.3'	22°44.68	9.3'	59.1'
6	270°28.51	N22°17.32	294°8.92	6.2'	N22°53.95 23°3.08	9.1'	59.1'
7 8	285°28.41 300°28.30	17.63 17.93	308°34.08 322°59.11	6.0' 5.9'	23° 3.08 23° 12.08	9.0' 8.9'	59.2' 59.2'
9	315°28.20	• • 18.24	337°24.02	5.8'	23°20.94	8.7'	59.2'
10	330°28.10	18.55	351°48.81	5.7'	$23^{\circ}29.66$	8.6'	59.3'
11	345°27.99 0°27.89	18.86	6°13.47	5.5'	23°38.24	8.4'	59.3'
12 13	0°27.89 15°27.78	N22°19.16 19.47	20°38.01 35°2.43	5.4' 5.3'	N23°46.67 23°54.96	8.3' 8.1'	59.3' 59.4'
14	30°27.68	19.78	49°26.73	5.2'	24°3.10	8.0'	59.4'
15	45°27.57	• • 20.08	63°50.90	5.1'	24°11.08	7.8'	59.4'
16	60°27.47	20.38	78°14.96	4.9'	24°18.92	7.7'	59.4'
17 18	75°27.36 90°27.26	20.69 N22°20.99	92°38.90 107°2.73	4.8' 4.7'	24°26.60 N24°34.13	7.5' 7.4'	59.5' 59.5'
19	105°27.15	21.29	107 2.73 121°26.43	4.6'	24°41.50	7.2'	59.5'
20	120° 27.05	21.59	135°50.03	4.5'	24°48.71	7.0'	59.6'
21	135°26.94	• • 21.89	150°13.51	4.4'	24°55.75	6.9'	59.6'
22	150°26.84	22.19	164°36.88	4.3'	25°2.64	6.7'	59.6'
23	165°26.73	22.49	179°0.14	4.2'	25°9.36	6.6'	59.6'
	SD = 15.8'	d = 0.3'		SI	D = 16.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	$180^{\circ}26.62$	N22°22.79	193°23.30	4.0'	$N25^{\circ}15.91$	6.4'	59.7'
1	195°26.52	23.09	207°46.34	3.9'	25°22.30	6.2'	59.7'
2	210°26.41 225°26.30	23.38	222°9.29 236°32.13	3.8' 3.7'	25°28.51 25°34.55	6.0' 5.9'	59.7' 59.7'
3 4	240°26.20	23.98	250°54.86	3.6'	25°40.42	5.9 5.7'	59.1°
5	255°26.09	24.27	265°17.50	3.5'	25°46.12	5.5'	59.8'
6	270°25.98	N22°24.57	279°40.05	3.4'	N25°51.64	5.3'	59.8'
7	285°25.88	24.86	294°2.50	3.4'	25°56.98	5.2'	59.8'
8 9	300°25.77 315°25.66	25.15 •• 25.44	308°24.85 322°47.11	3.3' 3.2'	26°2.14 26°7.11	5.0' 4.8'	59.9' 59.9'
10	330°25.55	25.74	337°9.29	3.1'	26°11.91	4.6'	59.9'
11	345°25.44	26.03	351°31.38	3.0'	26°16.52	4.4'	59.9'
12	0°25.34	N22°26.32	5°53.39	2.9'	N26°20.95	4.2'	60.0'
13 14	15°25.23 30°25.12	26.61 26.89	20°15.31 34°37.16	2.8' 2.8'	26°25.19 26°29.24	4.1' 3.9'	60.0' 60.0'
15	45°25.01	27.18	48°58.93	2.6	26°33.10	3.9 3.7'	60.0
16	60°24.90	27.47	63°20.62	2.6'	26°36.77	3.5'	60.0'
17	75°24.79	27.76	$77^{\circ}42.25$	2.6'	$26^{\circ}40.25$	3.3'	60.1'
18	90°24.68	N22°28.04	92°3.80	2.5'	N26°43.54	3.1'	60.1'
19 20	105°24.58 120°24.47	28.33 28.61	106°25.29 120°46.72	2.4' 2.4'	26°46.63 26°49.53	2.9' 2.7'	60.1' 60.1'
21	135°24.36	• • 28.90	135°8.09	2.3'	26°52.23	2.5'	60.1
22	$150^{\circ}24.25$	29.18	149°29.40	2.3'	26°54.73	2.3'	60.2'
23	165°24.14	29.46	163°50.65	2.2'	26°57.04	2.1'	60.2'
	SD = 15.8'	d = 0.3'		SI	O = 16.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	$180^{\circ}24.03$	N22°29.74	178°11.86	2.2'	$N26^{\circ}59.14$	1.9'	60.2'
1	195°23.92	30.03	192°33.01	2.1'	27°1.05	1.7'	60.2'
2	210°23.81 225°23.70	30.31 · · 30.59	206°54.12 221°15.19	2.1' 2.0'	27°2.76 27°4.26	1.5' 1.3'	60.2' 60.3'
3 4	225°23.70 240°23.59	30.59	221°15.19 235°36.22	2.0'	27°4.26 27°5.57	1.3	60.3
5	255°23.48	31.14	249°57.21	2.0'	27°6.67	0.9'	60.3
6	270°23.36	N22°31.42	264°18.17	1.9'	N27°7.57	0.7'	60.3'
7	285°23.25	31.70	278°39.10	1.9'	27°8.26	0.5'	60.3'
8 9	300°23.14 315°23.03	31.98 •• 32.25	293°0.01 307°20.88	1.9' 1.9'	27°8.75 27°9.04	0.3' 0.1'	60.3' 60.3'
10	330°22.92	32.53	321°41.74	1.8'	27°9.04	-0.1	60.4
11	$345^{\circ}22.81$	32.80	336°2.58	1.8'	$27^{\circ}9.00$	-0.3'	60.4
12	0°22.70	N22°33.07	350°23.41	1.8'	N27°8.67	-0.5'	60.4
13 14	15°22.59 30°22.47	33.35 33.62	4°44.23 19°5.04	1.8' 1.8'	27°8.14 27°7.40	-0.7' -0.9'	60.4' 60.4'
14 15	45° 22.36	33.62 · · 33.89	19°5.04 33°25.84	1.8'	27° 7.40 27° 6.45	-0.9 -1.1'	60.4
16	60°22.25	34.16	47°46.65	1.8'	27°5.30	-1.4	60.4
17	75°22.14	34.43	62°7.46	1.8'	27°3.95	-1.6'	60.4'
18	90°22.03	N22°34.70	76°28.27	1.8'	N27°2.39	-1.8'	60.4'
19 20	105°21.91 120°21.80	34.97 35.24	90°49.09 105°9.92	1.8' 1.8'	27°0.62 26°58.65	-2.0' -2.2'	60.5' 60.5'
21	135°21.69	35.51	105 9.92 119°30.77	1.9'	26°56.47	-2.2 -2.4'	60.5
22	150°21.57	35.77	133°51.63	1.9'	26°54.09	-2.6'	60.5'
23	165°21.46	36.04	148°12.52	1.9'	26°51.51	-2.8'	60.5'
	SD = 15.8'	d = 0.3'		SI	O = 16.4'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	28-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-0%	
03	01:57	01:52	11:58	10:34	23:04		
04	01:46	01:41	11:58	11:35	-:-		
05	01:36	01:31	11:58	12:40	80:00		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
C		CHA De-	CUA De-			SHA
Sun	GHA	GHA Dec	GHA Dec		GHA Dec	SHA
0	254°11.16	199°17.34 N18°24.22	92°43.68 N09°5.88	110°23.64 N15°21.61	230°36.14 N07°20.42	Alpheratz 357°32.80
1	269° 13.63	214° 16.69 25.00	107° 45.07 5.38	125°25.76 21.49	245°38.38 20.50	Ankaa 353° 5.38
2	284° 16.09	229° 16.05 25.77	122°46.46 4.89	140°27.88 21.38	260°40.62 20.58	Schedar 349°28.96
3	299° 18.56	244° 15.41 · · · 26.54	137° 47.84 · · 4.40	155°30.00 · · 21.26	275°42.86 · · 20.66	Diphda 348°45.47
4	314°21.02	259°14.77 27.31	152°49.23 3.90	170°32.12 21.15	290°45.10 20.74	Achernar 335°19.14
5	329°23.48	274°14.12 28.09	167°50.62 3.41	185°34.24 21.03	305°47.34 20.82	Hamal 327°49.20
6	344°25.95	289°13.48 N18°28.86	182°52.01 N09°2.92	200°36.36 N15°20.91	320°49.57 N07°20.90	Polaris 313°25.07
7	359°28.41	304°12.83 29.63	197° 53.40 2.42	215°38.48 20.80	335°51.81 20.98	Acamar 315°10.66
8	14°30.88	319°12.19 30.39	212°54.78 1.93	230°40.60 20.68	350°54.05 21.06	Menkar 314°4.36
9	29°33.34	334°11.54 · · 31.16	227°56.17 · · 1.44	245°42.72 · · 20.56	5°56.29 · · 21.14	Mirfak 308°25.85
10	44°35.81	349°10.89 31.93	242°57.56 0.94	260°44.84 20.45	20°58.53 21.22	Aldebaran 290°37.69
11	59°38.27	4° 10.25 32.70	257°58.94 0.45	275°46.95 20.33	36°0.77 21.29	Rigel 281°2.31
12	74°40.73	19°9.60 N18°33.46	273°0.33 N08°59.95	290°49.07 N15°20.21	51°3.01 N07°21.37	Capella 280°19.44
13	89°43.20	34°8.95 34.23	288°1.72 08°59.46	305°51.19 20.10	66°5.25 21.45	Bellatrix 278°21.09
14	104°45.66	49°8.30 34.99	303°3.10 58.96	320°53.31 19.98	81°7.49 21.53	Elnath 277°59.74
15	119°48.13	64°7.65 · · 35.75	318°4.49 · · 58.47	335°55.43 · · 19.86	96°9.72 · · 21.61	Alnilam 275°36.05
16	134°50.59	79°7.00 36.52	333°5.87 57.97	350°57.54 19.75	111°11.96 21.69	Betelgeuse 270°50.27
17	149°53.06	94°6.35 37.28	348°7.26 57.48	5°59.66 19.63	126°14.20 21.77	Canopus 263°52.04
18	164°55.52	109°5.70 N18°38.04	3°8.64 N08°56.98	21°1.78 N15°19.51	141°16.44 N07°21.85	Sirius 258°24.82
19	179°57.98	124°5.05 38.80	18° 10.02 56.49	36°3.89 19.40	156°18.68 21.93	Adhara 255° 4.65
20	195°0.45	139°4.40 39.56	33° 11.41 55.99	51°6.01 19.28	171°20.92 22.01	Procyon 244°49.04
21	210°2.91	154°3.75 · · 40.31	48° 12.79 · · 55.50	66° 8.13 · · 19.16	186°23.16 · · 22.09	Pollux 243°15.20
22	225°5.38	169°3.10 41.07	63° 14.17 55.00	81°10.24 19.04	201°25.40 22.16	Avior 234°14.35
23	240°7.84	184°2.45 41.83	78° 15.56 54.50	96°12.36 18.93	216°27.64 22.24	Suhail 222°45.07
Mer.r	pass. 07:02	ν-0.6' d0.8' m-3.87	ν1.4' d-0.5' m0.82	ν2.1' d-0.1' m-1.90	ν 2.2' d0.1' m0.67	Miaplacidus 221°38.28
						Alphard 217°45.95
			-		-	Regulus 207°32.44
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.67
0	255° 10.30	199°1.79 N18°42.58	93°16.94 N08°54.01	111°14.48 N15°18.81	231°29.88 N07°22.32	Denebola 182°22.88
1	270° 12.77	214°1.14 43.34	108° 18.32 53.51	126°16.59 18.69	246°32.12 22.40	Gienah 175°41.43
2	285° 15.23	229°0.48 44.09	123°19.70 53.01	141°18.71 18.58	261°34.36 22.48	Acrux 172°57.55
3	300° 17.70	243°59.83 · · 44.85	138°21.09 · · 52.52	156°20.82 · · 18.46	276°36.61 · · 22.56	Gacrux 171°49.16
4	315°20.16	258°59.17 45.60	153°22.47 52.02	171°22.94 18.34	291°38.85 22.64	Alioth 166°11.02
5	330°22.63	273°58.52 46.35	168° 23.85 51.52	186°25.05 18.22	306°41.09 22.71	Spica 158°20.01
6	345°25.09	288°57.86 N18°47.10	183°25.23 N08°51.03	201°27.17 N15°18.10 216°29.28 17.99	321°43.33 N07°22.79	Alkaid 152°50.15
7	0°27.55	303°57.21 47.85	198°26.61 50.53		336°45.57 22.87	Hadar 148°32.64
8	15°30.02	318°56.55 48.60	213°27.99 50.03	231°31.40 17.87	351°47.81 22.95	Menkent 147°54.96
9	30° 32.48 45° 34.95	333°55.89 · · 49.35	228°29.37 · · 49.53	246°33.51 · · 17.75	6°50.05 · · 23.03	Arcturus 145°45.85
10	45 34.95 60°37.41	348°55.23 50.09 3°54.58 50.84	243°30.75 49.04	261°35.63 17.63	21°52.29 23.11	Rigil Kent. 139°36.96
11			258°32.13 48.54 273°33.51 N08°48.04	276°37.74 17.51	36°54.53 23.18 51°56.78 N07°23.26	Kochab 137°18.93
12	75° 39.88 90° 42.34	18°53.92 N18°51.58		291°39.85 N15°17.40 306°41.97 17.28		Zuben'ubi 136°53.52
13	90 42.34 105°44.80	33°53.26 52.33 48°52.60 53.07			66°59.02 23.34 82°1.26 23.42	Alphecca 126° 1.73
14	105 44.80 120° 47.27					Antares 112°13.02
15 16	120 47.27 135°49.73	63°51.94 · · 53.82 78°51.28 54.56	318° 37.64 · · · 46.54 333° 39.02 46.04	336°46.19 · · 17.04 351°48.31 16.92	97°3.50 · · 23.50 112°5.74 23.57	Atria 107° 4.86
17	150° 52.20	93°50.61 55.30	348° 40.39 45.54	6°50.42 16.80	112 5.74 25.57 127°7.98 23.65	Sabik 102° 0.16
18	165° 54.66	108°49.95 N18°56.04	3°41.77 N08°45.05	21°52.53 N15°16.68	142°10.23 N07°23.73	Shaula 96°7.25
19	180° 57.12	123°49.29 56.78	100 10 15	36°54.64 16.57	157°12.47 23.81	Rasalhague 95°56.37
20	195° 59.59	138°48.63 57.52	18° 43.15 44.55 33° 44.53 44.05	51°56.76 16.45	172°14.71 23.89	Eltanin 90°40.73
21	211°2.05	153° 47.97 · · 58.26	48° 45.90 · · 43.55	66°58.87 · · 16.33	187°16.95 · · 23.96	Kaus Aust. 83°29.50
22	226°4.52	168° 47.30 58.99	63°47.28 43.05	82° 0.98 16.21	202°19.20 24.04	Vega 80°31.48
23	241°6.98	183°46.64 59.73	78° 48.65 42.55	97°3.09 16.09	217°21.44 24.12	Nunki 75°44.98
			-			Altair 61°57.77
Mer.p	pass. 06:58	u-0.7 $'$ d 0.8 $'$ m-3.87	$ u 1.4' \ d$ -0.5 $' \ { m m} 0.83$	$ u 2.1' \ d$ -0.1' m-1.90	$ u 2.2' \; d0.1' \; { m m0.67}$	Peacock 53°2.26
						Deneb 49°24.15
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.73
0 0	256°9.45	198°45.97 N19°0.46	93°50.03 N08°42.05	112°5.20 N15°15.97	232°23.68 N07°24.20	Al Na'ir 27°30.35
1	250 9.45 271°11.91	213°45.31 1.20	108° 51.40 41.55	112 5.20 N15 15.97 127°7.31 15.85	247°25.92 24.27	Fomalhaut 15°12.34
2	286° 14.37	228°44.64 1.93	123°52.78 41.05	142° 9.43 15.73	262°28.17 24.35	Scheat 13°43.26
3	280 14.37 301°16.84	243°43.98 · · 2.66	138°54.15 · · 40.54	142 9.43 15.73 157°11.54 · · 15.61	277°30.41 · · 24.43	Markab 13°27.91
4	316° 19.30	258°43.31 3.40	153°55.53 40.04	172°13.65 15.49	292°32.65 24.51	Jun 06 Sun SHA
5	331° 21.77	273° 42.64 4.13	168° 56.90 39.54	187°15.76 15.37	307°34.90 24.58	Venus 305° 6.17
6	346°24.23	288°41.98 N19°4.86	183°58.27 N08°39.04	202°17.87 N15°15.26	322°37.14 N07°24.66	Mars 198°32.51
7	1°26.70	303°41.31 5.59	198° 59.65 38.54	217°19.98 15.14	337°39.38 24.74	Jupiter 216°12.48
8	16°29.16	318° 40.64 6.31	214°1.02 38.04	232°22.09 15.02	352°41.63 24.82	Saturn 336°24.98
9	31°31.62	333°39.97 · · 7.04	229°2.39 · · 37.54	247°24.20 · · 14.90	7°43.87 · · 24.89	
10	46°34.09	348°39.30 7.77	244°3.76 37.04	262°26.31 14.78	22°46.11 24.97	Jun 07 Mon SHA
11	61°36.55	3°38.63 8.49	259°5.14 36.53	277°28.42 14.66	37°48.36 25.05	Venus 303°51.49
12	76°39.02	18°37.96 N19°9.22	274°6.51 N08°36.03	292°30.53 N15°14.54	52°50.60 N07°25.12	Mars 198° 6.63
13	91°41.48	33°37.29 9.94	289°7.88 35.53	307°32.64 14.42	67°52.85 25.20	Jupiter 216°4.17
14	106°43.94	48° 36.62 10.67	304°9.25 35.03	322°34.75 14.30	82°55.09 25.28	Saturn 336°19.58
15	121°46.41	63°35.95 · · 11.39	319°10.62 · · 34.52	337°36.85 · · 14.18	97°57.33 · · 25.35	Jun 08 Tue SHA
16	136°48.87	78°35.28 12.11	334°11.99 34.02	352°38.96 14.06	112°59.58 25.43	Venus 302°36.53
17	151°51.34	93°34.60 12.83	349°13.36 33.52	7°41.07 13.94	128°1.82 25.51	Mars 197°40.58
18	166° 53.80	108°33.93 N19°13.55	4°14.73 N08°33.02	22°43.18 N15°13.82	143°4.07 N07°25.59	Jupiter 215°55.76
19	181°56.27	123°33.26 14.27	19°16.10 32.51	37°45.29 13.70	158°6.31 25.66	Saturn 336°14.23
20	196°58.73	138° 32.58 14.99	34°17.47 32.01	52°47.40 13.58	173°8.56 25.74	
21	212°1.19	153°31.91 · · 15.70	49°18.84 · · 31.50	67°49.50 · · 13.46	188°10.80 · · 25.81	Horizontal parallax
22	227°3.66	168° 31.23 16.42	64°20.21 31.00	82°51.61 13.33	203°13.05 25.89	Venus:
23	242°6.12	183°30.56 17.14	79°21.58 30.50	97°53.72 13.21	218°15.29 25.97	Mars:
Merr	pass. 06:54	ν-0.7' d0.7' m-3.87	ν1.4' d-0.5' m0.85	ν2.1' d-0.1' m-1.89	$\nu 2.2' \ d0.1' \ m0.67$	
14101.		- J.1 GO.1 III-J.01	ν 1.1 α 0.5 III0.05	G O.1 III-1.03	do.1 mo.01	

Dec

29°14.40 -42°9.15

56°41.06

 $\text{-}57^{\circ}5.58$

 $23^{\circ}35.44$

89°22.57

-40°11.54

4°11.82

49°57.38

16°33.80

-8°10.24

 $46^{\circ}1.46$

 $6^{\circ}22.41$

28°37.77

 $-1^{\circ}11.12$

 $7^{\circ}24.67$

-52°42.72 -16°45.33

-29°0.69

-59°36.11

-43°32.88

-69°50.11

-8°46.81

11°49.94

61°36.38

 $14^{\circ}25.10$

-17°41.86

-63°15.43

 $-57^{\circ}16.36$

55°48.81

-11°18.41

49°10.69

-60°30.57

-36°30.50

 $19^{\circ}2.37$

-60°57.14

 $74^{\circ}2.65$

-16°9.45

26°37.34

-26°29.60

-69°4.58

-15°45.53

-37°7.37

 $12^{\circ}32.38$

51°29.02

-34°22.18

38°48.45 -26°15.64

8°56.44

-56°38.51

45°22.53

-46°49.38

-29°28.39 28°13.79

15°21.13

Mer.pass

10:43

17:47

16:36

08:36

10:44

17:45

16:33

08:33

10:45

17:43

16:29

08:29

0.1

0.1

Mer.pass

Mer.pass

 $10^{\circ}0.04$

 $5^{\circ}9.20$ 27°57.58

-17°50.03

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.35	N22°36.31	$162^{\circ}33.43$	1.9'	$N26^{\circ}48.72$	-3.0'	60.5'
1	195°21.23	36.57	176°54.37	2.0'	26°45.73	-3.2'	60.5'
2	210°21.12 225°21.01	36.83 · · 37.10	191° 15.34 205° 36.34	2.0' 2.0'	26°42.54 26°39.15	-3.4' -3.6'	60.5' 60.5'
4	240°20.89	37.36	219°57.38	2.1'	26°35.55	-3.8'	60.5'
5	255°20.78	37.62	234°18.46	2.1'	$26^{\circ}31.75$	-4.0'	60.5'
6	270°20.67	N22°37.88	248°39.58	2.2'	N26°27.76	-4.2'	60.5'
7 8	285°20.55 300°20.44	38.14 38.40	263°0.74 277°21.96	2.2' 2.3'	26°23.56 26°19.17	-4.4' -4.6'	60.5' 60.5'
9	315°20.32	• • 38.66	291°43.22	2.3'	26°14.58	-4.8'	60.5'
10	330°20.21	38.92	306°4.54	2.4'	$26^{\circ}9.80$	-5.0'	60.5'
11	345°20.09	39.18	320°25.92	2.4'	26°4.82	-5.2'	60.5
12 13	0°19.98 15°19.86	N22°39.44 39.69	334°47.35 349°8.85	2.5' 2.6'	N25°59.64 25°54.27	-5.4' -5.6'	60.5' 60.5'
14	30°19.75	39.95	3° 30.41	2.6'	25°48.71	-5.8'	60.5
15	45°19.63	• • 40.21	$17^{\circ}52.03$	2.7'	$25^{\circ}42.96$	-5.9'	60.5'
16	60°19.52	40.46	32°13.73	2.8'	25°37.02	-6.1'	60.5'
17 18	75°19.40 90°19.29	40.71 N22° 40.97	46° 35.50 60° 57.34	2.8'	25°30.90 N25°24.58	-6.3' -6.5'	60.5' 60.5'
19	105°19.17	41.22	75° 19.25	3.0'	25°18.08	-6.7'	60.5
20	120°19.06	41.47	89°41.25	3.1'	25°11.40	-6.9	60.5
21	135°18.94	• • 41.72	104°3.32	3.2'	$25^{\circ}4.53$	-7.0'	60.5'
22	150°18.82	41.97	118° 25.48	3.2'	24°57.48	-7.2'	60.5'
23	165°18.71	42.22	132°47.72	3.3'	24°50.26	-7.4'	60.5'
	SD = 15.8′	d = 0.3'		S	D = 16.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.59	N22° 42.47	$147^{\circ}10.05$	3.4'	N24°42.85	-7.6'	60.5'
1	195°18.47	42.72	161°32.47	3.5'	24°35.27	-7.8'	60.5'
2	210°18.36	42.97	175°54.98	3.6'	24°27.51	-7.9'	60.5'
3 4	225°18.24 240°18.12	· · 43.21 43.46	190° 17.57 204° 40.27	3.7' 3.8'	24°19.58 24°11.48	-8.1' -8.3'	60.5' 60.5'
5	255°18.01	43.70	219°3.05	3.9'	24° 3.21	-8.4'	60.5
6	270°17.89	N22°43.95	233°25.94	4.0'	N23°54.77	-8.6'	60.5'
7	285°17.77	44.19	247° 48.92	4.1'	23°46.17	-8.8'	60.5'
8	300°17.66	44.44	262°12.00	4.2'	23°37.40	-8.9'	60.5'
9 10	315°17.54 330°17.42	· · 44.68 44.92	276° 35.18 290° 58.47	4.3' 4.4'	23°28.47 23°19.37	-9.1' -9.3'	60.5' 60.5'
11	345°17.30	45.16	305° 21.85	4.5'	23°10.12	-9.3 -9.4'	60.5
12	0°17.19	N22°45.40	319°45.35	4.6'	N23°0.71	-9.6'	60.4'
13	15°17.07	45.64	334°8.94	4.7'	22°51.14	-9.7'	60.4'
14 15	30°16.95 45°16.83	45.88 •• 46.12	348°32.65 2°56.46	4.8' 4.9'	22°41.42 22°31.55	-9.9' -10.0'	60.4' 60.4'
16	60°16.71	46.36	2 50.40 17°20.38	4.9 5.0'	22°21.53	-10.0	60.4
17	75°16.60	46.60	31°44.41	5.1'	22°11.37	-10.3	60.4
18	90°16.48	N22°46.83	46°8.55	5.2'	$N22^{\circ}1.05$	-10.5'	60.4'
19	105°16.36	47.07	60°32.80	5.4'	21°50.60	-10.6'	60.4
20 21	120°16.24 135°16.12	47.30 •• 47.54	74°57.16 89°21.63	5.5' 5.6'	21°40.00 21°29.26	-10.7' -10.9'	60.4' 60.3'
22	150°16.00	47.77	103°46.21	5.7'	21°18.38	-10.9	60.3
23	165°15.88	48.00	$118^{\circ}10.91$	5.8'	21°7.37	-11.1'	60.3'
	SD = 15.8'	d = 0.2'		S	D = 16.5'		
_							
Tue 0	GHA 180° 15.76	Dec N22° 48.24	GHA 132° 35.72	u 5.9'	Dec N20°56.22	d -11.3'	HP 60.3'
1	180 15.76 195°15.64	N22 48.24 48.47	132 35.72 147°0.65	5.9 6.0'	20°44.95	-11.3 -11.4'	60.3
2	210°15.53	48.70	$161^{\circ}25.69$	6.2'	$20^{\circ}33.54$	-11.5'	60.3'
3	225°15.41	• • 48.93	175°50.84	6.3'	20°22.01	-11.7'	60.3'
4 5	240°15.29 255°15.17	49.16 49.39	190°16.10 204°41.48	6.4' 6.5'	20°10.35 19°58.56	-11.8' -11.9'	60.3' 60.2'
6	255°15.17 270°15.05	49.39 N22°49.61	204°41.48 219°6.98	6.6'	N19°46.66	-11.9 -12.0'	60.2'
7	285°14.93	49.84	233° 32.59	6.7'	19°34.63	-12.1'	60.2'
8	300°14.81	50.07	247°58.31	6.8'	19°22.49	-12.3'	60.2'
9	315°14.69	• • 50.29	262°24.15	7.0'	19°10.23	-12.4'	60.2'
10 11	330°14.57 345°14.45	50.52 50.74	276°50.10 291°16.16	7.1' 7.2'	18°57.86 18°45.38	-12.5' -12.6'	60.2' 60.1'
12	0°14.33	N22°50.97	305°42.34	7.3'	N18°32.79	-12.7	60.1
13	15°14.20	51.19	320°8.63	7.4'	18°20.09	-12.8'	60.1'
14	30°14.08	51.41	334°35.03	7.5'	18°7.29	-12.9'	60.1
15 16	45°13.96 60°13.84	· · 51.63 51.86	349°1.55 3°28.18	7.6' 7.7'	17°54.38 17°41.38	-13.0' -13.1'	60.1' 60.0'
16 17	75°13.72	51.86 52.08	3° 28.18 17° 54.92	7.7 7.9'	17°41.38 17°28.27	-13.1 -13.2'	60.0
18	90°13.60	N22°52.30	32°21.77	8.0'	N17°15.07	-13.3'	60.0'
19	105°13.48	52.51	46°48.73	8.1'	17° 1.77	-13.4'	60.0'
20	120°13.36	52.73	61°15.80	8.2'	16°48.38	-13.5'	60.0'
21 22	135°13.24 150°13.12	· · 52.95 53.17	75° 42.98 90° 10.27	8.3' 8.4'	16°34.90 16°21.33	-13.6' -13.7'	59.9' 59.9'
23	165°12.99	53.38	104° 37.67	8.5'	16°7.67	-13.7'	59.9'
	SD = 15.8'	d = 0.2'			D = 16.4'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	2-4
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-14%
06	01:25	01:20	11:59	13:45	01:13	
07	01:14	01:09	11:59	14:48	02:17	
08	01:03	00:57	11:59	15:46	03:17	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	257°8.59	198°29.88 N19°17.85	94°22.94 N08°29.99	112°55.82 N15°13.09	233°17.54 N07°26.04	
1	272°11.05	213°29.21 18.56	109°24.31 29.49	127°57.93 12.97	248°19.78 26.12	Alpheratz 357°32.78
2	287° 13.51	228°28.53 19.28	124°25.68 28.98	143°0.04 12.85	263°22.03 26.20	Ankaa 353° 5.35 Schedar 349° 28.93
3	$302^{\circ}15.98$	243°27.85 · · 19.99	139°27.05 · · 28.48	158°2.14 · · 12.73	278°24.27 · · 26.27	Schedar 349°28.93 Diphda 348°45.44
4	317° 18.44	258°27.17 20.70	154°28.41 27.98	173° 4.25 12.61	293°26.52 26.35	Achernar 335°19.11
5	332°20.91	273°26.50 21.41	169°29.78 27.47	188° 6.36 12.49	308°28.76 26.43	Hamal 327°49.18
6 7	347°23.37 2°25.84	288°25.82 N19°22.12 303°25.14 22.83	184°31.15 N08°26.97 199°32.51 26.46	203°8.46 N15°12.37 218°10.57 12.25	323°31.01 N07°26.50 338°33.26 26.58	Polaris 313°24.16
8	17°28.30	318°24.46 23.53	214°33.88 25.96	233°12.68 12.13	353°35.50 26.65	Acamar 315°10.64
9	32°30.76	333°23.78 · · 24.24	229°35.25 · · 25.45	248°14.78 · · 12.00	8°37.75 · · 26.73	Menkar 314°4.34
10	47°33.23	348°23.10 24.95	244°36.61 24.94	263°16.89 11.88	23°39.99 26.81	Mirfak 308°25.83 Aldebaran 290°37.68
11	62°35.69	3°22.42 25.65	259°37.98 24.44	278°18.99 11.76	38°42.24 26.88	Rigel 281°2.30
12	77°38.16	18°21.74 N19°26.35	274°39.34 N08°23.93	293°21.10 N15°11.64	53°44.49 N07°26.96	Capella 280° 19.42
13 14	92°40.62 107°43.08	33°21.05 27.06 48°20.37 27.76	289° 40.70 23.43 304° 42.07 22.92	308°23.20 11.52 323°25.31 11.40	68°46.73 27.03 83°48.98 27.11	Bellatrix 278°21.08
15	107 45.06 122° 45.55	63°19.69 · · 28.46	319°43.43 · · 22.41	338°27.41 · · 11.27	98°51.23 · · 27.18	Elnath 277° 59.73
16	137°48.01	78°19.00 29.16	334°44.80 21.91	353°29.51 11.15	113°53.47 27.26	Alnilam 275°36.05
17	152°50.48	93°18.32 29.86	349°46.16 21.40	8°31.62 11.03	128°55.72 27.34	Betelgeuse 270°50.27
18	167°52.94	108°17.64 N19°30.56	4°47.52 N08°20.89	23°33.72 N15°10.91	143°57.97 N07°27.41	Canopus 263° 52.04 Sirius 258° 24.81
19	182°55.40	123°16.95 31.26	19°48.89 20.39	38°35.83 10.79	159°0.21 27.49	Adhara 255°4.65
20	197°57.87	138°16.27 31.95	34°50.25 19.88	53°37.93 10.67	174°2.46 27.56	Procyon 244°49.04
21 22	213°0.33 228°2.80	153°15.58 · · 32.65 168°14.89 33.34	49°51.61 · · 19.37 64°52.97 18.86	68°40.03 · · 10.54 83°42.14 10.42	189°4.71 · · 27.64 204°6.96 27.71	Pollux 243°15.20
23	243°5.26	183°14.21 34.04	79°54.33 18.36	98°44.24 10.30	219° 9.20 27.79	Avior 234°14.37
_		·				Suhail 222°45.08
Mer.	pass. 06:50	ν-0.7' d0.7' m-3.87	ν1.4' d-0.5' m0.86	ν2.1' d-0.1' m-1.89	ν2.2' d0.1' m0.67	Miaplacidus 221° 38.32 Alphard 217° 45.96
						Regulus 207°32.44
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.69
0	258°7.73	198°13.52 N19°34.73	94°55.70 N08°17.85	113°46.34 N15°10.18	234°11.45 N07°27.86	Denebola 182°22.89
1 2	273° 10.19 288° 12.65	213°12.83 35.42 228°12.15 36.11	109°57.06 17.34 124°58.42 16.83	128°48.44 10.05 143°50.55 9.93	249°13.70 27.94 264°15.95 28.01	Gienah 175°41.44
3	303° 15.12	243°11.46 · · 36.81	139°59.78 · · 16.33	158°52.65 · · 9.81	279°18.20 · · 28.09	Acrux 172°57.58
4	318° 17.58	258°10.77 37.49	155°1.14 15.82	173°54.75 9.69	294°20.44 28.16	Gacrux 171°49.17
5	333°20.05	273°10.08 38.18	170°2.50 15.31	188°56.85 9.56	309°22.69 28.24	Alioth 166°11.03 Spica 158°20.01
6	348°22.51	288°9.39 N19°38.87	185°3.86 N08°14.80	203°58.96 N15°9.44	324°24.94 N07°28.31	Alkaid 152°50.16
7	3°24.97	303°8.70 39.56	200°5.22 14.29	219°1.06 9.32	339°27.19 28.39	Hadar 148° 32.66
8	18° 27.44	318°8.01 40.24 333°7.32 · · 40.93	215°6.58 13.78 230°7.93 · · 13.27	234° 3.16 9.20	354°29.44 28.46 9°31.69 · · 28.54	Menkent 147°54.96
9 10	33°29.90 48°32.37	333°7.32 · · 40.93 348°6.63 41.61	230°7.93 · · 13.27 245°9.29	249°5.26 · · 9.07 264°7.36 8.95	24°33.93 28.61	Arcturus 145°45.85
11	63°34.83	3°5.93 42.30	260°10.65 12.25	279° 9.46 8.83	39°36.18 28.69	Rigil Kent. 139°36.97
12	78°37.29	18°5.24 N19°42.98	275°12.01 N08°11.74	294°11.56 N15°8.70	54°38.43 N07°28.76	Kochab 137°18.96 Zuben'ubi 136°53.52
13	93°39.76	33°4.55 43.66	290°13.37 11.23	309°13.66 8.58	69°40.68 28.84	Zuben'ubi 136° 53.52 Alphecca 126° 1.73
14	108°42.22	48°3.85 44.34	305°14.72 10.72	324°15.76 8.46	84°42.93 28.91	Antares 112° 13.01
15	123°44.69	63°3.16 · · 45.02	320°16.08 · · 10.21	339°17.86 · · 8.33	99°45.18 · · 28.99	Atria 107°4.84
16 17	138° 47.15 153° 49.61	78°2.47 45.70 93°1.77 46.38	335°17.44 9.70 350°18.79 9.19	354°19.96 8.21 9°22.06 8.09	114°47.43 29.06 129°49.68 29.14	Sabik 102°0.14
18	168° 52.08	108°1.07 N19°47.05	5°20.15 N08°8.68	24°24.16 N15°7.96	144°51.93 N07°29.21	Shaula 96°7.24
19	183°54.54	123°0.38 47.73	20°21.51 8.17	39°26.26 7.84	159°54.18 29.28	Rasalhague 95°56.36
20	198°57.01	137°59.68 48.41	35°22.86 7.66	54°28.36 7.72	174°56.43 29.36	Eltanin 90° 40.72 Kaus Aust. 83° 29.48
21	213°59.47	152°58.99 · · 49.08	50°24.22 · · 7.15	69°30.46 · · 7.59	189°58.68 · · 29.43	Vega 80°31.46
22	229°1.94	167°58.29 49.75	65°25.57 6.64	84°32.56 7.47	205°0.93 29.51	Nunki 75°44.96
23	244°4.40	182°57.59 50.43	80°26.93 6.13	99°34.66 7.34	220°3.18 29.58	Altair 61°57.75
Mer.۱	oass. 06:46	ν -0.7 $'$ d 0.7 $'$ m-3.87	$\nu 1.4' \ d$ -0.5 $' \ m0.87$	$ u 2.1' \ d \text{-} 0.1' \ \text{m-} 1.88$	$ u 2.2' \ d0.1' \ { m m0.67}$	Peacock 53°2.22
						Deneb 49°24.12
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.70 Al Na'ir 27°30.31
0	259°6.86	197°56.89 N19°51.10	95°28.28 N08°5.62	114°36.76 N15°7.22	235°5.43 N07°29.66	Al Na'ir 27°30.31 Fomalhaut 15°12.31
1	274°9.33	212°56.19 51.77	110°29.64 5.11	129°38.86 7.10	250°7.68 29.73	Scheat 13°43.23
2	289°11.79	227°55.50 52.44	125°30.99 4.59	144°40.95 6.97	265°9.93 29.80	Markab 13°27.89
3 1	304° 14.26 319° 16.72	242°54.80 · · 53.11 257°54.10 53.77	140°32.34 · · 4.08 155°33.70 3.57	159°43.05 · · 6.85 174°45.15 6.72	280°12.18 · · 29.88 295°14.43 29.95	Jun 09 Wed SHA
4 5	319° 16.72 334° 19.18	257°54.10 53.77 272°53.40 54.44	155° 33.70 3.57 170° 35.05 3.06	174°45.15 6.72 189°47.25 6.60	295°14.43 29.95 310°16.68 30.02	Venus 301°21.30
6	349°21.65	287°52.69 N19°55.11	185°36.40 N08°2.55	204°49.35 N15°6.48	325°18.93 N07°30.10	Mars 197°14.36
7	4°24.11	302°51.99 55.77	200° 37.76 2.03	219°51.44 6.35	340°21.18 30.17	Jupiter 215°47.24
8	19°26.58	317°51.29 56.44	215°39.11 1.52	234°53.54 6.23	355°23.43 30.25	Saturn 336°8.95
9	34°29.04	332°50.59 · · 57.10	230° 40.46 · · 1.01	249°55.64 · · 6.10	10°25.68 · · 30.32	Jun 10 Thu SHA
10	49°31.50	347°49.89 57.76	245°41.81 0.49	264°57.73 5.98	25°27.94 30.39	Venus 300°5.80
11 12	64° 33.97 79° 36.43	2°49.18 58.42 17°48.48 N19°59.08	260°43.16 07°59.98 275°44.52 N07°59.47	279°59.83 5.85 295°1.93 N15°5.73	40°30.19 30.47 55°32.44 N07°30.54	Mars 196°47.97
13	94°38.90	32°47.78 19°59.74	290°45.87 58.95	310° 4.02 5.60	70°34.69 30.61	Jupiter 215° 38.62
14	109°41.36	47°47.07 20°0.40	305°47.22 58.44	325° 6.12 5.48	85°36.94 30.69	Saturn 336°3.73
15	124° 43.82	62°46.37 · · 1.06	320°48.57 · · 57.93	340°8.22 · · 5.35	100°39.19 · · 30.76	Jun 11 Fri SHA
16	139°46.29	77°45.66 1.72	335°49.92 57.41	355°10.31 5.23	115°41.45 30.83	Venus 298° 50.03
17	154°48.75	92°44.95 2.37	350°51.27 56.90	10°12.41 5.10	130°43.70 30.91	Mars 196°21.42
18 19	169°51.22 184°53.68	107°44.25 N20°3.03 122°43.54 3.68	5°52.62 N07°56.39 20°53.97 55.87	25°14.50 N15°4.98 40°16.60 4.85	145°45.95 N07°30.98 160°48.20 31.05	Jupiter 215°29.89
20	199° 56.14	137°42.83 4.33	35°55.32 55.36	55°18.69 4.73	175°50.45 31.13	Saturn 335°58.56
21	214°58.61	152°42.13 · · 4.99	50°56.67 · · 54.84	70°20.79 · · 4.60	190°52.71 · · 31.20	Horizontal parallax
22	$230^{\circ}1.07$	167°41.42 5.64	65°58.01 54.33	85°22.88 4.48	205°54.96 31.27	Venus:
23	245°3.54	182°40.71 6.29	80°59.36 53.81	100°24.98 4.35	220°57.21 31.35	Mars:
Mer.	pass. 06:42	ν-0.7' d0.7' m-3.88	ν1.4' d-0.5' m0.88	ν2.1' d-0.1' m-1.88	ν2.3' d0.1' m0.66	

Dec 29°14.41 -42°9.13 56°41.06 -17° 50.02 $\text{-}57^{\circ}5.56$ $23^{\circ}35.45$ $89^{\circ}22.56$ -40°11.52 4°11.83 49°57.38 16°33.81 -8°10.23 $46^{\circ}1.46$ $6^{\circ}22.42$ 28°37.77 $\text{-}1^{\circ}11.11$ 7°24.67 -52°42.70 -16°45.32 -29°0.68 5°9.20 27°57.58 -59°36.09 -43°32.87 -69°50.10 -8°46.80 11°49.94 61°36.38 $14^{\circ}\,25.10$ $-17^{\circ}41.86$ -63°15.44 -57°16.36 55°48.82 -11°18.41 49°10.69 -60° 30.58 -36°30.50 19°2.37 -60°57.15 74°2.66 $-16^{\circ}9.46$ 26°37.35 -26°29.60 -69°4.59 $-15^{\circ}45.53$ $-37^{\circ}7.37$ $12^{\circ}32.39$ 51°29.04 -34°22.19 38°48.47 -26° 15.64 8°56.45 $\textbf{-56}^{\circ}38.51$ 45°22.54 $10^{\circ}0.05$ -46°49.37 -29°28.38 28°13.80 15°21.14 Mer.pass 10:46 17:41 16:26 08:26 Mer.pass 10:48 17:39 16:23 08:22

> Mer.pass 10:49 17:37 16:19 08:18

> > 0.1 0.1

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.87	N22°53.60	$119^{\circ}5.17$	8.6'	N15°53.93	-13.8'	59.9'
1	195°12.75	53.81	133°32.78	8.7'	15°40.10	-13.9'	59.9'
2	210°12.63 225°12.51	54.03 •• 54.24	148°0.49 162°28.31	8.8' 8.9'	15°26.19 15°12.21	-14.0' -14.1'	59.8' 59.8'
4	240°12.38	54.45	176°56.24	9.0'	14°58.14	-14.1'	59.8'
5	255°12.26	54.67	191°24.27	9.1'	14°44.01	-14.2'	59.8'
6	270°12.14	N22°54.88	205°52.40	9.2'	N14°29.79	-14.3'	59.8'
7	285°12.02 300°11.89	55.09	220°20.63 234°48.96	9.3'	14°15.51 14°1.16	-14.4'	59.7'
8 9	300°11.89 315°11.77	55.30 •• 55.51	234 48.96 249°17.39	9.4' 9.5'	14°1.16 13°46.73	-14.4' -14.5'	59.7' 59.7'
10	330°11.65	55.72	263°45.91	9.6'	13°32.25	-14.6'	59.7'
11	345°11.53	55.92	278°14.54	9.7'	$13^{\circ}17.70$	-14.6'	59.6'
12	0°11.40	N22°56.13	292°43.26	9.8'	N13°3.08	-14.7'	59.6'
13 14	15°11.28 30°11.16	56.34 56.54	307°12.08 321°40.99	9.9' 10.0'	12°48.41 12°33.68	-14.7' -14.8'	59.6' 59.6'
15	45°11.03	56.75	336°9.99	10.1	12° 18.89	-14.8'	59.5'
16	60°10.91	56.95	350°39.09	10.2'	12°4.04	-14.9'	59.5'
17	75°10.79	57.15	5°8.27	10.3'	11°49.14	-14.9'	59.5'
18	90°10.66 105°10.54	N22°57.36	19°37.55 34°6.91	10.4'	N11°34.19 11°19.20	-15.0' -15.0'	59.5' 59.5'
19 20	105°10.54 120°10.42	57.56 57.76	48°36.36	10.5' 10.5'	11°19.20 11°4.15	-15.0 -15.1'	59.5° 59.4'
21	135°10.29	• • 57.96	63°5.90	10.6	10°49.05	-15.1'	59.4
22	150°10.17	58.16	77°35.52	10.7'	10°33.92	-15.2'	59.4'
23	165°10.05	58.36	92°5.22	10.8'	10°18.74	-15.2'	59.4'
	SD = 15.7'	d = 0.2'		SI	D = 16.3'		
-	CILA				-	,	
Thu 0	GHA 180° 9.92	Dec N22°58.56	GHA 106°35.01	u 10.9'	Dec N10°3.51	d -15.3'	HP 59.3'
1	195° 9.80	58.76	100 35.01 121°4.88	10.9'	09°48.25	-15.3'	59.3'
2	210° 9.67	58.95	135°34.82	11.0'	09°32.95	-15.3'	59.3'
3	225° 9.55	59.15	150°4.85	11.1'	09°17.62	-15.4'	59.2'
4	240° 9.42 255° 9.30	59.35 59.54	164°34.95 179°5.13	11.2' 11.3'	09°2.24 08°46.84	-15.4'	59.2' 59.2'
5 6	255 9.30 270° 9.18	59.54 N22°59.74	179 5.13 193°35.38	11.3	N08°31.41	-15.4' -15.5'	59.2'
7	285° 9.05	22°59.93	208°5.71	11.4'	08°15.94	-15.5'	59.1
8	300°8.93	$23^{\circ}0.12$	222°36.11	11.5'	$08^{\circ}0.45$	-15.5'	59.1'
9	315°8.80	• • 0.32	237°6.58	11.5'	07°44.93	-15.5'	59.1'
10 11	330° 8.68 345° 8.55	0.51 0.70	251°37.11 266°7.72	11.6' 11.7'	07°29.38 07°13.81	-15.6' -15.6'	59.1' 59.0'
12	0°8.43	N23°0.89	280°38.39	11.7	N06°58.22	-15.6'	59.0'
13	15°8.30	1.08	295°9.13	11.8'	06°42.61	-15.6'	59.0'
14	30°8.18	1.27	309°39.93	11.9'	$06^{\circ}26.97$	-15.6'	59.0'
15	45°8.05 60°7.92	. 1.45	324°10.79 338°41.72	11.9' 12.0'	06°11.32 05°55.66	-15.7'	58.9'
16 17	7.92 75°7.80	1.64 1.83	358 41.72 353°12.70	12.0'	05°39.98	-15.7' -15.7'	58.9' 58.9'
18	90°7.67	N23°2.01	7°43.74	12.1'	N05°24.28	-15.7'	58.8'
19	105°7.55	2.20	22°14.84	12.2'	05°8.58	-15.7'	58.8'
20	120°7.42	2.38	36°46.00		04°52.86		58.8'
21 22	135°7.30 150°7.17	· · 2.57 2.75	51°17.21 65°48.47	12.3' 12.3'	04°37.14 04°21.40	-15.7' -15.7'	58.8' 58.7'
23	165°7.04	2.73	80°19.79	12.4'	04°21.40	-15.7'	58.7'
	SD = 15.7'	d = 0.2'		SI	D = 16.2'		
Fri 0	GHA 180° 6.92	Dec N23°3.11	GHA 94°51.15	u 12.4'	Dec N03°49.92	d -15.7'	HP 58.7'
1	195°6.79	3.30	109°22.57	12.5'	03°34.17	-15.8'	58.7'
2	210° 6.67	3.48	123°54.03	12.5'	03°18.42	-15.8'	58.6'
3	225°6.54	• • 3.66	138°25.53	12.6'	03°2.67	-15.8'	58.6'
4 5	240° 6.41 255° 6.29	3.83 4.01	152°57.09 167°28.68	12.6' 12.6'	02°46.91 02°31.16	-15.7' -15.7'	58.6' 58.5'
6	270° 6.16	N23°4.19	182°0.32	12.7'	N02°15.42	-15.7'	58.5'
7	285°6.03	4.37	196°32.00	12.7'	$01^{\circ}59.67$	-15.7'	58.5'
8	300°5.91	4.54	211°3.72	12.8'	01°43.94	-15.7'	58.5'
9 10	315° 5.78 330° 5.65	· · 4.72 4.89	225°35.47 240°7.26	12.8' 12.8'	01°28.21 01°12.49	-15.7' -15.7'	58.4' 58.4'
10	330 5.65 345°5.53	4.89 5.07	240 7.26 254°39.09	12.8	01 12.49 00°56.77	-15.7' -15.7'	58.4'
12	0° 5.40	N23°5.24	269°10.95	12.9'	N00°41.07	-15.7	58.3
13	15° 5.27	5.41	283°42.85	12.9'	00°25.38	-15.7'	58.3'
14	30°5.14 45°5.02	5.58	298°14.77 312°46.73	13.0'	N00°9.70 S00°5.96	-15.7'	58.3'
15 16	45°5.02 60°4.89	· · 5.76 5.93	312°46.73 327°18.71	13.0' 13.0'	500°5.96 00°21.61	15.6' 15.6'	58.3' 58.2'
17	75° 4.76	6.10	341°50.73	13.0'	00°21.01	15.6'	58.2'
18	90°4.63	N23°6.26	356°22.76	13.1'	S00°52.85	15.6'	58.2'
19	105° 4.51	6.43	10°54.83	13.1'	01°8.45	15.6'	58.2'
20 21	120° 4.38 135° 4.25	6.60 • • 6.77	25°26.91 39°59.02	13.1' 13.1'	01°24.02 01°39.58	15.6' 15.5'	58.1' 58.1'
21	135° 4.25 150° 4.12	6.93	39°59.02 54°31.15	13.1'	01°39.58 01°55.11	15.5' 15.5'	58.1' 58.1'
23	165° 4.00	7.10	69°3.30	13.2'	02°10.61	15.5'	58.0'
	SD = 15.7'	d = 0.2'		SI	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-45%	
09	00:51	00:46	11:59	16:39	04:13		
10	00:40	00:34	11:59	17:28	05:04		
11	00:28	00:22	12:00	18:15	05:52		

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

h	Aries	, Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0 0	260°6.00	197° 40.00	N20° 6.94	96°0.71	N07°53.30	115°27.07	N15°4.23	235°59.46	N07° 31.42		
1	275°8.47	212°39.29	7.59	111°2.06	52.78	130°29.17	4.10	251°1.72	31.49	Alpheratz	357°32.75
2	290° 10.93	212 39.29 227°38.58	8.23	126°3.41	52.70	145°31.26	3.98	266°3.97	31.56	Ankaa	353°5.32
3	305° 13.39	242°37.87	• 8.88	141°4.75	• • 51.75	160°33.36	• • 3.85	281°6.22	• • 31.64	Schedar	349°28.90
4	320° 15.86	257°37.16	9.52	156°6.10	51.73	175°35.45	3.72	296°8.48	31.71	Diphda	348°45.42
5	335° 18.32	272°36.45	10.17	171°7.45	50.72	190°37.54	3.60	311°10.73	31.78	Achernar	335°19.08
6	350°20.79	287°35.74	N20°10.81	186°8.79	N07°50.20	205°39.64	N15°3.47	326°12.98	N07°31.85	Hamal	327°49.16
7	5°23.25	302°35.02	11.46	201° 10.14	49.69	220°41.73	3.35	341°15.24	31.93	Polaris	313°23.25
8	20°25.71	317°34.31	12.10	216° 11.48	49.17	235°43.82	3.22	356°17.49	32.00	Acamar	315°10.63
9	35°28.18	332°33.60	. 12.74	231°12.83	• • 48.66	250°45.92	3.09	11°19.74	• • 32.07	Menkar	314°4.33
10	50°30.64	347°32.88	13.38	246° 14.18	48.14	265°48.01	2.97	26°22.00	32.14	Mirfak	308°25.81
11	65°33.11	2°32.17	14.02	261° 15.52	47.62	280°50.10	2.84	41°24.25	32.22	Aldebaran	290°37.67
12	80°35.57	17°31.46	N20°14.66	276° 16.87	N07°47.11	295°52.19	N15°2.72	56°26.51	N07°32.29	Rigel	281°2.29
13	95°38.03	32°30.74	15.29	291° 18.21	46.59	310°54.29	2.59	71°28.76	32.36	Capella	280°19.42
14	110° 40.50	47°30.03	15.93	306° 19.55	46.07	325°56.38	2.46	86°31.01	32.43	Bellatrix	278°21.08
15	125°42.96	62°29.31	• • 16.56	321°20.90	• • 45.55	340°58.47	2.34	101°33.27	• • 32.51	Elnath	277°59.73
16	140°45.43	77°28.59	17.20	336°22.24	45.04	356° 0.56	2.21	116°35.52	32.58	Alnilam	275°36.04
17	155° 47.89	92°27.88	17.83	351°23.59	44.52	11°2.65	2.08	131°37.78	32.65	Betelgeuse	270°50.27
18	170°50.35	107°27.16	N20°18.47	6°24.93	N07°44.00	26° 4.75	N15°1.96	146°40.03	N07°32.72	Canopus	263°52.05
19	185°52.82	122°26.44	19.10	21°26.27	43.48	41°6.84	1.83	161°42.29	32.79	Sirius	258°24.82
20	200°55.28	137°25.72	19.73	$36^{\circ}27.61$	42.96	56°8.93	1.70	176°44.54	32.87	Adhara	255°4.65
21	215°57.75	152°25.00	• • 20.36	51°28.96	• • 42.45	71°11.02	• • 1.58	191°46.80	• • 32.94	Procyon	244°49.04
22	231°0.21	167°24.29	20.99	66°30.30	41.93	$86^{\circ}13.11$	1.45	206°49.05	33.01	Pollux	243°15.20 234°14.39
23	246°2.68	182°23.57	21.61	81°31.64	41.41	101°15.20	1.32	221°51.31	33.08	Avior	
N 4	06:30	- 0.7/ -10	6/ 2.00	-12/ -10	0.5′ m0.89	-21/ -/ 0	.1′ m-1.87	- 2 2/ -10	.1′ m0.66	Suhail	222°45.10
ivier.p	pass. 06:39	ν -0.7 au	.6′ m-3.88	ν 1.3 a-0	0.5° m0.89	ν 2.1 a-0.	.1' m-1.8 <i>1</i>	ν 2.3 au	.1' mu.oo	Miaplacidus	221°38.36
										Alphard	217°45.97
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°32.45 193°38.72
0	261°5.14	197°22.85	N20°22.24	96°32.98	N07°40.89	116°17.29	N15°1.19	236°53.56	N07°33.15		193 38.72 182°22.90
1	276°7.60	212°22.13	22.87	111°34.32	40.37	131°19.38	1.07	251°55.82	33.22	Denebola	
2	291°10.07	227°21.40	23.49	126°35.67	39.85	146°21.47	0.94	266°58.07	33.30	Gienah	175°41.45 172°57.61
3	306° 12.53	242°20.68	• • 24.12	141°37.01	• • 39.33	161°23.56	• • 0.81	282°0.33	• • 33.37		172 57.01 171°49.20
4	321°15.00	257° 19.96	24.74	156°38.35	38.82	176°25.65	0.69	297°2.59	33.44	Gacrux Alioth	
5	336° 17.46	272°19.24	25.36	171°39.69	38.30	191°27.74	0.56	312°4.84	33.51	Spica	158°20.02
6	351°19.92	287°18.52	N20°25.98	186°41.03	N07°37.78	206°29.83	N15°0.43	327°7.10	N07°33.58	Alkaid	150 20.02 152°50.17
7	6°22.39	302°17.79	26.60	201°42.37	37.26	221°31.92	0.30	342°9.35	33.65	Hadar	148°32.67
8	21°24.85	317°17.07	27.22	$216^{\circ}43.71$	36.74	236°34.01	0.18	$357^{\circ}11.61$	33.72		146 52.07 147°54.97
9	36°27.32	332°16.35	• • 27.84	231°45.05	• • 36.22	251°36.10	15°0.05	12°13.87	• • 33.80	Arcturus	145°45.86
10	51°29.78	347°15.62	28.46	246°46.38	35.70	266°38.19	14°59.92	$27^{\circ}16.12$	33.87	Rigil Kent.	139°36.99
11	66°32.24	2°14.90	29.07	261°47.72	35.18	281°40.28	59.79	42°18.38	33.94	Kochab	137°18.99
12	81°34.71	17° 14.17	N20°29.69	276°49.06	N07°34.66	296°42.36	N14°59.66	57°20.64	N07°34.01	Zuben'ubi	136°53.53
13	96°37.17	32°13.45	30.30	291°50.40	34.14	311°44.45	59.54	72°22.89	34.08	Alphecca	126°1.73
14	111°39.64	47° 12.72	30.92	$306^{\circ}51.74$	33.62	326°46.54	59.41	87°25.15	34.15	Antares	112° 13.01
15	126°42.10	62°11.99	• • 31.53	321°53.08	• • 33.09	341°48.63	• • 59.28	$102^{\circ}27.41$	• • 34.22	Atria	107°4.84
16	141°44.56	$77^{\circ}11.27$	32.14	$336^{\circ}54.41$	32.57	356°50.72	59.15	$117^{\circ}29.66$	34.29	Sabik	102°0.14
17	156° 47.03	92°10.54	32.75	351°55.75	32.05	11°52.80	59.02	132°31.92	34.36	Shaula	96°7.23
18	171°49.49	107°9.81	N20°33.36	6°57.09	N07°31.53	26°54.89	N14°58.90	147°34.18	N07°34.44	Rasalhague	95°56.35
19	186°51.96	122°9.08	33.97	21°58.42	31.01	41°56.98	58.77	162°36.44	34.51	Eltanin	90°40.71
20	201°54.42	137°8.35	34.58	36° 59.76	30.49	56°59.07	58.64	177°38.69	34.58	Kaus Aust.	83°29.47
21	216°56.89	152°7.62	• • 35.18	52°1.10	• • 29.97	72° 1.15	• • 58.51	192°40.95	• • 34.65	Vega	80°31.45
22	231°59.35	167°6.89	35.79	67°2.43	29.45	87° 3.24	58.38	207°43.21	34.72	Nunki	75°44.94
23	247°1.81	182°6.16	36.39	82°3.77	28.92	102°5.33	58.25	222°45.47	34.79	Altair	61°57.73
Mer r	pass. 06:35	ν -0.7' d0	.6′ m-3.88	$\nu 1.3' d-0$	0.5′ m0.90	$\nu 2.1' d-0$.1′ m-1.87	$\nu^2 3' d0$.1′ m0.66	Peacock	53°2.19
										Deneb	49°24.10
										Enif	33°36.68
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.28
0	262°4.28	197°5.43	N20°37.00	97°5.10	N07°28.40		N14°58.13	237°47.73	N07°34.86	Fomalhaut	15°12.29
1	277°6.74	212°4.70	37.60	112°6.44	27.88	132° 9.50	58.00	252°49.98	34.93	Scheat	13°43.21
2	292°9.21	227°3.97	38.20	127°7.77	27.36	147°11.59	57.87	267°52.24	35.00	Markab	13°27.87
3	307°11.67	242°3.24	• • 38.80	142°9.11	• • 26.83	162°13.67	• • 57.74	282°54.50	• • 35.07	1. 10.0	CIIA
4	322°14.13	257°2.51	39.40	157°10.44	26.31	177°15.76	57.61	297°56.76	35.14	Jun 12 Sat	SHA
5	337° 16.60	272°1.77	40.00	172°11.78	25.79	192°17.84	57.48	312°59.02	35.21		297°34.00
6	352°19.06		N20°40.60	187° 13.11		207°19.93			N07°35.28		195°54.71
7	7°21.53	302°0.31	41.20	202°14.44	24.74	222°22.01	57.22	343°3.53	35.35		215°21.07
8	22°23.99	316°59.57	41.79	217° 15.78	24.22	237°24.10	57.09	358°5.79	35.42	Saturn	335°53.46
9	37°26.45	331°58.84	• • 42.39	232°17.11	• • 23.70	252°26.18	56.96	13°8.05	• • 35.49	Jun 13 Sun	SHA
10	52°28.92	346°58.10	42.98	247° 18.44	23.17	267°28.27	56.84	28°10.31	35.56		296°17.71
11	67°31.38	1°57.37	43.58	262°19.77	22.65	282°30.35	56.71	43°12.57	35.63		195°27.84
12	82°33.85	16°56.63	N20°44.17	277°21.11	N07°22.12	297°32.44	N14°56.58		N07°35.70		215°12.15
13	97°36.31	31°55.90	44.76 45.35	292°22.44	21.60	312°34.52	56.45 56.32	73°17.09 88°19.35	35.77 35.84	Saturn	335°48.42
14	112°38.77	46°55.16	45.35	307°23.77	21.08	327°36.61	56.32		35.84		
15 16	127° 41.24 142° 43.70	61°54.42 76°53.69	• • 45.94 46.53	322°25.10 337°26.43	· · 20.55 20.03	342°38.69 357°40.77	· · 56.19	103°21.61 118°23.87	· · 35.91	Jun 14 Mon	SHA
16 17			46.53 47.12	352° 27.76			56.06 55.03	118°23.87 133°26.13	35.98 36.05	Venus	295°1.16
17 18	157° 46.17 172° 48.63	91°52.95 106°52.21	47.12 N20°47.70	7°29.10	19.50 N07°18.98	12°42.86 27°44.94	55.93 N14°55.80		36.05 N07°36.12	Mars	195°0.83
18 19	172°48.63 187°51.10	106 52.21 121°51.47	N20 47.70 48.29	22°30.43	18.45	42°47.03	55.67	148° 28.39 163° 30.65	36.19	Jupiter	215°3.14
20	202°53.56	121 51.47 136°50.73	48.29 48.87	22 30.43 37°31.76	17.93	42 47.03 57°49.11	55.54	103 30.05 178°32.91	36.19	Saturn	335°43.45
21	202 53.56 217°56.02	150 50.73 151°49.99	48.87 • • 49.46	52° 33.09	17.93	72°51.19	55.54	178 32.91 193°35.17	36.33	Horizor	ıtal parallax
22	217 56.02 232°58.49	151 49.99 166°49.25	50.04	52 33.09 67°34.42	16.88	72 51.19 87°53.27	55.28	193 35.17 208°37.43	36.40		Venus:
23	232 36.49 248°0.95	100 49.25 181°48.51	50.62	82°35.74	16.35	102°55.36	55.26 55.15	206 37.43 223°39.69	36.47		Mars:
Mer.p	pass. 06:31	ν -0.7 $'$ d0	.6′ m-3.88	ν 1.3′ d-0	$0.5' \; \text{m} 0.91$	$\nu 2.1' \ d-0.0$	$.1^\prime$ m-1.86	$\nu 2.3' \ d0$.1′ m0.66		

Alpheratz Ankaa 357°32.75 29°14.41 Ankaa 353°5.32 42°9.12 Schedar Diphda Adhernar Alpheratz Schedar Diphda Asa°45.42 -17°5.0.01 Achernar Alamal Araberias Alamar Alamal Amirfak Amirfak Alfaka Amirfak Alfaka Alfakar Aldebaran Rigel Capella Bellatrix Elnath Betelgeuse Canopus Sirius Adhara Adhara Adhara Adhara Elnath Betelgeuse Canopus Sirius Adhara Adhara Adhara Adhara Adhara Betelgeuse Canopus Sirius Adhara Canopus Sara Alioth Alphard Alphard Alphard Alphard Alphard Alphard Alphard Alphard Alphard Alkaid Alfare Alkaid Alkaid Alkaid Alkaid Alkaid Alfare Arcturus Alfa-8-8-0.02 Alphocca Alphecca Altares Antares Antares Antares Antares Antares Alphecca Altari Alfa-3-5-0.35 Alphecca Altari Alfa-3-5-0.17 Alioth Alkaid Alphecca Altari Alfa-4.33 Aloth Alkaid Alphecca Altari Alfa-4-3-3-2-0.40 Alphecca Altari Alfa-4-3-3-2-0.40 Alphecca Altari Alfa-4-3-3-2-0.40 Alphecca Altari Alfa-4-3-3-2-0.40 Altari Alfa-6-9-6-6-3-5-3-1-6-9-45 Alphecca Altari Alfa-6-9-6-6-3-5-5-4-6-6-3-3-5-6-6-6-3-5-5-4-6-6-6-3-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6		Stars	
Ankaa 353°5.32 -42°9.12 Schedar 349°28.90 56°41.06 Diphda 348°45.42 -17°50.01 Achernar 335°19.08 -57°5.55 Hamal 327°49.16 23°35.45 Polaris 313°23.25 89°22.55 Acamar Mirfak 308°25.81 49°57.37 Aldebaran 280°1.06 -40°11.51 Melkar 281°2.29 -8°10.22 Capella 280°19.42 46°1.45 Bellatrix 278°21.08 6°22.43 Elnath 277°59.73 28°37.77 Alnilam 275°36.04 -1°11.11 Betelgeuse 270°50.27 7°24.68 Canopus 263°52.05 -52°42.68 Sirius 258°2.482 -16°45.31 Adhara 255°4.65 -29°0.67 Procyon 244°49.04 5°9.21 Pollux 243°15.20 27°57.58 Avior 221°38.36 -69°50.09 Alphard 217°45.97 -8°46.80		SHA	Dec
Schedar 349°28.90 56°41.06 Diphda 348°45.42 -17°50.01 Achernar 335°19.08 -57°5.55 Hamal 327°49.16 23°35.45 Polaris 313°23.25 89°22.55 Acamar 316°10.63 -40°11.51 Menkar 314°4.33 4°11.84 Mirfak 308°25.81 49°57.37 Aldebaran 290°37.67 16°33.81 Rigel 281°2.29 -8°10.22 Capella 280°19.42 46°1.45 Bellatrix 278°21.08 6°22.43 Elnath 277°59.73 28°37.77 Alnilam 275°36.04 -1°11.11 Betelgeuse 270°50.27 7°24.68 Canopus 263°52.05 -52°4.68 Sirius 258°24.82 -16°45.31 Adhara 255°4.65 -29°0.67 Procyon 244°40.4 5°9.21 Pollux 243°15.20 27°57.58 Aviari 222°45.10 -43°32.86 <			
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Shaula 96°7.23 -37°7.38 Rasalhague 95°56.35 12°32.40 Eltanin 90°40.71 51°29.06 Kaus Aust. 83°29.47 -34°22.19 Vega 80°31.45 38°48.48 Nunki 75°44.94 -26°15.64 Altair 61°57.73 8°56.46 Peacock 53°2.19 -56°38.51 Deneb 49°24.10 45°22.55 Enif 33°36.68 10°0.06 Al Na'ir 27°30.28 -46°49.37 Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 Jun 12 Sat SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°12.07 16:16 Saturn 335°53.46 08:15 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jupiter 295°1.1			
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Kaus Aust. 83°29.47 -34°22.19 Vega 80°31.45 38°48.48 Nunki 75°44.94 -26°15.64 Altair 61°57.73 8°56.46 Peacock 53°2.19 -56°38.51 Deneb 49°24.10 45°22.55 Enif 33°36.68 10°0.06 Al Na'ir 27°30.28 -46°49.37 Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 Jun 12 Sat SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA			12°32.40
Vega 80°31.45 38°48.48 Nunki 75°44.94 -26°15.64 Altair 61°57.73 8°56.46 Peacock 53°2.19 -56°38.51 Deneb 49°24.10 45°22.55 Enif 33°36.68 10°0.06 Al Na'ir 27°30.28 -46°49.37 Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 Jun 12 Sat SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 1		$90^{\circ}40.71$	
Nunki 75° 44.94 -26° 15.64 Altair 61° 57.73 8° 56.46 Peacock 53° 2.19 -56° 38.51 Deneb 49° 24.10 45° 22.55 Enif 33° 36.68 10° 0.06 Al Na'ir 27° 30.28 -46° 49.37 Fomalhaut 15° 12.29 -29° 28.38 Scheat 13° 27.87 15° 21.15 Jun 12 Sat SHA Mer.pass Venus 297° 34.00 10:50 Mars 195° 44.71 17:34 Jupiter 215° 21.07 16:16 Saturn 335° 53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296° 17.71 10:51 Mars 195° 27.84 17:32 Jupiter 215° 12.15 16:13 Saturn 335° 48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295° 1.16 10:52 Mars 195° 0.83 17:30 Jupiter 215° 3			
Altair 61°57.73 8°56.46 Peacock 53°2.19 -56°38.51 Deneb 49°24.10 45°22.55 Enif 33°36.68 10°0.06 Al Na'ir 27°30.28 -46°49.37 Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09 <			
Peacock Deneb 53° 2.19 -56° 38.51 Deneb 49° 24.10 45° 22.55 Enif 33° 36.68 10° 0.06 Al Na'ir 27° 30.28 -46° 49.37 Fomalhaut 15° 12.29 -29° 28.38 Scheat 13° 43.21 28° 13.81 Markab 13° 27.87 15° 21.15 Jun 12 Sat SHA Mer.pass Venus 297° 34.00 10:50 Mars 195° 54.71 17:34 Jupiter 215° 21.07 16:16 Saturn 335° 53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296° 17.71 10:51 Mars 195° 27.84 17:32 Jupiter 215° 12.15 16:13 Saturn 335° 48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295° 1.16 10:52 Mars 195° 0.83 17:30 Jupiter 215° 3.14 16:09			
Enif 33°36.68 10°0.06 Al Na'ir 27°30.28 -46°49.37 Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 Jun 12 Sat SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09		$53^{\circ}2.19$	-56°38.51
Al Na'ir Fomalhaut Fomalhaut Scheat Scheat 13°43.21 Jun 12 Sat Venus 297°34.00 Mars Jupiter Saturn Venus 15°54.71 Jun 13 Sun Venus 195°54.71 Mars 195°54.71 Mars 195°54.71 Jupiter 215°21.07 Mer.pass Mer.pass Mer.pass Mer.pass Mer.pass Mer.pass 195°27.84 Mer.pass 195°27.84 17:32 Jupiter 215°12.15 Jupiter 215°12.15 Saturn Jupiter 215°12.15 Saturn Jupiter 215°12.15			
Fomalhaut 15°12.29 -29°28.38 Scheat 13°43.21 28°13.81 Markab 13°27.87 15°21.15 Jun 12 Sat SHA Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09			
Scheat Markab 13°43.21 15°21.15 Jun 12 Sat Venus SHA 297°34.00 10:50 Mars 195°54.71 17:34 15°21.07 16:16 Jun 13 Sun SHA Venus SHA 08:15 Jun 13 Sun Venus SHA 08:15 Jun 13 Sun Venus SHA 17:32 Jupiter 296°17.71 10:51 10:51 Mars 195°27.84 17:32 17:32 Jupiter 215°12.15 16:13 335°48.42 08:11 Jun 14 Mon Venus 295°1.16 10:52 10:52 Mars 195°0.83 17:30 17:30 Jupiter 215°3.14 16:09 16:09			
Jun 12 Sat SHA Verus Mer.pass Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09	Scheat	$13^{\circ}43.21$	
Venus 297°34.00 10:50 Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 Jun 13 Sun SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09	Markab	13°27.87	15°21.15
Mars 195°54.71 17:34 Jupiter 215°21.07 16:16 Saturn 335°53.46 08:15 SHA Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09			
Jupiter Saturn 215°21.07 335°53.46 16:16 08:15 Jun 13 Sun Venus SHA 296°17.71 29:51 Mer.pass 17:32 Jupiter 215°27.84 29:11 17:32 29:16:13 Jupiter 215°12.15 32:11 16:13 335°48.42 08:11 Jun 14 Mon Venus 295°1.16 10:52 10:52 Mars 195°0.83 17:30 195°0.83 17:30 Jupiter 215°3.14 16:09 16:09			
Jun 13 Sun SHA Verus Mer.pass Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09		$215^{\circ}21.07$	
Venus 296°17.71 10:51 Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09	Saturn	335°53.46	08:15
Mars 195°27.84 17:32 Jupiter 215°12.15 16:13 Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09			
Jupiter Saturn 215°12.15 235°48.42 16:13 08:11 Jun 14 Mon Venus Venus 295°1.16 Mars 195°0.83 17:30 Jupiter 215°3.14 Mer.pass 17:30 17:30 17:30 17:30 17:30			
Saturn 335°48.42 08:11 Jun 14 Mon SHA Mer.pass Venus 295°1.16 10:52 Mars 195°0.83 17:30 Jupiter 215°3.14 16:09			
Venus 295° 1.16 10:52 Mars 195° 0.83 17:30 Jupiter 215° 3.14 16:09			
Mars 195° 0.83 17:30 Jupiter 215° 3.14 16:09			
Jupiter 215°3.14 16:09			
•			

0.1 0.1

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°3.87	N23°7.26	83°35.46	13.2'	S02°26.09	15.5'	58.0'
1	195°3.74	7.43	98°7.65	13.2'	$02^{\circ}41.55$	15.4'	58.0'
2	210°3.61	7.59	112°39.85	13.2'	02°56.98	15.4	58.0'
3 4	225°3.48 240°3.36	· · 7.75 7.92	127°12.06 141°44.29	13.2' 13.2'	03°12.38 03°27.75	15.4' 15.3'	57.9' 57.9'
5	255° 3.23	8.08	156° 16.52	13.2'	03°43.09	15.3'	57.9'
6	270°3.10	N23°8.24	170° 48.77	13.3'	S03°58.40	15.3'	57.8'
7	285°2.97	8.40	$185^{\circ}21.03$	13.3'	$04^{\circ}13.68$	15.2'	57.8'
8	300°2.84	8.56	199°53.30	13.3'	04°28.92	15.2'	57.8'
9 10	315°2.71 330°2.58	· · 8.71 8.87	214°25.57 228°57.85	13.3' 13.3'	04°44.13 04°59.30	15.2' 15.1'	57.8' 57.7'
11	345°2.46	9.03	243°30.14	13.3'	04 59.30 05°14.44	15.1	57.7'
12	0°2.33	N23°9.19	258°2.43	13.3'	S05°29.53	15.1'	57.7'
13	15°2.20	9.34	272°34.72	13.3'	$05^{\circ}44.59$	15.0'	57.7'
14	30°2.07	9.50	287°7.01	13.3'	05°59.61	15.0'	57.6'
15 16	45°1.94 60°1.81	•• 9.65 9.80	301°39.30 316°11.59	13.3' 13.3'	06° 14.58 06° 29.52	14.9' 14.9'	57.6' 57.6'
17	75°1.68	9.96	330°43.88	13.3'	06° 44.41	14.8'	57.5
18	90°1.55	N23°10.11	345° 16.16	13.3'	S06°59.25	14.8'	57.5'
19	105°1.42	10.26	359° 48.44	13.3'	$07^{\circ}14.06$	14.8'	57.5'
20	120°1.29	10.41	14°20.71	13.3'	07°28.81	14.7'	57.5'
21 22	135°1.16 150°1.03	· · 10.56 10.71	28°52.98 43°25.24	13.3' 13.2'	07°43.52 07°58.17	14.7' 14.6'	57.4' 57.4'
23	165°0.90	10.71	57° 57.49	13.2'	07 38.17 08°12.78	14.6'	57.4'
_5	SD = 15.7'	d = 0.2'			0 = 15.8'		
	<u> </u>	<u>u = 0.2</u>		JL	7 — 15.6		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°0.78 195°0.65	N23°11.00 11.15	72°29.73 87°1.95	13.2' 13.2'	\$08°27.34 08°41.85	14.5' 14.5'	57.4' 57.3'
2	210°0.52	11.15	101°34.17	13.2'	08°56.30	14.5	57.3'
3	225°0.39	• • 11.44	116°6.37	13.2'	09° 10.70	14.3'	57.3'
4	240°0.26	11.59	130°38.56	13.2'	$09^{\circ}25.05$	14.3'	57.2'
5	255°0.13	11.73	145° 10.73	13.2'	09°39.34	14.2'	57.2'
6 7	270°0.00 284°59.87	N23°11.88 12.02	159° 42.88 174° 15.02	13.1' 13.1'	\$09°53.57 10°7.74	14.2' 14.1'	57.2' 57.2'
8	299°59.74	12.02	174 15.02 188° 47.14	13.1	10 7.74 10°21.86	14.1	57.2 57.1'
9	314°59.61	• • 12.30	203° 19.24	13.1'	10°35.92	14.0'	57.1'
10	329°59.48	12.44	$217^{\circ}51.32$	13.1'	$10^{\circ}49.91$	13.9'	57.1'
11	344°59.35	12.58	232°23.38	13.0'	11°3.85	13.9'	57.1'
12 13	359°59.21 14°59.08	N23° 12.72 12.86	246°55.42 261°27.43	13.0' 13.0'	\$11°17.72 11°31.53	13.8' 13.7'	57.0' 57.0'
14	29°58.95	13.00	201 27.43 275°59.42	13.0'	11°45.27	13.7'	57.0'
15	44°58.82	• • 13.14	290°31.38	12.9'	11°58.95	13.6'	57.0'
16	59°58.69	13.27	305°3.32	12.9'	12° 12.56	13.5'	56.9'
17	74°58.56	13.41	319°35.23	12.9'	12°26.11	13.5'	56.9'
18 19	89°58.43 104°58.30	N23° 13.54 13.68	334°7.11 348°38.96	12.9' 12.8'	\$12°39.58 12°52.99	13.4' 13.3'	56.9' 56.9'
20	119°58.17	13.81	3° 10.79	12.8'	13°6.32	13.3'	56.8'
21	134°58.04	• • 13.94	17° 42.58	12.8'	13° 19.59	13.2'	56.8'
22	149°57.91	14.08	$32^{\circ}14.35$	12.7'	13°32.78	13.1'	56.8'
23	164°57.78	14.21	46°46.08	12.7'	13°45.90	13.0'	56.8'
	SD = 15.7'	d = 0.1'		SE	0 = 15.6'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°57.65	N23°14.34	61° 17.78	12.7'	S 13°58.94	13.0'	56.7'
1	194°57.51	14.47	75°49.44	12.6'	14°11.91	12.9' 12.8'	56.7'
2	209°57.38 224°57.25	14.60 •• 14.72	90°21.07 104°52.67	12.6' 12.6'	14°24.81 14°37.62	12.8° 12.7'	56.7' 56.7'
4	239°57.12	14.72	119° 24.23	12.5'	14°50.36	12.7'	56.6'
5	254°56.99	14.98	133°55.76	12.5'	15°3.02	12.6'	56.6'
6	269°56.86	N23° 15.11	148° 27.25	12.5'	\$15°15.60	12.5'	56.6'
7	284°56.73 299°56.60	15.23 15.36	162°58.70 177°30.11	12.4' 12.4'	15°28.09 15°40.51	12.4' 12.3'	56.6' 56.5'
8 9	314°56.46	15.36	177° 30.11 192° 1.48	12.4	15° 40.51 15° 52.84	12.3	56.5'
10	329°56.33	15.60	206° 32.82	12.3'	16°5.09	12.2'	56.5
11	344°56.20	15.73	221°4.11	12.3'	16° 17.26	12.1'	56.5'
12	359°56.07	N23° 15.85	235°35.37	12.2'	\$16°29.33	12.0'	56.4
13 14	14°55.94 29°55.81	15.97 16.09	250°6.58 264°37.76	12.2' 12.1'	16°41.33 16°53.23	11.9' 11.8'	56.4' 56.4'
14 15	29°55.81 44°55.67	16.09	264°37.76 279°8.89	12.1'	10°53.23 17°5.05	11.8	56.4'
16	59°55.54	16.33	293°39.97	12.0'	17° 16.77	11.6'	56.4
17	74°55.41	16.45	308°11.02	12.0'	$17^{\circ}28.41$	11.5'	56.3'
18	89°55.28	N23° 16.57	322° 42.02	12.0'	\$17°39.96	11.5'	56.3'
19 20	104°55.15 119°55.01	16.68 16.80	337°12.98 351°43.89	11.9' 11.9'	17°51.41 18°2.77	11.4' 11.3'	56.3' 56.3'
21	119 55.01 134°54.88	16.80	6°14.76	11.9	18 2.77 18°14.04	11.3	56.2'
22	149°54.75	17.03	20° 45.58	11.8'	18° 25.21	11.1'	56.2
23	164°54.62	17.15	35° 16.36	11.7'	18°36.28	11.0'	56.2'
	SD = 15.7'	d = 0.1'		SE	0 = 15.5'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	56-76%	
12	00:15	00:09	12:00	19:01	06:38		
13	00:03	00:03	12:00	19:47	07:24		
14	00:09	00:16	12:00	20:34	08:10		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	263°3.42	196°47.77 N20°51.20	97°37.07 N07°15.83	117°57.44 N14°55.02	238°41.95 N07°36.54	Alpheratz 357°32.73 29°14.42
1	278°5.88	211° 47.03 51.78	112° 38.40 15.30	132°59.52 54.89	253°44.21 36.61	Ankaa 353°5.30 -42°9.11
2	293°8.34	226°46.29 52.36	127°39.73 14.78	148° 1.60 54.76	268°46.47 36.68	Schedar 349°28.86 56°41.06
3 4	308° 10.81 323° 13.27	241° 45.54 · · 52.94 256° 44.80 53.51	142°41.06 · · 14.25 157°42.39 13.72	163° 3.69 · · 54.63 178° 5.77 54.50	283°48.73 · · 36.74 298°50.99 36.81	Diphda 348°45.40 -17°50.00
5	338° 15.74	271°44.06 54.09	172°43.72 13.20	176 5.77 54.30 193° 7.85 54.37	313°53.26 36.88	Achernar 335°19.06 -57°5.53
6	353° 18.20	286°43.31 N20°54.66	187°45.04 N07°12.67	208°9.93 N14°54.24	328°55.52 N07°36.95	Hamal 327°49.14 23°35.45 Polaris 313°22.03 89°22.54
7	8°20.67	301°42.57 55.24	202°46.37 12.14	223°12.01 54.11	343°57.78 37.02	Acamar 315°10.61 -40°11.50
8	23°23.13	316°41.83 55.81	217° 47.70 11.62	238°14.09 53.97	359°0.04 37.09	Menkar 314°4.31 4°11.84
9 10	38°25.59 53°28.06	331°41.08 · · 56.38 346°40.33 56.95	232°49.03 ·· 11.09 247°50.35	253°16.18 · · 53.84 268°18.26 53.71	14°2.30 · · 37.16 29°4.56 37.23	Mirfak 308°25.79 49°57.36
11	68° 30.52	1°39.59 57.52	262°51.68 10.04	283°20.34 53.58	44°6.83 37.30	Aldebaran 290° 37.66 16° 33.81
12	83°32.99	16°38.84 N20°58.09	277°53.00 N07°9.51	298°22.42 N14°53.45	59°9.09 N07°37.37	Rigel 281°2.29 -8°10.22 Capella 280°19.41 46°1.44
13	98° 35.45	31°38.10 58.66	292°54.33 8.98	313°24.50 53.32	74°11.35 37.43	Bellatrix 278°21.07 6°22.43
14	113°37.91	46°37.35 59.22 61°36.60 20°59.79	307°55.66 8.45	328°26.58 53.19	89°13.61 37.50	Elnath 277°59.72 28°37.77
15 16	128° 40.38 143° 42.84	76°35.85 21°0.36	322°56.98 · · 7.93 337°58.31 7.40	343°28.66 · · 53.06 358°30.74 52.93	104°15.87 · · 37.57 119°18.14 37.64	Alnilam 275°36.04 -1°11.10
17	158° 45.31	91°35.11 0.92	352°59.63 6.87	13°32.82 52.80	134°20.40 37.71	Betelgeuse 270°50.26 7°24.68
18	173° 47.77	106°34.36 N21°1.48	8°0.96 N07°6.34	28°34.90 N14°52.66	149°22.66 N07°37.78	Canopus 263°52.05 -52°42.67 Sirius 258°24.82 -16°45.30
19	188°50.24	121°33.61 2.04	23°2.28 5.82	43°36.98 52.53	164°24.92 37.84	Adhara 255°4.65 -29°0.66
20	203°52.70 218°55.16	136°32.86 2.60 151°32.11 · · 3.16	38°3.60 5.29 53°4.93 •• 4.76	58°39.06 52.40 73°41.14 • 52.27	179°27.19 37.91 194°29.45 · · 37.98	Procyon 244°49.04 5°9.21
21 22	218°55.16 233°57.63	151°32.11 · · · 3.16 166°31.36 · · · 3.72	68° 6.25 4.23	73°41.14 · · · 52.27 88°43.22 52.14	209°31.71 38.05	Pollux 243°15.20 27°57.58
23	249°0.09	181°30.61 4.28	83°7.58 3.70	103°45.30 52.01	224°33.98 38.12	Avior 234°14.40 -59°36.07
Merr	pass. 06:27	ν-0.7' d0.6' m-3.88	ν1.3' d-0.5' m0.92	ν2.1' d-0.1' m-1.86	$\nu 2.3' \ d0.1' \ m0.65$	Suhail 222°45.11 -43°32.85 Miaplacidus 221°38.39 -69°50.08
14161.1		ν σ.τ ασ.σ III-3.σσ	ν1.5 u-0.5 III0.92		ν 2.5 do.1 iiio.05	Alphard 217°45.98 -8°46.79
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.46 11°49.94
vvea 0	264°2.56	196°29.86 N21°4.84	98°8.90 N07°3.17	118°47.37 N14°51.87	GHA Dec 239°36.24 N07°38.19	Dubhe 193°38.75 61°36.38
1	279°5.02	211°29.10 5.39	113°10.22 2.64	133°49.45 51.74	254°38.50 38.25	Denebola 182°22.91 14°25.11 Gienah 175°41.46 -17°41.85
2	294°7.48	226°28.35 5.95	128° 11.54 2.11	148°51.53 51.61	269°40.77 38.32	Acrux 172°57.63 -63°15.44
3	309°9.95	241°27.60 · · 6.50	143°12.87 · · 1.58	163°53.61 · · 51.48	284°43.03 · · 38.39	Gacrux 171°49.21 -57°16.37
4 5	324° 12.41 339° 14.88	256°26.85 7.06 271°26.09 7.61	158°14.19 1.05 173°15.51 0.53	178°55.69 51.35 193°57.77 51.22	299°45.30 38.46 314°47.56 38.53	Alioth 166°11.08 55°48.83
6	354° 17.34	286°25.34 N21°8.16	188°16.83 N07°0.00	208°59.84 N14°51.08	329°49.82 N07°38.59	Spica 158°20.03 -11°18.41
7	9° 19.81	301°24.58 8.71	203°18.15 06°59.47	224° 1.92 50.95	344°52.09 38.66	Alkaid 152°50.19 49°10.71 Hadar 148°32.69 -60°30.60
8	24°22.27	316°23.83 9.26	218° 19.48 58.94	239°4.00 50.82	359°54.35 38.73	Menkent 147°54.98 -36°30.51
9	39°24.73	331°23.07 · · 9.80	233°20.80 · · 58.41	254°6.08 · · 50.69	14°56.62 · · 38.80	Arcturus 145°45.87 19°2.39
10 11	54°27.20 69°29.66	346°22.32 10.35 1°21.56 10.90	248° 22.12 57.87 263° 23.44 57.34	269° 8.15 50.55 284° 10.23 50.42	29°58.88 38.86 45°1.15 38.93	Rigil Kent. 139°37.00 -60°57.17
12	84°32.13	16°20.81 N21°11.44	278°24.76 N06°56.81	299°12.31 N14°50.29	60°3.41 N07°39.00	Kochab 137°19.04 74°2.68
13	99°34.59	31°20.05 11.99	293°26.08 56.28	314°14.38 50.16	75°5.67 39.07	Zuben'ubi 136°53.53 -16°9.45 Alphecca 126°1.73 26°37.37
14	114° 37.05	46°19.29 12.53	308° 27.40 55.75	329°16.46 50.02	90°7.94 39.13	Antares 112°13.01 -26°29.61
15	129°39.52	61°18.54 · · 13.07	323°28.72 · · 55.22	344°18.54 · · 49.89	105°10.20 · · 39.20	Atria 107°4.83 -69°4.62
16 17	144° 41.98 159° 44.45	76°17.78 13.61 91°17.02 14.15	338°30.04 54.69 353°31.35 54.16	359°20.61 49.76 14°22.69 49.63	120°12.47 39.27 135°14.74 39.34	Sabik 102°0.13 -15°45.52
18	174° 46.91	106°16.26 N21°14.69	8°32.67 N06°53.63	29°24.76 N14°49.49	150°17.00 N07°39.40	Shaula 96°7.22 -37°7.38
19	189°49.38	121°15.50 15.23	23°33.99 53.10	44°26.84 49.36	165°19.27 39.47	Rasalhague 95°56.35 12°32.41 Eltanin 90°40.71 51°29.07
20	204°51.84	136°14.74 15.76	38°35.31 52.56	59°28.92 49.23	180°21.53 39.54	Kaus Aust. 83°29.46 -34°22.19
21 22	219°54.30 234°56.77	151°13.98 · · 16.30 166°13.22 16.83	53°36.63 · · 52.03 68°37.95 51.50	74°30.99 · · 49.09 89°33.07 48.96	195°23.80 · · 39.61 210°26.06 39.67	Vega 80°31.44 38°48.50
23	249° 59.23	166° 13.22 16.83 181° 12.46 17.37	83°39.26 50.97	104°35.14 48.83	225°28.33 39.74	Nunki 75°44.93 -26°15.64
				-		Altair 61°57.72 8°56.47 Peacock 53°2.17 -56°38.52
ivier.p	pass. 06:23	ν-0.8' d0.6' m-3.88	ν1.3' d-0.5' m0.93	ν2.1' d-0.1' m-1.86	$\nu 2.3' \ d0.1' \ m0.65$	Peacock 53°2.17 -56°38.52 Deneb 49°24.08 45°22.57
	~	-	-	-		Enif 33°36.66 10°0.07
Thu 0	GHA 265°1.70	GHA Dec 196°11.70 N21°17.90	GHA Dec 98°40.58 N06°50.44	GHA Dec 119°37.22 N14°48.69	GHA Dec 240°30.60 N07°39.81	Al Na'ir 27°30.26 -46°49.37
1	280°4.16	211°10.94 18.43	113°41.90 49.90	134°39.29 48.56	255°32.86 39.87	Fomalhaut 15°12.27 -29°28.37 Scheat 13°43.18 28°13.82
2	295°6.62	226°10.17 18.96	128°43.21 49.37	149°41.37 48.43	270°35.13 39.94	Scheat 13°43.18 28°13.82 Markab 13°27.84 15°21.16
3	310°9.09	241°9.41 · · 19.49	143°44.53 · · 48.84	164°43.44 · · 48.29	285°37.39 · · 40.01	
4	325°11.55 340°14.02	256°8.65 20.02 271°7.89 20.55	158° 45.85 48.31 173° 47.16 47.77	179°45.52 48.16 194°47.59 48.03	300°39.66 40.07	Jun 15 Tue SHA Mer.pass Venus 293°44.35 10:53
5 6	340° 14.02 355° 16.48	271°7.89 20.55 286°7.12 N21°21.08	173°47.16 47.77 188°48.48 N06°47.24	194°47.59 48.03 209°49.66 N14°47.89	315°41.93 40.14 330°44.19 N07°40.21	Mars 194°33.66 17:28
7	10° 18.95	301°6.36 21.60	203°49.79 46.71	224°51.74 47.76	345°46.46 40.27	Jupiter 214°54.02 16:06
8	25°21.41	316°5.59 22.13	218°51.11 46.17	239°53.81 47.63	0°48.73 40.34	Saturn 335°38.53 08:04
9	40°23.87	331°4.83 · · 22.65	233°52.42 · · 45.64	254°55.88 · · 47.49	15°51.00 · · 40.41	Jun 16 Wed SHA Mer.pass
10 11	55°26.34 70°28.80	346°4.06 23.17 1°3.30 23.69	248° 53.74 45.11 263° 55.05 44.57	269°57.96 47.36 285°0.03 47.22	30°53.26 40.47 45°55.53 40.54	Venus 292°27.30 10:55
12	85°31.27	16°2.53 N21°24.21	278°56.37 N06°44.04	300°2.10 N14°47.09	60°57.80 N07°40.61	Mars 194°6.34 17:26
13	$100^{\circ}33.73$	31°1.76 24.73	293°57.68 43.50	315°4.18 46.96	76°0.07 40.67	Jupiter 214°44.82 16:03 Saturn 335°33.68 08:00
14	115°36.19	46°1.00 25.25	308°59.00 42.97	330° 6.25 46.82	91°2.33 40.74	
15 16	130°38.66	61°0.23 · · 25.77	324°0.31 · · 42.44	345°8.32 · · 46.69	106°4.60 · · 40.80	Jun 17 Thu SHA Mer.pass
16 17	145° 41.12 160° 43.59	75°59.46 26.29 90°58.69 26.80	339°1.62 41.90 354°2.94 41.37	0°10.40 46.55 15°12.47 46.42	121°6.87 40.87 136°9.14 40.94	Venus 291°10.00 10:56 Mars 193°38.88 17:24
18	175° 46.05	105°57.92 N21°27.32	9°4.25 N06°40.83	30°14.54 N14°46.29	151°11.41 N07°41.00	Jupiter 214°35.52 15:59
19	190°48.52	120°57.16 27.83	24°5.56 40.30	45°16.61 46.15	166°13.67 41.07	Saturn 335°28.90 07:57
20	205°50.98	135° 56.39 28.34	39°6.87 39.76	60°18.68 46.02	181°15.94 41.13	Horizontal parallax
21 22	220° 53.44 235° 55.91	150°55.62 · · 28.85 165°54.85 29.36	54°8.19 · · 39.23 69°9.50 38.69	75°20.76 · · 45.88 90°22.83 45.75	196°18.21 · · 41.20 211°20.48 41.27	Venus: 0.1
23	250° 58.37	180°54.07 29.87	84°10.81 38.16	105°24.90 45.61	226°22.75 41.33	Mars: 0.1
	pass. 06:19	ν-0.8' d0.5' m-3.88	ν1.3' d-0.5' m0.94	ν2.1' d-0.1' m-1.85	ν2.3' d0.1' m0.65	
.vici.þ	00.13					

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.48	N23°17.26	49°47.09	11.7'	S18°47.26	10.9'	56.2'
1	194°54.35	17.37	64°17.78	11.6'	$18^{\circ}58.14$	10.8'	56.1'
2	209°54.22	17.48	78°48.42	11.6'	19°8.93	10.7'	56.1'
3	224°54.09	• • 17.60	93°19.02	11.5'	19°19.61	10.6'	56.1'
4 5	239°53.95 254°53.82	17.71 17.82	107°49.56 122°20.06	11.5' 11.5'	19°30.19 19°40.68	10.5' 10.4'	56.1' 56.1'
6	269°53.69	N23° 17.93	136°50.52	11.5	\$19°51.06	10.4	56.0'
7	284°53.56	18.03	151°20.93	11.4	20°1.33	10.2	56.0'
8	299°53.42	18.14	165°51.29	11.3'	20° 11.51	10.1'	56.0'
9	314°53.29	• 18.25	180°21.60	11.3'	$20^{\circ}21.58$	10.0'	56.0'
10	329°53.16	18.36	194°51.86	11.2'	20°31.54	9.9'	55.9'
11	344°53.03	18.46	209°22.08	11.2'	20°41.40	9.8'	55.9'
12 13	359°52.89 14°52.76	N23° 18.57 18.67	223°52.25 238°22.37	11.1' 11.1'	\$20°51.15 21°0.79	9.6' 9.5'	55.9'
13 14	29°52.63	18.78	252°52.45	11.1	21 0.79 21°10.33	9.5 9.4'	55.9' 55.9'
15	44°52.49	• • 18.88	267°22.48	11.0'	21°10.33	9.3	55.8'
16	59°52.36	18.98	281°52.46	10.9'	21°29.07	9.2'	55.8'
17	74°52.23	19.08	296°22.39	10.9'	21°38.27	9.1'	55.8'
18	89°52.10	N23°19.18	310°52.28	10.8'	S21°47.36	9.0'	55.8'
19	104°51.96	19.28	325°22.12	10.8'	21°56.34	8.9'	55.8'
20	119°51.83	19.38	339°51.91	10.7'	22°5.20	8.8'	55.7'
21 22	134°51.70 149°51.56	· · 19.48 19.58	354°21.65 8°51.35	10.7' 10.7'	22°13.95 22°22.59	8.6' 8.5'	55.7' 55.7'
22	149°51.56 164°51.43	19.58 19.68	8°51.35 23°21.01	10.7	22° 22.59 22° 31.11	8.5° 8.4'	55.7' 55.7'
20						5.4	33.1
	SD = 15.7'	d = 0.1'		SL	0 = 15.3'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.30	N23° 19.77	37°50.61	10.6'	\$22°39.51	8.3'	55.7'
1 2	194°51.16 209°51.03	19.87 19.96	52°20.18 66°49.69	10.5' 10.5'	22°47.79 22°55.96	8.2' 8.0'	55.6' 55.6'
3	209 51.03 224°50.90	20.06	81°19.17	10.5	22 55.96 23°4.01	8.0 7.9'	55.6'
4	239°50.76	20.15	95°48.59	10.4	23°11.94	7.8'	55.6'
5	254°50.63	20.24	110°17.98	10.3'	23° 19.74	7.7'	55.6'
6	269°50.50	N23°20.34	124°47.32	10.3'	S23°27.43	7.6'	55.5'
7	284°50.36	20.43	139°16.61	10.3'	23°35.00	7.4'	55.5'
8	299°50.23	20.52	153°45.87	10.2'	23°42.44	7.3'	55.5'
9	314°50.09	• • 20.61	168°15.08	10.2'	23°49.76	7.2'	55.5'
10 11	329°49.96 344°49.83	20.70 20.79	182°44.25 197°13.38	10.1' 10.1'	23°56.95 24°4.02	7.1' 6.9'	55.5' 55.4'
12	359°49.69	N23°20.87	211°42.47	10.1	\$24° 10.97	6.8	55.4
13	14°49.56	20.96	226°11.52	10.0'	24° 17.79	6.7'	55.4'
14	29°49.43	21.05	240°40.53	10.0'	24°24.49	6.6'	55.4'
15	44°49.29	• • 21.13	$255^{\circ}9.50$	9.9'	$24^{\circ}31.05$	6.4'	55.4'
16	59°49.16	21.22	269°38.44	9.9'	24°37.49	6.3'	55.4'
17	74°49.02 89°48.89	21.30 N23°21.39	284°7.34 298°36.20	9.9' 9.8'	24°43.80 \$24°49.99	6.2'	55.3'
18 19	89°48.89 104°48.76	N23° 21.39 21.47	313°5.02	9.8'	24° 56.04	6.1' 5.9'	55.3' 55.3'
20	119°48.62	21.55	327°33.82	9.8'	25°1.96	5.8'	55.3'
21	134°48.49	• • 21.63	342°2.57	9.7'	25°7.76	5.7'	55.3'
22	149°48.35	21.71	356°31.30	9.7'	$25^{\circ}13.42$	5.5'	55.2'
23	164°48.22	21.79	$10^{\circ}59.99$	9.7'	$25^{\circ}18.95$	5.4'	55.2'
	SD = 15.7'	d = 0.1'		SE	0 = 15.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.09	N23°21.87	25°28.65	9.6'	S25°24.35	5.3'	55.2'
1	194°47.95	21.95	39°57.28	9.6'	25°29.62	5.1'	55.2'
2	209°47.82	22.03	54°25.88	9.6'	25°34.75	5.0'	55.2'
3 4	224°47.68 239°47.55	· · 22.11 22.18	68°54.46 83°23.00	9.5' 9.5'	25°39.75 25°44.62	4.9' 4.7'	55.2' 55.1'
4 5	239°47.55 254°47.41	22.18	97°51.52	9.5° 9.5'	25°44.62 25°49.35	4.7° 4.6'	55.1'
6	269°47.28	N23°22.33	112°20.01	9.5	\$25°53.95	4.5	55.1'
7	284°47.15	22.41	126°48.48	9.4'	25°58.42	4.3'	55.1'
8	299°47.01	22.48	141°16.93	9.4'	$26^{\circ}2.75$	4.2'	55.1'
9	314°46.88	• • 22.56	155°45.35	9.4'	26°6.94	4.1'	55.1'
10	329°46.74	22.63	170°13.75	9.4'	26°11.00	3.9'	55.0'
11 12	344°46.61 359°46.47	22.70 N23°22.77	184°42.13 199°10.50	9.4' 9.3'	26° 14.92 \$26° 18.70	3.8' 3.6'	55.0' 55.0'
13	359 46.47 14°46.34	22.84	213°38.84	9.3 9.3'	26°22.35	3.5'	55.0'
14	29°46.20	22.91	213 36.64 228°7.17	9.3'	26°25.86	3.4	55.0'
15	44°46.07	• • 22.98	242°35.48	9.3'	26°29.24	3.2'	55.0'
16	59°45.94	23.05	257°3.78	9.3'	$26^{\circ}32.47$	3.1'	54.9'
17	74°45.80	23.11	271°32.06	9.3'	26°35.57	3.0'	54.9'
18	89°45.67	N23°23.18	286°0.34	9.3'	S26°38.53	2.8'	54.9'
19 20	104°45.53 119°45.40	23.25 23.31	300°28.60 314°56.85	9.3' 9.2'	26°41.35 26°44.03	2.7'	54.9' 54.9'
20	119 45.40 134° 45.26	23.37	314°56.85 329°25.10	9.2' 9.2'	26° 44.03 26° 46.58	2.5' 2.4'	54.9'
22	149°45.13	23.44	343°53.33	9.2'	26°48.99	2.4	54.8'
23	164°44.99	23.50	358°21.56	9.2'	26°51.25	2.1'	54.8'
	SD = 15.7'	d = 0.1'		SE	0 = 15.1'		

			2027 Ju	ıne 15 t	to Jun.	17 UT
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut.
N 72°						
N 70°						
68°						
66°						
64°		////	01:33	22:29	////	////
62°	11111	////	02:10	21:52	////	////
60°	1777	00:52	02:10	21:26	23:10	////
N 58°	1111	01:41	02:56	21:05	22:21	////
56°	11111	01:41	02.50	20:49	21:51	////
54°	00:48	02:11	03:13	20:49	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	22:01
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:45
35°	03:39	03:36	04:31	19:16	19:46	20:43
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:39	18:22	18:45	19:12
0°	05:08	05:34	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:28	17:52	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:04
35°	06:07	06:38	07:06	16:55	17:23	17:55
40°	06:16	06:50	07:21	16:41	17:11	17:45
45°	06:26	07:03	07:37	16:24	16:58	17:35
S 50°	06:38	07:19	07:58	16:03	16:42	17:23
52°	06:43	07:27	08:08	15:54	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:31	15:30	16:17	17:06
58°	07:02	07:54	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:04	14:58	15:55	16:52
Lat.		Moonris	se .		Moonset	t
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°	19:45	_		22:49		
64°	19:03	21:13		23:31	23:08	
62°	18:35	20:19	21:55	00:00	00:00	00:03
60°	18:14	19:46	21:08	00:15	00:22	00:36
N 58°	17:57	19:22	20:38	00:28	00:40	01:00
56°	17:42	19:03	20:15	00:39	00:55	01:19
54°	17:29	18:47	19:57	00:49	01:08	01:36
52° 50°	17:18	18:33	19:41	00:58	01:20	01:50
45°	17:09	18:21 17:56	19:27	01:05 01:22	01:30 01:52	02:02 02:28
	16:48		19:00			
N 40°	16:32	17:37	18:38	01:36	02:09	02:48
35° 30°	16:18	17:20	18:20	01:48	02:24	03:05
30° 20°	16:06 15:45	17:06 16:42	18:04 17:38	01:58 02:16	02:37 02:59	03:20 03:45
N 10°	15:45	16:42 16:21	17:38 17:15	02:16	02:59	03:45
	15:26	16:21	16:54	02:31	03:16	04:07
n٥	15.11	15:43				
0°	14.55		16:33	03:00	03:53	04:47
S 10°	14:55			02.16	04.12	05.00
S 10° 20°	14:38	15:22	16:11	03:16	04:13 04:35	05:09 05:34
S 10° 20° 30°	14:38 14:18	15:22 14:59	16:11 15:45	03:34	04:35	05:34
S 10° 20° 30° 35°	14:38 14:18 14:06	15:22 14:59 14:45	16:11 15:45 15:29	03:34 03:45	04:35 04:48	05:34 05:49
S 10° 20° 30°	14:38 14:18	15:22 14:59	16:11 15:45	03:34	04:35	05:34

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Age		
Day	00 ^h	12 ^h	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-96%	
15	00:22	00:28	12:00	21:23	08:59		
16	00:35	00:41	12:01	22:14	09:49		
17	00:48	00:54	12:01	23:07	10:41		

14:24

14:11

13:56

13:38

13:17

04:29

04:38

04:47

04:58

05:10

05:24

05:44

05:55

06:07

06:21

06:38

06:54

07:06

07:21

07:38

07:59

08:26

13:19

13:10

13:00

12:49

12:36

S 50° 52°

54°

56°

58° **S** 60°

13:47

13:36

13:23

13:08

12:51

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	266°0.84	195°53.30 N21°30.38	99°12.12 N06°37.62	120°26.97 N14°45.48	241°25.02 N07°41.40	
1	281°3.30	210°52.53 30.89	114°13.43 37.09	135°29.04 45.34	256°27.29 41.46	Alpheratz 357°32.70 29°14.43
2	296°5.77	225°51.76 31.39	129°14.74 36.55	150°31.11 45.21	271°29.56 41.53	Ankaa 353°5.27 -42°9.10
3	311°8.23	240°50.99 · · 31.90	144°16.05 · · 36.01	165°33.18 · · 45.07	286°31.82 · · 41.59	Schedar 349°28.81 56°41.07 Diphda 348°45.38 -17°49.99
4	$326^{\circ}10.69$	255°50.22 32.40	159°17.36 35.48	180°35.25 44.94	301°34.09 41.66	Achernar 335°19.02 -57°5.52
5	$341^{\circ}13.16$	270°49.44 32.91	174° 18.67 34.94	195°37.32 44.80	316°36.36 41.73	Hamal 327°49.11 23°35.46
6	356° 15.62	285°48.67 N21°33.41	189°19.98 N06°34.41	210°39.39 N14°44.67	331°38.63 N07°41.79	Polaris 313°20.67 89°22.53
7	11° 18.09	300°47.89 33.91	204°21.29 33.87	225°41.46 44.53	346°40.90 41.86	Acamar 315°10.59 -40°11.48
8	26° 20.55	315°47.12 34.41	219°22.60 33.33	240°43.53 44.40	1°43.17 41.92	Menkar 314°4.29 4°11.85
9	41°23.01	330°46.35 · · 34.91	234°23.91 · · 32.80	255°45.60 · · 44.26	16°45.44 · · 41.99	Mirfak 308°25.75 49°57.36
10 11	56° 25.48 71° 27.94	345°45.57 35.41 0°44.80 35.90	249°25.22 32.26 264°26.53 31.72	270°47.67 44.13 285°49.74 43.99	31°47.71 42.05 46°49.98 42.12	Aldebaran 290°37.64 16°33.81
12	86° 30.41	15°44.02 N21°36.40	279°27.84 N06°31.18	300°51.81 N14°43.86	61°52.25 N07°42.18	Rigel 281°2.27 -8°10.21
13	101°32.87	30°43.24 36.89	294°29.15 30.65	315°53.88 43.72	76°54.52 42.25	Capella 280°19.39 46°1.44
14	116° 35.34	45°42.47 37.39	309°30.45 30.11	330°55.95 43.59	91°56.79 42.31	Bellatrix 278°21.06 6°22.43
15	131°37.80	60°41.69 · · 37.88	324°31.76 · · 29.57	345°58.02 · · 43.45	106°59.06 · · 42.38	Elnath 277°59.70 28°37.76
16	146°40.26	75°40.91 38.37	339°33.07 29.03	1°0.09 43.31	122°1.34 42.44	Alnilam 275°36.03 -1°11.10
17	$161^{\circ}42.73$	90°40.13 38.86	354°34.38 28.50	16°2.16 43.18	137°3.61 42.51	Betelgeuse 270°50.25 7°24.68 Canopus 263°52.05 -52°42.66
18	$176^{\circ}45.19$	105°39.36 N21°39.35	9°35.68 N06°27.96	31°4.23 N14°43.04	152°5.88 N07°42.57	Sirius 258°24.81 -16°45.29
19	191°47.66	120°38.58 39.84	24°36.99 27.42	46° 6.29 42.91	167°8.15 42.64	Adhara 255°4.65 -29°0.65
20	206°50.12	135°37.80 40.33	39°38.30 26.88	61°8.36 42.77	182°10.42 42.70	Procyon 244°49.04 5°9.21
21	221°52.59	150°37.02 · · 40.82	54°39.60 · · 26.34	76°10.43 · · 42.64	197°12.69 · · 42.77	Pollux 243°15.20 27°57.57
22	236° 55.05	165°36.24 41.30	69° 40.91 25.81	91°12.50 42.50	212°14.96 42.83	Avior 234°14.42 -59°36.06
23	251° 57.51	180°35.46 41.79	84°42.22 25.27	106°14.57 42.36	227°17.23 42.89	Suhail 222°45.12 -43°32.85
Mer.	pass. 06:15	ν -0.8' d 0.5' m-3.88	$ u 1.3' \ d$ -0.5' m0.95	$ u 2.1' \ d$ -0.1' m-1.85	$ u 2.3' \ d0.1' \ { m m0.65}$	Miaplacidus 221°38.42 -69°50.08
						Alphard 217°45.98 -8°46.79
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.46 11°49.94
0	266° 59.98	195°34.68 N21°42.27	99°43.52 N06°24.73	121°16.63 N14°42.23	242°19.51 N07°42.96	Dubhe 193°38.77 61°36.37
1	282°2.44	210°33.90 42.75	114°44.83 24.19	136°18.70 42.09	257°21.78 43.02	Denebola 182°22.91 14°25.11
2	297°4.91	225°33.12 43.23	129°46.13 23.65	151°20.77 41.95	272°24.05 43.09	Gienah 175°41.46 -17°41.85
3	312°7.37	240°32.33 · · 43.71	144°47.44 · · 23.11	166°22.84 · · 41.82	287°26.32 · · 43.15	Acrux 172°57.65 -63°15.45
4	327°9.83	255°31.55 44.19	159° 48.74 22.57	181°24.90 41.68	302°28.59 43.22	Gacrux 171°49.23 -57°16.37 Alioth 166°11.10 55°48.83
5	$342^{\circ}12.30$	270°30.77 44.67	174°50.05 22.03	196°26.97 41.55	317°30.87 43.28	Spica 158°20.03 -11°18.41
6	$357^{\circ}14.76$	285°29.99 N21°45.15	189°51.35 N06°21.49	211°29.04 N14°41.41	332°33.14 N07°43.35	Alkaid 152°50.20 49°10.72
7	$12^{\circ}17.23$	300°29.20 45.62	204°52.65 20.95	226°31.10 41.27	347°35.41 43.41	Hadar 148°32.69 -60°30.60
8	27° 19.69	315°28.42 46.10	219°53.96 20.41	241°33.17 41.14	2°37.68 43.47	Menkent 147°54.98 -36°30.51
9	42°22.16	330°27.64 · · 46.57	234°55.26 · · 19.87	256°35.24 · · 41.00	17°39.96 · · 43.54	Arcturus 145°45.87 19°2.39
10	57° 24.62	345°26.85 47.05	249°56.56 19.33	271°37.30 40.86	32°42.23 43.60	Rigil Kent. 139°37.00 -60°57.18
11 12	72° 27.08 87° 29.55	0°26.07 47.52 15°25.28 N21°47.99	264° 57.87 18.79 279° 59.17 N06° 18.25	286°39.37 40.72 301°41.43 N14°40.59	47°44.50 43.67 62°46.78 N07°43.73	Kochab 137°19.08 74°2.69
13	102° 32.01	30°24.50 48.46	279 59.17 NOO 18.25 295°0.47 17.71	316°43.50 40.45	77°49.05 43.79	Zuben'ubi 136°53.53 -16°9.45
14	102 32.01 117°34.48	45°23.71 48.93	310°1.78 17.17	331°45.57 40.31	92°51.32 43.86	Alphecca 126°1.73 26°37.38
15	132° 36.94	60°22.92 · · 49.39	325°3.08 · · 16.63	346°47.63 · · 40.18	107°53.60 · · 43.92	Antares 112°13.00 -26°29.61
16	147° 39.41	75°22.14 49.86	340°4.38 16.09	1°49.70 40.04	122°55.87 43.98	Atria 107°4.81 -69°4.63
17	$162^{\circ}41.87$	90°21.35 50.33	355°5.68 15.55	16°51.76 39.90	137°58.14 44.05	Sabik 102°0.12 -15°45.52 Shaula 96°7.21 -37°7.38
18	177°44.33	105°20.56 N21°50.79	10°6.98 N06°15.01	31°53.83 N14°39.77	153°0.42 N07°44.11	Rasalhague 95°56.34 12°32.42
19	192°46.80	120°19.77 51.25	25°8.28 14.47	46°55.89 39.63	168°2.69 44.17	Eltanin 90°40.70 51°29.09
20	207°49.26	135°18.99 51.72	40°9.58 13.93	61°57.96 39.49	183°4.96 44.24	Kaus Aust. 83°29.44 -34°22.19
21	222°51.73	150°18.20 · · 52.18	55°10.88 · · 13.38	77° 0.02 · · 39.35	198°7.24 · · 44.30	Vega 80°31.43 38°48.52
22	237° 54.19	165°17.41 52.64	70°12.19 12.84	92°2.08 39.22	213°9.51 44.36	Nunki 75°44.91 -26°15.64
23	252°56.65	180°16.62 53.10	85°13.49 12.30	107°4.15 39.08	228°11.79 44.43	Altair 61°57.70 8°56.49
Mer.	pass. 06:11	ν -0.8 $'$ d 0.5 $'$ m-3.88	$ u 1.3' \ d$ -0.5 $' \ { m m0.96}$	$ u 2.1' \; d$ -0.1' m-1.84	$ u 2.3' \; d0.1' \; { m m0.64}$	Peacock 53°2.13 -56°38.52
						Deneb 49°24.06 45°22.59
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.64 10°0.08
0	267° 59.12	195°15.83 N21°53.56	100°14.79 N06°11.76	122°6.21 N14°38.94	243°14.06 N07°44.49	Al Na'ir 27°30.22 -46°49.36
1	283°1.58	210°15.04 54.01	115° 16.09 11.22	137° 8.28 38.80	258°16.34 44.55	Fomalhaut 15°12.24 -29°28.36 Scheat 13°43.15 28°13.83
2	298°4.05	225°14.25 54.47	130°17.38 10.67	152°10.34 38.66	273°18.61 44.62	Markab 13°27.81 15°21.17
3	$313^{\circ}6.51$	240°13.46 · · 54.92	145°18.68 · · 10.13	167°12.40 · · 38.53	288°20.89 · · 44.68	
4	328°8.98	255° 12.67 55.38	160°19.98 9.59	182°14.47 38.39	303°23.16 44.74	Jun 18 Fri SHA Mer.pass
5	343°11.44	270°11.88 55.83	175°21.28 9.05	197°16.53 38.25	318°25.44 44.81	Venus 289°52.47 10:57
6	358° 13.90	285°11.08 N21°56.28	190°22.58 N06°8.51	212°18.59 N14°38.11	333°27.71 N07°44.87	Mars 193°11.28 17:22
7	13° 16.37	300°10.29 56.73	205°23.88 7.96	227°20.66 37.98	348°29.99 44.93	Jupiter 214°26.13 15:56
8	28° 18.83	315°9.50 57.18	220°25.18 7.42	242°22.72 37.84	3°32.26 45.00	Saturn 335°24.18 07:53
9 10	43°21.30 58°23.76	330°8.71 · · 57.63 345°7.91 58.08	235°26.47 · · 6.88 250°27.77 6.33	257°24.78 · · 37.70 272°26.85 37.56	18°34.54 · · 45.06 33°36.81 45.12	Jun 19 Sat SHA Mer.pass
11	73° 26.22	0°7.12 58.53	265°29.07 5.79	287°28.91 37.42	48°39.09 45.18	Venus 288°34.70 10:58
12	88° 28.69	15°6.32 N21°58.97	280°30.37 N06°5.25	302°30.97 N14°37.28	63°41.37 N07°45.25	Mars 192° 43.54 17:20
13	103°31.15	30°5.53 59.42	295°31.66 4.70	317°33.03 37.15	78°43.64 45.31	Jupiter 214°16.66 15:53
14	118° 33.62	45°4.73 21°59.86	310°32.96 4.16	332°35.09 37.01	93°45.92 45.37	Saturn 335°19.53 07:50
15	133°36.08	60°3.94 22°0.30	325°34.26 · · 3.62	347°37.16 · · 36.87	108°48.19 · · 45.43	Jun 20 Sun SHA Mer.pass
16	$148^{\circ}38.55$	75°3.14 0.74	340°35.55 3.07	2°39.22 36.73	123°50.47 45.50	Venus 287°16.71 11:00
17	163°41.01	90°2.35 1.18	355°36.85 2.53	17°41.28 36.59	138°52.75 45.56	Mars 192°15.67 17:18
18	178°43.47	105°1.55 N22°1.62	10°38.14 N06°1.98	32°43.34 N14°36.45	153°55.02 N07°45.62	Jupiter 214°7.09 15:49
19	193° 45.94	120°0.75 2.06	25°39.44 1.44	47°45.40 36.31	168°57.30 45.68	Saturn 335°14.94 07:46
20	208° 48.40	134°59.96 2.50	40°40.74 0.89	62°47.46 36.17	183°59.58 45.75	Horizontal parallax
21 22	223° 50.87 238° 53.33	149°59.16 · · 2.93 164°58.36 3.37	55°42.03 06°0.35 70°43.33 05°59.80	77°49.52 · · 36.04 92°51.58 35.90	199°1.86 · · 45.81 214°4.13 45.87	Venus: 0.1
23	253° 55.80	179° 57.56 3.80	85° 44.62 59.26	107°53.65 35.76	214°4.13 45.87 229°6.41 45.93	Mars: 0.1
						_
Wer.	pass. 06:07	ν-0.8′ d0.5′ m-3.89	ν1.3' d-0.5' m0.97	ν2.1' d-0.1' m-1.84	ν2.3′ d0.1′ m0.64	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.86	N23°23.56	12°49.79	9.2'	S 26°53.38	2.0'	54.8'
1	194° 44.72	23.62	27°18.02	9.2'	26°55.37	1.9'	54.8'
2	209°44.59 224°44.45	23.69 •• 23.75	41°46.24 56°14.46	9.2' 9.2'	26°57.22 26°58.94	1.7' 1.6'	54.8' 54.8'
4	239° 44.32	23.80	70°42.68	9.2'	27°0.51	1.4'	54.8'
5	$254^{\circ}44.18$	23.86	85°10.91	9.2'	$27^{\circ}1.94$	1.3'	54.7'
6	269° 44.05	N23°23.92	99°39.13	9.2'	\$27°3.24	1.2'	54.7'
7 8	284° 43.91 299° 43.78	23.98 24.03	114°7.36 128°35.60	9.2' 9.2'	27° 4.39 27° 5.41	1.0' 0.9'	54.7' 54.7'
9	314° 43.64	• • 24.09	143° 3.85	9.3'	27° 6.29	0.7'	54.7'
10	329°43.51	24.15	157°32.10	9.3'	$27^{\circ}7.03$	0.6'	54.7'
11	344° 43.37 359° 43.24	24.20 N23°24.25	172°0.36	9.3'	27°7.63	0.5'	54.7'
12 13	359°43.24 14°43.10	N23 24.25 24.31	186°28.64 200°56.93	9.3' 9.3'	\$27°8.09 27°8.41	0.3' 0.2'	54.6' 54.6'
14	29° 42.97	24.36	215°25.23	9.3'	27°8.60	0.0'	54.6'
15	44° 42.83	• • 24.41	229°53.54	9.3'	27°8.64	-0.1'	54.6'
16	59° 42.70 74° 42.56	24.46	244°21.88 258°50.23	9.4' 9.4'	27°8.55 27°8.32	-0.2'	54.6'
17 18	89° 42.43	24.51 N23°24.56	258 50.23 273°18.59	9.4	\$27°7.96	-0.4' -0.5'	54.6' 54.6'
19	104° 42.29	24.61	287°46.98	9.4'	27°7.45	-0.6'	54.6'
20	119° 42.16	24.66	302°15.39	9.4'	27°6.81	-0.8'	54.5'
21 22	134° 42.02 149° 41.89	• • 24.70	316°43.83 331°12.29	9.5' 9.5'	27° 6.03 27° 5.12	-0.9'	54.5'
23	149 41.89 164° 41.75	24.75 24.80	331 12.29 345°40.77	9.5' 9.5'	27° 4.07	-1.1' -1.2'	54.5' 54.5'
	SD = 15.7'	d = 0.1'			= 15.0'		
	<u> </u>	u — U.1		30	_ 13.0		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°41.62	N23°24.84	0°9.28 14°37.82	9.5'	\$27°2.88	-1.3'	54.5'
1 2	194°41.48 209°41.35	24.89 24.93	14°37.82 29°6.38	9.6' 9.6'	27°1.56 27°0.11	-1.5' -1.6'	54.5' 54.5'
3	224° 41.21	• • 24.97	43°34.98	9.6'	26°58.52	-1.7'	54.5
4	239°41.08	25.01	58°3.61	9.7'	$26^{\circ}56.79$	-1.9'	54.4'
5	254° 40.94	25.06	72°32.27	9.7'	26°54.93	-2.0'	54.4
6 7	269° 40.81 284° 40.67	N23°25.10 25.14	87°0.97 101°29.70	9.7' 9.8'	\$26°52.94 26°50.81	-2.1' -2.3'	54.4' 54.4'
8	299° 40.54	25.14	115°58.46	9.8'	26°48.55	-2.4'	54.4'
9	314°40.40	• • 25.21	130°27.27	9.8'	$26^{\circ}46.16$	-2.5'	54.4'
10	329° 40.27	25.25	144°56.11 159°24.99	9.9'	26°43.64	-2.7'	54.4
11 12	344°40.13 359°39.99	25.29 N23°25.33	159°24.99 173°53.91	9.9' 10.0'	26°40.99 \$26°38.20	-2.8' -2.9'	54.4' 54.4'
13	14°39.86	25.36	188°22.87	10.0'	26°35.29	-3.0'	54.3'
14	29°39.72	25.40	202°51.88	10.0'	$26^{\circ}32.24$	-3.2'	54.3'
15	44°39.59 59°39.45	• • 25.43	217°20.93 231°50.02	10.1' 10.1'	26°29.07 26°25.77	-3.3'	54.3' 54.3'
16 17	59 39.45 74°39.32	25.46 25.50	231 50.02 246°19.16	10.1	26°22.34	-3.4' -3.6'	54.3'
18	89°39.18	N23°25.53	260°48.35	10.2'	S26°18.78	-3.7'	54.3'
19	104°39.05	25.56	275°17.58	10.3'	26°15.10	-3.8'	54.3'
20	119°38.91 134°38.78	25.59	289°46.87 304°16.20	10.3' 10.4'	26°11.29 26°7.35		54.3' 54.3'
21 22	134 38.78 149°38.64	· · 25.62 25.65	318°45.58	10.4	26° 3.29	-4.1' -4.2'	54.3'
23	164°38.51	25.68	333°15.01	10.5'	25°59.11	-4.3'	54.2'
	SD = 15.7'	d = 0.0'		SD	= 14.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°38.37 194°38.24	N23°25.71 25.73	347°44.50 2°14.04	10.5' 10.6'	\$25°54.80 25°50.37	-4.4' -4.6'	54.2' 54.2'
2	209°38.10	25.76	16°43.63	10.6'	25°45.82	-4.7'	54.2
3	224°37.96	• • 25.79	31°13.27	10.7'	25°41.14	-4.8'	54.2'
4	239° 37.83 254° 37.69	25.81 25.83	45°42.98 60°12.73	10.8'	25°36.35 25°31.43	-4.9'	54.2' 54.2'
5 6	254°37.69 269°37.56	25.83 N23°25.86	60°12.73 74°42.55	10.8' 10.9'	25°31.43 \$25°26.40	-5.0' -5.2'	54.2'
7	284° 37.42	25.88	89°12.42	10.9'	25°21.25	-5.3'	54.2
8	299°37.29	25.90	103°42.34	11.0'	25°15.97	-5.4'	54.2'
9	314° 37.15 329° 37.02	· · 25.92 25.95	118°12.33 132°42.38	11.0' 11.1'	25°10.59 25°5.08	-5.5'	54.2' 54.2'
10 11	329°37.02 344°36.88	25.95 25.97	132°42.38 147°12.48	11.1	25°5.08 24°59.46	-5.6' -5.7'	54.2° 54.1'
12	359°36.75	N23°25.98	161°42.65	11.2'	S24°53.73	-5.8'	54.1'
13	14°36.61	26.00	176°12.87	11.3'	24°47.88	-6.0'	54.1
14 15	29°36.48 44°36.34	26.02 •• 26.04	190°43.16 205°13.51	11.3' 11.4'	24°41.91 24°35.84	-6.1' -6.2'	54.1' 54.1'
15 16	44°36.34 59°36.20	26.04	205°13.51 219°43.92	11.4	24° 35.84 24° 29.65	-6.2' -6.3'	54.1'
17	74°36.07	26.07	234°14.39	11.5'	24°23.35	-6.4'	54.1
18	89°35.93	N23°26.08	248°44.93	11.6'	\$24°16.95	-6.5'	54.1'
19 20	104° 35.80 119° 35.66	26.10 26.11	263°15.53 277°46.19	11.7' 11.7'	24°10.43 24°3.80	-6.6' -6.7'	54.1' 54.1'
20	119° 35.66 134° 35.53	. 26.11	277°46.19 292°16.92	11.7	24° 3.80 23° 57.07	-6.8'	54.1'
22	149°35.39	26.14	306°47.71	11.9'	23°50.23	-6.9	54.1'
23	164°35.26	26.15	321°18.57	11.9'	23°43.28	-7.1'	54.1'
	SD = 15.7'	d = 0.0'		SD	= 14.8'		

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

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

			Sun		Moon			
ı	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	,	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
l		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-99%	
	18	01:01	01:07	12:01	23:59	11:33		
l	19	01:14	01:20	12:01	-:-	12:25		
	20	01:27	01:33	12:02	00:51	13:16		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	268° 58.26	194° 56.76	N22° 4.23	100°45.91	N05°58.71	122°55.71	N14°35.62	244°8.69	N07° 45.99		
1	284° 0.72	209°55.97	4.67	115° 47.21	58.17	137°57.77	35.48	259°10.96	46.06	Alpheratz	
2	299°3.19	224°55.17	5.10	130°48.50	57.62	152°59.83	35.34	274°13.24	46.12	Ankaa	353° 5.24
3	$314^{\circ}5.65$	239°54.37	• • 5.53	145°49.80	• • 57.08	168° 1.89	• • 35.20	289°15.52	• • 46.18	Schedar Diphda	349°28.77 348°45.35
4	$329^{\circ}8.12$	254°53.57	5.95	160°51.09	56.53	183° 3.95	35.06	304°17.80	46.24	Achernar	335°18.99
5	344° 10.58	269°52.77	6.38	175° 52.38	55.99	198° 6.01	34.92	319°20.08	46.30	Hamal	327°49.09
6	359° 13.04	284°51.97	N22°6.81	190°53.68	N05°55.44	213°8.07	N14°34.78	334°22.35	N07°46.36	Polaris	313°19.43
7	14° 15.51	299°51.16	7.23	205°54.97	54.90	228°10.13	34.64	349°24.63	46.43	Acamar	315°10.57
8 9	29° 17.97 44° 20.44	314°50.36 329°49.56	7.66 •• 8.08	220° 56.26 235° 57.55	54.35 •• 53.80	243°12.19 258°14.24	34.50 •• 34.36	4°26.91 19°29.19	46.49 •• 46.55	Menkar	314°4.27
10	59°22.90	344°48.76	8.50	250° 58.84	53.26	273°16.30	34.22	34°31.47	46.61	Mirfak	308°25.72
11	74°25.37	359°47.96	8.92	266°0.14	52.71	288°18.36	34.09	49°33.75	46.67	Aldebaran	290°37.62
12	89°27.83	14°47.15	N22°9.34	281°1.43	N05°52.16	303°20.42	N14°33.95	64°36.03	N07°46.73	Rigel	281°2.26
13	104°30.29	29°46.35	9.76	296°2.72	51.62	318°22.48	33.81	79°38.30	46.79	Capella Bellatrix	280°19.37 278°21.04
14	$119^{\circ}32.76$	44°45.55	10.18	311°4.01	51.07	333°24.54	33.67	94°40.58	46.86	Elnath	277° 59.69
15	134°35.22	59°44.74	• • 10.59	326°5.30	• • 50.52	348°26.60	• • 33.53	109°42.86	• • 46.92	Alnilam	275°36.01
16	149°37.69	74°43.94	11.01	341°6.59	49.98	3°28.65	33.39	124°45.14	46.98	Betelgeuse	270°50.24
17	164° 40.15	89°43.13	11.42	356°7.88	49.43	18°30.71	33.25	139°47.42	47.04	Canopus	263°52.05
18 19	179° 42.61 194° 45.08	104° 42.33 119° 41.52	N22°11.84 12.25	11°9.17 26°10.46	N05°48.88 48.34	33°32.77 48°34.83	N14°33.11 32.97	154°49.70 169°51.98	N07°47.10 47.16	Sirius	258°24.80
20	209° 47.54	134°40.72	12.25	41° 11.75	47.79	63°36.89	32.82	184°54.26	47.22	Adhara	255° 4.65
21	224°50.01	149°39.91	• • 13.07	56° 13.04	• • 47.24	78°38.94	32.68	199°56.54	• • 47.28	Procyon	244°49.03
22	239°52.47	164°39.11	13.48	71°14.33	46.69	93°41.00	32.54	214°58.82	47.34	Pollux	243°15.19
23	254°54.94	179°38.30	13.89	86°15.62	46.14	108°43.06	32.40	230°1.10	47.40	Avior Suhail	234°14.43 222°45.12
Merr	pass. 06:03	v-0.8' d0	.4′ m-3.89	v1 3' d-0	.5′ m0.98	v2 1' d-0	.1′ m-1.84	υ2 3' d0	.1′ m0.64	Miaplacidus	221°38.45
- IVICI.P	Dass. 00.05	ν-0.0 ασ.		ν1.5 u-0	.5 1110.90	ν2.1 d-0	.1 111-1.04		.1 1110.04	Alphard	217°45.98
_			_		_		_		_	Regulus	207°32.46
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.79
0	269°57.40	194°37.49	N22°14.29	101°16.91	N05°45.60	123°45.12	N14°32.26	245°3.38	N07° 47.46	Denebola	182°22.92
1 2	284°59.86 300°2.33	209°36.68 224°35.88	14.70 15.10	116° 18.20 131° 19.49	45.05 44.50	138°47.17 153°49.23	32.12 31.98	260°5.66 275°7.94	47.53 47.59	Gienah	$175^{\circ}41.47$
3	300 2.33 315°4.79	239° 35.07	15.10	131 19.49 146° 20.77	• • 43.95	168°51.29	31.84	275 7.94 290°10.22	•• 47.65		172°57.67
4	330°7.26	254°34.26	15.91	161°22.06	43.40	183°53.34	31.70	305°12.50	47.71		171°49.24
5	345°9.72	269°33.45	16.31	176°23.35	42.85	198°55.40	31.56	320°14.79	47.77	Alioth	166°11.11
6	0°12.18	284°32.64	N22°16.71	191°24.64	N05°42.30	213°57.46	N14°31.42	335°17.07	N07°47.83	Spica Alkaid	158°20.04 152°50.22
7	$15^{\circ}14.65$	299°31.83	17.11	$206^{\circ}25.92$	41.76	$228^{\circ}59.51$	31.28	$350^{\circ}19.35$	47.89	Hadar	148°32.71
8	30° 17.11	314°31.02	17.51	221° 27.21	41.21	244°1.57	31.14	5°21.63	47.95		147°54.98
9	45° 19.58	329°30.21	• • 17.91	236°28.50	• • 40.66	259° 3.62	• • 31.00	20°23.91	• • 48.01		145°45.87
10	60°22.04	344°29.40	18.30	251°29.78	40.11	274° 5.68	30.86	35°26.19	48.07	Rigil Kent.	139°37.01
11 12	75°24.51 90°26.97	359°28.59 14°27.78	18.70 N22°19.09	266°31.07 281°32.36	39.56 N05°39.01	289°7.73 304°9.79	30.71 N14°30.57	50°28.47 65°30.76	48.13 N07°48.19	Kochab	$137^{\circ}19.12$
13	105° 29.43	29°26.97	19.48	296° 33.64	38.46	319°11.84	30.43	80°33.04	48.25	Zuben'ubi	136°53.53
14	120°31.90	44°26.16	19.88	311°34.93	37.91	334°13.90	30.29	95°35.32	48.31	Alphecca	126°1.73
15	135°34.36	59°25.34	20.27	326°36.21	• • 37.36	349°15.95	· · 30.15	110°37.60	• • 48.37	Antares	112°12.99 107°4.80
16	$150^{\circ}36.83$	74°24.53	20.66	341°37.50	36.81	4°18.01	30.01	125°39.88	48.43	Atria Sabik	107 4.80 102° 0.11
17	165°39.29	89°23.72	21.04	356° 38.78	36.26	19°20.06	29.87	140°42.17	48.49	Shaula	96°7.19
18	180°41.75		N22°21.43	11°40.07	N05°35.71	34°22.12	N14°29.72	155°44.45	N07°48.55	Rasalhague	95°56.33
19	195°44.22	119°22.09	21.82	26°41.35	35.16	49°24.17	29.58	170°46.73	48.61	Eltanin	90°40.70
20	210° 46.68 225° 49.15	134°21.28	22.20	41° 42.64	34.61	64°26.23	29.44	185°49.01	48.67	Kaus Aust.	83°29.43
21 22	240°51.61	149°20.46 164°19.65	· · 22.59 22.97	56°43.92 71°45.20	· · 34.06 33.51	79°28.28 94°30.34	· · 29.30 29.16	200°51.30 215°53.58	· · 48.73 48.79	Vega	80°31.42
23	255° 54.07	179° 18.84	23.35	86° 46.49	32.96	109°32.39	29.02	230°55.86	48.85	Nunki	75°44.89
		-				_				Altair	61°57.68
Mer.p	bass. 05:59	ν -0.8′ d0.	.4′ m-3.89	$\nu 1.3' \ d-0$.5′ m0.99	$\nu 2.1' \ d-0$.1′ m-1.83	$\nu^{2.3'} d0$.1′ m0.63	Peacock Deneb	53°2.09 49°24.03
										Enif	33°36.61
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.19
0	270°56.54	194° 18.02	N22°23.73	101°47.77	N05°32.40	124°34.44	N14°28.87	245°58.15	N07°48.91	Fomalhaut	15°12.21
1	285°59.00	209° 17.20	24.11	116°49.05	31.85	139°36.50	28.73	261°0.43	48.96	Scheat	13°43.13
2	301°1.47	224°16.39	24.49	131°50.34	31.30	154°38.55	28.59	276°2.71	49.02	Markab	13°27.79
3 4	316°3.93 331°6.40	239° 15.57 254° 14.76	· · 24.87 25.24	146°51.62 161°52.90	· · 30.75 30.20	169°40.60 184°42.66	· · 28.45 28.31	291°5.00 306°7.28	· · 49.08 49.14	Jun 21 Mon	SHA
5	346°8.86	269° 13.94	25.62	176° 54.18	29.65	199°44.71	28.16	300 7.28 321°9.57	49.14		285°58.51
6	1°11.32		N22°25.99	191°55.47	N05°29.09	214°46.76	N14°28.02		N07° 49.26	I	191°47.65
7	16° 13.79	299°12.30	26.36	206° 56.75	28.54	229°48.81	27.88	351°14.13	49.32		213°57.45
8	31° 16.25	314° 11.49	26.74	221°58.03	27.99	244°50.87	27.74	6°16.42	49.38		335°10.43
9	46° 18.72	$329^{\circ}10.67$	•• 27.11	236°59.31	• • 27.44	259°52.92	• • 27.59	21°18.70	• • 49.44	I 22 T	SHA
10	61°21.18	344°9.85	27.48	252°0.59	26.89	274°54.97	27.45	36°20.99	49.50	Jun 22 Tue	SHA 284°40.09
11	76°23.64	359°9.03	27.84	267°1.87	26.33	289°57.02	27.31	51°23.27	49.56		191°19.51
12	91°26.11		N22°28.21	282°3.15	N05°25.78	304°59.08	N14°27.17	66°25.56			213° 47.72
13	106°28.57	29°7.39	28.58	297°4.43	25.23	320°1.13	27.02	81°27.84	49.67	Saturn	335°5.98
14 15	121°31.04 136°33.50	44°6.57 59°5.75	28.94 •• 29.31	312°5.71 327°6.99	24.68 •• 24.12	335°3.18 350°5.23	26.88 •• 26.74	96°30.13 111°32.41	49.73 •• 49.79		
15 16	150 33.50 151°35.97	59 5.75 74°4.93	29.67	342° 8.27	23.57	5°7.28	26.60	111 32.41 126°34.70	49.79	Jun 23 Wed	SHA 283°21.48
17	166° 38.43	89°4.11	30.03	357° 9.55	23.02	20° 9.33	26.45	141°36.98	49.83		283°21.48 190°51.23
18	181° 40.89		N22°30.39	12° 10.83	N05°22.46	35°11.39	N14°26.31		N07°49.97		213°37.90
19	196°43.36	119°2.47	30.75	27° 12.11	21.91	50°13.44	26.17	171°41.55	50.02	Saturn	335°1.61
20	211°45.82	134°1.65	31.11	42° 13.39	21.36	65°15.49	26.02	186°43.84	50.08		
21	226°48.29	149°0.83	• • 31.47	57° 14.67	• • 20.80	80°17.54	• • 25.88	201°46.13	• • 50.14	Horizor	ntal parallax
22	241°50.75	164°0.00	31.82	72°15.95	20.25	95°19.59	25.74	216°48.41	50.20		Venus: Mars:
23	256° 53.21	178°59.18	32.18	87°17.23	19.69	110°21.64	25.59	231°50.70	50.26		ividi5.
Mer.p	bass. 05:55	ν -0.8′ d0.	.4′ m-3.89	$\nu 1.3' d-0$.6′ m1.00	$\nu 2.1' d-0$.1′ m-1.83	$\nu 2.3' d0$.1′ m0.63		

Dec 29°14.44

-42°9.09

56°41.07

-17°49.98 -57°5.51

23°35.47

89°22.52

40°11.47

4°11.86

49°57.36 16°33.82

-8°10.20

 $46^{\circ}1.43$

 $6^{\circ}22.44$

28°37.76

 $-1^{\circ}11.09$

 $7^{\circ}24.69$

-52°42.64 -16°45.28

-29°0.64

-59°36.05

-43°32.84

-69°50.07

-8°46.78 11°49.95

61°36.37

14°25.11

-17°41.85

 $-63^{\circ}15.45$

 $-57^{\circ}16.38$

55°48.84

-11°18.40

49°10.72

-60°30.61

-36°30.52

 $19^{\circ}2.40$

-60°57.19

 $74^{\circ}2.70$

 $-16^{\circ}9.45$

26°37.39 -26°29.61

-69°4.64

 $-15^{\circ}45.52$

 $-37^{\circ}7.39$

 $12^{\circ}32.43$

51°29.11

-34°22.20

38°48.53

 $-26^{\circ}15.64$

 $8^{\circ}56.50$

-56°38.52

 $45^{\circ}22.60$

 $10^{\circ}0.09$

-46°49.36

-29°28.35 28°13.84

15°21.18

Mer.pass

11:01

17:15

15:46

07:42

11:02

17:13

15:43

07:39

11:03

17:11

15:40

07:35

0.1

0.1

Mer.pass

Mer.pass

 $5^{\circ}9.21$ 27°57.57

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.12	N23°26.16	335°49.49	12.0'	\$23°36.23	-7.2	54.1'
1	194°34.99	26.17	350°20.48	12.1'	23°29.07	-7.3'	54.1'
2	209°34.85	26.18	4°51.53	12.1'	23°21.81	-7.4'	54.1'
3	224°34.72	• • 26.19	19°22.64	12.2'	23°14.45	-7.5	54.0'
4	239°34.58	26.19	33°53.83	12.2'	23°6.98	-7.6'	54.0'
5	254°34.44 269°34.31	26.20 N23°26.21	48°25.07 62°56.39	12.3' 12.4'	22°59.42 \$22°51.75	-7.7'	54.0' 54.0'
6 7	284°34.31	26.21	02 50.39 77°27.77	12.4	22° 43.99	-7.8' -7.9'	54.0'
8	299°34.04	26.22	91°59.21	12.5'	22°36.12	-8.0'	54.0'
9	314°33.90	26.22	106°30.73	12.6'	22°28.16	-8.1'	54.0'
10	329°33.77	26.23	121°2.30	12.6'	$22^{\circ}20.10$	-8.2'	54.0'
11	344°33.63	26.23	135°33.95	12.7'	$22^{\circ}11.95$	-8.2'	54.0'
12	359°33.50	N23°26.23	150°5.66	12.8'	\$22°3.70	-8.3'	54.0'
13	14°33.36	26.23	164° 37.44	12.8'	21°55.35	-8.4'	54.0'
14 15	29°33.23 44°33.09	26.23 •• 26.23	179°9.28 193°41.19	12.9' 13.0'	21°46.92 21°38.39	-8.5' -8.6'	54.0' 54.0'
16	59°32.96	26.23	208° 13.16	13.0'	21 36.39 21°29.77	-8.7'	54.0'
17	74°32.82	26.23	222° 45.20	13.1'	21°21.05	-8.8'	54.0'
18	89°32.69	N23°26.23	237° 17.30	13.2'	S21°12.25	-8.9'	54.0'
19	104°32.55	26.23	251° 49.47	13.2'	21°3.36	-9.0'	54.0'
20	119°32.42	26.22	$266^{\circ}21.71$	13.3'	20°54.38	-9.1'	54.0'
21	134°32.28	• • 26.22	280°54.01	13.4'	20°45.31	-9.2'	54.0'
22	149°32.15	26.21	295°26.37	13.4'	20°36.16	-9.2'	54.0'
23	164°32.01	26.21	309°58.80	13.5'	20°26.92	-9.3'	54.0'
	SD = 15.7'	d = 0.0'		SI	O = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	179°31.88	N23°26.20	324°31.30	13.6'	S20° 17.60	-9.4'	54.0'
1	194°31.74	26.19	$339^{\circ}3.85$	13.6'	20°8.19	-9.5'	54.0'
2	209°31.61	26.18	353°36.47	13.7'	19°58.70	-9.6'	54.0'
3	224°31.47	• • 26.18	8°9.16	13.7'	19°49.12	-9.7'	54.0'
4	239°31.34	26.17	22°41.90	13.8'	19°39.47	-9.7'	54.0'
5	254°31.20 269°31.06	26.16 N23°26.15	37°14.71 51°47.58	13.9' 13.9'	19°29.73 \$19°19.92	-9.8' -9.9'	54.0'
6 7	284°30.93	26.13	66°20.52	14.0'	19° 10.02	-9.9 -10.0'	54.0' 54.0'
8	299°30.79	26.12	80°53.51	14.1	19°10.02	-10.0'	54.0'
9	314°30.66	. 26.11	95° 26.57	14.1'	18° 50.00	-10.1	54.0'
10	329°30.52	26.09	109°59.68	14.2'	18° 39.88	-10.2	54.0'
11	344°30.39	26.08	124°32.86	14.2'	$18^{\circ}29.68$	-10.3'	54.0'
12	359°30.26	N23°26.06	139°6.09	14.3'	S 18° 19.40	-10.4'	54.0'
13	14°30.12	26.05	153°39.39	14.4'	18°9.05	-10.4'	54.0'
14	29°29.99	26.03	168° 12.74	14.4'	17°58.63	-10.5'	54.0'
15	44°29.85 59°29.72	• • 26.01	182°46.15 197°19.62	14.5' 14.5'	17°48.13 17°37.56	-10.6'	54.0'
16 17	59 29.72 74°29.58	26.00 25.98	211°53.14	14.5 14.6'	17 37.50 17°26.93	-10.6' -10.7'	54.0' 54.0'
18	89°29.45	N23°25.96	226° 26.72	14.6'	\$17°16.22	-10.7	54.0'
19	104°29.31	25.94	241°0.36	14.7'	17°5.44	-10.8'	54.0'
20	119°29.18	25.92	255°34.05	14.7'	16°54.60	-10.9'	54.0'
21	134°29.04	• • 25.90	270°7.80	14.8'	$16^{\circ}43.68$	-11.0'	54.0'
22	149°28.91	25.87	284°41.60	14.9'	16°32.70	-11.0'	54.0'
23	164°28.77	25.85	299° 15.45	14.9'	16°21.66	-11.1'	54.0'
	SD = 15.7'	d = -0.0'		SI	O = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°28.64	N23°25.83	313°49.36	15.0'	\$16° 10.55	-11.2'	54.0'
1	194°28.50	25.80	328° 23.31	15.0'	15°59.38	-11.2'	54.0'
2	209°28.37	25.78	342°57.32	15.1'	15°48.14	-11.3'	54.0'
3 4	224°28.23 239°28.10	· · 25.75 25.72	357°31.38 12°5.49	15.1' 15.2'	15°36.84 15°25.47	-11.4' -11.4'	54.0' 54.0'
4 5	239°28.10 254°27.96	25.72 25.70	26°39.65	15.2' 15.2'	15° 25.47 15° 14.05	-11.4 -11.5'	54.0'
6	269°27.83	N23° 25.67	41° 13.85	15.2	\$15°2.57	-11.5'	54.1
7	284°27.70	25.64	55°48.11	15.3'	14°51.02	-11.6'	54.1'
8	299°27.56	25.61	70°22.41	15.3'	14°39.42	-11.7'	54.1'
9	314°27.43	• • 25.58	84°56.76	15.4'	$14^{\circ}27.76$	-11.7'	54.1'
10	329°27.29	25.55	99°31.15	15.4'	14° 16.04	-11.8'	54.1'
11	344°27.16	25.52	114°5.59	15.5'	14°4.27	-11.8'	54.1'
12	359°27.02	N23°25.49	128° 40.07	15.5'	\$13°52.44	-11.9'	54.1'
13 14	14°26.89 29°26.75	25.45 25.42	143°14.59 157°49.16	15.6' 15.6'	13°40.55 13°28.61	-11.9' -12.0'	54.1' 54.1'
14 15	29°26.75 44°26.62	25.42	157° 49.16 172° 23.77	15.6'	13° 28.61 13° 16.62	-12.0' -12.0'	54.1' 54.1'
16	59°26.49	25.35	172 23.77 186°58.41	15.7	13°4.57	-12.1'	54.1
17	74°26.35	25.31	201°33.10	15.7'	12°52.47	-12.1'	54.1'
18	89°26.22	N23°25.28	216°7.83	15.8'	S12°40.32	-12.2'	54.1'
19	104°26.08	25.24	230°42.59	15.8'	$12^{\circ}28.12$	-12.3'	54.1'
20	119°25.95	25.20	245° 17.40	15.8'	12° 15.87	-12.3'	54.1'
21	134°25.81	• • 25.16	259°52.24	15.9'	12°3.57	-12.3'	54.2'
22	149°25.68	25.12	274°27.11	15.9'	11°51.22	-12.4'	54.2'
23	164°25.55	25.08	289°2.02	15.9'	11°38.83	-12.4'	54.2'
	SD = 15.7'	d = -0.0'		SI	O = 14.7'		

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°	////	00:49	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°	02:00	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:51	20:28	21:18
N 40°	03:17	03:59	04:31	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:13
0°	05:10	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:46
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

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

		Sun	Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.	
Juy	00 ^h	12 ^h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-86%
21	01:40	01:46	12:02	01:40	14:03	
22	01:52	01:59	12:02	02:26	14:49	
23	02:05	02:12	12:02	03:10	15:31	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	271°55.68	193°58.36 N22°32.53	102°18.50 N05°19.14	125°23.69 N14°25.45	246°52.98 N07°50.31	
1	$286^{\circ}58.14$	208°57.54 32.89	117°19.78 18.59	140°25.74 25.31	261°55.27 50.37	Alpheratz 357°32.64 29°14.45 Ankaa 353°5.21 -42°9.08
2	302°0.61	223°56.71 33.24	132°21.06 18.03	155°27.79 25.16	276°57.56 50.43	Schedar 349°28.74 56°41.08
3	317°3.07	238°55.89 · · 33.59	147°22.34 · · 17.48	170°29.84 · · 25.02	291°59.84 · · 50.49	Diphda 348°45.32 -17°49.97
4 5	332°5.53 347°8.00	253°55.06 33.94 268°54.24 34.29	162°23.61 16.92 177°24.89 16.37	185°31.89 24.88 200°33.94 24.73	307°2.13 50.55 322°4.42 50.60	Achernar 335°18.96 -57°5.49
6	2° 10.46	283°53.42 N22°34.63	192°26.17 N05°15.81	215°35.99 N14°24.59	337°6.70 N07°50.66	Hamal 327°49.07 23°35.47
7	17° 12.93	298°52.59 34.98	207° 27.44 15.26	230°38.04 24.45	352°8.99 50.72	Polaris 313°18.33 89°22.51
8	$32^{\circ}15.39$	313°51.76 35.33	222°28.72 14.70	245°40.09 24.30	7°11.28 50.78	Acamar 315°10.55 -40°11.45 Menkar 314°4.25 4°11.87
9	47° 17.85	328°50.94 · · 35.67	237°29.99 · · 14.15	260°42.14 · · 24.16	22°13.57 · · 50.84	Mirfak 308°25.70 49°57.36
10	62°20.32	343°50.11 36.01	252°31.27 13.59	275°44.19 24.01	37°15.85 50.89	Aldebaran 290°37.61 16°33.82
11 12	77° 22.78 92° 25.25	358°49.29 36.35 13°48.46 N22°36.70	267°32.55 13.04 282°33.82 N05°12.48	290°46.23 23.87 305°48.28 N14°23.73	52°18.14 50.95 67°20.43 N07°51.01	Rigel 281°2.25 -8°10.19
13	107° 27.71	28°47.63 37.03	297°35.10 11.93	320°50.33 23.58	82°22.72 51.06	Capella 280°19.35 46°1.43
14	122°30.18	43°46.81 37.37	312°36.37 11.37	335°52.38 23.44	97°25.01 51.12	Bellatrix 278°21.04 6°22.45
15	$137^{\circ}32.64$	58°45.98 · · 37.71	327°37.64 · · 10.81	350°54.43 · · 23.29	112°27.29 · · 51.18	Elnath 277°59.68 28°37.76 Alnilam 275°36.00 -1°11.08
16	152° 35.10	73°45.15 38.05	342° 38.92 10.26	5°56.48 23.15	127°29.58 51.24	Betelgeuse 270°50.23 7°24.70
17	167° 37.57	88°44.32 38.38	357° 40.19 9.70	20°58.52 23.00	142°31.87 51.29	Canopus 263°52.05 -52°42.62
18 19	182° 40.03 197° 42.50	103°43.49 N22°38.72 118°42.67 39.05	12°41.47 N05°9.15 27°42.74 8.59	36°0.57 N14°22.86 51°2.62 22.72	157°34.16 N07°51.35 172°36.45 51.41	Sirius 258°24.80 -16°45.27
20	212° 44.96	133°41.84 39.38	42°44.01 8.03	66° 4.67 22.57	187°38.74 51.47	Adhara 255°4.65 -29°0.62
21	227°47.42	148°41.01 · · 39.71	57°45.29 · · 7.48	81° 6.72 · · 22.43	202°41.03 · · 51.52	Procyon 244°49.03 5°9.22
22	242°49.89	163°40.18 40.04	72°46.56 6.92	96° 8.76 22.28	217°43.31 51.58	Pollux 243°15.19 27°57.57
23	257° 52.35	178°39.35 40.37	87°47.83 6.36	111°10.81 22.14	232°45.60 51.64	Avior 234°14.45 -59°36.04 Suhail 222°45.14 -43°32.83
Mer.	pass. 05:51	ν-0.8' d0.4' m-3.89	ν1.3' d-0.6' m1.01	ν2.1' d-0.1' m-1.82	ν2.3' d0.1' m0.63	Miaplacidus 221°38.49 -69°50.06
	pass. 00.01					Alphard 217°45.99 -8°46.78
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.47 11°49.95
0	272° 54.82	193°38.52 N22°40.70	102°49.11 N05°5.81	126°12.86 N14°21.99	247°47.89 N07°51.69	Dubhe 193°38.81 61°36.36
1	287° 57.28	208° 37.69 41.02	117°50.38 5.25	141°14.90 21.85	262°50.18 51.75	Denebola 182°22.93 14°25.11
2	302°59.74	223°36.86 41.35	132°51.65 4.69	156°16.95 21.70	277°52.47 51.81	Gienah 175°41.48 -17°41.84 Acrux 172°57.70 -63°15.45
3	$318^{\circ}2.21$	238°36.03 · · 41.67	147°52.92 · · 4.13	171°19.00 · · 21.56	292°54.76 · · 51.86	Gacrux 171°49.27 -57°16.38
4	333°4.67	253°35.19 41.99	162°54.19 3.58	186°21.04 21.41	307°57.05 51.92	Alioth 166°11.13 55°48.84
5	348°7.14	268°34.36 42.32	177°55.46 3.02	201°23.09 21.27	322°59.34 51.98	Spica 158°20.04 -11°18.40
6 7	3°9.60 18°12.06	283°33.53 N22°42.64 298°32.70 42.96	192°56.74 N05°2.46 207°58.01 1.90	216°25.14 N14°21.12 231°27.18 20.98	338°1.63 N07°52.03 353°3.92 52.09	Alkaid 152°50.23 49°10.73
8	33° 14.53	313°31.87 43.27	222°59.28 1.34	246°29.23 20.83	8°6.21 52.14	Hadar 148°32.73 -60°30.62
9	48° 16.99	328°31.03 · · 43.59	238° 0.55 · · 0.79	261°31.27 · · 20.69	23°8.50 · · 52.20	Menkent 147°54.99 -36°30.52 Arcturus 145°45.88 19°2.40
10	$63^{\circ}19.46$	343°30.20 43.91	253°1.82 05°0.23	276°33.32 20.54	38°10.79 52.26	Rigil Kent. 139°37.03 -60°57.20
11	78°21.92	358°29.37 44.22	268°3.09 04°59.67	291°35.37 20.40	53°13.08 52.31	Kochab 137°19.16 74°2.71
12	93°24.39	13°28.53 N22°44.54	283°4.36 N04°59.11	306°37.41 N14°20.25	68°15.37 N07°52.37	Zuben'ubi 136°53.53 -16°9.45
13 14	108° 26.85 123° 29.31	28°27.70 44.85 43°26.87 45.16	298°5.63 58.55 313°6.90 57.99	321°39.46 20.11 336°41.50 19.96	83°17.67 52.43 98°19.96 52.48	Alphecca 126°1.74 26°37.40
15	138° 31.78	58°26.03 · · 45.47	328°8.17 · · 57.44	351°43.55 · · 19.82	113°22.25 · · 52.54	Antares 112°12.99 -26°29.61
16	153°34.24	73°25.20 45.78	343°9.43 56.88	6°45.59 19.67	128°24.54 52.59	Atria 107°4.80 -69°4.65 Sabik 102°0.11 -15°45.52
17	$168^{\circ}36.71$	88°24.36 46.09	358° 10.70 56.32	21°47.64 19.52	143°26.83 52.65	Shaula 96°7.19 -37°7.39
18	183°39.17	103°23.53 N22°46.40	13°11.97 N04°55.76	36°49.68 N14°19.38	158°29.12 N07°52.71	Rasalhague 95°56.32 12°32.44
19	198°41.63	118°22.69 46.70	28° 13.24 55.20	51°51.73 19.23	173°31.41 52.76	Eltanin 90°40.69 51°29.12
20 21	213°44.10 228°46.56	133°21.85 47.01 148°21.02 · · 47.31	43°14.51 54.64 58°15.78 •• 54.08	66°53.77 19.09 81°55.81 · · 18.94	188°33.71 52.82 203°36.00 •• 52.87	Kaus Aust. 83°29.42 -34°22.20
22	243°49.03	163°20.18 47.61	73°17.04 53.52	96°57.86 18.79	218°38.29 52.93	Vega 80°31.41 38°48.54
23	258°51.49	178°19.35 47.91	88°18.31 52.96	111°59.90 18.65	233°40.58 52.98	Nunki 75°44.88 -26°15.64 Altair 61°57.67 8°56.50
Mer	pass. 05:47	ν-0.8' d0.3' m-3.89	ν1.3' d-0.6' m1.02	ν2.0' d-0.1' m-1.82	ν2.3' d0.1' m0.62	Peacock 53°2.07 -56°38.53
- IVICI.	pass. 03.47	ν-0.0 d0.3 iii-3.09	ν1:3 d-0:0 III1:02	ν2.0 α-0.1 III-1.02	ν2.3 d0.1 mo.02	Deneb 49°24.02 45°22.62
_						Enif 33°36.59 10°0.10
Sat 0	GHA 273° 53.95	GHA Dec 193°18.51 N22°48.21	GHA Dec 103°19.58 N04°52.40	GHA Dec 127°1.95 N14°18.50	GHA Dec 248° 42.88 N07° 53.04	Al Na'ir 27°30.16 -46°49.36
1	273 55.95 288° 56.42	193°18.51 N22°48.21 208°17.67 48.51	103°19.58 N04°52.40 118°20.85 51.84	142°3.99 18.36	263°45.17 53.09	Fomalhaut 15°12.18 -29°28.34
2	303°58.88	223°16.83 48.81	133°22.11 51.28	157° 6.03 18.21	278°47.46 53.15	Scheat 13°43.10 28°13.85 Markab 13°27.77 15°21.19
3	$319^{\circ}1.35$	238°16.00 · · 49.11	148°23.38 · · 50.72	172°8.08 · · 18.06	293°49.75 · · 53.20	
4	334°3.81	253°15.16 49.40	163°24.64 50.16	187°10.12 17.92	308°52.05 53.26	Jun 24 Thu SHA Mer.pass
5	349°6.27	268°14.32 49.70	178°25.91 49.60	202°12.16 17.77	323°54.34 53.32	Venus 282°2.68 11:05 Mars 190°22.83 17:09
6 7	4°8.74 19°11.20	283°13.48 N22°49.99 298°12.64 50.28	193°27.18 N04°49.04 208°28.44 48.48	217°14.21 N14°17.62 232°16.25 17.48	338°56.63 N07°53.37 353°58.93 53.43	Jupiter 213°28.01 15:36
8	34° 13.67	313°11.80 50.57	223°29.71 47.92	247°18.29 17.33	9°1.22 53.48	Saturn 334°57.31 07:31
9	49° 16.13	328°10.96 · · 50.86	238°30.97 · · 47.36	262°20.34 · · 17.18	24°3.51 · · 53.54	
10	64°18.60	343°10.12 51.15	253°32.24 46.79	277°22.38 17.04	39°5.81 53.59	Jun 25 Fri SHA Mer.pass Venus 280°43.70 11:06
11	79°21.06	358° 9.28 51.44	268° 33.50 46.23	292°24.42 16.89	54°8.10 53.64	Mars 189°54.29 17:07
12	94°23.52	13°8.44 N22°51.73	283°34.77 N04°45.67	307°26.46 N14°16.74	69°10.39 N07°53.70	Jupiter 213°18.04 15:33
13 14	109° 25.99 124° 28.45	28°7.60 52.01 43°6.76 52.30	298°36.03 45.11 313°37.30 44.55	322°28.50 16.60 337°30.55 16.45	84°12.69 53.75 99°14.98 53.81	Saturn 334°53.08 07:28
15	139° 30.92	58°5.92 · · 52.58	328°38.56 · · 43.99	352°32.59 · · 16.30	114°17.28 · · 53.86	Jun 26 Sat SHA Mer.pass
16	154° 33.38	73°5.08 52.86	343°39.82 43.42	7°34.63 16.16	129°19.57 53.92	Venus 279°24.55 11:07
17	169° 35.84	88°4.24 53.14	358°41.09 42.86	22°36.67 16.01	144°21.87 53.97	Mars 189°25.62 17:05
18	184° 38.31	103°3.40 N22°53.42	13°42.35 N04°42.30	37°38.71 N14°15.86	159°24.16 N07°54.03	Jupiter 213°7.99 15:30
19	199° 40.77	118°2.55 53.70	28° 43.61 41.74	52°40.76 15.72	174°26.46 54.08	Saturn 334°48.92 07:24
20 21	214° 43.24 229° 45.70	133°1.71 53.98 148°0.87 •• 54.26	43°44.87 41.18 58°46.14 • 40.61	67°42.80 15.57 82°44.84 · · 15.42	189°28.75 54.14 204°31.05 • 54.19	Horizontal parallax
22	244°48.16	163°0.03 54.53	73°47.40 40.05	97°46.88 15.27	219°33.34 54.24	Venus: 0.1
23	259° 50.63	177°59.18 54.80	88°48.66 39.49	112°48.92 15.13	234°35.64 54.30	Mars: 0.1
Mer	pass. 05:43	ν-0.8' d0.3' m-3.89	$\nu 1.3' \ d$ -0.6' m1.02	ν2.0' d-0.1' m-1.82	ν2.3' d0.1' m0.62	
	- 200. 00.70					

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°25.41	N23°25.04	303°36.96	16.0'	S11°26.39	-12.5'	54.2'
1 2	194°25.28 209°25.14	25.00 24.96	318°11.94 332°46.94	16.0' 16.0'	11°13.90 11°1.36	-12.5' -12.6'	54.2' 54.2'
3	209 25.14 224°25.01	24.91	347°21.98	16.1'	10°48.78	-12.6'	54.2'
4	239°24.88	24.87	1°57.05	16.1'	10°36.15	-12.7'	54.2'
5	254°24.74	24.83	16°32.15	16.1'	10°23.49	-12.7'	54.2'
6 7	269°24.61 284°24.48	N23°24.78 24.73	31°7.27 45°42.42	16.2' 16.2'	\$10° 10.77 09° 58.02	-12.8' -12.8'	54.2' 54.3'
8	299°24.34	24.73	60° 17.60	16.2'	09° 45.23	-12.8'	54.3'
9	314°24.21	• • 24.64	74°52.81	16.2'	09°32.39	-12.9'	54.3'
10	329°24.07	24.59	89°28.03	16.3'	09°19.51	-12.9'	54.3'
11 12	344°23.94 359°23.81	24.54 N23°24.49	104°3.29 118°38.56	16.3' 16.3'	09°6.60 \$08°53.64	-13.0' -13.0'	54.3' 54.3'
13	14°23.67	24.44	133° 13.85	16.3'	08°40.65	-13.0'	54.3'
14	29°23.54	24.39	147°49.17	16.3'	$08^{\circ}27.62$	-13.1'	54.3'
15	44°23.41 59°23.27	• • 24.34	162°24.51	16.4	08°14.55 08°1.45	-13.1'	54.4'
16 17	59 23.27 74°23.14	24.29 24.23	176°59.86 191°35.23	16.4' 16.4'	08 1.45 07°48.31	-13.1' -13.2'	54.4' 54.4'
18	89°23.01	N23°24.18	206° 10.62	16.4	S07°35.14	-13.2'	54.4'
19	104°22.87	24.13	220°46.02	16.4'	07°21.93	-13.2'	54.4'
20	119°22.74 134°22.61	24.07 •• 24.02	235°21.44 249°56.87	16.4	07°8.69 06°55.42	-13.3'	54.4'
21 22	134 22.61 149°22.47	23.96	249 50.87 264°32.31	16.4' 16.5'	06°55.42	-13.3' -13.3'	54.4' 54.5'
23	164°22.34	23.90	279°7.76	16.5'	06°28.78	-13.4'	54.5'
	SD = 15.7'	d = -0.0'		SI	D = 14.8'		
_							
Fri 0	GHA 179°22.21	Dec N23° 23.84	GHA 293°43.23	u 16.5'	Dec 506°15.41	d -13.4'	HP 54.5'
1	179 22.21 194°22.07	23.78	293 43.23 308°18.70	16.5'	06°2.02	-13.4 -13.4'	54.5'
2	209°21.94	23.72	322°54.18	16.5'	05°48.59	-13.5'	54.5'
3	224°21.81	• • 23.66	337°29.67	16.5'	05°35.13	-13.5'	54.5'
4 5	239°21.67 254°21.54	23.60 23.54	352°5.16 6°40.66	16.5' 16.5'	05°21.65 05°8.14	-13.5' -13.5'	54.6' 54.6'
6	269°21.41	N23°23.48	21°16.16	16.5'	S04°54.60	-13.6'	54.6'
7	284°21.28	23.42	35°51.66	16.5'	04°41.04	-13.6'	54.6'
8	299°21.14	23.35	50°27.17	16.5'	04°27.45	-13.6'	54.6'
9 10	314°21.01 329°20.88	· · 23.29 23.22	65°2.67 79°38.18	16.5' 16.5'	04°13.84 04°0.20	-13.6' -13.7'	54.6' 54.7'
11	344°20.74	23.16	94°13.68	16.5'	03°46.54	-13.7'	54.7'
12	359°20.61	N23°23.09	108°49.18	16.5'	S03°32.86	-13.7'	54.7'
13 14	14°20.48 29°20.35	23.02 22.95	123°24.68 138°0.17	16.5' 16.5'	03°19.15 03°5.42	-13.7' -13.7'	54.7' 54.7'
15	44°20.21	22.88	150 0.17 152°35.66	16.5	03 5.42 02°51.68	-13.7 -13.8'	54. <i>1</i> 54.8'
16	59°20.08	22.81	167°11.13	16.5'	02°37.91	-13.8'	54.8'
17	74°19.95	22.74	181°46.60	16.5'	02°24.12	-13.8'	54.8'
18 19	89°19.82 104°19.69	N23°22.67 22.60	196°22.06 210°57.51	16.4' 16.4'	\$02°10.32 01°56.49	-13.8' -13.8'	54.8' 54.8'
20	119°19.55	22.53	225° 32.95		01°42.65		54.9'
21	134°19.42	• • 22.46	240°8.37	16.4'	$01^{\circ}28.80$	-13.9'	54.9'
22	149°19.29	22.38	254°43.78	16.4	01°14.92	-13.9'	54.9'
23	164°19.16	22.31	269°19.17	16.4'	01°1.03	-13.9'	54.9'
	SD = 15.7'	d = -0.1'			D = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.02	N23°22.23	283°54.55	16.4'	S00°47.13	-13.9'	55.0'
1 2	194°18.89 209°18.76	22.16 22.08	298°29.90 313°5.24	16.3' 16.3'	00°33.22 00°19.29	-13.9' -13.9'	55.0' 55.0'
3	209 18.70 224°18.63	22.00	327° 40.56	16.3'	500°5.34	-13.9 -14.0'	55.0'
4	239°18.50	21.92	342°15.86	16.3'	N00°8.61	14.0'	55.0'
5	254°18.36	21.84	356°51.13	16.3'	00°22.57	14.0'	55.1'
6 7	269°18.23 284°18.10	N23°21.77 21.68	11°26.38 26°1.61	16.2' 16.2'	N00°36.55 00°50.53	14.0' 14.0'	55.1' 55.1'
8	299°17.97	21.60	40°36.81	16.2'	01°4.52	14.0'	55.1
9	314°17.84	• • 21.52	55° 11.98	16.1'	01°18.52	14.0'	55.2'
10	329°17.71 344°17.58	21.44	69°47.12 84°22.23	16.1'	01°32.53	14.0'	55.2'
11 12	344°17.58 359°17.44	21.36 N23°21.27	84° 22.23 98° 57.32	16.1' 16.0'	01°46.55 N02°0.57	14.0' 14.0'	55.2' 55.2'
13	14°17.31	21.19	113°32.36	16.0'	$02^{\circ}14.59$	14.0'	55.3'
14	29°17.18	21.10	128°7.38	16.0'	02°28.62	14.0'	55.3'
15 16	44°17.05 59°16.92	· · 21.02 20.93	142°42.36 157°17.30	15.9' 15.9'	02° 42.65 02° 56.69	14.0' 14.0'	55.3' 55.3'
16 17	74°16.79	20.93	157°17.30 171°52.21	15.9' 15.9'	02°56.69 03°10.73	14.0'	55.4'
18	89°16.66	N23°20.75	186°27.08	15.8'	N03°24.77	14.0'	55.4'
19	104°16.53	20.67	201°1.91	15.8'	03°38.81	14.0'	55.4'
20 21	119°16.39 134°16.26	20.58 •• 20.49	215°36.69 230°11.44	15.7' 15.7'	03°52.84 04°6.88	14.0' 14.0'	55.5' 55.5'
22	134 16.26 149°16.13	20.39	244° 46.14	15.7' 15.7'	04 6.88 04°20.92	14.0'	55.5'
23	164°16.00	20.30	259°20.79	15.6'	04°34.95	14.0'	55.5'
	SD = 15.7'	d = -0.1'		SI	D = 15.0'		

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

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

		Sun		Moon		
Day	Egn.of Time		Mer.	Mer.	Pass.	Age
- 4,	00 ^h	12 ^h	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-62%
24	02:18	02:25	12:02	03:52	16:12	
25	02:31	02:38	12:03	04:33	16:53	
26	02:44	02:50	12:03	05:13	17:33	

h	Aries	, Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0 0	274°53.09	192°58.34	N22°55.08	103° 49.92	N04°38.93	127°50.96	N14°14.98	249°37.93	N07° 54.35		
1	289° 55.56	207°57.50	55.35	118° 51.19	38.36	142°53.00	14.83	264°40.23	54.41	Alpheratz	357°32.62
2	304°58.02	207 57.50 222° 56.65	55.62	133°52.45	37.80	157°55.04	14.68	279°42.52	54.46	Ankaa	353°5.18
3	320°0.48	237°55.81	• • 55.89	148°53.71	• • 37.24	172°57.08	• • 14.54	294°44.82	• • 54.51	Schedar	349°28.71
4	335°2.95	252°54.96	56.16	163°54.97	36.67	187°59.12	14.39	309°47.12	54.57	Diphda	348°45.30
5	350°5.41	267°54.12	56.43	178°56.23	36.11	$203^{\circ}1.16$	14.24	324°49.41	54.62	Achernar	335°18.93 327°49.05
6	5°7.88	282°53.27	N22°56.69	193°57.49	N04°35.55	218° 3.20	N14°14.09	339°51.71	N07°54.68	Hamal Polaris	
7	20° 10.34	297°52.43	56.96	208°58.75	34.98	233°5.24	13.94	354°54.00	54.73	Acamar	315°10.53
8	35° 12.80	312°51.58	57.22	224°0.01	34.42	248°7.28	13.80	9°56.30	54.78	Menkar	314° 4.24
9	50° 15.27	327°50.74	• • 57.48	239°1.27	• • 33.85	263°9.32	• • 13.65	24°58.60	• • 54.84	Mirfak	308°25.68
10	65° 17.73	342°49.89	57.74	254°2.53	33.29	278°11.36	13.50	40°0.89	54.89	Aldebaran	290°37.60
11 12	80° 20.20 95° 22.66	357°49.05 12°48.20	58.00 N22°58.26	269°3.79 284°5.05	32.73 N04°32.16	293°13.40 308°15.44	13.35 N14°13.20	55°3.19 70°5.49	54.94 N07°55.00	Rigel	281°2.24
13	110°25.13	27° 47.35	58.52	299°6.31	31.60	323°17.48	13.06	85°7.79	55.05	Capella	280°19.34
14	125°27.59	42°46.51	58.78	314°7.57	31.03	338°19.52	12.91	100°10.08	55.10	Bellatrix	278°21.03
15	140°30.05	57° 45.66	• • 59.03	329°8.82	• • 30.47	353°21.55	• • 12.76	115°12.38	• • 55.16	Elnath	277°59.67
16	155°32.52	72°44.81	59.29	344°10.08	29.90	8°23.59	12.61	130°14.68	55.21	Alnilam	275°36.00 270°50.22
17	170°34.98	87°43.96	59.54	359°11.34	29.34	23°25.63	12.46	145°16.98	55.26	Betelgeuse Canopus	263°52.05
18	185°37.45	102°43.12	N22°59.79	14°12.60	N04°28.77	38°27.67	N14°12.31	160°19.27	N07°55.32	Sirius	258°24.80
19	200°39.91	117° 42.27	23°0.05	29°13.86	28.21	53°29.71	12.17	175°21.57	55.37	Adhara	255° 4.65
20	215° 42.37	132°41.42	0.30	44°15.11	27.64	68°31.75	12.02	190°23.87	55.42	Procyon	244°49.03
21 22	230° 44.84 245° 47.30	147°40.57 162°39.72	· · 0.54 0.79	59° 16.37 74° 17.63	· · 27.08 26.51	83°33.78 98°35.82	· · 11.87 11.72	205°26.17 220°28.47	• • 55.48 55.53	Pollux	243°15.19
23	260°49.77	177°38.87	1.04	89° 18.88	25.95	113°37.86	11.72	235°30.76	55.58	Avior	234°14.46
							_			Suhail	222°45.15
Mer.p	pass. 05:40	ν -0.8′ d0	.3′ m-3.89	ν 1.3′ d-0	.6′ m1.03	$\nu 2.0' \ d-0$.1′ m-1.81	ν 2.3′ d0	.1′ m0.62	Miaplacidus	221°38.52
										Alphard Regulus	217°45.99 207°32.48
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.84
0	275°52.23	192°38.02	N23°1.28	104°20.14	N04°25.38	128°39.90	N14°11.42	250°33.06	N07°55.63	Denebola	182°22.94
1	290°54.69	207°37.18	1.53	119°21.40	24.82	143°41.94	11.27	265°35.36	55.69	Gienah	175°41.49
2	305°57.16	222°36.33	1.77	134°22.65	24.25	158°43.97	11.12	280°37.66	55.74	Acrux	172°57.73
3 4	320°59.62 336°2.09	237°35.48 252°34.63	· · 2.01 2.25	149°23.91 164°25.17	· · 23.69 23.12	173°46.01 188°48.05	· · 10.97 10.83	295°39.96 310°42.26	· · 55.79 55.85	Gacrux	171°49.29
5	351°4.55	267° 33.78	2.49	179° 26.42	22.55	203°50.08	10.68	325°44.56	55.90	Alioth	166°11.16
6	6°7.01	282°32.92	N23° 2.73	194°27.68	N04°21.99	218°52.12	N14°10.53	340°46.86	N07°55.95	Spica	158°20.06
7	21°9.48	297°32.07	2.97	209°28.93	21.42	233°54.16	10.38	355°49.16	56.00	Alkaid Hadar	152°50.25 148°32.75
8	$36^{\circ}11.94$	312°31.22	3.20	224°30.19	20.85	248°56.19	10.23	10°51.46	56.06		146 32.75 147°55.00
9	51° 14.41	327°30.37	• • 3.44	239°31.44	• • 20.29	263°58.23	•• 10.08	25°53.76	•• 56.11		145°45.89
10	66° 16.87	342°29.52	3.67	254°32.70	19.72	279°0.27	9.93	40°56.06	56.16		139°37.06
11	81°19.34	357°28.67 12°27.82	3.91	269°33.95	19.15	294°2.30	9.78	55°58.36	56.21	Kochab	$137^{\circ}19.20$
12 13	96°21.80 111°24.26	27°26.96	N23° 4.14 4.37	284°35.20 299°36.46	N04°18.59 18.02	309° 4.34 324° 6.37	N14°9.63 9.48	71°0.66 86°2.96	N07° 56.26 56.32	Zuben'ubi	
13	111 24.20 126°26.73	42°26.11	4.57	314° 37.71	17.45	339° 8.41	9.46	101°5.26	56.37	Alphecca	126°1.75
15	141°29.19	57°25.26	• 4.83	329°38.96	16.88	354°10.45	• • 9.18	116°7.56	• • 56.42	Antares	112°13.00
16	156°31.66	72°24.41	5.05	344° 40.22	16.32	9°12.48	9.03	131°9.86	56.47	Atria	107°4.81
17	171°34.12	87°23.55	5.28	359°41.47	15.75	$24^{\circ}14.52$	8.88	$146^{\circ}12.16$	56.52	Sabik Shaula	102°0.11 96°7.19
18	$186^{\circ}36.58$	102°22.70	N23°5.50		N04°15.18	39°16.55	N14°8.73	161°14.46	N07°56.58	Rasalhague	95°56.32
19	201°39.05	117°21.85	5.73	29°43.97	14.61	54°18.59	8.58	176°16.76	56.63	Eltanin	90°40.70
20	216°41.51	132°20.99	5.95	44° 45.23	14.05	69°20.62	8.43	191°19.06	56.68	Kaus Aust.	83°29.41
21	231° 43.98 246° 46.44	147°20.14 162°19.28	• • 6.17	59°46.48	13.48	84°22.66 99°24.69	• • 8.28	206°21.37	• • 56.73	Vega	80°31.41
22 23	246 46.44 261°48.90	102 19.28 177°18.43	6.39 6.61	74°47.73 89°48.98	12.91 12.34	99 24.69 114°26.73	8.13 7.98	221°23.67 236°25.97	56.78 56.83	Nunki	75°44.87
										Altair	61°57.66
Mer.p	pass. 05:36	ν -0.8' d0	.2′ m-3.89	$\nu 1.3' \ d-0$.6′ m1.04	$\nu 2.0' \ d-0$	$.1^\prime$ m-1.81	ν 2.3′ d0	.1' m 0.62	Peacock	53°2.05
										Deneb Enif	49°24.00 33°36.58
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.14
0	$276^{\circ}51.37$	192°17.58	N23°6.83	$104^{\circ}50.23$	$N04^{\circ}11.77$	129°28.76	N14°7.83	251°28.27	N07°56.88	Fomalhaut	15°12.16
1	291°53.83	207°16.72	7.04	119°51.48	11.20	144°30.80	7.68	266°30.57	56.94	Scheat	13°43.08
2	306° 56.30	222°15.87	7.26	134°52.74	10.64	159°32.83	7.53	281°32.88	56.99	Markab	13°27.75
3	321°58.76	237°15.01 252°14.15	• • 7.47	149°53.99	• • 10.07	174°34.86	· · 7.38	296°35.18 311°37.48	• • 57.04	Jun 27 Sun	SHA
4 5	337°1.23 352°3.69	252 14.15 267°13.30	7.68 7.90	164°55.24 179°56.49	9.50 8.93	189°36.90 204°38.93	7.23 7.08	311 37.48 326°39.78	57.09 57.14	Venus	
6	7°6.15	282° 12.44	N23°8.11	179 50.49 194° 57.74	0.93 N04°8.36	204 36.93 219°40.97	N14°6.93	341°42.09		I	188°56.83
7	22°8.62	297°11.59	8.32	209°58.99	7.79	234°43.00	6.78	356°44.39	57.24		212°57.87
8	37°11.08	312°10.73	8.52	225°0.24	7.22	249°45.03	6.63	11°46.69	57.29		334°44.84
9	52° 13.55	327°9.87	· · 8.73	240°1.49	• • 6.65	264°47.07	• • 6.48	26°48.99	• • 57.34	I 20 Mars	SHA
10	$67^{\circ}16.01$	$342^{\circ}9.02$	8.94	255°2.73	6.08	279°49.10	6.33	41°51.30	57.40	Jun 28 Mon	276° 45.79
11	82° 18.47	357°8.16	9.14	270°3.98	5.51	294°51.13	6.18	56°53.60	57.45		188°27.91
12	97°20.94	12°7.30	N23° 9.35	285°5.23	N04°4.94	309°53.17	N14°6.02	71°55.90			212°47.67
13 14	112°23.40 127°25.87	27°6.45 42°5.59	9.55 9.75	300°6.48 315°7.73	4.37 3.80	324°55.20 339°57.23	5.87 5.72	86°58.21 102°0.51	57.55 57.60		334°40.83
14 15	142° 28.33	42 5.59 57°4.73	9.75 •• 9.95	315 7.73 330°8.98	. 3.80	354°59.27	5.72 · · 5.57	102 0.51 117°2.81	57.65	Jun 29 Tue	SHA
16	142 26.33 157°30.79	72°3.87	10.15	345°10.22	2.66	10° 1.30	5.42	132°5.12	57.05		SHA 275°26.21
17	172°33.26	87°3.02	10.15	0°11.47	2.09	25°3.33	5.42	147°7.42	57.75		187°58.86
18	187° 35.72		N23°10.54	15° 12.72	N04° 1.52	40° 5.36	N14°5.12	162°9.73			212°37.39
19	$202^{\circ}38.19$	$117^{\circ}1.30$	10.74	$30^{\circ}13.97$	0.95	55°7.39	4.97	177°12.03	57.85		334°36.90
20	217° 40.65	132°0.44	10.93	45° 15.21	04°0.38	70°9.43	4.82	192°14.34	57.90	L1!-	stal navall-
21	232°43.12	146°59.58	• • 11.13	60°16.46	03°59.81	85°11.46	• • 4.66	207°16.64	• • 57.95	Horizor	ntal parallax Venus:
22 23	247° 45.58 262° 48.04	161°58.72 176°57.86	11.32 11.51	75° 17.71 90° 18.95	59.24 58.67	100°13.49 115°15.52	4.51 4.36	222°18.95 237°21.25	58.00 58.05		venus: Mars:
Mer.p	pass. 05:32	ν -0.9′ d0	.2′ m-3.90	$\nu 1.3' \ d-0$.6′ m1.05	$\nu 2.0' \ d-0$.2′ m-1.81	$\nu 2.3' d0$.1′ m0.61		

Dec 29°14.46

-42°9.08

56°41 08

-17°49.96 -57°5.48

 $23^{\circ}35.48$

89°22.50

-40°11.44

4°11.88

49°57.35

16°33.83 -8°10.18

 $46^{\circ}1.42$

 $6^{\circ}22.45$

28°37.76

 $-1^{\circ}11.07$

-52°42.60 -16°45.26

 $-29^{\circ}0.61$ $5^{\circ}9.22$

 $27^{\circ}57.57$

-59°36.02

-43°32.81

-69°50.05

-8°46.77

11°49.95

61°36.36

14°25.12

 $-17^{\circ}41.84$

-63°15.45

-57°16.37

55°48.84

-11°18.40

49°10.74

-60°30.62

-36°30.52

 $19^{\circ}2.41$

-60°57.20

 $74^{\circ}2.72$

-16°9.45

26°37.41 -26°29.61

-69°4.67

-15°45.52

 $-37^{\circ}7.40$

 $12^{\circ}32.45$

51°29.14

-34°22.20

38°48.56

-26°15.64

8°56.51

-56°38.54

45°22.63

 $10^{\circ}0.11$

-46°49.36

-29°28.34 28°13.86

15°21.20

Mer.pass

11:09

17:03

15:27

07:20

11:10

17:01

15:23

07:17

11:11 16:59

15:20

07:13

0.1

0.1

Mer.pass

Mer.pass

 $7^{\circ}24.70$

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.87	N23°20.21	$273^{\circ}55.40$	15.6'	N04°48.98	14.0'	55.6'
1	194°15.74	20.12	288°29.96	15.5'	05°3.00	14.0'	55.6'
2 3	209°15.61 224°15.48	20.02 •• 19.93	303°4.47 317°38.93	15.5' 15.4'	05°17.02 05°31.03	14.0' 14.0'	55.6' 55.7'
4	239°15.35	19.83	332° 13.35	15.4'	05°45.04	14.0'	55.7'
5	254°15.22	19.74	$346^{\circ}47.70$	15.3'	$05^{\circ}59.03$	14.0'	55.7'
6	269°15.09	N23° 19.64	1°22.01	15.2'	N06° 13.02	14.0'	55.7'
7 8	284°14.96 299°14.83	19.54 19.44	15°56.25 30°30.45	15.2' 15.1'	06°27.00 06°40.97	14.0' 14.0'	55.8' 55.8'
9	314°14.70	. 19.35	45°4.58	15.1'	06° 54.92	13.9'	55.8'
10	329°14.57	19.25	59° 38.65	15.0'	07°8.87	13.9'	55.9'
11	344°14.44	19.15	74° 12.67	15.0'	07°22.80	13.9'	55.9'
12 13	359°14.31 14°14.18	N23° 19.04 18.94	88° 46.62 103° 20.51	14.9' 14.8'	N07°36.71 07°50.61	13.9' 13.9'	55.9' 56.0'
14	29°14.05	18.84	117° 54.33	14.8'	08°4.50	13.9	56.0'
15	44°13.92	• • 18.74	$132^{\circ}28.09$	14.7'	$08^{\circ}18.36$	13.8'	56.0'
16	59°13.79	18.63	147°1.78	14.6'	08°32.21	13.8'	56.1'
17 18	74°13.66 89°13.53	18.53 N23° 18.42	161°35.41 176°8.96	14.6' 14.5'	08°46.04 N08°59.85	13.8' 13.8'	56.1' 56.1'
19	104°13.40	18.32	190° 42.44	14.4'	09° 13.63	13.8'	56.2'
20	119°13.27	18.21	$205^{\circ}15.85$	14.3'	$09^{\circ}27.40$	13.7'	56.2'
21	134°13.14	• • 18.10	219°49.19	14.3'	09°41.14	13.7'	56.2'
22 23	149°13.01 164°12.88	17.99 17.89	234°22.45 248°55.63	14.2' 14.1'	09°54.86 10°8.55	13.7' 13.7'	56.3' 56.3'
23						13.1	55.5
	SD = 15.7'	d = -0.1'		SL	0 = 15.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.75	N23° 17.78	263°28.74	14.0'	N10°22.21	13.6'	56.3'
1	194°12.62 209°12.50	17.67 17.56	278°1.77 292°34.71	13.9' 13.9'	10°35.85 10°49.46	13.6' 13.6'	56.4' 56.4'
2	209°12.50 224°12.37	17.56 •• 17.44	292°34.71 307°7.58	13.9' 13.8'	10°49.46 11°3.04	13.6° 13.5°	56.4' 56.4'
4	239°12.24	17.33	321°40.36	13.7'	11°16.58	13.5'	56.5'
5	254°12.11	17.22	336° 13.06	13.6'	11° 30.10	13.5'	56.5'
6	269°11.98 284°11.85	N23° 17.10	350° 45.68 5° 18.20	13.5'	N11°43.58 11°57.03	13.4'	56.5'
7 8	284°11.85 299°11.72	16.99 16.87	19°50.64	13.4' 13.3'	11°57.03 12°10.44	13.4' 13.4'	56.6' 56.6'
9	314°11.59	. 16.76	34°22.99	13.3'	12°23.81	13.3'	56.6'
10	329°11.47	16.64	$48^{\circ}55.25$	13.2'	$12^{\circ}37.15$	13.3'	56.7'
11	344°11.34	16.52	63°27.42	13.1'	12°50.44	13.3'	56.7'
12 13	359°11.21 14°11.08	N23° 16.41 16.29	77°59.49 92°31.47	13.0' 12.9'	N13°3.70 13°16.91	13.2' 13.2'	56.7' 56.8'
14	29°10.95	16.17	107°3.35	12.8'	13°30.08	13.1'	56.8'
15	44°10.83	• • 16.05	$121^{\circ}35.14$	12.7'	$13^{\circ}43.21$	13.1'	56.8'
16	59°10.70	15.93	136°6.83	12.6'	13°56.29	13.0'	56.9'
17 18	74°10.57 89°10.44	15.80 N23° 15.68	150°38.42 165°9.91	12.5' 12.4'	14°9.32 N14°22.30	13.0' 12.9'	56.9' 57.0'
19	104°10.31	15.56	179° 41.29	12.3'	14° 35.24	12.9'	57.0'
20	119°10.19	15.44	$194^{\circ}12.58$		14°48.12	12.8'	57.0'
21	134°10.06	. 15.31	208°43.76	12.1'	15°0.95	12.8'	57.1'
22 23	149°9.93 164°9.80	15.19 15.06	223°14.83 237°45.80	12.0' 11.9'	15° 13.73 15° 26.45	12.7' 12.7'	57.1' 57.1'
23			237 43.00			12.1	37.1
	SD = 15.7′	d = -0.1'		SL	0 = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°9.68	N23°14.93	252° 16.66	11.8'	N15°39.11	12.6'	57.2'
1 2	194° 9.55 209° 9.42	14.81 14.68	266° 47.41 281° 18.05	11.6' 11.5'	15°51.72 16°4.26	12.5' 12.5'	57.2' 57.3'
3	209 9.42 224°9.29	14.08	281 18.05 295°48.58	11.5 11.4'	16 4.26 16°16.75	12.5 12.4'	57.3'
4	239°9.17	14.42	$310^{\circ}19.00$	11.3'	16°29.17	12.4'	57.3'
5	254°9.04	14.29	324°49.30	11.2'	16°41.52	12.3'	57.4'
6 7	269°8.91 284°8.79	N23°14.16 14.03	339° 19.49 353° 49.56	11.1' 11.0'	N16°53.81 17°6.04	12.2' 12.2'	57.4' 57.5'
8	299°8.66	13.89	8° 19.52	10.8'	17° 18.19	12.1'	57.5'
9	314°8.53	• • 13.76	22°49.36	10.7'	$17^{\circ}30.27$	12.0'	57.5'
10	329°8.41	13.63	37°19.09	10.6'	17°42.28	11.9'	57.6'
11 12	344°8.28 359°8.15	13.49 N23°13.36	51° 48.69 66° 18.17	10.5' 10.4'	17°54.22 N18°6.08	11.9' 11.8'	57.6' 57.6'
13	14°8.03	13.22	80° 47.54	10.4	18° 17.87	11.7	57.7'
14	29°7.90	13.09	95° 16.78	10.1'	$18^{\circ}29.57$	11.6'	57.7'
15	44°7.78	• 12.95	109° 45.89	10.0'	18° 41.20	11.5'	57.8'
16 17	59°7.65 74°7.52	12.81 12.67	124° 14.89 138° 43.75	9.9' 9.7'	18°52.74 19°4.20	11.5' 11.4'	57.8' 57.8'
18	89°7.40	N23° 12.53	158 45.75 153°12.50	9.7	N19° 15.57	11.4	57.8 57.9'
19	104°7.27	12.39	167°41.12	9.5'	19°26.86	11.2'	57.9'
20	119°7.15	12.25	182°9.61	9.4'	19°38.06	11.1'	58.0'
21 22	134°7.02 149°6.90	· · 12.11 11.97	196°37.97 211°6.21	9.2' 9.1'	19°49.16 20°0.18	11.0' 10.9'	58.0' 58.0'
23	149 6.90 164° 6.77	11.97	211 0.21 225°34.31	9.1	20° 11.10	10.9	58.1
	SD = 15.7'	d = -0.1'		ςr	O = 15.6'		
				J.	10.0		

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

Lat.		Moonris	е		Moonset	: 1
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	22:14	21:24		13:49	16:14	
N 70°	22:29	21:56	20:39	13:37	15:44	18:44
68°	22:41	22:19	21:43	13:27	15:22	17:42
66°	22:51	22:37	22:18	13:19	15:06	17:07
64°	22:59	22:52	22:44	13:12	14:52	16:42
62°	23:07	23:05	23:04	13:06	14:41	16:23
60°	23:13	23:16	23:21	13:01	14:31	16:07
N 58°	23:19	23:25	23:35	12:57	14:22	15:54
56°	23:24	23:34	23:47	12:53	14:15	15:43
54°	23:28	23:41	23:58	12:49	14:09	15:33
52°	23:32	23:48		12:46	14:03	15:24
50°	23:36	23:54		12:43	13:57	15:16
45°	23:44		00:07	12:37	13:46	14:59
N 40°	23:51		00:18	12:31	13:37	14:45
35°	23:57		00:27	12:27	13:29	14:34
30°		00:02	00:35	12:23	13:22	14:24
20°		00:12	00:49	12:16	13:09	14:07
N 10°		00:20	01:02	12:10	12:59	13:52
0°		00:27	01:14	12:05	12:49	13:38
S 10°		00:35	01:26	11:59	12:39	13:24
20°		00:43	01:39	11:53	12:29	13:09
30°		00:53	01:53	11:46	12:17	12:52
35°		00:59	02:02	11:43	12:10	12:42
40°	00:01	01:05	02:12	11:38	12:03	12:31
45°	00:04	01:12	02:24	11:33	11:54	12:18
S 50°	80:00	01:21	02:38	11:27	11:43	12:02
52°	00:10	01:25	02:45	11:24	11:38	11:55
54°	00:12	01:30	02:52	11:21	11:32	11:47
56°	00:15	01:35	03:00	11:18	11:26	11:38
58°	00:17	01:41	03:10	11:14	11:20	11:27
S 60°	00:20	01:47	03:21	11:10	11:12	11:15

		Sun		Moon				ı
	Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		ı
	,	00 ^h	12 ^h	Pass	Upper	Lower	23-25	١
ı		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-32%	ı
	27	02:57	03:03	12:03	05:54	18:16		ı
ı	28	03:09	03:15	12:03	06:38	19:01		ı
	29	03:21	03:27	12:03	07:26	19:51		١

h	Aries	Venus	, , Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	277°50.51	191°57.00 N23°11.70	105°20.20 N03°58.10	130°17.55 N14°4.21	252°23.56 N07°58.10	
1	292°52.97	206° 56.14 11.89	120°21.44 57.52	145°19.58 4.06	267°25.86 58.15	Alpheratz 357°32.60
2	307°55.44	221°55.28 12.07	135°22.69 56.95	160°21.62 3.91	282°28.17 58.20	Ankaa 353°5.16
3	322°57.90	236°54.42 · · 12.26	150°23.94 · · 56.38	175°23.65 · · 3.75	297°30.47 · · 58.25	Schedar 349°28.67
4	338°0.36	251°53.56 12.44	165°25.18 55.81	190°25.68 3.60	312°32.78 58.30	Diphda 348°45.28
5	353°2.83	266°52.70 12.63	180° 26.43 55.24	205°27.71 3.45	327°35.08 58.35	Achernar 335°18.90
6	8°5.29	281°51.84 N23°12.81	195°27.67 N03°54.67	220°29.74 N14°3.30	342°37.39 N07°58.40	Hamal 327°49.02 Polaris 313°15.63
7	23°7.76	296°50.98 12.99	210°28.92 54.09	235°31.77 3.15	357°39.70 58.45	Polaris 313°15.63 Acamar 315°10.51
8	$38^{\circ}10.22$	311°50.12 13.17	225°30.16 53.52	250°33.80 2.99	12°42.00 58.50	Menkar 314°4.22
9	53°12.69	326°49.26 · · 13.35	240°31.40 · · 52.95	265°35.83 · · 2.84	27°44.31 · · 58.55	Mirfak 308°25.65
10	68° 15.15	341°48.40 13.53	255° 32.65 52.38	280°37.86 2.69	42°46.61 58.60	Aldebaran 290° 37.58
11	83° 17.61	356°47.54 13.71	270°33.89 51.80	295°39.89 2.54	57°48.92 58.65	Rigel 281°2.23
12	98°20.08	11°46.68 N23°13.88	285°35.14 N03°51.23	310°41.92 N14°2.39	72°51.23 N07°58.70	Capella 280° 19.32
13	113°22.54	26°45.81 14.06	300°36.38 50.66	325°43.95 2.23	87°53.53 58.75	Bellatrix 278°21.02
14	128° 25.01 143° 27.47	41°44.95 14.23 56°44.09 •• 14.40	315°37.62 50.09 330°38.86 • 49.51	340°45.98 2.08	102°55.84 58.80 117°58.15 •• 58.85	Elnath 277° 59.65
15 16	143 27.47 158° 29.93	56°44.09 · · 14.40 71°43.23 14.57	330°38.86 · · 49.51 345°40.11 48.94	355°48.01 · · 1.93 10°50.04 1.78	117°58.15 · · 58.85 133°0.46 58.90	Alnilam 275°35.99
17	173° 32.40	86°42.36 14.74	0°41.35 48.37	25°52.07 1.62	148°2.76 58.94	Betelgeuse 270°50.21
18	188° 34.86	101°41.50 N23°14.91	15°42.59 N03°47.79	40°54.10 N14°1.47	163°5.07 N07°58.99	Canopus 263° 52.04
19	203°37.33	116° 40.64 15.08	30°43.83 47.22	55°56.13 1.32	178°7.38 59.04	Sirius 258°24.79
20	218° 39.79	131°39.78 15.24	45°45.07 46.65	70°58.16 1.17	193°9.69 59.09	Adhara 255°4.64
21	233°42.26	146°38.91 · · 15.41	60°46.32 · · 46.07	86° 0.19 · · 1.01	208°11.99 · · 59.14	Procyon 244°49.03
22	248°44.72	161°38.05 15.57	75° 47.56 45.50	101°2.22 0.86	223°14.30 59.19	Pollux 243°15.19
23	263°47.18	176°37.19 15.74	90°48.80 44.93	116° 4.25 0.71	238°16.61 59.24	Avior 234°14.47
	05.00					Suhail 222°45.15
ivier.	pass. 05:28	ν-0.9' d0.2' m-3.90	ν1.2' d-0.6' m1.06	ν2.0′ d-0.2′ m-1.80	$\nu 2.3' \ d0.1' \ m0.61$	Miaplacidus 221°38.54 Alphard 217°46.00
						Alphard 217°46.00 Regulus 207°32.49
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.86
0	278°49.65	191°36.32 N23°15.90	105°50.04 N03°44.35	131°6.27 N14°0.55	253°18.92 N07°59.29	Denebola 182°22.95
1	293°52.11	206° 35.46 16.06	120°51.28 43.78	146°8.30 0.40	268°21.23 59.34	Gienah 175°41.50
2	308°54.58	221°34.59 16.22	135°52.52 43.20	161°10.33 0.25	283°23.54 59.38	Acrux 172°57.75
3	323°57.04	236°33.73 · · 16.38	150° 53.76 · · 42.63	176°12.36 14°0.10	298°25.84 · · 59.43	Gacrux 171°49.31
4	338° 59.50	251°32.87 16.53	165°55.00 42.06	191°14.39 13°59.94	313°28.15 59.48	Alioth 166°11.18
5	354°1.97	266°32.00 16.69	180°56.24 41.48	206°16.42 59.79	328°30.46 59.53	Spica 158°20.06
6	9°4.43	281°31.14 N23°16.84	195°57.48 N03°40.91	221°18.44 N13°59.64	343°32.77 N07°59.58	Alkaid 152°50.27
7	24°6.90	296°30.27 17.00	210° 58.72 40.33	236°20.47 59.48	358°35.08 59.63	Hadar 148°32.76
8 9	39°9.36 54°11.83	311°29.41 17.15 326°28.54 · · 17.30	225°59.96 39.76 241°1.20 · 39.18	251°22.50 59.33 266°24.53 • 59.18	13°37.39 59.67 28°39.70 • 59.72	Menkent 147°55.01
10	69° 14.29	341°27.68 17.45	256°2.44 38.61	281°26.55 59.02	43°42.01 59.77	Arcturus 145°45.90
11	84° 16.75	356°26.81 17.60	271°3.68 38.03	296°28.58 58.87	58°44.32 59.82	Rigil Kent. 139°37.07
12	99° 19.22	11°25.94 N23°17.74	286°4.91 N03°37.46	311°30.61 N13°58.72	73°46.63 N07°59.87	Kochab 137°19.26
13	114°21.68	26°25.08 17.89	301°6.15 36.88	326°32.64 58.56	88°48.94 07°59.92	Zuben'ubi 136°53.55
14	129° 24.15	41°24.21 18.04	316°7.39 36.31	341°34.66 58.41	103°51.25 07°59.96	Alphecca 126°1.75
15	144° 26.61	56°23.35 · · 18.18	331°8.63 · · 35.73	356°36.69 · · 58.25	118°53.56 · · 0.01	Antares 112°13.00
16	159° 29.08	71°22.48 18.32	346°9.86 35.16	11°38.72 58.10	133°55.87 0.06	Atria 107°4.81 Sabik 102°0.11
17	$174^{\circ}31.54$	86°21.61 18.46	1°11.10 34.58	26°40.74 57.95	148°58.18 0.11	Shaula 96°7.18
18	189°34.00	101°20.75 N23°18.60	16°12.34 N03°34.00	41°42.77 N13°57.79	164°0.49 N08°0.15	Rasalhague 95°56.32
19	204°36.47	116° 19.88 18.74	31°13.58 33.43	56°44.79 57.64	179°2.80 0.20	Eltanin 90°40.70
20	219°38.93	131°19.01 18.88	46° 14.81 32.85	71°46.82 57.48	194°5.11 0.25	Kaus Aust. 83°29.40
21	234°41.40	146° 18.15 · · 19.02	61°16.05 · · 32.28	86°48.85 · · 57.33	209°7.43 · · 0.30	Vega 80°31.40
22	249°43.86	161°17.28 19.15	76°17.28 31.70	101°50.87 57.18	224°9.74 0.34	Nunki 75°44.86
23	264°46.32	176°16.41 19.29	91°18.52 31.12	116°52.90 57.02	239°12.05 0.39	Altair 61°57.64
Mer.	pass. 05:24	ν -0.9 $'$ d0.2 $'$ m-3.90	$\nu 1.2' \ d$ -0.6' m1.07	$\nu 2.0' \ d$ -0.2' m-1.80	$\nu 2.3' \ d0.0' \ m0.61$	Peacock 53°2.02
	<u> </u>					Deneb 49°23.98
F!	CIIA	CHA D	CHA De-	CHA De-	CHA D	Enif 33°36.56
Fri 0	GHA 279° 48.79	GHA Dec 191°15.54 N23°19.42	GHA Dec 106°19.76 N03°30.55	GHA Dec 131°54.92 N13°56.87	GHA Dec 254°14.36 N08°0.44	Al Na'ir 27°30.11
1	294°51.25	206°14.68 19.55	121°20.99 29.97	146°56.95 56.71	269°16.67 0.49	Fomalhaut 15°12.14
2	309°53.72	221°13.81 19.68	136°22.23 29.39	161°58.98 56.56	284°18.98 0.53	Scheat 13°43.06
3	324°56.18	236°12.94 · · 19.81	151°23.46 · · 28.82	177°1.00 · · 56.40	299°21.30 · · 0.58	Markab 13°27.72
4	339° 58.65	251°12.07 19.94	166°24.70 28.24	192° 3.03 56.25	314°23.61 0.63	Jun 30 Wed SHA
5	355°1.11	266°11.21 20.07	181°25.93 27.66	207° 5.05 56.10	329°25.92 0.68	Venus 274°6.50
6	10°3.57	281°10.34 N23°20.19	196°27.17 N03°27.08	222°7.08 N13°55.94	344°28.23 N08°0.72	Mars 187°29.69
7	25°6.04	296° 9.47 20.32	211°28.40 26.51	237° 9.10 55.79	359°30.55 0.77	Jupiter 212°27.05
8	40°8.50	311°8.60 20.44	226°29.63 25.93	252°11.13 55.63	14°32.86 0.82	Saturn 334°33.05
9	$55^{\circ}10.97$	326°7.73 · · · 20.57	241°30.87 · · 25.35	267°13.15 · · 55.48	29°35.17 · · 0.86	Jul 01 Thu SHA
10	70°13.43	341°6.86 20.69	256°32.10 24.77	282°15.18 55.32	44°37.48 0.91	Venus 272°46.67
11	85° 15.90	356°5.99 20.81	271°33.33 24.20	297°17.20 55.17	59°39.80 0.96	Mars 187° 0.39
12	100° 18.36	11°5.12 N23°20.93	286°34.57 N03°23.62	312°19.22 N13°55.01	74°42.11 N08°1.00	Jupiter 212°16.63
13	115°20.82	26°4.26 21.04	301°35.80 23.04	327°21.25 54.86	89°44.42 1.05	Saturn 334°29.27
14	130°23.29	41°3.39 21.16	316°37.03 22.46	342°23.27 54.70	104°46.74 1.10	
15	145° 25.75	56°2.52 · · 21.28	331°38.27 · · 21.89	357°25.30 · · 54.55	119°49.05 · · 1.14	Jul 02 Fri SHA
16 17	160°28.22	71°1.65 21.39	346°39.50 21.31	12°27.32 54.39	134°51.37 1.19	Venus 271°26.76
17 18	175° 30.68 190° 33.15	86°0.78 21.50 100°59.91 N23°21.62	1°40.73 20.73 16°41.96 N03°20.15	27°29.34 54.24 42°31.37 N13°54.08	149°53.68 1.24 164°55.99 N08°1.28	Mars 186°30.97
18	205° 35.61	115°59.04 21.73	31°43.19 19.57	57°33.39 53.93	179°58.31 1.33	Jupiter 212°6.14 Saturn 334°25.57
20	220° 38.07	130°58.17 21.84	46°44.42 18.99	72°35.41 53.77	195°0.62 1.37	Jaium 334 25.57
21	235°40.54	145°57.30 · · 21.94	61°45.66 · · 18.41	87°37.44 · · 53.62	210°2.94 · · 1.42	Horizontal parallax
22	250°43.00	160°56.43 22.05	76°46.89 17.83	102°39.46 53.46	225°5.25 1.47	Venus:
23	265°45.47	175°55.56 22.16	91°48.12 17.26	117°41.48 53.31	240°7.57 1.51	Mars:
	pass. 05:20	ν-0.9' d0.1' m-3.90	ν1.2' d-0.6' m1.07	ν2.0' d-0.2' m-1.80	ν2.3' d0.0' m0.60	
- IVIEL.	puss. UJ.ZU	ν-υ.σ αυ.1 III-3.90	ν1.2 U-0.0 III1.01	ν Δ.υ u-υ.∠ III-1.0U	ν Δ.Ο ΙΠΟ.ΟΟ ——————————————————————————————————	

Dec

29°14.47 -42°9.07 56°41.09 -17°49.95

-57°5.48 23°35.48 89°22.49 -40°11.43 4°11.88 49°57.35

16°33.83 -8°10.17 46°1.41 6°22.45 28°37.76 -1°11.07 7°24.70 -52°42.59

-16°45.25 -29°0.60 5°9.23

27°57.56 -59°36.01 -43°32.81 -69°50.04 -8°46.77

11° 49.95 61° 36.36 14° 25.12 -17° 41.84 -63° 15.45 -57° 16.37 55° 48.85 -11° 18.39 49° 10.75 -60° 30.63

-36° 30.52 19° 2.42 -60° 57.21 74° 2.73 -16° 9.45 26° 37.42 -26° 29.61 -69° 4.68 -15° 45.51

-37°7.40 12°32.46 51°29.16 -34°22.20 38°48.58 -26°15.64

8°56.53

-56°38.54 45°22.65 10°0.13 -46°49.36 -29°28.33

28° 13.87 15° 21.22 Mer.pass

11:13

16:57

15:17 07:09 **Mer.pass** 11:14 16:55 15:14 07:06 **Mer.pass**

11:16 16:53 15:10 07:02

0.1

0.1

	011-010 =	T0.1371 Sec		011		, 300	
h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°6.64 194°6.52	N23°11.68 11.54	240°2.29 254°30.14	8.8' 8.7'	N20°21.92 20°32.64	10.7' 10.6'	58.1' 58.2'
1 2	209°6.39	11.54	254 30.14 268° 57.86	8. <i>1</i> '	20° 43.27	10.6	58.2'
3	224°6.27	• • 11.25	283°25.44	8.5'	20°53.79	10.4	58.2'
4	239°6.14	11.10	297°52.90	8.3'	$21^{\circ}4.21$	10.3'	58.3'
5	254°6.02	10.95	312°20.22	8.2'	21°14.53	10.2'	58.3'
6	269°5.90	N23° 10.80	326° 47.42	8.1'	N21°24.73 21°34.83	10.1'	58.4'
7 8	284°5.77 299°5.65	10.66 10.51	341°14.48 355°41.40	7.9' 7.8'	21° 34.83 21° 44.82	10.0' 9.9'	58.4' 58.4'
9	314°5.52	. 10.36	10°8.20	7.7'	21°54.69	9.8'	58.5
10	329°5.40	10.21	24°34.86	7.5'	22°4.45	9.6'	58.5'
11	344°5.27	10.05	39°1.39	7.4'	22°14.09	9.5'	58.6'
12 13	359°5.15 14°5.02	N23°9.90 9.75	53°27.79 67°54.06	7.3' 7.1'	N22°23.62 22°33.02	9.4' 9.3'	58.6' 58.6'
14	29°4.90	9.75	82°20.19	7.1 7.0'	22°42.30	9.3 9.2'	58.7'
15	44°4.78	• • 9.44	96°46.19	6.9'	22°51.45	9.0'	58.7'
16	59°4.65	9.29	$111^{\circ}12.05$	6.7'	23°0.48	8.9'	58.7'
17	74°4.53	9.13	125°37.79	6.6'	23°9.38	8.8'	58.8'
18 19	89°4.41 104°4.28	N23°8.97 8.82	140°3.39 154°28.86	6.5' 6.3'	N23°18.16 23°26.79	8.6' 8.5'	58.8' 58.9'
20	119°4.16	8.66	168° 54.20	6.2	23°25.30	6.5 8.4'	58.9'
21	134°4.04	• • 8.50	183° 19.41	6.1'	23°43.67	8.2'	58.9'
22	149°3.91	8.34	$197^{\circ}44.48$	5.9'	23°51.90	8.1'	59.0'
23	164°3.79	8.18	212°9.43	5.8'	23°59.99	7.9'	59.0'
	SD = 15.7'	d = -0.1'		S	D = 15.9'		
Thu 0	GHA 179°3.67	Dec N23°8.02	GHA 226° 34.25	u 5.7'	Dec N24°7.93	d 7.8'	HP 59.1'
1	194°3.54	7.86	240°58.94	5.6'	24°15.74	7.7'	59.1'
2	209°3.42	7.70	255°23.50	5.4'	24°23.40	7.5'	59.1'
3	224°3.30	• • 7.53	269° 47.94	5.3'	24°30.91	7.4'	59.2'
4	239°3.17	7.37	284° 12.25	5.2'	24°38.27	7.2'	59.2'
5 6	254°3.05 269°2.93	7.21 N23°7.04	298°36.43 313°0.49	5.1' 4.9'	24°45.48 N24°52.54	7.1' 6.9'	59.2' 59.3'
7	284°2.81	6.88	327° 24.43	4.8'	24°59.44	6.7	59.3'
8	299°2.69	6.71	341°48.24	4.7'	25°6.18	6.6'	59.3'
9	314°2.56	• • 6.54	$356^{\circ}11.94$	4.6'	$25^{\circ}12.77$	6.4'	59.4'
10	329°2.44	6.38	10°35.51	4.5'	25°19.19	6.3'	59.4'
11 12	344°2.32 359°2.20	6.21 N23°6.04	24° 58.97 39° 22.31	4.3' 4.2'	25°25.45 N25°31.55	6.1' 5.9'	59.5' 59.5'
13	14°2.08	5.87	53° 45.54	4.1'	25°37.48	5.8'	59.5'
14	29°1.95	5.70	68°8.65	4.0'	25°43.24	5.6'	59.6'
15	44°1.83	• • 5.53	82°31.65	3.9'	25°48.83	5.4'	59.6'
16	59°1.71 74°1.59	5.36	96° 54.54 111° 17.32	3.8' 3.7'	25°54.26 25°59.51	5.2' 5.1'	59.6'
17 18	89°1.47	5.18 N23°5.01	111 17.32 125°39.99	3.6'	25 59.51 N26°4.58	5.1 4.9'	59.7' 59.7'
19	104°1.35	4.84	140°2.56	3.5'	26° 9.48	4.7'	59.7'
20	119°1.23	4.66	$154^{\circ}25.03$	3.4'	26°14.20	4.5'	59.8'
21	134°1.11	• • 4.49	168°47.40	3.3'	26°18.73	4.4'	59.8'
22 23	149°0.99 164°0.87	4.31 4.13	183°9.67 197°31.84	3.2' 3.1'	26°23.09 26°27.27	4.2' 4.0'	59.8' 59.9'
23		d = -0.2'	197 31.04		D = 16.1'	4.0	39.9
	SD = 15.7'	d = -0.2'		5	D = 16.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°0.74	N23°3.96	211°53.91	3.0'	N26°31.26	3.8'	59.9'
1	194°0.62	3.78	226° 15.90	2.9'	26°35.06	3.6'	59.9'
2	209°0.50 224°0.38	3.60 · · 3.42	240°37.79 254°59.60	2.8' 2.7'	26°38.68 26°42.11	3.4' 3.2'	60.0' 60.0'
4	239°0.26	3.42	269°21.32	2.6'	26°45.35	3.0'	60.0
5	254°0.14	3.06	283°42.96	2.6'	26°48.40	2.9'	60.1'
6	269°0.02	N23°2.88	298°4.52	2.5'	N26°51.26	2.7'	60.1
7 8	283°59.90 298°59.79	2.69 2.51	312°26.00 326°47.41	2.4' 2.3'	26°53.92 26°56.39	2.5' 2.3'	60.1' 60.2'
9	298°59.79 313°59.67	2.33	326°47.41 341°8.75	2.3'	26°56.39 26°58.66	2.3'	60.2'
10	328°59.55	2.14	355° 30.02	2.2'	27° 0.73	1.9'	60.2
11	343°59.43	1.96	9°51.22	2.1'	27°2.61	1.7'	60.2'
12	358°59.31	N23°1.77	24° 12.35	2.1'	N27° 4.28	1.5'	60.3'
13 14	13°59.19 28°59.07	1.58 1.40	38° 33.43 52° 54.45	2.0' 2.0'	27° 5.76 27° 7.03	1.3' 1.1'	60.3' 60.3'
14 15	28°59.07 43°58.95	1.40	52°54.45 67°15.42	2.0° 1.9°	27° 7.03 27° 8.11	0.9'	60.4
16	58°58.83	1.02	81°36.33	1.9'	27°8.98	0.7'	60.4
17	73°58.71	0.83	95° 57.20	1.8'	$27^{\circ}9.64$	0.5'	60.4'
18	88°58.60	N23°0.64	110° 18.02	1.8'	N27°10.10	0.3'	60.4
19 20	103°58.48 118°58.36	0.45 0.26	124° 38.79 138° 59.53	1.7' 1.7'	27°10.36 27°10.41	0.1' -0.2'	60.5' 60.5'
20	118°58.36 133°58.24	0.26 23°0.07	138°59.53 153°20.24	1.7'	27°10.41 27°10.26	-0.2° -0.4'	60.5
22	148°58.12	23° 59.87	167°40.91	1.6'	27° 9.89	-0.4	60.5
23	163°58.01	59.68	182°1.55	1.6'	27° 9.32	-0.8'	60.6
	SD = 15.7'	d = -0.2'	-	S	D = 16.3'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-7%
30	03:33	03:39	12:04	08:18	20:46	
01	03:45	03:51	12:04	09:16	21:47	
02	03:57	04:03	12:04	10:19	22:52	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	280° 47.93	190°54.69 N23°22.2		132°43.51 N13°53.15	255°9.88 N08°1.56	
1	295°50.40	205°53.81 22.3		147°45.53 52.99	270°12.20 1.60	Alpheratz 357°32.56 29°14.48
2	310°52.86	220°52.94 22.4		162°47.55 52.84	285°14.51 1.65	Ankaa 353°5.12 -42°9.06
3	325°55.32	235°52.07 · · 22.5		177°49.58 · · 52.68	300°16.83 · · 1.70	Schedar 349°28.62 56°41.10
4	340°57.79	250°51.20 22.6	7 166°54.27 14.36	192°51.60 52.53	315°19.14 1.74	Diphda 348°45.25 -17°49.93
5	356°0.25	265°50.33 22.7	7 181°55.50 13.78	207°53.62 52.37	330°21.46 1.79	Achernar 335°18.86 -57°5.46 Hamal 327°48.99 23°35.49
6	11°2.72	280°49.46 N23°22.8	7 196°56.73 N03°13.20	222°55.64 N13°52.22	345°23.78 N08°1.83	Hamal 327°48.99 23°35.49 Polaris 313°13.95 89°22.49
7	26°5.18	295°48.59 22.9		237°57.66 52.06	0°26.09 1.88	Acamar 315°10.48 -40°11.41
8	41°7.65	310°47.72 23.0		252°59.69 51.90	15°28.41 1.92	Menkar 314°4.19 4°11.89
9	56° 10.11	325°46.84 · · 23.1		268° 1.71 · · 51.75	30°30.72 · · 1.97	Mirfak 308°25.61 49°57.35
10	71° 12.57	340°45.97 23.2		283° 3.73 51.59	45°33.04 2.01	Aldebaran 290°37.55 16°33.83
11 12	86° 15.04 101° 17.50	355°45.10 23.3 10°44.23 N23°23.4		298° 5.75 51.44 313° 7.77 N13° 51.28	60°35.36 2.06 75°37.67 N08°2.11	Rigel 281°2.21 -8°10.16
13	116° 19.97	25°43.36 23.5		328° 9.79 51.12	90°39.99 2.15	Capella 280°19.29 46°1.41
14	131°22.43	40°42.49 23.6		343°11.82 50.97	105°42.31 2.20	Bellatrix 278°20.99 6°22.46
15	146°24.89	55°41.61 · · 23.6		358°13.84 · · 50.81	120°44.62 · · 2.24	Elnath 277°59.63 28°37.76
16	161°27.36	70°40.74 23.7		13°15.86 50.65	135°46.94 2.29	Alnilam 275°35.97 -1°11.06
17	176°29.82	85°39.87 23.8	6 2°10.23 6.82	28°17.88 50.50	150°49.26 2.33	Betelgeuse 270°50.20 7°24.71
18	191°32.29	100°39.00 N23°23.9	5 17°11.46 N03°6.23	43°19.90 N13°50.34	165°51.58 N08°2.38	Canopus 263°52.03 -52°42.58 Sirius 258°24.78 -16°45.25
19	206° 34.75	115°38.12 24.0		58°21.92 50.19	180°53.89 2.42	Adhara 255°4.63 -29°0.59
20	221°37.22	130°37.25 24.1		73°23.94 50.03	195°56.21 2.47	Procyon 244°49.02 5°9.23
21	236° 39.68	145°36.38 · · 24.1		88°25.96 · · 49.87	210°58.53 · · 2.51	Pollux 243°15.18 27°57.56
22	251° 42.14	160°35.50 24.2		103°27.98 49.72	226°0.85 2.56	Avior 234°14.48 -59°36.00
23	266° 44.61	175°34.63 24.3	5 92°17.59 3.33	118°30.00 49.56	241°3.17 2.60	Suhail 222°45.16 -43°32.80
Mer.	pass. 05:16	ν-0.9' d0.1' m-3.9	$\nu 1.2' \ d$ -0.6' m1.08	ν2.0' d-0.2' m-1.79	ν2.3' d0.0' m0.60	Miaplacidus 221°38.57 -69°50.03
						Alphard 217°45.99 -8°46.76
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.48 11°49.95
0	281° 47.07	190°33.76 N23°24.4		133°32.02 N13°49.40	256°5.48 N08°2.64	Dubhe 193°38.88 61°36.35
1	296° 49.54	205°32.88 24.5		148°34.04 49.25	271°7.80 2.69	Denebola 182°22.95 14°25.12
2	311°52.00	220°32.01 24.5		163°36.06 49.09	286°10.12 2.73	Gienah 175°41.50 -17°41.84
3	326° 54.47	235°31.14 · · 24.6		178°38.08 · · 48.93	301°12.44 · · 2.78	Acrux 172°57.77 -63°15.46 Gacrux 171°49.32 -57°16.38
4	341°56.93	250°30.26 24.7	2 167°23.72 03°0.42	193°40.10 48.77	316°14.76 2.82	Alioth 166°11.20 55°48.85
5	356° 59.39	265°29.39 24.7		208°42.12 48.62	331°17.08 2.87	Spica 158°20.06 -11°18.39
6	12°1.86	280°28.52 N23°24.8		223°44.14 N13°48.46	346°19.40 N08°2.91	Alkaid 152°50.28 49°10.75
7	27°4.32	295°27.64 24.9		238°46.16 48.30	1°21.72 2.95	Hadar 148°32.77 -60°30.63
8	42°6.79	310°26.77 24.9		253°48.18 48.15	16°24.04 3.00	Menkent 147°55.01 -36°30.52
9 10	57°9.25 72°11.72	325°25.90 · · 25.0 340°25.02 25.3		268°50.20 · · 47.99 283°52.22 47.83	31°26.36 · · 3.04 46°28.68 3.09	Arcturus 145°45.90 19°2.42
11	87° 14.18	355°24.15 25.1		283°52.22 47.83 298°54.24 47.67	46°28.68 3.09 61°31.00 3.13	Rigil Kent. 139°37.08 -60°57.21
12	102° 16.64	10°23.27 N23°25.2		313°56.26 N13°47.52	76°33.32 N08°3.17	Kochab 137°19.31 74°2.74
13	117° 19.11	25°22.40 25.3		328°58.28 47.36	91°35.64 3.22	Zuben'ubi 136°53.54 -16°9.45
14	132°21.57	40°21.53 25.3		344°0.29 47.20	106°37.96 3.26	Alphecca 126°1.76 26°37.43 Antares 112°12.99 -26°29.61
15	147°24.04	55°20.65 · · 25.4	2 332°37.17 · · 54.01	359°2.31 · · 47.04	121°40.28 · · 3.31	Antares 112°12.99 -26°29.61 Atria 107°4.80 -69°4.69
16	162°26.50	70°19.78 25.4		14°4.33 46.89	136°42.60 3.35	Sabik 102°0.10 -15°45.51
17	177°28.97	85°18.90 25.5		29° 6.35 46.73	151°44.92 3.39	Shaula 96°7.17 -37°7.40
18	192°31.43	100°18.03 N23°25.5		44°8.37 N13°46.57	166°47.24 N08°3.44	Rasalhague 95°56.31 12°32.47
19	207°33.89	115°17.15 25.6		59°10.38 46.41	181°49.56 3.48	Eltanin 90°40.69 51°29.17
20 21	222°36.36 237°38.82	130°16.28 25.7 145°15.40 •• 25.7		74°12.40 46.26 89°14.42 •• 46.10	196°51.88 3.52 211°54.20 · · 3.57	Kaus Aust. 83°29.38 -34°22.21
22	252° 41.29	160°14.53 25.8		104°16.44 45.94	226°56.53 3.61	Vega 80°31.39 38°48.60
23	267° 43.75	175° 13.65 25.8		119°18.46 45.78	241°58.85 3.65	Nunki 75°44.84 -26°15.64
				· · ·		Altair 61°57.63 8°56.54
Mer.	pass. 05:12	ν -0.9' d 0.1' m-3.9	$\nu 1.2' \ d$ -0.6' m1.09	ν2.0′ d-0.2′ m-1.79	$\nu 2.3' \ d0.0' \ m0.59$	Peacock 53°1.99 -56°38.54
						Deneb 49°23.96 45°22.67 Enif 33°36.53 10°0.14
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.07 -46°49.35
0	282°46.21	190°12.78 N23°25.9		134°20.47 N13°45.62	257°1.17 N08°3.70	Fomalhaut 15°12.11 -29°28.32
1	297° 48.68	205°11.90 25.9		149°22.49 45.47	272°3.49 3.74	Scheat 13°43.03 28°13.89
2	312°51.14	220°11.03 25.9		164°24.51 45.31	287°5.81 3.78	Markab 13°27.69 15°21.23
3	327°53.61	235°10.15 · · 26.0		179°26.53 · · 45.15	302°8.14 · · 3.83	
4	342°56.07	250°9.28 26.0		194°28.54 44.99	317°10.46 3.87	Jul 03 Sat SHA Mer.pass
5 6	357°58.54 13°1.00	265°8.40 26.3		209°30.56 44.83	332°12.78 3.91 347°15.10 N08°3.95	Venus 270°6.75 11:17 Mars 186°1.42 16:51
7	28°3.46	280°7.53 N23°26.3 295°6.65 26.2		224°32.58 N13°44.67 239°34.59 44.52	347°15.10 N08°3.95 2°17.43 4.00	Jupiter 211°55.58 15:07
8	43°5.93	310°5.78 26.2		254°36.61 44.36	17°19.75 4.04	Saturn 334°21.95 06:58
9	58°8.39	325°4.90 · · 26.2		269°38.63 · · 44.20	32°22.07 · · 4.08	
10	73°10.86	340°4.02 26.3		284°40.64 44.04	47°24.40 4.12	Jul 04 Sun SHA Mer.pass
11	88° 13.32	355°3.15 26.3	4 273°1.57 42.32	299°42.66 43.88	62°26.72 4.17	Venus 268°46.69 11:18 Mars 185°31.74 16:49
12	103° 15.79	10°2.27 N23°26.3		314°44.67 N13°43.72	77°29.04 N08°4.21	Mars 185°31.74 16:49 Jupiter 211°44.95 15:04
13	118° 18.25	25°1.40 26.4		329°46.69 43.57	92°31.37 4.25	Saturn 334°18.41 06:55
14 15	133°20.71 148°23.18	40°0.52 26.4 54°59.64 · · 26.4		344°48.71 43.41 359°50.72 · · 43.25	107°33.69 4.29 122°36.01 • 4.34	
15 16	148° 23.18 163° 25.64	69°58.77 26.5		14°52.74 43.09	137°38.34 4.38	Jul 05 Mon SHA Mer.pass Venus 267°26.56 11:20
17	178° 28.11	84°57.89 26.5		29°54.75 42.93	152°40.66 4.42	Venus 267°26.56 11:20 Mars 185°1.95 16:47
18	193°30.57	99°57.02 N23°26.5		44°56.77 N13°42.77	167°42.99 N08°4.46	Jupiter 211°34.26 15:01
19	208°33.03	114°56.14 26.5	7 33°11.31 37.64	59°58.79 42.61	182°45.31 4.50	Saturn 334°14.95 06:51
20	223°35.50	129°55.26 26.6		75° 0.80 42.45	197°47.64 4.55	
21	238° 37.96	144°54.39 · · 26.6		90°2.82 · · 42.29	212°49.96 · · 4.59	Horizontal parallax Venus: 0.1
22 23	253° 40.43 268° 42.89	159°53.51 26.6 174°52.64 26.6		105° 4.83 42.13 120° 6.85 41.98	227°52.29 4.63 242°54.61 4.67	Venus: 0.1 Mars: 0.1
				· ——		
Mer.p	oass. 05:08	ν -0.9′ d 0.0′ m -3.9	$\nu 1.2' \ d$ -0.6' m1.10	$\nu 2.0' \ d$ -0.2' m-1.79	$ u 2.3' \ d0.0' \ m0.59$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 57.89	N22°59.49	196°22.16	1.6'	N27°8.55	-1.0'	60.6'
1	193°57.77	59.29	210°42.76	1.6'	27°7.56	-1.2'	60.6'
2	208° 57.65	59.10	225°3.33	1.6'	27°6.37	-1.4'	60.6'
3 4	223° 57.54 238° 57.42	• • 58.90 58.70	239°23.88 253°44.43	1.5' 1.5'	27°4.97 27°3.36	-1.6' -1.8'	60.6' 60.7'
5	250 57.42 253°57.30	58.51	268° 4.96	1.5'	27° 1.54	-1.6 -2.0'	60.7
6	268° 57.19	N22°58.31	282°25.49	1.5'	N26°59.52	-2.2'	60.7'
7	283°57.07	58.11	296°46.01	1.5'	26°57.28	-2.4'	60.7'
8	298° 56.95	57.91	311°6.53	1.5'	26°54.84	-2.7'	60.8'
9 10	313°56.84 328°56.72	· · 57.71 57.51	325°27.06 339°47.59	1.5' 1.5'	26°52.18 26°49.32	-2.9' -3.1'	60.8' 60.8'
11	343°56.60	57.30	354°8.14	1.6'	26°46.26	-3.1 -3.3'	60.8
12	358° 56.49	N22°57.10	8°28.69	1.6'	N26°42.98	-3.5'	60.8
13	13°56.37	56.90	22°49.26	1.6'	26°39.49	-3.7'	60.8'
14	28° 56.25	56.69	37°9.85	1.6'	26°35.80	-3.9'	60.9'
15 16	43°56.14 58°56.02	· · 56.49 56.28	51°30.47 65°51.11	1.6' 1.7'	26°31.91 26°27.80	-4.1' -4.3'	60.9' 60.9'
17	73°55.91	56.08	80°11.77	1.7'	26°23.50	-4.5'	60.9
18	88° 55.79	N22°55.87	94°32.47	1.7'	N26°18.98	-4.7'	60.9'
19	103°55.68	55.66	108°53.21	1.8'	$26^{\circ}14.26$	-4.9'	60.9'
20	118°55.56	55.46	123°13.98	1.8'	26°9.34	-5.1'	61.0'
21 22	133° 55.45 148° 55.33	• • 55.25 55.04	137°34.79 151°55.65	1.9' 1.9'	26°4.22 25°58.90	-5.3' -5.5'	61.0'
22	148°55.33 163°55.22	55.04 54.83	151°55.65 166°16.55	2.0'	25°58.90 25°53.37	-5.5° -5.7'	61.0' 61.0'
						5.1	-2.5
	SD = 15.7'	d = -0.2'		5	D = 16.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.10	N22°54.62	180°37.50	2.0'	N25°47.65	-5.9'	61.0'
1	193°54.99 208°54.87	54.40	194°58.51 209°19.57	2.1'	25°41.72 25°35.60	-6.1'	61.0'
2 3	208°54.87 223°54.76	54.19 •• 53.98	209°19.57 223°40.68	2.1' 2.2'	25° 35.60 25° 29.29	-6.3' -6.5'	61.0' 61.0'
4	238° 54.65	53.77	238°1.86	2.2'	25°22.77	-6.7'	61.0'
5	253° 54.53	53.55	252°23.10	2.3'	25°16.07	-6.9'	61.1'
6	268°54.42	N22°53.34	266°44.41	2.4'	N25°9.17	-7.1'	61.1'
7	283°54.31	53.12	281°5.78	2.4'	25°2.08	-7.3'	61.1'
8 9	298°54.19 313°54.08	52.90 •• 52.69	295°27.22 309°48.73	2.5' 2.6'	24°54.80 24°47.33	-7.5' -7.7'	61.1' 61.1'
10	328° 53.97	52.47	324°10.32	2.7	24° 47.33 24° 39.67	-7.8'	61.1
11	343°53.85	52.25	338°31.99	2.7'	24°31.83	-8.0'	61.1'
12	358°53.74	N22°52.03	352°53.73	2.8'	N24°23.81	-8.2'	61.1'
13	13°53.63	51.81	7°15.56	2.9'	24°15.60	-8.4'	61.1'
14 15	28°53.51 43°53.40	51.59 •• 51.37	21°37.47 35°59.46	3.0' 3.1'	24°7.21 23°58.64	-8.6' -8.7'	61.1' 61.1'
16	58° 53.29	51.15	50°21.55	3.2	23°49.90	-8.9'	61.1
17	73°53.18	50.92	64°43.72	3.3'	23°40.97	-9.1'	61.1'
18	88°53.07	N22°50.70	79° 5.98	3.4'	N23°31.88	-9.3'	61.1'
19	103°52.95	50.48	93°28.33	3.4'	23°22.61	-9.4'	61.1'
20 21	118° 52.84 133° 52.73	50.25 •• 50.03	107°50.77 122°13.32	3.5' 3.6'	23°13.17 23°3.56	-9.6' -9.8'	61.1' 61.1'
22	148° 52.62	49.80	136°35.95	3.7'	22°53.79	-9.9'	61.1'
23	163°52.51	49.57	150°58.69	3.8'	22°43.85	-10.1'	61.1'
	SD = 15.7'	d = -0.2'		S	D = 16.6'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 52.40	N22°49.35	165°21.53	3.9'	N22°33.75	-10.3'	61.1'
1	193°52.29	49.12	179°44.46	4.0'	22°23.49	-10.4'	61.1'
2	208°52.17	48.89	194°7.50	4.1'	22°13.07	-10.6'	61.1'
3 4	223°52.06 238°51.95	•• 48.66 48.43	208°30.64 222°53.89	4.2' 4.4'	22°2.49 21°51.76	-10.7' -10.9'	61.1' 61.1'
4 5	238°51.95 253°51.84	48.43 48.20	222°53.89 237°17.24	4.4 4.5'	21°51.76 21°40.87	-10.9° -11.0°	61.1
6	268° 51.73	N22°47.97	251°40.70	4.6'	N21°29.84	-11.2	61.1'
7	283°51.62	47.73	266° 4.26	4.7'	21°18.65	-11.3'	61.1'
8	298°51.51	47.50	280°27.93	4.8'	21°7.32	-11.5'	61.1'
9 10	313°51.40 328°51.29	· · 47.27 47.03	294°51.71 309°15.60	4.9' 5.0'	20°55.85 20°44.23	-11.6' -11.8'	61.1' 61.1'
10 11	328°51.29 343°51.18	47.03 46.80	309°15.60 323°39.60	5.0° 5.1'	20°44.23 20°32.48	-11.8° -11.9'	61.1'
12	358° 51.07	N22°46.56	338° 3.71	5.2'	N20°20.58	-12.0'	61.1
13	13°50.97	46.33	352°27.93	5.3'	20°8.55	-12.2'	61.1'
14	28° 50.86	46.09	6°52.26	5.4'	19°56.39	-12.3'	61.0'
15 16	43°50.75 58°50.64	•• 45.85 45.61	21°16.70 35°41.26	5.6' 5.7'	19°44.09 19°31.67	-12.4' -12.6'	61.0' 61.0'
16 17	73°50.53	45.61 45.37	50° 5.93	5.7° 5.8'	19°31.67 19°19.12	-12.6 -12.7'	61.0'
18	88° 50.42	N22°45.13	64°30.71	5.9'	N19°6.45	-12.8'	61.0'
19	103°50.31	44.89	78°55.60	6.0'	18°53.65	-12.9'	61.0'
20	118°50.20	44.65	93°20.60	6.1'	18°40.73	-13.0'	61.0'
21 22	133°50.10 148°49.99	· · 44.41 44.17	107°45.72 122°10.95	6.2' 6.3'	18°27.70 18°14.55	-13.2' -13.3'	61.0' 61.0'
22	148°49.99 163°49.88	44.1 <i>7</i> 43.92	122°10.95 136°36.29	6.3'	18°14.55 18°1.28	-13.3° -13.4'	61.0
0	SD = 15.7'	d = -0.2'			D = 16.7'	20.1	
	JD — 13.1	u — -0.2			D — 10.1		

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

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	283°45.36	189°51.76 N23°26.68	108°17.39 N02°34.71	135°8.86 N13°41.82	257°56.94 N08°4.71	
1	298° 47.82	204°50.88 26.70	123° 18.60 34.12	150°10.88 41.66	272°59.26 4.76	Alpheratz 357°32.53 29°14.49
2	313°50.28	219°50.01 26.72	138° 19.82 33.53	165°12.89 41.50	288°1.59 4.80	Ankaa 353°5.09 -42°9.05
3	328°52.75	234°49.13 · · 26.73	153°21.03 · · 32.95	180°14.90 · · 41.34	303°3.91 · · 4.84	Schedar 349°28.58 56°41.11 Diphda 348°45.22 -17°49.92
4	$343^{\circ}55.21$	249° 48.25 26.75	168°22.25 32.36	195°16.92 41.18	318°6.24 4.88	Achernar 335°18.82 -57°5.45
5	358° 57.68	264° 47.38 26.76	183°23.46 31.77	210°18.93 41.02	333°8.57 4.92	Hamal 327°48.96 23°35.50
6	14°0.14	279°46.50 N23°26.77	198°24.68 N02°31.19	225°20.95 N13°40.86	348°10.89 N08°4.96	Polaris 313°12.56 89°22.48
7	29°2.60	294°45.62 26.78	213°25.89 30.60	240°22.96 40.70	3°13.22 5.00	Acamar 315°10.45 -40°11.40
8	44°5.07	309° 44.75 26.79	228°27.10 30.01	255°24.98 40.54	18°15.54 5.05	Menkar 314°4.16 4°11.90
9	59°7.53	324°43.87 · · 26.80	243°28.32 · · 29.42	270°26.99 · · 40.38	33°17.87 · · 5.09	Mirfak 308°25.57 49°57.35
10 11	74° 10.00 89° 12.46	339° 42.99 26.81 354° 42.12 26.81	258°29.53 28.84 273°30.74 28.25	285°29.00 40.22 300°31.02 40.06	48°20.20 5.13 63°22.52 5.17	Aldebaran 290°37.53 16°33.84
12	104° 14.93	9°41.24 N23°26.82	288°31.96 N02°27.66	315°33.03 N13°39.90	78°24.85 N08°5.21	Rigel 281°2.19 -8°10.15
13	119° 17.39	24°40.36 26.82	303°33.17 27.07	330°35.04 39.74	93°27.18 5.25	Capella 280°19.27 46°1.41
14	134° 19.85	39°39.49 26.82	318°34.38 26.49	345°37.06 39.58	108°29.51 5.29	Bellatrix 278°20.98 6°22.47
15	149°22.32	54°38.61 · · 26.82	333°35.59 · · 25.90	0°39.07 · · 39.42	123°31.83 · · 5.33	Elnath 277°59.61 28°37.76
16	164°24.78	69°37.73 26.82	348° 36.81 25.31	15°41.08 39.26	138°34.16 5.37	Alnilam 275°35.95 -1°11.05 Betelgeuse 270°50.18 7°24.71
17	$179^{\circ}27.25$	84°36.86 26.82	3°38.02 24.72	30°43.10 39.10	153°36.49 5.41	Canopus 263°52.03 -52°42.56
18	194°29.71	99°35.98 N23°26.82	18°39.23 N02°24.13	45°45.11 N13°38.94	168°38.82 N08°5.45	Sirius 258°24.77 -16°45.23
19	209°32.17	114°35.10 26.82	33°40.44 23.55	60°47.12 38.78	183°41.14 5.50	Adhara 255°4.62 -29°0.57
20	224°34.64	129°34.23 26.81	48° 41.65 22.96	75°49.14 38.62	198° 43.47 5.54	Procyon 244°49.01 5°9.23
21	239°37.10	144°33.35 · · 26.80	63°42.86 · · 22.37	90°51.15 · · 38.46	213°45.80 · · 5.58	Pollux 243°15.17 27°57.56
22 23	254° 39.57 269° 42.03	159°32.47 26.80 174°31.59 26.79	78°44.07 21.78 93°45.28 21.19	105°53.16 38.30 120°55.17 38.14	228°48.13 5.62 243°50.46 5.66	Avior 234°14.49 -59°35.98
_						Suhail 222°45.16 -43°32.78
Mer.p	oass. 05:04	ν -0.9 $'$ d 0.0 $'$ m-3.90	$\nu 1.2' \ d ext{-}0.6' \ m1.10$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.78$	$\nu 2.3' \ d0.0' \ m0.59$	Miaplacidus 221°38.59 -69°50.02
						Alphard 217°45.99 -8°46.76
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.48 11°49.95 Dubhe 193°38.89 61°36.34
0	284°44.49	189°30.72 N23°26.78	108°46.50 N02°20.60	135°57.19 N13°37.98	258°52.79 N08°5.70	Denebola 182°22.95 14°25.12
1	299° 46.96	204°29.84 26.77	123°47.71 20.01	150°59.20 37.82	273°55.12 5.74	Gienah 175°41.51 -17°41.83
2	314°49.42	219°28.96 26.76	138°48.92 19.43	166°1.21 37.66	288°57.45 5.78	Acrux 172°57.80 -63°15.46
3	329°51.89	234°28.09 · · 26.74	153°50.12 · · 18.84	181° 3.22 · · · 37.50	303°59.77 · · 5.82	Gacrux 171°49.34 -57°16.38
4 5	344° 54.35 359° 56.82	249° 27.21 26.73 264° 26.33 26.71	168°51.33 18.25 183°52.54 17.66	196° 5.23 37.34 211° 7.25 37.18	319°2.10 5.86 334°4.43 5.90	Alioth 166°11.21 55°48.84
6	14° 59.28	279°25.45 N23°26.69	198°53.75 N02°17.07	226°9.26 N13°37.02	349°6.76 N08°5.94	Spica 158°20.07 -11°18.39
7	30°1.74	294°24.58 26.68	213°54.96 16.48	241°11.27 36.86	4°9.09 5.98	Alkaid 152°50.29 49°10.75
8	45°4.21	309°23.70 26.66	228° 56.17 15.89	256°13.28 36.69	19°11.42 6.02	Hadar 148°32.79 -60°30.64 Menkent 147°55.02 -36°30.53
9	60°6.67	324°22.82 · · 26.64	243°57.38 · · 15.30	271°15.29 · · 36.53	34°13.75 · · 6.06	Menkent 147°55.02 -36°30.53 Arcturus 145°45.91 19°2.42
10	$75^{\circ}9.14$	339°21.95 26.62	258° 58.59 14.71	286°17.30 36.37	49°16.08 6.10	Rigil Kent. 139°37.09 -60°57.22
11	90°11.60	354°21.07 26.59	273°59.80 14.12	301°19.31 36.21	64°18.41 6.14	Kochab 137°19.35 74°2.74
12	105° 14.06	9°20.19 N23°26.57	289°1.00 N02°13.53	316°21.33 N13°36.05	79°20.74 N08°6.18	Zuben'ubi 136°53.55 -16°9.45
13 14	120° 16.53 135° 18.99	24°19.31 26.54 39°18.44 26.52	304°2.21 12.94 319°3.42 12.35	331°23.34 35.89 346°25.35 35.73	94°23.07 6.22 109°25.41 6.25	Alphecca 126°1.76 26°37.43
15	150°21.46	54°17.56 · · 26.49	334°4.63 · · 11.76	1°27.36 · · 35.57	124°27.74 · · 6.29	Antares 112°12.98 -26°29.62
16	165°23.92	69°16.68 26.46	349°5.83 11.17	16°29.37 35.41	139°30.07 6.33	Atria 107°4.80 -69°4.70
17	180°26.38	84°15.81 26.43	4°7.04 10.58	31°31.38 35.25	154°32.40 6.37	Sabik 102°0.09 -15°45.51 Shaula 96°7.16 -37°7.41
18	195°28.85	99°14.93 N23°26.40	19°8.25 N02°9.99	46°33.39 N13°35.08	169°34.73 N08°6.41	Rasalhague 95°56.31 12°32.48
19	210°31.31	114°14.05 26.37	34°9.45 9.40	61°35.40 34.92	184°37.06 6.45	Eltanin 90°40.70 51°29.19
20	225°33.78	129°13.17 26.33	49°10.66 8.81	76°37.41 34.76	199°39.39 6.49	Kaus Aust. 83°29.37 -34°22.21
21	240°36.24	144°12.30 · · 26.30	64°11.87 · · 8.22	91°39.42 · · 34.60	214°41.73 · · 6.53	Vega 80°31.39 38°48.61
22	255° 38.71 270° 41.17	159°11.42 26.26 174°10.54 26.22	79°13.07 7.63 94°14.28 7.04	106°41.43 34.44 121°43.44 34.28	229°44.06 6.57 244°46.39 6.61	Nunki 75°44.83 -26°15.64
23						Altair 61°57.61 8°56.55
Mer.p	oass. 05:00	ν -0.9 $'$ d-0.0 $'$ m-3.90	$\nu 1.2' \ d$ -0.6' m1.11	$ u 2.0' \ d$ -0.2' m-1.78	$\nu 2.3' \ d0.0' \ m0.58$	Peacock 53°1.96 -56°38.55
						Deneb 49°23.95 45°22.69 Enif 33°36.51 10°0.15
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.04 -46°49.35
0	285°43.63	189°9.67 N23°26.18	109°15.48 N02°6.44	136°45.45 N13°34.12	259°48.72 N08°6.65	Fomalhaut 15°12.08 -29°28.32
1	300°46.10	204°8.79 26.14	124°16.69 5.85	151°47.46 33.95	274°51.05 6.68	Scheat 13°43.00 28°13.90
2	315° 48.56	219°7.91 26.10	139° 17.89 5.26	166°49.47 33.79	289°53.39 6.72	Markab 13°27.67 15°21.24
3	330°51.03	234°7.03 · · 26.06	154°19.10 · · 4.67	181°51.48 · · 33.63	304°55.72 · · 6.76	
4	345°53.49	249°6.16 26.02	169°20.30 4.08	196°53.49 33.47	319°58.05 6.80	Jul 06 Tue SHA Mer.pass Venus 266°6.40 11:21
5 6	0°55.95 15°58.42	264°5.28 25.97 279°4.40 N23°25.93	184°21.51 3.49 199°22.71 N02°2.90	211°55.50 33.31 226°57.51 N13°33.14	335°0.39 6.84 350°2.72 N08°6.88	Venus 266°6.40 11:21 Mars 184°32.03 16:45
7	31°0.88	294°3.53 25.88	214°23.91 2.31	241°59.52 32.98	$5^{\circ}5.05$ 6.92	Jupiter 211°23.51 14:57
8	46°3.35	309°2.65 25.83	229° 25.12 1.71	257°1.53 32.82	20°7.39 6.95	Saturn 334°11.58 06:47
9	61°5.81	324°1.77 · · 25.78	244°26.32 · · 1.12	272°3.54 · · 32.66	35°9.72 · · 6.99	
10	76°8.27	339°0.89 25.73	259°27.53 02°0.53	287° 5.54 32.50	50°12.05 7.03	Jul 07 Wed SHA Mer.pass Venus 264° 46.22 11:23
11	91°10.74	354°0.02 25.68	274°28.73 01°59.94	302°7.55 32.33	65°14.39 7.07	Mars 184°2.00 16:44
12	106° 13.20	8°59.14 N23°25.63	289°29.93 N01°59.35	317°9.56 N13°32.17	80°16.72 N08°7.11	Jupiter 211°12.69 14:54
13 14	121° 15.67 136° 18.13	23°58.26 25.57 38°57.39 25.52	304°31.13 58.75 319°32.34 58.16	332°11.57 32.01 347°13.58 31.85	95°19.06 7.14 110°21.39 7.18	Saturn 334°8.29 06:43
14 15	150 18.13 151°20.59	53° 56.51 · · · 25.46	334°33.54 · · 57.57	2°15.59 · · 31.69	110 21.39 7.18 125°23.72 · · 7.22	Jul 08 Thu SHA Mer.pass
16	166°23.06	68°55.63 25.40	349°34.74 56.98	17°17.60 31.52	140°26.06 7.26	Jul 08 Thu SHA Mer.pass Venus 263°26.03 11:24
17	181°25.52	83°54.76 25.35	4°35.94 56.38	32°19.60 31.36	155°28.39 7.30	Mars 183°31.85 16:42
18	196°27.99	98°53.88 N23°25.29	19°37.15 N01°55.79	47°21.61 N13°31.20	170°30.73 N08°7.33	Jupiter 211°1.82 14:51
19	211° 30.45	113°53.00 25.22	34°38.35 55.20	62°23.62 31.04	185°33.06 7.37	Saturn 334°5.09 06:40
20	226°32.91	128° 52.13 25.16	49°39.55 54.61	77°25.63 30.87	200°35.40 7.41	Horizontal parallax
21 22	241°35.38 256°37.84	143°51.25 · · 25.10 158°50.37 25.03	64°40.75 · · 54.01 79°41.95 53.42	92°27.64 · · 30.71 107°29.64 30.55	215°37.73 · · 7.45 230°40.07 7.48	Venus: 0.1
23	271°40.31	173°49.49 24.97	94°43.15 52.83	107 29.04 30.35 122°31.65 30.38	245°42.41 7.52	Mars: 0.1
		ν -0.9' d-0.0' m-3.91				
ivier.	pass. 04:56	ν-υ.9 <i>a</i> -υ.υ m-3.91	$\nu 1.2' \; d$ -0.6' m 1.12	$ u 2.0' \ d$ -0.2' m-1.78	$\nu 2.3' \ d0.0' \ m0.58$	

h	Su	Moon					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.77	N22°43.68	151°1.74	6.6'	$N17^{\circ}47.91$	-13.5'	60.9'
1	193°49.67	43.44	165°27.31	6.7'	17°34.43	-13.6'	60.9'
2	208°49.56 223°49.45	43.19 •• 42.94	179°52.99 194°18.77	6.8' 6.9'	17°20.84 17°7.14	-13.7' -13.8'	60.9' 60.9'
4	238°49.35	42.70	208°44.68	7.0'	16°53.35	-13.6' -13.9'	60.9
5	253°49.24	42.45	223°10.69	7.1'	16°39.45	-14.0'	60.8'
6	268°49.13	N22°42.20	$237^{\circ}36.81$	7.2'	$N16^{\circ}25.46$	-14.1'	60.8'
7	283°49.03	41.95	252°3.04	7.3'	16°11.37	-14.2'	60.8'
8 9	298°48.92 313°48.81	41.70 •• 41.45	266°29.38 280°55.83	7.5' 7.6'	15°57.19 15°42.91	-14.3' -14.4'	60.8' 60.8'
10	328°48.71	41.49	295°22.39	7.7'	15° 28.55	-14.4'	60.8
11	343°48.60	40.95	309°49.06	7.8'	15°14.10	-14.5'	60.7'
12	358°48.50	N22°40.70	324°15.83	7.9'	N14°59.57	-14.6'	60.7'
13	13°48.39 28°48.29	40.45	338°42.71 353°9.70	8.0'	14°44.96 14°30.26	-14.7'	60.7'
14 15	28°48.29 43°48.18	40.19 •• 39.94	7°36.79	8.1' 8.2'	14° 30.26 14° 15.49	-14.8' -14.8'	60.7' 60.7'
16	58°48.08	39.68	22°3.98	8.3	14°0.64	-14.9'	60.6'
17	73°47.97	39.43	$36^{\circ}31.28$	8.4'	$13^{\circ}45.72$	-15.0'	60.6'
18	88°47.87	N22°39.17	50°58.68	8.5'	N13°30.73	-15.1'	60.6'
19 20	103°47.76 118°47.66	38.91 38.66	65°26.19 79°53.79	8.6' 8.7'	13°15.67 13°0.54	-15.1' -15.2'	60.6' 60.5'
20	118°47.66 133°47.55	38.00	79°53.79 94°21.49	8.7	13°0.54 12°45.35	-15.2 -15.3'	60.5
22	148°47.45	38.14	108°49.30	8.9'	12°30.09	-15.3'	60.5
23	163°47.35	37.88	123°17.20	9.0'	12°14.78	-15.4'	60.5'
	SD = 15.7'	d = -0.2'		SI	D = 16.6'		
Wed 0	GHA 178°47.24	Dec N22°37.62	GHA 137°45.19	u 9.1'	Dec N11°59.40	d -15.4'	HP 60.4'
1	178 47.24 193°47.14	37.36	157 45.19 152°13.29	9.1 9.2'	11°43.97	-15.4 -15.5'	60.4 60.4
2	208°47.04	37.10	166°41.48	9.3	11°28.48	-15.5'	60.4
3	223°46.93	• • 36.83	181°9.76	9.4'	11°12.95	-15.6'	60.4'
4	238°46.83	36.57	195°38.13	9.5'	10°57.36	-15.6'	60.3'
5 6	253°46.73 268°46.62	36.31 N22°36.04	210°6.60 224°35.15	9.6' 9.6'	10°41.72 N10°26.03	-15.7' -15.7'	60.3' 60.3'
7	283°46.52	35.78	239°3.80	9.7'	10° 10.31	-15.8'	60.3
8	298°46.42	35.51	253°32.53	9.8'	$09^{\circ}54.53$	-15.8'	60.2'
9	313°46.32	• • 35.24	268°1.36	9.9'	09°38.72	-15.9'	60.2'
10	328°46.22 343°46.11	34.98 34.71	282°30.26 296°59.25	10.0' 10.1'	09°22.87 09°6.98	-15.9'	60.2' 60.2'
11 12	343 46.11 358°46.01	34.71 N22°34.44	290 59.25 311°28.33	10.1	N08°51.06	-15.9' -16.0'	60.2
13	13°45.91	34.17	325°57.49	10.2	08°35.10	-16.0'	60.1
14	28°45.81	33.90	340°26.72	10.3'	$08^{\circ}19.12$	-16.0'	60.1'
15	43°45.71	• • 33.63	354°56.04	10.4	08°3.10	-16.0'	60.0'
16 17	58°45.61 73°45.51	33.36 33.09	9°25.44 23°54.91	10.5' 10.5'	07°47.06 07°30.99	-16.1' -16.1'	60.0' 60.0'
18	88°45.41	N22°32.82	38°24.46	10.6	N07°14.89	-16.1	60.0'
19	103°45.31	32.54	52°54.08	10.7'	06°58.78	-16.1'	59.9'
20	118°45.21	32.27	67°23.78		06°42.64		59.9'
21 22	133°45.11 148°45.01	· · 31.99 31.72	81°53.55 96°23.39	10.8' 10.9'	06°26.49 06°10.31	-16.2' -16.2'	59.9' 59.8'
23	163°44.91	31.72	90 23.39 110°53.30	11.0'	05°54.13	-16.2'	59.8'
	SD = 15.7'	d = -0.3'		SI	D = 16.5'		
Thu 0	GHA 178°44.81	Dec N22°31.17	GHA 125°23.27	u 11.0'	Dec N05°37.93	d -16.2'	HP 59.8'
1	193°44.71	30.89	139°53.32	11.1'	05°21.71	-16.2'	59.7'
2	208°44.61	30.61	154°23.42	11.2'	05°5.49	-16.2'	59.7'
3	223°44.51	• • 30.33	168°53.60	11.2'	04°49.26	-16.2'	59.7'
4 5	238°44.41 253°44.31	30.05 29.77	183°23.83 197°54.13	11.3' 11.4'	04°33.02 04°16.78	-16.2' -16.2'	59.6' 59.6'
6	268°44.21	29.77 N22°29.49	212°24.49	11.4	N04°0.53	-16.2'	59.6'
7	283°44.12	29.21	$226^{\circ}54.90$	11.5'	03°44.28	-16.2	59.5'
8	298°44.02	28.93	241°25.37	11.5'	03°28.03	-16.2'	59.5'
9	313°43.92	• • 28.65	255°55.90	11.6'	03°11.78	-16.2'	59.5'
10 11	328°43.82 343°43.72	28.36 28.08	270°26.48 284°57.12	11.6' 11.7'	02°55.54 02°39.30	-16.2' -16.2'	59.4' 59.4'
12	358°43.63	N22°27.79	204 57.12 299°27.81	11.7'	N02°23.06	-16.2'	59.4
13	13°43.53	27.51	$313^\circ 58.55$	11.8'	$02^{\circ}6.83$	-16.2'	59.3'
14	28°43.43	27.22	328°29.34	11.8'	01°50.61	-16.2'	59.3'
15 16	43°43.34 58°43.24	· · 26.93 26.65	343°0.17 357°31.05	11.9' 11.9'	01°34.40 01°18.20	-16.2' -16.2'	59.3' 59.2'
16 17	58°43.24 73°43.14	26.65	12°1.98	11.9 12.0'	01°18.20 01°2.02	-16.2'	59.2' 59.2'
18	88°43.05	N22°26.07	26°32.95	12.0'	N00°45.84	-16.2	59.2'
19	103°42.95	25.78	41°3.96	12.1'	00°29.69	-16.1'	59.1'
20	118°42.86	25.49	55°35.02	12.1'	N00°13.55	-16.1'	59.1'
21 22	133°42.76 148°42.66	· · 25.20 24.91	70°6.11 84°37.25	12.1' 12.2'	\$00°2.57 00°18.67	16.1' 16.1'	59.1' 59.0'
23	163°42.57	24.91	99°8.42	12.2'	00°18.07	16.1	59.0'
	SD = 15.7'	d = -0.3'		SI	D = 16.3'		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	2-4
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-21%
06	04:41	04:46	12:05	14:28	02:00	
07	04:51	04:56	12:05	15:21	02:55	
80	05:01	05:05	12:05	16:10	03:46	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	286° 42.77	188°48.62 N23°24.90		137°33.66 N13°30.22	260°44.74 N08°7.56	
1	301°45.24	203°47.74 24.83		152°35.67 30.06	275°47.08 7.60	Alpheratz 357°32.51 29°14.50
2	316° 47.70	218° 46.87 24.76		167°37.67 29.90	290°49.41 7.63	Ankaa 353°5.06 -42°9.04
3	331°50.16	233°45.99 · · 24.69		182°39.68 · · 29.73	305°51.75 · · 7.67	Schedar 349°28.55 56°41.12
4	346°52.63	248°45.11 24.62		197°41.69 29.57	320°54.09 7.71	Diphda 348°45.20 -17°49.92
5	1°55.09	263°44.24 24.55		212°43.69 29.41		Achernar 335°18.78 -57°5.44
						Hamal 327°48.94 23°35.51
6	16° 57.56	278°43.36 N23°24.47		227°45.70 N13°29.24	350°58.76 N08°7.78	Polaris 313°11.24 89°22.48
7	32°0.02	293°42.48 24.39		242°47.71 29.08	6°1.10 7.82	Acamar 315°10.43 -40°11.38
8	47°2.48	308°41.61 24.32		257°49.71 28.92	21°3.43 7.86	Menkar 314°4.14 4°11.91
9	62°4.95	323°40.73 · · 24.24		272°51.72 · · 28.75	36°5.77 · · 7.89	Mirfak 308°25.55 49°57.35
10	77°7.41	338°39.85 24.16		287°53.73 28.59	51°8.11 7.93	Aldebaran 290°37.52 16°33.84
11	92°9.88	353°38.98 24.08		302°55.73 28.43	66°10.45 7.97	Rigel 281°2.18 -8°10.14
12	107° 12.34	8°38.10 N23°24.00		317°57.74 N13°28.26	81°12.78 N08°8.00	Capella 280°19.25 46°1.40
13	122°14.80	23°37.22 23.92		332°59.75 28.10	96°15.12 8.04	Bellatrix 278°20.97 6°22.47
14	$137^{\circ}17.27$	38°36.35 23.83		348°1.75 27.94	111°17.46 8.08	Elnath 277°59.60 28°37.76
15	$152^{\circ}19.73$	53°35.47 · · 23.75	335°2.34 · · 43.33	$3^{\circ}3.76 \cdot \cdot 27.77$	126°19.80 · · 8.11	Alnilam 275°35.94 -1°11.04
16	167°22.20	68°34.60 23.66	350°3.53 42.73	18°5.76 27.61	141°22.14 8.15	
17	182°24.66	83°33.72 23.57	5°4.73 42.14	33°7.77 27.45	156°24.47 8.18	
18	197° 27.12	98°32.84 N23°23.48	20°5.93 N01°41.54	48° 9.78 N13° 27.28	171°26.81 N08°8.22	Canopus 263°52.02 -52°42.54
19	212°29.59	113°31.97 23.39		63°11.78 27.12	186°29.15 8.26	Sirius 258°24.76 -16°45.22
20	227°32.05	128°31.09 23.30		78°13.79 26.96	201°31.49 8.29	Adhara 255°4.62 -29°0.56
21	242°34.52	143°30.22 · · 23.21		93°15.79 · · 26.79	216°33.83 · · 8.33	Procyon 244°49.01 5°9.24
22	242 34.52 257°36.98	158°29.34 23.11		108°17.80 26.63		Pollux 243°15.17 27°57.56
						Avior 234°14.50 -59°35.97
23	272°39.44	173°28.47 23.02	95°11.91 38.57	123°19.80 26.46	246°38.51 8.40	Suhail 222°45.17 -43°32.77
Mer	pass. 04:52	ν-0.9' d-0.1' m-3.91	$\nu 1.2' \ d$ -0.6' m1.12	ν2.0' d-0.2' m-1.78	$\nu 2.3' \ d0.0' \ m0.58$	Miaplacidus 221°38.62 -69°50.00
						Alphard 217°46.00 -8°46.75
						Regulus 207°32.49 11°49.96
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.91 61°36.33
0	287°41.91	188°27.59 N23°22.92	110°13.11 N01°37.97	138°21.81 N13°26.30	261°40.85 N08°8.44	Denebola 182°22.96 14°25.12
1	302°44.37	203°26.71 22.83	125°14.30 37.38	153°23.81 26.14	276°43.19 8.47	
2	317° 46.84	218°25.84 22.73	140° 15.50 36.78	168°25.82 25.97	291°45.53 8.51	
3	332°49.30	233°24.96 · · 22.63		183°27.82 · · 25.81	306°47.87 ⋅⋅ 8.54	Acrux 172°57.83 -63°15.45
4	347°51.77	248°24.09 22.53		198°29.83 25.64	321°50.21 8.58	Gacrux 171°49.37 -57°16.37
5	2°54.23	263°23.21 22.43		213°31.83 25.48	336°52.55 8.62	Alioth 166°11.24 55°48.84
6	17°56.69	278°22.34 N23°22.32		228°33.84 N13°25.32	351°54.89 N08°8.65	Spica 158°20.08 -11°18.39
7	32°59.16	293°21.46 22.22		243°35.84 25.15		Alkaid 152°50.31 49°10.75
						Hadar 148°32.82 -60°30.64
8	48°1.62	308°20.59 22.11		258°37.85 24.99	21°59.57 8.72	Menkent 147°55.03 -36°30.52
9	63°4.09	323°19.71 · · 22.00		273°39.85 · · 24.82	37°1.91 · · 8.76	Arcturus 145°45.92 19°2.43
10	78°6.55	338°18.84 21.90		288°41.85 24.66	52°4.25 8.79	Rigil Kent. 139°37.12 -60°57.22
11	93°9.01	353°17.96 21.79		303°43.86 24.49	67° 6.59 8.83	Kochab 137°19.40 74°2.75
12	108° 11.48	8°17.09 N23°21.68		318°45.86 N13°24.33	82°8.93 N08°8.86	Zuben'ubi 136°53.56 -16°9.44
13	123°13.94	23°16.21 21.57	305°28.63 30.23	333°47.87 24.16	97°11.27 8.90	Alphecca 126°1.77 26°37.44
14	138° 16.41	38°15.34 21.45	320°29.83 29.63	348°49.87 24.00	112°13.61 8.93	Antares 112°12.99 -26°29.62
15	153° 18.87	53°14.46 · · 21.34	335°31.02 · · 29.03	3°51.87 · · 23.84	127°15.96 · · 8.97	Atria 107°4.82 -69°4.71
16	168°21.33	68°13.59 21.22	350°32.21 28.44	18°53.88 23.67	142°18.30 9.00	Sabik 102°0.10 -15°45.51
17	183°23.80	83°12.71 21.11	5°33.41 27.84	33°55.88 23.51	157°20.64 9.04	I
18	198° 26.26	98°11.84 N23°20.99	20°34.60 N01°27.24	48°57.88 N13°23.34	172°22.98 N08°9.07	Shaula 96°7.16 -37°7.41
19	213°28.73	113°10.97 20.87		63°59.89 23.18	187°25.32 9.11	Rasalhague 95°56.31 12°32.48
20	228°31.19	128°10.09 20.75		79°1.89 23.01	202°27.67 9.14	Eltanin 90°40.70 51°29.20
21	243°33.65	143°9.22 · · 20.63		94° 3.89 · · 22.85	217°30.01 · · 9.18	Kaus Aust. 83°29.37 -34°22.22
22	258°36.12	158°8.34 20.51		109° 5.90 22.68	232°32.35 9.21	Vega 80°31.39 38°48.62
						Nunki 75°44.83 -26°15.64
23	273°38.58	173°7.47 20.38	95°40.56 24.26	124°7.90 22.52	247°34.69 9.25	Altair 61°57.61 8°56.56
Mer.	pass. 04:48	ν -0.9' d-0.1' m-3.91	ν1.2' d-0.6' m1.13	$\nu 2.0' \ d$ -0.2' m-1.77	$\nu 2.3' \ d0.0' \ m0.57$	Peacock 53°1.94 -56°38.56
						Deneb 49°23.94 45°22.70
						Enif 33°36.50 10°0.16
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.02 -46°49.35
0	288°41.05	188°6.60 N23°20.26		139°9.90 N13°22.35	262°37.04 N08°9.28	Fomalhaut 15°12.06 -29°28.31
1	303°43.51	203°5.72 20.13		154°11.91 22.19	277°39.38 9.32	Scheat 13°42.98 28°13.91
2	318° 45.98	218°4.85 20.00		169°13.91 22.02	292°41.72 9.35	Markab 13°27.65 15°21.25
3	333° 48.44	233°3.97 · · 19.88		184°15.91 · · 21.86	307°44.07 · · 9.38	
4	348°50.90	248°3.10 19.75	170°46.51 21.27	199°17.91 21.69	322°46.41 9.42	Jul 09 Fri SHA Mer.pass
5	3°53.37	263°2.23 19.62		214°19.92 21.53	337°48.75 9.45	Venus 262°5.85 11:25
6	18°55.83	278°1.35 N23°19.48		229°21.92 N13°21.36	352°51.10 N08°9.49	Mars 183°1.58 16:40
7	33°58.30	293°0.48 19.35		244°23.92 21.19	7°53.44 9.52	Jupiter 210°50.89 14:48
8	49°0.76	307°59.61 19.22		259°25.92 21.03	22°55.79 9.55	Saturn 334°1.97 06:36
9	64°3.22	322°58.73 · · 19.08		274°27.92 · · 20.86	37°58.13 · · 9.59	
10	79°5.69	337°57.86 18.94		289°29.93 20.70	53°0.48 9.62	Jul 10 Sat SHA Mer.pass
						Venus 260°45.68 11:27
11	94°8.15	352°56.99 18.81		304°31.93 20.53	68°2.82 9.66	Mars 182°31.20 16:38
12	109° 10.62	7°56.11 N23°18.67		319°33.93 N13°20.37	83°5.17 N08°9.69	Jupiter 210°39.90 14:45
13	124° 13.08	22°55.24 18.53		334°35.93 20.20	98°7.51 9.72	Saturn 333°58.94 06:32
14	139° 15.54	37°54.37 18.38		349°37.93 20.04	113°9.86 9.76	
15	154° 18.01	52°53.50 · · 18.24		4°39.93 · · 19.87	128°12.20 · · 9.79	Jul 11 Sun SHA Mer.pass
16	169°20.47	67°52.62 18.10	351°0.78 14.09	19°41.94 19.70	143°14.55 9.82	Venus 259°25.55 11:28
17	184°22.94	82°51.75 17.95	6°1.96 13.50	34°43.94 19.54	158°16.89 9.86	Mars 182° 0.70 16:36
18	199°25.40	97°50.88 N23°17.81	21°3.15 N01°12.90	49°45.94 N13°19.37	173°19.24 N08°9.89	Jupiter 210°28.86 14:41
19	214°27.86	112°50.01 17.66		64°47.94 19.21	188°21.58 9.92	Saturn 333°55.99 06:29
20	229°30.33	127°49.13 17.51		79°49.94 19.04	203°23.93 9.96	2212111 000 00133 00123
21	244°32.79	142°48.26 · · 17.36		94°51.94 · · 18.87	218°26.28 · · 9.99	Horizontal parallax
22	259°35.26	157° 47.39 17.21		109°53.94 18.71	233°28.62 10.02	Venus: 0.1
23	274°37.72	172°46.52 17.06		124°55.94 18.54	248°30.97 10.06	Mars: 0.1
			_			
Mer.۱	pass. 04:44	ν -0.9 $'$ d-0.1 $'$ m-3.91	$ u 1.2' \; d$ -0.6 $' \; {\sf m} 1.14$	$ u 2.0' \ d$ -0.2' m-1.77	$ u 2.3' \ d0.0' \ m0.57$	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 42.47	N22°24.32	113°39.62	12.2'	S00°50.80	16.0'	59.0'
1	193°42.38	24.03	128°10.86	12.3'	$01^{\circ}6.84$	16.0'	58.9'
2	208° 42.28	23.74	142°42.13	12.3'	01°22.84	16.0'	58.9'
3	223° 42.19	• • 23.44	157°13.44	12.3'	01°38.82	16.0'	58.9'
4 5	238° 42.10 253° 42.00	23.15 22.85	171°44.77 186°16.14	12.4' 12.4'	01°54.77 02°10.70	15.9' 15.9'	58.8' 58.8'
6	268° 41.91	N22°22.55	200°47.53	12.4'	S02°26.59	15.9'	58.7'
7	283°41.81	22.26	215°18.95	12.4	02°42.45	15.8'	58.7'
8	298°41.72	21.96	229°50.39	12.5'	02°58.28	15.8'	58.7'
9	313°41.63	• • 21.66	244°21.86	12.5'	$03^{\circ}14.07$	15.8'	58.6'
10	328°41.53	21.36	258°53.35	12.5'	03°29.83	15.7'	58.6'
11	343°41.44	21.06 N22°20.76	273°24.87	12.5'	03°45.55 504°1.23	15.7'	58.6'
12 13	358°41.35 13°41.25	20.46	287°56.40 302°27.95	12.6' 12.6'	04°16.87	15.6' 15.6'	58.5' 58.5'
14	28° 41.16	20.46	316°59.52	12.6'	04°10.87	15.6'	58.5
15	43°41.07	. 19.85	331°31.11	12.6'	04°48.04	15.5'	58.4
16	58°40.98	19.55	$346^{\circ}2.71$	12.6'	$05^{\circ}3.56$	15.5'	58.4'
17	73°40.89	19.24	0°34.33	12.6'	$05^{\circ}19.04$	15.4'	58.4'
18	88° 40.79	N22°18.94	15°5.95	12.6'	S05°34.47	15.4'	58.3'
19	103° 40.70	18.63	29°37.60 44°9.25	12.7'	05°49.85	15.3'	58.3'
20 21	118° 40.61 133° 40.52	18.33 •• 18.02	44°9.25 58°40.91	12.7' 12.7'	06°5.19 06°20.48	15.3' 15.2'	58.3' 58.2'
22	148° 40.43	17.71	73°12.57	12.7'	06°20.46	15.2'	58.2'
23	163°40.34	17.40	87°44.25	12.7'	06°50.91	15.1'	58.1
	SD = 15.7'	d = -0.3'			0 = 16.1'		
	<u> </u>	u — -0.3		JL	, — 10.1		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178° 40.25 193° 40.16	N22°17.10 16.79	102°15.93 116°47.61	12.7' 12.7'	\$07°6.05 07°21.14	15.1' 15.0'	58.1' 58.1'
2	208° 40.07	16.48	131°19.30	12.7'	07°21.14	15.0'	58.0'
3	223°39.98	• • 16.16	145°50.99	12.7'	07°51.15	14.9'	58.0'
4	238°39.89	15.85	160°22.69	12.7'	$08^{\circ}6.07$	14.9'	58.0'
5	253°39.80	15.54	174°54.38	12.7'	08°20.93	14.8'	57.9'
6	268°39.71 283°39.62	N22°15.23 14.91	189°26.07 203°57.76	12.7' 12.7'	\$08°35.74 08°50.49	14.7'	57.9'
7 8	283°39.62 298°39.53	14.91 14.60	203°57.76 218°29.45	12.7'	08°50.49	14.7' 14.6'	57.9' 57.8'
9	313°39.44	• • 14.29	233° 1.13	12.7'	09°19.81	14.6'	57.8'
10	328°39.35	13.97	247°32.80	12.7'	09°34.37	14.5'	57.8'
11	343°39.26	13.65	$262^{\circ}4.47$	12.7'	09°48.88	14.4'	57.7'
12	358°39.18	N22°13.34	276°36.14	12.7'	\$10°3.31	14.4'	57.7'
13 14	13°39.09 28°39.00	13.02 12.70	291°7.79 305°39.44	12.6' 12.6'	10°17.69 10°32.00	14.3' 14.2'	57.7' 57.6'
15	43°38.91	12.38	320°11.07	12.6'	10° 32.00	14.2'	57.6'
16	58° 38.83	12.06	334°42.69	12.6'	11°0.41	14.1'	57.5'
17	73°38.74	11.74	$349^{\circ}14.30$	12.6'	$11^{\circ}14.52$	14.0'	57.5'
18	88°38.65	N22°11.42	3°45.90	12.6'	S11°28.55	14.0'	57.5'
19 20	103°38.56 118°38.48	11.10 10.78	18°17.48 32°49.05	12.6' 12.6'	11°42.51 11°56.41	13.9' 13.8'	57.4'
21	133°38.39	10.46	47°20.60	12.5'	11 50.41 12°10.23	13.7	57.4′ 57.4′
22	148°38.31	10.13	61°52.14	12.5'	12°23.97	13.7'	57.3'
23	163°38.22	9.81	$76^{\circ}23.65$	12.5'	$12^{\circ}37.65$	13.6'	57.3'
	SD = 15.7'	d = -0.3'		SE	0 = 15.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 38.13	N22° 9.48	90°55.15	12.5'	S12°51.24	13.5'	57.3
1	193°38.05	9.16	105°26.63	12.5'	13° 4.76	13.4'	57.2'
2	208°37.96	8.83	119°58.09	12.4	13°18.20	13.4'	57.2'
3 4	223°37.88 238°37.79	· · 8.50 8.18	134°29.52 149°0.94	12.4' 12.4'	13°31.57 13°44.86	13.3' 13.2'	57.2' 57.1'
4 5	238°37.79 253°37.71	8.18 7.85	149°0.94 163°32.33	12.4' 12.4'	13°44.86 13°58.06	13.2	57.1'
6	268° 37.62	N22°7.52	178° 3.69	12.3'	\$14°11.19	13.0'	57.1
7	283°37.54	7.19	192°35.03	12.3'	$14^{\circ}24.23$	13.0'	57.0'
8	298°37.45	6.86	207°6.35	12.3'	14°37.19	12.9'	57.0'
9	313°37.37	• • 6.53	221°37.64	12.3'	14°50.07 15°2.86	12.8'	57.0'
10 11	328° 37.29 343° 37.20	6.20 5.87	236°8.90 250°40.14	12.2' 12.2'	15°2.86 15°15.57	12.7' 12.6'	56.9' 56.9'
12	358° 37.12	5.87 N22°5.53	265°11.35	12.2'	515°28.19	12.5	56.9
13	13°37.04	5.20	279°42.53	12.1'	15°40.72	12.4	56.9
14	28° 36.95	4.87	294°13.68	12.1'	15°53.17	12.4'	56.8'
15	43°36.87	• • 4.53	308°44.80	12.1'	16°5.53	12.3'	56.8'
16 17	58°36.79 73°36.70	4.20 3.86	323°15.88 337°46.94	12.1' 12.0'	16°17.80 16°29.97	12.2' 12.1'	56.8' 56.7'
18	88° 36.62	3.80 N22° 3.52	352°17.97	12.0'	S16°42.06	12.1	56.7'
19	103°36.54	3.19	6°48.96	12.0'	16°54.05	11.9'	56.7'
20	118°36.46	2.85	21°19.92	11.9'	17°5.96	11.8'	56.6'
21	133°36.38	• • 2.51	35°50.84	11.9'	17°17.76	11.7'	56.6'
22	148°36.30	2.17	50°21.73 64°52.59	11.9' 11.8'	17°29.48	11.6'	56.6'
23	163°36.21	1.83	04 52.59		17°41.10	11.5'	56.5'
	SD = 15.7'	d = -0.3'		SE	0 = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	31-53%	
09	05:10	05:15	12:05	16:58	04:34		
10	05:19	05:23	12:05	17:44	05:21		
11	05.27	05.32	12:06	18:32	06:08		

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

	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
3 394 47.3 327 46.3 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0							
3 19-19-19							
8 4 9 1							
5 1954							
19 19 19 19 19 19 19 19							
7 94°57.48 202°9555 15.79 120°1857 15.79 120°1857 15.79 17.21 29°4975 10.32 64°11.71 10.32							
10	7	34°57.43	292°39.55 15.79		245°11.95 17.21	8°49.75 10.32	
19 97.49 32.79.99 19.30.7 19.31 20.13.99 10.27 19.40 19.13.90 19.27 19.40 19.13.90 19.27 19.40 19.13.10 19.27 19.40 19.13.10 19.40 1							
19 97.29							
11 10 19 76							
13 1 126*11.22							
Binds 17.5		$125^{\circ}12.22$	22°34.32 14.80		335°23.94 16.21		
Amalian 1978 1979 1971							
17 1867 20.00							
18 200°247-96 12°2910 13°79							0
19 216 277 278							
200 201	19	$215^{\circ}27.00$	112°29.10 13.76	5 36°32.77 57.90			
Policy 243 15.16 2797.55 2797.86 2							
Mer.pass 04-41							
True GHA CHA Dec CH							
CHA CHA CHA CHA CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec CHA							
Color	Mer.p	pass. 04:41	ν -0.9′ <i>d</i> -0.2′ m-3.91	$\nu_{1.2'} d$ -0.6' m1.14	ν 2.0′ <i>d</i> -0.2′ m-1.77	ν2.3′ d0.0′ m0.56	
Tue GHA							
1 305°41.79 202°23.89 12.66 126°39.87 59.30 185°47.93 14.04 279°32.03 10.90 (Grown 1.174°4.15 55.70 170°49.93 14.04 296°93.88 10.90 46.35 13.35 14.07 14.05							"
2 330°44.25 217°230.2 1.49							
3 35°4677 22°2215 1.23 156°4223 5.309 185°51.93 1.387 309°56.73 1.109 1.099							
4 390°4918 247°21.28 117°434 1 5249 200°53.92 13.70 324°39.08 10.99 10.00°11.25 55°48.45 10.50 10.00°11.25 55°48.45 10.00°11.25 55°48.45 10.00°11.25 10.00°11.							
5 5:51.65 202°20.41 1193 186°44.59 51.89 215°55.92 133.33 394°4.13 11.05							
8 69°904 307°113 11 135 216°4095 80.09 245°5092 13.20 9°46.14 11.08 Hold 11.2°3.03.2°4°4.09 11.11 11.08 80°5094 307°131 11.36 231°4.01 30.09 261°19.2 13.03 24°4.04 11.01 11.11 Hold 11.08 11.09 11.11 11.09 10.00 11.00							
8 50°590.4 30°71.78 il 1.36 231°48.13 5.009 261°1.92 13.03 24°48.49 11.11 59°6.50 322°16.94 11.13 18°2.97 337°16.07 10.97 261°50.49 48.28 30°9.91 12.70 54°53.19 11.81 11.21 11.21 11.21 11.20 54°53.19 11.81 11.21 11.21 11.21 11.22 11.22 11.22 11.22 11.22 11.22 10.07 261°51.67 48.28 30°9.91 12.25 60°55.25 60°55.25 11.22 11.27 11.22 11.2				_			Alkaid 152°50.34 49°10.76
9 66°1.50 32°2°16.94 11.17 246°49.31 · 49.48 276°3.91 · 12.86 39°50.84 · 11.15 Arctural 145°4.99 19°2.43 11.18 Arctural 145°4.99 19°2.43 11.18 45°4.99 173.37 11.18 45°4.99 18.38 29°1.59.18 11.18 11.18 45°1.49 45°1.49 45°1.							
11 96°6.43 392°15.21 10.97 261°5.049 48.88 291°5.91 12.70 \$4°5.55 41 11.21							
11 1 196°6.43	10	81°3.97	337°16.07 10.97	261°50.49 48.88		54°53.19 11.18	
13 126°11.36 22°13.47 10.38 30°64.03 4708 336°11.90 12.02 115°2.60 11.37 14.14°13.22 371.260 10.18 321°5.52 1 46.47 336°13.90 12.02 115°2.60 11.30 12.02 115°2.60 11.30 1.50°16.29 15.50°16.29 52°11.74 9.98 336°6.39 45.87 6°15.90 11.86 130°4.95 11.33 1.50°1.36 11.71 1.50°1.07 1.44 6.09°4.72 11.75 11.80°21.22 82°10.00 9.58 6°8.74 4.467 36°19.89 11.52 160°9.65 11.39 1.50°1.45 11.42 1.50°2.61 11.75 11.80°21.22 82°10.00 9.58 6°8.74 4.467 36°19.89 11.52 160°9.65 11.39 1.50°1.45 11.42 1.50°2.61 11.28°2.77 9.17 37°1.10 10.43.46 6°2.38.89 11.02 20°2.11 1.50°2.61 11.28°2.77 9.17 37°1.10 10.43.46 6°2.38.89 11.02 20°2.11 1.50°1.45 11.18 190°4.57 11.48 1.20°2.51 11.50°2.61 11.75 11.20°1.00°1.45 11.18 190°4.57 11.48 1.20°2.51 11.50°2.61 11.75 11.20°2.51 11.50							
141°13.82 37°12.60 10.18 321°55.21 46.47 351°13.90 12.02 115°2.60 11.30 13.07							
15 156°16.29 \$22°11.74 \$\tau\$ 9.98 \$36°56.39 \$4.887 \$6'15.90 \$11.69 \$165°73.0 \$11.33 \$4.87 \$10°1.00 \$12°1.00 \$16.90 \$16.97 \$16							
16 171°18.75 67°10.87 9.76 351°57.56 45.27 221°17.90 11.69 145°7.30 11.36							
180°21.28 82°10.00 9.58 6°58.74 44.60′ 30°19.89 11.52 160°9.26 1672 11.81 80°14.2 11.82 100°23.66 97°19.14 N23°9.32 21°59.92 N00°44.07 51°21.89 N13°11.35 175°12.01 N08°11.42 11.84 11.82 11.84 11.84 10.85 11.45 11.45 11.84 11.84 10.85 11.45 11.45 11.84 11.84 11.84 11.85		$171^{\circ}18.75$		351°57.56 45.27			
19 216°26.14 112°8.27 9.17 37°1.10 43.46 66°23.89 11.18 190°1.4.36 11.45 120°3.18 11.18 190°1.4.36 11.45 120°3.18 11.18 190°1.4.36 11.45 11.29 11.48 120°3.18 11.29 11.48 120°3.18 11.29 11.48 120°3.18 11.29 11.2							
20 231°28.61 127°7.40 8.97 52°2.28 42.86 81°25.88 11.02 20°16.72 11.48 Kaus Mary 22°2 246°31.07 142°6.54 8.76 67°3.45 · 42.26 96°27.88 · 10.85 22°0.90.77 · 11.51 Vega 80°3.139 38°48.64 Nunki 75°4.82 26°15.64 23°2.76°36.00 172°4.81 8.34 97°5.81 41.05 126°31.87 10.51 250°23.78 11.57 Vega 80°31.39 38°48.64 Nunki 75°4.82 26°15.64 Nunki 75°4.82 26							9
21 246°3.107 142°6.54 · 8.76 67°3.45 · · 42.26 96°27.88 · · · 10.85 220°19.07 · · · · · · · · · · · · · · · · · · ·							
22 261°33.54 157°5.67 8.55 82°4.63 41.65 111°29.88 10.68 235°2.1.42 11.54 23 276°36.00 172°4.81 8.34 97°5.81 41.05 126°31.87 10.51 250°2.78 11.57 Mer.pass. 04:37							
Mer.pass							
Wed GHA GHA Dec GHA Al Nair 27°30.00 -46°9.936 1 306°40.93 202°3.08 7.92 127°8.16 39.85 156°35.87 10.10 280°28.49 11.66 Al Nair 50°40.20 6.84 310°33.19 11.66 Al Nair 50°40.20 11.66 Al Nair 50°40.20 11.66 Al Nair 50°40.20 11.66 Al Nair 50°40.20 11.76 Markab 13°27.63 15°21.26 5 6°50.79 261°59.61 7.06 187°11.28 37.43 210°43.85 9.50 340°37.90 11.75 Markab 120°27.60 Markab 11.30 Markab <td>23</td> <td>276°36.00</td> <td>172°4.81 8.34</td> <td>97°5.81 41.05</td> <td>126°31.87 10.51</td> <td>250°23.78 11.57</td> <td></td>	23	276°36.00	172°4.81 8.34	97°5.81 41.05	126°31.87 10.51	250°23.78 11.57	
Wed GHA GHA Dec GHA N0°11.60 Al Nai" 27°30.00 -46°49.36 1 306°40.93 202°3.08 7.92 127°8.16 39.85 156°35.87 10.10 280°28.49 11.63 Scheat 13°42.96 28°13.93 3 336°45.86 232°1.34 7.49 157°10.51 38.64 186°39.86 9.84 310°33.19 11.69 Markab 13°27.63 28°13.93 5 6°50.79 26°59.61 7.06 187°12.87 37.43 21°44.85 9.60 325°35.55 11.72 Markab 13°27.63 8°20.26 8°1.78 8°55.71 91°57.89 6.62 217°15.22 36.23 246°47.84 9.91 10°42.61 11.81 34°27.63 34°37.31 36°55.71 21°27.50 6.62 217°15.72 35.02 276°5	Mer.p	bass. 04:37	ν -0.9' d-0.2' m-3.91	$ u 1.2' \ d$ -0.6' m1.15	$\nu 2.0' \ d$ -0.2' m-1.76	$\nu 2.4' \ d0.0' \ m0.56$	
Wed GHA GHA Dec GHA Dec GHA Dec All Nair 27°30.00 46°49.36 0 291°38.46 187°3.94 N02°40.45 141°38.77 N13°10.34 265°26.13 N08°11.60 Formalhaut 15°12.04 -29°28.31 1 306°40.93 202°3.08 7.92 127°8.16 39.85 156°35.87 10.17 280°28.49 11.63 Scheat 13°42.96 28913.93 2 321°43.39 217°2.21 7.71 142°9.34 39.24 171°37.86 10.00 295°30.84 11.66 4 351°48.32 247°0.48 7.28 172°11.69 38.04 201°41.85 9.67 325°35.55 11.72 Jul 12 Mon SHA Markab 13°27.63 15°21.26 5 6°50.79 261°59.61 7.06 187°12.87 37.43 216°43.85 9.50 30°37.90 11.75 Markab 13°27.63 15°21.26 4 351°58.18 306°57.02 6.64 232°16.39 35.62<							
0 291°38.46 187°3.94 N23°8.13 112°6.99 N00°40.45 141°33.87 N13°10.34 265°26.13 N08°11.60 20°3.08 7.92 127°8.16 39.85 156°3.87 10.17 280°28.49 11.63 3 33°6′45.86 230°21.34 · 7.74 157°10.51 · 38.64 186°39.86 · 9.84 310°33.19 · 11.69	Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 306°40,93 202°3.08 7.92 127°8.16 39.85 156°35.87 10.17 280°28.49 11.63 232°43.39 217°2.21 7.71 142°9.34 39.24 171°37.86 10.00 295°30.84 11.66 33.36°45.86 232°1.34 7.49 157°10.51 38.64 186°39.86 9.89 310°33.19 11.69 4 351°48.32 247°0.48 7.28 172°11.69 38.04 201°41.85 9.67 325°35.55 11.72 7.66°50.79 261°59.61 7.06 187°12.87 37.43 216°43.85 9.50 340°37.90 11.75 7.66°21°53.25 276°58.75 N23°6.84 202°14.04 N00°36.83 231°45.85 N13°9.33 355°40.26 N08°11.78 7.66°21°58.18 306°57.02 6.40 232°16.39 35.62 261°49.84 8.99 25°44.97 11.84 1.90°55.71 291°57.89 6.62 217°15.22 36.23 246°47.84 9.16 10°42.61 11.81 1.90°55.71 311°58.18 336°55.29 5.96 262°18.74 34.42 291°53.83 8.65 55°49.68 11.90 11.97°5.57 315°54.43 5.73 277°19.92 33.81 306°55.82 8.49 70°52.04 11.93 112°8.04 6°53.56 N23°5.51 292°21.09 N00°32.13 215°57.82 N13°8.32 85°54.39 N08°11.96 11.20							
3 336°45.86 232°1.34 · 7.49 157°10.51 · 38.64 186°39.86 · 9.84 310°33.19 · 11.69 4 351°48.32 247°0.48 7.28 172°11.69 38.04 201°41.85 9.67 325°35.55 11.72 11.69 56°50.79 261°59.61 7.06 187°12.87 37.43 216°43.85 9.50 340°37.90 11.75 6 21°53.25 276°58.75 N23°6.84 202°14.04 N00°36.83 231°45.85 N13°9.33 355°40.26 N08°11.78 11.81 216°43.85 9.50 340°37.90 11.75 Mars 181°30.09 16.34 11.30 16.34 11.30 16.34 11.30 16.34 11.30 16.34 11.30 16.34 11.30 11.31 1.31 1							Scheat 13°42.96 28°13.93
4 351°48.32 247°0.48 7.28 172°11.69 38.04 201°41.85 9.67 325°35.55 11.72 Jul 12 Mon SHA Mer.pass 5 6°50.79 261°59.61 7.06 187°12.87 37.43 216°43.85 9.50 340°37.90 11.75 Mars 1818°30.09 16.34 7 36°55.71 291°57.89 6.62 217°15.22 36.23 246°47.84 9.16 10°42.61 11.81 Jupiter 210°17.76 14:38 8 51°58.18 306°57.02 6.40 232°16.39 35.62 261°49.84 8.99 25°44.97 11.84 Jupiter 210°17.76 14:38 9 67°0.64 321°56.16 6.81 247°17.57 35.02 276°51.83 8.82 40°47.32 11.87 Mars 1818°30.09 16:34							Markab 13°27.63 15°21.26
5 6°50.79 261°59.61 7.06 187°12.87 37.43 216°43.85 9.50 340°37.90 11.75 6 21°53.25 276°58.75 N23°6.84 202°14.04 N00°36.83 231°45.85 N13°9.33 355°40.26 N08°11.78 Mars 181°30.09 16:34 7 36°55.71 291°57.89 6.62 217°15.22 36.23 246°47.84 9.16 10°42.61 11.81 34 34°55.29 5.96 262°18.74 34.42 291°53.83 8.65 55°49.68 11.90 11.2°8.04 6°53.56 N23°5.51 292°21.09 N00°33.21 112°8.04 6°53.56 N23°5.51 292°21.09 N00°33.21 321°57.82 N13°8.32 85°54.39 N08°11.96 112°10°6.61 14:35 Saturn 333°50.35 06:21 141°45.20 36°55.84 33°22.344 32.00 352°1.81 7.98 115°59.10 12.02 15 157°15.43 51°50.97 · 4.83 337°24.62 · 31.40 7°3.80 · 7.81 131°1.46 · 12.05 Saturn 333°50.35 06:21 18 202°22.82 96°48.38 N23°4.14 22°28.14 N00°29.58 52°9.79 N13°7.30 176°8.53 N08°12.14 140°4.52 8 111°47.52 3.90 37°29.31 28.98 67°11.78 7.13 191°10.89 12.16 25°55.40 141°32 22°262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 12.81 11°44.07 2.96 97°34.00 26.56 127°19.76 6.46 251°20.32 12.28 12.81 Mars: 0.1							Jul 12 Mon SHA Mer.pass
7 36°55.71 291°57.89 6.62 217°15.22 36.23 246°47.84 9.16 10°42.61 11.81 8 51°58.18 306°57.02 6.40 232°16.39 35.62 261°49.84 8.99 25°44.97 11.84 9.16 51°58.18 306°57.02 6.40 232°16.39 35.62 261°49.84 8.99 25°44.97 11.84 8.11.84 9.16 10°42.61 11.81 8.18 11.84 9.16 10°42.61 11.81 11.84 11.8	5	6°50.79	261°59.61 7.06	i 187° 12.87 37.43	216°43.85 9.50	340°37.90 11.75	
8 51°58.18 306°57.02 6.40 232°16.39 35.62 261°49.84 8.99 25°44.97 11.84 9 67°0.64 321°56.16 · 6.18 247°17.57 · 35.02 276°51.83 · 8.82 40°47.32 · 11.87 10 82°3.11 336°55.29 5.96 262°18.74 34.42 291°53.83 8.65 55°49.68 11.90 11 97°5.57 351°54.43 5.73 277°19.92 33.81 306°55.82 8.49 70°52.04 11.93 12 112°8.04 6°53.56 N23°5.51 292°21.09 N00°33.21 321°57.82 N13°8.32 85°54.39 N08°11.96 13 127°10.50 21°52.70 5.28 307°22.27 32.60 336°59.81 8.15 100°56.75 11.99 14 142°12.96 36°51.84 5.06 322°23.44 32.00 352°1.81 7.98 115°59.10 12.02 15 157°15.43 51°50.97 · 4.83 337°24.62 · 31.40 7°3.80 · 7.81 131°1.46 · 12.05 16 172°17.89 66°50.11 4.60 352°25.79 30.79 22°5.80 7.64 146°3.82 12.08 17 187°20.36 81°49.25 4.37 7°26.96 30.19 37°7.79 7.47 161°6.17 12.11 18 202°22.82 96°48.38 N23°4.14 22°28.14 N00°29.58 52°9.79 N13°7.30 176°8.53 N08°12.14 19 217°25.28 111°47.52 3.90 37°29.31 28.98 67°11.78 7.13 191°10.89 12.16 20 232°27.75 126°46.66 3.67 52°30.48 28.38 82°13.78 6.96 206°13.24 12.19 21 247°30.21 141°45.80 · 3.43 67°31.66 · 27.77 97°15.77 · 6.79 221°15.60 · 12.22 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 2 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 3 277°35.14 171°44.07 2.96 97°34.00 26.56 127°19.76 6.46 251°20.32 12.28							
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22 262°32.68 156°44.93 3.20 82°32.83 27.17 112°17.77 6.62 236°17.96 12.25 Venus: 0.1 23 277°35.14 171°44.07 2.96 97°34.00 26.56 127°19.76 6.46 251°20.32 12.28 Mars: 0.1							Horizontal parallax
25 217 55.11 112 1157 2.55 57 57.65 26.55 127 157.75 57.75	22	262°32.68	156°44.93 3.20	$82^{\circ}32.83$ 27.17	112°17.77 6.62	236°17.96 12.25	1
Mer.pass. 04:33 ν -0.9' d -0.2' m-3.91 ν 1.2' d -0.6' m1.16 ν 2.0' d -0.2' m-1.76 ν 2.4' d 0.0' m0.56	23	277°35.14	171°44.07 2.96	97°34.00 26.56	127°19.76 6.46	251°20.32 12.28	Mars: 0.1
	Mer.p	pass. 04:33	ν-0.9' d-0.2' m-3.91	$\nu 1.2' \ d$ -0.6' m1.16	$\nu 2.0' \ d-0.2' \ m-1.76$	ν 2.4′ d 0.0′ m 0.56	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°36.13	N22°1.49	$79^{\circ}23.41$	11.8'	S 17°52.62	11.4'	56.5'
1	193°36.05	1.15	93°54.19	11.7'	18°4.04	11.3'	56.5'
2 3	208°35.97 223°35.89	0.81 · · 0.47	108° 24.94 122° 55.66	11.7' 11.7'	18° 15.37 18° 26.60	11.2' 11.1'	56.5' 56.4'
4	238°35.81	22°0.12	137°26.33	11.6'	18° 37.73	11.0'	56.4'
5	253°35.73	$21^{\circ}59.78$	$151^{\circ}56.97$	11.6'	$18^{\circ}48.75$	10.9'	56.4'
6	268°35.65	N21°59.43	166°27.57	11.6'	S18°59.68	10.8'	56.3'
7 8	283°35.57 298°35.49	59.09 58.74	180° 58.13 195° 28.66	11.5' 11.5'	19° 10.51 19° 21.23	10.7' 10.6'	56.3' 56.3'
9	313°35.41	. 58.40	209° 59.14	11.5	19 21.23 19°31.85	10.5	56.2'
10	328°35.33	58.05	224° 29.59	11.4'	19°42.37	10.4	56.2'
11	343°35.26	57.70	239°0.00	11.4'	19°52.78	10.3'	56.2'
12 13	358°35.18 13°35.10	N21°57.35 57.00	253°30.37 268°0.70	11.3' 11.3'	\$20°3.08 20°13.28	10.2' 10.1'	56.2' 56.1'
14	28°35.02	56.66	200 0.70 282°30.98	11.3	20°13.26 20°23.37	10.1	56.1'
15	43°34.94	• • 56.30	297°1.23	11.2'	20°33.36	9.9'	56.1'
16	58°34.87	55.95	311° 31.44	11.2'	20°43.23	9.8'	56.1'
17	73°34.79 88°34.71	55.60 N21°55.25	326°1.61 340°31.74	11.1' 11.1'	20°53.00 \$21°2.65	9.7' 9.5'	56.0'
18 19	103°34.63	N21 55.25 54.90	340 31.74 355°1.83	11.1	21°12.20	9.5 9.4'	56.0' 56.0'
20	118°34.56	54.54	9°31.88	11.0'	21°21.63	9.3'	55.9'
21	133°34.48	• • 54.19	24°1.89	11.0'	$21^{\circ}30.95$	9.2'	55.9'
22	148°34.40	53.83	38° 31.86	10.9'	21°40.16	9.1'	55.9'
23	163°34.33	53.48	53°1.79	10.9'	21°49.26	9.0'	55.9'
	SD = 15.7'	d = -0.3'		SE	0 = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.25	N21°53.12	$67^{\circ}31.67$	10.8'	S21°58.24	8.9'	55.8'
1 2	193°34.18 208°34.10	52.77 52.41	82°1.52 96°31.33	10.8' 10.8'	22°7.10 22°15.85	8.7' 8.6'	55.8' 55.8'
3	208 34.10 223°34.03	. 52.41	90 31.33 111°1.10	10.8	22 15.85 22°24.48	8.5'	55.8'
4	238°33.95	51.69	125°30.83	10.7'	22°33.00	8.4'	55.7'
5	253°33.88	51.33	140°0.51	10.6'	22°41.40	8.3'	55.7'
6 7	268°33.80 283°33.73	N21°50.97 50.61	154° 30.16 168° 59.77	10.6' 10.6'	\$22°49.68 22°57.84	8.2' 8.0'	55.7' 55.7'
8	298°33.65	50.25	183°29.34	10.5	23°5.88	7.9'	55.6'
9	313°33.58	• • 49.89	$197^{\circ}58.88$	10.5'	$23^{\circ}13.80$	7.8'	55.6'
10	328°33.50	49.53	212°28.37	10.5'	23°21.60 23°29.28	7.7'	55.6'
11 12	343°33.43 358°33.36	49.16 N21°48.80	226° 57.83 241° 27.25	10.4' 10.4'	23 29.28 S23°36.84	7.6' 7.4'	55.6' 55.5'
13	13°33.28	48.43	255° 56.63	10.3'	23°44.27	7.3	55.5'
14	28°33.21	48.07	270°25.97	10.3'	23°51.58	7.2'	55.5'
15 16	43°33.14 58°33.07	· · 47.70 47.34	284° 55.28 299° 24.55	10.3' 10.2'	23°58.77 24°5.83	7.1' 6.9'	55.5' 55.4'
17	73°32.99	46.97	313°53.79	10.2'	24° 12.77	6.8'	55.4'
18	88°32.92	N21°46.60	328°22.99	10.2'	S24°19.58	6.7'	55.4'
19	103°32.85	46.23	342°52.16	10.1'	24°26.27	6.6'	55.4'
20 21	118°32.78 133°32.71	45.86 •• 45.49	357°21.29 11°50.39	10.1' 10.1'	24°32.83 24°39.26	6.4' 6.3'	55.4' 55.3'
22	148°32.63	45.12	26° 19.46	10.1	24° 45.57	6.2	55.3'
23	163°32.56	44.75	40°48.50	10.0'	$24^{\circ}51.75$	6.0'	55.3'
	SD = 15.7'	d = -0.4'		SE	0 = 15.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.49	N21°44.38	$55^{\circ}17.50$	10.0'	S24°57.79	5.9'	55.3'
1	193°32.42	44.01	69°46.47	9.9'	25°3.71 25°9.50	5.8'	55.3'
2	208°32.35 223°32.28	43.64 •• 43.26	84° 15.41 98° 44.33	9.9' 9.9'	25°9.50 25°15.17	5.7' 5.5'	55.2' 55.2'
4	238°32.21	42.89	113° 13.21	9.9'	25° 20.69	5.4	55.2'
5	253°32.14	42.51	127° 42.07	9.8'	25° 26.09	5.3'	55.2'
6	268°32.07 283°32.00	N21°42.14 41.76	142° 10.90 156° 39.70	9.8' 9.8'	\$25°31.36 25°36.50	5.1' 5.0'	55.1' 55.1'
7 8	283°32.00 298°31.93	41.76 41.38	156° 39.70 171° 8.47	9.8'	25° 36.50 25° 41.50	5.0 4.9'	55.1' 55.1'
9	313°31.86	• • 41.01	$185^{\circ}37.23$	9.7'	25°46.38	4.7'	55.1'
10	328°31.80	40.63	200°5.95	9.7'	25°51.11	4.6'	55.1'
11 12	343°31.73 358°31.66	40.25 N21°39.87	214°34.66 229°3.34	9.7' 9.7'	25°55.72 \$26°0.19	4.5' 4.3'	55.0' 55.0'
13	13°31.59	39.49	243° 32.00	9.7 9.6'	26° 4.53	4.3 4.2'	55.0'
14	28°31.52	39.11	258°0.64	9.6'	26°8.74	4.1'	55.0'
15	43°31.46	• • 38.73	272°29.26	9.6'	26° 12.81	3.9'	55.0'
16 17	58°31.39 73°31.32	38.35 37.96	286° 57.86 301° 26.45	9.6' 9.6'	26° 16.75 26° 20.55	3.8' 3.7'	55.0' 54.9'
18	88°31.25	N21°37.58	315°55.02	9.6'	S26°24.21	3.5'	54.9'
19	103°31.19	37.20	330°23.57	9.5'	26°27.74	3.4'	54.9'
20 21	118°31.12 133°31.06	36.81 •• 36.43	344° 52.11 359° 20.63	9.5' 9.5'	26°31.14 26°34.40	3.3' 3.1'	54.9' 54.9'
21	133°31.06 148°30.99	36.43	359°20.63 13°49.14	9.5' 9.5'	26° 34.40 26° 37.52	3.1	54.9° 54.8'
23	163°30.92	35.66	28° 17.65	9.5'	26° 40.51	2.9'	54.8'
	SD = 15.7'	d = -0.4'		SE	0 = 15.1'		
			-				

1	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:25	22:42	////	////
64°	////	////	02:09	22:00	////	////
62°	////	00:28	02:38	21:32	23:33	////
60°	////	01:38	02:59	21:11	22:31	////
N 58°	////	02:11	03:17	20:54	21:59	////
56°	00:26	02:35	03:32	20:39	21:36	23:36
54°	01:30	02:53	03:44	20:26	21:17	22:39
52°	02:00	03:09	03:55	20:16	21:01	22:10
50°	02:23	03:23	04:05	20:06	20:48	21:48
45°	03:02	03:49	04:26	19:45	20:22	21:09
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:44	20:20
30°	04:08	04:41	05:08	19:03	19:30	20:03
20°	04:35	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:45	06:12	06:35	17:36	18:00	18:27
30°	06:00	06:29	06:55	17:17	17:43	18:12
35°	06:07	06:39	07:06	17:05	17:33	18:04
40°	06:16	06:49	07:19	16:52	17:22	17:56
45°	06:25	07:02	07:35	16:37	17:10	17:47
S 50°	06:35	07:16	07:54	16:18	16:56	17:36
52°	06:40	07:23	08:02	16:09	16:49	17:32
54°	06:45	07:30	08:12	15:59	16:42	17:27
56°	06:50	07:38	08:24	15:48	16:34	17:22
58°	06:56	07:47	08:37	15:35	16:25	17:16
S 60°	07:03	07:58	08:52	15:20	16:14	17:09
Lat.		Moonris	e		Moonset	:
Ldl.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°	18.13			20.13		

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	63-81%	
12	05:35	05:39	12:06	19:21	06:56		
13	05:43	05:47	12:06	20:11	07:46		
14	05:50	05:53	12:06	21:03	08:37		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	292°37.61	186°43.21 N23°2.72	112°35.17 N00°25.96	142°21.76 N13°6.29	266°22.67 N08°12.31	
1	307°40.07	201°42.35 2.48	127°36.35 25.35	157°23.75 6.12	281°25.03 12.34	Alpheratz 357°32.46 29°14.53
2	322°42.53	216°41.49 2.24	142°37.52 24.75	172°25.74 5.95	296°27.39 12.37	Ankaa 353°5.01 -42°9.03
3	337°45.00	231°40.63 · · 1.99	157°38.69 · · 24.14	187°27.74 • • 5.78	311°29.75 · · 12.39	Schedar 349°28.47 56°41.14 Diphda 348°45.15 -17°49.90
4	$352^{\circ}47.46$	246°39.76 1.75	172°39.86 23.54	202°29.73 5.61	326°32.11 12.42	Achernar 335°18.72 -57°5.43
5	7°49.93	261°38.90 1.51	187°41.03 22.93	217°31.73 5.44	341°34.46 12.45	Hamal 327°48.89 23°35.52
6	22°52.39	276°38.04 N23°1.26	202°42.20 N00°22.33	232°33.72 N13°5.27	356°36.82 N08°12.48	Polaris 313°7.92 89°22.47
7	37° 54.85	291°37.18 1.01	217° 43.37 21.72	247°35.71 5.10	11°39.18 12.51	Acamar 315°10.38 -40°11.36
8	52° 57.32 67° 59.78	306°36.32 0.76 321°35.46 · 0.51	232° 44.54 21.12 247° 45.72 · · · 20.51	262°37.71 4.93 277°39.70 · · 4.76	26°41.54 12.54 41°43.90 •• 12.56	Menkar 314°4.10 4°11.93
10	83°2.25	336°34.60 0.26	262°46.89 19.91	292°41.69 4.59	56°46.26 12.59	Mirfak 308°25.48 49°57.35
11	98°4.71	351°33.74 23°0.01	202 40.09 19.91 277°48.06 19.30	307°43.69 4.42	71°48.62 12.62	Aldebaran 290°37.48 16°33.85
12	113°7.18	6°32.88 N22°59.76	292°49.23 N00°18.70	322°45.68 N13°4.25	86°50.98 N08°12.65	Rigel 281°2.15 -8°10.12
13	128°9.64	21°32.02 59.50	307°50.40 18.09	337°47.67 4.08	101°53.34 12.68	Capella 280°19.20 46°1.39
14	$143^{\circ}12.10$	36°31.16 59.25	322°51.57 17.48	352°49.67 3.91	116°55.70 12.70	Bellatrix 278°20.93 6°22.48 Elnath 277°59.56 28°37.75
15	$158^{\circ}14.57$	51°30.30 · · 58.99	337°52.73 ·· 16.88	7°51.66 · · 3.74	131°58.06 · · 12.73	Elnath 277°59.56 28°37.75 Alnilam 275°35.91 -1°11.03
16	$173^{\circ}17.03$	66°29.44 58.73	352°53.90 16.27	22°53.65 3.57	147°0.42 12.76	Betelgeuse 270°50.14 7°24.73
17	188° 19.50	81°28.59 58.47	7°55.07 15.67	37°55.65 3.40	162°2.78 12.79	Canopus 263°52.00 -52°42.51
18	203°21.96	96°27.73 N22°58.21	22°56.24 N00°15.06	52°57.64 N13°3.23	177°5.14 N08°12.81	Sirius 258°24.74 -16°45.21
19	218° 24.43	111° 26.87 57.95 126° 26.01 57.69	37°57.41 14.46	67°59.63 3.06 83°1.62 2.89	192°7.50 12.84 207°9.86 12.87	Adhara 255°4.60 -29°0.54
20 21	233° 26.89 248° 29.35	126°26.01 57.69 141°25.15 · · 57.43	52°58.58 13.85 67°59.75 · · 13.24	83°1.62 2.89 98°3.62 · · 2.72	207°9.86 12.87 222°12.22 · · 12.90	Procyon 244°48.99 5°9.24
22	263° 31.82	156°24.29 57.16	83°0.91 12.64	113° 5.61 2.55	237°14.58 12.92	Pollux 243°15.15 27°57.55
23	278° 34.28	171°23.44 56.89	98°2.08 12.03	128° 7.60 2.38	252°16.94 12.95	Avior 234°14.50 -59°35.94
		-				Suhail 222°45.17 -43°32.75
Mer.	pass. 04:29	ν-0.9' d-0.2' m-3.91	$\nu 1.2' \ d$ -0.6' m1.16	ν2.0′ d-0.2′ m-1.76	ν2.4' d0.0' m0.55	Miaplacidus 221°38.65 -69°49.98
						Alphard 217°46.00 -8°46.74 Regulus 207°32.49 11°49.96
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.95 61°36.32
0	293°36.75	186°22.58 N22°56.63	113°3.25 N00°11.42	143°9.59 N13°2.20	267°19.30 N08°12.98	Denebola 182°22.98 14°25.13
1	308° 39.21	201°21.72 56.36	128°4.42 10.82	158°11.59 2.03	282°21.66 13.00	Gienah 175°41.53 -17°41.82
2	323°41.67 338°44.14	216°20.86 56.09 231°20.01 · · 55.82	143°5.59 10.21 158°6.75 • 9.60	173°13.58 1.86 188°15.57 · · 1.69	297°24.03 13.03 312°26.39 · · 13.06	Acrux 172°57.87 -63°15.45
4	353° 46.60	246°19.15 55.55	173° 7.92 9.00	203°17.56 1.52	327°28.75 13.09	Gacrux 171°49.40 -57°16.37
5	8°49.07	261°18.29 55.27	188°9.09 8.39	218°19.55 1.35	342°31.11 13.11	Alioth 166°11.28 55°48.84
6	23°51.53	276°17.44 N22°55.00	203°10.25 N00°7.78	233°21.55 N13°1.18	357°33.47 N08°13.14	Spica 158°20.09 -11°18.38
7	38°54.00	291°16.58 54.72	218° 11.42 7.18	248°23.54 1.01	12°35.84 13.17	Alkaid 152° 50.35 49° 10.76 Hadar 148° 32.85 -60° 30.64
8	53°56.46	306°15.73 54.45	233°12.58 6.57	263°25.53 0.84	27°38.20 13.19	Menkent 147°55.05 -36°30.52
9	68°58.92	321°14.87 · · 54.17	248° 13.75 · · 5.96	278°27.52 · · 0.67	42°40.56 · · 13.22	Arcturus 145°45.94 19°2.44
10	84°1.39	336°14.01 53.89	263° 14.92 5.36	293°29.51 0.50	57°42.92 13.25	Rigil Kent. 139°37.16 -60°57.23
11	99°3.85	351°13.16 53.61 6°12.30 N22°53.33	278°16.08 4.75	308°31.50 0.33 323°33.50 N13°0.15	72°45.29 13.27 87°47.65 N08°13.30	Kochab 137°19.52 74°2.76
12 13	114°6.32 129°8.78	6°12.30 N22°53.33 21°11.45 53.05	293°17.25 N00°4.14 308°18.41 3.54	323°33.50 N13°0.15 338°35.49 12°59.98	102°50.01 13.33	Zuben'ubi 136°53.57 -16°9.44
14	144° 11.24	36°10.59 52.76	323° 19.58 2.93	353°37.48 12°59.81	117°52.38 13.35	Alphecca 126°1.79 26°37.46
15	159° 13.71	51°9.74 · · 52.48	338°20.74 · · 2.32	8°39.47 · · 59.64	132°54.74 · · 13.38	Antares 112°13.00 -26°29.62
16	$174^{\circ}16.17$	66°8.88 52.19	353°21.91 1.71	23°41.46 59.47	147°57.11 13.40	Atria 107°4.84 -69°4.73 Sabik 102°0.10 -15°45.50
17	$189^{\circ}18.64$	81°8.03 51.90	8°23.07 1.11	38°43.45 59.30	162°59.47 13.43	Shaula 96°7.16 -37°7.42
18	204°21.10	96°7.18 N22°51.61	23°24.23 N00°0.50	53°45.44 N12°59.13	178°1.83 N08°13.46	Rasalhague 95°56.31 12°32.50
19	219°23.57	111°6.32 51.33	38°25.40	68°47.43 58.96	193°4.20 13.48	Eltanin 90°40.71 51°29.24
20 21	234° 26.03 249° 28.49	126°5.47 51.03 141°4.62 · · 50.74	53°26.56 0.72 68°27.73 · · 1.32	83°49.42 58.78 98°51.41 •• 58.61	208°6.56 13.51 223°8.93 · · 13.53	Kaus Aust. 83°29.36 -34°22.22
22	264° 30.96	156°3.76 50.45	83°28.89 1.93	113°53.40 58.44	238°11.29 13.56	Vega 80°31.39 38°48.66
23	279° 33.42	171°2.91 50.15	98° 30.05 2.54	128°55.40 58.27	253°13.66 13.59	Nunki 75°44.81 -26°15.64
						Altair 61°57.59 8°56.58 Peacock 53°1.90 -56°38.57
ivier.	pass. 04:25	ν-0.9' d-0.3' m-3.91	ν1.2' d-0.6' m1.17	ν2.0′ d-0.2′ m-1.76	ν 2.4′ d 0.0′ m 0.55	Deneb 49°23.91 45°22.74
						Enif 33°36.46 10°0.19
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.97 -46°49.36
0	294° 35.89	186°2.06 N22°49.86	113°31.22	143°57.39 N12°58.10	268°16.02 N08°13.61	Fomalhaut 15°12.01 -29°28.30
1 2	309° 38.35 324° 40.82	201°1.21 49.56 216°0.35 49.26	128° 32.38 3.76 143° 33.54 4.36	158°59.38 57.93 174°1.37 57.76	283°18.39 13.64 298°20.75 13.66	Scheat 13°42.94 28°13.94
3	339°43.28	230°59.50 · · 48.97	158°34.70 · · 4.97	189° 3.36 · · 57.58		Markab 13°27.61 15°21.28
3 4	354° 45.74	245°58.65 48.67	173°35.87 5.58	204° 5.35 57.41	313°23.12 · · 13.69 328°25.48 13.71	Jul 15 Thu SHA Mer.pass
5	9°48.21	260°57.80 48.36	188° 37.03 6.19	219°7.34 57.24	343°27.85 13.74	Venus 254°5.61 11:34
6	24°50.67	275°56.95 N22°48.06	203°38.19 S 00°6.80	234°9.33 N12°57.07	358°30.22 N08°13.76	Mars 179° 57.57 16:28
7	39°53.14	290°56.09 47.76	218°39.35 7.41	249°11.32 56.90	13°32.58 13.79	Jupiter 209°44.15 14:29
8	54°55.60	305°55.24 47.45	233° 40.51 8.01	264°13.31 56.72	28°34.95 13.82	Saturn 333°45.07 06:14
9	69° 58.06	320°54.39 · · 47.15	248°41.67 · · 8.62	279°15.30 · · 56.55	43°37.32 · · 13.84	Jul 16 Fri SHA Mer.pass
10	85°0.53	335°53.54 46.84	263°42.84 9.23	294°17.28 56.38	58°39.68 13.87	Venus 252°45.83 11:35
11 12	100°2.99 115°5.46	350°52.69 46.53 5°51.84 N22°46.22	278°44.00 9.84 293°45.16 \$00°10.45	309°19.27 56.21 324°21.26 N12°56.04	73°42.05 13.89 88°44.42 N08°13.92	Mars 179°26.50 16:27
13	130°7.92	20°50.99 45.91	308° 46.32 11.06	339°23.25 55.86	103°46.78 13.94	Jupiter 209°32.85 14:25
14	145° 10.39	35°50.14 45.60	323°47.48 11.67	354°25.24 55.69	118°49.15 13.97	Saturn 333°42.56 06:10
15	$160^{\circ}12.85$	50°49.29 · · 45.29	338°48.64 · · 12.28	9°27.23 · · 55.52	133°51.52 · · 13.99	Jul 17 Sat SHA Mer.pass
16	175° 15.31	65°48.44 44.97	353°49.80 12.88	24°29.22 55.35	148°53.89 14.02	Venus 251°26.17 11:37
17	190° 17.78	80°47.60 44.66	8°50.96 13.49	39°31.21 55.18	163°56.25 14.04	Mars 178°55.33 16:25
18	205°20.24	95°46.75 N22°44.34	23°52.12	54°33.20 N12°55.00 69°35.19 54.83	178°58.62 N08°14.06 194°0.99 14.09	Jupiter 209°21.50 14:22
19 20	220° 22.71 235° 25.17	110° 45.90 44.02 125° 45.05 43.71	38°53.28 14.71 53°54.44 15.32	69°35.19 54.83 84°37.18 54.66	194°0.99 14.09 209°3.36 14.11	Saturn 333°40.14 06:06
21	250° 27.63	140°44.20 · · 43.39	68°55.59 · · 15.93	99°39.16 · · 54.49	224°5.73 · · 14.14	Horizontal parallax
22	265° 30.10	155°43.35 43.06	83°56.75 16.54	114°41.15 54.31	239°8.09 14.16	Venus: 0.1
23	280° 32.56	170°42.51 42.74	98°57.91 17.15	129°43.14 54.14	254°10.46 14.19	Mars: 0.1
Mer.	pass. 04:21	ν-0.9' d-0.3' m-3.91	ν1.2' d0.6' m1.18	ν2.0' d-0.2' m-1.76	ν2.4' d0.0' m0.54	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.86	N21°35.27	42°46.14	9.5'	S 26°43.36	2.7'	54.8'
1	193°30.79	34.88	$57^{\circ}14.62$	9.5'	$26^{\circ}46.07$	2.6'	54.8'
2	208° 30.73	34.49	71°43.09	9.5'	26°48.65	2.4'	54.8'
3	223°30.66	• • 34.10	86°11.56	9.5'	26°51.09	2.3'	54.8'
4 5	238°30.60 253°30.53	33.71 33.32	100°40.02 115°8.47	9.5' 9.5'	26°53.40 26°55.56	2.2' 2.0'	54.7' 54.7'
6	268° 30.47	33.32 N21°32.93	115 6.47 129°36.92	9.5	S26°57.59	1.9'	54.7'
7	283°30.40	32.54	144° 5.37	9.4'	26°59.49	1.8'	54.7'
8	298°30.34	32.15	158°33.82	9.4'	27°1.24	1.6'	54.7'
9	313°30.28	• • 31.76	173°2.27	9.4'	$27^{\circ}2.86$	1.5'	54.7'
10	328° 30.21	31.36	187°30.71	9.5'	27° 4.34	1.3'	54.6'
11	343°30.15	30.97	201°59.17	9.5'	27°5.69	1.2'	54.6'
12 13	358°30.09 13°30.03	N21°30.57 30.18	216°27.62 230°56.08	9.5' 9.5'	\$27° 6.89 27° 7.96	1.1' 0.9'	54.6' 54.6'
14	28° 29.96	29.78	245°24.54	9.5'	27°8.90	0.9	54.6'
15	43°29.90	• • 29.39	259°53.01	9.5'	27° 9.69	0.7'	54.6'
16	58°29.84	28.99	274°21.49	9.5'	$27^{\circ}10.35$	0.5'	54.6'
17	73°29.78	28.59	288°49.98	9.5'	$27^{\circ}10.87$	0.4'	54.5'
18	88° 29.72	N21°28.19	303°18.48	9.5'	S27°11.26	0.2'	54.5'
19	103°29.65	27.79	317°46.99	9.5'	27°11.51	0.1'	54.5'
20 21	118° 29.59 133° 29.53	27.39 •• 26.99	332°15.51 346°44.05	9.5' 9.6'	27°11.62 27°11.59	-0.0' -0.2'	54.5' 54.5'
22	133 29.53 148°29.47	26.59	1°12.61	9.6'	27 11.59 27°11.43	-0.2 -0.3'	54.5'
23	163°29.41	26.19	15°41.18	9.6'	27°11.43	-0.3	54.5
	SD = 15.7'	d = -0.4'			0 = 14.9'		
	3D = 15.7	a = -0.4		30	14.9		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.35	N21°25.79	30°9.76	9.6'	\$27°10.71	-0.6'	54.4
1 2	193°29.29 208°29.23	25.39 24.98	44°38.37 59°6.99	9.6' 9.6'	27°10.14 27°9.44	-0.7' -0.8'	54.4' 54.4'
3	206 29.23 223°29.17	24.58	73°35.64	9.0 9.7'	27°8.60	-0.6 -1.0'	54.4'
4	238°29.11	24.17	88° 4.31	9.7'	27° 7.62	-1.1'	54.4'
5	253°29.05	23.77	102°33.00	9.7'	27°6.52	-1.2'	54.4'
6	268°28.99	N21°23.36	$117^{\circ}1.72$	9.7'	S27°5.28	-1.4'	54.4'
7	283°28.94	22.96	131°30.46	9.8'	27°3.90	-1.5'	54.4'
8	298°28.88	22.55	145°59.23	9.8'	27° 2.39	-1.6'	54.4'
9	313°28.82 328°28.76	· · 22.14 21.73	160°28.03 174°56.86	9.8' 9.9'	27° 0.75 26° 58.98	-1.8' -1.9'	54.3' 54.3'
10 11	328 28.76 343°28.70	21.73	174 50.80 189°25.72	9.9 9.9'	26°57.07	-1.9 -2.0'	54.3'
12	358° 28.65	N21°20.91	203°54.61	9.9'	\$26°55.03	-2.2'	54.3
13	13°28.59	20.50	218°23.53	10.0'	26°52.86	-2.3'	54.3'
14	28°28.53	20.09	232°52.48	10.0'	$26^{\circ}50.56$	-2.4'	54.3'
15	43°28.47	• • 19.68	247°21.47	10.0'	26°48.13	-2.6'	54.3'
16	58° 28.42 73° 28.36	19.27	261°50.50 276°19.56	10.1'	26°45.57 26°42.87	-2.7'	54.3'
17 18	88° 28.30	18.86 N21°18.44	270 19.50 290°48.66	10.1' 10.1'	20 42.87 S26°40.05	-2.8' -3.0'	54.3' 54.2'
19	103°28.25	18.03	305°17.80	10.1	26°37.10	-3.1'	54.2'
20	118° 28.19	17.61	319°46.98	10.2'	26°34.02	-3.2'	54.2'
21	133°28.14	• • 17.20	334°16.20	10.3'	26°30.81	-3.3'	54.2'
22	148°28.08	16.78	348°45.46	10.3'	26°27.48	-3.5'	54.2'
23	163°28.03	16.37	3°14.76	10.3'	26°24.02	-3.6'	54.2'
	SD = 15.7'	d = -0.4'		SD	= 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	$178^{\circ}27.97$	N21°15.95	17°44.10	10.4'	S26°20.43	-3.7'	54.2'
1	193°27.92	15.53	32°13.49	10.4'	26°16.71	-3.8'	54.2'
2	208°27.86	15.11	46°42.93	10.5'	26°12.88	-4.0'	54.2'
3 4	223°27.81 238°27.76	· · 14.69 14.27	61°12.41 75°41.94	10.5' 10.6'	26° 8.91 26° 4.82	-4.1' -4.2'	54.2' 54.1'
4 5	238° 27.76 253° 27.70	14.27 13.85	75°41.94 90°11.52	10.6'	26° 4.82 26° 0.61	-4.2 -4.3'	54.1' 54.1'
6	268° 27.65	N21°13.43	104°41.14	10.7	\$25°56.28	-4.5'	54.1
7	283°27.60	13.01	119° 10.82	10.7'	25°51.82	-4.6'	54.1'
8	298°27.54	12.59	133°40.54	10.8'	25°47.25	-4.7'	54.1'
9	313°27.49	• • 12.16	148°10.32	10.8'	25°42.55	-4.8'	54.1'
10	328° 27.44 343° 27.39	11.74	162°40.14	10.9'	25°37.73 25°32.79	-4.9'	54.1'
11 12	343°27.39 358°27.33	11.32 N21°10.89	177°10.02 191°39.96	10.9' 11.0'	25°32.79 \$25°27.73	-5.1' -5.2'	54.1' 54.1'
13	13° 27.28	10.47	206° 9.94	11.0'	25°22.56	-5.2 -5.3'	54.1
14	28° 27.23	10.04	220°39.98	11.1'	25°17.26	-5.4'	54.1'
15	43°27.18	• • 9.61	$235^{\circ}10.08$	11.2'	$25^{\circ}11.85$	-5.5'	54.1'
16	58°27.13	9.19	249°40.23	11.2'	25°6.33	-5.6'	54.1'
17	73°27.08	8.76	264°10.44	11.3'	25°0.69	-5.8'	54.1'
18 19	88°27.03 103°26.98	N21°8.33 7.90	278°40.70 293°11.02	11.3' 11.4'	\$24°54.93 24°49.06	-5.9' -6.0'	54.0' 54.0'
20	118° 26.93	7.90 7.47	307°41.40	11.4 11.4'	24 49.06 24°43.08	-6.0 -6.1'	54.0'
21	133°26.88	7.04	322°11.84	11.5'	24°36.98	-6.2'	54.0'
22	148° 26.83	6.61	336°42.33	11.6'	24°30.77	-6.3'	54.0'
23	163°26.78	6.18	351°12.89	11.6'	24°24.46	-6.4'	54.0'
	SD = 15.7'	d = -0.4'		SD	= 14.8'		

			2021	July 15	to Jui	. 17 0
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:39	22:30	////	////
64°	////	////	02:18	21:52	////	////
62°	////	00:55	02:44	21:26	23:11	////
60°	////	01:47	03:05	21:06	22:22	////
N 58 $^{\circ}$	////	02:18	03:22	20:49	21:53	////
56°	00:51	02:40	03:36	20:35	21:30	23:16
54°	01:38	02:58	03:48	20:23	21:13	22:31
52°	02:07	03:13	03:59	20:13	20:58	22:04
50°	02:28	03:26	04:08	20:03	20:45	21:43
45°	03:06	03:52	04:28	19:43	20:19	21:05
N 40°	03:33	04:13	04:44	19:27	19:59	20:39
35°	03:53	04:29	04:58	19:14	19:43	20:18
30°	04:10	04:43	05:10	19:02	19:29	20:02
20°	04:37	05:05	05:29	18:43	19:07	19:35
N 10°	04:57	05:24	05:47	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:16	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:18	17:44	18:14
35°	06:06	06:38	07:05	17:07	17:35	18:06
40°	06:15	06:48	07:18	16:55	17:24	17:58
45°	06:23	07:00	07:33	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:21	16:59	17:39
52°	06:38	07:20	08:00	16:13	16:52	17:35
54°	06:43	07:28	08:09	16:03	16:45	17:30
56°	06:48	07:35	08:20	15:52	16:37	17:25
58°	06:53	07:44	08:33	15:40	16:29	17:19
S 60°	07:00	07:54	08:47	15:25	16:19	17:13
		Moonris	e		Moonset	;
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						_
66°						
64°			22:12			
62°	20.57	21.25	21.21	22.52		00.12

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-97%	
15	05:57	06:00	12:06	21:55	09:29		
16	06:03	06:05	12:06	22:47	10:21		
17	06:08	06.11	12:06	23:36	11.12		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	295°35.03	185°41.66 N22°42.42	113°59.07 S 00°17.76	144°45.13 N12°53.97	269°12.83 N08°14.21	
1	$310^{\circ}37.49$	200°40.81 42.09	129°0.23 18.37	159°47.12 53.80	284°15.20 14.23	Alpheratz 357°32.43 29°14.54 Ankaa 353°4.98 -42°9.03
2	325°39.96	215°39.97 41.77	144°1.39 18.98	174°49.11 53.62	299°17.57 14.26	Schedar 349°28.44 56°41.15
3	340° 42.42	230°39.12 · · 41.44	159°2.54 · · 19.59	189°51.10 · · 53.45	314°19.94 · · 14.28	Diphda 348°45.13 -17°49.89
4 5	355° 44.88 10° 47.35	245°38.27 41.11 260°37.43 40.78	174°3.70 20.20 189°4.86 20.81	204°53.08 53.28 219°55.07 53.10	329°22.31 14.31 344°24.68 14.33	Achernar 335°18.68 -57°5.42
6	25°49.81	275°36.58 N22°40.45	204°6.02 S00°21.42	234°57.06 N12°52.93	359°27.05 N08°14.35	Hamal 327°48.86 23°35.53
7	40°52.28	290°35.73 40.12	219°7.17 22.03	249°59.05 52.76	14°29.42 14.38	Polaris 313°6.32 89°22.47
8	55° 54.74	305°34.89 39.79	234°8.33 22.64	265° 1.04 52.59	29°31.79 14.40	Acamar 315°10.35 -40°11.35 Menkar 314°4.07 4°11.94
9	70° 57.20	320°34.04 · · 39.46	249°9.49 · · 23.25	280°3.02 · · 52.41	44°34.16 · · 14.43	Mirfak 308°25.44 49°57.35
10	85°59.67	335°33.20 39.12	264°10.64 23.86	295° 5.01 52.24	59°36.53 14.45	Aldebaran 290°37.45 16°33.85
11	101°2.13	350°32.35 38.78	279°11.80 24.47	310°7.00 52.07	74°38.90 14.47	Rigel 281°2.13 -8°10.11
12 13	116°4.60 131°7.06	5°31.51 N22°38.45 20°30.67 38.11	294°12.96 S00°25.08 309°14.11 25.69	325°8.99 N12°51.89 340°10.97 51.72	89°41.27 N08°14.50 104°43.64 14.52	Capella 280°19.17 46°1.39
14	146°9.53	35°29.82 37.77	324°15.27 26.30	355°12.96 51.55	119°46.01 14.54	Bellatrix 278°20.91 6°22.49
15	161°11.99	50°28.98 · · 37.43	339°16.42 · · 26.91	10°14.95 · · 51.37	134°48.38 · · 14.57	Elnath 277°59.53 28°37.76
16	$176^{\circ}14.45$	65°28.13 37.09	354°17.58 27.52	25°16.94 51.20	149°50.75 14.59	Alnilam 275°35.89 -1°11.02 Betelgeuse 270°50.12 7°24.73
17	191°16.92	80°27.29 36.74	9°18.73 28.13	40°18.92 51.03	164°53.13 14.61	Canopus 263°51.98 -52°42.50
18	206° 19.38	95°26.45 N22°36.40	24°19.89	55°20.91 N12°50.85	179°55.50 N08°14.64	Sirius 258°24.73 -16°45.19
19 20	221°21.85 236°24.31	110°25.61 36.05 125°24.76 35.71	39°21.04 29.35 54°22.20 29.96	70°22.90 50.68 85°24.88 50.51	194°57.87 14.66 210°0.24 14.68	Adhara 255°4.59 -29°0.52
21	250° 24.51° 251° 26.77	140°23.92 · · 35.36	69°23.35 · · 30.57	100°26.87 · · 50.33	225°2.61 · · 14.71	Procyon 244°48.98 5°9.25
22	266° 29.24	155°23.08 35.01	84°24.50 31.18	115°28.86 50.16	240°4.99 14.73	Pollux 243°15.14 27°57.55
23	281°31.70	170°22.24 34.66	99°25.66 31.79	130°30.84 49.99	255°7.36 14.75	Avior 234°14.50 -59°35.93 Suhail 222°45.17 -43°32.74
Merr	pass. 04:17	ν-0.8' d-0.3' m-3.91	$\nu 1.2' \ d0.6' \ m1.18$	ν2.0' d-0.2' m-1.75	ν 2.4' d 0.0' m 0.54	Miaplacidus 221°38.67 -69°49.96
14161.	Juss. UT.11	ν σ.σ α-σ.σ π-σ.σ1	ν 1.2 do.0 iii1.10		ν Δ.¬ αυ.υ πυ.υ -	Alphard 217°45.99 -8°46.73
B.4.	CIIA	CHA D	CHA D	CHA D	CHA D	Regulus 207°32.49 11°49.96
Mon 0	GHA 296°34.17	GHA Dec 185°21.40 N22°34.31	GHA Dec 114°26.81 S 00°32.41	GHA Dec 145°32.83 N12°49.81	GHA Dec 270°9.73 N08°14.77	Dubhe 193°38.96 61°36.31
1	311°36.63	200°20.55 33.96	129° 27.97 33.02	160°34.82 49.64	285°12.10 14.80	Denebola 182°22.98 14°25.13
2	326°39.10	215°19.71 33.60	144°29.12 33.63	175°36.80 49.47	300°14.48 14.82	Gienah 175°41.54 -17°41.82 Acrux 172°57.90 -63°15.44
3	341°41.56	230°18.87 · · 33.25	159°30.27 · · 34.24	190°38.79 · · 49.29	315°16.85 · · 14.84	Acrux 172°57.90 -63°15.44 Gacrux 171°49.42 -57°16.36
4	356° 44.02	245°18.03 32.89	174°31.43 34.85	205°40.78 49.12	330°19.22 14.86	Alioth 166°11.30 55°48.84
5	11°46.49	260°17.19 32.54	189°32.58 35.46	220°42.76 48.94	345°21.60 14.89	Spica 158°20.10 -11°18.38
6	26°48.95	275°16.35 N22°32.18	204°33.73	235°44.75 N12°48.77	0°23.97 N08°14.91	Alkaid 152°50.37 49°10.76
7 8	41°51.42 56°53.88	290° 15.51 31.82 305° 14.67 31.46	219°34.88 36.68 234°36.04 37.30	250°46.73 48.60 265°48.72 48.42	15°26.34 14.93 30°28.72 14.95	Hadar 148°32.87 -60°30.65
9	71°56.34	320°13.83 · · 31.10	249°37.19 · · 37.91	280°50.71 · · 48.25	45°31.09 · · 14.98	Menkent 147°55.06 -36°30.52
10	86°58.81	335°12.99 30.73	264°38.34 38.52	295°52.69 48.08	60°33.47 15.00	Arcturus 145°45.95 19°2.44 Rigil Kent. 139°37.18 -60°57.23
11	102°1.27	350°12.16 30.37	279°39.49 39.13	310°54.68 47.90	75°35.84 15.02	Kochab 137°19.57 74°2.76
12	117°3.74	5°11.32 N22°30.00	294°40.64 \$00°39.74	325°56.66 N12°47.73	90°38.22 N08°15.04	Zuben'ubi 136°53.57 -16°9.44
13	132°6.20	20°10.48 29.64	309°41.79 40.35	340°58.65 47.55	105°40.59 15.06	Alphecca 126°1.79 26°37.46
14 15	147°8.67 162°11.13	35°9.64 29.27 50°8.80 •• 28.90	324° 42.94 40.97 339° 44.09 · · 41.58	356°0.63 47.38 11°2.62 · 47.20	120°42.97 15.09 135°45.34 •• 15.11	Antares 112°13.00 -26°29.62
16	102 11.13 177°13.59	50°8.80 · · 28.90 65°7.97 28.53	354°45.25 42.19	26° 4.61 47.03	135°45.34 · · 15.11 150°47.72 15.13	Atria 107°4.85 -69°4.74
17	192° 16.06	80°7.13 28.16	9° 46.40 42.80	41°6.59 46.86	165°50.09 15.15	Sabik 102°0.09 -15°45.50
18	207° 18.52	95°6.29 N22°27.79	24°47.55 \$00°43.41	56°8.58 N12°46.68	180°52.47 N08°15.17	Shaula 96°7.15 -37°7.42 Rasalhague 95°56.31 12°32.51
19	222°20.99	110°5.46 27.42	39°48.70 44.03	71°10.56 46.51	195°54.84 15.19	Eltanin 90°40.72 51°29.25
20	237°23.45	125°4.62 27.04	54°49.85 44.64	86°12.55 46.33	210°57.22 15.22	Kaus Aust. 83°29.35 -34°22.22
21 22	252°25.91 267°28.38	140°3.78 ·· 26.67 155°2.95 26.29	69°51.00 · · 45.25 84°52.14 45.86	101°14.53 · · 46.16 116°16.52 45.98	225°59.59 · · 15.24 241°1.97 15.26	Vega 80°31.39 38°48.67
23	282°30.84	170°2.11 25.91	99°53.29 46.47	131°18.50 45.81	241°1.97 15.26 256°4.35 15.28	Nunki 75°44.80 -26°15.64
						Altair 61°57.58 8°56.59
Mer.p	pass. 04:13	ν-0.8' d-0.4' m-3.92	ν1.2' d0.6' m1.19	ν2.0′ d-0.2′ m-1.75	ν 2.4′ d 0.0′ m 0.54	Peacock 53°1.88 -56°38.58 Deneb 49°23.90 45°22.75
						Enif 33°36.45 10°0.20
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.94 -46°49.36
0	297°33.31	185°1.28 N22°25.53	114°54.44 \$00°47.09	146°20.49 N12°45.63	271°6.72 N08°15.30	Fomalhaut 15°11.98 -29°28.30
1 2	312°35.77 327°38.23	200°0.44 25.15 214°59.61 24.77	129°55.59 47.70 144°56.74 48.31	161°22.47 45.46 176°24.46 45.29	286°9.10 15.32 301°11.48 15.34	Scheat 13°42.91 28°13.96
3	327 38.23 342°40.70	214 59.61 24.77 229°58.77 •• 24.39	159°57.89 · · 48.92	176 24.46 45.29 191°26.44 · · 45.11	316°13.85 · · 15.36	Markab 13°27.59 15°21.29
4	357°43.16	244°57.94 24.01	174°59.04 49.54	206°28.42 44.94	331°16.23 15.38	Jul 18 Sun SHA Mer.pass
5	$12^{\circ}45.63$	259° 57.11 23.62	190°0.19 50.15	221°30.41 44.76	346°18.61 15.41	Venus 250°6.63 11:38
6	27°48.09	274°56.27 N22°23.24	205°1.33 S00°50.76	236°32.39 N12°44.59	1°20.99 N08°15.43	Mars 178°24.04 16:23
7	42°50.56	289°55.44 22.85	220°2.48 51.38	251°34.38 44.41	16°23.36 15.45	Jupiter 209°10.10 14:19
8 9	57° 53.02 72° 55.48	304°54.61 22.46 319°53.77 •• 22.07	235°3.63 51.99 250°4.78 •• 52.60	266°36.36 44.24 281°38.35 •• 44.06	31°25.74 15.47 46°28.12 · · 15.49	Saturn 333°37.80 06:02
10	72 55.46 87° 57.95	334°52.94 21.68	265°5.92 53.21	296°40.33 43.89	46°28.12 · · 15.49 61°30.50 15.51	Jul 19 Mon SHA Mer.pass
11	103°0.41	349°52.11 21.29	280°7.07 53.83	311°42.31 43.71	76°32.87 15.53	Venus 248°47.23 11:39
12	118°2.88	4°51.28 N22°20.90	295°8.22 \$00°54.44	326°44.30 N12°43.54	91°35.25 N08°15.55	Mars 177°52.65 16:21 Jupiter 208°58.66 14:16
13	133°5.34	19°50.45 20.51	310°9.36 55.05	341°46.28 43.36	106°37.63 15.57	Saturn 333°35.56 05:58
14	148°7.80	34°49.61 20.11	325°10.51 55.67	356°48.27 43.19	121°40.01 15.59	
15 16	163° 10.27 178° 12.73	49°48.78 · · 19.72 64°47.95 19.32	340°11.66 · · 56.28 355°12.80 56.89	11°50.25 · · 43.01 26°52.23 42.84	136°42.39 · · 15.61 151°44.77	Jul 20 Tue SHA Mer.pass
17	176 12.73 193°15.20	79°47.12 18.92	10°13.95 57.51	41°54.22 42.66	166°47.15 15.65	Venus 247°27.97 11:41 Mars 177°21.14 16:19
18	208° 17.66	94°46.29 N22°18.52	25°15.09 S00°58.12	56°56.20 N12°42.49	181°49.53 N08°15.67	Jupiter 208°47.18 14:13
19	$223^{\circ}20.12$	109°45.46 18.12	40°16.24 58.73	71°58.18 42.31	196°51.91 15.69	Saturn 333°33.42 05:55
20	238° 22.59	124°44.63 17.72	55°17.38 00°59.35	87° 0.17 42.13	211°54.29 15.71	
21	253°25.05	139°43.80 · · 17.32	70°18.53 00°59.96	102°2.15 · · 41.96	226°56.67 · 15.73	Horizontal parallax Venus: 0.1
22 23	268°27.52 283°29.98	154° 42.97 16.91 169° 42.14 16.51	85°19.67 0.57 100°20.82 1.19	117° 4.13 41.78 132° 6.12 41.61	241°59.05 15.75 257°1.43 15.77	Mars: 0.1
Mer.	pass. 04:09	ν-0.8′ d-0.4′ m-3.92	$ u 1.1' \; d0.6' \; {\rm m} 1.19$	$ u 2.0' \ d$ -0.2' m-1.75	ν 2.4′ d 0.0′ m 0.53	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.73	N21°5.75	5°43.50	11.7'	S24°18.03	-6.5'	54.0'
1	193°26.68	5.31	20° 14.18	11.7'	24°11.49	-6.6'	54.0'
2 3	208°26.63 223°26.58	4.88 •• 4.45	34° 44.91 49° 15.71	11.8' 11.9'	24°4.84 23°58.09	-6.8' -6.9'	54.0' 54.0'
3 4	223 20.58 238°26.53	4.01	49 15.71 63°46.57	11.9 11.9'	23°51.23	-6.9 -7.0'	54.0'
5	253°26.48	3.58	78° 17.48	12.0'	23°44.26	-7.1'	54.0'
6	268°26.44	N21°3.14	92°48.46	12.0'	S 23°37.18	-7.2'	54.0'
7	283°26.39	2.70	$107^{\circ}19.51$	12.1'	$23^{\circ}30.01$	-7.3'	54.0'
8	298°26.34	2.27	121°50.61	12.2'	23°22.73	-7.4'	54.0'
9 10	313°26.29 328°26.25	· · 1.83 1.39	136°21.78 150°53.01	12.2' 12.3'	23°15.34 23°7.85	-7.5' -7.6'	54.0' 54.0'
11	343°26.20	0.95	165°24.30	12.4	23°0.27	-7.0 -7.7'	54.0'
12	358°26.15	N21°0.51	179°55.65	12.4'	S22°52.58	-7.8'	54.0'
13	13°26.11	21°0.07	194°27.07	12.5'	22°44.79	-7.9'	54.0'
14	28°26.06	$20^{\circ}59.63$	208° 58.55	12.5'	$22^{\circ}36.90$	-8.0'	53.9'
15	43°26.02	• • 59.19	223°30.10	12.6'	22°28.91	-8.1'	53.9'
16	58°25.97 73°25.93	58.75 58.31	238°1.71 252°33.38	12.7' 12.7'	22°20.83 22°12.65	-8.2' -8.3'	53.9' 53.9'
17 18	73 25.93 88°25.88	N20° 57.86	252 33.38 267°5.11	12.7	522°4.38	-8.4'	53.9'
19	103°25.84	57.42	281°36.91	12.9'	21°56.01	-8.5	53.9'
20	118°25.79	56.97	296°8.77	12.9'	21°47.54	-8.6'	53.9'
21	133°25.75	• • 56.53	310°40.70	13.0'	21°38.99	-8.6'	53.9'
22	148°25.70	56.08	325° 12.69	13.1'	21°30.34	-8.7'	53.9'
23	163°25.66	55.64	339°44.74	13.1'	21°21.60	-8.8'	53.9'
	SD = 15.7'	d = -0.4'		SI	O = 14.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.62	N20°55.19	354° 16.86	13.2'	\$21° 12.77	-8.9'	53.9'
1	193°25.57	54.74	8°49.04	13.2'	21°3.85	-9.0'	53.9'
2	208°25.53	54.29	$23^{\circ}21.28$	13.3'	$20^{\circ}54.84$	-9.1'	53.9'
3	223°25.49	• • 53.85	37°53.58	13.4'	20°45.74	-9.2'	53.9'
4	238°25.44	53.40	52°25.95	13.4'	20°36.56	-9.3	53.9'
5 6	253°25.40 268°25.36	52.95 N20° 52.50	66°58.38 81°30.87	13.5' 13.6'	20°27.29 S 20°17.94	-9.4' -9.4'	53.9' 53.9'
7	283°25.32	52.04	96°3.43	13.6'	20°8.50	-9.4 -9.5'	53.9'
8	298°25.28	51.59	110°36.05	13.7'	19° 58.97	-9.6'	53.9'
9	313°25.23	51.14	125°8.72	13.7'	19°49.37	-9.7'	53.9'
10	328°25.19	50.69	139°41.46	13.8'	19°39.68	-9.8'	53.9'
11	343°25.15	50.23	154° 14.27	13.9'	$19^{\circ}29.91$	-9.8'	53.9'
12	358°25.11	N20°49.78	168°47.13	13.9'	\$19°20.06	-9.9'	53.9'
13	13°25.07 28°25.03	49.32 48.87	183°20.05 197°53.03	14.0' 14.0'	19° 10.13 19° 0.13	-10.0'	53.9'
14 15	28 25.03 43°24 99	48.87 •• 48.41	212°26.07	14.0 14.1'	19 0.13 18°50.04	-10.1' -10.2'	53.9' 53.9'
16	58°24.95	47.96	226° 59.18	14.2	18° 39.88	-10.2'	53.9'
17	73°24.91	47.50	241°32.34	14.2'	18° 29.64	-10.3'	53.9'
18	88°24.87	N20°47.04	256°5.56	14.3'	\$18° 19.33	-10.4'	53.9'
19	103°24.83	46.58	270°38.83	14.3'	18°8.95	-10.5'	53.9'
20	118°24.79	46.12	285° 12.17	14.4	17° 58.49	-10.5'	53.9'
21 22	133°24.76 148°24.72	· · 45.66 45.20	299° 45.56 314° 19.01	14.4' 14.5'	17°47.95 17°37.35	-10.6' -10.7'	53.9' 53.9'
23	163°24.68	44.74	328° 52.52	14.6	17°26.68	-10.7	53.9'
	SD = 15.7'	d = -0.4'		SI	D = 14.7'		
-						,	
Tue 0	GHA 178°24.64	Dec N20°44.28	GHA 343°26.08	u 14.6'	Dec 517° 15.93	d -10.8'	HP 53.9'
1	193°24.60	43.82	357° 59.70	14.7	17°5.12	-10.6	53.9
2	208°24.57	43.36	12°33.37	14.7'	16°54.23	-10.9'	53.9'
3	223°24.53	• • 42.89	27°7.10	14.8'	16°43.28	-11.0'	53.9'
4	238°24.49	42.43	41°40.88	14.8'	16° 32.27	-11.1'	53.9'
5	253°24.45 268°24.42	41.96	56° 14.71	14.9'	16°21.19 \$16°10.04	-11.1'	53.9'
6 7	268°24.42 283°24.38	N20°41.50 41.03	70°48.60 85°22.54	14.9' 15.0'	15° 58.83	-11.2' -11.3'	53.9' 53.9'
8	298°24.35	40.57	99°56.53	15.0'	15° 47.55	-11.3'	53.9'
9	313°24.31	40.10	114° 30.57	15.1'	15°36.21	-11.4	54.0'
10	328°24.27	39.63	$129^{\circ}4.66$	15.1'	$15^{\circ}24.81$	-11.5'	54.0'
11	343°24.24	39.16	143°38.80	15.2'	15°13.35	-11.5'	54.0'
12	358°24.20	N20°38.69	158° 12.99	15.2'	\$15°1.83	-11.6'	54.0'
13	13°24.17 28°24.14	38.22 37.75	172° 47.23 187° 21.52	15.3' 15.3'	14°50.25 14°38.62	-11.6' -11.7'	54.0' 54.0'
14 15	28°24.14 43°24.10	37.75 •• 37.28	187°21.52 201°55.85	15.3' 15.4'	14°38.62 14°26.92	-11.7' -11.8'	54.0° 54.0°
16	58°24.07	36.81	216° 30.23	15.4'	14° 20.92 14° 15.17	-11.8'	54.0'
17	73°24.03	36.34	231°4.66	15.5'	14°3.36	-11.9	54.0'
18	88°24.00	N20°35.87	245°39.13	15.5'	S13°51.50	-11.9'	54.0'
19	103°23.97	35.40	260° 13.64	15.6'	13°39.58	-12.0'	54.0'
20	118°23.93	34.92	274°48.20	15.6'	13°27.61	-12.0'	54.0'
21 22	133°23.90 148°23.87	· · 34.45 33.97	289°22.80 303°57.45	15.6' 15.7'	13° 15.58 13° 3.50	-12.1' -12.1'	54.0' 54.0'
23	148 23.87 163°23.83	33.50	318° 32.13	15.7'	13 3.50 12°51.37	-12.1 -12.2'	54.0'
	SD = 15.7'	d = -0.5'			D = 14.7'		
	35 - 13.1	<u> </u>		JI	~ _ <u>1</u> 7.1		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:43	23:19	////	////
66°	////	////	01:52	22:17	////	////
64°	////	////	02:27	21:44	////	////
62°	////	01:14	02:52	21:19	22:54	////
60°	////	01:57	03:11	21:00	22:13	////
N 58°	////	02:25	03:27	20:44	21:46	////
56°	01:08	02:46	03:41	20:31	21:25	23:01
54°	01:47	03:03	03:52	20:19	21:08	22:23
52°	02:13	03:18	04:03	20:09	20:54	21:58
50°	02:33	03:30	04:12	20:00	20:41	21:38
45°	03:10	03:56	04:31	19:41	20:16	21:02
N 40°	03:36	04:15	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:12	04:44	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	17:38	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:04	17:09	17:37	18:08
40° 45°	06:13	06:46	07:16	16:57	17:27	18:00
	06:22	06:58	07:31	16:42	17:15	17:51
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:18	07:57	16:17	16:55	17:38
54°	06:40	07:24	08:06	16:07	16:49	17:33
56° 58°	06:45	07:32	08:16	15:57	16:41	17:28
S 60°	06:50 06:56	07:40 07:50	08:28 08:42	15:45 15:31	16:33 16:23	17:23 17:17
3 00	00.50	01.30	00.42	15.51	10.23	11.11

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

		Sun	-	Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-98%	
18	06:13	06:15	12:06	-:-	12:00		
19	06:18	06:20	12:06	00:24	12:46		
20	06:21	06:23	12:06	01:08	13:30		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	298°32.45	184°41.32 N22°16.10	115°21.96	147°8.10 N12°41.43	272°3.81 N08°15.79	
1	313°34.91	199°40.49 15.69	130°23.11 2.42	162°10.08 41.26	287°6.19 15.81	Alpheratz 357°32.41 29°14.55
2	328°37.37	214°39.66 15.29	145°24.25 3.03	177°12.07 41.08	302°8.57 15.83	Ankaa 353°4.95 -42°9.02
3	343°39.84	229°38.83 · · 14.88	160°25.39 · · 3.64	192°14.05 · · 40.91	317°10.95 · · 15.85	Schedar 349°28.40 56°41.16
4	358°42.30	244°38.01 14.47	175°26.54 4.26	207°16.03 40.73	332°13.33 15.87	Diphda 348°45.10 -17°49.88
5	13°44.77	259°37.18 14.05	190°27.68 4.87	222°18.01 40.55	347°15.71 15.89	Achernar 335°18.64 -57°5.42 Hamal 327°48.84 23°35.54
6	28° 47.23	274°36.35 N22°13.64	205°28.82 S01°5.49	237°20.00 N12°40.38	2°18.09 N08°15.91	Hamal 327°48.84 23°35.54 Polaris 313°4.90 89°22.47
7	43°49.69	289°35.53 13.23	220°29.97 6.10	252°21.98 40.20	17°20.47 15.93	Acamar 315°10.33 -40°11.34
8	$58^{\circ}52.16$	304°34.70 12.81	235°31.11 6.71	267°23.96 40.03	32°22.85 15.95	Menkar 314°4.05 4°11.95
9	73°54.62	319°33.87 · · 12.40	$250^{\circ}32.25$ · · 7.33	282°25.94 · · 39.85	47°25.24 · · 15.97	Mirfak 308°25.41 49°57.36
10	88°57.09	334°33.05 11.98	265° 33.39 7.94	297°27.93 39.67	62°27.62 15.99	Aldebaran 290°37.43 16°33.86
11	103°59.55	349°32.22 11.56	280°34.54 8.56	312°29.91 39.50	77°30.00 16.00	Rigel 281°2.11 -8°10.10
12	119°2.01	4°31.40 N22°11.14	295°35.68 S01°9.17	327°31.89 N12°39.32	92°32.38 N08°16.02	Capella 280°19.15 46°1.39
13	134°4.48 149°6.94	19°30.57 10.72 34°29.75 10.30	310°36.82 9.79 325°37.96 10.40	342°33.87 39.15 357°35.85 38.97	107°34.76 16.04 122°37.15 16.06	Bellatrix 278°20.89 6°22.50
14 15	149 0.94 164°9.41	49°28.92 · · 9.87	325°37.96 10.40 340°39.10 · · 11.02	357°35.85 38.97 12°37.84 · · 38.79	122°37.15 16.06 137°39.53 · · 16.08	Elnath 277°59.51 28°37.76
16	179° 11.87	64°28.10 9.45	355°40.25 11.63	27°39.82 38.62	152°41.91 16.10	Alnilam 275°35.87 -1°11.01
17	194° 14.34	79°27.28 9.02	10°41.39 12.25	42°41.80 38.44	167°44.30 16.12	Betelgeuse 270°50.11 7°24.74
18	209° 16.80	94°26.45 N22°8.60	25°42.53 S01°12.86	57°43.78 N12°38.27	182°46.68 N08°16.14	Canopus 263°51.97 -52°42.48
19	224° 19.26	109°25.63 8.17	40°43.67 13.47	72°45.76 38.09	197°49.06 16.15	Sirius 258°24.72 -16°45.18
20	239°21.73	124°24.81 7.74	55°44.81 14.09	87°47.75 37.91	212°51.45 16.17	Adhara 255°4.58 -29°0.51
21	254°24.19	139°23.99 · · 7.31	70°45.95 · · 14.70	102°49.73 · · 37.74	227°53.83 · · 16.19	Procyon 244°48.97 5°9.25
22	269°26.66	154°23.17 6.88	85°47.09 15.32	117°51.71 37.56	242°56.21 16.21	Pollux 243°15.13 27°57.54
23	284°29.12	169°22.34 6.45	100° 48.23 15.93	132°53.69 37.38	257°58.60 16.23	Avior 234°14.51 -59°35.91
1/1	2255 04:0E	ν-0.8' d-0.4' m-3.92	$\nu 1.1' \ d0.6' \ m1.20$	ν2.0' d-0.2' m-1.75	ν2.4' d0.0' m0.53	Suhail 222°45.18 -43°32.72 Miaplacidus 221°38.69 -69°49.95
ivier.	pass. 04:05	ν-υ.ο <i>α</i> -υ.4 m-3.92	ν _{1.1} α _{0.0} m _{1.20}	ν2.υ α-υ.2 m-1./5	ν2.4 αυ.υ mu.53	Miaplacidus 221°38.69 -69°49.95 Alphard 217°46.00 -8°46.73
						Regulus 207°32.49 11°49.96
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.97 61°36.30
0	299°31.58	184°21.52 N22°6.01	115°49.37 S 01°16.55	147°55.67 N12°37.21	273°0.98 N08°16.25	Denebola 182°22.99 14°25.13
1	314°34.05	199°20.70 5.58	130°50.51 17.16	162°57.65 37.03	288°3.37 16.26	Gienah 175°41.55 -17°41.81
2	329°36.51	214°19.88 5.14	145° 51.65 17.78	177°59.63 36.85	303°5.75 16.28	Acrux 172°57.93 -63°15.44
3	344°38.98	229°19.06 · · 4.71	160°52.79 · · 18.40	193°1.62 · · 36.68	318°8.14 · · 16.30	Gacrux 171°49.45 -57°16.36
4	359°41.44	244°18.24 4.27	175°53.92 19.01	208° 3.60 36.50	333°10.52 16.32	Alioth 166°11.31 55°48.83
5	14°43.90	259°17.42 3.83	190°55.06 19.63	223°5.58 36.32	348°12.91 16.34	Spica 158°20.11 -11°18.38
6	29°46.37	274°16.60 N22°3.39 289°15.78 2.95	205°56.20 \$01°20.24	238°7.56 N12°36.15	3°15.29 N08°16.35	Alkaid 152°50.38 49°10.76
7	44° 48.83 59° 51.30		220° 57.34 20.86 235° 58.48 21.47	253° 9.54 35.97 268° 11.52 35.79	18°17.68 16.37 33°20.06 16.39	Hadar 148°32.90 -60°30.65
8 9	74° 53.76	304°14.96 2.51 319°14.14 •• 2.06	235°58.48 21.47 250°59.62 · · 22.09	268°11.52 35.79 283°13.50 · · 35.62	33°20.06 16.39 48°22.45 · 16.41	Menkent 147°55.07 -36°30.52
10	89° 56.22	334°13.33 1.62	266° 0.75 22.70	298°15.48 35.44	63°24.83 16.42	Arcturus 145°45.96 19°2.44
11	104°58.69	349°12.51 1.17	281°1.89 23.32	313°17.46 35.26	78°27.22 16.44	Rigil Kent. 139°37.20 -60°57.24
12	120°1.15	4°11.69 N22°0.73	296°3.03 S01°23.94	328°19.44 N12°35.09	93°29.60 N08°16.46	Kochab 137°19.62 74°2.76
13	135°3.62	19°10.87 22°0.28	311°4.17 24.55	343°21.42 34.91	108°31.99 16.48	Zuben'ubi 136°53.58 -16°9.44
14	150°6.08	34°10.06 21°59.83	326°5.30 25.17	358°23.40 34.73	123°34.38 16.49	Alphecca 126°1.80 26°37.46
15	165°8.54	49°9.24 · · 59.38	341°6.44 · · 25.78	13°25.38 · · 34.55	138°36.76 · · 16.51	Antares 112°13.00 -26°29.62 Atria 107°4.87 -69°4.75
16	$180^{\circ}11.01$	64°8.42 58.93	356°7.58 26.40	28°27.36 34.38	153°39.15 16.53	Atria 107°4.87 -69°4.75 Sabik 102°0.10 -15°45.51
17	195° 13.47	79°7.61 58.48	11°8.71 27.01	43°29.34 34.20	168°41.54 16.55	Shaula 96°7.16 -37°7.43
18	210° 15.94	94°6.79 N21°58.02	26°9.85 S01°27.63	58°31.32 N12°34.02	183°43.92 N08°16.56	Rasalhague 95°56.31 12°32.52
19	$225^{\circ}18.40$	109°5.98 57.57	41°10.98 28.25	73°33.30 33.85	198°46.31 16.58	Eltanin 90°40.73 51°29.26
20	240°20.87	124°5.16 57.11	56°12.12 28.86	88°35.28 33.67	213°48.70 16.60	Kaus Aust. 83°29.35 -34°22.23
21	255°23.33	139°4.35 · · 56.66	71°13.26 · · 29.48	103°37.26 · · 33.49	228°51.09 · · 16.61	Vega 80°31.39 38°48.68
22	270°25.79	154°3.53 56.20	86°14.39 30.10	118°39.24 33.31	243°53.47 16.63	Nunki 75°44.80 -26°15.64
23	285°28.26	169°2.72 55.74	101°15.53 30.71	133°41.22 33.14	258°55.86 16.65	Altair 61°57.57 8°56.60
Mer.	pass. 04:01	ν-0.8' d-0.4' m-3.92	$\nu 1.1' \ d0.6' \ m1.20$	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.52	Peacock 53°1.87 -56°38.59
			- —			Deneb 49°23.89 45°22.77
E.·!	CHA	CUA D	CUA D	CUA D	CUA D	Enif 33°36.43 10°0.21
Fri 0	GHA 300° 30.72	GHA Dec 184°1.91 N21°55.28	GHA Dec 116°16.66 S 01°31.33	GHA Dec 148°43.20 N12°32.96	GHA Dec 273°58.25 N08°16.66	Al Na'ir 27°29.92 -46°49.36
1	315°33.19	199°1.09 54.82	131°17.80 31.94	163°45.18 32.78	289°0.64 16.68	Fomalhaut 15°11.96 -29°28.30
2	330° 35.65	214°0.28 54.36	146°18.93 32.56	178°47.16 32.60	304°3.03 16.70	Scheat 13°42.90 28°13.97
3	345°38.11	228°59.47 · · 53.89	161°20.06 · · 33.18	193°49.14 · · 32.43	319°5.42 · · 16.71	Markab 13°27.57 15°21.30
4	0°40.58	243°58.65 53.43	176°21.20 33.79	208°51.12 32.25	334°7.80 16.73	Jul 21 Wed SHA Mer.pass
5	15°43.04	258° 57.84 52.96	191°22.33 34.41	223°53.10 32.07	349°10.19 16.75	Venus 246°8.87 11:42
6	30°45.51	273°57.03 N21°52.50	206°23.47 S 01°35.03	238°55.08 N12°31.89	4°12.58 N08°16.76	Mars 176°49.52 16:17
7	45°47.97	288° 56.22 52.03	221°24.60 35.64	253°57.06 31.71	19°14.97 16.78	Jupiter 208°35.65 14:10
8	60° 50.43	303°55.41 51.56	236°25.73 36.26	268°59.04 31.54	34°17.36 16.79	Saturn 333°31.36 05:51
9	75°52.90	318°54.60 · · 51.09	251°26.87 · · 36.88	284°1.02 · · 31.36	49°19.75 · · 16.81	Jul 22 Thu SHA Mer.pass
10	90°55.36	333°53.79 50.62	266°28.00 37.49	299°3.00 31.18	64°22.14 16.83	Venus 244°49.94 11:43
11	105°57.83	348°52.98 50.14	281°29.13 38.11	314° 4.98 31.00	79°24.53 16.84	Mars 176°17.78 16:15
12	121°0.29	3°52.17 N21°49.67	296°30.26 S01°38.73	329°6.95 N12°30.83	94°26.92 N08°16.86	Jupiter 208°24.09 14:06
13	136°2.75	18°51.36 49.20	311°31.40 39.35	344°8.93 30.65	109°29.31 16.87	Saturn 333°29.40 05:47
14 15	151°5.22	33°50.55 48.72	326°32.53 39.96	359°10.91 30.47	124°31.70 16.89	
15 16	166°7.68 181°10.15	48°49.74 · · 48.24 63°48.93 47.77	341°33.66 · · 40.58 356°34.79 41.20	14°12.89 · · · 30.29 29°14.87	139°34.09 · · 16.91 154°36.48 16.92	Jul 23 Fri SHA Mer.pass
16	181 10.15 196° 12.61	78° 48.12 47.29	11°35.92 41.81	44°16.85 29.94	169°38.87 16.94	Venus 243°31.18 11:45
18	211° 15.07	93°47.32 N21°46.81	26°37.06 S01°42.43	59°18.83 N12°29.76	184°41.26 N08°16.95	Mars 175°45.94 16:14 Jupiter 208°12.48 14:03
19	226° 17.54	108°46.51 46.33	41°38.19 43.05	74°20.80 29.58	199°43.65 16.97	Jupiter 208°12.48 14:03 Saturn 333°27.53 05:43
20	241°20.00	123°45.70 45.84	56°39.32 43.67	89°22.78 29.40	214°46.05 16.98	Jacum 333 21.33 05:43
21	256°22.47	138°44.89 · · 45.36	71°40.45 · · 44.28	104°24.76 · · 29.22	229°48.44 · · 17.00	Horizontal parallax
22	271°24.93	153°44.09 44.88	86°41.58 44.90	119°26.74 29.04	244°50.83 17.01	Venus: 0.1
23	$286^{\circ}27.39$	168°43.28 44.39	101°42.71 45.52	134°28.72 28.87	259°53.22 17.03	Mars: 0.1
Merr	pass. 03:57	ν-0.8' d-0.5' m-3.92	$\nu 1.1' \ d0.6' \ m1.21$	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.52	
14161.		₽ 0.0 G 0.0 III-0.92	ν 1.1 ασ.σ III1.21			

L	C		$\Delta I = II$		N/		
h	Su				Moon		
Wed	GHA 178°23.80	Dec N20°33.02	GHA 333° 6.86	ν 15.0'	Dec \$12°39.20	d 12.2'	HP
0 1	178 23.80 193°23.77	32.54	347°41.62	15.8' 15.8'	12°26.97	-12.2' -12.3'	54.0' 54.0'
2	208°23.74	32.07	2°16.43	15.8'	12°14.69	-12.3'	54.0'
3	223°23.71	31.59	16°51.27	15.9'	12°2.36	-12.4'	54.0'
4	238°23.68	31.11	$31^{\circ}26.15$	15.9'	11°49.99	-12.4'	54.0'
5	253°23.65	30.63	$46^{\circ}1.07$	16.0'	11°37.57	-12.5'	54.1'
6	268°23.61	N20°30.15	60°36.02	16.0'	\$11°25.10	-12.5'	54.1'
7	283°23.58	29.67	75°11.01	16.0'	11°12.59	-12.6'	54.1'
8	298°23.55	29.19	89°46.03	16.1'	11°0.04	-12.6'	54.1'
9 10	313°23.52 328°23.49	· · 28.71 28.23	104°21.09 118°56.18	16.1' 16.1'	10°47.44 10°34.79	-12.6' -12.7'	54.1' 54.1'
11	343°23.47	27.75	133°31.30	16.2	10°34.79	-12.7' -12.7'	54.1
12	358°23.44	N20°27.26	148°6.45	16.2	\$10°9.38	-12.8'	54.1'
13	13°23.41	26.78	162°41.63	16.2'	09°56.62	-12.8'	54.1'
14	28°23.38	26.29	177°16.84	16.2'	09°43.81	-12.8'	54.1'
15	43°23.35	• • 25.81	191°52.08	16.3'	09°30.97	-12.9'	54.1'
16	58°23.32	25.32	206°27.35	16.3'	09°18.08	-12.9'	54.1'
17	73°23.29 88°23.27	24.84 N20°24.35	221°2.64 235°37.96	16.3'	09°5.16 \$08°52.20	-13.0'	54.2'
18 19	103°23.24	N20 24.35 23.86	250°13.30	16.3' 16.4'	08°39.21	-13.0' -13.0'	54.2' 54.2'
20	103 23.24 118°23.21	23.86	264°48.67	16.4	08° 26.18	-13.0 -13.1'	54.2'
21	133°23.18	22.89	279°24.06	16.4	08°13.11	-13.1'	54.2'
22	148°23.16	22.40	293°59.47	16.4	08°0.01	-13.1'	54.2'
23	163°23.13	21.91	308°34.90	16.5'	07°46.88	-13.2	54.2'
	SD = 15.7'	d = -0.5'			0 = 14.7'		
	JD = 13.1	u = -0.3		اد	J — 14.1°		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.10	N20°21.42	323°10.35	16.5'	\$07°33.72	-13.2'	54.2'
1	193°23.08 208°23.05	20.93	337°45.82 352°21.32	16.5'	07°20.52 07°7.29	-13.2'	54.2' 54.2'
2	208°23.05 223°23.03	20.44	352°21.32 6°56.82	16.5' 16.5'	07° 7.29 06° 54.04	-13.3' -13.3'	54.2′ 54.3′
4	238°23.00	19.45	21°32.35	16.5	06°40.75	-13.3'	54.3'
5	253°22.98	18.96	36°7.89	16.6'	06°27.43	-13.3'	54.3'
6	268°22.95	N20°18.46	50°43.44	16.6'	S06°14.09	-13.4	54.3'
7	283°22.93	17.97	65°19.01	16.6'	06°0.72	-13.4'	54.3'
8	298°22.90	17.47	79°54.59	16.6'	05°47.32	-13.4'	54.3'
9	313°22.88	• • 16.98	94°30.18	16.6'	05°33.89	-13.5'	54.3'
10	328°22.85	16.48	109°5.78	16.6'	05°20.44	-13.5'	54.3'
11	343°22.83 358°22.81	15.98 N20°15.49	123°41.39 138°17.01	16.6'	05°6.97 \$04°53.47	-13.5'	54.3'
12 13	13°22.78	14.99	152°52.64	16.6' 16.6'	04°39.95	-13.5' -13.5'	54.4' 54.4'
14	28°22.76	14.49	167°28.27	16.6'	04 39.95 04°26.40	-13.5' -13.6'	54.4'
15	43°22.74	• • 13.99	182°3.91	16.6'	04°12.84	-13.6'	54.4'
16	58°22.72	13.49	196°39.56	16.6'	03°59.25	-13.6'	54.4'
17	73°22.69	12.99	211°15.20	16.6'	03°45.64	-13.6'	54.4'
18	88°22.67	N20°12.49	225°50.85	16.7'	S03°32.02	-13.6'	54.4'
19	103°22.65	11.99	240°26.51		03°18.37		54.5'
20	118°22.63	11.49	255°2.16	16.7'	03°4.71	-13.7'	54.5'
21	133°22.61 148°22.59	· · 10.98 10.48	269°37.81 284°13.46	16.6' 16.6'	02°51.03 02°37.33	-13.7' -13.7'	54.5'
22 23	146 22.59 163°22.57	9.98	298°49.10	16.6'	02°23.61	-13.7' -13.7'	54.5' 54.5'
23			290 49.10			-15.7	J4.J
	SD = 15.7'	d = -0.5'		51	O = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.54	N20°9.47	$313^{\circ}24.75$	16.6'	S 02°9.88	-13.7'	54.5'
1	193°22.52	8.97	328°0.39	16.6'	01°56.14	-13.8'	54.5'
2	208°22.50	8.46	342°36.02	16.6'	01°42.38	-13.8'	54.6'
3 4	223°22.49 238°22.47	· · 7.96 7.45	357°11.64 11°47.26	16.6' 16.6'	01°28.61 01°14.83	-13.8' -13.8'	54.6' 54.6'
4 5	238° 22.47 253° 22.45	7.45 6.94	26°22.87	16.6'	01°14.83 01°1.03	-13.8'	54.6'
6	268°22.43	N20°6.43	40°58.47	16.6'	500°47.23	-13.8'	54.6'
7	283°22.41	5.92	55°34.05	16.6'	00°33.41	-13.8'	54.6'
8	298°22.39	5.42	70°9.63	16.6'	00°19.58	-13.8'	54.7'
9	313°22.37	• • 4.91	84°45.19	16.5'	S00°5.75	-13.8'	54.7'
10	328°22.35	4.40	99°20.73	16.5'	N00°8.10	13.9'	54.7'
11	343°22.34	3.88	113°56.26	16.5'	00°21.95	13.9'	54.7'
12	358°22.32	N20°3.37	128°31.77	16.5'	N00°35.80	13.9'	54.7'
13 14	13°22.30 28°22.28	2.86 2.35	143°7.27 157°42.75	16.5' 16.5'	00°49.67 01°3.54	13.9' 13.9'	54.8' 54.8'
14 15	43°22.27	· · 1.83	157 42.75 172°18.20	16.4	01 3.54 01°17.41	13.9'	54.8'
16	58°22.25	1.32	186°53.64	16.4	01°31.28	13.9'	54.8'
17	73°22.23	0.81	201°29.05	16.4	01°45.16	13.9'	54.8'
18	88°22.22	N20°0.29	216°4.44	16.4'	N01°59.05	13.9'	54.8'
19	103°22.20	19°59.78	230°39.80	16.3'	$02^{\circ}12.93$	13.9'	54.9'
20	118°22.19	59.26	245°15.14	16.3'	02°26.81	13.9'	54.9'
	133°22.17	• • 58.74	259°50.45	16.3'	02°40.70	13.9'	54.9'
21			274925 74	16 21	02°54.58	13.9'	54.9'
22	148°22.16	58.23	274°25.74	16.3'			
	163°22.14	57.71	289°0.99	16.2'	03°8.46	13.9'	54.9'
22				16.2'			

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper Lower		17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-84%	
21	06:25	06:26	12:06	01:51	14:11		
22	06:28	06:29	12:06	02:31	14:52		
23	06:30	06:31	12:07	03:12	15:32		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	301°29.86	183°42.48 N21°43.90	116°43.84 S 01°46.14	149°30.70 N12°28.69	274°55.61 N08°17.04	
1	316°32.32	198°41.67 43.42	131° 44.97 46.75	164°32.67 28.51	289°58.00 17.06	Alpheratz 357°32.40 29°14.56 Ankaa 353°4.93 -42°9.02
2	331°34.79	213° 40.87 42.93	146°46.10 47.37	179°34.65 28.33	305°0.40 17.08	Schedar 349°28.38 56°41.17
3	346° 37.25	228° 40.06 · · 42.44	161°47.23 · · 47.99	194°36.63 · · 28.15	320°2.79 · · 17.09	Diphda 348°45.09 -17°49.88
4 5	1°39.72 16°42.18	243°39.26 41.94 258°38.45 41.45	176° 48.36 48.61 191° 49.49 49.22	209°38.61 27.97 224°40.58 27.79	335°5.18 17.10 350°7.57 17.12	Achernar 335°18.61 -57°5.41
6	31° 44.64	273°37.65 N21°40.96	206°50.62 S01°49.84	239°42.56 N12°27.62	5°9.97 N08°17.13	Hamal 327°48.82 23°35.55
7	46° 47.11	288°36.85 40.46	221°51.75 50.46	254°44.54 27.44	20°12.36 17.15	Polaris 313°3.45 89°22.46
8	61°49.57	303°36.04 39.97	236°52.87 51.08	269°46.52 27.26	35°14.75 17.16	Acamar 315°10.30 -40°11.33 Menkar 314°4.03 4°11.95
9	76°52.04	318°35.24 · · 39.47	251°54.00 · · 51.70	284°48.50 · · 27.08	50°17.15 · · 17.18	Mirfak 308°25.39 49°57.36
10	91°54.50	333°34.44 38.97	266°55.13 52.31	299°50.47 26.90	65°19.54 17.19	Aldebaran 290°37.41 16°33.86
11 12	106° 56.96 121° 59.43	348°33.64 38.48 3°32.83 N21°37.98	281°56.26 52.93 296°57.39 \$01°53.55	314°52.45 26.72 329°54.43 N12°26.54	80°21.93 17.21 95°24.33 N08°17.22	Rigel 281°2.10 -8°10.09
13	137°1.89	18°32.03	311°58.51 54.17	344°56.40 26.36	110°26.72 17.24	Capella 280°19.13 46°1.38
14	152°4.36	33°31.23 36.97	326°59.64 54.79	359°58.38 26.18	125°29.12 17.25	Bellatrix 278°20.88 6°22.50
15	$167^{\circ}6.82$	48°30.43 · · 36.47	342°0.77 · · 55.41	15°0.36 · · 26.01	140°31.51 ·· 17.26	Elnath 277°59.50 28°37.76 Alnilam 275°35.86 -1°11.01
16	182°9.28	63°29.63 35.97	357°1.90 56.02	30°2.34 25.83	155°33.91 17.28	Betelgeuse 270°50.09 7°24.74
17	197°11.75	78°28.83 35.46	12°3.02 56.64	45° 4.31 25.65	170°36.30 17.29	Canopus 263°51.96 -52°42.46
18 19	212° 14.21 227° 16.68	93°28.03 N21°34.95 108°27.23 34.45	27°4.15 S01°57.26 42°5.28 57.88	60°6.29 N12°25.47 75°8.27 25.29	185°38.70 N08°17.31 200°41.09 17.32	Sirius 258°24.71 -16°45.17
20	242° 19.14	123°26.43 33.94	57°6.40 58.50	90°10.24 25.11	215°43.49 17.33	Adhara 255°4.57 -29°0.50
21	257°21.60	138°25.64 · · 33.43	72°7.53 · · 59.12	105°12.22 · · 24.93	230°45.88 · · 17.35	Procyon 244°48.97 5°9.26
22	272°24.07	153°24.84 32.92	87°8.65 01°59.73	120°14.20 24.75	245°48.28 17.36	Pollux 243°15.12 27°57.54 Avior 234°14.51 -59°35.89
23	287° 26.53	168°24.04 32.40	$102^{\circ}9.78$ $02^{\circ}0.35$	135°16.17 24.57	260°50.67 17.38	Suhail 222°45.18 -43°32.71
Mer.r	pass. 03:53	ν-0.8' d-0.5' m-3.92	ν1.1' d0.6' m1.22	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.51	Miaplacidus 221°38.70 -69°49.93
						Alphard 217°46.00 -8°46.72
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.50 11°49.96
0	302°29.00	183°23.24 N21°31.89	117°10.90 S02°0.97	150°18.15 N12°24.39	275°53.07 N08°17.39	Dubhe 193°38.99 61°36.29
1	317°31.46	198°22.45 31.38	132°12.03 1.59	165°20.13 24.21	290°55.46 17.40	Denebola 182°23.00 14°25.13 Gienah 175°41.56 -17°41.81
2	$332^{\circ}33.92$	213°21.65 30.86	147° 13.16 2.21	180°22.10 24.03	305°57.86 17.42	Acrux 172°57.96 -63°15.43
3	347°36.39	228°20.85 · · 30.35	162°14.28 · · 2.83	195°24.08 · · 23.85	321°0.26 · · 17.43	Gacrux 171°49.47 -57°16.35
4	2°38.85	243°20.06 29.83	177°15.40 3.45	210°26.05 23.68	336°2.65 17.44	Alioth 166°11.34 55°48.83
5 6	17° 41.32 32° 43.78	258°19.26 29.31 273°18.47 N21°28.79	192°16.53 4.07 207°17.65 \$02°4.69	225°28.03 23.50 240°30.01 N12°23.32	351°5.05 17.46 6°7.45 N08°17.47	Spica 158°20.12 -11°18.37
7	47° 46.24	288° 17.67 28.27	222°18.78 5.30	255°31.98 23.14	21°9.84 17.48	Alkaid 152°50.40 49°10.76
8	62°48.71	303°16.88 27.75	237°19.90 5.92	270°33.96 22.96	36°12.24 17.50	Hadar 148°32.93 -60°30.65 Menkent 147°55.09 -36°30.52
9	$77^{\circ}51.17$	318°16.08 · · 27.22	252°21.02 · · 6.54	285°35.94 · · 22.78	51°14.64 · · 17.51	Arcturus 145°45.97 19°2.45
10	92°53.64	333°15.29 26.70	267°22.15 7.16	300°37.91 22.60	66°17.04 17.52	Rigil Kent. 139°37.23 -60°57.24
11 12	107°56.10 122°58.57	348°14.50 26.17 3°13.70 N21°25.65	282°23.27 7.78 297°24.39 \$02°8.40	315°39.89 22.42 330°41.86 N12°22.24	81°19.43 17.54 96°21.83 N08°17.55	Kochab 137°19.67 74°2.76
13	138°1.03	18°12.91 25.12	312°25.52 9.02	345°43.84 22.06	111°24.23 17.56	Zuben'ubi 136°53.60 -16°9.43
14	153°3.49	33°12.12 24.59	327°26.64 9.64	0°45.81 21.88	126°26.63 17.57	Alphecca 126°1.82 26°37.47 Antares 112°13.01 -26°29.62
15	$168^{\circ}5.96$	48° 11.33 · · · 24.06	342°27.76 · · 10.26	15°47.79 · · 21.70	141°29.03 · · 17.59	Antares 112°13.01 -26°29.62 Atria 107°4.90 -69°4.76
16	183°8.42	63°10.53 23.53	357°28.88 10.88	30°49.76 21.52	156°31.43 17.60	Sabik 102°0.11 -15°45.50
17	198° 10.89	78°9.74 23.00	12°30.01 11.50	45°51.74 21.34	171°33.82 17.61	Shaula 96°7.17 -37°7.43
18 19	213° 13.35 228° 15.81	93°8.95 N21°22.47 108°8.16 21.94	27°31.13	60°53.72 N12°21.16 75°55.69 20.98	186°36.22 N08°17.62 201°38.62 17.64	Rasalhague 95°56.32 12°32.52
20	243° 18.28	123°7.37 21.40	42°32.25 12.74 57°33.37 13.36	90°57.67 20.80	201° 38.62 17.64 216° 41.02 17.65	Eltanin 90°40.74 51°29.27
21	258° 20.74	138°6.58 · · 20.86	72°34.49 · · 13.98	105°59.64 · · 20.62	231°43.42 · · 17.66	Kaus Aust. 83°29.36 -34°22.23 Vega 80°31.40 38°48.69
22	273°23.21	153°5.79 20.33	87°35.61 14.60	121° 1.62 20.44	246°45.82 17.67	Nunki 75°44.80 -26°15.65
23	288°25.67	168°5.00 19.79	102°36.73 15.22	136° 3.59 20.26	261°48.22 17.69	Altair 61°57.57 8°56.61
Mer.p	pass. 03:49	ν -0.8' d-0.5' m-3.92	$\nu 1.1' \ d0.6' \ m1.22$	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.51	Peacock 53°1.86 -56°38.60
						Deneb 49°23.88 45°22.79
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.42 10°0.22
0	303°28.13	183°4.21 N21°19.25	117°37.85 S02°15.84	151°5.57 N12°20.08	276°50.62 N08°17.70	Al Na'ir 27°29.90 -46°49.37 Fomalhaut 15°11.95 -29°28.30
1	$318^{\circ}30.60$	198°3.43 18.71	132°38.97 16.46	166°7.54 19.90	291°53.02 17.71	Scheat 13°42.88 28°13.98
2	333°33.06	213°2.64 18.17	147°40.09 17.08	181° 9.52 19.72	306°55.42 17.72	Markab 13°27.55 15°21.31
3 4	348°35.53	228°1.85 · · 17.63 243°1.06 17.08	162°41.21 ·· 17.70	196°11.49 · · 19.54	321°57.82 · · 17.73	Jul 24 Sat SHA Mer.pass
4 5	3°37.99 18°40.45	243°1.06 17.08 258°0.28 16.54	177° 42.33 18.32 192° 43.45 18.94	211°13.47 19.35 226°15.44 19.17	337°0.22 17.75 352°2.62 17.76	Venus 242°12.62 11:46
6	33°42.92	272°59.49 N21°15.99	207° 44.57 S02° 19.56	241°17.41 N12°18.99	7°5.02 N08°17.77	Mars 175°13.98 16:12
7	48° 45.38	287°58.70 15.45	222°45.69 20.18	256°19.39 18.81	22°7.42 17.78	Jupiter 208°0.84 14:00
8	63°47.85	302°57.92 14.90	237°46.81 20.80	271°21.36 18.63	37°9.82 17.79	Saturn 333°25.75 05:39
9	78°50.31	317°57.13 · · 14.35	252°47.93 · · 21.42	286°23.34 · · 18.45	52°12.23 · · 17.80	Jul 25 Sun SHA Mer.pass
10 11	93°52.78 108°55.24	332°56.35 13.80 347°55.56 13.25	267°49.05 22.04 282°50.17 22.66	301°25.31 18.27 316°27.29 18.09	67°14.63 17.82 82°17.03 17.83	Venus 240°54.25 11:47
12	106 55.24 123°57.70	2°54.78 N21°12.70	297°51.29 S02°23.28	331°29.26 N12°17.91	97°19.43 N08°17.84	Mars 174°41.91 16:10
13	139°0.17	17°54.00 12.14	312°52.40 23.90	346°31.24 17.73	112°21.83 17.85	Jupiter 207°49.15 13:57
14	154°2.63	32°53.21 11.59	327°53.52 24.52	1°33.21 17.55	127°24.23 17.86	Saturn 333°24.07 05:36
15	169°5.10	47°52.43 · · 11.03	342°54.64 · · 25.14	16°35.18 · · 17.37	142°26.64 · · 17.87	Jul 26 Mon SHA Mer.pass
16	184°7.56	62°51.65 10.48	357° 55.76 25.76	31°37.16 17.19	157°29.04 17.88	Venus 239°36.08 11:48
17 18	199° 10.02 214° 12.49	77°50.86 9.92 92°50.08 N21°9.36	12°56.87 26.38 27°57.99 \$02°27.00	46°39.13 17.01 61°41.11 N12°16.82	172°31.44 17.89 187°33.84 N08°17.91	Mars 174°9.72 16:08
19	214 12.49 229°14.95	107°49.30 8.80	42°59.11 27.62	76°43.08 16.64	202°36.25 17.92	Jupiter 207°37.43 13:54 Saturn 333°22.48 05:32
20	244° 17.42	122°48.52 8.24	58°0.22 28.24	91°45.05 16.46	217°38.65 17.93	
21	$259^{\circ}19.88$	137°47.74 · · 7.68	73°1.34 · · 28.86	106°47.03 · · 16.28	232°41.05 · · 17.94	Horizontal parallax
22	274°22.34	152°46.96 7.12	88°2.46 29.48	121°49.00 16.10	247°43.46 17.95	Venus: 0.1 Mars: 0.1
23	289°24.81	167°46.18 6.55	103°3.57 30.10	136°50.97 15.92	262°45.86 17.96	iviais: U.1
Mer.p	pass. 03:46	ν-0.8′ d-0.5′ m-3.92	$\nu 1.1' \ d0.6' \ m1.23$	$ u 2.0' \ d$ -0.2' m-1.74	$ u 2.4' \ d0.0' \ m0.51$	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.13	N19°57.19	303°36.22	16.2'	N03°22.34	13.9'	55.0'
1	193°22.11	56.67	318° 11.41	16.2'	03°36.21	13.9'	55.0'
2	208°22.10	56.15	332°46.57	16.1'	03°50.09	13.9'	55.0'
3	223°22.09	• • 55.63	$347^{\circ}21.69$	16.1'	04°3.95	13.9'	55.0'
4	238°22.07	55.11	1°56.78	16.1'	04° 17.81	13.9'	55.1'
5	253°22.06	54.59	16°31.84	16.0'	04°31.67	13.8'	55.1'
6	268°22.05 283°22.03	N19°54.07	31°6.86 45°41.83	16.0'	N04° 45.52 04° 59.36	13.8'	55.1'
7 8	283 22.03 298°22.02	53.54 53.02	45 41.83 60°16.77	15.9' 15.9'	04 59.30 05°13.19	13.8' 13.8'	55.1' 55.1'
9	313°22.01	52.50	74°51.67	15.9'	05°27.01	13.8'	55.2'
10	328°22.00	51.97	89°26.53	15.8'	05°40.82	13.8'	55.2'
11	343°21.98	51.45	104°1.34	15.8'	05° 54.62	13.8'	55.2'
12	358°21.97	N19°50.92	118°36.11	15.7'	N06°8.41	13.8'	55.2'
13	13°21.96	50.40	133° 10.83	15.7'	06°22.18	13.8'	55.3'
14	28°21.95	49.87	147° 45.50	15.6'	06°35.94	13.7'	55.3'
15	43°21.94	• • 49.34	162°20.13	15.6'	06°49.69	13.7'	55.3'
16 17	58°21.93 73°21.92	48.82 48.29	176°54.71 191°29.24	15.5' 15.5'	07°3.42 07°17.14	13.7' 13.7'	55.3' 55.4'
18	88°21.91	46.29 N19°47.76	206°3.71	15.4	N07°30.83	13.7	55.4
19	103°21.90	47.23	220°38.14	15.4'	07°44.51	13.7'	55.4'
20	118°21.89	46.70	235° 12.50	15.3'	07°58.17	13.6'	55.4'
21	133°21.88	• • 46.17	249°46.82	15.3'	$08^{\circ}11.81$	13.6'	55.5'
22	148°21.87	45.64	264°21.07	15.2'	08°25.43	13.6'	55.5'
23	163°21.86	45.10	278° 55.27	15.1'	08°39.03	13.6'	55.5'
	SD = 15.7'	d = -0.5'		SE	O = 15.0'		
_							
Sun	GHA	Dec	GHA	ν 15 1'	Dec	d 12.6'	HP
0 1	178°21.85 193°21.84	N19° 44.57 44.04	293°29.41 308°3.49	15.1' 15.0'	N08° 52.61 09° 6.16	13.6' 13.5'	55.5' 55.6'
2	208°21.84	43.51	322° 37.51	15.0'	09° 19.69	13.5'	55.6'
3	223°21.83	. 42.97	337°11.47	14.9'	09°33.19	13.5'	55.6'
4	238°21.82	42.44	351°45.36	14.8'	09°46.67	13.4'	55.6'
5	253°21.81	41.90	$6^{\circ}19.19$	14.8'	$10^{\circ}0.11$	13.4'	55.7'
6	268°21.81	N19°41.37	20°52.95	14.7'	N10° 13.53	13.4'	55.7'
7	283°21.80	40.83	35°26.64	14.6'	10°26.93	13.4'	55.7'
8	298°21.79	40.29	50°0.26 64°33.82	14.6'	10°40.29	13.3'	55.7'
9 10	313°21.79 328°21.78	· · 39.76 39.22	79°7.30	14.5' 14.4'	10°53.62 11°6.91	13.3' 13.3'	55.8' 55.8'
11	343°21.77	38.68	93°40.71	14.4	11 0.91 11°20.18	13.2	55.8'
12	358°21.77	N19°38.14	108° 14.05	14.3	N11°33.40	13.2'	55.9'
13	13°21.76	37.60	122° 47.31	14.2'	11° 46.60	13.2'	55.9'
14	28°21.76	37.06	$137^{\circ}20.50$	14.1'	11°59.76	13.1'	55.9'
15	43°21.75	• • 36.52	$151^{\circ}53.61$	14.0'	12° 12.88	13.1'	55.9'
16	58°21.75	35.98	166°26.64	14.0'	12°25.96	13.0'	56.0'
17	73°21.74	35.44	180° 59.59	13.9'	12°39.00	13.0'	56.0'
18 19	88°21.74 103°21.74	N19°34.89 34.35	195°32.46 210°5.24	13.8' 13.7'	N12°52.00 13°4.96	13.0' 12.9'	56.0' 56.1'
20	118°21.73	33.81	224°37.95	13.6'	13° 17.87	12.9'	56.1
21	133°21.73	33.26	239° 10.57	13.5'	13°30.75	12.8'	56.1'
22	148°21.73	32.72	253°43.10	13.4'	13°43.57	12.8'	56.2'
23	163°21.72	32.17	$268^{\circ}15.55$	13.4'	13°56.35	12.7'	56.2'
	SD = 15.7'	d = -0.5'		SE	O = 15.1'		
Mon	GHA		GHA		Dec	d	HP
0	178°21.72	Dec N19° 31.63	282° 47.91	u 13.3'	N14° 9.08	12.7'	56.2'
1	176 21.72 193°21.72	31.08	297°20.18	13.2'	14° 21.77	12.6'	56.3
2	208°21.72	30.53	311°52.36	13.1'	14°34.40	12.6'	56.3'
3	223°21.71	• • 29.98	$326^{\circ}24.45$	13.0'	$14^{\circ}46.98$	12.5'	56.3'
4	238°21.71	29.44	340°56.45	12.9'	14°59.51	12.5'	56.4'
5	253°21.71	28.89	355°28.35	12.8'	15°11.99	12.4	56.4
6 7	268°21.71 283°21.71	N19° 28.34 27.79	10°0.16 24°31.87	12.7' 12.6'	N15°24.41 15°36.78	12.4' 12.3'	56.4'
7 8	283°21.71 298°21.71	27.79 27.24	24°31.87 39°3.49	12.5'	15° 36.78 15° 49.08	12.3'	56.4' 56.5'
9	313°21.71	. 26.69	53° 35.01	12.4	16°1.33	12.2'	56.5'
10	328°21.71	26.14	68°6.42	12.3'	16° 13.52	12.1'	56.5'
11	343°21.71	25.58	82°37.74	12.2'	16°25.65	12.1'	56.6'
12	358°21.71	N19°25.03	97°8.96	12.1'	N16°37.72	12.0'	56.6'
13	13°21.71	24.48	111° 40.07	12.0'	16°49.72	11.9'	56.6'
14	28°21.71	23.92	126°11.08	11.9'	17°1.65	11.9'	56.7'
15 16	43°21.71 58°21.71	· · 23.37 22.81	140°41.99 155°12.79	11.8' 11.7'	17° 13.52 17° 25.32	11.8' 11.7'	56.7' 56.7'
16 17	58°21.71 73°21.72	22.81	155° 12.79 169° 43.48	11.6'	17°25.32 17°37.06	11.7' 11.7'	56.7° 56.8'
18	88°21.72	N19°21.70	184° 14.07	11.5'	N17°48.72	11.6'	56.8'
19	103°21.72	21.15	198° 44.55	11.4'	18°0.31	11.5'	56.9'
20	118°21.72	20.59	213° 14.92	11.3'	18° 11.82	11.4'	56.9'
21	133°21.72	• • 20.03	227°45.18	11.1'	18° 23.26	11.4'	56.9'
22	148°21.73	19.47	242° 15.32	11.0'	18° 34.63	11.3'	57.0'
23	163°21.73	18.91	256° 45.36	10.9'	18°45.91	11.2'	57.0'
	SD = 15.7'	d = -0.5'		SE	0 = 15.3'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:34	22:34	////	////
66°	////	////	02:17	21:53	////	////
64°	////	00:41	02:45	21:26	23:21	////
62°	////	01:44	03:07	21:05	22:25	////
60°	////	02:17	03:24	20:48	21:54	////
N 58°	00:37	02:40	03:38	20:33	21:31	23:25
56°	01:35	02:59	03:51	20:21	21:12	22:35
54°	02:05	03:15	04:01	20:11	20:57	22:06
52°	02:27	03:28	04:11	20:01	20:44	21:44
50°	02:45	03:39	04:19	19:53	20:33	21:27
45°	03:18	04:03	04:37	19:35	20:10	20:54
N 40°	03:42	04:21	04:52	19:21	19:52	20:30
35°	04:01	04:36	05:04	19:09	19:37	20:11
30°	04:17	04:48	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	05:48	18:25	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:43	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:25	06:50	17:23	17:49	18:18
35°	06:02	06:33	07:00	17:13	17:40	18:11
40°	06:09	06:42	07:12	17:02	17:31	18:04
45°	06:17	06:53	07:25	16:48	17:21	17:57
S 50°	06:26	07:05	07:41	16:32	17:08	17:48
52°	2° 06:29 07:11		07:49	16:25	17:03	17:44
54°	06:33	07:17	07:58	16:16	16:56	17:40
56°	06:38 07:2		08:07	16:06	16:50	17:36
58°	06:42	07:32	08:18	15:56	16:42	17:31
S 60°	06:48	07:40	08:31	15:43	16:34	17:26

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

Day		Sun		Moon				
	Eqn.of	f Time	Mer.	Mer.Pass.		Age		
	00 ^h	12 ^h	Pass	Upper	Lower	20-22		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-57%		
24	06:31	06:32	12:07	03:52	16:13			
25	06:33	06:33	12:07	04:34	16:56			
26	06:33	06:33	12:07	05:19	17:42			

h	Aries	Venus	, can	,	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	304°27.27		21°5.99	118°4.69	S02°30.72	151°52.95	N12° 15.74	277°48.27	N08° 17.97			
1	319° 29.74	197°44.62	5.42	133°5.80	31.35	166°54.92	15.56	292°50.67	17.98	Alpheratz	357°32.37	29° 14.57
2	334° 32.20	212° 43.84	4.86	148°6.92	31.97	181°56.89	15.38	307°53.07	17.99	Ankaa	353°4.90	-42°9.02
3	349° 34.67		• 4.29	163°8.03	32.59	196°58.87	. 15.19	322°55.48	• • 18.00	Schedar	349°28.34	56°41.18
4	4° 37.13	242°42.28	3.72	178° 9.15	33.21	212° 0.84	15.01	337°57.88	18.01	Diphda	348°45.06	-17°49.87
5	19° 39.59	257°41.51	3.15	193°10.26	33.83	227° 2.81	14.83	353°0.29	18.02	Achernar	335°18.58	-57°5.41
6	34°42.06		21°2.58	208°11.38	S02°34.45	242° 4.79	N12° 14.65	8°2.69	N08° 18.03	Hamal	327°48.79	23°35.56
7	49°44.52	287°39.95	2.01	223°12.49	35.07	257° 6.76	14.47	23°5.10	18.04	Polaris	313°1.73	89°22.46 -40°11.33
8	64°46.99	302°39.18	1.43	238°13.61	35.69	272°8.73	14.29	38°7.50	18.05	Acamar	315°10.28 314°4.01	4°11.33
9	79°49.45	317°38.40 ·	• 0.86	253° 14.72	• • 36.31	287°10.71	• • 14.11	53°9.91	• • 18.06	Menkar Mirfak	308° 25.35	4 11.90 49°57.36
10	$94^{\circ}51.91$	332° 37.62 2	21°0.28	268° 15.83	36.94	302°12.68	13.92	68°12.31	18.07	Aldebaran	290°37.39	16°33.87
11	109°54.38		0°59.71	283°16.95	37.56	317°14.65	13.74	83°14.72	18.08	Rigel	281°2.08	-8° 10.09
12	124° 56.84		0°59.13	298° 18.06	S02°38.18	332°16.62	N12°13.56	98°17.12	N08° 18.09	Capella	280° 19.11	46°1.38
13	139° 59.31	17°35.30	58.55	313° 19.17	38.80	347°18.60	13.38	113°19.53	18.10	Bellatrix	278° 20.86	6°22.50
14	155°1.77	32°34.53	57.97	328°20.29	39.42	2°20.57	13.20	128°21.94	18.11	Elnath	277°59.48	28° 37.76
15	170°4.23		57.39	343°21.40	• • 40.04	17°22.54	• • 13.02	143°24.34	• • 18.12	Alnilam	275°35.85	-1°11.00
16	185°6.70	62°32.98	56.81	358°22.51	40.66	32°24.51	12.83	158°26.75	18.13	Betelgeuse	270°50.08	$7^{\circ}24.75$
17	200°9.16	77°32.21	56.22	13°23.62	41.29	47°26.49	12.65	173°29.16	18.14	Canopus	263°51.94	-52°42.45
18 19	215°11.63 230°14.09	92°31.43 N20 107°30.66	0°55.64 55.06	28°24.73 43°25.85	\$02°41.91 42.53	62°28.46 77°30.43	N12° 12.47 12.29	188°31.56 203°33.97	N08° 18.15 18.16	Sirius	258°24.70	$-16^{\circ}45.17$
20	245° 16.56	122°29.89	54.47	58° 26.96	43.15	92°32.40	12.29	203 33.97 218°36.38	18.17	Adhara	255°4.56	-29°0.49
21	260° 19.02		53.88	73° 28.07	• • 43.77	107°34.38	•• 11.92	233°38.78	• 18.18	Procyon	244°48.96	5°9.26
22	275°21.48	152°28.35	53.29	88°29.18	44.39	122°36.35	11.74	248°41.19	18.19	Pollux	243° 15.11	27°57.54
23	290°23.95	167°27.58	52.71	103°30.29	45.02	137°38.32	11.56	263°43.60	18.20	Avior	234° 14.50	-59°35.88
		-					_			Suhail	222°45.18	-43°32.70
Mer.p	pass. 03:42	u-0.8 $'$ <i>d</i> -0.6 $'$ n	n-3.92	$\nu 1.1' d0$	6′ m1.23	$\nu 2.0' d-0$.2′ m-1.73	ν 2.4′ d0.	.0′ m0.50	Miaplacidus	221°38.71	-69°49.92
										Alphard	217°46.00	-8°46.71
Wed	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.50	11°49.96
0	305°26.41	182°26.81 N20)°52.12	118°31.40	S02°45.64	152°40.29	N12°11.38	278°46.01	N08° 18.20	Dubhe Denebola	193°39.01 182°23.01	61°36.28 14°25.13
1	320°28.88	197°26.04	51.52	133°32.51	46.26	167°42.27	11.20	293°48.41	18.21	Gienah	162 23.01 175°41.57	-17°41.80
2	$335^{\circ}31.34$	212°25.27	50.93	148°33.62	46.88	182°44.24	11.01	308°50.82	18.22	Acrux	173 41.37 172°57.98	-63° 15.42
3	$350^{\circ}33.80$		50.34	163°34.73	• • 47.50	197°46.21	• • 10.83	323°53.23	• • 18.23	Gacrux	172 37.90 171°49.49	-57° 16.34
4	5°36.27	242°23.73	49.74	178°35.84	48.13	212°48.18	10.65	338°55.64	18.24	Alioth	166° 11.36	55° 48.83
5	20°38.73	257°22.96	49.15	193°36.95	48.75	227°50.15	10.47	353°58.05	18.25	Spica	158° 20.13	-11° 18.37
6	35°41.20)°48.55	208°38.06	S02°49.37	242°52.12	N12° 10.28	9°0.46	N08° 18.26	Alkaid	152°50.43	49° 10.76
7	50°43.66	287°21.42	47.95	223°39.17	49.99	257°54.10	10.10	24°2.87	18.27	Hadar	148°32.95	-60° 30.64
8	65°46.13	302°20.66	47.36	238° 40.28	50.61	272°56.07	9.92	39°5.28	18.28	Menkent	147°55.10	-36°30.52
9	80°48.59		46.76	253°41.39	• • 51.24	287°58.04	• • 9.74	54°7.68	• • 18.28	Arcturus	145°45.98	19°2.45
10	95°51.05	332°19.12	46.16	268° 42.50	51.86	303°0.01	9.55	69°10.09	18.29	Rigil Kent.	139°37.26	-60° 57.23
11	110°53.52	347°18.36	45.55	283°43.61	52.48 \$02°53.10	318° 1.98	9.37	84°12.50	18.30 N08° 18.31	Kochab	137° 19.74	74°2.76
12 13	125° 55.98 140° 58.45	2°17.59 N20 17°16.83	0°44.95 44.35	298° 44.72 313° 45.82	53.73	333° 3.95 348° 5.92	N12°9.19 9.01	99°14.91 114°17.32	18.32	Zuben'ubi	136°53.61	-16°9.43
14	156° 0.91	32°16.06	44.35	328° 46.93	53.73 54.35	3°7.90	8.82	114 17.32 129°19.73	18.33	Alphecca	126°1.83	26° 37.48
15	171°3.37		43.14	343°48.04	• • 54.97	18° 9.87	. 8.64	144°22.14	. 18.33	Antares	112°13.02	-26°29.62
16	186°5.84	62°14.54	42.53	358°49.15	55.59	33°11.84	8.46	159°24.55	18.34	Atria	107°4.92	-69°4.77
17	201°8.30	77°13.77	41.92	13° 50.25	56.22	48°13.81	8.28	174°26.97	18.35	Sabik	102°0.11	-15°45.50
18	216° 10.77		0°41.31	28°51.36	S02°56.84	63°15.78	N12°8.09	189°29.38	N08° 18.36	Shaula	96°7.17	-37°7.43
19	231°13.23	107° 12.25	40.70	43°52.47	57.46	78°17.75	7.91	204°31.79	18.37	Rasalhague	95°56.33	12°32.53
20	$246^{\circ}15.70$	122°11.48	40.09	58° 53.58	58.08	93°19.72	7.73	219°34.20	18.37	Eltanin Kaus Aust.	90°40.76 83°29.36	51°29.29 -34°22.23
21	$261^{\circ}18.16$	137°10.72 · ·	39.48	73°54.68	• • 58.71	108°21.69	• • 7.55	234°36.61	• • 18.38	Vega	80° 31.40	-34 22.23 38°48.71
22	$276^{\circ}20.62$	152°9.96	38.87	88°55.79	$02^{\circ}59.33$	123°23.66	7.36	249°39.02	18.39	Nunki	75°44.80	-26° 15.65
23	291°23.09	167°9.20	38.25	103°56.89	02°59.95	138°25.63	7.18	264°41.43	18.40	Altair	61°57.57	8°56.62
Merr	pass. 03:38	ν-0.8' d-0.6' n	n_3 02	v1 1' d0	6' m1.23	v2 0′ d₌0	.2′ m-1.73	v2 4' d0	.0′ m0.50	Peacock	53°1.85	-56°38.61
	333. 03.30	- V 0.0 U 0.0 II	11 3.32	ν1.1 do.	1111.25	- VZ.O U O	.2 111 1.75			Deneb	49°23.88	45°22.80
										Enif	33°36.41	$10^{\circ}0.23$
Thu	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.89$	-46°49.37
0	306° 25.55	182°8.44 N20		118°58.00	\$03°0.58	153°27.60	N12°7.00	279°43.84	N08° 18.40	Fomalhaut	15°11.93	-29°28.30
1	321°28.02	197°7.68	37.02	133°59.11	1.20	168°29.58	6.81	294°46.26	18.41	Scheat	13°42.86	28° 13.99
2	336° 30.48 351° 32.95	212°6.92 227°6.16 · ·	36.40 35.78	149°0.21 164°1.32	1.82 •• 2.44	183°31.55 198°33.52	6.63 • • 6.45	309°48.67 324°51.08	18.42 •• 18.43	Markab	13°27.54	15°21.32
4	6°35.41	242°5.40	35.17	179°2.42	3.07	213°35.49	6.26	339°53.49	18.43	Jul 27 Tue	SHA	Mer.pass
5	21°37.87	257°4.64	34.55	179 2.42 194° 3.53	3.69	213 33.49 228°37.46	6.08	354°55.91	18.44		238° 18.13	11:50
6	36°40.34		0°33.92	209°4.63	S03°4.31	243°39.43	N12°5.90	9°58.32	N08° 18.45	I	173°37.41	16:06
7	51°42.80	287°3.13	33.30	224°5.74	4.94	258°41.40	5.71	25°0.73	18.45	Jupiter	207°25.67	13:51
8	66° 45.27	302°2.37	32.68	239°6.84	5.56	273°43.37	5.53	40°3.15	18.46	Saturn	333°20.99	05:28
9	81°47.73		32.05	254°7.94	6.18	288°45.34	• • 5.35	55°5.56	• • 18.47	11 20 244 .		
10	$96^{\circ}50.19$	332°0.86	31.43	269°9.05	6.81	303°47.31	5.16	70°7.97	18.48	Jul 28 Wed	SHA	Mer.pass
11	111°52.66	347°0.10	30.80	284°10.15	7.43	318°49.28	4.98	85°10.39	18.48	Venus Mars	237°0.39 173°4.99	11:51 16:05
12	126° 55.12		0°30.17	299° 11.25	S03°8.05	333°51.25	N12°4.80	100°12.80	N08° 18.49	Jupiter	207°13.88	13:48
13	141°57.59	16°58.59	29.54	314°12.36	8.67	348°53.22	4.61	115°15.21	18.50	Saturn	333° 19.59	05:24
14	157°0.05	31°57.83	28.92	329°13.46	9.30	3°55.19	4.43	130°17.63	18.50			55.24
15	172°2.52		28.28	344° 14.56	• • 9.92	18°57.16	• • 4.25	145°20.04	• • 18.51	Jul 29 Thu	SHA	Mer.pass
16	187°4.98	61°56.33	27.65	359° 15.67	10.54	33°59.13	4.06	160°22.46	18.52	Venus	235°42.89	11:52
17	202°7.44	76°55.57	27.02	14°16.77	11.17	49°1.10	3.88	175°24.87	18.52		172°32.45	16:03
18	217°9.91		0°26.39		503°11.79	64°3.07	N12°3.70	190°27.29	N08° 18.53	Jupiter	207°2.05	13:44
19 20	232° 12.37 247° 14.84	106°54.07 121°53.31	25.75 25.12	44° 18.97 59° 20.07	12.42 13.04	79°5.04 94°7.01	3.51 3.33	205°29.70 220°32.12	18.54 18.54	Saturn	333°18.29	05:20
20	247° 14.84 262° 17.30		25.12	74° 21.18	13.04	109°8.98	3.33 · · 3.15	220°32.12 235°34.53	18.54	Horizor	ntal parallax	
22	202 17.30 277° 19.77	150°52.50°151	23.84	89° 22.28	14.29	109 0.96 124°10.95	2.96	250°36.95	18.55		Venus:	0.1
23	292°22.23	166°51.06	23.20	104°23.38	14.91	139°12.91	2.78	265°39.36	18.56		Mars:	0.1
Mer.p	pass. 03:34	ν-0.8′ d-0.6′ n	n-3.92	$\nu 1.1' d0.$	o m1.24	ν2.0′ d-0	.2′ m-1.73	ν 2.4′ d0	.0′ m0.49			

h	Su	n		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°21.73	N19°18.35	271°15.28	10.8'	N18°57.12	11.1'	57.0'	
1	193°21.74	17.79	285°45.09	10.7'	19°8.24	11.0'	57.1'	
2	208°21.74	17.23	$300^{\circ}14.78$	10.6'	19°19.29	11.0'	57.1'	
3	223°21.75	• • 16.67	314°44.36	10.5'	19°30.25	10.9'	57.1'	
4	238°21.75	16.11	329°13.83	10.3'	19°41.12	10.8'	57.2'	
5	253°21.75	15.55	343°43.17 358°12.40	10.2'	19°51.91 N20°2.61	10.7'	57.2'	
6 7	268°21.76 283°21.77	N19°14.99 14.42	358 12.40 12°41.51	10.1' 10.0'	N20°2.61 20°13.21	10.6' 10.5'	57.2' 57.3'	
8	298°21.77	13.86	27° 10.50	9.9'	20°13.21	10.5	57.3'	
9	313°21.78	. 13.29	41°39.38	9.8'	20°34.15	10.3	57.4	
10	328°21.78	12.73	56°8.13	9.6'	20°44.48	10.2'	57.4'	
11	343°21.79	12.16	70°36.76	9.5'	20°54.72	10.1'	57.4'	
12	358°21.79	N19°11.60	85°5.27	9.4'	N21°4.85	10.0'	57.5'	
13	13°21.80	11.03	99°33.66	9.3'	21°14.88	9.9'	57.5'	
14 15	28°21.81 43°21.82	10.46 •• 9.90	114°1.92 128°30.07	9.1' 9.0'	21°24.82 21°34.65	9.8' 9.7'	57.5' 57.6'	
16	58°21.82	9.33	142° 58.09	9.0 8.9'	21°44.37	9.6'	57.6'	
17	73°21.83	8.76	157°25.98	8.8'	21°53.99	9.5'	57.7'	
18	88°21.84	N19°8.19	171°53.76	8.6'	N22°3.50	9.4'	57.7'	
19	103°21.85	7.62	$186^{\circ}21.41$	8.5'	22°12.91	9.3'	57.7'	
20	118°21.86	7.05	200°48.93	8.4'	22°22.20	9.2'	57.8'	
21	133°21.86	• • 6.48	215°16.33	8.3'	22°31.37	9.1'	57.8'	
22	148°21.87	5.91 5.33	229°43.61 244°10.76	8.2'	22°40.44 22°49.38	8.9'	57.8'	
23	163°21.88		244 - 10.76	8.0'		8.8'	57.9'	
	SD = 15.7'	d = -0.6'		SE	O = 15.6'			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°21.89	N19°4.76	258°37.78	7.9'	N22°58.21	8.7'	57.9'	
1	193°21.90	4.19	273°4.69	7.8'	$23^{\circ}6.92$	8.6'	58.0'	
2	208°21.91	3.61	287°31.46	7.7'	23°15.51	8.5'	58.0'	
3	223°21.92	• • 3.04	301°58.11	7.5'	23°23.97	8.3'	58.0'	
4	238°21.93	2.47	316°24.64	7.4'	23°32.31	8.2'	58.1'	
5 6	253°21.94 268°21.95	1.89 N19°1.31	330°51.04 345°17.32	7.3' 7.2'	23°40.52 N23°48.60	8.1' 8.0'	58.1' 58.1'	
7	283°21.97	0.74	359°43.47	7.0'	23°56.56	7.8	58.2	
8	298°21.98	19°0.16	14° 9.50	6.9'	24°4.38	7.7'	58.2'	
9	313°21.99	18°59.58	28°35.40	6.8'	24°12.06	7.6'	58.3'	
10	328°22.00	59.00	43°1.19	6.7'	24°19.62	7.4'	58.3'	
11	343°22.01	58.43	57°26.85	6.5'	24°27.03	7.3'	58.3'	
12	358°22.03	N18°57.85	71°52.38	6.4'	N24°34.31	7.1'	58.4'	
13	13°22.04	57.27	86°17.80	6.3'	24°41.44 24°48.43	7.0'	58.4'	
14 15	28°22.05 43°22.06	56.69 •• 56.10	100°43.09 115°8.27	6.2' 6.1'	24°48.43 24°55.28	6.8' 6.7'	58.5' 58.5'	
16	58°22.08	55.52	129°33.32	5.9'	25°1.99	6.6'	58.5'	
17	73°22.09	54.94	143°58.26	5.8'	25°8.54	6.4'	58.6'	
18	88°22.11	N18°54.36	158°23.08	5.7'	N25°14.95	6.3'	58.6'	
19	103°22.12	53.78	172°47.78	5.6'	25°21.20	6.1'	58.6'	
20	118°22.13	53.19	187°12.36	5.5'	25°27.31	5.9'	58.7'	
21 22	133°22.15 148°22.16	· · 52.61 52.02	201°36.83 216°1.19	5.4' 5.2'	25°33.26 25°39.05	5.8' 5.6'	58.7' 58.8'	
23	148 22.16 163°22.18	52.02 51.44	210 1.19 230°25.43	5.2 5.1'	25 39.05 25°44.68	5.5'	58.8'	
23	SD = 15.7'	d = -0.6'	230 23.43		0 = 15.8'	3.3	30.0	
	$\frac{3D = 15.7}{}$	u = -0.0		- JL	7 = 15.6			
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°22.20	N18°50.85	244°49.56	5.0'	N25°50.16	5.3'	58.8'	
1 2	193°22.21 208°22.23	50.27	259°13.58 273°37.49	4.9'	25°55.47 26°0.63	5.2'	58.9'	
3	208°22.23 223°22.24	49.68 •• 49.09	273°37.49 288°1.29	4.8' 4.7'	26°0.63 26°5.61	5.0' 4.8'	58.9' 59.0'	
3 4	238°22.26	48.50	302°24.99	4. <i>1</i> 4.6'	26°10.44	4.0 4.7'	59.0'	
5	253°22.28	47.91	316°48.58	4.5'	26°15.09	4.5'	59.0'	
6	268°22.29	N18°47.33	331°12.07	4.4'	N26°19.58	4.3'	59.1'	
7	283°22.31	46.74	345°35.45	4.3'	$26^{\circ}23.90$	4.1'	59.1'	
8	298°22.33	46.15	359°58.74	4.2'	26°28.04	4.0'	59.1'	
9	313°22.35	· · 45.56	14°21.93	4.1'	26°32.01 26°35.81	3.8'	59.2'	
10 11	328°22.37 343°22.38	44.96 44.37	28°45.02 43°8.01	4.0' 3.9'	26°35.81 26°39.43	3.6' 3.4'	59.2' 59.3'	
11	343°22.38 358°22.40	44.37 N18°43.78	43°8.01 57°30.92	3.9	26° 39.43 N26° 42.88	3.4	59.3'	
13	13°22.42	43.19	71°53.73	3.7'	26°46.14	3.1'	59.3'	
14	28°22.44	42.59	86° 16.45	3.6'	26°49.23	2.9'	59.4'	
15	43°22.46	• • 42.00	100°39.09	3.6'	$26^{\circ}52.13$	2.7'	59.4'	
16	58°22.48	41.41	115°1.64	3.5'	26°54.85	2.5'	59.4'	
17	73°22.50	40.81	129°24.11	3.4'	26°57.39	2.4'	59.5'	
18 19	88°22.52 103°22.54	N18°40.22 39.62	143°46.50 158°8.81	3.3' 3.2'	N26°59.74 27°1.90	2.2' 2.0'	59.5' 59.5'	
20	103°22.54 118°22.56	39.62 39.02	158° 8.81 172° 31.04	3.2'	27°1.90 27°3.88	2.0 1.8'	59.5° 59.6'	
21	133°22.58	• • 38.43	186°53.20	3.1'	27°5.67	1.6'	59.6'	
22	148°22.60	37.83	201°15.29	3.0'	27°7.27	1.4'	59.7'	
23	163°22.62	37.23	215°37.31	3.0'	27°8.67	1.2'	59.7'	
	SD = 15.7'	d = -0.6'		SE	O = 16.0'			

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

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

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	307°24.69	181°50.31	N20°22.56	119°24.48	S03°15.53	154° 14.88	N12°2.59	280°41.78	N08° 18.57	Alpheratz	357°32.35	29° 14.59
1	322°27.16	196°49.56	21.92	134°25.58	16.16	169°16.85	2.41	295°44.20	18.57	Ankaa	353°4.87	-42°9.02
2	337°29.62	211°48.81	21.28	149°26.68	16.78	184°18.82	2.23	310°46.61	18.58	Schedar	349°28.30	56°41.19
3	352°32.09	226°48.06	• • 20.64	164°27.78	17.40	199°20.79	• • 2.04	325°49.03	18.58	Diphda	348°45.04	-17°49.86
4 5	7°34.55 22°37.01	241°47.31 256°46.56	19.99 19.35	179°28.88 194°29.98	18.03 18.65	214°22.76 229°24.73	1.86 1.67	340°51.44 355°53.86	18.59 18.60	Achernar	335° 18.54	-57°5.41
6	37°39.48	250 40.50 271°45.81	N20°18.70	209°31.08	S03°19.28	244°26.70	1.07 N12°1.49	10°56.28	N08° 18.60	Hamal	327°48.76	23°35.57
7	52°41.94	286° 45.07	18.05	209 31.08 224°32.18	19.90	259°28.67	1.31	25°58.70	18.61	Polaris	312°59.83	89°22.46
8	67°44.41	301°44.32	17.41	239°33.28	20.52	274°30.64	1.12	41°1.11	18.61	Acamar	315° 10.25	-40°11.32
9	82°46.87	316° 43.57	. 16.76	254°34.38	. 21.15	289°32.61	0.94	56°3.53	. 18.62	Menkar	314°3.98	4°11.97
10	97°49.34	331°42.82	16.11	269°35.48	21.77	304°34.57	0.75	71°5.95	18.62	Mirfak	308°25.31	49°57.36
11	112°51.80	346°42.08	15.46	284° 36.57	22.40	319°36.54	0.57	86°8.37	18.63	Aldebaran	290°37.37	16°33.87
12	127° 54.26	1°41.33	N20°14.80	299°37.67	S03°23.02	334°38.51	N12°0.39	101°10.78	N08° 18.63	Rigel	281°2.06	-8°10.08
13	142°56.73	16°40.59	14.15	314°38.77	23.64	349°40.48	0.20	116°13.20	18.64	Capella	280°19.07	46°1.37 6°22.51
14	$157^{\circ}59.19$	31°39.84	13.50	329°39.87	24.27	4°42.45	12°0.02	$131^{\circ}15.62$	18.64	Bellatrix Elnath	278°20.84 277°59.45	28° 37.76
15	$173^{\circ}1.66$	46°39.10	• • 12.84	344°40.97	• • 24.89	19°44.42	11°59.83	146°18.04	• • 18.65	Alnilam	277 39.43 275°35.82	-1°11.00
16	188°4.12	61°38.35	12.19	359°42.06	25.52	34°46.39	59.65	161°20.46	18.65	Betelgeuse	270°50.05	7°24.75
17	203°6.59	76°37.61	11.53	14°43.16	26.14	49°48.35	59.46	176°22.88	18.66	Canopus	263°51.92	-52° 42.44
18	218°9.05	91°36.87	N20°10.87	29°44.26	S03°26.76	64°50.32	N11°59.28	191°25.29	N08° 18.66	Sirius	258°24.68	-16°45.16
19	233°11.51	106°36.13	10.21	44° 45.36	27.39	79°52.29	59.09	206°27.71	18.67	Adhara	255°4.55	-29°0.48
20	248° 13.98	121°35.38	9.55	59°46.45	28.01	94°54.26	58.91	221°30.13	18.67	Procyon	244°48.94	5°9.26
21	263° 16.44	136°34.64	• • 8.89	74° 47.55	• • 28.64	109°56.23	58.73	236°32.55	18.68	Pollux	243°15.09	27°57.53
22 23	278° 18.91	151°33.90	8.23	89°48.65	29.26	124°58.20	58.54	251°34.97	18.68	Avior	234°14.50	-59°35.87
	293°21.37	166°33.16	7.57	104°49.74	29.89	140°0.16	58.36	266°37.39	18.69	Suhail	222°45.18	-43°32.69
Mer.ı	pass. 03:30	ν -0.8' d-0).6′ m-3.92	$\nu 1.1' \ d0.$.6′ m1.24	$\nu 2.0' \ d-0$.2′ m-1.73	ν 2.4′ d0	.0' m0.49	Miaplacidus	221°38.71	-69°49.91
										Alphard	217°45.99	-8°46.71
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.50	11°49.96
0	308°23.84	181°32.42	N20° 6.90	119°50.84	S03°30.51	155°2.13	N11°58.17	281°39.81	N08° 18.69	Dubhe	193°39.02	61°36.26
1	323°26.30	196°31.68	6.24	134°51.93	31.14	170° 4.10	57.99	296°42.23	18.70	Denebola	182°23.01	14°25.13
2	338°28.76	211°30.94	5.57	149°53.03	31.76	185° 6.07	57.80	311°44.65	18.70	Gienah	175°41.57	-17°41.80
3	353°31.23	226°30.20	• • 4.90	164°54.12	32.38	200° 8.03	57.62	326°47.07	. 18.70	Acrux	172°58.00	-63°15.42
4	8°33.69	241°29.46	4.23	179°55.22	33.01	215°10.00	57.43	341°49.49	18.71	Gacrux	171°49.50	-57° 16.34
5	23°36.16	256°28.72	3.57	194°56.31	33.63	230°11.97	57.25	$356^{\circ}51.91$	18.71	Alioth Spica	166°11.38 158°20.14	55°48.82 -11°18.37
6	38°38.62	271°27.98	N20°2.90	209°57.41	S03°34.26	245°13.94	N11°57.06	11°54.33	N08° 18.72	Alkaid	150 20.14 152°50.44	49° 10.76
7	53°41.08	286°27.25	2.22	224°58.50	34.88	$260^{\circ}15.91$	56.88	26°56.76	18.72	Hadar	148° 32.97	-60° 30.64
8	68° 43.55	301°26.51	1.55	239°59.60	35.51	275°17.87	56.69	41°59.18	18.73	Menkent	140° 52.97 147° 55.11	-36°30.51
9	83°46.01	316°25.77	• • 0.88	255°0.69	• • 36.13	290°19.84	• • 56.51	57°1.60	• • 18.73	Arcturus	145°45.99	19°2.45
10	98°48.48	331°25.04	20°0.20	270°1.78	36.76	305°21.81	56.32	72°4.02	18.73	Rigil Kent.	139°37.27	-60°57.24
11	113°50.94	346°24.30	19°59.53	285°2.88	37.38	320°23.78	56.14	87°6.44	18.74	Kochab	137°19.80	74°2.76
12	128°53.41	1°23.57	N19°58.85	300°3.97	S03°38.01	335°25.74	N11°55.95	102°8.86	N08° 18.74	Zuben'ubi	$136^{\circ}53.61$	-16°9.43
13	143°55.87	16°22.83	58.18	315°5.06	38.63	350°27.71	55.77	117°11.29	18.74	Alphecca	126°1.84	26°37.48
14	158° 58.33	31°22.10	57.50	330°6.16	39.26	5°29.68	55.58	132°13.71	18.75	Antares	112°13.02	-26°29.62
15	174°0.80 189°3.26	46°21.36 61°20.63	• • 56.82 56.14	345°7.25 0°8.34	· · 39.88 40.51	20°31.65 35°33.61	• • 55.40 55.21	147°16.13 162°18.55	· · 18.75	Atria	107°4.93	-69°4.78
16 17	204°5.73	76° 19.90	55.46	15°9.43	41.13	50°35.58	55.03	102 10.55 177°20.98	18.75 18.76	Sabik	102°0.11	-15°45.50
18	219°8.19	91° 19.16	N19°54.78		\$03°41.76	65°37.55	N11° 54.84	192°23.40	N08° 18.76	Shaula	96°7.17	-37°7.44
19	234° 10.66	106° 18.43	54.09	45°11.62	42.38	80°39.51	54.66	207°25.82	18.76	Rasalhague	95°56.33	12°32.54
20	249° 13.12	121°17.70	53.41	60°12.71	43.01	95°41.48	54.47	222°28.25	18.77	Eltanin	90°40.77	51°29.30
21	264° 15.58	136° 16.97	52.72	75° 13.80	• • 43.63	110°43.45	• • 54.29	237°30.67	• • 18.77	Kaus Aust.	83°29.35	-34°22.24
22	279° 18.05	151°16.24	52.04	90°14.89	44.26	125°45.41	54.10	252°33.09	18.77	Vega	80°31.40 75°44.79	38°48.73 -26°15.65
23	294°20.51	166°15.51	51.35	$105^{\circ}15.98$	44.88	140°47.38	53.92	267°35.52	18.78	Nunki Altair	61°57.56	8° 56.63
Mari	pass. 03:26	0.7/ d.0).7′ m-3.92	$\nu 1.1' d0.$	6' m1 25		.2′ m-1.73		.0′ m0.48	Peacock	53°1.83	-56°38.61
ivier.	pass. 03.20	ν-0.1 u-0).1 III-3.92 ————	ν1.1 do.	.0 1111.25	ν2.0 u -0	.2 111-1.73	ν2.4 d0	.0 1110.46	Deneb	49°23.87	45°22.82
										Enif	33°36.40	10°0.24
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.86	-46°49.37
0	309°22.98		N19°50.66		S03°45.51	155°49.35	N11°53.73	282°37.94	N08° 18.78	Fomalhaut	15°11.91	-29°28.29
1	324°25.44	196°14.05	49.97	135° 18.17	46.13	170°51.31	53.54	297°40.37	18.78	Scheat	13°42.84	28°14.01
2	339°27.91	211°13.32	49.28	150° 19.26	46.76	185°53.28	53.36	312°42.79	18.79	Markab	13°27.51	15°21.34
3	354°30.37	226°12.59 241°11.86	• • 48.59	165°20.35	• • 47.38	200°55.25	• • 53.17	327°45.21 342°47.64	• • 18.79	Jul 30 Fri	SHA	N4
4 5	9°32.83 24°35.30	256°11.13	47.90 47.21	180°21.44 195°22.53	48.01 48.63	215°57.21 230°59.18	52.99 52.80	357°50.06	18.79 18.79	Venus	234°25.61	Mer.pass 11:53
6	39° 37.76	271° 10.41	N19°46.51		\$03°49.26	230 59.16 246°1.15	N11°52.62	12°52.49	N08° 18.80		171°59.78	16:01
7	54°40.23	286°9.68	45.82	225°24.70	49.88	261°3.11	52.43	27°54.91	18.80	Jupiter	206°50.19	13:41
8	69°42.69	301°8.95	45.12	240°25.79	50.51	276° 5.08	52.43	42°57.34	18.80	Saturn	333°17.09	05:16
9	84°45.15	316°8.23	• • 44.43	255°26.88	51.13	291°7.05	52.06	57°59.77	• • 18.80			
10	99°47.62	331°7.50	43.73	270°27.97	51.76	306° 9.01	51.87	73°2.19	18.81	Jul 31 Sat	SHA	Mer.pass
11	114°50.08	346°6.78	43.03	285°29.06	52.39	321°10.98	51.69	88°4.62	18.81	Venus	233°8.58	11:54
12	129° 52.55	1°6.05	N19°42.33		S03°53.01	336°12.95	N11°51.50	103°7.04	N08° 18.81		171°27.00	15:59
13	144°55.01	16°5.33	41.63	315°31.24	53.64	351°14.91	51.32	118°9.47	18.81	Jupiter	206°38.30	13:38
14	159°57.48	31°4.60	40.93	330°32.32	54.26	$6^{\circ}16.88$	51.13	133°11.90	18.81	Saturn	333°15.98	05:13
15	$174^{\circ}59.94$	46°3.88	• • 40.22	$345^{\circ}33.41$	• • 54.89	21°18.84	• • 50.94	148°14.32	• • 18.82	Aug 01 Sun	SHA	Mer.pass
16	190°2.40	61°3.16	39.52	0°34.50	55.51	$36^{\circ}20.81$	50.76	163°16.75	18.82		231°51.80	11:56
17	205°4.87	76°2.43	38.82	15°35.59	56.14	51°22.78	50.57	178° 19.18	18.82	Mars	$170^{\circ}54.10$	15:58
18	220°7.33		N19°38.11		S03°56.76	66°24.74	N11°50.39	193°21.60	N08° 18.82	Jupiter	$206^{\circ}26.37$	13:35
19	235°9.80	106°0.99	37.40	45°37.76	57.39	81°26.71	50.20	208°24.03	18.82	Saturn	333°14.96	05:09
20	250° 12.26	121°0.27	36.70	60°38.85	58.02	96°28.67	50.01	223°26.46	18.83	Hauter	atal parallar	
21	265°14.72	135°59.55	• • 35.99	75°39.93	• • 58.64	111°30.64	• • 49.83	238°28.89	• • 18.83	Horizoi	ntal parallax Venus:	0.1
22	280° 17.19	150°58.83	35.28	90°41.02	59.27	126°32.60	49.64	253°31.31	18.83		Venus: Mars:	0.1
23	295° 19.65	165°58.11	34.57	105° 42.11	59.89	141°34.57	49.46	268°33.74	18.83		ividi3.	0.1
Mer. _ا	pass. 03:22	ν -0.7′ d -0).7′ m-3.92	$\nu 1.1' \ d0.$.6′ m1.25	ν 2.0′ d-0	.2′ m-1.73	ν 2.4′ d0	.0′ m0.48			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 22.65	N18°36.63	229°59.27	2.9'	N27°9.89	1.0'	59.7'
1 2	193°22.67 208°22.69	36.03 35.43	244°21.16 258°42.99	2.8' 2.8'	27°10.91 27°11.74	0.8' 0.6'	59.8' 59.8'
3	206 22.09 223°22.71	34.83	273° 4.76	2.0	27 11.74 27°12.37	0.6	59.8'
4	238° 22.74	34.23	287°26.47	2.7'	27°12.81	0.2'	59.9'
5	253° 22.76	33.63	301°48.14	2.6'	27°13.06	0.0'	59.9'
6 7	268°22.78 283°22.81	N18°33.03 32.43	316° 9.75 330° 31.31	2.6' 2.5'	N27°13.10 27°12.95	-0.2' -0.4'	59.9' 60.0'
8	298° 22.83	31.82	344°52.83	2.5'	27°12.60	-0.4 -0.5	60.0
9	313°22.85	• • 31.22	359°14.31	2.4'	$27^{\circ}12.05$	-0.7'	60.0'
10	328° 22.88	30.61	13°35.74 27°57.14	2.4'	27°11.30 27°10.35	-0.9'	60.1'
11 12	343°22.90 358°22.93	30.01 N18°29.41	42°18.51	2.4'	N27°9.20	-1.2' -1.4'	60.1' 60.1'
13	13°22.95	28.80	56°39.85	2.3'	27°7.85	-1.6'	60.2'
14	28°22.98	28.19	71°1.15	2.3'	27°6.29	-1.8'	60.2'
15 16	43°23.00 58°23.03	· · 27.59 26.98	85°22.44 99°43.70	2.3' 2.2'	27°4.54 27°2.58	-2.0' -2.2'	60.2' 60.2'
17	73° 23.05	26.37	114° 4.94	2.2'	27° 0.42	-2.2 -2.4'	60.3
18	88°23.08	N18°25.76	128°26.16	2.2'	N26°58.06	-2.6'	60.3'
19	103°23.11	25.15	142°47.37	2.2'	26°55.50	-2.8'	60.3'
20 21	118°23.13 133°23.16	24.55 •• 23.94	157°8.57 171°29.77	2.2' 2.2'	26°52.73 26°49.76	-3.0' -3.2'	60.4' 60.4'
22	133 23.10 148°23.19	23.33	171 29.77 185°50.95	2.2'	26°46.59	-3.4'	60.4
23	163°23.22	22.71	200°12.14	2.2'	26°43.21	-3.6'	60.5'
	SD = 15.7'	d = -0.6'		S	D = 16.3'		
. .					Б.	,	
Sat 0	GHA 178°23.24	Dec N18°22.10	GHA 214°33.33	ν 2.2'	Dec N26°39.64	d -3.8'	HP 60.5'
1	176 23.24 193°23.27	21.49	214 55.55 228°54.52	2.2'	26°35.86	-3.6 -4.0'	60.5
2	208°23.30	20.88	243°15.72	2.2'	$26^{\circ}31.87$	-4.2'	60.5'
3	223°23.33	• • 20.27	257°36.92 271°58.14	2.2'	26°27.69	-4.4'	60.6'
4 5	238°23.36 253°23.39	19.65 19.04	271°58.14 286°19.38	2.2' 2.3'	26°23.30 26°18.72	-4.6' -4.8'	60.6' 60.6'
6	268° 23.42	N18°18.42	300°40.63	2.3'	N26°13.93	-5.0'	60.6
7	283° 23.45	17.81	315° 1.91	2.3'	26°8.94	-5.2'	60.7'
8 9	298°23.48 313°23.51	17.19 •• 16.58	329°23.20 343°44.53	2.3' 2.4'	26°3.76 25°58.37	-5.4' -5.6'	60.7' 60.7'
10	328° 23.54	15.96	358° 5.88	2.4'	25°52.78	-5.8'	60.7'
11	343°23.57	15.34	12°27.27	2.4'	25°47.00	-6.0'	60.8'
12	358°23.60	N18°14.73	26°48.69	2.5'	N25°41.02	-6.2'	60.8'
13 14	13°23.63 28°23.66	14.11 13.49	41°10.14 55°31.64	2.5' 2.5'	25°34.85 25°28.48	-6.4' -6.6'	60.8' 60.8'
15	43°23.69	• • 12.87	69°53.17	2.6'	25°21.91	-6.8'	60.8
16	58° 23.73	12.25	84°14.76	2.6'	25°15.15	-7.0'	60.9'
17 18	73°23.76 88°23.79	11.63 N18°11.01	98°36.38 112°58.06	2.7'	25°8.20 N25°1.06	-7.1' -7.3'	60.9' 60.9'
19	103°23.82	10.39	112 58.00 127°19.79	2.7	24°53.73	-7.5'	60.9
20	118° 23.86	9.77	141°41.57		24°46.21	-7.7'	60.9'
21	133°23.89	• • 9.14	156° 3.41	2.9'	24°38.50	-7.9'	61.0'
22 23	148°23.92 163°23.96	8.52 7.90	170°25.31 184°47.26	3.0' 3.0'	24°30.60 24°22.52	-8.1' -8.3'	61.0' 61.0'
23	SD = 15.7'	d = -0.6'			D = 16.5'	0.5	
	<u>JD = 13.7</u>	<u>u = -0.0</u>			D = 10.5		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°23.99 193°24.03	N18° 7.27 6.65	199° 9.28 213° 31.36	3.1' 3.1'	N24°14.25 24°5.80	-8.4' -8.6'	61.0' 61.0'
2	208° 24.06	6.02	213 31.30 227°53.51	3.1	24 5.80 23°57.17	-8.8'	61.1'
3	223°24.10	• • 5.40	242°15.73	3.3'	23°48.36	-9.0'	61.1'
4	238°24.13	4.77	256°38.02	3.4'	23°39.37	-9.2'	61.1'
5 6	253°24.17 268°24.20	4.15 N18° 3.52	271°0.38 285°22.81	3.4' 3.5'	23°30.21 N23°20.86	-9.3' -9.5'	61.1' 61.1'
7	283°24.24	2.89	299°45.32	3.6'	23°11.35	-9.7'	61.1
8	298°24.27	2.26	314°7.90	3.7'	23°1.66	-9.9'	61.1'
9 10	313°24.31 328°24.35	· · 1.64 1.01	328°30.56 342°53.31	3.7' 3.8'	22°51.80 22°41.77	-10.0' -10.2'	61.2' 61.2'
10	328 24.35 343°24.38	1.01 18°0.38	342 53.31 357°16.13	3.8	22 41.77 22°31.58	-10.2 -10.4	61.2'
12	358° 24.42	N17°59.75	11°39.04	4.0'	N22°21.22	-10.5'	61.2'
13	13°24.46	59.12	26°2.03	4.1'	22°10.69	-10.7'	61.2'
14 15	28°24.50 43°24.54	58.49 •• 57.85	40°25.10 54°48.26	4.2' 4.2'	22°0.01 21°49.16	-10.8' -11.0'	61.2' 61.2'
16	43 24.54 58°24.57	57.22	69°11.51	4.2	21°49.16 21°38.16	-11.0	61.2'
17	73°24.61	56.59	83°34.85	4.4'	21°27.00	-11.3'	61.2'
18	88°24.65	N17°55.96	97°58.28	4.5'	N21°15.68	-11.5'	61.2'
19 20	103°24.69 118°24.73	55.32 54.69	112°21.80 126°45.41	4.6' 4.7'	21°4.21 20°52.60	-11.6' -11.8'	61.2' 61.3'
21	133°24.77	• • 54.06	141°9.11	4.8'	20°40.83	-11.9'	61.3
22	148°24.81	53.42	155°32.90	4.9'	20°28.92	-12.1'	61.3'
23	163°24.85	52.78	169°56.79	5.0'	20°16.86	-12.2'	61.3'
	SD = 15.7'	d = -0.6'		S	D = 16.6'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	17-3%
30	06:29	06:28	12:06	09:03	21:36	
31	06:27	06:26	12:06	10:08	22:40	
01	06:24	06:22	12:06	11:11	23:42	

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
	310°22.12	180°57.39 N19°33.86	120°43.19 S 04°0.52	156°36.54 N11°49.27	283°36.17 N08°18.83
0 1	310 22.12 325°24.58	195°56.67 33.14	120 43.19 504 0.52 135°44.28 1.14	171°38.50 49.08	283 30.17 NUS 18.83 298°38.60 18.83
2	340°27.05	210°55.95 32.43	150°45.36 1.77	186°40.47 48.90	313°41.03 18.83
3	355°29.51	210 55.95	165° 46.45 · · 2.40	201°42.43 · · 48.71	328°43.45 · · 18.84
4	10°31.97	240°54.52 31.00	180°47.53 3.02	216°44.40 48.52	343°45.88 18.84
5	25°34.44	255°53.80 30.28	195°48.62 3.65	231°46.36 48.34	358°48.31 18.84
6	40°36.90	270°53.08 N19°29.57	210°49.70 S04°4.27	246°48.33 N11°48.15	13°50.74 N08°18.84
7	55°39.37	285°52.37 28.85	225°50.79 4.90	261°50.29 47.96	28°53.17 18.84
8	70°41.83	300°51.65 28.13	240°51.87 5.53	276°52.26 47.78	43°55.60 18.84
9	85°44.29	315°50.93 · · 27.41	255°52.95 · · 6.15	291°54.22 · · 47.59	58°58.03 · · 18.84
10	100°46.76	330°50.22 26.69	270°54.04 6.78	306°56.19 47.40	74°0.46 18.84
11	115°49.22	345°49.51 25.97	285°55.12 7.40	321°58.15 47.22	89°2.89 18.84
12	130°51.69	0°48.79 N19°25.24	300°56.20 S 04°8.03	337°0.12 N11°47.03	104°5.32 N08°18.84
13	145°54.15	15°48.08 24.52	315°57.29 8.66	352°2.08 46.85	119°7.75 18.84
14	160° 56.62	30°47.36 23.79	330°58.37 9.28	7°4.05 46.66	134°10.18 18.84
15	175°59.08	45°46.65 · · 23.07	345°59.45 · · 9.91	22°6.01 · · 46.47	149°12.61 · · 18.84
16	191°1.54	60°45.94 22.34	1°0.53 10.53	37°7.98 46.29	164°15.04 18.85
17	206°4.01	75°45.23 21.61	16°1.62 11.16	52° 9.94 46.10	179°17.47 18.85
18	221°6.47	90°44.52 N19°20.89	31°2.70 S 04°11.79	67°11.91 N11°45.91	194°19.90 N08°18.85
19	236°8.94	105°43.81 20.16	46°3.78 12.41	82°13.87 45.72	209°22.34 18.85
20	251°11.40	120°43.10 19.42	61°4.86 13.04	97°15.84 45.54	224°24.77 18.85
21	266° 13.86	135°42.39 · · 18.69	76°5.94 · · 13.66	112°17.80 · · 45.35	239°27.20 · · 18.85
22	281°16.33	150°41.68 17.96	91°7.02 14.29	127°19.77 45.16	254°29.63 18.85
23	296° 18.79	165°40.97 17.23	106°8.10 14.92	142°21.73 44.98	269°32.06 18.85
Mari	225 02:19	ν-0.7' d-0.7' m-3.92	ν1.1' d0.6' m1.26	ν2.0' d-0.2' m-1.72	ν2.4' d0.0' m0.47
ivier.	pass. 03:18	ν-0.1 a-0.1 m-3.92	ν1.1 αυ.ο m1.2ο	ν2.0 a-0.2 m-1.72	υ2.4 d0.0 m0.47
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	311°21.26	180°40.26 N19°16.49	121°9.19 S 04°15.54	157°23.70 N11°44.79	284°34.50 N08°18.85
1	326°23.72	195°39.55 15.76	136° 10.27 16.17	172°25.66 44.60	299°36.93 18.85
2	341°26.19	210°38.84 15.02	151°11.35 16.80	187°27.63 44.42	314°39.36 18.85
3	356° 28.65	225°38.14 · · 14.28	166°12.43 · · 17.42	202°29.59 · · 44.23	329°41.79 · · 18.84
4	11°31.11	240°37.43 13.54	181°13.51 18.05	217°31.55 44.04	344°44.23 18.84
5	26°33.58	255°36.72 12.81	196°14.59 18.68	232°33.52 43.85	359°46.66 18.84
6	41°36.04	270°36.02 N19°12.07	211°15.66 S 04°19.30	247°35.48 N11°43.67	14°49.09 N08°18.84
7	56°38.51	285°35.31 11.32	226° 16.74 19.93	262°37.45 43.48	29°51.53 18.84
8	71°40.97	300°34.61 10.58	241°17.82 20.55	277°39.41 43.29	44°53.96 18.84
9	86°43.43	315°33.90 · · 9.84	256°18.90 · · 21.18	292°41.37 · · 43.11	59°56.39 · · 18.84
10	101°45.90	330°33.20 9.10	271°19.98 21.81	307°43.34 42.92	74°58.83 18.84
11	116°48.36	345°32.50 8.35	286°21.06 22.43	322°45.30 42.73	90°1.26 18.84
12	131°50.83	0°31.79 N19°7.60	301°22.14 S 04°23.06	337°47.27 N11°42.54	105°3.70 N08°18.84
13	146°53.29	15°31.09 6.86	316°23.21 23.69	352°49.23 42.36	120°6.13 18.84
14	161°55.75	30°30.39 6.11	331°24.29 24.31	7°51.19 42.17	135°8.57 18.84
15	176°58.22	45°29.69 · · 5.36	346°25.37 · · 24.94	22°53.16 · · 41.98	150°11.00 · · 18.84
16	192°0.68	60°28.99 4.61	1°26.45 25.57	37°55.12 41.79	165°13.43 18.83
17	207°3.15	75°28.28 3.86	16°27.52 26.19	52°57.09 41.61	180°15.87 18.83
18	222°5.61	90°27.58 N19°3.11	31°28.60 S04°26.82	67°59.05 N11°41.42	195°18.31 N08°18.83
19			46°29.68 27.45	83°1.01 41.23	210°20.74 18.83
20	252° 10.54 267° 13.00	120°26.19 1.60 135°25.49 · · 0.85	61°30.75 28.07	98°2.98 41.04 113°4.94 • 40.86	225°23.18 18.83
21 22	267° 13.00 282° 15.47	135°25.49 · · 0.85 150°24.79 19°0.09	76°31.83 · · 28.70		240°25.61 · · 18.83 255°28.05 18.83
			91°32.91 29.33		
23	297° 17.93	165°24.09 18°59.34	106°33.98 29.95		
Mer.p	pass. 03:14	ν -0.7' d-0.7' m-3.92	$ u 1.1' \; d 0.6' \; { m m} 1.26$	$\nu 2.0' \ d$ -0.2' m-1.72	ν2.4′ d-0.0′ m0.47
\A/- I	CIIA	CHA D	CHA 5	CHV D	CHA D
Wed	GHA 312°20.40	GHA Dec 180°23.39 N18°58.58	GHA Dec 121°35.06 S 04°30.58	GHA Dec 158°10.83 N11°40.29	GHA Dec 285°32.92 N08°18.82
0 1	312° 20.40 327° 22.86	195°22.70 57.82	136° 36.13 31.21	158°10.83 N11°40.29 173°12.79 40.11	300°35.36 18.82
2	327 22.80 342°25.32	210°22.00 57.06	151°37.21 31.83	173 12.79 40.11 188°14.76 39.92	315°37.79 18.82
3	342 25.32 357°27.79	210 22.00 57.06 225°21.30 •• 56.30	166° 38.28 · · 32.46	203°16.72 · · 39.73	315 37.79 18.82 =
3 4	12° 30.25	240°20.61 55.54	181°39.36 33.09	218°18.68 39.54	345°42.67 18.81
5	27° 32.72	255°19.91 54.78	196° 40.43 33.71	233°20.65 39.35	0°45.11 18.81
6	42°35.18	270°19.22 N18°54.02	211°41.51 \$04°34.34	248°22.61 N11°39.17	15°47.54 N08°18.81
7	42 35.16 57°37.64	270 19.22 N16 54.02 285°18.52 53.25	211 41.51 304 34.34 226° 42.58 34.97	263°24.57 38.98	30°49.98 18.81
8	72°40.11	300°17.83 52.49	241°43.65 35.59	278°26.54 38.79	45°52.42 18.81
9	87° 42.57	315°17.14 · · 51.72	256° 44.73 · · · 36.22	293°28.50 · · 38.60	60°54.86 · · 18.80
10	102° 45.04	330°16.44 50.96	271°45.80 36.85	308°30.46 38.41	75°57.29 18.80
11	102 45.04 117° 47.50	345°15.75 50.19	286° 46.87 37.48	323°32.43 38.23	90°59.73 18.80
12	132°49.96	0°15.06 N18°49.42	301°47.95 \$04°38.10	338°34.39 N11°38.04	106°2.17 N08°18.80
13	147°52.43	15°14.37 48.65	316°49.02 38.73	353°36.35 37.85	121°4.61 18.79
14	162°54.89	30°13.68 47.88	331°50.09 39.36	8°38.31 37.66	136°7.05 18.79
15	177°57.36	45°12.99 · · 47.11	346°51.17 · · 39.98	23°40.28 · · 37.47	151°9.49 · · 18.79
16	192°59.82	60°12.30 46.34	1°52.24 40.61	38°42.24 37.29	166°11.93 18.79
17	208°2.28	75°11.61 45.57	16°53.31 41.24	53°44.20 37.10	181°14.37 18.78
18	223°4.75	90°10.92 N18°44.79	31°54.38 S04°41.86	68°46.16 N11°36.91	196°16.80 N08°18.78
19	238°7.21	105°10.23 44.02	46°55.45 42.49	83°48.13 36.72	211°19.24 18.78
20	253°9.68	120°9.54 43.24	61°56.52 43.12	98°50.09 36.53	226°21.68 18.77
21	268° 12.14	135°8.85 · · 42.47	76°57.60 · · 43.75	113°52.05 · · 36.34	241°24.12 · · 18.77
22	283° 14.60	150°8.17 41.69	91°58.67 44.37	128°54.01 36.16	256°26.56 18.77
23	298° 17.07	165°7.48 40.91	106°59.74 45.00	143°55.98 35.97	271°29.00 18.76
Mer.	pass. 03:10	ν-0.7' d-0.8' m-3.92	ν1.1' d0.6' m1.27	ν2.0′ d-0.2′ m-1.72	ν2.4' d-0.0' m0.46
					

Stars SHA

357°32.32 353°4.84

349°28 27

348°45.01

Alpheratz

Ankaa Schedar

Diphda

Dec 29° 14.60

-42°9.02

56°41.21 -17°49.86

h	Su	Moon					
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.89	$N17^{\circ}52.15$	$184^{\circ}20.78$	5.1'	N20°4.66	-12.3'	61.3'
1	193°24.93	51.51	198° 44.85	5.2'	19°52.32	-12.5'	61.3'
2	208°24.97 223°25.01	50.87 •• 50.24	213°9.03 227°33.30	5.3' 5.4'	19°39.84 19°27.23	-12.6' -12.7'	61.3' 61.3'
4	238°25.05	49.60	241°57.66	5.5'	19°27.23	-12.7 -12.9'	61.3
5	253°25.10	48.96	256°22.13	5.6'	19°1.60	-13.0'	61.3'
6	268°25.14	$N17^{\circ}48.32$	270°46.69	5.7'	N18°48.60	-13.1'	61.3'
7	283°25.18	47.68	285°11.35	5.8'	18° 35.46	-13.3'	61.3'
8 9	298°25.22 313°25.27	47.04 •• 46.40	299°36.10 314°0.96	5.9' 6.0'	18°22.20 18°8.81	-13.4' -13.5'	61.3' 61.3'
10	328°25.31	45.76	328° 25.91	6.1	17°55.31	-13.5'	61.3
11	343°25.35	45.12	342°50.96	6.1'	17°41.69	-13.7'	61.3'
12	358°25.40	N17°44.48	357° 16.11	6.2'	N17°27.95	-13.9'	61.3'
13	13°25.44 28°25.48	43.83	11°41.35 26°6.70	6.3'	17°14.09 17°0.12	-14.0'	61.3'
14 15	43°25.48	43.19 •• 42.55	40°32.14	6.4' 6.5'	16°46.05	-14.1' -14.2'	61.3' 61.3'
16	58°25.57	41.90	54°57.68	6.6'	16° 31.86	-14.3'	61.3'
17	73°25.62	41.26	69°23.32	6.7'	$16^{\circ}17.58$	-14.4'	61.2'
18	88°25.66	N17°40.61	83°49.06	6.8'	N16°3.18	-14.5'	61.2'
19	103°25.71 118°25.75	39.97	98° 14.89	6.9'	15°48.69 15°34.10	-14.6'	61.2'
20 21	118°25.75 133°25.80	39.32 •• 38.67	112° 40.82 127° 6.84	7.0' 7.1'	15°34.10 15°19.41	-14.7' -14.8'	61.2' 61.2'
22	148°25.85	38.03	141°32.97	7.2'	15°4.63	-14.9'	61.2'
23	163°25.89	37.38	155°59.18	7.3'	14°49.76	-15.0'	61.2'
	SD = 15.8'	d = -0.6'		SI	O = 16.7'		
Tue	GHA 178°25.94	Dec N17°36.73	GHA 170°25.50	u 7.4'	Dec N14°34.80	<i>d</i> −15.0'	HP 61.2'
0 1	178°25.94 193°25.99	N17 36.73 36.08	170° 25.50 184° 51.90	7.4° 7.5'	14° 19.75	-15.0° -15.1'	61.2'
2	208°26.03	35.43	199° 18.41	7.6'	14°4.62	-15.2'	61.2'
3	223°26.08	• • 34.78	213°45.00	7.7'	13°49.40	-15.3'	61.2'
4	238°26.13	34.13	228° 11.69	7.8'	13°34.10	-15.4'	61.1'
5	253°26.18 268°26.23	33.48 N17° 32.83	242°38.47 257°5.34	7.9'	13°18.73 N13°3.28	-15.5'	61.1'
6 7	283°26.23	32.18	257 5.34 271°32.30	8.0' 8.1'	12° 47.75	-15.5' -15.6'	61.1' 61.1'
8	298°26.32	31.53	285°59.36	8.1'	12°32.16	-15.7'	61.1'
9	313°26.37	• • 30.88	$300^{\circ}26.50$	8.2'	$12^{\circ}16.49$	-15.7'	61.1'
10	328°26.42	30.22	314°53.73	8.3'	12°0.76	-15.8'	61.1'
11 12	343°26.47 358°26.52	29.57 N17°28.92	329°21.05 343°48.45	8.4' 8.5'	11°44.96 N11°29.10	-15.9' -15.9'	61.0' 61.0'
13	13°26.57	28.26	358° 15.95	8.6'	11° 13.18	-15.9 -16.0'	61.0'
14	28°26.62	27.61	12°43.52	8.7'	10°57.21	-16.0'	61.0'
15	43°26.67	• • 26.95	27°11.18	8.7'	10°41.17	-16.1'	61.0'
16	58°26.72	26.29	41°38.93	8.8'	10°25.08 10°8.94	-16.1'	61.0' 60.9'
17 18	73°26.77 88°26.83	25.64 N17°24.98	56° 6.75 70° 34.66	8.9' 9.0'	10 8.94 N09°52.76	-16.2' -16.2'	60.9'
19	103°26.88	24.32	85°2.65	9.1'	09°36.52	-16.3	60.9'
20	118°26.93	23.67	99°30.72	9.1'	$09^{\circ}20.24$		60.9'
21	133°26.98	· · 23.01	113°58.87	9.2'	09°3.91	-16.4	60.9'
22 23	148°27.04 163°27.09	22.35 21.69	128°27.09 142°55.39	9.3' 9.4'	08°47.55 08°31.14	-16.4' -16.4'	60.8' 60.8'
23	SD = 15.8'	d = -0.6'	142 33.39		D = 16.7'	-10.4	
	<u> </u>	<u>u = -0.0</u>			J = 10.7		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°27.14 193°27.19	N17°21.03 20.37	157°23.77 171°52.22	9.4' 9.5'	N08° 14.70 07° 58.22	-16.5' -16.5'	60.8' 60.8'
2	208°27.25	19.71	186° 20.74	9.6'	07°41.71	-16.5	60.7'
3	223°27.30	• 19.05	200°49.33	9.7'	07°25.17	-16.6'	60.7'
4	238°27.36 253°27.41	18.38	215° 18.00 229° 46.73	9.7'	07°8.60 06°52.01	-16.6'	60.7'
5 6	253°27.41 268°27.47	17.72 N17° 17.06	229° 46.73 244° 15.54	9.8' 9.9'	06°52.01 N06°35.38	-16.6' -16.6'	60.7' 60.6'
7	283°27.52	16.40	258° 44.41	9.9'	06° 18.74	-16.7	60.6
8	298°27.58	15.73	273°13.35	10.0'	$06^{\circ}2.08$	-16.7'	60.6'
9	313°27.63	• • 15.07	287° 42.35	10.1'	05°45.39	-16.7'	60.6'
10 11	328°27.69 343°27.74	14.40 13.74	302°11.42 316°40.54	10.1' 10.2'	05°28.69 05°11.98	-16.7' -16.7'	60.5' 60.5'
11	358°27.80	13.74 N17° 13.07	310 40.54 331°9.73	10.2	N04°55.25	-16.7'	60.5
13	13°27.86	12.41	345°38.99	10.3'	04°38.51	-16.7	60.5
14	28°27.91	11.74	0°8.30	10.4'	04°21.76	-16.8'	60.4'
15	43°27.97	•• 11.07	14°37.66	10.4'	04°5.01	-16.8'	60.4
16 17	58°28.03 73°28.09	10.40 9.74	29°7.09 43°36.57	10.5' 10.5'	03°48.25 03°31.48	-16.8' -16.8'	60.4' 60.3'
18	73 28.09 88°28.14	9.74 N17°9.07	43 30.57 58°6.10	10.5	N03°14.71	-16.8'	60.3
19	103°28.20	8.40	72°35.69	10.6'	02°57.95	-16.8	60.3
20	118°28.26	7.73	87°5.33	10.7'	02°41.18	-16.8'	60.3'
21	133°28.32	· · 7.06	101°35.02	10.7'	02°24.42	-16.8'	60.2'
22 23	148°28.38 163°28.44	6.39 5.72	116°4.76 130°34.54	10.8' 10.8'	02°7.66 01°50.92	-16.7' -16.7'	60.2' 60.2'
23	SD = 15.8'	d = -0.7'			D = 16.6'	20.1	55.2
		<u> </u>		ال			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%	
02	06:20	06:18	12:06	12:11	-:-		
03	06:16	06:14	12:06	13:07	00:40		
04	06:11	06:09	12:06	13:59	01:34		

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

h	Aries	Ven	us	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	313° 19.53		N18°40.13	122°0.81	S04°45.63	158°57.94	N11°35.78	286°31.44	N08° 18.76			
1	328° 22.00	195°6.11	39.35	137°1.88	46.25	173°59.90	35.59	301°33.89	18.76	Alpheratz	357°32.30	29° 14.61
2	343°24.46	210°5.42	38.57	152°2.95	46.88	$189^{\circ}1.86$	35.40	316°36.33	18.75	Ankaa	353°4.82	-42°9.02
3	$358^{\circ}26.92$	225°4.74	• • 37.79	167°4.02	• • 47.51	204°3.83	• • 35.21	331°38.77	• • 18.75	Schedar Diphda	349°28.24 348°44.99	56°41.22 -17°49.85
4	$13^{\circ}29.39$	240°4.05	37.00	182°5.09	48.14	$219^{\circ}5.79$	35.03	$346^{\circ}41.21$	18.75	Achernar	335°18.47	-17 49.85 -57°5.40
5	$28^{\circ}31.85$	255°3.37	36.22	$197^{\circ}6.16$	48.76	234°7.75	34.84	1°43.65	18.74	Hamal	327°48.71	23°35.59
6	43°34.32		N18°35.44	212°7.23	S04°49.39	249° 9.71	N11°34.65	16°46.09	N08° 18.74	Polaris	312°56.72	89°22.47
7	58° 36.78	285°2.00	34.65	227°8.29	50.02	264°11.68	34.46	31°48.53	18.74	Acamar	315°10.19	-40°11.30
8	73°39.25	300°1.32	33.86	242°9.36	50.64	279°13.64	34.27	46°50.97	18.73	Menkar	314°3.93	4°11.99
9	88° 41.71	315°0.64	• • 33.08	257° 10.43	• • 51.27	294°15.60	• • 34.08	61°53.42	• • 18.73	Mirfak	308°25.24	49°57.37
10 11	103° 44.17 118° 46.64	329°59.96 344°59.28	32.29 31.50	272°11.50 287°12.57	51.90 52.53	309°17.56 324°19.52	33.89 33.70	76°55.86 91°58.30	18.72 18.72	Aldebaran	290°37.32	$16^{\circ}33.88$
12	133° 49.10		N18°30.71	302° 13.64	\$04°53.15	339°21.49	N11°33.52	107°0.74	N08° 18.72	Rigel	281°2.02	-8° 10.06
13	148° 51.57	14° 57.92	29.92	317° 14.70	53.78	354°23.45	33.33	122°3.19	18.71	Capella	280°19.01	46°1.37
14	163°54.03	29°57.24	29.12	332° 15.77	54.41	9°25.41	33.14	137°5.63	18.71	Bellatrix	278°20.80	6°22.52
15	178° 56.49	44°56.56	• • 28.33	347°16.84	• • 55.03	24°27.37	• • 32.95	152°8.07	• • 18.70	Elnath	277°59.40	28°37.76
16	193°58.96	59°55.88	27.54	$2^{\circ}17.91$	55.66	39°29.33	32.76	$167^{\circ}10.52$	18.70	Alnilam	275°35.78	-1°10.98
17	209°1.42	74°55.20	26.74	$17^{\circ}18.97$	56.29	54°31.29	32.57	$182^{\circ}12.96$	18.70	Betelgeuse Canopus	270°50.02 263°51.88	7°24.76 -52°42.41
18	224°3.89		N18°25.95	32°20.04	S04°56.92	69°33.26	N11°32.38	197°15.40	N08° 18.69	Sirius	258°24.65	-16°45.14
19	239°6.35	104°53.84	25.15	47°21.11	57.54	84°35.22	32.19	212°17.85	18.69	Adhara	255°4.52	-29°0.45
20	254°8.81	119°53.17	24.35	62°22.17	58.17	99°37.18	32.00	227°20.29	18.68	Procyon	244°48.92	5°9.27
21	269°11.28	134°52.49	• • 23.56	77°23.24	• • 58.80	114°39.14	• • 31.82	242°22.73	• • 18.68	Pollux	243°15.07	27° 57.53
22	284° 13.74	149°51.82	22.76	92°24.30	04°59.43	129°41.10	31.63	257°25.18	18.67	Avior	234°14.49	-59°35.83
23	299°16.21	164°51.14	21.96	107°25.37	05°0.05	144°43.06	31.44	272°27.62	18.67	Suhail	222°45.17	-43°32.66
Mer.	pass. 03:06	ν -0.7′ d-0.8	8′ m-3.92	u 1.1' d0	.6′ m1.27	ν 2.0′ d-0	.2′ m-1.72	ν 2.4′ d-0	0.0′ m0.46	Miaplacidus	221°38.73	-69°49.87
										Alphard	217°45.98	-8°46.70
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.49	11°49.96
0	314° 18.67		N18°21.15	122°26.43	S05°0.68	159°45.03	N11°31.25	287°30.07	N08° 18.66	Dubhe	193°39.03	61°36.24
1	329° 21.13	194°49.79	20.35	137° 27.50	1.31	174°46.99	31.06	302°32.51	18.66	Denebola	182°23.01	14°25.12
2	344°23.60	209°49.12	19.55	152° 28.56	1.93	189°48.95	30.87	317°34.96	18.65	Gienah	175°41.58	-17°41.79 -63°15.40
3	359°26.06	224°48.44	• • 18.75	167°29.63	• • 2.56	204°50.91	• • 30.68	332°37.40	• • 18.65		172°58.05 171°49.54	-63 15.40 -57°16.32
4	$14^{\circ}28.53$	239°47.77	17.94	182°30.69	3.19	219°52.87	30.49	347°39.85	18.64	Alioth	166°11.41	55°48.80
5	29°30.99	254°47.10	17.14	197°31.76	3.82	234°54.83	30.30	2°42.29	18.64	Spica	158°20.15	-11° 18.36
6	44° 33.45		N18°16.33	212°32.82	S05°4.44	249°56.79	N11°30.11	17°44.74	N08° 18.63	Alkaid	152°50.47	49° 10.75
7	59° 35.92	284° 45.75	15.52	227°33.89	5.07	264°58.75	29.92	32°47.18	18.63	Hadar	148°33.02	-60°30.64
8	74° 38.38	299° 45.08	14.71	242°34.95	5.70	280° 0.72	29.73	47°49.63	18.62	Menkent	147°55.13	$-36^{\circ}30.51$
9	89°40.85	314° 44.41	• • 13.90	257°36.01	• • 6.33	295°2.68	• • 29.54	62°52.08	18.62	Arcturus	$145^{\circ}46.01$	19°2.45
10 11	104° 43.31 119° 45.77	329°43.74 344°43.07	13.09 12.28	272°37.08 287°38.14	6.95 7.58	310° 4.64 325° 6.60	29.36 29.17	77°54.52 92°56.97	18.61 18.61	Rigil Kent.	139°37.33	-60° 57.24
12	134° 48.24		N18°11.47	302°39.20	\$05°8.21	340° 8.56	N11°28.98	107°59.42	N08° 18.60	Kochab	137°19.90	74°2.76
13	149°50.70	14°41.73	10.66	317°40.27	8.84	355°10.52	28.79	123°1.86	18.59	Zuben'ubi		-16°9.43
14	164°53.17	29°41.07	9.85	332°41.33	9.46	10°12.48	28.60	138°4.31	18.59	Alphecca	126°1.86	26°37.49
15	179°55.63	44°40.40	• • 9.03	347°42.39	• • 10.09	25°14.44	• • 28.41	153°6.76	• • 18.58	Antares	112°13.04	-26°29.62
16	194°58.09	59°39.73	8.22	2°43.45	10.72	40°16.40	28.22	168°9.20	18.58	Atria Sabik	107°4.99 102°0.12	-69°4.79 -15°45.50
17	$210^{\circ}0.56$	74°39.06	7.40	$17^{\circ}44.51$	11.35	55°18.36	28.03	183°11.65	18.57	Shaula	96°7.18	-37°7.45
18	225°3.02	89°38.40	N18° 6.58	32°45.57	S05°11.97	70°20.33	N11°27.84	$198^{\circ}14.10$	N08° 18.57	Rasalhague	95°56.34	12°32.55
19	240°5.49	104°37.73	5.76	47° 46.64	12.60	85°22.29	27.65	213°16.55	18.56	Eltanin	90°40.80	51°29.32
20	255°7.95	119°37.07	4.95	62°47.70	13.23	100°24.25	27.46	228°18.99	18.55	Kaus Aust.	83°29.36	-34°22.25
21	270° 10.42	134°36.40	• • 4.13	77°48.76	. 13.86	115°26.21	• • 27.27	243°21.44	• • 18.55	Vega	80°31.42	38°48.75
22	285°12.88	149°35.74	3.31	92°49.82	14.48	130°28.17	27.08	258°23.89	18.54	Nunki	75°44.79	$-26^{\circ}15.65$
23	300°15.34	164°35.07	2.48	107°50.88	15.11	145°30.13	26.89	273°26.34	18.53	Altair	61°57.55	8°56.64
Mer.	pass. 03:02	ν -0.7' d-0.8	8′ m-3.92	u 1.1' d0	.6′ m1.27	ν 2.0′ d-0	.2′ m-1.72	ν 2.4′ d-0	1.0' m 0.45	Peacock	53°1.81	-56° 38.64
				-				-		Deneb	49°23.86	45°22.85
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.37	10°0.26
0 0	315° 17.81	179°34.41	N18° 1.66	122°51.94		160°32.09	N11°26.70	288°28.79	N08° 18.53	Al Na'ir	27°29.83 15°11.87	-46°49.39 -29°28.29
1	330° 20.27	194°33.75	0.84	137° 53.00	16.37	175°34.05	26.51	303°31.24	18.52	Fomalhaut Scheat	15°11.87 13°42.81	-29° 28.29 28° 14.04
2	345° 22.74	209°33.08	18°0.01	152°54.06	16.99	190°36.01	26.32	318°33.69	18.52	Markab	13 42.61 13°27.48	26 14.04 15°21.36
3	0°25.20	224°32.42	$17^{\circ}59.19$	167°55.12	• • 17.62	205°37.97	• • 26.13	333°36.14	• 18.51			
4	15° 27.66	239°31.76	58.36	182°56.18	18.25	220°39.93	25.94	348°38.59	18.50	Aug 05 Thu	SHA	Mer.pass
5	30°30.13	254°31.10	57.54	197°57.24	18.88	235°41.89	25.75	3°41.03	18.50		226°47.26	12:00
6	45° 32.59		N17°56.71	212°58.30	S05°19.50	250°43.85	N11°25.56	18°43.48	N08° 18.49		168°41.27	15:51
7	60°35.06	284° 29.78	55.88	227°59.36	20.13	265°45.81	25.37	33°45.93	18.48	Jupiter	205°38.41	13:22
8 9	75° 37.52 90° 39.98	299°29.12 314°28.46	55.05	243°0.41 258°1.47	20.76	280°47.77 295°49.73	25.18	48°48.38 63°50.83	18.48 •• 18.47	Saturn	333°11.91	04:53
10	90° 39.98 105° 42.45	314 28.46 329° 27.80	54.22 53.39	258°1.47 273°2.53	· · 21.39 22.02	295°49.73 310°51.69	· · 24.99 24.80	78°53.28	18.47	Aug 06 Fri	SHA	Mer.pass
11	105 42.45 120°44.91	344°27.14	52.56	273 2.53 288°3.59	22.02	325°53.65	24.60	93°55.74	18.45	Venus	225°31.79	12:01
12	135° 47.38		N17°51.72	303°4.65	S05°23.27	340°55.61		108°58.19	N08° 18.45	Mars	168°7.76	15:49
13	150° 49.84	14° 25.83	50.89	318°5.70	23.90	355°57.57	24.23	124°0.64	18.44	Jupiter	205°26.36	13:19
14	165°52.30	29°25.17	50.06	333°6.76	24.53	10°59.53	24.04	139°3.09	18.43	Saturn	333°11.40	04:49
15	180°54.77	44°24.51	• • 49.22	348°7.82	• • 25.15	26°1.49	• • 23.85	154°5.54	• 18.43	Aug 07 Sat	SHA	Mer.pass
16	195°57.23	59°23.86	48.38	3°8.87	25.78	41°3.45	23.66	169°7.99	18.42		224°16.60	12:02
17	210°59.70	74°23.20	47.55	18°9.93	26.41	56° 5.41	23.47	184°10.44	18.41		$167^{\circ}34.13$	15:47
18	226°2.16		N17°46.71	33°10.99	S05°27.04	71°7.37		199°12.89	N08° 18.40	Jupiter	$205^{\circ}14.28$	13:16
19	241°4.62	104°21.89	45.87	48° 12.04	27.66	86° 9.33	23.09	214°15.35	18.40	Saturn	333°10.98	04:45
20	256°7.09	119°21.24	45.03	63°13.10	28.29	101°11.29	22.90	229°17.80	18.39	Horizon	ntal parallax	
21 22	271°9.55 286°12.02	134°20.58 149°19.93	· · 44.19 43.35	78° 14.16 93° 15.21	· · 28.92	116°13.25 131°15.21	•• 22.71	244°20.25 259°22.70	· · 18.38	11011201	Venus:	0.1
23	301° 14.48	149 19.93 164° 19.28	43.35 42.51	93 15.21 108° 16.27	29.55 30.17	131 15.21 146°17.17	22.52 22.33	259 22.70 274°25.16	18.37 18.36		Mars:	0.1
Mer.	pass. 02:58	ν -0.7′ d-0.8	8′ m-3.92	$\nu^{1.1'} d0$.6′ m1.28	$\nu^{2.0'} d^{-0}$.2′ m-1.72	$\nu^{2.4'} d-0$	0.0′ m0.45			

h	Su	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°28.50	N17°5.05	145°4.38	10.9'	$N01^{\circ}34.17$	-16.7'	60.1'	
1	193°28.56	4.37	159°34.26	10.9'	01°17.44	-16.7'	60.1	
2	208°28.62 223°28.68	3.70 · · 3.03	174°4.18 188°34.15	11.0' 11.0'	01°0.73 00°44.02	-16.7' -16.7'	60.1' 60.0'	
4	238°28.74	2.36	203°4.15	11.0'	00° 44.02	-16.7'	60.0'	
5	253°28.80	1.68	217°34.20	11.1'	N00°10.66	-16.7'	60.0'	
6	268°28.86	$N17^{\circ}1.01$	232°4.29	11.1'	S00°5.99	16.6'	59.9'	
7	283°28.92	17°0.33	246°34.42	11.2'	00°22.62	16.6'	59.9'	
8 9	298°28.98 313°29.04	16°59.66 •• 58.98	261°4.58 275°34.78	11.2' 11.2'	00°39.23 00°55.82	16.6' 16.6'	59.9' 59.8'	
10	313 29.04 328°29.11	58.30	275 34.76 290°5.01	11.2	00 55.62 01°12.38	16.5	59.8'	
11	343°29.17	57.63	304°35.28	11.3'	01°28.92	16.5	59.8'	
12	358°29.23	N16°56.95	319°5.58	11.3'	S01°45.42	16.5'	59.7'	
13	13°29.30	56.27	333°35.91	11.4'	02°1.90	16.4'	59.7'	
14 15	28°29.36 43°29.42	55.59 •• 54.92	348° 6.27 2° 36.65	11.4' 11.4'	02°18.34 02°34.76	16.4' 16.4'	59.7' 59.6'	
16	58°29.49	54.24	2 30.03 17°7.07	11.4	02°51.13	16.3	59.6'	
17	73°29.55	53.56	31°37.51	11.5'	03°7.48	16.3	59.5'	
18	88°29.61	N16°52.88	46°7.97	11.5'	S03°23.78	16.3'	59.5'	
19	103°29.68	52.20	60°38.46	11.5'	03°40.05	16.2'	59.5'	
20 21	118°29.74 133°29.81	51.52 •• 50.83	75°8.97 89°39.51	11.5' 11.6'	03°56.27 04°12.46	16.2' 16.1'	59.4' 59.4'	
22	133 29.81 148°29.87	50.15	104° 10.06	11.6'	04°12.40	16.1	59.4'	
23	163°29.94	49.47	118° 40.63	11.6'	04°44.69	16.1	59.3'	
	SD = 15.8'	d = -0.7'		SI	D = 16.4'			
					_ 10.7			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°30.01 193°30.07	N16°48.79	133°11.22 147°41.83	11.6'	\$05°0.75	16.0'	59.3'	
1 2	193°30.07 208°30.14	48.10 47.42	147°41.83 162°12.45	11.6' 11.6'	05°16.75 05°32.70	16.0' 15.9'	59.2' 59.2'	
3	223°30.21	• • 46.74	176°43.08	11.6'	05°48.61	15.9'	59.2'	
4	238°30.27	46.05	191°13.73	11.7'	06°4.46	15.8'	59.1'	
5	253°30.34	45.37	205°44.39	11.7'	06°20.27	15.7'	59.1'	
6	268°30.41 283°30.48	N16° 44.68	220°15.06 234°45.74	11.7'	\$06°36.01 06°51.71	15.7'	59.1'	
7 8	283°30.48 298°30.54	43.99 43.31	234°45.74 249°16.43	11.7' 11.7'	06°51.71 07°7.34	15.6' 15.6'	59.0' 59.0'	
9	313°30.61	• • 42.62	263°47.13	11.7'	07°22.92	15.5'	58.9'	
10	328°30.68	41.93	$278^{\circ}17.84$	11.7'	07°38.44	15.5'	58.9'	
11	343°30.75	41.24	292°48.55	11.7'	07°53.90	15.4'	58.9'	
12	358°30.82 13°30.89	N16° 40.56 39.87	307°19.26 321°49.98	11.7'	\$08°9.30 08°24.63	15.3' 15.3'	58.8'	
13 14	28°30.96	39.87 39.18	321 49.98 336°20.70	11.7' 11.7'	08°24.63	15.3 15.2'	58.8' 58.7'	
15	43°31.03	• • 38.49	350°51.42	11.7'	08°55.11	15.1'	58.7'	
16	58°31.10	37.80	5°22.14	11.7'	$09^{\circ}10.26$	15.1'	58.7'	
17	73°31.17	37.11	19°52.87	11.7'	09°25.33	15.0'	58.6'	
18 19	88°31.24 103°31.31	N16° 36.42 35.72	34°23.59 48°54.30	11.7' 11.7'	\$09° 40.33 09° 55.27	14.9' 14.9'	58.6' 58.6'	
20	118°31.38	35.72	63° 25.02		10° 10.14	14.8	58.5	
21	133°31.45	• • 34.34	77°55.73	11.7'	10°24.93	14.7'	58.5'	
22	148°31.52	33.65	92°26.43	11.7'	$10^{\circ}39.65$	14.6'	58.4'	
23	163°31.60	32.95	106°57.13	11.7'	10°54.29	14.6'	58.4'	
	SD = 15.8'	d = -0.7'		SI	D = 16.2'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0 0	178°31.67	N16°32.26	121° 27.82	ν 11.7'	\$11°8.87	14.5'	58.4'	
1	193°31.74	31.56	135°58.50	11.7'	$11^{\circ}23.36$	14.4'	58.3'	
2	208°31.81	30.87	150°29.18	11.7'	11°37.78	14.3'	58.3'	
3	223°31.89 238°31.96	30.17	164°59.84	11.7'	11°52.12	14.3'	58.2'	
4 5	238°31.96 253°32.03	29.48 28.78	179°30.49 194°1.13	11.6' 11.6'	12°6.38 12°20.56	14.2' 14.1'	58.2' 58.2'	
6	268°32.11	N16°28.08	208°31.76	11.6'	\$12°34.65	14.0'	58.1'	
7	283°32.18	27.39	223°2.38	11.6'	$12^{\circ}48.67$	13.9'	58.1'	
8	298°32.26	26.69	237°32.98	11.6'	13°2.60	13.8'	58.0'	
9 10	313°32.33 328°32.41	· · 25.99 25.29	252°3.57 266°34.14	11.6' 11.6'	13°16.45 13°30.21	13.8' 13.7'	58.0' 58.0'	
11	343°32.48	25.29 24.59	200 34.14 281°4.69	11.5	13°43.89	13.6'	58.0 57.9'	
12	358°32.56	N16°23.89	295° 35.23	11.5'	\$13°57.48	13.5'	57.9'	
13	13°32.63	23.19	310°5.75	11.5'	14° 10.97	13.4'	57.8'	
14	28°32.71	22.49	324°36.25	11.5'	14°24.39	13.3'	57.8'	
15 16	43°32.79 58°32.86	· · 21.79 21.09	339°6.73 353°37.19	11.5' 11.4'	14°37.71 14°50.93	13.2' 13.1'	57.8' 57.7'	
17	73°32.94	20.39	8°7.63	11.4'	14 50.93 15°4.07	13.1	57.7'	
18	88°33.02	N16° 19.69	22°38.05	11.4'	S15°17.11	12.9'	57.6'	
19	103°33.09	18.99	37°8.45	11.4'	15° 30.06	12.9'	57.6'	
20 21	118°33.17 133°33.25	18.28 •• 17.58	51°38.83 66°9.18	11.4' 11.3'	15° 42.92 15° 55.68	12.8' 12.7'	57.6' 57.5'	
21	133°33.25 148°33.33	· · 17.58 16.87	66°9.18 80°39.51	11.3'	15°55.68 16°8.34	12.7' 12.6'	57.5' 57.5'	
23	163°33.41	16.17	95°9.81	11.3'	16°20.90	12.5'	57.5'	
	SD = 15.8'	d = -0.7'		SI	D = 15.9'			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	10-27%	
05	06:06	06:03	12:06	14:49	02:25		
06	06:00	05:57	12:06	15:38	03:14		
07	05:53	05:50	12:06	16:26	04:02		

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	316° 16.95	179°18.63 N17°41.66	123°17.32	161°19.13 N11°22.14	289°27.61 N08°18.36
1	331° 19.41	194°17.97 40.82	138°18.38 31.43	176°21.09 21.95	304°30.06 18.35
2	346° 21.87	209°17.32 39.97	153° 19.43 32.06	191°23.05 21.75	319°32.51 18.34
3	1°24.34	224°16.67 · · 39.13	168° 20.49 · · 32.68	206°25.01 · · 21.56	334°34.97 · · 18.33
4	16° 26.80	239°16.02 38.28	183°21.54 33.31	221°26.97 21.37	349°37.42 18.32
	31° 29.27				
5	31 29.27 46°31.73	254°15.37 37.43 269°14.72 N17°36.58	198°22.59 33.94 213°23.65 \$05°34.57	236°28.93 21.18 251°30.89 N11°20.99	4°39.88 18.32 19°42.33 N08°18.31
6					
7	61°34.19	284°14.07 35.74	228°24.70 35.20	266°32.85 20.80	34°44.78 18.30
8	76°36.66	299°13.43 34.89	243°25.76 35.82	281°34.81 20.61	49°47.24 18.29
9	91°39.12	314°12.78 · · 34.03	258°26.81 · · 36.45	296°36.77 · · 20.42	64°49.69 · · 18.28
10	106°41.59	329°12.13 33.18	273°27.86 37.08	311°38.73 20.23	79°52.15 18.27
11	121°44.05	344°11.48 32.33	288°28.91 37.71	326°40.69 20.04	94°54.60 18.27
12	136°46.51	359°10.84 N17°31.48	303°29.97 S05°38.33	341°42.65 N11°19.85	109°57.06 N08°18.26
13	151°48.98	14°10.19 30.62	318°31.02 38.96	356°44.61 19.66	124°59.51 18.25
14	166°51.44	29°9.55 29.77	333°32.07 39.59	11°46.56 19.47	140°1.97 18.24
15	181°53.91	44°8.90 · · 28.91	348°33.12 · · 40.22	26°48.52 · · 19.28	155°4.42 · · 18.23
16	196°56.37	59°8.26 28.05	3°34.18 40.84	41°50.48 19.08	170°6.88 18.22
17	211°58.84	74°7.61 27.20	18° 35.23 41.47	56°52.44 18.89	185°9.33 18.21
18	227°1.30	89°6.97 N17°26.34	33°36.28 S05°42.10	71°54.40 N11°18.70	200°11.79 N08°18.20
19	242°3.76	104°6.33 25.48	48°37.33 42.73	86°56.36 18.51	215°14.24 18.20
20	257°6.23	119°5.68 24.62	63°38.38 43.36	101°58.32 18.32	230°16.70 18.19
21	272°8.69	134°5.04 · · 23.76	78°39.43 · · 43.98	117°0.28 · · 18.13	245°19.16 · · 18.18
22	287°11.16	149°4.40 22.89	93°40.48 44.61	132°2.24 17.94	260°21.61 18.17
23	302° 13.62	164°3.76 22.03	108°41.53 45.24	147° 4.20 17.75	275°24.07 18.16
	pass. 02:54	ν -0.7' d-0.8' m-3.92	$\nu 1.1' \ d0.6' \ m1.28$	$\nu 2.0' \ d$ -0.2' m-1.72	$\nu 2.5' \ d$ -0.0' m0.44
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$317^{\circ}16.08$	179°3.12 N17°21.17	123°42.58 \$05°45.87	162°6.16 N11°17.56	290°26.53 N08°18.15
1	$332^{\circ}18.55$	194°2.48 20.30	138°43.63 46.49	177° 8.11 17.36	305°28.98 18.14
2	347°21.01	209°1.84 19.44	153°44.68 47.12	192°10.07 17.17	320°31.44 18.13
3	2°23.48	224°1.20 · · 18.57	168° 45.73 · · 47.75	207°12.03 · · 16.98	335°33.90 · · 18.12
4	17° 25.94	239°0.56 17.71	183°46.78 48.38	222°13.99 16.79	350°36.36 18.11
5	32°28.40	253°59.92 16.84	198°47.83 49.00	237°15.95 16.60	5°38.81 18.10
6	47° 30.87	268°59.28 N17°15.97	213°48.88 S05°49.63	252°17.91 N11°16.41	20°41.27 N08°18.09
7	62°33.33	283°58.65 15.10	228°49.93 50.26	267°19.87 16.22	35°43.73 18.08
8	77° 35.80	298°58.01 14.23	243°50.97 50.89		
9	92°38.26	313°57.37 · · 13.36	258° 52.02 · · 51.51	297°23.78 · · 15.83	65°48.65 · · 18.06
10	107°40.73	328° 56.74 12.49	273°53.07 52.14	312°25.74 15.64	80°51.11 18.05
11	122°43.19	343°56.10 11.61	288° 54.12 52.77	327°27.70 15.45	95°53.56 18.04
12	137°45.65	358°55.47 N17°10.74	303°55.17 S05°53.40	342°29.66 N11°15.26	110°56.02 N08°18.03
13	152°48.12	13°54.83 9.87	318°56.21 54.03	357°31.62 15.07	125°58.48 18.02
14	167° 50.58	28°54.20 8.99	333°57.26 54.65	12°33.58 14.88	141°0.94 18.01
15	182°53.05	43°53.56 · · 8.11	348°58.31 · · 55.28	27°35.54 · · 14.69	156°3.40 · · 18.00
16	197°55.51	58°52.93 7.24	3°59.35 55.91	42°37.49 14.49	171°5.86 17.99
17	212°57.97	73°52.30 6.36	19°0.40 56.54	57°39.45 14.30	186°8.32 17.98
18	228°0.44	88°51.67 N17°5.48	34°1.45 S 05°57.16	72°41.41 N11°14.11	201°10.78 N08°17.97
19	243°2.90	103°51.04 4.60	49°2.49 57.79	87°43.37 13.92	216°13.24 17.96
20	258°5.37	118°50.40 3.72	64°3.54 58.42	102°45.33 13.73	231°15.70 17.95
21	273°7.83	133°49.77 · · 2.84	79°4.58 · · 59.05	117°47.29 · · 13.54	246°18.16 · · 17.94
22	288° 10.30	148°49.14 1.96	94°5.63 05°59.67	132°49.24 13.34	261°20.62 17.93
23	303° 12.76	163°48.51 1.07	109°6.67 06°0.30	147°51.20 13.15	276°23.08 17.92
	pass. 02:50	ν-0.6' d-0.9' m-3.92	ν1.0' d0.6' m1.29	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.44
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$318^{\circ}15.22$	178°47.88 N17°0.19	124°7.72 \$06°0.93	162°53.16 N11°12.96	291°25.54 N08°17.91
1	333° 17.69	193°47.26 16°59.31	139°8.76 1.56	177°55.12 12.77	306°28.01 17.89
2	348°20.15	208°46.63 58.42	154°9.81 2.18	192°57.08 12.58	321°30.47 17.88
3	3°22.62	223°46.00 · · 57.54	169° 10.85 · · 2.81	207°59.03 · · 12.38	336°32.93 · · 17.87
4	18° 25.08	238°45.37 56.65	184°11.90 3.44	223°0.99 12.19	351°35.39 17.86
5	33° 27.54	253°44.75 55.76	199°12.94 4.07	238°2.95 12.00	6°37.85 17.85
6	48° 30.01	268°44.12 N16°54.87	214°13.98	253°4.91 N11°11.81	21°40.31 N08°17.84
7	63°32.47	283°43.49 53.98	229°15.03 5.32	268° 6.87 11.62	36°42.78 17.83
8	78° 34.94	298° 42.87 53.09	244°16.07 5.95	283°8.82 11.42	51°45.24 17.82
9	93°37.40	313°42.24 · · 52.20	259° 17.11 · · 6.58	298°10.78 · · 11.23	66°47.70 · · 17.80
10	108° 39.86	328°41.62 51.31	274°18.16 7.21	313°12.74 11.04	81°50.16 17.79
11	106 39.60 123°42.33	343°40.99 50.42	289° 19.20 7.83	328°14.70 10.85	96°52.63 17.78
12	123 42.33 138°44.79	358°40.37 N16°49.52	304°20.24 S06°8.46	343°16.66 N11°10.66	111°55.09 N08°17.77
13	158 44.79 153°47.26	13°39.75 48.63	319° 21.28 9.09		111 55.09 NO8 17.77 126°57.55 17.76
	153°47.26 168°49.72		319°21.28 9.09 334°22.32 9.72		
14					
15	183°52.19	43°38.50 · · 46.84	349°23.37 · · 10.34	28°22.53 · · 10.08	157°2.48 · · 17.73
16	198° 54.65	58° 37.88 45.94	4°24.41 10.97	43°24.49 9.89	172°4.94 17.72
17	213°57.11	73°37.26 45.05	19°25.45 11.60	58°26.44 9.70	187°7.41 17.71
18	228° 59.58	88°36.64 N16°44.15	34°26.49	73°28.40 N11°9.50	202°9.87 N08°17.70
19	244°2.04	103°36.02 43.25	49°27.53 12.85	88°30.36 9.31	217°12.34 17.69
20	259°4.51	118°35.40 42.35	64°28.57 13.48	103°32.32 9.12	232°14.80 17.67
21	274°6.97	133°34.78 •• 41.45	79°29.61 · · 14.11	118°34.27 · · 8.93	247°17.27 · · 17.66
22	289°9.43	148°34.16 40.55	94°30.65 14.74	133°36.23 8.73	262°19.73 17.65
23	$304^{\circ}11.90$	163°33.54 39.64	109°31.69 15.36	148°38.19 8.54	277°22.20 17.64
Mar	pass. 02:47	ν-0.6' d-0.9' m-3.92	ν1.0' d0.6' m1.29	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.43
- ivier.p	Jass. U2.41	ν-υ.υ α-υ. υ III-3. 9 2	ν1.0 d0.0 III1.29	ν2.0 u-0.2 III-1./1	ν2.3 u-0.0 III0.43

Stars SHA

 $357^{\circ}32.29$ 353°4.80

349°28 21

348°44.98

335°18.44

327°48.69

 $312^{\circ}55.00$

315°10.17

 $314^{\circ}3.91$

308°25.21 290°37.30

281°2.00

280°18.99

 $278^{\circ}20.78$

277°59.38

275°35.77

 $270^{\circ}50.00$

263°51.86

258°24.63

255°4.51

244°48.91

 $243^{\circ}15.05$

 $234^{\circ}14.48$

222°45.17

221°38.72

217°45.98 207°32.49

193°39.04

182°23.02

 $175^{\circ}41.59$

172°58.07

 $171^{\circ}49.56$

 $166^{\circ}11.43$

158°20.16

152°50.50

148°33.04

147°55.15

145°46.02

139°37.35

137°19.97

Alpheratz

Ankaa Schedar

Diphda Achernar

Hamal

Polaris

Acamar

Menkar

Mirfak

Capella

Bellatrix

Elnath

Alnilam

Betelgeuse

Canopus

Sirius

Adhara

Procyon

Miaplacidus

Pollux

Avior Suhail

Alphard

Regulus

Dubhe Denebola

Gienah

Acrux

Gacrux

Alioth

Spica

Alkaid

Hadar

Menkent

Arcturus

Kochab

Rigil Kent.

Zuben'ubi

Aldebaran Rigel

Dec 29°14.63

-42°9.02

56°41 23 -17°49.85

 $-57^{\circ}5.41$

 $23^{\circ}35.59$

89°22.47

-40°11.30

49°57.37

16°33.89

-8°10.06

46°1.37

 $6^{\circ}22.53$

28°37.76

-1°10.98

 $7^{\circ}24.76$

-52°42.39

-16°45.13

-29°0.44

 $27^{\circ}57.52$

-59° 35.82

-43°32.64 -69°49.86

-8°46.69

11°49.96

 $61^{\circ}36.23$

 $14^{\circ}25.12$

-17°41.78

-63°15.39

-57°16.31

55°48.80

-11°18.36

49°10.75 -60°30.64

-36°30.50

 $19^{\circ}2.45$

 $74^{\circ}2.76$

-16°9.42

26°37.49

-26°29.62

-69°4.80

-15°45.50

 $-37^{\circ}7.45$

 $12^{\circ}32.56$

51°29.34

-34°22.25

38°48.76

8°56.65

-56° 38.64

45°22.87

-46°49.39

-29°28.29

28°14.05

15°21.37

Mer.pass

12:03

15:46

13:13

04:41

12:04

15:44

13:10

04:37

15:42

13:07

04:34

0.1

0.1

Mer.pass 12:05

Mer.pass

 $10^{\circ}0.27$

-60°57.23

5°9.27

4°11.99

h	Su	Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.48	$N16^{\circ}15.46$	$109^{\circ}40.09$	11.3'	S 16°33.37	12.4'	57.4'
1	193°33.56	14.76	124° 10.35	11.2'	16°45.74	12.3'	57.4'
2	208°33.64 223°33.72	14.05 •• 13.35	138° 40.57 153° 10.78	11.2' 11.2'	16° 58.00 17° 10.17	12.2' 12.1'	57.3' 57.3'
4	238°33.80	12.64	167° 40.95	11.1'	17°22.23	12.0'	57.3'
5	253°33.88	11.93	$182^{\circ}11.10$	11.1'	$17^{\circ}34.19$	11.9'	57.2'
6	268°33.96	N16°11.23	196°41.22	11.1'	\$17°46.05	11.8'	57.2'
7 8	283°34.04 298°34.12	10.52 9.81	211°11.31 225°41.38	11.1' 11.0'	17°57.81 18°9.45	11.6' 11.5'	57.2' 57.1'
9	313°34.20	9.10	240°11.41	11.0'	18° 21.00	11.4	57.1
10	328°34.29	8.39	254°41.42	11.0'	$18^{\circ}32.43$	11.3'	57.0'
11	343°34.37	7.68	269°11.40 283°41.34	10.9'	18° 43.76	11.2'	57.0'
12 13	358°34.45 13°34.53	N16°6.97 6.26	283°41.34 298°11.26	10.9' 10.9'	\$18°54.98 19°6.09	11.1' 11.0'	57.0' 56.9'
14	28°34.61	5.55	312°41.15	10.9'	19° 17.10	10.9'	56.9'
15	43°34.70	• • 4.84	327°11.00	10.8'	19°27.99	10.8'	56.9'
16	58°34.78 73°34.86	4.12	341° 40.83 356° 10.62	10.8'	19° 38.77 19° 49.44	10.7'	56.8'
17 18	73 34.86 88°34.95	3.41 N16°2.70	10°40.38	10.8' 10.7'	S19°59.99	10.6' 10.4'	56.8' 56.8'
19	103°35.03	1.99	25° 10.12	10.7'	20° 10.43	10.3'	56.7'
20	118°35.11	1.27	39°39.82	10.7'	20°20.76	10.2'	56.7'
21	133°35.20	16°0.56	54°9.48	10.6'	20°30.97 20°41.07	10.1'	56.7'
22 23	148°35.28 163°35.37	15°59.84 59.13	68°39.12 83°8.73	10.6' 10.6'	20°41.07 20°51.05	10.0' 9.9'	56.6' 56.6'
	SD = 15.8'	d = -0.7'			0 = 15.7'		
	JD — 13.0	u — -0.1		JL	7 — 13.1		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.45	N15° 58.41	97°38.30	10.5'	\$21°0.92	9.7'	56.5'
1 2	193°35.54 208°35.62	57.70 56.98	112°7.84 126°37.35	10.5' 10.5'	21°10.67 21°20.30	9.6' 9.5'	56.5' 56.5'
3	200 35.02 223°35.71	. 56.26	141°6.83	10.5	21°29.81	9.5 9.4'	56.4'
4	238°35.79	55.54	$155^{\circ}36.27$	10.4'	21°39.20	9.3'	56.4'
5	253°35.88	54.83	170°5.69	10.4	21°48.47	9.2'	56.4'
6 7	268°35.97 283°36.05	N15°54.11 53.39	184°35.07 199°4.42	10.4' 10.3'	\$21°57.62 22°6.65	9.0' 8.9'	56.3' 56.3'
8	298°36.14	52.67	213°33.74	10.3'	22° 15.56	8.8'	56.3'
9	313°36.23	•• 51.95	228°3.03	10.3'	$22^{\circ}24.34$	8.7'	56.2'
10	328°36.32	51.23	242°32.28	10.2'	22°33.01 22°41.55	8.5'	56.2'
11 12	343°36.40 358°36.49	50.51 N15°49.79	257°1.51 271°30.70	10.2' 10.2'	522°49.96	8.4' 8.3'	56.2' 56.1'
13	13°36.58	49.07	285°59.87	10.1'	22° 58.25	8.2'	56.1'
14	28°36.67	48.35	$300^{\circ}29.00$	10.1'	$23^{\circ}6.41$	8.0'	56.1'
15	43°36.76 58°36.85	• • 47.62	314°58.11 329°27.18	10.1'	23°14.45 23°22.37	7.9'	56.1'
16 17	73°36.94	46.90 46.18	343°56.23	10.0' 10.0'	23 22.37 23°30.15	7.8' 7.7'	56.0' 56.0'
18	88°37.03	N15°45.45	358° 25.24	10.0'	S23°37.81	7.5'	56.0'
19	103°37.12	44.73	12°54.23	10.0'	23°45.34	7.4'	55.9'
20 21	118°37.21 133°37.30	44.01 •• 43.28	27°23.19 41°52.12	9.9' 9.9'	23°52.74 24°0.02	7.3' 7.1'	55.9' 55.9'
22	133 37.30 148°37.39	42.56	56°21.03	9.9 9.9'	24 0.02 24°7.16	7.1 7.0'	55.8'
23	163°37.48	41.83	70°49.91	9.9'	24° 14.18	6.9'	55.8'
	SD = 15.8'	d = -0.7'		SE	0 = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d 6.0'	HP
0 1	178°37.57 193°37.66	N15°41.10 40.38	85° 18.76 99° 47.58	9.8' 9.8'	\$24°21.06 24°27.82	6.8' 6.6'	55.8' 55.8'
2	208°37.75	39.65	114° 16.38	9.8'	24° 34.44	6.5	55.7'
3	223°37.84	• • 38.92	128°45.16	9.8'	24°40.93	6.4	55.7'
4 5	238°37.94 253°38.03	38.19 37.47	143° 13.91 157° 42.64	9.7' 9.7'	24° 47.29 24° 53.52	6.2' 6.1'	55.7' 55.6'
6	268°38.12	N15° 36.74	157 42.04 172°11.34	9.7'	24 53.52 \$24°59.61	6.0'	55.6'
7	283°38.22	36.01	$186^{\circ}40.02$	9.7'	$25^{\circ}5.58$	5.8'	55.6'
8	298°38.31	35.28	201°8.68	9.6'	25°11.41	5.7'	55.6'
9 10	313°38.40 328°38.50	· · 34.55 33.82	215°37.32 230°5.94	9.6' 9.6'	25°17.10 25°22.66	5.6' 5.4'	55.5' 55.5'
11	343°38.59	33.82	230 5.94 244°34.54	9.6' 9.6'	25° 28.09	5.4 5.3'	55.5'
12	358°38.68	N15°32.36	259°3.12	9.6'	S25°33.38	5.2'	55.4'
13	13°38.78	31.62	273°31.68	9.5'	25° 38.54	5.0'	55.4'
14 15	28°38.87 43°38.97	30.89 · · 30.16	288°0.23 302°28.76	9.5' 9.5'	25° 43.57 25° 48.45	4.9' 4.8'	55.4' 55.4'
16	45° 39.06	29.43	316° 57.27	9.5' 9.5'	25° 53.21	4.6'	55.3'
17	73°39.16	28.69	331°25.77	9.5'	25°57.82	4.5'	55.3'
18	88°39.26	N15° 27.96	345°54.25	9.5'	\$26°2.30	4.3'	55.3'
19 20	103°39.35 118°39.45	27.22 26.49	0°22.72 14°51.17	9.5' 9.4'	26°6.65 26°10.85	4.2' 4.1'	55.3' 55.2'
21	133°39.54	25.75	29° 19.62	9.4' 9.4'	26° 14.92	4.1 3.9'	55.2'
22	148°39.64	25.02	43°48.05	9.4'	$26^{\circ}18.86$	3.8'	55.2'
23	163°39.74	24.28	58°16.48	9.4'	26°22.65	3.7'	55.2'
	SD = 15.8'	d = -0.7'		SE	0 = 15.2'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-58%	
08	05:46	05:42	12:06	17:16	04:51		
09	05:38	05:34	12:06	18:07	05:41		
10	05:30	05:25	12:05	18:58	06:32		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
	319° 14.36	178°32.93 N16°38.7		163°40.15 N11°8.35	292°24.66 N08°17.63	эпа
0	334° 16.83					Alpheratz 357°32.26
1 2	349° 19.29	193°32.31 37.8 208°31.69 36.9		178°42.10 8.16 193°44.06 7.96	307°27.13 17.61 322°29.59 17.60	Ankaa 353° 4.78
3	4°21.76	208 31.09		208°46.02 · · 7.77	337°32.06 · · 17.59	Schedar 349°28.17
4	19°24.22	238°30.46 35.1		203°47.98 7.58	352°34.52 17.58	Diphda 348°44.95
5	34°26.68	253°29.84 34.2		238°49.93 7.39	7°36.99 17.56	Achernar 335°18.41
6	49°29.15	268°29.23 N16°33.3		253°51.89 N11°7.19	22°39.45 N08°17.55	Hamal 327°48.66
7	64°31.61	283°28.61 32.4	_	268°53.85 7.00	37°41.92 17.54	Polaris 312°53.15
8	79°34.08	298°28.00 31.4		283°55.81 6.81	52°44.39 17.52	Acamar 315°10.14
9	94°36.54	313°27.39 · · 30.5		298°57.76 · · 6.62	67°46.85 · · 17.51	Menkar 314° 3.89
10	109°39.00	328° 26.77 29.6	7 274°43.12 22.26	313°59.72 6.42	82°49.32 17.50	Mirfak 308°25.17
11	124°41.47	343°26.16 28.7	5 289°44.15 22.89	329° 1.68 6.23	97°51.79 17.49	Aldebaran 290°37.27 Rigel 281°1.97
12	139°43.93	358°25.55 N16°27.8	4 304°45.19 \$06°23.52	344°3.63 N11°6.04	112°54.26 N08°17.47	Rigel 281°1.97 Capella 280°18.95
13	154°46.40	13°24.94 26.9	3 319°46.23 24.15	359° 5.59 5.85	127°56.72 17.46	Bellatrix 278°20.76
14	169°48.86	28°24.33 26.0		14°7.55 5.65	142°59.19 17.45	Elnath 277°59.36
15	184°51.33	43°23.72 · · 25.1		29° 9.51 · · 5.46	158°1.66 · · 17.43	Alnilam 275°35.74
16	199°53.79	58°23.11 24.1		44°11.46 5.27	173°4.13 17.42	Betelgeuse 270°49.98
17	214°56.25	73°22.50 23.2		59°13.42 5.08	188°6.59 17.41	Canopus 263°51.84
18	229°58.72	88°21.89 N16°22.3		74°15.38 N11°4.88	203°9.06 N08°17.39	Sirius 258°24.61
19	245°1.18	103°21.28 21.4		89°17.33 4.69	218°11.53 17.38	Adhara 255° 4.49
20	260°3.65 275°6.11	118°20.67 20.5		104°19.29 4.50 119°21.25 · · 4.30	233°14.00 17.36	Procyon 244°48.89
21 22	275 0.11 290°8.58	133°20.06 · · 19.5 148°19.45 18.6	_	119°21.25 · · 4.30 134°23.20 4.11	248°16.47 · · 17.35 263°18.94 17.34	Pollux 243°15.04
23	305° 11.04	148°19.45 18.6 163°18.85 17.7		149°25.16 3.92	263°18.94 17.34 278°21.41 17.32	Avior 234°14.47
	303 11.04		_			Suhail 222°45.16
Mer.p	pass. 02:43	ν -0.6' d-0.9' m-3.9	$\nu 1.0' \ d0.6' \ m1.29$	ν 2.0′ <i>d</i> -0.2′ m-1.71	$\nu 2.5' \ d$ -0.0' m0.43	Miaplacidus 221°38.72
						Alphard 217° 45.97
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.48
0	320° 13.50	178°18.24 N16°16.8		164°27.12 N11°3.72	293°23.87 N08°17.31	Dubhe 193°39.05
1	335° 15.97	193°17.64 15.9		179°29.07 3.53	308°26.34 17.30	Denebola 182°23.02
2	350° 18.43	208°17.03 14.9		194°31.03 3.34	323°28.81 17.28	Gienah 175°41.59
3	5°20.90	223°16.42 · · 14.0		209°32.99 · · 3.15	338°31.28 · · 17.27	Acrux 172°58.08
4	20°23.36	238°15.82 13.1		224°34.94 2.95	353°33.75 17.25	Gacrux 171°49.57
5	35°25.82	253°15.22 12.2	L 200°2.79 34.18	239°36.90 2.76	8°36.22 17.24	Alioth 166°11.45 Spica 158°20.17
6	50°28.29	268°14.61 N16°11.2	3 215°3.82 \$06°34.81	254°38.86 N11°2.57	23°38.69 N08°17.23	Alkaid 152°50.51
7	65°30.75	283°14.01 10.3		269°40.81 2.37	38°41.16 17.21	Hadar 148°33.06
8	80°33.22	298°13.41 9.4	3 245°5.89 36.06	284°42.77 2.18	53°43.63 17.20	Menkent 147°55.16
9	95°35.68	313°12.80 · · 8.5		299°44.73 · · 1.99	68°46.11 · · 17.18	Arcturus 145°46.03
10	110°38.15	328°12.20 7.5		314°46.68 1.79	83°48.58 17.17	Rigil Kent. 139°37.37
11	125°40.61	343°11.60 6.6		329°48.64 1.60	98°51.05 17.15	Kochab 137°20.03
12	140°43.07	358°11.00 N16°5.7		344°50.60 N11°1.41	113°53.52 N08°17.14	Zuben'ubi 136°53.65
13	155° 45.54	13°10.40 4.7		359°52.55 1.21	128°55.99 17.12	Alphecca 126°1.89
14	170°48.00	28°9.80 3.8		14°54.51 1.02	143°58.46 17.11	Antares 112°13.06
15	185° 50.47	43°9.20 · · 2.9		29°56.47 · · 0.83	159°0.93 · · 17.09	Atria 107° 5.04
16 17	200° 52.93 215° 55.39	58°8.60 1.9 73°8.00 1.0		44°58.42 0.63 60°0.38 0.44	174°3.41 17.08 189°5.88 17.06	Sabik 102°0.14
18	230° 57.86	88°7.41 N16°0.1		75°2.34 N11°0.25	204°8.35 N08°17.05	Shaula 96°7.20
19	246°0.32	103°6.81 15°59.1		90°4.29 11°0.05	219°10.82 17.03	Rasalhague 95°56.35
20	261°2.79	118°6.21 58.2	_	105°6.25 10°59.86	234°13.29 17.02	Eltanin 90°40.83
21	276°5.25	133°5.62 · · 57.2		120° 8.20 · · 59.67	249°15.77 · · 17.00	Kaus Aust. 83°29.37
22	291°7.72	148°5.02 56.3	_	135°10.16 59.47	264°18.24 16.99	Vega 80°31.44
23	$306^{\circ}10.18$	163°4.42 55.4	l 110°21.35 45.47	150°12.12 59.28	279°20.71 16.97	Nunki 75°44.80 Altair 61°57.55
1/1044	pass. 02:39	ν-0.6' d-0.9' m-3.9	$\nu 1.0' \ d0.6' \ m1.30$	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.42	Peacock 53°1.81
ivier.p	pass. 02:39	ν-0.0 a-0.9 m-3.9		V2.0 d-0.2 M-1.71	ν2.5 <i>a</i> -0.0 mo.42	Deneb 49°23.86
						Enif 33°36.36
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.80
0	321°12.64	178°3.83 N15°54.4		165°14.07 N10°59.09	294°23.19 N08°16.96	Fomalhaut 15°11.84
1	336° 15.11	193°3.23 53.5		180°16.03 58.89	309°25.66 16.94	Scheat 13°42.78
2	351° 17.57	208°2.64 52.5		195°17.99 58.70	324°28.13 16.93	Markab 13°27.45
3	6°20.04	223°2.05 · · 51.6		210°19.94 · · 58.51	339°30.61 · · 16.91	Aug 11 Wed SHA
4 5	21°22.50 36°24.96	238°1.45 50.7 253°0.86 49.7		225°21.90 58.31 240°23.85 58.12	354°33.08 16.90 9°35.56 16.88	Venus 219°18.56
6	50° 24.90 51° 27.43	268°0.27 N15°48.8		255°25.81 N10°57.92	24°38.03 N08°16.86	Mars 165°18.37
7	66°29.89	282°59.68 47.8		270°27.77 57.73	39°40.51 16.85	Jupiter 204°25.78
8	81°32.36	297°59.08 46.9		285°29.72 57.54	54°42.98 16.83	Saturn 333°10.30
9	96°34.82	312°58.49 · · 45.9		300°31.68 · · 57.34	69°45.45 · · 16.82	
10	111°37.29	327°57.90 45.0		315°33.63 57.15	84°47.93 16.80	Aug 12 Thu SHA
11	126°39.75	342°57.31 44.0		330°35.59 56.96	99°50.40 16.79	Venus 218° 4.74
12	141°42.21	357°56.72 N15°43.1		345°37.55 N10°56.76	114°52.88 N08°16.77	Mars 164°44.12
13	156° 44.68	12°56.13 42.1	_	0°39.50 56.57	129°55.36 16.75	Jupiter 204°13.61
14	171°47.14	27°55.55 41.2		15°41.46 56.37	144°57.83 16.74	Saturn 333°10.37
15	$186^{\circ}49.61$	42°54.96 · · 40.2		30°43.41 · · 56.18	160°0.31 · · 16.72	Aug 13 Fri SHA
16	$201^{\circ}52.07$	57°54.37 39.3		45°45.37 55.99	175°2.78 16.70	Venus 216°51.19
17	216° 54.53	72°53.78 38.3		60°47.32 55.79	190°5.26 16.69	Mars 164°9.74
18	231°57.00	87°53.20 N15°37.4		75°49.28 N10°55.60	205°7.74 N08°16.67	Jupiter 204°1.43
19	246°59.46	102°52.61 36.4		90°51.24 55.41	220°10.21 16.65	Saturn 333°10.54
20	262°1.93	117°52.02 35.5		105°53.19 55.21	235°12.69 16.64	Horizontal parallax
21	277°4.39	132°51.44 · · 34.5		120°55.15 · · 55.02	250°15.17 · · 16.62	Venus:
22	292°6.86	147°50.85 33.5		135°57.10 54.82	265°17.64 16.60	Mars:
23	307°9.32	162°50.27 32.6		150°59.06 54.63	280°20.12 16.59	iviui3.
Mer.p	pass. 02:35	ν -0.6′ d -0.9′ m-3.9	$\nu 1.0' \ d0.6' \ m1.30$	$\nu 2.0' \ d$ -0.2' m-1.71	$ u 2.5' \ d$ -0.0' m0.42	

Dec

29°14.64

-42°9.02

56°41 25

-17°49.84

-57°5.41

 $23^{\circ}35.60$

89°22.47

-40°11.29

4°12.00 49°57.38

16°33.89 -8°10.05

 $46^{\circ}1.37$

 $6^{\circ}22.53$

28°37.76

 $-1^{\circ}10.97$

 $7^{\circ}24.76$

-52°42.38 -16°45.12

-29°0.43 $5^{\circ}9.27$

 $27^{\circ}57.52$

-59°35.81

-43°32.63

-69°49.84

-8°46.69 11°49.95

 $61^{\circ}36.21$

 $14^{\circ}25.12$

-17°41.78

-63°15.39

-57°16.31

55°48.79

-11°18.35

49°10.74

-60°30.63

-36°30.50

 $19^{\circ}2.45$

-60°57.23

 $74^{\circ}2.76$

-16°9.42

26°37.50 -26°29.62

-69°4.80

-15°45.49

 $\text{-}37^{\circ}7.45$

 $12^{\circ}32.57$

51°29.35

-34°22.25

38°48.77

 $-26^{\circ}15.65$

-56°38.65

 $45^{\circ}22.89$

 $10^{\circ}0.28$

-46°49.40

-29°28.29 28°14.07

15°21.38

Mer.pass

12:06

15:41

13:04

04:30

12:07

15:39

13:00

04:26

12:08

15:37

12:57

04:22

0.1

0.1

Mer.pass

Mer.pass

8°56.66

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.84	$N15^{\circ}23.55$	72°44.89	9.4'	S26°26.31	3.5'	55.1'
1	193°39.93	22.81	87° 13.30	9.4'	26°29.84	3.4'	55.1'
2 3	208°40.03 223°40.13	22.07 •• 21.33	101°41.70 116°10.10	9.4' 9.4'	26° 33.22 26° 36.47	3.2' 3.1'	55.1' 55.1'
4	238°40.23	20.60	130°38.48	9.4'	26°39.58	3.0'	55.1'
5	253°40.33	19.86	145°6.87	9.4'	26°42.55	2.8'	55.0'
6 7	268°40.43 283°40.52	N15° 19.12 18.38	159°35.25 174°3.63	9.4' 9.4'	\$26°45.38 26°48.08	2.7' 2.6'	55.0' 55.0'
8	298°40.62	17.64	188°32.01	9.4' 9.4'	26°50.64	2.4	55.0'
9	313°40.72	• • 16.90	203°0.39	9.4'	26°53.06	2.3'	54.9'
10	328°40.82	16.16	217°28.76	9.4'	26°55.34	2.1'	54.9'
11 12	343°40.92 358°41.02	15.42 N15° 14.68	231°57.14 246°25.53	9.4' 9.4'	26° 57.48 \$26° 59.49	2.0' 1.9'	54.9' 54.9'
13	13°41.12	13.93	260°53.91	9.4'	27°1.36	1.7'	54.9'
14	28°41.23	13.19	275°22.31	9.4'	27°3.09	1.6'	54.8'
15 16	43°41.33 58°41.43	· · 12.45 11.71	289°50.70 304°19.11	9.4' 9.4'	27°4.68 27°6.14	1.5' 1.3'	54.8' 54.8'
17	73°41.53	10.96	318° 47.52	9.4 9.4'	27°7.45	1.2'	54.8'
18	88°41.63	N15° 10.22	333° 15.95	9.4'	S27°8.63	1.0'	54.8'
19	103°41.73	9.47	347°44.38	9.4'	27°9.67	0.9'	54.7'
20 21	118°41.84 133°41.94	8.73 • • 7.98	2°12.82 16°41.28	9.5' 9.5'	27° 10.58 27° 11.35	0.8' 0.6'	54.7' 54.7'
22	133 41.94 148°42.04	7.24	31°9.75	9.5' 9.5'	27°11.33	0.6	54.7'
23	163°42.14	6.49	45°38.23	9.5'	27° 12.47	0.4'	54.7'
	SD = 15.8′	d = -0.7'		SD	= 15.0'		
TI	CLIA	De-	CUA		D	.i	шп
Thu 0	GHA 178° 42.25	Dec N15°5.75	GHA 60°6.73	u 9.5'	Dec 527° 12.83	<i>d</i> 0.2'	HP 54.6'
1	193°42.35	5.00	74°35.25	9.5'	27° 13.05	0.1	54.6'
2	208°42.46	4.25	89°3.78	9.6'	27°13.13	-0.1'	54.6'
3 4	223°42.56 238°42.66	· · 3.50 2.76	103°32.33 118°0.91	9.6' 9.6'	27°13.08 27°12.89	-0.2' -0.3'	54.6' 54.6'
5	253°42.77	2.70	132°29.50	9.6'	27°12.59	-0.5'	54.6'
6	268°42.87	N15°1.26	146°58.12	9.6'	S27°12.11	-0.6'	54.5'
7	283°42.98	15°0.51	161°26.75	9.7'	27°11.51	-0.7'	54.5'
8 9	298°43.08 313°43.19	14°59.76 •• 59.01	175°55.42 190°24.10	9.7' 9.7'	27° 10.78 27° 9.92	-0.9' -1.0'	54.5' 54.5'
10	328°43.30	58.26	204°52.82	9.7'	27°8.92	-1.1'	54.5
11	343°43.40	57.51	219°21.56	9.8'	27°7.79	-1.3'	54.5'
12	358°43.51 13°43.62	N14° 56.75 56.00	233°50.33 248°19.12	9.8' 9.8'	\$27°6.53 27°5.13	-1.4' -1.5'	54.5' 54.4'
13 14	28°43.72	55.25	248 19.12 262°47.95	9.8 9.9'	27° 3.60	-1.5 -1.7'	54.4' 54.4'
15	43°43.83	• • 54.50	277°16.81	9.9'	27°1.93	-1.8'	54.4'
16	58°43.94	53.74	291°45.70	9.9'	27°0.14	-1.9'	54.4'
17 18	73°44.04 88°44.15	52.99 N14° 52.24	306°14.63 320°43.58	10.0' 10.0'	26°58.21 \$26°56.15	-2.1' -2.2'	54.4' 54.4'
19	103°44.26	51.48	335° 12.58	10.0'	26°53.96	-2.3'	54.4
20	118°44.37	50.73	349°41.61		$26^{\circ}51.64$		54.3'
21	133°44.48	· · 49.97 49.22	4° 10.67 18° 39.78	10.1' 10.1'	26° 49.19 26° 46.61	-2.6'	54.3'
22 23	148°44.59 163°44.70	49.22 48.46	33°8.92	10.1	26°43.90	-2.7' -2.8'	54.3' 54.3'
	SD = 15.8'	d = -0.7'			0 = 14.9'		
Fri	GHA 178°44.80	Dec	GHA	ν	Dec	d	HP
0 1	178°44.80 193°44.91	N14° 47.71 46.95	47°38.10 62°7.32	10.2' 10.3'	\$26°41.07 26°38.10	-3.0' -3.1'	54.3' 54.3'
2	208°45.02	46.19	76°36.58	10.3'	$26^{\circ}35.01$	-3.2'	54.3'
3	223°45.13	• • 45.43	91°5.89	10.3'	26°31.79	-3.3'	54.3'
4 5	238°45.24 253°45.36	44.68 43.92	105°35.24 120°4.63	10.4' 10.4'	26°28.45 26°24.97	-3.5' -3.6'	54.2' 54.2'
6	268°45.47	N14° 43.16	134°34.07	10.4	\$26°21.38	-3.7'	54.2'
7	283°45.58	42.40	149°3.55	10.5'	26° 17.65	-3.8'	54.2'
8 9	298°45.69 313°45.80	41.64 •• 40.88	163°33.07 178°2.65	10.6' 10.6'	26°13.81 26°9.84	-4.0' -4.1'	54.2' 54.2'
10	313°45.80 328°45.91	40.12	178° 2.65 192° 32.27	10.6	26° 5.75	-4.1' -4.2'	54.2'
11	343°46.02	39.36	207°1.94	10.7'	$26^{\circ}1.53$	-4.3'	54.2'
12	358°46.14	N14°38.60	221°31.66	10.8'	\$25°57.19	-4.5'	54.2'
13 14	13°46.25 28°46.36	37.84 37.07	236°1.43 250°31.25	10.8' 10.9'	25°52.73 25°48.15	-4.6' -4.7'	54.1' 54.1'
15	43°46.47	36.31	265°1.12	10.9'	25°43.45	-4.7 -4.8'	54.1
16	58°46.59	35.55	279°31.04	11.0'	25°38.64	-4.9'	54.1'
17	73°46.70	34.78 N14°34.02	294°1.01	11.0'	25°33.70	-5.1'	54.1'
18 19	88°46.82 103°46.93	N14°34.02 33.26	308°31.03 323°1.11	11.1' 11.1'	\$25°28.64 25°23.47	-5.2' -5.3'	54.1' 54.1'
20	118°47.04	32.49	337°31.25	11.2'	25° 18.18	-5.4'	54.1
21	133°47.16	• • 31.73	352°1.43	11.2'	25° 12.77	-5.5'	54.1'
22 23	148°47.27 163°47.39	30.96 30.20	6°31.67 21°1.97	11.3' 11.4'	25°7.25 25°1.61	-5.6' -5.8'	54.1' 54.1'
23		d = -0.8'				-3.0	54.1
	SD = 15.8'	a = -0.8		SD	0 = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut
N 72°	////	////	02:00	22:04	////	////
N 70°	////	////	02:39	21:27	////	////
68°	////	01:14	03:06	21:01	22:47	////
66°	////	02:03	03:26	20:42	22:02	////
64°	////	02:33	03:42	20:26	21:33	////
62°	01:06	02:55	03:55	20:13	21:12	22:56
60°	01:50	03:13	04:06	20:02	20:55	22:16
N 58°	02:18	03:28	04:16	19:53	20:41	21:49
56°	02:39	03:40	04:24	19:44	20:29	21:29
54°	02:55	03:51	04:32	19:37	20:18	21:13
52°	03:09	04:00	04:39	19:30	20:09	20:59
50°	03:21	04:08	04:45	19:24	20:01	20:47
45°	03:45	04:25	04:58	19:12	19:44	20:24
N 40°	04:03	04:39	05:08	19:01	19:30	20:06
35°	04:18	04:50	05:18	18:52	19:19	19:52
30°	04:30	05:00	05:25	18:44	19:10	19:40
20°	04:49	05:16	05:39	18:31	18:54	19:2
N 10°	05:03	05:29	05:51	18:19	18:41	19:07
0°	05:15	05:40	06:02	18:08	18:30	18:55
S 10°	05:26	05:51	06:12	17:58	18:19	18:45
20°	05:35	06:01	06:24	17:47	18:09	18:35
30°	05:44	06:12	06:37	17:34	17:59	18:27
35°	05:48	06:18	06:44	17:26	17:53	18:23
40°	05:52	06:24	06:53	17:18	17:46	18:18
45°	05:57	06:32	07:02	17:08	17:39	18:14
S 50°	06:02	06:40	07:14	16:57	17:31	18:09
52°	06:04	06:44	07:19	16:51	17:27	18:07
54°	06:06	06:48	07:25	16:45	17:23	18:05
56°	06:08	06:52	07:32	16:39	17:19	18:03
58°	06:10	06:57	07:40	16:31	17:14	18:0
S 60°	06:13	07:03	07:48	16:23	17:09	17:58
Lat.		Moonris	ie .		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri

Lat.		Moonris	е		Moonset	;
Lut.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°						
64°			20:36			22:38
62°	18:51	19:33	19:43	20:49	21:56	23:30
60°	17:59	18:47	19:11	21:41	22:42	•• ••
N 58°	17:28	18:16	18:47	22:13	23:12	
56°	17:04	17:54	18:27	22:37	23:35	•• ••
54°	16:45	17:35	18:11	22:56	23:53	
52°	16:28	17:19	17:57	23:12	•• ••	00:09
50°	16:14	17:05	17:45	23:26		00:22
45°	15:46	16:37	17:19	23:55		00:50
N 40°	15:24	16:15	16:59		00:17	01:12
35°	15:05	15:57	16:42	••••	00:36	01:30
30°	14:49	15:41	16:28	00:02	00:52	01:45
20°	14:23	15:15	16:03	00:28	01:19	02:12
N 10°	14:00	14:52	15:41	00:50	01:42	02:34
0°	13:38	14:30	15:21	01:11	02:03	02:55
S 10°	13:17	14:09	15:01	01:32	02:25	03:16
20°	12:54	13:46	14:39	01:54	02:48	03:38
30°	12:27	13:19	14:14	02:21	03:15	04:04
35° 40°	12:12 11:54	13:03 12:45	13:59 13:42	02:36 02:54	03:31	04:19 04:37
40 45°	11:54	12:45	13:42	02:54	03:49 04:11	04:37 04:58
1						
S 50°	11:04	11:55	12:55	03:43	04:40	05:25
52° 54°	10:50 10:35	11:41 11:25	12:42 12:28	03:56 04:12	04:54 05:10	05:38 05:53
56°	10:35	11:25	12:28	04:12	05:10 05:28	06:10
58°	09:54	10:43	11:50	04:50	05:26	06:10
S 60°	09:34	10:43	11:24	05:21	06:23	06:58
	22.20		<u>_</u> .		22.20	22.00

		Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	68-84%	
11	05:21	05:16	12:05	19:51	07:25		
12	05:11	05:06	12:05	20:43	08:17		
13	05:01	04:55	12:05	21:33	09:08		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	322°11.78	177°49.69 N15°31.67	125°47.02 S 07°1.14	166°1.01 N10°54.43	295°22.60 N08°16.57	
1	337° 14.25	192°49.10 30.71	140°48.05 1.76	181°2.97 54.24	310°25.08 16.55	Alpheratz 357°32.24
2	$352^{\circ}16.71$	207° 48.52 29.75	155°49.07 2.39	196° 4.93 54.05	325°27.55 16.54	Ankaa 353°4.75
3	$7^{\circ}19.18$	222°47.94 · · 28.79	170°50.09 · · 3.02	211°6.88 · · 53.85	340°30.03 · · 16.52	Schedar 349°28.14 Diphda 348°44.93
4	$22^{\circ}21.64$	237° 47.36 27.83	185°51.12 3.64	226° 8.84 53.66	355°32.51 16.50	Achernar 335°18.37
5	$37^{\circ}24.10$	252°46.77 26.87	200°52.14 4.27	241°10.79 53.46	10°34.99 16.49	Hamal 327°48.63
6	52°26.57	267°46.19 N15°25.90	215°53.16 \$07°4.90	256°12.75 N10°53.27	25°37.47 N08°16.47	Polaris 312°51.45
7	67°29.03	282°45.61 24.94	230°54.18 5.52	271°14.70 53.08	40°39.94 16.45	Acamar 315°10.11
8	82°31.50	297°45.03 23.97	245°55.21 6.15	286°16.66 52.88	55°42.42 16.43	Menkar 314°3.86
9	97°33.96	312°44.45 · · 23.01	260°56.23 · · 6.77	301°18.61 · · 52.69	70°44.90 · · 16.42	Mirfak 308°25.14
10	112° 36.43 127° 38.89	327° 43.87 22.04 342° 43.29 21.08	275°57.25 7.40 290°58.27 8.03	316°20.57 52.49	85°47.38 16.40	Aldebaran 290°37.25
11 12	127 38.89 142°41.35	342°43.29 21.08 357°42.72 N15°20.11	290°58.27 8.03 305°59.29 \$07°8.65	331°22.52 52.30 346°24.48 N10°52.10	100°49.86 16.38 115°52.34 N08°16.36	Rigel 281°1.95
13	157°43.82	12°42.14 19.14	321°0.31 9.28	1°26.44 51.91	130°54.82 16.35	Capella 280°18.92
14	172°46.28	27°41.56 18.17	336°1.34 9.91	16°28.39 51.72	145°57.30 16.33	Bellatrix 278°20.73
15	187°48.75	42°40.98 · · 17.20	351°2.36 · · 10.53	31°30.35 · · 51.52	160°59.78 · · 16.31	Elnath 277°59.33
16	202°51.21	57° 40.41 16.23	6°3.38 11.16	46°32.30 51.33	176°2.26 16.29	Alnilam 275°35.72
17	$217^{\circ}53.67$	72°39.83 15.26	21°4.40 11.78	61°34.26 51.13	191°4.74 16.28	Betelgeuse 270°49.95
18	232°56.14	87°39.25 N15°14.29	36°5.42 S07°12.41	76°36.21 N10°50.94	206°7.22 N08°16.26	Canopus 263°51.82 Sirius 258°24.59
19	247°58.60	102°38.68 13.32	51°6.44 13.04	91°38.17 50.74	221°9.70 16.24	Adhara 255° 4.47
20	263°1.07	117°38.11 12.34	66°7.46 13.66	106°40.12 50.55	236°12.18 16.22	Procyon 244°48.87
21	278°3.53	132°37.53 · · 11.37	81°8.48 · · 14.29	121°42.08 · · 50.35	251°14.66 · · 16.20	Pollux 243°15.02
22	293°5.99	147°36.96 10.39	96°9.50 14.91	136°44.03 50.16	266°17.14 16.18	Avior 234°14.45
23	308°8.46	162°36.38 9.42	111°10.51 15.54	151°45.99 49.97	281°19.63 16.17	Suhail 222°45.15
Mer.	pass. 02:31	$\nu\text{-}0.6'~d\text{-}1.0'~\text{m-}3.92$	$\nu 1.0' \ d0.6' \ m1.30$	$\nu 2.0' \ d$ -0.2' m-1.71	$\nu 2.5' \ d\text{-}0.0' \ \text{m}0.41$	Miaplacidus 221°38.71
						Alphard 217°45.96
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.48
0	323° 10.92	177°35.81 N15°8.44	126°11.53	166°47.94 N10°49.77	296°22.11 N08°16.15	Dubhe 193°39.05 Denebola 182°23.02
1	$338^{\circ}13.39$	192°35.24 7.47	141°12.55 16.79	181°49.90 49.58	311°24.59 16.13	Gienah 175°41.60
2	$353^{\circ}15.85$	207°34.67 6.49	156° 13.57 17.42	196°51.85 49.38	326°27.07 16.11	Acrux 172°58.10
3	8° 18.32	222°34.10 · · 5.51	171°14.59 · · 18.04	211°53.81 · · 49.19	341°29.55 · · 16.09	Gacrux 171°49.58
4	23°20.78	237°33.52 4.53	186°15.61 18.67	226°55.76 48.99	356°32.03 16.07	Alioth 166°11.46
5	38° 23.24	252°32.95 3.55	201°16.62 19.30	241°57.72 48.80	11°34.52 16.06	Spica 158°20.17
6	53°25.71	267°32.38 N15°2.57	216°17.64 \$07°19.92	256°59.67 N10°48.60	26°37.00 N08°16.04 41°39.48 16.02	Alkaid 152°50.53
7 8	68° 28.17 83° 30.64	282°31.81 1.59 297°31.24 15°0.61	231°18.66 20.55 246°19.68 21.17	272°1.63 48.41 287°3.58 48.21		Hadar 148°33.08
9	98° 33.10	312°30.68 14°59.63	261°20.69 · · 21.80	302°5.54 · · 48.02	56°41.96 16.00 71°44.45 •• 15.98	Menkent 147° 55.17
10	113°35.56	327°30.11 58.64	276°21.71 22.42	317°7.49 47.82	86°46.93 15.96	Arcturus 145°46.04
11	128° 38.03	342°29.54 57.66	291°22.73 23.05	332° 9.45 47.63	101°49.41 15.94	Rigil Kent. 139°37.39
12	143°40.49	357°28.97 N14°56.67	306°23.74 S 07°23.68	347°11.40 N10°47.43	116°51.90 N08°15.92	Kochab 137°20.09 Zuben'ubi 136°53.66
13	158°42.96	12°28.41 55.69	321°24.76 24.30	2°13.36 47.24	131°54.38 15.90	Alphecca 126°1.90
14	173°45.42	27°27.84 54.70	336°25.77 24.93	17°15.31 47.04	146°56.87 15.89	Antares 112°13.07
15	188°47.89	42°27.27 · · 53.72	351°26.79 · · 25.55	32°17.27 · · 46.85	161°59.35 · · 15.87	Atria 107°5.07
16	203°50.35	57°26.71 52.73	6°27.80 26.18	47°19.22 46.65	177°1.83 15.85	Sabik 102°0.14
17 18	218° 52.81 233° 55.28	72°26.14 51.74 87°25.58 N14°50.75	21°28.82 26.80 36°29.83 507°27.43	62°21.18 46.46 77°23.13 N10°46.26	192°4.32 15.83 207°6.80 N08°15.81	Shaula 96°7.20
19	248° 57.74	102°25.01 49.76	51°30.85 28.06	92°25.08 46.07	222°9.29 15.79	Rasalhague 95°56.36
20	264°0.21	117°24.45 48.77	66°31.86 28.68	107°27.04 45.87	237°11.77 15.77	Eltanin 90°40.85
21	279°2.67	132°23.89 · · 47.78	81°32.88 · · 29.31	122°28.99 · · 45.68	252°14.26 · · 15.75	Kaus Aust. 83°29.37 Vega 80°31.44
22	294°5.13	147°23.32 46.79	96°33.89 29.93	137°30.95 45.48	267°16.74 15.73	Vega 80°31.44 Nunki 75°44.80
23	309°7.60	162°22.76 45.79	111°34.90 30.56	152°32.90 45.29	282°19.23 15.71	Altair 61°57.55
Mer	pass. 02:27	ν -0.6' d-1.0' m-3.92	ν1.0' d0.6' m1.30	ν 2.0' d-0.2' m-1.71	ν 2.5' d-0.0' m0.41	Peacock 53°1.80
						Deneb 49°23.86
	6114	GU4 B	6114	6114	6114	Enif 33°36.35
Mon	GHA	GHA Dec 177°22.20 N14°44.80	GHA Dec	GHA Dec 167°34.86 N 10°45.09	GHA Dec	Al Na'ir 27°29.78
0 1	324° 10.06 339° 12.53	177°22.20 N14°44.80 192°21.64 43.81	126°35.92 S 07°31.18 141°36.93 31.81	167°34.86 N10°45.09 182°36.81 44.90	297°21.71 N08°15.69 312°24.20 15.67	Fomalhaut 15°11.82
2	354° 14.99	207°21.08 42.81	156° 37.94 32.43	197°38.77 44.70	327°26.69 15.65	Scheat 13°42.76
3	9° 17.45	222°20.52 · · 41.82	171°38.96 · · 33.06	212°40.72 · · 44.51	342°29.17 · · 15.63	Markab 13°27.44
4	24° 19.92	237°19.96 40.82	186°39.97 33.68	227°42.68 44.31	357°31.66 15.61	Aug 14 Sat SHA
5	39°22.38	252°19.40 39.83	201°40.98 34.31	242°44.63 44.12	12°34.14 15.59	Venus 215°37.90
6	54°24.85	267°18.84 N14°38.83	216°41.99 S07°34.93	257°46.58 N10°43.92	27°36.63 N08°15.57	Mars 163°35.24
7	69°27.31	282°18.28 37.83	231°43.00 35.56	272°48.54 43.73	42°39.12 15.55	Jupiter 203°49.23
8	84°29.78	297°17.72 36.83	246°44.02 36.19	287°50.49 43.53	57°41.60 15.53	Saturn 333°10.81
9	99°32.24	312°17.16 · · 35.83	261°45.03 · · 36.81	302°52.45 · · 43.34	72°44.09 · · 15.51	Aug 15 Sun SHA
10 11	114° 34.70 129° 37.17	327°16.61 34.83 342°16.05 33.83	276°46.04 37.44 291°47.05 38.06	317°54.40 43.14 332°56.36 42.95	87°46.58 15.49 102°49.07 15.47	Venus 214°24.89
12	144° 39.63	357°15.49 N14°32.83	306°48.06 S07°38.69	347°58.31 N10°42.75	117°51.55 N08°15.45	Mars 163°0.61
13	159°42.10	12°14.94 31.83	321°49.07 39.31	3° 0.27 42.56	132°54.04 15.43	Jupiter 203°37.02
14	174° 44.56	27°14.38 30.82	336°50.08 39.94	18° 2.22 42.36	147°56.53 15.41	Saturn 333°11.18
15	$189^{\circ}47.02$	42°13.83 · · 29.82	351°51.09 · · 40.56	33°4.17 · · 42.16	162°59.02 · · 15.38	Aug 16 Mon SHA
16	204° 49.49	57° 13.27 28.82	6°52.10 41.19	48° 6.13 41.97	178°1.51 15.36	Venus 213°12.14
17	219°51.95	72°12.72 27.81	21°53.11 41.81	63°8.08 41.77	193°3.99 15.34	Mars 162°25.85
18	234° 54.42	87°12.16 N14°26.81	36°54.12	78°10.04 N10°41.58	208°6.48 N08°15.32	Jupiter 203°24.80
19 20	249° 56.88 264° 59.34	102°11.61 25.80 117°11.06 24.79	51°55.13 43.06 66°56.14 43.69	93°11.99 41.38 108°13.95 41.19	223°8.97 15.30 238°11.46 15.28	Saturn 333°11.65
21	280°1.81	132°10.50 · · 23.78	81°57.15 · · 44.31	123°15.90 · · 40.99	253°13.95 · · 15.26	Horizontal parallax
22	295°4.27	147° 9.95 22.78	96°58.16 44.94	138°17.85 40.80	268°16.44 15.24	Venus:
23	$310^{\circ}6.74$	162°9.40 21.77	111°59.16 45.56	153°19.81 40.60	283°18.93 15.22	Mars:
Mer	pass. 02:23	ν-0.6' d-1.0' m-3.92	ν1.0' d0.6' m1.31	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.40	
		- 0.0 0 2.0 111 0.32				

Dec

29°14.65 -42°9.02

56°41.26

-17°49.84

-57°5.41

 $23^{\circ}35.61$

 $89^{\circ}22.48$

-40°11.29

4°12.01

49°57.38

16°33.89 -8°10.04

 $46^{\circ}1.37$

 $6^{\circ}22.53$

28°37.76

 $-1^{\circ}10.97$

7°24.77

-52°42.37 -16°45.12

 $-29^{\circ}0.42$

 $27^{\circ}57.51$

-59°35.79

-43°32.62

-69°49.83 -8°46.69

11°49.95

 $61^{\circ}36.20$

 $14^{\circ}25.12$

-17°41.77

 $-63^{\circ}15.38$

 $-57^{\circ}16.30$

55°48.78

-11°18.35

49°10.73 -60°30.63

-36°30.50

-60° 57.23

 $19^{\circ}2.45$

 $74^{\circ}2.75$

-16°9.42

26°37.50

-26°29.62

 $-69^{\circ}4.81$

-15°45.49

-37°7.45

 $12^{\circ}32.57$

51°29.36

-34°22.25

38°48.78

 $-26^{\circ}15.65$

8°56.67

-56°38.66

 $45^{\circ}22.91$

-46°49.40

-29°28.29 28°14.08

15°21.39

Mer.pass

12:09

15:36

12:54

04:18

12:10

15:34

12:51

04:14

15:33

12:48 04:10

Mer.pass 12:11

0.1

0.1

Mer.pass

 $10^{\circ}0.29$

 $5^{\circ}9.27$

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.50	N14°29.43	$35^{\circ}32.32$	11.4'	\$24°55.86	-5.9'	54.1'
1	193°47.62	28.66	50°2.73	11.5'	24°50.00	-6.0'	54.1'
2	208°47.73 223°47.85	27.90 •• 27.13	64°33.20 79°3.72	11.5' 11.6'	24°44.02 24°37.93	-6.1' -6.2'	54.0' 54.0'
4	238°47.97	26.36	93°34.30	11.6'	24°31.73	-6.3	54.0'
5	253°48.08	25.59	$108^{\circ}4.94$	11.7'	$24^{\circ}25.42$	-6.4'	54.0'
6	268°48.20	N14°24.83	122°35.63	11.8'	\$24°19.00	-6.5'	54.0'
7 8	283°48.32 298°48.43	24.06 23.29	137°6.39 151°37.20	11.8' 11.9'	24°12.48 24°5.84	-6.6' -6.7'	54.0' 54.0'
9	313°48.55	22.52	166°8.07	11.9'	23° 59.09	-6.9'	54.0'
10	328°48.67	21.75	$180^{\circ}39.00$	12.0'	$23^{\circ}52.24$	-7.0'	54.0'
11	343°48.79	20.98	195°9.99	12.1'	23°45.29	-7.1'	54.0'
12 13	358°48.90 13°49.02	N14°20.21 19.44	209°41.05 224°12.16	12.1' 12.2'	\$23°38.22 23°31.06	-7.2' -7.3'	54.0' 54.0'
14	28°49.14	18.67	238° 43.33	12.2'	23°23.79	-7.3 -7.4'	54.0'
15	43°49.26	• • 17.89	$253^{\circ}14.56$	12.3'	$23^{\circ}16.41$	-7.5'	54.0'
16	58°49.38	17.12	267°45.85	12.4'	23°8.94	-7.6'	54.0'
17 18	73°49.50 88°49.62	16.35 N14° 15.57	282° 17.20 296° 48.61	12.4' 12.5'	23°1.36 S 22°53.68	-7.7' -7.8'	54.0' 54.0'
19	103°49.74	14.80	311°20.09	12.5'	22° 45.90	-7.9'	54.0'
20	118°49.86	14.03	325°51.62	12.6'	22°38.03	-8.0'	54.0'
21	133°49.98	• • 13.25	340°23.22	12.7'	22°30.05	-8.1'	54.0'
22 23	148°50.10 163°50.22	12.48 11.70	354°54.87 9°26.59	12.7' 12.8'	22°21.98 22°13.81	-8.2' -8.3'	54.0' 53.9'
23			9 20.59			-0.3	55.9
	SD = 15.8'	d = -0.8'		SI	O = 14.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.34	$N14^{\circ}10.93$	23°58.37	12.8'	\$22°5.55	-8.4'	53.9'
1	193°50.46	10.15	38° 30.21	12.9'	21°57.19 21°48.74	-8.5'	53.9'
2	208°50.58 223°50.70	9.38 · · 8.60	53°2.11 67°34.07	13.0' 13.0'	21°48.74 21°40.19	-8.5' -8.6'	53.9' 53.9'
4	238°50.83	7.82	82°6.09	13.1'	21°31.55	-8.7'	53.9'
5	253°50.95	7.04	$96^{\circ}38.17$	13.1'	$21^{\circ}22.82$	-8.8'	53.9'
6	268°51.07	N14°6.27	111°10.32	13.2'	\$21°14.00	-8.9'	53.9'
7 8	283°51.19 298°51.32	5.49 4.71	125° 42.52 140° 14.79	13.3' 13.3'	21°5.09 20°56.08	-9.0' -9.1'	53.9' 53.9'
9	313°51.44	3.93	154° 47.11	13.4	20° 47.00	-9.1 -9.2'	53.9'
10	328°51.56	3.15	$169^{\circ}19.49$	13.4'	20°37.82	-9.3'	53.9'
11	343°51.69	2.37	183°51.94	13.5'	20°28.55	-9.4'	53.9'
12 13	358°51.81 13°51.93	N14°1.59 0.81	198°24.44 212°57.00	13.6' 13.6'	\$20°19.20 20°9.77	-9.4' -9.5'	53.9' 53.9'
14	28°52.06	14°0.03	212 37.00 227°29.63	13.7	20° 0.25	-9.5' -9.6'	53.9'
15	43°52.18	13° 59.25	242°2.31	13.7'	19°50.65	-9.7'	53.9'
16	58°52.31	58.47	256° 35.05	13.8'	19°40.96	-9.8'	53.9'
17 18	73°52.43 88°52.56	57.69 N13°56.90	271°7.84 285°40.70	13.9' 13.9'	19°31.19 \$19°21.34	-9.8' -9.9'	53.9' 53.9'
19	103°52.68	56.12	300° 13.61	14.0'	19° 11.42	-9.9 -10.0'	53.9'
20	118°52.81	55.34	314°46.58	14.0'	19°1.41		53.9'
21	133°52.93	• • 54.55	329° 19.61	14.1'	18°51.32	-10.2'	53.9'
22 23	148°53.06 163°53.19	53.77 52.99	343°52.70 358°25.84	14.1' 14.2'	18°41.16 18°30.92	-10.2' -10.3'	53.9' 53.9'
23			330 23.04			-10.5	55.9
	SD = 15.8'	d = -0.8'		SI	O = 14.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.31	N13°52.20	12°59.03	14.3'	S18°20.60	-10.4'	53.9'
1	193°53.44	51.42	27°32.29 42°5.59	14.3'	18° 10.21	-10.5'	53.9'
2	208°53.57 223°53.69	50.63 •• 49.84	42°5.59 56°38.95	14.4' 14.4'	17°59.74 17°49.20	-10.5' -10.6'	53.9' 53.9'
4	238°53.82	49.06	71° 12.37	14.5	17° 49.20 17° 38.58	-10.0	53.9'
5	253°53.95	48.27	85° 45.84	14.5'	17° 27.90	-10.8'	53.9'
6	268°54.08 283°54.20	N13° 47.48	100° 19.36 114° 52.94	14.6'	\$17°17.14 17°6.32	-10.8'	53.9'
7 8	283°54.20 298°54.33	46.70 45.91	114°52.94 129°26.57	14.6' 14.7'	17°6.32 16°55.42	-10.9' -11.0'	54.0' 54.0'
9	313°54.46	45.12	144°0.25	14.7	16° 44.46	-11.0'	54.0'
10	328°54.59	44.33	158° 33.98	14.8'	16°33.42	-11.1'	54.0'
11	343°54.72	43.54	173°7.76	14.8'	16° 22.32	-11.2'	54.0'
12 13	358°54.85 13°54.98	N13° 42.75 41.96	187°41.59 202°15.47	14.9' 14.9'	\$16°11.16 15°59.93	-11.2' -11.3'	54.0' 54.0'
14	28°55.11	41.17	216° 49.40	15.0'	15°48.63	-11.4	54.0'
15	43°55.24	• • 40.38	231°23.38	15.0'	15° 37.27	-11.4'	54.0'
16	58°55.37	39.59	245°57.41	15.1'	15° 25.85	-11.5'	54.0'
17 18	73°55.50 88°55.63	38.80 N13°38.01	260°31.48 275°5.61	15.1' 15.2'	15°14.36 \$15°2.82	-11.5' -11.6'	54.0' 54.0'
19	103°55.76	37.22	289°39.77	15.2'	14°51.21	-11.0 -11.7'	54.0'
20	118°55.89	36.43	$304^{\circ}13.99$	15.3'	$14^{\circ}39.55$	-11.7'	54.0'
21	133°56.02 148°56.15	• • 35.63	318° 48.24 333° 22.55	15.3'	14°27.82 14°16.04	-11.8'	54.0'
22 23	148°56.15 163°56.29	34.84 34.05	333°22.55 347°56.89	15.3' 15.4'	14°16.04 14°4.20	-11.8' -11.9'	54.0' 54.0'
_5	SD = 15.8'	d = -0.8'			D = 14.7'		
		u — -0.0		اد	J — 14.1		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-98%	
14	04:50	04:44	12:05	22:21	09:57		
15	04:39	04:33	12:05	23:06	10:44		
16	04:27	04:21	12:04	23:50	11:28		

	J, -	z, <u>_</u> z	,,		
h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	325°9.20	177°8.85 N14°20.76	127°0.17 S 07°46.18	168°21.76 N10°40.41	298°21.42 N08°15.20
1	340° 11.66	192°8.30 19.75	142°1.18 46.81	183°23.72 40.21	313°23.91 15.17
2	355° 14.13	207°7.75 18.74	157°2.19 47.43	198°25.67 40.01	328°26.40 15.15
3	10° 16.59	222°7.20 · · 17.72	172°3.20 · · 48.06	213°27.62 · · 39.82	343°28.89 · · 15.13
4	25° 19.06				358°31.38 15.11
5	40°21.52	252°6.10 15.70	202°5.21 49.31	243°31.53 39.43	13°33.87 15.09
6	55°23.99	267°5.55 N14°14.68	217°6.22 S 07°49.93	258°33.49 N10°39.23	28°36.36 N08°15.07
7	70°26.45	282°5.00 13.67	232°7.22 50.56	273°35.44 39.04	43°38.85 15.04
8	$85^{\circ}28.91$	297°4.46 12.65	247°8.23 51.18	288°37.39 38.84	58°41.34 15.02
9	100°31.38	312°3.91 · · 11.64	262°9.23 · · 51.81	303°39.35 · · 38.64	73°43.83 · · 15.00
10	115°33.84	327°3.36 10.62	277°10.24 52.43	318°41.30 38.45	88°46.32 14.98
11	130°36.31	342°2.82 9.60	292°11.25 53.06	333°43.26 38.25	103°48.81 14.96
12	145°38.77	357°2.27 N14°8.59	307°12.25 \$07°53.68	348°45.21 N10°38.06	118°51.31 N08°14.94
13	160°41.23	12°1.73 7.57	322°13.26 54.30	3°47.16 37.86	133°53.80 14.91
14	175°43.70	27°1.18 6.55	337°14.26 54.93	18°49.12 37.66	148°56.29 14.89
15	190°46.16	42°0.64 · · 5.53	352°15.27 · · 55.55	33°51.07 · · 37.47	163°58.78 · · 14.87
16	205° 48.63	57°0.09 4.51	7°16.27 56.18	48°53.03 37.27	179°1.27 14.85
	200° 51.09				
17					
18	235°53.55	86°59.01 N14°2.47	37°18.28	78°56.93 N10°36.88	209°6.26 N08°14.80
19	250° 56.02	101°58.46 1.44	52°19.28 58.05	93°58.89 36.69	224°8.75 14.78
20	265° 58.48	116°57.92 14°0.42	67°20.29 58.67	109° 0.84 36.49	239°11.25 14.76
21	281°0.95	131°57.38 13°59.40	82°21.29 · · 59.30	124°2.80 · · 36.29	254°13.74 · · 14.73
22	296°3.41	146°56.84 58.37	97°22.29 07°59.92	139° 4.75 36.10	269°16.23 14.71
23	311°5.87	161°56.30 57.35	112°23.30 08°0.55	154° 6.70 35.90	284°18.73 14.69
				-	
ıvler.p	pass. 02:19	ν-0.6' d-1.0' m-3.92	ν1.0′ d0.6′ m1.31	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.40
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	326°8.34	176°55.76 N13°56.32	127°24.30 S 08°1.17	169°8.66 N10°35.71	299°21.22 N08°14.67
1	$341^{\circ}10.80$	191°55.22 55.29	142°25.30 1.79	184°10.61 35.51	314°23.71 14.64
2	$356^{\circ}13.27$	206°54.68 54.27	157°26.30 2.42	199°12.56 35.31	329°26.21 14.62
3	11° 15.73	221°54.14 · · 53.24	172°27.30 · · 3.04	214°14.52 · · 35.12	344°28.70 · · 14.60
4	$26^{\circ}18.19$	236° 53.60 52.21	187°28.31 3.67	229°16.47 34.92	359°31.20 14.57
5	41°20.66	251°53.06 51.18	202°29.31 4.29	244°18.42 34.72	14°33.69 14.55
6	56°23.12	266°52.52 N13°50.15	217°30.31	259°20.38 N10°34.53	29°36.19 N08°14.53
7	71°25.59	281°51.98 49.12	232°31.31 5.54	274°22.33 34.33	44°38.68 14.50
	71 25.59 86°28.05				
8					
9	101°30.51	311°50.91 · · 47.06	262°33.31 · · 6.78	304°26.24 · · 33.94	74°43.67 · · 14.46
10	116° 32.98	326°50.37 46.02	277°34.31 7.41	319°28.19 33.74	89°46.17 14.43
11	131°35.44	341°49.84 44.99	292°35.31 8.03	334°30.15 33.55	104°48.66 14.41
12	146°37.91	356°49.30 N13°43.96	307°36.31 S 08°8.66	349°32.10 N10°33.35	119°51.16 N08°14.39
13	$161^{\circ}40.37$	11°48.77 42.92	322°37.31 9.28	4°34.05 33.15	134°53.65 14.36
14	$176^{\circ}42.84$	26°48.23 41.89	337°38.31 9.90	19°36.01 32.96	149°56.15 14.34
15	191°45.30	41°47.70 · · 40.85	352°39.31 · · 10.53	34°37.96 · · 32.76	164°58.64 · · 14.32
16	206° 47.76	56°47.17 39.82	7°40.31 11.15	49°39.91 32.57	180°1.14 14.29
17	221°50.23	71°46.63 38.78	22°41.31 11.77	64°41.87 32.37	195°3.64 14.27
18	236° 52.69	86°46.10 N13°37.74	37°42.31	79°43.82 N10°32.17	210°6.13 N08°14.25
19	251°55.16	101°45.57 36.70	52°43.30 13.02	94°45.77 31.98	225°8.63 14.22
20	266° 57.62	116°45.04 35.66	67°44.30 13.64	109°47.73 31.78	240°11.13 14.20
21	282°0.08	131°44.51 · · 34.62	82°45.30 · · 14.27	124°49.68 · · 31.58	255°13.63 · · 14.17
22	297°2.55	146°43.97 33.58	97°46.30 14.89	139°51.63 31.39	270°16.12 14.15
23	312°5.01	161°43.44 32.54	112°47.29 15.51	154°53.59 31.19	285°18.62 14.12
Mer.	pass. 02:15	ν-0.5' d-1.0' m-3.92	$\nu 1.0' \ d0.6' \ m1.31$	ν2.0' d-0.2' m-1.71	ν2.5' d-0.0' m0.39
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	327°7.48	176°42.91 N13°31.50		169°55.54 N10°30.99	300°21.12 N08°14.10
1	342°9.94	191° 42.38 30.46	142°49.29 16.76	184°57.49 30.80	315°23.62 14.08
2	357° 12.40	206°41.85 29.42	157°50.29 17.38	199°59.45 30.60	330°26.11 14.05
3	12° 14.87	221°41.33 · · 28.37	172°51.28 · · 18.01	215° 1.40 · · · 30.40	345°28.61 · · 14.03
4	$27^{\circ}17.33$	236°40.80 27.33	187°52.28 18.63	230° 3.35 30.21	0°31.11 14.00
5	$42^{\circ}19.80$	251°40.27 26.29	202°53.27 19.25	245°5.31 30.01	15°33.61 13.98
6	57°22.26	266°39.74 N13°25.24	217°54.27	260°7.26 N10°29.81	30°36.11 N08°13.95
7	72°24.72	281°39.21 24.19	232°55.27 20.50	275° 9.21 29.62	45°38.61 13.93
8	87° 27.19	296°38.69 23.15	247° 56.26 21.12	290°11.17 29.42	60°41.11 13.90
9	102° 29.65	311°38.16 · · 22.10	262°57.26 · · 21.74	305°13.12 · · 29.22	75°43.61 · · 13.88
10	117° 32.12	326°37.64 21.05	277°58.25 22.37	320°15.07 29.03	90°46.10 13.85
11	117 32.12 132°34.58	341°37.11 20.00	292°59.25 22.99	335°17.03 28.83	105°48.60 13.83
	132 34.58 147°37.04	356°36.59 N13°18.95	308°0.24 \$08°23.61		
12					120°51.10 N08°13.80
13	162°39.51	11°36.06 17.90	323°1.23 24.23	5°20.93 28.44	135°53.60 13.78
14	177°41.97	26°35.54 16.85	338°2.23 24.86	20°22.89 28.24	150°56.10 13.75
15	192°44.44	41°35.01 · · 15.80	353°3.22 · · 25.48	35°24.84 · · 28.04	165°58.60 · · 13.73
16	207°46.90	56°34.49 14.75	8°4.21 26.10	50°26.79 27.85	181°1.10 13.70
17	222°49.36	71°33.97 13.70	23°5.21 26.72	65°28.75 27.65	196°3.61 13.68
18	237°51.83	86°33.44 N13°12.65	38°6.20 \$08°27.35	80°30.70 N10°27.45	211°6.11 N08°13.65
19	252° 54.29	101°32.92 11.59	53°7.19 27.97	95°32.65 27.26	226°8.61 13.63
20	267° 56.76	116°32.40 10.54	68°8.19 28.59	110°34.61 27.06	241°11.11 13.60
21	282° 59.22	131°31.88 · · 9.48	83°9.18 · · 29.21	125°36.56 · · 26.86	256°13.61 · · 13.58
	282 59.22 298°1.68				
22		146°31.36 8.43	98°10.17 29.84	140°38.51 26.66	271°16.11 13.55
23	313°4.15	161°30.84 7.37	113°11.16 30.46	155°40.46 26.47	286°18.61 13.53
Mer.	pass. 02:11	ν-0.5' d-1.0' m-3.92	$\nu 1.0' \ d0.6' \ m1.32$	ν2.0' d-0.2' m-1.71	ν2.5′ d-0.0′ m0.39

	SHA	Dec
Alpheratz	357°32.23	29°14.67
Ankaa Schedar	353°4.73 349°28.12	-42°9.02 56°41.28
Diphda	348°44.91	-17°49.84
Achernar	335°18.34	-57°5.41
Hamal Polaris	327°48.61 312°49.97	23°35.62 89°22.48
Acamar	315°10.09	-40°11.28
Menkar	$314^{\circ}3.84$	4°12.01
Mirfak	308°25.10 290°37.22	49°57.39 16°33.90
Aldebaran Rigel	290 37.22 281°1.93	-8°10.04
Capella	280°18.89	46°1.37
Bellatrix	278°20.71	6°22.54 28°37.76
Elnath Alnilam	277°59.31 275°35.70	-1°10.96
Betelgeuse	270°49.93	7°24.78
Canopus	263°51.79	-52°42.36
Sirius Adhara	258°24.58 255°4.45	-16°45.11 -29°0.41
Procyon	244°48.86	5°9.28
Pollux	243°15.00	27°57.51
Avior Suhail	234°14.44 222°45.15	-59°35.77 -43°32.61
Miaplacidus	221°38.71	-43 32.01 -69°49.81
Alphard	217°45.96	-8°46.68
Regulus	207°32.47 193°39.05	11°49.95 61°36.18
Dubhe Denebola	193 39.05 182°23.03	14°25.12
Gienah	$175^{\circ}41.60$	-17°41.77
Acrux	172°58.13	-63°15.37
Gacrux Alioth	171°49.60 166°11.48	-57°16.29 55°48.77
Spica	158°20.18	-11°18.35
Alkaid	152°50.54	49°10.73
Hadar Menkent	148°33.11 147°55.18	-60°30.62 -36°30.49
Arcturus	147 55.16 145°46.05	19°2.45
Rigil Kent.	139°37.42	-60°57.22
Kochab	137°20.14 136°53.67	74°2.74 -16°9.42
Zuben'ubi Alphecca	130 53.07 126°1.91	-16 9.42 26°37.50
Antares	112°13.08	-26°29.62
Atria Sabik	107°5.10 102°0.15	-69°4.82 -15°45.49
Shaula	96°7.22	-15 45.49 -37°7.46
Rasalhague	$95^{\circ}56.37$	12°32.57
Eltanin	90°40.87 83°29.38	51°29.36 -34°22.26
Kaus Aust. Vega	83 29.38 80°31.46	-34 22.26 38°48.79
Nunki	75°44.80	-26°15.66
Altair	61°57.55	8°56.67
Peacock Deneb	53°1.80 49°23.86	-56°38.67 45°22.92
Enif	33°36.34	10°0.30
Al Na'ir	27°29.77	-46°49.41
Fomalhaut Scheat	15°11.81 13°42.75	-29°28.30 28°14.09
Markab	13°27.43	15°21.40
Aug 17 Tue	SHA	Mer.pass
Venus	211°59.65	12:12
Mars	161°50.97	15:31
Jupiter Saturn	203°12.56 333°12.22	12:45 04:06
Aug 18 Wed Venus	SHA 210°47.42	Mer.pass 12:13
Mars	$161^{\circ}15.96$	15:29
Jupiter Saturn	203°0.32 333°12.88	12:42 04:02
Aug 19 Thu	333°12.88	Mer.pass
Venus	209°35.44	12:14
Mars	$160^{\circ}40.82$	15:28
Jupiter Saturn	202°48.07 333°13.64	12:39 03:58
		33.30
Horizon	tal parallax Venus:	0.1
	Mars:	0.1

Stars

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.42	N13°33.25	2°31.28	15.4'	S 13°52.30	-12.0'	54.0'
1	193°56.55	32.46	17°5.71	15.5'	13°40.35	-12.0'	54.0'
2 3	208°56.68 223°56.81	31.67 · · 30.87	31°40.18 46°14.70	15.5' 15.6'	13°28.34 13°16.28	-12.1' -12.1'	54.0'
3 4	223 56.81 238°56.95	30.87	46 14.70 60°49.25	15.6'	13 10.28 13°4.17	-12.1 -12.2'	54.0' 54.0'
5	253°57.08	29.28	75°23.84	15.6'	13° 52.00	-12.2'	54.0'
6	268°57.21	N13°28.48	89°58.48	15.7'	S12°39.78	-12.3'	54.1'
7	283°57.35	27.69	$104^{\circ}33.15$	15.7'	$12^{\circ}27.51$	-12.3'	54.1'
8	298°57.48	26.89	119°7.85	15.7'	12°15.19	-12.4'	54.1'
9 10	313°57.62 328°57.75	· · 26.09 25.30	133°42.60 148°17.38	15.8' 15.8'	12°2.83 11°50.41	-12.4' -12.5'	54.1' 54.1'
11	343°57.88	24.50	140 17.30 162°52.19	15.8'	11 50.41 11°37.94	-12.5'	54.1'
12	358°58.02	N13°23.70	177°27.04	15.9'	S11°25.43	-12.6'	54.1'
13	13°58.15	22.90	$192^{\circ}1.93$	15.9'	$11^{\circ}12.88$	-12.6'	54.1'
14	28°58.29	22.10	206°36.84	15.9'	11°0.27	-12.6'	54.1'
15 16	43°58.42 58°58.56	· · 21.30 20.50	221°11.79 235°46.77	16.0' 16.0'	10°47.63 10°34.93	-12.7' -12.7'	54.1' 54.1'
17	73°58.70	19.70	250°21.78	16.0'	10° 34.93	-12.7	54.1
18	88°58.83	N13°18.90	264°56.82	16.1'	S10°9.42	-12.8'	54.1'
19	103°58.97	18.10	279°31.89	16.1'	$09^{\circ}56.61$	-12.9'	54.1'
20	118°59.10	17.30	294°6.99	16.1'	09°43.75	-12.9'	54.2'
21	133°59.24 148°59.38	· · 16.50	308°42.11 323°17.26	16.2'	09°30.85 09°17.91	-12.9'	54.2'
22 23	148°59.38 163°59.51	15.70 14.90	323°17.26 337°52.44	16.2' 16.2'	09°17.91 09°4.94	-13.0' -13.0'	54.2' 54.2'
20	SD = 15.8'	d = -0.8'			D = 14.7'	20.0	J 1.2
	3D = 15.δ'	$a = -0.8^{\circ}$		51	J = 14.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°59.65	N13°14.09	352°27.64	16.2'	S08°51.93	-13.0'	54.2'
1	193°59.79	13.29	7°2.87	16.2'	08°38.88	-13.1'	54.2'
2	208°59.93 224°0.06	12.49 •• 11.68	21°38.11 36°13.39	16.3' 16.3'	08°25.79 08°12.67	-13.1' -13.2'	54.2' 54.2'
3 4	239° 0.20	10.88	50°48.68	16.3'	08 12.67 07°59.52	-13.2'	54.2'
5	254° 0.34	10.07	65°23.99	16.3'	07°46.33	-13.2'	54.2'
6	269°0.48	N13°9.27	79°59.32	16.4'	S07°33.11	-13.3'	54.2'
7	284°0.62	8.46	94°34.68	16.4'	07°19.86	-13.3'	54.3'
8	299° 0.76	7.66	109°10.05	16.4	07°6.57	-13.3'	54.3'
9 10	314° 0.90 329° 1.04	· · 6.85 6.05	123°45.43 138°20.84	16.4' 16.4'	06°53.26 06°39.91	-13.3' -13.4'	54.3' 54.3'
11	344°1.18	5.24	150 20.04 152°56.26	16.4	06°26.54	-13.4'	54.3'
12	359°1.32	N13°4.43	167°31.69	16.4'	S06°13.14	-13.4	54.3'
13	14°1.46	3.63	$182^{\circ}7.14$	16.5'	$05^{\circ}59.71$	-13.5'	54.3'
14	29°1.60	2.82	196°42.60	16.5'	05°46.25	-13.5'	54.3'
15 16	44°1.74 59°1.88	· · 2.01	211°18.07 225°53.55	16.5' 16.5'	05°32.77 05°19.26	-13.5' -13.5'	54.3' 54.3'
17	74° 2.02	13°0.39	240°29.04	16.5	05 19.20 05°5.73	-13.5'	54.4'
18	89° 2.16	N12°59.58	255°4.54	16.5'	S04°52.18	-13.6'	54.4'
19	104°2.30	58.77	269°40.05	16.5'	04°38.60	-13.6'	54.4'
20	119°2.44	57.96	284°15.57		04°25.00		54.4'
21 22	134°2.59 149°2.73	· · 57.15 56.34	298°51.09 313°26.62	16.5' 16.5'	04°11.38 03°57.74	-13.6' -13.7'	54.4' 54.4'
23	164° 2.87	55.53	328°2.15	16.5'	03°44.08	-13.7'	54.4'
	SD = 15.8'	d = -0.8'		SI	D = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°3.01 194°3.15	N12°54.72 53.91	342°37.69 357°13.23	16.5' 16.5'	\$03°30.40 03°16.70	-13.7' -13.7'	54.4' 54.5'
2	209° 3.30	53.91	11°48.77	16.5	03°2.99	-13.7'	54.5'
3	224° 3.44	• • 52.29	26°24.31	16.5'	02°49.25	-13.7'	54.5'
4	239° 3.58	51.47	40°59.85	16.5'	02°35.51	-13.8'	54.5'
5	254° 3.73 269° 3.87	50.66 N12°49.85	55°35.39 70°10.93	16.5'	02°21.74	-13.8'	54.5'
6 7	269°3.87 284°4.02	N12°49.85 49.03	70°10.93 84°46.46	16.5' 16.5'	\$02°7.97 01°54.18	-13.8' -13.8'	54.5' 54.5'
8	299° 4.16	48.22	99°21.99	16.5	01°40.37	-13.8'	54.5
9	314° 4.30	• • 47.40	113°57.52	16.5'	01°26.56	-13.8'	54.6'
10	329° 4.45	46.59	128°33.03	16.5'	01°12.73	-13.8'	54.6'
11	344°4.59	45.78	143°8.55	16.5'	00°58.89	-13.8'	54.6'
12 13	359° 4.74 14° 4.88	N12°44.96 44.14	157°44.05 172°19.54	16.5' 16.5'	\$00°45.05 00°31.19	-13.9' -13.9'	54.6' 54.6'
13	29° 5.03	44.14	172 19.54 186°55.03	16.5'	00° 17.33	-13.9' -13.9'	54.6'
15	44°5.17	• • 42.51	201°30.50	16.5'	S00°3.46	-13.9'	54.6'
16	59° 5.32	41.69	216°5.96	16.4'	N00°10.42	13.9'	54.7'
17	74° 5.47	40.88	230°41.41	16.4	00°24.30	13.9'	54.7'
18 19	89° 5.61 104° 5.76	N12°40.06 39.24	245°16.84 259°52.26	16.4' 16.4'	N00°38.19 00°52.08	13.9' 13.9'	54.7' 54.7'
20	104°5.76 119°5.91	39.24 38.42	259°52.26 274°27.66	16.4	00°52.08 01°5.97	13.9'	54.7' 54.7'
21	134° 6.05	37.60	289°3.04	16.4	01°19.87	13.9'	54.7'
22	149°6.20	36.79	303°38.41	16.3'	01°33.77	13.9'	54.7'
23	164°6.35	35.97	318°13.76	16.3'	01°47.67	13.9'	54.8'
	SD = 15.8'	d = -0.8'		SI	O = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%	
17	04:14	04:08	12:04	-:-	12:10		
18	04:01	03:55	12:04	00:31	12:51		
19	03:48	03:41	12:04	01:11	13:32		

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

h	Aries	Venus	ŕ	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA De		GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	328°6.61	176°30.32 N13°		128° 12.15	\$08°31.08	170°42.42	N10°26.27	301°21.11	N08° 13.50			
1	343°9.08			143° 13.14	31.70	185°44.37	26.07	316°23.62	13.47	Alpheratz	357°32.22	$29^{\circ}14.68$
2	358° 11.54			158° 14.14	32.33	200°46.32	25.88	331°26.12	13.45	Ankaa	353°4.71	-42°9.03
3	13° 14.00			173° 15.13	32.95	215°48.28	• • 25.68	346°28.62	. 13.42	Schedar	349°28.10	56°41.29
4	$28^{\circ}16.47$			188° 16.12	33.57	230°50.23	25.48	1°31.12	13.40	Diphda	348°44.90	-17°49.84
5	43°18.93	251°27.72	1.02	203° 17.11	34.19	245°52.18	25.29	16°33.63	13.37	Achernar	335°18.31 327°48.60	-57°5.41 23°35.63
6	58°21.40	266°27.21 N12°5	9.96	218° 18.10	S08°34.81	260°54.14	N10°25.09	31°36.13	N08° 13.34	Hamal Polaris	312°48.50	89°22.49
7	73°23.86	281°26.69 12°5		233° 19.09	35.44	275°56.09	24.89	46°38.63	13.32	Acamar	315°10.06	-40° 11.28
8	88°26.32			248° 20.08	36.06	290°58.04	24.69	61°41.13	13.29	Menkar	314°3.82	4° 12.02
9	103°28.79	311°25.66 · · · 5		263°21.07	• • 36.68	305°59.99	• • 24.50	76°43.64	• • 13.27	Mirfak	308°25.08	49°57.40
10	118° 31.25			278°22.06	37.30	321°1.95	24.30	91°46.14	13.24	Aldebaran	290°37.20	16°33.90
11	133°33.72			293°23.05	37.92	336° 3.90	24.10	106°48.64	13.21	Rigel	281°1.91	-8°10.03
12 13	148° 36.18 163° 38.65	356°24.11 N12°5 11°23.60 5		308°24.03 323°25.02	\$08°38.55	351°5.85 6°7.81	N10°23.91	121°51.15 136°53.65	N08° 13.19 13.16	Capella	280°18.86	$46^{\circ}1.37$
14	103 36.05 178°41.11			338° 26.01	39.17 39.79	21° 9.76	23.71 23.51	150 55.05 151°56.16	13.10	Bellatrix	278°20.70	6°22.54
15	193°43.57	41°22.57 · · · 5		353° 27.00	• • 40.41	36°11.71	23.31	166°58.66	13.11	Elnath	277°59.29	28° 37.76
16	208°46.04		9.33	8°27.99	41.03	51°13.66	23.12	182°1.16	13.08	Alnilam	275°35.68	-1°10.95
17	223°48.50		8.26	23°28.97	41.65	66°15.62	22.92	197°3.67	13.05	Betelgeuse	270°49.92	7°24.78
18	238°50.97	86°21.03 N12°4		38°29.96	S08°42.28	81°17.57	N10°22.72	212°6.17	N08°13.03	Canopus	263°51.77	-52°42.35
19	253°53.43		6.12	53°30.95	42.90	$96^{\circ}19.52$	22.52	227°8.68	13.00	Sirius	258°24.56 255°4.44	-16°45.10 -29°0.40
20	268°55.89		5.05	68°31.94	43.52	111°21.48	22.33	242°11.18	12.97	Adhara Procyon	255 4.44 244°48.85	-29 0.40 5°9.28
21	283°58.36	131°19.50 · · 4		83°32.92	• • 44.14	126°23.43	• • 22.13	257°13.69	•• 12.95	Pollux	243°14.99	27° 57.51
22	299°0.82		2.91	98°33.91	44.76	141°25.38	21.93	272°16.19	12.92	Avior	234°14.43	-59° 35.76
23	314°3.29	161°18.47 4	1.84	113°34.90	45.38	156°27.33	21.74	287°18.70	12.89	Suhail	222°45.14	-43°32.59
Mer.	pass. 02:07	ν -0.5' d-1.1' m-3	3.92	$\nu 1.0' d0$.6′ m1.32	$\nu 2.0' \ d-0$.2′ m-1.70	$\nu 2.5' \ d-0$	0.0′ m0.38	Miaplacidus	221°38.71	-69°49.80
										Alphard	217°45.95	-8°46.67
C-4	CHA	CUA D-	_	CIIA	D	CHA	D	CHA	D	Regulus	207°32.47	$11^{\circ}49.95$
Sat 0	GHA 329°5.75	GHA De 176°17.96 N12°4		GHA 128° 35.88	Dec \$08°46.01	GHA 171°29.29	Dec N10°21.54	GHA 302°21.21	Dec N08° 12.87	Dubhe	193°39.06	61°36.17
1	329 5.75 344°8.21			128 35.88 143°36.87	46.63	171 29.29 186°31.24	21.34	302 21.21 317°23.71	12.84	Denebola	182°23.03	14°25.12
2	359° 10.68			158° 37.85	47.25	201°33.19	21.34	332°26.22	12.84	Gienah	175°41.61	-17°41.76
3	14° 13.14	221°16.44 · · · 3		173°38.84	• • 47.87	216°35.14	20.95	347°28.72	. 12.78		172°58.15	-63°15.35
4	29° 15.61			188°39.82	48.49	231°37.10	20.75	2°31.23	12.76	Gacrux	171°49.62	-57°16.28
5	44° 18.07			203°40.81	49.11	246°39.05	20.55	17°33.74	12.73	Alioth	166°11.50	55°48.76
6	59°20.53	266°14.91 N12°3	4.33	218°41.79	S08°49.73	261°41.00	N10°20.35	32°36.24	N08° 12.70	Spica Alkaid	158° 20.20 152° 50.56	-11° 18.35 49° 10.72
7	$74^{\circ}23.00$	281°14.41 3		233° 42.78	50.35	276°42.96	20.16	47°38.75	12.67	Hadar	148° 33.14	-60° 30.62
8	89°25.46		2.18	248°43.76	50.97	291°44.91	19.96	62°41.26	12.65	Menkent	147°55.20	-36°30.49
9	104°27.93	311°13.39 · · · 3		263°44.74	•• 51.60	306°46.86	• • 19.76	77°43.77	• • 12.62	Arcturus	145°46.07	19°2.45
10	119°30.39			278°45.73	52.22	321°48.81	19.56	92°46.27	12.59	Rigil Kent.	139°37.46	-60°57.22
11	134° 32.85			293°46.71	52.84	336°50.77	19.36	107°48.78	12.56	Kochab	137°20.19	$74^{\circ}2.74$
12 13	149° 35.32 164° 37.78	356°11.88 N12°2 11°11.37 2		308° 47.69 323° 48.68	\$08°53.46 54.08	351°52.72 6°54.67	N10° 19.17 18.97	122°51.29 137°53.80	N08° 12.53 12.51	Zuben'ubi	136°53.68	-16°9.41
14	179° 40.25			338° 49.66	54.70	21°56.62	18.77	152°56.30	12.48	Alphecca	126°1.93	26°37.50
15	194° 42.71	41°10.36 · · · 2		353°50.64	55.32	36°58.58	• • 18.57	167°58.81	. 12.45	Antares	112°13.10	-26°29.62 -69°4.82
16	209°45.17	56°9.86 2	3.55	8°51.62	55.94	52°0.53	18.38	183°1.32	12.42	Atria Sabik	107°5.15 102°0.17	-09 4.62 -15° 45.49
17	224° 47.64	71°9.36	2.47	$23^{\circ}52.61$	56.56	67°2.48	18.18	198°3.83	12.39	Shaula	96°7.23	-37°7.46
18	239°50.10	86°8.85 N12°2	1.39	38°53.59	S08°57.18	82°4.43	N10° 17.98	213°6.34	N08° 12.37	Rasalhague	95°56.39	12°32.58
19	254° 52.57		0.30	53°54.57	57.80	97° 6.39	17.78	228°8.85	12.34	Eltanin	90°40.89	51°29.37
20	269°55.03		9.22	68°55.55	58.42	112°8.34	17.59	243°11.36	12.31	Kaus Aust.		-34°22.26
21	284° 57.49	131°7.35 · · · 1		83°56.53	• • 59.04	127°10.29	•• 17.39	258°13.87	• • 12.28	Vega	80°31.47	38°48.80
22 23	299°59.96 315°2.42		7.05	98°57.51 113°58.49	08°59.66 09°0.28	142°12.24 157°14.20	17.19 16.99	273°16.38 288°18.88	12.25	Nunki	75°44.82	-26°15.66
23	313 2.42							200 10.00	12.22	Altair	61°57.56	8°56.68
Mer.	pass. 02:03	ν -0.5 $'$ d -1.1 $'$ m-3	3.92	ν 1.0′ d0	.6' m1.32	$\nu 2.0' \ d-0$.2′ m-1.70	$\nu 2.5' \ d-0$	0.0′ m0.38	Peacock	53°1.81	-56°38.69
										Deneb	49°23.87	45°22.93
Sun	GHA	GHA De	С	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.34	10°0.30
0	330°4.89	176°5.85 N12°1		128° 59.47	S09°0.90	172°16.15	N10°16.79	303°21.39	N08° 12.20	Al Na'ir Fomalhaut	27°29.77 15°11.80	-46°49.42 -29°28.30
1	345°7.35		3.80	$144^{\circ}0.45$	1.52	$187^{\circ}18.10$	16.60	$318^{\circ}23.90$	12.17	Scheat	13°42.75	28° 14.10
2	$0^{\circ}9.81$	206°4.85	2.71	$159^{\circ}1.43$	2.14	202°20.05	16.40	333°26.41	12.14	Markab	13°27.42	15°21.41
3	15° 12.28	221°4.35 · · 1		174°2.41	• • 2.76	217°22.01	• • 16.20	348°28.92	• • 12.11			
4	30° 14.74		0.54	189°3.39	3.39	232°23.96	16.00	3°31.44	12.08	Aug 20 Fri	SHA	Mer.pass
5	45° 17.21		9.45	204°4.37	4.01	247°25.91	15.80	18°33.95	12.05		208°23.71	12:14
6	60° 19.67	266°2.85 N12°		219°5.35	\$09°4.63	262°27.86	N10° 15.61	33°36.46	N08° 12.02	Mars	160°5.54	15:26
7	75°22.14		7.27	234°6.33	5.25	277°29.82	15.41	48°38.97	11.99		202°35.80 333°14.50	12:36 03:54
8 9	90°24.60 105°27.06		6.18 5.09	249°7.31 264°8.29	5.87 • • 6.48	292°31.77 307°33.72	15.21 •• 15.01	63°41.48 78°43.99	11.96 •• 11.94			
10	120°29.53		4.00	279°9.26	7.10	307 33.72 322°35.67	14.81	93°46.50	11.94	Aug 21 Sat		Mer.pass
11	135°31.99			294° 10.24	7.72	337°37.63	14.62	108°49.01	11.88		207°12.21	12:15
12	150° 34.46	355°59.87 N12°		309°11.22	S09°8.34	352°39.58	N10°14.42	123°51.52	N08° 11.85		159°30.13	15:25
13	165°36.92			324°12.20	8.96	7°41.53	14.22	138°54.04	11.82		202°23.54	12:32
14	$180^{\circ}39.38$	25°58.88 11°5		339° 13.17	9.58	22°43.48	14.02	153°56.55	11.79	Saturn	333°15.46	03:50
15	195°41.85	40°58.39 · · 5		354° 14.15	• • 10.20	37°45.43	•• 13.82	168°59.06	•• 11.76	Aug 22 Sun	SHA	Mer.pass
16	210°44.31		7.44	9°15.13	10.82	52°47.39	13.63	184°1.57	11.73		$206^{\circ}0.96$	12:16
17	225° 46.78		6.34	24°16.10	11.44	67°49.34	13.43	199°4.09	11.70	I	158°54.59	15:23
18	240°49.24	85°56.91 N11°5		39°17.08	\$09°12.06	82°51.29	N10° 13.23	214°6.60	N08° 11.67		202°11.26	12:29
19	255°51.70 270°54.17		4.15	54° 18.05	12.68	97°53.24	13.03	229°9.11	11.64	Saturn	333°16.51	03:46
20 21	270°54.17 285°56.63	115°55.92 5 130°55.43 · · · 5	3.05	69°19.03 84°20.00	13.30 •• 13.92	112°55.20 127°57.15	12.83 •• 12.63	244°11.63 259°14.14	11.61 •• 11.58	Horizo	ntal parallax	
22	300° 59.10		0.86	99°20.98	14.54	127 57.15 142°59.10	12.44	259 14.14 274°16.65	11.55		Venus:	0.1
23	316°1.56			114°21.95	15.16	158° 1.05	12.24	289°19.17	11.52		Mars:	0.1
		ν-0.5' d-1.1' m-3			.6′ m1.32		.2′ m-1.70		0.0' m0.37		-	
ivier.	pass. 01:59	ν-υ.5 α-1.1 m	J.92 —— –	ν1.0 α0	.0 1111.32	ν2.0 a-0	.∠ 111-1./∪	ν2.5 a-0	.0 1110.37			

CHA	h	Su	n			Moon		
1 194°664 34 34 347°24 39 63 02°1547 13.9 54.8 2 209°679 33.51 1°5449 16.2 02°43.26 13.9 54.8 3 224°694 32.60 16°3494 16.2 02°43.26 13.9 54.8 4 239°7.09 31.06 31°01.71 16.2 02°57.15 13.9 54.9 6 269°7.38 N12°30.22 60°20.57 16.2 03°24.02 13.9 54.9 7 284°7.53 29.40 74°55.72 16.1 03°52.67 13.9 54.9 8 299°7.68 28.88 89°30.85 16.1 03°52.67 13.9 54.9 9 314°8.83 -27.75 104°5.95 16.1 03°52.67 13.9 54.9 10 329°7.98 26.93 118°41.02 16.0 04°20.33 13.8 55.0 11 344°8.13 26.11 133°1605 16.0 04°34.23 13.8 55.0 12 359°8.28 N12°52.28 147°51.05 16.0 N04°48.07 13.8 55.0 14 29°8.58 23.63 177°0.96 15.9 05°1.89 13.8 55.0 15 44°8.73 -22.81 191°5.66 15.9 05°1.89 13.8 55.0 16 59°8.88 21.08 206°10.72 15.8 05°4.23 13.8 55.0 17 74°0.03 21.16 229°5.03 15.7 06°38.29 13.7 55.1 18 88°9.18 N12°20.33 238°20.33 15.7 06°38.29 13.7 55.1 21 134°0.64 -17.85 279°4.3 15.6 06°52.00 13.7 55.1 22 149°9.79 17.03 293°39.05 15.6 06°52.00 13.7 55.1 2 209°1.04 13.1 315°5.70 15.4 07°4.66 13.6 55.2 25 24°10.86 11.23 35°4.07 15.2 06°0.24 13.6 55.2 25 24°10.86 11.23 35°4.07 15.2 06°0.24 13.6 55.2 25 254°10.86 11.23 35°4.07 15.2 06°0.24 13.6 55.2 26 26 10.1 N12°1.57 322°4.61 44.9 10°1.53 13.3 55.7 27 284°11.17 9.57 64°48.8 15.1 09°7.90 13.5 55.3 29 314°1.48 -7.90 39°5.60 15.0 00°4.81 13.4 55.4 29 13 48°1.18 -7.90 39°5.60 15.0 00°4.81 13.4 55.4 13 34°1.18 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 13 34°1.18 0.7 0.4 0.4 0.4 0.4 0.4 0.4 0.4 14 14 14 14 14 14 14	Fri	GHA	Dec	GHA	ν	Dec	d	HP
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14		43.66	155°55.89	12.9'	$15^{\circ}46.99$	12.1'	56.0'
17 74°16.51 41.14 199°31.41 12.7' 16°23.05 11.9' 56.1' 18 89°16.67 N11°40.30 214°3.07 12.6' N16°34.94 11.8' 56.1' 19 104°16.83 39.45 228°34.64 12.5' 16°46.76 11.8' 56.2' 20 119°16.99 38.61 243°6.12 12.4' 16°58.52 11.7' 56.2' 21 134°17.15 · · 37.77 257°37.51 12.3' 17°10.21 11.6' 56.2' 22 149°17.31 36.93 272°8.80 12.2' 17°21.83 11.6' 56.2' 23 164°17.48 36.08 286°40.01 12.1' 17°33.38 11.5' 56.3'								
18 89°16.67 N11°40.30 214°3.07 12.6' N16°34.94 11.8' 56.1' 19 104°16.83 39.45 228°34.64 12.5' 16°46.76 11.8' 56.2' 20 119°16.99 38.61 243°6.12 12.4' 16°58.52 11.7' 56.2' 21 134°17.15 · · 37.77 257°37.51 12.3' 17°10.21 11.6' 56.2' 22 149°17.31 36.93 272°8.80 12.2' 17°21.83 11.6' 56.2' 23 164°17.48 36.08 286°40.01 12.1' 17°33.38 11.5' 56.3'								
20 119°16.99 38.61 243°6.12 12.4' 16°58.52 11.7' 56.2' 21 134°17.15 · 37.77 257°37.51 12.3' 17°10.21 11.6' 56.2' 22 149°17.31 36.93 272°8.80 12.2' 17°21.83 11.6' 56.2' 23 164°17.48 36.08 286°40.01 12.1' 17°33.38 11.5' 56.3'	18	89°16.67	N11°40.30	214°3.07	12.6'	N16°34.94	11.8'	56.1'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
22 149°17.31 36.93 272°8.80 12.2' 17°21.83 11.6' 56.2' 23 164°17.48 36.08 286°40.01 12.1' 17°33.38 11.5' 56.3'								
	22	149°17.31	36.93	272°8.80	12.2'	$17^{\circ}21.83$	11.6'	56.2'
SD = 15.8' d = -0.8' $SD = 15.2'$	23			286°40.01			11.5'	56.3'
		SD = 15.8'	d = -0.8'		SE	0 = 15.2'		

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

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

		Sun		Moon			
Day	Eqn.of Time Mer. Mer.Pass.		Age				
,	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-80%	
20	03:34	03:27	12:03	01:52	14:12		
21	03:20	03:12	12:03	02:33	14:55		
22	03:05	02:57	12:03	03:17	15:39		

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

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars
Man	GHA	CHA	Dec	CHA	Dee	GHA	Dec	GHA	Dee		SHA
Mon		GHA		GHA	Dec				Dec		эпа
0	331°4.02	175°53.96	N11°48.66	129°22.93	S09°15.78	173°3.01	N10°12.04	304°21.68	N08° 11.49	Alpheratz	357°32.20
1	346°6.49	190°53.47	47.56	144°23.90	16.40	188° 4.96	11.84	319°24.19	11.46	Ankaa	353°4.70
2	1°8.95	205°52.98	46.46	159° 24.88	17.02	203°6.91	11.64	334°26.71	11.43	Schedar	349°28.08
3	16°11.42	220°52.49	• • 45.36	174° 25.85	17.63	218° 8.86	• • 11.45	349°29.22	• • 11.40	Diphda	348°44.89
4	31°13.88	235°52.00	44.26	189° 26.82	18.25	233°10.81	11.25	4°31.74	11.37	Achernar	335°18.28
5 6	46° 16.35 61° 18.81	250°51.51 265°51.02	43.16 N11°42.05	204°27.80 219°28.77	18.87 \$09°19.49	248°12.77	11.05 N10° 10.85	19°34.25 34°36.77	11.34 N08°11.31	Hamal	327°48.57
7	76°21.27	280° 50.53	40.95	219 20.77 234° 29.74	20.11	263°14.72 278°16.67	10.65	49°39.28	11.28	Polaris	312°46.81
8	91°23.74	200 50.53 295° 50.04	39.85	234 29.74 249°30.72	20.11	278 10.07 293°18.62		64°41.80		Acamar	315°10.04
9	91 23.74 106°26.20	310°49.56	38.74	264° 31.69	. 21.35	308°20.58	10.45 •• 10.25	79°44.31	11.25 •• 11.22	Menkar	314°3.80
10	100 20.20 121°28.67	325° 49.07	37.64	279° 32.66	21.33	323°22.53	10.25	94°46.83	11.19	Mirfak	308°25.05
11	136°31.13	340°48.58	36.53	279 32.00 294° 33.63	22.59	323 22.53 338°24.48	9.86	94 40.63 109°49.34	11.19	Aldebaran	290°37.18
12	150° 31.13 151° 33.59	355°48.10	N11°35.43	309° 34.60	509°23.20	353°26.43	N10°9.66	109 49.34 124°51.86	N08° 11.13	Rigel	281°1.89
13	166° 36.06	10°47.61	34.32	324° 35.58	23.82	8°28.38	9.46	139°54.37	11.10	Capella	280°18.84
14	181°38.52	25°47.12	33.21	339°36.55	24.44	23°30.34	9.26	154°56.89	11.07	Bellatrix	278°20.68
15	196° 40.99	40°46.64	32.11	354° 37.52	25.06	38°32.29	9.06	169°59.41	• • 11.03	Elnath	277°59.26
16	211°43.45	55°46.15	31.00	9°38.49	25.68	53°34.24	8.87	185°1.92	11.00	Alnilam	275°35.67
17	226° 45.91	70°45.67	29.89	24°39.46	26.30	68°36.19	8.67	200°4.44	10.97	Betelgeuse	270°49.90
18	241°48.38	85°45.19	N11°28.78	39°40.43	S09°26.91	83°38.14	N10°8.47	215°6.96	N08° 10.94	Canopus	263°51.75
19	256° 50.84	100°44.70	27.67	54°41.40	27.53	98°40.10	8.27	230°9.47	10.91	Sirius	258°24.55
20	271°53.31	115°44.22	26.56	69°42.37	28.15	113°42.05	8.07	245°11.99	10.88	Adhara	255°4.42
21	286°55.77	130°43.74	• • 25.45	84°43.34	• • 28.77	128°44.00	• • 7.87	260°14.51	• • 10.85	Procyon Pollux	244°48.83 243°14.97
22	301°58.23	145°43.25	24.34	99°44.31	29.39	143°45.95	7.67	275°17.02	10.82	Avior	234° 14.41
23	317°0.70	160°42.77	23.23	114°45.28	30.00	158°47.90	7.48	290°19.54	10.79	Suhail	222°45.13
More	pass. 01:55	ν-0.5' d-1	1' m-3 02	1/1 n/ dn	6′ m1.33	1/2 N/ 4 N	.2′ m-1.70	1/2 5/ d 0	0.0' m0.37	Miaplacidus	222 45.13 221°38.69
- Ivier.p	Jass. U1.33	ν-0.5 u-1	.1 11-3.94	ν1.0 d0.	· IIII.33	ν2.0 u -0	.2 111-1.70	ν2.5 u-0	110.31	Alphard	221 36.09 217°45.95
										Regulus	217 45.95 207°32.48
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°39.06
0	332°3.16	175°42.29	N11°22.12	129°46.24	S09°30.62	173°49.86	N10°7.28	$305^{\circ}22.06$	N08° 10.75		182°23.04
1	347°5.63	190°41.81	21.00	144°47.21	31.24	188°51.81	7.08	320°24.58	10.72		175°41.62
2	2°8.09	205°41.33	19.89	159° 48.18	31.86	203°53.76	6.88	335°27.10	10.69		172°58.17
3	17° 10.56	220° 40.85	• • 18.78	174°49.15	• • 32.48	218°55.71	• • 6.68	350°29.61	• • 10.66		171°49.63
4	32°13.02	235°40.37	17.66	189°50.12	33.09	233°57.67	6.48	5°32.13	10.63	Alioth	
5	47° 15.48	250° 39.89	16.55	204°51.08	33.71	248°59.62	6.28	20°34.65	10.60		158°20.21
6	62° 17.95	265°39.41	N11°15.43	219°52.05	S09°34.33	264° 1.57	N10°6.08	35°37.17	N08° 10.56		152°50.58
7	77°20.41	280°38.93	14.32	234°53.02	34.95	279°3.52	5.89	50°39.69	10.53		148°33.16
8	92°22.88	295°38.45	13.20	249°53.99	35.56	294°5.47	5.69	65°42.21	10.50		$147^{\circ}55.21$
9	107°25.34	310°37.97	• • 12.08	264°54.95	• • 36.18	309°7.43	• • 5.49	80°44.73	• • 10.47	Arcturus	145°46.08
10	122°27.80	325°37.49	10.96	279°55.92	36.80	324° 9.38	5.29	95°47.25	10.44	Rigil Kent.	139°37.48
11	137°30.27	340°37.01	9.85	294°56.88	37.42	339°11.33	5.09	110°49.77	10.40	Kochab	$137^{\circ}20.26$
12	152°32.73	355°36.54	N11°8.73	309°57.85	\$09°38.03	354°13.28	N10°4.89	125°52.29	N08° 10.37	Zuben'ubi	$136^{\circ}53.70$
13	167° 35.20	10°36.06	7.61	324°58.82	38.65	9°15.23	4.69	140°54.80	10.34	Alphecca	126°1.94
14	182°37.66	25° 35.58	6.49	339°59.78	39.27	24°17.19	4.49	155°57.33 170°59.85	10.31	Antares	112°13.11
15	197° 40.13 212° 42.59	40°35.11	• • 5.37	355°0.75 10°1.71	39.89	39°19.14 54°21.09	• • 4.29	170°59.85 186°2.37	10.28	Atria	$107^{\circ}5.19$
16 17	212 42.59 227° 45.05	55°34.63 70°34.16	4.25 3.13	25°2.68	40.50 41.12	69°23.04	4.10 3.90	201°4.89	10.24 10.21	Sabik	102°0.18
18	242° 47.52	85° 33.68	N11° 2.00	40°3.64	\$09°41.74	84°24.99	N10°3.70		N08° 10.18	Shaula	96°7.25
19	257° 49.98	100°33.21	11° 0.88	55°4.60	42.35	99°26.95	3.50	231°9.93	10.15	Rasalhague	95°56.40
20	272°52.45	115°32.73	10°59.76	70°5.57	42.97	114°28.90	3.30	246°12.45	10.11	Eltanin	90°40.91
21	287° 54.91	130°32.26	• • 58.64	85°6.53	• • 43.59	129°30.85	3.10	261°14.97	• • 10.08	Kaus Aust.	83°29.40
22	302°57.37	145°31.79	57.51	100°7.49	44.21	144°32.80	2.90	276°17.49	10.05	Vega	80°31.49
23	317°59.84	160°31.31	56.39	115°8.46	44.82	159°34.75	2.70	291°20.01	10.02	Nunki	75°44.83
						-				Altair	61°57.57
Mer.p	pass. 01:51	ν -0.5' d-1	.1′ m-3.92	ν 1.0′ d0.	6′ m1.33	$\nu 2.0' d-0$.2′ m-1.70	ν 2.5′ d-0	1.0' m 0.36	Peacock	53°1.82
										Deneb	49°23.88
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.34
0	333°2.30	175°30.84	N10°55.26	130°9.42	S09°45.44	174°36.71	N10°2.50	306°22.53	N08°9.98	Al Na'ir Fomalhaut	27°29.77 15°11.80
1	348°4.77	190°30.37	54.14	145° 10.38	46.06	189°38.66	2.30	321°25.06	9.95	Scheat	15 11.80 13°42.74
2	3°7.23	205°29.89	53.01	$160^{\circ}11.35$	46.67	204°40.61	2.11	336°27.58	9.92	Markab	13° 42.74
3	$18^{\circ}9.69$	$220^{\circ}29.42$	• • 51.88	$175^{\circ}12.31$	• • 47.29	219°42.56	• • 1.91	351°30.10	• • 9.88		
4	$33^{\circ}12.16$	$235^{\circ}28.95$	50.76	190°13.27	47.90	234°44.51	1.71	6°32.62	9.85	Aug 23 Mon	SHA
5	48° 14.62	250°28.48	49.63	205°14.23	48.52	249°46.46	1.51	21°35.15	9.82		204°49.93
6	63° 17.09	265°28.01		220° 15.19	S09°49.14	264°48.42	N10°1.31	36°37.67	N08°9.78		158°18.90
7	78° 19.55	280°27.54	47.37	235° 16.15	49.75	279°50.37	1.11	51°40.19	9.75		201°58.98
8	93°22.02	295°27.07	46.24	250°17.11	50.37	294°52.32	0.91	66°42.71	9.72	Saturn	333°17.65
9	108°24.48	310°26.60	• • 45.11	265° 18.08	• • 50.99	309°54.27	• • 0.71	81°45.24	• • 9.68	Aug 24 Tue	SHA
10	123°26.94	325°26.13	43.98	280° 19.04	51.60	324°56.22	0.51	96°47.76	9.65		203°39.13
11	138° 29.41	340°25.66	42.85	295°20.00	52.22	339°58.18	0.31	111°50.28	9.62		157°43.08
12	153°31.87		N10°41.72	310°20.96	S09°52.83	355° 0.13	N10°0.11	126°52.81	N08°9.58		201°46.69
13	168°34.34	10°24.72	40.59	325°21.92	53.45	10°2.08	09°59.91	141°55.33	9.55		333°18.90
14	183°36.80	25°24.26	39.46	340°22.87	54.07	25° 4.03	59.72	156°57.86	9.52		
15 16	198°39.26	40°23.79 55°23.32	•• 38.33	355°23.83 10°24.79	• • 54.68	40° 5.98 55° 7.94	· · 59.52	172°0.38 187°2.90	• • 9.48	Aug 25 Wed	SHA
16 17	213° 41.73 228° 44.19	55° 23.32 70° 22.86	37.19 36.06	25° 25.75	55.30 55.01	55° 7.94 70° 9.89	59.32 59.12	202°5.43	9.45		202°28.54
17 18	228° 44.19 243° 46.66		36.06 N10°34.92	25°25.75 40°26.71	55.91 \$09°56.53	70° 9.89 85° 11.84	59.12 N09°58.92	202°5.43 217°7.95	9.42 N08°9.38	Mars	157°7.12
18	243 40.00 258°49.12	100°21.92	33.79	40 26.71 55°27.67	57.15	100°13.79	58.72	217 7.95 232°10.48	9.35		201°34.40
20	273°51.59	100 21.92 115°21.46	32.66	70° 28.63	57.15	100 15.79 115°15.74	58.52	247°13.00	9.33	Saturn	333°20.23
21	273 51.59 288°54.05	130°20.99	• 31.52	85° 29.58	• 58.38	130°17.69	58.32	262°15.53	• • 9.28	Horizor	ntal parallax
22	303°56.51	145°20.53	30.38	100° 30.54	58.99	145°19.65	58.12	202 13.33 277°18.05	9.25		Venus:
23	318° 58.98	160°20.06	29.25	115° 31.50	59.61	160°21.60	57.92	292°20.58	9.21		Mars:
Mer.p	pass. 01:48	ν -0.5' d-1	.1′ m-3.92	ν 1.0′ d 0.	6′ m1.33	ν 2.0′ d -0	.2′ m-1.70	ν 2.5′ d -0	0.0′ m0.36		

Dec

29°14.69

-42°9.03

56°41 31

-17°49.83 -57°5.42

 $23^{\circ}35.64$

89°22.49

-40°11.28

4°12.02 49°57.40

16°33.91 -8°10.03

 $46^{\circ}1.36$

 $6^{\circ}22.55$

28°37.76

 $-1^{\circ}10.95$

 $7^{\circ}24.78$

-52°42.34 -16°45.09

-29°0.39 $5^{\circ}9.28$

 $27^{\circ}57.50$

-59°35.75

-43°32.58

-69°49.78

-8°46.67

11°49.96

 $61^{\circ}36.16$

 $14^{\circ}25.11$

-17°41.75

-63°15.34

 $-57^{\circ}16.26$

55°48.75

-11°18.34

49°10.72 -60°30.61

-36°30.48

 $19^{\circ}2.45$

 $74^{\circ}2.73$

-16°9.41

26°37.50

-26°29.62

-69°4.82

-37°7.46

 $12^{\circ}32.58$

51°29.38

-34°22.26

38°48.81

 $-26^{\circ}15.66$

-56° 38.69

 $45^{\circ}22.95$

 $10^{\circ}0.31$

-46°49.43

-29°28.31 28°14.12

15°21.42

Mer.pass

12:17

15:21

12:26

03:42

12:18

15:20

12:23

03:38

12:18

15:18

12:20

03:34

0.1

0.1

Mer.pass

Mer.pass

 $8^{\circ}56.69$

-15°45.49

-60°57.21

h	Su	n		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°17.64	$N11^{\circ}35.24$	301°11.12	12.0'	N17° 44.86	11.4'	56.3'	
1	194°17.80	34.39	315° 42.13	11.9'	17°56.27	11.3'	56.3'	
2	209°17.96 224°18.12	33.55 •• 32.71	330° 13.05 344° 43.87	11.8' 11.7'	18°7.60 18°18.85	11.3' 11.2'	56.3' 56.4'	
4	239°18.29	31.86	359° 14.60	11.6'	18° 30.03	11.1'	56.4	
5	254°18.45	31.01	13° 45.23	11.5'	18°41.13	11.0'	56.4'	
6	269°18.61	N11°30.17	28° 15.76	11.4'	N18°52.15	10.9'	56.5'	
7	284°18.77 299°18.94	29.32 28.48	42° 46.19 57° 16.51	11.3'	19°3.09 19°13.94	10.9'	56.5	
8 9	299 18.94 314° 19.10	28.48	57°16.51 71°46.74	11.2' 11.1'	19° 13.94 19° 24.72	10.8' 10.7'	56.5' 56.5'	
10	329°19.26	26.78	86° 16.87	11.0'	19° 35.40	10.7	56.6'	
11	344°19.43	25.94	100°46.90	10.9'	$19^{\circ}46.01$	10.5'	56.6'	
12	359°19.59	N11°25.09	115° 16.82	10.8'	N19°56.52	10.4	56.6'	
13 14	14°19.75 29°19.92	24.24 23.39	129° 46.64 144° 16.35	10.7' 10.6'	20°6.94 20°17.28	10.3' 10.2'	56.7' 56.7'	
15	44°20.08	. 22.54	158° 45.97	10.5	20 17.20 20°27.52	10.2	56.7'	
16	59°20.25	21.69	173° 15.47	10.4'	20° 37.67	10.1'	56.7'	
17	74°20.41	20.84	187° 44.87	10.3'	$20^{\circ}47.72$	10.0'	56.8'	
18	89°20.58	N11°20.00	202°14.17	10.2'	N20°57.68	9.9'	56.8'	
19 20	104°20.74 119°20.91	19.15 18.30	216° 43.36 231° 12.44	10.1' 10.0'	21°7.54 21°17.30	9.8' 9.7'	56.8' 56.9'	
21	134°21.07	10.30	245°41.41	9.9'	21° 17.30 21° 26.97	9.6'	56.9'	
22	149°21.24	16.59	260° 10.28	9.8'	21°36.53	9.5'	56.9'	
23	164°21.40	15.74	274°39.04	9.7'	21°45.98	9.4'	56.9'	
	SD = 15.8'	d = -0.8'		SE	D = 15.4'			
т.	CILA	D	CUA		D	J	UP	
Tue 0	GHA 179°21.57	Dec N11° 14.89	GHA 289°7.69	u 9.5'	Dec N21° 55.33	d 9.2'	HP 57.0'	
1	194°21.74	14.04	303° 36.24	9.4'	22°4.58	9.1	57.0'	
2	209°21.90	13.19	318°4.67	9.3'	22°13.72	9.0'	57.0'	
3	224°22.07	• • 12.34	332°33.00	9.2'	22°22.75	8.9'	57.1'	
4 5	239°22.24 254°22.40	11.48 10.63	347°1.21 1°29.32	9.1' 9.0'	22°31.67 22°40.47	8.8' 8.7'	57.1' 57.1'	
6	269°22.57	N11°9.78	15° 57.32	8.9'	N22°49.17	8.6'	57.1	
7	284°22.74	8.92	30° 25.21	8.8'	22°57.75	8.5'	57.2'	
8	299°22.90	8.07	44° 52.99	8.7'	23°6.21	8.3'	57.2'	
9	314°23.07	• • 7.21	59° 20.66	8.6'	23° 14.55	8.2'	57.3'	
10 11	329°23.24 344°23.41	6.36 5.51	73° 48.22 88° 15.68	8.5' 8.3'	23°22.78 23°30.88	8.1' 8.0'	57.3' 57.3'	
12	359°23.58	N11°4.65	102°43.02	8.2'	N23°38.87	7.9'	57.3'	
13	14°23.74	3.79	$117^{\circ}10.25$	8.1'	$23^{\circ}46.72$	7.7'	57.4'	
14	29°23.91	2.94	131° 37.38	8.0'	23°54.46	7.6'	57.4'	
15 16	44°24.08 59°24.25	· · 2.08 1.23	146°4.40 160°31.31	7.9' 7.8'	24°2.06 24°9.54	7.5' 7.3'	57.4' 57.5'	
17	74°24.42	11°0.37	174° 58.11	7.7'	24° 16.89	7.2'	57.5'	
18	89°24.59	N10°59.51	189°24.80	7.6'	N24°24.11	7.1'	57.5'	
19	104°24.76	58.66	203°51.39	7.5'	24°31.19	7.0'	57.6'	
20 21	119°24.93 134°25.10	57.80 •• 56.94	218° 17.87 232° 44.24	7.4' 7.3'	24°38.15 24°44.96	6.8' 6.7'	57.6' 57.6'	
22	149°25.27	56.08	247° 10.51	7.3 7.2'	24° 44.90	6.5	57.0 57.7'	
23	164°25.44	55.22	261°36.67	7.1'	24°58.18	6.4	57.7'	
	SD = 15.8'	d = -0.9'		SE	O = 15.5'			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°25.61	N10°54.36	276° 2.73	ν 7.0'	N25°4.58	6.3'	57.7'	
1	194°25.78	53.51	290°28.69	6.9'	$25^{\circ}10.84$	6.1'	57.8'	
2	209°25.95	52.65	304° 54.54	6.7'	25° 16.96	6.0'	57.8'	
3 4	224°26.12 239°26.29	· · 51.79 50.93	319°20.29 333°45.93	6.6' 6.5'	25°22.93 25°28.75	5.8' 5.7'	57.8' 57.9'	
4 5	254°26.46	50.93	333 45.93 348°11.48	6.4'	25 28.75 25°34.43	5. <i>1</i> 5.5'	57.9' 57.9'	
6	269°26.63	N10°49.21	2°36.93	6.3'	N25°39.97	5.4'	57.9'	
7	284°26.80	48.34	17°2.28	6.3'	25°45.35	5.2'	58.0'	
8	299°26.97 314°27.15	47.48	31°27.53 45°52.68	6.2' 6.1'	25°50.58 25°55.65	5.1' 4.9'	58.0'	
9 10	314°27.15 329°27.32	• • 46.62 45.76	45°52.68 60°17.74	6.1′ 6.0′	25°55.65 26°0.58	4.9' 4.8'	58.0' 58.1'	
11	344°27.49	44.90	74°42.70	5.9'	26°5.35	4.6'	58.1	
12	359°27.66	N10°44.04	89°7.57	5.8'	N26°9.96	4.5'	58.1'	
13	14°27.83	43.17	103°32.35	5.7'	26° 14.41	4.3'	58.2'	
14 15	29°28.01 44°28.18	42.31 •• 41.45	117°57.03 132°21.63	5.6' 5.5'	26° 18.71 26° 22.84	4.1' 4.0'	58.2' 58.2'	
16	59°28.35	40.58	132 21.03 146°46.14	5.4'	26° 26.82	3.8'	58.3'	
17	74°28.53	39.72	$161^{\circ}10.56$	5.3'	$26^{\circ}30.63$	3.6'	58.3'	
18	89°28.70	N10°38.85	175°34.90	5.3'	N26°34.27	3.5'	58.3'	
19	104°28.87 119°29.05	37.99	189°59.15 204°23.32	5.2' 5.1'	26°37.75 26°41.07	3.3'	58.4'	
20 21	119°29.05 134°29.22	37.12 · · 36.26	204°23.32 218°47.41	5.1′ 5.0′	26°41.07 26°44.21	3.1' 3.0'	58.4' 58.4'	
22	149°29.39	35.39	233° 11.42	4.9'	26° 47.19	2.8'	58.5	
23	164°29.57	34.53	247° 35.35	4.9'	26°50.00	2.6'	58.5'	
	SD = 15.8'	d = -0.9'		SE	0 = 15.7'			

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

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

		Sun		Moon				
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.			
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	72-51%		
23	02:49	02:42	12:03	04:03	16:28			
24	02:34	02:26	12:02	04:54	17:21			
25	02:18	02:09	12:02	05:49	18:18			

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	334°1.44	175°19.60	N10°28.11	130°32.45	S10°0.22	175°23.55	N09°57.72	307°23.10	N08° 9.18			
1	349°3.91	190°19.13	26.97	145°33.41	0.84	190°25.50	57.52	322°25.63	9.14	Alpheratz	357°32.18	29°14.70
2	4°6.37	205°18.67	25.83	$160^{\circ}34.37$	1.45	205°27.45	57.32	337°28.16	9.11	Ankaa	353°4.68	-42°9.04
3	19°8.84	220°18.21	• • 24.70	175°35.32	• • 2.07	220°29.41	• • 57.12	352°30.68	• • 9.08	Schedar Diphda	349°28.04 348°44.86	56°41.32 -17°49.83
4	$34^{\circ}11.30$	235°17.74	23.56	190°36.28	2.68	235°31.36	56.92	7°33.21	9.04	Achernar	335° 18.25	-17 49.63 -57° 5.42
5	$49^{\circ}13.76$	250° 17.28	22.42	205°37.24	3.30	250°33.31	56.73	22°35.74	9.01	Hamal	327° 48.55	23°35.65
6	64° 16.23	265°16.82	N10°21.28	220°38.19	S10°3.91	265°35.26	N09°56.53	37°38.26	N08°8.97	Polaris	312°44.95	89°22.50
7	79° 18.69	280°16.36	20.14	235°39.15	4.53	280°37.21	56.33	52°40.79	8.94	Acamar	315° 10.01	-40°11.28
8	94°21.16	295°15.90	18.99	250°40.10	5.14	295°39.16	56.13	67°43.32	8.90	Menkar	314°3.78	4°12.03
9	109° 23.62	310°15.43	• • 17.85	265°41.06	• • 5.76	310°41.12	• • 55.93	82°45.84	• • 8.87	Mirfak	308°25.01	49°57.41
10	124° 26.08	325°14.97	16.71	280° 42.01	6.37	325°43.07	55.73	97°48.37	8.83	Aldebaran	290°37.15	16°33.91
11	139° 28.55 154° 31.01	340°14.51 355°14.05	15.57 N10°14.43	295° 42.96 310° 43.92	6.99 \$10°7.60	340°45.02 355°46.97	55.53 N09°55.33	112°50.90 127°53.43	8.80	Rigel	$281^{\circ}1.87$	-8°10.02
12 13	169° 33.48	10° 13.59	13.28	310 43.92 325°44.87	8.22	10°48.92	55.13	142°55.95	N08° 8.76 8.73	Capella	280°18.80	$46^{\circ}1.36$
14	184° 35.94	25° 13.13	12.14	340° 45.83	8.83	25°50.88	54.93	157°58.48	8.69	Bellatrix	278°20.65	6°22.55
15	199° 38.41	40°12.68	. 10.99	355°46.78	• • 9.45	40°52.83	54.73	173°1.01	• • 8.66	Elnath	277°59.23	28°37.76
16	214°40.87	55° 12.22	9.85	10°47.73	10.06	55°54.78	54.53	188°3.54	8.62	Alnilam	275°35.64	-1°10.95
17	229°43.33	70°11.76	8.70	25°48.68	10.67	70°56.73	54.33	203°6.07	8.59	Betelgeuse	270°49.87	7°24.78
18	244°45.80	85°11.30	N10°7.56	40°49.64	S10°11.29	85°58.68	N09°54.13	218°8.59	N08°8.55	Canopus	263°51.72	-52°42.33
19	259°48.26	100°10.84	6.41	55°50.59	11.90	101°0.63	53.93	233°11.12	8.52	Sirius	258°24.53 255°4.40	-16°45.09 -29°0.39
20	274°50.73	115°10.38	5.26	$70^{\circ}51.54$	12.52	116°2.59	53.73	248°13.65	8.48	Adhara	255 4.40 244° 48.81	5° 9.28
21	$289^{\circ}53.19$	130°9.93	• • 4.12	85°52.49	• • 13.13	131° 4.54	• • 53.53	263°16.18	• • 8.45	Procyon Pollux	244 46.61 243°14.95	27°57.50
22	304°55.65	145°9.47	2.97	100°53.44	13.74	146°6.49	53.33	278°18.71	8.41	Avior	234° 14.39	-59°35.73
23	319°58.12	$160^{\circ}9.01$	1.82	115°54.39	14.36	161°8.44	53.13	293°21.24	8.38	Suhail	222°45.12	-43°32.57
Mer	pass. 01:44	ν -0.5' d-1	.1′ m-3.92	ν 1 0' d0	.6′ m1.33	ν2 0' d-0	.2' m-1.70	$\nu 2.5' \ d-0$.0′ m0 35	Miaplacidus	221°38.67	-69°49.77
		ν 0.5 U-1		I.O UO			1.70			Alphard	217°45.93	-8°46.67
										Regulus	207°32.46	11°49.95
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°39.06	61°36.14
0	335°0.58	175°8.56	N10°0.67	130°55.35	\$10°14.97	176°10.39	N09°52.93	308°23.77	N08°8.34	Denebola	182°23.04	14°25.11
1	350°3.05	190°8.10	09°59.52	145°56.30	15.59	191°12.35	52.73	323°26.30	8.30	Gienah	175°41.62	-17°41.75
2	5°5.51	205°7.65	58.37	160° 57.25	16.20	206°14.30	52.53	338°28.83	8.27	Acrux	172°58.17	-63°15.33
3 4	20°7.98 35°10.44	220°7.19 235°6.74	• • 57.22 56.07	175°58.20 190°59.15	· · 16.81 17.43	221°16.25 236°18.20	• • 52.33	353°31.36 8°33.89	• • 8.23	Gacrux	171°49.64	-57°16.26
5	50° 12.90	250°6.28	54.92	206° 0.10	18.04	250 16.20 251°20.15	52.13 51.93	0 33.09 23°36.42	8.20 8.16	Alioth	166°11.53	55°48.74
6	65° 15.37	265° 5.83	N09°53.77	200 0.10 221°1.05	S10°18.65	266°22.10	N09°51.73	38°38.95	N08°8.13	Spica	158° 20.21	-11°18.34
7	80° 17.83	280°5.38	52.62	236°1.99	19.27	281°24.06	51.53	53°41.48	8.09	Alkaid	152°50.60	49°10.71
8	95° 20.30	295°4.92	51.46	251°2.94	19.88	296°26.01	51.33	68°44.01	8.05	Hadar	148°33.18	-60°30.60
9	110° 22.76	310°4.47	50.31	266°3.89	20.49	311°27.96	51.13	83°46.54	• • 8.02	Menkent	147°55.22	-36°30.48
10	125° 25.23	325°4.02	49.16	281°4.84	21.11	326°29.91	50.94	98°49.07	7.98	Arcturus	145°46.09	19°2.44
11	140°27.69	340°3.56	48.00	296°5.79	21.72	341°31.86	50.74	113°51.61	7.95	Rigil Kent.	139°37.50 137°20.32	-60°57.21 74°2.73
12	155°30.15	355°3.11	N09°46.85	311°6.74	S10°22.33	356°33.81	N09°50.54	128°54.14	N08°7.91	Kochab Zuben'ubi	136°53.70	-16° 9.41
13	$170^{\circ}32.62$	10°2.66	45.70	326°7.68	22.95	11°35.77	50.34	143°56.67	7.87	Alphecca	126°1.96	26°37.50
14	$185^{\circ}35.08$	25°2.21	44.54	341°8.63	23.56	26°37.72	50.14	158°59.20	7.84	Antares	112° 13.12	-26°29.62
15	$200^{\circ}37.55$	40°1.76	• • 43.38	356°9.58	• • 24.17	41°39.67	• • 49.94	$174^{\circ}1.73$	• • 7.80	Atria	107°5.21	-69°4.82
16	215° 40.01	55°1.31	42.23	11°10.53	24.79	56°41.62	49.74	189°4.26	7.76	Sabik	102°0.19	-15°45.49
17	230°42.47	70°0.86	41.07	26°11.47	25.40	71°43.57	49.54	204°6.80	7.73	Shaula	96°7.26	-37°7.46
18	245° 44.94	85°0.41	N09°39.91		\$10°26.01	86°45.53	N09°49.34	219°9.33	N08°7.69	Rasalhague	95°56.41	12°32.59
19	260° 47.40	99°59.96	38.76	56° 13.36	26.62	101°47.48	49.14	234°11.86	7.65	Eltanin	90°40.93	51°29.39
20	275° 49.87	114°59.51	37.60	71°14.31	27.24	116°49.43	48.94	249°14.40	7.62	Kaus Aust.	83°29.41	-34°22.26
21 22	290° 52.33 305° 54.80	129°59.06 144°58.61	· · 36.44 35.28	86° 15.26 101° 16.20	· · 27.85 28.46	131°51.38 146°53.33	· · 48.74 48.54	264°16.93 279°19.46	· · 7.58 7.54	Vega	80°31.50	38°48.82
23	320° 57.26	159°58.16	34.12	116° 17.15	29.07	161°55.28	48.34	294°21.99	7.54	Nunki	75° 44.83	-26°15.66
										Altair	61°57.57	8°56.69
Mer.	pass. 01:40	ν -0.5' d-1	1.1' m- 3.92	$\nu 1.0' \ d0$.6′ m1.34	$\nu 2.0' \ d-0$.2′ m-1.70	$\nu 2.5' \ d-0$.0′ m0.35	Peacock	53°1.82	-56°38.70
										Deneb	49°23.88	45°22.97
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°36.33 27°29.76	10°0.32 -46°49.43
0	335° 59.72		N09°32.96		S10°29.69	176°57.24	N09°48.14	309°24.53	N08°7.47	Fomalhaut	27 29.76 15°11.78	-46 49.43 -29°28.31
1	351°2.19	$189^{\circ}57.27$	31.80	$146^{\circ}19.04$	30.30	191°59.19	47.94	324°27.06	7.43	Scheat	13°42.72	28°14.13
2	6°4.65	204°56.82	30.64	$161^{\circ}19.98$	30.91	$207^{\circ}1.14$	47.74	339°29.60	7.40	Markab	13°27.40	15°21.43
3	21°7.12	219°56.37	• • 29.48	176°20.92	• • 31.52	222°3.09	• • 47.54	354°32.13	• • 7.36			
4	36°9.58	234°55.93	28.32	191°21.87	32.14	237° 5.04	47.34	9°34.66	7.32	Aug 26 Thu	SHA	Mer.pass
5	51° 12.05	249°55.48	27.15	206°22.81	32.75	252°6.99	47.14	24°37.20	7.28		201°18.16	12:19
6	66° 14.51	264°55.03	N09°25.99	221°23.76	\$10°33.36	267°8.95	N09°46.94	39°39.73	N08°7.25		156°31.01	15:17
7	81°16.97	279°54.59	24.83	236°24.70	33.97	282°10.90	46.74	54°42.27	7.21	Jupiter	201°22.11	12:17
8 9	96° 19.44 111° 21.90	294°54.14 309°53.70	23.67 •• 22.50	251°25.64 266°26.58	34.58	297°12.85 312°14.80	46.54 •• 46.34	69°44.80 84°47.34	7.17	Saturn	333°21.66	03:30
10	111 21.90 126° 24.37	309 53.70 324°53.25	21.34	200 20.58 281°27.53	· · 35.19 35.81	312 14.80 327°16.75	46.14	99°49.87	7.14 7.10	Aug 27 Fri	SHA	Mer.pass
11	141° 26.83	339° 52.81	20.17	201 27.55 296°28.47	36.42	342°18.71	46.14 45.94	99 49.67 114°52.41	7.10	Venus	200°7.98	12:20
12	156° 29.29	354°52.36	N09°19.01		\$10°37.03	357°20.66	N09°45.74	129°54.94	N08°7.02	1	155°54.76	15:15
13	171°31.76	9°51.92	17.84	326°30.35	37.64	12°22.61	45.54	144°57.48	6.98	Jupiter	201°9.81	12:14
14	186° 34.22	24°51.48	16.68	341°31.29	38.25	27°24.56	45.34	160°0.01	6.95	Saturn	333°23.19	03:26
15	201°36.69	39°51.03	• • 15.51	356°32.23	• • 38.86	42°26.51	• • 45.13	175°2.55	• • 6.91	Aug 28 Sat	SHA	Mer.pass
16	$216^{\circ}39.15$	54°50.59	14.34	11°33.17	39.47	57°28.46	44.93	190°5.09	6.87		198°57.99	12:21
17	231°41.62	69°50.15	13.17	$26^{\circ}34.11$	40.09	72°30.42	44.73	205°7.62	6.83	I	155° 18.37	15:14
18	246° 44.08	84°49.70	N09°12.01	41°35.05	\$10°40.70	87°32.37	N09°44.53	220°10.16	N08°6.80	Jupiter		12:11
19	261°46.54	99°49.26	10.84	56°35.99	41.31	102°34.32	44.33	235°12.69	6.76	Saturn	333°24.80	03:22
20	276°49.01	114°48.82	9.67	71°36.93	41.92	117°36.27	44.13	250°15.23	6.72	11	atal pagetter	
21	291°51.47	129°48.38	• • 8.50	86°37.87	• • 42.53	132°38.22	• • 43.93	265°17.77	• • 6.68	Horizoi	ntal parallax Venus:	0.1
22	306° 53.94	144°47.94	7.33	101°38.81	43.14	147°40.17	43.73	280°20.31	6.64		venus: Mars:	0.1 0.1
23	321°56.40	159°47.50	6.16	116°39.75	43.75	162°42.13	43.53	295°22.84	6.61		iviais.	0.1
Mer.	pass. 01:36	ν -0.4′ d-1	2′ m-3.92	$ u$ 0.9 $^{\prime}$ d0	.6′ m1.34	ν 2.0′ d-0	.2′ m-1.70	ν 2.5′ d-0	.0′ m0.34			

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22 200°30.09 31.03 290°36.69 46' 26°57.39 2.1' 58 3 224°30.77 3.10 30 30°33.9 46' 26°57.39 2.1' 58 4 239°30.44 30.20 319°33.90 45' 27°1.44 1.8' 58 56 209°30.79 N10°28.46 348°20.84 4.4' 27°3.21 1.6' 58 57 284°30.97 27.59 2°44.22 4.3' 27°6.21 1.2' 58 299°31.14 26.72 17°7.53 4.3' 27°7.44 1.1' 58 59 314°31.32 · 2.5.86 31°30.79 4.2' 27°8.84 0.9' 58 59 314°31.32 · 2.5.86 31°30.79 4.2' 27°8.84 0.9' 58 51 344°31.32 · 2.5.86 31°30.79 4.2' 27°8.84 0.9' 58 51 344°31.32 · 2.5.86 31°30.79 4.2' 27°8.84 0.9' 58 51 344°32.02 22.38 89°3.26 40' 22°10.85 0.5' 58 51 344°32.33 · 20.64 117°49.20 3.9' 27°10.05 0.5' 58 51 44°32.33 · 20.64 117°49.20 3.9' 27°10.05 0.6' 59 51 55°32.55 19.77 132°12.10 3.9' 27°10.05 0.6' 59 51 56°32.55 19.77 132°12.10 3.9' 27°10.05 0.6' 59 51 58' 32.55 19.77 132°12.10 3.9' 27°10.05 0.6' 59 51 196°33.30 116°18.02 160°57.78 3.8' N27°9.73 - 0.8' 59 51 191°33.26 16.28 180°43.32 3.7' 27°6.91 - 1.2' 59 51 191°33.26 16.28 180°43.32 3.7' 27°6.91 - 1.2' 59 51 191°33.26 16.28 180°43.32 3.7' 27°6.91 - 1.3' 59 52 146°33.80 1.6' 28°25 13.8' N27°9.73 - 0.8' 59 51 194°34.15 11.92 240°3.03 7.7' 27°6.61 1.3' 59 52 146°33.80 1.6' 28°25 13.8' N27°9.21 3.0' 59 51 248°35.50 5 N10°7.55 333°29.41 3.5' N26°5.30 2.2' 59 52 248°35.52 16.6' 34°6.3 3.7' 27°5.66 1.5' 59 52 34°34.87 8.42 319°6.88 3.5' 26°6.1.5' 59 52 34°34.87 8.42 319°6.88 3.5' 26°6.1.5' 59 52 34°34.87 8.42 319°6.88 3.5' 26°6.1.5' 59 52 34°34.87 8.42 319°6.88 3.5' 26°6.1.5' 59 53 314°35.58 4.9' 50°9.44 47 3.5' 26°5.30 - 2.1' 59 51 314°35.58 4.9' 50°9.44 47 3.5' 26°5.30 - 2.1' 59 51 314°35.58 4.9' 50°9.44 47 3.5' 26°3.45 3.4' 59 51 314°35.58 4.9' 50°9.44 47 3.5' 26°3.53 9.6' 4.6' 50°9.72 2.9' 59 51 34°3.75 5.5 710°7.55 333°2.94 3.5' 26°3.81 3.3' 26°6.55 3.0' 2.7' 50°9.9 4.0' 50°9.9 4.0' 50°9.9 4.0' 50°9.9 4.0' 50°9.9 50°9										
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Character Cha	23	164°33.80	13.66	232°51.38	3.6'	27°3.92	-1.7'	59.3		
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11 344°40.31 42.06 30°28.01 4.2' 24°3.27 -8.4' 60 12 359°40.49 N09°41.18 44°51.23 4.3' N23°54.87 -8.6' 60 13 14°40.68 40.30 59°14.50 4.3' 23°46.30 -8.7' 60 14 29°40.86 39.41 73°37.82 4.4' 23°28.63 -9.1' 60 15 44°41.04 · 38.53 88°1.20 4.4' 23°28.63 -9.1' 60 16 59°41.23 37.64 102°24.64 4.5' 23°19.55 -9.3' 60 17 74°41.41 36.76 116°48.13 4.6' 23°10.29 -9.4' 60 18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9'	10							60.3		
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13 14°40.68 40.30 59°14.50 4.3' 23°46.30 -8.7' 60 14 29°40.86 39.41 73°37.82 4.4' 23°37.55 -8.9' 60 15 44°41.04 · 38.53 88°1.20 4.4' 23°28.63 -9.1' 60 16 59°41.23 37.64 102°24.64 4.5' 23°19.55 -9.3' 60 17 74°41.41 36.76 116°48.13 4.6' 23°10.29 -9.4' 60 18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 · 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9'	12							60.3		
14 29°40.86 39.41 73°37.82 4.4' 23°37.55 -8.9' 60 15 44°41.04 38.53 88°1.20 4.4' 23°28.63 -9.1' 60 16 59°41.23 37.64 102°24.64 4.5' 23°19.55 -9.3' 60 17 74°41.41 36.76 116°48.13 4.6' 23°10.29 -9.4' 60 18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60								60.3		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14							60.4		
16 59°41.23 37.64 102°24.64 4.5' 23°19.55 -9.3' 60 17 74°41.41 36.76 116°48.13 4.6' 23°10.29 -9.4' 60 18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 · 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60								60.4		
17 74°41.41 36.76 116°48.13 4.6' 23°10.29 -9.4' 60 18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60								60.4		
18 89°41.60 N09°35.88 131°11.69 4.6' N23°0.87 -9.6' 60 19 104°41.78 34.99 145°35.30 4.7' 22°51.28 -9.8' 60 20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 · 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60								60.4		
19										
20 119°41.97 34.11 159°58.98 4.7' 22°41.53 -9.9' 60 21 134°42.15 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60										
21 134°42.15 ·· 33.22 174°22.72 4.8' 22°31.62 -10.1' 60 22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60										
22 149°42.34 32.33 188°46.53 4.9' 22°21.55 -10.2' 60 23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60										
23 164°42.52 31.45 203°10.40 4.9' 22°11.31 -10.4' 60			00.22							
	')')									
SD = 15.8' d = -0.9' $SD = 16.4'$		161° 12 E2						(11)		
				203 10.40		-	10.1			

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-19%
26	02:01	01:53	12:02	06:49	19:19	
27	01:44	01:36	12:02	07:51	20:22	
28	01:27	01:18	12:01	08:53	21:23	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	336°58.86	174°47.06 N09°4.99	131°40.69 \$10°44.36	177°44.08 N09°43.33	310°25.38 N08°6.57	
1	$352^{\circ}1.33$	189°46.62 3.82	146° 41.63 44.97	192°46.03 43.13	325°27.92 6.53	Alpheratz 357°32.17 29°14.72 Ankaa 353°4.65 -42°9.04
2	7°3.79	204°46.18 2.65	161°42.57 45.58	207°47.98 42.93	340°30.45 6.49	Schedar 349°28.02 56°41.34
3	22°6.26	219°45.74 · · 1.48	176°43.51 · · 46.19	222°49.93 · · 42.73	355°32.99 · · 6.45	Diphda 348°44.84 -17°49.83
4 5	37°8.72	234°45.30 09°0.30 249°44.86 08°59.13	191°44.44 46.80	237°51.89 42.53	10°35.53 6.41 25°38.07 6.37	Achernar 335°18.22 -57°5.43
6	52°11.19 67°13.65	249°44.86 08°59.13 264°44.42 N08°57.96	206°45.38 47.41 221°46.32 \$10°48.02	252°53.84 42.33 267°55.79 N09°42.13	25°38.07 6.37 40°40.61 N08°6.34	Hamal 327°48.52 23°35.66
7	82°16.11	279°43.98 56.78	236°47.25 48.63	282°57.74 41.93	55°43.15 6.30	Polaris 312°43.30 89°22.51
8	97° 18.58	294°43.54 55.61	251°48.19 49.24	297°59.69 41.73	70°45.68 6.26	Acamar 315°9.98 -40°11.28
9	112°21.04	309°43.11 · · 54.44	266°49.13 · · 49.85	313°1.64 · · 41.53	85°48.22 · · 6.22	Menkar 314°3.75 4°12.04 Mirfak 308°24.97 49°57.42
10	127°23.51	324°42.67 53.26	281°50.06 50.46	328° 3.60 41.33	100°50.76 6.18	Aldebaran 290°37.13 16°33.92
11	142°25.97	339° 42.23 52.09	296°51.00 51.07	343°5.55 41.13	115°53.30 6.14	Rigel 281°1.84 -8°10.02
12	157°28.43	354°41.80 N08°50.91	311°51.94 \$10°51.68	358°7.50 N09°40.93	130°55.84 N08°6.10	Capella 280°18.76 46°1.36
13 14	172°30.90 187°33.36	9°41.36 49.73 24°40.92 48.56	326°52.87 52.29 341°53.81 52.90	13° 9.45 40.73 28° 11.40 40.53	145°58.38 6.06 161°0.92 6.03	Bellatrix 278°20.62 6°22.55
15	202°35.83	39°40.49 · · 47.38	356° 54.74 · · 53.51	43°13.36 · · 40.33	176°3.46 · · 5.99	Elnath 277°59.20 28°37.77
16	217°38.29	54°40.05 46.20	11°55.68 54.12	58°15.31 40.13	191°6.00 5.95	Alnilam 275°35.61 -1°10.94
17	232°40.76	69°39.62 45.03	26° 56.61 54.73	73°17.26 39.93	206°8.54 5.91	Betelgeuse 270°49.85 7°24.79
18	247°43.22	84°39.18 N08°43.85	41°57.54 \$10°55.34	88°19.21 N09°39.73	221°11.08 N08°5.87	Canopus 263°51.69 -52°42.32 Sirius 258°24.50 -16°45.08
19	262°45.68	99°38.75 42.67	56°58.48 55.95	103°21.16 39.53	236°13.62 5.83	Adhara 255°4.38 -29°0.38
20	277° 48.15	114°38.31 41.49	71°59.41 56.56	118°23.11 39.33	251°16.16 5.79	Procyon 244°48.79 5°9.28
21 22	292°50.61 307°53.08	129°37.88 · · 40.31 144°37.45 39.13	87°0.34 · · 57.17 102°1.28 57.78	133°25.07 · · 39.13 148°27.02 38.93	266°18.70 · · 5.75 281°21.24 5.71	Pollux 243°14.93 27°57.49
23	307 55.06 322°55.54	144°37.45 39.13 159°37.01 37.95	102°1.28 57.78 117°2.21 58.39	148°27.02 38.93 163°28.97 38.73	281°21.24 5.71 296°23.78 5.67	Avior 234°14.37 -59°35.72
						Suhail 222°45.11 -43°32.56
Mer. _I	pass. 01:32	ν -0.4′ <i>d</i> -1.2′ m-3.91	ν 0.9′ d0.6′ m1.34	$\nu 2.0' \ d$ -0.2' m-1.70	$\nu 2.5' \ d$ -0.0' m0.34	Miaplacidus 221°38.66 -69°49.75
						Alphard 217°45.92 -8°46.66 Regulus 207°32.45 11°49.94
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.45 11°49.94 Dubhe 193°39.05 61°36.12
0	337°58.00	174°36.58 N08°36.77	132°3.14 S 10°59.00	178°30.92 N09°38.53	311°26.32 N08°5.63	Denebola 182°23.03 14°25.10
1	353°0.47	189°36.15 35.59	147°4.07 10°59.61	193°32.87 38.32	326°28.87 5.59	Gienah 175°41.62 -17°41.75
2	8°2.93	204°35.71 34.41	162°5.01 11°0.21	208°34.83 38.12	341°31.41 5.55	Acrux 172°58.19 -63°15.32
3 4	23°5.40 38°7.86	219°35.28 · · 33.23 234°34.85 32.04	177°5.94 · · 0.82 192°6.87 1.43	223°36.78 · · 37.92 238°38.73 37.72	356°33.95 · · 5.51 11°36.49 5.47	Gacrux 171°49.65 -57°16.25
5	53° 10.32	249°34.42 30.86	207°7.80 2.04	253°40.68 37.52	26°39.03 5.43	Alioth 166°11.53 55°48.72
6	68° 12.79	264°33.99 N08°29.68	222°8.73 \$11°2.65	268°42.63 N09°37.32	41°41.57 N08°5.39	Spica 158°20.21 -11°18.34
7	83° 15.25	279°33.56 28.49	237°9.66 3.26	283°44.59 37.12	56°44.12 5.35	Alkaid 152°50.61 49°10.70 Hadar 148°33.19 -60°30.60
8	$98^{\circ}17.72$	294°33.13 27.31	252°10.59 3.87	298°46.54 36.92	71°46.66 5.31	Menkent 147°55.23 -36°30.47
9	113°20.18	309°32.69 · · 26.13	267°11.52 · · 4.47	313°48.49 · · 36.72	86°49.20 · · 5.27	Arcturus 145°46.09 19°2.44
10	128°22.65	324°32.26 24.94	282°12.45 5.08	328°50.44 36.52	101°51.74 5.23	Rigil Kent. 139°37.52 -60°57.20
11	143°25.11 158°27.57	339°31.83 23.76	297°13.38 5.69 312°14.31 \$11°6.30	343°52.39 36.32	116°54.29 5.19	Kochab 137°20.37 74°2.72
12 13	173° 30.04	354°31.41 N08°22.57 9°30.98 21.39	312°14.31 \$11°6.30 327°15.24 6.91	358°54.35 N09°36.12 13°56.30 35.92	131°56.83 N08°5.15 146°59.37 5.11	Zuben'ubi 136° 53.71 -16° 9.41
14	188° 32.50	24°30.55 20.20	342°16.17 7.51	28°58.25 35.72	162°1.92 5.07	Alphecca 126°1.96 26°37.50
15	203°34.97	39°30.12 · · 19.01	357°17.10 · · 8.12	44°0.20 · · 35.52	177° 4.46 · · 5.03	Antares 112°13.12 -26°29.62 Atria 107°5.24 -69°4.83
16	218°37.43	54°29.69 17.83	12°18.03 8.73	59°2.15 35.32	192°7.00 4.99	Sabik 102°0.19 -15°45.49
17	233°39.89	69°29.26 16.64	27°18.96 9.34	74°4.11 35.12	207°9.55 4.95	Shaula 96°7.26 -37°7.46
18	248° 42.36	84°28.83 N08°15.45	42°19.88 \$11°9.94	89°6.06 N09°34.92	222°12.09 N08°4.91	Rasalhague 95° 56.41 12° 32.59
19	263°44.82	99°28.41 14.26	57°20.81 10.55	104°8.01 34.72	237°14.64 4.87 252°17.18 4.83	Eltanin 90°40.95 51°29.40
20 21	278° 47.29 293° 49.75	114°27.98 13.07 129°27.55 •• 11.88	72°21.74 11.16 87°22.67 · · 11.77	119° 9.96 34.52 134° 11.91 · · 34.32	252°17.18 4.83 267°19.73 • 4.79	Kaus Aust. 83°29.41 -34°22.27
22	308°52.21	144°27.13 10.69	102°23.59 12.37	149°13.87 34.12	282°22.27 4.74	Vega 80°31.51 38°48.83
23	323°54.68	159°26.70 9.50	117°24.52 12.98	164°15.82 33.92	297°24.82 4.70	Nunki 75°44.83 -26°15.66 Altair 61°57.57 8°56.70
Mori	pass. 01:28	ν-0.4' d-1.2' m-3.91	ν0.9' d0.6' m1.34	ν2.0' d-0.2' m-1.70	ν 2.5' d-0.0' m0.33	Peacock 53°1.81 -56°38.71
- Ivier.	pass. 01.20	ν-0.4 u-1.2 III-3.91		ν2.0 α-0.2 III-1.70	ν2.5 <i>u</i> -0.0 III0.33	Deneb 49°23.88 45°22.98
						Enif 33°36.33 10°0.33
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.74 -46°49.44
0 1	338° 57.14 353° 59.61	174°26.27 N08°8.31 189°25.85 7.12	132°25.45 \$11°13.59 147°26.37 14.19	179°17.77 N09°33.71 194°19.72 33.51	312°27.36 N08°4.66 327°29.91 4.62	Fomalhaut 15°11.77 -29°28.31
2	9°2.07	204°25.42 5.93	162° 27.30 14.80	209°21.68 33.31	342°32.45 4.58	Scheat 13° 42.71 28° 14.15
3	24°4.53	219°25.00 · · 4.74	177°28.22 · · 15.41	224°23.63 · · 33.11	357°35.00 · · 4.54	Markab 13°27.39 15°21.44
4	39°7.00	234°24.57 3.55	192°29.15 16.01	239°25.58 32.91	12°37.54 4.50	Aug 29 Sun SHA Mer.pass
5	54°9.46	249°24.15 2.36	207° 30.07 16.62	254°27.53 32.71	27°40.09 4.46	Venus 197°48.19 12:21
6	69°11.93	264°23.72 N08°1.17	222°31.00 \$11°17.23	269°29.48 N09°32.51	42°42.63 N08°4.42	Mars 154°41.83 15:12
7	84° 14.39	279°23.30 07°59.97	237°31.92 17.83	284°31.44 32.31	57°45.18 4.37	Jupiter 200° 45.21 12:07 Saturn 333° 26.52 03:18
8 9	99° 16.85 114° 19.32	294°22.87 07°58.78 309°22.45 · · 57.59	252°32.85 18.44 267°33.77 •• 19.05	299°33.39 32.11 314°35.34 · · 31.91	72°47.73 4.33 87°50.27 · · 4.29	Saturn 333°26.52 03:18
10	114 19.32 129°21.78	324°22.03 56.39	282°34.69 19.65	329°37.29 31.71	102°52.82 4.25	Aug 30 Mon SHA Mer.pass
11	144°24.25	339°21.60 55.20	297°35.62 20.26	344°39.25 31.51	117°55.37 4.21	Venus 196°38.58 12:22
12	159°26.71	354°21.18 N07°54.00	312°36.54 \$11°20.87	359°41.20 N09°31.31	132°57.91 N08°4.17	Mars 154°5.14 15:11
13	174°29.18	9°20.76 52.81	327° 37.46 21.47	14°43.15 31.11	148°0.46 4.13	Jupiter 200° 32.92 12:04 Saturn 333° 28.32 03:14
14	189°31.64	24°20.34 51.61	342°38.39 22.08	29°45.10 30.91	163°3.01 4.08	
15	204°34.10	39°19.92 · · 50.42	357°39.31 · · 22.68	44°47.06 · · 30.70	178°5.55 · · 4.04	Aug 31 Tue SHA Mer.pass
16 17	219° 36.57 234° 39.03	54°19.49 49.22 69°19.07 48.02	12°40.23 23.29 27°41.15 23.89	59°49.01 30.50 74°50.96 30.30	193°8.10 4.00 208°10.65 3.96	Venus 195° 29.13 12:23
18	234 39.03 249°41.50	84°18.65 N07°46.83	42°42.07 \$11°24.50	89°52.91 N09°30.10	208 10.05 3.90 223°13.20 N08°3.92	Mars 153°28.30 15:09 Jupiter 200°20.63 12:01
19	264° 43.96	99° 18.23 45.63	57°43.00 25.11	104°54.87 29.90	238°15.74 3.87	Saturn 333°30.22 03:10
20	279°46.42	114°17.81 44.43	72°43.92 25.71	119°56.82 29.70	253°18.29 3.83	
21	294° 48.89	129°17.39 · · 43.23	87°44.84 · · 26.32	134°58.77 · · 29.50	268°20.84 · · 3.79	Horizontal parallax
22	309°51.35	144°16.97 42.03	102°45.76 26.92	150° 0.72 29.30	283°23.39 3.75	Venus: 0.1
23	324°53.82	159°16.55 40.84	117°46.68 27.53	165°2.68 29.10	298°25.94 3.71	Mars: 0.1
Mer. _I	pass. 01:24	$\nu\text{-}0.4'~d\text{-}1.2'~\text{m-}3.91$	$\nu 0.9'~d0.6'~{\rm m}1.34$	$\nu 2.0' \ d$ -0.2' m-1.70	ν 2.5′ <i>d</i> -0.0′ m0.33	

h	Su	n		Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°42.71	N09°30.56	217°34.34	5.0'	$N22^{\circ}0.92$	-10.5'	60.6'		
1	194° 42.89	29.68	231°58.35	5.1'	21°50.37	-10.7'	60.6'		
2	209° 43.08 224° 43.27	28.79 •• 27.90	246°22.43 260°46.58	5.1' 5.2'	21°39.66 21°28.81	-10.9' -11.0'	60.6' 60.6'		
4	239° 43.45	27.02	275°10.79	5.3'	21°17.79	-11.2'	60.6'		
5	254°43.64	26.13	289°35.08	5.4'	$21^{\circ}6.63$	-11.3'	60.7'		
6	269° 43.83	N09°25.24	303°59.45	5.4'	N20°55.32	-11.5'	60.7'		
7 8	284° 44.01 299° 44.20	24.35 23.46	318°23.88 332°48.39	5.5' 5.6'	20°43.86 20°32.26	-11.6' -11.7'	60.7' 60.7'		
9	314° 44.39	• • 22.58	347°12.98	5.7'	20°20.51	-11.9'	60.7		
10	329°44.57	21.69	1°37.63	5.7'	$20^{\circ}8.62$	-12.0'	60.7'		
11	344° 44.76	20.80	16°2.37	5.8'	19°56.59	-12.2'	60.8'		
12 13	359° 44.95 14° 45.13	N09°19.91 19.02	30°27.18 44°52.07	5.9' 6.0'	N19°44.42 19°32.12	-12.3' -12.4'	60.8' 60.8'		
14	29° 45.32	18.13	59°17.03	6.0'	19° 19.67	-12.4'	60.8		
15	44°45.51	• • 17.24	73°42.08	6.1'	$19^{\circ}7.10$	-12.7'	60.8'		
16	59° 45.70	16.35	88°7.19	6.2'	18°54.39	-12.8'	60.8'		
17 18	74° 45.89 89° 46.07	15.46 N09°14.57	102°32.39 116°57.67	6.3' 6.4'	18°41.56 N18°28.59	-13.0' -13.1'	60.8' 60.8'		
19	104° 46.26	13.68	131°23.02	6.4	18° 15.50	-13.1	60.9		
20	119°46.45	12.78	145°48.46	6.5'	18°2.29	-13.3'	60.9'		
21	134° 46.64	• • 11.89	160°13.97	6.6'	17°48.95	-13.5'	60.9'		
22 23	149° 46.83 164° 47.02	11.00 10.11	174°39.56 189°5.23	6.7' 6.7'	17°35.50 17°21.92	-13.6' -13.7'	60.9' 60.9'		
23			109 5.25			-13.1	00.9		
	SD = 15.8'	d = -0.9'		S	D = 16.5'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°47.21	N09° 9.22	203°30.98	6.8'	$N17^{\circ}8.23$	-13.8'	60.9'		
1	194° 47.40	8.32	217°56.80	6.9'	16°54.43	-13.9'	60.9'		
2	209° 47.58 224° 47.77	7.43 •• 6.54	232°22.71 246°48.69	7.0' 7.1'	16°40.51 16°26.48	-14.0' -14.1'	60.9' 60.9'		
3 4	239° 47.96	5.64	261°14.76	7.1'	16° 12.34	-14.1 -14.2'	60.9		
5	254° 48.15	4.75	275°40.90	7.2'	15°58.10	-14.3'	60.9'		
6	269°48.34	N09°3.86	290°7.12	7.3'	N15°43.75	-14.4'	60.9'		
7 8	284° 48.53 299° 48.72	2.96 2.07	304°33.41 318°59.79	7.4' 7.5'	15°29.30 15°14.75	-14.6' -14.6'	60.9' 61.0'		
9	314° 48.91	. 1.17	318 59.79 333°26.24	7.5'	15 14.75 15°0.10	-14.0 -14.7'	61.0'		
10	329°49.10	09°0.28	347°52.76	7.6'	14°45.36	-14.8'	61.0'		
11	344°49.30	08°59.38	2°19.37	7.7'	14°30.52	-14.9'	61.0'		
12	359°49.49 14°49.68	N08°58.49 57.59	16°46.05 31°12.80	7.8' 7.8'	N14°15.59 14°0.57	-15.0'	61.0' 61.0'		
13 14	14°49.68 29°49.87	57.59 56.70	45°39.63	7.8° 7.9°	14°0.57 13°45.46	-15.1' -15.2'	61.0'		
15	44° 50.06	• • 55.80	60° 6.54	8.0'	13°30.26	-15.3	61.0'		
16	59° 50.25	54.90	74°33.52	8.1'	13°14.99	-15.4'	61.0'		
17	74°50.44 89°50.63	54.01 N08°53.11	89°0.57 103°27.69	8.1' 8.2'	12°59.62 N12°44.18	-15.4'	61.0'		
18 19	104° 50.83	52.21	103 27.09 117°54.89	8.3	12°28.67	-15.5' -15.6'	61.0' 61.0'		
20	119°51.02	51.32	132°22.16	8.3'	12°13.07		61.0'		
21	134°51.21	• • 50.42	146°49.49	8.4'	11°57.41	-15.7'	61.0'		
22	149°51.40	49.52	161°16.90	8.5'	11°41.67	-15.8'	61.0'		
23	164°51.59	48.62	175°44.38	8.5'	11°25.86	-15.9'	61.0'		
	SD = 15.8'	d = -0.9'		S	D = 16.6'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°51.79	N08°47.72	190°11.93	8.6'	N11°9.98	-15.9'	60.9		
1	194°51.98	46.83	204°39.54	8.7'	10°54.04	-16.0'	60.9'		
2	209° 52.17 224° 52.36	45.93 •• 45.03	219°7.22 233°34.97	8.7' 8.8'	10°38.04 10°21.98	-16.1' -16.1'	60.9' 60.9'		
3 4	224 52.36 239° 52.56	44.13	233 34.97 248°2.79	8.9'	10 21.98 10°5.85	-16.1 -16.2'	60.9'		
5	254°52.75	43.23	262°30.66	8.9'	09°49.67	-16.2'	60.9'		
6	269°52.94	N08°42.33	276°58.61	9.0'	N09°33.44	-16.3'	60.9'		
7 8	284°53.14 299°53.33	41.43 40.53	291°26.61 305°54.68	9.1' 9.1'	09°17.15 09°0.81	-16.3' -16.4'	60.9' 60.9'		
9	299 53.33 314° 53.52	40.53 · · 39.63	305°54.68 320°22.80	9.1	09°0.81 08°44.43	-16.4'	60.9'		
10	329°53.72	38.73	334°50.99	9.2'	08°27.99	-16.5'	60.9'		
11	344°53.91	37.83	349°19.24	9.3'	08°11.51	-16.5'	60.9'		
12 13	359° 54.11 14° 54.30	N08°36.93 36.02	3°47.55 18°15.91	9.4' 9.4'	N07°54.99 07°38.43	-16.6' -16.6'	60.9' 60.8'		
13 14	14 54.30 29°54.50	35.12	18° 15.91 32° 44.33	9.4	07°38.43 07°21.84	-16.6'	60.8		
15	44°54.69	• • 34.22	47°12.80	9.5'	07°5.20	-16.7'	60.8		
16	59° 54.88	33.32	61°41.33	9.6'	06°48.53	-16.7'	60.8'		
17	74° 55.08 89° 55.27	32.42 N08°31.51	76°9.91 90°38.55	9.6'	06°31.83 N06°15.10	-16.7'	60.8'		
18 19	89°55.27 104°55.47	N08°31.51 30.61	90°38.55 105°7.24	9.7' 9.7'	N06°15.10 05°58.34	-16.8' -16.8'	60.8' 60.8'		
20	119°55.66	29.71	119°35.97	9.8'	$05^{\circ}41.56$	-16.8'	60.8		
21	134° 55.86	• • 28.80	134° 4.76	9.8'	05°24.75	-16.8'	60.7'		
22 23	149° 56.05 164° 56.25	27.90 27.00	148°33.59 163°2.48	9.9' 9.9'	05°7.91 04°51.06	-16.9' -16.9'	60.7' 60.7'		
23			103 2.48			-10.9	00.7		
	SD = 15.8'	d = -0.9'		S	D = 16.6'				

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-1%	
29	01:09	01:00	12:01	09:53	22:22		
30	00:51	00:42	12:01	10:50	23:18		
31	00:33	00:24	12:00	11:44	-:-		

September 01, 02, 03 UT (Wed., Thu., Fri.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	339°56.28		N07°39.64	132°47.60	S11°28.13	180°4.63	N09°28.90	313°28.49	N08°3.66	Alabasata	357°32.16	29°14.73
1	354° 58.74	189° 15.71	38.44	147° 48.52	28.74	195° 6.58	28.69	328°31.04	3.62	Alpheratz Ankaa	353°4.64	-42°9.05
2	10°1.21	204° 15.29	37.24	162°49.44	29.34	210°8.53	28.49	343°33.59	3.58	Schedar	349°28.00	56°41.36
3 4	25°3.67 40°6.14	219°14.87 234°14.46	· · 36.04 34.84	177°50.36 192°51.28	· · 29.95 30.55	225°10.49 240°12.44	· · 28.29 28.09	358°36.13 13°38.68	· · 3.54 3.49	Diphda	348°44.83	-17°49.83
5	55°8.60	249° 14.04	33.63	207°52.19	31.16	255°14.39	27.89	28°41.23	3.45	Achernar	335°18.19	-57°5.43
6	70°11.06	264°13.62	N07°32.43	222°53.11	S11°31.76	270°16.34	N09°27.69	43°43.78	N08° 3.41	Hamal	327°48.51	23°35.67
7	$85^{\circ}13.53$	279°13.20	31.23	237°54.03	32.36	285°18.29	27.49	58°46.33	3.37	Polaris Acamar	312°41.92 315°9.96	89°22.52 -40°11.28
8	100° 15.99	294°12.79	30.03	252°54.95	32.97	300°20.25	27.29	73°48.88	3.32	Menkar	314°3.73	4° 12.04
9	115° 18.46 130° 20.92	309°12.37	• • 28.83	267°55.87	• • 33.57	315°22.20	•• 27.09	88°51.43	• • 3.28	Mirfak	308°24.94	49°57.43
10 11	130 20.92 145°23.38	324°11.95 339°11.54	27.62 26.42	282°56.78 297°57.70	34.18 34.78	330°24.15 345°26.10	26.89 26.68	103°53.98 118°56.53	3.24 3.19	Aldebaran	$290^{\circ}37.11$	16°33.92
12	160°25.85	354°11.12	N07°25.22	312°58.62	S11°35.39	0°28.06	N09°26.48	133°59.08	N08° 3.15	Rigel	281°1.82	-8°10.01
13	$175^{\circ}28.31$	9°10.70	24.01	327°59.54	35.99	15°30.01	26.28	149°1.64	3.11	Capella Bellatrix	280°18.73 278°20.60	46°1.37 6°22.56
14	190°30.78	24°10.29	22.81	343°0.45	36.59	30°31.96	26.08	164°4.19	3.06	Elnath	277°59.18	28° 37.77
15 16	205°33.24 220°35.70	39°9.87 54°9.46	· · 21.60 20.40	358°1.37 13°2.28	· · 37.20 37.80	45°33.91 60°35.87	· · 25.88 25.68	179°6.74 194°9.29	· · 3.02 2.98	Alnilam	275°35.59	-1°10.94
17	235°38.17	69°9.04	19.19	28°3.20	38.40	75°37.82	25.48	209°11.84	2.96	Betelgeuse	270°49.83	7°24.79
18	250° 40.63	84°8.63	N07°17.99		S11°39.01	90°39.77	N09°25.28	224°14.39	N08°2.89	Canopus	263°51.67	-52°42.31
19	265°43.10	99°8.21	16.78	58°5.03	39.61	105°41.72	25.08	239°16.94	2.85	Sirius Adhara	258°24.48 255°4.36	-16°45.08 -29°0.37
20	280°45.56	114°7.80	15.58	73°5.94	40.21	120°43.68	24.87	254°19.50	2.81	Procyon	244°48.78	5°9.28
21	295° 48.02	129°7.39	• • 14.37	88°6.86	• • 40.82	135°45.63	• • 24.67	269°22.05	• • 2.76	Pollux	243°14.91	27°57.49
22 23	310°50.49 325°52.95	144°6.97 159°6.56	13.16 11.95	103°7.77 118°8.69	41.42 42.02	150°47.58 165°49.53	24.47 24.27	284°24.60 299°27.15	2.72 2.67	Avior	$234^{\circ}14.36$	-59°35.71
					_	-				Suhail	222°45.10	-43°32.55
Mer.p	pass. 01:20	ν -0.4′ d-1	2′ m-3.91	ν 0.9′ d0.	.6′ m1.34	ν 2.0′ d-0	.2′ m-1.70	$\nu 2.5' \ d-0$.u′ m0.32	Miaplacidus Alphard	221°38.65 217°45.91	-69°49.74 -8°46.66
										Regulus	217 45.91 207°32.44	-6 40.00 11°49.94
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°39.05	61°36.11
0 1	340°55.42 355°57.88	174°6.15 189°5.73	N07°10.75 9.54	133°9.60 148°10.51	\$11°42.63 43.23	180°51.49 195°53.44	N09°24.07 23.87	314°29.70 329°32.26	N08° 2.63 2.59	Denebola	$182^{\circ}23.03$	14°25.10
2	11°0.34	204°5.32	8.33	163°11.43	43.23	210°55.39	23.67	344°34.81	2.59	Gienah	175°41.62	-17°41.74
3	26°2.81	219°4.91	7.12	178° 12.34	• • 44.43	225°57.34	. 23.47	359°37.36	2.50		172°58.21 171°49.66	-63°15.31 -57°16.23
4	41°5.27	234°4.50	5.91	193°13.25	45.04	240°59.30	23.26	14°39.92	2.46	Gacrux Alioth	171 49.00 166°11.55	-57 16.23 55°48.71
5	56°7.74	249°4.08	4.70	208° 14.17	45.64	256° 1.25	23.06	29°42.47	2.41	Spica	158°20.22	-11°18.34
6	71°10.20	264°3.67	N07°3.49	223°15.08	S11°46.24	271°3.20	N09°22.86	44°45.02	N08° 2.37	Alkaid	$152^{\circ}50.62$	49°10.69
7 8	86° 12.66 101° 15.13	279°3.26 294°2.85	2.28 07°1.07	238° 15.99 253° 16.90	46.84 47.45	286° 5.16 301° 7.11	22.66 22.46	59°47.58 74°50.13	2.32 2.28	Hadar	148°33.22	-60°30.59
9	116° 17.59	309°2.44	06°59.86	268° 17.81	48.05	316° 9.06	22.26	89°52.68	• • 2.24	Menkent	147°55.24	-36°30.47
10	131°20.06	324°2.03	58.65	283° 18.72	48.65	331°11.01	22.06	104°55.24	2.19	Arcturus Rigil Kent.	145°46.10 139°37.55	19°2.44 -60°57.20
11	146° 22.52	339°1.62	57.44	298° 19.63	49.25	346°12.97	21.86	119°57.79	2.15	Kochab	137°20.42	74°2.71
12	161°24.98	354°1.21	N06°56.23	313°20.55	S11°49.86	1°14.92	N09°21.66	135°0.35	N08°2.10	Zuben'ubi	136°53.72	-16°9.40
13 14	176°27.45 191°29.91	9°0.80 24°0.39	55.01 53.80	328°21.46 343°22.37	50.46 51.06	16°16.87 31°18.82	21.45 21.25	150°2.90 165°5.45	2.06 2.02	Alphecca	$126^{\circ}1.98$	26°37.49
15	206° 32.38	38° 59.98	• • 52.59	358° 23.28	• • 51.66	46°20.78	21.05	180°8.01	. 1.97	Antares	112°13.14	-26°29.62
16	221°34.84	53°59.57	51.38	13°24.19	52.26	61°22.73	20.85	195°10.56	1.93	Atria Sabik	107°5.28 102°0.21	-69°4.83 -15°45.49
17	236° 37.30	68°59.16	50.16	28° 25.09	52.86	76°24.68	20.65	210°13.12	1.88	Shaula	96°7.28	-37°7.47
18	251°39.77	83°58.75	N06°48.95	43°26.00	S11°53.46	91°26.63	N09° 20.45	225°15.67	N08° 1.84	Rasalhague	95°56.43	12°32.59
19 20	266° 42.23 281° 44.70	98°58.35 113°57.94	47.73 46.52	58° 26.91 73° 27.82	54.07 54.67	106°28.59 121°30.54	20.25 20.05	240°18.23 255°20.79	1.79 1.75	Eltanin	90°40.98	51°29.40
21	296° 47.16	128° 57.53	• • 45.30	88°28.73	55.27	136°32.49	• • 19.84	270°23.34	1.70	Kaus Aust.	83°29.43 80°31.53	-34°22.27 38°48.83
22	311°49.62	143°57.12	44.09	103°29.64	55.87	151°34.45	19.64	285°25.90	1.66	Vega Nunki	75°44.84	-26°15.67
23	326°52.09	158°56.72	42.87	118°30.54	56.47	166°36.40	19.44	300°28.45	1.61	Altair	61°57.58	8°56.70
Mer.p	pass. 01:16	ν -0.4' d-1	2′ m-3.91	ν 0.9′ d0.	.6′ m1.35	$\nu 2.0' \ d-0$.2′ m-1.70	ν 2.6′ d-0.	.0′ m0.32	Peacock	53°1.83	-56° 38.72
										Deneb	49°23.90	45°22.99
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.33 27°29.74	10°0.33 -46°49.45
0	$341^{\circ}54.55$	$173^{\circ}56.31$	N06°41.66	133°31.45	S11°57.07	181°38.35	N09° 19.24	$315^{\circ}31.01$	N08° 1.57	Al Na'ir Fomalhaut	27 29.74 15°11.76	-46 49.45 -29°28.31
1	356° 57.02	188°55.90	40.44	148°32.36	57.67	196°40.30	19.04	330°33.57	1.52	Scheat	13°42.71	28°14.16
2	11°59.48 27°1.95	203°55.49	39.23	163°33.27	58.27	211°42.26	18.84	345°36.12	1.48	Markab	13°27.38	15°21.45
3 4	42°4.41	218°55.09 233°54.68	· · 38.01 36.79	178°34.17 193°35.08	· · 58.87 11°59.47	226°44.21 241°46.16	· · 18.64 18.43	0°38.68 15°41.24	· · 1.43 1.39	Sep 01 Wed	SHA	Mer.pass
5	57°6.87	248°54.28	35.57	208° 35.99	12°0.07	256°48.12	18.23	30°43.79	1.34		194° 19.85	12:23
6	72°9.34	263°53.87	N06°34.36	223°36.89	S12°0.67	271°50.07	N09° 18.03	45°46.35	$N08^{\circ}1.30$		152°51.32	15:08
7	87°11.80	278°53.47	33.14	238° 37.80	1.27	286°52.02	17.83	60°48.91	1.25	Jupiter	200°8.35	11:58
8 9	102° 14.27 117° 16.73	293°53.06 308°52.66	31.92 · · 30.70	253°38.70 268°39.61	1.87 • • 2.47	301°53.97 316°55.93	17.63 •• 17.43	75°51.46 90°54.02	1.21 · · 1.16	Saturn	333°32.21	03:06
10	132° 19.19	323°52.25	29.48	283° 40.51	3.07	331° 57.88	17.43	90 54.02 105°56.58	1.12	Sep 02 Thu	SHA	Mer.pass
11	147° 21.66	338°51.85	28.26	298°41.42	3.67	346°59.83	17.03	120°59.14	1.07		193°10.73	12:24
12	162°24.12	353°51.44	N06°27.04	313°42.32	S12°4.27	2°1.79	N09°16.82	136°1.70	$N08^{\circ}1.03$	Mars Jupiter	152°14.18 199°56.07	15:06 11:55
13	177°26.59	8°51.04	25.82	328° 43.22	4.87	17°3.74	16.62	151°4.25	0.98	Saturn	333°34.29	03:02
14 15	192°29.05 207°31.51	23°50.63 38°50.23	24.60 •• 23.38	343°44.13 358°45.03	5.47 •• 6.07	32° 5.69 47° 7.65	16.42 •• 16.22	166°6.81 181°9.37	0.93			
15 16	207 31.51 222°33.98	58 50.23 53°49.83	22.16	13° 45.03	6.67	62° 9.60	16.02	181 9.37 196°11.93	0.84	Sep 03 Fri Venus	SHA 192°1.76	Mer.pass 12:25
17	237° 36.44	68°49.42	20.94	28°46.84	7.27	77°11.55	15.82	211°14.49	0.80		151°36.90	15:05
18	252°38.91	83°49.02	N06°19.72	43°47.74	S12°7.87	92°13.51	N09° 15.62	226°17.05	N08° 0.75	Jupiter		11:52
19	267°41.37	98°48.62	18.50	58° 48.64	8.47	107°15.46	15.41	241°19.61	0.71	Saturn	333°36.46	02:57
20 21	282° 43.83 297° 46.30	113°48.22 128°47.81	17.27 •• 16.05	73°49.55 88°50.45	9.07 •• 9.66	122°17.41 137°19.36	15.21 •• 15.01	256°22.16 271°24.72	0.66 · · 0.61	Horizor	ıtal parallax	
22	312° 48.76	143° 47.41	14.83	103°51.35	10.26	152°21.32	14.81	286°27.28	0.57		Venus:	0.1
23	327°51.23	158°47.01	13.61	118°52.25	10.86	167°23.27	14.61	301°29.84	0.52		Mars:	0.1
Mer.r	pass. 01:12	ν -0.4' d-1	2′ m-3.91	$\nu 0.9' d0$.6′ m1.35	$\nu 2.0' d-0$.2′ m-1.70	ν 2.6′ d-0.	.0′ m0.31			
						0						

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°56.45	N08°26.09	177°31.40	10.0'	N04°34.19	-16.9'	60.7'
1 2	194°56.64 209°56.84	25.19 24.28	192°0.38 206°29.39	10.0' 10.1'	04°17.30 04°0.40	-16.9' -16.9'	60.7' 60.7'
3	224°57.03	• • 23.38	200° 29.39 220° 58.45	10.1	03°43.49	-16.9'	60.6
4	239°57.23	22.47	235°27.55	10.1'	03°26.57	-16.9'	60.6'
5	254°57.43	21.57	249°56.70	10.2'	03°9.64	-16.9'	60.6'
6 7	269°57.62 284°57.82	N08°20.66 19.76	264°25.88 278°55.10	10.2' 10.3'	N02°52.70 02°35.75	-16.9' -16.9'	60.6' 60.6'
8	299°58.02	18.85	293°24.36	10.3	02° 18.81	-16.9'	60.5
9	314°58.21	• • 17.94	307°53.65	10.3'	02°1.86	-16.9'	60.5'
10	329°58.41	17.04	322°22.98	10.4	01°44.92	-16.9'	60.5
11 12	344°58.61 359°58.81	16.13 N08°15.23	336°52.35 351°21.75	10.4' 10.4'	01°27.97 N01°11.03	-16.9' -16.9'	60.5' 60.5'
13	14°59.00	14.32	5°51.18	10.5	00°54.10	-16.9'	60.4
14	29°59.20	13.41	20°20.64	10.5'	$00^{\circ}37.18$	-16.9'	60.4'
15	44°59.40	• • 12.50	34°50.13 49°19.65	10.5'	00°20.27 N00°3.37	-16.9'	60.4'
16 17	59°59.60 74°59.79	11.60 10.69	49 19.05 63°49.19	10.5' 10.6'	S00°13.52	-16.9' 16.9'	60.4' 60.3'
18	89°59.99	N08°9.78	78°18.76	10.6'	S00°30.39	16.9'	60.3
19	105°0.19	8.87	92°48.36	10.6'	00°47.24	16.8'	60.3'
20	120° 0.39 135° 0.59	7.96	107°17.99 121°47.63	10.6' 10.7'	01°4.08 01°20.89	16.8' 16.8'	60.3' 60.2'
21 22	135°0.59 150°0.79	· · 7.05 6.14	121°47.63 136°17.30	10.7'	01°20.89 01°37.68	16.8'	60.2'
23	165° 0.98	5.23	150°46.99	10.7'	01°54.45	16.7	60.2'
	SD = 15.8'	d = -0.9'		SI	D = 16.6'		
Thu 0	GHA 180° 1.18	Dec N08°4.32	GHA 165°16.70	u 10.7'	Dec \$02°11.18	d 16.7'	HP 60.2'
1	180 1.18 195°1.38	3.42	179°46.43	10.7'	02°27.90	16.7	60.2 60.1'
2	210°1.58	2.51	194°16.17	10.8'	02°44.58	16.7'	60.1'
3	225°1.78	• • 1.59	208°45.94	10.8'	03°1.23	16.6'	60.1'
4 5	240° 1.98 255° 2.18	08°0.68 07°59.77	223°15.71 237°45.51	10.8' 10.8'	03°17.85 03°34.43	16.6' 16.5'	60.0' 60.0'
6	270° 2.38	N07°58.86	252°15.31	10.8	\$03°50.97	16.5	60.0'
7	285°2.58	57.95	$266^{\circ}45.13$	10.8'	04°7.48	16.5'	60.0'
8	300°2.78	57.04	281°14.96	10.8'	04°23.95	16.4	59.9'
9 10	315°2.98 330°3.18	· · 56.13 55.22	295°44.80 310°14.65	10.9' 10.9'	04°40.38 04°56.76	16.4' 16.3'	59.9' 59.9'
11	345° 3.38	54.30	324°44.51	10.9	05°13.10	16.3	59.8'
12	0°3.58	N07°53.39	339°14.38	10.9'	S05°29.39	16.2'	59.8'
13	15°3.78 30°3.98	52.48	353°44.25 8°14.13	10.9'	05°45.64	16.2'	59.8'
14 15	30° 3.98 45° 4.18	51.57 •• 50.65	8°14.13 22°44.01	10.9' 10.9'	06°1.84 06°17.98	16.1' 16.1'	59.7' 59.7'
16	60° 4.38	49.74	37°13.90	10.9	06°34.08	16.0'	59.7'
17	75° 4.58	48.83	51°43.79	10.9'	06°50.12	16.0'	59.6'
18 19	90° 4.78 105° 4.99	N07°47.91 47.00	66°13.68 80°43.57	10.9' 10.9'	\$07°6.10 07°22.03	15.9' 15.9'	59.6' 59.6'
20	105 4.99 120° 5.19	46.09	95°13.46	10.9	07°22.03	15.8'	59.5'
21	135°5.39	• • 45.17	109°43.34	10.9'	$07^{\circ}53.71$	15.7'	59.5'
22	150°5.59	44.26	124°13.23	10.9'	08°9.46	15.7'	59.5'
23	165°5.79	43.34	138°43.11	10.9'	08°25.14	15.6'	59.4'
	SD = 15.8'	d = -0.9'		51	D = 16.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 5.99	N07°42.43	153°12.99 167°42.87	10.9'	\$08°40.76	15.6'	59.4'
1 2	195° 6.20 210° 6.40	41.51 40.60	167°42.87 182°12.74	10.9' 10.9'	08°56.32 09°11.81	15.5' 15.4'	59.4' 59.3'
3	225°6.60	• • 39.68	196°42.60	10.9'	09°27.23	15.4'	59.3'
4	240°6.80	38.77	211°12.45	10.8'	09°42.58	15.3'	59.3'
5 6	255°7.00 270°7.21	37.85 N07°36.94	225°42.30 240°12.13	10.8' 10.8'	09°57.86 \$10°13.07	15.2' 15.1'	59.2' 59.2'
7	270 7.21 285°7.41	36.02	254° 41.96	10.8	10°28.20	15.1'	59.2'
8	300°7.61	35.10	269°11.78	10.8'	10°43.26	15.0'	59.1'
9	315°7.82	• • 34.19	283°41.58	10.8'	10°58.25	14.9'	59.1'
10 11	330° 8.02 345° 8.22	33.27 32.35	298°11.37 312°41.15	10.8' 10.8'	11°13.15 11°27.98	14.8' 14.7'	59.0' 59.0'
12	0°8.43	N07°31.43	312 41.15 327°10.92	10.8	S11°42.72	14.7	59.0'
13	15°8.63	30.52	341°40.67	10.7'	11°57.39	14.6'	58.9'
14	30°8.83	29.60	356°10.40	10.7	12°11.97	14.5'	58.9'
15 16	45° 9.04 60° 9.24	· · 28.68 27.76	10°40.12 25°9.82	10.7' 10.7'	12°26.46 12°40.88	14.4' 14.3'	58.9' 58.8'
17	75° 9.44	26.84	39°39.51	10.7'	12° 40.88 12° 55.20	14.3	58.8'
18	90° 9.65	N07°25.93	54°9.17	10.6'	S13°9.44	14.1'	58.7'
19	105° 9.85	25.01	68°38.82	10.6	13°23.59	14.1'	58.7'
20 21	120°10.06 135°10.26	24.09 •• 23.17	83°8.45 97°38.06	10.6' 10.6'	13°37.64 13°51.61	14.0' 13.9'	58.7' 58.6'
22	150°10.47	22.25	112°7.65	10.6'	14°5.49	13.8'	58.6'
23	165°10.67	21.33	126°37.22	10.5'	14°19.27	13.7'	58.6'
	SD = 15.8'	d = -0.9'	-	SI	D = 16.2'		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-7%
01	00:14	00:05	12:00	12:36	00:10	
02	00:05	00:14	12:00	13:26	01:01	
03	00:24	00:34	11:59	14:16	01:51	

September 04, 05, 06 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	turn		Stars
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	342°53.69	173°46.61	N06°12.38	133°53.15	S12°11.46	182°25.22	N09° 14.41	316°32.40	N08°0.48		
1	357°56.15	188°46.21	11.16	148° 54.05	12.06	197°27.18	14.21	331°34.96	0.43	Alpheratz	
2	12°58.62	203°45.81	9.93	163°54.95	12.66	212°29.13	14.01	346°37.52	0.38	Ankaa	353°4.63
3	28°1.08	218°45.41	· · 8.71	178°55.85	• • 13.26	227°31.08	• • 13.80	1°40.08	• • 0.34	Schedar	349°27.99
4	43°3.55	233°45.01	7.49	193° 56.75	13.85	242°33.04	13.60	16°42.64	0.29	Diphda Achernar	348°44.82 335°18.17
5	$58^{\circ}6.01$	248°44.61	6.26	208° 57.65	14.45	257°34.99	13.40	31°45.20	0.24	Hamal	327°48.49
6	73°8.47	263°44.21	N06°5.04	223°58.55	S 12°15.05	272°36.94	N09°13.20	46°47.76	N08°0.20		312°40.34
7	88° 10.94	278°43.81	3.81	238°59.45	15.65	287°38.90	13.00	61°50.33	0.15	Acamar	315°9.94
8	103°13.40	293°43.41	2.58	254°0.35	16.24	302°40.85	12.80	76°52.89	0.11	Menkar	314°3.71
9	118° 15.87	308°43.01	·· 1.36 06°0.13	269°1.25	16.84	317°42.80 332°44.76	• • 12.60	91°55.45	• • 0.06	Mirfak	$308^{\circ}24.91$
10 11	133° 18.33 148° 20.79	323°42.61 338°42.21	05°58.91	284°2.15 299°3.05	17.44 18.04	332 44.76 347°46.71	12.39 12.19	106°58.01 122°0.57	0.01 07°59.97	Aldebaran	290°37.09
12	163°23.26	353° 41.81	N05°57.68	314°3.94	\$12°18.63	2°48.66	N09°11.99	137°3.13	N07°59.92	Rigel	$281^{\circ}1.80$
13	178°25.72	8°41.41	56.45	329°4.84	19.23	17°50.62	11.79	152°5.69	59.87	Capella	280°18.71
14	193°28.19	23°41.01	55.22	344°5.74	19.83	32°52.57	11.59	167°8.26	59.83	Bellatrix	278°20.58
15	208°30.65	38°40.62	• • 54.00	359°6.64	• • 20.43	47°54.52	• • 11.39	$182^{\circ}10.82$	• • 59.78	Elnath	277°59.16
16	223°33.12	53°40.22	52.77	$14^{\circ}7.53$	21.02	62°56.48	11.19	197°13.38	59.73	Alnilam Betelgeuse	275°35.58 270°49.81
17	238° 35.58	68°39.82	51.54	29°8.43	21.62	77°58.43	10.98	212°15.94	59.68	Canopus	263°51.64
18	253°38.04	83°39.42	N05°50.31	44°9.33	S12°22.22	93°0.38	N09° 10.78	227°18.50	N07°59.64	Sirius	258°24.47
19	268°40.51	98°39.03	49.08	59° 10.22	22.81	108° 2.34	10.58	242°21.07	59.59	Adhara	255°4.34
20	283°42.97	113°38.63	47.85	74°11.12	23.41	123° 4.29	10.38	257°23.63	59.54	Procyon	244°48.76
21	298° 45.44	128°38.23	• • 46.62	89° 12.01	• • 24.01	138° 6.24	• • 10.18	272°26.19	• • 59.50	Pollux	243°14.89
22 23	313° 47.90 328° 50.36	143°37.83 158°37.44	45.39 44.16	104° 12.91 119° 13.80	24.60 25.20	153°8.20 168°10.15	9.98 9.77	287°28.76 302°31.32	59.45 59.40	Avior	234°14.33
	320 30.30			_						Suhail	222°45.08
Mer.p	pass. 01:08	ν -0.4' d-1	2′ m-3.91	$\nu 0.9' \ d0.$.6′ m1.35	$\nu 2.0' \ d-0$.2′ m-1.70	ν 2.6 $^{\prime}$ d-0	0.0' m 0.31	Miaplacidus	221°38.62
										Alphard	217°45.91
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°32.44
0	343°52.83	173°37.04	N05°42.93	134°14.70	S 12°25.79	183°12.11	N09°9.57	317°33.88	N07°59.35	Dubhe Denebola	193°39.05 182°23.04
1	$358^{\circ}55.29$	188°36.65	41.70	149° 15.59	26.39	$198^{\circ}14.06$	9.37	332°36.45	59.31		175°41.63
2	13°57.76	203°36.25	40.47	164° 16.49	26.99	213°16.01	9.17	347°39.01	59.26		172°58.22
3	29°0.22	218° 35.85	• • 39.24	179° 17.38	• • 27.58	228°17.97	• • 8.97	2°41.57	• • 59.21		171°49.67
4 5	44°2.68 59°5.15	233°35.46 248°35.06	38.01	194° 18.28 209° 19.17	28.18	243°19.92 258°21.87	8.77	17°44.14 32°46.70	59.16	Alioth	$166^{\circ}11.56$
6	74°7.61	263°34.67	36.78 N05°35.55	209 19.17 224° 20.06	28.77 \$12°29.37	273°23.83	8.57 N09°8.36	47°49.27	59.12 N07°59.07		158°20.23
7	89° 10.08	278°34.27	34.31	239°20.96	29.96	288°25.78	8.16	62°51.83	59.02		152°50.64
8	104° 12.54	293°33.88	33.08	254°21.85	30.56	303°27.74	7.96	77°54.39	58.97	I	148°33.24
9	$119^{\circ}15.00$	308°33.49	• • 31.85	269°22.74	• • 31.15	318°29.69	• • 7.76	92°56.96	• • 58.93		147°55.25 145°46.12
10	$134^{\circ}17.47$	323°33.09	30.61	284°23.63	31.75	333°31.64	7.56	107°59.52	58.88	Rigil Kent.	139°37.58
11	149° 19.93	338°32.70	29.38	299°24.52	32.34	348°33.60	7.36	123°2.09	58.83	Kochab	137°20.48
12	164°22.40	353°32.30	N05°28.15	314°25.42	S12°32.94	3°35.55	N09°7.15	138°4.65	N07°58.78	Zuben'ubi	136°53.73
13	179°24.86 194°27.33	8°31.91 23°31.52	26.91 25.68	329°26.31 344°27.20	33.53 34.13	18°37.50 33°39.46	6.95	153°7.22 168°9.78	58.73	Alphecca	$126^{\circ}2.00$
14 15	209°29.79	38°31.12	• • 24.44	359° 28.09	• • 34.72	48°41.41	6.75 •• 6.55	183°12.35	58.69 •• 58.64	Antares	112°13.16
16	224°32.25	53°30.73	23.21	14°28.98	35.32	63°43.37	6.35	198°14.92	58.59	Atria	107°5.33
17	239°34.72	68°30.34	21.97	29°29.87	35.91	78°45.32	6.15	213°17.48	58.54	Sabik	102°0.23
18	254°37.18	83°29.95	N05°20.74	44°30.76	S12°36.51	93°47.27	N09°5.95	228°20.05	N07°58.49	Shaula	96°7.30 95°56.44
19	269°39.65	98° 29.55	19.50	59°31.65	37.10	108°49.23	5.74	243°22.61	58.45	Rasalhague Eltanin	95°50.44 90°41.00
20	$284^{\circ}42.11$	113°29.16	18.27	74°32.54	37.69	123°51.18	5.54	258°25.18	58.40	Kaus Aust.	83°29.45
21	299° 44.57	128°28.77	• • 17.03	89°33.43	• • 38.29	138°53.14	• • 5.34	273°27.75	• • 58.35	Vega	80°31.55
22	314° 47.04	143°28.38	15.80	104°34.32	38.88	153°55.09	5.14	288°30.31	58.30	Nunki	75°44.86
23	329°49.50	158°27.99	14.56	119°35.21	39.48	168°57.04	4.94	303°32.88	58.25	Altair	61°57.59
Mer.p	pass. 01:04	ν -0.4' d-1	2′ m-3.91	ν 0.9′ d0.	.6′ m1.35	ν 2.0′ d-0	.2′ m-1.70	ν 2.6′ d-0	0.0′ m0.30	Peacock	53°1.84
										Deneb	49°23.91
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.33
0	344°51.97	173°27.60	N05°13.32	134°36.09	\$12°40.07	183°59.00	N09°4.74	318°35.45	N07°58.20	Al Na'ir	27°29.74
1	359° 54.43	188°27.20	12.08	149°36.98	40.66	199° 0.95	4.53	333°38.01	58.16	Fomalhaut Scheat	15°11.76 13°42.70
2	$14^{\circ}56.89$	203°26.81	10.85	164°37.87	41.26	$214^{\circ}2.91$	4.33	348°40.58	58.11	Markab	13°27.38
3	$29^{\circ}59.36$	218°26.42	•• 9.61	179°38.76	• • 41.85	229° 4.86	• • 4.13	3°43.15	• • 58.06		
4	45°1.82	233°26.03	8.37	194°39.64	42.44	244°6.81	3.93	18°45.72	58.01	Sep 04 Sat	SHA
5	60°4.29	248°25.64	7.13	209° 40.53	43.03	259° 8.77	3.73	33°48.28	57.96		190°52.92
6	75°6.75	263°25.25	N05°5.90	224°41.42	S12°43.63	274°10.72	N09°3.53		N07° 57.91	1	150°59.46
7	90°9.22	278°24.86	4.66	239°42.31 254°43.19	44.22	289°12.68	3.32	63°53.42 78°55.99	57.86		199°31.53 333°38.71
8 9	105° 11.68 120° 14.14	293°24.47 308°24.08	3.42 · · 2.18	269° 44.08	44.81 •• 45.41	304°14.63 319°16.59	3.12 · · 2.92	93°58.56	57.81 •• 57.77		
10	135° 16.61	323°23.69	05° 0.94	284° 44.96	46.00	334°18.54	2.72	109°1.12	57.72	Sep 05 Sun	SHA
11	150° 19.07	338°23.30	04°59.70	299° 45.85	46.59	349°20.49	2.52	124°3.69	57.67		189°44.21
12	165°21.54		N04°58.46	314°46.73	S12°47.18	4°22.45	N09°2.32		N07°57.62		150°21.87 199°19.28
13	180°24.00	8°22.53	57.22	329° 47.62	47.78	19°24.40	2.12	154°8.83	57.57		333°41.05
14	195°26.46	23°22.14	55.98	344° 48.50	48.37	34°26.36	1.91	169°11.40	57.52		
15 16	210°28.93 225°31.39	38°21.75 53°21.36	• • 54.74 53.50	359°49.39 14°50.27	· · 48.96 49.55	49°28.31 64°30.27	· · 1.71 1.51	184°13.97 199°16.54	• • 57.47 57.42	Sep 06 Mon	SHA
10 17	240°33.86	53 21.30 68°20.97	53.50 52.26	29°51.16	49.55 50.14	79°32.22	1.31	214°19.11	57.42 57.37		188°35.63 149°44.13
18	255°36.32	83°20.59	N04°51.01	44°52.04	\$12°50.73	94°34.17	N09°1.11	229°21.68	N07°57.32	Jupiter	149 44.13 199°7.03
19	270°38.79	98° 20.20	49.77	59°52.92	51.33	109°36.13	0.91	244°24.25	57.27		333°43.48
20	285°41.25	113° 19.81	48.53	74°53.81	51.92	124°38.08	0.70	259°26.82	57.22		
21	300°43.71	128°19.42	• • 47.29	89°54.69	• • 52.51	139°40.04	• • 0.50	274°29.39	• • 57.17	Horizor	ntal parallax Venus:
22 23	315° 46.18 330° 48.64	143°19.04 158°18.65	46.05 44.80	104°55.57 119°56.45	53.10 53.69	154°41.99 169°43.95	0.30 0.10	289°31.96 304°34.53	57.12 57.07		venus: Mars:
										L	
ıvler.	pass. 01:00	ν-0.4′ d-1	2′ m-3.91	ν 0.9′ d 0.	.6′ m1.35	ν 2.0′ d-0	.2′ m-1.70	ν 2.6′ d -0	0.0′ m0.30		

Dec

29°14.74 -42°9.06

56°41.37

-17°49.83

-57°5.44

 $23^{\circ}35.67$

 $89^{\circ}22.52$

40°11.28

4°12.04

49°57.43

16°33.92

-8°10.01

 $46^{\circ}1.36$ 6°22.56

28°37.77

 $-1^{\circ}10.94$

 $7^{\circ}24.79$

-52°42.30 -16°45.08

-29°0.36

-59°35.70

-43°32.53

-69°49.72 -8°46.65

11°49.94

 $61^{\circ}36.09$

 $14^{\circ}25.10$

 $-17^{\circ}41.74$

 $-63^{\circ}15.29$ -57°16.22

55°48.70

-11°18.33

49°10.68 -60°30.58

-36°30.46

 $19^{\circ}2.43$

-60°57.19

 $74^{\circ}2.70$

-16°9.40

26°37.49

-26°29.61 -69°4.83

-15°45.49

 $-37^{\circ}7.46$

12°32.59

51°29.41

-34°22.27

38°48.84

-26°15.67

8°56.71

-56° 38.73

 $45^{\circ}23.00$

 $10^{\circ}0.34$

-46°49.46

-29°28.32

28°14.17

15°21.46

Mer.pass

12:25

15:04

11:49

02:53

12:26

15:02

11:46

02:49

15:01

11:43

02:45

0.1

0.1

Mer.pass 12:26

Mer.pass

 $5^{\circ}9.28$ 27°57.48

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.87	N07°20.41	141°6.76	10.5'	S14°32.95	13.6'	58.5'
1	195°11.08	19.49	155°36.29	10.5'	14°46.55	13.5'	58.5'
2	210°11.28 225°11.49	18.57 •• 17.65	170°5.79 184°35.27	10.5' 10.5'	15°0.04 15°13.43	13.4' 13.3'	58.4' 58.4'
4	240°11.69	16.73	199°4.72	10.4	15°26.73	13.2'	58.4'
5	255°11.90	15.81	213°34.15	10.4'	$15^{\circ}39.93$	13.1'	58.3'
6	270°12.11	N07°14.89	228°3.56	10.4	\$15°53.02	13.0'	58.3'
7 8	285°12.31 300°12.52	13.96 13.04	242°32.94 257°2.29	10.4' 10.3'	16°6.02 16°18.91	12.9' 12.8'	58.2' 58.2'
9	315°12.72	• • 12.12	271°31.63	10.3	16° 31.69	12.7'	58.2'
10	330°12.93	11.20	286°0.93	10.3'	$16^{\circ}44.37$	12.6'	58.1'
11	345°13.13	10.28 N07°9.35	300°30.21	10.3'	16°56.95	12.5'	58.1'
12 13	0°13.34 15°13.55	N07 9.35 8.43	314°59.46 329°28.68	10.2' 10.2'	\$17°9.41 17°21.77	12.4' 12.2'	58.0' 58.0'
14	30°13.75	7.51	343°57.88	10.2'	17°34.02	12.1'	58.0'
15	45°13.96	• • 6.59	358° 27.05	10.1'	17°46.16	12.0'	57.9'
16	60°14.17 75°14.37	5.66	12°56.19 27°25.30	10.1' 10.1'	17°58.19 18°10.10	11.9' 11.8'	57.9'
17 18	90°14.58	4.74 N07°3.82	41°54.39	10.1	\$18°21.90	11.7	57.9' 57.8'
19	105°14.79	2.89	56° 23.45	10.0'	18° 33.59	11.6'	57.8'
20	120°14.99	1.97	70°52.47	10.0'	18° 45.17	11.5'	57.7'
21	135°15.20 150°15.41	• • 1.05	85°21.47	10.0'	18° 56.63	11.3'	57.7'
22 23	150° 15.41 165° 15.61	07°0.12 06°59.20	99° 50.45 114° 19.39	9.9' 9.9'	19°7.97 19°19.19	11.2' 11.1'	57.7' 57.6'
	SD = 15.8'	d = -0.9'			0 = 16.0'		
	JD — 13.0°	u = -0.9)L	- 10.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.82	N06° 58.27	128° 48.30	9.9'	\$19°30.30	11.0'	57.6'
1 2	195°16.03 210°16.24	57.35 56.42	143°17.18 157°46.04	9.9' 9.8'	19°41.29 19°52.16	10.9' 10.7'	57.5' 57.5'
3	225°16.45	55.50	172° 14.87	9.8'	20°2.91	10.6	57.5'
4	240°16.65	54.57	186°43.66	9.8'	$20^{\circ}13.53$	10.5'	57.4'
5	255°16.86	53.65	201°12.43	9.7'	20°24.04	10.4	57.4'
6 7	270°17.07 285°17.28	N06°52.72 51.79	215°41.17 230°9.88	9.7' 9.7'	\$20°34.42 20°44.68	10.3' 10.1'	57.3' 57.3'
8	300°17.49	50.87	244°38.56	9.7'	20°54.81	10.1	57.3'
9	315°17.69	• • 49.94	259°7.22	9.6'	$21^{\circ}4.82$	9.9'	57.2'
10	330°17.90 345°18.11	49.02	273°35.84	9.6'	21°14.70	9.8'	57.2'
11 12	0°18.32	48.09 N06° 47.16	288°4.44 302°33.01	9.6' 9.5'	21°24.46 S 21°34.09	9.6' 9.5'	57.2' 57.1'
13	15°18.53	46.23	317°1.55	9.5'	21°43.59	9.4'	57.1
14	30°18.74	45.31	331°30.06	9.5'	$21^{\circ}52.97$	9.2'	57.0'
15 16	45°18.95 60°19.16	· · 44.38 43.45	345°58.55 0°27.01	9.5' 9.4'	22°2.21 22°11.33	9.1' 9.0'	57.0' 57.0'
17	75°19.37	43.45 42.52	14°55.44	9.4 9.4'	22°11.33	9.0 8.9'	56.9'
18	90°19.57	N06°41.60	29° 23.84	9.4'	S22°29.17	8.7'	56.9'
19	105°19.78	40.67	43°52.22	9.4'	22° 37.89	8.6'	56.9'
20 21	120°19.99 135°20.20	39.74 •• 38.81	58° 20.58 72° 48.91	9.3' 9.3'	22°46.48 22°54.94	8.5' 8.3'	56.8' 56.8'
22	150°20.41	37.88	87° 17.21	9.3'	22 54.94 23°3.27	8.2'	56.7'
23	165°20.62	36.95	101°45.49	9.3'	23°11.46	8.1'	56.7'
	SD = 15.9'	d = -0.9'		SE	0 = 15.7'		
Mon	GHA	Dec	GHA	ν	Dec	d 7.0'	HP
0 1	180°20.83 195°21.04	N06° 36.02 35.09	116° 13.75 130° 41.98	9.2' 9.2'	\$23° 19.52 23° 27.45	7.9' 7.8'	56.7' 56.6'
2	210°21.25	34.16	$145^{\circ}10.19$	9.2'	$23^{\circ}35.23$	7.7'	56.6'
3	225°21.46	• • 33.23	159°38.38	9.2'	23°42.89	7.5'	56.6'
4 5	240°21.67 255°21.88	32.30 31.37	174°6.55 188°34.69	9.1' 9.1'	23°50.41 23°57.79	7.4' 7.2'	56.5' 56.5'
6	255 21.88 270°22.09	31.37 N06°30.44	203°2.82	9.1	\$24°5.03	7.2	56.5
7	285°22.31	29.51	$217^{\circ}30.92$	9.1'	24°12.14	7.0'	56.4'
8	300°22.52	28.58	231°59.01	9.1'	24°19.11	6.8'	56.4
9 10	315°22.73 330°22.94	· · 27.65 26.72	246°27.07 260°55.12	9.0' 9.0'	24°25.94 24°32.64	6.7' 6.6'	56.4' 56.3'
10	330 22.94 345°23.15	25.79	260 55.12 275°23.15	9.0'	24 32.64 24°39.19	6.4	56.3
12	0°23.36	N06°24.86	289°51.17	9.0'	\$24°45.61	6.3'	56.3'
13	15°23.57	23.93	304° 19.17	9.0'	24°51.88	6.1'	56.2'
14 15	30°23.78 45°23.99	23.00 •• 22.06	318° 47.15 333° 15.12	9.0' 9.0'	24°58.02 25°4.02	6.0' 5.9'	56.2' 56.2'
16	60°24.21	21.13	347° 43.07	8.9'	25° 9.87	5.7'	56.1'
17	75°24.42	20.20	2°11.02	8.9'	$25^{\circ}15.59$	5.6'	56.1'
18	90°24.63	N06° 19.27	16°38.95	8.9'	\$25°21.17	5.4'	56.1'
19 20	105°24.84 120°25.05	18.33 17.40	31°6.87 45°34.78	8.9' 8.9'	25°26.60 25°31.90	5.3' 5.2'	56.0' 56.0'
21	135°25.27	16.47	60°2.68	8.9'	25° 37.05	5.2' 5.0'	56.0'
22	150°25.48	15.54	74°30.57	8.9'	25°42.06	4.9'	55.9'
23	165°25.69	14.60	88° 58.45	8.9'	25°46.93	4.7'	55.9'
	SD = 15.9'	d = -0.9'		SE	0 = 15.5'		

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

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

September 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	345°51.11	173°18.26 N04°43.56	134°57.34 S 12°54.28	184°45.90 N08°59.90	319°37.10 N07°57.03	
1	0°53.57	188°17.87 42.32	149°58.22 54.87	199°47.86 59.70	334°39.67 56.98	Alpheratz 357°32.13 29°14.75 Ankaa 353°4.61 -42°9.06
2	15°56.03	203°17.49 41.07	164°59.10 55.46	214°49.81 59.49	349°42.24 56.93	Schedar 349°27.96 56°41.39
3	30°58.50	218°17.10 · · 39.83	179°59.98 · · 56.05	229°51.77 · · 59.29	4°44.81 · · 56.88	Diphda 348°44.81 -17°49.83
4	46°0.96	233°16.72 38.59	195°0.86 56.64	244°53.72 59.09	19°47.38 56.83	Achernar 335°18.15 -57°5.45
5 6	61°3.43 76°5.89	248°16.33 37.34 263°15.94 N04°36.10	210°1.74 57.23 225°2.62 \$12°57.83	259°55.67 58.89 274°57.63 N08°58.69	34°49.95 56.78 49°52.52 N07°56.73	Hamal 327°48.47 23°35.68
7	91°8.36	278°15.56 34.85	240°3.50 58.42	289°59.58 58.49	64°55.09 56.68	Polaris 312°38.61 89°22.53
8	106° 10.82	293°15.17 33.61	255°4.38 59.01	305°1.54 58.28	79°57.66 56.63	Acamar 315°9.92 -40°11.28
9	121° 13.28	308°14.79 · · 32.36	270°5.26 12°59.60	320° 3.49 · · 58.08	95°0.24 · · 56.58	Menkar 314°3.69 4°12.05
10	136° 15.75	323°14.40 31.12	285°6.14 13°0.19	335°5.45 57.88	110°2.81 56.53	Mirfak 308°24.88 49°57.44 Aldebaran 290°37.06 16°33.92
11	151° 18.21	338°14.02 29.87	300°7.02 0.77	350°7.40 57.68	125°5.38 56.48	Rigel 281°1.78 -8°10.01
12	166° 20.68	353°13.63 N04°28.63	315°7.90 \$13°1.36	5°9.36 N08°57.48	140°7.95 N07°56.43	Capella 280°18.67 46°1.36
13	181°23.14	8°13.25 27.38	330°8.78 1.95	20°11.31 57.28	155°10.52 56.38 170°13.10 56.32	Bellatrix 278°20.56 6°22.56
14 15	196°25.60 211°28.07	23°12.86 26.14 38°12.48 •• 24.89	345°9.66 2.54 0°10.53 · · 3.13	35°13.27 57.07 50°15.22 · · 56.87	170°13.10 56.32 185°15.67 · · 56.27	Elnath 277°59.13 28°37.77
16	226° 30.53	53°12.10 23.64	15°11.41 3.72	65°17.18 56.67	200°18.24 56.22	Alnilam 275°35.55 -1°10.94
17	241°33.00	68°11.71 22.40	30°12.29 4.31	80°19.13 56.47	215°20.81 56.17	Betelgeuse 270°49.79 7°24.79
18	256°35.46	83°11.33 N04°21.15	45°13.17 S 13°4.90	95°21.09 N08°56.27	230°23.39 N07°56.12	Canopus 263°51.61 -52°42.30 Sirius 258°24.44 -16°45.07
19	271°37.92	98°10.95 19.90	60°14.04 5.49	110°23.04 56.07	245°25.96 56.07	Adhara 255°4.32 -29°0.36
20	286° 40.39	113°10.56 18.65	75°14.92 6.08	125°25.00 55.86	260°28.53 56.02	Procyon 244°48.74 5°9.28
21	301°42.85	128°10.18 · · 17.41 143°9.80	90°15.80 · · 6.67	140°26.95 · · 55.66	275°31.11 · · 55.97	Pollux 243°14.87 27°57.48
22 23	316° 45.32 331° 47.78	143°9.80 16.16 158°9.41 14.91	105°16.67 7.25 120°17.55 7.84	155°28.91 55.46 170°30.86 55.26	290°33.68 55.92 305°36.25 55.87	Avior 234°14.31 -59°35.69
				·		Suhail 222°45.07 -43°32.53
Mer.p	oass. 00:56	ν -0.4 $'$ <i>d</i> -1.2 $'$ m-3.91	$ u 0.9' \ d0.6' \ m1.35$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.70$	$\nu 2.6' \ d$ -0.0' m0.29	Miaplacidus 221°38.60 -69°49.71
						Alphard 217°45.89 -8°46.65
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.43 11°49.93 Dubhe 193°39.05 61°36.08
0	$346^{\circ}50.25$	173°9.03 N04°13.66	135°18.42 \$13°8.43	185°32.82 N08°55.06	320°38.83 N07°55.82	Denebola 182°23.03 14°25.09
1	1°52.71	188°8.65 12.41	150°19.30 9.02	200°34.77 54.86	335°41.40 55.77	Gienah 175°41.62 -17°41.73
2	16°55.17	203°8.26 11.16	165°20.17 9.61	215°36.73 54.65	350°43.98 55.72	Acrux 172°58.22 -63°15.28
3 4	31°57.64 47°0.10	218°7.88 · · 9.92 233°7.50 8.67	180°21.05 · · 10.19 195°21.92	230°38.68 · · 54.45	5°46.55 · · 55.67	Gacrux 171°49.68 -57°16.21
5	62°2.57	233°7.50 8.67 248°7.12 7.42	195°21.92 10.78 210°22.80 11.37	245°40.64 54.25 260°42.59 54.05	20°49.12 55.62 35°51.70 55.56	Alioth 166°11.57 55°48.69
6	77°5.03	263°6.74 N04°6.17	225°23.67 \$13°11.96	275°44.55 N08°53.85	50°54.27 N07°55.51	Spica 158°20.23 -11°18.33
7	92°7.49	278°6.35 4.92	240°24.54 12.54	290°46.50 53.65	65°56.85 55.46	Alkaid 152°50.66 49°10.67 Hadar 148°33.26 -60°30.57
8	$107^{\circ}9.96$	293°5.97 3.67	255°25.42 13.13	305°48.46 53.44	80°59.42 55.41	Hadar 148°33.26 -60°30.57 Menkent 147°55.26 -36°30.45
9	$122^{\circ}12.42$	308°5.59 · · 2.42	270°26.29 · · 13.72	320°50.41 · · 53.24	96°2.00 · · 55.36	Arcturus 145°46.12 19°2.43
10	137° 14.89	323°5.21 04°1.17	285°27.16 14.31	335°52.37 53.04	111°4.57 55.31	Rigil Kent. 139°37.59 -60°57.18
11	152° 17.35	338°4.83 03°59.92	300°28.04 14.89	350°54.33 52.84	126°7.15 55.26	Kochab 137°20.53 74°2.69
12	167° 19.82 182° 22.28	353°4.45 N03°58.67	315°28.91 \$13°15.48	5°56.28 N08°52.64	141°9.72 N07°55.21	Zuben'ubi 136°53.74 -16°9.40
13 14	182 22.28 197°24.74	8°4.07 57.41 23°3.69 56.16	330°29.78 16.07 345°30.65 16.65	20°58.24 52.44 36°0.19 52.23	156°12.30 55.15 171°14.88 55.10	Alphecca 126°2.01 26°37.49
15	212° 27.21	38°3.31 · · 54.91	0°31.52 · · 17.24	51°2.15 · · 52.03	186°17.45 · · 55.05	Antares 112°13.17 -26°29.61
16	227°29.67	53°2.93 53.66	15°32.40 17.83	66° 4.10 51.83	201°20.03 55.00	Atria 107° 5.36 -69° 4.82
17	242°32.14	68°2.55 52.41	30°33.27 18.41	81°6.06 51.63	216°22.60 54.95	Sabik 102°0.24 -15°45.48 Shaula 96°7.31 -37°7.46
18	257°34.60	83°2.17 N03°51.16	45°34.14 \$13°19.00	96°8.01 N08°51.43	231°25.18 N07°54.90	Rasalhague 95°56.45 12°32.60
19	272°37.06	98°1.79 49.90	60°35.01 19.58	111° 9.97 51.23	246°27.76 54.84	Eltanin 90°41.03 51°29.41
20	287°39.53	113°1.41 48.65	75°35.88 20.17	126°11.92 51.02	261°30.33 54.79	Kaus Aust. 83°29.46 -34°22.27
21 22	302°41.99 317°44.46	128°1.03 · · 47.40 143°0.65 46.15	90°36.75 · · · 20.76 105°37.62	141°13.88 · · 50.82 156°15.84 50.62	276°32.91 · · 54.74 291°35.49 54.69	Vega 80°31.56 38°48.85
23	332° 46.92	158° 0.27 44.89	105°37.62 21.34 120°38.49 21.93	156°15.84 50.62 171°17.79 50.42	291°35.49 54.69 306°38.06 54.64	Nunki 75°44.87 -26°15.67
						Altair 61°57.60 8°56.71
Mer.p	pass. 00:53	ν-0.4' d-1.2' m-3.91	ν 0.9′ d 0.6′ m 1.35	ν2.0' d-0.2' m-1.70	$\nu 2.6' \ d$ -0.1' m0.29	Peacock 53°1.85 -56°38.74 Deneb 49°23.92 45°23.02
						Enif 33°36.33 10°0.35
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.74 -46°49.47
0	347°49.39	172°59.89 N03°43.64	135°39.36 \$13°22.51	186°19.75 N08°50.22	321°40.64 N07°54.59	Fomalhaut 15°11.75 -29°28.32
1	2°51.85	187°59.51 42.39	150°40.23 23.10	201°21.70 50.02	336°43.22 54.53	Scheat 13°42.70 28°14.18
2	17° 54.31 32° 56.78	202°59.13 41.13 217°58.75 · · 39.88	165°41.09 23.68 180°41.96 · · 24.27	216°23.66 49.81 231°25.61 • 49.61	351°45.80 54.48 6°48.37 · · 54.43	Markab 13°27.37 15°21.47
4	47° 59.24	232°58.38 38.62	195° 42.83 24.85	246°27.57 49.41	21°50.95 54.38	Sep 07 Tue SHA Mer.pass
5	63°1.71	247°58.00 37.37	210° 43.70 25.44	261°29.53 49.21	36°53.53 54.33	Venus 187°27.16 12:27
6	78°4.17	262°57.62 N03°36.11	225°44.57 \$13°26.02	276°31.48 N08°49.01	51°56.11 N07°54.27	Mars 149° 6.23 14:59
7	93°6.63	277° 57.24 34.86	240°45.43 26.61	291°33.44 48.81	66°58.69 54.22	Jupiter 198°54.80 11:39
8	108°9.10	292°56.86 33.60	255°46.30 27.19	306°35.39 48.60	82°1.26 54.17	Saturn 333°45.99 02:41
9	123°11.56	307°56.49 · · 32.35	270°47.17 · · 27.78	321°37.35 · · 48.40	97°3.84 · · 54.12	Sep 08 Wed SHA Mer.pass
10 11	138° 14.03 153° 16.49	322°56.11 31.09 337°55.73 29.84	285°48.03 28.36 300°48.90 28.94	336°39.31 48.20 351°41.26 48.00	112°6.42 54.06 127°9.00 54.01	Venus 186°18.78 12:28
12	168° 18.96	352°55.35 N03°28.58	315°49.77 \$13°29.53	6°43.22 N08°47.80	142°11.58 N07°53.96	Mars 148°28.18 14:58
13	183°21.42	7°54.98 27.33	330°50.63 30.11	21°45.17 47.60	157°14.16 53.91	Jupiter 198°42.57 11:36
14	198°23.88	22°54.60 26.07	345°51.50 30.70	36°47.13 47.39	172°16.74 53.85	Saturn 333°48.58 02:37
15	213°26.35	37°54.22 · · 24.82	0°52.36 · · 31.28	51°49.09 · · 47.19	187°19.32 · · 53.80	Sep 09 Thu SHA Mer.pass
16	228° 28.81	52°53.84 23.56	15°53.23 31.86	66°51.04 46.99	202°21.89 53.75	Venus 185°10.50 12:28
17	243°31.28	67°53.47 22.30	30°54.09 32.45	81°53.00 46.79	217°24.47 53.70	Mars 147°49.97 14:57
18 19	258° 33.74 273° 36.20	82°53.09 N03°21.05 97°52.71 19.79	45°54.95 \$13°33.03 60°55.82 33.61	96°54.95 N08°46.59 111°56.91 46.39	232°27.05 N07°53.64 247°29.63 53.59	Jupiter 198°30.36 11:33
20	273 36.20 288°38.67	112°52.34 18.53	75° 56.68 34.19	111 50.91 40.39 126°58.87 46.18	262°32.21 53.54	Saturn 333°51.26 02:33
21	303°41.13	127°51.96 · · 17.27	90°57.55 · · 34.78	142° 0.82 · · 45.98	277°34.79 · · 53.48	Horizontal parallax
22	318°43.60	142°51.59 16.02	105°58.41 35.36	157° 2.78 45.78	292°37.37 53.43	Venus: 0.1
23	333°46.06	157°51.21 14.76	120°59.27 35.94	172° 4.74 45.58	307°39.95 53.38	Mars: 0.1
Mer	pass. 00:49	ν-0.4' d-1.3' m-3.91	ν0.9' d0.6' m1.36	ν2.0' d-0.2' m-1.70	ν2.6' d-0.1' m0.28	

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°25.90	N06°13.67	103°26.33	8.9'	S25°51.66	4.6'	55.9'
1	195° 26.11	12.73	117° 54.20	8.9'	25°56.24	4.4'	55.8'
2	210°26.33	11.80	132°22.07	8.9'	26°0.69	4.3'	55.8'
3 4	225°26.54 240°26.75	· · 10.87 9.93	146°49.93 161°17.79	8.9' 8.9'	26° 4.99 26° 9.15	4.2' 4.0'	55.8' 55.7'
5	255° 26.96	9.93	175° 45.64	8.9	26°13.16	3.9'	55.7'
6	270°27.18	N06°8.06	190° 13.50	8.9'	S26°17.04	3.7'	55.7'
7	285°27.39	7.13	204°41.36	8.9'	$26^{\circ}20.77$	3.6'	55.7'
8	300°27.60	6.19	219°9.21	8.9'	26°24.36	3.4'	55.6'
9 10	315°27.82 330°28.03	• • 5.26 4.32	233°37.07 248°4.93	8.9' 8.9'	26°27.81 26°31.11	3.3' 3.2'	55.6' 55.6'
11	345° 28.24	3.39	262° 32.80	8.9'	26°34.27	3.0'	55.5'
12	0°28.46	N06°2.45	277°0.67	8.9'	S26°37.29	2.9'	55.5'
13	15°28.67	1.52	291°28.54	8.9'	$26^{\circ}40.17$	2.7'	55.5'
14	30°28.88	06°0.58	305°56.42	8.9'	26°42.90	2.6'	55.5'
15 16	45°29.10 60°29.31	05°59.64 58.71	320°24.32 334°52.22	8.9' 8.9'	26°45.49 26°47.94	2.4' 2.3'	55.4' 55.4'
17	75° 29.53	57.77	349°20.12	8.9'	26°50.25	2.2'	55.4'
18	90°29.74	N05°56.84	3°48.05	8.9'	S26°52.42	2.0'	55.3'
19	105°29.95	55.90	18° 15.98	8.9'	26°54.44	1.9'	55.3'
20	120°30.17	54.96	32°43.92	9.0'	26°56.32	1.7'	55.3'
21 22	135°30.38 150°30.60	• • 54.02 53.09	47°11.89 61°39.86	9.0' 9.0'	26°58.06 26°59.66	1.6' 1.5'	55.3' 55.2'
23	165°30.81	53.09 52.15	76°7.85	9.0' 9.0'	20 59.00 27°1.12	1.3'	55.2'
	SD = 15.9'	d = -0.9'			0 = 15.2'		
	JD — 13.9	u = -0.9		عد	- 13.2		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°31.02	N05°51.21	90°35.86	9.0'	\$27°2.43	1.2'	55.2'
1 2	195°31.24 210°31.45	50.27 49.34	105°3.89 119°31.94	9.0' 9.1'	27° 3.61 27° 4.64	1.0' 0.9'	55.2' 55.1'
3	210 31.45 225°31.67	49.34 • • 48.40	119 31.94 134°0.01	9.1 9.1'	27 4.04 27°5.54	0.9	55.1'
4	240°31.88	47.46	148° 28.10	9.1'	27° 6.29	0.6'	55.1'
5	255°32.10	46.52	$162^{\circ}56.21$	9.1'	27°6.90	0.5'	55.1'
6	270°32.31	N05°45.58	177° 24.35	9.2'	S27°7.38	0.3'	55.0'
7	285°32.53	44.64	191°52.51 206°20.69	9.2'	27°7.71 27°7.91	0.2'	55.0'
8 9	300°32.74 315°32.96	43.71 •• 42.77	206° 20.69 220° 48.91	9.2' 9.2'	27° 7.91 27° 7.97	0.1' -0.1'	55.0' 55.0'
10	330°33.17	41.83	235° 17.15	9.3'	27°7.89	-0.2	54.9'
11	345°33.39	40.89	249° 45.42	9.3'	$27^{\circ}7.67$	-0.4'	54.9'
12	0°33.61	N05°39.95	264° 13.72	9.3'	\$27°7.31	-0.5	54.9'
13 14	15°33.82 30°34.04	39.01 38.07	278° 42.05 293° 10.41	9.4' 9.4'	27° 6.82 27° 6.19	-0.6' -0.8'	54.9'
14 15	30 34.04 45°34.25	37.13	293 10.41 307°38.81	9.4 9.4'	27 0.19 27°5.42	-0.8 -0.9'	54.9' 54.8'
16	60°34.47	36.19	322°7.24	9.5'	27° 4.52	-1.0'	54.8'
17	75°34.68	35.25	$336^{\circ}35.70$	9.5'	$27^{\circ}3.48$	-1.2'	54.8'
18	90°34.90	N05°34.31	351°4.20	9.5'	\$27°2.30	-1.3'	54.8'
19	105°35.12 120°35.33	33.37	5°32.74 20°1.31	9.6' 9.6'	27°1.00 26°59.55	-1.4' -1.6'	54.8' 54.7'
20 21	120 35.33 135°35.55	32.43 •• 31.49	20 1.31 34°29.92	9.6 9.7'	26°57.97	-1.0 -1.7'	54.7'
22	150° 35.76	30.54	48° 58.57	9.7'	26°56.26	-1.8'	54.7'
23	165°35.98	29.60	63°27.26	9.7'	$26^{\circ}54.42$	-2.0'	54.7'
	SD = 15.9'	d = -0.9'		SD	0 = 15.1'		
	CUA	Б.	CILA		Б.	,	
Thu 0	GHA 180° 36.20	Dec N05°28.66	GHA 77° 56.00	u 9.8'	Dec \$26° 52.45	d -2.1'	HP 54.7'
1	195° 36.41	27.72	92°24.77	9.8'	26°50.34	-2.1 -2.2'	54.6
2	210°36.63	26.78	$106^{\circ}53.59$	9.9'	26°48.10	-2.4'	54.6'
3	225°36.85	• • 25.84	121°22.45	9.9'	26°45.73	-2.5'	54.6'
4 5	240°37.06 255°37.28	24.89 23.95	135°51.36 150°20.31	10.0' 10.0'	26°43.23 26°40.60	-2.6' -2.8'	54.6' 54.6'
6	255 37.28 270°37.50	N05°23.01	164° 49.30	10.0'	526°37.84	-2.8 -2.9'	54.6'
7	285°37.71	22.07	179° 18.34	10.1'	$26^{\circ}34.95$	-3.0'	54.5'
8	300°37.93	21.12	193°47.44	10.1'	26°31.93	-3.1'	54.5'
9	315°38.15	• • 20.18	208° 16.57	10.2'	26°28.79	-3.3'	54.5'
10 11	330°38.37 345°38.58	19.24 18.30	222°45.76 237°15.00	10.2' 10.3'	26°25.52 26°22.12	-3.4' -3.5'	54.5' 54.5'
12	0°38.80	N05°17.35	251° 44.29	10.3	\$26°18.60	-3.6'	54.5
13	15°39.02	16.41	$266^{\circ}13.63$	10.4'	$26^{\circ}14.95$	-3.8'	54.4'
14	30°39.24	15.47	280°43.02	10.4'	26°11.18	-3.9'	54.4
15 16	45°39.45 60°39.67	· · 14.52 13.58	295°12.46 309°41.95	10.5' 10.5'	26° 7.28 26° 3.27	-4.0' -4.1'	54.4' 54.4'
16 17	75°39.89	13.58	309°41.95 324°11.50	10.6'	25° 59.12	-4.1 -4.3'	54.4' 54.4'
18	90°40.11	N05°11.69	338°41.11	10.7'	\$25°54.86	-4.4'	54.4'
19	105°40.32	10.74	353° 10.76	10.7'	25°50.47	-4.5'	54.4'
20	120°40.54	9.80	7°40.48	10.8'	25°45.97	-4.6'	54.3'
21 22	135°40.76 150°40.98	· · 8.86 7.91	22° 10.24 36° 40.07	10.8' 10.9'	25°41.34 25°36.60	-4.7' -4.9'	54.3' 54.3'
23	165°41.20	6.97	50 40.07 51°9.95	10.9'	25°31.74	-4.9 -5.0'	54.3'
	SD = 15.9'	d = -0.9'		SE	0 = 14.9'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-62%	
07	01:44	01:54	11:58	17:44	05:18		
08	02:04	02:14	11:58	18:37	06:11		
09	02:25	02:35	11:57	19:28	07:03		

September 10, 11, 12 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	348° 48.53		N03°13.50	136°0.13	\$13°36.53	187° 6.69	N08° 45.38	322°42.53	N07°53.33			
1	3°50.99	187°50.46	12.24	151°1.00	37.11	202°8.65	45.18	337°45.12	53.27	Alpheratz	357°32.12 353°4.60	29°14.77 -42°9.07
2	18°53.45	202°50.08	10.99	$166^{\circ}1.86$	37.69	$217^{\circ}10.60$	44.97	352°47.70	53.22	Ankaa Schedar	353 4.60 349°27.94	-42 9.07 56°41.41
3	33°55.92	217°49.71	• • 9.73	181°2.72	• • 38.27	232°12.56	• • 44.77	7°50.28	• • 53.17	Diphda	348°44.79	-17° 49.83
4	48° 58.38	232°49.33	8.47	196°3.58	38.85	247°14.52	44.57	22°52.86	53.11	Achernar	$335^{\circ}18.12$	-57°5.46
5 6	64°0.85 79°3.31	247°48.96 262°48.58	7.21 N03°5.95	211°4.44 226°5.30	39.44 \$13°40.02	262°16.47 277°18.43	44.37 N08° 44.17	37°55.44 52°58.02	53.06 N07°53.01	Hamal	327°48.44	23°35.69
7	94°5.77	277°48.21	4.69	241°6.17	40.60	292°20.39	43.97	68° 0.60	52.95	Polaris	312°37.04	89°22.55
8	109°8.24	292°47.83	3.43	256°7.03	41.18	307°22.34	43.76	83°3.18	52.90	Acamar	315°9.89	-40°11.29
9	124° 10.70	307°47.46	• • 2.17	271°7.89	• • 41.76	$322^{\circ}24.30$	• • 43.56	98°5.76	• • 52.85	Menkar Mirfak	314°3.67 308°24.84	4° 12.05 49° 57.45
10	139° 13.17	322°47.08	03°0.91	286°8.75	42.34	337°26.26	43.36	113°8.35	52.79	Aldebaran	290°37.03	16° 33.93
11	154° 15.63	337°46.71	02°59.65	301°9.61	42.92	352°28.21	43.16	128°10.93	52.74	Rigel	281°1.75	-8°10.01
12 13	169° 18.09 184° 20.56	352°46.33 N 7°45.96	N02°58.39 57.13	316° 10.46 331° 11.32	\$13°43.50 44.09	7°30.17 22°32.13	N08° 42.96 42.76	143°13.51 158°16.09	N07° 52.69 52.63	Capella	280°18.63	46°1.37
14	199°23.02	22°45.58	55.87	346° 12.18	44.67	37°34.08	42.55	173° 18.68	52.58	Bellatrix	278°20.53	6°22.56
15	214°25.49	37°45.21	• • 54.61	1°13.04	• • 45.25	52°36.04	• • 42.35	188°21.26	• • 52.52	Elnath	277°59.10	28°37.77
16	229°27.95	52°44.84	53.35	$16^{\circ}13.90$	45.83	67°38.00	42.15	203°23.84	52.47	Alnilam Betelgeuse	275°35.53 270°49.76	-1°10.93 7°24.79
17	244°30.42	67°44.46	52.09	31°14.76	46.41	82°39.95	41.95	218°26.42	52.42	Canopus	263°51.58	-52° 42.29
18	259°32.88		N02°50.83	46° 15.62	\$13°46.99	97°41.91	N08°41.75	233°29.01	N07°52.36	Sirius	258° 24.42	-16° 45.07
19 20	274°35.34 289°37.81	97° 43.72 112° 43.34	49.57 48.31	61°16.47 76°17.33	47.57 48.15	112°43.87 127°45.82	41.55 41.34	248°31.59 263°34.17	52.31 52.26	Adhara	255°4.29	-29°0.36
21	304° 40.27	127°42.97	• • 47.05	91°18.19	. 48.73	142°47.78	• • 41.14	278°36.76	• • 52.20	Procyon	244°48.72	5°9.28
22	319° 42.74	142°42.60	45.79	106° 19.04	49.31	157°49.74	40.94	293°39.34	52.15	Pollux	243°14.85	27°57.47
23	334°45.20	157°42.22	44.53	121°19.90	49.89	$172^{\circ}51.69$	40.74	308°41.92	52.09	Avior Suhail	234°14.28 222°45.05	-59°35.68 -43°32.52
Meri	pass. 00:45	ν -0.4' d-1.3	R' m-3 91	ν0 9' d0	.6′ m1.36	ν2 0' d-0	.2′ m-1.70	ν2 6′ d-0	.1′ m0.28	Miaplacidus	221°38.57	-69° 49.70
	Puss. 00.15	- U.1 G 1.5		- 0.5 40				- V Z.O 'U O		Alphard	217°45.88	-8°46.65
C-4	CIIA	CIIA	D	CHA	D	CIIA	D	CHA	D	Regulus	$207^{\circ}32.41$	11°49.93
Sat 0	GHA 349° 47.66	GHA 172°41.85	Dec N02°43.26	GHA 136° 20.76	Dec \$13°50.47	GHA 187°53.65	Dec N08° 40.54	GHA 323°44.51	Dec N07°52.04	Dubhe	193°39.04	61°36.06
1	4°50.13	187°41.48	42.00	151° 21.61	51.04	202°55.61	40.34	338°47.09	51.98	Denebola	182°23.03	14°25.09
2	19°52.59	202°41.10	40.74	166°22.47	51.62	217°57.57	40.13	353°49.67	51.93	Gienah	175°41.62	-17°41.73 -63°15.27
3	34°55.06	217°40.73	• • 39.48	181°23.32	• • 52.20	232°59.52	• • 39.93	8°52.26	• • 51.88	Acrux	172°58.22 171°49.68	-63 15.27 -57°16.20
4	49°57.52	232°40.36	38.22	196°24.18	52.78	248°1.48	39.73	23°54.84	51.82	Alioth	166°11.58	55° 48.67
5	64° 59.99	247°39.99	36.95	211°25.03	53.36	263°3.44	39.53	38°57.43	51.77	Spica	158° 20.23	-11°18.33
6 7	80°2.45 95°4.91	262°39.61 N 277°39.24	N02°35.69 34.43	226°25.89 241°26.74	\$13°53.94 54.52	278° 5.39 293° 7.35	N08°39.33 39.13	54°0.01 69°2.60	N07°51.71 51.66	Alkaid	$152^{\circ}50.66$	49°10.66
8	110°7.38	292°38.87	33.16	256° 27.60	55.10	308° 9.31	38.92	84°5.18	51.60	Hadar	148°33.27	-60°30.56
9	125°9.84	307°38.50	• • 31.90	271°28.45	55.67	323°11.27	• • 38.72	99°7.77	• • 51.55	Menkent	147°55.27 145°46.13	-36°30.45 19°2.42
10	140°12.31	322°38.12	30.64	286°29.30	56.25	$338^{\circ}13.22$	38.52	114°10.35	51.50	Arcturus Rigil Kent.	145 46.13 139°37.61	-60°57.17
11	155° 14.77	337° 37.75	29.37	301°30.16	56.83	353°15.18	38.32	129°12.94	51.44	Kochab	137°20.58	74°2.68
12	170° 17.23		N02°28.11	316°31.01	\$13°57.41	8°17.14	N08°38.12	144°15.52	N07°51.39	Zuben'ubi	136°53.75	-16°9.39
13 14	185° 19.70 200° 22.16	7°37.01 22°36.64	26.85 25.58	331°31.86 346°32.71	57.98 58.56	23°19.10 38°21.05	37.92 37.71	159°18.11 174°20.69	51.33 51.28	Alphecca	$126^{\circ}2.02$	26° 37.49
15	215°24.63	37°36.27	• • 24.32	1° 33.57	59.14	53°23.01	•• 37.51	189°23.28	• • 51.22	Antares	112°13.18	-26°29.61
16	230° 27.09	52°35.89	23.06	16°34.42	13°59.72	68°24.97	37.31	204°25.86	51.17	Atria Sabik	107°5.39 102°0.24	-69°4.82 -15°45.48
17	245°29.55	67°35.52	21.79	31°35.27	14°0.29	83°26.93	37.11	219°28.45	51.11	Shaula	96°7.32	-15 45.46 -37°7.46
18	260°32.02		N02°20.53	46°36.12	S14°0.87	98°28.88	N08°36.91	234°31.04	N07°51.06	Rasalhague	95°56.46	12°32.60
19	275°34.48	97°34.78	19.26	61°36.97	1.45	113°30.84	36.71	249°33.62	51.00	Eltanin	90°41.05	51°29.42
20 21	290°36.95 305°39.41	112°34.41 127°34.04	18.00 •• 16.73	76°37.82 91°38.67	2.02 •• 2.60	128°32.80 143°34.76	36.51 · · 36.30	264°36.21 279°38.80	50.95 •• 50.89	Kaus Aust.	83°29.46	-34° 22.28
22	320°41.88	142°33.67	15.47	106°39.52	3.18	158°36.71	36.10	294°41.38	50.84	Vega	80°31.58	38° 48.85
23	335°44.34	157°33.30	14.20	121°40.37	3.75	173°38.67	35.90	309°43.97	50.78	Nunki Altair	75°44.87 61°57.60	-26° 15.67 8° 56.72
Meri	pass. 00:41	ν-0.4' d-1.3	2′ m-3 00	υΩ Ω' dΩ	.6′ m1.36	1/2 0' d-0	.2′ m-1.70		.1′ m0.27	Peacock	53°1.86	-56° 38.75
	pass. 00.41	ν σ. + α 1.5			.0 1111.50			- V2.0 U 0	.1 1110.27	Deneb	49°23.93	45°23.03
•	CILA	CUA		CIIA	Б	CIIA	Б.	CIIA	ъ.	Enif	33°36.33	10°0.36
Sun 0	GHA 350° 46.80	GHA 172°32.93	Dec N02°12.94	GHA 136° 41.22	Dec \$14°4.33	GHA 188°40.63	Dec N08°35.70	GHA 324°46.56	Dec N07° 50.73	Al Na'ir	27°29.74	-46°49.48
1	5° 49.27	187°32.56	11.67	150° 41.22	4.91	203°42.59	35.50	339°49.14	50.67	Fomalhaut Scheat	15°11.74 13°42.69	-29°28.33
2	20°51.73	202°32.19	10.41	166° 42.92	5.48	218°44.54	35.30	354°51.73	50.62	Markab	13° 42.69 13° 27.36	28° 14.19 15° 21.48
3	35° 54.20	217°31.82	•• 9.14	181°43.77	• • 6.06	233°46.50	•• 35.09	9°54.32	•• 50.56			
4	50° 56.66	232°31.45	7.87	196° 44.62	6.63	248°48.46	34.89	24°56.91	50.51	Sep 10 Fri	SHA	Mer.pass
5	65°59.12	247°31.08	6.61	211° 45.46	7.21	263°50.42	34.69	39°59.49	50.45	Venus	184°2.31 147°11.61	12:29
6 7	81°1.59 96°4.05	262°30.70 277°30.33	N02°5.34 4.08	226°46.31 241°47.16	\$14°7.78 8.36	278°52.38 293°54.33	N08°34.49 34.29	55°2.08 70°4.67	N07° 50.39 50.34		147 11.61 198° 18.17	14:55 11:30
8	111°6.52	292°29.96	2.81	256° 48.01	8.94	308°56.29	34.09	85°7.26	50.28	Saturn	333°54.01	02:29
9	126°8.98	307°29.59	• 1.54	271°48.85	• • 9.51	323°58.25	• • 33.88	100°9.84	• • 50.23	Sc. 11 C		
10	141° 11.44	322°29.23	02°0.28	286°49.70	10.08	339°0.21	33.68	115°12.43	50.17	Sep 11 Sat	SHA 182°54.18	Mer.pass 12:30
11	156° 13.91	337°28.86	01°59.01	301°50.55	10.66	354°2.17	33.48	130°15.02	50.12		146° 33.09	14:54
12 13	171° 16.37 186° 18.84	352°28.49 N 7°28.12	N01°57.74 56.48	316°51.39 331°52.24	\$14°11.23 11.81	9°4.12 24°6.08	N08°33.28 33.08	145°17.61 160°20.20	N07° 50.06 50.01	Jupiter	198°5.99	11:27
14	201°21.30	7 28.12 22°27.75	55.48 55.21	331 52.24 346°53.09	12.38	24 6.08 39°8.04	33.08	175° 22.79	49.95	Saturn	333°56.84	02:25
15	216°23.76	37°27.38	53.94	1°53.93	. 12.96	54°10.00	• • 32.68	190°25.38	• • 49.89	Sep 12 Sun	SHA	Mer.pass
16	231°26.23	52°27.01	52.68	16°54.78	13.53	69°11.96	32.47	205°27.97	49.84		181°46.12	12:30
17	246°28.69	67°26.64	51.41	31°55.62	14.10	84°13.91	32.27	220°30.55	49.78	Mars	145°54.42	14:52
18	261°31.16		N01°50.14	46°56.47	\$14°14.68	99°15.87	N08° 32.07	235°33.14	N07° 49.73		197°53.83	11:24
19 20	276°33.62 291°36.09	97°25.90 112°25.53	48.87 47.61	61°57.31 76°58.15	15.25 15.83	114°17.83 129°19.79	31.87 31.67	250°35.73 265°38.32	49.67 49.61	Saturn	333°59.75	02:20
21	306°38.55	112 25.53 127°25.16	• • 46.34	91°59.00	16.40	144°21.75	•• 31.47	205 36.32 280°40.91	• • 49.56	Horizor	ntal parallax	
22	321°41.01	142°24.79	45.07	106° 59.84	16.97	159°23.71	31.27	295°43.50	49.50		Venus:	0.1
23	336° 43.48	157°24.42	43.80	122°0.68	17.55	174°25.66	31.06	310°46.09	49.45		Mars:	0.1
Mer.	pass. 00:37	ν -0.4' d-1.3	3′ m-3.90	$-\nu$ 0.8′ d0	.6′ m1.36	$\nu 2.0' \ d-0$.2′ m-1.70	$\nu 2.6' \ d-0$.1′ m0.27			

h	Su	n	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°41.41	N05°6.02	65°39.89	11.0'	\$25°26.75	-5.1'	54.3'	
1	195°41.63	5.08	80°9.88	11.1'	$25^{\circ}21.66$	-5.2'	54.3'	
2	210°41.85	4.13	94°39.94	11.1'	25°16.44	-5.3'	54.3'	
3	225° 42.07	• • 3.18	109° 10.05	11.2'	25°11.11	-5.4'	54.3'	
4 5	240°42.29 255°42.51	2.24 1.29	123°40.22 138°10.45	11.2' 11.3'	25°5.66 25°0.10	-5.6' -5.7'	54.2' 54.2'	
6	255 42.51 270°42.72	N05° 0.35	150° 40.74	11.3	25 0.10 \$24°54.43	-5.8'	54.2'	
7	285° 42.94	04°59.40	167° 11.08	11.4	24°48.64	-5.9'	54.2'	
8	300°43.16	58.45	181°41.49	11.5'	24°42.74	-6.0'	54.2'	
9	315°43.38	• • 57.51	196°11.96	11.5'	24°36.73	-6.1'	54.2'	
10	330°43.60	56.56	210° 42.49	11.6'	24°30.61	-6.2'	54.2'	
11	345°43.82	55.62	225° 13.08	11.7'	24°24.38	-6.3	54.2'	
12	0°44.04	N04°54.67	239° 43.73	11.7'	\$24°18.04 24°11.59	-6.4'	54.2'	
13 14	15°44.26 30°44.48	53.72 52.77	254° 14.44 268° 45.22	11.8' 11.8'	24°11.59 24°5.04	-6.6' -6.7'	54.2' 54.2'	
15	45°44.70	• • 51.83	283° 16.05	11.9'	24° 5.04 23° 58.37	-6.8'	54.1'	
16	60°44.91	50.88	297°46.95	12.0'	23°51.60	-6.9'	54.1'	
17	75°45.13	49.93	$312^{\circ}17.91$	12.0'	23°44.73	-7.0'	54.1'	
18	90°45.35	N04°48.98	326°48.93	12.1'	S23°37.75	-7.1'	54.1'	
19	105° 45.57	48.04	341°20.01	12.1'	23°30.66	-7.2'	54.1'	
20	120°45.79	47.09	355°51.15	12.2'	23°23.48	-7.3'	54.1'	
21 22	135°46.01 150°46.23	· · 46.14	10°22.36 24°53.63	12.3' 12.3'	23°16.19 23°8.80	-7.4'	54.1' 54.1'	
22	150°46.23 165°46.45	45.19 44.24	24°53.63 39°24.96	12.3'	23°8.80 23°1.30	-7.5' -7.6'	54.1' 54.1'	
23			J9 24.90 —			-7.0	J+.1	
	SD = 15.9'	d = -0.9'		SI	O = 14.8'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	180° 46.67	N04°43.30	53°56.35	12.5'	\$22°53.71	-7.7'	54.1'	
1	195°46.89	42.35	68°27.81	12.5'	22°46.02	-7.8'	54.1'	
2	$210^{\circ}47.11$	41.40	82°59.33	12.6'	22°38.23	-7.9'	54.1'	
3	225°47.33	• • 40.45	97°30.91	12.6'	22°30.34	-8.0'	54.1'	
4	240° 47.55	39.50	112°2.55	12.7'	22°22.36	-8.1'	54.1'	
5	255°47.77 270°47.99	38.55 N04°37.60	126°34.25 141°6.02	12.8' 12.8'	22°14.28 522°6.10	-8.2' -8.3'	54.1' 54.1'	
6 7	270 47.99 285°48.21	36.65	155° 37.84	12.0	21°57.83	-o.s -8.4'	54.1'	
8	300°48.43	35.70	170°9.73	12.9'	21°49.47	-8.5'	54.0'	
9	315°48.65	• • 34.75	184°41.68	13.0'	21°41.01	-8.6'	54.0'	
10	330°48.87	33.80	199°13.69	13.1'	21°32.46	-8.6'	54.0'	
11	345°49.09	32.85	213°45.76	13.1'	21°23.82	-8.7'	54.0'	
12	0°49.31	N04°31.90	228°17.89	13.2'	S21°15.08	-8.8'	54.0'	
13	15° 49.53	30.95	242°50.09	13.3'	21°6.26	-8.9'	54.0'	
14	30°49.75 45°49.97	30.00 •• 29.05	257°22.34 271°54.65	13.3' 13.4'	20°57.35 20°48.35	-9.0'	54.0'	
15 16	60°50.19	· · 29.05 28.10	286° 27.03	13.4	20°46.33 20°39.26	-9.1' -9.2'	54.0' 54.0'	
17	75°50.41	27.15	300°59.46	13.5'	20°30.09	-9.3	54.0'	
18	90° 50.64	N04°26.20	315°31.95	13.6'	\$20°20.83	-9.3'	54.0'	
19	105°50.86	25.25	330°4.50	13.6'	20°11.48	-9.4'	54.0'	
20	120°51.08	24.30	344°37.11	13.7'	20°2.05	-9.5'	54.0'	
21	135°51.30	• • 23.35	359°9.78	13.7'	19°52.54	-9.6'	54.0'	
22	150°51.52	22.39	13°42.50	13.8'	19°42.94	-9.7'	54.0'	
23	165°51.74	21.44	28°15.28	13.8'	19°33.26	-9.8'	54.0'	
	SD = 15.9'	d = -0.9'		SI	O = 14.8'			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°51.96	N04°20.49	42°48.12	13.9'	S19°23.50	-9.8'	54.0'	
1	195°52.18	19.54	57°21.02	14.0'	$19^{\circ}13.66$	-9.9'	54.0'	
2	210°52.40	18.59	71°53.97	14.0'	19°3.74	-10.0'	54.0'	
3	225°52.62	17.64	86°26.98	14.1'	18°53.74	-10.1'	54.0'	
4 5	240°52.85 255°53.07	16.68 15.73	101°0.04 115°33.16	14.1' 14.2'	18°43.67 18°33.51	-10.2' -10.2'	54.0' 54.0'	
6	255°53.07 270°53.29	15.73 N04°14.78	130°6.33	14.2'	518°23.28	-10.2	54.0'	
7	285°53.51	13.83	144° 39.56	14.3'	18°12.98	-10.3	54.0'	
8	300°53.73	12.87	159° 12.84	14.3'	18° 2.59	-10.5'	54.0'	
9	315°53.95	• • 11.92	173°46.17	14.4'	$17^{\circ}52.14$	-10.5'	54.0'	
10	330°54.17	10.97	188° 19.56	14.4'	17°41.61	-10.6'	54.0'	
11	345°54.40	10.01	202°53.00	14.5'	17°31.01	-10.7'	54.0'	
12	0°54.62 15°54.84	N04° 9.06	217°26.48 232°0.02	14.5'	\$17°20.33 17°9.59	-10.7'	54.0'	
13 14	15°54.84 30°55.06	8.11 7.15	232°0.02 246°33.62	14.6' 14.6'	17° 9.59 16° 58.77	-10.8' -10.9'	54.0' 54.0'	
15	45° 55.28	. 6.20	240 33.02 261°7.26	14.0	16°47.89	-10.9	54.0'	
16	60°55.50	5.25	275°40.94	14.7'	16°36.93	-11.0'	54.0'	
17	75°55.73	4.29	290°14.68	14.8'	16°25.91	-11.1'	54.1'	
18	90°55.95	N04°3.34	304°48.47	14.8'	S 16°14.82	-11.2'	54.1'	
19	105°56.17	2.39	319°22.30	14.9'	16°3.67	-11.2'	54.1'	
20	120°56.39	1.43	333°56.18	14.9'	15°52.45	-11.3'	54.1'	
21 22	135°56.61 150°56.84	04°0.48 03°59.52	348°30.11 3°4.08	15.0' 15.0'	15°41.16 15°29.81	-11.3' -11.4'	54.1' 54.1'	
23	150°50.84 165°57.06	03°59.52 58.57	3°4.08 17°38.10	15.1'	15° 29.81 15° 18.40	-11.4 -11.5'	54.1' 54.1'	
23	SD = 15.9'	d = -1.0'			D = 14.7'	11.5	J 1.1	
	JU = 15.9′	u = -1.0		51	J = 14.7°			

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

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

Sun

12^h

mm:ss

02:56 03:17 03:38 Mer.

Pass

hh:mm

11:57

11:57 11:56

Eqn.of Time

00^h

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02:46 03:07 03:28

Day

11 12 Moon

Lower

hh:mm

07:53 08:41 09:26 Age

10-12 71-86%

Mer.Pass.

Upper hh:mm

20:17 21:03 21:47

September 13, 14, 15 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	351°45.94	172°24.06 N01°42.53	137°1.53 \$14°18.12	189°27.62 N08°30.86	325°48.68 N07°49.39
1	6°48.41	187°23.69 41.26	152°2.37 18.69	204°29.58 30.66	340°51.27 49.33
2	21°50.87	202°23.32 40.00	167°3.21 19.26	219°31.54 30.46	355°53.86 49.28
3 4	36° 53.33 51° 55.80	217°22.95 · · 38.73 232°22.58	182°4.05 · · 19.84 197°4.90 20.41	234°33.50 · · 30.26 249°35.46 30.06	10°56.45 · · 49.22 25°59.04 49.16
5	66° 58.26	247°22.21 36.19	212°5.74 20.98	264° 37.42 29.85	41°1.63 49.11
6	82°0.73	262°21.85 N01°34.92	227°6.58 \$14°21.55	279°39.37 N08°29.65	56°4.23 N07°49.05
7	97°3.19	277°21.48 33.65	242°7.42 22.12	294°41.33 29.45	71°6.82 48.99
8	112°5.65	292°21.11 32.38	257°8.26 22.70	309°43.29 29.25	86°9.41 48.94
9	127°8.12	307°20.74 · · 31.11	272°9.10 · · 23.27	324°45.25 •• 29.05	101°12.00 · · 48.88
10	$142^{\circ}10.58$	322°20.37 29.84	287°9.94 23.84	339°47.21 28.85	116°14.59 48.82
11	157° 13.05	337°20.00 28.58	302°10.78 24.41	354°49.17 28.65	131°17.18 48.77
12	172° 15.51	352°19.64 N01°27.31	317°11.62 \$14°24.98	9°51.13 N08°28.44	146°19.77 N07°48.71
13	187° 17.97 202° 20.44	7°19.27 26.04 22°18.90 24.77	332°12.46 25.55 347°13.30 26.12	24°53.09 28.24 39°55.04 28.04	161°22.36 48.65 176°24.96 48.60
14 15	202 20.44 217°22.90	37°18.53 · · 23.50	2°14.14 · · 26.69	54°57.00 · · 27.84	176 24.96 48.60 191°27.55 •• 48.54
16	232°25.37	52°18.17 22.23	17°14.98 27.27	69°58.96 27.64	206°30.14 48.48
17	247°27.83	67° 17.80 20.96	32°15.81 27.84	85° 0.92 27.44	221°32.73 48.43
18	262°30.29	82°17.43 N01°19.69	47°16.65 \$14°28.41	100°2.88 N08°27.24	236°35.33 N07°48.37
19	277°32.76	97°17.06 18.42	62°17.49 28.98	115° 4.84 27.03	251°37.92 48.31
20	292°35.22	112°16.70 17.15	77°18.33 29.55	130°6.80 26.83	266°40.51 48.26
21	307°37.69	127°16.33 · · 15.88	$92^{\circ}19.16$ · · 30.12	145°8.76 · · 26.63	281°43.10 · · 48.20
22	322°40.15	142°15.96 14.61	107°20.00 30.69	160°10.72 26.43	296°45.70 48.14
23	337°42.61	157°15.59 13.33	122°20.84 31.26	175°12.68 26.23	311°48.29 48.08
Mer.p	bass. 00:33	$\nu\text{-}0.4'~d\text{-}1.3'~\text{m-}3.90$	$ u 0.8' \ d0.6' \ m1.36$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.70$	ν2.6′ d-0.1′ m0.26
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	352° 45.08	172°15.23 N01°12.06	137°21.67 \$14°31.83	190°14.64 N08°26.03	326°50.88 N07°48.03
1	7°47.54	187° 14.86 10.79	152°22.51 32.39	205°16.59 25.83	341°53.48 47.97
2	22°50.01	202°14.49 9.52	167°23.35 32.96	220°18.55 25.62	356°56.07 47.91
3 4	37° 52.47 52° 54.94	217°14.12 · · 8.25 232°13.76 6.98	182°24.18 · · 33.53 197°25.02 34.10	235°20.51 · · 25.42 250°22.47 25.22	11°58.66 · · 47.85 27°1.26 47.80
5	67° 57.40	247°13.39 5.71	212°25.85 34.67	265°24.43 25.02	42°3.85 47.74
6	82°59.86	262°13.02 N01°4.44	227°26.69 \$14°35.24	280°26.39 N08°24.82	57°6.44 N07°47.68
7	98°2.33	277°12.66 3.17	242°27.52 35.81	295°28.35 24.62	72°9.04 47.62
8	113°4.79	292°12.29 1.90	257°28.35 36.38	310°30.31 24.42	87°11.63 47.57
9	128°7.26	307°11.92 01°0.62	272°29.19 · · 36.94	325°32.27 · · 24.22	102°14.23 · · 47.51
10	$143^{\circ}9.72$	322°11.56 00°59.35	287° 30.02 37.51	340°34.23 24.01	117°16.82 47.45
11	$158^{\circ}12.18$	337°11.19 58.08	302°30.86 38.08	355°36.19 23.81	132°19.42 47.39
12	173° 14.65	352°10.82 N00°56.81	317°31.69 \$14°38.65	10°38.15 N08°23.61	147°22.01 N07°47.34
13	188° 17.11	7°10.46 55.54	332°32.52 39.22	25°40.11 23.41	162°24.61 47.28
14	203° 19.58	22°10.09 54.27	347°33.35 39.78	40°42.07 23.21	177°27.20 47.22
15 16	218° 22.04 233° 24.50	37°9.72 · · · 52.99 52°9.36	2°34.19 · · 40.35 17°35.02 40.92	55°44.03 · · 23.01 70°45.99 22.81	192°29.80 · · 47.16 207°32.39 47.10
17	233 24.50 248°26.97	67°8.99 50.45	32°35.85 41.48	85°47.95 22.60	207 32.39 47.10 222°34.99 47.05
18	263°29.43	82°8.62 N00°49.18	47°36.68 \$14°42.05	100°49.91 N08°22.40	237°37.58 N07°46.99
19	278°31.90	97°8.26 47.90	62°37.51 42.62	115°51.87 22.20	252°40.18 46.93
20	293°34.36	112°7.89 46.63	77°38.34 43.19	130°53.83 22.00	267°42.77 46.87
21	308°36.82	127°7.53 · · 45.36	92°39.17 · · 43.75	145°55.79 · · 21.80	282°45.37 · · 46.81
22	323°39.29	142°7.16 44.09	107° 40.00 44.32	160°57.75 21.60	297°47.96 46.76
23	338°41.75	157°6.79 42.81	122°40.83 44.88	175°59.71 21.40	312°50.56 46.70
Mer.p	pass. 00:29	ν-0.4' d-1.3' m-3.90	ν0.8' d0.6' m1.36	ν2.0' d-0.2' m-1.70	ν2.6' d-0.1' m0.26
	-				
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	353°44.22	172°6.43 N00°41.54	137°41.66	191°1.67 N08°21.20	327°53.16 N07°46.64
1	8°46.68	187°6.06 40.27	152° 42.49 46.02	206° 3.63 20.99	342°55.75 46.58
2	23°49.14	202°5.69 39.00	167°43.32 46.58	221°5.59 20.79	357°58.35 46.52
3	38°51.61	217°5.33 · · 37.72	182°44.15 · · 47.15	236°7.55 · · 20.59	13°0.95 · · 46.47
4	53°54.07	232°4.96 36.45	197° 44.98 47.71	251°9.51 20.39	28°3.54 46.41 \$
5	68° 56.54	247°4.60 35.18 262°4.23 N00°33.90	212°45.81 48.28	266°11.47 20.19	43°6.14 46.35
6 7	83°59.00 99°1.46	262°4.23 N00°33.90 277°3.86 32.63	227° 46.63	281°13.43 N08°19.99 296°15.39 19.79	58°8.74 N07°46.29 73°11.33 46.23
8	99 1.46 114°3.93	292°3.50 31.36	242 47.46 49.41 257°48.29 49.97	311°17.35 19.59	73 11.33 46.23 88°13.93 46.17
9	114 5.95 129°6.39	307°3.13 · · 30.09	272°49.11 · · 50.54	326°19.31 · · 19.38	103°16.53 · · 46.11
10	144°8.86	322°2.77 28.81	287° 49.94 51.10	341°21.27 19.18	118°19.12 46.06
11	159° 11.32	337°2.40 27.54	302°50.77 51.67	356°23.23 18.98	133°21.72 46.00
12	174° 13.78	352°2.03 N00°26.26	317°51.59 \$14°52.23	11°25.19 N08°18.78	148°24.32 N07°45.94
13	189° 16.25	7°1.67 24.99	332°52.42 52.79	26°27.15 18.58	163°26.92 45.88
14	204° 18.71	22°1.30 23.72	347°53.25 53.36	41°29.11 18.38	178°29.52 45.82 _
15	219°21.18	37°0.94 · · 22.44	2°54.07 · · 53.92	56°31.07 · · 18.18	193°32.11 · · · 45.76
16	234°23.64	52°0.57 21.17	17°54.90 54.49	71°33.03 17.98	208°34.71 45.70
17	249°26.10	67°0.21 19.90	32°55.72 55.05	86°34.99 17.78	223°37.31 45.64
18 19	264° 28.57 279° 31.03	81°59.84 N00°18.62 96°59.47 17.35	47°56.55 \$14°55.61 62°57.37 56.18	101°36.96 N08°17.57 116°38.92 17.37	238°39.91 N07°45.58 253°42.51 45.53
20	279 31.03 294°33.50	111°59.11 16.08	77°58.19 56.74	131°40.88 17.17	268°45.11 45.47
21	309°35.96	126°58.74 · · 14.80	92°59.02 · · 57.30	146°42.84 · · 16.97	283°47.70 · · 45.41
22	324° 38.42	141°58.38 13.53	107° 59.84 57.86	161°44.80 16.77	298°50.30 45.35
23	$339^{\circ}40.89$	156°58.01 12.25	123°0.66 58.43	176°46.76 16.57	313°52.90 45.29
Mer r	pass. 00:25	ν-0.4' d-1.3' m-3.90	ν0.8' d0.6' m1.36	ν2.0' d-0.2' m-1.70	ν2.6' d-0.1' m0.25
		2 3 4 1.5 111 3.50		21.0 3 0.2 111 1.10	

	Stars	
	SHA	Dec
Alpheratz	$357^{\circ}32.11$	29° 14.78
Ankaa Schedar	353°4.58 349°27.93	-42°9.08 56°41.42
Diphda	348°44.78	-17°49.83
Achernar	$335^{\circ}18.10$	-57°5.47
Hamal	327°48.43	23°35.70
Polaris Acamar	312°35.71 315°9.87	89°22.56 -40°11.29
Menkar	314°3.65	4° 12.06
Mirfak	308°24.81	49°57.46
Aldebaran Rigel	290°37.01 281°1.73	16°33.93 -8°10.00
Capella	280°18.60	46°1.37
Bellatrix	278°20.51	6°22.57
Elnath Alnilam	277°59.08 275°35.50	28°37.77 -1°10.93
Betelgeuse	270°49.74	7° 24.79
Canopus	263°51.55	-52°42.29
Sirius Adhara	258°24.40 255°4.27	-16°45.07 -29°0.35
Procyon	244°48.70	5°9.28
Pollux	243°14.82	27° 57.47
Avior Suhail	234°14.26 222°45.03	-59°35.66 -43°32.51
Miaplacidus	222 45.05 221°38.55	-43 32.51 -69°49.68
Alphard	217°45.86	-8°46.65
Regulus	207°32.40	11°49.93
Dubhe Denebola	193°39.02 182°23.03	61°36.04 14°25.08
Gienah	175°41.62	-17°41.73
Acrux	172°58.24	-63° 15.26
Gacrux Alioth	171°49.69 166°11.58	-57° 16.19 55° 48.66
Spica	158°20.24	-11°18.33
Alkaid	152°50.67	49° 10.64
Hadar Menkent	148°33.29 147°55.28	-60°30.55 -36°30.44
Arcturus	147 55.26 145°46.14	19°2.42
Rigil Kent.	139°37.63	-60°57.16
Kochab Zuben'ubi	137°20.63 136°53.76	74°2.67 -16°9.39
Alphecca	126°2.03	26°37.48
Antares	$112^{\circ}13.19$	-26°29.61
Atria	107°5.43 102°0.26	-69°4.82 -15°45.49
Sabik Shaula	96°7.34	-15 45.49 -37°7.47
Rasalhague	95°56.48	12°32.60
Eltanin	90°41.08	51°29.42
Kaus Aust. Vega	83°29.48 80°31.60	-34°22.28 38°48.86
Nunki	75°44.88	-26° 15.67
Altair	61°57.61	8°56.72
Peacock Deneb	53°1.87 49°23.94	-56°38.76 45°23.04
Enif	33°36.33	10°0.36
Al Na'ir	27°29.74	-46°49.49
Fomalhaut Scheat	15°11.74 13°42.69	-29°28.33 28°14.20
Markab	13°27.36	15°21.49
Sep 13 Mon	SHA	Mer.pass
Venus	$180^{\circ}38.11$	12:31
Mars	145°15.59	14:51
Jupiter Saturn	197°41.68 334°2.74	11:21 02:16
Sep 14 Tue Venus	SHA 179°30.15	Mer.pass 12:31
Mars	144°36.60	14:50
Jupiter Saturn	197°29.56 334°5.80	11:18 02:12
Sep 15 Wed Venus	SHA 178°22.21	Mer.pass 12:32
Mars	143°57.45	14:48
Jupiter	197°17.45	11:14
Saturn	334°8.94	02:08

Horizontal parallax

Venus: Mars: 0.1 0.1

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°57.28	N03°57.61	32°12.16	15.1'	\$15°6.92	-11.5'	54.1'
1	195°57.50	56.66	46°46.27	15.1'	$14^{\circ}55.39$	-11.6'	54.1'
2	210°57.73	55.70	61°20.42	15.2'	14°43.79	-11.7'	54.1'
3	225°57.95	• • 54.75	75°54.61	15.2'	14°32.13	-11.7'	54.1'
4 5	240°58.17 255°58.39	53.79 52.84	90°28.84 105°3.11	15.3' 15.3'	14°20.41 14°8.63	-11.8' -11.8'	54.1' 54.1'
6	270°58.61	N03°51.88	105 3.11 119°37.43	15.4'	\$13°56.80	-11.0	54.1'
7	285°58.84	50.93	134°11.78	15.4'	13°44.90	-11.9'	54.1'
8	300°59.06	49.97	148°46.17	15.4'	13°32.96	-12.0'	54.1'
9	315°59.28	• • 49.02	163°20.60	15.5'	13° 20.95	-12.1'	54.1'
10	330°59.50	48.06	177°55.07	15.5'	13°8.89	-12.1'	54.1'
11	345°59.73 0°59.95	47.10 N03°46.15	192°29.58 207°4.12	15.5' 15.6'	12°56.78 \$12°44.61	-12.2' -12.2'	54.2' 54.2'
12 13	0 59.95 16°0.17	45.19	207 4.12 221°38.69	15.6'	12°32.39	-12.2 -12.3'	54.2'
14	31°0.40	44.23	236° 13.30	15.6'	12°20.12	-12.3	54.2'
15	46°0.62	• • 43.28	250° 47.95	15.7'	12°7.80	-12.4'	54.2'
16	61°0.84	42.32	265°22.63	15.7'	11°55.43	-12.4'	54.2'
17	76°1.06	41.37	279°57.34	15.7'	11°43.00	-12.5'	54.2'
18	91°1.29	N03°40.41	294°32.08	15.8'	S11°30.53	-12.5'	54.2'
19 20	106°1.51 121°1.73	39.45 38.49	309°6.85 323°41.65	15.8' 15.8'	11°18.01 11°5.45	-12.6' -12.6'	54.2' 54.2'
20	121 1.73 136°1.96	38.49 •• 37.54	323 41.05 338°16.48	15.8 15.9'	11 5.45 10°52.84	-12.0 -12.7'	54.2'
22	151°2.18	36.58	352°51.34	15.9'	10° 40.18	-12.7'	54.2'
23	166°2.40	35.62	7°26.23	15.9'	10°27.47	-12.7'	54.2'
	SD = 15.9'	d = -1.0'		SI	D = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°2.62 196°2.85	N03°34.67 33.71	22°1.14 36°36.08	15.9' 16.0'	\$10° 14.73 10° 1.94	-12.8' -12.8'	54.3' 54.3'
2	211°3.07	32.75	50° 50.06 51° 11.04	16.0'	09°49.10	-12.6 -12.9'	54.3'
3	226°3.29	31.79	65°46.03	16.0'	09°36.23	-12.9'	54.3'
4	241°3.52	30.83	80°21.05	16.0'	$09^{\circ}23.31$	-13.0'	54.3'
5	256°3.74	29.88	94°56.08	16.1'	09° 10.35	-13.0'	54.3'
6	271°3.96 286°4.19	N03°28.92 27.96	109°31.14 124°6.21	16.1' 16.1'	\$08° 57.36 08° 44.32	-13.0' -13.1'	54.3' 54.3'
7 8	301°4.41	27.96 27.00	124 0.21 138°41.31	16.1	08 44.32 08°31.25	-13.1'	54.3'
9	316°4.63	. 26.04	153° 16.43	16.1	08° 18.14	-13.1'	54.3'
10	331°4.86	25.09	167°51.57	16.2'	08°4.99	-13.2'	54.4'
11	346°5.08	24.13	182°26.72	16.2'	07°51.81	-13.2'	54.4'
12	1°5.30	N03°23.17	197°1.89	16.2'	S07°38.59	-13.3'	54.4'
13 14	16°5.53 31°5.75	22.21 21.25	211°37.07 226°12.27	16.2' 16.2'	07°25.34 07°12.05	-13.3' -13.3'	54.4' 54.4'
15	46°5.97	20.29	240° 47.49	16.2'	06°58.73	-13.4'	54.4'
16	61°6.20	19.33	255°22.72	16.2'	06°45.38	-13.4	54.4'
17	76°6.42	18.37	$269^{\circ}57.96$	16.3'	$06^{\circ}32.00$	-13.4'	54.4'
18	91°6.64	N03° 17.41	284°33.21	16.3'	S06° 18.59	-13.4'	54.4'
19	106°6.87	16.45	299°8.47	16.3'	06°5.15	-13.5'	54.5'
20 21	121°7.09 136°7.32	15.49 •• 14.53	313° 43.74 328° 19.02	16.3' 16.3'	05°51.68 05°38.18	-13.5' -13.5'	54.5' 54.5'
22	150 7.52 151°7.54	13.57	342° 54.31	16.3'	05°24.65	-13.5'	54.5'
23	166°7.76	12.61	357°29.61	16.3'	05°11.10	-13.6'	54.5'
	SD = 15.9'	d = -1.0'		SI	D = 14.8'		
147 .					Б.	,	
Wed 0	GHA 181°7.99	Dec N03° 11.65	GHA 12°4.91	u 16.3'	Dec 504° 57.52	<i>d</i> −13.6′	HP 54.5'
1	181 7.99 196°8.21	10.69	26° 40.22	16.3'	04°43.92	-13.6'	54.5'
2	211°8.43	9.73	41° 15.53	16.3'	04°30.30	-13.6'	54.5'
3	226°8.66	• • 8.77	$55^{\circ}50.84$	16.3'	$04^{\circ}16.65$	-13.7'	54.6'
4	241°8.88	7.81	70°26.16	16.3'	04°2.97	-13.7'	54.6'
5	256°9.11	6.85	85°1.48	16.3'	03°49.28	-13.7'	54.6'
6 7	271°9.33 286°9.55	N03°5.89 4.93	99°36.80 114°12.12	16.3' 16.3'	\$03°35.57 03°21.83	-13.7' -13.8'	54.6' 54.6'
8	280 9.55 301°9.78	4.93 3.97	114 12.12 128° 47.44	16.3'	03 21.83 03°8.08	-13.8'	54.6'
9	316°10.00	· · 3.01	143° 22.75	16.3'	02°54.30	-13.8'	54.6'
10	331°10.22	2.05	$157^{\circ}58.06$	16.3'	$02^{\circ}40.51$	-13.8'	54.7'
11	346°10.45	1.09	172°33.37	16.3'	02°26.71	-13.8'	54.7'
12	1°10.67 16°10.90	N03°0.13	187°8.68	16.3'	\$02° 12.88	-13.8'	54.7'
13 14	16°10.90 31°11.12	02°59.17 58.20	201°43.98 216°19.27	16.3' 16.3'	01°59.05 01°45.19	-13.9' -13.9'	54.7' 54.7'
15	46°11.34	57.24	230° 54.55	16.3'	01°31.33	-13.9'	54.7'
16	61°11.57	56.28	245°29.82	16.3'	$01^{\circ}17.45$	-13.9'	54.7'
17	76°11.79	55.32	260°5.09	16.3'	01°3.56	-13.9'	54.7'
18	91°12.02	N02°54.36	274°40.34	16.2'	S00°49.65	-13.9'	54.8'
19 20	106°12.24 121°12.46	53.40 52.43	289° 15.59 303° 50.82	16.2' 16.2'	00°35.74 00°21.82	-13.9' -13.9'	54.8' 54.8'
20	121 12.46 136°12.69	52.43	318° 26.03	16.2'	500°7.89	-13.9'	54.8'
22	151°12.91	50.51	333°1.23	16.2'	N00°6.05	13.9	54.8'
23	$166^{\circ}13.14$	49.55	347°36.42	16.2'	00°20.00	14.0'	54.8'
	SD = 15.9'	d = -1.0'		SI	O = 14.9'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%	
13	03:49	04:00	11:56	22:29	10:09		
14	04:10	04:21	11:56	23:10	10:50		
15	04:32	04:43	11:55	23:51	11:31		

September 16, 17, 18 UT (Thu., Fri., Sat.)

h	Aries	Venus		Μ	lars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA D	ec GH	ΙΔ	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	354° 43.35			1.49	\$14°58.99	191°48.72	N08° 16.37	328°55.50	N07°45.23			
1	9°45.82	186°57.28	9.70 153°		14°59.55	206°50.68	16.17	343°58.10	45.17	Alpheratz	357°32.11	29°14.79
2	24°48.28	201°56.91	8.43 168°		15°0.11	221°52.64	15.96	359°0.70	45.11	Ankaa	353°4.58	-42°9.09
3	39°50.74			3.95	. 0.68	236°54.60	. 15.76	14°3.30	45.05	Schedar	349°27.92	56°41.44
4	54°53.21	231°56.18		4.78	1.24	251°56.56	15.56	29°5.90	44.99	Diphda	348°44.77	-17°49.84
5	69°55.67	246°55.82		5.60	1.80	266°58.53	15.36	44°8.50	44.93	Achernar	335°18.08	-57°5.48
6	84°58.14			6.42	S15°2.36	282°0.49	N08° 15.16	59°11.10	N07°44.87	Hamal	327°48.42	23°35.71
7	100°0.60	276°55.09		7.24	2.92	297° 2.45	14.96	74°13.70	44.81	Polaris	312°34.46	89°22.57
8	115°3.06			8.06	3.48	312° 4.41	14.76	89°16.30	44.75	Acamar	315°9.85	-40°11.29
9	130°5.53	306°54.36 S00	0°0.49 273°	8.88	• • 4.04	327°6.37	• • 14.56	104°18.90	• • 44.70	Menkar	314°3.64	4°12.06
10	145°7.99	321°53.99	1.77 288°	9.70	4.61	342°8.33	14.36	119°21.50	44.64	Mirfak	308°24.79	49°57.47
11	$160^{\circ}10.46$	336°53.63	3.04 303°1	0.52	5.17	357°10.29	14.15	134°24.10	44.58	Aldebaran	290°36.99	16°33.93
12	$175^{\circ}12.92$	351°53.26 S00	°4.31 318°1	1.34	S15°5.73	$12^{\circ}12.25$	N08° 13.95	149°26.70	N07°44.52	Rigel	281°1.71	-8°10.00 46°1.37
13	$190^{\circ}15.38$	6°52.89	5.59 333°1	2.16	6.29	$27^{\circ}14.22$	13.75	164°29.30	44.46	Capella Bellatrix	280°18.58 278°20.49	6°22.57
14	$205^{\circ}17.85$	21°52.53	6.86 348° 1	2.98	6.85	42°16.18	13.55	179°31.90	44.40	Elnath	277°59.06	28° 37.78
15	220°20.31	36°52.16 · ·		3.80	• • 7.41	57°18.14	• • 13.35	194°34.50	• • 44.34	Alnilam	277 39.00 275°35.49	-1°10.93
16	235°22.78	51°51.80	9.41 18° 1	4.61	7.97	72°20.10	13.15	209°37.10	44.28	Betelgeuse	270°49.72	7° 24.80
17	250°25.24	66°51.43		5.43	8.53	87°22.06	12.95	224°39.71	44.22	Canopus	263°51.52	-52° 42.28
18	265°27.70	81°51.07 S 00°	°11.96 48° 1	6.25	S15°9.09	102°24.02	N08° 12.75	239°42.31	N07°44.16	Sirius	258°24.38	-16° 45.06
19	$280^{\circ}30.17$		13.24 63°1	7.07	9.65	117°25.99	12.55	254°44.91	44.10	Adhara	255°4.25	-29°0.35
20	295°32.63	111°50.34	14.51 78° 1	7.88	10.21	132°27.95	12.35	269°47.51	44.04	Procyon	244°48.68	5°9.28
21	$310^{\circ}35.10$	126°49.97 · ·	15.79 93°1	8.70	•• 10.76	$147^{\circ}29.91$	• • 12.14	284°50.11	• • 43.98	Pollux	243°14.81	27° 57.47
22	325°37.56	141°49.60	17.06 108° 1	9.52	11.32	162°31.87	11.94	299°52.71	43.92	Avior	234°14.23	-59°35.65
23	340°40.03	156°49.24	18.34 123°2	20.33	11.88	177°33.83	11.74	314°55.31	43.86	Suhail	222°45.02	-43°32.49
Mar	pass. 00:21	ν-0.4' d-1.3' m-	-3 90 7,0 9	אר אר	0.6' m1.36	1/2 n/ d n	.2′ m-1.71	1/2 6/ d 0	0.1' m0.25	Miaplacidus	222 45.02 221°38.52	-43 32.49 -69°49.67
ivier.	pass. UU.21	ν-0.4 U-1.3 III	-5.90 ν0.0	<i>, u</i> (7.0 1111.30	ν2.0 u-0.	.∠ 111-1./1	ν2.0 U-0	.1110.23	Alphard	221 36.52 217°45.85	-8°46.64
										Regulus	217 45.85 207°32.40	11°49.92
Fri	GHA		ec GH	ΙA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°39.02	61°36.03
0	355°42.49		19.61 138°2		S15°12.44	192°35.79	N08°11.54	329°57.92	N07°43.80	Denebola	182°23.03	14°25.08
1	$10^{\circ}44.95$	186°48.51	20.89 153°2	21.97	13.00	207°37.76	11.34	345°0.52	43.74	Gienah	175°41.63	-17°41.72
2	25°47.42	201°48.14	22.16 168°2	22.78	13.56	222°39.72	11.14	0°3.12	43.68	Acrux	173° 41.03	-63° 15.24
3	$40^{\circ}49.88$	216°47.78 · ·	23.44 183°2	23.60	• • 14.12	237°41.68	• • 10.94	15°5.72	• • 43.62	Gacrux	171°49.70	-57° 16.17
4	55°52.35	231°47.41	24.71 198°2	24.41	14.67	252°43.64	10.74	30°8.33	43.56	Alioth	166°11.59	55° 48.64
5	$70^{\circ}54.81$	246°47.05	25.99 213°2	25.23	15.23	267°45.60	10.54	45°10.93	43.50	Spica	158°20.25	-11°18.32
6	85°57.27	261°46.68 S 00°	°27.27 228°2	26.04	S15°15.79	282°47.57	N08° 10.34	60°13.53	N07°43.44	Alkaid	150° 20.23	49° 10.63
7	$100^{\circ}59.74$		28.54 243°2	26.85	16.35	297°49.53	10.13	$75^{\circ}16.13$	43.37	Hadar	148°33.31	-60°30.54
8	$116^{\circ}2.20$	291°45.95	29.82 258°2	27.67	16.90	312°51.49	9.93	90°18.74	43.31	Menkent	147°55.29	-36°30.43
9	131°4.67	306°45.58 · ·	31.09 273°2	28.48	• • 17.46	327°53.45	• • 9.73	105°21.34	• • 43.25	Arcturus	145°46.15	19°2.41
10	$146^{\circ}7.13$	321°45.22	32.37 288°2	9.29	18.02	342°55.42	9.53	120°23.94	43.19	Rigil Kent.	139°37.66	-60°57.15
11	$161^{\circ}9.59$	336° 44.85	33.64 303°3	80.11	18.58	357°57.38	9.33	135°26.55	43.13	Kochab	137°20.67	74°2.65
12	$176^{\circ}12.06$		34.92 318°3		S15°19.13	12°59.34	N08°9.13	150°29.15	$N07^{\circ}43.07$	Zuben'ubi	136°53.77	-16°9.39
13	$191^{\circ}14.52$	6°44.12	36.19 333°3	31.73	19.69	28°1.30	8.93	165°31.75	43.01	Alphecca	126°2.05	26° 37.48
14	$206^{\circ}16.99$	21°43.76	37.47 348°3	32.54	20.25	43°3.26	8.73	180°34.36	42.95	Antares	112° 13.21	-26°29.61
15	$221^{\circ}19.45$	36°43.39 · ·	38.74 3°3	3.36	• • 20.80	58° 5.23	• • 8.53	195°36.96	• • 42.89	Atria	107°5.48	-69°4.82
16	$236^{\circ}21.91$	51°43.03	40.02 18°3	34.17	21.36	73°7.19	8.33	210°39.57	42.83	Sabik	102°0.28	-15°45.48
17	251°24.38	66°42.66	41.30 33°3	34.98	21.91	88° 9.15	8.13	225°42.17	42.77	Shaula	96°7.36	-37°7.47
18	266°26.84			35.79	S15°22.47	103°11.11	N08°7.92	240°44.77	N07°42.71	Rasalhague	95°56.50	12°32.60
19	281°29.31			86.60	23.03	118°13.08	7.72	255°47.38	42.65	Eltanin	90°41.10	51°29.42
20	296°31.77			37.41	23.58	133°15.04	7.52	270°49.98	42.59	Kaus Aust.	83°29.50	-34°22.28
21	311°34.23			88.22	• • 24.14	148°17.00	• • 7.32	285°52.59	• • 42.52	Vega	80°31.62	38°48.86
22	326° 36.70		47.67 108°3		24.69	163°18.97	7.12	300°55.19	42.46	Nunki	75°44.90	-26° 15.68
23	341°39.16	156° 40.46	48.95 123°3	39.84	25.25	178°20.93	6.92	315°57.80	42.40	Altair	61°57.63	8°56.72
Mer	pass. 00:17	ν-0.4' d1.3' m-	3 90 10 8	3′ 40	0.6' m1.36	$\nu^2 0' d = 0$.2′ m-1.71	$\nu^{2} 6' d^{-0}$	0.1' m0.24	Peacock	53°1.89	-56° 38.77
- IVICI.	pass. 00.11	ν σ. + σ1.5 m		- 40	7.0 1111.50	V2.0 U 0	.2 111 1.71	- V2.0 U 0		Deneb	49°23.96	45°23.05
										Enif	33°36.34	10°0.36
Sat	GHA		ec GH		Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.75	-46°49.50
0	356°41.63		°50.22 138°4		S15°25.80	193°22.89	N08°6.72	331°0.40	N07°42.34	Fomalhaut	15°11.74	-29°28.34
1	11°44.09		51.50 153°4		26.36	208°24.85	6.52	346°3.01	42.28	Scheat	13°42.69	28°14.21
2	26° 46.55		52.78 168°4		26.91	223°26.82	6.32	1°5.61	42.22	Markab	13°27.36	15°21.49
3	41°49.02		54.05 183°4		• • 27.47	238°28.78	• • 6.12	16°8.22	• • 42.16	C. 10 T	CIIC	
4	56°51.48		55.33 198°4		28.02	253°30.74	5.92	31°10.82	42.10	Sep 16 Thu	SHA	Mer.pass
5	71°53.95		56.60 213°4		28.57	268°32.71	5.72	46°13.43	42.04	Venus		12:32
6	86° 56.41		57.88 228°4		\$15°29.13	283°34.67	N08°5.51	61°16.03	N07°41.97	Mars	143°18.13	14:47
7	101°58.87		959.15 243°4		29.68	298°36.63	5.31	76°18.64	41.91	Jupiter	197°5.37	11:11
8	117°1.34		.°0.43 258°4		30.24	313°38.60	5.11	91°21.24	41.85	Saturn	334°12.15	02:04
9	132°3.80		1.71 273°4		• • 30.79	328°40.56	• • 4.91	106°23.85	• • 41.79	Sep 17 Fri	SHA	Mer.pass
10	147°6.27	321°36.44	2.98 288°4		31.34	343°42.52	4.71	121°26.46	41.73	Venus	176°6.38	12:33
11	162°8.73	336°36.07	4.26 303°4		31.89	358°44.48	4.51	136°29.06	41.67	Mars	142°38.66	14:46
12	177° 11.19		°5.53 318°5		\$15°32.45	13°46.45	N08°4.31	151°31.67	N07°41.61	Jupiter	196°53.31	11:08
13	192° 13.66	6°35.34	6.81 333°5		33.00	28°48.41	4.11	166°34.27	41.54	Saturn	334°15.43	02:00
14	207°16.12	21°34.97	8.08 348°5		33.55	43°50.38	3.91	181°36.88	41.48			
15	222° 18.59			2.75	• • 34.11	58°52.34	3.71	196°39.49	• • 41.42	Sep 18 Sat	SHA	Mer.pass
16	237°21.05			3.56	34.66	73°54.30	3.51	211°42.09	41.36		174°58.47	12:34
17	252°23.51			4.36	35.21 \$15°25.76	88°56.27	3.31	226°44.70	41.30		141°59.02	14:44
18	267°25.98			55.16	\$15°35.76	103°58.23	N08°3.11	241°47.31	N07°41.24		196°41.27	11:05
19	282°28.44			55.97	36.31 36.87	119°0.19	2.90	256°49.92	41.17	Saturn	334°18.78	01:56
20	297°30.91 312°33.37			6.77 7.57	36.87 •• 37.42	134°2.16 149°4.12	2.70 •• 2.50	271°52.52 286°55.13	41.11 •• 41.05	Horizor	ntal parallax	
21 22	312 33.37 327°35.83		18.29 108°5		37.42	149 4.12 164° 6.08	2.30	280 55.13 301°57.74	40.99		Venus:	0.1
23	342° 38.30		19.57 123°5		38.52	179°8.05	2.30	317°0.34	40.99		Mars:	0.1
Mer.	pass. 00:13	ν-0.4′ d1.3′ m-	$-3.90 \nu 0.8$	3′ d0	0.6′ m1.36	ν 2.0′ d-0.	.2′ m-1.71	ν 2.6′ d-0	0.1′ m0.24			

, i i —	011-010 =	+0.1413 360	$\Delta I = II$	-011	— +09.0 4 21	300	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°13.36	N02°48.58	2°11.59	16.2'	N00°33.95	14.0'	54.9'
1	196°13.58	47.62	16°46.74	16.1'	00°47.90	14.0'	54.9'
2	211°13.81	46.66	31°21.88	16.1'	01°1.87 01°15.83	14.0'	54.9'
3 4	226°14.03 241°14.26	· · 45.70 44.73	45°56.99 60°32.09	16.1' 16.1'	01°15.83 01°29.80	14.0' 14.0'	54.9' 54.9'
5	256°14.48	43.77	75°7.16	16.1	01°29.80	14.0'	54.9'
6	271°14.71	N02°42.81	89° 42.22	16.0'	N01°57.74	14.0'	54.9'
7	$286^{\circ}14.93$	41.85	$104^{\circ}17.24$	16.0'	02°11.71	14.0'	55.0'
8	301°15.15	40.88	118°52.25	16.0'	02°25.68	14.0'	55.0'
9 10	316°15.38 331°15.60	· · 39.92 38.96	133°27.23 148°2.18	16.0' 15.9'	02°39.65 02°53.61	14.0' 14.0'	55.0' 55.0'
11	346°15.83	37.99	162°37.11	15.9'	02 55.01 03°7.57	14.0'	55.0'
12	1°16.05	N02°37.03	177° 12.00	15.9'	N03°21.53	14.0'	55.0'
13	$16^{\circ}16.27$	36.07	191°46.87	15.8'	03°35.48	13.9'	55.1'
14	31°16.50	35.10	206°21.71	15.8'	03°49.43	13.9'	55.1'
15 16	46°16.72 61°16.95	· · 34.14 33.17	220°56.52 235°31.30	15.8' 15.7'	04°3.37 04°17.30	13.9' 13.9'	55.1' 55.1'
17	76°17.17	32.21	250°6.04	15.7'	04 17.30 04°31.22	13.9	55.1'
18	91°17.40	N02°31.25	264° 40.75	15.7'	N04° 45.13	13.9'	55.1'
19	106°17.62	30.28	279°15.42	15.6'	04°59.04	13.9'	55.2'
20	121°17.84	29.32	293°50.06	15.6'	05° 12.93	13.9'	55.2'
21	136°18.07	• • 28.35	308°24.66	15.6'	05°26.80	13.9'	55.2'
22 23	151°18.29 166°18.52	27.39 26.43	322°59.22 337°33.75	15.5' 15.5'	05° 40.67 05° 54.52	13.8' 13.8'	55.2' 55.2'
23			331 33.13			13.0	35.2
	SD = 15.9'	d = -1.0'		SI	O = 15.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°18.74	N02°25.46	352°8.23	15.4'	N06°8.35	13.8'	55.2'
1	196°18.97	24.50	6°42.67	15.4'	06°22.17	13.8'	55.3'
2	211°19.19	23.53	21°17.08	15.4'	06°35.97	13.8'	55.3'
3	226°19.41 241°19.64	• • 22.57	35°51.43 50°25.75	15.3'	06° 49.75 07° 3.51	13.8'	55.3'
4 5	241 19.64 256°19.86	21.60 20.64	50 25.75 65°0.02	15.3' 15.2'	07 3.51 07°17.26	13.7' 13.7'	55.3' 55.3'
6	271°20.09	N02° 19.67	79°34.24	15.2'	N07°30.98	13.7'	55.3'
7	286°20.31	18.71	94°8.42	15.1'	07°44.68	13.7'	55.4'
8	301°20.54	17.74	108° 42.55	15.1'	07°58.35	13.7'	55.4'
9	316°20.76	• • 16.78	123°16.63	15.0'	08°12.01	13.6'	55.4'
10 11	331°20.98 346°21.21	15.81 14.85	137°50.66 152°24.64	15.0' 14.9'	08°25.63 08°39.23	13.6' 13.6'	55.4' 55.4'
12	1°21.43	N02° 13.88	166° 58.57	14.9	N08° 52.81	13.5'	55.5
13	16°21.66	12.91	181°32.45	14.8'	09°6.35	13.5'	55.5'
14	31°21.88	11.95	196°6.27	14.8'	$09^{\circ}19.87$	13.5'	55.5'
15	46°22.11	• • 10.98	210°40.03	14.7'	09°33.35	13.5'	55.5'
16 17	61°22.33 76°22.55	10.02 9.05	225°13.75 239°47.40	14.7' 14.6'	09°46.81 10°0.23	13.4' 13.4'	55.5' 55.5'
18	91°22.78	N02°8.09	254°21.00	14.5	N10° 13.62	13.4	55.6'
19	106°23.00	7.12	268°54.54	14.5'	10°26.97		55.6'
20	121°23.23	6.15	283°28.02	14.4'	10°40.29	13.3'	55.6'
21	136°23.45	5.19	298°1.44	14.4'	10°53.57	13.2'	55.6'
22 23	151°23.68 166°23.90	4.22 3.25	312°34.80 327°8.09	14.3' 14.2'	11°6.82 11°20.02	13.2' 13.2'	55.6' 55.7'
23			321 0.09			13.2	33.1
	SD = 15.9'	d = -1.0'		SL	O = 15.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°24.12	N02°2.29	341°41.33	14.2'	N11°33.19	13.1'	55.7'
1	196°24.35	1.32	356° 14.50	14.1'	11°46.31	13.1'	55.7'
2	211°24.57 226°24.80	02°0.35 01°59.39	10°47.60 25°20.64	14.0' 14.0'	11°59.39 12°12.43	13.0' 13.0'	55.7' 55.7'
3 4	226°24.80 241°25.02	01°59.39 58.42	39°53.61	14.0	12° 12.43 12° 25.43	13.0	55.7° 55.8'
5	256°25.24	57.45	54°26.51	13.8'	12° 38.38	12.9'	55.8'
6	271°25.47	N01°56.49	68°59.35	13.8'	N12°51.28	12.9'	55.8'
7	286°25.69	55.52	83°32.11	13.7'	13°4.13	12.8'	55.8'
8 9	301°25.92 316°26.14	54.55 •• 53.59	98°4.81 112°37.43	13.6' 13.6'	13°16.94 13°29.70	12.8' 12.7'	55.8' 55.9'
10	316°26.14 331°26.37	52.62	112° 37.43 127° 9.98	13.5	13° 29.70 13° 42.40	12.7' 12.7'	55.9'
11	346°26.59	51.65	141° 42.46	13.4	13°55.06	12.6'	55.9'
12	1°26.81	N01°50.68	156° 14.87	13.3'	N14°7.65	12.5'	55.9'
13	16°27.04	49.72	170°47.19	13.3'	14°20.20	12.5'	55.9'
14	31°27.26	48.75	185°19.45	13.2'	14° 32.69	12.4'	56.0'
15 16	46°27.49 61°27.71	· · 47.78 46.81	199°51.63 214°23.73	13.1' 13.0'	14° 45.12 14° 57.50	12.4' 12.3'	56.0' 56.0'
16 17	76°27.71	46.81 45.85	214 23.73 228°55.75	13.0	14°57.50 15°9.81	12.3'	56.0'
18	91°28.16	N01°44.88	243°27.69	12.9'	N15°22.06	12.2'	56.0'
19	106°28.38	43.91	257°59.56	12.8'	15°34.26	12.1'	56.1'
20	121°28.61	42.94	272°31.34	12.7'	15°46.39	12.1'	56.1'
21	136°28.83	• • 41.98	287°3.04	12.6'	15°58.45 16°10.45	12.0' 11.9'	56.1' 56.1'
22	15100005						
23	151°29.05 166°29.28	41.01 40.04	301°34.66 316°6.20	12.5' 12.5'			
23	$ \begin{array}{r} 151^{\circ}29.05 \\ 166^{\circ}29.28 \\ \hline SD = 15.9' \end{array} $	$\frac{41.01}{40.04}$ $d = -1.0'$	301°34.66 316°6.20	12.5'	$ \begin{array}{c} 16 & 10.45 \\ 16^{\circ} 22.39 \\ 0 = 15.2' \end{array} $	11.9'	56.1

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%	
16	04:53	05:04	11:55	-:-	12:12		
17	05:15	05:26	11:55	00:32	12:54		
18	05:36	05:47	11:54	01:15	13:38		

September 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	357° 40.76	171°31.31 S01°20.84	138°59.98	194°10.01 N08°1.90	332°2.95 N07°40.86	
1	12°43.23	186°30.94 22.12	154°0.78 39.62	209°11.98 1.70	347°5.56 40.80	Alpheratz 357°32.11 29°14.80 Ankaa 353°4.57 -42°9.10
2	27° 45.69	201°30.58 23.39	169°1.59 40.17	224°13.94 1.50	2°8.17 40.74	Ankaa 353°4.57 -42°9.10 Schedar 349°27.91 56°41.45
3	42°48.16	216°30.21 · · 24.67	184°2.39 · · 40.72	239°15.90 · · 1.30	17°10.78 •• 40.68	Diphda 348°44.77 -17°49.84
4	57° 50.62	231°29.84 25.94	199° 3.19 41.27	254°17.87 1.10	32°13.38 40.62	Achernar 335°18.07 -57°5.49
5	72°53.08	246°29.48 27.22	214°3.99 41.82	269°19.83 0.90	47°15.99 40.55	Hamal 327°48.40 23°35.71
6 7	87°55.55 102°58.01	261°29.11 S01°28.49 276°28.74 29.77	229° 4.79 S15° 42.37 244° 5.59 42.92	284°21.79 N08°0.70 299°23.76 0.50	62°18.60 N07°40.49 77°21.21 40.43	Polaris 312°33.02 89°22.58
8	118° 0.48	291°28.38 31.05	259°6.39 43.47	314°25.72 0.30	92°23.82 40.37	Acamar 315°9.83 -40°11.30
9	133°2.94	306°28.01 · · 32.32	274°7.19 · · 44.02	329°27.69 08°0.10	107° 26.43 · · 40.31	Menkar 314°3.62 4°12.06
10	148°5.40	321°27.64 33.60	289°7.99 44.57	344°29.65 07°59.90	122°29.03 40.24	Mirfak 308°24.76 49°57.47 Aldebaran 290°36.97 16°33.94
11	163°7.87	336°27.27 34.87	304°8.79 45.12	359°31.62 59.69	137° 31.64 40.18	Aldebaran 290°36.97 16°33.94 Rigel 281°1.70 -8°10.00
12	178° 10.33	351°26.91 S01°36.15	319°9.59 \$15°45.67	14°33.58 N07°59.49	152°34.25 N07°40.12	Capella 280°18.55 46°1.37
13	193° 12.80	6°26.54 37.42	334°10.39 46.22	29°35.54 59.29	167°36.86 40.06	Bellatrix 278°20.47 6°22.57
14 15	208° 15.26 223° 17.72	21°26.17 38.70 36°25.81 · · 39.97	349°11.18 46.77 4°11.98 • 47.31	44°37.51 59.09 59°39.47 •• 58.89	182°39.47 39.99 197°42.08 · · 39.93	Elnath 277°59.03 28°37.77
16	238°20.19	51°25.44 41.25	19°12.78 47.86	74°41.44 58.69	212°44.69 39.87	Alnilam 275°35.47 -1°10.93
17	253°22.65	66°25.07 42.52	34°13.58 48.41	89°43.40 58.49	227°47.30 39.81	Betelgeuse 270°49.70 7°24.79
18	268°25.12	81°24.70 S01°43.80	49°14.37 S 15°48.96	104°45.37 N07°58.29	242°49.91 N07°39.74	Canopus 263°51.49 -52°42.28
19	283°27.58	96°24.34 45.08	64°15.17 49.51	119°47.33 58.09	257° 52.52 39.68	Sirius 258°24.36 -16°45.06 Adhara 255°4.23 -29°0.34
20	298°30.04	111°23.97 46.35	79°15.97 50.05	134°49.30 57.89	272°55.13 39.62	Procyon 244°48.67 5°9.28
21	313°32.51	126°23.60 · · 47.63	94°16.76 · · 50.60	149°51.26 · · 57.69	287° 57.74 · · · 39.56	Pollux 243°14.79 27°57.46
22	328°34.97	141°23.23 48.90	109°17.56 51.15	164°53.23 57.49	303°0.35 39.49	Avior 234°14.21 -59°35.64
23	343°37.44	156°22.86 50.18	124°18.35 51.70	179°55.19 57.29	318°2.96 39.43	Suhail 222°45.00 -43°32.49
Mer.	pass. 00:09	u-0.4 $'$ $d1.3'$ m-3.90	$ u 0.8' \ d0.6' \ m1.36$	$\nu 2.0' \ d$ -0.2' m-1.71	ν 2.6′ <i>d</i> -0.1′ m0.23	Miaplacidus 221°38.49 -69°49.66
						Alphard 217°45.84 -8°46.64
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.39 11°49.92
0	358°39.90	171°22.50 S 01°51.45	139°19.15 \$15°52.24	194°57.16 N07°57.09	333°5.57 N07°39.37	Dubhe 193°39.01 61°36.01 Denebola 182°23.03 14°25.07
1	13°42.37	186°22.13 52.73	154°19.94 52.79	209°59.12 56.89	348°8.18 39.30	Gienah 175°41.63 -17°41.71
2	28° 44.83	201°21.76 54.00	169°20.74 53.34	225°1.09 56.69	3°10.79 39.24	Acrux 172°58.25 -63°15.23
3	43°47.29	216°21.39 · · 55.28	184°21.53 · · 53.88	240°3.05 · · 56.49	18°13.40 · · 39.18	Gacrux 171°49.70 -57°16.16
4	58° 49.76	231°21.02 56.55	199°22.33 54.43	255°5.02 56.29	33°16.01 39.12	Alioth 166°11.61 55°48.63
5 6	73°52.22 88°54.69	246°20.66 57.83 261°20.29 \$01°59.10	214°23.12 54.98 229°23.92 \$15°55.52	270°6.98 56.09 285°8.95 N07°55.89	48°18.62 39.05 63°21.23 N07°38.99	Spica 158°20.25 -11°18.32
7	103°57.15	276°19.92 02°0.38	244°24.71 56.07	300°10.91 55.69	78°23.84 38.93	Alkaid 152°50.70 49°10.62
8	118° 59.61	291°19.55 1.65	259°25.50 56.61	315°12.88 55.49	93°26.46 38.86	Hadar 148°33.33 -60°30.53
9	134°2.08	306°19.18 · · 2.93	274°26.29 · · 57.16	330°14.84 · · 55.28	108°29.07 · · 38.80	Menkent 147°55.30 -36°30.42
10	149°4.54	321°18.81 4.20	289°27.09 57.70	345°16.81 55.08	123°31.68 38.74	Arcturus 145°46.16 19°2.41 Rigil Kent. 139°37.68 -60°57.14
11	164°7.01	336° 18.45 5.48	304°27.88 58.25	0°18.77 54.88	138° 34.29 38.67	Kochab 137°20.73 74°2.64
12	179°9.47	351°18.08 \$02°6.75	319°28.67 \$15°58.79	15°20.74 N07°54.68	153°36.90 N07°38.61	Zuben'ubi 136°53.78 -16°9.39
13	194°11.93	6°17.71 8.02	334°29.46 59.34	30°22.70 54.48	168° 39.51 38.55	Alphecca 126°2.07 26°37.48
14	209°14.40	21°17.34 9.30 36°16.97 · · 10.57	349°30.25 15°59.88 4°31.04 16°0.43	45°24.67 54.28	183°42.13 38.49 198°44.74 · · · 38.42	Antares 112°13.23 -26°29.60
15 16	224° 16.86 239° 19.33	36°16.97 · · 10.57 51°16.60 11.85	4°31.04 16°0.43 19°31.83 0.97	60°26.63 · · 54.08 75°28.60 53.88	198°44.74 · · 38.42 213°47.35 38.36	Atria 107°5.52 -69°4.82
17	254°21.79	66°16.23 13.12	34°32.63 1.52	90°30.56 53.68	228°49.96 38.30	Sabik 102°0.29 -15°45.48
18	269°24.26	81°15.86 S 02°14.40	49°33.42 \$16°2.06	105°32.53 N07°53.48	243°52.57 N07°38.23	Shaula 96°7.38 -37°7.46 Rasalhague 95°56.51 12°32.60
19	284°26.72	96° 15.49 15.67	64°34.20 2.60	120°34.50 53.28	258° 55.19 38.17	Rasalhague 95°56.51 12°32.60 Eltanin 90°41.13 51°29.42
20	299°29.18	111°15.13 16.95	79°34.99 3.15	135°36.46 53.08	273°57.80 38.10	Kaus Aust. 83°29.52 -34°22.28
21	314°31.65	126°14.76 · · 18.22	94°35.78 · · 3.69	150°38.43 · · 52.88	289°0.41 · · 38.04	Vega 80°31.64 38°48.87
22	329°34.11	141°14.39 19.49	109°36.57 4.23	165°40.39 52.68	304°3.02 37.98	Nunki 75°44.92 -26°15.68
23	344°36.58	156°14.02 20.77	124°37.36 4.78	180°42.36 52.48	319°5.64 37.91	Altair 61°57.64 8°56.73
Mer.	pass. 00:05	u-0.4 $'$ $d1.3'$ m-3.90	$ u 0.8' \; d0.5' \; { m m} 1.36$	$ u 2.0' \ d$ -0.2' m-1.71	ν 2.6′ <i>d</i> -0.1′ m0.23	Peacock 53°1.92 -56°38.78
						Deneb 49°23.97 45°23.06
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.35 10°0.37 Al Na'ir 27°29.76 -46°49.51
0	359°39.04	171°13.65 \$02°22.04	139°38.15 \$16°5.32	195°44.32 N07°52.28	334°8.25 N07°37.85	Fomalhaut 15°11.75 -29°28.35
1	14°41.50	186° 13.28 23.32	154°38.94 5.86	210°46.29 52.08	349°10.86 37.79	Scheat 13°42.69 28°14.22
2	29° 43.97	201°12.91 24.59	169°39.72 6.40	225°48.26 51.88	4°13.48 37.72	Markab 13°27.37 15°21.50
3 4	44°46.43	216°12.54 · · 25.87 231°12.17 27.14	184°40.51 · · 6.95 199°41.30 7.49	240°50.22 · · 51.68	19°16.09 · · 37.66 34°18.70 37.60	Sep 19 Sun SHA Mer.pass
4 5	59° 48.90 74° 51.36	231°12.17 27.14 246°11.80 28.41	199°41.30 7.49 214°42.09 8.03	255°52.19 51.48 270°54.15 51.28	34°18.70 37.60 49°21.32 37.53	Venus 173°50.55 12:34
6	89°53.82	261°11.43 S02°29.69	229°42.87 \$16°8.57	285°56.12 N07°51.08	64°23.93 N07°37.47	Mars 141°19.22 14:43
7	104° 56.29	276°11.06 30.96	244°43.66 9.11	300°58.09 50.88	79°26.54 37.40	Jupiter 196°29.25 11:02
8	119° 58.75	291°10.69 32.23	259°44.44 9.66	316° 0.05 50.68	94°29.16 37.34	Saturn 334°22.19 01:51
9	$135^{\circ}1.22$	306°10.32 · · 33.51	274°45.23 · · 10.20	331°2.02 · · 50.48	109°31.77 · · · 37.28	Sep 20 Mon SHA Mer.pass
10	150°3.68	321°9.95 34.78	289°46.02 10.74	346°3.99 50.28	124°34.39 37.21	Sep 20 Mon SHA Mer.pass Venus 172°42.60 12:35
11	165°6.15	336°9.58 36.06	304°46.80 11.28	1°5.95 50.08	139°37.00 37.15	Mars 140°39.25 14:42
12 13	180°8.61 195°11.07	351°9.21 S02°37.33 6°8.84 38.60	319°47.59 \$16°11.82 334°48.37 12.36	16°7.92 N07°49.88 31°9.89 49.68	154°39.61 N07°37.08 169°42.23 37.02	Jupiter 196°17.25 10:59
13 14	210° 13.54	6°8.84 38.60 21°8.46 39.88	349°49.15 12.90	31°9.89 49.68 46°11.85 49.48	184° 44.84 36.96	Saturn 334°25.67 01:47
15	225° 16.00	36°8.09 · · 41.15	4°49.94 · · 13.44	61°13.82 · · 49.28	199° 47.46 · · · 36.89	Sep 21 Tue SHA Mer.pass
16	240° 18.47	51°7.72 42.42	19°50.72 13.98	76°15.79 49.08	214°50.07 36.83	Venus 171°34.61 12:35
17	255°20.93	66°7.35 43.70	34°51.50 14.52	91°17.75 48.88	229°52.69 36.76	Mars 139°59.11 14:41
18	270°23.39	81°6.98 S 02°44.97	49°52.29 \$16°15.06	106°19.72 N07°48.68	244°55.30 N07°36.70	Jupiter 196°5.28 10:56
19	285°25.86	96°6.61 46.24	64°53.07 15.60	121°21.69 48.48	259°57.92 36.64	Saturn 334°29.21 01:43
20	300°28.32	111°6.24 47.51	79°53.85 16.14	136°23.65 48.28	275°0.53 36.57	Horizontal parallax
21 22	315°30.79 330°33.25	126°5.87 · · 48.79 141°5.49 50.06	94°54.64 · · 16.68 109°55.42 17.22	151°25.62 · · 48.08 166°27.59 47.88	290°3.15 · · 36.51 305°5.76 36.44	Venus: 0.1
23	345°35.72	156° 5.12 51.33	124°56.20 17.76	181°29.55 47.68	320°8.38 36.38	Mars: 0.1
ivier.	pass. 23:57	ν-0.4' d1.3' m-3.90	$\nu 0.8' \ d0.5' \ m1.36$	ν2.0′ d-0.2′ m-1.71	ν2.6' d-0.1' m0.23	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°29.50	N01°39.07	$330^{\circ}37.65$	12.4'	$N16^{\circ}34.25$	11.8'	56.2'
1	196°29.72	38.10	345°9.02	12.3'	16°46.05	11.7'	56.2'
2 3	211°29.95 226°30.17	37.14 · · 36.17	359°40.31 14°11.51	12.2' 12.1'	16°57.77 17°9.43	11.7' 11.6'	56.2' 56.2'
4	241°30.40	35.20	28°42.62	12.0'	17°21.01	11.5'	56.2'
5	256°30.62	34.23	43°13.65	11.9'	$17^{\circ}32.52$	11.4'	56.3'
6	271°30.84	N01°33.26	57°44.59	11.9'	N17°43.95	11.4'	56.3'
7 8	286°31.07 301°31.29	32.29 31.32	72°15.44 86°46.20	11.8' 11.7'	17°55.30 18°6.58	11.3' 11.2'	56.3' 56.3'
9	316°31.52	• • 30.36	101°16.88	11.6'	18° 17.78	11.1'	56.3'
10	331°31.74	29.39	115°47.46	11.5'	18°28.89	11.0'	56.4'
11	346°31.96	28.42	130°17.95	11.4'	18°39.93	11.0'	56.4
12 13	1°32.19 16°32.41	N01°27.45 26.48	144°48.36 159°18.67	11.3' 11.2'	N18°50.88 19°1.75	10.9' 10.8'	56.4' 56.4'
14	31°32.63	25.51	173°48.89	11.1'	19°12.53	10.7	56.5
15	46°32.86	• • 24.54	$188^{\circ}19.01$	11.0'	$19^{\circ}23.22$	10.6'	56.5'
16	61°33.08	23.57	202°49.05	10.9'	19°33.83	10.5'	56.5'
17 18	76°33.30 91°33.53	22.60 N01°21.63	217°18.99 231°48.84	10.8' 10.8'	19°44.34 N19°54.77	10.4' 10.3'	56.5' 56.5'
19	106°33.75	20.66	246°18.59	10.7	20°5.10	10.3	56.6
20	121°33.97	19.69	260°48.25	10.6'	20°15.34	10.1'	56.6'
21	136°34.20	• • 18.73	275°17.81	10.5'	20°25.48	10.0'	56.6'
22	151°34.42 166°34.64	17.76	289°47.28 304°16.66	10.4'	20°35.53 20°45.48	9.9'	56.6'
23		16.79	304 10.00	10.3'		9.8'	56.6'
	SD = 15.9'	d = -1.0'		SE	0 = 15.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°34.87	N01°15.82	$318^{\circ}45.93$	10.2'	N20°55.33	9.7'	56.7'
1	196°35.09	14.85	333°15.12	10.1'	21°5.08	9.6'	56.7'
2	211°35.31 226°35.54	13.88 •• 12.91	347°44.20 2°13.20	10.0' 9.9'	21°14.72 21°24.27	9.5' 9.4'	56.7' 56.7'
4	241°35.76	11.94	16°42.09	9.8'	21°24.27 21°33.71	9.4	56.8'
5	256°35.98	10.97	31°10.89	9.7'	21°43.04	9.2'	56.8'
6	271°36.21	N01°10.00	45°39.59	9.6'	N21°52.27	9.1'	56.8'
7	286°36.43	9.03	60°8.19	9.5'	22°1.39	9.0'	56.8'
8 9	301°36.65 316°36.88	8.06 • • 7.09	74°36.70 89°5.12	9.4' 9.3'	22°10.39 22°19.29	8.9' 8.8'	56.8' 56.9'
10	331° 37.10	6.12	103°33.43	9.3 9.2'	22°19.29	8.7'	56.9'
11	346°37.32	5.15	118° 1.65	9.1'	22°36.74	8.6'	56.9'
12	1°37.55	N01°4.18	132°29.77	9.0'	N22°45.30	8.4'	56.9'
13 14	16°37.77 31°37.99	3.21 2.24	146°57.80 161°25.73	8.9' 8.8'	22°53.73 23°2.05	8.3' 8.2'	57.0' 57.0'
15	46°38.21	. 1.26	175° 53.56	8.7'	23°10.25	8.1	57.0'
16	61°38.44	01°0.29	190°21.30	8.6'	23°18.33	8.0'	57.0'
17	76°38.66	00°59.32	204°48.95	8.5'	23°26.29	7.8'	57.1'
18	91°38.88	N00°58.35	219°16.50	8.5'	N23°34.12 23°41.83	7.7'	57.1'
19 20	106°39.10 121°39.33	57.38 56.41	233°43.95 248°11.31	8.4' 8.3'	23°41.83 23°49.41	7.6' 7.5'	57.1' 57.1'
21	136°39.55	• • 55.44	262°38.58	8.2'	23°56.87	7.3	57.1'
22	151°39.77	54.47	277°5.75	8.1'	24°4.20	7.2'	57.2'
23	166°40.00	53.50	291°32.83	8.0'	24°11.39	7.1'	57.2'
	SD = 15.9'	d = -1.0'		SE	O = 15.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°40.22	N00°52.53	305°59.81	7.9'	N24°18.46	6.9'	57.2'
1	196°40.44	51.56	320°26.71	7.8'	24°25.39	6.8'	57.2'
2	211°40.66	50.59	334°53.51	7.7'	24°32.19	6.7'	57.3'
3 4	226°40.89 241°41.11	· · 49.61 48.64	349°20.22 3°46.85	7.6' 7.5'	24°38.85 24°45.38	6.5' 6.4'	57.3' 57.3'
5	256°41.33	47.67	18°13.38	7.3 7.4'	24° 51.77	6.3	57.3'
6	271°41.55	N00°46.70	32°39.82	7.4'	N24°58.02	6.1'	57.4'
7	286°41.77	45.73	47°6.18	7.3'	25°4.13	6.0'	57.4'
8 9	301°42.00 316°42.22	44.76 •• 43.79	61°32.45 75°58.64	7.2' 7.1'	25°10.10 25°15.92	5.8' 5.7'	57.4' 57.4'
10	316°42.22 331°42.44	42.82	75°58.64 90°24.73	7.1	25°15.92 25°21.60	5.7° 5.5'	57.4° 57.5'
11	346°42.66	41.84	104°50.75	6.9'	25°27.14	5.4'	57.5'
12	1°42.89	N00°40.87	119°16.68	6.8'	N25°32.53	5.2'	57.5'
13 14	16°43.11 31°43.33	39.90 38.93	133°42.53 148°8.29	6.8' 6.7'	25°37.77 25°42.87	5.1' 4.9'	57.5' 57.5'
14 15	31°43.33 46°43.55	38.93 •• 37.96	148° 8.29 162° 33.98	6.6'	25°42.87 25°47.81	4.9° 4.8'	57.5° 57.6'
16	61°43.77	36.99	176°59.59	6.5	25°52.61	4.6'	57.6'
17	76°43.99	36.01	191°25.12	6.5'	25°57.25	4.5'	57.6'
18	91°44.22	N00°35.04	205°50.57	6.4'	N26°1.74	4.3'	57.6'
19 20	106°44.44 121°44.66	34.07 33.10	220°15.95 234°41.25	6.3' 6.2'	26°6.07 26°10.25	4.2' 4.0'	57.7' 57.7'
20	121°44.66 136°44.88	33.10	234°41.25 249°6.48	6.2'	26°10.25 26°14.28	4.0° 3.9'	57.7'
22	151°45.10	31.16	263°31.64	6.1	26°18.14	3.7'	57.7'
23	166°45.32	30.18	277°56.73	6.0'	26°21.85	3.5'	57.8'
	SD = 15.9'	d = -1.0'		SE	O = 15.6'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer. Mer.F		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-75%	
19	05:58	06:09	11:54	02:01	14:26		
20	06:19	06:30	11:53	02:51	15:17		
21	06:41	06:52	11:53	03:44	16:13		

September 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	0°38.18	171°4.75 S02°52.61	139°56.98 \$16°18.29	196°31.52 N07°47.48	335°10.99 N07°36.31	
1	15°40.64	186°4.38 53.88	154°57.76 18.83	211°33.49 47.28	350°13.61 36.25	Alpheratz 357°32.09 29°14.81 Ankaa 353°4.56 -42°9.11
2	30°43.11	201°4.01 55.15	169°58.54 19.37	226°35.45 47.08	5°16.22 36.19	Schedar 349°27.89 56°41.47
3	45° 45.57	216°3.64 · · 56.42	184°59.32 · · 19.91	241°37.42 · · 46.88	20° 18.84 · · 36.12	Diphda 348°44.76 -17°49.84
4	60°48.04	231°3.26 57.70	200° 0.10 20.45	256°39.39 46.68	35°21.46 36.06	Achernar 335°18.05 -57°5.50
5 6	75° 50.50 90° 52.96	246°2.89 02°58.97 261°2.52 \$03°0.24	215°0.88 20.98 230°1.66 \$16°21.52	271°41.36 46.48 286°43.32 N07°46.28	50°24.07 35.99 65°26.69 N07°35.93	Hamal 327°48.38 23°35.72
7	105°55.43	276°2.15 1.51	245°2.44 22.06	301°45.29 46.08	80°29.31 35.86	Polaris 312°31.43 89°22.59
8	120°57.89	291°1.77 2.78	260° 3.22 22.60	316°47.26 45.88	95°31.92 35.80	Acamar 315°9.81 -40°11.31
9	136°0.36	306°1.40 · · 4.06	275°4.00 · · 23.13	331°49.23 · · 45.68	110°34.54 · · 35.73	Menkar 314°3.60 4°12.06 Mirfak 308°24.73 49°57.48
10	151°2.82	321°1.03 5.33	290°4.78 23.67	346°51.19 45.48	125°37.15 35.67	Aldebaran 290°36.95 16°33.94
11	166°5.29	336°0.65 6.60	305°5.55 24.21	1°53.16 45.28	140°39.77 35.60	Rigel 281°1.67 -8°10.00
12	181°7.75	351°0.28	320°6.33 \$16°24.74	16°55.13 N07°45.08	155°42.39 N07°35.54	Capella 280°18.51 46°1.37
13 14	196° 10.21 211° 12.68	5°59.91 9.14 20°59.54 10.41	335°7.11 25.28 350°7.89 25.82	31°57.10 44.88 46°59.06 44.68	170°45.00 35.47 185°47.62 35.41	Bellatrix 278°20.45 6°22.57
15	226° 15.14	35°59.16 · · 11.69	5°8.66 · · 26.35	62°1.03 · · 44.48	200°50.24 · · 35.35	Elnath 277°59.00 28°37.77
16	241°17.61	50°58.79 12.96	20°9.44 26.89	77°3.00 44.28	215°52.86 35.28	Alnilam 275°35.44 -1°10.93
17	$256^{\circ}20.07$	65°58.41 14.23	35°10.21 27.42	92°4.97 44.08	230°55.47 35.22	Betelgeuse 270°49.68 7°24.79 Canopus 263°51.46 -52°42.28
18	271°22.53	80°58.04 S 03°15.50	50°10.99 \$16°27.96	107°6.93 N07°43.88	245°58.09 N07°35.15	Sirius 258°24.34 -16°45.07
19	286°25.00	95°57.67 16.77	65°11.77 28.49	122°8.90 43.68	261°0.71 35.09	Adhara 255°4.21 -29°0.35
20	301°27.46	110°57.29 18.04	80°12.54 29.03	137°10.87 43.48	276°3.33 35.02	Procyon 244°48.64 5°9.27
21 22	316°29.93 331°32.39	125°56.92 · · 19.31 140°56.55 20.58	95°13.32 · · · 29.56 110°14.09	152°12.84 · · 43.28 167°14.81	291°5.94 · · 34.96 306°8.56 34.89	Pollux 243°14.76 27°57.45
23	346°34.86	155° 56.17 21.85	125°14.87 30.63	182°16.78 42.88	321°11.18 34.83	Avior 234°14.17 -59°35.64
		-				Suhail 222°44.98 -43°32.48
Mer.p	pass. 23:54	ν-0.4' d1.3' m-3.90	ν0.8′ d0.5′ m1.36	ν2.0′ d-0.2′ m-1.71	ν2.6' d-0.1' m0.22	Miaplacidus 221°38.45 -69°49.65 Alphard 217°45.82 -8°46.65
						Alphard 217°45.82 -8°46.65 Regulus 207°32.37 11°49.91
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°39.00 61°35.99
0	1°37.32	170°55.80 \$03°23.12	140°15.64 \$16°31.17	197°18.74 N07°42.68	336°13.80 N07°34.76	Denebola 182°23.02 14°25.07
1	16°39.78	185°55.42 24.40	155°16.41 31.70	212°20.71 42.48	351°16.42 34.69	Gienah 175°41.62 -17°41.71
2	31° 42.25 46° 44.71	200° 55.05 25.67 215° 54.67 •• 26.94	170°17.19 32.23 185°17.96 · · 32.77	227°22.68 42.28 242°24.65 • 42.08	6°19.03 34.63 21°21.65 · · 34.56	Acrux 172°58.24 -63°15.21
4	61°47.18	230°54.30 28.21	200°18.73 33.30	257°26.62 41.88	36°24.27 34.50	Gacrux 171°49.69 -57°16.15
5	76°49.64	245°53.92 29.48	215°19.51 33.83	272°28.58 41.68	51°26.89 34.43	Alioth 166°11.61 55°48.61
6	91°52.10	260°53.55 \$03°30.75	230°20.28 S 16°34.37	287°30.55 N07°41.48	66°29.51 N07°34.37	Spica 158°20.25 -11°18.32 Alkaid 152°50.71 49°10.61
7	$106^{\circ}54.57$	275°53.17 32.02	245°21.05 34.90	$302^{\circ}32.52$ 41.28	81°32.13 34.30	Hadar 148°33.33 -60°30.51
8	121°57.03	290°52.80 33.29	260°21.82 35.43	317°34.49 41.08	96°34.75 34.24	Menkent 147°55.30 -36°30.42
9	136° 59.50	305°52.42 · · 34.56	275°22.59 · · 35.97	332°36.46 · · 40.88	111°37.36 · · 34.17	Arcturus 145°46.16 19°2.40
10 11	152°1.96 167°4.43	320°52.05 35.83 335°51.67 37.10	290°23.36 36.50 305°24.13 37.03	347°38.43 40.69 2°40.40 40.49	126°39.98 34.11 141°42.60 34.04	Rigil Kent. 139°37.69 -60°57.13
12	182°6.89	350°51.29 \$03°38.37	320°24.91 \$16°37.56	17°42.37 N07°40.29	156°45.22 N07°33.98	Kochab 137°20.77 74°2.63
13	197°9.35	5°50.92 39.63	335°25.68 38.09	32°44.33 40.09	171°47.84 33.91	Zuben'ubi 136°53.79 -16°9.38
14	212°11.82	20°50.54 40.90	350°26.45 38.63	47°46.30 39.89	186°50.46 33.84	Alphecca 126°2.08 26°37.47 Antares 112°13.23 -26°29.60
15	$227^{\circ}14.28$	35°50.17 · · 42.17	5°27.21 · · 39.16	62°48.27 · · 39.69	201°53.08 · · 33.78	Atria 107°5.55 -69°4.81
16	242°16.75	50°49.79 43.44	20°27.98 39.69	77°50.24 39.49	216°55.70 33.71	Sabik 102°0.30 -15°45.48
17	257° 19.21	65°49.41 44.71	35°28.75 40.22	92°52.21 39.29	231°58.32 33.65	Shaula 96°7.39 -37°7.46
18 19	272°21.67 287°24.14	80°49.04 S03°45.98 95°48.66 47.25	50°29.52 \$16°40.75 65°30.29 41.28	107°54.18 N07°39.09 122°56.15 38.89	247°0.94 N07°33.58 262°3.56 33.52	Rasalhague 95°56.52 12°32.60
20	302°26.60	110°48.28 48.52	80°31.06 41.81	137°58.12 38.69	277°6.18 33.45	Eltanin 90°41.16 51°29.42
21	317°29.07	125°47.90 · · 49.79	95°31.83 · · 42.34	153°0.09 · · 38.49	292°8.80 · · 33.39	Kaus Aust. 83°29.53 -34°22.28
22	332°31.53	140°47.53 51.05	110°32.59 42.87	168°2.06 38.29	307°11.42 33.32	Vega 80°31.65 38°48.87 Nunki 75°44.93 -26°15.67
23	347°34.00	155°47.15 52.32	125°33.36 43.40	183°4.03 38.09	322°14.04 33.25	Altair 61°57.65 8°56.73
Mer r	pass. 23:50	ν-0.4' d1.3' m-3.89	ν0.8' d0.5' m1.36	ν2.0' d-0.2' m-1.71	$\nu 2.6' \ d$ -0.1' m0.22	Peacock 53°1.93 -56°38.78
		2 3.1. 41.5 111 3.03				Deneb 49°23.98 45°23.07
E.·!	СПУ	CHV D	CUA D	CHA D	CUA D	Enif 33°36.35 10°0.38
Fri 0	GHA 2°36.46	GHA Dec 170°46.77 S 03°53.59	GHA Dec 140°34.13 S 16°43.93	GHA Dec 198°5.99 N07°37.89	GHA Dec 337°16.66 N07°33.19	Al Na'ir 27°29.76 -46°49.52
1	17°38.92	185°46.40 54.86	155°34.89 44.46	213°7.96 37.69	352°19.28 33.12	Fomalhaut 15°11.74 -29°28.35 Scheat 13°42.69 28°14.24
2	32°41.39	200°46.02 56.13	170°35.66 44.99	228°9.93 37.49	7°21.90 33.06	Markab 13°27.36 15°21.51
3	47° 43.85	215°45.64 · · 57.39	185°36.43 · · 45.52	243°11.90 · · 37.29	22°24.52 · · 32.99	
4	62°46.32	230°45.26 58.66	200°37.19 46.05	258°13.87 37.10	37°27.14 32.92	Sep 22 Wed SHA Mer.pass
5	77°48.78	245°44.88 03°59.93	215°37.96 46.58	273°15.84 36.90	52°29.76 32.86	Venus 170°26.57 12:36 Mars 139°18.80 14:39
6 7	92°51.25 107°53.71	260°44.50 \$04°1.20 275°44.13 2.46	230°38.72 \$16°47.11 245°39.49 47.64	288°17.81 N07°36.70 303°19.78 36.50	67°32.39 N07°32.79 82°35.01 32.73	Jupiter 195°53.34 10:52
8	107 55.71 122° 56.17	290°43.75 3.73	260°40.25 48.16	318°21.75 36.30	97°37.63 32.66	Saturn 334°32.81 01:39
9	137°58.64	305°43.37 · · 5.00	275°41.02 · · 48.69	333°23.72 · · 36.10	112°40.25 · · 32.59	
10	153°1.10	320°42.99 6.26	290°41.78 49.22	348°25.69 35.90	127° 42.87 32.53	Sep 23 Thu SHA Mer.pass Venus 169°18.48 12:37
11	168°3.57	335°42.61 7.53	305°42.54 49.75	3°27.66 35.70	142°45.49 32.46	Mars 138°38.32 14:38
12	183°6.03	350°42.23	320°43.31 \$16°50.28	18°29.63 N07°35.50	157°48.11 N07°32.40	Jupiter 195°41.42 10:49
13 14	198°8.49 213°10.96	5°41.85 10.06 20°41.47 11.33	335°44.07 50.80 350°44.83 51.33	33°31.60 35.30 48°33.57 35.10	172°50.74 32.33 187°53.36 32.26	Saturn 334°36.48 01:35
14 15	213 10.90 228° 13.42	35°41.09 · · 12.60	5°45.60 · · 51.86	63°35.54 · · 34.90	202°55.98 · · 32.20	Sep 24 Fri SHA Mer.pass
16	243° 15.89	50°40.71 13.86	20°46.36 52.38	78°37.51 34.70	217°58.60 32.13	Venus 168°10.31 12:37
17	258° 18.35	65°40.33 15.13	35°47.12 52.91	93°39.48 34.51	233°1.22 32.06	Mars 137°57.67 14:37
18	273°20.82	80°39.95 S 04°16.40	50°47.88 S 16°53.44	108°41.45 N07°34.31	248°3.85 N07°32.00	Jupiter 195°29.53 10:46
19	288°23.28	95°39.57 17.66	65°48.64 53.96	123°43.42 34.11	263°6.47 31.93	Saturn 334°40.20 01:31
20 21	303°25.74 318°28.21	110°39.19 18.93 125°38.81 · · 20.19	80°49.40 54.49 95°50.16 • 55.01	138°45.39 33.91 153°47.36 · · 33.71	278°9.09 31.86 293°11.71 · · 31.80	Horizontal parallax
22	318 28.21 333°30.67	140°38.43 21.46	110°50.92 55.54	168°49.33 33.51	293°11.71 · · 31.80 308°14.34 31.73	Venus: 0.1
23	348°33.14	155°38.05 22.72	125°51.68 56.07	183°51.30 33.31	323°16.96 31.66	Mars: 0.1
		ν-0.4' d1.3' m-3.89	ν 0.8' d0.5' m1.36	ν2.0' d-0.2' m-1.71	ν 2.6' d-0.1' m0.21	
ivier.p	pass. 23:46	ν-υ.4 α1.5 M-3.89	νυ.ο αυ.ο m1.30	ν∠.υ u-υ.∠ m-1./1	ν2.0 α-0.1 m0.21	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°45.55	$N00^{\circ}29.21$	292°21.75	6.0'	$N26^{\circ}25.40$	3.4'	57.8'
1	196° 45.77	28.24	306°46.70	5.9'	26°28.79	3.2'	57.8'
2	211° 45.99 226° 46.21	27.27 •• 26.29	321°11.59 335°36.41	5.8' 5.8'	26°32.01 26°35.08	3.1' 2.9'	57.8' 57.9'
4	241°46.43	25.32	350°1.17	5.7'	26°37.98	2.7'	57.9'
5	256° 46.65	24.35	4°25.87	5.6'	26°40.72	2.6'	57.9'
6 7	271°46.87 286°47.10	N00°23.38 22.41	18°50.51 33°15.09	5.6' 5.5'	N26°43.30 26°45.70	2.4' 2.2'	57.9' 58.0'
8	301°47.32	21.43	47°39.61	5.5'	26°47.95	2.1'	58.0'
9	316° 47.54	• • 20.46	62°4.08	5.4'	26°50.02	1.9'	58.0'
10	331°47.76	19.49	76°28.50	5.4'	26°51.93	1.7'	58.0'
11 12	346° 47.98 1° 48.20	18.52 N00°17.54	90°52.87 105°17.18	5.3' 5.3'	26°53.67 N26°55.24	1.6' 1.4'	58.1' 58.1'
13	16°48.42	16.57	119°41.45	5.2'	26°56.64	1.2'	58.1
14	31°48.64	15.60	134° 5.67	5.2'	26°57.87	1.1'	58.1'
15 16	46° 48.86 61° 49.08	· · 14.63 13.65	148°29.85 162°53.98	5.1' 5.1'	26°58.92 26°59.81	0.9' 0.7'	58.2' 58.2'
17	76°49.30	12.68	102 55.98 177°18.08	5.1'	20° 59.81 27° 0.52	0.7	58.2'
18	91°49.52	N00°11.71	191°42.14	5.0'	N27°1.06	0.4'	58.2'
19	106°49.74	10.74	206° 6.16	5.0'	27°1.43	0.2'	58.3'
20 21	121°49.97 136°50.19	9.76 • • 8.79	220°30.14 234°54.09	5.0' 4.9'	27°1.62 27°1.64	0.0' -0.2'	58.3' 58.3'
22	151° 50.41	7.82	249°18.01	4.9'	27°1.48	-0.3	58.3
23	166°50.63	6.84	263°41.91	4.9'	$27^{\circ}1.15$	-0.5'	58.4'
	SD = 15.9'	d = -1.0'		SI	D = 15.8'		
The	GHA	Dec			Dar	d	HP
Thu 0	GHA 181°50.85	Dec N00°5.87	GHA 278° 5.77	ν 4.8'	Dec N27°0.64	d -0.7'	HP 58.4'
1	196°51.07	4.90	292°29.61	4.8'	26°59.96	-0.9'	58.4'
2	211°51.29	3.93	306°53.43	4.8'	26°59.10	-1.0'	58.4'
3 4	226°51.51 241°51.73	· · 2.95 1.98	321°17.23 335°41.01	4.8' 4.8'	26°58.06 26°56.85	-1.2' -1.4'	58.4' 58.5'
5	256° 51.95	1.01	350°4.77	4.7'	26°55.46	-1.6'	58.5
6	271°52.17	N00° 0.03	4°28.52	4.7'	N26°53.89	-1.7'	58.5'
7	286°52.39 301°52.61	S00°0.94	18°52.25	4.7'	26°52.15 26°50.23	-1.9'	58.5'
8 9	301°52.61 316°52.83	1.91 •• 2.89	33°15.97 47°39.69	4.7' 4.7'	26°50.23 26°48.13	-2.1' -2.3'	58.6' 58.6'
10	331°53.05	3.86	62°3.39	4.7'	26°45.85	-2.5'	58.6'
11	346°53.26	4.83	76°27.09	4.7'	26°43.39	-2.6'	58.6'
12 13	1°53.48 16°53.70	\$00°5.80 6.78	90°50.79 105°14.49	4.7' 4.7'	N26°40.76 26°37.95	-2.8' -3.0'	58.7' 58.7'
14	31°53.92	7.75	119°38.19	4.7'	26°34.96	-3.2	58.7
15	46°54.14	• • 8.72	134°1.89	4.7'	26°31.80	-3.3'	58.7'
16 17	61°54.36 76°54.58	9.70 10.67	148°25.60 162°49.31	4.7' 4.7'	26°28.45 26°24.93	-3.5' -3.7'	58.8' 58.8'
18	91° 54.80	500°11.64	102 49.31 177°13.03	4.7'	N26°21.24	-3.7	58.8'
19	106°55.02	12.62	191°36.76	4.7'	$26^{\circ}17.36$	-4.0'	58.8'
20	121°55.24 136°55.46	13.59	206° 0.51		26°13.31 26°9.09	-4.2' -4.4'	58.9'
21 22	150 55.46 151°55.68	· · 14.56 15.54	220°24.27 234°48.05	4.8' 4.8'	26° 4.69	-4.4 -4.6'	58.9' 58.9'
23	166°55.89	16.51	249°11.84	4.8'	26°0.11	-4.8'	58.9'
	SD = 15.9'	d = -1.0'		SI	D = 15.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°56.11	500°17.48	263°35.65	4.8'	N25°55.36	-4.9'	59.0'
1	196° 56.33	18.46	277°59.49	4.9'	25°50.43	-5.1'	59.0'
2	211°56.55 226°56.77	19.43 •• 20.40	292°23.35 306°47.23	4.9' 4.9'	25°45.33 25°40.05	-5.3' -5.4'	59.0' 59.0'
4	241°56.99	21.38	300 47.23 321°11.14	4.9' 4.9'	25°34.61	-5.4 -5.6'	59.0'
5	256° 57.21	22.35	335°35.08	5.0'	25°28.99	-5.8'	59.1'
6	271°57.42 286°57.64	\$00°23.33 24.30	349°59.05 4°23.05	5.0' 5.0'	N25°23.19 25°17.23	-6.0' -6.1'	59.1' 59.1'
7 8	286°57.64 301°57.86	24.30 25.27	4°23.05 18°47.09	5.0	25°17.23 25°11.10	-6.1'	59.1' 59.1'
9	316° 58.08	• • 26.25	33°11.16	5.1'	25°4.79	-6.5'	59.2'
10	331°58.30	27.22	47°35.26	5.1'	24°58.32	-6.6'	59.2'
11 12	346°58.51 1°58.73	28.19 \$00°29.17	61°59.41 76°23.59	5.2' 5.2'	24°51.67 N24°44.86	-6.8' -7.0'	59.2' 59.2'
13	16°58.95	30.14	90°47.82	5.3'	24°37.88	-7.1'	59.2'
14	31°59.17	31.11	105°12.08	5.3'	24°30.74	-7.3'	59.3'
15 16	46°59.39 61°59.60	· · 32.09 33.06	119°36.39 134°0.75	5.4' 5.4'	24°23.43 24°15.96	-7.5' -7.6'	59.3' 59.3'
16 17	76°59.82	33.06 34.04	134° 0.75 148° 25.15	5.4' 5.4'	24°15.96 24°8.32	-7.8'	59.3'
18	92°0.04	S00°35.01	162°49.60	5.5'	N24°0.52	-8.0'	59.4'
19	107°0.26	35.98	177°14.10	5.5'	23°52.55	-8.1'	59.4'
20 21	122°0.47 137°0.69	36.96 · · 37.93	191°38.65 206°3.25	5.6' 5.7'	23°44.43 23°36.14	-8.3' -8.4'	59.4' 59.4'
22	152°0.91	38.90	220° 27.90	5.7'	23°27.70	-8.6'	59.4
23	167°1.12	39.88	234°52.61	5.8'	23°19.10	-8.8'	59.5'
	SD = 15.9'	d = 1.0'		SI	D = 16.1'		

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

Lat.	Moonrise			Moonset		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°			19:58			18:37
64°			21:05			17:29
62°	18:24	19:47	21:40	15:57	16:41	16:53
60°	19:10	20:26	22:06	15:11	16:02	16:28
N 58°	19:40	20:53	22:26	14:41	15:35	16:07
56°	20:03	21:14	22:42	14:19	15:14	15:50
54°	20:22	21:31	22:56	14:00	14:56	15:35
52°	20:38	21:46	23:08	13:44	14:41	15:23
50°	20:52	21:59	23:19	13:30	14:28	15:11
45°	21:20	22:26	23:42	13:03	14:01	14:48
N 40°	21:42	22:47		12:41	13:39	14:29
35°	22:00	23:04		12:22	13:21	14:13
30°	22:16	23:19	•• ••	12:07	13:06	13:59
20° N 10°	22:42 23:05	23:45	00:07	11:40 11:17	12:40 12:17	13:36 13:15
0°	23:05		00:07	10:56	12:17 11:56	12:56
1						
S 10°	23:48		00:48	10:34	11:35	12:37
20° 30°		00:12 00:38	01:10 01:35	10:11 09:45	11:12	12:16 11:52
35°		00:38	01:35	09:45	10:45 10:29	11:52
40°	00:10	01:13	02:07	09:29	10:29	11:37
45°	00:10	01:35	02:07	08:49	09:49	11:01
S 50°						
52°	01:00 01:13	02:03 02:17	02:54 03:06	08:21 08:07	09:21 09:07	10:35 10:23
54°	01:13	02:17	03:06	08:07	09:07	10:23
56°	01:29	02:53	03:21	07:31	08:32	09:53
58°	02:10	02:52	03:57	07:33	08:09	09.33
S 60°	02:10	03:46	04:22	06:41	07:38	09:09
3 00	02.33	33.70	07.22	00.71	01.50	09.09

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-44%	
22	07:02	07:13	11:53	04:42	17:11		
23	07:23	07:34	11:52	05:41	18:12		
24	07:44	07:55	11:52	06:42	19:12		

September 25, 26, 27 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	3°35.60	170°37.67 S 04°23.99	140°52.44 \$16°56.59	198°53.28 N07°33.11	338°19.58 N07°31.60	
1	18°38.06	185° 37.29 25.25	155°53.20 57.12	213°55.25 32.91	353°22.20 31.53	Alpheratz 357°32.08 29°14.82 Ankaa 353°4.55 -42°9.11
2	33°40.53	200°36.91 26.52	170°53.96 57.64	228°57.22 32.71	8°24.83 31.46	Ankaa 353°4.55 -42°9.11 Schedar 349°27.87 56°41.49
3	48° 42.99	215° 36.53 · · 27.78	185°54.72 · · 58.17	243°59.19 · · 32.51	23°27.45 · · 31.40	Diphda 348°44.74 -17°49.84
4	63°45.46	230°36.14 29.05	200°55.48 58.69	259°1.16 32.32	38°30.07 31.33	Achernar 335°18.03 -57°5.51
5	78° 47.92	245°35.76 30.31	215°56.24 59.21	274°3.13 32.12	53°32.70 31.26	Hamal 327°48.36 23°35.73
6 7	93°50.39 108°52.85	260°35.38 \$04°31.57 275°35.00 32.84	230°57.00 \$16°59.74 245°57.75 17°0.26	289°5.10 N07°31.92 304°7.07 31.72	68°35.32 N07°31.20 83°37.94 31.13	Polaris 312°30.04 89°22.61
8	108 52.85 123°55.31	290°34.62 34.10	260°58.51 0.79	319°9.04 31.52	98° 40.57 31.06	Acamar 315°9.79 -40°11.31
9	138° 57.78	305°34.23 · · 35.37	275°59.27 · · 1.31	334°11.01 · · 31.32	113°43.19 · · 31.00	Menkar 314°3.58 4°12.07
10	154°0.24	320°33.85 36.63	291°0.02 1.83	349°12.98 31.12	128° 45.81 30.93	Mirfak 308°24.70 49°57.49
11	169°2.71	335°33.47 37.89	306° 0.78 2.36	4°14.96 30.92	143°48.44 30.86	Aldebaran 290°36.92 16°33.94
12	184°5.17	350°33.08 S 04°39.16	321°1.54 \$17°2.88	19°16.93 N07°30.72	158°51.06 N07°30.80	Rigel 281°1.64 -8°10.00 Capella 280°18.47 46°1.38
13	199°7.63	5°32.70 40.42	336°2.29 3.40	34°18.90 30.53	173°53.69 30.73	Bellatrix 278°20.42 6°22.57
14	214° 10.10	20°32.32 41.68	351°3.05 3.92	49°20.87 30.33	188° 56.31 30.66	Elnath 277°58.97 28°37.78
15	229° 12.56	35°31.93 · · 42.95	6°3.80 · · 4.45	64°22.84 · · 30.13	203°58.93 · · 30.60	Alnilam 275°35.42 -1°10.93
16	244° 15.03	50°31.55 44.21	21°4.56 4.97	79°24.81 29.93	219°1.56 30.53	Betelgeuse 270°49.65 7°24.79
17 18	259° 17.49 274° 19.95	65°31.17 45.47 80°30.78 \$04°46.73	36°5.31 5.49 51°6.07 \$17°6.01	94°26.78 29.73 109°28.76 N07°29.53	234°4.18 30.46 249°6.81 N07°30.40	Canopus 263°51.43 -52°42.28
19	289° 22.42	95°30.40 48.00	66° 6.82 6.53	124°30.73 29.33	264°9.43 30.33	Sirius 258°24.31 -16°45.06
20	304° 24.88	110°30.01 49.26	81°7.57 7.05	139°32.70 29.13	279°12.06 30.26	Adhara 255°4.18 -29°0.34
21	319°27.35	125°29.63 · · 50.52	96°8.33 · · 7.58	154°34.67 · · 28.94	294°14.68 · · 30.19	Procyon 244°48.62 5°9.27
22	334°29.81	140°29.25 51.78	111° 9.08 8.10	169°36.64 28.74	309° 17.31 30.13	Pollux 243°14.73 27°57.45 Avior 234°14.14 -59°35.63
23	349°32.28	155°28.86 53.04	126° 9.83 8.62	184°38.62 28.54	324° 19.93 30.06	Avior 234°14.14 -59°35.63 Suhail 222°44.96 -43°32.48
Mer	pass. 23:42	ν-0.4' d1.3' m-3.89	ν 0.8' d0.5' m1.36	ν2.0' d-0.2' m-1.71	ν2.6' d-0.1' m0.21	Miaplacidus 221°38.41 -69°49.64
- IVICI.	Pa33. 23.42	- V 0.4 U1.5 III 5.05				Alphard 217°45.80 -8°46.65
_						Regulus 207°32.35 11°49.90
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.98 61°35.97
0	4°34.74	170°28.48	141°10.59 \$17°9.14 156°11.34 9.66	199°40.59 N07°28.34 214°42.56 28.14	339°22.56 N07°29.99 354°25.18 29.92	Denebola 182°23.01 14°25.06
1 2	19°37.20 34°39.67	185°28.09 55.57 200°27.70 56.83	171°12.09 10.18	214°42.56 28.14 229°44.53 27.94	354°25.18 29.92 9°27.81 29.86	Gienah 175°41.61 -17°41.71
3	49° 42.13	215°27.32 · · 58.09	186°12.84 · · 10.70	244°46.50 · · 27.74	24°30.43 · · 29.79	Acrux 172°58.24 -63°15.20
4	64° 44.60	230°26.93 04°59.35	201°13.59 11.22	259°48.48 27.55	39°33.06 29.72	Gacrux 171°49.69 -57°16.14
5	79° 47.06	245°26.55 05°0.61	216°14.34 11.74	274°50.45 27.35	54°35.68 29.66	Alioth 166°11.61 55°48.59
6	94°49.52	260°26.16 S 05°1.87	231°15.09 S 17°12.26	289°52.42 N07°27.15	69°38.31 N07°29.59	Spica 158°20.25 -11°18.32 Alkaid 152°50.72 49°10.59
7	109°51.99	275°25.78 3.13	246°15.84 12.78	304°54.39 26.95	84°40.93 29.52	Hadar 148°33.34 -60°30.51
8	124°54.45	290°25.39 4.39	261°16.59 13.29	319°56.36 26.75	99°43.56 29.45	Menkent 147°55.30 -36°30.41
9	139°56.92	305°25.00 · · 5.65	276°17.34 · · 13.81	334°58.34 · · 26.55	114°46.19 · · 29.39	Arcturus 145°46.17 19°2.39
10	154°59.38	320°24.62 6.91	291°18.09 14.33	350°0.31 26.35	129°48.81 29.32	Rigil Kent. 139°37.70 -60°57.12
11	170°1.84 185°4.31	335°24.23 8.17 350°23.84 \$05°9.43	306°18.84 14.85	5°2.28 26.16	144°51.44 29.25	Kochab 137°20.81 74°2.61
12 13	200° 6.77	5°23.45 10.69	321°19.59 \$17°15.37 336°20.34 15.89	20°4.25 N07°25.96 35°6.23 25.76	159°54.06 N07°29.18 174°56.69 29.12	Zuben'ubi 136°53.79 -16°9.38
14	215° 9.24	20°23.07 11.95	351°21.09 16.40	50°8.20 25.56	189°59.32 29.05	Alphecca 126°2.08 26°37.46
15	230°11.70	35°22.68 · · 13.21	6°21.84 · · 16.92	65°10.17 · · 25.36	205°1.94 · · 28.98	Antares 112°13.24 -26°29.60
16	245° 14.17	50°22.29 14.47	21°22.58 17.44	80°12.15 25.16	220°4.57 28.91	Atria 107°5.58 -69°4.81
17	260° 16.63	65°21.90 15.73	36°23.33 17.96	95°14.12 24.97	235°7.20 28.84	Sabik 102°0.31 -15°45.48 Shaula 96°7.40 -37°7.46
18	275°19.09	80°21.51 S 05°16.98	51°24.08 S 17°18.47	110°16.09 N07°24.77	250°9.82 N07°28.78	Rasalhague 95°56.53 12°32.60
19	290°21.56	95°21.13 18.24	66°24.82 18.99	125°18.06 24.57	265° 12.45 28.71	Eltanin 90°41.18 51°29.42
20	305°24.02	110°20.74 19.50	81°25.57 19.51	140°20.04 24.37	280° 15.08 28.64	Kaus Aust. 83°29.54 -34°22.28
21	320°26.49	125°20.35 · · 20.76	96°26.32 · · 20.02	155°22.01 · · 24.17	295° 17.70 · · 28.57	Vega 80°31.67 38°48.87
22	335°28.95	140°19.96 22.02	111°27.06 20.54	170°23.98 23.97	310°20.33 28.51	Nunki 75°44.94 -26°15.68
23	350°31.41	155°19.57 23.27	126°27.81 21.05	185°25.96 23.78	325°22.96 28.44	Altair 61°57.65 8°56.73
Mer.	pass. 23:38	u-0.4 $'$ $d1.3'$ m-3.89	$ u 0.8' \ d0.5' \ m1.36$	$\nu 2.0' \ d$ -0.2' m-1.72	$ u 2.6' \ d$ -0.1' m0.20	Peacock 53°1.94 -56°38.79
						Deneb 49°24.00 45°23.08
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.35 10°0.38
0	5°33.88	170°19.18 S05°24.53	141°28.55 \$17°21.57	200°27.93 N07°23.58	340°25.58 N07°28.37	Al Na'ir 27°29.76 -46°49.52 Fomalhaut 15°11.74 -29°28.36
1	20°36.34	185°18.79 25.79	156°29.30 22.08	215°29.90 23.38	355°28.21 28.30	Scheat 13°42.68 28°14.25
2	35°38.81	200°18.40 27.04	171°30.04 22.60	230°31.88 23.18	10°30.84 28.23	Markab 13°27.36 15°21.51
3	50°41.27	215° 18.01 · · 28.30	186°30.79 · · 23.11	245°33.85 · · 22.98	25°33.47 · · 28.17	
4	65° 43.73	230°17.62 29.56	201°31.53 23.63	260°35.82 22.78	40°36.09 28.10	Sep 25 Sat SHA Mer.pass
5	80°46.20	245°17.23 30.81	216°32.27 24.14	275°37.80 22.59	55°38.72 28.03	Venus 167°2.07 12:38
6	95°48.66	260°16.84 \$05°32.07	231°33.02 \$17°24.66	290°39.77 N07°22.39	70°41.35 N07°27.96	Mars 137°16.84 14:36 Jupiter 195°17.68 10:43
7 8	110°51.13 125°53.59	275°16.45 33.33 290°16.06 34.58	246°33.76 25.17 261°34.50 25.69	305°41.75 22.19 320°43.72 21.99	85°43.98 27.89 100°46.61 27.83	Saturn 334°43.98 01:26
9	125 53.59 140°56.05	305°15.67 · · 35.84	276°35.25 · · 26.20	320 43.72 21.99 335°45.69 · · 21.79	115°49.23 · · 27.76	
10	155° 58.52	320°15.28 37.09	291°35.99 26.71	350°47.67 21.60	130°51.86 27.69	Sep 26 Sun SHA Mer.pass
11	171°0.98	335°14.88 38.35	306°36.73 27.23	5°49.64 21.40	145°54.49 27.62	Venus 165°53.74 12:38
12	186°3.45	350°14.49 S 05°39.60	321°37.47 \$17°27.74	20°51.62 N07°21.20	160°57.12 N07°27.55	Mars 136°35.85 14:35
13	201°5.91	5°14.10 40.86	336°38.21 28.25	35°53.59 21.00	175°59.75 27.48	Jupiter 195°5.85 10:40 Saturn 334°47.82 01:22
14	216°8.38	20° 13.71 42.11	351°38.95 28.77	50°55.56 20.80	191°2.38 27.42	Jatum 334 47.02 U1:22
15	231° 10.84	35°13.32 · · 43.37	6°39.69 · · 29.28	65°57.54 · · 20.61	206°5.00 · · 27.35	Sep 27 Mon SHA Mer.pass
16	246° 13.30	50°12.92 44.62	21°40.43 29.79	80°59.51 20.41	221°7.63 27.28	Venus 164°45.30 12:39
17	261°15.77	65°12.53 45.88	36°41.17 30.30	96°1.49 20.21	236°10.26 27.21	Mars 135°54.68 14:33
18 19	276° 18.23 291° 20.70	80°12.14 S05°47.13 95°11.74 48.38	51°41.91 \$17°30.82 66°42.65 31.33	111°3.46 N07°20.01 126°5.44 19.81	251°12.89 N07°27.14 266°15.52 27.07	Jupiter 194°54.05 10:37
20	306°23.16	95 11.74 48.38 110°11.35 49.64	81°43.39 31.84	120 5.44 19.81 141°7.41 19.62	281°18.15 27.01	Saturn 334°51.71 01:18
21	321°25.62	125°10.96 · · 50.89	96°44.13 · · 32.35	156°9.38 · · 19.42	296°20.78 · · 26.94	Horizontal parallax
22	336°28.09	140°10.56 52.14	111°44.87 32.86	171°11.36 19.22	311°23.41 26.87	Venus: 0.1
23	351°30.55	155°10.17 53.40	126°45.61 33.37	186°13.33 19.02	326°26.04 26.80	Mars: 0.1
Mor	pass. 23:34	ν-0.4' d1.3' m-3.89	ν0.7' d0.5' m1.36	ν2.0′ d-0.2′ m-1.72	ν2.6' d-0.1' m0.20	
IVICI.						

h	Sui	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°1.34	S 00°40.85	$249^{\circ}17.37$	5.8'	$N23^{\circ}10.34$	-8.9'	59.5'
1	197°1.56	41.83	263° 42.18	5.9'	23°1.43	-9.1'	59.5'
2 3	212°1.78 227°1.99	42.80 •• 43.77	278°7.05 292°31.98	5.9' 6.0'	22°52.36 22°43.14	-9.2' -9.4'	59.5' 59.5'
4	242°2.21	44.75	306° 56.97	6.0'	22°33.77	-9.5'	59.6'
5	257°2.43	45.72	321°22.02	6.1'	$22^{\circ}24.24$	-9.7'	59.6'
6	272°2.64	S00°46.69	335°47.12 350°12.29	6.2'	N22°14.57 22°4.75	-9.8'	59.6'
7 8	287°2.86 302°3.08	47.67 48.64	4°37.52	6.2' 6.3'	22°4.75 21°54.78	-10.0' -10.1'	59.6' 59.6'
9	317°3.29	• • 49.62	19°2.81	6.4	21°44.66	-10.3	59.7'
10	332°3.51	50.59	33°28.16	6.4'	21°34.40	-10.4'	59.7'
11	347°3.72 2°3.94	51.56 \$00°52.54	47°53.57 62°19.05	6.5' 6.5'	21°23.99 N21°13.45	-10.5' -10.7'	59.7'
12 13	2 3.94 17°4.16	53.51	76° 44.59	6.6'	N21 13.45 21°2.76	-10.7 -10.8'	59.7' 59.7'
14	32°4.37	54.48	91° 10.20	6.7'	20°51.93	-11.0'	59.7'
15	47°4.59	• • 55.46	105° 35.87	6.7'	20°40.96	-11.1'	59.8'
16 17	62°4.80 77°5.02	56.43 57.41	120°1.61 134°27.42	6.8' 6.9'	20°29.86 20°18.62	-11.2' -11.4'	59.8' 59.8'
18	92°5.24	57.41 S00°58.38	134 27.42 148°53.29	6.9	N20°7.25	-11.4	59.8'
19	107°5.45	00°59.35	163° 19.22	7.0'	19°55.75	-11.6'	59.8'
20	122°5.67	$01^{\circ}0.33$	177° 45.23	7.1'	19°44.11	-11.8'	59.8'
21	137°5.88 152°6.10	• • 1.30	192°11.30	7.1'	19°32.35	-11.9'	59.9'
22 23	152°6.10 167°6.31	2.28 3.25	206°37.43 221°3.64	7.2' 7.3'	19°20.45 19°8.43	-12.0' -12.1'	59.9' 59.9'
_5	SD = 15.9'	d = 1.0'			D = 16.2'		
	JU = 15.9′	u = 1.0°		51	J = 10.2°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°6.53	S01°4.22	235°29.91	7.3'	N18°56.29	-12.3'	59.9'
1 2	197°6.74 212°6.96	5.20 6.17	249° 56.25 264° 22.66	7.4' 7.5'	18° 44.02 18° 31.63	-12.4' -12.5'	59.9' 59.9'
3	212 0.90 227°7.17	7.15	278° 49.13	7.5'	18° 19.12	-12.5 -12.6'	59.9'
4	242°7.39	8.12	293° 15.67	7.6'	18°6.49	-12.7'	60.0'
5	257°7.60	9.09	307° 42.28	7.7'	17°53.74	-12.9'	60.0'
6 7	272°7.82 287°8.03	S01°10.07 11.04	322°8.96 336°35.70	7.7' 7.8'	N17°40.88 17°27.91	-13.0' -13.1'	60.0' 60.0'
8	287 8.03 302°8.24	12.01	351°2.51	7.8 7.9'	17 27.91 17°14.82	-13.1 -13.2'	60.0
9	317°8.46	• • 12.99	5°29.39	7.9'	17°1.62	-13.3'	60.0'
10	332°8.67	13.96	19°56.34	8.0'	16°48.31	-13.4'	60.0'
11 12	347°8.89 2°9.10	14.94 S 01°15.91	34°23.35 48°50.42	8.1' 8.1'	16°34.89 N16°21.37	-13.5' -13.6'	60.1' 60.1'
13	2 9.10 17°9.32	16.88	48 50.42 63°17.56	8.2'	16°7.74	-13.0 -13.7'	60.1
14	32°9.53	17.86	77° 44.77	8.3'	15°54.01	-13.8'	60.1
15	47°9.74	• 18.83	92°12.04	8.3'	15°40.18	-13.9'	60.1'
16 17	62°9.96 77°10.17	19.80 20.78	106°39.38 121°6.78	8.4' 8.5'	15°26.25 15°12.23	-14.0' -14.1'	60.1' 60.1'
18	92°10.38	S01°21.75	135°34.24	8.5	N14°58.11	-14.1	60.1
19	107°10.60	22.73	150°1.77	8.6'	14°43.89	-14.3'	60.1'
20	122°10.81	23.70	164°29.36	8.7'	14°29.58		60.1'
21 22	137°11.02 152°11.24	· · 24.67 25.65	178°57.01 193°24.73	8.7' 8.8'	14° 15.18 14° 0.69	-14.5' -14.6'	60.2' 60.2'
23	167°11.45	26.62	207° 52.50	8.8'	13°46.12	-14.7'	60.2'
	SD = 15.9'	d = 1.0'		SI	D = 16.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°11.66 197°11.88	S01°27.59 28.57	222°20.34 236°48.23	8.9' 9.0'	N13°31.46 13°16.71	-14.7' -14.8'	60.2' 60.2'
2	212°12.09	29.54	251° 16.19	9.0'	13°1.88	-14.9	60.2
3	227°12.30	• • 30.52	265°44.20	9.1'	12°46.98	-15.0'	60.2'
4	242°12.52	31.49 32.46	280° 12.27	9.1'	12°31.99 12°16.93	-15.1'	60.2'
5 6	257°12.73 272°12.94	32.46 \$01°33.44	294°40.40 309°8.59	9.2' 9.2'	12°16.93 N12°1.79	-15.1' -15.2'	60.2' 60.2'
7	287° 13.15	34.41	323° 36.83	9.3	11° 46.58	-15.3	60.2
8	302°13.36	35.38	338°5.12	9.3'	11°31.30	-15.4'	60.2'
9	317°13.58	• • 36.36	352°33.47	9.4'	11°15.95	-15.4'	60.2'
10 11	332°13.79 347°14.00	37.33 38.30	7°1.87 21°30.33	9.5' 9.5'	11°0.53 10°45.05	-15.5' -15.5'	60.2' 60.2'
12	2°14.21	S01°39.28	35° 58.84	9.6'	N10°29.50	-15.6'	60.2
13	17°14.42	40.25	50°27.39	9.6'	10° 13.89	-15.7'	60.2'
14	32°14.64	41.22	64°56.00	9.7'	09°58.21 09°42.48	-15.7'	60.3'
15 16	47°14.85 62°15.06	· · 42.20 43.17	79°24.66 93°53.37	9.7' 9.8'	09°42.48 09°26.70	-15.8' -15.8'	60.3' 60.3'
17	77°15.27	44.14	108° 22.12	9.8'	09° 10.85	-15.9	60.3
18	92°15.48	S01°45.12	122°50.92	9.8'	N08° 54.96	-15.9'	60.3'
19	107°15.69	46.09	137° 19.76	9.9'	08°39.01	-16.0'	60.3'
20 21	122°15.90 137°16.12	47.06 •• 48.04	151°48.65 166°17.59	9.9' 10.0'	08°23.01 08°6.97	-16.0' -16.1'	60.3' 60.3'
22	152°16.33	49.01	180° 46.56	10.0'	07°50.87	-16.1	60.3
23	167°16.54	49.98	195° 15.58	10.1'	07°34.74	-16.2'	60.3'
	SD = 15.9'	d = 1.0'		SI	D = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer. Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-13%	
25	08:05	08:16	11:52	07:41	20:09		
26	08:26	08:36	11:51	08:37	21:04		
27	08:47	08:57	11:51	09:31	21:57		

September 28, 29, 30 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	6°33.02	170°9.78 \$05°54.65	141°46.35 \$17°33.88	201°15.31 N07°18.82	341°28.66 N07°26.73	
1	21°35.48	185°9.38 55.90	156°47.08 34.39	216°17.28 18.63	356°31.29 26.66	Alpheratz 357°32.08
2	36°37.94	200°8.99 57.15	171°47.82 34.90	231°19.26 18.43	11°33.92 26.60	Ankaa 353° 4.55
3	51°40.41	215°8.59 · · 58.41	186°48.56 · · 35.41	246°21.23 ·· 18.23	26°36.55 · · 26.53	Schedar 349°27.87
4	66° 42.87	230°8.20 05°59.66	201°49.29 35.92	261°23.21 18.03	41°39.18 26.46	Diphda 348°44.74 Achernar 335°18.01
5	81°45.34	245°7.80 06°0.91	216°50.03 36.43	276°25.18 17.84	56°41.81 26.39	Hamal 327°48.35
6	96°47.80	260°7.41 S 06°2.16	231°50.77 S17°36.94	291°27.16 N07°17.64	71°44.44 N07°26.32	Polaris 312°28.95
7	111°50.26	275°7.01 3.41	246°51.50 37.45	306°29.13 17.44	86°47.07 26.25	Acamar 315°9.77
8	126°52.73	290°6.61 4.66	261°52.24 37.96	321°31.11 17.24	101°49.70 26.18	Menkar 314° 3.56
9	141°55.19	305°6.22 · · 5.92	276°52.97 · · 38.47	336°33.08 · · 17.05	116°52.33 · · 26.11	Mirfak 308°24.67
10	156° 57.66	320°5.82 7.17	291°53.71 38.98	351°35.06 16.85	131°54.96 26.05	Aldebaran 290°36.90
11	172°0.12 187°2.58	335°5.42 8.42 350°5.03 \$06°9.67	306°54.44 39.49 321°55.18 \$17°39.99	6°37.03 16.65 21°39.01 N07°16.45	146°57.59 25.98 162°0.22 N07°25.91	Rigel 281°1.62
12 13	202°5.05	5°4.63 10.92	336°55.91 40.50	36°40.99 16.25	162°0.22 N07°25.91 177°2.85 25.84	Capella 280°18.45
14	202 5.05 217°7.51	20°4.23 12.17	351°56.64 41.01	51°42.96 16.06	177 2.65 25.64 192°5.48 25.77	Bellatrix 278°20.40
15	232°9.98	35°3.84 · · 13.42	6°57.38 · · 41.52	66°44.94 · · 15.86	207°8.11 · · 25.70	Elnath 277° 58.95
16	247° 12.44	50°3.44 14.67	21°58.11 42.02	81°46.91 15.66	222°10.74 25.63	Alnilam 275°35.40
17	262°14.90	65°3.04 15.91	36°58.84 42.53	96°48.89 15.46	237°13.38 25.56	Betelgeuse 270°49.63
18	277° 17.37	80°2.64 S 06°17.16	51°59.58 S 17°43.04	111°50.86 N07°15.27	252°16.01 N07°25.50	Canopus 263°51.40
19	292°19.83	95°2.24 18.41	67° 0.31 43.55	126°52.84 15.07	267°18.64 25.43	Sirius 258°24.29
20	307°22.30	110°1.85 19.66	82°1.04 44.05	141°54.82 14.87	282°21.27 25.36	Adhara 255° 4.16 Procyon 244° 48.60
21	322°24.76	125°1.45 · · 20.91	97°1.77 · · 44.56	156°56.79 · · 14.68	297°23.90 · · 25.29	Pollux 243°14.71
22	337°27.22	140°1.05 22.16	112°2.50 45.06	171°58.77 14.48	312°26.53 25.22	Avior 234°14.11
23	352°29.69	155°0.65 23.40	127° 3.23 45.57	187°0.74 14.28	327°29.16 25.15	Suhail 222°44.94
Mer.	pass. 23:30	ν-0.4' d1.3' m-3.89	ν 0.7' d0.5' m1.36	ν2.0' d-0.2' m-1.72	$\nu 2.6' \ d$ -0.1' m0.19	Miaplacidus 221°38.38
						Alphard 217°45.79
	6114	S.1.4. D	GU4 B	6114	6114	Regulus 207°32.34
Wed	GHA 7° 30, 15	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.96
0 1	7°32.15 22°34.62	170°0.25 S06°24.65 184°59.85 25.90	142°3.96 \$17°46.08 157°4.69 46.58	202°2.72 N07°14.08 217°4.70 13.89	342°31.79 N07°25.08 357°34.42 25.01	Denebola 182°23.00
2	37°37.08	199°59.45 27.15	172°5.42 47.09	232°6.67 13.69	12°37.06 24.94	Gienah 175°41.61
3	52°39.54	214°59.05 · · 28.39	187°6.15 · · 47.59	247°8.65 · · 13.49	27°39.69 · · 24.87	Acrux 172°58.24
4	67° 42.01	229°58.65 29.64	202°6.88 48.10	262°10.63 13.29	42°42.32 24.80	Gacrux 171°49.69
5	82° 44.47	244°58.25 30.89	217°7.61 48.60	277°12.60 13.10	57°44.95 24.74	Alioth 166°11.61
6	97°46.94	259°57.85 \$06°32.13	232°8.34 S 17°49.10	292°14.58 N07°12.90	72°47.58 N07°24.67	Spica 158°20.25
7	112°49.40	274°57.45 33.38	247° 9.07 49.61	307°16.56 12.70	87°50.21 24.60	Alkaid 152°50.72
8	127°51.86	289°57.04 34.62	262° 9.80 50.11	322°18.53 12.50	102°52.85 24.53	Hadar 148°33.35 Menkent 147°55.31
9	142°54.33	304°56.64 · · 35.87	277°10.52 · · 50.62	337°20.51 · · 12.31	117°55.48 •• 24.46	Arcturus 145°46.17
10	157° 56.79	319°56.24 37.11	292°11.25 51.12	352°22.49 12.11	132°58.11 24.39	Rigil Kent. 139°37.72
11	172°59.26	334°55.84 38.36	307°11.98 51.62	7°24.46 11.91	148°0.74 24.32	Kochab 137°20.85
12	188°1.72	349°55.44 \$06°39.60	322°12.71 \$17°52.13	22°26.44 N07°11.72	163°3.38 N07°24.25	Zuben'ubi 136°53.80
13	203°4.18	4°55.03 40.85	337°13.43 52.63	37°28.42 11.52	178°6.01 24.18	Alphecca 126°2.10
14	218°6.65 233°9.11	19°54.63 42.09 34°54.23 • 43.34	352°14.16 53.13 7°14.88 · · 53.63	52°30.39 11.32 67°32.37 · · 11.13	193°8.64 24.11 208°11.27 •• 24.04	Antares 112°13.25
15 16	233 9.11 248°11.58	34°54.23 · · 43.34 49°53.83 · · 44.58	7°14.88 · · 53.63 22°15.61 54.14	67°32.37 ·· 11.13 82°34.35 10.93	208°11.27 · · 24.04 223°13.91 23.97	Atria 107° 5.62
17	263° 14.04	64°53.42 45.82	37°16.34 54.64	97°36.33 10.73	238°16.54 23.90	Sabik 102°0.32
18	278° 16.50	79°53.02 S06°47.07	52°17.06 \$17°55.14	112°38.30 N07°10.53	253°19.17 N07°23.83	Shaula 96°7.42
19	293° 18.97	94°52.62 48.31	67°17.79 55.64	127°40.28 10.34	268°21.80 23.76	Rasalhague 95°56.55
20	$308^{\circ}21.43$	109°52.21 49.55	82°18.51 56.14	142°42.26 10.14	283°24.44 23.69	Eltanin 90°41.21 Kaus Aust. 83°29.56
21	323°23.90	124°51.81 · · 50.80	97°19.23 · · 56.64	157°44.24 · · 9.94	298°27.07 · · 23.62	Vega 80°31.69
22	338°26.36	139°51.40 52.04	112°19.96 57.14	172°46.21 9.75	313°29.70 23.56	Nunki 75°44.95
23	353°28.82	154°51.00 53.28	127°20.68 57.64	187°48.19 9.55	328°32.34 23.49	Altair 61°57.67
Mer.	pass. 23:26	ν-0.4' d1.2' m-3.89	ν0.7' d0.5' m1.36	ν2.0' d-0.2' m-1.72	ν2.6' d-0.1' m0.19	Peacock 53°1.96
						Deneb 49°24.02
	CILA	CIIA D	CUA D	CIIA	CIIA	Enif 33°36.36
Thu 0	GHA 8°31.29	GHA Dec 169°50.59 S 06°54.52	GHA Dec 142°21.40 \$17°58.14	GHA Dec 202°50.17 N07°9.35	GHA Dec 343°34.97 N07°23.42	Al Na'ir 27°29.77
1	0 31.29 23°33.75	184°50.19 55.76	157°22.13 58.64	202 50.17 No7 9.55 217°52.15 9.16	358° 37.60 23.35	Fomalhaut 15°11.74
2	38° 36.22	199°49.78 57.01	172°22.85 59.14	232°54.12 8.96	13° 40.24 23.28	Scheat 13°42.69
3	53°38.68	214°49.38 · · 58.25	187°23.57 17°59.64	247°56.10 · · 8.76	28° 42.87 · · 23.21	Markab 13°27.36
4	68°41.14	229°48.97 06°59.49	202°24.29 18°0.14	262°58.08 8.57	43°45.50 23.14	Sep 28 Tue SHA
5	83°43.61	244°48.56 07°0.73	217°25.02 0.64	278°0.06 8.37	58°48.14 23.07	Venus 163°36.76
6	98°46.07	259°48.16 S 07°1.97	232°25.74 \$18°1.14	293°2.04 N07°8.17	73°50.77 N07°23.00	Mars 135°13.33
7	113°48.54	274°47.75 3.21	247°26.46 1.64	308°4.01 7.97	88°53.40 22.93	Jupiter 194°42.29
8	128°51.00	289°47.34 4.45	262°27.18 2.14	323°5.99 7.78	103°56.04 22.86	Saturn 334°55.65
9	143°53.46	304°46.94 · · 5.69	277°27.90 · · 2.64	338°7.97 · · 7.58	118° 58.67 · · 22.79	Sep 29 Wed SHA
10	158° 55.93	319°46.53 6.93	292°28.62 3.14	353°9.95 7.38	134°1.31 22.72	Venus 162°28.10
11	173°58.39	334°46.12 8.17	307°29.34 3.63	8°11.93 7.19	149°3.94 22.65	Mars 134°31.81
12 13	189°0.86 204°3.32	349°45.71 S07°9.40 4°45.30 10.64	322°30.06 \$18°4.13 337°30.78 4.63	23°13.91 N07°6.99 38°15.89 6.79	164°6.57 N07°22.58 179°9.21 22.51	Jupiter 194°30.57
13 14	204 3.32 219°5.79	19°44.89 11.88	352°31.50 5.13	53°17.86 6.60	179 9.21 22.51 194°11.84 22.44	Saturn 334°59.64
15	234°8.25	34°44.49 · · 13.12	7°32.22 · · 5.62	68°19.84 · · 6.40	209°14.48 · · 22.37	Sep 30 Thu SHA
16	249° 10.71	49°44.08 14.36	22°32.93 6.12	83°21.82 6.21	224°17.11 22.30	Venus 161°19.30
17	264°13.18	64°43.67 15.59	37°33.65 6.62	98°23.80 6.01	239°19.75 22.23	Mars 133°50.12
18	279° 15.64	79°43.26 S 07°16.83	52°34.37	113°25.78 N07°5.81	254°22.38 N07°22.16	Jupiter 194°18.88
19	294°18.11	94°42.85 18.07	67°35.09 7.61	128°27.76 5.62	269°25.01 22.09	Saturn 335° 3.68
20	309°20.57	109° 42.44 19.31	82°35.80 8.10	143°29.74 5.42	284° 27.65 22.02	
21	324°23.03	124°42.03 · · 20.54	97°36.52 · · 8.60	158°31.72 · · 5.22	299°30.28 · · 21.95	Horizontal parallax
22	339°25.50	139°41.62 21.78	112°37.24 9.10	173°33.70 5.03	314°32.92 21.88	Venus: Mars:
23	354°27.96	154°41.21 23.01	127°37.95 9.59	188°35.68 4.83	329°35.55 21.81	Ividi5:
Mer.p	bass. 23:22	u-0.4 $'$ d 1.2 $'$ m-3.89	$ u 0.7' \ d0.5' \ m1.36$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.72$	$\nu 2.6' \ d\text{-}0.1' \ \text{m}0.19$	

Dec

29°14.83 -42°9.12

56°41.50

-17°49.85

 $\text{-}57^{\circ}5.52$

23°35.74 89°22.62

-40°11.32 4°12.07

49°57.50 16°33.94

 $\text{-8}^{\circ}10.00$

46°1.38 6°22.57

28°37.78 -1°10.93

7°24.80 -52°42.28

-16°45.06

-29°0.34

5°9.27 27°57.45

-59°35.62 -43°32.47 -69°49.63

-8°46.64

11°49.90

 $61^{\circ}35.96$

 $14^{\circ}25.05$

-17°41.71 -63°15.19 -57°16.12

55°48.58 -11°18.32

49°10.58 -60°30.49

 $-36^{\circ}30.40$

-60°57.11

 $19^{\circ}2.39$

74°2.60 -16°9.38

26°37.46 -26°29.60

-69°4.80

 $\text{-}37^{\circ}7.46$

 $12^{\circ}32.60$

51°29.42 -34°22.28

38°48.87

 $-26^{\circ}15.68$ $8^{\circ}56.73$

-56°38.80

45°23.09 10°0.38

-46°49.54 -29°28.36

28°14.26

15°21.52 Mer.pass

12:40

14:32

10:34

01:14 Mer.pass

12:40

14:31

10:30

01:10 Mer.pass

12:41

14:30

10:27

01:05

0.1

0.1

 $\text{-}15^{\circ}45.48$

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 16.75	S01°50.96	209°44.64	10.1'	N07°18.56	-16.2'	60.3
1	$197^{\circ}16.96$	51.93	224°13.74	10.1'	$07^{\circ}2.34$	-16.3'	60.3'
2	212° 17.17	52.90	238°42.88	10.2'	06°46.08	-16.3'	60.3'
3	227° 17.38	• • 53.88	253°12.05	10.2'	06°29.79	-16.3'	60.2
4 5	242° 17.59 257° 17.80	54.85 55.82	267°41.27 282°10.52	10.2' 10.3'	06°13.46 05°57.09	-16.4' -16.4'	60.2' 60.2'
6	272° 18.01	501°56.80	296°39.80	10.3	N05°40.69	-16.4	60.2
7	287° 18.22	57.77	311° 9.12	10.4	05°24.27	-16.5	60.2
8	302° 18.43	58.74	325°38.47	10.4'	05°7.81	-16.5'	60.2'
9	317° 18.64	$01^{\circ}59.72$	340°7.85	10.4'	04°51.33	-16.5'	60.2'
10	332° 18.85	02°0.69	354°37.26	10.4'	04°34.83	-16.5'	60.2'
11	347° 19.06 2° 19.27	1.66 \$02°2.63	9°6.71 23°36.18	10.5' 10.5'	04°18.30 N04°1.75	-16.5' -16.6'	60.2' 60.2'
12 13	2 19.27 17°19.48	3.61	23 30.18 38°5.68	10.5	03°45.19	-16.6'	60.2'
14	32° 19.69	4.58	52°35.20	10.6'	03°28.60	-16.6'	60.2
15	47° 19.90	• • 5.55	67° 4.76	10.6'	03°12.00	-16.6'	60.2
16	$62^{\circ}20.11$	6.53	81°34.33	10.6'	02°55.39	-16.6'	60.2'
17	77° 20.32	7.50	96°3.93	10.6'	02°38.76	-16.6'	60.2'
18	92°20.52	S02°8.47	110°33.55	10.6'	N02°22.12	-16.6'	60.2'
19	107°20.73 122°20.94	9.44	125°3.20 139°32.86	10.7' 10.7'	02°5.48 01°48.83	-16.7'	60.1'
20 21	122°20.94 137°21.15	10.42	139°32.86 154°2.54	10.7'	01°48.83 01°32.17	-16.7' -16.7'	60.1' 60.1'
22	152°21.36	12.36	168°32.25	10.7'	01°15.51	-16.7	60.1
23	167° 21.57	13.33	183° 1.96	10.7'	00°58.85	-16.7'	60.1
	SD = 16.0'	d = 1.0'		SI	D = 16.4'		
					==::		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°21.78 197°21.98	\$02°14.31 15.28	197°31.70 212°1.45	10.7' 10.8'	N00°42.19 00°25.54	-16.7' -16.7'	60.1' 60.1'
2	212° 22.19	16.25	226°31.21	10.8	N00°8.88	-16.6'	60.1
3	227° 22.40	17.22	241°0.99	10.8'	S00°7.77	16.6'	60.1
4	242°22.61	18.20	255°30.78	10.8'	00°24.41	16.6'	60.0'
5	257°22.82	19.17	270°0.58	10.8'	00°41.04	16.6'	60.0'
6	272°23.02 287°23.23	S02°20.14 21.11	284°30.39 299°0.21	10.8' 10.8'	\$00°57.66 01°14.26	16.6'	60.0'
7 8	302°23.44	22.09	299 0.21 313°30.03	10.8	01 14.26 01°30.86	16.6' 16.6'	60.0' 60.0'
9	317°23.65	23.06	327°59.86	10.8'	01°47.43	16.6	60.0'
10	332° 23.85	24.03	342°29.70	10.8'	02°3.99	16.5'	60.0'
11	347°24.06	25.00	356°59.54	10.8'	02°20.53	16.5'	59.9'
12	2°24.27	S02°25.98	11°29.39	10.8'	S02°37.05	16.5	59.9'
13 14	17°24.47 32°24.68	26.95 27.92	25°59.24 40°29.09	10.9' 10.9'	02°53.54 03°10.01	16.5' 16.4'	59.9' 59.9'
15	47° 24.89	• • 28.89	54° 58.94	10.9	03°26.45	16.4	59.9'
16	62°25.09	29.86	69°28.79	10.8'	03°42.87	16.4	59.9'
17	77°25.30	30.84	83°58.64	10.8'	03°59.25	16.4'	59.8'
18	92°25.51	S02°31.81	98°28.49	10.8'	S04°15.60	16.3'	59.8'
19	107°25.71	32.78	112°58.33 127°28.17	10.8'	04°31.92	16.3	59.8'
20 21	122°25.92 137°26.12	33.75 · · 34.72	127°28.17 141°58.01	10.8' 10.8'	04°48.21 05°4.46	16.2' 16.2'	59.8' 59.8'
22	152° 26.33	35.69	156°27.84	10.8	05°20.67	16.2	59.7'
23	167° 26.54	36.67	170°57.66	10.8'	05°36.84	16.1'	59.7'
	SD = 16.0'	d = 1.0'		SI	D = 16.4'		
Thu	GHA	Dec	GHA		Dec	d	HP
i nu O	182° 26.74	S02°37.64	БПА 185°27.47	u 10.8'	S05°52.97	a 16.1'	пР 59.7'
1	197° 26.95	38.61	199°57.27	10.8'	06° 9.05	16.0'	59.7'
2	212°27.15	39.58	214°27.07	10.8'	$06^{\circ}25.09$	16.0'	59.7'
3	227° 27.36	• • 40.55	228°56.85	10.8'	06°41.09	15.9'	59.6'
4	242°27.56	41.52	243°26.62 257°56.38	10.8'	06°57.03	15.9' 15.8'	59.6' 59.6'
5 6	257° 27.77 272° 27.97	42.49 S 02°43.47	257°56.38 272°26.12	10.7' 10.7'	07°12.93 \$07°28.77	15.8' 15.8'	59.6' 59.6'
7	287° 28.18	44.44	286°55.86	10.7'	07°44.57	15.7'	59.6'
8	302°28.38	45.41	301°25.57	10.7'	08° 0.30	15.7'	59.5'
9	317°28.59	• • 46.38	315°55.27	10.7'	08°15.99	15.6'	59.5'
10	332°28.79	47.35	330°24.95	10.7'	08°31.61	15.6'	59.5'
11	347°29.00	48.32 S 02°49.29	344°54.62 359°24.27	10.6	08°47.18	15.5'	59.5'
12 13	2°29.20 17°29.41	502°49.29 50.26	359°24.27 13°53.89	10.6' 10.6'	\$09°2.68 09°18.12	15.4' 15.4'	59.4' 59.4'
14	32°29.61	51.23	28°23.50	10.6'	09°18.12	15.4	59.4'
15	47° 29.81	• • 52.21	42°53.09	10.6'	09°48.81	15.2'	59.4'
16	62°30.02	53.18	57°22.65	10.5'	10°4.06	15.2'	59.3'
17	77°30.22	54.15	71°52.20	10.5	10°19.24	15.1'	59.3'
18 19	92°30.42 107°30.63	\$02°55.12 56.09	86°21.72 100°51.21	10.5' 10.5'	\$10°34.35 10°49.39	15.0' 15.0'	59.3' 59.2'
19 20	107° 30.63 122° 30.83	56.09 57.06	100°51.21 115°20.69	10.5'	10°49.39 11°4.35	15.0° 14.9'	59.2'
21	137° 31.03	• • 58.03	129°50.13	10.4	11°19.24	14.8	59.2'
22	152° 31.24	02°59.00	144°19.55	10.4	11°34.06	14.7'	59.2'
23	167°31.44	02°59.97	158°48.95	10.4'	11°48.79	14.7'	59.1'
	SD = 16.0'	d = 1.0'		SI	D = 16.3'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%	
28	09:07	09:17	11:51	10:22	22:47		
29	09:27	09:37	11:50	11:12	23:37		
30	09:47	09:57	11:50	12:02	-:-		

October 01, 02, 03 UT (Fri., Sat., Sun.)

h	Aries	Venus	,	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	9°30.43		°24.25	142°38.67	S18°10.09	203°37.65	N07°4.63	344°38.19	N07°21.74			
1	24°32.89	184°40.38	25.48	157°39.39	10.58	218°39.63	4.44	359°40.82	21.67	Alpheratz	357°32.08	29°14.84
2	39°35.35	199°39.97	26.72	172°40.10	11.07	233°41.61	4.24	14°43.46	21.60	Ankaa	353°4.55	-42°9.14
3	54°37.82	214°39.56 · ·	27.95	187°40.82	• • 11.57	248°43.59	• • 4.04	29°46.09	• • 21.53	Schedar Diphda	349°27.86 348°44.74	56°41.52 -17°49.85
4	69°40.28	229°39.15	29.19	202°41.53	12.06	263°45.57	3.85	44°48.73	21.46	Achernar	335°18.00	-57° 5.54
5	84° 42.75	244°38.74	30.42	217°42.25	12.56	278°47.55	3.65	59°51.36	21.39	Hamal	327°48.34	23°35.74
6	99° 45.21		°31.66	232°42.96	\$18°13.05	293°49.53	N07°3.46	74°54.00	N07°21.32	Polaris	312°27.75	89°22.63
7	114° 47.67	274°37.91	32.89	247°43.67	13.54	308°51.51	3.26	89°56.64	21.25	Acamar	315° 9.75	-40°11.33
8	129° 50.14 144° 52.60	289°37.50 304°37.08	34.12 35.36	262°44.39 277°45.10	14.04 •• 14.53	323°53.49 338°55.47	3.06 •• 2.87	104°59.27 120°1.91	21.18 •• 21.11	Menkar	314°3.55	4°12.07
10	159° 55.07	319° 36.67	36.59	292°45.81	15.02	353° 57.45	2.67	135°4.54	21.11	Mirfak	308°24.65	49°57.51
11	174° 57.53	334°36.26	37.82	307°46.53	15.52	8°59.43	2.48	150°7.18	20.97	Aldebaran	290°36.88	16°33.94
12	189° 59.99		°39.05	322°47.24	\$18°16.01	24°1.41	N07°2.28	165°9.81	N07°20.90	Rigel	281°1.61	-8°10.01
13	205°2.46	4°35.43	40.29	337°47.95	16.50	39°3.39	2.08	180°12.45	20.83	Capella	280°18.42	46°1.38
14	220°4.92	19°35.01	41.52	352°48.66	16.99	54°5.37	1.89	195°15.09	20.76	Bellatrix Elnath	278°20.38 277°58.93	6°22.57 28°37.78
15	235°7.39		42.75	7°49.37	• • 17.48	69°7.35	•• 1.69	210° 17.72	• • 20.69	Alnilam	277 36.93 275°35.38	-1°10.93
16	250°9.85	49°34.18	43.98	22°50.08	17.97	84°9.33	1.49	225°20.36	20.61	Betelgeuse	270°49.61	7°24.79
17	265° 12.31	64°33.77	45.21	37°50.79	18.47	99°11.31	1.30	240°23.00	20.54	Canopus	263°51.37	-52°42.28
18	280° 14.78		°46.44	52°51.50	\$18°18.96	114°13.29	N07°1.10	255°25.63	N07°20.47	Sirius	258°24.27	$-16^{\circ}45.07$
19 20	295° 17.24 310° 19.71	94°32.93 109°32.52	47.67 48.90	67°52.21 82°52.92	19.45 19.94	129°15.28 144°17.26	0.91 0.71	270°28.27 285°30.90	20.40 20.33	Adhara	255°4.14	-29°0.34
21	325°22.17	109 32.52 124°32.10 · ·		97°53.63	. 20.43	159°19.24	0.71	300°33.54	20.26	Procyon	244°48.58	5°9.27
22	340° 24.63	139°31.68	51.36	112°54.34	20.43	174°21.22	0.32	315°36.18	20.20	Pollux	243°14.69	27°57.44
23	355° 27.10	154°31.27	52.59	127°55.05	21.41	189°23.20	0.12	330°38.81	20.12	Avior	234°14.08	-59°35.62
_							_			Suhail	222°44.92	-43°32.46
Mer.	pass. 23:18	ν-0.4' d1.2' m	1-3.89	ν 0.7' d0	.5′ m1.36	ν 2.0′ d-0.	.2′ m-1.72	ν 2.6′ d -0	0.1′ m0.18	Miaplacidus	221°38.34	-69°49.62
										Alphard Regulus	217°45.78 207°32.33	-8°46.64 11°49.90
Sat	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.95	61°35.94
0	10°29.56		°53.82	142°55.76	\$18°21.90	204°25.18	N06°59.93	345°41.45	N07°20.05	Denebola	182°23.00	14°25.05
1	25° 32.03	184°30.43	55.05	157°56.47	22.39	219°27.16	59.73	0°44.09	19.98	Gienah	175°41.61	-17°41.70
2	40° 34.49 55° 36.96	199°30.01 214°29.59	56.28 57.50	172°57.18 187°57.88	22.88 •• 23.36	234°29.14 249°31.12	59.54 •• 59.34	15°46.72 30°49.36	19.91 •• 19.84	Acrux	172°58.24	-63°15.17
4	70° 39.42		°58.73	202°58.59	23.85	264°33.10	59.14	45°52.00	19.77	Gacrux	171°49.69	-57°16.11
5	85°41.88		°59.96	217°59.30	24.34	279°35.09	58.95	60°54.64	19.70	Alioth	166°11.61	55°48.56
6	100° 44.35		8°1.19	233° 0.01	S18°24.83	294°37.07	N06°58.75	75° 57.27	N07°19.63	Spica Alkaid	158°20.25 152°50.73	-11°18.32 49°10.57
7	$115^{\circ}46.81$	274° 27.92	2.41	248° 0.71	25.32	309°39.05	58.56	$90^{\circ}59.91$	19.56	Hadar	148°33.37	-60°30.48
8	130°49.28	289° 27.50	3.64	263°1.42	25.81	324°41.03	58.36	106°2.55	19.49	Menkent	147°55.32	-36°30.40
9	145°51.74		• 4.87	278° 2.12	• • 26.29	339°43.01	• • 58.17	121°5.18	• • 19.42	Arcturus	145°46.18	19°2.38
10	160°54.20	319°26.66	6.09	293°2.83	26.78	354°44.99	57.97	136°7.82	19.34	Rigil Kent.	139°37.74	-60°57.10
11 12	175° 56.67 190° 59.13	334°26.24 349°25.82 S 0	7.32 8°8.54	308° 3.53 323° 4.24	27.27 \$18°27.75	9°46.97 24°48.96	57.77 N06°57.58	151° 10.46 166° 13.10	19.27 N07°19.20	Kochab	137°20.89	$74^{\circ}2.59$
13	206°1.60	4° 25.40	9.77	338° 4.24	28.24	39°50.94	57.38	181°15.73	19.13	Zuben'ubi	136°53.81	-16°9.38
14	221°4.06	19°24.97	10.99	353° 5.65	28.73	54°52.92	57.19	196° 18.37	19.06	Alphecca	126°2.11	26°37.45
15	236°6.52		12.22	8° 6.35	29.21	69°54.90	• • 56.99	211°21.01	• • 18.99	Antares Atria	112°13.27 107°5.66	-26°29.59 -69°4.80
16	251°8.99	49°24.13	13.44	23°7.06	29.70	84°56.88	56.80	226°23.65	18.92	Sabik	107 5.00 102° 0.34	-15°45.48
17	266° 11.45	64°23.71	14.66	38°7.76	30.18	99°58.87	56.60	241°26.29	18.85	Shaula	96°7.44	-37°7.46
18	281°13.92		°15.89	53°8.46	\$18°30.67	115°0.85	N06° 56.41	256°28.92	N07°18.78	Rasalhague	95°56.56	12°32.60
19	296° 16.38 311° 18.84	94°22.86	17.11	68° 9.17	31.15	130°2.83 145°4.81	56.21	271°31.56	18.71	Eltanin	90°41.23	51°29.42
20 21	311 18.84 326°21.31	109°22.44 124°22.02	18.33 19.56	83° 9.87 98° 10.57	31.64 •• 32.12	145 4.81 160°6.80	56.02 •• 55.82	286°34.20 301°36.84	18.64 •• 18.57	Kaus Aust.	83°29.58	-34°22.28
22	341°23.77	139°21.59	20.78	113°11.27	32.12	175°8.78	55.62	316°39.48	18.49	Vega	80°31.71	38°48.87
23	356° 26.24	154°21.17	22.00	128°11.97	33.09	190°10.76	55.43	331° 42.11	18.42	Nunki	75°44.97	-26°15.68
										Altair	61°57.68	8°56.74
Mer.	pass. 23:14	ν -0.4' d 1.2' m	1-3.89	$\nu 0.7' d0$.5′ m1.36	$\nu 2.0' d-0$.2′ m-1.72	$\nu^{2.6'} d^{-0}$	0.1′ m0.18	Peacock Deneb	53°1.99 49°24.04	-56°38.80 45°23.10
										Enif	33°36.37	10°0.39
Sun	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.78	-46°49.55
0	11°28.70	169°20.74 S 08			S 18°33.58	205°12.74	N06°55.23	346°44.75	N07°18.35	Fomalhaut	15°11.75	-29°28.37
1	26°31.17	184°20.32	24.44	158°13.38	34.06	220°14.73	55.04	1°47.39	18.28	Scheat	13°42.69	$28^{\circ}14.26$
2	41°33.63	199° 19.89	25.66	173°14.08	34.54	235°16.71	54.84	16°50.03	18.21	Markab	13°27.36	$15^{\circ}21.52$
3	56°36.09		26.88	188°14.78	35.03	250°18.69	• • 54.65	31°52.67	18.14	Oct 01 E-1	SHA	Mer.pass
4 5	71°38.56 86°41.02	229°19.04 244°18.62	28.10	203°15.48 218°16.18	35.51 35.00	265°20.68 280°22.66	54.45 54.26	46°55.31 61°57.95	18.07	Oct 01 Fri Venus	SHA 160°10.37	Mer.pass 12:42
5 6	101°43.49	244 18.62 259° 18.19 S 08	29.32 ° 30.54	218°16.18 233°16.88	35.99 \$18°36.47	280°22.66 295°24.64	54.26 N06° 54.06	77°0.58	18.00 N07°17.93	Mars	133°8.24	14:29
7	116° 45.49	274°17.77	31.76	248° 17.58	36.96	310°26.63	53.87	92°3.22	17.86	Jupiter	194°7.23	10:24
8	131°48.41	289°17.34	32.98	263°18.28	37.44	325°28.61	53.67	107°5.86	17.78	Saturn	335°7.76	01:01
9	$146^{\circ}50.88$		34.20	278°18.97	• • 37.92	340°30.59	• • 53.48	122°8.50	• • 17.71	0 . 00 6 .	CILA	
10	161°53.34	319°16.48	35.42	293°19.67	38.40	355°32.58	53.28	$137^{\circ}11.14$	17.64	Oct 02 Sat Venus	SHA 159°1.29	Mer.pass 12:42
11	176°55.81	334°16.06	36.64	308°20.37	38.88	10°34.56	53.09	152°13.78	17.57		132°26.20	14:28
12	191°58.27		°37.85	323°21.07	\$18°39.36	25°36.54	N06° 52.89	167°16.42	N07°17.50		193°55.62	10:21
13 14	207°0.73 222°3.20	4°15.20 19°14.77	39.07 40.29	338°21.76 353°22.46	39.85 40.33	40°38.53 55°40.51	52.70 52.50	182°19.06 197°21.70	17.43 17.36	Saturn	335°11.89	00:57
15	237°5.66		41.51	8°23.16	40.81	70°42.49	• • 52.31	212°24.34	17.29	Oct 03 Sun	SHA	Mer.pass
16	252°8.13	49° 13.91	42.72	23°23.86	41.29	85°44.48	52.11	227°26.98	17.22		157°52.04	12:43
17	267° 10.59	64°13.49	43.94	38°24.55	41.77	100°46.46	51.92	242°29.61	17.14		131°43.97	14:26
18	282° 13.06		°45.15	53°25.25	S 18°42.25	115°48.45	$N06^{\circ}51.72$	257° 32.25	N07°17.07		193°44.04	10:18
19	297° 15.52	94°12.63	46.37	68°25.94	42.73	130°50.43	51.53	272°34.89	17.00	Saturn	335°16.05	00:53
20	312°17.98	109°12.20	47.58	83°26.64	43.20	145°52.41	51.33	287°37.53	16.93	Horizon	ntal parallax	
21 22	327° 20.45 342° 22.91	124°11.76 · · · 139°11.33	48.80 50.01	98°27.33 113°28.03	· · 43.68 44.16	160°54.40 175°56.38	•• 51.14 50.94	302°40.17 317°42.81	· · 16.86 16.79	11011201	Venus:	0.1
23	357° 25.38	154° 10.90	51.23	113 28.03 128°28.72	44.10	175 50.38 190°58.37	50.94	332° 45.45	16.79		Mars:	0.1
	pass. 23:10	ν-0.4' d1.2' m			.5′ m1.36		.2′ m-1.72		0.1′ m0.17			
IVICI.	pass. 25.10	ν σ. τ σ1.2 Π	. 5.09	- VO.1 UU	.5 111.30	ν Δ.Ο U-U	1.14	ν Δ.Ο U-0				

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°31.64 197°31.85	\$03°0.94 1.91	173°18.32 187°47.66	10.3' 10.3'	\$12°3.45 12°18.03	14.6' 14.5'	59.1' 59.1'
2	212° 32.05	2.88	202°16.97	10.3'	12° 32.53	14.5 14.4'	59.1'
3	227° 32.25	• • 3.85	216°46.26	10.3'	12°46.94	14.3'	59.0'
4 5	242°32.45 257°32.66	4.82 5.79	231°15.51 245°44.74	10.2' 10.2'	13°1.27 13°15.52	14.2' 14.2'	59.0' 59.0'
6	272° 32.86	5.79 \$03°6.76	260°13.93	10.2'	\$13°29.68	14.1	58.9'
7	287°33.06	7.73	274°43.10	10.1'	13°43.75	14.0'	58.9'
8 9	302°33.26 317°33.46	8.70 •• 9.67	289°12.23 303°41.33	10.1' 10.1'	13°57.73 14°11.62	13.9' 13.8'	58.9' 58.8'
10	332°33.67	10.64	318°10.40	10.1	14°25.41	13.7'	58.8'
11	347° 33.87	11.61	332°39.44	10.0'	14°39.11	13.6'	58.8'
12 13	2°34.07 17°34.27	S03°12.58 13.55	347°8.44 1°37.41	10.0' 9.9'	\$14°52.72 15°6.23	13.5' 13.4'	58.7' 58.7'
14	32°34.47	14.52	16° 6.35	9.9'	15°19.65	13.3'	58.7'
15	47°34.67	• • 15.49	30°35.26	9.9'	15°32.96	13.2'	58.7'
16 17	62°34.87 77°35.07	16.46 17.43	45°4.13 59°32.96	9.8' 9.8'	15°46.18 15°59.29	13.1' 13.0'	58.6' 58.6'
18	92°35.27	S03°18.40	74° 1.76	9.8'	\$16°12.30	12.9'	58.6'
19	107° 35.48	19.37	88°30.53	9.7'	16°25.21	12.8'	58.5
20 21	122°35.68 137°35.88	20.34	102°59.26 117°27.95	9.7' 9.7'	16°38.01 16°50.71	12.7' 12.6'	58.5' 58.5'
22	152° 36.08	22.27	131°56.61	9.6'	17°3.30	12.5'	58.4'
23	167°36.28	23.24	146°25.23	9.6'	17°15.78	12.4'	58.4'
	SD = 16.0'	d = 1.0'		SE	0 = 16.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	182° 36.48	S03°24.21	160°53.82	9.6'	S 17°28.15	12.3'	58.4'
1 2	197°36.68 212°36.88	25.18 26.15	175°22.37 189°50.89	9.5' 9.5'	17°40.41 17°52.56	12.1' 12.0'	58.3' 58.3'
3	212 30.00 227° 37.08	. 27.12	204°19.37	9.5 9.4'	17 52.50 18°4.59	11.9'	58.3'
4	242°37.27	28.09	218°47.81	9.4'	$18^{\circ}16.52$	11.8'	58.2'
5 6	257°37.47 272°37.67	29.06 \$03°30.02	233°16.22 247°44.59	9.4' 9.3'	18°28.32 \$18°40.01	11.7' 11.6'	58.2' 58.2'
7	287° 37.87	30.99	262°12.93	9.3'	18°51.58	11.5	58.1'
8	302° 38.07	31.96	276°41.23	9.3'	19°3.04	11.3'	58.1'
9 10	317°38.27 332°38.47	· · 32.93 33.90	291°9.49 305°37.72	9.2' 9.2'	19°14.37 19°25.59	11.2' 11.1'	58.1' 58.0'
11	347°38.67	33.90 34.87	320° 5.91	9.2' 9.2'	19 25.59 19°36.68	11.1	58.0'
12	2°38.87	S03°35.83	334°34.07	9.1'	S 19°47.65	10.8'	58.0'
13 14	17°39.06 32°39.26	36.80 37.77	349°2.19 3°30.27	9.1' 9.1'	19°58.50 20°9.22	10.7' 10.6'	57.9' 57.9'
15	47° 39.46	• • 38.74	17°58.33	9.0'	20°19.82	10.5	57.8'
16	62°39.66	39.70	32°26.34	9.0'	20°30.29	10.3'	57.8'
17 18	77°39.86 92°40.05	40.67 \$03°41.64	46°54.33 61°22.28	8.9' 8.9'	20°40.63 \$20°50.85	10.2' 10.1'	57.8' 57.7'
19	107°40.25	42.61	75°50.19	8.9'	21°0.94	10.0'	57.7'
20	122° 40.45	43.58	90°18.07	8.8' 8.8'	21°10.90		57.7'
21 22	137° 40.64 152° 40.84	•• 44.54 45.51	104°45.92 119°13.74	8.8'	21°20.73 21°30.42	9.7' 9.6'	57.6' 57.6'
23	167°41.04	46.48	133°41.53	8.8'	21°39.99	9.4'	57.6'
	SD = 16.0'	d = 1.0'		SE	0 = 15.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	182°41.24	S03°47.44	148° 9.28	8.7'	S21°49.42	9.3'	57.5'
1 2	197°41.43 212°41.63	48.41 49.38	162°37.01 177°4.70	8.7' 8.7'	21°58.72 22°7.89	9.2' 9.0'	57.5' 57.5'
3	212°41.63 227°41.83	49.38 •• 50.35	177° 4.70 191° 32.36	8. <i>1</i> ′ 8.6′	22° 7.89 22° 16.92	9.0° 8.9°	57.5° 57.4'
4	242°42.02	51.31	206° 0.00	8.6'	22°25.81	8.8'	57.4'
5 6	257° 42.22 272° 42.41	52.28 \$03°53.25	220°27.60 234°55.18	8.6' 8.6'	22°34.57 \$22°43.19	8.6' 8.5'	57.4' 57.3'
7	287° 42.41	54.21	249°22.73	8.5'	22°51.67	8.3'	57.3'
8	302°42.81	55.18	263°50.25	8.5'	23°0.02	8.2'	57.3'
9 10	317°43.00 332°43.20	· · 56.15 57.11	278°17.75 292°45.22	8.5' 8.4'	23°8.22 23°16.29	8.1' 7.9'	57.2' 57.2'
11	347°43.39	58.08	307°12.67	8.4'	23°24.22	7.8'	57.1'
12	2°43.59	\$03°59.04	321°40.09	8.4'	\$23°32.00	7.6'	57.1
13 14	17°43.78 32°43.98	04°0.01 0.98	336°7.49 350°34.87	8.4' 8.4'	23°39.65 23°47.15	7.5' 7.4'	57.1' 57.0'
15	47°44.17	• • 1.94	5°2.23	8.3'	23°54.51	7.2'	57.0'
16	62°44.37	2.91	19°29.57	8.3'	24°1.73	7.1'	57.0'
17 18	77° 44.56 92° 44.75	3.87 S 04°4.84	33°56.88 48°24.18	8.3' 8.3'	24°8.80 \$24°15.74	6.9' 6.8'	56.9' 56.9'
19	107° 44.95	5.81	62°51.46	8.3'	24°22.52	6.6'	56.9'
20	122° 45.14	6.77	77°18.73	8.2'	24°29.17	6.5'	56.8'
21 22	137° 45.34 152° 45.53	· · 7.74 8.70	91°45.97 106°13.21	8.2' 8.2'	24°35.66 24°42.02	6.4' 6.2'	56.8' 56.8'
23	167° 45.72	9.67	120°40.42	8.2'	24°48.23	6.1	56.7'
	SD = 16.0'	d = 1.0'		SE	0 = 15.7'		
				_	_		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Luy	00 ^h	12 ^h	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-11%
01	10:07	10:16	11:50	12:53	00:28	
02	10:26	10:35	11:49	13:45	01:19	
03	10:45	10:54	11:49	14:39	02:12	

October 04, 05, 06 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	12°27.84	169°10.47 \$08°52.44	143°29.42 \$18°45.12	206°0.35 N06°50.55	347°48.09 N07°16.65	
1	27°30.30	184°10.04 53.65	158°30.11 45.60	221°2.34 50.36	2°50.73 16.57	Alpheratz 357°32.08 29°14.85
2	42°32.77	199° 9.61 54.87	173°30.80 46.07	236°4.32 50.16	17°53.37 16.50	Ankaa 353°4.54 -42°9.15
3	57°35.23	214°9.17 · · 56.08	188°31.50 · · 46.55	251°6.30 · · 49.97	32°56.01 · · 16.43	Schedar 349°27.85 56°41.53
4	72°37.70	229°8.74 57.29	203°32.19 47.03	266°8.29 49.78	47°58.65 16.36	Diphda 348°44.73 -17°49.86
5	87°40.16	244°8.31 58.50	218°32.88 47.51	281°10.27 49.58	63°1.29 16.29	Achernar 335°17.99 -57°5.55 Hamal 327°48.32 23°35.75
6	102°42.63	259°7.88 S 08°59.72	233°33.57 S 18°47.98	296°12.26 N06°49.39	78°3.93 N07°16.22	Polaris 312° 26.36 89° 22.65
7	117° 45.09	274°7.44 09°0.93	248°34.27 48.46	311°14.24 49.19	93°6.57 16.15	Acamar 315°9.74 -40°11.34
8	132°47.55	289°7.01 2.14	263°34.96 48.94	326°16.23 49.00	108°9.21 16.08	Menkar 314°3.53 4°12.07
9	147° 50.02	304°6.57 · · 3.35	278°35.65 · · 49.41	341°18.21 · · 48.80	123°11.85 · · 16.00	Mirfak 308°24.62 49°57.52
10 11	162° 52.48 177° 54.95	319°6.14 4.56 334°5.70 5.77	293°36.34 49.89 308°37.03 50.36	356°20.20 48.61 11°22.18 48.41	138°14.49 15.93 153°17.13 15.86	Aldebaran 290°36.86 16°33.94
12	192°57.41	349°5.27 S09°6.98	323°37.72 \$18°50.84	26°24.17 N06°48.22	168°19.78 N07°15.79	Rigel 281°1.58 -8°10.01
13	207°59.87	4°4.83 8.19	338°38.41 51.31	41°26.16 48.03	183°22.42 15.72	Capella 280°18.39 46°1.38
14	223°2.34	19°4.40 9.40	353°39.10 51.79	56°28.14 47.83	198°25.06 15.65	Bellatrix 278°20.36 6°22.56
15	238°4.80	34°3.96 · · 10.60	8°39.79 · · 52.26	71°30.13 · · 47.64	213°27.70 · · 15.58	Elnath 277°58.90 28°37.78
16	253°7.27	49°3.53 11.81	23°40.48 52.74	86°32.11 47.44	228°30.34 15.50	Alnilam 275°35.35 -1°10.94
17	$268^{\circ}9.73$	64°3.09 13.02	38°41.17 53.21	101°34.10 47.25	243°32.98 15.43	Betelgeuse 270°49.58 7°24.79 Canopus 263°51.33 -52°42.29
18	283°12.20	79°2.65 S 09°14.23	53°41.86 S 18°53.69	116°36.08 N06°47.05	258°35.62 N07°15.36	Sirius 258°24.25 -16°45.07
19	298° 14.66	94°2.21 15.44	68° 42.55 54.16	131°38.07 46.86	273° 38.26 15.29	Adhara 255°4.11 -29°0.35
20	313°17.12	109°1.78 16.64	83°43.23 54.63	146°40.06 46.67	288° 40.90 15.22	Procyon 244°48.56 5°9.26
21	328° 19.59	124°1.34 · · 17.85	98°43.92 · · 55.11	161°42.04 · · 46.47	303°43.54 · · 15.15	Pollux 243°14.67 27°57.43
22 23	343°22.05 358°24.52	139°0.90 19.05 154°0.46 20.26	113°44.61 55.58 128°45.30 56.05	176°44.03 46.28 191°46.01 46.08	318°46.18 15.07 333°48.83 15.00	Avior 234°14.04 -59°35.62
23	330 24.32					Suhail 222°44.89 -43°32.46
Mer.	pass. 23:06	ν -0.4 $'$ $d1.2'$ m-3.89	$ u 0.7' \ d0.5' \ m1.36$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.73$	$ u 2.6' \ d$ -0.1' m0.17	Miaplacidus 221°38.29 -69°49.61
						Alphard 217°45.76 -8°46.65
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.31 11°49.89 Dubhe 193°38.93 61°35.92
0	$13^{\circ}26.98$	169°0.02 S 09°21.47	143°45.98 \$18°56.52	206°48.00 N06°45.89	348°51.47 N07°14.93	Denebola 182°22.99 14°25.04
1	28°29.44	183°59.58 22.67	158°46.67 57.00	221°49.99 45.70	3°54.11 14.86	Gienah 175°41.60 -17°41.70
2	43°31.91	198°59.14 23.87	173°47.35 57.47	236°51.97 45.50	18° 56.75 14.79	Acrux 172°58.22 -63°15.16
3	58°34.37	213°58.70 · · 25.08	188° 48.04 · · 57.94	251°53.96 · · 45.31	33°59.39 · · 14.72	Gacrux 171°49.67 -57°16.10
4 5	73°36.84 88°39.30	228°58.26 26.28 243°57.82 27.49	203°48.73 58.41 218°49.41 58.88	266°55.95 45.11 281°57.93 44.92	49°2.03 14.64 64°4.67 14.57	Alioth 166°11.61 55°48.55
6	00 39.30 103°41.77	258°57.38 S09°28.69	233°50.10 \$18°59.35	296°59.92 N06°44.73	64°4.67 14.57 79°7.32 N07°14.50	Spica 158°20.25 -11°18.32
7	118° 44.23	273°56.94 29.89	248°50.78 18°59.82	312°1.91 44.53	94°9.96 14.43	Alkaid 152°50.74 49°10.55
8	133° 46.69	288°56.50 31.09	263°51.47 19°0.29	327°3.89 44.34	109° 12.60 14.36	Hadar 148°33.37 -60°30.47
9	148°49.16	303°56.06 · · 32.30	278°52.15 · · 0.76	342°5.88 · · 44.14	124° 15.24 · · 14.29	Menkent 147°55.32 -36°30.39 Arcturus 145°46.18 19°2.37
10	163°51.62	318°55.61 33.50	293°52.83 1.23	357°7.87 43.95	139° 17.88 14.21	Rigil Kent. 139°37.74 -60°57.09
11	178°54.09	333°55.17 34.70	308°53.52 1.70	12°9.85 43.76	154°20.52 14.14	Kochab 137°20.94 74°2.57
12	193° 56.55	348°54.73 S09°35.90	323°54.20 \$19°2.17	27°11.84 N06°43.56	169°23.17 N07°14.07	Zuben'ubi 136°53.81 -16°9.38
13	208°59.01	3°54.29 37.10	338°54.88 2.64	42°13.83 43.37	184°25.81 14.00	Alphecca 126°2.12 26°37.45
14 15	224°1.48 239°3.94	18°53.84 38.30 33°53.40 · · 39.50	353°55.57 3.11 8°56.25 · · 3.58	57°15.82 43.17 72°17.80 · · 42.98	199°28.45 13.93 214°31.09 · · 13.86	Antares 112°13.28 -26°29.59
16	254°6.41	33°53.40 · · 39.50 48°52.95 40.70	8°56.25 · · 3.58 23°56.93 4.05	72°17.80 · · 42.98 87°19.79 42.79	229°33.73 13.78	Atria 107°5.69 -69°4.79
17	269°8.87	63°52.51 41.90	38°57.61 4.52	102°21.78 42.59	244°36.38 13.71	Sabik 102°0.35 -15°45.48
18	284°11.33	78°52.06 \$09°43.10	53°58.29 S 19°4.98	117°23.77 N06°42.40	259°39.02 N07°13.64	Shaula 96°7.45 -37°7.45 Rasalhague 95°56.58 12°32.60
19	299° 13.80	93°51.62 44.30	68°58.97 5.45	132°25.75 42.21	274° 41.66 13.57	Eltanin 90°41.26 51°29.42
20	$314^{\circ}16.26$	108°51.17 45.49	83°59.65 5.92	147°27.74 42.01	289°44.30 13.50	Kaus Aust. 83°29.59 -34°22.28
21	329° 18.73	123°50.73 · · 46.69	99°0.33 · · 6.39	162°29.73 · · 41.82	304°46.95 · · 13.43	Vega 80°31.73 38°48.87
22	344°21.19	138°50.28 47.89	114° 1.01 6.85	177°31.72 41.63	319° 49.59 13.35	Nunki 75°44.98 -26°15.68
23	359°23.66	153°49.83 49.08	129°1.69 7.32	192°33.71 41.43	334°52.23 13.28	Altair 61°57.69 8°56.74
Mer.	pass. 23:02	ν -0.4 $'$ d1.2 $'$ m-3.88	$ u 0.7' \ d0.5' \ m1.36$	$\nu 2.0' \ d$ -0.2' m-1.73	$ u 2.6' \ d$ -0.1' m0.17	Peacock 53°2.01 -56°38.81
						Deneb 49°24.05 45°23.11
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.37 10°0.39
0	14°26.12	168°49.39 \$09°50.28	144°2.37 \$19°7.79	207°35.69 N06°41.24	349°54.87 N07°13.21	Al Na'ir 27°29.79 -46°49.55
1	29°28.58	183°48.94 51.48	159°3.05 8.25	222°37.68 41.05	4°57.52 13.14	Fomalhaut 15°11.75 -29°28.38 Scheat 13°42.69 28°14.27
2	44°31.05	198°48.49 52.67	174°3.73 8.72	237°39.67 40.85	20°0.16 13.07	Markab 13°27.36 15°21.53
3	59°33.51	213°48.04 · · 53.87	189°4.41 · · 9.18	252°41.66 · · 40.66	35°2.80 · · 12.99	
4	74°35.98	228°47.60 55.06	204°5.09 9.65	267°43.65 40.47	50°5.44 12.92	Oct 04 Mon SHA Mer.pass
5	89°38.44	243°47.15 56.26	219°5.77 10.11	282°45.64 40.27	65°8.09 12.85	Venus 156° 42.63 12:44
6	104° 40.90	258°46.70 S09°57.45	234°6.45 \$19°10.58	297°47.62 N06°40.08	80°10.73 N07°12.78	Mars 131°1.58 14:25
7	119°43.37	273°46.25 58.64	249°7.12 11.04	312°49.61 39.89	95°13.37 12.71	Jupiter 193° 32.51 10:15 Saturn 335° 20.25 00:49
8 9	134° 45.83 149° 48.30	288°45.80 09°59.84 303°45.35 10°1.03	264°7.80 11.51 279°8.48 · · 11.97	327°51.60 39.69 342°53.59 · · 39.50	110°16.02 12.63 125°18.66 •• 12.56	Saturn 333 20.25 00:49
10	149 46.30 164° 50.76	318°44.90 2.22	279°8.48 · · 11.97 294°9.15 12.43	342°53.59 · · 39.50 357°55.58 39.31	140°21.30 12.49	Oct 05 Tue SHA Mer.pass
11	179°53.23	333°44.45 3.42	309° 9.83 12.90	12°57.57 39.11	155°23.95 12.42	Venus 155° 33.04 12:44
12	194° 55.69	348°44.00 \$10°4.61	324°10.51 S 19°13.36	27°59.56 N06°38.92	170°26.59 N07°12.35	Mars 130° 19.00 14:24
13	209°58.15	3°43.55 5.80	339°11.18 13.82	43°1.55 38.73	185°29.23 12.27	Jupiter 193°21.02 10:11 Saturn 335°24.49 00:44
14	225°0.62	18°43.09 6.99	354°11.86 14.29	58°3.54 38.53	200°31.88 12.20	
15	240°3.08	33°42.64 · · 8.18	9°12.53 · · 14.75	73°5.52 · · 38.34	215°34.52 · · 12.13	Oct 06 Wed SHA Mer.pass
16	255°5.55	48°42.19 9.37	24°13.21 15.21	88°7.51 38.15	230°37.16 12.06	Venus 154°23.27 12:45
17 18	270°8.01 285°10.47	63°41.74 10.56 78°41.28 \$10°11.75	39°13.88 15.67 54°14.55 \$19°16.14	103°9.50 37.96 118°11.49 N06°37.76	245°39.81 11.99 260°42.45 N07°11.91	Mars 129° 36.25 14:23 Jupiter 193° 9.57 10:08
19	300° 12.94	93°40.83 12.94	69°15.23 16.60	133°13.48 37.57	275° 45.09 11.84	Saturn 335° 28.75 00:40
20	315° 15.40	108°40.38 14.13	84°15.90 17.06	148°15.47 37.38	290° 47.74 11.77	
21	330° 17.87	123°39.92 · · 15.31	99°16.58 · · 17.52	163°17.46 · · 37.18	305°50.38 · · 11.70	Horizontal parallax
22	345°20.33	138°39.47 16.50	114°17.25 17.98	178°19.45 36.99	320°53.02 11.63	Venus: 0.1
23	0°22.80	153°39.01 17.69	129°17.92 18.44	193°21.44 36.80	335°55.67 11.55	Mars: 0.1
Mer.	pass. 22:58	ν-0.4' d1.2' m-3.88	$ u 0.7' \ d0.5' \ m1.36$	ν2.0′ d-0.2′ m-1.73	ν2.6' d-0.1' m0.16	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°45.92	S04°10.63	135°7.63	8.2'	\$24°54.29	5.9'	56.7'
1	197°46.11	11.60	$149^{\circ}34.82$	8.2'	$25^{\circ}0.20$	5.8'	56.7'
2	212°46.30	12.56	164°2.01	8.2'	25°5.97	5.6'	56.6'
3	227°46.50	• • 13.53	178°29.18	8.2'	25°11.60 25°17.07	5.5'	56.6'
4 5	242°46.69 257°46.88	14.49 15.46	192°56.34 207°23.50	8.2' 8.1'	25°17.07 25°22.40	5.3' 5.2'	56.6' 56.5'
6	272°47.08	504° 16.42	201° 23.50 221° 50.65	8.1'	S25°27.58	5.0'	56.5
7	287°47.27	17.39	236° 17.79	8.1'	25°32.62	4.9'	56.5
8	302°47.46	18.35	250°44.93	8.1'	25°37.51	4.7'	56.4
9	317°47.65	• • 19.31	$265^{\circ}12.06$	8.1'	25°42.24	4.6'	56.4'
10	332°47.85	20.28	279°39.20	8.1'	25°46.83	4.4'	56.4'
11	347°48.04	21.24	294°6.33 308°33.46	8.1'	25°51.28	4.3'	56.3'
12 13	2°48.23 17°48.42	S04°22.21 23.17	308° 33.46 323° 0.59	8.1' 8.1'	\$25°55.57 25°59.72	4.1' 4.0'	56.3' 56.3'
14	32°48.61	24.13	337° 27.73	8.1'	26°3.72	3.8'	56.2'
15	47°48.80	25.10	351°54.87	8.1'	26°7.57	3.7'	56.2'
16	62°48.99	26.06	$6^{\circ}22.01$	8.2'	$26^{\circ}11.27$	3.6'	56.2'
17	77°49.19	27.03	$20^{\circ}49.16$	8.2'	$26^{\circ}14.82$	3.4'	56.1'
18	92°49.38	S04°27.99	35° 16.32	8.2'	S26°18.23	3.3'	56.1'
19	107°49.57 122°49.76	28.95	49°43.49 64°10.66	8.2' 8.2'	26°21.48 26°24.59	3.1'	56.1'
20 21	122°49.76 137°49.95	29.92 •• 30.88	64° 10.66 78° 37.85	8.2'	26°24.59 26°27.55	3.0' 2.8'	56.0' 56.0'
22	157 49.95 152°50.14	31.84	93°5.05	8.2'	26°30.37	2.7'	56.0'
23	167°50.33	32.81	107°32.26	8.2'	26°33.03	2.5'	56.0'
	SD = 16.0'	d = 1.0'			0 = 15.5'		
	JD — 10.0	u — 1.0		عد	- 13.3		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°50.52 197°50.71	\$04°33.77 34.73	121°59.49 136°26.73	8.2' 8.3'	\$26°35.55 26°37.92	2.4' 2.2'	55.9' 55.9'
2	212°50.71	34.73 35.69	150° 53.99	8.3'	26° 40.14	2.2	55.9' 55.9'
3	227°51.09	• • 36.66	165°21.26	8.3'	26°42.22	1.9'	55.8'
4	242°51.28	37.62	179°48.56	8.3'	$26^{\circ}44.14$	1.8'	55.8'
5	257°51.47	38.58	194° 15.88	8.3'	26°45.93	1.6'	55.8'
6	272°51.66	S04° 39.54	208°43.22	8.4'	\$26°47.56	1.5'	55.7'
7 8	287°51.84 302°52.03	40.51 41.47	223°10.58 237°37.96	8.4' 8.4'	26°49.05 26°50.39	1.3' 1.2'	55.7' 55.7'
9	317°52.22	42.43	252°5.37	8.4	26°51.59	1.1'	55.7'
10	332°52.41	43.39	266°32.81	8.5'	26°52.64	0.9'	55.6'
11	347°52.60	44.35	281°0.28	8.5'	$26^{\circ}53.55$	0.8'	55.6'
12	2°52.79	S04°45.32	295°27.77	8.5'	S26°54.31	0.6'	55.6'
13	17°52.98 32°53.16	46.28 47.24	309°55.30 324°22.85	8.6' 8.6'	26°54.93 26°55.40	0.5' 0.3'	55.5' 55.5'
14 15	47°53.35	• 48.20	338° 50.44	8.6'	26°55.73	0.3	55.5'
16	62°53.54	49.16	353° 18.07	8.7'	26°55.92	0.0'	55.5'
17	77°53.73	50.12	$7^{\circ}45.72$	8.7'	$26^{\circ}55.96$	-0.1'	55.4'
18	92°53.91	S04°51.08	22°13.42	8.7'	S26°55.87	-0.2'	55.4'
19	107°54.10	52.04	36°41.15	8.8'	26°55.63	-0.4'	55.4'
20 21	122°54.29 137°54.47	53.01 •• 53.97	51°8.91 65°36.72	8.8' 8.8'	26°55.24 26°54.72	-0.5' -0.7'	55.4' 55.3'
22	157 54.47 152°54.66	54.93	80°4.57	8.9'	26°54.06	-0. <i>1</i> -0.8'	55.3'
23	167°54.85	55.89	94°32.46	8.9'	26°53.26	-0.9	55.3'
	SD = 16.0'	d = 1.0'		SD	0 = 15.3'		
Wed	GHA 182°55.03	Dec S 04° 56.85	GHA 109°0.39	u 9.0'	Dec \$26°52.32	d -1.1'	HP 55.3'
0 1	182°55.03 197°55.22	57.81	109°0.39 123°28.36	9.0'	26°51.24	-1.1 -1.2'	55.3' 55.2'
2	212°55.41	58.77	137°56.38	9.1'	26°50.02	-1.4'	55.2'
3	227°55.59	$04^{\circ}59.73$	$152^{\circ}24.44$	9.1'	26°48.66	-1.5'	55.2'
4	242°55.78	$05^{\circ}0.69$	166° 52.55	9.2'	26°47.17	-1.6'	55.2'
5	257°55.96	1.65	181°20.71 195°48.91	9.2'	26°45.54	-1.8'	55.1'
6 7	272°56.15 287°56.33	S05°2.61 3.57	195°48.91 210°17.17	9.3' 9.3'	\$26°43.77 26°41.87	-1.9' -2.0'	55.1' 55.1'
8	302°56.52	3.57 4.53	210 17.17 224°45.47	9.3 9.4'	26°39.83	-2.0 -2.2'	55.1'
9	317°56.70	• • 5.49	239° 13.83	9.4'	26°37.66	-2.3'	55.0'
10	332°56.89	6.45	253°42.23	9.5'	$26^{\circ}35.36$	-2.4'	55.0'
11	347°57.07	7.40	268° 10.69	9.5'	26°32.92	-2.6'	55.0'
12	2°57.26	S05°8.36	282°39.21	9.6'	\$26°30.35	-2.7'	55.0'
13 14	17°57.44 32°57.63	9.32 10.28	297°7.77 311°36.39	9.6' 9.7'	26°27.65 26°24.82	-2.8' -3.0'	54.9' 54.9'
15	47°57.81	• 11.24	326°5.07	9.7'	26°21.86	-3.0 -3.1'	54.9'
16	62°57.99	12.20	$340^{\circ}33.81$	9.8'	$26^{\circ}18.76$	-3.2'	54.9'
17	77°58.18	13.16	355°2.60	9.8'	26°15.54	-3.3'	54.9'
18	92°58.36	S05° 14.12	9°31.45	9.9'	\$26°12.19	-3.5'	54.8'
19 20	107°58.54 122°58.73	15.07 16.03	24°0.35 38°29.32	10.0' 10.0'	26° 8.72 26° 5.12	-3.6' -3.7'	54.8' 54.8'
21	122 58.73 137°58.91	16.03	58 29.32 52°58.35	10.0	26°1.39	-3.1 -3.9'	54.8'
22	152°59.09	17.95	67°27.44	10.1	25°57.53	-4.0'	54.8'
23	167°59.27	18.91	81°56.58	10.2'	25°53.55	-4.1'	54.7'
	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°	04:08	05:28	06:36	16:59	18:06	19:26
N 70°	04:17	05:30	06:30	17:05	18:05	19:17
68°	04:25	05:31	06:26	17:09	18:04	19:09
66°	04:31	05:31	06:22	17:13	18:04	19:03
64°	04:36	05:32	06:19	17:16	18:03	18:59
62°	04:41	05:32	06:17	17:19	18:03	18:54
60°	04:44	05:33	06:14	17:21	18:03	18:51
N 58°	04:47	05:33	06:12	17:24	18:03	18:48
56°	04:50	05:33	06:10	17:26	18:03	18:46
54°	04:52	05:33	06:09	17:27	18:03	18:43
52°	04:54	05:33	06:07	17:29	18:03	18:42
50°	04:56	05:33	06:06	17:30	18:03	18:40
45°	04:59	05:33	06:03	17:34	18:03	18:37
N 40°	05:01	05:33	06:00	17:36	18:03	18:35
35°	05:03	05:32	05:58	17:39	18:04	18:33
30°	05:04	05:32	05:55	17:41	18:05	18:33
20°	05:04	05:30	05:52	17:45	18:07	18:32
N 10°	05:03	05:27	05:48	17:48	18:09	18:34
0°	05:00	05:24	05:45	17:52	18:12	18:37
S 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°	04:42	05:10	05:34	18:04	18:28	18:56
35°	04:36	05:06	05:31	18:06	18:32	19:02
40°	04:29	05:01	05:29	18:09	18:36	19:09
45°	04:20	04:56	05:25	18:13	18:42	19:18
S 50°	04:09	04:48	05:21	18:17	18:50	19:29
52°	04:04	04:45	05:19	18:19	18:53	19:35
54°	03:57	04:41	05:17	18:21	18:57	19:41
56°	03:50	04:37	05:15	18:23	19:02	19:48
58°	03:42	04:32	05:12	18:26	19:06	19:57
S 60°	03:33	04:27	05:09	18:29	19:12	20:06

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-36%
04	11:04	11:13	11:49	15:34	03:06	
05	11:22	11:31	11:48	16:28	04:01	
06	11:40	11:49	11:48	17:21	04:54	

October 07, 08, 09 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA D	ec
0	15° 25.26	168°38.56 \$10°18.88	144°18.59 \$19°18.90	208°23.43 N06°36.61	350°58.31 N07°11.48		14.86
1	$30^{\circ}27.72$	183°38.10 20.06	159°19.27 19.36	223°25.42 36.41	6°0.96 11.41		14.80 9.16
2	45°30.19	198°37.65 21.25	174°19.94 19.82	238°27.41 36.22	21°3.60 11.34		41.55
3	60° 32.65	213°37.19 · · 22.43	189°20.61 · · 20.28	253°29.40 · · 36.03	36°6.24 · · 11.27	Diphda 348°44.72 -17°4	
4	75° 35.12	228°36.73 23.62	204°21.28 20.74	268°31.39 35.83 283°33.38 35.64	51°8.89 11.19		°5.56
5 6	90°37.58 105°40.04	243°36.28 24.80 258°35.82 \$10°25.99	219°21.95 21.20 234°22.62 \$19°21.66	283°33.38 35.64 298°35.37 N06°35.45	66°11.53 11.12 81°14.18 N07°11.05		35.76
7	120°42.51	273°35.36 27.17	249°23.29 22.12	313°37.36 35.26	96°16.82 10.98		22.66
8	135° 44.97	288°34.90 28.36	264°23.96 22.57	328°39.35 35.06	111° 19.46 10.90	Acamar 315°9.72 -40°	
9	$150^{\circ}47.44$	303°34.45 · · 29.54	279°24.63 · · 23.03	343°41.35 · · 34.87	126°22.11 · · 10.83	l .	12.07 57.53
10	$165^{\circ}49.90$	318°33.99 30.72	294°25.30 23.49	358°43.34 34.68	141°24.75 10.76		33.95
11	180°52.37	333°33.53 31.91	309°25.97 23.95	13°45.33 34.49	156°27.40 10.69		10.01
12	195° 54.83	348°33.07 \$10°33.09 3°32.61 34.27	324°26.64 \$19°24.40 339°27.31 24.86	28°47.32 N06°34.29 43°49.31 34.10	171°30.04 N07°10.62 186°32.69 10.54		°1.39
13 14	210° 57.29 225° 59.76	3°32.61 34.27 18°32.15 35.45	339°27.31 24.86 354°27.97 25.32	43°49.31 34.10 58°51.30 33.91	186°32.69 10.54 201°35.33 10.47		22.56
15	241°2.22	33°31.69 · · 36.63	9°28.64 · · 25.77	73°53.29 · · 33.72	216°37.97 · · 10.40		37.78
16	256°4.69	48°31.23 37.81	24°29.31 26.23	88°55.28 33.53	231°40.62 10.33		10.94 24.79
17	271°7.15	63°30.77 38.99	39°29.98 26.69	103°57.27 33.33	246°43.26 10.25	Betelgeuse 270°49.56 7°2 Canopus 263°51.30 -52°4	
18	286°9.61	78°30.30 \$10°40.17	54°30.64 \$19°27.14	118°59.27 N06°33.14	261°45.91 N07°10.18		45.07
19	301°12.08	93°29.84 41.35	69°31.31 27.60	134°1.26 32.95	276°48.55 10.11		°0.35
20 21	316° 14.54 331° 17.01	108°29.38 42.53 123°28.92 · · 43.71	84°31.98 28.05 99°32.64 •• 28.51	149°3.25 32.76 164°5.24 · · 32.56	291°51.20 10.04 306°53.84 · · 9.96	Procyon 244°48.53 5°	°9.26
22	346° 19.47	138°28.45 44.88	114°33.31 28.96	179°7.23 32.37	321°56.49 9.89		57.43
23	1°21.94	153°27.99 46.06	129°33.97 29.42	194°9.22 32.18	336°59.13 9.82	Avior 234°14.01 -59°3	
						Suhail 222°44.87 -43°3	
ivier.	pass. 22:55	ν-0.5′ d1.2′ m-3.88	$\nu 0.7' \ d0.5' \ m1.36$	ν2.0' d-0.2' m-1.73	$\nu 2.6' \ d$ -0.1' m0.16		49.61 46.65
							49.88
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		35.90
0	16°24.40	168°27.53 \$10°47.24	144°34.64 \$19°29.87	209°11.22 N06°31.99	352°1.78 N07°9.75		25.03
1 2	31°26.86 46°29.33	183°27.06 48.41 198°26.60 49.59	159°35.30 30.32 174°35.97 30.78	224°13.21 31.80 239°15.20 31.60	7°4.42 9.68 22°7.07 9.60	Gienah 175°41.59 -17°4	
3	40 29.33 61°31.79	213°26.13 · · 50.77	174°35.97 30.78 189°36.63 · · 31.23	239°15.20 31.60 254°17.19 · · 31.41	22°7.07 9.60 37°9.71 · · 9.53	Acrux 172°58.21 -63°	
4	76° 34.26	228°25.67 51.94	204°37.30 31.68	269°19.18 31.22	52°12.36 9.46	Gacrux 171°49.66 -57°1	
5	91°36.72	243°25.20 53.12	219°37.96 32.14	284°21.18 31.03	67°15.00 9.39		48.53 18.32
6	106°39.18	258°24.74 \$10°54.29	234°38.62 \$19°32.59	299°23.17 N06°30.84	82°17.65 N07°9.31		10.52
7	121°41.65	273°24.27 55.46	249°39.29 33.04	314°25.16 30.64	97°20.29 9.24	Hadar 148°33.36 -60°3	
8	136°44.11	288°23.80 56.64	264°39.95 33.49	329°27.15 30.45	112°22.94 9.17	Menkent 147°55.31 -36°3	
9	151°46.58	303°23.33 · · 57.81	279°40.61 · · 33.94	344°29.15 · · 30.26	127°25.58 · · 9.10	Arcturus 145°46.18 19°	°2.36
10 11	166° 49.04 181° 51.50	318°22.87 10°58.98 333°22.40 11°0.15	294°41.27 34.40 309°41.94 34.85	359°31.14 30.07 14°33.13 29.88	142°28.23 9.02 157°30.87 8.95	Rigil Kent. 139°37.75 -60°!	
12	196° 53.97	348°21.93 \$11°1.33	324°42.60 \$19°35.30	29°35.13 N06°29.69	172°33.52 N07°8.88		2.55
13	211°56.43	3°21.46 2.50	339°43.26 35.75	44°37.12 29.49	187°36.17 8.81		°9.38 37.44
14	226°58.90	18°20.99 3.67	354°43.92 36.20	59°39.11 29.30	202°38.81 8.73	Alphecca 126°2.13 26°3 Antares 112°13.28 -26°3	
15	242°1.36	33°20.52 · · 4.84	9°44.58 · · 36.65	74°41.11 · · 29.11	217°41.46 •• 8.66		°4.78
16	257°3.83	48°20.05 6.01	24°45.24 37.10	89°43.10 28.92	232°44.10 8.59	Sabik 102°0.35 -15°4	
17 18	272°6.29 287°8.75	63°19.58 7.18 78°19.11 \$11°8.35	39°45.90 37.55 54°46.56 \$19°38.00	104°45.09 28.73 119°47.09 N06°28.54	247°46.75 8.52 262°49.39 N07°8.44		°7.45
19	302° 11.22	93°18.64 9.52	69°47.22 38.45	134°49.08 28.35	202 49.39 No7 8.44 277°52.04 8.37		32.59
20	317° 13.68	108° 18.17 10.68	84°47.88 38.90	149°51.07 28.15	292°54.68 8.30		29.41
21	332° 16.15	123°17.70 · · 11.85	99°48.54 · · 39.34	164°53.07 · · 27.96	307°57.33 · · 8.23	Kaus Aust. 83°29.60 -34°2 Vega 80°31.75 38°4	22.28 48.87
22	$347^{\circ}18.61$	138° 17.23 13.02	114°49.20 39.79	179°55.06 27.77	322°59.98 8.15	Nunki 75°44.99 -26°1	
23	2°21.07	153°16.75 14.19	129°49.85 40.24	194°57.05 27.58	338°2.62 8.08		56.74
Mer.ı	pass. 22:51	ν-0.5' d1.2' m-3.88	ν 0.7' d0.5' m1.36	ν2.0' d-0.2' m-1.73	ν2.6' d-0.1' m0.15	Peacock 53°2.03 -56°3	
							23.12
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		0.39
0	17°23.54	168°16.28 \$11°15.35	144°50.51 \$19°40.69	209°59.05 N06°27.39	353°5.27 N07°8.01	Al Na'ir 27°29.80 -46°4 Fomalhaut 15°11.75 -29°2	
1	32°26.00	183°15.81 16.52	159°51.17 41.13	225°1.04 27.20	8°7.91 7.94	I .	28.38 14.28
2	47° 28.47	198°15.34 17.68	174°51.83 41.58	240°3.04 27.01	23°10.56 7.86		21.54
3	62°30.93	213°14.86 · · 18.85	189°52.48 · · 42.03	255°5.03 · · 26.81	38°13.21 · · 7.79		
4 5	77° 33.39 92° 35.86	228°14.39 20.01	204°53.14 42.48 219°53.80 42.92	270°7.03 26.62 285°9.02 26.43	53°15.85 7.72 68°18.50 7.65		.pass 12:46
6	92°35.86 107°38.32	243°13.91 21.18 258°13.44 \$11°22.34	219°53.80 42.92 234°54.45 \$19°43.37	285°9.02 26.43 300°11.01 N06°26.24	68° 18.50 7.65 83° 21.14 N07° 7.57		14:22
7	122° 40.79	273°12.96 23.50	249°55.11 43.81	315°13.01 26.05	98°23.79 7.50		10:05
8	137° 43.25	288°12.49 24.67	264°55.77 44.26	330°15.00 25.86	113°26.44 7.43		00:36
9	152° 45.72	303°12.01 · · 25.83	279°56.42 · · 44.70	345°17.00 · · 25.67	128°29.08 · · 7.36	Oct 08 Fri SHA Mer	.pass
10	167°48.18	318°11.53 26.99	294°57.08 45.15	0°18.99 25.48	143°31.73 7.28		.pass 12:47
11	182° 50.64 197° 53.11	333°11.06 28.15 348°10.58 \$11°29.31	309°57.73 45.59 324°58.38 \$19°46.04	15°20.99 25.29 30°22.98 N06°25.10	158°34.38 7.21 173°37.02 N07°7.14	I .	14:21
12 13	197 53.11 212° 55.57	348 10.58 S11 29.31 3° 10.10 30.47	324 58.38 519 46.04 339 59.04 46.48	45°24.98 N06°25.10	173°37.02 N07°7.14 188°39.67 7.07	Jupiter 192°46.82	10:02
14	227° 58.04	18°9.62 31.63	354°59.69 46.93	60°26.97 24.71	203°42.32 6.99	Saturn 335°37.38	00:32
15	243°0.50	33°9.14 · · 32.79	10°0.35 · · 47.37	75°28.97 · · 24.52	218°44.96 · · 6.92	Oct 09 Sat SHA Mer	.pass
16	258°2.96	48°8.66 33.95	25°1.00 47.81	90°30.96 24.33	233° 47.61 6.85		12:47
17	273°5.43	63°8.18 35.11	40°1.65 48.26	105°32.96 24.14	248°50.26 6.78		14:20
18	288°7.89	78°7.71 \$11°36.27 93°7.22 37.42	55°2.30 \$19°48.70 70°2.96 49.14	120°34.95 N06°23.95 135°36.95 23.76	263°52.90 N07°6.70 278°55.55 6.63	1	09:59
19 20	303° 10.36 318° 12.82	108° 6.74 38.58	70°2.96 49.14 85°3.61 49.58	135°36.95 23.76 150°38.95 23.57	278°55.55 6.63 293°58.20 6.56	Saturn 335°41.73	00:28
21	333° 15.28	123°6.26 · · 39.74	100° 4.26 · · 50.03	165°40.94 · · 23.38	309°0.84 · · 6.49	Horizontal parallax	
22	$348^{\circ}17.75$	138°5.78 40.89	115° 4.91 50.47	180°42.94 23.19	324°3.49 6.41	Venus: 0	.1
23	$3^{\circ}20.21$	153°5.30 42.05	130° 5.56 50.91	195°44.93 23.00	339°6.14 6.34	Mars: 0.	.1
Mer.ı	pass. 22:47	ν-0.5' d1.2' m-3.88	ν0.7' d0.4' m1.36	ν2.0' d-0.2' m-1.74	ν2.6' d-0.1' m0.15		

<u>.</u>		+0.1425 sec			N.4.	7 360	
h	Su				Moon		
Thu 0	GHA 182° 59.46	Dec \$05°19.86	GHA 96°25.79	u 10.3'	Dec \$25°49.45	d -4.2'	HP 54.7'
1	182 59.46 197°59.64	20.82	90 25.79 110°55.07	10.3	25°45.23	-4.2 -4.3'	54.7'
2	212° 59.82	21.78	125°24.40	10.4	25°40.88	-4.5'	54.7'
3	228°0.00	• • 22.74	$139^{\circ}53.80$	10.5'	$25^{\circ}36.41$	-4.6'	54.7'
4	243°0.19	23.69	154°23.26	10.5'	25°31.82	-4.7'	54.7'
5	258° 0.37 273° 0.55	24.65 \$05°25.61	168°52.79 183°22.38	10.6' 10.7'	25°27.11 \$25°22.28	-4.8' -4.9'	54.6' 54.6'
6 7	273 0.55 288°0.73	26.56	183 22.38 197°52.03	10.7	25° 17.33	-4.9 -5.1'	54.6'
8	303°0.91	27.52	212°21.75	10.8	25°12.27	-5.2'	54.6'
9	318°1.09	• • 28.48	226°51.54	10.9'	25°7.09	-5.3'	54.6'
10	333°1.27	29.43	241°21.39	10.9'	25°1.79	-5.4'	54.6'
11 12	348°1.45 3°1.63	30.39 \$05°31.35	255°51.31 270°21.29	11.0' 11.1'	24°56.37 \$24°50.85	-5.5' -5.6'	54.5' 54.5'
13	3 1.03 18°1.81	32.30	270 21.29 284°51.34	11.1	24° 45.21	-5.8'	54.5'
14	33°1.99	33.26	299°21.46	11.2'	24°39.45	-5.9'	54.5'
15	48°2.17	• • 34.21	$313^{\circ}51.65$	11.3'	24°33.59	-6.0'	54.5'
16	63°2.35	35.17	328°21.90	11.3'	24°27.61	-6.1'	54.5'
17 18	78°2.53 93°2.71	36.12 \$05°37.08	342°52.23 357°22.61	11.4' 11.5'	24°21.52 \$24°15.32	-6.2' -6.3'	54.4' 54.4'
18	93 2.71 108°2.89	38.03	11°53.07	11.5'	24° 9.02	-6.4	54.4'
20	123°3.07	38.99	26°23.60	11.6'	24° 2.60	-6.5	54.4'
21	138°3.25	• • 39.95	40°54.19	11.7'	23°56.08	-6.6'	54.4'
22	153°3.43	40.90	55°24.85	11.7'	23°49.45	-6.7'	54.4'
23	168°3.61	41.85	69°55.58	11.8'	23°42.72	-6.8'	54.4'
	SD = 16.0'	d = 1.0'		SI	0 = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
6 0	183°3.79	S05°42.81	84°26.38	u 11.9'	S23°35.88	а -6.9'	пР 54.4'
1	198°3.96	43.76	98°57.25	11.9'	23°28.94	-7.0'	54.3'
2	213°4.14	44.72	113°28.18	12.0'	23°21.89	-7.1'	54.3'
3	228°4.32	• • 45.67	127°59.19	12.1'	23°14.75	-7.2'	54.3'
4 5	243°4.50 258°4.67	46.63 47.58	142°30.26 157°1.40	12.1' 12.2'	23°7.50 23°0.15	-7.3' -7.4'	54.3' 54.3'
6	273°4.85	\$05°48.53	171°32.61	12.2	\$22°52.70	-7.4 -7.5'	54.3'
7	288°5.03	49.49	186°3.88	12.3'	22°45.15	-7.6'	54.3'
8	303°5.21	50.44	200°35.23	12.4'	22°37.50	-7.7'	54.3'
9	318°5.38	• • 51.40	215°6.64	12.5'	22°29.76	-7.8'	54.3'
10 11	333°5.56 348°5.74	52.35 53.30	229°38.12 244°9.67	12.5' 12.6'	22°21.92 22°13.98	-7.9' -8.0'	54.3' 54.3'
12	3°5.91	505°54.25	258°41.28	12.7	S22°5.95	-8.1'	54.2'
13	18°6.09	55.21	273°12.96	12.7'	21°57.83	-8.2	54.2'
14	33°6.26	56.16	287°44.71	12.8'	$21^{\circ}49.61$	-8.3'	54.2'
15	48°6.44	• • 57.11	302°16.52	12.9'	21°41.30 21°32.90	-8.4'	54.2'
16 17	63°6.61 78°6.79	58.07 05°59.02	316°48.40 331°20.34	12.9' 13.0'	21°32.90 21°24.40	-8.5' -8.6'	54.2' 54.2'
18	93°6.97	S05°59.97	345°52.36	13.1'	S21°15.82	-8.7'	54.2'
19	108°7.14	0.92	0°24.43	13.1'	$21^{\circ}7.15$	-8.8'	54.2'
20	123°7.32	1.87	14°56.57	13.2'	20°58.39	-8.8'	54.2'
21 22	138°7.49 153°7.66	· · 2.83 3.78	29°28.78 44°1.05	13.3' 13.3'	20°49.54 20°40.60	-8.9' -9.0'	54.2' 54.2'
23	168°7.84	3.76 4.73	58°33.38	13.4	20°40.60 20°31.58	-9.0 -9.1'	54.2'
	SD = 16.0'	d=1.0'			D = 14.8'		
	3D = 10.0	<u>u = 1.0</u>		31	J = 14.0		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°8.01	S06° 5.68	73°5.78	13.5'	520°22.47	-9.2'	54.2'
1 2	198°8.19 213°8.36	6.63 7.58	87°38.24 102°10.76	13.5' 13.6'	20°13.28 20°4.01	-9.3' -9.4'	54.2' 54.2'
3	213 8.30 228°8.53	· · 8.53	102 10.76 116°43.34	13.6'	20 4.01 19°54.65	-9.4 -9.4'	54.2'
4	243°8.71	9.48	131°15.99	13.7'	19°45.21	-9.5'	54.2'
5	258°8.88	10.43	145°48.69	13.8'	19°35.69	-9.6'	54.1'
6	273°9.05	S06°11.39	160°21.46	13.8'	\$19°26.09	-9.7'	54.1'
7 8	288°9.23 303°9.40	12.34 13.29	174°54.29 189°27.18	13.9' 13.9'	19°16.41 19°6.64	-9.8' -9.8'	54.1' 54.1'
9	303 9.40 318° 9.57	13.29	204° 0.12	14.0'	19 6.64 18°56.81	-9.8 -9.9'	54.1'
10	333°9.74	15.19	218°33.13	14.1'	18°46.89	-10.0'	54.1'
11	348°9.92	16.14	233°6.19	14.1'	18°36.90	-10.1'	54.1'
12	3°10.09	S06°17.09	247°39.31	14.2'	\$18°26.83	-10.1'	54.1'
13 14	18° 10.26 33° 10.43	18.03 18.98	262°12.48 276°45.71	14.2' 14.3'	18°16.69 18°6.47	-10.2' -10.3'	54.1' 54.1'
15	48° 10.60	• • 19.93	291°19.00	14.3	17°56.18	-10.3	54.1
16	63° 10.77	20.88	305°52.35	14.4'	17°45.81	-10.4	54.1'
17	78° 10.94	21.83	320°25.74	14.5'	17°35.37	-10.5'	54.1'
18	93°11.11	S06°22.78	334°59.19	14.5'	\$17°24.87	-10.6'	54.1'
19 20	108° 11.28 123° 11.45	23.73 24.68	349°32.70 4°6.25	14.6' 14.6'	17°14.29 17°3.64	-10.6' -10.7'	54.1' 54.1'
20	123 11.45 138° 11.63	24.08	4 6.25 18°39.86	14.0 14.7'	17 3.04 16°52.92	-10.7 -10.8'	54.1'
22	153° 11.79	26.57	33°13.52	14.7'	16°42.14	-10.9'	54.1'
23	$168^{\circ}11.96$	27.52	47°47.23	14.8'	$16^{\circ}31.28$	-10.9'	54.1'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		
		-					

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-64%	
07	11:58	12:07	11:48	18:11	05:46		
08	12:15	12:24	11:48	18:58	06:35		
09	12:32	12:40	11:47	19:43	07:21		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	18° 22.68	168°4.82 \$11°43.21	145° 6.21 \$19° 51.35	210°46.93 N06°22.81	354°8.78 N07°6.27	
1	33°25.14	183°4.34 44.36	160° 6.86 51.79	225°48.93 22.62	9°11.43 6.19	Alpheratz 357°32.07 29°14.87
2	48°27.60	198°3.85 45.51	175°7.51 52.23	240°50.92 22.43	24°14.08 6.12	Ankaa 353°4.54 -42°9.17
3	63°30.07	213°3.37 · · 46.67	190°8.16 · · 52.67	255°52.92 · · 22.24	39°16.72 · · 6.05	Schedar 349°27.84 56°41.57 Diphda 348°44.72 -17°49.87
4	78°32.53	228°2.89 47.82	205°8.81 53.11	270°54.91 22.04	54°19.37 5.98	Diphda 348°44.72 -17°49.87 Achernar 335°17.97 -57°5.58
5	93°35.00	243°2.40 48.97	220° 9.46 53.55	285°56.91 21.85	69°22.02 5.90	Hamal 327°48.30 23°35.76
6	108° 37.46	258°1.92 S 11°50.13	235°10.11 \$19°53.99	300°58.91 N06°21.66	84°24.66 N07°5.83	Polaris 312°24.20 89°22.68
7	123°39.93	273°1.43 51.28	250°10.76 54.43	316°0.90 21.47	99° 27.31 5.76	Acamar 315°9.70 -40°11.36
8	138° 42.39	288°0.95 52.43	265°11.41 54.87	331°2.90 21.28	114°29.96 5.69	Menkar 314°3.50 4°12.07
9	153° 44.85	303°0.46 · · 53.58	280°12.06 · · 55.31	346°4.90 · · 21.09	129°32.61 · · 5.61	Mirfak 308°24.57 49°57.54
10 11	168° 47.32 183° 49.78	317°59.97 54.73 332°59.49 55.88	295°12.71 55.75 310°13.35 56.18	1°6.89 20.90 16°8.89 20.71	144° 35.25 5.54 159° 37.90 5.47	Aldebaran 290°36.81 16°33.95
12	198° 52.25	347°59.00 \$11°57.03	325°14.00 \$19°56.62	31°10.89 N06°20.52	174°40.55 N07°5.40	Rigel 281°1.54 -8°10.01
13	213°54.71	2°58.51 58.18	340°14.65 57.06	46°12.89 20.33	189°43.20 5.32	Capella 280°18.32 46°1.39
14	228°57.17	17°58.03 11°59.33	355°15.29 57.50	61°14.88 20.14	204° 45.84 5.25	Bellatrix 278°20.31 6°22.56
15	243°59.64	32°57.54 12°0.48	10°15.94 · · 57.93	76°16.88 ·· 19.95	219°48.49 · · 5.18	Elnath 277°58.85 28°37.78
16	259°2.10	47°57.05 1.62	25°16.59 58.37	91°18.88 19.76	234°51.14 5.10	Alnilam 275°35.31 -1°10.94 Betelgeuse 270°49.53 7°24.79
17	274°4.57	62°56.56 2.77	40°17.23 58.81	106°20.87 19.57	249°53.78 5.03	Canopus 263°51.27 -52°42.29
18	289°7.03	77°56.07 \$12°3.92	55°17.88 \$19°59.24	121°22.87 N06°19.38	264°56.43 N07°4.96	Sirius 258°24.20 -16°45.08
19	304°9.49	92°55.58 5.06	70°18.52 19°59.68	136°24.87 19.19	279°59.08 4.89	Adhara 255°4.06 -29°0.35
20	319° 11.96	107°55.09 6.21	85°19.17 20°0.12	151°26.87 19.00	295°1.73 4.81	Procyon 244°48.51 5°9.26
21	334° 14.42 349° 16.89	122°54.60 · · 7.35	100°19.81 · · 0.55	166°28.87 · · 18.81	310°4.37 · · 4.74	Pollux 243°14.61 27°57.43
22 23	4° 19.35	137°54.11 8.50 152°53.62 9.64	115°20.46 0.99 130°21.10 1.42	181°30.86 18.62 196°32.86 18.43	325°7.02 4.67 340°9.67 4.60	Avior 234°13.97 -59°35.61
	4 19.55					Suhail 222°44.84 -43°32.45
Mer. _I	pass. 22:43	ν -0.5 $'$ $d1.2'$ m-3.88	$ u 0.7' \ d0.4' \ m1.36$	ν 2.0′ <i>d</i> -0.2′ m-1.74	$ u 2.6' \ d$ -0.1' m0.14	Miaplacidus 221°38.21 -69°49.60
						Alphard 217°45.72 -8°46.65
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.28 11°49.87 Dubhe 193°38.88 61°35.89
0	19°21.81	167°53.13 \$12°10.79	145°21.74 S 20°1.86	211°34.86 N06°18.24	355°12.32 N07°4.52	Dubhe 193°38.88 61°35.89 Denebola 182°22.97 14°25.02
1	34°24.28	182°52.63 11.93	160°22.39 2.29	226°36.86 18.05	10° 14.97 4.45	Gienah 175°41.58 -17°41.70
2	49°26.74	197°52.14 13.07	175°23.03 2.72	241°38.86 17.86	25°17.61 4.38	Acrux 172°58.20 -63°15.14
3	64°29.21	212°51.65 · · 14.21	190°23.67 · · 3.16	256°40.85 · · 17.67	40°20.26 · · 4.30	Gacrux 171°49.65 -57°16.08
4	79°31.67	227°51.15 15.36 242°50.66 16.50	205°24.32 3.59	271°42.85 17.48	55°22.91 4.23	Alioth 166°11.60 55°48.51
5 6	94°34.13 109°36.60	242°50.66 16.50 257°50.17 \$12°17.64	220°24.96 4.02 235°25.60 \$20°4.46	286°44.85 17.30 301°46.85 N06°17.11	70°25.56 4.16 85°28.20 N07°4.09	Spica 158°20.24 -11°18.32
7	124°39.06	272°49.67 18.78	250°26.24 4.89	316°48.85 16.92	100°30.85 4.01	Alkaid 152°50.74 49°10.52
8	139° 41.53	287°49.18 19.92	265°26.88 5.32	331°50.85 16.73	115° 33.50 3.94	Hadar 148°33.37 -60°30.45
9	154° 43.99	302°48.68 · · 21.06	280°27.52 · · 5.75	346°52.85 · · 16.54	130°36.15 · · 3.87	Menkent 147°55.32 -36°30.38
10	169° 46.45	317°48.19 22.19	295°28.16 6.19	1°54.85 16.35	145°38.80 3.79	Arcturus 145°46.18 19°2.35 Rigil Kent. 139°37.75 -60°57.06
11	184°48.92	332°47.69 23.33	310°28.80 6.62	16°56.84 16.16	160°41.44 3.72	Kochab 137°21.00 74°2.54
12	199°51.38	347°47.19 \$12°24.47	325°29.44 \$20°7.05	31°58.84 N06°15.97	175°44.09 N07°3.65	Zuben'ubi 136°53.81 -16°9.38
13	214°53.85	2°46.69 25.61	340°30.08 7.48	47°0.84 15.78	190°46.74 3.58	Alphecca 126°2.13 26°37.43
14	229° 56.31	17°46.20 26.74	355°30.72 7.91	62°2.84 15.59	205°49.39 3.50	Antares 112°13.29 -26°29.59
15	244°58.78 260°1.24	32°45.70 · · 27.88 47°45.20 29.02	10°31.36 · · 8.34 25°32.00 8.77	77°4.84 · · 15.40 92°6.84	220°52.04 · · 3.43 235°54.69 3.36	Atria 107°5.75 -69°4.78
16 17	275°3.70	47° 45.20 29.02 62° 44.70 30.15	25°32.00 8.77 40°32.64 9.20	92°6.84 15.21 107°8.84 15.02	235°54.69 3.36 250°57.33 3.28	Sabik 102°0.36 -15°45.48
18	290°6.17	77°44.20 \$12°31.29	55°33.28 \$20°9.63	122°10.84 N06°14.83	265°59.98 N07°3.21	Shaula 96°7.47 -37°7.45
19	305°8.63	92°43.70 32.42	70°33.92 10.06	137°12.84 14.64	281°2.63 3.14	Rasalhague 95°56.60 12°32.59 Eltanin 90°41.31 51°29.41
20	320°11.10	107°43.20 33.55	85°34.55 10.49	152°14.84 14.46	296°5.28 3.07	Eltanin 90°41.31 51°29.41 Kaus Aust. 83°29.61 -34°22.28
21	335° 13.56	122°42.70 · · 34.69	100°35.19 · · 10.92	167°16.84 · · 14.27	311°7.93 · · 2.99	Vega 80°31.77 38°48.87
22	350° 16.02	137°42.20 35.82	115°35.83 11.34	182°18.84 14.08	326° 10.57 2.92	Nunki 75°45.00 -26°15.68
23	5°18.49	152°41.70 36.95	130°36.47 11.77	197°20.84 13.89	341°13.22 2.85	Altair 61°57.72 8°56.74
Mer.	pass. 22:39	ν -0.5 $'$ $d1.1'$ m-3.88	$ u 0.6' \ d0.4' \ m 1.36$	$\nu 2.0' \ d$ -0.2' m-1.74	$ u 2.6' \ d$ -0.1' m0.14	Peacock 53°2.05 -56°38.82
						Deneb 49°24.09 45°23.12
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.39 10°0.40
0	20°20.95	167°41.20 \$12°38.08	145°37.10 \$20°12.20	212°22.84 N06°13.70	356°15.87 N07°2.78	Al Na'ir 27°29.81 -46°49.57
1	35°23.42	182°40.70 39.21	160°37.74 12.63	227°24.84 13.51	11°18.52 2.70	Fomalhaut 15°11.76 -29°28.39 Scheat 13°42.70 28°14.29
2	50°25.88	197°40.19 40.34	175°38.37 13.05	242°26.84 13.32	26°21.17 2.63	Scheat 13°42.70 28°14.29 Markab 13°27.37 15°21.54
3	65°28.34	212°39.69 · · 41.47	190°39.01 · · 13.48	257°28.84 · · 13.13	41°23.82 · · 2.56	
4	$80^{\circ}30.81$	227°39.19 42.60	205°39.64 13.91	272°30.84 12.94	56°26.47 2.48	Oct 10 Sun SHA Mer.pass
5	95° 33.27	242°38.68 43.73	220°40.28 14.33	287°32.84 12.76	71°29.11 2.41	Venus 149°42.14 12:48
6	110°35.74	257°38.18 \$12°44.86	235°40.91	302°34.84 N06°12.57	86°31.76 N07°2.34	Mars 126° 43.54 14:19
7	125°38.20	272°37.67 45.99	250°41.55 15.19	317°36.85 12.38	101°34.41 2.27	Jupiter 192°24.25 09:56 Saturn 335°46.11 00:23
8 9	140° 40.66 155° 43.13	287°37.17 47.11 302°36.66 · · 48.24	265°42.18 15.61 280°42.82 · · 16.04	332°38.85 12.19 347°40.85 •• 12.00	116°37.06 2.19 131°39.71 · · 2.12	
10	170° 45.59	317°36.16 49.37	295°43.45 16.46	2°42.85 11.81	146° 42.36 2.05	Oct 11 Mon SHA Mer.pass
11	185° 48.06	332°35.65 50.49	310°44.08 16.89	17°44.85 11.62	161° 45.01 1.97	Venus 148°31.31 12:49
12	200°50.52	347°35.14 \$12°51.62	325°44.72 \$20°17.31	32°46.85 N06°11.43	176°47.65 N07°1.90	Mars 125°59.93 14:18 Jupiter 192°13.05 09:52
13	215°52.98	2°34.64 52.74	340°45.35 17.73	47°48.85 11.25	191°50.30 1.83	Saturn 335°50.50 00:19
14	230°55.45	17°34.13 53.87	355°45.98 18.16	62°50.85 11.06	206°52.95 1.76	
15 16	245°57.91	32°33.62 · · 54.99 47°33.11 56.11	10°46.61 · · 18.58	77°52.86 · · 10.87	221°55.60 · · 1.68	Oct 12 Tue SHA Mer.pass
16 17	261°0.38 276°2.84	47°33.11 56.11 62°32.60 57.23	25°47.25 19.01 40°47.88 19.43	92°54.86 10.68 107°56.86 10.49	236°58.25 1.61 252°0.90 1.54	Venus 147°20.25 12:50
18	270 2.04 291°5.30	77°32.09 \$12°58.36	55°48.51 S20°19.85	122°58.86 N06°10.30	267°3.55 N07°1.46	Mars 125°16.15 14:17 Jupiter 192°1.89 09:49
19	306°7.77	92°31.58 12°59.48	70°49.14 20.27	138°0.86 10.12	282°6.20 1.39	Saturn 335°54.92 00:15
20	321°10.23	107°31.07 13°0.60	85°49.77 20.70	153°2.87 9.93	297°8.85 1.32	
21	336° 12.70	122°30.56 · · 1.72	100°50.40 · · 21.12	168°4.87 · · 9.74	312°11.49 · · 1.25	Horizontal parallax
22	351° 15.16	137°30.05 2.84	115°51.03 21.54	183°6.87 9.55	327°14.14 1.17	Venus: 0.1 Mars: 0.1
23	6°17.62	152°29.54 3.96	130°51.66 21.96	198°8.87 9.36	342°16.79 1.10	ivials. U.I
Mer.	pass. 22:35	ν-0.5′ d1.1′ m-3.88	ν 0.6′ d0.4′ m1.36	ν2.0′ d-0.2′ m-1.74	ν2.6' d-0.1' m0.13	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°12.13	S06°28.47	62°20.99	14.8'	S 16°20.36	-11.0'	54.1'
1	198°12.30	29.42	76°54.80	14.9'	16°9.38	-11.1'	54.1'
2	213°12.47 228°12.64	30.36 · · 31.31	91°28.66 106°2.56	14.9' 15.0'	15°58.33 15°47.21	-11.1' -11.2'	54.1' 54.1'
4	243°12.81	32.26	120°36.51	15.0'	15°36.03	-11.2'	54.2'
5	258°12.98	33.21	$135^{\circ}10.51$	15.0'	$15^{\circ}24.79$	-11.3'	54.2'
6	273°13.15	S06°34.15	149°44.55	15.1'	\$15°13.48	-11.4'	54.2'
7 8	288°13.32 303°13.48	35.10 36.05	164°18.64 178°52.77	15.1' 15.2'	15°2.11 14°50.68	-11.4' -11.5'	54.2' 54.2'
9	318° 13.65	36.99	193°26.95	15.2'	14°39.19	-11.5'	54.2'
10	333°13.82	37.94	208°1.16	15.3'	$14^{\circ}27.65$	-11.6'	54.2'
11	348°13.99	38.89	222°35.42 237°9.72	15.3'	14°16.04 \$14°4.37	-11.7' -11.7'	54.2'
12 13	3°14.15 18°14.32	\$06°39.83 40.78	237 9.72 251°44.06	15.3' 15.4'	13°52.65	-11.7 -11.8'	54.2' 54.2'
14	33°14.49	41.72	266°18.44	15.4'	13°40.87	-11.8'	54.2'
15	48°14.65	• • 42.67	$280^{\circ}52.86$	15.5'	13°29.04	-11.9'	54.2'
16	63°14.82 78°14.99	43.61	295°27.31 310°1.80	15.5' 15.5'	13°17.15 13°5.20	-11.9'	54.2' 54.2'
17 18	93°15.15	44.56 \$06°45.50	310 1.80 324°36.33	15.6'	\$12°53.20	-12.0' -12.1'	54.2'
19	108° 15.32	46.45	339°10.89	15.6'	12°41.15	-12.1'	54.2'
20	123°15.48	47.39	353°45.49	15.6'	12°29.04	-12.2'	54.2'
21	138°15.65 153°15.82	• • 48.34	8°20.12 22°54.78	15.7'	12°16.89 12°4.68	-12.2'	54.2'
22 23	153 15.82 168°15.98	49.28 50.23	22 54.78 37°29.48	15.7' 15.7'	12 4.08 11°52.42	-12.3' -12.3'	54.3' 54.3'
	SD = 16.0'	d = 0.9'			D = 14.8'		
	JD = 10.0°	u = 0.9		اد	J — 14.0°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°16.15	S06°51.17	52°4.20	15.8'	S11°40.11	-12.4'	54.3'
1 2	198°16.31 213°16.47	52.11 53.06	66°38.96 81°13.74	15.8' 15.8'	11°27.76 11°15.35	-12.4' -12.5'	54.3' 54.3'
3	228°16.64	• • 54.00	95°48.56	15.8'	11°13.33	-12.5'	54.3'
4	243°16.80	54.95	110°23.40	15.9'	$10^{\circ}50.40$	-12.5'	54.3'
5	258°16.97	55.89	124°58.26	15.9'	10°37.86	-12.6'	54.3'
6 7	273°17.13 288°17.29	\$06°56.83 57.77	139°33.16 154°8.07	15.9' 15.9'	\$10°25.27 10°12.63	-12.6' -12.7'	54.3' 54.3'
8	303°17.46	58.72	168°43.01	16.0'	09°59.96	-12.7'	54.3'
9	$318^{\circ}17.62$	$06^{\circ}59.66$	183°17.98	16.0'	09°47.23	-12.8'	54.4'
10	333°17.78 348°17.95	07°0.60	197°52.97 212°27.97	16.0'	09°34.47 09°21.66	-12.8'	54.4'
11 12	348 17.95 3°18.11	1.54 \$07°2.49	212 27.97 227°3.00	16.0' 16.0'	509°8.81	-12.8' -12.9'	54.4' 54.4'
13	18° 18.27	3.43	241°38.05	16.1'	08°55.93	-12.9'	54.4'
14	33°18.43	4.37	$256^{\circ}13.12$	16.1'	08°43.00	-13.0'	54.4'
15 16	48°18.59 63°18.76	· · 5.31 6.25	270°48.20 285°23.30	16.1' 16.1'	08°30.03 08°17.03	-13.0' -13.0'	54.4' 54.4'
17	78° 18.92	7.19	205 23.30 299°58.41	16.1	08°3.99	-13.1'	54.4'
18	93°19.08	507°8.14	314°33.55	16.1'	S07°50.91	-13.1'	54.5'
19	108°19.24	9.08	329°8.69	16.2'	07°37.79	-13.2'	54.5'
20 21	123°19.40 138°19.56	10.02 •• 10.96	343°43.85 358°19.02	16.2' 16.2'	07°24.64 07°11.45	-13.2' -13.2'	54.5' 54.5'
22	150 19.50 153°19.72	11.90	12°54.20	16.2	06°58.23	-13.2	54.5'
23	168°19.88	12.84	27°29.39	16.2'	06°44.98	-13.3'	54.5'
	SD = 16.0'	d = 0.9'	-	SI	D = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d 12.2'	HP
0 1	183°20.04 198°20.20	S07°13.78 14.72	42°4.59 56°39.79	16.2' 16.2'	\$06°31.70 06°18.38	-13.3' -13.3'	54.5' 54.5'
2	213°20.36	15.66	$71^{\circ}15.01$	16.2'	06°5.03	-13.4'	54.6'
3	228°20.52	• • 16.60	85°50.23	16.2'	05°51.65	-13.4'	54.6'
4 5	243°20.68 258°20.84	17.54 18.48	100°25.46 115°0.69	16.2' 16.2'	05°38.24 05°24.80	-13.4' -13.5'	54.6' 54.6'
6	273°21.00	S07°19.42	129°35.92	16.2'	S05°11.34	-13.5'	54.6'
7	288°21.15	20.35	$144^{\circ}11.16$	16.2'	04°57.85	-13.5'	54.6'
8	303°21.31	21.29	158°46.40	16.2'	04°44.33	-13.5'	54.6'
9 10	318°21.47 333°21.63	· · 22.23 23.17	173°21.64 187°56.87	16.2' 16.2'	04°30.78 04°17.21	-13.6' -13.6'	54.7' 54.7'
11	348°21.79	24.11	202°32.11	16.2'	04°17.21	-13.6'	54.7
12	3°21.94	S07°25.05	217°7.34	16.2'	S03°49.99	-13.6'	54.7'
13	18°22.10 33°22.26	25.98	231°42.58 246°17.80	16.2'	03°36.35 03°22.69	-13.7'	54.7'
14 15	33°22.26 48°22.41	26.92 •• 27.86	246°17.80 260°53.02	16.2' 16.2'	03°22.69 03°9.00	-13.7' -13.7'	54.7' 54.8'
16	63°22.57	28.80	275°28.24	16.2	02°55.30	-13.7	54.8'
17	78°22.73	29.73	290°3.44	16.2'	02°41.57	-13.7'	54.8'
18 19	93°22.88 108°23.04	\$07°30.67 31.61	304°38.64 319°13.83	16.2' 16.2'	\$02°27.82 02°14.06	-13.8' -13.8'	54.8' 54.8'
20	108°23.04 123°23.19	31.61 32.54	319°13.83 333°49.01	16.2'	02°14.06 02°0.28	-13.8'	54.8'
21	138°23.35	• • 33.48	$348^{\circ}24.18$	16.2	01°46.48	-13.8'	54.9'
22	153°23.51	34.42	2°59.33	16.1'	01°32.67	-13.8'	54.9'
23	168°23.66	35.35	17°34.48	16.1'	01°18.84	-13.8'	54.9'
	SD = 16.0'	d = 0.9'		SI	O = 14.9'		

	Twi	light			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N. 70 0			07.04	16.00		
N 72°	04:36	05:55	07:04	16:28	17:37	18:55
N 70°	04:42	05:53	06:55	16:37	17:39	18:49
68°	04:47	05:52	06:48	16:44	17:40	18:44
66°	04:51	05:50	06:42	16:50	17:42	18:41
64°	04:54	05:49	06:37	16:55	17:43	18:38
62°	04:57	05:48	06:33	17:00	17:44	18:35
60°	04:59	05:47	06:29	17:04	17:45	18:33
N 58°	05:01	05:46	06:25	17:07	17:46	18:32
56°	05:02	05:45	06:22	17:10	17:47	18:30
54°	05:03	05:44	06:20	17:13	17:48	18:29
52°	05:04	05:43	06:17	17:15	17:49	18:28
50°	05:05	05:43	06:15	17:18	17:50	18:27
45°	05:07	05:41	06:10	17:23	17:52	18:26
N 40°	05:07	05:39	06:06	17:27	17:54	18:25
35°	05:08	05:37	06:02	17:31	17:56	18:25
30°	05:07	05:35	05:59	17:34	17:58	18:26
20°	05:06	05:31	05:53	17:40	18:02	18:28
N 10°	05:03	05:27	05:48	17:45	18:06	18:31
0°	04:59	05:23	05:44	17:50	18:11	18:35
S 10°	04:53	05:17	05:39	17:55	18:16	18:41
20°	04:45	05:11	05:33	18:01	18:23	18:49
30°	04:34	05:03	05:27	18:07	18:31	19:00
35°	04:27	04:58	05:23	18:11	18:37	19:07
40°	04:19	04:51	05:19	18:15	18:43	19:16
45°	04:08	04:44	05:14	18:20	18:50	19:27
S 50°	03:55	04:35	05:08	18:26	19:00	19:40
52°	03:48	04:31	05:06	18:29	19:04	19:47
54°	03:41	04:26	05:03	18:32	19:09	19:55
56°	03:32	04:20	04:59	18:36	19:15	20:03
58°	03:23	04:14	04:56	18:39	19:21	20:13
S 60°	03:11	04:07	04:51	18:44	19:28	20:25

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-88%
10	12:49	12:57	11:47	20:26	08:05	
11	13:05	13:12	11:47	21:07	08:46	
12	13:20	13:28	11:47	21:48	09:27	

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	21°20.09	167°29.03 \$13°5.08	145°52.29	213°10.87 N06°9.17	357°19.44 N07°1.03	
1	$36^{\circ}22.55$	182°28.51 6.20	160°52.92 22.80	228°12.88 8.99	12°22.09 0.95	Alpheratz 357°32.08 29°14.87 Ankaa 353°4.54 -42°9.18
2	51°25.02	197°28.00 7.31	175°53.55 23.22	243°14.88 8.80	27°24.74 0.88	Ankaa 353°4.54 -42°9.18 Schedar 349°27.84 56°41.58
3	66°27.48	212°27.49 · · 8.43	190°54.18 · · 23.64	258°16.88 • • 8.61	42°27.39 · · 0.81	Diphda 348°44.72 -17°49.87
4	81°29.94	227°26.97 9.55	205°54.80 24.06	273°18.89 8.42	57°30.04 0.74	Achernar 335°17.97 -57°5.59
5	96°32.41	242°26.46 10.66	220°55.43 24.48	288°20.89 8.23	72°32.69 0.66	Hamal 327°48.29 23°35.77
6 7	111°34.87 126°37.34	257°25.94 \$13°11.78 272°25.43 12.89	235°56.06 \$20°24.90 250°56.69 25.32	303°22.89 N06°8.05 318°24.89 7.86	87°35.34 N07°0.59 102°37.99 0.52	Polaris 312°23.37 89°22.70
8	141°39.80	287°24.91 14.01	265°57.31 25.74	333°26.90 7.67	117° 40.63 0.44	Acamar 315°9.69 -40°11.37
9	156° 42.26	302°24.40 · · 15.12	280°57.94 · · 26.16	348°28.90 · · 7.48	132°43.28 · · 0.37	Menkar 314°3.49 4°12.07
10	171°44.73	317°23.88 16.23	295°58.57 26.57	3°30.90 7.30	147°45.93 0.30	Mirfak 308°24.55 49°57.55
11	$186^{\circ}47.19$	332°23.36 17.35	310°59.19 26.99	18°32.91 7.11	162°48.58 0.23	Aldebaran 290°36.80 16°33.95 Rigel 281°1.52 -8°10.02
12	201°49.66	347°22.85 \$13°18.46	325°59.82 \$20°27.41	33°34.91 N06°6.92	177°51.23 N07°0.15	Capella 280°18.30 46°1.40
13	216°52.12	2°22.33 19.57	341°0.44 27.83	48°36.91 6.73	192°53.88 0.08	Bellatrix 278°20.29 6°22.56
14 15	231° 54.58 246° 57.05	17°21.81 20.68 32°21.29 · · 21.79	356°1.07 28.24 11°1.69 · · 28.66	63°38.92 6.54 78°40.92 · · 6.36	207°56.53 07°0.01 222°59.18 06°59.93	Elnath 277°58.83 28°37.79
16	261°59.51	47°20.77 22.90	26°2.32 29.08	93°42.93 6.17	238°1.83 59.86	Alnilam 275°35.29 -1°10.94
17	277°1.98	62°20.25 24.01	41°2.94 29.49	108°44.93 5.98	253°4.48 59.79	Betelgeuse 270°49.52 7°24.79
18	292°4.44	77°19.73 \$13°25.12	56°3.57 S20°29.91	123°46.93 N06°5.79	268°7.13 N06°59.72	Canopus 263°51.24 -52°42.30
19	307°6.90	92°19.21 26.23	71°4.19 30.32	138°48.94 5.61	283°9.78 59.64	Sirius 258°24.18 -16°45.08 Adhara 255°4.04 -29°0.35
20	$322^{\circ}9.37$	107°18.69 27.34	86° 4.81 30.74	153°50.94 5.42	298°12.43 59.57	Adhara 255°4.04 -29°0.35 Procyon 244°48.49 5°9.25
21	337° 11.83	122°18.17 · · 28.44	101°5.44 · · 31.15	168°52.95 · · 5.23	313°15.08 · · 59.50	Pollux 243°14.59 27°57.42
22	352°14.30	137°17.65 29.55	116°6.06 31.57	183°54.95 5.05	328°17.73 59.42	Avior 234°13.94 -59°35.61
23	7° 16.76	152°17.13 30.66	131°6.68 31.98	198°56.96 4.86	343°20.38 59.35	Suhail 222°44.82 -43°32.45
Mer.	pass. 22:31	$\nu\text{-}0.5'~d1.1'~\text{m-}3.88$	$\nu 0.6' \ d0.4' \ m1.36$	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.74$	$\nu 2.6' \ \textit{d}0.1' \ \textrm{m}0.12$	Miaplacidus 221°38.16 -69°49.59
						Alphard 217°45.70 -8°46.65
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.26 11°49.87
0	22° 19.23	167°16.60 \$13°31.76	146°7.31 \$20°32.39	213°58.96 N06°4.67	358°23.02 N06°59.28	Dubhe 193°38.86 61°35.87
1	37°21.69	182°16.08 32.87	161°7.93 32.81	229°0.97 4.48	13°25.67 59.21	Denebola 182°22.96 14°25.01 Gienah 175°41.57 -17°41.70
2	$52^{\circ}24.15$	197°15.56 33.97	176°8.55 33.22	244°2.97 4.30	28°28.32 59.13	Acrux 172°58.19 -63°15.12
3	67° 26.62	212°15.03 · · 35.07	191°9.17 · · 33.63	259°4.98 · · 4.11	43°30.97 · · 59.06	Gacrux 171°49.65 -57°16.06
4	82°29.08	227°14.51 36.18	206° 9.79 34.05	274°6.98 3.92	58° 33.62 58.99	Alioth 166°11.60 55°48.49
5	97°31.55	242°13.98 37.28	221°10.41 34.46	289°8.99 3.73	73°36.27 58.91	Spica 158°20.24 -11°18.32
6 7	112°34.01 127°36.47	257°13.46 \$13°38.38 272°12.93 39.48	236°11.03 \$20°34.87 251°11.65 35.28	304°10.99 N06°3.55 319°13.00 3.36	88°38.92 N06°58.84 103°41.57 58.77	Alkaid 152°50.74 49°10.50
8	142° 38.94	272°12.93 39.48 287°12.40 40.58	251°11.65 35.28 266°12.27 35.70	319°13.00 3.36 334°15.00 3.17	103°41.57 58.77 118°44.22 58.70	Hadar 148°33.38 -60°30.43
9	157°41.40	302°11.88 · · 41.68	281°12.89 · · 36.11	349°17.01 · · 2.99	133°46.87 · · 58.62	Menkent 147°55.32 -36°30.37
10	172°43.87	317°11.35 42.78	296°13.51 36.52	4°19.01 2.80	148°49.52 58.55	Arcturus 145°46.19 19°2.35
11	187°46.33	332°10.82 43.88	311°14.13 36.93	19°21.02 2.61	163°52.17 58.48	Rigil Kent. 139°37.77 -60°57.05 Kochab 137°21.02 74°2.52
12	202°48.79	347°10.29 \$13°44.98	326°14.75	34°23.02 N06°2.43	178°54.82 N06°58.40	Zuben'ubi 136°53.82 -16°9.37
13	217°51.26	2°9.77 46.08	341°15.37 37.75	49°25.03 2.24	193°57.47 58.33	Alphecca 126°2.14 26°37.42
14	232°53.72	17°9.24 47.18	356°15.99 38.16	64°27.04 2.05	209°0.12 58.26	Antares 112°13.31 -26°29.58
15	247°56.19	32°8.71 · · 48.27	11°16.60 · · 38.57	79°29.04 · · 1.87	224°2.77 · · 58.19	Atria 107°5.79 -69°4.77
16 17	262°58.65 278°1.11	47°8.18 49.37 62°7.65 50.47	26°17.22 38.98 41°17.84 39.39	94°31.05 1.68 109°33.06 1.49	239°5.42 58.11 254°8.07 58.04	Sabik 102°0.38 -15°45.48
18	293°3.58	77°7.12 \$13°51.56	56°18.46 \$20°39.79	124°35.06 N06°1.31	269°10.72 N06°57.97	Shaula 96°7.49 -37°7.45
19	308°6.04	92°6.58 52.66	71°19.07 40.20	139°37.07 1.12	284°13.37 57.89	Rasalhague 95°56.61 12°32.59
20	323°8.51	107°6.05 53.75	86°19.69 40.61	154°39.07 0.93	299° 16.02 57.82	Eltanin 90°41.33 51°29.40 Kaus Aust. 83°29.63 -34°22.28
21	$338^{\circ}10.97$	122°5.52 · · 54.84	101°20.31 · · 41.02	169°41.08 · · 0.75	314°18.67 · · 57.75	Kaus Aust. 83°29.63 -34°22.28 Vega 80°31.79 38°48.87
22	353° 13.43	137°4.99 55.94	116°20.92 41.43	184°43.09 0.56	329°21.32 57.68	Nunki 75°45.02 -26°15.68
23	8° 15.90	152°4.45 57.03	131°21.54 41.83	199°45.09 0.37	344°23.97 57.60	Altair 61°57.73 8°56.74
Mer.ı	pass. 22:27	ν-0.5' d1.1' m-3.88	ν0.6' d0.4' m1.36	ν 2.0' d-0.2' m-1.75	ν2.6' d-0.1' m0.11	Peacock 53°2.08 -56°38.82
						Deneb 49°24.11 45°23.12
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.40 10°0.40
0	23° 18.36	167°3.92 \$13°58.12	146°22.15 \$20°42.24	214°47.10 N06°0.19	359°26.62 N06°57.53	Al Na'ir 27°29.83 -46°49.58
1	38° 20.83	182°3.39 13°59.21	161°22.77 42.65	229°49.11 06°0.00	14°29.27 57.46	Fomalhaut 15°11.77 -29°28.40 Scheat 13°42.71 28°14.30
2	53°23.29	197°2.85 14°0.30	176°23.38 43.05	244°51.12 05°59.81	29°31.92 57.39	Markab 13°27.38 15°21.54
3	68° 25.75	212°2.32 · · 1.39	191°24.00 · · 43.46	259°53.12 · · 59.63	44°34.57 · · 57.31	
4	83°28.22	227°1.78 2.48	206°24.61 43.86	274°55.13 59.44	59°37.22 57.24	Oct 13 Wed SHA Mer.pass
5	98°30.68	242°1.25 3.57	221°25.22 44.27	289°57.14 59.26	74°39.87 57.17	Venus 146°8.94 12:51
6 7	113°33.15 128°35.61	257°0.71 \$14°4.66 272°0.17 5.74	236°25.84 \$20°44.67 251°26.45 45.08	304°59.15 N05°59.07 320°1.15 58.88	89°42.52 N06°57.09 104°45.17 57.02	Mars 124°32.20 14:16 Jupiter 191°50.79 09:46
8	128 35.01 143°38.07	272°0.17 5.74 286°59.63 6.83	266°27.06 45.48	320 1.15 58.88 335°3.16 58.70	104° 45.17 57.02 119° 47.82 56.95	Saturn 335°59.35 00:11
9	158° 40.54	301°59.10 · · 7.92	281°27.68 · · 45.89	350°5.17 · · 58.51	134°50.47 · · 56.88	
10	173°43.00	316°58.56 9.00	296°28.29 46.29	5°7.18 58.32	149°53.12 56.80	Oct 14 Thu SHA Mer.pass
11	188° 45.47	331°58.02 10.09	311°28.90 46.69	20°9.19 58.14	164°55.77 56.73	Venus 144°57.38 12:51 Mars 123°48.08 14:15
12	203° 47.93	346°57.48 \$14°11.17	326°29.51 \$20°47.10	35°11.19 N05°57.95	179°58.42 N06°56.66	Mars 123°48.08 14:15 Jupiter 191°39.74 09:43
13	218° 50.39	1°56.94 12.26	341°30.12 47.50	50°13.20 57.77	195°1.07 56.58	Saturn 336°3.80 00:06
14	233°52.86	16°56.40 13.34	356°30.73 47.90	65°15.21 57.58	210°3.72 56.51	
15 16	248° 55.32 263° 57.79	31°55.86 · · 14.42 46°55.32 15.50	11°31.34 · · 48.31 26°31.95 48.71	80°17.22 · · 57.40 95°19.23 57.21	225°6.37 · · 56.44 240°9.02 56.37	Oct 15 Fri SHA Mer.pass
10 17	203 57.79 279°0.25	61°54.78 16.59	41°32.56 49.11	95 19.23 57.21 110°21.24 57.02	240 9.02 56.37 255°11.67 56.29	Venus 143°45.56 12:52 Mars 123°3.79 14:14
18	294°2.71	76°54.24 S14°17.67	56°33.17 S20°49.51	125°23.24 N05°56.84	270°14.32 N06°56.22	Jupiter 191°28.74 09:40
19	309°5.18	91°53.69 18.75	71°33.78 49.91	140°25.25 56.65	285°16.97 56.15	Saturn 336°8.26 00:02
20	324°7.64	106°53.15 19.83	86°34.39 50.31	155°27.26 56.47	300°19.62 56.08	
21	339° 10.11	121°52.61 · · 20.91	101°35.00 · · 50.71	170°29.27 · · 56.28	315°22.27 · · 56.00	Horizontal parallax
22	354° 12.57	136°52.06 21.98	116°35.61 51.11	185°31.28 56.10	330°24.92 55.93	Venus: 0.1 Mars: 0.1
23	9°15.04	151°51.52 23.06	131°36.22 51.51	200°33.29 55.91	345°27.57 55.86	ivialS. U.1
Mer. _I	pass. 22:23	u-0.5' $d1.1$ ' m-3.88	u0.6′ d 0.4′ m 1.35	$\nu 2.0' \ d\text{-}0.2' \ \text{m-}1.75$	$ u 2.6' \ d 0.1' \ \text{m} 0.11$	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.82	S07°36.29	$32^{\circ}9.60$	16.1'	S01°4.99	-13.9'	54.9'
1	198°23.97	37.22	46°44.71	16.1'	00°51.14	-13.9'	54.9'
2 3	213°24.12 228°24.28	38.16 •• 39.09	61°19.81 75°54.89	16.1' 16.1'	00°37.27 00°23.39	-13.9' -13.9'	54.9' 55.0'
4	243°24.43	40.03	90°29.95	16.0'	S00°9.49	-13.9'	55.0'
5	258°24.59	40.96	105°4.99	16.0'	N00°4.41	13.9'	55.0'
6	273°24.74	S07°41.90	119°40.01	16.0'	N00°18.32	13.9'	55.0'
7 8	288°24.89 303°25.05	42.83 43.77	134°15.01 148°49.98	16.0' 16.0'	00°32.25 00°46.17	13.9' 13.9'	55.0' 55.1'
9	318°25.20	44.70	163°24.94	15.9'	01°0.11	13.9'	55.1'
10	333°25.35	45.64	177°59.87	15.9'	$01^{\circ}14.05$	13.9'	55.1'
11	348°25.50	46.57 S 07°47.50	192°34.77	15.9'	01°28.00 N01°41.95	14.0'	55.1'
12 13	3°25.66 18°25.81	48.44	207°9.64 221°44.49	15.8' 15.8'	01°55.91	14.0' 14.0'	55.1' 55.1'
14	33°25.96	49.37	236°19.31	15.8'	02°9.87	14.0'	55.2'
15	48°26.11	• • 50.30	250°54.10	15.8'	02°23.83	14.0'	55.2'
16	63°26.26 78°26.41	51.24	265°28.86 280°3.59	15.7'	02°37.79	14.0'	55.2' 55.2'
17 18	93°26.41	52.17 \$07°53.10	280° 3.59 294° 38.29	15.7' 15.7'	02°51.75 N03°5.71	14.0' 14.0'	55.2'
19	108°26.71	54.03	309°12.95	15.6'	03°19.67	14.0'	55.3'
20	123°26.86	54.96	323°47.58	15.6'	03°33.62	14.0'	55.3'
21	138°27.01	• • 55.90	338°22.17	15.6'	03°47.57	13.9'	55.3'
22 23	153°27.16 168°27.31	56.83 57.76	352°56.73 7°31.25	15.5' 15.5'	04°1.52 04°15.46	13.9' 13.9'	55.3' 55.3'
23		d = 0.9'	- 31.23			13.3	33.3
	SD = 16.0'	$a = 0.9^{\circ}$		51	D = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°27.46	S07°58.69	22°5.72	15.4'	N04°29.40	13.9'	55.4'
1 2	198°27.61 213°27.76	07°59.62 08°0.55	36°40.16 51°14.56	15.4' 15.4'	04°43.33 04°57.25	13.9' 13.9'	55.4' 55.4'
3	213 27.70 228°27.91	• 1.48	65°48.92	15.4	04 37.23 05°11.16	13.9'	55.4'
4	243°28.06	2.41	80°23.23	15.3'	05°25.06	13.9'	55.4'
5	258°28.21	3.34	94°57.50	15.2'	05°38.95	13.9'	55.5'
6 7	273°28.36 288°28.50	\$08°4.27 5.20	109°31.73 124°5.91	15.2' 15.1'	N05°52.82 06°6.69	13.9' 13.8'	55.5' 55.5'
8	303°28.65	6.13	138°40.04	15.1'	06°20.53	13.8'	55.5'
9	318°28.80	• • 7.06	153°14.13	15.0'	06°34.37	13.8'	55.5'
10	333°28.95	7.99	167°48.16	15.0'	06°48.19	13.8'	55.6'
11 12	348°29.09 3°29.24	8.92 \$08° 9.85	182°22.15 196°56.08	14.9' 14.9'	07°1.99 N07°15.77	13.8' 13.8'	55.6' 55.6'
13	18°29.39	10.78	211°29.97	14.8'	07°29.53	13.7'	55.6'
14	33°29.53	11.71	226°3.80	14.8'	$07^{\circ}43.28$	13.7'	55.7'
15	48°29.68 63°29.82	• • 12.64	240°37.58	14.7'	07°57.00	13.7'	55.7'
16 17	63°29.82 78°29.97	13.57 14.49	255°11.30 269°44.96	14.7' 14.6'	08°10.70 08°24.37	13.7' 13.7'	55.7' 55.7'
18	93°30.11	S08°15.42	284° 18.57	14.6'	N08°38.02	13.6'	55.7'
19	108°30.26	16.35	298°52.13	14.5'	08°51.65	13.6'	55.8'
20	123°30.40	17.28	313°25.62 327°59.05	14.4' 14.4'	09°5.25	13.6' 13.5'	55.8'
21 22	138°30.55 153°30.69	· · 18.20 19.13	327°59.05 342°32.43	14.4	09°18.82 09°32.36	13.5'	55.8' 55.8'
23	168°30.84	20.06	357°5.74	14.2'	09°45.87	13.5'	55.8'
	SD = 16.0'	d = 0.9'		SI	D = 15.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°30.98 198°31.12	\$08°20.98 21.91	11°38.98 26°12.17	14.2' 14.1'	N09°59.35 10°12.80	13.4' 13.4'	55.9' 55.9'
2	213°31.27	22.84	40°45.29	14.1'	10°12.80 10°26.21	13.4	55.9'
3	228°31.41	• • 23.76	55°18.35	14.0'	10°39.59	13.3'	55.9'
4	243°31.55 258°31.70	24.69	69°51.33	13.9'	10°52.94	13.3'	56.0'
5 6	258°31.70 273°31.84	25.61 \$08°26.54	84°24.26 98°57.11	13.9' 13.8'	11°6.25 N11°19.51	13.3' 13.2'	56.0' 56.0'
7	288°31.98	27.46	113°29.89	13.7'	11°32.74	13.2'	56.0'
8	303°32.12	28.39	128°2.61	13.6'	11°45.93	13.1'	56.0'
9	318°32.26 333°32.41	· · 29.31 30.24	142°35.25 157°7.82	13.6' 13.5'	11°59.08 12°12.19	13.1' 13.1'	56.1' 56.1'
10 11	333°32.41 348°32.55	30.24 31.16	157°7.82 171°40.32	13.5'	12°12.19 12°25.25	13.1	56.1'
12	3°32.69	S08°32.09	186°12.74	13.4'	N12°38.26	13.0'	56.1
13	18°32.83	33.01	200°45.09	13.3'	12°51.23	12.9'	56.1'
14 15	33°32.97 48°33.11	33.93 · · 34.86	215°17.37 229°49.57	13.2' 13.1'	13°4.15 13°17.03	12.9' 12.8'	56.2' 56.2'
16	48 33.11 63°33.25	35.78	244°21.69	13.1	13 17.03 13°29.85	12.8'	56.2'
17	78°33.39	36.70	258°53.73	13.0'	13°42.62	12.7'	56.2'
18	93°33.53	S08°37.63	273°25.70	12.9'	N13°55.34	12.7'	56.3'
19 20	108°33.67 123°33.81	38.55 39.47	287°57.59 302°29.39	12.8' 12.7'	14°8.00 14°20.61	12.6' 12.6'	56.3' 56.3'
20	123°33.81 138°33.95	39.47	302°29.39 317°1.12	12.7	14°20.61 14°33.16	12.6	56.3'
22	153°34.08	41.32	331°32.76	12.6'	14°45.66	12.4'	56.3
23	168°34.22	42.24	346°4.32	12.5'	14°58.09	12.4'	56.4'
	SD = 16.0'	d = 0.9'		SI	D = 15.2'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
- ",	00 ^h	12 ^h	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-99%	
13	13:35	13:43	11:46	22:29	10:08		
14	13:50	13:57	11:46	23:12	10:50		
15	14:04	14:11	11:46	23:58	11:34		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	24° 17.50	166°50.97 \$14°24.14	146°36.83 \$20°51.91	215°35.30 N05°55.72	0°30.22 N06°55.79	
1	39° 19.96	181°50.43 25.22	161°37.44 52.31	230°37.31 55.54	15°32.87 55.71	Alpheratz 357°32.08 29°14.88
2	54°22.43	196°49.88 26.29	176°38.04 52.71	245°39.32 55.35	30°35.52 55.64	Ankaa 353°4.54 -42°9.19 Schedar 349°27.84 56°41.59
3	69°24.89	211°49.34 · · 27.37	191°38.65 · · 53.11	260°41.33 · · 55.17	45°38.17 · · 55.57	Diphda 348°44.72 -17°49.88
4	84°27.36	226°48.79 28.44	206°39.26 53.51	275°43.34 54.98	60°40.83 55.49	Achernar 335°17.97 -57°5.61
5	99°29.82	241°48.24 29.52	221°39.86 53.91	290°45.35 54.80 305°47.36 N05°54.61	75°43.48 55.42	Hamal 327°48.28 23°35.77
6 7	114°32.28 129°34.75	256°47.69 \$14°30.59 271°47.15 31.66	236°40.47 \$20°54.30 251°41.08 54.70	305°47.36 N05°54.61 320°49.37 54.43	90°46.13 N06°55.35 105°48.78 55.28	Polaris 312°22.41 89°22.71
8	144° 37.21	286°46.60 32.74	266°41.68 55.10	335°51.38 54.24	120° 51.43 55.20	Acamar 315°9.68 -40°11.38
9	159° 39.68	301°46.05 · · 33.81	281°42.29 · · 55.50	350°53.39 · · 54.06	135°54.08 · · 55.13	Menkar 314°3.48 4°12.07 Mirfak 308°24.53 49°57.56
10	174°42.14	316°45.50 34.88	296°42.89 55.89	5°55.40 53.87	150° 56.73 55.06	Mirfak 308°24.53 49°57.56 Aldebaran 290°36.78 16°33.95
11	189°44.60	331°44.95 35.95	311°43.50 56.29	20°57.41 53.69	165°59.38 54.99	Rigel 281°1.51 -8°10.02
12	204° 47.07	346°44.40 \$14°37.02	326°44.10 \$20°56.68	35°59.42 N05°53.50	181°2.03 N06°54.91	Capella 280°18.27 46°1.40
13 14	219° 49.53 234° 52.00	1°43.85 38.09 16°43.30 39.16	341°44.71 57.08 356°45.31 57.47	51°1.43 53.32 66°3.44 53.13	196°4.68 54.84 211°7.33 54.77	Bellatrix 278°20.28 6°22.56
15	249° 54.46	31°42.74 · · 40.23	11°45.91 · · 57.87	81°5.45 · · 52.95	226°9.98 · · 54.70	Elnath 277° 58.81 28° 37.78
16	264°56.92	46°42.19 41.29	26°46.52 58.26	96°7.46 52.76	241°12.63 54.62	Alnilam 275° 35.27 -1° 10.95
17	279°59.39	61°41.64 42.36	41°47.12 58.66	111°9.47 52.58	256° 15.28 54.55	Betelgeuse 270°49.50 7°24.78 Canopus 263°51.21 -52°42.30
18	295°1.85	76°41.08 S 14°43.43	56°47.72 S 20°59.05	126°11.48 N05°52.39	271°17.93 N06°54.48	Sirius 258°24.16 -16°45.09
19	310°4.32	91°40.53 44.49	71°48.33 59.45	141°13.49 52.21	286°20.58 54.41	Adhara 255°4.02 -29°0.36
20	325°6.78 340°9.24	106°39.98 45.56 121°39.42 • 46.62	86°48.93 20°59.84 101°49.53 21°0.23	156°15.51 52.02	301°23.23 54.33 316°25.88 •• 54.26	Procyon 244°48.47 5°9.25
21 22	340 9.24 355°11.71	121°39.42 · · 46.62 136°38.87 47.68	116°50.13 0.63	171°17.52 · · 51.84 186°19.53 51.65	310 25.88 · · 54.20 331°28.53 54.19	Pollux 243°14.57 27°57.42
23	10° 14.17	151°38.31 48.75	131°50.73 1.02	201°21.54 51.47	346°31.18 54.11	Avior 234°13.91 -59°35.61
						Suhail 222° 44.80 -43° 32.45
ivier.	pass. 22:19	ν-0.5′ d1.1′ m-3.88	$\nu 0.6' \ d0.4' \ m1.35$	ν2.0′ d-0.2′ m-1.75	$\nu 2.7' \ d$ -0.1' m0.10	Miaplacidus 221°38.11 -69°49.59 Alphard 217°45.68 -8°46.66
						Regulus 207°32.25 11°49.86
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.84 61°35.86
0	25° 16.64	166°37.75 \$14°49.81	146°51.33 \$21°1.41	216°23.55 N05°51.28	1°33.83 N06°54.04	Denebola 182°22.95 14°25.00
1 2	40° 19.10 55° 21.57	181°37.20 50.87 196°36.64 51.93	161°51.94 1.80 176°52.54 2.19	231°25.56 51.10 246°27.57 50.91	16°36.48 53.97 31°39.14 53.90	Gienah 175°41.57 -17°41.70
3	70°24.03	211°36.08 · · 52.99	191°53.14 · · 2.59	261°29.59 · · 50.73	46°41.79 · · 53.82	Acrux 172°58.17 -63°15.11
4	85°26.49	226°35.52 54.05	206°53.74 2.98	276°31.60 50.54	61°44.44 53.75	Gacrux 171°49.64 -57°16.05
5	$100^{\circ}28.96$	241°34.96 55.11	221°54.34 3.37	291°33.61 50.36	76°47.09 53.68	Alioth 166°11.60 55°48.48 Spica 158°20.24 -11°18.32
6	115° 31.42	256°34.41 \$14°56.17	236°54.93 S 21°3.76	306°35.62 N05°50.18	91°49.74 N06°53.61	Alkaid 152°50.75 49°10.49
7	130°33.89	271°33.85 57.23	251°55.53 4.15	321°37.64 49.99	106°52.39 53.53	Hadar 148°33.38 -60°30.42
8 9	145°36.35	286°33.29 58.29 301°32.72 14°59.34	266°56.13 4.54	336°39.65 49.81 351°41.66 • 49.62	121°55.04 53.46	Menkent 147°55.32 -36°30.36
10	160°38.81 175°41.28	301°32.72 14°59.34 316°32.16 15°0.40	281°56.73 · · 4.93 296°57.33 5.32	351°41.66 · · 49.62 6°43.67 49.44	136°57.69 · · 53.39 152°0.34 53.32	Arcturus 145°46.19 19°2.34
11	190°43.74	331°31.60 1.45	311°57.93 5.70	21°45.69 49.25	167°2.99 53.24	Rigil Kent. 139°37.77 -60°57.04
12	205°46.21	346°31.04 \$15°2.51	326°58.52 \$21°6.09	36°47.70 N05°49.07	182°5.64 N06°53.17	Kochab 137°21.05 74°2.51 Zuben'ubi 136°53.82 -16°9.37
13	220°48.67	1°30.48 3.56	341°59.12 6.48	51°49.71 48.89	197°8.29 53.10	Zuben'ubi 136°53.82 -16°9.37 Alphecca 126°2.15 26°37.41
14	$235^{\circ}51.13$	16°29.91 4.62	356°59.72 6.87	66°51.73 48.70	212° 10.94 53.03	Antares 112°13.32 -26°29.58
15	250°53.60	31°29.35 · · 5.67	12°0.32 · · 7.26	81°53.74 · · 48.52	227°13.59 · · 52.96	Atria 107°5.82 -69°4.76
16 17	265° 56.06	46°28.79 6.72	27°0.91 7.64 42°1.51 8.03	96°55.75 48.33	242°16.24 52.88 257°18.89 52.81	Sabik 102°0.39 -15°45.48
18	280°58.53 296°0.99	61°28.22 7.77 76°27.66 \$15°8.82	42°1.51 8.03 57°2.10 \$21°8.42	111°57.77 48.15 126°59.78 N05°47.97	257°18.89 52.81 272°21.55 N06°52.74	Shaula 96°7.51 -37°7.44
19	311°3.46	91°27.09 9.87	72°2.70 8.80	142°1.79 47.78	287°24.20 52.67	Rasalhague 95°56.63 12°32.58
20	326°5.92	106°26.52 10.92	87°3.29 9.19	157°3.81 47.60	302°26.85 52.59	Eltanin 90°41.36 51°29.40 Kaus Aust. 83°29.65 -34°22.28
21	341°8.38	121°25.96 · · 11.97	102°3.89 · · 9.58	172°5.82 · · 47.41	317°29.50 · · 52.52	Vega 80°31.81 38°48.87
22	356° 10.85	136°25.39 13.02	117° 4.48 9.96	187°7.83 47.23	332°32.15 52.45	Nunki 75°45.04 -26°15.68
23	11°13.31	151°24.82 14.07	132°5.08 10.35	202°9.85 47.05	347°34.80 52.38	Altair 61°57.75 8°56.74
Mer.p	pass. 22:15	$\nu\text{-}0.6'~d1.1'~\text{m-}3.88$	$ u 0.6' \ d0.4' \ m1.35$	$\nu 2.0' \ d$ -0.2' m-1.75	$\nu 2.7' \ d\text{-}0.1' \ \text{m}0.09$	Peacock 53°2.11 -56°38.83
						Deneb 49°24.13 45°23.13
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.41 10°0.40 Al Na'ir 27°29.85 -46°49.59
0	26° 15.78	166°24.26 \$15°15.12	147°5.67 \$21°10.73	217°11.86 N05°46.86	2°37.45 N06°52.30	Al Na'ir 27°29.85 -46°49.59 Fomalhaut 15°11.78 -29°28.41
1	41° 18.24	181°23.69 16.16	162° 6.27 11.12	232°13.88 46.68	17°40.10 52.23	Scheat 13°42.72 28°14.30
2	56°20.70	196°23.12 17.21	177°6.86 11.50	247°15.89 46.50	32°42.75 52.16	Markab 13°27.38 15°21.54
3	71°23.17 86°25.63	211°22.55 · · 18.25 226°21.98 19.30	192°7.45 · · 11.88 207°8.05 12.27	262°17.90 · · 46.31 277°19.92 46.13	47°45.40 · · 52.09 62°48.05 52.01	Oct 16 Sat SHA Mer.pass
4 5	86°25.63 101°28.10	226°21.98 19.30 241°21.41 20.34	207°8.05 12.27 222°8.64 12.65	277°19.92 46.13 292°21.93 45.95	62°48.05 52.01 77°50.70 51.94	Oct 16 Sat SHA Mer.pass Venus 142° 33.47 12:53
6	116° 30.56	256°20.84 S15°21.38	237° 9.23 S21° 13.03	307°23.95 N05°45.76	92°53.35 N06°51.87	Mars 122°19.33 14:13
7	131°33.03	271°20.26 22.43	252°9.82 13.42	322°25.96 45.58	107°56.00 51.80	Jupiter 191°17.80 09:36
8	$146^{\circ}35.49$	286°19.69 23.47	267°10.41 13.80	337°27.98 45.40	122°58.66 51.73	Saturn 336°12.72 23:54
9	161°37.95	301°19.12 · · 24.51	282°11.01 · · 14.18	352°29.99 · · 45.21	138°1.31 · · 51.65	Oct 17 Sun SHA Mer.pass
10	176° 40.42	316° 18.55 25.55	297°11.60 14.56	7°32.01 45.03	153°3.96 51.58	Venus 141°21.12 12:54
11 12	191° 42.88 206° 45.35	331°17.97 26.59 346°17.40 \$15°27.63	312°12.19 14.94 327°12.78 \$21°15.32	22°34.02 44.85 37°36.04 N05°44.66	168°6.61 51.51 183°9.26 N06°51.44	Mars 121°34.70 14:12
13	200 45.35 221° 47.81	1°16.83 28.67	342°13.37 15.70	52°38.05 44.48	198°11.91 51.36	Jupiter 191°6.91 09:33
14	236° 50.27	16°16.25 29.71	357°13.96 16.08	67°40.07 44.30	213° 14.56 51.29	Saturn 336° 17.20 23:50
15	251°52.74	31°15.67 · · · 30.74	12°14.55 · · 16.46	82°42.09 · · 44.11	228°17.21 · · 51.22	Oct 18 Mon SHA Mer.pass
16	266° 55.20	46° 15.10 31.78	27°15.14 16.84	97°44.10 43.93	243°19.86 51.15	Venus 140°8.48 12:55
17	281°57.67	61°14.52 32.81	42°15.73 17.22	112°46.12 43.75	258°22.51 51.08	Mars 120°49.90 14:11
18	297°0.13 312°2.59	76°13.94 \$15°33.85	57°16.31 \$21°17.60	127°48.13 N05°43.56	273°25.16 N06°51.00 288°27.81 50.93	Jupiter 190° 56.09 09:30
19 20	312° 2.59 327° 5.06	91°13.37 34.88 106°12.79 35.92	72°16.90 17.98 87°17.49 18.36	142°50.15 43.38 157°52.17 43.20	288°27.81 50.93 303°30.46 50.86	Saturn 336° 21.67 23:45
21	342°7.52	121°12.21 · · 36.95	102°18.08 · · 18.74	172°54.18 · · 43.02	318°33.11 · · 50.79	Horizontal parallax
22	357°9.99	136°11.63 37.98	117°18.67 19.12	187°56.20 42.83	333°35.77 50.71	Venus: 0.1
23	$12^{\circ}12.45$	151°11.05 39.02	132°19.25 19.49	202°58.21 42.65	348°38.42 50.64	Mars: 0.1
Mer.r	pass. 22:11	ν-0.6' d1.0' m-3.88	ν0.6' d0.4' m1.35	ν2.0' d-0.2' m-1.75	ν2.7' d-0.1' m0.09	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°34.36	S08°43.16	0°35.80	12.4'	N15° 10.46	12.3'	56.4'
1	198°34.50	44.08	15°7.19	12.3'	15°22.78 15°35.03	12.2'	56.4
2	213°34.64 228°34.77	45.00 •• 45.92	29°38.50 44°9.72	12.2' 12.1'	15° 35.03 15° 47.21	12.2' 12.1'	56.4' 56.4'
4	243°34.91	46.84	58° 40.86	12.1'	15°59.33	12.1'	56.5
5	258°35.05	47.76	73°11.91	12.0'	16°11.38	12.0'	56.5'
6	273°35.18	S08°48.69	87°42.88	11.9'	N16°23.36	11.9'	56.5'
7	288°35.32	49.61	102°13.75	11.8'	16°35.28	11.8'	56.5'
8 9	303°35.46 318°35.59	50.53 •• 51.44	116° 44.54 131° 15.24	11.7' 11.6'	16° 47.12 16° 58.89	11.8' 11.7'	56.6' 56.6'
10	333°35.73	52.36	145° 45.85	11.5'	17° 10.58	11.6'	56.6
11	348°35.86	53.28	$160^{\circ}16.36$	11.4'	17°22.20	11.5'	56.6'
12	3°36.00	S08°54.20	174° 46.79	11.3'	N17°33.74	11.5'	56.6'
13 14	18°36.13 33°36.27	55.12 56.04	189° 17.13 203° 47.37	11.2' 11.2'	17° 45.21 17° 56.59	11.4' 11.3'	56.7'
15	48°36.40	• • 56.96	203 47.37 218° 17.52	11.1'	17 50.59 18°7.90	11.3	56.7' 56.7'
16	63°36.53	57.88	232° 47.58	11.0'	18° 19.12	11.1'	56.7'
17	78°36.67	58.79	$247^{\circ}17.55$	10.9'	18°30.25	11.1'	56.7'
18	93°36.80	S08°59.71	261°47.42	10.8'	N18°41.31	11.0'	56.8'
19	108°36.94 123°37.07	09°0.63	276° 17.20	10.7' 10.6'	18°52.27	10.9'	56.8'
20 21	123°37.07 138°37.20	1.55 •• 2.46	290°46.88 305°16.47	10.5	19°3.15 19°13.94	10.8' 10.7'	56.8' 56.8'
22	153°37.33	3.38	319° 45.96	10.4	19°13.94	10.7	56.9
23	168°37.47	4.30	334° 15.36	10.3'	19°35.24	10.5'	56.9'
	SD = 16.0'	d = 0.9'		SI	O = 15.4'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°37.60 198°37.73	S09°5.21 6.13	348° 44.67 3° 13.88	10.2' 10.1'	N19° 45.75 19° 56.16	10.4' 10.3'	56.9' 56.9'
2	213°37.86	7.05	3 13.88 17°42.99	10.1	19 56.16 20°6.48	10.3	56.9'
3	228°37.99	• • 7.96	32° 12.01	9.9'	20° 16.70	10.1	57.0'
4	243°38.12	8.88	46°40.93	9.8'	20°26.82	10.0'	57.0'
5	258°38.25	9.79	61°9.75	9.7'	20°36.84	9.9'	57.0'
6	273°38.38 288°38.51	S09°10.71	75°38.48 90°7.11	9.6'	N20°46.76 20°56.57	9.8'	57.0'
7 8	303°38.64	11.62 12.54	90°7.11 104°35.65	9.5' 9.4'	20°56.57 21°6.28	9.7' 9.6'	57.0' 57.1'
9	318°38.77	• • 13.45	119°4.08	9.3'	21°15.88	9.5'	57.1
10	333°38.90	14.37	133°32.43	9.2'	21°25.38	9.4'	57.1'
11	348°39.03	15.28	148°0.67	9.2'	21°34.76	9.3'	57.1'
12	3°39.16	S09°16.19	162°28.82	9.1'	N21°44.03	9.2'	57.1'
13 14	18°39.29 33°39.42	17.11 18.02	176° 56.88 191° 24.84	9.0' 8.9'	21°53.19 22°2.24	9.0' 8.9'	57.2' 57.2'
15	48°39.55	• • 18.93	205°52.70	8.8'	22°11.17	8.8'	57.2'
16	63°39.68	19.85	220°20.47	8.7'	22°19.98	8.7'	57.2'
17	78°39.80	20.76	234°48.14	8.6'	22°28.68	8.6'	57.2'
18 19	93°39.93 108°40.06	S09°21.67 22.58	249° 15.72 263° 43.21	8.5' 8.4'	N22° 37.25 22° 45.71	8.5' 8.3'	57.3' 57.3'
20	106 40.00 123°40.18	23.49	278° 10.60	8.3'	22°54.04	8.2'	57.3'
21	138°40.31	• • 24.41	292°37.89	8.2'	23°2.25	8.1	57.3'
22	153°40.44	25.32	307°5.10	8.1'	23°10.33	8.0'	57.3'
23	168°40.56	26.23	321°32.21	8.0'	23° 18.28	7.8'	57.4'
	SD = 16.0'	d = 0.9'		SE	O = 15.5'		
Mon	GHA	Dec	GHA		Dec	d	HP
0	183°40.69	Dec S 09°27.14	335°59.23	u 7.9'	N23° 26.11	a 7.7'	пР 57.4'
1	198°40.81	28.05	350°26.16	7.8'	23°33.81	7.6'	57.4
2	213°40.94	28.96	4°53.00	7.7'	23°41.38	7.4'	57.4'
3	228°41.06	• • 29.87	19° 19.74	7.7'	23° 48.82	7.3'	57.4'
4 5	243°41.19 258°41.31	30.78 31.69	33°46.40 48°12.97	7.6' 7.5'	23°56.12 24°3.29	7.2' 7.0'	57.5' 57.5'
6	273°41.44	\$1.69 \$09°32.60	48 12.97 62°39.45	7.5 7.4'	N24° 10.32	6.9'	57.5'
7	288°41.56	33.51	77°5.85	7.3'	24° 17.22	6.8	57.5
8	303°41.68	34.42	91°32.16	7.2'	24°23.97	6.6'	57.5'
9	318°41.81	• • 35.33	105°58.38	7.1'	24° 30.59	6.5'	57.6'
10 11	333°41.93 348°42.05	36.23 37.14	120°24.52 134°50.58	7.1' 7.0'	24°37.06 24°43.40	6.3' 6.2'	57.6' 57.6'
12	348 42.05 3°42.18	37.14 \$09°38.05	134 50.58 149°16.56	6.9'	N24° 49.59	6.0'	57.6'
13	18°42.30	38.96	163° 42.45	6.8'	24°55.63	5.9'	57.6'
14	33°42.42	39.87	178°8.26	6.7'	25°1.53	5.8'	57.6'
15	48°42.54	• • 40.77	192°34.00	6.7'	25°7.28	5.6'	57.7'
16 17	63°42.66 78°42.79	41.68 42.59	206°59.66 221°25.24	6.6' 6.5'	25°12.89 25°18.34	5.5' 5.3'	57.7' 57.7'
18	93°42.91	42.59 \$09°43.49	221 25.24 235°50.74	6.4	N25°23.64	5.3	57.7'
19	108°43.03	44.40	$250^{\circ}16.17$	6.4	25°28.79	5.0'	57.7'
20	123°43.15	45.31	264°41.53	6.3'	25°33.79	4.8'	57.8'
21	138°43.27	• • 46.21	279°6.82	6.2'	25° 38.64	4.7'	57.8'
22 23	153°43.39 168°43.51	47.12 48.02	293°32.04 307°57.19	6.1' 6.1'	25° 43.33 25° 47.86	4.5' 4.4'	57.8' 57.8'
23			307 37.19			4.4	31.0
	SD = 16.0'	d = 0.9'		SL	O = 15.7'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-93%	
16	14:17	14:24	11:46	-:-	12:22		
17	14:30	14:37	11:45	00:47	13:13		
18	14:43	14:49	11:45	01:40	14:08		

October 19, 20, 21 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	27° 14.92	166°10.47 \$15°40.05	147°19.84 S 21°19.87	218°0.23 N05°42.47	3°41.07 N06°50.57	
1	42°17.38	181°9.89 41.08	162°20.43 20.25	233°2.25 42.28	18°43.72 50.50	Alpheratz 357°32.08
2	57° 19.84	196° 9.31 42.11	177°21.01 20.62	248°4.26 42.10	33°46.37 50.43	Ankaa 353°4.55 Schedar 349°27.84
3	$72^{\circ}22.31$	211°8.73 · · 43.14	192°21.60 · · 21.00	263°6.28 · · 41.92	48°49.02 · · 50.35	Diphda 348°44.72
4	87°24.77	226°8.15 44.16	207°22.19 21.38	278°8.30 41.74	63°51.67 50.28	Achernar 335°17.96
5	102°27.24	241°7.56 45.19	222°22.77 21.75	293°10.32 41.55	78°54.32 50.21	Hamal 327°48.27
6	117°29.70	256°6.98 \$15°46.22	237°23.36	308°12.33 N05°41.37	93°56.97 N06°50.14	Polaris 312°21.28
7	132°32.16	271°6.40 47.24	252°23.94 22.50	323°14.35 41.19	108° 59.62 50.07	Acamar 315° 9.67
8 9	147°34.63 162°37.09	286°5.81 48.27 301°5.23 · · 49.30	267°24.53 22.88 282°25.11 · · 23.25	338°16.37 41.01 353°18.39 • 40.82	124°2.27 49.99 139°4.92 •• 49.92	Menkar 314°3.47
10	102 37.09 177°39.56	301°5.23 · · 49.30 316°4.64 50.32	282°25.11 ·· 23.25 297°25.69 23.63	353°18.39 · · 40.82 8°20.40 40.64	139°4.92 · · 49.92 154°7.57 49.85	Mirfak 308°24.51
11	192° 42.02	331°4.06 51.34	312°26.28 24.00	23°22.42 40.46	169°10.22 49.78	Aldebaran 290°36.76
12	207° 44.49	346°3.47 \$15°52.37	327°26.86	38°24.44 N05°40.28	184°12.88 N06°49.71	Rigel 281°1.48
13	222°46.95	1°2.89 53.39	342°27.45 24.75	53°26.46 40.10	199° 15.53 49.63	Capella 280°18.24
14	237°49.41	16°2.30 54.41	357°28.03 25.12	68°28.47 39.91	214°18.18 49.56	Bellatrix 278°20.25
15	$252^{\circ}51.88$	31°1.71 · · 55.43	12°28.61 •• 25.49	83°30.49 · · 39.73	229°20.83 •• 49.49	Elnath 277°58.78 Alnilam 275°35.25
16	267°54.34	46°1.12 56.45	27°29.19 25.86	98°32.51 39.55	244°23.48 49.42	Betelgeuse 270°49.47
17	282°56.81	61°0.53 57.47	42°29.78 26.23	113°34.53 39.37	259°26.13 49.35	Canopus 263°51.18
18	297°59.27	75°59.95 \$15°58.49	57°30.36 S21°26.61	128°36.55 N05°39.19	274°28.78 N06°49.27	Sirius 258°24.14
19	313°1.74	90°59.36 15°59.51	72°30.94 26.98	143°38.57 39.00	289°31.43 49.20	Adhara 255°3.99
20	328°4.20	105°58.77 16°0.52 120°58.17 · · 1.54	87°31.52 27.35	158°40.59 38.82	304°34.08 49.13	Procyon 244°48.45
21 22	343°6.66 358°9.13		102°32.10 ·· 27.72 117°32.68 28.09	173°42.60 · · 38.64 188°44.62 38.46	319°36.73 · · 49.06 334°39.38	Pollux 243°14.54
23	13° 11.59	135°57.58 2.56 150°56.99 3.57	132°33.26 28.46	203°46.64 38.28	349°42.03 48.91	Avior 234°13.87
_						Suhail 222°44.77
Mer.	pass. 22:07	ν -0.6′ $d1.0$ ′ m-3.88	$ u 0.6' \ d0.4' \ m1.35$	$\nu 2.0' \ d$ -0.2' m-1.76	$ u 2.7' \ d$ -0.1' m0.09	Miaplacidus 221°38.06
						Alphard 217°45.66 Regulus 207°32.23
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°32.23 Dubhe 193°38.82
0	$28^{\circ}14.06$	165°56.40 \$16°4.59	147°33.84 S 21°28.83	218°48.66 N05°38.09	4°44.68 N06°48.84	Denebola 182°22.94
1	43° 16.52	180°55.81 5.60	162°34.42 29.20	233°50.68 37.91	19°47.33 48.77	Gienah 175°41.55
2	58° 18.98	195°55.21 6.61	177°35.00 29.57	248°52.70 37.73	34°49.98 48.70	Acrux 172°58.15
3 4	73°21.45 88°23.91	210°54.62 · · 7.63 225°54.03 8.64	192°35.58 ·· 29.93 207°36.16 30.30	263°54.72 · · 37.55 278°56.74 37.37	49°52.64 · · 48.63 64°55.29 48.55	Gacrux 171°49.61
5	103°26.38	240°53.43 9.65	207 30.10 30.30 222°36.74 30.67	293°58.76 37.19	79°57.94 48.48	Alioth 166°11.59
6	118° 28.84	255°52.84 \$16°10.66	237°37.32 S 21°31.04	309°0.78 N05°37.01	95°0.59 N06°48.41	Spica 158°20.23
7	133°31.31	270°52.24 11.67	252°37.89 31.41	324°2.80 36.82	110°3.24 48.34	Alkaid 152°50.75 Hadar 148°33.37
8	148°33.77	285°51.64 12.68	267°38.47 31.77	339°4.82 36.64	125°5.89 48.27	Menkent 147°55.31
9	163°36.23	300°51.05 · · 13.69	282°39.05 · · 32.14	354°6.84 · · 36.46	140°8.54 · · 48.20	Arcturus 145°46.19
10	178°38.70	315°50.45 14.69	297°39.63 32.51	9°8.86 36.28	155° 11.19 48.12	Rigil Kent. 139°37.77
11	193°41.16	330°49.85 15.70	312°40.20 32.87	24°10.88 36.10	170°13.84 48.05	Kochab 137°21.08
12 13	208° 43.63 223° 46.09	345°49.25 \$16°16.71 0°48.65 17.71	327°40.78	39°12.90 N05°35.92 54°14.92 35.74	185°16.49 N06°47.98 200°19.14 47.91	Zuben'ubi 136°53.82
14	238° 48.55	0°48.65 17.71 15°48.05 18.72	357°41.93 33.97	54°14.92 35.74 69°16.94 35.56	215°21.79 47.84	Alphecca 126°2.16
15	253°51.02	30°47.45 · · 19.72	12°42.51 · · 34.33	84°18.96 · · 35.37	230°24.44 · · 47.77	Antares 112°13.32
16	268° 53.48	45°46.85 20.72	27°43.08 34.70	99°20.98 35.19	245°27.09 47.69	Atria 107°5.83 Sabik 102°0.40
17	283°55.95	60°46.25 21.73	42°43.66 35.06	114°23.00 35.01	260°29.74 47.62	Shaula 96°7.52
18	298°58.41	75°45.65 \$16°22.73	57°44.23 S 21°35.42	129°25.02 N05°34.83	275°32.39 N06°47.55	Rasalhague 95°56.63
19	314°0.88	90°45.05 23.73	72°44.81 35.79	144°27.04 34.65	290°35.05 47.48	Eltanin 90°41.38
20	329°3.34	105°44.45 24.73	87°45.38 36.15	159°29.07 34.47 174°31.09 · · 34.29	305°37.70 47.41	Kaus Aust. 83°29.66
21 22	344°5.80 359°8.27	120°43.84 · · 25.73 135°43.24 26.73	102°45.95 · · 36.51 117°46.53 36.88	174°31.09 · · 34.29 189°33.11 34.11	320°40.35 · · 47.34 335°43.00 47.26	Vega 80°31.82
23	14° 10.73	150°42.64 27.73	117°46.53 36.88 132°47.10 37.24	204°35.13 33.93	335°43.00 47.26 350°45.65 47.19	Nunki 75°45.05
						Altair 61°57.76
Mer.	pass. 22:03	ν-0.6' d1.0' m-3.88	ν 0.6′ d0.4′ m1.35	ν2.0′ d-0.2′ m-1.76	ν2.7' d-0.1' m0.10	Peacock 53°2.13 Deneb 49°24.14
						Enif 33°36.42
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.86
0	29° 13.20	165°42.03 \$16°28.72	147°47.67 S 21°37.60	219°37.15 N05°33.75	5°48.30 N06°47.12	Fomalhaut 15°11.78
1	44° 15.66	180°41.43 29.72	162°48.25 37.96	234°39.17 33.57	20°50.95 47.05	Scheat 13°42.72
2	59° 18.13	195°40.82 30.72	177°48.82 38.32	249°41.20 33.39	35°53.60 46.98	Markab 13°27.39
3	74°20.59	210°40.22 · · 31.71	192°49.39 · · 38.68	264°43.22 · · 33.20	50°56.25 · · 46.91	Oct 19 Tue SHA
4	89°23.05 104°25.52	225°39.61 32.71 240°39.00 33.70	207°49.96 39.04 222°50.53 39.40	279°45.24 33.02	65°58.90 46.83 81°1.55 46.76	Oct 19 Tue SHA Venus 138°55.56
5 6	104° 25.52 119° 27.98	255°38.39 \$16°34.69	222°50.53 39.40 237°51.11 \$21°39.76	294°47.26 32.84 309°49.28 N05°32.66	81°1.55 46.76 96°4.20 N06°46.69	Mars 120°4.93
7	119 27.96 134°30.45	270°37.79 35.69	257 51.11 521 59.70 252°51.68 40.12	324°51.31 32.48	111°6.85 46.62	Jupiter 190°45.32
8	149°32.91	285°37.18 36.68	267°52.25 40.48	339°53.33 32.30	126°9.50 46.55	Saturn 336°26.15
9	164°35.37	300°36.57 · · 37.67	282°52.82 · · 40.84	354°55.35 · · 32.12	141°12.15 · · 46.48	0 - 20 - 24 - 1
10	179°37.84	315°35.96 38.66	297°53.39 41.20	9°57.38 31.94	156° 14.80 46.41	Oct 20 Wed SHA Venus 137°42.34
11	194°40.30	330°35.35 39.65	312°53.96 41.56	24°59.40 31.76	171°17.45 46.33	Venus 137°42.34 Mars 119°19.79
12	209° 42.77	345°34.74 \$16°40.64	327°54.53	40°1.42 N05°31.58	186°20.10 N06°46.26	Jupiter 190°34.60
13	224° 45.23	0°34.12 41.62	342°55.10 42.27	55°3.44 31.40	201°22.75 46.19	Saturn 336°30.63
14 15	239° 47.70 254° 50.16	15°33.51 42.61 30°32.90 · · 43.60	357°55.67 42.63 12°56.23 • 42.99	70°5.47 31.22 85°7.49 · · 31.04	216°25.40 46.12 231°28.05 • 46.05	
16	269° 52.62	45°32.29 44.58	27°56.80 43.34	100°9.51 30.86	246°30.70 45.98	Oct 21 Thu SHA Venus 136°28.84
17	284°55.09	60°31.67 45.57	42°57.37 43.70	115°11.54 30.68	261°33.36 45.91	Mars 118°34.48
18	299° 57.55	75°31.06 \$16°46.55	57°57.94 S 21°44.05	130°13.56 N05°30.50	276°36.01 N06°45.84	Jupiter 190°23.96
19	315°0.02	90°30.45 47.54	72°58.51 44.41	145°15.59 30.32	291°38.66 45.76	Saturn 336°35.10
20	330°2.48	105°29.83 48.52	87°59.07 44.76	160°17.61 30.14	306°41.31 45.69	Horizontal maraller
21	345°4.94	120°29.22 · · 49.50	102°59.64 · · 45.12	175°19.63 · · 29.96	321°43.96 · · 45.62	Horizontal parallax Venus:
22 23	0°7.41 15°9.87	135°28.60 50.48 150°27.98 51.46	118° 0.21 45.47 133° 0.77 45.83	190°21.66 29.78 205°23.68 29.60	336°46.61 45.55 351°49.26 45.48	Mars:
Wer.p	pass. 22:00	ν-0.6′ d1.0′ m-3.88	ν0.6′ d0.4′ m1.35	ν2.0′ d-0.2′ m-1.76	ν2.7' d-0.1' m0.10	

Dec 29°14.89 -42°9.20 56°41.61 -17°49.89 -57°5.62 $23^{\circ}35.78$ $89^{\circ}22.73$ -40°11.39 4°12.07 49°57.57 16°33.95 -8°10.03 $46^{\circ}1.40$ $6^{\circ}22.55$ $28^{\circ}37.78$ -1°10.95 $7^{\circ}24.78$ -52°42.31 -16°45.09 -29°0.36 5°9.24 27°57.41 -59°35.61 -43°32.45 -69°49.59 -8°46.66 11°49.85 61°35.84 $14^{\circ}24.99$ -17°41.70 $-63^{\circ}15.10$ -57°16.04 55°48.46 -11°18.32 49° 10.47 -60° 30.41 -36°30.35 $19^{\circ}2.33$ -60°57.03 $74^{\circ}2.49$ $-16^{\circ}9.37$ $26^{\circ}37.40$ -26°29.58 -69°4.74 $-15^{\circ}45.47$ $\text{-}37^{\circ}7.44$ $12^{\circ}32.58$ 51°29.39 -34°22.27 38°48.86 -26°15.68 8°56.74 -56°38.83 $45^{\circ}23.14$ $10^{\circ}0.40$ -46°49.59 -29°28.41 28°14.31 15°21.55 Mer.pass 12:56 14:10 09:27 23:41 Mer.pass 12:57 14:09 09:23 23:37 Mer.pass 12:58 14:08 09:20 23:33

 $0.1 \\ 0.1$

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°43.63	S09°48.93	322°22.27	6.0'	N25°52.24	4.2'	57.8'
1 2	198°43.75 213°43.86	49.83 50.74	336°47.29 351°12.24	6.0' 5.9'	25°56.46 26°0.52	4.1' 3.9'	57.8' 57.9'
3	228°43.98	51.64	5°37.13	5.8'	26° 4.42	3.7'	57.9'
4	243°44.10	52.55	20°1.96	5.8'	26°8.16	3.6'	57.9'
5	258°44.22 273°44.34	53.45 \$09° 54.36	34°26.73 48°51.45	5.7' 5.7'	26°11.74 N26°15.16	3.4' 3.3'	57.9' 57.9'
6 7	273 44.34 288°44.45	509 54.36 55.26	48 51.45 63°16.10	5.7° 5.6'	N26 15.16 26°18.41	3.1'	57.9 58.0'
8	303°44.57	56.16	77°40.71	5.6'	26°21.50	2.9'	58.0'
9	318°44.69	• • 57.07	92°5.26	5.5'	26°24.42	2.8'	58.0'
10 11	333°44.80 348°44.92	57.97 58.87	106°29.76 120°54.21	5.5' 5.4'	26°27.18 26°29.77	2.6' 2.4'	58.0' 58.0'
12	3°45.04	50.07 S09°59.77	135°18.62	5.4'	N26°32.19	2.3'	58.0'
13	18°45.15	10°0.67	$149^{\circ}42.98$	5.3'	$26^{\circ}34.45$	2.1'	58.1'
14	33°45.27 48°45.38	1.58	164°7.29 178°31.57	5.3' 5.2'	26°36.54 26°38.46	1.9'	58.1'
15 16	48 45.38 63°45.50	· · 2.48 3.38	178 31.57 192°55.81	5.2'	26°40.21	1.7' 1.6'	58.1' 58.1'
17	78°45.61	4.28	207°20.01	5.2'	26°41.79	1.4'	58.1'
18	93°45.73	\$10°5.18	221°44.17	5.1'	N26°43.20	1.2'	58.1'
19 20	108°45.84 123°45.95	6.08 6.98	236°8.30 250°32.40	5.1' 5.1'	26°44.44 26°45.50	1.1' 0.9'	58.2' 58.2'
21	138°46.07	• • 7.88	264°56.47	5.0'	26°46.40	0.9	58.2
22	153°46.18	8.78	$279^{\circ}20.51$	5.0'	$26^{\circ}47.12$	0.5'	58.2'
23	168°46.29	9.68	293°44.53	5.0'	26°47.67	0.4'	58.2'
	SD = 16.0'	d = 0.9'		SI	O = 15.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°46.41	S10°10.58	$308^{\circ}8.52$	5.0'	N26°48.04	0.2'	58.2'
1	198°46.52 213°46.63	11.48 12.38	322°32.49 336°56.44	5.0'	26°48.25	0.0' -0.1'	58.3' 58.3'
2	213°46.63 228°46.74	12.38	351°20.38	4.9' 4.9'	26°48.27 26°48.13	-0.1 -0.3	58.3'
4	243°46.85	14.17	5°44.30	4.9'	26°47.81	-0.5	58.3
5	258°46.96	15.07	20°8.20	4.9'	26°47.31	-0.7'	58.3'
6 7	273°47.08 288°47.19	\$10° 15.97 16.87	34°32.10 48°55.99	4.9' 4.9'	N26°46.65 26°45.80	-0.8' -1.0'	58.3' 58.3'
8	303°47.30	17.76	63°19.86	4.9'	26°44.78	-1.0	58.4'
9	318°47.41	• • 18.66	77°43.74	4.9'	26°43.59	-1.4'	58.4'
10 11	333°47.52 348°47.63	19.56 20.45	92°7.61 106°31.48	4.9' 4.9'	26°42.22 26°40.68	-1.5' -1.7'	58.4' 58.4'
12	3°47.74	20.45 \$10°21.35	100 31.46 120°55.35	4.9'	N26°38.96	-1.7	58.4
13	18°47.84	22.25	135°19.23	4.9'	26°37.07	-2.1'	58.4'
14	33°47.95	23.14	149°43.11	4.9'	26°35.00	-2.2'	58.4'
15 16	48°48.06 63°48.17	· · 24.04 24.93	164°7.00 178°30.89	4.9' 4.9'	26°32.76 26°30.35	-2.4' -2.6'	58.5' 58.5'
17	78°48.28	25.83	192°54.80	4.9'	26°27.76	-2.8'	58.5
18	93°48.38	\$10°26.72	207°18.72	4.9'	N26°25.00	-2.9'	58.5'
19 20	108°48.49 123°48.60	27.62 28.51	221°42.66 236°6.61	5.0' 5.0'	26°22.06 26°18.95	-3.1' -3.3'	58.5' 58.5'
21	138°48.71	. 29.40	250°30.59	5.0'	26°15.67	-3.5'	58.5
22	153°48.81	30.30	264°54.58	5.0'	$26^{\circ}12.21$	-3.6'	58.6'
23	168°48.92	31.19	279°18.60	5.0'	26°8.58	-3.8'	58.6'
	SD = 16.1'	d = 0.9'		SI	D = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.02	\$10°32.08	293°42.64	5.1'	N26° 4.78	-4.0'	58.6'
1 2	198°49.13 213°49.23	32.98 33.87	308°6.70 322°30.80	5.1' 5.1'	26°0.81 25°56.67	-4.1' -4.3'	58.6' 58.6'
3	228°49.34	• • 34.76	336°54.92	5.2'	25°52.36	-4.5	58.6
4	243°49.44	35.65	351°19.08	5.2'	25°47.88	-4.7'	58.6'
5 6	258°49.55 273°49.65	36.54 \$10°37.44	5°43.27 20°7.50	5.2' 5.3'	25°43.23 N25°38.41	-4.8' -5.0'	58.7' 58.7'
7	273 49.05 288°49.76	38.33	34°31.76	5.3'	25°33.42	-5.0 -5.2'	58.7'
8	303°49.86	39.22	48°56.06	5.3'	25°28.27	-5.3'	58.7'
9	318°49.96 333°50.06	· · 40.11 41.00	63°20.40 77°44.79	5.4' 5.4'	25°22.95 25°17.46	-5.5' -5.7'	58.7'
10 11	333°50.06 348°50.17	41.00 41.89	92°9.21	5.4 5.5'	25°17.46 25°11.81	-5.7° -5.8'	58.7' 58.7'
12	3°50.27	S10°42.78	106°33.68	5.5'	N25°5.99	-6.0'	58.8'
13	18°50.37 33°50.47	43.67	120°58.20 135°22.76	5.6'	25°0.02	-6.1'	58.8'
14 15	33°50.47 48°50.57	44.56 •• 45.45	135°22.76 149°47.38	5.6' 5.7'	24°53.87 24°47.57	-6.3' -6.5'	58.8' 58.8'
16	63°50.68	46.33	164°12.04	5.7'	24°41.10	-6.6'	58.8'
17	78°50.78	47.22	178°36.75	5.8'	24°34.48	-6.8'	58.8'
18 19	93°50.88 108°50.98	\$10°48.11 49.00	193°1.52 207°26.34	5.8' 5.9'	N24°27.69 24°20.75	-6.9' -7.1'	58.8' 58.8'
20	123°51.08	49.89	221°51.22	5.9'	24°13.65	-7.1°	58.9'
21	138°51.18	• • 50.77	236°16.15	6.0'	24°6.39	-7.4'	58.9'
22 23	153°51.28 168°51.37	51.66 52.55	250°41.14 265°6.19	6.0' 6.1'	23°58.98 23°51.42	-7.6' -7.7'	58.9' 58.9'
23	SD = 16.1'	d = 0.9'			O = 16.0'	1.1	33.3
	JD — 10.1	<u>u — 0.9</u>		JL	_ 10.0		

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

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

I			Sun		Moon			
	Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
ĺ	,	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
l		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-69%	
	19	14:55	15:00	11:45	02:37	15:06		
١	20	15:06	15:11	11:45	03:36	16:06		
١	21	15:16	15:21	11:45	04:36	17:06		

October 22, 23, 24 UT (Fri., Sat., Sun.)

h	Aries	Ven	us	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	30° 12.34	165°27.37		148°1.34	S21°46.18	220°25.71	N05°29.42	6°51.91	N06°45.41	Alpheratz	357°32.07	29°14.90
1	45° 14.80	180° 26.75	53.42	163°1.91	46.53	235°27.73	29.24	21°54.56	45.34	Ankaa	353°4.54	-42° 9.21
2	60° 17.27 75° 19.73	195°26.13 210°25.51	54.40 •• 55.38	178°2.47 193°3.04	46.89 •• 47.24	250°29.75 265°31.78	29.06 •• 28.89	36°57.21 51°59.86	45.27 •• 45.19	Schedar	349°27.83	$56^{\circ}41.63$
4	90°22.19	225° 24.89	56.36	208° 3.60	47.59	280°33.80	28.71	67°2.51	45.19	Diphda	348°44.71	-17°49.89
5	105°24.66	240°24.27	57.33	223°4.17	47.94	295°35.83	28.53	82°5.16	45.05	Achernar	335°17.96	-57° 5.63
6	120°27.12		S16°58.31	238° 4.73	S21°48.30	310°37.85	N05°28.35	97°7.81	N06°44.98	Hamal	327°48.26	23°35.79
7	135°29.59	270°23.03	$16^{\circ}59.28$	253°5.29	48.65	325°39.88	28.17	$112^{\circ}10.46$	44.91	Polaris Acamar	312°20.36 315°9.65	89°22.75 -40°11.40
8	150° 32.05	$285^{\circ}22.41$	$17^{\circ}0.26$	268° 5.86	49.00	340°41.90	27.99	127° 13.11	44.84	Menkar	314° 3.45	4°12.07
9	165°34.51	300°21.79	• • 1.23	283°6.42	• • 49.35	355°43.93	• • 27.81	142° 15.76	• • 44.77	Mirfak	308°24.48	49°57.58
10	180°36.98	315°21.16	2.20	298° 6.98	49.70	10°45.96	27.63	157° 18.41	44.70	Aldebaran	290°36.73	16°33.95
11 12	195°39.44 210°41.91	330°20.54 345°19.92	3.17 \$17° 4.15	313°7.55	50.05 \$21°50.40	25°47.98 40°50.01	27.45 N05°27.27	172°21.06 187°23.71	44.62 N06°44.55	Rigel	281°1.46	-8°10.03
13	210 41.91 225°44.37	0° 19.29	5.12	328° 8.11 343° 8.67	50.75	55°52.03	27.09	202°26.36	44.48	Capella	280°18.20	$46^{\circ}1.41$
14	240°46.84	15° 18.67	6.08	358° 9.23	51.10	70°54.06	26.91	217°29.01	44.41	Bellatrix	278°20.23	6°22.55
15	255°49.30	30°18.04	7.05	13°9.80	• • 51.45	85°56.08	26.74	232°31.66	• • 44.34	Elnath	277°58.75	28°37.79
16	$270^{\circ}51.76$	45°17.42	8.02	28°10.36	51.80	100°58.11	26.56	247°34.31	44.27	Alnilam	275°35.22	-1°10.95 7°24.77
17	$285^{\circ}54.23$	$60^{\circ}16.79$	8.99	43°10.92	52.14	$116^{\circ}0.14$	26.38	262°36.96	44.20	Betelgeuse Canopus	270°49.45 263°51.15	-52°42.32
18	300°56.69	75° 16.17	S17°9.95	58°11.48	S21°52.49	131°2.16	N05° 26.20	277°39.61	N06°44.13	Sirius	258°24.11	-32 42.32 -16°45.10
19	315°59.16	90°15.54	10.92	73°12.04	52.84	146°4.19	26.02	292°42.26	44.06	Adhara	255°3.97	-29°0.37
20	331°1.62	105° 14.91	11.88	88°12.60	53.19	161°6.22	25.84	307°44.91	43.99	Procyon	244°48.42	5°9.24
21	346°4.08	120° 14.28	12.85	103°13.16	53.53	176°8.24	•• 25.66	322°47.56	• • 43.91	Pollux	243°14.51	$27^{\circ}57.40$
22 23	1°6.55 16°9.01	135°13.65 150°13.02	13.81	118°13.72 133°14.28	53.88	191°10.27 206°12.30	25.48	337°50.21 352°52.86	43.84	Avior	234°13.83	-59°35.61
			14.77		54.23		25.31		43.77	Suhail	222°44.74	-43°32.45
Mer.	pass. 21:56	ν -0.6' d 1.0)′ m-3.88	$\nu 0.6' \ d0.$	4′ m1.35	$\nu 2.0' \ d-0$).2′ m-1.76	ν 2.7 $^{\prime}$ d-0	$.1^\prime$ m 0.11	Miaplacidus	221°38.01	-69°49.59
										Alphard	217°45.63	-8°46.67
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°32.20	11°49.84
0	31°11.48		S17°15.74	148°14.84	S21°54.57	221°14.32	N05° 25.13	7°55.51	N06°43.70	Dubne	193°38.78 182°22.92	61°35.82 14°24.98
1	$46^{\circ}13.94$	$180^{\circ}11.76$	16.70	163°15.40	54.92	$236^{\circ}16.35$	24.95	22°58.16	43.63	Gienah	175°41.53	-17°41.70
2	$61^{\circ}16.41$	$195^{\circ}11.13$	17.66	178°15.96	55.26	251°18.38	24.77	38°0.81	43.56	Acrux	172°58.12	-63°15.09
3	76° 18.87	210° 10.50	• • 18.62	193°16.52	•• 55.61	266°20.41	• • 24.59	53°3.46	• • 43.49	Gacrux	171°49.59	-57°16.03
4	91°21.33	225°9.87	19.58	208°17.07	55.95	281°22.43	24.41	68°6.11	43.42	Alioth	166°11.57	55°48.44
5	106° 23.80	240°9.24	20.53	223°17.63	56.29	296°24.46	24.24	83°8.76	43.35	Spica	158°20.22	-11°18.32
6 7	121° 26.26 136° 28.73	255°8.60 270°7.97	\$17°21.49 22.45	238°18.19 253°18.75	\$21°56.64 56.98	311°26.49 326°28.52	N05°24.06 23.88	98°11.41 113°14.06	N06°43.28 43.21	Alkaid	152°50.74	$49^{\circ}10.45$
8	150° 26.73 151° 31.19	285°7.34	23.40	268°19.30	57.32	341°30.54	23.70	113 14.00 128° 16.71	43.21	Hadar	148°33.35	-60°30.40
9	166° 33.65	300°6.70	• • 24.36	283°19.86	57.67	356°32.57	• • 23.52	143° 19.36	• • 43.07	Menkent	147°55.30	-36°30.35
10	181°36.12	315°6.07	25.31	298°20.42	58.01	11°34.60	23.34	158° 22.01	42.99	Arcturus	145°46.18	19° 2.32
11	196°38.58	330°5.43	26.26	313°20.97	58.35	26°36.63	23.17	173°24.66	42.92	Rigil Kent. Kochab	139°37.76 137°21.10	-60°57.02 74°2.47
12	211°41.05	345°4.79	S17°27.22	328°21.53	S21°58.69	41°38.66	N05°22.99	188°27.31	N06°42.85	Zuben'ubi	136°53.81	-16° 9.37
13	226°43.51	0°4.16	28.17	343°22.08	59.03	56°40.69	22.81	203°29.96	42.78	Alphecca	126° 2.16	26°37.39
14	241°45.97	15°3.52	29.12	358°22.64	59.38	71°42.71	22.63	218°32.61	42.71	Antares	112°13.32	-26°29.57
15	256° 48.44	30°2.88	• • 30.07	13°23.19	21°59.72	86°44.74	• • 22.46	233°35.26	• • 42.64	Atria	107° 5.85	-69° 4.74
16	271°50.90	45°2.24	31.02	28°23.75	22°0.06	101°46.77	22.28	248°37.90	42.57	Sabik	102°0.40	-15°45.47
17 18	286°53.37 301°55.83	60°1.61	31.97 \$17°32.92	43°24.30 58°24.86	0.40 \$22°0.74	116°48.80 131°50.83	22.10 N05°21.92	263° 40.55 278° 43.20	42.50 N06°42.43	Shaula	96°7.52	-37°7.44
19	316°58.30	90°0.33	33.86	73°25.41	1.07	146°52.86	21.74	293°45.85	42.36	Rasalhague	95°56.64	12°32.58
20	332°0.76	104° 59.69	34.81	88°25.96	1.41	161°54.89	21.57	308°48.50	42.29	Eltanin	90°41.40	51°29.38
21	347°3.22	119°59.04	35.75	103°26.52	. 1.75	176°56.92	21.39	323°51.15	• • 42.22	Kaus Aust.	83°29.67 80°31.84	-34°22.27 38°48.86
22	2°5.69	134°58.40	36.70	118°27.07	2.09	191°58.95	21.21	338°53.80	42.15	Vega Nunki	75°45.06	-26°15.68
23	17°8.15	$149^{\circ}57.76$	37.64	133°27.62	2.43	207°0.98	21.04	353°56.45	42.08	Altair	61°57.76	8°56.74
Mer	pass. 21:52	ν -0.6' d1.0)′ m-3.88	ν0 6' d0	3′ m1.35	v2 0' d-0	0.2' m-1.77	ν2 6' d-0	.1′ m0.12	Peacock	53°2.14	-56°38.83
- IVICI.	Pa33. 21.32	ν 0.0 d1.0						- V Z.O U C		Deneb	49°24.16	45°23.14
										Enif	33°36.42	10°0.40
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.86	-46°49.60
0	32° 10.62 47° 13.08	164°57.12 179°56.47	39.53	148°28.17 163°28.73	\$22°2.77	222°3.01	N05° 20.86 20.68	8°59.10	N06°42.01	Fomalhaut	15°11.78	-29°28.42
1 2	62° 15.54	194°55.83	40.47	178° 29.28	3.10 3.44	237°5.04 252°7.07	20.50	24°1.75 39°4.40	41.94 41.87	Scheat	13°42.72	28°14.32
3	77° 18.01	209°55.19	• • 41.41	193°29.83	• • 3.78	267°9.10	. 20.33	54°7.05	. 41.79	Markab	13°27.39	15°21.55
4	92° 20.47	224°54.54	42.35	208°30.38	4.11	282°11.13	20.15	69°9.70	41.72	Oct 22 Fri	SHA	Mer.pass
5	107°22.94	239°53.90	43.29	223°30.93	4.45	297°13.16	19.97	84°12.35	41.65	Venus	135°15.03	12:59
6	122°25.40		S17°44.23	238°31.48	S22°4.78	312°15.19	N05° 19.79	99° 15.00	N06°41.58		$117^{\circ}49.00$	14:07
7	137° 27.86	269° 52.60	45.16	253°32.03	5.12	327°17.22	19.62	114° 17.65	41.51	Jupiter	190°13.37	09:17
8	152°30.33	284°51.96	46.10	268°32.58	5.45	342°19.25	19.44	129°20.30	41.44	Saturn	336°39.57	23:28
9	167°32.79	299°51.31	• • 47.04	283°33.13	• • 5.79	357°21.28	• • 19.26	144°22.94	• • 41.37	Oct 23 Sat	SHA	Mer.pass
10	182°35.26	314°50.66	47.97	298°33.68	6.12	12°23.31	19.09	159°25.59	41.30	Venus	134°0.92	13:00
11	197° 37.72	329°50.01	48.91	313°34.23	6.46	27°25.34	18.91	174°28.24	41.23	Mars	117°3.36	14:06
12 13	212° 40.19 227° 42.65	344°49.36 359°48.71	\$17°49.84 50.77	328°34.78 343°35.33	\$22°6.79 7.12	42°27.37 57°29.41	N05° 18.73 18.56	189°30.89 204°33.54	N06°41.16 41.09	Jupiter	190°2.85	09:14
14	242° 45.11	14° 48.06	50.77 51.70	343 35.33 358°35.88	7.12 7.45	72°31.44	18.38	204 33.54 219°36.19	41.09	Saturn	336°44.03	23:24
15	257° 47.58	29° 47.41	• 52.64	13°36.42	• • 7.79	87°33.47	18.20	219 30.19 234°38.84	• • 40.95	Oct 24 Sun	SHA	Mer.pass
16	272°50.04	44°46.76	53.57	28°36.97	8.12	102°35.50	18.03	249°41.49	40.88	Venus	3HA 132°46.50	13:01
17	287°52.51	59°46.11	54.49	43°37.52	8.45	117°37.53	17.85	264°44.14	40.81	Mars	132 40.50 116°17.56	14:06
18	302°54.97		S17°55.42	58°38.07	S22°8.78	132°39.56	N05° 17.67	279°46.79	N06°40.74	I	189°52.39	09:11
19	$317^{\circ}57.43$	89°44.80	56.35	73°38.61	9.11	147°41.60	17.50	294°49.44	40.67	Saturn	336°48.49	23:20
20	332° 59.90	104°44.15	57.28	88°39.16	9.44	162°43.63	17.32	309°52.08	40.60			
21	348°2.36	119°43.50	58.20	103°39.71	• • 9.77	177°45.66	• • 17.15	324°54.73	• • 40.53	Horizoi	ntal parallax	0.1
22	3°4.83	134° 42.84	17°59.13	118°40.25	10.10	192°47.69	16.97	339°57.38	40.46		Venus: Mars:	0.1 0.1
23	18°7.29	149°42.19	18° 0.05	133°40.80	10.43	207°49.73	16.79	355°0.03	40.39		iviars:	0.1
Mer.	pass. 21:48	ν -0.6′ d 0.9	9′ m-3.88	ν 0.6′ d0.	3′ m1.34	ν 2.0′ d-0).2′ m-1.77	ν 2.6′ d-0	.1′ m0.13			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.47	S10°53.43	279°31.30	6.2'	N23°43.70	-7.9'	58.9'
1	198°51.57	54.32	293°56.47	6.2'	23°35.82	-8.0'	58.9'
2	213°51.67 228°51.77	55.21 •• 56.09	308°21.70 322°47.00	6.3'	23°27.80 23°19.63	-8.2'	58.9'
3 4	243°51.87	· · 56.09 56.98	322 47.00 337°12.35	6.4' 6.4'	23 19.03 23°11.31	-8.3' -8.5'	58.9' 58.9'
5	258° 51.96	57.86	351°37.77	6.5	23°2.84	-8.6'	59.0'
6	273°52.06	\$10°58.75	6°3.26	6.6'	N22°54.22	-8.8'	59.0'
7	288°52.16	$10^{\circ}59.63$	$20^{\circ}28.81$	6.6'	$22^{\circ}45.46$	-8.9'	59.0'
8	303°52.25	11°0.51	34°54.43	6.7'	22°36.55	-9.0'	59.0'
9	318°52.35	• 1.40	49°20.11	6.8'	22°27.50	-9.2'	59.0'
10 11	333°52.44 348°52.54	2.28 3.17	63°45.86 78°11.69	6.8' 6.9'	22°18.31 22°8.98	-9.3' -9.5'	59.0' 59.0'
12	3°52.63	\$11° 4.05	92°37.58	7.0'	N21°59.51	-9.6'	59.0'
13	18°52.73	4.93	107°3.53	7.0'	21°49.90	-9.7'	59.0'
14	33°52.82	5.81	$121^{\circ}29.56$	7.1'	21°40.15	-9.9'	59.1'
15	48°52.92	• • 6.70	135°55.66	7.2'	21°30.27	-10.0'	59.1'
16	63°53.01	7.58	150°21.83	7.2'	21°20.25	-10.1'	59.1'
17 18	78°53.11 93°53.20	8.46 \$11° 9.34	164°48.07 179°14.38	7.3' 7.4'	21°10.10 N20°59.82	-10.3' -10.4'	59.1' 59.1'
19	108° 53.29	10.22	179 14.36 193°40.77	7.5'	20°49 41	-10.4 -10.5'	59.1'
20	123°53.38	11.10	208°7.22	7.5'	20°38.87	-10.7	59.1
21	138°53.48	• • 11.98	222°33.75	7.6'	20°28.20	-10.8'	59.1'
22	153° 53.57	12.86	237°0.35	7.7'	20°17.41	-10.9'	59.1'
23	168°53.66	13.74	251°27.02	7.7'	20°6.49	-11.0'	59.1'
	SD = 16.1'	d = 0.9'		SI	D = 16.1'		
C L	СПУ	Daa	CUA		Dec	d	HP
Sat 0	GHA 183°53.75	Dec \$11°14.62	GHA 265°53.77	ν 7.8'	Dec N19°55.44	d -11.2'	HP 59.1'
1	198°53.84	15.50	280°20.58	7.8 7.9'	19°44.28	-11.2	59.1 59.2'
2	213°53.93	16.38	294°47.47	8.0'	19°32.99	-11.4'	59.2'
3	228°54.02	• • 17.26	$309^{\circ}14.43$	8.0'	19°21.59	-11.5'	59.2'
4	243°54.11	18.14	323°41.46	8.1'	19°10.06	-11.6'	59.2'
5	258° 54.20 273° 54.29	19.02 \$11°19.89	338° 8.57 352° 35.75	8.2' 8.2'	18°58.42 N18°46.67	-11.8'	59.2' 59.2'
6 7	273 54.29 288°54.38	20.77	35∠ 35.75 7°3.00	8.3'	18°34.80	-11.9' -12.0'	59.2'
8	303°54.47	21.65	21°30.32	8.4	18°22.82	-12.1'	59.2'
9	318° 54.56	22.53	35°57.71	8.5'	18°10.73	-12.2'	59.2'
10	333°54.65	23.40	50°25.17	8.5'	$17^{\circ}58.53$	-12.3'	59.2'
11	348°54.74	24.28	64°52.71	8.6'	17°46.22	-12.4'	59.2'
12	3°54.83	S11°25.16	79°20.31	8.7'	N17°33.81	-12.5'	59.2'
13 14	18° 54.91 33° 55.00	26.03 26.91	93°47.99 108°15.74	8.7' 8.8'	17°21.29 17°8.67	-12.6' -12.7'	59.3' 59.3'
15	48°55.09	27.78	122°43.55	8.9'	16°55.94	-12.7	59.3'
16	63°55.17	28.66	137°11.44	9.0'	16°43.12	-12.9'	59.3'
17	78°55.26	29.53	151°39.39	9.0'	16°30.20	-13.0'	59.3'
18	93°55.35	S11°30.41	166°7.41	9.1'	N16°17.17	-13.1'	59.3'
19	108°55.43	31.28	180°35.50	9.2'	16°4.06	-13.2'	59.3'
20 21	123°55.52 138°55.60	32.15 · · 33.03	195°3.65 209°31.88	9.2' 9.3'	15°50.85 15°37.54	-13.3' -13.4'	59.3' 59.3'
22	150 55.00 153°55.69	33.90	209 31.00 224° 0.17	9.3 9.4'	15° 24.15	-13.4	59.3'
23	168°55.77	34.77	238°28.52	9.4'	15°10.66	-13.6'	59.3'
	SD = 16.1'	d = 0.9'		SI	D = 16.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°55.85 198°55.94	S11°35.65 36.52	252°56.94 267°25.42	9.5' 9.5'	N14°57.09 14°43.43	-13.7' -13.7'	59.3'
2	213° 56.02	36.52 37.39	267 25.42 281°53.97	9.5'	14°43.43 14°29.68	-13.7 -13.8'	59.3' 59.3'
3	228° 56.10	• • 38.26	296°22.58	9.7'	14° 25.85	-13.9'	59.3'
4	243°56.19	39.13	$310^{\circ}51.25$	9.7'	14°1.94	-14.0'	59.3'
5	258° 56.27	40.00	325°19.98	9.8'	13°47.94	-14.1'	59.4'
6	273°56.35	S11°40.87	339°48.77	9.9'	N13°33.87	-14.2'	59.4'
7	288° 56.43 303° 56.52	41.74 42.61	354°17.63 8°46.54	9.9' 10.0'	13°19.72 13°5.49	-14.2' -14.3'	59.4' 59.4'
8 9	303°56.52 318°56.60	42.61 •• 43.48	8°46.54 23°15.51	10.0'	13°5.49 12°51.19	-14.3' -14.4'	59.4' 59.4'
10	333°56.68	44.35	37°44.53	10.1	12°36.82	-14.4'	59.4'
11	348° 56.76	45.22	52°13.62	10.1'	12°22.37	-14.5'	59.4'
12	3°56.84	S11°46.09	66°42.76	10.2'	N12°7.86	-14.6'	59.4'
13	18°56.92	46.96	81°11.95	10.2'	11°53.27	-14.7'	59.4'
14	33°57.00	47.83	95°41.20	10.3'	11°38.62 11°23.90	-14.7'	59.4'
15 16	48° 57.08 63° 57.16	· · 48.70 49.56	110°10.50 124°39.85	10.4' 10.4'	11°23.90 11°9.12	-14.8' -14.8'	59.4' 59.4'
17	78° 57.24	50.43	139° 9.26	10.4	10°54.28	-14.6 -14.9'	59.4'
18	93°57.31	S11°51.30	153°38.71	10.5'	N10°39.37	-15.0'	59.4'
19	108°57.39	52.17	168°8.21	10.6'	10°24.41	-15.0'	59.4'
20	123°57.47	53.03	182°37.77	10.6'	10°9.39	-15.1'	59.4'
21	138° 57.55 153° 57.62	· · 53.90	197°7.37 211°37.01	10.6'	09°54.31 09°39.17	-15.1'	59.4'
22 23	153°57.62 168°57.70	54.76 55.63	211°37.01 226°6.70	10.7' 10.7'	09°39.17 09°23.99	-15.2' -15.2'	59.4' 59.4'
23	SD = 16.1'	d = 0.9'			D = 16.2'	19.4	33.7
	JD = 10.1	u = 0.9	-	31	J = 10.2°		

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

Lat.	Moonrise			Moonset		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°		21:09			17:11	16:08
N 70°		21:49			16:29	15:51
68°	19:33	22:16		16:50	16:01	15:37
66°	20:21	22:36		16:01	15:39	15:25
64°	20:52	22:52		15:29	15:22	15:15
62°	21:14	23:05		15:06	15:07	15:07
60°	21:32	23:17		14:47	14:55	15:00
N 58°	21:48	23:26		14:31	14:44	14:53
56°	22:00	23:35		14:17	14:35	14:48
54°	22:12	23:42		14:05	14:27	14:42
52°	22:21	23:49		13:55	14:19	14:38
50°	22:30	23:55		13:46	14:12	14:34
45°	22:49		80:00	13:26	13:58	14:24
N 40°	23:04		00:18	13:10	13:46	14:17
35°	23:16		00:27	12:56	13:35	14:10
30°	23:27		00:35	12:44	13:26	14:04
20°	23:46		00:49	12:23	13:11	13:54
$N 10^{\circ}$		00:03	01:00	12:05	12:57	13:44
0°		00:18	01:11	11:48	12:44	13:36
S 10°		00:33	01:22	11:31	12:30	13:27
20°		00:49	01:34	11:13	12:16	13:18
30°	00:22	01:07	01:47	10:52	12:00	13:07
35°	00:36	01:18	01:55	10:39	11:50	13:01
40°	00:51	01:30	02:03	10:25	11:39	12:53
45°	01:09	01:45	02:13	10:07	11:26	12:45
S 50°	01:32	02:02	02:26	09:46	11:10	12:35
52°	01:42	02:10	02:31	09:36	11:03	12:30
54°	01:55	02:19	02:37	09:24	10:54	12:25
56°	02:08	02:30	02:44	09:11	10:45	12:19
58°	02:25	02:41	02:52	08:55	10:34	12:12
S 60°	02:44	02:55	03:00	08:36	10:21	12:05

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-36%
22	15:26	15:31	11:44	05:35	18:03	
23	15:35	15:39	11:44	06:31	18:58	
24	15:43	15:47	11:44	07:24	19:49	

October 25, 26, 27 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	33°9.75	164°41.53 \$18°0.98	148°41.34	222°51.76 N05°16.62	10°2.68 N06°40.32	
1	48° 12.22	179°40.88 1.90	163°41.89 11.09	237°53.79 16.44	25°5.33 40.25	Alpheratz 357°32.08 29°14.91 Ankaa 353°4.55 -42°9.22
2	63° 14.68	194°40.22 2.82	178°42.43 11.42	252°55.82 16.26	40°7.98 40.18	Schedar 349°27.84 56°41.64
3	78° 17.15	209°39.56 · · 3.74	193°42.98 · · 11.75	267°57.86 · · 16.09	55°10.63 · · 40.11	Diphda 348°44.71 -17°49.90
4	93° 19.61	224°38.90 4.66	208°43.52 12.08	282°59.89 15.91	70°13.28 40.04	Achernar 335°17.95 -57°5.65
5 6	108° 22.07 123° 24.54	239°38.25 5.58 254°37.59 \$18°6.50	223°44.07 12.40 238°44.61 \$22°12.73	298°1.92 15.74 313°3.96 N05°15.56	85°15.92 39.97 100°18.57 N06°39.90	Hamal 327°48.25 23°35.79
7	138°27.00	269°36.93 7.42	253°45.15 13.06	328°5.99 15.38	115°21.22 39.83	Polaris 312°19.77 89°22.76
8	153°29.47	284°36.27 8.34	268°45.70 13.38	343°8.02 15.21	130° 23.87 39.76	Acamar 315°9.64 -40°11.42
9	168°31.93	299°35.61 · · 9.25	283°46.24 · · 13.71	358°10.06 · · 15.03	145°26.52 · · 39.69	Menkar 314°3.44 4°12.07 Mirfak 308°24.46 49°57.60
10	183°34.39	314°34.95 10.17	298°46.78 14.03	13°12.09 14.86	160°29.17 39.62	Aldebaran 290°36.72 16°33.95
11	198°36.86	329°34.28 11.09	313°47.33 14.36	28°14.13 14.68	175°31.82 39.55	Rigel 281°1.44 -8°10.04
12 13	213° 39.32 228° 41.79	344°33.62 \$18°12.00 359°32.96 12.91	328°47.87	43°16.16 N05°14.51 58°18.19 14.33	190°34.46 N06°39.48 205°37.11 39.41	Capella 280°18.18 46°1.41
14	243° 44.25	14°32.30 13.82	343°48.41 15.01 358°48.95 15.33	58°18.19 14.33 73°20.23 14.16	205°37.11 39.41 220°39.76 39.34	Bellatrix 278°20.21 6°22.55
15	258° 46.71	29°31.63 · · 14.74	13°49.49 · · 15.66	88°22.26 · · 13.98	235°42.41 · · 39.27	Elnath 277°58.73 28°37.79
16	273°49.18	44°30.97 15.65	28°50.03 15.98	103°24.30 13.80	250°45.06 39.20	Alnilam 275°35.21 -1°10.96
17	288°51.64	59°30.30 16.56	43°50.57 16.30	118°26.33 13.63	265°47.71 39.13	Betelgeuse 270°49.43 7°24.77 Canopus 263°51.12 -52°42.33
18	303°54.11	74°29.64 \$18°17.47	58°51.11 S22°16.63	133°28.37 N05°13.45	280°50.36 N06°39.06	Sirius 258°24.09 -16°45.10
19	318° 56.57	89°28.97 18.37	73°51.65 16.95	148°30.40 13.28	295°53.00 38.99	Adhara 255°3.94 -29°0.37
20 21	333°59.04 349°1.50	104°28.31 19.28 119°27.64 · · 20.19	88°52.19 17.27 103°52.73 · · 17.59	163°32.44 13.10 178°34.47 •• 12.93	310°55.65 38.92 325°58.30 · · 38.85	Procyon 244°48.39 5°9.23
22	4°3.96	134°26.97 21.09	118°53.27 17.92	193°36.51 12.75	341°0.95 38.78	Pollux 243°14.48 27°57.40
23	19°6.43	149°26.30 22.00	133°53.81 18.24	208°38.54 12.58	356°3.60 38.71	Avior 234°13.79 -59°35.61
		ν-0.7' d0.9' m-3.88		ν2.0' d-0.2' m-1.77		Suhail 222°44.71 -43°32.45 Miaplacidus 221°37.96 -69°49.58
ivier.	pass. 21:44	ν-υ.ι αυ.9 m-3.88	$\nu 0.5' \ d0.3' \ m1.34$	ν2.υ α-υ.2 m-1.//	ν2.6' d-0.1' m0.14	Alphard 217°45.61 -8°46.67
	_					Regulus 207°32.18 11°49.84
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.75 61°35.81
0	34°8.89	164°25.63 \$18°22.90	148°54.35 \$22°18.56	223°40.58 N05°12.40	11°6.25 N06°38.64	Denebola 182°22.90 14°24.97
1 2	49° 11.36 64° 13.82	179°24.97 23.80 194°24.30 24.71	163°54.89 18.88 178°55.43 19.20	238° 42.61 12.23 253° 44.65 12.05	26°8.89 38.58 41°11.54 38.51	Gienah 175°41.52 -17°41.70
3	79° 16.28	209°23.63 · · 25.61	193°55.97 · · 19.52	268°46.69 · · 11.88	56°14.19 · · 38.44	Acrux 172°58.11 -63°15.08
4	94° 18.75	224°22.96 26.51	208°56.50 19.84	283°48.72 11.70	71°16.84 38.37	Gacrux 171°49.58 -57°16.02
5	$109^{\circ}21.21$	239°22.28 27.41	223°57.04 20.16	298°50.76 11.53	86°19.49 38.30	Alioth 166°11.56 55°48.42 Spica 158°20.21 -11°18.32
6	124°23.68	254°21.61 \$18°28.31	238°57.58 S 22°20.47	313°52.79 N05°11.35	101°22.13 N06°38.23	Alkaid 152°50.73 49°10.43
7	139°26.14	269°20.94 29.21	253°58.11 20.79	328°54.83 11.18	116°24.78 38.16	Hadar 148°33.35 -60°30.39
8	154°28.60	284°20.27 30.10	268°58.65 21.11	343°56.87 11.01	131°27.43 38.09	Menkent 147°55.30 -36°30.34
9 10	169° 31.07 184° 33.53	299°19.59 · · 31.00 314°18.92	283°59.19 · · 21.43 298°59.72 21.75	358°58.90 · · 10.83 14°0.94 10.66	146°30.08 · · 38.02 161°32.73 37.95	Arcturus 145°46.18 19°2.30
11	199°36.00	329°18.24 32.79	314°0.26 22.06	29°2.98 10.48	176°35.37 37.88	Rigil Kent. 139°37.76 -60°57.00
12	214°38.46	344°17.57 \$18°33.68	329°0.79 S 22°22.38	44°5.01 N05°10.31	191°38.02 N06°37.81	Kochab 137°21.11 74°2.45 Zuben'ubi 136°53.81 -16°9.37
13	229°40.92	359°16.89 34.58	344°1.33 22.69	59°7.05 10.13	206°40.67 37.74	Zuben'ubi 136°53.81 -16°9.37 Alphecca 126°2.16 26°37.38
14	244°43.39	14°16.22 35.47	359°1.86 23.01	74°9.09 9.96	221°43.32 37.67	Antares 112°13.33 -26°29.57
15	259° 45.85	29°15.54 · · 36.36	14°2.40 · · 23.33	89°11.13 · · 9.79	236°45.96 · · 37.60	Atria 107°5.88 -69°4.73
16	274° 48.32 289° 50.78	44°14.86 37.25	29°2.93 23.64	104°13.16 9.61	251°48.61 37.53	Sabik 102°0.41 -15°45.48
17 18	289 50.78 304°53.24	59°14.19 38.14 74°13.51 \$18°39.03	44°3.47 23.96 59°4.00 \$22°24.27	119°15.20 9.44 134°17.24 N05°9.26	266°51.26 37.47 281°53.91 N06°37.40	Shaula 96°7.53 -37°7.43
19	319°55.71	89°12.83 39.92	74°4.53 24.58	149°19.28 9.09	296° 56.55 37.33	Rasalhague 95°56.65 12°32.57
20	334°58.17	104°12.15 40.80	89°5.07 24.90	164°21.32 8.92	311°59.20 37.26	Eltanin 90°41.42 51°29.37 Kaus Aust. 83°29.68 -34°22.27
21	350°0.64	119°11.47 · · 41.69	104°5.60 · · 25.21	179°23.35 · · 8.74	327°1.85 · · 37.19	Kaus Aust. 83°29.68 -34°22.27 Vega 80°31.86 38°48.85
22	5°3.10	134°10.79 42.57	119°6.13 25.52	194°25.39 8.57	342°4.50 37.12	Nunki 75°45.07 -26°15.68
23	20°5.56	149°10.11 43.46	134°6.67 25.84	209°27.43 8.39	357°7.14 37.05	Altair 61°57.78 8°56.73
Mer.	pass. 21:40	ν-0.7' d0.9' m-3.88	ν0.5′ d0.3′ m1.34	ν2.0' d-0.2' m-1.78	ν2.6' d-0.1' m0.14	Peacock 53°2.17 -56°38.83
						Deneb 49°24.18 45°23.14
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.43 10°0.40
0	35°8.03	164°9.43 \$18°44.34	149°7.20 \$22°26.15	224°29.47 N05°8.22	12°9.79 N06°36.98	Al Na'ir 27°29.88 -46°49.61 Fomalhaut 15°11.79 -29°28.43
1	$50^{\circ}10.49$	179°8.74 45.22	164°7.73 26.46	239°31.51 8.05	27°12.44 36.91	Scheat 13°42.73 28°14.32
2	65° 12.96	194°8.06 46.11	179°8.26 26.77	254°33.55 7.87	42°15.09 36.84	Markab 13°27.39 15°21.56
3	80° 15.42	209°7.38 · · 46.99 224°6.69 47.87	194°8.79 · · 27.08	269°35.59 · · 7.70	57°17.73 · · 36.77	Oct 25 Mon SHA Mer.pass
4 5	95° 17.88 110° 20.35	224°6.69 47.87 239°6.01 48.75	209° 9.32 27.39 224° 9.85 27.70	284°37.62 7.53 299°39.66 7.35	72°20.38 36.71 87°23.03 36.64	Venus 131°31.78 13:02
6	110 20.35 125°22.81	254°5.32 \$18°49.63	239°10.38 \$22°28.01	299 39.00 7.35 314°41.70 N05°7.18	102°25.68 N06°36.57	Mars 115° 31.59 14:05
7	140°25.28	269°4.64 50.50	254°10.91 28.32	329°43.74 7.01	117°28.32 36.50	Jupiter 189°42.00 09:07
8	155°27.74	284°3.95 51.38	269°11.44 28.63	344°45.78 6.83	132°30.97 36.43	Saturn 336°52.93 23:16
9	170°30.20	299°3.27 · · 52.26	284°11.97 · · 28.94	359°47.82 · · 6.66	147°33.62 · · 36.36	Oct 26 Tue SHA Mer.pass
10	185°32.67	314°2.58 53.13	299°12.50 29.25	14°49.86 6.49	162°36.26 36.29	Venus 130°16.74 13:03
11	200°35.13 215°37.60	329°1.89 54.00 344°1.20 \$18°54.88	314°13.03 29.56 329°13.56 \$22°29.87	29°51.90 6.31 44°53.94 N05°6.14	177°38.91 36.22 192°41.56 N06°36.15	Mars 114°45.46 14:04
12 13	215° 37.60 230° 40.06	344°1.20 \$18°54.88 359°0.52 55.75	329°13.56	44°53.94 N05°6.14 59°55.98 5.97	192°41.56 N06°36.15 207°44.21 36.09	Jupiter 189°31.69 09:04
14	245° 42.52	13°59.83 56.62	359°14.62 30.48	74°58.02 5.79	222°46.85 36.02	Saturn 336°57.35 23:11
15	260° 44.99	28°59.14 · · 57.49	14°15.15 · · 30.79	90°0.06 · · 5.62	237°49.50 · · 35.95	Oct 27 Wed SHA Mer.pass
16	275° 47.45	43°58.45 58.36	29°15.67 31.09	105°2.10 5.45	252°52.15 35.88	Venus 129°1.40 13:04
17	290°49.92	58°57.76 18°59.23	44°16.20 31.40	120°4.14 5.27	267°54.79 35.81	Mars 113°59.17 14:03
18	305° 52.38 320° 54.85	73°57.06 \$19°0.10 88°56.37 0.97	59°16.73 S22°31.71 74°17.25 32.01	135°6.18 N05°5.10 150°8.22 4.93	282°57.44 N06°35.74 298°0.09 35.67	Jupiter 189°21.44 09:01
19 20	320°54.85 335°57.31	88° 56.37 0.97 103° 55.68 1.83	74°17.25 32.01 89°17.78 32.32	150°8.22 4.93 165°10.27 4.76	313°2.73 35.61	Saturn 337°1.76 23:07
21	350° 59.77	118°54.99 · · 2.70	104°18.31 · · 32.62	180°12.31 · · 4.58	328°5.38 · · 35.54	Horizontal parallax
22	6°2.24	133°54.29 3.56	119°18.83 32.92	195°14.35 4.41	343°8.03 35.47	Venus: 0.1
23	21°4.70	148°53.60 4.42	134°19.36 33.23	210°16.39 4.24	358° 10.67 35.40	Mars: 0.1
Mer.ı	pass. 21:36	ν-0.7' d0.9' m-3.88	ν0.5′ d0.3′ m1.34	ν2.0' d-0.2' m-1.78	$\nu 2.6' \ d$ -0.1' m0.15	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.78	S11°56.49	240°36.44	10.8'	N09°8.75	-15.3'	59.4'
1	198°57.85	57.36	255°6.21	10.8'	08°53.46	-15.3'	59.4'
2	213°57.93	58.22	269°36.03	10.9'	08°38.12	-15.4'	59.4'
3	228°58.01	11°59.09	284°5.90	10.9'	08°22.74	-15.4'	59.4'
4 5	243°58.08 258°58.16	11°59.95 0.82	298°35.80 313°5.74	10.9' 11.0'	08°7.31 07°51.83	-15.5' -15.5'	59.4' 59.4'
6	273°58.23	512°1.68	327°35.72	11.0'	N07°36.32	-15.6'	59.4
7	288°58.31	2.54	342°5.73	11.1'	07°20.76	-15.6'	59.4'
8	303°58.38	3.40	356°35.78	11.1'	07°5.16	-15.6'	59.4'
9	318°58.45	• • 4.27	11°5.87	11.1'	06°49.53	-15.7'	59.4'
10	333°58.53	5.13	25°35.99	11.2'	06°33.86	-15.7'	59.4'
11	348°58.60 3°58.67	5.99 \$12°6.85	40°6.14 54°36.33	11.2' 11.2'	06°18.15 N06°2.41	-15.7' -15.8'	59.4' 59.4'
12 13	3 58.07 18°58.74	7.71	54 30.33 69°6.54	11.2'	05°46.64	-15.8'	59.4 59.4'
14	33°58.82	8.57	83°36.79	11.3'	05°30.84	-15.8'	59.4'
15	48°58.89	9.43	98°7.06	11.3'	05°15.01	-15.9'	59.4'
16	63°58.96	10.29	$112^{\circ}37.36$	11.3'	04°59.15	-15.9'	59.4'
17	78°59.03	11.15	127°7.68	11.3'	04°43.26	-15.9'	59.4'
18	93°59.10	S12°12.01	141°38.03	11.4'	N04°27.36	-15.9'	59.4'
19	108°59.17	12.87	156°8.40	11.4'	04°11.43	-16.0'	59.4
20 21	123°59.24 138°59.31	13.73 •• 14.59	170°38.80 185°9.22	11.4' 11.4'	03°55.48 03°39.50	-16.0' -16.0'	59.4' 59.4'
22	150 59.31 153°59.38	15.45	105 9.22 199°39.66	11.5'	03°23.52	-16.0'	59.4'
23	168°59.45	16.30	214°10.11	11.5'	03°7.51	-16.0'	59.4
	SD = 16.1'	d = 0.9'			D = 16.2'		
	JD — 10.1	u = 0.9		اد	J — 10.2°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.52	S12°17.16	228°40.59	11.5'	N02°51.49	-16.0'	59.4'
1	198°59.59	18.02	243°11.08	11.5'	02°35.46	-16.0'	59.4
2	213°59.66 228°59.72	18.88 •• 19.73	257°41.59 272°12.11	11.5' 11.5'	02°19.41 02°3.35	-16.1' -16.1'	59.4' 59.4'
3 4	243°59.79	20.59	272 12.11 286°42.64	11.5'	02 3.35 01°47.29	-16.1	59.4'
5	258°59.86	21.44	301°13.19	11.6'	01°31.22	-16.1	59.3'
6	273°59.93	S12°22.30	315°43.75	11.6'	N01°15.14	-16.1'	59.3'
7	288°59.99	23.16	$330^{\circ}14.32$	11.6'	00°59.06	-16.1'	59.3'
8	304°0.06	24.01	344°44.90	11.6'	00°42.97	-16.1'	59.3'
9	319°0.12	• • 24.86	359°15.49	11.6'	00°26.88	-16.1'	59.3'
10 11	334° 0.19 349° 0.26	25.72 26.57	13°46.08 28°16.68	11.6' 11.6'	N00°10.80 S00°5.29	-16.1' 16.1'	59.3' 59.3'
12	4° 0.32	\$12°27.43	42°47.28	11.6'	500° 5.29 500° 21.37	16.1	59.3
13	19° 0.39	28.28	57°17.89	11.6'	00°37.44	16.1	59.3'
14	34°0.45	29.13	71°48.49	11.6'	$00^{\circ}53.51$	16.1'	59.3'
15	49° 0.51	• • 29.98	$86^{\circ}19.10$	11.6'	$01^{\circ}9.58$	16.1'	59.3'
16	64° 0.58	30.84	100°49.71	11.6'	01°25.63	16.0'	59.3'
17	79° 0.64 94° 0.70	31.69 \$12°32.54	115°20.32 129°50.93	11.6' 11.6'	01°41.67 S01°57.70	16.0'	59.3' 59.3'
18 19	109° 0.77	33.39	144°21.53	11.6'	02°13.71	16.0' 16.0'	59.3 59.2'
20	124° 0.83	34.24	158°52.13	11.6'	02°29.71	16.0'	59.2'
21	139° 0.89	• • 35.09	173°22.73	11.6'	02°45.69	16.0'	59.2'
22	154°0.95	35.94	$187^{\circ}53.31$	11.6'	03°1.66	15.9'	59.2'
23	169°1.01	36.79	202°23.89	11.6'	03°17.60	15.9'	59.2'
	SD = 16.1'	d = 0.9'		SI	D = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 1.08	S12°37.64	216°54.46	11.6'	S03°33.52	15.9'	59.2'
1	199°1.14	38.49	231°25.03	11.6'	03°49.42	15.9'	59.2'
2	214° 1.20	39.34	245°55.58	11.5'	04°5.30	15.8'	59.2'
3	229° 1.26 244° 1.32	• • 40.19	260°26.12 274°56.64	11.5'	04°21.14	15.8'	59.2'
4 5	244°1.32 259°1.38	41.04 41.88	274°56.64 289°27.16	11.5' 11.5'	04°36.97 04°52.76	15.8' 15.8'	59.2' 59.1'
6	274° 1.44	\$12°42.73	303°57.65	11.5'	S05°8.52	15.7	59.1
7	289° 1.49	43.58	318°28.14	11.5'	05°24.24	15.7'	59.1
8	304°1.55	44.43	332°58.60	11.4'	05°39.94	15.7'	59.1'
9	319° 1.61	• • 45.27	347°29.05	11.4'	05°55.60	15.6'	59.1'
10	334° 1.67	46.12	1°59.48	11.4'	06°11.22	15.6'	59.1'
11 12	349°1.73 4°1.78	46.96 \$12°47.81	16°29.89 31°0.28	11.4' 11.4'	06°26.81 \$06°42.35	15.5' 15.5'	59.1' 59.1'
13	4 1.78 19°1.84	48.65	45°30.64	11.4	06°57.85	15.5'	59.1 59.0'
14	34° 1.90	49.50	60°0.99	11.3'	07°13.31	15.4	59.0'
15	49°1.95	• • 50.34	74°31.31	11.3'	$07^{\circ}28.73$	15.4'	59.0'
16	64°2.01	51.19	89°1.61	11.3'	07°44.10	15.3'	59.0'
17	79°2.06	52.03	103°31.88	11.2'	07°59.43	15.3'	59.0'
18 19	94°2.12 109°2.17	\$12°52.87 53.72	118°2.12 132°32.34	11.2' 11.2'	\$08°14.70 08°29.92	15.2' 15.2'	59.0' 59.0'
19 20	109°2.17 124°2.23	53.72 54.56	132°32.34 147°2.53	11.2'	08°29.92 08°45.10	15.2° 15.1'	59.0° 58.9'
21	139° 2.28	55.40	147 2.55 161°32.69	11.1'	06 45.10 09°0.22	15.1	58.9'
22	154° 2.34	56.24	176° 2.82	11.1'	09°15.28	15.0'	58.9'
23	169°2.39	57.09	190°32.93	11.1'	09°30.29	15.0'	58.9'
	SD = 16.1'	d = 0.8'	_	SI	D = 16.1'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-8%
25	15:51	15:55	11:44	08:14	20:39	
26	15:58	16:01	11:44	09:03	21:27	
27	16:04	16:07	11:44	09:52	22:16	

October 28, 29, 30 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	36°7.17	163°52.90 \$19°5.29	149°19.88	225°18.43 N05°4.07	13°13.32 N06°35.33		
1	51°9.63	178°52.21 6.15	164°20.41 33.84	240°20.47 3.89	28° 15.97 35.26		29°14.91
2	$66^{\circ}12.09$	193°51.51 7.01	179°20.93 34.14	255°22.51 3.72	43° 18.61 35.19		-42°9.24 56°41.65
3	$81^{\circ}14.56$	208°50.82 · · 7.87	194°21.46 · · 34.44	270°24.56 · · 3.55	58°21.26 · · 35.13		17°49.91
4	96° 17.02	223°50.12 8.73	209°21.98 34.74	285°26.60 3.38	73°23.90 35.06		-57° 5.67
5	111°19.49	238°49.42 9.59	224°22.51 35.04	300°28.64 3.21	88°26.55 34.99		23°35.79
6 7	126° 21.95 141° 24.41	253°48.72 \$19°10.44 268°48.03 11.30	239°23.03	315°30.68 N05°3.03 330°32.73 2.86	103°29.20 N06°34.92 118°31.84 34.85		89°22.78
8	156° 26.88	283°47.33 12.16	269°24.08 35.95	345°34.77 2.69	133°34.49 34.78		40°11.43
9	171° 29.34	298°46.63 · · 13.01	284°24.60 · · 36.25	0°36.81 · · 2.52	148°37.14 · · 34.72	Menkar 314°3.43	4°12.06
10	$186^{\circ}31.81$	313°45.93 13.87	299°25.12 36.55	15°38.85 2.34	163°39.78 34.65		49°57.61 16°33.95
11	201°34.27	328°45.23 14.72	314°25.65 36.85	30°40.90 2.17	178°42.43 34.58		-8°10.04
12	216° 36.73	343°44.53 S19°15.57	329°26.17	45°42.94 N05°2.00	193°45.07 N06°34.51	Capella 280° 18.16	46°1.42
13	231°39.20 246°41.66	358° 43.82 16.42	344°26.69 37.44 359°27.21 37.74	60°44.98 1.83	208° 47.72 34.44 223° 50.37 34.38	Bellatrix 278°20.19	6°22.55
14 15	261°44.13	13°43.12 17.27 28°42.42 · · 18.12	359°27.21 37.74 14°27.73 · · 38.04	75°47.03 1.66 90°49.07 · · 1.49	223°50.37 34.38 238°53.01 · · 34.31		28°37.79
16	276° 46.59	43°41.72 18.97	29°28.25 38.34	105°51.11 1.31	253°55.66 34.24		-1°10.96
17	291°49.05	58°41.01 19.82	44°28.78 38.64	120°53.16 1.14	268°58.30 34.17	Betelgeuse 270°49.41	7°24.77 52°42.34
18	306°51.52	73°40.31 S 19°20.66	59°29.30 S 22°38.93	135°55.20 N05°0.97	284°0.95 N06°34.10		16°45.11
19	321°53.98	88°39.60 21.51	74°29.82 39.23	150°57.25 0.80	299°3.59 34.04		-29°0.38
20	336° 56.45	103°38.90 22.35	89°30.34 39.53	165°59.29 0.63	314°6.24 33.97	Procyon 244°48.38	5°9.23
21 22	351°58.91 7°1.37	118°38.19 · · 23.20 133°37.49 24.04	104°30.86 · · 39.82 119°31.38	181°1.33 · · 0.46 196°3.38 · · 0.29	329°8.89 · · 33.90 344°11.53	Pollux 243°14.46 2	27°57.40
23	22°3.84	148°36.78 24.88	134°31.89 40.41	211°5.42 0.11	359°14.18 33.76	1	59°35.61
_							43°32.45
Mer.	pass. 21:32	ν-0.7' d0.9' m-3.88	ν 0.5′ d 0.3′ m 1.34	ν2.0′ d-0.2′ m-1.78	$\nu 2.6' \ d$ -0.1' m0.15		69°49.58 -8°46.68
							-6 40.06 11°49.83
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	, ,	61°35.79
0	37°6.30	163°36.07 \$19°25.72	149°32.41	226°7.47 N04°59.94	14°16.82 N06°33.70		14°24.96
1	52°8.77	178°35.36 26.56	164°32.93 41.00	241°9.51 59.77	29°19.47 33.63 44°22.11 33.56	Gienah 175°41.51 -1	17°41.70
2	67° 11.23 82° 13.70	193°34.65 27.40 208°33.94 •• 28.24	179°33.45 41.29 194°33.97 • 41.59	256°11.56 59.60 271°13.60 • 59.43	44°22.11 33.56 59°24.76 · · 33.49		63°15.07
4	97° 16.16	200 33.94 20.24 223°33.23 29.08	209°34.49 41.88	286°15.65 59.26	74°27.40 33.43		57°16.01
5	112° 18.62	238°32.52 29.92	224°35.00 42.17	301°17.69 59.09	89°30.05 33.36		55°48.40 11°18.32
6	127°21.09	253°31.81 S 19°30.75	239°35.52 S 22°42.47	316°19.74 N04°58.92	104°32.69 N06°33.29		11 18.32 49°10.42
7	$142^{\circ}23.55$	268°31.10 31.59	254°36.04 42.76	331°21.78 58.75	119° 35.34 33.22		60°30.37
8	157° 26.02	283°30.39 32.42	269°36.56 43.05	346°23.83 58.58	134°37.99 33.15	1	36°30.34
9	172°28.48	298°29.68 · · 33.25	284°37.07 · · 43.34 299°37.59 43.63	1°25.88 · · 58.41	149°40.63 · · 33.09	Arcturus 145°46.18	$19^{\circ}2.30$
10 11	187° 30.94 202° 33.41	313°28.96 34.09 328°28.25 34.92	299°37.59 43.63 314°38.10 43.92	16°27.92 58.23 31°29.97 58.06	164° 43.28 33.02 179° 45.92 32.95		60°56.99
12	217° 35.87	343°27.54 \$19°35.75	329°38.62 S 22°44.21	46°32.01 N04°57.89	194°48.57 N06°32.88	Kochab 137°21.13	74°2.43
13	232°38.34	358°26.82 36.58	344°39.14 44.50	61°34.06 57.72	209°51.21 32.82		-16° 9.37 26° 37.37
14	247°40.80	13°26.11 37.41	359°39.65 44.79	76°36.11 57.55	224°53.86 32.75		26°29.57
15	262°43.26	28°25.39 · · 38.23	14°40.17 · · 45.08	91°38.15 · · 57.38	239°56.50 · · 32.68		-69°4.71
16	277° 45.73	43°24.68 39.06	29°40.68 45.37	106°40.20 57.21	254°59.14 32.61		15°45.47
17 18	292°48.19 307°50.66	58°23.96 39.89 73°23.24 \$19°40.71	44°41.20 45.66 59°41.71 \$22°45.95	121°42.25 57.04 136°44.29 N04°56.87	270°1.79 32.55 285°4.43 N06°32.48		-37°7.43
19	322°53.12	88° 22.52 41.53	74°42.22 46.23	151°46.34 56.70	300°7.08 32.41		12°32.56
20	337°55.58	103°21.81 42.36	89°42.74 46.52	166°48.39 56.53	315°9.72 32.35		51°29.37 34°22.27
21	352°58.05	118°21.09 · · 43.18	104°43.25 · · 46.81	181°50.44 · · 56.36	330° 12.37 · · · 32.28		38°48.85
22	8°0.51	133°20.37 44.00	119°43.76 47.10	196°52.48 56.19	345°15.01 32.21	, ,	26°15.68
23	23°2.98	148°19.65 44.82	134°44.28 47.38	211°54.53 56.02	0°17.66 32.14	Altair 61° 57.79	8°56.73
Mer.	pass. 21:28	ν -0.7 $'$ d0.8 $'$ m-3.88	$ u 0.5' \ d0.3' \ m1.34$	ν 2.0′ d-0.2′ m-1.78	$\nu 2.6' \ d$ -0.1' m0.16		56°38.83
						Deneb 49°24.21	45°23.14
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		10°0.40
0	38°5.44	163°18.93 \$19°45.64	149°44.79 \$22°47.67	226°56.58 N04°55.85	15°20.30 N06°32.08		46°49.62 29°28.43
1	53°7.91	178° 18.21 46.46	164°45.30 47.95	241°58.63 55.68	30°22.95 32.01		29° 26.43 28° 14.33
2	68° 10.37	193°17.48 47.28	179°45.81 48.24	257°0.67 55.51	45°25.59 31.94	1	15°21.56
3	83° 12.83	208°16.76 · · 48.09	194°46.32 · · 48.52	272°2.72 · · 55.34	60°28.23 · · 31.88	Oct 20 Thu SHA	Max =====
4 5	98° 15.30 113° 17.76	223°16.04 48.91 238°15.32 49.72	209°46.84 48.81 224°47.35 49.09	287° 4.77 55.17 302° 6.82 55.00	75°30.88 31.81 90°33.52 31.74	Oct 28 Thu SHA I Venus 127° 45.74	Mer.pass 13:05
6	128° 20.23	253°14.59 \$19°50.54	239°47.86 S 22°49.37	317°8.87 N04°54.83	105°36.17 N06°31.67	Mars 113°12.72	14:02
7	143°22.69	268°13.87 51.35	254°48.37 49.66	332°10.92 54.66	120°38.81 31.61	Jupiter 189° 11.27	08:58
8	$158^{\circ}25.15$	283°13.14 52.16	269°48.88 49.94	347°12.97 54.49	135°41.45 31.54	Saturn 337°6.15	23:03
9	173°27.62	298°12.42 · · 52.97	284°49.39 · · 50.22	2°15.02 · · 54.33	150° 44.10 · · 31.47	Oct 29 Fri SHA I	Mer.pass
10	188°30.08	313°11.69 53.78	299°49.90 50.50	17°17.06 54.16	165°46.74 31.41	Venus 126°29.77	13:06
11 12	203°32.55 218°35.01	328°10.97 54.59 343°10.24 \$19°55.40	314°50.41 50.79 329°50.92 \$22°51.07	32°19.11 53.99 47°21.16 N04°53.82	180°49.39 31.34 195°52.03 N06°31.27	Mars 112°26.11	14:01
13	233° 37.48	358°9.51 56.21	344°51.43 51.35	62°23.21 53.65	210° 54.67 31.21	Jupiter 189°1.16	08:54
14	248° 39.94	13°8.78 57.01	359°51.94 51.63	77°25.26 53.48	225°57.32 31.14	Saturn 337°10.52	22:59
15	263°42.40	28°8.05 · · 57.82	14°52.45 · · 51.91	92°27.31 · · 53.31	240°59.96 · · 31.07		Mer.pass
16	278° 44.87	43°7.33 58.62	29°52.95 52.19	107°29.36 53.14	256°2.60 31.01	Venus 125°13.49	13:07
17	293°47.33	58°6.60 19°59.43 73°5.87 S20°0.23	44°53.46 52.47 59°53.97 \$22°52.75	122°31.41 52.97 137°33.46 N04°52.80	271°5.25 30.94 286°7.89 N06°30.87	Mars 111°39.35	14:01
18 19	308° 49.80 323° 52.26	73°5.87 S 20°0.23 88°5.14 1.03	59°53.97 S22°52.75 74°54.48 53.03	137°33.46 N04°52.80 152°35.51 52.64	286°7.89 N06°30.87 301°10.54 30.81	Jupiter 188°51.14 Saturn 337°14.86	08:51
20	338° 54.72	103°4.40 1.83	89°54.98 53.30	167°37.56 52.47	316° 13.18 30.74		22:55
21	353°57.19	118°3.67 · · 2.63	104°55.49 · · 53.58	182°39.61 · · 52.30	331°15.82 · · 30.67	Horizontal parallax	
22	8°59.65	133°2.94 3.43	119°56.00 53.86	197°41.67 52.13	346° 18.47 30.61	Venus:	0.1
23	24°2.12	148°2.21 4.23	134°56.51 54.14	212°43.72 51.96	1°21.11 30.54	Mars:	0.1
Mer.	pass. 21:24	ν-0.7' d0.8' m-3.88	$ u 0.5' \ d0.3' \ m1.34$	ν2.0′ d-0.2′ m-1.79	ν2.6' d-0.1' m0.16		

–	011-010 =	T0.1433 360	Δ· – · ·	-011	_ +09.0 1 01	300	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°2.44	\$12°57.93	205°3.00	11.0'	S09°45.24	14.9'	58.9'
1	199°2.50	58.77	219°33.04	11.0'	10°0.13	14.8'	58.9'
2	214°2.55 229°2.60	12°59.61 13°0.45	234°3.04 248°33.01	11.0' 10.9'	10°14.97 10°29.74	14.8' 14.7'	58.8' 58.8'
4	244°2.65	1.29	263° 2.95	10.9	10°29.74	14.6	58.8'
5	259°2.71	2.13	277°32.86	10.9'	10°59.08	14.6'	58.8'
6	274°2.76	S 13°2.97	292°2.72	10.8'	S11°13.66	14.5'	58.8'
7	289°2.81	3.81	306°32.55	10.8'	11°28.17	14.4'	58.8'
8 9	304°2.86 319°2.91	4.64 •• 5.48	321°2.35 335°32.11	10.8' 10.7'	11°42.60 11°56.97	14.4' 14.3'	58.7' 58.7'
10	334°2.96	6.32	350°1.82	10.7'	11 30.97 12°11.27	14.2'	58.7'
11	349°3.01	7.16	4°31.50	10.6'	12°25.49	14.1'	58.7'
12	4°3.06	S13°7.99	19° 1.14	10.6'	S12°39.64	14.1'	58.7'
13	19°3.11	8.83	33°30.74	10.6'	12°53.71	14.0'	58.6'
14 15	34°3.15 49°3.20	9.67 •• 10.50	48° 0.30 62° 29.82	10.5' 10.5'	13°7.70 13°21.61	13.9' 13.8'	58.6' 58.6'
16	64°3.25	11.34	76°59.30	10.4	13°35.44	13.8'	58.6'
17	79°3.30	12.17	91°28.73	10.4'	13°49.19	13.7'	58.6'
18	94°3.35	\$13°13.01	105°58.12	10.3'	S14°2.86	13.6'	58.5'
19	109°3.39	13.84	120°27.47	10.3'	14°16.44	13.5'	58.5'
20 21	124°3.44 139°3.49	14.68 •• 15.51	134°56.77 149°26.03	10.3' 10.2'	14°29.94 14°43.35	13.4' 13.3'	58.5' 58.5'
22	159 3.49 154°3.53	16.34	163°55.25	10.2'	14°56.67	13.2'	58.4
23	169°3.58	17.18	178°24.42	10.1'	15° 9.90	13.1'	58.4
	SD = 16.1'	d = 0.8'		SE	0 = 16.1'		
	<u> </u>	<u>u — 0.0</u>		JL	- 10.1		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°3.62	S13°18.01	192°53.55	10.1'	\$15°23.04	13.0'	58.4'
1	199°3.67	18.84	207°22.63	10.0'	15°36.08	13.0'	58.4'
2	214°3.71 229°3.76	19.67 •• 20.51	221°51.66 236°20.65	10.0' 9.9'	15°49.03 16°1.89	12.9' 12.8'	58.4' 58.3'
4	244°3.80	21.34	250° 49.59	9.9'	16°14.65	12.7'	58.3
5	259°3.84	22.17	265°18.49	9.8'	16°27.31	12.6'	58.3'
6	274°3.89	S 13°23.00	279°47.34	9.8'	S16°39.87	12.5'	58.3'
7	289°3.93	23.83	294°16.14	9.8'	16°52.33	12.4'	58.2'
8 9	304°3.97 319°4.02	24.66 •• 25.49	308°44.90 323°13.61	9.7' 9.7'	17° 4.69 17° 16.94	12.3' 12.2'	58.2' 58.2'
10	334°4.06	26.32	337°42.27	9.6'	17°10.94	12.2	58.2'
11	349°4.10	27.14	352°10.88	9.6'	17°41.14	11.9'	58.1
12	4°4.14	S13°27.97	6°39.45	9.5'	S17°53.08	11.8'	58.1'
13	19°4.18	28.80	21°7.97	9.5'	18° 4.91	11.7'	58.1'
14 15	34°4.22 49°4.26	29.63 •• 30.46	35°36.44 50°4.86	9.4' 9.4'	18°16.63 18°28.23	11.6' 11.5'	58.1' 58.1'
16	64°4.30	31.28	64°33.24	9.4	18°39.73	11.4	58.0'
17	79°4.34	32.11	79° 1.57	9.3'	18°51.12	11.3'	58.0'
18	94°4.38	S13°32.93	93°29.85	9.2'	S 19°2.39	11.2'	58.0'
19	109°4.42	33.76	107°58.09	9.2'	19°13.54		57.9'
20 21	124°4.46 139°4.50	34.59 •• 35.41	122°26.28 136°54.42	9.1' 9.1'	19°24.58 19°35.50	10.9' 10.8'	57.9' 57.9'
22	154°4.54	36.24	150° 54.42 151° 22.52	9.1'	19° 35.30 19° 46.30	10.8	57.9'
23	169°4.57	37.06	165°50.57	9.0'	19°56.99	10.6'	57.8'
	SD = 16.1'	d = 0.8'		SE	0 = 15.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°4.61 199°4.65	\$13°37.88 38.71	180°18.57 194°46.53	9.0' 8.9'	\$20°7.55 20°17.99	10.4' 10.3'	57.8' 57.8'
2	214°4.68	39.53	194 46.53 209°14.44	8.9'	20 17.99 20°28.30	10.3	57.8'
3	229°4.72	• • 40.35	223°42.31	8.8'	$20^{\circ}38.50$	10.1	57.7'
4	244°4.76	41.17	238°10.14	8.8'	20°48.56	9.9'	57.7'
5	259°4.79	42.00	252°37.92	8.7'	20°58.51	9.8'	57.7'
6 7	274°4.83 289°4.86	\$13°42.82 43.64	267°5.66 281°33.35	8.7' 8.7'	\$21°8.32 21°18.01	9.7' 9.6'	57.7' 57.6'
8	304°4.90	43.04 44.46	201 33.33 296°1.01	8.6'	21 16.01 21°27.56	9.0 9.4'	57.6'
9	319°4.93	• • 45.28	310°28.62	8.6'	21°36.99	9.3'	57.6'
10	334°4.96	46.10	$324^{\circ}56.19$	8.5'	$21^{\circ}46.29$	9.2'	57.5'
11	349°5.00	46.92	339°23.72	8.5'	21°55.45	9.0'	57.5'
12 13	4°5.03 19°5.06	\$13°47.74 48.56	353°51.21 8°18.66	8.5' 8.4'	\$22°4.49 22°13.39	8.9' 8.8'	57.5' 57.5'
14	34°5.10	49.38	22°46.07	8.4'	22°13.39 22°22.15	8.6'	57.5 57.4'
15	49°5.13	• • 50.20	37°13.45	8.3'	22°30.78	8.5'	57.4'
16	64°5.16	51.01	51°40.78	8.3'	22°39.28	8.4'	57.4'
17	79°5.19	51.83	66°8.08	8.3'	22°47.63	8.2'	57.4'
18 19	94°5.22 109°5.25	\$13°52.65 53.46	80°35.35 95°2.58	8.2' 8.2'	\$22°55.85 23°3.93	8.1' 7.9'	57.3' 57.3'
20	109 5.25 124°5.29	53.46 54.28	95 2.58 109°29.78	8.2'	23 3.93 23°11.88	7.9 7.8'	57.3'
21	139°5.32	• • 55.10	123°56.94	8.1'	23°19.68	7.7'	57.2'
22	154°5.35	55.91	138°24.07	8.1'	23°27.34	7.5'	57.2'
23	169°5.38	56.73	152°51.18	8.1'	23°34.86	7.4'	57.2'
	SD = 16.1'	d = 0.8'		SE	0 = 15.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	28-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-0%
28	16:10	16:12	11:44	10:41	23:07	
29	16:14	16:17	11:44	11:32	23:59	
30	16:18	16:20	11:44	12:26	-:-	

October 31, 01, 02 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	39°4.58	163°1.47 \$20°5.02	149°57.01 \$22°54.41	227°45.77 N04°51.79	16°23.75 N06°30.47
1	54°7.04	178° 0.74 5.82	164°57.52 54.69	242°47.82 51.62	31°26.39 30.41
2	69°9.51	193°0.01 6.61	179°58.02 54.97	257°49.87 51.46	46°29.04 30.34
3	84° 11.97	207°59.27 · · 7.41	194°58.53 · · 55.24	272°51.92 · · 51.29	61°31.68 · · · 30.28
4	99° 14.44	207 59.27 7.41 222°58.54 8.20	209°59.03 55.52	287°53.97 51.12	76°34.32 30.21
5	114° 16.90	237°57.80 8.99	224°59.54 55.79	302°56.02 50.95	91°36.97 30.14
6	129° 19.37	252°57.06 \$20°9.78	240°0.04 \$22°56.07	317°58.08 N04°50.78	106°39.61 N06°30.08
7	144°21.83	267°56.33 10.57	255°0.55 56.34	333°0.13 50.61	121° 42.25 30.01
8	159°24.29	282°55.59 11.36	270°1.05 56.61	348°2.18 50.45	136°44.90 29.94
9	174°26.76	297°54.85 · · 12.15	285°1.56 · · 56.89	3°4.23 · · 50.28	151°47.54 · · 29.88
10	189°29.22	312°54.11 12.94	300°2.06 57.16	18°6.29 50.11	166°50.18 29.81
11	204°31.69	327°53.37 13.72	315°2.56 57.43	33°8.34 49.94	181°52.82 29.75
12	219°34.15	342°52.63 S 20°14.51	330°3.07 \$ 22°57.71	48°10.39 N04°49.77	196°55.47 N06°29.68
13	234°36.61	357°51.89 15.29	345°3.57 57.98	63°12.44 49.61	211°58.11 29.61
14	249°39.08	12°51.15 16.08	0°4.07 58.25	78°14.50 49.44	227°0.75 29.55
15	264°41.54	27°50.41 · · 16.86	15°4.57 · · 58.52	93°16.55 •• 49.27	242°3.39 · · 29.48
16	279°44.01	42°49.67 17.64	30°5.08 58.79	108°18.60 49.10	257°6.04 29.42
17	294°46.47	57°48.93 18.42	45°5.58 59.06	123°20.66 48.94	272°8.68 29.35
18	309°48.94	72°48.18 S 20°19.20	60°6.08 S 22°59.33	138°22.71 N04°48.77	287°11.32 N06°29.28
19	324°51.40	87° 47.44 19.98	75°6.58 59.60	153°24.76 48.60	302°13.96 29.22
20	339°53.86	102°46.70 20.76	90°7.08 22°59.87	168°26.82 48.43	317°16.60 29.15
21	354° 56.33	117°45.95 · · 21.54	105°7.58 23°0.14	183°28.87 · · 48.27	332°19.25 · · 29.09
22	9°58.79	132°45.21 22.31	120° 8.08 0.41	198°30.93 48.10	347°21.89 29.02
23	25°1.26	147°44.46 23.09	135°8.58 0.67	213°32.98 47.93	2°24.53 28.95
Mer.	pass. 21:20	ν-0.7' d0.8' m-3.88	$\nu 0.5' \ d0.3' \ m1.33$	ν2.1' d-0.2' m-1.79	ν2.6' d-0.1' m0.17
N4 -	CIIA	CHA D	CHA 5	CHA D	CHA
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	40°3.72	162°43.72 S20°23.86	150°9.08 \$23°0.94	228°35.03 N04°47.77	17°27.17 N06°28.89
1	55°6.18	177° 42.97 24.63	165° 9.58 1.21	243°37.09 47.60	32°29.81 28.82
2	70°8.65	192°42.22 25.40	180°10.08 1.48	258°39.14 47.43	47°32.46 28.76
3	85°11.11	207°41.47 · · 26.18	195°10.58 · · 1.74	273°41.20 · · 47.26	62°35.10 · · 28.69
4	100° 13.58	222°40.73 26.95	210°11.08 2.01	288°43.25 47.10	77°37.74 28.63
5	115° 16.04	237°39.98 27.71 252°39.23 \$20°28.48	225°11.58 2.28 240°12.08 \$23°2.54	303°45.31 46.93 318°47.36 N04°46.76	92°40.38 28.56
6	130° 18.51 145° 20.97				107°43.02 N06°28.50 122°45.66 28.43
7	145 20.97 160°23.43	267° 38.48 29.25 282° 37.73 30.02	255°12.58 2.81 270°13.08 3.07	333°49.42 46.60 348°51.47 46.43	
8 9	175° 25.90	282 37.73 30.02 297°36.98 · · 30.78	270°13.08 3.07 285°13.57 · · 3.33	3°53.53 · · 46.26	137°48.30 28.36 152°50.95 · · 28.30
10	175 25.90 190°28.36	312°36.23 31.54	300°14.07 3.60	18°55.59 46.10	167°53.59 28.23
11	205°30.83	312 30.23 31.34 327°35.48 32.31	315°14.57 3.86	33°57.64 45.93	182° 56.23 28.17
12	200° 33.29	342°34.72 S 20°33.07	330°15.07 S23°4.12	48°59.70 N04°45.76	197°58.87 N06°28.10
13	235° 35.75	357° 33.97 33.83	345°15.56 4.39	64°1.75 45.60	213°1.51 28.04
14	250° 38.22	12°33.22 34.59	0°16.06 4.65	79°3.81 45.43	228°4.15 27.97
15	265°40.68	27°32.46 · · 35.35	15°16.56 · · 4.91	94°5.87 · · 45.27	243°6.79 · · 27.91
16	280°43.15	42°31.71 36.11	30°17.05 5.17	109°7.92 45.10	258° 9.43 27.84
17	295°45.61	57°30.95 36.87	45°17.55 5.43	124°9.98 44.93	273°12.07 27.78
18	310°48.08	72°30.20 S20°37.62	60°18.04 S 23°5.69	139°12.04 N04°44.77	288°14.72 N06°27.71
19	325°50.54	87° 29.44 38.38	75°18.54 5.96	154°14.09 44.60	303°17.36 27.65
20	340°53.00	102°28.69 39.13	90°19.03 6.22	169°16.15 44.44	318°20.00 27.58
21	355°55.47	117°27.93 · · 39.88	105°19.53 · · 6.47	184°18.21 · · 44.27	333°22.64 · · 27.52
22	10°57.93	132°27.17 40.64	120°20.02 6.73	199°20.27 44.10	348°25.28 27.45
23	26°0.40	147°26.41 41.39	135°20.52 6.99	214°22.32 43.94	3°27.92 27.39
		ν-0.7' d0.8' m-3.88	ν0.5' d0.3' m1.33	ν2.1' d-0.2' m-1.79	ν2.6' d-0.1' m0.17
ivier.p	pass. 21:16	ν-0.7 d0.8 m-3.88	νυ.5 αυ.3 m1.33	ν2.1 d-0.2 m-1.79	ν2.0° <i>d</i> -0.1° m0.17
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	41°2.86	162°25.66 \$20°42.14	150°21.01 \$23°7.25	229°24.38 N04°43.77	18°30.56 N06°27.32
1	56°5.33	177°24.90 42.89	165°21.51 7.51	244°26.44 43.61	33°33.20 27.26
2	71°7.79	192°24.14 43.64	180°22.00 7.77	259°28.50 43.44	48° 35.84 27.19
3	86° 10.25	207°23.38 · · 44.38	195°22.49 · · 8.02	274°30.55 · · 43.28	63°38.48 · · 27.13
4	101° 12.72	222°22.62 45.13	210°22.99 8.28	289°32.61 43.11	78°41.12 27.06
5	116° 15.18	237°21.85 45.88	225°23.48 8.54	304°34.67 42.95	93°43.76 27.00
6	131°17.65	252°21.09 S20°46.62	240°23.97	319°36.73 N04°42.78	108°46.40 N06°26.93
7	146°20.11	267°20.33 47.36	255°24.46 9.05	334°38.79 42.61	123° 49.04 26.87
8	161°22.57	282°19.57 48.11	270°24.96 9.30	349°40.85 42.45	138°51.68 26.80
9	176°25.04	297°18.81 · · 48.85	285°25.45 · · 9.56	4°42.91 · · 42.28	153° 54.32 · · · 26.74
10	191°27.50	312°18.04 49.59	300°25.94 9.81	19°44.97 42.12	168°56.96 26.68
11	206°29.97	327°17.28 50.33	315°26.43 10.07	34°47.02 41.95	183°59.60 26.61
12	221°32.43	342°16.51 \$20°51.06	330°26.92 \$23°10.32	49°49.08 N04°41.79	199°2.24 N06°26.55
13	236°34.90	357°15.75 51.80	345°27.41 10.58	64°51.14 41.62	214°4.88 26.48
14	251°37.36	12°14.98 52.54	0°27.90 10.83	79°53.20 41.46	229°7.52 26.42 _
15 16	266°39.82	27°14.22 · · 53.27	15°28.39 · · 11.08	94°55.26 · · 41.29	244°10.16 · · 26.35
16	281°42.29	42°13.45 54.01	30°28.88 11.33	109°57.32 41.13	259°12.80 26.29
17	296°44.75	57°12.68 54.74	45°29.37 11.58	124°59.38 40.97 140°1.44 N04°40.80	274°15.44 26.22 289°18.08 N06°26.16
18 19	311° 47.22 326° 49.68	72°11.91 \$20°55.47 87°11.15 56.21	60°29.86 S23°11.84 75°30.35 12.09	140°1.44 N04°40.80 155°3.50 40.64	289°18.08 N06°26.16 304°20.72 26.10
	326°49.68 341°52.14			155 3.50 40.64 170° 5.56 40.47	
20	341°52.14 356°54.61	102°10.38 56.94 117°9.61 · · 57.67	90°30.84 12.34 105°31.33 · · 12.59	170°5.56 40.47 185°7.63 •• 40.31	319°23.35 26.03 334°25.99 · · 25.97
21 22	350°54.01 11°57.07	117 9.61 · · 57.67 132°8.84 58.39	105°31.33 · · 12.59 120°31.82 12.84	200°9.69 40.14	34°25.99 · · 25.97 349°28.63 25.90
23	26°59.54	132°8.84 58.39 147°8.07 59.12	120°31.82 12.84 135°32.31 13.09	200 9.69 40.14 215°11.75 39.98	4°31.27 25.84
Mer.p	bass. 21:12	ν -0.8′ d 0.7′ m-3.88	$ u 0.5' \ d0.3' \ m1.33$	$ u 2.1' \ d ext{-}0.2' \ ext{m-}1.80$	$ u 2.6' \ d$ -0.1' m0.18

	Stars	
	SHA	Dec
Alpheratz	357°32.09	29°14.92
Ankaa	353°4.56	-42°9.25
Schedar Diphda	349°27.84 348°44.72	56°41.67 -17°49.91
Achernar	335°17.96	-57°5.68
Hamal	327°48.24	23°35.80
Polaris Acamar	312°18.32 315°9.63	89°22.80 -40°11.45
Menkar	314°3.42	4° 12.06
Mirfak	308°24.43	49°57.61
Aldebaran	290°36.68	16°33.95
Rigel Capella	281°1.41 280°18.13	-8°10.05 46°1.42
Bellatrix	278°20.17	6°22.54
Elnath	277°58.69	28° 37.79
Alnilam	275°35.17 270°49.39	-1° 10.97 7° 24.76
Betelgeuse Canopus	270 49.39 263°51.07	7 24.76 -52°42.35
Sirius	258°24.05	-16° 45.12
Adhara	255°3.90	-29°0.39
Procyon Pollux	244°48.35 243°14.43	5°9.22 27°57.39
Avior	243 14.43 234°13.71	-59°35.62
Suhail	$222^{\circ}44.65$	-43°32.46
Miaplacidus	221°37.85	-69°49.58
Alphard Regulus	217°45.57 207°32.14	-8°46.69 11°49.82
Dubhe	207 32.14 193°38.70	61°35.78
Denebola	$182^{\circ}22.87$	14° 24.95
Gienah	175°41.49	-17°41.70
Acrux Gacrux	172°58.05 171°49.53	-63°15.06 -57°16.00
Alioth	166°11.54	55° 48.39
Spica	$158^{\circ}20.19$	-11° 18.33
Alkaid	152°50.73 148°33.33	49°10.40 -60°30.36
Hadar Menkent	148 33.33 147°55.29	-00 30.30 -36°30.33
Arcturus	145°46.17	19°2.28
Rigil Kent.	139°37.75	-60°56.98
Kochab Zuben'ubi	137°21.15 136°53.81	74°2.41 -16°9.37
Alphecca	126°2.17	26° 37.36
Antares	112°13.34	-26°29.56
Atria Sabik	107°5.91 102°0.42	-69°4.70 -15°45.47
Shaula	96°7.56	-37°7.42
Rasalhague	95°56.67	12°32.56
Eltanin	90°41.47	51°29.36
Kaus Aust. Vega	83°29.71 80°31.89	-34°22.27 38°48.84
Vega Nunki	75°45.10	-26° 15.68
Altair	$61^{\circ}57.80$	8°56.73
Peacock	53°2.22	-56°38.83
Deneb Enif	49°24.22 33°36.46	45°23.14 10°0.40
Al Na'ir	$27^{\circ}29.92$	-46°49.62
Fomalhaut	15°11.82	-29°28.44
Scheat Markab	13°42.75 13°27.41	28° 14.33 15° 21.56
Oct 31 Sun Venus	SHA 123°56.89	Mer.pass 13:09
Mars	110°52.43	14:00
Jupiter	$188^{\circ}41.19$	08:48
Saturn	337°19.17	22:50
Nov 01 Mon Venus	SHA 122°40.00	Mer.pass
venus Mars	122 40.00 110°5.36	13:10 13:59
Jupiter	188°31.31	08:44
Saturn	337°23.45	22:46
Nov 02 Tue	SHA	Mer.pass
Venus Mars	121°22.79 109°18.15	13:11 13:58
Jupiter	188°21.52	08:41
Saturn	337°27.70	22:42
Horizon	ıtal parallax	
	Venus:	0.1

Venus: Mars:

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.40	S13°57.54	167°18.25	8.0'	S23°42.24	7.2'	57.2'
1 2	199°5.43 214°5.46	58.36 13°59.17	181°45.29 196°12.30	8.0' 8.0'	23°49.48 23°56.57	7.1' 7.0'	57.1' 57.1'
3	229°5.49	13°59.98	210°39.29	8.0'	24°3.52	6.8	57.1
4	244°5.52	0.80	225°6.25	7.9'	24°10.33	6.7'	57.0'
5	259°5.55 274°5.57	1.61 \$14°2.42	239°33.19 254°0.10	7.9'	24°16.99 \$24°23.51	6.5'	57.0'
6 7	274 5.57 289°5.60	3.23	254 0.10 268°26.99	7.9' 7.9'	24°29.88	6.4' 6.2'	57.0' 57.0'
8	304°5.63	4.04	282°53.86	7.8'	24°36.10	6.1'	56.9'
9	319°5.65	• • 4.86	297°20.71	7.8'	24°42.18	5.9'	56.9'
10 11	334°5.68 349°5.70	5.67 6.48	311°47.54 326°14.35	7.8' 7.8'	24°48.11 24°53.90	5.8' 5.6'	56.9' 56.8'
12	4°5.73	S14°7.29	340°41.15	7.8'	S24°59.53	5.5'	56.8
13	19°5.75	8.10	355°7.93	7.8'	25°5.02	5.3'	56.8'
14 15	34°5.78 49°5.80	8.91 •• 9.72	9°34.70 24°1.45	7.8' 7.7'	25°10.36 25°15.55	5.2' 5.0'	56.7' 56.7'
16	64° 5.83	10.52	38°28.19	7.7'	25°20.59	4.9'	56.7
17	79°5.85	11.33	52°54.92	7.7'	$25^{\circ}25.48$	4.7'	56.7'
18	94°5.87 109°5.90	\$14°12.14	67°21.65	7.7'	S25°30.22	4.6'	56.6'
19 20	109°5.90 124°5.92	12.95 13.75	81°48.36 96°15.07	7.7' 7.7'	25°34.82 25°39.26	4.4' 4.3'	56.6' 56.6'
21	139°5.94	. 14.56	110°41.78	7.7'	25°43.55	4.1'	56.5
22	154°5.96	15.37	125°8.48	7.7'	25°47.69	4.0'	56.5'
23	169°5.98	16.17	139°35.18	7.7'	25°51.68	3.8'	56.5'
	SD = 16.1'	d = 0.8'		SE	O = 15.6'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.00	S 14°16.98	154° 1.88	7.7'	\$25°55.52	3.7'	56.5'
1	199°6.02 214°6.04	17.78 18.59	168°28.58 182°55.28	7.7' 7.7'	25°59.21 26°2.75	3.5' 3.4'	56.4' 56.4'
2	214 6.04 229 6.07	18.59	182°55.28 197°21.99	7.7' 7.7'	26° 6.13	3.4	56.4'
4	244°6.08	20.19	211°48.70	7.7'	26°9.37	3.1'	56.3'
5	259°6.10	21.00	226°15.42	7.7'	26°12.46	2.9'	56.3'
6 7	274°6.12 289°6.14	\$14°21.80 22.60	240°42.14 255°8.88	7.7' 7.7'	\$26°15.39 26°18.17	2.8' 2.6'	56.3' 56.3'
8	304°6.16	23.40	269°35.63	7.8'	26°20.81	2.5'	56.2
9	319°6.18	• • 24.21	284°2.38	7.8'	26°23.29	2.3'	56.2'
10 11	334°6.20 349°6.21	25.01 25.81	298°29.16 312°55.95	7.8' 7.8'	26°25.62 26°27.80	2.2' 2.0'	56.2' 56.1'
12	4°6.23	\$14°26.61	327°22.75	7.8'	S26°29.83	1.9'	56.1
13	19°6.25	27.41	341°49.57	7.8'	26°31.71	1.7'	56.1'
14 15	34°6.26 49°6.28	28.21 •• 29.01	356°16.42 10°43.28	7.9' 7.9'	26°33.44 26°35.02	1.6' 1.4'	56.1' 56.0'
16	64° 6.29	29.01	25°10.17	7.9' 7.9'	26°36.45	1.4	56.0'
17	79°6.31	30.60	39°37.08	7.9'	$26^{\circ}37.74$	1.1'	56.0'
18	94°6.32 109°6.34	\$14°31.40 32.20	54° 4.01 68° 30.97	8.0'	\$26°38.87 26°39.85	1.0'	56.0'
19 20	109 0.34 124°6.35	33.00	82°57.96	8.0' 8.0'	26°40.69	0.8' 0.7'	55.9' 55.9'
21	139°6.37	• • 33.79	97°24.98	8.1'	$26^{\circ}41.38$	0.5'	55.9'
22	154°6.38	34.59	111°52.03	8.1'	26°41.92	0.4'	55.8'
23	169°6.39	35.39	126°19.12	8.1'	26°42.31	0.2'	55.8'
	SD = 16.1'	d = 0.8'		SL	D = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°6.41 199°6.42	\$14°36.18 36.98	140°46.23 155°13.38	8.2' 8.2'	\$26°42.56 26°42.66	0.1' -0.0'	55.8' 55.8'
2	214°6.43	30.98 37.77	155 13.38 169°40.57	8.2'	26°42.62	-0.0 -0.2	55.7'
3	229°6.44	• • 38.57	184°7.80	8.3'	$26^{\circ}42.43$	-0.3'	55.7'
4	244°6.46 259°6.47	39.36	198°35.06 213°2.37	8.3' 8.3'	26°42.09 26°41.61	-0.5' -0.6'	55.7'
5 6	259°6.47 274°6.48	40.15 \$14°40.95	213°2.37 227°29.71	8.3'	26°41.61 \$26°40.99	-0.6' -0.8'	55.7' 55.6'
7	289°6.49	41.74	241°57.10	8.4'	$26^{\circ}40.22$	-0.9'	55.6'
8	304°6.50	42.53	256°24.54	8.5'	26°39.31	-1.1'	55.6'
9 10	319°6.51 334°6.52	· · 43.32 44.11	270°52.02 285°19.54	8.5' 8.6'	26°38.26 26°37.07	-1.2' -1.3'	55.6' 55.5'
11	349°6.53	44.91	299°47.11	8.6'	26°35.73	-1.5'	55.5'
12	4°6.53	\$14°45.70	314°14.73	8.7'	\$26°34.25	-1.6'	55.5'
13 14	19°6.54 34°6.55	46.49 47.28	328°42.41 343°10.13	8.7' 8.8'	26°32.64 26°30.89	-1.8' -1.9'	55.5' 55.4'
15	49°6.56	• • 48.07	357°37.90	8.8'	26°28.99	-2.0'	55.4
16	64°6.57	48.85	12°5.73	8.9'	26°26.96	-2.2'	55.4'
17 18	79°6.57 94°6.58	49.64 \$14°50.43	26°33.61 41°1.55	8.9' 9.0'	26°24.79 \$26°22.49	-2.3' -2.4'	55.4' 55.3'
19	94 6.58 109°6.59	51.22	55°29.55	9.0 9.1'	26°20.05	-2.4 -2.6'	55.3'
20	124°6.59	52.01	69°57.60	9.1'	$26^{\circ}17.47$	-2.7'	55.3'
21 22	139°6.60 154°6.60	· · 52.79 53.58	84°25.71 98°53.88	9.2' 9.2'	26°14.76 26°11.92	-2.8' -3.0'	55.3' 55.2'
23	169°6.61	53.58 54.36	98 53.88 113°22.10	9.2 9.3'	26°11.92 26°8.94	-3.0 -3.1'	55.2'
	SD = 16.1'	d = 0.8'			D = 15.2'		

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

Lat.		Moonris	se	Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°				_		
N 70°				_		
68°						
66°						
64°	12:14			14:19		
62°	11:22	12:55	13:49	15:11	15:34	16:33
60°	10:50	12:12	13:07	15:44	16:17	17:15
N 58°	10:27	11:43	12:38	16:08	16:46	17:44
56°	10:08	11:21	12:16	16:27	17:08	18:06
54°	09:52	11:03	11:58	16:43	17:27	18:24
52°	09:38	10:47	11:43	16:57	17:42	18:39
50°	09:26	10:34	11:29	17:10	17:56	18:52
45°	09:01	10:06	11:02	17:35	18:23	19:19
N 40°	08:41	09:45	10:40	17:55	18:45	19:41
35°	08:25	09:27	10:22	18:12	19:03	19:59
30°	08:11	09:11	10:07	18:27	19:19	20:14
20°	07:47	08:45	09:41	18:52	19:45	20:40
N 10°	07:26	08:23	09:18	19:13	20:08	21:02
0°	07:07	08:02	08:57	19:33	20:29	21:23
S 10°	06:48	07:41	08:36	19:54	20:50	21:43
20°	06:28	07:19	08:13	20:15	21:12	22:05
30°	06:04	06:53	07:47	20:40	21:39	22:31
35° 40°	05:50	06:38	07:32 07:14	20:55	21:54	22:46
40 45°	05:35 05:16	06:21 06:00	06:52	21:12 21:33	22:12 22:34	23:03 23:24
S 50°	04:53	05:33	06:25	21:59	23:01	23:50
52° 54°	04:41	05:20	06:11	22:12	23:15	
54°	04:29 04:14	05:06 04:49	05:56 05:38	22:26 22:43	23:30 23:48	
58°	03:57	04:49	05:38	22:43	23:48	00:10
S 60°	03:37	04:28	04:47	23:04		00:10
3 00	05.51	07.02	07.41	25.50		00.39

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age 2-4
,	00 ^h	12 ^h	Pass	Upper	Upper Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-13%
31	16:22	16:23	11:44	13:20	00:53	
01	16:24	16:25	11:44	14:15	01:48	
02	16:26	16:26	11:44	15:10	02:43	

November 03, 04, 05 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	42°2.00	162°7.30 \$20°59.85	150°32.79 \$23°13.34	230°13.81 N04°39.81	19°33.91 N06°25.78
1	57°4.47	177°6.53 21°0.57	165°33.28 13.59	245°15.87 39.65	34°36.55 25.71
2	72°6.93	192°5.75 1.30	180°33.77 13.83	260°17.93 39.49	49°39.19 25.65
3	87°9.39	207°4.98 · · 2.02	195°34.26 · · 14.08	275°19.99 · · 39.32	64°41.83 · · 25.58
4	102° 11.86	222°4.21 2.74	210°34.74 14.33	290°22.05 39.16	79°44.47 25.52
5	117° 14.32	237°3.43 3.46	225°35.23 14.58	305°24.12 38.99	94°47.10 25.46
6	132° 16.79	252°2.66 S21°4.18	240°35.72 \$23°14.82	320°26.18 N04°38.83	109°49.74 N06°25.39
7	147° 19.25	267°1.89 4.90	255°36.20 15.07	335°28.24 38.67	124°52.38 25.33
8	162°21.71	282°1.11 5.62	270°36.69 15.31	350°30.30 38.50	139° 55.02 25.26
9	177°24.18	297°0.34 · · 6.34	285°37.18 · · 15.56	5°32.37 · · 38.34	154° 57.66 · · 25.20
10	192°26.64	311°59.56 7.05	300°37.66 15.81	20°34.43 38.18	170°0.30 25.14
11	207°29.11	326°58.78 7.77	315°38.15 16.05	35°36.49 38.01	185°2.93 25.07
12	222°31.57	341°58.01 S 21°8.48	330°38.63 \$23°16.29	50°38.55 N04°37.85	200°5.57 N06°25.01
13	237°34.04	356° 57.23 9.20	345°39.12 16.54	65°40.62 37.69	215°8.21 24.95
14	252°36.50	11°56.45 9.91	0°39.60 16.78	80°42.68 37.52	230°10.85 24.88
15	267°38.96	26°55.67 · · 10.62	15°40.09 · · 17.03	95°44.74 · · 37.36	245°13.49 · · 24.82
16	282°41.43	41°54.89 11.33	30°40.57 17.27	110°46.81 37.20	260°16.12 24.76
17	297°43.89	56°54.11 12.04	45°41.06 17.51	125°48.87 37.03	275°18.76 24.69
18	312°46.36	71°53.33 S 21°12.75	60°41.54 S 23°17.75	140°50.93 N04°36.87	290°21.40 N06°24.63
19	327°48.82	86°52.55 13.45	75°42.02 17.99	155°53.00 36.71	305°24.04 24.57
20	342°51.28	101°51.77 14.16	90°42.51 18.24	170°55.06 36.54	320°26.68 24.50
21	357° 53.75	116°50.99 · · 14.87	105°42.99 · · 18.48	185°57.13 · · 36.38	335°29.31 · · 24.44
22	12°56.21	131°50.21 15.57	120°43.47 18.72	200°59.19 36.22	350°31.95 24.38
23	27°58.68	146°49.43 16.27	135°43.95 18.96	216°1.25 36.05	5°34.59 24.31
Mer.p	pass. 21:08	ν-0.8' d0.7' m-3.88	ν0.5' d0.2' m1.33	ν2.1' d-0.2' m-1.80	ν2.6' d-0.1' m0.18
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0 0	43°1.14	161°48.64 S 21°16.97	150°44.44 \$23°19.20	231°3.32 N04°35.89	20°37.23 N06°24.25
1	58°3.61	176° 47.86 17.67	165°44.92 19.44	246°5.38 35.73	35°39.86 24.19
2	73°6.07	170 47.80 17.07 191°47.08 18.37	180°45.40 19.67	261°7.45 35.57	50°42.50 24.12
3	88°8.53	206°46.29 · · 19.07	195°45.88 · · 19.91	276°9.51 · · 35.40	65°45.14 · · 24.06
4	103°11.00	200 40.29 19.07 221°45.51 19.77	210°46.36 20.15	291°11.58 35.24	80° 47.77 24.00
5	118° 13.46	236°44.72 20.47	225°46.84 20.39	306°13.64 35.08	95°50.41 23.93
6	133° 15.93	251°43.94 S21°21.16	240°47.33 \$23°20.63	321°15.71 N04°34.92	110°53.05 N06°23.87
7	148° 18.39	266°43.15 21.86	255°47.81 20.86	336°17.78 34.75	125° 55.68 23.81
8	163°20.85	281°42.36 22.55	270°48.29 21.10	351°19.84 34.59	140°58.32 23.74
9	178°23.32	296°41.57 · · 23.24	285°48.77 · · 21.33	6°21.91 · · 34.43	156°0.96 · · 23.68
10	193°25.78	311°40.79 23.94	300°49.25 21.57	21°23.97 34.27	171°3.59 23.62
11	208°28.25	326°40.00 24.63	315°49.73 21.81	36°26.04 34.11	186°6.23 23.56
12	223°30.71	341°39.21 S21°25.32	330°50.21 \$23°22.04	51°28.11 N04°33.94	201°8.87 N06°23.49
13	238°33.18	356°38.42 26.00	345°50.69 22.28	66°30.17 33.78	216°11.50 23.43
14	253°35.64	11°37.63 26.69	0°51.16 22.51	81°32.24 33.62	231°14.14 23.37
15	268°38.10	26°36.84 · · 27.38	15°51.64 · · 22.74	96°34.31 · · 33.46	246°16.78 · · 23.31
16	283°40.57	41°36.05 28.06	30°52.12 22.98	111°36.37 33.30	261°19.41 23.24
17	298°43.03	56°35.26 28.75	45°52.60 23.21	126°38.44 33.14	276°22.05 23.18
18	313°45.50	71°34.47 S 21°29.43	60°53.08 S 23°23.44	141°40.51 N04°32.97	291°24.68 N06°23.12
19	328° 47.96	86°33.67 30.11	75°53.56 23.67	156°42.57 32.81	306°27.32 23.06
20	343°50.42	101°32.88 30.79	90°54.03 23.91	171°44.64 32.65	321°29.96 22.99
21	358° 52.89	116°32.09 · · 31.47	105°54.51 · · 24.14	186°46.71 · · 32.49	336°32.59 · · 22.93
22	13°55.35	131°31.29 32.15	120°54.99 24.37	201°48.78 32.33	351°35.23 22.87
23	28° 57.82	146°30.50 32.83	135°55.46 24.60	216°50.85 32.17	6°37.86 22.81
Mer r	pass. 21:04	ν-0.8' d0.7' m-3.88	ν0.5' d0.2' m1.33	ν2.1' d-0.2' m-1.80	ν2.6' d-0.1' m0.19
	7433. 21.04	- 0.0 do.1 iii 3.00			
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	44°0.28	161°29.70 S21°33.51	150°55.94 \$23°24.83	231°52.91 N04°32.01	21°40.50 N06°22.74
1	59°2.75	176°28.91 34.18	165°56.42 25.06	246°54.98 31.84	36°43.13 22.68
2	74°5.21	191°28.11 34.86 206°27.32 · · 35.53	180°56.89 25.29 195°57.37 · · 25.52	261°57.05 31.68	51°45.77 22.62
3	89°7.67			276°59.12 · · 31.52 292°1.19 31.36	66°48.41 · · · 22.56 81°51.04
4 5	104° 10.14 119° 12.60	221°26.52 36.20 236°25.72 36.88	210°57.85 25.74 225°58.32 25.97	292°1.19 31.36 307°3.26 31.20	81°51.04 22.49 N 96°53.68 22.43
6	119° 12.60 134° 15.07	251°24.92 S21°37.55	240°58.80 S23°26.20	307° 3.26 31.20 322° 5.33 N04° 31.04	96°53.68 22.43 111°56.31 N06°22.37
7	134 15.07 149° 17.53	266°24.13 38.22	255°59.27 26.43	322 5.33 N04 31.04 337°7.40 30.88	126° 58.95 22.31
8	149 17.53 164° 19.99	281°23.33 38.88	255 59.27 26.43 270°59.75 26.65	357 7.40 30.88 352°9.46 30.72	120 58.95 22.31 142°1.58 22.25
9	179°22.46	296°22.53 · · 39.55	286° 0.22 · · 26.88	7°11.53 · · · 30.56	157°4 22 · · · 22 18
10	179 22.40 194°24.92	311°21.73 40.22	301°0.69 27.11	22°13.60 30.40	172°6.85 22.12
11	209°27.39	326°20.93 40.88	316°1.17 27.33	37°15.67 30.24	187°9.49 22.06
12	209 27.39 224°29.85	341°20.13 S21°41.55	331°1.64 \$23°27.56	52°17.74 N04°30.08	202°12.12 N06°22.00
13	239°32.31	356°19.33 42.21	346°2.12 27.78	67°19.81 29.92	217°14.76 21.94
14	254°34.78	11°18.52 42.87	1°2.59 28.01	82°21.88 29.76	232°17.39 21.87
15	269°37.24	26°17.72 · · 43.53	16°3.06 · · 28.23	97°23.95 · · 29.60	247°20.02 · · 21.81
16	284°39.71	41°16.92 44.19	31°3.54 28.45	112°26.03 29.44	262°22.66 21.75
17	299°42.17	56°16.12 44.85	46°4.01 28.68	127°28.10 29.28	277°25.29 21.69
18	314° 44.64	71°15.31 S21°45.51	61°4.48 \$23°28.90	142°30.17 N04°29.12	292°27.93 N06°21.63
19	329°47.10	86°14.51 46.17	76° 4.95 29.12	157°32.24 28.96	307°30.56 21.57
20	344°49.56	101°13.70 46.82	91°5.43 29.34	172°34.31 28.80	322°33.20 21.50
21	359°52.03	116°12.90 · · 47.48	106° 5.90 · · 29.57	187°36.38 · · 28.64	337°35.83 · · 21.44
22	14° 54.49	131°12.09 48.13	121°6.37 29.79	202°38.45 28.48	352°38.46 21.38
23	29° 56.96	146°11.29 48.78	136° 6.84 30.01	217°40.52 28.32	7°41.10 21.32
			ν 0.5' d0.2' m1.32	$\nu 2.1' \ d$ -0.2' m-1.81	
ivier.p	pass. 21:01	ν-0.8′ d0.7′ m-3.88	νυ.5 αυ.2 m1.32	ν2.1 α-υ.2 m-1.81	ν2.6' d-0.1' m0.19

Ankaa Schedar 3 Diphda 3 Achernar 3 Hamal 3 Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	SHA 157° 32.09 353° 4.57 149° 27.84 148° 44.72 135° 17.97 127° 48.23 12° 17.64 315° 9.62 314° 3.41 108° 24.41 190° 36.66 281° 1.39 180° 18.09 178° 20.15 177° 58.66 175° 35.15 170° 49.36	Dec 29°14.92 -42°9.26 56°41.68 -17°49.92 -57°5.69 23°35.80 89°22.82 -40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79 -1°10.98
Ankaa Schedar 3 Diphda 3 Achernar 3 Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	353° 4.57 449° 27.84 448° 44.72 335° 17.97 427° 48.23 312° 17.64 315° 9.62 314° 3.41 408° 24.41 4090° 36.66 281° 1.39 480° 18.09 478° 20.15 477° 58.66 475° 35.15 470° 49.36	-42°9.26 56°41.68 -17°49.92 -57°5.69 23°35.80 89°22.82 -40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Schedar 3 Diphda 3 Achernar 3 Hamal 3 Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	27.84 448° 44.72 335° 17.97 527° 48.23 512° 17.64 315° 9.62 314° 3.41 608° 24.41 690° 36.66 281° 1.39 880° 18.09 778° 20.15 777° 58.66 6775° 35.15	56°41.68 -17°49.92 -57°5.69 23°35.80 89°22.82 -40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Diphda 3 Achernar 3 Hamal 3 Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	448°44.72 435°17.97 427°48.23 512°17.64 315°9.62 314°3.41 108°24.41 1290°36.66 281°1.39 180°18.09 178°20.15 177°58.66 175°35.15 170°49.36	-17°49.92 -57°5.69 23°35.80 89°22.82 -40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Achernar 3 Hamal 3 Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	35°17.97 327°48.23 312°17.64 315°9.62 314°3.41 308°24.41 90°36.66 281°1.39 800°18.09 178°20.15 177°58.66 175°35.15 170°49.36	23° 35.80 89° 22.82 -40° 11.46 4° 12.06 49° 57.63 16° 33.95 -8° 10.06 46° 1.43 6° 22.54 28° 37.79
Polaris 3 Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	312°17.64 315°9.62 314°3.41 308°24.41 290°36.66 281°1.39 280°18.09 278°20.15 277°58.66 275°35.15 270°49.36	89°22.82 -40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Acamar Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	315° 9.62 314° 3.41 608° 24.41 290° 36.66 281° 1.39 880° 18.09 178° 20.15 277° 58.66 275° 35.15 270° 49.36	-40°11.46 4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Menkar Mirfak 3 Aldebaran 2 Rigel Capella 2	314° 3.41 108° 24.41 190° 36.66 281° 1.39 180° 18.09 178° 20.15 177° 58.66 175° 35.15 170° 49.36	4°12.06 49°57.63 16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Mirfak 3 Aldebaran 2 Rigel Capella 2	808°24.41 290°36.66 281°1.39 880°18.09 278°20.15 277°58.66 275°35.15 270°49.36	16°33.95 -8°10.06 46°1.43 6°22.54 28°37.79
Rigel Capella 2	281°1.39 280°18.09 278°20.15 277°58.66 275°35.15 270°49.36	-8°10.06 46°1.43 6°22.54 28°37.79
Capella 2	280°18.09 278°20.15 277°58.66 275°35.15 270°49.36	46°1.43 6°22.54 28°37.79
	278°20.15 277°58.66 275°35.15 270°49.36	6°22.54 28°37.79
Bellatrix 2	277°58.66 275°35.15 270°49.36	28°37.79
	270°49.36	-1°10.98
		7°24.76
	263°51.04 258°24.02	-52°42.36 -16°45.13
Adhara	255° 3.87	-10 45.15 -29°0.40
	244°48.32	5°9.21
	243°14.40	27°57.38
	234°13.67	-59°35.63
	22°44.62 21°37.80	-43°32.46 -69°49.59
	21 37.60 217°45.54	-8°46.69
	207°32.12	11°49.81
Dubhe 1	.93°38.66	61°35.76
	.82°22.85	14°24.94
	.75°41.47 .72°58.02	-17°41.71 -63°15.05
	.72 58.02 .71°49.50	-63 15.05 -57°16.00
	.66°11.52	55°48.37
Spica 1	.58°20.18	-11°18.33
	.52°50.72	49°10.38
	.48°33.31 .47°55.27	-60°30.35 -36°30.33
	.47 55.27 .45°46.16	-30 30.33 19°2.27
	.39°37.73	-60°56.97
l	.37°21.16	74°2.39
	.36°53.80	-16°9.37
Alphecca Antares 1	126°2.17 .12°13.34	26°37.34 -26°29.56
Atria	107°5.92	-69°4.69
Sabik	102°0.42	-15°45.47
Shaula	96°7.56	-37°7.42
Rasalhague	95°56.67	12°32.55 51°29.35
Eltanin Kaus Aust.	90°41.48 83°29.71	-34°22.26
Vega	80°31.90	38°48.84
Nunki	75°45.10	$-26^{\circ}15.68$
Altair	61°57.81	8°56.73
Peacock	53°2.24 49°24.24	-56°38.83 45°23.15
Deneb Enif	33°36.46	45°23.15 10°0.40
Al Na'ir	27°29.93	-46°49.62
Fomalhaut	15°11.82	-29°28.44
Scheat	13°42.75	28°14.34
Markab	13°27.41	15°21.56
Nov 03 Wed	SHA	Mer.pass
Venus Mars 1	120°5.30 .08°30.79	13:12 13:57
Jupiter 1	.88°11.81	08:38
Saturn 3	37°31.91	22:38
Nov 04 Thu	SHA	Mer.pass
	.18°47.50	13:13
Mars 1	.07°43.30	13:57
Jupiter Saturn 3	188°2.18 37°36.08	08:35 22:34
Nov 05 Fri Venus 1	SHA .17°29.42	Mer.pass 13:15
	.17 29.42 .06°55.66	13:15
	.87°52.63	08:31
Saturn 3	37°40.22	22:29
Horizonta	l parallax	
	Venus:	0.1
	Mars:	0.1

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h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.61	S14°55.15	127°50.39	9.4'	\$26° 5.83	-3.2'	55.2'
1 2	199°6.62 214°6.62	55.94 56.72	142°18.75 156°47.16	9.4' 9.5'	26°2.59 25°59.22	-3.4' -3.5'	55.2' 55.1'
3	229°6.62	57.50	171°15.64	9.5' 9.5'	25 59.22 25°55.72	-3.5' -3.6'	55.1'
4	244°6.63	58.29	185°44.18	9.6'	25°52.09	-3.8'	55.1'
5	259°6.63	59.07	200°12.79	9.7'	25°48.33	-3.9'	55.1'
6	274°6.63 289°6.63	\$14°59.85 15°0.64	214°41.46 229°10.20	9.7' 9.8'	\$25°44.45 25°40.44	-4.0' -4.1'	55.1' 55.0'
7 8	289 6.63 304°6.64	15 0.04	243°39.01	9.8 9.9'	25 40.44 25°36.30	-4.1 -4.3'	55.0'
9	319°6.64	2.20	258°7.89	9.9'	25°32.04	-4.4'	55.0'
10	334°6.64	2.98	272°36.83	10.0'	25°27.65	-4.5'	55.0'
11 12	349°6.64 4°6.64	3.76 \$15° 4.54	287°5.84 301°34 92	10.1' 10.2'	25°23.14 \$25°18.51	-4.6' -4.8'	55.0' 54.9'
13	19°6.64	5.32	316° 4.08	10.2'	25°13.76	-4.6 -4.9'	54.9'
14	34°6.64	6.10	330°33.30	10.3	25°8.88	-5.0'	54.9'
15	49°6.64	• • 6.88	345°2.59	10.4'	25°3.89	-5.1'	54.9'
16 17	64°6.64 79°6.64	7.66 8.44	359°31.96 14°1.40	10.4' 10.5'	24°58.78 24°53.55	-5.2' -5.3'	54.9' 54.8'
18	94°6.64	S15° 9.22	28°30.91	10.5	\$24°48.20	-5.5'	54.8'
19	109°6.63	9.99	43° 0.49	10.7'	24°42.73	-5.6'	54.8'
20	124°6.63	10.77	57°30.15	10.7'	24°37.16	-5.7'	54.8'
21	139°6.63	• • 11.55	71°59.88	10.8'	24°31.46	-5.8'	54.8'
22 23	154°6.63 169°6.62	12.32 13.10	86°29.68 100°59.56	10.9' 11.0'	24°25.66 24°19.74	-5.9' -6.0'	54.7' 54.7'
	SD = 16.1'	d = 0.8'			D = 15.1'	0.0	
	3D = 10.1°	u = 0.0°		اد	J — 13.1°		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.62	S15°13.88	115°29.51	11.0'	\$24°13.71	-6.1'	54.7'
1 2	199°6.61 214°6.61	14.65 15.42	129°59.54 144°29.64	11.1' 11.2'	24°7.57 24°1.31	-6.3' -6.4'	54.7' 54.7'
3	229°6.61	. 16.20	158°59.81	11.3'	24 1.31 23°54.95	-6.5'	54.7'
4	244°6.60	16.97	173°30.06	11.3'	23°48.49	-6.6'	54.6'
5	259°6.59	17.74	188° 0.39	11.4'	23°41.91	-6.7'	54.6'
6 7	274°6.59 289°6.58	\$15°18.52 19.29	202°30.79 217°1.27	11.5' 11.6'	\$23°35.23 23°28.44	-6.8' -6.9'	54.6' 54.6'
8	304°6.58	20.06	231°31.82	11.6'	23°21.55	-0.9 -7.0'	54.6'
9	319°6.57	• • 20.83	246° 2.45	11.7'	23°14.56	-7.1'	54.6'
10	334°6.56	21.60	260°33.15	11.8'	23°7.46	-7.2	54.5'
11 12	349°6.55 4°6.55	22.37 \$15°23.14	275°3.93 289°34.78	11.9' 11.9'	23°0.26 5 22°52.96	-7.3' -7.4'	54.5' 54.5'
13	19°6.54	23.91	269 34.76 304°5.71	12.0'	22°45.56	-7.4 -7.5'	54.5'
14	34°6.53	24.68	318°36.71	12.1'	22°38.06	-7.6'	54.5'
15	49°6.52	• • 25.45	333°7.79	12.2'	22°30.47	-7.7'	54.5'
16 17	64°6.51 79°6.50	26.22 26.99	347°38.94 2°10.17	12.2' 12.3'	22°22.77 22°14.98	-7.8' -7.9'	54.5' 54.5'
18	94°6.49	\$15°27.75	16°41.47	12.4	\$22°7.10	-8.0'	54.4'
19	109°6.48	28.52	31°12.85	12.4'	$21^{\circ}59.12$	-8.1'	54.4'
20	124°6.47	29.29	45°44.30		21°51.05	-8.2'	54.4'
21 22	139°6.46 154°6.45	· · 30.05 30.82	60°15.82 74°47.42	12.6' 12.7'	21°42.88 21°34.62	-8.3' -8.3'	54.4' 54.4'
23	169°6.44	31.58	89°19.09	12.7'	21°26.27	-8.4'	54.4'
	SD = 16.1'	d = 0.8'		SI	D = 14.9'		
	<u> </u>	<u>u = 0.0</u>			J = 14.5		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°6.42 199°6.41	\$15°32.35 33.11	103°50.83 118°22.65	12.8' 12.9'	\$21°17.84 21°9.31	-8.5' -8.6'	54.4' 54.4'
2	214°6.40	33.11	118 22.05 132°54.53	13.0'	21 9.31 21°0.69	-8.7'	54.4' 54.4'
3	229°6.39	• • 34.64	147°26.49	13.0'	20°51.99	-8.8'	54.3'
4	244°6.37	35.40	161°58.52	13.1'	20°43.20	-8.9'	54.3'
5 6	259°6.36 274°6.34	36.17 \$15°36.93	176°30.62 191°2.80	13.2' 13.2'	20°34.33 \$20°25.37	-9.0' -9.0'	54.3' 54.3'
7	274 6.34 289°6.33	37.69	205°35.04	13.2	20° 16.32	-9.0 -9.1'	54.3'
8	304°6.31	38.45	220°7.35	13.4'	20°7.20	-9.2'	54.3'
9	319°6.30	• • 39.21	234°39.73	13.4'	19°57.99	-9.3'	54.3'
10 11	334°6.28 349°6.27	39.97 40.73	249°12.18 263°44.70	13.5' 13.6'	19°48.70 19°39.33	-9.4' -9.5'	54.3' 54.3'
12	4°6.25	40.73 \$15°41.49	263 44.70 278°17.29	13.7	19 39.33 \$19°29.88	-9.5'	54.3
13	19°6.23	42.25	292°49.94	13.7'	$19^{\circ}20.35$	-9.6'	54.3'
14	34°6.22	43.01	307°22.66	13.8'	19°10.74	-9.7'	54.2'
15 16	49°6.20 64°6.18	· · 43.77 44.52	321°55.44 336°28.29	13.9' 13.9'	19°1.06 18°51.30	-9.8' -9.8'	54.2' 54.2'
16 17	79°6.16	44.52 45.28	336°28.29 351°1.21	14.0'	18° 51.30 18° 41.46	-9.8° -9.9'	54.2'
18	94°6.15	S15°46.04	5°34.19	14.0'	S18°31.55	-10.0'	54.2'
19	109°6.13	46.79	20°7.23	14.1'	18°21.57	-10.1'	54.2'
20 21	124°6.11 139°6.09	47.55 •• 48.30	34°40.34 49°13.51	14.2' 14.2'	18°11.51 18°1.38	-10.1' -10.2'	54.2' 54.2'
21	139°6.09 154°6.07	49.06	49°13.51 63°46.74	14.2'	18° 1.38 17° 51.18	-10.2° -10.3'	54.2' 54.2'
23	169°6.05	49.81	78°20.03	14.4'	17°40.91	-10.3	54.2'
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	5-7
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-38%
03	16:26	16:27	11:44	16:02	03:36	
04	16:26	16:26	11:44	16:51	04:27	
05	16:26	16:25	11:44	17:37	05:14	

November 06, 07, 08 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	$44^{\circ}59.42$	161°10.48	S21°49.43	151°7.31	\$23°30.23	232°42.60	N04°28.16	22°43.73	N06°21.26	
1	60°1.88	176°9.67	50.09	166°7.78	30.45	247°44.67	28.00	37°46.36	21.20	
2	75°4.35 90°6.81	191°8.87 206°8.06	50.73 •• 51.38	181°8.25 196°8.72	30.67 •• 30.89	262°46.74 277°48.81	27.84 •• 27.68	52°49.00 67°51.63	21.14 21.08	
4	105°9.28	200 8.00 221°7.25	52.03	211°9.19	31.11	292°50.88	27.52	82°54.27	21.00	
5	120° 11.74	236°6.44	52.68	226° 9.66	31.32	307°52.96	27.36	97°56.90	20.95	
6	135° 14.20	251°5.63	S21°53.32	241°10.13	\$23°31.54	322°55.03	N04°27.20	112° 59.53	N06°20.89	
7	$150^{\circ}16.67$	266°4.82	53.97	256°10.60	31.76	337°57.10	27.04	128°2.17	20.83	
8	165° 19.13	281°4.01	54.61	271°11.07	31.98	352°59.17	26.88	143°4.80	20.77	
9 10	180°21.60 195°24.06	296°3.20 311°2.39	• • 55.25 55.89	286°11.54 301°12.01	· · 32.19 32.41	8°1.25 23°3.32	• • 26.72	158°7.43 173°10.06	· · 20.71 20.65	
11	210°26.53	311 2.39 326°1.58	56.53	316°12.48	32.41	25 5.32 38°5.39	26.56 26.40	173 10.00 188°12.70	20.05	
12	225°28.99	341°0.77	S21°57.17	331°12.95	S23°32.84	53°7.47	N04° 26.25	203°15.33	N06°20.53	
13	$240^{\circ}31.45$	355°59.95	57.81	$346^{\circ}13.41$	33.06	68°9.54	26.09	$218^{\circ}17.96$	20.46	
14	255° 33.92	10°59.14	58.44	1°13.88	33.27	83°11.62	25.93	233°20.60	20.40	
15	270°36.38	25°58.33	• • 59.08	16°14.35	• • 33.49	98°13.69	• • 25.77	248°23.23	• • 20.34	
16 17	285°38.85 300°41.31	40°57.51 55°56.70	21°59.71 22°0.35	31°14.82 46°15.28	33.70 33.91	113°15.76 128°17.84	25.61 25.45	263°25.86 278°28.49	20.28 20.22	
18	315° 43.77	70°55.88	\$22°0.98	61°15.75	\$23°34.13	143°19.91	N04° 25.29	293°31.13	N06°20.16	
19	330° 46.24	85°55.07	1.61	76°16.22	34.34	158°21.99	25.14	308°33.76	20.10	
20	345°48.70	100°54.25	2.24	91°16.68	34.55	173°24.06	24.98	323°36.39	20.04	
21	$0^{\circ}51.17$	115°53.43	• • 2.87	106°17.15	• • 34.76	188°26.14	• • 24.82	338°39.02	• • 19.98	
22	15°53.63	130°52.62	3.49	121°17.62	34.97	203°28.21	24.66	353°41.65	19.92	
23	30° 56.09	145°51.80	4.12	136°18.08	35.19	218°30.29	24.50	8°44.29	19.86	
Mer.p	bass. 20:57	ν -0.8' d0	.7′ m-3.88	$\nu 0.5' d0$.2′ m1.32	$\nu 2.1' \ d-0$.2′ m-1.81	$\nu 2.6' d-0$	0.1′ m0.20	1
_	_									
Sun	GHA 45° 58.56	GHA 160°50.98	Dec \$22° 4.75	GHA 151°18.55	Dec \$23°35.40	GHA 233°32.36	Dec N04° 24.34	GHA	Dec N06°19.80	
0 1	45 58.50 61°1.02	175°50.16	5.37	151 18.55 166°19.01	35.61	233 32.30 248°34.44	24.34	23°46.92 38°49.55	19.74	
2	76°3.49	190°49.34	5.99	181°19.48	35.82	263°36.51	24.03	53°52.18	19.68	
3	91°5.95	205°48.53	• • 6.62	196°19.94	• • 36.03	278°38.59	• • 23.87	68°54.81	• • 19.62	
4	106°8.42	220°47.71	7.24	211°20.41	36.23	293°40.67	23.71	83°57.44	19.56	
5	121° 10.88 136° 13.34	235°46.89 250°46.07	7.86 \$22°8.48	226°20.87 241°21.34	36.44	308°42.74 323°44.82	23.56	99°0.08	19.50	
6 7	150 15.34 151°15.81	250 46.07 265°45.24	9.10	241 21.34 256°21.80	\$23°36.65 36.86	323 44.82 338°46.90	N04° 23.40 23.24	114°2.71 129°5.34	N06°19.44 19.38	
8	166° 18.27	280°44.42	9.71	271°22.27	37.07	353°48.97	23.08	144°7.97	19.32	
9	181°20.74	295°43.60	• • 10.33	286°22.73	• • 37.27	8°51.05	• • 22.93	$159^{\circ}10.60$	• • 19.26	
10	196°23.20	310°42.78	10.94	301°23.19	37.48	23°53.13	22.77	174° 13.23	19.20	
11	211°25.66 226°28.13	325°41.96 340°41.13	11.56 \$22°12.17	316°23.66	37.69 \$23°37.89	38°55.20 53°57.28	22.61 N04°22.45	189°15.86 204°18.49	19.14 N06°19.08	
12 13	220 28.13 241°30.59	340 41.13 355°40.31	12.78	331°24.12 346°24.58	38.10	53 57.28 68°59.36	22.30	204 18.49 219°21.13	19.02	
14	256°33.06	10°39.48	13.39	1°25.04	38.30	84°1.44	22.14	234°23.76	18.96	
15	271°35.52	25°38.66	• • 14.00	16°25.51	• • 38.51	99°3.51	• • 21.98	249°26.39	• • 18.90	
16	286° 37.98	40°37.83	14.61	31°25.97	38.71	114°5.59	21.83	264°29.02	18.84	
17	301°40.45	55°37.01	15.21 \$22°15.82	46°26.43	38.91 \$23°39.12	129°7.67	21.67 N04°21.51	279°31.65	18.78 N06°18.72	
18 19	316° 42.91 331° 45.38	70°36.18 85°35.35	16.43	61°26.89 76°27.35	39.32	144°9.75 159°11.83	21.35	294°34.28 309°36.91	18.66	
20	346° 47.84	100°34.53	17.03	91°27.81	39.52	174°13.90	21.20	324°39.54	18.60	
21	1°50.30	115°33.70	• • 17.63	106°28.28	• • 39.72	189°15.98	• • 21.04	339°42.17	• • 18.54	
22	$16^{\circ}52.77$	130°32.87	18.23	121°28.74	39.93	204°18.06	20.88	354°44.80	18.48	
23	31°55.23	145°32.04	18.83	136°29.20	40.13	219°20.14	20.73	9°47.43	18.42	
Mer.p	pass. 20:53	ν -0.8' d0	.6′ m-3.88	ν 0.5′ d0.	.2′ m1.32	$\nu 2.1' \ d-0$.2′ m-1.82	$\nu 2.6' \ d-0$	0.1′ m0.20	
	C	S	5	611.5				6111	5	
Mon 0	GHA 46° 57.70	GHA 160°31.22	Dec \$22°19.43	GHA 151°29.66	Dec \$23°40.33	GHA 234°22.22	Dec N04° 20.57	GHA 24°50.06	Dec N06°18.36	
1	62°0.16	175°30.39	20.03	166°30.12	40.53	249°24.30	20.42	39°52.69	18.30	
2	77°2.62	190°29.56	20.63	181°30.58	40.73	264°26.38	20.26	54°55.32	18.24	
3	92°5.09	205°28.73	•• 21.22	196°31.04	• • 40.93	279°28.46	• • 20.10	69°57.95	• 18.18	H
4	107°7.55	220°27.89	21.82	211°31.50	41.13	294°30.54	19.95	85°0.58	18.12	'
5 6	122° 10.02 137° 12.48	235°27.06 250°26.23	22.41 \$22°23.00	226°31.96 241°32.41	41.33 \$23°41.52	309°32.62 324°34.70	19.79 N04° 19.63	100°3.21 115°5.84	18.06 N06°18.00	
7	157 12.46 152° 14.95	265°25.40	23.60	256°32.87	41.72	339°36.78	19.48	130°8.47	17.94	
8	167° 17.41	280°24.57	24.19	271°33.33	41.92	354°38.86	19.32	145°11.09	17.88	
9	$182^{\circ}19.87$	295°23.73	• • 24.78	286°33.79	• • 42.12	9°40.94	• • 19.17	$160^{\circ}13.72$	• • 17.83	
10	197°22.34	310°22.90	25.36	301°34.25	42.31	24°43.02	19.01	175° 16.35	17.77	'
11 12	212°24.80 227°27.27	325°22.07 340°21.23	25.95 \$22°26.54	316°34.71 331°35.16	42.51 \$23°42.70	39°45.10 54°47.18	18.86 N04° 18.70	190°18.98 205°21.61	17.71 N06°17.65	
13	242°29.73	355°20.40	27.12	346°35.62	42.90	69°49.26	18.54	205 21.01 220°24.24	17.59	
14	257°32.19	10° 19.56	27.71	1°36.08	43.10	84°51.34	18.39	235°26.87	17.53	
15	272°34.66	25°18.73	• • 28.29	16°36.54	• • 43.29	99°53.43	• 18.23	250°29.50	• • 17.47	N
16	287°37.12	40°17.89	28.87	31°36.99	43.48	114°55.51	18.08	265°32.13	17.41	
17	302°39.59 317°42.05	55°17.06	29.45	46°37.45	43.68 \$23°43.87	129°57.59 144°59.67	17.92	280°34.75 295°37.38	17.35	
18 19	317°42.05 332°44.51	70° 16.22 85° 15.38	\$22°30.03 30.61	61°37.91 76°38.36	44.06	144 59.67 160°1.75	N04° 17.77 17.61	295° 37.38 310° 40.01	N06°17.30 17.24	
20	347°46.98	100° 14.54	31.18	91°38.82	44.26	175°3.84	17.46	325° 42.64	17.18	H
21	2°49.44	115°13.70	• • 31.76	106°39.27	• • 44.45	190°5.92	•• 17.30	340°45.27	• • 17.12	
22	17°51.91	130°12.87	32.33	121°39.73	44.64	205°8.00	17.15	355° 47.89	17.06	
23	32°54.37	145°12.03	32.91	136°40.18	44.83	220°10.08	16.99	10°50.52	17.00	
Mer.p	pass. 20:49	ν -0.8′ d0	.6′ m-3.88	ν 0.5′ d0.	.2′ m1.32	$\nu 2.1' \ d-0$.2′ m-1.82	$\nu 2.6' d-0$	0.1′ m0.21	

	Stars	
	SHA	Dec
Alpheratz	357°32.09	29°14.93
Ankaa Schedar	353°4.57 349°27.85	-42°9.27 56°41.69
Diphda	348°44.72	-17°49.92
Achernar	335°17.97	-57°5.71
Hamal	327°48.22 312°17.27	23°35.81 89°22.83
Polaris Acamar	312 17.27 315°9.61	-40°11.47
Menkar	314°3.40	4°12.06
Mirfak	308°24.39	49°57.64
Aldebaran Rigel	290°36.65 281°1.37	16°33.95 -8°10.07
Capella	280°18.07	46°1.43
Bellatrix	278°20.13	6°22.53
Elnath Alnilam	277°58.64 275°35.13	28°37.79 -1°10.98
Betelgeuse	270°49.34	7°24.76
Canopus	263°51.01	-52°42.37
Sirius Adhara	258°24.00 255°3.85	-16°45.14 -29°0.41
Procyon	235 3.65 244°48.30	5°9.20
Pollux	243°14.37	27°57.38
Avior	234°13.64	-59°35.63
Suhail Miaplacidus	222°44.59 221°37.75	-43°32.47 -69°49.59
Alphard	217°45.52	-8°46.70
Regulus	207°32.09	11°49.80
Dubhe Denebola	193°38.62 182°22.83	61°35.75 14°24.93
Gienah	102 22.03 175°41.45	-17°41.71
Acrux	172°57.99	-63° 15.04
Gacrux	171°49.48	-57° 15.99
Alioth Spica	166°11.50 158°20.16	55°48.35 -11°18.34
Alkaid	150° 50.70	49° 10.36
Hadar	148°33.29	-60°30.34
Menkent Arcturus	147°55.26 145°46.16	-36°30.32 19°2.26
Rigil Kent.	145 46.16 139°37.72	-60°56.96
Kochab	$137^{\circ}21.16$	$74^{\circ}2.37$
Zuben'ubi	136°53.79	-16°9.37
Alphecca Antares	126°2.17 112°13.34	26°37.33 -26°29.56
Atria	$107^{\circ}5.93$	-69°4.68
Sabik	102°0.43	-15°45.48
Shaula Rasalhague	96°7.56 95°56.68	-37°7.42 12°32.55
Eltanin	90°41.50	51°29.34
Kaus Aust.	83°29.72	-34°22.26
Vega	80°31.92 75°45.11	38°48.83 -26°15.68
Nunki Altair	61°57.82	8°56.73
Peacock	53°2.26	-56°38.83
Deneb	49°24.26	45°23.14 10°0.40
Enif Al Na'ir	33°36.47 27°29.94	-46°49.63
Fomalhaut	15°11.83	-29°28.45
Scheat	13°42.76	28° 14.34
Markab	13°27.42	15°21.56
Nov 06 Sat	SHA	Mer.pass
Venus Mars	116°11.06 106°7.89	13:16 13:55
Jupiter	187°43.17	08:28
Saturn	337°44.31	22:25
Nov 07 Sun	SHA	Mer.pass
Venus Mars	114°52.42 105°19.99	13:17 13:54
Jupiter	105 19.99 187°33.80	08:25
Saturn	337°48.36	22:21
Nov 08 Mon	SHA	Mer.pass
Venus	113°33.52 104°31.96	13:19
Mars Jupiter	104 31.96 187°24.52	13:54 08:21
Saturn	337°52.36	22:17
Horizon	ıtal parallax	

Venus: Mars:

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.03	S15°50.57	$92^{\circ}53.38$	14.4'	S 17°30.56	-10.4'	54.2'
1	199°6.01	51.32	107°26.79	14.5'	17°20.15	-10.5'	54.2'
2 3	214° 5.99 229° 5.96	52.07 •• 52.82	122°0.26 136°33.79	14.5' 14.6'	17°9.67 16°59.13	-10.5' -10.6'	54.2' 54.2'
4	244° 5.94	53.58	151°7.37	14.6'	16°48.51	-10.7	54.2'
5	259°5.92	54.33	$165^{\circ}41.01$	14.7'	$16^{\circ}37.83$	-10.7'	54.2'
6	274° 5.90	S 15°55.08	180°14.71	14.8'	S16°27.09	-10.8'	54.2'
7 8	289°5.87 304°5.85	55.83 56.58	194°48.46 209°22.27	14.8' 14.9'	16°16.28 16°5.40	-10.9' -10.9'	54.2' 54.2'
9	319° 5.83	57.33	209 22.27 223°56.13	14.9'	15°54.47	-10.9 -11.0'	54.2'
10	334° 5.80	58.08	238°30.04	15.0'	15°43.47	-11.1'	54.2'
11	349°5.78	58.83	253°4.01	15.0'	$15^{\circ}32.41$	-11.1'	54.2'
12	4°5.75	S15°59.58	267°38.02	15.1'	\$15°21.28	-11.2'	54.2'
13 14	19° 5.73 34° 5.70	16°0.32 1.07	282°12.09 296°46.21	15.1' 15.2'	15°10.10 14°58.86	-11.2' -11.3'	54.2' 54.2'
15	49° 5.68	. 1.82	311°20.37	15.2'	14° 47.56	-11.4'	54.2'
16	64°5.65	2.56	325°54.58	15.3'	14°36.21	-11.4'	54.2'
17	79°5.62	3.31	340°28.84	15.3'	14°24.79	-11.5'	54.2'
18 19	94° 5.60 109° 5.57	\$16°4.06 4.80	355°3.15 9°37.50	15.4' 15.4'	\$14°13.32 14°1.79	-11.5' -11.6'	54.2' 54.2'
20	109 5.57 124° 5.54	4.80 5.54	9 37.50 24°11.90	15.4' 15.4'	14 1.79 13°50.21	-11.6' -11.6'	54.2'
21	139° 5.51	. 6.29	38°46.33	15.5'	13°38.57	-11.7'	54.2'
22	154° 5.48	7.03	53°20.82	15.5'	13°26.88	-11.7'	54.2'
23	169° 5.46	7.78	67°55.34	15.6'	13°15.14	-11.8'	54.2'
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.43	S 16°8.52	$82^{\circ}29.90$	15.6'	S13°3.34	-11.8'	54.2'
1	199°5.40	9.26	97°4.51	15.6'	12°51.50	-11.9'	54.2'
2	214°5.37	10.00	111°39.15	15.7'	12°39.60	-11.9'	54.2'
3 4	229°5.34 244°5.31	· · 10.74 11.48	126°13.83 140°48.55	15.7' 15.8'	12°27.65 12°15.65	-12.0' -12.0'	54.2' 54.2'
5	259° 5.28	12.22	155°23.30	15.8'	12°3.61	-12.1'	54.2'
6	274°5.25	S16°12.96	169°58.09	15.8'	S 11°51.51	-12.1'	54.2'
7	289° 5.21	13.70	184°32.92	15.9'	11°39.37	-12.2'	54.2'
8 9	304° 5.18 319° 5.15	14.44 •• 15.18	199°7.78 213°42.67	15.9' 15.9'	11°27.18 11°14.94	-12.2' -12.3'	54.2' 54.2'
10	334° 5.12	15.16	213 42.07 228°17.59	16.0'	11°2.66	-12.3'	54.3
11	349° 5.08	16.66	242°52.54	16.0'	10°50.34	-12.4'	54.3'
12	4°5.05	S16°17.39	257°27.52	16.0'	\$10°37.97	-12.4'	54.3'
13 14	19° 5.02 34° 4.98	18.13 18.87	272°2.53 286°37.57	16.0' 16.1'	10°25.55 10°13.10	-12.5' -12.5'	54.3' 54.3'
15	49° 4.95	. 19.60	301°12.63	16.1	10°0.60	-12.5'	54.3'
16	64°4.91	20.34	315°47.73	16.1'	09°48.06	-12.6'	54.3'
17	79° 4.88	21.07	330°22.84	16.1'	09°35.47	-12.6'	54.3'
18 19	94° 4.84 109° 4.81	\$16°21.81 22.54	344°57.98 359°33.14	16.2' 16.2'	\$09°22.85 09°10.19	-12.7' -12.7'	54.3' 54.3'
20	109 4.81 124° 4.77	23.27	14°8.32		09°10.19		54.3
21	139° 4.73	• • 24.00	28°43.53	16.2'	08°44.75	-12.8'	54.3'
22	154° 4.70	24.74	43°18.75	16.2'	08°31.98	-12.8'	54.4'
23	169° 4.66	25.47	57°53.99	16.3'	08°19.16	-12.8'	54.4'
	SD = 16.1'	d = 0.7'		SI	D = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184° 4.62 199° 4.58	\$16°26.20 26.93	72°29.25 87°4.53	16.3' 16.3'	\$08°6.31 07°53.43	-12.9' -12.9'	54.4' 54.4'
2	214° 4.55	27.66	101°39.82	16.3	07°55.45	-12.9 -13.0'	54.4'
3	229°4.51	• • 28.39	$116^{\circ}15.13$	16.3'	$07^{\circ}27.55$	-13.0'	54.4'
4	244°4.47	29.12	130°50.45	16.3'	07°14.57	-13.0'	54.4'
5 6	259° 4.43 274° 4.39	29.85 \$16°30.58	145°25.78 160°1.13	16.3' 16.4'	07°1.54 \$06°48.49	-13.1' -13.1'	54.4' 54.4'
7	274 4.39 289° 4.35	31.31	174°36.48	16.4	06°35.40	-13.1'	54.4 54.5'
8	304°4.31	32.03	$189^{\circ}11.85$	16.4	06°22.29	-13.1	54.5'
9	319° 4.27	• • 32.76	203°47.22	16.4'	06°9.14	-13.2'	54.5'
10 11	334° 4.23 349° 4.18	33.49 34.21	218°22.60 232°57.99	16.4' 16.4'	05°55.96 05°42.76	-13.2' -13.2'	54.5' 54.5'
11	349° 4.18 4° 4.14	34.21 \$16°34.94	232°57.99 247°33.38	16.4	505°29.52	-13.2	54.5'
13	19°4.10	35.66	262°8.78	16.4	$05^{\circ}16.26$	-13.3'	54.5'
14	34°4.06	36.39	276°44.17	16.4	05°2.97	-13.3'	54.6'
15 16	49° 4.01 64° 3.97	· · 37.11 37.83	291°19.58 305°54.98	16.4'	04°49.65 04°36.31	-13.3'	54.6' 54.6'
16 17	64° 3.97 79° 3.93	37.83 38.56	305°54.98 320°30.38	16.4' 16.4'	04°36.31 04°22.94	-13.4' -13.4'	54.6'
18	94° 3.88	S16°39.28	335°5.78	16.4	S04°9.55	-13.4	54.6'
19	109°3.84	40.00	349°41.18	16.4'	03°56.13	-13.4'	54.6'
20	124°3.79 139°3.75	40.72	4°16.58 18°51.97	16.4	03°42.69	-13.5'	54.6'
21 22	139°3.75 154°3.70	· · 41.44 42.16	18°51.97 33°27.35	16.4' 16.4'	03°29.23 03°15.75	-13.5' -13.5'	54.7' 54.7'
23	169° 3.66	42.88	48°2.73	16.4	03°2.24	-13.5'	54.7'
	SD = 16.1'	d = 0.7'		SI	D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	47-66%	
06	16:24	16:23	11:44	18:20	05:59		
07	16:22	16:20	11:44	19:02	06:41		
08	16:18	16:17	11:44	19:42	07:22		

November 09, 10, 11 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	47° 56.83	160°11.19	151°40.64 \$23°45.02	235°12.17 N04°16.84	25°53.15 N06°16.94
1	62° 59.30	175°10.35 34.05	166°41.09 45.21	250°14.25 16.68	40°55.78 16.89
2	78° 1.76	190°9.51 34.62	181°41.55 45.40	265°16.33 16.53	55°58.41 16.83
3	93°4.23	205°8.67 · · 35.19	196°42.00 · · 45.59	280°18.42 · · 16.37	71°1.03 · · 16.77
4	108°6.69	220°7.82 35.76	211°42.46 45.78	295°20.50 16.22	86°3.66 16.71
5	123°9.15	235°6.98 36.33	226°42.91 45.97	310°22.58 16.06	101°6.29 16.65
6	138° 11.62	250°6.14 S22°36.89	241°43.37 \$23°46.16	325°24.67 N04°15.91	116° 8.91 N06° 16.59
7	153° 14.08	265°5.30 37.46	256°43.82 46.35	340°26.75 15.76	131° 11.54 16.54
8	168° 16.55	280°4.46 38.02	271°44.27 46.53	355°28.84 15.60	146°14.17 16.48
9	183° 19.01	295°3.61 · · 38.58	286°44.73 · · 46.72	10°30.92 · · 15.45	161°16.80 · · 16.42
10	198° 21.47	310°2.77 39.14	301°45.18 46.91	25°33.00 15.29	176° 19.42 16.36
11	213°23.94	325°1.92 39.70	316°45.63 47.09	40°35.09 15.14	191°22.05 16.30
12	228° 26.40	340°1.08 \$22°40.26	331°46.09	55°37.17 N04°14.99	206° 24.68 N06° 16.25
13	243°28.87	355°0.23 40.82	346°46.54 47.46	70°39.26 14.83	221°27.30 16.19
14	258°31.33	9°59.39 41.38	1°46.99 47.65	85°41.34 14.68	236°29.93 16.13
15	273°33.80	24°58.54 · · 41.93	16°47.44 · · 47.83	100°43.43 · · 14.52	251°32.56 · · 16.07
16	288°36.26	39°57.70 42.49	31°47.89 48.02	115° 45.51 14.37	266°35.18 16.02
17	303°38.72	54°56.85 43.04	46°48.35 48.20	130°47.60 14.22	281°37.81 15.96
18	318°41.19	69°56.00 \$22°43.59	61°48.80 S 23°48.38	145°49.69 N04°14.06	296°40.44 N06°15.90
19	333°43.65	84°55.15 44.14	76°49.25 48.57	160°51.77 13.91	311°43.06 15.84
20	$348^{\circ}46.12$	99°54.30 44.69	91°49.70 48.75	175°53.86 13.76	326°45.69 15.78
21	3°48.58	114°53.46 · · 45.24	106°50.15 · · 48.93	190°55.94 · · 13.60	341°48.31 · · 15.73
22	18°51.04	129°52.61 45.79	121°50.60 49.11	205°58.03 13.45	356° 50.94 15.67
23	$33^{\circ}53.51$	144°51.76 46.34	136°51.05 49.29	221°0.12 13.30	11°53.56 15.61
Merr	pass. 20:45	ν-0.8' d0.6' m-3.88	ν 0.5' d0.2' m1.32	ν2.1' d-0.2' m-1.82	ν2.6' d-0.1' m0.21
	Jass. 20.45	ν-0.0 d0.0 m-3.00		ν2.1 d-0.2 III-1.02	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	48° 55.97	159°50.91 S 22°46.88	151°51.50 \$23°49.48	236°2.20 N04°13.14	26°56.19 N06°15.55
1	63°58.44	174°50.06 47.43	166°51.95 49.66	251°4.29 12.99	41°58.82 15.50
2	79°0.90	189°49.21 47.97	181°52.40 49.84	266°6.38 12.84	57°1.44 15.44
3	94°3.36	204°48.36 · · 48.51	196°52.85 · · 50.02	281°8.47 · · 12.68	72°4.07 · · 15.38
4	109°5.83	219°47.50 49.05	211°53.30 50.19	296°10.55 12.53	87°6.69 15.33
5	124°8.29	234°46.65 49.59	226°53.75 50.37	311°12.64 12.38	102°9.32 15.27
6	139° 10.76	249°45.80 S22°50.13	241°54.20 \$23°50.55	326°14.73 N04°12.23	117°11.94 N06°15.21
7	154° 13.22	264°44.95 50.67	256°54.64 50.73	341°16.82 12.07	132° 14.57 15.15
8	169° 15.68	279°44.09 51.20	271°55.09 50.91	356°18.90 11.92	147° 17.19 15.10
9	184° 18.15	294°43.24 · · 51.74	286°55.54 · · 51.08	11°20.99 · · 11.77	162°19.82 · · 15.04
10	199° 20.61	309°42.39 52.27	301°55.99 51.26	26°23.08 11.62	177°22.44 14.98
11	214° 23.08	324°41.53 52.80	316°56.44 51.44	41°25.17 11.46 56°27.26 N04°11.31	192°25.07 14.93
12	229°25.54	339°40.68	331°56.88 \$23°51.61		207°27.69 N06°14.87
13	244° 28.00 259° 30.47	354°39.82 53.87 9°38.96 54.40	346°57.33 51.79 1°57.78 51.96		222°30.32 14.81
14	259 30.47 274° 32.93			86°31.44 11.01 101°33.52 · · 10.85	237°32.94 14.76 252°35.56 · · 14.70
15	274 32.93 289°35.40	24°38.11 · · 54.92 39°37.25 55.45			
16 17	289 35.40 304° 37.86	54°36.40 55.98	31°58.67 52.31 46°59.12 52.48	116°35.61 10.70 131°37.70 10.55	267°38.19 14.64 282°40.81 14.59
18	319°40.32	69°35.54 S22°56.50	61°59.57 \$23°52.66	146°39.79 N04°10.40	297°43.44 N06°14.53
19	334° 42.79	84°34.68 57.03	77°0.01 52.83	161°41.88 10.25	312° 46.06 14.47
20	349°45.25	99° 33.82 57.55	92°0.46 53.00	176°43.97 10.09	312 40.00 14.47 327°48.68 14.42
21	4° 47.72	114°32.96 · · 58.07	107° 0.90 · · 53.17	191°46.06 · · 9.94	342°51.31 · · 14.36
22	19°50.18	129°32.10 58.59	122°1.35 53.35	206°48.15 9.79	357°53.93 14.30
23	34°52.64	144°31.24 59.11	137°1.80 53.52	221°50.24 9.64	12°56.55 14.25
Mer.p	pass. 20:41	ν -0.9 $'$ d 0.5 $'$ m-3.88	$ u 0.4' \ d0.2' \ m1.32$	$\nu 2.1' \ d$ -0.2' m-1.83	ν2.6′ d-0.1′ m0.22
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	49°55.11	159°30.38	152°2.24 \$23°53.69	236°52.33 N04°9.49	27°59.18 N06°14.19
1	64° 57.57	174°29.52 23°0.14	167°2.69 53.86	251°54.43 9.34	43°1.80 14.13
2	80°0.04	189°28.66 0.66	182°3.13 54.03	266°56.52 9.19	58°4.42 14.08
3	95°2.50	204°27.80 · · 1.17	197°3.57 · · 54.20	281°58.61 · · 9.03	73°7.05 · · 14.02
4	110°4.97	219°26.94 1.69	212°4.02 54.37	297°0.70 8.88	88°9.67 13.97 I
5	125°7.43	234°26.08 2.20	227°4.46 54.53	312°2.79 8.73	103°12.29 13.91
6	140°9.89	249°25.22 \$23°2.71	242°4.91 S 23°54.70	327°4.88 N04°8.58	118°14.92 N06°13.85
7	$155^{\circ}12.36$	264°24.35 3.22	257°5.35 54.87	342°6.97 8.43	133°17.54 13.80
8	$170^{\circ}14.82$	279°23.49 3.73	272°5.79 55.04	357°9.07 8.28	148°20.16 13.74
9	185° 17.29	294°22.63 · · 4.23	287°6.24 · · 55.20	12°11.16 · · 8.13	163°22.78 · · 13.69
10	$200^{\circ}19.75$	309°21.76 4.74	302°6.68 55.37	27°13.25 7.98	1/8°25.41 13.63
11	215° 22.21	324°20.90 5.24	317°7.12 55.54	42°15.34 7.83	193°28.03 13.57
12	230°24.68	339°20.04 \$23°5.75	332°7.57 \$23°55.70	57°17.44 N04°7.68	208°30.65 N06°13.52
13	245°27.14	354°19.17 6.25	347°8.01 55.87	72°19.53 7.53	223°33.27 13.46
14	260° 29.61	9°18.30 6.75	2°8.45 56.03	87°21.62 7.38	238°35.90 13.41
15	275° 32.07	24°17.44 · · 7.25	17°8.89 · · 56.20	102°23.71 · · 7.23	253°38.52 · · 13.35
16	290°34.53	39°16.57 7.75	32°9.34 56.36	117°25.81 7.07	268°41.14 13.30
17	305°37.00	54°15.71 8.25	47° 9.78 56.52	132°27.90 6.92	283°43.76 13.24
18	320° 39.46	69°14.84 \$23°8.75	62°10.22 S 23°56.69	147°29.99 N04°6.77	298°46.38 N06°13.19
19	335°41.93	84°13.97 9.24	77°10.66 56.85	162°32.09 6.62	313° 49.00 13.13
20	350°44.39	99°13.10 9.74	92°11.10 57.01	177°34.18 6.47	328°51.63 13.07
21	5°46.85	114°12.24 · · 10.23	107°11.54 · · 57.17	192°36.28 · · 6.32	343°54.25 · · 13.02
22	20°49.32	129°11.37 10.72	122°11.98 57.33	207°38.37 6.17	358° 56.87 12.96
23	35°51.78	144° 10.50 11.21	137°12.42 57.49	222°40.46 6.02	13°59.49 12.91
Mer.	pass. 20:37	ν -0.9 $'$ d0.5 $'$ m-3.88	ν 0.4′ d 0.2′ m 1.31	$\nu 2.1' \ d$ -0.2' m-1.83	$ u 2.6' \ d$ -0.1' m0.22

	Stars	
	SHA	Dec
Alpheratz	357°32.10	29°14.93
Ankaa Schedar	353°4.58 349°27.87	-42°9.28 56°41.70
Diphda	348°44.73	-17°49.93
Achernar	$335^{\circ}17.98$	$-57^{\circ}5.72$
Hamal	327°48.23	23°35.81
Polaris Acamar	312°17.07 315°9.61	89°22.85 -40°11.48
Menkar	314° 3.40	4°12.05
Mirfak	308°24.39	49°57.65
Aldebaran Rigel	290°36.64 281°1.36	16°33.95 -8°10.07
Capella	280°18.05	46°1.44
Bellatrix	278°20.12	6°22.53
Elnath Alnilam	277°58.62 275°35.11	28°37.79 -1°10.99
Betelgeuse	270°49.33	7°24.75
Canopus	263°50.99	-52°42.38
Sirius	258°23.98	-16°45.15
Adhara Procyon	255°3.83 244°48.28	-29°0.42 5°9.20
Pollux	244 46.26 243°14.35	27°57.38
Avior	234°13.60	-59°35.64
Suhail	222°44.57	-43°32.47
Miaplacidus Alphard	221°37.70 217°45.50	-69°49.59 -8°46.71
Regulus	$207^{\circ}32.07$	11°49.79
Dubhe	193°38.58	61°35.74
Denebola	182°22.82 175°41.44	14°24.92 -17°41.71
Gienah Acrux	175 41.44 172°57.97	-17 41.71 -63°15.04
Gacrux	171°49.46	-57°15.98
Alioth	166°11.48	55°48.33
Spica Alkaid	158°20.16 152°50.69	-11°18.34 49°10.35
Hadar	148°33.28	-60°30.33
Menkent	$147^{\circ}55.25$	-36°30.32
Arcturus	145°46.15	19°2.25 -60°56.95
Rigil Kent. Kochab	139°37.72 137°21.16	-60°56.95 74°2.35
Zuben'ubi	136°53.79	$-16^{\circ}9.37$
Alphecca	126°2.17	26°37.32
Antares Atria	112°13.34 107°5.95	-26°29.56 -69°4.67
Sabik	107 3.93 102°0.43	-15°45.48
Shaula	$96^{\circ}7.57$	-37°7.41
Rasalhague	95°56.69	12°32.54
Eltanin Kaus Aust.	90°41.52 83°29.73	51°29.32 -34°22.26
Vega	80°31.93	38°48.82
Nunki	75°45.12	-26°15.68
Altair Peacock	61°57.84 53°2.28	8°56.72 -56°38.83
Peacock Deneb	53° 2.28 49° 24.28	-56° 38.83 45° 23.14
Enif	33°36.49	$10^{\circ}0.40$
Al Na'ir	27°29.97	-46°49.64
Fomalhaut Scheat	15°11.84 13°42.78	-29°28.46 28°14.34
Markab	13°27.43	15°21.56
Nov 09 Tue	SHA	Mer.pass
Venus	112°14.35	13:20
Mars Jupiter	103°43.81 187°15.33	13:53 08:18
Saturn	337°56.32	22:13
Nov 10 Wed	SHA	Mer.pass
Venus	110°54.94	13:21
Mars Jupiter	102°55.53 187°6.23	13:52 08:15
Saturn	338° 0.22	22:08
Nov 11 Thu	SHA	Mer.pass
Venus	109°35.28	13:23
Mars Jupiter	102°7.13 186°57.23	13:51 08:11
Saturn	338° 4.07	22:04
Horizon	ital parallax	
1.011201	Venus:	0.1
	Mars:	0.1

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 3.61	S16°43.60	62°38.10	16.4'	S02°48.72	-13.5'	54.7'
1	199°3.56	44.32	77°13.47	16.4'	02°35.17	-13.6'	54.7'
2	214°3.52	45.04	91°48.82	16.3'	02°21.61	-13.6'	54.8'
3	229° 3.47	• • 45.76	106°24.16	16.3'	02°8.03	-13.6'	54.8'
4 5	244° 3.42 259° 3.37	46.48 47.19	120°59.49 135°34.81	16.3' 16.3'	01°54.43 01°40.81	-13.6' -13.6'	54.8' 54.8'
6	259 3.37 274° 3.33	47.19 \$16°47.91	150°10.12	16.3	S01°27.18	-13.6'	54.8'
7	289°3.28	48.63	164°45.40	16.3	01°13.53	-13.7	54.8'
8	304°3.23	49.34	179°20.68	16.3'	00°59.86	-13.7'	54.9'
9	319°3.18	• • 50.06	193°55.93	16.2'	00°46.19	-13.7'	54.9'
10	334°3.13	50.77	208°31.17	16.2'	00°32.50	-13.7'	54.9'
11	349° 3.08	51.49	223°6.38	16.2	00°18.79	-13.7'	54.9'
12 13	4°3.03 19°2.98	\$16°52.20 52.91	237°41.58 252°16.75	16.2' 16.2'	S00°5.08 N00°8.65	-13.7' 13.7'	54.9' 55.0'
14	34° 2.93	53.63	266°51.90	16.1	00°22.39	13.7	55.0'
15	49°2.87	• • 54.34	281°27.03	16.1	00°36.14	13.8'	55.0'
16	64°2.82	55.05	296°2.13	16.1'	00°49.89	13.8'	55.0'
17	79°2.77	55.76	310°37.21	16.0'	$01^{\circ}3.66$	13.8'	55.0'
18	94°2.72	S16°56.47	325°12.25	16.0'	N01°17.43	13.8'	55.1'
19	109°2.66	57.18	339°47.27	16.0'	01°31.20	13.8'	55.1'
20 21	124°2.61 139°2.56	57.89 •• 58.60	354°22.26 8°57.22	16.0' 15.9'	01°44.99 01°58.78	13.8' 13.8'	55.1' 55.1'
21	139° 2.50 154° 2.50	16°59.31	8°57.22 23°32.15	15.9' 15.9'	01°58.78 02°12.57	13.8'	55.1'
23	169° 2.45	10 59.51 17°0.02	38°7.04	15.9'	02°12.37	13.8'	55.2'
-	SD = 16.1'	d = 0.7'			D = 14.9'		
	3D = 10.1	u = 0.1		31	∪ = 14.9°		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°2.39	S17°0.73	52°41.90	15.8'	N02°40.17	13.8'	55.2'
1	199°2.34 214°2.28	1.43	67°16.73 81°51.52	15.8'	02°53.97 03°7.77	13.8'	55.2'
2	214°2.28 229°2.23	2.14	81°51.52 96°26.27	15.8' 15.7'	03°7.77 03°21.57	13.8' 13.8'	55.2' 55.3'
4	244° 2.17	3.55	111°0.98	15.7'	03°21.37	13.8'	55.3'
5	259°2.11	4.26	125°35.65	15.6'	03°49.17	13.8'	55.3'
6	274°2.06	S 17°4.96	140°10.29	15.6'	N04°2.97	13.8'	55.3'
7	289°2.00	5.66	154°44.88	15.5'	04°16.76	13.8'	55.4'
8	304°1.94	6.37	169°19.42	15.5'	04°30.55	13.8'	55.4'
9	319° 1.88 334° 1.82	• • 7.07	183°53.93 198°28.38	15.5'	04°44.34 04°58.11	13.8'	55.4'
10 11	334°1.82 349°1.76	7.77 8.48	213°2.79	15.4' 15.4'	04°58.11 05°11.89	13.8' 13.8'	55.4' 55.4'
12	4° 1.71	\$17°9.18	227°37.16	15.3'	N05°25.65	13.8	55.5'
13	19°1.65	9.88	242°11.47	15.3'	05°39.41	13.7'	55.5'
14	34°1.59	10.58	256°45.74	15.2'	05°53.15	13.7'	55.5'
15	49° 1.53	• • 11.28	271°19.95	15.2'	06°6.89	13.7'	55.5'
16	64°1.46	11.98	285°54.11	15.1'	06°20.61 06°34.32	13.7'	55.6'
17 18	79°1.40 94°1.34	12.68 S 17°13.38	300°28.22 315°2.27	15.1' 15.0'	06°34.32 N06°48.02	13.7' 13.7'	55.6' 55.6'
19	109° 1.28	14.07	329°36.27	14.9'	07°1.70	13.7'	55.6'
20	124°1.22	14.77	344°10.21	14.9'	07°15.37	13.7'	55.7'
21	$139^{\circ}1.16$	• • 15.47	358°44.10	14.8'	07°29.02	13.6'	55.7'
22	154° 1.09	16.16	13°17.92	14.8'	07°42.66	13.6'	55.7'
23	169°1.03	16.86	27°51.69	14.7'	07°56.27	13.6'	55.8'
	SD = 16.1'	d = 0.7'		SI	D = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°0.97	S17°17.56	42°25.40	14.6'	$N08^{\circ}9.87$	13.6'	55.8'
1	199°0.90	18.25	56°59.04	14.6'	08°23.45	13.6'	55.8'
2	214° 0.84 229° 0.77	18.94	71°32.62	14.5' 14.5'	08°37.00 08°50.53	13.5'	55.8'
3 4	229°0.77 244°0.71	· · 19.64 20.33	86°6.13 100°39.58	14.5′ 14.4′	08°50.53 09°4.04	13.5' 13.5'	55.9' 55.9'
5	259° 0.64	21.02	100 39.36 115°12.97	14.4	09° 17.53	13.5'	55.9'
6	274° 0.58	S17°21.72	129°46.28	14.2'	N09°30.98	13.4'	55.9'
7	289°0.51	22.41	144°19.53	14.2'	09°44.42	13.4'	56.0'
8	304°0.44	23.10	158°52.71	14.1'	09°57.82	13.4'	56.0'
9	319° 0.38 334° 0.31	• • 23.79	173°25.82	14.0'	10°11.19 10°24.54	13.3'	56.0'
10 11	334°0.31 349°0.24	24.48 25.17	187°58.85 202°31.82	14.0' 13.9'	10°24.54 10°37.85	13.3' 13.3'	56.0' 56.1'
12	4° 0.17	\$17°25.86	202 31.62 217°4.71	13.8'	N10°51.13	13.2	56.1
13	19°0.11	26.55	231°37.52	13.7'	11°4.38	13.2'	56.1
14	34°0.04	27.24	246°10.26	13.7'	11°17.59	13.2'	56.2'
15	48°59.97	• • 27.92	260°42.92	13.6'	11°30.76	13.1'	56.2'
16	63°59.90 78°59.83	28.61	275°15.50 289°48.01	13.5'	11°43.90	13.1'	56.2'
17 18	78°59.83 93°59.76	29.30 \$17°29.98	289°48.01 304°20.43	13.4' 13.3'	11°57.00 N12°10.06	13.1' 13.0'	56.2' 56.3'
19	108°59.69	30.67	318°52.78	13.3'	12°23.08	13.0'	56.3
20	123°59.62	31.35	333°25.04	13.2'	12°36.06	12.9'	56.3
21	138°59.55	• • 32.04	347°57.22	13.1'	12°48.99	12.9'	56.3'
22	153°59.48	32.72	2°29.31	13.0'	13°1.88	12.8'	56.4'
23	168°59.40	33.41	17°1.32	12.9'	13°14.73	12.8'	56.4'
	SD = 16.1'	d = 0.7'		S	D = 15.2'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	74-89%	
09	16:14	16:12	11:44	20:23	08:03		
10	16:10	16:07	11:44	21:05	08:44		
11	16:04	16:01	11:44	21:50	09:27		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	50° 54.25	159°9.63 \$23°11.70	152°12.86	237°42.56 N04°5.87	29°2.11 N06°12.85	
1	65° 56.71	174°8.76 12.19	167°13.30 57.81	252°44.65 5.73	44°4.73 12.80	Alpheratz 357°32.11 29°14.93
2	80°59.17	189°7.89 12.68	182°13.74 57.97	267°46.75 5.58	59°7.35 12.74	Ankaa 353°4.60 -42°9.29
3	96°1.64	204°7.02 · · 13.17	197°14.18 · · 58.13	282°48.84 · · 5.43	74°9.97 · · 12.69	Schedar 349°27.88 56°41.71
4	$111^{\circ}4.10$	219°6.15 13.65	212°14.62 58.29	297°50.94 5.28	89°12.59 12.63	Diphda 348°44.73 -17°49.94 Achernar 335°17.99 -57°5.74
5	$126^{\circ}6.57$	234°5.28 14.14	227°15.06 58.45	312°53.03 5.13	104° 15.21 12.58	Hamal 327°48.23 23°35.81
6	141°9.03	249°4.40 S23°14.62	242°15.50 \$23°58.61	327°55.13 N04°4.98	119°17.83 N06°12.52	Polaris 312°16.76 89°22.87
7	156° 11.50	264°3.53 15.10	257°15.94 58.76	342°57.23 4.83	134°20.45 12.47	Acamar 315°9.61 -40°11.50
8	171°13.96	279°2.66 15.58	272°16.38 58.92 287°16.82 · · 59.08	357°59.32 4.68	149°23.07 12.41	Menkar 314°3.39 4°12.05
9 10	186° 16.42 201° 18.89	294°1.79 · · 16.06 309°0.91 16.54	287°16.82 · · 59.08 302°17.26 59.23	13°1.42 · · 4.53 28°3.51 4.38	164°25.70 · · 12.36 179°28.32 12.30	Mirfak 308°24.38 49°57.66
11	216°21.35	324°0.04 17.01	317°17.69 59.39	43°5.61 4.23	194°30.94 12.25	Aldebaran 290°36.62 16°33.95
12	231°23.82	338°59.17 S23°17.49	332°18.13 S23°59.55	58°7.71 N04°4.08	209°33.55 N06°12.20	Rigel 281°1.34 -8°10.08
13	246° 26.28	353°58.29 17.96	347°18.57 59.70	73°9.80 3.93	224°36.17 12.14	Capella 280°18.03 46°1.44
14	261°28.74	8°57.42 18.44	2°19.01 23°59.85	88°11.90 3.79	239° 38.79 12.09	Bellatrix 278°20.10 6°22.52
15	$276^{\circ}31.21$	23°56.54 · · 18.91	17°19.45 24°0.01	103°14.00 · · 3.64	254°41.41 · · 12.03	Elnath 277°58.61 28°37.79 Alnilam 275°35.10 -1°10.99
16	291°33.67	38°55.67 19.38	32°19.88 0.16	118°16.10 3.49	269°44.03 11.98	Betelgeuse 270°49.31 7°24.74
17	306°36.14	53°54.79 19.85	47°20.32 0.31	133°18.19 3.34	284°46.65 11.92	Canopus 263°50.96 -52°42.40
18	321°38.60	68°53.91 S23°20.32	62°20.76	148°20.29 N04°3.19	299°49.27 N06°11.87	Sirius 258°23.97 -16°45.16
19 20	336° 41.06 351° 43.53	83°53.04 20.79 98°52.16 21.25	77°21.19 0.62 92°21.63 0.77	163°22.39 3.04 178°24.49 2.89	314°51.89 11.81 329°54.51 11.76	Adhara 255°3.81 -29°0.43
21	6°45.99	113°51.28 · · 21.72	107°22.07 · · 0.92	193°26.58 · · 2.75	344°57.13 · · 11.71	Procyon 244°48.26 5°9.19
22	21°48.46	128° 50.41 22.18	122°22.50 1.07	208°28.68 2.60	359°59.75 11.65	Pollux 243°14.33 27°57.37
23	36°50.92	143°49.53 22.65	137°22.94 1.22	223°30.78 2.45	15°2.37 11.60	Avior 234°13.57 -59°35.65
N 4	20.22			ν2.1' d-0.1' m-1.83	ν2.6' d-0.1' m0.22	Suhail 222°44.54 -43°32.48 Miaplacidus 221°37.64 -69°49.59
ivier.	pass. 20:33	ν-0.9' d0.5' m-3.88	$\nu 0.4' \ d0.2' \ m1.31$	ν2.1 <i>α</i> -0.1 m-1.65	ν2.0 <i>a</i> -0.1 mo.22	Miaplacidus 221°37.64 -69°49.59 Alphard 217°45.48 -8°46.71
						Regulus 207°32.05 11°49.78
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.55 61°35.72
0	51°53.39	158°48.65 \$23°23.11 173°47.77 23.57	152°23.37	238°32.88 N04°2.30	30°4.99 N06°11.54	Denebola 182°22.80 14°24.91
1 2	66° 55.85 81° 58.31	173°47.77 23.57 188°46.89 24.03	167°23.81 1.52 182°24.24 1.67	253°34.98 2.15 268°37.08 2.01	45°7.60 11.49 60°10.22 11.44	Gienah 175°41.42 -17°41.71
3	97°0.78	203°46.01 · · 24.48	197°24.68 · · 1.82	283°39.18 · · 1.86	75°12.84 · · 11.38	Acrux 172°57.93 -63°15.03
4	112°3.24	218° 45.13 24.94	212°25.11 1.97	298°41.28 1.71	90°15.46 11.33	Gacrux 171°49.43 -57°15.98
5	127°5.71	233°44.25 25.40	227°25.55 2.12	313°43.38 1.56	105°18.08 11.27	Alioth 166°11.47 55°48.31 Spica 158°20.14 -11°18.34
6	142°8.17	248°43.37 S 23°25.85	242°25.98 S 24°2.27	328°45.47 N04°1.42	120°20.70 N06°11.22	Alkaid 152°50.69 49°10.33
7	157° 10.63	263°42.49 26.30	257°26.42 2.41	343°47.57 1.27	135°23.31 11.17	Hadar 148°33.27 -60°30.32
8	172°13.10	278°41.61 26.76	272°26.85 2.56	358°49.67 1.12	150°25.93 11.11	Menkent 147°55.24 -36°30.31
9	187° 15.56	293°40.73 · · 27.21	287°27.29 · · 2.71	13°51.77 · · 0.97	165°28.55 · · 11.06	Arcturus 145°46.14 19°2.24
10	202°18.03 217°20.49	308°39.85 27.66	302°27.72 2.85 317°28.15 3.00	28°53.87 0.83 43°55.98 0.68	180°31.17 11.01 195°33.78 10.95	Rigil Kent. 139°37.70 -60°56.93
11 12	232°22.95	323°38.96 28.11 338°38.08 \$23°28.55	317°28.15 3.00 332°28.59 \$24°3.14	43°55.98 0.68 58°58.08 N04°0.53	195°33.78 10.95 210°36.40 N06°10.90	Kochab 137°21.16 74°2.34
13	247°25.42	353°37.20 29.00	347°29.02 3.29	74°0.18 0.38	225°39.02 10.85	Zuben'ubi 136°53.79 -16°9.37
14	262°27.88	8°36.31 29.44	2°29.45 3.43	89°2.28 0.24	240°41.64 10.79	Alphecca 126°2.17 26°37.31 Antares 112°13.35 -26°29.55
15	$277^{\circ}30.35$	23°35.43 · · 29.89	17°29.89 · · 3.57	104°4.38 04°0.09	255°44.25 · · 10.74	Antares 112°13.35 -26°29.55 Atria 107°5.96 -69°4.65
16	292°32.81	38°34.54 30.33	32°30.32 3.72	119°6.48 03°59.94	270°46.87 10.69	Sabik 102°0.44 -15°45.48
17	307°35.28	53°33.66 30.77	47°30.75 3.86	134°8.58 59.80	285°49.49 10.63	Shaula 96°7.58 -37°7.40
18 19	322° 37.74 337° 40.20	68°32.78 \$23°31.21 83°31.89 31.65	62°31.18	149°10.68 N03°59.65 164°12.79 59.50	300°52.10 N06°10.58 315°54.72 10.53	Rasalhague 95°56.70 12°32.53
20	352° 42.67	83°31.89 31.65 98°31.00 32.09	77°31.61 4.14 92°32.05 4.29	164°12.79 59.50 179°14.89 59.36	315°54.72 10.53 330°57.34 10.47	Eltanin 90°41.54 51°29.31
21	7°45.13	113°30.12 · · 32.52	107°32.48 · · 4.43	194°16.99 · · 59.21	345°59.95 · · 10.42	Kaus Aust. 83°29.74 -34°22.25
22	22°47.60	128°29.23 32.96	122°32.91 4.57	209°19.09 59.06	1°2.57 10.37	Vega 80°31.95 38°48.81
23	37°50.06	143°28.35 33.39	137°33.34 4.71	224°21.19 58.92	16°5.19 10.31	Nunki 75°45.14 -26°15.68 Altair 61°57.85 8°56.72
Mar	20:20	ν -0.9' d0.5' m-3.88	ν0.4' d0.1' m1.31	ν2.1' d-0.1' m-1.84	ν2.6' d-0.1' m0.23	Altair 61°57.85 8°56.72 Peacock 53°2.31 -56°38.83
ivier.	pass. 20:29	ν-0.9 d0.5 m-5.00	νο.4 αυ.1 m1.31	ν2.1 <i>α</i> -0.1 m-1.64	V2.0 <i>a</i> -0.1 mo.25	Deneb 49°24.30 45°23.14
						Enif 33°36.50 10°0.40
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.99 -46°49.64
0	52° 52.52	158°27.46 \$23°33.83	152°33.77	239°23.30 N03°58.77	31°7.80 N06°10.26	Fomalhaut 15°11.86 -29°28.46
1	67°54.99	173°26.57 34.26	167°34.20 4.99	254°25.40 58.63	46°10.42 10.21	Scheat 13°42.79 28°14.34
2	82° 57.45 97° 59.92	188°25.68 34.69 203°24.79 · · 35.12	182°34.63 5.12 197°35.06 • 5.26	269°27.50 58.48 284°29.61 • 58.33	61°13.03 10.16 76°15.65 · · 10.10	Markab 13°27.45 15°21.56
4	113°2.38	218°23.91 35.55	212°35.49 5.40	299°31.71 58.19	91°18.27 10.05	Nov 12 Fri SHA Mer.pass
5	128°4.85	233°23.02 35.97	212 35.49 5.40 227°35.93 5.54	314°33.81 58.04	106°20.88 10.00	Venus 108°15.38 13:24
6	143°7.31	248°22.13 S23°36.40	242°36.36 S24°5.68	329°35.92 N03°57.90	121°23.50 N06°9.95	Mars 101°18.62 13:51
7	$158^{\circ}9.77$	263°21.24 36.82	257°36.78 5.81	344°38.02 57.75	136° 26.11 9.89	Jupiter 186°48.31 08:08
8	173° 12.24	278° 20.35 37.25	272°37.21 5.95	359°40.12 57.60	151°28.73 9.84	Saturn 338°7.86 22:00
9	188° 14.70	293°19.46 · · 37.67	287°37.64 · · 6.08	14°42.23 · · 57.46	166°31.34 · · 9.79	Nov 13 Sat SHA Mer.pass
10	203° 17.17	308°18.57 38.09	302°38.07 6.22	29°44.33 57.31	181°33.96 9.74 196°36.57 9.68	Venus 106° 55.26 13:26
11 12	218° 19.63 233° 22.09	323°17.68 38.51 338°16.79 \$23°38.93	317°38.50 6.35 332°38.93 \$24°6.49	44°46.44 57.17 59°48.54 N03°57.02	196°36.57 9.68 211°39.19 N06°9.63	Mars 100°29.99 13:50
13	248°24.56	353°15.89 39.35	347°39.36 6.62	74°50.65 56.88	211 39.19 Noo 9.03 226°41.80 9.58	Jupiter 186°39.49 08:05
14	263°27.02	8°15.00 39.76	2°39.79 6.76	89°52.75 56.73	241°44.42 9.53	Saturn 338°11.60 21:56
15	278°29.49	23°14.11 · · 40.18	17°40.22 · · 6.89	104°54.86 · · 56.59	256°47.03 · · 9.48	Nov 14 Sun SHA Mer.pass
16	293°31.95	38°13.22 40.59	32°40.64 7.02	119°56.96 56.44	271°49.65 9.42	Venus 105°34.93 13:27
17	308°34.42	53°12.33 41.00	47°41.07 7.16	134°59.07 56.30	286°52.26 9.37	Mars 99°41.25 13:49
18 19	323°36.88 338°39.34	68°11.43 S 23°41.41 83°10.54 41.82	62°41.50 S 24°7.29 77°41.93 7.42	150°1.17 N03°56.15 165°3.28 56.01	301°54.87 N06°9.32 316°57.49 9.27	Jupiter 186°30.77 08:01
20	353°41.81	98° 9.64 42.23	92°42.36 7.55	180°5.39 55.86	332°0.10 9.22	Saturn 338°15.28 21:52
21	8°44.27	113°8.75 · · 42.64	107°42.78 · · 7.68	195°7.49 · · 55.72	347°2.72 · · 9.16	Horizontal parallax
22	23°46.74	128°7.86 43.05	122°43.21 7.81	210°9.60 55.57	2°5.33 9.11	Venus: 0.1
23	38°49.20	143°6.96 43.45	137°43.64 7.94	225°11.71 55.43	17°7.94 9.06	Mars: 0.1
Mer.	pass. 20:25	ν-0.9' d0.4' m-3.88	ν0.4' d0.1' m1.31	ν2.1' d-0.1' m-1.84	ν2.6' d-0.1' m0.23	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.33	S17°34.09	31°33.24	12.8'	$N13^{\circ}27.52$	12.7'	56.4'
1	198° 59.26	34.77	46°5.08	12.7'	13°40.27	12.7'	56.5'
2	213°59.19 228°59.11	35.45 •• 36.14	60°36.83 75°8.49	12.7' 12.6'	13°52.97 14°5.62	12.6' 12.6'	56.5' 56.5'
4	243°59.04	36.82	89°40.06	12.5'	14°18.21	12.5'	56.5
5	258° 58.96	37.50	104°11.55	12.4'	14°30.75	12.5'	56.6'
6	273°58.89	S 17°38.18	118°42.94	12.3'	N14°43.23	12.4'	56.6'
7	288° 58.81 303° 58.74	38.86	133°14.23	12.2'	14°55.66	12.4'	56.6' 56.7'
8 9	303°58.74 318°58.66	39.53 •• 40.21	147°45.44 162°16.55	12.1' 12.0'	15°8.03 15°20.34	12.3' 12.3'	56.7'
10	333° 58.59	40.89	176° 47.57	11.9'	15°32.59	12.2'	56.7'
11	348°58.51	41.57	191°18.49	11.8'	15°44.78	12.1'	56.7'
12	3°58.43	\$17°42.24	205°49.32	11.7'	N15°56.91	12.1'	56.8'
13 14	18° 58.36 33° 58.28	42.92 43.59	220°20.05 234°50.68	11.6' 11.5'	16°8.97 16°20.96	12.0' 11.9'	56.8' 56.8'
15	48° 58.20	• • 44.27	249°21.21	11.4	16°32.88	11.9'	56.8'
16	63°58.12	44.94	263°51.65	11.3'	16°44.74	11.8'	56.9'
17	78°58.05	45.62	278°21.98	11.2'	16°56.53	11.7'	56.9'
18 19	93°57.97 108°57.89	\$17°46.29 46.96	292°52.22 307°22.35	11.1' 11.0'	N17°8.24 17°19.88	11.6' 11.6'	56.9' 57.0'
20	100 57.89 123°57.81	40.90 47.64	301° 22.35 321° 52.39	10.9'	17 19.00 17°31.44	11.5	57.0'
21	138° 57.73	• • 48.31	336°22.32	10.8'	17°42.93	11.4'	57.0'
22	153° 57.65	48.98	350°52.15	10.7'	17°54.34	11.3'	57.0'
23	168°57.57	49.65	5°21.87	10.6'	18°5.66	11.2'	57.1'
	SD = 16.1'	d = 0.7'		SI	O = 15.4'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.49	\$17°50.32	19°51.50	10.5'	N18°16.91	11.2'	57.1'
1	198°57.40	50.99	34°21.01	10.4'	18°28.07	11.1'	57.1'
2	213°57.32 228°57.24	51.66 •• 52.33	48°50.43 63°19.74	10.3' 10.2'	18°39.15 18°50.15	11.0' 10.9'	57.2' 57.2'
3 4	243°57.16	53.00	77°48.94	10.2	10 50.15 19°1.05	10.9	57.2'
5	258° 57.07	53.66	92°18.04	10.0'	19°11.87	10.7'	57.2'
6	273°56.99	S17°54.33	106°47.03	9.9'	N19°22.60	10.6'	57.3'
7 8	288° 56.91 303° 56.82	55.00 55.66	121°15.92 135°44.70	9.8' 9.7'	19°33.23 19°43.77	10.5' 10.4'	57.3' 57.3'
9	318° 56.74	56.33	150°13.37	9.7	19 43.77 19°54.21	10.4	57.3'
10	333° 56.65	56.99	164°41.94	9.5'	20°4.56	10.2'	57.4'
11	348° 56.57	57.66	179°10.40	9.4'	20°14.81	10.1'	57.4'
12 13	3°56.48 18°56.40	\$17°58.32 58.98	193°38.75 208°7.00	9.2' 9.1'	N20°24.96 20°35.01	10.0' 9.9'	57.4'
13	33°56.31	58.98 17°59.65	208 7.00 222°35.13	9.1	20°35.01	9.9 9.8'	57.4' 57.5'
15	48° 56.22	18° 0.31	237°3.16	8.9'	20°54.79	9.7'	57.5'
16	63°56.14	0.97	251°31.09	8.8'	21°4.52	9.6'	57.5'
17 18	78° 56.05 93° 55.96	1.63 \$18° 2.29	265°58.90 280°26.61	8.7' 8.6'	21°14.14 N21°23.65	9.5' 9.4'	57.6' 57.6'
19	108° 55.87	2.95	294°54.21	8.5	21°33.06	9.4	57.6'
20	123°55.79	3.61	309°21.71	8.4'	21°42.34	9.2'	57.6'
21	138°55.70	• • 4.27	323°49.10	8.3'	21°51.52	9.1'	57.7'
22 23	153° 55.61 168° 55.52	4.93 5.59	338°16.38 352°43.55	8.2' 8.1'	22° 0.58 22° 9.51	8.9' 8.8'	57.7' 57.7'
23	SD = 16.2'	d = 0.7'			0 = 15.6'	0.0	31.1
	<u>JD = 10.2</u>	u = 0.7		31	J = 15.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°55.43 198°55.34	\$18° 6.24 6.90	7°10.62 21°37.59	8.0' 7.9'	N22°18.33 22°27.03	8.7' 8.6'	57.7' 57.8'
2	213°55.25	7.56	36° 4.45	7.8	22°35.61	8.5	57.8'
3	228°55.16	• • 8.21	50°31.20	7.7'	22°44.06	8.3'	57.8'
4	243°55.07	8.87	64°57.86	7.5'	22°52.39	8.2'	57.8'
5 6	258° 54.97 273° 54.88	9.52 \$18°10.17	79°24.40 93°50.85	7.4' 7.3'	23° 0.59 N23° 8.66	8.1' 7.9'	57.9' 57.9'
7	273 54.66 288°54.79	10.83	93 50.65 108°17.19	7.3 7.2'	23°16.60	7.9 7.8'	57.9'
8	303°54.70	11.48	122°43.44	7.1'	23°24.40	7.7'	57.9'
9	318°54.60	• • 12.13	137° 9.58	7.0'	23°32.08	7.5'	58.0'
10 11	333°54.51 348°54.42	12.79 13.44	151°35.62 166°1.56	6.9' 6.8'	23°39.62 23°47.02	7.4' 7.3'	58.0' 58.0'
12	3°54.32	\$18°14.09	180° 27.40	6.7	N23°54.28	7.3	58.0'
13	18° 54.23	14.74	194°53.15	6.7'	$24^{\circ}1.41$	7.0'	58.0'
14	33°54.13	15.39	209°18.80	6.6'	24°8.39	6.8'	58.1'
15 16	48° 54.04 63° 53.94	· · 16.04 16.68	223°44.36 238°9.82	6.5' 6.4'	24°15.23 24°21.93	6.7' 6.6'	58.1' 58.1'
17	78° 53.84	17.33	250° 9.02 252° 35.19	6.3	24° 21.93	6.4	58.1
18	93°53.75	S18°17.98	267° 0.47	6.2'	N24°34.88	6.3'	58.2'
19	108° 53.65	18.63	281°25.65	6.1'	24°41.14	6.1'	58.2'
20 21	123°53.55 138°53.46	19.27 •• 19.92	295°50.75 310°15.76	6.0' 5.9'	24°47.24 24°53.20	6.0' 5.8'	58.2' 58.2'
22	153°53.36	20.56	324°40.68	5.8'	24°59.00	5.6'	58.3
23	168°53.26	21.21	339° 5.52	5.8'	25°4.65	5.5'	58.3'
	SD = 16.2'	d = 0.7'		SI	O = 15.7'		

Lat. Naut. Civil Sunrise Sunset Civil N 72° 06:51 08:24 10:30 12:57 15:0 N 70° 06:42 08:03 09:35 13:52 15:2 68° 06:34 07:46 09:02 14:25 15:4 66° 06:28 07:33 08:39 14:49 15:5 64° 06:22 07:22 08:20 15:08 16:1 62° 06:17 07:12 08:05 15:23 16:1 60° 06:12 07:04 07:52 15:36 16:2 N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	16:36 16:45 1 16:53 15 17:00 16 17:05 17:11 17:15 11 17:19 18 17:23
N 70° 06:42 08:03 09:35 13:52 15:2 68° 06:34 07:46 09:02 14:25 15:4 66° 06:28 07:33 08:39 14:49 15:5 64° 06:22 07:22 08:20 15:08 16:0 62° 06:17 07:12 08:05 15:23 16:1 60° 06:12 07:04 07:52 15:36 16:2 N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	5 16:45 1 16:53 15 17:00 16 17:05 17:11 14 17:15 11 17:19 18 17:23
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1 16:53 17:00 16 17:05 5 17:11 14 17:15 11 17:19 18 17:23
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	17:00 16 17:05 17:11 14 17:15 11 17:19 18 17:23
64° 06:22 07:22 08:20 15:08 16:0 62° 06:17 07:12 08:05 15:23 16:1 60° 06:12 07:04 07:52 15:36 16:2 N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	16 17:05 5 17:11 14 17:15 11 17:19 18 17:23
62° 06:17 07:12 08:05 15:23 16:1 60° 06:12 07:04 07:52 15:36 16:2 N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	5 17:11 4 17:15 11 17:19 18 17:23
60° 06:12 07:04 07:52 15:36 16:2 N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	17:15 1 17:19 18 17:23
N 58° 06:08 06:56 07:41 15:46 16:3 56° 06:04 06:50 07:32 15:56 16:3	17:19 8 17:23
56° 06:04 06:50 07:32 15:56 16:3	8 17:23
	4 17:27
54° 06:01 06:44 07:23 16:04 16:4	·
52° 05:58 06:39 07:16 16:12 16:4	9 17:30
50° 05:55 06:34 07:09 16:19 16:5	4 17:33
45° 05:47 06:23 06:54 16:34 17:0	5 17:41
N 40° 05:41 06:14 06:42 16:46 17:1	4 17:47
35° 05:35 06:05 06:32 16:56 17:2	
30° 05:29	
20° 05:18	4 18:10
N 10° 05:06 05:32 05:54 17:35 17:5	
0° 04:54 05:19 05:41 17:48 18:1	.0 18:35
S 10° 04:39 05:05 05:28 18:01 18:2	3 18:49
20° 04:22 04:50 05:13 18:15 18:3	9 19:07
30° 04:00 04:31 04:57 18:32 18:5	
35° 03:46 04:20 04:48 18:41 19:0	
40° 03:29 04:06 04:37 18:53 19:2	
45° 03:08 03:50 04:24 19:06 19:3	9 20:22
S 50° 02:39 03:29 04:08 19:22 20:0	
52° 02:24 03:19 04:00 19:29 20:1	
54° 02:06 03:08 03:52 19:38 20:2	
56° 01:43 02:55 03:43 19:47 20:3	
58° 01:12 02:39 03:32 19:58 20:5	
S 60° 00:09 02:20 03:20 20:10 21:1	1 ////

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-100%	
12	15:57	15:54	11:44	22:38	10:13		
13	15:50	15:46	11:44	23:30	11:03		
14	15:42	15:37	11:44	-:-	11:58		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	53°51.66	158°6.07 \$23°43.86	152°44.06 \$24°8.07	240°13.81 N03°55.28	32°10.56 N06°9.01	
1	$68^{\circ}54.13$	173°5.17 44.26	167°44.49 8.20	255°15.92 55.14	47°13.17 8.96	Alpheratz 357°32.11 29°14.94 Ankaa 353°4.61 -42°9.30
2	83°56.59	188°4.27 44.66	182°44.92 8.33	270°18.03 54.99	62°15.78 8.91	Ankaa 353°4.61 -42°9.30 Schedar 349°27.88 56°41.72
3	98°59.06	203°3.38 · · 45.06	197°45.34 · · 8.45	285°20.13 · · 54.85	77°18.40 · · 8.85	Diphda 348°44.74 -17°49.95
4 5	114°1.52 129°3.99	218°2.48 45.46 233°1.58 45.86	212°45.77 8.58 227°46.19 8.71	300°22.24 54.71 315°24.35 54.56	92°21.01 8.80 107°23.62 8.75	Achernar 335°18.00 -57°5.75
6	129 5.99 144°6.45	248°0.69 S23°46.25	242°46.62 S24°8.84	330°26.46 N03°54.42	107 25.02 8.75 122°26.24 N06°8.70	Hamal 327°48.22 23°35.82
7	159°8.91	262°59.79 46.65	257°47.05 8.96	345°28.56 54.27	137°28.85 8.65	Polaris 312°16.28 89°22.89
8	$174^{\circ}11.38$	277°58.89 47.04	272°47.47 9.09	0°30.67 54.13	152°31.46 8.60	Acamar 315°9.61 -40°11.52 Menkar 314°3.38 4°12.05
9	189° 13.84	292°57.99 · · 47.44	287°47.90 · · 9.21	15°32.78 · · 53.99	167°34.08 · · 8.55	Mirfak 308°24.36 49°57.67
10 11	204° 16.31 219° 18.77	307°57.10 47.83 322°56.20 48.22	302°48.32 9.34 317°48.74 9.46	30°34.89 53.84 45°37.00 53.70	182°36.69 8.50 197°39.30 8.44	Aldebaran 290°36.61 16°33.94
12	234°21.23	337°55.30 \$23°48.61	332°49.17 \$24°9.59	60°39.11 N03°53.56	212°41.91 N06°8.39	Rigel 281°1.33 -8°10.09
13	249°23.70	352°54.40 49.00	347°49.59 9.71	75°41.22 53.41	227°44.52 8.34	Capella 280°18.00 46°1.45 Bellatrix 278°20.08 6°22.52
14	264°26.16	7°53.50 49.38	2°50.02 9.83	90°43.33 53.27	242°47.14 8.29	Bellatrix 278°20.08 6°22.52 Elnath 277°58.59 28°37.79
15	279°28.63	22°52.60 · · 49.77	17°50.44 · · 9.96	105°45.44 · · 53.13	257° 49.75 · · 8.24	Alnilam 275°35.08 -1°11.00
16 17	294°31.09 309°33.56	37°51.70 50.15 52°50.80 50.54	32°50.87 10.08 47°51.29 10.20	120°47.54 52.98 135°49.65 52.84	272°52.36 8.19 287°54.97 8.14	Betelgeuse 270°49.29 7°24.74
18	324° 36.02	67°49.90 S23°50.92	62°51.71 \$24°10.32	150°51.76 N03°52.70	302°57.58 N06°8.09	Canopus 263°50.94 -52°42.42
19	339°38.48	82°49.00 51.30	77°52.14 10.44	165°53.87 52.55	318°0.20 8.04	Sirius 258°23.94 -16°45.17 Adhara 255°3.79 -29°0.45
20	354° 40.95	97°48.09 51.68	92°52.56 10.56	180°55.98 52.41	333°2.81 7.99	Procyon 244°48.24 5°9.18
21	9°43.41	112°47.19 · · 52.06	107°52.98 · · 10.68	195°58.10 · · 52.27	348°5.42 · · 7.94	Pollux 243°14.30 27°57.37
22 23	24° 45.88 39° 48.34	127°46.29 52.44 142°45.39 52.81	122°53.40 10.80 137°53.83 10.92	211°0.21 52.12 226°2.32 51.98	3°8.03 7.89 18°10.64 7.84	Avior 234°13.53 -59°35.66
			· · · · · · · · · · · · · · · · · · ·			Suhail 222°44.51 -43°32.49
Mer.p	pass. 20:21	ν-0.9' d0.4' m-3.88	ν 0.4' d0.1' m1.31	ν2.1' d-0.1' m-1.85	ν2.6' d-0.1' m0.24	Miaplacidus 221°37.58 -69°49.60 Alphard 217°45.45 -8°46.72
						Alphard 217°45.45 -8°46.72 Regulus 207°32.03 11°49.77
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.52 61°35.71
0 1	54°50.81 69°53.27	157°44.48	152°54.25	241°4.43 N03°51.84 256°6.54 51.70	33°13.25 N06°7.79 48°15.86 7.74	Denebola 182°22.78 14°24.90
2	84°55.73	187° 42.68 53.93	167°54.67 11.16 182°55.09 11.28	271°8.65 51.55	63°18.47 7.69	Gienah 175°41.40 -17°41.72
3	99°58.20	202°41.77 · · 54.30	197°55.52 ·· 11.39	286°10.76 · · 51.41	78°21.08 · · 7.64	Acrux 172°57.89 -63°15.02 Gacrux 171°49.39 -57°15.97
4	$115^{\circ}0.66$	217°40.87 54.67	212°55.94 11.51	301°12.87 51.27	93°23.69 7.59	Gacrux 171°49.39 -57°15.97 Alioth 166°11.45 55°48.30
5	130°3.13	232°39.96 55.04	227°56.36 11.63	316°14.99 51.13	108°26.30 7.53	Spica 158°20.13 -11°18.35
6	145°5.59	247°39.06 S23°55.41 262°38.16 55.77	242°56.78 \$24°11.74	331°17.10 N03°50.98 346°19.21 50.84	123°28.91 N06°7.48 138°31.52 7.43	Alkaid 152°50.67 49°10.31
7 8	160°8.05 175°10.52	262°38.16 55.77 277°37.25 56.14	257°57.20 11.86 272°57.62 11.97	346°19.21 50.84 1°21.32 50.70	138°31.52 7.43 153°34.13 7.39	Hadar 148°33.23 -60°30.31
9	190° 12.98	292°36.34 · · 56.50	287°58.04 · · 12.09	16°23.43 · · 50.56	168°36.74 · · 7.34	Menkent 147°55.22 -36°30.31 Arcturus 145°46.13 19°2.22
10	$205^{\circ}15.45$	307°35.44 56.87	302°58.46 12.20	31°25.55 50.42	183°39.35 7.29	Arcturus 145°46.13 19°2.22 Rigil Kent. 139°37.68 -60°56.92
11	220° 17.91	322°34.53 57.23	317°58.88 12.32	46°27.66 50.27	198°41.96 7.24	Kochab 137°21.16 74°2.32
12	235°20.38	337°33.63 \$23°57.59	332°59.30 \$24°12.43	61°29.77 N03°50.13	213°44.57 N06°7.19	Zuben'ubi 136°53.77 -16°9.38
13 14	250°22.84 265°25.30	352°32.72 57.95 7°31.81 58.30	347°59.72 12.54 3°0.14 12.66	76°31.89 49.99 91°34.00 49.85	228°47.18 7.14 243°49.79 7.09	Alphecca 126°2.16 26°37.29
15	280° 27.77	22°30.90 · · 58.66	18° 0.56 · · 12.77	106°36.11 · · 49.71	258°52.40 · · 7.04	Antares 112°13.34 -26°29.55
16	295°30.23	37°30.00 59.01	33°0.98 12.88	121°38.23 49.57	273°55.01 6.99	Atria 107°5.96 -69°4.64 Sabik 102°0.44 -15°45.47
17	310°32.70	52°29.09 59.37	48°1.40 12.99	136°40.34 49.42	288°57.62 6.94	Shaula 96°7.58 -37°7.40
18 19	325°35.16 340°37.63	67°28.18 \$23°59.72 82°27.27 24°0.07	63°1.82 S 24°13.10 78°2.24 13.21	151°42.46 N03°49.28 166°44.57 49.14	304°0.23 N06°6.89 319°2.84 6.84	Rasalhague 95°56.70 12°32.53
20	355° 40.09	97°26.36 0.42	93°2.66 13.32	181°46.68 49.00	334°5.45 6.79	Eltanin 90°41.55 51°29.30
21	10°42.55	112°25.45 · · 0.77	108° 3.08 · · 13.43	196°48.80 · · 48.86	349°8.06 · · 6.74	Kaus Aust. 83°29.75 -34°22.25 Vega 80°31.96 38°48.80
22	25° 45.02	127°24.54 1.12	123° 3.50 13.54	211°50.91 48.72	4°10.66 6.69	Nunki 75°45.14 -26°15.67
23	40°47.48	142°23.64 1.46	138° 3.92 13.65	226°53.03 48.58	19°13.27 6.64	Altair 61°57.85 8°56.72
Mer.p	pass. 20:17	ν -0.9 $'$ d0.4 $'$ m-3.89	u0.4′ d 0.1′ m 1.30	$ u 2.1' \ d 0.1' \ \text{m} 1.85$	$\nu 2.6' \ d$ -0.1' m0.24	Peacock 53°2.33 -56°38.82
						Deneb 49°24.32 45°23.14
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.51 10°0.40 Al Na'ir 27°30.00 -46°49.64
0	55° 49.95	157°22.73 S 24°1.81	153°4.33 S 24°13.76	241°55.14 N03°48.44	34°15.88 N06°6.59	Fomalhaut 15°11.87 -29°28.47
1	70°52.41	172°21.81 2.15	168° 4.75 13.87	256°57.26 48.30	49°18.49 6.54	Scheat 13°42.79 28°14.35
2	85°54.88 100°57.34	187°20.90 2.50 202°19.99 · · 2.84	183°5.17 13.97 198°5.59 · · 14.08	271°59.38 48.16 287°1.49 •• 48.02	64°21.10 6.50 79°23.70 · · 6.45	Markab 13°27.45 15°21.56
4	115° 59.80	217°19.08 3.18	213°6.01 14.19	302°3.61 47.88	94°26.31 6.40	Nov 15 Mon SHA Mer.pass
5	131°2.27	232°18.17 3.52	228°6.42 14.29	317°5.72 47.73	109°28.92 6.35	Venus 104°14.40 13:28
6	146°4.73	247°17.26 \$24°3.86	243°6.84 S24°14.40	332°7.84 N03°47.59	124°31.53 N06°6.30	Mars 98°52.40 13:49
7	161°7.20	262°16.35 4.19	258°7.26 14.50	347°9.96 47.45	139°34.13 6.25	Jupiter 186°22.15 07:58 Saturn 338°18.89 21:48
8 9	176°9.66 191°12.12	277°15.44 4.53 292°14.52 • 4.86	273° 7.67 14.61 288° 8.09 · · 14.71	2°12.07 47.31 17°14.19 •• 47.17	154°36.74 6.20 169°39.35 • 6.15	
10	206° 14.59	307°13.61 5.19	303°8.51 14.81	32°16.31 47.03	184°41.96 6.11	Nov 16 Tue SHA Mer.pass
11	221°17.05	322°12.70 5.53	318° 8.92 14.92	47°18.42 46.89	199°44.56 6.06	Venus 102°53.68 13:30 Mars 98°3.44 13:48
12	236° 19.52	337°11.78	333°9.34 \$24°15.02	62°20.54 N03°46.75	214°47.17 N06°6.01	Jupiter 186°13.62 07:55
13 14	251°21.98 266°24.45	352°10.87 6.18 7°9.96 6.51	348° 9.76 15.12 3° 10.17 15.22	77°22.66 46.61 92°24.78 46.47	229°49.78 5.96 244°52.38 5.91	Saturn 338°22.45 21:43
15	281°26.91	22°9.04 · · 6.84	18°10.59 · · 15.33	107°26.89 · · 46.34	259° 54.99 · · 5.86	Nov 17 Wed SHA Mer.pass
16	296°29.37	37°8.13 7.16	33°11.00 15.43	122°29.01 46.20	274°57.60 5.82	Venus 101°32.78 13:31
17	311°31.84	52°7.21 7.49	48°11.42 15.53	137°31.13 46.06	290°0.20 5.77	Mars 97°14.39 13:47
18	326°34.30	67°6.30 S24°7.81	63°11.83	152°33.25 N03°45.92	305°2.81 N06°5.72	Jupiter 186°5.20 07:51
19 20	341°36.77 356°39.23	82°5.38 8.13 97°4.47 8.45	78°12.25 15.73 93°12.66 15.83	167°35.37 45.78 182°37.49 45.64	320°5.41 5.67 335°8.02 5.62	Saturn 338°25.93 21:39
21	11° 41.70	112°3.55 · · 8.77	108°13.08 · · 15.93	197°39.61 · · 45.50	350°10.63 · · 5.57	Horizontal parallax
22	$26^{\circ}44.16$	127°2.64 9.09	123°13.49 16.02	212°41.72 45.36	5°13.23 5.53	Venus: 0.1
23	41°46.62	142°1.72 9.41	138°13.91 16.12	227°43.84 45.22	20°15.84 5.48	Mars: 0.1
Mer.	pass. 20:13	ν-0.9′ d0.3′ m-3.89	$ u 0.4' \ d0.1' \ m1.30 $	$ u 2.1' \ d\text{-}0.1' \ \text{m-}1.86$	$\nu 2.6' \ d$ -0.0' m0.25	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.16	S18°21.85	353°30.27	5.7'	N25°10.14	5.3'	58.3'
1	198°53.06	22.49	7°54.94	5.6'	25°15.48	5.2'	58.3'
2	213°52.96	23.14	$22^{\circ}19.53$	5.5'	25°20.66	5.0'	58.3'
3	228°52.86	• • 23.78	36°44.04	5.4'	25°25.68	4.9'	58.4'
4	243°52.76	24.42	51°8.48	5.4'	25°30.55	4.7'	58.4'
5	258° 52.66	25.06	65°32.84	5.3'	25°35.25	4.5'	58.4'
6	273°52.56	\$18°25.70	79°57.12	5.2'	N25°39.78	4.4'	58.4'
7	288°52.46	26.34	94°21.33	5.1'	25°44.16	4.2'	58.4'
8	303°52.36	26.98	108°45.47	5.1'	25°48.37	4.0'	58.5'
9	318°52.26 333°52.15	· · 27.62 28.26	123° 9.55 137° 33.55	5.0' 4.9'	25°52.41 25°56.29	3.9' 3.7'	58.5' 58.5'
10 11	348° 52.05	28.90	151°57.49	4.9'	25° 50.29	3. <i>1</i> 3.5'	58.5'
12	3°51.95	\$18°29.53	166°21.37	4.8'	N26°3.55	3.4'	58.5
13	18°51.84	30.17	180°45.19	4.8'	26°6.92	3.2'	58.6'
14	33°51.74	30.81	195°8.94	4.7'	26°10.12	3.0'	58.6'
15	48°51.64	• • 31.44	209°32.64	4.6'	26°13.15	2.9'	58.6'
16	63°51.53	32.08	223°56.29	4.6'	26°16.01	2.7'	58.6'
17	78°51.43	32.71	$238^{\circ}19.88$	4.5'	26°18.69	2.5'	58.6'
18	93°51.32	S 18°33.35	252°43.43	4.5'	N26°21.21	2.3'	58.6'
19	108°51.21	33.98	267° 6.92	4.4'	26°23.54	2.2'	58.7'
20	123°51.11	34.61	281°30.37	4.4'	26°25.70	2.0'	58.7'
21	138°51.00	• • 35.24	295°53.78	4.4'	26°27.69	1.8'	58.7'
22	153°50.90 168°50.79	35.88 36.51	310°17.14 324°40.46	4.3' 4.3'	26°29.50 26°31.13	1.6'	58.7'
23			J24 4U.40			1.5'	58.7'
	SD = 16.2'	d = 0.6'		SI	O = 15.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.68	\$18°37.14	339° 3.75	4.3'	N26°32.58	1.3'	58.7'
1	198° 50.57 213° 50.46	37.77	353°27.00 7°50.22	4.2'	26°33.86 26°34.96	1.1'	58.8'
2	213°50.46 228°50.36	38.40 •• 39.03	7°50.22 22°13.41	4.2' 4.2'	26°34.96 26°35.87	0.9' 0.7'	58.8' 58.8'
3 4	243°50.25	39.65	22 13.41 36°36.58	4.2 4.1'	26°35.87 26°36.61	0.7	58.8'
5	258° 50.14	40.28	50°59.72	4.1'	26°37.17	0.4	58.8'
6	273°50.03	\$18°40.91	65°22.83	4.1'	N26°37.54	0.2'	58.8'
7	288°49.92	41.53	79°45.93	4.1'	26°37.74	0.0'	58.8'
8	303°49.81	42.16	94°9.00	4.1'	26°37.75	-0.2'	58.9'
9	318° 49.70	• • 42.79	108°32.06	4.0'	26°37.59	-0.3'	58.9'
10	333° 49.58	43.41	122°55.11	4.0'	26°37.24	-0.5'	58.9'
11	348° 49.47	44.03	137°18.15	4.0'	26°36.71	-0.7'	58.9'
12 13	3°49.36 18°49.25	\$18°44.66 45.28	151°41.18 166°4.20	4.0' 4.0'	N26°36.00 26°35.10	-0.9' -1.1'	58.9' 58.9'
14	33°49.14	45.26 45.90	180°27.22	4.0'	26°34.03	-1.1 -1.3'	58.9'
15	48° 49.02	• • 46.53	194°50.24	4.0'	26°32.77	-1.4	59.0'
16	63°48.91	47.15	209°13.27	4.0'	26°31.33	-1.6'	59.0'
17	78° 48.80	47.77	223°36.29	4.0'	$26^{\circ}29.71$	-1.8'	59.0'
18	93°48.68	\$18°48.39	237°59.32	4.0'	N26°27.91	-2.0'	59.0'
19	108° 48.57	49.01	252°22.36	4.1'	26°25.93		59.0'
20 21	123° 48.45 138° 48.34	49.63 •• 50.24	266°45.41 281°8.48	4.1' 4.1'	26°23.76 26°21.42	-2.3' -2.5'	59.0' 59.0'
22	150 40.34 153°48.22	50.86	295°31.56	4.1'	26°18.89	-2.5 -2.7'	59.0'
23	168° 48.10	51.48	309°54.66	4.1'	26°16.18	-2.9'	59.0'
	SD = 16.2'	d = 0.6'			D = 16.0'		
Wed	GHA	Dec C10° E2 10	GHA	ν 4.1'	Dec	d 2.1'	HP
0 1	183° 47.99 198° 47.87	\$18°52.10 52.71	324°17.78 338°40.92	4.1' 4.2'	N26°13.30 26°10.23	-3.1' -3.2'	59.1' 59.1'
2	213° 47.75	53.33	353° 4.09	4.2'	26° 6.99	-3.2 -3.4'	59.1'
3	228° 47.64	• • 53.94	7°27.28	4.2'	26°3.56	-3.6'	59.1
4	243° 47.52	54.56	21°50.51	4.3'	25°59.96	-3.8'	59.1'
5	258° 47.40	55.17	36°13.76	4.3'	25°56.18	-4.0'	59.1'
6	273° 47.28	S18°55.78	50°37.05	4.3'	N25°52.22	-4.1'	59.1'
7	288°47.16	56.40	65°0.38	4.4'	25°48.09	-4.3'	59.1'
8	303°47.04	57.01	79°23.74	4.4'	25°43.78	-4.5'	59.1'
9 10	318° 46.92 333° 46.80	· · 57.62 58.23	93°47.14 108°10.59	4.4' 4.5'	25°39.30 25°34.64	-4.7' -4.8'	59.1' 59.1'
11	333 46.80 348° 46.68	58.23 58.84	108 10.59 122°34.08	4.5' 4.5'	25 34.04 25°29.81	-4.8 -5.0'	59.1 59.2'
12	3°46.56	\$18°59.45	136°57.61	4.6'	N25°24.80	-5.2	59.2'
13	18°46.44	19°0.06	151°21.20	4.6'	25°19.63	-5.3'	59.2'
14	33°46.32	0.67	165°44.83	4.7'	25°14.28	-5.5'	59.2'
15	48° 46.20	• • 1.28	180°8.51	4.7'	25°8.76	-5.7'	59.2'
16	63°46.07	1.88	194°32.25	4.8'	25°3.08	-5.9'	59.2'
17 18	78° 45.95 93° 45.83	2.49 \$19°3.10	208°56.05 223°19.90	4.8' 4.9'	24°57.22 N24°51.20	-6.0' -6.2'	59.2' 59.2'
18 19	93°45.83 108°45.71	3.70	223°19.90 237°43.80	4.9° 5.0'	N24°51.20 24°45.01	-6.2' -6.4'	59.2'
20	123° 45.58	4.31	257 45.60 252°7.77	5.0'	24° 38.66	-6.5'	59.2'
21	138° 45.46	4.91	266°31.80	5.1'	24°32.14	-6.7	59.2'
22	153° 45.33	5.52	280°55.90	5.2'	24°25.46	-6.8'	59.2'
23	168° 45.21	6.12	295°20.05	5.2'	24°18.62	-7.0'	59.2'
	SD = 16.2'	d = 0.6'	-	SI	D = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-90%	
15	15:33	15:28	11:45	00:27	12:57		
16	15:23	15:17	11:45	01:27	13:58		
17	15:12	15:06	11:45	02:29	14:59		

November 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 Dec
0	56° 49.09	157°0.80 \$24°9.72	153°14.32 S 24°16.22	242°45.96 N03°45.08	35°18.44 N06°5.43	
1	$71^{\circ}51.55$	171°59.89 10.04	168°14.73 16.32	257°48.08 44.94	50°21.05 5.38	Alpheratz 357°32.11 29°14.95 Ankaa 353°4.61 -42°9.31
2	86°54.02	186°58.97 10.35	183°15.15 16.41	272°50.20 44.80	65°23.65 5.34	Schedar 349°27.89 56°41.74
3	101°56.48	201°58.05 · · 10.66	198°15.56 · · 16.51	287°52.32 · · 44.67	80°26.26 · · 5.29	Diphda 348°44.74 -17°49.95
4 5	116°58.94 132°1.41	216°57.13 10.97 231°56.22 11.28	213°15.97 16.61 228°16.39 16.70	302°54.44 44.53 317°56.56 44.39	95°28.86 5.24 110°31.47 5.19	Achernar 335°18.01 -57°5.76
6	147°3.87	246°55.30 \$24°11.59	243°16.80 S 24°16.80	332°58.68 N03°44.25	125°34.07 N06°5.15	Hamal 327°48.21 23°35.82
7	162°6.34	261°54.38 11.89	258°17.21 16.89	348°0.81 44.11	140°36.68 5.10	Polaris 312°15.99 89°22.91
8	177°8.80	276°53.46 12.20	273°17.63 16.98	3°2.93 43.97	155°39.28 5.05	Acamar 315°9.60 -40°11.53 Menkar 314°3.37 4°12.05
9	$192^{\circ}11.27$	291°52.54 · · 12.50	288°18.04 · · 17.08	18°5.05 · · 43.84	170°41.89 · · 5.00	Menkar 314°3.37 4°12.05 Mirfak 308°24.34 49°57.68
10	207° 13.73	306°51.62 12.81	303°18.45 17.17	33°7.17 43.70	185°44.49 4.96	Aldebaran 290°36.59 16°33.94
11	222°16.19	321°50.70 13.11	318°18.86 17.26	48°9.29 43.56	200° 47.10 4.91	Rigel 281°1.31 -8°10.10
12 13	237° 18.66 252° 21.12	336°49.78 S24°13.41 351°48.86 13.71	333°19.28 S 24°17.35 348°19.69 17.45	63°11.41 N03°43.42 78°13.53 43.28	215°49.70 N06°4.86 230°52.30 4.81	Capella 280°17.97 46°1.46
14	267°23.59	6°47.94 14.00	3°20.10 17.54	93°15.66 43.15	245°54.91 4.77	Bellatrix 278°20.06 6°22.51
15	282°26.05	21°47.02 · · 14.30	18°20.51 · · 17.63	108°17.78 · · 43.01	260°57.51 · · 4.72	Elnath 277°58.56 28°37.79
16	297°28.52	36°46.10 14.60	33°20.92 17.72	123°19.90 42.87	276°0.11 4.67	Alnilam 275°35.06 -1°11.01 Betelgeuse 270°49.27 7°24.73
17	312°30.98	51°45.18 14.89	48°21.34 17.81	138°22.02 42.73	291°2.72 4.63	Canopus 263°50.91 -52°42.43
18	327°33.44	66°44.26 \$24°15.18	63°21.75 S24°17.90	153°24.15 N03°42.60	306°5.32 N06°4.58	Sirius 258°23.92 -16°45.18
19 20	342°35.91 357°38.37	81° 43.34 15.48 96° 42.42 15.77	78°22.16 17.99 93°22.57 18.08	168°26.27 42.46 183°28.39 42.32	321°7.92 4.53 336°10.53 4.49	Adhara 255°3.76 -29°0.46
21	12° 40.84	111°41.50 · · 16.05	108°22.98 · · 18.16	198°30.52 · · 42.18	351°13.13 · · 4.44	Procyon 244°48.21 5°9.17
22	27°43.30	126°40.57 16.34	123°23.39 18.25	213°32.64 42.05	6° 15.73 4.39	Pollux 243°14.27 27°57.36
23	42°45.76	141°39.65 16.63	138°23.80 18.34	228°34.76 41.91	21°18.34 4.35	Avior 234°13.49 -59°35.67 Suhail 222°44.47 -43°32.50
Meri	pass. 20:09	ν-0.9' d0.3' m-3.89	ν0.4' d0.1' m1.30	ν2.1' d-0.1' m-1.86	ν 2.6' d-0.0' m0.25	Miaplacidus 221°37.53 -69°49.61
- IVICI.	pass. 20.09	ν-0.9 d0.5 iii-3.09		ν2.1 u-0.1 III-1.00	ν2.0 d-0.0 1110.25	Alphard 217°45.42 -8°46.73
	6114	GUA B	6114 B	G114 B	6114 B	Regulus 207°31.99 11°49.76
Fri 0	GHA 57° 48.23	GHA Dec 156°38.73 \$24°16.91	GHA Dec 153°24.21 S 24°18.43	GHA Dec 243°36.89 N03°41.77	GHA Dec 36°20.94 N06°4.30	Dubhe 193°38.47 61°35.69
1	72°50.69	171°37.81 17.20	168°24.62 18.51	258°39.01 41.64	51°23.54 4.25	Denebola 182°22.75 14°24.89
2	87°53.16	186°36.88 17.48	183°25.03 18.60	273°41.14 41.50	66°26.14 4.21	Gienah 175°41.37 -17°41.73
3	102° 55.62	201°35.96 · · 17.76	198°25.44 · · 18.68	288°43.26 · · 41.36	81°28.75 · · 4.16	Acrux 172°57.85 -63°15.02 Gacrux 171°49.36 -57°15.97
4	$117^{\circ}58.09$	216°35.04 18.04	213°25.85 18.77	303°45.39 41.23	96°31.35 4.11	Alioth 166°11.42 55°48.28
5	133°0.55	231°34.11 18.32	228°26.26 18.85	318°47.51 41.09	111°33.95 4.07	Spica 158°20.10 -11°18.36
6	148°3.01	246°33.19 \$24°18.60	243°26.67 \$24°18.94	333°49.64 N03°40.95	126°36.55 N06°4.02	Alkaid 152°50.65 49°10.29
7 8	163°5.48 178°7.94	261°32.26 18.88 276°31.34 19.15	258°27.08 19.02 273°27.49 19.10	348°51.76 40.82 3°53.89 40.68	141°39.15 3.98 156°41.76 3.93	Hadar 148°33.20 -60°30.30
9	176 7.94 193° 10.41	291°30.42 · · 19.42	288°27.90 · · 19.19	18°56.01 · · 40.54	171°44.36 · · 3.88	Menkent 147°55.20 -36°30.31
10	208° 12.87	306°29.49 19.70	303°28.30 19.27	33°58.14 40.41	186°46.96 3.84	Arcturus 145°46.11 19°2.21
11	223° 15.33	321°28.57 19.97	318°28.71 19.35	49°0.26 40.27	201°49.56 3.79	Rigil Kent. 139°37.65 -60°56.92 Kochab 137°21.15 74°2.30
12	238° 17.80	336°27.64 S 24°20.24	333°29.12 S 24°19.43	64°2.39 N03°40.14	216°52.16 N06°3.75	Zuben'ubi 136°53.75 -16°9.38
13	253°20.26	351°26.71 20.51	348°29.53 19.51	79°4.52 40.00	231°54.76 3.70	Alphecca 126°2.15 26°37.28
14	268°22.73	6°25.79 20.77	3°29.94 19.59	94°6.64 39.86	246°57.36 3.66	Antares 112°13.33 -26°29.55
15 16	283°25.19 298°27.66	21°24.86 · · 21.04 36°23.94	18°30.34 · · 19.67 33°30.75 19.75	109°8.77 · · 39.73 124°10.90 39.59	261°59.96 · · 3.61 277°2.56 3.56	Atria 107°5.95 -69°4.63
17	313°30.12	51°23.01 21.57	48°31.16 19.83	139°13.02 39.46	292°5.16 3.52	Sabik 102°0.43 -15°45.48
18	328° 32.58	66°22.08 S 24°21.83	63°31.57 S 24°19.91	154°15.15 N03°39.32	307°7.76 N06°3.47	Shaula 96°7.57 -37°7.39 Rasalhague 95°56.69 12°32.52
19	343°35.05	81°21.16 22.09	78°31.97 19.99	169°17.28 39.19	322°10.37 3.43	Eltanin 90°41.56 51°29.29
20	358° 37.51	96°20.23 22.35	93°32.38 20.07	184°19.41 39.05	337°12.97 3.38	Kaus Aust. 83°29.74 -34°22.25
21 22	13°39.98 28°42.44	111°19.30 · · 22.61 126°18.37 22.87	108°32.79 · · 20.14	199°21.53 · · 38.92 214°23.66 38.78	352°15.57 · · 3.34 7°18.17 3.29	Vega 80°31.97 38°48.79
23	28 42.44 43°44.90	126°18.37 22.87 141°17.45 23.13	123°33.20 20.22 138°33.60 20.30	214°23.66 38.78 229°25.79 38.65	7°18.17 3.29 22°20.77 3.25	Nunki 75°45.14 -26°15.67
			-	-		Altair 61°57.86 8°56.71
Mer. _I	pass. 20:05	ν-0.9' d0.3' m-3.89	ν 0.4' d0.1' m1.30	ν2.1' d-0.1' m-1.86	ν2.6' d-0.0' m0.26	Peacock 53°2.34 -56°38.82 Deneb 49°24.33 45°23.14
						Enif 33°36.51 10°0.40
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.01 -46°49.64
0	58° 47.37	156°16.52 \$24°23.38	153°34.01 \$24°20.37	244°27.92 N03°38.51	37°23.36 N06°3.20	Fomalhaut 15°11.87 -29°28.47
1 2	73° 49.83 88° 52.30	171°15.59 23.63 186°14.66 23.89	168°34.41 20.45	259°30.05 38.38	52°25.96 3.16 67°28.56 3.11	Scheat 13°42.80 28°14.35
3	88° 52.30 103° 54.76	186°14.66 23.89 201°13.73 •• 24.14	183°34.82 20.52 198°35.23 · · 20.60	274°32.18 38.24 289°34.30 · · 38.11	67°28.56 3.11 82°31.16 · · 3.07	Markab 13°27.45 15°21.56
4	118° 57.23	216°12.81 24.39	213°35.63 20.67	304°36.43 37.97	97°33.76 3.02	Nov 18 Thu SHA Mer.pass
5	$133^{\circ}59.69$	231°11.88 24.64	228°36.04 20.74	319°38.56 37.84	112°36.36 2.98	Venus 100°11.71 13:33
6	149°2.15	246°10.95 S 24°24.88	243°36.44 S 24°20.82	334°40.69 N03°37.70	127°38.96 N06°2.93	Mars 96°25.23 13:47
7	164°4.62	261°10.02 25.13	258°36.85 20.89	349°42.82 37.57	142°41.56 2.89	Jupiter 185° 56.88 07:48
8 9	179°7.08 194°9.55	276°9.09 25.37 291°8.16 •• 25.62	273°37.25 20.96 288°37.66 · · 21.04	4°44.95 37.43 19°47.08 · · 37.30	157° 44.16 2.84 172° 46.76 ••• 2.80	Saturn 338°29.36 21:35
10	194 9.55 209° 12.01	306°7.23 25.86	288°37.66 · · 21.04 303°38.06 21.11	19°47.08 · · 37.30 34°49.21 37.17	187°49.35 2.75	Nov 19 Fri SHA Mer.pass
11	224° 14.47	321°6.30 26.10	318°38.47 21.18	49°51.34 37.03	202°51.95 2.71	Venus 98°50.50 13:34
12	239° 16.94	336°5.37 S 24°26.34	333°38.87 S 24°21.25	64°53.47 N03°36.90	217°54.55 N06°2.66	Mars 95°35.98 13:46
13	254° 19.40	351°4.44 26.58	348°39.28 21.32	79°55.60 36.76	232°57.15 2.62	Jupiter 185°48.66 07:44 Saturn 338°32.71 21:31
14	269°21.87	6°3.51 26.82	3°39.68 21.39	94°57.74 36.63	247°59.75 2.57	
15 16	284°24.33	21°2.58 · · 27.05	18°40.09 · · 21.46	109°59.87 · · 36.50	263°2.34 · · 2.53	Nov 20 Sat SHA Mer.pass
16 17	299°26.79 314°29.26	36°1.64 27.29 51°0.71 27.52	33°40.49 21.53 48°40.89 21.59	125°2.00 36.36 140°4.13 36.23	278°4.94 2.49 293°7.54 2.44	Venus 97°29.15 13:36 Mars 94°46.64 13:45
18	329°31.72	65°59.78 \$24°27.75	63°41.30 S 24°21.66	155°6.26 N03°36.10	308°10.14 N06°2.40	Mars 94°46.64 13:45 Jupiter 185°40.55 07:41
19	344°34.19	80°58.85 27.98	78°41.70 21.73	170°8.39 35.96	323°12.73 2.35	Saturn 338°36.00 21:27
20	359° 36.65	95°57.92 28.21	93°42.10 21.80	185°10.53 35.83	338° 15.33 2.31	
21	14°39.12	110°56.98 · · 28.44	108°42.51 · · 21.86	200°12.66 · · 35.70	353°17.93 · · 2.27	Horizontal parallax Venus: 0.1
22 23	29° 41.58 44° 44.04	125°56.05 28.67 140°55.12 28.89	123°42.91 21.93 138°43.31 21.99	215°14.79 35.56 230°16.92 35.43	8° 20.53 2.22 23° 23.12 2.18	Venus: 0.1 Mars: 0.1
				-		
Mer.	pass. 20:02	ν-0.9' d0.3' m-3.89	ν0.4' d0.1' m1.29	ν2.1' d-0.1' m-1.87	ν2.6' d-0.0' m0.26	

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.08	S 19°6.72	309°44.28	5.3'	$N24^{\circ}11.61$	-7.2'	59.2'
1	198°44.96	7.32	324°8.57	5.4'	24°4.45	-7.3'	59.2'
2	213°44.83 228°44.70	7.93 • • 8.53	338°32.93 352°57.36	5.4' 5.5'	23°57.13 23°49.65	-7.5' -7.6'	59.2' 59.3'
4	243°44.58	9.13	7°21.86	5.6'	23°42.01	-7.8'	59.3'
5	258°44.45	9.73	21°46.43	5.6'	23°34.22	-7.9'	59.3'
6	273°44.32	S 19°10.33	36°11.08	5.7'	N23°26.28	-8.1'	59.3'
7	288°44.20	10.92	50°35.80	5.8'	23°18.19	-8.2'	59.3'
8 9	303°44.07 318°43.94	11.52 •• 12.12	65°0.60 79°25.48	5.9' 6.0'	23°9.94 23°1.54	-8.4' -8.5'	59.3' 59.3'
10	333°43.81	12.72	93°50.43	6.0'	22°53.00	-8.7'	59.3'
11	348°43.68	13.31	108°15.46	6.1'	22°44.31	-8.8'	59.3'
12	3°43.55	\$19°13.91	122°40.57	6.2'	N22°35.48	-9.0'	59.3'
13 14	18°43.42 33°43.29	14.50 15.10	137°5.76 151°31.03	6.3' 6.4'	22°26.50 22°17.37	-9.1' -9.3'	59.3' 59.3'
15	48°43.16	15.10	165°56.39	6.4	22 17.37 22°8.11	-9.3 -9.4'	59.3'
16	63°43.03	16.28	180°21.82	6.5'	21°58.71	-9.5'	59.3'
17	78°42.90	16.88	194°47.34	6.6'	$21^{\circ}49.17$	-9.7'	59.3'
18	93°42.77	S19°17.47	209°12.94	6.7'	N21°39.49	-9.8'	59.3'
19 20	108°42.63 123°42.50	18.06 18.65	223°38.63 238°4.40	6.8' 6.9'	21°29.67 21°19.73	-9.9' -10.1'	59.3' 59.3'
21	138°42.37	19.24	252°30.25	6.9	21 19.73 21°9.65	-10.1	59.3'
22	153°42.23	19.83	266°56.19	7.0'	20°59.44	-10.3	59.3
23	$168^{\circ}42.10$	20.42	281°22.22	7.1'	$20^{\circ}49.10$	-10.5'	59.3'
	SD = 16.2'	d = 0.6'		SI	D = 16.2'		
						,	
Fri 0	GHA 183°41.97	Dec S 19°21.01	GHA 295°48.33	u 7.2'	Dec N20°38.63	<i>d</i> −10.6'	HP 59.3'
1	198°41.83	21.60	310°14.53	7.3'	20°28.04	-10.0	59.3'
2	213°41.70	22.18	324°40.81	7.4'	$20^{\circ}17.32$	-10.8'	59.3'
3	228°41.56	• • 22.77	339°7.18	7.5'	20°6.48	-11.0'	59.3'
4	243°41.43 258°41.29	23.35 23.94	353°33.64 8°0.18	7.5'	19°55.52 19°44.44	-11.1' -11.2'	59.3' 59.3'
5 6	258 41.29 273°41.15	23.94 S19°24.53	8 0.18 22°26.81	7.6' 7.7'	N19°33.24	-11.2	59.3'
7	288°41.02	25.11	36°53.53	7.8'	19°21.92	-11.4	59.3'
8	303°40.88	25.69	51°20.33	7.9'	$19^{\circ}10.49$	-11.5'	59.3'
9	318°40.74	• • 26.28	65°47.22	8.0'	18°58.95	-11.7'	59.3'
10 11	333°40.60 348°40.47	26.86 27.44	80°14.20 94°41.26	8.1' 8.1'	18°47.29 18°35.52	-11.8' -11.9'	59.3' 59.3'
12	3°40.33	\$19°28.02	109°8.41	8.2'	N18°23.65	-11.9	59.3'
13	18°40.19	28.60	123°35.64	8.3'	18°11.67	-12.1'	59.3'
14	33°40.05	29.18	138°2.96	8.4'	17°59.58	-12.2'	59.3'
15 16	48°39.91 63°39.77	· · 29.76 30.34	152°30.37 166°57.86	8.5' 8.6'	17°47.39 17°35.09	-12.3' -12.4'	59.3' 59.3'
17	78°39.63	30.34	181°25.43	8.7'	17 35.09 17°22.70	-12.4 -12.5'	59.3'
18	93°39.49	S19°31.49	195°53.09	8.7'	N17°10.20	-12.6'	59.3'
19	108°39.35	32.07	210°20.83	8.8'	$16^{\circ}57.61$	-12.7'	59.3'
20	123°39.21	32.65	224°48.65	8.9'	16°44.92	-12.8'	59.3'
21 22	138°39.07 153°38.92	· · 33.22 33.80	239°16.56 253°44.54	9.0' 9.1'	16°32.14 16°19.27	-12.9' -13.0'	59.3' 59.3'
23	168°38.78	34.37	268°12.61	9.1	16°6.30	-13.1'	59.3'
	SD = 16.2'	d = 0.6'		SI	D = 16.2'		
		<u> </u>					
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°38.64 198°38.49	\$19°34.95 35.52	282°40.76 297°8.99	9.2' 9.3'	N15°53.25 15°40.10	-13.1' -13.2'	59.2' 59.2'
2	213°38.35	36.09	311°37.30	9.3 9.4'	15°26.87	-13.2 -13.3'	59.2'
3	228°38.21	• • 36.66	326°5.69	9.5'	15°13.56	-13.4'	59.2'
4	243°38.06	37.24	340°34.16	9.5'	15°0.16	-13.5'	59.2'
5 6	258°37.92 273°37.77	37.81 \$19°38.38	355°2.70 9°31.32	9.6' 9.7'	14°46.68 N14°33.13	-13.6' -13.6'	59.2' 59.2'
о 7	2/3°37.77 288°37.63	38.95	9°31.32 24°0.02	9.7	14°19.49	-13.6 -13.7'	59.2' 59.2'
8	303°37.48	39.51	38°28.79	9.8'	14°5.78	-13.8'	59.2'
9	318°37.34	• • 40.08	52°57.64	9.9'	13°51.99	-13.9'	59.2'
10	333°37.19	40.65	67°26.55	10.0'	13°38.12	-13.9'	59.2'
11 12	348°37.04 3°36.90	41.22 \$19°41.78	81°55.55 96°24.61	10.1' 10.1'	13°24.19 N13°10.18	-14.0' -14.1'	59.2' 59.2'
13	18°36.75	42.35	110°53.74	10.1	12°56.11	-14.1	59.2'
14	33°36.60	42.91	125°22.95	10.3'	$12^{\circ}41.97$	-14.2'	59.2'
15	48°36.45	• • 43.48	139°52.22	10.3'	12°27.76	-14.3'	59.2'
16 17	63°36.30 78°36.15	44.04 44.61	154°21.56 168°50.97	10.4' 10.5'	12°13.49 11°59.16	-14.3' -14.4'	59.2' 59.2'
18	93°36.00	\$19°45.17	183°20.44	10.5	N11°44.76	-14.4	59.2'
19	108°35.85	45.73	197°49.98	10.6'	11°30.31	-14.5'	59.1'
20	123°35.70	46.29	212°19.58	10.7'	11°15.79	-14.6'	59.1'
21	138°35.55 153°35.40	· · 46.85 47.41	226°49.25 241°18.97	10.7'	11°1.22 10°46.60	-14.6'	59.1'
22 23	153°35.40 168°35.25	47.41 47.97	241°18.97 255°48.76	10.8' 10.8'	10°46.60 10°31.92	-14.7' -14.7'	59.1' 59.1'
	SD = 16.2'	d = 0.6'			D = 16.2'		
	<u> </u>	<u>u — 0.0</u>	-	اد			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	82-62%	
18	15:00	14:54	11:45	03:29	15:58		
19	14:48	14:41	11:45	04:27	16:54		
20	14:35	14:28	11:46	05:21	17:46		

November 21, 22, 23 UT (Sun., Mon., Tue.)

h	Aries	Venus	` S	M	ars	Jup	oiter	Sat	urn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	59° 46.51		24°29.12	153°43.72	\$24°22.06	245°19.06	N03°35.30	38°25.72	N06°2.13	
1	74° 48.97	170°53.25	29.34	168°44.12	22.12	260°21.19	35.16	53°28.32	2.09	Alpheratz
2	89°51.44	185°52.32	29.56	183°44.52	22.19	275°23.32	35.03	68°30.91	2.05	Ankaa Schedar
3	104°53.90		• 29.78	198°44.92	• • 22.25	290°25.46	• • 34.90	83°33.51	• • 2.00	Diphda
4	119°56.36	215°50.45	30.00	213°45.33	22.31	305°27.59	34.77	98°36.10	1.96	Achernar
5	134°58.83	230°49.52	30.22	228°45.73	22.38	320°29.72	34.63	113°38.70	1.92	Hamal
6 7	150°1.29 165°3.76	245° 48.59 S2 260° 47.65	24°30.44 30.65	243°46.13 258°46.53	\$24°22.44	335°31.86 350°33.99	N03°34.50 34.37	128°41.30 143°43.89	N06° 1.87	Polaris
8	105 3.76 180°6.22	275°46.72	30.85	258 46.53 273°46.93	22.50 22.56	5°36.13	34.37 34.24	143 43.89 158°46.49	1.83 1.79	Acamar
9	195°8.68		• 31.08	288°47.34	• • 22.62	20°38.26	34.10	173° 49.08	1.74	Menkar
10	210°11.15	305°44.85	31.29	303°47.74	22.68	35°40.40	33.97	188°51.68	1.70	Mirfak
11	225° 13.61	320°43.91	31.50	318°48.14	22.74	50°42.53	33.84	203°54.27	1.66	Aldebaran
12	240°16.08		24°31.71	333°48.54	S24°22.80	65°44.67	N03°33.71	218°56.87	N06° 1.61	Rigel Capella
13	255° 18.54	350°42.04	31.92	348°48.94	22.86	80°46.80	33.58	233°59.46	1.57	Bellatrix
14	270°21.00	5°41.11	32.12	3°49.34	22.92	95°48.94	33.45	249°2.06	1.53	Elnath
15	285°23.47		• 32.33	18°49.74	• • 22.98	110°51.07	• • 33.31	264°4.65	• • 1.48	Alnilam
16 17	300°25.93 315°28.40	35°39.24 50°38.30	32.53 32.73	33°50.14 48°50.54	23.04 23.09	125°53.21 140°55.35	33.18 33.05	279°7.25 294°9.84	1.44 1.40	Betelgeuse
18	330° 30.86		32.73 24°32.94	63°50.94	\$24°23.15	155° 57.48	N03° 32.92	309° 12.44	N06° 1.36	Canopus
19	345°33.33	80°36.43	33.14	78°51.34	23.21	170°59.62	32.79	324° 15.03	1.31	Sirius
20	0°35.79	95° 35.49	33.33	93°51.74	23.26	186°1.76	32.66	339° 17.63	1.27	Adhara
21	15°38.25		• 33.53	108°52.14	23.32	201°3.89	• • 32.53	354°20.22	. 1.23	Procyon
22	30°40.72	125°33.62	33.73	123°52.54	23.37	216°6.03	32.39	9°22.81	1.18	Pollux Avior
23	45°43.18	140°32.68	33.92	138°52.94	23.43	231°8.17	32.26	24°25.41	1.14	Suhail
Mer.r	pass. 19:58	ν -0.9' d0.2'	m-3.89	$\nu 0.4' d0$	1' m1.29	$\nu 2.1' \ d-0$.1′ m-1.87	$\nu 2.6' \ d-0$.0′ m0.27	Miaplacidus
	3433. 13.30	- 0.5 do.2								Alphard
	CIIA	CIIA		CIIA	Б	CIIA	Б	CIIA	ъ.	Regulus
Mon	GHA 60° 45.65	GHA 155°31.75 S 2	Dec 24°34.12	GHA 153°53.34	Dec 524°23.48	GHA 246°10.30	Dec N03° 32.13	GHA 39°28.00	Dec N06°1.10	Dubhe
0 1	75°48.11	170°30.81	24 34.12 34.31	153 53.34 168°53.74	23.54	240 10.30 261°12.44	32.00	54° 30.59	1.06	Denebola
2	90°50.57	185° 29.87	34.50	183°54.14	23.59	276°14.58	31.87	69°33.19	1.00	Gienah
3	105° 53.04		• 34.69	198°54.54	23.64	291°16.72	31.74	84°35.78	0.97	Acrux
4	120°55.50	215°28.00	34.88	213°54.94	23.69	306°18.86	31.61	99°38.37	0.93	Gacrux
5	135°57.97	230°27.06	35.07	228°55.34	23.75	321°21.00	31.48	114°40.97	0.89	Alioth Spica
6	151°0.43	245°26.12 S2	24°35.25	243°55.73	S24°23.80	336°23.13	N03°31.35	129°43.56	$N06^{\circ}0.85$	Alkaid
7	166°2.89	260°25.19	35.44	258°56.13	23.85	351°25.27	31.22	144°46.15	0.80	Hadar
8	181°5.36	275° 24.25	35.62	273°56.53	23.90	6°27.41	31.09	159°48.74	0.76	Menkent
9	196°7.82		• 35.80	288°56.93	• • 23.95	21°29.55	• • 30.96	174°51.34	• • 0.72	Arcturus
10	211°10.29	305°22.37	35.98	303°57.33	24.00	36°31.69	30.83	189°53.93	0.68	Rigil Kent.
11 12	226°12.75 241°15.21	320°21.43 335°20.49 S 2	36.16 24°36.34	318°57.72 333°58.12	24.05 S 24°24.10	51°33.83 66°35.97	30.70 N03°30.57	204°56.52 219°59.11	0.64 N06° 0.60	Kochab
13	256° 17.68	350° 19.55	36.52	348°58.52	24.14	81°38.11	30.44	235°1.71	0.55	Zuben'ubi
14	271°20.14	5° 18.61	36.69	3°58.92	24.19	96°40.25	30.31	250°4.30	0.51	Alphecca
15	286° 22.61		• 36.87	18°59.31	24.24	111°42.39	30.18	265°6.89	• • 0.47	Antares
16	301°25.07	35°16.74	37.04	$33^{\circ}59.71$	24.29	126°44.53	30.05	280°9.48	0.43	Atria Sabik
17	316° 27.53	50°15.80	37.21	49°0.11	24.33	141°46.67	29.92	295°12.07	0.39	Shaula
18	331°30.00		24°37.38	64° 0.50	S24°24.38	156°48.81	N03°29.79	310° 14.66	N06° 0.35	Rasalhague
19	346°32.46	80°13.92	37.55	79°0.90	24.42	171°50.96	29.66	325° 17.25	0.30	Eltanin
20	1°34.93	95° 12.98	37.72	94°1.30	24.47	186°53.10	29.53	340° 19.84	0.26	Kaus Aust.
21 22	16°37.39 31°39.86	110°12.04 · 125°11.10	· 37.88 38.05	109°1.69 124°2.09	· · 24.51 24.56	201°55.24 216°57.38	· · 29.40 29.27	355°22.44 10°25.03	• • 0.22	Vega
23	46° 42.32	140° 10.16	38.21	124 2.09 139° 2.49	24.50	231°59.52	29.27	25° 27.62	0.18 0.14	Nunki
										Altair
Mer.p	oass. 19:54	ν -0.9' d 0.2'	m-3.89	ν 0.4′ d0.	1' m1.29	$\nu 2.1' \ d-0$	$.1^\prime$ m- 1.88	$\nu 2.6' \ d-0$.0′ m0.27	Peacock
						-				Deneb
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir
0	61°44.78	155°9.22 S2	24°38.38	154°2.88	S24°24.64	247°1.66	N03°29.02	40°30.21	N06°0.10	Fomalhaut
1	76°47.25	170°8.28	38.54	169°3.28	24.69	262°3.81	28.89	55°32.80	0.06	Scheat
2	91°49.71	185°7.34	38.70	184° 3.67	24.73	277°5.95	28.76	70°35.39	0.02	Markab
3	106°52.18		• 38.86	199°4.07	• • 24.77	292°8.09	• • 28.63	85°37.98	05°59.98	Nov. 21.C
4	121°54.64 136°57.10	215°5.45	39.01	214° 4.47 229° 4.86	24.81	307°10.24	28.50	100°40.57	05°59.94	Nov 21 Sun Venus
5 6	150 57.10 151°59.57	230°4.51 245°3.57 S2	39.17		24.85 \$24°24.89	322°12.38 337°14.52	28.37 N03°28.25	115°43.16 130°45.75	59.89 N05°59.85	Mars
7	167°2.03	245 3.57 52 260°2.63	39.48	244 5.26 259° 5.65	24.89	352°16.67	28.12	130 45.75 145°48.34	59.85	Jupiter
8	182°4.50	275°1.69	39.63	274° 6.05	24.97	7°18.81	27.99	160°50.93	59.77	Saturn
9	197°6.96		• 39.78	289°6.44	• • 25.01	22°20.95	27.86	175°53.52	59.73	
10	212°9.42	304°59.81	39.93	304° 6.83	25.05	37°23.10	27.73	190°56.10	59.69	Nov 22 Mon
11	227°11.89	319°58.86	40.08	319°7.23	25.09	52°25.24	27.61	205°58.69	59.65	Venus
12	242° 14.35		24°40.23	334°7.62	S24°25.12	67°27.39	N03°27.48	221°1.28	N05°59.61	Mars Jupiter
13	257° 16.82	349°56.98	40.37	349°8.02	25.16	82°29.53	27.35	236°3.87	59.57	Saturn
14	272° 19.28	4°56.04	40.52	4°8.41	25.20	97°31.68	27.22	251°6.46	59.53	
15 16	287°21.74		40.66	19°8.81	•• 25.23	112°33.82	· · 27.10	266°9.05	· · 59.49	Nov 23 Tue
16 17	302°24.21	34°54.15 49°53.21	40.80 40.94	34° 9.20 49° 9.59	25.27	127°35.97 142°38.11	26.97	281°11.64 296°14.22	59.45 50.41	Venus
17 18	317°26.67 332°29.14		40.94 24°41.08	49°9.59 64°9.99	25.30 \$24°25.34	142°38.11 157°40.26	26.84 N03°26.71	311° 16.81	59.41 N05°59.37	Mars
19	347°31.60	79°51.33	41.22	79°10.38	25.37	172°42.40	26.59	326° 19.40	59.33	Jupiter Saturn
20	2°34.06	94°50.38	41.36	94°10.77	25.41	187°44.55	26.46	341°21.99	59.29	
21	17°36.53		• 41.49	109°11.17	• • 25.44	202°46.70	• • 26.33	356° 24.58	• • 59.25	Horizon
22	32° 38.99	124°48.50	41.63	124°11.56	25.47	217°48.84	26.21	11°27.16	59.21	
23	47°41.46	139° 47.55	41.76	139°11.95	25.51	232°50.99	26.08	26°29.75	59.17	
Mer.r	pass. 19:50	ν -0.9' d 0.2'	m-3.89	$\nu 0.4' \ d0.$	0′ m1.29	$\nu 2.1' \ d-0$.1′ m-1.88	ν 2.6′ d-0	.0′ m0.28	

Stars SHA

 $357^{\circ}32.12$

353°4.62

349°27 90

348°44.74

 $335^{\circ}18.02$

 $327^{\circ}48.21$

312°16.07

 $315^{\circ}9.60$

314°3.37 308°24.33

290°36.58

281°1.29

 $280^{\circ}17.95$

278°20.05

277°58.54

275°35.04

270°49.25

263°50.89

258°23.90

255°3.74

244°48.19

 $243^{\circ}14.24$

234°13.46

222°44.45

221°37.48

217°45.40 207°31.97

193°38.43

182°22.73

 $175^{\circ}41.35$

 $172^{\circ}57.81$

 $171^{\circ}49.33$

166°11.39

158°20.09

152°50.63

148°33.18 $147^{\circ}55.18$

 $145^{\circ}46.10$

139°37.63

137°21.14

136°53.74

112°13 32

107°5.95

 $102^{\circ}0.43$

 $96^{\circ}7.57$

 $95^{\circ}56.70$

90°41.57

83°29.75

80°31.98

75°45.14

 $61^{\circ}57.87$

53°2.36

49°24.35

33°36.53

 $27^{\circ}30.03$

15°11.88

13°42.81

13°27.46

SHA

96°7.68

93°57.21

 $185^{\circ}32.55$

 $338^{\circ}39.21$

SHA

185°24.66

338°42.36

SHA

93°24.43

 $92^{\circ}18.10$

 $185^{\circ}16.88$

 $338^{\circ}45.42$

Venus: Mars

Horizontal parallax

94°46.10

93°7.70

 $126^{\circ}2.15$

Dec 29°14.95

-42°9.32

56°41 75

-17°49.96

 $-57^{\circ}5.78$

 $23^{\circ}35.83$

89°22.93

-40°11.54

4°12.04

49°57.69

16°33.95

-8°10.11

 $46^{\circ}1.46$

 $6^{\circ}22.51$

28° 37.80

 $-1^{\circ}11.01$

 $7^{\circ}24.73$ -52°42.44

-16°45.19

-29°0.47

 $27^{\circ}57.36$

-59°35.68

-43°32.50

-69°49.61

-8°46.74

11°49.75

61°35.68

 $14^{\circ}24.87$

-17°41.73

-63°15.02

-57° 15.97

55°48.26

-11°18.36

49°10.27 -60°30.29

-36°30.31

 $19^{\circ}2.19$

74°2.28

-16°9.38

26°37.26

-26° 29.55

-69°4.62

-15°45.48

 $-37^{\circ}7.39$

12°32.51

51°29.27

-34°22.24

38°48.78

-26°15.67

8°56.71

-56°38.82

45°23.13

 $10^{\circ}0.39$

-46°49.65

-29°28.48

28°14.35

15°21.56

Mer.pass

13:37

13:45

07:38

21:23

13:39

13:44

07:34

21:18

13:40

13:43

07:31

21:14

0.1

0.1

Mer.pass

Mer.pass

-60°56.91

5°9.17

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.10	S19°48.53	270°18.61	10.9'	$N10^{\circ}17.19$	-14.8'	59.1'
1	198°34.95	49.09	284° 48.52	11.0'	10°2.40	-14.8'	59.1'
2 3	213°34.80 228°34.64	49.65 •• 50.21	299° 18.48 313° 48.50	11.0' 11.1'	09° 47.57 09° 32.69	-14.9' -14.9'	59.1' 59.1'
4	243°34.49	50.76	328° 18.58	11.1'	09° 17.77	-15.0'	59.1'
5	258°34.34	51.32	342°48.71	11.2'	$09^{\circ}2.80$	-15.0'	59.1'
6	273°34.18	S19°51.87	357° 18.89	11.2'	N08° 47.78 08° 32.73	-15.1'	59.1'
7 8	288°34.03 303°33.87	52.43 52.98	11°49.13 26°19.41	11.3' 11.3'	08° 32.73 08° 17.63	-15.1' -15.1'	59.1' 59.1'
9	318°33.72	• • 53.53	40° 49.75	11.4	08°2.50	-15.1	59.0'
10	333°33.56	54.09	55°20.13	11.4'	07° 47.33	-15.2'	59.0'
11	348°33.41 3°33.25	54.64 \$19°55.19	69° 50.56	11.5' 11.5'	07°32.12 N07°16.88	-15.2'	59.0'
12 13	3 33.25 18°33.10	55.74	84°21.04 98°51.56	11.6'	07°1.60	-15.3' -15.3'	59.0' 59.0'
14	33°32.94	56.29	113°22.13	11.6'	06° 46.29	-15.3'	59.0'
15	48°32.78	• • 56.84	127° 52.74	11.6'	06°30.95	-15.4'	59.0'
16 17	63°32.63 78°32.47	57.39 57.94	142°23.39 156°54.08	11.7' 11.7'	06°15.59 06°0.19	-15.4' -15.4'	59.0' 59.0'
18	93°32.31	57.94 \$19°58.49	150 54.08 171°24.81	11.7	N05° 44.77	-15.4'	59.0'
19	108°32.15	59.03	185°55.57	11.8'	05°29.33	-15.5'	59.0'
20	123°31.99	19°59.58	200° 26.38	11.8'	05°13.86	-15.5'	58.9'
21	138°31.83	20°0.13	214°57.21	11.9'	04°58.37 04°42.86	-15.5'	58.9'
22 23	153°31.68 168°31.52	0.67 1.21	229°28.09 243°58.99	11.9' 11.9'	04°42.86 04°27.33	-15.5' -15.5'	58.9' 58.9'
	SD = 16.2'	d = 0.6'			D = 16.1'		
	JD — 10.2	u = 0.0		اد	J — 10.1°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°31.36	\$20°1.76	258° 29.93	12.0'	N04°11.78	-15.6'	58.9'
1 2	198°31.19 213°31.03	2.30 2.84	273°0.90 287°31.89	12.0' 12.0'	03°56.22 03°40.64	-15.6' -15.6'	58.9' 58.9'
3	228°30.87	3.39	302°2.92	12.1'	03°25.05	-15.6'	58.9'
4	243°30.71	3.93	316°33.97	12.1'	03°9.44	-15.6'	58.9'
5	258°30.55	4.47	331°5.04	12.1'	02°53.83	-15.6'	58.9'
6 7	273°30.39 288°30.22	\$20°5.01 5.55	345°36.14 0°7.27	12.1' 12.1'	N02°38.20 02°22.57	-15.6' -15.6'	58.9' 58.8'
8	303°30.06	6.09	14°38.41	12.1	02° 22.37	-15.6'	58.8'
9	318°29.90	. 6.62	29°9.57	12.2'	01°51.28	-15.6'	58.8'
10	333°29.73	7.16	43°40.76	12.2'	01°35.63	-15.7'	58.8'
11 12	348°29.57 3°29.41	7.70 S 20°8.24	58° 11.96 72° 43.18	12.2' 12.2'	01°19.98 N01°4.33	-15.7' -15.7'	58.8' 58.8'
13	18°29.24	8.77	87° 14.41	12.2'	00° 48.67	-15.7'	58.8'
14	33°29.08	9.31	101°45.66	12.3'	00°33.02	-15.6'	58.8'
15	48°28.91	• • 9.84	116° 16.92	12.3'	00°17.37	-15.6'	58.8'
16 17	63°28.74 78°28.58	10.37 10.91	130°48.20 145°19.48	12.3' 12.3'	N00°1.73 S00°13.91	-15.6' 15.6'	58.7' 58.7'
18	93°28.41	S20°11.44	159°50.77	12.3'	S00° 29.55	15.6'	58.7
19	108°28.24	11.97	174°22.08	12.3'	00°45.17	15.6'	58.7'
20	123°28.08	12.50	188°53.38			15.6'	58.7'
21 22	138°27.91 153°27.74	· · 13.03 13.56	203°24.70 217°56.02	12.3' 12.3'	01°16.40 01°31.99	15.6' 15.6'	58.7' 58.7'
23	168°27.57	14.09	232° 27.34	12.3'	01°47.57	15.6'	58.7'
	SD = 16.2'	d = 0.5'		SI	D = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d 15.67	HP
0 1	183°27.40 198°27.24	\$20°14.62 15.15	246°58.66 261°29.99	12.3' 12.3'	\$02°3.14 02°18.69	15.6' 15.5'	58.6' 58.6'
2	213°27.07	15.67	276°1.31	12.3'	02°34.23	15.5'	58.6'
3	228°26.90	• • 16.20	290°32.63	12.3'	02°49.74	15.5'	58.6'
4 5	243°26.73 258°26.56	16.73 17.25	305°3.95 319°35.27	12.3' 12.3'	03°5.24 03°20.71	15.5' 15.5'	58.6' 58.6'
6	258° 26.56 273° 26.39	17.25 \$20°17.78	319°35.27 334°6.58	12.3'	503° 36.16	15.5	58.6'
7	288°26.21	18.30	348° 37.89	12.3'	03°51.59	15.4'	58.6'
8	303°26.04	18.82	3°9.18	12.3'	04°7.00	15.4'	58.5'
9 10	318°25.87 333°25.70	· · 19.35 19.87	17°40.47 32°11.75	12.3' 12.3'	04°22.38 04°37.73	15.4' 15.3'	58.5' 58.5'
10	333 25.70 348°25.53	20.39	32 11.75 46°43.02	12.3'	04 37.73 04°53.05	15.3'	58.5'
12	3°25.35	S20°20.91	61°14.28	12.2'	S05°8.34	15.3	58.5'
13	18°25.18	21.43	75° 45.52	12.2'	05°23.60	15.2'	58.5'
14 15	33°25.01 48°24.83	21.95 •• 22.47	90° 16.75 104° 47.97	12.2' 12.2'	05°38.82 05°54.02	15.2' 15.2'	58.5' 58.5'
15 16	48 24.83 63°24.66	22.99	104 47.97 119° 19.17	12.2'	05 54.02 06°9.18	15.2 15.1'	58.4'
17	78°24.48	23.50	133° 50.35	12.2'	06°24.30	15.1'	58.4
18	93°24.31	S20°24.02	148°21.51	12.1'	S06°39.38	15.0'	58.4'
19	108°24.13 123°23.96	24.54 25.05	162°52.66 177°23.78	12.1' 12.1'	06°54.42 07°9.43	15.0' 15.0'	58.4' 58.4'
20 21	123°23.96 138°23.78	25.05	177°23.78 191°54.88	12.1'	07°9.43	15.0° 14.9°	58.4'
22	153°23.61	26.08	206°25.96	12.1'	$07^{\circ}39.31$	14.9'	58.4'
23	168°23.43	26.60	220°57.02	12.0'	07°54.18	14.8'	58.3'
	SD = 16.2'	d = 0.5'		SI	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	51-29%	
21	14:20	14:13	11:46	06:11	18:35		
22	14:05	13:58	11:46	06:59	19:23		
23	13:50	13:41	11:46	07:47	20:11		

November 24, 25, 26 UT (Wed., Thu., Fri.)

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn	_
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	62°43.92	154°46.61	S24°41.89	154°12.35	S24°25.54	247°53.14	N03°25.95	41°32.34	N05°59.13	
1	77°46.38	169°45.67	42.02	169°12.74	25.57	262°55.28	25.82	56°34.92	59.09	
2	92° 48.85	184°44.72	42.15	184°13.13	25.60	277°57.43	25.70	71°37.51	59.05	
3	107°51.31	199°43.78	• • 42.28	199°13.52	• • 25.63	292°59.58	• • 25.57	86°40.10	• • 59.01	
4	122°53.78	214° 42.84	42.41	214°13.92	25.66	308°1.73	25.45	101°42.68	58.98	
5 6	137° 56.24 152° 58.71	229°41.89 244°40.95	42.53 \$24°42.65	229°14.31 244°14.70	25.69 \$24°25.72	323°3.88 338°6.02	25.32 N03° 25.19	116° 45.27 131° 47.86	58.94 N05°58.90	
7	152 58.71 168°1.17	244 40.95 259°40.01	42.78	244 14.70 259°15.09	25.75	353° 8.17	25.07	131 47.86 146°50.44	58.86	
8	183°3.63	274°39.06	42.70	274°15.48	25.78	8°10.32	24.94	161°53.03	58.82	
9	198°6.10	289°38.12	• • 43.02	289°15.88	• • 25.80	23°12.47	• • 24.82	176° 55.62	• • 58.78	
10	213°8.56	304°37.17	43.14	304°16.27	25.83	38°14.62	24.69	191°58.20	58.74	
11	228°11.03	319°36.23	43.25	319°16.66	25.86	53°16.77	24.56	207°0.79	58.70	
12	243°13.49	334°35.28	S24°43.37	334°17.05	S24°25.89	68°18.92	N03°24.44	222°3.37	N05°58.66	
13	$258^{\circ}15.95$	349°34.34	43.48	349°17.44	25.91	83°21.07	24.31	237°5.96	58.62	
14	273° 18.42	4°33.40	43.60	4°17.83	25.94	98°23.22	24.19	252°8.54	58.59	
15	288° 20.88	19°32.45	• • 43.71	19°18.22	• • 25.96	113°25.37	• • 24.06	267°11.13	• • 58.55	
16	303°23.35	34°31.51 49°30.56	43.82	34°18.61	25.99	128°27.52 143°29.67	23.94	282°13.71 297°16.30	58.51	
17 18	318°25.81 333°28.27	49 30.56 64°29.62	43.93 \$24°44.04	49°19.00 64°19.40	26.01 \$24°26.03	143 29.07 158°31.82	23.81 N03° 23.69	312° 18.88	58.47 N05°58.43	
19	348° 30.74	79°28.67	44.15	79°19.79	26.06	173°33.97	23.56	312 10.00 327°21.47	58.39	
20	3°33.20	94°27.73	44.25	94°20.18	26.08	188°36.12	23.44	342°24.05	58.35	
21	18°35.67	109°26.78	• • 44.36	109°20.57	. 26.10	203°38.27	23.31	357°26.64	• • 58.32	
22	33°38.13	124°25.84	44.46	124°20.96	26.12	218°40.42	23.19	12°29.22	58.28	
23	48° 40.59	139°24.89	44.56	139°21.35	26.15	233°42.57	23.06	27°31.80	58.24	
Merr	pass. 19:46	ν-0 0' d0	.1′ m-3.89	νη Δ' Δη	.0′ m1.29	ν2 1' d-0	.1′ m-1.89	v2 6' d 0	.0′ m0.28	.
IVICI.	Dass. 19.40	ν-0.9 α0	.1 111-3.09	- VO.4 UO.	.0 1111.29	ν2.1 α-0	.1 111-1.09	ν2.0 <i>u</i> -0	.0 1110.20	.
			_		_		_		_	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	63°43.06	154°23.95	\$24°44.66	154°21.74	\$24°26.17	248°44.73	N03°22.94	42°34.39	N05°58.20	
1 2	78° 45.52 93° 47.99	169°23.00 184°22.05	44.76 44.86	169°22.13 184°22.52	26.19 26.21	263°46.88 278°49.03	22.81 22.69	57°36.97 72°39.56	58.16 58.13	
3	93 47.99 108°50.45	184 22.05 199°21.11	44.80 •• 44.95	184 22.52 199°22.90	26.23	278 49.03 293°51.18	22.56	72 39.50 87°42.14	58.09	
4	108 50.45 123°52.92	214°20.16	45.05	214°23.29	26.25	308°53.34	22.44	102°44.72	58.05	
5	138°55.38	229° 19.22	45.14	229°23.68	26.26	323°55.49	22.32	117°47.31	58.01	
6	153° 57.84	244°18.27	S24°45.24	244°24.07	S24°26.28	338°57.64	N03°22.19	132°49.89	N05°57.97	
7	169°0.31	259° 17.33	45.33	259°24.46	26.30	353°59.80	22.07	$147^{\circ}52.47$	57.94	
8	184°2.77	$274^{\circ}16.38$	45.42	274°24.85	26.32	9°1.95	21.94	$162^{\circ}55.05$	57.90	
9	199°5.24	289°15.43	• • 45.51	289°25.24	• • 26.33	24°4.10	• • 21.82	177° 57.64	• • 57.86	
10	214°7.70	304°14.49	45.59	304°25.63	26.35	39°6.26	21.70	193°0.22	57.82	
11	229° 10.16	319°13.54	45.68	319°26.02	26.37	54°8.41	21.57	208°2.80	57.79	
12	244° 12.63	334°12.60	\$24°45.76	334°26.40	\$24°26.38	69°10.56	N03°21.45	223°5.38	N05°57.75	
13 14	259° 15.09 274° 17.56	349°11.65 4°10.70	45.85 45.93	349°26.79 4°27.18	26.40 26.41	84°12.72 99°14.87	21.33 21.20	238°7.97 253°10.55	57.71 57.68	
15	289°20.02	4 10.70 19°9.76	· · 46.01	4 27.16 19°27.57	. 26.42	99 14.07 114°17.03	21.20	268° 13.13	• • 57.64	
16	304°22.48	34°8.81	46.09	34°27.96	26.44	129°19.18	20.96	283° 15.71	57.60	
17	319°24.95	49°7.86	46.17	49°28.34	26.45	144°21.34	20.83	298° 18.29	57.56	
18	334°27.41	64°6.92	S24°46.24	64°28.73	S24°26.46	159°23.50	N03°20.71	313°20.87	N05°57.53	
19	349°29.88	79°5.97	46.32	79°29.12	26.47	174°25.65	20.59	328°23.46	57.49	
20	4°32.34	94°5.03	46.39	94°29.51	26.49	189°27.81	20.46	343°26.04	57.45	
21	19°34.81	109°4.08	• • 46.47	109°29.90	• • 26.50	204°29.96	• • 20.34	358° 28.62	• • 57.42	
22	34° 37.27	124°3.13	46.54	124°30.28	26.51	219°32.12	20.22	13°31.20	57.38	
23	49°39.73	139°2.19	46.61	139°30.67	26.52	234°34.28	20.10	28°33.78	57.34	
Mer.p	pass. 19:42	ν -0.9 $'$ d0	.1′ m-3.90	ν 0.4′ d0.	.0′ m1.28	ν 2.2′ d-0	.1′ m-1.89	ν 2.6′ d-0	.0′ m0.29	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	64° 42.20	154°1.24	\$24°46.68	154°31.06	S24°26.53	249°36.43	N03° 19.97	43°36.36	N05°57.31	
1	79°44.66	169°0.29	46.75	169°31.44	26.54	264°38.59	19.85	58°38.94	57.27	
2	94°47.13	183°59.35	46.81	184°31.83	26.55	279°40.75	19.73	73°41.52	57.23	
3	$109^{\circ}49.59$	198°58.40	• • 46.88	199°32.22	• • 26.55	294°42.90	• • 19.61	88°44.10	• • 57.20	F
4	124° 52.05	213°57.45	46.94	214°32.60	26.56	309°45.06	19.49	103°46.68	57.16	N
5	139°54.52	228°56.50	47.00	229°32.99	26.57	324°47.22	19.36	118°49.26	57.12	
6	154°56.98	243°55.56	\$24°47.07	244°33.38	\$24°26.58	339°49.38	N03°19.24	133°51.84	N05°57.09	
7	169°59.45	258°54.61 273°53.66	47.13	259°33.76	26.58	354°51.54 9°53.69	19.12	148°54.42	57.05	
8 9	185°1.91 200°4.38	273°53.00 288°52.72	47.18 •• 47.24	274°34.15 289°34.53	26.59 •• 26.59	9°53.69 24°55.85	19.00 •• 18.88	163°57.00 178°59.58	57.02 •• 56.98	L
10	200 4.36 215°6.84	303°51.77	47.30	209 34.53 304°34.92	26.60	39°58.01	18.76	176 59.56 194°2.16	56.94	ı
11	230°9.30	318° 50.82	47.35	319°35.31	26.60	55°0.17	18.63	209°4.74	56.94	
12	245°11.77	333°49.88	\$24°47.41	334°35.69	\$24°26.61	70°2.33	N03° 18.51	224°7.32	N05°56.87	
13	260°14.23	348° 48.93	47.46	349°36.08	26.61	85°4.49	18.39	239°9.89	56.84	
14	$275^{\circ}16.70$	3°47.98	47.51	4°36.46	26.61	$100^{\circ}6.65$	18.27	254° 12.47	56.80	느
15	$290^{\circ}19.16$	18°47.03	• • 47.56	19°36.85	• • 26.62	115°8.81	• 18.15	$269^{\circ}15.05$	• • 56.77	
16	305°21.62	33°46.09	47.61	34°37.23	26.62	130°10.97	18.03	284°17.63	56.73	
17	320°24.09	48°45.14	47.65	49°37.62	26.62	145°13.13	17.91	299°20.21	56.69	
18	335°26.55	63°44.19	\$24°47.70	64°38.00	\$24°26.62	160°15.29	N03° 17.79	314°22.79	N05°56.66	
19	350°29.02 5°31.48	78°43.24 93°42.30	47.74 47.70	79°38.39 94°38.77	26.62	175°17.45 190°19.61	17.67	329°25.36	56.62	
20 21	5°31.48 20°33.94	93°42.30 108°41.35	47.79 •• 47.83	94°38.77 109°39.16	26.62 •• 26.62	190°19.61 205°21.77	17.55 •• 17.43	344°27.94 359°30.52	56.59 •• 56.55	
22	20 33.94 35°36.41	108 41.35 123°40.40	47.87	109 39.16 124°39.54	26.62	205 21.77 220°23.93	17.43	14°33.10	56.52	
23	50°38.87	138°39.45	47.91	139°39.93	26.62	235°26.10	17.18	29°35.67	56.48	
										-
Mer.p	bass. 19:38	ν -0.9′ d0	.1′ m-3.90	$-\nu$ 0.4′ d0.	.0′ m1.28	$\nu^{2.2'} d-0$.1′ m-1.90	ν 2.6′ d -0	.0′ m0.29	

	SHA	Dec
Alpheratz	357°32.14	29°14.95
Ankaa	353°4.64	-42°9.33
Schedar Diphda	349°27.92 348°44.75	56°41.75 -17°49.96
Achernar	$335^{\circ}18.03$	-57°5.79
Hamal	327°48.22	23°35.83
Polaris Acamar	312°16.15 315°9.60	89°22.94 -40°11.55
Acamar Menkar	315 9.00 314°3.37	4°12.04
Mirfak	308°24.33	49°57.70
Aldebaran	290°36.57	16°33.94
Rigel Capella	281°1.28 280°17.94	-8°10.12 46°1.47
Bellatrix	278°20.04	6°22.51
Elnath	277°58.53	28°37.80
Alnilam	275°35.03 270°49.24	-1°11.02 7°24.72
Betelgeuse Canopus	270 49.24 263°50.87	-52°42.46
Sirius	258°23.89	-16°45.20
Adhara	255°3.72	-29°0.48
Procyon Pollux	244°48.17 243°14.22	5°9.16 27°57.36
Avior	243°14.22 234°13.42	-59°35.69
Suhail	222°44.42	-43°32.51
Miaplacidus	221°37.43	-69°49.62
Alphard Regulus	217°45.38 207°31.95	-8°46.75 11°49.74
Dubhe	193°38.39	61°35.67
Denebola	182°22.71	14°24.86
Gienah	175°41.33 172°57.78	-17°41.74
Acrux Gacrux	172°57.78 171°49.30	-63°15.01 -57°15.96
Alioth	166°11.37	55°48.25
Spica	$158^{\circ}20.07$	-11°18.37
Alkaid	152°50.62 148°33.16	49°10.26 -60°30.28
Hadar Menkent	148 33.10 147°55.17	-00 30.28 -36°30.31
Arcturus	145°46.09	19°2.18
Rigil Kent.	139°37.62	-60°56.90
Kochab Zuben'ubi	137°21.13 136°53.74	74°2.26 -16°9.39
Alphecca	126° 2.14	26°37.25
Antares	$112^{\circ}13.32$	-26°29.55
Atria	107° 5.95 102° 0.43	-69°4.60 -15°45.48
Sabik Shaula	96°7.58	-15 45.48 -37°7.39
Rasalhague	95°56.70	12°32.50
Eltanin	90°41.59	51°29.26
Kaus Aust. Vega	83°29.76 80°31.99	-34°22.24 38°48.77
Nunki	75°45.15	-26°15.67
Altair	61°57.88	8°56.70
Peacock	53°2.38	-56°38.81
Deneb Enif	49°24.37 33°36.54	45°23.12 10°0.39
Al Na'ir	27°30.05	-46°49.65
Fomalhaut	15°11.90	-29°28.48
Scheat Markab	13°42.83 13°27.48	28°14.35 15°21.56
Nov 24 Wed Venus	SHA 92°2.69	Mer.pass 13:42
Venus Mars	92 2.09 91°28.43	13:42
Jupiter	$185^{\circ}9.22$	07:27
Saturn	338°48.42	21:10
Nov 25 Thu	SHA	Mer.pass
Venus	90°40.89 90°38.68	13:43
Mars Jupiter	90°38.68 185°1.67	13:42 07:24
Saturn	338°51.33	21:06
Nov 26 Fri	SHA	Mer.pass
Venus	89°19.04	13:45
Mars Jupiter	89°48.86 184°54.23	13:42 07:21
Saturn	338°54.16	21:02
Horizon	ıtal parallax	
	Venus:	0.1
	Mars:	0.1

Stars

h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.25	S20°27.11	235°28.05	12.0'	S08°9.01	14.8'	58.3'
1	198°23.07	27.62	249°59.05	12.0'	08°23.79	14.7'	58.3'
2	213°22.90 228°22.72	28.13 •• 28.64	264°30.03 279°0.98	12.0' 11.9'	08°38.53 08°53.21	14.7' 14.6'	58.3' 58.3'
4	243°22.54	29.15	293°31.91	11.9'	09°7.85	14.6'	58.3'
5	258°22.36	29.66	308°2.80	11.9'	09°22.43	14.5'	58.2'
6	273°22.18	\$20°30.17	322°33.66	11.8'	S09°36.96	14.5'	58.2'
7 8	288°22.00 303°21.82	30.68 31.19	337°4.50 351°35.30	11.8' 11.8'	09°51.43 10°5.85	14.4' 14.4'	58.2' 58.2'
9	318°21.64	31.69	6°6.06	11.7'	10° 20.21	14.3'	58.2
10	333°21.46	32.20	20°36.80	11.7'	$10^{\circ}34.51$	14.2'	58.2'
11	348°21.28 3°21.10	32.71	35°7.49	11.7'	10°48.75	14.2'	58.2'
12 13	18°20.92	\$20°33.21 33.72	49°38.16 64°8.78	11.6' 11.6'	\$11°2.94 11°17.05	14.1' 14.1'	58.1' 58.1'
14	33°20.74	34.22	78°39.37	11.6'	11°31.11	14.0'	58.1'
15	48°20.56	• • 34.72	93°9.92	11.5'	11°45.10	13.9'	58.1'
16	63°20.37 78°20.19	35.22	107°40.43 122°10.91	11.5' 11.4'	11°59.03 12°12.88	13.9'	58.1' 58.1'
17 18	93°20.01	35.73 \$20°36.23	136°41.34	11.4	S12°26.67	13.8' 13.7'	58.0'
19	108°19.82	36.73	151°11.73	11.3'	12°40.39	13.6'	58.0'
20	123°19.64	37.23	165°42.08	11.3'	12°54.04	13.6'	58.0'
21	138°19.46 153°19.27	· · 37.73 38.22	180°12.38 194°42.65	11.3'	13°7.62 13°21.12	13.5'	58.0' 58.0'
22 23	168°19.27	38.22 38.72	194 42.05 209°12.87	11.2' 11.2'	13 21.12 13°34.54	13.4' 13.4'	58.0'
	SD = 16.2'	d = 0.5'			0 = 15.9'		
	JD = 10.2	u = 0.5		JL.	v — 13.9°		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°18.90 198°18.72	\$20°39.22	223°43.04	11.1'	\$13°47.90	13.3'	57.9'
1 2	198° 18.72 213° 18.53	39.72 40.21	238°13.17 252°43.25	11.1' 11.0'	14°1.17 14°14.36	13.2' 13.1'	57.9' 57.9'
3	228°18.34	40.71	267°13.29	11.0'	14°27.48	13.0'	57.9'
4	243°18.16	41.20	281°43.28	10.9'	14°40.51	13.0'	57.9'
5	258°17.97 273°17.78	41.69 \$20°42.19	296°13.23 310°43.12	10.9' 10.8'	14°53.46 \$15°6.33	12.9'	57.9'
6 7	288°17.60	42.68	325°12.97	10.8	15°19.11	12.8' 12.7'	57.8' 57.8'
8	303°17.41	43.17	339°42.77	10.7'	15°31.81	12.6'	57.8'
9	318° 17.22	• • 43.66	354°12.52	10.7'	15°44.42	12.5'	57.8'
10 11	333°17.03 348°16.84	44.15 44.64	8°42.22 23°11.87	10.6' 10.6'	15°56.94 16°9.37	12.4' 12.3'	57.8' 57.7'
12	3°16.65	\$20°45.13	37°41.46	10.5	S16°21.71	12.2'	57.7'
13	18°16.46	45.62	52°11.01	10.5'	16°33.95	12.2'	57.7'
14	33°16.27	46.11	66°40.51	10.4'	16°46.11	12.1'	57.7'
15 16	48°16.08 63°15.89	· · 46.59 47.08	81°9.95 95°39.35	10.4' 10.3'	16°58.17 17°10.13	12.0' 11.9'	57.7' 57.7'
17	78° 15.70	47.57	110°8.69	10.3'	17°22.00	11.8'	57.6'
18	93°15.51	S20°48.05	124°37.98	10.2'	S 17°33.76	11.7'	57.6'
19	108°15.32	48.54	139°7.22	10.2'	17°45.43 17°57.00	11.6'	57.6'
20 21	123°15.13 138°14.94	49.02 •• 49.50	153°36.40 168°5.53	10.1'	17°57.00 18°8.47	11.5' 11.4'	57.6' 57.6'
22	153°14.74	49.98	182°34.61	10.0'	18°19.83	11.3'	57.5'
23	168°14.55	50.47	197°3.64	10.0'	18°31.09	11.2'	57.5'
	SD = 16.2'	d = 0.5'		SD	0 = 15.8'		
	CUA		CIIA		ъ	,	
Fri 0	GHA 183°14.36	Dec \$20°50.95	GHA 211°32.61	u 9.9'	Dec \$18°42.24	<i>d</i> 11.0'	HP 57.5'
1	198°14.16	51.43	226°1.53	9.9'	18°53.29	10.9'	57.5
2	213°13.97	51.91	240°30.40	9.8'	19°4.23	10.8'	57.5'
3 4	228°13.78 243°13.58	· · 52.39 52.86	254°59.21 269°27.98	9.8' 9.7'	19°15.06 19°25.78	10.7' 10.6'	57.4' 57.4'
5	243 13.36 258°13.39	53.34	209 27.96 283°56.68	9.7' 9.7'	19 25.76 19°36.39	10.5	57.4'
6	273°13.19	S20°53.82	298°25.34	9.6'	S19°46.89	10.4'	57.4'
7	288°13.00	54.29	312°53.94	9.6'	19°57.28	10.3'	57.4'
8 9	303°12.80 318°12.60	54.77 •• 55.24	327°22.49 341°50.99	9.5' 9.4'	20°7.55 20°17.70	10.2' 10.0'	57.3' 57.3'
10	333°12.41	55.72	356°19.44	9.4'	20°27.74	9.9'	57.3'
11	348°12.21	56.19	10°47.83	9.3'	20°37.67	9.8'	57.3'
12	3°12.01 18°11.82	\$20°56.67	25°16.18 39°44.47	9.3'	\$20°47.47	9.7'	57.3'
13 14	18°11.82 33°11.62	57.14 57.61	39°44.47 54°12.71	9.2' 9.2'	20°57.16 21°6.72	9.6' 9.4'	57.2' 57.2'
15	48°11.42	• 58.08	68°40.90	9.1'	21°16.17	9.3	57.2'
16	63°11.22	58.55	83°9.04	9.1'	$21^{\circ}25.49$	9.2'	57.2'
17	78°11.02	59.02	97°37.13	9.0'	21°34.68 \$21°43.76	9.1'	57.2'
18 19	93°10.82 108°10.62	\$20°59.49 20°59.96	112°5.18 126°33.17	9.0' 8.9'	\$21°43.76 21°52.70	8.9' 8.8'	57.1' 57.1'
20	123°10.43	0.42	141°1.12	8.9'	21° 52.70 22° 1.53	8.7'	57.1
21	138°10.23	• • 0.89	155°29.02	8.9'	$22^{\circ}10.22$	8.6'	57.1'
22 23	153°10.02 168°9.82	1.36	169°56.87 184°24.67	8.8' 8.8'	22°18.79 22°27.23	8.4'	57.1' 57.0'
23		1.82	104 24.07			8.3'	57.0
	SD = 16.2'	d = 0.5'		SL	0 = 15.7'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	19-5%	
24	13:33	13:24	11:47	08:35	20:59		
25	13:16	13:07	11:47	09:24	21:49		
26	12:57	12:48	11:47	10:15	22:42		

November 27, 28, 29 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	65°41.34	153°38.51 S 24°47.95	154°40.31 \$24°26.62	250°28.26 N03°17.06	44°38.25 N05°56.45
1	80°43.80	168° 37.56 47.98	169°40.70 26.62	265°30.42 16.94	59° 40.83 56.41
2	95° 46.27 110° 48.73	183°36.61 48.02 198°35.67 • 48.05	184°41.08 26.62 199°41.46 · · 26.61	280°32.58 16.82 295°34.74 · · 16.70	74°43.40 56.38 89°45.98 • 56.34
3 4	110 46.73 125°51.19	213°34.72 48.08	199°41.46 · · 26.61 214°41.85 26.61	295°34.74 · · 16.70 310°36.91 16.58	89°45.98 · · 56.34 104°48.56 56.31
5	140°53.66	228°33.77 48.11	229°42.23 26.61	325°39.07 16.46	119° 51.13 56.27
6	155°56.12	243°32.82 \$24°48.14	244°42.62 \$24°26.60	340°41.23 N03°16.35	134°53.71 N05°56.24
7	170°58.59	258°31.88 48.17	259°43.00 26.60	355°43.40 16.23	149° 56.29 56.20
8	$186^{\circ}1.05$	273°30.93 48.20	274°43.38 26.59	10°45.56 16.11	164°58.86 56.17
9	201°3.51	288°29.98 · · 48.23	289°43.77 · · 26.59	25°47.72 · · 15.99	180°1.44 · · 56.14
10	216°5.98	303°29.03 48.25	304°44.15 26.58	40°49.89 15.87	195°4.01 56.10
11 12	231°8.44 246°10.91	318°28.09 48.27 333°27.14 \$24°48.30	319°44.53 26.57 334°44.92 \$24°26.57	55°52.05 15.75 70°54.22 N03°15.63	210°6.59 56.07 225°9.16 N05°56.03
13	240 10.91 261°13.37	348°26.19 48.32	349°45.30 26.56	85°56.38 15.51	240°11.74 56.00
14	276° 15.84	3°25.24 48.34	4°45.68 26.55	100°58.54 15.39	255°14.31 55.96
15	291°18.30	18°24.30 · · 48.36	19°46.06 · · 26.54	116°0.71 · · 15.27	270° 16.89 · · 55.93
16	$306^{\circ}20.76$	33°23.35 48.37	34°46.45 26.53	131°2.87 15.15	285°19.46 55.90
17	321°23.23	48°22.40 48.39	49°46.83 26.52	146°5.04 15.04	300°22.04 55.86
18	336°25.69	63°21.45 S 24°48.40	64°47.21 S 24°26.51	161°7.21 N03°14.92	315°24.61 N05°55.83
19	351°28.16 6°30.62	78° 20.51 48.41 93° 19.56 48.43	79°47.60 26.50	176°9.37 14.80	330°27.19 55.79
20 21	6° 30.62 21° 33.09	93°19.56 48.43 108°18.61 •• 48.44	94°47.98 26.49 109°48.36 • 26.48	191°11.54 14.68 206°13.70 · · 14.56	345°29.76 55.76 0°32.34 • 55.73
22	36° 35.55	123°17.66 48.45	124°48.74 26.47	200 15.70 14.50 221°15.87 14.44	15°34.91 55.69
23	51°38.01	138°16.72 48.45	139°49.12 26.46	236°18.04 14.33	30°37.48 55.66
				· ———	
Mer.p	pass. 19:34	ν-0.9' d0.0' m-3.90	ν0.4' d-0.0' m1.28	ν2.2' d-0.1' m-1.90	ν2.6' d-0.0' m0.30
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	66°40.48	153°15.77 \$24°48.46	154°49.51 \$24°26.44	251°20.20 N03°14.21	45°40.06 N05°55.63
1	81°42.94	168°14.82 48.46	169°49.89 26.43	266°22.37 14.09	60° 42.63 55.59
2 3	96° 45.41 111° 47.87	183°13.88 48.47 198°12.93 • 48.47	184°50.27 26.42 199°50.65 · 26.40	281°24.54 13.97 296°26.71 · · 13.85	75°45.20 55.56 90°47.78 •• 55.53
4	126° 50.33	213°11.98 48.47	214°51.03 26.39	311°28.87 13.74	105°50.35 55.49
5	141°52.80	228°11.03 48.47	229°51.41 26.37	326°31.04 13.62	120° 52.92 55.46
6	156°55.26	243°10.09 S 24°48.47	244°51.80 \$24°26.36	341°33.21 N03°13.50	135°55.49 N05°55.43
7	171°57.73	258°9.14 48.47	259°52.18 26.34	356°35.38 13.38	150°58.07 55.39
8	187°0.19	273°8.19 48.46	274°52.56 26.33	11°37.55 13.27	166°0.64 55.36
9	202°2.66	288°7.24 · · 48.46	289°52.94 · · 26.31	26°39.71 · · 13.15	181°3.21 · · 55.33
10 11	217°5.12 232°7.58	303°6.30 48.45 318°5.35 48.44	304°53.32 26.29 319°53.70 26.27	41°41.88 13.03 56°44.05 12.92	196° 5.78 55.30 211° 8.36 55.26
12	232 7.36 247°10.05	333°4.40 S24°48.43	334°54.08 S24°26.26	71°46.22 N03°12.80	211 6.30 55.20 226°10.93 N05°55.23
13	262° 12.51	348°3.46 48.42	349°54.46 26.24	86°48.39 12.68	241°13.50 55.20
14	277° 14.98	3°2.51 48.41	4°54.84 26.22	101°50.56 12.57	256° 16.07 55.16
15	292° 17.44	18°1.56 · · 48.40	19°55.22 · · 26.20	116°52.73 · · 12.45	271°18.64 · · 55.13
16	$307^{\circ}19.90$	33°0.62 48.38	34°55.60 26.18	131°54.90 12.33	286°21.21 55.10
17	322°22.37	47°59.67 48.37	49°55.98 26.16	146°57.07 12.22	301°23.79 55.07
18	337°24.83	62°58.72	64°56.36 \$24°26.14	161°59.24 N03°12.10	316°26.36 N05°55.04
19	352°27.30 7°29.76	77°57.78 48.33 92°56.83 48.31	79°56.74 26.11 94°57.13 26.09	177°1.41 11.98 192°3.59 11.87	331°28.93 55.00 346°31.50 54.97
20 21	22°32.23	107°55.88 · · 48.29	109°57.51 · · 26.07	207°5.76 · · 11.75	346°31.50 54.97 1°34.07 • 54.94
22	37°34.69	122°54.94 48.27	124°57.88 26.05	222°7.93 11.64	16°36.64 54.91
23	52°37.15	137°53.99 48.25	139°58.26 26.02	237°10.10 11.52	31°39.21 54.87
Merr	pass. 19:30	ν-0.9' d0.0' m-3.90	ν0.4' d-0.0' m1.28	ν2.2' d-0.1' m-1.91	ν2.6' d-0.0' m0.30
- IVICI.	7833. 19.50	ν-0.9 d0.0 III-3.90		ν2.2 d-0.1 III-1.91	
	CIIA	CUA D	CIIA	CIIA D	CIIA D
Mon 0	GHA 67° 39.62	GHA Dec 152°53.04 S 24°48.22	GHA Dec 154°58.64 S 24°26.00	GHA Dec 252°12.27 N03°11.40	GHA Dec 46°41.78 N 05°54.84
1	82°42.08	167°52.10 48.19	169°59.02 25.97	267°14.44 11.29	61°44.35 54.81
2	97°44.55	182°51.15 48.17	184°59.40 25.95	282°16.62 11.17	76°46.92 54.78
3	$112^{\circ}47.01$	197°50.20 · · 48.14	199°59.78 · · 25.92	297°18.79 · · 11.06	91°49.49 · · 54.75
4	127°49.48	212°49.26 48.11	215°0.16 25.90	312°20.96 10.94	106°52.06 54.72 I
5	142°51.94	227° 48.31 48.08	230°0.54 25.87	327°23.14 10.83	121°54.63 54.68
6	157°54.40	242°47.37	245°0.92 \$24°25.84	342°25.31 N03°10.71	136°57.20 N05°54.65
7 8	172° 56.87 187° 59.33	257°46.42 48.01 272°45.47 47.97	260°1.30 25.82 275°1.68 25.79	357°27.48 10.60 12°29.66 10.48	151°59.76 54.62 167°2.33 54.59
9	203°1.80	287°44.53 · · 47.94	290°2.06 · · 25.76	27°31.83 · · 10.37	182°4 90 · · 54 56
10	203 1.80 218°4.26	302°43.58 47.90	305°2.44 25.73	42°34.00 10.25	197°7.47 54.53
11	233°6.72	317°42.64 47.86	320°2.82 25.70	57°36.18 10.14	212° 10.04 54.50
12	248°9.19	332°41.69 S 24°47.82	335°3.19 S 24°25.67	72°38.35 N03°10.02	227°12.61 N05°54.47
13	263°11.65	347° 40.74 47.78	350° 3.57 25.64	87°40.53 9.91	242°15.18 54.43
14	278°14.12	2°39.80 47.73	5°3.95 25.61	102°42.70 9.80	257°17.74 54.40
15	293° 16.58	17°38.85 · · 47.69	20°4.33 · · 25.58	117°44.88 · · 9.68	272°20.31 · · 54.37 N
16	308° 19.05	32°37.91 47.64 47°36.96 47.60	35°4.71 25.55	132°47.05 9.57	287° 22.88 54.34
17 18	323°21.51 338°23.97	47°36.96 47.60 62°36.02 \$24°47.55	50°5.09 25.52 65°5.46 \$24°25.49	147°49.23 9.45 162°51.41 N03°9.34	302°25.45 54.31 317°28.01 N05°54.28
19	353° 26.44	77°35.07 47.50	80°5.84 25.45	177°53.58 9.23	332°30.58 54.25
20	8°28.90	92°34.13 47.45	95° 6.22 25.42	192°55.76 9.11	347°33.15 54.22
21	$23^{\circ}31.37$	107°33.18 · · 47.39	110°6.60 · · 25.39	207°57.93 · · 9.00	2°35.71 · · 54.19
22	38° 33.83	122°32.24 47.34	125° 6.98 25.35	223°0.11 8.88	17°38.28 54.16
23	53°36.30	137°31.29 47.28	140°7.35 25.32	238°2.29 8.77	32°40.85 54.13
Mer.p	bass. 19:26	ν-0.9' d-0.0' m-3.90	ν0.4' d-0.0' m1.27	ν2.2' d-0.1' m-1.91	ν2.6' d-0.0' m0.31

	Stars	
	SHA	Dec
Alpheratz	357°32.14	29°14.95
Ankaa Schedar	353°4.65 349°27.93	-42°9.33 56°41.76
Diphda	348°44.76	-17°49.97
Achernar	335°18.05	-57°5.80
Hamal	327°48.21	23°35.83
Polaris Acamar	312°16.05 315°9.61	89°22.96 -40°11.57
Menkar	314°3.36	4°12.03
Mirfak	308°24.32	49°57.71
Aldebaran Rigel	290°36.56 281°1.27	16°33.94 -8°10.13
Capella	280° 17.92	-6°10.13
Bellatrix	$278^{\circ}20.02$	6°22.50
Elnath Alnilam	277°58.51 275°35.02	28°37.80 -1°11.03
Betelgeuse	275 35.02 270°49.22	-1 11.03 7°24.72
Canopus	263°50.85	-52°42.48
Sirius	258°23.87	-16°45.22
Adhara Procyon	255°3.70 244°48.15	-29°0.50 5°9.15
Procyon	244 48.15 243°14.20	5 9.15 27°57.35
Avior	$234^{\circ}13.38$	-59°35.70
Suhail	222°44.39	-43°32.52
Miaplacidus Alphard	221°37.37 217°45.35	-69°49.63 -8°46.76
Regulus	207°31.92	11°49.73
Dubhe	193°38.35	61°35.66
Denebola	182°22.69	14°24.85 -17°41.75
Gienah Acrux	175°41.31 172°57.73	-17 41.75 -63°15.01
Gacrux	171°49.26	-57°15.96
Alioth	166°11.34	55°48.23
Spica Alkaid	158° 20.05 152° 50.60	-11°18.37 49°10.24
Hadar	148°33.12	-60°30.28
Menkent	$147^{\circ}55.15$	-36°30.30
Arcturus	145°46.08	19°2.17
Rigil Kent. Kochab	139° 37.58 137° 21.11	-60°56.89 74°2.24
Zuben'ubi	136°53.72	-16°9.39
Alphecca	126°2.13	26°37.24
Antares Atria	112°13.31 107°5.94	-26°29.55 -69°4.59
Sabik	102°0.43	-15°45.48
Shaula	96°7.58	-37°7.38
Rasalhague	95°56.70	12°32.49
Eltanin Kaus Aust.	90°41.59 83°29.76	51°29.25 -34°22.23
Vega	80°32.00	38°48.76
Nunki	75°45.16	-26°15.67
Altair Peacock	61°57.88 53°2.40	8°56.70 -56°38.81
Deneb	49°24.39	45°23.12
Enif	33°36.55	$10^{\circ}0.39$
Al Na'ir	27°30.07	-46°49.65
Fomalhaut Scheat	15°11.91 13°42.83	-29°28.48 28°14.35
Markab	13° 27.49	15°21.56
Nov 27 Sat	SHA	Mer.pass
Venus	$87^{\circ}57.17$	13:46
Mars	88°58.97	13:41
Jupiter Saturn	184° 46.92 338° 56.91	07:17 20:58
Nov 28 Sun	SHA	Mer.pass
Venus	86°35.29	13:48
Mars	88°9.03	13:40
Jupiter Saturn	184° 39.73 338° 59.58	07:14 20:54
Nov 29 Mon	SHA	Mer.pass
Venus	85° 13.42	13:49
Mars	$87^{\circ}19.03$	13:40
Jupiter	184°32.65	07:10
Saturn	339°2.16	20:50
Horizon	ital parallax	0.1
	Venus: Mars:	0.1 0.1
L		V.1

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°9.62	S21°2.29	198°52.43	8.7'	S22°35.53	8.2'	57.0'
1	198°9.42	2.75	$213^{\circ}20.15$	8.7'	$22^{\circ}43.71$	8.0'	57.0'
2	213°9.22	3.21	227°47.82	8.6'	22°51.76	7.9'	57.0'
3	228°9.02 243°8.82	· · 3.67 4.14	242°15.45 256°43.03	8.6' 8.5'	22°59.67 23°7.45	7.8'	56.9'
4 5	243°8.82 258°8.61	4.14 4.60	250°43.03 271°10.58	8.5'	23° 7.45 23° 15.10	7.6' 7.5'	56.9' 56.9'
6	273°8.41	\$21°5.06	285°38.08	8.5'	S23°22.61	7.4	56.9'
7	288°8.21	5.52	300°5.54	8.4'	23°29.99	7.2'	56.9'
8	303°8.00	5.98	314°32.97	8.4'	23°37.23	7.1'	56.8'
9	318°7.80	• • 6.44	329°0.35	8.3'	23°44.33	7.0'	56.8'
10 11	333°7.60 348°7.39	6.89 7.35	343°27.70 357°55.01	8.3' 8.3'	23°51.29 23°58.12	6.8' 6.7'	56.8' 56.8'
12	3°7.19	521°7.81	12°22.29	8.2'	S24°4.81	6.5	56.8
13	18°6.98	8.26	26°49.53	8.2'	24°11.36	6.4	56.7'
14	33°6.78	8.72	41°16.74	8.2'	$24^{\circ}17.77$	6.3'	56.7'
15	48°6.57	• • 9.17	55°43.92	8.1'	24°24.03	6.1'	56.7'
16 17	63°6.36 78°6.16	9.63 10.08	70°11.07 84°38.18	8.1' 8.1'	24°30.16 24°36.14	6.0' 5.8'	56.7' 56.6'
18	93° 5.95	521°10.53	99° 5.27	8.1	24 30.14 S24°41.98	5.8	56.6'
19	108°5.74	10.98	113°32.33	8.0'	24°47.68	5.6'	56.6'
20	123°5.54	11.43	127°59.36	8.0'	24°53.24	5.4'	56.6'
21	138°5.33	•• 11.88	$142^{\circ}26.37$	8.0'	24°58.65	5.3'	56.6'
22	153°5.12	12.33	156°53.36	8.0'	25°3.91	5.1'	56.5'
23	168°4.91	12.78	171°20.32	7.9'	25°9.03	5.0'	56.5'
	SD = 16.2'	d = 0.5'		SI	D = 15.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°4.70	S21°13.23	185°47.27	7.9'	\$25°14.01	4.8'	56.5'
1 2	198° 4.50 213° 4.29	13.68 14.12	200°14.19 214°41.09	7.9' 7.9'	25°18.83 25°23.52	4.7' 4.5'	56.5' 56.4'
3	213 4.29 228°4.08	14.12	214 41.09 229°7.98	7.9' 7.9'	25 23.52 25°28.05	4.5 4.4'	56.4'
4	243°3.87	15.01	243°34.85	7.9'	25°32.44	4.2'	56.4
5	258°3.66	15.46	258° 1.71	7.8'	25°36.68	4.1'	56.4'
6	273°3.45	S21°15.90	272°28.55	7.8'	S25°40.78	3.9'	56.3'
7	288°3.24	16.35	286°55.38	7.8'	25°44.72	3.8'	56.3'
8 9	303°3.03 318°2.81	16.79 •• 17.23	301°22.20 315°49.02	7.8' 7.8'	25°48.52 25°52.17	3.6' 3.5'	56.3' 56.3'
10	333° 2.60	17.67	330°15.82	7.8'	25°55.67	3.4'	56.3
11	348°2.39	18.11	344°42.63	7.8'	25°59.03	3.2'	56.2
12	3°2.18	S21°18.55	359° 9.42	7.8'	S26°2.23	3.1'	56.2'
13	18°1.97	18.99	13°36.22	7.8'	26°5.28	2.9'	56.2'
14 15	33°1.75 48°1.54	19.43 •• 19.87	28°3.01 42°29.80	7.8' 7.8'	26°8.19 26°10.95	2.8' 2.6'	56.2' 56.1'
16	63°1.33	20.30	56° 56.60	7.8'	26°13.56	2.5'	56.1
17	78°1.11	20.74	71°23.40	7.8'	26°16.01	2.3'	56.1'
18	93°0.90	S21°21.17	85°50.20	7.8'	S26°18.32	2.2'	56.1'
19	108°0.68	21.61	100°17.01	7.8'	26°20.48	2.0'	56.1'
20	123°0.47 138°0.25	22.04 •• 22.48	114°43.83 129°10.66	7.8' 7.8'	26°22.49 26°24.36	1.9' 1.7'	56.0' 56.0'
21 22	150 0.25 153°0.04	22.46	143°37.49	7.0 7.9'	26°26.07	1.6'	56.0'
23	167°59.82	23.34	158° 4.35	7.9'	26°27.63	1.4'	56.0'
	SD = 16.2'	d = 0.4'		SI	O = 15.4'		
	CIIA		CIIA				
Mon 0	GHA 182° 59.61	Dec \$21°23.77	GHA 172°31.21	u 7.9'	Dec \$26°29.05	d 1.3'	HP 55.9'
1	197° 59.39	24.20	172 51.21 186°58.09	7.9'	26°30.32	1.1'	55.9'
2	212°59.18	24.63	201°24.99	7.9'	$26^{\circ}31.43$	1.0'	55.9'
3	227° 58.96	• • 25.06	215°51.91	7.9'	26°32.40	0.8'	55.9'
4	242°58.74 257°58.52	25.49	230°18.85 244°45.81	8.0'	26°33.23 26°33.90	0.7'	55.9'
5 6	257°58.52 272°58.31	25.92 S 21°26.35	244°45.81 259°12.79	8.0' 8.0'	26°33.90 \$26°34.43	0.5' 0.4'	55.8' 55.8'
7	287° 58.09	26.77	273°39.80	8.0'	26°34.81	0.4	55.8'
8	302°57.87	27.20	288°6.83	8.1'	26°35.04	0.1'	55.8'
9	317° 57.65	• • 27.62	302°33.90	8.1'	26°35.13	-0.1'	55.7'
10	332°57.43 347°57.21	28.05	317°0.99 331°28.11	8.1'	26°35.07 26°34.86	-0.2'	55.7'
11 12	347°57.21 2°56.99	28.47 S 21°28.89	331°28.11 345°55.27	8.2' 8.2'	26°34.86 \$26°34.51	-0.4' -0.5'	55.7' 55.7'
13	17° 56.77	29.31	0°22.46	8.2'	26°34.01	-0.5 -0.6'	55.7'
14	32°56.55	29.74	14°49.68	8.3'	26°33.37	-0.8'	55.6'
15	47° 56.33	• • 30.16	29°16.94	8.3'	26°32.59	-0.9'	55.6'
16	62°56.11	30.58	43°44.24	8.3'	26°31.66	-1.1'	55.6'
17 18	77° 55.89 92° 55.67	31.00 S 21°31.41	58°11.58 72°38.96	8.4' 8.4'	26°30.59 \$26°29.37	-1.2' -1.4'	55.6' 55.5'
19	92 55.07 107°55.45	31.83	72 38.96 87°6.38	8.5'	26°28.02	-1.4 -1.5'	55.5'
20	122°55.23	32.25	101°33.85	8.5'	26°26.52	-1.6'	55.5'
21	137°55.01	• • 32.67	116° 1.36	8.6'	26°24.88	-1.8'	55.5'
22	152°54.78	33.08	130°28.92	8.6'	26°23.10	-1.9'	55.5'
23	167°54.56	33.50	144°56.52	8.7'	26°21.18	-2.1'	55.4'
	SD = 16.2'	d = 0.4'		SI	D = 15.3'		

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

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

			Sun		Moon			
	Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
l	,	00 ^h	12 ^h	Pass	Upper	Lower	29-1	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-1%	
	27	12:38	12:29	11:48	11:09	23:36		
	28	12:19	12:09	11:48	12:04	-:-		
	29	11:58	11:48	11:48	12:58	00:31		

November 30, 01, 02 UT (Tue., Wed., Thu.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	68°38.76	152° 30.35	\$24°47.23	155° 7.73	\$24°25.28	253°4.46	N03°8.66	47°43.41	N05°54.10			
1	83°41.22	167°29.40	47.17	170°8.11	25.25	268°6.64	8.54	62°45.98	54.07	Alpheratz	357°32.15	29°14.95
2	98°43.69	182°28.46	47.11	185°8.49	25.21	283°8.82	8.43	77°48.55	54.04	Ankaa Schedar	353°4.66 349°27.94	-42° 9.34 56° 41.77
3	113°46.15	197°27.51	• • 47.05	200°8.86	•• 25.17	298°11.00	• • 8.32	92°51.11	• • 54.01	Diphda	348° 44.76	-17°49.97
4	128° 48.62	212°26.57	46.99	215°9.24	25.14	313°13.18	8.20	107°53.68	53.98	Achernar	335°18.06	-57° 5.81
5	143°51.08	227°25.62	46.93 \$24°46.86	230°9.62	25.10	328°15.35	8.09	122°56.24	53.95	Hamal	$327^{\circ}48.21$	23°35.83
6 7	158° 53.54 173° 56.01	242°24.68 257°23.73	46.80	245°10.00 260°10.37	\$24°25.06 25.02	343°17.53 358°19.71	N03°7.98 7.87	137°58.81 153°1.38	N05°53.92 53.89	Polaris	$312^{\circ}16.06$	89°22.98
8	188° 58.47	272° 22.79	46.73	275° 10.75	24.98	13°21.89	7.75	168° 3.94	53.86	Acamar	315°9.61	-40°11.58
9	204°0.94	287°21.85	• • 46.66	290°11.13	• • 24.94	28°24.07	• • 7.64	183° 6.51	• • 53.83	Menkar	314°3.36	4°12.03
10	219°3.40	302°20.90	46.59	305°11.50	24.90	43°26.25	7.53	198° 9.07	53.80	Mirfak	308°24.31 290°36.54	49°57.72 16°33.94
11	234°5.87	$317^{\circ}19.96$	46.52	320°11.88	24.86	58°28.43	7.42	213°11.64	53.77	Aldebaran Rigel	290 30.54 281°1.26	-8°10.14
12	249°8.33	332°19.01	S24°46.45	335°12.26	S24°24.82	73°30.61	N03°7.30	228°14.20	N05°53.74	Capella	280° 17.90	46°1.48
13	264° 10.79	347°18.07	46.38	350°12.63	24.78	88°32.79	7.19	243°16.76	53.71	Bellatrix	278°20.00	6°22.49
14 15	279° 13.26 294° 15.72	2°17.13 17°16.18	46.30 •• 46.23	5°13.01 20°13.39	24.74 •• 24.70	103°34.97 118°37.15	7.08 •• 6.97	258°19.33 273°21.89	53.68 •• 53.65	Elnath	277°58.49	28°37.80
16	309° 18.19	32° 15.24	46.15	35°13.76	24.65	133°39.33	6.86	273 21.69 288°24.46	53.62	Alnilam	275°35.00	-1°11.04
17	324° 20.65	47°14.30	46.07	50°14.14	24.61	148°41.51	6.75	303°27.02	53.59	Betelgeuse	270°49.20	7°24.71
18	339°23.12	62°13.35	S24°45.99	65°14.52	S24°24.57	163°43.69	N03°6.63	318°29.58	N05°53.56	Canopus	263°50.83	-52°42.50
19	354°25.58	77° 12.41	45.91	80°14.89	24.52	178°45.87	6.52	333°32.15	53.53	Sirius Adhara	258°23.85 255°3.68	-16°45.23 -29°0.51
20	9°28.04	92°11.47	45.83	95°15.27	24.48	193°48.05	6.41	348°34.71	53.51	Procyon	233 3.06 244°48.12	5°9.14
21	24°30.51	107° 10.52	• • 45.74	110°15.65	• • 24.43	208°50.24	• • 6.30	3°37.27	• • 53.48	Pollux	243°14.17	27°57.34
22	39°32.97	122°9.58	45.66	125°16.02	24.39	223°52.42	6.19	18°39.84	53.45	Avior	234° 13.35	-59°35.72
23	54°35.44	137°8.64	45.57	140°16.40	24.34	238°54.60	6.08	33°42.40	53.42	Suhail	222°44.36	-43°32.54
Mer.p	pass. 19:22	ν -0.9' d-0	0.1′ m-3.90	ν 0.4′ d-0	0.0′ m1.27	ν 2.2′ d-0	.1′ m-1.92	$\nu 2.6' \ d-0$	0.0' m 0.31	Miaplacidus	221°37.32	-69°49.64
		-				-				Alphard	217° 45.32	-8°46.78
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.89	11°49.72
0	69°37.90	152°7.70	S24°45.48	155°16.77	524°24.29	253°56.78	N03° 5.97	48°44.96	N05°53.39	Dubhe Denebola	193°38.30 182°22.66	61°35.65 14°24.84
1	84°40.36	167°6.75	45.39	170°17.15	24.25	268°58.97	5.85	63°47.53	53.36	Gienah	182 22.00 175°41.28	-17°41.75
2	99°42.83	182°5.81	45.30	185°17.52	24.20	284°1.15	5.74	78°50.09	53.33	Acrux	173° 41.28 172° 57.68	-63°15.01
3	114° 45.29	197°4.87	• • 45.21	200°17.90	• • 24.15	299°3.33	• • 5.63	93°52.65	• • 53.30	Gacrux	171°49.21	-57°15.96
4	129° 47.76	212°3.93	45.12	215°18.28	24.10	314°5.52	5.52	108°55.21	53.28	Alioth	166° 11.31	55°48.21
5 6	144°50.22 159°52.69	227°2.98 242°2.04	45.02 \$24°44.93	230°18.65 245°19.03	24.05 \$24°24.01	329°7.70 344°9.88	5.41 N03°5.30	123°57.77 139°0.34	53.25 N05°53.22	Spica	158° 20.03	-11°18.38
7	174° 55.15	242 2.04 257°1.10	44.83	245 19.03 260°19.40	23.96	359°12.07	5.19	159° 0.54 154° 2.90	53.19	Alkaid	152°50.58	49°10.22
8	189°57.61	272°0.16	44.73	275°19.78	23.91	14°14.25	5.08	169° 5.46	53.16	Hadar	148°33.09	-60°30.27
9	205°0.08	286°59.22	• • 44.63	290°20.15	• • 23.85	29°16.44	• • 4.97	184° 8.02	53.13	Menkent	147°55.12	-36°30.30
10	220°2.54	301°58.28	44.53	305°20.53	23.80	44°18.62	4.86	199°10.58	53.11	Arcturus Rigil Kent.	145°46.06 139°37.55	19°2.15 -60°56.88
11	235°5.01	$316^{\circ}57.33$	44.43	320°20.90	23.75	59°20.81	4.75	214°13.14	53.08	Kochab	137°21.09	74°2.22
12	250°7.47	331°56.39	S24°44.33	335°21.28	S24°23.70	74°22.99	N03°4.64	229°15.70	N05°53.05	Zuben'ubi	136°53.70	-16° 9.39
13	265°9.94	346°55.45	44.22	350°21.65	23.65	89°25.18	4.53	244°18.26	53.02	Alphecca	126°2.12	26°37.22
14	280° 12.40	1°54.51	44.12	5°22.03	23.59	104°27.36	4.42	259°20.83	53.00	Antares	112°13.30	-26°29.55
15	295°14.86 310°17.33	16°53.57 31°52.63	· · 44.01 43.90	20°22.40 35°22.78	• • 23.54	119°29.55 134°31.73	· · 4.31 4.20	274°23.39 289°25.95	· · 52.97 52.94	Atria	107°5.92	-69° 4.57
16 17	325° 19.79	46°51.69	43.79	50°23.15	23.49 23.43	149°33.92	4.20	304°28.51	52.94	Sabik	102°0.42	-15°45.48
18	340°22.26	61°50.75	S24°43.68	65°23.53	S24°23.38	164°36.11	N03°3.98	319°31.07	N05°52.88	Shaula	96°7.57	-37°7.37
19	355° 24.72	76°49.81	43.57	80°23.90	23.32	179°38.29	3.88	334°33.63	52.86	Rasalhague	95°56.69	12°32.48 51°29.23
20	$10^{\circ}27.18$	91°48.87	43.45	95°24.27	23.26	194°40.48	3.77	349°36.19	52.83	Eltanin Kaus Aust.	90°41.60 83°29.75	-34°22.23
21	25° 29.65	106° 47.93	• • 43.34	110°24.65	• • 23.21	209°42.67	• • 3.66	4°38.75	• • 52.80	Vega	80°32.00	38°48.75
22	40°32.11	121°46.99	43.22	125°25.02	23.15	224°44.85	3.55	19°41.30	52.78	Nunki	75°45.15	-26°15.66
23	55°34.58	136°46.05	43.10	140°25.40	23.09	239°47.04	3.44	34°43.86	52.75	Altair	61°57.89	8°56.69
Mer.p	pass. 19:18	ν -0.9' d-0	0.1' m-3.91	ν 0.4' d-0	0.0′ m1.27	ν 2.2′ d-0	.1′ m-1.92	ν 2.6′ d-0	.0′ m0.32	Peacock	53°2.41	-56°38.80
										Deneb	49°24.40	45°23.11
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.55	10°0.38
0	70°37.04		S24°42.99		S24°23.04	254°49.23		49°46.42	N05°52.72	Al Na'ir	27°30.08	-46°49.65 -29°28.49
1	85°39.51	166°44.17	42.87	170°26.15	22.98	269°51.42	3.22	64°48.98	52.69	Fomalhaut Scheat	15°11.92 13°42.84	-29 28.49 28°14.35
2	100°41.97	181°43.23	42.74	185°26.52	22.92	284°53.61	3.11	79°51.54	52.67	Markab	13° 27.49	15°21.56
3	115° 44.43	196°42.29	• • 42.62	200°26.89	• • 22.86	299°55.79	• • 3.01	94°54.10	• • 52.64			
4	130°46.90	211°41.35	42.50	215°27.27	22.80	314°57.98	2.90	109°56.66	52.61	Nov 30 Tue Venus	SHA 83°51.59	Mer.pass
5	145°49.36	226°40.42	42.37 \$24°42.24	230°27.64	22.74 \$24°22.68	330°0.17 345°2.36	2.79	124°59.22	52.59	Mars	86° 28.97	13:51 13:39
6 7	160°51.83 175°54.29	241°39.48 256°38.54	42.12	245°28.02 260°28.39	22.62	345 2.36 0°4.55	N03°2.68 2.57	140°1.77 155°4.33	N05°52.56 52.53	Jupiter	184° 25.71	07:07
8	175 54.29 190° 56.75	271° 37.60	41.99	275°28.76	22.56	15°6.74	2.47	170° 6.89	52.53	Saturn	339°4.65	20:46
9	205° 59.22	286° 36.66	• • 41.86	290°29.14	• • 22.49	30°8.93	. 2.36	185° 9.45	• • 52.48			
10	221°1.68	301°35.72	41.72	305°29.51	22.43	45°11.12	2.25	200°12.00	52.45	Dec 01 Wed Venus	SHA 82°29.80	Mer.pass 13:52
11	236°4.15	316°34.79	41.59	320°29.88	22.37	60°13.31	2.14	215° 14.56	52.43	Mars	82 29.80 85°38.87	13:52
12	251°6.61	331°33.85	\$24°41.46	335°30.26	\$24°22.30	75°15.50	N03°2.04	230°17.12	N05°52.40	Jupiter	184° 18.88	07:03
13	266°9.08 281°11.54	346°32.91	41.32 41.18	350°30.63 5°31.00	22.24	90°17.69	1.93	245°19.68 260°22.23	52.38 52.35	Saturn	339°7.06	20:41
14 15	281°11.54 296°14.00	1°31.97 16°31.04	41.18 •• 41.04	20°31.38	22.18 •• 22.11	105°19.88 120°22.07	1.82 · · 1.71	260°22.23 275°24.79	52.35 •• 52.32	Doc 02 TI-	СПУ	
15 16	311° 16.47	31°30.10	40.90	20 31.38 35°31.75	22.05	120 22.07 135°24.27	1.61	275 24.79 290°27.35	52.32	Dec 02 Thu Venus	SHA 81°8.07	Mer.pass 13:54
17	326° 18.93	46° 29.16	40.76	50°32.12	21.98	150°26.46	1.50	305°29.90	52.27	Mars	81 8.07 84°48.73	13:54
18	341°21.40		S24°40.62	65°32.50	S24°21.91	165°28.65	N03°1.39	320°32.46	N05°52.25	Jupiter		07:00
19	356°23.86	76° 27.29	40.48	80°32.87	21.85	180°30.84	1.29	335°35.02	52.22	Saturn	339°9.38	20:37
20	11°26.32	91°26.35	40.33	95°33.24	21.78	195°33.03	1.18	350°37.57	52.19			
21	26°28.79	106°25.42	• • 40.19	110°33.62	• • 21.71	210°35.23	• 1.07	5°40.13	• • 52.17	Horizor	ntal parallax	0.1
22	41°31.25	121°24.48	40.04	125°33.99	21.64	225°37.42	0.97	20°42.68	52.14		Venus: Mars:	0.1 0.1
23	56°33.72	136°23.54	39.89	140°34.36	21.57	240°39.61	0.86	35°45.24	52.12		141013.	V.1
Mer.p	pass. 19:14	ν -0.9' d-0	0.1′ m-3.91	ν 0.4′ d-0	0.1′ m1.27	$\nu 2.2' \ d-0$.1′ m-1.93	$\nu 2.6' d-0$	0.0′ m0.32			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°54.34	S21°33.91	$159^{\circ}24.17$	8.7'	S26°19.12	-2.2'	55.4'
1	197°54.11	34.32	173°51.88	8.8'	26°16.93	-2.3'	55.4'
2	212°53.89 227°53.67	34.74 •• 35.15	188°19.63 202°47.44	8.8' 8.9'	26° 14.59 26° 12.12	-2.5' -2.6'	55.4' 55.4'
4	242°53.44	35.56	217°15.30	8.9'	26°9.51	-2.7'	55.3'
5	257°53.22	35.97	231°43.21	9.0'	26°6.77	-2.9'	55.3'
6 7	272°52.99 287°52.77	\$21°36.38 36.79	246°11.18 260°39.21	9.0' 9.1'	\$26°3.89 26°0.88	-3.0' -3.1'	55.3' 55.3'
8	302°52.54	37.20	275°7.29	9.1'	25°57.73	-3.1 -3.3'	55.2'
9	317°52.32	• • 37.61	289°35.44	9.2'	$25^{\circ}54.45$	-3.4'	55.2'
10	332°52.09	38.01	304°3.64 318°31.91	9.3'	25°51.04	-3.5'	55.2'
11 12	347°51.87 2°51.64	38.42 \$21°38.83	318 31.91 333°0.23	9.3' 9.4'	25°47.49 \$25°43.82	-3.7' -3.8'	55.2' 55.2'
13	17°51.41	39.23	347°28.62	9.5'	25°40.02	-3.9'	55.1'
14	32°51.19	39.64	1°57.08	9.5'	25°36.08	-4.1'	55.1'
15 16	47°50.96 62°50.73	•• 40.04 40.44	16°25.60 30°54.18	9.6' 9.7'	25° 32.02 25° 27.84	-4.2' -4.3'	55.1' 55.1'
17	77°50.50	40.84	45°22.83	9.7'	25°23.52	-4.4'	55.1'
18	92°50.27	S21°41.24	59°51.55	9.8'	S25°19.08	-4.6'	55.1'
19	107°50.05 122°49.82	41.65	74°20.34 88°49.19	9.9'	25°14.52 25°9.83	-4.7'	55.0'
20 21	122°49.82 137°49.59	42.05 •• 42.44	103°18.12	9.9' 10.0'	25°5.02	-4.8' -4.9'	55.0' 55.0'
22	152°49.36	42.84	117°47.11	10.1	25°0.09	-5.1'	55.0'
23	167°49.13	43.24	132°16.17	10.1'	24°55.03	-5.2'	55.0'
	SD = 16.2'	d = 0.4'		SD	0 = 15.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
oved 0	182°48.90	S21°43.64	дна 146°45.31	ν 10.2'	S24°49.86	а -5.3'	пР 54.9'
1	197°48.67	44.03	161°14.52	10.3'	24°44.56	-5.4'	54.9'
2	212°48.44 227°48.21	44.43 •• 44.82	175°43.80 190°13.15	10.4' 10.4'	24°39.15 24°33.62	-5.5' -5.6'	54.9'
3 4	227°48.21 242°47.98	45.22	190°13.15 204°42.58	10.4	24° 33.62 24° 27.98	-5.6° -5.8'	54.9' 54.9'
5	257°47.75	45.61	219°12.08	10.6'	24°22.22	-5.9'	54.8'
6	272°47.52	S21°46.01	233°41.66	10.7'	S24°16.34	-6.0'	54.8'
7 8	287°47.28 302°47.05	46.40 46.79	248°11.31 262°41.04	10.7' 10.8'	24°10.35 24°4.25	-6.1' -6.2'	54.8' 54.8'
9	317°46.82	• • 47.18	202 41.04 277°10.84	10.8	24° 4.23° 58.03	-6.3'	54.8
10	332°46.59	47.57	291°40.72	11.0'	$23^{\circ}51.71$	-6.4'	54.8'
11	347°46.35	47.96	306°10.67	11.0'	23°45.27	-6.5'	54.7'
12 13	2°46.12 17°45.89	\$21°48.35 48.73	320°40.70 335°10.81	11.1' 11.2'	\$23°38.73 23°32.08	-6.7' -6.8'	54.7' 54.7'
14	32°45.65	49.12	349°41.00	11.3'	23°25.32	-6.9'	54.7'
15	47°45.42	• • 49.51	4°11.26	11.3'	23°18.46	-7.0'	54.7'
16 17	62°45.19 77°44.95	49.89 50.28	18°41.60 33°12.02	11.4' 11.5'	23°11.49 23°4.41	-7.1' -7.2'	54.7' 54.6'
18	92°44.72	S21°50.66	47°42.51	11.6'	S22°57.24	-7.3'	54.6'
19	107°44.48	51.04	62°13.08	11.7'	22°49.96	-7.4'	54.6'
20 21	122°44.25 137°44.01	51.43 •• 51.81	76°43.73 91°14.46	11.7' 11.8'	22°42.58 22°35.10	-7.5' -7.6'	54.6' 54.6'
22	157 44.01 152°43.77	52.19	105°45.27	11.0	22° 27.52	-7.0 -7.7'	54.6'
23	167°43.54	52.57	120°16.15	12.0'	22°19.84	-7.8'	54.6'
	SD = 16.2'	d = 0.4'		SD	= 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	182°43.30	S21°52.95	134°47.12	12.0'	S22°12.07	-7.9'	54.5'
1	197°43.06	53.33	149°18.16	12.1'	22°4.20	-8.0'	54.5'
2	212°42.83 227°42.59	53.71 •• 54.08	163°49.27 178°20.47	12.2' 12.3'	21°56.23 21°48.17	-8.1' -8.2'	54.5' 54.5'
4	242°42.35	54.46	176 20.47 192°51.74	12.4'	21°40.17	-8.2'	54.5'
5	257°42.11	54.84	207°23.09	12.4'	21°31.77	-8.3'	54.5'
6 7	272°41.88 287°41.64	\$21°55.21 55.59	221°54.52 236°26.03	12.5' 12.6'	\$21°23.44 21°15.01	-8.4' -8.5'	54.5' 54.4'
8	302°41.40	55.59 55.96	250°57.61	12.6	21°15.01 21°6.49	-8.6'	54.4' 54.4'
9	317°41.16	• • 56.33	265°29.26	12.7'	$20^{\circ}57.89$	-8.7'	54.4'
10	332°40.92	56.71	280°1.00	12.8'	20°49.19	-8.8'	54.4'
11 12	347°40.68 2°40.44	57.08 \$21°57.45	294°32.81 309°4.69	12.9' 13.0'	20°40.41 \$20°31.55	-8.9' -9.0'	54.4' 54.4'
13	17°40.20	57.82	323°36.65	13.0'	20°22.60	-9.0'	54.4'
14	32°39.96	58.19	338°8.69	13.1'	20°13.56	-9.1'	54.4'
15 16	47°39.72 62°39.48	•• 58.56 58.93	352°40.80 7°12.98	13.2' 13.3'	20°4.45 19°55.25	-9.2' -9.3'	54.4' 54.3'
16 17	62°39.48 77°39.24	58.93 59.29	7°12.98 21°45.24	13.3'	19°55.25 19°45.97	-9.3° -9.4'	54.3'
18	92°39.00	S21°59.66	36°17.57	13.4'	S19°36.61	-9.4'	54.3'
19	107°38.76	22°0.02	50°49.97	13.5'	19°27.17	-9.5'	54.3'
20 21	122°38.52 137°38.27	0.39 · · 0.75	65°22.45 79°55.00	13.5' 13.6'	19°17.65 19°8.06	-9.6' -9.7'	54.3' 54.3'
22	152°38.03	1.12	94°27.61	13.7'	18°58.39	-9.7'	54.3'
23	167°37.79	1.48	109°0.30	13.8'	18°48.64	-9.8'	54.3'
	SD = 16.2'	d = 0.4'		SD	9 = 14.9'		

N 72° O7:50 O9:49 ■	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 07:34 09:10 ■ 14:27 16:03 68° 07:21 08:43 10:35 13:03 14:54 16:16 66° 07:10 08:22 09:46 13:51 15:15 16:27 64° 07:01 08:06 09:15 14:22 15:32 16:37 62° 06:53 07:52 08:53 14:45 15:45 16:45 60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:06 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 <	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° 07:21 08:43 10:35 13:03 14:54 16:16 66° 07:10 08:22 09:46 13:51 15:15 16:27 64° 07:01 08:06 09:15 14:22 15:32 16:37 62° 06:53 07:52 08:53 14:45 15:45 16:45 60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 18:25 00° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 52° 04:24 00:12 06:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 55° 06:29 18:09 18:32 18:58 20° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:46 03:33 04:09 19:29 20:05 20:53 55° 00:19 02:19 03:45 02:25 55° 00:19 02:19 03:64 02:25 55° 00:19 02:19 03:64 02:25 55° 00:19 02:19 03:64 02:23 22:32 55° 00:19 02:19 03:16 20:23 21:24 56° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:23 21:24 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 02:19 03:16 20:33 21:20 23:28 58° 00:19 0	N 72°	07:50	09:49			13:48	15:47
66° 07:10 08:22 09:46 13:51 15:15 16:27 64° 07:01 08:06 09:15 14:22 15:32 16:37 62° 06:53 07:52 08:53 14:45 15:45 16:45 60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:42 06:12 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:05 25:3	N 70°	07:34	09:10			14:27	16:03
64° 07:01 08:06 09:15 14:22 15:32 16:37 62° 06:53 07:52 08:53 14:45 15:45 16:45 60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 0° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 20:05 20:53 S 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 30:38 03:38 04:09 19:29 20:05 20:53 55° 01:15 02:38 03:39 19:59 20:46 21:54 54° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////	68°	07:21	08:43	10:35	13:03	14:54	16:16
62° 06:53 07:52 08:53 14:45 15:45 16:45 60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:10 17:26 17:55 0° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 19:28 20:05 253 S 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:35 04:09 19:29 20:05 20:53 55° 00:19 02:19 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////		07:10	08:22	09:46	13:51	15:15	16:27
60° 06:45 07:40 08:34 15:03 15:57 16:52 N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57		07:01	08:06	09:15	14:22	15:32	16:37
N 58° 06:39 07:30 08:19 15:18 16:07 16:58 56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:10 17:26 17:55 20° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57		06:53	07:52	08:53	14:45	15:45	16:45
56° 06:33 07:21 08:06 15:31 16:17 17:04 54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06		06:45	07:40	08:34	15:03	15:57	16:52
54° 06:28 07:13 07:55 15:42 16:25 17:10 52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 30° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47		06:39	07:30	08:19	15:18	16:07	16:58
52° 06:23 07:06 07:45 15:52 16:32 17:15 50° 06:18 06:59 07:36 16:01 16:39 17:19 45° 06:08 06:44 07:18 16:20 16:53 17:30 N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:09 17:43 18:10 N 10° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:35 04:10					15:31	16:17	17:04
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N 40° 05:59 06:32 07:02 16:35 17:05 17:39 35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33							
35° 05:50 06:22 06:49 16:48 17:16 17:47 30° 05:42 06:12 06:38 17:00 17:26 17:55 20° 05:28 05:55 06:18 17:19 17:43 18:10 N 10° 05:13 05:39 06:01 17:36 17:59 18:25 0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33 04:09 19:29 20:05 20:53 50° 02:07 03:06	45°	06:08	06:44	07:18	16:20	16:53	17:30
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0° 04:57 05:23 05:45 17:53 18:15 18:41 S 10° 04:40 05:06 05:29 18:09 18:32 18:58 20° 04:19 04:47 05:12 18:26 18:51 19:19 30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33 04:09 19:29 20:05 20:53 5 50° 02:07 03:06 03:49 19:50 20:32 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////							
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30° 03:52 04:24 04:51 18:47 19:14 19:46 35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33 04:09 19:29 20:05 20:53 \$ 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:23 23:28 58° //// 01:56 03:01 20:38 21:44 ////		04:40	05:06	05:29	18:09	18:32	18:58
35° 03:35 04:10 04:39 18:59 19:28 20:04 40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33 04:09 19:29 20:05 20:53 \$ 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////		04:19	04:47	05:12	18:26	18:51	19:19
40° 03:14 03:54 04:26 19:13 19:45 20:25 45° 02:46 03:33 04:09 19:29 20:05 20:53 S 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////		03:52	04:24	04:51		19:14	19:46
45° 02:46 03:33 04:09 19:29 20:05 20:53 \$ 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////					l		
S 50° 02:07 03:06 03:49 19:50 20:32 21:32 52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////						19:45	
52° 01:45 02:53 03:39 19:59 20:46 21:54 54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////	45°	02:46	03:33	04:09	19:29	20:05	20:53
54° 01:15 02:38 03:28 20:10 21:01 22:25 56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////		02:07	03:06	03:49	19:50	20:32	21:32
56° 00:19 02:19 03:16 20:23 21:20 23:28 58° //// 01:56 03:01 20:38 21:44 ////		01:45		03:39	19:59	20:46	21:54
58° /// 01:56 03:01 20:38 21:44 ///	1				1		-
S 60° /// 01:24 02:44 20:55 22:17 ///					l		
	S 60°	////	01:24	02:44	20:55	22:17	////

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	2-4
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-14%
30	11:37	11:27	11:49	13:52	01:25	
01	11:16	11:04	11:49	14:43	02:18	
02	10:53	10:42	11:49	15:30	03:07	

December 03, 04, 05 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Sta	ars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	S	HA Dec
0	71°36.18	151°22.61 \$24°39.74	155°34.73	255°41.80 N03°0.75	50°47.79 N05°52.09		
1	86°38.65	166°21.67 39.59	170°35.11 21.43	270°44.00 0.65	65°50.35 52.07		32.15 29°14.96
2	101°41.11	181°20.74 39.43	185°35.48 21.36	285°46.19 0.54	80°52.90 52.04		3°4.67 -42°9.35
3	116° 43.57	196°19.80 · · 39.28	200°35.85 · · 21.29	300°48.39 · · 0.44	95°55.46 · · 52.02		27.95 56°41.78
4	131°46.04	211°18.87 39.12	215°36.23 21.22	315°50.58 0.33	110°58.01 51.99		°44.77 -17°49.98
5	$146^{\circ}48.50$	226°17.93 38.97	230°36.60 21.15	330°52.77 0.22	126°0.57 51.96		°18.08 -57°5.82 °48.21 23°35.83
6	161°50.97	241°17.00 S24°38.81	245°36.97 S24°21.08	345°54.97 N03°0.12	141°3.12 N05°51.94		16.38 89°23.00
7	176°53.43	256°16.06 38.65	260°37.34 21.01	$0^{\circ}57.16$ $03^{\circ}0.01$	156°5.68 51.91		5°9.61 -40°11.59
8	191°55.89	271°15.13 38.49	275°37.71 20.93	15°59.36 02°59.91	171°8.23 51.89		1°3.35 4°12.03
9	206° 58.36	286°14.20 · · 38.33	290°38.09 · · 20.86	31°1.55 · · 59.80	186° 10.78 · · 51.87		24.30 49°57.73
10	222°0.82	301°13.26 38.16	305°38.46 20.79	46°3.75 59.70	201°13.34 51.84		36.53 16°33.94
11	237°3.29 252°5.75	316°12.33 38.00	320°38.83 20.71 335°39.20 \$24°20.64	61°5.95 59.59	216°15.89 51.82 231°18.44 N05°51.79	Rigel 281	°1.24 -8°10.14
12 13	267°8.21	331°11.39 \$24°37.83 346°10.46 37.67	335°39.20 \$24°20.64 350°39.58 20.56	76°8.14 N02°59.49 91°10.34 59.38	231°18.44 N05°51.79 246°21.00 51.77	Capella 280°	17.88 46°1.49
14	282° 10.68	1°9.53 37.50	5°39.95 20.49	106°12.53 59.28	261°23.55 51.74	Bellatrix 278°	°19.99 6°22.49
15	297° 13.14	16°8.59 · · 37.33	20°40.32 · · 20.41	121°14.73 · · · 59.17	276°26.10 · · 51.72		58.48 28°37.80
16	312° 15.61	31°7.66 37.16	35°40.69 20.33	136°16.93 59.07	291°28.66 51.69		34.99 -1°11.05
17	327° 18.07	46°6.73 36.99	50°41.06 20.25	151°19.12 58.96	306°31.21 51.67		49.19 7°24.71
18	342°20.54	61°5.80 \$24°36.81	65°41.43 S 24°20.18	166°21.32 N02°58.86	321°33.76 N05°51.64		50.82 -52°42.51
19	357°23.00	76°4.86 36.64	80°41.81 20.10	181°23.52 58.75	336°36.31 51.62		°23.83 -16°45.24
20	$12^{\circ}25.46$	91°3.93 36.46	95°42.18 20.02	196°25.72 58.65	351°38.87 51.60		5°3.66 -29°0.53 °48.10 5°9.13
21	$27^{\circ}27.93$	106°3.00 · · 36.28	110°42.55 · · 19.94	211°27.92 · · 58.55	6°41.42 · · 51.57		°14.14 27°57.34
22	42°30.39	121°2.07 36.10	125°42.92 19.86	226°30.11 58.44	21°43.97 51.55		°13.32 -59°35.73
23	57° 32.86	136°1.14 35.92	140°43.29 19.78	241°32.31 58.34	36° 46.52 51.52		44.33 -43°32.55
Mer	pass. 19:10	ν-0.9' d-0.2' m-3.91	ν0.4' d-0.1' m1.26	ν2.2' d-0.1' m-1.93	ν2.6' d-0.0' m0.33		37.28 -69°49.65
		- U 0.3 G 0.2 III 0.31					45.30 -8°46.79
							31.87 11°49.71
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	_	38.26 61°35.64
0	72°35.32	151°0.21 S24°35.74	155°43.66	256°34.51 N02°58.23	51°49.07 N05°51.50	Denebola 182°	22.63 14°24.83
1	87° 37.78	165°59.28 35.56	170°44.04 19.62	271°36.71 58.13	66°51.62 51.48	Gienah 175°	41.26 -17°41.76
2	102° 40.25	180°58.35 35.38	185°44.41 19.54	286°38.91 58.03	81°54.17 51.45	Acrux 172°	
3 4	117° 42.71 132° 45.18	195°57.41 · · 35.19 210°56.48 35.01	200°44.78 · · 19.46 215°45.15 19.37	301°41.11 · · 57.92 316°43.31 57.82	96°56.73 · · 51.43 111°59.28 51.41		°49.18 -57°15.96
5	147° 47.64	210 50.46 55.01 225°55.55 34.82	230°45.52 19.29	331° 45.51 57.72	127°1.83 51.38		°11.28 55°48.20
6	162° 50.11	240°54.62 S 24°34.63	245°45.89 S24°19.21	346°47.71 N02°57.61	142°4.38 N05°51.36		20.00 -11°18.39
7	177° 52.57	255°53.69 34.44	260°46.26 19.12	1°49.91 57.51	157°6.93 51.34		50.55 49°10.20
8	192°55.03	270°52.77 34.25	275°46.64 19.04	16°52.11 57.41	172°9.48 51.31		33.05 -60°30.27
9	207°57.50	285°51.84 · · 34.05	290°47.01 · · 18.95	31°54.31 · · 57.31	187° 12.03 · · 51.29		55.10 -36°30.31
10	222°59.96	300°50.91 33.86	305°47.38 18.87	46°56.51 57.20	202°14.58 51.27		946.04 19°2.14 937.52 -60°56.87
11	238°2.43	315°49.98 33.66	320°47.75 18.78	61°58.71 57.10	217° 17.13 51.24		37.52 -60°56.87 21.07 74°2.20
12	253°4.89	330°49.05 \$24°33.47	335°48.12 S 24°18.70	77°0.91 N02°57.00	232°19.68 N05°51.22		°53.68 -16°9.40
13	268°7.35	345°48.12 33.27	350°48.49 18.61	92°3.12 56.89	247°22.23 51.20		5°2.11 26°37.20
14	$283^{\circ}9.82$	0°47.19 33.07	5°48.86 18.52	107°5.32 56.79	262°24.78 51.17		°13.29 -26°29.55
15	298° 12.28	15°46.26 · · 32.87	20°49.23 · · 18.43	122°7.52 · · 56.69	277°27.33 · · 51.15		°5.90 -69°4.56
16	313° 14.75	30°45.34 32.67	35°49.60 18.35	137°9.72 56.59	292°29.87 51.13		2°0.41 -15°45.48
17	328° 17.21	45°44.41 32.46	50°49.97 18.26	152°11.92 56.49	307°32.42 51.11	Shaula 96	5°7.56 -37°7.37
18	343° 19.67	60°43.48	65°50.34 S24°18.17	167°14.13 N02°56.38	322°34.97 N05°51.08	Rasalhague 95°	56.69 12°32.47
19	358° 22.14	75°42.55 32.05	80°50.71 18.08	182°16.33 56.28 197°18.53 56.18	337°37.52 51.06	Eltanin 90°	41.60 51°29.22
20 21	13°24.60 28°27.07	90°41.63 31.85 105°40.70 · · 31.64	95°51.09 17.99 110°51.46 · · 17.90	197°18.53 56.18 212°20.74 • 56.08	352°40.07 51.04 7°42.62 · · 51.02		°29.75 -34°22.23
22	43° 29.53	120°39.77 31.43	125°51.83 17.81	227°22.94 55.98	22°45.16 50.99	_	32.00 38°48.73
23	58° 31.99	135°38.85 31.22	140°52.20 17.72	242°25.14 55.88	37°47.71 50.97		45.15 -26°15.66
			-				°57.89 8°56.69
Mer.	pass. 19:07	ν -0.9' d-0.2' m-3.91	$ u 0.4' \ d$ -0.1' m1.26	$\nu 2.2' \ d$ -0.1' m-1.94	ν 2.6′ <i>d</i> -0.0′ m0.33		3°2.42 -56°38.79
							24.42 45°23.11 36.56 10°0.38
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		30.09 -46°49.65
0	73°34.46	150°37.92 S 24°31.00	155°52.57 S 24°17.62	257°27.35 N02°55.77	52°50.26 N05°50.95	I	°11.93 -29°28.49
1	88°36.92	165°37.00 30.79	170°52.94 17.53	272°29.55 55.67	67°52.81 50.93		42.85 28°14.35
2	103° 39.39	180° 36.07 30.58	185°53.31 17.44	287°31.76 55.57	82°55.35 50.90		27.50 15°21.56
3	118°41.85	195°35.15 · · 30.36	200°53.68 · · 17.34	302°33.96 · · 55.47	97°57.90 · · 50.88		
4	133° 44.32	210°34.22 30.14	215°54.05 17.25	317°36.17 55.37	113°0.45 50.86		HA Mer.pass
5	148° 46.78	225°33.30 29.92	230°54.42 17.16	332°38.37 55.27	128°3.00 50.84		² 46.43 13:55
6	163°49.24	240°32.37 \$24°29.70	245°54.79 \$24°17.06	347°40.58 N02°55.17	143°5.54 N05°50.82	I	°58.55 13:37
7	178°51.71	255°31.45 29.48	260°55.16 16.97	2°42.79 55.07	158°8.09 50.80		1°5.62 06:56 °11.61 20:33
8 9	193°54.17 208°56.64	270°30.52 29.26 285°29.60 •• 29.04	275°55.53 16.87 290°55.90 · · 16.77	17°44.99 54.97 32°47.20 • 54.87	173°10.63 50.77 188°13.18 • 50.75	Jatuili 339	11.61 20:33
10	208 50.04 223°59.10	300°28.68 28.81	305°56.27 16.68	47°49.40 54.77	203°15.73 50.73		HA Mer.pass
11	239°1.56	315°27.75 28.58	320°56.64 16.58	62°51.61 54.67	218° 18.27 50.71		24.89 13:57
12	254°4.03	330°26.83	335°57.01 \$24°16.48	77°53.82 N02°54.57	233°20.82 N05°50.69		3°8.34 13:37
13	269°6.49	345°25.91 28.13	350°57.38 16.38	92°56.03 54.47	248°23.36 50.67	Jupiter 183°	
14	284°8.96	0°24.98 27.90	5°57.75 16.29	107°58.23 54.37	263°25.91 50.65	Saturn 339°	13.75 20:29
15	299°11.42	15°24.06 · · 27.67	20°58.12 · · 16.19	123°0.44 · · 54.27	278°28.45 · · 50.62	Dec 05 Sun S	HA Mer.pass
16	$314^{\circ}13.88$	30°23.14 27.43	35°58.49 16.09	138°2.65 54.17	293°31.00 50.60		7°3.46 13:58
17	329° 16.35	45°22.22 27.20	50°58.86 15.99	153°4.86 54.07	308°33.54 50.58	Mars 82°	18.11 13:36
18	344° 18.81	60°21.30 S 24°26.96	65°59.23 S 24°15.89	168°7.07 N02°53.97	323°36.09 N05°50.56	Jupiter 183°	52.89 06:49
19	359°21.28	75°20.38 26.73	80°59.60 15.79	183°9.27 53.87	338°38.63 50.54	Saturn 339°	15.80 20:25
20	14°23.74	90°19.45 26.49	95°59.97 15.68	198°11.48 53.77	353°41.18 50.52	Horizontal pa	arallay
21	29°26.21	105°18.53 · · 26.25	111°0.34 · · 15.58	213°13.69 · · 53.67	8°43.72 · · 50.50	1	Venus: 0.1
22 23	44° 28.67 59° 31.13	120°17.61 26.01 135°16.69 25.77	126° 0.71 15.48 141° 1.08 15.38	228°15.90 53.57 243°18.11 53.47	23° 46.27 50.48 38° 48.81 50.46		Mars: 0.1
Mer.	pass. 19:03	ν -0.9′ <i>d</i> -0.2′ m-3.91	$ u 0.4' \ d$ -0.1' m1.26	$ u 2.2' \ d$ -0.1' m-1.95	$\nu 2.5' \ d$ -0.0' m0.34		

h	Su	n			Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP			
0 1	182°37.55 197°37.30	\$22°1.84 2.20	123°33.06 138°5.89	13.8' 13.9'	\$18°38.82 18°28.93	-9.9' -10.0'	54.3' 54.3'			
2	212° 37.06	2.56	152°38.79	14.0'	18°18.96	-10.0'	54.2'			
3	227° 36.82	• • 2.92	167°11.76	14.0'	18°8.92	-10.1'	54.2'			
4 5	242°36.57 257°36.33	3.28 3.64	181°44.80 196°17.90	14.1' 14.2'	17°58.81 17°48.63	-10.2' -10.2'	54.2' 54.2'			
6	272°36.08	S22°4.00	210°51.07	14.2'	\$17°38.38	-10.3	54.2'			
7	287° 35.84	4.36	225°24.30	14.3'	17°28.06	-10.4'	54.2'			
8 9	302°35.60 317°35.35	4.71 •• 5.07	239°57.61 254°30.97	14.4' 14.4'	17°17.68 17°7.22	-10.5' -10.5'	54.2' 54.2'			
10	332° 35.10	5.42	269° 4.40	14.5'	16°56.70	-10.6'	54.2'			
11	347°34.86	5.78	283°37.90	14.6'	16°46.12	-10.6'	54.2'			
12 13	2°34.61 17°34.37	\$22°6.13 6.48	298°11.45 312°45.07	14.6' 14.7'	\$16°35.47 16°24.76	-10.7' -10.8'	54.2' 54.2'			
14	32°34.12	6.83	327°18.75	14.7'	16°13.99	-10.8'	54.2'			
15 16	47°33.87 62°33.63	· · 7.18 7.53	341°52.49 356°26.29	14.8' 14.9'	16°3.15 15°52.25	-10.9' -11.0'	54.2' 54.2'			
17	77° 33.38	7.55 7.88	11°0.15	14.9'	15 52.25 15°41.30	-11.0'	54.2 54.1'			
18	92°33.13	S 22°8.23	25°34.06	15.0'	S15°30.28	-11.1'	54.1'			
19 20	107°32.88 122°32.64	8.58 8.93	40°8.04 54°42.07	15.0' 15.1'	15°19.21 15°8.07	-11.1' -11.2'	54.1' 54.1'			
21	137° 32.39	· · 9.27	69°16.16	15.1	15 6.07 14°56.88	-11.2'	54.1'			
22	152° 32.14	9.62	83°50.30	15.2'	14°45.64	-11.3'	54.1'			
23	167°31.89	9.97	98°24.49	15.2'	14°34.34	-11.4'	54.1'			
	SD = 16.2'	d = 0.4'		SD = 14.8'						
Sat	GHA	Dec	GHA	ν	Dec	d	HP			
0	182°31.64	S22°10.31	112°58.74	15.3'	\$14°22.98	-11.4'	54.1'			
1 2	197°31.39 212°31.14	10.65 11.00	127°33.04 142°7.40	15.4' 15.4'	14°11.57 14°0.11	-11.5' -11.5'	54.1' 54.1'			
3	227° 30.89	•• 11.34	156°41.80	15.5'	13°48.59	-11.6'	54.1'			
4	242°30.64	11.68	171°16.25	15.5'	13°37.02	-11.6'	54.1'			
5 6	257°30.39 272°30.14	12.02 \$22°12.36	185°50.76 200°25.31	15.6' 15.6'	13°25.40 \$13°13.74	-11.7' -11.7'	54.1' 54.1'			
7	287° 29.89	12.70	214°59.91	15.6'	13°2.02	-11.8'	54.1'			
8	302°29.64	13.04	229°34.55 244°9.24	15.7'	12°50.25 12°38.44	-11.8'	54.1'			
9 10	317°29.39 332°29.14	· · 13.37 13.71	244 9.24 258°43.98	15.7' 15.8'	12 38.44 12°26.57	-11.9' -11.9'	54.1' 54.1'			
11	347°28.89	14.05	273°18.75	15.8'	12°14.67	-12.0'	54.1'			
12 13	2°28.64 17°28.39	\$22°14.38 14.72	287°53.57 302°28.44	15.9' 15.9'	\$12°2.71 11°50.71	-12.0' -12.0'	54.1' 54.1'			
14	32°28.13	15.05	317°3.34	15.9'	11°38.67	-12.1'	54.1'			
15	47°27.88	• 15.38	331°38.28	16.0'	11°26.58	-12.1'	54.1'			
16 17	62°27.63 77°27.37	15.72 16.05	346°13.26 0°48.28	16.0' 16.1'	11°14.45 11°2.27	-12.2' -12.2'	54.1' 54.1'			
18	92°27.12	S22°16.38	15°23.34	16.1	\$10°50.06	-12.3'	54.1'			
19	107°26.87	16.71	29°58.43	16.1'	10°37.80 10°25.51	-12.3'	54.1'			
20 21	122° 26.61 137° 26.36	17.04 •• 17.37	44°33.56 59°8.72	16.2' 16.2'	10°25.51 10°13.17	-12.3' -12.4'	54.1' 54.1'			
22	152°26.11	17.69	$73^{\circ}43.91$	16.2'	10°0.80	-12.4'	54.1'			
23	167°25.85	18.02	88°19.14	16.3'	09°48.38	-12.5'	54.1'			
	SD = 16.2'	d = 0.3'		SI	D = 14.8'					
Sun	GHA	Dec	GHA	ν	Dec	d	HP			
0 1	182°25.60 197°25.34	\$22°18.35 18.67	102°54.40 117°29.69	16.3' 16.3'	\$09°35.93 09°23.44	-12.5' -12.5'	54.1' 54.2'			
2	212° 25.09	19.00	132° 5.00	16.3	09°23.44 09°10.92	-12.5'	54.2'			
3	227°24.83	• • 19.32	146°40.35	16.4'	08°58.36	-12.6'	54.2'			
4 5	242°24.58 257°24.32	19.65 19.97	161°15.72 175°51.11	16.4' 16.4'	08°45.76 08°33.13	-12.6' -12.7'	54.2' 54.2'			
6	272°24.06	S22°20.29	175 51.11 190°26.54	16.4	S08°20.47	-12.7'	54.2'			
7	287°23.81	20.61	205°1.98	16.5	08°7.77	-12.7'	54.2'			
8 9	302°23.55 317°23.29	20.93 •• 21.25	219°37.45 234°12.94	16.5' 16.5'	07°55.05 07°42.28	-12.8' -12.8'	54.2' 54.2'			
10	332°23.04	21.57	248°48.45	16.5	07°29.49	-12.8'	54.2'			
11	347°22.78	21.89	263°23.98	16.5'	07°16.67	-12.9'	54.2'			
12 13	2°22.52 17°22.26	\$22°22.20 22.52	277°59.53 292°35.10	16.6' 16.6'	\$07°3.82 06°50.94	-12.9' -12.9'	54.2' 54.2'			
14	$32^{\circ}22.01$	22.84	$307^{\circ}10.68$	16.6'	06°38.03	-12.9'	54.2'			
15 16	47°21.75 62°21.49	· · 23.15 23.47	321°46.28 336°21.89	16.6' 16.6'	06°25.09 06°12.12	-13.0' -13.0'	54.3' 54.3'			
16	77°21.23	23.78	350°57.52	16.6'	05°59.13	-13.0' -13.0'	54.3'			
18	92°20.97	S22°24.09	5°33.16	16.6'	S05°46.11	-13.0'	54.3'			
19 20	107°20.71 122°20.45	24.40 24.72	20°8.81 34°44.47	16.7' 16.7'	05°33.06 05°20.00	-13.1' -13.1'	54.3' 54.3'			
21	137° 20.19	25.03	49°20.14	16.7	$05^{\circ}6.90$	-13.1'	54.3'			
22	152° 19.93	25.34	63°55.81	16.7'	04°53.78	-13.1'	54.3'			
23	167° 19.67	25.64	78°31.50	16.7'	04°40.64	-13.2'	54.3'			
	SD = 16.2'	d = 0.3'		SI	O = 14.8'					

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	5-7
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-39%
03	10:30	10:18	11:50	16:15	03:53	
04	10:07	09:55	11:50	16:57	04:36	
05	09:42	09:30	11:50	17:37	05:17	

December 06, 07, 08 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	74°33.60	150°15.77 \$24°25.52	156°1.45 \$24°15.27	258°20.32 N02°53.37	53°51.35 N05°50.44	
1	89°36.06	165°14.85 25.28	171°1.82 15.17	273°22.53 53.28	68°53.90 50.42	Alpheratz 357°32.17
2	104°38.53	180°13.93 25.03	186°2.19 15.06	288°24.74 53.18	83°56.44 50.40	Ankaa 353°4.69 Schedar 349°27.98
3	$119^{\circ}40.99$	195°13.01 · · 24.79	201°2.56 · · 14.96	303°26.95 · · 53.08	98°58.98 · · 50.38	Diphda 348° 44.78
4	134° 43.45	210° 12.10 24.54	216°2.92 14.85	318°29.16 52.98	114°1.53 50.36	Achernar 335° 18.10
5	149°45.92	225°11.18 24.29	231°3.29 14.75	333°31.37 52.88	129°4.07 50.34	Hamal 327° 48.22
6	164°48.38	240°10.26 \$24°24.04	246°3.66 \$24°14.64	348°33.58 N02°52.78	144°6.61 N05°50.32	Polaris 312° 16.91
7	179°50.85	255°9.34 23.79	261° 4.03 14.54	3°35.80 52.69	159°9.15 50.30	Acamar 315° 9.61
8 9	194°53.31	270°8.42 23.53	276° 4.40 14.43	18°38.01 52.59 33°40.22 · · 52.49	174°11.70 50.28	Menkar 314°3.36
10	209°55.77 224°58.24	285°7.51 · · 23.28 300°6.59 23.02	291°4.77 ·· 14.32 306°5.14 14.21	33°40.22 · · 52.49 48°42.43 52.39	189°14.24 · · 50.26 204°16.78 50.24	Mirfak 308°24.31
11	240°0.70	315°5.67 22.76	321°5.51 14.10	63°44.64 52.29	219° 19.32 50.22	Aldebaran 290°36.53
12	255°3.17	330°4.75 S24°22.51	336°5.88 S24°14.00	78°46.86 N02°52.20	234°21.87 N05°50.20	Rigel 281°1.24
13	270°5.63	345°3.84 22.25	351°6.25 13.89	93°49.07 52.10	249°24.41 50.18	Capella 280°17.87
14	285°8.09	0°2.92 21.99	6° 6.62 13.78	108°51.28 52.00	264°26.95 50.16	Bellatrix 278° 19.98
15	$300^{\circ}10.56$	15°2.01 · · 21.72	21°6.99 · · 13.67	123°53.50 · · 51.90	279°29.49 · · 50.14	Elnath 277° 58.47 Alnilam 275° 34.98
16	$315^{\circ}13.02$	30°1.09 21.46	36°7.36 13.55	138°55.71 51.81	294°32.03 50.12	Betelgeuse 270°49.18
17	330° 15.49	45°0.17 21.19	51°7.72 13.44	153°57.92 51.71	309°34.57 50.10	Canopus 263° 50.80
18	345° 17.95	59°59.26 S24°20.93	66°8.09 S24°13.33	169°0.14 N02°51.61	324°37.11 N05°50.08	Sirius 258°23.82
19	0°20.41	74°58.34 20.66	81°8.46 13.22	184°2.35 51.52	339°39.65 50.06	Adhara 255°3.65
20	15°22.88	89°57.43 20.39 104°56.52 · · 20.12	96°8.83 13.11	199° 4.57 51.42	354°42.19 50.04	Procyon 244°48.08
21 22	30°25.34 45°27.81	104°56.52 · · 20.12 119°55.60 19.85	111°9.20 · · 12.99 126°9.57 12.88	214°6.78 · · 51.32 229°9.00 51.23	9°44.73 · · 50.02 24°47.27 50.00	Pollux 243°14.12
23	60°30.27	134°54.69 19.58	126° 9.57 12.88 141° 9.94 12.76	229°9.00 51.23 244°11.21 51.13	39°49.81 49.98	Avior 234° 13.29
						Suhail 222° 44.31
Mer.p	ass. 18:59	ν -0.9′ <i>d</i> -0.2′ m-3.91	$ u 0.4' \ d\text{-}0.1' \ \text{m}1.26$	$ u 2.2' \ d$ -0.1' m-1.95	$\nu 2.5' \ d$ -0.0' m0.34	Miaplacidus 221°37.23
						Alphard 217° 45.28
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.85
0	75°32.74	149°53.77 S 24°19.30	156°10.31 \$24°12.65	259°13.43 N02°51.03	54°52.35 N05°49.97	Dubhe 193°38.21 Denebola 182°22.61
1	90°35.20	164°52.86 19.03	171°10.68 12.53	274°15.64 50.94	69°54.89 49.95	Gienah 175°41.23
2	$105^{\circ}37.66$	179°51.95 18.75	186°11.04 12.42	289°17.86 50.84	84°57.43 49.93	Acrux 172°57.60
3	$120^{\circ}40.13$	194°51.04 · · 18.48	201°11.41 · · 12.30	304°20.08 · · 50.75	99°59.97 · · 49.91	Gacrux 171°49.15
4	135° 42.59	209°50.12 18.20	216°11.78 12.19	319°22.29 50.65	115°2.51 49.89	Alioth 166°11.25
5	150°45.06	224°49.21 17.92	231°12.15 12.07	334°24.51 50.55	130°5.05 49.87	Spica 158° 19.99
6	165° 47.52	239°48.30 S24°17.64	246°12.52 S24°11.95	349°26.73 N02°50.46	145°7.59 N05°49.85	Alkaid 152° 50.53
7 8	180° 49.98 195° 52.45	254°47.39 17.35 269°46.48 17.07	261°12.89 11.83 276°13.26 11.71	4°28.94 50.36 19°31.16 50.27	160° 10.13 49.84 175° 12.67 49.82	Hadar 148°33.03
9	210° 54.91	284°45.57 · · 16.78	291°13.63 · · 11.60	19°31.16 50.27 34°33.38 · · 50.17	175° 12.67 49.82 190° 15.20 · · 49.80	Menkent 147° 55.08
10	225° 57.38	299° 44.66 16.50	306°13.99 11.48	49°35.60 50.08	205°17.74 49.78	Arcturus 145°46.02
11	240°59.84	314°43.75 16.21	321°14.36 11.36	64°37.81 49.98	220°20.28 49.76	Rigil Kent. 139°37.50
12	256°2.30	329°42.84 S 24°15.92	336°14.73 S 24°11.24	79°40.03 N02°49.89	235°22.82 N05°49.74	Kochab 137°21.03 Zuben'ubi 136°53.67
13	271°4.77	344°41.93 15.63	351°15.10 11.11	94°42.25 49.79	250°25.36 49.73	Alphecca 126°2.10
14	286°7.23	359°41.02 15.34	6°15.47 10.99	109°44.47 49.70	265°27.89 49.71	Antares 112° 13.28
15	301°9.70	14°40.11 · · 15.05	21°15.84 · · 10.87	124°46.69 · · 49.60	280°30.43 · · 49.69	Atria 107°5.89
16	316° 12.16	29°39.20 14.75	36°16.21 10.75	139°48.91 49.51	295°32.97 49.67	Sabik 102°0.40
17 18	331°14.62 346°17.09	44°38.29 14.46 59°37.38 \$24°14.16	51°16.57 10.63 66°16.94 \$24°10.50	154°51.13 49.41 169°53.35 N02°49.32	310°35.50 49.66 325°38.04 N05°49.64	Shaula 96°7.56
19	1° 19.55	74°36.48 13.86	81°17.31 10.38	184°55.57 49.22	340°40.58 49.62	Rasalhague 95°56.69
20	16°22.02	89°35.57 13.56	96°17.68 10.25	199°57.79 49.13	355°43.11 49.60	Eltanin 90°41.61
21	31°24.48	104°34.66 · · 13.26	111°18.05 · · 10.13	215°0.01 · · 49.04	10°45.65 · · 49.59	Kaus Aust. 83°29.75 Vega 80°32.01
22	46° 26.95	119°33.76 12.96	126°18.42 10.00	230°2.23 48.94	25°48.19 49.57	
23	61°29.41	134°32.85 12.66	141°18.79 9.88	245°4.45 48.85	40°50.72 49.55	Nunki 75°45.16 Altair 61°57.90
Marr	ass. 18:55	ν-0.9' d-0.3' m-3.92	ν0.4' d-0.1' m1.26	ν2.2' d-0.1' m-1.96	ν 2.5' d-0.0' m0.35	Peacock 53°2.44
- IVICI.P	7433. 10.33	ν-0.9 u-0.5 III-3.92			ν2.3 α-0.0 III0.33	Deneb 49° 24.43
						Enif 33°36.57
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 30.11
0	76°31.87	149°31.94 \$24°12.35	156°19.15 \$24°9.75	260°6.67 N02°48.75	55°53.26 N05°49.53 70°55.79 49.52	Fomalhaut 15°11.94
1 2	91°34.34 106°36.80	164°31.04 12.05 179°30.13 11.74	171°19.52 9.63 186°19.89 9.50	275°8.89 48.66 290°11.11 48.57	70°55.79 49.52 85°58.33 49.50	Scheat 13° 42.87
3	106 36.80 121°39.27	194°29.23 · · 11.43	201°20.26 · · 9.37	305°13.34 · · 48.47	101°0.87 · · 49.48	Markab 13°27.51
4	136° 41.73	209°28.32 11.12	216°20.63 9.24	320°15.56 48.38	116°3.40 49.47	Dec 06 Mon SHA
5	151° 44.19	224°27.42 10.81	231°21.00 9.11	335°17.78 48.29	131°5.94 49.45	Venus 75° 42.18
6	166° 46.66	239°26.51 S 24°10.50	246°21.36 S 24°8.99	350°20.00 N02°48.19	146°8.47 N05°49.43	Mars 81°27.85
7	181°49.12	254°25.61 10.19	261°21.73 8.86	5°22.23 48.10	161°11.01 49.42	Jupiter 183°46.72
8	196° 51.59	269°24.71 9.87	276°22.10 8.73	20°24.45 48.01	176° 13.54 49.40	Saturn 339°17.76
9	211°54.05	284°23.80 · · 9.56	291°22.47 · · 8.60	35°26.67 · · 47.91	191°16.07 · · 49.38	Dec 07 Tue SHA
10	226° 56.51	299°22.90 9.24	306°22.84 8.46	50°28.90 47.82	206° 18.61 49.37	Venus 74°21.04
11	241°58.98	314°22.00 8.92	321°23.20 8.33	65°31.12 47.73	221°21.14 49.35	Mars 80° 37.57
12	257°1.44	329°21.09	336°23.57	80°33.35 N02°47.64	236°23.68 N05°49.33 251°26.21 49.32	Jupiter 183° 40.69
13 14	272°3.91 287°6.37	344°20.19 8.28 359°19.29 7.96	351°23.94 8.07 6°24.31 7.94	95°35.57 47.54 110°37.79 47.45	251°26.21 49.32 266°28.74 49.30	Saturn 339°19.62
15	302°8.83	14°18.39 · · 7.64	21°24.68 · · 7.80	110 37.79 47.45 125°40.02 · · 47.36	281°31.28 · · 49.28	Dec 08 Wed SHA
16	317°11.30	29°17.49 7.32	36°25.05 7.67	140°42.24 47.27	296°33.81 49.27	Venus 73°0.07
17	332° 13.76	44°16.59 6.99	51°25.41 7.53	155°44.47 47.18	311°36.34 49.25	Mars 79° 47.28
18	347°16.23	59°15.69 S 24°6.66	66°25.78 S 24°7.40	170°46.70 N02°47.08	326°38.88 N05°49.24	Jupiter 183°34.80
19	2°18.69	74°14.79 6.33	81°26.15 7.26	185°48.92 46.99	341°41.41 49.22	Saturn 339°21.39
20	17°21.15	89°13.89 6.01	96°26.52 7.13	200°51.15 46.90	356° 43.94 49.21	Horizontal parallax
21 22	32°23.62 47°26.08	104°12.99 · · 5.67 119°12.09 5.34	111°26.89 · · 6.99 126°27.25 6.86	215°53.37 · · 46.81 230°55.60 46.72	11°46.47 · · 49.19 26°49.01 49.17	Venus:
23	47 26.08 62°28.55	119°12.09 5.34 134°11.19 5.01	120 27.25 0.80 141°27.62 6.72	245°57.83 46.63	41°51.54 49.16	Mars:
		-				
Wer.p	pass. 18:51	ν-0.9' d-0.3' m-3.92	ν0.4' d-0.1' m1.25	ν2.2' d-0.1' m-1.96	ν2.5' d-0.0' m0.35	

Dec

29°14.95

-42°9.35

56°41.79 -17°49.99

-57°5.83

 $23^{\circ}35.84$

 $89^{\circ}23.01$

-40°11.61

4°12.02

49°57.74 16°33.94

-8°10.15

 $46^{\circ}\,1.50$ 6°22.48

28°37.80

 $-1^{\circ}11.05$

 $7^{\circ}24.70$

-52°42.53 -16°45.25

-29°0.54

27°57.34

-59°35.74

-43°32.56

-69°49.66 -8°46.79

11°49.70

61°35.64

 $14^{\circ}24.82$

-17°41.77

 $-63^{\circ}15.01$ -57°15.96

55°48.18

-11°18.40

49°10.19 -60°30.26

-36°30.31

-60°56.87

 $19^{\circ}\,2.13$

 $74^{\circ}\,2.18$

-16°9.40

26°37.19

-26°29.55

-69°4.55

-15°45.49

-37°7.37

 $12^{\circ}32.46$

51°29.20

-34°22.22

38°48.72

 $-26^{\circ}15.66$ 8°56.68

-56°38.79

 $45^{\circ}23.10$

-46°49.65

-29°28.49

28°14.35

15°21.55

Mer.pass

14:00

13:36

06:46

20:21

14:01

13:35

06:42

20:17

14:03

13:34

06:39

20:13

0.1

0.1

Mer.pass

Mer.pass

 $10^{\circ}\,0.37$

 $5^{\circ}\,9.13$

Mon GHA Dec 0 32"19.15 522"25.95 93"7.18 16.7" 504"27.48 -13.2" 54 1 19"19.15 522"25.95 93"7.18 16.7" 504"27.48 -13.2" 54 2 212"18.93 26.57 122"18.57 16.7" 04"1.09 -13.2" 54 2 242"18.37 27.18 151"29.97 16.7" 04"1.09 -13.2" 54 5 25"18.11 27"48 166"66" 16.7" 03"34.62 -13.3" 54 6 272"17.95 522"27.79 180"41.37 16.7" 503"8.07 -13.3" 54 8 302"17.32 28.33 209"52.77 16.7" 02"41.45 -13.3" 54 9 317"17.06 -28.69 224"28.46 16.7" 02"28.11 -13.4" 54 11 347"16.54 29.29 239"4.14 16.7" 02"41.45 -13.3" 54 12 2"16.7 522"25.95 266"15.49 16.7" 02"14.76 -13.4" 54 13 17"16.01 29.89 282"51.15 16.7" 01"34.61 -13.4" 54 14 32"15.75 30.10 297"26.80 16.6" 01"21.20 -13.4" 54 15 47"15.84 -30.48 312"2.44 16.6" 00"40.89 -13.5" 54 16 62"15.22 30.78 336"3 36"6 16.6" 00"40.89 -13.5" 54 17 77"14.95 31.08 341"13.68 16.6" 00"40.89 -13.5" 54 18 92"14.46 31.06 23"39"35.98 16.5" 000"40.89 -13.5" 54 19 107"14.43 31.66 10"24.86 16.6" 00"40.89 -13.5" 54 22 122"15.16 32.25 38"35.98 16.5" 000"13.01 13.5" 54 22 127"13.37 32.38 68"47.02 16.5" 00"60.53.52 13.5" 54 22 127"12.30 -3.39 127"8.38 16.4" 01"7.04 13.5" 54 22 122"12.57 33.70 112"33.41 16.4" 01"20.56 13.5" 54 23 10"73.37 32.83 68"47.02 16.5" 00"40.01 31.5" 54 24 242"12.04 34.27 141"44.21 16.4" 01"47.62 13.5" 54 25 25"11.70 35.41 20"5.84 16.5" 00"62.55 13.5" 54 25 25"11.70 35.41 20"5.84 16.5" 00"64.01 13.5" 54 26 272"11.50 522"34.84 170"54.91 16.3" 00"24.73 13.5" 54 27 27 29 05 22"36.54 258"6.64 16.1" 00"40.73 13.5" 54 28 302"10.97 35.41 20"5.84 16.5" 00"64.01 13.5" 54 29 317"10.70 35.41 20"5.84 16.5" 00"64.01 13.5" 54 21 2"2"2.50			+0.1431 360		-011		555	
182°19.41 S22°25.95 93°7.18 16.7′ S04°27.48 -13.2′ 54°	h	Su	n			Moon		
197°1915 26.26 107°42.88 16.7' 04°14.30 -13.2' 54° 22°18.89 -26° 122°18.75 16.7' 03°47.86 -13.2' 54° 24°18.37 -27.18 151°297 16.7' 03°47.86 -13.2' 54° 24°18.37 -27.18 151°297 16.7' 03°47.86 -13.2' 54° 24° 18.3' 27° 18.5' 16.7' 03°47.86 -13.2' 54° 27° 17.8' 28° 18.5' 16.7' 03°47.86 -13.2' 54° 27° 18.5' 18.7' 16.7' 03°47.86 -13.2' 54° 27° 16.7' 03°47.86 -13.2' 54° 27° 18.5' 18.3' 36° 27° 18.7' 16.7' 03°41.75 -13.3' 54° 18.3' 36° 27° 28° 16.7' 02°44.75 -13.3' 54° 18.3'								HP
2 212°18.68								54.3' 54.4'
3 227°18.63 · · · · · · · · · · · · · · · · · · ·								54.4' 54.4'
242°18.37 77.18 151°29.97 16.7' 03°21.35 -13.3' 54 627°17.58 820°9 195°17.07 16.7' 03°21.35 -13.3' 54 627°17.58 830°27.79 180°41.37 16.7' 02°54.77 -13.3' 54 63 63°27.32 23.93 290°57.77 16.7' 02°54.77 -13.3' 54 63 63 63 63 63 63 63 6								54.4'
Color								54.4'
8 302°17.32 28.39 209°52.77 16.7′ 02°41.45 -13.3′ 54 9 317°17.06 · · 28.69 224°28.46 16.7′ 02°41.45 -13.3′ 54 10 332°16.80 28.99 239°4.14 16.7′ 02°41.476 -13.4′ 54 11 347°16.54 29.29 253°3.82 16.7′ 02°1.39 13.4′ 54 12 2°16.27 522°29.59 268°15.49 16.7′ 501°48.01 -13.4′ 54 13 17°16.01 29.89 282°51.15 16.7′ 01°34.61 13.4′ 54 14 32°15.75 30.19 297°28.80 16.6′ 01°21.20 -13.4′ 54 15 47°15.48 · · · 30.48 112°2.44 16.6′ 01°21.20 -13.4′ 54 16 62°15.22 30.78 326°38.07 16.6′ 00°40.49 -13.5′ 54 16 62°15.22 30.78 326°38.07 16.6′ 00°40.49 -13.5′ 54 17 77°14.95 31.08 341°13.68 16.6′ 00°44.34 -13.4′ 54 18 92°14.69 \$22°31.37 355′49.28 16.6′ 00°40.39 -13.5′ 54 19 107°14.43 31.66 10°24.86 16.6′ 00°41.36′ -13.5′ 54 20 122°14.16 31.96 25°0.43 16.5′ 00°26.50 13.5′ 54 21 137°13.90 · · 32.25 39°35.98 16.5′ N00°13.01 13.5′ 54 22 152°13.63 32.54 54′11.51 16.5′ 00°40.01 13.5′ 54 23 167°13.37 32.83 68°47.02 16.5′ 00°40.01 13.5′ 54 24 119°12.83 33.41 97°57.97 16.4′ 01°7.04 13.5′ 54 25 215°21.23 33.30 12 83°3.99 12°8.83 16.4′ 01°3.40 13.5′ 54 25 215°11.77 34.56 156′19.58 16.3′ 02°11.61 13.5′ 54 26 272°11.50 \$22°34.84 170°54.91 16.3′ 02°11.61 13.5′ 54 27 287°11.23 35.13 185°3.02 11.63′ 02°11.61 13.5′ 54 28 302°10.97 35.41 200°54.91 16.3′ 02°14.70 13.5′ 54 29 317°10.70 · · 35.70 214′40.73 16.2′ 02°41.78 13.5′ 54 11 347°10.16 36.26 243°51.10 16.1′ 03°22.41 13.5′ 54 11 347°10.16 36.26 23°3.14 16.4′ 01°3.49 13.5′ 54 12 2°9.90 \$22°3.64 286°50.04 15.9′ 04°43.02 13.5′ 55 13 17°6.93 39.58 20°3.14 15.9′ 04°43.02 13.5′ 55 14 3°29.90 \$23°3.64 286°60 04°3.00 13.5′ 55 15 47°9.00 · · 37.38 30°1.12°3.14 16.1′ 03°3.94 13.5′ 55 16 62°8.82 37.65 316°6.40 15.9′ 04°3.00 91.35′ 55 19 107°8.01 38.48 0°3.01 15.5′ 00°4.01 13.5′ 55 11 347°10.70 · · 35.70 214′40.73 16.2′ 02°55.33 13.5′ 54 19 107°8.01 38.48 0°3.01 15.5′ 00°4.01 13.5′ 55 11 347°2.90 52°3.65 428°6.66 10°3.00 13.5′ 55 11 347°2.00 39.30 44°15.91 16.1′ 03°2.41 13.5′ 55 11 347°2.00 39.30 30.81 14.1′ 16.1′ 03°3.94 13.5′ 55 11 37°6.93 39.58 50°6.04 15.9′ 00°4.30 09°1.35′ 55 11 37°6.93 39.58 50°6.04 15.9′ 00°	5	$257^{\circ}18.11$	27.48	$166^{\circ}5.67$	16.7'	03°21.35	-13.3'	54.4'
8 302°17.32 28.39 209°52.77 16.7' 02°4.45 1.33 5 8 10 332°16.80 28.69 224°28.46 16.7' 02°28.11 -13.4' 54 11 347°1654 29.29 224°28.14 16.7' 02°18.176 -13.4' 54 11 347°1654 29.29 253°39.82 16.7' 02°1.39 -13.4' 54 11 347°1654 29.29 553°39.82 16.7' 02°1.39 -13.4' 54 11 347°1654 29.29 553°39.82 16.7' 02°1.39 -13.4' 54 11 347°1654 29.29 52°51.5 16.7' 01°34.61 -13.4' 54 11 32°15.75 30.19 297°26.80 16.6' 01°21.20 13.4' 54 11 32°15.75 30.19 297°26.80 16.6' 01°21.20 13.4' 54 11 32°15.75 30.19 297°26.80 16.6' 01°21.20 13.4' 54 11 56 16°21.52 20 30.78 326°3.80 7 16.6' 00°54.34 -13.4' 54 11 56 16°21.52 20 30.78 326°3.80 7 16.6' 00°54.34 -13.4' 54 11 56 16°21.52 20 30.78 326°3.80 7 16.6' 00°54.34 -13.4' 54 11 50°1.52 21 137°1.390					16.7'		-13.3'	54.4'
9 317°17.06 28.69 224°28.46 16.7° 02°28.11 .13.4° 54 11 347°16.94 29.29 239°4.14 16.7° 02°14.76 .13.4° 54 12 2°16.27 S22°29.59 268°15.49 16.7° 02°14.76 .13.4° 54 13 17°16.01 29.89 282°51.15 16.7° 01°34.61 .13.4° 54 14 32°15.75 30.19 297°26.80 16.6° 01°21.20 .13.4° 54 15 44°15.48 .30.48 312°2.44 16.6° 01°21.71 .13.4° 54 16 62°15.22 30.78 326°38.07 16.6° 00°40.89 .13.5° 54 17 77°14.95 31.08 341°13.68 16.6° 00°40.89 .13.5° 54 18 92°14.69 S22°31.37 355°49.28 16.6° 00°43.4 .13.5° 54 19 107°14.43 31.66 10°24.86 16.6° 00°13.96 .13.5° 54 20 122°14.16 31.96 25°0.43 16.5° S00°0.48 .13.5° 54 21 137°13.90 .32.54 54°11.51 16.5° 00°26.56 13.5° 54 22 152°13.63 32.54 54°11.51 16.5° 00°26.56 13.5° 54 23 167°13.37 32.83 68°47.02 16.5° 00°40.01 13.5° 54 21 197°12.83 33.41 97°57.97 16.4° 01°7.04 13.5° 54 22 122°13.05 33.99 127°8.83 16.4° 01°7.04 13.5° 54 23 212°12.30 33.70 112°33.41 16.4° 01°47.62 13.5° 54 24 242°12.04 34.27 141°44.21 16.4° 01°47.62 13.5° 54 25 25°711.77 34.56 156°19.58 16.3° 02°21.61 13.5° 54 28 302°10.97 35.41 200°5.99 16.2° 02°4.18 13.5° 54 29 317°10.70 35.70 214°40.73 16.2° 02°4.17 13.5° 54 21 347°10.70 35.70 214°40.73 16.2° 02°4.17 13.5° 54 21 27°7.43 36.68 22°3.54 36°50.04 15.6° 00°4.03 13.5° 54 21 347°10.70 35.70 214°40.73 16.2° 02°55.33 13.5° 54 21 137°6.93 39.58 22°3.59 15.6° N06°18.63 13.5° 54 21 137°6.93 39.58 58°50.04 15.6° 00°4.17 13.5° 54 21 137°6.93 39.58 58°50.04 15.6° 00°4.17 13.5° 55 21 137°4.74 33.66 156°50.04 15.6° 00°4.17 13.5° 55 21 137°6.93 39.58 15.6° 15.6° 00°4.17 13.5° 55 22 152°7.20 39.30 44°15.17 15.5° 00°4.17								54.4'
10 332°16 80 28.99 239°4.14 16.7° 02°1.476 -12.4° 54.176 12.4° 54.2° 29.29 253°3 8.2 16.7° 02°1.39 -13.4° 54.12° 12.2° 27.6° 27.9° 27								54.4'
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0 182°6.66 S22°39.85 73°24.65 15.6' N06°18.07 13.5' 55 1 197°6.39 40.12 87°59.21 15.5' 06°31.53 13.4' 55 2 212°6.12 40.39 102°33.72 15.5' 06°44.97 13.4' 55 3 227°5.85 · 40.66 117°8.18 15.4' 06°58.39 13.4' 55 4 242°5.58 40.93 131°42.58 15.3' 07°11.81 13.4' 55 5 257°5.31 41.19 146°16.92 15.3' 07°25.21 13.4' 55 6 272°5.04 S22°41.46 160°51.21 15.2' N07°38.59 13.4' 55 7 287°4.76 41.73 175°25.44 15.2' 07°51.96 13.3' 55 8 302°4.49 41.99 189°59.61 15.1' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3'								
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2 212°6.12 40.39 102°33.72 15.5' 06°44.97 13.4' 55 3 227°5.85 · · 40.66 117°8.18 15.4' 06°58.39 13.4' 55 4 242°5.58 40.93 131°42.58 15.3' 07°11.81 13.4' 55 5 257°5.31 41.19 146°16.92 15.3' 07°25.21 13.4' 55 6 272°5.04 \$22°41.46 160°51.21 15.2' N07°38.59 13.4' 55 8 302°4.49 41.99 189°59.61 15.1' 08°5.30 13.3' 55 9 317°4.22 · · 42.26 204°33.71 15.0' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 \$22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55 15 47°2.58 · · 43.83 291°57.01 14.6' 09°38.17 13.2' 55 16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55 17 77°2.03 44.34 321°4.23 14.5' 10°44.49 13.1' 55 18 92°1.76 \$22°44.60 335°37.73 14.4' N10°17.61 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55 21 137°0.93 · · 45.37 19°17.80 14.2' 10°56.79 13.0' 55 22 152°0.66 45.62 33°51.01 14.1' 11°2.79 13.0' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55								55.2'
3 227°5.85 · · · 40.66 117°8.18 15.4' 06°58.39 13.4' 55 4 242°5.58 40.93 131°42.58 15.3' 07°11.81 13.4' 55 5 257°5.31 41.19 146°16.92 15.3' 07°25.21 13.4' 55 6 272°5.04 S22°41.46 160°51.21 15.2' N07°38.59 13.4' 55 7 287°4.76 41.73 175°25.44 15.2' 07°51.96 13.3' 55 8 302°4.49 41.99 189°59.61 15.1' 08°5.30 13.3' 55 9 317°4.22 · 42.26 204°33.71 15.0' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8'								55.3' 55.3'
4 242°5.58 40.93 131°42.58 15.3' 07°11.81 13.4' 55 5 257°5.31 41.19 146°16.92 15.3' 07°25.21 13.4' 55 6 272°5.04 S22°41.46 160°51.21 15.2' N07°38.59 13.4' 55 7 287°4.76 41.73 175°25.44 15.2' 07°51.96 13.3' 55 8 302°4.49 41.99 189°59.61 15.1' 08°58.50 13.3' 55 9 317°4.22 42.26 204°33.71 15.0' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' <								55.3'
5 257°5.31 41.19 146°16.92 15.3' 07°25.21 13.4' 55 6 272°5.04 S22°41.46 160°51.21 15.2' N07°38.59 13.4' 55 7 287°4.76 41.73 175°25.44 15.2' 07°51.96 13.3' 55 8 302°4.49 41.99 189°59.61 15.1' 08°5.30 13.3' 55 9 317°4.22 • 42.26 204°33.71 15.0' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2'								55.4'
7 287° 4.76 41.73 175° 25.44 15.2' 07° 51.96 13.3' 55 8 302° 4.49 41.99 189° 59.61 15.1' 08° 53.00 13.3' 55 9 317° 4.22 · 42.26 204° 33.71 15.0' 08° 18.63 13.3' 55 10 332° 3.95 42.78 233° 41.74 14.9' 08° 45.23 13.3' 55 11 347° 3.67 42.78 233° 41.74 14.9' 08° 45.23 13.3' 55 12 2° 3.40 522° 43.05 248° 15.66 14.9' N08° 58.50 13.2' 55 13 17° 3.13 43.31 262° 49.51 14.8' 09° 11.75 13.2' 55 14 32° 2.85 43.57 277° 23.29 14.7' 09° 24.97 13.2' 55 15 47° 2.58 · 43.83 291° 57.01 14.6' 09° 38.17 13.2' 55 16 62° 2.31 44.09 306° 30.65 14.6' 09° 51.34 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>55.4'</th>								55.4'
8 302°4.49 41.99 189°59.61 15.1' 08°5.30 13.3' 55 9 317°4.22 · · · 42.26 204°33.71 15.0' 08°18.63 13.3' 55 10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55 15 47°2.58 · 43.83 291°57.01 14.6' 09°38.17 13.2' 55 16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55 17 77°2.03 44.34 321°4.23 14.5' 10°4.49 13.1' 55 18 92°1.76 S22°44.60 335°3.773 14.4'								55.4'
9 317°4.22 ·· 42.26 204°33.71 15.0' 08°18.63 13.3' 55°10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55°11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55°12 2°3.40 \$22°43.05 248°15.66 14.9' \$N08°58.50 13.2' 55°13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55°14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55°15 47°2.58 ·· 43.83 291°57.01 14.6' 09°38.17 13.2' 55°16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55°17 77°2.03 44.34 321°4.23 14.5' 10°4.49 13.1' 55°18 92°1.76 \$22°44.60 335°37.73 14.4' \$N10°17.61 13.1' 55°19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55°19 12°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55°12 152°0.66 45.62 33°51.01 14.1' 11°9.79 13.0' 55°23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55°11 12.9' 55°11 12.9' 55°11 12.9' 55°11 12.9' 55°11 14.0' 11°22.76 12.9' 55°11 15°11 15°11 15°11 15°12.76 12.9' 55°11 15°11 15°2.76 12.9' 55°11 15°11 15°2.76 12.9' 55°11 15°11 15°2.76 12.9' 55°11 1								55.4'
10 332°3.95 42.52 219°7.76 15.0' 08°31.94 13.3' 55 11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55 15 47°2.58 43.83 291°57.01 14.6' 09°38.17 13.2' 55 16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55 18 92°1.76 S22°44.60 335°37.73 14.4' N10°17.61 13.1' 55 19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0'								55.5' 55.5'
11 347°3.67 42.78 233°41.74 14.9' 08°45.23 13.3' 55 12 2°3.40 S22°43.05 248°15.66 14.9' N08°58.50 13.2' 55 13 17°3.13 43.31 262°49.51 14.8' 09°11.75 13.2' 55 14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55 15 47°2.58 • 43.83 291°57.01 14.6' 09°38.17 13.2' 55 16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55 17 77°2.03 44.34 321°4.23 14.5' 10°4.49 13.1' 55 18 92°1.76 522°44.60 335°37.73 14.4' N10°17.61 13.1' 55 19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55 21 137°0.93 45.37 19°17.80 14.2' <								55.5'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								55.5'
14 32°2.85 43.57 277°23.29 14.7' 09°24.97 13.2' 55 15 47°2.58 · 43.83 291°57.01 14.6' 09°38.17 13.2' 55 16 62°2.31 44.09 306°30.65 14.6' 09°51.34 13.1' 55 17 77°2.03 44.34 321°4.23 14.5' 10°4.49 13.1' 55 18 92°1.76 522°44.60 33°37.73 14.4' N10°17.61 13.1' 55 19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55 21 137°0.93 · 45.37 19°17.80 14.2' 10°56.79 13.0' 55 22 152°0.66 45.62 33°51.01 14.1' 11°2.76 12.9' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55	12		S22°43.05	248° 15.66	14.9'	N08°58.50	13.2'	55.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								55.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								55.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								55.7' 55.7'
18 92°1.76 \$22°44.60 335°37.73 14.4' \$N10°17.61 13.1' 55 19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55 21 137°0.93 · 45.37 19°17.80 14.2' 10°56.79 13.0' 55 22 152°0.66 45.62 33°51.01 14.1' 11°9.79 13.0' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55								55.7' 55.7'
19 107°1.48 44.86 350°11.16 14.4' 10°30.70 13.1' 55 20 122°1.21 45.12 4°44.52 14.3' 10°43.76 13.0' 55 21 137°0.93 · 45.37 19°17.80 14.2' 10°56.79 13.0' 55 22 152°0.66 45.62 33°51.01 14.1' 11°9.79 13.0' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55								55.7'
21 137°0.93 ·· 45.37 19°17.80 14.2' 10°56.79 13.0' 55 22 152°0.66 45.62 33°51.01 14.1' 11°9.79 13.0' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55	19	107°1.48	44.86	$350^{\circ}11.16$	14.4'	$10^{\circ}30.70$	13.1'	55.8'
22 152°0.66 45.62 33°51.01 14.1' 11°9.79 13.0' 55 23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55								55.8'
23 167°0.38 45.88 48°24.13 14.0' 11°22.76 12.9' 55								55.8'
								55.9' 55.9'
SD = 16.2' $d = 0.3'$ $SD = 15.1'$	23			46 24.13			12.9	55.9
		5D = 16.2'	a = 0.3'		SI	$\nu = 15.1'$		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
Day	00 ^h	12 ^h	Pass	Upper	Lower	8-10
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-67%
06	09:18	09:05	11:51	18:17	05:57	
07	08:52	08:40	11:51	18:58	06:37	
08	08:27	08:14	11:52	19:40	07:19	

December 09, 10, 11 UT (Thu., Fri., Sat.)

h	Aries	Venus	М	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	77°31.01	149°10.29 \$24°4		S24°6.58	261°0.05	N02°46.53	56° 54.07	N05°49.14	A l l		
1	92°33.48	164°9.40 4	.34 171°28.36	6.44	276°2.28	46.44	71°56.60	49.13	Alpheratz Ankaa	357°32.18 353°4.70	29°14.95 -42°9.36
2	107°35.94		.00 186°28.73	6.31	291°4.51	46.35	86°59.13	49.11	Schedar	349°28.00	56°41.79
3	122°38.40	194°7.60 · · 3		• • 6.17	306°6.74	• • 46.26	102°1.66	• • 49.10	Diphda	348°44.79	-17°49.99
4	137° 40.87		.33 216°29.46	6.03	321°8.96	46.17	117°4.19	49.08	Achernar	$335^{\circ}18.12$	-57° 5.85
5 6	152° 43.33 167° 45.80	224°5.81 2 239°4.91 \$24°2	.98 231°29.83 .64 246°30.20	5.89 \$24°5.75	336°11.19 351°13.42	46.08 N02°45.99	132°6.73 147°9.26	49.07 N05°49.05	Hamal	327°48.22	23°35.83
7	182° 48.26		.30 261°30.57	5.61	6°15.65	45.90	162°11.79	49.04	Polaris	312°17.36	89°23.03
8	197° 50.72		.96 276°30.93	5.46	21°17.88	45.81	177° 14.32	49.02	Acamar	315°9.62	-40°11.62
9	$212^{\circ}53.19$	284°2.23 · · 1	.61 291°31.30	• • 5.32	36°20.11	• • 45.72	192°16.85	• • 49.01	Menkar Mirfak	314°3.36 308°24.31	4°12.02 49°57.75
10	$227^{\circ}55.65$.26 306°31.67	5.18	51°22.34	45.63	207°19.38	48.99	Aldebaran	290°36.52	16°33.93
11	242°58.12		.91 321°32.04	5.04	66°24.57	45.54	222°21.91	48.98	Rigel	281°1.23	-8°10.16
12 13	258°0.58 273°3.04	328°59.54		\$24°4.89 4.75	81°26.80 96°29.03	N02° 45.45 45.36	237° 24.44 252° 26.97	N05°48.96 48.95	Capella	280°17.86	$46^{\circ}1.50$
14	288°5.51	358°57.76 23°59		4.75	90° 29.03 111° 31.26	45.27	267°29.50	48.93	Bellatrix	278°19.98	6°22.48
15	303°7.97	13°56.86 · · 59		• • 4.46	126°33.49	• • 45.18	282°32.03	• • 48.92	Elnath	277°58.46	28°37.80
16	$318^{\circ}10.44$	28°55.97 59	.16 36°33.88	4.32	141°35.72	45.09	297°34.56	48.91	Alnilam	275°34.97 270°49.17	-1°11.06 7°24.70
17	$333^{\circ}12.90$	43°55.08 58	.80 51°34.25	4.17	156°37.95	45.00	312°37.08	48.89	Betelgeuse Canopus	263°50.79	-52°42.55
18	348° 15.37	58°54.19 S23°58		S24°4.02	171°40.18	N02°44.91	327°39.61	N05°48.88	Sirius	258°23.80	-16°45.26
19	3° 17.83		.08 81°34.98	3.88	186°42.41	44.82	342°42.14	48.86	Adhara	255°3.64	-29° 0.55
20 21	18° 20.29 33° 22.76	88°52.40 57 103°51.51 · · · 57	.73 96°35.35 .36 111°35.72	3.73 · · 3.58	201°44.64 216°46.88	44.73 •• 44.64	357° 44.67 12° 47.20	48.85 •• 48.83	Procyon	244°48.07	$5^{\circ}9.12$
22	48° 25.22		.00 126°36.08	3.44	231°49.11	44.55	27°49.73	48.82	Pollux	243°14.11	27°57.34
23	63°27.69		.64 141°36.45	3.29	246°51.34	44.47	42°52.25	48.81	Avior	234°13.26	-59°35.76
									Suhail	222°44.28	-43°32.57
ivier.	pass. 18:47	ν-0.9' d-0.3' m-3	$\frac{92}{}$ ν 0.4 d -0	0.1′ m1.25	ν2.2 a-0	0.1' m-1.97	ν2.5 α-C	0.0′ m0.36	Miaplacidus Alphard	221°37.18 217°45.26	-69°49.68 -8°46.81
	_								Regulus	217 45.20 207°31.82	11°49.69
Fri	GHA	GHA Dec		Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.18	61°35.63
0	78° 30.15	148°48.84 S 23°56 163°47.95 55		\$24°3.14	261°53.57	N02°44.38	57° 54.78	N05°48.79	Denebola	182°22.59	$14^{\circ}24.81$
1 2	93°32.61 108°35.08		.91 171°37.19 .54 186°37.56	2.99 2.84	276°55.81 291°58.04	44.29 44.20	72°57.31 87°59.84	48.78 48.77	Gienah	175°41.21	-17°41.78
3	123° 37.54	193°46.18 · · 55		2.69	307°0.27	• • 44.11	103°2.36	• • 48.75	Acrux	172°57.56	-63°15.01
4	138° 40.01		.81 216°38.29	2.54	322°2.51	44.02	118°4.89	48.74	Gacrux	171°49.11 166°11.22	-57°15.96
5	153°42.47	223°44.40 54	.43 231°38.66	2.39	337°4.74	43.94	133°7.42	48.73	Alioth Spica	158° 19.97	55°48.17 -11°18.40
6	168°44.93	238°43.51 S 23°54		S24°2.23	352°6.98	N02°43.85	148°9.95	N05°48.71	Alkaid	152° 50.51	49°10.18
7	183°47.40		.69 261°39.40	2.08	7°9.21	43.76	163° 12.47	48.70	Hadar	148°32.99	-60°30.25
8 9	198° 49.86		.32 276°39.76	1.93	22°11.45	43.67	178° 15.00	48.69	Menkent	$147^{\circ}55.06$	-36°30.30
10	213° 52.33 228° 54.79	283°40.85 · · 52 298°39.97 52	.94 291°40.13 .56 306°40.50	· · 1.78 1.62	37°13.68 52°15.92	· · 43.58 43.50	193°17.53 208°20.05	•• 48.67 48.66	Arcturus	145°46.01	19°2.11
11	243°57.26		.19 321°40.87	1.47	67°18.15	43.41	223°22.58	48.65	Rigil Kent.	139°37.47	-60°56.86
12	258° 59.72	328°38.19		S24°1.31	82°20.39	N02°43.32	238° 25.10	N05°48.63	Kochab	137°21.01 136°53.65	74°2.17 -16°9.41
13	274°2.18	343°37.31 51	.43 351°41.60	1.16	97°22.62	43.23	253°27.63	48.62	Zuben'ubi Alphecca	130 53.05 126°2.09	-16 9.41 26°37.18
14	289°4.65		.04 6°41.97	1.00	112°24.86	43.15	268°30.15	48.61	Antares	112° 13.27	-26°29.54
15	304°7.11		.66 21°42.34	• • 0.85	127°27.10	• • 43.06	283°32.68	• • 48.60	Atria	107°5.88	-69° 4.53
16 17	319°9.58 334°12.04		.28 36°42.71 .89 51°43.07	0.69 0.53	142°29.33 157°31.57	42.97 42.89	298°35.20 313°37.73	48.58 48.57	Sabik	$102^{\circ}0.40$	-15°45.49
18	349° 14.50	58°32.89 S 23°49		524°0.38	172°33.81	N02°42.80	313 37.73 328°40.25	N05°48.56	Shaula	96°7.55	-37°7.36
19	4° 16.97		.12 81°43.81	0.22	187°36.05	42.71	343°42.78	48.55	Rasalhague	95°56.69	12°32.45
20	19° 19.43		.73 96°44.18	24°0.06	202°38.28	42.63	358° 45.30	48.53	Eltanin Kaus Aust.	90°41.61 83°29.75	51°29.18 -34°22.22
21	$34^{\circ}21.90$	103°30.25 · · 48		23°59.90	217°40.52	• • 42.54	13°47.83	• • 48.52	Vega	80°32.02	38°48.70
22	49° 24.36		.95 126°44.91	59.74	232°42.76	42.45	28°50.35	48.51	Nunki	75°45.16	-26°15.66
23	64° 26.83	133°28.48 47	.55 141°45.28	59.58	247°45.00	42.37	43°52.88	48.50	Altair	61°57.90	8°56.67
Mer. _l	pass. 18:43	ν -0.9 $'$ d-0.4 $'$ m-3	92 ν 0.4′ d -0	$0.1' \; { m m} 1.25$	ν 2.2′ d-0).1′ m-1.97	$\nu 2.5' \ d-0$	0.0′ m0.36	Peacock	53°2.46	-56°38.78
									Deneb	49°24.45	45°23.09
Sat	GHA	GHA Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.58	10°0.37
0	79° 29.29	148°27.60 \$23°47		\$23°59.42	262°47.24	N02° 42.28	58° 55.40	N05°48.48	Al Na'ir Fomalhaut	27°30.13 15°11.96	-46°49.65 -29°28.50
1	94° 31.75	163°26.72 46	.76 171°46.02	59.26	277°49.48	42.20	73°57.92	48.47	Scheat	13°42.88	28°14.34
2	109°34.22		.37 186°46.39	59.10	292°51.72	42.11	89°0.45	48.46	Markab	13°27.52	$15^{\circ}21.55$
3 4	124° 36.68 139° 39.15	193°24.96 · · 45 208°24.08 45	.97 201°46.75 .57 216°47.12	· · 58.94 58.78	307°53.95 322°56.19	· · 42.02 41.94	104°2.97 119°5.49	• • 48.45 48.44	Dec 09 Thu	SHA	Mer.pass
5	154° 41.61		.17 231°47.49	58.61	337°58.43	41.85	119 5.49 134°8.02	48.43	Venus	71°39.28	14:04
6	169° 44.07	238°22.33 \$23°44		\$23°58.45	353°0.67	N02°41.77	149° 10.54	N05°48.41	Mars	78°56.98	13:34
7	184°46.54		.37 261°48.22	58.29	8°2.92	41.68	164° 13.06	48.40	Jupiter	183°29.04	06:35
8	199° 49.00		.96 276°48.59	58.12	23°5.16	41.60	179° 15.58	48.39	Saturn	339°23.06	20:09
9	214°51.47	283°19.69 · · 43		• • 57.96	38°7.40	• • 41.51	194° 18.11	• • 48.38	Dec 10 Fri	SHA	Mer.pass
10 11	229° 53.93 244° 56.40		.15 306°49.33 .74 321°49.70	57.79 57.63	53°9.64 68°11.88	41.43 41.34	209°20.63 224°23.15	48.37 48.36	Venus	70° 18.69	14:06
12	259° 58.86	313 17.94 42 328°17.07 \$23°42		57.03 \$23°57.46	83°14.12	N02°41.26	224 23.15 239° 25.67	48.30 N05°48.35	Mars	78°6.67	13:33
13	275°1.32		.93 351°50.43	57.30	98°16.36	41.17	254°28.19	48.33	Jupiter	183°23.42	06:31
14	290°3.79		.51 6°50.80	57.13	113°18.61	41.09	269°30.71	48.32	Saturn	339°24.63	20:05
15	305°6.25	13°14.44 · · 41		• • 56.96	128°20.85	• • 41.00	284°33.23	• • 48.31	Dec 11 Sat	SHA	Mer.pass
16	320°8.72		.69 36°51.54	56.79	143°23.09	40.92	299°35.76	48.30	Venus	68°58.31	14:07
17	335°11.18	43°12.69 40 58°11.82 S 23°39	.27 51°51.90	56.62	158°25.33	40.84 N02°40.75	314°38.28	48.29	Mars	77°16.36	13:33
18 19	350° 13.64 5° 16.11		.86 66°52.27 .44 81°52.64	\$23°56.46 56.29	173°27.58 188°29.82	N02° 40.75 40.67	329° 40.80 344° 43.32	N05°48.28 48.27	Jupiter Saturn	183°17.95 339°26.11	06:28 20:01
20	20° 18.57		.02 96°53.01	56.12	203°32.06	40.58	359° 45.84	48.26			∠0:01
21	35°21.04	103°9.20 · · 38		• • 55.95	218°34.31	• • 40.50	14°48.36	• • 48.25	Horizo	ntal parallax	
22	50°23.50		.18 126°53.74	55.78	233°36.55	40.42	29°50.88	48.24		Venus:	0.1
23	65°25.97	133°7.46 37	.76 141°54.11	55.61	248°38.80	40.33	44°53.40	48.23		Mars:	0.1
Mer.	pass. 18:39	ν-0.9' d-0.4' m-3	93 $\nu 0.4' d-0$).2′ m1.25	ν 2.2′ d-0	0.1′ m-1.98	ν 2.5′ d -0	0.0′ m0.37			

	011-010 =	T0.1432 36C	Δ. –	-011		, 300	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°0.11 196°59.83	\$22°46.13 46.38	62°57.18 77°30.15	14.0' 13.9'	N11°35.69 11°48.59	12.9' 12.9'	55.9' 56.0'
2	211°59.56	46.38 46.63	92°3.04	13.8'	11 48.59 12°1.45	12.9	56.0'
3	226°59.28	• • 46.89	106°35.84	13.7'	12°14.28	12.8'	56.0'
4	241°59.01	47.14	121°8.56	13.6'	$12^{\circ}27.06$	12.7'	56.1'
5	256°58.73	47.38	135°41.20	13.6'	12°39.81	12.7'	56.1'
6 7	271°58.45 286°58.18	\$22°47.63 47.88	150°13.75 164°46.21	13.5' 13.4'	N12°52.52 13°5.19	12.7' 12.6'	56.1' 56.1'
8	301°57.90	48.13	179°18.59	13.4	13 5.19 13°17.81	12.6'	56.2
9	316°57.62	• • 48.37	193°50.88	13.2'	13°30.39	12.5'	56.2'
10	331°57.35	48.62	208°23.07	13.1'	13°42.93	12.5'	56.2'
11	346°57.07	48.86	222°55.18	13.0'	13°55.41	12.4' 12.4'	56.3' 56.3'
12 13	1°56.79 16°56.51	\$22°49.11 49.35	237°27.19 251°59.11	12.9' 12.8'	N14°7.86 14°20.25	12.4	56.3
14	31°56.24	49.59	266°30.94	12.7'	14°32.59	12.3'	56.4
15	46°55.96	• • 49.83	$281^{\circ}2.67$	12.6'	14°44.88	12.2'	56.4'
16	61°55.68	50.07	295°34.30	12.5'	14°57.12	12.2'	56.4'
17 18	76°55.40 91°55.12	50.31 \$22°50.55	310°5.84 324°37.28	12.4' 12.3'	15°9.30 N15°21.43	12.1' 12.1'	56.5' 56.5'
19	106°54.84	50.79	339°8.62	12.2'	15°33.50	12.0'	56.5
20	121°54.56	51.03	353°39.85	12.1'	15°45.51	12.0'	56.6'
21	136°54.28	•• 51.26	8°10.99	12.0'	15°57.47	11.9'	56.6'
22	151°54.00 166°53.73	51.50	22°42.02 37°12.96	11.9'	16°9.36	11.8'	56.6'
23		51.73	37 12.96	11.8'	16°21.19	11.8'	56.7'
	SD = 16.2'	d = 0.3'		SI	O = 15.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°53.45	\$22°51.97	51°43.78	11.7'	N16°32.96	11.7'	56.7'
1	196°53.17	52.20	66°14.50	11.6'	16°44.66	11.6'	56.7'
2	211°52.89 226°52.61	52.43 •• 52.67	80°45.12 95°15.63	11.5' 11.4'	16°56.30 17°7.87	11.6' 11.5'	56.8' 56.8'
3 4	241°52.32	52.90	95 15.03 109°46.03	11.4	17 7.87 17°19.37	11.5	56.8'
5	256°52.04	53.13	124°16.33	11.2'	17°30.80	11.4'	56.9'
6	271°51.76	S22°53.36	138°46.51	11.1'	N17°42.15	11.3'	56.9'
7	286°51.48	53.58	153°16.59	11.0'	17°53.44	11.2'	56.9'
8 9	301°51.20 316°50.92	53.81 •• 54.04	167°46.55 182°16.40	10.9' 10.7'	18°4.64 18°15.78	11.1' 11.1'	57.0' 57.0'
10	331°50.64	54.27	196°46.14	10.6	18°26.83	11.0'	57.0'
11	346°50.36	54.49	211°15.77	10.5'	18°37.80	10.9'	57.1'
12	1°50.07	\$22°54.72	225°45.29	10.4'	N18°48.69	10.8'	57.1'
13	16°49.79 31°49.51	54.94	240°14.69 254°43.97	10.3' 10.2'	18°59.50 19°10.23	10.7'	57.2'
14 15	46°49.23	55.16 •• 55.39	269°13.15	10.2	19 10.23 19°20.86	10.6' 10.6'	57.2' 57.2'
16	61°48.95	55.61	283°42.20	9.9'	19°31.41	10.5	57.3'
17	76°48.66	55.83	298°11.14	9.8'	19°41.88	10.4'	57.3'
18 19	91°48.38 106°48.10	\$22°56.05 56.27	312°39.97 327°8.67	9.7' 9.6'	N19°52.25 20°2.52	10.3' 10.2'	57.3' 57.4'
20	100 48.10 121°47.81	56.49	341°37.26	9.0 9.5'	20° 2.52 20° 12.71	10.2	57.4'
21	136°47.53	• • 56.70	356°5.73	9.4	20°22.79	10.0'	57.4'
22	151°47.25	56.92	10°34.09	9.2'	20°32.79	9.9'	57.5'
23	166°46.96	57.14	25°2.32	9.1'	20°42.68	9.8'	57.5'
	SD = 16.2'	d = 0.2'		SI	O = 15.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°46.68	S22°57.35	39°30.44	9.0'	$N20^{\circ}52.47$	9.7'	57.5'
1	196°46.39	57.57	53°58.44	8.9'	21°2.16	9.6'	57.6'
2	211°46.11 226°45.83	57.78 •• 57.99	68°26.32 82°54.08	8.8' 8.6'	21°11.74 21°21.22	9.5' 9.4'	57.6' 57.6'
4	241°45.54	58.21	97°21.72	8.5'	21°30.59	9.4	57.7'
5	256°45.26	58.42	111°49.25	8.4'	21°39.85	9.2'	57.7'
6	271°44.97	S22°58.63	126°16.65	8.3'	N21°49.00	9.0'	57.7'
7 8	286°44.69 301°44.40	58.84 59.05	140°43.94 155°11.10	8.2' 8.0'	21°58.04 22°6.96	8.9' 8.8'	57.8' 57.8'
9	316°44.12	59.26	169°38.15	7.9'	22 0.90 22°15.77	8.7'	57.8'
10	331°43.83	59.46	$184^{\circ}5.08$	7.8'	$22^{\circ}24.46$	8.6'	57.9'
11	346°43.54	59.67	198°31.89	7.7'	22°33.03	8.5'	57.9'
12 13	1°43.26 16°42.97	\$22°59.88 23°0.08	212°58.58 227°25.16	7.6' 7.5'	N22°41.48 22°49.81	8.3' 8.2'	58.0' 58.0'
14	31°42.69	0.29	241°51.61	7.3	22°58.02	8.1'	58.0'
15	46°42.40	• • 0.49	256°17.95	7.2'	23°6.09	7.9'	58.1'
16	61°42.11	0.69	270°44.18	7.1'	23°14.04	7.8'	58.1'
17				7.0'	23°21.86	7.7'	58.1'
18	76°41.83	0.89	285°10.29			7.61	E0 31
19	76°41.83 91°41.54	S23°1.10	299°36.28	6.9'	N23°29.55	7.6' 7.4'	58.2' 58.2'
19 20	76°41.83					7.6' 7.4' 7.3'	58.2' 58.2' 58.2'
20 21	76°41.83 91°41.54 106°41.25 121°40.96 136°40.68	\$23°1.10 1.30 1.50 •• 1.69	299°36.28 314°2.16 328°27.92 342°53.57	6.9' 6.8' 6.7' 6.5'	N23°29.55 23°37.10 23°44.52 23°51.81	7.4' 7.3' 7.1'	58.2' 58.2' 58.3'
20 21 22	76° 41.83 91° 41.54 106° 41.25 121° 40.96 136° 40.68 151° 40.39	\$23°1.10 1.30 1.50 •• 1.69 1.89	299°36.28 314°2.16 328°27.92 342°53.57 357°19.11	6.9' 6.8' 6.7' 6.5' 6.4'	N23°29.55 23°37.10 23°44.52 23°51.81 23°58.95	7.4' 7.3' 7.1' 7.0'	58.2' 58.2' 58.3' 58.3'
20 21	76°41.83 91°41.54 106°41.25 121°40.96 136°40.68	\$23°1.10 1.30 1.50 •• 1.69	299°36.28 314°2.16 328°27.92 342°53.57	6.9' 6.8' 6.7' 6.5' 6.4' 6.3'	N23°29.55 23°37.10 23°44.52 23°51.81	7.4' 7.3' 7.1'	58.2' 58.2' 58.3'

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	11-13
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-91%
09	08:00	07:47	11:52	20:26	08:03	
10	07:34	07:20	11:53	21:16	08:51	
11	07:07	06:53	11:53	22:11	09:43	

December 12, 13, 14 UT (Sun., Mon., Tue.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	80°28.43	148°6.59	\$23°37.34	156°54.48	\$23°55.43	263°41.04	N02°40.25	59°55.92	N05°48.22	Alpheratz	357°32.19
1	95°30.89	163°5.72	36.91	171°54.85	55.26	278°43.29	40.17	74°58.44	48.21	Ankaa	353° 4.72
2	110°33.36	178°4.85	36.48	186°55.22	55.09	293°45.53	40.08	90°0.96	48.20	Schedar	349°28.01
3 4	125°35.82 140°38.29	193°3.98 208°3.11	· · 36.06 35.63	201°55.58 216°55.95	•• 54.92 54.74	308°47.78 323°50.02	· · 40.00 39.92	105°3.48 120°5.99	· · 48.19 48.18	Diphda	348°44.80
5	155° 40.75	200° 3.11 223° 2.24	35.20	231°56.32	54.57	338°52.27	39.83	135°8.51	48.17	Achernar	335° 18.14
6	170°43.21	238°1.37	S23°34.77	246°56.69	\$23°54.39	353°54.52	N02°39.75	150° 11.03	N05°48.16	Hamal	327°48.22
7	$185^{\circ}45.68$	253°0.50	34.34	261°57.06	54.22	8°56.76	39.67	$165^{\circ}13.55$	48.15	Polaris Acamar	312° 17.63 315° 9.63
8	200°48.14	267°59.64	33.90	276°57.43	54.04	23°59.01	39.59	180° 16.07	48.14	Menkar	314°3.36
9	215°50.61	282°58.77	• • 33.47	291°57.79	• • 53.87	39°1.26	• • 39.50	195° 18.59	• • 48.13	Mirfak	308°24.30
10 11	230° 53.07 245° 55.54	297°57.90 312°57.04	33.03 32.60	306°58.16 321°58.53	53.69 53.51	54°3.50 69°5.75	39.42 39.34	210°21.11 225°23.62	48.12 48.11	Aldebaran	290°36.51
12	260°58.00	312 57.04 327°56.17	\$23°32.16	336°58.90	\$23°53.34	84°8.00	N02°39.26	240°26.14	N05°48.10	Rigel	$281^{\circ}1.22$
13	276°0.46	342°55.30	31.72	351°59.27	53.16	99°10.25	39.17	255°28.66	48.09	Capella	280° 17.84
14	291°2.93	357°54.44	31.28	6°59.63	52.98	114°12.49	39.09	270°31.18	48.08	Bellatrix Elnath	278° 19.96 277° 58.44
15	306°5.39	12°53.58	• • 30.84	22°0.00	• • 52.80	129°14.74	• • 39.01	285°33.69	• • 48.07	Alnilam	277 38.44 275° 34.96
16	321°7.86	27°52.71	30.40	37° 0.37	52.62	144°16.99	38.93	300°36.21	48.06	Betelgeuse	270°49.15
17	336° 10.32 351° 12.79	42°51.85 57°50.98	29.95 \$23°29.51	52°0.74 67°1.11	52.44 \$23°52.26	159°19.24 174°21.49	38.85 N02°38.77	315°38.73	48.05 N05°48.04	Canopus	263°50.78
18 19	6° 15.25	72°50.12	29.06	82° 1.48	52.08	174 21.49 189°23.74	38.68	330°41.24 345°43.76	48.04	Sirius	$258^{\circ}23.79$
20	21° 17.71	87° 49.26	28.61	97°1.84	51.90	204°25.99	38.60	0°46.28	48.03	Adhara	255°3.62
21	36°20.18	102°48.40	• • 28.16	112°2.21	• • 51.72	219°28.24	• • 38.52	15°48.79	• • 48.02	Procyon	244° 48.05
22	51°22.64	117° 47.54	27.71	127° 2.58	51.54	234°30.49	38.44	$30^{\circ}51.31$	48.01	Pollux Avior	243°14.08 234°13.23
23	66°25.11	132°46.67	27.26	142°2.95	51.36	249°32.74	38.36	45°53.82	48.00	Suhail	222° 44.25
Mer.p	pass. 18:35	ν -0.9' d-0	.4' m-3.93	$\nu 0.4' \ d-0$.2′ m1.24	$\nu 2.2' \ d-0$.1′ m-1.99	$\nu 2.5' \ d-0$	0.0′ m0.37	Miaplacidus	221°37.13
										Alphard	$217^{\circ}45.23$
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.80
0	81°27.57	147°45.81	S23°26.81	157°3.32	S23°51.17	264°34.99	N02°38.28	60°56.34	N05°47.99	Dubhe	193°38.14
1	96°30.04	162°44.95	26.36	172°3.69	50.99	279°37.24	38.20	75°58.85	47.98	Denebola Gienah	182°22.56 175°41.18
2	111°32.50	177°44.09	25.90	187°4.05	50.81	294°39.49	38.12	91°1.37	47.97		175° 41.16
3	126°34.96	192°43.23	• • 25.44	202°4.42	• • 50.62	309°41.74	• • 38.04	106°3.88	• • 47.97		171°49.06
4	141°37.43	207° 42.37	24.99	217° 4.79	50.44	324°44.00	37.96	121°6.40	47.96	Alioth	$166^{\circ}11.19$
5 6	156° 39.89 171° 42.36	222°41.52 237°40.66	24.53 \$23°24.07	232°5.16 247°5.53	50.25 \$23°50.07	339°46.25 354°48.50	37.88 N02°37.80	136°8.91 151°11.43	47.95 N05°47.94	Spica	158° 19.94
7	186°44.82	252°39.80	23.61	262°5.90	49.88	9°50.75	37.72	166° 13.94	47.93	Alkaid	152°50.48
8	201°47.28	267°38.94	23.15	277° 6.26	49.69	24°53.00	37.64	181°16.46	47.93	Hadar Menkent	148°32.95 147°55.03
9	$216^{\circ}49.75$	282°38.09	• • 22.68	292°6.63	• • 49.51	39°55.26	• • 37.56	$196^{\circ}18.97$	• • 47.92	Arcturus	147 55.05 145° 45.99
10	231°52.21	297°37.23	22.22	307°7.00	49.32	54°57.51	37.48	211°21.49	47.91	Rigil Kent.	139°37.42
11	246° 54.68	312°36.37 327°35.52	21.75 \$23°21.29	322°7.37	49.13 \$23°48.94	69°59.76	37.40	226°24.00	47.90 N05°47.89	Kochab	$137^{\circ}20.98$
12 13	261° 57.14 276° 59.61	342°34.66	20.82	337°7.74 352°8.11	48.75	85°2.02 100°4.27	N02° 37.32 37.24	241°26.51 256°29.03	47.89	Zuben'ubi	136°53.63
14	292°2.07	357°33.81	20.35	7°8.48	48.56	115°6.53	37.16	271°31.54	47.88	Alphecca	126°2.07
15	307°4.53	12°32.96	• • 19.88	22°8.84	• • 48.37	130°8.78	• • 37.08	286°34.05	• • 47.87	Antares Atria	112°13.26 107°5.85
16	322°7.00	27°32.10	19.41	37° 9.21	48.18	145°11.04	37.00	301°36.56	47.86	Sabik	107° 0.39
17	337°9.46	42°31.25	18.93	52°9.58	47.99	160°13.29	36.92	316°39.08	47.86	Shaula	96°7.54
18 19	352°11.93 7°14.39	57°30.40 72°29.54	\$23°18.46 17.98	67° 9.95 82° 10.32	\$23°47.80 47.61	175°15.55 190°17.80	N02° 36.84 36.77	331°41.59 346°44.10	N05°47.85 47.84	Rasalhague	95°56.68
20	7 14.39 22°16.86	87° 28.69	17.51	97°10.69	47.01	205°20.06	36.69	1°46.61	47.84	Eltanin	90°41.62
21	37° 19.32	102°27.84	•• 17.03	112°11.06	• • 47.22	220°22.31	36.61	16°49.13	• • 47.83	Kaus Aust.	83°29.75
22	52°21.78	117°26.99	16.55	127°11.43	47.03	235°24.57	36.53	31°51.64	47.82	Vega Nunki	80°32.02 75°45.16
23	67°24.25	132°26.14	16.07	142°11.79	46.84	250°26.83	36.45	$46^{\circ}54.15$	47.81	Altair	61°57.90
Mer.p	pass. 18:31	ν -0.9' d-0	.5′ m-3.93	ν 0.4' d-0	.2′ m1.24	$\nu 2.3' \ d-0$.1′ m-1.99	$\nu 2.5' \ d-0$	0.0' m0.38	Peacock	53°2.47
										Deneb	49°24.46
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.59
0	82°26.71	147° 25.29	\$23°15.59	157°12.16	\$23°46.64	265°29.08	N02°36.37	61°56.66	N05°47.81	Al Na'ir Fomalhaut	27°30.14 15°11.97
1	97°29.18	162°24.44	15.11	172°12.53	46.45	280°31.34	36.30	76°59.17	47.80	Fomalhaut	15° 11.97 13° 42.89
2	112°31.64	177°23.59	14.62	187°12.90	46.25	295°33.60	36.22	92°1.68	47.79	Markab	13° 27.53
3	127°34.11	192°22.74	• • 14.14	202°13.27	• • 46.06	310°35.85	36.14	107°4.19	• • 47.79		
4	142° 36.57 157° 39.03	207°21.89	13.65	217°13.64	45.86	325°38.11	36.06	122°6.71	47.78	Dec 12 Sun Venus	SHA 67°38.16
5 6	157 39.03 172°41.50	222°21.05 237°20.20	13.17 \$23°12.68	232°14.01 247°14.38	45.66 \$23°45.47	340°40.37 355°42.63	35.98 N02°35.91	137°9.22 152°11.73	47.78 N05°47.77	Mars	76° 26.05
7	187°43.96	252°19.35	12.19	262°14.75	45.27	10°44.89	35.83	167° 14.24	47.76		183° 12.61
8	202°46.43	267° 18.51	11.70	277°15.12	45.07	25°47.15	35.75	182° 16.75	47.76	Saturn	$339^{\circ}27.49$
9	217°48.89	282°17.66	• • 11.20	292°15.48	• • 44.87	40°49.41	• • 35.68	$197^{\circ}19.26$	• • 47.75	Dec 13 Mon	SHA
10	232°51.36	297°16.81	10.71	307°15.85	44.67	55°51.66	35.60	212°21.77	47.74	Venus	66° 18.24
11	247°53.82	312°15.97	10.22	322°16.22	44.47	70°53.92	35.52	227°24.28	47.74	Mars	75°35.75
12 13	262° 56.28 277° 58.75	327°15.13 342°14.28	\$23° 9.72 9.23	337°16.59 352°16.96	\$23°44.28 44.07	85°56.18 100°58.44	N02° 35.45 35.37	242°26.79 257°29.29	N05°47.73 47.73	Jupiter	183°7.42
14	293°1.21	357° 13.44	9.23 8.73	7°17.33	43.87	116° 0.70	35.29	272°31.80	47.72	Saturn	339° 28.77
15	308°3.68	12° 12.59	• • 8.23	22°17.70	• • 43.67	131°2.97	• • 35.22	287°34.31	• • 47.71	Dec 14 Tue	SHA
16	323°6.14	27° 11.75	7.73	37°18.07	43.47	146°5.23	35.14	302°36.82	47.71	Venus	64°58.58
17	338°8.61	42°10.91	7.23	52°18.44	43.27	161°7.49	35.06	317°39.33	47.70	Mars	74° 45.45
18	353° 11.07 8° 13.53	57° 10.07 72° 9.23	\$23° 6.72	67°18.81	\$23°43.07	176°9.75 191°12.01	N02°34.99	332°41.84 347°44.35	N05°47.70	Jupiter	183°2.37
19 20	8 13.53 23°16.00	72 9.23 87°8.39	6.22 5.72	82°19.18 97°19.55	42.86 42.66	206°14.27	34.91 34.84	347 44.35 2°46.85	47.69 47.69	Saturn	339°29.95
21	38° 18.46	102°7.55	. 5.72	$112^{\circ}19.92$	• • 42.46	221°16.53	34.76	17°49.36	• • 47.68	Horizor	ntal parallax
22	53°20.93	$117^{\circ}6.71$	4.70	127°20.28	42.25	236°18.80	34.68	$32^{\circ}51.87$	47.68		Venus:
23	68°23.39	132°5.87	4.19	142°20.65	42.05	251°21.06	34.61	47° 54.38	47.67		Mars:
Mer.p	pass. 18:27	ν -0.8' d-0	.5′ m-3.93	ν 0.4' d-0	.2′ m1.24	$\nu 2.3' d-0$.1′ m-2.00	ν 2.5' d-0	0.0′ m0.38		

Dec 29°14.95 -42°9.37 56°41.79 -17°50.00

-57°5.85 23°35.83 89°23.04 -40°11.64 4°12.01

49°57.75 16°33.93 -8°10.18 46°1.51 6°22.47 28°37.80 -1°11.07 7°24.69 -52°42.57

-16°45.28 -29°0.57 5°9.11

27°57.33 -59°35.78 -43°32.59 -69°49.69

-8°46.82

11°49.68

61°35.62 14°24.80 -17°41.79 -63°15.01 -57°15.97

55°48.16 -11°18.41 49°10.16 -60°30.25

-36°30.31

-15° 45.49 -37° 7.35 12° 32.44 51° 29.17 -34° 22.21 38° 48.69 -26° 15.66

8°56.67

-56°38.77

45°23.08 10°0.37 -46°49.65 -29°28.50

28°14.34 15°21.55

Mer.pass 14:08

Mer.pass 14:10 13:31 06:21 19:53 Mer.pass

13:32

06:24

14:11 13:31 06:17 19:49

0.1

0.1

19°2.10 -60°56.85 74°2.15 -16°9.41 26°37.16 -26°29.54 -69°4.52

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°39.81	S23°2.29	26° 9.85	6.2'	N24° 12.82	6.7'	58.4'
1	196°39.53	2.48	40°35.05	6.1'	$24^{\circ}19.55$	6.6'	58.4'
2	211°39.24	2.68	55° 0.15	6.0'	24°26.12	6.4'	58.4'
3	226° 38.95	• • 2.87	69°25.14	5.9'	24°32.56	6.3'	58.4'
4	241°38.66 256°38.37	3.06 3.26	83°50.02 98°14.80	5.8'	24°38.84 24°44.97	6.1'	58.5'
5 6	250 38.37 271°38.08	5.20 S23°3.45	98 14.80 112°39.47	5.7' 5.6'	24 44.97 N24°50.96	6.0' 5.8'	58.5' 58.5'
7	286° 37.79	3.64	127°4.04	5.5'	24° 56.79	5.7'	58.6'
8	301°37.51	3.83	141°28.51	5.4'	25°2.46	5.5'	58.6'
9	316°37.22	• • 4.02	155°52.87	5.3'	25°7.99	5.4'	58.6'
10	331°36.93	4.21	$170^{\circ}17.14$	5.2'	25°13.35	5.2'	58.7'
11	346°36.64	4.39	184°41.31	5.1'	25° 18.56	5.0'	58.7'
12	1°36.35	S23°4.58	199°5.39	5.0'	N25°23.60	4.9'	58.7'
13 14	16°36.06 31°35.77	4.77 4.95	213°29.37 227°53.26	4.9' 4.8'	25°28.49 25°33.21	4.7' 4.6'	58.8' 58.8'
15	46° 35.48	5.14	242°17.06	4.7	25°37.76	4.4	58.8'
16	61°35.19	5.32	256°40.77	4.6'	25°42.15	4.2'	58.9'
17	76°34.90	5.50	271°4.39	4.5'	25°46.38	4.1'	58.9'
18	91°34.61	S23°5.69	285°27.93	4.5'	N25°50.44	3.9'	58.9'
19	106°34.32	5.87	299°51.38	4.4'	25°54.32	3.7'	58.9'
20	121°34.02	6.05	314°14.75	4.3'	25°58.04	3.5'	59.0'
21	136° 33.73	• • 6.23	328°38.04	4.2'	26°1.58	3.4'	59.0'
22 23	151°33.44 166°33.15	6.41 6.59	343°1.26 357°24.40	4.1' 4.1'	26°4.95 26°8.15	3.2' 3.0'	59.0' 59.1'
23						3.0	39.1
	SD = 16.2'	d = 0.2'		SI	O = 15.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181° 32.86 196° 32.57	\$23°6.76 6.94	11°47.46 26°10.46	4.0' 3.9'	N26°11.17 26°14.01	2.8' 2.7'	59.1' 59.1'
2	211° 32.28	7.12	40°33.39	3.9'	26°16.68	2.7	59.1'
3	226°31.98	7.29	54°56.25	3.8'	26°19.17	2.3'	59.2'
4	241°31.69	7.47	69°19.05	3.7'	26°21.47	2.1'	59.2'
5	256°31.40	7.64	83°41.78	3.7'	26°23.60	1.9'	59.2'
6	271°31.11	S23°7.81	98°4.46	3.6'	N26° 25.55	1.8'	59.2'
7	286°30.81	7.98	112°27.08	3.6'	26° 27.31	1.6'	59.3'
8	301°30.52 316°30.23	8.15	126°49.65 141°12.16	3.5' 3.5'	26°28.89 26°30.28	1.4' 1.2'	59.3' 59.3'
9 10	310 30.23 331°29.94	· · 8.32 8.49	141 12.10 155°34.62	3.5 3.4'	26°31.49	1.0'	59.3'
11	346° 29.64	8.66	169°57.04	3.4	26° 32.52	0.8'	59.4'
12	1°29.35	\$23°8.83	184° 19.42	3.3'	N26° 33.36	0.7	59.4'
13	16°29.06	9.00	198°41.75	3.3'	26°34.01	0.5'	59.4'
14	31°28.76	9.16	$213^{\circ}4.05$	3.3'	26°34.47	0.3'	59.4'
15	46°28.47	• • 9.33	227°26.30	3.2'	26°34.75	0.1'	59.5'
16	61°28.18 76°27.88	9.49 9.66	241°48.53 256°10.72	3.2' 3.2'	26°34.84 26°34.74	-0.1' -0.3'	59.5' 59.5'
17 18	91°27.59	9.00 S23°9.82	250 10.72 270°32.89	3.1'	20 34.74 N26°34.45	-0.5'	59.5'
19	106° 27.29	9.98	284°55.03	3.1'	26° 33.97	-0.7	59.6'
20	121°27.00	10.15	299°17.15	3.1'	26°33.30	-0.9'	59.6'
21	136° 26.70	• • 10.31	313°39.25	3.1'	26°32.44	-1.1'	59.6'
22	151°26.41	10.47	$328^{\circ}1.33$	3.1'	26°31.39	-1.2'	59.6'
23	166°26.12	10.63	342°23.40	3.1'	26°30.14	-1.4'	59.6'
	SD = 16.2'	d = 0.2'		SI	O = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°25.82	S23°10.78	356°45.46	3.0'	N26°28.71	-1.6'	59.7'
1	196°25.53	10.94	11°7.51	3.0'	$26^{\circ}27.09$	-1.8'	59.7'
2	211°25.23	11.10	25°29.55	3.0'	26°25.27	-2.0'	59.7'
3	226°24.94	• • 11.25	39°51.59	3.0'	26°23.27	-2.2'	59.7'
4 5	241°24.64 256°24.34	11.41 11.56	54°13.63 68°35.68	3.0' 3.0'	26°21.07 26°18.69	-2.4' -2.6'	59.7' 59.7'
6	256 24.34 271° 24.05	523°11.72	82°57.72	3.1'	N26° 16.11	-2.6' -2.8'	59.7° 59.8'
7	286° 23.75	11.87	97°19.78	3.1'	26° 13.34	-3.0'	59.8'
8	301°23.46	12.02	111°41.85	3.1'	26° 10.38	-3.1'	59.8'
9	$316^{\circ}23.16$	• • 12.17	126° 3.93	3.1'	26°7.24	-3.3'	59.8'
10	331°22.87	12.32	140°26.02	3.1'	26°3.90	-3.5'	59.8'
11	346°22.57	12.47	154°48.14	3.1'	26°0.37	-3.7'	59.9'
12 13	1°22.27 16°21.98	\$23°12.62 12.77	169°10.27 183°32.43	3.2' 3.2'	N25°56.66 25°52.75	-3.9' -4.1'	59.9' 59.9'
13 14	31°21.68	12.77 12.92	183° 32.43 197° 54.62	3.2' 3.2'	25° 52.75 25° 48.66	-4.1 -4.3'	59.9' 59.9'
15	46°21.38	• • 13.06	212°16.83	3.2'	25°44.39	-4.5'	59.9'
16	61°21.09	13.21	226°39.08	3.3'	25°39.92	-4.7'	59.9'
17	76°20.79	13.35	241°1.36	3.3'	25°35.27	-4.8'	59.9'
18	91°20.49	S23°13.50	255°23.68	3.4'	N25°30.44	-5.0'	60.0'
19	106°20.19	13.64	269°46.04	3.4'	25°25.42	-5.2'	60.0'
20 21	121°19.90 136°19.60	13.78 · · 13.92	284° 8.44 298° 30.88	3.4' 3.5'	25°20.21 25°14.83	-5.4' -5.6'	60.0' 60.0'
22	150 19.00 151°19.30	14.06	298 30.88 312°53.37	3.5'	25 14.83 25°9.26	-5.0 -5.7'	60.0
23	166° 19.00	14.20	327°15.90	3.6'	25°3.51	-5.9'	60.0'
	SD = 16.2'	d = 0.2'	-	SI	D = 16.3'		

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

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

December 15, 16, 17 UT (Wed., Thu., Fri.)

h	Aries	Ven	nus	Ma	ars	Jup	oiter	Sat	urn		Stars
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	83°25.85	147°5.03	S23°3.68	157°21.02	S23°41.84	266°23.32	N02°34.53	62°56.88	N05°47.67	Alpheratz	357°32.19
1 2	98°28.32 113°30.78	162°4.19 177°3.35	3.17 2.66	172°21.39 187°21.76	41.63 41.43	281°25.59 296°27.85	34.46 34.38	77°59.39 93°1.90	47.66 47.66	Ankaa	353°4.72
3	128° 33.25	192°2.51	. 2.15	202°22.13	• 41.43	311°30.11	34.31	108°4.41	• • 47.65	Schedar	349°28.02
4	143°35.71	207°1.68	1.63	$217^{\circ}22.50$	41.01	326°32.38	34.23	123°6.91	47.65	Diphda Achernar	348°44.80 335°18.16
5	158° 38.18	222°0.84	1.12	232°22.87	40.81	341°34.64	34.16	138°9.42	47.64	Hamal	327°48.22
6	173° 40.64	237°0.01	\$23°0.60	247°23.24	\$23°40.60	356°36.91	N02°34.08	153°11.92	N05°47.64	Polaris	312°18.02
7 8	188° 43.10 203° 45.57	251°59.17 266°58.33	23°0.08 22°59.56	262°23.61 277°23.98	40.39 40.18	11°39.17 26°41.44	34.01 33.93	168° 14.43 183° 16.94	47.63 47.63	Acamar	$315^{\circ}9.63$
9	218° 48.03	281°57.50	• • 59.04	292°24.35	• 39.97	41°43.70	• • 33.86	198° 19.44	• • 47.62	Menkar	314°3.35
10	233°50.50	296°56.67	58.52	307°24.72	39.76	56°45.97	33.79	213°21.95	47.62	Mirfak Aldebaran	308°24.30 290°36.50
11	248° 52.96	311°55.83	58.00	322°25.09	39.55	71°48.23	33.71	228° 24.45	47.61	Rigel	281°1.21
12 13	263°55.43 278°57.89	326°55.00 341°54.17	\$22°57.48 56.95	337°25.46 352°25.83	\$23°39.34 39.13	86°50.50 101°52.76	N02° 33.64 33.56	243°26.96 258°29.46	N05°47.61 47.61	Capella	280°17.82
14	294°0.35	356°53.33	56.43	7°26.20	38.92	116°55.03	33.49	273°31.97	47.60	Bellatrix	278°19.95
15	309°2.82	$11^{\circ}52.50$	• • 55.90	22°26.57	• • 38.70	131°57.30	• • 33.42	288°34.47	• • 47.60	Elnath Alnilam	277°58.43 275°34.94
16	324°5.28	26°51.67	55.37	37°26.94	38.49	146°59.56	33.34	303°36.98	47.59	Betelgeuse	270°49.13
17	339°7.75 354°10.21	41°50.84 56°50.01	54.84	52°27.31 67°27.68	38.28 \$23°38.06	162°1.83 177°4.10	33.27 N02°33.20	318°39.48 333°41.99	47.59 N05°47.59	Canopus	263°50.76
18 19	9°12.68	71°49.18	\$22°54.31 53.78	82°28.05	37.85	192°6.37	33.12	348° 44.49	47.58	Sirius	258°23.77
20	24° 15.14	86° 48.35	53.24	97°28.42	37.63	207°8.64	33.05	3°46.99	47.58	Adhara	255°3.60
21	$39^{\circ}17.60$	101°47.52	• • 52.71	112°28.79	• • 37.42	222°10.90	• • 32.98	18°49.50	• • 47.58	Procyon Pollux	244°48.02 243°14.05
22	54°20.07	116°46.70	52.18	127°29.16	37.20	237°13.17	32.90	33°52.00	47.57	Avior	234°13.20
23	69°22.53	131°45.87	51.64	142°29.53	36.99	252°15.44	32.83	48°54.50	47.57	Suhail	222°44.22
Mer.p	pass. 18:23	ν -0.8′ <i>d</i> -0.	.5′ m-3.93	ν 0.4′ d-0	.2′ m1.24	ν 2.3′ <i>d</i> -0	.1′ m-2.00	$\nu 2.5' \ d-0$	0.0′ m0.39	Miaplacidus	221°37.09
										Alphard Regulus	217°45.20 207°31.77
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°38.08
0	84°25.00		\$22°51.10	157°29.90	\$23°36.77	267°17.71	N02°32.76	63°57.01	N05°47.57	Denebola	182°22.53
1 2	99°27.46 114°29.92	161°44.21 176°43.39	50.56 50.02	172°30.27 187°30.64	36.55 36.33	282°19.98 297°22.25	32.69 32.61	78°59.51 94°2.01	47.56 47.56		175°41.15
3	129°32.39	191°42.56	• • 49.48	202°31.01	36.12	312°24.52	• • 32.54	109°4.52	• • 47.56		172°57.45
4	$144^{\circ}34.85$	$206^{\circ}41.74$	48.94	217°31.38	35.90	327°26.79	32.47	124°7.02	47.55		171°49.02 166°11.15
5	159°37.32	221°40.91	48.40	232°31.75	35.68	342°29.06	32.40	139°9.52	47.55	1	158° 19.91
6 7	174° 39.78 189° 42.25	236°40.09 251°39.26	\$22°47.85 47.30	247°32.12 262°32.49	\$23°35.46 35.24	357°31.33 12°33.60	N02° 32.32 32.25	154° 12.02 169° 14.53	N05°47.55 47.54	Alkaid	152°50.45
8	204° 44.71	266°38.44	46.76	202 32.49 277°32.86	35.24	27°35.87	32.23	184° 17.03	47.54	Hadar	148°32.90
9	219° 47.17	281°37.62	• • 46.21	292°33.23	• • 34.80	42°38.14	• • 32.11	199° 19.53	• • 47.54	Menkent	147°54.99 145°45.96
10	234° 49.64	296°36.80	45.66	307°33.60	34.58	57°40.42	32.04	214°22.03	47.54	Rigil Kent.	
11 12	249°52.10 264°54.57	311°35.97 326°35.15	45.11 \$22°44.56	322°33.98 337°34.35	34.36 \$23°34.13	72°42.69 87°44.96	31.97 N02°31.90	229°24.53 244°27.03	47.53 N05°47.53	Kochab	137°20.94
13	204 54.57 279°57.03	341°34.33	44.01	352°34.72	33.91	102°47.23	31.82	259° 29.53	47.53		136°53.60
14	294° 59.50	356°33.51	43.45	7°35.09	33.69	117°49.51	31.75	274°32.03	47.53	Alphecca	126°2.05 112°13.23
15	310°1.96	11°32.69	• • 42.90	22°35.46	• • 33.46	132°51.78	• • 31.68	289°34.53	• • 47.52	Antares	107°5.81
16	325°4.42	26°31.87	42.34	37°35.83	33.24	147°54.05	31.61	304°37.03	47.52	Sabik	102°0.37
17 18	340°6.89 355°9.35	41°31.05 56°30.24	41.78 \$22°41.22	52°36.20 67°36.57	33.01 \$23°32.79	162°56.33 177°58.60	31.54 N02°31.47	319°39.54 334°42.04	47.52 N05°47.52	Shaula	96°7.52
19	10° 11.82	71°29.42	40.66	82°36.94	32.56	193°0.87	31.40	349° 44.53	47.52	Rasalhague	95°56.67 90°41.61
20	$25^{\circ}14.28$	86°28.60	40.10	97°37.31	32.34	208°3.15	31.33	4°47.03	47.51	Eltanin Kaus Aust.	83°29.73
21	40° 16.74	101°27.78	• • 39.54	112°37.68	• • 32.11	223°5.42	• • 31.26	19°49.53	• • 47.51	Vega	80°32.01
22 23	55° 19.21 70° 21.67	116°26.97 131°26.15	38.98 38.41	127°38.05 142°38.43	31.88 31.66	238°7.70 253°9.97	31.19 31.12	34°52.03 49°54.53	47.51 47.51	Nunki	75°45.15
										Altair	61°57.90
Mer.p	pass. 18:19	ν -0.8′ d-0.	.5′ m-3.94	$\nu^{0.4'} d^{-0}$.2′ m1.23	$\nu 2.3' \ d-0$.1′ m-2.01	$\nu^{2.5'}$ d-0	0.0′ m0.39	Peacock Deneb	53°2.47 49°24.47
										Enif	33°36.59
Fri	GHA	GHA	Dec	GHA	Dec	GHA 268°12.25	Dec	GHA	Dec	Al Na'ir	$27^{\circ}30.15$
0 1	85°24.14 100°26.60	146°25.34 161°24.52	\$22°37.85 37.28	157°38.80 172°39.17	\$23°31.43 31.20	283°14.52	N02°31.05 30.98	64°57.03 79°59.53	N05°47.51 47.51	Fomalhaut	15°11.97
2	115°29.07	176°23.71	36.72	187°39.54	30.97	298°16.80	30.91	95°2.03	47.50	Scheat Markab	13°42.89 13°27.53
3	130°31.53	191°22.89	• • 36.15	202°39.91	• • 30.74	313°19.08	• • 30.84	110°4.53	• • 47.50		
4	145°33.99	206°22.08	35.58	217°40.28	30.51	328°21.35	30.77	125°7.03	47.50	Dec 15 Wed Venus	SHA 63°39.17
5 6	160°36.46 175°38.92	221°21.27 236°20.46	35.01 \$22°34.43	232°40.65 247°41.02	30.28 \$23°30.05	343°23.63 358°25.91	30.70 N02°30.63	140°9.52 155°12.02	47.50 N05°47.50	Mars	73°55.17
7	190°41.39	251°19.64	33.86	262°41.40	29.82	13°28.18	30.56	170° 14.52	47.50		182°57.47
8	205°43.85	266° 18.83	33.28	277°41.77	29.59	28°30.46	30.50	185° 17.02	47.50	Saturn	339°31.03
9	220°46.31	281°18.02	• • 32.71	292°42.14	• • 29.36	43°32.74	• • 30.43	200° 19.51	• • 47.50	Dec 16 Thu	SHA
10 11	235° 48.78 250° 51.24	296°17.21 311°16.40	32.13 31.55	307°42.51 322°42.88	29.12 28.89	58°35.02 73°37.30	30.36 30.29	215°22.01 230°24.51	47.49 47.49	Venus	62°20.04
12	265°53.71		S22°30.98	337°43.25	S23°28.66	88°39.57	N02°30.22	245°27.01	N05°47.49	Mars	73°4.90
13	$280^{\circ}56.17$	$341^{\circ}14.79$	30.40	352°43.63	28.42	103°41.85	30.15	260°29.50	47.49	Jupiter Saturn	182°52.71 339°32.01
14	295°58.64	356°13.98	29.81	7°44.00	28.19	118°44.13	30.08	275°32.00	47.49		
15 16	311°1.10 326°3.56	11°13.17 26°12.36	· · 29.23 28.65	22°44.37 37°44.74	· · 27.95 27.72	133°46.41 148°48.69	· · 30.02 29.95	290°34.50 305°36.99	•• 47.49 47.49	Dec 17 Fri	SHA 61°1 20
17	341°6.03	41°11.56	28.06	57 44.74 52°45.11	27.72	146 46.09 163°50.97	29.95	320° 39.49	47.49 47.49	Venus Mars	61°1.20 72°14.66
18	356°8.49		\$22°27.48	67°45.48	\$23°27.25	178°53.25	N02°29.81	335°41.98	N05°47.49		182°48.11
19	11° 10.96	71°9.95	26.89	82°45.86	27.01	193°55.53	29.74	350°44.48	47.49	Saturn	339°32.89
20	26° 13.42 41° 15.88	86°9.14 101°8.34	26.30	97°46.23 112°46.60	26.77	208°57.81 224°0.09	29.68	5°46.97 20°49.47	47.49	Horizor	ntal parallax
21 22	41° 15.88 56° 18.35	101°8.34 116°7.53	· · 25.71 25.12	112°46.60 127°46.97	· · 26.54 26.30	224°0.09 239°2.37	· · 29.61 29.54	20°49.47 35°51.96	•• 47.49 47.49	1.0.1201	Venus:
23	71°20.81	131°6.73	24.53	142°47.35	26.06	254°4.66	29.48	50°54.46	47.49		Mars:
Mer r	pass. 18:15	ν-0.8′ d-0.	.6′ m-3.94	ν0.4′ d-0	.2′ m1.23	ν2.3' d-0	.1′ m-2.02	$\nu^{2.5'} d_{-0}$	0.0' m0.40		

Dec

29°14.95 -42°9.37

56° 41.80 -17° 50.00

 $\text{-}57^{\circ}5.86$

 $23^{\circ}35.84$

 $89^{\circ}23.06$

-40°11.64

4°12.01

49°57.76 16°33.93

-8°10.18 46°1.52 6°22.47

28°37.81 -1°11.08

7°24.68 -52°42.59

-16°45.29

-29°0.59

 $27^{\circ}57.33$

-59°35.79

 $-43^{\circ}32.61$ $-69^{\circ}49.71$

-8°46.83

11°49.67

61°35.61 14°24.78

-17°41.80 -63°15.01 -57°15.97

55°48.14 -11°18.42

49°10.14 -60°30.25

-36°30.31

-60° 56.85

 $19^{\circ}2.09$

74°2.13 -16°9.42

26°37.15 -26°29.54

-69°4.51

 $-15^{\circ}45.49$

 $\text{-}37^{\circ}7.35$

12°32.43 51°29.15

-34°22.21 38°48.68

-26° 15.65 8° 56.66

-56°38.76

 $45^{\circ}23.07$

 $10^{\circ}0.36$

-46°49.64 -29°28.50

28°14.34 15°21.55

Mer.pass

Mer.pass

14:12

13:30

06:14

14:14

13:30

06:10

19:41 Mer.pass

14:15

13:29 06:06

19:37

0.1

0.1

 $5^{\circ}9.10$

	011-010 =	+0.1433 360		-011		0 000	
h	Su				Moon		
Wed 0	GHA 181° 18.71	Dec \$23°14.34	GHA 341°38.49	ν 3.6'	Dec N24°57.58	<i>d</i> -6.1'	HP 60.0'
1	196° 18.41	14.48	356°1.13	3.7'	24°51.48	-6.3	60.0'
2	211° 18.11	14.62	10°23.83	3.8'	24°45.19	-6.5'	60.0'
3	226° 17.81 241° 17.51	· · 14.76 14.89	24°46.58 39°9.39	3.8' 3.9'	24°38.73 24°32.09	-6.6' -6.8'	60.1' 60.1'
4 5	241 17.51 256° 17.21	15.03	53° 32.26	3.9'	24 32.09 24°25.28	-0.8 -7.0'	60.1
6	271°16.92	S23°15.16	67°55.19	4.0'	$N24^{\circ}18.30$	-7.2'	60.1
7	286°16.62	15.30	82°18.19	4.1'	24°11.14	-7.3'	60.1
8 9	301°16.32 316°16.02	15.43 •• 15.56	96°41.26 111°4.39	4.1' 4.2'	24°3.81 23°56.31	-7.5' -7.7'	60.1' 60.1'
10	331° 15.72	15.69	125°27.59	4.3'	23°48.65	-7.8	60.1
11	346° 15.42	15.82	139°50.87	4.3'	23°40.82	-8.0'	60.1'
12 13	1°15.12 16°14.82	\$23°15.95 16.08	154°14.22 168°37.64	4.4' 4.5'	N23°32.82 23°24.66	-8.2' -8.3'	60.1' 60.1'
14	31° 14.52	16.21	183°1.14	4.6'	23°16.33	-8.5'	60.1
15	46°14.22	•• 16.33	197°24.72	4.7'	23°7.85	-8.6'	60.1'
16 17	61°13.92 76°13.62	16.46 16.59	211°48.38 226°12.12	4.7' 4.8'	22°59.20 22°50.40	-8.8' -9.0'	60.1' 60.1'
18	91° 13.32	523°16.71	240°35.94	4.8	N22°41.44	-9.0 -9.1'	60.1
19	106° 13.02	16.83	254°59.84	5.0'	22°32.32	-9.3'	60.2'
20	121°12.72	16.96	269°23.83	5.1'	22°23.05	-9.4'	60.2'
21 22	136° 12.42 151° 12.12	· · 17.08 17.20	283°47.90 298°12.06	5.2' 5.2'	22°13.63 22°4.06	-9.6' -9.7'	60.2' 60.2'
23	166°11.82	17.32	312°36.31	5.3'	21°54.34	-9.7 -9.9'	60.2
	SD = 16.2'	d = 0.1'		S	D = 16.4'		
_							
Thu 0	GHA 181° 11.52	Dec \$23°17.44	GHA 327° 0.64	ν 5.4'	Dec N21°44.48	d -10.0'	HP 60.2'
1	181 11.52 196°11.22	17.56	327 0.04 341°25.06	5.4 5.5'	21°34.47	-10.0 -10.2'	60.2'
2	211°10.92	17.68	$355^{\circ}49.58$	5.6'	$21^{\circ}24.31$	-10.3'	60.2'
3	226° 10.62 241° 10.32	• • 17.80	10°14.18 24°38.88	5.7'	21°14.02 21°3.58	-10.4'	60.2'
4 5	241 10.32 256° 10.01	17.91 18.03	24°38.88 39°3.67	5.8' 5.9'	21° 3.58 20° 53.01	-10.6' -10.7'	60.2' 60.2'
6	271°9.71	S23°18.14	53°28.55	6.0'	N20°42.30	-10.8'	60.2'
7	286°9.41	18.26	67°53.52	6.1'	20°31.46	-11.0'	60.2
8 9	301°9.11 316°8.81	18.37 •• 18.48	82°18.59 96°43.76	6.2' 6.3'	20°20.48 20°9.37	-11.1' -11.2'	60.2' 60.2'
10	331° 8.51	18.60	111° 9.01	6.4	19°58.13	-11.4	60.2
11	346°8.20	18.71	125°34.37	6.4'	19°46.77	-11.5'	60.1'
12 13	1°7.90 16°7.60	\$23°18.82 18.93	139°59.81 154°25.36	6.5' 6.6'	N19°35.28 19°23.67	-11.6' -11.7'	60.1' 60.1'
14	31°7.30	19.03	168°51.00	6.7'	19 23.07 19°11.93	-11.7 -11.9'	60.1
15	46°7.00	• • 19.14	$183^{\circ}16.73$	6.8'	$19^{\circ}0.08$	-12.0'	60.1'
16	61°6.69 76°6.39	19.25	197°42.57 212°8.49	6.9'	18°48.10 18°36.01	-12.1'	60.1
17 18	91°6.09	19.36 \$23°19.46	212 8.49 226°34.52	7.0' 7.1'	N18°23.81	-12.2' -12.3'	60.1' 60.1'
19	106°5.78	19.57	241°0.64	7.2'	18°11.50		60.1'
20	121°5.48	19.67	255°26.85	7.3'	17°59.07	-12.5'	60.1
21 22	136°5.18 151°4.88	· · 19.77 19.87	269°53.16 284°19.57	7.4' 7.5'	17°46.53 17°33.89	-12.6' -12.7'	60.1' 60.1'
23	166°4.57	19.98	298°46.08	7.6'	17°21.15	-12.8'	60.1
	SD = 16.2'	d = 0.1'		S	D = 16.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°4.27	\$23°20.08	313°12.67	7.7'	N17°8.30	-12.9'	60.1
1	196°3.97	20.18	327°39.37	7.8'	16°55.35	-13.0'	60.1'
2	211°3.66	20.27	342°6.16 356°33.04	7.9'	16°42.30	-13.1'	60.1'
3 4	226°3.36 241°3.06	20.37	356°33.04 11°0.01	8.0' 8.1'	16°29.15 16°15.91	-13.2' -13.3'	60.1' 60.0'
5	256°2.75	20.57	$25^{\circ}27.08$	8.2'	$16^{\circ}2.58$	-13.4'	60.0'
6	271°2.45	\$23°20.66	39°54.24	8.3'	N15°49.15	-13.5'	60.0'
7 8	286°2.14 301°1.84	20.76 20.85	54°21.50 68°48.85	8.3' 8.4'	15°35.63 15°22.03	-13.6' -13.7'	60.0' 60.0'
9	316°1.54	• • 20.94	83°16.28	8.5'	15°8.34	-13.8'	60.0'
10	331°1.23	21.04	97°43.81	8.6'	14°54.57	-13.9'	60.0'
11 12	346°0.93 1°0.62	21.13 \$23°21.22	112°11.43 126°39.14	8.7' 8.8'	14°40.71 N14°26.78	-13.9' -14.0'	60.0' 60.0'
13	16°0.32	21.31	141° 6.94	8.9'	14°12.76	-14.1	60.0
14	31°0.01	21.40	155°34.82	9.0'	13°58.67	-14.2'	59.9'
15 16	45°59.71 60°59.40	· · 21.49 21.57	170°2.79 184°30.85	9.1' 9.1'	13°44.50 13°30.26	-14.2' -14.3'	59.9' 59.9'
16 17	60°59.40 75°59.10	21.57	184°30.85 198°58.99	9.1° 9.2'	13°30.26 13°15.95	-14.3' -14.4'	59.9'
18	90°58.79	S23°21.75	213°27.22	9.3'	N13°1.58	-14.4'	59.9'
19	105°58.49	21.83	227°55.53	9.4'	12°47.13	-14.5'	59.9'
20 21	120°58.18 135°57.88	21.91 •• 22.00	242°23.93 256°52.41	9.5' 9.6'	12°32.62 12°18.04	-14.6' -14.6'	59.9' 59.8'
22	150°57.57	22.08	271°20.97	9.6'	12°18.04	-14.0 -14.7'	59.8'
23	165°57.27	22.16	285°49.61	9.7'	11°48.70	-14.8'	59.8'
	SD = 16.2'	d = 0.1'		S	D = 16.4'		

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

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°			18:53			12:57
N 70°		16:20	19:18		13:33	12:30
68°		17:10	19:37		12:42	12:09
66°	15:02	17:41	19:52	12:45	12:09	11:53
64°	15:54	18:04	20:04	11:53	11:45	11:39
62°	16:25	18:22	20:14	11:20	11:26	11:28
60°	16:49	18:37	20:23	10:56	11:10	11:18
N 58°	17:08	18:50	20:30	10:37	10:57	11:09
56°	17:24	19:01	20:37	10:20	10:45	11:01
54°	17:37	19:10	20:43	10:06	10:35	10:55
52°	17:49	19:19	20:48	09:54	10:25	10:48
50°	17:59	19:26	20:53	09:43	10:17	10:43
45°	18:21	19:43	21:03	09:21	10:00	10:30
N 40°	18:38	19:56	21:12	09:02	09:45	10:20
35°	18:53	20:07	21:19	08:47	09:33	10:12
30°	19:06	20:17	21:25	08:33	09:22	10:04
20°	19:27	20:33	21:36	08:10	09:03	09:50
N 10°	19:46	20:48	21:46	07:50	08:47	09:38
0°	20:03	21:01	21:55	07:31	08:31	09:27
S 10°	20:21	21:15	22:04	07:12	08:16	09:16
20°	20:39	21:29	22:14	06:52	07:59	09:04
30°	21:00	21:45	22:24	06:28	07:40	08:50
35°	21:13	21:55	22:30	06:14	07:28	08:42
40° 45°	21:27 21:44	22:05 22:18	22:38 22:46	05:58 05:39	07:15 06:59	08:32 08:21
S 50°	22:04	22:33	22:55	05:14	06:40	80:80
52°	22:14	22:40	23:00	05:02	06:31	08:01
54° 56°	22:25	22:48	23:05	04:49	06:21	07:54
56°	22:37	22:57	23:10	04:33	06:09	07:46
S 60°	22:51 23:08	23:06 23:18	23:16 23:23	04:15 03:52	05:55 05:39	07:38 07:27
3 60	23:08	23:18	23:23	03:52	05:39	07:27

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-85%	
15	05:15	05:00	11:55	01:17	13:47		
16	04:46	04:32	11:55	02:17	14:46		
17	04:17	04:02	11:56	03:14	15:41		

December 18, 19, 20 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	86°23.28	146°5.93	\$22°23.94	157°47.72	\$23°25.82	269°6.94	N02°29.41	65°56.95	N05°47.49	Alpheratz
1 2	101°25.74 116°28.20	161°5.12 176°4.32	23.34 22.75	172°48.09 187°48.46	25.58 25.34	284°9.22 299°11.50	29.34 29.27	80°59.45 96°1.94	47.49 47.49	Ankaa
3	131°30.67	191°3.52	22.15	202°48.83	25.10	314°13.78	29.21	111°4.44	• • 47.49	Schedar
4	$146^{\circ}33.13$	206°2.72	21.56	$217^{\circ}49.21$	24.86	$329^{\circ}16.07$	29.14	126°6.93	47.49	Diphda Achernar
5	161°35.60	221°1.92	20.96	232°49.58	24.62	344°18.35	29.08	141°9.43	47.49	Hamal
6	176°38.06	236°1.12	\$22°20.36	247°49.95	\$23°24.38	359°20.63	N02°29.01	156°11.92	N05°47.49	Polaris
7 8	191°40.53 206°42.99	251°0.32 265°59.52	19.76 19.16	262°50.32 277°50.70	24.13 23.89	14°22.92 29°25.20	28.94 28.88	171°14.41 186°16.91	47.49 47.49	Acamar
9	221° 45.45	280°58.72	19.10	292°51.07	• • 23.65	44°27.48	• 28.81	201° 19.40	• • 47.49	Menkar
10	236° 47.92	295°57.93	17.95	307°51.44	23.40	59°29.77	28.74	$216^{\circ}21.89$	47.49	Mirfak Aldebaran
11	251°50.38	310°57.13	17.34	322°51.81	23.16	74°32.05	28.68	231°24.39	47.49	Rigel
12	266° 52.85 281° 55.31	325°56.33 340°55.54	\$22°16.74 16.13	337°52.19 352°52.56	\$23°22.92 22.67	89°34.34 104°36.62	N02°28.61	246°26.88 261°29.37	N05°47.50	Capella
13 14	201 55.31 296°57.77	355°54.74	15.52	7°52.93	22.42	104 30.02 119°38.91	28.55 28.48	201 29.37 276°31.86	47.50 47.50	Bellatrix
15	312°0.24	10°53.95	• • 14.91	22°53.31	• • 22.18	134°41.20	28.42	291°34.36	• • 47.50	Elnath
16	327°2.70	25°53.15	14.30	37°53.68	21.93	149°43.48	28.35	306° 36.85	47.50	Alnilam Betelgeuse
17	342°5.17	40°52.36	13.69	52°54.05	21.68	164°45.77	28.29	321°39.34	47.50	Canopus
18 19	357°7.63 12°10.09	55°51.57 70°50.77	\$22°13.08 12.46	67°54.43 82°54.80	\$23°21.44 21.19	179°48.05 194°50.34	N02°28.22 28.16	336°41.83 351°44.32	N05°47.50 47.50	Sirius
20	27° 12.56	85°49.98	11.85	97°55.17	20.94	209°52.63	28.09	6°46.81	47.51	Adhara
21	42° 15.02	100°49.19	• • 11.23	112°55.54	• • 20.69	224°54.92	• • 28.03	21°49.30	• • 47.51	Procyon Pollux
22	57° 17.49	115°48.40	10.61	127°55.92	20.44	239°57.20	27.96	36°51.80	47.51	Avior
23	72° 19.95	130°47.61	9.99	142°56.29	20.19	254°59.49	27.90	51°54.29	47.51	Suhail
Mer.p	oass. 18:11	ν -0.8′ d -0).6′ m-3.94	ν 0.4′ d-0	.2′ m1.23	ν 2.3′ d-0	.1′ m-2.02	ν 2.5 $^{\prime}$ d0	.0′ m0.40	Miaplacidus
										Alphard
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe
0	87°22.42	145°46.82	\$22°9.37	157°56.66	S23°19.94	270°1.78	N02°27.84	66° 56.78	$N05^{\circ}47.51$	Denebola
1	102°24.88	160°46.03	8.75	172°57.04	19.69	285°4.07	27.77	81°59.27	47.51	Gienah
2	117°27.34 132°29.81	175°45.24 190°44.45	8.13 • • 7.51	187°57.41 202°57.79	19.44 •• 19.19	300°6.36 315°8.64	27.71 •• 27.64	97°1.76 112°4.25	47.52 •• 47.52	Acrux
4	147°32.27	205°43.66	6.88	217°58.16	18.94	330°10.93	27.58	127°6.74	47.52	Gacrux
5	$162^{\circ}34.74$	220°42.88	6.26	232°58.53	18.69	$345^{\circ}13.22$	27.52	142°9.23	47.52	Alioth Spica
6	177°37.20	235°42.09	\$22°5.63	247°58.91	\$23°18.43	0°15.51	N02°27.45	157°11.72	N05°47.53	Alkaid
7 8	192°39.66 207°42.13	250°41.30 265°40.52	5.01 4.38	262°59.28 277°59.65	18.18 17.92	15°17.80 30°20.09	27.39 27.33	172° 14.21 187° 16.69	47.53 47.53	Hadar
9	207 42.13 222° 44.59	280°39.73	• • 3.75	293° 0.03	17.92	45°22.38	• • 27.26	202° 19.18	• • 47.53	Menkent
10	237° 47.06	295°38.95	3.12	308° 0.40	17.42	60°24.68	27.20	217°21.67	47.54	Arcturus Rigil Kent.
11	252°49.52	310°38.16	2.49	323°0.78	17.16	75°26.97	27.14	232°24.16	47.54	Kochab
12	267°51.98	325°37.38 340°36.60	\$22°1.85	338° 1.15	\$23°16.90	90°29.26 105°31.55	N02°27.07	247°26.65 262°29.14	N05°47.54	Zuben'ubi
13 14	282°54.45 297°56.91	355°35.81	1.22 22°0.58	353°1.52 8°1.90	16.65 16.39	105 31.55 120°33.84	27.01 26.95	262 29.14 277°31.63	47.54 47.55	Alphecca
15	312°59.38	10°35.03	21°59.95	23°2.27	16.13	135°36.13	26.89	292°34.11	• • 47.55	Antares
16	$328^{\circ}1.84$	25°34.25	59.31	38°2.65	15.88	150°38.43	26.83	307°36.60	47.55	Atria Sabik
17	343°4.30	40°33.47	58.67	53°3.02	15.62	165°40.72	26.76	322°39.09	47.56	Shaula
18 19	358°6.77 13°9.23	55°32.69 70°31.91	\$21°58.03 57.39	68°3.39 83°3.77	\$23°15.36 15.10	180°43.01 195°45.30	N02°26.70 26.64	337°41.58 352°44.06	N05°47.56 47.56	Rasalhague
20	28° 11.70	85°31.13	56.75	98° 4.14	14.84	210°47.60	26.58	7°46.55	47.56	Eltanin
21	43°14.16	100°30.35	• • 56.11	113° 4.52	• • 14.58	225°49.89	26.52	22°49.04	• • 47.57	Kaus Aust. Vega
22	58° 16.63	115°29.57	55.46	128°4.89	14.32	240°52.19	26.45	37°51.52	47.57	Nunki
23	73° 19.09	130°28.80	54.82	143°5.27	14.06	255°54.48	26.39	52°54.01	47.58	Altair
Mer.	oass. 18:08	ν -0.8′ d-0).6′ m-3.94	ν 0.4′ d-0	.3′ m1.22	ν 2.3′ d-0	.1′ m-2.03	ν 2.5 $^{\prime}$ d0	.0′ m0.40	Peacock
										Deneb Enif
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir
0	88°21.55	145°28.02		158° 5.64	\$23°13.80	270°56.78	N02°26.33	67°56.50	N05°47.58	Fomalhaut
1 2	103°24.02 118°26.48	160°27.24 175°26.47	53.52 52.87	173°6.02 188°6.39	13.54 13.27	285°59.07 301°1.37	26.27 26.21	82°58.98 98°1.47	47.58 47.59	Scheat
3	133°28.95	190°25.69	52.23	203° 6.77	13.01	316°3.66	. 26.15	113°3.95	• • 47.59	Markab
4	148°31.41	205°24.92	51.57	218°7.14	12.75	331°5.96	26.09	128°6.44	47.59	Dec 18 Sat
5	163°33.87	220°24.14	50.92	233°7.52	12.49	346°8.25	26.03	143°8.93	47.60	Venus
6	178° 36.34	235°23.37	\$21°50.27	248°7.89	\$23°12.22	1°10.55	N02°25.97	158°11.41	N05°47.60	Mars
7 8	193°38.80 208°41.27	250°22.60 265°21.82	49.62 48.96	263°8.27 278°8.64	11.96 11.69	16°12.85 31°15.14	25.91 25.85	173°13.90 188°16.38	47.61 47.61	Jupiter Saturn
9	223° 43.73	280°21.05	• • 48.31	293° 9.02	. 11.43	46°17.44	25.79	203° 18.87	• • 47.61	
10	$238^{\circ}46.19$	295°20.28	47.65	308° 9.39	11.16	61°19.74	25.72	218°21.35	47.62	Dec 19 Sun Venus
11	253° 48.66	310° 19.51	46.99	323° 9.77	10.89	76°22.03	25.66	233°23.83	47.62	Mars
12	268°51.12 283°53.59	325°18.74 340°17.97	\$21°46.33 45.67	338°10.14 353°10.52	\$23°10.63 10.36	91°24.33 106°26.63	N02° 25.61 25.55	248°26.32 263°28.80	N05°47.63 47.63	Jupiter
13 14	283 53.59 298° 56.05	340 17.97 355°17.20	45.07 45.01	8°10.89	10.36	100 20.03 121°28.93	25.55 25.49	203 28.80 278°31.29	47.63 47.64	Saturn
15	313°58.51	10° 16.43	• • 44.35	23°11.27	• • 9.82	136°31.23	• • 25.43	293°33.77	• • 47.64	Dec 20 Mon
16	329°0.98	25° 15.66	43.68	38°11.65	9.55	151°33.53	25.37	308°36.25	47.65	Venus
17	344°3.44	40°14.90	43.02	53°12.02	9.29	166°35.83	25.31	323°38.74	47.65	Mars
18 19	359°5.91 14°8.37	55°14.13 70°13.36	\$21°42.35 41.69	68°12.40 83°12.77	\$23°9.02 8.75	181°38.13 196°40.42	N02°25.25 25.19	338°41.22 353°43.70	N05°47.66 47.66	Jupiter
20	29° 10.83	85° 12.60	41.03	98°13.15	8.48	211°42.72	25.13	8°46.19	47.67	Saturn
21	44°13.30	100°11.83	• • 40.35	113°13.52	• • 8.20	226°45.03	• • 25.07	23°48.67	• • 47.67	Horizon
22	59° 15.76	115°11.07	39.68	128°13.90	7.93	241°47.33	25.01	38°51.15	47.68	
23	74°18.23	130°10.30	39.01	143°14.28	7.66	256°49.63	24.95	53°53.63	47.68	
Mer.	bass. 18:04	ν -0.8′ d-0	0.6′ m-3.95	ν 0.4′ d-0	.3′ m1.22	$\nu 2.3' d-0$.1′ m-2.04	$\nu^{2.5'} d0$.0′ m0.41	

Stars SHA

357°32.20

353°4.74

349° 28 04

348°44.80

335°18.17

 $327^{\circ}48.23$

 $312^{\circ}18.82$

315°9.64

314°3.35

308°24.30

290°36.49

281°1.20

 $280^{\circ}\,17.81$

 $278^{\circ}19.94$

277°58.42

275°34.93

Dec

29°14.95

-42°9.37

56°41.81

-17°50.01

 $-57^{\circ}5.87$

 $23^{\circ}35.84$

89°23.08

-40°11.65

4°12.01

49°57.77

16°33.93

-8°10.19

 $46^{\circ}1.53$

 $6^{\circ}22.46$

28°37.81

 $-1^{\circ}11.08$

 $7^{\circ}24.68$

-52°42.60

-16°45.30

-29°0.60

 $27^{\circ}57.33$

-59°35.81

-43°32.62

-69°49.72

-8°46.84

11°49.66

 $61^{\circ}35.61$

 $14^{\circ}24.77$

-17°41.81

-63°15.02

-57°15.98

55°48.13

-11°18.43

49°10.13 -60°30.25

-36°30.32

-60°56.85

 $19^{\circ}\,2.07$

 $74^{\circ}\,2.11$

-16°9.43

26°37.13

-26°29.55

-69°4.50

 $-37^{\circ}7.35$

 $12^{\circ}32.42$

51°29.13

-34°22.21

38°48.66

-26°15.65

8°56.65

-56°38.75

 $45^{\circ}23.06$

-46°49.64

-29°28.50

28°14.34

15°21.54

Mer.pass

14:16

13:28

06:03

19:33

14:18

13:28

05:59

19:29

14:19

13:27

05:55

19:25

0.1

0.1

Venus: Mars: Mer.pass

Mer.pass

 $10^{\circ}\,0.36$

 $-15^{\circ}45.50$

5°9.09

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°56.96	S23°22.24	$300^{\circ}18.32$	9.8'	N11°33.94	-14.8'	59.8'
1	195°56.66	22.32	314°47.12	9.9'	11° 19.13	-14.9'	59.8'
2	210°56.35 225°56.05	22.40	329° 15.99	9.9'	11°4.26 10°49.34	-14.9'	59.8'
3 4	225°56.05 240°55.74	· · 22.48 22.56	343°44.94 358°13.97	10.0' 10.1'	10°49.34 10°34.37	-15.0' -15.0'	59.8' 59.7'
5	255°55.43	22.64	12° 43.07	10.1	10° 19.34	-15.0 -15.1'	59.7'
6	270°55.13	S23°22.71	27° 12.24	10.2'	N10°4.27	-15.1'	59.7'
7	285°54.82	22.79	41°41.48	10.3'	$09^{\circ}49.15$	-15.2'	59.7'
8	300°54.52	22.86	56° 10.80	10.4	09°33.99	-15.2'	59.7'
9 10	315°54.21 330°53.90	· · 22.94 23.01	70°40.18 85°9.64	10.5' 10.5'	09°18.78 09°3.53	-15.2' -15.3'	59.7' 59.6'
11	345°53.60	23.08	99°39.16	10.6'	08° 48.25	-15.3'	59.6'
12	0°53.29	523°23.15	114°8.75	10.7'	N08°32.92	-15.4'	59.6'
13	15°52.99	23.22	128°38.40	10.7'	$08^{\circ}17.56$	-15.4'	59.6'
14	30°52.68	23.29	143°8.12	10.8'	08°2.16	-15.4'	59.6'
15 16	45°52.37 60°52.06	· · 23.36 23.43	157°37.90 172°7.74	10.8' 10.9'	07°46.73 07°31.27	-15.5' -15.5'	59.6' 59.5'
17	75°51.76	23.50	186°37.64	11.0'	07° 15.78	-15.5'	59.5'
18	90°51.45	\$23°23.56	201°7.60	11.0'	N07°0.26	-15.5'	59.5'
19	105°51.14	23.63	215° 37.62	11.1'	06°44.72	-15.6'	59.5'
20	120°50.84	23.69	230°7.69	11.1'	06°29.15	-15.6'	59.5'
21 22	135°50.53 150°50.22	· · 23.76 23.82	244°37.82 259°8.01	11.2' 11.2'	06° 13.55 05° 57.93	-15.6' -15.6'	59.4' 59.4'
23	150°50.22 165°49.92	23.82	259°8.01 273°38.25	11.2	05°57.93 05°42.30	-15.6 -15.7'	59.4' 59.4'
	SD = 16.2'	d = 0.1'			D = 16.3'		
	JD — 10.2	u = 0.1		اد	∪ — 10.3°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.61	\$23°23.94	288°8.54	11.3'	N05°26.64	-15.7'	59.4'
1 2	195°49.30 210°48.99	24.00 24.06	302°38.88 317°9.27	11.4' 11.4'	05°10.96 04°55.27	-15.7' -15.7'	59.4' 59.4'
3	210 48.99 225°48.69	. 24.00	331° 39.70	11.5'	04° 39.57	-15.7'	59.4 59.3'
4	240°48.38	24.18	346° 10.19	11.5'	04°23.85	-15.7'	59.3'
5	255°48.07	24.24	0°40.72	11.6'	04°8.12	-15.7'	59.3'
6	270°47.76	\$23°24.29	15° 11.29	11.6'	N03°52.38	-15.7'	59.3'
7 8	285°47.45 300°47.15	24.35 24.41	29°41.91 44°12.57	11.7' 11.7'	03°36.64 03°20.88	-15.8' -15.8'	59.3' 59.2'
9	315°46.84	24.46	58° 43.27	11.7'	03°5.12	-15.8'	59.2'
10	330°46.53	24.51	73° 14.00	11.8'	02°49.36	-15.8'	59.2'
11	345°46.22	24.57	87° 44.78	11.8'	02°33.59	-15.8'	59.2'
12	0°45.91	\$23°24.62	102° 15.59	11.8'	N02°17.82	-15.8'	59.1'
13 14	15°45.61 30°45.30	24.67 24.72	116° 46.44 131° 17.32	11.9' 11.9'	02°2.05 01°46.28	-15.8' -15.8'	59.1' 59.1'
15	45°44.99	24.77	145°48.23	11.9'	01°30.52	-15.8'	59.1'
16	60°44.68	24.82	$160^{\circ}19.18$	12.0'	$01^{\circ}14.76$	-15.8'	59.1'
17	75°44.37	24.86	174°50.15	12.0'	00°59.00	-15.7'	59.0'
18	90°44.06 105°43.76	\$23°24.91	189°21.15 203°52.18	12.0'	N00° 43.25 00° 27.51	-15.7'	59.0'
19 20	105 43.76 120°43.45	24.96 25.00	203 52.18 218°23.24	12.1' 12.1'		-15.7' -15.7'	59.0' 59.0'
21	135°43.14	• • 25.05	232°54.32	12.1'	S00°3.94	15.7'	59.0'
22	150°42.83	25.09	247°25.43	12.1'	$00^{\circ}19.65$	15.7'	58.9'
23	165°42.52	25.13	261°56.55	12.1'	00°35.34	15.7'	58.9'
	SD = 16.2'	d = 0.1'		SI	D = 16.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.21	\$23°25.17	276°27.70	ν 12.2'	S00°51.02	15.7'	58.9'
1	195°41.90	25.21	290°58.87	12.2'	$01^{\circ}6.68$	15.6'	58.9'
2	210°41.59	25.25	305°30.06	12.2'	01°22.33	15.6'	58.8'
3 4	225°41.29 240°40.98	· · 25.29 25.33	320°1.26 334°32.48	12.2' 12.2'	01°37.95 01°53.56	15.6' 15.6'	58.8' 58.8'
4 5	240 40.98 255°40.67	25.33 25.37	334 32.48 349°3.71	12.2'	01 53.50 02°9.14	15.6'	58.8'
6	270°40.36	\$23°25.41	3°34.96	12.3'	S02°24.71	15.5'	58.8'
7	285°40.05	25.44	18°6.22	12.3'	02°40.25	15.5'	58.7'
8	300°39.74 315°39.43	25.48	32°37.49	12.3'	02°55.76 03°11.25	15.5'	58.7'
9 10	315°39.43 330°39.12	· · 25.51 25.55	47°8.77 61°40.06	12.3' 12.3'	03°11.25 03°26.71	15.5' 15.4'	58.7' 58.7'
11	345°38.81	25.58	76°11.36	12.3'	03°42.14	15.4'	58.6'
12	0°38.50	\$23°25.61	90°42.66	12.3'	S03°57.54	15.4'	58.6'
13	15°38.19	25.64	105° 13.97	12.3'	04° 12.91	15.3'	58.6'
14 15	30°37.88 45°37.57	25.67 •• 25.70	119° 45.28 134° 16.59	12.3' 12.3'	04°28.24 04°43.54	15.3' 15.3'	58.6' 58.6'
15 16	45°37.57 60°37.26	25.70	134° 16.59 148° 47.90	12.3'	04°43.54 04°58.81	15.3' 15.2'	58.6° 58.5'
17	75°36.95	25.76	163° 19.22	12.3'	05° 14.04	15.2'	58.5'
18	90°36.64	S23°25.79	177°50.53	12.3'	S05°29.24	15.2'	58.5'
19	105°36.33	25.81	192°21.84	12.3'	05°44.39	15.1'	58.5'
20 21	120°36.02 135°35.71	25.84 •• 25.86	206°53.15 221°24.45	12.3' 12.3'	05°59.51 06°14.58	15.1' 15.0'	58.4' 58.4'
21	135°35.71 150°35.40	25.89	221° 24.45 235° 55.75	12.3'	06° 14.58 06° 29.62	15.0° 15.0°	58.4'
23	165°35.09	25.91	250°27.03	12.3'	06° 44.60	14.9'	58.4'
	SD = 16.2'	d = 0.0'		SI	D = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
- ",	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-54%	
18	03:48	03:33	11:56	04:07	16:33		
19	03:18	03:04	11:57	04:57	17:21		
20	02:49	02:34	11:57	05:45	18:09		

December 21, 22, 23 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	89°20.69	145°9.54 \$21°38.33	158°14.65 \$23°7.39	271°51.93 N02°24.90	68°56.11 N05°47.69	JIIA
1	104°23.16	160°8.78 37.66	173°15.03 7.12	286°54.23 24.84	83°58.60 47.69	Alpheratz 357°32.21
2	119° 25.62	175°8.01 36.99	173 15.03 7.12 188° 15.41 6.84	301°56.53 24.78	99°1.08 47.70	Ankaa 353°4.76
3	134°28.08	190°7.25 · · 36.31	203°15.78 · · 6.57	316°58.83 · · 24.72	114°3.56 · · 47.70	Schedar 349°28.07
4	149°30.55	205°6.49 35.63	218° 16.16 6.29	332°1.14 24.66	129°6.04 47.71	Diphda 348°44.82
5	164° 33.01	200° 5.73 34.96	233°16.53 6.02	347°3.44 24.61	144°8.52 47.71	Achernar 335°18.20
6	179°35.48	235°4.97 S21°34.28	248°16.91 \$23°5.74	2°5.74 N02°24.55	159°11.00 N05°47.72	Hamal 327°48.24
7	194°37.94	250°4.21 33.60	263°17.29 5.47	17°8.04 24.49	174°13.48 47.73	Polaris 312°19.64
8	209°40.40	265°3.45 32.92	278°17.66 5.19	32°10.35 24.43	189° 15.96 47.73	Acamar 315°9.65
9	224° 42.87	280°2.69 · · 32.24	293°18.04 · · 4.92	47°12.65 · · 24.38	204° 18.45 · · 47.74	Menkar 314°3.36
10	239°45.33	295°1.93 31.55	308°18.42 4.64	62°14.95 24.32	219° 20.93 47.74	Mirfak 308°24.31
11	254° 47.80	310°1.18 30.87	323°18.79 4.36	77°17.26 24.26	234° 23.41 47.75	Aldebaran 290°36.50
12	269° 50.26	325°0.42 \$21°30.18	338°19.17 S 23°4.08	92°19.56 N02°24.20	249°25.89 N05°47.76	Rigel 281°1.20
13	284°52.72	339°59.66 29.50	353°19.55 3.81	107°21.87 24.15	264°28.37 47.76	Capella 280°17.81
14	299°55.19	354°58.91 28.81	8°19.93 3.53	122°24.17 24.09	279°30.84 47.77	Bellatrix 278°19.94
15	314° 57.65	9°58.15 · · 28.12	23°20.30 · · 3.25	137°26.48 · · 24.03	294°33.32 · · 47.78	Elnath 277°58.41
16	$330^{\circ}0.12$	24°57.40 27.43	38°20.68 2.97	152°28.78 23.98	309°35.80 47.78	Alnilam 275°34.93 Betelgeuse 270°49.12
17	345°2.58	39°56.64 26.74	53°21.06 2.69	167°31.09 23.92	324°38.28 47.79	Betelgeuse 270°49.12 Canopus 263°50.75
18	0°5.04	54°55.89 S 21°26.05	68°21.43 S23°2.41	182°33.40 N02°23.87	339°40.76 N05°47.79	Sirius 258°23.75
19	15°7.51	69°55.14 25.36	83°21.81 2.13	197°35.70 23.81	354° 43.24 47.80	Adhara 255°3.58
20	30°9.97	84°54.39 24.66	98°22.19 1.84	212°38.01 23.75	9° 45.72 47.81	Procyon 244°47.99
21	45° 12.44	99°53.63 · · 23.97	113°22.57 · · 1.56	227°40.32 · · 23.70	24°48.20 · · 47.82	Pollux 243°14.02
22	60°14.90	114°52.88 23.27	128°22.95 1.28	242°42.62 23.64	39°50.67 47.82	Avior 234°13.15
23	75° 17.37	129°52.13 22.58	143°23.32 1.00	257°44.93 23.59	54°53.15 47.83	Suhail 222°44.18
Mer.r	pass. 18:00	ν-0.8' d-0.7' m-3.95	ν0.4' d-0.3' m1.22	ν2.3' d-0.1' m-2.04	ν 2.5′ d0.0′ m0.41	Miaplacidus 221°37.01
						Alphard 217°45.16
						Regulus 207°31.72
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.00
0	90° 19.83	144°51.38	158°23.70 \$23°0.71	272°47.24 N02°23.53	69°55.63 N05°47.84	Denebola 182°22.48
1	105°22.29	159°50.63 21.18	173°24.08 0.43	287°49.55 23.48	84°58.11 47.84	Gienah 175°41.11
2	120°24.76	174°49.88 20.48	188°24.46 23°0.14	302°51.85 23.42	100°0.59 47.85	Acrux 172°57.37
3	135°27.22	189°49.14 · · 19.78	203°24.83 22°59.86	317°54.16 · · 23.36	115°3.06 · · 47.86	Gacrux 171°48.95
4	150°29.69	204°48.39 19.08	218°25.21 59.57	332°56.47 23.31	130°5.54 47.87	Alioth 166°11.08
5 6	165°32.15	219°47.64 18.37 234°46.90 \$21°17.67	233°25.59 59.29 248°25.97 \$22°59.00	347°58.78 23.25 3°1.09 N02°23.20	145°8.02 47.87	Spica 158°19.87
7	180°34.61 195°37.08				160°10.49 N05°47.88 175°12.97 47.89	Alkaid 152°50.40
8	210°39.54	249°46.15 16.96 264°45.40 16.26	263°26.35 58.72 278°26.73 58.43	18°3.40 23.15 33°5.71 23.09	175°12.97 47.89 190°15.45 47.90	Hadar 148°32.83
9	210 39.34 225°42.01	279°44.66 · · 15.55	293°27.10 · · 58.14	48°8.02 · · 23.04	205°17.92 · · 47.90	Menkent 147°54.95
10	240° 44.47	294°43.92 14.84	308°27.48 57.85	63°10.33 22.98	220°20.40 47.91	Arcturus 145°45.92
11	255° 46.93	309°43.17 14.13	323°27.86 57.57	78°12.64 22.93	235°22.87 47.92	Rigil Kent. 139°37.31
12	270°49.40	324°42.43 \$21°13.42	338°28.24 S 22°57.28	93°14.95 N02°22.87	250°25.35 N05°47.93	Kochab 137°20.86
13	285°51.86	339°41.69 12.71	353°28.62 56.99	108°17.26 22.82	265°27.83 47.94	Zuben'ubi 136°53.57
14	300°54.33	354°40.95 12.00	8°29.00 56.70	123°19.58 22.77	280° 30.30 47.94	Alphecca 126°2.02
15	315°56.79	9°40.20 · · 11.28	23°29.38 · · 56.41	138°21.89 · · 22.71	295° 32.78 · · 47.95	Antares 112°13.21
16	330° 59.26	24°39.46 10.57	38°29.75 56.12	153°24.20 22.66	310° 35.25 47.96	Atria 107°5.77
17	346°1.72	39°38.72 9.85	53°30.13 55.83	168°26.51 22.61	325°37.73 47.97	Sabik 102°0.35
18	1°4.18	54°37.98 S 21°9.13	68°30.51 S 22°55.53	183°28.83 N02°22.55	340°40.20 N05°47.98	Shaula 96°7.50 Rasalhague 95°56.65
19	$16^{\circ}6.65$	69°37.24 8.42	83°30.89 55.24	198°31.14 22.50	355° 42.67 47.98	
20	$31^{\circ}9.11$	84°36.51 7.70	98°31.27 54.95	213°33.45 22.45	10° 45.15 47.99	Eltanin 90°41.61 Kaus Aust. 83°29.72
21	$46^{\circ}11.58$	99°35.77 · · 6.98	113°31.65 · · 54.66	228°35.77 · · 22.39	25°47.62 · · 48.00	Vega 80°32.01
22	61°14.04	114°35.03 6.26	128°32.03 54.36	243°38.08 22.34	40°50.10 48.01	Nunki 75°45.14
23	$76^{\circ}16.50$	129°34.30 5.53	143°32.41 54.07	258°40.39 22.29	55° 52.57 48.02	Altair 61°57.91
Merr	pass. 17:56	ν-0.7' d-0.7' m-3.95	ν0.4' d-0.3' m1.22	ν2.3' d-0.1' m-2.05	$\nu 2.5' \ d0.0' \ m0.42$	Peacock 53°2.48
	7433. 17.50	ν-0.1 α-0.1 π-3.93		V2.5 d-0.1 III-2.05		Deneb 49°24.49
						Enif 33°36.61
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.17
0	91°18.97	144°33.56 S21°4.81	158°32.79 \$22°53.77	273°42.71 N02°22.24	70°55.04 N05°48.03	Fomalhaut 15°11.99
1	106°21.43	159°32.82 4.09	173°33.17 53.48	288°45.02 22.18	85° 57.52 48.04	Scheat 13°42.92
2	121°23.90	174°32.09 3.36	188°33.55 53.18	303°47.34 22.13	100°59.99 48.05	Markab 13°27.55
3	136°26.36	189°31.35 · · 2.63 204°30.62 1.91	203°33.93 · · 52.89 218°34.31 52.59	318°49.65 · · 22.08 333°51.97 22.03	116°2.46 · · 48.06 131°4.94	Dec 21 Tue SHA
4	151°28.82 166°31.29		218°34.31 52.59 233°34.69 52.30			Venus 55°48.85
5 6	166°31.29 181°33.75	219°29.89 1.18 234°29.16 \$21°0.45	233°34.69 52.30 248°35.07 S 22°52.00	348°54.28 21.97 3°56.60 N02°21.92	146°7.41 48.07 161°9.88 N05°48.08	Mars 68°53.96
7	181 33.75 196°36.22	249°28.42 20°59.72	248 35.07 522 52.00 263°35.45 51.70	18°58.92 21.87	176° 12.35 48.09	Jupiter 182°31.24
8	211°38.68	264° 27.69 58.99	278°35.83 51.40	34°1.23 21.82	170 12.35 46.09 191°14.82 48.10	Saturn 339°35.42
9	211 30.00 226°41.15	279°26.96 · · 58.25	293°36.21 · · 51.10	49°3.55 · · 21.77	206°17.30 · · 48.11	
10	241°43.61	294°26.23 57.52	308°36.59 50.81	64°5.87 21.72	221° 19.77 48.12	Dec 22 Wed SHA
11	256° 46.07	309°25.50 56.79	323°36.97 50.51	79°8.19 21.67	236°22.24 48.13	Venus 54°31.55
12	271°48.54	324°24.77 \$20°56.05	338°37.35 \$22°50.21	94°10.50 N02°21.61	251°24.71 N05°48.14	Mars 68°3.87
13	286°51.00	339°24.05 55.31	353°37.73 49.91	109°12.82 21.56	266°27.18 48.15	Jupiter 182°27.41
14	301°53.47	354°23.32 54.58	8°38.11 49.61	124°15.14 21.51	281°29.65 48.16	Saturn 339°35.80
15	$316^{\circ}55.93$	9°22.59 · · 53.84	23°38.49 · · 49.30	139°17.46 · · 21.46	296°32.12 · · 48.17	Dec 23 Thu SHA
16	331°58.39	24°21.86 53.10	38°38.87 49.00	154°19.78 21.41	311°34.59 48.18	Venus 53°14.59
17	347°0.86	39°21.14 52.36	53°39.25 48.70	169°22.10 21.36	326°37.06 48.19	Mars 67°13.82
18	2°3.32	54°20.41 S 20°51.62	68°39.63 S 22°48.40	184°24.42 N02°21.31	341°39.54 N05°48.20	Jupiter 182°23.74
19	17°5.79	69°19.69 50.87	83°40.02 48.09	199°26.74 21.26	356° 42.01 48.21	Saturn 339°36.07
20	32°8.25	84°18.96 50.13	98°40.40 47.79	214°29.06 21.21	11°44.48 48.22	
21	47° 10.72	99°18.24 · · 49.38	113°40.78 · · 47.49	229°31.38 · · 21.16	26°46.94 · · 48.23	Horizontal parallax
22	62° 13.18	114°17.52 48.64	128°41.16 47.18	244°33.70 21.11	41°49.41 48.24	Venus: Mars:
23	77° 15.64	129°16.80 47.89	143°41.54 46.88	259°36.02 21.06	56° 51.88 48.25	iviars:
Mer.p	pass. 17:52	ν-0.7' d-0.7' m-3.96	ν0.4' d-0.3' m1.21	ν2.3' d-0.1' m-2.06	$\nu 2.5' \ d0.0' \ m0.42$	
						

Dec 29°14.95 -42°9.38 56° 41.81 -17° 50.01 -57°5.88 $23^{\circ}35.84$ 89°23.09 -40°11.67 4°12.00 49°57.78 16°33.93 -8° 10.20 $46^{\circ}1.53$ $6^{\circ}22.46$ 28°37.81 -1°11.09 7°24.67 -52°42.62 -16°45.32 -29°0.62 5°9.08 27°57.33 -59°35.83 -43°32.64 -69°49.74 -8°46.85 11°49.66 $61^{\circ}35.61$ $14^{\circ}24.76$ -17°41.82 -63° 15.02 -57° 15.98 55°48.12 -11°18.44 49°10.11 -60°30.25 -36°30.32 $19^{\circ}2.06$ -60°56.84 $74^{\circ}2.10$ -16°9.43 $26^{\circ}37.12$ -26°29.54 -69°4.49 $-15^{\circ}45.50$ $-37^{\circ}7.34$ $12^{\circ}32.41$ 51°29.12 -34°22.20 38°48.65 -26° 15.65 8° 56.64 -56°38.74 $45^{\circ}23.05$ $10^{\circ}0.35$ -46°49.64 -29°28.50 28°14.33 15°21.54 Mer.pass 14:20 13:27 05:52 19:21 Mer.pass 14:21 13:26 05:48 19:17 Mer.pass 14:22 13:25 05:44 19:13

> 0.1 0.1

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°34.78	\$23°25.93	264°58.32	12.3'	S06°59.55	14.9'	58.3'
1	195°34.47	25.95	279°29.59	12.3'	$07^{\circ}14.45$	14.9'	58.3'
2	210°34.16	25.98	294°0.85	12.3'	07°29.30	14.8'	58.3'
3	225°33.85	• • 25.99	308°32.10	12.2'	07°44.10	14.8'	58.3'
4	240°33.54	26.01	323°3.34 337°34.56	12.2'	07°58.86	14.7'	58.3'
5 6	255°33.23 270°32.92	26.03 \$23°26.05	337°34.56 352°5.77	12.2' 12.2'	08°13.56 \$08°28.22	14.7' 14.6'	58.2' 58.2'
7	270 32.92 285°32.61	26.07	6°36.97	12.2'	08°42.82	14.5	58.2'
8	300°32.30	26.08	21°8.14	12.2'	08°57.36	14.5	58.2'
9	315°31.99	. 26.10	35°39.30	12.1'	09°11.85	14.4'	58.1'
10	330°31.68	26.11	50°10.44	12.1'	09°26.29	14.4'	58.1'
11	345°31.37	26.12	64°41.57	12.1'	09°40.67	14.3'	58.1'
12	0°31.06	\$23°26.14	79°12.67	12.1'	S09°54.99	14.3'	58.1'
13	15°30.75	26.15	93°43.74	12.1'	10°9.25	14.2'	58.0'
14	30°30.44 45°30.13	26.16	108°14.80 122°45.83	12.0' 12.0'	10°23.45 10°37.58	14.1'	58.0'
15 16	60°29.82	· · 26.17 26.18	122 45.83 137°16.84	12.0'	10°51.66	14.1' 14.0'	58.0' 58.0'
17	75°29.51	26.19	151°47.82	12.0'	10°51.60	13.9'	57.9'
18	90°29.19	S23°26.19	166°18.77	11.9'	S11°19.62	13.9'	57.9'
19	105°28.88	26.20	180°49.70	11.9'	11°33.50	13.8'	57.9'
20	120°28.57	26.21	195°20.60	11.9'	$11^{\circ}47.31$	13.7'	57.9'
21	135°28.26	• • 26.21	209°51.47	11.8'	12°1.05	13.7'	57.9'
22	150°27.95	26.22	224°22.31	11.8'	12°14.73	13.6'	57.8'
23	165°27.64	26.22	238°53.12	11.8'	12°28.33	13.5'	57.8'
	SD = 16.2'	d = 0.0'		SE	0 = 15.9'		
\A/1	CUV	Daa	CH 4		Dec	ل	HP
Wed	GHA 180°27.33	Dec \$23°26.22	GHA 253°23.89	u 11.7'	Dec \$12°41.86	d 13.5'	HP 57.8'
1	195°27.02	26.22	267°54.64	11.7'	12°55.32	13.4	57.8'
2	210°26.71	26.22	282°25.35	11.7'	13°8.71	13.3'	57.7'
3	225°26.40	• • 26.22	296°56.02	11.6'	13°22.02	13.2'	57.7'
4	240°26.09	26.22	311°26.67	11.6'	13°35.25	13.2'	57.7'
5	255°25.77	26.22	325°57.27	11.6'	13°48.41	13.1'	57.7'
6	270°25.46	\$23°26.22	340°27.84	11.5'	\$14°1.49	13.0'	57.7'
7	285°25.15	26.22	354°58.37 9°28.87	11.5'	14°14.49 14°27.41	12.9'	57.6'
8 9	300°24.84 315°24.53	26.21 •• 26.21	9°28.87 23°59.32	11.5' 11.4'	14°27.41 14°40.25	12.8' 12.8'	57.6' 57.6'
10	330°24.22	26.20	25 59.52 38°29.74	11.4	14 40.25 14°53.00	12.7	57.6'
11	345°23.91	26.20	53°0.12	11.3'	15°5.68	12.6'	57.5'
12	0°23.60	S23°26.19	67°30.45	11.3'	S15°18.26	12.5'	57.5'
13	15°23.29	26.18	82°0.75	11.3'	15°30.76	12.4'	57.5'
14	30°22.97	26.17	96°31.00	11.2'	15°43.18	12.3'	57.5'
15	45°22.66	26.16	111°1.21	11.2'	15°55.51	12.2'	57.4'
16	60°22.35	26.15	125°31.38 140°1.51	11.1'	16°7.74 16°19.89	12.1'	57.4
17 18	75°22.04 90°21.73	26.14 \$23°26.13	140 1.51 154°31.59	11.1' 11.0'	\$16°31.95	12.1' 12.0'	57.4' 57.4'
19	105°21.42	26.12	169°1.63	11.0'	16°43.92	11.9'	57.4
20	120°21.11	26.10	183°31.62				
21	135°20.80	• • 26.09	198°1.57	10.9'	17°7.57	11.7'	57.3'
22	150°20.48	26.07	212°31.47	10.9'	$17^{\circ}19.25$	11.6'	57.3'
23	165°20.17	26.06	227°1.32	10.8'	17°30.84	11.5'	57.3'
	SD = 16.3'	d = 0.0'		SE	0 = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 19.86	\$23°26.04	241°31.13	10.8'	\$17°42.33	11.4'	57.2'
1	195°19.55	26.02	256°0.90	10.7'	17°53.72	11.3'	57.2'
2	210°19.24	26.00	$270^{\circ}30.61$	10.7'	$18^{\circ}5.01$	11.2'	57.2'
3	225°18.93	• • 25.98	285°0.28	10.6'	18°16.20	11.1'	57.2'
4	240°18.62	25.96	299°29.90	10.6'	18°27.30	11.0'	57.2'
5 6	255°18.30 270°17.99	25.94 \$23°25.92	313°59.48 328°29.00	10.5' 10.5'	18°38.29 \$18°49.17	10.9' 10.8'	57.1' 57.1'
7	270 17.99 285°17.68	25.90	342°58.48	10.5	18°59.95	10.8	57.1'
8	300°17.37	25.87	357°27.91	10.4	10° 39.93 19° 10.63	10.7	57.1
9	315°17.06	• • 25.85	11°57.29	10.3'	19°21.20	10.5	57.0'
10	330°16.75	25.82	$26^{\circ}26.63$	10.3'	19°31.66	10.4'	57.0'
11	345°16.44	25.80	40°55.91	10.2'	19°42.02	10.2'	57.0'
12	0°16.12	\$23°25.77	55°25.15	10.2'	\$19°52.27	10.1'	57.0'
13	15°15.81	25.74	69°54.33 84°23.47	10.1'	20°2.40	10.0'	57.0'
14 15	30°15.50 45°15.19	25.71 •• 25.68	84°23.47 98°52.56	10.1' 10.0'	20°12.43 20°22.34	9.9' 9.8'	56.9' 56.9'
15 16	45 15.19 60°14.88	25.65	98 52.50 113°21.60	10.0'	20°22.34 20°32.15	9.8 9.7'	56.9'
17	75°14.57	25.62	113 21.60 127°50.60	9.9'	20° 41.83	9.7 9.6'	56.9'
18	90°14.26	S23°25.59	142°19.54	9.9'	S20°51.41	9.5'	56.9'
19	105°13.94	25.56	156°48.44	9.8'	21°0.86	9.3'	56.8'
20	120°13.63	25.53	171°17.28	9.8'	$21^{\circ}10.21$	9.2'	56.8'
21	135°13.32	• • 25.49	185°46.08	9.8'	21°19.43	9.1'	56.8'
22	150°13.01	25.46	200°14.84	9.7'	21°28.54	9.0'	56.8'
23	165°12.70	25.42	214°43.54	9.7'	21°37.52	8.9'	56.7'
	SD = 16.3'	d = -0.0'		SE	0 = 15.6'		

	Twi	light	٠.		Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	08:26	10:58			12:59	15:31
N 70°	08:06	09:55			14:02	15:51
68°	07:50	09:19			14:37	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:34	09:52	14:04	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:02	14:55	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:43	08:30	15:27	16:14	17:04
54°	06:47	07:33	08:17	15:40	16:23	17:10
52°	06:41	07:25	08:06	15:51	16:32	17:15
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:24	07:02	07:35	16:21	16:55	17:33
N 40°	06:14	06:48	07:19	16:38	17:09	17:43
35°	06:04	06:36	07:04	16:52	17:21	17:52
30°	05:56	06:26	06:52	17:05	17:31	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:49	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:53	05:18	18:39	19:03	19:33
30°	03:55	04:28	04:56	19:01	19:28	20:02
35°	03:36	04:13	04:43	19:14	19:44	20:20
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:32	04:10	19:47	20:25	21:14
S 50°	01:57	03:03	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:21	21:09	22:28
54°	00:42	02:29	03:24	20:33	21:27	23:15
56° 58°		02:07	03:10 02:53	20:47 21:04	21:50 22:20	//// ////
S 60°	////	01:37 00:46	02:53	21:04	22:20	1111
3 60	1///	00:40	02:32	21:25	25:11	////

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-23%
21	02:19	02:04	11:58	06:33	18:57	
22	01:49	01:34	11:58	07:21	19:45	
23	01:19	01:04	11:59	08:10	20:36	

December 24, 25, 26 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	92° 18.11	144°16.07 \$20°47.14	158°41.92 \$22°46.57	274°38.34 N02°21.01	71°54.35 N05°48.26	
1	107° 20.57	159° 15.35 46.40	173°42.30 46.27	289°40.66 20.96	86° 56.82 48.27	Alpheratz 357°32.22 29°14.95
2	122°23.04	174°14.63 45.65	188°42.68 45.96	304°42.98 20.91	101°59.29 48.28	Ankaa 353°4.77 -42°9.38
3	137°25.50	189°13.91 · · 44.89	203°43.07 · · 45.65	319°45.30 · · 20.86	117°1.76 · · 48.30	Schedar 349°28.08 56°41.81
4	152°27.96	204°13.19 44.14	218°43.45 45.35	334°47.63 20.81	132°4.23 48.31	Diphda 348°44.83 -17°50.02
5	$167^{\circ}30.43$	219° 12.47 43.39	233°43.83 45.04	349°49.95 20.76	147°6.70 48.32	Achernar 335°18.22 -57°5.88 Hamal 327°48.24 23°35.84
6	182°32.89	234°11.76 S 20°42.64	248°44.21 \$22°44.73	4°52.27 N02°20.72	162°9.16 N05°48.33	Hamal 327°48.24 23°35.84 Polaris 312°20.28 89°23.10
7	197°35.36	249°11.04 41.88	263°44.59 44.42	19°54.60 20.67	177° 11.63 48.34	Acamar 315°9.66 -40°11.68
8	212°37.82	264° 10.32 41.12	278°44.98 44.11	34°56.92 20.62	192°14.10 48.35	Menkar 314°3.36 4°12.00
9	227°40.29	279°9.60 · · 40.37	293°45.36 · · 43.81	49°59.24 · · 20.57	207°16.57 · · 48.36	Mirfak 308°24.31 49°57.78
10	242°42.75	294°8.89 39.61	308°45.74 43.50	65°1.57 20.52	222°19.03 48.37	Aldebaran 290°36.49 16°33.93
11	257°45.21	309°8.17 38.85	323°46.12 43.19	80°3.89 20.47	237°21.50 48.39	Rigel 281°1.20 -8°10.21
12	272°47.68	324°7.46 \$20°38.09	338°46.51 \$22°42.87	95°6.22 N02°20.42	252°23.97 N05°48.40	Capella 280°17.80 46°1.54
13	287° 50.14	339°6.74 37.33	353°46.89 42.56	110°8.54 20.38	267°26.44 48.41	Bellatrix 278°19.93 6°22.45
14 15	302°52.61 317°55.07	354°6.03 36.57 9°5.32 · · 35.80	8°47.27 42.25 23°47.65 · · 41.94	125°10.87 20.33 140°13.19 · · 20.28	282°28.90 48.42 297°31.37 • 48.43	Elnath 277°58.40 28°37.81
16	332° 57.53	24°4.61 35.04	38°48.04 41.63	155°15.52 20.23	312°33.83 48.44	Alnilam 275°34.92 -1°11.10
17	348°0.00	39°3.90 34.27	53°48.42 41.31	170°17.84 20.19	327°36.30 48.46	Betelgeuse 270°49.11 7°24.67
18	3°2.46	54°3.18 \$20°33.51	68°48.80 \$22°41.00	185°20.17 N02°20.14	342°38.77 N05°48.47	Canopus 263°50.74 -52°42.64
19	18°4.93	69°2.47 32.74	83°49.19 40.69	200°22.50 20.09	357°41.23 48.48	Sirius 258°23.74 -16°45.33
20	33°7.39	84°1.76 31.97	98°49.57 40.37	215°24.82 20.04	12°43.70 48.49	Adhara 255°3.57 -29°0.63
21	48°9.86	99°1.05 · · 31.20	113°49.95 · · 40.06	230°27.15 · · 20.00	27°46.16 · · 48.50	Procyon 244°47.98 5°9.07
22	63°12.32	114°0.35 30.43	128°50.34 39.74	245°29.48 19.95	42°48.63 48.52	Pollux 243°14.00 27°57.33 Avior 234°13.13 -59°35.85
23	$78^{\circ}14.78$	128°59.64 29.66	143°50.72 39.43	260°31.80 19.90	57°51.09 48.53	
Mor	nass 17:40	0.7' d 0.7' m 2.06	ν 0.4' d-0.3' m1.21	ν2.3' d-0.0' m-2.06		I .
ivier.	pass. 17:48	ν-0.7' d-0.7' m-3.96	νυ.4 α-υ.5 M1.21	ν∠.ο α-υ.υ m-∠.υο	$\nu 2.5' \ d0.0' \ m0.43$	Miaplacidus 221°36.97 -69°49.75 Alphard 217°45.14 -8°46.87
						Regulus 207°31.70 11°49.65
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.96 61°35.60
0	93° 17.25	143°58.93 S 20°28.89	158°51.10 S22°39.11	275°34.13 N02°19.86	72°53.56 N05°48.54	Denebola 182°22.46 14°24.75
1	$108^{\circ}19.71$	158°58.22 28.12	173°51.49 38.79	290°36.46 19.81	87°56.02 48.55	Gienah 175°41.08 -17°41.83
2	123°22.18	173°57.52 27.34	188°51.87 38.48	305°38.79 19.76	102°58.49 48.57	Acrux 172°57.32 -63°15.03
3	138°24.64	188°56.81 · · 26.57	203°52.25 · · 38.16	320°41.12 · · 19.72	118°0.95 · · 48.58	Gacrux 171°48.90 -57°15.99
4	153° 27.11	203°56.11 25.79	218°52.64 37.84	335°43.45 19.67	133°3.42 48.59	Alioth 166°11.04 55°48.11
5	168° 29.57	218°55.40 25.01	233°53.02 37.52	350°45.78 19.63	148°5.88 48.60	Spica 158°19.84 -11°18.45
6	183°32.03	233°54.70 \$20°24.24	248°53.40 \$22°37.21	5°48.11 N02°19.58	163°8.34 N05°48.62	Alkaid 152°50.37 49°10.10
7	198° 34.50	248°54.00 23.46	263°53.79 36.89	20°50.44 19.53	178° 10.81 48.63	Hadar 148°32.78 -60°30.24
8 9	213° 36.96 228° 39.43	263°53.29 22.68 278°52.59 •• 21.90	278°54.17 36.57 293°54.56 · · 36.25	35°52.77 19.49 50°55.10 •• 19.44	193°13.27 48.64 208°15.73 • 48.66	Menkent 147°54.92 -36°30.32
10	243°41.89	293°51.89 21.11	308°54.94 35.93	65°57.43 19.40	200 13.73 4 48.00 223° 18.20 48.67	Arcturus 145°45.90 19°2.05
11	258° 44.35	308°51.19 20.33	323°55.33 35.60	80°59.76 19.35	238°20.66 48.68	Rigil Kent. 139°37.27 -60°56.84
12	273°46.82	323°50.49 \$20°19.55	338°55.71 \$22°35.28	96°2.09 N02°19.31	253°23.12 N05°48.70	Kochab 137°20.82 74°2.09
13	288°49.28	338°49.79 18.76	353°56.10 34.96	111°4.42 19.26	268°25.59 48.71	Zuben'ubi 136°53.54 -16°9.44
14	303°51.75	353°49.09 17.98	8°56.48 34.64	126°6.75 19.22	283°28.05 48.72	Alphecca 126°2.00 26°37.10
15	$318^{\circ}54.21$	8°48.39 · · 17.19	23°56.87 · · 34.32	141°9.09 · · 19.17	298°30.51 · · 48.74	Antares 112°13.19 -26°29.54 Atria 107°5.73 -69°4.47
16	333°56.68	23°47.70 16.40	38°57.25 33.99	156°11.42 19.13	313°32.97 48.75	Sabik 102°0.34 -15°45.50
17	$348^{\circ}59.14$	38°47.00 15.61	53°57.64 33.67	171°13.75 19.08	328°35.43 48.76	Shaula 96°7.49 -37°7.34
18	4°1.60	53°46.30 S 20°14.82	68°58.02 S 22°33.34	186°16.09 N02°19.04	343°37.90 N05°48.78	Rasalhague 95°56.64 12°32.40
19	19°4.07	68° 45.61 14.03	83°58.41 33.02	201°18.42 18.99	358° 40.36 48.79	Eltanin 90°41.60 51°29.10
20	34° 6.53	83°44.91 13.24	98°58.79 32.70	216°20.75 18.95	13° 42.82 48.80	Kaus Aust. 83°29.71 -34°22.20
21	49°9.00	98°44.22 · · 12.45	113°59.18 · · 32.37	231°23.09 · · 18.91	28°45.28 · · 48.82	Vega 80°32.01 38°48.63
22	64° 11.46	113°43.52 11.65	128°59.56 32.04	246°25.42 18.86	43°47.74 48.83	Nunki 75°45.14 -26°15.65
23	79° 13.93	128°42.83 10.86	143°59.95 31.72	261°27.76 18.82	58°50.20 48.85	Altair 61°57.90 8°56.64
Mer.	pass. 17:44	ν -0.7′ d-0.8′ m-3.96	$ u 0.4' \ d$ -0.3' m1.21	$\nu 2.3' \ d$ -0.0' m-2.07	$ u 2.5' \ d0.0' \ \text{m}0.43$	Peacock 53°2.49 -56°38.73
						Deneb 49°24.50 45°23.04
c	CHA	CHA De-	CHA De-	CHA De-	CHA De-	Enif 33°36.61 10°0.35
Sun 0	GHA 94° 16.39	GHA Dec 143°42.14 \$20°10.06	GHA Dec 159° 0.33 S 22° 31.39	GHA Dec 276°30.09 N02°18.78	GHA Dec 73°52.66 N05°48.86	Al Na'ir 27°30.19 -46°49.63
1	109° 18.85	158°41.45 9.26	174° 0.72 31.06	291°32.42 18.73	88°55.12 48.88	Fomalhaut 15°12.00 -29°28.50
2	124°21.32	173°40.75 8.47	189°1.11 30.74	306°34.76 18.69	103°57.58 48.89	Scheat 13°42.93 28°14.33
3	139° 23.78	188°40.06 · · 7.67	204°1.49 · · 30.41	321°37.10 · · 18.65	119°0.04 · · 48.90	Markab 13°27.56 15°21.53
4	154° 26.25	203°39.37 6.87	219°1.88 30.08	336°39.43 18.60	134°2.50 48.92	Dec 24 Fri SHA Mer.pass
5	$169^{\circ}28.71$	218°38.68 6.07	234°2.26 29.75	351°41.77 18.56	149°4.96 48.93	Venus 51°57.97 14:24
6	184°31.17	233°37.99 S 20°5.26	249°2.65 \$22°29.42	6°44.10 N02°18.52	164°7.42 N05°48.95	Mars 66°23.81 13:25
7	199° 33.64	248°37.31 4.46	264° 3.04 29.09	21°46.44 18.47	179°9.88 48.96	Jupiter 182°20.23 05:41
8	214°36.10	263°36.62 3.66	279°3.42 28.76	36°48.78 18.43	194°12.34 48.98	Saturn 339°36.24 19:09
9	229° 38.57	278°35.93 · · 2.85	294°3.81 · · 28.43	51°51.12 · · 18.39	209°14.80 · · 48.99	Dec 25 Sat SHA Mer.pass
10	244°41.03	293°35.24 2.05	309° 4.20 28.10	66°53.45 18.35	224°17.26 49.01	Venus 50°41.68 14:25
11	259° 43.50	308°34.56 1.24	324° 4.58 27.77	81°55.79 18.30	239°19.71 49.02	Mars 65°33.85 13:24
12	274° 45.96	323°33.87	339° 4.97 S22° 27.43 354° 5.36 27.10	96°58.13 N02°18.26	254°22.17 N05°49.04	Jupiter 182°16.88 05:37
13 14	289° 48.42 304° 50.89	338°33.19 19°59.63 353°32.50 58.82	354° 5.36 27.10 9° 5.74 26.77	112°0.47 18.22 127°2.81 18.18	269°24.63 49.05 284°27.09 49.07	Saturn 339°36.31 19:05
14 15	304 50.89 319°53.35	8°31.82 · · 58.01	9 5.74 26.77 24°6.13 · · 26.43	127 2.81 18.18 142°5.15 · · 18.14	299° 29.55 · · 49.08	Dec 26 Sup. 5114 44
15 16	319 53.35 334° 55.82	23°31.14 57.19	39°6.52 26.10	142 5.15 · · 18.14 157°7.49 18.09	314°32.00 49.10	Dec 26 Sun SHA Mer.pass Venus 49°25.75 14:26
17	349° 58.28	38°30.46 56.38	54°6.91 25.77	172°9.83 18.05	329°34.46 49.11	Venus 49°25.75 14:26 Mars 64°43.94 13:24
18	5°0.75	53°29.77 \$19°55.57	69°7.29 S22°25.43	187°12.17 N02°18.01	344°36.92 N05°49.13	Jupiter 182°13.70 05:33
19	20°3.21	68°29.09 54.75	84°7.68 25.10	202°14.51 17.97	359°39.38 49.14	Saturn 339°36.27 19:01
20	35°5.67	83°28.41 53.94	99°8.07 24.76	217°16.85 17.93	14°41.83 49.16	
21	50°8.14	98°27.73 · · 53.12	114°8.46 · · 24.42	232°19.19 · · 17.89	29°44.29 · · 49.18	Horizontal parallax
22	$65^{\circ}10.60$	113°27.05 52.31	129°8.84 24.09	247°21.53 17.85	44°46.75 49.19	Venus: 0.1
23	80° 13.07	128°26.37 51.49	144° 9.23 23.75	262°23.87 17.81	59°49.20 49.21	Mars: 0.1
Mer	pass. 17:40	ν-0.7' d-0.8' m-3.96	ν0.4' d-0.3' m1.21	ν2.3' d-0.0' m-2.08	ν2.5' d0.0' m0.44	
	, , , , , , , , , , , , , , , , , , , ,					

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	$180^{\circ}12.39$	\$23°25.38	229°12.20	9.6'	S21°46.39	8.7'	56.7'
1	195° 12.07	25.35	243°40.81	9.6'	21°55.14	8.6'	56.7'
2	210° 11.76 225° 11.45	25.31	258° 9.37 272° 37.89	9.5' 9.5'	22°3.76 22°12.26	8.5'	56.7'
3 4	225 11.45 240°11.14	· · 25.27 25.23	212 31.89 287°6.36	9.5 9.4'	22 12.20 22°20.64	8.4' 8.3'	56.7' 56.6'
5	255° 10.83	25.19	301°34.79	9.4	22°28.90	8.1	56.6'
6	270° 10.52	S23°25.15	316° 3.17	9.3'	S22°37.03	8.0'	56.6'
7	$285^{\circ}10.21$	25.10	330°31.51	9.3'	22°45.04	7.9'	56.6'
8	300°9.90	25.06	344°59.81	9.3'	22°52.91	7.8'	56.6'
9 10	315°9.58 330°9.27	· · 25.02 24.97	359°28.06 13°56.26	9.2' 9.2'	23°0.67 23°8.29	7.6' 7.5'	56.5' 56.5'
11	345°8.96	24.93	28°24.43	9.1'	23°15.78	7.4	56.5
12	0°8.65	5 23°24.88	42°52.55	9.1'	S23°23.15	7.2'	56.5'
13	15°8.34	24.83	57°20.64	9.0'	23°30.39	7.1'	56.4'
14	30°8.03	24.78	71°48.68	9.0'	23°37.49	7.0'	56.4'
15 16	45°7.72 60°7.40	· · 24.74 24.69	86°16.68 100°44.65	9.0' 8.9'	23°44.46 23°51.31	6.8' 6.7'	56.4' 56.4'
17	75°7.09	24.64	115° 12.58	8.9'	23°58.01	6.6'	56.4
18	90°6.78	S 23°24.58	129°40.47	8.9'	S24°4.59	6.4	56.3'
19	105°6.47	24.53	144°8.32	8.8'	24°11.03	6.3'	56.3'
20	120°6.16	24.48	158°36.14	8.8'	24°17.34	6.2'	56.3'
21 22	135°5.85 150°5.54	· · 24.42 24.37	173°3.92 187°31.67	8.7' 8.7'	24°23.51 24°29.54	6.0' 5.9'	56.3' 56.3'
23	150°5.54 165°5.23	24.37 24.31	201°59.39	8.7' 8.7'	24°29.54 24°35.44	5.9° 5.8'	56.2
	SD = 16.3'	d = -0.0'			D = 15.5'	5.5	
	JD = 10.3′	$a = -0.0^{\circ}$		51	υ = 15.5°		
Sat	GHA	Dec	GHA	ν	Dec	d F.G.	HP
0 1	180°4.92 195°4.60	\$23°24.26 24.20	216°27.08 230°54.73	8.7' 8.6'	\$24°41.21 24°46.83	5.6' 5.5'	56.2' 56.2'
2	210°4.29	24.20	245°22.35	8.6'	24°52.32	5.3'	56.2
3	225°3.98	• • 24.08	259°49.95	8.6'	$24^{\circ}57.67$	5.2'	56.2'
4	240°3.67	24.02	274°17.52	8.5'	25°2.88	5.1'	56.1'
5	255°3.36	23.96 \$23°23.90	288°45.06	8.5'	25°7.95 \$25°12.87	4.9'	56.1'
6 7	270°3.05 285°2.74	23.84	303°12.58 317°40.07	8.5' 8.5'	25°17.66	4.8' 4.6'	56.1' 56.1'
8	300°2.43	23.78	332°7.54	8.4	25°22.31	4.5	56.1
9	315°2.12	• • 23.71	346°34.98	8.4'	25°26.82	4.4'	56.0'
10	$330^{\circ}1.81$	23.65	1°2.41	8.4'	$25^{\circ}31.19$	4.2'	56.0'
11	345°1.49	23.58	15°29.81	8.4'	25°35.41	4.1'	56.0'
12 13	0°1.18 15°0.87	\$23°23.52 23.45	29°57.20 44°24.57	8.4' 8.4'	\$25°39.49 25°43.43	3.9' 3.8'	56.0' 56.0'
14	30°0.56	23.45	58°51.92	8.3	25°47.23	3.7'	55.9'
15	45°0.25	• • 23.32	73°19.26	8.3'	25°50.88	3.5'	55.9'
16	59° 59.94	23.25	87°46.59	8.3'	25°54.40	3.4'	55.9'
17	74°59.63	23.18 \$23°23.10	102°13.90	8.3'	25°57.76	3.2' 3.1'	55.9'
18 19	89°59.32 104°59.01	23.03	116°41.20 131°8.49	8.3' 8.3'	\$26°0.99 26°4.06	3.1 2.9'	55.9' 55.8'
20	119°58.70	22.96	145°35.78	8.3'	26°7.00	2.8'	55.8'
21	134°58.39	• • 22.89	160°3.06	8.3'	26°9.79	2.6'	55.8'
22	149°58.08	22.81	174°30.33	8.3'	26°12.44	2.5'	55.8'
23	164°57.77	22.74	188°57.60	8.3'	26°14.94	2.4'	55.8'
	SD = 16.3'	d = -0.1'		SI	D = 15.3'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 57.46	S23°22.66	203°24.86	8.3'	S26°17.29	2.2'	55.8'
1	194°57.15	22.58	217°52.13	8.3'	26°19.51	2.1'	55.7'
2	209° 56.84 224° 56.53	22.51 •• 22.43	232°19.39 246°46.66	8.3' 8.3'	26°21.57 26°23.50	1.9' 1.8'	55.7' 55.7'
3 4	224 56.53 239°56.22	22.43	240 40.00 261°13.93	8.3'	26°25.27	1.6'	55.7'
5	254° 55.91	22.27	275°41.20	8.3'	$26^{\circ}26.91$	1.5'	55.7'
6	269°55.60	S23°22.19	290°8.48	8.3'	S26°28.39	1.3'	55.6'
7	284°55.29	22.11	304°35.77	8.3'	26°29.74	1.2'	55.6'
8 9	299°54.97 314°54.66	22.02 •• 21.94	319°3.06 333°30.37	8.3' 8.3'	26°30.94 26°31.99	1.1' 0.9'	55.6' 55.6'
10	329° 54.35	21.94	347°57.68	8.3'	26°32.90	0.9	55.6'
11	344°54.05	21.77	2°25.01	8.3'	26°33.66	0.6'	55.5'
12	359°53.74	S23°21.69	16°52.36	8.4'	S26°34.29	0.5'	55.5'
13	14°53.43	21.60	31°19.72	8.4'	26°34.76	0.3'	55.5'
14 15	29°53.12 44°52.81	21.51 •• 21.42	45°47.10 60°14.50	8.4' 8.4'	26°35.10 26°35.28	0.2' 0.0'	55.5' 55.5'
16	59° 52.50	21.42	74°41.91	8.4'	26°35.28	-0.1	55.5'
17	74°52.19	21.25	89° 9.35	8.5'	26°35.23	-0.2	55.4'
18	89°51.88	\$23°21.16	103°36.81	8.5'	S26°34.99	-0.4	55.4'
19	104°51.57	21.06	118°4.30	8.5'	26°34.61	-0.5'	55.4'
20 21	119°51.26 134°50.95	20.97 •• 20.88	132°31.81 146°59.35	8.5' 8.6'	26°34.09 26°33.42	-0.7' -0.8'	55.4' 55.4'
22	149° 50.64	20.78	161°26.92	8.6'	26°32.61	-0.8	55.3'
23	164°50.33	20.69	175°54.52	8.6'	26°31.66	-1.1'	55.3'
	SD = 16.3'	d = -0.1'		SI	D = 15.2'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-3%
24	00:50	00:35	11:59	09:02	21:29	
25	00:20	00:05	12:00	09:56	22:23	
26	00:10	00:25	12:00	10:50	23:17	

December 27, 28, 29 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	95° 15.53	143°25.70 \$19°50.67	159° 9.62 \$22° 23.41	277°26.21 N02°17.77	74°51.66 N05°49.22	
1	110° 17.99	158°25.02 49.85	174°10.01 23.08	292°28.55 17.73	89°54.12 49.24	Alpheratz 357°32.23 29°14.95
2	125°20.46	173°24.34 49.03	189°10.40 22.74	307°30.90 17.69	104° 56.57 49.26	Ankaa 353°4.78 -42°9.38
3	140°22.92	188°23.67 · · 48.20	204°10.79 · · 22.40	322°33.24 · · 17.65	119°59.03 · · 49.27	Schedar 349°28.10 56°41.81
4	155° 25.39	203°22.99 47.38	219°11.17 22.06	337°35.58 17.61	135°1.48 49.29	Diphda 348°44.83 -17°50.02
5	170°27.85	218°22.32 46.56	234°11.56 21.72	352°37.93 17.57	150°3.94 49.30	Achernar 335°18.24 -57°5.89 Hamal 327°48.24 23°35.84
6	185° 30.32	233°21.64 S 19°45.73	249°11.95 S 22°21.38	7°40.27 N02°17.53	165°6.39 N05°49.32	Polaris 312° 20.98 89° 23.12
7	200°32.78	248°20.97 44.91	264°12.34 21.04	22°42.61 17.49	180°8.85 49.34	Acamar 315°9.67 -40°11.69
8	215°35.24	263°20.30 44.08	279°12.73 20.70	37°44.96 17.45	195°11.30 49.35	Menkar 314°3.36 4°11.99
9	230°37.71	278°19.62 · · 43.25	294°13.12 · · 20.36	52°47.30 · · 17.41	210°13.76 · · 49.37	Mirfak 308°24.31 49°57.79
10 11	245° 40.17 260° 42.64	293°18.95 42.42 308°18.28 41.59	309°13.51 20.01 324°13.90 19.67	67°49.65 17.37 82°51.99 17.33	225°16.21 49.39 240°18.67 49.40	Aldebaran 290°36.48 16°33.93
12	275° 45.10	323°17.61 \$19°40.76	339°14.29	97°54.34 N02°17.29	255°21.12 N05°49.42	Rigel 281°1.19 -8°10.22
13	290° 47.57	338°16.94 39.93	354°14.68 18.99	112°56.68 17.25	270°23.57 49.44	Capella 280°17.79 46°1.54
14	305°50.03	353°16.27 39.10	9°15.06 18.64	127°59.03 17.21	285°26.03 49.46	Bellatrix 278°19.92 6°22.44
15	320° 52.49	8°15.60 · · 38.27	24°15.45 · · 18.30	143°1.37 · · 17.17	300°28.48 ⋅⋅ 49.47	Elnath 277°58.39 28°37.81
16	335°54.96	23°14.94 37.43	39°15.84 17.95	158°3.72 17.13	315°30.93 49.49	Alnilam 275°34.91 -1°11.11 Betelgeuse 270°49.10 7°24.66
17	350° 57.42	38°14.27 36.60	54°16.23 17.61	173°6.07 17.10	330°33.39 49.51	Betelgeuse 270°49.10 7°24.66 Canopus 263°50.74 -52°42.66
18	5°59.89	53°13.60 S 19°35.76	69°16.62 S 22°17.26	188°8.41 N02°17.06	345°35.84 N05°49.52	Sirius 258°23.73 -16°45.35
19	21°2.35	68°12.93 34.92	84°17.01 16.92	203°10.76 17.02	0°38.29 49.54	Adhara 255°3.55 -29°0.65
20	36°4.81	83°12.27 34.09	99°17.40 16.57	218°13.11 16.98	15°40.75 49.56	Procyon 244°47.96 5°9.07
21	51°7.28	98°11.60 · · 33.25 113°10.94 32.41	114°17.79 · · 16.22 129°18.19 15.88	233°15.46 · · 16.94	30°43.20 · · 49.58	Pollux 243°13.98 27°57.33
22 23	66°9.74 81°12.21	113°10.94 32.41 128°10.28 31.57		248°17.80 16.91 263°20.15 16.87	45°45.65 49.59 60°48.10 49.61	Avior 234°13.11 -59°35.87
23	01 12.21	126 10.26 31.37	144°18.58 15.53	263°20.15 16.87		Suhail 222°44.13 -43°32.67
Mer.	pass. 17:36	ν -0.7' d-0.8' m-3.97	$ u 0.4' \ d$ -0.3' m1.20	$\nu 2.3' \ d$ -0.0' m-2.08	$ u 2.5' \ d0.0' \ m0.44$	Miaplacidus 221°36.93 -69°49.77
						Alphard 217°45.12 -8°46.88
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.67 11°49.63 Dubhe 193°37.91 61°35.60
0	96°14.67	143°9.61 \$19°30.72	159°18.97 S 22°15.18	278°22.50 N02°16.83	75°50.55 N05°49.63	Denebola 182°22.43 14°24.74
1	111° 17.14	158°8.95 29.88	174°19.36 14.83	293°24.85 16.79	90°53.01 49.65	Gienah 175°41.05 -17°41.84
2	126° 19.60	173°8.29 29.04	189°19.75 14.48	308°27.20 16.76	105°55.46 49.66	Acrux 172°57.26 -63°15.04
3	141°22.06	188°7.63 · · 28.19	204°20.14 · · 14.13	323°29.55 · · 16.72	120°57.91 · · 49.68	Gacrux 171°48.85 -57°16.00
4 5	156° 24.53 171° 26.99	203°6.97 27.35 218°6.31 26.50	219°20.53 13.78 234°20.92 13.43	338°31.90 16.68 353°34.25 16.65	136°0.36 49.70 151°2.81 49.72	Alioth 166°11.01 55°48.10
6	186° 29.46	233°5.65 \$19°25.65	249°21.31 \$22°13.08	8°36.60 N02°16.61	166°5.26 N05°49.74	Spica 158°19.81 -11°18.46
7	201°31.92	248°4.99 24.80	264°21.70 12.73	23°38.95 16.57	181°7.71 49.75	Alkaid 152°50.34 49°10.09
8	216° 34.39	263°4.33 23.96	279°22.10 12.38	38°41.30 16.54	196° 10.16 49.77	Hadar 148° 32.73 -60° 30.25
9	231°36.85	278°3.68 · · 23.11	294°22.49 · · 12.03	53°43.65 · · 16.50	211°12.61 · · 49.79	Menkent 147°54.88 -36°30.33 Arcturus 145°45.87 19°2.03
10	246°39.31	293°3.02 22.25	309°22.88 11.68	68°46.00 16.46	226° 15.06 49.81	Rigil Kent. 139°37.22 -60°56.84
11	261°41.78	308°2.36 21.40	324°23.27 11.32	83°48.36 16.43	241°17.51 49.83	Kochab 137°20.77 74°2.07
12	276° 44.24	323°1.71 S19°20.55	339°23.66	98°50.71 N02°16.39	256°19.96 N05°49.85	Zuben'ubi 136°53.51 -16°9.44
13	291°46.71	338°1.05 19.69 353°0.40 18.84	354°24.05 10.62 9°24.45 10.26	113°53.06 16.35 128°55.41 16.32	271°22.41 49.87 286°24.86 49.88	Alphecca 126°1.98 26°37.09
14 15	306° 49.17 321° 51.63	353°0.40 18.84 7°59.74 · · 17.98	9°24.45 10.26 24°24.84 · · 9.91	128°55.41 16.32 143°57.77 · · 16.28	286°24.86 49.88 301°27.31 • 49.90	Antares 112°13.16 -26°29.54
16	336°54.10	22°59.09 17.13	39°25.23 9.55	159°0.12 16.25	316°29.76 49.92	Atria 107°5.69 -69°4.46
17	351°56.56	37°58.44 16.27	54°25.62 9.20	174°2.47 16.21	331°32.21 49.94	Sabik 102°0.32 -15°45.50
18	6°59.03	52°57.79 S 19°15.41	69°26.02 S 22°8.84	189°4.83 N02°16.18	346°34.66 N05°49.96	Shaula 96°7.47 -37°7.33 Rasalhague 95°56.63 12°32.39
19	22°1.49	67°57.14 14.55	84°26.41 8.48	204°7.18 16.14	1°37.10 49.98	Eltanin 90°41.60 51°29.08
20	37°3.96	82°56.49 13.69	99°26.80 8.13	219°9.54 16.11	16°39.55 50.00	Kaus Aust. 83°29.70 -34°22.19
21	52°6.42	97°55.84 · · 12.83	114°27.19 · · 7.77	234°11.89 · · 16.07	31°42.00 · · 50.02	Vega 80°32.00 38°48.62
22	67°8.88	112°55.19 11.97	129°27.59 7.41	249°14.25 16.04	46°44.45 50.04	Nunki 75°45.12 -26°15.65
23	82°11.35	127°54.54 11.10	144°27.98 7.05	264°16.60 16.00	61°46.90 50.06	Altair 61°57.90 8°56.63
Mer.ı	pass. 17:32	ν -0.7′ <i>d</i> -0.8′ m-3.97	$ u 0.4' \ d$ -0.3' m1.20	ν 2.3′ d-0.0′ m-2.09	$ u 2.5' \ d0.0' \ m0.44$	Peacock 53°2.49 -56°38.72
						Deneb 49°24.50 45°23.03
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.61 10°0.34
0	97° 13.81	142°53.89 \$19°10.24	159°28.37	279°18.96 N02°15.97	76°49.34 N05°50.08	Al Na'ir 27°30.19 -46°49.62 Fomalhaut 15°12.01 -29°28.50
1	112° 16.28	157°53.24 9.38	174°28.77 6.34	294°21.31 15.93	91°51.79 50.10	Scheat 13°42.93 28°14.32
2	127° 18.74	172°52.60 8.51	189°29.16 5.98	309°23.67 15.90	106°54.24 50.11	Markab 13°27.57 15°21.53
3	142°21.21	187°51.95 · · 7.64	204°29.55 · · 5.62	324°26.02 · · 15.87	121°56.69 · · 50.13	
4	157° 23.67	202°51.31 6.78	219°29.95 5.26	339°28.38 15.83	136°59.13 50.15	Dec 27 Mon SHA Mer.pass
5	172°26.13	217°50.66 5.91	234°30.34 4.90	354°30.74 15.80	152°1.58 50.17	Venus 48° 10.17 14:27
6	187°28.60	232°50.02 \$19°5.04	249°30.74	9°33.10 N02°15.76	167°4.03 N05°50.19	Mars 63°54.09 13:23
7	202°31.06	247°49.37 4.17	264°31.13 4.17	24°35.45 15.73	182°6.47 50.21	Jupiter 182°10.68 05:29 Saturn 339°36.13 18:57
8 9	217°33.53 232°35.99	262°48.73 3.30 277°48.09 •• 2.42	279°31.52 3.81 294°31.92 · · 3.45	39°37.81 15.70 54°40.17 •• 15.66	197°8.92 50.23 212°11.36 · · 50.25	
10	247°38.45	292°47.45 1.55	309°32.31 3.09	69°42.53 15.63	212 11.30 50.23 227°13.81 50.27	Dec 28 Tue SHA Mer.pass
11	262° 40.92	307°46.81 19°0.68	324°32.71 2.72	84°44.89 15.60	242°16.25 50.29	Venus 46°54.94 14:28
12	277°43.38	322°46.17 \$18°59.80	339°33.10 S 22°2.36	99°47.25 N02°15.57	257°18.70 N05°50.31	Mars 63°4.29 13:22 Jupiter 182°7.83 05:26
13	292°45.85	337°45.53 58.93	354°33.50 1.99	114°49.61 15.53	272°21.15 50.34	Saturn 339°35.88 18:54
14	307°48.31	352°44.89 58.05	9°33.89 1.63	129°51.97 15.50	287°23.59 50.36	
15 16	322°50.78	7°44.25 · · 57.17	24°34.29 · · 1.27	144°54.33 · · 15.47	302°26.03 · · 50.38	Dec 29 Wed SHA Mer.pass
16 17	337° 53.24 352° 55.70	22°43.61 56.29 37°42.97 55.41	39°34.68 0.90 54°35.08 0.53	159°56.69 15.44 174°59.05 15.40	317°28.48 50.40 332°30.92 50.42	Venus 45° 40.08 14:29
18	7°58.17	52°42.34 \$18°54.53	69°35.47 S22°0.17	190°1.41 N02°15.37	347°33.37 N05°50.44	Mars 62°14.56 13:22 Jupiter 182°5.14 05:22
19	23°0.63	67°41.70 53.65	84°35.87 21°59.80	205°3.77 15.34	2°35.81 50.46	Saturn 339°35.53 18:50
20	38°3.10	82°41.07 52.77	99°36.26 59.43	220°6.13 15.31	17°38.26 50.48	
21	53°5.56	97°40.43 · · 51.89	114°36.66 · · 59.07	235°8.49 · · 15.28	32°40.70 · · 50.50	Horizontal parallax
22	68°8.02	112°39.80 51.00	129°37.06 58.70	250°10.86 15.24	47°43.14 50.52	Venus: 0.1
23	0.0 0.0 0.0	127°39.17 50.12	144°37.45 58.33	265°13.22 15.21	62°45.59 50.54	Mars: 0.1
	83°10.49		ν0.4' d-0.4' m1.20	ν 2.4′ d-0.0′ m-2.10		

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.02	5 23°20.59	190°22.15	8.7'	S26°30.57	-1.2'	55.3'
1 2	194°49.71 209°49.40	20.50 20.40	204°49.82 219°17.51	8.7' 8.7'	26° 29.34 26° 27.97	-1.4' -1.5'	55.3' 55.3'
3	209 49.40 224°49.09	. 20.30	219 17.51 233°45.25	8.8'	26°26.46	-1.5 -1.6'	55.3'
4	239°48.78	20.20	248° 13.02	8.8'	26°24.81	-1.8'	55.2'
5	254°48.48	20.10	262°40.83	8.8'	26°23.02	-1.9'	55.2'
6 7	269°48.17 284°47.86	\$23°20.00 19.90	277°8.67 291°36.56	8.9' 8.9'	\$26°21.10 26°19.03	-2.1' -2.2'	55.2' 55.2'
8	299°47.55	19.80	306°4.49	9.0'	26°16.83	-2.2 -2.3'	55.2'
9	314°47.24	• • 19.70	320°32.47	9.0'	$26^{\circ}14.50$	-2.5'	55.2'
10	329°46.93	19.59	335°0.49	9.1'	26°12.02	-2.6'	55.1'
11 12	344°46.62 359°46.31	19.49 \$23°19.38	349°28.55 3°56.66	9.1' 9.2'	26°9.42 \$26°6.67	-2.7' -2.9'	55.1' 55.1'
13	14°46.01	19.28	18° 24.82	9.2'	26°3.80	-3.0'	55.1'
14	29°45.70	19.17	32°53.03	9.3'	26°0.79	-3.1'	55.1'
15 16	44°45.39 59°45.08	· · 19.06 18.96	47°21.28 61°49.59	9.3' 9.4'	25° 57.65 25° 54.37	-3.3' -3.4'	55.1' 55.0'
17	74°44.77	18.85	76° 17.96	9.4'	25°50.96	-3.4 -3.5'	55.0'
18	89°44.46	S23°18.74	90°46.37	9.5'	S25°47.43	-3.7'	55.0'
19	104°44.16	18.63	105° 14.84	9.5'	25°43.76	-3.8'	55.0'
20 21	119°43.85 134°43.54	18.51 •• 18.40	119°43.37 134°11.95	9.6' 9.6'	25°39.97 25°36.04	-3.9' -4.1'	55.0' 55.0'
22	149°43.23	18.29	148° 40.59	9.7'	25°31.99	-4.2'	54.9'
23	164°42.92	18.17	163°9.29	9.8'	25° 27.81	-4.3'	54.9'
	SD = 16.3'	d = -0.1'		SD	0 = 15.1'		
т	CILA	D	CUA		D	J	LIP
Tue 0	GHA 179° 42.62	Dec \$23° 18.06	GHA 177°38.04	u 9.8'	Dec \$25° 23.50	d -4.4'	HP 54.9'
1	194°42.31	17.94	192°6.86	9.9'	$25^{\circ}19.07$	-4.6'	54.9'
2	209°42.00	17.83	206°35.74	9.9'	25° 14.52	-4.7'	54.9'
3 4	224°41.69 239°41.39	· · 17.71 17.59	221°4.68 235°33.69	10.0' 10.1'	25°9.84 25°5.03	-4.8' -4.9'	54.9' 54.8'
5	254°41.08	17.47	250°2.75	10.1	25°0.11	-4.9 -5.0'	54.8'
6	269°40.77	S23°17.35	264°31.88	10.2'	S24°55.06	-5.2'	54.8'
7	284°40.46	17.23	279°1.08 293°30.34	10.3'	24°49.90 24°44.61	-5.3'	54.8'
8 9	299°40.16 314°39.85	17.11 •• 16.99	293°30.34 307°59.67	10.3' 10.4'	24° 44.61 24° 39.20	-5.4' -5.5'	54.8' 54.8'
10	329°39.54	16.86	322°29.07	10.5'	24°33.68	-5.6'	54.8'
11	344°39.24	16.74	336°58.53	10.5'	24°28.04	-5.8'	54.7'
12 13	359°38.93 14°38.62	\$23°16.61 16.49	351°28.06 5°57.66	10.6' 10.7'	\$24°22.28 24°16.41	-5.9' -6.0'	54.7' 54.7'
14	29°38.32	16.36	20° 27.33	10.7'	24°10.41	-6.1'	54.7'
15	44°38.01	• • 16.24	34°57.07	10.8'	24°4.33	-6.2'	54.7'
16	59°37.70	16.11	49°26.88	10.9'	23°58.11 23°51.79	-6.3'	54.7'
17 18	74°37.40 89°37.09	15.98 \$23°15.85	63°56.76 78°26.72	11.0' 11.0'	23 51.79 \$23°45.35	-6.4' -6.5'	54.7' 54.6'
19	104°36.78	15.72	92°56.74	11.1'	23°38.81	-6.7'	54.6'
20	119°36.48	15.59	107°26.84	11.2'	23°32.16	0.0	54.6'
21 22	134°36.17 149°35.87	· · 15.46 15.32	121°57.01 136°27.25	11.2' 11.3'	23°25.39 23°18.53	-6.9' -7.0'	54.6' 54.6'
23	164° 35.56	15.32	150° 57.57	11.4'	23°11.55	-7.0 -7.1'	54.6
	SD = 16.3'	d = -0.1'		SD	0 = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°35.25 194°34.95	\$23°15.05 14.92	165°27.95 179°58.42	11.5' 11.5'	\$23°4.47 22°57.29	-7.2' -7.3'	54.6' 54.5'
2	209°34.64	14.78	194°28.95	11.6'	22°50.00	-7.4'	54.5'
3	224°34.34	• • 14.65	208°59.56	11.7'	22°42.61	-7.5'	54.5'
4 5	239°34.03 254°33.73	14.51 14.37	223°30.25 238°1.01	11.8' 11.8'	22°35.12 22°27.53	-7.6' -7.7'	54.5' 54.5'
6	269°33.42	\$23°14.23	252°31.84	11.9'	\$22°19.85	-7.8'	54.5'
7	284°33.12	14.09	267°2.75	12.0'	22°12.06	-7.9'	54.5'
8 9	299°32.81 314°32.51	13.95 •• 13.81	281°33.73 296°4.79	12.1' 12.1'	22°4.17 21°56.19	-8.0' -8.1'	54.5' 54.4'
10	314 32.51 329°32.20	13.67	296°4.79 310°35.92	12.1	21°56.19 21°48.12	-8.1' -8.2'	54.4'
11	344°31.90	13.52	325°7.13	12.3'	21°39.94	-8.3'	54.4'
12	359°31.59	\$23°13.38	339°38.41	12.4'	S21°31.68	-8.4'	54.4'
13 14	14°31.29 29°30.98	13.23 13.09	354°9.77 8°41.20	12.4' 12.5'	21°23.32 21°14.88	-8.4' -8.5'	54.4' 54.4'
15	44°30.68	12.94	23°12.71	12.6'	21°6.34	-8.6'	54.4
16	59°30.37	12.79	37°44.29	12.7'	20°57.71	-8.7'	54.4'
17	74°30.07	12.64	52° 15.95	12.7'	20°48.99	-8.8'	54.3'
18 19	89°29.76 104°29.46	\$23°12.50 12.35	66° 47.68 81° 19.48	12.8' 12.9'	\$20°40.19 20°31.30	-8.9' -9.0'	54.3' 54.3'
20	119°29.16	12.20	95°51.36	13.0'	20° 22.32	-9.1'	54.3
21	134°28.85	• • 12.04	110°23.31	13.0'	20°13.26	-9.1'	54.3'
22 23	149°28.55 164°28.25	11.89 11.74	124°55.34 139°27.43	13.1' 13.2'	20°4.12 19°54.89	-9.2' -9.3'	54.3' 54.3'
23			139 21.43			-9.3	54.5
	SD = 16.3'	d = -0.1'		SL	0 = 14.9'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-1%	
27	00:40	00:55	12:01	11:44	-:-		
28	01:10	01:24	12:01	12:35	00:10		
29	01:39	01:54	12:02	13:24	01:00		

December 30, 31, 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	98° 12.95	142°38.53 \$18°49.23	159°37.85 S 21°57.96	280°15.58 N02°15.18	77°48.03 N05°50.56		
1	$113^{\circ}15.42$	157°37.90 48.35	174°38.24 57.59	295°17.94 15.15	92°50.47 50.59	Alpheratz 357°32.2 Ankaa 353°4.7	
2	128° 17.88	172°37.27 47.46	189°38.64 57.22	310°20.31 15.12	107° 52.92 50.61	Schedar 349°28.1	
3	143°20.35	187°36.64 · · 46.57	204°39.04 · · 56.85	325°22.67 · · 15.09	122°55.36 · · 50.63	Diphda 348° 44.8	
4	158° 22.81	202°36.01 45.68	219°39.43 56.48	340°25.03 15.06	137° 57.80 50.65	Achernar 335°18.2	
5 6	173°25.27 188°27.74	217°35.38 44.79 232°34.75 \$18°43.90	234°39.83 56.11 249°40.23 \$21°55.74	355°27.40 15.03 10°29.76 N02°15.00	153°0.24 50.67 168°2.69 N05°50.69	Hamal 327°48.2	
7	203°30.20	247°34.12 43.01	264°40.62 55.36	25°32.13 14.96	183°5.13 50.71	Polaris 312°21.9	
8	218°32.67	262°33.49 42.11	279°41.02 54.99	40°34.49 14.93	198°7.57 50.74	Acamar 315°9.6	
9	233°35.13	277°32.87 · · 41.22	294°41.42 · · 54.62	55°36.86 · · 14.90	213°10.01 · · 50.76	Menkar 314°3.3 Mirfak 308°24.3	
10	248°37.59	292°32.24 40.33	309°41.82 54.25	70°39.22 14.87	228° 12.45 50.78	Aldebaran 290°36.4	
11	263°40.06	307°31.61 39.43	324°42.21 53.87	85°41.59 14.84	243°14.89 50.80	Rigel 281°1.1	
12	278° 42.52	322°30.99 \$18°38.53	339°42.61 \$21°53.50	100°43.96 N02°14.81	258°17.33 N05°50.82	Capella 280°17.7	
13 14	293° 44.99 308° 47.45	337°30.37 37.64 352°29.74 36.74	354°43.01 53.12 9°43.41 52.75	115°46.32 14.78 130°48.69 14.76	273°19.78 50.85 288°22.22 50.87	Bellatrix 278°19.9	2 6°22.44
15	323°49.92	7°29.12 · · 35.84	24°43.80 · · 52.37	145°51.06 · · 14.73	303°24.66 · · 50.89	Elnath 277°58.3	
16	338° 52.38	22°28.50 34.94	39°44.20 52.00	160°53.42 14.70	318°27.10 50.91	Alnilam 275°34.9	
17	353°54.84	37°27.87 34.04	54°44.60 51.62	175°55.79 14.67	333°29.54 50.94	Betelgeuse 270°49.0	
18	8°57.31	52°27.25 \$18°33.14	69°45.00 S 21°51.24	190°58.16 N02°14.64	348°31.98 N05°50.96	Canopus 263° 50.7 Sirius 258° 23.7	
19	23°59.77	67°26.63 32.24	84°45.40 50.87	206°0.53 14.61	3°34.42 50.98	Adhara 255°3.5	
20	39°2.24	82°26.01 31.33	99°45.79 50.49	221°2.90 14.58	18°36.86 51.00	Procyon 244° 47.9	
21	54°4.70	97°25.39 · · 30.43	114°46.19 · · 50.11	236°5.27 ·· 14.55 251°7.63 14.52	33°39.30 · · 51.03	Pollux 243°13.9	
22 23	69°7.16 84°9.63	112°24.77 29.52 127°24.16 28.62	129°46.59 49.73 144°46.99 49.35	251°7.63 14.52 266°10.00 14.50	48°41.73 51.05 63°44.17 51.07	Avior 234°13.0	
			· · · · · · · · · · · · · · · · · · ·			Suhail 222°44.1	
Mer.	pass. 17:24	ν-0.6' d-0.9' m-3.98	ν0.4' d-0.4' m1.20	ν2.4' d-0.0' m-2.10	$\nu 2.4' \ d0.0' \ m0.45$	Miaplacidus 221°36.9	
						Alphard 217°45.0 Regulus 207°31.6	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.8	
0	$99^{\circ}12.09$	142°23.54 S 18°27.71	159°47.39 S 21°48.97	281°12.37 N02°14.47	78°46.61 N05°51.09	Denebola 182° 22.4	
1	114° 14.56	157°22.92 26.80	174°47.79 48.59	296°14.74 14.44	93°49.05 51.12	Gienah 175°41.0	
2	129° 17.02	172°22.31 25.89	189°48.19 48.21	311°17.11 14.41	108°51.49 51.14	Acrux 172°57.2	
3 4	144° 19.48 159° 21.95	187°21.69 · · 24.98 202°21.08 24.07	204°48.59 · · 47.83 219°48.99 47.45	326°19.49 · · 14.38 341°21.86 14.36	123°53.93 · · 51.16 138°56.37 51.19	Gacrux 171°48.8	
5	174° 24.41	217°20.46 23.16	234°49.39 47.45	356°24.23 14.33	153° 58.80 51.21	Alioth 166° 10.9	
6	189°26.88	232°19.85 \$18°22.25	249°49.79 S 21°46.69	11°26.60 N02°14.30	169°1.24 N05°51.23	Spica 158°19.7	
7	204°29.34	247° 19.24 21.34	264°50.19 46.31	26°28.97 14.27	184°3.68 51.26	Alkaid 152° 50.3 Hadar 148° 32.6	
8	$219^{\circ}31.81$	262°18.62 20.42	279°50.59 45.92	41°31.34 14.25	199°6.12 51.28	Menkent 147° 54.8	
9	234°34.27	277° 18.01 · · 19.51	294°50.99 · · 45.54	56°33.72 · · 14.22	214°8.55 · · 51.30	Arcturus 145°45.8	
10	249°36.73	292°17.40 18.59	309°51.39 45.16	71°36.09 14.19	229°10.99 51.33	Rigil Kent. 139°37.1	
11 12	264° 39.20 279° 41.66	307°16.79 17.68 322°16.18 \$18°16.76	324°51.79 44.77 339°52.19 \$21°44.39	86°38.46 14.16 101°40.83 N02°14.14	244°13.43 51.35 259°15.86 N05°51.38	Kochab 137°20.7	
13	279 41.00 294°44.13	337°15.57 15.84	354°52.59 44.00	116°43.21 14.11	274°18.30 51.40	Zuben'ubi 136°53.4	
14	309°46.59	352°14.96 14.92	9°52.99 43.62	131°45.58 14.09	289°20.74 51.42	Alphecca 126°1.9	
15	324°49.05	7°14.35 · · 14.00	24°53.39 · · 43.23	146°47.96 · · 14.06	304°23.17 · · 51.45	Antares 112°13.1 Atria 107°5.6	
16	$339^{\circ}51.52$	22°13.75 13.08	39°53.79 42.85	161°50.33 14.03	319°25.61 51.47	Atria 107°5.6 Sabik 102°0.3	
17	354°53.98	37°13.14 12.16	54°54.19 42.46	176°52.71 14.01	334°28.05 51.50	Shaula 96°7.4	
18	9°56.45	52°12.54 \$18°11.24	69°54.59 \$21°42.07	191°55.08 N02°13.98	349°30.48 N05°51.52	Rasalhague 95° 56.6	
19	24°58.91	67°11.93 10.32 82°11.33 9.39	84°55.00 41.69	206°57.46 13.96	4°32.92 51.54	Eltanin 90°41.5	9 51°29.06
20 21	40°1.38 55°3.84	82°11.33 9.39 97°10.72 • 8.47	99°55.40 41.30 114°55.80 · 40.91	221°59.83 13.93 237°2.21 · · 13.90	19°35.35 51.57 34°37.79 · · 51.59	Kaus Aust. 83°29.6	
22	70°6.30	112°10.12 7.54	129°56.20 40.52	252°4.58 13.88	49°40.22 51.62	Vega 80°32.0	
23	85°8.77	127°9.52 6.61	144°56.60 40.13	267°6.96 13.85	64° 42.66 51.64		1 -26°15.65
Mar	pass. 17:20	ν-0.6' d-0.9' m-3.98	ν 0.4' d-0.4' m1.19	ν2.4' d-0.0' m-2.11	ν2.4' d0.0' m0.46	Altair 61°57.8 Peacock 53°2.4	
ivier.	pass. 17.20	ν-0.0 α-0.9 III-3.90	νο.4 <i>u</i> -ο.4 III.19	ν2.4 <i>u</i> -0.0 III-2.11	ν2.4 αυ.υ IIIυ.40	Deneb 49° 24.5	
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Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 30.2	0 -46°49.62
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2	130° 16.16	172°7.71 3.83	189°57.81 38.96	312°14.09 13.78	109°49.96 51.72	Scheat 13°42.9	
3	145° 18.62	187°7.11 · · · 2.90	204°58.21 · · 38.57	327°16.47 · · 13.75	124°52.39 · · 51.74	Markab 13°27.5	7 15°21.52
4	160°21.09	202°6.51 1.97	219°58.61 38.18	342°18.85 13.73	139°54.83 51.77	Dec 30 Thu SHA	Mer.pass
5	175° 23.55	217°5.91 1.04	234°59.02 37.79	357°21.23 13.70	154° 57.26 51.79	Venus 44°25.5	
6	190°26.02	232°5.31 \$18°0.10	249°59.42 \$21°37.40	12°23.61 N02°13.68	169°59.69 N05°51.82	Mars 61°24.8	
7	205°28.48	247°4.72 17°59.17	264°59.82 37.00	27°25.98 13.66	185°2.13 51.84	Jupiter 182°2.6 Saturn 339°35.0	
8 9	220°30.94 235°33.41	262°4.12 58.24 277°3.52 · · 57.30	280° 0.23 36.61 295° 0.63 · · · 36.22	42°28.36 13.63 57°30.74 · · 13.61	200°4.56 51.87 215°6.99 · · 51.89	5aturn 559 55.0	0 10:40
10	250° 35.87	292°2.93 56.37	310°1.03 35.82	72°33.12 13.58	230°9.43 51.92	Dec 31 Fri SHA	Mer.pass
11	265°38.34	307°2.33 55.43	325°1.44 35.43	87°35.50 13.56	245°11.86 51.94	Venus 43°11.4	
12	280° 40.80	322°1.74 S 17°54.49	340°1.84 S 21°35.03	102°37.88 N02°13.54	260°14.29 N05°51.97	Mars 60°35.3	
13	295°43.26	337°1.14 53.55	355°2.24 34.64	117°40.26 13.51	275°16.72 51.99	Jupiter 182°0.2 Saturn 339°34.5	
14	310°45.73	352°0.55 52.61	10°2.65 34.24	132°42.65 13.49	290°19.16 52.02		
15	325°48.19	6°59.96 · · 51.67	25°3.05 · · 33.85	147°45.03 · · 13.47	305°21.59 · · 52.04	Jan 01 Sat SHA	Mer.pass
16 17	340°50.66 355°53.12	21°59.37 50.73 36°58.78 49.79	40°3.46 33.45 55°3.86 33.05	162°47.41 13.44 177°49.79 13.42	320°24.02 52.07 335°26.45 52.10	Venus 41°57.6	
18	10° 55.59	51°58.18 S17°48.85	70°4.27 S21°32.66	192°52.17 N02°13.40	350°28.88 N05°52.12	Mars 59°45.7 Jupiter 181°58.1	
19	25° 58.05	66°57.60 47.91	85°4.67 32.26	207°54.56 13.38	5°31.31 52.15	Saturn 339°33.8	
20	41°0.51	81°57.01 46.96	100° 5.07 31.86	222°56.94 13.35	20°33.74 52.17		
21	56°2.98	96°56.42 · · 46.02	115°5.48 · · 31.46	237°59.32 · · 13.33	35°36.17 · · 52.20	Horizontal paralla	
22	71°5.44	111°55.83 45.07	130°5.88 31.06	253°1.71 13.31	50°38.60 52.23	Venus	
23	86°7.91	126°55.24 44.12	145°6.29 30.67	268°4.09 13.29	65°41.04 52.25	Mars	s: 0.1
Mer.	pass. 17:16	ν -0.6′ <i>d</i> -0.9′ m-3.98	$ u 0.4' \ d$ -0.4' m1.19	ν 2.4′ <i>d</i> -0.0′ m-2.12	$\nu 2.4' \ d0.0' \ m0.46$		

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12 359°17.09 S23°5.51 318°2.55 15.5′ S13°23.87 -11.7′ 54.0′ 13 14°16.79 5.33 32°37.07 15.6′ 13°12.18 -11.7′ 54.0′ 14 29°16.49 5.14 347°11.64 15.6′ 13°0.44 -11.8′ 54.0′ 15.6′ 44°16.19 · · · · 4.96 1°46.26 15.7′ 12°48.66 -11.8′ 54.0′ 16 59°15.89 4.77 16°20.93 15.7′ 12°36.83 -11.9′ 54.0′ 18 89°15.29 S23°4.40 45°30.42 15.8′ S12°13.03 -12.0′ 54.0′ 19 104°15.00 4.21 60°5.23 15.9′ 12°1.07 -12.0′ 54.0′ 20 119°14.70 4.02 74°40.09 15.9′ 11°49.06 -12.1′ 54.0′ 21 134°14.40 · · 3.83 89°14.99 15.9′ 11°37.01 -12.1′ 54.0′ 22 149°14.10 3.64 118°24.93 16.0′ 11°12.78 -12.2′ 54.0′ 31 164°13.80 3.45 118°24.93 16.0′ 11°12.78 -12.2′ 54.0′ 31 194°13.21 3.06 147°35.04 16.1′ 10°48.39 -12.3′ 54.0′ 31 22°49°12.32 2.48 191°20.50 16.2′ 10°36.14 -12.3′ 54.0′ 31 22°49°12.32 2.48 191°20.50 16.2′ 10°36.14 -12.3′ 54.0′ 31 22°49°12.32 2.48 191°20.50 16.2′ 10°36.14 -12.3′ 54.0′ 31 22°49°1.13 1.62° 2.28 205°55.73 16.3′ 09°59.16 -12.4′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.3′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 32°41.142 1.88 235°6.30 16.3′ 09°34.32 -12.5′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.24 1.08 293°27.86 16.5′ 08°44.25 -12.6′ 54.0′ 11 34°10.83 · · · · · · · · · · · · · · · · · · ·								
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0 179°13.51 S23°3.25 132°59.96 16.1' S11°0.61 -12.2' 54.0' 1 194°13.21 3.06 147°35.04 16.1' 10°48.39 -12.3' 54.0' 2 209°12.91 2.87 162°10.15 16.2' 10°36.14 -12.3' 54.0' 3 224°12.61 · · · 2.67 176°45.31 16.2' 10°23.85 -12.3' 54.0' 4 239°12.32 2.48 191°20.50 16.2' 10°11.52 -12.4' 54.0' 5 254°12.02 2.28 205°55.73 16.3' 09°59.16 -12.4' 54.0' 6 269°11.72 S23°2.08 220°31.00 16.3' S09°46.76 -12.4' 54.0' 7 284°11.42 1.88 235°6.30 16.3' 09°34.32 -12.5' 54.0' 8 299°11.13 1.69 249°41.64 16.4' 09°9.35 -12.5' 54.0' 9 314°10.83 · · 1.49 264°17.01 16.4' 09°9.35 -12.5' 54.0' 10 329°10.53 1.29		SD = 16.3'	d = -0.2'		SI	O = 14.7'		
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5 254°12.02 2.28 205°55.73 16.3' 09°59.16 -12.4' 54.0' 6 269°11.72 \$23°2.08 220°31.00 16.3' \$09°46.76 -12.4' 54.0' 7 284°11.42 1.88 235°6.30 16.3' 09°34.32 -12.5' 54.0' 8 299°11.13 1.69 249°41.64 16.4' 09°21.85 -12.5' 54.0' 9 314°10.83 · 1.49 264°17.01 16.4' 09°9.35 -12.5' 54.0' 10 329°10.53 1.29 278°52.42 16.4' 08°56.81 -12.6' 54.0' 11 344°10.24 1.08 293°27.86 16.5' 08°44.25 -12.6' 54.0' 12 359°9.94 \$23°0.88 308°3.33 16.5' \$08°31.65 -12.6' 54.0' 13 14°9.65 0.68 322°38.83 16.5' \$08°19.01 -12.7' 54.0' 14 29°9.35 0.48 337°14.36 16.6' 07°53								
6 269°11.72 \$23°2.08 \$220°31.00 16.3' \$59°46.76 -12.4' \$54.0' 7 284°11.42 1.88 235°6.30 16.3' 09°34.32 -12.5' \$54.0' 8 299°11.13 1.69 249°41.64 16.4' 09°21.85 -12.5' \$54.0' 9 314°10.83 · · 1.49 264°17.01 16.4' 09°9.35 -12.5' \$54.0' 10 329°10.53 1.29 278°52.42 16.4' 08°56.81 -12.6' \$44.0' 11 344°10.24 1.08 293°27.86 16.5' 08°44.25 -12.6' \$44.0' 12 359°9.94 \$23°0.88 308°3.33 16.5' \$08°44.25 -12.6' \$54.0' 13 14°9.65 0.68 322°38.83 16.5' \$08°19.01 -12.7' \$54.0' 14 29°9.35 0.48 337°14.36 16.6' 08°6.35 -12.7' \$4.0' 15 44°9.05 · · 0.27 351°49.91 16.6'								
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16 59° 8.76 23° 0.07 6° 25.50 16.6' 07° 40.94 -12.7' 54.0' 17 74° 8.46 22° 59.86 21° 1.11 16.6' 07° 28.19 -12.8' 54.0' 18 89° 8.17 \$22° 59.65 35° 36.75 16.7' \$07° 15.42 -12.8' 54.0' 19 104° 7.87 59.45 50° 12.41 16.7' 07° 2.62 -12.8' 54.0' 20 119° 7.58 59.24 64° 48.09 16.7' 06° 49.79 -12.9' 54.0' 21 134° 7.28 · 59.03 79° 23.80 16.7' 06° 36.93 -12.9' 54.0' 22 149° 6.99 58.82 93° 59.53 16.7' 06° 24.05 -12.9' 54.0' 23 164° 6.69 58.61 108° 35.28 16.8' 06° 11.15 -12.9' 54.0'								
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19 104°7.87 59.45 50°12.41 16.7' 07°2.62 -12.8' 54.0' 20 119°7.58 59.24 64°48.09 16.7' 06°49.79 -12.9' 54.0' 21 134°7.28 · 59.03 79°23.80 16.7' 06°36.93 -12.9' 54.0' 22 149°6.99 58.82 93°59.53 16.7' 06°24.05 -12.9' 54.0' 23 164°6.69 58.61 108°35.28 16.8' 06°11.15 -12.9' 54.0'								
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21 134°7.28 · · · 59.03 79°23.80 16.7' 06°36.93 -12.9' 54.0' 22 149°6.99 58.82 93°59.53 16.7' 06°24.05 -12.9' 54.0' 23 164°6.69 58.61 108°35.28 16.8' 06°11.15 -12.9' 54.0'								
23 164°6.69 58.61 108°35.28 16.8' 06°11.15 -12.9' 54.0'	21	134°7.28	• • 59.03	79°23.80	16.7'	06°36.93	-12.9'	54.0'
SD = 16.3' d = -0.2' $SD = 14.7'$	23			108~35.28			-12.9′	54.0′
		SD = 16.3'	d = -0.2'		SI	ש = 14.7′		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-15%
30	02:08	02:23	12:02	14:10	01:47	
31	02:37	02:52	12:03	14:53	02:32	
01	03:06	03:20	12:03	15:34	03:13	