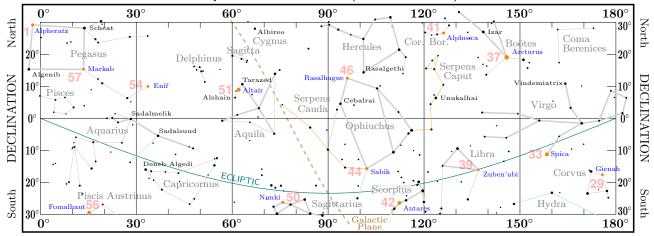
# GENERATED USING SKYFIELD

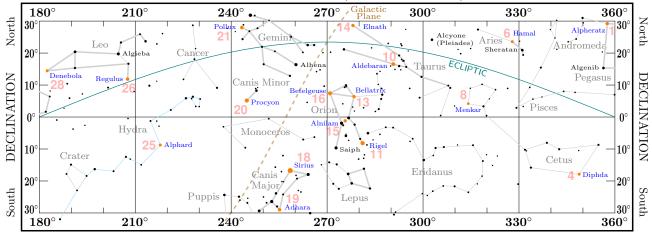
http://rhodesmill.org/skyfield/

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



SIDEREAL HOUR ANGLE

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



SIDEREAL HOUR ANGLE

# THE NAUTICAL ALMANAC

# 2028

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

September 6, 2025

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

## Information in the data page footers

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

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

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

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

IERS Earth Orientation data as of dd-mmm-yyyy

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

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

IERS Earth Orientation predictions end dd-mmm-yyyy

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

No IERS EOP prediction data available

Skyfield then defaults to using the  $\Delta T$  and leap second files that ship with Skyfield internally.

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

### Brief historical overview

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

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

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

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

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

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

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

## January 01, 02, 03 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	100°11.23	142°8.91 \$18°5.69	159°57.01 \$21°39.74	282°9.34 N02°13.83	79°45.09 N05°51.67	
1	115° 13.70	157°8.31 4.76	174°57.41 39.35	297°11.72 13.80	94°47.53 51.69	Alpheratz 357°32.25 29°14.94
2	130° 16.16	172°7.71 3.83	189°57.81 38.96	312°14.09 13.78	109°49.96 51.72	Ankaa 353°4.80 -42°9.38   Schedar 349°28.14 56°41.81
3	$145^{\circ}18.62$	187°7.11 · · 2.90	204°58.21 · · 38.57	327°16.47 · · 13.75	124°52.39 · · 51.74	Diphda 348°44.85 -17°50.02
4	160°21.09	202°6.51 1.97	219°58.61 38.18	342°18.85 13.73	139°54.83 51.77	Achernar 335°18.28 -57°5.89
5	175°23.55	217°5.91 1.04	234°59.02 37.79	357°21.23 13.70	154°57.26 51.79	Hamal 327°48.26 23°35.84
6 7	190°26.02 205°28.48	232°5.31 \$18°0.10 247°4.72 17°59.17	249°59.42 S21°37.40 264°59.82 37.00	12°23.61 N02°13.68 27°25.98 13.66	169°59.69 N05°51.82 185°2.13 51.84	Polaris 312°22.78 89°23.14
8	220° 30.94	262°4.12 58.24	280° 0.23 36.61	42°28.36 13.63	200°4.56 51.87	Acamar 315°9.69 -40°11.70
9	235°33.41	277°3.52 · · 57.30	295° 0.63 · · 36.22	57°30.74 · · 13.61	215°6.99 · · 51.89	Menkar 314°3.37 4°11.99
10	250°35.87	292°2.93 56.37	310°1.03 35.82	72°33.12 13.58	230°9.43 51.92	Mirfak 308°24.32 49°57.81
11	265°38.34	307°2.33 55.43	325°1.44 35.43	87°35.50 13.56	245°11.86 51.94	Aldebaran 290°36.48 16°33.93 Rigel 281°1.18 -8°10.23
12	280° 40.80	322°1.74 \$17°54.49	340°1.84 <b>S</b> 21°35.03	102°37.88 N02°13.54	260°14.29 N05°51.97	Capella 280°17.78 46°1.56
13	295° 43.26	337°1.14 53.55	355°2.24 34.64	117°40.26 13.51	275°16.72 51.99	Bellatrix 278°19.92 6°22.44
14 15	310° 45.73 325° 48.19	352°0.55 52.61 6°59.96 · · 51.67	10°2.65 34.24 25°3.05 · · 33.85	132°42.65 13.49 147°45.03 · · 13.47	290°19.16 52.02 305°21.59 · · 52.04	Elnath 277°58.38 28°37.82
16	340°50.66	21°59.37 50.73	40°3.46 33.45	162°47.41 13.44	320°24.02 52.07	Alnilam 275°34.91 -1°11.12
17	355°53.12	36°58.78 49.79	55°3.86 33.05	177°49.79 13.42	335°26.45 52.10	Betelgeuse 270°49.09 7°24.66
18	10°55.59	51°58.18 S17°48.85	70°4.27 <b>S</b> 21°32.66	192°52.17 N02°13.40	350°28.88 N05°52.12	Canopus 263°50.73 -52°42.69
19	25°58.05	66°57.60 47.91	85°4.67 32.26	207°54.56 13.38	5°31.31 52.15	Sirius 258°23.71 -16°45.36 Adhara 255°3.54 -29°0.67
20	41°0.51	81°57.01 46.96	100° 5.07 31.86	222°56.94 13.35	20°33.74 52.17	Adhara 255°3.54 -29°0.67 Procyon 244°47.94 5°9.06
21	56°2.98	96°56.42 · · 46.02	115° 5.48 · · 31.46	237°59.32 · · 13.33	35°36.17 · · 52.20	Pollux 243°13.95 27°57.33
22	71°5.44	111°55.83 45.07	130° 5.88 31.06	253°1.71 13.31	50°38.60 52.23	Avior 234°13.08 -59°35.90
23	86°7.91	126°55.24 44.12	145°6.29 30.67	268°4.09 13.29	65°41.04 52.25	Suhail 222°44.09 -43°32.70
Mer.p	pass. 17:16	$\nu$ -0.6′ $d$ -0.9′ m-3.98	$ u 0.4' \ d$ -0.4' m1.19	$\nu$ 2.4′ <i>d</i> -0.0′ m-2.12	$ u 2.4' \ d0.0' \ m0.46$	Miaplacidus 221°36.89 -69°49.80
						Alphard 217°45.08 -8°46.90
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.63 11°49.62
0	101° 10.37	141°54.66 \$17°43.18	160°6.70 <b>S</b> 21°30.27	283°6.47 N02°13.26	80°43.47 N05°52.28	Dubhe 193°37.83 61°35.60 Denebola 182°22.39 14°24.72
1	116° 12.83	156°54.07 42.23	175°7.10 29.87	298°8.86 13.24	95°45.90 52.31	Denebola 182°22.39 14°24.72 Gienah 175°41.00 -17°41.86
2	131° 15.30	171°53.48 41.28	190°7.51 29.46	313°11.24 13.22	110°48.33 52.33	Acrux 172°57.19 -63°15.05
3	146° 17.76	186°52.90 · · 40.33	205°7.91 · · 29.06	328°13.63 · · 13.20	125°50.76 · · 52.36	Gacrux 171°48.79 -57°16.01
4	161°20.23	201°52.31 39.38	220°8.32 28.66	343°16.01 13.18	140°53.18 52.39	Alioth 166°10.94 55°48.08
5 6	176°22.69 191°25.15	216°51.73 38.43 231°51.15 \$17°37.47	235°8.72 28.26 250°9.13 \$21°27.86	358°18.40 13.16 13°20.78 N02°13.14	155°55.61 52.41 170°58.04 N05°52.44	Spica 158°19.77 -11°18.48
7	206° 27.62	246°50.57 36.52	265° 9.54 27.46	28°23.17 13.11	186° 0.47 52.47	Alkaid 152°50.28 49°10.07
8	221°30.08	261°49.98 35.57	280° 9.94 27.05	43°25.56 13.09	201°2.90 52.49	Hadar 148°32.67 -60°30.25
9	236° 32.55	276°49.40 · · 34.61	295°10.35 · · 26.65	58°27.94 · · 13.07	216°5.33 · · 52.52	Menkent 147°54.83 -36°30.34 Arcturus 145°45.83 19°2.01
10	251°35.01	291°48.82 33.66	310°10.76 26.24	73°30.33 13.05	231°7.76 52.55	Arcturus 145°45.83 19°2.01 Rigil Kent. 139°37.15 -60°56.84
11	266° 37.48	306°48.24 32.70	325°11.16 25.84	88°32.72 13.03	246° 10.19 52.57	Kochab 137°20.68 74°2.05
12	281°39.94	321°47.66 \$17°31.74	340°11.57 S21°25.44	103°35.11 N02°13.01	261°12.61 N05°52.60	Zuben'ubi 136°53.47 -16°9.46
13	296° 42.40	336°47.09 30.78	355°11.98 25.03	118°37.49 12.99	276°15.04 52.63	Alphecca 126°1.94 26°37.06
14	311°44.87	351°46.51 29.83 6°45.93 · · 28.87	10°12.38 24.62 25°12.79 · · 24.22	133°39.88 12.97 148°42.27 · · 12.95	291°17.47 52.66 306°19.90 · · 52.68	Antares 112°13.13 -26°29.55
15 16	326° 47.33 341° 49.80	6°45.93 · · 28.87 21°45.35       27.91	25°12.79 · · 24.22 40°13.20 23.81	148°42.27 · · 12.95 163°44.66 12.93	306°19.90 · · 52.68 321°22.32 52.71	Atria 107°5.62 -69°4.45
17	356° 52.26	36°44.78 26.94	55°13.61 23.41	178°47.05 12.91	336°24.75 52.74	Sabik 102°0.29 -15°45.51
18	11°54.72	51°44.20 \$17°25.98	70°14.01 <b>S</b> 21°23.00	193°49.44 N02°12.89	351°27.18 N05°52.77	Shaula 96°7.44 -37°7.33 Rasalhague 95°56.61 12°32.37
19	$26^{\circ}57.19$	66°43.63 25.02	85°14.42 22.59	208°51.83 12.87	6°29.61 52.79	Eltanin 90°41.58 51°29.05
20	41°59.65	81°43.05 24.06	100°14.83 22.18	223°54.22 12.85	21°32.03 52.82	Kaus Aust. 83°29.68 -34°22.19
21	57°2.12	96°42.48 · · 23.09	115°15.24 · · 21.77	238°56.61 · · 12.83	36°34.46 · · 52.85	Vega 80°31.99 38°48.59
22	72°4.58	111°41.91 22.13	130°15.65 21.36	253°59.00 12.81	51°36.88 52.88	Nunki 75°45.11 -26°15.65
23	87°7.04	126°41.34 21.16	145°16.06 20.96	269°1.39 12.79	66°39.31 52.90	Altair 61°57.89 8°56.62
Mer.բ	pass. 17:12	$\nu$ -0.6′ $d$ -0.9′ m-3.99	$ u 0.4' \ d$ -0.4' m1.19	$\nu$ 2.4′ <i>d</i> -0.0′ m-2.13	$ u 2.4' \ d0.0' \ m0.46$	Peacock 53°2.49 -56°38.71
						Deneb 49°24.52 45°23.00 Enif 33°36.62 10°0.33
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.62 10°0.33 Al Na'ir 27°30.20 -46°49.62
0	$102^{\circ}9.51$	141°40.77 \$17°20.19	160°16.46 \$21°20.55	284°3.78 N02°12.78	81°41.74 N05°52.93	Fomalhaut 15°12.02 -29°28.50
1	117° 11.97	156°40.19 19.22	175°16.87 20.14	299°6.17 12.76	96°44.16 52.96	Scheat 13°42.95 28°14.31
2	132° 14.44	171°39.62 18.26	190°17.28 19.72	314°8.56 12.74	111°46.59 52.99	Markab 13°27.58 15°21.52
3	147° 16.90 162° 19.36	186°39.06 · · 17.29 201°38.49	205°17.69 · · 19.31 220°18.10 18.90	329°10.96 · · 12.72 344°13.35 12.70	126°49.01 · · 53.02 141°51.44 53.05	Jan 01 Sat SHA Mer.pass
4 5	162° 19.36 177° 21.83	201°38.49 16.32 216°37.92 15.35	220°18.10 18.90 235°18.51 18.49	344°13.35 12.70 359°15.74 12.68	141°51.44 53.05 156°53.86 53.07	Jan 01 Sat         SHA         Mer.pass           Venus         41°57.68         14:32
6	177 21.03 192°24.29	231°37.35 S17°14.37	250°18.92 S21°18.08	14°18.13 N02°12.67	171°56.29 N05°53.10	Mars 59°45.77 13:20
7	207°26.76	246°36.78 13.40	265°19.33 17.67	29°20.53 12.65	186°58.71 53.13	Jupiter 181°58.11 05:11
8	222°29.22	261°36.22 12.43	280°19.74 17.25	44°22.92 12.63	202°1.14 53.16	Saturn 339°33.86 18:38
9	237° 31.68	276°35.65 · · 11.45	295°20.15 · · 16.84	59°25.31 · · 12.61	217°3.56 · · 53.19	Jan 02 Sun SHA Mer.pass
10	252°34.15	291°35.09 10.48	310°20.56 16.42	74°27.71 12.59	232°5.99 53.22	Venus 40°44.29 14:33
11	267°36.61	306°34.52 9.50	325°20.97 16.01	89°30.10 12.58	247°8.41 53.25	Mars 58°56.33 13:19
12 13	282°39.08 297°41.54	321°33.96 \$17°8.53 336°33.40 7.55	340°21.38 S21°15.60 355°21.79 15.18	104°32.50 N02°12.56 119°34.89 12.54	262°10.83 N05°53.27 277°13.26 53.30	Jupiter 181°56.10 05:07
13 14	312° 44.01	351°32.83 6.57	10°22.20 14.76	119°34.89 12.54 134°37.29 12.53	277°13.26 53.30 292°15.68 53.33	Saturn 339°33.10 18:34
15	327° 46.47	6°32.27 · · 5.59	25°22.61 · · 14.35	149°39.68 · · 12.51	307°18.10 · · 53.36	Jan 03 Mon SHA Mer.pass
16	342° 48.93	21°31.71 4.61	40°23.02 13.93	164°42.08 12.49	322°20.53 53.39	Venus 39°31.26 14:34
17	$357^{\circ}51.40$	36°31.15 3.63	55°23.43 13.52	179°44.48 12.47	337°22.95 53.42	Mars 58°6.96 13:19
18	12°53.86	51°30.59 \$17°2.65	70°23.84 <b>S</b> 21°13.10	194°46.87 N02°12.46	352°25.37 N05°53.45	Jupiter 181°54.27 05:03
19	27°56.33	66°30.03 1.67	85°24.25 12.68	209°49.27 12.44	7°27.80 53.48	Saturn 339°32.23 18:30
20	42°58.79	81°29.47 17°0.69	100°24.67 12.26	224°51.67 12.43	22°30.22 53.51	Horizontal parallax
21 22	58°1.25 73°3.72	96°28.91 16°59.70 111°28.36 58.72	115°25.08 · · 11.84 130°25.49 · · 11.43	239°54.07 · · 12.41 254°56.46	37°32.64 · · 53.54 52°35.06 53.57	Venus: 0.1
23	73 3.72 88°6.18	111 26.30 56.72 126°27.80 57.73	145°25.90 11.01	269°58.86 12.38	67°37.48 53.60	Mars: 0.1
			-			
ivier.p	pass. 17:09	$\nu$ -0.6′ <i>d</i> -1.0′ m-3.99	$ u 0.4' \ d$ -0.4' m1.19	$\nu$ 2.4′ <i>d</i> -0.0′ m-2.13	$ u 2.4' \ d0.0' \ m0.47$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°13.51	\$23°3.25	$132^{\circ}59.96$	16.1'	<b>S</b> 11°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°12.91 224°12.61	2.87 • • 2.67	162° 10.15 176° 45.31	16.2' 16.2'	10°36.14 10°23.85	-12.3' -12.3'	54.0' 54.0'
4	239°12.32	2.48	191°20.50	16.2'	10° 25.65 10° 11.52	-12.4'	54.0'
5	254°12.02	2.28	$205^{\circ}55.73$	16.3'	$09^{\circ}59.16$	-12.4'	54.0'
6	269°11.72	S23°2.08	220°31.00	16.3'	509°46.76	-12.4'	54.0'
7 8	284°11.42 299°11.13	1.88 1.69	235°6.30 249°41.64	16.3' 16.4'	09°34.32 09°21.85	-12.5' -12.5'	54.0' 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°10.24 359°9.94	1.08 <b>S</b> 23°0.88	293°27.86 308°3.33	16.5'	08°44.25 \$08°31.65	-12.6'	54.0'
12 13	359 9.94 14°9.65	0.68	308 3.33 322°38.83	16.5' 16.5'	08° 19.01	-12.6' -12.7'	54.0' 54.0'
14	29°9.35	0.48	337° 14.36	16.6'	08°6.35	-12.7'	54.0'
15	44°9.05	• • 0.27	351°49.91	16.6'	07°53.66	-12.7'	54.0'
16 17	59°8.76 74°8.46	23°0.07 22°59.86	6°25.50 21°1.11	16.6' 16.6'	07°40.94 07°28.19	-12.7' -12.8'	54.0' 54.0'
18	89°8.17	\$22°59.65	35°36.75	16.7	S07° 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 22	134°7.28 149°6.99	· · 59.03 58.82	79°23.80 93°59.53	16.7' 16.7'	06°36.93 06°24.05	-12.9' -12.9'	54.0' 54.0'
23	149 6.99 164°6.69	58.62 58.61	93 59.53 108°35.28	16.7	06 24.05 06°11.15	-12.9' -12.9'	54.0'
	SD = 16.3'	d = -0.2'			D = 14.7'	-	
		<u> </u>		JI	17.1		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°6.40 194°6.10	\$22°58.40 58.18	123°11.04 137°46.83	16.8' 16.8'	\$05°58.23 05°45.28	-12.9' -13.0'	54.0' 54.0'
2	194 ° 6.10 209° 5.81	58.18 57.97	137° 46.83 152° 22.64	16.8	05°45.28 05°32.31	-13.0' -13.0'	54.0'
3	224°5.52	• • 57.76	166° 58.46	16.8'	05° 19.31	-13.0'	54.1'
4	239°5.22	57.54	181°34.29	16.8'	05°6.30	-13.0'	54.1'
5 6	254°4.93 269°4.64	57.33 \$22° 57.11	196° 10.14 210° 46.00	16.9' 16.9'	04°53.27 \$04°40.21	-13.1' -13.1'	54.1' 54.1'
7	284°4.34	56.89	225° 21.88	16.9'	04°27.14	-13.1'	54.1'
8	299°4.05	56.67	239°57.77	16.9'	04°14.05	-13.1'	54.1'
9	314°3.76	• • 56.46	254°33.66	16.9'	04°0.94	-13.1'	54.1'
10 11	329°3.46 344°3.17	56.24 56.02	269° 9.57 283° 45.48	16.9' 16.9'	03°47.82 03°34.67	-13.1' -13.2'	54.1' 54.1'
12	359°2.88	50.02 522°55.80	298°21.40	16.9	503°21.52	-13.2'	54.1
13	14°2.58	55.57	$312^{\circ}57.33$	16.9'	03°8.35	-13.2'	54.1'
14	29°2.29	55.35	327°33.26	16.9'	02°55.16 02°41.96	-13.2'	54.1'
15 16	44°2.00 59°1.71	· · 55.13 54.90	342°9.20 356°45.14	16.9' 16.9'	02°41.96 02°28.75	-13.2' -13.2'	54.1' 54.1'
17	74°1.42	54.68	11°21.08	16.9'	02°15.52	-13.2	54.2'
18	89°1.12	\$22°54.45	25°57.02	16.9'	S02°2.28	-13.2'	54.2'
19 20	104°0.83 119°0.54	54.23 54.00	40°32.96 55°8.90	16.9' 16.9'	01°49.03 01°35.77	-13.3'	54.2' 54.2'
21	134°0.25	• • 53.77	69°44.83	16.9'	01°33.77	-13.3'	54.2'
22	148°59.96	53.54	84°20.76	16.9'	01°9.22	-13.3'	54.2'
23	163°59.67	53.31	98°56.69	16.9'	00°55.94	-13.3'	54.2'
	SD = 16.3'	d = -0.2'		SI	O = 14.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	178°59.38	\$22°53.08	113°32.61	16.9'	S00° 42.64	-13.3'	54.2'
1	193°59.09	52.85	128°8.53	16.9'	00°29.34	-13.3'	54.2'
2	208°58.80 223°58.51	52.62 •• 52.38	142°44.43 157°20.33	16.9' 16.9'	00°16.03 500°2.71	-13.3' -13.3'	54.3' 54.3'
3 4	238°58.22	52.38	157 20.33 171°56.22	16.9'	N00° 10.61	-13.3'	54.3'
5	253°57.93	51.92	186°32.09	16.9'	00°23.94	13.3'	54.3'
6	268°57.64	\$22°51.68	201°7.96	16.8'	N00°37.27	13.3'	54.3'
7 8	283°57.35 298°57.06	51.44 51.21	215° 43.81 230° 19.64	16.8' 16.8'	00°50.60 01°3.94	13.3' 13.3'	54.3' 54.3'
9	313°56.77	50.97	244°55.46	16.8	01° 17.28	13.3'	54.3
10	328°56.48	50.73	259°31.26	16.8'	01°30.62	13.3'	54.4'
11 12	343°56.19 358°55.90	50.49 \$22° 50.25	274°7.04 288°42.81	16.8' 16.7'	01°43.96 N01°57.30	13.3' 13.3'	54.4' 54.4'
13	358°55.90 13°55.61	50.25	288° 42.81 303° 18.55	16.7'	02° 10.64	13.3'	54.4' 54.4'
14	28°55.32	49.77	317° 54.27	16.7'	02°23.98	13.3'	54.4'
15	43°55.04	• • 49.53	332°29.97	16.7'	02°37.32	13.3'	54.4'
16 17	58°54.75 73°54.46	49.28 49.04	347°5.65 1°41.30	16.7' 16.6'	02°50.66 03°3.99	13.3' 13.3'	54.5' 54.5'
18	73°54.46 88°54.17	49.04 \$22°48.80	1° 41.30 16° 16.92	16.6'	N03° 17.32	13.3'	54.5'
19	103°53.89	48.55	30°52.52	16.6'	03°30.65	13.3'	54.5'
20	118°53.60	48.30	45°28.09	16.5'	03°43.97	13.3'	54.5'
21 22	133°53.31 148°53.02	· · 48.06 47.81	60°3.62 74°39.13	16.5' 16.5'	03°57.29 04°10.59	13.3' 13.3'	54.5' 54.6'
23	148 53.02 163°52.74	47.81 47.56	74 39.13 89°14.61	16.5 16.4'	04 10.59 04°23.90	13.3'	54.6'
_	SD = 16.3'	d = -0.2'			O = 14.8'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-31%	
01	03:06	03:20	12:03	15:34	03:13		
02	03:34	03:48	12:04	16:13	03:54		
03	04:02	04:16	12:04	16:53	04:33		

# January 04, 05, 06 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	103°8.65	141°27.24 \$16°56.75	160°26.31 \$21°10.59	285°1.26 N02°12.36	82°39.90 N05°53.63	
1	118° 11.11	156°26.69 55.76	175°26.73 10.17	300°3.66 12.35	97°42.33 53.66	Alpheratz 357°32.26 29°14.93
2	133° 13.57	171°26.13 54.77	190°27.14 9.75	315°6.06 12.33	112°44.75 53.69	Ankaa 353°4.82 -42°9.38
3	148°16.04	186°25.58 · · 53.78	205°27.55 · · 9.32	330°8.46 · · 12.32	127° 47.17 · · · 53.72	Schedar 349°28.16 56°41.81 Diphda 348°44.86 -17°50.03
4	$163^{\circ}18.50$	201°25.03 52.79	220°27.96 8.90	345°10.86 12.30	142°49.59 53.75	Achernar 335°18.31 -57°5.90
5	178°20.97	216°24.47 51.81	235°28.38 8.48	0°13.26 12.29	157°52.01 53.78	Hamal 327°48.27 23°35.83
6	193°23.43	231°23.92 S16°50.81	250°28.79 S21°8.06	15°15.66 N02°12.27	172°54.43 N05°53.81	Polaris 312°23.97 89°23.15
7	208°25.89	246°23.37 49.82	265°29.20 7.64	30°18.06 12.26	187° 56.85 53.84	Acamar 315°9.70 -40°11.71
8 9	223°28.36 238°30.82	261°22.82 48.83 276°22.27 • 47.84	280°29.61 7.21 295°30.03 · · 6.79	45°20.46 12.24 60°22.86 · 12.23	202°59.27 53.87 218°1.69 · · 53.90	Menkar 314°3.38 4°11.99
10	250° 30.02 253° 33.29	291°21.72 46.84	310°30.44 6.37	75°25.26 12.21	218°1.69 · · 53.90 233°4.11 53.93	Mirfak 308°24.34 49°57.81
11	268° 35.75	306°21.17 45.85	325°30.85 5.94	90°27.66 12.20	248°6.53 53.96	Aldebaran 290°36.49 16°33.92
12	283°38.21	321°20.62 \$16°44.85	340°31.27 S21°5.52	105°30.06 N02°12.18	263°8.95 N05°53.99	Rigel 281°1.19 -8°10.24
13	298° 40.68	336°20.07 43.86	355°31.68 5.09	120°32.47 12.17	278°11.37 54.02	Capella 280°17.79 46°1.56
14	313°43.14	351°19.53 42.86	10°32.10 4.67	135°34.87 12.16	293°13.79 54.05	Bellatrix 278°19.92 6°22.43 Elnath 277°58.39 28°37.82
15	328°45.61	6°18.98 · · 41.86	25°32.51 · · 4.24	150°37.27 · · 12.14	308°16.21 · · 54.08	Elnath 277°58.39 28°37.82 Alnilam 275°34.91 -1°11.12
16	343°48.07	21°18.43 40.87	40°32.93 3.81	165°39.68 12.13	323°18.63 54.11	Betelgeuse 270°49.09 7°24.65
17	358° 50.54	36°17.89 39.87	55°33.34 3.39	180°42.08 12.11	338°21.05 54.14	Canopus 263°50.74 -52°42.70
18	13°53.00	51°17.34 \$16°38.87	70°33.75 S21°2.96	195°44.48 N02°12.10	353°23.46 N05°54.17	Sirius 258°23.71 -16°45.38
19	28° 55.46	66°16.80 37.87	85°34.17 2.53	210°46.89 12.09	8°25.88 54.21	Adhara 255°3.54 -29°0.69
20	43°57.93	81°16.26 36.87	100°34.58 2.10	225°49.29 12.08	23°28.30 54.24	Procyon 244°47.93 5°9.05
21 22	59°0.39 74°2.86	96°15.71 · · 35.86 111°15.17 34.86	115°35.00 · · 1.68 130°35.41 1.25	240°51.70 · · 12.06 255°54.10 12.05	38°30.72 · · 54.27 53°33.14 54.30	Pollux 243°13.94 27°57.33
23	74°2.86 89°5.32	111°15.17 34.86 126°14.63 33.86	130°35.41 1.25 145°35.83 0.82	255°54.10 12.05 270°56.51 12.04	53°33.14 54.30 68°35.55 54.33	Avior 234°13.07 -59°35.91
					-	Suhail 222°44.08 -43°32.71
Mer.p	pass. 17:05	$\nu$ -0.6' d-1.0' m-3.99	$ u 0.4' \ d$ -0.4' m1.18	$\nu 2.4' \ d$ -0.0' m-2.14	$\nu 2.4' \ d0.0' \ m0.47$	Miaplacidus 221°36.86 -69°49.82
						Alphard 217°45.07 -8°46.91
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.61 11°49.62
0	104°7.78	141°14.09 \$16°32.85	160°36.25 <b>S</b> 21°0.39	285°58.91 N02°12.02	83°37.97 N05°54.36	Dubhe 193°37.80 61°35.60 Denebola 182°22.37 14°24.71
1	$119^{\circ}10.25$	156° 13.55 31.85	175°36.66 20°59.96	301°1.32 12.01	98°40.39 54.39	Gienah 175°40.98 -17°41.87
2	134° 12.71	171°13.01 30.84	190°37.08 20°59.53	316°3.72 12.00	113°42.80 54.42	Acrux 172°57.15 -63°15.05
3	149° 15.18	186°12.47 · · 29.84	205°37.49 · · 59.10	331°6.13 · · 11.99	128° 45.22 · · 54.46	Gacrux 171°48.76 -57°16.02
4 5	164° 17.64 179° 20.10	201°11.93 28.83 216°11.40 27.82	220°37.91 58.67 235°38.33 58.23	346°8.54 11.97 1°10.95 11.96	143°47.64 54.49 158°50.05 54.52	Alioth 166°10.91 55°48.08
6	179 20.10 194°22.57	231°10.86 \$16°26.81	235°38.33 58.23 250°38.74 \$20°57.80	1°10.95 11.96 16°13.35 N02°11.95	158°50.05 54.52 173°52.47 N05°54.55	Spica 158°19.75 -11°18.48
7	209°25.03	246°10.32 25.80	265°39.16 57.37	31°15.76 11.94	188°54.89 54.58	Alkaid 152°50.25 49°10.06
8	224°27.50	261°9.79 24.79	280°39.58 56.94	46°18.17 11.93	203° 57.30 54.62	Hadar 148°32.63 -60°30.25
9	239°29.96	276°9.25 · · 23.78	295°39.99 · · 56.50	61°20.58 · · 11.92	218° 59.72 · · 54.65	Menkent 147°54.81 -36°30.34 Arcturus 145°45.81 19°2.00
10	254°32.42	291°8.72 22.77	310°40.41 56.07	76°22.99 11.91	234°2.13 54.68	Rigil Kent. 139°37.12 -60°56.84
11	269°34.89	306°8.18 21.76	325°40.83 55.64	91°25.39 11.89	249°4.55 54.71	Kochab 137°20.62 74°2.04
12	284° 37.35	321°7.65 \$16°20.74	340°41.24 \$20°55.20	106°27.80 N02°11.88	264°6.96 N05°54.74	Zuben'ubi 136°53.46 -16°9.46
13	299°39.82	336°7.12 19.73	355°41.66 54.77	121°30.21 11.87	279°9.38 54.78	Alphecca 126°1.93 26°37.05
14	314° 42.28 329° 44.75	351°6.59 18.71 6°6.06 · · 17.70	10°42.08 54.33 25°42.50 · · 53.89	136°32.62 11.86 151°35.03 · · 11.85	294°11.79 54.81 309°14.21 · · 54.84	Antares 112°13.12 -26°29.55
15 16	344° 47.21	6°6.06 ·· 17.70 21°5.52 16.68	25°42.50 · · 53.89 40°42.92 53.46	151°35.03 ·· 11.85 166°37.44 11.84	309°14.21 · · 54.84 324°16.62 54.87	Atria 107°5.59 -69°4.44
17	359° 49.67	36°5.00 15.66	55°43.33 53.02	181°39.85 11.83	339°19.04 54.91	Sabik 102°0.28 -15°45.52
18	14°52.14	51°4.47	70°43.75 <b>S</b> 20°52.59	196°42.27 N02°11.82	354°21.45 N05°54.94	Shaula 96°7.43 -37°7.33 Rasalhague 95°56.60 12°32.36
19	29°54.60	66°3.94 13.63	85°44.17 52.15	211°44.68 11.81	9°23.87 54.97	Rasalhague 95°56.60 12°32.36 Eltanin 90°41.57 51°29.03
20	44°57.07	81°3.41 12.61	100°44.59 51.71	226°47.09 11.80	24°26.28 55.00	Kaus Aust. 83°29.67 -34°22.18
21	59°59.53	96°2.88 · · 11.59	115°45.01 · · 51.27	241°49.50 · · 11.79	39°28.69 · · 55.04	Vega 80°31.99 38°48.57
22	75°1.99	111°2.35 10.57	130°45.43 50.83	256°51.91 11.78	54°31.11 55.07	Nunki 75°45.10 -26°15.65
23	90°4.46	126°1.83 9.55	145°45.85 50.39	271°54.33 11.77	69°33.52 55.10	Altair 61°57.89 8°56.61
Mer.p	pass. 17:01	ν-0.5' d-1.0' m-4.00	ν0.4' d-0.4' m1.18	ν2.4' d-0.0' m-2.15	ν2.4' d0.0' m0.48	Peacock 53°2.49 -56°38.70
						Deneb 49°24.52 45°22.99
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.63 10°0.32
0	105°6.92	141°1.30 \$16°8.52	160°46.26 \$20°49.95	286°56.74 N02°11.76	84°35.93 N05°55.14	Al Na'ir 27°30.22 -46°49.61
1	120°9.39	156°0.78 7.50	175°46.68 49.51	301°59.15 11.75	99°38.35 55.17	Fomalhaut 15°12.03 -29°28.50 Scheat 13°42.96 28°14.31
2	135° 11.85	171°0.25 6.48	190°47.10 49.07	317°1.57 11.74	114°40.76 55.20	Markab 13°27.59 15°21.51
3	$150^{\circ}14.31$	185°59.73 · · 5.45	205°47.52 · · 48.63	332°3.98 · · 11.73	129°43.17 · · 55.24	
4	165°16.78	200°59.21 4.43	220°47.94 48.19	347°6.39 11.72	144°45.58 55.27	Jan 04 Tue SHA Mer.pass
5	180° 19.24	215°58.68 3.40	235°48.36 47.75	2°8.81 11.72	159°48.00 55.30	Venus 38° 18.60 14:35
6	195°21.71	230°58.16 \$16°2.38	250°48.78 \$20°47.31	17°11.22 N02°11.71	174°50.41 N05°55.34	Mars 57°17.67 13:18
7	210°24.17	245°57.64 1.35	265°49.20 46.87	32°13.64 11.70	189°52.82 55.37	Jupiter 181°52.61 04:59 Saturn 339°31.26 18:26
8 9	225°26.64 240°29.10	260°57.12 16°0.32 275°56.60 15°59.29	280°49.62 46.43 295°50.04 • 45.98	47°16.05 11.69 62°18.47 •• 11.68	204°55.23 55.40 219°57.64 • 55.44	
10	255°31.56	290°56.08 58.26	310°50.47 45.54	77°20.88 11.67	235°0.05 55.47	Jan 05 Wed SHA Mer.pass
11	270°34.03	305°55.56 57.23	325°50.89 45.09	92°23.30 11.67	250°2.47 55.51	Venus 37°6.31 14:36
12	285°36.49	320°55.05 \$15°56.20	340°51.31 \$20°44.65	107°25.72 N02°11.66	265°4.88 N05°55.54	Mars 56°28.46 13:17 Jupiter 181°51.13 04:55
13	300°38.96	335°54.53 55.17	355°51.73 44.21	122°28.13 11.65	280°7.29 55.57	Jupiter 181°51.13 04:55 Saturn 339°30.19 18:23
14	315°41.42	350°54.01 54.14	10°52.15 43.76	137°30.55 11.64	295°9.70 55.61	
15	330° 43.88	5°53.50 · · 53.10	25°52.57 · · 43.32	152°32.97 · · 11.63	310°12.11 · · 55.64	Jan 06 Thu SHA Mer.pass
16	345° 46.35	20°52.98 52.07	40°52.99 42.87	167°35.39 11.63	325°14.52 55.68	Venus 35°54.38 14:36
17 18	0° 48.81 15° 51.28	35°52.47 51.04 50°51.95 \$15°50.00	55°53.41 42.42 70°53.84 \$20°41.98	182°37.80 11.62 197°40.22 N02°11.61	340°16.93 55.71 355°19.34 N05°55.74	Mars 55°39.34 13:17
19	30°53.74	65°51.44 48.96	85°54.26 41.53	212°42.64 11.61	10° 21.75 55.78	Jupiter 181°49.82 04:51 Saturn 339°29.01 18:19
20	45° 56.20	80°50.92 47.93	100°54.68 41.08	227°45.06 11.60	25°24.16 55.81	
21	$60^{\circ}58.67$	95°50.41 · · 46.89	115°55.10 · · 40.63	242°47.48 · · 11.59	40°26.57 · · 55.85	Horizontal parallax
22	76°1.13	110°49.90 45.85	130°55.53 40.19	257°49.90 11.59	55°28.98 55.88	Venus: 0.1
23	91°3.60	125°49.39 44.81	145°55.95 39.74	272°52.32 11.58	70°31.39 55.92	Mars: 0.1
Mer.p	pass. 16:57	ν-0.5' d-1.0' m-4.00	ν0.4' d-0.4' m1.18	ν2.4' d-0.0' m-2.15	ν2.4' d0.0' m0.48	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.45	S22°47.31	$103^{\circ}50.05$	16.4'	N04°37.19	13.3'	54.6'
1	193°52.16	47.06	118°25.46	16.4'	04°50.48	13.3'	54.6'
2	208°51.88 223°51.59	46.81 •• 46.56	133°0.83 147°36.17	16.3' 16.3'	05°3.75 05°17.02	13.3' 13.3'	54.6' 54.7'
4	238°51.30	46.30	162°11.47	16.3'	05°30.27	13.2'	54.7'
5	253°51.02	46.05	$176^{\circ}46.73$	16.2'	$05^{\circ}43.52$	13.2'	54.7'
6	268°50.73	S22°45.80	191°21.95	16.2'	N05°56.75	13.2'	54.7'
7 8	283°50.45 298°50.16	45.54 45.29	205°57.13 220°32.26	16.1' 16.1'	06°9.97 06°23.17	13.2' 13.2'	54.7' 54.8'
9	313°49.88	• • 45.03	235°7.35	16.0'	06°36.37	13.2'	54.8'
10	328°49.59	44.77	249°42.40	16.0'	06°49.54	13.2'	54.8'
11	343°49.31 358°49.02	44.51	264°17.40	16.0'	07°2.70	13.1'	54.8'
12 13	358 49.02 13°48.74	\$22°44.26 44.00	278°52.36 293°27.26	15.9' 15.9'	N07°15.85 07°28.97	13.1' 13.1'	54.8' 54.9'
14	28°48.46	43.74	308°2.12	15.8'	07°42.08	13.1	54.9'
15	43°48.17	• • 43.47	322°36.93	15.8'	07°55.17	13.1'	54.9'
16	58°47.89	43.21	337°11.68 351°46.38	15.7'	08°8.24 08°21.29	13.0'	54.9'
17 18	73°47.60 88°47.32	42.95 \$22°42.69	6°21.02	15.6' 15.6'	N08°34.32	13.0' 13.0'	55.0' 55.0'
19	103°47.04	42.42	20°55.62	15.5'	08°47.33	13.0'	55.0'
20	118°46.75	42.16	$35^{\circ}30.15$	15.5'	$09^{\circ}0.31$	13.0'	55.0'
21	133°46.47	• • 41.89	50°4.62	15.4'	09°13.27	12.9'	55.0'
22 23	148°46.19 163°45.91	41.62 41.36	64°39.04 79°13.40	15.4' 15.3'	09°26.20 09°39.11	12.9' 12.9'	55.1' 55.1'
23	SD = 16.3'	d = -0.3'			09 39.11 0 = 14.9'	14.3	55.1
	3D = 10.3'	u = -0.3		)L	J — 14.9°		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°45.62	S22°41.09	93°47.69	15.2'	N09°52.00	12.9'	55.1'
1 2	193°45.34 208°45.06	40.82 40.55	108°21.92 122°56.09	15.2' 15.1'	10°4.85 10°17.68	12.8' 12.8'	55.1' 55.2'
3	206 45.00 223°44.78	· · 40.28	137°30.19	15.1	10 17.08 10°30.48	12.8	55.2'
4	238°44.50	40.01	152°4.23	15.0'	10°43.25	12.7'	55.2'
5	253°44.21	39.73	166°38.20	14.9'	10°55.98	12.7'	55.3'
6 7	268°43.93 283°43.65	\$22°39.46 39.19	181°12.10 195°45.93	14.8' 14.8'	N11°8.69 11°21.36	12.7' 12.6'	55.3' 55.3'
8	298°43.37	38.91	210°19.69	14.7	11 21.30 11°34.00	12.6'	55.3'
9	313°43.09	• • 38.64	224°53.38	14.6'	11°46.61	12.6'	55.4'
10	328°42.81	38.36	239°26.99	14.5'	11°59.18	12.5'	55.4'
11 12	343°42.53 358°42.25	38.09 \$22°37.81	254°0.53 268°34.00	14.5' 14.4'	12°11.72 N12°24.21	12.5' 12.5'	55.4' 55.4'
13	13°41.97	37.53	283°7.38	14.4	12°36.67	12.5	55.5'
14	28°41.69	37.25	297°40.69	14.2'	12°49.09	12.4'	55.5'
15	43°41.41	• • 36.97	312°13.92	14.1'	13°1.47	12.3'	55.5'
16 17	58°41.13 73°40.85	36.69 36.41	326°47.07 341°20.14	14.1' 14.0'	13°13.80 13°26.10	12.3' 12.3'	55.6' 55.6'
18	88°40.57	50.41 \$22°36.13	355°53.12	13.9'	N13°38.35	12.3	55.6'
19	103°40.30	35.84	10°26.02	13.8'	13°50.56	12.2'	55.7'
20	118°40.02	35.56	24°58.84		14°2.72		55.7'
21 22	133°39.74 148°39.46	· · 35.27 34.99	39°31.57 54°4.21	13.6' 13.6'	14°14.83 14°26.90	12.1' 12.0'	55.7' 55.7'
23	163°39.18	34.99 34.70	68°36.77	13.5'	14°20.90 14°38.92	12.0'	55.8'
	SD = 16.3'	d = -0.3'			0 = 15.0'		
	JD — 10.3	u — -0.3		JL			
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°38.91	\$22°34.42	83°9.23	13.4'	N14°50.89	11.9'	55.8'
1 2	193°38.63 208°38.35	34.13 33.84	97°41.61 112°13.89	13.3' 13.2'	15°2.80 15°14.67	11.9' 11.8'	55.8' 55.9'
3	223°38.07	• • 33.55	126°46.08	13.1'	15°26.48	11.8'	55.9'
4	238°37.80	33.26	141°18.18	13.0'	15°38.24	11.7'	55.9'
5 6	253°37.52 268°37.24	32.97 \$22°32.68	155°50.18 170°22.09	12.9' 12.8'	15°49.94 N16°1.58	11.6' 11.6'	56.0' 56.0'
о 7	268° 37.24 283° 36.97	32.39	170°22.09 184°53.90	12.8	16°13.17	11.5	56.0'
8	298°36.69	32.09	199°25.61	12.6'	16°24.69	11.5'	56.1
9	313°36.42	• • 31.80	213°57.22	12.5'	16°36.16	11.4'	56.1
10 11	328°36.14 343°35.87	31.50 31.21	228°28.74 243°0.15	12.4' 12.3'	16°47.56 16°58.91	11.3' 11.3'	56.1' 56.2'
11	343°35.87 358°35.59	31.21 \$22°30.91	243°0.15 257°31.46	12.3'	N17°10.18	11.3	56.2'
13	13°35.31	30.62	272°2.67	12.1'	$17^{\circ}21.39$	11.1'	56.2'
14	28°35.04	30.32	286°33.77	12.0'	17°32.54	11.1'	56.3'
15 16	43°34.77 58°34.49	· · 30.02 29.72	301°4.77 315°35.66	11.9' 11.8'	17°43.61 17°54.62	11.0' 10.9'	56.3' 56.3'
16 17	73°34.49	29.72 29.42	315°35.66 330°6.45	11.8	17°54.62 18°5.56	10.9	56.4
18	88°33.94	S22°29.12	344°37.13	11.6'	N18°16.42	10.8	56.4'
19	103°33.67	28.82	359°7.70	11.5'	18°27.21	10.7'	56.5
20 21	118°33.40 133°33.12	28.52 •• 28.21	13°38.16 28°8.52	11.4' 11.2'	18°37.92 18°48.56	10.6' 10.6'	56.5' 56.5'
21	133°33.12 148°32.85	27.91	28°8.52 42°38.76	11.2	18°48.56 18°59.12	10.6'	56.6'
23	163°32.58	27.60	57°8.89	11.0'	19°9.60	10.4	56.6'
	SD = 16.3'	d = -0.3'		SE	0 = 15.2'		
					-		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-59%	
04	04:30	04:44	12:05	17:34	05:13		
05	04:58	05:11	12:05	18:17	05:55		
06	05:24	05:38	12:06	19:04	06:40		

# January 07, 08, 09 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	106° 6.06	140°48.88 \$15°43.77	160°56.37 \$20°39.29	287°54.74 N02°11.57	85°33.79 N05°55.95		
1	121°8.53	155°48.37 42.73	175°56.79 38.84	302°57.16 11.57	100°36.20 55.99		29°14.93
2	136° 10.99	170°47.86 41.69	190°57.22 38.39	317°59.58 11.56	115°38.61 56.02	l .	-42°9.38
3	151° 13.45	185° 47.35 · · 40.65	205°57.64 · · 37.94	333°2.00 · · 11.56	130°41.02 · · 56.06		56°41.80
4	166° 15.92	200°46.84 39.61	220°58.07 37.49	348°4.42 11.55	145°43.43 56.09		17°50.03
5	181° 18.38	215°46.34 38.57	235°58.49 37.04	3°6.85 11.54	160°45.84 56.13		-57°5.90
6	196° 20.85	230°45.83 <b>S</b> 15°37.52	250°58.91 <b>S</b> 20°36.59	18°9.27 N02°11.54	175°48.24 N05°56.16	1	23°35.83
7	211°23.31	245°45.32 36.48	265°59.34 36.13	33°11.69 11.53	190° 50.65 56.20		89°23.16
8	226°25.77	260°44.82 35.43	280°59.76 35.68	48°14.11 11.53	205°53.06 56.23	_	40°11.72 4°11.98
9	241°28.24	275°44.31 · · 34.39	296°0.19 · · 35.23	63°16.53 · · 11.52	220°55.47 · · 56.27		4 11.96 49°57.81
10	256° 30.70	290°43.81 33.34	311°0.61 34.78	78°18.96 11.52	235° 57.87 56.30		16°33.92
11	271°33.17	305°43.31 32.29	326°1.03 34.32	93°21.38 11.51	251°0.28 56.34		-8°10.25
12	286° 35.63	320°42.80 \$15°31.25	341°1.46	108°23.81 N02°11.51	266°2.69 N05°56.38	Capella 280°17.79	46° 1.57
13	301°38.10	335°42.30 30.20	356°1.88 33.41	123°26.23 11.50	281°5.09 56.41	Bellatrix 278°19.92	6°22.43
14	316° 40.56	350°41.80 29.15	11°2.31 32.96	138°28.65 11.50	296°7.50 56.45		28°37.82
15	331°43.02	5°41.30 · · 28.10	26° 2.73 · · 32.50	153°31.08 · · 11.49	311°9.91 · · 56.48	Alnilam 275°34.91	-1°11.13
16 17	346° 45.49 1° 47.95	20°40.80 27.05 35°40.30 26.00	41°3.16 32.05 56°3.59 31.59	168°33.50 11.49 183°35.93 11.49	326°12.31 56.52 341°14.72 56.55	Betelgeuse 270°49.09	$7^{\circ}24.64$
18	1 47.95 16°50.42	50°39.80 S15°24.94	71°4.01 S20°31.14	198°38.35 N02°11.48	356°17.12 N05°56.59	Canopus 263°50.74 -5	52°42.72
19	31° 52.88	65°39.30 23.89	86° 4.44 30.68	213°40.78 11.48	11°19.53 56.63		16°45.39
20	46° 55.34	80°38.80 22.84	101°4.86 30.22	228°43.21 11.47	26°21.93 56.66		-29°0.70
21	61°57.81	95°38.31 · · 21.78	116° 5.29 · · 29.77	243°45.63 · · 11.47	41°24.34 · · 56.70	Procyon 244°47.92	5°9.04
22	77°0.27	110°37.81 20.73	131°5.72 29.31	258°48.06 11.47	56°26.74 56.74		27°57.33
23	92°2.74	125°37.31 19.67	146°6.14 28.85	273°50.49 11.46	71°29.15 56.77		59°35.93
						1	43°32.73
Mer.	pass. 16:53	ν-0.5' d-1.0' m-4.00	ν0.4' d-0.4' m1.18	ν2.4' d-0.0' m-2.16	ν2.4' d0.0' m0.48		69°49.84
							-8°46.92
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	1	11°49.61 61°35.60
0	107°5.20	140°36.82 \$15°18.62	161°6.57 <b>S</b> 20°28.39	288°52.91 N02°11.46	86°31.55 N05°56.81	l .	14°24.71
1	122°7.67	155°36.32 17.56	176°7.00 27.93	303°55.34 11.46	101°33.96 56.84		17°41.88
2	$137^{\circ}10.13$	170°35.83 16.50	191°7.42 27.47	318°57.77 11.46	116°36.36 56.88		63°15.06
3	$152^{\circ}12.59$	185°35.34 · · 15.44	206°7.85 · · 27.01	334°0.20 · · 11.45	131°38.77 · · 56.92		57°16.03
4	$167^{\circ}15.06$	200°34.84 14.38	221°8.28 26.55	349°2.63 11.45	146°41.17 56.95		55°48.07
5	182° 17.52	215°34.35 13.32	236° 8.71 26.09	4°5.06 11.45	161°43.57 56.99	1	11°18.49
6	197° 19.99	230°33.86 \$15°12.26	251°9.13 <b>S</b> 20°25.63	19°7.49 N02°11.44	176°45.98 N05°57.03		49°10.05
7	212°22.45	245°33.37 11.20	266° 9.56 25.17	34°9.92 11.44	191°48.38 57.07		60°30.25
8	227°24.91	260°32.88 10.14	281°9.99 24.71	49°12.35 11.44	206°50.78 57.10	Menkent 147°54.78 -3	36°30.34
9	242°27.38	275°32.39 · · 9.08	296°10.42 · · 24.25	64°14.78 · · 11.44	221°53.19 · · 57.14	Arcturus 145°45.79	$19^{\circ}1.99$
10	257° 29.84	290°31.90 8.02	311°10.85 23.78	79°17.21 11.44	236°55.59 57.18	Rigil Kent. 139°37.07 -6	60°56.84
11 12	272° 32.31 287° 34.77	305°31.41 6.95 320°30.92 \$15°5.89	326°11.27 23.32 341°11.70 \$20°22.86	94°19.64 11.43 109°22.07 N02°11.43	251°57.99 57.21 267°0.39 N05°57.25	Kochab 137°20.57	74°2.03
13	302° 37.24	335°30.43 4.82	356°12.13 22.39	124°24.50 11.43	282°2.80 57.29	l .	-16°9.47
14	317°39.70	350°29.95 3.76	11°12.56 21.93	139°26.93 11.43	297°5.20 57.33	· ·	26°37.04
15	332°42.16	5°29.46 · · 2.69	26°12.99 · · 21.47	154°29.36 · · 11.43	312°7.60 · · 57.36	l .	26°29.55
16	347° 44.63	20°28.98 1.62	41°13.42 21.00	169°31.80 11.43	327°10.00 57.40		-69°4.43
17	2°47.09	35°28.49 15°0.56	56°13.85 20.54	184°34.23 11.43	342°12.40 57.44		15°45.52
18	17° 49.56	50°28.01 \$14°59.49	71°14.28 <b>S</b> 20°20.07	199°36.66 N02°11.43	357°14.81 N05°57.48	_	-37°7.32
19	32°52.02	65°27.52 58.42	86°14.71 19.60	214°39.09 11.43	12°17.21 57.51		12°32.35 51°29.02
20	47°54.49	80°27.04 57.35	101°15.14 19.14	229°41.53 11.42	27° 19.61 57.55		34°22.18
21	62°56.95	95°26.56 · · 56.28	116°15.57 · · 18.67	244°43.96 · · 11.42	42°22.01 · · 57.59		38°48.56
22	$77^{\circ}59.41$	110°26.08 55.21	131°16.00 18.20	259°46.40 11.42	57°24.41 57.63	_	26°15.64
23	93°1.88	125°25.60 54.14	146°16.43 17.74	274°48.83 11.42	72°26.81 57.67	Altair 61°57.89	8°56.60
Mer	pass. 16:49	ν-0.5' d-1.1' m-4.01	$\nu$ 0.4' d-0.5' m1.17	ν2.4' d-0.0' m-2.17	ν2.4' d0.0' m0.49		56°38.68
	<del></del>	- 0.5 d 1.1 III 1.01					45°22.98
						Enif 33°36.63	$10^{\circ}0.32$
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		46°49.60
0	108°4.34	140°25.11 \$14°53.06	161°16.86 \$20°17.27	289°51.27 N02°11.42	87°29.21 N05°57.70		29°28.50
1 2	123°6.81 138°9.27	155°24.63 51.99 170°24.16 50.92	176°17.29 16.80 191°17.72 16.33	304°53.70 11.42 319°56.14 11.42	102°31.61 57.74 117°34.01 57.78		28°14.30
3	158 9.27 153° 11.73	170 24.16 50.92 185°23.68 · · 49.84	191°17.72 16.33 206°18.15 •• 15.86	334°58.57 · · 11.42	132°36.41 · · 57.82	Markab 13°27.60	15°21.51
4	168° 14.20	200°23.20 48.77	200 18.15 15.80 221°18.58 15.39	350°1.01 11.43	147°38.81 57.86	Jan 07 Fri SHA I	Mer.pass
5	183° 16.66	215°22.72 47.69	236°19.01 14.92	5°3.44 11.43	162°41.21 57.90	Venus 34°42.82	14:37
6	198° 19.13	230°22.24 \$14°46.62	251°19.45 S20°14.45	20°5.88 N02°11.43	177°43.61 N05°57.93	Mars 54°50.31	13:16
7	213°21.59	245°21.77 45.54	266°19.88 13.98	35°8.32 11.43	192°46.01 57.97	Jupiter 181°48.68	04:48
8	228° 24.06	260°21.29 44.46	281°20.31 13.51	50°10.75 11.43	207°48.41 58.01	Saturn 339°27.73	18:15
9	$243^{\circ}26.52$	275°20.82 · · 43.38	296°20.74 · · 13.04	65°13.19 · · 11.43	222°50.81 · · 58.05	lon 00 Set CUA	Mora
10	258°28.98	290°20.34 42.30	311°21.17 12.57	80°15.63 11.43	237°53.21 58.09	Jan 08 Sat SHA I Venus 33°31.62	Mer.pass 14:38
11	273°31.45	305°19.87 41.22	326°21.61 12.09	95°18.07 11.43	252°55.60 58.13	Mars 54°1.37	13:15
12	288° 33.91	320°19.40 \$14°40.14	341°22.04 \$20°11.62	110°20.51 N02°11.43	267°58.00 N05°58.17	Jupiter 181°47.71	04:44
13	303°36.38	335°18.92 39.06	356°22.47 11.15	125°22.94 11.44	283°0.40 58.21	Saturn 339°26.35	18:11
14	318° 38.84	350°18.45 37.98	11°22.90 10.67	140°25.38 11.44	298°2.80 58.24		
15 16	333°41.31	5°17.98 · · 36.90	26°23.34 · · 10.20	155°27.82 · · 11.44	313°5.20 · · 58.28		Mer.pass
16 17	348° 43.77 3° 46.23	20°17.51 35.82 35°17.04 34.73	41°23.77 9.73 56°24.20 9.25	170°30.26 11.44 185°32.70 11.44	328°7.59 58.32 343°9.99 58.36	Venus 32°20.77	14:39
17 18	3°46.23 18°48.70	35°17.04 34.73 50°16.57 \$14°33.65	56°24.20 9.25 71°24.64 \$20°8.78	185°32.70 11.44 200°35.14 N02°11.45	343°9.99 58.36 358°12.39 N05°58.40	Mars 53°12.52	13:14
19	33°51.16	65°16.10 32.56	86°25.07 8.30	215°37.58 11.45	13°14.79 58.44	Jupiter 181°46.92 Saturn 339°24.87	04:40 18:07
20	48° 53.63	80°15.63 31.48	101°25.51 7.83	230°40.02 11.45	28° 17.18 58.48	Jatum 339 24.01	10:07
21	63° 56.09	95°15.17 · · 30.39	116°25.94 · · 7.35	245°42.47 · · 11.45	43°19.58 · · 58.52	Horizontal parallax	
22	78°58.56	110°14.70 29.31	131°26.37 6.87	260°44.91 11.46	58°21.98 58.56	Venus:	0.1
23	94°1.02	125°14.23 28.22	146°26.81 6.40	275°47.35 11.46	73°24.37 58.60	Mars:	0.1
Mer	pass. 16:45	ν-0.5' d-1.1' m-4.01	ν0.4' d-0.5' m1.17	ν2.4' d0.0' m-2.18	ν2.4' d0.0' m0.49		
14161.	P433. 10.73		- U. 1 U U.J IIII.II	UO.O III-2.10	do.o iiio.49		

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.30	S22°27.30	71°38.91	10.9'	$N19^{\circ}20.01$	10.3'	56.6'
1	193°32.03	26.99	86°8.81	10.8'	19°30.32	10.2	56.7'
2	208°31.76 223°31.49	26.69 •• 26.38	100°38.61 115°8.28	10.7' 10.6'	19°40.56 19°50.71	10.2' 10.1'	56.7' 56.7'
4	238°31.22	26.07	129°37.85	10.4	20°0.78	10.1	56.8'
5	253°30.94	25.76	144°7.29	10.3'	20°10.75	9.9'	56.8'
6	268°30.67	S22°25.45	158° 36.63	10.2'	N20°20.64	9.8'	56.9'
7	283°30.40	25.14 24.83	173°5.84	10.1'	20°30.44	9.7'	56.9'
8 9	298°30.13 313°29.86	24.83	187°34.94 202°3.92	10.0' 9.9'	20°40.14 20°49.75	9.6' 9.5'	56.9' 57.0'
10	328°29.59	24.20	216°32.78	9.7'	20°59.26	9.4	57.0'
11	343°29.32	23.89	231°1.53	9.6'	21°8.68	9.3'	57.0'
12	358°29.05	S22°23.57	245°30.15	9.5'	N21°18.00	9.2'	57.1'
13	13°28.78	23.26	259°58.66	9.4'	21°27.22	9.1'	57.1'
14 15	28°28.51 43°28.24	22.94 •• 22.63	274°27.04 288°55.31	9.3' 9.1'	21°36.34 21°45.35	9.0' 8.9'	57.2' 57.2'
16	58°27.97	22.31	303°23.46	9.0'	21°54.26	8.8'	57.2'
17	73°27.70	21.99	$317^{\circ}51.48$	8.9'	$22^{\circ}3.06$	8.7'	57.3'
18	88°27.43	S22°21.67	332°19.39	8.8'	N22°11.76	8.6'	57.3'
19 20	103°27.16 118°26.90	21.35 21.03	346°47.17 1°14.83	8.7' 8.5'	22°20.35 22°28.82	8.5' 8.4'	57.4' 57.4'
21	118 26.90 133°26.63	. 20.71	1 14.83 15°42.38	8.4'	22 28.82 22°37.18	8.4 8.2'	57.4 57.4'
22	148°26.36	20.39	30°9.80	8.3'	22°45.43	8.1'	57.5'
23	163°26.09	20.06	44°37.10	8.2'	22°53.56	8.0'	57.5'
	SD = 16.3'	d = -0.3'		SI	O = 15.4'		
•						,	
Sat 0	<b>GHA</b> 178°25.82	Dec \$22°19.74	<b>GHA</b> 59°4.28	u  8.1'	<b>Dec</b> N23°1.57	d 7.9'	<b>HP</b> 57.6'
1	176 25.62 193°25.56	19.42	73°31.34	7.9'	23°9.47	7.8'	57.6'
2	208°25.29	19.09	87°58.27	7.8'	23°17.24	7.7'	57.6'
3	223°25.02	• • 18.76	102°25.09	7.7'	23°24.89	7.5'	57.7'
4	238°24.76 253°24.49	18.44	116°51.79 131°18.37	7.6'	23°32.41 23°39.81	7.4'	57.7'
5 6	268°24.22	18.11 \$22°17.78	131 18.37 145°44.83	7.5' 7.3'	23 39.81 N23°47.09	7.3' 7.1'	57.8' 57.8'
7	283°23.96	17.45	160°11.17	7.2'	23°54.23	7.0'	57.8'
8	298°23.69	17.12	174°37.39	7.1'	$24^{\circ}1.24$	6.9'	57.9'
9	313°23.43	• • 16.79	189°3.49	7.0'	24°8.12	6.7'	57.9'
10 11	328°23.16 343°22.90	16.46 16.13	203°29.47 217°55.34	6.9' 6.8'	24°14.87 24°21.48	6.6' 6.5'	58.0' 58.0'
12	358°22.63	522°15.80	232°21.09	6.6	N24°27.95	6.3	58.0'
13	13°22.37	15.46	246°46.73	6.5	24°34.28	6.2'	58.1'
14	28°22.10	15.13	261°12.25	6.4'	24°40.48	6.1'	58.1'
15	43°21.84	• • 14.79	275°37.65	6.3'	24°46.53	5.9'	58.2'
16 17	58°21.58 73°21.31	14.46 14.12	290°2.95 304°28.13	6.2' 6.1'	24°52.43 24°58.19	5.8' 5.6'	58.2' 58.2'
18	88°21.05	\$22°13.78	318°53.20	6.0'	N25°3.81	5.5'	58.3'
19	103°20.79	13.45	333°18.16	5.8'	25°9.27	5.3'	58.3'
20	118°20.52	13.11	347°43.01	5.7'	25°14.59	5.2'	58.4'
21 22	133°20.26 148°20.00	· · 12.77 12.43	2°7.75 16°32.38	5.6' 5.5'	25°19.75 25°24.76	5.0' 4.9'	58.4'
23	148 20.00 163°19.74	12.43	30°56.91	5.4'	25 24.76 25°29.62	4.9 4.7'	58.4' 58.5'
	SD = 16.3'	d = -0.3'			O = 15.7'		
	<u> </u>	<del>u = 0.5</del>			J = 13.1		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°19.47 193°19.21	\$22°11.74 11.40	45°21.33 59°45.65	5.3' 5.2'	N25°34.31 25°38.86	4.5' 4.4'	58.5' 58.5'
2	208°18.95	11.40	74°9.87	5.2 5.1'	25°43.24	4.4	58.6'
3	223°18.69	• • 10.71	88°33.99	5.0'	25°47.46	4.1'	58.6'
4	238°18.43	10.37	102°58.01	4.9'	25°51.52	3.9'	58.7'
5	253°18.17 268°17.91	10.02 \$22°9.68	117°21.93 131°45.76	4.8' 4.7'	25°55.41 N25°59.14	3.7'	58.7'
6 7	268°17.91 283°17.65	9.33	131°45.76 146°9.49	4.7° 4.6'	N25°59.14 26°2.70	3.6' 3.4'	58.7' 58.8'
8	298°17.39	8.98	160°33.13	4.6'	26°6.10	3.2'	58.8'
9	313°17.13	• • 8.63	174°56.68	4.5'	26°9.33	3.1'	58.9'
10	328°16.87	8.28	189°20.14	4.4'	26°12.38	2.9'	58.9'
11 12	343°16.61 358°16.35	7.93 \$22°7.58	203°43.52 218°6.81	4.3' 4.2'	26°15.27 N26°17.98	2.7' 2.5'	58.9' 59.0'
13	13°16.09	7.23	218 0.81 232°30.02	4.2 4.1'	26°20.51	2.5 2.4'	59.0'
14	28°15.83	6.88	246°53.14	4.0'	26°22.87	2.2'	59.0'
15	43°15.57	• • 6.52	$261^{\circ}16.19$	4.0'	26°25.06	2.0'	59.1'
16	58°15.31	6.17	275°39.16	3.9'	26°27.07	1.8'	59.1'
17 18	73°15.06 88°14.80	5.82 \$22°5.46	290°2.06 304°24.88	3.8' 3.8'	26°28.89 N26°30.54	1.6' 1.5'	59.2' 59.2'
19	103°14.54	5.10	318°47.64	3.7'	26°32.01	1.3'	59.2'
20	118°14.28	4.75	333°10.32	3.6'	26°33.30	1.1'	59.3'
21	133°14.03	• • 4.39	347°32.94	3.6'	26°34.40	0.9'	59.3'
22 23	148°13.77 163°13.51	4.03 3.67	1°55.50 16°18.00	3.5' 3.4'	26°35.32 26°36.05	0.7' 0.5'	59.3' 59.4'
23	$\frac{163^{\circ}13.51}{\text{SD} = 16.3'}$	d = -0.3'	10 18.00			0.5	J9.4
	JD = 10.3′	$a = -0.3^{\circ}$		51	O = 16.0'		

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

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°	08:55			05:47		
66°	09:39	08:37		05:04	07:57	
64°	10:08	10:00		04:36	06:35	
62°	10:31	10:37	10:56	04:14	05:59	07:42
60°	10:49	11:04	11:34	03:56	05:33	07:05
N 58°	11:04	11:25	12:00	03:42	05:12	06:38
56°	11:17	11:42	12:22	03:29	04:55	06:17
54° 52°	11:29	11:57	12:39	03:19	04:41 04:28	06:00 05:45
52°	11:39 11:48	12:10 12:21	12:54 13:07	03:09 03:01	04:28 04:18	05:45
45°	12:07	12:45	13:34	03:01	03:55	05:32
N 40°	12:23	13:04	13:55	02:42	03:36	04:45
35°	12:23	13:04	14:13	02:26	03:30	04:45
30°	12:48	13:34	14:13	02:15	03:21	04:13
20°	13:08	13:57	14:54	01:46	02:45	03:48
N 10°	13:26	14:18	15:16	01:30	02:26	03:26
0°	13:42	14:37	15:37	01:15	02:08	03:05
S 10°	13:59	14:57	15:58	01:01	01:50	02:45
20°	14:17	15:18	16:21	00:45	01:30	02:23
30°	14:37	15:42	16:47	00:27	01:08	01:58
35°	14:49	15:56	17:03	00:16	00:55	01:43
40°	15:03	16:13	17:21	00:04	00:40	01:26
45°	15:20	16:33	17:42		00:23	01:05
<b>S</b> 50°	15:41	16:58	18:10		00:01	00:40
52°	15:51	17:10	18:24	23:51		00:27
54°	16:02	17:24	18:39	23:39		00:13
56°	16:15	17:41	18:58	23:26	23:56	
58°	16:30	18:00	19:20	23:10	23:36	02.52
<b>S</b> 60°	16:48	18:24	19:49	22:52	23:11	23:53

		Sun			Moon		
Day		Eqn.of Time		Mer.	Mer.Pass.		Age
Luy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	69-87%
	07	05:51	06:04	12:06	19:55	07:29	
	80	06:17	06:29	12:06	20:51	08:22	
	09	06:42	06:55	12:07	21:52	09:21	

# January 10, 11, 12 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	109°3.48	140°13.77 \$14°27.13	161°27.24 \$20°5.92	290°49.79 N02°11.46	88°26.77 N05°58.64	
1	124°5.95	155°13.30 26.04	176°27.68 5.44	305°52.23 11.47	103°29.16 58.68	Alpheratz 357°32.28 29°14.93 Ankaa 353°4.85 -42°9.38
2	139°8.41	170°12.84 24.95	191°28.11 4.96	320°54.68 11.47	118°31.56 58.72	Schedar 349°28.20 56°41.80
3	154° 10.88	185°12.37 · · 23.86	206°28.55 · · 4.48	335°57.12 · · 11.47	133°33.96 · · 58.76	Diphda 348°44.88 -17°50.03
4 5	169° 13.34 184° 15.80	200° 11.91 22.77 215° 11.45 21.68	221°28.98 4.00 236°29.42 3.53	350°59.56 11.48 6°2.01 11.48	148°36.35 58.80 163°38.75 58.84	Achernar 335°18.36 -57°5.90
6	199° 18.27	230°10.99 S14°20.59	251°29.85 S20°3.05	21°4.45 N02°11.48	178°41.14 N05°58.88	Hamal 327°48.28 23°35.83
7	214°20.73	245°10.52 19.50	266°30.29 2.57	36°6.89 11.49	193° 43.54 58.92	Polaris 312°25.90 89°23.17 Acamar 315°9.73 -40°11.73
8	229°23.20	260°10.06 18.40	281°30.73 2.09	51°9.34 11.49	208° 45.93 58.96	Acamar 315°9.73 -40°11.73 Menkar 314°3.39 4°11.98
9	244°25.66	275°9.60 · · 17.31	296°31.16 · · 1.60	66°11.78 · · 11.50	223°48.33 · · 59.00	Mirfak 308°24.35 49°57.82
10	259°28.13	290°9.14 16.21	311°31.60 1.12	81°14.23 11.50	238°50.72 59.04	Aldebaran 290°36.49 16°33.92
11 12	274°30.59 289°33.05	305°8.68 15.12 320°8.22 \$14°14.02	326°32.03 0.64 341°32.47 \$20°0.16	96°16.67 11.51 111°19.12 N02°11.51	253°53.12 59.08 268°55.51 N05°59.12	Rigel 281°1.19 -8°10.26
13	304°35.52	335°7.77 12.93	356°32.91 19°59.68	126°21.56 11.51	283°57.90 59.16	Capella 280°17.78 46°1.58
14	319°37.98	350°7.31 11.83	11°33.34 59.19	141°24.01 11.52	299°0.30 59.20	Bellatrix 278°19.91 6°22.42 Elnath 277°58.38 28°37.82
15	334° 40.45	5°6.85 · · 10.73	26°33.78 · · 58.71	156°26.46 · · 11.53	314°2.69 · · 59.24	Elnath 277°58.38 28°37.82   Alnilam 275°34.90 -1°11.14
16	349° 42.91	20°6.40 9.64	41°34.22 58.23	171°28.90 11.53	329°5.08 59.28	Betelgeuse 270°49.08 7°24.64
17 18	4° 45.38 19° 47.84	35°5.94 8.54 50°5.49 \$14°7.44	56°34.66 57.74 71°35.09 \$19°57.26	186°31.35 11.54 201°33.80 N02°11.54	344°7.48 59.33 359°9.87 N05°59.37	Canopus 263°50.74 -52°42.74
19	34°50.30	65°5.03 6.34	86°35.53 56.78	216°36.25 11.55	14°12.26 59.41	Sirius 258°23.70 -16°45.40
20	49°52.77	80°4.58 5.24	101°35.97 56.29	231°38.70 11.55	29° 14.66 59.45	Adhara 255°3.52 -29°0.72
21	64°55.23	95°4.13 · · 4.14	116°36.41 · · 55.81	246°41.14 · · 11.56	44°17.05 · · 59.49	Procyon 244°47.91 5°9.03 Pollux 243°13.91 27°57.32
22	79°57.70	110°3.67 3.03	131°36.85 55.32	261°43.59 11.56	59°19.44 59.53	Avior 234°13.03 -59°35.96
23	95°0.16	125°3.22 1.93	146°37.28 54.83	276°46.04 11.57	74°21.83 59.57	Suhail 222°44.04 -43°32.75
Mer.۱	oass. 16:41	$\nu$ -0.5 $'$ <i>d</i> -1.1 $'$ m-4.02	$ u 0.4' \ d \text{-} 0.5' \ \text{m} 1.17$	$\nu$ 2.4′ $d$ 0.0′ m-2.18	$ u 2.4' \ d0.0' \ m0.49$	Miaplacidus 221°36.80 -69°49.86
	•					Alphard 217°45.03 -8°46.94
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.57 11°49.60
0	110°2.63	140°2.77 \$14°0.83	161°37.72 <b>S</b> 19°54.35	291°48.49 N02°11.58	89°24.23 N05°59.61	Dubhe 193°37.72 61°35.60 Denebola 182°22.31 14°24.70
1	125°5.09	155°2.32 13°59.72	176°38.16 53.86	306°50.94 11.58	104°26.62 59.65	Gienah 175°40.93 -17°41.89
2	140°7.55	170°1.87 58.62	191°38.60 53.37	321°53.39 11.59	119°29.01 59.70	Acrux 172°57.05 -63°15.08
3 4	155° 10.02 170° 12.48	185°1.42 · · 57.52 200°0.97 56.41	206°39.04 · · 52.88 221°39.48 52.40	336°55.84 ·· 11.60 351°58.29     11.60	134°31.40 · · 59.74 149°33.79 59.78	Gacrux 171°48.67 -57°16.04
5	185° 14.95	215°0.52 55.30	236°39.92 51.91	7°0.74 11.61	164° 36.18 59.82	Alioth 166°10.83 55°48.06
6	200° 17.41	230°0.08 S13°54.20	251°40.36 S19°51.42	22°3.19 N02°11.62	179°38.58 N05°59.86	Spica 158°19.69 -11°18.50 Alkaid 152°50.19 49°10.04
7	$215^{\circ}19.88$	244°59.63 53.09	266°40.80 50.93	37°5.65 11.62	194° 40.97 59.90	Hadar 148°32.53 -60°30.26
8	230° 22.34	259°59.18 51.98	281°41.24 50.44	52°8.10 11.63	209°43.36 05°59.95	Menkent 147°54.74 -36°30.35
9	245°24.80	274°58.74 · · 50.87	296°41.68 · · 49.95	67°10.55 · · 11.64	224°45.75 05°59.99	Arcturus 145°45.76 19°1.98
10 11	260°27.27 275°29.73	289°58.29 49.76 304°57.85 48.65	311°42.12 49.46 326°42.56 48.97	82°13.00 11.65 97°15.45 11.65	239°48.14 0.03 254°50.53 0.07	Rigil Kent. 139°37.02 -60°56.84
12	290°32.20	319°57.40 \$13°47.54	341°43.00 S19°48.48	112°17.91 N02°11.66	269°52.92 N06°0.12	Kochab 137°20.52 74°2.01
13	305°34.66	334°56.96 46.43	356°43.44 47.99	127°20.36 11.67	284°55.31 0.16	Zuben'ubi 136°53.40 -16°9.48 Alphecca 126°1.88 26°37.03
14	$320^{\circ}37.12$	349°56.52 45.32	11°43.88 47.50	142°22.81 11.68	299° 57.70 0.20	Antares 112°13.06 -26°29.55
15	335°39.59	4°56.07 · · 44.21	26°44.32 · · 47.00	157°25.27 · · 11.69	315°0.09 · · 0.24	Atria 107°5.49 -69°4.42
16 17	350° 42.05 5° 44.52	19°55.63 43.10 34°55.19 41.98	41°44.76 46.51 56°45.20 46.02	172°27.72 11.69 187°30.18 11.70	330°2.48 0.28 345°4.87 0.33	Sabik 102°0.24 -15°45.52
18	20°46.98	49°54.75 \$13°40.87	71°45.65 \$19°45.52	202°32.63 N02°11.71	0°7.25 N06°0.37	Shaula 96°7.38 -37°7.32
19	35°49.45	64°54.31 39.75	86°46.09 45.03	217°35.09 11.72	15°9.64 0.41	Rasalhague 95°56.56 12°32.34 Eltanin 90°41.54 51°29.00
20	50°51.91	79°53.87 38.64	101°46.53 44.54	232°37.54 11.73	30° 12.03 0.46	Eltanin 90°41.54 51°29.00   Kaus Aust. 83°29.63 -34°22.17
21	65°54.37	94°53.43 · · 37.52	116°46.97 · · 44.04	247°40.00 · · 11.74	45° 14.42 · · 0.50	Vega 80°31.97 38°48.55
22	80° 56.84 95° 59.30	109°52.99 36.41	131°47.41 43.55	262°42.45 11.75	60°16.81 0.54	Nunki 75°45.08 -26°15.64
23		124°52.56 35.29	146°47.86 43.05	277°44.91 11.76	75°19.20 0.58	Altair 61°57.88 8°56.60
Mer.	pass. 16:37	ν-0.5' d-1.1' m-4.02	$\nu$ 0.4′ <i>d</i> -0.5′ m1.17	$\nu$ 2.4′ $d$ 0.0′ m-2.19	$\nu 2.4' \ d0.0' \ m0.50$	Peacock 53°2.48 -56°38.67
						Deneb 49°24.53 45°22.96 Enif 33°36.63 10°0.31
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.23 -46°49.59
0	111°1.77	139°52.12 \$13°34.17	161°48.30 \$19°42.56	292°47.37 N02°11.77	90°21.58 N06°0.63	Fomalhaut 15°12.04 -29°28.49
1	126°4.23 141°6.70	154°51.68 33.05	176°48.74 42.06 191°49.18 41.56	307°49.83 11.78	105°23.97 0.67 120°26.36 0.71	Scheat 13°42.97 28°14.29
2	141°6.70 156°9.16	169°51.25 31.94 184°50.81 · · 30.82	191°49.18 41.56 206°49.63 · · 41.07	322°52.28 11.79 337°54.74 · · 11.80	120°26.36 0.71 135°28.75 · · 0.76	Markab 13°27.60 15°21.50
4	171° 11.62	199° 50.38 29.70	221°50.07 40.57	352°57.20 11.81	150°31.13 0.80	Jan 10 Mon SHA Mer.pass
5	186°14.09	214°49.94 28.58	236°50.51 40.07	7°59.66 11.82	165°33.52 0.84	Venus 31°10.28 14:40
6	201°16.55	229°49.51 \$13°27.45	251°50.96 \$19°39.57	23°2.11 N02°11.83	180°35.91 N06°0.89	Mars 52°23.76 13:14
7	216° 19.02	244°49.08 26.33	266°51.40 39.08	38°4.57 11.84	195° 38.30 0.93	Jupiter 181°46.31 04:36   Saturn 339°23.29 18:03
8 9	231°21.48 246°23.95	259° 48.65 25.21 274° 48.21 •• 24.09	281°51.85 38.58 296°52.29 · · 38.08	53°7.03 11.85 68°9.49 · · 11.86	210° 40.68 0.97 225° 43.07 · 1.02	
10	261°26.41	289° 47.78 22.96	311°52.73 37.58	83°11.95 11.87	240° 45.45 1.06	Jan 11 Tue SHA Mer.pass
11	276°28.87	304°47.35 21.84	326°53.18 37.08	98°14.41 11.88	255° 47.84 1.10	Venus 30°0.14 14:40
12	291°31.34	319°46.92 \$13°20.72	341°53.62 \$19°36.58	113°16.87 N02°11.89	270°50.23 N06°1.15	Mars 51°35.10 13:13   Jupiter 181°45.87 04:32
13	306°33.80	334°46.49 19.59	356°54.07 36.08	128°19.33 11.90	285°52.61 1.19	Saturn 339°21.60 18:00
14 15	321°36.27 336°38.73	349°46.06 18.46 4°45.64 •• 17.34	11°54.51 35.58 26°54.96 · · 35.08	143°21.79 11.91 158°24.26 · · 11.92	300°55.00 1.24 315°57.38 · · 1.28	
16	351°41.19	19°45.21 16.21	41°55.40 34.57	173°26.72 11.94	330°59.77 1.32	Jan 12 Wed         SHA         Mer.pass           Venus         28°50.35         14:41
17	6°43.66	34°44.78 15.08	56°55.85 34.07	188°29.18 11.95	346°2.15 1.37	Mars 50°46.53 13:12
18	21°46.12	49°44.36 <b>S</b> 13°13.96	71°56.29 <b>S</b> 19°33.57	203°31.64 N02°11.96	1°4.54 N06°1.41	Jupiter 181°45.60 04:28
19	36° 48.59	64°43.93 12.83	86°56.74 33.07	218°34.10 11.97	16°6.92 1.46	Saturn 339°19.82 17:56
20 21	51°51.05 66°53.52	79°43.51 11.70 94°43.08 · · 10.57	101°57.19 32.56 116°57.63 · · 32.06	233°36.57 11.98 248°39.03 · · 12.00	31°9.31 1.50 46°11.69 · · 1.54	Horizontal parallax
22	81°55.98	109°42.66 9.44	131°58.08 31.56	263°41.49 12.01	61°14.08 1.59	Venus: 0.1
23	96° 58.44	124° 42.23 8.31	146°58.53 31.05	278°43.96 12.02	76°16.46 1.63	Mars: 0.1
Mer	pass. 16:33	ν-0.4' d-1.1' m-4.02	ν0.4' d-0.5' m1.16	ν2.5' d0.0' m-2.20	ν2.4' d0.0' m0.50	
.,,,,,						

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°13.26	\$22°3.31	$30^{\circ}40.44$	3.4'	$N26^{\circ}36.60$	0.4'	59.4'
1	193°13.00	2.95	45°2.82	3.3'	26°36.96	0.2'	59.4'
2	208°12.74	2.59	59°25.15	3.3'	26°37.14	-0.0'	59.5'
3 4	223°12.49 238°12.23	· · 2.23 1.87	73°47.43 88°9.66	3.2' 3.2'	26°37.12 26°36.92	-0.2' -0.4'	59.5' 59.6'
5	253°11.98	1.50	102° 31.85	3.1'	26°36.53	-0.4 -0.6'	59.6'
6	268°11.72	S22°1.14	116°53.99	3.1'	N26°35.95	-0.8'	59.6'
7	283°11.47	0.77	$131^{\circ}16.09$	3.1'	$26^{\circ}35.18$	-1.0'	59.7'
8	298°11.22	0.41	145°38.16	3.0'	26°34.22	-1.2'	59.7'
9 10	313°10.96 328°10.71	22°0.04 21°59.67	160°0.19 174°22.19	3.0' 3.0'	26°33.06 26°31.72	-1.3' -1.5'	59.7' 59.8'
11	343°10.45	59.30	188°44.15	2.9'	26°30.18	-1.7'	59.8'
12	358°10.20	S21°58.94	203°6.09	2.9'	N26°28.45	-1.9'	59.8'
13	13°9.95	58.57	$217^{\circ}28.01$	2.9'	$26^{\circ}26.53$	-2.1'	59.9'
14	28°9.69	58.20	231°49.91	2.9'	26°24.41	-2.3'	59.9'
15 16	43°9.44 58°9.19	· · 57.82 57.45	246° 11.78 260° 33.64	2.9' 2.8'	26°22.10 26°19.60	-2.5' -2.7'	59.9' 59.9'
17	73°8.94	57.08	274°55.49	2.8'	26°16.90	-2.9'	60.0'
18	88°8.69	S21°56.71	289° 17.33	2.8'	N26°14.01	-3.1'	60.0'
19	103°8.43	56.33	303°39.16	2.8'	26°10.93	-3.3'	60.0'
20	118°8.18	55.96	318°0.98	2.8'	26°7.65	-3.5'	60.1
21 22	133°7.93 148°7.68	· · 55.58 55.21	332°22.80 346°44.62	2.8' 2.8'	26°4.18 26°0.51	-3.7' -3.9'	60.1' 60.1'
23	148 7.08 163°7.43	55.21 54.83	1°6.45	2.8'	25°56.65	-3.9 -4.1'	60.1
	SD = 16.3'	d = -0.4'			D = 16.2'		
	JD — 10.3	u — -0.4			D — 10.2°		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°7.18	S21° 54.45	15°28.28	2.8'	N25°52.60	-4.2'	60.2'
1 2	193°6.93 208°6.68	54.07 53.69	29°50.12 44°11.97	2.9' 2.9'	25°48.36 25°43.92	-4.4' -4.6'	60.2' 60.2'
3	223°6.43	53.31	58° 33.83	2.9'	25°39.30	-4.8'	60.3
4	238°6.18	52.93	72°55.71	2.9'	25°34.48	-5.0'	60.3'
5	253°5.93	52.55	87° 17.61	2.9'	25°29.47	-5.2'	60.3'
6	268°5.68	\$21°52.17	101°39.53	2.9'	N25°24.27	-5.4'	60.3'
7 8	283°5.43 298°5.19	51.79 51.40	116°1.48 130°23.45	3.0' 3.0'	25°18.88 25°13.30	-5.6' -5.8'	60.4' 60.4'
9	313°4.94	51.02	144°45.45	3.0'	25°7.53	-6.0'	60.4
10	328°4.69	50.63	159°7.48	3.1'	$25^{\circ}1.57$	-6.1'	60.4'
11	343°4.44	50.25	173°29.55	3.1'	24°55.43	-6.3'	60.5'
12	358°4.19 13°3.95	\$21°49.86	187°51.65	3.1'	N24°49.10 24°42.58	-6.5'	60.5
13 14	28° 3.70	49.47 49.09	202° 13.79 216° 35.97	3.2' 3.2'	24°42.58 24°35.88	-6.7' -6.9'	60.5' 60.5'
15	43°3.45	48.70	230° 58.20	3.3'	24°29.00	-7.1	60.5
16	58°3.21	48.31	$245^{\circ}20.46$	3.3'	$24^{\circ}21.94$	-7.2'	60.6'
17	73°2.96	47.92	259°42.78	3.4'	24°14.69	-7.4'	60.6'
18 19	88°2.72 103°2.47	\$21°47.53 47.13	274°5.15 288°27.57	3.4' 3.5'	N24°7.26 23°59.65	-7.6' -7.8'	60.6' 60.6'
20	103 2.47 118°2.23	47.13 46.74	302°50.04	3.5'	23°51.87	-7.8 -8.0'	60.7
21	133°1.98	46.35	317° 12.57	3.6'	23°43.91	-8.1'	60.7
22	148°1.74	45.96	$331^{\circ}35.15$	3.6'	23°35.77	-8.3'	60.7'
23	163°1.49	45.56	345°57.80	3.7'	23°27.46	-8.5'	60.7'
	SD = 16.3'	d = -0.4'		S	D = 16.4'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°1.25	S21°45.17	$0^{\circ}20.50$	3.8'	$N23^{\circ}18.97$	-8.7'	60.7'
1	193°1.00	44.77	14°43.27	3.8'	23°10.31	-8.8'	60.7'
2 3	208°0.76 223°0.52	44.37 •• 43.97	29°6.10 43°29.00	3.9' 4.0'	23°1.48 22°52.49	-9.0' -9.2'	60.8' 60.8'
3 4	223°0.52 238°0.27	43.58	43° 29.00 57° 51.97	4.0'	22°52.49 22°43.32	-9.2' -9.3'	60.8
5	253°0.03	43.18	72° 15.01	4.1'	22°33.99	-9.5'	60.8
6	267°59.79	S21°42.78	86°38.12	4.2'	N22°24.50	-9.7'	60.8'
7	282°59.54	42.38	101°1.30	4.3'	22°14.84	-9.8'	60.8'
8 9	297°59.30 312°59.06	41.98 •• 41.57	115°24.55 129°47.88	4.3' 4.4'	22°5.02 21°55.04	-10.0' -10.1'	60.8' 60.9'
10	312 59.00 327°58.82	41.17	144° 11.29	4.4 4.5'	21°55.04 21°44.91	-10.1	60.9
11	342°58.58	40.77	$158^{\circ}34.78$	4.6'	$21^{\circ}34.61$	-10.4'	60.9'
12	357°58.34	S21°40.36	172°58.34	4.6'	N21°24.16	-10.6'	60.9'
13	12°58.10 27°57.85	39.96	187°21.99	4.7'	21°13.56 21°2.81	-10.8'	60.9'
14 15	27°57.85 42°57.61	39.55 •• 39.15	201°45.71 216°9.52	4.8' 4.9'	21°2.81 20°51.91	-10.9' -11.0'	60.9' 60.9'
16	57°57.37	38.74	230° 33.41	5.0'	20°40.86	-11.0	60.9'
17	72°57.13	38.33	244°57.38	5.1'	$20^{\circ}29.67$	-11.3'	60.9'
18	87°56.89	S21°37.92	259°21.44	5.1'	N20°18.33	-11.5'	60.9'
19 20	102°56.66 117°56.42	37.51 37.10	273°45.59 288°9.82	5.2' 5.3'	20°6.85 19°55.23	-11.6' -11.8'	61.0' 61.0'
20 21	117°56.42 132°56.18	37.10 · · 36.69	288° 9.82 302° 34.14	5.3° 5.4'	19°55.23 19°43.47	-11.8° -11.9'	61.0'
22	147°55.94	36.28	316° 58.55	5.5'	19°31.58	-12.0'	61.0'
23	162°55.70	35.87	331°23.04	5.6'	$19^{\circ}19.55$	-12.2'	61.0'
	SD = 16.3'	d = -0.4'		S	D = 16.6'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-100%	
10	07:07	07:19	12:07	22:55	10:24		
11	07:31	07:43	12:08	23:59	11:27		
12	07:55	08:07	12:08	-:-	12:29		

# January 13, 14, 15 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	112°0.91	139°41.81 \$13°7.17	161°58.97 \$19°30.55	293°46.42 N02°12.03	91°18.84 N06°1.68	
1	127°3.37	154°41.39 6.04	176°59.42 30.04	308°48.89 12.05	106°21.23 1.72	Alpheratz 357°32.28 29°14.92
2	142°5.84	169°40.97 4.91	191°59.87 29.54	323°51.35 12.06	121°23.61 1.77	Ankaa 353°4.86 -42°9.38 Schedar 349°28.22 56°41.80
3	157°8.30	184°40.55 · · 3.78	207° 0.31 · · 29.03	338°53.81 · · 12.07	136°25.99 · · 1.81	Diphda 348°44.88 -17°50.03
4	172° 10.76	199° 40.12 2.64	222°0.76 28.53	353°56.28 12.08	151°28.38 1.86	Achernar 335°18.38 -57°5.90
5 6	187° 13.23 202° 15.69	214°39.70 1.51 229°39.29 \$13°0.37	237°1.21 28.02 252°1.66 \$19°27.51	8°58.75 12.10 24°1.21 N02°12.11	166°30.76 1.90 181°33.14 N06°1.95	Hamal 327°48.29 23°35.83
7	202 15.09 217° 18.16	244°38.87 12°59.24	267°2.10 27.01	39°3.68 12.13	196°35.53 1.99	Polaris 312°27.12 89°23.19
8	232°20.62	259°38.45 58.10	282°2.55 26.50	54°6.14 12.14	211°37.91 2.04	Acamar 315°9.74 -40°11.73
9	247° 23.09	274°38.03 · · 56.96	297°3.00 · · 25.99	69°8.61 · · 12.15	226°40.29 · · 2.08	Menkar 314°3.39 4°11.98
10	$262^{\circ}25.55$	289°37.61 55.83	312°3.45 25.48	84°11.08 12.17	241° 42.67 2.13	Mirfak 308° 24.36 49° 57.83 Aldebaran 290° 36.49 16° 33.92
11	277°28.01	304°37.20 54.69	327° 3.90 24.97	99°13.55 12.18	256° 45.05 2.17	Rigel 281°1.18 -8°10.26
12	292°30.48	319°36.78 \$12°53.55	342°4.35 \$19°24.46	114°16.01 N02°12.19	271°47.44 N06°2.22	Capella 280°17.78 46°1.58
13	307°32.94 322°35.41	334°36.37 52.41 349°35.95 51.27	357° 4.80 23.95 12° 5.24 23.45	129°18.48 12.21 144°20.95 12.22	286°49.82 2.26 301°52.20 2.31	Bellatrix 278°19.91 6°22.42
14 15	337° 37.87	4°35.54 · · 50.13	12°5.24 23.45 27°5.69 · · 22.93	159°23.42 · · 12.24	301°52.20 2.31 316°54.58 · · 2.35	Elnath 277°58.37 28°37.83
16	352°40.33	19°35.12 48.99	42°6.14 22.42	174°25.89 12.25	331°56.96 2.40	Alnilam 275°34.90 -1°11.14
17	7°42.80	34°34.71 47.85	57°6.59 21.91	189°28.36 12.27	346°59.34 2.45	Betelgeuse 270°49.07 7°24.64
18	22°45.26	49°34.30 \$12°46.71	72°7.04 \$19°21.40	204°30.83 N02°12.28	2°1.72 N06°2.49	Canopus 263°50.74 -52°42.76 Sirius 258°23.69 -16°45.41
19	37°47.73	64°33.89 45.57	87°7.49 20.89	219°33.30 12.30	17°4.10 2.54	Adhara 255°3.52 -29°0.73
20	52°50.19	79°33.48 44.42	102°7.94 20.38	234°35.77 12.31	32°6.48 2.58	Procyon 244°47.89 5°9.03
21	67°52.66 82°55.12	94°33.06 · · 43.28	117°8.39 · · 19.87	249°38.24 · · 12.33	47°8.86 · · 2.63	Pollux 243°13.90 27°57.33
22 23	97°57.58	109°32.65 42.14 124°32.24 40.99	132°8.84 19.35 147°9.29 18.84	264°40.71 12.34 279°43.18 12.36	62°11.25 2.67 77°13.62 2.72	Avior 234°13.03 -59°35.97
						Suhail 222°44.02 -43°32.77
Mer.p	pass. 16:29	$\nu$ -0.4′ <i>d</i> -1.1′ m-4.03	$ u 0.4' \ d$ -0.5' m1.16	$\nu 2.5' \ d0.0' \ \text{m-}2.20$	$ u 2.4' \ d0.0' \ m0.50$	Miaplacidus 221°36.78 -69°49.88
						Alphard 217°45.01 -8°46.95 Regulus 207°31.55 11°49.59
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.67 61°35.60
0	113°0.05	139°31.84 <b>S</b> 12°39.85	162°9.75 \$19°18.33	294°45.65 N02°12.38	92°16.00 N06°2.77	Denebola 182°22.28 14°24.69
1	128°2.51	154°31.43 38.70	177°10.20 17.81	309°48.12 12.39	107°18.38 2.81	Gienah 175°40.90 -17°41.91
2	143°4.98	169°31.02 37.56	192°10.65 17.30	324°50.59 12.41	122°20.76 2.86	Acrux 172°57.00 -63°15.09
3 4	158°7.44 173°9.90	184°30.61 · · 36.41 199°30.21 35.26	207°11.10 · · 16.78 222°11.55 16.27	339°53.07 · · 12.42 354°55.54	137°23.14 · · 2.91 152°25.52 2.95	Gacrux 171°48.63 -57°16.05
5	188° 12.37	214°29.80 34.11	237°12.00 15.75	9°58.01 12.46	167°27.90 3.00	Alioth 166°10.79 55°48.06
6	203°14.83	229°29.39 \$12°32.97	252°12.45 \$19°15.24	25°0.48 N02°12.47	182°30.28 N06°3.04	Spica 158°19.66 -11°18.52
7	$218^{\circ}17.30$	244°28.99 31.82	267°12.91 14.72	40°2.96 12.49	197°32.66 3.09	Alkaid 152°50.15 49°10.03 Hadar 148°32.48 -60°30.26
8	233° 19.76	259°28.58 30.67	282°13.36 14.21	55°5.43 12.51	212°35.04 3.14	Menkent 147°54.71 -36°30.36
9	248°22.23	274°28.18 · · 29.52	297°13.81 · · 13.69	70°7.91 · · 12.52	227° 37.41 · · 3.18	Arcturus 145°45.73 19°1.96
10	263°24.69	289°27.78 28.37	312°14.26 13.17	85°10.38 12.54	242°39.79 3.23	Rigil Kent. 139°36.97 -60°56.84
11 12	278°27.15 293°29.62	304°27.37 27.22 319°26.97 \$12°26.07	327°14.72 12.65 342°15.17 \$19°12.14	100°12.86 12.56 115°15.33 N02°12.58	257° 42.17 3.28 272° 44.55 N06° 3.32	Kochab 137°20.46 74°2.00
13	308° 32.08	334°26.57 24.91	357°15.62 11.62	130°17.81 12.59	287°46.93 3.37	Zuben'ubi 136°53.37 -16°9.49
14	323°34.55	349°26.17 23.76	12°16.08 11.10	145°20.28 12.61	302°49.30 3.42	Alphecca 126°1.85 26°37.01 Antares 112°13.04 -26°29.56
15	338°37.01	4°25.77 · · 22.61	27°16.53 · · 10.58	160°22.76 · · 12.63	317°51.68 · · 3.47	Arria 107°5.43 -69°4.41
16	353°39.47	19°25.37 21.45	42°16.98 10.06	175°25.23 12.65	332°54.06 3.51	Sabik 102°0.21 -15°45.53
17	8°41.94	34°24.97 20.30	57°17.44 9.54	190°27.71 12.66	347°56.43 3.56	Shaula 96°7.35 -37°7.32
18	23° 44.40 38° 46.87	49°24.57 \$12°19.15	72°17.89 \$19°9.02	205°30.19 N02°12.68 220°32.66 12.70	2°58.81 N06°3.61 18°1.19 3.65	Rasalhague 95°56.55 12°32.33
19 20	50° 40.07 53° 49.33	64°24.17 17.99 79°23.78 16.83	87°18.34 8.50 102°18.80 7.98	220°32.66 12.70 235°35.14 12.72	18°1.19 3.65 33°3.56 3.70	Eltanin 90°41.53 51°28.98
21	68°51.79	94°23.38 · · 15.68	117°19.25 · · 7.46	250°37.62 · · 12.74	48°5.94 · · 3.75	Kaus Aust. 83°29.61 -34°22.17
22	83°54.26	109°22.98 14.52	132°19.71 6.94	265°40.10 12.76	63°8.32 3.80	Vega 80° 31.96 38° 48.53 Nunki 75° 45.06 -26° 15.64
23	98°56.72	124°22.59 13.36	147°20.16 6.42	280°42.58 12.78	78° 10.69 3.84	Altair 61°57.87 8°56.59
Mer.r	pass. 16:25	ν-0.4' d-1.1' m-4.03	$\nu$ 0.5' d-0.5' m1.16	$\nu$ 2.5' d0.0' m-2.21	ν2.4' d0.0' m0.51	Peacock 53°2.47 -56°38.66
						Deneb 49°24.53 45°22.95
c	CIIA	CHA D	CHA D	CHV D	CHA D	Enif 33°36.63 10°0.31
Sat 0	<b>GHA</b> 113°59.19	<b>GHA Dec</b> 139°22.19 <b>S</b> 12°12.21	<b>GHA Dec</b> 162°20.62 <b>S</b> 19°5.89	<b>GHA Dec</b> 295°45.06 N02°12.80	<b>GHA Dec</b> 93°13.07 N06°3.89	Al Na'ir 27°30.23 -46°49.58
1	129°1.65	154°21.80 11.05	177°21.07 5.37	310°47.53 12.81	108°15.44 3.94	Fomalhaut 15°12.04 -29°28.49 Scheat 13°42.98 28°14.29
2	144°4.11	169°21.40 9.89	192°21.53 4.85	325°50.01 12.83	123° 17.82 3.99	Markab 13°27.60 15°21.50
3	159°6.58	184°21.01 · · 8.73	207°21.98 · · 4.32	340°52.49 · · 12.85	138°20.19 · · 4.04	
4	174°9.04	199°20.61 7.57	222°22.44 3.80	355°54.97 12.87	153°22.57 4.08	Jan 13 Thu SHA Mer.pass
5	189°11.51	214°20.22 6.41	237°22.90 3.28	10°57.45 12.89	168°24.94 4.13	Venus 27°40.90 14:42 Mars 49°58.06 13:12
6 7	204° 13.97 219° 16.44	229°19.83 \$12°5.25 244°19.44 4.09	252°23.35	25°59.93 N02°12.91 41°2.42 12.93	183°27.32 N06°4.18 198°29.69 4.23	Jupiter 181°45.51 04:24
8	219 10.44 234° 18.90	259°19.05 2.92	282°24.26 1.70	56°4.90 12.95	213°32.07 4.28	Saturn 339°17.94 17:52
9	249°21.36	274°18.66 · · 1.76	297°24.72 · · 1.18	71°7.38 · · 12.97	228°34.44 · · 4.32	
10	264°23.83	289°18.27 12°0.60	312°25.18 0.65	86°9.86 12.99	243°36.81 4.37	Jan 14 Fri         SHA         Mer.pass           Venus         26°31.79         14:42
11	279°26.29	304°17.88 11°59.43	327°25.63 19°0.13	101°12.34 13.01	258°39.19 4.42	Venus 26 31.79 14:42 Mars 49 9.70 13:11
12	294°28.76	319°17.49 \$11°58.27	342°26.09 \$18°59.60	116°14.82 N02°13.03	273°41.56 N06°4.47	Jupiter 181°45.60 04:20
13 14	309°31.22 324°33.68	334°17.10 57.11 349°16.71 55.94	357°26.55 59.07 12°27.01 58.54	131°17.31 13.05 146°19.79 13.07	288°43.94 4.52 303°46.31 4.57	Saturn 339°15.96 17:48
14 15	324 33.08 339°36.15	4°16.33 · · 54.77	27°27.46 · · 58.02	161°22.27 · · 13.10	318°48.68 · · 4.61	Jan 15 Sat SHA Mer.pass
16	354°38.61	19°15.94 53.61	42°27.92 57.49	176°24.76 13.12	333°51.06 4.66	Jan 15 Sat         SHA         Mer.pass           Venus         25°23.00         14:43
17	9°41.08	34°15.55 52.44	57°28.38 56.96	191°27.24 13.14	348°53.43 4.71	Mars 48°21.43 13:10
18	24°43.54	49°15.17 <b>S</b> 11°51.27	72°28.84 <b>S</b> 18°56.43	206°29.73 N02°13.16	3°55.80 N06°4.76	Jupiter 181°45.87 04:16
19	39°46.00	64°14.78 50.11	87°29.30 55.90	221°32.21 13.18	18°58.17 4.81	Saturn 339°13.88 17:44
20	54°48.47	79°14.40 48.94	102°29.75 55.37	236°34.70 13.20	34°0.55 4.86	Horizontal parallax
21 22	69° 50.93 84° 53.40	94°14.02 · · 47.77 109°13.63 46.60	117°30.21 · · 54.84 132°30.67 54.31	251°37.18 · · 13.22 266°39.67 13.25	49°2.92 · · 4.91 64°5.29 4.96	Venus: 0.1
23	99°55.86	109 13.03 40.00 124°13.25 45.43	132°30.67 54.31 147°31.13 53.78	266°39.67 13.25 281°42.15 13.27	79°7.66 5.01	Mars: 0.1
Mer.p	oass. 16:21	$\nu$ -0.4' d-1.2' m-4.03	$ u 0.5' \; d$ -0.5 $' \; { m m} 1.16$	$\nu 2.5' \ d0.0' \ \text{m-}2.22$	$ u 2.4' \ d0.0' \ m0.51$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°55.46	S21°35.46	$345^{\circ}47.62$	5.7'	$N19^{\circ}7.39$	-12.3'	61.0'
1	192°55.23	35.04	0°12.30	5.8'	18°55.10	-12.4'	61.0'
2	207°54.99 222°54.75	34.63 •• 34.21	14°37.06 29°1.91	5.9' 5.9'	18° 42.68 18° 30.13	-12.5' -12.7'	61.0' 61.0'
4	237°54.51	33.80	43°26.85	6.0'	18° 17.46	-12.8'	61.0'
5	252°54.28	33.38	57°51.89	6.1'	18°4.67	-12.9'	61.0'
6	267°54.04	S21°32.96	72° 17.01	6.2'	N17°51.75	-13.0'	61.0'
7	282°53.80 297°53.57	32.55 32.13	86°42.23 101°7.53	6.3'	17°38.72	-13.1'	61.0'
8 9	312°53.57	32.13	101°7.53 115°32.93	6.4' 6.5'	17°25.58 17°12.32	-13.3' -13.4'	61.0' 61.0'
10	312 53.55 327°53.10	31.29	129°58.42	6.6'	16°58.94	-13.5'	61.0'
11	342°52.86	30.87	144°24.00	6.7'	$16^{\circ}45.46$	-13.6'	61.0'
12	357°52.63	S21°30.45	158° 49.67	6.8'	N16°31.87	-13.7'	61.0'
13 14	12°52.39 27°52.16	30.02 29.60	173°15.43 187°41.28	6.9' 6.9'	16° 18.17 16° 4.38	-13.8' -13.9'	61.0' 61.0'
14 15	42°51.93	29.00	202°7.22	6.9 7.0'	16 4.38 15°50.47	-13.9 -14.0'	61.0'
16	57°51.69	28.75	216°33.26	7.1'	15°36.47	-14.1'	61.0'
17	72°51.46	28.33	230°59.38	7.2'	$15^{\circ}22.38$	-14.2'	61.0'
18	87°51.23	S21°27.90	245°25.59	7.3'	N15°8.19	-14.3'	61.0'
19 20	102°50.99 117°50.76	27.48 27.05	259°51.90 274°18.29	7.4' 7.5'	14°53.90 14°39.52	-14.4' -14.5'	61.0' 61.0'
21	132°50.53	. 26.62	288° 44.77	7.6'	14° 25.06	-14.5'	60.9'
22	147°50.30	26.19	303°11.34	7.7'	14° 10.51	-14.6'	60.9'
23	162°50.06	25.76	317° 37.99	7.7'	13°55.87	-14.7'	60.9'
	SD = 16.3'	d = -0.4'		SI	O = 16.6'		
E.:!	СПУ	Das	CUA		Dec	اد	μn
Fri 0	<b>GHA</b> 177°49.83	Dec \$21°25.33	<b>GHA</b> 332° 4.74	u 7.8'	Dec N13° 41.15	<i>d</i> -14.8′	<b>HP</b> 60.9'
1	192°49.60	24.90	346°31.57	7.9'	13°26.36	-14.9'	60.9'
2	207°49.37	24.47	0°58.48	8.0'	13°11.48	-15.0'	60.9'
3	222°49.14	• • 24.04	15°25.48	8.1'	12°56.53	-15.0'	60.9'
4 5	237°48.91 252°48.68	23.60 23.17	29°52.57 44°19.74	8.2' 8.3'	12°41.50 12°26.40	-15.1' -15.2'	60.9' 60.9'
6	267°48.45	S21°22.74	58° 47.00	8.3'	N12°11.24	-15.2'	60.9'
7	282°48.22	22.30	73°14.33	8.4'	$11^{\circ}56.00$	-15.3'	60.9'
8	297°47.99	21.86	87°41.75	8.5'	11°40.70	-15.4'	60.8'
9 10	312°47.76 327°47.53	· · 21.43 20.99	102°9.25 116°36.83	8.6' 8.7'	11°25.34 11°9.91	-15.4' -15.5'	60.8' 60.8'
11	342°47.30	20.55	131° 4.49	8.7'	10°54.42	-15.5'	60.8
12	357°47.07	S21°20.11	145°32.23	8.8'	N10°38.88	-15.6'	60.8'
13	12°46.85	19.67	160°0.04	8.9'	10°23.28	-15.7'	60.8'
14	27°46.62	19.23	174°27.93	9.0'	10°7.63	-15.7'	60.8'
15 16	42°46.39 57°46.16	· · 18.79 18.35	188°55.90 203°23.94	9.0' 9.1'	09°51.93 09°36.18	-15.8' -15.8'	60.7' 60.7'
17	72°45.94	17.91	217°52.06	9.2'	09°20.38	-15.8'	60.7'
18	87°45.71	S21°17.47	232°20.25	9.3'	N09°4.54	-15.9'	60.7'
19	102°45.48	17.02	246°48.51	9.3'	08°48.65	-15.9'	60.7'
20 21	117°45.26 132°45.03	16.58 •• 16.13	261°16.85 275°45.25	9.4' 9.5'	08°32.72 08°16.76	-16.0' -16.0'	60.7' 60.6'
22	147°44.81	15.69	290°13.72	9.5'	08°0.75	-16.0'	60.6'
23	162°44.58	15.24	304° 42.26	9.6'	$07^{\circ}44.71$	-16.1'	60.6'
	SD = 16.3'	d = -0.4'		SI	O = 16.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°44.36	S21°14.79	$319^{\circ}10.87$	9.7'	N07°28.64	-16.1'	60.6'
1	192°44.13	14.34	333°39.54	9.7'	07°12.53	-16.1'	60.6'
2	207°43.91 222°43.68	13.90 •• 13.45	348°8.28 2°37.08	9.8' 9.9'	06°56.40 06°40.23	-16.2' -16.2'	60.5' 60.5'
3 4	222 43.08 237°43.46	13.45	2 37.08 17°5.94	9.9 9.9'	06° 24.05	-16.2'	60.5
5	252°43.24	12.55	31°34.87	10.0'	06°7.83	-16.2	60.5'
6	267°43.01	S21°12.09	46°3.85	10.0'	N05°51.60	-16.3'	60.5'
7 8	282°42.79 297°42.57	11.64 11.19	60°32.89 75°1.99	10.1' 10.2'	05°35.35 05°19.07	-16.3' -16.3'	60.4' 60.4'
9	312°42.35	11.19	75°1.99 89°31.15	10.2'	05°19.07 05°2.78	-16.3'	60.4
10	327°42.12	10.28	104°0.36	10.3'	04°46.48	-16.3	60.4
11	342°41.90	9.83	118° 29.63	10.3'	04°30.16	-16.3'	60.4'
12	357°41.68	\$21°9.37	132°58.95	10.4'	N04°13.83	-16.3'	60.3'
13 14	12°41.46 27°41.24	8.91 8.46	147°28.33 161°57.75	10.4' 10.5'	03°57.50 03°41.15	-16.3' -16.4'	60.3' 60.3'
15	42°41.02	• • 8.00	176° 27.22	10.5'	03°24.80	-16.4	60.3
16	57°40.80	7.54	190°56.74	10.6'	03°8.44	-16.4'	60.2'
17	72°40.58	7.08	205°26.31	10.6'	02°52.09	-16.4	60.2'
18 19	87°40.36 102°40.14	\$21°6.62 6.16	219°55.92 234°25.58	10.7' 10.7'	N02°35.73 02°19.37	-16.4' -16.4'	60.2' 60.2'
20	102 40.14 117°39.92	5.70	234 25.58 248°55.28	10.7'	02 19.37 02°3.02	-16.4'	60.2
21	132°39.70	• • 5.24	263°25.03	10.8'	01°46.66	-16.3'	60.1'
22	147°39.48	4.77	277°54.81	10.8'	01°30.32	-16.3'	60.1'
23	162°39.26	4.31	292°24.64	10.9'	01°13.98	-16.3'	60.0'
	SD = 16.3'	d = -0.4'		SI	O = 16.5'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-89%	
13	08:18	08:29	12:08	00:59	13:28		
14	08:41	08:52	12:09	01:56	14:23		
15	09:03	09:13	12:09	02:49	15:15		

## January 16, 17, 18 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$114^{\circ}58.32$	139°12.87 <b>S</b> 11°44.26	162°31.59 \$18°53.25	296°44.64 N02°13.29	94°10.03 N06°5.06	Alpheratz 357°32.30 29°14.92
1	130°0.79	154°12.49 43.09	177°32.05 52.72	311°47.12 13.31	109° 12.40 5.10	Ankaa 353°4.87 -42°9.38
2	145°3.25	169°12.10 41.92	192°32.51 52.19	326°49.61 13.34	124°14.78 5.15	Schedar 349°28.24 56°41.80
3 4	160°5.72 175°8.18	184°11.72 · · · 40.75 199°11.34	207°32.97 · · 51.66 222°33.43 51.12	341°52.10 · · 13.36 356°54.59 13.38	139°17.15 · · 5.20 154°19.52 5.25	Diphda 348°44.89 -17°50.03
5	190° 10.65	214°10.96 38.40	237°33.89 50.59	11°57.07 13.40	169°21.89 5.30	Achernar 335°18.40 -57°5.90
6	205°13.11	229°10.59 <b>S</b> 11°37.23	252°34.35 \$18°50.06	26°59.56 N02°13.43	184°24.26 N06°5.35	Hamal 327°48.30 23°35.83 Polaris 312°28.57 89°23.19
7	220° 15.57	244°10.21 36.05	267°34.81 49.52	42°2.05 13.45	199°26.63 5.40	Acamar 315°9.75 -40°11.74
8 9	235° 18.04 250° 20.50	259°9.83 34.88 274°9.45 · · 33.70	282°35.27 48.99 297°35.73 • 48.46	57°4.54 13.47 72°7.03 · · 13.50	214°29.00 5.45 229°31.37 · · 5.50	Menkar 314°3.40 4°11.97
10	265° 22.97	289°9.08 32.53	312°36.19 47.92	87°9.52 13.52	244°33.74 5.55	Mirfak 308°24.38 49°57.83
11	280°25.43	304°8.70 31.35	327°36.65 47.39	102°12.01 13.54	259° 36.11 5.60	Aldebaran 290°36.49 16°33.92 Rigel 281°1.19 -8°10.27
12	295°27.89	319°8.32 <b>S</b> 11°30.18	342°37.11 \$18°46.85	117°14.50 N02°13.57	274°38.48 N06°5.65	Rigel 281°1.19 -8°10.27 Capella 280°17.78 46°1.59
13	310°30.36	334°7.95 29.00	357°37.58 46.32	132°16.99 13.59	289° 40.85 5.70	Bellatrix 278°19.91 6°22.42
14 15	325° 32.82 340° 35.29	349°7.57 27.82 4°7.20 · · 26.64	12°38.04 45.78 27°38.50 · · 45.24	147°19.48 13.62 162°21.97 · · 13.64	304°43.22 5.75 319°45.59 · · 5.80	Elnath 277°58.38 28°37.83
16	355° 37.75	19°6.83 25.47	42°38.96 44.71	177°24.46 13.66	334°47.96 5.85	Alnilam 275°34.90 -1°11.15
17	$10^{\circ}40.21$	34°6.45 24.29	57°39.42 44.17	192°26.95 13.69	349°50.32 5.90	Betelgeuse 270°49.07 7°24.63 Canopus 263°50.75 -52°42.77
18	25°42.68	49°6.08 \$11°23.11	72°39.89 \$18°43.63	207°29.44 N02°13.71	4°52.69 N06°5.95	Sirius 258°23.69 -16°45.42
19	40° 45.14 55° 47.61	64°5.71 21.93 79°5.34 20.75	87°40.35 43.10 102°40.81 42.56	222°31.93 13.74 237°34.43 13.76	19°55.06 6.00 34°57.43 6.05	Adhara 255°3.52 -29°0.75
20 21	70° 50.07	94°4.97 · · 19.57	117°41.27 · · 42.02	252°36.92 · · 13.79	49°59.80 · · 6.10	Procyon 244°47.89 5°9.02
22	85°52.53	109°4.60 18.39	132°41.74 41.48	267°39.41 13.81	65°2.17 6.15	Pollux 243°13.89 27°57.33
23	$100^{\circ}55.00$	124°4.23 17.20	147°42.20 40.94	282°41.90 13.84	80°4.53 6.20	Avior 234°13.02 -59°35.99 Suhail 222°44.01 -43°32.79
Mer.	pass. 16:17	ν-0.4' d-1.2' m-4.04	$\nu$ 0.5' d-0.5' m1.15	ν2.5' d0.0' m-2.23	ν2.4' d0.0' m0.51	Miaplacidus 221°36.77 -69°49.89
						Alphard 217°45.00 -8°46.96
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.53 11°49.59
0	115° 57.46	139°3.86 S11°16.02	162°42.66 \$18°40.40	297°44.40 N02°13.86	95°6.90 N06°6.26	Dubhe 193°37.63 61°35.61 Denebola 182°22.26 14°24.68
1	$130^{\circ}59.93$	154°3.49 14.84	177°43.13 39.86	312°46.89 13.89	110°9.27 6.31	Gienah 175°40.88 -17°41.92
2	146°2.39	169°3.12 13.66	192°43.59 39.32	327°49.39 13.91	125°11.64 6.36	Acrux 172°56.97 -63°15.10
3 4	161°4.85 176°7.32	184°2.76 · · 12.47 199°2.39	207°44.06 · · 38.78 222°44.52 38.24	342°51.88 ·· 13.94 357°54.38 13.97	140°14.00 · · 6.41 155°16.37 6.46	Gacrux 171°48.60 -57°16.06
5	170 7.32 191°9.78	214°2.02 10.10	237°44.98 37.70	12°56.87 13.99	170°18.74 6.51	Alioth 166°10.75 55°48.05
6	206° 12.25	229°1.66 \$11°8.92	252°45.45 \$18°37.16	27°59.37 N02°14.02	185°21.10 N06°6.56	Spica 158°19.64 -11°18.53 Alkaid 152°50.12 49°10.02
7	221° 14.71	244°1.29 7.73	267°45.91 36.62	43°1.86 14.04	200°23.47 6.61	Hadar 148°32.44 -60°30.27
8	236° 17.17	259°0.93 6.55	282°46.38 36.07	58°4.36 14.07	215°25.84 6.66	Menkent 147°54.69 -36°30.37
9 10	251° 19.64 266° 22.10	274°0.56 · · 5.36 289°0.20 4.17	297°46.84 · · 35.53 312°47.31 34.99	73°6.85 · · 14.10 88°9.35	230°28.20 · · 6.71 245°30.57 6.77	Arcturus 145°45.71 19°1.95
11	281°24.57	303°59.83 2.99	327°47.77 34.44	103°11.85 14.15	260° 32.93 6.82	Rigil Kent. 139°36.93 -60°56.85
12	296°27.03	318°59.47 \$11°1.80	342°48.24 \$18°33.90	118°14.34 N02°14.18	275°35.30 N06°6.87	Kochab 137°20.39 74°1.99 Zuben'ubi 136°53.35 -16°9.50
13	311°29.50	333°59.11 11°0.61	357°48.71 33.36	133°16.84 14.20	290°37.66 6.92	Alphecca 126°1.83 26°37.00
14	326° 31.96 341° 34.42	348°58.75 10°59.42 3°58.39 · · 58.23	12°49.17 32.81 27°49.64 · · 32.27	148°19.34 14.23 163°21.84 · · 14.26	305°40.03 6.97 320°42.39 · · 7.02	Antares 112°13.02 -26°29.56
15 16	356° 36.89	18°58.03 57.04	27°49.64 · · · 32.27 42°50.10	163°21.84 · · 14.26 178°24.34	320°42.39 · · 7.02 335°44.76 7.08	Atria 107°5.39 -69°4.41
17	11°39.35	33°57.67 55.85	57°50.57 31.18	193°26.84 14.31	350°47.12 7.13	Sabik 102°0.20 -15°45.53 Shaula 96°7.34 -37°7.31
18	26°41.82	48°57.31 <b>S</b> 10°54.66	72°51.04 <b>S</b> 18°30.63	208°29.33 N02°14.34	5°49.49 N06°7.18	Rasalhague 95°56.53 12°32.32
19	41°44.28	63°56.95 53.47	87°51.50 30.09	223°31.83 14.37	20°51.85 7.23	Eltanin 90°41.51 51°28.97
20 21	56° 46.74 71° 49.21	78°56.59 52.28 93°56.23 •• 51.09	102°51.97 29.54 117°52.44 •• 28.99	238°34.33 14.40 253°36.83 · · 14.43	35°54.22 7.28 50°56.58 · · 7.34	Kaus Aust. 83°29.60 -34°22.17
22	86°51.67	108°55.87 49.89	132°52.90 28.44	268°39.33 14.45	65°58.95 7.39	Vega 80°31.95 38°48.51
23	101°54.14	123°55.52 48.70	147°53.37 27.90	283°41.83 14.48	81°1.31 7.44	Nunki 75°45.05 -26°15.64 Altair 61°57.87 8°56.58
Mer.	pass. 16:14	ν-0.4' d-1.2' m-4.04	$\nu$ 0.5' d-0.5' m1.15	ν2.5' d0.0' m-2.23	$\nu$ 2.4' $d$ 0.1' $m$ 0.52	Peacock 53°2.47 -56°38.65
			-			Deneb 49°24.53 45°22.93
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.63 10°0.30
0	116° 56.60	138°55.16 \$10°47.51	162°53.84 \$18°27.35	298°44.34 N02°14.51	96°3.67 N06°7.49	Al Na'ir 27°30.23 -46°49.58 Fomalhaut 15°12.05 -29°28.49
1	131°59.06	153°54.80 46.31	177°54.31 26.80	313°46.84 14.54	111°6.04 7.54	Scheat 13°42.99 28°14.28
2	147°1.53	168°54.45 45.12	192°54.78 26.25	328°49.34 14.57	126°8.40 7.60	Markab 13°27.61 15°21.49
3 4	162°3.99 177°6.46	183°54.09 · · 43.92 198°53.74 42.73	207°55.24 · · 25.70 222°55.71 25.15	343°51.84 · · 14.60 358°54.34	141°10.76 · · 7.65 156°13.13 7.70	Jan 16 Sun SHA Mer.pass
5	192°8.92	213°53.39 41.53	237°56.18 24.60	13°56.84 14.65	171°15.49 7.75	Venus 24°14.54 14:44
6	207°11.38	228°53.03 <b>S</b> 10°40.33	252°56.65 \$18°24.05	28°59.35 N02°14.68	186°17.85 N06°7.81	Mars 47°33.27 13:09
7	222°13.85	243°52.68 39.14	267°57.12 23.50	44°1.85 14.71	201°20.21 7.86	Jupiter 181°46.31 04:12
8 9	237° 16.31 252° 18.78	258°52.33 37.94 273°51.97 · · 36.74	282°57.59 22.95 297°58.06 •• 22.40	59°4.35 14.74 74°6.86 •• 14.77	216°22.58 7.91 231°24.94 · · 7.96	Saturn 339°11.71 17:41
10	267°21.24	288°51.62 35.55	312°58.53 21.85	89°9.36 14.80	246° 27.30 8.02	Jan 17 Mon SHA Mer.pass
11	282°23.71	303°51.27 34.35	327°59.00 21.30	104°11.87 14.83	261°29.66 8.07	Venus 23°6.40 14:44
12	297°26.17	318°50.92 \$10°33.15	342°59.47 \$18°20.75	119°14.37 N02°14.86	276°32.02 N06°8.12	Mars 46°45.20 13:09 Jupiter 181°46.94 04:08
13	312°28.63	333°50.57 31.95	357°59.94 20.19	134°16.88 14.89	291°34.38 8.18	Saturn 339°9.44 17:37
14 15	327°31.10 342°33.56	348°50.22 30.75 3°49.88 • 29.55	13°0.41 19.64 28°0.88 · · 19.09	149°19.38 14.92 164°21.89 · · 14.95	306°36.75 8.23 321°39.11 • 8.28	Jan 18 Tue SHA Mer.pass
16	357° 36.03	18°49.53 28.35	43°1.35 18.54	179°24.39 14.98	336°41.47 8.34	Venus 21°58.56 14:45
17	12°38.49	33°49.18 27.15	58°1.82 17.98	194°26.90 15.01	351°43.83 8.39	Mars 45°57.24 13:08
18	27°40.95	48°48.83 \$10°25.94	73°2.29 \$18°17.43	209°29.40 N02°15.05	6°46.19 N06°8.44	Jupiter 181°47.73 04:04
19 20	42° 43.42 57° 45.88	63°48.49 24.74 78°48.14 23.54	88°2.76 16.87 103°3.23 16.32	224°31.91 15.08 239°34.42 15.11	21°48.55 8.50 36°50.91 8.55	Saturn 339°7.07 17:33
21	72°48.35	93°47.79 · · 22.34	118° 3.70 · · 15.76	254°36.93 · · 15.14	51°53.27 · · 8.60	Horizontal parallax
22	87°50.81	108°47.45 21.13	133° 4.17 15.21	269°39.43 15.17	66° 55.63 8.66	Venus: 0.1
23	102°53.27	123°47.10 19.93	148° 4.65 14.65	284°41.94 15.20	81°57.99 8.71	Mars: 0.1
Mer.	pass. 16:10	$\nu$ -0.4′ d-1.2′ m-4.05	ν0.5′ d-0.5′ m1.15	$\nu$ 2.5′ $d$ 0.0′ $m$ -2.24	$\nu 2.4' \ d0.1' \ m0.52$	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°39.04	S21°3.84	$306^{\circ}54.50$	10.9'	N00°57.65	-16.3'	60.0'
1	192°38.83	3.38	321°24.40	10.9'	00°41.34	-16.3'	60.0'
2	207°38.61 222°38.39	2.91 •• 2.45	335°54.34 350°24.31	11.0' 11.0'	00°25.03 N00°8.74	-16.3' -16.3'	60.0' 59.9'
4	237°38.17	1.98	4°54.31	11.0'	S00°7.53	16.3	59.9'
5	252°37.96	1.51	19°24.35	11.1'	$00^{\circ}23.79$	16.2'	59.9'
6	267°37.74	S21°1.04	33°54.42	11.1'	500°40.03	16.2	59.9'
7 8	282°37.52 297°37.31	0.57 21°0.10	48°24.52 62°54.64	11.1' 11.2'	00°56.25 01°12.45	16.2' 16.2'	59.8' 59.8'
9	312°37.09	20°59.63	77°24.80	11.2'	01°28.62	16.1	59.8'
10	327°36.88	59.16	91°54.98	11.2'	$01^{\circ}44.77$	16.1'	59.7'
11	342°36.66 357°36.45	58.69 \$20°58.22	106° 25.18	11.2'	02°0.89 \$02°16.99	16.1	59.7'
12 13	12°36.23	57.75	120°55.41 135°25.66	11.3' 11.3'	02°33.05	16.1' 16.0'	59.7' 59.6'
14	27°36.02	57.27	149°55.94	11.3'	02°49.09	16.0'	59.6'
15	42°35.81	• • 56.80	164° 26.23	11.3'	03°5.09	16.0'	59.6'
16 17	57°35.59 72°35.38	56.32 55.84	178° 56.54 193° 26.87	11.3' 11.3'	03°21.06 03°36.99	15.9' 15.9'	59.6' 59.5'
18	87°35.17	\$20°55.37	207° 57.22	11.4'	S03° 52.89	15.9'	59.5'
19	102°34.95	54.89	222° 27.58	11.4'	04°8.75	15.8'	59.5'
20	117°34.74	54.41	236°57.96	11.4'	04° 24.57	15.8'	59.4'
21 22	132°34.53 147°34.32	· · 53.93 53.45	251°28.35 265°58.75	11.4' 11.4'	04°40.35 04°56.09	15.7' 15.7'	59.4' 59.4'
23	147 34.32 162°34.10	53.45 52.97	205 58.75 280°29.16	11.4 11.4'	04 56.09 05°11.78	15.7' 15.7'	59.4 59.3'
	SD = 16.3'	d = -0.5'			D = 16.4'		
				JI			
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	177°33.89 192°33.68	\$20° 52.49 52.01	294°59.58 309°30.01	11.4' 11.4'	\$05°27.44 05°43.04	15.6' 15.6'	59.3' 59.3'
2	192°33.68 207°33.47	52.01 51.53	309°30.01 324°0.45	11.4' 11.4'	05° 43.04 05° 58.60	15.5	59.3' 59.2'
3	222°33.26	• • 51.04	338° 30.89	11.4'	06° 14.11	15.5'	59.2'
4	237°33.05	50.56	353°1.34	11.5'	06°29.56	15.4'	59.2'
5 6	252°32.84 267°32.63	50.08 \$20°49.59	7°31.79 22°2.25	11.5' 11.5'	06°44.97 \$07°0.33	15.4' 15.3'	59.1' 59.1'
7	282°32.42	49.11	36°32.70	11.5'	07° 15.63	15.2'	59.1'
8	297°32.21	48.62	51°3.16	11.5'	07°30.88	15.2'	59.0'
9	312°32.01	• • 48.13	65°33.62	11.5'	07°46.07	15.1'	59.0'
10 11	327°31.80 342°31.59	47.64 47.15	80°4.07 94°34.53	11.5' 11.4'	08°1.20 08°16.27	15.1' 15.0'	59.0' 58.9'
12	357°31.38	\$20°46.67	109°4.98	11.4	508° 31.29	15.0'	58.9'
13	12°31.17	46.18	123°35.42	11.4'	$08^{\circ}46.24$	14.9'	58.9'
14	27°30.97 42°30.76	45.68	138°5.86	11.4'	09°1.13 09°15.96	14.8'	58.9'
15 16	42°30.76 57°30.55	· · 45.19 44.70	152°36.29 167°6.72	11.4' 11.4'	09° 15.96 09° 30.72	14.8' 14.7'	58.8' 58.8'
17	72°30.35	44.21	181°37.14	11.4'	09°45.42	14.6'	58.8'
18	87°30.14	S20°43.71	196°7.54	11.4'	S10°0.05	14.6'	58.7'
19 20	102°29.94 117°29.73	43.22 42.73	210°37.94 225°8.32	11.4' 11.4'	10° 14.61 10° 29.10	14.5' 14.4'	58.7' 58.7'
21	132°29.52	. 42.73	239°38.70	11.4'	10° 29.10 10° 43.53	14.4	58.6'
22	147°29.32	41.73	254°9.05	11.3'	10°57.88	14.3'	58.6'
23	162°29.12	41.24	268°39.40	11.3'	11° 12.15	14.2'	58.6'
	SD = 16.3'	d = -0.5'		SI	D = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°28.91	\$20°40.74	283°9.73	11.3'	S11°26.36	14.1'	58.5'
1	192°28.71	40.24 39.74	297° 40.04 312° 10.34	11.3'	11°40.49 11°54.54	14.1'	58.5'
2	207°28.50 222°28.30	39.74 · · 39.24	312°10.34 326°40.62	11.3' 11.3'	11°54.54 12°8.52	14.0' 13.9'	58.5' 58.4'
4	237°28.10	38.74	341°10.88	11.2'	12°22.41	13.8'	58.4
5	252°27.90	38.24	355°41.12	11.2'	12°36.23	13.7'	58.4'
6 7	267°27.69 282°27.49	\$20°37.74 37.24	10°11.34 24°41.54	11.2' 11.2'	\$12°49.97 13°3.63	13.7' 13.6'	58.3' 58.3'
8	282°27.49 297°27.29	37.24 36.73	39° 11.72	11.2'	13° 17.20	13.5	58.3'
9	312°27.09	• • 36.23	53°41.87	11.1'	13°30.69	13.4'	58.2'
10	327°26.89	35.73	68° 12.00	11.1'	13°44.10	13.3'	58.2'
11 12	342°26.69 357°26.48	35.22 \$20°34.72	82°42.11 97°12.19	11.1' 11.1'	13°57.42 \$14°10.65	13.2' 13.1'	58.2' 58.1'
13	12°26.28	34.21	111° 42.25	11.1	14° 23.80	13.1	58.1
14	27°26.08	33.70	126° 12.28	11.0'	14°36.85	13.0'	58.1'
15	42°25.88	• • 33.19	140° 42.28	11.0'	14° 49.82	12.9'	58.0'
16 17	57°25.69 72°25.49	32.69 32.18	155° 12.26 169° 42.21	10.9' 10.9'	15°2.70 15°15.48	12.8' 12.7'	58.0' 58.0'
18	87°25.29	52.16 S20°31.67	184° 12.13	10.9	\$15°28.17	12.6'	57.9'
19	102°25.09	31.16	198° 42.02	10.9'	15°40.77	12.5'	57.9'
20	117°24.89	30.64	213° 11.88	10.8'	15°53.28	12.4'	57.9'
21 22	132°24.69 147°24.50	· · 30.13 29.62	227°41.71 242°11.50	10.8' 10.8'	16°5.69 16°18.00	12.3' 12.2'	57.8' 57.8'
23	162°24.30	29.02	256° 41.27	10.8	16°30.21	12.1	57.8'
	SD = 16.3'	d = -0.5'		SI	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	80-59%	
16	09:24	09:34	12:10	03:40	16:04		
17	09:44	09:54	12:10	04:29	16:53		
18	10:04	10:14	12:10	05:18	17:43		

# January 19, 20, 21 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	117°55.74	138°46.76 \$10°18.72	163°5.12 \$18°14.10	299°44.45 N02°15.23	97°0.35 N06°8.76	
1	132°58.20	153°46.42 17.52	178°5.59 13.54	314°46.96 15.27	112°2.71 8.82	Alpheratz 357°32.31 29°14.91 Ankaa 353°4.89 -42°9.37
2	148°0.67	168°46.07 16.31	193°6.06 12.98	329°49.47 15.30	127°5.07 8.87	Ankaa 353°4.89 -42°9.37 Schedar 349°28.26 56°41.79
3	163°3.13	183°45.73 · · 15.11	208°6.53 · · 12.42	344°51.98 · · 15.33	142°7.43 · · 8.93	Diphda 348°44.91 -17°50.04
4	178°5.60	198°45.39 13.90	223°7.01 11.87	359°54.49 15.36	157°9.78 8.98	Achernar 335°18.43 -57°5.90
5	193°8.06	213°45.05 12.70	238°7.48 11.31	14°57.00 15.39	172°12.14 9.03	Hamal 327°48.31 23°35.82
6	208° 10.52	228°44.71 \$10°11.49	253°7.95 \$18°10.75	29°59.51 N02°15.43	187°14.50 N06°9.09	Polaris 312°29.82 89°23.20
7 8	223° 12.99 238° 15.45	243°44.37 10.28 258°44.03 9.07	268° 8.43 10.19 283° 8.90 9.63	45°2.02 15.46 60°4.53 15.49	202°16.86 9.14 217°19.22 9.20	Acamar 315°9.77 -40°11.74
9	253° 17.92	273°43.69 · · 7.86	298° 9.37 · · 9.07	75°7.04 · · 15.52	232°21.58 · · 9.25	Menkar 314°3.42 4°11.97
10	268°20.38	288° 43.35 6.66	313° 9.85 8.51	90°9.55 15.56	247°23.93 9.31	Mirfak 308°24.39 49°57.83
11	283°22.84	303°43.01 5.45	328°10.32 7.95	105°12.06 15.59	262°26.29 9.36	Aldebaran 290°36.50 16°33.91
12	298°25.31	318°42.67 \$10°4.24	343°10.80 \$18°7.39	120°14.57 N02°15.62	277°28.65 N06°9.42	Rigel 281°1.20 -8°10.28
13	$313^{\circ}27.77$	333°42.33 3.03	358°11.27 6.83	135°17.09 15.66	292°31.01 9.47	Capella 280°17.79 46°1.59 Bellatrix 278°19.92 6°22.41
14	328°30.24	348°42.00 1.82	13°11.74 6.27	150°19.60 15.69	307°33.36 9.52	Elnath 277° 58.38 28° 37.83
15	343°32.70	3°41.66 10°0.61	28°12.22 · · 5.71	165°22.11 ·· 15.72	322°35.72 · · 9.58	Alnilam 275°34.91 -1°11.16
16	358°35.16	18°41.32 09°59.39	43°12.69 5.15	180°24.62 15.76	337°38.08 9.63	Betelgeuse 270°49.08 7°24.63
17	13°37.63	33°40.99 58.18	58°13.17 4.59	195°27.14 15.79	352°40.44 9.69	Canopus 263°50.76 -52°42.79
18	28° 40.09 43° 42.56	48°40.65 \$09°56.97	73°13.64 \$18°4.03 88°14.12 3.46	210°29.65 N02°15.83 225°32.17 15.86	7°42.79 N06°9.74 22°45.15 9.80	Sirius 258°23.69 -16°45.44
19 20	43 42.50 58°45.02	63°40.32 55.76 78°39.99 54.54	88°14.12 3.46 103°14.59 2.90	225°32.17 15.86 240°34.68 15.89	22°45.15 9.80 37°47.50 9.85	Adhara 255°3.52 -29°0.76
21	73°47.49	93°39.65 · · 53.33	118°15.07 · · 2.34	255°37.19 · · 15.93	52°49.86 · · 9.91	Procyon 244°47.89 5°9.02
22	88° 49.95	108°39.32 52.12	133°15.55 1.77	270°39.71 15.96	67°52.22 9.96	Pollux 243°13.89 27°57.33
23	103°52.41	123°38.99 50.90	148°16.02 1.21	285°42.23 16.00	82°54.57 10.02	Avior 234°13.01 -59°36.01
N 4 - · · ·	16.06			ν2.5' d0.0' m-2.25		Suhail 222°44.00 -43°32.80
ivier.p	pass. 16:06	ν-0.3' d-1.2' m-4.05	$\nu$ 0.5′ <i>d</i> -0.6′ m1.14	ν2.5° α0.0° m-2.25	$\nu 2.4' \ d0.1' \ m0.52$	Miaplacidus 221°36.75 -69°49.91 Alphard 217°44.99 -8°46.97
						Regulus 207°31.52 11°49.58
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.60 61°35.61
0	118°54.88	138°38.66	163°16.50 \$18°0.64	300°44.74 N02°16.03	97°56.93 N06°10.07	Denebola 182°22.24 14°24.67
1	133°57.34	153°38.32 48.47	178°16.98 18°0.08	315°47.26 16.07	112°59.28 10.13	Gienah 175°40.86 -17°41.93
2	148° 59.81	168° 37.99 47.26	193°17.45 17°59.51	330°49.77 16.10	128°1.64 10.19	Acrux 172°56.92 -63°15.11
3 4	164°2.27 179°4.73	183°37.66 · · 46.04 198°37.33 44.83	208°17.93 · · 58.95 223°18.41 58.38	345°52.29 · · 16.14 0°54.81 16.17	143°3.99 ·· 10.24 158°6.35 10.30	Gacrux 171°48.56 -57°16.07
5	179 4.73 194°7.20	213° 37.00 43.61	238°18.88 57.82	15°57.32 16.21	158°6.35 10.30 173°8.70 10.35	Alioth 166°10.72 55°48.05
6	209°9.66	228°36.67 S09°42.39	253°19.36 \$17°57.25	30°59.84 N02°16.24	188°11.06 N06°10.41	Spica 158°19.62 -11°18.53
7	224° 12.13	243°36.35 41.17	268°19.84 56.68	46°2.36 16.28	203° 13.41 10.46	Alkaid 152°50.09 49°10.01
8	239° 14.59	258° 36.02 39.96	283°20.32 56.12	61°4.88 16.32	218° 15.77 10.52	Hadar 148°32.40 -60°30.27
9	$254^{\circ}17.06$	273°35.69 · · 38.74	298°20.79 · · 55.55	76°7.40 · · 16.35	233°18.12 · · 10.58	Menkent 147°54.66 -36°30.38 Arcturus 145°45.68 19°1.95
10	$269^{\circ}19.52$	288°35.36 37.52	313°21.27 54.98	91°9.91 16.39	248° 20.47 10.63	Rigil Kent. 139°36.89 -60°56.85
11	284°21.98	303°35.04 36.30	328°21.75 54.41	106°12.43 16.42	263°22.83 10.69	Kochab 137°20.34 74°1.99
12	299°24.45	318°34.71 S09°35.08	343°22.23 \$17°53.85	121°14.95 N02°16.46	278°25.18 N06°10.74	Zuben'ubi 136°53.33 -16°9.50
13	314°26.91	333°34.39 33.86	358°22.71 53.28	136°17.47 16.50	293°27.54 10.80	Alphecca 126°1.81 26°36.99
14	329°29.38	348°34.06 32.64	13°23.19 52.71	151°19.99 16.53 166°22.51 · · 16.57	308°29.89 10.86 323°32.24 · · 10.91	Antares 112°13.00 -26°29.56
15 16	344° 31.84 359° 34.30	3°33.74 · · 31.42 18°33.41	28°23.66 · · 52.14 43°24.14 51.57	166°22.51 · · 16.57 181°25.03 16.61	323°32.24 · · 10.91 338°34.60 10.97	Atria 107°5.35 -69°4.40
17	14°36.77	33°33.09 28.98	58°24.62 51.00	196°27.55 16.64	353°36.95 11.02	Sabik 102°0.18 -15°45.53
18	29°39.23	48°32.76 S09°27.75	73°25.10 \$17°50.43	211°30.08 N02°16.68	8°39.30 N06°11.08	Shaula 96°7.32 -37°7.31
19	44°41.70	63°32.44 26.53	88°25.58 49.86	226°32.60 16.72	23°41.65 11.14	Rasalhague 95°56.52 12°32.31
20	59°44.16	78°32.12 25.31	103°26.06 49.29	241°35.12 16.76	38° 44.01 11.19	Eltanin 90°41.50 51°28.95 Kaus Aust. 83°29.58 -34°22.16
21	74°46.63	93°31.80 · · 24.08	118°26.54 · · 48.71	256°37.64 · · 16.79	53°46.36 · · 11.25	Vega 80°31.94 38°48.50
22	89°49.09	108°31.48 22.86	133°27.02 48.14	271°40.16 16.83	68° 48.71 11.31	Nunki 75°45.04 -26°15.63
23	104°51.55	123°31.16 21.64	148°27.50 47.57	286°42.69 16.87	83°51.06 11.36	Altair 61°57.86 8°56.57
Mer	pass. 16:02	ν-0.3' d-1.2' m-4.06	ν0.5' d-0.6' m1.14	ν2.5' d0.0' m-2.25	ν2.4' d0.1' m0.53	Peacock 53°2.46 -56°38.63
						Deneb 49°24.53 45°22.92
F. *	CIIA	CHV 2	CHA 5	CHA 5	CHA D	Enif 33°36.63 10°0.29
Fri 0	<b>GHA</b> 119° 54.02	<b>GHA Dec</b> 138°30.84 \$09°20.41	<b>GHA Dec</b> 163°27.98 <b>S</b> 17°47.00	<b>GHA Dec</b> 301°45.21 N02°16.91	<b>GHA Dec</b> 98°53.41 N06°11.42	Al Na'ir 27° 30.24 -46° 49.57
1	119 54.02 134° 56.48	150 30.64 309 20.41 153°30.52 19.19	178°28.46 46.43	316°47.73 16.94	113°55.76 11.48	Fomalhaut 15°12.06 -29°28.48
2	149°58.95	168°30.20 17.96	193°28.95 45.85	331°50.26 16.98	128°58.12 11.53	Scheat 13°43.00 28°14.27 Markab 13°27.62 15°21.49
3	165°1.41	183°29.88 · · 16.74	208°29.43 · · 45.28	346°52.78 · · 17.02	144°0.47 · · 11.59	IVIAIKAD 13 21.02 15 21.49
4	180°3.87	198°29.56 15.51	223°29.91 44.71	1°55.30 17.06	159°2.82 11.65	Jan 19 Wed SHA Mer.pass
5	195°6.34	213°29.24 14.28	238°30.39 44.13	16°57.83 17.10	174°5.17 11.71	Venus 20°51.02 14:45
6	210°8.80	228°28.93 <b>S</b> 09°13.06	253°30.87 \$17°43.56	32°0.35 N02°17.14	189°7.52 N06°11.76	Mars 45°9.38 13:07
7	225°11.27	243°28.61 11.83	268°31.35 42.98	47°2.88 17.18	204°9.87 11.82	Jupiter 181° 48.71 04:00
8	240°13.73	258°28.29 10.60	283°31.83 42.41	62°5.40 17.21	219°12.22 11.88	Saturn 339°4.61 17:29
9	255° 16.20	273°27.98 · · 9.37	298°32.32 · · 41.83	77°7.93 · · 17.25	234°14.57 · · 11.93	Jan 20 Thu SHA Mer.pass
10 11	270° 18.66 285° 21.12	288°27.66 8.15 303°27.35 6.92	313°32.80 41.26 328°33.28 40.68	92°10.46 17.29 107°12.98 17.33	249°16.92 11.99 264°19.27 12.05	Venus 19°43.78 14:46
12	300°23.59	318°27.03 S09°5.69	343°33.76 S17°40.10	107 12.98 17.33 122°15.51 N02°17.37	279°21.62 N06°12.11	Mars 44°21.62 13:06
13	315°26.05	333°26.72 4.46	358°34.25 39.53	137°18.04 17.41	294°23.97 12.16	Jupiter 181°49.86 03:56
14	330°28.52	348°26.41 3.23	13°34.73 38.95	152°20.56 17.45	309°26.32 12.22	Saturn 339°2.05 17:25
15	345°30.98	3°26.09 · · 2.00	28°35.21 · · 38.37	167°23.09 · · 17.49	324°28.67 · · 12.28	Jan 21 Fri SHA Mer.pass
16	0°33.44	18°25.78 09°0.77	43°35.70 37.79	182°25.62 17.53	339°31.02 12.34	Venus 18°36.82 14:46
17	15°35.91	33°25.47 08°59.54	58°36.18 37.22	197°28.15 17.57	354°33.37 12.40	Mars 43°33.97 13:06
18	30°38.37	48°25.16 \$08°58.31	73°36.67 <b>S</b> 17°36.64	212°30.68 N02°17.61	9°35.71 N06°12.45	Jupiter 181°51.19 03:52
19	45° 40.84	63°24.85 57.07	88°37.15 36.06	227°33.21 17.65	24°38.06 12.51	Saturn 338°59.40 17:22
20	60°43.30	78°24.53 55.84	103°37.63 35.48	242°35.73 17.69	39°40.41 12.57	Horizontal parallax
21 22	75° 45.77 90° 48.23	93°24.22 · · 54.61	118°38.12 · · 34.90 133°38.60 34.32	257°38.26 ·· 17.73 272°40.79 17.77	54° 42.76 · · 12.63 69° 45.11 12.69	Venus: 0.1
23	90 48.23 105°50.69	108°23.91 53.38 123°23.61 52.14	133°38.60 34.32 148°39.09 33.74	272°40.79 17.77 287°43.32 17.81	69°45.11 12.69 84°47.46 12.74	Mars: 0.1
Mer.p	pass. 15:58	$\nu$ -0.3' d-1.2' m-4.06	$ u 0.5' \ d$ -0.6' m1.14	$\nu 2.5' \ d0.0' \ \text{m-}2.26$	$ u 2.4' \ d0.1' \ m0.53$	

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°24.10	S20°28.59	271°11.01	10.7'	S16°42.33	12.0'	57.7'
1	192°23.90	28.08	285°40.71	10.7'	16°54.35	11.9'	57.7'
2	207°23.71	27.56	300°10.38	10.6'	17°6.26	11.8'	57.7'
3	222°23.51	• • 27.05	314°40.01	10.6'	$17^{\circ}18.08$	11.7'	57.6'
4	237°23.32	26.53	$329^{\circ}9.62$	10.6'	17°29.79	11.6'	57.6'
5	252°23.12	26.01	343°39.19	10.5'	$17^{\circ}41.40$	11.5'	57.6'
6	267°22.93	S20°25.50	358°8.72	10.5'	<b>S</b> 17°52.91	11.4'	57.5'
7	282°22.73	24.98	12°38.22	10.5'	18°4.31	11.3'	57.5'
8	297°22.54	24.46	27°7.68	10.4'	18° 15.61	11.2'	57.5'
9	312°22.34	• • 23.94	41°37.11	10.4'	18°26.80	11.1'	57.4'
10	327°22.15	23.42	56°6.50	10.4	18° 37.88	11.0'	57.4'
11	342°21.95	22.90	70°35.86	10.3'	18°48.86	10.9'	57.4'
12	357°21.76 12°21.57	\$20°22.37 21.85	85°5.18 99°34.46	10.3' 10.2'	\$18° 59.72 19° 10.47	10.8' 10.6'	57.3'
13 14	27°21.38	21.85	99 34.46 114°3.71	10.2'	19 10.47 19°21.12	10.5	57.3' 57.3'
15	42°21.18	20.80	114 3.71 128°32.92	10.2'	19°21.12	10.5	57.3'
16	57°20.99	20.28	143°2.09	10.2	19° 31.03	10.4	57.3'
17	72°20.80	19.75	157°31.23	10.1	19°52.38	10.2	57.2'
18	87°20.61	\$20°19.23	172°0.33	10.1	\$20°2.57	10.1	57.2'
19	102°20.42	18.70	186°29.39	10.0'	20° 12.65	10.0'	57.1
20	117°20.23	18.17	200°58.42	10.0'	20°22.61	9.8'	57.1
21	132°20.04	17.65	215°27.40	10.0'	20°32.46	9.7'	57.1
22	147°19.85	17.12	229°56.35	9.9'	20°42.18	9.6'	57.0'
23	162°19.66	16.59	244°25.27	9.9'	20°51.79	9.5'	57.0'
	SD = 16.2'	d = -0.5'		C	0 = 15.7'		
	3D = 10.2'	a = -0.5		5L	v = 15.1°		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°19.47	\$20°16.06	258°54.14	9.8'	S21°1.29	9.4'	57.0'
1	192°19.28	15.53	273°22.98	9.8'	21°10.66	9.3'	56.9'
2	207°19.09	15.00	287°51.78	9.8'	21°19.91	9.1'	56.9'
3	222°18.90	• • 14.46	302°20.55	9.7'	21°29.04	9.0'	56.9'
4	237°18.71	13.93	316°49.28	9.7'	21°38.05	8.9'	56.9'
5	252°18.52	13.40	331°17.97	9.7'	21°46.94	8.8'	56.8'
6	267°18.34 282°18.15	\$20°12.86 12.33	345°46.63 0°15.25	9.6' 9.6'	\$21°55.70 22°4.34	8.6' 8.5'	56.8'
7 Ω	282°18.15 297°17.96	12.33 11.79	0°15.25 14°43.83	9.6 <sup>7</sup> 9.5 <sup>7</sup>	22°4.34 22°12.86	8.5 <sup>7</sup> 8.4 <sup>7</sup>	56.8' 56.7'
8 9	297°17.96 312°17.77	11.79	14°43.83 29°12.38	9.5' 9.5'	22°12.86 22°21.25	8.4	56.7' 56.7'
10	312 17.77 327°17.59	10.72	43°40.89	9.5'	22°29.51	8.1'	56.7'
11	342°17.40	10.18	58° 9.37	9.5 9.4'	22° 37.65	8.0'	56.7
12	357°17.22	\$20°9.65	72°37.81	9.4	S22°45.66	7.9	56.6'
13	12°17.03	9.11	87°6.22	9.4'	22°53.54	7.8'	56.6'
14	27°16.85	8.57	101°34.60	9.3'	23°1.30	7.6'	56.6'
15	42°16.66	8.03	116°2.94	9.3'	23°8.93	7.5'	56.5'
16	57°16.48	7.49	130°31.25	9.3'	23°16.42	7.4'	56.5'
17	$72^{\circ}16.29$	6.95	144°59.53	9.2'	23°23.79	7.2'	56.5'
18	87°16.11	S20°6.41	159°27.78	9.2'	S23°31.02	7.1'	56.5'
19	102°15.92	5.86	173°55.99	9.2'	23°38.13	7.0'	56.4'
20	117°15.74	5.32	$188^{\circ}24.18$	9.2'	$23^{\circ}45.10$	6.8'	56.4'
21	132°15.56	• • 4.78	202°52.33	9.1'	23°51.94	6.7'	56.4'
22	147°15.38	4.23	217°20.46	9.1'	23°58.65	6.6'	56.4'
23	162°15.19	3.69	231°48.55	9.1'	24°5.22	6.4'	56.3'
	SD = 16.2'	d = -0.5'		SE	0 = 15.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°15.01	\$20°3.14	246°16.62	9.0'	S24°11.67	6.3'	56.3'
1	192°14.83	2.59	260°44.66	9.0'	24°17.97	6.2'	56.3'
2	207°14.65	2.05	275°12.68	9.0'	24°24.14	6.0'	56.2'
3	222°14.47	• • 1.50	289°40.66	9.0'	$24^{\circ}30.18$	5.9'	56.2'
4	237°14.29	0.95	$304^{\circ}8.63$	8.9'	$24^{\circ}36.08$	5.8'	56.2'
5	252°14.11	20°0.40	318°36.57	8.9'	24°41.84	5.6'	56.2'
6	267°13.93	<b>S</b> 19°59.85	333°4.48	8.9'	S24°47.47	5.5'	56.1'
7	282°13.75	59.30	347°32.37	8.9'	24°52.96	5.4'	56.1'
8	297°13.57	58.75	2°0.24	8.8'	24°58.32	5.2'	56.1'
9	312°13.39	• • 58.20	16°28.09	8.8'	25°3.53	5.1'	56.1'
10	327°13.21	57.65	30°55.92	8.8'	25°8.61	4.9'	56.0'
11	342°13.03	57.09 \$19°56.54	45°23.73	8.8' 8.8'	25° 13.55	4.8'	56.0'
12 13	357°12.85 12°12.67	519°56.54 55.98	59°51.52 74°19.29	8.8'	\$25° 18.35 25° 23.02	4.7' 4.5'	56.0' 56.0'
13 14	27°12.50	55.43	74 19.29 88°47.05	8.7'	25 23.02 25°27.54	4.5 4.4'	55.9'
15	42°12.32	• • 54.87	103°14.79	8.7'	25°31.92	4.4 4.2'	55.9'
16	57°12.14	54.32	117°42.52	8.7'	25°36.17	4.1'	55.9'
17	72°11.97	53.76	132° 10.23	8.7'	25°40.27	4.0'	55.9'
18	87°11.79	\$19°53.20	146°37.93	8.7'	\$25°44.23	3.8'	55.9'
19	102°11.61	52.65	161°5.62	8.7'	25°48.05	3.7'	55.8'
20	117°11.44	52.09	175°33.30	8.7'	25°51.74	3.5'	55.8'
21	132°11.26	• • 51.53	190°0.97	8.7'	$25^{\circ}55.28$	3.4'	55.8'
22	147°11.09	50.97	204°28.63	8.7'	$25^{\circ}58.68$	3.3'	55.8'
23	162°10.91	50.41	218°56.29	8.6'	$26^{\circ}1.94$	3.1'	55.7'
	SD = 16.2'	d = -0.5'		SE	0 = 15.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:49	09:33			14:50	16:34
N 70°	07:36	09:04	11:09	13:13	15:19	16:47
68°	07:25	08:42	10:12	14:11	15:41	16:57
66°	07:16	08:25	09:39	14:44	15:58	17:06
64°	07:09	08:11	09:15	15:08	16:12	17:14
62°	07:02	07:59	08:56	15:27	16:23	17:21
60°	06:56	07:49	08:40	15:42	16:34	17:27
<b>N</b> 58°	06:50	07:40	08:27	15:55	16:43	17:32
56°	06:45	07:32	08:16	16:07	16:50	17:37
54°	06:41	07:25	08:06	16:17	16:58	17:42
52°	06:36	07:18	07:57	16:26	17:04	17:46
50°	06:32	07:12	07:49	16:33	17:10	17:50
45°	06:23	06:59	07:32	16:50	17:23	17:59
<b>N</b> 40°	06:15	06:48	07:18	17:04	17:34	18:07
35°	06:08	06:39	07:06	17:16	17:43	18:14
30°	06:01	06:30	06:56	17:26	17:52	18:21
20°	05:47	06:14	06:38	17:44	18:08	18:34
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:14	18:36	19:02
<b>S</b> 10°	05:03	05:30	05:52	18:29	18:52	19:18
20°	04:44	05:12	05:36	18:45	19:09	19:37
30°	04:19	04:51	05:17	19:04	19:30	20:02
35°	04:03	04:38	05:06	19:15	19:43	20:18
40°	03:44	04:23	04:54	19:27	19:58	20:37
45°	03:19	04:04	04:39	19:42	20:17	21:02
<b>S</b> 50°	02:44	03:40	04:20	20:00	20:41	21:36
52°	02:26	03:28	04:12	20:09	20:53	21:54
54°	02:02	03:14	04:02	20:19	21:06	22:17
56°	01:28	02:58	03:51	20:30	21:22	22:49
58°	////	02:38	03:38	20:43	21:41	////
<b>S</b> 60°	////	02:13	03:23	20:57	22:06	////
	1	N4		I		

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

Sun			Moon			
Eqn.of Time		Mer.	Mer.Pass.		Age	
00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25	
mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-28%	
10:24	10:33	12:11	06:08	18:33		
10:42	10:51	12:11	06:59	19:25		
11:00	11:09	12:11	07:52	20:18		
	00 <sup>h</sup> mm:ss 10:24 10:42	00 <sup>h</sup> 12 <sup>h</sup> mm:ss mm:ss 10:24 10:33 10:42 10:51	Eqn. of Time 00h 12h Pass mm:ss mm:ss hh:mm           10:24         10:33         12:11           10:42         10:51         12:11	Eqn. of Time 00h 12h Pass Upper hh:mm           mm:ss         mm:ss         hh:mm         hh:mm           10:24         10:33         12:11         06:08           10:42         10:51         12:11         06:59	Eqn. of Time 00h 12h Pass         Mer. Der Pass.           mm:ss mm:ss hh:mm         hh:mm         hh:mm         hh:mm           10:24 10:33 12:11 06:08 18:33 10:42 10:51 12:11 06:59 19:25         19:25	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	120°53.16	138°23.30	163°39.57 \$17°33.16	302°45.85 N02°17.85	99°49.80 N06°12.80	
1	135°55.62	153°22.99 49.68	178°40.06 32.58	317°48.38 17.90	114°52.15 12.86	Alpheratz 357°32.32 29°14.90
2	150°58.09	168°22.68 48.44	193°40.54 32.00	332°50.92 17.94	129° 54.50 12.92	Ankaa 353°4.90 -42°9.37
3	166°0.55	183°22.37 · · 47.21	208°41.03 · · 31.42	347°53.45 · · 17.98	144°56.85 · · 12.98	Schedar 349°28.28 56°41.79
4	181°3.01	198°22.07 45.97	223°41.51 30.84	2°55.98 18.02	159°59.19 13.04	Diphda 348°44.91 -17°50.04
5	196°5.48	213°21.76 44.74	238°42.00 30.25	17°58.51 18.06	175°1.54 13.10	Achernar 335°18.46 -57°5.90
6	211°7.94	228°21.46 \$08°43.50	253°42.49 \$17°29.67	33°1.04 N02°18.10	190°3.89 N06°13.15	Hamal 327°48.32 23°35.82
7	226° 10.41	243°21.15 42.26	268°42.97 29.09	48°3.58 18.15	205°6.23 13.21	Polaris 312°30.98 89°23.21
8	241°12.87	258°20.84 41.03	283°43.46 28.51	63°6.11 18.19	220°8.58 13.27	Acamar 315°9.79 -40°11.75 Menkar 314°3.42 4°11.96
9	256° 15.34	273°20.54 · · 39.79	298°43.95 · · 27.92	78°8.64 · · 18.23	235°10.93 · · 13.33	1
10	271°17.80	288°20.24 38.55	313°44.43 27.34	93°11.17 18.27	250°13.27 13.39	I I
11	286°20.26	303°19.93 37.31	328°44.92 26.76	108°13.71 18.31	265°15.62 13.45	I I
12	301°22.73	318°19.63 \$08°36.08	343°45.41 \$17°26.17	123°16.24 N02°18.36	280°17.96 N06°13.51	Rigel 281°1.20 -8°10.29 Capella 280°17.79 46°1.60
13	$316^{\circ}25.19$	333°19.33 34.84	358°45.89 25.59	138°18.78 18.40	295°20.31 13.57	Bellatrix 278°19.92 6°22.41
14	331°27.66	348°19.03 33.60	13°46.38 25.00	153°21.31 18.44	310°22.65 13.63	Elnath 277°58.38 28°37.83
15	346°30.12	3°18.72 · · 32.36	28°46.87 · · 24.42	168°23.85 · · 18.49	325°25.00 · · 13.68	Alnilam 275°34.91 -1°11.17
16	1°32.59	18° 18.42 31.12	43°47.36 23.83	183°26.38 18.53	340°27.34 13.74	Betelgeuse 270°49.08 7°24.62
17	16°35.05	33°18.12 29.88	58°47.85 23.25	198°28.92 18.57	355°29.69 13.80	Canopus 263°50.77 -52°42.81
18	31°37.51	48°17.82 <b>S</b> 08°28.64	73°48.33 <b>S</b> 17°22.66	213°31.45 N02°18.62	10°32.03 N06°13.86	Sirius 258°23.69 -16°45.45
19	46°39.98	63° 17.52 27.40	88°48.82 22.07	228°33.99 18.66	25°34.38 13.92	Adhara 255°3.51 -29°0.78
20	61°42.44	78° 17.22 26.16	103°49.31 21.49	243°36.53 18.70	40°36.72 13.98	Procyon 244°47.88 5°9.01
21	76°44.91	93°16.92 · · 24.92	118°49.80 · · 20.90	258°39.06 · · 18.75	55°39.07 · · 14.04	Pollux 243°13.88 27°57.33
22	91°47.37	108°16.63 23.68	133°50.29 20.31	273°41.60 18.79	70°41.41 14.10	Avior 234°13.01 -59°36.03
23	106°49.83	123°16.33 22.43	148°50.78 19.72	288°44.14 18.83	85°43.76 14.16	Suhail 222°43.99 -43°32.83
Mori	2255 15·54	ν-0.3' d-1.2' m-4.06	$\nu$ 0.5' d-0.6' m1.14	ν2.5' d0.0' m-2.27	ν2.3' d0.1' m0.53	Miaplacidus 221°36.73 -69°49.93
ivier.	pass. 15:54	ν-0.5 U-1.2 III-4.00	νυ.5 α-υ.υ III1.14	ν Δ.J UU.U III-Ζ.ΖΙ	ν Δ.3 UU.1 IIIU.33	Alphard 217°44.97 -8°46.98
						Regulus 207°31.50 11°49.57
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.57 61°35.61
0	121°52.30	138°16.03 <b>S</b> 08°21.19	163°51.27 <b>S</b> 17°19.14	303°46.68 N02°18.88	100°46.10 N06°14.22	Denebola 182°22.22 14°24.66
1	$136^{\circ}54.76$	153° 15.73 19.95	178°51.76 18.55	318°49.21 18.92	115°48.44 14.28	Gienah 175°40.83 -17°41.94
2	151° 57.23	168°15.44 18.71	193°52.25 17.96	333°51.75 18.97	130°50.79 14.34	Acrux 172°56.87 -63°15.12
3	166° 59.69	183°15.14 · · 17.46	208°52.74 · · 17.37	348°54.29 · · 19.01	145°53.13 · · 14.40	Gacrux 171°48.52 -57°16.09
4	$182^{\circ}2.16$	198°14.84 16.22	223°53.23 16.78	3°56.83 19.06	160°55.47 14.46	Alioth 166°10.68 55°48.05
5	197°4.62	213° 14.55 14.97	238°53.72 16.19	18°59.37 19.10	175°57.82 14.52	Spica 158°19.59 -11°18.55
6	212°7.08	228°14.25 \$08°13.73	253°54.21 <b>S</b> 17°15.60	34°1.91 N02°19.15	191°0.16 N06°14.58	Alkaid 152°50.06 49°10.01
7	$227^{\circ}9.55$	243°13.96 12.48	268°54.70 15.01	49°4.45 19.19	206°2.50 14.64	Hadar 148°32.35 -60°30.28
8	242°12.01	258°13.67 11.24	283°55.19 14.42	64°6.99 19.24	221°4.84 14.70	Menkent 147°54.62 -36°30.38
9	257° 14.48	273°13.37 · · 9.99	298°55.68 · · 13.83	79°9.53 · · 19.28	236°7.19 · · 14.76	Arcturus 145°45.66 19°1.94
10	272°16.94	288°13.08 8.75	313°56.17 13.24	94°12.07 19.33	251°9.53 14.82	Rigil Kent. 139°36.84 -60°56.85
11	287° 19.41	303°12.79 7.50	328°56.66 12.65	109°14.61 19.37	266° 11.87 14.88	Kochab 137°20.28 74°1.98
12	302°21.87	318°12.50 <b>S</b> 08°6.26	343°57.15 \$17°12.05	124°17.15 N02°19.42	281°14.21 N06°14.94	Zuben'ubi 136°53.30 -16°9.51
13	317°24.33	333°12.20 5.01	358°57.65 11.46	139°19.69 19.46	296°16.55 15.00	Alphecca 126°1.78 26°36.98
14	332°26.80	348°11.91 3.76	13°58.14 10.87	154°22.23 19.51	311°18.90 15.06	Antares 112°12.97 -26°29.56
15	347°29.26	3°11.62 · · 2.51	28°58.63 ·· 10.28	169°24.78 · · 19.56	326°21.24 · · 15.12	Atria 107°5.29 -69°4.39
16	2°31.73	18°11.33 1.27	43°59.12 9.68	184°27.32 19.60	341°23.58 15.18	Sabik 102°0.15 -15°45.54
17	17°34.19	33°11.04 08°0.02	58°59.61 9.09	199°29.86 19.65	356°25.92 15.25	Shaula 96°7.29 -37°7.31
18	32° 36.65	48°10.75 <b>S</b> 07°58.77	74°0.11 \$17°8.50	214°32.41 N02°19.69	11°28.26 N06°15.31	Rasalhague 95°56.50 12°32.30
19	47°39.12	63°10.46 57.52	89°0.60 7.90	229°34.95 19.74	26°30.60 15.37	Eltanin 90°41.48 51°28.94
20	62°41.58	78° 10.18 56.27	104°1.09 7.31	244°37.49 19.79	41°32.94 15.43	Kaus Aust. 83°29.56 -34°22.16
21	77° 44.05	93°9.89 · · 55.02	119°1.59 · · 6.71	259°40.04 · · 19.83	56°35.28 · · 15.49	Vega 80°31.92 38°48.49
22	92°46.51	108°9.60 53.77	134°2.08 6.12	274°42.58 19.88	71°37.62 15.55	Nunki 75°45.02 -26°15.63
23	107°48.98	123°9.31 52.52	149° 2.57 5.52	289°45.13 19.93	86°39.96 15.61	Altair 61°57.85 8°56.57
Meri	pass. 15:50	ν-0.3' d-1.2' m-4.07	ν0.5' d-0.6' m1.13	ν2.5' d0.0' m-2.28	ν2.3' d0.1' m0.53	Peacock 53°2.45 -56°38.62
						Deneb 49°24.53 45°22.91
						Enif 33°36.63 10°0.29
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.24 -46°49.56
0	122°51.44	138°9.03 S07°51.27	164°3.07 \$17°4.93	304°47.67 N02°19.98	101°42.30 N06°15.67	Fomalhaut 15°12.06 -29°28.48
1	137°53.90	153°8.74 50.02	179°3.56 4.33	319°50.22 20.02	116°44.64 15.73	Scheat 13°43.00 28°14.26
2	152° 56.37	168°8.46 48.77	194°4.06 3.73	334°52.76 20.07	131°46.98 15.79	Markab 13°27.62 15°21.48
3	167°58.83	183°8.17 · · 47.52	209°4.55 · · 3.14	349°55.31 · · 20.12	146°49.32 · · 15.86	1 22 5
4	183°1.30	198°7.89 46.27	224°5.04 2.54	4°57.85 20.17	161°51.66 15.92	Jan 22 Sat SHA Mer.pass
5	198°3.76	213°7.60 45.01	239°5.54 1.94	20°0.40 20.21	176°54.00 15.98	Venus 17°30.14 14:47
6	213°6.22	228°7.32 S07°43.76	254°6.03 \$17°1.35	35°2.95 N02°20.26	191°56.34 N06°16.04	Mars 42°46.41 13:05
7	228°8.69	243°7.03 42.51	269° 6.53 0.75	50°5.49 20.31	206°58.68 16.10	Jupiter 181°52.70 03:48
8	243°11.15	258°6.75 41.26	284°7.03 17°0.15	65°8.04 20.36	222°1.02 16.16	Saturn 338°56.64 17:18
9	258° 13.62	273°6.47 · · 40.00	299°7.52 16°59.55	80°10.59 · · 20.41	237°3.36 · · 16.23	Jan 23 Sun SHA Mer.pass
10	273°16.08	288°6.19 38.75	314°8.02 58.95	95°13.14 20.46	252°5.69 16.29	Venus 16°23.73 14:47
11	288° 18.55	303°5.90 37.49	329°8.51 58.35	110°15.69 20.50	267°8.03 16.35	Mars 41°58.97 13:04
12	303°21.01	318°5.62 <b>S</b> 07°36.24	344°9.01 \$16°57.75	125°18.23 N02°20.55	282°10.37 N06°16.41	Jupiter 181°54.38 03:44
13	318°23.47	333°5.34 34.99	359°9.50 57.15	140°20.78 20.60	297°12.71 16.47	Saturn 338°53.80 17:14
14	333° 25.94	348°5.06 33.73	14°10.00 56.55	155°23.33 20.65	312°15.05 16.54	
15	348°28.40	3°4.78 · · 32.48	29°10.50 · · 55.95	170°25.88 · · 20.70	327°17.38 · · 16.60	Jan 24 Mon SHA Mer.pass
16	3°30.87	18°4.50 31.22	44°10.99 55.35	185°28.43 20.75	342°19.72 16.66	Venus 15°17.59 14:48
17	18° 33.33	33°4.22 29.96	59°11.49 54.75	200°30.98 20.80	357°22.06 16.72	Mars 41°11.63 13:03
18	33°35.80	48°3.94 S07°28.71	74°11.99 \$16°54.15	215°33.53 N02°20.85	12°24.39 N06°16.78	Jupiter 181°56.23 03:40
19	48°38.26	63°3.67 27.45	89°12.49 53.55	230°36.08 20.90	27°26.73 16.85	Saturn 338°50.86 17:11
20	63°40.72	78°3.39 26.19	104°12.98 52.95	245°38.63 20.95	42°29.07 16.91	Horizontal parallax
21	78°43.19	93°3.11 · · 24.94	119°13.48 · · 52.35	260°41.19 · · 21.00	57°31.41 · · 16.97	Venus: 0.1
22 23	93°45.65 108°48.12	108°2.83 23.68 123°2.56 22.42	134°13.98 51.74 149°14.48 51.14	275°43.74 21.05 290°46.29 21.10	72°33.74 17.03	Mars: 0.1
					87°36.08 17.10	
Mer.	pass. 15:46	$\nu$ -0.3′ <i>d</i> -1.3′ m-4.07	$ u 0.5' \ d\text{-}0.6' \ \text{m}1.13$	$\nu 2.5' \ d0.0' \ \text{m-}2.28$	$ u 2.3' \ d0.1' \ { m m0.54}$	

CHA	h	Su	n		ı	Moon		
1	Sat	GHA	Dec	GHA	ν	Dec	d	HP
2								
	1							
The color of the								
8								
10   327"901   4420		297°9.36		349°5.05		26°24.89		
11   342"8.84	9	312°9.18	• • 44.76		8.7'	$26^{\circ}26.73$	1.7'	55.5'
12								
13								
14								
15								
17								
18	16	57°7.99	40.78	104°46.46	8.7'	$26^{\circ}35.66$	0.7'	55.4'
10	17				8.7'		0.6'	55.3'
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Sun         GHA         Dec         GHA         ν         Dec         d         HP           0         177°6.65         S19°3618         220°28.79         8.9'         26°36.74         0.4'         55.2'           1         192°6.49         35.60         234°56.68         8.9'         26°36.99         -0.6'         55.2'           3         222°6.16         ·34.45         263°52.53         9.0'         26°38.75         38.75         55.2'           4         237°5.99         33.87         278°20.50         9.0'         26°34.93         -1.0'         55.1'           6         267°5.66         S19°32.71         307°16.52         9.1'         226°31.96         -1.2'         55.1'           7         282°5.50         32.12         321°44.58         9.1'         26°31.62         -1.4'         55.1'           9         312°5.17         -30.96         350°40.79         9.2'         26°27.08         -1.5'         55.0'           10         327°5.01         30.38         5°8.95         9.2'         26°28.30         -1.9'         55.0'           11         342°4.84         29.79         19°37.15         9.2'         26°28.30         -1.9'         55.		SD - 16.2/	d0.6/		SD	- 15 2/		
177°6.65		JD — 10.2	u — -0.0		30	- 15.2		
1 192°6.49 35.60 234°56.68 8.9' 26°36.99 -0.6' 55.2' 2 207°6.32 35.02 249°24.59 8.9' 26°36.44 -0.7' 55.2' 3 222°6.16 · 34.45 263°52.53 9.0' 26°34.93 -1.0' 55.1' 4 237°5.99 33.87 278°20.50 9.0' 26°34.93 -1.0' 55.1' 5 252°5.83 33.29 292°48.49 9.0' 26°33.96 -1.1' 55.1' 6 267°5.66 519°32.71 307°16.52 9.1' 26°31.62 -1.4' 55.1' 7 282°5.50 32.12 321°44.58 9.1' 26°31.62 -1.4' 55.1' 8 297°5.33 31.54 336°12.67 9.1' 26°31.62 -1.4' 55.1' 8 297°5.33 31.54 336°12.67 9.1' 26°31.62 -1.4' 55.1' 10 332°5.01 30.38 5°8.95 9.2' 26°27.08 -1.8' 55.0' 11 342°4.84 29.79 19°37.15 9.2' 26°22.30 -1.9' 55.0' 12 357°4.68 519°29.21 34°5.38 9.3' 226°23.38 -2.1' 55.0' 13 12°4.52 28.62 48°33.65 9.3' 26°21.33 -2.2' 55.0' 14 27°4.36 28.04 63°1.96 9.4' 26°11.84 -2.3' 55.0' 15 42°4.20 · 27.45 77°30.31 9.4' 26°14.37 -2.6' 54.9' 16 57°4.04 26.87 91°8.70 9.4' 26°11.82 -2.5' 54.9' 17 72°3.87 26.28 106°27.14 9.5' 26°01.78 -2.7' 54.9' 18 87°3.71 519°25.69 120°55.62 9.5' 526°9.06 -2.8' 54.9' 20 117°3.39 24.51 149°52.71 9.6' 26°3.23 -1.1' 55.0' 21 132°3.23 · 23.92 164°21.32 9.7' 26°01.2 -3.2' 54.8' 22 147°3.08 23.33 178°49.98 9.7' 25°56.88 -3.4' 54.8' 22 147°3.08 23.33 178°49.98 9.7' 25°56.88 -3.4' 54.8' 23 162°2.92 22.74 193°18.69 9.8' 25°55.01 -3.5' 54.8' 24 207°2.44 20.96 236°45.13 9.9' 25°46.39 -3.8' 54.8' 25 22°2.28 · 20.37 251°14.04 10.0' 25°34.76 -4.1' 54.7' 37 282°1.66 17.99 309°10.23 10.2' 25°34.76 -4.1' 54.7' 38 297°1.50 17.39 323°3.94 10.0' 25°34.76 -4.1' 54.7' 38 297°1.50 17.39 332°3.94 10.0' 25°34.76 -4.1' 54.7' 38 297°1.50 17.39 332°3.94 10.0' 25°34.76 -4.1' 54.7' 38 297°1.50 17.39 332°3.97 10.4' 25°81.8 -4.7' 54.7' 38 297°1.50 17.39 332°3.97 10.4' 25°81.4 -4.9' 54.6' 11 342°1.04 15.60 7°7.33 10.4' 25°81.8 -4.1' 54.7' 11 342°1.04 15.60 7°7.33 10.0' 25°34.76 -4.1' 54.7' 11 342°1.04 15.60 7°7.33 10.0' 25°34.76 -4.1' 54.7' 11 342°1.04 15.60 7°7.33 10.0' 25°34.76 -4.1' 54.7' 11 342°1.04 15.60 7°7.33 10.0' 25°34.76 -4.1' 54.7' 11 342°1.04 15.60 7°7.33 10.0' 25°34.76 -4.1' 54.7' 11 342°1.99 100°35.90 100°35.90 100°35.90 10.7' 24°31.8 -5.0' 54.6' 12								
2 207°6.32 35.02 249°24.59 8.9' 26°36.44 -0.7' 55.2' 3 222°6.16 · 34.45 263°52.53 9.0' 26°35.75 -0.8' 55.2' 4 237°5.99 33.87 278°20.50 9.0' 26°33.96 -1.1' 55.1' 5 252°5.83 33.29 292°48.49 9.0' 26°33.96 -1.1' 55.1' 6 267°5.66 \$19°32.71 307°16.52 9.1' \$26°32.86 -1.2' 55.1' 7 282°5.50 32.12 321°4.58 9.1' 26°31.62 -1.4' 55.1' 8 297°5.33 31.54 336°12.67 9.1' 26°31.62 -1.4' 55.1' 8 297°5.33 31.54 336°12.67 9.1' 26°30.24 -1.5' 55.1' 9 312°5.17 · 30.96 350°40.79 9.2' 26°28.73 -1.6' 55.0' 10 327°5.01 30.38 5°8.95 9.2' 26°27.08 -1.8' 55.0' 11 342°4.84 29.79 19°37.15 9.2' 26°25.30 -1.9' 55.0' 12 357°4.68 \$19°9.21 34°5.38 9.3' \$26°23.38 -2.1' 55.0' 13 12°4.52 28.62 48°33.65 9.3' 26°21.33 -2.2' 55.0' 14 27°4.36 28.04 63°1.96 9.4' 26°11.14 -2.3' 55.0' 15 42°4.20 · 27.45 77°30.31 9.4' 26°14.37 -2.6' 54.9' 16 57°4.04 26.87 91°58.70 9.4' 26°14.37 -2.6' 54.9' 17 72°3.87 26.28 106°27.14 9.5' 26°11.73 -2.7' 54.9' 18 87°3.71 \$19°5.69 120°55.62 9.5' \$26°0.06 -2.8' 54.9' 19 102°3.55 25.10 135°24.14 9.6' 26°6.21 -3.0' 54.9' 20 117°3.39 24.51 149°52.71 9.6' 26°3.23 3.1' 54.9' 21 132°3.23 · 23.92 164°21.32 9.7' 25°56.88 -3.4' 54.8' 22 217°2.44 20.96 236°45.13 9.9' 25°42.64 -3.9' 54.8' 23 162°2.92 22.74 193°18.69 9.8' 25°35.51 -3.5' 54.8'  SD = 16.2' d = -0.6'  GHA Dec								
3								
5         252°5.83         33.29         292°48.49         9.0'         26°33.96         -1.1'         55.1'           6         267°5.66         S19°32.71         307°16.52         9.1'         S26°32.86         -1.2'         55.1'           7         282°5.50         32.12         321°44.88         9.1'         26°30.24         -1.5'         55.1'           8         297°5.33         31.54         336°12.67         9.1'         26°30.24         -1.5'         55.1'           9         312°5.17         30.96         350°40.79         9.2'         26°27.08         -1.8'         55.0'           10         327°5.01         30.38         5°8.95         9.2'         26°25.30         -1.9'         55.0'           11         342°4.84         29.79         19°37.15         9.2'         26°25.30         -1.9'         55.0'           12         357°4.68         S19°29.21         34°5.38         9.3'         26°23.33         -2.1'         55.0'           13         12°4.52         28.62         48°3.65         9.3'         26°21.33         -2.1'         55.0'           15         42°4.20         -2.74.5         77°30.31         9.4'         26°14.37         2.								
6	4	237°5.99	33.87	278°20.50	9.0'	$26^{\circ}34.93$	-1.0'	55.1'
7 282°5.50 32.12 321°44.58 9.1' 26°31.62 -1.4' 55.1' 8 297°5.33 31.54 336°12.67 9.1' 26°30.24 -1.5' 55.1' 9 312°5.17 · 30.96 350°40.79 9.2' 26°28.73 -1.6' 55.0' 10 327°5.01 30.38 5°8.95 9.2' 26°27.08 -1.8' 55.0' 11 342°4.84 29.79 19°37.15 9.2' 26°25.30 -1.9' 55.0' 12 357°4.68 519°29.21 34°5.38 9.3' 526°23.38 -2.1' 55.0' 14 27°4.36 28.04 63°1.96 9.4' 26°19.14 -2.3' 55.0' 14 27°4.36 28.04 63°1.96 9.4' 26°19.14 -2.3' 55.0' 15 42°4.20 · · 27.45 77°30.31 9.4' 26°19.14 -2.3' 55.0' 16 57°4.04 26.87 91°58.70 9.4' 26°11.78 -2.7' 54.9' 17 72°3.87 26.28 106°27.14 9.5' 26°11.78 -2.7' 54.9' 18 87°3.71 519°25.69 120°55.62 9.5' 526°9.06 -2.8' 54.9' 19 102°3.55 25.10 135°24.14 9.6' 26°6.21 -3.0' 54.9' 20 117°3.39 24.51 149°52.71 9.6' 26°3.23 -3.1' 54.9' 21 132°3.23 · · 23.92 164°21.32 9.7' 26°0.12 -3.2' 54.8' 22 147°3.08 23.33 178°49.98 9.7' 25°56.88 -3.4' 54.8' 22 147°3.08 23.33 178°49.89 9.7' 25°56.88 -3.4' 54.8' 22 207°2.44 20.96 236°45.13 9.9' 25°42.64 -3.9' 54.8' 22 207°2.44 20.96 236°45.13 9.9' 25°42.64 -3.9' 54.8' 22 207°2.44 20.96 236°45.13 9.9' 25°42.64 -3.9' 54.8' 22 207°2.44 20.96 236°45.13 9.9' 25°42.64 -3.9' 54.8' 24 237°2.13 19.78 25°5.01 10.1' 25°30.63 -4.0' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 5 252°1.97 19.18 280°12.03 10.1' 25°30.63 -4.3' 54.7' 6 26°1.13 519°18.59 294°41.10 10.1' 525°2.638 -4.4' 54.7' 7 282°1.66 17.99 300°10.23 10.2' 25°2.200 -4.5' 54.7' 10 327°1.19 16.20 352°3.797 10.4' 25°3.84 -4.9' 54.6' 11 342°1.04 15.60 7°7.33 10.4' 25°3.28 -4.9' 54.6' 11 342°1.04 15.60 7°7.33 10.4' 25°3.28 -5.0' 54.6' 11 37°0.73 14.40 36°6.22 10.5' 24°53.19 -5.5' 54.6' 11 37°0.75 11.39 10.8' 34.38 11.0' 24°42.03 -5.5' 54.6' 11 37°0.75 11.39 10.8' 34.38 11.0' 24°42.03 -5.5' 54.6' 11 37°0.75 11.39 10.9' 34.38 10.9' 24°2.12 -5.9' 54.6' 11 37°0.75 11.39 10.9' 34.38 10.9' 24°2.12 -5.9' 54.								
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Mon         GHA         Dec         GHA         ν         Dec         d         HP           0         177°2.76         519°22.15         207°47.45         9.8'         \$25°50.02         -3.6'         54.8'           1         192°2.60         21.56         222°16.26         9.9'         25°46.39         -3.8'         54.8'           2         207°2.44         20.96         236°45.13         9.9'         25°42.64         -3.9'         54.8'           3         222°2.28         · 20.37         251°14.04         10.0'         25°38.76         -4.0'         54.7'           4         237°2.13         19.78         265°43.01         10.0'         25°34.76         -4.1'         54.7'           5         252°1.97         19.18         280°12.03         10.1'         25°30.63         -4.3'         54.7'           6         267°1.81         S19°18.59         294°41.10         10.1'         S25°26.38         -4.4'         54.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°17.50         -4.6'			22.74			25°53.51		
0         177°2.76         \$19°22.15         207°47.45         9.8'         \$25°50.02         -3.6'         \$4.8'           1         192°2.60         21.56         222°16.26         9.9'         25°46.39         -3.8'         \$4.8'           2         207°2.44         20.96         236°45.13         9.9'         25°42.64         -3.9'         \$4.8'           3         222°2.28         · 20.37         251°14.04         10.0'         25°34.76         -4.1'         \$4.7'           4         237°2.13         19.78         265°43.01         10.0'         25°34.76         -4.1'         \$4.7'           5         252°1.97         19.18         280°12.03         10.1'         \$25°30.63         -4.3'         \$4.7'           6         267°1.81         \$19°18.59         294°41.10         10.1'         \$25°20.33         -4.3'         \$4.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         \$4.7'           8         297°1.50         17.39         323°39.42         10.2'         25°12.88         -4.7'         \$4.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88		SD = 16.2'	d = -0.6'		SD	= 15.1'		
0         177°2.76         \$19°22.15         207°47.45         9.8'         \$25°50.02         -3.6'         \$4.8'           1         192°2.60         21.56         222°16.26         9.9'         25°46.39         -3.8'         \$4.8'           2         207°2.44         20.96         236°45.13         9.9'         25°42.64         -3.9'         \$4.8'           3         222°2.28         · 20.37         251°14.04         10.0'         25°34.76         -4.1'         \$4.7'           4         237°2.13         19.78         265°43.01         10.0'         25°34.76         -4.1'         \$4.7'           5         252°1.97         19.18         280°12.03         10.1'         \$25°30.63         -4.3'         \$4.7'           6         267°1.81         \$19°18.59         294°41.10         10.1'         \$25°20.33         -4.3'         \$4.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         \$4.7'           8         297°1.50         17.39         323°39.42         10.2'         25°12.88         -4.7'         \$4.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88	Mon	CHV	Doc	CHV.	1,	Doc	d	нр
1       192°2.60       21.56       222°16.26       9.9'       25°46.39       -3.8'       54.8'         2       207°2.44       20.96       236°45.13       9.9'       25°42.64       -3.9'       54.8'         3       222°2.28       · 20.37       251°14.04       10.0'       25°38.76       -4.0'       54.7'         4       237°2.13       19.78       265°43.01       10.0'       25°34.76       -4.1'       54.7'         5       252°1.97       19.18       280°12.03       10.1'       25°30.63       -4.1'       54.7'         6       267°1.81       519°18.59       294°41.10       10.1'       525°26.38       -4.4'       54.7'         7       282°1.66       17.99       309°10.23       10.2'       25°22.00       -4.5'       54.7'         8       297°1.50       17.39       323°39.42       10.2'       25°12.88       -4.7'       54.7'         9       312°1.35       · 16.80       338°8.66       10.3'       25°12.88       -4.7'       54.7'         10       327°1.19       16.20       352°37.97       10.4'       25°3.28       -5.0'       54.6'         12       357°0.88       519°15.00       21°36.74 <th></th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
3         222°2.28         · · 20.37         251°14.04         10.0'         25°38.76         -4.0'         54.7'           4         237°2.13         19.78         265°43.01         10.0'         25°34.76         -4.1'         54.7'           5         252°1.97         19.18         280°12.03         10.1'         25°30.63         -4.3'         54.7'           6         267°1.81         519°18.59         294°41.10         10.1'         525°22.00         -4.5'         54.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°17.50         -4.6'         54.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°8.14         -4.9'         54.6'           12         357°0.88         519°15.00         21°36.74         10.5'         524°53.19 <th></th> <td>192°2.60</td> <td>21.56</td> <td><math>222^{\circ}16.26</math></td> <td>9.9'</td> <td><math>25^{\circ}46.39</math></td> <td>-3.8'</td> <td>54.8'</td>		192°2.60	21.56	$222^{\circ}16.26$	9.9'	$25^{\circ}46.39$	-3.8'	54.8'
4         237°2.13         19.78         265°43.01         10.0'         25°34.76         -4.1'         54.7'           5         252°1.97         19.18         280°12.03         10.1'         25°30.63         -4.3'         54.7'           6         267°1.81         519°18.59         294°41.10         10.1'         525°26.38         -4.4'         54.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°12.88         -4.7'         54.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°3.28         -5.0'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°3.28         -5.0'         54.6'           12         357°0.88         S19°15.00         21°36.74         10.5'         S24°53.19         -5.2'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19								
5         252°1.97         19.18         280°12.03         10.1'         25°30.63         -4.3'         54.7'           6         267°1.81         519°18.59         294°41.10         10.1'         \$25°26.38         -4.4'         54.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°17.50         -4.6'         54.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°8.28         -5.0'         54.6'           12         357°0.88         S19°15.00         21°36.74         10.5'         S24°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97								
6         267°1.81         S19°18.59         294°41.10         10.1'         S25°26.38         -4.4'         54.7'           7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°17.50         -4.6'         54.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°3.28         -5.0'         54.6'           12         357°0.88         S19°15.00         21°36.74         10.5'         S24°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97         -5.3'         54.6'           15         42°0.42         · 13.20         65°5.36         10.7'         24°42.63								
7         282°1.66         17.99         309°10.23         10.2'         25°22.00         -4.5'         54.7'           8         297°1.50         17.39         323°39.42         10.2'         25°17.50         -4.6'         54.7'           9         312°1.35         · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°3.28         -5.0'         54.6'           12         357°0.88         519°15.00         21°36.74         10.5'         524°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97         -5.3'         54.6'           15         42°0.42         · 13.20         65°5.36         10.7'         24°42.63         -5.5'         54.6'           16         57°0.27         12.60         79°35.02         10.7'         24°37.18 <td< td=""><th></th><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>								
9         312°1.35         · · · 16.80         338°8.66         10.3'         25°12.88         -4.7'         54.7'           10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°8.14         -4.9'         54.6'           12         357°0.88         519°15.00         21°36.74         10.5'         524°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97         -5.3'         54.6'           15         42°0.42         · 13.20         65°5.36         10.7'         24°42.63         -5.5'         54.6'           16         57°0.27         12.60         79°35.02         10.7'         24°37.18         -5.6'         54.6'           17         72°0.12         11.99         94°4.75         10.8'         24°31.61         -5.7'         54.5'           18         86°59.96         S19°11.39         108°34.53         10.9'         S24°25.92								
10         327°1.19         16.20         352°37.97         10.4'         25°8.14         -4.9'         54.6'           11         342°1.04         15.60         7°7.33         10.4'         25°8.28         -5.0'         54.6'           12         357°0.88         519°15.00         21°36.74         10.5'         \$24°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97         -5.3'         54.6'           15         42°0.42         13.20         65°5.36         10.7'         24°42.63         -5.5'         54.6'           16         57°0.27         12.60         79°35.02         10.7'         24°37.18         -5.6'         54.6'           17         72°0.12         11.99         94°4.75         10.8'         24°37.18         -5.6'         54.6'           18         86°59.96         S19°11.39         108°34.53         10.9'         \$24°25.92         -5.8'         54.5'           19         101°59.81         10.79         123°4.38         10.9'         24°20.12         <								
11         342°1.04         15.60         7°7.33         10.4'         25°3.28         -5.0'         54.6'           12         357°0.88         S19°15.00         21°36.74         10.5'         S24°58.30         -5.1'         54.6'           13         12°0.73         14.40         36°6.22         10.5'         24°53.19         -5.2'         54.6'           14         27°0.57         13.80         50°35.76         10.6'         24°47.97         -5.3'         54.6'           15         42°0.42         · 13.20         65°5.36         10.7'         24°42.63         -5.5'         54.6'           16         57°0.27         12.60         79°35.02         10.7'         24°37.18         -5.6'         54.6'           17         72°0.12         11.99         94°4.75         10.8'         24°37.18         -5.7'         54.5'           18         86°59.96         S19°11.39         108°34.53         10.9'         S24°25.92         -5.8'         54.5'           19         101°59.81         10.79         123°4.38         10.9'         24°20.12         -5.9'         54.5'           20         116°59.66         10.18         137°34.30         11.0'         24°14.21								
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14				10.6'			54.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
18       86°59.96       \$19°11.39       108°34.53       10.9'       \$24°25.92       -5.8'       54.5'         19       101°59.81       10.79       123°4.38       10.9'       24°20.12       -5.9'       54.5'         20       116°59.66       10.18       137°34.30       11.0'       24°14.21       -6.0'       54.5'         21       131°59.51       • 9.58       152°4.28       11.0'       24°8.18       -6.1'       54.5'         22       146°59.36       8.97       166°34.32       11.1'       24°2.05       -6.2'       54.5'         23       161°59.21       8.37       181°4.43       11.2'       23°55.80       -6.4'       54.5'								
19     101°59.81     10.79     123°4.38     10.9'     24°20.12     -5.9'     54.5'       20     116°59.66     10.18     137°34.30     11.0'     24°14.21     -6.0'     54.5'       21     131°59.51     • 9.58     152°4.28     11.0'     24°8.18     -6.1'     54.5'       22     146°59.36     8.97     166°34.32     11.1'     24°2.05     -6.2'     54.5'       23     161°59.21     8.37     181°4.43     11.2'     23°55.80     -6.4'     54.5'								
20     116°59.66     10.18     137°34.30     11.0'     24°14.21     -6.0'     54.5'       21     131°59.51     • 9.58     152°4.28     11.0'     24°8.18     -6.1'     54.5'       22     146°59.36     8.97     166°34.32     11.1'     24°2.05     -6.2'     54.5'       23     161°59.21     8.37     181°4.43     11.2'     23°55.80     -6.4'     54.5'								
21 131°59.51 ··· 9.58 152°4.28 11.0' 24°8.18 -6.1' 54.5' 22 146°59.36 8.97 166°34.32 11.1' 24°2.05 -6.2' 54.5' 23 161°59.21 8.37 181°4.43 11.2' 23°55.80 -6.4' 54.5'								
23 161°59.21 8.37 181°4.43 11.2' 23°55.80 -6.4' 54.5'	21	131°59.51	• • 9.58	$152^{\circ}4.28$	11.0'	24°8.18		54.5'
SD = 16.2'  d = -0.6' $SD = 14.9'$	23			181°4.43			-6.4'	54.5'
		SD = 16.2'	d = -0.6'		SD	9 = 14.9'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	19-6%	
22	11:17	11:25	12:11	08:45	21:12		
23	11:33	11:41	12:12	09:39	22:05		
24	11.49	11.56	12.12	10:31	22.56		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	123°50.58	138°2.28 <b>S</b> 07°21.16	164°14.98 \$16°50.54	305°48.84 N02°21.15	102°38.41 N06°17.16	
1	138°53.04	153°2.01 19.91	179°15.47 49.93	320°51.39 21.20	117° 40.75 17.22	Alpheratz 357°32.32 29°14.90
2	153°55.51	168°1.73 18.65	194°15.97 49.33	335°53.95 21.25	132°43.09 17.28	Ankaa 353°4.91 -42°9.36 Schedar 349°28.30 56°41.78
3	168° 57.97	183°1.46 · · 17.39	209°16.47 · · 48.73	350°56.50 · · 21.30	147° 45.42 · · 17.35	Diphda 348° 44.92 -17° 50.03
4	184°0.44	198°1.18 16.13	224°16.97 48.12	5°59.05 21.35	162°47.76 17.41	Achernar 335°18.48 -57°5.89
5	199°2.90	213°0.91 14.87	239°17.47 47.52	21°1.61 21.40	177°50.09 17.47	Hamal 327°48.33 23°35.82
6	214°5.37	228°0.64 \$07°13.61	254°17.97 \$16°46.91	36°4.16 N02°21.45	192°52.43 N06°17.54	Polaris 312°32.32 89°23.21
7 8	229°7.83 244°10.29	243°0.36 12.35 258°0.09 11.09	269°18.47 46.31 284°18.97 45.70	51°6.72 21.50 66°9.27 21.55	207° 54.76 17.60 222° 57.10 17.66	Acamar 315°9.80 -40°11.75
9	259° 12.76	272°59.82 · · 9.83	299°19.47 · · 45.09	81°11.83 · · 21.61	237°59.43 · · 17.73	Menkar 314°3.43 4°11.96
10	274° 15.22	287°59.55 8.57	314°19.97 44.49	96°14.38 21.66	253°1.77 17.79	Mirfak 308°24.42 49°57.84
11	289° 17.69	302°59.27 7.30	329°20.47 43.88	111°16.94 21.71	268°4.10 17.85	Aldebaran 290°36.51 16°33.91
12	304°20.15	317°59.00 S07°6.04	344°20.97 \$16°43.28	126°19.49 N02°21.76	283°6.43 N06°17.92	Rigel 281°1.20 -8°10.29
13	$319^{\circ}22.61$	332°58.73 4.78	359°21.47 42.67	141°22.05 21.81	298°8.77 17.98	Capella 280°17.80 46°1.61 Bellatrix 278°19.92 6°22.40
14	334°25.08	347°58.46 3.52	14°21.97 42.06	156°24.60 21.86	313°11.10 18.04	Elnath 277° 58.38 28° 37.83
15	349°27.54	2°58.19 · · 2.26	29°22.47 · · 41.45	171°27.16 · · 21.92	328°13.44 · · 18.11	Alnilam 275°34.91 -1°11.17
16	4°30.01	17°57.93 07°0.99	44°22.97 40.84	186°29.72 21.97	343°15.77 18.17	Betelgeuse 270°49.07 7°24.62
17	19°32.47	32°57.66 06°59.73	59°23.47 40.24	201°32.28 22.02	358°18.10 18.23	Canopus 263°50.78 -52°42.82
18 19	34°34.94 49°37.40	47°57.39 \$06°58.47 62°57.12 57.20	74°23.98 \$16°39.63 89°24.48 39.02	216°34.83 N02°22.07 231°37.39 22.13	13°20.44 N06°18.30 28°22.77 18.36	Sirius 258°23.69 -16°45.46
20	64°39.86	77°56.85 55.94	104°24.98 38.41	246°39.95 22.18	43°25.10 18.42	Adhara 255°3.51 -29°0.79
21	79°42.33	92°56.59 · · 54.67	119°25.48 · · 37.80	261°42.51 · · 22.23	58°27.44 · · 18.49	Procyon 244°47.87 5°9.00
22	94°44.79	107°56.32 53.41	134°25.98 37.19	276°45.07 22.29	73°29.77 18.55	Pollux 243°13.87 27°57.33
23	109°47.26	122°56.05 52.14	149°26.49 36.58	291°47.63 22.34	88° 32.10 18.62	Avior 234°13.00 -59°36.05 Suhail 222°43.98 -43°32.84
Merr	pass. 15:42	ν-0.3' d-1.3' m-4.08	$\nu 0.5' \ d$ -0.6' m1.13	ν2.6' d0.1' m-2.29	$\nu 2.3' \ d0.1' \ m0.54$	Suhail 222°43.98 -43°32.84   Miaplacidus 221°36.72 -69°49.95
- IVICI.	Jass. 1J.42	ν-0.5 α-1.5 III-4.00	νο.5 α-ο.0 III1.15	ν2.0 d0.1 III-2.29	ν2.3 d0.1 iii0.54	Alphard 217°44.96 -8°46.99
						Regulus 207°31.48 11°49.57
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.53 61°35.62
0 1	124° 49.72 139° 52.18	137°55.79 S06°50.88 152°55.52 49.61	164°26.99 \$16°35.97 179°27.49 35.36	306°50.19 N02°22.39 321°52.74 22.45	103°34.43 N06°18.68 118°36.77 18.74	Denebola 182°22.19 14°24.66
2	159° 52.18 154° 54.65	167°55.26 48.35	194°28.00 34.75	336°55.30 22.50	133°39.10 18.81	Gienah 175°40.80 -17°41.95
3	169° 57.11	182°54.99 · · 47.08	209°28.50 · · 34.14	351°57.87 · · 22.55	148°41.43 · · 18.87	Acrux 172°56.83 -63°15.14
4	184° 59.58	197°54.73 45.82	224°29.00 33.52	7°0.43 22.61	163°43.76 18.94	Gacrux 171°48.48 -57°16.10
5	200°2.04	212°54.47 44.55	239°29.51 32.91	22°2.99 22.66	178°46.09 19.00	Alioth 166°10.64 55°48.05 Spica 158°19.56 -11°18.56
6	215°4.50	227°54.20 \$06°43.28	254°30.01 <b>S</b> 16°32.30	37°5.55 N02°22.71	193°48.42 N06°19.06	Alkaid 152°50.02 49°10.00
7	230°6.97	242°53.94 42.02	269°30.51 31.69	52°8.11 22.77	208°50.75 19.13	Hadar 148°32.30 -60°30.29
8	245°9.43	257°53.68 40.75	284°31.02 31.08	67°10.67 22.82	223°53.09 19.19	Menkent 147°54.59 -36°30.39
9 10	260° 11.90 275° 14.36	272°53.42 · · 39.48 287°53.15 38.21	299°31.52 · · 30.46 314°32.03 29.85	82°13.23 ·· 22.88 97°15.80 22.93	238°55.42 · · 19.26 253°57.75 19.32	Arcturus 145°45.63 19°1.93
11	275 14.30 290°16.83	302°52.89 36.94	329°32.53 29.23	112°18.36 22.99	269°0.08 19.39	Rigil Kent. 139°36.79 -60°56.86
12	305° 19.29	317°52.63 \$06°35.68	344°33.04 \$16°28.62	127°20.92 N02°23.04	284°2.41 N06°19.45	Kochab 137°20.21 74°1.97
13	320°21.75	332°52.37 34.41	359°33.54 28.01	142°23.48 23.10	299°4.74 19.52	Zuben'ubi 136°53.27 -16°9.52 Alphecca 126°1.75 26°36.97
14	$335^{\circ}24.22$	347°52.11 33.14	14°34.05 27.39	157°26.05 23.15	314°7.07 19.58	Antares 112° 12.94 -26° 29.57
15	350°26.68	2°51.85 · · 31.87	29°34.55 · · 26.78	172°28.61 · · 23.21	329°9.40 · · 19.65	Atria 107°5.23 -69°4.38
16	5°29.15	17°51.59 30.60	44°35.06 26.16	187°31.18 23.26	344°11.73 19.71	Sabik 102°0.13 -15°45.54
17	20°31.61 35°34.07	32°51.33 29.33 47°51.08 \$06°28.06	59°35.57 25.55 74°36.07 \$16°24.93	202°33.74 23.32 217°36.31 N02°23.37	359°14.06 19.78	Shaula 96°7.26 -37°7.31
18 19	50°36.54	62°50.82 26.79	74°36.07 \$16°24.93 89°36.58 24.31	217°36.31 N02°23.37 232°38.87 23.43	14°16.39 N06°19.84 29°18.72 19.91	Rasalhague 95°56.47 12°32.29
20	65°39.00	77°50.56 25.52	104°37.08 23.70	247°41.44 23.49	44°21.05 19.97	Eltanin 90°41.46 51°28.92
21	80°41.47	92°50.30 · · 24.25	119°37.59 · · 23.08	262°44.00 · · 23.54	59°23.38 · · 20.04	Kaus Aust. 83°29.54 -34°22.16
22	95°43.93	107°50.05 22.98	134°38.10 22.46	277°46.57 23.60	74°25.70 20.10	Vega 80°31.90 38°48.47 Nunki 75°45.00 -26°15.63
23	$110^{\circ}46.40$	122°49.79 21.70	149°38.61 21.85	292°49.13 23.65	89°28.03 20.17	Nunki 75°45.00 -26°15.63 Altair 61°57.83 8°56.56
Mer r	pass. 15:38	ν-0.3' d-1.3' m-4.08	$\nu$ 0.5' d-0.6' m1.13	ν2.6' d0.1' m-2.30	$\nu 2.3' \ d0.1' \ m0.54$	Peacock 53°2.43 -56°38.61
	3433. 13.30	- 0.0 u 1.0 iii i.00				Deneb 49°24.52 45°22.89
<b>-</b> .	6114	6114	6114	6114	6114	Enif 33°36.63 10°0.28
Thu 0	GHA	<b>GHA Dec</b> 137°49.54 <b>S</b> 06°20.43	<b>GHA Dec</b> 164°39.11 <b>S</b> 16°21.23	<b>GHA Dec</b> 307°51.70 N02°23.71	<b>GHA Dec</b> 104°30.36 N06°20.23	Al Na'ir 27°30.24 -46°49.55
1	125° 48.86 140° 51.32	157 49.54 500 20.45 152°49.28 19.16	179°39.62 20.61	322°54.27 23.77	119°32.69 20.30	Fomalhaut 15°12.06 -29°28.47
2	155°53.79	167°49.03 17.89	194°40.13 19.99	337°56.84 23.82	134°35.02 20.36	Scheat 13°43.00 28°14.26 Markab 13°27.62 15°21.48
3	170° 56.25	182°48.77 · · 16.62	209°40.64 · · 19.37	352°59.40 · · 23.88	149°37.35 · · 20.43	Markab 13°27.62 15°21.48
4	$185^{\circ}58.72$	197°48.52 15.34	224°41.14 18.75	8°1.97 23.94	164°39.67 20.50	Jan 25 Tue SHA Mer.pass
5	201°1.18	212°48.26 14.07	239°41.65 18.14	23°4.54 23.99	179°42.00 20.56	Venus 14°11.70 14:48
6	216°3.64	227°48.01 \$06°12.80	254°42.16 \$16°17.52	38°7.11 N02°24.05	194°44.33 N06°20.63	Mars 40°24.40 13:03
7	231°6.11	242°47.76 11.52	269°42.67 16.90	53°9.68 24.11	209° 46.66 20.69	Jupiter 181° 58.26 03:36
8 9	246°8.57 261°11.04	257°47.50 10.25 272°47.25 • 8.98	284°43.18 16.28 299°43.69 •• 15.66	68°12.24 24.16 83°14.81 · · 24.22	224°48.98 20.76 239°51.31 · · 20.82	Saturn 338°47.83 17:07
10	276° 13.50	287°47.00 7.70	314°44.20 15.04	98°17.38 24.28	254°53.64 20.89	Jan 26 Wed SHA Mer.pass
11	291° 15.96	302°46.75 6.43	329°44.70 14.41	113°19.95 24.34	269° 55.96 20.96	Venus 13°6.07 14:49
12	306° 18.43	317°46.50 \$06°5.15	344°45.21 \$16°13.79	128°22.52 N02°24.40	284°58.29 N06°21.02	Mars 39°37.27 13:02 Jupiter 182°0.47 03:32
13	321°20.89	332°46.25 3.88	359°45.72 13.17	143°25.09 24.45	300°0.62 21.09	Saturn 338°44.71 17:03
14	336°23.36	347°46.00 2.60	14°46.23 12.55	158°27.66 24.51	315°2.94 21.16	
15 16	351°25.82 6°28.29	2°45.75 ··· 1.33 17°45.50 06°0.05	29°46.74 · · 11.93 44°47.25	173°30.24 · · 24.57 188°32.81 24.63	330°5.27 ·· 21.22 345°7.60 21.29	Jan 27 Thu SHA Mer.pass
16 17	6° 28.29 21° 30.75	17°45.50 06°0.05 32°45.25 05°58.77	44°47.25 11.31 59°47.76 10.68	188°32.81 24.63 203°35.38 24.69	345°7.60 21.29 0°9.92 21.35	Venus 12°0.68 14:49 Mars 38°50.25 13:01
18	36°33.21	47°45.00 S05°57.50	74°48.28 \$16°10.06	218°37.95 N02°24.75	15°12.25 N06°21.42	Mars 38°50.25 13:01   Jupiter 182°2.84 03:28
19	51°35.68	62°44.75 56.22	89°48.79 9.44	233°40.52 24.80	30° 14.57 21.49	Saturn 338° 41.50 16:59
20	66°38.14	77°44.51 54.95	104°49.30 8.81	248°43.10 24.86	45°16.90 21.55	
21	81°40.61	92°44.26 · · 53.67	119°49.81 · · 8.19	263°45.67 · · 24.92	60°19.22 · · 21.62	Horizontal parallax
22	96°43.07	107°44.01 52.39	134°50.32 7.57	278°48.24 24.98 293°50.81 25.04	75°21.55 21.69	Venus: 0.1 Mars: 0.1
23	111°45.53	122°43.77 51.11	149°50.83 6.94		90°23.87 21.75	Midi3. U.I
Mer.p	pass. 15:34	ν-0.3′ <i>d</i> -1.3′ m-4.09	$\nu 0.5' \ d$ -0.6' m1.12	ν2.6′ d0.1′ m-2.30	$\nu 2.3' \ d0.1' \ m0.54$	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°59.06	S19°7.76	$195^{\circ}34.60$	11.2'	\$23°49.44	-6.5'	54.5'
1	191°58.91	7.15	210°4.84	11.3'	23°42.97	-6.6'	54.4
2 3	206° 58.76 221° 58.61	6.55 • • 5.94	224°35.15 239°5.52	11.4' 11.4'	23°36.39 23°29.71	-6.7' -6.8'	54.4' 54.4'
4	236° 58.46	5.33	253°35.96	11.5'	23°22.92	-6.9'	54.4'
5	251°58.31	4.72	$268^{\circ}6.47$	11.6'	$23^{\circ}16.02$	-7.0'	54.4'
6	266° 58.16	S19°4.11	282°37.05	11.6'	\$23°9.02	-7.1'	54.4
7 8	281°58.01 296°57.87	3.50 2.89	297°7.69 311°38.40	11.7' 11.8'	23°1.91 22°54.71	-7.2' -7.3'	54.4' 54.4'
9	311°57.72	2.27	326° 9.18	11.8'	22°47.40	-7.4'	54.4'
10	326° 57.57	1.66	340°40.03	11.9'	22°39.98	-7.5'	54.3'
11	341°57.42	1.05	355°10.95	12.0'	22°32.47 522°24.86	-7.6'	54.3'
12 13	356° 57.28 11° 57.13	\$19°0.43 18°59.82	9°41.93 24°12.99	12.1' 12.1'	\$22°24.86 22°17.15	-7.7' -7.8'	54.3' 54.3'
14	26° 56.99	59.20	38°44.11	12.1	22°9.34	-7.9'	54.3'
15	41°56.84	• • 58.59	$53^{\circ}15.31$	12.3'	22°1.43	-8.0'	54.3'
16	56° 56.70	57.97	67°46.57	12.3'	21°53.43	-8.1'	54.3'
17 18	71° 56.55 86° 56.41	57.36 \$18°56.74	82°17.90 96°49.31	12.4' 12.5'	21°45.34 \$21°37.15	-8.2' -8.3'	54.3' 54.3'
19	101°56.26	56.12	111°20.78	12.5'	21°28.86	-8.4'	54.2'
20	116°56.12	55.50	125°52.32	12.6'	21°20.49	-8.5'	54.2'
21	131°55.98	• • 54.88	140°23.93	12.7'	21°12.02	-8.6'	54.2'
22 23	146°55.83 161°55.69	54.26 53.64	154°55.61 169°27.36	12.7' 12.8'	21°3.46 20°54.82	-8.6' -8.7'	54.2' 54.2'
23			109 21.30			-0.1	J+.∠
	SD = 16.2'	d = -0.6'		SI	O = 14.9'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°55.55	S18°53.02	183°59.18	12.9'	S20°46.08	-8.8'	54.2'
1	191°55.41	52.40	198°31.06	13.0' 13.0'	20°37.26	-8.9'	54.2'
2	206° 55.27 221° 55.13	51.78 •• 51.15	213°3.02 227°35.04	13.0′ 13.1′	20°28.35 20°19.36	-9.0' -9.1'	54.2' 54.2'
4	236° 54.98	50.53	242°7.14	13.1	20°19.30	-9.1 -9.2'	54.2'
5	251°54.84	49.91	256°39.30	13.2'	$20^{\circ}1.12$	-9.2'	54.2'
6	266° 54.70	S18°49.28	271°11.53	13.3'	\$19°51.87	-9.3'	54.1'
7 8	281° 54.56 296° 54.43	48.66 48.03	285°43.83 300°16.19	13.4' 13.4'	19°42.54 19°33.13	-9.4' -9.5'	54.1' 54.1'
9	311° 54.29	• • 47.40	314°48.62	13.5'	19° 23.64	-9.5' -9.6'	54.1
10	326° 54.15	46.78	329°21.12	13.6'	19°14.07	-9.6'	54.1'
11	341°54.01	46.15	343°53.69	13.6'	19°4.43	-9.7'	54.1'
12 13	356°53.87 11°53.73	\$18°45.52 44.89	358°26.33 12°59.03	13.7' 13.8'	\$18°54.70 18°44.90	-9.8' -9.9'	54.1' 54.1'
14	26° 53.60	44.26	27°31.79	13.8'	18°35.03	-9.9 -10.0'	54.1'
15	41°53.46	• • 43.63	42°4.62	13.9'	18°25.08	-10.0'	54.1'
16	56°53.32	43.00	56°37.52	14.0'	18°15.05	-10.1'	54.1'
17 18	71°53.19 86°53.05	42.37 \$18°41.74	71°10.48 85°43.51	14.0' 14.1'	18°4.95 \$17°54.79	-10.2' -10.2'	54.1' 54.1'
19	101°52.92	41.11	100°16.60	14.1	17°44.55	-10.2	54.1°
20	116°52.78	40.47	114°49.75	14.2'	17°34.24		54.0'
21	131°52.65	• • 39.84	129°22.97	14.3'	17°23.86	-10.4'	54.0'
22 23	146° 52.51 161° 52.38	39.21 38.57	143°56.25 158°29.59	14.3' 14.4'	17°13.41 17°2.89	-10.5' -10.6'	54.0' 54.0'
23			150 29.59			-10.0	34.0
	SD = 16.2'	d = -0.6'		SI	O = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.24	S18°37.94	173°2.99	14.5'	S16°52.31	-10.6'	54.0'
1 2	191°52.11 206°51.98	37.30 36.66	187°36.45 202°9.98	14.5' 14.6'	16°41.67 16°30.95	-10.7' -10.8'	54.0' 54.0'
3	206°51.98 221°51.84	36.00 · · 36.03	202° 9.98 216° 43.57	14.6'	16° 30.95 16° 20.18	-10.8'	54.0' 54.0'
4	236° 51.71	35.39	231°17.21	14.7'	16°9.34	-10.9	54.0'
5	251°51.58	34.75	245°50.91	14.8'	15°58.44	-11.0'	54.0'
6 7	266°51.45 281°51.32	\$18°34.11 33.47	260°24.68 274°58.50	14.8' 14.9'	\$15°47.48 15°36.46	-11.0' -11.1'	54.0' 54.0'
8	281 51.32 296°51.18	33.47 32.83	274 58.50 289°32.37	14.9'	15 30.40 15°25.38	-11.1'	54.0'
9	311°51.05	• • 32.19	$304^{\circ}6.31$	15.0'	15°14.24	-11.2'	54.0'
10	326°50.92	31.55	318°40.30	15.0'	15°3.04	-11.3'	54.0'
11 12	341°50.79 356°50.66	30.91 \$18°30.27	333°14.35 347°48.45	15.1' 15.2'	14°51.79 \$14°40.48	-11.3' -11.4'	54.0' 53.9'
13	11°50.54	29.62	2°22.60	15.2'	14°29.11	-11.4 -11.4'	53.9' 53.9'
14	26°50.41	28.98	$16^{\circ}56.81$	15.3'	14°17.69	-11.5'	53.9'
15	41°50.28	• • 28.34	31°31.08	15.3'	14°6.22	-11.5'	53.9'
16 17	56° 50.15 71° 50.02	27.69 27.05	46°5.39 60°39.76	15.4' 15.4'	13°54.70 13°43.12	-11.6' -11.6'	53.9' 53.9'
18	71°50.02 86°49.89	27.05 \$18°26.40	75°14.17	15.4	S13°31.50	-11.0	53.9'
19	101°49.77	25.75	89°48.64	15.5'	13°19.82	-11.7'	53.9
20	116°49.64	25.11	104°23.16	15.6'	13°8.09	-11.8'	53.9'
21 22	131° 49.51 146° 49.39	· · 24.46 23.81	118°57.73 133°32.34	15.6' 15.7'	12°56.32 12°44.50	-11.8'	53.9' 53.9'
22	146°49.39 161°49.26	23.81	133°32.34 148°7.00	15.7' 15.7'	12°44.50 12°32.63	-11.9' -11.9'	53.9° 53.9'
	SD = 16.2'	d = -0.6'			D = 14.7'		
	JD — 10.2	<u>u — -0.0</u>		اد	J — 14.1		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	29-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-0%	
25	12:04	12:11	12:12	11:20	23:44		
26	12:18	12:25	12:12	12:06	-:-		
27	12:31	12:37	12:13	12:50	00:29		

# January 28, 29, 30 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	126° 48.00	137°43.52 \$05°49.84	164°51.34 \$16°6.32	308°53.39 N02°25.10	105°26.20 N06°21.82	
1	141° 50.46	152°43.27 48.56	179°51.86 5.69	323°55.96 25.16	120°28.52 21.89	Alpheratz 357°32.33 29°14.89
2	156°52.93	167° 43.03 47.28	194°52.37 5.07	338°58.54 25.22	135°30.85 21.95	Ankaa 353°4.92 -42°9.36 Schedar 349°28.32 56°41.78
3	171°55.39	182°42.78 · · 46.00	209°52.88 · · 4.44	354°1.11 · · 25.28	150°33.17 · · 22.02	Diphda 348°44.93 -17°50.03
4	186° 57.85	197°42.54 44.72	224°53.39 3.81	9°3.69 25.34	165° 35.50 22.09	Achernar 335°18.50 -57°5.89
5	202°0.32	212°42.30 43.44 227°42.05 \$05°42.16	239°53.91 3.19	24°6.26 25.40	180°37.82 22.15 195°40.14 N06°22.22	Hamal 327°48.34 23°35.82
6 7	217°2.78 232°5.25	227°42.05 \$05°42.16 242°41.81 40.89	254°54.42 \$16°2.56 269°54.93 1.94	39°8.84 N02°25.46 54°11.41 25.52	195°40.14 N06°22.22 210°42.47 22.29	Polaris 312°33.91 89°23.22
8	247°7.71	257°41.57 39.61	284°55.44 1.31	69°13.99 25.58	225°44.79 22.36	Acamar 315°9.82 -40°11.75
9	262° 10.17	272°41.32 · · 38.33	299°55.96 · · 0.68	84°16.56 · · 25.64	240°47.12 · · 22.42	Menkar 314°3.44 4°11.96
10	$277^{\circ}12.64$	287°41.08 37.05	314°56.47 16°0.05	99°19.14 25.70	255° 49.44 22.49	Mirfak 308°24.43 49°57.84 Aldebaran 290°36.52 16°33.91
11	292° 15.10	302°40.84 35.77	329°56.99 15°59.43	114°21.72 25.76	270°51.76 22.56	Rigel 281°1.21 -8°10.30
12	307° 17.57	317°40.60 \$05°34.49	344°57.50 \$15°58.80	129°24.30 N02°25.82	285°54.08 N06°22.63	Capella 280°17.81 46°1.61
13 14	322°20.03 337°22.50	332°40.36 33.20 347°40.12 31.92	359°58.01 58.17 14°58.53 57.54	144°26.87 25.88 159°29.45 25.94	300°56.41 22.69 315°58.73 22.76	Bellatrix 278°19.92 6°22.40
15	352°24.96	2°39.88 · · 30.64	29°59.04 · · 56.91	174°32.03 · · 26.00	331°1.05 · · 22.83	Elnath 277°58.39 28°37.84
16	7°27.42	17°39.64 29.36	44°59.56 56.28	189°34.61 26.07	346°3.38 22.90	Alnilam 275°34.91 -1°11.17
17	22°29.89	32°39.40 28.08	60°0.07 55.65	204°37.19 26.13	1°5.70 22.96	Betelgeuse 270°49.08 7°24.62 Canopus 263°50.79 -52°42.83
18	37° 32.35	47°39.16 \$05°26.80	75°0.59 \$15°55.02	219°39.76 N02°26.19	16°8.02 N06°23.03	Sirius 258°23.69 -16°45.47
19	52°34.82	62°38.92 25.52	90°1.10 54.39	234°42.34 26.25	31°10.34 23.10	Adhara 255°3.52 -29°0.80
20	67° 37.28	77°38.68 24.23	105° 1.62 53.76	249°44.92 26.31 264°47.50 •• 26.37	46°12.66 23.17	Procyon 244°47.87 5°9.00
21 22	82°39.74 97°42.21	92°38.44 · · 22.95 107°38.21 21.67	120°2.13 · · 53.13 135°2.65 52.50	264°47.50 · · 26.37 279°50.08 26.44	61°14.98 · · 23.24 76°17.31 23.30	Pollux 243°13.86 27°57.33
23	112° 44.67	122°37.97 20.38	150°3.17 51.87	294°52.66 26.50	91°19.63 23.37	Avior 234°13.01 -59°36.07
_						Suhail 222°43.97 -43°32.86
Wer	.pass. 15:30	ν-0.2' d-1.3' m-4.09	$\nu 0.5' \ d$ -0.6' m1.12	$\nu 2.6' \ d0.1' \ \text{m-}2.31$	$\nu 2.3' \ d0.1' \ \text{m}0.55$	Miaplacidus 221°36.72 -69°49.97 Alphard 217°44.95 -8°47.00
						Regulus 207°31.46 11°49.56
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.50 61°35.63
0	127° 47.14	137°37.73 \$05°19.10	165°3.68 \$15°51.24	309°55.24 N02°26.56	106°21.95 N06°23.44	Denebola 182°22.17 14°24.65
1 2	142° 49.60 157° 52.06	152°37.50 17.82 167°37.26 16.53	180° 4.20 50.61 195° 4.72 49.97	324°57.83 26.62 340°0.41 26.68	121°24.27 23.51 136°26.59 23.58	Gienah 175°40.78 -17°41.96
3	172° 54.53	167°37.26 16.53 182°37.03 · · 15.25	210°5.23 · · 49.34	340°0.41 26.68 355°2.99 · · 26.75	136°26.59 23.58 151°28.91 · · 23.64	Acrux 172°56.80 -63°15.15
4	187° 56.99	197°36.79 13.97	225° 5.75 48.71	10°5.57 26.81	166°31.23 23.71	Gacrux 171°48.45 -57°16.11
5	202°59.46	212°36.56 12.68	240°6.27 48.07	25°8.15 26.87	181°33.55 23.78	Alioth 166°10.61 55°48.05 Spica 158°19.54 -11°18.57
6	218°1.92	227°36.32 <b>S</b> 05°11.40	255°6.79 \$15°47.44	40°10.74 N02°26.94	196°35.87 N06°23.85	Alkaid 152°49.99 49°10.00
7	233°4.38	242°36.09 10.11	270°7.30 46.81	55°13.32 27.00	211°38.19 23.92	Hadar 148°32.26 -60°30.30
8 9	248°6.85	257°35.85 8.83	285°7.82 46.17	70°15.90 27.06 85°18.48 •• 27.13	226°40.51 23.99 241°42.83 •• 24.05	Menkent 147°54.56 -36°30.40
10	263°9.31 278°11.78	272°35.62 · · 7.54 287°35.39 6.26	300°8.34 · · 45.54 315°8.86 44.91	85°18.48 · · 27.13 100°21.07 27.19	241°42.83 · · 24.05 256°45.15 24.12	Arcturus 145°45.60 19°1.92
11	293°14.24	302°35.16 4.97	330°9.38 44.27	115°23.65 27.25	271° 47.47 24.19	Rigil Kent. 139°36.75 -60°56.87
12	308° 16.71	317°34.92 S05°3.69	345°9.89 \$15°43.64	130°26.24 N02°27.32	286°49.79 N06°24.26	Kochab 137°20.14 74°1.96
13	323° 19.17	332°34.69 2.40	0°10.41 43.00	145°28.82 27.38	301°52.11 24.33	Zuben'ubi 136°53.24 -16°9.53 Alphecca 126°1.73 26°36.96
14	338°21.63	347°34.46 05°1.11	15°10.93 42.37	160°31.41 27.44	316°54.43 24.40	Antares 112°12.91 -26°29.57
15	353°24.10	2°34.23 04°59.83	30°11.45 · · 41.73	175°33.99 · · 27.51	331°56.75 · · 24.47	Atria 107°5.18 -69°4.38
16 17	8° 26.56 23° 29.03	17°34.00 58.54 32°33.77 57.26	45°11.97 41.09 60°12.49 40.46	190°36.58 27.57 205°39.16 27.64	346°59.06 24.54 2°1.38 24.61	Sabik 102°0.11 -15°45.55
18	38° 31.49	47°33.54 \$04°55.97	75°13.01 \$15°39.82	220°41.75 N02°27.70	17°3.70 N06°24.67	Shaula 96°7.24 -37°7.31
19	53° 33.95	62°33.31 54.68	90°13.53 39.18	235°44.33 27.77	32°6.02 24.74	Rasalhague 95°56.46 12°32.28
20	68°36.42	77°33.08 53.39	105°14.05 38.55	250°46.92 27.83	47°8.34 24.81	Eltanin 90°41.43 51°28.91 Kaus Aust. 83°29.52 -34°22.16
21	83°38.88	92°32.85 · · 52.11	120°14.57 · · 37.91	265°49.51 · · 27.90	62°10.66 · · 24.88	Vega 80°31.89 38°48.46
22	98°41.35	107°32.62 50.82	135°15.09 37.27	280°52.09 27.96	77°12.97 24.95	Nunki 75°44.98 -26°15.63
23	113°43.81	122°32.40 49.53	150°15.61 36.63	295°54.68 28.03	92°15.29 25.02	Altair 61°57.83 8°56.55
Mer.	pass. 15:26	$\nu$ -0.2 $'$ d-1.3 $'$ m-4.10	$ u 0.5' \ d$ -0.6' m1.12	$ u 2.6' \ d0.1' \ \text{m-}2.32$	$ u 2.3' \; d0.1' \; { m m0.55}$	Peacock 53°2.42 -56°38.60
						Deneb 49°24.52 45°22.88
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.62 10°0.28
0	128° 46.27	137°32.17 <b>S</b> 04°48.24	165°16.13 \$15°35.99	310°57.27 N02°28.09	107°17.61 N06°25.09	Al Na'ir 27°30.24 -46°49.54 Fomalhaut 15°12.06 -29°28.47
1	143°48.74	152°31.94 46.95	180°16.65 35.36	325°59.86 28.16	122°19.93 25.16	Scheat 13°43.01 28°14.25
2	158° 51.20	167°31.71 45.67	195°17.17 34.72	341°2.45 28.22	137°22.24 25.23	Markab 13°27.63 15°21.47
3 4	173°53.67 188°56.13	182°31.49 · · 44.38 197°31.26 43.09	210°17.70 · · 34.08 225°18.22 33.44	356°5.03 · · 28.29 11°7.62 28.35	152°24.56 · · 25.30 167°26.88 25.37	Jan 28 Fri SHA Mer.pass
4 5	188°56.13 203°58.59	197 31.26 43.09 212°31.04 41.80	240°18.74 32.80	26°10.21 28.42	182°29.19 25.44	Venus 10°55.52 14:49
6	219°1.06	227°30.81 S04°40.51	255°19.26 \$15°32.16	41°12.80 N02°28.48	197°31.51 N06°25.51	Mars 38°3.35 13:00
7	234°3.52	242°30.59 39.22	270°19.78 31.52	56°15.39 28.55	212°33.83 25.58	Jupiter 182°5.39 03:24
8	249°5.99	257° 30.36 37.93	285°20.31 30.88	71°17.98 28.62	227° 36.14 25.65	Saturn 338°38.20 16:56
9	264°8.45	272°30.14 · · 36.64	300°20.83 · · 30.24	86°20.57 · · 28.68	242°38.46 · · 25.72	Jan 29 Sat SHA Mer.pass
10	279°10.91	287°29.91 35.35	315°21.35 29.60	101°23.16 28.75	257° 40.77 25.79	Venus 9°50.60 14:50
11 12	294° 13.38 309° 15.84	302°29.69 34.06 317°29.47 \$04°32.77	330°21.87 28.95 345°22.40 \$15°28.31	116°25.75 28.82 131°28.34 N02°28.88	272°43.09 25.86 287°45.41 N06°25.93	Mars 37°16.55 12:59
13	324° 18.31	332°29.24 31.48	0°22.92 27.67	146°30.94 28.95	302°47.72 26.00	Jupiter 182°8.11 03:20
14	339° 20.77	347°29.02 30.19	15°23.44 27.03	161°33.53 29.02	317°50.04 26.07	Saturn 338°34.81 16:52
15	354°23.23	2°28.80 · · 28.90	30°23.97 · · 26.39	176°36.12 · · 29.08	332°52.35 · · 26.14	Jan 30 Sun SHA Mer.pass
16	9°25.70	17°28.58 27.61	45°24.49 25.74	191°38.71 29.15	347°54.67 26.21	Venus 8°45.89 14:50
17	24°28.16	32°28.36 26.32	60°25.02 25.10	206°41.30 29.22	2°56.98 26.28	Mars 36°29.86 12:58
18 19	39°30.63 54°33.09	47°28.14 S04°25.02 62°27.91 23.73	75°25.54 \$15°24.46 90°26.06 23.81	221°43.90 N02°29.28 236°46.49 29.35	17°59.30 N06°26.35 33°1.61 26.42	Jupiter 182°11.00 03:16
20	69°35.56	77°27.69 22.44	105°26.59 23.17	251°49.08 29.42	48°3.93 26.49	Saturn 338°31.33 16:48
21	84°38.02	92°27.47 · · 21.15	120°27.11 · · · 22.53	266°51.68 · · 29.49	63°6.24 · · 26.56	Horizontal parallax
22	99° 40.48	107°27.26 19.86	135°27.64 21.88	281°54.27 29.56	78°8.55 26.63	Venus: 0.1
23	114° 42.95	122°27.04 18.56	150°28.16 21.24	296°56.87 29.62	93°10.87 26.70	Mars: 0.1
Mer	.pass. 15:22	ν-0.2' d-1.3' m-4.10	ν0.5' d-0.6' m1.12	ν2.6' d0.1' m-2.32	ν2.3' d0.1' m0.55	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.14	S18°22.51	162°41.71	15.8'	S12°20.71	-12.0'	53.9'
1	191°49.01 206°48.89	21.86 21.21	177°16.47 191°51.27	15.8' 15.8'	12°8.75 11°56.75	-12.0'	53.9'
2	200 46.69 221°48.76	. 20.56	206°26.11	15.6 15.9'	11 50.75 11°44.70	-12.0' -12.1'	53.9' 53.9'
4	236°48.64	19.91	221°1.00	15.9'	11°32.61	-12.1'	53.9'
5	251°48.52	19.26	235°35.93	16.0'	11°20.48	-12.2'	53.9'
6 7	266°48.39 281°48.27	\$18° 18.60 17.95	250°10.90 264°45.92	16.0' 16.1'	\$11°8.31 10°56.10	-12.2' -12.3'	53.9' 53.9'
8	296°48.15	17.30	279°20.97	16.1	10° 43.85	-12.3'	53.9'
9	311°48.02	• 16.64	293°56.07	16.1'	10°31.55	-12.3'	53.9'
10	326°47.90	15.99	308°31.20	16.2'	10°19.23	-12.4'	53.9'
11 12	341°47.78 356°47.66	15.33 \$18° 14.68	323°6.38 337°41.59	16.2' 16.2'	10°6.86 509°54.46	-12.4' -12.4'	53.9' 53.9'
13	11°47.54	14.02	352°16.83	16.3'	09°42.02	-12.5'	53.9'
14	26°47.42	13.36	6°52.12	16.3'	$09^{\circ}29.55$	-12.5'	53.9'
15	41°47.30 56°47.18	• • 12.70	21°27.43 36°2.79	16.4	09°17.04 09°4.51	-12.5'	53.9'
16 17	71°47.06	12.04 11.39	50° 38.17	16.4' 16.4'	09 4.51 08°51.93	-12.6' -12.6'	53.9' 53.9'
18	86°46.94	\$18° 10.73	65°13.59	16.4'	508°39.33	-12.6'	53.9'
19	101°46.82	10.07	79°49.04	16.5'	08°26.70	-12.7'	53.9'
20 21	116°46.70 131°46.59	9.41 •• 8.74	94°24.52 109°0.03	16.5' 16.5'	08°14.03 08°1.34	-12.7' -12.7'	53.9' 53.9'
22	131 40.59 146°46.47	8.08	109 0.03 123°35.57	16.6'	06 1.34 07°48.62	-12.7 -12.8'	53.9'
23	161°46.35	7.42	138°11.13	16.6'	07°35.87	-12.8'	53.9'
	SD = 16.2'	d = -0.6'		SI	O = 14.7'		
-							
Sat 0	<b>GHA</b> 176°46.23	<b>Dec</b> \$18°6.76	<b>GHA</b> 152°46.73	u 16.6'	<b>Dec</b> \$07° 23.09	<i>d</i> −12.8'	<b>HP</b> 53.9'
1	176 46.23 191°46.12	6.09	167°22.35	16.6'	07° 10.29	-12.8'	53.9'
2	206°46.00	5.43	181°57.99	16.7'	06°57.46	-12.9'	53.9'
3	221°45.89	• • 4.76	196°33.66	16.7'	06°44.60	-12.9'	53.9'
4 5	236°45.77 251°45.65	4.10 3.43	211°9.36 225°45.08	16.7' 16.7'	06°31.72 06°18.82	-12.9' -12.9'	53.9' 53.9'
6	266°45.54	\$18°2.77	240°20.81	16.8'	S06°5.89	-12.9'	53.9'
7	281°45.43	2.10	254°56.57	16.8'	$05^{\circ}52.95$	-13.0'	53.9'
8	296°45.31	1.43	269°32.35	16.8'	05°39.98	-13.0'	53.9'
9 10	311°45.20 326°45.08	· · 0.76 18°0.10	284°8.15 298°43.97	16.8' 16.8'	05°26.99 05°13.98	-13.0' -13.0'	53.9' 53.9'
11	341°44.97	17°59.43	313°19.81	16.9'	05°0.95	-13.0'	53.9'
12	356°44.86	<b>S</b> 17°58.76	327°55.66	16.9'	S04°47.90	-13.1'	53.9'
13 14	11°44.75 26°44.64	58.09 57.42	342°31.53 357°7.41	16.9' 16.9'	04°34.84 04°21.76	-13.1' -13.1'	53.9' 53.9'
15	41°44.52	56.74	11°43.30	16.9'	04 21.76 04°8.66	-13.1'	53.9'
16	56°44.41	56.07	26°19.21	16.9'	03°55.55	-13.1'	53.9'
17	71°44.30	55.40	40°55.13	16.9'	03°42.42	-13.1'	53.9'
18 19	86°44.19 101°44.08	\$17°54.73 54.05	55°31.06 70°7.00	16.9' 16.9'	\$03°29.27 03°16.12	-13.2' -13.2'	53.9' 54.0'
20	116°43.97	53.38	84°42.95		03°2.95		54.0'
21	131°43.86	• • 52.70	99°18.91	17.0'	$02^{\circ}49.76$	-13.2'	54.0'
22	146°43.75	52.03	113°54.87	17.0'	02°36.57	-13.2'	54.0'
23	161°43.64	51.35	128°30.84	17.0'	02°23.37	-13.2'	54.0'
	SD = 16.2'	d = -0.7'		SI	O = 14.7'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°43.54	<b>S</b> 17°50.68	143°6.82	17.0'	S02°10.15	-13.2'	54.0'
1 2	191°43.43 206°43.32	50.00 49.32	157°42.80 172°18.78	17.0' 17.0'	01°56.93 01°43.69	-13.2' -13.2'	54.0' 54.0'
3	200 43.32 221°43.21	· · 48.64	172 16.76 186°54.77	17.0'	01°43.09	-13.2'	54.0'
4	236°43.11	47.96	201°30.75	17.0'	01°17.20	-13.3'	54.0'
5	251°43.00 266°42.89	47.29 \$17°46.61	216°6.74 230°42.73	17.0'	01°3.95 \$00°50.69	-13.3' -13.3'	54.0'
6 7	266°42.89 281°42.79	45.93	230°42.73 245°18.71	17.0' 17.0'	500°50.69 00°37.42	-13.3' -13.3'	54.0' 54.0'
8	296°42.68	45.24	259°54.69	17.0'	00°24.15	-13.3'	54.0'
9	311°42.58	• • 44.56	274°30.67	17.0'	S00°10.88	-13.3'	54.0'
10 11	326°42.47 341°42.37	43.88 43.20	289°6.64 303°42.61	17.0' 17.0'	N00°2.40 00°15.68	13.3' 13.3'	54.1' 54.1'
12	356°42.26	\$17°42.52	318° 18.57	17.0'	N00°28.97	13.3'	54.1
13	11°42.16	41.83	332°54.52	16.9'	$00^{\circ}42.25$	13.3'	54.1'
14	26°42.06 41°41.95	41.15	347°30.47	16.9'	00°55.53 01°8.82	13.3'	54.1'
15 16	41°41.95 56°41.85	· · 40.46 39.78	2°6.40 16°42.32	16.9' 16.9'	01°8.82 01°22.10	13.3' 13.3'	54.1' 54.1'
17	71°41.75	39.09	31°18.24	16.9	01°35.38	13.3'	54.1'
18	86°41.65	S17°38.41	45°54.13	16.9'	N01°48.66	13.3'	54.1'
19 20	101°41.55 116°41.45	37.72 37.03	60°30.02 75°5.89	16.9' 16.9'	02°1.94 02°15.21	13.3' 13.3'	54.1' 54.1'
20	116 41.45 131 41.34	37.03 · · 36.34	75°5.89 89°41.74	16.8'	02°15.21 02°28.48	13.3'	54.1
22	146°41.24	35.66	104°17.58	16.8'	$02^{\circ}41.75$	13.3'	54.2'
23	161°41.14	34.97	118°53.40	16.8'	02°55.00	13.3'	54.2'
	SD = 16.2'	d = -0.7'		SI	O = 14.7'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-10%	
28	12:43	12:49	12:13	13:32	01:11		
29	12:55	13:01	12:13	14:12	01:52		
30	13:06	13:11	12:13	14:51	02:32		

# January 31, 01, 02 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	129° 45.41	137°26.82 S04°17.27	165°28.69 \$15°20.59	311°59.46 N02°29.69	108°13.18 N06°26.77	
1	144° 47.88	152°26.60 15.98	180°29.22 19.95	327°2.05 29.76	123°15.50 26.84	Alpheratz 357°32.35 29°14.88
2	159°50.34	167°26.38 14.69	195°29.74 19.30	342°4.65 29.83	138° 17.81 26.91	Ankaa 353°4.94 -42°9.35 Schedar 349°28.35 56°41.77
3	$174^{\circ}52.80$	182°26.16 · · 13.39	210°30.27 · · 18.65	357°7.25 · · 29.90	153°20.12 · · 26.99	Schedar 349°28.35 56°41.77 Diphda 348°44.94 -17°50.04
4	189°55.27	197°25.95 12.10	225°30.79 18.01	12°9.84 29.96	168° 22.44 27.06	Achernar 335°18.53 -57°5.89
5	204°57.73	212°25.73 10.81	240°31.32 17.36	27°12.44 30.03	183°24.75 27.13	Hamal 327°48.36 23°35.81
6 7	220°0.20 235°2.66	227°25.51	255°31.85 \$15°16.72	42°15.03 N02°30.10	198°27.06 N06°27.20	Polaris 312°35.52 89°23.22
8	250°5.12	242°25.30 8.22 257°25.08 6.92	270°32.37 16.07 285°32.90 15.42	57°17.63 30.17 72°20.23 30.24	213°29.37 27.27 228°31.69 27.34	Acamar 315°9.84 -40°11.75
9	265°7.59	272°24.86 · · 5.63	300°33.43 · · 14.77	87°22.82 · · 30.31	243°34.00 · · 27.41	Menkar 314°3.45 4°11.96
10	280° 10.05	287°24.65 4.34	315°33.95 14.13	102°25.42 30.38	258°36.31 27.48	Mirfak 308°24.46 49°57.84
11	295° 12.52	302°24.43 3.04	330°34.48 13.48	117°28.02 30.45	273°38.62 27.55	Aldebaran 290°36.53 16°33.91
12	310°14.98	317°24.22 <b>S</b> 04°1.75	345°35.01 \$15°12.83	132°30.62 N02°30.52	288°40.94 N06°27.63	Rigel 281°1.22 -8°10.30 Capella 280°17.82 46°1.62
13	325° 17.44	332°24.01 04°0.45	0°35.54 12.18	147°33.22 30.59	303°43.25 27.70	Bellatrix 278°19.94 6°22.40
14	340° 19.91	347°23.79 03°59.16	15°36.07 11.53	162°35.81 30.66	318° 45.56 27.77	Elnath 277°58.40 28°37.84
15 16	355°22.37	$2^{\circ}23.58 \cdots 57.86$ $17^{\circ}23.37 \qquad 56.57$	30°36.59 · · 10.88	177°38.41 ·· 30.73 192°41.01 30.80	333°47.87 · · 27.84 348°50.18 27.91	Alnilam 275°34.92 -1°11.18
17	10°24.84 25°27.30	17°23.37 56.57 32°23.15 55.27	45°37.12 10.23 60°37.65 9.59	192°41.01 30.80 207°43.61 30.87	348°50.18 27.91 3°52.49 27.98	Betelgeuse 270°49.09 7°24.62
18	40°29.76	47°22.94 S03°53.98	75°38.18 \$15°8.94	222°46.21 N02°30.94	18°54.80 N06°28.05	Canopus 263°50.81 -52°42.85
19	55°32.23	62°22.73 52.68	90°38.71 8.29	237°48.81 31.01	33°57.12 28.13	Sirius 258°23.70 -16°45.47
20	70°34.69	77°22.52 51.39	105°39.24 7.64	252°51.41 31.08	48° 59.43 28.20	Adhara 255°3.53 -29°0.81 Procyon 244°47.87 5°9.00
21	85°37.16	92°22.31 · · 50.09	120°39.77 · · 6.98	267°54.01 · · 31.15	64°1.74 · · 28.27	Procyon 244°47.87 5°9.00 Pollux 243°13.87 27°57.34
22	100°39.62	107°22.09 48.79	135°40.30 6.33	282°56.61 31.22	79°4.05 28.34	Avior 234°13.01 -59°36.09
23	115°42.08	122°21.88 47.50	150°40.83 5.68	297°59.21 31.29	94°6.36 28.41	Suhail 222°43.97 -43°32.88
Mer.p	pass. 15:18	ν-0.2' d-1.3' m-4.11	ν0.5' d-0.6' m1.12	ν2.6' d0.1' m-2.33	$\nu$ 2.3' $d$ 0.1' m0.55	Miaplacidus 221°36.71 -69°49.99
						Alphard 217°44.94 -8°47.01
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.46 11°49.56
0	130° 44.55	137°21.67 \$03°46.20	165°41.36 \$15°5.03	313°1.82 N02°31.36	109°8.67 N06°28.49	Dubhe 193°37.47 61°35.63
1	145° 47.01	152°21.46 44.90	180°41.89 4.38	328°4.42 31.43	124°10.98 28.56	Denebola 182°22.16 14°24.65
2	160°49.48	167°21.25 43.61	195°42.42 3.73	343°7.02 31.50	139°13.29 28.63	Gienah 175°40.77 -17°41.97
3	175°51.94	182°21.04 · · 42.31	210°42.95 · · 3.08	358°9.62 · · 31.57	154° 15.60 · · 28.70	Acrux 172°56.77 -63°15.17 Gacrux 171°48.42 -57°16.13
4	190°54.40	197°20.84 41.01	225°43.48 2.42	13°12.22 31.64	169°17.91 28.77	Alioth 166°10.58 55°48.05
5	205°56.87	212°20.63 39.72	240°44.01 1.77	28°14.83 31.72	184°20.22 28.85	Spica 158°19.52 -11°18.58
6	220°59.33	227°20.42 \$03°38.42	255°44.54 \$15°1.12	43°17.43 N02°31.79	199°22.53 N06°28.92	Alkaid 152°49.96 49°10.00
7	236°1.80	242°20.21 37.12	270°45.07 15°0.46	58°20.03 31.86	214°24.84 28.99	Hadar 148°32.22 -60°30.30
8 9	251°4.26 266°6.73	257°20.00 35.82 272°19.80 · · 34.53	285°45.60 14°59.81 300°46.13 · · 59.16	73°22.64 31.93 88°25.24 · · 32.00	229°27.14 29.06 244°29.45 •• 29.14	Menkent 147°54.54 -36°30.41
10	281°9.19	287°19.59 33.23	315°46.67 58.50	103°27.84 32.07	259°31.76 29.21	Arcturus 145°45.58 19°1.91
11	296° 11.65	302°19.38 31.93	330°47.20 57.85	118°30.45 32.15	274°34.07 29.28	Rigil Kent. 139°36.71 -60°56.87
12	311°14.12	317°19.18	345°47.73 \$14°57.19	133°33.05 N02°32.22	289°36.38 N06°29.35	Kochab 137°20.08 74°1.96
13	$326^{\circ}16.58$	332°18.97 29.33	0°48.26 56.54	148°35.66 32.29	304°38.69 29.43	Zuben'ubi 136°53.22 -16°9.53 Alphecca 126°1.71 26°36.95
14	$341^{\circ}19.05$	347°18.77 28.03	15°48.80 55.88	163°38.26 32.36	319°41.00 29.50	Antares 112°12.89 -26°29.58
15	356°21.51	2°18.56 · · 26.74	30°49.33 · · 55.23	178°40.87 · · 32.44	334°43.30 · · 29.57	Atria 107°5.13 -69°4.38
16	11°23.97	17°18.36 25.44	45°49.86 54.57	193°43.48 32.51	349° 45.61 29.65	Sabik 102°0.09 -15°45.55
17	26°26.44	32°18.15 24.14 47°17.95 \$03°22.84	60°50.39 53.92	208°46.08 32.58	4°47.92 29.72 19°50.23 N06°29.79	Shaula 96°7.22 -37°7.30
18 19	41°28.90 56°31.37	47°17.95 \$03°22.84 62°17.74 21.54	75°50.93 \$14°53.26 90°51.46 52.60	223°48.69 N02°32.65 238°51.30 32.73	19°50.23 N06°29.79 34°52.53 29.86	Rasalhague 95°56.44 12°32.27
20	71°33.83	77°17.54 20.24	105°52.00 51.95	253°53.90 32.80	49°54.84 29.94	Eltanin 90°41.41 51°28.89
21	86°36.29	92°17.34 · · 18.94	120°52.53 · · 51.29	268°56.51 · · 32.87	64°57.15 · · 30.01	Kaus Aust. 83°29.50 -34°22.15 Vega 80°31.87 38°48.44
22	101°38.76	107° 17.13 17.64	135°53.06 50.63	283°59.12 32.95	79° 59.45 30.08	Vega 80°31.87 38°48.44 Nunki 75°44.97 -26°15.63
23	$116^{\circ}41.22$	122°16.93 16.34	150°53.60 49.98	299°1.73 33.02	95°1.76 30.16	Altair 61°57.82 8°56.54
Mer r	pass. 15:15	ν-0.2' d-1.3' m-4.11	$\nu$ 0.5′ <i>d</i> -0.7′ m1.11	ν2.6' d0.1' m-2.34	$\nu 2.3' \ d0.1' \ m0.55$	Peacock 53°2.41 -56°38.59
		- 0.2 4 1.5 111 1.11				Deneb 49°24.52 45°22.86
	6114	6114	CUA B	6114 B	GU.4 B	Enif 33°36.63 10°0.27
Wed 0	<b>GHA</b> 131° 43.69	<b>GHA Dec</b> 137°16.73 <b>S</b> 03°15.04	<b>GHA Dec</b> 165°54.13 <b>S</b> 14°49.32	<b>GHA Dec</b> 314°4.33 N02°33.10	<b>GHA Dec</b> 110°4.07 N06°30.23	Al Na'ir 27°30.24 -46°49.53
1	131 43.09 146° 46.15	152°16.53 13.74	180°54.67 48.66	329°6.94 33.17	125°6.37 30.30	Fomalhaut 15°12.07 -29°28.46
2	161°48.61	167°16.33 12.44	195°55.20 48.00	344°9.55 33.24	140°8.68 30.38	Scheat 13°43.02 28°14.24 Markab 13°27.63 15°21.46
3	176°51.08	182°16.13 · · 11.14	210°55.74 · · 47.34	359°12.16 · · 33.32	155°10.99 · · 30.45	IVIAINAU 13 21.03 13 21.40
4	191°53.54	197° 15.92 9.84	225°56.27 46.68	14°14.77 33.39	170°13.29 30.52	Jan 31 Mon SHA Mer.pass
5	206°56.01	212°15.72 8.54	240°56.81 46.03	29°17.38 33.46	185°15.60 30.60	Venus 7°41.41 14:50
6	221°58.47	227°15.52 \$03°7.24	255°57.34 \$14°45.37	44°19.99 N02°33.54	200°17.91 N06°30.67	Mars 35°43.28 12:58
7	237°0.93	242°15.32 5.94	270°57.88 44.71	59°22.60 33.61	215°20.21 30.75	Jupiter 182°14.05 03:11
8 9	252°3.40 267°5.86	257°15.12 4.64 272°14.93 · · 3.34	285°58.42 44.05 300°58.95 •• 43.39	74°25.21 33.69 89°27.82 · · 33.76	230°22.52 30.82 245°24.82 · · 30.89	Saturn 338°27.77 16:45
10	282°8.33	287°14.73 2.04	315°59.49 42.73	104°30.43 33.84	260°27.13 30.97	Feb 01 Tue SHA Mer.pass
11	202 0.33 297° 10.79	302°14.53 03°0.74	331°0.02 42.07	119°33.04 33.91	275°29.43 31.04	Venus 6°37.12 14:51
12	312° 13.26	317°14.33 S02°59.43	346°0.56 \$14°41.40	134°35.65 N02°33.99	290°31.74 N06°31.11	Mars 34°56.81 12:57
13	$327^{\circ}15.72$	332°14.13 58.13	1°1.10 40.74	149°38.26 34.06	305°34.04 31.19	Jupiter 182°17.27 03:07 Saturn 338°24.12 16:41
14	342° 18.18	347°13.94 56.83	16°1.64 40.08	164°40.88 34.14	320° 36.35 31.26	Saturn 338°24.12 16:41
15	357°20.65	2°13.74 · · 55.53	31°2.17 · · 39.42	179°43.49 · · 34.21	335°38.65 · · 31.34	Feb 02 Wed SHA Mer.pass
16	12°23.11	17°13.54 54.23	46°2.71 38.76	194°46.10 34.29	350°40.96 31.41	Venus 5°33.04 14:51
17 18	27°25.58 42°28.04	32°13.34 52.93 47°13.15 \$02°51.62	61°3.25 38.10 76°3.79 \$14°37.43	209°48.71 34.36 224°51.33 N02°34.44	5°43.26 31.48 20°45.56 N06°31.56	Mars 34°10.45 12:56
19	42 28.04 57°30.50	62°12.95 50.32	91°4.32 36.77	239°53.94 34.52	35°47.87 31.63	Jupiter 182°20.65 03:03 Saturn 338°20.38 16:37
20	72°32.97	77°12.76 49.02	106° 4.86 36.11	254°56.55 34.59	50°50.17 31.71	Saturn 338°20.38 16:37
21	87°35.43	92°12.56 · · 47.72	121°5.40 · · 35.45	269°59.17 · · 34.67	65°52.47 · · 31.78	Horizontal parallax
22	102° 37.90	107°12.37 46.41	136° 5.94 34.78	285°1.78 34.74	80°54.78 31.86	Venus: 0.1
23	117° 40.36	122°12.17 45.11	151°6.48 34.12	300°4.40 34.82	95°57.08 31.93	Mars: 0.1
Mer.p	pass. 15:11	ν-0.2' d-1.3' m-4.12	ν0.5′ d-0.7′ m1.11	ν2.6' d0.1' m-2.34	ν2.3' d0.1' m0.56	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.04	S17°34.28	$133^{\circ}29.20$	16.8'	N03°8.26	13.2'	54.2'
1	191°40.95	33.59	148°4.99	16.8'	03°21.50	13.2'	54.2'
2	206°40.85 221°40.75	32.90 · · 32.21	162° 40.75 177° 16.48	16.7' 16.7'	03°34.74 03°47.97	13.2' 13.2'	54.2' 54.2'
4	236°40.65	31.51	191°52.20	16.7'	03 47.97 04°1.19	13.2'	54.2'
5	251°40.55	30.82	206° 27.89	16.7'	04° 14.40	13.2'	54.2'
6	266°40.45	<b>S</b> 17°30.13	221°3.56	16.6'	N04°27.59	13.2'	54.3'
7	281°40.36	29.44	235°39.20	16.6'	04°40.78 04°53.96	13.2'	54.3'
8 9	296°40.26 311°40.16	28.74 •• 28.05	250° 14.81 264° 50.39	16.6' 16.6'	04°53.96 05°7.12	13.2' 13.1'	54.3' 54.3'
10	326°40.07	27.35	279° 25.95	16.5	05° 20.27	13.1	54.3'
11	341°39.97	26.66	294°1.47	16.5'	$05^{\circ}33.41$	13.1'	54.3'
12	356°39.88	S17°25.96	308°36.97	16.5'	N05°46.53	13.1'	54.3'
13 14	11°39.78 26°39.69	25.26 24.57	323°12.43 337°47.86	16.4' 16.4'	05°59.63 06°12.72	13.1' 13.1'	54.4' 54.4'
14 15	26 39.69 41°39.59	23.87	352°23.25	16.4	06 12.72 06°25.79	13.1	54.4' 54.4'
16	56°39.50	23.17	6°58.61	16.3'	06°38.84	13.0'	54.4'
17	71°39.41	22.47	21°33.93	16.3'	$06^{\circ}51.88$	13.0'	54.4'
18	86°39.31	S17°21.77	36°9.21	16.2'	N07°4.89	13.0'	54.4'
19 20	101°39.22 116°39.13	21.07 20.37	50° 44.45 65° 19.66	16.2' 16.2'	07°17.89 07°30.87	13.0' 13.0'	54.4' 54.5'
21	131°39.03	19.67	79°54.82	16.1	07°43.82	12.9'	54.5
22	146°38.94	18.97	94° 29.94	16.1	07°56.75	12.9'	54.5'
23	161°38.85	18.27	$109^{\circ}5.02$	16.0'	08°9.66	12.9'	54.5'
	SD = 16.2'	d = -0.7'		SE	0 = 14.8'		
<b>T</b>	CILA	D	CUA		D	.1	LID
Tue 0	<b>GHA</b> 176°38.76	Dec \$17° 17.57	<b>GHA</b> 123° 40.05	u 16.0'	<b>Dec</b> N08° 22.54	d 12.9'	<b>HP</b> 54.5'
1	191°38.67	16.86	138° 15.04	15.9'	08°35.40	12.8'	54.5'
2	206°38.58	16.16	$152^{\circ}49.98$	15.9'	$08^{\circ}48.23$	12.8'	54.6'
3	221°38.49	• • 15.46	167°24.88	15.8'	09°1.04	12.8'	54.6'
4 5	236°38.40 251°38.31	14.75 14.05	181°59.73 196°34.52	15.8' 15.7'	09° 13.82 09° 26.58	12.8' 12.7'	54.6' 54.6'
6	266°38.22	\$17° 13.34	211° 9.27	15.7'	N09°39.30	12.7'	54.6
7	281°38.13	12.64	225°43.97	15.6'	09°52.00	12.7'	54.7'
8	296°38.04	11.93	240°18.61	15.6'	10°4.66	12.6'	54.7'
9	311°37.96	• • 11.22	254°53.20	15.5'	10°17.29	12.6'	54.7'
10 11	326°37.87 341°37.78	10.51 9.81	269°27.73 284°2.21	15.5' 15.4'	10°29.90 10°42.47	12.6' 12.5'	54.7' 54.7'
12	356°37.70	S17°9.10	298°36.63	15.4'	N10°55.00	12.5'	54.7'
13	11°37.61	8.39	313° 10.99	15.3'	11°7.50	12.5'	54.8'
14	26°37.52	7.68	327° 45.30	15.2'	11° 19.97	12.4' 12.4'	54.8'
15 16	41°37.44 56°37.35	· · 6.97 6.26	342° 19.54 356° 53.72	15.2' 15.1'	11°32.40 11°44.79	12.4'	54.8' 54.8'
17	71°37.27	5.55	11°27.84	15.1'	11°57.15	12.3'	54.9'
18	86°37.18	S17°4.83	$26^{\circ}1.90$	15.0'	N12°9.46	12.3'	54.9'
19	101°37.10	4.12	40°35.89	14.9'	12°21.74	12.2'	54.9'
20 21	116°37.02 131°36.93	3.41 · · 2.70	55°9.82 69°43.68	14.9' 14.8'	12°33.98 12°46.17	12.2' 12.2'	54.9' 54.9'
22	146°36.85	1.98	84° 17.47	14.7'	12°58.33	12.1'	55.0'
23	161°36.77	1.27	98°51.20	14.7'	13° 10.43	12.1'	55.0'
	SD = 16.2'	d = -0.7'		SE	0 = 14.9'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.68	S17°0.55	113°24.85	14.6'	N13°22.50	12.0'	55.0'
1	191°36.60	16° 59.84	127°58.43	14.5'	13°34.52	12.0'	55.0'
2	206°36.52 221°36.44	59.12	142°31.95 157°5.39	14.4' 14.4'	13°46.50 13°58.42	11.9'	55.1' 55.1'
3 4	221°36.44 236°36.36	•• 58.40 57.69	157°5.39 171°38.75	14.4	13°58.42 14°10.30	11.9' 11.8'	55.1'
5	251°36.28	56.97	186° 12.04	14.2'	14°22.13	11.8'	55.1'
6	266°36.20	S16°56.25	200°45.26	14.1'	N14° 33.91	11.7'	55.2'
7	281°36.12	55.53	215° 18.40	14.1'	14°45.64	11.7'	55.2'
8 9	296°36.04 311°35.96	54.81 •• 54.09	229°51.46 244°24.44	14.0' 13.9'	14°57.32 15°8.95	11.6' 11.6'	55.2' 55.2'
10	326°35.88	53.37	258° 57.34	13.8'	15° 20.52	11.5'	55.3'
11	341°35.80	52.65	273°30.16	13.7'	15°32.04	11.5'	55.3'
12	356°35.72	\$16°51.93	288°2.90	13.7'	N15° 43.50	11.4'	55.3'
13 14	11°35.65 26°35.57	51.21 50.49	302°35.56 317°8.13	13.6' 13.5'	15°54.90 16°6.25	11.3' 11.3'	55.3' 55.4'
15	41°35.49	• • 49.77	331° 40.62	13.4'	16° 17.53	11.3	55.4'
16	56°35.42	49.04	$346^{\circ}13.02$	13.3'	$16^{\circ}28.76$	11.2'	55.4'
17	71°35.34	48.32	0°45.34	13.2'	16°39.93	11.1'	55.4'
18	86°35.26 101°35.19	\$16°47.59	15° 17.57 29° 49.71	13.1'	N16°51.03 17°2.07	11.0'	55.5'
19 20	101°35.19 116°35.11	46.87 46.15	29°49.71 44°21.76	13.1' 13.0'	17°2.07 17°13.05	11.0' 10.9'	55.5' 55.5'
21	131°35.04	• 45.42	58° 53.72	12.9'	17°23.96	10.8	55.6'
22	146°34.96	44.69	73°25.59	12.8'	17° 34.80	10.8'	55.6'
23	161°34.89	43.97	87°57.37	12.7'	17°45.58	10.7'	55.6'
	SD = 16.2'	d = -0.7'		SE	0 = 15.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-33%	
31	13:16	13:20	12:13	15:31	03:11		
01	13:25	13:29	12:13	16:13	03:52		
02	13:33	13:37	12:14	16:57	04:34		

# February 03, 04, 05 UT (Thu., Fri., Sat.)

h	Aries	Venus	, , , , , , , , ,	Mars	Ju	piter	Sat	turn		Stars	
Thu	GHA	GHA De	c GHA	N Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	$132^{\circ}42.82$	137°11.98 <b>S</b> 02°4	3.81 166°7	.02 <b>S</b> 14°33.45	315°7.01	N02°34.90	110°59.38	N06°32.01	Alpheratz	357°32.36	29°14.87
1	$147^{\circ}45.29$		2.51 181°7		330°9.63		126°1.69	32.08	Ankaa	353° 4.95	-42° 9.35
2	162° 47.75		1.20 196°8		345°12.24		141°3.99	32.15	Schedar	349°28.37	56°41.76
3	177°50.22	182°11.40 · · · 3			0°14.86		156°6.29	• • 32.23	Diphda	348°44.95	-17°50.04
4 5	192° 52.68 207° 55.15		8.60 226°9 7.29 241°9		15°17.47 30°20.09		171°8.60 186°10.90	32.30 32.38	Achernar	$335^{\circ}18.56$	-57° 5.88
6	222° 57.61	227°10.82 \$02°3			45°22.71		201° 13.20	N06°32.45	Hamal	327°48.37	23°35.81
7	238°0.07		4.69 271°10		60°25.32		216° 15.50	32.53	Polaris	312°36.92	89°23.22
8	253°2.54	257°10.44 3	3.38 286°11		75°27.94		231°17.80	32.60	Acamar Menkar	315°9.86 314°3.47	-40°11.76 4°11.95
9	268°5.00	272°10.25 · · 3			90°30.56		246°20.11	• • 32.68	Mirfak	308°24.48	4 11.95 49°57.84
10	283°7.47		0.78 316°12		105°33.17		261°22.41	32.75	Aldebaran	290°36.54	16°33.91
11	298° 9.93		9.47 331°12		120°35.79		276° 24.71	32.83 N06°32.90	Rigel	281°1.23	-8°10.31
12 13	313° 12.39 328° 14.86	317°9.67 <b>S</b> 02°2 332°9.48 2	8.17 346°13 6.86 1°14		135°38.41 150°41.03		291°27.01 306°29.31	32.98	Capella	280°17.84	$46^{\circ}1.62$
14	343° 17.32		5.56 16°14		165°43.65		300°29.31 321°31.61	33.05	Bellatrix	278°19.95	6°22.39
15	358° 19.79	2°9.10 · · 2			180°46.27	• • 36.06	336° 33.91	• • 33.13	Elnath	277°58.41	28°37.84
16	13°22.25	17°8.92 2	2.95 46°15	.67 22.80	195°48.89	36.13	351°36.22	33.20	Alnilam	275°34.93 270°49.10	-1°11.18 7°24.61
17	28°24.71		1.65 61°16		210°51.50		6°38.52	33.28	Betelgeuse Canopus	263°50.82	-52°42.86
18	43°27.18	47°8.54 S02°2			225°54.12		21°40.82	N06°33.36	Sirius	258°23.71	-16°45.49
19	58°29.64		9.04 91°17		240°56.74		36°43.12	33.43	Adhara	255° 3.53	-29°0.83
20 21	73°32.11 88°34.57	77°8.16 1 92°7.97 · · · 1	7.73 106°17 6.43 121°18		255°59.36 271°1.99		51°45.42 66°47.72	33.51 •• 33.58	Procyon	244°47.87	5°8.99
22	103°37.04		5.12 136°18		286°4.61		81°50.02	33.66	Pollux	243°13.87	27°57.34
23	118° 39.50		3.82 151°19		301°7.23		96°52.32	33.73	Avior	234°13.01	-59°36.11
N 4	15.07	ν-0.2' d-1.3' m-4		d-0.7' m1.11		0.1' m-2.35		.1′ m0.56	Suhail Miaplacidus	222°43.96 221°36.71	-43°32.89 -69°50.01
ivier.	pass. 15:07	ν-0.2 α-1.5 m-2	+.12 \(\nu \text{00.5}\)	<i>a</i> -0.7 m1.11	ν2.0 d0	7.1 III-2.33	ν2.3 d0	.1 1110.50	Alphard	221 30.71 217°44.94	-8°47.02
									Regulus	207°31.45	11°49.56
Fri	GHA	GHA De			GHA	Dec	GHA	Dec	Dubhe	193°37.45	61°35.64
0	133°41.96	137°7.41 S02°1			316°9.85		111°54.62	N06°33.81	Denebola	$182^{\circ}22.14$	$14^{\circ}24.64$
1 2	148° 44.43 163° 46.89		1.21 181°20 9.90 196°21		331°12.47 346°15.09		126° 56.92 141° 59.22	33.89 33.96	Gienah	175°40.75	-17°41.98
3	178° 49.36	182°6.86 · ·			1°17.71		157°1.52	• • 34.04	Acrux	172°56.73	-63°15.18
4	193°51.82		7.29 226°22		16°20.34		172°3.81	34.11	Gacrux	171°48.39	-57°16.14
5	208°54.28	212°6.49	5.99 241°22	.73 14.09	31°22.96	37.16	187°6.11	34.19	Alioth Spica	166°10.55 158°19.50	55°48.05 -11°18.58
6	223°56.75	227°6.30 S02°			46°25.58		202°8.41	N06°34.27	Alkaid	150° 19.50° 152° 49.93	49°10.00
7	238°59.21		3.38 271°23		61°28.21		217° 10.71	34.34	Hadar	148°32.18	-60°30.31
8	254°1.68		2.07 286°24		76°30.83		232° 13.01	34.42	Menkent	$147^{\circ}54.51$	$-36^{\circ}30.42$
9 10	269°4.14 284°6.60	272°5.75 02° 287°5.57 01°5	0.76 301°24 9.46 316°25		91°33.45 106°36.08		247° 15.31 262° 17.61	· · 34.49 34.57	Arcturus	145°45.56	$19^{\circ}1.91$
11	299°9.07		8.15 331°26		121°38.70		277° 19.90	34.65	Rigil Kent.	139°36.67	-60°56.88
12	314° 11.53	317°5.20 S01°5			136°41.33		292°22.20	N06°34.72	Kochab	137°20.02	74°1.96
13	329° 14.00	332°5.02 5	5.54 1°27		151°43.95		307°24.50	34.80	Zuben'ubi Alphecca	136°53.20 126°1.69	-16°9.54 26°36.94
14	344°16.46		4.23 16°27		166°46.58		322°26.80	34.88	Antares	112° 12.87	-26°29.58
15	359° 18.93		2.93 31°28		181°49.20		337°29.10	• • 34.95	Atria	107°5.08	-69°4.37
16	14°21.39		1.62 46°28		196°51.83		352°31.39	35.03	Sabik	102°0.07	-15°45.55
17 18	29°23.85 44°26.32	32°4.29 5 47°4.11 \$01°4	0.32 61°29 9.01 76°29		211°54.45 226°57.08		7°33.69 22°35.99	35.11 N06°35.18	Shaula	96°7.20	-37°7.30
19	59° 28.78		7.70 91°30		241°59.70		37°38.28	35.26	Rasalhague	95°56.42	12°32.26
20	74°31.25		6.40 106°30		257°2.33		52° 40.58	35.34	Eltanin Kaus Aust.	90°41.39 83°29.48	51°28.88 -34°22.15
21	89°33.71	92°3.57 · · 4	5.09 121°31	.47 •• 3.32	272°4.96	• • 38.45	67°42.88	• • 35.41	Vega	80°31.86	-34 22.15 38°48.43
22	104°36.17		3.78 136°32		287°7.59		82°45.17	35.49	Nunki	75°44.95	-26°15.62
23	119°38.64	122°3.21 4	2.48 151°32	.56 1.97	302°10.21	38.61	97°47.47	35.57	Altair	61°57.81	8°56.53
Mer.	pass. 15:03	ν-0.2' d-1.3' m-4	$1.13  \nu 0.5'$	d-0.7' m1.11	$\nu$ 2.6′ d0	0.1′ m-2.35	$\nu$ 2.3′ d0	.1′ m0.56	Peacock	53°2.40	-56°38.57
									Deneb	49°24.51	45°22.85
Sat	GHA	GHA De	c GHA	A Dec	GHA	Dec	GHA	Dec	Enif	33°36.63	10°0.26
0	134° 41.10	137°3.03 S01°4			317°12.84		112°49.77		Al Na'ir Fomalhaut	27°30.25 15°12.08	-46°49.52 -29°28.46
1	149°43.57	152°2.85 3	9.86 181°33		332°15.47	38.77	127°52.06	35.72	Scheat	13°43.02	28°14.23
2	164°46.03		8.55 196°34		347°18.10		142°54.36	35.80	Markab	13°27.64	15°21.45
3	179° 48.50	182°2.49 · · 3			2°20.73		157° 56.65	• • 35.88	E 1 02 TI	CLIA	
4 5	194° 50.96 209° 53.42		5.94 226°35 4.63 241°35		17°23.35 32°25.98		172°58.95 188°1.25	35.95 36.03	Feb 03 Thu Venus	<b>SHA</b> 4°29.15	Mer.pass 14:51
6	209°53.42 224°55.89	212°2.14 3 227°1.96 \$01°3			47°28.61		203°3.54	N06°36.11	Mars	33°24.19	12:55
7	239° 58.35		2.02 271°36		62°31.24		218°5.84	36.18	Jupiter		02:59
8	255°0.82		0.71 286°37		77°33.87		233°8.13	36.26	Saturn	$338^{\circ}16.56$	16:34
9	270°3.28	272°1.43 · · · 2	9.40 301°38	.05 •• 55.20	92°36.50	• • 39.43	248°10.43	• • 36.34	Feb 04 Fri	SHA	Mor pace
10	285°5.74		8.10 316°38		107°39.13		263°12.72	36.42	Venus	3°25.45	Mer.pass 14:52
11	300°8.21		6.79 331°39		122°41.76		278° 15.02	36.49	Mars	32°38.05	12:54
12 13	315° 10.67 330° 13.14	317°0.90 S01°2 332°0.73 2	5.48 346°39 4.17 1°40		137°44.39 152°47.03		293°17.31 308°19.61	N06°36.57 36.65	Jupiter		02:55
13 14	345° 15.60		4.17 1 40 2.87 16°40		152 47.03 167°49.66		308 19.61 323°21.90	36.73	Saturn	338°12.65	16:30
15	0° 18.07	2°0.38 · · 2	1.56 31°41	.35 •• 51.13	182°52.29		338° 24.19	• • 36.80	Feb 05 Sat	SHA	Mer.pass
16	15° 20.53		0.25 46°41		197°54.92		353°26.49	36.88	Venus	2°21.93	14:52
17	30°22.99		8.94 61°42	.46 49.77	212°57.55	40.10	8°28.78	36.96	Mars	31°52.01	12:53
18	45°25.46	46°59.85 S01°1			228°0.19		23°31.08	N06°37.04	Jupiter		02:51
19	60°27.92		6.33 91°43		243°2.82		38°33.37	37.12	Saturn	338°8.66	16:26
20 21	75°30.39 90°32.85	76°59.51 1 91°59.33 · · 1	5.02 106°44 3.71 121°44		258°5.45 273°8.09		53°35.66 68°37.96	37.19 · · 37.27	Horizo	ntal parallax	
22	90 32.65 105°35.32		3.71 121 44 2.40 136°45		273 6.09 288°10.72		83°40.25	37.35		Venus:	0.1
23	120° 37.78		1.09 151°45		303°13.35		98° 42.54	37.43		Mars:	0.1
Mar	pass. 14:59	ν-0.2′ d-1.3′ m-4		d-0.7' m1.10	1/2 6/ 40	0.1′ m-2.36	112 31 40	.1′ m0.56			
IVICI.	Pass. 17.J3	ν 0.2 u-1.3 ill-4	15 VO.3	G 0.7 IIII.IU		111-2.30	ν2.3 d0	1110.30			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.82	S16°43.24	$102^{\circ}29.06$	12.6'	$N17^{\circ}56.28$	10.6'	55.6'
1	191°34.74	42.51	117°0.65	12.5'	18°6.92	10.6'	55.7'
2	206°34.67 221°34.60	41.78 •• 41.05	131°32.15 146°3.55	12.4' 12.3'	18° 17.49 18° 27.98	10.5' 10.4'	55.7' 55.7'
4	236°34.52	40.33	160°34.86	12.2'	18°38.40	10.3	55.8'
5	251°34.45	39.60	175°6.07	12.1'	18°48.74	10.3'	55.8'
6	266°34.38	S16°38.87	189°37.18	12.0'	N18°59.01	10.2'	55.8'
7 8	281°34.31 296°34.24	38.13 37.40	204°8.19 218°39.11	11.9' 11.8'	19°9.20 19°19.32	10.1' 10.0'	55.8' 55.9'
9	311°34.17	36.67	233°9.92	11.7'	19° 29.35	10.0'	55.9'
10	326°34.10	35.94	247°40.64	11.6'	19°39.30	9.9'	55.9'
11	341°34.03 356°33.96	35.21 \$16°34.47	262°11.25 276°41.77	11.5'	19°49.18	9.8'	56.0'
12 13	350°33.90 11°33.89	33.74	276°41.77 291°12.18	11.4' 11.3'	N19°58.96 20°8.67	9.7' 9.6'	56.0' 56.0'
14	26°33.82	33.01	305°42.48	11.2'	20° 18.28	9.5'	56.1'
15	41°33.75	• • 32.27	320° 12.69	11.1'	20°27.81	9.4'	56.1'
16	56°33.69 71°33.62	31.54	334° 42.78 349° 12.78	11.0'	20°37.25 20°46.61	9.4'	56.1' 56.2'
17 18	71°33.62 86°33.55	30.80 \$16°30.06	349°12.78 3°42.67	10.9' 10.8'	N20° 55.87	9.3' 9.2'	56.2'
19	101°33.48	29.33	18° 12.45	10.7'	21°5.04	9.1'	56.2'
20	116°33.42	28.59	$32^{\circ}42.13$	10.6'	$21^{\circ}14.11$	9.0'	56.3'
21	131°33.35	• • 27.85	47° 11.70	10.5'	21°23.09	8.9'	56.3'
22 23	146°33.29 161°33.22	27.11 26.38	61°41.16 76°10.52	10.4' 10.2'	21°31.97 21°40.76	8.8' 8.7'	56.3' 56.4'
23	SD = 16.2'		.0 10.32		0 = 15.2'	5.1	55. r
	3D = 10.2'	d = -0.7'		51	$J = 15.2^{\circ}$		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°33.16	\$16°25.64	90°39.77	10.1'	N21°49.44	8.6'	56.4
1 2	191°33.09 206°33.03	24.90 24.16	105°8.91 119°37.94	10.0' 9.9'	21°58.03 22°6.52	8.5' 8.4'	56.4' 56.5'
3	200 33.03 221°32.96	. 23.42	119 37.94 134°6.86	9.9 9.8'	22 0.52 22°14.90	8.3'	56.5'
4	236°32.90	22.67	148°35.67	9.7'	22°23.17	8.2'	56.5'
5	251°32.84	21.93	163°4.38	9.6'	22°31.34	8.1'	56.6'
6 7	266°32.77 281°32.71	\$16°21.19 20.45	177°32.97 192°1.46	9.5' 9.4'	N22°39.41 22°47.36	8.0' 7.8'	56.6' 56.7'
8	281 32.71 296°32.65	20.45 19.70	192 1.46 206° 29.83	9.4 9.3'	22 47.30 22°55.21	7.8 7.7'	56.7'
9	311°32.59	• • 18.96	220°58.10	9.2'	23°2.94	7.6'	56.7'
10	326° 32.52	18.22	235° 26.26	9.0'	23° 10.56	7.5'	56.8'
11 12	341°32.46 356°32.40	17.47 \$16° 16.73	249°54.30 264°22.24	8.9' 8.8'	23°18.07 N23°25.46	7.4' 7.3'	56.8' 56.8'
13	11°32.34	15.98	278° 50.06	8.7'	23°32.73	7.3 7.2'	56.9'
14	26°32.28	15.24	293° 17.78	8.6'	23°39.88	7.0'	56.9'
15	41°32.22	• • 14.49	307°45.39	8.5'	23°46.92	6.9'	57.0'
16 17	56°32.16 71°32.10	13.74 13.00	322°12.88 336°40.27	8.4' 8.3'	23°53.83 24°0.62	6.8' 6.7'	57.0' 57.0'
18	86°32.05	\$16° 12.25	351°7.55	8.2'	N24°7.29	6.5	57.1
19	101°31.99	11.50	5°34.72	8.1'	24°13.83	6.4'	57.1'
20	116°31.93	10.75	20°1.78	8.0'	24°20.24	6.3'	57.1'
21 22	131°31.87 146°31.82	· · 10.00 9.25	34°28.73 48°55.58	7.8' 7.7'	24°26.53 24°32.68	6.2' 6.0'	57.2' 57.2'
23	161°31.76	9.25 8.50	63° 22.32	7.7 7.6'	24° 32.06 24° 38.71	5.9'	57.2 57.3'
	SD = 16.2'	d = -0.7'			D = 15.4'		
	3D = 10.2	<u>u = -0.1</u>		JL	J — 13.4		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°31.70 191°31.65	\$16°7.75	77° 48.95 92° 15.48	7.5'	N24°44.60 24°50.35	5.8'	57.3'
1 2	191°31.65 206°31.59	7.00 6.25	92°15.48 106°41.90	7.4' 7.3'	24°50.35 24°55.97	5.6' 5.5'	57.3' 57.4'
3	221°31.54	• • 5.49	121°8.21	7.2'	25°1.46	5.3'	57.4'
4	236°31.48	4.74	135°34.42	7.1'	25°6.80	5.2'	57.5'
5 6	251°31.43 266°31.37	3.99 \$16°3.23	150°0.53 164°26.53	7.0' 6.9'	25°12.01 N25°17.07	5.1' 4.9'	57.5' 57.5'
7	281°31.32	2.48	104° 20.53 178° 52.44	6.8'	N25°17.07 25°21.99	4.9'	57.5° 57.6'
8	296°31.26	1.73	193° 18.24	6.7'	25° 26.77	4.6'	57.6'
9	311°31.21	•• 0.97	207°43.94	6.6'	25°31.40	4.5'	57.7'
10 11	326°31.16 341°31.11	16°0.21 15°59.46	222°9.54 236°35.04	6.5' 6.4'	25°35.89 25°40.23	4.3' 4.2'	57.7' 57.7'
11	341°31.11 356°31.05	\$15°59.46 \$15°58.70	236° 35.04 251° 0.45	6.3	25°40.23 N25°44.41	4.2'	57.7
13	11°31.00	57.94	265°25.75	6.2'	25°48.45	3.9'	57.8'
14	26°30.95	57.19	279°50.97	6.1'	25°52.34	3.7'	57.9'
15 16	41°30.90 56°30.85	· · 56.43 55.67	294°16.09 308°41.11	6.0' 5.9'	25°56.07 25°59.65	3.6' 3.4'	57.9' 57.9'
16	71°30.80	55.67 54.91	308°41.11 323°6.05	5.9° 5.8'	25°59.65 26°3.07	3.4	57.9 58.0'
18	86°30.75	S15° 54.15	337°30.89	5.8'	N26°6.33	3.1'	58.0'
19	101°30.70	53.39	351°55.65	5.7'	26°9.44	2.9'	58.1'
20 21	116°30.65 131°30.60	52.63 •• 51.87	6°20.31 20°44.89	5.6' 5.5'	26°12.38 26°15.17	2.8' 2.6'	58.1' 58.1'
21	131°30.60 146°30.55	51.87 51.11	20°44.89 35°9.39	5.5° 5.4'	26° 15.17 26° 17.79	2.6'	58.1'
23	161°30.50	50.35	49° 33.80	5.3'	26° 20.25	2.3'	58.2'
	SD = 16.2'	d = -0.8'		SI	D = 15.6'		
					- •		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-63%	
03	13:41	13:44	12:14	17:45	05:20		
04	13:47	13:50	12:14	18:37	06:10		
05	13:53	13:56	12:14	19:34	07:05		

## February 06, 07, 08 UT (Sun., Mon., Tue.)

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	135°40.24	136°58.81	S01°9.79	166° 46.32	\$13°45.00	318° 15.99	N02°40.68	113°44.83	N06°37.51			
1	150°42.71	151°58.64	8.48	181°46.87	44.32	333°18.62	40.77	128°47.13	37.59	Alpheratz	357°32.36	29°14.87
2	$165^{\circ}45.17$	$166^{\circ}58.47$	7.17	196°47.43	43.64	348°21.26	40.85	143°49.42	37.66	Ankaa Schedar	353°4.96 349°28.38	-42°9.34 56°41.75
3	180°47.64	181°58.30	• • 5.86	211° 47.98	• • 42.96	3°23.89	• • 40.94	158°51.71	• • 37.74	Diphda	348°44.95	-17°50.03
4	195°50.10	196°58.13	4.55	226° 48.53	42.27	18°26.53	41.02	173°54.01	37.82	Achernar	335°18.58	-57° 5.88
5	210° 52.56	211°57.96	3.24	241°49.09	41.59 \$13°40.91	33°29.16	41.11	188°56.30	37.90	Hamal	327°48.38	23°35.80
6 7	225°55.03 240°57.49	226°57.79 241°57.62	S01°1.93 01°0.63	256°49.64 271°50.19	40.22	48°31.80 63°34.43	N02°41.19 41.28	203°58.59 219°0.88	N06° 37.98 38.06	Polaris	$312^{\circ}38.16$	89°23.23
8	255° 59.96	256° 57.45	01°0.03	286° 50.75	39.54	78°37.07	41.26	234°3.17	38.13	Acamar	315°9.87	-40°11.76
9	271°2.42	271°57.28	58.01	301°51.30	• • 38.86	93°39.71	• • 41.45	249°5.46	• • 38.21	Menkar	314°3.47	4°11.95
10	286°4.89	$286^{\circ}57.11$	56.70	$316^{\circ}51.85$	38.17	108°42.34	41.53	264°7.76	38.29	Mirfak Aldebaran	308° 24.49 290° 36.55	49°57.84 16°33.91
11	301°7.35	301°56.94	55.39	331°52.41	37.49	123°44.98	41.62	279°10.05	38.37	Rigel	290 30.33 281°1.24	-8°10.32
12	316°9.81	316°56.77	S00°54.08	346°52.96	\$13°36.81	138°47.62	N02°41.70	294°12.34	N06°38.45	Capella	280° 17.84	46°1.62
13	331°12.28 346°14.74	331°56.60 346°56.43	52.77 51.47	1°53.52 16°54.07	36.12	153°50.25 168°52.89	41.79	309°14.63 324°16.92	38.53	Bellatrix	$278^{\circ}19.95$	6°22.39
14 15	1° 17.21	1°56.27	50.16	31° 54.63	35.44 •• 34.75	100 52.09 183°55.53	41.87 •• 41.96	339°19.21	38.61 •• 38.69	Elnath	277°58.42	28°37.84
16	16° 19.67	16°56.10	48.85	46°55.18	34.07	198°58.17	42.05	354°21.50	38.76	Alnilam	275°34.94	-1°11.19
17	31°22.14	31°55.93	47.54	61°55.74	33.38	214° 0.81	42.13	9°23.79	38.84	Betelgeuse	270°49.10	7°24.61
18	$46^{\circ}24.60$	46°55.76	S00°46.23	76°56.30	S13°32.69	229°3.45	N02°42.22	24°26.08	N06°38.92	Canopus Sirius	263°50.84 258°23.71	-52°42.88 -16°45.50
19	61°27.06	61°55.60	44.92	91°56.85	32.01	244°6.09	42.30	39°28.37	39.00	Adhara	255°3.53	-29° 0.84
20	76° 29.53	76°55.43	43.61	106° 57.41	31.32	259° 8.72	42.39	54°30.66	39.08	Procyon	244°47.87	5°8.98
21 22	91°31.99 106°34.46	91°55.26 106°55.10	•• 42.30 40.99	121°57.96 136°58.52	· · 30.64 29.95	274°11.36 289°14.00	•• 42.48 42.56	69°32.95 84°35.24	· · 39.16 39.24	Pollux	$243^{\circ}13.86$	27°57.34
23	100° 34.40 121° 36.92	100 55.10 121°54.93	39.69	150° 58.52 151° 59.08	29.95	304° 16.64	42.65	99°37.53	39.32	Avior	234°13.02	-59°36.13
										Suhail	222°43.96	-43°32.91
Mer.p	ass. 14:55	$\nu$ -0.2' d-1	.3′ m-4.14	$\nu 0.6' \ d-0$	.7′ m1.10	$\nu 2.6' d0.$	1′ m-2.37	$\nu^{2.3'} d0$	.1′ m0.56	Miaplacidus	221°36.70	-69°50.03
										Alphard Regulus	217°44.92 207°31.43	-8°47.03 11°49.55
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.42	61°35.65
0	136°39.38	136°54.77	S00°38.38	166°59.64	S13°28.58	319°19.28	N02°42.74	114°39.82	N06°39.40	Denebola	182°22.12	14°24.64
1	151°41.85	151°54.60	37.07	182°0.19	27.89	334°21.93	42.82	129°42.11	39.48	Gienah	$175^{\circ}40.72$	-17°42.00
2	166° 44.31 181° 46.78	166°54.44 181°54.27	35.76 •• 34.45	197°0.75 212°1.31	27.20 · · 26.51	349°24.57 4°27.21	42.91 •• 43.00	144°44.40 159°46.69	39.56 •• 39.64		172°56.69	-63°15.20
4	196° 49.24	196°54.11	33.14	212 1.31 227°1.86	25.82	19°29.85	43.00	174°48.98	39.72		171°48.35	-57°16.16
5	211°51.71	211°53.94	31.83	242°2.42	25.14	34°32.49	43.17	189°51.27	39.80	Alioth	166° 10.52	55°48.05
6	226°54.17	226°53.78	S00°30.52	257°2.98	S13°24.45	49°35.13	N02°43.26	204°53.56	N06°39.88	Spica Alkaid	158° 19.47 152° 49.90	-11°18.59 49°9.99
7	$241^{\circ}56.63$	$241^{\circ}53.62$	29.21	272°3.54	23.76	64°37.77	43.35	$219^{\circ}55.85$	39.96	Hadar	148°32.13	-60°30.32
8	256°59.10	256°53.45	27.90	287°4.10	23.07	79°40.42	43.43	234°58.13	40.04		147°54.48	-36°30.43
9	272°1.56	271°53.29	• • 26.59	302°4.66	• • 22.38	94°43.06	• • 43.52	250°0.42	• • 40.12	Arcturus	$145^{\circ}45.53$	19°1.90
10 11	287°4.03 302°6.49	286°53.13 301°52.96	25.28 23.98	317°5.21 332°5.77	21.69 21.00	109°45.70 124°48.35	43.61 43.70	265°2.71 280°5.00	40.20 40.27	Rigil Kent.	139°36.62	-60°56.88
12	317°8.96	316°52.80	S00°22.67	347°6.33	\$13°20.31	139°50.99	N02°43.79	295°7.29	N06°40.35	Kochab	137°19.96	74°1.96
13	332°11.42	331°52.64	21.36	2°6.89	19.62	154°53.63	43.87	310°9.57	40.43	Zuben'ubi	136°53.17	-16°9.55
14	$347^{\circ}13.88$	$346^{\circ}52.48$	20.05	17°7.45	18.93	169°56.28	43.96	$325^{\circ}11.86$	40.51	Alphecca Antares	126°1.66 112°12.84	26°36.94 -26°29.58
15	$2^{\circ}16.35$	$1^{\circ}52.32$	• • 18.74	32°8.01	• • 18.24	184°58.92	• • 44.05	$340^{\circ}14.15$	• • 40.60	Atria	107°5.01	-69° 4.36
16	17° 18.81	16°52.16	17.43	47°8.57	17.55	200°1.57	44.14	355°16.44	40.68	Sabik	102°0.04	-15°45.55
17	32°21.28 47°23.74	31°52.00	16.12	62°9.13 77°9.69	16.86	215° 4.21	44.23	10°18.72 25°21.01	40.76	Shaula	$96^{\circ}7.16$	-37°7.30
18 19	47 23.74 62° 26.20	46°51.83 61°51.67	500°14.81 13.50	92° 10.25	\$13°16.17 15.48	230° 6.86 245° 9.50	N02° 44.32 44.40	40°23.30	N06° 40.84 40.92	Rasalhague	95°56.40	12°32.26
20	77° 28.67	76°51.51	12.19	107° 10.23	14.79	260°12.15	44.49	55°25.58	41.00	Eltanin	90°41.37	51°28.87
21	92°31.13	91°51.35	• • 10.88	122°11.37	• • 14.09	275°14.79	• • 44.58	70°27.87	• • 41.08	Kaus Aust. Vega	83°29.45 80°31.84	-34°22.14 38°48.42
22	$107^{\circ}33.60$	$106^{\circ}51.19$	9.57	$137^{\circ}11.93$	13.40	290°17.44	44.67	85°30.16	41.16	Nunki	75°44.93	-26°15.62
23	122°36.06	121°51.04	8.26	152° 12.49	12.71	305°20.08	44.76	100°32.44	41.24	Altair	61°57.79	8°56.53
Mer.p	ass. 14:51	$\nu$ -0.2' d-1	.3′ m-4.14	$\nu 0.6' \ d-0$	.7′ m1.10	$\nu 2.6' d0.$	1′ m-2.37	$\nu 2.3' d0$	.1′ m0.56	Peacock	53°2.38	-56°38.56
										Deneb	$49^{\circ}24.50$	45°22.83
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.62	10°0.26
0	137° 38.53	136°50.88	S00° 6.95	167° 13.06	S13°12.02	320°22.73	N02° 44.85	115°34.73	N06°41.32	Al Na'ir Fomalhaut	27°30.24 15°12.08	-46°49.51 -29°28.45
1	$152^{\circ}40.99$	151°50.72	5.64	182°13.62	11.32	335°25.38	44.94	130°37.02	41.40	Scheat	15 12.08 13°43.02	-29 28.45 28°14.22
2	167° 43.45	166° 50.56	4.33	197° 14.18	10.63	350°28.02	45.03	145°39.30	41.48	Markab	13°27.64	15°21.45
3	182°45.92	181°50.40	• • 3.03	212°14.74	• • 9.94	5°30.67	· · 45.12	160°41.59	• • 41.56	Est oc c		
4	197°48.38	196°50.24	1.72	227°15.30	9.24	20°33.32	45.21 45.20	175°43.87	41.64	Feb 06 Sun Venus	<b>SHA</b> 1° 18.57	Mer.pass 14:52
5 6	212°50.85 227°53.31	211°50.09 226°49.93	S00°0.41 N00°0.90	242° 15.87 257° 16.43	8.55 \$13°7.86	35°35.97 50°38.61	45.30 N02° 45.39	190°46.16 205°48.45	41.72 N06°41.80	Mars	1 18.57 31°6.08	12:52
7	242°55.78	241°49.77	2.21	272°16.99	7.16	65°41.26	45.48	220°50.73	41.88		182°35.74	02:46
8	257° 58.24	256°49.61	3.52	287° 17.55	6.47	80°43.91	45.57	235°53.02	41.96	Saturn	338°4.59	16:23
9	273°0.70	271°49.46	• • 4.83	302°18.12	•• 5.77	95°46.56	• • 45.66	250°55.30	• • 42.05	Feb 07 Mon	SHA	Mer.pass
10	288°3.17	286°49.30	6.14	317°18.68	5.08	110°49.21	45.75	265°57.59	42.13	Venus	о° 15.38	14:53
11	303°5.63	301°49.14	7.45	332°19.24	4.38	125°51.86	45.84	280°59.87	42.21	Mars	30° 20.25	12:52
12 13	318°8.10 333°10.56	316°48.99 331°48.83	N00°8.76 10.07	347° 19.81 2° 20.37	\$13°3.69 2.99	140°54.51 155°57.16	N02°45.93 46.02	296°2.16 311°4.44	N06° 42.29 42.37	Jupiter	$182^{\circ}39.90$	02:42
13 14	348° 13.02	346°48.68	11.38	2 20.37 17°20.93	2.99	170°59.81	46.02	311 4.44 326°6.72	42.45	Saturn	338°0.44	16:19
15	3° 15.49	1°48.52	• • 12.69	32°21.50	• • 1.60	186° 2.46	• • 46.20	341°9.01	• • 42.53	Feb 08 Tue	SHA	Mer.pass
16	18° 17.95	16°48.37	14.00	47°22.06	0.91	201°5.11	46.29	356°11.29	42.61		359° 12.35	14:53
17	33° 20.42	31°48.21	15.31	62°22.63	13°0.21	216°7.76	46.38	11°13.58	42.69	Mars	$29^{\circ}34.53$	12:51
18	48°22.88		N00°16.62	77°23.19	S12°59.51		N02°46.47	26°15.86	N06°42.78		182°44.20	02:38
19	63° 25.35 78° 27.81	61°47.90	17.92	92°23.76 107°24.32	58.82 58.12	246°13.06 261°15.71	46.56 46.66	41°18.14 56°20.43	42.86 42.04	Saturn	337°56.21	16:15
20 21	78° 27.81 93° 30.27	76° 47.75 91° 47.60	19.23 •• 20.54	107°24.32 122°24.89	58.12 •• 57.42	261°15.71 276°18.37	46.66 •• 46.75	71°22.71	42.94 •• 43.02	Horizor	ital parallax	
22	108° 32.74	106°47.44	21.85	137° 25.45	56.72	291°21.02	46.84	86°24.99	43.10		Venus:	0.1
23	123°35.20	121°47.29	23.16	152°26.02	56.03	306°23.67	46.93	101°27.28	43.18		Mars:	0.1
Merr	ass. 14:47	$\nu$ -0.2' d-1	3′ m-4 15	ν0 6' d-0	.7′ m1.10	ν2 6' d0	1′ m-2.38	1/2 3/ d0	.1′ m0.57			
		. 5.2 0.1				- 2.0 00.	2.50					

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.46	S15°49.59	63°58.13	5.3'	N26°22.55	2.1'	58.3'
1	191°30.41	48.82	78°22.38	5.2'	26°24.68	2.0'	58.3'
2	206°30.36	48.06	92°46.55	5.1'	26°26.65	1.8'	58.3'
3 4	221°30.32 236°30.27	· · 47.30 46.53	107°10.65 121°34.67	5.0' 4.9'	26°28.44 26°30.07	1.6' 1.5'	58.4' 58.4'
5	251°30.22	45.77	135°58.61	4.9'	26°31.53	1.3	58.5'
6	266°30.18	S15°45.00	150°22.49	4.8'	N26°32.82	1.1'	58.5'
7	281°30.13	44.24	$164^{\circ}46.29$	4.7'	26°33.93	0.9'	58.5'
8	296°30.09	43.47	179°10.03	4.7'	26°34.88	0.8'	58.6'
9 10	311°30.04 326°30.00	· · 42.70 41.94	193°33.70 207°57.30	4.6' 4.5'	26°35.65 26°36.24	0.6' 0.4'	58.6' 58.7'
11	341°29.95	41.17	207 37.30 222°20.85	4.5'	26°36.66	0.4	58.7'
12	356°29.91	S15°40.40	236°44.33	4.4'	N26°36.91	0.1'	58.7'
13	11°29.87	39.63	251°7.75	4.4'	26°36.97	-0.1'	58.8'
14	26°29.83	38.87	265°31.12	4.3'	26°36.86	-0.3	58.8'
15 16	41°29.78 56°29.74	· · 38.10 37.33	279°54.43 294°17.70	4.3' 4.2'	26°36.57 26°36.10	-0.5' -0.6'	58.9' 58.9'
17	71°29.70	36.56	308°40.91	4.2'	26°35.45	-0.8'	58.9'
18	86°29.66	<b>S</b> 15°35.79	323°4.07	4.1'	N26°34.62	-1.0'	59.0'
19	101°29.62	35.01	337°27.19	4.1'	26°33.61	-1.2'	59.0'
20	116°29.58	34.24	351°50.26	4.0'	26° 32.42	-1.4'	59.1'
21 22	131°29.54 146°29.50	· · 33.47 32.70	6°13.29 20°36.29	4.0' 4.0'	26°31.05 26°29.49	-1.6' -1.7'	59.1' 59.1'
23	161°29.46	31.93	34°59.24	4.0 3.9'	26° 27.75	-1.7 -1.9'	59.1 59.2'
	SD = 16.2'	d = -0.8'			D = 15.9'		
	JD — 10.2	u — -0.0°			— 13.9°		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°29.42 191°29.38	\$15°31.15 30.38	49°22.16 63°45.05	3.9'	N26°25.82 26°23.71	-2.1'	59.2'
1 2	191°29.38 206°29.34	30.38 29.60	63°45.05 78°7.91	3.9' 3.8'	26°23.71 26°21.42	-2.3' -2.5'	59.3' 59.3'
3	200 29.34 221°29.30	• • 28.83	92°30.74	3.8'	26°18.94	-2.3 -2.7'	59.3'
4	236°29.26	28.05	106°53.54	3.8'	26°16.28	-2.8'	59.4'
5	251°29.23	27.28	$121^{\circ}16.32$	3.8'	$26^{\circ}13.43$	-3.0'	59.4'
6	266°29.19	S15°26.50	135°39.08	3.7'	N26°10.40	-3.2'	59.5'
7 8	281°29.15 296°29.12	25.73 24.95	150°1.82 164°24.55	3.7' 3.7'	26°7.18 26°3.77	-3.4' -3.6'	59.5' 59.5'
9	311°29.08	24.17	104 24.55 178°47.26	3.7'	26°0.18	-3.8'	59.5'
10	326°29.04	23.39	193° 9.96	3.7'	25°56.40	-4.0'	59.6'
11	341°29.01	22.62	207°32.64	3.7'	$25^{\circ}52.43$	-4.2'	59.7'
12	356°28.97	S15°21.84	221°55.32	3.7'	N25°48.28	-4.3'	59.7'
13 14	11°28.94 26°28.90	21.06 20.28	236°18.00 250°40.67	3.7' 3.7'	25°43.95 25°39.42	-4.5' -4.7'	59.7' 59.8'
15	41°28.87	. 19.50	265°3.34	3.7'	25°34.72	-4.7 -4.9'	59.8'
16	56°28.84	18.72	279°26.02	3.7'	25°29.82	-5.1'	59.8'
17	71°28.80	17.94	293°48.69	3.7'	25°24.74	-5.3'	59.9'
18	86°28.77 101°28.74	\$15°17.15	308°11.38	3.7'	N25°19.48 25°14.03	-5.4'	59.9'
19 20	101°28.74 116°28.71	16.37 15.59	322°34.07 336°56.77	3.7' 3.7'	25°14.03 25°8.40	-5.6' -5.8'	59.9' 60.0'
21	131°28.67	14.81	351°19.48	3.7'	25°2.58	-6.0'	60.0'
22	146°28.64	14.02	5°42.21	3.7'	24°56.58	-6.2'	60.0'
23	161°28.61	13.24	20°4.96	3.8'	24°50.40	-6.4'	60.1'
	SD = 16.2'	d = -0.8'		S	D = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 28.58	\$15°12.46	34°27.72	υ 3.8'	N24° 44.03	-6.5'	60.1'
1	191°28.55	11.67	$48^{\circ}50.51$	3.8'	24°37.49	-6.7'	60.2'
2	206°28.52	10.89	63°13.31	3.8'	24°30.76	-6.9'	60.2'
3 4	221°28.49 236°28.46	· · 10.10 9.32	77°36.15 91°59.01	3.9' 3.9'	24°23.85 24°16.76	-7.1' -7.3'	60.2' 60.3'
4 5	251°28.46	9.32 8.53	106°21.89	3.9'	24° 16.76 24° 9.49	-7.3° -7.4'	60.3
6	266°28.40	S15°7.74	120°44.81	4.0'	N24°2.05	-7.6'	60.3
7	281°28.37	6.96	135°7.76	4.0'	23°54.42	-7.8'	60.3'
8	296°28.35	6.17	149°30.75	4.0'	23°46.62	-8.0'	60.4
9 10	311°28.32 326°28.29	· · 5.38 4.59	163°53.77 178°16.83	4.1' 4.1'	23°38.65 23°30.50	-8.2' -8.3'	60.4' 60.4'
10	341°28.26	4.59 3.80	178 10.83 192°39.93	4.1'	23° 30.50 23° 22.17	-8.5'	60.5
12	356°28.24	\$15°3.01	207°3.07	4.2'	N23° 13.67	-8.7'	60.5
13	11°28.21	2.22	221°26.25	4.2'	23°5.00	-8.8'	60.5'
14	26°28.19	1.43	235°49.48	4.3'	22°56.16	-9.0'	60.6'
15 16	41°28.16 56°28.13	15°0.64 14°59.85	250°12.75 264°36.08	4.3' 4.4'	22°47.16 22°37.98	-9.2' -9.3'	60.6' 60.6'
17	71°28.11	59.06	278°59.45	4.4' 4.4'	22°28.63	-9.5' -9.5'	60.6
18	86°28.09	\$14°58.27	293°22.87	4.5'	N22°19.12	-9.7'	60.7
19	101°28.06	57.47	307°46.34	4.5'	22°9.45	-9.8'	60.7'
20	116°28.04	56.68	322°9.87	4.6'	21°59.61	-10.0'	60.7'
21 22	131°28.01 146°27.99	• • 55.89 55.09	336°33.45 350°57.08	4.6' 4.7'	21°49.61 21°39.45	-10.2' -10.3'	60.8' 60.8'
23	140°27.99 161°27.97	54.30	5°20.78	4.8'	21° 29.13	-10.5'	60.8
	SD = 16.2'	d = -0.8'		S	D = 16.4'		
					_ 10.7		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-90%	
06	13:58	14:00	12:14	20:34	08:03		
07	14:02	14:04	12:14	21:36	09:05		
08	14:06	14:07	12:14	22:38	10:07		

# February 09, 10, 11 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	138° 37.67	136°47.14 N00°24.47	167°26.58 \$12°55.33	321°26.32 N02°47.02	116°29.56 N06°43.26	
1	153° 40.13	151°46.99 25.78	182°27.15 54.63	336°28.98 47.11	131°31.84 43.35	Alpheratz 357°32.36 29°14.86
2	168°42.59	166°46.83 27.09	197°27.71 53.93	351°31.63 47.21	146°34.13 43.43	Ankaa 353°4.96 -42°9.33 Schedar 349°28.39 56°41.74
3	183°45.06	181°46.68 · · 28.40	212°28.28 · · 53.23	6°34.28 · · 47.30	161°36.41 · · 43.51	Diphda 348°44.96 -17°50.03
4	198° 47.52	196°46.53 29.71	227°28.85 52.54	21°36.94 47.39	176°38.69 43.59	Achernar 335°18.59 -57°5.87
5 6	213°49.99	211°46.38 31.02	242°29.41 51.84	36°39.59 47.48	191°40.97 43.67	Hamal 327°48.38 23°35.80
7	228° 52.45 243° 54.92	226°46.23 N00°32.33 241°46.08 33.63	257°29.98 S12°51.14 272°30.55 50.44	51°42.24 N02°47.57 66°44.90 47.67	206°43.26 N06°43.76 221°45.54 43.84	Polaris 312°39.60 89°23.23
8	258° 57.38	256°45.92 34.94	287° 31.11 49.74	81°47.55 47.76	236°47.82 43.92	Acamar 315°9.89 -40°11.75
9	273°59.84	271°45.77 · · 36.25	302°31.68 · · 49.04	96°50.21 · · 47.85	251°50.10 · · 44.00	Menkar 314° 3.48 4° 11.95
10	289°2.31	286°45.62 37.56	317°32.25 48.34	111°52.86 47.94	266°52.38 44.08	Mirfak 308°24.50 49°57.84 Aldebaran 290°36.55 16°33.91
11	304°4.77	301°45.47 38.87	332°32.82 47.64	126°55.52 48.04	281°54.67 44.17	Rigel 281°1.24 -8°10.32
12	319°7.24	316°45.32 N00°40.18	347°33.38 \$12°46.94	141°58.17 N02°48.13 157°0.83 48.22	296°56.95 N06°44.25	Capella 280°17.85 46°1.63
13 14	334°9.70 349°12.16	331°45.17 41.49 346°45.02 42.80	2°33.95 46.24 17°34.52 45.54	157°0.83 48.22 172°3.48 48.32	311°59.23 44.33 327°1.51 44.41	Bellatrix 278°19.95 6°22.39
15	4° 14.63	1°44.88 · · 44.11	32°35.09 · · 44.84	187° 6.14 · · 48.41	342°3.79 · · 44.50	Elnath 277°58.42 28°37.84
16	19° 17.09	16°44.73 45.42	47°35.66 44.14	202°8.80 48.50	357°6.07 44.58	Alnilam 275°34.94 -1°11.19
17	$34^{\circ}19.56$	31°44.58 46.72	62°36.22 43.43	217°11.45 48.60	12°8.35 44.66	Betelgeuse 270°49.10 7°24.61 Canopus 263°50.85 -52°42.89
18	49°22.02	46°44.43 N00°48.03	77°36.79 \$12°42.73	232°14.11 N02°48.69	27°10.63 N06°44.74	Sirius 258°23.71 -16°45.50
19	64°24.49	61°44.28 49.34	92°37.36 42.03	247°16.77 48.78	42°12.91 44.82	Adhara 255°3.54 -29°0.85
20 21	79°26.95 94°29.41	76°44.13 50.65 91°43.99 · · 51.96	107° 37.93 41.33 122° 38.50 · · 40.63	262°19.43 48.88 277°22.08 • 48.97	57°15.19 44.91 72°17.47 · · 44.99	Procyon 244°47.86 5°8.98
22	109° 31.88	106°43.84 53.27	137°39.07 39.92	292°24.74 49.06	87°19.75 45.07	Pollux 243°13.86 27°57.34
23	124°34.34	121°43.69 54.58	152°39.64 39.22	307°27.40 49.16	102°22.03 45.16	Avior 234°13.02 -59°36.14
			$\frac{102 \text{ GS.6}}{\nu 0.6'  d\text{-}0.7' \text{ m}1.09}$	$\frac{1}{\nu^{2.7'} d^{0.1'} \text{ m-2.38}}$		Suhail 222°43.95 -43°32.93
ivier.p	pass. 14:43	ν-0.2' d1.3' m-4.15	νυ.υ <i>α</i> -υ. <i>ι</i> m1.09	ν2.1 αυ.1 m-2.38	ν2.3′ d0.1′ m0.57	Miaplacidus 221°36.71 -69°50.05 Alphard 217°44.91 -8°47.04
						Regulus 207°31.41 11°49.55
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.39 61°35.66
0	139°36.81	136°43.54 N00°55.88	167°40.21 \$12°38.52	322°30.06 N02°49.25	117°24.31 N06°45.24	Denebola 182°22.10 14°24.63
1 2	154° 39.27 169° 41.73	151°43.40 57.19 166°43.25 58.50	182° 40.78 37.81 197° 41.35 37.11	337°32.72 49.35 352°35.38 49.44	132°26.59 45.32 147°28.87 45.40	Gienah 175°40.70 -17°42.01
3	184° 44.20	181°43.10 00°59.81	212°41.92 · · 36.41	7°38.03 · · 49.54	162°31.15 · · 45.49	Acrux 172°56.65 -63°15.21
4	199° 46.66	196°42.96 01°1.12	227° 42.49 35.70	22°40.69 49.63	177°33.43 45.57	Gacrux 171°48.32 -57°16.18 Alioth 166°10.48 55°48.05
5	214°49.13	211°42.81 2.43	242°43.06 35.00	37°43.35 49.72	192°35.71 45.65	Spica 158°19.45 -11°18.61
6	229°51.59	226°42.67 N01°3.74	257°43.63 \$12°34.30	52°46.01 N02°49.82	207°37.99 N06°45.74	Alkaid 152°49.87 49°9.99
7	244°54.06	241° 42.52 5.04	272°44.20 33.59	67°48.67 49.91	222°40.27 45.82	Hadar 148°32.09 -60°30.34
8 9	259° 56.52 274° 58.98	256°42.38 6.35 271°42.23 · · 7.66	287° 44.78 32.89 302° 45.35 · · 32.18	82°51.33 50.01 97°53.99 · · 50.10	237°42.55 45.90 252°44.83 •• 45.98	Menkent 147°54.45 -36°30.44
10	290°1.45	286°42.09 8.97	317°45.92 31.48	112°56.66 50.20	267°47.10 46.07	Arcturus 145°45.50 19°1.89
11	305°3.91	301°41.94 10.28	332°46.49 30.77	127°59.32 50.29	282°49.38 46.15	Rigil Kent. 139°36.57 -60°56.90 Kochab 137°19.89 74°1.95
12	320°6.38	316°41.80 N01°11.58	347°47.06 \$12°30.07	143°1.98 N02°50.39	297°51.66 N06°46.23	Kochab 137°19.89 74°1.95 Zuben'ubi 136°53.14 -16°9.56
13	335°8.84	331°41.65 12.89	2°47.64 29.36	158° 4.64 50.48	312°53.94 46.32	Alpheca 126°1.63 26°36.93
14	350° 11.30	346°41.51 14.20	17°48.21 28.65	173°7.30 50.58	327°56.22 46.40	Antares 112°12.81 -26°29.59
15	5° 13.77	1°41.37 · · 15.51	32°48.78 · · 27.95	188° 9.96 · · 50.68	342°58.49 · · 46.48	Atria 107°4.94 -69°4.36
16 17	20° 16.23 35° 18.70	16°41.22 16.82 31°41.08 18.12	47° 49.35 27.24 62° 49.93 26.54	203°12.63 50.77 218°15.29 50.87	358° 0.77 46.57 13° 3.05 46.65	Sabik 102°0.01 -15°45.56
18	50°21.16	46°40.94 N01°19.43	77°50.50 \$12°25.83	233°17.95 N02°50.96	28°5.33 N06°46.74	Shaula 96°7.13 -37°7.30
19	65° 23.62	61°40.80 20.74	92°51.07 25.12	248°20.61 51.06	43°7.60 46.82	Rasalhague 95°56.37 12°32.25 Eltanin 90°41.34 51°28.85
20	80°26.09	76°40.65 22.05	107°51.65 24.41	263°23.28 51.15	58°9.88 46.90	Eltanin 90°41.34 51°28.85 Kaus Aust. 83°29.42 -34°22.14
21	95° 28.55	91°40.51 · · 23.35	122°52.22 · · 23.71	278°25.94 · · 51.25	73°12.16 · · 46.99	Vega 80°31.81 38°48.41
22	110°31.02	106°40.37 24.66	137°52.79 23.00	293°28.61 51.35	88°14.44 47.07	Nunki 75°44.90 -26°15.62
23	125°33.48	121°40.23 25.97	152°53.37 22.29	308°31.27 51.44	103°16.71 47.15	Altair 61°57.77 8°56.52
Mer.p	pass. 14:39	u-0.1 $'$ $d$ 1.3 $'$ m-4.16	$ u 0.6' \ d$ -0.7' m1.09	$\nu 2.7' \ d0.1' \ \text{m-}2.39$	$ u 2.3' \; d0.1' \; { m m0.57}$	Peacock 53°2.35 -56°38.54
						Deneb 49°24.49 45°22.82
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.61 10°0.25 Al Na'ir 27°30.23 -46°49.49
0	140°35.94	136°40.09 N01°27.28	167°53.94 \$12°21.58	323°33.93 N02°51.54	118°18.99 N06°47.24	Fomalhaut 15°12.07 -29°28.44
1	155° 38.41	151°39.95 28.58	182°54.52 20.88	338°36.60 51.64	133°21.27 47.32	Scheat 13°43.02 28°14.21
2	170°40.87	166°39.80 29.89	197°55.09 20.17 212°55.66 · · 19.46	353°39.26 51.73 8°41.93 · · 51.83	148°23.54 47.41	Markab 13°27.63 15°21.44
3 4	185° 43.34 200° 45.80	181°39.66 · · 31.20 196°39.52 32.51	212°55.66 · · 19.46 227°56.24 18.75	8°41.93 · · 51.83 23°44.59 51.93	163°25.82 · · 47.49 178°28.09 47.57	Feb 09 Wed SHA Mer.pass
5	215° 48.27	211°39.38 33.81	242°56.81 18.04	38°47.26 52.02	193°30.37 47.66	Venus 358°9.47 14:53
6	230° 50.73	226°39.24 N01°35.12	257°57.39 \$12°17.33	53°49.92 N02°52.12	208°32.65 N06°47.74	Mars 28°48.92 12:50
7	245°53.19	241°39.10 36.43	272°57.97 16.62	68°52.59 52.22	223°34.92 47.83	Jupiter 182°48.66 02:34
8	260°55.66	256°38.96 37.73	287° 58.54 15.91	83°55.26 52.31	238°37.20 47.91	Saturn 337°51.89 16:12
9	275°58.12	271°38.82 · · 39.04	302°59.12 · · 15.20	98°57.92 · · 52.41	253°39.47 · · 47.99	Feb 10 Thu SHA Mer.pass
10 11	291°0.59 306°3.05	286°38.68 40.35 301°38.55 41.66	317°59.69 14.49 333°0.27 13.78	114°0.59 52.51 129°3.26 52.61	268°41.75 48.08 283°44.02 48.16	Venus 357°6.74 14:53
12	321°5.51	316°38.41 N01°42.96	348°0.84 \$12°13.07	144° 5.92 N02° 52.70	298°46.30 N06°48.25	Mars 28°3.40 12:49
13	336°7.98	331°38.27 44.27	3°1.42 12.36	159° 8.59 52.80	313°48.57 48.33	Jupiter 182°53.25 02:30
14	351° 10.44	346°38.13 45.58	18°2.00 11.65	174°11.26 52.90	328°50.85 48.42	Saturn 337°47.51 16:08
15	6°12.91	1°37.99 · · 46.88	33°2.57 · · 10.94	189°13.93 · · 53.00	343°53.12 · · 48.50	Feb 11 Fri SHA Mer.pass
16	21° 15.37	16°37.85 48.19	48°3.15 10.23	204°16.59 53.10	358°55.40 48.58	Venus 356°4.14 14:53
17 18	36° 17.83 51° 20.30	31°37.72 49.49 46°37.58 N01°50.80	63°3.73 9.52 78°4.31 \$12°8.81	219°19.26 53.19 234°21.93 N02°53.29	13°57.67 48.67 28°59.95 N06°48.75	Mars 27°18.00 12:48
19	66° 22.76	61°37.44 52.11	93°4.88 8.09	249°24.60 53.39	44°2.22 48.84	Jupiter 182°57.99 02:25 Saturn 337°43.04 16:04
20	81°25.23	76° 37.30 53.41	108°5.46 7.38	264°27.27 53.49	59°4.49 48.92	
21	96°27.69	91°37.17 · · 54.72	123°6.04 · · 6.67	279°29.94 · · 53.59	74°6.77 · · 49.01	Horizontal parallax
22	111°30.15	106°37.03 56.03	138°6.62 5.96	294°32.61 53.69	89°9.04 49.09	Venus: 0.1 Mars: 0.1
23	126°32.62	121°36.89 57.33	153°7.19 5.24	309°35.28 53.78	104°11.32 49.18	Mars: 0.1
Mer.p	pass. 14:35	ν-0.1′ d1.3′ m-4.17	ν0.6' d-0.7' m1.09	ν2.7' d0.1' m-2.40	$\nu 2.3' \ d0.1' \ m0.57$	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.95	S14°53.50	19°44.53	4.8'	$N21^{\circ}18.65$	-10.6'	60.8'
1	191°27.92	52.71	34°8.34	4.9'	21°8.01	-10.8'	60.9'
2	206°27.90 221°27.88	51.91 •• 51.12	48°32.21 62°56.14	4.9' 5.0'	20°57.22 20°46.28	-10.9' -11.1'	60.9' 60.9'
4	236°27.86	50.32	77°20.14	5.1'	20°35.19	-11.2'	60.9'
5	251°27.84	49.52	91°44.19	5.1'	$20^{\circ}23.94$	-11.4'	60.9'
6	266°27.82 281°27.80	\$14°48.73	106°8.32	5.2'	N20° 12.55	-11.5'	61.0'
7 8	281°27.80 296°27.78	47.93 47.13	120°32.50 134°56.76	5.3' 5.3'	20°1.01 19°49.32	-11.7' -11.8'	61.0' 61.0'
9	311°27.76	• • 46.33	149°21.07	5.4'	19° 37.49	-12.0'	61.0'
10	326°27.74	45.53	163°45.46	5.5'	$19^{\circ}25.52$	-12.1'	61.1'
11	341°27.72	44.73	178°9.92	5.5'	19°13.41 N19°1.16	-12.2'	61.1'
12 13	356°27.70 11°27.68	\$14°43.93 43.13	192°34.44 206°59.03	5.6' 5.7'	N19°1.16 18°48.77	-12.4' -12.5'	61.1' 61.1'
14	26°27.67	42.33	200 39.03 221°23.69	5.7'	18° 36.25	-12.7'	61.1'
15	41°27.65	• • 41.53	235°48.42	5.8'	$18^{\circ}23.60$	-12.8'	61.1'
16	56°27.63	40.73	250°13.22	5.9'	18° 10.81	-12.9'	61.2'
17 18	71°27.62 86°27.60	39.93 \$14°39.13	264°38.10 279°3.04	5.9' 6.0'	17°57.90 N17°44.85	-13.0' -13.2'	61.2' 61.2'
19	101°27.58	38.32	293°28.06	6.1	17°31.69	-13.2	61.2'
20	116°27.57	37.52	307°53.14	6.2'	17° 18.40	-13.4'	61.2'
21	131°27.55	• • 36.72	322°18.30	6.2'	17°4.98	-13.5'	61.2'
22 23	146°27.54 161°27.52	35.91 35.11	336°43.53 351°8.84	6.3' 6.4'	16°51.45 16°37.80	-13.7' -13.8'	61.3' 61.3'
23			331 0.04			-13.0	01.3
	SD = 16.2'	d = -0.8'		S	D = 16.6'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°27.51	<b>S</b> 14°34.30	5°34.21	6.4'	N16°24.03	-13.9'	61.3'
1	191°27.50 206°27.48	33.50 32.69	19°59.66 34°25.18	6.5' 6.6'	16° 10.16 15° 56.16	-14.0' -14.1'	61.3' 61.3'
2 3	206 27.48 221°27.47	32.69 · · 31.89	34°25.18 48°50.77	6.7	15° 50.16 15° 42.06	-14.1 -14.2'	61.3
4	236°27.46	31.08	63°16.44	6.7	15° 27.85	-14.3'	61.3
5	251°27.44	30.27	77°42.18	6.8'	15° 13.54	-14.4'	61.3'
6	266°27.43	<b>S</b> 14°29.46	92°7.99	6.9'	N14°59.12	-14.5'	61.3'
7	281°27.42	28.66	106°33.87	7.0'	14° 44.60	-14.6'	61.3'
8 9	296°27.41 311°27.40	27.85 •• 27.04	120°59.82 135°25.84	7.0' 7.1'	14°29.99 14°15.27	-14.7' -14.8'	61.4' 61.4'
10	326°27.39	26.23	149°51.94	7.2'	14 15.27 14°0.46	-14.9'	61.4
11	341°27.37	25.42	164°18.11	7.2'	13°45.56	-15.0'	61.4
12	356°27.36	<b>S</b> 14°24.61	178°44.34	7.3'	N13°30.56	-15.1'	61.4'
13	11°27.35 26°27.35	23.80	193°10.65 207°37.03	7.4' 7.4'	13° 15.48 13° 0.31	-15.2' -15.3'	61.4'
14 15	20 27.35 41°27.34	22.99 •• 22.18	207 37.03 222°3.48	7.4 7.5'	13 0.31 12°45.05	-15.3'	61.4' 61.4'
16	56°27.33	21.37	236°29.99	7.6'	12° 29.72	-15.4	61.4
17	71°27.32	20.55	$250^{\circ}56.58$	7.7'	$12^{\circ}14.30$	-15.5'	61.4'
18	86°27.31	S14°19.74	265°23.23	7.7'	N11°58.80	-15.6'	61.4'
19 20	101°27.30 116°27.30	18.93 18.12	279°49.95 294°16.73	7.8' 7.9'	11°43.23 11°27.59	-15.6'	61.4' 61.4'
21	131°27.29	18.12	294 16.73 308°43.59	7.9 7.9'	11 27.59 11°11.87	-15.7 -15.8'	61.4
22	146°27.28	16.49	323°10.50	8.0'	10°56.08	-15.9'	61.4
23	161°27.27	15.67	337°37.49	8.0'	10°40.23	-15.9'	61.4'
	SD = 16.2'	d = -0.8'		S	D = 16.7′		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	176°27.27	\$14°14.86	352°4.53	8.1'	N10°24.31	-16.0'	61.4
1	191°27.26	14.04	6°31.64	8.2'	$10^{\circ}8.33$	-16.0'	61.4'
2	206°27.26	13.23	20°58.82	8.2'	09°52.28	-16.1'	61.4'
3 4	221°27.25 236°27.25	· · 12.41 11.59	35°26.05 49°53.35	8.3' 8.4'	09°36.18 09°20.02	-16.2' -16.2'	61.4' 61.4'
4 5	250 27.25 251°27.24	11.59	49 53.35 64°20.71	8.4'	09 20.02 09°3.81	-16.2 -16.3'	61.4
6	266°27.24	\$14°9.96	78°48.12	8.5'	N08°47.54	-16.3	61.4'
7	281°27.24	9.14	93°15.60	8.5'	08°31.23	-16.4'	61.4'
8	296°27.23	8.32	107°43.13	8.6'	08° 14.87	-16.4'	61.4'
9 10	311°27.23 326°27.23	· · 7.51 6.69	122°10.73 136°38.37	8.6' 8.7'	07°58.46 07°42.00	-16.5' -16.5'	61.3' 61.3'
10	320 27.23 341°27.22	5.87	150 38.37 151°6.08	8.8'	07 42.00 07°25.51	-16.5'	61.3
12	356°27.22	\$14°5.05	165°33.84	8.8'	N07°8.98	-16.6	61.3
13	11°27.22	4.23	180°1.65	8.9'	06°52.40	-16.6'	61.3'
14	26°27.22	3.41	194°29.51	8.9'	06°35.80	-16.6'	61.3'
15 16	41°27.22 56°27.22	· · 2.59 1.76	208°57.43 223°25.40	9.0' 9.0'	06°19.16 06°2.49	-16.7' -16.7'	61.3' 61.3'
17	71°27.22	0.94	223 25.40 237°53.41	9.0 9.1'	05° 45.79	-16.7'	61.3
18	86°27.22	S14°0.12	252°21.48	9.1'	N05°29.06	-16.8'	61.3'
19	101°27.22	13°59.30	266°49.60	9.2'	05° 12.31	-16.8'	61.2'
20	116°27.22	58.47	281°17.76	9.2'	04°55.54	-16.8'	61.2'
21 22	131°27.22 146°27.22	· · 57.65 56.83	295°45.96 310°14.22	9.3' 9.3'	04°38.74 04°21.93	-16.8' -16.8'	61.2' 61.2'
23	140 27.22 161°27.22	56.00	324° 42.51	9.3'	04 21.93 04°5.10	-16.8'	61.2
	SD = 16.2'	d = -0.8'			D = 16.7'		
					20.1		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-100%	
09	14:08	14:09	12:14	23:37	11:08		
10	14:10	14:11	12:14	-:-	12:05		
11	14:11	14:11	12:14	00:33	13:00		

## February 12, 13, 14 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	141°35.08	136°36.76 N01°58.64	168°7.77 \$12°4.53	324°37.95 N02°53.88	119°13.59 N06°49.26	3114
1	156° 37.55	151°36.62 01°59.94	183°8.35 3.82	339°40.62 53.98	134°15.86 49.35	Alpheratz 357°32.37
2	171°40.01	166°36.49 02°1.25	198°8.93 3.11	354°43.29 54.08	149°18.14 49.43	Ankaa 353°4.97
3	186°42.47	181°36.35 · · 2.55	213°9.51 · · 2.39	9°45.96 · · 54.18	164°20.41 · · 49.52	Schedar 349°28.42
4	201°44.94	196°36.22 3.86	228° 10.09 1.68	24°48.63 54.28	179°22.68 49.60	Diphda 348°44.97
5	216°47.40	211°36.08 5.17	243°10.67 0.96	39°51.30 54.38	194°24.95 49.69	Achernar 335°18.62
6	231°49.87	226°35.95 N02°6.47	258°11.25 \$12°0.25	54°53.97 N02°54.48	209°27.23 N06°49.77	Hamal 327°48.40
7	246° 52.33	241°35.81 7.78	273°11.83 11°59.54	69°56.64 54.58	224°29.50 49.86	Polaris 312°41.27
8	261°54.79	256°35.68 9.08	288°12.40 58.82	84°59.32 54.68	239°31.77 49.94	Acamar 315° 9.90
9	276° 57.26	271°35.54 · · 10.39	303°12.98 · · 58.11	100°1.99 · · 54.78	254°34.05 · · 50.03	Menkar 314°3.49
10	291°59.72	286°35.41 11.69	318° 13.56 57.39	115° 4.66 54.88	269°36.32 50.11	Mirfak 308°24.53
11	307°2.19	301°35.27 13.00	333°14.14 56.68	130°7.33 54.97	284°38.59 50.20	Aldebaran 290°36.57
12	322°4.65	316°35.14 N02°14.30	348°14.73 \$11°55.96	145°10.01 N02°55.07	299°40.86 N06°50.28	Rigel 281°1.25
13	337°7.12	331°35.01 15.61	3°15.31 55.25	160°12.68 55.17	314°43.13 50.37	Capella 280° 17.87
14	352°9.58	346°34.87 16.91	18° 15.89 54.53	175°15.35 55.27	329°45.40 50.45	Bellatrix 278°19.96
15	7°12.04	1°34.74 · · 18.22	33°16.47 · · 53.81	190°18.03 · · 55.37	344°47.68 · · 50.54	Elnath 277° 58.43
16	22° 14.51	16°34.61 19.52	48° 17.05 53.10	205°20.70 55.47	359°49.95 50.63	Alnilam 275°34.95
17	$37^{\circ}16.97$	31°34.47 20.82	63° 17.63 52.38	220°23.37 55.58	14°52.22 50.71	Betelgeuse 270°49.11
18	52° 19.44	46°34.34 N02°22.13	78°18.21 <b>S</b> 11°51.67	235°26.05 N02°55.68	29°54.49 N06°50.80	Canopus 263° 50.87
19	$67^{\circ}21.90$	61°34.21 23.43	93°18.79 50.95	250°28.72 55.78	44°56.76 50.88	Sirius 258°23.72 Adhara 255°3.55
20	82°24.36	76°34.08 24.74	108° 19.37 50.23	265°31.40 55.88	59°59.03 50.97	Procyon 244°47.87
21	97°26.83	91°33.95 · · 26.04	123°19.96 · · 49.52	280°34.07 · · 55.98	75°1.30 · · 51.05	Pollux 243°13.86
22	112°29.29	106°33.81 27.35	138°20.54 48.80	295°36.75 56.08	90°3.57 51.14	Avior 234°13.04
23	127°31.76	121°33.68 28.65	153°21.12 48.08	310°39.42 56.18	105°5.84 51.23	Suhail 222°43.95
Mer	pass. 14:31	ν-0.1' d1.3' m-4.17	ν0.6' d-0.7' m1.09	ν2.7' d0.1' m-2.40	$\nu 2.3' \ d0.1' \ m0.57$	Miaplacidus 221°36.72
14161.		ν σ.1 σ1.5 III-7.17		UO.1 111-2.TU		Alphard 217°44.91
						Regulus 207°31.41
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.37
0	142°34.22	136°33.55 N02°29.95	168°21.70 <b>S</b> 11°47.36	325°42.10 N02°56.28	120°8.11 N06°51.31	Denebola 182°22.09
1	157° 36.68	151°33.42 31.26	183°22.28 46.65	340°44.77 56.38	135°10.39 51.40	Gienah 175° 40.69
2	172°39.15	166°33.29 32.56	198°22.87 45.93	355°47.45 56.48	150°12.66 51.48	Acrux 172° 56.63
3	187°41.61	181°33.16 · · 33.86	213°23.45 · · 45.21	10°50.13 · · 56.58	165°14.93 · · 51.57	Gacrux 171°48.30
4	202°44.08	196°33.03 35.17	228°24.03 44.49	25°52.80 56.68	180°17.20 51.66	Alioth 166° 10.45
5	217° 46.54	211°32.90 36.47	243°24.62 43.77	40°55.48 56.79	195°19.47 51.74	Spica 158°19.43
6	232°49.00	226°32.77 N02°37.77	258°25.20 \$11°43.05	55°58.16 N02°56.89	210°21.73 N06°51.83	Alkaid 152°49.84
7	247°51.47	241°32.64 39.08	273°25.78 42.33	71°0.83 56.99	225°24.00 51.91	Hadar 148°32.05
8	262°53.93 277°56.40	256°32.51 40.38 271°32.38 • 41.68	288°26.37 41.62 303°26.95 · · 40.90	86°3.51 57.09 101°6.19 · · 57.19	240°26.27 52.00 255°28.54 • 52.09	Menkent 147° 54.42
9	277 56.40 292°58.86					Arcturus 145°45.48
10 11	292 58.80 308°1.32	286°32.25 42.99 301°32.12 44.29	318°27.54 40.18 333°28.12 39.46	116°8.87 57.29 131°11.54 57.40	270°30.81 52.17 285°33.08 52.26	Rigil Kent. 139°36.53
12	306 1.32 323°3.79	316°31.99 N02°45.59	348°28.70 S11°38.74	146°14.22 N02°57.50	300°35.35 N06°52.35	Kochab 137°19.82
13	338° 6.25	331°31.86 46.89	3°29.29 38.02	161°16.90 57.60	315°37.62 52.43	Zuben'ubi 136° 53.12
14	353°8.72	346°31.73 48.20	18° 29.87 37.30	176°19.58 57.70	330°39.89 52.52	Alphecca 126°1.61
15	8° 11.18	1°31.61 · · 49.50	33°30.46 · · 36.58	191°22.26 · · 57.80	345°42.16 · · 52.60	Antares 112°12.78
16	23° 13.64	16°31.48 50.80	48°31.04 35.86	206°24.94 57.91	0°44.42 52.69	Atria 107° 4.89
17	38° 16.11	31°31.35 52.10	63°31.63 35.13	221°27.62 58.01	15°46.69 52.78	Sabik 101°59.99
18	53° 18.57	46°31.22 N02°53.41	78°32.21 \$11°34.41	236°30.30 N02°58.11	30°48.96 N06°52.86	Shaula 96°7.11
19	68°21.04	61°31.09 54.71	93°32.80 33.69	251°32.98 58.21	45°51.23 52.95	Rasalhague 95°56.35
20	83°23.50	76°30.97 56.01	108°33.38 32.97	266°35.66 58.32	60°53.50 53.04	Eltanin 90°41.31
21	98°25.96	91°30.84 · · 57.31	123°33.97 · · 32.25	281°38.34 · · 58.42	75°55.76 · · 53.12	Kaus Aust. 83°29.40 Vega 80°31.80
22	113°28.43	106°30.71 58.61	138°34.56 31.53	296°41.02 58.52	90°58.03 53.21	· .
23	128°30.89	121°30.59 59.91	153°35.14 30.81	311°43.70 58.63	106°0.30 53.30	Nunki 75°44.89 Altair 61°57.76
Marr	pass. 14:27	ν-0.1' d1.3' m-4.18	$\nu 0.6' \ d$ -0.7' m1.08	ν2.7' d0.1' m-2.41	$\nu 2.3' \ d0.1' \ m0.57$	Peacock 53°2.33
ivier.	pass. 14:21	ν-0.1 a1.3 m-4.16	νο.ο <i>α</i> -ο. <i>τ</i> m1.οο	V2.1 d0.1 m-2.41	ν2.3 d0.1 m0.51	Deneb 49°24.48
						Enif 33°36.61
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 30.23
0	143°33.36	136°30.46 N03°1.22	168°35.73 <b>S</b> 11°30.08	326°46.38 N02°58.73	121°2.57 N06°53.39	Fomalhaut 15°12.07
1	158° 35.82	151°30.33 2.52	183°36.32 29.36	341°49.06 58.83	136°4.83 53.47	Scheat 13°43.03
2	173°38.28	166°30.21 3.82	198° 36.90 28.64	356°51.74 58.94	151°7.10 53.56	Markab 13°27.64
3	188° 40.75	181°30.08 · · 5.12	213°37.49 · · 27.92	11°54.42 · · 59.04	166°9.37 · · 53.65	
4	203°43.21	196°29.95 6.42	228° 38.08 27.19	26°57.11 59.14	181°11.63 53.73	Feb 12 Sat SHA
5	218° 45.68	211°29.83 7.72	243°38.66 26.47	41°59.79 59.25	196°13.90 53.82	Venus 355°1.68
6	233° 48.14	226°29.70 N03°9.02	258°39.25 \$11°25.75	57°2.47 N02°59.35	211°16.17 N06°53.91	Mars 26°32.69 Jupiter 183°2.87
7	248° 50.60	241°29.58 10.32	273°39.84 25.02	72°5.15 59.45	226°18.43 53.99	Jupiter 183°2.87 Saturn 337°38.51
8 9	263° 53.07 278° 55.53	256°29.45 11.62 271°29.33 · · 12.92	288° 40.43 24.30 303° 41.01 · · · 23.57	87°7.84 59.56 102°10.52 • 59.66	241°20.70 54.08 256°22.97 •• 54.17	Jatum 337 30.31
10	278 55.53 293°58.00	286°29.20 14.22	318°41.60 22.85	117°13.20 59.76	271°25.23 54.26	Feb 13 Sun SHA
10	309°0.46	301°29.08 15.52	333° 42.19 22.13	132°15.89 02°59.87	271 25.23 54.20 286°27.50 54.34	Venus 353°59.33
12	309 0.40 324°2.93	316°28.95 N03°16.82	348° 42.78 S11° 21.40	147°18.57 N02°59.97	301°29.76 N06°54.43	Mars 25° 47.48
13	339°5.39	331°28.83 18.12	3°43.37 20.68	162°21.25 0.08	316°32.03 54.52	Jupiter 183°7.88
14	354°7.85	346°28.71 19.42	18°43.96 19.95	177°23.94 0.18	331°34.30 54.61	Saturn 337°33.90
15	9° 10.32	1°28.58 · · 20.72	33°44.54 · · 19.23	192°26.62 · · 0.29	346°36.56 · · 54.69	Feb 14 Mon SHA
16	24° 12.78	16°28.46 22.02	48°45.13 18.50	207°29.31 0.39	1°38.83 54.78	Venus 352°57.10
17	39° 15.25	31°28.33 23.32	63°45.72 17.78	222°31.99 0.49	16°41.09 54.87	Mars 25°2.37
18	54° 17.71	46°28.21 N03°24.62	78°46.31 <b>S</b> 11°17.05	237°34.68 N03°0.60	31°43.36 N06°54.96	Jupiter 183°13.02
19	69°20.17	61°28.09 25.92	93°46.90 16.32	252°37.36 0.70	46°45.62 55.04	Saturn 337°29.21
20	84°22.64	76°27.96 27.22	108°47.49 15.60	267°40.05 0.81	61°47.89 55.13	
21	99°25.10	91°27.84 · · 28.52	123°48.08 · · 14.87	282°42.73 · · 0.91	76°50.15 · · 55.22	Horizontal parallax
22	114°27.57	106°27.72 29.82	138° 48.67 14.15	297°45.42 1.02	91°52.42 55.31	Venus:
23	129°30.03	121°27.60 31.11	153°49.26 13.42	312°48.10 1.12	106°54.68 55.40	Mars:
Mer	pass. 14:23	ν-0.1' d1.3' m-4.18	ν0.6' d-0.7' m1.08	ν2.7' d0.1' m-2.41	ν2.3' d0.1' m0.57	
	220					

**Dec** 29°14.85 -42°9.32

56°41.73 -17°50.03 -57°5.86

23°35.80 89°23.23

-40°11.75 4°11.95 49°57.84

16°33.91 -8°10.32 46°1.63 6°22.39 28°37.84 -1°11.19 7°24.61 -52°42.90

-16°45.51 -29°0.86 5°8.98 27°57.35

-59°36.16 -43°32.94 -69°50.07 -8°47.05 11°49.55 61°35.67 14°24.63 -17°42.02 -63°15.23 -57°16.19 55°48.06 -11°18.61 49°9.99 -60°30.35 -36°30.45

19°1.89 -60°56.90 74°1.95 -16°9.57 26°36.92 -26°29.59

-69°4.36

-15°45.57 -37°7.30 12°32.24 51°28.84

-34°22.14 38°48.39

-26°15.62

-56°38.53

45°22.80 10°0.25 -46°49.48 -29°28.44

28°14.20 15°21.44 Mer.pass 14:54

12:47 02:21 16:01 Mer.pass 14:54

12:46

02:17 15:57 Mer.pass

14:54 12:45

02:13 15:53

0.1

0.1

8°56.52

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.22	S13°55.18	$339^{\circ}10.85$	9.4'	N03°48.25	-16.9'	61.2'
1	191°27.22	54.35	353°39.24	9.4'	03°31.40	-16.9'	61.1'
2	206°27.23 221°27.23	53.53 •• 52.70	8°7.66 22°36.12	9.5' 9.5'	03°14.53 02°57.66	-16.9' -16.9'	61.1' 61.1'
4	236°27.23	51.87	37°4.62	9.5'	02°40.77	-16.9	61.1
5	251°27.23	51.05	$51^{\circ}33.16$	9.6'	$02^{\circ}23.89$	-16.9'	61.1'
6	266°27.24	\$13°50.22	66°1.74	9.6'	N02°7.00	-16.9'	61.1'
7 8	281°27.24 296°27.25	49.39 48.56	80°30.35 94°59.00	9.6' 9.7'	01°50.11 01°33.22	-16.9' -16.9'	61.0' 61.0'
9	311°27.25	• • 47.74	109°27.68	9.7'	01°16.34	-16.9	61.0'
10	326°27.26	46.91	123°56.39	9.7'	00°59.46	-16.9'	61.0'
11	341°27.26 356°27.27	46.08 \$13°45.25	138°25.13 152°53.91	9.8'	00°42.59 N00°25.72	-16.9'	61.0'
12 13	11°27.27	44.42	152 53.91 167°22.71	9.8' 9.8'	N00 25.72 N00°8.87	-16.9' -16.8'	60.9' 60.9'
14	26°27.28	43.59	181°51.54	9.9'	S00°7.97	16.8	60.9'
15	41°27.29	• • 42.76	196°20.40	9.9'	00°24.79	16.8'	60.9'
16	56°27.29 71°27.30	41.93 41.10	210°49.28 225°18.19	9.9' 9.9'	00°41.60 00°58.39	16.8' 16.8'	60.8'
17 18	86°27.31	\$13°40.26	239°47.13	10.0'	501°15.15	16.8	60.8' 60.8'
19	101°27.32	39.43	254° 16.08	10.0'	01°31.90	16.7'	60.8'
20	116°27.33	38.60	268° 45.06	10.0'	01°48.62	16.7'	60.7'
21	131°27.33	• • 37.77	283°14.06	10.0'	02°5.32	16.7'	60.7'
22 23	146°27.34 161°27.35	36.93 36.10	297° 43.07 312° 12.11	10.0' 10.1'	02°21.98 02°38.62	16.6' 16.6'	60.7' 60.7'
_5	SD = 16.2'	d = -0.8'			O = 16.7'	_0.0	
	JD — 10.2	u — -0.0		31	J — 10.1		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°27.36	\$13°35.26	326°41.16	10.1'	\$02°55.23	16.6'	60.6'
1 2	191°27.37 206°27.38	34.43 33.59	341°10.23 355°39.32	10.1' 10.1'	03°11.80 03°28.34	16.5' 16.5'	60.6' 60.6'
3	221°27.39	32.76	10°8.42	10.1	03°44.85	16.5	60.5
4	236°27.40	31.92	$24^{\circ}37.53$	10.1'	$04^{\circ}1.31$	16.4'	60.5'
5	251°27.41	31.09 \$13°30.25	39°6.66 53°35.79	10.1'	04°17.74 \$04°34.12	16.4'	60.5'
6 7	266°27.43 281°27.44	29.41	53 35.79 68°4.94	10.1' 10.2'	04°50.46	16.3' 16.3'	60.5' 60.4'
8	296°27.45	28.58	82°34.09	10.2'	05°6.76	16.2	60.4
9	311°27.46	•• 27.74	97°3.26	10.2'	05°23.00	16.2'	60.4'
10 11	326°27.48 341°27.49	26.90 26.06	111°32.43 126°1.60	10.2' 10.2'	05°39.21 05°55.36	16.2' 16.1'	60.3' 60.3'
12	356°27.50	\$13°25.22	140°30.78	10.2	506° 11.46	16.1	60.3
13	11°27.52	24.38	154° 59.97	10.2'	06°27.50	16.0'	60.2'
14	26°27.53	23.54	169°29.16	10.2'	06°43.49	15.9'	60.2'
15 16	41°27.54 56°27.56	· · 22.70 21.86	183°58.35 198°27.54	10.2' 10.2'	06°59.43 07°15.31	15.9' 15.8'	60.2' 60.1'
17	71°27.57	21.02	212° 56.73	10.2'	07°31.13	15.8'	60.1
18	86°27.59	S13°20.18	227°25.93	10.2'	<b>S</b> 07°46.89	15.7'	60.1'
19	101°27.61	19.34	241°55.12	10.2'	08°2.58	15.6'	60.0'
20 21	116°27.62 131°27.64	18.50 •• 17.66	256° 24.30 270° 53.49	10.2' 10.2'	08° 18.21 08° 33.78	15.6' 15.5'	60.0' 60.0'
22	146°27.65	16.81	285°22.67	10.2'	08°49.28	15.4	59.9'
23	161°27.67	15.97	299°51.84	10.2'	09°4.71	15.4'	59.9'
	SD = 16.2'	d = -0.8'		SI	O = 16.5'		
Mon	GHA	Doo	GHA		Dec	d	HP
0	176°27.69	Dec \$13° 15.13	314°21.01	u  10.2'	S09° 20.08	15.3'	59.9'
1	191°27.71	14.28	$328^{\circ}50.17$	10.2'	09°35.37	15.2'	59.8'
2	206°27.72	13.44	343° 19.33	10.1'	09°50.59	15.1'	59.8'
3 4	221°27.74 236°27.76	· · 12.59 11.75	357° 48.47 12° 17.61	10.1' 10.1'	10°5.73 10°20.80	15.1' 15.0'	59.8' 59.7'
5	250°27.78	10.90	26° 46.73	10.1	10° 20.80 10° 35.79	14.9'	59.7'
6	266°27.80	S13°10.06	41° 15.85	10.1'	S10°50.71	14.8'	59.6'
7	281°27.82	9.21	55° 44.95	10.1'	11°5.55	14.8'	59.6'
8 9	296°27.84 311°27.86	8.37 •• 7.52	70°14.04 84°43.12	10.1' 10.1'	11°20.30 11°34.97	14.7' 14.6'	59.6' 59.5'
10	326°27.88	6.67	99° 12.18	10.1	11 34.97 11°49.56	14.5	59.5'
11	341°27.90	5.82	113°41.23	10.0'	12°4.07	14.4'	59.5'
12	356°27.92	\$13°4.98	128° 10.26	10.0'	\$12° 18.49	14.3'	59.4'
13 14	11°27.94 26°27.96	4.13 3.28	142°39.28 157°8.28	10.0' 10.0'	12°32.82 12°47.06	14.2' 14.2'	59.4' 59.4'
15	41°27.98	2.43	171° 37.26	10.0'	13°1.22	14.2	59.4 59.3'
16	56°28.01	1.58	186°6.23	9.9'	13° 15.28	14.0'	59.3'
17	71°28.03	13°0.73	200°35.17	9.9'	13°29.25	13.9'	59.2'
18 19	86°28.05 101°28.08	\$12°59.88 59.03	215°4.10 229°33.00	9.9' 9.9'	\$13°43.13 13°56.91	13.8' 13.7'	59.2' 59.2'
20	101 28.08 116°28.10	59.03 58.18	244°1.89	9.9' 9.9'	13 50.91 14° 10.60	13.6'	59.2 59.1'
21	131°28.12	• • 57.33	258°30.75	9.8'	14°24.19	13.5'	59.1'
22	146°28.15	56.48	272°59.60	9.8'	14°37.68	13.4'	59.0'
23	161°28.17	55.62	287°28.42	9.8'	14°51.08	13.3'	59.0'
	SD = 16.2'	d = -0.8'		SI	D = 16.3'		

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

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

1			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
ĺ	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-84%	
	12	14:11	14:11	12:14	01:26	13:52		
	13	14:11	14:10	12:14	02:18	14:44		
l	14	14:09	14:08	12:14	03:09	15:35		

# February 15, 16, 17 UT (Tue., Wed., Thu.)

h	Aries	Venus		Ma	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	144°32.49		3°32.41		S11°12.69	327°50.79	N03°1.23	121°56.94	N06°55.48			
1	159°34.96	151°27.35	33.71	183°50.44	11.97	342°53.48	1.33	$136^{\circ}59.21$	55.57	Alpheratz	357°32.38 353°4.99	29°14.84 -42°9.32
2	174°37.42	166°27.23	35.01	$198^{\circ}51.03$	11.24	$357^{\circ}56.16$	1.44	$152^{\circ}1.47$	55.66	Ankaa Schedar	349° 28.43	-42 9.32 56°41.72
3	189°39.89		36.31	213°51.62	• • 10.51	12°58.85	• • 1.55	167°3.74	• • 55.75	Diphda	348°44.98	-17°50.03
4	204° 42.35	196°26.99	37.61	228°52.21	9.78	28° 1.54	1.65	182°6.00	55.84	Achernar	335°18.64	-57° 5.85
5 6	219° 44.81 234° 47.28	211°26.86 226°26.74 N03	38.90 3°40.20	243°52.80 258°53.40	9.06 \$11°8.33	43° 4.23 58° 6.91	1.76 N03°1.86	197°8.26 212°10.53	55.92 N06°56.01	Hamal	$327^{\circ}48.41$	23°35.79
7	249° 49.74	241°26.62	41.50	273°53.99	7.60	73° 9.60	1.97	227° 12.79	56.10	Polaris	312°42.71	89°23.23
8	264°52.21	256° 26.50	42.80	288° 54.58	6.87	88°12.29	2.07	242° 15.05	56.19	Acamar	315°9.92	-40°11.75
9	279°54.67	271°26.38 · ·	44.09	303°55.17	• • 6.14	103°14.98	• • 2.18	257° 17.32	• • 56.28	Menkar Mirfak	314°3.51 308°24.55	4°11.94 49°57.83
10	294°57.14	286°26.26	45.39	318°55.76	5.42	118°17.67	2.29	272°19.58	56.37	Aldebaran	290°36.58	16°33.90
11	309°59.60	301°26.14	46.69	333°56.36	4.69	133°20.36	2.39	287°21.84	56.45	Rigel	281°1.27	-8°10.33
12 13	325°2.06 340°4.53	316°26.02 N03 331°25.90	3°47.98 49.28	348° 56.95 3° 57.54	\$11°3.96 3.23	148°23.04 163°25.73	N03°2.50 2.60	302°24.11 317°26.37	N06° 56.54 56.63	Capella	280°17.89	$46^{\circ}1.63$
14	355°6.99	346°25.78	50.58	18° 58.13	2.50	178° 28.42	2.71	332°28.63	56.72	Bellatrix	278°19.98	6°22.39
15	10°9.46		• 51.87	33°58.72	1.77	193°31.11	2.82	347°30.89	56.81	Elnath	277°58.45	28°37.84
16	$25^{\circ}11.92$	16°25.54	53.17	48°59.32	1.04	208°33.80	2.92	2°33.16	56.90	Alnilam	275°34.97 270°49.12	-1°11.20 7°24.60
17	40°14.38	31°25.42	54.47	$63^{\circ}59.91$	$11^{\circ}0.31$	223°36.49	3.03	17°35.42	56.99	Betelgeuse Canopus	263°50.89	-52°42.91
18	55° 16.85		3°55.76	79°0.50	\$10°59.58	238°39.18	N03°3.14	32°37.68	N06°57.07	Sirius	258°23.73	-16°45.52
19	70°19.31	61°25.18	57.06	94°1.10 109°1.69	58.85	253°41.87	3.24	47°39.94	57.16	Adhara	255°3.56	-29°0.87
20 21	85°21.78 100°24.24	76°25.06 91°24.94 03	58.35 3°59.65	109 1.09 124°2.28	58.12 •• 57.39	268°44.56 283°47.25	3.35 · · 3.46	62°42.20 77°44.47	57.25 •• 57.34	Procyon	244°47.88	5°8.97
22	115°26.70		04°0.94	139°2.88	56.66	298°49.95	3.56	92°46.73	57.43	Pollux	243°13.87	27°57.35
23	130°29.17	121°24.71	2.24	154°3.47	55.93	313°52.64	3.67	107°48.99	57.52	Avior	234° 13.05	-59°36.18
	pass. 14:19	ν-0.1′ d1.3′ m		$\nu$ 0.6′ d-0		$\nu 2.7' \ d0.1$			.1′ m0.57	Suhail Miaplacidus	222°43.95 221°36.72	-43°32.96 -69°50.09
ivier.	pass. 14:19	ν-υ.1 d1.5 m	11-4.19	νυ.υ a-0	.ι ιιι1.υδ	ν2.1 <b>α</b> υ	111-2.42	ν2.3 d0	10.01	Alphard	221° 36.72 217° 44.91	-8°47.06
			_		_		_		_	Regulus	207°31.40	11°49.54
Wed	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.35	61°35.68
0 1	145°31.63 160°34.10	136°24.59 NO 151°24.47	04°3.53 4.83	169°4.07 184°4.66	\$10°55.20 54.47	328°55.33 343°58.02	N03°3.78 3.89	122°51.25 137°53.51	N06°57.61 57.70	Denebola	182°22.07	14°24.63
2	175°36.56	166°24.35	6.12	199°5.26	53.73	359° 0.71	3.99	157° 55.51 152° 55.77	57.79	Gienah	175°40.67	-17°42.03
3	190°39.02		• 7.42	214°5.85	• • 53.00	14° 3.41	4.10	167° 58.03	• • 57.87	Acrux Gacrux	172°56.60 171°48.27	-63°15.24 -57°16.20
4	$205^{\circ}41.49$	196°24.12	8.71	229°6.44	52.27	29°6.10	4.21	183°0.30	57.96	Alioth	171 46.27 166° 10.43	55°48.07
5	220° 43.95	211°24.00	10.01	244°7.04	51.54	44°8.79	4.32	198°2.56	58.05	Spica	158° 19.41	-11°18.62
6	235° 46.42		4°11.30	259°7.64	\$10°50.81	59°11.48	N03°4.42	213°4.82	N06°58.14	Alkaid	152°49.81	49°9.99
7 8	250°48.88	241°23.76 256°23.65	12.60	274°8.23 289°8.83	50.07	74°14.18 89°16.87	4.53	228°7.08 243°9.34	58.23	Hadar	$148^{\circ}32.02$	-60°30.35
9	265°51.35 280°53.81		13.89 • 15.18	304° 9.42	49.34 •• 48.61	104° 19.56	4.64 • • 4.75	243 9.34 258°11.60	58.32 •• 58.41	Menkent	147°54.40	-36°30.46
10	295°56.27	286°23.41	16.48	319° 10.02	47.88	119°22.26	4.85	273° 13.86	58.50	Arcturus	145°45.46	19°1.88
11	310°58.74	301°23.30	17.77	334° 10.61	47.14	134°24.95	4.96	288° 16.12	58.59	Rigil Kent. Kochab	139°36.50 137°19.76	-60°56.91 74°1.96
12	326°1.20		4°19.06	$349^{\circ}11.21$	S10°46.41	149°27.64	N03°5.07	303°18.38	N06°58.68	Zuben'ubi	136°53.10	-16° 9.57
13	341°3.67	331°23.06	20.36	4°11.81	45.68	164°30.34	5.18	318°20.64	58.77	Alphecca	126°1.58	26°36.92
14	356°6.13	346°22.95	21.65	19° 12.40	44.94	179°33.03	5.29	333°22.90	58.86	Antares	$112^{\circ}12.76$	-26°29.59
15 16	11°8.59 26°11.06	1°22.83 · · · 16°22.72	· 22.94 24.23	34°13.00 49°13.60	· · 44.21 43.48	194°35.73 209°38.42	• • 5.40 5.50	348°25.16 3°27.42	• • 58.95 59.04	Atria	107°4.84	-69°4.36
17	41°13.52	31°22.60	25.53	64° 14.19	42.74	209 36.42 224°41.12	5.61	18° 29.67	59.04	Sabik	101°59.97	-15°45.57
18	56° 15.99		4°26.82	79° 14.79	S10°42.01	239°43.81	N03°5.72	33°31.93	N06°59.22	Shaula	96°7.08	-37°7.30
19	71° 18.45	61°22.37	28.11	94°15.39	41.27	254°46.51	5.83	48°34.19	59.31	Rasalhague Eltanin	95°56.34 90°41.29	12°32.23 51°28.83
20	86°20.92	76° 22.25	29.40	109° 15.98	40.54	269°49.20	5.94	63°36.45	59.40	Kaus Aust.	83° 29.38	-34°22.14
21	101°23.38		30.69	124° 16.58	• • 39.80	284°51.90	• • 6.05	78°38.71	• • 59.49	Vega	80°31.78	38°48.38
22 23	116° 25.84 131° 28.31	106°22.02 121°21.91	31.99 33.28	139° 17.18 154° 17.78	39.07 38.33	299°54.60 314°57.29	6.16 6.27	93°40.97 108°43.23	59.58 50.66	Nunki	75°44.87	-26°15.62
						-			59.66	Altair	61°57.75	8°56.51
Mer.	pass. 14:16	$\nu$ -0.1' $d$ 1.3' m	n-4.20	$\nu$ 0.6′ d-0	.7′ m1.08	$\nu 2.7' \ d0.1$	1′ m-2.42	$\nu^{2.3'} d0$	.1′ m0.58	Peacock	53°2.32 49°24.47	-56°38.52 45°22.79
										Deneb Enif	49° 24.47 33° 36.60	45°22.79 10°0.24
Thu	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 30.23	-46°49.47
0	146°30.77		4°34.57	169° 18.37	S10°37.60	329°59.99	N03°6.38	123°45.49	N06°59.75	Fomalhaut	15°12.08	-29°28.43
1	161°33.24	151°21.68	35.86	184° 18.97	36.86	345°2.69	6.48	138° 47.74	59.84	Scheat	13°43.03	$28^{\circ}14.19$
2	176°35.70 191°38.16	166°21.57 181°21.45	37.15 38.44	199° 19.57 214° 20.17	36.13 · · 35.39	0°5.38 15°8.08	6.59 •• 6.70	153° 50.00 168° 52.26	06°59.93 07°0.02	Markab	13°27.64	15°21.43
3 4	206° 40.63	196°21.34	39.73	214 20.17 229° 20.77	34.66	30°10.78	6.81	183°54.52	0.12	Feb 15 Tue	SHA	Mer.pass
5	221°43.09	211°21.22	41.02	244°21.37	33.92	45°13.48	6.92	198° 56.78	0.21	Venus	351°54.98	14:54
6	236° 45.56	226°21.11 N04	4°42.31	259°21.97	<b>S</b> 10°33.18	60°16.17	N03°7.03	213°59.03	$N07^{\circ}0.30$	Mars	24° 17.36	12:44
7	251°48.02	241°21.00	43.60	274°22.56	32.45	75°18.87	7.14	229°1.29	0.39	Jupiter		02:08
8	266°50.48	256°20.88	44.89	289°23.16	31.71	90°21.57	7.25	244°3.55	0.48	Saturn	337°24.45	15:50
9 10	281°52.95 296°55.41	271°20.77 · · · 286°20.66	46.18 47.47	304°23.76 319°24.36	· · 30.97 30.24	105°24.27 120°26.97	· · 7.36 7.47	259°5.81 274°8.06	· · 0.57 0.66	Feb 16 Wed	SHA	Mer.pass
11	311°57.88	301°20.54	48.76	334°24.96	29.50	135°29.67	7.58	289° 10.32	0.00	Venus	350°52.95	14:54
12	327°0.34		4°50.05	349° 25.56	S10°28.76	150°32.37	N03°7.69	304°12.58	N07°0.84	Mars	23°32.43	12:43
13	$342^{\circ}2.81$	331°20.32	51.34	4°26.16	28.02	165°35.07	7.80	$319^{\circ}14.83$	0.93	Jupiter Saturn	183°23.70 337°19.62	02:04 15:46
14	357°5.27	346°20.20	52.63	19°26.76	27.29	180°37.76	7.91	334°17.09	1.02			
15 16	12°7.73		53.92	34°27.36	· · 26.55	195°40.46	• • 8.02	349°19.35	1.11	Feb 17 Thu	SHA	Mer.pass
16 17	27° 10.20 42° 12.66	16°19.98 31°19.87	55.20 56.49	49°27.96 64°28.56	25.81 25.07	210°43.16 225°45.86	8.13 8.24	4°21.60 19°23.86	1.20 1.29	Venus	349°51.02 22°47.60	14:55
18	57° 15.13		4°57.78	79°29.16	\$10°24.33	240°48.56	N03°8.35	34°26.12	N07°1.38	Mars Jupiter	183° 29.22	12:42 02:00
19	$72^{\circ}17.59$		4°59.07	94°29.77	23.60	255°51.27	8.46	49°28.37	1.47	Saturn	337°14.71	15:43
20	87°20.05		05°0.36	109°30.37	22.86	270°53.97	8.57	64°30.63	1.56			
21	102°22.52		1.64	124°30.97	22.12	285°56.67	· · 8.69	79°32.88	1.65	Horizoi	ntal parallax Venus:	0.2
22 23	117°24.98 132°27.45	106°19.31 121°19.20	2.93 4.22	139°31.57 154°32.17	21.38 20.64	300°59.37 316°2.07	8.80 8.91	94°35.14 109°37.39	1.74 1.83		Mars:	0.2
										L		
Mer.	pass. 14:12	ν-0.1′ d1.3′ m	n-4.20	$\nu$ 0.6′ d-0	./′ m1.08	$\nu$ 2.7′ d0.3	ı m-2.43	$\nu^{2.3'} d0$	.1′ m0.58			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.20	S12°54.77	$301^{\circ}57.22$	9.8'	<b>S</b> 15°4.37	13.2'	59.0'
1	191°28.22	53.92	316°25.99	9.8'	15°17.56	13.1'	58.9'
2	206°28.25 221°28.27	53.07 •• 52.21	330°54.75 345°23.48	9.7' 9.7'	15°30.65 15°43.64	13.0' 12.9'	58.9' 58.8'
4	236°28.30	51.36	359°52.18	9.7'	15°56.52	12.8'	58.8'
5	251°28.33	50.50	14°20.86	9.7'	$16^{\circ}9.29$	12.7'	58.8'
6	266°28.35	S12°49.65	28°49.51	9.6'	\$16°21.96	12.6'	58.7'
7 8	281°28.38 296°28.41	48.79 47.94	43°18.14 57°46.75	9.6' 9.6'	16°34.52 16°46.98	12.5' 12.3'	58.7' 58.7'
9	311°28.43	• • 47.08	72°15.32	9.6'	16°59.32	12.2'	58.6'
10	326°28.46	46.23	86°43.88	9.5'	17°11.55	12.1'	58.6'
11 12	341°28.49 356°28.52	45.37 \$12°44.51	101°12.40 115°40.90	9.5' 9.5'	17°23.67 \$17°35.68	12.0' 11.9'	58.5' 58.5'
13	11°28.55	43.66	130°9.37	9.5 9.4'	17°47.57	11.8'	58.5'
14	26°28.58	42.80	144°37.81	9.4'	17°59.35	11.7'	58.4'
15	41°28.61	• • 41.94	159°6.23	9.4'	18°11.01	11.5'	58.4'
16 17	56°28.63 71°28.66	41.08 40.22	173°34.62 188°2.98	9.4' 9.3'	18°22.56 18°33.99	11.4' 11.3'	58.3' 58.3'
18	86°28.69	\$12°39.37	202°31.31	9.3'	\$18°45.30	11.2'	58.3'
19	101°28.73	38.51	216°59.61	9.3'	$18^{\circ}56.49$	11.1'	58.2'
20	116°28.76	37.65	231°27.89	9.2'	19°7.56	11.0'	58.2'
21 22	131°28.79 146°28.82	· · 36.79 35.93	245°56.14 260°24.36	9.2' 9.2'	19°18.52 19°29.35	10.8' 10.7'	58.1' 58.1'
23	161°28.85	35.93	274°52.55	9.2'	19°40.05	10.6	58.1
	SD = 16.2'	d = -0.9'			D = 16.1'		
				- 51	10.1		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°28.88 191°28.92	\$12°34.20 33.34	289°20.72 303°48.85	9.1' 9.1'	\$19°50.64 20°1.10	10.5' 10.3'	58.0' 58.0'
2	206°28.95	32.48	318°16.96	9.1'	20°11.43	10.3	57.9'
3	221°28.98	• • 31.62	$332^{\circ}45.04$	9.1'	$20^{\circ}21.64$	10.1'	57.9'
4	236°29.01	30.76	347°13.10	9.0'	20°31.72	10.0'	57.9'
5 6	251°29.05 266°29.08	29.89 \$12°29.03	1°41.12 16°9.12	9.0' 9.0'	20°41.68 \$20°51.51	9.8' 9.7'	57.8' 57.8'
7	281°29.12	28.17	30°37.09	8.9'	21°1.20	9.6'	57.7'
8	296°29.15	27.30	45°5.04	8.9'	21°10.77	9.4'	57.7'
9	311°29.19	• • 26.44	59°32.96	8.9'	21°20.21	9.3'	57.7'
10 11	326°29.22 341°29.26	25.57 24.71	74°0.85 88°28.72	8.9' 8.8'	21°29.52 21°38.70	9.2' 9.0'	57.6' 57.6'
12	356°29.29	<b>S</b> 12°23.84	102°56.55	8.8'	S21°47.75	8.9'	57.6'
13	11°29.33	22.98	117°24.37	8.8'	21°56.66	8.8'	57.5'
14 15	26°29.36 41°29.40	22.11 •• 21.25	131°52.16 146°19.92	8.8' 8.7'	22°5.44 22°14.09	8.6' 8.5'	57.5' 57.4'
16	56°29.44	20.38	160°47.66	8.7'	22°22.60	8.4	57.4'
17	71°29.48	19.51	$175^{\circ}15.38$	8.7'	$22^{\circ}30.98$	8.2'	57.4'
18	86°29.51	\$12°18.64	189°43.07	8.7'	\$22°39.22 22°47.33	8.1'	57.3'
19 20	101°29.55 116°29.59	17.78 16.91	204°10.74 218°38.39	8.6' 8.6'	22 47.33 22°55.30	8.0' 7.8'	57.3' 57.3'
21	131°29.63	. 16.04	233°6.02	8.6'	23°3.13	7.7'	57.2'
22	146°29.67	15.17	247°33.62	8.6'	23°10.83	7.6'	57.2'
23	161°29.71	14.30	262°1.21	8.6'	23°18.38	7.4'	57.1'
	SD = 16.2'	d = -0.9'		SI	O = 15.8'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°29.75	S12°13.43	276°28.77	8.5'	S23°25.80	7.3'	57.1'
1 2	191°29.78 206°29.82	12.56 11.69	290°56.32 305°23.84	8.5' 8.5'	23°33.08 23°40.22	7.1' 7.0'	57.1' 57.0'
3	206 29.82 221°29.86	11.69	305°23.84 319°51.35	8.5'	23°40.22 23°47.22	7.0 6.9'	57.0' 57.0'
4	236°29.91	9.95	$334^{\circ}18.84$	8.5'	23°54.08	6.7'	57.0'
5	251°29.95	9.08	348°46.31	8.5'	24°0.80	6.6'	56.9'
6 7	266°29.99 281°30.03	\$12°8.21 7.34	3°13.77 17°41.21	8.4' 8.4'	\$24°7.38 24°13.82	6.4' 6.3'	56.9' 56.9'
8	296°30.07	6.46	32°8.64	8.4	24°20.12	6.2	56.8'
9	311°30.11	• • 5.59	46°36.05	8.4'	24°26.27	6.0'	56.8'
10 11	326°30.16 341°30.20	4.72 3.85	61°3.45 75°30.84	8.4' 8.4'	24°32.29 24°38.16	5.9' 5.7'	56.7' 56.7'
12	341 30.20 356°30.24	3.85 \$12°2.97	75° 30.84 89° 58.21	8.4'	524°43.89	5.6'	56.7'
13	11°30.28	2.10	104°25.58	8.4'	24°49.47	5.4'	56.6'
14	26°30.33	1.22	118°52.94	8.3'	24°54.91	5.3'	56.6'
15 16	41°30.37 56°30.42	12°0.35 11°59.47	133°20.28 147°47.62	8.3' 8.3'	25° 0.21 25° 5.36	5.2' 5.0'	56.6' 56.5'
17	71°30.46	58.60	147 47.62 162°14.95	8.3'	25° 10.37	5.0 4.9'	56.5'
18	86°30.50	S11°57.72	176°42.28	8.3'	S25°15.24	4.7'	56.5'
19	101°30.55	56.85	191°9.60	8.3'	25°19.96 25°24.54	4.6'	56.4'
20 21	116°30.59 131°30.64	55.97 •• 55.10	205°36.92 220°4.23	8.3' 8.3'	25°24.54 25°28.97	4.4' 4.3'	56.4' 56.4'
22	146°30.69	54.22	234°31.55	8.3'	25°33.26	4.1	56.3
23	161°30.73	53.34	248°58.86	8.3'	25°37.41	4.0'	56.3'
	SD = 16.2'	d = -0.9'		SI	O = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		A	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-5	
15	14:07	14:06	12:14	04:01	16:27	400	
16	14:04	14:03	12:14	04:53	17:20		
17	14:01	13:59	12:14	05:47	18:14	40	

# February 18, 19, 20 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	147°29.91	136°19.09 N05°5.50	169°32.77 \$10°19.90	331°4.77 N03°9.02	124°39.65 N07°1.93	
1	162°32.38	151°18.98 6.79	184°33.37 19.16	346°7.47 9.13	139°41.91 2.02	Alpheratz 357°32.38 29°14.84
2	177°34.84	166°18.87 8.08	199° 33.98 18.42	1°10.17 9.24	154°44.16 2.11	Ankaa 353°4.99 -42°9.31
3	192°37.30	181°18.75 · · 9.36	214°34.58 · · 17.68	16°12.88 · · 9.35	169°46.42 · · 2.20	Schedar 349°28.44 56°41.71
4	207°39.77	196° 18.64 10.65	229°35.18 16.94	31°15.58 9.46	184°48.67 2.29	Diphda 348°44.98 -17°50.02
5	222° 42.23	211°18.53 11.94	244°35.78 16.20	46°18.28 9.57	199°50.93 2.38	Achernar 335°18.67 -57°5.84 Hamal 327°48.42 23°35.79
6	237°44.70	226°18.42 N05°13.22	259°36.39 \$10°15.46	61°20.98 N03°9.69	214°53.18 N07°2.47	Hamal 327°48.42 23°35.79 Polaris 312°43.98 89°23.22
7	252°47.16	241°18.31 14.51	274°36.99 14.72	76°23.69 9.80	229°55.44 2.56	Acamar 315°9.94 -40°11.75
8	267° 49.62	256°18.20 15.79	289°37.59 13.98	91°26.39 9.91	244°57.69 2.65	Menkar 314°3.52 4°11.94
9	282°52.09	271°18.09 · · 17.08	304°38.20 · · 13.24	106°29.09 · · 10.02	259°59.94 · · 2.75	Mirfak 308°24.56 49°57.83
10	297°54.55	286°17.98 18.36	319°38.80 12.50	121°31.80 10.13	275°2.20 2.84 290°4.45 2.93	Aldebaran 290°36.59 16°33.90
11 12	312°57.02 327°59.48	301°17.87 19.65 316°17.76 N05°20.93	334°39.40 11.76 349°40.01 \$10°11.02	136°34.50 10.24 151°37.21 N03°10.36	290°4.45 2.93 305°6.71 N07°3.02	Rigel 281°1.28 -8°10.33
13	343°1.95	331°17.65 22.22	4°40.61 10.28	166°39.91 10.47	320°8.96 3.11	Capella 280°17.90 46°1.64
14	358°4.41	346°17.55 23.50	19°41.21 9.53	181°42.61 10.58	335°11.21 3.20	Bellatrix 278°19.99 6°22.38
15	13°6.87	1°17.44 · · 24.79	34°41.82 · · 8.79	196°45.32 · · 10.69	350°13.47 · · 3.29	Elnath 277°58.46 28°37.84
16	28°9.34	16°17.33 26.07	49°42.42 8.05	211°48.02 10.80	5°15.72 3.39	Alnilam 275°34.97 -1°11.20
17	43°11.80	31°17.22 27.35	64°43.03 7.31	226°50.73 10.92	20°17.97 3.48	Betelgeuse 270°49.13 7°24.60
18	58° 14.27	46°17.11 N05°28.64	79°43.63 \$10°6.57	241°53.43 N03°11.03	35°20.23 N07°3.57	Canopus 263°50.91 -52°42.92 Sirius 258°23.74 -16°45.53
19	73°16.73	61°17.00 29.92	94°44.23 5.82	256°56.14 11.14	50°22.48 3.66	Adhara 255°3.57 -29°0.88
20	88° 19.19	76°16.89 31.20	109°44.84 5.08	271°58.84 11.25	65°24.73 3.75	Procyon 244°47.88 5°8.97
21	103°21.66	91°16.79 · · 32.49	124° 45.44 · · 4.34	287°1.55 · · 11.37	80°26.99 · · 3.84	Pollux 243°13.87 27°57.35
22	118°24.12	106°16.68 33.77	139°46.05 3.60	302°4.26 11.48	95°29.24 3.94	Avior 234°13.06 -59°36.20
23	133°26.59	121°16.57 35.05	154°46.66 2.85	317° 6.96 11.59	110°31.49 4.03	Suhail 222°43.95 -43°32.98
Mer.	pass. 14:08	$\nu$ -0.1 $'$ d1.3 $'$ m-4.21	$ u 0.6' \ d$ -0.7' m $1.07$	$ u 2.7' \ d0.1' \ \text{m-}2.43$	$ u 2.3' \ d0.1' \ \text{m}0.58$	Miaplacidus 221°36.73 -69°50.11
						Alphard 217°44.90 -8°47.07
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.39 11°49.54
0	148° 29.05	136°16.46 N05°36.33	169°47.26 \$10°2.11	332°9.67 N03°11.71	125°33.75 N07°4.12	Dubhe 193°37.34 61°35.69 Denebola 182°22.06 14°24.63
1	163°31.52	151°16.35 37.61	184°47.87 1.37	347°12.37 11.82	140°36.00 4.21	Denebola 182°22.06 14°24.63 Gienah 175°40.65 -17°42.04
2	178°33.98	166°16.25 38.90	199°48.47 10°0.62	2°15.08 11.93	155°38.25 4.30	Acrux 172°56.56 -63°15.26
3	193°36.44	181°16.14 · · 40.18	214°49.08 09°59.88	17°17.79 · · 12.04	170°40.50 • • 4.40	Gacrux 171°48.24 -57°16.22
4	208°38.91	196°16.03 41.46	229°49.68 59.13	32°20.50 12.16	185°42.75 4.49	Alioth 166°10.40 55°48.07
5	223°41.37	211°15.92 42.74	244°50.29 58.39	47°23.20 12.27	200°45.01 4.58	Spica 158°19.39 -11°18.63
6	238° 43.84	226°15.82 N05°44.02	259°50.90 S09°57.65	62°25.91 N03°12.38	215°47.26 N07°4.67	Alkaid 152°49.78 49°10.00
7	253° 46.30	241°15.71 45.30	274°51.50 56.90	77°28.62 12.50	230°49.51 4.76	Hadar 148°31.97 -60°30.37
8 9	268° 48.76 283° 51.23	256° 15.60 46.58 271° 15.50 · · 47.86	289°52.11 56.16 304°52.72 • 55.41	92°31.33 12.61 107°34.03 · · 12.72	245°51.76 4.86 260°54.01 • 4.95	Menkent 147°54.37 -36°30.47
10	298° 53.69	286°15.39 49.14	319°53.32 54.67	122°36.74 12.84	275°56.26 5.04	Arcturus 145°45.44 19°1.88
11	313°56.16	301°15.28 50.42	334°53.93 53.92	137°39.45 12.95	290°58.52 5.13	Rigil Kent. 139°36.45 -60°56.92
12	328° 58.62	316°15.18 N05°51.70	349°54.54 \$09°53.18	152°42.16 N03°13.07	306°0.77 N07°5.23	Kochab 137°19.70 74°1.96 Zuben'ubi 136°53.07 -16°9.58
13	$344^{\circ}1.09$	331°15.07 52.98	4°55.14 52.43	167°44.87 13.18	321°3.02 5.32	Zuben'ubi 136°53.07 -16°9.58 Alphecca 126°1.56 26°36.91
14	359°3.55	346°14.96 54.26	19°55.75 51.69	182°47.58 13.29	336°5.27 5.41	Antares 112°12.73 -26°29.60
15	14°6.01	1°14.86 · · 55.54	34°56.36 · · 50.94	197°50.29 · · 13.41	351°7.52 · · 5.50	Atria 107°4.77 -69°4.36
16	29°8.48	16°14.75 56.82	49°56.97 50.20	212°53.00 13.52	6°9.77 5.59	Sabik 101°59.95 -15°45.57
17 18	44° 10.94 59° 13.41	31°14.65 58.10 46°14.54 N05°59.37	64°57.58 49.45 79°58.18 \$09°48.70	227°55.70 13.63 242°58.41 N03°13.75	21°12.02 5.69 36°14.27 N07°5.78	Shaula 96°7.05 -37°7.30
19	74° 15.87	61°14.44 06°0.65	94°58.79 47.96	258°1.12 13.86	51°16.52 5.87	Rasalhague 95°56.31 12°32.23
20	89° 18.33	76°14.33 1.93	109°59.40 47.21	273° 3.83 13.98	66°18.77 5.97	Eltanin 90°41.26 51°28.83
21	104°20.80	91°14.23 · · 3.21	125°0.01 · · 46.47	288° 6.55 · · 14.09	81°21.02 · · 6.06	Kaus Aust. 83°29.36 -34°22.13
22	119°23.26	106°14.12 4.49	140°0.62 45.72	303° 9.26 14.21	96°23.27 6.15	Vega 80°31.75 38°48.38
23	134°25.73	121°14.02 5.76	155°1.23 44.97	318°11.97 14.32	111°25.52 6.24	Nunki 75°44.85 -26°15.61 Altair 61°57.73 8°56.51
Mari	pass. 14:04	ν-0.1' d1.3' m-4.21	ν0.6' d-0.7' m1.07	ν2.7' d0.1' m-2.43	$\nu 2.3' \ d0.1' \ m0.58$	Peacock 53°2.29 -56°38.51
ivier.	Dass. 14.04	ν-0.1 d1.3 III-4.21		ν2.1 d0.1 III-2.43	ν2.3 d0.1 iii0.36	Deneb 49°24.46 45°22.78
						Enif 33°36.59 10°0.24
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.22 -46°49.46
0	149°28.19	136°13.91 N06°7.04	170°1.84 S09°44.23	333°14.68 N03°14.44	126°27.77 N07°6.34	Fomalhaut 15°12.07 -29°28.42
1	164°30.66	151°13.81 8.32	185°2.45 43.48	348°17.39 14.55	141°30.02 6.43	Scheat 13°43.03 28°14.18
2	179°33.12	166°13.70 9.59	200°3.05 42.73	3°20.10 14.66	156°32.27 6.52	Markab 13°27.64 15°21.43
3 4	194° 35.58 209° 38.05	181°13.60 · · 10.87 196°13.49	215°3.66 · · 41.98 230°4.27 41.24	18°22.81 · · 14.78 33°25.52 14.89	171°34.52 · · 6.61 186°36.77 6.71	Feb 18 Fri SHA Mer.pass
4 5	209 38.05 224°40.51	211°13.39 13.42	245°4.88 40.49	48°28.23 15.01	201°39.02 6.80	Venus 348°49.18 14:55
6	239° 42.98	226°13.28 N06°14.70	260°5.49 S09°39.74	63°30.95 N03°15.12	216°41.27 N07°6.89	Mars 22°2.86 12:41
7	254° 45.44	241°13.18 15.97	275°6.10 38.99	78°33.66 15.24	231°43.52 6.99	Jupiter 183°34.86 01:55
8	269°47.90	256°13.08 17.25	290°6.71 38.24	93°36.37 15.35	246°45.77 7.08	Saturn 337° 9.74 15:39
9	284°50.37	271°12.97 · · 18.52	305°7.32 · · 37.50	108°39.08 · · 15.47	261°48.01 · · 7.17	Feb 19 Sat SHA Mer.pass
10	299°52.83	286°12.87 19.80	320°7.93 36.75	123°41.80 15.58	276°50.26 7.27	Venus 347°47.41 14:55
11	314°55.30	301°12.76 21.07	335°8.55 36.00	138°44.51 15.70	291°52.51 7.36	Mars 21°18.21 12:40
12 13	329° 57.76 345° 0.23	316°12.66 N06°22.34 331°12.56 23.62	350°9.16 S09°35.25 5°9.77 34.50	153°47.22 N03°15.82 168°49.94 15.93	306°54.76 N07°7.45 321°57.01 7.55	Jupiter 183°40.62 01:51
13 14	0°2.69	331°12.56 23.62 346°12.46 24.89	20°10.38 33.75	183°52.65 16.05	321°57.01 7.55 336°59.26 7.64	Saturn 337°4.69 15:35
15	15°5.15	1°12.35 · · 26.17	35°10.99 · · 33.00	198°55.36 · · 16.16	352°1.50 · · 7.73	Feb 20 Sun SHA Mer.pass
16	30°7.62	16°12.25 27.44	50°11.60 32.25	213°58.08 16.28	7°3.75 7.83	Venus 346°45.72 14:55
17	45° 10.08	31°12.15 28.71	65°12.21 31.50	229°0.79 16.39	22°6.00 7.92	Mars 20°33.64 12:39
18	60° 12.55	46°12.04 N06°29.98	80°12.82 <b>S</b> 09°30.75	244° 3.51 N03° 16.51	37°8.25 N07°8.01	Jupiter 183°46.49 01:47
19	75° 15.01	61°11.94 31.26	95°13.44 30.00	259° 6.22 16.63	52°10.50 8.11	Saturn 336°59.58 15:32
20	90°17.47	76°11.84 32.53	110°14.05 29.25	274°8.93 16.74	67°12.74 8.20	Horizontal parallax
21 22	105° 19.94 120° 22.40	91°11.74 · · · 33.80 106°11.63	125°14.66 · · 28.50 140°15.27 27.75	289°11.65 · · 16.86 304°14.36 · · 16.97	82°14.99 · · 8.29 97°17.24 8.39	Venus: 0.2
23	135°24.87	121°11.53 36.34	155°15.89 27.00	319°17.08 17.09	112°19.48 8.48	Mars: 0.1
		$\frac{121 \text{ H}.33}{\nu - 0.1' \text{ d}1.3' \text{ m}-4.22}$	$\frac{133 \text{ 13.03}}{\nu 0.6' \text{ d-0.7' m1.07}}$	$\frac{13.77 \cdot 00^{\circ}}{\nu^{2.7'} d^{0.1'} \text{ m-2.44}}$	$\nu$ 2.2' d0.1' m0.58	
ivier.	pass. 14:00	ν-υ.1 u1.3 III-4.22	$\nu$ 0.0 $u$ -0.1 III1.01	νζ.ι UU.1 III-2.44	ν Δ. Δ UU.1 IIIU.30	

h	= Su		$\Delta 1 = 11$		Moon	, 555	
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.78	\$11°52.46	263°26.17	8.3'	\$25°41.41	3.9'	56.3
1	191°30.83	51.59	277°53.48	8.3'	25°45.26	3.7'	56.2'
2	206°30.87	50.71	292°20.79	8.3'	25°48.97	3.6'	56.2'
3	221°30.92	• • 49.83	306°48.11	8.3'	$25^{\circ}52.54$	3.4'	56.2'
4	236° 30.97	48.95	321°15.43	8.3'	25°55.96	3.3'	56.1'
5	251°31.02	48.07	335°42.75	8.3'	25°59.23	3.1'	56.1'
6	266°31.06	S11°47.19	350°10.08	8.3'	\$26°2.36	3.0'	56.1'
7	281°31.11 296°31.16	46.31 45.43	4°37.42 19°4.77	8.3' 8.4'	26°5.35 26°8.19	2.8' 2.7'	56.1'
8 9	290 31.10 311°31.21	45.43	33°32.12	8.4'	26 8.19 26°10.88	2.1 2.6'	56.0' 56.0'
10	326° 31.26	43.67	33 32.12 47°59.49	8.4'	26°13.43	2.4	56.0'
11	341°31.31	42.79	62°26.87	8.4'	26°15.84	2.3'	55.9'
12	356°31.36	S11°41.91	76°54.26	8.4'	\$26°18.10	2.1'	55.9'
13	11°31.41	41.02	91°21.66	8.4'	26°20.22	2.0'	55.9'
14	26°31.46	40.14	105°49.08	8.4'	26°22.19	1.8'	55.8'
15	41°31.51	• • 39.26	120°16.52	8.5'	26°24.02	1.7'	55.8'
16	56°31.56	38.38	134°43.97	8.5'	26°25.71	1.5'	55.8'
17	71°31.61	37.49 \$11°36.61	149°11.44 163°38.93	8.5'	26°27.25	1.4' 1.3'	55.8'
18 19	86°31.67 101°31.72	35.73	163° 38.93 178° 6.44	8.5' 8.5'	\$26°28.65 26°29.91	1.3	55.7' 55.7'
20	101 31.72 116°31.77	34.84	176 0.44 192°33.97	8.6'	26°31.02	1.0'	55.7'
21	131°31.82	• • 33.96	207°1.53	8.6'	26°31.99	0.8'	55.6'
22	146°31.88	33.07	221°29.10	8.6'	26°32.82	0.7'	55.6'
23	161°31.93	32.19	235°56.71	8.6'	26°33.51	0.5'	55.6'
	SD = 16.2'	d = -0.9'		C C	0 = 15.3'		
	3D = 10.2	a = -0.9		31	$0 = 15.5^{\circ}$		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°31.98	S11°31.30	250°24.34	8.7'	S26°34.05	0.4'	55.6'
1	191°32.04	30.42	264°51.99	8.7'	26°34.45	0.3'	55.5'
2	206°32.09	29.53	279°19.68	8.7'	26°34.72	0.1'	55.5'
3	221°32.14	• • 28.65	293°47.39	8.7'	26°34.84	-0.0'	55.5'
4	236° 32.20	27.76	308°15.13	8.8'	26°34.82	-0.2'	55.5'
5 6	251°32.25 266°32.31	26.87 \$11°25.98	322°42.91 337°10.72	8.8' 8.8'	26°34.66 \$26°34.36	-0.3' -0.4'	55.4' 55.4'
7	281°32.36	25.10	351° 38.56	8.9'	26°33.92	-0.4 -0.6'	55.4'
8	296° 32.42	24.21	6°6.44	8.9'	26°33.34	-0.0	55.4'
9	311°32.48	• • 23.32	20°34.35	8.9'	26°32.63	-0.9	55.3'
10	326° 32.53	22.43	35°2.30	9.0'	26°31.78	-1.0'	55.3'
11	341°32.59	21.54	49°30.28	9.0'	26°30.78	-1.1'	55.3'
12	356° 32.65	S11°20.65	63°58.31	9.1'	\$26°29.66	-1.3'	55.3'
13	11°32.70	19.76	78°26.37	9.1'	26°28.39	-1.4'	55.2'
14	26°32.76	18.88	92°54.48	9.1'	26°26.99	-1.5'	55.2'
15	41°32.82	• • 17.99	107°22.62	9.2'	26°25.46	-1.7'	55.2'
16	56° 32.88 71° 32.93	17.09	121°50.81 136°19.05	9.2' 9.3'	26°23.79 26°21.98	-1.8' -1.9'	55.2' 55.1'
17 18	86° 32.99	16.20 \$11°15.31	150° 47.33	9.3	26 21.98 S26°20.04	-1.9	55.1
19	101°33.05	14.42	165°15.65	9.4'	26°17.97	-2.1	55.1'
20	116°33.11	13.53	179°44.02	9.4'	26°15.76	-2.3'	55.1'
21	131°33.17	. 12.64	194°12.44	9.5'	26°13.43	-2.5'	55.0'
22	146°33.23	11.75	208°40.90	9.5'	26°10.96	-2.6'	55.0'
23	161°33.29	10.85	223°9.42	9.6'	26°8.36	-2.7'	55.0'
	SD = 16.2'	d = -0.9'		SD	0 = 15.2'		
						,	
Sun	GHA	<b>Dec</b> <b>S</b> 11° 9.96	GHA	u 9.6'	Dec	d -2.9'	<b>HP</b> 55.0'
0 1	176°33.35 191°33.41	\$11° 9.96 9.07	237°37.98 252°6.59	9.6′ 9.7′	\$26° 5.63 26° 2.76	-2.9' -3.0'	55.0' 55.0'
2	191 33.41 206°33.47	9.07 8.17	252 0.59 266°35.26	9.7 9.7'	20 2.70 25°59.78	-3.0 -3.1'	55.0 54.9'
3	200 33.47 221°33.53	• • 7.28	281°3.98	9.8'	25°56.66	-3.1 -3.2'	54.9'
4	236°33.60	6.39	295°32.75	9.8'	25°53.41	-3.4	54.9'
5	251°33.66	5.49	310°1.58	9.9'	25°50.04	-3.5'	54.9'
6	266°33.72	S11°4.60	324°30.46	9.9'	S25°46.54	-3.6'	54.9'
7	281°33.78	3.70	$338^{\circ}59.39$	10.0'	$25^{\circ}42.91$	-3.8'	54.8'
8	296° 33.84	2.81	353°28.38	10.0'	25°39.16	-3.9'	54.8'
9	311°33.91	· · 1.91	7°57.43	10.1'	25°35.29	-4.0'	54.8'
10	326° 33.97	1.01	22°26.54	10.2'	25°31.29	-4.1'	54.8'
11	341°34.03	11°0.12	36°55.70	10.2'	25°27.17	-4.2'	54.8'
12 13	356°34.10 11°34.16	\$10°59.22 58.33	51°24.92 65°54.21	10.3' 10.3'	\$25°22.92 25°18.56	-4.4' -4.5'	54.7' 54.7'
13 14	26°34.22	58.33 57.43	80°23.55	10.4	25°18.56 25°14.07	-4.5' -4.6'	54.7' 54.7'
15	41°34.29	56.53	94°52.95	10.4	25 14.07 25°9.47	-4.0 -4.7'	54.7'
16	56°34.35	55.63	109°22.41	10.5	25° 4.74	-4.8'	54.7'
17	71°34.42	54.74	123°51.94	10.6'	24°59.90	-5.0'	54.7'
18	86°34.48	S10°53.84	138°21.52	10.6'	S24°54.93	-5.1'	54.6'
19	101°34.55	52.94	152°51.17	10.7'	24°49.85	-5.2'	54.6'
20	116°34.62	52.04	$167^{\circ}20.88$	10.8'	24°44.66	-5.3'	54.6'
21	131° 34.68	• • 51.14	181°50.66	10.8'	24°39.35	-5.4'	54.6'
22	146°34.75	50.24	196°20.50	10.9'	24°33.92	-5.5'	54.6'
23	161°34.82	49.34	210°50.40	11.0'	24°28.38	-5.7'	54.6'
	SD = 16.2'	d = -0.9'		SD	0 = 15.0'		

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

Lat.		Moonris	e		Moonset	t .
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	_					
N 70°	_					
68°						
66°						
64°			07:52			09:07
62°	05:06	06:15	06:46	08:12	08:55	10:13
60°	04:28	05:32	06:11	08:50	09:38	10:48
N 58°	04:01	05:03	05:45	09:17	10:07	11:13
56°	03:40	04:41	05:25	09:38	10:29	11:33
54° 52°	03:23	04:23	05:08	09:56	10:47	11:50
52°	03:08 02:55	04:08 03:54	04:54 04:41	10:11 10:24	11:02 11:16	12:04 12:17
45°	02:33	03:54	04:41	10:24	11:10	12:17
N 40° 35°	02:07 01:50	03:05 02:47	03:54 03:37	11:12 11:30	12:05 12:23	13:02 13:19
30°	01:30	02:47	03:37	11:30	12:23	13:19
20°	01:33	02:05	03:22	12:11	13:04	13:58
N 10°	00:48	01:43	02:35	12:33	13:27	14:20
0°	00:28	01:22	02:15	12:54	13:47	14:39
S 10°	00:08	01:01	01:54	13:15	14:08	14:59
20°		00:38	01:32	13:37	14:31	15:20
30°	•• ••	00:12	01:07	14:03	14:57	15:44
35°	23:57		00:52	14:18	15:12	15:58
40°	23:39		00:34	14:36	15:29	16:15
45°	23:18	•• ••	00:13	14:57	15:51	16:34
<b>S</b> 50°	22:51	23:47	•• ••	15:24	16:17	16:59
52°	22:37	23:34		15:37	16:30	17:11
54°	22:22	23:19	•• ••	15:52	16:45	17:24
56°	22:04	23:02		16:10	17:03	17:39
58° <b>S</b> 60°	21:43	22:41 22:14	23:53	16:32	17:24 17:51	17:57
<b>5</b> 00°	21:15	22:14	23:32	16:59	17:51	18:20

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-25%
18	13:57	13:55	12:14	06:41	19:08	
19	13:52	13:49	12:14	07:35	20:01	
20	13:47	13:44	12:14	08:27	20:52	

## February 21, 22, 23 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	150° 27.33	136°11.43 N06°37.62	170°16.50 S09°26.25	334°19.79 N03°17.21	127°21.73 N07°8.57	
1	$165^{\circ}29.80$	151°11.33 38.89	185°17.11 25.50	349°22.51 17.32	142°23.98 8.67	Alpheratz 357°32.38 29°14.83 Ankaa 353°5.00 -42°9.29
2	180°32.26	166°11.23 40.16	200° 17.72 24.75	4°25.23 17.44	157°26.22 8.76	Schedar 349°28.45 56°41.70
3 4	195°34.72 210°37.19	181°11.12 · · 41.43 196°11.02 42.70	215°18.34 · · 24.00 230°18.95 23.25	19°27.94 · · 17.56 34°30.66 17.67	172°28.47 · · · 8.86 187°30.72 8.95	Diphda 348°44.98 -17°50.02
5	210 37.19 225°39.65	211°10.92 43.97	245° 19.56 22.50	34°30.66 17.67 49°33.37 17.79	187°30.72 8.95 202°32.96 9.04	Achernar 335°18.68 -57°5.83
6	240° 42.12	226°10.82 N06°45.24	260°20.18 S09°21.75	64°36.09 N03°17.90	217°35.21 N07°9.14	Hamal 327°48.42 23°35.79
7	255°44.58	241°10.72 46.51	275°20.79 21.00	79°38.81 18.02	232°37.46 9.23	Polaris 312°45.38 89°23.22 Acamar 315°9.96 -40°11.75
8	270°47.04	256° 10.62 47.78	290°21.40 20.24	94°41.52 18.14	247°39.70 9.32	Menkar 314°3.52 4°11.94
9	285°49.51	271°10.52 · · 49.04	305°22.02 · · 19.49	109°44.24 · · 18.26	262°41.95 · · 9.42	Mirfak 308°24.58 49°57.83
10 11	300°51.97 315°54.44	286°10.42 50.31 301°10.32 51.58	320°22.63 18.74 335°23.25 17.99	124°46.96 18.37 139°49.68 18.49	277°44.19 9.51 292°46.44 9.61	Aldebaran 290°36.60 16°33.90
12	330° 56.90	316°10.21 N06°52.85	350°23.86 S09°17.24	154°52.39 N03°18.61	307°48.69 N07°9.70	Rigel 281°1.28 -8°10.33
13	345° 59.37	331°10.11 54.12	5°24.48 16.48	169°55.11 18.72	322°50.93 9.80	Capella 280°17.91 46°1.64 Bellatrix 278°19.99 6°22.38
14	1°1.83	346°10.01 55.39	20°25.09 15.73	184°57.83 18.84	337°53.18 9.89	Elnath 277° 58.47 28° 37.84
15	16°4.29	1°9.91 · · 56.65	35°25.70 ·· 14.98 50°26.32 14.23	200° 0.55 ·· 18.96 215° 3.26 ·· 19.07	352°55.42 · · 9.98 7°57.67 10.08	Alnilam 275°34.98 -1°11.21
16 17	31°6.76 46°9.22	16°9.81 57.92 31°9.71 06°59.19	50°26.32 14.23 65°26.94 13.47	215° 3.26 19.07 230° 5.98 19.19	7°57.67 10.08 22°59.91 10.17	Betelgeuse 270°49.14 7°24.60
18	61°11.69	46°9.61 N07°0.45	80°27.55 S09°12.72	245°8.70 N03°19.31	38°2.16 N07°10.27	Canopus 263°50.93 -52°42.93
19	$76^{\circ}14.15$	61°9.51 1.72	95°28.17 11.97	260°11.42 19.43	53°4.40 10.36	Sirius 258° 23.75 -16° 45.53 Adhara 255° 3.58 -29° 0.89
20	91°16.61	76°9.41 2.99	110°28.78 11.21	275°14.14 19.54	68°6.65 10.46	Procyon 244°47.88 5°8.97
21	106° 19.08	91°9.31 · · 4.25	125°29.40 · · 10.46	290°16.86 · · 19.66	83°8.89 · · 10.55	Pollux 243°13.87 27°57.35
22 23	121°21.54 136°24.01	106°9.21 5.52 121°9.11 6.78	140°30.01 9.71 155°30.63 8.95	305°19.58 19.78 320°22.30 19.90	98°11.13 10.64 113°13.38 10.74	Avior 234°13.07 -59°36.21
		-		·		Suhail 222°43.95 -43°33.00
Mer.p	bass. 13:56	ν-0.1' d1.3' m-4.23	ν0.6' d-0.8' m1.07	ν2.7' d0.1' m-2.44	$\nu 2.2' \ d0.1' \ \text{m}0.58$	Miaplacidus 221°36.74 -69°50.13 Alphard 217°44.90 -8°47.07
						Alphard 217°44.90 -8°47.07 Regulus 207°31.39 11°49.54
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.31 61°35.70
0	151°26.47 166°28.93	136°9.01 N07°8.05 151°8.92 9.31	170°31.24 S09°8.20	335°25.02 N03°20.02 350°27.74 20.13	128°15.62 N07°10.83 143°17.87 10.93	Denebola 182°22.04 14°24.62
1 2	100 28.93 181°31.40	151°8.92 9.31 166°8.82 10.58	185°31.86 7.44 200°32.48 6.69	350°27.74 20.13 5°30.46 20.25	143°17.87 10.93 158°20.11 11.02	Gienah 175°40.63 -17°42.05
3	196° 33.86	181°8.72 · · 11.84	215°33.09 · · 5.94	20°33.18 · · 20.37	173°22.36 · · 11.12	Acrux 172°56.53 -63°15.28
4	211°36.33	196°8.62 13.11	230°33.71 5.18	35°35.90 20.49	188°24.60 11.21	Gacrux 171°48.21 -57°16.24 Alioth 166°10.37 55°48.08
5	226°38.79	211°8.52 14.37	245°34.33 4.43	50°38.62 20.61	203°26.84 11.31	Spica 158°19.37 -11°18.64
6	241°41.26	226°8.42 N07°15.63	260°34.94 S09°3.67	65°41.34 N03°20.72	218°29.09 N07°11.40	Alkaid 152°49.75 49°10.00
7 8	256° 43.72 271° 46.18	241°8.32 16.90 256°8.22 18.16	275° 35.56 2.92 290° 36.18 2.16	80°44.06 20.84 95°46.78 20.96	233°31.33 11.50 248°33.57 11.59	Hadar 148°31.93 -60°30.38
9	286° 48.65	271°8.13 · · 19.42	305°36.80 · · 1.41	110°49.50 · · 21.08	263°35.82 · · 11.69	Menkent 147°54.34 -36°30.48
10	301°51.11	286°8.03 20.68	320°37.41 09°0.65	125°52.22 21.20	278°38.06 11.78	Arcturus 145°45.42 19°1.88 Rigil Kent. 139°36.40 -60°56.93
11	$316^{\circ}53.58$	301°7.93 21.95	335°38.03 08°59.90	140°54.94 21.32	293°40.30 11.88	Kochab 137°19.64 74°1.96
12	331°56.04	316°7.83 N07°23.21	350°38.65 S08°59.14	155°57.67 N03°21.43	308°42.55 N07°11.97	Zuben'ubi 136°53.04 -16°9.59
13	346°58.50 2°0.97	331°7.73 24.47 346°7.64 25.73	5°39.27 58.38 20°39.89 57.63	171°0.39 21.55 186°3.11 21.67	323°44.79 12.07	Alphecca 126°1.53 26°36.91
14 15	2 0.97 17°3.43	346°7.64 25.73 1°7.54 •• 26.99	20°39.89 57.63 35°40.50 •• 56.87	186° 3.11 21.67 201° 5.83 · · 21.79	338°47.03 12.16 353°49.27 · · 12.26	Antares 112°12.70 -26°29.60
16	32°5.90	16°7.44 28.25	50°41.12 56.12	216° 8.55 21.91	8°51.52 12.35	Atria 107°4.70 -69°4.36 Sabik 101°59.92 -15°45.57
17	47°8.36	31°7.34 29.51	65°41.74 55.36	231°11.28 22.03	23°53.76 12.45	Shaula 96°7.02 -37°7.30
18	62°10.82	46°7.24 N07°30.77	80°42.36 S08°54.60	246°14.00 N03°22.15	38°56.00 N07°12.54	Rasalhague 95°56.29 12°32.22
19	77° 13.29 92° 15.75	61°7.15 32.03	95°42.98 53.85 110°43.60 53.09	261°16.72 22.27 276°19.44 22.39	53°58.24 12.64	Eltanin 90°41.23 51°28.82
20 21	92 15.75 107°18.22	76°7.05 33.29 91°6.95 · · 34.55	110°43.60 53.09 125°44.22 · · 52.33	276°19.44 22.39 291°22.17 · · · 22.50	69°0.48 12.73 84°2.73 · · 12.83	Kaus Aust. 83°29.33 -34°22.13
22	122°20.68	106°6.86 35.81	140°44.84 51.58	306°24.89 22.62	99°4.97 12.92	Vega 80°31.73 38°48.37 Nunki 75°44.82 -26°15.61
23	$137^{\circ}23.15$	121°6.76 37.07	155°45.46 50.82	321°27.61 22.74	114°7.21 13.02	Altair 61°57.71 8°56.50
Mer.r	pass. 13:52	ν-0.1' d1.3' m-4.23	ν0.6' d-0.8' m1.06	ν2.7' d0.1' m-2.45	$\nu 2.2' \ d0.1' \ m0.58$	Peacock 53°2.27 -56°38.49
		7 0.1 01.0 1.20				Deneb 49°24.44 45°22.77
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.58 10°0.23
0	152° 25.61	136°6.66 N07°38.33	<b>GHA Dec</b> 170°46.08 <b>S</b> 08°50.06	336°30.34 N03°22.86	<b>GHA Dec</b> 129°9.45 N07°13.11	Al Na'ir 27°30.21 -46°49.44 Fomalhaut 15°12.06 -29°28.41
1	167°28.07	151°6.56 39.58	185°46.70 49.30	351°33.06 22.98	144°11.69 13.21	Fomalhaut 15°12.06 -29°28.41 Scheat 13°43.02 28°14.18
2	182°30.54	166°6.47 40.84	200° 47.32 48.55	6°35.79 23.10	159°13.93 13.30	Markab 13°27.63 15°21.42
3	197°33.00	181°6.37 · · 42.10	215° 47.94 · · 47.79	21°38.51 · · 23.22	174°16.17 · · 13.40	
4 5	212°35.47 227°37.93	196°6.28 43.36 211°6.18 44.61	230°48.56 47.03 245°49.18 46.27	36°41.23 23.34 51°43.96 23.46	189°18.42 13.50 204°20.66 13.59	Feb 21 Mon         SHA         Mer.pass           Venus         345°44.10         14:55
6	242°40.39	226°6.08 N07°45.87	260°49.80 S08°45.52	66°46.68 N03°23.58	219°22.90 N07°13.69	Mars 19°49.17 12:38
7	257° 42.86	241°5.99 47.13	275°50.42 44.76	81°49.41 23.70	234°25.14 13.78	Jupiter 183°52.46 01:42
8	272°45.32	256°5.89 48.38	290°51.04 44.00	96°52.13 23.82	249°27.38 13.88	Saturn 336° 54.40 15:28
9	287° 47.79	271°5.79 · · 49.64	305°51.66 · · 43.24	111°54.86 · · 23.94	264°29.62 · · 13.97	Feb 22 Tue SHA Mer.pass
10 11	302°50.25 317°52.71	286°5.70 50.89 301°5.60 52.15	320°52.28 42.48 335°52.90 41.72	126°57.58 24.06 142°0.31 24.18	279°31.86 14.07 294°34.10 14.17	Venus 344° 42.54 14:55
12	332°55.18	316°5.51 N07°53.40	350°53.52 \$08°40.96	157°3.04 N03°24.30	309°36.34 N07°14.26	Mars 19°4.77 12:37
13	347° 57.64	331°5.41 54.66	5° 54.14 40.21	172° 5.76 24.42	324°38.58 14.36	Jupiter 183°58.55 01:38
14	3°0.11	346°5.32 55.91	20° 54.77 39.45	187° 8.49 24.54	339°40.82 14.45	Saturn 336°49.15 15:25
15	18°2.57	1°5.22 · · 57.17	35°55.39 · · 38.69	202°11.21 · · 24.66	354°43.06 · · 14.55	Feb 23 Wed SHA Mer.pass
16 17	33°5.04 48°7.50	16°5.13 58.42 31°5.03 07°59.67	50° 56.01 37.93 65° 56.63 37.17	217°13.94 24.78 232°16.67 24.90	9°45.30 14.64 24°47.54 14.74	Venus 343°41.05 14:56
18	63°9.96	46°4.94 N08°0.93	80° 57.25 S08° 36.41	247°19.39 N03°25.02	39°49.78 N07°14.84	Mars 18° 20.47 12:36 Jupiter 184° 4.73 01:34
19	$78^{\circ}12.43$	61°4.84 2.18	95°57.88 35.65	262°22.12 25.14	54°52.02 14.93	Saturn 336°43.84 15:21
20	93°14.89	76°4.75 3.43	110°58.50 34.89	277°24.85 25.26	69°54.26 15.03	
21 22	108° 17.36 123° 19.82	91°4.65 · · 4.68 106°4.56 5.94	125°59.12 · · 34.13 140°59.74 33.37	292°27.57 · · 25.38 307°30.30	84°56.50 · · 15.13 99°58.74 15.22	Horizontal parallax Venus: 0.2
23	138° 22.28	100 4.50 5.94 121° 4.46 7.19	156° 0.37 32.61	322°33.03 25.62	115°0.97 15.32	Mars: 0.1
ivier.p	bass. 13:48	ν-0.1' d1.3' m-4.24	ν0.6′ d-0.8′ m1.06	ν2.7' d0.1' m-2.45	ν2.2' d0.1' m0.58	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.88	S10°48.44	225°20.37	11.0'	S24°22.73	-5.8'	54.5'
1	191°34.95	47.54	239°50.40	11.1'	24°16.97	-5.9'	54.5'
2	206°35.02	46.64	254°20.50	11.2'	24°11.09	-6.0'	54.5
3 4	221°35.09 236°35.15	• • 45.74 44.84	268°50.66 283°20.89	11.2' 11.3'	24°5.11 23°59.01	-6.1' -6.2'	54.5' 54.5'
5	250 35.15 251°35.22	43.94	203 20.09 297°51.19	11.4	23°52.80	-6.2 -6.3	54.5'
6	266°35.29	\$10°43.03	312°21.55	11.4	\$23°46.49	-6.4	54.4'
7	281°35.36	42.13	326°51.98	11.5'	23°40.07	-6.5'	54.4'
8	296°35.43	41.23	341°22.48	11.6'	23°33.54	-6.6'	54.4'
9	311°35.50	• • 40.33	355°53.04	11.6'	23°26.91	-6.7'	54.4'
10 11	326°35.57 341°35.64	39.42 38.52	10°23.67 24°54.37	11.7' 11.8'	23°20.17 23°13.33	-6.8' -6.9'	54.4' 54.4'
12	356°35.71	510°37.62	39°25.13	11.8'	523°6.38	-7.0'	54.4'
13	11°35.78	36.71	53°55.97	11.9'	22°59.34	-7.1'	54.3'
14	26°35.85	35.81	68°26.87	12.0'	$22^{\circ}52.19$	-7.2'	54.3'
15	41°35.92	• • 34.91	82°57.84	12.0'	22°44.94	-7.3'	54.3'
16 17	56°35.99 71°36.07	34.00 33.10	97°28.88 111°59.98	12.1' 12.2'	22°37.59 22°30.14	-7.4' -7.5'	54.3' 54.3'
18	86°36.14	510°32.19	111 59.96 126°31.15	12.2'	\$22°22.60	-7.6'	54.3'
19	101°36.21	31.28	141°2.40	12.3'	22°14.95	-7.7'	54.3'
20	116°36.28	30.38	155°33.71	12.4'	22°7.22	-7.8'	54.3'
21	131°36.35	• • 29.47	170°5.08	12.4'	21°59.38	-7.9'	54.2'
22	146°36.43	28.57	184°36.53	12.5'	21°51.45	-8.0'	54.2'
23	161°36.50	27.66	199°8.04	12.6'	21°43.43	-8.1'	54.2'
	SD = 16.2'	d = -0.9'		SI	O = 14.9'		
Tue	GHA	Dec	GHA		Dec	d	НР
1 ue 0	176°36.57	S10°26.75	213°39.62	u 12.6'	S21°35.31	a -8.2'	пР 54.2'
1	191°36.65	25.85	228°11.27	12.7'	21°27.11	-8.3	54.2'
2	206°36.72	24.94	242°42.99	12.8'	$21^{\circ}18.81$	-8.4'	54.2'
3	221°36.80	• • 24.03	257°14.77	12.9'	21°10.42	-8.5'	54.2'
4	236°36.87 251°36.95	23.12 22.21	271°46.63 286°18.54	12.9' 13.0'	21°1.94 20°53.38	-8.6'	54.2' 54.2'
5 6	266°37.02	\$10°21.30	280 18.54 300°50.53	13.1'	20°53.38 \$20°44.72	-8.7' -8.7'	54.2
7	281°37.10	20.40	315°22.58	13.1	20°35.98	-8.8'	54.1'
8	296°37.17	19.49	329°54.70	13.2'	20°27.16	-8.9'	54.1'
9	311°37.25	• 18.58	344°26.89	13.3'	$20^{\circ}18.25$	-9.0'	54.1'
10	326°37.33	17.67	358°59.14	13.3'	20°9.25	-9.1'	54.1'
11	341°37.40 356°37.48	16.76	13°31.46 28°3.84	13.4'	20°0.17 \$19°51.01	-9.2'	54.1'
12 13	356 37.48 11°37.56	\$10°15.85 14.94	28° 3.84 42° 36.29	13.4' 13.5'	19°41.77	-9.2' -9.3'	54.1' 54.1'
14	26°37.63	14.03	57°8.80	13.6'	19°32.45	-9.4'	54.1'
15	41°37.71	• • 13.11	71°41.38	13.6'	19°23.04	-9.5'	54.1'
16	56°37.79	12.20	86°14.02	13.7'	19°13.56	-9.6'	54.1'
17	71°37.87	11.29	100°46.73	13.8'	19°4.00	-9.6'	54.0'
18 19	86°37.95 101°38.03	\$10°10.38 9.47	115°19.49 129°52.33	13.8' 13.9'	\$18°54.37 18°44.65	-9.7' -9.8'	54.0' 54.0'
20	116°38.10	8.56	144°25.22		18°34.87		54.0'
21	131°38.18	• • 7.64	158°58.18	14.0'	18°25.00	-9.9'	54.0'
22	146°38.26	6.73	173°31.20	14.1'	$18^{\circ}15.07$	-10.0'	54.0'
23	161°38.34	5.82	188°4.28	14.1'	18°5.06	-10.1'	54.0'
	SD = 16.2'	d = -0.9'		SI	O = 14.8'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°38.42	S10°4.90	202°37.42	14.2'	S17°54.98	-10.2'	54.0'
1	191°38.50	3.99	217°10.63	14.3'	17°44.82	-10.2'	54.0'
2	206°38.58	3.07	231°43.89	14.3'	17°34.60	-10.3'	54.0'
3 4	221°38.67 236°38.75	· · 2.16 1.25	246°17.21 260°50.59	14.4' 14.4'	17°24.31 17°13.95	-10.4' -10.4'	54.0' 54.0'
4 5	250 38.75 251°38.83	1.25 10°0.33	275°24.03	14.4 14.5'	17 13.95 17°3.52	-10.4 -10.5'	54.0'
6	266°38.91	S09°59.42	289°57.53	14.6'	\$16°53.03	-10.6'	54.0'
7	281°38.99	58.50	304°31.09	14.6'	$16^{\circ}42.46$	-10.6'	54.0'
8	296°39.07	57.58	319°4.70	14.7'	16°31.84	-10.7'	54.0'
9	311°39.16	• • 56.67	333°38.37	14.7'	16°21.15	-10.8'	53.9'
10 11	326°39.24 341°39.32	55.75 54.84	348°12.10 2°45.88	14.8' 14.8'	16°10.39 15°59.58	-10.8' -10.9'	53.9' 53.9'
12	356°39.41	54.84 \$09°53.92	2 45.88 17°19.72	14.8	515°48.70	-10.9'	53.9'
13	11°39.49	53.00	31°53.61	14.9'	15°37.76	-11.0'	53.9'
14	26°39.57	52.08	46°27.55	15.0'	15°26.76	-11.1'	53.9'
15	41°39.66	• • 51.17	61°1.55	15.1'	15°15.70	-11.1'	53.9'
16	56°39.74	50.25	75°35.60	15.1'	15°4.58	-11.2'	53.9'
17 18	71°39.83 86°39.91	49.33 \$09°48.41	90°9.70 104°43.86	15.2' 15.2'	14°53.41 \$14°42.17	-11.2' -11.3'	53.9' 53.9'
18	101°40.00	47.49	104 43.86 119°18.06	15.2 15.3'	14°30.89	-11.3'	53.9'
20	116°40.08	46.58	133°52.31	15.3'	14°19.54	-11.4	53.9'
21	131°40.17	• • 45.66	148°26.62	15.4'	14°8.15	-11.5'	53.9'
22	146°40.25	44.74	163°0.97	15.4'	13°56.69	-11.5'	53.9'
23	161°40.34	43.82	177°35.37	15.4'	13°45.19	-11.6'	53.9'
	SD = 16.2'	d = -0.9'		SI	O = 14.7'		
		<del></del>					

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	17-5%	
21	13:40	13:37	12:14	09:17	21:41		
22	13:34	13:30	12:14	10:04	22:27		
23	13:26	13:22	12:13	10:49	23:10		

# February 24, 25, 26 UT (Thu., Fri., Sat.)

h	Aries	Venu	ıs	Ma	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	153° 24.75		N08°8.44	171°0.99	S08°31.85	337°35.76	N03°25.74	130°3.21	N07° 15.41		357°32.39	29°14.82
1	$168^{\circ}27.21$	151°4.27	9.69	186°1.61	31.09	352°38.48	25.87	145°5.45	15.51	Alpheratz Ankaa	357 32.39 353°5.00	-42° 9.28
2	183°29.68	166°4.18	10.94	201°2.24	30.33	7°41.21	25.99	160°7.69	15.61	Schedar	349°28.47	56°41.69
3	198°32.14		• • 12.19	216°2.86	• • 29.57	22°43.94	• • 26.11	175°9.93	• • 15.70	Diphda	348° 44.99	-17°50.01
4 5	213°34.60 228°37.07	196°3.99 211°3.90	13.44 14.69	231°3.48 246°4.11	28.81 28.04	37°46.67 52°49.40	26.23 26.35	190°12.17 205°14.41	15.80 15.90	Achernar	$335^{\circ}18.70$	-57° 5.82
6	243°39.53		14.09 N08°15.94	261°4.73	S08°27.28	67°52.12	N03°26.47	220° 16.64	N07° 15.99	Hamal	327°48.44	23°35.78
7	258° 42.00	241°3.71	17.19	276°5.35	26.52	82°54.85	26.59	235°18.88	16.09	Polaris	312°46.97	89°23.22
8	273°44.46	256°3.61	18.44	291°5.98	25.76	97°57.58	26.71	250°21.12	16.18	Acamar Menkar	315°9.97 314°3.54	-40°11.74 4°11.94
9	288°46.92		• • 19.69	306°6.60	•• 25.00	113°0.31	• • 26.83	265°23.36	• • 16.28	Mirfak	308° 24.60	4 11.94 49°57.83
10	303°49.39	286°3.43	20.93	321°7.23	24.24	128°3.04	26.95	280°25.60	16.38	Aldebaran	290°36.61	16°33.90
11	318°51.85	301°3.33	22.18	336°7.85	23.48	143°5.77	27.08	295°27.83	16.47	Rigel	281°1.30	-8°10.34
12 13	333° 54.32 348° 56.78	316°3.24 N 331°3.15	108°23.43 24.68	351°8.48 6°9.10	\$08°22.71 21.95	158° 8.50 173° 11.23	N03°27.20 27.32	310°30.07 325°32.31	N07°16.57 16.67	Capella	$280^{\circ}17.93$	$46^{\circ}1.64$
14	3°59.24	346°3.05	25.92	21°9.73	21.19	188°13.96	27.44	340°34.55	16.76	Bellatrix	278°20.01	6°22.38
15	19°1.71		• • 27.17	36° 10.35	20.43	203°16.69	• • 27.56	355°36.78	• • 16.86	Elnath	277°58.48	28°37.84
16	34°4.17	16°2.87	28.42	51°10.98	19.67	$218^{\circ}19.42$	27.68	10°39.02	16.96	Alnilam Betelgeuse	275°34.99 270°49.15	-1°11.21 7°24.60
17	49°6.64	31°2.77	29.66	66°11.60	18.90	233°22.15	27.81	25°41.26	17.05	Canopus	263°50.96	-52°42.94
18	64°9.10		N08°30.91	81°12.23	S08°18.14	248°24.88	N03°27.93	40°43.49	N07° 17.15	Sirius	258° 23.76	-16°45.54
19 20	79° 11.57 94° 14.03	61°2.59 76°2.50	32.15 33.40	96° 12.85 111° 13.48	17.38 16.62	263°27.61 278°30.34	28.05 28.17	55°45.73 70°47.97	17.25 17.35	Adhara	255°3.59	-29°0.89
21	109° 16.49		• • 34.64	126° 14.11	15.85	293°33.07	. 28.29	85°50.20	• • 17.44	Procyon	244°47.89	5°8.97
22	124° 18.96	106°2.31	35.89	141°14.73	15.09	308°35.80	28.41	100°52.44	17.54	Pollux	243°13.88	27°57.36
23	139°21.42	121°2.22	37.13	156° 15.36	14.33	323°38.53	28.54	115°54.68	17.64	Avior Suhail	234°13.09 222°43.96	-59°36.23 -43°33.01
Meri	pass. 13:44	$\nu$ -0.1' d1.3'	′ m-4 25	$\nu$ 0.6′ d-0.	8′ m1.06	v2 7′ d0	1′ m-2.45	ν2 2' d0	1' m0.58	Miaplacidus	221°36.76	-43° 53.01
	Pass. 15.44	ν 0.1 u1.5				- V2.1 UO.		ν 2.2 do	1110.50	Alphard	217°44.90	-8°47.08
	CIIA	CUA		CIIA	Б	CILA	Б.	CIIA		Regulus	$207^{\circ}31.38$	11°49.54
Fri 0	<b>GHA</b> 154° 23.89	<b>GHA</b> 136°2.13 N	<b>Dec</b> 108°38.38	<b>GHA</b> 171° 15.98	<b>Dec</b> \$08°13.56	<b>GHA</b> 338°41.26	<b>Dec</b> N03°28.66	<b>GHA</b> 130°56.91	<b>Dec</b> N07° 17.73	Dubhe	193°37.30	61°35.71
1	169° 26.35	150° 2.13° N	39.62	186° 16.61	12.80	353°44.00	28.78	145°59.15	17.83	Denebola	182°22.03	14°24.62
2	184° 28.81	166°1.94	40.86	201°17.24	12.04	8°46.73	28.90	161°1.38	17.93	Gienah	175°40.62	-17°42.06
3	199°31.28		• • 42.10	216° 17.86	• • 11.27	23°49.46	• • 29.03	176°3.62	• • 18.02	Acrux Gacrux	172°56.51 171°48.20	-63°15.30 -57°16.26
4	214°33.74	196°1.76	43.35	231°18.49	10.51	$38^{\circ}52.19$	29.15	191°5.86	18.12	Alioth	166° 10.34	55°48.08
5	229° 36.21	211°1.67	44.59	246° 19.12	9.74	53°54.92	29.27	206°8.09	18.22	Spica	158° 19.35	-11°18.65
6	244° 38.67	226°1.57 N 241°1.48	17.07 VIO8°45.83	261°19.75	S08°8.98	68°57.66	N03°29.39	221°10.33	N07° 18.32	Alkaid	$152^{\circ}49.73$	49°10.00
7 8	259°41.13 274°43.60	241 1.48 256°1.39	47.07 48.31	276°20.37 291°21.00	8.22 7.45	84° 0.39 99° 3.12	29.51 29.64	236°12.56 251°14.80	18.41 18.51	Hadar	148°31.90	-60°30.39
9	289°46.06		• • 49.55	306°21.63	. 6.69	114° 5.85	. 29.76	266°17.03	. 18.61	Menkent	147°54.32	-36°30.50
10	304°48.53	286°1.21	50.79	321°22.26	5.92	129°8.59	29.88	281°19.27	18.71	Arcturus Rigil Kent.	145°45.40 139°36.37	19°1.87 -60°56.94
11	$319^{\circ}50.99$	301°1.12	52.03	336°22.88	5.16	$144^{\circ}11.32$	30.01	296°21.50	18.80	Kochab	139° 30.37 137° 19.57	74°1.96
12	334° 53.45		√08°53.27	351°23.51	S08°4.39	159°14.05	N03°30.13	311°23.74	N07°18.90	Zuben'ubi	136°53.02	-16° 9.60
13	349°55.92	331°0.93	54.51	6°24.14	3.63	174°16.78	30.25	326°25.97	19.00	Alphecca	$126^{\circ}1.51$	26°36.90
14 15	4°58.38 20°0.85	346°0.84 1°0.75	55.75 •• 56.99	21°24.77 36°25.40	2.86 · · 2.10	189°19.52 204°22.25	30.37 · · 30.50	341°28.21 356°30.44	19.09 •• 19.19	Antares	112° 12.68	-26°29.61
16	35°3.31	16°0.66	58.23	51°26.02	1.33	219°24.98	30.62	11°32.68	19.19	Atria	107°4.65	-69°4.36
17	50°5.77	31°0.57	08°59.47	66° 26.65	08°0.57	234°27.72	30.74	26°34.91	19.39	Sabik	101°59.89 96°6.99	-15°45.58 -37°7.30
18	65°8.24		N09° 0.71	81°27.28	S07°59.80	249°30.45	N03°30.87	41°37.15	N07°19.49	Shaula Rasalhague	96 6.99 95°56.26	-37 7.30 12°32.21
19	80° 10.70	61°0.39	1.94	96°27.91	59.04	264°33.19	30.99	56°39.38	19.58	Eltanin	90°41.20	51°28.81
20	95° 13.17	76°0.30	3.18	111°28.54	58.27	279°35.92	31.11	71°41.61	19.68	Kaus Aust.	83°29.30	-34°22.13
21 22	110° 15.63 125° 18.09	91°0.21 106°0.12	• • 4.42 5.65	126°29.17 141°29.80	•• 57.50 56.74	294°38.66 309°41.39	· · 31.23 31.36	86°43.85 101°46.08	· · 19.78 19.88	Vega	80°31.71	38°48.36
23	140° 20.56	121°0.03	6.89	156° 30.43	55.97	324°44.12	31.48	116°48.32	19.00	Nunki	75°44.80	-26°15.61
										Altair	61°57.70	8°56.50
Wer.	pass. 13:40	$\nu$ -0.1' d1.2'	m-4.25	$\nu 0.6' \ d-0.6$	.σ΄ m1.U6	$\nu$ 2.1′ d0.	.1′ m-2.46	ν2.2′ d0	.1′ m0.58	Peacock Deneb	53°2.24 49°24.43	-56°38.48 45°22.75
										Enif	33°36.58	10° 0.23
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.20	-46°49.43
0	155° 23.02		N09°8.12	171°31.06	S07°55.21	339°46.86	N03°31.60	131°50.55	N07° 20.07	Fomalhaut	15° 12.06	-29°28.41
1 2	170° 25.49 185° 27.95	150° 59.85 165° 59.76	9.36 10.59	186°31.69 201°32.32	54.44 53.67	354°49.59 9°52.33	31.73 31.85	146°52.78 161°55.02	20.17 20.27	Scheat	13°43.02	28°14.17
3	200° 30.41		. 11.83	216°32.95	• • 52.91	24°55.06	31.03	176° 57.25	• • 20.37	Markab	13°27.63	15°21.42
4	215°32.88	195°59.58	13.06	231°33.58	52.14	39°57.80	32.10	191°59.48	20.46	Feb 24 Thu	SHA	Mer.pass
5	230° 35.34	210°59.49	14.30	246°34.21	51.37	55° 0.54	32.22	207°1.72	20.56	Venus		14:56
6	245° 37.81		N09°15.53	261°34.84	S07°50.61	70°3.27	N03°32.35	222°3.95	N07°20.66	Mars	17°36.24	12:35
7 8	260° 40.27 275° 42.73	240°59.31 255°59.22	16.76 18.00	276°35.47 291°36.10	49.84 49.07	85° 6.01 100° 8.74	32.47 32.59	237°6.18 252°8.41	20.76 20.86	Jupiter Saturn	184°11.01 336°38.47	01:29 15:18
9	275 42.73 290°45.20		19.23	306° 36.73	· · 48.31	100 8.74 115°11.48	32.59 · · 32.72	252 8.41 267°10.65	20.86			
10	305° 47.66	285°59.04	20.46	321°37.36	47.54	130°14.22	32.84	282°12.88	21.05	Feb 25 Fri	SHA	Mer.pass
11	$320^{\circ}50.13$	300°58.95	21.69	336°37.99	46.77	$145^{\circ}16.95$	32.96	297°15.11	21.15	Venus Mars	341°38.24 16°52.10	14:56 12:34
12	335° 52.59		N09°22.93	351°38.62	S07°46.00	160°19.69	N03°33.09	312°17.34	N07°21.25		16 52.10 184° 17.38	01:25
13	350° 55.05	330°58.77	24.16	6°39.26	45.24	175°22.42	33.21	327°19.58	21.35	Saturn	336°33.03	15:14
14 15	5° 57.52 20° 59.98	345°58.68 0°58.60	25.39 •• 26.62	21°39.89 36°40.52	44.47 •• 43.70	190°25.16 205°27.90	33.34 · · 33.46	342°21.81 357°24.04	21.44 •• 21.54			
16	36°2.45	15°58.51	27.85	50°41.15	42.93	205 27.90 220°30.64	33.58	12°26.27	21.64	Feb 26 Sat Venus	<b>SHA</b> 340° 36.92	Mer.pass 14:56
17	51°4.91	30°58.42	29.08	66°41.78	42.16	235°33.37	33.71	27°28.51	21.74	Mars	16°8.04	12:33
18	66°7.38	45°58.33	√09°30.31	81°42.42	S07°41.40	250°36.11	N03°33.83	42°30.74	N07°21.84		184°23.84	01:21
19	81°9.84	60°58.24	31.54	96°43.05	40.63	265°38.85	33.96	57°32.97	21.94	Saturn	336°27.53	15:10
20	96° 12.30	75°58.15	32.76	111°43.68	39.86	280°41.58	34.08	72°35.20	22.03	Horizo	ntal parallax	
21 22	111° 14.77 126° 17.23	90°58.06 105°57.98	· · 33.99 35.22	126°44.31 141°44.95	· · 39.09 38.32	295°44.32 310°47.06	· · 34.20 34.33	87°37.43 102°39.66	· · 22.13 22.23	1.1011201	Venus:	0.2
23	141° 19.70	120°57.89	36.45	156° 45.58	37.55	325°49.80	34.45	117°41.89	22.33		Mars:	0.1
	pass. 13:36	ν-0.1' d1.2'		$\nu 0.6' \ d-0.6'$			1′ m-2.46		.1′ m0.58			
ivier.	pass. 13:30	ν-υ.1 α1.2	111-4.20	$\nu$ 0.0 $a$ -0.	.0 1111.00	ν2.1° α0.	111-∠.40	ν2.2° α0	T 1110.30			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.43	S09°42.90	192°9.82	15.5'	<b>S</b> 13°33.63	-11.6'	53.9'
1	191°40.51	41.98	206°44.31	15.5'	13°22.03	-11.7'	53.9'
2	206°40.60 221°40.69	41.06 •• 40.14	221°18.85 235°53.44	15.6' 15.6'	13°10.37 12°58.66	-11.7' -11.8'	53.9' 53.9'
4	236°40.77	39.22	250°28.07	15.7'	12°46.90	-11.8'	53.9'
5	251°40.86	38.29	265°2.74	15.7'	12°35.10	-11.9'	53.9'
6	266°40.95	S09°37.37	279°37.46	15.8'	<b>S</b> 12°23.25	-11.9'	53.9'
7	281°41.04	36.45	294°12.22	15.8'	12°11.35	-11.9'	53.9'
8 9	296°41.13 311°41.22	35.53 •• 34.61	308°47.02 323°21.87	15.8' 15.9'	11°59.41 11°47.42	-12.0' -12.0'	53.9' 53.9'
10	326°41.30	33.68	325 21.67 337°56.75	15.9'	11 47.42 11°35.39	-12.0 -12.1'	53.9'
11	341°41.39	32.76	352°31.67	16.0'	11°23.31	-12.1'	53.9'
12	356°41.48	S09°31.84	7°6.63	16.0'	S11°11.20	-12.2'	53.9'
13	11°41.57	30.92	21°41.63	16.0'	10°59.04	-12.2'	53.9'
14 15	26°41.66 41°41.75	29.99 •• 29.07	36°16.67 50°51.74	16.1' 16.1'	10°46.84 10°34.60	-12.2' -12.3'	53.9' 53.9'
16	56°41.84	28.15	65°26.85	16.1	10° 34.00 10° 22.32	-12.3'	53.9'
17	71°41.94	27.22	80°2.00	16.2'	10°10.00	-12.4'	53.9'
18	86°42.03	S09°26.30	94°37.18	16.2'	S09°57.64	-12.4'	53.9'
19	101°42.12	25.37	109°12.39	16.2'	09°45.25	-12.4'	53.9'
20 21	116°42.21 131°42.30	24.45 •• 23.52	123°47.63 138°22.91	16.3' 16.3'	09°32.82 09°20.36	-12.5' -12.5'	53.9' 53.9'
22	146°42.39	22.60	152°58.22	16.3	09°20.30	-12.5'	53.9'
23	161°42.49	21.67	167°33.56	16.4'	08°55.32	-12.6'	53.9'
	SD = 16.2'	d = -0.9'		SI	D = 14.7'		
					=		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°42.58 191°42.67	\$09°20.75 19.82	182°8.93 196°44.32	16.4' 16.4'	\$08°42.76 08°30.16	-12.6' -12.6'	53.9' 53.9'
2	191 42.67 206°42.76	19.82	190 44.32 211°19.75	16.5	08°17.53	-12.0 -12.7'	53.9' 53.9'
3	221°42.86	17.97	225°55.20	16.5'	08°4.87	-12.7'	53.9'
4	236°42.95	17.04	240°30.68	16.5'	$07^{\circ}52.17$	-12.7'	53.9'
5	251°43.05	16.11	255°6.18	16.5'	07°39.45	-12.7'	53.9'
6 7	266°43.14 281°43.23	\$09°15.18 14.26	269°41.71 284°17.26	16.6' 16.6'	\$07°26.70 07°13.93	-12.8' -12.8'	53.9' 53.9'
8	201 43.23 296°43.33	13.33	298°52.84	16.6'	07 13.93 07°1.12	-12.8'	53.9'
9	311°43.42	. 12.40	313°28.43	16.6'	06°48.29	-12.9'	53.9'
10	326°43.52	11.47	328°4.05	16.6'	$06^{\circ}35.44$	-12.9'	53.9'
11	341°43.61	10.54	342°39.69	16.7'	06°22.55	-12.9'	53.9'
12 13	356°43.71 11°43.81	\$09°9.62 8.69	357°15.35 11°51.03	16.7' 16.7'	\$06°9.65 05°56.72	-12.9' -13.0'	53.9' 53.9'
14	26°43.90	7.76	26°26.72	16.7'	05°43.77	-13.0'	53.9'
15	41°44.00	• • 6.83	41°2.43	16.7'	05°30.80	-13.0'	53.9'
16	56°44.09	5.90	55°38.16	16.7'	05°17.80	-13.0'	53.9'
17	71°44.19	4.97 \$09°4.04	70°13.91	16.8'	05°4.79 \$04°51.75	-13.0'	53.9'
18 19	86°44.29 101°44.39	3.11	84°49.66 99°25.44	16.8' 16.8'	04°38.70	-13.1' -13.1'	53.9' 53.9'
20	116°44.48	2.18		16.8'	04°25.63		53.9'
21	131°44.58	• • 1.25	128°37.02	16.8'	04°12.54	-13.1'	53.9'
22	146°44.68	09°0.32	143°12.83	16.8'	03°59.43	-13.1'	53.9'
23	161°44.78	08°59.38	157°48.65	16.8'	03°46.31	-13.1'	53.9'
	SD = 16.2'	d = -0.9'		SI	O = 14.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	176°44.88	S08°58.45	172°24.47	16.8'	503°33.17	-13.2'	53.9'
1	191°44.98	57.52	187°0.31	16.8'	$03^{\circ}20.02$	-13.2'	53.9'
2	206°45.08	56.59	201°36.15	16.9'	03°6.85	-13.2'	53.9'
3 4	221°45.18 236°45.27	• • 55.66 54.72	216°12.00 230°47.86	16.9' 16.9'	02°53.68 02°40.49	-13.2' -13.2'	54.0' 54.0'
4 5	250 45.27 251°45.37	54.72	230 47.80 245°23.72	16.9	02 40.49 02°27.28	-13.2'	54.0'
6	266°45.47	S08°52.86	259°59.59	16.9'	S02°14.07	-13.2'	54.0'
7	281°45.58	51.92	274°35.46	16.9'	02°0.85	-13.2'	54.0'
8	296°45.68 311°45.78	50.99	289°11.33 303°47.20	16.9'	01°47.61 01°34.37	-13.2'	54.0'
9 10	311°45.78 326°45.88	· · 50.06 49.12	303°47.20 318°23.07	16.9' 16.9'	01°34.37 01°21.12	-13.2' -13.3'	54.0' 54.0'
11	341°45.98	48.19	332°58.94	16.9'	01°21.12	-13.3'	54.0'
12	356°46.08	S08°47.26	347°34.82	16.9'	S00°54.60	-13.3'	54.0'
13	11°46.18	46.32	2°10.68	16.9'	00°41.34	-13.3'	54.0'
14 15	26°46.29 41°46.39	45.39 •• 44.45	16°46.55 31°22.41	16.9' 16.9'	00°28.06 00°14.79	-13.3' -13.3'	54.0' 54.0'
15 16	41°46.39 56°46.49	43.52	45°58.27	16.9	500°14.79	-13.3' -13.3'	54.0'
17	71°46.59	42.58	60°34.12	16.8	N00°11.78	13.3	54.0'
18	86°46.70	S08°41.64	75°9.96	16.8'	N00°25.06	13.3'	54.0'
19	101°46.80	40.71	89°45.80	16.8'	00°38.35	13.3'	54.1'
20 21	116°46.90 131°47.01	39.77 •• 38.84	104°21.63 118°57.45	16.8' 16.8'	00°51.64 01°4.93	13.3' 13.3'	54.1' 54.1'
22	131°47.01 146°47.11	37.90	118°57.45 133°33.25	16.8	01°4.93 01°18.21	13.3'	54.1' 54.1'
23	161°47.22	36.96	148°9.05	16.8'	01°31.50	13.3'	54.1'
	SD = 16.1'	d = -0.9'		SI	D = 14.7'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	29-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-0%	
24	13:18	13:14	12:13	11:31	23:51		
25	13:10	13:05	12:13	12:11	-:-		
26	13:00	12:56	12:13	12:51	00:31		

#### February 27, 28, 29 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	156°22.16	135°57.80 N09°37.67	171°46.21 S07°36.78	340°52.54 N03°34.58	132°44.13 N07°22.43	
1	171°24.62	150°57.71 38.90	186°46.84 36.02	355°55.27 34.70	147°46.36 22.53	Alpheratz 357°32.40
2	186°27.09	165°57.62 40.13	201°47.48 35.25	10°58.01 34.83	162°48.59 22.63	Ankaa 353°5.01
3	201°29.55	180°57.54 · · 41.35	216°48.11 · · 34.48	26° 0.75 · · 34.95	177°50.82 · · 22.72	Schedar 349° 28.49
4	216°32.02	195°57.45 42.58	231°48.74 33.71	41° 3.49 35.08	192°53.05 22.82	Diphda 348°45.00
5	231°34.48	210°57.36 43.80	246°49.38 32.94	56° 6.23 35.20	207°55.28 22.92	Achernar 335° 18.72
6	246°36.94	225°57.27 N09°45.03	261°50.01 S07°32.17	71°8.97 N03°35.33	222°57.51 N07°23.02	Hamal 327° 48.45
7	261°39.41	240°57.19 46.25	276°50.64 31.40	86°11.71 35.45	237°59.74 23.12	Polaris 312° 48.56
8	276°41.87	255°57.10 47.48	291°51.28 30.63	101°14.45 35.58	253°1.97 23.22	Acamar 315°9.99
9	291°44.34	270°57.01 · · 48.70	306°51.91 · · 29.86	116°17.19 · · 35.70	268°4.20 · · 23.32	Menkar 314°3.55
10	306°46.80	285°56.92 49.93	321°52.55 29.09	131°19.92 35.82	283°6.43 23.42	Mirfak 308°24.63
11	321°49.26	300°56.84 51.15	336°53.18 28.32	146°22.66 35.95	298°8.66 23.51	Aldebaran 290°36.63
12	336°51.73	315°56.75 N09°52.37	351°53.82 \$07°27.55	161°25.40 N03°36.07	313°10.89 N07°23.61	Rigel 281°1.32
13	351°54.19	330°56.66 53.59	6°54.45 26.78	176°28.14 36.20	328°13.12 23.71	Capella 280°17.95
14	6°56.66	345°56.57 54.82	21°55.09 26.01	191°30.88 36.32	343°15.35 23.81	Bellatrix 278°20.02 Elnath 277°58.50
15	$21^{\circ}59.12$	0°56.49 · · 56.04	36°55.72 · · 25.24	206°33.62 · · 36.45	358°17.58 · · 23.91	Elnath 277°58.50 Alnilam 275°35.01
16	$37^{\circ}1.58$	15°56.40 57.26	51°56.36 24.47	221°36.36 36.58	13°19.81 24.01	Betelgeuse 270°49.17
17	52°4.05	30°56.31 58.48	66° 56.99 23.70	236°39.10 36.70	28°22.04 24.11	Canopus 263° 50.99
18	$67^{\circ}6.51$	45°56.23 N09°59.70	81°57.63 <b>S</b> 07°22.93	251°41.85 N03°36.83	43°24.27 N07°24.21	Sirius 258°23.77
19	82°8.98	60°56.14 10°0.92	96°58.26 22.16	266°44.59 36.95	58°26.50 24.31	Adhara 255°3.61
20	97° 11.44	75°56.05 2.14	111°58.90 21.38	281°47.33 37.08	73°28.73 24.41	Procyon 244°47.90
21	112° 13.90	90°55.97 · · 3.36	126°59.53 · · 20.61	296°50.07 · · 37.20	88°30.95 · · 24.51	Pollux 243°13.89
22	127° 16.37	105°55.88 4.58	142°0.17 19.84	311°52.81 37.33	103°33.18 24.60	Avior 234°13.11
23	142° 18.83	120°55.80 5.80	157°0.80 19.07	326°55.55 37.45	118°35.41 24.70	Suhail 222°43.97
Mer.r	pass. 13:32	ν-0.1' d1.2' m-4.27	ν0.6' d-0.8' m1.05	ν2.7' d0.1' m-2.46	$\nu$ 2.2' d0.1' m0.58	Miaplacidus 221°36.78
						Alphard 217°44.90
						Regulus 207°31.38
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.29
0	157°21.30	135°55.71 N10°7.01	172°1.44 S07°18.30	341°58.29 N03°37.58	133°37.64 N07°24.80	Denebola 182°22.02
1	172°23.76	150°55.62 8.23	187°2.08 17.53	357°1.03 37.70	148°39.87 24.90	Gienah 175°40.61
2	187°26.22	165°55.54 9.45	202°2.71 16.76	12°3.77 37.83	163°42.10 25.00	Acrux 172°56.49
3	202°28.69	180°55.45 · · 10.67	217°3.35 · · 15.99	27°6.51 · · 37.95	178°44.33 · · 25.10	Gacrux 171°48.18
4	217°31.15	195°55.37 11.88	232°3.99 15.21	42°9.26 38.08	193°46.55 25.20	Alioth 166° 10.32
5	232°33.62	210°55.28 13.10	247°4.62 14.44	57°12.00 38.21	208°48.78 25.30	Spica 158° 19.34
6	247°36.08	225°55.19 N10°14.32	262°5.26 S07°13.67	72°14.74 N03°38.33	223°51.01 N07°25.40	Alkaid 152°49.71
7	262°38.54	240°55.11 15.53	277°5.90 12.90	87°17.48 38.46	238°53.24 25.50	Hadar 148°31.87
8 9	277° 41.01 292° 43.47	255°55.02 16.75 270°54.94 · · 17.96	292°6.53 12.13 307°7.17 · · 11.35	102°20.22 38.58 117°22.97 · · 38.71	253°55.47 25.60 268°57.69 •• 25.70	Menkent 147° 54.30
	292 43.47 307°45.94					Arcturus 145°45.38
10 11	307 45.94 322°48.40	285°54.85 19.18 300°54.77 20.39	322°7.81 10.58 337°8.45 9.81	132°25.71 38.83 147°28.45 38.96	283°59.92 25.80 299°2.15 25.90	Rigil Kent. 139°36.34
12	322 46.40 337°50.86	315°54.68 N10°21.60	352°9.08 <b>S</b> 07°9.04	162°31.19 N03°39.09	314°4.38 N07°26.00	Kochab 137°19.51
13	352° 53.33	330°54.60 10 21.00 22.82	7°9.72 8.26	177°33.94 39.21	329°6.60 26.10	Zuben'ubi 136°53.01
14	7°55.79	345°54.51 24.03	22°10.36 7.49	192°36.68 39.34	344°8.83 26.20	Alphecca 126°1.49
15	22°58.26	0°54.43 · · 25.24	37°11.00 · · 6.72	207°39.42 · · 39.46	359°11.06 · · 26.30	Antares 112° 12.66
16	38°0.72	15°54.34 26.45	52°11.64 5.94	207 39.42 39.40 222°42.17 39.59	14°13.29 26.40	Atria 107°4.60
17	53°3.18	30°54.26 27.66	67°12.27 5.17	237°44.91 39.72	29°15.51 26.50	Sabik 101°59.88
18	68°5.65	45°54.17 N10°28.88	82°12.91 S07°4.40	252°47.65 N03°39.84	44°17.74 N07°26.60	Shaula 96°6.97
19	83°8.11	60°54.09 30.09	97°13.55 3.62	267°50.40 39.97	59°19.97 26.70	Rasalhague 95°56.25
20	98° 10.58	75°54.00 31.30	112°14.19 2.85	282°53.14 40.10	74°22.19 26.80	Eltanin 90°41.17
21	113° 13.04	90°53.92 · · 32.51	127° 14.83 · · · 2.08	297°55.88 · · 40.22	89°24.42 · · 26.90	Kaus Aust. 83°29.28
22	128° 15.50	105°53.84 33.72	142°15.47 1.30	312°58.63 40.35	104°26.65 27.00	Vega 80°31.69
23	143° 17.97	120°53.75 34.93	157° 16.11 0.53	328° 1.37 40.47	119°28.87 27.10	Nunki 75°44.78
						Altair 61°57.69
Mer.p	pass. 13:28	ν-0.1′ d1.2′ m-4.27	ν0.6' d-0.8' m1.05	ν2.7' d0.1' m-2.47	$\nu 2.2' \ d0.1' \ \text{m}0.58$	Peacock 53°2.22 Deneb 49°24.42
						Deneb 49°24.42 Enif 33°36.57
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.19
0	158° 20.43	135°53.67 N10°36.13	172°16.74 \$06°59.76	343°4.12 N03°40.60	134°31.10 N07°27.20	Fomalhaut 15°12.06
1	$173^{\circ}22.90$	150°53.58 37.34	187°17.38 58.98	358° 6.86 40.73	149°33.32 27.30	Scheat 13°43.03
2	$188^{\circ}25.36$	165°53.50 38.55	202°18.02 58.21	13° 9.61 40.85	164°35.55 27.40	Markab 13°27.64
3	203°27.83	180°53.42 · · 39.76	217° 18.66 · · 57.43	28°12.35 · · 40.98	179°37.78 · · 27.50	
4	218° 30.29	195°53.33 40.97	232°19.30 56.66	43°15.09 41.11	194°40.00 27.60	Feb 27 Sun SHA
5	233°32.75	210°53.25 42.17	247°19.94 55.89	58°17.84 41.23	209°42.23 27.70	Venus 339°35.64
6	248°35.22	225°53.16 N10°43.38	262°20.58 \$06°55.11	73°20.58 N03°41.36	224°44.45 N07°27.80	Mars 15°24.05
7	263°37.68	240°53.08 44.58	277°21.22 54.34	88°23.33 41.49	239°46.68 27.90	Jupiter 184°30.38
8	278° 40.15	255°53.00 45.79	292°21.86 53.56	103°26.07 41.61	254°48.90 28.00	Saturn 336°21.97
9	293°42.61	270°52.91 · · 47.00	307°22.50 · · 52.79	118°28.82 · · 41.74	269°51.13 · · 28.10	Feb 28 Mon SHA
10	308° 45.07	285°52.83 48.20	322°23.14 52.01	133°31.56 41.87	284°53.35 28.20	Venus 338°34.41
11	323°47.54	300°52.75 49.40	337°23.78 51.24	148°34.31 41.99	299°55.58 28.30	Mars 14°40.14
12	338°50.00	315°52.66 N10°50.61	352°24.43 \$06°50.46	163°37.06 N03°42.12	314°57.80 N07°28.40	Jupiter 184°36.99
13	353° 52.47 8° 54.93	330°52.58 51.81 345°52.50 53.01	7°25.07 49.69 22°25.71 48.91	178°39.80 42.25	330°0.03 28.50	Saturn 336°16.35
14 15	8°54.93 23°57.39	345°52.50 53.01 0°52.41 •• 54.22	37°26.35 · · 48.14	193°42.55 42.38 208°45.29 •• 42.50	345°2.25 28.60 0°4.48 · · 28.70	F-1-20 T 2014
15 16	23 57.39 38°59.86	15°52.33 55.42	52°26.99 47.36	208 45.29 · · 42.50 223°48.04 42.63	0°4.48 · · 28.70 15°6.70 28.80	Feb 29 Tue SHA
17	56 59.60 54°2.32	30°52.25 56.62	67°27.63 46.59	238°50.78 42.76	30°8.93 28.90	Venus 337°33.23
18	69°4.79	45°52.17 N10°57.82	82°28.27 \$06°45.81	253°53.53 N03°42.88	45°11.15 N07°29.00	Mars 13°56.31 Jupiter 184°43.68
19	84°7.25	60°52.08 10°59.02	97°28.91 45.04	268°56.28 43.01	60°13.38 29.10	Saturn 336°10.66
20	99°9.71	75°52.00 11°0.22	112°29.56 44.26	283°59.02 43.14	75°15.60 29.20	Jacum 330 10.00
21	114° 12.18	90°51.92 · · 1.42	127°30.20 · · 43.48	299°1.77 · · 43.26	90°17.83 · · 29.30	Horizontal parallax
22	129° 14.64	105°51.84 2.62	142°30.84 42.71	314° 4.52 43.39	105°20.05 29.40	Venus:
23	144° 17.11	120°51.75 3.82	157°31.48 41.93	329°7.26 43.52	120°22.27 29.50	Mars:
			-			
ivier.	pass. 13:24	ν-0.1′ d1.2′ m-4.28	$\nu$ 0.6′ <i>d</i> -0.8′ m1.05	ν2.7' d0.1' m-2.47	ν2.2' d0.1' m0.58	

Dec 29°14.81 -42°9.28 56°41.67 -17°50.01  $\textbf{-57}^{\circ}\,5.81$  $23^{\circ}35.78$ 89°23.21 -40°11.74 4°11.94 49°57.82 16°33.90 -8°10.34  $46^{\circ}1.64$  $6^{\circ}22.38$ 28°37.84 -1°11.21  $7^{\circ}24.60$ -52°42.95 -16°45.54 -29°0.90  $5^{\circ}8.97$  $27^{\circ}57.36$ -59°36.24 -43°33.02 -69°50.16 -8°47.08 11°49.54 61°35.73  $14^{\circ}24.62$ -17°42.07 -63°15.31 -57°16.27 55°48.09 -11°18.65 49°10.01 -60°30.41 -36°30.51  $19^{\circ}\,1.87$ -60°56.95  $74^{\circ}1.97$ -16°9.60 26°36.90 -26°29.61 -69°4.36  $-15^{\circ}45.58$  $-37^{\circ}7.30$  $12^{\circ}32.21$ 51°28.80 -34°22.13 38°48.35 -26°15.61 8°56.49 -56°38.47 45°22.74  $10^{\circ}0.22$ -46°49.42 -29°28.40 28°14.16 15°21.41 Mer.pass 14:56 12:32 01:16 15:07 Mer.pass 14:56 12:31 01:12 15:03 Mer.pass 14:57 12:30 01:08 15:00

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.32	S08°36.03	$162^{\circ}44.84$	16.8'	N01°44.78	13.3'	54.1'
1	191°47.43	35.09	177°20.61	16.8'	01°58.06	13.3'	54.1'
2 3	206°47.53 221°47.64	34.15 · · 33.21	191°56.37 206°32.11	16.7' 16.7'	02°11.33 02°24.60	13.3' 13.3'	54.1' 54.1'
4	236°47.74	32.28	221°7.83	16.7	02° 37.87	13.3'	54.1'
5	251°47.85	31.34	235°43.54	16.7'	02°51.13	13.3'	54.1'
6	266°47.95	508°30.40	250°19.24	16.7'	N03°4.38	13.2'	54.1'
7	281°48.06	29.46 28.52	264°54.91	16.7'	03°17.62 03°30.86	13.2'	54.2'
8 9	296°48.17 311°48.27	28.52	279°30.56 294°6.20	16.6' 16.6'	03°30.86	13.2' 13.2'	54.2' 54.2'
10	326°48.38	26.64	308°41.81	16.6'	03°57.30	13.2'	54.2'
11	341°48.49	25.70	323°17.40	16.6'	04°10.50	13.2'	54.2'
12	356°48.59	S08°24.76	337°52.97	16.5'	N04°23.70	13.2'	54.2'
13 14	11°48.70 26°48.81	23.82 22.88	352°28.51 7°4.02	16.5' 16.5'	04°36.88 04°50.05	13.2' 13.2'	54.2' 54.2'
14 15	41°48.92	21.94	7 4.02 21°39.52	16.5	04 50.05 05°3.20	13.1	54.2'
16	56°49.03	21.00	36°14.98	16.4	05°16.34	13.1'	54.2'
17	71°49.14	20.06	$50^{\circ}50.41$	16.4'	$05^{\circ}29.47$	13.1'	54.3'
18	86°49.24	S08°19.12	65°25.82	16.4'	N05°42.57	13.1'	54.3'
19 20	101°49.35 116°49.46	18.18 17.24	80°1.20 94°36.55	16.3' 16.3'	05°55.67 06°8.74	13.1' 13.1'	54.3' 54.3'
21	116 49.46 131°49.57	16.30	94 30.55 109°11.86	16.3'	06 8.74 06°21.79	13.1	54.3'
22	146°49.68	15.36	123°47.14	16.2'	06°34.83	13.0'	54.3'
23	161°49.79	14.41	138°22.39	16.2'	06°47.85	13.0'	54.3'
	SD = 16.1'	d = -0.9'		SE	D = 14.8'		
Mon 0	<b>GHA</b> 176°49.90	Dec \$08°13.47	<b>GHA</b> 152°57.60	u  16.2'	<b>Dec</b> N07°0.84	<i>d</i> 13.0'	<b>HP</b> 54.3'
1	176 49.90 191°50.01	12.53	152 57.60 167°32.78	16.2 16.1'	07°13.81	13.0'	54.3'
2	206°50.12	11.59	182°7.93	16.1'	07°26.76	12.9'	54.4'
3	221°50.24	• • 10.64	196°43.03	16.1'	07°39.69	12.9'	54.4'
4	236°50.35	9.70	211°18.10	16.0'	07°52.59	12.9'	54.4'
5 6	251°50.46 266°50.57	8.76 \$08°7.82	225°53.12 240°28.11	16.0' 15.9'	08°5.47 N08°18.32	12.9' 12.8'	54.4' 54.4'
7	281°50.68	6.87	255°3.06	15.9'	08°31.15	12.8'	54.4'
8	296°50.79	5.93	269°37.96	15.9'	08°43.95	12.8'	54.4'
9	311°50.91	• • 4.98	$284^{\circ}12.82$	15.8'	$08^{\circ}56.72$	12.7'	54.4'
10	326°51.02	4.04	298°47.64	15.8'	09°9.46	12.7'	54.5'
11 12	341°51.13 356°51.25	3.10 \$08°2.15	313°22.42 327°57.14	15.7' 15.7'	09°22.17 N09°34.85	12.7' 12.6'	54.5' 54.5'
13	11°51.36	1.21	342°31.82	15.6'	09°47.50	12.6'	54.5'
14	26°51.47	08°0.26	357°6.46	15.6'	10°0.12	12.6'	54.5'
15	41°51.59	07°59.32	11°41.04	15.5'	10°12.70	12.5'	54.5'
16	56°51.70 71°51.82	58.37	26°15.58 40°50.06	15.5'	10°25.25	12.5'	54.5'
17 18	71 51.82 86°51.93	57.42 \$07°56.48	40 50.06 55°24.50	15.4' 15.4'	10°37.77 N10°50.24	12.5' 12.4'	54.6' 54.6'
19	101°52.04	55.53	69°58.88	15.3'	11°2.69	12.4	54.6'
20	116°52.16	54.59	84°33.21	15.3'	11°15.09	12.4'	54.6'
21	131°52.27	• • 53.64	99°7.48	15.2'	11°27.46	12.3'	54.6'
22 23	146°52.39 161°52.51	52.69 51.75	113°41.70 128°15.87	15.2' 15.1'	11°39.78 11°52.07	12.3' 12.2'	54.6' 54.7'
23	SD = 16.1'	d = -0.9'	120 13.07		0 = 14.8'	12.2	34.1
	3D = 10.1	<u>u = -0.9</u>		JL	7 — 14.0		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°52.62 191°52.74	\$07°50.80	142°49.98 157°24.03	15.1'	N12°4.31 12°16.52	12.2'	54.7'
1 2	191°52.74 206°52.85	49.85 48.91	157°24.03 171°58.02	15.0' 14.9'	12°16.52 12°28.68	12.2' 12.1'	54.7' 54.7'
3	221°52.97	47.96	186°31.95	14.9'	12°40.79	12.1'	54.7'
4	236°53.09	47.01	201°5.83	14.8'	12°52.86	12.0'	54.7'
5	251°53.21	46.06	215°39.64	14.7'	13°4.89	12.0'	54.8'
6 7	266°53.32 281°53.44	S07°45.11 44.17	230°13.39 244°47.07	14.7' 14.6'	N13°16.87 13°28.80	11.9' 11.9'	54.8' 54.8'
8	296°53.56	43.22	259°20.70	14.6'	13°40.68	11.8'	54.8'
9	311°53.68	• • 42.27	273°54.26	14.5'	13°52.52	11.8'	54.8'
10	326°53.79	41.32	288°27.75	14.4'	14°4.30	11.7'	54.8'
11	341°53.91 356°54.03	40.37 \$07°39.42	303°1.18 317°34.54	14.4' 14.3'	14°16.03 N14°27.71	11.7' 11.6'	54.9' 54.9'
12 13	350 54.03 11°54.15	38.47	317 34.54 332°7.83	14.3	14°39.34	11.6'	54.9' 54.9'
14	26°54.27	37.52	346°41.05	14.2'	14°50.91	11.5'	54.9'
15	41°54.39	• • 36.57	1°14.21	14.1'	15°2.43	11.5'	54.9'
16	56°54.51	35.62	15°47.29	14.0'	15°13.89	11.4'	54.9'
17 18	71°54.63 86°54.75	34.67 \$07°33.72	30°20.31 44°53.25	13.9' 13.9'	15°25.30 N15°36.64	11.3' 11.3'	55.0' 55.0'
19	80 54.75 101°54.87	32.77	59°26.11	13.8'	15°47.93	11.3	55.0'
20	116°54.99	31.82	73°58.91	13.7'	15°59.16	11.2'	55.0'
21	131°55.11	• • 30.87	88°31.63	13.6'	16°10.32	11.1'	55.0'
22 23	146°55.23 161°55.35	29.92 28.97	103°4.28 117°36.84	13.6' 13.5'	16°21.43 16°32.47	11.0' 11.0'	55.1' 55.1'
23			11/ 30.84			11.0	1.cc
	SD = 16.1'	d = -0.9'		SL	0 = 14.9'		

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

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

١			Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age		
İ	Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper Lower		2-4	
l		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-11%	
l	27	12:51	12:46	12:13	13:31	01:11		
l	28	12:40	12:35	12:13	14:12	01:51		
	29	12:30	12:24	12:12	14:55	02:33		

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	159° 19.57	135°51.67 N11°5.02	172°32.12 <b>S</b> 06°41.16	344°10.01 N03°43.65	135°24.50 N07°29.61
1	174°22.03	150°51.59 6.22	187°32.77 40.38	359°12.76 43.77	150°26.72 29.71
2	189°24.50	165°51.51 7.42	202°33.41 39.60	14°15.50 43.90	165°28.94 29.81
3	204°26.96	180°51.43 · · 8.62	217°34.05 · · 38.83	29°18.25 · · 44.03	180°31.17 · · 29.91
4	219°29.43	195°51.34 9.81	232°34.69 38.05	44°21.00 44.16	195°33.39 30.01
5	234°31.89	210°51.26 11.01	247°35.34 37.28	59°23.75 44.28	210°35.61 30.11
6	249°34.35	225°51.18 N11°12.21	262°35.98 <b>S</b> 06°36.50	74°26.49 N03°44.41	225°37.84 N07°30.21
7	264°36.82	240°51.10 13.40	277° 36.62 35.72	89°29.24 44.54	240°40.06 30.31
8	279°39.28	255°51.02 14.60	292°37.27 34.95	104°31.99 44.67	255°42.28 30.41
9	294°41.75	270°50.94 · · 15.79	307°37.91 · · 34.17	119°34.74 · · 44.79	270°44.51 · · 30.51
10	309°44.21	285°50.85 16.99	322°38.55 33.39	134°37.48 44.92	285°46.73 30.61
11	324° 46.68	300°50.77 18.18	337°39.20 32.61	149°40.23 45.05	300°48.95 30.72
12	339°49.14	315°50.69 N11°19.38	352°39.84 <b>S</b> 06°31.84	164°42.98 N03°45.18	315°51.18 N07°30.82
13	354°51.60	330°50.61 20.57	7°40.48 31.06	179°45.73 45.30	330°53.40 30.92
14	9°54.07	345°50.53 21.76	22°41.13 30.28	194°48.48 45.43	345°55.62 31.02
15	24°56.53	0°50.45 · · 22.95	37°41.77 · · 29.51	209°51.23 · · 45.56	0°57.84 · · 31.12
16	39°59.00	15°50.37 24.15	52°42.42 28.73	224°53.97 45.69	16°0.06 31.22
17	55°1.46	30°50.29 25.34	67°43.06 27.95	239°56.72 45.81	31°2.29 31.32
18	70°3.92	45°50.21 N11°26.53	82°43.71 S06°27.17	254°59.47 N03°45.94	46°4.51 N07°31.42
19	85°6.39	60°50.13 27.72	97°44.35 26.40	270°2.22 46.07	61°6.73 31.52
20	100°8.85	75°50.05 28.91	112°44.99 25.62	285° 4.97 46.20	76°8.95 31.63
21	$115^{\circ}11.32$	90°49.96 · · 30.10	127°45.64 · · 24.84	300°7.72 · · 46.33	91°11.17 · · 31.73
22	130° 13.78	105°49.88 31.29	142°46.28 24.06	315°10.47 46.45	106°13.40 31.83
23	145°16.24	120°49.80 32.48	157°46.93 23.28	330°13.22 46.58	121°15.62 31.93
	12:01	ν-0.1' d1.2' m-4.29	ν0.6' d-0.8' m1.05	ν2.7' d0.1' m-2.47	ν2.2' d0.1' m0.58
ivier.p	pass. 13:21	ν-υ.1 α1.2 m-4.29	νυ.υ <i>α</i> -υ.δ m1.υ5	ν2.1 αυ.1 m-2.41	ν2.2 αU.1 mU.58
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$160^{\circ}18.71$	135°49.72 N11°33.67	172°47.57 <b>S</b> 06°22.51	345°15.97 N03°46.71	136°17.84 N07°32.03
1	175°21.17	150°49.64 34.86	187°48.22 21.73	0°18.72 46.84	151°20.06 32.13
2	190°23.64	165°49.56 36.04	202°48.87 20.95	15°21.47 46.97	166°22.28 32.23
3	205°26.10	180°49.48 · · 37.23	217°49.51 · · 20.17	30°24.22 · · 47.09	181°24.50 · · 32.34
4	220°28.56	195°49.40 38.42	232°50.16 19.39	45°26.96 47.22	196°26.72 32.44
5	235°31.03	210°49.32 39.60	247°50.80 18.61	60°29.71 47.35	211°28.95 32.54
6	250°33.49	225°49.24 N11°40.79	262°51.45 \$06°17.83	75°32.46 N03°47.48	226°31.17 N07°32.64
7	265°35.96	240°49.16 41.98	277°52.09 17.06	90°35.21 47.61	241°33.39 32.74
8	280°38.42	255°49.08 43.16	292°52.74 16.28	105°37.96 47.74	256°35.61 32.84
9	295° 40.89	270°49.01 · · 44.35	307°53.39 · · 15.50	120°40.71 · · 47.86	271°37.83 · · 32.95
10	310°43.35	285°48.93 45.53	322°54.03 14.72	135°43.47 47.99	286°40.05 33.05
11	325° 45.81	300°48.85 46.71	337°54.68 13.94	150°46.22 48.12	301°42.27 33.15
12	340° 48.28	315°48.77 N11°47.90	352°55.33 S06°13.16	165°48.97 N03°48.25	316°44.49 N07°33.25
13	355°50.74	330°48.69 49.08	7°55.97 12.38	180°51.72 48.38	331°46.71 33.35
14	10°53.21	345°48.61 50.26	22°56.62 11.60	195°54.47 48.51	346°48.93 33.45
15	25°55.67	0°48.53 · · 51.44	37° 57.27 · · 10.82	210°57.22 · · 48.63	1°51.15 · · 33.56
16	40°58.13	15°48.45 52.62	52°57.91 10.04	225°59.97 48.76	16°53.37 33.66
17	56°0.60	30°48.37 53.81	67° 58.56 9.26	241°2.72 48.89	31°55.59 33.76
18	71°3.06	45°48.29 N11°54.99	82°59.21 <b>S</b> 06°8.48	256° 5.47 N03° 49.02	46°57.81 N07°33.86
19	86°5.53	60°48.22 56.17	97°59.86 7.71	271°8.22 49.15	62°0.03 33.96
20	101°7.99	75°48.14 57.35	113°0.50 6.93	286°10.97 49.28	77°2.25 34.07
21	116° 10.45	90°48.06 · · 58.53	128°1.15 · · 6.15	301°13.73 · · 49.40	92°4.47 · · 34.17
22	131° 12.92	105°47.98 11°59.70	143°1.80 5.37	316°16.48 49.53	107°6.69 34.27
23	146° 15.38	120°47.90 12°0.88	158°2.45 4.59	331°19.23 49.66	122°8.91 34.37
	10.17		-		
Mer.p	pass. 13:17	ν-0.1' d1.2' m-4.29	$\nu$ 0.6' d-0.8' m1.05	ν2.7' d0.1' m-2.47	ν2.2′ d0.1′ m0.58
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	161° 17.85	135°47.82 N12°2.06	173°3.10 \$06°3.81	346°21.98 N03°49.79	137°11.13 N07°34.47
1	176° 20.31	150° 47.75 3.24	188°3.74 3.03	1°24.73 49.92	152°13.35 34.58
2	191°22.78	165°47.67 4.41	203°4.39 2.25	16°27.48 50.05	167°15.56 34.68
3	206°25.24	180°47.59 · · 5.59	218°5.04 · · 1.46	31°30.24 · · 50.18	182°17.78 · · 34.78
4	221°27.70	195°47.51 6.77	233°5.69 06°0.68	46°32.99 50.31	197°20.00 34.88 <b>N</b>
5	236°30.17	210°47.43 7.94	248°6.34 05°59.90	61°35.74 50.43	212°22.22 34.99
6	251°32.63	225°47.36 N12°9.12	263°6.99 S05°59.12	76°38.49 N03°50.56	227°24.44 N07°35.09
7	266°35.10	240°47.28 10.29	278°7.64 58.34	91°41.24 50.69	242°26.66 35.19
8	281°37.56	255°47.20 11.47	293°8.29 57.56	106°44.00 50.82	257°28.88 35.29
9	296°40.02	270°47.12 · · 12.64	308°8.93 · · 56.78	121°46.75 · · 50.95	272°31 09 · · 35 39
10	311°42.49	285°47.05 13.81	323°9.58 56.00	136°49.50 51.08	287°33.31 35.50
11	326°44.95	300°46.97 14.99	338°10.23 55.22	151°52.25 51.21	302°35.53 35.60
12	341°47.42	315°46.89 N12°16.16	353°10.88	166°55.01 N03°51.34	317°37.75 N07°35.70
13	$356^{\circ}49.88$	330°46.81 17.33	8° 11.53 53.66	181°57.76 51.47	332°39.97 35.80
14	11°52.35	345°46.74 18.50	23° 12.18 52.88	197° 0.51 51.59	347°42.19 35.91 <u></u>
15	$26^{\circ}54.81$	0°46.66 · · 19.67	38°12.83 · · 52.10	212° 3.26 · · 51.72	2°44.40 · · 36.01
16	41°57.27	15°46.58 20.84	53°13.48 51.31	227°6.02 51.85	17°46.62 36.11
17	56° 59.74	30°46.51 22.01	68° 14.13 50.53	242°8.77 51.98	32°48.84 36.21
18	72°2.20	45°46.43 N12°23.18	83°14.78	257°11.52 N03°52.11	47°51.06 N07°36.32
19	87°4.67	60°46.35 24.35	98°15.43 48.97	272°14.28 52.24	62°53.27 36.42
20	102°7.13	75°46.28 25.52	113°16.08 48.19	287°17.03 52.37	77°55.49 36.52
21	117°9.59	90°46.20 · · 26.69	128° 16.73 · · 47.41	302°19.78 · · 52.50	92°57.71 · · 36.62
22	132° 12.06	105°46.12 27.86	143°17.38 46.62	317°22.54 52.63	107°59.93 36.73
23	$147^{\circ}14.52$	120°46.05 29.02	158° 18.04 45.84	332°25.29 52.76	123°2.14 36.83
			-		
ivier.p	pass. 13:13	ν-0.1' d1.2' m-4.30	ν0.6' d-0.8' m1.04	ν2.8′ d0.1′ m-2.47	ν2.2' d0.1' m0.58

357°32.40	29°14.80
05005.00	0
353°5.02	-42°9.27
349°28.50	$56^{\circ}41.66$
	-17°50.01
	-57°5.80
	23°35.77
	89°23.21
	-40°11.74
	4°11.93
	49°57.81
	16°33.89
	-8°10.34
	46°1.64
	6°22.38
	28°37.84
	-1°11.21
	7°24.59
	-52°42.95
	-16°45.55
	-29°0.91
	5°8.96
	27°57.36
	-59°36.26
	-43°33.04
221°36.80	-69°50.18
217°44.91	-8°47.09
207°31.38	11°49.54
	61°35.74
	$14^{\circ}24.62$
$175^{\circ}40.60$	$-17^{\circ}42.08$
$172^{\circ}56.47$	$-63^{\circ}15.33$
171°48.16	$-57^{\circ}16.29$
$166^{\circ}10.31$	$55^{\circ}48.10$
$158^{\circ}19.32$	-11°18.66
152°49.69	49°10.02
148°31.84	-60°30.42
147°54.28	-36°30.51
$145^{\circ}45.36$	$19^{\circ}1.87$
$139^{\circ}36.30$	-60°56.96
$137^{\circ}19.46$	$74^{\circ}1.98$
$136^{\circ}52.99$	$-16^{\circ}9.61$
$126^{\circ}1.47$	$26^{\circ}36.90$
$112^{\circ}12.63$	$-26^{\circ}29.61$
$107^{\circ}4.54$	-69°4.36
$101^{\circ}59.85$	$-15^{\circ}45.58$
	-37°7.30
95°56.23	$12^{\circ}32.21$
	51°28.79
	-34°22.13
	38°48.34
75°44.76	-26°15.60
	8°56.49
53°2.20	-56°38.46
49°24.40	45°22.73
	10°0.22
	-46°49.41
15°12.06	-29°28.39
13°43.02	28°14.15
13°27.63	15°21.40
CHV	Mer.pass
	14:57
	12:29
	01:03
	14:56
SHA	Mer.pass
335°31.02	14:57
12°28.87	12:28
	00:59
335°59.13	14:53
SHA	Mer.pass
	14:57
	12:27
	00:54
	14:49
	14:49
ıtal parallax	
Venus:	0.2
Mars:	0.2
	217° 44.91 207° 31.38 193° 37.29 182° 22.02 175° 40.60 172° 56.47 171° 48.16 166° 10.31 158° 19.32 152° 49.69 148° 31.84 147° 54.28 139° 36.30 137° 19.46 136° 52.99 126° 1.47 112° 12.63 107° 4.54 101° 59.85 96° 6.94 95° 56.23 90° 41.15 83° 29.26 80° 31.66 75° 44.76 61° 57.67 53° 2.20 49° 24.40 33° 36.56 27° 30.19 15° 12.06 13° 43.02 13° 27.63  SHA 336° 32.10 13° 12.55 184° 50.44 336° 4.93  SHA 336° 31.02 12° 28.87 184° 57.26 335° 59.13  SHA 334° 29.98 11° 45.25 185° 4.13 335° 53.28

Stars SHA

Dec

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°55.47	S07°28.01	132°9.34	13.4'	N16°43.44	10.9'	55.1'
1	191°55.60	27.06	146°41.75	13.3'	16°54.36	10.8'	55.1'
2	206°55.72	26.11	161°14.09	13.3'	17°5.20	10.8	55.1'
3 4	221°55.84 236°55.96	· · 25.16 24.21	175°46.35 190°18.53	13.2' 13.1'	17°15.98 17°26.69	10.7' 10.6'	55.2' 55.2'
5	251°56.08	23.25	204°50.63	13.0'	17°37.33	10.6'	55.2'
6	266°56.21	S07°22.30	219°22.65	12.9'	N17°47.90	10.5'	55.2'
7	281°56.33	21.35	233°54.59	12.9'	17°58.40	10.4'	55.3'
8	296°56.45	20.40	248°26.44	12.8'	18°8.82	10.4'	55.3'
9	311°56.58 326°56.70	19.44	262°58.21 277°29.90	12.7'	18°19.18 18°29.45	10.3'	55.3'
10 11	320 50.70 341°56.82	18.49 17.54	277 29.90 292°1.51	12.6' 12.5'	18° 29.45 18° 39.66	10.2' 10.1'	55.3' 55.3'
12	356°56.95	S07°16.58	306°33.03	12.4	N18°49.78	10.0'	55.4'
13	11°57.07	15.63	321°4.46	12.3'	$18^{\circ}59.83$	10.0'	55.4'
14	26°57.20	14.67	335°35.81	12.3'	19°9.80	9.9'	55.4'
15 16	41°57.32 56°57.45	· · 13.72 12.76	350°7.08 4°38.25	12.2' 12.1'	19°19.68 19°29.49	9.8' 9.7'	55.4' 55.5'
17	71°57.57	12.76	4 36.25 19°9.34	12.1	19 29.49 19°39.22	9.7 9.6'	55.5'
18	86°57.70	S07°10.86	33°40.34	11.9'	N19°48.86	9.6'	55.5'
19	101°57.82	9.90	48°11.26	11.8'	19°58.41	9.5'	55.5'
20	116°57.95	8.95	62°42.08	11.7'	20°7.88	9.4'	55.6'
21	131°58.07	• • 7.99	77°12.82	11.6'	20°17.27	9.3'	55.6'
22 23	146°58.20 161°58.33	7.03 6.08	91°43.46 106°14.02	11.6' 11.5'	20°26.56 20°35.77	9.2' 9.1'	55.6' 55.6'
23			100 14.02			9.1	33.0
	SD = 16.1'	d = -1.0'		SI	O = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°58.45	S07°5.12	120°44.48	11.4'	N20°44.88	9.0'	55.7'
1	191°58.58	4.17	135°14.86	11.3'	20°53.91	8.9'	55.7'
2	206°58.71	3.21	149°45.14	11.2'	21°2.84	8.8'	55.7'
3 4	221°58.83 236°58.96	· · 2.25 1.30	164°15.33 178°45.43	11.1' 11.0'	21°11.68 21°20.42	8.7' 8.6'	55.7' 55.8'
5	250 56.90 251°59.09	07°0.34	176 45.45 193°15.44	10.9	21°29.06	8.5'	55.8'
6	266°59.22	S06°59.38	207°45.35	10.8'	N21°37.61	8.5'	55.8'
7	281°59.35	58.43	222°15.18	10.7'	21°46.06	8.4'	55.8'
8	296°59.47	57.47	236°44.91	10.6'	21°54.41	8.2'	55.9'
9	311°59.60	• • 56.51	251°14.54	10.5'	22°2.66	8.1'	55.9'
10 11	326°59.73 341°59.86	55.56 54.60	265°44.09 280°13.54	10.5' 10.4'	22°10.81 22°18.86	8.0' 7.9'	55.9' 55.9'
12	356°59.99	S06°53.64	294°42.89	10.4	N22°26.80	7.8	56.0'
13	12°0.12	52.68	309°12.16	10.2'	22°34.63	7.7'	56.0'
14	27° 0.25	51.72	323°41.33	10.1'	22°42.36	7.6'	56.0'
15	42°0.38 57°0.51	• • 50.77	338°10.40	10.0'	22°49.98 22°57.49	7.5'	56.1'
16 17	72° 0.64	49.81 48.85	352°39.38 7°8.27	9.9' 9.8'	22°57.49 23°4.89	7.4' 7.3'	56.1' 56.1'
18	87° 0.77	506°47.89	21°37.07	9.7	N23°12.17	7.2	56.1
19	102°0.90	46.93	36°5.77	9.6'	23°19.35	7.1'	56.2'
20	117° 1.03	45.97	50°34.38	9.5'	23°26.41	6.9'	56.2'
21	132°1.16	• • 45.01	65°2.89	9.4'	23°33.36	6.8'	56.2'
22 23	147° 1.29 162° 1.43	44.05 43.09	79°31.32 93°59.65	9.3' 9.2'	23°40.19 23°46.90	6.7' 6.6'	56.3' 56.3'
23			93 59.05	-		0.0	50.3
	SD = 16.1'	d = -1.0'		SI	O = 15.2'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177° 1.56	S06°42.13	$108^{\circ}27.88$	9.1'	N23°53.49	6.5'	56.3'
1	192°1.69	41.17	122°56.03	9.1'	23°59.96	6.4'	56.3'
2	207° 1.82 222° 1.95	40.21 •• 39.25	137°24.08 151°52.04	9.0' 8.9'	24°6.31 24°12.54	6.2'	56.4'
3 4	222°1.95 237°2.09	39.25	151°52.04 166°19.91	8.9'	24°12.54 24°18.65	6.1' 6.0'	56.4' 56.4'
5	252° 2.22	37.33	180°47.69	8.7'	24°24.63	5.9'	56.5'
6	267° 2.35	S06°36.37	195°15.38	8.6'	N24°30.49	5.7'	56.5'
7	282° 2.49	35.41	209°42.97	8.5'	24°36.21	5.6'	56.5'
8	297°2.62	34.45	224°10.48	8.4'	24°41.81	5.5'	56.6'
9 10	312°2.75 327°2.89	· · 33.49 32.53	238°37.90 253°5.23	8.3' 8.2'	24°47.28 24°52.62	5.3' 5.2'	56.6' 56.6'
11	327 2.89 342° 3.02	32.53 31.56	253 5.23 267°32.47	8.2'	24 52.02 24°57.83	5.2 5.1'	56.7'
12	357° 3.16	S06°30.60	281°59.63	8.1'	N25°2.91	4.9'	56.7
13	12°3.29	29.64	$296^{\circ}26.69$	8.0'	25°7.85	4.8'	56.7'
14	27°3.42	28.68	310°53.67	7.9'	25°12.65	4.7'	56.7'
15 16	42° 3.56 57° 3.69	· · 27.72 26.75	325°20.57 339°47.38	7.8' 7.7'	25°17.32 25°21.85	4.5' 4.4'	56.8' 56.8'
16 17	72° 3.83	26.75 25.79	354°14.11	7.7° 7.6'	25°21.85 25°26.25	4.4	56.8'
18	87° 3.96	S06°24.83	8°40.75	7.6'	N25°30.50	4.1'	56.9'
19	102°4.10	23.87	23°7.32	7.5'	25°34.62	4.0'	56.9'
20	117° 4.24	22.90	37°33.80	7.4'	25°38.59	3.8'	56.9'
21	132° 4.37	• • 21.94	52°0.20	7.3'	25°42.42	3.7'	57.0'
22 23	147° 4.51 162° 4.65	20.98 20.01	66°26.52 80°52.76	7.2' 7.2'	25°46.10 25°49.64	3.5' 3.4'	57.0' 57.0'
23						J. <del>4</del>	31.0
	SD = 16.1'	d = -1.0'		SL	D = 15.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-36%	
01	12:18	12:12	12:12	15:41	03:17		
02	12:06	12:00	12:12	16:30	04:05		
03	11.54	11.47	12.12	17.24	04.57		

h	Aries	Venu	ıs	M	ars	Jup	oiter	Sat	turn
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162° 16.99	135°45.97	12°30.19	173° 18.69	S05°45.06	347°28.04	N03°52.89	138°4.36	N07°36.93
1	$177^{\circ}19.45$	150°45.90	31.35	188° 19.34	44.28	2°30.80	53.02	153°6.58	37.04
2	192°21.92	165°45.82	32.52	203°19.99	43.50	17°33.55	53.14	168°8.79	37.14
3	207°24.38	180°45.74	• • 33.69	218°20.64	• • 42.71	32°36.31	• • 53.27	$183^{\circ}11.01$	• • 37.24
4	222°26.84	195°45.67	34.85	233°21.29	41.93	47°39.06	53.40	198°13.23	37.34
5	$237^{\circ}29.31$	210°45.59	36.01	248°21.94	41.15	62°41.81	53.53	213°15.44	37.45
6	252°31.77		12°37.18	263°22.59	S05°40.37	77°44.57	N03°53.66	228°17.66	N07°37.55
7	267°34.24	240°45.44	38.34	278°23.25	39.59	92°47.32	53.79	243°19.88	37.65
8	282°36.70	255° 45.37	39.50	293°23.90	38.80	107°50.08	53.92	258°22.09	37.76
9	297°39.16	270°45.29	• • 40.67	308°24.55	• • 38.02	122°52.83	• • 54.05	273°24.31	• • 37.86
10	312°41.63	285°45.22	41.83	323°25.20	37.24	137°55.59	54.18	288°26.52	37.96
11	327°44.09	300°45.14	42.99	338°25.85	36.46	152°58.34	54.31	303°28.74	38.06
12	342° 46.56		12°44.15	353°26.51	S05°35.67	168°1.10	N03°54.44	318°30.96	N07°38.17
13	357°49.02	330°44.99	45.31	8°27.16	34.89	183°3.85	54.57	333°33.17	38.27
14	12°51.49	345°44.92	46.47	23°27.81	34.11	198° 6.61	54.70	348°35.39	38.37
15	27°53.95	0°44.84	• • 47.63	38°28.46	• • 33.32	213°9.36	• • 54.83	3°37.60	• • 38.48
16	42°56.41	15°44.77	48.79	53°29.12	32.54	228°12.11	54.96	18°39.82	38.58
17	57°58.88	30°44.69	49.95	68°29.77	31.76	243°14.87	55.09	33°42.03	38.68
18	73°1.34		112°51.11	83°30.42	S05°30.97	258°17.62	N03°55.22	48°44.25	N07°38.79
19	88°3.81	60°44.54	52.26	98°31.08	30.19	273°20.38	55.34	63°46.46	38.89
20	103°6.27	75° 44.47	53.42	113°31.73	29.41	288°23.14	55.47	78°48.68	38.99
21	118°8.73	90°44.39	• • 54.58	128°32.38	• • 28.62	303°25.89	• • 55.60	93°50.89	• • 39.10
22	133°11.20	105°44.32	55.73	143°33.04	27.84	318°28.65	55.73	108°53.11	39.20
23	148°13.66	120°44.25	56.89	158°33.69	27.06	333°31.40	55.86	123°55.32	39.30
Mer.p	pass. 13:09	$\nu$ -0.1' $d1.2'$	m-4.31	$\nu$ 0.7′ d-0	0.8′ m1.04	$\nu$ 2.8′ d0.	1′ m-2.48	$\nu^{2.2'} d0$	.1′ m0.58
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°16.13		112°58.04	173°34.34	S05°26.27	348°34.16	N03°55.99	138°57.54	N07°39.41
1	178° 18.59	150° 44.10	12°59.20	188°35.00	25.49	3°36.91	56.12	153°59.75	39.51
2	193°21.06	165°44.02	13°0.35	203°35.65	24.71	18°39.67	56.25	169°1.97	39.61
3	208° 23.52	180°43.95	• • 1.50	218°36.31	• • 23.92	33°42.42	56.38	184°4.18	39.72
4	223°25.98	195°43.88	2.66	233°36.96	23.14	48°45.18	56.51	199°6.40	39.82
5	238°28.45	210°43.80	3.81	248°37.61	22.36	63°47.94	56.64	214°8.61	39.92
6	253°30.91	225°43.73	N13°4.96	263°38.27	S05°21.57	78°50.69	N03°56.77	229°10.83	N07°40.03
7	268° 33.38	240°43.66	6.11	278°38.92	20.79	93°53.45	56.90	244°13.04	40.13
8	283°35.84	255°43.58	7.26	293°39.58	20.00	108°56.20	57.03	259°15.25	40.23
9	298°38.30	270°43.51	• • 8.42	308°40.23	• • 19.22	123°58.96	• • 57.16	274°17.47	• • 40.34
10	313° 40.77	285°43.44	9.57	323°40.89	18.43	139° 1.72	57.29	289°19.68	40.44
11	328° 43.23	300°43.36	10.71	338°41.54	17.65	154° 4.47	57.42	304°21.90	40.54
12	343° 45.70	315°43.29	13°11.86	353°42.20	S05°16.87	169°7.23	N03°57.55	319°24.11	N07°40.65
13	358°48.16	330°43.22	13.01	8°42.85	16.08	184° 9.99	57.68	334°26.32	40.75
14	13°50.63	345°43.15	14.16	23°43.51	15.30	199°12.74	57.81	349°28.54	40.86
15	28°53.09	0°43.07	• • 15.31	38°44.16	• • 14.51	214°15.50	• • 57.94	4°30.75	• • 40.96
16	43°55.55	15°43.00	16.45	53°44.82	13.73	229°18.26	58.07	19°32.96	41.06
17	58° 58.02	30°42.93	17.60	68°45.47	12.94	244°21.01	58.20	34°35.18	41.17
18	74°0.48		13°18.75	83°46.13	S05°12.16	259°23.77	N03°58.33	49°37.39	N07°41.27
19	89°2.95	60°42.79	19.89	98°46.79	11.37	274°26.53	58.46	64°39.60	41.37
20	104°5.41	75°42.71	21.04	113°47.44	10.59	289°29.28	58.59	79°41.82	41.48
21	119°7.87		• • 22.18	128°48.10	• • 9.80	304°32.04	• • 58.72	94°44.03	• • 41.58
22	134° 10.34	105°42.57	23.33	143°48.75	9.02	319°34.80	58.85	109°46.24	41.69
23	149°12.80	120°42.50	24.47	158°49.41	8.23	334°37.55	58.98	124°48.45	41.79
Mer.p	pass. 13:05	ν-0.1' d1.2'	m-4.32	$\nu$ 0.7′ d-0	0.8′ m1.04	$\nu$ 2.8′ d0.	1′ m-2.48	$\nu$ 2.2′ d0	.1′ m0.58
					_		_		_
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164° 15.27	135°42.43 N		173°50.07	S05°7.45	349°40.31		139°50.67	
1	179° 17.73	150° 42.35	26.75	188° 50.72	6.66	4°43.07	59.24	154°52.88	42.00
2	194°20.20	165°42.28	27.90	203°51.38	5.88	19°45.83	59.37	169°55.09	42.10
3	209°22.66	180° 42.21	• • 29.04	218°52.04	• • 5.09	34°48.58	• • 59.50	184°57.30	• • 42.21
4	224°25.12	195°42.14	30.18	233°52.69	4.31	49°51.34	59.63	199°59.52	42.31
5	239°27.59	210°42.07	31.32	248° 53.35	3.52	64°54.10	59.76	215°1.73	42.41
6	254°30.05		113°32.46	263°54.01	\$05°2.74		N03°59.89	230°3.94	N07°42.52
7	269°32.52	240°41.93 255°41.86	33.60	278° 54.67 293° 55.32	1.95	94°59.61 110°2.37	04°0.02	245°6.15 260°8.36	42.62
8	284°34.98 299°37.44	255°41.86 270°41.79	34.74 •• 35.87	293°55.32 308°55.98	1.17 05°0.38	110°2.37 125°5.13	0.15	260°8.36 275°10.58	42.73 •• 42.83
9		270°41.79 285°41.72			05°0.38 04°59.60	125°5.13 140°7.89			
10	314°39.91 329°42.37	285°41.72 300°41.64	37.01 38.15	323°56.64 338°57.29		140° 7.89 155° 10.64	0.41 0.54	290°12.79 305°15.00	42.94 43.04
11 12	329° 42.37 344° 44.84	300°41.64 315°41.57			58.81 \$04°58.02	155° 10.64 170° 13.40	0.54 N04°0.67	305°15.00 320°17.21	
13	344° 44.84 359° 47.30	315°41.57 N	40.42	353°57.95 8°58.61	504 58.02 57.24	170° 13.40 185° 16.16	0.80	320°17.21 335°19.42	43.14 43.25
13 14	359° 47.30 14° 49.77	345°41.43	40.42 41.56	23°59.27	57.24 56.45	200°18.92	0.80	350°21.63	43.25 43.35
	14° 49.77 29° 52.23	0°41.36	41.56	23°59.27 38°59.93	56.45	200° 18.92 215° 21.68	1.06	5°23.85	43.35 •• 43.46
15 16	29°52.23 44°54.69	0°41.36 15°41.29	43.83	54° 0.58	54.88	215°21.68 230°24.43	1.19	5°23.85 20°26.06	43.46
10 17	44 54.69 59°57.16	30°41.22	43.83 44.96	69°1.24	54.88 54.09	230 24.43 245°27.19	1.19	20 26.06 35°28.27	43.50 43.67
18	74°59.62		44.96 113°46.10		54.09 \$04°53.31	245 27.19 260°29.95	1.32 N04°1.45	50°30.48	43.07 N07°43.77
19	90°2.09	60°41.08	47.23	99°2.56	52.52	200 29.95 275°32.71	1.58	65°32.69	43.87
20	105°4.55	75°41.01	48.36	114°3.22	52.52	275 32.71 290°35.47	1.71	80°34.90	43.98
21	105 4.55 120°7.01	75 41.01 90°40.94	48.30	114 3.22 129°3.88	50.95	305°38.23	1.71	95°37.11	· · 44.08
22	135°9.48	105°40.88	50.62	144° 4.54	50.16	320°40.99	1.98	110°39.32	44.19
23	150°11.94	120°40.81	51.76	159°5.19	49.38	335°43.74	2.11	125°41.53	44.19
Mer.p	ass. 13:01	$\nu$ -0.1' $d1.1'$	m-4.32	$\nu$ 0.7′ $d$ -0	).8′ m1.04	$\nu$ 2.8′ d0.	1′ m-2.48	$\nu$ 2.2′ d0	.1′ m0.58

	Stars	
	SHA	Dec
Alpheratz	357°32.40	29° 14.79
Ankaa Schedar	353°5.03 349°28.50	-42°9.25 56°41.65
Diphda	$348^{\circ}45.01$	-17°50.00
Achernar Hamal	335°18.76 327°48.47	-57°5.79 23°35.76
Hamai Polaris	327°48.47 312°51.04	23°35.76 89°23.20
Acamar	315°10.03	-40°11.73
Menkar Mirfak	314°3.57 308°24.66	4°11.93 49°57.81
Aldebaran	290°36.65	16°33.89
Rigel	281°1.34	-8°10.34
Capella Bellatrix	280°17.99 278°20.05	46°1.64 6°22.37
Elnath	277°58.53	28° 37.84
Alnilam	275°35.03 270°49.19	-1°11.21 7°24.59
Betelgeuse Canopus	263°51.03	-52°42.96
Sirius	258°23.80	-16°45.55
Adhara Procyon	255°3.63 244°47.92	-29°0.92 5°8.96
Pollux	243°13.91	27°57.37
Avior	234°13.14	-59°36.27
Suhail Miaplacidus	222°43.98 221°36.82	-43°33.05 -69°50.20
Alphard	217°44.91	-8°47.10
Regulus	207°31.38	11° 49.54 61° 35.75
Dubhe Denebola	193°37.28 182°22.00	61°35.75 14°24.62
Gienah	175°40.59	-17°42.09
Acrux Gacrux	172°56.45 171°48.14	-63°15.35 -57°16.31
Alioth	171 48.14 166°10.29	-57 16.31 55°48.11
Spica	$158^{\circ}19.30$	-11°18.67
Alkaid Hadar	152°49.66 148°31.80	49°10.02 -60°30.43
Menkent	$147^{\circ}54.26$	-36°30.53
Arcturus	145°45.34	19°1.87
Rigil Kent. Kochab	139°36.26 137°19.41	-60°56.98 74°1.98
Zuben'ubi	$136^{\circ}52.96$	-16°9.61
Alphecca Antares	126°1.44 112°12.60	26°36.90 -26°29.61
Antares	112 12.60 107°4.47	-69°4.36
Sabik	101°59.83	-15°45.58
Shaula Rasalhague	96°6.91 95°56.20	-37°7.30 12°32.21
Eltanin	90°41.11	51°28.79
Kaus Aust.	83°29.23	-34°22.12
Vega Nunki	80°31.64 75°44.73	38°48.34 -26°15.60
Altair	61°57.65	8°56.49
Peacock Deneb	53°2.17 49°24.38	-56° 38.45 45° 22.72
Deneb Enif	49°24.38 33°36.55	10°0.22
Al Na'ir	$27^{\circ}30.17$	-46°49.39
Fomalhaut Scheat	15°12.05 13°43.02	-29°28.38 28°14.14
Markab	13°27.63	15° 21.40
Mar 04 Sat	SHA	Mer.pass
Venus Mars	333°28.99 11°1.70	14:57 12:26
Jupiter	11°1.70 185°11.06	00:50
Saturn	335°47.37	14:46
Mar 05 Sun	SHA	Mer.pass
Venus Mars	332°28.05 10°18.22	14:57 12:25
Jupiter	$185^{\circ}18.03$	00:46
Saturn	335°41.41	14:42
Mar 06 Mon Venus	<b>SHA</b> 331°27.16	Mer.pass 14:57
Venus Mars	9°34.80	12:24
Jupiter	185°25.04	00:41
Saturn	335°35.40	14:38
Horizon	tal parallax Venus:	0.2
	Venus: Mars:	0.2 0.1

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°4.78	S06°19.05	95°18.93	7.1'	N25°53.03	3.2'	57.1'
1 2	192°4.92 207°5.06	18.09 17.12	109°45.01 124°11.03	7.0' 6.9'	25°56.28 25°59.38	3.1' 2.9'	57.1' 57.1'
3	222°5.19	16.16	138°36.97	6.9'	26°2.33	2.8'	57.2'
4	237°5.33	15.19	153° 2.83	6.8'	26°5.13	2.6'	57.2'
5 6	252°5.47 267°5.61	14.23 \$06°13.27	167°28.62 181°54.35	6.7' 6.7'	26°7.78 N26°10.27	2.5'	57.2' 57.3'
7	282°5.74	12.30	196°20.00	6.6'	26°12.62	2.3	57.3'
8	297°5.88	11.34	210°45.58	6.5'	$26^{\circ}14.81$	2.0'	57.4'
9	312°6.02 327°6.16	• • 10.37	225°11.10 239°36.55	6.5'	26°16.84 26°18.72	1.9'	57.4' 57.4'
10 11	342°6.30	9.41 8.44	239 30.55 254°1.94	6.4' 6.3'	26 18.72 26°20.45	1.7' 1.6'	57.4 57.5'
12	357°6.44	S06°7.48	268°27.27	6.3'	N26°22.02	1.4'	57.5'
13	12°6.58	6.51	282°52.53	6.2'	26°23.42	1.2'	57.5'
14 15	27°6.72 42°6.86	5.55 •• 4.58	297°17.73 311°42.88	6.1' 6.1'	26°24.67 26°25.76	1.1' 0.9'	57.6' 57.6'
16	57°7.00	3.61	326°7.96	6.0'	26°26.69	0.8'	57.6'
17	72°7.14	2.65	340°33.00	6.0'	26°27.46	0.6'	57.7'
18 19	87°7.28 102°7.42	S06°1.68 06°0.72	354°57.97 9°22.90	5.9' 5.9'	N26°28.07	0.4' 0.3'	57.7' 57.7'
20	117°7.56	05°59.75	23°47.77	5.8'	26°28.79	0.3	57.8'
21	132°7.70	• • 58.78	38°12.59	5.8'	$26^{\circ}28.91$	-0.0'	57.8'
22	147°7.84 162°7.98	57.82	52°37.37 67°2.10	5.7'	26°28.86 26°28.64	-0.2'	57.8'
23		56.85	67-2.10	5.7'		-0.4'	57.9'
	SD = 16.1'	d = -1.0'		SI	O = 15.6'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°8.12	S05°55.88	81°26.78	5.6'	N26°28.27	-0.5'	57.9'
1 2	192°8.26 207°8.41	54.92 53.95	95°51.43 110°16.03	5.6' 5.6'	26°27.72 26°27.01	-0.7' -0.9'	58.0' 58.0'
3	222°8.55	52.98	124°40.59	5.5'	26°26.13	-1.0'	58.0'
4	237°8.69	52.01	139°5.11	5.5'	26°25.08	-1.2'	58.1'
5 6	252°8.83 267°8.97	51.05 \$05°50.08	153°29.59 167°54.05	5.5' 5.4'	26°23.86 N26°22.48	-1.4' -1.6'	58.1' 58.1'
7	282°9.12	49.11	182°18.47	5.4'	26°20.92	-1.0 -1.7'	58.2
8	297°9.26	48.14	196°42.85	5.4'	26°19.20	-1.9'	58.2'
9	312°9.40	• • 47.17	211°7.21	5.3'	26°17.30 26°15.24	-2.1'	58.2'
10 11	327°9.55 342°9.69	46.21 45.24	225°31.54 239°55.85	5.3' 5.3'	26°15.24 26°13.00	-2.2' -2.4'	58.3' 58.3'
12	357°9.83	S05°44.27	254°20.13	5.3'	N26°10.60	-2.6'	58.4'
13	12°9.98	43.30	268°44.39	5.2'	26°8.02	-2.7'	58.4'
14 15	27° 10.12 42° 10.27	42.33 •• 41.36	283°8.62 297°32.84	5.2' 5.2'	26°5.27 26°2.35	-2.9' -3.1'	58.4' 58.5'
16	57° 10.41	40.39	311°57.05	5.2'	25°59.26	-3.3'	58.5'
17	72° 10.56	39.42	326°21.23	5.2'	25°55.99	-3.4'	58.5'
18 19	87° 10.70 102° 10.85	\$05°38.45 37.48	340°45.41 355°9.57	5.2' 5.2'	N25°52.56 25°48.95	-3.6' -3.8'	58.6' 58.6'
20	117° 10.99	36.52	9°33.72		25°45.17		58.7'
21	132° 11.14	• • 35.55	23°57.86	5.1'	25°41.22	-4.1'	58.7'
22 23	147°11.28 162°11.43	34.58 33.61	38°22.00 52°46.13	5.1' 5.1'	25°37.10 25°32.80	-4.3' -4.5'	58.7' 58.8'
23	SD = 16.1'	d = -1.0'	32 10.13		D = 15.8'	1.5	30.0
Mon 0	<b>GHA</b> 177° 11.57	<b>Dec</b> \$05°32.64	<b>GHA</b> 67°10.26	u 5.1'	Dec N25°28.33	d -4.6'	<b>HP</b> 58.8'
1	192° 11.72	31.67	81°34.39	5.1'	25°23.69	-4.8'	58.8'
2	207° 11.87	30.69	95°58.52	5.1'	25°18.88	-5.0'	58.9'
3 4	222° 12.01 237° 12.16	· · 29.72 28.75	110°22.65 124°46.79	5.1' 5.1'	25°13.90 25°8.75	-5.2' -5.3'	58.9' 58.9'
5	252° 12.31	27.78	139°10.93	5.1'	25°3.42	-5.5'	59.0'
6	267°12.45	S05°26.81	153°35.07	5.2'	N24°57.93	-5.7'	59.0'
7 8	282°12.60 297°12.75	25.84 24.87	167°59.23 182°23.39	5.2' 5.2'	24°52.26 24°46.43	-5.8' -6.0'	59.1' 59.1'
9	312° 12.75	. 23.90	102 23.39 196°47.57	5.2'	24°40.43	-6.2'	59.1'
10	327° 13.04	22.93	211°11.76	5.2'	$24^{\circ}34.24$	-6.3'	59.2'
11	342°13.19 357°13.34	21.96 \$05°20.98	225°35.97 240°0.19	5.2'	24°27.90 N24°21.39	-6.5'	59.2'
12 13	357° 13.34 12° 13.49	20.01	240°0.19 254°24.43	5.2' 5.3'	N24°21.39 24°14.71	-6.7' -6.8'	59.2' 59.3'
14	27° 13.64	19.04	268°48.69	5.3'	24°7.86	-7.0'	59.3'
15	42°13.78	· · 18.07	283°12.97	5.3'	24°0.85	-7.2'	59.3'
16 17	57° 13.93 72° 14.08	17.10 16.12	297°37.28 312°1.61	5.3' 5.4'	23°53.67 23°46.32	-7.3' -7.5'	59.4' 59.4'
18	87° 14.23	S05°15.15	326°25.96	5.4'	N23°38.81	-7.7'	59.4'
19	102°14.38	14.18	340°50.34	5.4'	23°31.13	-7.8'	59.5'
20 21	117° 14.53 132° 14.68	13.21 •• 12.23	355°14.74 9°39.18	5.4' 5.5'	23°23.29 23°15.29	-8.0' -8.2'	59.5' 59.6'
22	147° 14.83	11.26	24°3.64	5.5'	23°7.13	-8.3'	59.6'
23	162°14.98	10.29	38°28.14	5.5'	22°58.80	-8.5'	59.6'
	SD = 16.1'	d = -1.0'		SI	O = 16.0'		

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

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

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	46-68%
04	11:41	11:34	12:12	18:21	05:52	
05	11:28	11:21	12:11	19:20	06:50	
06	11:14	11:07	12:11	20:20	07:50	

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

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	165° 14.41	135°40.74 N13°52.89	174°5.85 \$04°48.59	350°46.50 N04°2.24	140°43.74 N07°44.40
1	180° 16.87	150°40.67 54.02	189°6.51 47.80	5°49.26 2.37	155°45.95 44.50
2	195° 19.34	165° 40.60 55.14	204°7.17 47.02	20°52.02 2.50	170°48.16 44.61
3	210° 21.80	180°40.53 · · 56.27	219°7.83 · · 46.23	35°54.78 · · 2.63	185°50.37 · · 44.71
4	225° 24.26	195° 40.46 57.40	234°8.49 45.44	50°57.54 2.76	200°52.59 44.82
5	240° 26.73	210° 40.39 58.53	249°9.15 44.66	66° 0.30 2.89	215°54.80 44.92
6	255°29.19	225°40.32 N13°59.66	264°9.81 S04°43.87	81°3.06 N04°3.02	230°57.01 N07°45.02
7	270°31.66	240°40.26 14°0.78	279°10.47 43.08	96°5.81 3.15	245°59.22 45.13
8	285°34.12	255°40.19 1.91	294°11.13 42.30	111°8.57 3.28	261°1.43 45.23
9	300° 36.58	270°40.12 · · 3.04	309°11.79 · · 41.51	126°11.33 · · 3.41	276°3.63 · · 45.34
10	315°39.05	285°40.05 4.16	324°12.45 40.72	141°14.09 3.54	291°5.84 45.44
11	$330^{\circ}41.51$	300°39.98 5.28	339°13.11 39.94	156°16.85 3.67	306°8.05 45.55
12	345°43.98	315°39.91 N14°6.41	354°13.77 S04°39.15	171°19.61 N04°3.80	321°10.26 N07°45.65
13	0°46.44	330°39.85 7.53	9°14.43 38.36	186°22.37 3.93	336°12.47 45.76
14	15°48.91	345°39.78 8.65	24°15.09 37.57	201°25.13 4.06	351°14.68 45.86
15	30°51.37	0°39.71 · · 9.78	39°15.75 · · 36.79	216°27.89 · · 4.19	6°16.89 · · 45.97
16	45°53.83	15°39.64 10.90	54°16.41 36.00	231°30.65 4.32	21°19.10 46.07
17	60°56.30	30°39.58 12.02	69°17.07 35.21	246°33.41 4.45	36°21.31 46.18
18	75°58.76	45°39.51 N14°13.14	84°17.73 S04°34.43	261°36.17 N04°4.58	51°23.52 N07°46.28
19 20	91°1.23 106°3.69	60°39.44 14.26 75°39.38 15.38	99°18.39 33.64 114°19.06 32.85	276°38.93 4.71 291°41.69 4.85	66°25.73 46.39 81°27.94 46.49
21	100 3.09 121°6.15	90°39.31 · · 16.50	129°19.72 · · 32.06	306°44.45 · · 4.98	96°30.15 · · 46.60
22	136°8.62	105°39.24 17.62	144°20.38 31.28	321°47.21 5.11	111°32.35 46.70
23	151° 11.08	120°39.17 18.74	159°21.04 30.49	336°49.97 5.24	126°34.56 46.81
Mer.	pass. 12:57	ν-0.1' d1.1' m-4.33	ν0.7' d-0.8' m1.04	ν2.8' d0.1' m-2.48	ν2.2' d0.1' m0.58
			<del></del> _		
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$166^{\circ}13.55$	135°39.11 N14°19.85	174°21.70 <b>S</b> 04°29.70	351°52.73 N04°5.37	141°36.77 N07°46.91
1	$181^{\circ}16.01$	150°39.04 20.97	189°22.36 28.91	6°55.49 5.50	156°38.98 47.02
2	$196^{\circ}18.48$	165°38.98 22.09	204°23.02 28.12	21°58.25 5.63	171°41.19 47.12
3	211°20.94	180°38.91 · · 23.20	219°23.69 · · 27.34	37° 1.01 · · 5.76	186°43.40 · · 47.23
4	226°23.40	195°38.84 24.32	234°24.35 26.55	52° 3.77 5.89	201°45.60 47.33
5	241°25.87	210°38.78 25.43	249°25.01 25.76	67°6.53 6.02	216°47.81 47.44
6	256° 28.33	225°38.71 N14°26.55	264°25.67 \$04°24.97	82°9.29 N04°6.15	231°50.02 N07°47.54
7	271°30.80	240°38.65 27.66	279°26.33 24.19	97°12.05 6.28	246°52.23 47.65
8	286°33.26 301°35.72	255°38.58 28.77 270°38.51 •• 29.89	294°27.00 23.40 309°27.66 · · 22.61	112°14.81 6.41 127°17.57 · · 6.54	261°54.44 47.75 276°56.64 • 47.86
9 10	316°38.19	270°38.51 · · 29.89 285°38.45 31.00	309°27.66 · · 22.61 324°28.32 21.82	127°17.57 · · · 6.54 142°20.33 6.67	276°56.64 · · 47.86 291°58.85 47.96
11	331° 40.65	300°38.38 32.11	339°28.98 21.03	142 20.33 0.07 157°23.09 6.80	307°1.06 48.07
12	346° 43.12	315°38.32 N14°33.22	354°29.65 S04°20.24	172°25.85 N04°6.93	322°3.27 N07°48.18
13	1°45.58	330°38.25 34.33	9°30.31 19.46	187°28.61 7.07	337°5.47 48.28
14	16° 48.04	345°38.19 35.44	24°30.97 18.67	202°31.37 7.20	352°7.68 48.39
15	31°50.51	0°38.12 · · 36.55	39°31.64 · · 17.88	217°34.13 · · 7.33	7°9.89 · · 48.49
16	46°52.97	15°38.06 37.66	54°32.30 17.09	232°36.89 7.46	22°12.10 48.60
17	$61^{\circ}55.44$	30°37.99 38.77	69°32.96 16.30	247°39.65 7.59	37°14.30 48.70
18	76° 57.90	45°37.93 N14°39.87	84°33.63 <b>S</b> 04°15.51	262°42.41 N04°7.72	52°16.51 N07°48.81
19	92°0.37	60°37.86 40.98	99°34.29 14.73	277°45.17 7.85	67°18.72 48.91
20	107°2.83	75°37.80 42.09	114°34.95 13.94	292°47.93 7.98	82°20.92 49.02
21	122°5.29	90°37.74 · · 43.19	129°35.62 · · 13.15	307°50.69 · · 8.11	97°23.13 · · 49.12
22	137°7.76	105°37.67 44.30	144°36.28 12.36	322°53.45 8.24	112°25.34 49.23
23	152° 10.22	120°37.61 45.40	159° 36.94 11.57	337°56.21 8.37	127°27.54 49.34
Mer.p	pass. 12:53	u-0.1 $'$ $d$ 1.1 $'$ m-4.34	$ u 0.7' \ d  0.8' \ \text{m} 1.03$	$\nu 2.8' \ d0.1' \ \text{m-}2.48$	ν2.2' d0.1' m0.58
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$167^{\circ}12.69$	135°37.54 N14°46.51	174°37.61 \$04°10.78	352°58.98 N04°8.50	142°29.75 N07°49.44
1	$182^{\circ}15.15$	150°37.48 47.61	189°38.27 9.99	8°1.74 8.63	157°31.96 49.55
2	$197^{\circ}17.61$	165°37.42 48.71	204°38.94 9.20	23°4.50 8.76	172°34.16 49.65
3	212°20.08	180°37.35 · · 49.81	219°39.60 · · 8.42	38°7.26 · · 8.90	187°36.37 · · 49.76
4	227° 22.54	195°37.29 50.92	234°40.26 7.63	53°10.02 9.03	202°38.58 49.86 <b>N</b>
5	242°25.01	210°37.23 52.02	249°40.93 6.84	68°12.78 9.16	217°40.78 49.97
6	257°27.47	225°37.16 N14°53.12	264°41.59 S04°6.05	83°15.54 N04°9.29	232°42.99 N07°50.07
7	272°29.93	240°37.10 54.22	279° 42.26 5.26	98°18.30 9.42	247°45.19 50.18
8 9	287°32.40 302°34.86	255° 37.04 55.32 270° 36.97 · · · 56.42	294° 42.92 4.47 309° 43.59 · · 3.68	113°21.06 9.55 128°23.82 • 9.68	262°47.40 50.29 277°49.61 • 50.39
9 10	302°34.86 317°37.33	270°36.97 · · 56.42 285°36.91 57.52	309°43.59 · · 3.68 324°44.25 2.89	128°23.82 · · 9.68 143°26.59 9.81	277°49.61 · · 50.39 292°51.81 50.50
10	317° 37.33 332° 39.79	285°36.91 57.52 300°36.85 58.61	324°44.25 2.89 339°44.92 2.10	143°20.59 9.81 158°29.35 9.94	307°54.02 50.60
12	347°42.25	315°36.79 N14°59.71	354°45.58 S04°1.31	173°32.11 N04°10.07	322°56.22 N07°50.71
13	2° 44.72	330°36.72 15°0.81	9°46.25 04°0.52	188°34.87 10.20	337°58.43 50.82
14	17° 47.18	345°36.66 1.90	24°46.91 03°59.73	203°37.63 10.33	353° 0.63 50.92
15	32°49.65	0°36.60 · · 3.00	39°47.58 · · 58.95	218°40.39 · · 10.46	8°2.84 · · 51.03
16	47° 52.11	15°36.54 4.09	54°48.24 58.16	233°43.15 10.59	23°5.04 51.13
17	62°54.57	30°36.48 5.19	69°48.91 57.37	248°45.92 10.73	38°7.25 51.24
18	77° 57.04	45°36.42 N15°6.28	84°49.58 <b>S</b> 03°56.58	263°48.68 N04°10.86	53°9.45 N07°51.34
19	92°59.50	60°36.35 7.38	99°50.24 55.79	278°51.44 10.99	68°11.66 51.45
20	108°1.97	75°36.29 8.47	114°50.91 55.00	293°54.20 11.12	83°13.86 51.56
21	123°4.43	90°36.23 · · 9.56	129°51.57 · · 54.21	308°56.96 · · 11.25	98°16.07 · · 51.66
22	138°6.90	105°36.17 10.65	144°52.24 53.42	323°59.72 11.38	113°18.27 51.77
23	153°9.36	120°36.11 11.74	159°52.91 52.63	339°2.49 11.51	128°20.48 51.88
Mer.	pass. 12:49	ν-0.1' d1.1' m-4.35	ν0.7' d-0.8' m1.03	ν2.8' d0.1' m-2.48	ν2.2′ d0.1′ m0.57

	Stars	
	SHA	Dec
Alpheratz	357°32.39	29°14.79
Ankaa Schedar	353°5.02 349°28.51	-42°9.24 56°41.64
Diphda	348°45.00	-17°49.99
Achernar	335°18.77	-57°5.77
Hamal Polaris	327°48.47 312°52.26	23°35.76 89°23.19
Acamar	315°10.04	-40°11.72
Menkar	314°3.58	4°11.94
Mirfak Aldebaran	308°24.67 290°36.66	49°57.81 16°33.89
Rigel	$281^{\circ}1.35$	-8°10.34
Capella	280°18.00 278°20.05	46°1.64 6°22.37
Bellatrix Elnath	276 20.05 277°58.53	28°37.84
Alnilam	275°35.04	-1°11.21
Betelgeuse Canopus	270°49.20 263°51.06	7°24.59 -52°42.97
Sirius	258°23.81	-32 42.97 -16°45.56
Adhara	255° 3.64	-29°0.92
Procyon Pollux	244°47.92 243°13.91	5°8.96 27°57.37
Avior	234° 13.91	-59°36.29
Suhail	222°43.99	-43°33.07
Miaplacidus Alphard	221°36.85 217°44.91	-69°50.22 -8°47.11
Regulus	217 44.91 207°31.37	-8 47.11 11°49.53
Dubhe	193°37.27	61°35.76
Denebola	182°21.99 175°40.57	14°24.62 -17°42.10
Gienah Acrux	175°40.57 172°56.42	-17 42.10 -63°15.37
Gacrux	$171^{\circ}48.12$	$-57^{\circ}16.32$
Alioth	166°10.26	55°48.12
Spica Alkaid	158°19.28 152°49.64	-11°18.68 49°10.03
Hadar	$148^{\circ}31.76$	-60°30.45
Menkent	147°54.23 145°45.32	-36°30.54 19°1.87
Arcturus Rigil Kent.	145°45.32 139°36.22	-60°56.99
Kochab	$137^{\circ}19.35$	$74^{\circ}1.99$
Zuben'ubi Alphecca	136°52.94 126°1.41	-16°9.62 26°36.90
Antares	112° 12.57	-26°29.62
Atria	107°4.40	-69°4.37
Sabik Shaula	101°59.80 96°6.88	-15°45.59 -37°7.30
Rasalhague	95°56.17	12°32.20
Eltanin	90°41.08	51°28.79
Kaus Aust. Vega	83°29.19 80°31.61	-34°22.12 38°48.33
Nunki	75°44.70	-26°15.60
Altair	61°57.63	8°56.48
Peacock Deneb	53°2.13 49°24.36	-56°38.43 45°22.71
Enif	33°36.53	10°0.21
Al Na'ir	27°30.15	-46°49.38
Fomalhaut Scheat	15°12.04 13°43.01	-29°28.37 28°14.13
Markab	13°27.62	15°21.40
Mar 07 Tue	SHA	Mer.pass
Venus	330°26.33	14:57
Mars Jupiter	8°51.45 185°32.10	12:23 00:37
Saturn	335°29.34	14:35
Mar 08 Wed	SHA	Mer.pass
Venus Mars	329°25.56 8°8.15	14:57 12:22
Jupiter	$185^{\circ}39.18$	00:32
Saturn	335°23.22	14:31
Mar 09 Thu Venus	<b>SHA</b> 328°24.86	Mer.pass 14:58
Mars	7°24.92	12:21
Jupiter Saturn	185°46.29 335°17.06	00:28 14:28
		1 1.20
Horizon	ntal parallax Venus:	0.2
	Mars:	0.1

Page 46

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 15.13	S05°9.32	52°52.67	5.6'	N22°50.31	-8.6'	59.7'
1	192° 15.28	8.34	67°17.24	5.6'	22°41.67	-8.8'	59.7'
2	207° 15.43	7.37	81°41.84	5.6'	22°32.86	-9.0'	59.7'
3	222° 15.58	• • 6.40	96°6.47	5.7'	22°23.90	-9.1'	59.8'
4 5	237° 15.73 252° 15.88	5.42 4.45	110°31.14 124°55.85	5.7' 5.7'	22°14.78 22°5.50	-9.3' -9.4'	59.8' 59.8'
6	267° 16.04	505°3.48	139°20.60	5.8'	N21°56.07	-9.4 -9.6'	59.8
7	282°16.19	2.50	153°45.39	5.8'	21°46.49	-9.7'	59.9'
8	297° 16.34	1.53	168°10.22	5.9'	21°36.75	-9.9'	59.9'
9	$312^{\circ}16.49$	05°0.55	182°35.10	5.9'	21°26.86	-10.0'	59.9'
10	327°16.64	04°59.58	197°0.01	6.0'	21°16.82	-10.2'	60.0'
11	342°16.80 357°16.95	58.61 \$04°57.63	211°24.97 225°49.97	6.0' 6.0'	21°6.63 N20°56.29	-10.3' -10.5'	60.0' 60.0'
12 13	12° 17.10	56.66	240°15.02	6.1	20°45.80	-10.5 -10.6'	60.0
14	27° 17.25	55.68	254°40.12	6.1'	20°35.17	-10.8	60.1
15	42° 17.41	• • 54.71	269° 5.26	6.2'	20°24.39	-10.9'	60.1
16	57° 17.56	53.73	283°30.44	6.2'	20°13.47	-11.1'	60.2'
17	72° 17.71	52.76	297°55.68	6.3'	20°2.40	-11.2'	60.2'
18	87° 17.87	S04°51.78	312°20.96	6.3'	N19°51.20	-11.3'	60.2'
19	102°18.02 117°18.17	50.81	326°46.30 341°11.68	6.4'	19°39.85 19°28.37	-11.5'	60.3'
20 21	117° 18.17 132° 18.33	49.83 •• 48.86	341°11.68 355°37.11	6.4' 6.5'	19°28.37 19°16.75	-11.6' -11.8'	60.3' 60.3'
22	147° 18.48	47.88	10°2.59	6.5	19° 4.99	-11.0	60.3
23	162° 18.63	46.91	24°28.13	6.6'	18°53.10	-12.0'	60.4
	SD = 16.1'	d = -1.0'		S	D = 16.3'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177° 18.79 192° 18.94	\$04°45.93	38°53.71	6.6'	N18°41.07	-12.2'	60.4
1 2	192° 18.94 207° 19.10	44.96 43.98	53°19.35 67°45.03	6.7' 6.7'	18°28.92 18°16.63	-12.3' -12.4'	60.4' 60.5'
3	222° 19.25	• • 43.00	82°10.77	6.8'	18°4.22	-12.5'	60.5
4	237° 19.41	42.03	96°36.56	6.8'	17°51.67	-12.7'	60.5
5	$252^{\circ}19.56$	41.05	$111^{\circ}2.41$	6.9'	17°39.01	-12.8'	60.5'
6	267° 19.72	S04°40.08	125°28.30	6.9'	N17°26.22	-12.9'	60.6'
7	282°19.87 297°20.03	39.10 38.12	139°54.25 154°20.25	7.0' 7.1'	17°13.30 17°0.27	-13.0' -13.2'	60.6'
8 9	312° 20.19	38.12	154 20.25 168°46.31	7.1'	17 0.27 16°47.11	-13.2 -13.3'	60.6' 60.6'
10	327° 20.34	36.17	183°12.41	7.2'	16°33.84	-13.4	60.7
11	342° 20.50	35.19	197°38.57	7.2'	16°20.45	-13.5'	60.7'
12	357° 20.65	S04°34.22	$212^{\circ}4.78$	7.3'	N16°6.95	-13.6'	60.7'
13	12°20.81	33.24	226°31.05	7.3'	15°53.34	-13.7'	60.7'
14 15	27°20.97 42°21.12	32.26 •• 31.28	240°57.37 255°23.74	7.4' 7.4'	15°39.61 15°25.78	-13.8' -13.9'	60.7' 60.8'
16	57°21.28	30.31	269°50.16	7. <del>4</del> 7.5'	15°11.83	-13.9 -14.0'	60.8
17	72°21.44	29.33	284°16.63	7.5'	14°57.79	-14.2'	60.8'
18	87°21.60	S04°28.35	298°43.16	7.6'	N14°43.63	-14.3'	60.8'
19	102°21.75	27.38	313°9.73	7.6'	14°29.38	-14.4'	60.9'
20	117°21.91	26.40	327°36.36	7.7'	14°15.02 14°0.57	-14.5'	60.9'
21 22	132°22.07 147°22.23	· · 25.42 24.44	342°3.04 356°29.77	7.7' 7.8'	14°0.57 13°46.02	-14.6' -14.6'	60.9' 60.9'
23	162° 22.38	23.46	10°56.55	7.8'	13°31.37	-14.7'	60.9
	SD = 16.1'	d = -1.0'			D = 16.5'		
	<u> </u>	<u>u = 1.0</u>			D = 10.5		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°22.54	\$04°22.49	25°23.38 39°50.26	7.9'	N13°16.63 13°1.80	-14.8'	60.9'
1 2	192°22.70 207°22.86	21.51 20.53	39°50.26 54°17.19	7.9' 8.0'	13°1.80 12°46.88	-14.9' -15.0'	61.0' 61.0'
3	222° 23.02	19.55	68°44.17	8.0'	12° 31.87	-15.1'	61.0'
4	237°23.18	18.57	83°11.19	8.1'	12°16.77	-15.2'	61.0'
5	252°23.34	17.59	97°38.27	8.1'	12°1.59	-15.3'	61.0'
6	267°23.50	S04°16.62	112°5.39	8.2'	N11°46.33	-15.3'	61.0'
7	282°23.66 297°23.81	15.64	126°32.55 140°59.77	8.2' 8.3'	11°30.99 11°15.57	-15.4'	61.1'
8 9	297°23.81 312°23.97	14.66 •• 13.68	140°59.77 155°27.03	8.3'	11°15.57 11°0.07	-15.5' -15.6'	61.1' 61.1'
10	312 23.97 327°24.13	12.70	169°54.33	8.3'	10°44.50	-15.6'	61.1
11	342°24.29	11.72	184°21.68	8.4	10°28.86	-15.7'	61.1
12	357° 24.45	S04°10.74	198°49.07	8.4'	N10°13.14	-15.8'	61.1'
13	12°24.61	9.76	213°16.50	8.5'	09°57.36	-15.9'	61.1'
14 15	27° 24.77 42° 24.94	8.78 •• 7.81	227°43.98 242°11.50	8.5' 8.6'	09°41.51 09°25.59	-15.9' -16.0'	61.1' 61.2'
15 16	42°24.94 57°25.10	6.83	242°11.50 256°39.06	8.6'	09°25.59 09°9.62	-16.0' -16.0'	61.2'
17	72°25.26	5.85	271° 6.66	8.6'	09°53.58	-16.1	61.2
18	87° 25.42	<b>S</b> 04°4.87	285°34.29	8.7'	N08°37.48	-16.2'	61.2'
19	102°25.58	3.89	300°1.97	8.7'	08°21.33	-16.2'	61.2'
20	117° 25.74	2.91	314°29.69	8.8'	08°5.12	-16.3'	61.2'
21 22	132°25.90 147°26.06	· · 1.93 0.95	328°57.44 343°25.23	8.8' 8.8'	07°48.86 07°32.54	-16.3' -16.4'	61.2' 61.2'
23	147 26.06 162°26.22	0.95 59.97	343 25.23 357°53.05	8.9'	07 32.54 07°16.18	-16.4'	61.2'
	SD = 16.1'	d = -1.0'			D = 16.6'		
	<u> </u>	<u>a — -1.0</u>					

Lat.         Naut.         Civil         Sunrise         Sunset         Civil           N 72°         04:31         05:51         06:58         17:26         18:33           N 70°         04:40         05:52         06:52         17:31         18:33           68°         04:48         05:53         06:48         17:35         18:36           66°         04:54         05:54         06:45         17:38         18:22           64°         04:59         05:54         06:41         17:41         18:29           60°         05:03         05:55         06:39         17:44         18:29           60°         05:07         05:55         06:36         17:46         18:29           N 58°         05:10         05:55         06:34         17:48         18:2           56°         05:12         05:55         06:32         17:50         18:2           54°         05:15         05:56         06:31         17:52         18:2           52°         05:17         05:56         06:29         17:53         18:2           50°         05:18         05:56         06:28         17:54         18:2	Twilight		
N 70°         04:40         05:52         06:52         17:31         18:3:           68°         04:48         05:53         06:48         17:35         18:3:           66°         04:54         05:54         06:45         17:38         18:2!           64°         04:59         05:54         06:41         17:41         18:2!           62°         05:03         05:55         06:39         17:44         18:2!           60°         05:07         05:55         06:36         17:46         18:2!           N 58°         05:10         05:55         06:34         17:48         18:2!           56°         05:12         05:55         06:32         17:50         18:2!           54°         05:15         05:56         06:31         17:52         18:2'           52°         05:17         05:56         06:29         17:53         18:2'	l Naut.		
68°         04:48         05:53         06:48         17:35         18:36           66°         04:54         05:54         06:45         17:38         18:29           64°         04:59         05:54         06:41         17:41         18:29           62°         05:03         05:55         06:39         17:44         18:29           60°         05:07         05:55         06:36         17:46         18:29           N 58°         05:10         05:55         06:34         17:48         18:22           56°         05:12         05:55         06:32         17:50         18:2           54°         05:15         05:56         06:31         17:52         18:2           52°         05:17         05:56         06:29         17:53         18:2'	3 19:54		
66°         04:54         05:54         06:45         17:38         18:29           64°         04:59         05:54         06:41         17:41         18:29           62°         05:03         05:55         06:39         17:44         18:29           60°         05:07         05:55         06:36         17:46         18:29           N 58°         05:10         05:55         06:34         17:48         18:22           56°         05:12         05:55         06:32         17:50         18:22           54°         05:15         05:56         06:31         17:52         18:2           52°         05:17         05:56         06:29         17:53         18:2'	2 19:44		
64°         04:59         05:54         06:41         17:41         18:2!           62°         05:03         05:55         06:39         17:44         18:2!           60°         05:07         05:55         06:36         17:46         18:2!           N 58°         05:10         05:55         06:34         17:48         18:2'           56°         05:12         05:55         06:32         17:50         18:2'           54°         05:15         05:56         06:31         17:52         18:2'           52°         05:17         05:56         06:29         17:53         18:2'	0 19:36		
62°         05:03         05:55         06:39         17:44         18:24           60°         05:07         05:55         06:36         17:46         18:24           N 58°         05:10         05:55         06:34         17:48         18:2           56°         05:12         05:55         06:32         17:50         18:2           54°         05:15         05:56         06:31         17:52         18:2           52°         05:17         05:56         06:29         17:53         18:2'	9 19:30		
60°         05:07         05:55         06:36         17:46         18:28           N 58°         05:10         05:55         06:34         17:48         18:2           56°         05:12         05:55         06:32         17:50         18:2           54°         05:15         05:56         06:31         17:52         18:2           52°         05:17         05:56         06:29         17:53         18:2	9 19:24		
N 58°         05:10         05:55         06:34         17:48         18:2'           56°         05:12         05:55         06:32         17:50         18:2'           54°         05:15         05:56         06:31         17:52         18:2'           52°         05:17         05:56         06:29         17:53         18:2'			
56°         05:12         05:55         06:32         17:50         18:2'           54°         05:15         05:56         06:31         17:52         18:2'           52°         05:17         05:56         06:29         17:53         18:2'	8 19:16		
54°         05:15         05:56         06:31         17:52         18:2'           52°         05:17         05:56         06:29         17:53         18:2'	7 19:13		
52° 05:17 05:56 06:29 17:53 18:2°	7 19:10		
	7 19:08		
50° 05:18 05:56 06:28 17:54 18:2	7 19:06		
	7 19:04		
45° 05:21 05:55 06:25 17:57 18:2	7 19:01		
<b>N</b> 40° 05:24 05:55 06:22 18:00 18:2	7 18:58		
35° 05:25 05:54 06:20 18:02 18:2	7 18:57		
30° 05:26 05:54 06:18 18:04 18:28	8 18:56		
20°   05:26	0 18:55		
<b>N</b> 10° 05:25 05:50 06:11 18:11 18:32	2 18:56		
0° 05:23 05:47 06:07 18:14 18:39	5 18:59		
<b>S</b> 10°   05:18	8 19:03		
20°   05:12	3 19:09		
30° 05:04 05:32 05:56 18:25 18:49	9 19:17		
35° 04:58 05:28 05:53 18:27 18:53	3 19:23		
40° 04:51 05:23 05:51 18:30 18:5	7 19:29		
45° 04:42 05:17 05:47 18:33 19:03	3 19:38		
<b>S</b> 50° 04:31 05:10 05:43 18:37 19:10			
52° 04:25 05:07 05:41 18:39 19:13	3 19:54		
54° 04:19 05:03 05:39 18:41 19:1	7 20:00		
56° 04:12 04:59 05:37 18:43 19:23	1 20:07		
58° 04:04 04:54 05:34 18:46 19:20			
<b>S</b> 60° 03:55 04:48 05:31 18:48 19:3	1 20:24		

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

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	78-94%	
07	10:59	10:52	12:11	21:18	08:49		
08	10:45	10:37	12:11	22:15	09:47		
09	10:30	10:22	12:10	23:09	10:42		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	168°11.82	135°36.05 N15°12.83	174°53.57 \$03°51.84	354°5.25 N04°11.64	143°22.68 N07°51.98	
1	183° 14.29	150°35.99 13.92	189° 54.24 51.05	9°8.01 11.77	158°24.89 52.09	Alpheratz 357°32.40 29°14.78 Ankaa 353°5.02 -42°9.23
2	$198^{\circ}16.75$	165°35.93 15.01	204°54.90 50.26	24°10.77 11.90	173°27.09 52.19	Schedar 349°28.52 56°41.63
3	213° 19.22	180°35.87 · · 16.10	219°55.57 · · 49.47	39°13.53 · · 12.03	188°29.30 · · 52.30	Diphda 348°45.01 -17°49.99
4	228°21.68	195°35.81 17.19	234°56.24 48.68	54°16.29 12.16	203°31.50 52.41	Achernar 335°18.79 -57°5.76
5 6	243°24.14 258°26.61	210°35.75 18.28 225°35.69 N15°19.36	249°56.90 47.89 264°57.57 \$03°47.10	69°19.06 12.29 84°21.82 N04°12.43	218°33.70 52.51 233°35.91 N07°52.62	Hamal 327°48.48 23°35.76
7	273°29.07	240°35.63 20.45	279°58.24 46.31	99°24.58 12.56	248°38.11 52.72	Polaris 312°53.70 89°23.19
8	288°31.54	255°35.57 21.53	294°58.90 45.52	114°27.34 12.69	263°40.32 52.83	Acamar 315°10.06 -40°11.71
9	303°34.00	270°35.51 · · 22.62	309°59.57 · · 44.73	129°30.10 · · 12.82	278°42.52 · · 52.94	Menkar 314°3.59 4°11.94
10	318°36.46	285°35.45 23.70	325°0.24 43.94	144°32.87 12.95	293°44.72 53.04	Mirfak 308°24.70 49°57.80 Aldebaran 290°36.68 16°33.89
11	333°38.93	300°35.39 24.79	340°0.91 43.15	159°35.63 13.08	308°46.93 53.15	Rigel 281°1.37 -8°10.34
12	348°41.39	315°35.33 N15°25.87	355°1.57 \$03°42.36	174°38.39 N04°13.21	323°49.13 N07°53.26	Capella 280°18.02 46°1.64
13	3°43.86	330°35.27 26.95 345°35.21 28.04	10°2.24 41.57 25°2.91 40.78	189°41.15 13.34 204°43.91 13.47	338°51.33 53.36 353°53.54 53.47	Bellatrix 278°20.07 6°22.38
14 15	18° 46.32 33° 48.78	345°35.21 28.04 0°35.15 · · 29.12	25°2.91 40.78 40°3.58 · · 39.99	204°43.91 13.47 219°46.68 · · 13.60	353°53.54 53.47 8°55.74 •• 53.57	Elnath 277°58.55 28°37.84
16	48°51.25	15°35.09 30.20	55°4.24 39.20	234°49.44 13.73	23°57.94 53.68	Alnilam 275°35.06 -1°11.21
17	63°53.71	30°35.03 31.28	70°4.91 38.41	249°52.20 13.86	39°0.15 53.79	Betelgeuse 270°49.21 7°24.59
18	78°56.18	45°34.97 N15°32.36	85°5.58 <b>S</b> 03°37.62	264°54.96 N04°13.99	54°2.35 N07°53.89	Canopus 263°51.09 -52°42.97 Sirius 258°23.82 -16°45.56
19	93°58.64	60°34.92 33.44	100°6.25 36.83	279°57.72 14.12	69°4.55 54.00	Sirius 258°23.82 -16°45.56 Adhara 255°3.66 -29°0.93
20	109°1.10	75°34.86 34.52	115°6.92 36.04	295°0.49 14.26	84°6.76 54.11	Procyon 244°47.93 5°8.96
21	124°3.57	90°34.80 · · 35.59	130°7.58 · · 35.25	310° 3.25 · · 14.39	99°8.96 · · 54.21	Pollux 243°13.92 27°57.37
22	139°6.03	105°34.74 36.67	145°8.25 34.46	325°6.01 14.52	114°11.16 54.32	Avior 234°13.19 -59°36.30
23	154°8.50	120°34.68 37.75	160°8.92 33.67	340° 8.77 14.65	129°13.36 54.43	Suhail 222°44.00 -43°33.08
Mer.	pass. 12:45	u-0.1 $'$ $d$ 1.1 $'$ m-4.36	$ u 0.7' \ d\text{-}0.8' \ \text{m}1.03$	$\nu 2.8' \ d0.1' \ \text{m-}2.48$	$ u 2.2' \ d0.1' \ m0.57$	Miaplacidus 221°36.88 -69°50.23
						Alphard 217°44.91 -8°47.11
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.38 11°49.54
0	169° 10.96	135°34.63 N15°38.82	175°9.59 \$03°32.87	355°11.54 N04°14.78	144°15.57 N07°54.53	Dubhe 193°37.26 61°35.78 Denebola 182°21.99 14°24.62
1	184° 13.42	150°34.57 39.90	190° 10.26 32.08	10°14.30 14.91	159°17.77 54.64	Gienah 175°40.57 -17°42.11
2	199° 15.89	165°34.51 40.98	205°10.93 31.29	25°17.06 15.04	174°19.97 54.75	Acrux 172°56.41 -63°15.39
3	214° 18.35	180°34.45 · · 42.05	220°11.60 · · 30.50	40°19.82 · · 15.17	189°22.17 · · 54.85	Gacrux 171°48.11 -57°16.34
4 5	229°20.82 244°23.28	195°34.40 43.12 210°34.34 44.20	235°12.26 29.71 250°12.93 28.92	55°22.59 15.30 70°25.35 15.43	204°24.38 54.96 219°26.58 55.07	Alioth 166°10.24 55°48.13
6	259°25.74	210°34.34 44.20 225°34.28 N15°45.27	250°12.93 28.92 265°13.60 \$03°28.13	85°28.11 N04°15.56	219°26.58 55.07 234°28.78 N07°55.17	Spica 158°19.27 -11°18.68
7	274°28.21	240°34.22 46.34	280°14.27 27.34	100°30.87 15.69	249°30.98 55.28	Alkaid 152°49.62 49°10.04
8	289° 30.67	255°34.17 47.41	295°14.94 26.55	115°33.64 15.82	264°33.18 55.39	Hadar 148°31.73 -60°30.46
9	304°33.14	270°34.11 · · 48.48	310° 15.61 · · 25.76	130°36.40 · · 15.95	279°35.39 · · 55.49	Menkent 147°54.21 -36°30.55 Arcturus 145°45.30 19°1.87
10	$319^{\circ}35.60$	285°34.05 49.55	325°16.28 24.97	145°39.16 16.08	294°37.59 55.60	Rigil Kent. 139°36.19 -60°57.00
11	334°38.06	300°34.00 50.62	340°16.95 24.18	160°41.92 16.22	309°39.79 55.71	Kochab 137°19.30 74°2.00
12	349° 40.53	315°33.94 N15°51.69	355°17.62 \$03°23.38	175°44.69 N04°16.35	324°41.99 N07°55.81	Zuben'ubi 136°52.92 -16°9.63
13 14	4° 42.99 19° 45.46	330°33.89 52.76 345°33.83 53.83	10°18.29 22.59 25°18.96 21.80	190°47.45 16.48 205°50.21 16.61	339°44.19 55.92 354°46.40 56.03	Alphecca 126°1.39 26°36.90
15	34° 47.92	0°33.77 · · 54.90	40°19.63 · · 21.01	220°52.97 · · 16.74	9°48.60 · · 56.13	Antares 112°12.55 -26°29.63
16	49°50.38	15°33.72 55.96	55°20.30 20.22	235°55.74 16.87	24°50.80 56.24	Atria 107°4.35 -69°4.37 Sabik 101°59.78 -15°45.59
17	64°52.85	30°33.66 57.03	70°20.97 19.43	250°58.50 17.00	39°53.00 56.35	Sabik 101°59.78 -15°45.59 Shaula 96°6.85 -37°7.30
18	79°55.31	45°33.61 N15°58.09	85°21.64 <b>S</b> 03°18.64	266°1.26 N04°17.13	54°55.20 N07°56.45	Rasalhague 95°56.15 12°32.20
19	94°57.78	60°33.55 15°59.16	100°22.31 17.85	281°4.02 17.26	69°57.40 56.56	Eltanin 90°41.05 51°28.78
20	110°0.24	75°33.50 16°0.22	115°22.98 17.06	296° 6.79 17.39	84°59.60 56.67	Kaus Aust. 83°29.17 -34°22.12
21 22	125°2.70 140°5.17	90°33.44 ·· 1.29 105°33.39 2.35	130°23.65 · · 16.26 145°24.32	311°9.55 · · 17.52 326°12.31 17.65	100°1.80 · · 56.78 115°4.00 56.88	Vega 80°31.59 38°48.33
23	155°7.63	120° 33.33 3.41	160°24.99 14.68	341°15.07 17.78	130°6.21 56.99	Nunki 75°44.68 -26°15.60
						Altair 61°57.61 8°56.48
Mer.	pass. 12:41	ν-0.1' d1.1' m-4.36	ν0.7' d-0.8' m1.03	ν2.8′ d0.1′ m-2.48	$\nu 2.2' \ d0.1' \ \text{m}0.57$	Peacock 53°2.10 -56°38.43 Deneb 49°24.35 45°22.70
						Enif 33°36.53 10°0.21
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.14 -46°49.37
0	170° 10.10	135°33.28 N16°4.47	175°25.66 \$03°13.89	356°17.84 N04°17.91	145°8.41 N07°57.10	Fomalhaut 15°12.04 -29°28.36
1	185° 12.56 200° 15.02	150°33.23 5.53	190°26.33 13.10	11°20.60 18.04 26°23.36 18.17	160°10.61 57.20	Scheat 13°43.00 28°14.12
2 3	200 15.02 215° 17.49	165°33.17 6.59 180°33.12 · · 7.65	205°27.00 12.31 220°27.67 · · 11.52	26°23.36 18.17 41°26.13 · · 18.30	175°12.81 57.31 190°15.01 · · 57.42	Markab 13°27.61 15°21.39
4	230° 19.95	195°33.06 8.71	235°28.34 10.73	56°28.89 18.43	205°17.21 57.52	Mar 10 Fri SHA Mer.pass
5	245°22.42	210°33.01 9.77	250°29.01 9.93	71°31.65 18.56	220°19.41 57.63	Venus 327°24.22 14:58
6	260°24.88	225°32.96 N16°10.83	265°29.68 \$03°9.14	86°34.41 N04°18.70	235°21.61 N07°57.74	Mars 6°41.75 12:20
7	275°27.34	240°32.90 11.89	280°30.36 8.35	101°37.18 18.83	250°23.81 57.85	Jupiter 185°53.42 00:24
8	290°29.81	255°32.85 12.94	295°31.03 7.56	116°39.94 18.96	265°26.01 57.95	Saturn 335°10.86 14:24
9	305°32.27	270°32.80 · · 14.00	310°31.70 · · 6.77	131°42.70 · · 19.09	280°28.21 · · 58.06	Mar 11 Sat SHA Mer.pass
10	320°34.74	285°32.74 15.06	325°32.37 5.98	146°45.47 19.22	295°30.41 58.17	Venus 326°23.67 14:58
11 12	335° 37.20 350° 39.66	300°32.69 16.11 315°32.64 N16°17.17	340°33.04 5.18 355°33.71 \$03°4.39	161°48.23 19.35 176°50.99 N04°19.48	310°32.61 58.27 325°34.81 N07°58.38	Mars 5°58.63 12:19
13	5° 42.13	330°32.59 18.22	10°34.38 3.60	191°53.75 19.61	340°37.01 58.49	Jupiter 186° 0.58 00:19
14	20° 44.59	345°32.53 19.27	25°35.06 2.81	206°56.52 19.74	355°39.21 58.60	Saturn 335°4.61 14:21
15	35°47.06	0°32.48 · · 20.32	40°35.73 · · 2.02	221°59.28 · · 19.87	10°41.41 · · 58.70	Mar 12 Sun SHA Mer.pass
16	50° 49.52	15° 32.43 21.38	55°36.40 1.23	237° 2.04 20.00	25°43.61 58.81	Venus 325°23.18 14:58
17	65°51.98	30°32.38 22.43	70°37.07 03°0.43	252° 4.81 20.13	40°45.81 58.92	Mars 5°15.56 12:18
18	80°54.45	45°32.32 N16°23.48	85°37.74 \$02°59.64	267°7.57 N04°20.26	55°48.01 N07°59.03	Jupiter 186°7.74 00:15
19 20	95° 56.91 110° 59.38	60°32.27 24.53 75°32.22 25.58	100°38.42 58.85 115°39.09 58.06	282°10.33 20.39 297°13.09 20.52	70°50.21 59.13 85°52.40 59.24	Saturn 334°58.31 14:17
21	110 59.36 126°1.84	90°32.17 · · · 26.63	130°39.76 · · 57.27	312°15.86 · · 20.65	100°54.60 · · 59.35	Horizontal parallax
22	141°4.31	105°32.12 27.67	145° 40.43 56.47	327°18.62 20.78	115°56.80 59.46	Venus: 0.2
23	156°6.77	120°32.07 28.72	160°41.10 55.68	342°21.38 20.91	130°59.00 59.56	Mars: 0.1
Mer	pass. 12:37	ν-0.1' d1.1' m-4.37	ν0.7' d-0.8' m1.03	ν2.8' d0.1' m-2.48	ν2.2' d0.1' m0.57	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°26.39	S03°58.99	12°20.91	8.9'	$N06^{\circ}59.77$	-16.5'	61.2'
1	192°26.55	58.01	26°48.80	8.9'	06°43.32	-16.5	61.2'
2	207°26.71 222°26.87	57.03 •• 56.05	41°16.73 55°44.69	9.0' 9.0'	06° 26.82 06° 10.28	-16.5' -16.6'	61.2' 61.2'
4	237°27.04	55.07	70°12.68	9.0'	05°53.71	-16.6'	61.2'
5	252°27.20	54.09	84°40.70	9.0'	05°37.09	-16.6'	61.2'
6	267°27.36	S03°53.10	99°8.74	9.1'	N05°20.44	-16.7'	61.2'
7	282°27.52	52.12	113°36.82 128°4.93	9.1'	05°3.76	-16.7'	61.2'
8 9	297°27.69 312°27.85	51.14 •• 50.16	128° 4.93 142° 33.06	9.1' 9.2'	04°47.05 04°30.31	-16.7' -16.8'	61.2' 61.2'
10	327°28.01	49.18	157°1.22	9.2'	04° 13.54	-16.8'	61.2'
11	342°28.18	48.20	171°29.40	9.2'	03°56.75	-16.8'	61.2'
12	357°28.34	S03°47.22	185°57.60	9.2'	N03°39.94	-16.8'	61.2'
13 14	12°28.50 27°28.67	46.24 45.26	200°25.83 214°54.09	9.3' 9.3'	03°23.10 03°6.25	-16.9' -16.9'	61.2' 61.2'
14 15	42°28.83	45.26 •• 44.28	214 54.09 229°22.36	9.3'	03 6.25 02°49.38	-16.9'	61.2
16	57°29.00	43.29	243°50.65	9.3'	02°32.50	-16.9'	61.2'
17	72°29.16	42.31	258°18.96	9.3'	$02^{\circ}15.60$	-16.9'	61.2'
18	87°29.32	S03°41.33	272°47.29	9.3'	N01°58.69	-16.9'	61.2'
19 20	102°29.49 117°29.65	40.35 39.37	287°15.64 301°44.01	9.4' 9.4'	01°41.78 01°24.85	-16.9' -16.9'	61.2' 61.2'
21	132°29.82	• • 38.39	316°12.39	9.4' 9.4'	01°24.63	-16.9'	61.2'
22	147°29.98	37.40	330°40.78	9.4'	00°51.00	-16.9'	61.2'
23	162°30.15	36.42	345°9.19	9.4'	00°34.07	-16.9'	61.2'
	SD = 16.1'	d = -1.0'		S	5D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	177°30.31	S03°35.44	359°37.61	9.4'	N00° 17.14	-16.9'	61.2'
1	192°30.48	34.46	14°6.04	9.4'	N00°0.21	-16.9'	61.2'
2	207°30.64	33.48	28°34.48	9.5'	S00°16.70	16.9'	61.2'
3 4	222°30.81 237°30.98	· · 32.49 31.51	43°2.93 57°31.39	9.5' 9.5'	00°33.61 00°50.52	16.9' 16.9'	61.1' 61.1'
5	252°31.14	30.53	71°59.86	9.5'	00 50.52 01°7.41	16.9	61.1
6	267°31.31	S03°29.55	86°28.33	9.5'	501°24.28	16.9'	61.1'
7	282°31.47	28.56	100°56.81	9.5'	01°41.14	16.8'	61.1'
8	297°31.64	27.58	115°25.30	9.5'	01°57.99	16.8'	61.1'
9 10	312°31.81 327°31.97	· · 26.60 25.62	129°53.79 144°22.28	9.5' 9.5'	02°14.81 02°31.61	16.8' 16.8'	61.1' 61.1'
11	342°32.14	24.63	158°50.77	9.5'	02°48.39	16.8	61.0'
12	357°32.31	S03°23.65	173°19.27	9.5'	S03°5.15	16.7'	61.0'
13	12°32.47	22.67	187°47.76	9.5'	03°21.87	16.7'	61.0'
14 15	27°32.64 42°32.81	21.68	202°16.25 216°44.75	9.5' 9.5'	03°38.57 03°55.24	16.7' 16.6'	61.0' 61.0'
16	57°32.98	19.72	231°13.23	9.5'	03 55.24 04°11.87	16.6'	61.0'
17	72°33.14	18.73	245°41.72	9.5'	04°28.47	16.6'	60.9'
18	87°33.31	S03°17.75	260°10.20	9.5'	S04°45.03	16.5'	60.9'
19	102°33.48 117°33.65	16.77	274°38.68 289°7.14	9.5' 9.5'	05°1.55	16.5	60.9'
20 21	117°33.65 132°33.81	15.78 •• 14.80	289° 7.14 303° 35.61	9.5'	05°18.03 05°34.47	16.4' 16.4'	60.9' 60.9'
22	147°33.98	13.82	318°4.06	9.4'	05°50.87	16.3'	60.8'
23	162°34.15	12.83	332°32.50	9.4'	06°7.22	16.3'	60.8'
	SD = 16.1'	d = -1.0'		S	5D = 16.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	177°34.32	S03°11.85	347°0.94	9.4'	S06°23.52	16.3'	60.8'
1	192°34.49	10.87	1°29.36	9.4'	06°39.77	16.2'	60.8'
2	207°34.66 222°34.82	9.88 •• 8.90	15°57.77 30°26.17	9.4' 9.4'	06°55.97 07°12.12	16.1' 16.1'	60.8' 60.7'
3 4	222 34.82 237°34.99	7.91	30 20.17 44°54.56	9.4 9.4'	07 12.12 07°28.21	16.1	60.7'
5	252°35.16	6.93	59°22.93	9.4'	$07^{\circ}44.24$	16.0'	60.7'
6	267°35.33	S03°5.95	73°51.29	9.3'	S08°0.22	15.9'	60.7'
7 8	282°35.50 297°35.67	4.96 3.98	88°19.64 102°47.96	9.3' 9.3'	08° 16.13 08° 31.98	15.9' 15.8'	60.6' 60.6'
9	297°35.67 312°35.84	3.98 •• 2.99	102°47.96 117°16.27	9.3'	08° 31.98 08° 47.77	15.8	60.6
10	327°36.01	2.01	131°44.56	9.3'	09°3.49	15.7'	60.6
11	342°36.18	1.02	146°12.84	9.3'	09° 19.15	15.6'	60.5'
12	357°36.35	\$03°0.04	160°41.09	9.2'	\$09°34.73	15.5'	60.5'
13 14	12°36.52 27°36.69	02°59.05 58.07	175°9.32 189°37.54	9.2' 9.2'	09°50.25 10°5.69	15.4' 15.4'	60.5' 60.4'
15	42°36.86	• • 57.09	204°5.73	9.2'	10° 21.06	15.3'	60.4
16	57°37.03	56.10	218°33.90	9.1'	$10^{\circ}36.35$	15.2'	60.4'
17	72°37.20	55.12	233°2.05	9.1'	10°51.56	15.1'	60.4
18 19	87°37.37 102°37.54	\$02°54.13 53.15	247°30.18 261°58.28	9.1' 9.1'	\$11°6.70 11°21.75	15.1' 15.0'	60.3' 60.3'
20	102 37.54 117°37.71	53.15	201 58.28 276°26.35	9.1 9.1'	11 21.75 11°36.72	15.0 14.9'	60.3
21	132°37.88	• • 51.18	290°54.41	9.0'	$11^{\circ}51.61$	14.8'	60.2'
22	147°38.05	50.19	305°22.43	9.0'	12°6.41	14.7'	60.2'
23	162°38.22	49.21	319°50.44	9.0'	12°21.12	14.6'	60.2'
	SD = 16.1'	d = -1.0'			5D = 16.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time   Mei		Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-98%	
10	10:14	10:07	12:10	-:-	11:35		
11	09:59	09:51	12:10	00:02	12:28		
12	09:43	09:35	12:10	00:54	13:20		

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	171°9.23	135°32.02 N16°29.77	175°41.78 \$02°54.89	357°24.15 N04°21.04	146°1.20 N07°59.67
1	186° 11.70	150°31.97 30.82	190° 42.45 54.10	12°26.91 21.17	161°3.40 59.78
2	201° 14.16	165°31.92 31.86	205°43.12 53.31	27°29.67 21.30	176°5.60 07°59.89
3	216° 16.63	180°31.86 · · 32.91	220°43.80 · · 52.51	42°32.44 · · 21.43	191°7.80 07°59.99
4	231°19.09	195°31.81 33.95	235° 44.47 51.72	57°35.20 21.56	206°10.00 0.10
5	$246^{\circ}21.55$	210°31.76 34.99	250°45.14 50.93	72°37.96 21.69	221°12.19 0.21
6	261°24.02	225°31.71 N16°36.04	265°45.81 <b>S</b> 02°50.14	87°40.72 N04°21.82	236°14.39 N08°0.32
7	276°26.48	240°31.66 37.08	280°46.49 49.35	102°43.49 21.95	251°16.59 0.42
8	291°28.95	255° 31.62 38.12	295° 47.16 48.55	117°46.25 22.08	266°18.79 0.53
9	306°31.41	270°31.57 · · 39.16	310°47.83 · · 47.76	132°49.01 · · 22.21	281°20.99 · · 0.64
10	321°33.87	285°31.52 40.20	325°48.51 46.97	147°51.78 22.34	296°23.19 0.75
11	336° 36.34	300°31.47 41.24 315°31.42 N16°42.28	340°49.18 46.18	162°54.54 22.47 177°57.30 N04°22.60	311°25.38 0.85 326°27.58 N08°0.96
12 13	351°38.80 6°41.27	315°31.42 N16°42.28 330°31.37 43.32	355°49.85 S02°45.39 10°50.53 44.59	177°57.30 N04°22.60 193°0.07 22.73	326°27.58 N08°0.96 341°29.78 1.07
13	21°43.73	345°31.32 44.36	25°51.20 43.80	208° 2.83 22.86	356°31.98 1.18
15	36°46.19	0°31.27 · · 45.40	40°51.88 · · 43.01	223°5.59 · · 22.99	11°34.18 · · 1.28
16	51°48.66	15°31.22 46.43	55°52.55 42.22	238° 8.35 23.12	26°36.37 1.39
17	66°51.12	30°31.18 47.47	70°53.22 41.42	253°11.12 23.25	41°38.57 1.50
18	81°53.59	45°31.13 N16°48.50	85°53.90 <b>S</b> 02°40.63	268°13.88 N04°23.38	56°40.77 N08°1.61
19	96°56.05	60°31.08 49.54	100°54.57 39.84	283°16.64 23.51	71°42.97 1.72
20	111°58.51	75°31.03 50.57	115°55.24 39.05	298°19.41 23.64	86°45.16 1.82
21	127°0.98	90°30.98 · · 51.61	130°55.92 · · 38.25	313°22.17 · · 23.77	101°47.36 · · 1.93
22	142°3.44	105°30.94 52.64	145°56.59 37.46	328°24.93 23.90	116°49.56 2.04
23	157°5.91	120°30.89 53.67	160°57.27 36.67	343°27.69 24.03	131°51.75 2.15
Mer.p	ass. 12:33	ν-0.1' d1.0' m-4.38	ν0.7' d-0.8' m1.03	$\nu 2.8' \ d0.1' \ \text{m-}2.48$	ν2.2' d0.1' m0.57
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	172°8.37	135°30.84 N16°54.70	175°57.94 \$02°35.88	358°30.46 N04°24.16	146°53.95 N08°2.26
1	187° 10.83	150°30.79 55.74	190°58.62 35.08	13°33.22 24.29	161°56.15 2.36
2	202°13.30	165°30.75 56.77	205°59.29 34.29	28°35.98 24.42	176°58.35 2.47
3	217° 15.76	180°30.70 · · 57.80	220°59.97 · · 33.50	43°38.75 · · 24.55	192°0.54 · · 2.58
4	232° 18.23	195°30.66 58.82	236°0.64 32.71	58°41.51 24.68	207°2.74 2.69
5	247°20.69	210°30.61 16°59.85	251°1.32 31.91	73°44.27 24.81	222°4.94 2.80
6	262°23.16	225°30.56 N17°0.88	266°1.99 <b>S</b> 02°31.12	88°47.04 N04°24.94	237°7.13 N08°2.90
7	277°25.62	240°30.52 1.91	281°2.67 30.33	103°49.80 25.07	252°9.33 3.01
8	292°28.08	255° 30.47 2.93	296°3.34 29.54	118°52.56 25.20	267°11.53 3.12
9	307°30.55	270°30.43 · · 3.96	311°4.02 · · 28.74	133°55.32 · · 25.33	282°13.72 · · 3.23
10 11	322°33.01 337°35.48	285°30.38 4.99 300°30.33 6.01	326°4.69 27.95 341°5.37 27.16	148°58.09 25.46 164°0.85 25.59	297°15.92 3.34 312°18.11 3.44
12	352° 37.94	315°30.29 N17°7.03	356°6.04 \$02°26.37	179°3.61 N04°25.72	327°20.31 N08°3.55
13	7°40.40	330°30.24 8.06	11°6.72 25.57	194° 6.38 25.85	342°22.51 3.66
14	22°42.87	345°30.20 9.08	26°7.39 24.78	209° 9.14 25.98	357°24.70 3.77
15	37° 45.33	0°30.16 · · 10.10	41°8.07 · · 23.99	224°11.90 · · 26.11	12°26.90 · · 3.88
16	52°47.80	15° 30.11 11.12	56°8.74 23.20	239°14.66 26.24	27°29.09 3.99
17	$67^{\circ}50.26$	30°30.07 12.14	71°9.42 22.40	254°17.43 26.37	42°31.29 4.09
18	82°52.72	45°30.02 N17°13.16	86°10.09 S02°21.61	269°20.19 N04°26.50	57°33.49 N08°4.20
19	97°55.19		101°10.77 20.82	284°22.95 26.63	72°35.68 4.31
20 21	112°57.65 128°0.12	75°29.93 15.20 90°29.89 · · 16.22	116°11.45 20.02 131°12.12 · · 19.23	299°25.72 26.76 314°28.48 •• 26.89	87°37.88 4.42 102°40.07 • 4.53
22	143°2.58	105°29.85 17.24	146°12.80 18.44	329°31.24 27.02	117°42.27 4.63
23	158° 5.05	120°29.80 18.25	161°13.47 17.65	344°34.00 27.15	132°44.46 4.74
Mer.p	bass. 12:29	ν-0.0′ d1.0′ m-4.39	ν0.7' d-0.8' m1.02	ν2.8′ d0.1′ m-2.48	ν2.2' d0.1' m0.57
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	173°7.51	135°29.76 N17°19.27	176°14.15 S02°16.85	359°36.77 N04°27.28	147°46.66 N08°4.85
1	188°9.97	150°29.72 20.29	191°14.83 16.06	14°39.53 27.41	162°48.85 4.96
2	203° 12.44 218° 14.90	165°29.68 21.30 180°29.63 · · 22.31	206° 15.50 15.27 221° 16.18 •• 14.48	29°42.29 27.54 44°45.06 •• 27.67	177°51.05 5.07 192°53.25 · 5.18
3 4	218° 14.90 233° 17.37	180°29.59	236°16.86 13.68	59°47.82 27.80	207°55.44 5.29
5	233 17.37 248° 19.83	210° 29.55 24.34	251°17.53 12.89	74°50.58 27.92	207 55.44 5.29 F
6	263°22.29	225°29.51 N17°25.35	266°18.21 S02°12.10	89°53.34 N04°28.05	237°59.83 N08°5.50
7	278° 24.76	240°29.47 26.36	281°18.89 11.30	104°56.11 28.18	253°2.02 5.61
8	293° 27.22	255°29.42 27.38	296°19.56 10.51	119°58.87 28.31	268°4.22 5.72
9	$308^{\circ}29.69$	270°29.38 · · 28.39	311°20.24 · · 9.72	135°1.63 · · 28.44	283°6.41 · · 5.83
10	323° 32.15	285°29.34 29.40	326°20.92 8.92	150° 4.39 28.57	298°8.61 5.94
11	338°34.61	300°29.30 30.40	341°21.59 8.13	165°7.16 28.70	313°10.80 6.04
12	353° 37.08	315°29.26 N17°31.41	356°22.27 S02°7.34	180°9.92 N04°28.83	328°13.00 N08°6.15
13	8°39.54	330°29.22 32.42	11°22.95 6.55	195°12.68 28.96	343°15.19 6.26
14 15	23°42.01 38°44.47	345°29.18 33.43 0°29.14 · · 34.43	26°23.63 5.75 41°24.30 •• 4.96	210°15.44 29.09 225°18.21 •• 29.22	358°17.39 6.37 13°19.58 · · 6.48
15 16	38° 44.47 53° 46.94	15°29.10 35.44	56°24.98 4.17	240°20.97 29.35	13°19.58 · · · 6.48   r 28°21.77 6.59
17	68° 49.40	30°29.06 36.44	71°25.66 3.37	255°23.73 29.48	43°23.97 6.70
18	83°51.86	45°29.02 N17°37.45	86°26.34 S02°2.58	270°26.49 N04°29.60	58°26.16 N08°6.81
19	98°54.33	60°28.98 38.45	101°27.01 1.79	285°29.26 29.73	73°28.36 6.91
20	113°56.79	75°28.94 39.45	116° 27.69 1.00	300°32.02 29.86	88°30.55 7.02
21	128°59.26	90°28.90 · · 40.46	131°28.37 02°0.20	315°34.78 · · 29.99	103°32.74 · · 7.13
22	144°1.72	105°28.86 41.46	146°29.05 01°59.41	330°37.54 30.12	118°34.94 7.24
23	159°4.18	120°28.82 42.46	161°29.72 58.62	345°40.31 30.25	133°37.13 7.35
Mer.r	pass. 12:25	ν-0.0' d1.0' m-4.40	ν0.7' d-0.8' m1.02	ν2.8' d0.1' m-2.48	ν2.2' d0.1' m0.57

	Stars	
	SHA	Dec
Alpheratz	357°32.40	29° 14.77
Ankaa Schedar	353°5.03 349°28.52	-42°9.22 56°41.61
Diphda	348°45.01	-17°49.98
Achernar	$335^{\circ}18.80$	-57°5.75
Hamal	327°48.49	23°35.75
Polaris Acamar	312°54.91 315°10.07	89°23.18 -40°11.71
Menkar	314°3.60	4° 11.93
Mirfak	$308^{\circ}24.72$	49°57.79
Aldebaran	290°36.69	16° 33.89
Rigel Capella	281°1.38 280°18.05	-8° 10.35 46° 1.64
Bellatrix	278°20.09	6°22.37
Elnath	$277^{\circ}58.57$	28° 37.84
Alnilam	275°35.07	-1°11.22
Betelgeuse Canopus	270°49.23 263°51.11	7°24.59 -52°42.97
Sirius	258°23.84	-16° 45.56
Adhara	255°3.68	-29°0.93
Procyon	244°47.95	5°8.96
Pollux Avior	243°13.94 234°13.22	27°57.38 -59°36.31
Suhail	234 13.22 222°44.01	-59 30.31 -43°33.09
Miaplacidus	221°36.90	-69°50.25
Alphard	$217^{\circ}44.92$	-8°47.11
Regulus	207°31.38	11°49.54
Dubhe Denebola	193°37.27 182°21.98	61°35.79 14°24.63
Gienah	175°40.56	-17°42.11
Acrux	172°56.40	-63° 15.40
Gacrux	$171^{\circ}48.10$	$-57^{\circ}16.36$
Alioth	166°10.23	55°48.14
Spica Alkaid	158°19.26 152°49.60	-11°18.69 49°10.05
Hadar	148°31.71	-60° 30.47
Menkent	147°54.20	-36°30.56
Arcturus	$145^{\circ}45.29$	$19^{\circ}1.88$
Rigil Kent.	139°36.17	-60°57.01
Kochab Zuben'ubi	137°19.25 136°52.90	74°2.01 -16°9.63
Alphecca	126°1.38	26°36.91
Antares	$112^{\circ}12.53$	-26° 29.63
Atria	107°4.30	-69°4.37
Sabik Shaula	101°59.76 96°6.83	-15°45.59 -37°7.30
Rasalhague	95°56.13	12° 32.20
Eltanin	90°41.02	51°28.78
Kaus Aust.	83°29.15	-34°22.12
Vega Nunki	80°31.56 75°44.66	38°48.32 -26°15.59
Altair	61°57.60	8°56.48
Peacock	53°2.08	-56°38.41
Deneb	49°24.33	$45^{\circ}22.69$
Enif	33°36.52	10°0.21
Al Na'ir Fomalhaut	27°30.13 15°12.03	-46°49.36 -29°28.35
Scheat	13°43.00	-29 26.35 28°14.12
Markab	13°27.61	15°21.39
Mar 13 Mon	SHA	Mer.pass
Venus	324°22.78 4°32.54	14:58
Mars Jupiter	4°32.54 186°14.91	12:17 00:10
Saturn	334°51.97	14:14
Mar 14 Tue	SHA	Mer.pass
Venus	323°22.47	14:58
Mars	3°49.57	12:16
Jupiter Saturn	186°22.09 334°45.58	00:06 14:10
Mar 15 Wed	SHA	Mer.pass
Venus	$322^{\circ}22.25$	14:58
Mars	3°6.64	12:15
Jupiter Saturn	186°29.26 334°39.15	00:02 14:07
		14.07
Horizon	tal parallax Venus:	0.2
	Mars:	0.2

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°38.39	S02°48.22	334° 18.41	8.9'	S12°35.75	14.5'	60.1'
1 2	192°38.56 207°38.74	47.24 46.25	348°46.36 3°14.28	8.9' 8.9'	12°50.28 13°4.72	14.4' 14.3'	60.1' 60.1'
3	222°38.91	• • 45.26	17° 42.17	8.9'	13°19.07	14.3'	60.0'
4	237°39.08	44.28	32° 10.04	8.8'	13°33.33	14.2'	60.0'
5	252°39.25	43.29	46° 37.87	8.8'	13°47.49 \$14°1.55	14.1'	60.0'
6 7	267°39.42 282°39.59	\$02°42.31 41.32	61°5.68 75°33.46	8.8' 8.7'	514°1.55 14°15.51	14.0' 13.9'	59.9' 59.9'
8	297°39.77	40.34	90°1.21	8.7'	14°29.37	13.8'	59.9'
9	312°39.94	• • 39.35	104°28.93	8.7'	14°43.12	13.7'	59.8'
10 11	327°40.11 342°40.28	38.37 37.38	118° 56.62 133° 24.28	8.7' 8.6'	14°56.78 15°10.33	13.5' 13.4'	59.8' 59.8'
12	357°40.46	502°36.39	147°51.90	8.6'	\$15°23.77	13.3'	59.7'
13	12°40.63	35.41	$162^{\circ}19.50$	8.6'	$15^{\circ}37.11$	13.2'	59.7'
14 15	27°40.80 42°40.97	34.42 · · 33.44	176°47.06 191°14.60	8.5' 8.5'	15°50.33 16°3.45	13.1' 13.0'	59.7' 59.6'
15 16	42 40.97 57°41.15	32.45	205° 42.10	8.5'	16° 3.45	12.9'	59.6'
17	72°41.32	31.46	220°9.57	8.4'	16°29.35	12.8'	59.6'
18	87°41.49	S02°30.48	234°37.01	8.4'	\$16°42.13	12.7'	59.5'
19 20	102°41.67 117°41.84	29.49 28.51	249°4.42 263°31.79	8.4' 8.3'	16°54.79 17°7.34	12.5' 12.4'	59.5' 59.4'
21	132°42.01	27.52	277°59.14	8.3'	17°19.76	12.3'	59.4
22	147°42.19	26.53	292°26.45	8.3'	17°32.07	12.2'	59.4'
23	162°42.36	25.55	306°53.73	8.2'	17°44.26	12.1'	59.3'
	SD = 16.1'	d = -1.0'		SI	D = 16.4'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°42.53	S02°24.56	321°20.98	8.2'	S17°56.33	11.9'	59.3'
1	192°42.71	23.57	335°48.20	8.2'	18°8.28	11.8'	59.3'
2	207°42.88 222°43.06	22.59 •• 21.60	350° 15.38 4° 42.53	8.2' 8.1'	18°20.10 18°31.80	11.7' 11.6'	59.2' 59.2'
4	237°43.23	20.61	19°9.66	8.1	18°43.37	11.4'	59.1'
5	252°43.40	19.63	33°36.75	8.1'	18°54.81	11.3'	59.1'
6 7	267°43.58 282°43.75	S02°18.64 17.65	48°3.81 62°30.84	8.0' 8.0'	\$19°6.13 19°17.32	11.2' 11.1'	59.1' 59.0'
8	282 43.75 297°43.93	16.67	76° 57.84	8.0'	19 17.32 19°28.37	10.9'	59.0'
9	312°44.10	• • 15.68	91°24.81	7.9'	19°39.30	10.8'	58.9'
10	327°44.28	14.69	105°51.74	7.9'	19°50.10 20°0.76	10.7'	58.9'
11 12	342°44.45 357°44.63	13.71 \$02°12.72	120° 18.65 134° 45.53	7.9' 7.9'	20°0.76 S20°11.29	10.5' 10.4'	58.9' 58.8'
13	12°44.80	11.73	149° 12.39	7.8'	20°21.68	10.3	58.8'
14	27°44.98	10.75	163°39.21	7.8'	20°31.94	10.1'	58.7'
15 16	42°45.15 57°45.33	· · 9.76 8.77	178°6.00 192°32.77	7.8' 7.7'	20°42.06 20°52.05	10.0' 9.8'	58.7' 58.7'
17	72°45.50	7.78	206° 59.51	7.7'	21°1.90	9.7'	58.6'
18	87°45.68	S02°6.80	221°26.23	7.7'	S21°11.60	9.6'	58.6'
19 20	102°45.85 117°46.03	5.81 4.82	235°52.92 250°19.58	7.7' 7.6'	21°21.17 21°30.60	9.4' 9.3'	58.5' 58.5'
21	132°46.20	• • 3.84	264° 46.22	7.6'	21°39.89	9.3 9.1'	58.5'
22	147°46.38	2.85	$279^{\circ}12.83$	7.6'	21°49.03	9.0'	58.4'
23	162°46.56	1.86	293°39.42	7.6'	21°58.03	8.9'	58.4'
	SD = 16.1'	d = -1.0'		SI	O = 16.2'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°46.73	\$02°0.87	308°5.99	7.5'	\$22°6.89	8.7'	58.3'
1 2	192°46.91 207°47.08	01°59.89 58.90	322°32.54 336°59.06	7.5' 7.5'	22°15.61 22°24.18	8.6' 8.4'	58.3' 58.3'
3	222°47.26	57.91	351°25.57	7.5'	22°32.61	8.3	58.2
4	237°47.44	56.92	5°52.05	7.5'	22°40.89	8.1'	58.2
5 6	252°47.61 267°47.79	55.94 \$01°54.95	20° 18.52 34° 44.97	7.4' 7.4'	22°49.02 <b>S</b> 22°57.01	8.0' 7.8'	58.1' 58.1'
7	282°47.97	53.96	49° 11.40	7.4 7.4'	23°4.85	7.0 7.7'	58.1
8	297°48.14	52.97	63°37.81	7.4'	23°12.54	7.5'	58.0'
9	312°48.32	• • 51.99	78°4.21	7.4' 7.4'	23°20.08 23°27.47	7.4'	58.0' 57.9'
10 11	327°48.50 342°48.67	51.00 50.01	92°30.59 106°56.96	7.4° 7.4°	23°27.47 23°34.72	7.2' 7.1'	57.9'
12	357°48.85	S01°49.02	121°23.32	7.3'	S23°41.81	6.9'	57.9'
13	12°49.03	48.03	135°49.66	7.3'	23°48.76	6.8'	57.8'
14 15	27°49.21 42°49.38	47.05 •• 46.06	150° 16.00 164° 42.32	7.3' 7.3'	23°55.55 24°2.20	6.6' 6.5'	57.8' 57.7'
16	57°49.56	45.07	179°8.63	7.3'	24° 8.69	6.3	57.7'
17	72°49.74	44.08	193°34.94	7.3'	24°15.03	6.2'	57.7'
18 19	87°49.92 102°50.09	S01°43.09 42.11	208°1.24 222°27.54	7.3' 7.3'	\$24°21.22 24°27.26	6.0' 5.9'	57.6' 57.6'
20	102 50.09 117°50.27	42.11	222 27.54 236° 53.83	7.3'	24 27.26 24°33.15	5.9 5.7'	57.5'
21	132°50.45	• • 40.13	251°20.11	7.3'	24°38.88	5.6'	57.5'
22 23	147°50.63 162°50.81	39.14 38.15	265°46.40 280°12.68	7.3' 7.3'	24°44.46 24°49.89	5.4' 5.3'	57.5' 57.4'
23	SD = 16.1'		200 12.08		D = 15.9'	5.3	51.4
	טט = 10.1	d = -1.0'		- 51	J — 15.9		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-79%	
13	09:26	09:18	12:09	01:47	14:13		
14	09:10	09:01	12:09	02:40	15:08		
15	08:53	08:45	12:09	03:36	16:04		

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

h	Aries	Venus	5	Ma	irs	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	174°6.65		.7°43.46	176°30.40	S01°57.82	0°43.07	N04°30.38	148°39.33	N08°7.46			
1	189°9.11	150°28.74	44.46	191°31.08	57.03	15°45.83	30.51	163°41.52	7.57	Alpheratz	357°32.39	29°14.77
2	204° 11.58	165°28.71	45.46	206° 31.76	56.24	30°48.59	30.64	178°43.71	7.68	Ankaa	353°5.03	-42°9.20
3	219° 14.04		• 46.46	221°32.44	• • 55.44	45°51.36	30.77	193°45.91	• • 7.78	Schedar	349°28.52	56°41.60
4	234° 16.51	195°28.63	47.45	236° 33.11	54.65	60°54.12	30.89	208°48.10	7.89	Diphda	348°45.01	-17°49.98
5	249° 18.97	210°28.59	48.45	251°33.79	53.86	75°56.88	31.02	223°50.29	8.00	Achernar	335°18.82 327°48.50	-57°5.73 23°35.75
6	264°21.43	225°28.55 N1	.7°49.45	266° 34.47	S01°53.06	90°59.64	N04°31.15	238°52.49	N08°8.11	Hamal Polaris	312°55.84	89° 23.17
7	279°23.90	240°28.52	50.44	281°35.15	52.27	106°2.41	31.28	253°54.68	8.22	Acamar	315°10.09	-40°11.70
8	294°26.36	255°28.48	51.44	296° 35.83	51.48	121°5.17	31.41	268°56.87	8.33	Menkar	314°3.61	4°11.93
9	309°28.83		• 52.43	311°36.51	• • 50.69	136°7.93	• • 31.54	283°59.07	• • 8.44	Mirfak	308°24.73	49°57.78
10	324°31.29	285°28.41	53.42	326°37.18	49.89	151°10.69	31.67	299°1.26	8.55	Aldebaran	290°36.70	16°33.89
11	339°33.75	300°28.37	54.42 .7°55.41	341°37.86	49.10	166°13.45 181°16.22	31.80	314°3.45	8.66	Rigel	281°1.39	-8° 10.35
12 13	354° 36.22 9° 38.68	315°28.33 N1 330°28.30	56.40	356°38.54 11°39.22	\$01°48.31 47.51	196° 18.98	N04°31.92 32.05	329°5.64 344°7.84	N08°8.76 8.87	Capella	280°18.06	46°1.64
13	9 36.06 24°41.15	345°28.26	57.39	26°39.90	46.72	211°21.74	32.18	359°10.03	8.98	Bellatrix	278°20.10	6°22.37
15	39°43.61		• 58.38	41°40.58	• • 45.93	226°24.50	32.31	14°12.22	9.09	Elnath	277°58.58	28° 37.84
16	54°46.07		.7°59.37	56°41.26	45.13	241°27.26	32.44	29°14.41	9.20	Alnilam	275°35.08	-1°11.22
17	69° 48.54		18°0.36	71°41.94	44.34	256°30.03	32.57	44°16.61	9.31	Betelgeuse	270°49.24	7°24.59
18	84°51.00		18° 1.35		S01°43.55	271°32.79	N04°32.70	59°18.80	N08°9.42	Canopus	263°51.14	-52°42.98
19	99°53.47	60°28.09	2.34	101°43.30	42.75	286°35.55	32.82	74°20.99	9.53	Sirius	258°23.85	-16°45.57 -29°0.94
20	$114^{\circ}55.93$	75°28.05	3.32	116°43.97	41.96	301°38.31	32.95	89°23.18	9.64	Adhara Procyon	255°3.69 244°47.96	5°8.95
21	129°58.40	90°28.02	• • 4.31	131°44.65	• • 41.17	316°41.07	• • 33.08	104°25.38	• • 9.75	Pollux	244 47.90 243°13.95	27°57.38
22	145°0.86	105°27.98	5.29	146°45.33	40.37	331°43.84	33.21	119°27.57	9.86	Avior	234° 13.24	-59° 36.32
23	160°3.32	120°27.95	6.28	161°46.01	39.58	346°46.60	33.34	134°29.76	9.96	Suhail	222°44.02	-43°33.10
Mer	pass. 12:22	ν-0.0' d1.0' r	m-4.40	$\nu$ 0.7′ d-0.	8' m1.02	ν2.8′ dΩ	.1' m-2.48	$\nu 2.2' \ d0$	1′ m0.57	Miaplacidus	221°36.93	-69°50.26
		- 1.0 01.0 1								Alphard	217°44.92	-8°47.12
			_		_		_		_	Regulus	207°31.38	11°49.54
Fri	GHA	GHA	Dec	GHA	Dec	GHA 1940-26	Dec	GHA	Dec	Dubhe	193°37.27	61°35.80
0	175°5.79 190°8.25		18°7.26	176°46.69 191°47.37	S01°38.79	1°49.36 16°52.12	N04°33.47	149°31.95 164°34.14	N08° 10.07	Denebola	182°21.98	14°24.63
1 2	205° 10.72	150°27.88 165°27.85	8.25 9.23	191 47.37 206°48.05	38.00 37.20	31°54.88	33.60 33.72	179°36.33	10.18 10.29	Gienah	175°40.55	-17°42.12
3	205 10.72 220°13.18		· 10.21	200 48.05 221°48.73	36.41	46°57.64	33.85	179 30.33 194°38.53	10.29		172°56.38	-63°15.42
4	235° 15.64	195°27.78	11.19	236°49.41	35.62	62° 0.41	33.98	209°40.72	10.40		171°48.08	-57° 16.37
5	250° 18.11	210°27.75	12.17	251°50.09	34.82	77°3.17	34.11	224°42.91	10.62	Alioth	166°10.22	55°48.16
6	265°20.57		.8°13.15	266° 50.77	S01°34.03	92°5.93	N04°34.24	239°45.10	N08° 10.73	Spica	158°19.24	-11°18.69
7	280°23.04	240°27.68	14.13	281°51.45	33.24	107°8.69	34.36	254°47.29	10.84	Alkaid	152°49.58	49° 10.06
8	295°25.50	255°27.65	15.11	296°52.13	32.44	122°11.45	34.49	269°49.48	10.95	Hadar	148°31.67	-60°30.49
9	310°27.97		• 16.09	311°52.81	• • 31.65	137°14.21	• • 34.62	284°51.68	• • 11.06		147°54.17 145°45.27	-36°30.57 19°1.88
10	325°30.43	285°27.59	17.06	326°53.49	30.86	152°16.97	34.75	299°53.87	11.17	Arcturus Rigil Kent.	139°36.13	-60°57.03
11	$340^{\circ}32.89$	300°27.55	18.04	341°54.17	30.06	167°19.74	34.88	314°56.06	11.28	Kochab	137°19.21	74°2.02
12	355° 35.36	315°27.52 N1	.8°19.02	356° 54.85	S01°29.27	182°22.50	N04°35.01	329°58.25	N08° 11.39	Zuben'ubi	136°52.88	-16°9.64
13	10°37.82	330°27.49	19.99	11°55.53	28.48	197°25.26	35.13	345°0.44	11.49	Alphecca	126°1.35	26°36.91
14	25°40.29	345°27.46	20.97	26° 56.21	27.68	212°28.02	35.26	0°2.63	11.60	Antares	112°12.50	-26° 29.63
15	40° 42.75		• 21.94	41°56.89	• • 26.89	227°30.78	• • 35.39	15°4.82	• • 11.71	Atria	107°4.23	-69°4.38
16	55° 45.21	15°27.40	22.91	56° 57.57	26.10	242°33.54	35.52	30°7.01	11.82	Sabik	101°59.73	-15°45.59
17	70°47.68	30°27.37	23.88	71°58.25 86°58.93	25.31	257°36.30 272°39.07	35.64	45°9.20	11.93	Shaula	96°6.79	-37°7.30
18 19	85° 50.14 100° 52.61	45°27.34 N1 60°27.31	.8°24.86 25.83	101°59.62	S01°24.51 23.72	272 39.07 287°41.83	N04° 35.77 35.90	60°11.39 75°13.58	N08° 12.04 12.15	Rasalhague	95°56.11	12°32.20
20	115°55.07	75°27.28	26.80	117°0.30	22.93	302°44.59	36.03	90°15.78	12.13	Eltanin	90°40.99	51°28.78
21	130°57.54		• 27.77	132°0.98	• • 22.13	317°47.35	36.16	105°17.97	• • 12.37	Kaus Aust.	83°29.12	-34°22.11
22	146°0.00	105°27.22	28.74	147°1.66	21.34	332°50.11	36.28	120°20.16	12.48	Vega	80°31.54	38°48.32
23	161°2.46	120°27.19	29.70	162°2.34	20.55	347°52.87	36.41	135°22.35	12.59	Nunki	75°44.64	-26°15.59
										Altair	61°57.57	8°56.48 -56°38.40
Mer.	pass. 12:18	ν-0.0′ d1.0′ r	m-4.41	$\nu$ 0.7′ d-0.	8′ m1.02	$\nu$ 2.8° d0.	.1′ m-2.48	$\nu$ 2.2' d0	1′ m0.57	Peacock Deneb	53°2.05 49°24.30	-50 38.40 45°22.68
										Enif	33°36.50	10°0.21
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.11	-46°49.34
0	$176^{\circ}4.93$	135°27.16 N1	.8°30.67	177°3.02	S01°19.75	2°55.63	N04°36.54	150°24.54	N08° 12.70	Fomalhaut	15°12.02	-29°28.34
1	191°7.39	150°27.14	31.64	192°3.70	18.96	17°58.39	36.67	165°26.73	12.81	Scheat	13°42.99	28° 14.11
2	206°9.86	165°27.11	32.60	207°4.38	18.17	33° 1.15	36.79	180°28.92	12.92	Markab	$13^{\circ}27.60$	15°21.39
3	221°12.32		• 33.57	222°5.06	17.37	48° 3.91	• • 36.92	195°31.11	• • 13.03	M: 1C T	CIIA	
4	236° 14.78	195°27.05	34.53	237°5.74	16.58	63°6.67	37.05	210°33.30	13.14	Mar 16 Thu	SHA 321°22 13	Mer.pass
5 6	251° 17.25 266° 19.71	210°27.02 225°27.00 N1	35.50 8°36.46	252°6.43 267°7.11	15.79 S01°15.00	78° 9.44 93° 12.20	37.18 N04°37.30	225°35.49 240°37.68	13.25 N08°13.36	Venus	321°22.13 2°23.75	14:58 12:13
7	281°22.18	240°26.97	37.42	282°7.79	14.20	93 12.20 108°14.96	37.43	240 37.08 255°39.87	13.47		186°36.42	23:53
8	296°24.64	255°26.94	38.38	297°8.47	13.41	108 14.90 123°17.72	37.43 37.56	270°42.06	13.58	Saturn	334°32.68	14:03
9	311°27.11		• 39.35	312°9.15	. 12.62	138°20.48	• • 37.69	285°44.25	• • 13.69			
10	326°29.57	285°26.89	40.31	327°9.83	11.82	153°23.24	37.81	300°46.44	13.80	Mar 17 Fri	SHA	Mer.pass
11	341°32.03	300°26.86	41.27	342° 10.52	11.03	168°26.00	37.94	315°48.63	13.91	1	320°22.13	14:58
12	356° 34.50		.8°42.22	357° 11.20	S01°10.24	183°28.76	N04°38.07	330°50.81	N08°14.01	Mars	1°40.90	12:12
13	11°36.96	$330^{\circ}26.81$	43.18	$12^{\circ}11.88$	9.44	198°31.52	38.20	345°53.00	14.12	Jupiter Saturn	186°43.57 334°26.16	23:48 14:00
14	26°39.43	345°26.79	44.14	27° 12.56	8.65	213°34.28	38.32	0°55.19	14.23	Saturn	JJ4 20.10	14:00
15	41°41.89		• 45.10	42° 13.24	• • 7.86	228°37.04	• • 38.45	15°57.38	• • 14.34	Mar 18 Sat	SHA	Mer.pass
16	56° 44.35	15°26.74	46.05	57°13.92	7.07	243°39.80	38.58	30°59.57	14.45		$319^{\circ}22.24$	14:58
17	71°46.82	30°26.71	47.01	72°14.61	6.27	258°42.56	38.70	46°1.76	14.56	Mars	0°58.09	12:11
18	86°49.28		.8°47.96	87° 15.29	S01°5.48	273°45.32		61°3.95	N08° 14.67		186°50.70	23:44
19	101°51.75	60°26.66	48.92	102° 15.97	4.69	288°48.08	38.96	76°6.14	14.78	Saturn	334°19.61	13:56
20 21	116° 54.21 131° 56.68	75°26.64 90°26.61	49.87 • 50.82	117° 16.65 132° 17.34	3.89 · · 3.10	303°50.84 318°53.60	39.09 · · 39.21	91°8.33 106°10.52	14.89 •• 15.00	Horizo	ntal parallax	
22	131 50.08 146°59.14	105°26.59	51.78	132 17.34 147°18.02	2.31	318 53.00 333°56.36	39.21	100 10.52 121°12.71	15.11		Venus:	0.2
23	162°1.60	120°26.57	52.73	162° 18.70	1.51	348°59.12	39.47	136°14.89	15.11		Mars:	0.1
ivier.	pass. 12:14	ν-0.0′ d1.0′ r	m-4.42	$\nu$ 0.7′ d-0.	o m1.02	ν2.8' d0.	.1′ m-2.48	ν2.2' d0	1′ m0.56			

h	Su	n	Moon				
			CUA			.,	
Thu 0	<b>GHA</b> 177°50.98	Dec S01°37.17	<b>GHA</b> 294°38.97	u 7.3'	Dec \$24°55.16	<i>d</i> 5.1'	<b>HP</b> 57.4'
1	192°51.16	36.18	309° 5.25	7.3'	25°0.28	5.0'	57.3'
2	207°51.34	35.19	323°31.54	7.3'	25°5.25	4.8'	57.3'
3 4	222°51.52 237°51.70	· · 34.20 33.21	337°57.83 352°24.12	7.3' 7.3'	25°10.07 25°14.73	4.7' 4.5'	57.3' 57.2'
5	252° 51.88	32.23	6°50.42	7.3'	25°14.73	4.4	57.2'
6	267°52.06	S01°31.24	$21^{\circ}16.73$	7.3'	S25°23.59	4.2'	57.1'
7	282°52.23	30.25	35°43.04 50°9.37	7.3'	25°27.79	4.0'	57.1'
8 9	297°52.41 312°52.59	29.26 •• 28.27	64°35.70	7.3' 7.3'	25°31.84 25°35.73	3.9' 3.7'	57.1' 57.0'
10	327° 52.77	27.28	79°2.05	7.4'	25°39.47	3.6'	57.0'
11	342° 52.95	26.30	93°28.41	7.4'	25°43.06	3.4'	57.0'
12 13	357°53.13 12°53.31	S01°25.31 24.32	107°54.79 122°21.18	7.4' 7.4'	\$25°46.50 25°49.78	3.3' 3.1'	56.9' 56.9'
14	27° 53.49	23.33	136°47.59	7.4'	25°52.91	3.0'	56.8
15	42°53.67	• • 22.34	$151^{\circ}14.01$	7.4'	$25^{\circ}55.88$	2.8'	56.8'
16	57° 53.85	21.35	165°40.46	7.5'	25°58.71	2.7'	56.8'
17 18	72°54.03 87°54.20	20.37 <b>S</b> 01°19.38	180°6.92 194°33.41	7.5' 7.5'	26°1.38 \$26°3.90	2.5'	56.7' 56.7'
19	102°54.38	18.39	208°59.92	7.5'	26° 6.26	2.2'	56.7'
20	117°54.56	17.40	223°26.46	7.6'	26°8.48	2.1'	56.6'
21	132°54.74	• • 16.41	237°53.02	7.6'	26°10.54	1.9'	56.6'
22 23	147°54.92 162°55.10	15.42 14.43	252°19.61 266°46.22	7.6' 7.6'	26°12.46 26°14.22	1.8' 1.6'	56.5' 56.5'
23	SD = 16.1'	d = -1.0'			0 = 15.6'	1.0	30.3
	JD = 10.1′	$a = -1.0^{\circ}$		5L	v = 15.0°		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	177°55.28 192°55.46	S01°13.45 12.46	281°12.87 295°39.55	7.7' 7.7'	\$26°15.83 26°17.29	1.5' 1.3'	56.5' 56.4'
2	192 55.46 207°55.64	12.46 11.47	295 39.55 310°6.26	7.7'	26 17.29 26°18.60	1.3	56.4'
3	222°55.82	• • 10.48	324°33.00	7.8'	26°19.77	1.0'	56.4
4	237° 56.00	9.49	338°59.78	7.8'	26°20.78	0.9'	56.3'
5 6	252°56.19 267°56.37	8.50 <b>S</b> 01°7.51	353°26.59 7°53.44	7.8' 7.9'	26°21.65 \$26°22.36	0.7' 0.6'	56.3' 56.3'
7	282° 56.55	6.53	22°20.32	7.9' 7.9'	26°22.93	0.6	56.2'
8	297° 56.73	5.54	36°47.25	8.0'	26°23.36	0.3'	56.2'
9	312° 56.91	• • 4.55	51°14.21	8.0'	26°23.63	0.1'	56.2'
10 11	327°57.09 342°57.27	3.56 2.57	65°41.22 80°8.27	8.1' 8.1'	26°23.76 26°23.75	-0.0' -0.2'	56.1' 56.1'
12	357° 57.45	501°1.58	94°35.37	8.1	S26°23.59	-0.2	56.1
13	12°57.63	01°0.59	109°2.50	8.2'	26°23.28	-0.4'	56.0'
14	27°57.81	00°59.60	123°29.69	8.2'	26°22.83	-0.6'	56.0'
15 16	42°57.99 57°58.17	· · 58.62 57.63	137°56.92 152°24.20	8.3' 8.3'	26°22.24 26°21.51	-0.7' -0.9'	56.0' 55.9'
17	72°58.36	56.64	166°51.53	8.4'	26°20.63	-1.0'	55.9'
18	87° 58.54	S00°55.65	181°18.91	8.4'	S26°19.61	-1.2'	55.9'
19 20	102°58.72 117°58.90	54.66 53.67	195°46.34 210°13.82	8.5' 8.5'	26°18.45 26°17.15	-1.3' -1.4'	55.8' 55.8'
21	132° 59.08	• • 52.68	210 13.62 224°41.36	8.6'	26°15.71	-1.4 -1.6'	55.8'
22	147°59.26	51.69	239°8.95	8.6'	$26^{\circ}14.14$	-1.7'	55.7'
23	162°59.44	50.71	253°36.59	8.7'	26°12.42	-1.9'	55.7'
	SD = 16.1'	d = -1.0'		SD	0 = 15.4'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177° 59.63	S00°49.72	$268^{\circ}4.29$	8.8'	S26°10.56	-2.0'	55.7'
1	192°59.81	48.73	282°32.05	8.8'	26°8.57	-2.1'	55.6'
2	207°59.99 223°0.17	47.74 •• 46.75	296°59.87 311°27.74	8.9' 8.9'	26° 6.45 26° 4.18	-2.3' -2.4'	55.6' 55.6'
4	238° 0.35	45.76	325°55.67	9.0'	$26^{\circ}1.79$	-2.4 -2.5'	55.6'
5	253°0.54	44.77	$340^{\circ}23.67$	9.1'	$25^{\circ}59.26$	-2.7'	55.5'
6	268°0.72	S00°43.78	354°51.72	9.1'	\$25°56.59	-2.8'	55.5'
7 8	283°0.90 298°1.08	42.80 41.81	9°19.84 23°48.02	9.2' 9.2'	25°53.80 25°50.87	-2.9' -3.1'	55.5' 55.4'
9	313°1.26	• • 40.82	38°16.27	9.3'	25°47.81	-3.1 -3.2'	55.4
10	328°1.45	39.83	52°44.57	9.4'	25°44.62	-3.3'	55.4'
11 12	343°1.63 358°1.81	38.84 \$00°37.85	67°12.95 81°41.38	9.4' 9.5'	25°41.30 \$25°37.86	-3.4' -3.6'	55.4' 55.3'
13	358° 1.81 13° 1.99	36.86	96°9.89	9.5° 9.6'	25°34.28	-3.6° -3.7'	55.3'
14	28°2.18	35.87	110°38.46	9.6'	25°30.58	-3.8'	55.3'
15	43°2.36	• • 34.89	125°7.10	9.7'	25°26.75	-4.0'	55.3'
16 17	58°2.54 73°2.72	33.90 32.91	139°35.81 154°4.58	9.8' 9.8'	25°22.80 25°18.72	-4.1' -4.2'	55.2' 55.2'
18	73°2.72 88°2.91	32.91 S00°31.92	154° 4.58 168° 33.42	9.8	25°18.72 S25°14.52	-4.2' -4.3'	55.2'
19	103°3.09	30.93	183°2.34	10.0'	25°10.20	-4.4'	55.1'
20	118°3.27	29.94	197°31.32	10.1'	25°5.76	-4.6'	55.1'
21 22	133°3.46 148°3.64	· · 28.95 27.96	212°0.38 226°29.50	10.1' 10.2'	25°1.19 24°56.50	-4.7' -4.8'	55.1' 55.1'
23	163°3.82	26.98	240°58.70	10.2	24°51.70	-4.6 -4.9'	55.0'
	SD = 16.1'	d = -1.0'			0 = 15.2'	-	
		<u>u — -1.0</u>	-	JL	_ 13.2		

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

Lat.		Moonris	e		Moonset	<u> </u>
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°	03:34	04.00	04.47	05:23	06.50	00.00
62° 60°	02:38 02:05	04:02 03:21	04:47 04:09	06:20 06:53	06:52 07:33	08:00 08:37
N 58°						
N 58°	01:41 01:21	02:53 02:31	03:43 03:22	07:17 07:37	08:01 08:23	09:03 09:24
54°	01:21	02:31	03:22	07:54	08:41	09:24
52°	00:51	01:58	02:50	08:08	08:56	09:55
50°	00:39	01:44	02:37	08:20	09:09	10:08
45°	00:14	01:17	02:11	08:46	09:37	10:34
N 40°		00:56	01:49	09:06	09:58	10:55
35°		00:38	01:32	09:23	10:16	11:12
30°		00:23	01:17	09:38	10:31	11:27
20°	23:57		00:51	10:03	10:57	11:52
N 10°	23:35		00:29	10:25	11:20	12:14
0°	23:14		00:09	10:45	11:40	12:34
<b>S</b> 10°	22:53	23:48		11:05	12:01	12:54
20° 30°	22:31 22:05	23:26 23:00	23:57	11:27 11:52	12:24 12:49	13:15 13:40
35°	22:05	23:00	23:43	12:07	13:05	13:40
40°	21:33	22:43	23:26	12:24	13:22	14:12
45°	21:12	22:06	23:07	12:45	13:44	14:32
<b>S</b> 50°	20:46	21:40	22:42	13:11	14:10	14:57
52°	20:33	21:27	22:30	13:24	14:23	15:09
54°	20:18	21:12	22:17	13:38	14:38	15:23
56°	20:01	20:54	22:01	13:55	14:56	15:39
58°	19:40	20:33	21:42	14:16	15:17	15:58
<b>S</b> 60°	19:14	20:06	21:19	14:42	15:44	16:21

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	70-50%
16	08:36	08:27	12:08	04:32	17:00	
17	08:19	08:10	12:08	05:27	17:55	
18	08:01	07.53	12.08	06:21	18.47	

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

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	177°4.07	135°26.54 N18°53.68	177°19.38 \$01°0.72	4°1.88 N04°39.59	151°17.08 N08°15.33
1	177 4.07 192°6.53	150°26.52 54.63	192°20.07 00°59.93	19°4.64 39.72	166°19.27 15.44
2	207° 9.00	165°26.50 55.58	207°20.75 59.14	34°7.40 39.85	181°21.46 15.55
3	222° 11.46	180°26.48 · · 56.52	222°21.43 · · 58.34	49°10.16 · · 39.97	196°23.65 · · 15.66
4	237° 13.92	195°26.45 57.47	237°22.11 57.55	64°12.92 40.10	211°25.84 15.77
5	252° 16.39	210°26.43 58.42	252°22.80 56.76	79°15.68 40.23	226°28.03 15.88
6	267° 18.85	225°26.41 N18°59.36	267°23.48 \$00°55.96	94°18.44 N04°40.35	241°30.21 N08°15.99
7	282°21.32	240°26.39 19°0.31	282°24.16 55.17	109°21.20 40.48	256°32.40 16.10
8	297°23.78	255°26.37 1.26	297°24.85 54.38	124°23.96 40.61	271°34.59 16.21
9	$312^{\circ}26.25$	270°26.35 · · 2.20	312°25.53 · · 53.59	139°26.72 · · 40.73	286°36.78 · · 16.32
10	327°28.71	285°26.33 3.14	327°26.21 52.79	154°29.48 40.86	301°38.97 16.43
11	$342^{\circ}31.17$	300°26.31 4.08	342°26.89 52.00	169°32.24 40.99	316°41.15 16.54
12	357° 33.64	315°26.29 N19°5.03	357°27.58 \$00°51.21	184°35.00 N04°41.11	331°43.34 N08°16.65
13	12°36.10	330°26.27 5.97	12°28.26 50.42	199°37.76 41.24	346°45.53 16.76
14	27°38.57	345°26.25 6.91	27°28.94 49.62	214°40.51 41.37	1°47.72 16.87
15	42°41.03	0°26.23 · · 7.85	42°29.63 · · 48.83	229°43.27 · · 41.49	16°49.91 · · 16.98
16	57°43.49	15°26.21 8.79	57°30.31 48.04	244°46.03 41.62	31°52.09 17.09
17	72°45.96	30°26.19 9.73	72°30.99 47.24	259°48.79 41.75	46°54.28 17.20
18	87°48.42	45°26.17 N19°10.66	87°31.68 S00°46.45	274°51.55 N04°41.87	61°56.47 N08°17.31
19	102°50.89	60°26.15 11.60	102°32.36 45.66	289°54.31 42.00	76°58.66 17.42
20	117°53.35	75°26.13 12.54	117° 33.05 44.87	304°57.07 42.12	92°0.84 17.53
21	132°55.81	90°26.12 · · 13.47	132°33.73 · · 44.07	319°59.83 · · 42.25	107°3.03 · · 17.64
22	147°58.28	105°26.10 14.41	147°34.41 43.28	335°2.59 42.38	122°5.22 17.75
23	163°0.74	120°26.08 15.34	162°35.10 42.49	350° 5.34 42.50	137°7.40 17.86
Mer.p	pass. 12:10	$\nu$ -0.0′ $d$ 0.9′ $m$ -4.43	$ u 0.7' \ d\text{-}0.8' \ \text{m}1.02$	$ u 2.8' \ d0.1' \ \text{m-}2.48$	$ u 2.2' \ d0.1' \ \text{m}0.56$
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	178°3.21	135°26.06 N19°16.27	177°35.78 \$00°41.70	5°8.10 N04°42.63	152°9.59 N08°17.97
1	193°5.67	150°26.05 17.21	192°36.46 40.90	20°10.86 42.75	167°11.78 18.08
2	208°8.14	165°26.03 18.14	207°37.15 40.11	35°13.62 42.88	182°13.97 18.20
3	223°10.60	180°26.02 · · 19.07	222°37.83 · · 39.32	50°16.38 · · 43.01	197°16.15 · · 18.31
4	238° 13.06	195°26.00 20.00	237°38.52 38.53	65°19.14 43.13	212°18.34 18.42
5	253° 15.53	210°25.98 20.93	252°39.20 37.73	80°21.90 43.26	227°20.53 18.53
6	268° 17.99	225°25.97 N19°21.86	267°39.88 \$00°36.94	95°24.65 N04°43.38	242°22.71 N08°18.64
7	283°20.46	240°25.95 22.79	282°40.57 36.15	110°27.41 43.51	257°24.90 18.75
8	298° 22.92	255°25.94 23.71	297°41.25 35.36	125°30.17 43.64	272°27.09 18.86
9	313°25.38	270°25.92 · · 24.64	312°41.94 · · 34.56	140°32.93 · · 43.76	287°29.27 · · 18.97
10	328° 27.85	285°25.91 25.56	327°42.62 33.77	155°35.69 43.89	302°31.46 19.08
11	343°30.31	300°25.90 26.49	342°43.31 32.98	170°38.44 44.01	317°33.65 19.19
12	358° 32.78	315°25.88 N19°27.41	357°43.99 \$00°32.19	185°41.20 N04°44.14	332°35.83 N08°19.30
13	13°35.24	330°25.87 28.34	12° 44.68 31.40	200°43.96 44.26	347°38.02 19.41 2°40.21 19.52
14	28° 37.70 43° 40.17	345°25.86 29.26 0°25.84 · · 30.18	27°45.36 30.60 42°46.04 •• 29.81	215°46.72 44.39 230°49.48 •• 44.51	
15	43°40.17 58°42.63			230°49.48 · · 44.51 245°52.23 44.64	
16 17	73°45.10	15°25.83 31.11 30°25.82 32.03	57°46.73 29.02 72°47.41 28.23	260°54.99 44.77	32°44.58 19.74 47°46.76 19.85
18	88° 47.56	45°25.81 N19°32.95	87°48.10 S00°27.43	275°57.75 N04°44.89	62°48.95 N08°19.96
19	103°50.03	60°25.79 33.87	102°48.78 26.64	291° 0.51 45.02	77°51.14 20.07
20	118° 52.49	75°25.78 34.78	117°49.47 25.85	306° 3.26 45.14	92°53.32 20.18
21	133°54.95	90°25.77 · · 35.70	132°50.15 · · 25.06	321°6.02 · · 45.27	107°55.51 · · 20.29
22	148° 57.42	105°25.76 36.62	147° 50.84 24.26	336° 8.78 45.39	122°57.69 20.40
23	163°59.88	120°25.75 37.53	162°51.52 23.47	351°11.54 45.52	137°59.88 20.51
	pass. 12:06	ν-0.0' d0.9' m-4.44	ν0.7' d-0.8' m1.02	ν2.8' d0.1' m-2.48	ν2.2' d0.1' m0.56
ivier.p	Dass. 12:00	ν-0.0 d0.9 m-4.44	νυ.τ α-υ.ο m1.υ2	ν2.0 d0.1 m-2.40	ν2.2 αυ.1 Mυ.30
т	CHA	CUA D	CUA De-	CUA D	CHA Dec
Tue	<b>GHA</b> 179°2.35	<b>GHA Dec</b> 135°25.74 N19°38.45	<b>GHA Dec</b> 177°52.21 <b>S</b> 00°22.68	<b>GHA Dec</b> 6°14.29 N04°45.64	GHA Dec
0 1	179°2.35 194°4.81	135°25.74 N19°38.45 150°25.73 39.37	177°52.21 \$00°22.68 192°52.89 21.89	6°14.29 N04°45.64 21°17.05 45.77	153°2.06 N08°20.62 168°4.25 20.73
2	194 4.81 209°7.27	165° 25.72 40.28	207° 53.58 21.10	36°19.81 45.89	183°6.44 20.84
3	209 7.27 224°9.74	180°25.71 · · 41.19	207 55.56 21.10 222°54.27 · · 20.30	51°22.56 · · 46.02	198°8.62 · · 20.96
4	239° 12.20	195°25.70 42.11	237°54.95 19.51	66°25.32 46.14	213°10.81 21.07
5	254° 14.67	210°25.69 43.02	252°55.64 18.72	81°28.08 46.27	228°12.99 21.18
6	269° 17.13	225°25.68 N19°43.93	267°56.32 S00°17.93	96°30.83 N04°46.39	243°15.18 N08°21.29
7	284° 19.59	240°25.68 44.84	282°57.01 17.14	111°33.59 46.52	258°17.36 21.40
8	299° 22.06	255°25.67 45.75	297°57.69 16.34	126°36.35 46.64	273°19.55 21.51
9	314°24.52	270°25.66 · · 46.66	312°58.38 · · 15.55	141°39.10 · · 46.77	288°21.73 · · 21.62
10	329°26.99	285°25.65 47.57	327°59.06 14.76	156°41.86 46.89	303°23.92 21.73
11	344°29.45	300°25.65 48.47	342°59.75 13.97	171°44.62 47.01	318°26.10 21.84
12	359°31.91	315°25.64 N19°49.38	358°0.44 <b>S</b> 00°13.18	186°47.37 N04°47.14	333°28.29 N08°21.95
13	14° 34.38	330°25.63 50.29	13°1.12 12.39	201°50.13 47.26	348°30.47 22.06
14	29°36.84	345°25.63 51.19	28°1.81 11.59	216°52.89 47.39	3°32.66 22.17
15	44°39.31	0°25.62 · · 52.10	43°2.49 · · 10.80	231°55.64 · · 47.51	18°34.84 · · 22.28
16	59°41.77	15°25.61 53.00	58°3.18 10.01	246°58.40 47.64	33°37.03 22.39
17	74°44.24	30°25.61 53.90	73°3.86 9.22	262°1.15 47.76	48°39.21 22.50
18	89°46.70	45°25.60 N19°54.80	88°4.55 S00°8.43	277°3.91 N04°47.89	63°41.39 N08°22.62
19	104°49.16	60°25.60 55.71	103°5.24 7.63	292°6.67 48.01	78°43.58 22.73
20	119°51.63	75°25.60 56.61	118°5.92 6.84	307°9.42 48.13	93°45.76 22.84
21	134° 54.09 149° 56.56	90°25.59 · · 57.51 105°25.59 58.41	133°6.61 · · 6.05	322°12.18 · · 48.26	108°47.95 · · 22.95
22 23	149°56.56 164°59.02	105°25.59 58.41 120°25.58 59.30	148°7.30 5.26 163°7.98 4.47	337°14.93 48.38 352°17.69 48.51	123°50.13 23.06 138°52.32 23.17
		-			
Mer.p	pass. 12:02	$\nu$ -0.0′ $d$ 0.9′ m-4.45	$ u 0.7' \ d$ -0.8' m1.02	$ u 2.8' \ d0.1' \ \text{m-}2.48$	$ u 2.2' \ d0.1' \ { m m0.56}$
			· -		

	SHA	Dec
Alpheratz	357°32.38	29° 14.76
Ankaa	353°5.03	-42°9.19
Schedar Diphda	349°28.52 348°45.01	56° 41.59 -17° 49.97
Achernar	335°18.83	-57°5.71
Hamal	327°48.50	23°35.74
Polaris	312°56.85	89°23.16
Acamar	315°10.10 314°3.61	-40°11.69 4°11.93
Menkar Mirfak	308°24.74	4 11.93 49°57.78
Aldebaran	290°36.71	16°33.89
Rigel	$281^{\circ}1.40$	-8° 10.35
Capella	280°18.08	46°1.64
Bellatrix Elnath	278°20.11 277°58.59	6°22.37 28°37.84
Alnilam	275°35.09	-1°11.22
Betelgeuse	270°49.25	7°24.59
Canopus	263°51.16	-52°42.98
Sirius	258°23.86 255°3.70	-16°45.57 -29°0.94
Adhara Procyon	255 3.70 244°47.96	-29 0.94 5°8.95
Pollux	243°13.96	27°57.38
Avior	$234^{\circ}13.26$	-59°36.33
Suhail	222°44.03	-43°33.12
Miaplacidus Alphard	221°36.96 217°44.93	-69°50.28 -8°47.13
Regulus	217 44.93 207°31.38	-6 47.13 11°49.54
Dubhe	193°37.27	61°35.81
Denebola	182°21.97	14°24.63
Gienah Acrux	175°40.54 172°56.37	-17° 42.13 -63° 15.44
Gacrux	172°56.37 171°48.06	-63° 15.44 -57° 16.39
Alioth	$166^{\circ}10.20$	55°48.17
Spica	158°19.23	-11° 18.70
Alkaid Hadar	152°49.56 148°31.64	49° 10.06 -60° 30.50
Menkent	146 51.04 147°54.15	-36° 30.58
Arcturus	$145^{\circ}45.25$	19°1.88
Rigil Kent.	139°36.09	-60°57.04
Kochab Zuben'ubi	137°19.17 136°52.86	74°2.03 -16°9.64
Alphecca	126°1.33	26°36.91
Antares	$112^{\circ}12.47$	-26° 29.63
Atria Sabik	107°4.17 101°59.70	-69°4.38 -15°45.59
Shaula	96°6.76	-15 45.59 -37°7.30
Rasalhague	95°56.08	12°32.20
Eltanin	90°40.96	51°28.78
Kaus Aust. Vega	83°29.09 80°31.51	-34°22.11 38°48.32
Nunki	75°44.61	-26° 15.59
Altair	$61^{\circ}57.55$	8°56.48
Peacock	53°2.01	-56°38.39
Deneb Enif	49°24.28 33°36.48	45°22.68 10°0.21
Al Na'ir	33 30.48 27°30.09	-46°49.33
Fomalhaut	$15^{\circ}12.01$	-29°28.33
Scheat	13°42.98	28°14.11
Markab	13°27.59	15°21.38
Mar 19 Sun	SHA	Mer.pass
Venus Mars	318°22.48 0°15.32	14:58 12:10
Jupiter	0 15.32 186°57.81	23:40
Saturn	334°13.02	13:53
Mar 20 Mon	SHA	Mer.pass
Venus	$317^{\circ}22.86$	14:58
Mars Jupiter	359°32.57 187°4.90	12:09 23:35
Saturn	334°6.39	13:49
Mar 21 Tue	SHA	Mer.pass
Venus	$316^{\circ}23.39$	14:58
Mars	358°49.86	12:08
Jupiter Saturn	187°11.95 333°59.72	23:31 13:46
		13:40
Horizon	tal parallax Venus:	0.2
	Mars:	0.2

Stars

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°4.01	500°25.99	255° 27.97	10.3'	\$24°46.78	-5.0'	55.0'
1	193°4.19 208°4.37	25.00 24.01	269°57.31 284°26.72	10.4' 10.5'	24°41.73 24°36.58	-5.2'	55.0' 55.0'
2	200 4.57 223°4.55	23.02	204 20.72 298°56.21	10.5	24 30.36 24°31.30	-5.3' -5.4'	55.0'
4	238°4.74	22.03	313°25.77	10.6'	24°25.92	-5.5'	54.9'
5	253°4.92	21.04	327°55.40	10.7'	24°20.41	-5.6'	54.9'
6	268°5.11 283°5.29	\$00°20.05 19.07	342°25.11 356°54.89	10.8' 10.9'	\$24° 14.80 24° 9.07	-5.7' -5.8'	54.9' 54.9'
7 8	283 5.29 298°5.47	19.07	350 54.89 11°24.74	10.9	24 9.07 24°3.24	-5.8 -5.9'	54.9 54.8'
9	313°5.66	17.09	25°54.67	11.0'	23°57.29	-6.1	54.8'
10	328°5.84	16.10	40°24.67	11.1'	23°51.23	-6.2'	54.8'
11	343°6.02 358°6.21	15.11 \$00°14.12	54°54.75 69°24.90	11.2' 11.2'	23°45.06 523°38.79	-6.3'	54.8' 54.8'
12 13	13°6.39	13.13	83°55.13	11.2	23°32.41	-6.4' -6.5'	54.8 54.7'
14	28° 6.57	12.15	98°25.43	11.4	23°25.92	-6.6'	54.7'
15	43°6.76	•• 11.16	$112^{\circ}55.81$	11.5'	$23^{\circ}19.33$	-6.7'	54.7'
16	58°6.94	10.17	127°26.26	11.5'	23°12.63	-6.8'	54.7'
17 18	73°7.13 88°7.31	9.18 \$00°8.19	141°56.79 156°27.39	11.6' 11.7'	23°5.84 <b>S</b> 22°58.93	-6.9' -7.0'	54.7' 54.6'
19	103°7.49	7.20	170° 58.07	11.8'	22°51.93	-7.1'	54.6'
20	118°7.68	6.22	185°28.82	11.8'	22°44.83	-7.2	54.6'
21	133°7.86	• • 5.23	199°59.65	11.9'	22°37.63	-7.3'	54.6'
22	148°8.05	4.24	214°30.55 229°1.53	12.0'	22°30.33	-7.4'	54.6'
23	163°8.23	3.25	229-1.53	12.1'	22°22.93	-7.5'	54.5'
	SD = 16.1'	d = -1.0'		SI	O = 15.0'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°8.42	S00°2.26	243°32.58	12.1'	\$22°15.43	-7.6'	54.5'
1	193°8.60	1.27	258°3.70	12.2'	22°7.84	-7.7'	54.5'
2	208°8.79 223°8.97	S00°0.28 N00°0.70	272°34.90 287°6.17	12.3' 12.3'	22°0.16 21°52.38	-7.8'	54.5'
3 4	223°8.97 238°9.15	N00°0.70 1.69	287°6.17 301°37.52	12.3' 12.4'	21°52.38 21°44.50	-7.9' -8.0'	54.5' 54.5'
5	253°9.34	2.68	316°8.94	12.5'	21°36.54	-8.1	54.4'
6	268°9.52	N00°3.67	330°40.44	12.6'	S21°28.48	-8.1'	54.4'
7	283°9.71	4.66	345° 12.00	12.6'	21°20.33	-8.2'	54.4'
8	298°9.89 313°10.08	5.64	359° 43.65 14° 15.36	12.7' 12.8'	21°12.10 21°3.77	-8.3'	54.4'
9 10	313 10.08 328°10.26	· · 6.63 7.62	28° 47.14	12.8 12.9'	21 3.77 20°55.36	-8.4' -8.5'	54.4' 54.4'
11	343°10.45	8.61	43° 19.00	12.9'	20°46.86	-8.6'	54.3'
12	358°10.63	N00°9.60	57°50.93	13.0'	\$20°38.27	-8.7'	54.3'
13	13°10.82	10.59	72°22.93	13.1'	20°29.60	-8.8'	54.3'
14 15	28°11.00 43°11.19	11.57 •• 12.56	86°55.00 101°27.14	13.1' 13.2'	20°20.84 20°12.00	-8.8' -8.9'	54.3' 54.3'
16	58°11.37	13.55	101 27.14 115°59.35	13.2	20°12.00	-0.9 -9.0'	54.3'
17	73°11.56	14.54	130°31.63	13.4'	19°54.08	-9.1'	54.3'
18	88°11.74	N00° 15.53	145°3.98	13.4'	S19°44.99	-9.2'	54.3'
19	103°11.93 118°12.11	16.51	159°36.40	13.5'	19° 35.83	-9.2'	54.2' 54.2'
20 21	118° 12.11 133° 12.30	17.50 •• 18.49	174°8.89 188°41.45	13.6' 13.6'	19°26.58 19°17.26	-9.3' -9.4'	54.2'
22	148°12.48	19.48	203° 14.07	13.7'	19°7.86	-9.5'	54.2'
23	163°12.67	20.46	$217^{\circ}46.76$	13.8'	18°58.38	-9.6'	54.2'
	SD = 16.1'	d = -1.0'		SI	O = 14.9'		
_							
Tue 0	<b>GHA</b> 178°12.86	<b>Dec</b> N00°21.45	<b>GHA</b> 232° 19.52	u 13.8'	<b>Dec</b> 518° 48.83	d -9.6'	<b>HP</b> 54.2'
1	178 12.80 193°13.04	22.44	246° 52.34	13.9'	18° 39.20	-9.0 -9.7'	54.2'
2	208°13.23	23.43	261°25.23	14.0'	18° 29.50	-9.8'	54.2'
3	223°13.41	• • 24.42	275°58.18	14.0'	18° 19.73	-9.8'	54.2'
4 5	238°13.60 253°13.78	25.40 26.39	290°31.20 305°4.28	14.1' 14.1'	18°9.88 17°59.97	-9.9' -10.0'	54.1' 54.1'
6	268°13.97	20.39 N00° 27.38	305 4.28 319°37.42	14.1	517°49.98	-10.0	54.1
7	283°14.15	28.37	$334^{\circ}10.63$	14.3'	$17^{\circ}39.92$	-10.1'	54.1'
8	298°14.34	29.35	348° 43.90	14.3'	17°29.79	-10.2'	54.1'
9	313°14.53	30.34	3°17.23	14.4'	17°19.59	-10.3'	54.1'
10 11	328°14.71 343°14.90	31.33 32.32	17°50.62 32°24.07	14.5' 14.5'	17°9.33 16°59.00	-10.3' -10.4'	54.1' 54.1'
12	358°15.08	N00° 33.30	46° 57.58	14.6'	\$16°48.61	-10.5	54.1
13	13°15.27	34.29	61°31.15	14.6'	$16^{\circ}38.15$	-10.5'	54.1'
14	28°15.46	35.28	76°4.78	14.7'	16° 27.62	-10.6'	54.1'
15 16	43°15.64 58°15.83	· · 36.27 37.25	90°38.46 105°12.20	14.7' 14.8'	16°17.03 16°6.38	-10.7' -10.7'	54.0' 54.0'
16 17	73°16.01	37.25 38.24	105° 12.20 119° 46.00	14.8 14.9'	15° 55.67	-10.7 -10.8'	54.0'
18	88°16.20	N00° 39.23	134° 19.86	14.9'	<b>S</b> 15°44.90	-10.8	54.0'
19	103°16.39	40.21	148° 53.77	15.0'	15°34.06	-10.9'	54.0'
20	118°16.57	41.20	163°27.73	15.0'	15°23.17	-11.0'	54.0'
21 22	133°16.76 148°16.94	· · 42.19 43.17	178°1.75 192°35.81	15.1' 15.1'	15°12.22 15°1.21	-11.0' -11.1'	54.0' 54.0'
23	163°17.13	43.17 44.16	207°9.94	15.1 15.2'	15 1.21 14° 50.14	-11.1'	54.0'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-22%
19	07:44	07:35	12:08	07:13	19:37	
20	07:26	07:17	12:07	08:01	20:24	
21	07:09	07:00	12:07	08:46	21:08	

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	180°1.48	135°25.58 N20°0.20	178°8.67 \$00°3.68	7°20.44 N04°48.63	153°54.50 N08°23.28
1	195°3.95	150°25.58 1.10	193°9.35 2.89	22°23.20 48.75	168°56.68 23.39
2	210°6.41	165°25.58 2.00	208° 10.04 2.09	37°25.95 48.88	183°58.87 23.50
3	225°8.88	180°25.57 · · 2.89	223°10.73 · · 1.30	52°28.71 · · 49.00	199°1.05 · · 23.61
4	240°11.34	195°25.57 3.79	238°11.41	67°31.46 49.13	214°3.24 23.72
5	255° 13.80	210°25.57 4.68	253°12.10 N00°0.28	82°34.22 49.25	229°5.42 23.83
6	270° 16.27	225°25.57 N20°5.57	268°12.79 N00°1.07	97°36.98 N04°49.37	244°7.60 N08°23.95
7	285° 18.73	240°25.57 6.46	283°13.47 1.86	112°39.73 49.50	259°9.79 24.06
8	300°21.20	255°25.57 7.36	298° 14.16 2.65	127°42.48 49.62	274°11.97 24.17
9	315°23.66	270°25.57 · · 8.25	313°14.85 · · 3.45	142°45.24 · · 49.74	289°14.16 · · 24.28
10	330°26.12	285°25.57 9.14	328° 15.53 4.24	157°47.99 49.87	304°16.34 24.39
11	345°28.59	300°25.57 10.03	343°16.22 5.03	172°50.75 49.99	319°18.52 24.50
12	0°31.05	315°25.57 N20°10.92	358°16.91 N00°5.82	187°53.50 N04°50.12	334°20.71 N08°24.61
13	15°33.52	330°25.57 11.80	13° 17.60 6.61	202°56.26 50.24	349°22.89 24.72
14	30°35.98	345°25.57 12.69	28° 18.28 7.40	217°59.01 50.36	4°25.07 24.83
15	45°38.44	0°25.57 · · 13.58	43° 18.97 · · 8.19	233° 1.77 · · 50.49	19°27.26 · · 24.94
16	60°40.91	15°25.58 14.46	58° 19.66 8.98	248° 4.52 50.61	34°29.44 25.05
17	75° 43.37	30°25.58 15.35	73°20.34 9.78	263°7.28 50.73	49°31.62 25.17
18	90° 45.84	45°25.58 N20°16.23	88°21.03 N00°10.57	278°10.03 N04°50.85	64°33.80 N08°25.28
19	105° 48.30	60°25.59 17.11	103°21.72 11.36	293°12.78 50.98	79°35.99 25.39
20	120° 50.77	75°25.59 18.00	118° 22.41 12.15	308°15.54 51.10	94°38.17 25.50
21	135° 53.23	90°25.59 · · 18.88	133°23.09 · · 12.94	323°18.29 · · 51.22	109°40.35 · · 25.61
22	150°55.69	105°25.60 19.76	148°23.78 13.73	338°21.04 51.35	124°42.54 25.72
23	165° 58.16	120°25.60 19.76	163°24.47 14.52	353°23.80 51.47	139°44.72 25.83
Mer.p	pass. 11:58	ν-0.0′ d0.9′ m-4.46	$\nu 0.7' \ d$ -0.8' m1.02	ν2.8′ d0.1′ m-2.47	ν2.2' d0.1' m0.56
<b></b> .	C114	CIIA -	CUA	CIIA	CUA
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	181°0.62	135°25.61 N20°21.52	178°25.15 N00°15.31	8°26.55 N04°51.59	154°46.90 N08°25.94
1	196°3.09	150°25.61 22.40	193°25.84 16.10	23°29.31 51.72	169°49.08 26.05
2	211°5.55	165°25.62 23.28	208°26.53 16.89	38°32.06 51.84	184°51.27 26.16
3	226°8.01	180°25.62 · · 24.15	223°27.22 · · 17.68	53°34.81 · · 51.96	199°53.45 · · 26.28
4	241°10.48	195°25.63 25.03	238°27.91 18.47	68°37.57 52.08	214°55.63 26.39
5	256° 12.94	210°25.64 25.91	253°28.59 19.27	83°40.32 52.21	229°57.82 26.50
6	271° 15.41	225°25.64 N20°26.78	268°29.28 N00°20.06	98°43.07 N04°52.33	245°0.00 N08°26.61
7	286° 17.87	240°25.65 27.65	283°29.97 20.85	113°45.82 52.45	260°2.18 26.72
8	301°20.33	255°25.66 28.53	298°30.66 21.64	128°48.58 52.57	275°4.36 26.83
9	316°22.80	270°25.67 · · 29.40	313°31.34 · · 22.43	143°51.33 · · 52.70	290°6.54 · · 26.94
10	331°25.26	285°25.68 30.27	328°32.03 23.22	158°54.08 52.82	305°8.73 27.05
11	346°27.73	300°25.68 31.14	343°32.72 24.01	173°56.84 52.94	320°10.91 27.16
12	1°30.19	315°25.69 N20°32.01	358°33.41 N00°24.80	188°59.59 N04°53.06	335°13.09 N08°27.28
13	16°32.65	330°25.70 32.88	13°34.10 25.59	204°2.34 53.19	350°15.27 27.39
14	31°35.12	345°25.71 33.75	28°34.78 26.38	219°5.09 53.31	5°17.45 27.50
15	46°37.58	$0^{\circ}25.72$ · · 34.62	43°35.47 · · 27.17	234°7.85 · · 53.43	20°19.64 · · 27.61
16	61°40.05	15°25.73 35.49	58°36.16 27.96	249°10.60 53.55	35°21.82 27.72
17	$76^{\circ}42.51$	30°25.74 36.35	73°36.85 28.75	264°13.35 53.67	50°24.00 27.83
18	91°44.97	45°25.76 N20°37.22	88°37.54 N00°29.54	279°16.10 N04°53.80	65°26.18 N08°27.94
19	106° 47.44	60°25.77 38.08	103°38.23 30.33	294°18.85 53.92	80°28.36 28.05
20	121°49.90	75°25.78 38.95	118°38.91 31.12	309°21.61 54.04	95°30.54 28.17
21	136°52.37	90°25.79 · · 39.81	133°39.60 · · 31.91	324°24.36 · · 54.16	110°32.73 · · 28.28
22	151°54.83	105°25.80 40.67	148°40.29 32.70	339°27.11 54.28	125°34.91 28.39
23	166° 57.29	120°25.82 41.54	163°40.98 33.49	354°29.86 54.41	140°37.09 28.50
Mer.r	pass. 11:54	ν0.0' d0.9' m-4.46	ν0.7' d0.8' m1.03	$\nu 2.8' \ d0.1' \ \text{m-}2.47$	ν2.2' d0.1' m0.56
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	181°59.76	135°25.83 N20°42.40	178°41.67 N00°34.28	9°32.61 N04°54.53	155°39.27 N08°28.61
1	197°2.22	150°25.85 43.26	193°42.36 35.07	24°35.36 54.65	170°41.45 28.72
2	212°4.69	165°25.86 44.12	208° 43.04 35.86	39°38.12 54.77	185°43.63 28.83
3	212 4.09 227°7.15	180°25.87 · · 44.97	223°43.73 · · 36.65	54°40.87 · · 54.89	200°45.81 · · 28.94
4	242°9.61	195°25.89 45.83	238°44.42 37.44	69°43.62 55.01	215°48.00 29.06
5	257° 12.08	210°25.90 46.69	253°45.11 38.23	84°46.37 55.13	230°50.18 29.17
6	272° 14.54	225°25.92 N20°47.55	268°45.80 N00°39.02	99°49.12 N04°55.26	245°52.36 N08°29.28
7	287° 17.01	240°25.94 48.40	283°46.49 39.81	114°51.87 55.38	260°54.54 29.39
8	302° 19.47	255°25.95 49.26	298° 47.18 40.60	129°54.62 55.50	275°56.72 29.50
9	317°21.93	270°25.97 · · 50.11	313°47.87 · · 41.39	144°57.37 · · 55.62	290°58.90 · · 29.61
10	332° 24.40	285°25.99 50.96	328°48.55 42.18	160° 0.12 55.74	306°1.08 29.72
11	347°26.86	300°26.01 51.82	343°49.24 42.97	175°2.87 55.86	321°3.26 29.84
12	2°29.33	315°26.02 N20°52.67	358°49.93 N00°43.76	190°5.62 N04°55.98	336°5.44 N08°29.95
13	2 29.33 17°31.79	330°26.04 53.52	13°50.62 44.55	205°8.37 56.10	351°7.62 30.06
14	32°34.25	345°26.06 54.37	28°51.31 45.34	205 6.57 56.10 220°11.12 56.22	6°9.80 30.17
15	47°36.72	0°26.08 · · 55.22	43°52.00 · · 46.13	235°13.87 · · 56.35	21°11.98 · · 30.28
15 16	47°36.72 62°39.18	15°26.10 56.07	58°52.69	250°16.62 56.47	36°14.16 30.39
17	77°41.65	30°26.12 56.91	73°53.38 47.70	265°19.37 56.59	51°16.34 30.50
18	92°44.11 107°46.57	45°26.14 N20°57.76 60°26.16 58.61	88°54.07 N00°48.49 103°54.76 49.28	280°22.12 N04°56.71 295°24.87 56.83	66°18.53 N08°30.62 81°20.71 30.73
19					
20	122° 49.04		118°55.45 50.07	310°27.62 56.95	96°22.89 30.84
21	137°51.50	90°26.20 21°0.30	133°56.13 · · 50.86	325°30.37 · · 57.07	111°25.07 · · 30.95
22	152°53.97	105°26.23 1.14 120°26.25 1.98	148° 56.82 51.65	340°33.12 57.19	126°27.25 31.06
23	167°56.43	120°26.25 1.98	163°57.51 52.44	355°35.87 57.31	141°29.43 31.17
Mer.p	pass. 11:50	$ u 0.0' \ d0.9' \ \text{m-4.47}$	$ u 0.7' \ d0.8' \ m1.03$	$\nu 2.8' \ d0.1' \ \text{m-}2.47$	$ u 2.2' \ d0.1' \ \text{m}0.55$

	Stars	
	SHA	Dec
Alpheratz	357°32.38	29°14.75
Ankaa Schedar	353°5.02 349°28.52	-42°9.17 56°41.58
Diphda	348°45.00	-17°49.96
Achernar	335°18.83	-57°5.70
Hamal Polaris	327°48.50 312°58.02	23°35.74 89°23.15
Acamar	$315^{\circ}10.11$	-40°11.68
Menkar	314° 3.62	4°11.94
Mirfak Aldebaran	308°24.76 290°36.72	49°57.77 16°33.89
Rigel	$281^{\circ}1.42$	-8°10.34
Capella Bellatrix	280°18.09 278°20.12	46°1.64 6°22.37
Elnath	277°58.61	28°37.84
Alnilam	275°35.11	-1°11.22
Betelgeuse Canopus	270°49.26 263°51.19	7°24.59 -52°42.98
Sirius	258°23.88	-16°45.57
Adhara	255°3.72	-29° 0.94 5° 8.95
Procyon Pollux	244°47.98 243°13.97	5°8.95 27°57.38
Avior	$234^{\circ}13.29$	-59°36.34
Suhail Miaplacidus	222°44.05 221°37.00	-43°33.12 -69°50.29
Alphard	221 37.00 217°44.93	-8°47.13
Regulus	207°31.39	11°49.54
Dubhe Denebola	193°37.27 182°21.96	61°35.83 14°24.63
Gienah	175°40.54	-17°42.14
Acrux	172°56.36	-63°15.46
Gacrux Alioth	171°48.06 166°10.19	-57°16.41 55°48.18
Spica	158° 19.22	-11°18.70
Alkaid	152°49.55	49°10.07
Hadar Menkent	148°31.62 147°54.14	-60°30.52 -36°30.59
Arcturus	$145^{\circ}45.24$	19° 1.88
Rigil Kent.	139°36.07 137°19.12	-60°57.06 74°2.04
Kochab Zuben'ubi	136°52.84	-16° 9.65
Alphecca	$126^{\circ}1.31$	26°36.91
Antares Atria	112°12.45 107°4.11	-26°29.64 -69°4.39
Sabik	101°59.68	-15°45.59
Shaula	96°6.73	-37°7.30
Rasalhague Eltanin	95°56.06 90°40.93	12°32.20 51°28.78
Kaus Aust.	83°29.06	-34°22.11
Vega	80°31.48	38°48.32
Nunki Altair	75°44.58 61°57.53	-26°15.59 8°56.48
Peacock	53°1.97	-56°38.38
Deneb Enif	49°24.26 33°36.47	45°22.67 10°0.21
Al Na'ir	27°30.07	-46°49.31
Fomalhaut	15°12.00	-29°28.32
Scheat Markab	13°42.97 13°27.58	28°14.10 15°21.38
Mar 22 Wed Venus	<b>SHA</b> 315°24.10	Mer.pass 14:58
Mars	$358^{\circ}7.18$	12:07
Jupiter Saturn	187°18.96 333°53.02	23:26 13:42
Mar 23 Thu	SHA	Mer.pass
Venus	314°24.99	14:58
Mars Jupiter	357°24.53 187°25.93	12:06 23:22
Saturn	333°46.28	13:39
Mar 24 Fri	SHA	Mer.pass
Venus Mars	313°26.07 356°41.91	14:58 12:05
Jupiter	$187^{\circ}32.85$	23:18
Saturn	333°39.51	13:35

Saturn 333°39.51 Horizontal parallax

Venus: Mars:

h	Su	Moon					
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°17.32	N00°45.15	221°44.11	15.2'	<b>S</b> 14°39.02	-11.2'	54.0'
1	193°17.50	46.14	236°18.33	15.3'	14°27.84	-11.2'	54.0'
2 3	208° 17.69 223° 17.88	47.12 •• 48.11	250°52.61 265°26.93	15.3' 15.4'	14°16.61 14°5.32	-11.3' -11.3'	54.0' 54.0'
4	238° 18.06	49.10	280°1.30	15.4	13°53.98	-11.4	54.0'
5	253° 18.25	50.08	294°35.72	15.5'	13°42.59	-11.4'	54.0'
6	268° 18.44	N00°51.07	309°10.18	15.5'	\$13°31.15	-11.5'	54.0'
7	283° 18.62	52.06	323°44.70	15.6'	13°19.65	-11.5'	54.0'
8 9	298° 18.81 313° 19.00	53.04 •• 54.03	338°19.25 352°53.85	15.6' 15.6'	13°8.11 12°56.51	-11.6' -11.6'	54.0' 54.0'
10	328° 19.18	55.02	7°28.50	15.7'	12°44.87	-11.7'	54.0'
11	343°19.37	56.00	22°3.19	15.7'	12°33.18	-11.7'	53.9'
12	358° 19.55	N00°56.99	36°37.92	15.8'	S12°21.44	-11.8'	53.9'
13 14	13° 19.74 28° 19.93	57.97 58.96	51°12.69 65°47.50	15.8' 15.9'	12°9.66 11°57.83	-11.8' -11.9'	53.9' 53.9'
14 15	43° 20.12	58.90 00°59.95	80°22.36	15.9'	11 57.83 11°45.95	-11.9 -11.9'	53.9'
16	58° 20.30	01°0.93	94°57.25	15.9'	11°34.03	-12.0'	53.9'
17	73°20.49	1.92	109°32.18	16.0'	$11^{\circ}22.07$	-12.0'	53.9'
18	88°20.68	N01°2.91	124°7.14	16.0'	\$11°10.06	-12.0'	53.9'
19 20	103°20.86 118°21.05	3.89 4.88	138°42.15 153°17.19	16.0' 16.1'	10°58.02 10°45.93	-12.1' -12.1'	53.9' 53.9'
21	133° 21.24	• • 5.86	167°52.26	16.1	10°43.93	-12.1	53.9'
22	148°21.42	6.85	182°27.37	16.1	10°21.63	-12.2'	53.9'
23	$163^{\circ}21.61$	7.84	$197^{\circ}2.51$	16.2'	$10^{\circ}9.42$	-12.2'	53.9'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		
<b>-</b> .							
Thu 0	<b>GHA</b> 178° 21.80	<b>Dec</b> N01°8.82	<b>GHA</b> 211°37.68	u 16.2'	Dec \$09°57.18	d -12.3'	<b>HP</b> 53.9'
1	193°21.98	9.81	226°12.89	16.2	09°44.89	-12.3'	53.9'
2	208°22.17	10.79	240°48.13	16.3'	09°32.57	-12.4'	53.9'
3	223°22.36	• • 11.78	255°23.39	16.3'	09°20.21	-12.4'	53.9'
4 5	238° 22.54 253° 22.73	12.76 13.75	269°58.69 284°34.01	16.3' 16.4'	09°7.82 08°55.39	-12.4' -12.5'	53.9' 53.9'
6	268° 22.92	N01°14.73	299° 9.36	16.4	508°42.93	-12.5'	53.9'
7	283°23.11	15.72	313°44.74	16.4	08°30.44	-12.5'	53.9'
8	298°23.29	16.71	328°20.14	16.4'	08°17.91	-12.6'	53.9'
9	313°23.48	• • 17.69	342°55.57	16.5'	08°5.35	-12.6'	53.9'
10 11	328° 23.67 343° 23.85	18.68 19.66	357°31.02 12°6.49	16.5' 16.5'	07°52.76 07°40.14	-12.6' -12.7'	53.9' 53.9'
12	358° 24.04	N01°20.65	26°41.99	16.5	S07°27.49	-12.7'	53.9'
13	13°24.23	21.63	41°17.51	16.5'	$07^{\circ}14.81$	-12.7'	53.9'
14	28°24.42	22.62	55°53.05	16.6'	07°2.10	-12.7'	54.0'
15 16	43°24.60 58°24.79	· · 23.60 24.59	70°28.60 85°4.18	16.6' 16.6'	06°49.37 06°36.60	-12.8' -12.8'	54.0' 54.0'
17	73° 24.98	25.57	99°39.77	16.6'	06°23.82	-12.8'	54.0'
18	88°25.17	N01°26.56	114°15.39	16.6'	S06°11.00	-12.8'	54.0'
19	103°25.35	27.54	128°51.01	16.6'	05°58.16	-12.9'	54.0'
20 21	118° 25.54 133° 25.73	28.53 •• 29.51	143°26.66 158°2.31	16.7' 16.7'	05°45.30 05°32.42	-12.9' -12.9'	54.0' 54.0'
22	133 25.73 148° 25.92	30.49	172°37.98	16.7	05 32.42 05°19.51	-12.9'	54.0'
23	163°26.10	31.48	187°13.67	16.7'	05°6.58	-13.0'	54.0'
	SD = 16.0'	d = 1.0'		SI	O = 14.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 26.29	N01°32.46	201°49.36	16.7'	S04°53.63	-13.0'	54.0'
1	193°26.48	33.45	216°25.06	16.7'	04°40.65	-13.0'	54.0'
2	208° 26.67	34.43	231°0.78	16.7'	04°27.66	-13.0'	54.0'
3 4	223° 26.85 238° 27.04	· · 35.42 36.40	245°36.50 260°12.24	16.7' 16.7'	04°14.65 04°1.62	-13.0' -13.0'	54.0' 54.0'
4 5	253° 27.04 253° 27.23	36.40 37.38	200 12.24 274°47.97	16.7'	04 1.62 03°48.58	-13.0 -13.1'	54.0'
6	268°27.42	N01°38.37	289°23.72	16.8'	S03°35.51	-13.1'	54.0'
7	283°27.60	39.35	303°59.47	16.8'	03°22.43	-13.1'	54.0'
8	298° 27.79 313° 27.98	40.34	318°35.23 333°10.99	16.8'	03°9.34 02°56.23	-13.1'	54.0'
9 10	313°27.98 328°28.17	· · 41.32 42.30	333°10.99 347°46.75	16.8' 16.8'	02°56.23 02°43.10	-13.1' -13.1'	54.0' 54.0'
11	343°28.35	43.29	2°22.51	16.8'	02°43.10	-13.1'	54.1'
12	358° 28.54	N01°44.27	16°58.27	16.8'	S02°16.82	-13.2'	54.1'
13	13°28.73	45.25	31°34.04	16.8'	02°3.66	-13.2'	54.1'
14 15	28°28.92 43°29.10	46.24 •• 47.22	46° 9.80 60° 45.56	16.8' 16.8'	01°50.48 01°37.30	-13.2' -13.2'	54.1' 54.1'
16	58° 29.29	48.20	75°21.32	16.8	01°24.11	-13.2'	54.1'
17	73°29.48	49.19	89°57.08	16.8'	01°10.91	-13.2'	54.1'
18	88°29.67	N01°50.17	104°32.83	16.7'	S00°57.70	-13.2'	54.1'
19	103° 29.85 118° 30.04	51.15 52.14	119°8.57 133°44.31	16.7'	00°44.48 00°31.26	-13.2'	54.1'
20 21	118°30.04 133°30.23	52.14 •• 53.12	133°44.31 148°20.04	16.7' 16.7'	00°31.26 00°18.03	-13.2' -13.2'	54.1' 54.1'
22	148° 30.42	54.10	162°55.77	16.7	500°4.80	-13.2'	54.1'
23	163°30.61	55.09	177°31.48	16.7'	N00°8.44	13.2'	54.1'
	SD = 16.0'	d = 1.0'		SI	O = 14.7'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-4%
22	06:51	06:42	12:07	09:29	21:50	
23	06:33	06:24	12:06	10:10	22:30	
24	06:15	06:06	12:06	10:50	23:10	

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	182° 58.89	135°26.27 N21°2.82	178°58.20 N00°53.23	10°38.62 N04°57.43	156°31.61 N08°31.28
1	198°1.36	150°26.30 3.67	193° 58.89 54.02	25°41.37 57.55	171°33.79 31.40
2	213°3.82	165°26.32 4.51	208° 59.58 54.81	40°44.12 57.67	186°35.97 31.51
3	228°6.29	180°26.34 · · 5.35	224°0.27 · · 55.59	55°46.87 · · 57.79	201°38.15 · · 31.62
4	243°8.75	195°26.37 6.19	239°0.96 56.38	70°49.62 57.91	216°40.33 31.73
5	258° 11.22	210°26.39 7.02	254°1.65 57.17	85°52.36 58.03	231°42.51 31.84
6	273° 13.68	225°26.42 N21°7.86	269°2.34 N00°57.96	100°55.11 N04°58.15	246°44.69 N08°31.95
7	288° 16.14	240°26.44 8.70	284°3.03 58.75	115°57.86 58.27	261°46.86 32.07
8	303° 18.61	255° 26.47 9.53	299°3.72 00°59.54	131°0.61 58.39	276°49.04 32.18
9	318°21.07	270°26.50 · · 10.37	314°4.41 01°0.33	146° 3.36 · · 58.51	291°51.22 · · 32.29
10	333°23.54	285°26.52 11.20	329°5.10 1.12	161°6.11 58.63	306°53.40 32.40
11	348° 26.00	300°26.55 12.04	344°5.79 1.90	176° 8.85 58.75	321°55.58 32.51
12	3°28.46	315°26.58 N21°12.87	359°6.48 N01°2.69	191°11.60 N04°58.87	336°57.76 N08°32.62
13	18° 30.93	330°26.61 13.70	14°7.17 3.48	206°14.35 58.99	351°59.94 32.74
14	33°33.39	345°26.64 14.53	29°7.86 4.27	221°17.10 59.11	7°2.12 32.85
15	48°35.86	0°26.67 · · 15.36	44°8.55 · · 5.06	236°19.84 · · 59.23	22°4.30 · · 32.96
16	63°38.32	15°26.70 16.19	59°9.24 5.85	251°22.59 59.35	37°6.48 33.07
17	78° 40.78	30°26.73 17.02	74°9.93 6.63	266°25.34 59.47	52°8.66 33.18
18	93° 43.25	45°26.76 N21°17.85	89°10.62 N01°7.42	281°28.09 N04°59.59	67°10.84 N08°33.29
19	108° 45.71	60°26.79 18.68	104°11.31 8.21	296°30.83 59.71	82°13.02 33.41
20	123°48.18	75°26.82 19.50	119° 12.00 9.00	311°33.58 59.82	97°15.20 33.52
21	138° 50.64	90°26.85 · · 20.33	134°12.69 · · 9.79	326°36.33 04°59.94	112°17.37 · · 33.63
22	153°53.10	105°26.88 21.15	149° 13.38 10.57	341°39.08 05°0.06	127°19.55 33.74
23	168° 55.57	120°26.92 21.98	164° 14.07 11.36	356°41.82 0.18	142°21.73 33.85
Mer.p	pass. 11:46	ν0.0′ d0.8′ m-4.48	ν0.7' d0.8' m1.03	ν2.7' d0.1' m-2.47	ν2.2' d0.1' m0.55
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	183°58.03	135°26.95 N21°22.80	179°14.76 N01°12.15	11°44.57 N05°0.30	157°23.91 N08°33.96
1	199°0.50	150°26.98 23.62	194°15.45 12.94	26°47.31 0.42	172°26.09 34.08
2	$214^{\circ}2.96$	165°27.02 24.44	209°16.14 13.73	41°50.06 0.54	187°28.27 34.19
3	229°5.42	180°27.05 · · 25.26	224°16.83 · · 14.51	56°52.81 · · 0.66	202°30.45 · · 34.30
4	244°7.89	195°27.09 26.08	239° 17.52 15.30	71°55.55 0.78	217°32.62 34.41
5	259° 10.35	210°27.12 26.90	254° 18.21 16.09	86°58.30 0.89	232°34.80 34.52
6	274°12.82	225°27.16 N21°27.72	269°18.90 N01°16.88	102°1.05 N05°1.01	247°36.98 N08°34.63
7	289° 15.28	240°27.19 28.54	284°19.59 17.66	117° 3.79 1.13	262°39.16 34.75
8	304° 17.74	255° 27.23 29.35	299° 20.28 18.45	132° 6.54 1.25	277°41.34 34.86
9	319°20.21	270°27.27 · · 30.17	314°20.98 · · 19.24	147° 9.28 · · 1.37	292°43.52 · · 34.97
10	334°22.67	285°27.31 30.98	329°21.67 20.03	162°12.03 1.49	307°45.69 35.08
11	349°25.14	300°27.34 31.80	344°22.36 20.81	177°14.77 1.60	322°47.87 35.19
12	4°27.60	315°27.38 N21°32.61	359°23.05 N01°21.60	192°17.52 N05°1.72	337°50.05 N08°35.30
13	19°30.06	330°27.42 33.43	14°23.74 22.39	207°20.26 1.84	352°52.23 35.42
14	34°32.53	345°27.46 34.24	29°24.43 23.17	222°23.01 1.96	7°54.41 35.53
15	49°34.99	0°27.50 · · 35.05	44°25.12 · · 23.96	237°25.75 · · 2.08	22°56.59 · · 35.64
16	64°37.46	15°27.54 35.86	59°25.81 24.75	252°28.50 2.19	37°58.76 35.75
17	79°39.92	30°27.58 36.67	74°26.50 25.53	267°31.24 2.31	53°0.94 35.86
18	94° 42.38	45°27.62 N21°37.48	89°27.19 N01°26.32	282°33.99 N05°2.43	68°3.12 N08°35.98
19	109° 44.85	60°27.67 38.28	104°27.88 27.11	297°36.73 2.55	83°5.30 36.09
20	124° 47.31	75°27.71 39.09	119°28.57 27.90	312°39.48 2.67	98°7.47 36.20
21	139° 49.78	90°27.75 · · 39.90	134°29.27 · · 28.68	327°42.22 · · 2.78	113°9.65 · · 36.31
22	154° 52.24	105°27.80 40.70	149°29.96 29.47	342°44.97 2.90	128°11.83 36.42
23	169°54.70	120°27.84 41.51	164°30.65 30.26	357°47.71 3.02	143°14.01 36.54
				$\frac{557 \text{ H.H}^2}{\nu 2.7' \text{ d}0.1' \text{ m-2.47}}$	
ıvler.p	pass. 11:42	ν0.0′ d0.8′ m-4.49	$\nu 0.7' \ d0.8' \ m1.04$	ν2.1' dU.1' m-2.41	ν2.2' d0.1' m0.55
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$184^{\circ}57.17$	135°27.88 N21°42.31	179°31.34 N01°31.04	12°50.45 N05°3.14	158°16.18 N08°36.65
1	$199^{\circ}59.63$	150°27.93 43.11	194° 32.03 31.83	27°53.20 3.25	173°18.36 36.76
2	215°2.10	165°27.97 43.92	209°32.72 32.62	42°55.94 3.37	188°20.54 36.87
3	230°4.56	180°28.02 · · 44.72	224°33.41 · · 33.40	57°58.69 · · 3.49	203°22.72 · · 36.98
4	245°7.02	195°28.07 45.52	239° 34.10 34.19	73°1.43 3.61	218°24.89 37.09
5	260°9.49	210°28.11 46.32	254°34.80 34.97	88° 4.17 3.72	233°27.07 37.21
6	275° 11.95	225°28.16 N21°47.12	269°35.49 N01°35.76	103°6.92 N05°3.84	248°29.25 N08°37.32
7	$290^{\circ}14.42$	240°28.21 47.91	284°36.18 36.55	118° 9.66 3.96	263°31.43 37.43
8	$305^{\circ}16.88$	255°28.26 48.71	299°36.87 37.33	133°12.40 4.07	278°33.60 37.54
9	320° 19.34	270°28.30 · · 49.51	314°37.56 · · 38.12	148°15.14 · · 4.19	293°35.78 · · 37.65
10	335°21.81	285°28.35 50.30	329°38.25 38.90	163°17.89 4.31	308°37.96 37.77
11	350°24.27	300°28.40 51.10	344°38.94 39.69	178°20.63 4.42	323°40.13 37.88
12	5°26.74	315°28.45 N21°51.89	359°39.64 N01°40.48	193°23.37 N05°4.54	338°42.31 N08°37.99
13	20°29.20	330°28.50 52.68	14°40.33 41.26	208°26.11 4.66	353°44.49 38.10
14	35°31.66	345°28.56 53.48	29°41.02 42.05	223°28.86 4.77	8°46.66 38.21
15	50°34.13	0°28.61 · · 54.27	44°41.71 · · 42.83	238°31.60 · · 4.89	23°48.84 · · 38.33
16	65°36.59	15°28.66 55.06	59° 42.40 43.62	253°34.34 5.01	38°51.02 38.44
17	80°39.06	30°28.71 55.85	74°43.09 44.41	268°37.08 5.12	53°53.19 38.55
18	95°41.52	45°28.77 N21°56.64	89°43.79 N01°45.19	283°39.82 N05°5.24	68°55.37 N08°38.66
19	110°43.99	60°28.82 57.43	104° 44.48 45.98	298°42.57 5.35	83°57.55 38.77
20	125° 46.45	75°28.87 58.21	119° 45.17 46.76	313°45.31 5.47	98°59.72 38.89
21	140°48.91	90°28.93 · · 59.00	134°45.86 · · 47.55	328°48.05 · · 5.59	114°1.90 · · 39.00
22	155°51.38	105°28.98 21°59.79	149° 46.55 48.33	343°50.79 5.70	129°4.08 39.11
23	$170^{\circ}53.84$	120°29.04 22°0.57	164° 47.24 49.12	358°53.53 5.82	144°6.25 39.22
More	pass. 11:38	ν0.0' d0.8' m-4.50	ν0.7' d0.8' m1.04	ν2.7' d0.1' m-2.46	ν2.2' d0.1' m0.55
- IVIEL.	Juss. 11.30			νΔ.1 UU.1 III-Δ.4U	ν 2.2 do.1 mo.33

	Stars	
	SHA	Dec
Alpheratz	357°32.38	29° 14.75
Ankaa Schedar	353°5.02 349°28.53	-42°9.16 56°41.56
Diphda	349 28.53 348°45.01	-17°49.95
Achernar	335°18.85	-57°5.68
Hamal	327°48.51	23°35.73
Polaris Acamar	312°59.17 315°10.13	89°23.13 -40°11.67
Menkar	314°3.63	4° 11.94
Mirfak	$308^{\circ}24.78$	49°57.76
Aldebaran	290°36.74	16°33.89
Rigel Capella	281°1.43 280°18.12	-8°10.34 46°1.63
Bellatrix	278°20.14	6°22.37
Elnath	277°58.63	28° 37.84
Alnilam Betelgeuse	275°35.13 270°49.28	-1°11.22 7°24.59
Canopus	263°51.22	-52°42.98
Sirius	258°23.90	$-16^{\circ}45.57$
Adhara	255°3.74	-29°0.94
Procyon Pollux	244°47.99 243°13.99	5°8.95 27°57.39
Avior	234°13.32	-59°36.35
Suhail	222°44.07	-43°33.13
Miaplacidus	221°37.04 217°44.94	-69°50.30 -8°47.13
Alphard Regulus	217 44.94 207°31.40	-8 47.13 11°49.54
Dubhe	193°37.28	61°35.84
Denebola	182°21.97	14°24.64
Gienah Acrux	175°40.54 172°56.36	-17° 42.14 -63° 15.47
Gacrux	172 30.30 171°48.05	-03 15.47 -57°16.42
Alioth	$166^{\circ}10.19$	55°48.19
Spica	158° 19.21	-11°18.71
Alkaid Hadar	152°49.54 148°31.60	49°10.09 -60°30.53
Menkent	147°54.13	-36°30.60
Arcturus	145°45.23	19°1.89
Rigil Kent. Kochab	139°36.05 137°19.08	-60°57.07 74°2.05
Zuben'ubi	136°52.83	-16°9.65
Alphecca	126°1.30	26°36.92
Antares	112°12.43 107°4.07	-26°29.64
Atria Sabik	107°4.07 101°59.66	-69°4.39 -15°45.60
Shaula	96°6.71	-37°7.31
Rasalhague	95°56.04	12°32.20
Eltanin Kaus Aust.	90°40.90 83°29.04	51°28.78
Vega	80°31.46	-34°22.11 38°48.32
Nunki	75°44.56	-26° 15.58
Altair	61°57.51	8°56.48
Peacock Deneb	53°1.95 49°24.24	-56°38.37 45°22.66
Enif	33°36.46	10°0.20
Al Na'ir	27°30.06	-46°49.30
Fomalhaut Scheat	15°11.99 13°42.96	-29°28.31 28°14.09
Markab	13 42.96 13°27.57	28 14.09 15°21.38
Mar 25 Sat	SHA	Mer.pass
Venus Mars	312°27.38 355°59.31	14:58 12:04
Jupiter	187°39.72	23:13
Saturn	333°32.71	13:32
Mar 26 Sun	SHA	Mer.pass
Venus	311°28.92	14:58
Mars Jupiter	355°16.73 187°46.54	12:02 23:09
Saturn	333°25.88	13:28
Mar 27 Mon	SHA	Mer.pass
Venus	310°30.72	14:58
Mars Jupiter	354°34.17 187°53.29	12:01 23:04
Saturn	333°19.02	13:25

 $333^{\circ}19.02$ Horizontal parallax

Venus: Mars:

12:01 23:04 13:25

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.79	N01°56.07	$192^{\circ}7.19$	16.7'	N00°21.69	13.2'	54.1'
1	193°30.98	57.05	206°42.88	16.7'	00°34.93	13.2'	54.2'
2	208°31.17 223°31.36	58.03 01°59.02	221°18.56 235°54.23	16.7' 16.7'	00°48.18 01°1.43	13.2' 13.2'	54.2' 54.2'
4	238° 31.54	02°0.00	250°29.89	16.6'	01°14.68	13.2'	54.2'
5	253°31.73	0.98	$265^{\circ}5.53$	16.6'	$01^{\circ}27.93$	13.2'	54.2'
6	268° 31.92	N02°1.96	279°41.15	16.6'	N01°41.18 01°54.43	13.2'	54.2'
7 8	283°32.11 298°32.29	2.95 3.93	294°16.76 308°52.36	16.6' 16.6'	01°54.43 02°7.67	13.2' 13.2'	54.2' 54.2'
9	313° 32.48	4.91	323°27.93	16.6'	02°20.91	13.2'	54.2'
10	328°32.67	5.89	$338^{\circ}3.49$	16.5'	$02^{\circ}34.15$	13.2'	54.2'
11	343°32.86 358°33.05	6.87	352°39.02 7°14.54	16.5'	02°47.38	13.2'	54.2'
12 13	13° 33.05	N02°7.86 8.84	7°14.54 21°50.03	16.5' 16.5'	N03°0.61 03°13.83	13.2' 13.2'	54.3' 54.3'
14	28° 33.42	9.82	36°25.50	16.4	03°27.05	13.2'	54.3'
15	43°33.61	• • 10.80	51°0.95	16.4'	03°40.25	13.2'	54.3'
16	58° 33.80 73° 33.99	11.78	65°36.37 80°11.76	16.4	03°53.45 04°6.64	13.2'	54.3'
17 18	73°33.99 88°34.17	12.76 N02°13.75	94°47.13	16.4' 16.3'	N04°19.82	13.2' 13.2'	54.3' 54.3'
19	103°34.36	14.73	109°22.48	16.3'	04°32.99	13.2'	54.3'
20	118°34.55	15.71	123°57.79	16.3'	$04^{\circ}46.14$	13.1'	54.3'
21	133°34.74	• • 16.69	138°33.08	16.3'	04°59.29	13.1'	54.4'
22 23	148°34.92 163°35.11	17.67 18.65	153°8.34 167°43.56	16.2' 16.2'	05°12.42 05°25.53	13.1' 13.1'	54.4' 54.4'
23						13.1	J T.→
	SD = 16.0'	d = 1.0'		SL	0 = 14.8'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°35.30	N02°19.63	182°18.76	16.2'	N05°38.63	13.1'	54.4'
1 2	193°35.49 208°35.68	20.61 21.59	196°53.92 211°29.05	16.1' 16.1'	05°51.72 06°4.78	13.1' 13.1'	54.4' 54.4'
3	208°35.88	22.57	211°29.05 226°4.14	16.1	06° 4.78	13.1	54.4'
4	238° 36.05	23.55	240°39.20	16.0'	06°30.87	13.0'	54.4'
5	253°36.24	24.53	$255^{\circ}14.22$	16.0'	06°43.88	13.0'	54.4'
6	268° 36.43 283° 36.61	N02°25.52	269°49.21 284°24.15	15.9'	N06°56.87	13.0'	54.5'
7 8	283°36.61 298°36.80	26.50 27.48	284°24.15 298°59.06	15.9' 15.9'	07°9.84 07°22.79	12.9' 12.9'	54.5' 54.5'
9	313°36.99	28.46	313°33.93	15.8'	07°35.72	12.9'	54.5'
10	328°37.18	29.44	$328^{\circ}8.76$	15.8'	$07^{\circ}48.62$	12.9'	54.5'
11	343°37.37	30.42	342°43.55	15.7'	08° 1.50	12.9'	54.5'
12 13	358° 37.55 13° 37.74	N02°31.40 32.38	357°18.29 11°52.99	15.7' 15.7'	N08°14.35 08°27.18	12.8' 12.8'	54.5' 54.5'
14	28° 37.93	33.35	26°27.65	15.6'	08°39.98	12.8'	54.6'
15	43°38.12	• • 34.33	$41^{\circ}2.26$	15.6'	$08^{\circ}52.76$	12.7'	54.6'
16	58° 38.31	35.31	55°36.83	15.5'	09°5.50	12.7'	54.6'
17 18	73°38.49 88°38.68	36.29 N02°37.27	70°11.35 84°45.82	15.5' 15.4'	09°18.21 N09°30.90	12.7' 12.7'	54.6' 54.6'
19	103°38.87	38.25	99°20.25	15.4'	09°43.55	12.6'	54.6'
20	118°39.06	39.23	$113^{\circ}54.62$	15.3'	09°56.17	12.6'	54.6'
21	133°39.24	• • 40.21	128°28.95	15.3'	10°8.76	12.6'	54.7'
22 23	148°39.43 163°39.62	41.19 42.17	143°3.22 157°37.45	15.2' 15.2'	10°21.31 10°33.82	12.5' 12.5'	54.7' 54.7'
23	SD = 16.0'		137 37.43			12.5	J4.1
	$5D = 16.0^{\circ}$	d = 1.0'		) JL	0 = 14.8'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°39.81	N02°43.15	172°11.62	15.1'	N10°46.31	12.4'	54.7'
1 2	193°40.00 208°40.18	44.12 45.10	186°45.73 201°19.80	15.1' 15.0'	10°58.75 11°11.16	12.4' 12.4'	54.7' 54.7'
3	208 40.18 223°40.37	45.10 •• 46.08	201 19.80 215°53.80	15.0'	11 11.10 11°23.52	12.4	54.7'
4	238°40.56	47.06	230°27.75	14.9'	11°35.85	12.3'	54.8'
5	253°40.75	48.04	245°1.65	14.8'	11°48.14	12.2'	54.8'
6 7	268° 40.93 283° 41.12	N02°49.02 49.99	259°35.49 274°9.27	14.8' 14.7'	N12°0.38 12°12.58	12.2' 12.2'	54.8' 54.8'
8	298°41.31	50.97	288°42.99	14.7'	12 12.56 12°24.74	12.2	54.8'
9	313°41.50	• • 51.95	303°16.65	14.6'	12°36.86	12.1'	54.8'
10	328°41.69	52.93	317°50.25	14.5'	12°48.92	12.0'	54.8'
11 12	343°41.87 358°42.06	53.91 N02°54.88	332°23.79 346°57.26	14.5' 14.4'	13°0.95 N13°12.92	12.0' 11.9'	54.9' 54.9'
13	13°42.25	55.86	1°30.68	14.4 14.4'	13°24.84	11.9' 11.9'	54.9'
14	28°42.44	56.84	$16^{\circ}4.03$	14.3'	13°36.72	11.8'	54.9'
15	43°42.62	• • 57.81	30°37.31	14.2'	13°48.55	11.8'	54.9'
16 17	58° 42.81 73° 43.00	58.79 02°59.77	45°10.53 59°43.69	14.2' 14.1'	14°0.32 14°12.04	11.7' 11.7'	54.9' 55.0'
18	73°43.00 88°43.19	02°59.77 N03°0.75	74°16.78	14.1	N14°23.71	11.6'	55.0'
19	103°43.37	1.72	88°49.80	14.0'	14°35.32	11.6'	55.0'
20	118°43.56	2.70	103°22.75	13.9'	14°46.88	11.5'	55.0'
21 22	133° 43.75 148° 43.94	· · 3.68 4.65	117°55.64 132°28.45	13.8' 13.7'	14°58.38 15°9.82	11.4' 11.4'	55.0' 55.0'
23	148° 43.94 163° 44.12	4.05 5.63	132°28.45 147°1.20	13.7'	15° 9.82 15° 21.20	11.4	55.0 55.1'
	SD = 16.0'	d = 1.0'	2.23		0 = 14.9'		
	<u> </u>	<u>u — 1.0</u>		JL			

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	29-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-1%
25	05:57	05:48	12:06	11:30	23:50	
26	05:39	05:30	12:05	12:11	-:-	
27	05:21	05:12	12:05	12:54	00:32	

h	Aries	Venus	Mars	Jupiter	Saturn _
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	185°56.31	135°29.10 N22°1.36	179°47.94 N01°49.90	13°56.27 N05°5.93	159°8.43 N08°39.33
1	200°58.77	150°29.15 2.14	194°48.63 50.69	28°59.01 6.05	174°10.61 39.45
2	216°1.23	165°29.21 2.92	209°49.32 51.47	44° 1.75 6.17	189°12.78 39.56
3	231°3.70	180°29.27 · · 3.70	224°50.01 · · 52.26	59°4.49 · · 6.28	204°14.96 · · 39.67
4	246°6.16	195°29.33 4.48	239°50.70 53.04	74°7.24 6.40	219°17.13 39.78
5	261°8.63	210°29.39 5.26	254°51.40 53.83	89°9.98 6.51	234°19.31 39.90
6	$276^{\circ}11.09$	225°29.45 N22°6.04	269°52.09 N01°54.61	104°12.72 N05°6.63	249°21.49 N08°40.01
7	291° 13.55	240°29.51 6.82	284°52.78 55.40	119°15.46 6.74	264°23.66 40.12
8	306° 16.02	255°29.57 7.60	299°53.47 56.18	134°18.20 6.86	279°25.84 40.23
9	321°18.48	270°29.63 · · 8.37	314°54.17 · · 56.97	149°20.94 · · 6.97	294°28.01 · · 40.34
10	336°20.95 351°23.41	285°29.69 9.15 300°29.75 9.93	329° 54.86 57.75 344° 55.55 58.54	164°23.68 7.09 179°26.41 7.20	309°30.19 40.46 324°32.37 40.57
11 12	6°25.87	300°29.75 9.93 315°29.81 N22°10.70	344°55.55 58.54 359°56.24 N01°59.32	179°26.41 7.20 194°29.15 N05°7.32	324°32.37 40.57 339°34.54 N08°40.68
13	0 25.67 21°28.34	330°29.88 11.47	14°56.93 02°0.10	209°31.89 7.43	354°36.72 40.79
14	36°30.80	345°29.94 12.25	29° 57.63 0.89	224°34.63 7.55	9°38.89 40.90
15	51°33.27	0°30.01 · · 13.02	44°58.32 · · 1.67	239°37.37 · · 7.66	24°41.07 · · 41.02
16	66° 35.73	15°30.07 13.79	59°59.01 2.46	254°40.11 7.78	39°43.24 41.13
17	81°38.19	30°30.14 14.56	74°59.70 3.24	269°42.85 7.89	54°45.42 41.24
18	96°40.66	45°30.20 N22°15.33	90°0.40 N02°4.03	284°45.59 N05°8.01	69°47.60 N08°41.35
19	111°43.12	60°30.27 16.10	105°1.09 4.81	299°48.33 8.12	84°49.77 41.47
20	126°45.59	75°30.34 16.86	120°1.78 5.59	314°51.07 8.24	99°51.95 41.58
21	141°48.05	90°30.40 · · 17.63	135°2.47 · · 6.38	329°53.80 · · 8.35	114°54.12 · · 41.69
22	156° 50.51	105°30.47 18.40	150°3.17 7.16	344°56.54 8.47	129°56.30 41.80
23	171°52.98	120°30.54 19.16	165°3.86 7.94	359°59.28 8.58	144°58.47 41.91
Mer.p	ass. 11:34	ν0.1' d0.8' m-4.51	ν0.7' d0.8' m1.05	ν2.7' d0.1' m-2.46	ν2.2' d0.1' m0.55
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	186°55.44	135°30.61 N22°19.93	180°4.55 N02°8.73	15°2.02 N05°8.69	160°0.65 N08°42.03
1	201°57.91	150° 30.68 20.69	195°5.24 9.51	30°4.76 8.81	175°2.82 42.14
2	217°0.37	165°30.75 21.45	210°5.94 10.30	45°7.49 8.92	190°5.00 42.25
3	232°2.84	180°30.82 · · 22.21	225°6.63 ·· 11.08	60°10.23 · · 9.04	205°7.17 · · 42.36
4	247°5.30	195°30.89 22.97	240°7.32 11.86	75°12.97 9.15	220°9.35 42.48
5	262°7.76	210°30.97 23.73	255°8.01 12.65	90°15.70 9.26	235°11.52 42.59
6	277°10.23	225°31.04 N22°24.49	270°8.71 N02°13.43	105°18.44 N05°9.38	250°13.70 N08°42.70
7 8	292° 12.69 307° 15.16	240°31.11 25.25 255°31.19 26.01	285°9.40 14.21 300°10.09 15.00	120°21.18 9.49 135°23.92 9.60	265°15.87 42.81 280°18.05 42.92
9	307 15.10 322° 17.62	255°31.19 26.01 270°31.26 · · 26.77	300°10.09 15.00 315°10.79 •• 15.78	135°23.92 9.60 150°26.65 • 9.72	280°18.05 42.92 295°20.22 · · 43.04
10	337° 20.08	285°31.34 27.52	330°11.48 16.56	165°29.39 9.83	310°22.40 43.15
11	352°22.55	300°31.41 28.28	345° 12.17 17.34	180°32.13 9.94	325°24.57 43.26
12	7°25.01	315°31.49 N22°29.03	0°12.86 N02°18.13	195°34.86 N05°10.06	340°26.75 N08°43.37
13	22°27.48	330°31.57 29.79	15°13.56 18.91	210°37.60 10.17	355°28.92 43.49
14	37°29.94	345°31.64 30.54	30°14.25 19.69	225°40.33 10.28	10°31.09 43.60
15	52°32.40	0°31.72 · · 31.29	45°14.94 · · 20.48	240°43.07 · · 10.40	25°33.27 · · 43.71
16	67°34.87	15°31.80 32.04	60° 15.64 21.26	255°45.81 10.51	40°35.44 43.82
17	82°37.33	30°31.88 32.79	75°16.33 22.04	270°48.54 10.62	55°37.62 43.93
18	97°39.80	45°31.96 N22°33.54	90°17.02 N02°22.82	285°51.28 N05°10.74	70°39.79 N08°44.05
19	112° 42.26		105°17.72 23.60	300°54.01 10.85	85°41.97 44.16
20	127° 44.73 142° 47.19	75°32.12 35.04 90°32.20 · · 35.78	120°18.41 24.39	315°56.75 10.96	100°44.14 44.27 115°46.31 • 44.38
21 22	142 47.19 157°49.65	90°32.20 · · 35.78 105°32.28 36.53	135°19.10 · · 25.17 150°19.80 25.95	330°59.48 ·· 11.07 346°2.22 11.19	115°46.31 · · 44.38 130°48.49 44.50
23	172° 52.12	105 32.26 30.53 120°32.37 37.27	165° 20.49 26.73	1°4.95 11.30	145°50.66 44.61
Mer.p	pass. 11:30	ν0.1' d0.8' m-4.52	$\nu 0.7' \ d0.8' \ m1.05$	ν2.7' d0.1' m-2.46	ν2.2' d0.1' m0.54
Thu	GHA	<b>GHA Dec</b> 135°32.45 N22°38.02	GHA Dec	GHA Dec	GHA Dec
0 1	187°54.58 202°57.05	135°32.45 N22°38.02 150°32.54 38.76	180°21.18 N02°27.52 195°21.88 28.30	16°7.69 N05°11.41 31°10.42 11.52	160°52.84 N08°44.72 175°55.01 44.83
2	202°57.05 217°59.51	165° 32.62 39.50	210° 22.57 29.08	46°13.15 11.64	175°55.01 44.83 190°57.19 44.95
3	217 59.51 233°1.97	180°32.71 · · 40.24	210 22.57 29.08 225°23.26 · · 29.86	61°15.89 · · 11.75	205°59.36 · · 45.06
4	248°4.44	195°32.79 40.99	240°23.96 30.64	76°18.62 11.86	203 39.50 45.00 221°1.53 45.17
5	263°6.90	210° 32.88 41.73	255°24.65 31.42	91°21.36 11.97	236°3.71 45.28
6	278°9.37	225°32.97 N22°42.46	270°25.34 N02°32.21	106°24.09 N05°12.08	251°5.88 N08°45.40
7	293°11.83	240°33.05 43.20	285°26.04 32.99	121°26.82 12.20	266°8.05 45.51
8	$308^{\circ}14.29$	255°33.14 43.94	300°26.73 33.77	136°29.56 12.31	281°10.23 45.62
9	323°16.76	270°33.23 · · 44.68	315°27.42 · · 34.55	151°32.29 · · 12.42	296°12.40 · · 45.73
10	338° 19.22	285°33.32 45.41	330°28.12 35.33	166°35.02 12.53	311°14.58 45.84
11	353°21.69	300°33.41 46.15	345°28.81 36.11	181°37.76 12.64	326°16.75 45.96
12	8°24.15	315°33.50 N22°46.88	0°29.50 N02°36.89	196°40.49 N05°12.75	341°18.92 N08°46.07
13 14	23°26.62 38°29.08	330°33.59 47.61 345°33.69 48.35	15°30.20 37.68 30°30.89 38.46	211°43.22 12.87 226°45.95 12.98	356°21.10 46.18 11°23.27 46.29
14 15	38° 29.08 53° 31.54	0°33.78 · · 49.08	45°31.58 · · 39.24	241°48.69 · · 13.09	26°25.44 · · 46.41
15 16	53 31.54 68° 34.01	15°33.87 49.81	60°32.28 40.02	256°51.42 13.20	41°27.62 46.52
17	83° 36.47	30°33.97 50.54	75°32.97 40.80	271°54.15 13.31	56°29.79 46.63
18	98° 38.94	45°34.06 N22°51.27	90°33.66 N02°41.58	286°56.88 N05°13.42	71°31.96 N08°46.74
19	113°41.40	60°34.16 52.00	105°34.36 42.36	301°59.61 13.53	86°34.14 46.86
20	128° 43.86	75°34.26 52.72	120°35.05 43.14	317°2.35 13.64	101°36.31 46.97
21	$143^{\circ}46.33$	90°34.35 · · 53.45	135°35.75 · · 43.92	332°5.08 · · 13.75	116°38.48 · · 47.08
22	158°48.79	105°34.45 54.18	150° 36.44 44.70	347°7.81 13.87	131°40.66 47.19
23	173°51.26	120°34.55 54.90	165°37.13 45.48	2°10.54 13.98	146°42.83 47.31
Mer.	ass. 11:26	ν0.1' d0.7' m-4.53	ν0.7' d0.8' m1.06	ν2.7' d0.1' m-2.45	ν2.2' d0.1' m0.54

	Stars	
	SHA	Dec
Alpheratz	357°32.38	29°14.74
Ankaa Schedar	353°5.02 349°28.52	-42°9.15 56°41.55
Diphda	348°45.01	-17°49.95
Achernar	$335^{\circ}18.86$	-57° 5.67
Hamal	327°48.52	23°35.73
Polaris Acamar	313°0.05 315°10.14	89°23.12 -40°11.66
Menkar	314°3.64	4°11.93
Mirfak	308°24.79	49°57.75
Aldebaran Rigel	290°36.76 281°1.45	16°33.88 -8°10.34
Capella	280°18.14	46° 1.63
Bellatrix	$278^{\circ}20.15$	6°22.37
Elnath	277°58.64 275°35.14	28°37.83 -1°11.22
Alnilam Betelgeuse	275 35.14 270°49.29	7°24.59
Canopus	263°51.25	-52°42.98
Sirius	258°23.91	-16°45.57
Adhara Procyon	255°3.76 244°48.01	-29°0.95 5°8.95
Pollux	243°14.01	27°57.39
Avior	$234^{\circ}13.35$	-59°36.36
Suhail	222°44.08	-43°33.14 -69°50.32
Miaplacidus Alphard	221°37.07 217°44.96	-8°47.13
Regulus	207°31.40	11°49.55
Dubhe	193°37.30	61°35.86
Denebola Gienah	182°21.97 175°40.54	14°24.64 -17°42.15
Acrux	173° 40.34 172° 56.35	-63°15.49
Gacrux	171°48.05	-57°16.44
Alioth	166°10.18	55°48.21 -11°18.71
Spica Alkaid	158° 19.21 152° 49.53	-11 18.71 49°10.10
Hadar	148°31.58	-60°30.55
Menkent	147°54.12	-36°30.61
Arcturus Rigil Kent.	145°45.22 139°36.02	19°1.89 -60°57.08
Kochab	137°19.05	74° 2.07
Zuben'ubi	136°52.82	-16° 9.65
Alphecca	126° 1.28 112° 12.41	26°36.93 -26°29.64
Antares Atria	112 12.41 107°4.02	-20 29.04 -69°4.40
Sabik	101°59.64	-15°45.59
Shaula	96°6.69	-37°7.31 12°32.20
Rasalhague Eltanin	95°56.02 90°40.87	51°28.79
Kaus Aust.	83°29.01	-34°22.11
Vega	80°31.44	38°48.32
Nunki Altair	75°44.54 61°57.49	-26°15.58 8°56.48
Peacock	53°1.92	-56°38.36
Deneb	49°24.21	45°22.66
Enif	33°36.44	10°0.20
Al Na'ir Fomalhaut	27°30.04 15°11.98	-46°49.29 -29°28.30
Scheat	13°42.95	28°14.09
Markab	13°27.57	15°21.37
Mar 28 Tue	SHA	Mer.pass
Venus Mars	309°32.79 353°51.63	14:58 12:00
Jupiter	187°59.97	23:00
Saturn	333°12.12	13:22
Mar 29 Wed Venus	<b>SHA</b> 308°35.17	Mer.pass 14:58
Mars	$353^{\circ}9.11$	11:59
Jupiter Saturn	188° 6.57 333° 5.20	22:56 13:18
Mar 30 Thu Venus	<b>SHA</b> 307°37.87	Mer.pass 14:58
Mars	352°26.60	11:58
Jupiter	188°13.10	22:51

Saturn 332°58.26

Horizontal parallax

Venus: Mars:

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 44.31	N03°6.60	161°33.87	13.6'	N15°32.53	11.3'	55.1'
1	193°44.50	7.58	176° 6.47	13.5'	15°43.79	11.2'	55.1'
2	208°44.69	8.56	190°39.01	13.5'	15°54.99	11.1'	55.1'
3	223°44.87	• • 9.53	205°11.46	13.4'	$16^{\circ}6.13$	11.1'	55.1'
4	238° 45.06	10.51	219°43.85	13.3'	16°17.20	11.0'	55.1'
5	253°45.25	11.48	234°16.16	13.2'	16°28.21	10.9'	55.2'
6	268° 45.44 283° 45.62	N03°12.46	248°48.40 263°20.56	13.2'	N16°39.16 16°50.03	10.9'	55.2'
7 8	283 45.62 298°45.81	13.44 14.41	203 20.50 277°52.65	13.1' 13.0'	10 50.03 17°0.84	10.8' 10.7'	55.2' 55.2'
9	313°46.00	15.39	292°24.66	12.9'	17°11.58	10.7	55.2'
10	328° 46.19	16.36	306°56.59	12.9'	17°22.24	10.6'	55.2'
11	343°46.37	17.34	321°28.45	12.8'	17°32.84	10.5'	55.3'
12	358° 46.56	N03°18.31	336° 0.23	12.7'	N17°43.36	10.4'	55.3'
13	13°46.75	19.29	350°31.93	12.6'	17°53.81	10.4'	55.3'
14	28°46.94	20.26	5°3.55	12.5'	18° 4.19	10.3'	55.3'
15 16	43°47.12 58°47.31	· · 21.24 22.21	19°35.10 34°6.56	12.5' 12.4'	18°14.48 18°24.71	10.2' 10.1'	55.3' 55.4'
17	73°47.50	23.18	48°37.94	12.4	18°34.85	10.1	55.4'
18	88° 47.68	N03°24.16	63° 9.25	12.3	N18°44.91	10.1	55.4
19	103°47.87	25.13	77°40.47	12.1'	18°54.90	9.9'	55.4'
20	118°48.06	26.11	92°11.61	12.1'	19° 4.80	9.8'	55.4'
21	133°48.25	• • 27.08	106°42.67	12.0'	19°14.62	9.7'	55.5'
22	148°48.43	28.05	121°13.65	11.9'	19°24.35	9.6'	55.5'
23	163°48.62	29.03	135°44.55	11.8'	19°34.00	9.6'	55.5'
	SD = 16.0'	d = 1.0'		SE	O = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 48.81	N03°30.00	150°15.36	ν 11.7'	N19°43.56	9.5'	55.5'
1	193°48.99	30.98	164°46.09	11.6'	19°53.04	9.4'	55.5'
2	208°49.18	31.95	$179^{\circ}16.74$	11.6'	$20^{\circ}2.43$	9.3'	55.5'
3	223°49.37	• • 32.92	193°47.30	11.5'	20°11.73	9.2'	55.6'
4	238°49.56	33.90	208°17.79	11.4'	20°20.93	9.1'	55.6'
5	253°49.74	34.87	222°48.18	11.3'	20°30.05	9.0'	55.6'
6	268°49.93 283°50.12	N03°35.84 36.81	237°18.50 251°48.73	11.2' 11.1'	N20°39.07 20°48.00	8.9' 8.8'	55.6'
7 8	283 50.12 298°50.30	36.81	266°18.87	11.1	20 48.00 20°56.84	8.7'	55.6' 55.7'
9	313°50.49	• • 38.76	280°48.93	11.1	20°5.57	8.6'	55.7'
10	328° 50.68	39.73	295°18.91	10.9'	21°14.21	8.5'	55.7'
11	343°50.86	40.70	309°48.80	10.8'	21°22.76	8.4'	55.7'
12	358°51.05	N03°41.68	324°18.61	10.7'	N21°31.20	8.3'	55.7'
13	13°51.24	42.65	338°48.33	10.6'	21°39.54	8.2'	55.8'
14	28°51.43	43.62	353°17.97	10.6'	21°47.78	8.1'	55.8'
15	43°51.61	• • 44.59	7°47.52 22°16.99	10.5'	21°55.91 22°3.94	8.0'	55.8'
16 17	58°51.80 73°51.99	45.56 46.54	22°16.99 36°46.38	10.4' 10.3'	22° 3.94 22° 11.87	7.9' 7.8'	55.8' 55.9'
18	88° 52.17	N03°47.51	51°15.68	10.3	N22°19.69	7.7'	55.9'
19	103°52.36	48.48	65°44.89	10.1'	22°27.40	7.6'	55.9'
20	118° 52.55	49.45	80°14.03	10.0'	22°35.00	7.5'	55.9'
21	133°52.73	• • 50.42	94°43.07	10.0'	22°42.49	7.4'	55.9'
22	148°52.92	51.39	109°12.04	9.9'	22°49.87	7.3'	56.0'
23	163°53.11	52.36	123°40.92	9.8'	22°57.14	7.2'	56.0'
	SD = 16.0'	d = 1.0'		SE	O = 15.1'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°53.29	N03°53.33	138° 9.72	9.7'	N23° 4.29	7.0'	56.0'
1	193°53.48	54.30	152°38.43	9.6'	23°11.33	6.9'	56.0'
2	208° 53.66 223° 53.85	55.27	167°7.07 181°35.62	9.6' 9.5'	23°18.26 23°25.07	6.8'	56.0'
3 4	223°53.85 238°54.04	· · 56.24 57.21	181°35.62 196°4.09	9.5 <sup>7</sup> 9.4 <sup>7</sup>	23°25.07 23°31.76	6.7' 6.6'	56.1' 56.1'
5	253° 54.04	58.18	210°32.47	9.4	23°38.33	6.5	56.1
6	268° 54.41	N03°59.15	225° 0.78	9.2'	N23°44.78	6.3'	56.1'
7	283°54.60	04°0.12	239°29.01	9.1'	23°51.11	6.2'	56.2'
8	298°54.78	1.09	253°57.15	9.1'	23°57.32	6.1'	56.2'
9	313°54.97	• • 2.06	268°25.22	9.0'	24° 3.40	6.0'	56.2'
10	328°55.16	3.03	282°53.21	8.9'	24° 9.36	5.8'	56.2'
11 12	343°55.34 358°55.53	4.00 N04°4.97	297°21.11 311°48.94	8.8' 8.8'	24°15.20 N24°20.91	5.7' 5.6'	56.2' 56.3'
13	358°55.53 13°55.71	N04 4.97 5.94	311°48.94 326°16.70	8.8	24°26.49	5.6° 5.5'	56.3'
13 14	28° 55.90	5.94 6.91	340°44.38	8. <i>1</i> 8.6'	24 20.49 24°31.94	5.3'	56.3'
15	43° 56.09	7.88	355°11.98	8.5'	24°37.27	5.2'	56.3'
16	58° 56.27	8.85	9°39.50	8.5'	24°42.46	5.1'	56.4'
17	73°56.46	9.81	24°6.96	8.4'	24°47.52	4.9'	56.4'
18	88° 56.64	N04°10.78	38°34.33	8.3'	N24°52.45	4.8'	56.4'
19	103°56.83	11.75	53°1.64	8.2'	24°57.24	4.7'	56.4'
20	118° 57.02	12.72	67°28.87	8.2'	25°1.90	4.5'	56.5'
21 22	133°57.20 148°57.39	· · 13.69 14.65	81°56.03 96°23.13	8.1' 8.0'	25°6.43 25°10.82	4.4' 4.3'	56.5' 56.5'
23	148 57.39 163°57.57	14.65 15.62	90 23.13 110°50.15	8.0'	25 10.82 25°15.07	4.3 4.1'	56.5'
	SD = 16.0'	d = 1.0'			D = 15.3'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4		
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	3-14%		
28	05:03	04:54	12:05	13:39	01:16			
29	04:45	04:36	12:05	14:28	02:03			
30	04:27	04:18	12:04	15:20	02:53			

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri -	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	188°53.72	135°34.65 N22°55.62	180°37.83 N02°46.26	17°13.27 N05°14.09	161°45.00 N08°47.42	
1	203°56.19	150°34.75 56.35	195°38.52 47.04	32°16.00 14.20	176°47.18 47.53	Alpheratz 357°32.36 29°14.73 Ankaa 353°5.02 -42°9.13
2	218° 58.65	165°34.85 57.07	210°39.21 47.82	47°18.73 14.31	191°49.35 47.64	Schedar 349°28.51 56°41.54
3	234°1.11	180°34.95 · · 57.79	225°39.91 · · 48.60	62°21.46 · · 14.42	206°51.52 · · 47.76	Diphda 348°45.00 -17°49.94
4 5	249°3.58 264°6.04	195°35.05 58.51 210°35.15 59.23	240°40.60 49.38 255°41.30 50.16	77°24.19 14.53 92°26.92 14.64	221°53.69 47.87 236°55.87 47.98	Achernar 335°18.86 -57°5.65
6	279°8.51	225°35.25 N22°59.95	270°41.99 N02°50.94	107°29.65 N05°14.75	251°58.04 N08°48.09	Hamal 327°48.52 23°35.72
7	294° 10.97	240°35.36 23°0.67	285° 42.68 51.72	122°32.38 14.86	267°0.21 48.21	Polaris 313°0.67 89°23.10
8	309°13.43	255°35.46 1.38	300°43.38 52.50	137°35.11 14.97	282°2.39 48.32	Acamar 315°10.15 -40°11.65 Menkar 314°3.65 4°11.93
9	324° 15.90	270°35.57 · · 2.10	315°44.07 · · 53.28	152°37.84 · · 15.08	297°4.56 · · 48.43	Mirfak 308°24.80 49°57.74
10	339° 18.36 354° 20.83	285°35.67 2.82	330°44.77 54.06	167°40.57 15.19	312°6.73 48.54	Aldebaran 290°36.76 16°33.88
11 12	9°23.29	300°35.78 3.53 315°35.89 N23°4.24	345°45.46 54.84 0°46.15 N02°55.62	182°43.30 15.30 197°46.03 N05°15.41	327°8.90 48.66 342°11.08 N08°48.77	Rigel 281°1.46 -8°10.34
13	24°25.75	330°35.99 4.96	15°46.85 56.40	212°48.76 15.52	357°13.25 48.88	Capella 280°18.15 46°1.62
14	39°28.22	345°36.10 5.67	30° 47.54 57.18	227°51.49 15.63	12°15.42 48.99	Bellatrix 278° 20.16 6° 22.37 Elnath 277° 58.65 28° 37.83
15	54°30.68	0°36.21 · · 6.38	45°48.24 •• 57.96	242°54.22 · · 15.74	27°17.59 · · 49.11	Elnath 277°58.65 28°37.83 Alnilam 275°35.15 -1°11.22
16	69°33.15	15°36.32 7.09	60°48.93 58.73	257°56.95 15.85	42°19.77 49.22	Betelgeuse 270°49.30 7°24.59
17 18	84°35.61 99°38.08	30°36.43 7.80 45°36.54 N23°8.51	75°49.62 02°59.51 90°50.32 N03°0.29	272°59.68 15.95 288°2.40 N05°16.06	57°21.94 49.33 72°24.11 N08°49.44	Canopus 263°51.28 -52°42.98
19	114° 40.54	60°36.65 9.22	105° 51.01 1.07	303°5.13 16.17	87°26.28 49.56	Sirius 258°23.92 -16°45.57
20	129°43.00	75° 36.77 9.92	120°51.71 1.85	318° 7.86 16.28	102°28.45 49.67	Adhara 255°3.77 -29°0.95
21	144° 45.47	90°36.88 · · 10.63	135°52.40 · · 2.63	333°10.59 · · 16.39	117°30.63 · · 49.78	Procyon 244°48.02 5°8.95 Pollux 243°14.02 27°57.39
22	159° 47.93	105°36.99 11.33	150°53.10 3.41	348°13.32 16.50	132°32.80 49.89	Avior 234°13.37 -59°36.37
23	174°50.40	120°37.11 12.04	165°53.79 4.19	3°16.04 16.61	147°34.97 50.01	Suhail 222°44.09 -43°33.15
Mer.	pass. 11:23	ν0.1' d0.7' m-4.54	ν0.7' d0.8' m1.06	ν2.7' d0.1' m-2.45	ν2.2' d0.1' m0.54	Miaplacidus 221°37.10 -69°50.33
						Alphard 217°44.96 -8°47.14
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.41 11°49.55
0	189°52.86	135°37.22 N23°12.74	180°54.48 N03°4.96	18°18.77 N05°16.72	162°37.14 N08°50.12	Dubhe 193°37.31 61°35.87 Denebola 182°21.97 14°24.64
1	$204^{\circ}55.32$	150° 37.34 13.44	195°55.18 5.74	33°21.50 16.83	177°39.31 50.23	Gienah 175°40.53 -17°42.16
2	219°57.79	165°37.46 14.15	210°55.87 6.52	48°24.23 16.93	192°41.49 50.34	Acrux 172°56.34 -63°15.51
3	235°0.25	180°37.57 · · 14.85	225°56.57 · · 7.30	63°26.95 · · 17.04	207°43.66 · · 50.46	Gacrux 171°48.04 -57°16.46
4 5	250°2.72 265°5.18	195°37.69 15.55 210°37.81 16.25	240°57.26 8.08 255°57.96 8.85	78°29.68 17.15 93°32.41 17.26	222°45.83 50.57 237°48.00 50.68	Alioth 166°10.18 55°48.22
6	280°7.65	225°37.93 N23°16.94	270°58.65 N03°9.63	108°35.13 N05°17.37	252°50.17 N08°50.79	Spica 158°19.19 -11°18.71
7	295° 10.11	240°38.05 17.64	285°59.34 10.41	123°37.86 17.48	267°52.35 50.91	Alkaid 152°49.52 49°10.11 Hadar 148°31.56 -60°30.56
8	310° 12.57	255°38.17 18.34	301°0.04 11.19	138°40.58 17.58	282°54.52 51.02	Menkent 147°54.10 -36°30.62
9	325° 15.04	270°38.30 · · 19.03	316°0.73 · · 11.96	153°43.31 · · 17.69	297°56.69 · · 51.13	Arcturus 145°45.21 19°1.90
10 11	340° 17.50 355° 19.97	285°38.42 19.73 300°38.54 20.42	331°1.43 12.74 346°2.12 13.52	168°46.04 17.80 183°48.76 17.91	312°58.86 51.25 328°1.03 51.36	Rigil Kent. 139°35.99 -60°57.09
12	10°22.43	315°38.67 N23°21.11	1°2.82 N03°14.30	198°51.49 N05°18.02	343°3.20 N08°51.47	Kochab 137°19.02 74°2.08
13	25°24.89	330°38.79 21.81	16°3.51 15.07	213°54.21 18.12	358°5.38 51.58	Zuben'ubi 136°52.80 -16°9.66 Alphecca 126°1.26 26°36.93
14	40°27.36	345°38.92 22.50	31°4.21 15.85	228°56.94 18.23	13°7.55 51.70	Antares 112° 12.39 -26° 29.65
15	55°29.82	0°39.04 · · 23.19	46°4.90 · · 16.63	243°59.66 · · 18.34	28°9.72 · · 51.81	Atria 107°3.95 -69°4.40
16 17	70°32.29	15°39.17 23.88	61°5.59 17.41	259°2.39 18.45	43°11.89 51.92	Sabik 101°59.62 -15°45.59
18	85°34.75 100°37.22	30°39.30 24.57 45°39.43 N23°25.25	76°6.29 18.18 91°6.98 N03°18.96	274°5.11 18.55 289°7.84 N05°18.66	58°14.06 52.03 73°16.23 N08°52.15	Shaula 96°6.66 -37°7.30
19	115°39.68	60°39.56 25.94	106°7.68 19.74	304°10.56 18.77	88°18.40 52.26	Rasalhague 95°56.00 12°32.21
20	130°42.14	75°39.69 26.63	121°8.37 20.51	319°13.28 18.87	103°20.58 52.37	Eltanin 90°40.84 51°28.79 Kaus Aust. 83°28.98 -34°22.11
21	145° 44.61	90°39.82 · · 27.31	136°9.07 · · 21.29	334°16.01 · · 18.98	118°22.75 · · 52.48	Vega 80°31.41 38°48.33
22	160° 47.07	105°39.95 28.00	151°9.76 22.07	349°18.73 19.09	133°24.92 52.60	Nunki 75°44.51 -26°15.58
23	175° 49.54	120°40.08 28.68	166°10.46 22.84	4°21.46 19.20	148°27.09 52.71	Altair 61°57.47 8°56.49
Mer. <sub>I</sub>	pass. 11:19	$ u 0.1' \ d0.7' \ \text{m-4.55}$	$ u 0.7' \ d0.8' \ m1.07$	$\nu 2.7' \ d0.1' \ \text{m-}2.45$	$ u 2.2' \ d0.1' \ \text{m}0.54$	Peacock 53°1.88 -56°38.35
						Deneb 49°24.19 45°22.66 Enif 33°36.42 10°0.21
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°30.02 -46°49.27
0	190°52.00	135°40.21 N23°29.36	181°11.15 N03°23.62	19°24.18 N05°19.30	163°29.26 N08°52.82	Fomalhaut 15°11.97 -29°28.29
1	205°54.47	150°40.35 30.05	196° 11.85 24.39	34°26.90 19.41	178°31.43 52.93	Scheat 13°42.94 28°14.08
2 3	220° 56.93 235° 59.39	165°40.48 30.73 180°40.62 · · 31.41	211°12.54 25.17 226°13.24 •• 25.95	49°29.63 19.52 64°32.35 •• 19.62	193°33.60 53.05 208°35.77 · · 53.16	Markab 13°27.55 15°21.37
4	251°1.86	195°40.75 32.09	241°13.93 26.72	79°35.07 19.73	223°37.94 53.27	Mar 31 Fri SHA Mer.pass
5	266°4.32	210°40.89 32.76	256°14.63 27.50	94°37.79 19.83	238°40.12 53.39	Venus 306°40.93 14:58
6	281°6.79	225°41.03 N23°33.44	271°15.32 N03°28.27	109°40.52 N05°19.94	253°42.29 N08°53.50	Mars 351° 44.11 11:57
7	296°9.25	240°41.17 34.12	286°16.02 29.05	124°43.24 20.05	268°44.46 53.61	Jupiter 188° 19.55 22:47
8	311°11.71	255°41.31 34.79	301°16.71 29.83	139°45.96 20.15	283°46.63 53.72	Saturn 332°51.28 13:11
9 10	326° 14.18 341° 16.64	270°41.45 · · 35.47 285°41.59 36.14	316°17.40 · · 30.60 331°18.10 31.38	154°48.68 · · 20.26 169°51.41 20.37	298°48.80 · · 53.84 313°50.97 53.95	Apr 01 Sat SHA Mer.pass
11	356° 19.11	300°41.73 36.82	346°18.79 32.15	184°54.13 20.47	328°53.14 54.06	Venus 305°44.36 14:57
12	11°21.57	315°41.87 N23°37.49	1°19.49 N03°32.93	199°56.85 N05°20.58	343°55.31 N08°54.17	Mars 351°1.62 11:56
13	26° 24.04	330°42.02 38.16	16°20.18 33.70	214°59.57 20.68	358°57.48 54.29	Jupiter 188°25.91 22:43   Saturn 332°44.28 13:08
14	41°26.50	345°42.16 38.83	31°20.88 34.48	230°2.29 20.79	13°59.65 54.40	
15 16	56°28.96 71°31.43	0°42.30 · · 39.50 15°42.45 40.17	46°21.57 · · 35.25 61°22.27 36.03	245°5.01 · · 20.89 260°7.73 21.00	29°1.82 · · 54.51 44°3.99 54.62	Apr 02 Sun SHA Mer.pass
17	71 31.43 86°33.89	30° 42.60 40.84	76° 22.96 36.80	275°10.45 21.10	59° 6.16 54.74	Venus 304°48.21 14:57 Mars 350°19.15 11:55
18	101°36.36	45°42.74 N23°41.50	91°23.66 N03°37.58	290°13.17 N05°21.21	74°8.33 N08°54.85	Jupiter 188°32.18 22:38
19	$116^{\circ}38.82$	60°42.89 42.17	106°24.35 38.35	305°15.89 21.31	89°10.50 54.96	Saturn 332°37.26 13:04
20	131°41.28	75°43.04 42.83	121°25.05 39.13	320°18.61 21.42	104°12.67 55.08	Horizontal parallax
21 22	146° 43.75 161° 46.21	90°43.19 · · 43.50 105°43.34 44.16	136°25.74 · · 39.90 151°26.44 40.67	335°21.33 ·· 21.52 350°24.05 21.63	119°14.84 · · 55.19 134°17.01 55.30	Venus: 0.2
23	176° 48.68	105 45.54 44.10 120°43.49 44.83	166° 27.13 41.45	5°26.77 21.73	149°19.19 55.41	Mars: 0.1
ivier.	pass. 11:15	ν0.1′ d0.7′ m-4.56	ν0.7′ d0.8′ m1.07	ν2.7′ d0.1′ m-2.44	ν2.2′ d0.1′ m0.53	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 57.76	N04°16.59	125° 17.10	7.9'	N25°19.18	4.0'	56.6'
1	193° 57.95 208° 58.13	17.56 18.52	139°43.99 154°10.81	7.8' 7.8'	25°23.16 25°26.99	3.8' 3.7'	56.6'
2	208 58.13 223°58.32	18.52	168°37.57	7.8 7.7'	25 26.99 25°30.68	3. <i>1</i> 3.6'	56.6' 56.6'
4	238° 58.50	20.46	183°4.26	7.6'	25°34.24	3.4'	56.7'
5	253° 58.69	21.42	197°30.88	7.6'	25°37.64	3.3'	56.7'
6	268° 58.87 283° 59.06	N04°22.39	211°57.45 226°23.95	7.5'	N25°40.91 25°44.03	3.1'	56.7'
7 8	283°59.06 298°59.24	23.36 24.32	226°23.95 240°50.40	7.4' 7.4'	25°44.03 25°47.01	3.0' 2.8'	56.7' 56.8'
9	313°59.43	• • 25.29	255°16.78	7.3'	25°49.84	2.7'	56.8'
10	328°59.62	26.26	269°43.11	7.3'	$25^{\circ}52.52$	2.5'	56.8'
11	343°59.80 358°59.99	27.22	284° 9.38	7.2'	25°55.06 N25°57.44	2.4'	56.8'
12 13	358°59.99 14°0.17	N04°28.19 29.15	298°35.60 313°1.76	7.2' 7.1'	25°59.68	2.2' 2.1'	56.9' 56.9'
14	29°0.36	30.12	327°27.87	7.1	26°1.77	1.9'	56.9'
15	44°0.54	• • 31.08	341°53.93	7.0'	$26^{\circ}3.71$	1.8'	56.9'
16	59°0.73	32.05	356°19.94	7.0'	26°5.50	1.6'	57.0'
17 18	74°0.91 89°1.10	33.01 N04°33.98	10°45.90 25°11.82	6.9' 6.9'	26°7.13 N26°8.62	1.5' 1.3'	57.0' 57.0'
19	104°1.28	34.94	39°37.69	6.8'	26°9.95	1.2'	57.0'
20	119°1.47	35.91	54°3.51	6.8'	26°11.12	1.0'	57.1'
21	134°1.65	• • 36.87	68°29.29	6.7'	26°12.15	0.9'	57.1'
22 23	149°1.84 164°2.02	37.84 38.80	82°55.03 97°20.73	6.7' 6.7'	26°13.02 26°13.73	0.7' 0.6'	57.1' 57.1'
23			91 20.13		D = 15.4'	0.0	31.1
	SD = 16.0'	d = 1.0'		51	$J = 15.4^{\circ}$		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°2.21 194°2.39	N04°39.77 40.73	111°46.39 126°12.01	6.6' 6.6'	N26°14.29 26°14.69	0.4' 0.2'	57.2' 57.2'
2	209°2.58	41.69	140°37.60	6.6'	26°14.93	0.1	57.2'
3	224°2.76	• • 42.66	155°3.16	6.5'	26°15.02	-0.1'	57.2'
4	239°2.95	43.62	169°28.68	6.5'	26°14.95	-0.2'	57.3'
5 6	254°3.13 269°3.32	44.58 N04°45.55	183°54.17 198°19.63	6.5' 6.4'	26°14.72 N26°14.34	-0.4' -0.5'	57.3' 57.3'
7	284°3.50	46.51	212°45.06	6.4'	26°13.79	-0.7	57.4'
8	299°3.68	47.47	227°10.47	6.4'	26°13.09	-0.9'	57.4'
9	314°3.87 329°4.05	• • 48.44	241°35.85 256°1.21	6.4' 6.3'	26°12.23 26°11.21	-1.0' -1.2'	57.4' 57.4'
10 11	329 4.05 344°4.24	49.40 50.36	250 1.21 270°26.54	6.3	26°11.21	-1.2 -1.3'	57.4 57.5'
12	359°4.42	N04°51.32	284°51.86	6.3'	N26°8.68	-1.5'	57.5'
13	14°4.61	52.28	299°17.16	6.3'	26°7.18	-1.7'	57.5'
14 15	29°4.79 44°4.98	53.25 •• 54.21	313°42.43 328°7.70	6.3' 6.3'	26°5.52 26°3.69	-1.8' -2.0'	57.5' 57.6'
16	59°5.16	55.17	342°32.95	6.2	26°1.71	-2.1'	57.6'
17	74°5.34	56.13	$356^{\circ}58.19$	6.2'	$25^{\circ}59.56$	-2.3'	57.6'
18	89°5.53	N04°57.09	11°23.41	6.2'	N25°57.26 25°54.79	-2.5'	57.7'
19 20	104°5.71 119°5.90	58.05 04°59.01	25°48.63 40°13.84	6.2' 6.2'	25 54.79 25°52.16	-2.6' -2.8'	57.7' 57.7'
21	134°6.08	04°59.98	54°39.04	6.2'	25°49.37	-3.0'	57.7'
22	149°6.26	0.94	69°4.24	6.2'	25°46.42	-3.1'	57.8'
23	164°6.45	1.90	83°29.44	6.2'	25°43.31	-3.3'	57.8'
	SD = 16.0'	d = 1.0'		SI	D = 15.6'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°6.63	N05° 2.86	97°54.63	6.2'	N25°40.04 25°36.60	-3.4'	57.8' 57.8'
1 2	194°6.81 209°7.00	3.82 4.78	112°19.83 126°45.02	6.2' 6.2'	25°36.60 25°33.01	-3.6' -3.8'	57.8° 57.9'
3	224°7.18	• • 5.74	141°10.22	6.2	25°29.25	-3.9'	57.9'
4	239°7.37	6.70	155°35.42	6.2'	25°25.34	-4.1'	57.9'
5 6	254°7.55 269°7.73	7.66 N05°8.62	170°0.63 184°25.84	6.2' 6.2'	25°21.26 N25°17.02	-4.2' -4.4'	58.0' 58.0'
7	269°7.73 284°7.92	9.57	184 25.84 198°51.07	6.2'	25°12.63	-4.4' -4.6'	58.0'
8	299°8.10	10.53	213°16.30	6.2'	25°8.07	-4.7'	58.0'
9	314°8.28	• • 11.49	227°41.54	6.3'	25°3.35	-4.9'	58.1'
10 11	329°8.47 344°8.65	12.45 13.41	242°6.80 256°32.07	6.3' 6.3'	24°58.48 24°53.44	-5.0' -5.2'	58.1' 58.1'
12	359°8.83	N05°14.37	270°57.36	6.3	N24°48.25	-5.4'	58.2
13	14°9.01	15.33	285°22.66	6.3'	24°42.90	-5.5'	58.2'
14 15	29°9.20 44°9.38	16.28	299°47.98 314°13.32	6.3'	24°37.39	-5.7'	58.2'
15 16	44°9.38 59°9.56	· · 17.24 18.20	314°13.32 328°38.69	6.4' 6.4'	24°31.73 24°25.90	-5.8' -6.0'	58.2' 58.3'
17	74°9.75	19.16	343°4.07	6.4	24° 19.92	-6.1'	58.3
18	89°9.93	N05°20.12	357°29.48	6.4'	N24°13.79	-6.3'	58.3'
19	104° 10.11 119° 10.29	21.07	11°54.91	6.5'	24°7.50	-6.4'	58.4'
20 21	119° 10.29 134° 10.48	22.03 •• 22.99	26°20.36 40°45.84	6.5' 6.5'	24°1.05 23°54.45	-6.6' -6.8'	58.4' 58.4'
22	149°10.66	23.94	55°11.35	6.5'	23°47.70	-6.9	58.4'
23	164°10.84	24.90	69°36.89	6.6'	23°40.79	-7.1'	58.5'
	SD = 16.0'	d = 1.0'		SI	O = 15.8'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup> Pass		Upper	Lower	5-7		
	mm:ss mm:s		hh:mm	hh:mm	hh:mm	22-41%		
31	04:09	04:00	12:04	16:15	03:47			
01	03:51	03:42	12:04	17:13	04:44			
02	03:33	03:25	12:03	18:10	05:42			

h	Aries	Ver	านร	, M	ars	Jur	oiter	Sat	urn		Stars
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	191°51.14		N23°45.49	181° 27.83	N03°42.22	20°29.49	N05°21.84	164°21.36	N08° 55.53		
1	206°53.61	150°43.80	46.15	196° 28.52	43.00	35°32.21	21.94	179°23.53	55.64	Alpheratz	$357^{\circ}32.35$
2	221°56.07	165°43.95	46.81	211°29.22	43.77	50°34.93	22.05	194°25.70	55.75	Ankaa	353°5.01
3	236°58.53	$180^{\circ}44.11$	• • 47.47	$226^{\circ}29.91$	• • 44.54	65°37.65	• • 22.15	209°27.87	• • 55.86	Schedar Diphda	349°28.50 348°44.99
4	252°1.00	195°44.26	48.13	241°30.61	45.32	80°40.37	22.26	224°30.04	55.98	Achernar	335° 18.86
5	267°3.46	210°44.42	48.78	256°31.30	46.09	95°43.09	22.36	239°32.21	56.09	Hamal	327°48.51
6 7	282°5.93 297°8.39	225° 44.58 240° 44.74	N23°49.44 50.10	271°32.00 286°32.69	N03°46.86 47.64	110°45.81 125°48.53	N05°22.47 22.57	254°34.38 269°36.55	N08° 56.20 56.31	Polaris	$313^{\circ}1.31$
8	312° 10.85	255° 44.89	50.75	301°33.39	48.41	140°51.24	22.67	284°38.72	56.43	Acamar	$315^{\circ}10.15$
9	327°13.32	270°45.05	51.40	316°34.08	• • 49.19	155°53.96	22.78	299°40.89	• • 56.54	Menkar	314°3.65
10	$342^{\circ}15.78$	285°45.21	52.06	331°34.78	49.96	170°56.68	22.88	314°43.06	56.65	Mirfak	308°24.80
11	$357^{\circ}18.25$	300°45.38	52.71	346°35.47	50.73	185°59.40	22.99	329°45.23	56.77	Aldebaran Rigel	290°36.77 281°1.47
12	12°20.71		N23°53.36	1°36.17	N03°51.50	201°2.11	N05°23.09	344°47.40	N08° 56.88	Capella	280° 18.16
13	27°23.18 42°25.64	330°45.70 345°45.87	54.01	16°36.87 31°37.56	52.28	216° 4.83 231° 7.55	23.19	359°49.56 14°51.73	56.99	Bellatrix	278°20.17
14 15	57°28.10	0°46.03	54.66 •• 55.31	46° 38.26	53.05 •• 53.82	231 7.33 246°10.26	23.30 •• 23.40	29°53.90	57.10 •• 57.22	Elnath	277°58.66
16	72°30.57	15°46.20	55.96	61°38.95	54.60	261°12.98	23.50	44°56.07	57.33	Alnilam	275°35.16
17	87°33.03	30°46.36	56.60	76°39.65	55.37	276°15.70	23.61	59°58.24	57.44	Betelgeuse	270°49.31
18	102°35.50		N23°57.25	91°40.34	N03°56.14	291°18.41	N05°23.71	75°0.41	N08° 57.55	Canopus Sirius	263°51.30 258°23.93
19	117°37.96	60°46.70	57.89	106°41.04	56.91	306°21.13	23.81	90°2.58	57.67	Adhara	255°3.79
20	132° 40.42	75°46.87	58.54	121°41.73	57.68	321°23.85	23.92	105°4.75	57.78	Procyon	244°48.02
21 22	147° 42.89 162° 45.35	90°47.04 105°47.21	· · 59.18 23°59.83	136° 42.43 151° 43.12	· · 58.46 03°59.23	336°26.56 351°29.28	· · 24.02 24.12	120°6.92 135°9.09	· · 57.89 58.01	Pollux	243°14.03
23	102 45.35 177° 47.82	120° 47.38	23 39.83 24° 0.47	166° 43.82	03 59.25 04°0.00	6°31.99	24.12	150°11.26	58.12	Avior	234° 13.40
							_			Suhail	222°44.11
Mer.p	pass. 11:11	$\nu$ 0.2′ d0.7	7′ m-4.57	$\nu 0.7' d0$	.8′ m1.08	$\nu 2.7' d0.$	1′ m-2.44	$\nu^{2.2'} d0$	.1′ m0.53	Miaplacidus	221°37.14
										Alphard Regulus	217°44.97 207°31.41
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.31
0	192°50.28	135°47.55	N24° 1.11	181°44.51	N04° 0.77	21°34.71	N05°24.33	165°13.43	N08° 58.23	Denebola	182°21.96
1	207°52.74	150°47.73	1.75	196° 45.21	1.54	36°37.42	24.43	180°15.60	58.34	Gienah	$175^{\circ}40.52$
2	222°55.21 237°57.67	165°47.90 180°48.08	2.39 · · 3.02	211°45.90 226°46.60	2.32 · · 3.09	51°40.14 66°42.85	24.53 •• 24.64	195°17.77 210°19.94	58.46 •• 58.57		172°56.33
4	253°0.14	195°48.25	3.66	241°47.29	3.86	81°45.57	24.74	225°22.11	58.68		171°48.03
5	268°2.60	210°48.43	4.30	256° 47.99	4.63	96°48.28	24.84	240°24.28	58.79		166° 10.17 158° 19.18
6	283°5.07	225°48.61	N24° 4.93	271°48.68	N04°5.40	111°51.00	N05°24.94	255°26.45	N08°58.91	Spica Alkaid	150 19.10 152° 49.50
7	298°7.53	240°48.79	5.57	286°49.38	6.17	126°53.71	25.04	270°28.61	59.02	Hadar	148°31.53
8	313°9.99	255°48.97	6.20	301°50.08	6.94	141°56.42	25.15	285°30.78	59.13		147°54.08
9	328° 12.46 343° 14.92	270° 49.15 285° 49.33	• • 6.83	316°50.77 331°51.47	· · 7.71 8.49	156°59.14 172°1.85	• • 25.25	300°32.95 315°35.12	• • 59.25	Arcturus	$145^{\circ}45.19$
10 11	343 14.92 358° 17.39	285 49.33 300°49.51	7.47 8.10	331 51.47 346°52.16	9.26	172 1.85 187° 4.57	25.35 25.45	315 35.12 330°37.29	59.36 59.47	Rigil Kent.	139°35.96
12	13° 19.85	315°49.70	N24° 8.73	1°52.86	N04°10.03	202°7.28	N05°25.55	345°39.46	N08° 59.58	Kochab	137°18.98
13	28°22.31	330°49.88	9.36	16°53.55	10.80	217° 9.99	25.65	0°41.63	59.70	Zuben'ubi Alphecca	136°52.78 126°1.24
14	43°24.78	345°50.07	9.99	$31^{\circ}54.25$	11.57	232°12.70	25.76	15°43.80	59.81	Antares	112° 12.36
15	58° 27.24	0°50.25	• • 10.61	46° 54.94	• • 12.34	247°15.42	•• 25.86	30°45.97	08°59.92	Atria	107°3.89
16	73°29.71	15°50.44	11.24	61°55.64	13.11	262°18.13	25.96	45°48.13	09°0.03	Sabik	101°59.59
17 18	88°32.17 103°34.63	30°50.63 45°50.82	11.87 N24°12.49	76°56.33 91°57.03	13.88 N04°14.65	277°20.84 292°23.55	26.06 N05°26.16	60°50.30 75°52.47	0.15 N09°0.26	Shaula	96°6.62
19	118° 37.10	60°51.01	13.11	106°57.73	15.42	307°26.26	26.26	90°54.64	0.37	Rasalhague	95°55.97
20	133°39.56	75°51.20	13.74	121°58.42	16.19	322°28.98	26.36	105°56.81	0.49	Eltanin	90°40.81
21	148°42.03	90°51.39	• • 14.36	136°59.12	• • 16.96	337°31.69	• • 26.46	120°58.98	• • 0.60	Kaus Aust. Vega	83°28.95 80°31.38
22	163°44.49	105°51.59	14.98	151°59.81	17.73	352°34.40	26.56	136°1.15	0.71	Nunki	75° 44.48
23	178° 46.96	120°51.78	15.60	167°0.51	18.50	7°37.11	26.67	151°3.32	0.82	Altair	61°57.44
Mer.p	pass. 11:07	$\nu$ 0.2′ d0.6	6′ m-4.58	$\nu$ 0.7′ d0	.8′ m1.08	$\nu 2.7' \ d0.$	1' m-2.44	$\nu 2.2' \ d0$	.1′ m0.53	Peacock	53°1.84
										Deneb	49°24.16
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.40
0	193°49.42	135°51.97		182°1.20	N04°19.27	22°39.82	N05°26.77	166°5.48	N09°0.94	Al Na'ir Fomalhaut	27°29.99 15°11.95
1	$208^{\circ}51.88$	$150^{\circ}52.17$	16.84	197°1.90	20.04	37°42.53	26.87	181°7.65	1.05	Scheat	13° 42.92
2	223°54.35	165°52.37	17.46	212°2.59	20.81	52°45.24	26.97	196°9.82	1.16	Markab	13°27.53
3	238°56.81	180° 52.56	18.07	227°3.29	• • 21.57	67°47.95	•• 27.07	211°11.99 226°14.16	1.27	Van US 142	SHA
4 5	253°59.28 269°1.74	195°52.76 210°52.96	18.69 19.30	242°3.98 257°4.68	22.34 23.11	82°50.66 97°53.37	27.17 27.27	226°14.16 241°16.33	1.39 1.50	Apr 03 Mon Venus	303°52.50
6	284°4.20	225°53.16		272°5.38	N04°23.88	112°56.08	N05°27.37	256°18.49	N09°1.61		349°36.69
7	299°6.67	240°53.36	20.53	287°6.07	24.65	127°58.79	27.47	271°20.66	1.73		188°38.35
8	$314^{\circ}9.13$	255°53.57	21.14	302°6.77	25.42	143° 1.50	27.57	286°22.83	1.84	Saturn	$332^{\circ}30.21$
9	329°11.60	270°53.77	• • 21.76	317°7.46	• • 26.19	158° 4.21	•• 27.67	301°25.00	• • 1.95	Apr 04 Tue	SHA
10	344°14.06	285°53.97	22.37	332°8.16	26.95	173°6.92	27.77	316°27.17	2.06		302°57.27
11	359° 16.52 14° 18.99	300°54.18 315°54.39	22.98 N24°23.59	347°8.85 2°9.55	27.72 N04°28.49	188° 9.63 203° 12.34	27.87 N05°27.97	331°29.34 346°31.50	2.18 N09°2.29		348° 54.23
12 13	14° 18.99 29° 21.45	315°54.39 330°54.59	N24 23.59 24.19	2°9.55 17°10.24	29.26	203°12.34 218°15.05	28.07	1°33.67	2.40		188°44.43
14	44°23.92	345°54.80	24.80	32° 10.94	30.03	233°17.75	28.16	16°35.84	2.51	Saturn	332°23.15
15	59°26.38	0°55.01	• • 25.41	47° 11.64	• • 30.80	248°20.46	• • 28.26	31°38.01	2.63	Apr 05 Wed	SHA
16	74°28.84	15°55.22	26.01	62°12.33	31.56	263°23.17	28.36	46°40.18	2.74	Venus	302°2.55
17	89°31.31	30°55.43	26.62	77°13.03	32.33	278°25.88	28.46	61°42.34	2.85		348°11.78
18 19	104°33.77 119°36.24	45°55.64 60°55.86	N24°27.22 27.82	92°13.72 107°14.42	N04°33.10 33.87	293°28.59	N05°28.56 28.66	76°44.51 91°46.68	N09°2.96 3.08		188°50.40
20	119° 36.24 134° 38.70	75°56.07	28.42	107° 14.42 122° 15.11	33.87 34.63	308°31.29 323°34.00	28.66 28.76	91°46.68 106°48.85	3.08	Saturn	332°16.06
21	149°41.17	90°56.29	• • 29.03	137° 15.81	• • 35.40	338°36.71	28.86	121°51.02	3.30	Horizor	ıtal parallax
22	$164^{\circ}43.63$	105°56.50	29.63	$152^{\circ}16.50$	36.17	353°39.41	28.96	136°53.18	3.42		Venus:
23	179°46.09	120° 56.72	30.22	167°17.20	36.93	8°42.12	29.05	151°55.35	3.53		Mars:
Mer.p	pass. 11:03	$\nu$ 0.2′ d0.6	6′ m-4.58	ν0.7′ d0	.8′ m1.09	$\nu$ 2.7′ d0.	1′ m-2.43	$\nu$ 2.2′ d0	.1′ m0.53		

Dec

29°14.73

-42°9.11

56°41 53

-17°49.93 -57°5.63

 $23^{\circ}35.72$ 

89°23.09

-40°11.64

4°11.94 49°57.74

16°33.88 -8°10.34

 $46^{\circ}1.62$ 

6°22.37

28°37.83

 $-1^{\circ}11.21$ 

 $7^{\circ}24.59$ 

-52°42.98

-16°45.57

-29°0.95  $5^{\circ}8.95$ 

 $27^{\circ}57.39$ 

-59°36.38

-43°33.16

-69°50.34

-8°47.14

11°49.55

61°35.88

 $14^{\circ}24.64$ 

 $-17^{\circ}42.16$ 

 $-63^{\circ}15.53$ 

-57°16.47

55°48.23

-11°18.72

49°10.12

-60°30.58

 $-36^{\circ}30.63$ 

-60°57.11

 $74^{\circ}2.09$ 

-16°9.66

26°36.94

-26°29.65

-69°4.41

-15°45.59

 $-37^{\circ}7.31$ 

 $12^{\circ}32.21$ 

51°28.79

-34°22.11

38°48.33

-26°15.57

8°56.49

-56°38.34

45°22.65

 $10^{\circ}0.21$ 

-46°49.26

-29°28.28 28°14.08

15°21.38

Mer.pass

14:57

11:54

22:34

13:01

14:57

11:52

22:30

12:57

11:51

22:25

12:54

0.2

0.1

Mer.pass 14:56

Mer.pass

 $19^{\circ}\,1.90$ 

h	Su	n					
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.03	N05°25.86	84°2.46	6.6'	$N23^{\circ}33.73$	-7.2'	58.5'
1	194°11.21	26.81	98°28.06	6.6'	23°26.52	-7.4'	58.5'
2	209°11.39 224°11.57	27.77 •• 28.72	112°53.69 127°19.35	6.7' 6.7'	23°19.16 23°11.64	-7.5' -7.7'	58.6' 58.6'
4	239°11.75	29.68	141°45.05	6.7	23°3.98	-7.7 -7.8'	58.6'
5	254°11.94	30.64	156°10.78	6.8'	22°56.17	-8.0'	58.6'
6	269°12.12	N05°31.59	170°36.55	6.8'	N22°48.21	-8.1'	58.7'
7	284°12.30	32.55	185°2.35 199°28.19	6.8'	22°40.10	-8.3'	58.7'
8 9	299°12.48 314°12.66	33.50 •• 34.46	213°54.07	6.9' 6.9'	22°31.84 22°23.44	-8.4' -8.5'	58.7' 58.8'
10	329°12.85	35.41	213 34.07 228°19.98	7.0'	22° 14.89	-8.7'	58.8'
11	344°13.03	36.37	242°45.94	7.0'	$22^{\circ}6.20$	-8.8'	58.8'
12	359°13.21	N05°37.32	257°11.93	7.0'	N21°57.37	-9.0'	58.8'
13 14	14°13.39 29°13.57	38.27 39.23	271°37.97 286°4.05	7.1' 7.1'	21°48.39 21°39.27	-9.1' -9.3'	58.9' 58.9'
14 15	29 13.57 44°13.76	39.23 •• 40.18	280 4.05 300°30.16	7.1 7.2'	21 39.27 21°30.01	-9.3 -9.4'	58.9'
16	59°13.94	41.14	314°56.33	7.2'	21°20.61	-9.5'	59.0'
17	74°14.12	42.09	329°22.53	7.2'	$21^{\circ}11.08$	-9.7'	59.0'
18	89°14.30	N05°43.04	343°48.78	7.3'	N21°1.40	-9.8'	59.0'
19 20	104°14.48 119°14.66	44.00 44.95	358°15.07 12°41.41	7.3' 7.4'	20°51.59 20°41.64	-9.9' -10.1'	59.0' 59.1'
21	134°14.84	• • 45.90	27°7.79	7.4'	20° 31.55	-10.1	59.1'
22	149°15.02	46.85	41°34.21	7.5'	20°21.34	-10.4	59.1'
23	$164^{\circ}15.21$	47.81	56°0.69	7.5'	$20^{\circ}10.98$	-10.5'	59.1'
	SD = 16.0'	d = 1.0'		S	D = 16.0'		
_					_		
Tue 0	<b>GHA</b> 179° 15.39	<b>Dec</b> N05°48.76	<b>GHA</b> 70°27.20	u 7.6'	<b>Dec</b> N20°0.50	<i>d</i> −10.6'	<b>HP</b> 59.2'
1	179 15.59 194°15.57	49.71	84°53.77	7.6'	19°49.89	-10.0	59.2'
2	209°15.75	50.66	99°20.38	7.7'	19°39.15	-10.9'	59.2'
3	224°15.93	• • 51.61	113°47.03	7.7'	19°28.28	-11.0'	59.2'
4	239°16.11 254°16.29	52.57	128°13.74 142°40.49	7.8' 7.8'	19°17.28 19°6.16	-11.1' -11.2'	59.3' 59.3'
5 6	269° 16.47	53.52 N05°54.47	142 40.49 157°7.29	7.8'	N18°54.91	-11.2	59.3'
7	284°16.65	55.42	171°34.13	7.9'	18°43.53	-11.5'	59.4'
8	299°16.83	56.37	186°1.02	7.9'	18°32.04	-11.6'	59.4'
9	314°17.01	• • 57.32	200°27.96	8.0'	18°20.42	-11.7'	59.4'
10 11	329°17.19 344°17.37	58.27 05°59.22	214°54.95 229°21.99	8.0' 8.1'	18°8.69 17°56.83	-11.9' -12.0'	59.4' 59.5'
12	359°17.55	N06°0.17	243°49.07	8.1'	N17°44.86	-12.1'	59.5'
13	14°17.73	1.12	$258^{\circ}16.20$	8.2'	$17^{\circ}32.77$	-12.2'	59.5'
14	29°17.91	2.07	272°43.37	8.2'	17°20.57	-12.3'	59.5'
15 16	44°18.09 59°18.27	· · 3.02 3.97	287°10.60 301°37.87	8.3' 8.3'	17°8.25 16°55.82	-12.4' -12.5'	59.6' 59.6'
17	74° 18.45	4.92	316°5.18	8.4	16°43.28	-12.7'	59.6'
18	89°18.63	N06°5.87	330°32.54	8.4'	N16°30.63	-12.8'	59.6'
19	104°18.81	6.82	344°59.95	8.5'	16° 17.87	-12.9'	59.7'
20	119°18.99 134°19.17	7.76 · · 8.71	359°27.41 13°54.91	8.5' 8.5'	16°5.00 15°52.03	-13.0' -13.1'	59.7' 59.7'
21 22	149°19.35	9.66	28°22.46	8.6'	15° 38.96	-13.1	59.7'
23	164° 19.53	10.61	42°50.05	8.6'	15°25.78	-13.3'	59.8'
	SD = 16.0'	d = 1.0'		S	D = 16.1'		
\A/I	CHA	D	CHA		D	.,	
Wed 0	<b>GHA</b> 179° 19.71	<b>Dec</b> N06°11.56	<b>GHA</b> 57°17.69	ν 8.7'	<b>Dec</b> N15°12.50	d -13.4'	<b>HP</b> 59.8'
1	194°19.89	12.50	71°45.37	8.7'	$14^{\circ}59.12$	-13.5'	59.8'
2	209°20.07	13.45	86°13.09	8.8'	14°45.64	-13.6'	59.8'
3	224°20.25	· · 14.40 15.35	100°40.86	8.8'	14°32.06	-13.7'	59.8'
4 5	239°20.43 254°20.61	15.35 16.29	115°8.67 129°36.52	8.9' 8.9'	14°18.39 14°4.62	-13.8' -13.9'	59.9' 59.9'
6	269°20.78	N06°17.24	144°4.42	8.9'	N13°50.76	-14.0'	59.9
7	284°20.96	18.19	158°32.36	9.0'	$13^{\circ}36.81$	-14.0'	59.9'
8	299°21.14	19.13	173°0.34	9.0'	13°22.77	-14.1'	60.0'
9 10	314°21.32 329°21.50	· · 20.08 21.02	187°28.36 201°56.42	9.1' 9.1'	13°8.64 12°54.42	-14.2' -14.3'	60.0' 60.0'
10	344°21.68	21.02	201 56.42 216°24.51	9.1 9.1'	12 54.42 12°40.12	-14.3 -14.4'	60.0
12	359°21.86	N06°22.92	230°52.65	9.2'	N12°25.74	-14.5'	60.0'
13	14°22.03	23.86	245°20.83	9.2'	12°11.27	-14.5'	60.1'
14	29°22.21	24.81	259°49.04	9.2'	11°56.72	-14.6'	60.1'
15 16	44°22.39 59°22.57	· · 25.75 26.70	274°17.29 288°45.57	9.3' 9.3'	11°42.09 11°27.39	-14.7' -14.8'	60.1' 60.1'
17	74°22.75	27.64	303°13.90	9.3 9.4'	11°12.61	-14.6 -14.9'	60.1
18	89°22.92	N06°28.58	317°42.25	9.4'	N10°57.75	-14.9'	60.1'
19	104°23.10	29.53	332°10.64	9.4'	10°42.82	-15.0'	60.2'
20	119°23.28 134°23.46	30.47 •• 31.42	346°39.06 1°7.52	9.5' 9.5'	10°27.82 10°12.75	-15.1'	60.2'
21 22	134°23.46 149°23.64	· · 31.42 32.36	1°7.52 15°36.01	9.5' 9.5'	10° 12.75 09° 57.61	-15.1' -15.2'	60.2' 60.2'
23	164°23.81	33.30	30°4.53	9.5'	09° 42.41	-15.3'	60.2'
	SD = 16.0'	d = 0.9'		S	D = 16.3'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
- 4,	00 <sup>h</sup>	00 <sup>h</sup> 12 <sup>h</sup>		Upper	Lower	8-10		
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	52-74%		
03	03:16 03:07		12:03	19:07	06:39			
04	02:58 02:50		12:03	20:02 07:35				
05	02:41	02:33	12:03	20:55	08:29			

h	Aries	Ver	nus	, M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	194° 48.56		N24°30.82	182° 17.90	N04°37.70	23°44.83	N05°29.15	166°57.52	N09°3.64	A I	357°32.34	29°14.73
1	$209^{\circ}51.02$	$150^{\circ}57.16$	31.42	197° 18.59	38.47	38°47.53	29.25	181°59.69	3.75	Ankaa	357 32.34 353°5.00	-42°9.10
2	224°53.49	165°57.38	32.02	212°19.29	39.23	53°50.24	29.35	197°1.86	3.87	Schedar	349°28.49	56°41.52
3	239°55.95	180°57.60	• • 32.61	227°19.98	• • 40.00	68°52.95	29.45	212°4.02 227°6.19	• • 3.98	Diphda	348°44.99	-17°49.92
4 5	254° 58.41 270° 0.88	195°57.82 210°58.04	33.21 33.80	242°20.68 257°21.37	40.77 41.53	83°55.65 98°58.36	29.55 29.64	242°8.36	4.09 4.20	Achernar	$335^{\circ}18.86$	-57°5.62
6	285°3.34		N24°34.39	272°22.07	N04°42.30	114° 1.06	N05°29.74	257°10.53	N09°4.32	Hamal		23°35.72
7	300°5.81	240°58.49	34.99	287° 22.76	43.07	129°3.77	29.84	272°12.69	4.43	Polaris	313°2.15	89°23.08
8	315°8.27	255°58.72	35.58	302°23.46	43.83	144°6.47	29.94	287°14.86	4.54	Acamar Menkar	315°10.16 314°3.65	-40°11.62 4°11.94
9	$330^{\circ}10.73$	270°58.95	• • 36.17	317° 24.16	• • 44.60	$159^{\circ}9.18$	• • 30.03	302°17.03	• • 4.66	Mirfak	308° 24.81	4 11.94 49°57.73
10	345° 13.20	285°59.18	36.76	332°24.85	45.36	174°11.88	30.13	317°19.20	4.77	Aldebaran		16°33.88
11	0° 15.66	300°59.41	37.34	347° 25.55	46.13	189°14.59	30.23	332°21.36	4.88	Rigel	281°1.48	-8°10.33
12 13	15° 18.13 30° 20.59	315°59.64 330°59.87	N24°37.93 38.52	2°26.24 17°26.94	N04°46.90 47.66	204°17.29 219°19.99	N05°30.33 30.42	347°23.53 2°25.70	N09°4.99 5.11	Capella	$280^{\circ}18.18$	46°1.62
14	45° 23.05	346° 0.10	39.10	32° 27.63	48.43	219 19.99 234°22.70	30.52	17°27.87	5.11	Bellatrix	278°20.18	6°22.37
15	60°25.52	1°0.33	• • 39.69	47° 28.33	• • 49.19	249°25.40	30.62	32°30.03	5.33	Elnath	277°58.67	28°37.83
16	$75^{\circ}27.98$	$16^{\circ}0.57$	40.27	62°29.02	49.96	264°28.10	30.71	47°32.20	5.44	Alnilam Betelgeuse	275°35.17 270°49.32	-1°11.21 7°24.59
17	90°30.45	31°0.81	40.86	77° 29.72	50.72	279°30.81	30.81	62°34.37	5.56	Canopus	263°51.33	-52°42.98
18	105° 32.91		N24°41.44	92°30.42	N04°51.49	294°33.51	N05°30.91	77°36.53	N09°5.67	Sirius	258°23.95	-16°45.57
19 20	120° 35.37 135° 37.84	61°1.28 76°1.52	42.02 42.60	107°31.11 122°31.81	52.25 53.02	309°36.21 324°38.92	31.00 31.10	92°38.70 107°40.87	5.78 5.89	Adhara	$255^{\circ}3.80$	-29°0.95
21	150° 40.30	91°1.76	• 43.18	137° 32.50	• • 53.78	339°41.62	31.20	107 40.87 122°43.04	• • 6.01	Procyon	244°48.04	5°8.96
22	165°42.77	106°2.00	43.76	152° 33.20	54.54	354°44.32	31.29	137°45.20	6.12	Pollux		27°57.39
23	180° 45.23	121°2.24	44.34	167° 33.89	55.31	9°47.02	31.39	152°47.37	6.23	Avior	234°13.44 222°44.13	-59°36.38 -43°33.17
Mer	pass. 10:59	ν0.2′ d0.6	5′ m-4 50	υ0.7' d0	.8′ m1.09	u2 7′ d0	1' m-2.43	$\nu 2.2' d0$	1′ m0 52	Suhail Miaplacidus	221°37.19	-43 33.17 -69°50.35
- Ivier.	pass. 10.59	νο.2 αο.0		νο.τ αο	.6 1111.09	ν2.1 do.	1 111-2.43	ν2.2 do.	1 1110.52		217°44.98	-8°47.14
			_		_		_		_		207°31.42	11°49.55
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°37.32	61°35.89
0 1	195° 47.69 210° 50.16	136°2.49 151°2.73	N24°44.91 45.49	182°34.59 197°35.28	N04°56.07 56.84	24°49.72 39°52.43	N05°31.49 31.58	167°49.54 182°51.70	N09°6.34 6.46	Denebola	$182^{\circ}21.96$	14°24.65
2	225° 52.62	166°2.98	46.06	212° 35.28	57.60	54°55.13	31.68	197°53.87	6.57		175°40.52	-17°42.17
3	240°55.09	181°3.22	• • 46.64	227° 36.68	58.37	69°57.83	31.77	212°56.04	6.68		172°56.34	-63°15.54
4	255° 57.55	196°3.47	47.21	242°37.37	59.13	85° 0.53	31.87	227°58.21	6.80	I	171°48.03 166°10.17	-57°16.49 55°48.25
5	271°0.01	$211^{\circ}3.72$	47.78	257°38.07	04°59.89	100°3.23	31.97	243°0.37	6.91		158° 19.18	-11°18.72
6	286°2.48		N24°48.35	272°38.76	N05° 0.66	115° 5.93	N05°32.06	258°2.54	N09°7.02		152°49.49	49°10.13
7	301°4.94	241°4.22	48.92	287°39.46	1.42	130°8.63	32.16	273°4.71	7.13	I	148°31.52	-60°30.59
8 9	316°7.41 331°9.87	256°4.47 271°4.72	49.49 •• 50.06	302°40.15 317°40.85	2.18 •• 2.95	145°11.33 160°14.03	32.25 · · 32.35	288°6.87 303°9.04	7.25 · · 7.36		$147^{\circ}54.07$	-36°30.64
10	346° 12.33	271 4.72 286°4.98	50.63	332°41.54	3.71	175° 16.73	32.44	318° 11.21	7.47	!	145°45.18	19°1.91
11	1° 14.80	301°5.23	51.20	347° 42.24	4.47	190°19.43	32.54	333°13.37	7.58	Rigil Kent.		-60°57.12
12	16° 17.26		N24°51.76	2°42.94	N05° 5.24	205°22.13	N05°32.63	348°15.54	N09°7.70		137° 18.95 136° 52.77	74°2.11 -16°9.67
13	$31^{\circ}19.73$	$331^{\circ}5.75$	52.33	17°43.63	6.00	220°24.83	32.73	3°17.71	7.81	Alphecca	126°1.22	26°36.94
14	46°22.19	346°6.00	52.89	32°44.33	6.76	235°27.53	32.82	$18^{\circ}19.87$	7.92		112° 12.34	-26°29.66
15	61°24.65	1°6.26	• • 53.46	47° 45.02	• • 7.52	250°30.23	• • 32.92	33°22.04	8.03	Atria	107°3.84	-69° 4.42
16 17	76°27.12 91°29.58	16°6.53 31°6.79	54.02	62° 45.72 77° 46.41	8.29 9.05	265°32.93 280°35.63	33.01 33.11	48°24.21 63°26.37	8.15	Sabik	$101^{\circ}59.57$	-15°45.60
18	91 29.56 106° 32.05		54.58 N24°55.14	92°47.11	9.05 N05° 9.81	295°38.32	N05°33.20	78° 28.54	8.26 N09°8.37	Shaula	96°6.60	-37°7.31
19	121°34.51	61°7.31	55.70	107°47.80	10.57	310°41.02	33.30	93°30.71	8.48	Rasalhague	95°55.95	12°32.21
20	136° 36.98	76°7.58	56.26	122°48.50	11.33	325°43.72	33.39	108°32.87	8.60	Eltanin Kaus Aust.	90°40.78 83°28.92	51°28.80 -34°22.11
21	151°39.44	91°7.85	• • 56.82	137°49.20	• • 12.10	340°46.42	• • 33.48	123°35.04	• • 8.71	Vega	80°31.36	38°48.33
22	166°41.90	106°8.11	57.37	152°49.89	12.86	355°49.11	33.58	138°37.21	8.82	Nunki	75°44.46	-26°15.57
23	181°44.37	121°8.38	57.93	167°50.59	13.62	10°51.81	33.67	153°39.37	8.94	Altair	$61^{\circ}57.42$	8°56.49
Mer.	pass. 10:55	$ u$ 0.2 $^{\prime}$ d0.6	6′ m-4.60	$\nu$ 0.7′ d0	.8′ m1.10	$\nu 2.7' \ d0.$	.1′ m-2.42	$\nu 2.2' \ d0.$	1'  m0.52	Peacock	$53^{\circ}1.80$	-56°38.34
										Deneb	49°24.13	45°22.65
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.39	10°0.21
0	196°46.83		N24°58.48	182°51.28	N05°14.38	25°54.51		168°41.54	N09°9.05	Al Na'ir Fomalhaut	27°29.97 15°11.93	-46°49.25 -29°28.27
1	211°49.30	151°8.92	59.04	197°51.98	15.14	40°57.21	33.86	183°43.70	9.16	Scheat	13°42.91	28°14.08
2	226°51.76	166°9.20	24°59.59	212°52.67	15.90	55°59.90	33.95	198°45.87	9.27	Markab	$13^{\circ}27.52$	15°21.38
3 4	241° 54.22 256° 56.69	181°9.47 196°9.74	25°0.14	227°53.37 242°54.06	17.43	71°2.60 86°5.29	· · 34.05	213°48.04 228°50.20	· · 9.39	Apr 06 Thu	SHA	Mer.pass
5	271°59.15	211°10.02	0.70 1.25	242 54.00 257° 54.76	17.43 18.19	101°7.99	34.14 34.23	243°52.37	9.50 9.61	Venus	301°8.38	14:56
6	287°1.62	226°10.30	N25°1.80	272°55.45	N05°18.95	116° 10.69	N05°34.33	258°54.54	N09°9.72		347°29.34	11:50
7	302°4.08	241°10.57	2.35	287° 56.15	19.71	131°13.38	34.42	273°56.70	9.84		188°56.27	22:21
8	$317^{\circ}6.54$	$256^{\circ}10.85$	2.89	302°56.85	20.47	$146^{\circ}16.08$	34.51	288°58.87	9.95	Saturn	$332^{\circ}8.96$	12:50
9	332°9.01	271°11.13	• • 3.44	317°57.54	• • 21.23	161°18.77	• • 34.61	304°1.03	• 10.06	Apr 07 Fri	SHA	Mer.pass
10	347° 11.47	286°11.41	3.99	332°58.24	21.99	176°21.47	34.70	319°3.20	10.17	Venus	300°14.79	14:56
11	2°13.94 17°16.40	301°11.70 316°11.98	4.53	347°58.93 2°59.63	22.75 N05°23.51	191°24.16 206°26.86	34.79 N05°34.89	334°5.37 349°7.53	10.29 N00° 10.40	Mars	346°46.89	11:49
12 13	32° 18.86	316°11.98 331°12.26	N25°5.08 5.62	18°0.32	NU5 23.51 24.27	206 26.86 221°29.55	34.89	349°7.53 4°9.70	N09° 10.40 10.51	Jupiter	189°2.03	22:17
14	47°21.33	346° 12.55	6.16	33°1.02	25.03	236°32.25	35.07	19°11.86	10.51	Saturn	332°1.84	12:47
15	62°23.79	1°12.84	• • 6.70	48°1.71	• • 25.79	251°34.94	• • 35.16	34°14.03	• • 10.74	Apr 08 Sat	SHA	Mer.pass
16	$77^{\circ}26.26$	$16^{\circ}13.13$	7.25	63°2.41	26.55	266°37.63	35.26	49°16.20	10.85	Venus		14:55
17	92°28.72	31°13.42	7.79	78°3.10	27.31	281°40.33	35.35	64°18.36	10.96	Mars	346°4.45	11:48
18	107°31.18	46° 13.71	N25°8.32	93°3.80	N05°28.07	296°43.02	N05°35.44	79°20.53	N09°11.07	Jupiter	189°7.68	22:12
19 20	122°33.65 137°36.11	61° 14.00 76° 14.29	8.86 9.40	108°4.49 123°5.19	28.83 29.59	311°45.71 326°48.41	35.53 35.62	94°22.69 109°24.86	11.19 11.30	Saturn	331°54.71	12:43
21	152° 38.58	76 14.29 91°14.59	• 9.40	123 5.19 138°5.89	· · 30.35	341°51.10	· · 35.72	109 24.86 124°27.03	11.30	Horizor	tal parallax	
22	167°41.04	106° 14.88	10.47	153°6.58	31.10	356°53.79	35.81	139°29.19	11.52		Venus:	0.3
23	182°43.50	121°15.18	11.01	168°7.28	31.86	11°56.48	35.90	154°31.36	11.64		Mars:	0.1
Mer	pass. 10:51	ν0.3′ d0.6	5′ m-4 61	ν0 7' d0	.8′ m1.10	$\nu 2.7' d0$	.1′ m-2.42	$\nu 2.2' \ d0.$	1′ m0 51			

h	Su	n	Moon				
hu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.99	N06°34.25	44°33.07	9.6'	N09°27.14	-15.3'	60.3
1	194°24.17	35.19	59°1.65	9.6'	$09^{\circ}11.81$	-15.4'	60.3
2	209°24.35	36.13	73°30.26	9.6'	$08^{\circ}56.41$	-15.5'	60.3
3	224°24.52	• • 37.07	87°58.89	9.7'	08°40.96	-15.5'	60.3
ŀ	239°24.70	38.02	102°27.55	9.7'	08°25.44	-15.6'	60.3
•	254°24.88	38.96	116°56.24	9.7'	08°9.87	-15.6'	60.3
5	269°25.05	N06°39.90	131°24.95	9.7'	N07°54.25	-15.7'	60.3
7	284°25.23	40.84	145°53.69	9.8'	07°38.57	-15.7'	60.4
3	299°25.41	41.78	160°22.44	9.8'	07°22.84	-15.8'	60.4
)	314°25.58	• • 42.73	174°51.23	9.8'	07°7.06	-15.8'	60.4
0	329°25.76	43.67	189°20.03	9.8'	06°51.24	-15.9'	60.4
1	344°25.94	44.61	203°48.85	9.8'	06°35.36	-15.9'	60.4
2	359°26.11	N06°45.55	218° 17.69	9.9'	N06° 19.44	-16.0'	60.4
3	14°26.29	46.49	232°46.56	9.9'	06°3.48	-16.0'	60.4
4	29°26.47	47.43	247° 15.43	9.9'	05°47.48	-16.0'	60.4
5	44°26.64	• • 48.37	261°44.33	9.9'	05°31.43	-16.1'	60.5
6	59°26.82	49.31	276°13.24	9.9'	05° 15.35	-16.1'	60.5
7	74°26.99	50.25	290°42.17	9.9'	04°59.23	-16.2'	60.5
8	89°27.17	N06°51.19	305°11.11	10.0'	N04°43.08	-16.2'	60.5
9	104°27.35	52.13	319°40.06	10.0'	04°26.90	-16.2'	60.5
0	119°27.52	53.07	334°9.03	10.0'	$04^{\circ}10.68$	-16.2'	60.5
1	134°27.70	•• 54.01	348°38.00	10.0'	03°54.43	-16.3'	60.5
2	149°27.87	54.94	3°6.99	10.0'	03°38.16	-16.3'	60.5
3	164°28.05	55.88	17°35.98	10.0'	03°21.86	-16.3'	60.5
	SD = 16.0'	d = 0.9'		SI	D = 16.4'		
	<u> </u>						
ri	GHA	Dec	GHA	$\nu$	Dec	d	HP
)	179°28.22	N06°56.82	32°4.98	10.0'	N03°5.54	-16.3'	60.5
	194°28.40	57.76	46°33.99	10.0'	02°49.20	-16.4'	60.5
2	209°28.57	58.70	61°3.01	10.0'	02°32.83	-16.4'	60.6
3	224°28.75	06°59.63	75°32.03	10.0'	$02^{\circ}16.45$	-16.4'	60.6
ŀ	239°28.92	07°0.57	90°1.05	10.0'	$02^{\circ}0.05$	-16.4'	60.6
5	254°29.10	1.51	104°30.08	10.0'	01°43.63	-16.4'	60.6
5	269°29.27	N07°2.45	118°59.11	10.0'	N01°27.21	-16.4'	60.6
7	284°29.45	3.38	133°28.14	10.0'	01°10.77	-16.4'	60.6
3	299°29.62	4.32	147°57.17	10.0'	00°54.32	-16.5'	60.6
)	314°29.80	5.26	162°26.20	10.0'	00°37.86	-16.5'	60.6
0	329°29.97	6.19	176°55.22	10.0'	00°21.40	-16.5'	60.6
1	344°30.15	7.13	191°24.24	10.0'	N00°4.93	-16.5'	60.6
2	359°30.32	N07°8.06	205°53.26	10.0'	S00°11.54	16.5'	60.6
3	14°30.49	9.00	220°22.28	10.0'	00°28.01	16.5'	60.6
4	29°30.67	9.94	234°51.28	10.0'	00°44.48	16.5'	60.6
5	44°30.84	. 10.87	249°20.28	10.0'	01°0.94	16.5'	60.6
6	59°31.02	11.81	263°49.27	10.0'	01° 17.40	16.5	60.6
7	74°31.19	12.74	278°18.26	10.0'	01°33.86	16.4'	60.6
8	89°31.36	N07°13.67	292°47.23	10.0'	S01°50.30	16.4	60.6
9	104°31.54	14.61	307° 16.19		02°6.74	16.4	60.6
0	119°31.71	15.54	321°45.14	9.9'	02°23.16	16.4	60.6
1	134°31.88	. 16.48	336°14.08	9.9'	02°39.57	16.4	60.6
2	149°32.06	17.41	350° 43.00	9.9'	02°55.96	16.4	60.6
3	164°32.23	18.34	5° 11.90	9.9'	02° 33.30	16.4	60.6
	SD = 16.0'	d = 0.9'			D = 16.5'		
					_ 10.5		
at	GHA	Dec	GHA	$\nu$	Dec	d	HP
)	179°32.40	N07° 19.28	19°40.79	9.9'	503°28.69	16.3'	60.6
L	194°32.58	20.21	34°9.67	9.9'	03°45.02	16.3'	60.6
2	209°32.75	21.14	48°38.52	9.8'	04°1.33	16.3'	60.6
3	224°32.92	• • 22.08	63°7.36	9.8'	$04^{\circ}17.62$	16.3'	60.6
1	239°33.09	23.01	77°36.18	9.8'	04°33.87	16.2'	60.6
5	254°33.27	23.94	92°4.97	9.8'	$04^{\circ}50.10$	16.2'	60.6
5	269°33.44	N07°24.87	106°33.75	9.8'	S05°6.30	16.2'	60.6
7	284°33.61	25.80	121°2.50	9.7'	05°22.47	16.1'	60.5
3	299°33.78	26.73	135°31.23	9.7'	05°38.60	16.1'	60.5
)	314°33.96	• • 27.67	149°59.93	9.7'	05°54.69	16.1'	60.5
0	329°34.13	28.60	$164^{\circ}28.61$	9.7'	$06^{\circ}10.75$	16.0'	60.5
1	344°34.30	29.53	178°57.26	9.6'	06°26.77	16.0'	60.5
2	359°34.47	N07°30.46	193°25.89	9.6'	S06°42.74	15.9'	60.5
3	14°34.64	31.39	207°54.49	9.6'	$06^{\circ}58.67$	15.9'	60.5
4	29°34.81	32.32	222°23.05	9.5'	$07^{\circ}14.56$	15.8'	60.5
5	44°34.99	• • 33.25	236°51.59	9.5'	07°30.40	15.8'	60.5
6	59°35.16	34.18	251°20.10	9.5'	07°46.19	15.7'	60.5
7	74°35.33	35.11	265°48.58	9.4'	08°1.93	15.7'	60.5
8	89°35.50	N07°36.04	280° 17.03	9.4'	508°17.61	15.6'	60.4
9	104°35.67	36.97	294° 45.45	9.4	08° 33.25	15.6'	60.4
0	119°35.84	37.90	309° 13.83	9.3'	08°48.82	15.5'	60.4
1	134°36.01	• • 38.82	323° 42.17	9.3'	00°43.02	15.5'	60.4
2	149°36.18	39.75	338° 10.49	9.3'	09° 19.80	15.4	60.4
3	164° 36.35	40.68	352°38.76	9.2'	09° 35.20	15.3'	60.4
						10.0	33.1
	SD = 16.0'	d = 0.9'		SI	D = 16.5'		
							_

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:58	04:21	19:46	21:11	////
N 70°	01:16	03:21	04:32	19:34	20:47	23:01
68°	02:04	03:39	04:42	19:25	20:28	22:07
66°	02:33	03:53	04:49	19:17	20:14	21:35
64°	02:55	04:04	04:56	19:10	20:02	21:13
62°	03:12	04:14	05:01	19:05	19:52	20:55
60°	03:25	04:22	05:06	19:00	19:44	20:41
N 58°	03:37	04:29	05:10	18:55	19:37	20:29
56°	03:47	04:35	05:14	18:51	19:30	20:19
54°	03:55	04:40	05:17	18:48	19:25	20:10
52°	04:03	04:45	05:20	18:45	19:20	20:03
50°	04:09	04:50	05:23	18:42	19:15	19:56
45°	04:23	04:59	05:29	18:36	19:06	19:42
<b>N</b> 40°	04:34	05:06	05:34	18:31	18:58	19:31
35°	04:42	05:12	05:38	18:26	18:52	19:23
30°	04:49	05:18	05:42	18:23	18:47	19:15
20°	05:00	05:26	05:48	18:16	18:38	19:04
<b>N</b> 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
<b>S</b> 10°	05:18	05:43	06:04	18:00	18:21	18:46
20°	05:21	05:47	06:09	17:55	18:17	18:43
30°	05:23	05:51	06:15	17:49	18:13	18:41
35°	05:23	05:52	06:18	17:46	18:11	18:40
40°	05:23	05:54	06:21	17:42	18:09	18:40
45°	05:22	05:56	06:26	17:38	18:07	18:41
<b>S</b> 50°	05:21	05:58	06:31	17:32	18:05	18:42
52°	05:20	05:59	06:33	17:30	18:04	18:43
54°	05:19	06:00	06:35	17:28	18:03	18:44
56°	05:18	06:01	06:38	17:25	18:02	18:45
58°	05:16	06:02	06:41	17:22	18:01	18:46
<b>S</b> 60°	05:15	06:03	06:45	17:18	18:00	18:48
					N4	

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-97%
06	02:24	02:16	12:02	21:47	09:21	
07	02:07	01:59	12:02	22:38	10:13	
08	01:50	01:42	12:02	23:30	11:04	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	197° 45.97	136°15.48 N25°11.54		26°59.18 N05°35.99	169°33.52 N09°11.75	
1	212°48.43	151°15.78 12.07		42°1.87 36.08	184°35.69 11.86	Alpheratz 357° 32.34
2	227° 50.90	166°16.08 12.60		57° 4.56 36.17	199°37.85 11.97	Ankaa 353°5.00 Schedar 349°28.49
3	$242^{\circ}53.36$	181°16.38 · · 13.13		72°7.25 · · 36.26	214°40.02 · · 12.09	Schedar 349°28.49 Diphda 348°44.98
4	257° 55.82	196°16.68 13.66		87° 9.94 36.36	229°42.19 12.20	Achernar 335° 18.87
5	272°58.29	211°16.98 14.19 226°17.29 N25°14.72		102°12.63 36.45 117°15.33 N05°36.54	244°44.35 12.31 259°46.52 N09°12.42	Hamal 327°48.52
6 7	288°0.75 303°3.22	226°17.29 N25°14.72 241°17.60 15.25		117°15.33 N05°36.54 132°18.02 36.63	259°46.52 N09°12.42 274°48.68 12.54	Polaris 313°2.79
8	318° 5.68	256°17.90 15.78		147°20.71 36.72	289°50.85 12.65	Acamar 315° 10.17
9	333°8.14	271°18.21 · · 16.30		162°23.40 · · 36.81	304°53.01 · · 12.76	Menkar 314°3.66
10	$348^{\circ}10.61$	286°18.52 16.83	333°14.92 40.20	177°26.09 36.90	319°55.18 12.87	Mirfak 308°24.83 Aldebaran 290°36.79
11	3°13.07	301°18.84 17.35		192°28.78 36.99	334°57.34 12.99	Rigel 281°1.49
12	18° 15.54	316°19.15 N25°17.87		207°31.47 N05°37.08	349°59.51 N09°13.10	Capella 280° 18.20
13 14	33° 18.00 48° 20.46	331°19.46 18.39 346°19.78 18.91		222°34.16 37.17 237°36.84 37.26	5°1.68 13.21 20°3.84 13.32	Bellatrix 278°20.19
15	63°22.93	1°20.09 · · 19.43		252°39.53 · · 37.35	35°6.01 · · 13.44	Elnath 277° 58.69
16	78°25.39	16°20.41 19.95		267°42.22 37.44	50°8.17 13.55	Alnilam 275°35.19
17	93°27.86	31°20.73 20.47		282°44.91 37.53	65°10.34 13.66	Betelgeuse 270°49.34 Canopus 263°51.35
18	108°30.32	46°21.05 N25°20.99		297°47.60 N05°37.62	80°12.50 N09°13.77	Sirius 258°23.97
19	123°32.78	61°21.37 21.51		312°50.29 37.71	95°14.67 13.89	Adhara 255°3.82
20 21	138° 35.25 153° 37.71	76°21.69 22.02 91°22.02 · · 22.54		327°52.98 37.80 342°55.66 · · 37.89	110°16.83 14.00 125°19.00 · · 14.11	Procyon 244°48.05
22	168° 40.18	106°22.34 23.05		357°58.35 37.98	140°21.16 14.22	Pollux 243°14.06
23	183° 42.64	121°22.67 23.56		13°1.04 38.07	155°23.33 14.34	Avior 234°13.47
-				ν2.7' d0.1' m-2.41	$\nu 2.2' \ d0.1' \ m0.51$	Suhail 222°44.15 Miaplacidus 221°37.23
ivier.p	pass. 10:47	ν0.3′ d0.5′ m-4.62	$\nu 0.7' \ d0.8' \ m1.11$	ν2.Γ αυ.1 m-2.41	ν2.2 d0.1 m0.51	Alphard 217°44.99
						Regulus 207°31.43
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.34
0 1	198° 45.11 213° 47.57	136°23.00 N25°24.07 151°23.33 24.58		28° 3.73 N05° 38.16 43° 6.41 38.25	170°25.49 N09°14.45 185°27.66 14.56	Denebola 182°21.97
2	213° 47.37 228° 50.03	166°23.66 25.09		58° 9.10 38.34	200°29.82 14.67	Gienah 175°40.53
3	243°52.50	181°23.99 · · 25.60		73°11.79 · · 38.42	215°31.99 · · 14.79	Acrux 172° 56.34 Gacrux 171° 48.03
4	$258^{\circ}54.96$	196°24.32 26.11	243°27.44 53.81	88°14.47 38.51	230°34.15 14.90	Alioth 166° 10.17
5	273°57.43	211°24.66 26.62		103°17.16 38.60	245°36.32 15.01	Spica 158° 19.17
6	288° 59.89	226°24.99 N25°27.13		118°19.84 N05°38.69	260°38.48 N09°15.12	Alkaid 152°49.49
7 8	304°2.35 319°4.82	241°25.33 27.63 256°25.67 28.14	_	133°22.53 38.78 148°25.21 38.87	275°40.65 15.24 290°42.81 15.35	Hadar 148°31.51
9	319 4.02 334°7.28	271°26.01 · · 28.64		163°27.90 · · 38.96	305°44.98 · · 15.46	Menkent 147° 54.06
10	349°9.75	286°26.35 29.14		178°30.58 39.04	320°47.14 15.57	Arcturus 145°45.18
11	4°12.21	301°26.69 29.64	348°32.30 59.10	193°33.27 39.13	335°49.31 15.69	Rigil Kent. 139°35.93 Kochab 137°18.93
12	19° 14.67	316°27.03 N25°30.15		208°35.95 N05°39.22	350°51.47 N09°15.80	Zuben'ubi 136°52.76
13	34° 17.14	331°27.38 30.65		223°38.64 39.31	5°53.64 15.91	Alphecca 126°1.21
14 15	49° 19.60 64° 22.07	346°27.72 31.15 1°28.07 · · 31.64		238°41.32 39.40 253°44.01 · · 39.48	20°55.80 16.02 35°57.97 •• 16.14	Antares 112°12.32
16	79°24.53	16°28.42 32.14		268°46.69 39.57	51°0.13 16.25	Atria 107°3.80
17	94°26.99	31°28.77 32.64		283°49.37 39.66	66°2.30 16.36	Sabik 101°59.55 Shaula 96°6.58
18	109°29.46	46°29.12 N25°33.13		298°52.06 N05°39.75	81°4.46 N09°16.47	Shaula 96°6.58 Rasalhague 95°55.94
19	124°31.92	61°29.47 33.63	_	313°54.74 39.83	96°6.63 16.59	Eltanin 90°40.75
20	139°34.39	76°29.83 34.12		328°57.42 39.92	111°8.79 16.70	Kaus Aust. 83°28.90
21 22	154° 36.85 169° 39.32	91°30.18 · · 34.61 106°30.54 35.11	_	344°0.11 · · 40.01 359°2.79 40.09	126°10.95 · · 16.81 141°13.12 16.92	Vega 80°31.33
23	184°41.78	121°30.90 35.60		14°5.47 40.18	156°15.28 17.04	Nunki 75°44.44
				ν2.7' d0.1' m-2.41		Altair 61°57.41 Peacock 53°1.77
ivier.p	pass. 10:43	ν0.3′ d0.5′ m-4.63	$_{-}$ $_{-}$ $_{-}$ $^{ u0.7'}$ $_{d0.8'}$ m1.11	ν2.Γ d0.1 m-2.41	$\nu 2.2' \ d0.1' \ \text{m}0.50$	Deneb 49°24.11
						Enif 33°36.37
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 29.95
0 1	199° 44.24 214° 46.71	136°31.26 N25°36.09 151°31.62 36.58		29°8.15 N05°40.27 44°10.83 40.35	171°17.45 N09°17.15 186°19.61 17.26	Fomalhaut 15°11.92
2	214 40.71 229°49.17	166°31.98 37.07		59°13.52 40.44	201°21.78 17.37	Scheat 13°42.90
3	244°51.64	181°32.34 · · 37.55		74°16.20 · · 40.53	216°23.94 · · 17.49	Markab 13°27.51
4	$259^{\circ}54.10$	196°32.71 38.04	243°44.11 11.90	89°18.88 40.61	231°26.11 17.60	Apr 09 Sun SHA
5	274°56.56	211°33.08 38.52		104°21.56 40.70	246°28.27 17.71	Venus 298°29.51
6	289°59.03	226°33.44 N25°39.01		119°24.24 N05°40.79	261°30.43 N09°17.82	Mars 345°22.00
7 8	305°1.49 320°3.96	241°33.81 39.49 256°34.18 39.98		134°26.92 40.87 149°29.60 40.96	276°32.60 17.93 291°34.76 18.05	Jupiter 189°13.21 Saturn 331°47.56
9	335°6.42	271°34.55 · · 40.46		164°32.28 · · 41.04	306°36.93 · · 18.16	
10	350°8.88	286°34.93 40.94		179°34.96 41.13	321°39.09 18.27	Apr 10 Mon SHA
11	5°11.35	301°35.30 41.42	348°48.97 17.16	194°37.64 41.21	336°41.26 18.38	Venus 297°37.89
12	20° 13.81	316°35.68 N25°41.90		209°40.32 N05°41.30	351°43.42 N09°18.50	Mars 344°39.55 Jupiter 189°18.62
13	35°16.28	331°36.05 42.38		224°43.00 41.39	6°45.59 18.61	Saturn 331°40.39
14 15	50° 18.74 65° 21.21	346°36.43 42.85 1°36.81 · · 43.33		239°45.68 41.47 254°48.36 •• 41.56	21°47.75 18.72 36°49.91 •• 18.83	
15 16	80°23.67	1 30.81 · · 43.33 16°37.19 43.81		269°51.03 41.64	51°52.08 18.95	<b>Apr 11 Tue SHA</b> Venus 296° 47.01
17	95°26.13	31°37.58 44.28		284°53.71 41.73	66°54.24 19.06	Mars 343°57.09
18	110°28.60	46°37.96 N25°44.76	93°53.83 N06°22.42	299°56.39 N05°41.81	81°56.41 N09°19.17	Jupiter 189°23.91
19	125°31.06	61°38.35 45.23		314°59.07 41.90	96°58.57 19.28	Saturn 331°33.20
20	140°33.53	76°38.73 45.70		330°1.75 41.98	112°0.73 19.40	Horizontal parallax
21 22	155° 35.99 170° 38.45	91°39.12 · · 46.17 106°39.51 46.64	_	345°4.42 · · 42.06 0°7.10 42.15	127°2.90 · · 19.51 142°5.06 19.62	Venus:
23	185° 40.92	121°39.90 47.11		15°9.78 42.23	157°7.23 19.73	Mars:
	pass. 10:39	ν0.4' d0.5' m-4.64	ν0.7' d0.8' m1.12	ν2.7' d0.1' m-2.40	$\nu 2.2' \ d0.1' \ m0.50$	
14161.		ν υ. τ   α υ. υ   III-4.04		ν Δ. ι	ν Δ.Δ. UU.1 IIIU.JU	

Dec

29°14.72

-42°9.09

56°41.50

-17°49.91  $\text{-}57^{\circ}5.60$ 

 $23^{\circ}35.71$ 

89°23.06

-40°11.61

4°11.94 49°57.72

16°33.88

-8°10.33

 $46^{\circ}1.61$ 

 $6^{\circ}22.37$ 

28°37.83

 $-1^{\circ}11.21$ 

-52°42.98 -16°45.57

-29°0.94

27°57.40 -59°36.39

-43°33.17

-69°50.36 -8°47.14

11°49.55 61°35.90

14°24.65

 $-17^{\circ}42.17$ 

 $-63^{\circ}15.56$ 

 $-57^{\circ}16.50$ 

55°48.26

-11°18.72

49°10.15 -60°30.61

 $-36^{\circ}30.65$ 

 $19^{\circ}1.91$ 

 $74^{\circ}\,2.12$ 

-16°9.67

26°36.95

-26°29.66 -69°4.43

-15°45.59  $-37^{\circ}7.31$ 

 $12^{\circ}32.22$ 

51°28.81

-34°22.11

38°48.33 -26°15.57

8°56.49

-56°38.33

45°22.65

 $10^{\circ}0.21$ 

-46°49.24

-29°28.26 28°14.07

15°21.37

Mer.pass

14:55

11:47

22:08

12:40

14:54

11:46

22:04

12:36

14:54

11:45

22:00 12:33

Mer.pass

0.3

0.1

Mer.pass

-60°57.14

 $5^{\circ}8.96$ 

 $7^{\circ}24.59$ 

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.52	N07°41.61	7°7.01	9.2'	S09°50.53	15.3'	60.4
1	194°36.69	42.54	21°35.21	9.2'	$10^{\circ}5.80$	15.2'	60.3'
2	209°36.86	43.46	36°3.38	9.1'	10°21.00	15.1'	60.3'
3	224°37.03	• • 44.39	50°31.51	9.1'	10°36.13	15.1'	60.3'
4 5	239°37.20 254°37.37	45.32 46.24	64°59.60 79°27.65	9.1' 9.0'	10°51.19 11°6.18	15.0' 14.9'	60.3' 60.3'
6	269°37.54	40.24 N07°47.17	93°55.66	9.0'	S11°21.10	14.9	60.3
7	284°37.71	48.10	108° 23.63	8.9'	11°35.94	14.8'	60.3
8	299°37.88	49.02	122°51.56	8.9'	11°50.70	14.7'	60.2'
9	314°38.05	• • 49.95	$137^{\circ}19.45$	8.8'	$12^{\circ}5.39$	14.6'	60.2'
10	329°38.22	50.88	151° 47.30	8.8'	12°19.99	14.5'	60.2'
11	344°38.39	51.80	166° 15.11	8.8'	12°34.51	14.4'	60.2'
12 13	359°38.56 14°38.73	N07° 52.73 53.65	180° 42.87 195° 10.59	8.7' 8.7'	\$12°48.94 13°3.30	14.4' 14.3'	60.2' 60.1'
13	29°38.90	54.58	209°38.27	8.6'	13° 17.56	14.3	60.1
15	44°39.07	• • 55.50	224°5.90	8.6'	13°31.73	14.1'	60.1
16	59°39.24	56.42	238°33.49	8.5'	13°45.81	14.0'	60.1'
17	74°39.40	57.35	253°1.03	8.5'	$13^{\circ}59.80$	13.9'	60.1'
18	89°39.57	N07°58.27	267°28.53	8.5'	\$14°13.70	13.8'	60.0'
19	104°39.74	07°59.20	281°55.99 296°23.39	8.4'	14°27.50	13.7'	60.0'
20 21	119°39.91 134°40.08	08°0.12 •• 1.04	296°23.39 310°50.76	8.4' 8.3'	14°41.20 14°54.80	13.6' 13.5'	60.0' 60.0'
22	149°40.25	1.97	325° 18.08	8.3	15°8.31	13.4	59.9'
23	164°40.41	2.89	339° 45.35	8.2'	15°21.71	13.3'	59.9'
	SD = 16.0'	d = 0.9'			D = 16.5'		
	JD — 10.0°	u — 0.9		اد	→ 10.3°		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°40.58	N08°3.81	354°12.58	8.2'	\$15°35.01	13.2'	59.9'
1 2	194°40.75 209°40.92	4.73 5.65	8°39.76 23°6.89	8.1' 8.1'	15°48.20 16°1.28	13.1' 13.0'	59.9' 59.8'
3	209 40.92 224°41.08	. 6.58	25 0.69 37°33.98	8.0'	16°14.26	12.9'	59.8'
4	239°41.25	7.50	52°1.02	8.0'	16°27.13	12.8'	59.8'
5	254°41.42	8.42	$66^{\circ}28.01$	7.9'	$16^{\circ}39.88$	12.6'	59.8'
6	269°41.58	N08°9.34	80°54.96	7.9'	\$16°52.53	12.5'	59.7'
7	284°41.75 299°41.92	10.26 11.18	95°21.87 109°48.72	7.9' 7.8'	17°5.05 17°17.47	12.4' 12.3'	59.7' 59.7'
8 9	314°42.08	12.10	109 46.72 124° 15.54	7.8'	17 17.47 17°29.76	12.3	59.1°
10	329°42.25	13.02	138° 42.30	7.7'	17°41.94	12.1'	59.6'
11	344°42.42	13.94	153°9.02	7.7'	17°54.00	11.9'	59.6'
12	359°42.58	N08° 14.86	167°35.70	7.6'	S18° 5.94	11.8'	59.6'
13	14°42.75 29°42.92	15.78	182°2.33 196°28.91	7.6'	18°17.75 18°29.44	11.7'	59.5'
14 15	29°42.92 44°43.08	16.70 •• 17.62	210°55.45	7.5' 7.5'	18° 29.44 18° 41.01	11.6' 11.4'	59.5' 59.5'
16	59°43.25	18.54	210 33.43 225°21.95	7.5'	18°52.45	11.4	59.5'
17	74°43.41	19.46	239° 48.40	7.4'	19° 3.76	11.2'	59.4'
18	89°43.58	N08° 20.37	254° 14.81	7.4'	S19°14.94	11.1'	59.4'
19	104°43.74	21.29	268°41.18	7.3'	19°25.99	10.9'	59.4'
20	119°43.91	22.21	283°7.51	7.3'	19°36.91 19°47.70	10.8' 10.7'	59.3'
21 22	134°44.07 149°44.24	· · 23.13 24.04	297°33.79 312°0.03	7.2' 7.2'	19°47.70 19°58.36	10.7	59.3' 59.3'
23	164°44.40	24.96	326° 26.23	7.2'	20° 8.87	10.4	59.2'
	SD = 16.0'	d = 0.9'		SI	O = 16.3'		
	<u> </u>	<u>u = 0.5</u>			J = 10.5		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°44.57	N08° 25.88 26.79	340°52.39 355°18.51	7.1'	\$20°19.26 20°29.50	10.2'	59.2'
1 2	194°44.73 209°44.90	26.79 27.71	355° 18.51 9° 44.60	7.1' 7.0'	20°29.50 20°39.61	10.1' 10.0'	59.2' 59.1'
3	209 44.90 224°45.06	28.63	24°10.64	7.0'	20° 49.58	9.8'	59.1
4	239°45.22	29.54	38° 36.65	7.0'	20°59.41	9.7'	59.1'
5	254°45.39	30.46	53°2.62	6.9'	$21^{\circ}9.10$	9.5'	59.0'
6	269°45.55	N08°31.37	67°28.55	6.9'	S21°18.64	9.4'	59.0'
7	284°45.72	32.29	81°54.45	6.9'	21°28.04	9.3'	59.0'
8 9	299°45.88 314°46.04	33.20 •• 34.12	96°20.32 110°46.15	6.8' 6.8'	21°37.30 21°46.41	9.1' 9.0'	58.9' 58.9'
10	314 46.04 329°46.21	35.03	110 46.15 125°11.95	6.8	21 46.41 21°55.38	9.0 8.8'	58.9'
11	344°46.37	35.95	139° 37.71	6.7'	21° 33.30° 22° 4.20	8.7'	58.8'
12	359°46.53	N08°36.86	154°3.45	6.7'	S22°12.87	8.5'	58.8'
13	14°46.70	37.77	168° 29.16	6.7'	22°21.39	8.4'	58.8'
14	29°46.86	38.69	182°54.84	6.7'	22°29.77	8.2'	58.7'
15 16	44°47.02 59°47.18	· · 39.60 40.51	197°20.49 211°46.12	6.6' 6.6'	22°37.99 22°46.07	8.1' 7.9'	58.7' 58.7'
16 17	59°47.18 74°47.35	40.51	211° 46.12 226° 11.72	6.6'	22°46.07 22°53.99	7.9° 7.8'	58.7° 58.6'
18	89°47.51	N08°42.34	240°37.29	6.6'	\$23°1.76	7.6'	58.6'
19	104°47.67	43.25	255°2.85	6.5'	23°9.37	7.5'	58.5'
20	119°47.83	44.16	269°28.38	6.5'	23°16.84	7.3'	58.5'
21	134°47.99	45.07	283°53.89	6.5'	23°24.15	7.2'	58.5'
22 23	149°48.16 164°48.32	45.98 46.90	298° 19.38 312° 44.86	6.5' 6.5'	23°31.30 23°38.30	7.0' 6.8'	58.4' 58.4'
23			J12 44.00			0.0	50.4
	SD = 16.0'	d = 0.9'		51	D = 16.1'		

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

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

		Sun			Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%	
09	01:34	01:26	12:01	-:-	11:57		
10	01:18	01:10	12:01	00:24	12:52		
11	01:02	00:54	12:01	01:20	13:48		

h	Aries	Venus	Mars	Jupiter	Saturn	
Wed	GHA	GHA Dec 136°40.30 N25°47.58	GHA Dec	GHA Dec	GHA Dec	
0 1	200° 43.38 215° 45.85	136°40.30 N25°47.58 151°40.69 48.05	183°58.00 N06°26.92 198°58.69 27.67	30°12.45 N05°42.32 45°15.13 42.40	172°9.39 N09°19.84 187°11.55 19.96	
2	230° 48.31	166°41.09 48.51	213° 59.38 28.42	60°17.81 42.49	202°13.72 20.07	
3	245° 50.78	181°41.48 · · 48.98	229°0.08 · · 29.17	75°20.48 · · 42.57	217°15.88 · · 20.18	
4	260°53.24	196°41.88 49.44	244°0.77 29.91	90°23.16 42.65	232°18.05 20.29	
5	275°55.70	211° 42.28 49.91	259°1.47 30.66	105°25.83 42.74	247°20.21 20.41	
6	290°58.17	226°42.68 N25°50.37	274°2.16 N06°31.41	120°28.51 N05°42.82	262°22.37 N09°20.52	
7	306°0.63	241°43.09 50.83	289°2.86 32.16	135°31.18 42.90	277°24.54 20.63	
8	321°3.10	256°43.49 51.29	304°3.55 32.91	150°33.86 42.99	292°26.70 20.74	
9	336°5.56	271°43.90 · · 51.75	319°4.24 · · 33.66	165°36.53 · · 43.07	307°28.87 · · 20.86	
10	351°8.02	286°44.30 52.21	334°4.94 34.41	180°39.21 43.15	322°31.03 20.97	
11	6°10.49	301°44.71 52.67	349°5.63 35.15	195°41.88 43.24	337°33.19 21.08	'
12	21° 12.95	316°45.12 N25°53.13	4°6.32 N06°35.90	210°44.56 N05°43.32	352°35.36 N09°21.19	
13	36° 15.42	331° 45.53 53.59	19°7.02 36.65	225°47.23 43.40	7°37.52 21.30	
14	51° 17.88	346°45.95 54.04	34°7.71 37.40	240°49.90 43.49	22°39.68 21.42	
15	66°20.35	1°46.36 · · 54.50	49°8.41 · · 38.14	255°52.58 · · 43.57	37°41.85 · · 21.53	
16	81°22.81 96°25.27	16°46.78 54.95 31°47.19 55.40	64°9.10 38.89 79°9.79 39.64	270°55.25 43.65 285°57.92 43.73	52°44.01 21.64 67°46.17 21.75	B
17 18	90 25.27 111°27.74	31°47.19 55.40 46°47.61 N25°55.86	79°9.79 39.64 94°10.49 N06°40.39	301°0.60 N05°43.82	67°46.17 21.75 82°48.34 N09°21.87	
19	126° 30.20	61°48.03 56.31	109°11.18 41.13	316°3.27 43.90	97°50.50 21.98	
20	141° 32.67	76° 48.46 56.76	124°11.88 41.88	331° 5.94 43.98	112°52.67 22.09	
21	156° 35.13	91°48.88 · · 57.21	139°12.57 · · 42.63	346°8.61 · · 44.06	127°54.83 · · 22.20	
22	171°37.59	106°49.30 57.65	154°13.26 43.37	1°11.28 44.14	142°56.99 22.31	
23	186° 40.06	121°49.73 58.10	169° 13.96 44.12	16°13.96 44.23	157°59.16 22.43	
						١.,
Mer.p	pass. 10:35	ν0.4' d0.5' m-4.65	$\nu$ 0.7′ d0.7′ m1.12	ν2.7' d0.1' m-2.40	ν2.2' d0.1' m0.49	Mi
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	201°42.52	136°50.16 N25°58.55	184°14.65 N06°44.87	31°16.63 N05°44.31	173°1.32 N09°22.54	
1	216°44.99	151°50.59 58.99	199° 15.34 45.61	46°19.30 44.39	188°3.48 22.65	
2	231°47.45	166°51.02 59.44	214°16.04 46.36	61°21.97 44.47	203°5.65 22.76	
3	246°49.92	181°51.45 25°59.88	229°16.73 · · 47.10	76°24.64 · · 44.55	218°7.81 · · 22.88	
4	261°52.38	196°51.88 26°0.33	244°17.42 47.85	91°27.31 44.63	233°9.97 22.99	
5	276°54.84	211°52.32 0.77 226°52.76 N26°1.21	259° 18.12 48.60	106°29.98 44.71	248°12.14 23.10	
6	291°57.31		274°18.81 N06°49.34	121°32.65 N05°44.80	263°14.30 N09°23.21	
7 8	306°59.77 322°2.24	241°53.20 1.65 256°53.64 2.09	289°19.50 50.09 304°20.20 50.83	136°35.32 44.88 151°37.99 44.96	278°16.46 23.32 293°18.63 23.44	
9	322 2.24 337°4.70	271°54.08 · · 2.53	319°20.89 · · 51.58	166°40.66 · · 45.04	308°20.79 · · 23.55	
10	352°7.16	286°54.52 2.96	334°21.58 52.32	181°43.33 45.12	323°22.95 23.66	
11	7°9.63	301°54.96 3.40	349°22.28 53.07	196°46.00 45.20	338°25.12 23.77	R
12	22° 12.09	316°55.41 N26°3.84	4°22.97 N06°53.81	211°48.67 N05°45.28	353°27.28 N09°23.89	١.
13	37° 14.56	331°55.86 4.27	19°23.66 54.55	226°51.33 45.36	8°29.44 24.00	7
14	$52^{\circ}17.02$	346°56.31 4.71	34°24.36 55.30	241°54.00 45.44	23°31.61 24.11	
15	$67^{\circ}19.49$	1°56.76 · · 5.14	49°25.05 •• 56.04	256°56.67 · · 45.52	38°33.77 · · 24.22	
16	82°21.95	16°57.21 5.57	64°25.74 56.79	271°59.34 45.60	53°35.93 24.33	
17	97°24.41	31°57.67 6.00	79°26.44 57.53	287°2.00 45.68	68°38.10 24.45	
18	112°26.88	46°58.12 N26°6.43	94°27.13 N06°58.27	302°4.67 N05°45.76	83°40.26 N09°24.56	R
19	127°29.34	61°58.58 6.86	109° 27.82 59.02	317°7.34 45.84	98°42.42 24.67	
20	142°31.81	76°59.04 7.29	124°28.52 06°59.76	332°10.01 45.92	113°44.59 24.78	K
21	157°34.27	91°59.50 · · 7.72	139°29.21 07°0.51	347°12.67 · · 46.00 2°15.34 · · 46.08	128°46.75 · · 24.89	
22 23	172°36.73 187°39.20	106°59.96 8.14 122°0.42 8.57	154°29.90 1.25 169°30.60 1.99	2°15.34 46.08 17°18.00 46.16	143°48.91 25.01 158°51.08 25.12	
Mer.p	pass. 10:31	$ u 0.4' \ d0.4' \ \text{m-4.66}$	$\nu 0.7'~d0.7'~\text{m}1.13$	$ u 2.7' \ d0.1' \ \text{m-}2.39$	$ u 2.2' \ d0.1' \ m0.49$	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	202°41.66	137°0.89 N26°8.99	184°31.29 N07°2.73	32°20.67 N05°46.24	173°53.24 N09°25.23	F
1	$217^{\circ}44.13$	152°1.35 9.42	199°31.98 3.48	47°23.34 46.32	188°55.40 25.34	'
2	232° 46.59	167°1.82 9.84	214° 32.68 4.22	62°26.00 46.39	203°57.56 25.46	
3	247°49.06	182°2.29 · · 10.26	229°33.37 · · 4.96	77°28.67 · · 46.47	218°59.73 · · 25.57	-
4	262°51.52	197°2.76 10.68	244°34.06 5.70	92°31.33 46.55	234°1.89 25.68	Ар
5	277°53.98	212°3.24 11.11	259°34.75 6.45	107°34.00 46.63	249°4.05 25.79	
6	292°56.45	227°3.71 N26°11.52	274°35.45 N07°7.19	122°36.66 N05°46.71	264°6.22 N09°25.90	
7	307°58.91	242°4.19 11.94	289°36.14 7.93	137°39.32 46.79	279°8.38 26.02	
8	323°1.38	257°4.66 12.36	304°36.83 8.67	152°41.99 46.87	294°10.54 26.13	
9 10	338°3.84 353°6.30	272°5.14 · · 12.78 287°5.62 13.19	319°37.52 · · 9.41 334°38.22 10.16	167°44.65 · · 46.94 182°47.31 47.02	309°12.70 · · 26.24 324°14.87 26.35	Ap
10 11	353°6.30 8°8.77	302°6.11 13.61	334°38.22 10.16 349°38.91 10.90	182°47.31 47.02 197°49.98 47.10	324°14.87 26.35 339°17.03 26.46	'
12	23°11.23	317°6.59 N26°14.02	4°39.60 N07°11.64	212°52.64 N05°47.18	354°19.19 N09°26.58	
13	38° 13.70	332°7.08 14.43	19°40.30 12.38	227°55.30 47.26	9°21.36 26.69	
14	53° 16.16	347°7.56 14.85	34°40.99 13.12	242°57.97 47.33	24°23.52 26.80	
15	68° 18.63	2°8.05 · · 15.26	49°41.68 · · 13.86	258° 0.63 · · 47.41	39°25.68 · · 26.91	4
16	83°21.09	17°8.54 15.67	64°42.37 14.60	273°3.29 47.49	54°27.84 27.02	[
17	98° 23.55	32°9.04 16.08	79°43.07 15.34	288° 5.95 47.57	69°30.01 27.14	
18	113°26.02	47°9.53 N26°16.49	94°43.76 N07°16.08	303°8.61 N05°47.64	84°32.17 N09°27.25	
19	128°28.48	62°10.03 16.89	109°44.45 16.82	318°11.28 47.72	99°34.33 27.36	
20	143°30.95	77°10.52 17.30	124°45.14 17.56	333°13.94 47.80	114°36.50 27.47	$\vdash$
21	158°33.41	92°11.02 · · 17.71	139°45.84 · · 18.30	348°16.60 · · 47.87	129°38.66 · · 27.58	
22	173°35.87	107°11.52 18.11	154°46.53 19.04	3°19.26 47.95	144°40.82 27.70	
23	188°38.34	122°12.03 18.51	169°47.22 19.78	18°21.92 48.03	159°42.98 27.81	Ш_
Mer.	pass. 10:28	ν0.5′ d0.4′ m-4.67	ν0.7' d0.7' m1.13	$\nu 2.7' \ d0.1' \ \text{m-}2.39$	ν2.2' d0.1' m0.48	

	Stars	
	SHA	Dec
Alpheratz	357°32.32	29°14.72
Ankaa	353°4.99	-42°9.07
Schedar	$349^{\circ}28.47$	56°41.49
Diphda	348°44.98	-17°49.90
Achernar	335°18.87	-57°5.58
Hamal	327°48.51	23°35.71
Polaris	313°3.07	89°23.05
Acamar	315°10.18	-40°11.60
Menkar	314°3.66	4°11.94
Mirfak	308°24.83 290°36.80	49°57.71
Aldebaran	290 36.80 281°1.50	16°33.88 -8°10.33
Rigel Capella	281 1.50 280°18.21	-8 10.33 46°1.60
Bellatrix	278°20.20	6°22.37
Elnath	277°58.70	28°37.82
Alnilam	275°35.19	-1°11.21
Betelgeuse	270°49.35	7°24.59
Canopus	263°51.38	-52°42.97
Sirius	258°23.98	-16°45.57
Adhara	255°3.84	-29°0.95
Procyon	244°48.07	5°8.95
Pollux	243°14.07	27°57.39
Avior	234°13.49	-59°36.39
Suhail	$222^{\circ}44.16$	-43°33.18
Miaplacidus	221°37.26	-69°50.37
Alphard	217°45.00	-8°47.14
Regulus	207°31.44	$11^{\circ}49.55$
Dubhe	193°37.36	$61^{\circ}35.91$
Denebola	182°21.97	14°24.66
Gienah	175°40.52	-17°42.18
Acrux	172°56.34	-63°15.57
Gacrux	171°48.03	-57°16.52
Alioth	166°10.17	55°48.28
Spica	158°19.17	-11°18.73
Alkaid	152°49.49	49°10.16
Hadar Menkent	148°31.49 147°54.05	-60°30.62 -36°30.66
Arcturus	147 54.05 145°45.17	19°1.92
Rigil Kent.	139°35.91	-60°57.15
Kochab	137°18.92	74°2.14
Zuben'ubi	136°52.74	-16°9.67
Alphecca	126°1.20	26°36.96
Antares	112°12.30	-26°29.66
Atria	107°3.74	-69°4.44
Sabik	101°59.53	$-15^{\circ}45.59$
Shaula	96°6.55	-37°7.31
Rasalhague	95°55.92	12°32.23
Eltanin	90°40.73	51°28.82
Kaus Aust.	83°28.87	-34°22.10
Vega	80°31.31	38°48.34
Nunki	75°44.41	-26°15.56
Altair	61°57.38	8°56.50
Peacock	53°1.73	-56°38.32
Deneb	49°24.08	45°22.65
Enif Al Na'ir	33°36.35 27°29.93	10°0.22 -46°49.22
Fomalhaut	27°29.93 15°11.90	-46°49.22 -29°28.24
Scheat	15 11.90 13°42.88	-29 28.24 28°14.07
Markab	13 42.00 13°27.49	26 14.07 15°21.38
Apr 12 Wed	SHA	Mer.pass
Venus	295°56.91	14:53
Mars	343°14.61	11:44
Jupiter	189°29.07	21:55
Saturn	331°26.01	12:30
Apr 13 Thu	SHA	Mer.pass
Venus	295°7.64	14:52
Mars	342°32.13	11:42
Jupiter	189°34.10	21:51
Saturn	331°18.80	12:26
Apr 14 Fri	SHA	Mer.pass
Venus	$294^{\circ}19.22$	14:51
Mars	341°49.63	11:41
Jupiter	189°39.01	21:47
Saturn	331°11.58	12:23
11	ıtal parallax	<u></u>
Horizon	itai paranaz	
Horizon	Venus:	0.3
Horizon	-	0.3 0.1

Stars

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.48	N08°47.81	327°10.31	6.4'	S23°45.14	6.7'	58.4'
1	194°48.64	48.72	341°35.75	6.4'	23°51.83	6.5'	58.3'
2	209°48.80	49.63	356°1.18	6.4'	23°58.36	6.4'	58.3'
3	224°48.96	• • 50.54	10°26.60	6.4'	24°4.73	6.2'	58.3'
4	239°49.12	51.45	24°52.00	6.4'	24°10.95	6.1'	58.2'
5	254°49.28	52.36	39°17.39	6.4'	$24^{\circ}17.01$	5.9'	58.2'
6	269°49.45	N08°53.27	53°42.78	6.4'	\$24°22.91	5.7'	58.1'
7	284°49.61	54.18	68°8.16	6.4'	24°28.65	5.6'	58.1'
8	299°49.77	55.08	82°33.53	6.4'	24°34.23	5.4'	58.1'
9	314°49.93 329°50.09	• • 55.99	96°58.89	6.4'	24°39.65 24°44.92	5.3'	58.0'
10 11	329°50.09 344°50.25	56.90 57.81	111°24.26 125°49.62	6.4' 6.4'	24°44.92 24°50.02	5.1' 4.9'	58.0' 58.0'
12	359°50.41	N08°58.72	125 49.02 140°14.99	6.4	S24°54.97	4.9	57.9
13	14°50.57	08°59.62	154° 40.35	6.4	24°59.75	4.6'	57.9'
14	29°50.73	09°0.53	169°5.72	6.4	25°4.38	4.5'	57.9'
15	44°50.88	. 1.44	183°31.09	6.4'	25°8.84	4.3'	57.8'
16	59°51.04	2.35	197°56.47	6.4'	25°13.14	4.1'	57.8'
17	74°51.20	3.25	212°21.86	6.4'	25°17.29	4.0'	57.7'
18	89°51.36	N09°4.16	226°47.25	6.4'	S25°21.27	3.8'	57.7'
19	104°51.52	5.06	241°12.66	6.4'	25°25.09	3.7'	57.7'
20	119°51.68	5.97	255°38.08	6.4'	25°28.76	3.5'	57.6'
21	134°51.84	• • 6.88	270°3.51	6.4'	25°32.26	3.3'	57.6'
22	149°52.00	7.78	284°28.96	6.5'	25°35.60	3.2'	57.6'
23	164°52.15	8.69	298°54.43	6.5'	25°38.78	3.0'	57.5'
	SD = 15.9'	d = 0.9'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°52.31	N09°9.59	313°19.91	6.5'	\$25°41.81	2.9'	57.5'
1	194°52.47 209°52.63	10.49	327°45.42 342°10.95	6.5'	25°44.67 25°47.37	2.7'	57.4'
2	209°52.63 224°52.78	11.40 •• 12.30	342°10.95 356°36.50	6.6' 6.6'	25°47.37 25°49.92	2.5' 2.4'	57.4' 57.4'
3 4	239°52.94	13.21	11°2.07	6.6'	25 49.92 25°52.30	2.4	57.4 57.3'
5	254°53.10	14.11	25°27.67	6.6'	25°54.53	2.1'	57.3'
6	269°53.26	N09°15.01	39°53.30	6.7'	\$25°56.60	1.9'	57.3'
7	284°53.41	15.92	54°18.96	6.7'	25°58.51	1.8'	57.2'
8	299°53.57	16.82	68°44.65	6.7'	26°0.26	1.6'	57.2'
9	314°53.73	• • 17.72	83°10.38	6.8'	26°1.85	1.4'	57.1'
10	329°53.88	18.62	97°36.14	6.8'	26°3.29	1.3'	57.1'
11	344°54.04	19.52	112°1.93	6.8'	26°4.57	1.1'	57.1'
12	359°54.20	N09°20.43	126°27.76	6.9'	\$26°5.70	1.0'	57.0'
13 14	14°54.35 29°54.51	21.33 22.23	140°53.63 155°19.54	6.9' 7.0'	26°6.67 26°7.48	0.8' 0.7'	57.0' 57.0'
15	44°54.66	23.13	169°45.49	7.0'	26°8.14	0.7	56.9'
16	59°54.82	24.03	184°11.48	7.0'	26°8.64	0.4	56.9
17	74°54.98	24.93	198°37.52	7.1'	26°8.99	0.2'	56.9'
18	89°55.13	N09°25.83	213°3.61	7.1'	S26°9.19	0.0'	56.8'
19	104°55.29	26.73	227°29.74	7.2'	26°9.24	-0.1'	56.8'
20	119°55.44	27.63	241°55.92	7.2'	26°9.13	-0.3'	56.7'
21	134°55.60	· · 28.53	256°22.15	7.3'	26°8.87	-0.4	56.7'
22	149°55.75	29.43	270°48.43	7.3'	26°8.47	-0.6'	56.7'
23	164°55.90	$\frac{30.32}{d = 0.9'}$	285°14.77	7.4'	26°7.91	-0.7'	56.6'
	SD = 15.9'			- SL	O = 15.7'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°56.06 194°56.21	N09°31.22 32.12	299°41.16 314°7.60	7.4' 7.5'	\$26°7.20 26°6.34	-0.9' -1.0'	56.6' 56.6'
2	209°56.37	32.12	314 7.00 328°34.10	7.5 7.6'	26 0.34 26°5.34	-1.0 -1.2'	56.5'
3	209 50.57 224°56.52	33.92	343°0.66	7.6'	20° 5.34 26° 4.19	-1.2 -1.3'	56.5'
4	239°56.68	34.81	357°27.28	7.7'	26°2.89	-1.4	56.5
5	254°56.83	35.71	11°53.96	7.7'	26°1.45	-1.6'	56.4
6	269°56.98	N09°36.61	26°20.70	7.8'	S25°59.86	-1.7'	56.4'
7	284°57.14	37.50	40°47.50	7.9'	$25^{\circ}58.12$	-1.9'	56.4'
8	299°57.29	38.40	55°14.36	7.9'	$25^{\circ}56.25$	-2.0'	56.3'
9	314°57.44	• • 39.30	69°41.29	8.0'	25°54.23	-2.2'	56.3'
10	329°57.59	40.19	84°8.29	8.1'	25°52.07	-2.3'	56.3'
11	344°57.75	41.09	98°35.35	8.1'	25°49.77	-2.4'	56.2'
12	359°57.90 14°58.05	N09°41.98 42.88	113°2.48 127°29.68	8.2' 8.3'	\$25°47.33 25°44.75	-2.6'	56.2'
13 14	14°58.05 29°58.20	42.88 43.77	127°29.68 141°56.95	8.3'	25°44.75 25°42.03	-2.7' -2.9'	56.2' 56.1'
14 15	29 58.20 44°58.36	· · 44.66	141 56.95 156°24.29	8.4'	25 42.03 25°39.18	-2.9 -3.0'	56.1'
16	59°58.51	45.56	170° 51.70	8.5'	25°36.18	-3.0 -3.1'	56.1
17	74°58.66	46.45	185°19.19	8.6'	25°33.06	-3.3'	56.0'
18	89°58.81	N09°47.35	199°46.75	8.6'	S25°29.79	-3.4'	56.0'
19	104°58.96	48.24	214°14.38	8.7'	25°26.40	-3.5'	56.0'
20	119°59.11	49.13	228°42.08	8.8'	25°22.87	-3.7'	55.9'
21	134°59.27 149°59.42	• • 50.02	243°9.87 257°37.72	8.9'	25°19.21 25°15.42	-3.8'	55.9'
22 23	149°59.42 164°59.57	50.92 51.81	257° 37.72 272° 5.66	8.9' 9.0'	25°15.42 25°11.50	-3.9' -4.0'	55.9' 55.8'
23		d = 0.9'				7.0	55.0
	SD = 15.9'	$u = 0.9^{\circ}$		51	O = 15.4'		

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

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°						
64°	00:35	03:00		03:49	03:25	
62°		01:34	02:38	04:28	04:51	05:45
60°		00:58	02:00	04:55	05:28	06:23
N 58°		00:31	01:33	05:17	05:54	06:50
56°		00:11	01:12	05:34	06:15	07:11
54°	23:54		00:54	05:49	06:32	07:28
52°	23:39	•• ••	00:39	06:02	06:47	07:43
50°	23:26		00:26	06:14	07:00	07:56
45°	23:00		00:00	06:37	07:26	08:23
N 40°	22:39	23:38		06:57	07:47	08:44
35°	22:22	23:21		07:13	08:05	09:01
30°	22:07	23:06	23:57	07:27	08:20	09:16
20°	21:42	22:40	23:33	07:50	08:45	09:42
N 10°	21:20	22:18	23:12	08:11	09:07	10:03
0°	21:00	21:57	22:52	08:30	09:28	10:24
<b>S</b> 10°	20:40	21:37	22:32	08:50	09:48	10:44
20°	20:19	21:14	22:11	09:10	10:10	11:06
30°	19:54	20:49	21:46	09:34	10:36	11:31
35°	19:40	20:34	21:32	09:48	10:51	11:46
40° 45°	19:23 19:03	20:16 19:55	21:15 20:55	10:05 10:24	11:08 11:29	12:03 12:23
1	1					
<b>S</b> 50°	18:38	19:29	20:30	10:49	11:56	12:49
52°	18:25	19:16	20:17	11:01	12:09	13:01
54°	18:12	19:01	20:03	11:14	12:23	13:16
56° 58°	17:56	18:44	19:47	11:30	12:41	13:32
<b>S</b> 60°	17:37 17:13	18:23 17:57	19:27 19:03	11:49 12:12	13:01 13:28	13:52 14:17
3 00	17:13	17:57	19:03	12:12	13:28	14:17

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-76%
12	00:46	00:38	12:01	02:17	14:45	
13	00:31	00:23	12:00	03:14	15:43	
14	00:16	80:00	12:00	04:11	16:38	

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	<b>GHA</b> 203° 40.80	<b>GHA Dec</b> 137°12.53 N26°18.92	<b>GHA Dec</b> 184°47.91 N07°20.52	<b>GHA Dec</b> 33°24.58 N05°48.10	<b>GHA Dec</b> 174°45.15 N09°27.92
0 1	203 40.60 218°43.27	157 12.55 N20 16.92 152°13.04 19.32	199° 48.60 21.26	48°27.24 48.18	174 45.15 NO9 27.92 189°47.31 28.03
2	233° 45.73	167°13.54 19.72	214°49.30 22.00	63°29.90 48.26	204°49.47 28.14
3	248° 48.20	182°14.05 · · 20.12	229°49.99 · · 22.74	78°32.56 · · 48.33	219°51.63 · · 28.26
4	263° 50.66	197°14.56 20.52	244°50.68 23.48	93°35.22 48.41	234°53.80 28.37
5	278°53.12	212°15.08 20.92	259°51.37 24.21	108°37.88 48.48	249°55.96 28.48
6	293°55.59	227°15.59 N26°21.32	274°52.07 N07°24.95	123°40.53 N05°48.56	264°58.12 N09°28.59
7	308°58.05	242°16.11 21.71	289°52.76 25.69	138°43.19 48.64	280°0.28 28.70
8	324°0.52	257° 16.62 22.11	304°53.45 26.43	153°45.85 48.71	295°2.45 28.82
9	339°2.98	272°17.14 · · 22.50	319°54.14 · · 27.17	168°48.51 · · 48.79	310°4.61 · · 28.93
10	354°5.44 9°7.91	287°17.66 22.90 302°18.19 23.29	334°54.83 27.91 349°55.53 28.64	183°51.17 48.86 198°53.82 48.94	325°6.77 29.04 340°8.93 29.15
11 12	24° 10.37	317°18.71 N26°23.68	4°56.22 N07°29.38	213°56.48 N05°49.01	355°11.10 N09°29.26
13	39° 12.84	332°19.24 24.07	19°56.91 30.12	228°59.14 49.09	10°13.26 29.37
14	54° 15.30	347°19.76 24.46	34°57.60 30.86	244°1.80 49.16	25°15.42 29.49
15	$69^{\circ}17.77$	2°20.29 · · 24.85	49°58.29 · · 31.59	259° 4.45 · · 49.24	40°17.58 · · 29.60
16	84°20.23	17°20.83 25.24	64°58.98 32.33	274°7.11 49.31	55°19.75 29.71
17	99°22.69	32°21.36 25.63	79°59.68 33.07	289° 9.76 49.39	70°21.91 29.82
18	114° 25.16	47°21.89 N26°26.01	95°0.37 N07°33.80	304°12.42 N05°49.46	85°24.07 N09°29.93
19	129° 27.62	62°22.43 26.40	110°1.06 34.54	319°15.08 49.54	100°26.23 30.05
20	144°30.09	77°22.97 26.78	125°1.75 35.28	334°17.73 49.61	115°28.40 30.16
21	159° 32.55	92°23.51 · · 27.17	140°2.44 · · 36.01	349°20.39 · · 49.69	130°30.56 · · 30.27
22	174°35.01	107°24.05 27.55	155°3.13 36.75	4°23.04 49.76	145°32.72 30.38
23	189°37.48	122°24.59 27.93	170°3.83 37.48	19°25.70 49.83	160°34.88 30.49
Mer.	pass. 10:24	ν0.5′ d0.4′ m-4.67	ν0.7' d0.7' m1.14	$\nu 2.7' \ d0.1' \ \text{m-}2.38$	ν2.2′ d0.1′ m0.47
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	204°39.94	137°25.14 N26°28.31	185°4.52 N07°38.22	34°28.35 N05°49.91	175°37.04 N09°30.60
1	219° 42.41 234° 44.87	152°25.68 28.69 167°26.23 29.07	200°5.21 38.96 215°5.90 39.69	49°31.00 49.98 64°33.66 50.05	190°39.21 30.72 205°41.37 30.83
2	249° 47.34	182°26.78 · · 29.45	230°6.59 · · 40.43	79°36.31 · · 50.13	200° 43.53 · · · 30.94
4	264° 49.80	197°27.34 29.83	245°7.28 41.16	94°38.97 50.20	235°45.69 31.05
5	279°52.26	212°27.89 30.21	260°7.98 41.90	109°41.62 50.28	250°47.86 31.16
6	294° 54.73	227°28.45 N26°30.58	275°8.67 N07°42.63	124°44.27 N05°50.35	265°50.02 N09°31.28
7	309°57.19	242°29.00 30.96	290°9.36 43.37	139°46.92 50.42	280°52.18 31.39
8	324°59.66	257°29.56 31.33	305° 10.05 44.10	154°49.58 50.49	295°54.34 31.50
9	340°2.12	272°30.12 · · 31.70	320°10.74 · · 44.83	169°52.23 · · 50.57	310°56.50 · · 31.61
10	355°4.58	287° 30.69 32.07	335°11.43 45.57	184°54.88 50.64	325°58.67 31.72
11	10°7.05	302°31.25 32.45	350°12.12 46.30	199°57.53 50.71	341°0.83 31.83
12	25°9.51 40°11.98	317°31.82 N26°32.82	5°12.81 N07°47.04	215°0.18 N05°50.79	356°2.99 N09°31.95 11°5.15 32.06
13 14	40 11.98 55°14.44	332°32.39 33.19 347°32.96 33.55	20°13.50 47.77 35°14.20 48.50	230°2.84 50.86 245°5.49 50.93	11°5.15 32.06 26°7.31 32.17
15	70° 16.90	2°33.53 · · 33.92	50°14.89 · · 49.24	260°8.14 · · 51.00	41°9.48 · · 32.28
16	85° 19.37	17°34.10 34.29	65°15.58 49.97	275°10.79 51.07	56°11.64 32.39
17	100°21.83	32°34.68 34.65	80° 16.27 50.70	290°13.44 51.15	71°13.80 32.50
18	115°24.30	47°35.26 N26°35.02	95°16.96 N07°51.44	305°16.09 N05°51.22	86°15.96 N09°32.62
19	130° 26.76		110°17.65 52.17		101°18.12 32.73
20	145°29.23	77°36.42 35.74	125°18.34 52.90	335°21.39 51.36	116°20.29 32.84
21	160°31.69	92°37.00 · · 36.11	140°19.03 · · 53.64	350°24.04 · · 51.43	131°22.45 · · · 32.95
22 23	175°34.15 190°36.62	107°37.58 36.47 122°38.17 36.83	155°19.72 54.37 170°20.41 55.10	5°26.69 51.51 20°29.34 51.58	146°24.61 33.06
					161°26.77 33.17
Mer. <sub>I</sub>	pass. 10:20	ν0.5′ d0.4′ m-4.68	$\nu$ 0.7′ $d$ 0.7′ $m$ 1.14	ν2.7' d0.1' m-2.38	ν2.2' d0.1' m0.46
	611.6	CUA	CIIA	CIIA	CIIA
Mon 0	<b>GHA</b> 205° 39.08	<b>GHA Dec</b> 137°38.76 N26°37.19	<b>GHA Dec</b> 185°21.10 N07°55.83	<b>GHA Dec</b> 35°31.98 N05°51.65	<b>GHA Dec</b> 176°28.93 N09°33.29
1	220° 41.55	157 30.70 N20 37.19 152°39.35 37.54	200°21.79 56.56	50°34.63 51.72	191°31.10 33.40
2	235° 44.01	167°39.94 37.90	215°22.49 57.30	65°37.28 51.79	206°33.26 33.51
3	250° 46.47	182°40.54 · · 38.26	230°23.18 · · 58.03	80°39.93 · · 51.86	221°35.42 · · 33.62
4	265°48.94	197°41.13 38.61	245°23.87 58.76	95°42.58 51.93	236°37.58 33.73
5	280°51.40	212°41.73 38.97	260°24.56 07°59.49	110°45.22 52.00	251°39.74 33.84
6	295°53.87	227°42.33 N26°39.32	275°25.25 N08°0.22	125°47.87 N05°52.07	266°41.91 N09°33.95
7	310°56.33	242°42.93 39.68	290°25.94 0.95	140°50.52 52.14	281°44.07 34.07
8	325°58.79	257°43.53 40.03	305°26.63 1.68	155°53.16 52.21	296°46.23 34.18
9	341°1.26 356°3.72	272°44.14 · · 40.38	320°27.32 · · 2.41	170°55.81 · · 52.28	311°48.39 · · 34.29 326°50.55 34.40
10 11	356° 3.72 11° 6.19	287°44.75 40.73 302°45.36 41.08	335°28.01 3.14 350°28.70 3.87	185°58.46 52.35 201°1.10 52.42	326°50.55 34.40 341°52.72 34.51
12	26°8.65	317°45.97 N26°41.43	5°29.39 N08°4.60	216°3.75 N05°52.49	356°54.88 N09°34.62
13	41°11.12	332°46.58 41.77	20°30.08 5.33	231°6.39 52.56	11°57.04 34.73
14	$56^{\circ}13.58$	347°47.20 42.12	35°30.77 6.06	246° 9.04 52.63	26°59.20 34.85
15	71° 16.04	2°47.81 · · 42.47	50°31.46 · · 6.79	261°11.68 · · 52.70	42°1.36 · · 34.96
16	86° 18.51	17°48.43 42.81	65°32.15 7.52	276°14.33 52.77	57°3.52 35.07
17	101°20.97	32°49.05 43.15	80°32.84 8.25	291°16.97 52.84	72°5.69 35.18
18	116°23.44	47°49.67 N26°43.50	95°33.53 N08°8.98	306°19.62 N05°52.91	87°7.85 N09°35.29
19 20	131°25.90 146°28.36	62°50.30 43.84 77°50.92 44.18	110°34.22 9.71 125°34.91 10.44	321°22.26 52.98 336°24.90 53.05	102°10.01 35.40 117°12.17 35.52
21	140 20.30 161° 30.83	92°51.55 · · 44.52	140°35.60 · · 11.17	351°27.55 · · 53.12	132°14.33 · · 35.63
22	176° 33.29	107°52.18 44.86	155°36.29 11.90	6°30.19 53.19	147°16.49 35.74
23	191°35.76	122°52.81 45.20	170°36.98 12.62	21°32.83 53.26	162°18.66 35.85
Mer	pass. 10:16	ν0.6' d0.4' m-4.69	ν0.7' d0.7' m1.15	ν2.6' d0.1' m-2.37	ν2.2' d0.1' m0.45
	,				

	эпа	Dec
Alpheratz	357°32.30	29°14.72
Ankaa	353°4.97	-42°9.05
Schedar	349°28.45	56°41.48
Diphda	348°44.96	-17°49.89
Achernar	$335^{\circ}18.87$	-57° 5.56
Hamal	327°48.50	23°35.71
Polaris	313°3.37	89°23.04
Acamar	$315^{\circ}10.18$	$-40^{\circ}11.58$
Menkar	314°3.66	$4^{\circ}11.95$
Mirfak	308°24.83	49°57.70
Aldebaran	290°36.80	16°33.88
Rigel	281°1.51	-8°10.33
Capella	280°18.22	46°1.60
Bellatrix	278°20.21	6°22.37
Elnath	277°58.70	28°37.82
Alnilam	275°35.20	$-1^{\circ}11.21$
Betelgeuse	270°49.35	7°24.59
Canopus	263°51.40	-52°42.97
Sirius	258°23.99	-16°45.57
Adhara	255°3.85	-29°0.94
Procyon	244°48.07	5°8.95
Pollux	243°14.08	27°57.40
Avior	234° 13.52	-59°36.40
Suhail	222°44.17	-43°33.19
Miaplacidus	221°37.30	-69°50.38
Alphard	217°45.00	-8°47.15
Regulus	207°31.44	11°49.56
Dubhe	193°37.37	61°35.92
Denebola	182°21.97	14°24.66
Gienah	175°40.52	-17°42.18
Acrux	175 40.52 172°56.33	-17 42.16 -63°15.59
Gacrux	172 50.55 171°48.02	-03 15.59 -57°16.53
Alioth	166° 10.17	55°48.29
Spica	158° 19.16	-11°18.73
Alkaid	150° 19.10 152° 49.48	49°10.17
Hadar	148°31.47	-60°30.64
Menkent	146 51.47 147°54.03	-36°30.67
Arcturus	147 54.05 145°45.16	19° 1.93
Arcturus Rigil Kent.	145°45.16 139°35.88	-60°57.17
Kigii Kent. Kochab	139° 35.88 137° 18.90	-60°57.17 74°2.15
Zuben'ubi	137 18.90 136°52.73	-16° 9.67
Alphecca	136°52.73 126°1.18	-16° 9.67 26° 36.97
Alphecca	120° 1.18 112° 12.27	-26°29.66
Antares Atria	112°12.27 107°3.69	-26°29.66 -69°4.45
Sabik	107 3.69 101°59.50	-09 4.45 -15°45.59
Sabik	96°6.52	-15 45.59 -37°7.31
Snaula Rasalhague	95°55.89	-37° 7.31 12° 32.23
Eltanin	95 55.89 90°40.70	51°28.82
Kaus Aust.	90 40.70 83°28.84	-34°22.10
Naus Aust. Vega	80°31.28	-34 22.10 38°48.35
•		
Nunki	75°44.38 61°57.35	-26°15.56 8°56.51
Altair		
Peacock	53°1.69	-56°38.31
Deneb	49°24.05	45°22.65
Enif	33°36.33	10°0.22
Al Na'ir	27°29.90	-46°49.21
Fomalhaut	15°11.88	-29°28.23
Scheat	13°42.85	28°14.07
Markab	13°27.47	15°21.38
Apr 15 Sat	SHA	Mer.pass
Venus	293°31.73	14:51
Mars	341°7.11	11:40
	189°43.78	21:43
Jupiter Saturn	331°4.34	12:19
Jupiter Saturn	331°4.34	
Jupiter Saturn Apr 16 Sun	331°4.34 SHA	Mer.pass
Jupiter Saturn Apr 16 Sun Venus	331°4.34 <b>SHA</b> 292°45.20	Mer.pass 14:50
Jupiter Saturn  Apr 16 Sun Venus Mars	331°4.34 <b>SHA</b> 292°45.20 340°24.58	Mer.pass 14:50 11:39
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter	331°4.34 SHA 292°45.20 340°24.58 189°48.41	Mer.pass 14:50 11:39 21:38
Jupiter Saturn  Apr 16 Sun Venus Mars	331°4.34 <b>SHA</b> 292°45.20 340°24.58	Mer.pass 14:50 11:39
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter	331°4.34 SHA 292°45.20 340°24.58 189°48.41	Mer.pass 14:50 11:39 21:38
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter Saturn	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10	Mer.pass 14:50 11:39 21:38 12:16
Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA	Mer.pass 14:50 11:39 21:38 12:16 Mer.pass
Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon Venus Mars	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA 291°59.68	Mer.pass 14:50 11:39 21:38 12:16 Mer.pass 14:49
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon Venus Mars Jupiter	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA 291°59.68 339°42.02	Mer.pass 14:50 11:39 21:38 12:16 Mer.pass 14:49 11:38
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon Venus Mars Jupiter Saturn	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA 291°59.68 339°42.02 189°52.90 330°49.85	Mer.pass 14:50 11:39 21:38 12:16  Mer.pass 14:49 11:38 21:34
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon Venus Mars Jupiter Saturn	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA 291°59.68 339°42.02 189°52.90 330°49.85 atal parallax	Mer.pass 14:50 11:39 21:38 12:16  Mer.pass 14:49 11:38 21:34 12:12
Jupiter Saturn  Apr 16 Sun Venus Mars Jupiter Saturn  Apr 17 Mon Venus Mars Jupiter Saturn	331°4.34 SHA 292°45.20 340°24.58 189°48.41 330°57.10 SHA 291°59.68 339°42.02 189°52.90 330°49.85	Mer.pass 14:50 11:39 21:38 12:16  Mer.pass 14:49 11:38 21:34

Dec

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.72	N09°52.70	286°33.67	9.1'	\$25°7.45	-4.2'	55.8'
1	194°59.87	53.59	301°1.76	9.2'	25°3.28	-4.3'	55.8'
2	210°0.02	54.48	315°29.93	9.2'	24°58.97	-4.4'	55.8'
3	225°0.17	• • 55.37	$329^{\circ}58.18$	9.3'	24° 54.54	-4.6'	55.7'
4	240°0.32	56.26	344°26.51	9.4'	24°49.99	-4.7'	55.7'
5	255°0.47	57.15	358° 54.92	9.5'	24°45.31	-4.8'	55.7'
6	270°0.62 285°0.77	N09°58.04	13°23.41	9.6'	\$24°40.51 24°35.59	-4.9'	55.6'
7 8	285°0.77 300°0.92	58.93 09° 59.82	27°51.99 42°20.64	9.7' 9.7'	24° 35.59 24° 30.54	-5.0' -5.2'	55.6' 55.6'
9	315°1.07	10° 0.71	56° 49.38	9.8'	24° 25.38	-5.2' -5.3'	55.5'
10	330°1.21	1.60	71° 18.20	9.9'	24°20.10	-5.4	55.5'
11	345°1.36	2.49	85°47.10	10.0'	24°14.70	-5.5'	55.5'
12	0°1.51	N10°3.38	100° 16.09	10.1'	S24°9.18	-5.6'	55.5'
13	15°1.66	4.27	114° 45.16	10.2'	24°3.55	-5.7'	55.4'
14	30°1.81	5.15	129° 14.31	10.2'	23°57.80	-5.9'	55.4'
15 16	45°1.96 60°2.10	· · 6.04 6.93	143°43.55 158°12.87	10.3' 10.4'	23°51.94 23°45.97	-6.0' -6.1'	55.4' 55.4'
17	75°2.25	7.82	172° 42.28	10.4	23°39.89	-6.2'	55.3'
18	90°2.40	N10°8.70	187° 11.77	10.6'	\$23°33.69	-6.3	55.3'
19	105°2.55	9.59	201°41.35	10.7'	23°27.39	-6.4	55.3'
20	120°2.69	10.47	$216^{\circ}11.01$	10.7'	23°20.97	-6.5'	55.2'
21	135°2.84	•• 11.36	230°40.75	10.8'	23° 14.45	-6.6'	55.2'
22	150°2.99	12.25	245°10.58	10.9'	23°7.82	-6.7'	55.2'
23	165°3.14	13.13	259° 40.50	11.0'	23°1.09	-6.8'	55.2'
	SD = 15.9'	d = 0.9'		SI	O = 15.2'		
<b>c</b>	CILA	D	GHA		D	.i	LID
Sun 0	<b>GHA</b> 180°3.28	<b>Dec</b> N10° 14.02	GHA 274°10.50	u  11.1'	Dec \$22° 54.26	d -6.9'	<b>HP</b> 55.1'
1	195°3.43	14.90	288° 40.58	11.1	22° 47.32	-0.9 -7.0'	55.1'
2	210°3.58	15.78	303° 10.75	11.3'	22°40.27	-7.1	55.1'
3	225°3.72	• • 16.67	$317^{\circ}41.01$	11.3'	22°33.13	-7.2'	55.1'
4	240°3.87	17.55	332° 11.35	11.4'	22°25.89	-7.3'	55.0'
5	255°4.01	18.43	346°41.77	11.5'	22° 18.54	-7.4	55.0'
6	270°4.16	N10°19.32	1°12.28	11.6'	\$22°11.10	-7.5'	55.0'
7 8	285°4.30 300°4.45	20.20 21.08	15° 42.87 30° 13.55	11.7' 11.8'	22°3.56 21°55.93	-7.6' -7.7'	55.0' 55.0'
9	315°4.59	21.06	44°44.31	11.8'	21° 48.20	-7.1 -7.8'	54.9'
10	330°4.74	22.85	59° 15.15	11.9'	21°40.20	-7.9'	54.9'
11	345°4.88	23.73	73°46.08	12.0'	21°32.46	-8.0'	54.9'
12	0°5.03	N10°24.61	88° 17.09	12.1'	S21°24.45	-8.1'	54.9'
13	15°5.17	25.49	$102^{\circ}48.18$	12.2'	$21^{\circ}16.35$	-8.2'	54.8'
14	30°5.32	26.37	117° 19.36	12.3'	21°8.16	-8.3'	54.8'
15	45°5.46 60°5.61	• • 27.25	131°50.61 146°21.95	12.3' 12.4'	20°59.88 20°51.51	-8.4'	54.8'
16 17	75°5.75	28.13 29.01	140 21.95 160°53.37	12.4	20° 51.51 20° 43.05	-8.5' -8.5'	54.8' 54.8'
18	90°5.89	N10° 29.89	175° 24.87	12.6'	\$20°34.51	-8.6'	54.7'
19	105°6.04	30.77	189° 56.45	12.7'	20°25.88	-8.7'	54.7'
20	120°6.18	31.65	204°28.11	12.7'	$20^{\circ}17.17$	-8.8'	54.7'
21	135°6.32	• • 32.53	$218^{\circ}59.85$	12.8'	20°8.38	-8.9'	54.7'
22	150°6.46	33.41	233°31.67	12.9'	19°59.50	-9.0'	54.7'
23	165°6.61	34.29	248°3.56	13.0'	19°50.54	-9.0'	54.6'
	SD = 15.9'	d = 0.9'		SI	O = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°6.75	N10°35.16	262° 35.54	13.1'	\$19°41.50	-9.1'	54.6'
1	195°6.89	36.04	277°7.59	13.1	19° 32.38	-9.2	54.6'
2	210°7.03	36.92	291°39.72	13.2'	$19^{\circ}23.19$	-9.3'	54.6'
3	225°7.18	• • 37.79	306° 11.92	13.3'	19° 13.91	-9.4'	54.6'
4	240°7.32	38.67	320°44.21	13.4'	19°4.56	-9.4'	54.6'
5 6	255°7.46 270°7.60	39.55 N10° 40.42	335°16.56 349°48.99	13.4' 13.5'	18°55.13 \$18°45.63	-9.5' -9.6'	54.5' 54.5'
7	270°7.60 285°7.74	41.30	349°48.99 4°21.50	13.6'	18° 36.05	-9.6° -9.7'	54.5'
8	300°7.88	42.17	18°54.08	13.7'	18° 26.40	-9.7'	54.5'
9	315°8.02	• • 43.05	33°26.73	13.7'	18° 16.68	-9.8'	54.5'
10	330°8.17	43.92	47° 59.45	13.8'	$18^{\circ}6.88$	-9.9'	54.5'
11	345°8.31	44.80	62°32.24	13.9'	17°57.02	-9.9'	54.4'
12	0°8.45	N10° 45.67	77°5.11	13.9'	\$17°47.08	-10.0'	54.4'
13 14	15°8.59 30°8.73	46.55 47.42	91°38.04 106°11.05	14.0' 14.1'	17°37.08 17°27.01	-10.1' -10.1'	54.4' 54.4'
14 15	30 8.73 45°8.87	• • 48.29	100 11.05 120°44.12	14.1'	17 27.01 17°16.87	-10.1 -10.2'	54.4' 54.4'
16	60°9.01	49.17	135° 17.26	14.2'	17° 6.67	-10.2	54.4'
17	75°9.15	50.04	149° 50.47	14.3'	16°56.40	-10.3	54.4'
18	90°9.29	N10°50.91	164°23.74	14.3'	<b>S</b> 16°46.06	-10.4'	54.3'
19	105°9.42	51.78	178°57.08	14.4'	16°35.67	-10.5'	54.3'
20	120°9.56	52.65	193°30.49	14.5'	16°25.20	-10.5'	54.3'
21 22	135°9.70 150°9.84	· · 53.52 54.40	208°3.96 222°37.49	14.5' 14.6'	16°14.68 16°4.10	-10.6'	54.3' 54.3'
23	150°9.84 165°9.98	54.40 55.27	222° 37.49 237° 11.09	14.6	15° 53.45	-10.6' -10.7'	54.3'
2.5	SD = 15.9'	d = 0.9'			D = 14.9'	10.1	31.3
	JD = 15.9′	$a = 0.9^{\circ}$		51	$J = 14.9^{\circ}$		

N   N   Civil   Civil   Naut.   N   Civil   Naut.   N   72°   //// 01:43   03:30   20:33   22:26   ////   N   70°   //// 02:24   03:48   20:14   21:41   //// 66°   01:29   03:12   04:14   19:47   20:51   22:39   66°   02:23   03:41   04:32   19:29   20:20   21:32   60°   02:50   03:53   04:39   19:22   20:09   21:12   N   58°   03:06   04:02   04:45   19:15   19:59   20:56   56°   03:19   04:10   04:51   19:10   19:51   20:43   54°   03:30   04:18   04:56   19:05   19:43   20:32   52°   03:39   04:24   05:00   19:00   19:36   20:22   50°   03:48   04:30   05:04   18:56   19:31   20:13   45°   04:05   04:42   05:13   18:47   19:18   19:56   N   40°   04:18   04:52   05:20   18:40   19:08   19:42   35°   04:29   05:00   05:26   18:34   19:00   19:31   30°   04:38   05:07   05:32   18:28   18:53   19:22   20°   04:52   05:18   05:41   18:19   18:41   19:08   N   10°   05:03   05:28   05:49   06:11   17:48   18:10   18:36   30°   05:28   05:56   06:20   17:39   18:03   18:24   18:48   S   10°   05:33   06:07   06:37   17:22   17:52   18:26   S   50°   05:34   06:12   06:45   17:14   17:47   18:24   52°   05:34   06:14   06:48   17:10   17:45   18:24   18:45   18:24   18:45   18:26   S   50°   05:34   06:14   06:48   17:10   17:45   18:24   18:45   18:24   18:44   18:44   18:44   18:44   18:44   18:44   18:44   18:45   18:50   18:27   17:52   18:26   S   50°   05:34   06:14   06:48   17:10   17:45   18:24   18:44   18	Lat.	Twi	light	Sunrise	Sunset	Twi	light	
N 70°         ////         02:24         03:48         20:14         21:41         ////           68°         ////         02:51         04:03         19:59         21:12         ////           66°         01:29         03:12         04:14         19:47         20:51         22:39           64°         02:06         03:28         04:24         19:38         20:34         21:59           62°         02:31         03:41         04:32         19:29         20:20         21:32           60°         02:50         03:35         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:43           52°         03:39         04:24         05:00         19:05         19:43         20:32           52°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:42           35°         04:29         05:00         <	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.	
68°         ////         02:51         04:03         19:59         21:12         ////           66°         01:29         03:12         04:14         19:47         20:51         22:39           64°         02:06         03:28         04:24         19:38         20:34         21:59           60°         02:50         03:53         04:39         19:29         20:20         21:32           60°         02:50         03:53         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00	N 72°	////	01:43	03:30	20:33	22:26	////	
66°         01:29         03:12         04:14         19:47         20:51         22:39           64°         02:06         03:28         04:24         19:38         20:34         21:59           62°         02:31         03:41         04:32         19:29         20:20         21:32           60°         02:50         03:53         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:34           54°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00	<b>N</b> 70°	////	02:24	03:48	20:14	21:41	////	
64°         02:06         03:28         04:24         19:38         20:34         21:59           62°         02:31         03:41         04:32         19:29         20:20         21:32           60°         02:50         03:53         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:43           52°         03:30         04:18         04:56         19:05         19:43         20:32           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18	68°	////	02:51	04:03	19:59	21:12	////	
62°         02:31         03:41         04:32         19:29         20:20         21:32           60°         02:50         03:53         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:43           52°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18		01:29	03:12	04:14	19:47	20:51	22:39	
60°         02:50         03:53         04:39         19:22         20:09         21:12           N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:43           54°         03:30         04:18         04:56         19:05         19:43         20:32           50°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:25	-	02:06	03:28	04:24	19:38	20:34	21:59	
N 58°         03:06         04:02         04:45         19:15         19:59         20:56           56°         03:19         04:10         04:51         19:10         19:51         20:43           54°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:26         18:34         19:00         19:31           30°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:18         05:42	_			04:32	19:29			
56°         03:19         04:10         04:51         19:10         19:51         20:43           54°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:28         05:49	60°	02:50	03:53	04:39	19:22	20:09	21:12	
54°         03:30         04:18         04:56         19:05         19:43         20:32           52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:28         05:56	N 58°	03:06	04:02	04:45	19:15	19:59	20:56	
52°         03:39         04:24         05:00         19:00         19:36         20:22           50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56	56°	03:19	04:10	04:51	19:10	19:51	20:43	
50°         03:48         04:30         05:04         18:56         19:31         20:13           45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59	54°	03:30	04:18	04:56	19:05	19:43	20:32	
45°         04:05         04:42         05:13         18:47         19:18         19:56           N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07	52°	03:39	04:24	05:00	19:00	19:36	20:22	
N 40°         04:18         04:52         05:20         18:40         19:08         19:42           35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:56         06:20         17:39         18:03         18:21           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07		03:48	04:30	05:04	18:56	19:31	20:13	
35°         04:29         05:00         05:26         18:34         19:00         19:31           30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:56         06:20         17:39         18:03         18:21           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           50°         05:34         06:12	45°	04:05	04:42	05:13	18:47	19:18	19:56	
30°         04:38         05:07         05:32         18:28         18:53         19:22           20°         04:52         05:18         05:41         18:19         18:41         19:08           N 10°         05:03         05:28         05:49         18:11         18:32         18:57           0°         05:11         05:35         05:56         18:03         18:24         18:48           S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:52         18:26           S 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24	<b>N</b> 40°	04:18	04:52	05:20	18:40	19:08	19:42	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	35°	04:29	05:00	05:26	18:34	19:00	19:31	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	30°	04:38	05:07	05:32	18:28	18:53	19:22	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		04:52	05:18	05:41	18:19	18:41	19:08	
S 10°         05:18         05:42         06:04         17:56         18:17         18:42           20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24	<b>N</b> 10°	05:03	05:28	05:49	18:11	18:32	18:57	
20°         05:23         05:49         06:11         17:48         18:10         18:36           30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24	0°	05:11	05:35	05:56	18:03	18:24	18:48	
30°         05:28         05:56         06:20         17:39         18:03         18:31           35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24		05:18	05:42	06:04	17:56	18:17	18:42	
35°         05:30         05:59         06:25         17:34         18:00         18:29           40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24	20°	05:23	05:49	06:11	17:48	18:10	18:36	
40°         05:31         06:03         06:30         17:28         17:56         18:27           45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24		05:28	05:56	06:20	17:39	18:03	18:31	
45°         05:33         06:07         06:37         17:22         17:52         18:26           \$ 50°         05:34         06:12         06:45         17:14         17:47         18:24           52°         05:34         06:14         06:48         17:10         17:45         18:24			05:59	06:25	17:34	18:00	18:29	
S 50°     05:34     06:12     06:45     17:14     17:47     18:24       52°     05:34     06:14     06:48     17:10     17:45     18:24		05:31	06:03	06:30	17:28	17:56	18:27	
52° 05:34 06:14 06:48 17:10 17:45 18:24	45°	05:33	06:07	06:37	17:22	17:52	18:26	
1 1 1 1000 1000 10000 10000 10000 10000	<b>S</b> 50°	05:34	06:12	06:45	17:14	17:47	18:24	
E40   0E.2E		05:34	06:14	06:48	17:10	17:45	18:24	
	54°	05:35	06:16	06:52	17:07	17:43	18:24	
56° 05:35 06:18 06:56 17:02 17:40 18:23		05:35	06:18	06:56	17:02	17:40	18:23	
58° 05:35 06:21 07:01 16:57 17:38 18:23								
<b>S</b> 60° 05:35 06:23 07:06 16:52 17:35 18:23	<b>S</b> 60°	05:35	06:23	07:06	16:52	17:35	18:23	

Lat.		Moonris	е	Moonset				
Lat.	Sat	Sun	Mon	Sat	Sun	Mon		
N 72°								
<b>N</b> 70°			05:22			08:18		
68°			04:34			09:06		
66°		04:25	04:02		07:36	09:36		
64°	03:52	03:44	03:39	06:23	08:16	09:58		
62°	03:06	03:16	03:20	07:10	08:43	10:16		
60°	02:35	02:54	03:05	07:39	09:05	10:31		
N 58°	02:13	02:37	02:52	08:02	09:22	10:43		
56°	01:54	02:22	02:40	08:20	09:36	10:54		
54°	01:38	02:09	02:30	08:36	09:49	11:03		
52°	01:25	01:57	02:21	08:49	10:00	11:12		
50°	01:13	01:47	02:13	09:01	10:10	11:19		
45°	00:48	01:26	01:56	09:25	10:30	11:35		
N 40°	00:28	01:09	01:42	09:44	10:46	11:48		
35°	00:11	00:54	01:30	10:00	11:00	11:59		
30°		00:41	01:20	10:14	11:12	12:09		
20°	••••	00:20	01:02	10:38	11:33	12:25		
N 10° 0°		00:01	00:46 10:58		11:50 12:07	12:40		
	23:43		00:31	11:17	12:53			
S 10°	23:25		00:16	11:36	12:23	13:06		
20°	23:06		00:00	11:56	12:40	13:20		
30° 35°	22:44 22:31	23:42 23:31	••••	12:19 12:32	13:00 13:12	13:36 13:45		
40°	22:31	23:31		12:32	13:12	13:45		
45°	21:59	23:04		13:07	13:41	14:08		
<b>S</b> 50°			00.55					
5 50°	21:37 21:26	22:46 22:37	23:55 23:49	13:29 13:40	14:00 14:09	14:23 14:30		
54°	21:20	22:37	23:49	13:40	14:09	14:30		
56°	21:00	22:20	23:34	14:07	14:19	14:46		
58°	20:44	22:05	23:25	14:24	14:43	14:56		
<b>S</b> 60°	20:24	21:50	23:15	14:44	14:58	15:07		

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-47%		
15	00:01	00:06	12:00	05:04	17:30			
16	00:13	00:20	12:00	05:55	18:19			
17	00:27	00:34	11:59	06:42	19:04			

h	Aries	, Ver	านร	M	ars	Jup	oiter	Sat	turn		Stars
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	206°38.22		N26°45.53	185° 37.67	N08°13.35	36°35.47	N05°53.32	177°20.82	N09° 35.96		
1	221°40.68	152°54.09	45.87	200°38.36	14.08	51°38.12	53.39	192°22.98	36.07	Alpheratz	
2	236° 43.15	167° 54.72	46.21	215°39.05	14.81	66°40.76	53.46	207°25.14	36.18	Ankaa	353°4.96 349°28.44
3	251°45.61	182°55.36	• • 46.54	230°39.74	• • 15.54	81°43.40	• • 53.53	222°27.30	• • 36.29	Schedar Diphda	349° 26.44 348° 44.95
4	266° 48.08	197°56.00	46.87	245°40.43	16.26	96°46.04	53.60	237°29.46	36.41	Achernar	335°18.86
5	281°50.54 296°53.00	212°56.65 227°57.29	47.21 N26°47.54	260°41.12	16.99	111°48.68	53.66	252°31.63	36.52 N09°36.63	Hamal	
6 7	290 53.00 311°55.47	242° 57.29	N20 47.54 47.87	275°41.81 290°42.50	N08°17.72 18.44	126°51.33 141°53.97	N05°53.73 53.80	267°33.79 282°35.95	36.74	Polaris	313°3.84
8	326° 57.93	257°58.59	48.20	305°43.19	19.17	156°56.61	53.87	297°38.11	36.85	Acamar	315°10.18
9	342°0.40	272°59.24	• • 48.53	320°43.88	• • 19.90	171°59.25	• • 53.94	312°40.27	• • 36.96	Menkar	314°3.66
10	357°2.86	287°59.90	48.86	335°44.57	20.62	$187^{\circ}1.89$	54.00	327°42.43	37.07	Mirfak Aldebaran	308°24.83 290°36.80
11	12°5.33	303°0.55	49.18	350°45.25	21.35	202°4.53	54.07	342°44.59	37.19	Rigel	281°1.52
12	27°7.79		N26°49.51	5° 45.94	N08°22.08	217°7.17	N05°54.14	357°46.76	N09°37.30	Capella	280°18.23
13 14	42° 10.25 57° 12.72	333°1.87 348°2.53	49.84 50.16	20°46.63 35°47.32	22.80 23.53	232° 9.81 247° 12.44	54.20 54.27	12°48.92 27°51.08	37.41 37.52	Bellatrix	278°20.22
15	72° 15.18	3°3.20	. 50.10	50° 48.01	24.26	262°15.08	• • 54.34	42°53.24	37.63	Elnath	277°58.71
16	87° 17.65	18°3.86	50.81	65°48.70	24.98	277°17.72	54.40	57°55.40	37.74	Alnilam	275°35.21
17	102°20.11	33°4.53	51.13	80°49.39	25.71	292°20.36	54.47	72°57.56	37.85	Betelgeuse	270°49.36
18	117°22.57	48°5.20	N26°51.45	95°50.08	N08°26.43	307°23.00	N05°54.54	87°59.73	N09°37.96	Canopus	263°51.43 258°24.00
19	132°25.04	63°5.87	51.77	110°50.77	27.16	322°25.64	54.60	103°1.89	38.07	Adhara	255°3.86
20	147°27.50	78°6.54	52.09	125°51.46	27.88	337°28.27	54.67	118°4.05	38.19	Procyon	244°48.08
21 22	162°29.97 177°32.43	93°7.22 108°7.90	• • 52.41 52.72	140°52.15 155°52.83	· · 28.61 29.33	352°30.91 7°33.55	• • 54.74 54.80	133°6.21 148°8.37	· · 38.30 38.41	Pollux	243°14.09
23	177 32.43 192°34.89	100 7.90 123°8.58	53.04	170° 53.52	30.05	22°36.19	54.87	163°10.53	38.52	Avior	234° 13.55
			-							Suhail	222°44.19
Mer.p	pass. 10:12	$\nu$ 0.6′ d0.3	3′ m-4.70	$\nu$ 0.7 d0	.7′ m1.15	$\nu$ 2.6′ d0.	.1′ m-2.36	$\nu^{2.2'}$ d0	.1′ m0.44	Miaplacidus Alphard	221°37.35 217°45.01
										Regulus	217 45.01 207°31.45
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.39
0	207°37.36	138°9.26	N26°53.35	185°54.21	N08°30.78	37°38.82	N05°54.93	178°12.69	N09°38.63	Denebola	$182^{\circ}21.97$
1 2	222°39.82 237°42.29	153°9.94 168°10.63	53.67 53.98	200° 54.90 215° 55.59	31.50 32.23	52°41.46 67°44.09	55.00 55.06	193°14.86 208°17.02	38.74 38.85	1	$175^{\circ}40.52$
3	257 42.29 252° 44.75	183°11.32	• • 54.30	230° 56.28	• • 32.25	82°46.73	. 55.13	200°17.02 223°19.18	38.96		172°56.34
4	267° 47.21	198° 12.01	54.61	245° 56.97	33.67	97°49.37	55.20	238°21.34	39.08		171°48.03
5	282°49.68	213°12.70	54.92	260°57.66	34.40	112°52.00	55.26	253°23.50	39.19		166°10.17 158°19.15
6	297°52.14	228°13.40	N26°55.23	275°58.34	N08°35.12	127°54.64	N05°55.33	268°25.66	N09°39.30		150° 19.13
7	312°54.61	243°14.09	55.54	290°59.03	35.84	142°57.27	55.39	283°27.82	39.41	Hadar	
8 9	327° 57.07 342° 59.53	258°14.79	55.84	305°59.72 321°0.41	36.57	157°59.90	55.46	298°29.98	39.52	Menkent	$147^{\circ}54.02$
10	342 59.53 358°2.00	273°15.49 288°16.19	• • 56.15 56.46	321 0.41 336°1.10	· · 37.29 38.01	173°2.54 188°5.17	• • 55.52 55.59	313°32.15 328°34.31	· · 39.63 39.74	1	145°45.15
11	13°4.46	303°16.90	56.76	351°1.79	38.73	203°7.81	55.65	343°36.47	39.85	Rigil Kent.	139°35.87
12	28°6.93	318° 17.60	N26°57.07	6°2.47	N08°39.46	218°10.44	N05°55.71	358°38.63	N09°39.96	Kochab	137°18.88 136°52.72
13	43°9.39	$333^{\circ}18.31$	57.37	21°3.16	40.18	233°13.07	55.78	13°40.79	40.07	Zuben'ubi Alphecca	130 52.72 126°1.17
14	58° 11.86	348° 19.02	57.67	36°3.85	40.90	248°15.71	55.84	28°42.95	40.19	Antares	112° 12.26
15	73°14.32	3°19.74	• • 57.98	51°4.54	• • 41.62	263°18.34	• • 55.91	43°45.11	• • 40.30	Atria	107°3.64
16 17	88° 16.78 103° 19.25	18°20.45 33°21.17	58.28 58.58	66°5.23 81°5.92	42.34 43.06	278°20.97 293°23.60	55.97 56.03	58°47.28 73°49.44	40.41 40.52	Sabik	101°59.48
18	103 19.25 118°21.71	48°21.89	N26°58.88	96°6.60	N08°43.79	308°26.24	N05°56.10	88°51.60	N09° 40.63	Shaula	96°6.49
19	133°24.18	63°22.61	59.17	111°7.29	44.51	323°28.87	56.16	103°53.76	40.74	Rasalhague	95°55.87
20	148° 26.64	78°23.34	59.47	126°7.98	45.23	338°31.50	56.22	118°55.92	40.85	Eltanin Kaus Aust.	90°40.67 83°28.81
21	$163^{\circ}29.10$	93°24.06	26°59.77	141°8.67	• • 45.95	353°34.13	• • 56.29	133°58.08	• • 40.96	Vega	80°31.25
22	178°31.57	108°24.79	27°0.06	156°9.36	46.67	8°36.76	56.35	149°0.24	41.07	Nunki	75°44.36
23	193°34.03	123°25.52	0.36	171°10.04	47.39	23°39.39	56.41	164°2.40	41.18	Altair	61°57.33
Mer.p	pass. 10:08	$\nu$ 0.7′ d0.3	3′ m-4.71	$ u$ 0.7 $^{\prime}$ d0	.7′ m1.16	$\nu$ 2.6′ d0.	1'  m-2.36	$\nu$ 2.2′ d0	.1' m0.44	Peacock	53°1.65
										Deneb	49°24.02
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.31
0	208° 36.50	138°26.25	N27° 0.65		N08°48.11	38°42.02	N05°56.48		N09°41.29	Al Na'ir Fomalhaut	27°29.87 15°11.86
1	223°38.96	153°26.99	0.94	201°11.42	48.83	53°44.65	56.54	194°6.73	41.41	Scheat	13°42.84
2	238° 41.42	168°27.72	1.23	216° 12.11	49.55	68°47.28	56.60	209°8.89	41.52	Markab	13°27.46
3	253° 43.89 268° 46.35	183°28.46 198°29.20	· · 1.52 1.81	231°12.79 246°13.48	• • 50.27 50.99	83°49.91 98°52.54	•• 56.67 56.73	224°11.05 239°13.21	· · 41.63 41.74	Apr 18 Tue	SHA
4 5	283° 48.82	213°29.95	2.10	240 13.46 261°14.17	50.99	96 52.54 113°55.17	56.79	259 15.21 254°15.37	41.74		291°15.23
6	298° 51.28	228°30.69	N27°2.39		N08°52.43	128°57.80	N05°56.85		N09°41.96		338°59.45
7	313°53.74	243°31.44	2.68	291°15.55	53.14	144°0.43	56.92	284°19.69	42.07	Jupiter	189°57.25
8	$328^{\circ}56.21$	258°32.19	2.96	$306^{\circ}16.23$	53.86	159°3.06	56.98	299°21.86	42.18	Saturn	330°42.60
9	343°58.67	273°32.94	• • 3.25	321°16.92	• • 54.58	174° 5.68	• • 57.04	314°24.02	• • 42.29	Apr 19 Wed	SHA
10	359°1.14 14°3.60	288°33.69 303°34.45	3.53 3.82	336° 17.61 351° 18.29	55.30 56.02	189°8.31 204°10.94	57.10 57.16	329°26.18 344°28.34	42.40		290°31.90
11 12	29°6.06	318° 35.21	3.62 N27°4.10	6°18.98	N08°56.74	204 10.94 219°13.57	57.16 N05°57.22	359°30.50	42.51 N09°42.62	Mars	$338^{\circ}16.85$
13	44°8.53	333°35.97	4.38	21° 19.67	57.45	219 13.57 234°16.19	57.29	14°32.66	42.74	Jupiter	190°1.46
14	59° 10.99	348°36.73	4.66	36°20.36	58.17	249°18.82	57.35	29°34.82	42.85	Saturn	330°35.34
15	$74^{\circ}13.46$	3°37.50	• • 4.94	51°21.04	• • 58.89	264°21.45	• • 57.41	44°36.98	• • 42.96	Apr 20 Thu	SHA
16	89° 15.92	18°38.26	5.22	66°21.73	08°59.61	279°24.07	57.47	59°39.14	43.07	Venus	289°49.76
17	104° 18.38	33°39.03	5.50	81°22.42	09°0.32	294°26.70	57.53	74°41.31	43.18		337°34.24
18 19	119°20.85 134°23.31	48°39.80 63°40.58	N27°5.78 6.05	96°23.10 111°23.79	N09° 1.04 1.76	309°29.32 324°31.95	N05°57.59 57.65	89°43.47 104°45.63	N09°43.29 43.40	Jupiter	190°5.53
20	134 23.31 149°25.78	78° 41.35	6.33	111 23.79 126° 24.48	2.47	324 31.95 339°34.57	57.05 57.71	104 45.03 119°47.79	43.40	Saturn	330°28.07
21	164°28.24	93°42.13	. 6.60	141°25.17	3.19	354°37.20	•• 57.77	134°49.95	• • 43.62	Horizor	ntal parallax
22	179°30.70	$108^{\circ}42.91$	6.87	$156^{\circ}25.85$	3.91	9°39.82	57.83	149°52.11	43.73		Venus:
23	194°33.17	123°43.70	7.15	171°26.54	4.62	24°42.45	57.89	164°54.27	43.84		Mars:
Mer.r	pass. 10:04	$\nu$ 0.7′ d0.3	3′ m-4.71	$\nu 0.7' d0$	.7′ m1.16	$\nu 2.6' \ d0$	.1′ m-2.35	$\nu 2.2' d0$	.1′ m0.43		

Dec

29°14.71 -42°9.04

56°41.47

-17°49.88

-57°5.55

 $23^{\circ}35.71$ 

89°23.02

-40°11.57

4°11.95

49°57.69 16°33.88

-8°10.32

 $46^{\circ}1.59$  $6^{\circ}22.38$ 

28°37.82

 $-1^{\circ}11.20$ 7°24.59 -52°42.96

-16°45.56 -29°0.94

5°8.96 27°57.40

-59°36.40

-43°33.19 -69°50.39

-8°47.15

11°49.56

61°35.93

 $14^{\circ}24.67$ 

 $-17^{\circ}42.19$ 

-63°15.61 -57°16.55

55°48.30 -11°18.73

49°10.19 -60°30.65

-36°30.68

 $-60^{\circ}57.18$ 

 $19^{\circ}1.93$ 

 $74^{\circ}2.17$ 

 $-16^{\circ}9.68$ 

26°36.98 -26°29.67

-69°4.46

-15°45.59  $-37^{\circ}7.32$ 

 $12^{\circ}32.23$ 

51°28.83

-34°22.10 38°48.35

-26°15.56

8°56.51

-56°38.30 45°22.65

 $10^{\circ}0.23$ 

-46°49.20 -29°28.22

28°14.07 15°21.38

Mer.pass

14:48

11:37

21:30

12:09 Mer.pass 14:47

11:36 21:26

12:05 Mer.pass

14:46

11:35

21:21

12:02

0.3

0.1

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.12	N10°56.14	251°44.74	14.7'	S15°42.75	-10.8'	54.3'
1	195°10.26	57.01	266°18.46	14.8'	15°31.99	-10.8'	54.3'
2	210°10.39	57.88	280°52.24	14.8'	15°21.16	-10.9'	54.3'
3	225°10.53	• • 58.75	295°26.08	14.9'	15°10.29	-10.9'	54.2'
4	240°10.67	10°59.62	309°59.97	15.0'	14°59.35	-11.0'	54.2'
5	255°10.81 270°10.94	11°0.48 N11°1.35	324°33.93 339°7.94	15.0' 15.1'	14°48.36 \$14°37.32	-11.0' -11.1'	54.2' 54.2'
6 7	270 10.94 285°11.08	2.22	353°42.00	15.1	14°26.22	-11.1	54.2'
8	300°11.22	3.09	8°16.13	15.2'	14°15.07	-11.2'	54.2'
9	315°11.35	3.96	22°50.30	15.2'	14°3.86	-11.3'	54.2'
10	330°11.49	4.82	37°24.53	15.3'	13°52.60	-11.3'	54.2'
11	345°11.63	5.69	51°58.81	15.3'	13°41.30	-11.4'	54.2'
12	0°11.76	N11°6.56	66°33.15	15.4'	\$13°29.94	-11.4'	54.2'
13	15°11.90	7.42	81°7.53	15.4'	13°18.53	-11.5'	54.2'
14 15	30°12.03 45°12.17	8.29 •• 9.16	95°41.97 110°16.45	15.5' 15.5'	13°7.08 12°55.57	-11.5' -11.6'	54.2' 54.1'
16	60°12.30	10.02	110 10.45 124°50.98	15.6'	12 55.57 12°44.02	-11.6'	54.1'
17	75°12.44	10.89	139°25.56	15.6'	12° 32.42	-11.6'	54.1'
18	90°12.57	N11°11.75	154°0.19	15.7'	\$12°20.78	-11.7'	54.1'
19	105°12.71	12.61	168°34.86	15.7'	12°9.09	-11.7'	54.1'
20	120°12.84	13.48	$183^{\circ}9.58$	15.8'	$11^{\circ}57.36$	-11.8'	54.1'
21	135°12.98	• • 14.34	197°44.34	15.8'	11°45.58	-11.8'	54.1'
22	150°13.11	15.21	212°19.14	15.8'	11°33.76	-11.9'	54.1'
23	165°13.25	16.07	226°53.98	15.9'	11°21.90	-11.9'	54.1'
	SD = 15.9'	d = 0.9'		SI	O = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
oveu 0	180°13.38	N11°16.93	241°28.87	ν 15.9'	S11°10.00	-11.9'	54.1'
1	195°13.51	17.79	256°3.79	16.0'	10°58.05	-12.0'	54.1'
2	210°13.65	18.66	270°38.76	16.0'	10°46.07	-12.0'	54.1'
3	225°13.78	•• 19.52	285°13.76	16.0'	10°34.05	-12.1'	54.1'
4	240°13.91	20.38	299°48.80	16.1'	10°21.99	-12.1'	54.1'
5	255°14.05	21.24	314°23.88	16.1'	10°9.89	-12.1'	54.1'
6	270°14.18	N11°22.10	328°58.99	16.1'	\$09°57.75	-12.2'	54.1'
7	285°14.31 300°14.44	22.96 23.82	343°34.13 358°9.31	16.2' 16.2'	09°45.57 09°33.36	-12.2' -12.2'	54.1' 54.1'
8 9	315°14.58	24.68	12°44.53	16.2	09°33.30	-12.2	54.1'
10	330°14.71	25.54	27°19.77	16.3	09°21.12	-12.3'	54.1'
11	345°14.84	26.40	41°55.04	16.3'	08°56.53	-12.3'	54.1'
12	0°14.97	N11°27.26	56°30.35	16.3'	508°44.18	-12.4'	54.1'
13	15°15.10	28.12	71°5.68	16.4'	08°31.80	-12.4'	54.1'
14	30°15.23	28.98	85°41.04	16.4'	08°19.39	-12.4'	54.1'
15	45°15.36	• • 29.84	100°16.42	16.4'	08°6.95	-12.5'	54.1'
16	60°15.50 75°15.63	30.69	114°51.84	16.4' 16.5'	07°54.47	-12.5'	54.1'
17 18	75 15.63 90°15.76	31.55 N11°32.41	129°27.27 144°2.73	16.5	07°41.97 507°29.44	-12.5' -12.6'	54.1' 54.1'
19	105°15.89	33.26	158°38.22	16.5	07°16.88	-12.6'	54.1'
20	120°16.02	34.12	173°13.72	16.5	07°4.29	-12.6'	54.1'
21	135°16.15	• • 34.98	187°49.25	16.5'	06°51.68	-12.6'	54.1'
22	150°16.28	35.83	202°24.80	16.6'	06°39.03	-12.7'	54.1'
23	165°16.41	36.69	217°0.36	16.6'	06°26.37	-12.7'	54.1'
	SD = 15.9'	d = 0.9'		SI	O = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.54	N11°37.54	231°35.95	16.6'	S06°13.67	-12.7'	54.1'
1	195°16.66	38.40	246°11.55	16.6'	06°0.95	-12.7'	54.1'
2	210°16.79	39.25	260°47.16	16.6'	05°48.21	-12.8'	54.1'
3	225°16.92 240°17.05	• • 40.10	275°22.80	16.6'	05°35.45	-12.8'	54.1'
4 5	240°17.05 255°17.18	40.96 41.81	289°58.44 304°34.10	16.7' 16.7'	05°22.66 05°9.85	-12.8' -12.8'	54.1' 54.1'
6	255°17.18 270°17.31	41.81 N11°42.66	304°34.10 319°9.77	16.7	504°57.02	-12.8'	54.1'
7	285°17.43	43.52	333°45.46	16.7	04°44.17	-12.9'	54.1'
8	300°17.56	44.37	348°21.15	16.7'	04°31.30	-12.9'	54.1'
9	315°17.69	• • 45.22	$2^{\circ}56.85$	16.7'	04°18.41	-12.9'	54.1'
10	330°17.82	46.07	17°32.56	16.7'	04°5.50	-12.9'	54.1'
11	345°17.94	46.92	32°8.28	16.7	03°52.58	-12.9'	54.1'
12	0°18.07	N11°47.78	46°44.00	16.7'	\$03°39.63	-13.0'	54.1'
13 14	15°18.20 30°18.33	48.63 49.48	61°19.73 75°55.47	16.7' 16.7'	03°26.67 03°13.70	-13.0' -13.0'	54.1' 54.1'
14 15	30° 18.33 45° 18.45	49.48 •• 50.33	90°31.20	16.7	03°13.70	-13.0' -13.0'	54.1' 54.1'
16	60°18.58	51.18	105°6.94	16.7	03 0.70 02°47.70	-13.0'	54.1
17	75°18.70	52.03	119°42.68	16.7	02°34.68	-13.0'	54.1'
18	90°18.83	N11°52.87	134°18.42	16.7'	S02°21.65	-13.0'	54.2'
19	105°18.96	53.72	148°54.17	16.7'	02°8.60	-13.1'	54.2'
20	120°19.08	54.57	163°29.90	16.7'	01°55.54	-13.1'	54.2'
21	135°19.21	• • 55.42	178°5.64	16.7'	01°42.47	-13.1'	54.2'
22 23	150°19.33 165°19.46	56.27 57.11	192°41.37 207°17.10	16.7' 16.7'	01°29.39 01°16.30	-13.1' -13.1'	54.2' 54.2'
23			201 11.10			-13.1	34.2
	SD = 15.9'	d = 0.9'		SI	D = 14.7'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-21%		
18	00:40	00:47	11:59	07:26	19:47			
19	00:54	01:00	11:59	08:08	20:28			
20	01:06	01:12	11:59	08:48	21:08			

h	Aries	Venus	· ,	Mars	Jup	oiter	Sa	turn		Stars	
Fri	GHA	GHA Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	209°35.63	138°44.48 N27°			39°45.07	N05°57.95	179°56.43	N09°43.95			
1	224°38.10		7.69 201°27.		54°47.70	58.01	194°58.59	44.06	Alpheratz		29°14.71
2	239° 40.56		7.96 216°28.		69°50.32	58.07	210°0.76	44.17	Ankaa	353°4.95	-42°9.02
3	254°43.03	183°46.85 · ·	3.23 231°29.	29 • • 7.49	84°52.94	• • 58.13	225°2.92	• • 44.29	Schedar	349°28.43 348°44.95	56°41.46 -17°49.87
4	269°45.49	198°47.64	3.50 246°29.	97 8.20	99°55.57	58.19	240°5.08	44.40	Diphda	335° 18.86	-17 49.87 -57°5.53
5	284° 47.95		3.76 261°30.	66 8.92	114°58.19	58.25	255°7.24	44.51	Hamal	327°48.50	23°35.71
6	299°50.42	228°49.24 N27°			130° 0.81	N05°58.31	270°9.40	N09°44.62	Polaris	313°4.29	89°23.01
7	314°52.88		9.29 291°32.		145° 3.43	58.37	285°11.56	44.73	Acamar	315° 10.19	-40°11.56
8	329° 55.35		9.56 306°32.		160°6.06	58.43	300°13.72	44.84	Menkar	314°3.66	4°11.95
9	344°57.81	273°51.65 · · ·			175°8.68	• • 58.49	315°15.88	• • 44.95	Mirfak	308°24.84	49°57.68
10 11	0°0.27 15°2.74		).08 336°34. ).34 351°34.		190°11.30 205°13.92	58.55 58.61	330°18.04 345°20.21	45.06 45.17	Aldebaran	290°36.82	16°33.88
12	30°5.20	318°54.08 N27°1			200° 16.54	N05°58.67	0°22.37	N09° 45.28	Rigel	281°1.53	-8°10.32
13	45°7.67		0.86 21°36.		235°19.16	58.73	15°24.53	45.39	Capella	280° 18.25	46°1.59
14	60° 10.13		1.12 36°36.		250°21.78	58.78	30°26.69	45.50	Bellatrix	278°20.23	6°22.38
15	$75^{\circ}12.59$	3°56.53 · · 1	.38 51°37.	52 •• 16.06	265°24.40	• • 58.84	45°28.85	• • 45.61	Elnath	277°58.73	28°37.82
16	$90^{\circ}15.06$	18°57.35 1	64 66°38.	21 16.77	280°27.02	58.90	60°31.01	45.72	Alnilam	275° 35.22 270° 49.38	-1°11.20 7°24.59
17	$105^{\circ}17.52$		.89 81°38.		295°29.64	58.96	75°33.17	45.83	Betelgeuse Canopus	263°51.45	-52°42.96
18	120° 19.99	48°59.00 N27°1			310°32.26	N05°59.02	90°35.33	N09°45.94	Sirius	258°24.02	-16°45.56
19	135°22.45		2.40 111°40.		325°34.88	59.07	105°37.49	46.05	Adhara	255°3.88	-29°0.93
20	150°24.91		2.66 126°40.		340°37.50	59.13	120°39.65	46.16	Procyon	244°48.10	5°8.96
21 22	165°27.38	94°1.50 · · 1: 109°2.33			355°40.12	• • 59.19	135°41.82	• • 46.28	Pollux	243°14.11	27°57.40
23	180° 29.84 195° 32.31		3.16 156°42. 3.41 171°43.		10°42.74 25°45.35	59.25 59.30	150°43.98 165°46.14	46.39 46.50	Avior	$234^{\circ}13.59$	-59°36.40
	195 52.51	-							Suhail	222°44.21	-43°33.19
Mer. <sub>l</sub>	pass. 10:00	$\nu$ 0.8′ d0.3′ m-4.	$\nu^{0.7'}$ $\nu^{0.7'}$	d0.7′ m1.17	$\nu 2.6' d0$	.1′ m-2.35	$\nu^{2.2'} d0$	.1′ m0.43	Miaplacidus	221°37.40	-69°50.39
										217°45.03 207°31.46	-8°47.14 11°49.56
Sat	GHA	GHA Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	193°37.41	61°35.95
0	210°34.77	139°4.01 N27°1			40°47.97	N05°59.36	180°48.30	N09°46.61	Denebola	182°21.98	14°24.67
1	225°37.23		3.91 201°44.		55°50.59	59.42	195°50.46	46.72	Gienah	175°40.53	-17°42.19
2	240°39.70		1.16 216°45.		70°53.21	59.48	210°52.62	46.83	Acrux	$172^{\circ}56.35$	-63°15.62
3 4	255° 42.16 270° 44.63	184°6.55 · · 1 199°7.40 1	1.40 231°45. 1.65 246°46.		85°55.82 100°58.44	• • 59.53 59.59	225°54.78 240°56.94	· · 46.94		171°48.04	-57°16.56
5	285° 47.09		1.89 261°47.		116° 1.06	59.59	255°59.10	47.05 47.16		166° 10.18	55°48.32
6	300° 49.55	229°9.10 N27°1			131° 3.67	N05°59.70	271°1.26	N09°47.27	Spica	158° 19.15	-11°18.73
7	315°52.02		5.38 291°48.		146° 6.29	59.76	286°3.43	47.38	Alkaid	152°49.47 148°31.45	49°10.20 -60°30.67
8	330°54.48	259°10.82	5.62 306°49.	18 28.15	161°8.90	59.82	301°5.59	47.49	Hadar Menkent	146 31.43 147°54.02	-36°30.69
9	345° 56.95	274°11.68 · · 1			176°11.52	• • 59.87	316°7.75	• • 47.60		145°45.15	19°1.94
10	0°59.41		5.10 336°50.		191°14.14	05°59.93	331°9.91	47.71		139°35.86	-60°57.19
11	16°1.87		5.34 351°51.		206°16.75	05°59.98	346°12.07	47.82		$137^{\circ}18.86$	74°2.18
12 13	31°4.34 46°6.80	319°14.28 N27°1 334°15.15 1	5.58 6°51. 5.82 21°52.		221°19.36 236°21.98	N06°0.04 0.10	1°14.23 16°16.39	N09°47.93 48.04		136°52.71	-16°9.68
14	61°9.27		7.06 36°53.		251°24.59	0.10	31°18.55	48.15	Alphecca	126°1.16	26°36.99
15	76°11.73	4°16.90 · · 1			266°27.21	0.21	46°20.71	48.26		112°12.24	-26°29.67
16	91° 14.19		7.53 66°54.		281°29.82	0.26	61°22.87	48.37	Atria	107°3.60 101°59.47	-69°4.47
17	$106^{\circ}16.66$		7.76 81°55.	34.54	296°32.43	0.32	76°25.03	48.48	Sabik Shaula	96°6.47	-15°45.59 -37°7.32
18	121° 19.12	49°19.55 N27°1	3.00 96°56.	03 N09°35.24	311°35.05	N06°0.37	91°27.20	N09°48.59	Rasalhague	95°55.86	12°32.24
19	136°21.59		3.23 111°56.		326°37.66	0.43	106°29.36	48.70	Eltanin	90°40.64	51°28.84
20	151°24.05		3.46 126°57.		341°40.27	0.48	121°31.52	48.81	Kaus Aust.	83°28.79	-34°22.10
21 22	166° 26.51 181° 28.98	94°22.21 · · 18 109°23.11 18	3.69 141°58. 3.92 156°58.		356°42.88 11°45.50	· · 0.54 0.59	136°33.68 151°35.84	• • 48.92 49.03	Vega	80°31.23	38°48.36
23	196°31.44		9.15 171°59.		26°48.11	0.59	166°38.00	49.03	Nunki	75°44.34	-26°15.56
									Altair	61°57.31	8°56.51
Mer. <sub>l</sub>	pass. 09:56	$\nu$ 0.8′ d0.2′ m-4.	$\frac{72}{100} = \frac{\nu_0.7'}{100}$	d0.7′ m1.17	$\nu 2.6' d0$	.1′ m-2.34	$\nu^{2.2'} d0$	.1′ m0.44	Peacock Deneb	53°1.62 49°24.00	-56°38.30 45°22.65
									Enif	33°36.29	10°0.23
Sun	GHA	GHA Dec		Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.85	-46°49.19
0	211°33.91	139°24.90 N27°1			41°50.72	N06°0.70	181°40.16		Fomalhaut	15° 11.85	-29°28.21
1	226°36.37		9.60 202°0.		56°53.33	0.76	196°42.32	49.36	Scheat	$13^{\circ}42.82$	28°14.07
2	241°38.83		9.83 217°1.		71°55.94	0.81	211°44.48	49.47	Markab	13°27.44	15°21.38
3 4	256° 41.30 271° 43.76	184°27.61 · · 20 199°28.52 20	).05 232°2. ).28 247°2.		86°58.55 102°1.16	· · 0.86 0.92	226°46.64 241°48.80	· · 49.58 49.69	Apr 21 Fri	SHA	Mer.pass
5	286° 46.23		0.50 262°3.		102 1.10 117°3.77	0.92	256°50.96	49.80	Venus	289°8.85	14:44
6	301°48.69	229°30.34 N27°2			132° 6.38	N06°1.02	271°53.13	N09°49.91	Mars		11:34
7	316°51.16		).94 292°4.		147° 8.99	1.08	286°55.29	50.02	Jupiter	190°9.44	21:17
8	331°53.62	259°32.18 2	1.16 307°5.	61 45.14	162°11.60	1.13	301°57.45	50.13	Saturn	330°20.80	11:59
9	346° 56.08	274°33.10 · · · 2			177°14.21	• • 1.19	316°59.61	• • 50.24	Apr 22 Sat	SHA	Mer.pass
10	1°58.55		1.60 337°6.		192°16.82	1.24	332°1.77	50.35	Venus	288°29.24	14:43
11	17°1.01		1.82 352°7.		207°19.43	1.29 N06°1.24	347°3.93	50.46	Mars	336°8.92	11:33
12 13	32°3.48 47°5.94	319°35.88 N27°2 334°36.81 2	2.03 7°8. 2.25 22°9.		222°22.03 237°24.64	N06°1.34 1.40	2°6.09 17°8.25	N09° 50.57 50.68		$190^{\circ}13.20$	21:13
14	62°8.40		2.25 22 9. 2.46 37°9.		252°27.25	1.40	32°10.41	50.06	Saturn	330° 13.53	11:55
15	77° 10.87	4°38.68 · · 2			267°29.86	• • 1.50	47°12.57	• • 50.90	Apr 23 Sun	SHA	Mer.pass
16	92° 13.33		2.89 67°11.		282°32.46	1.55	62°14.73	51.01		287°50.99	14:41
17	$107^{\circ}15.80$		3.10 82°11.	76 51.48	297°35.07	1.61	77°16.90	51.12		335°26.23	11:31
18	122° 18.26	49°41.50 N27°2			312°37.68	N06°1.66	92°19.06	N09°51.23		$190^{\circ}16.81$	21:09
19	137°20.72		3.52 112°13.		327°40.28	1.71	107°21.22	51.34	Saturn	330°6.25	11:52
20	152°23.19		3.73 127°13.		342°42.89	1.76	122°23.38	51.45	Horizor	ıtal parallax	
21 22	167°25.65 182°28.12	94°44.35 · · 2 109°45.30 2	3.94 142°14. 1.15 157°15.		357°45.49 12°48.10	· · 1.82 1.87	137°25.54 152°27.70	· · 51.56 51.67	1.0.1201	Venus:	0.3
23	197°30.58		1.35 172°15.		27°50.70	1.92	167°29.86	51.78		Mars:	0.1
		ν0.9' d0.2' m-4.		d0.7' m1.18		.1′ m-2.33		.1′ m0.44			
ivier.	pass. 09:52	νυ.σ αυ.Ζ III-4.	$\frac{\nu_0.7}{2}$	00.1 IIII.10	ν2.0 a0	.111-2.33	ν ∠. Δ · d ·	.1 1110.44			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.58	N11°57.96	221°52.82	16.7'	S01°3.21	-13.1'	54.2'
1 2	195°19.70 210°19.83	58.81 11° 59.65	236°28.54 251°4.25	16.7' 16.7'	00°50.10 00°36.99	-13.1' -13.1'	54.2' 54.2'
3	210 19.65 225°19.95	11 59.05 12°0.50	265°39.95	16.7	00° 23.86	-13.1'	54.2'
4	240°20.08	1.35	280°15.64	16.7'	S00°10.74	-13.1'	54.2'
5	255°20.20	2.19	294°51.32	16.7'	N00°2.40	13.1'	54.2'
6 7	270°20.32 285°20.45	N12°3.04 3.88	309°26.99 324°2.65	16.7' 16.6'	N00°15.54 00°28.68	13.1' 13.1'	54.2' 54.3'
8	300°20.57	4.72	338° 38.29	16.6'	00°28.08	13.1	54.3'
9	315°20.69	• • 5.57	353° 13.92	16.6'	$00^{\circ}54.98$	13.2'	54.3'
10	330°20.82	6.41	7°49.53	16.6'	01°8.13	13.2'	54.3'
11 12	345°20.94 0°21.06	7.25 N12°8.10	22°25.13 37°0.71	16.6' 16.6'	01°21.28 N01°34.44	13.2' 13.2'	54.3' 54.3'
13	15°21.18	8.94	51°36.27	16.5	01°47.59	13.2'	54.3'
14	30°21.30	9.78	66°11.82	16.5'	02°0.74	13.2'	54.3'
15 16	45°21.43 60°21.55	· · 10.62 11.46	80°47.34 95°22.84	16.5' 16.5'	02°13.89 02°27.04	13.1' 13.1'	54.3' 54.3'
17	75°21.67	12.31	109° 58.32	16.5	02° 40.19	13.1	54.4'
18	90°21.79	N12° 13.15	124°33.77	16.4	N02°53.33	13.1'	54.4'
19	105°21.91	13.99	139°9.20	16.4'	03°6.47	13.1'	54.4'
20 21	120°22.03 135°22.15	14.83 •• 15.67	153° 44.61 168° 19.99	16.4' 16.4'	03°19.60 03°32.73	13.1' 13.1'	54.4' 54.4'
22	150°22.27	16.51	182° 55.34	16.3	03°45.85	13.1	54.4'
23	165°22.39	17.34	197°30.67	16.3'	03°58.97	13.1'	54.4'
	SD = 15.9'	d = 0.8'		SI	D = 14.8'		
_							
Sat 0	<b>GHA</b> 180°22.51	<b>Dec</b> N12° 18.18	<b>GHA</b> 212°5.96	u 16.3'	<b>Dec</b> N04°12.07	d 13.1'	<b>HP</b> 54.4'
1	195°22.63	19.02	212 5.90 226°41.23	16.2	04°25.17	13.1	54.5
2	210°22.75	19.86	241°16.47	16.2'	04°38.25	13.1'	54.5'
3	225°22.87 240°22.99	• • 20.70	255°51.67	16.2'	04°51.33	13.1'	54.5'
4 5	240 22.99 255°23.11	21.53 22.37	270°26.84 285°1.98	16.1' 16.1'	05°4.39 05°17.44	13.1' 13.0'	54.5' 54.5'
6	270°23.23	N12°23.21	299°37.08	16.1	N05°30.48	13.0'	54.5'
7	285°23.35	24.04	314° 12.14	16.0'	05°43.51	13.0'	54.5'
8 9	300°23.46 315°23.58	24.88 •• 25.71	328° 47.17 343° 22.16	16.0' 16.0'	05°56.52 06°9.52	13.0' 13.0'	54.5' 54.6'
10	330°23.70	26.55	357° 57.12	15.9'	06° 22.49	13.0'	54.6'
11	345°23.82	27.38	12°32.03	15.9'	06°35.46	12.9'	54.6'
12	0°23.93	N12°28.22	27°6.90	15.8'	N06°48.40	12.9'	54.6'
13 14	15°24.05 30°24.17	29.05 29.89	41°41.73 56°16.52	15.8' 15.7'	07°1.33 07°14.23	12.9' 12.9'	54.6' 54.6'
15	45°24.29	30.72	70°51.27	15.7'	07°27.12	12.9'	54.6'
16	60°24.40	31.55	85°25.97	15.7'	07°39.98	12.8'	54.7'
17 18	75°24.52 90°24.64	32.39 N12°33.22	100°0.62 114°35.23	15.6' 15.6'	07°52.82 N08°5.64	12.8' 12.8'	54.7' 54.7'
19	105°24.75	34.05	114 35.23 129°9.80	15.5'	08° 18.44	12.8	54.7'
20	120°24.87	34.88	143°44.31		$08^{\circ}31.21$	12.7'	54.7'
21	135°24.98	• • 35.71	158° 18.78	15.4	08°43.95	12.7'	54.7'
22 23	150°25.10 165°25.21	36.54 37.37	172°53.19 187°27.56	15.4' 15.3'	08°56.67 09°9.36	12.7' 12.7'	54.8' 54.8'
23	SD = 15.9'	d = 0.8'	101 21.50		D = 14.8'	12.7	31.0
	<u>JD = 13.9</u>	<u>u = 0.0</u>		ال	D = 14.0		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°25.33 195°25.44	N12°38.20 39.03	202°1.87 216°36.13	15.3' 15.2'	N09°22.02 09°34.65	12.6' 12.6'	54.8' 54.8'
2	210°25.56	39.03 39.86	210 30.13 231°10.34	15.2'	09° 47.26	12.6'	54.8'
3	225°25.67	• • 40.69	245°44.50	15.1'	09°59.83	12.5'	54.8'
4	240°25.79	41.52	260°18.59	15.0'	10°12.37	12.5'	54.9'
5 6	255°25.90 270°26.01	42.35 N12°43.18	274°52.64 289°26.62	15.0' 14.9'	10°24.87 N10°37.34	12.5' 12.4'	54.9' 54.9'
7	285°26.13	44.00	304° 0.55	14.9'	10° 49.78	12.4	54.9
8	300°26.24	44.83	318°34.42	14.8'	11°2.18	12.4'	54.9'
9 10	315°26.35 330°26.47	•• 45.66 46.48	333°8.23 347°41.98	14.7' 14.7'	11°14.55 11°26.87	12.3' 12.3'	54.9' 55.0'
10	330 26.47 345°26.58	46.48 47.31	347 41.98 2°15.66	14.7° 14.6'	11 26.87 11°39.16	12.3'	55.0'
12	0°26.69	N12°48.14	16°49.29	14.6'	N11°51.41	12.2'	55.0'
13	15°26.80	48.96	31°22.85	14.5'	12°3.61	12.2'	55.0'
14 15	30°26.92 45°27.03	49.79 •• 50.61	45°56.35 60°29.79	14.4' 14.4'	12°15.78 12°27.90	12.1' 12.1'	55.0' 55.0'
16	60°27.14	51.44	75°3.16	14.3'	12° 39.98	12.1	55.1'
17	75°27.25	52.26	89°36.46	14.2'	12°52.01	12.0'	55.1'
18	90°27.36 105°27.47	N12°53.08 53.91	104°9.70 118°42.87	14.2' 14.1'	N13°4.00 13°15.94	11.9' 11.9'	55.1'
19 20	105°27.47 120°27.58	53.91 54.73	118° 42.87 133° 15.97	14.1	13° 15.94 13° 27.83	11.9'	55.1' 55.1'
21	135°27.70	• • 55.55	147°49.00	14.0'	13°39.67	11.8'	55.1'
22	150°27.81	56.37	162°21.96	13.9'	13°51.47	11.7'	55.2'
23	165°27.92	57.19	176°54.85	13.8'	14°3.21	11.7'	55.2'
	SD = 15.9'	d = 0.8'		SI	D = 14.9'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
24,5	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-3%	
21	01:18	01:24	11:59	09:28	21:48		
22	01:30	01:36	11:58	10:08	22:29		
23	01:41	01:47	11:58	10:51	23:13		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	212°33.04	139°47.22 N27°24.56	187°16.55 N09°56.41	42°53.31 N06°1.97	182°32.02 N09°51.89	
1	227°35.51	154°48.18 24.76	202° 17.23 57.11	57°55.91 2.02	197° 34.18 52.00	Alpheratz 357°32.27 29°14.71 Ankaa 353°4.94 -42°9.01
2	242°37.97	169°49.15 24.97	217° 17.91 57.81	72°58.52 2.07	212°36.34 52.11	Schedar 349°28.41 56°41.45
3	257° 40.44	184°50.11 · · 25.17	232°18.60 · · 58.51	88°1.12 · · 2.12	227°38.50 · · 52.22	Diphda 348°44.94 -17°49.86
4 5	272° 42.90 287° 45.36	199°51.08 25.37 214°52.06 25.57	247°19.28 59.22 262°19.96 09°59.92	103° 3.73 2.17 118° 6.33 2.23	242° 40.66 52.33 257° 42.83 52.44	Achernar 335°18.86 -57°5.51
6	302° 47.83	229°53.03 N27°25.77	277°20.65 N10°0.62	133°8.93 N06°2.28	272°44.99 N09°52.55	Hamal 327°48.50 23°35.70
7	317°50.29	244°54.01 25.97	292°21.33 1.32	148°11.54 2.33	287° 47.15 52.66	Polaris 313°4.46 89°22.99
8	332°52.76	259°54.99 26.17	307° 22.01 2.02	163°14.14 2.38	302°49.31 52.77	Acamar 315°10.19 -40°11.54 Menkar 314°3.66 4°11.95
9	347°55.22	274°55.97 · · 26.37	322°22.69 · · 2.72	178°16.74 · · 2.43	317°51.47 · · 52.88	Mirfak 308°24.84 49°57.67
10	2°57.68	289°56.96 26.56	337°23.38 3.42	193°19.34 2.48	332°53.63 52.99	Aldebaran 290°36.82 16°33.87
11 12	18°0.15 33°2.61	304°57.95 26.76 319°58.94 N27°26.95	352°24.06 4.12 7°24.74 N10°4.82	208°21.94 2.53 223°24.55 N06°2.58	347°55.79 53.10 2°57.95 N09°53.21	Rigel 281°1.54 -8°10.31
13	48°5.08	334°59.93 27.15	22°25.43 5.52	238°27.15 2.63	18° 0.11 53.32	Capella 280°18.26 46°1.58
14	63°7.54	350°0.93 27.34	37°26.11 6.22	253°29.75 2.68	33°2.27 53.43	Bellatrix 278°20.24 6°22.38 Elnath 277°58.74 28°37.81
15	$78^{\circ}10.01$	5°1.93 · · 27.53	$52^{\circ}26.79 \cdot \cdot 6.92$	268°32.35 · · 2.73	48°4.43 •• 53.54	Alnilam 275°35.23 -1°11.20
16	93°12.47	20°2.93 27.72	67°27.47 7.62	283°34.95 2.78	63°6.60 53.65	Betelgeuse 270°49.39 7°24.59
17 18	108° 14.93 123° 17.40	35°3.93 27.91 50°4.94 N27°28.10	82°28.16 8.32 97°28.84 N10°9.02	298°37.55 2.83 313°40.15 N06°2.88	78°8.76 53.76 93°10.92 N09°53.87	Canopus 263°51.48 -52°42.95
19	138° 19.86	65°5.95 28.29	112°29.52 9.72	328°42.75 2.92	108°13.08 53.98	Sirius 258°24.03 -16°45.55
20	153°22.33	80°6.96 28.48	127°30.20 10.42	343°45.35 2.97	123° 15.24 54.09	Adhara 255°3.90 -29°0.93
21	$168^{\circ}24.79$	95°7.97 · · 28.66	142°30.88 · · 11.12	358°47.95 · · 3.02	138° 17.40 · · 54.20	Procyon 244°48.11 5°8.96 Pollux 243°14.13 27°57.40
22	183°27.25	110°8.99 28.85	157°31.57 11.82	13°50.55 3.07	153° 19.56 54.31	Avior 234°13.62 -59°36.40
23	198°29.72	125°10.01 29.03	172°32.25 12.51	28°53.15 3.12	168°21.72 54.41	Suhail 222°44.23 -43°33.19
Mer.p	pass. 09:48	$\nu 1.0' \ d0.2' \ \text{m-4.74}$	$ u 0.7' \ d0.7' \ m1.18$	$\nu 2.6' \ d0.1' \ \text{m-}2.33$	$ u 2.2' \ d0.1' \ \text{m}0.45$	Miaplacidus 221°37.44 -69°50.40
						Alphard 217°45.04 -8°47.14
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.48 11°49.57 Dubhe 193°37.44 61°35.96
0	213°32.18	140°11.04 N27°29.22	187°32.93 N10°13.21	43°55.74 N06°3.17	183°23.88 N09°54.52	Dubhe 193°37.44 61°35.96 Denebola 182°21.99 14°24.68
1	228° 34.65	155°12.06 29.40	202°33.61 13.91	58°58.34 3.22	198°26.04 54.63	Gienah 175°40.53 -17°42.19
2	243°37.11	170°13.09 29.58	217°34.29 14.61	74°0.94 3.27	213°28.20 54.74	Acrux 172°56.36 -63°15.63
3 4	258° 39.57 273° 42.04	185°14.12 · · 29.76 200°15.15 29.94	232°34.98 ·· 15.31 247°35.66 16.00	89°3.54 · · 3.31 104°6.13 3.36	228°30.36 · · 54.85 243°32.53 54.96	Gacrux 171°48.04 -57°16.57
5	288° 44.50	215°16.19 30.12	262°36.34 16.70	119° 8.73 3.41	258° 34.69 55.07	Alioth 166°10.19 55°48.33
6	303°46.97	230°17.23 N27°30.30	277°37.02 N10°17.40	134°11.33 N06°3.46	273°36.85 N09°55.18	Spica 158°19.15 -11°18.73 Alkaid 152°49.47 49°10.22
7	$318^{\circ}49.43$	245°18.27 30.47	292°37.70 18.09	149°13.92 3.50	288°39.01 55.29	Hadar 148°31.44 -60°30.68
8	333°51.90	260°19.32 30.65	307°38.39 18.79	164°16.52 3.55	303°41.17 55.40	Menkent 147°54.02 -36°30.69
9 10	348°54.36 3°56.82	275°20.37 ·· 30.83 290°21.42 31.00	322°39.07 ·· 19.49 337°39.75 20.18	179°19.12 · · 3.60 194°21.71 3.65	318° 43.33 · · 55.51 333° 45.49 55.62	Arcturus 145°45.14 19°1.95
11	3 50.62 18°59.29	305°22.47 31.17	352°40.43 20.88	209°24.31 3.69	333° 45.49 55.62 348° 47.65 55.73	Rigil Kent. 139°35.85 -60°57.21
12	34°1.75	320°23.53 N27°31.35	7°41.11 N10°21.57	224°26.90 N06°3.74	3°49.81 N09°55.84	Kochab 137°18.86 74°2.20 Zuben'ubi 136°52.70 -16°9.68
13	49°4.22	335°24.58 31.52	22°41.79 22.27	239°29.50 3.79	18° 51.97 55.95	Zuben'ubi 136°52.70 -16°9.68 Alphecca 126°1.15 26°37.00
14	64°6.68	350°25.65 31.69	37° 42.47 22.96	254°32.09 3.84	33°54.13 56.06	Antares 112°12.23 -26°29.67
15	79°9.14	5°26.71 · · 31.86	52°43.16 · · 23.66	269°34.68 · · 3.88	48°56.30 · · 56.17	Atria 107°3.57 -69°4.48
16 17	94°11.61 109°14.07	20°27.78 32.03 35°28.85 32.19	67° 43.84 24.35 82° 44.52 25.05	284°37.28 3.93 299°39.87 3.97	63°58.46 56.27 79°0.62 56.38	Sabik 101°59.45 -15°45.59
18	124° 16.54	50°29.92 N27°32.36	97°45.20 N10°25.74	314°42.46 N06°4.02	94°2.78 N09°56.49	Shaula 96° 6.45 -37° 7.32
19	139°19.00	65°31.00 32.53	112°45.88 26.44	329°45.06 4.07	109°4.94 56.60	Rasalhague 95°55.84 12°32.25 Eltanin 90°40.62 51°28.85
20	154° 21.46	80° 32.07 32.69	127°46.56 27.13	344°47.65 4.11	124°7.10 56.71	Kaus Aust. 83°28.77 -34°22.10
21	169°23.93	95°33.15 · · 32.86	142°47.24 · · 27.83	359°50.24 · · 4.16	139°9.26 · · 56.82	Vega 80°31.21 38°48.37
22 23	184° 26.39 199° 28.86	110°34.24 33.02 125°35.33 33.18	157° 47.92 28.52 172° 48.60 29.21	14°52.84 4.20 29°55.43 4.25	154°11.42 56.93 169°13.58 57.04	Nunki 75°44.32 -26°15.55
				-		Altair 61°57.29 8°56.52
Mer.	pass. 09:44	ν1.0′ d0.2′ m-4.74	$\nu$ 0.7' d0.7' m1.19	ν2.6' d0.0' m-2.32	$\nu 2.2' \ d0.1' \ \text{m}0.46$	Peacock 53°1.59 -56°38.29 Deneb 49°23.97 45°22.66
						Enif 33°36.27 10°0.23
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.83 -46°49.18
0	214°31.32	140°36.42 N27°33.34	187°49.28 N10°29.91	44°58.02 N06°4.30	184°15.74 N09°57.15	Fomalhaut 15°11.83 -29°28.20
1 2	229°33.79 244°36.25	155°37.51 33.50 170°38.60 33.66	202°49.96 30.60 217°50.65 31.29	60° 0.61 4.34 75° 3.20 4.39	199°17.91 57.26 214°20.07 57.37	Scheat 13°42.81 28°14.07
3	259° 38.71	185°39.70 · · 33.82	232°51.33 · · 31.98	90° 5.79 · · 4.43	229°22.23 · · 57.48	Markab 13°27.43 15°21.38
4	274°41.18	200°40.80 33.98	247°52.01 32.68	105°8.38 4.48	244°24.39 57.58	Apr 24 Mon SHA Mer.pass
5	289°43.64	215°41.91 34.14	262°52.69 33.37	120°10.97 4.52	259° 26.55 57.69	Venus 287°14.18 14:40
6	304°46.11	230°43.01 N27°34.29	277°53.37 N10°34.06	135°13.56 N06°4.57	274°28.71 N09°57.80	Mars 334°43.50 11:30
7	319° 48.57	245°44.12 34.45	292°54.05 34.75	150°16.15 4.61	289°30.87 57.91	Jupiter 190°20.27 21:05 Saturn 329°58.98 11:48
8 9	334°51.03 349°53.50	260°45.24 34.60 275°46.35 · · 34.75	307°54.73 35.44 322°55.41 · · 36.14	165°18.74 4.66 180°21.33 · · 4.70	304°33.03 58.02 319°35.19 • 58.13	
10	4° 55.96	290°47.47 34.90	337°56.09 36.83	195°23.92 4.74	334°37.35 58.24	Apr 25 Tue SHA Mer.pass
11	19°58.43	305°48.59 35.06	352° 56.77 37.52	210°26.51 4.79	349°39.52 58.35	Venus 286°38.85 14:38
12	35°0.89	320°49.71 N27°35.21	7°57.45 N10°38.21	225°29.10 N06°4.83	4°41.68 N09°58.46	Mars 334° 0.75 11:29 Jupiter 190° 23.56 21:01
13	50°3.35	335°50.84 35.36	22°58.13 38.90	240°31.68 4.88	19° 43.84 58.57	Saturn 329°51.70 11:45
14 15	65°5.82 80°8.28	350°51.97 35.50 5°53.10 · · 35.65	37°58.81 39.59 52°59.49 •• 40.28	255°34.27 4.92 270°36.86 · · 4.96	34°46.00 58.68 49°48.16 •• 58.78	
16	95° 10.75	20°54.24 35.80	68°0.17 40.97	285°39.45 5.01	64° 50.32 58.89	Apr 26 Wed         SHA         Mer.pass           Venus         286° 5.09         14:36
17	110° 13.21	35°55.38 35.94	83°0.85 41.66	300°42.03 5.05	79°52.48 59.00	Mars 333°17.96 11:28
18	125° 15.68	50°56.52 N27°36.09	98°1.53 N10°42.35	315°44.62 N06°5.09	94°54.64 N09°59.11	Jupiter 190°26.70 20:57
19	140° 18.14	65° 57.66 36.23	113°2.21 43.04	330°47.21 5.14	109° 56.80 59.22	Saturn 329°44.42 11:41
20 21	155°20.60 170°23.07	80°58.81 36.37 95°59.96 · · 36.52	128°2.89 43.73 143°3.57 •• 44.42	345°49.79 5.18 0°52.38 · · 5.22	124°58.96 59.33 140°1.13 · · 59.44	Horizontal parallax
22	170 23.07 185° 25.53	95 59.96 · · 36.52 111°1.12 36.66	143 3.57 · · 44.42 158°4.25 45.11	15°54.96 5.27	155°3.29 59.55	Venus: 0.3
23	200° 28.00	126°2.27 36.80	173°4.93 45.80	30°57.55 5.31	170° 5.45 59.66	Mars: 0.1
Merr	pass. 09:40	ν1.1' d0.2' m-4.74	ν0.7' d0.7' m1.19	ν2.6' d0.0' m-2.31	ν2.2' d0.1' m0.46	
				GO.O III-2.JI	UO.1 1110.TO	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.03	N12°58.02	191°27.67	13.7'	$N14^{\circ}14.90$	11.6'	55.2'
1	195°28.14	58.84	206°0.42	13.7'	14°26.53	11.6'	55.2'
2 3	210°28.25 225°28.36	12°59.66 13°0.48	220°33.09 235°5.69	13.6' 13.5'	14°38.11 14°49.64	11.5' 11.5'	55.2' 55.3'
4	240°28.46	1.30	249°38.22	13.5'	15°1.11	11.4	55.3'
5	255°28.57	2.12	$264^{\circ}10.67$	13.4'	$15^{\circ}12.52$	11.4'	55.3'
6	270°28.68	N13°2.94	278°43.05	13.3'	N15°23.87	11.3'	55.3'
7 8	285°28.79 300°28.90	3.75 4.57	293°15.35 307°47.57	13.2' 13.1'	15°35.16 15°46.40	11.2' 11.2'	55.3' 55.4'
9	315°29.01	• • 5.39	322°19.72	13.1'	15°57.57	11.1'	55.4'
10	330°29.12	6.21	336°51.78	13.0'	$16^{\circ}8.67$	11.0'	55.4'
11	345°29.22	7.03	351°23.77	12.9'	16°19.71	11.0'	55.4'
12 13	0°29.33 15°29.44	N13°7.84 8.66	5°55.68 20°27.51	12.8' 12.8'	N16°30.69 16°41.60	10.9' 10.8'	55.4' 55.5'
14	30°29.55	9.47	34°59.27	12.7'	16°52.44	10.8	55.5'
15	45°29.65	• • 10.29	49°30.93	12.6'	17°3.21	10.7'	55.5'
16	60°29.76 75°29.87	11.11	64°2.52 78°34.03	12.5'	17°13.91 17°24.54	10.6'	55.5'
17 18	75°29.87 90°29.97	11.92 N13°12.74	78° 34.03 93° 5.45	12.4' 12.3'	N17°35.10	10.6' 10.5'	55.5' 55.5'
19	105°30.08	13.55	107°36.80	12.3'	17°45.58	10.4	55.6'
20	120°30.18	14.36	122°8.06	12.2'	17°55.99	10.3'	55.6'
21	135°30.29	• • 15.18	136°39.23	12.1'	18°6.32	10.3'	55.6'
22 23	150°30.39 165°30.50	15.99 16.80	151°10.32 165°41.33	12.0' 11.9'	18°16.58 18°26.75	10.2' 10.1'	55.6' 55.6'
	SD = 15.9'	d = 0.8'			D = 15.1'		
	3D = 15.9′	<u>u = υ.δ΄</u>		)L	y = 13.1°		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°30.60	N13°17.61	180°12.25	11.8'	N18°36.85	10.0'	55.7'
1 2	195°30.71 210°30.81	18.43 19.24	194°43.09 209°13.84	11.8' 11.7'	18°46.87 18°56.80	9.9' 9.8'	55.7' 55.7'
3	210 30.61 225°30.92	. 20.05	209 13.64 223°44.51	11.6'	10 50.60 19°6.65	9.8'	55.7'
4	240°31.02	20.86	238°15.09	11.5'	19°16.41	9.7'	55.7'
5	255°31.13	21.67	252°45.58	11.4'	19°26.09	9.6'	55.8'
6 7	270°31.23 285°31.33	N13°22.48 23.29	267°15.99 281°46.31	11.3' 11.2'	N19°35.69 19°45.19	9.5' 9.4'	55.8' 55.8'
8	300°31.44	24.10	201 40.51 296°16.55	11.1'	19 45.19 19°54.60	9.4	55.8'
9	315°31.54	• • 24.91	310°46.70	11.1'	20°3.93	9.2'	55.9'
10	330°31.64	25.72	325°16.76	11.0'	20°13.16	9.1'	55.9'
11 12	345°31.75 0°31.85	26.52 N13°27.33	339°46.73 354°16.62	10.9' 10.8'	20°22.30 N20°31.34	9.0' 8.9'	55.9' 55.9'
13	15°31.95	28.14	8°46.42	10.7	20°40.29	8.9'	55.9'
14	30°32.05	28.95	23°16.13	10.6'	$20^{\circ}49.14$	8.8'	56.0'
15	45°32.15 60°32.26	· · 29.75 30.56	37°45.76 52°15.29	10.5' 10.5'	20°57.89 21°6.55	8.7'	56.0'
16 17	75°32.36	31.36	52 15.29 66°44.74	10.5	21 0.55 21°15.10	8.6' 8.5'	56.0' 56.0'
18	90°32.46	N13°32.17	81°14.11	10.3	N21°23.55	8.3'	56.0'
19	105°32.56	32.97	95°43.38	10.2'	21°31.90	8.2'	56.1'
20	120°32.66 135°32.76	33.78 •• 34.58	110°12.57 124°41.68	10.1' 10.0'	21°40.15 21°48.29	8.1' 8.0'	56.1' 56.1'
21 22	150°32.86	35.39	139°10.69	9.9'	21 46.29 21°56.32	7.9'	56.1
23	165°32.96	36.19	153°39.62	9.8'	22°4.24	7.8'	56.1'
	SD = 15.9'	d = 0.8'		SI	D = 15.2'		
Wed	GHA	<b>Dec</b> N13°36.99	GHA	$\nu$	Dec	d 77,	HP
0 1	180°33.06 195°33.16	N13°36.99 37.80	168°8.47 182°37.22	9.8' 9.7'	N22°12.06 22°19.76	7.7' 7.6'	56.2' 56.2'
2	210°33.26	38.60	197°5.90	9.6'	22°27.36	7.5'	56.2
3	225°33.36	• • 39.40	211°34.49	9.5'	22°34.84	7.4'	56.2'
4 5	240°33.46 255°33.56	40.20 41.00	226°2.99 240°31.41	9.4' 9.3'	22°42.20 22°49.46	7.3' 7.1'	56.2' 56.3'
6	255 33.56 270°33.66	N13°41.80	254° 59.74	9.3	N22°56.59	7.1 7.0'	56.3
7	285°33.75	42.60	269°27.99	9.2'	23°3.61	6.9'	56.3'
8	300°33.85	43.40	283°56.16	9.1'	23°10.51	6.8'	56.3'
9 10	315°33.95 330°34.05	· · 44.20 45.00	298°24.25 312°52.25	9.0' 8.9'	23°17.29 23°23.95	6.7' 6.5'	56.3' 56.4'
11	345°34.15	45.00 45.80	312 52.25 327°20.17	8.9 8.8'	23°23.95 23°30.49	6.4	56.4'
12	0°34.24	N13°46.60	341°48.02	8.8'	N23°36.90	6.3'	56.4'
13	15°34.34	47.40	356° 15.78	8.7'	23°43.19	6.2'	56.4'
14 15	30°34.44 45°34.53	48.19 •• 48.99	10°43.46 25°11.07	8.6' 8.5'	23°49.35 23°55.39	6.0' 5.9'	56.4' 56.5'
16	60°34.63	49.79	39°38.59	8.4	24°1.30	5.8'	56.5
17	75°34.73	50.58	54°6.04	8.4'	24°7.08	5.7'	56.5'
18	90°34.82	N13°51.38	68°33.42	8.3'	N24°12.73	5.5'	56.5'
19 20	105°34.92 120°35.01	52.18 52.97	83°0.72 97°27.94	8.2' 8.2'	24°18.25 24°23.64	5.4' 5.3'	56.6' 56.6'
21	135°35.11	• • 53.77	97 27.94 111°55.09	8.1'	24°28.90	5.3 5.1'	56.6
22	150°35.20	54.56	126°22.17	8.0'	24°34.02	5.0'	56.6'
23	165°35.30	55.35	140°49.17	7.9'	24°39.00	4.9'	56.6'
	SD = 15.9'	d = 0.8'		SI	0 = 15.3'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age 0-2	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-2%	
24	01:52	01:57	11:58	11:36	23:59		
25	02:02	02:07	11:58	12:24	-:-		
26	02:12	02:17	11:58	13:16	00:49		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	215° 30.46	141°3.43 N27°36.94	188°5.61 N10°46.48	46° 0.13 N06° 5.35	185°7.61 N09°59.76	
1	230°32.92	156°4.59 37.07	203°6.29 47.17	61°2.72 5.39	200°9.77 09°59.87	Alpheratz 357°32.25 29°14.71 Ankaa 353°4.92 -42°8.99
2	245°35.39	171°5.76 37.21	218°6.97 47.86	76° 5.30 5.44	215°11.93 09°59.98	Ankaa 353°4.92 -42°8.99 Schedar 349°28.38 56°41.44
3	260° 37.85	186°6.93 · · 37.35	233°7.64 · · 48.55	91°7.89 · · 5.48	230°14.09 · · 0.09	Diphda 348°44.92 -17°49.85
4	275°40.32	201°8.10 37.48	248°8.32 49.24	106°10.47 5.52	245° 16.25 0.20	Achernar 335°18.85 -57°5.49
5	290° 42.78	216°9.27 37.62	263°9.00 49.92	121°13.05 5.56	260° 18.41 0.31	Hamal 327°48.49 23°35.70
6 7	305°45.25 320°47.71	231°10.45 N27°37.75 246°11.63 37.88	278°9.68 N10°50.61 293°10.36 51.30	136°15.64 N06°5.60 151°18.22 5.65	275°20.58 N10°0.42 290°22.74 0.53	Polaris 313°4.35 89°22.97
8	335° 50.17	261°12.81 38.02	308° 11.04 51.98	166°20.80 5.69	305°24.90 0.63	Acamar 315°10.19 -40°11.53
9	350°52.64	276°14.00 · · 38.15	323°11.72 · · 52.67	181°23.38 · · 5.73	320°27.06 · · 0.74	Menkar 314°3.66 4°11.96
10	5°55.10	291°15.19 38.28	338°12.40 53.36	196°25.97 5.77	335°29.22 0.85	Mirfak 308°24.84 49°57.66
11	$20^{\circ}57.57$	306°16.38 38.41	353°13.08 54.04	211°28.55 5.81	350°31.38 0.96	Aldebaran 290°36.82 16°33.87 Rigel 281°1.54 -8°10.31
12	36°0.03	321°17.58 N27°38.53	8°13.76 N10°54.73	226°31.13 N06°5.85	5°33.54 N10°1.07	Capella 280°18.27 46°1.57
13	51°2.49	336°18.77 38.66	23°14.43 55.42	241°33.71 5.89	20°35.70 1.18	Bellatrix 278°20.24 6°22.38
14 15	66°4.96 81°7.42	351°19.97 38.79 6°21.18 · · 38.91	38°15.11 56.10 53°15.79 · · 56.79	256°36.29 5.93 271°38.87 • 5.98	35°37.86 1.29 50°40.03 · · 1.39	Elnath 277°58.74 28°37.81
16	96°9.89	21°22.39 39.04	68° 16.47 57.47	286°41.45 6.02	65° 42.19 1.50	Alnilam 275°35.24 -1°11.20
17	111° 12.35	36°23.60 39.16	83°17.15 58.16	301°44.03 6.06	80°44.35 1.61	Betelgeuse 270°49.40 7°24.59
18	126° 14.82	51°24.81 N27°39.28	98°17.83 N10°58.84	316°46.61 N06°6.10	95°46.51 N10°1.72	Canopus 263°51.50 -52°42.94
19	$141^{\circ}17.28$	66°26.03 39.40	113°18.51 10°59.53	331°49.19 6.14	110°48.67 1.83	Sirius 258°24.04 -16°45.55 Adhara 255°3.91 -29°0.93
20	$156^{\circ}19.74$	81°27.25 39.52	128°19.18 11°0.21	346°51.77 6.18	125°50.83 1.94	Procyon 244°48.12 5°8.96
21	171°22.21	96°28.47 · · 39.64	143°19.86 · · 0.89	1°54.35 · · 6.22	140°52.99 · · 2.05	Pollux 243°14.14 27°57.40
22	186° 24.67	111°29.69 39.76	158°20.54 1.58	16°56.93 6.26	155°55.15 2.15	Avior 234°13.64 -59°36.41
23	201°27.14	126°30.92 39.88	173°21.22 2.26	31°59.51 6.30	170°57.32 2.26	Suhail 222°44.25 -43°33.20
Mer.	pass. 09:36	$ u 1.2^\prime \ d0.1^\prime \ \text{m-4.75}$	$ u 0.7' \ d0.7' \ m1.20$	$\nu 2.6' \ d0.0' \ \text{m-}2.31$	$\nu 2.2' \ d0.1' \ m0.47$	Miaplacidus 221°37.48 -69°50.40
						Alphard 217°45.05 -8°47.14
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.48 11°49.57
0	216° 29.60	141°32.16 N27°40.00	188°21.90 N11°2.94	47°2.09 N06°6.34	185°59.48 N10°2.37	Dubhe 193°37.46 61°35.97
1	231°32.06	156°33.39 40.11	203°22.58 3.63	62°4.66 6.38	201°1.64 2.48	Denebola 182°21.99 14°24.68 Gienah 175°40.53 -17°42.20
2	$246^{\circ}34.53$	171°34.63 40.23	218°23.25 4.31	77°7.24 6.41	216°3.80 2.59	Acrux 172°56.36 -63°15.65
3	261°36.99	186°35.87 · · 40.34	233°23.93 · · 4.99	92° 9.82 · · 6.45	231°5.96 · · 2.70	Gacrux 171°48.04 -57°16.59
4	276° 39.46	201°37.11 40.45	248°24.61 5.68	107°12.39 6.49	246°8.12 2.81	Alioth 166°10.20 55°48.34
5	291°41.92	216°38.36 40.57	263°25.29 6.36	122°14.97 6.53	261°10.28 2.91	Spica 158°19.15 -11°18.73
6 7	306° 44.39 321° 46.85	231°39.61 N27°40.68 246°40.87 40.79	278°25.96 N11°7.04 293°26.64 7.72	137°17.55 N06°6.57 152°20.12 6.61	276°12.44 N10°3.02 291°14.61 3.13	Alkaid 152°49.47 49°10.23
8	336°49.31	261°42.12 40.90	308° 27.32 8.41	167°22.70 6.65	306° 16.77 3.24	Hadar 148°31.43 -60°30.69
9	351°51.78	276°43.38 · · 41.00	323°28.00 · · 9.09	182°25.28 · · 6.69	321°18.93 · · 3.35	Menkent 147°54.01 -36°30.70
10	6°54.24	291°44.65 41.11	338°28.68 9.77	197°27.85 6.72	336°21.09 3.46	Arcturus 145°45.14 19°1.96
11	21°56.71	306°45.91 41.22	353°29.35 10.45	212°30.43 6.76	351°23.25 3.56	Rigil Kent. 139°35.83 -60°57.22 Kochab 137°18.86 74°2.22
12	$36^{\circ}59.17$	321°47.18 N27°41.32	8°30.03 N11°11.13	227°33.00 N06°6.80	6°25.41 N10°3.67	Zuben'ubi 136°52.69 -16°9.68
13	52°1.64	336°48.46 41.43	23°30.71 11.81	242°35.57 6.84	21°27.57 3.78	Alphecca 126°1.14 26°37.01
14	67°4.10	351°49.73 41.53	38°31.38 12.49	257°38.15 6.88	36°29.74 3.89	Antares 112°12.21 -26°29.67
15	82°6.56	6°51.01 · · 41.63	53°32.06 · · 13.17	272°40.72 · · 6.91	51°31.90 · · 4.00	Atria 107°3.52 -69°4.49
16 17	97°9.03 112°11.49	21°52.29 41.74 36°53.58 41.84	68° 32.74 13.85 83° 33.42 14.53	287°43.30 6.95 302°45.87 6.99	66°34.06 4.11 81°36.22 4.21	Sabik 101°59.43 -15°45.59
18	127° 13.96	51°54.87 N27°41.94	98°34.09 N11°15.21	317°48.44 N06°7.03	96°38.38 N10°4.32	Shaula 96°6.42 -37°7.32
19	142° 16.42	66° 56.16 42.04	113°34.77 15.89	332°51.02 7.06	111°40.54 4.43	Rasalhague 95°55.82 12°32.26
20	157° 18.88	81°57.45 42.13	128° 35.45 16.57	347°53.59 7.10	126° 42.70 4.54	Eltanin 90°40.59 51°28.87 Kaus Aust. 83°28.74 -34°22.10
21	$172^{\circ}21.35$	96°58.75 · · 42.23	143°36.12 · · 17.25	2°56.16 · · 7.14	141°44.87 · · 4.65	Vega 80°31.18 38°48.38
22	187°23.81	112°0.05 42.33	158°36.80 17.93	$17^{\circ}58.73$ 7.17	156° 47.03 4.75	Nunki 75°44.29 -26°15.55
23	202°26.28	127°1.36 42.42	173°37.48 18.61	33°1.30 7.21	171°49.19 4.86	Altair 61°57.27 8°56.53
Mer.	pass. 09:32	$\nu 1.2' \ d0.1' \ \text{m-4.75}$	$\nu 0.7' \ d0.7' \ m1.20$	$\nu 2.6' \ d0.0' \ \text{m-}2.30$	$\nu 2.2' \ d0.1' \ m0.47$	Peacock 53°1.55 -56°38.29
	·					Deneb 49°23.94 45°22.66
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°36.25 10°0.24
0 0	217° 28.74	142°2.66 N27°42.52	188°38.16 N11°19.29	48°3.87 N06°7.25	186°51.35 N10°4.97	Al Na'ir 27°29.80 -46°49.16
1	232° 31.21	157°3.98 42.61	203°38.83 19.96	63°6.45 7.28	201°53.51 5.08	Fomalhaut 15°11.81 -29°28.18 Scheat 13°42.78 28°14.07
2	247°33.67	172°5.29 42.70	218°39.51 20.64	78° 9.02 7.32	216°55.67 5.19	Markab 13°27.41 15°21.39
3	262° 36.13	187°6.61 · · 42.79	233°40.19 · · 21.32	93°11.59 · · 7.36	231°57.83 · · 5.29	
4	277° 38.60	202°7.93 42.88	248°40.86 22.00	108°14.16 7.39	247°0.00 5.40	Apr 27 Thu SHA Mer.pass
5	292°41.06	217°9.25 42.97 232°10.58 N27°43.06	263°41.54 22.67	123°16.73 7.43	262°2.16 5.51	Venus 285°32.97 14:35 Mars 332°35.15 11:27
6 7	307° 43.53 322° 45.99	232°10.58 N27°43.06 247°11.91 43.15	278°42.21 N11°23.35 293°42.89 24.03	138°19.30 N06°7.46 153°21.87 7.50	277°4.32 N10°5.62 292°6.48 5.73	Jupiter 190°29.67 20:52
8	322 45.99 337°48.45	247 11.91 43.15 262°13.24 43.24	308° 43.57 24.70	168°24.43 7.54	307°8.64 5.83	Saturn 329°37.15 11:38
9	352° 50.92	277°14.58 · · 43.32	323° 44.24 · · 25.38	183°27.00 · · 7.57	322°10.80 · · 5.94	
10	7° 53.38	292°15.92 43.41	338°44.92 26.06	198°29.57 7.61	337°12.96 6.05	Apr 28 Fri SHA Mer.pass
11	22°55.85	307°17.26 43.49	353°45.60 26.73	213°32.14 7.64	352°15.13 6.16	Venus 285°2.56 14:33 Mars 331°52.30 11:26
12	37°58.31	322°18.61 N27°43.57	8°46.27 N11°27.41	228°34.71 N06°7.68	7°17.29 N10°6.27	Jupiter 190°32.48 20:48
13	53°0.78	337°19.96 43.66	23°46.95 28.08	243°37.27 7.71	22°19.45 6.37	Saturn 329°29.88 11:34
14 15	68°3.24	352°21.31 43.74	38°47.62 28.76 53°48.30 •• 29.44	258°39.84 7.75	37°21.61 6.48	
15 16	83°5.70 98°8.17	7°22.67 · · 43.82 22°24.03 43.90	53°48.30 · · 29.44 68°48.98 30.11	273°42.41 · · 7.78 288°44.98 7.82	52°23.77 · · 6.59 67°25.93 6.70	Apr 29 Sat SHA Mer.pass Venus 284°33.92 14:31
17	113° 10.63	37°25.40 43.98	83°49.65 30.79	303°47.54 7.85	82°28.10 6.81	Venus 284°33.92 14:31 Mars 331°9.41 11:25
18	128° 13.10	52°26.76 N27°44.05	98°50.33 N11°31.46	318°50.11 N06°7.88	97°30.26 N10°6.91	Jupiter 190°35.13 20:44
19	143° 15.56	67°28.13 44.13	113°51.00 32.13	333°52.67 7.92	112°32.42 7.02	Saturn 329°22.61 11:31
20	158° 18.03	82°29.51 44.20	128°51.68 32.81	348°55.24 7.95	127° 34.58 7.13	
21	173°20.49	97°30.88 · · 44.28	143°52.35 · · 33.48	3°57.80 · · 7.99	142°36.74 · · 7.24	Horizontal parallax
22	188° 22.95	112°32.26 44.35	158° 53.03 34.16	19° 0.37 8.02	157° 38.90 7.34	Venus: 0.3 Mars: 0.1
23	203°25.42	127°33.65 44.43	173°53.70 34.83	34°2.93 8.05	172°41.07 7.45	ivials. U.1
Mer.	pass. 09:29	$ u 1.3' \ d0.1' \ \text{m-4.75}$	$ u 0.7' \; d0.7' \; \mathrm{m}1.21$	$\nu 2.6' \ d0.0' \ \text{m-}2.29$	$\nu 2.2' \ d0.1' \ m0.48$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.39	N13°56.15	155°16.11	7.9'	N24°43.86	4.7'	56.7'
1 2	195°35.49 210°35.58	56.94 57.73	169°42.97 184°9.77	7.8' 7.7'	24°48.57 24°53.14	4.6' 4.4'	56.7' 56.7'
3	225° 35.68	58.53	198°36.50	7.7'	24°57.58	4.3'	56.7
4	240° 35.77	13°59.32	213°3.17	7.6'	25°1.88	4.2'	56.7'
5	255° 35.87 270° 35.96	14°0.11 N14°0.90	227°29.76 241°56.30	7.5' 7.5'	25°6.03 N25°10.05	4.0' 3.9'	56.8' 56.8'
6 7	270 35.96 285°36.05	N14 0.90 1.69	241 56.30 256°22.77	7.5° 7.4'	N25 10.05 25°13.92	3.9° 3.7'	56.8
8	300°36.14	2.48	270°49.18	7.3'	25°17.65	3.6'	56.8'
9	315° 36.24	• • 3.27	285°15.53	7.3'	25°21.23	3.4'	56.8'
10 11	330°36.33 345°36.42	4.06 4.85	299°41.82 314°8.05	7.2' 7.2'	25°24.67 25°27.97	3.3' 3.1'	56.9' 56.9'
12	0°36.51	N14°5.64	328°34.23	7.1	N25°31.11	3.0'	56.9
13	15° 36.61	6.43	343°0.35	7.1'	25°34.11	2.9'	56.9'
14 15	30°36.70 45°36.79	7.22 •• 8.00	357°26.42 11°52.44	7.0' 7.0'	25°36.96 25°39.66	2.7' 2.6'	56.9' 57.0'
16	60°36.88	8.79	26°18.40	6.9'	25°42.22	2.4'	57.0'
17	75°36.97	9.58	$40^{\circ}44.32$	6.9'	25°44.62	2.3'	57.0'
18	90°37.06	N14°10.36	55°10.19 69°36.01	6.8'	N25°46.87	2.1'	57.0'
19 20	105°37.15 120°37.24	11.15 11.93	69°36.01 84°1.79	6.8' 6.7'	25°48.97 25°50.91	1.9' 1.8'	57.1' 57.1'
21	135° 37.33	12.72	98°27.53	6.7'	25°52.71	1.6'	57.1
22	150° 37.42	13.50	112°53.22	6.7'	25°54.35	1.5'	57.1'
23	165°37.51	14.29	127°18.87	6.6'	25°55.83	1.3'	57.1'
	SD = 15.9'	d = 0.8'		SI	O = 15.5'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°37.60	N14°15.07	141°44.49	6.6'	N25°57.16	1.2'	57.2'
1	195°37.69	15.86	156°10.07	6.5'	25°58.34	1.0'	57.2'
2	210°37.78 225°37.87	16.64 •• 17.42	170°35.61 185°1.12	6.5' 6.5'	25°59.36 26°0.23	0.9' 0.7'	57.2' 57.2'
4	240° 37.96	18.20	199°26.60	6.4	26°0.93	0.6'	57.2
5	255° 38.05	18.98	213°52.04	6.4'	26°1.49	0.4'	57.3'
6 7	270°38.14 285°38.22	N14°19.77 20.55	228°17.46 242°42.85	6.4' 6.4'	N26°1.88 26°2.12	0.2' 0.1'	57.3' 57.3'
8	300°38.31	21.33	257°8.22	6.3'	26°2.19	-0.1	57.3'
9	315° 38.40	• • 22.11	271°33.56	6.3'	26°2.11	-0.2'	57.3'
10 11	330°38.49 345°38.57	22.89 23.67	285°58.89 300°24.19	6.3' 6.3'	26°1.87 26°1.48	-0.4' -0.6'	57.4' 57.4'
12	0°38.66	23.07 N14°24.45	314°49.47	6.3	N26°0.92	-0.0	57.4
13	15°38.75	25.22	329°14.74	6.3'	26°0.20	-0.9'	57.4'
14	30°38.83	26.00	343°39.99	6.2'	25°59.33	-1.0'	57.4'
15 16	45°38.92 60°39.01	· · 26.78 27.56	358°5.22 12°30.45	6.2' 6.2'	25°58.29 25°57.10	-1.2' -1.4'	57.5' 57.5'
17	75°39.09	28.33	26°55.67	6.2'	25°55.74	-1.5'	57.5'
18	90°39.18	N14°29.11	41°20.88	6.2'	N25°54.23 25°52.55	-1.7'	57.5
19 20	105°39.26 120°39.35	29.89 30.66	55°46.08 70°11.28	6.2' 6.2'	25°52.55 25°50.72	-1.8' -2.0'	57.5' 57.6'
21	135°39.43	31.44	84°36.47	6.2'	25°48.72	-2.2'	57.6'
22	150° 39.52	32.21	99°1.66	6.2'	25°46.57	-2.3'	57.6'
23	165°39.60	32.99	113°26.86	6.2'	25°44.26	-2.5'	57.6'
	SD = 15.9'	d = 0.8'		SI	O = 15.6'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°39.69	N14°33.76	127°52.05 142°17.25	6.2'	N25°41.78 25°39.15	-2.6'	57.6' 57.7'
1 2	195°39.77 210°39.85	34.53 35.31	142°17.25 156°42.45	6.2' 6.2'	25°39.15 25°36.35	-2.8' -3.0'	57.7' 57.7'
3	225°39.94	• • 36.08	171°7.66	6.2'	25°33.40	-3.1'	57.7'
4	240°40.02	36.85	185°32.88	6.2'	25°30.29	-3.3'	57.7'
5 6	255°40.10 270°40.19	37.62 N14°38.39	199°58.11 214°23.36	6.2' 6.3'	25°27.02 N25°23.59	-3.4' -3.6'	57.7' 57.8'
7	285°40.27	39.16	$228^{\circ}48.61$	6.3'	25°20.00	-3.7'	57.8'
8	300°40.35	39.94	243°13.88	6.3'	25°16.25	-3.9'	57.8'
9 10	315°40.43 330°40.52	· · 40.71 41.47	257°39.17 272°4.47	6.3' 6.3'	25°12.35 25°8.28	-4.1' -4.2'	57.8' 57.8'
11	345°40.60	41.47 42.24	272 4.47 286°29.79	6.3	25 8.28 25°4.07	-4.2 -4.4'	57.8 57.9'
12	0°40.68	N14°43.01	300°55.14	6.4'	N24°59.69	-4.5'	57.9'
13	15°40.76 30°40.84	43.78	315°20.50	6.4'	24°55.16 24°50.47	-4.7'	57.9'
14 15	30°40.84 45°40.92	44.55 •• 45.32	329°45.89 344°11.31	6.4' 6.4'	24°50.47 24°45.62	-4.8' -5.0'	57.9' 57.9'
16	60°41.00	46.08	$358^{\circ}36.75$	6.5'	24°40.63	-5.2'	58.0'
17	75°41.08	46.85	13°2.22	6.5'	24°35.47	-5.3'	58.0'
18 19	90°41.16 105°41.24	N14°47.62 48.38	27°27.72 41°53.25	6.5' 6.6'	N24°30.17 24°24.71	-5.5' -5.6'	58.0' 58.0'
20	120°41.32	49.15	56° 18.81	6.6'	24° 19.09	-5.8'	58.0'
21	135°41.40	• • 49.91	70°44.40	6.6'	24°13.33	-5.9'	58.1'
22 23	150° 41.48 165° 41.56	50.68 51.44	85°10.03 99°35.69	6.7' 6.7'	24°7.41 24°1.34	-6.1' -6.2'	58.1' 58.1'
23	SD = 15.9'	d = 0.8'	99 33.09		D = 15.7'	-0.2	30.1
	<u>JD — 15.9</u>	u — 0.0		اد	J — 10.1		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-18%
27	02:22	02:26	11:58	14:11	01:43	
28	02:30	02:35	11:57	15:08	02:39	
29	02:39	02:43	11:57	16:06	03:37	

Sept	h	Aries	Venus	Mars	Jupiter	Saturn
0 21197288 1427563 1877642 4467 2017556 3689 7071068 1812 2007639 7.78 2 44473281 1877642 4467 2017556 3689 7071068 1815 20174755 7.78 3 4475281 77742 202 446 4277 2476768 38.10 1071573 6.22 2477818 7.78 5 293740.20 2174202 446 4277 246768 38.10 1071573 6.22 2477818 7.78 5 293740.20 2174202 446 1477 246768 38.10 1071573 6.22 2477818 7.78 5 293740.20 2174202 446 1477 246768 38.10 1071573 6.22 2477818 7.78 7 20274613 24774483 4477 2907501 40.21 15472344 8.12 2027630 8.10 8 3384763 24274022 446 174 2907501 40.21 15472344 8.12 2027630 8.10 8 7 20274613 24774483 4497 2907501 40.21 15472344 8.12 2027630 8.10 10 878252 24274020 45510 3927138 4222 1997313 8.42 3837489 8.64 11 227549 30775051 4552 347418 4222 1997313 8.42 3837489 8.64 11 227549 30775051 4552 347418 4282 1997313 8.42 3837489 8.64 12 3875745 3277532 446 452 247418 18 4289 2478386 8.45 383770 10 874 13 557505 3277532 4 458 6 3547450 44577 247439 1988 845 858 845 15 587548 2775524 4551 607575 851 84 627 2474386 8.10 16 99731 2275788 4551 60751 84742 84747 8	Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 233°903 8 117°378.02						
2 248*28.81 187*39.21 187*39.21 44.91 218*59.73 3.88.85 79*10.65 8.15 22*40.71 7.78 3 26*50.41 3.75.2 44.71 23*50.61 3.75.2 44.71 23*50.61 3.75.2 44.71 23*50.61 3.75.2 44.71 23*50.61 3.75.2 44.71 23*50.61 3.75.2 44.71 23*50.61 23*50.61 23*50.61 217*47.72 44.81 24.74 45.72 24.75.70 8.15.2 41.74 18.2 24.75.2 41.81 24.74 18.2 24.75.2 41.81 24.74 18.2 24.75.2 41.81 24.74 18.2 24.75.2 41.81 24.75 24.81 24.75 24.81 24.75 24.81 24.75 24.81 24.75 24.81 24.75 24.81 2						
3 023°35.27 302°40.10 1477 248°76.03 3.10 10715.75 8.19 222°49.71 7.78 8 47774 1272 402°40.61 44.77 248°76.03 3.10 10715.75 8.22 247°31.81 8.79 99 15 10715.75 8.22 247°31.82 18.79 99 15 127°40.10 14774.02 44.82 44.79 248°77.85 118°35.85 124°18.32 8.25 922°34.04 8.10 16 10 16 308°42.67 224°43.82 44.03 225°51.11 30°50.81 80.80 8.32 225°33.80 8.10 227°40.76 4.10 16 205°51.11 40.02 110°20.81 80.80 8.32 225°33.80 8.10 827°40.76 8.10 328°40.86 44.15 10 328°51.10 87°40.80 8.32 225°33.80 8.10 827°40.76 8.10 328°40.86 44.15 10 328°40.86 8.10 827°40.86 8.10 827°40.86 8.10 827°40.80 8.32 225°33.80 8.10 827°40.86 8.10 827°40.						
6 2978'97.76 2022'40.61 44.77 248'97.08 38.19 109'15.75 8.22 227'81.88 7.99 5 293'40.20 217'42.02 41.48 205'77.6 38.87 129'18.25 82.5 225'40.40 8.10 6 300'42.67 202'43.42 107'44.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 100'18.57 120'48.81 205'76.38 120'48.81 120'48.81 205'76.38 120'48.81 120'48.81 205'76.38 120'48.81 120'48.81 120'48.81 120'48.81 120'48.81 120'48.81 120'48.81 120'4						
5 293°400 0 121°4002 4484 265°5776 3887 124°1832 855 262°5604 810 6 306°4267 233°4342 427°4483 4497 295°5011 4021 154°2344 832 205°50.50 831 7 323°4513 247°4483 4497 295°5011 4021 154°2344 832 205°50.50 831 833°476 305°405 45.16 330°170 4081 169°200 6.38 300°50.56 841 10 25°459 307°5051 45.21 335°113 42.22 199°3113 842 333°468 6.43 11 25°459 307°5051 45.22 395°4181 4226 199°3113 842 333°468 6.44 12 35°5745 325°51.94 127°65.38 9°248 111°6356 229°36.25 806°8.48 8°317 110°8.85 13 55°596 33 35°51.95 45.24 235°1.18 42.22 199°31.33 8.68 8°317 110°8.85 14 69°233 35°51.95 45.24 395°1.83 44.90 259°41.37 8.91 38°1349 6.00 14 69°233 35°51.95 45.24 395°1.83 44.90 259°41.37 8.91 38°1349 6.00 14 69°233 35°51.95 45.51 86°5.18 46.91 259°41.37 8.91 38°1349 6.00 15 99°73 12 22°57.85 812°45.62 99°553 111′47.88 40.92 59°41.37 8.91 38°1349 6.00 16 99°73 12 22°57.85 812°45.62 99°553 111′47.88 319°161 80°8.67 98°21.4 110°550 10 144°1470 85°449 45.73 129°7.88 489 2349°50.7 8.73 125°244 6.07 112°24 6.00 10 144°1470 85°449 45.73 129°7.88 489 2349°50.7 8.73 125°244 6.07 112°24 6.00 10 149°420 159°10.81 147°50 46.58 114°7.90 5.00 3.35°4.4 6.82 137°3.29 5.00.3 12 220°4541 138°13.76 46.07 234°12.59 5.25 86 80°5.50 80°5.88 188°3.10 9.00 13 224°20.40 156°10.81 147°50 46.03 20°11.95 5.25 86 80°5.50 80°5.88 188°3.11 10°5.14 10°5.1						
6 986*4267 1 32**49.42 N2**49.11 278*56.43 N1**99.54 139**20.88 N06*8.29 277**56.20 N10**21.1	5	293°40.20	217°42.02 44.84	263° 57.76 38.87		
7 323*4513 347*4683 4.497 292*59.11 40.21 154*22.44 8.32 292*58.36 8.31 8.38*7.00 202*62.4 45.04 305*97.8 40.88 166*20.00 8.35 300*0.52 8.42 9 355*0.06 2.20*40.00 45.16 33.4*0.46 4.155 184*26.57 8.38 323*2.68 8.53 10 8*2.52 202*40.00 45.16 33.4*0.46 4.155 184*26.57 8.38 323*2.68 8.53 11 8*2.22 202*40.00 45.16 33.4*0.46 4.155 184*26.57 8.38 323*2.68 8.64 4.15 184*2.57 8.38 323*2.68 8.53 11 8*2.22 185*3.11 8.42 23*2.8*2.8*3.8*3.8*3.8*3.8*3.8*3.8*3.8*3.8*3.8*3	6	308°42.67	232°43.42 N27°44.91	278°58.43 N11°39.54	139°20.88 N06°8.29	277°56.20 N10°8.21
9 953°9.06 277°47.67 · 45.10 324°0.46 · 41.55 184°25.57 · 8.38 322°2.68 · 8.53 10 8°2.52 290°3.06 45.16 330°1.13 42.23 190°3.13 8.42 330°3.68 · 8.64 11 23°4.49 191°3.50 45.10 187.45 11 23°4.49 191°3.50 18.42 391°3.13 8.42 33°3.68 8.65 123°1.13 8.62 133°3.69 24°3.50 18.74 11 23°4.69 191°3.50 18.74 181°3.50 123°4.69 127°4.52 181°3.50 18.74 181°3.50 181°4	7	323°45.13	247° 44.83 44.97		154°23.44 8.32	292°58.36 8.31
10 6*82.52 292*40.00 45.16 339*1.13 4.222 199*3.13 8.42 338*4.85 8.64 11 23*54.99 307*50.51 45.22 35*1.81 4.22 21 99*3.13 8.42 338*4.85 8.64 11 23*54.99 307*50.51 45.22 35*1.81 4.52 29*3.02 5.006*8.48 8*0*1.71 100*8.85 13 53*9.92 337*53.73 45.34 22*3.13 4.49 0.25*4.37 1.85 3.85*1.33 8.96 14.60 4.34 0.35*3.83 4.49 0.25*4.37 1.85 3.85*1.33 8.96 14.60 4.34 0.35*3.83 4.49 0.25*4.37 1.85 3.85*1.34 0.00 14.60 1	8	338°47.60	262°46.25 45.04	308°59.78 40.88	169°26.00 8.35	308°0.52 8.42
11 23°F499 317°F551 45.22 35.41°B1 42.89 214*33.69 8.45 355*7.01 87.4 12 36°F4.65 32°F51.69 127*52.80 42.46 116*2.80 229*6.25 8.06°F8.46 81.91°T N0°F8.5 13 55°F9.92 33*75*3.37 4.5.34 24*3.15 44.23 224*38.81 8.51 22*11.33 8.96 14 69°7.238 352°F8.40 45.40 54*3.60 45.57 274*43.83 8.55 33*15.60 0.917 15 84*4.84 72.75 52.28 4.5.46 54*4.50 45.57 274*43.83 8.55 33*15.60 0.917 15 84*4.84 72.75 52.28 4.5.46 54*4.50 45.57 274*43.83 8.55 33*15.60 0.917 15 19*17*17 72.75 52.28 4.5.46 54*4.50 45.57 274*43.83 8.55 33*15.60 0.917 18 129*12.74 53*15.80 127*6.81 29 99°6.53 N11*47.58 139*51.61 N06*8.67 98*22.14 N10*9.80 20 159*17.17 83*34.84 45.73 129*7.88 48.92 349*56.73 8.73 128*26.47 0.71 21 174*19.3 99°4.94 45.78 14*65.5* 44.95 94*55.73 8.75 147*26.3 0.92 22 189*22.99 138*10.81 45.98 15.99*22 50.26 20*1.84 8.79 158*30.79 0.93 22 189*22.99 138*10.81 45.98 20*11.25 50.26 20*1.84 8.79 158*30.79 0.93 23 20*2*45.6 128*7.87 48.88 17*6.90 50.93 35*4.40 8.82 173*2.99 10.03  Mor. Phas. 09.25	9	353°50.06	277°47.67 · · 45.10	324°0.46 · · 41.55	184°28.57 · · 8.38	323°2.68 · · 8.53
12 38*57.45 32*2*51.94 N27*45.28 9*2.48 N11*43.56 220*36.25 N06*8.48 8*91.7 N10*8.85 13 563*90.2 337*53.7 45.34 23*24*1.35 4.23 244*3.81 8.51 23*11.33 8.96 14 69*2.38 32*54.80 4.54 0.39*2.83 4.490 259*41.57 8.54 38*13.49 9.07 15.84*4.84 7*55.24 4.54.6 54.0 39*2.83 4.490 259*41.57 8.54 38*13.49 9.07 15.84*4.84 7*55.24 4.54.6 55.1 69*5.18 4.6.24 289*46.9 8.61 68*17.62 9.23 17.14*19.77 37*59.13 4.55.7 94.58 5.4 40.1 304*49.05 8.64 83*19.98 9.39 9.39 18*124*12.14*19.77 37*59.13 4.55.7 94*5.85 4.01 304*49.05 8.64 83*19.98 9.39 9.39 18*124*12.14*19.63 89*4.94 4.45.78 128*2*2.24 80*2*2.09 113*6.40 4.58.81 158*9.22 5.0.56 20*14.8 8.79 18*2*2.14 N11*6*5.09 1.99*17.17 88*3.44 4.57.8 128*7.82 5.0.56 20*14.8 8.79 18*3*2.95 10.03 22*2.18*2.20*2.20*138*6.40 4.58.81 158*9.22 5.0.56 20*14.8 8.79 18*3*3.79 9.93 22*2.24*2.455 128*7.67 4.58.88 174*9.90 5.93 35*4.40 8.82 173*32.95 10.03 40*2.22*2.20*2.24*2.25 11.34*9.38 N27*45.80 189*10.57 N11*51.59 5.0.66 20*148 8.79 18*3*3.79 9.93 22*2.24*2.14*2.14*2.14*2.14*2.14*2.14*2.	10	8°52.52				
13   53°590   23   33°59.37   45.44   24°31.55   44.23   24°31.55   45.00   25°40.07   45.00   25°40.07   45.00   25°40.07   45.00   25°40.07   45.00   45.0	11					
14   6972.38   382754.80   45.46   3973.83   44.90   259741.57   8.54   38713.49   9.07     15   874.84   775.62   4.45.46   55.1   6675.18   46.24   289746.99   8.61   68717.82   9.28     17   11479.77   377591.3   45.57   6875.83   46.01   304749.05   8.61   68717.82   9.28     18   129712.24   5370.58   N2745.62   9976.53   N11747.58   310751.61   N0078.07   88722.14   N1179.50     18   41471.70   6872.33   45.66   41477.58   310751.61   N0078.07   88722.14   N1179.50     19   14471.70   6872.33   45.66   41477.58   41475.88   310751.61   N0078.07   88722.14   N1179.50     21   174719.63   9874.04   4.578   14475.85   4.49.99   2.69.28   8.76   14372.63   -9.82     22   18972.20   11376.40   4.48.83   13767.90   5.05   20714.8   8.79   138730.79   9.93     22   18972.20   11376.40   4.48.83   17479.90   5.03   3574.40   8.82   173732.99   10.03     Mer. pass. 09.25   \( \begin{array}{c} \b						
15 89"4.84 7"56.24 44.66 56"4.80 45.57 274"31.33 8.58 53"15.66 91.7 15.9 97.31 22"57.68 45.57 86"5.88 46.91 300"49.05 8.64 83"19.98 9.39 9.39 181 129"21.24 53"0.58 N27"45.62 99"6.53 11174"7.88 31.04"49.05 8.64 83"19.98 9.39 9.39 181 129"21.24 53"0.58 N27"45.62 99"6.53 11174"7.88 31.04"8.91 1.00"8.67 8.05 80"2.01 109"1.71 83"3.04 40.55 33.04"8.91 8.00"49.05 8.65 1113"4.30 9.60 1109"1.71 83"3.04 40.55 33.05"8.01 1.00"8.67 8.05 8.05 11.00"8.67 9.71 1.00"8.67 8.05 8.05 11.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.71 1.00"8.67 9.70 1.00 1.00"8.67 9.71 1.00"8.67 9.70 1.00 1.00"8.67 9.71 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1						
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18   139°1224   53°058   73°78612   84°57   84°585   46.91   304°49.05   8.64   83°19.08   9.39     18   139°1224   53°058   73°78.62   99°65.53   711°73   33°5417   8.70   113°42.30   9.60     19   144°14.70   83°3.48   45.73   129°7.88   48.92   349°6.63   8.73   132°2.43   9.60     21   189°2.20   113°6.40   45.83   159°9.22   50.56   20°11.84   8.79   132°2.64   9.93     22   189°2.20   113°6.40   45.83   159°9.22   50.56   20°11.84   8.79   158°30.79   9.93     23   204°24.56   128°7.87   45.88   174°9.90   59.93   35°4.40   8.82   173°32.95   10.03     Mer. pass. 09.25   \( \bullet \) 144°6.01   74.77   70.						
18 129*12.24 53*0.58 N27*45.62 99*6.53 N11*37.58 319*51.61 N06*8.67 98*22.14 N16*9.50 20 159*17.17 83*3.48 45.73 129*7.88 48.92 349*56.73 8.73 128*26.47 9.71 13*2*43 9.80 113*2*43 9.80 113*2*43 9.80 113*6*40 4.58.73 129*7.88 48.92 349*56.73 8.73 128*26.47 9.71 10.92 1174*10.63 98*4.94 4.58.73 159*9.22 50.25 20*4*2.65 128*7.87 45.88 159*9.22 50.25 20*1.84 8.79 158*9.079 9.93 122 204*24.55 128*7.87 45.88 159*9.22 50.25 20*1.84 8.79 158*9.079 9.93 125*2.20 40*2.45 128*2.45 128*7.87 45.88 174*9.90 50.93 35*4.40 8.82 173*2.92 10.02 124*3.94 N12*4.95 124*2.94 124*2.94 124*2.94 124*2.94 124*2.94 125 124*2.94 125 124*2.94 125 124*2.94 125 124*2.94 125 124*2.94 125*2.94						
19   144"1470						
20   19"11.17   89"3.48   45.73   129"7.88   49.92   349"56.73   8.73   128"26.47   9.71						
221 189°2.00 113°6.40 4.58.3 149°5.50 49.59 4°59.28 · 8.76 143°2.8.63 · 9.82 22 189°2.20 113°6.40 4.58.3 159°0.92 50.26 2018.8 8.79 158°3.07 9.9.9 132 2204°24.56 128°7.87 4.58.8 174°9.90 50.33 35°4.40 8.82 173°3.2.95 10.03 Mer.pass. 09.25						
22   189°22.09   113°6.40   45.83   159°9.22   50.26   20°1.84   8.79   158°30.79   9.93						
Mon   CHA   CHA   Dec   GHA   Dec   CHA   Dec						
Mon						
Mon GHA GHA	23	204°24.56	128~7.87 45.88	174~9.90 50.93	35~4.40 8.82	1/3~32.95 10.03
0 219°27 02 143°9,34 N27°45,93 189°10,57 N11°51,59 50°6,96 N06°8,86 188°35,11 N10°10,14 1 234°9,99 188°10,81 45,98 204°11,55 52,26 65°9,52 8,89 203°37,28 10,25 2 249°31,95 173°12,29 46,03 219°11,92 5.293 80°12,07 8,92 218°39,44 10.35 44 11 188°13,76 46,07 234°12,59 · 53,60 9°14,63 8,95 233°41,60 · 10.46 4 279°36,88 203°15,25 46,12 249°13,27 54,26 110°17,19 8,98 248°43,76 10,57 5 246°39,34 128°16,73 46,16 264°13,94 54,93 126°19,74 0,01 263°45,92 10,68 6 300°41,81 233°18,22 N27°46,20 29°14,61 N11°55,60 140°22,30 N06°0,04 278°48,99 100°10,78 7 324°44,27 248°10,72 44,25 294°15,29 56,26 140°22,30 N06°0,04 278°48,99 100°10,78 8 339°46,74 263°21,22 46,29 30°15,96 56,93 170°27,41 9,10 308°52,41 11.00 10 9°81,66 293°24,22 46,29 30°15,96 56,93 170°27,41 9,10 308°52,41 11.00 10 9°81,66 293°24,22 46,37 3324°16,63 · 57,60 188°29,96 · 912 333°85,07 411.21 126°44,13 308°85,73 46,40 336°17,38 83,26 200°32,52 9 15 338°55,74 11.21 126°44,13 308°85,73 46,40 336°17,38 83,26 200°32,52 9 15 338°55,74 11.21 126°44,13 308°85,73 46,40 336°17,38 8326°5,90 2133°35,00 7 918 333°35,90 1132 13 54°99,06 338°30,27 46,51 39°20,00 0.92 260°42,73 9.24 30°53,38 11.64 15 86°3,38 8°31,79 46,55 54°20,07 1.59 278°54,59 9 9,30 54°7,55 11.75 11.58 11.00 6.65 223°33,22 46,58 69°11,35 2.25 200°7,84 9.3 9.3 54°7,55 11.75 11.68 130°11,38 53°30,38 N27°46,64 99°22,69 N12°3,58 300°5,39 9.36 84°11,87 11.68 130°11,38 53°30,38 N27°46,64 99°22,69 N12°3,58 50°5,09 9,41 114°16,20 12.17 11.68 11.00 11.38 1348.58 132°5,44 40.00 40.78 142°2,57 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 335°5,50 9,41 114°16,20 12.17 12.62 11.07 138°13,34 46,83 12.20 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 335°5,50 9,41 114°16,20 12.17 12.62 12.175°10,10 13.3 53°3,38 N27°46,64 199°22,69 N12°3,35 50°5,05 9,44 129°14,33 11.20 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 30°5,50 9,44 129°14,33 31 120°2,50 120°2,50°4,34 9,50 9,50 9,50 9,50 9,50 9,50 9,50 9,50	Mer.p	pass. 09:25	ν1.4' d0.1' m-4.75	ν0.7' d0.7' m1.21	ν2.6' d0.0' m-2.29	ν2.2′ d0.1′ m0.48
0 219°27 02 143°9,34 N27°45,93 189°10,57 N11°51,59 50°6,96 N06°8,86 188°35,11 N10°10,14 1 234°9,99 188°10,81 45,98 204°11,55 52,26 65°9,52 8,89 203°37,28 10,25 2 249°31,95 173°12,29 46,03 219°11,92 5.293 80°12,07 8,92 218°39,44 10.35 44 11 188°13,76 46,07 234°12,59 · 53,60 9°14,63 8,95 233°41,60 · 10.46 4 279°36,88 203°15,25 46,12 249°13,27 54,26 110°17,19 8,98 248°43,76 10,57 5 246°39,34 128°16,73 46,16 264°13,94 54,93 126°19,74 0,01 263°45,92 10,68 6 300°41,81 233°18,22 N27°46,20 29°14,61 N11°55,60 140°22,30 N06°0,04 278°48,99 100°10,78 7 324°44,27 248°10,72 44,25 294°15,29 56,26 140°22,30 N06°0,04 278°48,99 100°10,78 8 339°46,74 263°21,22 46,29 30°15,96 56,93 170°27,41 9,10 308°52,41 11.00 10 9°81,66 293°24,22 46,29 30°15,96 56,93 170°27,41 9,10 308°52,41 11.00 10 9°81,66 293°24,22 46,37 3324°16,63 · 57,60 188°29,96 · 912 333°85,07 411.21 126°44,13 308°85,73 46,40 336°17,38 83,26 200°32,52 9 15 338°55,74 11.21 126°44,13 308°85,73 46,40 336°17,38 83,26 200°32,52 9 15 338°55,74 11.21 126°44,13 308°85,73 46,40 336°17,38 8326°5,90 2133°35,00 7 918 333°35,90 1132 13 54°99,06 338°30,27 46,51 39°20,00 0.92 260°42,73 9.24 30°53,38 11.64 15 86°3,38 8°31,79 46,55 54°20,07 1.59 278°54,59 9 9,30 54°7,55 11.75 11.58 11.00 6.65 223°33,22 46,58 69°11,35 2.25 200°7,84 9.3 9.3 54°7,55 11.75 11.68 130°11,38 53°30,38 N27°46,64 99°22,69 N12°3,58 300°5,39 9.36 84°11,87 11.68 130°11,38 53°30,38 N27°46,64 99°22,69 N12°3,58 50°5,09 9,41 114°16,20 12.17 11.68 11.00 11.38 1348.58 132°5,44 40.00 40.78 142°2,57 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 335°5,50 9,41 114°16,20 12.17 12.62 11.07 138°13,34 46,83 12.20 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 335°5,50 9,41 114°16,20 12.17 12.62 12.175°10,10 13.3 53°3,38 N27°46,64 199°22,69 N12°3,35 50°5,05 9,44 129°14,33 11.20 12.20 160°16,31 83°39,46 46,70 129°24,04 4.91 30°5,50 9,44 129°14,33 31 120°2,50 120°2,50°4,34 9,50 9,50 9,50 9,50 9,50 9,50 9,50 9,50	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 234°29.49   188°10.81   45.98   204°11.25   52.26   65°9.52   8.89   203°37.28   10.25   2 249°31.95   137°12.29   46.03   221°11.92   52.93   80°12.07   8.92   213°31.40   10.35   3 264°34.41   188°13.76   46.07   234°12.59   53.60   95°14.63   8.95   233°41.63   10.55   5 294°39.34   218°16.73   46.16   264°13.94   54.93   125°19.74   90.11   263°45.92   10.68   6 309°41.81   233°12.22   N27°46.20   279°14.61   NI1°55.60   140°22.30   000°6.94   278°48.00   N10°10.78   7 324°44.27   248°19.72   46.25   294°15.29   56.26   155°24.85   90.7   293°50.25   10.89   8 339°46.74   263°21.22   46.23   309°15.96   56.93   170°27.41   91.0   308°52.41   11.00   9 354°49.20   278°22.72   46.37   339°17.31   58.26   200°32.52   91.5   338°56.57   11.10   10 9°51.66   233°24.22   46.37   339°17.31   58.26   200°32.52   91.5   338°56.57   11.12   11 244°54.13   308°25.73   46.40   354°17.98   58.93   215°35.07   91.8   353°35.90   11.32   12 39°55.99   338°36.75   46.48   24°19.33   12°0.26   245°40.18   92.4   24°3.22   11.53   14 70°1.52   333°30.27   46.51   39°20.00   0.92   260°42.73   9.27   39°5.38   11.64   15 88°3.98   8°31.79   46.55   54°20.07   1.59   25°45.29   9.30   54°7.55   11.75   16 100°6.45   23°33.32   46.58   66°21.35   2.25   290°47.84   9.33   69°9.71   11.85   18 130°11.38   53°36.38   N27°46.64   84°22.02   2.92   200°50.99   9.30   84°11.87   11.96   18 130°11.38   53°36.38   N27°46.64   98°22.60   N12°3.58   320°52.94   N06°9.38   99°41.01   11.85   18 130°11.38   53°36.38   N27°46.64   99°22.60   N12°3.58   320°52.94   N06°9.38   99°41.01   11.96   18 130°11.38   53°36.38   N27°46.64   99°22.60   N12°3.58   320°52.94   N06°9.38   99°41.03   N06°12.17   20 160°16.31   83°39.46   46.70   129°24.04   4.91   350°58.05   9.44   129°18.36   12.28   21 175°18.17   98°40.00   46.73   144°24.17   5.57   6°6.06   9.47   144°6.20   12.17   20 160°16.31   83°39.46   46.70   129°24.04   4.91   350°58.05   9.44   129°18.35   12.28   21 175°18.18.77   98°40.00   46.73   148°22.70   9.50°50.99   9.36   84°11						
2 249°31.95 173°12.29 46.03 219°11.92 52.93 80°12.07 8.92 218°39.44 10.35 32°41.60 \tau10.46 4 279°36.88 203°15.25 46.12 249°13.27 54.26 110°17.19 8.98 248°43.76 10.57 5249°39.34 218°16.73 46.16 264°13.94 54.93 110°17.19 8.98 248°43.76 10.57 5249°39.34 218°16.73 46.16 264°13.94 54.93 110°17.19 8.98 248°43.76 10.57 65 294°34.27 248°10.72 44.25 294°15.29 56.26 140°22.20 N06°0.04 278°48.09 N10°10.78 132°44.72 448°10.72 44.25 294°15.29 56.26 140°22.20 N06°0.04 278°48.09 N10°10.78 133°44.07 24.27 248°10.72 44.25 294°15.29 56.26 140°22.20 N06°0.04 278°48.09 N10°10.78 130°15.99 10°10.79						
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14 70°1.52 353°30.27 46.51 39°20.00 0.92 260°42.73 9.27 39°5.38 11.64 15 88°3.98 8°31.79 · 46.55 54°20.67 · 1.59 275°45.29 · · · · · · · · · · · · · · · · · · ·	12	39°56.59	323°27.24 N27°46.44	9°18.65 N11°59.59	230°37.63 N06°9.21	9°1.06 N10°11.43
15 88°3.98 8°3.179 · · · · · · · · · · · · · · · · · · ·	13	54°59.06	338°28.75 46.48		245°40.18 9.24	24°3.22 11.53
16 100°6 45 23°33 32 46.58 69°21.35 2.25 290°47.84 9.33 69°97.1 11.85 17 115°8.91 38°34.85 46.61 84°22.02 2.92 305°50.94 N06°9.38 99°14.03 N10°12.07 19 145°13.84 68°37.92 46.67 114°23.37 4.24 335°55.50 9.41 114°16.20 12.17 20 160°16.31 83°9.94 46.70 122°24.04 4.91 350°55.50 9.41 114°16.20 12.17 20 160°16.31 83°9.94 46.70 122°24.04 4.91 350°55.50 9.41 114°16.20 12.17 20 160°16.31 83°9.94 46.70 122°24.04 4.91 350°55.50 9.41 114°16.20 12.18 21 175°18.77 98°41.00 · 46.73 144°24.71 · 5.57 6°0.60 · 9.47 144°20.52 · 12.39 22 190°21.23 113°42.55 46.76 159°25.38 6.23 21°3.15 9.50 159°22.68 12.50 23 205°23.70 128°44.10 46.79 174°26.06 6.90 36°5.70 9.52 174°24.85 12.60    Mer.pass. 09:21 ν1.5′ d0.0′ m-4.75 ν0.7′ d0.7′ m1.22 ν2.6′ d0.0′ m-2.28 ν2.2′ d0.1′ m0.49    Tue GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec 123°28.63 158°47.21 46.84 204°27.40 8.22 66°10.80 9.58 204°29.17 12.82 250°31.09 173°48.77 46.86 219°28.07 8.88 81°13.35 9.61 219°31.33 12.92 3 265°33.55 188°50.34 · 46.88 234°28.75 · 9.54 6°15.80 9.69 32*33.50 13.03 4 280°36.02 203°51.91 46.91 249°29.42 10.21 111°18.45 9.66 249°35.66 13.14 5 295°38.48 218°53.48 40.93 266°30.09 10.87 166°10.80 9.63 234°33.50 13.03 4 280°36.02 203°51.91 46.91 249°29.42 10.21 111°18.45 9.66 249°35.66 13.14 5 295°38.48 218°53.48 40.93 266°30.09 10.87 166°21.00 9.69 264°37.82 13.24 6 3 10°40.95 233°55.06 N27°46.95 279°30.76 N12°11.53 141°23.55 N06°9.71 279°39.89 N10°13.35 7 325°43.41 248°56.64 46.97 294°31.43 12.19 156°26.10 9.74 294°32.15 13.46 8 340°45.87 263°58.22 46.98 300°32.11 12.85 171°28.65 9.97 30°44.31 13.56 9.35°43.41 248°56.64 46.97 294°31.43 12.19 156°26.10 9.77 294°32.15 13.46 9.35°43.41 248°56.64 46.97 294°31.43 12.19 156°26.10 9.79 294°32.15 13.46 11 25°53.27 300°2.99 47.03 354°34.12 14.83 216°36.29 9.98 334°50.80 13.88 12 40°55.73 324°45.9 N27°4.04 9°34.79 N12°15.49 231°38.84 N06°9.87 9°52.96 N10°13.99 13 55°58.20 339°6.19 47.00 624°38.68 11.17.47 20°38.84 N10°13.35 14.20 15°39.77 14.42 11.00 110°50.80 294°1.40 47.00 60°37.48 18.13 12.95 54.41 1.00 110°50.80 29	14	$70^{\circ}1.52$	353°30.27 46.51	39°20.00 0.92	260°42.73 9.27	39°5.38 11.64
17 115°8.91 38°34.85 46.61 84°22.02 2.92 305°50.39 9.36 84°11.87 11.96 18 130°11.38 53°36.38 N27°46.64 99°22.69 N12°3.58 320°50.39 9.36 84°11.87 11.96 11.96 11.90°11.38 53°36.38 N27°46.64 99°22.69 N12°3.58 325°55.50 9.41 114°16.20 12.17 20 160°16.31 83°39.46 46.70 129°24.04 4.91 350°58.05 9.44 129°18.36 12.28 121 175°18.177 98°41.00 4.67.3 144°24.71 5.5.77 6°0.66 9.40 9.47 144°20.52 12.39 22 190°21.23 113°42.55 46.76 159°25.38 6.23 21°3.15 9.50 159°22.68 12.50 23 205°23.70 128°44.10 46.79 174°26.06 6.90 36°5.70 9.52 174°24.85 12.60    Mer.pass. 09:21	15	85°3.98	8°31.79 · · 46.55	54°20.67 · · 1.59	275°45.29 · · 9.30	54°7.55 · · 11.75
17 115°8.91 38°34.85 46.61 84°22.02 2.92 305°50.39 9.36 84°11.87 11.96 18 130°11.38 53°36.38 N27°46.64 99°22.69 N12°3.58 320°50.39 9.36 84°11.87 11.96 11.96 11.90°11.38 53°36.38 N27°46.64 99°22.69 N12°3.58 325°55.50 9.41 114°16.20 12.17 20 160°16.31 83°39.46 46.70 129°24.04 4.91 350°58.05 9.44 129°18.36 12.28 121 175°18.177 98°41.00 4.67.3 144°24.71 5.5.77 6°0.66 9.40 9.47 144°20.52 12.39 22 190°21.23 113°42.55 46.76 159°25.38 6.23 21°3.15 9.50 159°22.68 12.50 23 205°23.70 128°44.10 46.79 174°26.06 6.90 36°5.70 9.52 174°24.85 12.60    Mer.pass. 09:21	16	100°6.45	23°33.32 46.58	69°21.35 2.25	290°47.84 9.33	69°9.71 11.85
19 145°13.84 68°37.92 46.67 114°23.37 4.24 335°55.50 9.41 114°16.20 12.17 20 160°16.31 83°39.46 46.70 129°24.04 4.91 350°58.05 9.44 129°18.36 12.28 12.17°18.77 98°41.00 · 46.73 144°24.71 · 5.57 6°0.60 9.47 144°20.52 · 12.39 22 190°21.23 113°42.55 46.76 159°25.38 6.23 21°3.15 9.50 159°22.68 12.50 23 205°23.70 128°44.10 46.79 174°26.06 6.90 36°5.70 9.52 174°24.85 12.60    Mer.pass. 09:21 ν1.5′ d0.0′ m-4.75 ν0.7′ d0.7′ m1.22 ν2.6′ d0.0′ m-2.28 ν2.2′ d0.1′ m0.49    Tue GHA GHA Dec GHA Dec 0.20°26.16 143°45.65 N27°46.81 189°26.73 N12°7.56 51°8.25 N06°9.55 189°27.01 N10°12.71 1 235°28.63 158°47.21 46.84 204°27.40 8.22 66°10.80 9.58 204°29.17 12.82 2.25°31.09 173°48.77 46.86 219°28.07 8.88 81°13.35 9.61 219°31.33 12.92 3 265°33.55 188°50.34 · 46.88 234°28.75 · 9.54 96°15.90 · 9.63 234°33.50 · 13.03 4 280°36.02 203°51.91 46.91 249°29.42 10.21 111°18.45 9.66 249°35.66 13.14 5 295°38.48 218°53.48 46.93 264°30.09 10.87 126°21.00 9.69 264°37.82 13.24 6 310°40.95 233°55.06 N27°46.95 279°30.76 N12°11.53 141°23.55 N06°9.71 279°39.98 N10°13.35 9 35°48.34 248°56.64 46.97 294°31.43 12.19 156°26.10 9.74 294°44.31 13.56 9 355°48.34 278°59.81 · 47.00 324°32.78 · 13.51 186°31.19 · 9.79 324°46.47 · 13.67 10°50.80 244°1.40 47.02 339°33.45 14.17 201°33.74 9.82 339°45.08 13.88 12 40°55.73 324°4.59 N27°4.04 9°34.79 11.55 41.19 156°26.10 9.79 324°46.47 · 13.67 10°50.80 244°1.40 47.02 339°33.45 14.17 201°33.74 9.82 339°48.63 13.78 11 25°53.27 309°2.99 47.03 354°34.12 14.83 216°36.29 9.85 354°50.80 13.88 12 40°55.73 324°4.59 N27°47.04 9°34.79 N12°15.49 231°38.84 N06°9.87 9°52.96 N10°13.99 13 55°58.20 33°1.26 47.10 47.09 69°37.48 18.13 291°49.02 9.97 70°1.61 14.42 17°1.066 354°7.80 47.07 39°36.14 16.81 261°43.93 9.92 39°57.28 14.20 15 86°3.12 9°9.41 · 47.08 54°36.81 · 17.47 276°46.48 · 9.95 54°59.45 · 14.31 16°6.05 39°1.12 47.09 47.09 48.81 18.19 310.05 14.74 14.20 10°1.79 199°1.14 · 47.10 84°38.15 18.79 30°61.57 10.00 85°3.77 14.52 11.10 116°1.54 48 84°1.75 14.10 116°1.54 48 84°1.75 14.10 116°1.54 48 84°1.75 11.10 116°1.54 48 84°1.75 11.10	17	$115^{\circ}8.91$	38°34.85 46.61	84°22.02 2.92	305°50.39 9.36	84°11.87 11.96
20 160°16.31 83°39.46 46.70 129°24.04 4.91 350°58.05 9.44 129°18.36 12.28 21 175°18.77 98°41.00	18			99°22.69 N12°3.58		99°14.03 N10°12.07
21 175°18.77 98°41.00 · 46.73 144°24.71 · 5.57 6°0.60 · 9.47 144°20.52 · 12.39 22 190°21.23 113°42.55 46.76 159°25.38 6.23 21°3.15 9.50 159°22.68 12.50 Mer.pass. 09:21 \(\nu \)1.5′ \(do. 0.0'\) m-4.75 \(\nu \)0.7′ \(do. 7.0'\) m1.22 \(\nu \)2.6′ \(do. 0.0'\) m-2.28 \(\nu \)2.2′ \(do. 0.1'\) m0.49 \(\nu \)2.6′ \(do. 0.0'\) m-4.75 \(\nu \)0.7′ \(do. 7.0'\) m1.22 \(\nu \)2.6′ \(do. 0.0'\) m-2.28 \(\nu \)2.2′ \(do. 0.1'\) m0.49 \(\nu \)2.6′ 26.66 143° 45.65 N2° 46.81 2.50 \(do. 0.20'\)26.16 143° 45.65 N2° 46.84 204°27.40 8.22 66° 10.80 9.58 204°29.17 12.82 2.250° 31.09 173° 48.77 46.86 219° 28.07 8.88 81° 13.35 9.61 219° 31.33 12.92 3.265° 33.55 188° 50.34 · 46.88 234° 28.75 · 9.54 96° 15.90 · 9.63 234° 33.50 · 13.03 4.280° 36.02 203° 51.91 46.91 249° 29.42 10.21 111° 18.45 9.66 249° 35.66 13.14 5.295° 38.48 218° 53.48 46.93 264° 30.09 10.87 126° 21.00 9.69 264° 37.82 13.24 6.310° 40.95 233° 55.06 N2° 46.95 279° 30.76 N12° 11.53 141° 23.55 N06° 9.71 29° 39.98 N10° 13.35 13.56 355° 48.34 278° 59.81 · 47.00 324° 32.78 · 13.51 166° 31.19 · 9.77 309° 44.31 13.56 9.355° 48.34 278° 59.81 · 47.00 324° 32.78 · 13.51 166° 31.19 · 9.77 309° 44.31 13.56 10.0° 50.80 294° 1.40 47.02 339° 33.45 14.17 201° 33.74 9.82 399° 48.63 13.78 11.25° 53.27 309° 2.99 47.03 354° 34.12 14.83 216° 36.29 9.85 354° 50.80 13.88 12 40° 55.73 324° 4.59 N2° 47.04 9° 34.79 N12° 15.49 21° 31° 38.84 N06° 9.87 9° 52.96 N10° 13.99 13.55° 58.20 339° 6.19 47.06 24° 35.46 16.15 246° 41.38 9.90 24° 55.12 14.10 14 71° 0.66 354° 7.80 47.07 39° 38.81 17.47 70° 46.48 · 9.95 54° 59.45 14.11 11.40 16° 5.59 24° 11.02 47.09 69° 37.48 18.13 21° 54.60 48.99 9.95 54° 59.45 14.11 11.10 16° 5.59 24° 11.02 47.09 69° 37.48 18.13 21° 54.00 9.97 70° 1.61 14.42 11.10 16° 5.59 24° 11.02 47.09 69° 37.48 18.13 21° 54.00 9.97 70° 1.61 14.42 11.10 116° 5.59 24° 11.02 47.09 69° 37.48 18.13 29° 24.29 10.02 100° 5.93 N10° 14.63 19 146° 12.98 69° 15.88 47.11 116° 30.50 39° 12.64 47.10 84° 38.15 18.79 306° 51.57 10.00 85° 3.77 14.52 18 131° 10.52 44° 41.02 47.04 48.40 14.21 21.20 40° 5	19	145° 13.84	68°37.92 46.67	114°23.37 4.24	335°55.50 9.41	114°16.20 12.17
22   190°21.23   113°4.255   46.76   159°25.38   6.23   21°3.15   9.50   159°22.68   12.50	20	$160^{\circ}16.31$		129°24.04 4.91	350°58.05 9.44	129°18.36 12.28
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	21	175° 18.77	98°41.00 · · 46.73	144°24.71 • • 5.57		144°20.52 · · 12.39
Mer.pass. 09:21         ν1.5' d0.0' m-4.75         ν0.7' d0.7' m1.22         ν2.6' d0.0' m-2.28         ν2.2' d0.1' m0.49           Tue         GHA         GHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec           0         220°26.16         143°45.65         N27°46.81         189°27.40         8.22         66°10.80         9.58         204°27.01         N10°12.71           1         235°28.63         158°47.21         46.84         204°27.40         8.22         66°10.80         9.58         204°29.17         12.82           2 250°31.09         173°48.77         46.86         219°28.07         8.88         81°13.35         9.61         219°31.33         12.92           3 265°33.55         188°50.34         -46.88         234°28.75         -9.54         96°15.90         -9.63         234°33.50         13.03           4 280°36.02         203°51.91         46.91         249°29.42         10.21         111°18.45         9.66         249°35.66         13.14           5 295°38.48         218°53.48         46.93         264°30.09         10.87         126°21.00         9.69         264°37.82         13.24           6         310°40.95         233°55.06         N27°46.	22	190°21.23	113°42.55 46.76	159°25.38 6.23	21°3.15 9.50	159°22.68 12.50
Tue         GHA         GHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec           0         220°26.16         143°45.65         N27°46.81         189°26.73         N12°7.56         51°8.25         N06°9.55         189°27.01         N10°12.71           1         235°28.63         158°47.21         46.84         204°27.40         8.22         66°10.80         9.58         204°29.17         12.82           2         250°31.09         173°48.77         46.86         219°28.07         8.88         81°13.35         9.61         219°31.33         12.92           3         265°33.55         188°50.34         46.88         234°28.75         9.54         96°15.90         9.63         234°33.50         13.03           4         280°36.02         203°51.91         46.91         249°29.42         10.21         111°18.45         9.66         249°35.66         13.14           5         295°38.48         218°53.48         46.91         249°30.76         N12°11.53         141°23.55         N06°9.71         279°39.98         N10°13.35           7         325°43.41         248°56.64         46.97         294°31.43         12.19         156	23	205°23.70	128°44.10 46.79	174°26.06 6.90	36°5.70 9.52	174°24.85 12.60
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9 355°48.34 278°59.81 · · 47.00 324°32.78 · · 13.51 186°31.19 · · 9.79 324°46.47 · · 13.67 10 10°50.80 294°1.40 47.02 339°33.45 14.17 201°33.74 9.82 339°48.63 13.78 11 25°53.27 309°2.99 47.03 354°34.12 14.83 216°36.29 9.85 354°50.80 13.88 12 40°55.73 324°4.59 N27°47.04 9°34.79 N12°15.49 231°38.84 N06°9.87 9°52.96 N10°13.99 13 55°58.20 339°6.19 47.06 24°35.46 16.15 246°41.38 9.90 24°55.12 14.10 14 71°0.66 354°7.80 47.07 39°36.14 16.81 261°43.93 9.92 39°57.28 14.20 15 86°3.12 9°9.41 · · 47.08 54°36.81 · · 17.47 276°46.48 · · 9.95 54°59.45 · · 14.31 16 101°5.59 24°11.02 47.09 60°37.48 18.13 291°49.02 9.97 70°1.61 14.42 17 116°8.05 39°12.64 47.10 84°38.15 18.79 306°51.57 10.00 85°3.77 14.52 18 131°10.52 54°14.26 N27°47.11 99°38.82 N12°19.45 321°54.11 N06°10.02 100°5.93 N10°14.63 19 146°12.98 69°15.88 47.12 114°39.49 20.10 336°56.66 10.05 115°8.10 14.74 20 161°15.44 84°17.51 47.12 129°40.16 20.76 351°59.20 10.07 130°10.26 14.84 21 176°17.91 99°19.14 · · 47.13 144°40.84 · · 21.42 7°1.75 · · 10.10 145°12.42 · · 14.95 22 191°20.37 114°20.78 47.13 159°41.51 22.08 22°4.29 10.12 160°14.58 15.05 23 206°22.84 129°22.42 47.13 174°42.18 22.73 37°6.83 10.15 175°16.75 15.16						
10 10°50.80 294°1.40 47.02 339°33.45 14.17 201°33.74 9.82 339°48.63 13.78 11 25°53.27 309°2.99 47.03 354°34.12 14.83 216°36.29 9.85 354°50.80 13.88 12 40°55.73 324°4.59 N27°47.04 9°34.79 N12°15.49 231°38.84 N06°9.87 9°52.96 N10°13.99 13 55°58.20 339°6.19 47.06 24°35.46 16.15 246°41.38 9.90 24°55.12 14.10 14 71°0.66 354°7.80 47.07 39°36.14 16.81 261°43.93 9.92 39°57.28 14.20 15 86°3.12 9°9.41 · 47.08 54°36.81 · 17.47 276°46.48 · 9.95 54°59.45 · 14.31 16 101°5.59 24°11.02 47.09 69°37.48 18.13 291°49.02 9.97 70°1.61 14.42 17 116°8.05 39°12.64 47.10 84°38.15 18.79 306°51.57 10.00 85°3.77 14.52 18 131°10.52 54°14.26 N27°47.11 99°38.82 N12°19.45 321°54.11 N06°10.02 100°5.93 N10°14.63 19 146°12.98 69°15.88 47.12 114°39.49 20.10 336°56.66 10.05 115°8.10 14.74 20 161°15.44 84°17.51 47.12 129°40.16 20.76 351°59.20 10.07 130°10.26 14.84 21 176°17.91 99°19.14 · 47.13 144°40.84 · 21.42 7°1.75 · 10.10 145°12.42 · 14.95 22 191°20.37 114°20.78 47.13 159°41.51 22.08 22°4.29 10.12 160°14.58 15.05 23 206°22.84 129°22.42 47.13 174°42.18 22.73 37°6.83 10.15 175°16.75 15.16						
11       25°53.27       309°2.99       47.03       354°34.12       14.83       216°36.29       9.85       354°50.80       13.88         12       40°55.73       324°4.59       N27°47.04       9°34.79       N12°15.49       231°38.84       N06°9.87       9°52.96       N10°13.99         13       55°58.20       339°6.19       47.06       24°35.46       16.15       246°41.38       9.90       24°55.12       14.10         14       71°0.66       354°7.80       47.07       39°36.14       16.81       261°43.93       9.92       39°57.28       14.20         15       86°3.12       9°9.41       · 47.08       54°36.81       · 17.47       276°46.48       · 9.95       54°59.45       · 14.31         16       101°5.59       24°11.02       47.09       69°37.48       18.13       291°49.02       9.97       70°1.61       14.42         17       116°8.05       39°12.64       47.10       84°38.15       18.79       306°51.57       10.00       85°3.77       14.52         18       131°10.52       54°14.26       N27°47.11       99°38.82       N12°19.45       321°54.11       N06°10.02       100°5.93       N10°14.63         19       146°12.98       69°15.8						
12 40°55.73 324°4.59 N27°47.04 9°34.79 N12°15.49 231°38.84 N06°9.87 9°52.96 N10°13.99 13 55°58.20 339°6.19 47.06 24°35.46 16.15 246°41.38 9.90 24°55.12 14.10 14 71°0.66 354°7.80 47.07 39°36.14 16.81 261°43.93 9.92 39°57.28 14.20 15 86°3.12 9°9.41 · 47.08 54°36.81 · 17.47 276°46.48 · 9.95 54°59.45 · 14.31 16 101°5.59 24°11.02 47.09 69°37.48 18.13 291°49.02 9.97 70°1.61 14.42 17 116°8.05 39°12.64 47.10 84°38.15 18.79 306°51.57 10.00 85°3.77 14.52 18 131°10.52 54°14.26 N27°47.11 99°38.82 N12°19.45 321°54.11 N06°10.02 100°5.93 N10°14.63 19 146°12.98 69°15.88 47.12 114°39.49 20.10 336°56.66 10.05 115°8.10 14.74 20 161°15.44 84°17.51 47.12 129°40.16 20.76 351°59.20 10.07 130°10.26 14.84 21 176°17.91 99°19.14 · 47.13 144°40.84 · 21.42 7°1.75 · 10.10 145°12.42 · 14.95 19.10 19.00°22.42 47.13 174°42.18 22.73 37°6.83 10.15 175°16.75 15.16						
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16       101°5.59       24°11.02       47.09       69°37.48       18.13       291°49.02       9.97       70°1.61       14.42         17       116°8.05       39°12.64       47.10       84°38.15       18.79       306°51.57       10.00       85°3.77       14.52         18       131°10.52       54°14.26       N27°47.11       99°38.82       N12°19.45       321°54.11       N06°10.02       100°5.93       N10°14.63         19       146°12.98       69°15.88       47.12       114°39.49       20.10       336°56.66       10.05       115°8.10       14.74         20       161°15.44       84°17.51       47.12       129°40.16       20.76       351°59.20       10.07       130°10.26       14.84         21       176°17.91       99°19.14       47.13       144°40.84       21.42       7°1.75       10.10       145°12.42       14.95         22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
17       116°8.05       39°12.64       47.10       84°38.15       18.79       306°51.57       10.00       85°3.77       14.52         18       131°10.52       54°14.26       N27°47.11       99°38.82       N12°19.45       321°54.11       N06°10.02       100°5.93       N10°14.63         19       146°12.98       69°15.88       47.12       114°39.49       20.10       336°56.66       10.05       115°8.10       14.74         20       161°15.44       84°17.51       47.12       129°40.16       20.76       351°59.20       10.07       130°10.26       14.84         21       176°17.91       99°19.14       · 47.13       144°40.84       · 21.42       7°1.75       · 10.10       145°12.42       · 14.95         22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
18       131°10.52       54°14.26       N27°47.11       99°38.82       N12°19.45       321°54.11       N06°10.02       100°5.93       N10°14.63         19       146°12.98       69°15.88       47.12       114°39.49       20.10       336°56.66       10.05       115°8.10       14.74         20       161°15.44       84°17.51       47.12       129°40.16       20.76       351°59.20       10.07       130°10.26       14.84         21       176°17.91       99°19.14       · 47.13       144°40.84       · 21.42       7°1.75       · 10.10       145°12.42       · 14.95         22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
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20       161°15.44       84°17.51       47.12       129°40.16       20.76       351°59.20       10.07       130°10.26       14.84         21       176°17.91       99°19.14       · 47.13       144°40.84       · 21.42       7°1.75       · 10.10       145°12.42       · 14.95         22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
21       176°17.91       99°19.14       · · 47.13       144°40.84       · · 21.42       7°1.75       · · 10.10       145°12.42       · · 14.95         22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
22       191°20.37       114°20.78       47.13       159°41.51       22.08       22°4.29       10.12       160°14.58       15.05         23       206°22.84       129°22.42       47.13       174°42.18       22.73       37°6.83       10.15       175°16.75       15.16						
23 206°22.84 129°22.42 47.13 174°42.18 22.73 37°6.83 10.15 175°16.75 15.16						
vier.pass. u9:17						
	Mer.p	pass. 09:17	ν1.6′ d0.0′ m-4.75	ν0.7′ d0.7′ m1.22	ν2.6′ d0.0′ m-2.27	$\nu 2.2' \ d0.1' \ m0.49$

357°32.23 353°4.90

349°28.35

348°44.91

335°18.84

 $327^{\circ}48.47$ 

313°4.23

315°10.19

 $314^{\circ}3.65$ 

308°24.83

290°36.82

281°1.54

 $280^{\circ}18.27$ 

Alpheratz

Ankaa Schedar

Diphda

Hamal

Polaris

Acamar

Menkar

Mirfak

Rigel

Capella

Aldebaran

Achernar

**Dec** 29° 14.71

-42°8.98

56°41.44 -17°49.83

 $-57^{\circ}5.47$ 

 $23^{\circ}35.70$ 

89°22.96 -40°11.51

4°11.96

49°57.66

16°33.87

-8°10.30

 $46^{\circ}1.57$ 

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.64	N14°52.21	114°1.39	6.7'	N23°55.12	-6.4'	58.1'
1	195°41.72	52.97	128° 27.13	6.8'	23° 48.76	-6.5	58.1'
2	210°41.80 225°41.88	53.73 •• 54.49	142°52.91 157°18.73	6.8' 6.9'	23° 42.24 23° 35.58	-6.7' -6.8'	58.1' 58.2'
4	240°41.96	55.26	171° 44.58	6.9	23°28.76	-0.0 -7.0'	58.2'
5	255°42.03	56.02	186° 10.48	6.9'	23°21.80	-7.1'	58.2'
6	270°42.11	N14°56.78	200°36.42	7.0'	N23° 14.70	-7.2'	58.2'
7	285°42.19 300°42.26	57.54	215°2.41 229°28.44	7.0'	23°7.45 23°0.06	-7.4'	58.2'
8 9	300 42.26 315°42.34	58.30 •• 59.06	243°54.52	7.1' 7.1'	23 0.06 22°52.52	-7.5' -7.7'	58.3' 58.3'
10	330°42.42	14°59.82	258° 20.64	7.2'	22°44.84	-7.8	58.3'
11	345°42.50	15°0.58	272°46.81	7.2'	22°37.02	-8.0'	58.3'
12	0°42.57	N15°1.34	287°13.03	7.3'	N22°29.06	-8.1'	58.3'
13 14	15°42.65 30°42.72	2.09 2.85	301°39.29 316°5.61	7.3' 7.4'	22°20.96 22°12.72	-8.2' -8.4'	58.4' 58.4'
15	45°42.80	3.61	330°31.98	7.4 7.4'	22 12.72 22°4.34	-0.4 -8.5'	58.4'
16	60°42.87	4.37	344°58.39	7.5'	21°55.83	-8.7'	58.4'
17	75°42.95	5.12	359°24.86	7.5'	21°47.18	-8.8'	58.4'
18	90°43.02 105°43.10	N15°5.88 6.63	13°51.38 28°17.95	7.6' 7.6'	N21°38.39 21°29.47	-8.9' -9.1'	58.4'
19 20	105 43.10 120°43.17	6.63 7.39	28° 17.95 42° 44.58	7.6° 7.7'	21°29.47 21°20.42	-9.1' -9.2'	58.5' 58.5'
21	135°43.25	8.14	57° 11.26	7.7'	21° 20.42 21° 11.24	-9.2 -9.3'	58.5
22	150°43.32	8.90	71°37.99	7.8'	21°1.92	-9.4'	58.5'
23	165°43.40	9.65	86°4.78	7.8'	20°52.48	-9.6'	58.5'
	SD = 15.9'	d = 0.8'		SI	O = 15.8'		
ŊA:	GHA	D	CUA		D	J	UP
Mon 0	GHA 180°43.47	<b>Dec</b> N15° 10.40	<b>GHA</b> 100°31.62	u 7.9'	<b>Dec</b> N20° 42.90	d -9.7'	<b>HP</b> 58.6'
1	195°43.54	11.16	114°58.52	8.0'	20° 33.20	-9.8'	58.6'
2	210°43.62	11.91	$129^{\circ}25.47$	8.0'	$20^{\circ}23.37$	-10.0'	58.6'
3	225°43.69	• • 12.66	143°52.48	8.1'	20° 13.42	-10.1'	58.6'
4 5	240°43.76 255°43.83	13.41 14.16	158° 19.54 172° 46.66	8.1' 8.2'	20°3.34 19°53.14	-10.2' -10.3'	58.6' 58.6'
6	270°43.91	N15°14.91	187° 13.83	8.2'	N19° 42.82	-10.4	58.7'
7	285°43.98	15.66	201°41.06	8.3'	19°32.38	-10.6'	58.7'
8	300°44.05	16.41	216°8.35	8.3'	19°21.81	-10.7'	58.7'
9	315°44.12 330°44.19	· · 17.16 17.91	230°35.69 245°3.09	8.4' 8.5'	19°11.13 19°0.33	-10.8' -10.9'	58.7' 58.7'
10 11	345°44.26	17.91	245 3.09 259°30.55	8.5'	19 0.33 18°49.42	-10.9 -11.0'	58.7'
12	0°44.33	N15° 19.41	273°58.06	8.6'	N18°38.39	-11.1'	58.8'
13	15°44.40	20.16	$288^{\circ}25.63$	8.6'	$18^{\circ}27.24$	-11.3'	58.8'
14	30°44.47	20.90	302°53.26	8.7'	18° 15.99	-11.4'	58.8'
15 16	45°44.55 60°44.62	· · 21.65 22.40	317°20.94 331°48.68	8.7' 8.8'	18°4.62 17°53.14	-11.5' -11.6'	58.8' 58.8'
17	75°44.68	23.14	346° 16.47	8.8'	17°41.55	-11.7'	58.9'
18	90°44.75	N15°23.89	0°44.32	8.9'	$N17^{\circ}29.86$	-11.8'	58.9'
19	105°44.82	24.63	15° 12.22	9.0'	17° 18.06	-11.9'	58.9'
20 21	120°44.89 135°44.96	25.38 •• 26.12	29°40.18 44°8.20	9.0' 9.1'	17°6.15 16°54.15	-12.0′ -12.1′	58.9' 58.9'
22	150°45.03	26.86	58° 36.26	9.1'	16° 42.03	-12.1 -12.2'	58.9
23	165°45.10	27.61	73°4.39	9.2'	16°29.82	-12.3'	58.9'
	SD = 15.9'	d = 0.8'		SI	O = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.17	N15°28.35	87°32.56	9.2'	N16° 17.51	-12.4'	59.0'
1	195°45.23	29.09	102°0.79	9.3'	16°5.10	-12.5'	59.0'
2	210°45.30 225°45.37	29.83 · · · 30.58	116°29.08 130°57.41	9.3' 9.4'	15°52.59 15°39.98	-12.6' -12.7'	59.0'
3 4	225°45.37 240°45.44	· · 30.58 31.32	130°57.41 145°25.80	9.4° 9.4°	15°39.98 15°27.28	-12.7' -12.8'	59.0' 59.0'
5	255°45.50	32.06	159° 54.24	9.5'	15° 14.49	-12.9	59.0'
6	270°45.57	N15°32.80	174° 22.73	9.5'	N15°1.60	-13.0'	59.1'
7	285°45.64	33.54	188°51.27	9.6'	14°48.63	-13.1'	59.1'
8 9	300°45.70 315°45.77	34.27 •• 35.01	203° 19.87 217° 48.51	9.6' 9.7'	14°35.56 14°22.41	-13.2' -13.2'	59.1' 59.1'
10	330°45.84	35.75	232° 17.20	9.7'	14°22.41	-13.3'	59.1
11	345°45.90	36.49	246°45.93	9.8'	13°55.84	-13.4'	59.1'
12	0°45.97	N15° 37.23	261°14.72	9.8'	N13°42.43	-13.5'	59.2'
13 14	15°46.03 30°46.10	37.96 38.70	275° 43.55 290° 12.43	9.9' 9.9'	13° 28.94 13° 15.37	-13.6' -13.7'	59.2' 59.2'
15	45°46.16	39.44	304°41.36	9.9 10.0'	13 15.37 13°1.71	-13.7'	59.2'
16	60°46.23	40.17	319°10.33	10.0'	12°47.98	-13.8'	59.2'
17	75°46.29	40.91	333°39.34	10.1'	12° 34.17	-13.9'	59.2'
18	90°46.35	N15°41.64	348°8.40	10.1'	N12°20.29	-14.0'	59.2'
19 20	105°46.42 120°46.48	42.37 43.11	2°37.50 17°6.64	10.1' 10.2'	12°6.33 11°52.29	-14.0' -14.1'	59.3' 59.3'
21	135°46.54	• • 43.84	31°35.82	10.2'	11°38.19	-14.1	59.3'
22	150°46.61	44.57	46°5.05	10.3'	11°24.01	-14.2'	59.3'
23	165°46.67	45.31	60°34.31	10.3'	11°9.77	-14.3'	59.3'
	SD = 15.9'	d = 0.7'		SI	O = 16.1'		
			-				

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

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

I		Sun			Moon		
	Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	6-8
L		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-49%
	30	02:47	02:50	11:57	17:02	04:34	
	01	02:54	02:57	11:57	17:57	05:30	
L	02	03:01	03:04	11:57	18:49	06:23	

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	221°25.30	144°24.06 N27°47.14	189°42.85 N12°23.39	52°9.38 N06°10.17	190°18.91 N10°15.27
1	236°27.76	159°25.71 47.14	204°43.52 24.05	67°11.92 10.20	205°21.07 15.37
2	251°30.23	174°27.36 47.14	219°44.19 24.70	82°14.46 10.22	220°23.24 15.48
3	266°32.69	189°29.01 · · 47.14	234°44.86 · · 25.36	97°17.01 · · 10.25	235°25.40 · · 15.59
4	281°35.16	204°30.67 47.14	249°45.53 26.02	112°19.55 10.27	250°27.56 15.69
5	296° 37.62	219°32.33 47.13	264° 46.20 26.67	127°22.09 10.29	265°29.72 15.80
6	311°40.08	234°33.99 N27°47.13	279°46.87 N12°27.33	142°24.63 N06°10.32	280°31.89 N10°15.91
7	326°42.55	249°35.66 47.12	294°47.54 27.98	157°27.17 10.34	295°34.05 16.01
8	341°45.01	264°37.34 47.12	309°48.21 28.64	172°29.72 10.37	310°36.21 16.12
9	356° 47.48	279°39.01 · · 47.11	324°48.88 · · 29.29	187°32.26 · · 10.39	325°38.38 · · 16.22 340°40.54 16.33
10	11°49.94 26°52.41	294° 40.69 47.10 309° 42.38 47.10	339° 49.56 29.95 354° 50.23 30.60	202°34.80 10.41 217°37.34 10.43	340°40.54 16.33 355°42.70 16.44
11 12	41° 54.87	324°44.07 N27°47.09	9°50.90 N12°31.26	232°39.88 N06°10.46	10°44.87 N10°16.54
13	56° 57.33	339°45.76 47.08	24°51.57 31.91	247°42.42 10.48	25°47.03 16.65
14	71°59.80	354°47.46 47.06	39°52.24 32.57	262°44.96 10.50	40°49.19 16.75
15	87°2.26	9°49.16 · · 47.05	54°52.91 · · 33.22	277°47.50 · · 10.53	55°51.35 · · 16.86
16	102°4.73	24°50.86 47.04	69°53.58 33.87	292°50.04 10.55	70°53.52 16.97
17	117°7.19	39°52.57 47.02	84°54.25 34.53	307°52.57 10.57	85°55.68 17.07
18	132°9.65	54°54.28 N27°47.01	99°54.92 N12°35.18	322°55.11 N06°10.59	100°57.84 N10°17.18
19	$147^{\circ}12.12$	69°55.99 46.99	114°55.59 35.83	337°57.65 10.62	116°0.01 17.28
20	$162^{\circ}14.58$	84°57.71 46.97	129° 56.26 36.48	353°0.19 10.64	131°2.17 17.39
21	$177^{\circ}17.05$	99°59.43 · · 46.95	144°56.92 · · 37.14	8°2.73 · · 10.66	146°4.33 · · 17.50
22	192° 19.51	115°1.16 46.94	159°57.59 37.79	23°5.26 10.68	161°6.50 17.60
23	207°21.97	130°2.89 46.91	174°58.26 38.44	38°7.80 10.70	176°8.66 17.71
Mer.p	ass. 09:13	ν1.6' d0.0' m-4.74	ν0.7′ d0.7′ m1.23	ν2.5′ d0.0′ m-2.26	ν2.2' d0.1' m0.49
<b>T</b> I.	CUA	CHA 5	CHA 5		CHA
Thu 0	<b>GHA</b> 222° 24.44	<b>GHA Dec</b> 145°4.63 N27°46.89	<b>GHA Dec</b> 189°58.93 N12°39.09	<b>GHA Dec</b> 53°10.34 N06°10.72	<b>GHA Dec</b> 191°10.82 N10°17.81
1	237° 26.90	160°6.37 46.87	204°59.60 39.74	68°12.87 10.75	206°12.99 17.92
2	252°29.37	175°8.11 46.85	220°0.27 40.39	83°15.41 10.77	221°15.15 18.03
3	267°31.83	190°9.85 · · 46.82	235°0.94 · · 41.04	98°17.95 · · 10.79	236°17.31 · · 18.13
4	282°34.29	205°11.60 46.80	250°1.61 41.70	113°20.48 10.81	251°19.48 18.24
5	297°36.76	220°13.36 46.77	265°2.28 42.35	128°23.02 10.83	266°21.64 18.34
6	312°39.22	235°15.12 N27°46.74	280°2.95 N12°43.00	143°25.55 N06°10.85	281°23.80 N10°18.45
7	$327^{\circ}41.69$	250° 16.88 46.71	295°3.62 43.65	158°28.09 10.87	296°25.97 18.56
8	342°44.15	265°18.64 46.68	310°4.29 44.29	173°30.62 10.89	311°28.13 18.66
9	357°46.61	280°20.41 · · 46.65	325°4.96 · · 44.94	188°33.15 · · 10.91	326°30.29 · · 18.77
10	12°49.08	295°22.19 46.62	340°5.62 45.59	203°35.69 10.93	341°32.46 18.87
11	27°51.54	310°23.96 46.59	355°6.29 46.24	218°38.22 10.95	356°34.62 18.98
12	42°54.01	325°25.74 N27°46.56	10°6.96 N12°46.89	233°40.75 N06°10.97	11°36.78 N10°19.08
13	57° 56.47	340°27.53 46.52	25°7.63 47.54	248°43.29 10.99	26°38.95 19.19
14	72°58.93	355°29.32 46.49	40°8.30 48.19	263°45.82 11.01	41°41.11 19.30
15	88°1.40 103°3.86	10°31.11 · · · 46.45 25°32.91 46.41	55°8.97 · · 48.84 70°9.64	278°48.35 · · 11.03 293°50.88	56°43.27 · · 19.40 71°45.44 19.51
16 17	103 3.86 118°6.33	25°32.91 46.41 40°34.71 46.37	70°9.64 49.48 85°10.30 50.13	293°50.88 11.05 308°53.42 11.07	71°45.44 19.51 86°47.60 19.61
18	133°8.79	55°36.52 N27°46.33	100°10.97 N12°50.78	323°55.95 N06°11.09	101°49.77 N10°19.72
19	148° 11.26	70°38.33 46.29	115°11.64 51.43	338°58.48 11.11	116°51.93 19.82
20	163° 13.72	85°40.14 46.25	130°12.31 52.07	354°1.01 11.13	131°54.09 19.93
21	178° 16.18	100°41.96 · · 46.21	145°12.98 · · 52.72	9°3.54 · · 11.15	146°56.26 · · 20.03
22	193° 18.65	115°43.78 46.16	160°13.64 53.36	24° 6.07 11.17	161°58.42 20.14
23	208°21.11	130°45.60 46.12	175°14.31 54.01	39° 8.60 11.18	177°0.58 20.24
Mer.r	ass. 09:09	ν1.7' d-0.0' m-4.74	ν0.7' d0.7' m1.23	ν2.5' d0.0' m-2.26	ν2.2' d0.1' m0.49
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	223°23.58	145°47.43 N27°46.07	190°14.98 N12°54.66	54°11.13 N06°11.20	192°2.75 N10°20.35
1	238°26.04	160°49.26 46.03	205°15.65 55.30	69°13.66 11.22	207°4.91 20.46
2	253°28.50	175°51.10 45.98	220°16.32 55.95	84°16.19 11.24	222°7.07 20.56
3	268° 30.97	190°52.94 · · 45.93	235°16.98 · · 56.59	99°18.72 · · 11.26	237°9.24 · · 20.67
4	283°33.43	205° 54.79 45.88	250°17.65 57.24	114°21.24 11.27	252°11.40 20.77 267°13.57 20.88
5 6	298°35.90 313°38.36	220°56.64 45.83 235°58.49 N27°45.78	265°18.32 57.88 280°18.99 N12°58.53	129°23.77 11.29 144°26.30 N06°11.31	267°13.57 20.88 282°15.73 N10°20.98
7	313 38.30 328°40.82	251°0.35 45.73	280 18.99 N12 58.53 295°19.65 59.17	159°28.83 11.33	282 15.73 N10 20.98 297°17.89 21.09
8	343°43.29	266°2.21 45.67	310°20.32 12°59.81	174°31.36 11.35	312°20.06 21.19
9	358° 45.75	281°4.07 · · 45.62	325°20.99 13°0.46	189°33.88 ·· 11.36	327°22.22 ·· 21.30
10	13°48.22	296°5.94 45.56	340°21.65 1.10	204°36.41 11.38	342°24.39 21.40
11	28° 50.68	311°7.81 45.50	355°22.32 1.74	219°38.94 11.40	357°26.55 21.51
12	43°53.14	326°9.69 N27°45.45	10°22.99 N13°2.39	234°41.46 N06°11.41	12°28.71 N10°21.61
13	$58^{\circ}55.61$	341°11.57 45.39	25°23.66 3.03	249°43.99 11.43	27°30.88 21.72
14	73°58.07	356°13.46 45.33	40°24.32 3.67	264°46.51 11.45	42°33.04 21.82
15	89°0.54	11°15.35 · · 45.27	55°24.99 · · 4.32	279°49.04 · · 11.46	57°35.21 · · 21.93
16	104°3.00	26°17.24 45.20	70°25.66 4.96	294°51.56 11.48	72°37.37 22.03
17	119°5.46	41°19.14 45.14	85°26.32 5.60	309°54.09 11.50	87°39.53 22.14
18	134°7.93	56°21.04 N27°45.08	100°26.99 N13°6.24	324°56.61 N06°11.51	102°41.70 N10°22.24
19	149° 10.39	71°22.95 45.01	115°27.66 6.88	339°59.14 11.53	117° 43.86 22.35
20	164° 12.86 179° 15.32	86°24.86 44.95	130°28.32 7.52	355°1.66 11.55	132°46.03 22.45
21 22	179° 15.32 194° 17.78	101°26.77 · · 44.88 116°28.69 44.81	145°28.99 · · 8.16 160°29.65 8.80	10° 4.18 · · · 11.56 25° 6.71	147°48.19 · · 22.56 162°50.35 22.66
23	209° 20.25	131°30.61 44.74	175°30.32 9.44	40° 9.23 11.59	102 50.55 22.00 177°52.52 22.77
Merr	ass. 09:05	$\nu 1.8' \ d$ -0.0' m-4.73	$ u 0.7' \ d0.6' \ m1.24$	$\nu 2.5' \ d0.0' \ \text{m}-2.25$	$\nu 2.2' \ d0.1' \ m0.49$

	SHA	Dec
Alpheratz	357°32.21	29°14.71
Ankaa	353°4.88 349°28.33	-42°8.96 56°41.43
Schedar Diphda	349°28.33 348°44.89	56°41.43 -17°49.82
Achernar	335°18.82	-57°5.46
Hamal	327°48.46	23°35.70
Polaris	313°4.30	89°22.94
Acamar Menkar	315°10.19 314°3.64	-40°11.49 4°11.97
Mirfak	308°24.83	49°57.65
Aldebaran	290°36.82	16°33.88
Rigel	281°1.55	-8°10.29
Capella Bellatrix	280°18.27 278°20.25	46°1.56 6°22.39
Elnath	278 20.25 277°58.75	0 22.39 28°37.81
Alnilam	275°35.25	$-1^{\circ}11.19$
Betelgeuse	270°49.40	7°24.60
Canopus	263°51.54 258°24.06	-52°42.93 -16°45.54
Sirius Adhara	258°24.06 255°3.93	-16°45.54 -29°0.92
Procyon	244°48.14	5°8.97
Pollux	243°14.15	27°57.40
Avior	234°13.70	-59°36.40
Suhail Miaplacidus	222°44.28 221°37.57	-43°33.20 -69°50.41
Alphard	221 37.37 217°45.07	-8°47.14
Regulus	207°31.50	11°49.57
Dubhe	193°37.50	61°35.98
Denebola	182°22.00	14°24.69
Gienah Acrux	175°40.53 172°56.39	-17°42.20 -63°15.68
Gacrux	172 30.39 171°48.06	-57°16.61
Alioth	166°10.21	55°48.37
Spica	158° 19.14	-11°18.74
Alkaid	152°49.47	49°10.26 -60°30.72
Hadar Menkent	148°31.42 147°53.99	-60° 30.72 -36° 30.72
Arcturus	147° 35.99	19°1.97
Rigil Kent.	$139^{\circ}35.81$	-60°57.25
Kochab	137°18.85	74°2.25
Zuben'ubi Alphecca	136°52.67 126°1.11	-16°9.69 26°37.03
Antares	112° 12.17	-26°29.68
Atria	$107^{\circ}3.43$	-69°4.51
Sabik	101°59.39	-15°45.59
Shaula Rasalhague	96° 6.37 95° 55.78	-37°7.33 12°32.27
Eltanin	90°40.54	51°28.89
Kaus Aust.	83°28.69	-34°22.10
Vega	80°31.14	38°48.40
Nunki	75°44.23	-26°15.55
Altair Peacock	61°57.22 53°1.46	8°56.54 -56°38.28
Deneb	49°23.88	45°22.67
Enif	33°36.20	$10^{\circ}0.25$
Al Na'ir	27°29.73	-46°49.14
Fomalhaut Scheat	15°11.76 13°42.74	-29°28.16 28°14.08
Markab	13°27.36	15°21.40
May 03 Wed Venus	<b>SHA</b> 282°58.76	Mer.pass 14:21
Mars	328°17.55	11:21
Jupiter	190°44.08	20:28
Saturn	328°53.61	11:17
May 04 Thu	SHA	Mer.pass
Venus	282°40.19	14:18
Mars	327°34.50	11:20
Jupiter Saturn	190°45.90 328°46.39	20:24 11:14
May 05 Fri Venus	<b>SHA</b> 282°23.86	Mer.pass 14:15
Venus Mars	282 23.80 326°51.40	11:18
Jupiter	$190^{\circ}47.55$	20:20
Saturn	328°39.17	11:10
Horizon	ıtal parallax	
	Venus:	0.4
	Mars:	0.1

Stars

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.73	$N15^{\circ}46.04$	75°3.61	10.3'	N10°55.46	-14.4'	59.3'
1	195°46.80	46.77	89°32.95	10.4	10°41.08	-14.4'	59.3'
2 3	210°46.86 225°46.92	47.50 •• 48.23	104°2.33 118°31.74	10.4' 10.4'	10°26.64 10°12.13	-14.5' -14.6'	59.3' 59.4'
4	240°46.98	48.96	133°1.18	10.5'	09°57.56	-14.6'	59.4'
5	255°47.04	49.69	147°30.67	10.5'	09°42.94	-14.7'	59.4'
6	270°47.10	$N15^{\circ}50.42$	162°0.18	10.5'	N09°28.25	-14.7'	59.4'
7	285°47.17	51.15	176°29.73 190°59.31	10.6'	09°13.50 08°58.70	-14.8'	59.4
8 9	300°47.23 315°47.29	51.88 •• 52.60	205°28.91	10.6' 10.6'	08°58.70	-14.9' -14.9'	59.4' 59.4'
10	330°47.35	53.33	219°58.55	10.7	08°28.94	-14.9 -15.0'	59.4
11	345°47.41	54.06	234°28.22	10.7'	$08^{\circ}13.98$	-15.0'	59.5'
12	0°47.47	N15°54.78	248°57.91	10.7'	N07°58.96	-15.1'	59.5'
13 14	15°47.53 30°47.59	55.51 56.23	263°27.63 277°57.38	10.7' 10.8'	07°43.90 07°28.80	-15.1' -15.2'	59.5' 59.5'
15	45°47.65	56.96	292°27.15	10.8	07 28.60 07°13.64	-15.2'	59.5'
16	60°47.70	57.68	306°56.94	10.8'	06°58.44	-15.2'	59.5'
17	75°47.76	58.41	321°26.76	10.8'	06°43.20	-15.3'	59.5'
18	90°47.82	N15°59.13	335°56.59	10.9'	N06°27.91	-15.3'	59.5'
19 20	105°47.88 120°47.94	15°59.85 16°0.58	350°26.45 4°56.33	10.9' 10.9'	06°12.59 05°57.23	-15.4' -15.4'	59.5' 59.5'
21	135°48.00	. 1.30	19°26.22	10.9	05°41.82	-15.4'	59.6'
22	150°48.05	2.02	33°56.14	10.9'	05°26.39	-15.5'	59.6'
23	165°48.11	2.74	48°26.06	10.9'	05°10.92	-15.5'	59.6'
	SD = 15.9'	d = 0.7'		SI	D = 16.2'		
<b>-</b> .							
Thu 0	<b>GHA</b> 180°48.17	<b>Dec</b> N16°3.46	<b>GHA</b> 62°56.01	u 11.0'	<b>Dec</b> N04°55.41	<i>d</i> −15.5'	<b>HP</b> 59.6'
1	195°48.22	4.18	77°25.96	11.0'	04°39.87	-15.5' -15.6'	59.6'
2	210°48.28	4.90	91°55.93	11.0'	$04^{\circ}24.31$	-15.6'	59.6'
3	225°48.34	• • 5.62	106°25.92	11.0'	04°8.71	-15.6'	59.6'
4	240°48.39	6.34	120°55.91	11.0'	03°53.09	-15.6'	59.6'
5 6	255°48.45 270°48.51	7.06 N16°7.78	135°25.91 149°55.92	11.0' 11.0'	03°37.44 N03°21.77	-15.7' -15.7'	59.6' 59.6'
7	285°48.56	8.49	164°25.94	11.0'	03°6.08	-15.7'	59.6'
8	300°48.62	9.21	178°55.96	11.0'	02°50.36	-15.7'	59.6'
9	315°48.67	• • 9.93	193°25.99	11.0'	02°34.63	-15.8'	59.7'
10	330°48.73 345°48.78	10.64 11.36	207°56.02 222°26.05	11.0' 11.0'	02°18.87 02°3.10	-15.8'	59.7'
11 12	0°48.83	N16°12.07	222 26.05 236°56.09	11.0'	N01°47.32	-15.8' -15.8'	59.7' 59.7'
13	15°48.89	12.79	251°26.13	11.0'	01°31.52	-15.8'	59.7'
14	30°48.94	13.50	$265^{\circ}56.16$	11.0'	$01^{\circ}15.71$	-15.8'	59.7'
15	45°49.00	· · 14.22	280°26.20	11.0'	00°59.89	-15.8'	59.7'
16 17	60°49.05 75°49.10	14.93 15.64	294°56.23 309°26.26	11.0' 11.0'	00°44.06 00°28.22	-15.8' -15.8'	59.7' 59.7'
18	90°49.16	N16°16.36	323°56.28	11.0'	N00°12.38	-15.8'	59.7'
19	105°49.21	17.07	338°26.30	11.0'	S00°3.47	15.9'	59.7'
20	120°49.26	17.78	352°56.31	11.0'	00°19.32	15.9'	59.7'
21 22	135°49.31 150°49.36	· · 18.49 19.20	7°26.31 21°56.30	11.0' 11.0'	00°35.17 00°51.02	15.9' 15.8'	59.7' 59.7'
23	165°49.42	19.20	36°26.29	11.0'	00 51.02 01°6.87	15.8'	59.7'
	SD = 15.9'	d = 0.7'			D = 16.3'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°49.47 195°49.52	N16°20.62 21.33	50°56.25 65°26.21	11.0' 10.9'	\$01°22.72 01°38.56	15.8' 15.8'	59.7' 59.7'
2	210°49.57	22.04	79°56.16	10.9	01°54.39	15.8'	59.7'
3	225°49.62	• • 22.74	94°26.08	10.9'	$02^{\circ}10.22$	15.8'	59.7'
4	240°49.67	23.45	108°56.00	10.9'	02°26.03	15.8'	59.7'
5 6	255°49.72 270°49.77	24.16 N16°24.87	123°25.89 137°55.77	10.9' 10.9'	02°41.84 \$02°57.63	15.8' 15.8'	59.7' 59.7'
7	285°49.82	25.57	157 55.77 152°25.62	10.9	03°13.41	15.8'	59.7'
8	300°49.87	26.28	166°55.46	10.8'	03°29.17	15.7'	59.7'
9	315°49.92	• • 26.98	181°25.28	10.8'	03°44.92	15.7'	59.7'
10 11	330°49.97 345°50.02	27.69 28.39	195°55.07 210°24.84	10.8' 10.7'	04°0.64 04°16.35	15.7' 15.7'	59.7' 59.7'
11	0°50.02	28.39 N16°29.10	210°24.84 224°54.58	10.7'	504°32.03	15.7'	59.7' 59.7'
13	15°50.12	29.80	239°24.30	10.7'	04°47.69	15.6'	59.7'
14	30°50.16	30.50	253°54.00	10.7'	05°3.32	15.6'	59.7'
15	45°50.21	• • 31.20	268°23.66	10.6'	05°18.93	15.6'	59.7'
16 17	60°50.26 75°50.31	31.91 32.61	282°53.30 297°22.90	10.6' 10.6'	05°34.50 05°50.05	15.5' 15.5'	59.7' 59.7'
18	90°50.35	N16°33.31	311°52.48	10.5'	S06°5.56	15.5'	59.7'
19	105°50.40	34.01	326°22.02	10.5'	$06^{\circ}21.05$	15.4'	59.7'
20	120°50.45	34.71	340°51.54	10.5'	06°36.49	15.4'	59.7'
21	135°50.49 150°50.54	• • 35.41	355°21.01 9°50.46	10.4'	06°51.90	15.4'	59.7'
22 23	150°50.54 165°50.59	36.11 36.81	9°50.46 24°19.86	10.4' 10.4'	07°7.27 07°22.60	15.3' 15.3'	59.7' 59.7'
20	SD = 15.9'	d = 0.7'			D = 16.3'	10.0	55.1
		<u>u = 0.1</u>		اد	J — 10.3		

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

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

	Sun		Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-81%		
03	03:07	03:10	11:57	19:40	07:15			
04	03:13	03:15	11:57	20:29	08:04			
05	03:18	03:20	11:57	21:19	08:54			

h	Aries	` Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	224°22.71	146°32.54 N27°44.67	190°30.99 N13°10.08	55°11.75 N06°11.61	192°54.68 N10°22.87
1	239°25.18	161°34.47 44.60	205°31.65 10.72	70°14.28 11.62	207°56.85 22.98
2	254°27.64	176°36.40 44.53	220°32.32 11.36	85°16.80 11.64	222°59.01 23.08
3	269°30.10	191°38.34 · · 44.45	235°32.99 · · 12.00	100°19.32 · · 11.65	238°1.18 · · 23.19
4	284°32.57	206° 40.29 44.38	250°33.65 12.64	115°21.84 11.67	253°3.34 23.29
5	299°35.03	221°42.23 44.30	265°34.32 13.28	130°24.36 11.68	268°5.50 23.40
6	314° 37.50	236°44.18 N27°44.23	280°34.98 N13°13.92	145°26.88 N06°11.70	283°7.67 N10°23.50
7	329° 39.96	251°46.14 44.15	295°35.65 14.56	160°29.40 11.71	298° 9.83 23.61
8	344° 42.42	266°48.10 44.07	310° 36.31 15.20	175°31.92 11.73	313°12.00 23.71
9	359° 44.89	281°50.06 · · 43.99	325°36.98 · · 15.83	190°34.44 · · 11.74	328°14.16 · · 23.82
10	14° 47.35	296°52.03 43.91	340° 37.64 16.47	205°36.96 11.76	343°16.33 23.92
11	29°49.82	311°54.00 43.83	355°38.31 17.11	220°39.48 11.77	358°18.49 24.03
12	44°52.28	326°55.98 N27°43.75	10°38.98 N13°17.75	235°42.00 N06°11.78	13°20.66 N10°24.13
13	59°54.75	341°57.96 43.66	25°39.64 18.38	250°44.52 11.80	28°22.82 24.24
14	74°57.21	356°59.94 43.58	40°40.31 19.02	265°47.04 11.81	43°24.98 24.34
15	89°59.67	12°1.93 · · 43.49	55°40.97 · · 19.66	280°49.56 · · 11.82	58°27.15 · · 24.45
16	105°2.14	27°3.92 43.40	70°41.64 20.29	295°52.08 11.84	73°29.31 24.55
17	120°4.60	42°5.92 43.32	85°42.30 20.93	310°54.59 11.85	88°31.48 24.65
18	135°7.07	57°7.92 N27°43.23	100°42.97 N13°21.56	325°57.11 N06°11.86	103°33.64 N10°24.76
19	150°9.53	72°9.93 43.14	115°43.63 22.20	340°59.63 11.88	118°35.81 24.86
20	$165^{\circ}11.99$	87°11.94 43.05	130°44.30 22.84	356° 2.14 11.89	133°37.97 24.97
21	180°14.46	102°13.95 · · 42.95	145°44.96 · · 23.47	11°4.66 · · 11.90	148°40.14 · · 25.07
22	195°16.92	117° 15.97 42.86	160°45.63 24.10	26°7.18 11.92	163°42.30 25.18
23	210° 19.39	132°17.99 42.77	175°46.29 24.74	41°9.69 11.93	178°44.47 25.28
Mer.p	pass. 09:01	ν1.9' d-0.1' m-4.72	ν0.7' d0.6' m1.24	ν2.5' d0.0' m-2.24	$\nu 2.2' \ d0.1' \ m0.50$
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	225°21.85	147°20.02 N27°42.67	190°46.95 N13°25.37	56°12.21 N06°11.94	193°46.63 N10°25.39
1	$240^{\circ}24.31$	162°22.05 42.57	205°47.62 26.01	71°14.72 11.95	208°48.80 25.49
2	255°26.78	177°24.08 42.48	220°48.28 26.64	86°17.24 11.97	223°50.96 25.59
3	270°29.24	192°26.12 · · 42.38	235°48.95 · · 27.27	101°19.75 · · 11.98	238°53.13 · · 25.70
4	285°31.71	207°28.17 42.28	250°49.61 27.91	116°22.27 11.99	253°55.29 25.80
5	300°34.17	222°30.21 42.18	265°50.28 28.54	131°24.78 12.00	268°57.46 25.91
6	315°36.63	237°32.26 N27°42.08	280°50.94 N13°29.17	146°27.30 N06°12.01	283°59.62 N10°26.01
7	330°39.10	252°34.32 41.97	295°51.60 29.81	161°29.81 12.02	299°1.79 26.12
8	345°41.56	267°36.38 41.87	310°52.27 30.44	176°32.32 12.04	314°3.95 26.22
9	0°44.03	282°38.45 · · 41.76	325°52.93 · · 31.07	191°34.84 •• 12.05	329°6.12 · · 26.32
10	15° 46.49	297°40.51 41.66	340°53.60 31.70	206°37.35 12.06	344°8.28 26.43
11	30°48.96	312°42.59 41.55	355°54.26 32.33	221°39.86 12.07	359°10.45 26.53
12	45°51.42	327°44.67 N27°41.44	10°54.92 N13°32.97	236°42.37 N06°12.08	14°12.61 N10°26.64
13	60°53.88	342°46.75 41.33	25°55.59 33.60	251°44.89 12.09	29°14.78 26.74
14	75°56.35	357°48.83 41.22	40° 56.25 34.23	266°47.40 12.10	44°16.94 26.85
15	90°58.81	12°50.92 · · 41.11	55°56.91 · · 34.86	281°49.91 · · 12.11	59°19.11 · · 26.95
16	106°1.28	27°53.02 41.00	70° 57.58 35.49	296°52.42 12.12	74°21.27 27.05
17	121°3.74	42°55.12 40.89	85°58.24 36.12	311°54.93 12.13	89°23.44 27.16
18	136°6.20	57°57.22 N27°40.77	100°58.90 N13°36.75	326°57.44 N06°12.14	104°25.60 N10°27.26
19	151°8.67	72°59.33 40.66	115°59.57 37.38	341°59.95 12.15	119°27.77 27.37
20	166°11.13	88°1.44 40.54	131°0.23 38.01	357° 2.46 12.16	134°29.93 27.47
21	181° 13.60	103°3.55 · · 40.42	146°0.89 · · 38.64	12° 4.97 · · 12.17	149°32.10 · · 27.57
22	196°16.06	118°5.67 40.30	161°1.55 39.26	27°7.48 12.18	164°34.26 27.68
23	211° 18.52	133°7.80 40.18	176°2.22 39.89	42°9.99 12.19	179°36.43 27.78
Mer.p	pass. 08:57	ν2.0′ d-0.1′ m-4.71	ν0.7' d0.6' m1.24	ν2.5' d0.0' m-2.24	ν2.2' d0.1' m0.50
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	226°20.99	148°9.93 N27°40.06	191°2.88 N13°40.52	57°12.50 N06°12.20	194°38.59 N10°27.89
1	241°23.45	163°12.06 39.94	206°3.54 41.15	72°15.01 12.21	209°40.76 27.99
2	256°25.92	178°14.20 39.82	221°4.21 41.78	87°17.51 12.22	224°42.92 28.09
3	271°28.38	193°16.34 · · 39.69	236°4.87 · · 42.40	102°20.02 · · 12.23	239°45.09 · · 28.20
4	286°30.85	208° 18.49 39.57	251°5.53 43.03	117°22.53 12.24	254°47.26 28.30
5	301°33.31	223°20.64 39.44	266°6.19 43.66	132°25.04 12.25	269°49.42 28.41
6	316°35.77	238°22.79 N27°39.31	281°6.85 N13°44.29	147°27.54 N06°12.25	284°51.59 N10°28.51
7	331°38.24	253°24.95 39.18	296°7.52 44.91	162°30.05 12.26	299°53.75 28.61
8	346°40.70	268°27.11 39.05 283°29.28 · · 38.92	311°8.18 45.54 326°8.84 • 46.17	177°32.56 12.27	314°55.92 28.72
9	1°43.17			192°35.06 · · 12.28	329°58.08 · · 28.82 345°0.25 28.92
10	16° 45.63 31° 48.09	298° 31.45 38.79 313° 33.63 38.66	341°9.50 46.79 356°10.17 47.42	207°37.57 12.29 222°40.07 12.30	
11	46°50.56	313°33.63 38.66 328°35.81 N27°38.52	11°10.83 N13°48.04	237°42.58 N06°12.30	0°2.41 29.03 15°4.58 N10°29.13
12 13	46°50.56 61°53.02	328° 35.81 N27° 38.52 343° 38.00 38.39	26°11.49 48.67	252°45.08 12.31	30°6.75 29.23
13 14	76°55.49	358° 40.19 38.25	41°12.15 49.29	267°47.59 12.32	45°8.91 29.34
	76°55.49 91°57.95	13°42.38 · · 38.12	56°12.81 · · 49.92	282°50.09 · · 12.33	60°11.08 · · 29.44
15 16	91°57.95 107°0.41	28°44.58 · · 38.12	71°13.47 50.54	282°50.09 · · 12.33 297°52.60 12.33	75°13.24 29.55
	107° 0.41 122° 2.88				
17		43°46.78 37.84	86°14.14 51.17	312°55.10 12.34	90°15.41 29.65
18	137°5.34 152°7.81	58° 48.99 N27° 37.70 73° 51.20 37.55	101°14.80 N13°51.79 116°15.46 52.41	327°57.60 N06°12.35 343°0.11 12.35	105°17.57 N10°29.75 120°19.74 29.86
19	152° 7.81 167° 10.27	73°51.20 37.55 88°53.42 37.41	131° 16.12 53.04		120°19.74 29.86 135°21.91 29.96
20 21	167° 10.27 182° 12.74	88°53.42 37.41 103°55.64 · · 37.27	131°16.12 53.04 146°16.78 • 53.66	358°2.61 12.36 13°5.11 · · 12.37	135°21.91 29.96 150°24.07 · · · 30.06
22	182° 12.74 197° 15.20	103°55.64 · · 37.27 118°57.86 37.12	161°17.44 54.28	28° 7.61 12.38	165°26.24 30.17
23	212° 17.66	134°0.09 36.98	176° 18.10 54.90	43°10.12 12.38	180°28.40 30.27
Mer.p	pass. 08:53	$ u 2.1' \ d$ -0.1' m-4.70	$ u 0.7' \; d0.6' \; { m m} 1.25$	$\nu$ 2.5′ $d$ 0.0′ m-2.23	$ u 2.2' \ d0.1' \ m0.50$
<u> </u>					

357°32.19 353°4.87

349°28 31

348°44.88

335°18.81

 $327^{\circ}48.46$ 

313°4.22

315°10.19

 $314^{\circ}3.64$ 

308°24.83

290°36.83

281°1.56

 $280^{\circ}18.29$ 

 $278^{\circ}20.26$ 

277°58.76

275°35.25

 $270^{\circ}49.41$ 

263°51.56

258°24.07

255°3.95

244°48.15

243°14.17

234°13.73

222°44.30

221°37.62

217°45.08 207°31.51

193°37.53

182°22.01

 $175^{\circ}40.54$ 

 $172^{\circ}56.40$ 

 $171^{\circ}48.07$ 

166°10.22

158°19.14

152°49.48

148°31.42

147°53.99

145°45.13

139°35.81

137°18.85

136°52.67

126°1.11

112°12 16

107°3.40

101°59.38

 $96^{\circ}6.36$ 

95°55.77

90°40.52

83°28.67

80°31.12

75°44.22

61°57.20

53°1.43

49°23.85

33°36.18

 $27^{\circ}29.71$ 

15°11.74

13°42.72

13°27.34

SHA

282°9.83

326°8.27

190°49.04

 $328^{\circ}31.97$ 

SHA

 $281^{\circ}58.17$ 

 $325^{\circ}25.10$ 

190°50.36

328°24.78

281°48.94

 $324^{\circ}41.89$ 

190°51.51

 $328^{\circ}17.61$ 

Venus: Mars:

Horizontal parallax

Alpheratz

Ankaa Schedar

Diphda

Hamal

Polaris

Acamar

Menkar

Mirfak

Rigel

Capella

Bellatrix

Elnath

Alnilam

Betelgeuse

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

Vega Nunki

Altair

Deneb

Enif

Peacock

Al Na'ir

Scheat Markab

Venus

Mars

Jupiter

Saturn May 07 Sun

Venus

Mars

Jupiter

Saturn

Venus

Mars

Jupiter

Saturn

May 08 Mon

Fomalhaut

May 06 Sat

Rasalhague

Kaus Aust.

Pollux

Avior Suhail

Aldebaran

Achernar

**Dec** 29° 14.71

-42°8.95

56°41.42 -17°49.81

-57°5.44

 $23^{\circ}35.70$ 

89°22.93 -40°11.48

4°11.97

49°57.64

16°33.87

-8°10.29

 $46^{\circ}1.55$ 

 $6^{\circ}22.39$ 

28°37.80

 $-1^{\circ}11.18$ 

 $7^{\circ}24.60$ 

-52°42.92

-16°45.53

-29°0.91

 $27^{\circ}57.40$ 

-59°36.40

-43°33.20

-69°50.41

-8°47.14

11°49.58

61°35.99

 $14^{\circ}24.70$ 

-17°42.20

-63°15.69

-57°16.62

55°48.38

-11°18.74

49°10.27

-60° 30.74 -36° 30.73

 $19^{\circ}1.98$ 

-60°57.26

 $74^{\circ}2.27$ 

-16°9.69

26°37.04

-26°29.68

-69°4.52

 $-15^{\circ}45.58$ 

-37°7.33

 $12^{\circ}32.28$ 

51°28.90

-34°22.10

38°48.41

-26° 15.54 8° 56.55

-56° 38.28

45°22.68

 $10^{\circ}0.26$ 

-46°49.13

-29°28.15

 $28^{\circ}14.08$ 

15°21.40

Mer.pass

14:12

11:17

20:16

11:07

14:09

11:16

20:12 11:03

14:05

11:15

20:08

11:00

0.4

0.1

Mer.pass

Mer.pass

5°8.97

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.63	N16°37.50	$38^{\circ}49.24$	10.3'	<b>S</b> 07°37.89	15.2'	59.7'
1	195°50.68	38.20	53° 18.57	10.3'	07°53.14	15.2'	59.7'
2	210°50.72 225°50.77	38.90 •• 39.59	67° 47.87 82° 17.12	10.3' 10.2'	08°8.34 08°23.49	15.2' 15.1'	59.7' 59.7'
4	240°50.81	40.29	96°46.34	10.2'	08°38.60	15.1'	59.7'
5	255°50.86	40.99	$111^{\circ}15.52$	10.1'	$08^{\circ}53.65$	15.0'	59.7'
6	270°50.90	N16°41.68	125°44.65	10.1'	\$09°8.66	15.0'	59.7'
7 8	285°50.95 300°50.99	42.38 43.07	140° 13.75 154° 42.79	10.0' 10.0'	09°23.61 09°38.50	14.9' 14.8'	59.7' 59.7'
9	315°51.03	• • 43.76	169° 11.80	10.0'	09°53.34	14.8'	59.7'
10	330°51.08	44.46	$183^{\circ}40.76$	9.9'	$10^{\circ}8.13$	14.7'	59.7'
11	345°51.12 0°51.16	45.15	198° 9.67 212° 38.54	9.9'	10°22.85	14.7'	59.7'
12 13	15°51.16	N16° 45.84 46.53	212°38.54 227°7.36	9.8' 9.8'	\$10° 37.51 10° 52.11	14.6' 14.5'	59.6' 59.6'
14	30°51.25	47.22	241°36.14	9.7'	11°6.64	14.5'	59.6'
15	45°51.29	• • 47.92	256°4.86	9.7'	11°21.11	14.4'	59.6'
16	60°51.33 75°51.37	48.61	270°33.54 285°2.16	9.6'	11°35.51 11°49.84	14.3'	59.6'
17 18	75°51.37 90°51.42	49.30 N16°49.98	285° 2.16 299° 30.74	9.6' 9.5'	\$11°49.84 \$12°4.10	14.3' 14.2'	59.6' 59.6'
19	105°51.46	50.67	313°59.27	9.5'	12° 18.29	14.1'	59.6'
20	120°51.50	51.36	$328^{\circ}27.74$	9.4'	$12^{\circ}32.40$	14.0'	59.6'
21	135°51.54	• • 52.05	342°56.16	9.4'	12°46.44	14.0'	59.6'
22 23	150°51.58 165°51.62	52.74 53.42	357°24.53 11°52.84	9.3' 9.3'	13°0.40 13°14.28	13.9' 13.8'	59.6' 59.5'
23	SD = 15.8'		11 32.04		0 = 16.3'	13.0	33.3
	3υ = 15.8′	d = 0.7'		5L	v = 10.3°		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°51.66	N16°54.11	26°21.11	9.2'	\$13°28.08	13.7'	59.5'
1 2	195°51.70 210°51.74	54.80 55.48	40° 49.31 55° 17.47	9.2' 9.1'	13°41.80 13°55.43	13.6' 13.5'	59.5' 59.5'
3	210 51.74 225°51.78	56.17	69° 45.57	9.1 9.0'	13 55.45 14°8.98	13.5'	59.5'
4	240°51.82	56.85	84°13.61	9.0'	14°22.44	13.4'	59.5'
5	255°51.86	57.53	98°41.60	8.9'	14°35.81	13.3'	59.5'
6 7	270°51.89 285°51.93	N16°58.22 58.90	113°9.53 127°37.40	8.9' 8.8'	\$14°49.10 15°2.29	13.2' 13.1'	59.5' 59.4'
8	300°51.97	16° 59.58	142°5.22	o.o 8.8'	15° 2.29	13.1	59.4' 59.4'
9	315°52.01	17°0.27	156°32.98	8.7'	15°28.39	12.9'	59.4'
10	330°52.05	0.95	171°0.69	8.6'	15°41.30	12.8'	59.4'
11 12	345°52.08 0°52.12	1.63 N17°2.31	185° 28.33 199° 55.92	8.6' 8.5'	15°54.10 \$16°6.81	12.7' 12.6'	59.4' 59.4'
13	15°52.16	2.99	214°23.46	8.5	16° 19.42	12.5'	59.4'
14	30°52.19	3.67	$228^{\circ}50.93$	8.4'	$16^{\circ}31.93$	12.4'	59.3'
15	45°52.23	• • 4.35	243° 18.35	8.4'	16°44.33	12.3'	59.3'
16 17	60°52.27 75°52.30	5.02 5.70	257° 45.71 272° 13.01	8.3' 8.2'	16°56.63 17°8.81	12.2' 12.1'	59.3' 59.3'
18	90°52.34	N17°6.38	286° 40.25	8.2'	S17°20.90	12.0'	59.3'
19	105°52.37	7.06	301°7.44	8.1'	17°32.87	11.9'	59.3'
20	120°52.41	7.73	315° 34.57	8.1'		11.7'	59.2'
21 22	135°52.44 150°52.48	• • 8.41 9.09	330°1.64 344°28.65	8.0' 8.0'	17°56.47 18°8.11	11.6' 11.5'	59.2' 59.2'
23	165°52.51	9.76	358° 55.61	7.9'	18° 19.62	11.4'	59.2'
	SD = 15.8'	d = 0.7'		SE	0 = 16.2'		
					10.2		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°52.55 195°52.58	N17° 10.43 11.11	13°22.50 27°49.35	7.8' 7.8'	\$18°31.02 18°42.31	11.3' 11.2'	59.2' 59.1'
2	210°52.61	11.78	42° 16.13	7.7'	18° 53.47	11.0'	59.1
3	225°52.65	• • 12.46	56° 42.86	7.7'	19°4.51	10.9'	59.1'
4	240°52.68 255°52.71	13.13	71°9.54	7.6' 7.6'	19° 15.43 19° 26.22	10.8'	59.1'
5 6	255°52.71 270°52.75	13.80 N17°14.47	85°36.16 100°2.72	7.6° 7.5'	19°26.22 \$19°36.89	10.7' 10.5'	59.1' 59.0'
7	285°52.78	15.14	114° 29.23	7.5'	19° 47.43	10.4	59.0'
8	300°52.81	15.81	128°55.69	7.4'	19°57.85	10.3'	59.0'
9	315°52.84 330°52.88	· · 16.48 17.15	143°22.09 157°48.44	7.3' 7.3'	20°8.13 20°18.29	10.2' 10.0'	59.0' 59.0'
10 11	330°52.88 345°52.91	17.15 17.82	157° 48.44 172° 14.73	7.3° 7.2'	20° 18.29 20° 28.32	9.9'	59.0° 58.9'
12	0°52.94	N17°18.49	186°40.98	7.2'	S20°38.21	9.8'	58.9'
13	15°52.97	19.16	201°7.18	7.1'	20°47.97	9.6'	58.9'
14 15	30°53.00 45°53.03	19.83 •• 20.49	215°33.32 229°59.41	7.1' 7.0'	20°57.59 21°7.08	9.5' 9.3'	58.9' 58.8'
15 16	45 53.03 60°53.06	21.16	244° 25.46	7.0 7.0'	21 7.08 21°16.43	9.3 9.2'	58.8'
17	75°53.09	21.83	258° 51.46	7.0'	21°25.64	9.1	58.8'
18	90°53.12	N17°22.49	273° 17.41	6.9'	<b>S</b> 21°34.71	8.9'	58.8'
19 20	105°53.15 120°53.18	23.16 23.82	287°43.32 302°9.18	6.9' 6.8'	21°43.64 21°52.43	8.8' 8.6'	58.7' 58.7'
20	120°53.18 135°53.21	23.82	302°9.18 316°34.99	6.8	21°52.43 22°1.08	8.5	58.7' 58.7'
22	150°53.24	25.15	331°0.77	6.7'	22°9.58	8.4	58.7'
23	165°53.27	25.81	345°26.50	6.7'	22° 17.94	8.2'	58.6'
	SD = 15.8'	d = 0.7'	_	SE	0 = 16.1'		

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

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

10 19°43.05 301°19.49 26.36 341°56.97 31.19 210°37.21 12.54 347°36.25 36.33 11 34°45.51 316°21.99 26.14 356°57.62 31.79 225°39.70 12.54 2°38.41 36.44 12 49°47.98 331°24.49 N27°25.93 11°58.28 N14°32.40 240°42.18 N06°12.54 17°40.58 N10°36.54 13 64°50.44 346°27.00 25.71 26°58.94 33.01 255°44.67 12.54 32°42.75 36.64 14 79°52.91 1°29.51 25.49 41°59.59 33.61 270°47.15 12.54 47°44.92 36.74	h	Aries	Venus	Mars	Jupiter	Saturn
0 227*2013 164*245 0 166*2	Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 2472250 1706 1706 50 36.68 2007 100 20 30 50 40 20 20 20 20 20 20 20 20 20 20 20 20 20						I .
2 2577-25.0 p. 1916-80						
3 272"2752 999 299"13.50 **  4 287"2999 299"13.50 **  5 307"34.50 **  6 307"34.50 **  6 307"3						I .
4 987*99.98 200*11.30 36.23 251*21.41 58.01 118*22.92 12.41 255*30.23 30.79 15 30.75*30.23 30.79 15 30.75*30.23 30.79 15 30.75*30.23 30.79 15 30.79						
5 900°32.45 224°11.56 3608 266°22.07 \$86.63 133°25.12 12.42 270°41.40 30.89 6 317°34.07 230°12.78 133°5.09 148°27.60 50°12.42 285°4.57 100°3.09 9 130°12.41 285°4.57 100°3.09 17°3.20 11°3.20						I .
6 317*3491 29*18.26    127*35.92						
7 332°87.38 304 269°20.38 36.61 311°20.05 14°30.05 178°30.02 12.43 30°6.673 31.10 1 20°1.477 269°2.02 39.64 30°2.01 178°3.02 21.24 30°5.00 178°3.00 178°3.						
8 947°39.84 37°39.87 38°36.23 36.5 316°24.71 1.12 1.03°35.12 1.124 335°57.00 31.20 1.01 17°44.77 38°42.20 33.63 341°25.73 1.74 208°37.62 1.244 345°52.23 31.41 1.33°47.23 31.42°71.83 31.8 35°47.23 31.42°71.83 31.8 35°47.23 31.42°71.83 31.8 35°47.23 31.42°71.83 31.8 31.8 32°47.23 31.42°71.8 31.8 31.8 32°47.23 31.42°71.8 31.8 31.8 32°47.23 31.42°71.8 31.8 31.8 32°47.23 31.42°71.8 31.8 31.8 32°47.23 31.42°71.8 31.8 31.8 32°47.23 31.42°1.8 31.8 31.8 31.8 31.8 32°47.8 31.8 31.8 31.8 31.8 31.8 31.8 31.8 31						
9 2"4-3-11 39"2-9.0 35.0 34"1-7537 1.7 12 33"5-12 12.44 330"5-0.7 3.13.0 1.1 10 11"4-477 399"2-9.0 35.0 34"1-7537 1.7 12 32"3-7473 31 34"1-718 35.1 356"2-6.0 3 2.36 22"3-40.12 1.24 34"5-52.2 3.13.14 1.35"2-7473 39 11.70.0 1111-719 2.38"4-71.3 1.24 30"5-0.0 3.29"2-9.47 N27"3-9.9 11.70.0 1111-719 2.38"4-71.1 12.46 30"5-1.3 11.0 1.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0 1.3 11.0						
11 32°4723 314°77.18 55.14 356′2603 2.36 223°4012 1.245 0°54.40 31.51 12 47°49.70 320°29.71 377°3.49 11°260 N1°296 230°42.61 N06°12.45 15°56.56 N10°13.61 13 62°52.16 34°93.76 34.81 20°27.35 3.59 25°45.11 1.246 30°58.73 31.72 14 77°54.63 359°34.60 34.65 44.67 2801 4.21 288°47.61 1.246 46°9.90 31.52 15 92°57.00 14°36.36 34.65 44.95 56′28.67 3 48.3 283°50.11 1.247 66°9.90 31.52 15 92°57.00 14°36.36 34.95 67.42 80 34.22 28°84.51 1.247 66°9.90 31.52 15 92°57.00 14°36.36 34.95 67°4.28 10.22 28°84.51 1.247 66°9.90 34.22 12°83.50 11 1.247 61°3.06 31.32 18 18 18 18 18 10°59.67 33.82 116°3.90 5 N14°5.60 12.45 10°9.90 12.48 10°9.90 6 N10°32.23 18 18 18 10°9.90 5 74°45.00 33.82 116°3.33 17 7.92 189°5.60 N08°12.48 10°9.90 6 N10°32.23 12°183°11.81 10°9.90 5 74°45.00 33.82 116°3.33 17 7.92 189°2.50 12.49 130°13.00 32.44 122 183°11.81 10°9.90 5 73.46 14°9.20 33.3 16°33.20 9.15 29°7.58 12.50 166°18.23 3.264 122 193°14.34 11°9.28 8 33.31 16°33.23 9.15 29°7.58 12.50 166°18.23 3.264 122 123°16.80 133°45.49 13.31 13°19°3.39 9.17 44°10.08 12.50 166°18.23 3.264 122 123°16.80 133°45.49 123°1.23 123°16.80 133°45.49 123°1.23 123°16.80 133°45.49 123°1.23 123°16.80 133°45.49 123°1.23 123°1.60 133°45.40 123°1.23 123°1.60 133°45.40 123°1.23 123°1.60 133°45.40 123°1.23 123°1.60 133°45.40 123°1.23 123		2°42.31				
12   47*4970   336*29.47   N27*34   99   11*26.69   N14*290   338*42.61   N06*12.45   15*65.65   N10*31.61     13   62*52.16   344*31.67   34.81   326*72.35   3.59   253*34.11   12.46   46*0.90   3.18.2     14   77*94.63   359*34.06   34.46   56*26.77   34.83   233*50.11   12.47   76*52.3   32.03     15   92*57.00   14*96.06   34.45   56*26.77   34.83   233*50.11   12.47   76*52.3   32.03     16   107*99.55   73*46   73*27   34.16   36*2.99   36*2.90   31.55.10   12.48   97*4.45   32.13     17   123*2.02   44*30.70   N27*32   10.16*31.31   11*36.70   333*55.10   12.48   97*4.45   10.23     18   13*16.95   74*15.00   N27*32   10.16*31.31   11*36.70   333*55.10   12.48   12*11.31   32.23     19   13*16.95   74*15.00   33.46   146*32.63   0.85*4   14*50.90   12.49   151*10.60   32.24     12   138*11.88   11*35*5.05   33.34   146*32.63   0.85*4   14*50.90   12.49   151*10.60   32.24     12   138*11.88   13*45.41   33.13   176*33.94   9.77   44*10.08   12.50   181*20.40   32.75     Mer.pass. 08:49   \( \nu 2.22* \) d-0.1* m-4.69   \( \nu 0.7* \) d/0.6* m1.25   \( \nu 2.5* \) d-0.0* m-2.22   \( \nu 2.2* \) d-0.1* m-4.69   \( \nu 0.7* \) d/0.6* m1.25   \( \nu 2.5* \) d-0.0* m-2.22   \( \nu 2.2* \) d-0.1* m-3.6   \( \nu 3.2* \) s-0.2* d-0.1* m-3.6   \( \nu 3.2* \) s-0.2* d-0.1* m-3.6   \( \nu 3.2* \) s-0.2* d-0.1* m-4.6   \( \nu 0.7* \) d/0.6* m1.25   \( \nu 0.2* \) d-0.0* m-2.22   \( \nu 0.2* \) d-0.0* m-4.6   \( \nu 0.2* \) d-	10	$17^{\circ}44.77$	299°24.90 35.30	341°25.37 1.74	208°37.62 12.44	345°52.23 31.41
13 62°\$216 346°31.76 346°31.76 346° 34.67 376 346°30.76 31.62 15 92°\$7.09 11.26 30°\$8.73 31.72 15 92°\$7.09 11.26 33.66 34.82 71°2.29 33 5.65 12.21 24.77 61°3.06 1.31.02 16 107°\$9.55 22°\$38.66 34.32 71°2.29 33 5.65 12.21 24.77 61°3.06 1.31.02 16 107°\$9.55 22°\$38.68 34.32 71°2.29 33 5.65 12.21 24.89 10°7.40 52.33 16 18.60 20.99 6.07 31°5.51 01°2.48 91°7.40 32.33 16 18.60 20.99 6.07 31°5.51 01°2.48 91°7.40 32.33 16 18.60 20.99 6.07 31°5.51 01°2.48 91°7.40 32.33 16 18.18 148 4.40 55°4.28 N27°3.39 91.01°3.05 511.46 60 328 57.60 N06°12.48 10°5.59 310°3.23 20°3.20 188°9.14 80°4.70 22 33.65 112°3.10 7 7.92 33°5.55 10.00 N06°12.49 1136°13.00 32.44 122 1183°11.88 104°50.25 33.48 146°32.66 32.85 57.60 N06°12.49 1136°13.00 32.44 122 1183°11.88 104°50.25 33.48 146°32.66 32.85 57.60 N06°12.49 1136°13.00 32.44 122 1183°11.88 104°50.25 33.48 146°32.66 32.85 57.60 N06°12.49 1136°13.00 32.44 122 1183°11.88 104°50.25 33.48 146°32.66 32.85 52.13 12°3.10 7 7.92 339°7.59 11.25 10.10 181°2.04 33.33 16°33.28 9.15 22°7.58 12.50 166°18.23 32.64 122 121°3.10 183°2.24 122 121°6.60 133°3.49 12.20 120°4.00 N0.20 120°4.00 N0.20 120°4.00 N0.20 120°4.00 N0.20 120°4.00 N0.20 120°4.00 N0.20 120°4.00 N	11	32°47.23	314°27.18 35.14	356°26.03 2.36	223°40.12 12.45	0°54.40 31.51
14   77"54.63   359"34.06   34.65   41"28.01   4.21   288"47.61   12.46   46"0.00   31.82   15   92"57.00   14"93.65   34.49   55"28.67   34.32   38"51.01   12.47   76"52.3   32.03   10.07"93.55   32"38.66   34.49   55"28.67   34.12   36"29.99   6.07   313"551.01   12.48   91"74.0   32.13   32.03	12	47°49.70		11°26.69 N14°2.98	238°42.61 N06°12.45	
15   92°8709   14°80.56	13	$62^{\circ}52.16$	344°31.76 34.81	26°27.35 3.59	253°45.11 12.46	30°58.73 31.72
10 107°99.55						I .
18 18 18 28 448 59 59 42.28 N27 33.99 10 13 30 5 10 12 48 10 10 5 20 5 10 10 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 5 10 13 30 13 30 2 13 14 14 13 15 15 15 30 33 30 2 13 15 13 13 17 7.92 38 75 2.99 12 49 18 11 15 0.00 32 24 4 12 18 13 11 18 18 10 15 15 25 33 33 14 16 32 53 3 8 14 16 32 53 3 8 14 16 32 53 3 8 14 16 32 53 3 14 14 15 25 8 33 33 11 15 33 34 9 .97 12 49 18 11 15 0.00 32 24 4 13 13 15 15 15 15 15 15 15 15 15 15 15 15 15						
18   138"448   59"43.28   N2"33.99   101"30.65   N1"6.60   322"67.60   N0"612.48   101"95.66   N10"32.23   20   168"9.41   89"47.92   33.65   131"31.07   7.92   339"2.59   12.49   136"13.90   32.44   22   138"11.88   104"50.25   33.65   131"31.07   7.92   339"2.59   12.49   136"13.90   32.44   22   138"11.88   104"50.25   33.48   146"32.63   3.65   147"40.81   125"0   166"18.23   32.44   22   138"6.60   134"34.91   33.31   161"33.28   9.15   29"75.88   12.50   166"18.23   32.45   32.21"16.60   134"34.91   33.31   161"33.28   9.15   29"75.88   12.50   166"18.23   32.45   32.21"16.60   134"34.91   33.31   161"33.28   9.15   29"75.88   12.50   166"18.23   32.45   32.55   32.21"16.89   32.21"16.						I .
19   153°695   74°45.60   33.82   116°31.31   7.30   344°0.09   12.48   121°11.73   32.33   22   168°14.34   119°52.58   33.34   146°32.63   8.54   14°5.09   12.49   151°16.06   32.24   32.213°16.80   134°54.91   33.13   176°33.34   9.77   44°10.08   12.50   166°18.23   32.64   32.213°16.80   134°54.91   33.13   176°33.34   9.77   44°10.08   12.50   161°18.23   32.64   32.213°16.80   134°54.91   33.13   176°33.34   9.77   44°10.08   12.50   161°18.23   32.64   32.213°16.80   148°52.55   32.214   161°32.25   32.244   32.213°16.80   148°52.55   32.213°16.80   148°52.55   32.213°16.80   148°52.55   32.213°16.80   148°10.80   12.50   166°18.23   32.24   32.213°16.80   32.213						
20 168°941 88 04°5025 33.86 131°3107 7.92 359°2.59 12.49 136°13.90 22.44 22 138°14.34 119°52.58 33.85 146°32.63 2.86 9.15 29°7.58 12.50 166°18.23 32.64 22 123°16.80 134°34.91 33.13 161°33.28 9.15 29°7.58 12.50 166°18.23 32.64 22 123°16.80 134°34.91 33.13 161°33.28 9.15 29°7.58 12.50 166°18.23 32.64 22 123°16.80 134°34.91 33.13 161°33.28 9.15 29°7.58 12.50 166°18.23 32.65 22 26°32.20 180°19.27 180°3.29 191°34.60 144°10.39 191°2.57 No6°12.50 181°20.40 180.50 180°1.20 1						
22   198"11.88   104"50.25   \times 33.34   146"32.63   \times 8.75   14"5.09   \times 12.50   \times 11"16.00   \times 22.44   \times 22   198"16.80   \times 13"16.80   \times 33.48   \times 9.15   \times 29"7.88   12.50   \times 11"2.04.0   \times 22.75   \times 22.27   \times 22.2"   \times 22.3"   \times 23.55   \						
198° 14.34   119° 82.58   33.31   161° 33.82   9.15   29°7.58   12.50   181°20.40   32.75						
Mer.pass. 08:49         ν2.2' d-0.1' m-4.69         ν0.7' d0.6' m1.25         ν2.5' d0.0' m-2.22         ν2.2' d0.1' m0.50           Wed         GHA         GHA         Dec         GHA						
Wed         GHA         GHA         Dec         GHA <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
228°19.27   149°57.25   NZ°32.96   191°34.60   N14°10.39   59°12.57   NO6°12.50   196°22.66   N10°32.85   2 288°9.420   180°1.95   32.61   221°5.92   11.62   89°17.56   12.51   221°2.47   33.95   2 288°9.91.2   210°6.66   32.25   231°37.24   12.85   11.6°2.255   12.52   256°3.19   33.05   3 33°31.59   225°9.02   32.07   266°37.00   13.46   134°25.06   12.51   241°29.06   33.16   3 33°31.59   225°9.02   32.07   266°37.00   13.46   134°25.04   12.52   271°33.40   33.36   6 318°34.05   240°11.39   N27°31.89   281°38.56   N14°14.08   146°27.53   N06°12.52   266°35.56   N10°33.47   8 348°38.08   270°16.13   31.53   31.19   31.99   87   15.31   179°32.52   12.53   316°39.00   33.67   9 3°4.45   256°3.13   33.34   332°6.03   33.95   15.92   14.69   146°30.02   12.53   331°2.206   33.77   10 18°43.91   300°20.90   33.16   344°4.119   16.54   200°37.50   12.53   331°2.206   33.77   11 30°36.37   335°22.90   30.59   356°4.136   171.5   226°3.99   12.53   346°4.43   33.98   12 46°48.84   330°25.68   N27°30.78   11°22.51   N14°17.76   229°42.48   N06°12.53   16°45.65   N10°34.08   13 63°51.30   345°28.08   30.59   26°41.48   11.96   226°47.46   12.54   46°5.29   34.29   15 93°56.23   15°32.89   30.21   56°44.48   11.60   286°47.46   12.54   46°5.29   34.29   16 188°58.70   30°35.00   30.02   71°45.14   20.21   239°52.44   11.54   16°5.72   34.49   17 124°1.16   45°37.72   29.83   86°44.80   13.60   286°47.46   12.54   16°5.72   34.49   18 139°36.26   60°40.14   N27°2.96   101°46.48   31.23   326°57.47   12.54   15°5.72   34.49   19 154°59.70   30°54.76   N27°2.84   116°49.74   20.21   299°52.44   115°4.77   122°1.57   124°1.10   105°47.43   20.21   299°52.44   115°4.77   25.60   20.22   299°52.44   115°4.77   25.60   20.22   299°52.44   115°4.77   25.60   25.60   25.71   25.80   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34	Mer.p	oass. 08:49	$\nu$ 2.2′ <i>d</i> -0.1′ m-4.69	$ u 0.7' \; d0.6' \; { m m} 1.25$	$\nu$ 2.5′ $d$ 0.0′ m-2.22	$\nu 2.2' \ d0.1' \ \text{m}0.50$
228°19.27   149°57.25   NZ°32.96   191°34.60   N14°10.39   59°12.57   NO6°12.50   196°22.66   N10°32.85   2 288°9.420   180°1.95   32.61   221°5.92   11.62   89°17.56   12.51   221°2.47   33.95   2 288°9.91.2   210°6.66   32.25   231°37.24   12.85   11.6°2.255   12.52   256°3.19   33.05   3 33°31.59   225°9.02   32.07   266°37.00   13.46   134°25.06   12.51   241°29.06   33.16   3 33°31.59   225°9.02   32.07   266°37.00   13.46   134°25.04   12.52   271°33.40   33.36   6 318°34.05   240°11.39   N27°31.89   281°38.56   N14°14.08   146°27.53   N06°12.52   266°35.56   N10°33.47   8 348°38.08   270°16.13   31.53   31.19   31.99   87   15.31   179°32.52   12.53   316°39.00   33.67   9 3°4.45   256°3.13   33.34   332°6.03   33.95   15.92   14.69   146°30.02   12.53   331°2.206   33.77   10 18°43.91   300°20.90   33.16   344°4.119   16.54   200°37.50   12.53   331°2.206   33.77   11 30°36.37   335°22.90   30.59   356°4.136   171.5   226°3.99   12.53   346°4.43   33.98   12 46°48.84   330°25.68   N27°30.78   11°22.51   N14°17.76   229°42.48   N06°12.53   16°45.65   N10°34.08   13 63°51.30   345°28.08   30.59   26°41.48   11.96   226°47.46   12.54   46°5.29   34.29   15 93°56.23   15°32.89   30.21   56°44.48   11.60   286°47.46   12.54   46°5.29   34.29   16 188°58.70   30°35.00   30.02   71°45.14   20.21   239°52.44   11.54   16°5.72   34.49   17 124°1.16   45°37.72   29.83   86°44.80   13.60   286°47.46   12.54   16°5.72   34.49   18 139°36.26   60°40.14   N27°2.96   101°46.48   31.23   326°57.47   12.54   15°5.72   34.49   19 154°59.70   30°54.76   N27°2.84   116°49.74   20.21   299°52.44   115°4.77   122°1.57   124°1.10   105°47.43   20.21   299°52.44   115°4.77   25.60   20.22   299°52.44   115°4.77   25.60   20.22   299°52.44   115°4.77   25.60   25.60   25.71   25.80   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25.91   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34   25°3.34						
228°19.27   149°57.25   N27°32.96   191°34.60   N14°10.39   59°12.57   N06°12.56   196°22.66   N10°32.85   2 288°9.420   180°1.95   32.61   221°5.92   11.62   80°17.56   12.51   221°2.906   33.05   3 273°9.66   199°2.96   33.06   32.25   221°35.92   11.62   80°17.56   12.51   221°2.906   33.05   4 288°9.91.2   210°6.66   32.25   225°37.24   12.85   110°22.55   12.52   256°31.23   33.26   5 303°31.59   225°9.02   32.07   266°37.09   13.46   110°22.55   12.52   256°31.23   33.26   6 318°34.05   240°11.39   N27°31.89   281°38.56   N14°14.08   146°27.53   N06°12.52   266°35.56   N10°33.47   7 333°36.562   255°13.77   31.31   31.53   311°3.967   15.31   179°32.52   12.53   316°39.09   33.67   8 348°38.98   270°16.13   31.53   311°3.967   15.31   179°32.52   12.53   316°39.09   33.67   10 18°43.91   300°20.90   31.16   341°41.19   16.54   220°37.50   12.53   314°2.06   33.77   10 18°43.61   334°37   345°22.90   30.59   356°41.18   171°3   224°30.99   12.53   136°43.65   N10°34.08   11 33°46.37   315°22.90   30.59   356°41.18   171°3   224°30.99   12.53   16°48.56   N10°34.08   13 63°51.30   345°28.08   30.59   654°41.66   18.38   224°44.97   12.53   316°50.3   34.18   14 78°53.77   0°30.48   30.40   41°43.62   16.99   32.44   40.99°3.50   12.53   316°3.03   34.18   15 93°56.23   355°5.25   30.02   71°45.14   20.21   239°52.44   50°57.23   34.49   15 108°58.70   30°53.05   30.02   71°45.14   20.21   239°52.44   51°57.23   34.49   15 11 18°45.85   70°45.85   30.02   71°45.14   20.21   239°52.44   51°57.23   34.49   15 11 18°58.70   30°50.48   30.40   41°43.43   20.21   239°57.42   20.61   24.49   31°59.34   34.18   15 19 18°58.70   30°50.48   30.21   56°44.48   11.50   226°47.46   12.54   46°52.93   34.19   15 108°58.70   30°50.48   30.21   56°44.48   11.50   226°47.49   12.54   46°52.93   34.18   15 108°58.70   30°50.48   30.21   30°50.48   30.22   30°50.48   30.22   30°50.48   30.22   30°50.48   30.22   30°50.48   30.22   30°50.48   30°50.48   30.22   30°50.48   30°50.48   30°50.48   30°50.48   30°50.48   30°50.48	Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
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8 349°38.12 271°14.51 26.78 311°55.65 29.97 180°32.24 12.54 317°31.91 36.13 9 4°40.59 286°17.00 · · 26.57 326°56.31 · · · 30.58 195°34.73 · · 12.54 332°34.08 · · 36.23 10 19°43.05 301°19.49 26.36 341°56.97 31.19 210°37.21 12.54 347°36.25 36.33 11 34°45.51 316°21.99 26.14 356°57.62 31.79 225°39.70 12.54 2°38.41 36.44 12 49°47.98 331°24.49 N27°25.93 11°58.28 N14°32.40 240°42.18 N06°12.54 17°40.58 N10°36.54 13 64°50.44 346°27.00 25.71 26°58.94 33.01 255°44.67 12.54 32°42.75 36.64 14 79°52.91 1°29.51 25.49 41°59.59 33.61 270°47.15 12.54 47°44.92 36.74 15 94°55.37 16°32.03 · · 25.27 57°0.25 · · 34.22 285°49.63 · · 12.54 62°47.09 · · 36.84 16 109°57.84 31°34.55 25.05 72°0.90 34.83 300°52.12 12.53 77°49.25 36.95 17 125°0.30 46°37.07 24.83 87°1.56 35.43 315°54.60 12.53 92°51.42 37.05 18 140°2.76 61°39.60 N27°24.61 102°2.21 N14°36.04 330°57.08 N06°12.53 107°53.59 N10°37.15 19 155°5.23 76°42.14 24.39 117°2.87 36.64 345°59.56 12.53 120°55.76 37.25 20 170°7.69 91°44.67 24.16 132°3.53 37.25 1°2.05 12.53 137°57.93 37.35 21 185°10.16 106°47.22 · · 23.93 147°4.18 · · 37.85 16°4.53 · · 12.52 153°0.09 · · 37.46 22 200°12.62 121°49.77 23.71 162°4.84 38.46 31°7.01 12.52 183°4.43 37.66						
9 4°40.59 286°17.00 · · 26.57 326°56.31 · · 30.58 195°34.73 · · 12.54 332°34.08 · · 36.23 10 19°43.05 301°19.49 26.36 341°56.97 31.19 210°37.21 12.54 347°36.25 36.33 11 34°45.51 316°21.99 26.14 356°57.62 31.79 225°39.70 12.54 2°38.41 36.44 12 49°47.98 331°24.49 N27°25.93 11°58.28 N14°32.40 240°42.18 N06°12.54 17°40.58 N10°36.54 13 64°50.44 346°27.00 25.71 26°58.94 33.01 255°44.67 12.54 32°42.75 36.64 14 79°52.91 1°29.51 25.49 41°59.59 33.61 270°47.15 12.54 47°44.92 36.74 15 94°55.37 16°32.03 · · 25.27 57°0.25 · · 34.22 285°49.63 · · 12.54 62°47.09 · · · 36.84 16 109°57.84 31°34.55 25.05 72°0.90 34.83 300°52.12 12.53 77°49.25 36.95 17 125°0.30 46°37.07 24.83 87°1.56 35.43 315°54.60 12.53 92°51.42 37.05 18 140°2.76 61°39.60 N27°24.61 102°2.21 N14°36.04 330°57.08 N06°12.53 107°53.59 N10°37.15 19 155°5.23 76°42.14 24.39 117°2.87 36.64 345°59.56 12.53 122°55.76 37.25 20 170°7.69 91°44.67 24.16 132°3.53 37.25 1°2.05 12.53 137°57.93 37.35 21 185°10.16 106°47.22 · · 23.93 147°4.18 · · 37.85 16°4.53 · · 12.52 153°0.09 · · 37.46 22 200°12.62 121°49.77 23.71 162°4.84 38.46 31°7.01 12.52 168°2.26 37.56 23 215°15.09 136°52.32 23.48 177°5.49 39.06 46°9.49 12.52 183°4.43 37.66						
10 19°43.05 301°19.49 26.36 341°56.97 31.19 210°37.21 12.54 347°36.25 36.33 11 34°45.51 316°21.99 26.14 356°57.62 31.79 225°39.70 12.54 2°38.41 36.44 12 49°47.98 331°24.49 N27°25.93 11°58.28 N14°32.40 240°42.18 N06°12.54 17°40.58 N10°36.54 13 64°50.44 346°27.00 25.71 26°58.94 33.01 255°44.67 12.54 32°42.75 36.64 14 79°52.91 1°29.51 25.49 41°59.59 33.61 270°47.15 12.54 47°44.92 36.74 15 94°55.37 16°32.03 · · 25.27 57°0.25 · · 34.22 285°49.63 · · 12.54 62°47.09 · · · 36.84 16 109°57.84 31°34.55 25.05 72°0.90 34.83 300°52.12 12.53 77°49.25 36.95 17 125°0.30 46°37.07 24.83 87°1.56 35.43 315°54.60 12.53 92°51.42 37.05 18 140°2.76 61°39.60 N27°24.61 102°2.21 N14°36.04 330°57.08 N06°12.53 107°53.59 N10°37.15 19 155°5.23 76°42.14 24.39 117°2.87 36.64 345°59.56 12.53 122°55.76 37.25 20 170°7.69 91°44.67 24.16 132°3.53 37.25 1°2.05 12.53 137°57.93 37.35 21 185°10.16 106°47.22 · · 23.93 147°4.18 · · 37.85 16°4.53 · · 12.52 153°0.09 · · 37.46 22 200°12.62 121°49.77 23.71 162°4.84 38.46 31°7.01 12.52 168°2.26 37.56 23 215°15.09 136°52.32 23.48 177°5.49 39.06 46°9.49 12.52 183°4.43 37.66						332°34 08 · · 36 23
11 34°45.51 316°21.99 26.14 356°57.62 31.79 225°39.70 12.54 2°38.41 36.44 12 49°47.98 331°24.49 N27°25.93 11°58.28 N14°32.40 240°42.18 N06°12.54 17°40.58 N10°36.54 13 64°50.44 346°27.00 25.71 26°58.94 33.01 255°44.67 12.54 32°42.75 36.64 14 79°52.91 1°29.51 25.49 41°59.59 33.61 270°47.15 12.54 47°44.92 36.74 15 94°55.37 16°32.03 · 25.27 57°0.25 · 34.22 285°49.63 · 12.54 62°47.09 · 36.84 16 109°57.84 31°34.55 25.05 72°0.90 34.83 300°52.12 12.53 77°49.25 36.95 17 125°0.30 46°37.07 24.83 87°1.56 35.43 315°54.60 12.53 92°51.42 37.05 18 140°2.76 61°39.60 N27°24.61 102°2.21 N14°36.04 330°57.08 N06°12.53 107°53.59 N10°37.15 19 155°5.23 76°42.14 24.39 117°2.87 36.64 345°59.56 12.53 122°55.76 37.25 20 170°7.69 91°44.67 24.16 132°3.53 37.25 1°2.05 12.53 137°57.93 37.35 21 185°10.16 106°47.22 · 23.93 147°4.18 · 37.85 16°4.53 · 12.52 153°0.09 · 37.46 22 200°12.62 121°49.77 23.71 162°4.84 38.46 31°7.01 12.52 168°2.26 37.56 23 215°15.09 136°52.32 23.48 177°5.49 39.06 46°9.49 12.52 183°4.43 37.66						1 1
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16       109°57.84       31°34.55       25.05       72°0.90       34.83       300°52.12       12.53       77°49.25       36.95         17       125°0.30       46°37.07       24.83       87°1.56       35.43       315°54.60       12.53       92°51.42       37.05         18       140°2.76       61°39.60       N27°24.61       102°2.21       N14°36.04       330°57.08       N06°12.53       107°53.59       N10°37.15         19       155°5.23       76°42.14       24.39       117°2.87       36.64       345°59.56       12.53       122°55.76       37.25         20       170°7.69       91°44.67       24.16       132°3.53       37.25       1°2.05       12.53       137°57.93       37.35         21       185°10.16       106°47.22       · 23.93       147°4.18       · 37.85       16°4.53       · 12.52       153°0.09       · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						
17       125°0.30       46°37.07       24.83       87°1.56       35.43       315°54.60       12.53       92°51.42       37.05         18       140°2.76       61°39.60       N27°24.61       102°2.21       N14°36.04       330°57.08       N06°12.53       107°53.59       N10°37.15         19       155°5.23       76°42.14       24.39       117°2.87       36.64       345°59.56       12.53       122°55.76       37.25         20       170°7.69       91°44.67       24.16       132°3.53       37.25       1°2.05       12.53       137°57.93       37.35         21       185°10.16       106°47.22       · 23.93       147°4.18       · 37.85       16°4.53       · 12.52       153°0.09       · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						
18       140°2.76       61°39.60       N27°24.61       102°2.21       N14°36.04       330°57.08       N06°12.53       107°53.59       N10°37.15         19       155°5.23       76°42.14       24.39       117°2.87       36.64       345°59.56       12.53       122°55.76       37.25         20       170°7.69       91°44.67       24.16       132°3.53       37.25       1°2.05       12.53       137°57.93       37.35         21       185°10.16       106°47.22       · 23.93       147°4.18       · 37.85       16°4.53       · 12.52       153°0.09       · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						l l
19       155°5.23       76°42.14       24.39       117°2.87       36.64       345°59.56       12.53       122°55.76       37.25         20       170°7.69       91°44.67       24.16       132°3.53       37.25       1°2.05       12.53       137°57.93       37.35         21       185°10.16       106°47.22       · 23.93       147°4.18       · 37.85       16°4.53       · 12.52       153°0.09       · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						
20       170°7.69       91°44.67       24.16       132°3.53       37.25       1°2.05       12.53       137°57.93       37.35         21       185°10.16       106°47.22       · · 23.93       147°4.18       · · 37.85       16°4.53       · · 12.52       153°0.09       · · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						
21       185°10.16       106°47.22       · · 23.93       147°4.18       · · 37.85       16°4.53       · · 12.52       153°0.09       · · 37.46         22       200°12.62       121°49.77       23.71       162°4.84       38.46       31°7.01       12.52       168°2.26       37.56         23       215°15.09       136°52.32       23.48       177°5.49       39.06       46°9.49       12.52       183°4.43       37.66						
22       200° 12.62       121° 49.77       23.71       162° 4.84       38.46       31° 7.01       12.52       168° 2.26       37.56         23       215° 15.09       136° 52.32       23.48       177° 5.49       39.06       46° 9.49       12.52       183° 4.43       37.66						
23 215°15.09 136°52.32 23.48 177°5.49 39.06 46°9.49 12.52 183°4.43 37.66						
Mer.pass. 08:41 $\nu 2.5' \ d$ -0.2' m-4.65 $\nu 0.7' \ d$ 0.6' m1.26 $\nu 2.5' \ d$ 0.0' m-2.21 $\nu 2.2' \ d$ 0.1' m0.50						
	Mer.p	pass. 08:41	ν2.5′ d-0.2′ m-4.65	ν0.7' d0.6' m1.26	$\nu$ 2.5′ $d$ 0.0′ m-2.21	$\nu 2.2' \ d0.1' \ m0.50$

	SHA	Dec
Alpheratz	357°32.17	29°14.71
Ankaa	353° 4.85	-42°8.93
Schedar Diphda	349°28.28 348°44.86	56°41.42 -17°49.80
Achernar	335°18.80	-57°5.42
Hamal	327°48.44	23°35.70
Polaris	$313^{\circ}3.76$	89°22.91
Acamar	315°10.18	-40°11.47
Menkar Mirfak	314°3.63 308°24.81	4°11.98 49°57.63
Aldebaran	290°36.83	16°33.87
Rigel	281°1.56	-8°10.29
Capella	280°18.29	46°1.55
Bellatrix	278°20.26	6°22.39
Elnath Alnilam	277°58.76 275°35.26	28°37.80 -1°11.18
Betelgeuse	270°49.42	7°24.60
Canopus	263°51.57	-52°42.91
Sirius	258°24.08	-16°45.53
Adhara	255°3.96	-29°0.91
Procyon Pollux	244°48.16 243°14.18	5°8.97 27°57.40
Avior	234°13.76	-59°36.40
Suhail	222°44.32	-43°33.20
Miaplacidus	221°37.65	-69°50.42
Alphard	217°45.09 207°31.52	-8°47.14
Regulus Dubhe	207°31.52 193°37.55	11°49.58 61°36.00
Denebola	193 37.55 182°22.01	14°24.70
Gienah	175°40.54	-17°42.20
Acrux	172°56.41	-63°15.70
Gacrux	171°48.08	-57°16.63
Alioth Spica	166°10.24 158°19.14	55°48.39 -11°18.74
Alkaid	150° 19.14° 152° 49.49	49°10.28
Hadar	148°31.41	-60°30.75
Menkent	$147^{\circ}53.99$	-36°30.73
Arcturus	145°45.12	19°1.99
Rigil Kent. Kochab	139°35.80 137°18.87	-60°57.27 74°2.28
Zuben'ubi	136°52.66	-16°9.69
Alphecca	126° 1.10	26°37.06
Antares	112°12.14	-26°29.68
Atria	107°3.36 101°59.36	-69°4.53 -15°45.58
Sabik Shaula	96°6.33	-15 45.58 -37°7.33
Rasalhague	95°55.75	12°32.29
Itasaiiiague		51°28.92
Eltanin	90°40.50	
Eltanin Kaus Aust.	83°28.64	-34°22.10
Eltanin Kaus Aust. Vega	83°28.64 80°31.10	-34°22.10 38°48.43
Eltanin Kaus Aust.	83°28.64 80°31.10 75°44.19	-34°22.10 38°48.43 -26°15.54
Eltanin Kaus Aust. Vega Nunki Altair Peacock	83°28.64 80°31.10	-34°22.10 38°48.43
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72 13° 42.69	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41 Mer.pass 14:02 11:14
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41 Mer.pass 14:02 11:14 20:04
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41 Mer.pass 14:02 11:14
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA 281°37.99	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Mars	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA 281°37.99 323°15.34	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 <b>SHA</b> 281°42.20 323°58.64 190°52.49 328°10.44 <b>SHA</b> 281°37.99 323°15.34 190°53.30	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May Jupiter	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA 281°37.99 323°15.34 190°53.30 328°3.29	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA 281°37.99 323°15.34 190°53.30 328°3.29 SHA 281°36.35 322°31.99	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars Jupiter Saturn	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72 13° 42.69 13° 27.32 SHA 281° 42.20 323° 58.64 190° 52.49 328° 10.44 SHA 281° 37.99 323° 15.34 190° 53.30 328° 3.29 SHA 281° 36.35 322° 31.99 190° 53.95	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars Jupiter Saturn	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72 13° 42.69 13° 27.32 SHA 281° 42.20 323° 58.64 190° 52.49 328° 10.44 SHA 281° 37.99 323° 15.34 190° 53.30 328° 3.29 SHA 281° 36.35 322° 31.99 190° 53.95 327° 56.16	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars Jupiter Saturn	83°28.64 80°31.10 75°44.19 61°57.18 53°1.39 49°23.82 33°36.15 27°29.68 15°11.72 13°42.69 13°27.32 SHA 281°42.20 323°58.64 190°52.49 328°10.44 SHA 281°37.99 323°15.34 190°53.30 328°3.29 SHA 281°36.35 322°31.99 190°53.95 327°56.16	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53  Mer.pass 13:54 11:12 19:56 10:49
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars Jupiter Saturn	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72 13° 42.69 13° 27.32 SHA 281° 42.20 323° 58.64 190° 52.49 328° 10.44 SHA 281° 37.99 323° 15.34 190° 53.30 328° 3.29 SHA 281° 36.35 322° 31.99 190° 53.95 327° 56.16	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53
Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  May 09 Tue Venus Mars Jupiter Saturn  May 10 Wed Venus Mars Jupiter Saturn  May 11 Thu Venus Mars Jupiter Saturn	83° 28.64 80° 31.10 75° 44.19 61° 57.18 53° 1.39 49° 23.82 33° 36.15 27° 29.68 15° 11.72 13° 42.69 13° 27.32 SHA 281° 42.20 323° 58.64 190° 52.49 328° 10.44 SHA 281° 37.99 323° 15.34 190° 53.30 328° 3.29 SHA 281° 36.35 322° 31.99 190° 53.95 327° 56.16 Ital parallax Venus:	-34°22.10 38°48.43 -26°15.54 8°56.56 -56°38.27 45°22.69 10°0.27 -46°49.12 -29°28.14 28°14.08 15°21.41  Mer.pass 14:02 11:14 20:04 10:56  Mer.pass 13:58 11:13 20:00 10:53  Mer.pass 13:54 11:12 19:56 10:49

Stars

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.29	N17°26.47	$359^{\circ}52.19$	6.6'	S22°26.16	8.1'	58.6'
1	195°53.32	27.14	14° 17.84	6.6'	22°34.22	7.9'	58.6'
2	210°53.35 225°53.38	27.80 •• 28.46	28°43.45 43°9.02	6.6' 6.5'	22°42.14 22°49.92	7.8' 7.6'	58.6' 58.5'
4	240° 53.40	29.12	57°34.56	6.5	22°57.54	7.5	58.5
5	255°53.43	29.78	72°0.06	6.5'	23°5.01	7.3'	58.5'
6	270°53.46	N17°30.44	86°25.53	6.4'	\$23°12.33	7.2'	58.5'
7 8	285°53.48 300°53.51	31.10 31.76	100°50.96 115°16.36	6.4' 6.4'	23°19.51 23°26.52	7.0' 6.9'	58.4' 58.4'
9	315°53.54	• • 32.41	129°41.74	6.3	23°33.39	6.7'	58.4
10	330° 53.56	33.07	144°7.08	6.3'	23°40.10	6.6'	58.4'
11	345°53.59 0°53.61	33.73 N17°34.38	158° 32.40 172° 57.69	6.3'	23°46.66 \$23°53.06	6.4'	58.3'
12 13	15°53.61	N17 34.38 35.04	172°57.69 187°22.95	6.3' 6.2'	23°59.31	6.2' 6.1'	58.3' 58.3'
14	30°53.66	35.70	201°48.20	6.2'	24°5.40	5.9'	58.2'
15	45°53.69	• • 36.35	216° 13.42	6.2'	24°11.34	5.8'	58.2'
16	60°53.71 75°53.74	37.00 37.66	230°38.62 245°3.80	6.2' 6.2'	24°17.12 24°22.74	5.6' 5.5'	58.2' 58.2'
17 18	90° 53.76	37.00 N17°38.31	245 3.80 259°28.97	6.2	S24°28.20	5.3'	58.1'
19	105°53.78	38.96	273°54.12	6.1'	24°33.50	5.1'	58.1'
20	120° 53.81	39.62	288° 19.26	6.1'	24°38.65	5.0'	58.1'
21	135°53.83 150°53.85	· · 40.27 40.92	302°44.39 317°9.50	6.1'	24°43.63 24°48.46	4.8'	58.0' 58.0'
22 23	150°53.85 165°53.87	40.92 41.57	317°9.50 331°34.61	6.1' 6.1'	24°48.46 24°53.13	4.7' 4.5'	58.0'
_5	SD = 15.8'	d = 0.7'			O = 16.0'		
		u = 0.7		31	) — 10.0°		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°53.90	N17°42.22	345°59.71	6.1'	\$24°57.63	4.3'	58.0'
1 2	195°53.92 210°53.94	42.87 43.52	0°24.80 14°49.90	6.1' 6.1'	25°1.98 25°6.16	4.2' 4.0'	57.9' 57.9'
3	210 53.94 225°53.96	· · 44.17	29° 14.98	6.1	25 0.10 25°10.19	4.0 3.9'	57.9'
4	240° 53.98	44.82	43°40.07	6.1'	25°14.05	3.7'	57.8'
5	255°54.00	45.47	58°5.16	6.1'	25°17.75	3.5'	57.8'
6 7	270° 54.03 285° 54.05	N17°46.11 46.76	72°30.26 86°55.36	6.1' 6.1'	\$25°21.29 25°24.67	3.4' 3.2'	57.8' 57.7'
8	300° 54.07	47.41	101°20.46	6.1	25°27.89	3.1'	57.7'
9	315°54.09	• • 48.05	115° 45.58	6.1'	25°30.94	2.9'	57.7'
10	330°54.11	48.70	130° 10.70	6.1'	25°33.84	2.7'	57.7'
11 12	345°54.13 0°54.14	49.34 N17°49.98	144°35.84 159°0.99	6.2' 6.2'	25°36.57 \$25°39.14	2.6' 2.4'	57.6' 57.6'
13	15°54.16	50.63	173° 26.16	6.2	25°41.56	2.4	57.6'
14	30°54.18	51.27	$187^{\circ}51.35$	6.2'	$25^{\circ}43.81$	2.1'	57.5'
15	45°54.20	• • 51.91	202° 16.55	6.2'	25°45.89	1.9'	57.5'
16 17	60°54.22 75°54.24	52.56 53.20	216°41.78 231°7.02	6.2' 6.3'	25°47.82 25°49.59	1.8' 1.6'	57.5' 57.4'
18	90° 54.25	N17°53.84	245°32.30	6.3'	S25°51.20	1.4'	57.4
19	105°54.27	54.48	259° 57.60	6.3'	$25^{\circ}52.65$	1.3'	57.4'
20	120°54.29	55.12	274°22.92 288°48.28	٠	25°53.94	1.1'	57.3'
21 22	135°54.31 150°54.32	• • 55.76 56.40	288 48.28 303°13.67	6.4' 6.4'	25°55.07 25°56.04	1.0' 0.8'	57.3' 57.3'
23	165° 54.34	57.04	317°39.10	6.5'	25°56.85	0.7'	57.3'
	SD = 15.8'	d = 0.6'		SI	D = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d 0.5'	HP
0 1	180°54.36 195°54.37	N17°57.67 58.31	332°4.55 346°30.05	6.5' 6.5'	\$25°57.50 25°58.00	0.5' 0.3'	57.2' 57.2'
2	210° 54.39	58.95	0°55.58	6.6'	25°58.34	0.2	57.2
3	225°54.40	17°59.58	15°21.16	6.6'	25°58.52	0.0'	57.1'
4 5	240°54.42 255°54.43	18° 0.22 0.86	29°46.77 44°12.43	6.7' 6.7'	25°58.55 25°58.42	-0.1' -0.3'	57.1' 57.1'
6	255 54.43 270° 54.45	0.86 N18° 1.49	44°12.43 58°38.14	6.8'	25°58.42 \$25°58.13	-0.4	57.1° 57.0°
7	285°54.46	2.12	73°3.89	6.8'	25°57.69	-0.6'	57.0'
8	300°54.48	2.76	87°29.69	6.8'	25°57.10	-0.7'	57.0'
9 10	315°54.49 330°54.50	· · 3.39 4.02	101°55.54 116°21.44	6.9' 7.0'	25°56.35 25°55.46	-0.9' -1.1'	56.9' 56.9'
10	330 54.50 345°54.52	4.02 4.66	116 21.44 130° 47.39	7.0° 7.0°	25 55.46 25°54.40	-1.1 -1.2'	56.9'
12	0°54.53	N18°5.29	145°13.40	7.1'	S25°53.20	-1.4'	56.8'
13	15°54.54	5.92	159°39.46	7.1'	25°51.85	-1.5'	56.8'
14 15	30°54.56 45°54.57	6.55 •• 7.18	174°5.59 188°31.77	7.2' 7.2'	25°50.35 25°48.70	-1.7' -1.8'	56.8' 56.8'
16	45° 54.57 60° 54.58	7.10	202°58.01	7.3'	25°46.70	-1.6 -1.9'	56.7
17	75°54.59	8.44	217°24.31	7.4'	25°44.95	-2.1'	56.7'
18	90°54.61	N18° 9.07	231°50.68	7.4'	\$25°42.86	-2.2'	56.7'
19 20	105°54.62 120°54.63	9.69 10.32	246°17.11 260°43.60	7.5' 7.6'	25°40.62 25°38.24	-2.4' -2.5'	56.6' 56.6'
21	135° 54.64	10.95	275° 10.16	7.6'	25°35.71	-2.5' -2.7'	56.6
22	150° 54.65	11.57	289°36.79	7.7'	25°33.04	-2.8'	56.5'
23	165°54.66	12.20	304°3.49	7.8'	25°30.23	-3.0'	56.5'
	SD = 15.8'	d = 0.6'		SI	O = 15.6'		

			2028 N	May 09	to May	y. 11 U
Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.
N 72°						
<b>N</b> 70°	////	////	01:27	22:33	////	////
68°	7777	////	02:11	21:46	////	////
66°	7777	00:34	02:40	21:16	23:42	////
64°	7777	01:37	03:02	20:53	22:21	7777
62°	7777	02:10	03:19	20:36	21:46	7777
60°	00:30	02:34	03:33	20:30	21:21	23:43
<b>N</b> 58°	01:27	02:53	03:45	20:09	21:02	22:31
56°	01:57	03:08	03:56	19:58	20:47	21:59
54°	02:20	03:21	04:05	19:49	20:33	21:36
52°	02:37	03:32	04:13	19:40	20:22	21:17
50°	02:52	03:42	04:21	19:33	20:12	21:02
45°	03:21	04:03	04:21	19:17	19:51	20:33
N 40°	03:42	04:19	04:49	19:04	19:34	20:12
35°	03:59	04:32	05:00	18:53	19:21	19:55
30°	04:13	04:44	05:10	18:43	19:09	19:41
20°	04:35	05:02	05:26	18:27	18:51	19:18
N 10°	04:52	05:02	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
<b>S</b> 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:56	06:19	17:33	17:56	18:23
30°	05:41	06:10	06:35	17:18	17:43	18:11
35°	05:47	06:17	06:44	17:09	17:35	18:06
40°	05:53	06:25	06:54	16:58	17:27	18:00
45°	05:59	06:34	07:06	16:46	17:18	17:53
<b>S</b> 50°	06:06	06:45	07:20	16:32	17:07	17:46
52°	06:09	06:50	07:27	16:25	17:02	17:43
54°	06:12	06:55	07:35	16:18	16:57	17:40
56°	06:16	07:01	07:43	16:09	16:51	17:36
58°	06:20	07:08	07:52	16:00	16:44	17:32
<b>S</b> $60^{\circ}$	06:24	07:15	08:03	15:49	16:37	17:28
Lat.		Moonris	se		Moonse	t
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
<b>N</b> 70°						
68°						
66°				01:22		
64°	23:50			02:06	02:00	
62°	22:59		00:21	02:36	02:52	03:31
	1		'	1 11 11		–

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

h	Aries	Venus	Mars	Jupiter	Saturn
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	230° 17.55	151°54.88 N27°23.25	192°6.15 N14°39.66	61°11.97 N06°12.52	198°6.60 N10°37.76
1	245° 20.01	166° 57.44 23.02	207°6.80 40.27	76°14.45 12.51	213°8.77 37.86
2	260° 22.48	182°0.00 22.79	222°7.46 40.87	91°16.93 12.51	228°10.93 37.97
3	275°24.94	197°2.58 · · 22.55	237°8.11 · · 41.47	106°19.41 · · 12.51	243°13.10 · · 38.07
4	290°27.41	212°5.15 22.32	252°8.77 42.08	121°21.89 12.50	258°15.27 38.17
5	305° 29.87	227°7.73 22.08	267°9.42 42.68	136°24.37 12.50	273°17.44 38.27
6	320°32.33	242°10.32 N27°21.84	282°10.08 N14°43.28	151°26.85 N06°12.50	288°19.61 N10°38.37
7	335°34.80	257°12.91 21.61	297°10.73 43.88	166°29.33 12.49	303°21.78 38.47
8	350° 37.26	272°15.50 21.37	312°11.39 44.49	181°31.80 12.49	318°23.94 38.58
9	5°39.73	287°18.10 · · 21.13	327°12.04 · · 45.09	196°34.28 · · 12.49	333°26.11 · · · 38.68
10 11	20°42.19 35°44.66	302°20.70 20.88 317°23.31 20.64	342°12.70 45.69 357°13.35 46.29	211°36.76 12.48 226°39.24 12.48	348°28.28 38.78 3°30.45 38.88
12	50° 47.12	332°25.92 N27°20.40	12°14.01 N14°46.89	241°41.71 N06°12.47	18°32.62 N10°38.98
13	65° 49.58	347°28.54 20.15	27°14.66 47.49	256°44.19 12.47	33°34.79 39.08
14	80°52.05	2°31.16 19.90	42°15.31 48.09	271°46.67 12.47	48°36.95 39.19
15	95°54.51	17°33.78 · · 19.66	57°15.97 · · 48.69	286°49.14 · · 12.46	63°39.12 · · 39.29
16	110°56.98	32°36.42 19.41	72°16.62 49.29	301°51.62 12.46	78°41.29 39.39
17	125°59.44	47°39.05 19.16	87°17.28 49.89	316°54.10 12.45	93°43.46 39.49
18	141°1.90 156°4.37	62°41.69 N27°18.91 77°44.33 18.65	102°17.93 N14°50.49 117°18.58 51.09	331°56.57 N06°12.45 346°59.05 12.44	108°45.63 N10°39.59 123°47.80 39.69
19 20	150 4.37 171°6.83	77°44.33 18.65 92°46.98 18.40	117° 18.58 51.09 132° 19.24 51.69	346°59.05 12.44 2°1.52 12.44	123°47.80 39.69 138°49.97 39.79
21	186°9.30	107°49.64 · · 18.14	147°19.89 · · 52.28	17°4.00 · · 12.43	153°52.14 · · · 39.89
22	201°11.76	122°52.30 17.89	162°20.54 52.88	32°6.47 12.43	168°54.30 40.00
23	216° 14.23	137°54.96 17.63	177°21.20 53.48	47° 8.94 12.42	183°56.47 40.10
Mari	pass. 08:37	ν2.6' d-0.2' m-4.63	ν0.7' d0.6' m1.27	ν2.5' d-0.0' m-2.20	$\nu 2.2' \ d0.1' \ m0.50$
- IVICI.	pass. 00.57	ν2.0 d-0.2 III-4.03		ν2.3 α-0.0 III-2.20	
_					
Sat	<b>GHA</b> 231° 16.69	<b>GHA Dec</b> 152°57.63 N27°17.37	<b>GHA Dec</b> 192°21.85 N14°54.08	<b>GHA Dec</b> 62°11.42 N06°12.42	<b>GHA Dec</b> 198°58.64 N10°40.20
0 1	231° 16.69 246° 19.15	168°0.30 17.11	207° 22.50 N14° 54.08	77°13.89 12.41	214°0.81 40.30
2	261°21.62	183°2.97 16.85	222°23.16 55.27	92°16.36 12.40	229°2.98 40.40
3	276° 24.08	198° 5.65 · · 16.59	237°23.81 · · 55.87	107°18.84 · · 12.40	244°5.15 · · 40.50
4	291°26.55	213°8.34 16.32	252°24.46 56.47	122°21.31 12.39	259°7.32 40.60
5	$306^{\circ}29.01$	228°11.03 16.06	267°25.12 57.06	137°23.78 12.39	274°9.49 40.70
6	321°31.48	243°13.73 N27°15.79	282°25.77 N14°57.66	152°26.25 N06°12.38	289°11.66 N10°40.81
7	336° 33.94	258° 16.43 15.53	297°26.42 58.25	167°28.72 12.37	304°13.83 40.91
8	351°36.40 6°38.87	273°19.13 15.26	312°27.08 58.85	182°31.20 12.37	319°15.99 41.01
9 10	0 38.87 21°41.33	288°21.84 · · 14.99 303°24.55 14.72	327°27.73 14°59.44 342°28.38 15°0.04	197°33.67 · · 12.36 212°36.14 12.35	334°18.16 · · 41.11 349°20.33 41.21
11	36° 43.80	318°27.27 14.44	357°29.03 0.63	227°38.61 12.35	4°22.50 41.31
12	51°46.26	333°29.99 N27°14.17	12°29.69 N15°1.23	242°41.08 N06°12.34	19°24.67 N10°41.41
13	66° 48.72	348°32.72 13.89	27°30.34 1.82	257°43.55 12.33	34°26.84 41.51
14	81°51.19	3°35.45 13.62	42°30.99 2.41	272°46.02 12.32	49°29.01 41.61
15	96°53.65	18°38.19 · · 13.34	57°31.64 · · 3.01	287°48.49 · · 12.32	64°31.18 · · 41.71
16	111°56.12	33°40.93 13.06	72°32.29 3.60	302°50.96 12.31 317°53.42 12.30	79°33.35 41.82
17 18	126° 58.58 142° 1.05	48°43.67 12.78 63°46.42 N27°12.50	87°32.95 4.19 102°33.60 N15°4.79	317°53.42 12.30 332°55.89 N06°12.29	94°35.52 41.92 109°37.69 N10°42.02
19	157°3.51	78°49.18 12.22	117°34.25 5.38	347°58.36 12.28	124°39.86 42.12
20	172°5.97	93°51.94 11.94	132°34.90 5.97	3°0.83 12.28	139°42.03 42.22
21	187°8.44	108°54.70 · · 11.65	147°35.55 · · 6.56	18° 3.30 · · 12.27	154°44.20 · · 42.32
22	202° 10.90	123°57.47 11.37	$162^{\circ}36.21$ 7.16	33°5.76 12.26	169°46.37 42.42
23	217° 13.37	139°0.24 11.08	$177^{\circ}36.86$ 7.75	48° 8.23 12.25	184°48.54 42.52
Mer.	pass. 08:33	ν2.7' d-0.3' m-4.60	ν0.7' d0.6' m1.27	ν2.5' d-0.0' m-2.19	ν2.2' d0.1' m0.50
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	232° 15.83	154°3.02 N27°10.79	192°37.51 N15°8.34	63°10.70 N06°12.24	199°50.71 N10°42.62
1	247° 18.29	169°5.80 10.50	207°38.16 8.93	78°13.16 12.23	214°52.88 42.72
2	262°20.76	184°8.59 10.21	222°38.81 9.52	93°15.63 12.23	229°55.05 42.82
3	277°23.22	199°11.38 · · 9.92	237°39.46 · · 10.11	108°18.10 · · 12.22	244°57.22 · · · 42.92
4	292°25.69	214°14.18 9.62	252°40.11 10.70	123°20.56 12.21	259°59.38 43.02 I
5 6	307°28.15 322°30.62	229°16.98 9.33 244°19.78 N27°9.03	267° 40.76 11.29 282° 41.41 N15° 11.88	138°23.03 12.20 153°25.49 N06°12.19	275°1.55 43.12 290°3.72 N10°43.22
7	322 30.02 337°33.08	259° 22.59 8.73	282 41.41 N15 11.88 297°42.07 12.47	168°27.96 12.18	305°5.89 43.32
8	352°35.54	259 22.59 8.73 274°25.41 8.44	312° 42.72 13.06	183°30.42 12.17	320° 8.06 43.43
9	7°38.01	289°28.23 · · 8.14	327°43.37 · · 13.64	198°32.88 · · 12.16	335°10.23 · · 43.53
10	22°40.47	304°31.05 7.84	342°44.02 14.23	213°35.35 12.15	350°12.40 43.63
11	37° 42.94	319° 33.88 7.53	357°44.67 14.82	228°37.81 12.14	5°14.57 43.73
12	52°45.40	334°36.71 N27°7.23	12°45.32 N15°15.41	243°40.27 N06°12.13	20°16.75 N10°43.83
13	67°47.86	349°39.55 6.92	27°45.97 16.00	258°42.74 12.12	35°18.92 43.93
14 15	82°50.33 97°52.79	4°42.39 6.62 19°45.24 · 6.31	42° 46.62 16.58 57° 47.27 · · 17.17	273°45.20 12.11 288°47.66 · · 12.10	50°21.09 44.03 65°23.26 · · 44.13 M
15 16	97°52.79 112°55.26	34°48.09 6.00	72°47.92 17.76	303°50.12 12.10	65°23.26 · · 44.13 M 80°25.43 44.23
17	112 55.20 127°57.72	49°50.95 5.69	87°48.57 18.34	318°52.59 12.08	95°27.60 44.33
18	143°0.18	64°53.81 N27°5.38	102°49.22 N15°18.93	333°55.05 N06°12.07	110°29.77 N10°44.43
19	158°2.65	79°56.67 5.07	117°49.87 19.52	348°57.51 12.06	125°31.94 44.53
20	173°5.11	94°59.54 4.75	132°50.52 20.10	3°59.97 12.04	140°34.11 44.63
21	188°7.58	110°2.42 · · 4.44	147°51.17 · · 20.69	19°2.43 · · 12.03	155°36.28 · · 44.73
22 23	203°10.04	125°5.29 4.12	162°51.82 21.27	34° 4.89 12.02	170°38.45 44.83
	218° 12.51	140°8.18 3.80	177°52.47 21.86	49°7.35 12.01	185°40.62 44.93
Mer. <sub>I</sub>	pass. 08:30	ν2.8' d-0.3' m-4.57	ν0.7′ d0.6′ m1.28	ν2.5' d-0.0' m-2.19	ν2.2' d0.1' m0.50

	Stars	
	SHA	Dec
Alpheratz	357°32.14	29°14.71
Ankaa Schedar	353°4.83 349°28.25	-42°8.92 56°41.41
Diphda	348° 44.84	-17°49.79
Achernar	335° 18.78	-57° 5.40
Hamal Polaris	327°48.42 313°3.27	23°35.70 89°22.90
Acamar	315°10.17	-40°11.45
Menkar Mirfak	314°3.62 308°24.80	4°11.98 49°57.62
Aldebaran	290°36.82	16°33.87
Rigel Capella	281°1.56 280°18.28	-8°10.28 46°1.54
Bellatrix	278° 20.25	6°22.39
Elnath	277°58.75	28°37.79 -1°11.18
Alnilam Betelgeuse	275°35.25 270°49.41	-1°11.18 7°24.61
Canopus	263°51.59	-52°42.90
Sirius Adhara	258°24.08 255°3.96	-16°45.53 -29°0.90
Procyon	244°48.16	5°8.97
Pollux	243°14.18	27°57.40
Avior Suhail	234°13.78 222°44.33	-59°36.40 -43°33.20
Miaplacidus	221°37.70	-69°50.42
Alphard	217°45.10 207°31.52	-8°47.14 11°49.58
Regulus Dubhe	193°37.57	61°36.00
Denebola	182°22.02	14°24.70
Gienah Acrux	175° 40.54 172° 56.42	-17°42.21 -63°15.71
Gacrux	171°48.08	-57°16.65
Alioth	166° 10.25	55°48.40
Spica Alkaid	158° 19.14 152° 49.49	-11°18.74 49°10.30
Hadar	148°31.40	-60°30.76
Menkent Arcturus	147°53.98 145°45.12	-36°30.74 19°2.00
Rigil Kent.	139°35.79	-60°57.29
Kochab	137°18.88	74°2.30
Zuben'ubi Alphecca	136°52.65 126°1.09	-16° 9.69 26° 37.07
Antares	$112^{\circ}12.12$	-26°29.68
Atria Sabik	107°3.32 101°59.34	-69°4.54 -15°45.58
Shaula	96°6.30	-37°7.34
Rasalhague	95°55.73	12°32.30
Eltanin Kaus Aust.	90°40.48 83°28.61	51°28.93 -34°22.10
Vega	$80^{\circ}31.07$	38°48.44
Nunki Altair	75°44.16 61°57.15	-26°15.53 8°56.57
Peacock	53°1.34	-56°38.27
Deneb	49°23.79	45°22.70
Enif Al Na'ir	33°36.13 27°29.64	10°0.28 -46°49.11
Fomalhaut	$15^{\circ}11.69$	-29°28.12
Scheat Markab	13°42.66 13°27.29	28°14.09 15°21.42
May 12 Fri Venus	<b>SHA</b> 281°37.33	Mer.pass 13:50
Mars	$321^{\circ}48.60$	11:11
Jupiter Saturn	190°54.42 327°49.05	19:52 10:46
May 13 Sat Venus	<b>SHA</b> 281° 40.94	Mer.pass 13:46
Mars	$321^{\circ}5.16$	11:10
Jupiter Saturn	190°54.73 327°41.95	19:48 10:43
May 14 Sun	SHA	Mer.pass
Venus	281°47.19	13:41
Mars	320°21.68	11:09
Jupiter Saturn	190°54.87 327°34.88	19:44 10:39
Jatuill	JZ1 J4.00	10.39

Saturn 327°34.88

Horizontal parallax

Venus: Mars: 0.4 0.1

h	Su	n		Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.67	$N18^{\circ}12.83$	318°30.26	7.8'	S25°27.27	-3.1'	56.5'
1	195°54.68	13.45	$332^{\circ}57.10$	7.9'	$25^{\circ}24.18$	-3.2'	56.4'
2	210°54.69	14.07	347°24.01	8.0'	25°20.95	-3.4'	56.4'
3 4	225°54.70 240°54.71	· · 14.70 15.32	1°51.00 16°18.06	8.1' 8.1'	25°17.57 25°14.06	-3.5' -3.6'	56.4'
4 5	240 54.71 255°54.72	15.32 15.94	30° 45.20	8.2'	25 14.06 25°10.42	-3.6' -3.8'	56.4' 56.3'
6	270°54.73	N18° 16.57	45°12.41	8.3'	525° 6.64	-3.9'	56.3'
7	285°54.73	17.19	59°39.70	8.4'	25°2.72	-4.0'	56.3'
8	300°54.74	17.81	74°7.07	8.4'	24°58.67	-4.2'	56.2'
9	315°54.75	• • 18.43	88°34.52	8.5'	24°54.49	-4.3'	56.2'
10 11	330°54.76 345°54.77	19.05 19.67	103°2.05 117°29.66	8.6' 8.7'	24°50.18 24°45.73	-4.4'	56.2' 56.1'
12	0°54.77	N18°20.29	131°57 35	8.8'	524°41.16	-4.6' -4.7'	56.1
13	15°54.78	20.91	146°25.13	8.9'	24°36.46	-4.8'	56.1
14	30°54.79	21.52	160°52.98	8.9'	24°31.63	-5.0'	56.1'
15	45°54.79	• • 22.14	$175^{\circ}20.92$	9.0'	24°26.68	-5.1'	56.0'
16	60°54.80	22.76	189°48.95	9.1'	24°21.60	-5.2'	56.0'
17	75°54.80	23.37	204°17.06	9.2'	24°16.40	-5.3'	56.0'
18	90°54.81 105°54.82	N18°23.99	218° 45.26 233° 13.54	9.3'	\$24°11.07 24°5.62	-5.4' -5.6'	55.9'
19 20	105 54.82 120° 54.82	24.60 25.22	233° 13.54 247° 41.91	9.4' 9.5'	24° 5.62 24° 0.06	-5.0° -5.7'	55.9' 55.9'
20	120 54.82 135°54.83	25.22	247 41.91 262°10.36	9.5' 9.5'	24 0.06 23°54.37	-5.8'	55.9'
22	150°54.83	26.45	276°38.90	9.6'	23°48.56	-5.9'	55.8'
23	165°54.83	27.06	291°7.54	9.7'	23°42.64	-6.0'	55.8'
	SD = 15.8'	d = 0.6'		SI	D = 15.4'		
-							
Sat	<b>GHA</b> 180°54.84	<b>Dec</b> N18°27.67	<b>GHA</b> 305°36.25	u 9.8'	<b>Dec</b> 523°36.60	d -6.2'	<b>HP</b> 55.8'
0 1	180°54.84 195°54.84	N18°27.67 28.28	305°36.25 320°5.06	9.8'	23°36.60 23°30.45	-6.2° -6.3'	55.8° 55.7'
2	210° 54.85	28.90	334°33.96	10.0'	23°24.18	-6.4'	55.7'
3	225°54.85	• • 29.51	349°2.94	10.1'	23°17.80	-6.5'	55.7'
4	240°54.85	30.12	3°32.02	10.2'	23°11.31	-6.6'	55.7'
5	255°54.86	30.73 N18°31.34	18°1.18 32°30.44	10.3'	23°4.71 <b>S</b> 22°58.00	-6.7'	55.6'
6 7	270°54.86 285°54.86	31.94	32 30.44 46°59.78	10.3' 10.4'	22°51.18	-6.8' -6.9'	55.6' 55.6'
8	300°54.86	32.55	61°29.22	10.5	22°44.25	-0.9 -7.0'	55.6'
9	315°54.86	• • 33.16	75°58.74	10.6'	22°37.22	-7.1'	55.5'
10	330°54.87	33.77	90°28.35	10.7'	22°30.08	-7.2'	55.5'
11	345°54.87	34.37	104°58.06	10.8'	22°22.84	-7.3'	55.5'
12 13	0°54.87 15°54.87	N18°34.98 35.59	119°27.85 133°57.74	10.9' 11.0'	\$22°15.50 22°8.05	-7.4' -7.5'	55.4' 55.4'
14	30°54.87	36.19	133 57.74 148°27.71	11.1'	22° 0.05	-7.6'	55.4'
15	45°54.87	36.79	162°57.77	11.2'	21°52.87	-7.7'	55.4'
16	60°54.87	37.40	$177^{\circ}27.93$	11.2'	$21^{\circ}45.12$	-7.8'	55.3'
17	75°54.87	38.00	191°58.17	11.3'	21°37.28	-7.9'	55.3'
18	90°54.87 105°54.87	N18°38.60 39.21	206°28.51 220°58.93	11.4'	\$21°29.35 21°21.32	-8.0'	55.3'
19 20	105 54.87 120°54.87	39.21		11.5' 11.6'	21°13.20	-8.1' -8.2'	55.3' 55.3'
21	135°54.87	40.41	250°0.04	11.7'	21°4.98	-8.3	55.2'
22	150°54.86	41.01	264°30.73	11.8'	20°56.68	-8.4'	55.2'
23	165°54.86	41.61	279°1.51	11.9'	20°48.28	-8.5'	55.2'
	SD = 15.8'	d = 0.6'		SI	O = 15.2'		
c	СП.	Daa			Das		μn
Sun 0	<b>GHA</b> 180° 54.86	<b>Dec</b> N18°42.21	<b>GHA</b> 293°32.37	u 12.0'	<b>Dec</b> \$20°39.79	d -8.6'	<b>HP</b> 55.2'
1	195°54.86	42.81	308°3.32	12.0'	20°31.22	-8.7	55.1'
2	210°54.86	43.41	322°34.36	12.1'	$20^{\circ}22.56$	-8.7'	55.1'
3	225°54.85	• • 44.00	337°5.49	12.2'	20°13.81	-8.8'	55.1'
4	240°54.85 255°54.85	44.60 45.20	351°36.70 6°8.00	12.3'	20°4.98 19°56.06	-8.9' -9.0'	55.1'
5 6	255°54.85 270°54.84	45.20 N18°45.79	6°8.00 20°39.39	12.4' 12.5'	19°56.06 \$19°47.06	-9.0° -9.1'	55.0' 55.0'
7	285° 54.84	46.39	35° 10.86	12.6'	19°37.98	-9.1'	55.0'
8	300°54.84	46.99	49°42.41	12.6'	19°28.82	-9.2'	55.0'
9	315°54.83	• • 47.58	64°14.05	12.7'	19°19.58	-9.3'	55.0'
10	330°54.83 345°54.82	48.17	78° 45.77 93° 17.58	12.8'	19°10.26 19°0.87	-9.4'	54.9'
11 12	345°54.82 0°54.82	48.77 N18°49.36	93° 17.58 107° 49.47	12.9' 13.0'	19°0.87 \$18°51.39	-9.5' -9.5'	54.9' 54.9'
13	15°54.81	49.95	122° 21.44	13.1'	18°41.84	-9.6'	54.9'
14	30°54.81	50.54	136°53.49	13.1'	18°32.22	-9.7'	54.9'
15	45° 54.80	• • 51.14	151°25.62	13.2'	18°22.52	-9.8'	54.8'
16	60°54.79	51.73	165°57.83	13.3'	18°12.75	-9.8'	54.8'
17 18	75°54.79 90°54.78	52.32 N18°52.91	180°30.12 195°2.50	13.4' 13.4'	18°2.91 \$17°53.00	-9.9' -10.0'	54.8' 54.8'
19	90 54.78 105°54.77	53.49	195 2.50 209°34.94	13.4	17°43.02	-10.0	54.8'
20	120° 54.77	54.08	224°7.47	13.6'	17°32.97	-10.1	54.7'
21	135° 54.76	•• 54.67	238° 40.07	13.7'	17°22.85	-10.2'	54.7'
22	150°54.75	55.26	253°12.75	13.8'	17°12.67	-10.3'	54.7'
23	165°54.75	55.84	267°45.50	13.8'	17°2.41	-10.3'	54.7'
	$\frac{SD = 15.8'}{}$	d = 0.6'		SI	D = 15.0'		

	<b>Twilight</b> Naut. Civil				Twi	light
Lat.			Sunrise	Sunset	Civil	Naut.
N 72°						
<b>N</b> 70°	////	////	00:59	23:04	////	////
68°	////	////	01:55	22:02	////	////
66°	////	////	02:28	21:28	////	////
64°	////	01:19	02:52	21:03	22:40	////
62°	////	01:58	03:11	20:44	21:59	////
60°	////	02:24	03:26	20:28	21:31	////
N $58^{\circ}$	01:10	02:44	03:39	20:15	21:10	22:48
56°	01:46	03:01	03:50	20:04	20:53	22:10
54°	02:11	03:15	04:00	19:54	20:39	21:44
52°	02:30	03:27	04:09	19:45	20:27	21:25
50°	02:46	03:37	04:16	19:37	20:17	21:09
45°	03:16	03:59	04:33	19:21	19:55	20:38
N 40°	03:38	04:16	04:46	19:07	19:38	20:15
35°	03:56	04:30	04:58	18:55	19:23	19:57
30°	04:10	04:42	05:08	18:45	19:12	19:43
20°	04:33	05:01	05:25	18:28	18:52	19:20
<b>N</b> 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
<b>S</b> 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:57	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:16	17:41	18:10
35°	05:49	06:19	06:46	17:06	17:33	18:04
40°	05:55	06:28	06:57	16:55	17:24	17:57
45°	06:02	06:38	07:09	16:43	17:15	17:50
<b>S</b> 50°	06:10	06:49	07:25	16:28	17:03	17:42
52°	06:13	06:54	07:32	16:20	16:58	17:39
54°	06:17	07:00	07:40	16:12	16:52	17:35
56°	06:20	07:06	07:48	16:04	16:46	17:32
58°	06:25	07:13	07:58	15:54	16:39	17:27
<b>S</b> 60°	06:29	07:21	08:10	15:42	16:31	17:23
		Moonris	ie		Moonset	t.
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
NI 700						

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

	Sun			Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-73%
12	03:39	03:39	11:56	02:52	15:19	
13	03:39	03:39	11:56	03:45	16:10	
14	03:39	03:39	11:56	04:35	16:58	

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	233° 14.97	155°11.07 N27°3.49	192°53.12 N15°22.44	64° 9.81 N06° 12.00	200°42.79 N10°45.03
1	248° 17.43	170°13.96 3.17	207°53.77 23.03	79°12.27 11.99	215°44.96 45.13
2	263° 19.90	185°16.86 2.84	222°54.42 23.61	94°14.73 11.98	230°47.13 45.23
3	278° 22.36	200°19.76 · · 2.52	237°55.07 · · 24.19	109°17.19 · · 11.96	245°49.30 · · 45.33
4	293°24.83	215°22.66 2.20	252°55.71 24.78	124°19.64 11.95	260°51.47 45.43
5	308° 27.29	230°25.57 1.87	267° 56.36 25.36	139°22.10 11.94	275°53.64 45.53
6	323°29.75	245°28.49 N27°1.55	282°57.01 N15°25.94	154°24.56 N06°11.93	290°55.81 N10°45.63
7	338°32.22	260°31.41 1.22	297°57.66 26.52	169°27.02 11.91	305°57.98 45.73
8	353°34.68	275°34.33 0.89	312°58.31 27.11	184°29.48 11.90	321°0.16 45.83
9	8°37.15	290°37.26 · · 0.56	327°58.96 · · 27.69	199°31.93 · · 11.89	336°2.33 · · 45.93
10	23°39.61	305°40.20 27°0.23	342°59.61 28.27	214°34.39 11.88	351°4.50 46.03
11	38° 42.07	320°43.14 26°59.89	358° 0.26 28.85	229°36.85 11.86	6°6.67 46.13
12	53° 44.54	335°46.08 N26°59.56	13°0.90 N15°29.43	244°39.30 N06°11.85	21°8.84 N10°46.23
13	68° 47.00	350°49.03 59.22	28°1.55 30.01	259°41.76 11.84	36°11.01 46.33
14	83°49.47	5°51.98 58.89	43°2.20 30.60	274°44.21 11.82	51°13.18 46.43
15	98°51.93	20°54.93 · · 58.55	58°2.85 · · 31.18	289°46.67 · · 11.81	66°15.35 · · 46.53
16	113°54.40	35°57.90 58.21	73°3.50 31.76	304°49.12 11.80	81°17.52 46.63
17	128° 56.86	51°0.86 57.87	88°4.15 32.34	319°51.58 11.78	96°19.70 46.73
18	143°59.32	66°3.83 N26°57.52	103°4.79 N15°32.92	334°54.03 N06°11.77	111°21.87 N10°46.83
19	159°1.79	81°6.81 57.18	118°5.44 33.49	349°56.49 11.76	126°24.04 46.92
20	174°4.25	96°9.79 56.84	133°6.09 34.07	4°58.94 11.74	141°26.21 47.02
21	189°6.72	111°12.77 · · 56.49	148°6.74 · · 34.65	20°1.39 · · 11.73	156°28.38 · · 47.12
22	204°9.18	126° 15.76 56.14	163°7.38 35.23	35° 3.85 11.71	171°30.55 47.22
23	219°11.64	141°18.75 55.79	178°8.03 35.81	50°6.30 11.70	186°32.72 47.32
	pass. 08:26	ν2.9' d-0.3' m-4.54	$\nu$ 0.6' d0.6' m1.28	$\nu 2.5' \ d$ -0.0' m-2.18	ν2.2' d0.1' m0.50
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	234° 14.11	156°21.75 N26°55.44	193°8.68 N15°36.39	65°8.75 N06°11.68	201°34.90 N10°47.42
1	249° 16.57	171°24.75 55.09	208°9.33 36.96	80°11.21 11.67	216°37.07 47.52
2	264° 19.04	186°27.76 54.74	223°9.97 37.54	95°13.66 11.65	231°39.24 47.62
3	279°21.50	201°30.77 · · 54.39	238° 10.62 · · 38.12	110°16.11 · · 11.64	246°41.41 · · 47.72
4	294°23.96	216°33.78 54.03	253°11.27 38.70	125°18.56 11.62	261°43.58 47.82
5	309°26.43	231°36.80 53.67	268°11.92 39.27	140°21.01 11.61	276°45.75 47.92
6	324°28.89	246°39.83 N26°53.32	283°12.56 N15°39.85	155°23.46 N06°11.59	291°47.92 N10°48.02
7	339°31.36	261°42.86 52.96	298° 13.21 40.42	170°25.91 11.58	306°50.10 48.12
8	354°33.82	276° 45.89 52.60	313°13.86 41.00	185°28.36 11.56	321°52.27 48.22
9	9°36.29	291°48.93 · · 52.23	328° 14.50 · · 41.58	200°30.81 · · 11.55	336°54.44 · · 48.32
10	24°38.75	306°51.97 51.87	343°15.15 42.15	215°33.26 11.53	351°56.61 48.41
11	39°41.21	321°55.02 51.51	358° 15.80 42.73	230°35.71 11.52	6°58.78 48.51
12	54° 43.68	336°58.07 N26°51.14	13°16.44 N15°43.30	245°38.16 N06°11.50	22°0.96 N10°48.61
13	69°46.14	352°1.13 50.77	28° 17.09 43.87	260°40.61 11.48	37°3.13 48.71
14	84°48.61	7°4.19 50.40	43°17.73 44.45	275°43.06 11.47	52°5.30 48.81
15	99°51.07	22°7.25 · · 50.03	58°18.38 · · 45.02	290°45.51 · · 11.45	67°7.47 · · 48.91
16	114°53.53	37°10.32 49.66	73°19.03 45.59	305°47.96 11.43	82°9.64 49.01
17	129°56.00	52°13.40 49.29	88°19.67 46.17	320°50.40 11.42	97°11.82 49.11
18	144°58.46	67°16.48 N26°48.92	103°20.32 N15°46.74	335°52.85 N06°11.40	112°13.99 N10°49.21
19	160°0.93	82°19.56 48.54	118°20.97 47.31	350°55.30 11.38	127°16.16 49.31
20	175°3.39	97°22.65 48.17	133°21.61 47.89	5°57.74 11.37	142°18.33 49.40
21	190°5.85	112°25.74 · · 47.79	148°22.26 · · 48.46	21°0.19 · · 11.35	157°20.51 · · 49.50
22	205°8.32	127°28.84 47.41	163°22.90 49.03	36°2.64 11.33	172°22.68 49.60
23	220° 10.78	142°31.94 47.03	178°23.55 49.60	51°5.08 11.32	187°24.85 49.70
Mer.p	pass. 08:22	ν3.0′ d-0.4′ m-4.50	ν0.6′ d0.6′ m1.29	ν2.5' d-0.0' m-2.17	ν2.2' d0.1' m0.50
	CUA	CIIA	CUA	CIIA	CUA
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	235° 13.25	157°35.04 N26°46.65	193°24.19 N15°50.17	66°7.53 N06°11.30	202°27.02 N10°49.80
1	250° 15.71	172°38.15 46.26	208°24.84 50.74	81° 9.97 11.28	217°29.20 49.90
2	265° 18.17	187°41.27 45.88	223°25.48 51.31	96°12.42 11.26	232°31.37 50.00
3	280°20.64	202°44.39 · · 45.49	238°26.13 · · 51.88	111°14.86 · · 11.24	247°33.54 · · 50.10
4	295°23.10	217°47.51 45.11	253°26.77 52.45	126°17.31 11.23	262°35.71 50.19
5	310°25.57	232°50.64 44.72	268°27.42 53.02	141°19.75 11.21	277°37.89 50.29
6	325°28.03	247°53.77 N26°44.33	283°28.06 N15°53.59	156°22.20 N06°11.19	292°40.06 N10°50.39
7	340°30.49	262°56.91 43.94	298°28.71 54.16	171°24.64 11.17	307°42.23 50.49
8	355°32.96	278°0.05 43.54 293°3.19 · · 43.15	313°29.35 54.73	186°27.08 11.15	322°44.40 50.59
9	10°35.42		328°30.00 · · 55.30	201°29.53 · · 11.13	337°46.58 · · 50.69
10	25°37.89	308°6.34 42.76	343°30.64 55.87	216°31.97 11.12	352°48.75 50.79
11	40°40.35	323°9.50 42.36	358°31.29 56.44	231°34.41 11.10	7°50.92 50.88
12	55° 42.82	338°12.66 N26°41.96	13°31.93 N15°57.00	246°36.85 N06°11.08	22°53.10 N10°50.98
13	70°45.28	353°15.82 41.56	28°32.58 57.57	261°39.30 11.06	37°55.27 51.08
14	85°47.74	8°18.99 41.16	43°33.22 58.14	276°41.74 11.04	52°57.44 51.18 L
15	100°50.21	23°22.16 · · 40.76	58°33.86 · · 58.71	291°44.18 · · 11.02	67°59.61 · · 51.28
16	115°52.67	38°25.34 40.36	73°34.51 59.27	306°46.62 11.00	83°1.79 51.38
17	130°55.14	53°28.52 39.95	88°35.15 15°59.84	321°49.06 10.98	98°3.96 51.47
18	145°57.60	68°31.70 N26°39.55	103°35.80 N16°0.40	336°51.50 N06°10.96	113°6.13 N10°51.57
19	161°0.06	83°34.89 39.14	118°36.44 0.97	351°53.94 10.94	128°8.31 51.67
20	176°2.53	98°38.09 38.73	133°37.08 1.54	6°56.38 10.92	143°10.48 51.77
21	191°4.99	113°41.29 · · 38.32	148°37.73 · · 2.10	21°58.82 · · 10.90	158°12.65 · · 51.87
22	206°7.46 221°9.92	128° 44.49 37.91 143° 47.70 37.50	163°38.37 2.67	37°1.26 10.88	173°14.83 51.97
23			178°39.02 3.23	52° 3.70 10.86	188°17.00 52.06
Mer.p	ass. 08:18	u3.1′ <i>d</i> -0.4′ m-4.46	$ u 0.6' \ d0.6' \ m1.29$	$\nu 2.4' \ d\text{-}0.0' \ \text{m-}2.16$	$\nu 2.2' \ d0.1' \ \text{m}0.50$

357°32.12 353°4.80

349°28 22

348°44.82

335°18.76

 $327^{\circ}48.41$ 

 $313^{\circ}2.96$ 

Alpheratz

Ankaa Schedar

Diphda

Hamal

Polaris

Achernar

**Dec** 29° 14.72

-42°8.90

56°41.41 -17°49.78

 $\textbf{-57}^{\circ}5.38$ 

 $23^{\circ}35.70$ 

89°22.88

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°54.74	N18°56.43	282°18.33	13.9'	<b>S</b> 16°52.10	-10.4'	54.7'
1	195°54.73	57.02	296°51.24	14.0'	16°41.72	-10.4'	54.7'
2	210°54.72 225°54.71	57.60 •• 58.19	311°24.21 325°57.26	14.0' 14.1'	16°31.28 16°20.77	-10.5' -10.6'	54.6' 54.6'
4	240°54.70	58.77	340°30.38	14.1	16° 20.77	-10.6'	54.6'
5	255°54.69	59.35	355°3.57	14.3'	15°59.58	-10.7'	54.6'
6	270°54.68	$N18^{\circ}59.94$	9°36.83	14.3'	<b>S</b> 15°48.90	-10.7'	54.6'
7	285°54.67	19°0.52	24° 10.15	14.4'	15°38.15	-10.8'	54.6'
8 9	300°54.66 315°54.65	1.10 •• 1.68	38° 43.55 53° 17.02	14.5' 14.5'	15°27.35 15°16.49	-10.9' -10.9'	54.5' 54.5'
10	330°54.64	2.26	67°50.55	14.6'	15° 5.58	-10.9	54.5'
11	345°54.63	2.84	82°24.14	14.7'	14°54.61	-11.0'	54.5'
12	0°54.62	N19°3.42	96° 57.80	14.7'	S14°43.58	-11.1'	54.5'
13	15°54.61 30°54.60	4.00 4.58	111°31.53 126°5.32	14.8' 14.9'	14°32.50 14°21.37	-11.1' -11.2'	54.5' 54.5'
14 15	45°54.59	4.58 · · 5.16	120 5.32 140°39.17	14.9'	14 21.37 14°10.19	-11.2'	54.5'
16	60°54.57	5.74	155° 13.08	15.0'	13°58.96	-11.3'	54.4'
17	75°54.56	6.31	169°47.05	15.0'	$13^{\circ}47.68$	-11.3'	54.4'
18	90°54.55	N19°6.89	184°21.08	15.1'	\$13°36.35	-11.4'	54.4'
19 20	105°54.54 120°54.52	7.46 8.04	198°55.17 213°29.32	15.1' 15.2'	13°24.97 13°13.54	-11.4' -11.5'	54.4' 54.4'
21	135°54.51	. 8.61	213 29.32 228°3.52	15.2	13°2.06	-11.5'	54.4
22	150°54.50	9.19	242°37.78	15.3'	12°50.54	-11.6'	54.4'
23	$165^{\circ}54.48$	9.76	$257^{\circ}12.10$	15.4'	12°38.97	-11.6'	54.4'
	SD = 15.8'	d = 0.6'		SI	D = 14.9'		
Tue	GHA	<b>Dec</b> N19° 10.33	<b>GHA</b> 271° 46.47	ν 1Ε Δ'	<b>Dec</b> 512° 27.36	d 11.7'	HP
0 1	180°54.47 195°54.45	N19° 10.33 10.91	271°46.47 286°20.89	15.4' 15.5'	12° 15.71	-11.7' -11.7'	54.3' 54.3'
2	210°54.44	11.48	300° 55.36	15.5'	12°4.01	-11.7	54.3'
3	225°54.42	• • 12.05	315°29.88	15.6'	11°52.27	-11.8'	54.3'
4	240°54.41	12.62	330°4.46	15.6'	11°40.49	-11.8'	54.3'
5	255°54.39 270°54.38	13.19 N19°13.76	344°39.08 359°13.75	15.7' 15.7'	11°28.67 \$11°16.81	-11.9'	54.3'
6 7	270 54.38 285°54.36	14.33	13° 48.47	15.7 15.8'	11°4.90	-11.9' -11.9'	54.3' 54.3'
8	300°54.35	14.90	28°23.23	15.8'	10°52.96	-12.0'	54.3'
9	315°54.33	• • 15.46	42°58.04	15.9'	$10^{\circ}40.99$	-12.0'	54.3'
10	330°54.31	16.03	57°32.90	15.9'	10°28.97	-12.1'	54.3'
11 12	345°54.30 0°54.28	16.60 N19°17.16	72°7.79 86°42.73	15.9' 16.0'	10°16.92 \$10°4.83	-12.1' -12.1'	54.3' 54.2'
13	15°54.26	17.73	101° 17.71	16.0'	09°52.71	-12.1 -12.2'	54.2'
14	30°54.24	18.29	115°52.73	16.1'	09°40.55	-12.2'	54.2'
15	45°54.23	• 18.86	130°27.79	16.1'	09°28.36	-12.2'	54.2'
16 17	60°54.21 75°54.19	19.42 19.99	145°2.89 159°38.02	16.1' 16.2'	09°16.14 09°3.88	-12.3' -12.3'	54.2' 54.2'
18	90°54.19	N19°20.55	159 38.02 174°13.19	16.2'	S08°51.60	-12.3'	54.2'
19	105°54.15	21.11	188° 48.39	16.2'	08°39.28	-12.3'	54.2'
20	120°54.13	21.67	203°23.63	16.3'	08°26.93		54.2'
21	135°54.11	• • 22.23	217°58.90	16.3'	08° 14.55	-12.4'	54.2'
22 23	150°54.09 165°54.07	22.79 23.35	232°34.21 247°9.54	16.3' 16.4'	08°2.15 07°49.71	-12.4' -12.5'	54.2' 54.2'
25	SD = 15.8'	d = 0.6'			O = 14.8'	12.5	J 1.2
	3D = 15.6	<u>u = 0.0</u>		31	J = 14.0		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°54.05	N19°23.91	261°44.90	16.4	S07°37.25	-12.5'	54.2'
1 2	195°54.03 210°54.01	24.47 25.03	276°20.30 290°55.72	16.4' 16.4'	07°24.76 07°12.24	-12.5' -12.5'	54.2' 54.2'
3	225°53.99	25.59	305°31.16	16.5'	06°59.70	-12.6'	54.2'
4	240°53.97	26.14	320°6.64	16.5'	$06^{\circ}47.14$	-12.6'	54.2'
5	255°53.95	26.70	334°42.13	16.5'	06°34.55	-12.6'	54.2'
6 7	270°53.93 285°53.91	N19°27.25 27.81	349° 17.65 3° 53.20	16.5' 16.6'	\$06°21.93 06°9.30	-12.6' -12.7'	54.2' 54.2'
8	285 53.91 300°53.88	28.36	3 53.20 18°28.76	16.6'	06 9.30 05°56.64	-12.7'	54.2'
9	315°53.86	• • 28.92	33°4.35	16.6'	05°43.96	-12.7	54.2'
10	330°53.84	29.47	47°39.95	16.6'	05°31.26	-12.7'	54.2'
11	345°53.82	30.02	62° 15.57	16.6'	05°18.53	-12.7'	54.2'
12 13	0°53.79 15°53.77	N19°30.58 31.13	76°51.21 91°26.87	16.7' 16.7'	\$05°5.79 04°53.03	-12.8' -12.8'	54.2' 54.2'
14	30°53.75	31.68	106°2.54	16.7'	04° 33.03	-12.8'	54.2'
15	45°53.72	• • 32.23	120°38.23	16.7'	$04^{\circ}27.45$	-12.8'	54.2'
16	60°53.70	32.78	135° 13.93	16.7'	04°14.64	-12.8'	54.2'
17 18	75°53.67 90°53.65	33.33 N19°33.88	149°49.64 164°25.36	16.7' 16.7'	04°1.81 \$03°48.96	-12.8' -12.9'	54.2' 54.2'
19	90 53.65 105°53.62	34.43	104 25.30 179°1.09	16.7'	03°36.10	-12.9'	54.2'
20	120°53.60	34.98	193°36.83	16.7'	$03^{\circ}23.22$	-12.9'	54.2'
21	135°53.57	• • 35.52	208° 12.58	16.8'	03°10.33	-12.9'	54.2'
22 23	150°53.55 165°53.52	36.07 36.61	222°48.33 237°24.09	16.8' 16.8'	02°57.42 02°44.51	-12.9'	54.2' 54.2'
23		36.61	237 24.09			-12.9'	54.2
	SD = 15.8'	d = 0.6'		SI	O = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-45%
15	03:39	03:38	11:56	05:20	17:42	
16	03:38	03:37	11:56	06:03	18:24	
17	03:36	03:35	11:56	06:44	19:04	

Thu CHA CHA Dec OHA D	h	Aries	Venus	Mars	Jupiter	Saturn	
0 259*123.8 158*50.01 N26*17.05 193*30.6 N16*13.80 67*06.1 N06*10.84 221*9.17.1 N16*52.16 J 2 256*17.31 158*73.51 3.6.29 221*40.35 4.42 97*11.00 10.00 232*3.52 53.26 9 2 256*17.31 158*73.51 3.6.29 221*40.35 4.42 97*11.00 10.00 232*3.52 53.26 9 2 256*17.31 158*73.51 3.6.29 221*40.35 4.42 97*11.00 10.00 232*3.52 53.26 9 2 256*17.31 158*73.51 3.6.29 221*40.35 4.42 97*11.00 10.00 232*3.52 53.26 9 2 256*17.31 158*73.51 3.6.29 221*40.35 4.42 97*11.00 10.00 232*3.52 53.26 9 2 256*17.31 158*73.51 3.6.29 221*40.35 4.40 9.40 9.40 9.40 9.40 9.40 9.40 9.40							
1 251 14.68 173" 54.12 3.667 208" 40.30 4.30 82" 41.51 1.08" 57.35 52.26 4.26 22.26 17.30 2.28" 53.06 4.20 208" 11.08" 51.00 231" 21.52 53.36 4.20 208" 21.09 20.20 21.00 231" 2							
2 266°17.31 108°17.35 136.35 237°4.26 5.59 6.50 1211.13 108.00 237°3.52 53.36 1 208°17.37 209°10.77 237 35.55 1 209°10.77 237 237 237 237 237 237 237 237 237 2							1 4
3 281*19.78 294*09.76 57 - 38.88 288*41.99 - 5.49 112*13.46 - 10.78 288*25.69 - 52.46 4 206*26.24 218*36 36.34 1 235*24.23 6.05 127*15.89 110.76 283*27.87 25.25 5 311*24.70 224*70.30 24.99 206*42.88 6.01 142*18.33 10.74 278*30.04 10.25.65 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.34 10.05*26 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.34 10.25*26 17.34 218.33 10.74 278*30.04 10.25.65 17.34 218.34 10.25*26 17.34 218.34							
4 996*22 44 29*19.80							
5 311°41.70 294°10.27 324°70.27 324°70.27 324°3.25 206°42.88 6.61 142°18.33 10.74 278°3.00.04 22.65 5 6 320°47.17 294°10.27 310°43.45 206°44.16 7.74 172°23.00 10.00 386°34.30 50.26 5 6 320°54.16 350°3.00 279°11.07 33.17 313.44 30 6.00 167°22.60 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.26 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 50.20 5 6 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30 5 320°56 10.00 386°34.30							
6 926°27.17 9.1027   326°34.52   3415.206°4.416   7.74   172°33.07   10.09   300°3.22   301°3.52   315°4.61   10.09   300°3.206   330°3.00   32.08   32.09   3							
7 \$41°29.63 2091*13.51 \$41.5 209°44.16 7.74 172°23.30 10.09 308°34.39 \$2.89 \$48 \$36°2.07 2001 279°18.76 33.72 333°44.80 8.30 187°25.64 10.07 333°6.56 \$2.99 \$4.00 173.45 0 204°20.01 33.72 336°44.86 8.36 200°28.07 10.05 338°38°74 5.50.4 \$4.00 19.00							
8 586 22.10 291 507 507 507 507 507 507 507 507 507 507							
10							
11 41°3949 32°6562 324*4 386°4673 9.98 22°3294 10.01 8°4308 53.24 125 56°405 330°2379 370°320. 13°477 14.02 34°4526 330°2379 370°320. 13°477 14.02 34°4526 30°15.05 32°4570 10.05 38°47.43 53.44 18 80°46.08 0°50.05 31.14 41°47.05 50°45.05 10.05 40°37.95 10.05 38°47.43 53.44 18 80°46.08 0°50.05 31.14 11.12 22°37.01 10.05 08°37.45 10.05 38°47.43 53.44 18 10.05 1	9	11°34.56	294°20.01 · · 33.29	328°45.45 · · 8.86	202°28.07 · · 10.65	338°38.74 · · 53.04	
11 41 93-94 93 339 237 0 1265 32.44 195 93.64 93 93.89 195 10.51 10.14 93.45 80 53.24 11.5 56 94.65 81 97 10.5 10.14 93.5 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.10 10.1 93.45 10.1 10.1 10.1 10.1 10.1 10.1 10.1 10.	10	26°37.02				353°40.91 53.14	١ ,
13							~
14							
15   101°49.35   24°99.61   30.71   59°49.30   1.12.23   220°42.68   1.10.52   68°51.78   53.63   161   110°61.81   30°42.93   30°79.94   1.12.73   307°45.12   1.05.90   38°3.59.95   53.73   17   131°64.27   30°45.13   30°43.95   1.04   1.04   38°3.59.95   53.83   18   140°66.74   60°49.46   106°29.20   106°19.20   30°74.68   104   1.04   144°2.65   54.12   101°19.20   30°45.13   149°3.66   130°2.60   130°2.60   28.52   133°5.25   151.02   7°54.66   10.14   1.44°2.65   54.12   12°2.20   10°71.67   30°45.13   149°3.66   2.20   10°71.67   30°45.13   149°3.66   130°2.60   27.63   160°3.79   16.14   37°99.21   10.36   149°4.03   54.22   10.43   149°4.06   54.12   12°2.20   10°6.00   130°2.60   27.63   160°3.79   16.14   37°99.21   10.36   149°4.03   54.13   189°9.18   54.41   16.70   52°7.22   10.36   149°4.03   149							
16   16   16   18   18   39   42   89   30   27   73   49   41   12   79   30   74   51   10   10   50   53   73   55   55   73   73   89   54   13   53   32   24   74   55   10   4.7   55   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   10   4.7   51   51   51   51   51   51   51   5							
11   13  15  427							
18 166*56.74 69*49.46 N26*29.40 103*512.3 N16*13.90 337*49.98 N06*10.45 113*58.30 N10*53.92 19 10.16*19.20 84*25.76 2.89.66 138*61.30 1.46 332*52.42 10.43 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.48 54.02 12 1.29*0.04 145*59.7 27.18 1.39*59.78 1.05*59.79 16.14 37*59.72 1.10.36 174*7.00 54.31 1.29*0.04 145*59.7 27.18 1.39*59.88 1.00*0.05*1.18*0.05*1.18*0.05*1.00							Be
19   10 *99.20   84*92.76   28.96   118*91.87   14.46   392*52.42   10.43   129*0.48   54.12   12   121*147.67   99*550.5   28.52   21.33*0.25   15.02   75*4.85   10.41   14*2.65   54.12   12   121*147.67   99*550.5   28.52   21.33*0.25   15.52   22*57.28   10.38   159*4.83   54.22   22.20*0.65   130*2.06   27.63   130*53.79   10.14   37*59.72   10.36   159*0.18   54.41   14*2.65   54.12   14*2.65   14*2.							
20					352°52.42 10.43		
22   207°6.59   130°2.66   27.63   163°5.87.9   16.14   37°59.72   10.36   174°7.00   54.31	20	$177^{\circ}1.67$		133°52.51 15.02		144°2.65 54.12	
Metr.pass. 08:14	21	192°4.13			22°57.28 · · 10.38		
Mer.pass. 08:14							
Fri CHA GHA Dec CHA DE	23	222°9.06	145°5.97 27.18	178°54.44 16.70	53°2.15 10.34	$189^{\circ}9.18$ 54.41	
Fri GHA GHA Dec GHA DE	Mer.	pass. 08:14	ν3.2' d-0.4' m-4.41	ν0.6' d0.6' m1.30	ν2.4' d-0.0' m-2.16	$\nu$ 2.2' $d$ 0.1' $m$ 0.50	Mi
0 237°11.52 160°9.29 N26°26.74 193°55.08 N16°17.25 68°4.88 N06°10.31 204°11.35 N10°54.61 1 250°13.99 115°12.61 26.9 208°15.75 17.81 83°7.01 10.29 210°15.25 54.61 2 267°16.45 190°15.93 25.64 223°55.36 18.37 98°94.4 10.26 234°15.70 54.70 1 2 244°17.87 ** 54.80 1 2 20°19.15 10°15.93 238°57.00 ** 18.92 113°11.87 ** 10.24 244°17.87 ** 54.80 1 2 20°19.25 1 2 20°19.25 1 2 24.94 253°57.64 19.48 128°14.30 10.22 264°20.05 54.90 1 2 20°19.38 220°22.59 24.94 253°57.64 19.48 128°14.30 10.22 264°20.05 54.90 1 2 20°19.38		·					
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10   27° 36.16   310° 42.67   22.19   344° 1.49   22.81   218° 228.88   10.07   354° 33.10   55.48   14   42° 38.63   335° 46.03   21.73   359° 2.13   23.37   233° 31.31   10.05   9° 35.27   55.58   12   57° 41.09   340° 49.40   N26° 21.27   14° 2.77   N16° 23.92   248° 33.74   N06° 10.02   24° 37.45   N10° 55.68   27° 41.09   340° 49.40   N26° 21.27   14° 2.77   N16° 23.92   248° 33.74   N06° 10.02   24° 37.45   N10° 55.68   27° 41.09   340° 49.40   N26° 21.27   14° 2.77   N16° 23.92   248° 33.74   N06° 10.02   24° 37.45   N10° 55.68   27° 41.09   39° 39.62   55.77   15° 102° 48.48   25° 59.52   19.40   74° 53.3   26.13   308° 43.55   9.95   59° 43.39   1.55.97   16° 11° 50.95   41° 2.90   19.40   74° 5.33   26.13   308° 43.45   9.92   44° 46.15   56.06   17° 132° 53.41   56° 6.29   18.93   89° 5.97   26.69   323° 45.88   9.90   99° 48.32   56.16   18   14° 55.87   71° 96.8   N26° 18.46   104° 66.1 N16° 27.24   338° 48.30   N06° 9.48   32° 56.16   19° 162° 58.34   86° 13.07   17.99   119° 7.25   27.79   353° 50.73   9.84   129° 82.67   56.35   21° 193° 3.27   116° 19.87   17.04   149° 8.53   28.89   23° 55.58   9.82   144° 54.85   56.45   22° 208° 5.73   131° 23.28   16.56   164° 9.17   29.45   38° 58.00   9.77   174° 59.20   56.65   22° 208° 5.73   131° 23.28   16.56   164° 9.17   29.45   38° 58.00   9.77   174° 59.20   56.65   22° 223° 20° 146° 26.69   16.08   179° 9.81   30.00   54° 0.43   9.74   19° 0.13   56.94   22° 2.66   55.99   13° 2.95   14° 2.95							
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12   57°41 09   340°49 40   N26°21.27   14°2.77   N16°23.92   248°33.74   N06°10.02   24°37.45   N10°55.68     37°43.55   355°52.77   20.80   29°3.41   24.48   263°36.17   10.00   39°39.62   55.77     14   87°46.02   10°56.14   20.34   44°4.05   25.03   278°38.59   9.97   54°41.80   55.87     15   102°48.48   25°59.52   19.87   55°4.69   25.58   293°41.02   9.95   66°43.97   55.97     16   117′50.95   41°2.90   19.40   74°5.33   26.13   308°43.45   9.92   84°46.15   56.06     17   132°53.41   56°6.29   18.93   88°5.97   26.69   323°45.88   9.90   99°48.32   56.16     18   147°5.67   71°9.68   N26°18.46   104°6.61   N16°7.24   338°49.30   N06°9.87   114°50.50   N10°56.62     19   162°58.34   86°13.07   17.99   119°7.25   27.79   353°50.73   9.84   12°52.67   56.35     20   178°0.80   101′6.47   17.51   134°7.89   28.34   8°33.15   9.82   144°54.85   56.45     21   193°3.27   116°19.87   17.04   140°8.53   22.889   23°55.88   9.79   159°57.02   56.65     22   208°5.73   131°23.28   16.56   164°9.17   29.45   38°58.00   9.77   174°59.20   56.65     23   223°8.20   146°26.69   16.08   179°9.81   30.00   54°0.43   9.74   190°1.38   56.74      Mer.pass. 08:10   ν3.3′ d-0.4′ m-4.36   ν0.6′ d0.6′ m1.30   ν2.4′ d-0.0′ m-2.15   ν2.2′ d0.1′ m0.50      Sat GHA   GHA   Dec   GHA   Dec   GHA   Dec   GHA   Dec   250°5.79   57.03     3   283°18.05   206°40.38   14.16   239°12.36   32.20   114°10.13   9.63   255°10.08   57.13     4   298°20.52   22143.81   13.67   254°13.00   32.75   129°12.55   9.61   265°12.25   57.23     5   313°22.98   236°47.24   13.19   269°13.64   33.29   144°19.07   9.58   28.80   14.35   57.32     5   313°22.98   236°47.24   13.19   269°13.64   33.29   144°19.79   9.58   28.80   14.35   57.21     5   313°32.84   297°1.02   11.23   329°14.28   N16°37.13   249°31.30   32°5.10   30°18.78   57.51     10   28°33.30   312°4.48   10.73   344°16.64   36.64   219°27.09   9.44   35°2.25   9.66   N10°58.00     14   88°45.16   12°18.34   8.74   44°19.39   38.22   279°3.77   9.33   55°3.30   58.38     17   133°5							Ri
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17 132°53.41 56°6.29 18.93 89°5.97 26.69 323°45.88 9.90 99°48.32 56.16 18 147°55.87 71°9.68 N26°18.46 104°6.61 N16°27.24 338°48.30 N06°9.87 114°50.50 N10°56.26 19 162°58.34 86°13.07 17.99 119°7.25 27.79 353°50.73 9.84 129°52.67 55.35 20 178°0.80 101°16.47 17.51 134°7.89 28.34 8°53.15 9.82 144°54.85 56.45 21 193°3.27 116°19.87 17.04 149°8.53 .28.89 28.34 8°53.15 9.82 144°54.85 56.45 22 208°5.73 131°23.28 16.55 164°9.17 29.45 38°58.00 9.77 174°59.20 56.65 23 223°8.20 146°26.69 16.08 179°9.81 30.00 54°0.43 9.74 190°1.38 55.74    Mer.pass. 08:10 ν3.3′ d-0.4′ m-4.36 ν0.6′ d0.6′ m1.30 ν2.4′ d-0.0′ m-2.15 ν2.2′ d0.1′ m0.50     Sat GHA GHA Dec GHA Dec GHA Dec GHA Dec 238°10.66 161°30.11 N26°15.60 194°10.45 N16°30.55 69°2.85 N06°9.71 205°3.55 N10°56.84 1 253°13.12 176°33.53 15.12 209°11.09 31.10 84°5.28 9.69 220°5.73 356.94 2 268°15.59 191°36.95 14.64 224°11.73 31.65 99°7.70 9.66 235°7.00 57.03 3 283°18.05 206°40.38 · 14.16 239°12.36 · 32.20 114°10.13 · 9.63 250°10.08 · 57.13 4 298°20.52 221°43.81 13.67 254°13.00 32.75 129°12.55 9.61 265°12.25 57.23 5 313°2.298 236°47.24 13.19 269°13.64 33.29 144°14.97 9.58 280°14.43 57.32 5 313°2.298 236°47.24 13.19 269°13.64 33.29 144°14.97 9.58 280°14.43 57.32 6 328°25.44 251°50.68 N26°12.70 284°14.28 N16°33.84 159°17.40 N06°9.55 295°16.61 N10°57.42 7 343°2.791 266°54.12 12.21 299°14.92 34.39 174°19.82 9.52 310°18.78 57.52 8 358°30.37 281°57.57 11.72 314°15.56 34.94 189°22.24 9.50 325°20.96 57.61 11 43°37.76 332°7.94 48 10.73 344°16.84 36.04 219°27.09 9.44 355°25.31 57.81 11 43°37.63 342°1.40 N26°9.74 14°18.11 N16°37.13 249°31.93 N06°9.39 25°29.66 N10°58.00 13 73°42.69 357°14.87 9.24 29°18.75 37.68 264°34.35 9.36 40°31.84 58.09 14 88°45.16 12°18.34 8.74 44°19.39 38.22 279°36.77 9.93 55°34.01 58.19 150°40.50 56.75 11 11 33°52.55 57°28.78 7.24 89°21.31 39.86 324°40.31 9.30 10°55.80 10°55.80 110°55.	15	102°48.48	25°59.52 · · 19.87	59°4.69 · · 25.58		69°43.97 · · 55.97	
18							
19 162° 58.34 86° 13.07 17.99 119° 7.25 27.79 353° 50.73 9.84 129° 52.67 56.35 20 178° 0.80 101° 16.47 17.51 134° 7.89 28.34 8° 53.15 9.82 144° 54.85 56.45 21 193° 3.27 116° 19.87 17.04 149° 8.53 12 28.89 23° 55.58 10.97 159° 57.02 56.55 22 208° 5.73 131° 23.28 16.56 164° 9.17 29.45 38° 58.00 9.77 174′ 59.20 56.65 23 223° 8.20 146° 26.69 16.08 179° 9.81 30.00 54° 0.43 9.74 190° 1.38 56.74 20.60 16.08 179° 9.81 30.00 54° 0.43 9.74 190° 1.38 56.74 20.60 16.08 179° 9.81 30.00 54° 0.43 9.74 190° 1.38 56.74 20.60 16.08 179° 9.81 30.00 54° 0.43 9.74 190° 1.38 56.74 20.60 161° 30.11 N26° 15.60 194° 10.45 N16° 30.55 69° 2.85 N06° 9.71 200° 3.55 N10° 56.84 22 268° 15.59 191° 36.95 14.64 224° 11.73 31.65 99° 7.70 9.66 235° 7.00 57.03 238° 18.05 206° 40.38 14.16 239° 12.36 32.20 114° 10.13 9.63 250° 10.08 57.13 4 298° 20.52 221° 43.81 13.67 254° 13.00 32.75 129° 12.55 9.61 265° 12.25 57.23 4 298° 25.24 251° 50.68 N56° 12.72 248° 14.92 13.39 174° 19.82 9.52 310° 18.78 57.21 32.2 13° 12.21 290° 14.92 34.39 174° 19.82 9.52 310° 18.78 57.71 10.28° 35.30 312° 4.48 10.73 344° 16.84 36.58 24° 29.70 9.44 355° 25.31 57.81 11.33° 32.84 297° 1.02 11.23 329° 16.20 1.35 4.94 189° 22.24 9.50 325° 20.96 57.61 11.33° 327° 7.94 10.24 359° 17.48 36.58 24° 29.51 9.48 10.73 342° 11.40 N26° 9.74 14° 18.11 N16° 37.13 249° 31.93 N06° 9.39 25° 29.66 N10° 58.00 13 73° 42.69 357° 14.87 9.24 29° 18.75 37.68 264° 34.35 9.36 40° 31.84 58.09 14.88° 45.16 12° 18.34 8.74 44° 19.39 38.22 27° 9.34 1.61 9.27 9.9 9.25 38.37 58.38 17 133° 52.55 57° 28.78 7.24 89° 21.31 39.86 324° 24.03 9.25 100° 40.54 58.81 19.63° 74.88 67° 35.75 6.23 119° 22.58 40.95 35° 34.04 39° 25° 36.06 N10° 58.67 10.60° 74.85 75.81 11.23° 35° 74.88 75.22 11.50° 39° 14.60° 30° 14.60°							
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190°3.27   116°10.87 · 17.04   149°8.53 · 28.89   23°55.58 · 9.79   159°57.02 · 56.55   22 208°5.73   131°23.28   16.56   164°9.17   29.45   38°58.00   9.77   174°99.20   56.65   56.65   232°23°8.20   146°26.69   16.08   179°9.81   30.00   54°0.43   9.74   190°1.38   56.74							
22 208° 5.73 131° 23.28 16.56 16.8° 17° 9.81 30.00 54° 0.43 9.77 174° 59.20 55.65 23 223° 8.20 146° 26.69 16.08 179° 9.81 30.00 54° 0.43 9.74 190° 1.38 56.74  Mer.pass. 08:10 ν3.3′ d-0.4′ m-4.36 ν0.6′ d0.6′ m1.30 ν2.4′ d-0.0′ m-2.15 ν2.2′ d0.1′ m0.50  Sat GHA GHA Dec GHA Dec GHA Dec GHA Dec 0.238° 10.66 161° 30.11 N26° 15.60 194° 10.45 N16° 30.55 69° 2.85 N06° 9.71 205° 3.55 N10° 56.84 1 253° 13.12 176° 33.53 15.12 209° 11.09 31.10 84° 5.28 9.69 20° 5.73 56.94 2 20° 5.73 56.94 2 20° 5.73 56.94 1 226° 13.59 191° 36.95 14.64 224° 11.73 31.65 99° 7.70 9.66 235° 7.90 57.03 3 283° 18.05 206° 40.38 1.41.6 239° 12.36 1.32.0 114° 10.13 1.963 250° 10.08 1.57.13 4 298° 20.52 221° 43.81 13.67 254° 13.00 32.75 129° 12.55 9.61 265° 12.25 57.23 53 13° 22.98 236° 47.24 13.19 269° 13.64 33.29 144° 14.97 9.58 280° 14.43 57.32 6 328° 25.44 251° 50.68 N26° 12.70 284° 14.28 N16° 33.84 159° 17.40 N06° 9.55 295° 16.61 N10° 57.42 34° 27.91 266° 54.12 12.21 299° 14.92 34.39 174° 19.80 29.52 310° 18.78 57.52 8 358° 30.37 281° 57.57 11.72 314° 15.56 34.94 189° 22.24 9.50 325° 20.96 57.61 10.28° 35.30 312° 4.88 10.73 344° 16.84 36.04 219° 27.09 9.44 355° 55.31 57.81 11 43° 37.76 327° 7.94 10.24 359° 17.48 36.58 234° 29.51 9.41 10° 27.49 57.90 12 58° 40.23 342° 11.40 N26° 9.74 14° 18.11 N16° 37.13 249° 31.93 N06° 9.39 25° 29.66 N10° 58.00 13 73° 42.69 357° 14.87 9.24 29° 18.75 37.68 264° 43.55 9.36 40° 31.84 58.09 14 88° 45.16 12° 18.34 8.74 44° 19.39 38.22 279° 36.77 9.33 55° 34.01 58.19 15 103° 47.62 27° 21.81 8.24 59° 20.03 38.77 52.94 39.19 9.30 70° 36.19 58.29 16 118° 50.08 42° 25.55 57° 28.76 6.74 104° 21.94 N16° 40.41 339° 46.45 N06° 9.22 115° 42.72 N10° 58.58 19 163° 57.48 87° 35.75 6.23 119° 22.58 40.95 354° 48.87 9.19 130° 44.90 58.67 20 178° 59.94 102° 39.25 5.72 134° 23.22 41.50 9° 51.29 9.16 145° 47.07 58.76 22 209° 4.87 132° 46.25 4.70 164° 24.49 42.58 39° 56.13 9.10 175° 51.43 58.96 19.00° 53.60 59.06 22 105° 51.43 58.96 22 209° 4.87 132° 46.25 4.70 164° 24.49 42.58 39° 56.13 9.10 175° 51.43 58.96 22 209° 4.87 132° 46.25 4							Ka
23   223°8.20   146°26.69   16.08   179°9.81   30.00   54°0.43   9.74   190°1.38   56.74							
Mer.pass. 08:10   ν3.3' d-0.4' m-4.36   ν0.6' d0.6' m1.30   ν2.4' d-0.0' m-2.15   ν2.2' d0.1' m0.50							
Sat         GHA         Dec         Gen         GP4         26         26         25.5         5.20         20.6         23.5         5.5         1.6         4.2         24°11.73         31.65         99°7.70         9.66         235°7.99         57.03         32.8         4.2         28°11.33         22.9°12.55         9.61         26°12.25         57.23         Mas         4.2         28°13.25         3.2         20°12.55         9.61         26°12.25							
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8 358°30.37 281°57.57 11.72 314°15.56 34.94 189°22.24 9.50 325°20.96 57.61 9 13°32.84 297°1.02 · · 11.23 329°16.20 · · 35.49 204°24.67 · · 9.47 340°23.13 · · 57.71 10 28°35.30 312°4.48 10.73 344°16.84 36.04 219°27.09 9.44 355°25.31 57.81 11 43°37.76 327°7.94 10.24 359°17.48 36.58 234°29.51 9.41 10°27.49 57.90 12 58°40.23 342°11.40 N26°9.74 14°18.11 N16°37.13 249°31.93 N06°9.39 25°29.66 N10°58.00 13 73°42.69 357°14.87 9.24 29°18.75 37.68 264°34.35 9.36 40°31.84 58.09 14 88°45.16 12°18.34 8.74 44°19.39 38.22 279°36.77 9.33 55°34.01 58.19 15 103°47.62 27°21.81 · · · 8.24 59°20.03 · · · 38.77 294°39.19 · · · 9.30 70°36.19 · · · 58.29 16 118°50.08 42°25.29 7.74 74°20.67 39.31 309°41.61 9.27 85°38.37 58.38 17 133°52.55 57°28.78 7.24 89°21.31 39.86 324°44.03 9.25 100°40.54 58.48 18 148°55.01 72°32.26 N26°6.74 104°21.94 N16°40.41 339°46.45 N06°9.22 115°42.72 N10°58.58 19 163°57.48 87°35.75 6.23 119°22.58 40.95 354°48.87 9.19 130°44.90 58.67 20 178°59.94 102°39.25 5.72 134°23.22 41.50 9°51.29 9.16 145°47.07 58.77 21 194°2.40 117°42.75 · · 5.21 149°23.86 · · 42.04 24°53.71 · · 9.13 160°49.25 · · 58.86 22 209°4.87 132°46.25 4.70 164°24.49 42.58 39°56.13 9.10 175°51.43 58.96 23 224°7.33 147°49.76 4.19 179°25.13 43.13 54°58.55 9.07 190°53.60 59.06					174°19.82 9.52		
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10							M
12 58°40.23 342°11.40 N26°9.74 14°18.11 N16°37.13 249°31.93 N06°9.39 25°29.66 N10°58.00 13 73°42.69 357°14.87 9.24 29°18.75 37.68 264°34.35 9.36 40°31.84 58.09 14 88°45.16 12°18.34 8.74 44°19.39 38.22 279°36.77 9.33 55°34.01 58.19 15 103°47.62 27°21.81 · 8.24 59°20.03 · 38.77 294°39.19 · 9.30 70°36.19 · 58.29 16 118°50.08 42°25.29 7.74 74°20.67 39.31 309°41.61 9.27 85°38.37 58.38 17 133°52.55 57°28.78 7.24 89°21.31 39.86 324°44.03 9.25 100°40.54 58.48 18 148°55.01 72°32.26 N26°6.74 104°21.94 N16°40.41 339°46.45 N06°9.22 115°42.72 N10°58.58 19 163°57.48 87°35.75 6.23 119°22.58 40.95 354°48.87 9.19 130°44.90 58.67 20 178°59.94 102°39.25 5.72 134°23.22 41.50 9°51.29 9.16 145°47.07 58.77 21 194°2.40 117°42.75 · 5.21 149°23.86 · 42.04 24°53.71 · 9.13 160°49.25 · 58.86 22 209°4.87 132°46.25 4.70 164°24.49 42.58 39°56.13 9.10 175°51.43 58.96 23 224°7.33 147°49.76 4.19 179°25.13 43.13 54°58.55 9.07 190°53.60 59.06							""
13       73°42.69       357°14.87       9.24       29°18.75       37.68       264°34.35       9.36       40°31.84       58.09         14       88°45.16       12°18.34       8.74       44°19.39       38.22       279°36.77       9.33       55°34.01       58.19         15       103°47.62       27°21.81       · 8.24       59°20.03       · 38.77       294°39.19       · 9.30       70°36.19       · 58.29       Ma         16       118°50.08       42°25.29       7.74       74°20.67       39.31       309°41.61       9.27       85°38.37       58.38         17       133°52.55       57°28.78       7.24       89°21.31       39.86       324°44.03       9.25       100°40.54       58.48         18       148°55.01       72°32.26       N26°6.74       104°21.94       N16°40.41       339°46.45       N06°9.22       115°42.72       N10°58.58         19       163°57.48       87°35.75       6.23       119°22.58       40.95       354°48.87       9.19       130°44.90       58.67         20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
14       88°45.16       12°18.34       8.74       44°19.39       38.22       279°36.77       9.33       55°34.01       58.19         15       103°47.62       27°21.81       · · · 8.24       59°20.03       · · 38.77       294°39.19       · · · 9.30       70°36.19       · · 58.29         16       118°50.08       42°25.29       7.74       74°20.67       39.31       309°41.61       9.27       85°38.37       58.38         17       133°52.55       57°28.78       7.24       89°21.31       39.86       324°44.03       9.25       100°40.54       58.48         18       148°55.01       72°32.26       N26°6.74       104°21.94       N16°40.41       339°46.45       N06°9.22       115°42.72       N10°58.58         19       163°57.48       87°35.75       6.23       119°22.58       40.95       354°48.87       9.19       130°44.90       58.67         20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40       117°42.75       · · 5.21       149°23.86       · · 42.04       24°53.71       · · 9.13       160°49.25       · · 58.86         22       209°4.87 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
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16       118°50.08       42°25.29       7.74       74°20.67       39.31       309°41.61       9.27       85°38.37       58.38         17       133°52.55       57°28.78       7.24       89°21.31       39.86       324°44.03       9.25       100°40.54       58.48         18       148°55.01       72°32.26       N26°6.74       104°21.94       N16°40.41       339°46.45       N06°9.22       115°42.72       N10°58.58         19       163°57.48       87°35.75       6.23       119°22.58       40.95       354°48.87       9.19       130°44.90       58.67         20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40       117°42.75       · 5.21       149°23.86       · 42.04       24°53.71       · 9.13       160°49.25       · 58.86         22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06							Ma
17       133°52.55       57°28.78       7.24       89°21.31       39.86       324°44.03       9.25       100°40.54       58.48         18       148°55.01       72°32.26       N26°6.74       104°21.94       N16°40.41       339°46.45       N06°9.22       115°42.72       N10°58.58         19       163°57.48       87°35.75       6.23       119°22.58       40.95       354°48.87       9.19       130°44.90       58.67         20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40       117°42.75       · · 5.21       149°23.86       · · 42.04       24°53.71       · · 9.13       160°49.25       · · 58.86         22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06			42°25.29 7.74				
19       163°57.48       87°35.75       6.23       119°22.58       40.95       354°48.87       9.19       130°44.90       58.67         20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40       117°42.75       · · 5.21       149°23.86       · · 42.04       24°53.71       · · 9.13       160°49.25       · · 58.86         22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06		$133^{\circ}52.55$	57°28.78 7.24	89°21.31 39.86	324°44.03 9.25	100°40.54 58.48	
20       178°59.94       102°39.25       5.72       134°23.22       41.50       9°51.29       9.16       145°47.07       58.77         21       194°2.40       117°42.75       · · 5.21       149°23.86       · · 42.04       24°53.71       · · 9.13       160°49.25       · · 58.86         22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06							
21       194°2.40       117°42.75       · · 5.21       149°23.86       · · 42.04       24°53.71       · · 9.13       160°49.25       · · 58.86         22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06							
22       209°4.87       132°46.25       4.70       164°24.49       42.58       39°56.13       9.10       175°51.43       58.96         23       224°7.33       147°49.76       4.19       179°25.13       43.13       54°58.55       9.07       190°53.60       59.06							
23 224°7.33 147°49.76 4.19 179°25.13 43.13 54°58.55 9.07 190°53.60 59.06							
ivier.pass. υδ:06 ν3.4′ d-0.5′ m-4.31 ν0.6′ d0.6′ m1.31 ν2.4′ d-0.0′ m-2.14 ν2.2′ d0.1′ m0.50						-	
	Mer.	pass. 08:06	ν3.4′ d-0.5′ m-4.31	$\nu$ 0.6′ $d$ 0.6′ $m$ 1.31	ν2.4′ d-0.0′ m-2.14	$\nu$ 2.2′ $d$ 0.1′ $m$ 0.50	

	Stars	
	SHA	Dec
Alpheratz	357°32.10	29° 14.72
Ankaa	353°4.78 349°28.20	-42°8.89 56°41.41
Schedar Diphda	349°28.20 348°44.81	-17°49.77
Achernar	335°18.75	-57°5.37
Hamal	327°48.40	23°35.70
Polaris Acamar	313°2.65 315°10.16	89°22.87 -40°11.42
Menkar	314°3.61	4° 12.00
Mirfak	$308^{\circ}24.78$	$49^{\circ}57.61$
Aldebaran	290°36.81 281°1.56	16° 33.88 -8° 10.26
Rigel Capella	281°1.56 280°18.29	-8° 10.26 46° 1.53
Bellatrix	278°20.26	6°22.40
Elnath	277°58.76	28°37.79
Alnilam Betelgeuse	275°35.26 270°49.42	-1°11.16 7°24.61
Canopus	263°51.62	-52°42.87
Sirius	258°24.09	-16°45.51
Adhara Procyon	255°3.98 244°48.18	-29°0.88 5°8.98
Pollux	243°14.20	27° 57.40
Avior	234°13.84	-59°36.39
Suhail	222°44.37	-43°33.19
Miaplacidus Alphard	221°37.79 217°45.12	-69°50.42 -8°47.13
Regulus	207°31.54	11°49.59
Dubhe	193°37.62	61°36.01
Denebola Gienah	182°22.03 175°40.56	14°24.71 -17°42.21
Acrux	173° 40.30	-63°15.73
Gacrux	$171^{\circ}48.11$	$\textbf{-57}^{\circ}16.66$
Alioth	166°10.27 158°19.14	55°48.42 -11°18.74
Spica Alkaid	158° 19.14 152° 49.50	-11° 18.74 49° 10.32
Hadar	148°31.41	-60°30.79
Menkent	147°53.98	-36°30.76
Arcturus Rigil Kent.	145°45.12 139°35.79	19°2.01 -60°57.31
Kochab	137°18.90	74°2.33
Zuben'ubi	136°52.64	-16°9.69
Alphecca Antares	126°1.08 112°12.10	26°37.09 -26°29.69
Atria	107°3.26	-69°4.57
Sabik	101°59.31	-15°45.58
Shaula Rasalhague	96°6.27 95°55.70	-37°7.34 12°32.32
Eltanin	95° 55.70	51°28.96
Kaus Aust.	83°28.57	$-34^{\circ}22.10$
Vega	80°31.03	38°48.46
Nunki Altair	75°44.12 61°57.11	-26° 15.53 8° 56.59
Peacock	53°1.27	-56°38.26
Deneb	49°23.74	45°22.71
Enif Al Na'ir	33°36.08 27°29.58	10°0.29 -46°49.09
Fomalhaut	15°11.64	-40 49.09 -29°28.10
Scheat	$13^{\circ}42.62$	$28^{\circ}14.10$
Markab	13°27.25	15°21.43
May 18 Thu	SHA	Mer.pass
Venus Mars	282°38.52 317°27.27	13:22 11:05
Jupiter	190°53.75	19:28
Saturn	327°6.79	10:25
May 19 Fri	SHA	Mer.pass
Venus Mars	282°57.77 316°43.56	13:16 11:04
Jupiter	190°53.06	11:04
Saturn	326°59.83	10:22
May 20 Sat	SHA	Mer.pass
Venus	283°19.45	13:11
Mars Jupiter	315°59.79 190°52.20	11:03 19:21
Saturn	326°52.89	10:18

Horizontal parallax

Venus: Mars: 0.5 0.1

h	Su	n		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.50	$N19^{\circ}37.16$	$251^{\circ}59.86$	16.8'	S02°31.58	-12.9'	54.2'
1	195°53.47	37.71	266° 35.63	16.8'	02°18.63	-13.0'	54.2'
2	210°53.44 225°53.42	38.25 •• 38.79	281°11.40 295°47.17	16.8' 16.8'	02°5.68 01°52.72	-13.0' -13.0'	54.2' 54.2'
4	240°53.39	39.34	310°22.94	16.8	01°39.74	-13.0'	54.2'
5	255°53.36	39.88	324°58.71	16.8'	$01^{\circ}26.76$	-13.0'	54.2'
6	270°53.33	N19°40.42	339°34.48	16.8'	S01°13.77	-13.0'	54.2'
7 8	285°53.31 300°53.28	40.96 41.50	354° 10.25 8° 46.01	16.8' 16.8'	01°0.77 00°47.77	-13.0' -13.0'	54.2' 54.2'
9	315°53.25	• • 42.04	23°21.77	16.8	00°34.76	-13.0'	54.3'
10	330°53.22	42.58	37° 57.52	16.7'	$00^{\circ}21.74$	-13.0'	54.3'
11	345°53.19	43.12	52°33.27	16.7	S00°8.72	-13.0'	54.3'
12 13	0°53.16 15°53.13	N19°43.66 44.20	67°9.00 81°44.73	16.7' 16.7'	N00°4.31 00°17.34	13.0' 13.0'	54.3' 54.3'
14	30°53.11	44.74	96°20.45	16.7	00°17.34	13.0'	54.3'
15	45°53.08	• • 45.27	$110^{\circ}56.15$	16.7'	$00^{\circ}43.42$	13.0'	54.3'
16	60°53.05	45.81	125°31.84	16.7'	00°56.46	13.0'	54.3'
17 18	75°53.01 90°52.98	46.34 N19°46.88	140°7.52 154°43.19	16.7' 16.6'	01°9.50 N01°22.54	13.0' 13.0'	54.3' 54.3'
19	90 52.96 105°52.95	47.41	169° 18.84	16.6'	01°35.58	13.0'	54.3'
20	120°52.92	47.95	183° 54.47	16.6'	01°48.62	13.0'	54.3'
21	135°52.89	• • 48.48	198°30.08	16.6'	$02^{\circ}1.66$	13.0'	54.4'
22	150°52.86	49.01	213°5.68	16.6'	02°14.70	13.0'	54.4'
23	165°52.83	49.54	227°41.25	16.6'	02°27.74	13.0'	54.4'
	SD = 15.8'	d = 0.5'		SI	D = 14.8'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°52.80	$N19^{\circ}50.08$	$242^{\circ}16.81$	16.5'	N02°40.77	13.0'	54.4'
1	195°52.76	50.61	256° 52.34	16.5'	02°53.80	13.0'	54.4'
2	210°52.73 225°52.70	51.14 •• 51.67	271°27.85 286°3.33	16.5' 16.5'	03°6.82 03°19.84	13.0' 13.0'	54.4' 54.4'
4	240°52.67	52.20	300°38.79	16.4	03°32.86	13.0'	54.4
5	255°52.63	52.72	315° 14.22	16.4	03°45.86	13.0'	54.4'
6	270°52.60	N19°53.25	329°49.63	16.4'	N03°58.86	13.0'	54.5'
7	285°52.57	53.78	344°25.01	16.3'	04°11.85	13.0'	54.5'
8 9	300°52.53 315°52.50	54.31 •• 54.83	359°0.35 13°35.67	16.3' 16.3'	04°24.83 04°37.80	13.0' 13.0'	54.5' 54.5'
10	330°52.46	55.36	28° 10.95	16.3	04°50.76	13.0'	54.5
11	345°52.43	55.88	42°46.21	16.2'	05°3.71	12.9'	54.5'
12	0°52.39	N19°56.41	57°21.43	16.2'	N05° 16.65	12.9'	54.5'
13 14	15°52.36 30°52.32	56.93 57.45	71°56.61 86°31.76	16.1' 16.1'	05°29.58 05°42.49	12.9' 12.9'	54.5' 54.6'
15	45°52.29	• • 57.98	101°6.87	16.1	05° 42.49	12.9'	54.6'
16	60°52.25	58.50	115°41.94	16.0'	06°8.28	12.9'	54.6'
17	75°52.22	59.02	$130^{\circ}16.97$	16.0'	$06^{\circ}21.15$	12.9'	54.6'
18	90°52.18	N19°59.54	144°51.97	16.0'	N06°34.00	12.8'	54.6'
19 20	105°52.14 120°52.11	20°0.06 0.58	159° 26.92 174° 1.83	15.9' 15.9'	06° 46.83 06° 59.65	12.8' 12.8'	54.6' 54.6'
21	135°52.07	. 1.10	188° 36.70	15.8'	00° 39.03 07° 12.45	12.8'	54.7
22	150°52.03	1.62	203°11.52	15.8'	07°25.23	12.8'	54.7'
23	165°51.99	2.14	217°46.30	15.7'	07°37.99	12.7'	54.7'
	SD = 15.8'	d = 0.5'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	180°51.96	N20°2.65	232°21.03	15.7'	$N07^{\circ}50.73$	12.7'	54.7'
1	195°51.92	3.17	246°55.71	15.6'	08°3.44	12.7'	54.7'
2	210°51.88 225°51.84	3.69	261°30.35 276°4.94	15.6' 15.5'	08°16.14 08°28.81	12.7' 12.6'	54.7'
3 4	225°51.84 240°51.80	· · 4.20 4.72	276°4.94 290°39.47	15.5' 15.5'	08°28.81 08°41.45	12.6'	54.8' 54.8'
5	255°51.76	5.23	305°13.96	15.4'	08°54.08	12.6'	54.8'
6	270°51.72	N20°5.74	319°48.39	15.4'	N09°6.67	12.6'	54.8'
7	285°51.68	6.26	334°22.77	15.3'	09°19.24	12.5'	54.8'
8 9	300°51.65 315°51.61	6.77 •• 7.28	348°57.09 3°31.36	15.3' 15.2'	09°31.78 09°44.29	12.5' 12.5'	54.8' 54.9'
10	330°51.56	7.79	18°5.57	15.2'	09° 44.29	12.5'	54.9'
11	345°51.52	8.30	32°39.72	15.1'	10°9.22	12.4'	54.9'
12	0°51.48	N20°8.81	47° 13.82	15.0'	N10°21.64	12.4'	54.9'
13	15°51.44	9.32	61°47.86 76°21.83	15.0'	10° 34.03 10° 46.39	12.4'	54.9'
14 15	30°51.40 45°51.36	9.83 •• 10.34	76°21.83 90°55.75	14.9' 14.9'	10°46.39 10°58.71	12.3' 12.3'	55.0' 55.0'
16	60°51.32	10.85	105°29.60	14.8'	11° 10.99	12.3'	55.0'
17	75°51.28	11.35	120°3.39	14.7'	11°23.25	12.2'	55.0'
18	90°51.24	N20°11.86	134°37.12	14.7'	N11°35.46	12.2'	55.0'
19 20	105°51.19 120°51.15	12.37 12.87	149° 10.78 163° 44.37	14.6' 14.5'	11°47.63 11°59.77	12.1' 12.1'	55.1' 55.1'
20	120°51.15 135°51.11	12.87	163° 44.37 178° 17.90	14.5'	11°59.77 12°11.87	12.1'	55.1'
22	150°51.06	13.88	192°51.36	14.4	12° 23.92	12.0'	55.1'
23	165°51.02	14.38	207°24.74	14.3'	12°35.94	12.0'	55.1'
	SD = 15.8'	d = 0.5'		SI	D = 14.9'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	36-19%
18	03:34	03:33	11:56	07:24	19:44	
19	03:31	03:30	11:57	08:04	20:25	
20	03:28	03:26	11:57	08:45	21:07	

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	239°9.80	162°53.27 N26°3.68	194°25.77 N16°43.67	70°0.96 N06°9.04	205°55.78 N10°59.15
1	254° 12.26	177°56.78 3.17	209° 26.41 44.21	85°3.38 9.01	220° 57.96 59.25
2	269°14.73	193°0.30 2.65	224°27.04 44.76	100°5.80 8.98	236°0.13 59.35
3	$284^{\circ}17.19$	208°3.82 · · 2.13	239°27.68 · · 45.30	115°8.22 · · 8.95	251°2.31 · · 59.44
4	299° 19.65	223°7.35 1.62	254°28.32 45.84	130°10.63 8.92	266°4.49 59.54
5	314°22.12	238°10.88 1.10	269°28.96 46.38	145°13.05 8.89	281°6.66 59.63
6	329°24.58	253°14.41 N26°0.58	284°29.59 N16°46.93	160°15.46 N06°8.86	296°8.84 N10°59.73
7	344°27.05	268°17.95 26°0.05	299°30.23 47.47	175°17.88 8.83	311°11.02 59.82
8	359°29.51	283°21.49 25°59.53 298°25.04 · · 59.00	314°30.87 48.01	190°20.30 8.80	326°13.19 10°59.92
9	14°31.97 29°34.44	298°25.04 · · 59.00 313°28.58 58.48	329°31.50 · · 48.55 344°32.14 49.09	205°22.71 · · 8.77 220°25.13 8.74	341°15.37 11°0.02 356°17.55 0.11
10 11	44° 36.90	328° 32.14 57.95	359° 32.78 49.63	235°27.54 8.71	356°17.55 0.11 11°19.73 0.21
12	59°39.37	343°35.69 N25°57.42	14°33.41 N16°50.17	250°29.96 N06°8.68	26°21.90 N11°0.30
13	74°41.83	358° 39.25 56.89	29°34.05 50.71	265°32.37 8.65	41°24.08 0.40
14	89°44.29	13°42.82 56.36	44°34.69 51.25	280°34.78 8.62	56°26.26 0.50
15	104°46.76	28°46.39 · · 55.83	59°35.32 · · 51.79	295°37.20 · · 8.59	71°28.43 · · 0.59
16	119°49.22	43°49.96 55.29	74°35.96 52.33	310°39.61 8.56	86°30.61 0.69
17	134°51.69	58°53.53 54.76	89°36.59 52.86	325°42.02 8.53	101°32.79 0.78
18	149° 54.15	73°57.11 N25°54.22	104°37.23 N16°53.40	340°44.44 N06°8.49	116°34.97 N11°0.88
19	164°56.61	89°0.69 53.68	119° 37.87 53.94	355°46.85 8.46	131° 37.14 0.97
20	179°59.08	104°4.28 53.14	134°38.50 54.48	10°49.26 8.43	146°39.32 1.07
21	195°1.54	119°7.87 · · 52.60	149°39.14 · · 55.02	25°51.67 · · 8.40	161°41.50 · · 1.16
22	210°4.01	134°11.46 52.06	164°39.77 55.55	40°54.08 8.37	176° 43.68 1.26
23	225°6.47	149°15.06 51.51	179°40.41 56.09	55°56.50 8.34	191°45.86 1.35
Mer.p	pass. 08:02	ν3.5′ d-0.5′ m-4.25	$\nu$ 0.6′ d0.5′ m1.31	ν2.4' d-0.0' m-2.14	ν2.2' d0.1' m0.50
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	240°8.94	164°18.66 N25°50.97	194°41.04 N16°56.63	70°58.91 N06°8.30	206°48.03 N11°1.45
1	255° 11.40	179°22.27 50.42	209°41.68 57.16	86°1.32 8.27	200 48.03 N11 1.45 221°50.21 1.55
2	270° 13.86	194°25.87 49.87	224° 42.31 57.70	101°3.73 8.24	236°52.39 1.64
3	285° 16.33	209°29.49 · · 49.32	239° 42.95 · · 58.23	116° 6.14 · · 8.21	251°54.57 · · 1.74
4	300°18.79	224°33.10 48.77	254° 43.59 58.77	131°8.55 8.17	266° 56.75 1.83
5	$315^{\circ}21.26$	239°36.72 48.22	269° 44.22 59.30	146°10.96 8.14	281°58.92 1.93
6	330°23.72	254°40.34 N25°47.66	284°44.86 N16°59.84	161°13.37 N06°8.11	297°1.10 N11°2.02
7	345°26.18	269°43.97 47.11	299°45.49 17°0.37	176°15.78 8.07	312°3.28 2.12
8	0°28.65	284°47.60 46.55	314°46.13 0.90	191°18.18 8.04	327°5.46 2.21
9	15°31.11	299°51.23 · · 46.00	329°46.76 · · 1.44	206°20.59 · · 8.01	342°7.64 · · 2.31
10	30°33.58	314°54.87 45.44	344°47.39 1.97	221°23.00 7.97	357°9.82 2.40
11 12	45°36.04 60°38.50	329°58.51 44.88 345°2.15 N25°44.31	359°48.03 2.50 14°48.66 N17°3.04	236°25.41 7.94 251°27.82 N06°7.91	12°11.99 2.50 27°14.17 N11°2.59
13	75° 40.97	0°5.80 43.75	29°49.30 3.57	266°30.22 7.87	42°16.35 2.69
14	90°43.43	15°9.45 43.19	44°49.93 4.10	281°32.63 7.84	57° 18.53 2.78
15	105° 45.90	30°13.11 · · 42.62	59°50.57 · · 4.63	296°35.04 · · 7.80	72°20.71 · · 2.88
16	120° 48.36	45°16.77 42.05	74°51.20 5.17	311°37.44 7.77	87° 22.89 2.97
17	135°50.83	60°20.43 41.49	89°51.84 5.70	326°39.85 7.74	102°25.07 3.07
18	150°53.29	75°24.09 N25°40.92	104°52.47 N17°6.23	341°42.26 N06°7.70	117°27.24 N11°3.16
19	165°55.75	90°27.76 40.34	119°53.10 6.76	356°44.66 7.67	132°29.42 3.26
20	180°58.22	105°31.43 39.77	134°53.74 7.29	11°47.07 7.63	147°31.60 3.35
21	196°0.68	120°35.11 · · 39.20	149°54.37 · · 7.82	26°49.47 · · 7.60	162°33.78 · · · 3.45
22	211°3.15	135°38.79 38.62	164°55.00 8.35	41°51.88 7.56	177°35.96 3.54
23	226°5.61	150°42.47 38.05	179°55.64 8.88	56°54.28 7.53	192°38.14 3.64
Mer.p	pass. 07:58	ν3.6′ d-0.5′ m-4.18	ν0.6' d0.5' m1.32	ν2.4' d-0.0' m-2.13	ν2.2' d0.1' m0.50
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Tue 0	<b>GHA</b> 241°8.07	165°46.15 N25°37.47	194°56.27 N17°9.41	71°56.68 N06°7.49	207°40.32 N11°3.73
1	256° 10.54	180°49.84 36.89	209° 56.91 9.94	86°59.09 7.46	222° 42.50 3.83
2	271° 13.00	195°53.54 36.31	224°57.54 10.46	102°1.49 7.42	237° 44.68 3.92
3	286° 15.47	210°57.23 · · 35.73	239°58.17 · · 10.99	117°3.89 · · 7.39	252°46.86 · · 4.01
4	$301^{\circ}17.93$	226°0.93 35.14	254°58.81 11.52	132°6.30 7.35	267°49.03 4.11
5	$316^{\circ}20.40$	241°4.63 34.56	269°59.44 12.05	147°8.70 7.31	282°51.21 4.20
6	331°22.86	256°8.34 N25°33.97	285°0.07 N17°12.58	162°11.10 N06°7.28	297°53.39 N11°4.30
7	346° 25.32	271°12.05 33.39	300°0.70 13.10	177°13.51 7.24	312°55.57 4.39
8	1°27.79	286°15.76 32.80	315°1.34 13.63	192°15.91 7.21	327°57.75 4.49
9	16° 30.25	301°19.48 · · 32.21	330°1.97 · · 14.16	207°18.31 · · 7.17	342°59.93 · · 4.58
10	31°32.72	316°23.19 31.62 331°26.92 31.02	345°2.60 14.68 0°3.24 15.21	222°20.71 7.13 237°23.11 7.10	358°2.11 4.68 13°4.29 4.77
11 12	46°35.18 61°37.64	331°26.92 31.02 346°30.64 N25°30.43	0°3.24 15.21 15°3.87 N17°15.73	237°23.11 7.10 252°25.51 N06°7.06	13°4.29 4.77 28°6.47 N11°4.86
13	76°40.11	1°34.37 29.84	30°4.50 16.26	267°27.91 7.02	43°8.65 4.96
14	91° 42.57	16°38.10 29.24	45°5.13 16.78	282°30.31 6.99	58° 10.83 5.05
15	106° 45.04	31°41.84 · · 28.64	60°5.77 · · 17.31	297°32.71 · · 6.95	73°13.01 · · 5.15
16	121°47.50	46°45.58 28.04	75°6.40 17.83	312°35.11 6.91	88°15.19 5.24
17	136°49.97	61°49.32 27.44	90°7.03 18.36	327°37.51 6.88	103°17.37 5.34
18	151°52.43	76°53.06 N25°26.84	105°7.66 N17°18.88	342°39.91 N06°6.84	118°19.55 N11°5.43
19	166° 54.89	91°56.81 26.24	120°8.29 19.40	357°42.31 6.80	133°21.73 5.52
20	181°57.36	107°0.56 25.63	135°8.93 19.93	12°44.71 6.76	148°23.91 5.62
21	196° 59.82	122°4.32 · · 25.03	150°9.56 · · 20.45	27°47.10 · · 6.73	163°26.09 · · 5.71
22	212°2.29 227°4.75	137°8.07 24.42 152°11.83 23.81	165°10.19 20.97 180°10.82 21.49	42°49.50 6.69	178°28.27 5.81
23				57°51.90 6.65	193°30.45 5.90
Mer.p	pass. 07:54	ν3.7' d-0.6' m-4.10	$\nu 0.6' \ d0.5' \ m1.32$	ν2.4' d-0.0' m-2.12	ν2.2' d0.1' m0.50

	Stars	
	SHA	Dec
Alpheratz	357° 32.08	29°14.72
Ankaa Schedar	353°4.76 349°28.17	-42°8.87 56°41.40
Diphda	348° 44.79	-17°49.76
Achernar	335° 18.73	-57° 5.35
Hamal	327°48.39 313°2.11	23°35.70 89°22.85
Polaris Acamar	315° 10.15	-40°11.40
Menkar	$314^{\circ}3.60$	4°12.00
Mirfak Aldebaran	308° 24.77 290° 36.81	49°57.60 16°33.88
Rigel	290 36.81 281°1.56	-8°10.26
Capella	280°18.29	$46^{\circ}1.52$
Bellatrix	278° 20.26	6°22.40
Elnath Alnilam	277°58.76 275°35.26	28°37.79 -1°11.16
Betelgeuse	270°49.43	7°24.62
Canopus	263°51.63	-52°42.86
Sirius Adhara	258°24.10 255°3.99	-16°45.50 -29°0.87
Procyon	244°48.19	5°8.98
Pollux	243°14.21	$27^{\circ}57.40$
Avior Suhail	234°13.87 222°44.38	-59°36.38 -43°33.19
Miaplacidus	222°44.38 221°37.83	-43° 33.19 -69° 50.41
Alphard	217°45.13	-8°47.13
Regulus	207°31.56 193°37.65	11°49.59 61°36.02
Dubhe Denebola	193°37.65 182°22.04	61°36.02 14°24.72
Gienah	175°40.57	-17°42.21
Acrux	172°56.48	-63°15.74
Gacrux Alioth	171°48.13 166°10.29	-57°16.67 55°48.44
Spica	158° 19.15	-11°18.73
Alkaid	152°49.51	49°10.33
Hadar Menkent	148°31.42 147°53.98	-60°30.80 -36°30.76
Arcturus	147 55.96 145°45.12	19°2.02
Rigil Kent.	139°35.79	-60°57.32
Kochab Zuben'ubi	137° 18.92 136° 52.64	74°2.35 -16°9.69
Alphecca	130 52.04 126°1.08	26°37.10
Antares	$112^{\circ}12.09$	-26°29.69
Atria	107°3.24	-69° 4.58 -15° 45.57
Sabik Shaula	101°59.30 96°6.26	-15 45.57 -37°7.35
Rasalhague	95°55.69	12°32.33
Eltanin	90°40.43	51°28.98
Kaus Aust. Vega	83°28.56 80°31.02	-34°22.10 38°48.48
Nunki	75°44.10	-26°15.53
Altair	61°57.09	8°56.60
Peacock Deneb	53°1.24 49°23.71	-56°38.26 45°22.72
Enif	33°36.06	10° 0.30
Al Na'ir	27°29.56	-46°49.09
Fomalhaut Scheat	15°11.62 13°42.60	-29°28.09 28°14.10
Markab	13° 27.23	15°21.44
May 21 Sun	SHA	Mer.pass
Venus	283°43.47	13:05
Mars	315° 15.97	11:02
Jupiter Saturn	190°51.17 326°45.98	19:17 10:15
May 22 Mon Venus	<b>SHA</b> 284°9.73	Mer.pass 13:00
Mars	$314^{\circ}32.11$	11:01
Jupiter	190°49.97	19:13
Saturn	326°39.10	10:11
May 23 Tue Venus	<b>SHA</b> 284° 38.08	Mer.pass 12:54
Mars	313°48.20	11:00
Jupiter	$190^{\circ}48.61$	19:09
Saturn	326° 32.24	10:08
Horizor	ntal parallax	0.5
	Venus: Mars:	0.5 0.1
		-

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.98	N20°14.89	$221^{\circ}58.07$	14.2'	$N12^{\circ}47.91$	11.9'	55.2'
1	195°50.93	15.39	236°31.31	14.2'	12°59.84	11.9'	55.2'
2	210° 50.89 225° 50.85	15.89 •• 16.39	251°4.49 265°37.60	14.1' 14.0'	13°11.72 13°23.56	11.8' 11.8'	55.2' 55.2'
4	240° 50.80	16.89	280°10.63	14.0'	13°35.35	11.7'	55.2'
5	255°50.76	17.39	294°43.59	13.9'	13°47.09	11.7'	55.3'
6	270°50.71	N20°17.89	309°16.47	13.8'	N13°58.79	11.6'	55.3'
7 8	285°50.67 300°50.62	18.39 18.89	323°49.28 338°22.01	13.7' 13.7'	14°10.43 14°22.02	11.6' 11.5'	55.3' 55.3'
9	315°50.58	19.39	352°54.66	13.6'	14°22.02	11.5'	55.4'
10	330°50.53	19.88	7°27.24	13.5'	14°45.05	11.4'	55.4'
11	345°50.48 0°50.44	20.38 N20°20.87	21°59.73	13.4'	14°56.49	11.4'	55.4'
12 13	15° 50.44	21.37	36°32.15 51°4.48	13.3' 13.3'	N15°7.86 15°19.19	11.3' 11.3'	55.4' 55.4'
14	30°50.34	21.86	65°36.73	13.2'	15°30.45	11.2'	55.5'
15	45° 50.30	• • 22.36	80°8.91	13.1'	15°41.66	11.1'	55.5'
16	60° 50.25	22.85	94°40.99	13.0'	15°52.80 16°3.88	11.1' 11.0'	55.5'
17 18	75°50.20 90°50.15	23.34 N20°23.84	109°13.00 123°44.92	12.9' 12.8'	N16°14.91	11.0'	55.5' 55.6'
19	105°50.11	24.33	138°16.75	12.7'	16°25.86	10.9'	55.6'
20	120°50.06	24.82	$152^{\circ}48.50$	12.7'	$16^{\circ}36.76$	10.8'	55.6'
21	135°50.01	• • 25.31	167°20.17	12.6'	16°47.59	10.8'	55.6'
22 23	150° 49.96 165° 49.91	25.80 26.29	181°51.74 196°23.23	12.5' 12.4'	16°58.35 17°9.04	10.7' 10.6'	55.7' 55.7'
23						10.0	33.1
	SD = 15.8'	d = 0.5'		SL	O = 15.0'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°49.86	N20°26.78	210°54.63	12.3'	N17°19.67	10.6'	55.7'
1 2	195° 49.81 210° 49.76	27.26 27.75	225°25.94 239°57.17	12.2' 12.1'	17°30.22 17°40.70	10.5' 10.4'	55.7' 55.7'
3	210°49.76 225°49.71	28.24	254°28.30	12.1	17°40.70 17°51.11	10.4	55.7° 55.8'
4	240°49.66	28.72	268°59.34	12.0'	18°1.44	10.3	55.8'
5	255° 49.61	29.21	283°30.30	11.9'	18°11.70	10.2'	55.8'
6	270°49.56 285°49.51	N20°29.69	298°1.16 312°31.92	11.8' 11.7'	N18°21.88 18°31.99	10.1'	55.8'
7 8	285°49.51 300°49.46	30.18 30.66	312°31.92 327°2.60	11.7 11.6'	18° 31.99 18° 42.01	10.0' 9.9'	55.9' 55.9'
9	315°49.41	· · 31.14	341°33.19	11.5'	18°51.96	9.9'	55.9'
10	330°49.36	31.63	$356^{\circ}3.68$	11.4'	$19^{\circ}1.82$	9.8'	55.9'
11	345°49.31 0°49.26	32.11 N20°32.59	10°34.07 25°4.38	11.3'	19°11.60 N19°21.30	9.7'	56.0'
12 13	15° 49.26	N20 32.59 33.07	25°4.38 39°34.59	11.2' 11.1'	19°30.91	9.6' 9.5'	56.0' 56.0'
14	30°49.15	33.55	54° 4.70	11.0'	19°40.43	9.4'	56.0'
15	45°49.10	• • 34.03	68°34.72	10.9'	19°49.87	9.3'	56.1'
16	60° 49.05 75° 48.99	34.51 34.98	83°4.65 97°34.48	10.8'	19°59.21 20°8.47	9.3'	56.1'
17 18	75 48.99 90°48.94	34.98 N20°35.46	97 34.48 112°4.22	10.7' 10.6'	20 8.47 N20°17.63	9.2' 9.1'	56.1' 56.1'
19	105°48.89	35.94	126°33.86	10.5'	20°26.70	9.0'	56.2'
20	120° 48.83	36.41	141°3.41		20°35.67	8.9'	56.2'
21 22	135°48.78 150°48.73	· · 36.89 37.36	155°32.86 170°2.21	10.4' 10.3'	20°44.55 20°53.33	8.8' 8.7'	56.2' 56.2'
23	165° 48.67	37.84	170 2.21 184°31.47	10.3	20° 53.33 21° 2.02	8.6'	56.3'
	SD = 15.8'	d = 0.5'			O = 15.2'		
	3D = 15.6	<i>u</i> = 0.5		31	7 — 13.2		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°48.62	N20°38.31	199° 0.63 213° 29.70	10.1'	N21°10.60 21°19.08	8.5'	56.3'
1 2	195° 48.56 210° 48.51	38.79 39.26	213°29.70 227°58.67	10.0' 9.9'	21°19.08 21°27.46	8.4' 8.3'	56.3' 56.3'
3	225° 48.45	39.73	242°27.55	9.8'	21°35.73	8.2'	56.4
4	240°48.40	40.20	256°56.33	9.7'	21°43.90	8.1'	56.4'
5	255°48.34 270°48.28	40.67 N20°41.14	271°25.02 285°53.61	9.6' 9.5'	21°51.97 N21°59.92	8.0' 7.8'	56.4' 56.4'
6 7	270°48.28 285°48.23	N20°41.14 41.61	285°53.61 300°22.10	9.5° 9.4'	N21°59.92 22°7.77	7.8° 7.7'	56.5
8	300°48.17	42.08	314°50.51	9.3'	22°15.50	7.6'	56.5
9	315°48.12	• • 42.55	329°18.81	9.2'	22°23.13	7.5'	56.5'
10	330°48.06 345°48.00	43.02	343°47.03 358°15.15	9.1'	22°30.64 22°38.03	7.4'	56.5'
11 12	345°48.00 0°47.94	43.48 N20°43.95	358° 15.15 12° 43.18	9.0' 8.9'	22°38.03 N22°45.32	7.3' 7.2'	56.6' 56.6'
13	15° 47.89	44.41	27°11.11	8.8'	22°52.48	7.0'	56.6'
14	30°47.83	44.88	41°38.95	8.8'	22°59.52	6.9'	56.6'
15	45°47.77	· · 45.34	56° 6.71	8.7'	23°6.45	6.8'	56.7'
16 17	60° 47.71 75° 47.65	45.81 46.27	70°34.37 85°1.94	8.6' 8.5'	23°13.25 23°19.94	6.7' 6.6'	56.7' 56.7'
18	90°47.60	N20°46.73	99°29.41	8.4'	N23°26.49	6.4	56.7'
19	105°47.54	47.19	113°56.81	8.3'	23°32.93	6.3'	56.8'
20	120°47.48	47.66	128°24.11	8.2'	23°39.24	6.2'	56.8'
21 22	135° 47.42 150° 47.36	· · 48.12 48.58	142°51.32 157°18.45	8.1' 8.0'	23°45.42 23°51.47	6.1' 5.9'	56.8' 56.8'
23	165°47.30	49.04	171°45.49	8.0'	23°57.39	5.8'	56.9'
	SD = 15.8'	d = 0.5'		SI	D = 15.4'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-29
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-2%
21	03:24	03:22	11:57	09:29	21:52	
22	03:19	03:17	11:57	10:16	22:41	
23	03:14	03:12	11:57	11:07	23:34	

h	Aries	Venus	Mars	Jupiter	Saturn	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	242°7.21	167°15.60 N25°23.20	195°11.45 N17°22.02	72°54.30 N06°6.61	208°32.63 N11°5.99	
1	257°9.68	182°19.36 22.59	210°12.09 22.54	87°56.69 6.57	223°34.81 6.09	A
2	272° 12.14	197°23.13 21.98	225°12.72 23.06	102°59.09 6.53	238°36.99 6.18	
3	287° 14.61	212°26.91 · · 21.37	240°13.35 · · 23.58	118°1.49 · · 6.50	253°39.17 · · 6.28	
4	302° 17.07	227°30.68 20.75	255°13.98 24.10	133° 3.88 6.46	268° 41.35 6.37	
5	317° 19.54	242°34.46 20.14	270°14.61 24.62	148° 6.28 6.42	283°43.53 6.46	A
6	332°22.00	257°38.24 N25°19.52	285°15.24 N17°25.14	163°8.67 N06°6.38	298° 45.72 N11° 6.56	
7	347° 24.46	272°42.03 18.90	300°15.87 25.66	178°11.07 6.34	313°47.90 6.65	
8	2°26.93	287°45.81 18.28	315°16.50 26.18	193°13.47 6.30	328° 50.08 6.74	
9	17°29.39	302°49.61 · · 17.66	330°17.14 · · 26.70	208°15.86 · · 6.26	343°52.26 · · 6.84	
10	32°31.86	317°53.40 17.04	345°17.77 27.22	223°18.25 6.22	358° 54.44 6.93	١.
11	47°34.32	332°57.20 16.41	0°18.40 27.74	238°20.65 6.18	13°56.62 7.03	A
12	62°36.78	348°1.00 N25°15.79	15°19.03 N17°28.25	253°23.04 N06°6.15	28°58.80 N11°7.12	
13	$77^{\circ}39.25$	3°4.80 15.16	30° 19.66 28.77	268°25.44 6.11	44°0.98 7.21	
14	$92^{\circ}41.71$	18°8.60 14.53	45°20.29 29.29	283°27.83 6.07	59°3.16 7.31	
15	$107^{\circ}44.18$	33°12.41 · · 13.90	60°20.92 · · 29.81	298°30.22 · · 6.03	74°5.34 · · 7.40	
16	122°46.64	48°16.22 13.27	75°21.55 30.32	313°32.61 5.99	89°7.53 7.49	D <sub>0</sub>
17	$137^{\circ}49.11$	63°20.04 12.64	90°22.18 30.84	328°35.01 5.95	104°9.71 7.59	Be
18	$152^{\circ}51.57$	78°23.86 N25°12.01	105°22.81 N17°31.36	343°37.40 N06°5.91	119°11.89 N11°7.68	
19	167°54.03	93°27.68 11.38	120°23.44 31.87	358°39.79 5.86	134° 14.07 7.77	
20	182°56.50	108°31.50 10.74	135°24.07 32.39	13°42.18 5.82	149° 16.25 7.87	
21	197°58.96	123°35.32 · · 10.10	150°24.70 · · 32.90	28°44.57 · · 5.78	164° 18.43 · · · 7.96	
22	213°1.43	138°39.15 9.47	165°25.33 33.42	43°46.97 5.74	179°20.61 8.05	
23	228°3.89	153°42.98 8.83	180°25.96 33.93	58°49.36 5.70	194°22.80 8.15	
Mer.p	pass. 07:50	ν3.8' d-0.6' m-4.02	ν0.6' d0.5' m1.32	ν2.4' d-0.0' m-2.11	$\nu 2.2' \ d0.1' \ \text{m}0.50$	Mia
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	243°6.36	168°46.82 N25°8.19	195°26.59 N17°34.45	73°51.75 N06°5.66	209°24.98 N11°8.24	
1	258°8.82	183° 50.65 7.55	210°27.22 34.96	88°54.14 5.62	224°27.16 8.33	
2	273° 11.28	198°54.49 6.90	225° 27.85 35.48	103°56.53 5.58	239°29.34 8.43	
3	288° 13.75	213°58.34 · · 6.26	240°28.48 · · 35.99	118°58.92 · · 5.54	254° 31.52 · · 8.52	
4	303° 16.21	229°2.18 5.61	255°29.11 36.50	134° 1.31 5.50	269°33.70 8.61	
5	318° 18.68	244°6.03 4.97	270°29.74 37.02	149° 3.69 5.45	284°35.89 8.71	
6	333°21.14	259°9.88 N25°4.32	285°30.37 N17°37.53	164°6.08 N06°5.41	299°38.07 N11°8.80	
7	348°23.60	274°13.73 3.67	300°31.00 38.04	179°8.47 5.37	314°40.25 8.89	
8	3°26.07	289°17.59 3.02	315°31.63 38.55	194°10.86 5.33	329°42.43 8.99	1
9	18°28.53	304°21.45 · · 2.37	330°32.26 · · 39.06	209°13.25 · · 5.29	344°44.62 · · 9.08	,
10	33°31.00	319°25.31 1.72	345°32.88 39.58	224°15.63 5.24	359°46.80 9.17	Ri
11 12	48° 33.46 63° 35.93	334°29.17 1.06 349°33.04 N25°0.41	0°33.51 40.09 15°34.14 N17°40.60	239°18.02 5.20 254°20.41 N06°5.16	14°48.98 9.26 29°51.16 N11°9.36	
	78° 38.39	4°36.91 24°59.75	30°34.77 41.11	269°22.80 5.12	44°53.34 9.45	Z
13 14	78 38.39 93°40.85	4 30.91 24 59.75 19°40.78 59.10	45° 35.40 41.62	284°25.18 5.08	59°55.53 9.54	A
15	108° 43.32	34°44.65 · · 58.44	60°36.03 · · 42.13	299°27.57 · · 5.03	74°57.71 · · 9.64	
16	100° 45.32 123° 45.78	49°48.53 57.78	75°36.66 42.64	314°29.95 4.99	89°59.89 9.73	
17	138° 48.25	64°52.41 57.12	90°37.29 43.15	329°32.34 4.95	105°2.08 9.82	
18	153° 50.71	79°56.29 N24°56.45	105°37.91 N17°43.66	344°34.73 N06°4.90	120°4.26 N11°9.91	
19	168° 53.18	95°0.17 55.79	120°38.54 44.16	359°37.11 4.86	135°6.44 10.01	Ras
20	183°55.64	110°4.06 55.13	135°39.17 44.67	14°39.50 4.82	150°8.62 10.10	ļ .,
21	198° 58.10	125°7.95 · · 54.46	150°39.80 · · 45.18	29°41.88 · · 4.77	165°10.81 · · 10.19	Ka
22	214°0.57	140°11.84 53.79	165° 40.43 45.69	44°44.26 4.73	180° 12.99 10.28	
23	229°3.03	155°15.74 53.12	180°41.05 46.20	59°46.65 4.69	195° 15.17 10.38	
_						
Mer.p	pass. 07:46	ν3.8′ d-0.6′ m-3.94	ν0.6' d0.5' m1.33	ν2.4' d-0.0' m-2.11	$\nu 2.2' \ d0.1' \ \text{m}0.50$	
E.	CHV	CHV D	GHA Dec	CHV D	CUA D	
Fri 0	<b>GHA</b> 244°5.50	<b>GHA Dec</b> 170°19.63 N24°52.45	<b>GHA Dec</b> 195° 41.68 N17° 46.70	<b>GHA Dec</b> 74°49.03 N06°4.64	<b>GHA Dec</b> 210°17.36 <b>N</b> 11°10.47	
1	244 5.50 259°7.96	170 19.03 N24 52.45 185°23.53 51.78	210° 42.31 47.21	89°51.42 4.60	210 17.36 N11 10.47 225°19.54 10.56	Fo
2	259 7.90 274° 10.42	200°27.43 51.11	210 42.31 47.21 225°42.94 47.72	104°53.80 4.55	240°21.72 10.65	
3	289° 12.89	215°31.34 · · 50.44	240°43.57 · · 48.22	119°56.18 · · 4.51	255°23.90 · · 10.75	<u></u>
4	304° 15.35	230°35.24 49.76	255° 44.19 48.73	134°58.56 4.47	270°26.09 10.84	May
5	319° 17.82	245°39.15 49.09	270°44.82 49.23	150° 0.95 4.42	285°28.27 10.93	
6	334° 20.28	260°43.06 N24°48.41	285°45.45 N17°49.74	165°3.33 N06°4.38	300°30.46 N11°11.02	
7	349° 22.75	275°46.97 47.74	300°46.08 50.24	180° 5.71 4.33	315°32.64 11.12	
8	4°25.21	290°50.89 47.06	315°46.70 50.75	195°8.09 4.29	330°34.82 11.21	
9	19° 27.67	305°54.81 · · 46.38	330°47.33 · · 51.25	210°10.47 · · 4.24	345°37.01 · · 11.30	
10	34° 30.14	320°58.73 45.70	345°47.96 51.76	225°12.85 4.20	0°39.19 11.39	May
11	49° 32.60	336°2.65 45.01	0°48.58 52.26	240°15.23 4.15	15°41.37 11.48	
12	64° 35.07	351°6.57 N24°44.33	15°49.21 N17°52.76	255°17.61 N06°4.11	30°43.56 N11°11.58	
13	79° 37.53	6°10.50 43.64	30°49.84 53.27	270°19.99 4.06	45°45.74 11.67	
14	94°40.00	21°14.43 42.96	45°50.47 53.77	285°22.37 4.02	60°47.92 11.76	<u></u>
15	109°42.46	36°18.36 · · 42.27	60°51.09 · · 54.27	300°24.75 · · 3.97	75°50.11 · · 11.85	Ma
16	124°44.92	51°22.29 41.58	75°51.72 54.77	315°27.13 3.92	90° 52.29 11.94	
17	139°47.39	66°26.23 40.89	90°52.35 55.28	330°29.51 3.88	105°54.48 12.04	
18	154°49.85	81°30.17 N24°40.20	105°52.97 N17°55.78	345°31.89 N06°3.83	120°56.66 N11°12.13	
19	$169^{\circ}52.32$	96°34.11 39.51	120°53.60 56.28	0°34.27 3.79	135°58.84 12.22	
20	184°54.78	111°38.05 38.82	135°54.23 56.78	15°36.65 3.74	151°1.03 12.31	
21	199° 57.24	126°41.99 · · 38.13	150° 54.85 · · 57.28	30°39.02 · · 3.69	166°3.21 · · 12.40	
22	214°59.71	141°45.94 37.43	165° 55.48 57.78	45°41.40 3.65	181°5.40 12.50	
23	230°2.17	156°49.89 36.74	180°56.10 58.28	60°43.78 3.60	196°7.58 12.59	
Mer r	pass. 07:42	ν3.9' d-0.7' m-4.05	ν0.6' d0.5' m1.33	ν2.4' d-0.0' m-2.10	$\nu 2.2' \ d0.1' \ m0.50$	

	Julis	
	SHA	Dec
Alpheratz	357°32.06	29°14.73
Ankaa	353°4.74	-42°8.86
Schedar	349°28.13 348°44.77	56°41.40 -17°49.74
Diphda Achernar	348 44.77 335°18.71	-17 49.74 -57°5.34
Hamal	327°48.37	23°35.70
Polaris	313°1.27	89°22.84
Acamar	$315^{\circ}10.14$	-40°11.39
Menkar	314°3.58	4° 12.01
Mirfak	308°24.75	49°57.59 16°33.88
Aldebaran Rigel	290°36.80 281°1.56	-8°10.25
Capella	280°18.28	46°1.51
Bellatrix	278°20.26	6°22.41
Elnath	$277^{\circ}58.76$	28°37.78
Alnilam	275°35.26	-1°11.16
Betelgeuse	270°49.42	7°24.62
Canopus Sirius	263°51.65 258°24.11	-52° 42.85 -16° 45.50
Adhara	255°4.00	-29°0.87
Procyon	244°48.19	5°8.98
Pollux	$243^{\circ}14.22$	$27^{\circ}57.39$
Avior	234°13.89	-59°36.38
Suhail	222°44.40	-43°33.19
Miaplacidus	221°37.87 217°45.14	-69°50.41 -8°47.13
Alphard Regulus	217°45.14 207°31.57	-8°47.13 11°49.59
Dubhe	193°37.68	61°36.02
Denebola	182°22.05	14°24.72
Gienah	$175^{\circ}40.57$	$-17^{\circ}42.21$
Acrux	172°56.49	-63° 15.75
Gacrux	171°48.14	-57° 16.68
Alioth	166°10.31 158°19.15	55° 48.45 -11° 18.73
Spica Alkaid	150 19.15 152°49.52	49°10.35
Hadar	148°31.41	-60°30.81
Menkent	147°53.98	-36° 30.76
Arcturus	$145^{\circ}45.12$	$19^{\circ}2.03$
Rigil Kent.	139°35.79	-60°57.33
Kochab	137°18.95 136°52.64	74°2.36 -16°9.69
Zuben'ubi Alphecca	136°52.64 126°1.07	-16°9.69 26°37.11
Antares	112° 12.08	-26°29.69
Atria	107°3.21	-69°4.59
Sabik	$101^{\circ}59.29$	$-15^{\circ}45.57$
Shaula	96°6.23	-37°7.35
Rasalhague Eltanin	95°55.68 90°40.41	12°32.34 51°28.99
Kaus Aust.	90 40.41 83°28.53	-34°22.10
Vega	80°31.00	38° 48.50
Nunki	75°44.08	-26° 15.52
Altair	$61^{\circ}57.07$	$8^{\circ}56.61$
Peacock	53°1.20	-56° 38.26
Deneb	49°23.68	45°22.74
Enif Al Na'ir	33°36.04 27°29.52	10°0.31 -46°49.08
Fomalhaut	27°29.52 15°11.60	-46°49.08 -29°28.08
Scheat	13°42.57	28° 14.11
Markab	13°27.21	15°21.45
May 24 Wed	SHA	Mor pass
Venus	285°8.38	Mer.pass 12:48
Mars	313°4.24	10:59
Jupiter	190°47.08	19:05
Saturn	326°25.42	10:04
May 25 Thu	SHA	Mer.pass
Venus	285°40.46	12:42
Mars	$312^{\circ}20.24$	10:58
Jupiter	190°45.39	19:02
Saturn	326°18.62	10:01
May 26 Fri	SHA	Mer.pass
Venus	$286^{\circ}14.14$	12:35
Mars	311°36.19	10:57
Jupiter	190°43.54	18:58
Saturn	326°11.86	09:57
Horizor	ital parallax	
	Venus: Mars:	0.5 0.1
	iviars:	0.1

Stars

	011-010 =	T0.1314 36C		011	— +09.0320	, 500	
h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.24	N20°49.49	186°12.44	7.9'	N24°3.18	5.7'	56.9'
1	195°47.18	49.95	200°39.32 215°6.10	7.8'	24°8.84 24°14.37	5.5'	56.9'
2	210°47.12 225°47.06	50.41 •• 50.87	215° 6.10 229° 32.81	7.7' 7.6'	24° 14.37 24° 19.76	5.4' 5.3'	56.9' 57.0'
4	240°47.00	51.32	243°59.43	7.5'	24° 19.70	5.1'	57.0'
5	255°46.94	51.78	258°25.97	7.5'	24° 30.14	5.0'	57.0'
6	270°46.88	N20°52.23	272°52.44	7.4'	N24°35.12	4.8'	57.0'
7	285°46.81	52.69	$287^{\circ}18.82$	7.3'	24°39.96	4.7'	57.1'
8	300°46.75	53.14	301°45.13	7.2'	24°44.66	4.6'	57.1'
9	315°46.69	• • 53.60	316°11.36 330°37.52	7.2'	24° 49.22 24° 53.64	4.4' 4.3'	57.1
10 11	330°46.63 345°46.57	54.05 54.50	345°3.60	7.1' 7.0'	24 53.04 24°57.92	4.3 4.1'	57.1' 57.2'
12	0°46.50	N20°54.95	359°29.61	6.9	N25°2.05	4.0'	57.2
13	15°46.44	55.40	13°55.55	6.9'	25°6.04	3.8'	57.2'
14	30°46.38	55.85	$28^{\circ}21.42$	6.8'	25°9.87	3.7'	57.2'
15	45°46.32	• • 56.30	42°47.23	6.7'	25° 13.57	3.5'	57.3'
16	60°46.25	56.75	57°12.96	6.7'	25° 17.11	3.4'	57.3'
17 18	75°46.19 90°46.12	57.20 N20°57.65	71°38.63 86°4.24	6.6' 6.5'	25°20.50 N25°23.75	3.2' 3.1'	57.3' 57.3'
19	105°46.06	58.09	100°29.78	6.5	25° 26.84	2.9'	57.4'
20	120°46.00	58.54	114°55.27	6.4	25°29.78	2.8'	57.4'
21	135°45.93	• • 58.99	129°20.69	6.4'	25°32.57	2.6'	57.4'
22	150°45.87	59.43	143°46.06	6.3'	25°35.20	2.5'	57.4'
23	165°45.80	59.87	158°11.37	6.3'	25°37.68	2.3'	57.5'
	SD = 15.8'	d = 0.5'		SI	D = 15.5'		
					_		
Thu 0	<b>GHA</b> 180° 45.74	<b>Dec</b> N21°0.32	<b>GHA</b> 172°36.63	$\nu$ 6.2'	Dec N25° 40.01	d 2.2'	<b>HP</b> 57.5'
1	195°45.67	0.76	172 30.03 187°1.83	6.2	25° 42.18	2.2	57.5'
2	210°45.61	1.20	201°26.99	6.1'	25°44.19	1.9'	57.5'
3	225°45.54	•• 1.65	$215^{\circ}52.09$	6.1'	$25^{\circ}46.04$	1.7'	57.5'
4	240°45.47	2.09	230°17.15	6.0'	25° 47.74	1.5'	57.6'
5	255°45.41	2.53	244°42.16	6.0'	25°49.27	1.4'	57.6'
6 7	270°45.34 285°45.28	N21°2.97 3.41	259°7.13 273°32.06	5.9' 5.9'	N25°50.65 25°51.87	1.2' 1.1'	57.6' 57.6'
8	300°45.21	3.85	287°56.94	5.8'	25°52.93	0.9'	57.0°
9	315°45.14	• • 4.28	302°21.79	5.8'	25°53.82	0.7'	57.7'
10	330°45.07	4.72	316°46.60	5.8'	25° 54.56	0.6'	57.7'
11	345°45.01	5.16	331°11.38	5.7'	25°55.13	0.4'	57.7'
12	0°44.94	N21°5.59	345°36.13	5.7'	N25°55.54	0.2'	57.7'
13 14	15°44.87 30°44.80	6.03 6.46	0°0.84 14°25.53	5.7' 5.7'	25°55.79 25°55.87	0.1' -0.1'	57.8' 57.8'
15	45°44.74	. 6.90	28°50.19	5.6'	25°55.79	-0.1	57.8'
16	60°44.67	7.33	43°14.83	5.6'	25°55.55	-0.4	57.8'
17	75°44.60	7.77	57°39.44	5.6'	25°55.14	-0.6'	57.8'
18	90°44.53	N21°8.20	72°4.03	5.6'	N25°54.57	-0.7'	57.9'
19	105°44.46	8.63	86°28.61		25°53.83	-0.9'	57.9'
20 21	120°44.39 135°44.32	9.06 • • 9.49	100°53.16 115°17.71	5.5' 5.5'	25°52.92 25°51.86	-1.1' -1.2'	57.9' 57.9'
22	150°44.25	9.92	119 17.71 129°42.24	5.5'	25° 50.62	-1.2 -1.4'	57.9'
23	165°44.18	10.35	144°6.76	5.5'	25°49.22	-1.6'	58.0'
	SD = 15.8'	d = 0.4'		SI	D = 15.7'		
	<u> </u>	<u>u = 0.1</u>					
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°44.11	N21°10.78	158°31.27	5.5'	N25° 47.66	-1.7'	58.0'
1 2	195°44.04 210°43.97	11.21 11.63	172°55.77 187°20.27	5.5' 5.5'	25°45.93 25°44.03	-1.9' -2.1'	58.0' 58.0'
3	210 43.97 225°43.90	12.06	201°44.77	5.5'	25°41.97	-2.1 -2.2'	58.0'
4	240°43.83	12.49	216°9.26	5.5'	25°39.75	-2.4	58.1
5	255°43.76	12.91	230°33.76	5.5'	$25^{\circ}37.35$	-2.6'	58.1'
6	270°43.69	N21°13.34	244°58.26	5.5'	N25°34.80	-2.7'	58.1'
7	285°43.62	13.76	259°22.77	5.5'	25° 32.07	-2.9'	58.1'
8 9	300°43.54 315°43.47	14.19 •• 14.61	273°47.28 288°11.80	5.5' 5.5'	25°29.19 25°26.14	-3.1' -3.2'	58.1' 58.2'
10	315 43.47 330°43.40	15.03	288 11.80 302°36.33	5.5'	25 20.14 25°22.92	-3.2 -3.4'	58.2'
11	345°43.33	15.45	317°0.88	5.6'	25° 19.54	-3.5'	58.2
12	0°43.26	N21°15.87	331°25.43	5.6'	N25°15.99	-3.7'	58.2'
13	15°43.18	16.29	345°50.01	5.6'	25°12.28	-3.9'	58.2'
14	30°43.11	16.71	0°14.60	5.6'	25°8.41	-4.0'	58.3'
15 16	45°43.04 60°42.96	· · 17.13 17.55	14°39.22 29°3.85	5.6' 5.7'	25°4.38 25°0.18	-4.2' -4.4'	58.3' 58.3'
16 17	75°42.89	17.55 17.97	29° 3.85 43° 28.51	5.7' 5.7'	25°0.18 24°55.82	-4.4 -4.5'	58.3
18	90°42.82	N21°18.38	57°53.20	5.7'	N24°51.30	-4.7	58.3
19	105°42.74	18.80	$72^{\circ}17.91$	5.7'	24°46.62	-4.8'	58.3'
20	120°42.67	19.22	86°42.65	5.8'	24°41.78	-5.0'	58.4'
21	135°42.59	• • 19.63	101°7.42	5.8'	24°36.78	-5.2'	58.4'
22	150°42.52 165°42.45	20.05	115°32.22 129°57.06	5.8'	24°31.62 24°26.30	-5.3'	58.4'
23		20.46	129-57.06	5.9'		-5.5'	58.4'
	SD = 15.8'	d = 0.4'		SI	D = 15.8'		

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

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

		Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	0-2		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-3%		
24	03:09	03:06	11:57	12:02	-:-			
25	03:03	03:00	11:57	13:00	00:31			
26	02:56	02:53	11:57	13:59	01:29			

h	Aries	` Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	245°4.64	171°53.84 N24°36.04	195°56.73 N17°58.78	75°46.16 N06°3.55	211°9.77 N11°12.68
1	260°7.10	186°57.79 35.34	210°57.36 59.28	90°48.53 3.51	226°11.95 12.77
2	275°9.57	202°1.74 34.64	225°57.98 17°59.78	105°50.91 3.46	241°14.14 12.86
3	290° 12.03	217°5.70 · · 33.94	240°58.61 18°0.28	120°53.28 · · 3.41	256° 16.32 · · 12.95
4	305°14.49	232°9.66 33.24	255°59.23 0.77	135°55.66 3.37	271°18.51 13.05
5	320° 16.96	247°13.62 32.54	270°59.86 1.27	150°58.04 3.32	286°20.69 13.14
6	335° 19.42	262°17.58 N24°31.83	286°0.49 N18°1.77	166°0.41 N06°3.27	301°22.87 N11°13.23
7	350°21.89	277°21.54 31.13	301°1.11 2.27	181°2.79 3.22	316°25.06 13.32
8	5°24.35	292°25.51 30.42	316°1.74 2.76	196° 5.16 3.18	331°27.24 13.41
9	20°26.82	307°29.48 · · 29.72	331°2.36 · · 3.26	211°7.53 · · 3.13	346°29.43 · · 13.50
10	35°29.28	322°33.45 29.01	346°2.99 3.76	226° 9.91 3.08	1°31.61 13.59
11	50°31.74	337°37.42 28.30	1°3.61 4.25	241°12.28 3.03	16°33.80 13.69
12	65°34.21	352°41.39 N24°27.59	16°4.24 N18°4.75	256°14.66 N06°2.99	31°35.99 N11°13.78
13	80°36.67	7°45.37 26.88	31°4.86 5.24	271°17.03 2.94	46° 38.17 13.87
14	95°39.14	22°49.34 26.17	46°5.49 5.74	286°19.40 2.89	61°40.36 13.96
15	110°41.60	37°53.32 · · 25.45	61°6.11 · · 6.23	301°21.78 · · 2.84	76° 42.54 · · 14.05
16	125°44.06	52°57.30 24.74	76°6.74 6.73	316°24.15 2.79	91°44.73 14.14
17	140°46.53	68°1.29 24.02	91°7.36 7.22	331°26.52 2.74	106° 46.91 14.23
18	155° 48.99	83°5.27 N24°23.31	106°7.99 N18°7.72	346°28.89 N06°2.69	121°49.10 N11°14.33
19	170°51.46	98°9.26 22.59	121°8.61 8.21	1°31.26 2.65	136°51.28 14.42
20	185°53.92	113°13.24 21.87	136°9.24 8.70	16°33.63 2.60	151°53.47 14.51
21	200° 56.39	128°17.23 · · 21.15	151°9.86 · · 9.20	31°36.01 · · 2.55	166° 55.65 · · 14.60
22	215° 58.85	143°21.23 20.43	166°10.49 9.69	46°38.38 2.50	181°57.84 14.69
23	231°1.31	158°25.22 19.71	181°11.11 10.18	61°40.75 2.45	197°0.03 14.78
Mer.p	pass. 07:38	ν4.0′ d-0.7′ m-4.11	$\nu$ 0.6′ d0.5′ m1.34	ν2.4' d-0.0' m-2.09	ν2.2' d0.1' m0.50
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	246°3.78	173°29.21 N24°18.99	196°11.74 N18°10.67	76°43.12 N06°2.40	212°2.21 N11°14.87
1	261°6.24	188°33.21 18.27	211°12.36 11.17	91°45.49 2.35	227°4.40 14.96
2	276°8.71	203°37.21 17.54	226°12.98 11.66	106°47.86 2.30	242°6.58 15.05
3	291°11.17	218°41.21 · · 16.82	241°13.61 · · 12.15	121°50.23 · · 2.25	257°8.77 · · 15.14
4	306° 13.64	233°45.21 16.09	256°14.23 12.64	136°52.60 2.20	272°10.96 15.23
5	321°16.10	248°49.21 15.36	271°14.86 13.13	151°54.96 2.15	287°13.14 15.33
6	336° 18.56	263°53.21 N24°14.63	286°15.48 N18°13.62	166°57.33 N06°2.10	302°15.33 N11°15.42
7	351°21.03	278°57.22 13.90	301°16.10 14.11	181°59.70 2.05	317° 17.52 15.51
8	6°23.49	294°1.23 13.17	316°16.73 14.60	197°2.07 2.00	332°19.70 15.60
9	21°25.96	309°5.23 · · 12.44	331°17.35 · · 15.09	212°4.44 · · 1.95	347°21.89 · · 15.69
10	36°28.42	324°9.24 11.71	346°17.98 15.58	227°6.80 1.90	2°24.08 15.78
11	51°30.88	339°13.26 10.98	1°18.60 16.06	242°9.17 1.85	17°26.26 15.87
12	66°33.35	354°17.27 N24°10.24	16°19.22 N18°16.55	257°11.54 N06°1.80	32°28.45 N11°15.96
13	81°35.81	9°21.28 9.51	31°19.85 17.04	272°13.90 1.75	47°30.64 16.05
14	96°38.28	24°25.30 8.77	46°20.47 17.53	287°16.27 1.69	62°32.82 16.14
15	111° 40.74	39°29.32 · · 8.03	61°21.09 · · 18.02	302°18.64 · · 1.64	77°35.01 · · 16.23
16	126° 43.21	54°33.33 7.30	76°21.72 18.50	317°21.00 1.59	92°37.20 16.32
17	141° 45.67	69°37.35 6.56	91°22.34 18.99	332°23.37 1.54	107°39.38 16.41
18	156° 48.13	84°41.37 N24°5.82	106°22.96 N18°19.47	347°25.73 N06°1.49	122°41.57 N11°16.50
19	171°50.60	99° 45.40 5.08	121°23.58 19.96		137° 43.76 16.59
20	186°53.06	114°49.42 4.34	136°24.21 20.45	17°30.46 1.38	152° 45.94 16.68
21	201°55.53	129°53.45 · · 3.59	151°24.83 · · 20.93	32°32.83 · · 1.33	167°48.13 · · 16.77
22	216° 57.99	144°57.47 2.85	166°25.45 21.42	47°35.19 1.28	182°50.32 16.86
23	232°0.45	160°1.50 2.10	181°26.08 21.90	62°37.56 1.23	197° 52.51 16.95
		$\frac{100^{\circ} 100^{\circ}}{\nu 4.0^{\circ} d-0.7^{\circ} m-4.08}$	$\frac{101\ 20.00}{\nu 0.6'\ d0.5'\ m1.34}$	$\frac{\nu 2.4' \ d-0.0' \ m-2.09}{\nu 2.4' \ d-0.0' \ m-2.09}$	$\frac{15.7 \text{ GZ.61}}{\nu 2.2' \text{ d}0.1' \text{ m}0.50}$
ivier.p	pass. 07:35	ν4.υ <i>α</i> -υ. <i>ι</i> m-4.υδ	νυ.υ αυ.5 m1.34	ν2.4 α-0.0 m-2.09	ν∠.∠ αυ.1 mυ.5υ
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	247°2.92	175°5.53 N24°1.36	196°26.70 N18°22.39	77°39.92 N06°1.18	212°54.69 N11°17.04
1	262°5.38	190°9.56 24°0.61	211°27.32 22.87	92°42.28 1.12	227°56.88 17.13
2	277°7.85	205°13.59 23°59.87	226°27.94 23.35	107°44.64 1.07	242°59.07 17.22
3	292°10.31	220°17.62 · · 59.12	241°28.57 · · 23.84	122°47.01 · · 1.02	258°1.26 · · 17.31
4	307° 12.78	235°21.66 58.37	256°29.19 24.32	137°49.37 0.97	273°3.44 17.40
5	322° 15.24	250°25.69 57.62	271°29.81 24.80	152°51.73 0.91	288°5.63 17.49
6	337° 17.70	265°29.73 N23°56.87	286°30.43 N18°25.28	167°54.09 N06°0.86	303°7.82 N11°17.58
7	352°20.17	280°33.76 56.12	301°31.05 25.77	182°56.46 0.81	318°10.01 17.67
8	7°22.63	295°37.80 55.36	316°31.68 26.25	197°58.82 0.75	333°12.20 17.76
9	22°25.10	310°41.84 · · 54.61	331°32.30 · · 26.73	213°1.18 · · 0.70	348°14.38 · · 17.85
10	37°27.56	325°45.88 53.86	346°32.92 27.21	228° 3.54 0.65	3°16.57 17.94
11	52°30.02	340°49.92 53.10	1°33.54 27.69	243°5.90 0.59	18°18.76 18.03
12	67°32.49	355°53.96 N23°52.35	16°34.16 N18°28.17	258°8.26 N06°0.54	33°20.95 N11°18.12
13	82°34.95	10°58.01 51.59	31°34.79 28.65	273°10.62 0.49	48° 23.14 18.21
14	97°37.42	26°2.05 50.83	46°35.41 29.13	288°12.98 0.43	63°25.33 18.30
15	112°39.88	41°6.10 · · 50.07	61°36.03 · · 29.61	303°15.34 · · 0.38	78°27.51 · · 18.39
16	127° 42.35	56°10.14 49.32	76°36.65 30.09	318°17.70 0.32	93°29.70 18.48
17	142°44.81	71°14.19 48.56	91°37.27 30.57	333°20.06 0.27	108°31.89 18.57
18	157° 47.27	86°18.24 N23°47.79	106°37.89 N18°31.05	348°22.42 N06°0.22	123°34.08 N11°18.66
19	172°49.74	101°22.29 47.03	121°38.52 31.53	3°24.77 0.16	138°36.27 18.75
20	187°52.20	116°26.34 46.27	136°39.14 32.00	18°27.13 0.11	153°38.46 18.84
21	202°54.67	131°30.39 · · 45.51	151°39.76 · · 32.48	33°29.49 · · 0.05	168°40.65 · · 18.93
22	217°57.13	146°34.44 44.74	166°40.38 32.96	48°31.85 06°0.00	183°42.83 19.02
23	232°59.59	161°38.49 43.98	181°41.00 33.44	63°34.20 05°59.94	198° 45.02 19.11
Mer.r	pass. 07:31	ν4.0' d-0.7' m-3.97	ν0.6' d0.5' m1.35	ν2.4' d-0.1' m-2.08	$\nu 2.2' \ d0.1' \ m0.50$
		3 0.1 111 0.57		22 3 0.1 111 2.00	

	SHA	Dec
Alpheratz	357°32.03	29°14.73
Ankaa	353°4.71	-42°8.84
Schedar	349°28.09	56°41.40
Diphda	348°44.75	-17°49.73
Achernar	335°18.68	-57° 5.32
Hamal	327°48.34	23°35.71
Polaris	313°0.40	89°22.82
Acamar	315° 10.12	-40°11.37
Menkar	314°3.57	4°12.01
Mirfak	308°24.73	49°57.58
Aldebaran	290°36.79	16°33.88
Rigel	281°1.55	-8°10.24
Capella	280° 18.27	46°1.50
Bellatrix	278° 20.25	6°22.41
Elnath	277° 58.75	28°37.78
Alnilam	275°35.25	-1°11.15
Betelgeuse	270°49.42	7°24.62
Canopus	263°51.65	-52°42.84
Sirius	258°24.10	-16°45.49
Adhara	255°4.00	-29° 0.86
	244°48.19	5°8.98
Procyon	244° 48.19 243° 14.22	
Pollux		27°57.39
Avior	234°13.91	-59°36.37
Suhail	222°44.41	-43°33.18
Miaplacidus	221°37.91	-69°50.41
Alphard	217°45.14	-8°47.13
Regulus	207°31.57	11°49.59
Dubhe	193°37.70	$61^{\circ}36.02$
Denebola	$182^{\circ}22.05$	$14^{\circ}24.72$
Gienah	175°40.57	-17°42.21
Acrux	$172^{\circ}56.50$	$-63^{\circ}15.76$
Gacrux	171°48.14	-57°16.69
Alioth	$166^{\circ}10.32$	55°48.45
Spica	$158^{\circ}19.15$	-11°18.73
Alkaid	152°49.53	49°10.36
Hadar	148°31.41	-60°30.82
Menkent	147°53.97	-36°30.77
Arcturus	145°45.12	19°2.04
Rigil Kent.	139°35.78	-60°57.35
Kochab	137° 18.97	74°2.37
Zuben'ubi	136°52.63	-16° 9.69
Alphecca	126°1.07	26°37.12
Antares	112°12.06	-26°29.69
Atria	107°3.18	-69°4.60
Sabik	101°59.27	-15°45.57
Shaula	96°6.21	-37°7.35
Rasalhague	95°55.66	12°32.35
Eltanin	90°40.40	51°29.01
Kaus Aust.	83°28.50	-34°22.10
Vega	80°30.98	38°48.51
Nunki	75°44.05	-26°15.52
Altair	61°57.04	8°56.62
	53°1.15	
Peacock Deneb	49°23.65	-56°38.26 45°22.75
	49 23.05 33°36.01	45 22.75 10°0.33
Enif	27°29.49	
Al Na'ir		-46°49.07
Fomalhaut	15° 11.56	-29°28.07
Scheat	13°42.54	28°14.12
Markab	13°27.18	15°21.46
May 27 Sat	SHA	Mer.pass
Venus	286°49.20	12:29
Mars	310°52.09	10:56
Jupiter	190°41.52	18:54
Saturn	326°5.13	09:54
May 28 Sun	SHA	Mer.pass
Venus	287°25.43	12:23
Mars	310°7.96	10:55
	190°39.34	18:50
Jupiter	325°58.43	09:50
Jupiter Saturn		
Saturn	SHA	Mer.pass
Saturn May 29 Mon	SHA	Mer.pass 12:16
Saturn  May 29 Mon Venus	<b>SHA</b> 288°2.61	12:16
May 29 Mon Venus Mars	<b>SHA</b> 288°2.61 309°23.78	12:16 10:54
Saturn  May 29 Mon  Venus  Mars  Jupiter	SHA 288°2.61 309°23.78 190°37.00	12:16 10:54 18:46
Saturn  May 29 Mon  Venus  Mars  Jupiter  Saturn	SHA 288°2.61 309°23.78 190°37.00 325°51.78	12:16 10:54
Saturn  May 29 Mon  Venus  Mars  Jupiter  Saturn	SHA 288°2.61 309°23.78 190°37.00 325°51.78	12:16 10:54 18:46 09:47
Saturn  May 29 Mon  Venus  Mars  Jupiter  Saturn	SHA 288°2.61 309°23.78 190°37.00 325°51.78	12:16 10:54 18:46

Dec

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.37	N21°20.87	$144^{\circ}21.93$	5.9'	N24°20.82	-5.6'	58.4'
1	195° 42.30	21.29	158°46.84	5.9'	24°15.18	-5.8'	58.4'
2	210°42.22 225°42.14	21.70 •• 22.11	173°11.79 187°36.77	6.0' 6.0'	24° 9.39 24° 3.45	-5.9' -6.1'	58.5' 58.5'
4	240° 42.07	22.52	202°1.80	6.1'	23°57.35	-6.3	58.5
5	255°41.99	22.93	$216^{\circ}26.87$	6.1'	23°51.09	-6.4'	58.5'
6	270°41.92	N21°23.34	230°51.99	6.2'	N23°44.68	-6.6'	58.5'
7 8	285°41.84 300°41.76	23.75 24.16	245°17.15 259°42.35	6.2' 6.3'	23°38.12 23°31.40	-6.7' -6.9'	58.5' 58.5'
9	315°41.69	24.56	274°7.60	6.3'	23°24.54	-7.0'	58.6'
10	330°41.61	24.97	288°32.91	6.4'	23°17.53	-7.2'	58.6'
11	345°41.53 0°41.46	25.38 N21°25.78	302°58.26 317°23.66	6.4'	23°10.36 N23°3.05	-7.3'	58.6'
12 13	0 41.46 15°41.38	26.19	317 23.00 331°49.12	6.5' 6.5'	N23 3.05 22°55.59	-7.5' -7.6'	58.6' 58.6'
14	30°41.30	26.59	346°14.63	6.6'	22°47.99	-7.7'	58.6'
15	45°41.22	• • 27.00	0°40.20	6.6'	22°40.24	-7.9'	58.6'
16 17	60°41.15 75°41.07	27.40 27.80	15°5.82 29°31.50	6.7' 6.7'	22°32.35 22°24.31	-8.0' -8.2'	58.7' 58.7'
18	90°40.99	N21°28.20	43°57.23	6.8'	N22°16.13	-8.3	58.7'
19	105°40.91	28.60	58°23.02	6.9'	22°7.81	-8.5	58.7'
20	120°40.83	29.00	72°48.88	6.9'	21°59.35	-8.6'	58.7'
21 22	135° 40.75 150° 40.67	· · 29.40 29.80	87°14.79 101°40.76	7.0' 7.0'	21°50.76 21°42.02	-8.7' -8.9'	58.7' 58.7'
23	165° 40.59	30.20	101 40.76 116° 6.80	7.0 7.1'	21 42.02 21°33.15	-8.9 -9.0'	58.8'
	SD = 15.8'	d = 0.4'			D = 15.9'		
		u — v.T		JI			
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°40.51 195°40.44	N21°30.60 31.00	130°32.89 144°59.05	7.2' 7.2'	N21°24.15 21°15.01	-9.1' -9.3'	58.8' 58.8'
2	195°40.44 210°40.36	31.00	144 59.05 159°25.28	7.2 7.3'	21°15.01 21°5.74	-9.3° -9.4'	58.8'
3	225° 40.28	• • 31.79	173°51.57	7.4'	20°56.33	-9.5'	58.8'
4	240°40.19	32.18	188°17.92	7.4'	20°46.80	-9.7'	58.8'
5 6	255°40.11 270°40.03	32.58 N21°32.97	202°44.33 217°10.82	7.5' 7.5'	20°37.14 N20°27.35	-9.8' -9.9'	58.8' 58.8'
7	285° 39.95	33.36	231°37.37	7.6'	20°17.43	-10.0'	58.8'
8	300°39.87	33.76	246°3.98	7.7'	20°7.39	-10.2'	58.9'
9	315°39.79	• • 34.15	260°30.66	7.7'	19°57.23	-10.3'	58.9'
10 11	330°39.71 345°39.63	34.54 34.93	274°57.41 289°24.23	7.8' 7.9'	19°46.94 19°36.53	-10.4' -10.5'	58.9' 58.9'
12	0°39.55	N21°35.32	303°51.11	8.0'	N19°26.00	-10.6	58.9
13	15°39.46	35.71	$318^{\circ}18.06$	8.0'	$19^{\circ}15.36$	-10.8'	58.9'
14	30°39.38 45°39.30	36.10	332°45.08 347°12.16	8.1'	19° 4.59	-10.9'	58.9'
15 16	45°39.30 60°39.22	· · 36.49 36.87	1°39.32	8.2' 8.2'	18°53.71 18°42.72	-11.0' -11.1'	58.9' 58.9'
17	75°39.13	37.26	16°6.54	8.3'	18°31.61	-11.2'	58.9'
18	90°39.05	N21°37.65	30°33.83	8.4'	N18°20.39	-11.3'	59.0'
19 20	105°38.97 120°38.89	38.03 38.42	45°1.19 59°28.61	8.4' 8.5'	18° 9.07 17° 57.63	-11.4'	59.0' 59.0'
21	135° 38.80	38.80	73°56.11	8.6'	17°46.08	-11.5'	59.0'
22	150°38.72	39.18	88°23.67	8.6'	17°34.43	-11.8'	59.0'
23	165°38.63	39.57	102°51.30	8.7'	17°22.68	-11.9'	59.0'
	SD = 15.8'	d = 0.4'		SI	O = 16.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.55	N21°39.95	117°18.99	8.8'	N17°10.82	-12.0'	59.0'
1	195°38.47	40.33	131°46.76	8.8'	16°58.86	-12.1'	59.0'
2	210°38.38 225°38.30	40.71 •• 41.09	146°14.59 160°42.48	8.9' 9.0'	16°46.80 16°34.64	-12.2' -12.3'	59.0' 59.0'
3 4	225° 38.30 240° 38.21	41.09 41.47	160° 42.48 175° 10.44	9.0'	16° 34.64 16° 22.38	-12.3 -12.4'	59.0' 59.0'
5	255°38.13	41.85	189°38.47	9.1'	16°10.03	-12.4'	59.0'
6	270°38.04	N21°42.23	204° 6.57	9.2'	N15°57.59	-12.5'	59.1'
7 8	285°37.96 300°37.87	42.61 42.98	218°34.73 233°2.95	9.2' 9.3'	15°45.04 15°32.41	-12.6' -12.7'	59.1' 59.1'
9	315° 37.79	· · 43.36	233 2.95 247°31.24	9.3 9.4'	15 32.41 15°19.69	-12.7 -12.8'	59.1'
10	330° 37.70	43.73	261°59.59	9.4'	15°6.88	-12.9'	59.1'
11	345°37.61	44.11	276°28.00	9.5'	14°53.98	-13.0'	59.1'
12 13	0°37.53 15°37.44	N21°44.48 44.86	290°56.48 305°25.02	9.5' 9.6'	N14°41.00 14°27.93	-13.1' -13.2'	59.1' 59.1'
14	30°37.36	45.23	319°53.62	9.7'	14°14.78	-13.2'	59.1'
15	45°37.27	• • 45.60	334°22.28	9.7'	14°1.54	-13.3'	59.1'
16 17	60°37.18 75°37.10	45.97 46.35	348°51.00 3°19.79	9.8' 9.8'	13°48.23 13°34.84	-13.4' -13.5'	59.1' 59.1'
17	75°37.10 90°37.01	46.35 N21°46.72	3°19.79 17°48.63	9.8'	13°34.84 N13°21.37	-13.5' -13.5'	59.1'
19	105°36.92	47.09	$32^{\circ}17.53$	10.0'	13°7.83	-13.6'	59.1'
20	120° 36.83	47.45	46°46.48	10.0'	12°54.21	-13.7'	59.1'
21 22	135°36.75 150°36.66	· · 47.82 48.19	61°15.50 75°44.56	10.1' 10.1'	12°40.52 12°26.75	-13.8' -13.8'	59.1' 59.1'
23	165° 36.57	48.19 48.56	75 44.56 90°13.69	10.1	12 20.75 12°12.92	-13.8 -13.9'	59.1'
	SD = 15.8'	d = 0.4'			D = 16.1'		

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

N 72°         □         □         06:24         □         □         02:39           N 70°         □         □         06:24         □         □         02:39           N 70°         □         □         07:06         □         □         01:56           68°         □         04:59         07:34         □         02:07         01:26           66°         02:46         05:45         07:55         02:19         01:20         01:04           64°         04:14         06:15         08:11         00:51         00:49         00:46           60°         05:17         06:56         08:36         ···         00:07         00:19           N 58°         05:38         07:11         08:46         23:52         ···         00:08           56°         05:55         07:23         08:55         23:38         23:59         ···           54°         06:09         07:34         09:03         23:27         23:50         ···           52°         06:22         07:44         09:09         23:16         23:43         ···           50°         06:33         07:53         09:16         23:07         23:36 <th>Lat.</th> <th></th> <th>Moonris</th> <th>е</th> <th></th> <th>Moonset</th> <th>;</th>	Lat.		Moonris	е		Moonset	;
N 70°         □         □         07:06         □         □         01:56           68°         □         04:59         07:34         □         02:07         01:26           66°         02:46         05:45         07:55         02:19         01:20         01:04           64°         04:14         06:15         08:11         00:51         00:49         00:46           60°         04:51         06:38         08:25         00:14         00:26         00:31           60°         05:17         06:56         08:36         ···         00:07         00:19           N 58°         05:38         07:11         08:46         23:52         ···         00:08           56°         05:55         07:23         08:55         23:38         23:59         ···           54°         06:09         07:34         09:03         23:27         23:50         ···           52°         06:22         07:44         09:09         23:16         23:43         ···           50°         06:33         07:53         09:16         23:07         23:36         23:59           45°         06:56         08:11         09:29         22:4	Lat.	Sat	Sun	Mon	Sat	Sun	Mon
68° □ 04:59 07:34 □ 02:07 01:26 66° 02:46 05:45 07:55 02:19 01:20 01:04 64° 04:14 06:15 08:11 00:51 00:49 00:46 62° 04:51 06:38 08:25 00:14 00:26 00:31 60° 05:17 06:56 08:36 ⋯ 00:07 00:19 N 58° 05:38 07:11 08:46 23:52 ⋯ 00:08 56° 05:55 07:23 08:55 23:38 23:59 ⋯ 54° 06:09 07:34 09:03 23:27 23:50 ⋯ 52° 06:22 07:44 09:09 23:16 23:43 ⋯ 50° 06:33 07:53 09:16 23:07 23:36 23:59 45° 06:56 08:11 09:29 22:47 23:21 23:49 N 40° 07:14 08:26 09:39 22:31 23:09 23:41 335° 07:30 08:39 09:49 22:18 22:58 23:34 30° 07:43 08:50 09:57 22:06 22:49 23:28 20° 08:06 09:09 10:11 21:45 22:33 23:17 N 10° 08:25 09:25 10:23 21:28 22:19 23:07 0° 08:43 09:40 10:34 21:11 22:06 22:58 S 10° 09:02 09:55 10:45 20:54 21:53 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 40° 10:12 10:53 11:27 19:48 21:01 22:14 45° 10:30 11:07 11:37 19:31 20:48 22:05 S 50° 10:52 11:24 11:50 19:10 20:32 21:55 52° 11:02 11:33 11:56 19:00 20:24 21:50 56° 11:28 11:52 12:02 18:48 20:16 21:44 56° 11:28 11:52 12:09 18:35 20:06 21:38 58° 11:43 12:04 12:17 18:20 19:55 21:31	N 72°			06:24			02:39
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	<b>N</b> 70°			07:06			01:56
64° 04:14 06:15 08:11 00:51 00:49 00:46 62° 04:51 06:38 08:25 00:14 00:26 00:31 60° 05:17 06:56 08:36 ⋯ 00:07 00:19  N 58° 05:38 07:11 08:46 23:52 ⋯ 00:08 56° 05:55 07:23 08:55 23:38 23:59 ⋯ 52° 06:92 07:34 09:03 23:27 23:50 ⋯ 52° 06:33 07:53 09:16 23:07 23:36 23:59 45° 06:56 08:11 09:29 22:47 23:21 23:49  N 40° 07:14 08:26 09:39 22:31 23:09 23:41 35° 07:30 08:39 09:49 22:18 22:58 23:34 30° 07:43 08:50 09:57 22:06 22:49 23:28 20° 08:43 09:40 10:11 21:45 22:33 23:17  N 10° 08:25 09:25 10:23 21:28 22:19 23:07 0° 08:43 09:40 10:34 21:11 22:06 22:58 5 10° 09:02 09:55 10:45 20:54 21:53 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:49 20° 09:44 10:30 11:10 20:15 21:22 22:28 40° 10:12 10:53 11:27 19:48 21:01 22:14 45° 10:30 11:07 11:37 19:31 20:48 22:05 5 50° 10:52 11:24 11:50 19:10 20:32 21:55 52° 11:02 11:33 11:56 19:00 20:24 21:50 54° 11:44 11:42 12:02 18:48 20:16 21:44 56° 11:28 11:52 12:02 18:35 20:06 21:38 50:06 11:28 11:52 12:02 18:48 56° 11:28 11:52 12:02 18:48 56° 11:28 11:52 12:02 18:48 56° 11:28 11:52 12:00 11:55 21:31 50:06 21:38 50:06 11:28 11:52 12:00 11:55 21:31	68°		04:59	07:34		02:07	01:26
62° 04:51 06:38 08:25 00:14 00:26 00:31 60° 05:17 06:56 08:36 ···· 00:07 00:19    N 58° 05:38 07:11 08:46 23:52 ··· 00:08 56° 05:55 07:23 08:55 23:38 23:59 ··· 54° 06:09 07:34 09:03 23:27 23:50 ··· 550° 06:22 07:44 09:09 23:16 23:43 ··· 550° 06:22 07:44 09:09 23:16 23:43 ··· 550° 06:56 08:11 09:29 22:47 23:21 23:49    N 40° 07:14 08:26 09:39 22:31 23:09 23:41 35° 07:30 08:39 09:49 22:18 22:58 23:34 30° 07:43 08:50 09:57 22:06 22:49 23:28 20° 08:06 09:09 10:11 21:45 22:33 23:17    N 10° 08:25 09:25 10:23 21:28 22:19 23:07 0° 08:43 09:40 10:34 21:11 22:06 22:58    S 10° 09:02 09:55 10:45 20:54 21:53 22:49 20° 09:21 10:11 10:57 20:36 21:38 22:40 30° 09:44 10:30 11:10 20:15 21:22 22:28 40° 10:12 10:53 11:27 19:48 21:01 22:14 45° 10:30 11:07 11:37 19:31 20:48 22:05   S 50° 10:52 11:24 11:50 19:10 20:32 21:55 52° 11:02 11:33 11:56 19:00 20:24 21:50 54° 11:44 11:42 12:02 18:48 20:16 21:44 56° 11:28 11:52 12:09 18:35 20:06 21:38 58° 11:43 12:04 12:17 18:20 19:55 21:31	66°	02:46	05:45	07:55	02:19	01:20	01:04
60°         05:17         06:56         08:36         ···         00:07         00:19           N 58°         05:38         07:11         08:46         23:52         ···         00:08           56°         05:55         07:23         08:55         23:38         23:59         ···           54°         06:09         07:34         09:03         23:27         23:50         ···           52°         06:22         07:44         09:09         23:16         23:43         ···           50°         06:33         07:53         09:16         23:07         23:36         23:59           45°         06:56         08:11         09:29         22:47         23:21         23:49           N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         1		04:14	06:15	08:11	00:51	00:49	00:46
N 58°         05:38         07:11         08:46         23:52         ···         00:08           56°         05:55         07:23         08:55         23:38         23:59         ···           54°         06:09         07:34         09:03         23:27         23:50         ···           52°         06:22         07:44         09:09         23:16         23:43         ···           50°         06:33         07:53         09:16         23:07         23:36         23:59           45°         06:56         08:11         09:29         22:47         23:21         23:49           N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:59         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         10:23         21:28         22:19         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           5 10°         09:02         09:55 <t< th=""><th>62°</th><th>04:51</th><th>06:38</th><th>08:25</th><th>00:14</th><th>00:26</th><th>00:31</th></t<>	62°	04:51	06:38	08:25	00:14	00:26	00:31
56°         05:55         07:23         08:55         23:38         23:59            54°         06:09         07:34         09:03         23:27         23:50            52°         06:22         07:44         09:09         23:16         23:43            50°         06:33         07:53         09:16         23:07         23:36         23:59           45°         06:56         08:11         09:29         22:47         23:21         23:49           N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         10:23         21:28         22:19         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           5 10°         09:02         09:55 <td< th=""><th>60°</th><th>05:17</th><th>06:56</th><th>08:36</th><th></th><th>00:07</th><th>00:19</th></td<>	60°	05:17	06:56	08:36		00:07	00:19
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	56°	05:55	07:23	08:55	23:38	23:59	
50°         06:33         07:53         09:16         23:07         23:36         23:59           45°         06:56         08:11         09:29         22:47         23:21         23:49           N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:39         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           S 10°         09:02         09:55         10:45         20:54         21:53         22:49           20°         09:21         10:11         10:57         20:36         21:38         22:40           30°         09:44         10:30         11:10         20:15         21:22         22:22           40°         10:12         10:53         11:27         19:48         21:01         22:14           45°         10:30         11:07		06:09	07:34	09:03	23:27	23:50	
45°         06:56         08:11         09:29         22:47         23:21         23:49           N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         10:23         21:28         22:19         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           S 10°         09:02         09:55         10:45         20:54         21:53         22:49           20°         09:01         10:11         10:57         20:36         21:33         22:49           30°         09:44         10:30         11:10         20:15         21:22         22:28           35°         09:57         10:40         11:18         20:02         21:12         22:22           40°         10:12         10:53		06:22	07:44	09:09	23:16	23:43	•• ••
N 40°         07:14         08:26         09:39         22:31         23:09         23:41           35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         10:23         21:28         22:19         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           5 10°         09:02         09:55         10:45         20:54         21:53         22:49           20°         09:21         10:11         10:57         20:36         21:38         22:49           30°         09:44         10:30         11:10         20:15         21:22         22:28           35°         09:57         10:40         11:18         20:02         21:12         22:22           40°         10:12         10:53         11:27         19:48         21:01         22:14           45°         10:30         11:07		06:33	07:53	09:16	23:07	23:36	23:59
35°         07:30         08:39         09:49         22:18         22:58         23:34           30°         07:43         08:50         09:57         22:06         22:49         23:28           20°         08:06         09:09         10:11         21:45         22:33         23:17           N 10°         08:25         09:25         10:23         21:28         22:19         23:07           0°         08:43         09:40         10:34         21:11         22:06         22:58           S 10°         09:02         09:55         10:45         20:54         21:53         22:49           20°         09:21         10:11         10:57         20:36         21:38         22:40           30°         09:44         10:30         11:10         20:15         21:22         22:28           35°         09:57         10:40         11:18         20:02         21:12         22:22           40°         10:12         10:53         11:27         19:48         21:01         22:14           45°         10:30         11:07         11:37         19:31         20:48         22:05           50°         10:52         11:24	45°	06:56	08:11	09:29	22:47	23:21	23:49
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	<b>N</b> 40°	07:14	08:26	09:39	22:31	23:09	23:41
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		07:30	08:39	09:49	22:18	22:58	23:34
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	30°	07:43	08:50	09:57	22:06	22:49	23:28
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		08:06	09:09	10:11	21:45	22:33	23:17
S 10°     09:02     09:55     10:45     20:54     21:53     22:49       20°     09:21     10:11     10:57     20:36     21:38     22:40       30°     09:44     10:30     11:10     20:15     21:22     22:28       35°     09:57     10:40     11:18     20:02     21:12     22:22       40°     10:12     10:53     11:27     19:48     21:01     22:14       45°     10:30     11:07     11:37     19:31     20:48     22:05       S 50°     10:52     11:24     11:50     19:10     20:32     21:55       52°     11:02     11:33     11:56     19:00     20:24     21:50       54°     11:14     11:42     12:02     18:48     20:16     21:44       56°     11:28     11:52     12:09     18:35     20:06     21:38       58°     11:43     12:04     12:17     18:20     19:55     21:31					1		
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35°         09:57         10:40         11:18         20:02         21:12         22:22           40°         10:12         10:53         11:27         19:48         21:01         22:14           45°         10:30         11:07         11:37         19:31         20:48         22:05           5 50°         10:52         11:24         11:50         19:10         20:32         21:55           52°         11:02         11:33         11:56         19:00         20:24         21:50           54°         11:14         11:42         12:02         18:48         20:16         21:44           56°         11:28         11:52         12:09         18:35         20:06         21:38           58°         11:43         12:04         12:17         18:20         19:55         21:31		09:21	10:11	10:57	20:36	21:38	22:40
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45°         10:30         11:07         11:37         19:31         20:48         22:05           S 50°         10:52         11:24         11:50         19:10         20:32         21:55           52°         11:02         11:33         11:56         19:00         20:24         21:50           54°         11:14         11:42         12:02         18:48         20:16         21:44           56°         11:28         11:52         12:09         18:35         20:06         21:38           58°         11:43         12:04         12:17         18:20         19:55         21:31							
S 50°         10:52         11:24         11:50         19:10         20:32         21:55           52°         11:02         11:33         11:56         19:00         20:24         21:50           54°         11:14         11:42         12:02         18:48         20:16         21:44           56°         11:28         11:52         12:09         18:35         20:06         21:38           58°         11:43         12:04         12:17         18:20         19:55         21:31							
52°     11:02     11:33     11:56     19:00     20:24     21:50       54°     11:14     11:42     12:02     18:48     20:16     21:44       56°     11:28     11:52     12:09     18:35     20:06     21:38       58°     11:43     12:04     12:17     18:20     19:55     21:31		10:30	11:07	11:37	19:31	20:48	22:05
54°     11:14     11:42     12:02     18:48     20:16     21:44       56°     11:28     11:52     12:09     18:35     20:06     21:38       58°     11:43     12:04     12:17     18:20     19:55     21:31					1		
56°         11:28         11:52         12:09         18:35         20:06         21:38           58°         11:43         12:04         12:17         18:20         19:55         21:31	-	1					
58°   11:43   12:04   12:17   18:20   19:55   21:31	-	l					
		1					
<b>S</b> 60°   12:02		1					
	<b>S</b> 60°	12:02	12:17	12:26	18:02	19:43	21:23

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
2,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-25%	
27	02:49	02:46	11:57	14:57	02:28		
28	02:42	02:38	11:57	15:53	03:26		
29	02:34	02:30	11:57	16:46	04:20		

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	248°2.06	176°42.54 N23°43.21	196°41.62 N18°33.91	78°36.56 N05°59.89	213°47.21 N11°19.20
1	263°4.52	191°46.60 42.45	211°42.24 34.39	93°38.92 59.83	228°49.40 19.29
2	278° 6.99	206°50.65 41.68	226° 42.86 34.86	108°41.27 59.78	243°51.59 19.38
3	293°9.45	221°54.71 · · 40.91	241°43.48 · · 35.34	123°43.63 · · 59.72	258°53.78 · · 19.47
4	308°11.91	236°58.76 40.14	256°44.10 35.82	138°45.99 59.67	273°55.97 19.55
5	323°14.38	252°2.82 39.37	271°44.72 36.29	153°48.34 59.61	288°58.16 19.64
6	338° 16.84	267°6.88 N23°38.60	286°45.34 N18°36.76	168°50.70 N05°59.56	304°0.35 N11°19.73
7	353° 19.31	282°10.93 37.83	301°45.97 37.24	183°53.05 59.50	319°2.54 19.82
8	$8^{\circ}21.77$	297°14.99 37.06	316°46.59 37.71	198°55.41 59.44	334°4.73 19.91
9	23°24.24	312°19.05 · · 36.29	331°47.21 · · 38.19	213°57.76 · · 59.39	349°6.92 · · 20.00
10	38°26.70	327°23.11 35.52	346° 47.83 38.66	229°0.12 59.33	4°9.11 20.09
	53° 29.16	342°27.17 34.74	1°48.45 39.13	244°2.47 59.27	
11					
12	68°31.63	357°31.23 N23°33.97	16°49.07 N18°39.61	259°4.82 N05°59.22	34°13.49 N11°20.27
13	83°34.09	12°35.30 33.19	31°49.69 40.08	274°7.18 59.16	49°15.68 20.36
14	98°36.56	27°39.36 32.42	46°50.31 40.55	289°9.53 59.11	64°17.87 20.44
15	113°39.02	42°43.42 · · 31.64	61°50.93 · · 41.02	304°11.88 · · 59.05	79°20.06 · · 20.53
16	128°41.48	57°47.48 30.86	76°51.55 41.49	319°14.24 58.99	94°22.25 20.62
17	143°43.95	72°51.55 30.09	91°52.17 41.96	334°16.59 58.93	109°24.44 20.71
18	158° 46.41	87°55.61 N23°29.31	106°52.79 N18°42.43	349°18.94 N05°58.88	124°26.63 N11°20.80
	173° 48.88		121°53.40 42.91		
19					
20	188°51.34	118°3.74 27.75	136°54.02 43.38	19°23.64 58.76	154°31.01 20.98
21	203°53.80	133°7.81 · · 26.97	151°54.64 · · 43.85	34°25.99 · · 58.71	169°33.20 · · 21.07
22	218°56.27	148°11.87 26.19	166°55.26 44.31	49°28.35 58.65	184°35.39 21.15
23	233°58.73	163°15.94 25.41	181°55.88 44.78	64°30.70 58.59	199°37.58 21.24
				ν2.4' d-0.1' m-2.07	
ivier.p	pass. 07:27	ν4.1' d-0.8' m-3.78	$\nu 0.6' \ d0.5' \ m1.35$	ν2.4° α-0.1° m-2.07	ν2.2' d0.1' m0.50
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	249°1.20	178°20.01 N23°24.62	196°56.50 N18°45.25	79°33.05 N05°58.53	214°39.77 N11°21.33
			011° = 7 10 45 .23		
1	264°3.66	193°24.07 23.84	211°57.12 45.72	94°35.40 58.48	229°41.96 21.42
2	279°6.12	208°28.14 23.06	226° 57.74 46.19	109°37.75 58.42	244°44.15 21.51
3	294°8.59	223°32.21 · · 22.27	241°58.36 · · 46.66	124°40.10 •• 58.36	259°46.34 · · 21.60
4	$309^{\circ}11.05$	238°36.27 21.49	256° 58.98 47.12	139°42.45 58.30	274°48.53 21.68
5	324° 13.52	253°40.34 20.70	271°59.60 47.59	154°44.79 58.24	289°50.72 21.77
6	339° 15.98	268°44.41 N23°19.92	287°0.22 N18°48.06	169°47.14 N05°58.18	304°52.91 N11°21.86
7	354° 18.45	283°48.48 19.13	302°0.83 48.52	184°49.49 58.13	319°55.10 21.95
	9°20.91				
8					
9	24°23.37	313°56.62 · · 17.55	332°2.07 · · 49.46	214°54.19 · · 58.01	349°59.49 · · 22.13
10	39°25.84	329°0.69 16.77	347°2.69 49.92	229°56.54 57.95	5°1.68 22.21
11	54°28.30	344°4.76 15.98	2°3.31 50.39	244°58.88 57.89	20°3.87 22.30
12	69°30.77	359°8.82 N23°15.19	17°3.93 N18°50.85	260°1.23 N05°57.83	35°6.06 N11°22.39
13	84°33.23	14°12.89 14.40	32°4.55 51.32	275° 3.58 57.77	50°8.25 22.48
14	99°35.69	29°16.96 13.61	47°5.16 51.78	290° 5.92 57.71	65°10.44 22.57
		29 10.90 15.01			
15	114°38.16	44°21.03 · · 12.81	62°5.78 · · 52.24	305°8.27 · · 57.65	80°12.64 · · 22.65
16	129°40.62	59°25.10 12.02	77°6.40 52.71	320°10.62 57.59	95°14.83 22.74
17	144°43.09	74°29.17 11.23	92°7.02 53.17	335°12.96 57.53	110°17.02 22.83
18	159° 45.55	89°33.24 N23°10.44	107°7.64 N18°53.63	350°15.31 N05°57.47	125°19.21 N11°22.92
19	174°48.01	104°37.31 9.64	122°8.25 54.10	5°17.65 57.41	140°21.40 23.01
20	189°50.48	119°41.38 8.85		20°20.00 57.35	155°23.60 23.09
21	204°52.94	134°45.45 · · 8.06		35°22.34 · · 57.29	170°25.79 · · 23.18
22	219°55.41	149°49.52 7.26		50°24.69 57.23	185°27.98 23.27
23	234°57.87	164°53.59 6.47	182°10.73 55.94	65°27.03 57.17	200°30.17 23.36
Mer.p	ass. 07:23	ν4.1' d-0.8' m-3.51	$\nu$ 0.6' d0.5' m1.35	ν2.4' d-0.1' m-2.07	ν2.2' d0.1' m0.50
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	250°0.33	179°57.66 N23°5.67	197°11.34 N18°56.40	80°29.37 N05°57.11	215°32.36 N11°23.44
1	265°2.80	195°1.73 4.87		95°31.72 57.05	230°34.56 23.53
2	280°5.26	210°5.80 4.08		110°34.06 56.99	245°36.75 23.62
3	295°7.73	225°9.87 · · 3.28	242°13.20 · · 57.79	125°36.40 · · 56.93	260°38.94 · · 23.71
4	$310^{\circ}10.19$	240°13.94 2.48	257° 13.81 58.24	140°38.75 56.87	275°41.13 23.79
5	325°12.65	255°18.00 1.68	272°14.43 58.70	155°41.09 56.81	290°43.33 23.88
6	340° 15.12	270°22.07 N23°0.88	287°15.05 N18°59.16	170°43.43 N05°56.75	305°45.52 N11°23.97
7	355° 17.58	285°26.14 23°0.08	302°15.66 18°59.62	185°45.77 56.69	320°47.71 24.06
	10° 20.05				
8			317°16.28 19°0.08		335°49.90 24.14
9	25°22.51	315°34.28 · · 58.49	332°16.90 · · 0.54	215°50.46 · · 56.56	350°52.10 · · 24.23
10	40°24.98	330°38.34 57.68	347° 17.52 1.00	230°52.80 56.50	5°54.29 24.32
11	55° 27.44	345°42.41 56.88	2°18.13 1.45	245°55.14 56.44	20°56.48 24.41
12	70°29.90	0°46.48 N22°56.08	17°18.75 N19°1.91	260°57.48 N05°56.38	35°58.68 N11°24.49
13	85°32.37	15°50.54 55.28		275°59.82 56.32	51°0.87 24.58
14	100°34.83	30°54.61 54.48		291°2.16 56.25	66°3.06 24.67
	115° 37.30	45°58.68 · · 53.68			
15					
16	130°39.76	61°2.74 52.87		321°6.84 56.13	96°7.45 24.84
17	145°42.22	76°6.81 52.07		336° 9.18 56.07	111°9.64 24.93
18	160°44.69	91°10.87 N22°51.27	107°22.45 N19°4.64	351°11.52 N05°56.01	126°11.84 N11°25.02
	175°47.15	106°14.93 50.46	122°23.07 5.10	6°13.86 55.94	141°14.03 25.10
19		121°19.00 49.66	137°23.68 5.55	21°16.20 55.88	156°16.22 25.19
19	190°49.62				171°18.42 · · 25.28
19 20		136° 23 06 · · 48 8F	152°24 30 · · 6 01		
19 20 21	205°52.08	136°23.06 · · 48.85	152°24.30 · · 6.01	36°18.53 · · 55.82	
19 20 21 22	205°52.08 220°54.54	151°27.12 48.05	167°24.91 6.46	51°20.87 55.75	186°20.61 25.36
19 20 21	205°52.08				
19 20 21 22 23	205°52.08 220°54.54	151°27.12 48.05	167°24.91 6.46	51°20.87 55.75	186°20.61 25.36

357°32.00 353°4.68

349°28.06

348°44.72

335°18.66

 $327^{\circ}48.32$ 

312°59.74

315°10.11

 $314^{\circ}3.55$ 

308°24.71

290°36.78

281° 1.55

 $280^{\circ}18.26$ 

Alpheratz

Ankaa Schedar

Diphda

Hamal

Polaris

Acamar

Menkar

Mirfak

Rigel

Capella

Aldebaran

Achernar

**Dec** 29° 14.74

-42°8.83

56°41.40 -17°49.72

-57°5.30

 $23^{\circ}35.71$ 

89°22.81 -40°11.35

4°12.02

49°57.58

16°33.88

-8°10.23

 $46^{\circ}1.50$ 

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.48	N21°48.92	$104^{\circ}42.87$	10.2'	$N11^{\circ}59.02$	-14.0'	59.2'
1	195°36.39	49.29	119°12.10	10.3'	11°45.05	-14.0'	59.2'
2	210°36.30 225°36.22	49.65 •• 50.02	133°41.39 148°10.72	10.3' 10.4'	11°31.02 11°16.92	-14.1' -14.2'	59.2' 59.2'
4	240°36.13	50.38	162°40.11	10.4	11°2.76	-14.2'	59.2'
5	255°36.04	50.75	$177^{\circ}9.55$	10.5'	$10^{\circ}48.54$	-14.3'	59.2'
6	270°35.95	N21°51.11	191°39.04	10.5	N10°34.26	-14.3'	59.2'
7 8	285°35.86 300°35.77	51.47 51.83	206°8.58 220°38.16	10.6' 10.6'	10°19.92 10°5.52	-14.4' -14.5'	59.2' 59.2'
9	315°35.68	52.19	235°7.79	10.7	09°51.07	-14.5'	59.2'
10	330°35.59	52.55	249°37.47	10.7'	$09^{\circ}36.56$	-14.6'	59.2'
11	345°35.50	52.91	264°7.19 278°36.95	10.8'	09°22.01	-14.6'	59.2'
12 13	0°35.41 15°35.32	N21°53.27 53.63	278°36.95 293°6.76	10.8' 10.8'	N09°7.40 08°52.74	-14.7' -14.7'	59.2' 59.2'
14	30°35.23	53.98	307°36.61	10.9	08°38.03	-14.8'	59.2'
15	45°35.14	• • 54.34	$322^{\circ}6.49$	10.9'	$08^{\circ}23.28$	-14.8'	59.2'
16	60°35.05	54.70	336°36.42	11.0'	08°8.48	-14.8'	59.2'
17 18	75°34.95 90°34.86	55.05 N21°55.41	351°6.39 5°36.39	11.0' 11.0'	07°53.64 N07°38.75	-14.9' -14.9'	59.2' 59.2'
19	105°34.77	55.76	20°6.44	11.1'	07°23.82	-14.9 -15.0'	59.2'
20	120°34.68	56.11	34°36.51	11.1'	07°8.86	-15.0'	59.2'
21	135°34.59	• • 56.46	49°6.62	11.1'	06°53.85	-15.0'	59.2'
22	150°34.50 165°34.40	56.82 57.17	63°36.77 78°6.94	11.2'	06°38.81 06°23.74	-15.1' -15.1'	59.2'
23		57.17	/8°6.94	11.2'		-15.1	59.2'
	SD = 15.8'	d = 0.4'		SI	D = 16.1'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°34.31	N21°57.52	92°37.15	11.2'	N06°8.63	-15.1'	59.2'
1	195°34.22	57.87	107°7.39	11.3'	05°53.48	-15.2'	59.2'
2	210°34.13 225°34.03	58.22 •• 58.57	121°37.65 136°7.94	11.3' 11.3'	05°38.31 05°23.11	-15.2' -15.2'	59.2' 59.2'
3 4	240°33.94	•• 58.57 58.91	150 7.94 150°38.26	11.3	05 23.11 05°7.87	-15.2 -15.3'	59.2'
5	255°33.85	59.26	165°8.61	11.4'	04°52.62	-15.3'	59.2'
6	270°33.75	N21°59.61	179°38.98	11.4'	N04°37.33	-15.3'	59.2'
7	285°33.66	21°59.95	194°9.37	11.4'	04°22.02	-15.3'	59.2'
8 9	300°33.57 315°33.47	0.30 · · 0.64	208°39.78 223°10.22	11.4' 11.5'	04°6.69 03°51.34	-15.4' -15.4'	59.2' 59.2'
10	330°33.38	0.99	223 10.22 237°40.67	11.5'	03°35.97	-15.4'	59.2'
11	345°33.29	1.33	252°11.15	11.5'	03°20.58	-15.4'	59.2'
12	0°33.19	N22°1.67	266°41.64	11.5'	N03°5.17	-15.4'	59.2'
13	15°33.10	2.01	281°12.14	11.5'	02°49.75 02°34.31	-15.4'	59.2'
14 15	30°33.00 45°32.91	2.35 · · 2.69	295°42.66 310°13.20	11.5' 11.5'	02°34.31 02°18.86	-15.5' -15.5'	59.2' 59.2'
16	60°32.81	3.03	324°43.75	11.6'	02°10.00	-15.5'	59.2'
17	75°32.72	3.37	$339^{\circ}14.30$	11.6'	$01^{\circ}47.92$	-15.5'	59.2'
18	90°32.62	N22°3.71	353°44.87	11.6'	N01°32.44	-15.5'	59.2'
19 20	105°32.53 120°32.43	4.05 4.39	8°15.45 22°46.04	11.6' 11.6'	01°16.96 01°1.46	-15.5'	59.2' 59.2'
21	135°32.33	• • 4.72	37°16.63	11.6'	00°45.96	-15.5'	59.2'
22	150°32.24	5.06	51°47.23	11.6'	00°30.46	-15.5'	59.2'
23	165°32.14	5.39	66°17.83	11.6'	00°14.96	-15.5'	59.2'
	SD = 15.8'	d = 0.3'		SI	D = 16.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.05	N22°5.73	80°48.43	11.6'	S00°0.54	15.5'	59.2'
1	195°31.95 210°31.85	6.06	95°19.04 109°49.65	11.6'	00°16.05	15.5'	59.2'
2	210°31.85 225°31.76	6.40 • • 6.73	109°49.65 124°20.26	11.6' 11.6'	00°31.55 00°47.04	15.5' 15.5'	59.2' 59.2'
4	240°31.66	7.06	138°50.86	11.6'	01°2.53	15.5'	59.2'
5	255°31.56	7.39	153°21.46	11.6'	$01^{\circ}18.02$	15.5'	59.2'
6	270°31.47	N22°7.72	167°52.06	11.6'	S01°33.49	15.5'	59.2'
7 8	285°31.37 300°31.27	8.05 8.38	182°22.66 196°53.24	11.6' 11.6'	01°48.96 02°4.42	15.5' 15.4'	59.2' 59.2'
9	300 31.27 315°31.17	8.38 · · 8.71	211°23.82	11.6'	02 4.42 02°19.86	15.4' 15.4'	59.2'
10	330°31.07	9.04	$225^{\circ}54.40$	11.6'	$02^{\circ}35.29$	15.4'	59.2'
11	345°30.98	9.36	240°24.96	11.6'	02°50.71	15.4'	59.2'
12	0°30.88 15°30.78	N22°9.69	254°55.51 269°26.04	11.5'	\$03°6.11 03°21.49	15.4'	59.2'
13 14	15°30.78 30°30.68	10.01 10.34	269°26.04 283°56.57	11.5' 11.5'	03°21.49 03°36.85	15.4' 15.3'	59.2' 59.2'
15	45°30.58	10.66	298°27.08	11.5'	03°52.19	15.3'	59.1'
16	60°30.48	10.99	$312^{\circ}57.57$	11.5'	$04^{\circ}7.51$	15.3'	59.1'
17	75°30.39	11.31	327°28.05	11.5'	04°22.81	15.3'	59.1'
18 19	90°30.29 105°30.19	N22°11.63 11.96	341°58.51 356°28.95	11.4' 11.4'	\$04°38.08 04°53.33	15.2' 15.2'	59.1' 59.1'
20	105°30.19 120°30.09	11.96	350°28.95 10°59.37	11.4	04°53.33 05°8.55	15.2' 15.2'	59.1' 59.1'
21	135°29.99	12.60	25°29.77	11.4'	05°23.74	15.2'	59.1'
22	150°29.89	12.92	40°0.15	11.4'	05°38.90	15.1'	59.1'
23	165°29.79	13.23	54°30.51	11.3'	05°54.02	15.1'	59.1'
	SD = 15.8'	d = 0.3'		SI	D = 16.1'		

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

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

		Sun		Moon		
Day	Eqn.of	Eqn.of Time   Mer.		Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	6-8
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	35-58%
30	02:26	02:22	11:58	17:37	05:12	
31	02:17	02:13	11:58	18:26	06:01	
01	02:08	02:04	11:58	19:15	06:50	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	250° 59.47	181°35.25 N22°46.44	197°26.15 N19°7.37	81°25.55 N05°55.63	216°25.00 N11°25.54	
1	266°1.94	196°39.31 45.63	212° 26.76 7.82	96°27.89 55.56	231°27.19 25.62	Alpheratz 357°31.98 29°14.74
2	281°4.40	211°43.37 44.83	227°27.38 8.27	111°30.22 55.50	246°29.39 25.71	Ankaa 353°4.66 -42°8.82
3	296°6.86	226°47.43 · · 44.02	242°27.99 · · 8.72	126°32.56 · · 55.44	261°31.58 · · 25.80	Schedar 349°28.03 56°41.40 Diphda 348°44.71 -17°49.71
4	311°9.33	241°51.49 43.21	257°28.61 9.18	141°34.90 55.37	276°33.77 25.88	Achernar 335°18.63 -57°5.29
5	326°11.79	256°55.55 42.41	272°29.22 9.63	156°37.23 55.31	291°35.97 25.97	Hamal 327°48.31 23°35.71
6 7	341°14.26 356°16.72	271°59.60 N22°41.60 287°3.66 40.79	287°29.84 N19°10.08 302°30.46 10.53	171°39.57 N05°55.25 186°41.90 55.18	306°38.16 N11°26.06 321°40.36 26.14	Polaris 312°58.99 89°22.80
8	11° 19.18	302°7.72 39.98	302°30.46 10.53 317°31.07 10.98	201°44.24 55.12	336°42.55 26.23	Acamar 315°10.10 -40°11.34
9	26°21.65	317°11.77 · · 39.17	332°31.69 · · 11.43	216°46.57 · · 55.05	351°44.75 · · 26.32	Menkar 314°3.54 4°12.03
10	41°24.11	332°15.83 38.37	347°32.30 11.88	231°48.91 54.99	6°46.94 26.40	Mirfak 308°24.70 49°57.57
11	$56^{\circ}26.58$	347°19.88 37.56	2°32.92 12.33	246°51.24 54.93	21°49.14 26.49	Aldebaran 290°36.78 16°33.88 Rigel 281°1.55 -8°10.22
12	71°29.04	2°23.94 N22°36.75	17°33.53 N19°12.78	261°53.58 N05°54.86	36°51.33 N11°26.58	Capella 280°18.26 46°1.49
13	86°31.51	17°27.99 35.94	32°34.15 13.23	276°55.91 54.80	51°53.53 26.66	Bellatrix 278°20.24 6°22.42
14 15	101°33.97	32°32.04 35.13 47°36.09 · 34.32	47°34.76 13.67	291°58.24 54.73 307°0.58 •• 54.67	66°55.72 26.75	Elnath 277°58.74 28°37.78
16	116° 36.43 131° 38.90	47°36.09 · · 34.32 62°40.14 33.51	62°35.38 ·· 14.12 77°35.99 14.57	307°0.58 · · 54.67 322°2.91 54.60	81°57.92 · · 26.83 97°0.11 26.92	Alnilam 275°35.25 -1°11.13
17	146°41.36	77°44.19 32.70	92°36.61 15.02	337° 5.24 54.54	112°2.31 27.01	Betelgeuse 270°49.42 7°24.63
18	161°43.83	92°48.24 N22°31.89	107°37.22 N19°15.46	352°7.58 N05°54.47	127°4.50 N11°27.09	Canopus 263°51.67 -52°42.81
19	176°46.29	107°52.29 31.08	122°37.84 15.91	7°9.91 54.41	142°6.70 27.18	Sirius 258°24.11 -16°45.47 Adhara 255°4.01 -29°0.83
20	191°48.75	122°56.33 30.27	137°38.45 16.36	22°12.24 54.34	157°8.89 27.27	Procyon 244°48.20 5°8.99
21	206°51.22	138°0.38 · · 29.46	152°39.07 · · 16.80	37°14.57 · · 54.28	172°11.09 · · 27.35	Pollux 243°14.23 27°57.39
22	221°53.68	153°4.42 28.64	167°39.68 17.25	52°16.91 54.21	187°13.28 27.44	Avior 234°13.96 -59°36.35
23	236° 56.15	168°8.47 27.83	182°40.29 17.69	67°19.24 54.14	202°15.48 27.52	Suhail 222°44.44 -43°33.17
Mer.	pass. 07:15	u4.1′ $d$ -0.8′ m-3.25	$ u 0.6' \ d0.5' \ m1.36$	$\nu 2.3' \ d$ -0.1' m-2.05	$ u 2.2' \ d0.1' \ { m m0.50}$	Miaplacidus 221°37.99 -69°50.40
						Alphard 217°45.16 -8°47.11
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.59 11°49.60
0	251°58.61	183°12.51 N22°27.02	197°40.91 N19°18.14	82°21.57 N05°54.08	217°17.67 N11°27.61	Dubhe 193°37.75 61°36.02 Denebola 182°22.07 14°24.74
1	$267^{\circ}1.07$	198°16.55 26.21	212°41.52 18.58	97°23.90 54.01	232°19.87 27.70	Gienah 175° 40.59 -17° 42.21
2	282°3.54	213°20.59 25.40	227° 42.14 19.03	112°26.23 53.95	247°22.06 27.78	Acrux 172°56.55 -63°15.77
3	297°6.00	228°24.63 · · 24.59	242°42.75 · · 19.47	127°28.56 · · 53.88	262°24.26 · · 27.87	Gacrux 171°48.18 -57°16.70
4 5	312°8.47 327°10.93	243°28.67 23.77 258°32.71 22.96	257° 43.37 19.92 272° 43.98 20.36	142°30.89 53.81 157°33.22 53.75	277°26.46 27.95 292°28.65 28.04	Alioth 166°10.36 55°48.47
6	342° 13.39	273°36.75 N22°22.15	287°44.59 N19°20.80	172°35.55 N05°53.68	307°30.85 N11°28.12	Spica 158°19.16 -11°18.73
7	357° 15.86	288° 40.78 21.34	302°45.21 21.24	187°37.88 53.61	322°33.04 28.21	Alkaid 152°49.55 49°10.38
8	12° 18.32	303°44.82 20.53	317°45.82 21.69	202°40.21 53.55	337°35.24 28.30	Hadar 148°31.44 -60°30.84 Menkent 147°53.99 -36°30.78
9	$27^{\circ}20.79$	318°48.85 · · 19.71	332°46.44 · · 22.13	217°42.54 · · 53.48	352°37.44 · · 28.38	Arcturus 145°45.13 19°2.05
10	42°23.25	333°52.88 18.90	347°47.05 22.57	232°44.86 53.41	7°39.63 28.47	Rigil Kent. 139°35.80 -60°57.37
11	57° 25.72	348°56.91 18.09	2°47.66 23.01	247°47.19 53.35	22°41.83 28.55	Kochab 137°19.02 74°2.40
12	72°28.18	4°0.94 N22°17.27	17°48.28 N19°23.45	262°49.52 N05°53.28	37°44.03 N11°28.64	Zuben'ubi 136°52.63 -16°9.69
13 14	87° 30.64 102° 33.11	19°4.97 16.46 34°9.00 15.65	32°48.89 23.89 47°49.50 24.33	277°51.85 53.21 292°54.18 53.14	52°46.22 28.72 67°48.42 28.81	Alphecca 126°1.07 26°37.15
15	117° 35.57	49°13.03 · · 14.84	62°50.12 · · 24.77	307°56.50 · · 53.08	82°50.62 · · 28.89	Antares 112°12.05 -26°29.70
16	132° 38.04	64°17.05 14.02	77°50.73 25.21	322°58.83 53.01	97°52.81 28.98	Atria 107°3.15 -69°4.63 Sabik 101°59.25 -15°45.57
17	$147^{\circ}40.50$	79°21.07 13.21	92°51.34 25.65	338°1.16 52.94	112°55.01 29.07	Sabik 101°59.25 -15°45.57 Shaula 96°6.18 -37°7.36
18	162°42.96	94°25.10 N22°12.40	107°51.96 N19°26.09	353°3.48 N05°52.87	127°57.21 N11°29.15	Rasalhague 95°55.64 12°32.37
19	177° 45.43	109°29.12 11.58	122°52.57 26.53	8° 5.81 52.81	142°59.40 29.24	Eltanin 90°40.37 51°29.04
20 21	192° 47.89 207° 50.36	124°33.14 10.77 139°37.15 • • 9.96	137°53.18 26.97 152°53.80 •• 27.41	23°8.13 52.74 38°10.46 • 52.67	158°1.60 29.32 173°3.80 •• 29.41	Kaus Aust. 83°28.47 -34°22.11
22	207 50.30 222° 52.82	154°41.17 9.14	167° 54.41 27.84	53°12.79 52.60	188° 5.99 29.49	Vega 80°30.95 38°48.54
23	237° 55.28	169°45.19 8.33	182°55.02 28.28	68°15.11 52.53	203°8.19 29.58	Nunki 75°44.02 -26°15.52
						Altair 61°57.01 8°56.64 Peacock 53°1.09 -56°38.26
ivier.	pass. 07:11	ν4.0' d-0.8' m-3.56	$\nu 0.6' \ d0.4' \ m1.37$	ν2.3' d-0.1' m-2.05	ν2.2' d0.1' m0.49	Deneb 49°23.61 45°22.77
	_					Enif 33°35.97 10°0.34
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.43 -46°49.06
0 1	252°57.75 268°0.21	184°49.20 N22°7.52 199°53.21 6.70	197°55.63 N19°28.72 212°56.25 29.16	83°17.44 N05°52.46 98°19.76 52.40	218°10.39 N11°29.66 233°12.59 29.75	Fomalhaut 15°11.52 -29°28.05
2	283°2.68	214° 57.22 5.89	212 56.25 29.16 227°56.86 29.59	113°22.08 52.33	248°14.78 29.83	Scheat 13°42.49 28°14.13
3	298°5.14	230°1.23 · · 5.08	242°57.47 · · 30.03	128°24.41 · · 52.26	263°16.98 · · 29.92	Markab 13°27.13 15°21.47
4	313°7.61	245°5.24 4.27	257° 58.08 30.46	143°26.73 52.19	278°19.18 30.00	Jun 02 Fri SHA Mer.pass
5	328° 10.07	260°9.25 3.45	272°58.70 30.90	158°29.06 52.12	293°21.38 30.09	Venus 290°35.77 11:50
6	343° 12.53	275°13.25 N22°2.64	287°59.31 N19°31.33	173°31.38 N05°52.05	308°23.58 N11°30.17	Mars 306°26.67 10:50
7	358° 15.00	290°17.26 1.83	302°59.92 31.77	188°33.70 51.98	323°25.77 30.26	Jupiter 190°26.08 18:31
8 9	13° 17.46 28° 19.93	305°21.26 1.01 320°25.26 22°0.20	318°0.53 32.20 333°1.15 · · 32.64	203°36.02 51.91 218°38.35 · · 51.84	338°27.97 30.34 353°30.17 · · 30.43	Saturn 325°25.53 09:33
10	43° 22.39	335°29.26 21°59.39	348°1.76 33.07	233°40.67 51.77	8°32.37 30.51	Jun 03 Sat SHA Mer.pass
11	58° 24.85	350°33.26 58.58	3°2.37 33.50	248°42.99 51.70	23°34.57 30.60	Venus 291°13.90 11:44
12	73°27.32	5°37.25 N21°57.76	18°2.98 N19°33.94	263°45.31 N05°51.63	38°36.76 N11°30.68	Mars 305° 42.30 10:49
13	88° 29.78	20°41.25 56.95	33°3.59 34.37	278°47.63 51.56	53°38.96 30.77	Jupiter 190°22.96 18:28 Saturn 325°19.06 09:29
14	103° 32.25	35°45.24 56.14	48° 4.21 34.80	293°49.96 51.49	68°41.16 30.85	
15	118°34.71	50°49.23 · · 55.33	63°4.82 · · 35.23	308°52.28 · · 51.42	83°43.36 · · 30.93	Jun 04 Sun SHA Mer.pass
16 17	133° 37.17 148° 39.64	65°53.22 54.51 80°57.21 53.70	78°5.43 35.66 93°6.04 36.10	323°54.60 51.35 338°56.92 51.28	98°45.56 31.02 113°47.76 31.10	Venus 291°51.45 11:38
18	163° 42.10	96°1.19 N21°52.89	108°6.65 N19°36.53	353°59.24 N05°51.21	128°49.95 N11°31.19	Mars 304°57.88 10:48 Jupiter 190°19.69 18:24
19	178° 44.57	111°5.18 52.08	123°7.26 36.96	9°1.56 51.14	143°52.15 31.27	Saturn 325°12.64 09:26
20	193°47.03	126°9.16 51.27	138°7.88 37.39	24°3.88 51.07	158°54.35 31.36	
21	208° 49.50	141°13.14 · · 50.46	153°8.49 · · 37.82	39°6.20 · · 51.00	173°56.55 · · 31.44	Horizontal parallax
22	223°51.96	156°17.12 49.65	168° 9.10 38.25	54°8.52 50.93	188°58.75 31.53	Venus: 0.5 Mars: 0.1
23	238° 54.42	171°21.10 48.84	183°9.71 38.68	69°10.83 50.86	204°0.95 31.61	IVIAIS: U.1
Mer.	pass. 07:07	$\nu$ 4.0′ d-0.8′ m-3.81	$ u 0.6' \ d0.4' \ m1.37$	$\nu 2.3' \ d$ -0.1' m-2.04	$\nu 2.2' \ d0.1' \ m0.49$	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.69	$N22^{\circ}13.55$	69°0.84	11.3'	S06°9.12	15.1'	59.1'
1	195°29.59	13.87	83°31.14	11.3'	06°24.18	15.0'	59.1'
2	210°29.49 225°29.39	14.19 •• 14.50	98°1.42 112°31.67	11.3' 11.2'	06°39.20 06°54.19	15.0' 14.9'	59.1' 59.1'
4	240°29.29	14.82	127°1.89	11.2	07°9.14	14.9'	59.1'
5	255°29.19	15.13	141°32.08	11.2'	07°24.05	14.9'	59.1'
6	270°29.09	N22°15.45	156°2.24	11.1'	S07°38.92	14.8'	59.1'
7	285°28.98	15.76	170°32.37	11.1'	07°53.74	14.8'	59.1'
8 9	300°28.88 315°28.78	16.08 •• 16.39	185°2.47 199°32.53	11.1' 11.0'	08°8.52 08°23.25	14.7' 14.7'	59.0' 59.0'
10	330°28.68	16.70	214°2.56	11.0'	08°37.94	14.6'	59.0'
11	345°28.58	17.01	228°32.55	11.0'	$08^{\circ}52.58$	14.6'	59.0'
12	0°28.48	N22°17.32	243°2.51	10.9'	S09°7.17	14.5'	59.0'
13 14	15°28.37 30°28.27	17.63 17.94	257°32.43 272°2.31	10.9' 10.8'	09°21.71 09°36.19	14.5' 14.4'	59.0' 59.0'
14 15	30 28.27 45°28.17	17.94	272 2.31 286°32.15	10.8	09°50.62	14.4	59.0'
16	60°28.07	18.55	301°1.95	10.8'	10°5.00	14.3'	59.0'
17	75°27.96	18.86	$315^{\circ}31.71$	10.7'	$10^{\circ}19.31$	14.3'	59.0'
18	90°27.86	N22°19.17	330°1.42	10.7'	\$10°33.57	14.2'	59.0'
19 20	105°27.76 120°27.66	19.47 19.78	344°31.10 359°0.73	10.6' 10.6'	10°47.77 11°1.91	14.1' 14.1'	59.0' 58.9'
21	135°27.55	20.08	13°30.31	10.5	11°15.99	14.1	58.9
22	150°27.45	20.38	27°59.85	10.5'	11°30.00	13.9'	58.9'
23	165°27.35	20.69	42°29.35	10.4'	11°43.95	13.9'	58.9'
	SD = 15.8'	d = 0.3'		SE	0 = 16.1'		
C L	СП.	Daa			Das	d	μг
Sat 0	<b>GHA</b> 180°27.24	<b>Dec</b> N22°20.99	<b>GHA</b> 56°58.79	u 10.4'	Dec 511°57.83	<i>d</i> 13.8'	<b>HP</b> 58.9'
1	195°27.14	21.29	71°28.19	10.4'	12°11.64	13.7'	58.9'
2	210°27.03	21.59	$85^{\circ}57.55$	10.3'	$12^{\circ}25.38$	13.7'	58.9'
3	225°26.93	• • 21.89	100°26.85	10.3'	12°39.05	13.6'	58.9'
4 5	240°26.83 255°26.72	22.19 22.49	114°56.10 129°25.30	10.2' 10.2'	12°52.65 13°6.18	13.5' 13.4'	58.9' 58.9'
6	270°26.62	N22°22.79	143°54.45	10.2	S13°19.63	13.4	58.8'
7	285°26.51	23.08	158°23.55	10.0'	13°33.00	13.3'	58.8'
8	300°26.41	23.38	172°52.59	10.0'	13°46.30	13.2'	58.8'
9	315°26.30	• • 23.68	187°21.59	9.9'	13°59.51	13.1'	58.8'
10 11	330°26.20 345°26.09	23.97 24.27	201°50.53 216°19.41	9.9' 9.8'	14°12.65 14°25.70	13.1' 13.0'	58.8' 58.8'
12	0°25.99	N22°24.56	230°48.24	9.8'	S14°38.67	12.9'	58.8'
13	15°25.88	24.85	$245^{\circ}17.02$	9.7'	$14^{\circ}51.55$	12.8'	58.8'
14	30°25.78	25.15	259°45.74	9.7'	15°4.35	12.7'	58.8'
15 16	45°25.67 60°25.56	· · 25.44 25.73	274°14.40 288°43.01	9.6' 9.6'	15°17.06 15°29.68	12.6' 12.5'	58.7' 58.7'
17	75°25.46	26.02	303°11.56	9.5'	15°42.21	12.4	58.7'
18	90°25.35	N22°26.31	317°40.05	9.4'	S15°54.64	12.3'	58.7'
19	105°25.25	26.60	332°8.49	9.4'	16°6.99	12.2'	58.7'
20	120°25.14	26.89	346°36.87	9.3'	16°19.24 16°31.39	12.2' 12.1'	58.7'
21 22	135°25.03 150°24.93	· · 27.18 27.46	1°5.19 15°33.45	9.3' 9.2'	16 31.39 16°43.45	12.1	58.7' 58.7'
23	165°24.82	27.75	30°1.65	9.1'	16°55.40	11.9'	58.6'
	SD = 15.8'	d = 0.3'		SE	0 = 16.1'		
_							
Sun 0	<b>GHA</b> 180°24.71	<b>Dec</b> N22°28.03	<b>GHA</b> 44°29.79	u  9.1'	Dec \$17°7.26	d 11.8'	<b>HP</b> 58.6'
1	195°24.60	28.32	58°57.88	9.1	17°19.01	11.7	58.6
2	210°24.50	28.60	73°25.90	9.0'	17°30.67	11.5'	58.6'
3	225°24.39	• • 28.89	87°53.87	8.9'	17°42.22	11.4'	58.6'
4 5	240°24.28 255°24.17	29.17 29.45	102°21.77 116°49.62	8.8' 8.8'	17°53.66 18°5.00	11.3' 11.2'	58.6' 58.6'
6	270°24.07	N22°29.74	131° 17.41	8.7'	\$18° 16.22	11.1	58.5
7	285°23.96	30.02	$145^{\circ}45.14$	8.7'	18°27.34	11.0'	58.5'
8	300°23.85	30.30	160°12.81	8.6'	18°38.35	10.9'	58.5'
9 10	315°23.74 330°23.63	· · 30.58 30.85	174°40.41 189°7.96	8.6' 8.5'	18°49.25 19°0.03	10.8' 10.7'	58.5' 58.5'
10	330 23.63 345°23.52	30.85	189 7.96 203°35.46	8.4	19 0.03 19°10.70	10.7	58.5'
12	0°23.42	N22°31.41	218°2.89	8.4'	\$19°21.25	10.4	58.5
13	15°23.31	31.69	232°30.26	8.3'	19°31.69	10.3'	58.4'
14	30°23.20	31.96	246°57.58	8.3'	19°42.00	10.2'	58.4'
15 16	45°23.09 60°22.98	· · 32.24 32.51	261°24.83 275°52.03	8.2' 8.1'	19°52.20 20°2.28	10.1' 10.0'	58.4' 58.4'
17	75°22.87	32.51	275 52.03 290°19.17	8.1	20° 2.20 20° 12.23	9.8'	58.4'
18	90°22.76	N22°33.06	304°46.26	8.0'	S20°22.07	9.7'	58.4'
19	105°22.65	33.33	319°13.28	8.0'	20°31.78	9.6'	58.3'
20 21	120°22.54 135°22.43	33.61 •• 33.88	333°40.25 348°7.17	7.9' 7.9'	20°41.36 20°50.81	9.5' 9.3'	58.3' 58.3'
21 22	135°22.43 150°22.32	· · 33.88 34.15	348° 7.17 2° 34.03	7.9′ 7.8′	20°50.81 21°0.14	9.3' 9.2'	58.3' 58.3'
23	165°22.21	34.42	17°0.83	7.8'	21°9.34	9.1'	58.3
	SD = 15.8'	d = 0.3'		SE	0 = 16.0'		

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

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

	1					
		Sun	Moon			
Day	Eqn.of Time   Mer. Mer.Pass.		Pass.	Age		
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	69-87%
02	01:59	01:54	11:58	20:04	07:39	
03	01:49	01:44	11:58	20:55	08:30	
04	01:39	01:34	11:58	21:49	09:22	

h	Aries	Venus	Mars	Jupiter	Saturn	
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	253°56.89	186°25.07 N21°48.02	198°10.32 N19°39.11	84°13.15 N05°50.79	219°3.15 N11°31.69	
1	268° 59.35	201°29.04 47.21	213° 10.93 39.53	99°15.47 50.72	234°5.35 31.78	Alpheratz
2	$284^{\circ}1.82$	216°33.02 46.40	228°11.54 39.96	114°17.79 50.64	249°7.55 31.86	Ankaa
3	299°4.28	231°36.99 · · 45.59	243°12.15 · · 40.39	129°20.11 · · 50.57	264°9.75 · · 31.95	Schedar 3 Diphda 3
4	$314^{\circ}6.74$	246°40.95 44.78	258°12.76 40.82	144°22.42 50.50	279°11.95 32.03	Achernar 3
5	329°9.21	261°44.92 43.97	273°13.38 41.25	159°24.74 50.43	294°14.14 32.11	Hamal 3
6	344° 11.67	276°48.88 N21°43.16	288°13.99 N19°41.67	174°27.06 N05°50.36	309°16.34 N11°32.20	Polaris
7	359° 14.14	291°52.84 42.36	303°14.60 42.10	189°29.37 50.29	324°18.54 32.28	Acamar
8	14° 16.60	306°56.81 41.55	318° 15.21 42.52	204°31.69 50.21	339°20.74 32.37	Menkar
9	29° 19.07	322°0.76 · · 40.74	333°15.82 · · 42.95	219°34.01 · · 50.14	354°22.94 · · 32.45	Mirfak 3
10 11	44°21.53 59°23.99	337°4.72 39.93 352°8.67 39.12	348°16.43 43.38 3°17.04 43.80	234°36.32 50.07 249°38.64 50.00	9°25.14 32.53 24°27.34 32.62	Aldebaran 2
12	74° 26.46	7°12.63 N21°38.31	18°17.65 N19°44.23	264°40.95 N05°49.92	39°29.54 N11°32.70	Rigel
13	89°28.92	22°16.58 37.51	33°18.26 44.65	279°43.27 49.85	54°31.74 32.79	Capella 2
14	104°31.39	37°20.52 36.70	48° 18.87 45.08	294°45.58 49.78	69°33.94 32.87	Bellatrix 2
15	119°33.85	52°24.47 · · 35.89	63°19.48 · · 45.50	309°47.90 · · 49.71	84°36.14 · · 32.95	Elnath 2
16	134°36.31	67°28.41 35.08	78°20.09 45.92	324°50.21 49.63	99°38.34 33.04	Alnilam 2
17	$149^{\circ}38.78$	82°32.36 34.28	93°20.70 46.35	339°52.53 49.56	114°40.54 33.12	Betelgeuse 2
18	164°41.24	97°36.30 N21°33.47	108°21.31 N19°46.77	354°54.84 N05°49.49	129°42.75 N11°33.20	Canopus 2
19	179°43.71	112°40.23 32.67	123°21.92 47.19	9°57.16 49.41	144°44.95 33.29	Adhara
20	194°46.17	127° 44.17 31.86	138° 22.53 47.61	24°59.47 49.34	159°47.15 33.37	Procyon 2
21	209°48.64	142°48.10 · · 31.05	153°23.14 · · 48.04	40°1.78 · · 49.27	174°49.35 · · 33.46	Pollux
22	224°51.10	157°52.03 30.25	168° 23.75 48.46	55° 4.09 49.19	189°51.55 33.54	Avior 2
23	239°53.56	172°55.96 29.45	183°24.36 48.88	70°6.41 49.12	204°53.75 33.62	Suhail 2
Mer.ı	pass. 07:03	$\nu$ 4.0′ <i>d</i> -0.8′ m-3.99	$ u 0.6' \ d0.4' \ m1.38$	$\nu$ 2.3′ <i>d</i> -0.1′ m-2.03	$ u 2.2' \ d0.1' \ { m m0.49}$	Miaplacidus 2
						Alphard 2
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus
0	254° 56.03	187°59.89 N21°28.64	198°24.97 N19°49.30	85°8.72 N05°49.05	219°55.95 N11°33.71	Dubhe 1 Denebola 1
1	269°58.49	203°3.81 27.84	213°25.58 49.72	100°11.03 48.97	234°58.15 33.79	Gienah
2	285°0.96	218°7.74 27.03	228°26.19 50.14	115°13.34 48.90	250°0.35 33.87	Acrux
3	300°3.42	233°11.66 · · 26.23	243°26.80 · · 50.56	130°15.66 · · 48.82	265°2.55 · · 33.96	Gacrux
4	315°5.89	248° 15.58 25.43	258° 27.41 50.98	145°17.97 48.75	280°4.75 34.04	Alioth
5	330°8.35	263°19.49 24.63	273°28.02 51.40	160°20.28 48.68	295°6.96 34.12	Spica :
6 7	345° 10.81 0° 13.28	278°23.40 N21°23.82 293°27.32 23.02	288°28.63 N19°51.82 303°29.24 52.23	175°22.59 N05°48.60 190°24.90 48.53	310°9.16 N11°34.21 325°11.36 34.29	Alkaid :
8	15° 15.74	308°31.22 22.22	303°29.24 52.23 318°29.84 52.65	190°24.90 48.53 205°27.21 48.45	340°13.56 34.29	Hadar :
9	30° 18.21	323°35.13 · · 21.42	333°30.45 · · 53.07	220°29.52 · · 48.38	355°15.76 · · 34.45	Menkent :
10	45° 20.67	338°39.04 20.62	348° 31.06 53.49	235°31.83 48.30	10°17.96 34.54	Arcturus
11	60°23.13	353°42.94 19.82	3°31.67 53.91	250°34.14 48.23	25°20.17 34.62	Rigil Kent.
12	75°25.60	8°46.84 N21°19.02	18°32.28 N19°54.32	265°36.45 N05°48.15	40°22.37 N11°34.70	Kochab : Zuben'ubi :
13	90°28.06	23°50.73 18.22	33°32.89 54.74	280°38.76 48.08	55°24.57 34.79	Alphecca
14	$105^{\circ}30.53$	38°54.63 17.43	48°33.50 55.15	295°41.07 48.00	70°26.77 34.87	Antares
15	120°32.99	53°58.52 · · 16.63	63°34.11 · · 55.57	310°43.37 · · 47.93	85°28.97 · · 34.95	Atria
16	135° 35.46	69°2.41 15.83	78° 34.72 55.99	325°45.68 47.85	100°31.18 35.03	Sabik :
17	150° 37.92	84°6.30 15.03	93°35.32 56.40	340°47.99 47.78	115°33.38 35.12	Shaula
18 19	165° 40.38 180° 42.85	99°10.18 N21°14.24 114°14.06 13.44	108°35.93 N19°56.82 123°36.54 57.23	355°50.30 N05°47.70 10°52.61 47.63	130°35.58 N11°35.20 145°37.78 35.28	Rasalhague
20	100 42.05 195° 45.31	129°17.94 12.64	123° 36.54 57.23 138° 37.15 57.64	10°52.61 47.63 25°54.91 47.55	160°39.99 35.37	Eltanin
21	210° 47.78	144°21.82 · · 11.85	153°37.76 · · 58.06	40°57.22 · · 47.47	175°42.19 · · 35.45	Kaus Aust.
22	225° 50.24	159°25.70 11.06	168° 38.37 58.47	55°59.53 47.40	190°44.39 35.53	Vega
23	240°52.71	174°29.57 10.26	183°38.97 58.88	71°1.83 47.32	205°46.59 35.61	Nunki
	pass. 06:59	ν3.9' d-0.8' m-4.09	ν0.6' d0.4' m1.38	ν2.3' d-0.1' m-2.03	ν2.2' d0.1' m0.49	Altair Peacock
ivier.	pass. 00:59	ν <sub>3.9</sub> α-0.6 m-4.09	νο.ο αυ.4 m1.36	ν2.3 <i>a</i> -0.1 m-2.03	ν2.2 d0.1 m0.49	Deneb
						Enif
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir
0	255°55.17	189°33.44 N21°9.47	198°39.58 N19°59.30	86° 4.14 N05° 47.24	220°48.80 N11°35.70	Fomalhaut
1	270° 57.63	204°37.31 8.67	213°40.19 19°59.71 228°40.80 20°0.12	101°6.44 47.17	235°51.00 35.78	Scheat
2	286°0.10 301°2.56	219°41.17 7.88		116°8.75 47.09 131°11.06 •• 47.01	250°53.20 35.86	Markab
3 4	301 2.56 316°5.03	234°45.03 · · 7.09 249°48.89 6.30	243°41.41 · · 0.53 258°42.01 0.94	131°11.06 · · 47.01 146°13.36 46.94	265°55.40 · · 35.94 280°57.61 36.03	Jun 05 Mon
5	310 5.03 331°7.49	264° 52.75 5.51	273° 42.62 1.35	161°15.67 46.86	295°59.81 36.11	Venus 2
6	346°9.95	279°56.60 N21°4.72	288° 43.23 N20° 1.76	176°17.97 N05°46.78	311°2.01 N11°36.19	Mars 3
7	1°12.42	295°0.46 3.93	303°43.84 2.18	191°20.28 46.71	326°4.22 36.27	Jupiter
8	16° 14.88	310°4.31 3.14	318° 44.44 2.59	206°22.58 46.63	341°6.42 36.36	Saturn
9	$31^{\circ}17.35$	325°8.15 · · 2.35	333°45.05 · · 2.99	221°24.88 · · 46.55	356°8.62 · · 36.44	1 OC T
10	$46^{\circ}19.81$	340°12.00 1.56	348°45.66 3.40	236°27.19 46.48	11°10.83 36.52	Jun 06 Tue Venus
11	61°22.28	355° 15.84 0.78	3°46.27 3.81	251°29.49 46.40	26°13.03 36.60	Mars 3
12	76°24.74	10°19.67 N20°59.99	18°46.87 N20°4.22	266°31.79 N05°46.32	41°15.24 N11°36.68	Jupiter
13	91°27.20	25°23.51 20°59.20	33° 47.48 4.63	281°34.10 46.24	56°17.44 36.77	Saturn
14 15	106° 29.67	40°27.34 58.42	48° 48.09 5.04	296°36.40 46.16	71°19.64 36.85	
15 16	121° 32.13 136° 34.60	55°31.17 · · 57.63 70°35.00 56.85	63°48.70 · · 5.44 78°49.30 5.85	311°38.70 · · 46.09 326°41.00 46.01	86°21.85 · · 36.93 101°24.05 37.01	Jun 07 Wed
17	150 34.00 151°37.06	85°38.83 56.07	93°49.91 6.26	341°43.31 45.93	116°26.26 37.09	Venus 2 Mars 3
18	166°39.53	100°42.65 N20°55.28	108°50.52 N20°6.67	356°45.61 N05°45.85	131°28.46 N11°37.18	Jupiter
19	181°41.99	115°46.47 54.50	123°51.12 7.07	11°47.91 45.77	146°30.66 37.26	Saturn
20	196°44.45	130°50.28 53.72	138°51.73 7.48	26°50.21 45.70	161°32.87 37.34	
21	211°46.92	145°54.10 · · 52.94	153°52.34 · · 7.88	41°52.51 · · 45.62	176°35.07 · · 37.42	Horizonta
22	226°49.38	160°57.91 52.16	168° 52.94 8.29	56°54.81 45.54	191°37.28 37.50	
23	241°51.85	176°1.71 51.38	183°53.55 8.69	71°57.11 45.46	206°39.48 37.58	
Mer.	pass. 06:55	u3.9′ <i>d</i> -0.8′ m-4.10	$ u 0.6' \ d0.4' \ m1.38$	$\nu$ 2.3′ <i>d</i> -0.1′ m-2.02	$ u 2.2' \ d0.1' \ \text{m}0.49$	

	SHA	Dec
Alpheratz	357°31.95	29°14.75
Ankaa	353° 4.64	-42°8.81
Schedar	349°27.99	56°41.40
Diphda	348°44.69	-17°49.69
Achernar	335°18.61	-57°5.27
Hamal	327°48.29	23°35.72
	312°57.88	89°22.78
Polaris	312 57.88 315°10.09	-40°11.32
Acamar	315 10.09 314° 3.53	4°12.03
Menkar		
Mirfak	308°24.67	49°57.57
Aldebaran	290°36.77	16°33.88
Rigel	281°1.54	-8°10.22
Capella	280°18.25	46°1.48
Bellatrix	278°20.24	6°22.42
Elnath	277°58.73	28°37.77
Alnilam	275°35.25	-1°11.13
Betelgeuse	270°49.41	$7^{\circ}24.63$
Canopus	263°51.68	-52°42.80
Sirius	258°24.11	-16°45.46
Adhara	255°4.02	-29°0.83
Procyon	244°48.21	5°8.99
Pollux	243°14.23	27°57.39
Avior	234°13.98	-59°36.35
Suhail	222°44.45	-43°33.17
Miaplacidus	221°38.03	-69°50.40
Alphard	217°45.17	-8°47.11
Regulus	207°31.60	11°49.60
Dubhe	193°37.78	61°36.02
Denebola	182°22.08	14°24.74
Gienah	175°40.60	-17°42.21
Acrux	172°56.57	-63°15.78
Gacrux	171°48.20	-57°16.71
Alioth	166° 10.38	55°48.48
Spica	158° 19.16	-11°18.73
Alkaid	150° 19.10 152° 49.57	49°10.39
Hadar	152 49.57 148°31.44	-60°30.85
Menkent	146 31.44 147°53.99	-36°30.78
Arcturus	145°45.13	19°2.06
Rigil Kent.	139°35.80	-60°57.38
Kochab	137°19.06	74°2.41
Zuben'ubi	136°52.63	-16°9.69
Alphecca	126° 1.07	26°37.16
Antares	112°12.04	-26°29.70
Atria	107°3.13	-69°4.64
Sabik	101°59.24	-15°45.56
Shaula	96°6.17	-37°7.36
Rasalhague	95°55.63	$12^{\circ}32.38$
Eltanin	90°40.36	51°29.06
Kaus Aust.	83°28.45	-34°22.11
Vega	80°30.93	38°48.56
Nunki	75°44.00	-26°15.52
Altair	61°56.99	8°56.65
Peacock	53°1.05	-56°38.26
Deneb	49°23.58	45°22.79
Enif	33°35.94	10°0.36
Al Na'ir	27°29.40	-46°49.05
Fomalhaut	15°11.49	-29°28.04
Scheat	13°42.46	28°14.14
Markab	13°27.11	15°21.48
Jun 05 Mon	SHA	Mer.pass
Venus	292°28.18	11:31
Mars	$304^{\circ}13.43$	10:47
Jupiter	190°16.26	18:20
Saturn	325°6.26	09:22
	6114	
Jun 06 Tue	SHA	Mer.pass
Venus	293°3.86	11:25
Mars	303°28.94	10:46
Jupiter	190°12.69	18:17
Saturn	324°59.92	09:19
Jun 07 Wed	SHA	Mer.pass
Venus	293°38.27	11:19
Mars	302°44.41	10:45
Jupiter	190°8.97	10:45
•	190°8.97 324°53.63	
Saturn	3∠4 53.03	09:15
Horizor	ıtal parallax	
	Venus:	0.5
	Mars:	0.1

Stars

SHA

Dec

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.10	N22°34.69	31°27.58	7.7'	S21°18.41	8.9'	58.3'
1 2	195°21.99 210°21.88	34.96 35.22	45°54.28 60°20.93	7.6' 7.6'	21°27.35 21°36.16	8.8' 8.7'	58.2' 58.2'
3	225°21.77	• • 35.49	74°47.52	7.5	21°44.83	8.5'	58.2'
4	240°21.66	35.76	89°14.06	7.5'	21°53.37	8.4'	58.2'
5	255°21.55	36.02	103°40.55	7.4'	22°1.78	8.3'	58.2'
6 7	270°21.44 285°21.32	N22°36.29 36.55	118°6.99 132°33.38	7.4' 7.3'	\$22°10.05 22°18.18	8.1' 8.0'	58.1' 58.1'
8	300°21.21	36.82	146°59.72	7.3'	22°26.17	7.9'	58.1'
9	$315^{\circ}21.10$	• • 37.08	161°26.02	7.2'	$22^{\circ}34.03$	7.7'	58.1'
10	330°20.99 345°20.88	37.34	175°52.27 190°18.47	7.2' 7.2'	22°41.74 22°49.32	7.6'	58.1'
11 12	0°20.77	37.60 N22°37.87	204°44.63	7.1	\$22°56.75	7.4' 7.3'	58.0' 58.0'
13	15° 20.65	38.13	219°10.75	7.1'	23°4.04	7.1'	58.0'
14	30°20.54	38.39	233°36.82	7.0'	23°11.18	7.0'	58.0'
15 16	45°20.43 60°20.32	· · 38.64 38.90	248°2.86 262°28.85	7.0' 7.0'	23°18.18 23°25.04	6.9' 6.7'	58.0' 57.9'
17	75° 20.20	39.16	276°54.80	6.9'	23°31.75	6.6'	57.9'
18	90°20.09	N22°39.42	291°20.72	6.9'	S23°38.31	6.4'	57.9'
19	105°19.98	39.67	305°46.60	6.8'	23°44.73	6.3'	57.9'
20 21	120° 19.86 135° 19.75	39.93 •• 40.18	320°12.45 334°38.26	6.8' 6.8'	23°51.00 23°57.12	6.1' 6.0'	57.9' 57.8'
22	150° 19.64	40.18	349° 4.04	6.7'	24°3.09	5.8'	57.8'
23	165° 19.52	40.69	3°29.78	6.7'	24°8.91	5.7'	57.8'
	SD = 15.8'	d = 0.3'		SI	D = 15.9'		
_							
Tue 0	<b>GHA</b> 180° 19.41	Dec N22°40.94	<b>GHA</b> 17°55.50	u  6.7'	Dec 524° 14.58	<i>d</i> 5.5'	<b>HP</b> 57.8'
1	195° 19.30	41.20	32°21.19	6.7'	24° 20.09	5.4'	57.8'
2	210° 19.18	41.45	46°46.85	6.6'	24°25.46	5.2'	57.7'
3	225° 19.07	• • 41.70	61°12.49	6.6'	24°30.67	5.1'	57.7'
4 5	240° 18.96 255° 18.84	41.95 42.20	75°38.10 90°3.69	6.6' 6.6'	24°35.73 24°40.64	4.9' 4.8'	57.7' 57.7'
6	270° 18.73	N22°42.45	104°29.26	6.6'	S24°45.39	4.6'	57.7'
7	285° 18.61	42.70	118°54.81	6.5'	24°49.99	4.4'	57.6'
8	300° 18.50 315° 18.38	42.94	133°20.35 147°45.86	6.5'	24°54.44 24°58.72	4.3'	57.6'
9 10	315 18.38 330° 18.27	· · 43.19 43.44	147 45.86 162°11.36	6.5' 6.5'	24 58.72 25°2.86	4.1' 4.0'	57.6' 57.6'
11	345° 18.15	43.68	176°36.85	6.5'	25°6.84	3.8'	57.5'
12	0°18.04	N22°43.92	191°2.33	6.5'	S25°10.66	3.7'	57.5'
13 14	15°17.92 30°17.81	44.17 44.41	205°27.80 219°53.26	6.5' 6.5'	25°14.32 25°17.83	3.5' 3.4'	57.5' 57.5'
15	45° 17.69	• • 44.65	234°18.71	6.4	25°21.18	3.4	57.5'
16	$60^{\circ}17.58$	44.90	248°44.16	6.4'	$25^{\circ}24.38$	3.0'	57.4'
17	75°17.46 90°17.35	45.14 N22°45.38	263°9.61 277°35.05	6.4	25°27.41	2.9'	57.4
18 19	90°17.35 105°17.23	N22 45.38 45.62	277°35.05 292°0.50	6.4' 6.4'	\$25°30.29 25°33.02	2.7' 2.6'	57.4' 57.4'
20	120° 17.11	45.86	306°25.94		25°35.58	2.4'	57.3'
21	135° 17.00	• • 46.09	320°51.39	6.5'	25°37.99	2.3'	57.3'
22 23	150° 16.88 165° 16.77	46.33 46.57	335°16.85 349°42.32	6.5' 6.5'	25°40.24 25°42.33	2.1' 1.9'	57.3' 57.3'
23						1.9	31.3
	SD = 15.8'	d = 0.3'		51	O = 15.8'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180° 16.65	N22°46.81	4°7.79	6.5'	\$25°44.27	1.8'	57.2'
1 2	195° 16.53 210° 16.42	47.04 47.28	18°33.28 32°58.78	6.5' 6.5'	25°46.05 25°47.67	1.6' 1.5'	57.2' 57.2'
3	210 10.42 225°16.30	• • 47.51	47°24.29	6.5	25°49.13	1.3'	57.2'
4	$240^{\circ}16.18$	47.74	61°49.82	6.5'	25°50.44	1.1'	57.1'
5	255° 16.06	47.98 N22°48.21	76°15.37 90°40.94	6.6'	25°51.58 \$25°52.58	1.0'	57.1'
6 7	270° 15.95 285° 15.83	N22°48.21 48.44	90°40.94 105°6.53	6.6' 6.6'	25°52.58 25°53.41	0.8' 0.7'	57.1' 57.1'
8	300° 15.71	48.67	119°32.14	6.6'	25°54.09	0.5'	57.0'
9	315° 15.59	• • 48.90	133°57.78	6.7'	25°54.62	0.4'	57.0'
10 11	330° 15.48 345° 15.36	49.13 49.36	148°23.44 162°49.14	6.7' 6.7'	25°54.98 25°55.20	0.2' 0.1'	57.0' 57.0'
12	0° 15.24	N22°49.59	102 49.14 177°14.86	6.8'	\$25°55.26	-0.1	57.0'
13	15° 15.12	49.81	191°40.62	6.8'	25°55.16	-0.3'	56.9'
14 15	30°15.00	50.04	206° 6.41	6.8'	25°54.91	-0.4'	56.9'
15 16	45°14.89 60°14.77	· · 50.27 50.49	220°32.24 234°58.10	6.9' 6.9'	25°54.51 25°53.95	-0.6' -0.7'	56.9' 56.9'
17	75° 14.65	50.71	249°24.00	6.9'	25°53.24	-0.7	56.8
18	90°14.53	N22°50.94	263°49.95	7.0'	S25°52.38	-1.0'	56.8'
19 20	105° 14.41 120° 14.29	51.16 51.38	278°15.93 292°41.96	7.0' 7.1'	25°51.36 25°50.20	-1.2' -1.3'	56.8' 56.8'
21	120 14.29 135°14.17	51.38	307°8.04	7.1 7.1'	25° 48.88	-1.5'	56.7'
22	150°14.06	51.83	321°34.16	7.2'	25°47.42	-1.6'	56.7'
23	165°13.94	52.05	336° 0.33	7.2'	25°45.81	-1.8'	56.7'
	SD = 15.8'	d = 0.2'		SI	O = 15.6'		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
	Naut.	Civil			Civil	Naut.
N 72°						
<b>N</b> 70°						
68°						
66°	////	////	00:47	23:15	////	////
64°	////	////	01:46	22:14	////	////
62°	////	////	02:18	21:40	////	////
60°	////	01:11	02:42	21:16	22:49	////
N 58°	////	01:51	03:01	20:57	22:08	////
56° 54°	////	02:17	03:17	20:41	21:41	////
54° 52°	01:05	02:38	03:31	20:28	21:20	22:55
50°	01:42 02:06	02:55 03:09	03:42 03:53	20:16 20:05	21:04 20:49	22:17 21:52
45°	02:49	03:37	03:33	19:44	20:49	21:09
N 40°	03:18	03:59	04:31	19:26	19:59	20:40
35°	03:40	03.39	04:31	19:20	19:39	20:40
30°	03:58	04:17	04:59	18:59	19:41	20:10
20°	04:26	04:55	05:20	18:38	19:02	19:31
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:07	05:33	05:55	18:02	18:25	18:51
<b>S</b> 10°	05:23	05:49	06:12	17:46	18:08	18:34
20°	05:39	06:06	06:30	17:28	17:51	18:19
30°	05:54	06:24	06:50	17:07	17:33	18:03
35°	06:03	06:34	07:02	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:46
45°	06:22	06:59	07:32	16:25	16:59	17:36
<b>S</b> 50°	06:33	07:14	07:52	16:05	16:43	17:25
52°	06:38	07:21	08:01	15:56	16:36	17:20
54° 56°	06:43	07:29	08:12	15:45	16:28	17:14
50°	06:49 06:55	07:38 07:47	08:24 08:38	15:33 15:19	16:20 16:10	17:08 17:02
<b>S</b> 60°	07:02	07:58	08:54	15:03	15:59	16:55
		Moonris	se .		Moonse	t
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
<b>N</b> 72°						
N 70°	_					
68°						
66°	01.00	00.14		00.10	00.15	00.00
64° 62°	21:08 20:28	23:14 22:00	22:59	00:19 00:44	00:15 00:55	00:08 01:23
60°	20:28	21:25	22:24	01:03	01:23	01:59
N 58°	19:40	20:59	21:58	01:19	01:44	02:25
56°	19:40	20:38	21:37	01:19	02:02	02:25
54°	19:08	20:21	21:20	01:45	02:17	03:02
52°	18:55	20:07	21:06	01:56	02:30	03:17
50°	18:44	19:54	20:53	02:05	02:42	03:30
45°	18:20	19:28	20:27	02:25	03:06	03:56
N 40°	18:02	19:08	20:06	02:41	03:25	04:17
35°	17:46	18:51	19:49	02:55	03:41	04:34
30°	17:33	18:36	19:34	03:07	03:55	04:49
20°	17:10	18:11	19:08	03:28	04:19	05:14
N 10° 0°	16:50 16:32	17:49 17:29	18:47 18:26	03:46 04:03	04:40 04:59	05:36 05:57
<b>S</b> 10°						
	16:14 15:54	17:09 16:48	18:06 17:44	04:19 04:38	05:18 05:39	06:17 06:39
	15:54	16:48	17:44 17:19	04:58	06:03	06:39
20° 30°	l	16:08	17:19	05:11	06:03	07:04
30°	15.19				UU. 1	01.19
	15:19 15:04	15:52	16:47	05:25	06:34	07:36
30° 35°	l .			05:25 05:42	06:34 06:53	07:36 07:57
30° 35° 40° 45°	15:04	15:52	16:47			
30° 35° 40°	15:04 14:46	15:52 15:32	16:47 16:26	05:42	06:53	07:57
30° 35° 40° 45° <b>S</b> 50°	15:04 14:46 14:24	15:52 15:32 15:07	16:47 16:26 16:00	05:42 06:03	06:53 07:18	07:57 08:23

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
_ Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-100%
05	01:28	01:23	11:59	22:45	10:17	
06	01:18	01:12	11:59	23:43	11:14	
07	01:07	01:01	11:59	-:-	12:11	

14:55

14:29

06:52

08:18

08:41

09:28

09:53

14:06

13:42

58°

**S**  $60^{\circ}$ 

13:34

13:15

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	256° 54.31	191°5.52 N20°50.60	198°54.16 N20°9.10	86°59.41 N05°45.38	221°41.69 N11°37.67	
1	271°56.77	206°9.32 49.82	213°54.76 9.50	102° 1.71 45.30	236°43.89 37.75	Alpheratz 357°31.92 29°14.76
2	286°59.24	221°13.12 49.04	228°55.37 9.91	117° 4.01 45.22	251°46.10 37.83	Ankaa 353°4.61 -42°8.79 Schedar 349°27.95 56°41.40
3	$302^{\circ}1.70$	236°16.92 · · 48.27	243°55.98 · · 10.31	132°6.31 · · 45.14	266°48.30 · · 37.91	Schedar 349°27.95 56°41.40 Diphda 348°44.66 -17°49.68
4	317°4.17	251°20.71 47.49	258°56.58 10.71	147°8.61 45.06	281°50.51 37.99	Achernar 335°18.58 -57°5.26
5	332°6.63	266°24.50 46.72	273°57.19 11.11	162°10.91 44.98	296°52.71 38.07	Hamal 327°48.26 23°35.72
6 7	347°9.10 2°11.56	281°28.29 N20°45.94 296°32.07 45.17	288°57.80 N20°11.52 303°58.40 11.92	177°13.21 N05°44.91 192°15.51 44.83	311°54.92 N11°38.15 326°57.12 38.24	Polaris 312°56.71 89°22.77
8	17° 14.02	311°35.85 44.39	318° 59.01 12.32	207°17.80 44.75	341°59.33 38.32	Acamar 315°10.07 -40°11.31
9	32° 16.49	326°39.63 · · 43.62	333°59.61 · · 12.72	222°20.10 · · 44.67	357°1.53 · · 38.40	Menkar 314°3.51 4°12.04
10	47° 18.95	341°43.41 42.85	349°0.22 13.12	237°22.40 44.59	12°3.74 38.48	Mirfak 308°24.65 49°57.56
11	$62^{\circ}21.42$	356° 47.18 42.08	4°0.83 13.52	252°24.70 44.51	27°5.94 38.56	Aldebaran 290°36.75 16°33.89 Rigel 281°1.53 -8°10.21
12	77°23.88	11°50.95 N20°41.31	19°1.43 N20°13.92	267°26.99 N05°44.43	42°8.15 N11°38.64	Capella 280°18.23 46°1.47
13	92°26.35	26°54.72 40.54	34°2.04 14.32	282°29.29 44.35	57°10.36 38.72	Bellatrix 278°20.23 6°22.43
14 15	107°28.81	41°58.48 39.77 57°2.24 · · 39.00	49°2.64 14.72	297°31.59 44.27	72°12.56 38.80 87°14.77 · · 38.89	Elnath 277°58.72 28°37.77
16	122°31.27 137°33.74	57°2.24 · · 39.00 72°6.00 38.24	64°3.25 · · 15.12 79°3.86	312°33.88 · · 44.18 327°36.18	87°14.77 · · 38.89 102°16.97 38.97	Alnilam 275°35.24 -1°11.12
17	152° 36.20	87°9.75 37.47	94°4.46 15.92	342°38.47 44.02	117°19.18 39.05	Betelgeuse 270°49.40 7°24.63
18	167°38.67	102°13.50 N20°36.70	109°5.07 N20°16.32	357°40.77 N05°43.94	132°21.39 N11°39.13	Canopus 263°51.68 -52°42.78
19	182°41.13	117°17.25 35.94	124°5.67 16.72	12°43.07 43.86	147°23.59 39.21	Sirius 258°24.11 -16°45.46
20	197°43.59	132°21.00 35.18	139°6.28 17.11	27°45.36 43.78	162°25.80 39.29	Adhara 255°4.01 -29°0.82 Procyon 244°48.20 5°8.99
21	212°46.06	147°24.74 · · 34.41	154°6.88 · · 17.51	42°47.66 · · 43.70	177°28.00 · · 39.37	Pollux 243°14.23 27°57.38
22	227°48.52	162°28.48 33.65	169°7.49 17.91	57°49.95 43.62	192°30.21 39.45	Avior 234°13.99 -59°36.34
23	242°50.99	177°32.21 32.89	184°8.09 18.30	72°52.24 43.54	207°32.42 39.53	Suhail 222°44.46 -43°33.16
Mer.	pass. 06:51	$\nu$ 3.8′ d-0.8′ m-4.03	$\nu$ 0.6′ $d$ 0.4′ $m$ 1.39	$\nu$ 2.3′ d-0.1′ m-2.01	$\nu 2.2' \ d0.1' \ m0.49$	Miaplacidus 221°38.06 -69°50.39
	<u> </u>					Alphard 217°45.17 -8°47.11
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.60 11°49.60
0	257° 53.45	192°35.94 N20°32.13	199°8.70 N20°18.70	87°54.54 N05°43.46	222°34.62 N11°39.61	Dubhe 193°37.80 61°36.02
1	272°55.92	207°39.67 31.37	214°9.30 19.10	102°56.83 43.37	237°36.83 39.69	Denebola 182°22.08 14°24.74
2	287° 58.38	222°43.40 30.61	229°9.91 19.49	117°59.13 43.29	252°39.04 39.78	Gienah 175°40.60 -17°42.21 Acrux 172°56.59 -63°15.79
3	303°0.84	237°47.12 · · 29.85	244°10.51 · · 19.89	133°1.42 · · 43.21	267°41.25 · · 39.86	Gacrux 172 50.59 -03 15.79
4	318°3.31	252°50.84 29.09	259°11.12 20.28	148° 3.71 43.13	282°43.45 39.94	Alioth 166°10.40 55°48.48
5	333°5.77	267° 54.56 28.34	274°11.72 20.68	163°6.01 43.05	297°45.66 40.02	Spica 158°19.16 -11°18.73
6	348°8.24	282°58.27 N20°27.58	289°12.33 N20°21.07	178°8.30 N05°42.97	312°47.87 N11°40.10	Alkaid 152°49.57 49°10.40
7 8	3°10.70 18°13.17	298°1.98 26.83 313°5.69 26.07	304°12.93 21.46 319°13.54 21.86	193°10.59 42.88 208°12.88 42.80	327°50.07 40.18 342°52.28 40.26	Hadar 148°31.44 -60°30.86
9	33° 15.63	313°5.69 26.07 328°9.39 •• 25.32	319°13.54 21.86 334°14.14 · · · 22.25	206 12.66 42.60 223°15.17 · · 42.72	357°54.49 · · 40.34	Menkent 147°53.98 -36°30.79
10	48° 18.09	343°13.09 24.57	349°14.75 22.64	238°17.47 42.64	12°56.70 40.42	Arcturus 145°45.13 19°2.07
11	63°20.56	358° 16.79 23.82	4°15.35 23.04	253°19.76 42.55	27°58.90 40.50	Rigil Kent. 139°35.80 -60°57.39 Kochab 137°19.09 74°2.43
12	78°23.02	13°20.49 N20°23.07	19°15.96 N20°23.43	268°22.05 N05°42.47	43°1.11 N11°40.58	Kochab 137°19.09 74°2.43 Zuben'ubi 136°52.62 -16°9.69
13	93°25.49	28°24.18 22.32	34°16.56 23.82	283°24.34 42.39	58°3.32 40.66	Alphecca 126°1.06 26°37.17
14	108°27.95	43°27.86 21.57	49°17.16 24.21	298°26.63 42.31	73°5.53 40.74	Antares 112°12.02 -26°29.70
15	123°30.41	58°31.55 · · 20.82	64°17.77 · · 24.60	313°28.92 · · 42.22	88°7.73 · · 40.82	Atria 107°3.10 -69°4.65
16 17	138° 32.88 153° 35.34	73°35.23 20.08 88°38.91 19.33	79°18.37 24.99 94°18.98 25.38	328°31.21 42.14 343°33.50 42.06	103°9.94 40.90 118°12.15 40.98	Sabik 101°59.23 -15°45.56
18	168° 37.81	103°42.58 N20°18.59	109°19.58 N20°25.77	358°35.79 N05°41.97	133°14.36 N11°41.06	Shaula 96°6.15 -37°7.37
19	183°40.27	118°46.25 17.84	124°20.18 26.16	13°38.08 41.89	148°16.57 41.14	Rasalhague 95°55.62 12°32.39
20	198°42.74	133°49.92 17.10	139°20.79 26.55	28°40.37 41.81	163°18.77 41.22	Eltanin 90°40.35 51°29.08 Kaus Aust. 83°28.43 -34°22.11
21	213°45.20	148°53.58 · · 16.36	154°21.39 · · 26.94	43°42.66 · · 41.72	178°20.98 · · 41.30	Kaus Aust. 83°28.43 -34°22.11 Vega 80°30.92 38°48.57
22	228°47.66	163°57.24 15.62	169°22.00 27.33	58°44.94 41.64	193°23.19 41.38	Nunki 75°43.98 -26°15.52
23	243°50.13	179°0.90 14.88	184°22.60 27.72	73°47.23 41.55	208°25.40 41.46	Altair 61°56.97 8°56.66
Mer.	pass. 06:47	ν3.7' d-0.8' m-3.94	$\nu$ 0.6' $d$ 0.4' $m$ 1.39	ν2.3' d-0.1' m-2.01	$\nu$ 2.2' $d$ 0.1' $m$ 0.49	Peacock 53°1.01 -56°38.26
	<u>.                                    </u>					Deneb 49°23.55 45°22.80
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.91 10°0.37
0 0	258° 52.59	194°4.55 N20°14.14	199°23.20 N20°28.10	88°49.52 N05°41.47	223°27.61 N11°41.54	Al Na'ir 27°29.36 -46°49.04
1	273° 55.06	209°8.20 13.40	214°23.81 28.49	103°51.81 41.39	238°29.82 41.62	Fomalhaut 15°11.46 -29°28.03 Scheat 13°42.43 28°14.16
2	288° 57.52	224°11.85 12.67	229°24.41 28.88	118°54.10 41.30	253°32.03 41.70	Markab 13°27.08 15°21.50
3	303°59.98	239°15.49 · · 11.93	244°25.01 •• 29.27	133°56.38 · · 41.22	268°34.24 · · 41.78	
4	319°2.45	254° 19.13 11.20	259°25.62 29.65	148°58.67 41.13	283°36.44 41.86	Jun 08 Thu SHA Mer.pass
5	334°4.91	269°22.77 10.46	274°26.22 30.04	164° 0.96 41.05	298°38.65 41.94	Venus 294°11.21 11:13
6	349°7.38	284°26.40 N20°9.73	289°26.83 N20°30.42	179°3.24 N05°40.97	313°40.86 N11°42.02	Mars 301°59.85 10:44 Jupiter 190°5.10 18:09
7 8	4°9.84 19°12.31	299°30.03 9.00 314°33.66 8.27	304°27.43 30.81 319°28.03 31.20	194° 5.53 40.88 209° 7.82 40.80	328°43.07 42.10 343°45.28 42.18	Saturn 324°47.38 09:12
9	34° 14.77	329°37.28 · · 7.54	334°28.63 · · 31.58	224°10.10 · · 40.71	358°47.49 · · 42.26	
10	49° 17.23	344°40.90 6.81	349°29.24 31.96	239°12.39 40.63	13°49.70 42.34	Jun 09 Fri SHA Mer.pass
11	64° 19.70	359°44.52 6.08	4°29.84 32.35	254°14.67 40.54	28°51.91 42.42	Venus 294°42.49 11:07
12	79°22.16	14°48.13 N20°5.35	19°30.44 N20°32.73	269°16.96 N05°40.46	43°54.12 N11°42.50	Mars 301°15.25 10:43 Jupiter 190°1.09 18:06
13	94°24.63	29°51.74 4.63	34°31.05 33.12	284°19.24 40.37	58°56.33 42.57	Saturn 324°41.17 09:08
14	109°27.09	44°55.35 3.90	49°31.65 33.50	299°21.53 40.29	73°58.54 42.65	
15 16	124° 29.55	59°58.95 · · 3.18	64° 32.25 · · 33.88	314°23.81 · · 40.20	89°0.75 · · 42.73	Jun 10 Sat SHA Mer.pass
16 17	139° 32.02 154° 34.48	75°2.55 2.46 90°6.14 1.74	79°32.86 34.26 94°33.46 34.64	329°26.10 40.11 344°28.38 40.03	104°2.96 42.81 119°5.17 42.89	Venus 295°11.96 11:01
18	169° 36.95	105°9.73 N20°1.02	109°34.06 N20°35.03	359°30.66 N05°39.94	134°7.38 N11°42.97	Mars 300°30.61 10:42 Jupiter 189°56.93 18:02
19	184° 39.41	120°13.32 20°0.30	124°34.66 35.41	14°32.95 39.86	149°9.59 43.05	Saturn 324°35.02 09:05
20	199°41.88	135°16.90 19°59.58	139°35.27 35.79	29°35.23 39.77	164°11.80 43.13	
21	214°44.34	150° 20.48 · · 58.86	154°35.87 · · 36.17	44°37.51 · · 39.69	179°14.01 · · 43.21	Horizontal parallax
22	229° 46.80	165°24.06 58.15	169°36.47 36.55	59°39.80 39.60	194°16.22 43.29	Venus: 0.5 Mars: 0.1
23	244° 49.27	180°27.63 57.43	184°37.07 36.93	74°42.08 39.51	209°18.43 43.37	Mars: 0.1
Mer.	pass. 06:43	$\nu$ 3.7′ d-0.7′ m-4.03	$ u 0.6' \ d0.4' \ m1.40$	$\nu 2.3' \ d\text{-}0.1' \ \text{m-}2.00$	$ u 2.2' \ d0.1' \ m0.49$	

	011-010 =	+0.1313 360		-011			
h	Su	n			Moon		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°13.82 195°13.70	N22°52.27 52.49	350°26.55 4°52.82	7.3' 7.3'	\$25°44.04 25°42.13	-1.9' -2.1'	56.7' 56.6'
2	210°13.58	52.70	19°19.15	7.3 7.4'	25°40.07	-2.1 -2.2'	56.6
3	225°13.46	• • 52.92	33°45.53	7.4'	25°37.87	-2.3'	56.6'
4	240°13.34	53.14	48°11.96	7.5'	$25^{\circ}35.52$	-2.5'	56.6'
5	255°13.22	53.35	62°38.46	7.6'	25°33.03	-2.6'	56.5'
6 7	270°13.10 285°12.98	N22°53.57 53.78	77°5.01 91°31.62	7.6' 7.7'	\$25°30.39 25°27.61	-2.8' -2.9'	56.5' 56.5'
8	300°12.86	54.00	105°58.29	7.7'	25°24.68	-2.9 -3.1'	56.5'
9	315°12.74	• • 54.21	120°25.03	7.8'	25°21.62	-3.2'	56.4
10	330°12.62	54.42	134°51.83	7.9'	$25^{\circ}18.41$	-3.3'	56.4'
11	345°12.50	54.64	149°18.70	7.9'	25°15.06	-3.5'	56.4
12 13	0°12.38 15°12.25	N22°54.85 55.06	163°45.63 178°12.63	8.0' 8.1'	\$25°11.58 25°7.95	-3.6' -3.8'	56.4' 56.3'
14	30°12.13	55.27	192°39.69	8.1	25°4.19	-3.9'	56.3
15	45°12.01	• • 55.48	207°6.83	8.2'	25°0.30	-4.0'	56.3'
16	60°11.89	55.68	221°34.04	8.3'	24°56.26	-4.2'	56.3'
17	75°11.77 90°11.65	55.89	236°1.32	8.4'	24°52.10	-4.3'	56.2' 56.2'
18 19	90°11.65 105°11.53	N22°56.10 56.31	250°28.68 264°56.10	8.4' 8.5'	\$24°47.79 24°43.36	-4.4' -4.6'	56.2'
20	105 11.55 120°11.41	56.51	279°23.61	8.6'	24° 43.30 24° 38.80	-4.7'	56.2
21	135°11.28	56.72	293°51.18	8.7'	24°34.10	-4.8'	56.1'
22	$150^{\circ}11.16$	56.92	$308^{\circ}18.84$	8.7'	24°29.28	-5.0'	56.1'
23	165°11.04	57.12	322°46.57	8.8'	24°24.33	-5.1'	56.1'
	SD = 15.8'	d = 0.2'		SE	0 = 15.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	180°10.92	N22°57.33	337°14.38	ν 8.9'	\$24°19.25	-5.2'	56.1'
1	195°10.80	57.53	351°42.27	9.0'	24°14.04	-5.3'	56.0'
2	210°10.67	57.73	6°10.24	9.1'	24°8.71	-5.5'	56.0'
3	225°10.55	• • 57.93	20°38.30	9.1'	24°3.25	-5.6'	56.0'
4 5	240°10.43 255°10.31	58.13 58.33	35°6.43 49°34.64	9.2' 9.3'	23°57.68 23°51.98	-5.7' -5.8'	56.0' 55.9'
6	270°10.18	N22°58.53	64°2.94	9.3 9.4'	523°46.16	-5.0 -5.9'	55.9'
7	285°10.06	58.73	78°31.32	9.5'	23°40.22	-6.1'	55.9'
8	300° 9.94	58.92	92°59.79	9.5'	$23^{\circ}34.16$	-6.2'	55.9'
9	315°9.82	• • 59.12	107°28.33	9.6'	23°27.98	-6.3'	55.8'
10 11	330° 9.69 345° 9.57	59.32 59.51	121°56.97 136°25.69	9.7' 9.8'	23°21.69 23°15.28	-6.4' -6.5'	55.8' 55.8'
12	0° 9.45	N22°59.71	150° 54.49	9.6	523°8.76	-6.6'	55.8'
13	15° 9.32	22°59.90	165°23.38	10.0'	23°2.12	-6.7	55.7'
14	$30^{\circ}9.20$	23°0.09	$179^{\circ}52.36$	10.1'	22°55.37	-6.9'	55.7'
15	45° 9.08	• • 0.28	194°21.42	10.2'	22°48.52	-7.0'	55.7'
16 17	60° 8.95 75° 8.83	0.48 0.67	208°50.58 223°19.81	10.2' 10.3'	22°41.55 22°34.47	-7.1' -7.2'	55.7' 55.6'
18	90°8.71	N23°0.86	237°49.14	10.3	\$22°27.29	-7.3'	55.6'
19	105°8.58	1.05	252°18.55	10.5'	22°20.00		55.6'
20	120°8.46	1.24	266°48.06	10.6'	$22^{\circ}12.61$	-7.5'	55.6'
21	135°8.33	• • 1.42	281°17.64	10.7'	22°5.11	-7.6'	55.5'
22 23	150° 8.21 165° 8.08	1.61 1.80	295°47.32 310°17.09	10.8' 10.9'	21°57.51 21°49.81	-7.7' -7.8'	55.5' 55.5'
25	SD = 15.7'	d = 0.2'	310 17.03		0 = 15.3'	-1.0	33.3
	5D = 15.7	$a = 0.2^{\circ}$		- SL	$0 = 15.3^{\circ}$		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°7.96	N23°1.98	324°46.94	10.9'	S21°42.01	-7.9'	55.5'
1 2	195°7.84 210°7.71	2.17 2.35	339°16.89 353°46.92	11.0' 11.1'	21°34.10 21°26.11	-8.0' -8.1'	55.5' 55.4'
3	210 7.71 225°7.59	· · 2.54	353 46.92 8°17.04	11.1	21 20.11 21°18.01	-8.1 -8.2'	55.4'
4	240°7.46	2.72	22°47.25	11.3'	21°9.82	-8.3	55.4'
5	255°7.34	2.90	37°17.54	11.4'	21°1.53	-8.4'	55.4'
6	270°7.21	N23°3.08	51°47.93	11.5'	\$20°53.15	-8.5'	55.3'
7 8	285°7.09 300°6.96	3.27 3.45	66°18.40 80°48.96	11.6' 11.6'	20°44.68 20°36.12	-8.6' -8.7'	55.3' 55.3'
9	315° 6.84	· · 3.63	95°19.61	11.7	20° 30.12	-8.7'	55.3'
10	$330^{\circ}6.71$	3.80	109°50.34	11.8'	20°18.72	-8.8'	55.3'
11	345° 6.58	3.98	124°21.16	11.9'	20°9.89	-8.9'	55.2'
12	0°6.46	N23°4.16	138°52.07	12.0'	\$20°0.97	-9.0'	55.2'
13 14	15° 6.33 30° 6.21	4.34 4.51	153°23.07 167°54.15	12.1' 12.2'	19°51.97 19°42.88	-9.1' -9.2'	55.2' 55.2'
15	45° 6.08	• • 4.69	182°25.32	12.3'	19°42.88 19°33.71	-9.2 -9.3'	55.2'
16	60°5.96	4.86	$196^{\circ}56.57$	12.3'	19°24.46	-9.3'	55.1'
17	75° 5.83	5.04	211°27.91	12.4'	19°15.13	-9.4'	55.1'
18	90° 5.70 105° 5.58	N23°5.21	225°59.33 240°30.84	12.5'	\$19°5.72 18°56.22	-9.5' -9.6'	55.1'
19 20	105° 5.58 120° 5.45	5.38 5.56	240°30.84 255°2.43	12.6' 12.7'	18°56.22 18°46.65	-9.6' -9.6'	55.1' 55.1'
21	135° 5.32	• • 5.73	269°34.10	12.7	18° 37.01	-9.0 -9.7'	55.0'
22	150° 5.20	5.90	284°5.86	12.8'	18°27.29	-9.8'	55.0'
23	165°5.07	6.07	298°37.70	12.9'	$18^{\circ}17.49$	-9.9'	55.0'
	SD = 15.7'	d = 0.2'	-	SE	0 = 15.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer. Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-92%	
08	00:55	00:50	11:59	00:40	13:07		
09	00:44	00:38	11:59	01:34	14:01		
10	00:32 00:26		12:00	02:26 14:50			

June 11, 12, 13 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	259°51.73	195°31.20 N19°56.72	199°37.68 N20°37.31	89°44.36 N05°39.43	224°20.64 N11°43.44	
1	274° 54.20	210°34.77 56.00	214°38.28 37.69	104°46.64 39.34	239°22.85 43.52	Alpheratz 357°31.90 29°14.77
2	289°56.66	225°38.33 55.29	229°38.88 38.07	119°48.92 39.25	254°25.06 43.60	Ankaa 353°4.58 -42°8.78
3	$304^{\circ}59.12$	240°41.89 · · 54.58	244°39.48 · · 38.44	134°51.21 · · 39.17	269°27.27 · · 43.68	Schedar 349°27.91 56°41.40 Diphda 348°44.63 -17°49.67
4	320°1.59	255° 45.45 53.87	259° 40.08 38.82	149°53.49 39.08	284°29.48 43.76	Achernar 335°18.55 -57°5.24
5	335°4.05	270°49.00 53.16	274°40.69 39.20	164°55.77 38.99	299°31.70 43.84	Hamal 327°48.24 23°35.73
6	350°6.52	285°52.55 N19°52.46	289°41.29 N20°39.58	179°58.05 N05°38.91	314°33.91 N11°43.92	Polaris 312°55.72 89°22.76
7 8	5°8.98 20°11.45	300°56.09 51.75 315°59.63 51.05	304°41.89 39.96 319°42.49 40.33	195° 0.33 38.82 210° 2.61 38.73	329°36.12 44.00 344°38.33 44.07	Acamar 315°10.05 -40°11.29
9	35° 13.91	331°3.17 · · 50.34	334°43.09 · · 40.71	225°4.89 · · 38.64	359°40.54 · · 44.15	Menkar 314°3.49 4°12.05
10	50° 16.37	346°6.70 49.64	349°43.70 41.08	240°7.17 38.56	14°42.75 44.23	Mirfak 308°24.62 49°57.56
11	65° 18.84	1°10.23 48.94	4°44.30 41.46	255° 9.45 38.47	29°44.96 44.31	Aldebaran 290°36.74 16°33.89
12	80°21.30	16°13.76 N19°48.24	19°44.90 N20°41.83	270°11.73 N05°38.38	44°47.18 N11°44.39	Rigel 281°1.52 -8°10.20 Capella 280°18.22 46°1.47
13	95°23.77	31°17.28 47.54	34°45.50 42.21	285°14.01 38.29	59°49.39 44.47	Bellatrix 278°20.22 6°22.43
14	110°26.23	46°20.80 46.84	49°46.10 42.58	300°16.29 38.21	74°51.60 44.54	Elnath 277°58.71 28°37.77
15	125°28.69	61°24.31 · · 46.14	64°46.70 · · 42.96	315°18.56 · · 38.12	89°53.81 · · 44.62	Alnilam 275°35.23 -1°11.12
16	140°31.16	76°27.82 45.45 91°31.33 44.76	79°47.31 43.33 94°47.91 43.71	330°20.84 38.03 345°23.12 37.94	104°56.02 44.70	Betelgeuse 270°49.40 7°24.64
17 18	155° 33.62 170° 36.09	91°31.33 44.76 106°34.83 N19°44.06	94°47.91 43.71 109°48.51 N20°44.08	345°23.12 37.94 0°25.40 N05°37.85	119°58.24 44.78 135°0.45 N11°44.86	Canopus 263°51.69 -52°42.77
19	170 30.09 185°38.55	121°38.33 43.37	124°49.11 44.45	15°27.68 37.77	150°2.66 44.94	Sirius 258°24.10 -16°45.44
20	200°41.02	136°41.83 42.68	139°49.71 44.82	30°29.95 37.68	165°4.87 45.01	Adhara 255°4.01 -29°0.80
21	215°43.48	151°45.32 · · 41.99	154°50.31 · · 45.20	45°32.23 · · 37.59	180°7.08 · · 45.09	Procyon 244°48.20 5°9.00
22	230°45.94	166°48.81 41.30	169°50.91 45.57	60°34.51 37.50	195°9.30 45.17	Pollux 243°14.23 27°57.38 Avior 234°14.01 -59°36.33
23	245°48.41	181°52.29 40.61	184°51.51 45.94	75°36.78 37.41	210°11.51 45.25	Avior 234°14.01 -59°36.33 Suhail 222°44.47 -43°33.15
Meri	pass. 06:39	ν3.6' d-0.7' m-4.10	ν0.6' d0.4' m1.40	ν2.3' d-0.1' m-1.99	ν2.2' d0.1' m0.48	Miaplacidus 221°38.10 -69°50.39
					- V2.2 do.1 mo.40	Alphard 217°45.17 -8°47.10
						Regulus 207°31.60 11°49.61
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.82 61°36.02
0 1	260° 50.87 275° 53.34	196°55.77 N19°39.93 211°59.25 39.24	199°52.12 N20°46.31 214°52.72 46.68	90°39.06 N05°37.32 105°41.34 37.23	225°13.72 N11°45.33 240°15.94 45.40	Denebola 182°22.09 14°24.74
2	275 55.34 290°55.80	211 59.25 39.24 227°2.72 38.56	214 52.72 40.06 229°53.32 47.05	105 41.54 37.25 120°43.61 37.14	255°18.15 45.48	Gienah 175°40.61 -17°42.21
3	305°58.26	242°6.19 · · 37.88	244°53.92 · · 47.42	135°45.89 · · 37.06	270°20.36 · · 45.56	Acrux 172°56.61 -63°15.79
4	321°0.73	257°9.66 37.20	259° 54.52 47.79	150°48.16 36.97	285°22.57 45.64	Gacrux 171°48.23 -57°16.72
5	336°3.19	272°13.12 36.52	274°55.12 48.16	165°50.44 36.88	300°24.79 45.71	Alioth 166°10.41 55°48.49 Spica 158°19.17 -11°18.73
6	351°5.66	287°16.58 N19°35.84	289°55.72 N20°48.53	180°52.71 N05°36.79	315°27.00 N11°45.79	Alkaid 152°49.58 49°10.40
7	$6^{\circ}8.12$	302°20.03 35.16	304°56.32 48.90	195°54.99 36.70	330°29.21 45.87	Hadar 148°31.46 -60°30.87
8	21° 10.58	317°23.48 34.48	319°56.92 49.27	210°57.26 36.61	345°31.43 45.95	Menkent 147°53.99 -36°30.80
9	36° 13.05	332°26.93 · · 33.81	334°57.52 · · 49.63	225°59.53 · · 36.52	0°33.64 · · 46.03	Arcturus 145°45.14 19°2.07
10 11	51° 15.51 66° 17.98	347°30.37 33.14 2°33.81 32.46	349° 58.12 50.00 4° 58.72 50.37	241°1.81 36.43 256°4.08 36.34	15°35.85 46.10 30°38.07 46.18	Rigil Kent. 139°35.81 -60°57.40
12	81°20.44	17°37.25 N19°31.79	19°59.32 N20°50.74	271°6.36 N05°36.25	30°38.07 46.18 45°40.28 N11°46.26	Kochab 137°19.12 74°2.44
13	96°22.91	32°40.68 31.12	34°59.92 51.10	286°8.63 36.16	60°42.50 46.34	Zuben'ubi 136°52.62 -16°9.69
14	111°25.37	47°44.10 30.45	50°0.52 51.47	301°10.90 36.07	75°44.71 46.41	Alphecca 126°1.06 26°37.18
15	126°27.83	62°47.53 · · 29.79	65°1.12 · · 51.83	316°13.17 · · 35.98	90°46.92 · · 46.49	Antares 112°12.02 -26°29.70 Atria 107°3.09 -69°4.67
16	141°30.30	77°50.95 29.12	80°1.72 52.20	331°15.45 35.89	105°49.14 46.57	Sabik 101°59.22 -15°45.56
17	156°32.76	92°54.36 28.46	95°2.32 52.56	346°17.72 35.80	120°51.35 46.64	Shaula 96° 6.14 -37° 7.37
18	171°35.23	107°57.77 N19°27.79	110°2.92 N20°52.93	1°19.99 N05°35.71	135°53.57 N11°46.72	Rasalhague 95°55.61 12°32.40
19	186°37.69	123°1.18 27.13	125°3.52 53.29	16°22.26 35.62	150°55.78 46.80	Eltanin 90°40.34 51°29.09
20 21	201° 40.15 216° 42.62	138°4.59 26.47 153°7.99 · · 25.81	140°4.12 53.66 155°4.72 · · 54.02	31°24.53 35.52 46°26.80 · · 35.43	165°58.00 46.88 181°0.21 · · 46.95	Kaus Aust. 83°28.41 -34°22.11
22	231° 45.08	168°11.38 25.15	170°5.32 54.38	61°29.08 35.34	196°2.42 47.03	Vega 80°30.90 38°48.59
23	246° 47.55	183°14.77 24.50	185°5.92 54.75	76°31.35 35.25	211°4.64 47.11	Nunki 75°43.96 -26°15.52
						Altair 61°56.95 8°56.67
Mer.	pass. 06:36	ν3.5′ d-0.7′ m-4.17	$\nu$ 0.6' d0.4' m1.40	ν2.3' d-0.1' m-1.99	ν2.2' d0.1' m0.48	Peacock 53°0.98 -56°38.27 Deneb 49°23.53 45°22.82
						Enif 33°35.89 10°0.38
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.32 -46°49.04
0	261°50.01	198°18.16 N19°23.84	200°6.52 N20°55.11	91°33.62 N05°35.16	226°6.85 N11°47.18	Fomalhaut 15°11.43 -29°28.02
1	276° 52.47	213°21.55 23.19	215°7.12 55.47	106°35.89 35.07	241°9.07 47.26	Scheat 13°42.41 28°14.17
2	291°54.94 306°57.40	228°24.93 22.53 243°28.30 · · 21.88	230°7.72 55.83 245°8.32 · · 56.20	121°38.16 34.98 136°40.43 · · 34.89	256°11.28 47.34 271°13.50 · · 47.42	Markab 13°27.05 15°21.51
3 4	300 57.40 321°59.87	243°28.30 · · 21.88 258°31.68 21.23	260°8.92 56.56	151°42.70 34.79	271°13.50 · · 47.42 286°15.71 47.49	Jun 11 Sun SHA Mer.pass
5	337°2.33	273°35.04 20.58	275°9.52 56.92	166°44.97 34.70	301°17.93 47.57	Venus 295°39.47 10:55
6	352°4.80	288°38.41 N19°19.93	290°10.12 N20°57.28	181°47.23 N05°34.61	316°20.14 N11°47.65	Mars 299°45.94 10:41
7	7°7.26	303°41.77 19.29	305°10.72 57.64	196°49.50 34.52	331°22.36 47.72	Jupiter 189°52.63 17:58
8	22°9.72	318° 45.13 18.64	320°11.32 58.00	211°51.77 34.43	346°24.58 47.80	Saturn 324°28.91 09:01
9	37° 12.19	333°48.48 · · 18.00	335°11.92 · · 58.36	226°54.04 · · 34.33	1°26.79 · · 47.88	Jun 12 Mon SHA Mer.pass
10	52° 14.65	348°51.83 17.36	350°12.52 58.72	241°56.31 34.24	16°29.01 47.95	Venus 296° 4.90 10:50
11	67° 17.12 82° 19.58	3°55.17 16.72 18°58.51 N19°16.08	5°13.12 59.07 20°13.72 N20°59.43	256°58.58 34.15 272°0.84 N05°34.06	31°31.22 48.03 46°33.44 N11°48.10	Mars 299°1.24 10:40
12 13	82° 19.58 97° 22.04	34°1.85 15.44	35°14.31 20°59.79	287° 3.11 33.96	46°33.44 N11°48.10 61°35.65 48.18	Jupiter 189°48.19 17:55
14	112°24.51	49°5.18 14.80	50°14.91 21°0.15	302°5.38 33.87	76°37.87 48.26	Saturn 324°22.85 08:58
15	127°26.97	64°8.51 · · 14.17	65° 15.51 · · 0.51	317°7.64 · · 33.78	91°40.09 · · 48.33	Jun 13 Tue SHA Mer.pass
16	142°29.44	79°11.83 13.53	80° 16.11 0.86	332° 9.91 33.69	106°42.30 48.41	Venus 296°28.15 10:44
17	157°31.90	94°15.16 12.90	95° 16.71 1.22	347°12.18 33.59	121°44.52 48.49	Mars 298°16.51 10:39
18	172°34.36	109°18.47 N19°12.27	110°17.31 N21°1.58	2°14.44 N05°33.50	136°46.74 N11°48.56	Jupiter 189°43.61 17:51
19	187°36.83	124°21.78 11.64	125° 17.91 1.93	17°16.71 33.41	151°48.95 48.64	Saturn 324°16.84 08:54
20	202°39.29	139°25.09 11.01	140°18.51 2.29	32°18.98 33.31	166°51.17 48.72	Horizontal parallax
21 22	217° 41.76 232° 44.22	154°28.40 · · 10.38 169°31.70 9.75	155°19.11 · · 2.64 170°19.70 3.00	47°21.24 · · 33.22 62°23.51 33.13	181°53.39 · · 48.79 196°55.60 48.87	Venus: 0.5
23	247°46.68	184°34.99 9.13	185°20.30 3.35	77°25.77 33.03	211°57.82 48.94	Mars: 0.1
_3		5.19	5.55	55.05		

 $\nu 2.3' \ d\text{-}0.1' \ \text{m-}1.98$ 

 $\nu 2.2' \ d0.1' \ \text{m}0.48$ 

 $\nu 0.6' \ d0.4' \ m1.41$ 

 $\nu 3.4' \ d\text{-}0.7' \ \text{m-}4.24$ 

Mer.pass. 06:32

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°4.94	N23°6.24	$313^{\circ}9.62$	13.0'	<b>S</b> 18°7.62	-9.9'	55.0'
1	195°4.82	6.40	327°41.62	13.1'	17°57.68	-10.0'	55.0'
2	210°4.69 225°4.56	6.57 •• 6.74	342° 13.71 356° 45.87	13.2' 13.2'	17° 47.66 17° 37.58	-10.1' -10.2'	54.9' 54.9'
4	240°4.44	6.90	11° 18.12	13.3'	17°27.42	-10.2	54.9'
5	255°4.31	7.07	$25^{\circ}50.44$	13.4'	$17^{\circ}17.20$	-10.3'	54.9'
6	270°4.18	N23°7.24	40°22.84	13.5'	\$17°6.91	-10.4	54.9'
7 8	285°4.05 300°3.93	7.40 7.56	54°55.32 69°27.88	13.6' 13.6'	16° 56.56 16° 46.14	-10.4' -10.5'	54.8' 54.8'
9	315°3.80	7.73	84°0.51	13.7'	16° 35.65	-10.5'	54.8'
10	330°3.67	7.89	98°33.22	13.8'	$16^{\circ}25.10$	-10.6'	54.8'
11	345°3.54	8.05	113°6.00	13.9'	16°14.49	-10.7'	54.8'
12 13	0°3.42 15°3.29	N23°8.21 8.37	127°38.86 142°11.79	13.9' 14.0'	\$16°3.82 15°53.09	-10.7' -10.8'	54.8' 54.7'
14	30°3.16	8.53	156° 44.80	14.1'	15° 42.30	-10.8'	54.7'
15	45°3.03	8.69	171° 17.88	14.1'	15°31.45	-10.9'	54.7'
16	60°2.90	8.84	185°51.03	14.2'	15°20.54	-11.0'	54.7'
17	75°2.78	9.00	200°24.25	14.3'	15°9.58	-11.0'	54.7'
18 19	90°2.65 105°2.52	N23°9.16 9.31	214°57.53 229°30.89	14.4' 14.4'	\$14°58.56 14°47.48	-11.1' -11.1'	54.7' 54.6'
20	120°2.39	9.47	244°4.32	14.5'	14° 36.35	-11.1	54.6'
21	135°2.26	• • 9.62	258° 37.81	14.6'	14°25.17	-11.2'	54.6'
22	150°2.13	9.78	273°11.38	14.6'	14°13.94	-11.3'	54.6'
23	165°2.00	9.93	287° 45.00	14.7'	14°2.66	-11.3'	54.6'
	SD = 15.7'	d = 0.2'		SI	O = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°1.88	N23° 10.08	302° 18.69	ν 14.8'	\$13°51.32	-11.4'	54.6'
1	195°1.75	10.23	$316^{\circ}52.45$	14.8'	$13^{\circ}39.94$	-11.4'	54.6'
2	210°1.62	10.38	331°26.27	14.9'	13° 28.51	-11.5'	54.5'
3 4	225°1.49 240°1.36	· · 10.53 10.68	346°0.15 0°34.09	14.9' 15.0'	13° 17.03 13° 5.51	-11.5' -11.6'	54.5' 54.5'
5	255°1.23	10.83	0 34.09 15°8.10	15.1'	13 5.51 12°53.94	-11.6'	54.5'
6	270°1.10	N23°10.98	29° 42.16	15.1'	S12°42.32	-11.7'	54.5'
7	285°0.97	11.13	44°16.28	15.2'	$12^{\circ}30.66$	-11.7'	54.5'
8	300°0.84	11.27	58° 50.46	15.2'	12° 18.96	-11.7'	54.5'
9 10	315°0.71 330°0.58	· · 11.42 11.56	73°24.70 87°58.99	15.3' 15.3'	12°7.22 11°55.43	-11.8' -11.8'	54.5' 54.4'
11	345°0.45	11.71	102° 33.34	15.4'	11°43.60	-11.0 -11.9'	54.4'
12	0°0.32	N23° 11.85	117°7.74	15.5'	S11°31.73	-11.9'	54.4'
13	15°0.19	11.99	131° 42.20	15.5'	11°19.83	-11.9'	54.4'
14 15	30°0.06 44°59.93	12.14 •• 12.28	146° 16.71 160° 51.27	15.6' 15.6'	11°7.88 10°55.90	-12.0' -12.0'	54.4' 54.4'
16	59°59.80	12.42	175° 25.88	15.7'	10°55.90 10°43.88	-12.1'	54.4'
17	74°59.67	12.56	190°0.54	15.7'	10°31.83	-12.1'	54.4'
18	89°59.54	N23° 12.70	204°35.25	15.8'	S10° 19.74	-12.1'	54.4'
19	104°59.41 119°59.28	12.84 12.97	219° 10.00 233° 44.80	15.8' 15.8'	10°7.62 09°55.46	-12.2'	54.3' 54.3'
20 21	119 59.28 134°59.15	12.97	233° 44.80 248° 19.65	15.8° 15.9'	09°55.46	-12.2' -12.2'	54.3'
22	149°59.02	13.25	262° 54.54	15.9'	09°31.04	-12.3'	54.3'
23	164°58.89	13.38	$277^{\circ}29.48$	16.0'	09° 18.79	-12.3'	54.3'
	SD = 15.7'	d = 0.2'		SI	O = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0 0	179°58.76	N23° 13.52	292°4.46	ν 16.0'	509°6.51	-12.3'	54.3'
1	194°58.63	13.65	306°39.48	16.1'	$08^{\circ}54.19$	-12.3'	54.3'
2	209°58.50	13.79	321° 14.54	16.1'	08°41.85	-12.4'	54.3'
3 4	224°58.37 239°58.24	· · 13.92 14.05	335° 49.64 350° 24.77	16.1' 16.2'	08° 29.48 08° 17.08	-12.4' -12.4'	54.3' 54.3'
4 5	254°58.24	14.05	350 24.77 4°59.95	16.2'	08 17.08 08°4.65	-12.4 -12.5'	54.3'
6	269°57.97	N23°14.31	19°35.16	16.2'	S07°52.19	-12.5'	54.3'
7	284°57.84	14.44	34° 10.41	16.3'	07°39.72	-12.5'	54.3'
8	299°57.71	14.57	48° 45.69 63° 21.01	16.3' 16.3'	07°27.21 07°14.68	-12.5'	54.2'
9 10	314°57.58 329°57.45	· · 14.70 14.83	63°21.01 77°56.36	16.4	07°14.68 07°2.13	-12.6' -12.6'	54.2' 54.2'
11	344°57.32	14.96	92°31.73	16.4	06°49.56	-12.6'	54.2'
12	359°57.19	N23° 15.08	107°7.14	16.4'	<b>S</b> 06°36.96	-12.6'	54.2'
13	14°57.05	15.21	121° 42.58	16.5'	06°24.34	-12.6'	54.2'
14 15	29°56.92 44°56.79	15.33 •• 15.46	136° 18.05 150° 53.54	16.5' 16.5'	06° 11.70 05° 59.04	-12.7' -12.7'	54.2' 54.2'
16	59°56.66	15.58	165° 29.06	16.5	05°46.37	-12.7'	54.2'
17	74°56.53	15.70	180°4.61	16.6'	05°33.67	-12.7	54.2'
18	89°56.40	N23° 15.83	194° 40.18	16.6'	S05°20.95	-12.7'	54.2'
19	104°56.26	15.95	209° 15.77	16.6'	05°8.22	-12.8'	54.2'
20 21	119°56.13 134°56.00	16.07 •• 16.19	223°51.39 238°27.02	16.6' 16.7'	04°55.47 04°42.70	-12.8' -12.8'	54.2' 54.2'
22	149°55.87	16.31	253°2.68	16.7'	04 42.70 04°29.92	-12.8'	54.2'
23	164°55.74	16.43	267°38.35	16.7'	04° 17.12	-12.8'	54.2'
	SD = 15.7'	d = 0.1'		SI	D = 14.8'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-70%
11	00:20	00:14	12:00	03:13	15:36	
12	00:08	00:01	12:00	03:58	16:19	
13	00:05	00:11	12:00	04:39	17:00	

June 14, 15, 16 UT (Wed., Thu., Fri.)

h	Aries	Ve	nus	, , M	ars	Jup	oiter	Sat	turn		Stars
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	262°49.15	199°38.29	N19°8.51	200° 20.90	N21°3.70	92°28.04	N05°32.94	227°0.04	N11°49.02		
1	277°51.61	214°41.58	7.89	215°21.50	4.06	107°30.30	32.85	242°2.25	49.10	Alpheratz	$357^{\circ}31.88$
2	292°54.08	229° 44.86	7.27	230°22.10	4.41	122°32.56	32.75	257°4.47	49.17	Ankaa	353°4.55
3	307°56.54	244°48.14	. 6.65	245°22.70	4.76	137°34.83	32.66	272°6.69	• • 49.25	Schedar	349°27.88
4	322°59.01	259°51.42	6.03	260°23.29	5.12	152°37.09	32.56	287°8.91	49.32	Diphda	348° 44.61
5	338°1.47	274°54.69	5.41	275°23.89	5.47	167°39.35	32.47	302°11.12	49.40	Achernar	335° 18.52
6	353°3.93	289°57.96	N19°4.80	290°24.49	N21°5.82	182°41.62	N05°32.38	317°13.34	N11°49.47	Hamal	327°48.22
7	8°6.40	305°1.22	4.18	305°25.09	6.17	197°43.88	32.28	332°15.56	49.55	Polaris	312°54.79
8	23°8.86	320°4.48	3.57	320°25.69	6.52	212°46.14	32.19	347°17.78	49.63	Acamar	315° 10.03
9	38° 11.33	335°7.74	• • 2.96	335°26.29	• • 6.88	227°48.41	• • 32.09	2°19.99	• • 49.70	Menkar	314°3.47
10	53° 13.79	350°10.99	2.35	350° 26.88	7.23	242°50.67	32.00	$17^{\circ}22.21$	49.78	Mirfak	308°24.60
11	68° 16.25	5°14.24	1.75	5°27.48	7.58	257°52.93	31.90	$32^{\circ}24.43$	49.85	Aldebaran	290°36.73
12	83° 18.72	20°17.48	N19° 1.14	20°28.08	N21°7.93	272°55.19	N05°31.81	47°26.65	N11°49.93	Rigel	281°1.52 280°18.21
13	98°21.18	35°20.72	19°0.53	35°28.68	8.28	287°57.45	31.71	62°28.87	50.00	Capella Bellatrix	278° 20.21
14	113°23.65	50°23.96	$18^{\circ}59.93$	50° 29.27	8.62	302°59.72	31.62	77°31.08	50.08	Elnath	277° 58.70
15	$128^{\circ}26.11$	65°27.19	• • 59.33	65°29.87	· · 8.97	318°1.98	• • 31.52	92°33.30	• • 50.15	Alnilam	275°35.22
16	143°28.57	80°30.41	58.73	80°30.47	9.32	333° 4.24	31.43	107°35.52	50.23	Betelgeuse	270°49.39
17	158°31.04	95°33.64	58.13	95°31.07	9.67	348° 6.50	31.33	122°37.74	50.31	Canopus	263°51.69
18	173°33.50	110°36.86	N18°57.53	110°31.67	N21°10.02	3°8.76	N05°31.24	137°39.96	N11°50.38	Sirius	258°24.11
19	188°35.97	125°40.07	56.94	125°32.26	10.36	18°11.02	31.14	152°42.18	50.46	Adhara	255°4.02
20	203°38.43	140°43.28	56.34	140°32.86	10.71	33°13.28	31.04	167°44.40	50.53	Procyon	244°48.21
21	218° 40.89	155°46.49	• • 55.75	155°33.46	• • 11.06	48°15.54	• • 30.95	182°46.61	50.61	Pollux	243°14.23
22	233° 43.36	170°49.69	55.16	170°34.06	11.40	63°17.80	30.85	197°48.83	50.68	Avior	234°14.04
23	248° 45.82	185°52.89	54.57	185°34.65	11.75	78°20.06	30.76	212°51.05	50.76	Suhail	222°44.49
Mer.	pass. 06:28	$\nu$ 3.3′ d-0	.6′ m-4.30	$\nu$ 0.6′ d0	$.4'  \mathrm{m}1.41$	$\nu 2.3' \ d-0$	.1' m-1.97	$\nu 2.2' \ d0$	.1'  m $0.48$	Miaplacidus	221°38.14
		-				-				Alphard	$217^{\circ}45.18$
т	CIIA	CHA	D	CIIA	D	CIIA	D	CHA	D	Regulus	207°31.61
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.85
0 1	263° 48.29 278° 50.75	200°56.09 215°59.28	N18°53.98 53.39	200°35.25 215°35.85	N21°12.09 12.44	93°22.32 108°24.57	N05°30.66 30.56	227°53.27 242°55.49	N11°50.83 50.91	Denebola	182°22.10
2	276 50.75 293°53.21	215 59.26 231°2.46	52.80	215 35.65 230° 36.44	12.44	106 24.57 123°26.83		242 55.49 257°57.71	50.91	Gienah	175°40.62
3	293 53.21 308°55.68	231 2.46 246°5.64	52.80	230 30.44 245°37.04	12.78	123 20.83 138°29.09	30.47 · · 30.37	257 57.71 272°59.93	. 51.06	Acrux	172°56.64
4	323°58.14	261°8.82	51.64	260°37.64	13.13	153°31.35	30.28	288°2.15	51.13	Gacrux	171°48.25
5	339°0.61	276° 12.00	51.04	275° 38.24	13.47	168°33.61	30.28	303°4.37	51.13	Alioth	166° 10.43
6	354°3.07	291° 15.17	N18°50.48	290° 38.83	N21°14.16	183°35.86	N05°30.08	318° 6.59	N11°51.28	Spica	158° 19.17
7	9°5.54	306° 18.33	49.90	305° 39.43	14.50	198°38.12	29.99	333°8.81	51.36	Alkaid	152°49.60
8	24°8.00	321°21.49	49.32	320°40.03	14.85	213°40.38	29.89	348°11.03	51.43	Hadar	148°31.47
9	39° 10.46	336°24.65	• • 48.74	335°40.62	15.19	228°42.64	29.79	3°13.25	• • 51.50		147°54.00
10	54°12.93	351°27.80	48.17	350°41.22	15.53	243°44.89	29.69	18° 15.47	51.58	Arcturus	145°45.15
11	69° 15.39	6°30.95	47.60	5°41.82	15.87	258°47.15	29.60	33°17.69	51.65	Rigil Kent.	139°35.83
12	84° 17.86	21°34.10	N18°47.03	20°42.41	N21°16.21	273°49.40	N05°29.50	48°19.91	N11°51.73	Kochab	137°19.16
13	99°20.32	36°37.24	46.46	35°43.01	16.55	288°51.66	29.40	63°22.13	51.80	Zuben'ubi	136°52.63
14	114°22.78	51°40.38	45.89	50°43.61	16.89	303°53.92	29.31	78°24.35	51.88	Alphecca	126°1.07
15	129°25.25	66°43.51	• • 45.32	65°44.20	• • 17.23	318°56.17	• • 29.21	93°26.57	• • 51.95	Antares	112°12.02
16	144°27.71	81°46.64	44.76	80°44.80	17.57	333°58.43	29.11	108°28.79	52.03	Atria Sabik	107°3.08 101°59.21
17	159°30.18	96°49.76	44.19	95°45.40	17.91	349°0.68	29.01	123°31.01	52.10	Shaula	96°6.13
18	174°32.64	111°52.88	N18°43.63	110°45.99	N21°18.25	4°2.94	N05°28.91	138°33.23	N11°52.17	Rasalhague	95°55.60
19	189°35.10	126°56.00	43.07	125°46.59	18.59	19° 5.19	28.82	153°35.45	52.25	Eltanin	90°40.34
20	204°37.57	141°59.11	42.51	140°47.19	18.93	34°7.44	28.72	168°37.67	52.32	Kaus Aust.	83°28.40
21	219°40.03	157°2.21	• • 41.95	155° 47.78	• • 19.27	49° 9.70	• • 28.62	183°39.90	• • 52.40	Vega	80°30.90
22	234°42.50	172°5.32	41.40	170°48.38	19.60	64°11.95	28.52	198°42.12	52.47	Nunki	75°43.94
23	249°44.96	187°8.42	40.84	185°48.98	19.94	79°14.21	28.42	213°44.34	52.55	Altair	61°56.93
Merr	pass. 06:24	v3 2' d-0	.6′ m-4.35	ν0 6′ d0	.3′ m1.42	v2 3' d-0	.1′ m-1.97	ν2 2' d0	.1′ m0.48	Peacock	53°0.95
- IVICI.	Ja33. 00.24		.0 111 4.55			ν 2.5 α 0			.1 1110.40	Deneb	49°23.51
										Enif	33°35.87
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.30
0	264° 47.42	202°11.51		200°49.57	N21°20.28	94°16.46	N05°28.33	228°46.56	N11°52.62	Fomalhaut	$15^{\circ}11.41$
1	279°49.89	217°14.60	39.74	215°50.17	20.62	109°18.71	28.23	243°48.78	52.69	Scheat	$13^{\circ}42.39$
2	294° 52.35	232°17.69	39.19	230°50.76	20.95	124°20.97	28.13	258°51.00	52.77	Markab	13°27.03
3	309°54.82	247°20.77	38.64	245°51.36	• • 21.29	139°23.22	• • 28.03	273°53.22	52.84	Jun 14 Wed	SHA
4	324° 57.28	262°23.85	38.09	260°51.96	21.62	154°25.47	27.93	288°55.45	52.92		296° 49.14
5	339°59.74	277°26.92	37.55	275°52.55 290°53.15	21.96 N21°22.29	169°27.72	27.83	303°57.67	52.99		290° 49.14 297° 31.75
6	355°2.21	292°29.99	N18°37.00			184°29.97	N05°27.73	318°59.89	N11°53.06		189° 38.89
7	10°4.67	307°33.06 322°36.12	36.46	305°53.74 320°54.34	22.63 22.96	199°32.23	27.63	334°2.11 349°4.33	53.14	Saturn	324° 10.89
8 9	25°7.14 40°9.60	322 30.12 337°39.18	35.92 •• 35.38	320 54.34 335°54.94	. 23.29	214°34.48 229°36.73	27.53 •• 27.43	349 4.33 4°6.56	53.21 •• 53.28	Jatuill	52.1 10.09
10	55° 12.07	352° 42.23	34.84	350° 55.53	23.63	244°38.98	27.33	19°8.78	53.36	Jun 15 Thu	SHA
11	70°14.53	7° 45.28	34.31	5° 56.13	23.96	259°41.23	27.33	34°11.00	53.43	Venus	297°7.80
12	85° 16.99	22°48.33	N18°33.77	20° 56.72	N21°24.29	274°43.48	N05°27.14		N11°53.50	Mars	296° 46.96
13	100° 19.46	37°51.37	33.24	35° 57.32	24.63	289°45.73	27.04	64°15.45	53.58		189°34.03
14	115°21.92	52°54.40	32.71	50° 57.92	24.03	304°47.98	26.94	79°17.67	53.65	Saturn	324°4.98
15	130°24.39	67°57.44	32.18	65°58.51	• • 25.29	319°50.23	26.84	94°19.89	53.73	Jun 16 Fri	SHA
16	145°26.85	83°0.46	31.65	80°59.11	25.62	334°52.48	26.74	109°22.11	53.80	Venus	
17	160°29.31	98°3.49	31.12	95°59.70	25.95	349°54.73	26.64	124°24.34	53.87	Mars	297 24.09 296°2.15
18	175°31.78	113°6.51	N18°30.60	111°0.30	N21°26.28	4°56.98	N05°26.54	139°26.56	N11°53.95		189° 29.03
19	190°34.24	128°9.52	30.07	126°0.89	26.61	19°59.23	26.44	154°28.78	54.02		323°59.13
20	205°36.71	143°12.53	29.55	141°1.49	26.94	35°1.48	26.33	169°31.01	54.09		
21	$220^{\circ}39.17$	158° 15.54	• • 29.03	156°2.08	• • 27.27	50° 3.72	• • 26.23	184°33.23	• • 54.16	Horizor	ntal parallax
22	235°41.63	173°18.54	28.51	171°2.68	27.60	65° 5.97	26.13	199°35.45	54.24		Venus:
23	250°44.10	188°21.54	27.99	186°3.27	27.93	80°8.22	26.03	214°37.68	54.31		Mars:
Mer	pass. 06:20	ν3 1′ d-0	.6′ m-4.40	$\nu$ 0.6' d0	.3′ m1.42	ν2 3' d-0	.1′ m-1.96	ν2 2' dΩ	.1′ m0.48		
						- 2.5 0.0					

Dec 29°14.77 -42°8.77 56°41.41 -17°49.66 -57°5.23  $23^{\circ}35.73$  $89^{\circ}22.75$ -40°11.27 4°12.06 49°57.55 16°33.90 -8°10.19  $46^{\circ}1.46$  $6^{\circ}22.44$ 28°37.77  $\textbf{-1}^{\circ}\,11.11$ 7°24.65 -52°42.75 -16°45.43 -29°0.79 5°9.00 27°57.38 -59°36.31 -43°33.14 -69°50.38 -8°47.10 11°49.61 61°36.02  $14^{\circ}24.75$  $-17^{\circ}42.20$ -63° 15.79 -57°16.72 55°48.49 -11°18.72 49°10.41 -60°30.88 -36°30.80  $19^{\circ}2.08$ -60°57.41  $74^{\circ}2.45$ -16°9.69 26°37.19 -26°29.70 -69°4.68  $-15^{\circ}45.56$  $-37^{\circ}7.38$  $12^{\circ}32.41$ 51°29.11 -34°22.11 38°48.60 -26°15.52 8° 56.68 -56°38.27  $45^{\circ}22.83$  $10^{\circ}0.39$ -46°49.03 -29°28.02 28°14.17 15°21.52 Mer.pass 10:39 10:38 17:47

> Mer.pass 10:34 10:37 17:44 08:47 Mer.pass 10:29 10:36 17:40 08:44

> > 0.5 0.1

L	C		Moon				
h	Su						
Wed 0	<b>GHA</b> 179°55.60	<b>Dec</b> N23°16.55	<b>GHA</b> 282°14.04	u 16.7'	Dec \$04°4.31	d -12.8'	<b>HP</b> 54.2'
1	179 55.00 194°55.47	16.66	296°49.75	16.7'	03°51.49	-12.8'	54.2'
2	209°55.34	16.78	311°25.47	16.7	03°38.65	-12.9'	54.2'
3	224°55.21	• • 16.89	326°1.21	16.8'	03°25.80	-12.9'	54.2
4	239°55.07	17.01	340°36.96	16.8'	03°12.94	-12.9'	54.2'
5	254°54.94	17.12	355°12.72	16.8'	03°0.06	-12.9'	54.2'
6	269°54.81	N23°17.24	9°48.50	16.8'	S02°47.18	-12.9'	54.2'
7	284°54.67	17.35	24°24.29	16.8'	02°34.29	-12.9'	54.2'
8 9	299°54.54 314°54.41	17.46 •• 17.57	39°0.08 53°35.88	16.8' 16.8'	02°21.38 02°8.47	-12.9' -12.9'	54.2' 54.2'
10	329°54.28	17.69	68°11.69	16.8	02 0.47 01°55.55	-12.9'	54.2'
11	344°54.14	17.80	82°47.51	16.8'	01°42.63	-12.9'	54.2'
12	359°54.01	N23°17.90	97°23.33	16.8'	S01°29.69	-12.9'	54.2'
13	14°53.88	18.01	111°59.15	16.8'	01°16.75	-12.9'	54.2'
14	29°53.74	18.12	126°34.98	16.8'	01°3.81	-13.0'	54.2'
15	44°53.61	• • 18.23	141°10.80 155°46.63	16.8'	00°50.86	-13.0'	54.2'
16 17	59°53.48 74°53.34	18.34 18.44	155°46.63 170°22.46	16.8' 16.8'	00°37.90 00°24.94	-13.0' -13.0'	54.2' 54.2'
18	89°53.21	N23°18.55	170 22.40 184°58.29	16.8'	500°11.98	-13.0'	54.2'
19	104°53.08	18.65	199°34.11	16.8'	N00°0.98	13.0'	54.2'
20	119°52.94	18.75	214°9.93	16.8'	00°13.95	13.0'	54.2
21	134°52.81	• • 18.86	228°45.74	16.8'	00°26.91	13.0'	54.2'
22	149°52.68	18.96	243°21.55	16.8'	00°39.88	13.0'	54.2'
23	164°52.54	19.06	257°57.35	16.8'	00°52.85	13.0'	54.2'
	SD = 15.7'	d = 0.1'		SI	D = 14.8'		
<b></b> .						,	
Thu 0	<b>GHA</b> 179°52.41	<b>Dec</b> N23°19.16	<b>GHA</b> 272°33.15	u 16.8'	<b>Dec</b> N01°5.81	<i>d</i> 13.0'	HP 54.2'
1	179 52.41 194°52.27	19.26	287°8.93	16.8'	01°18.78	13.0'	54.2'
2	209°52.14	19.36	301°44.70	16.8'	01°31.74	13.0'	54.3'
3	224°52.01	• • 19.46	316°20.47	16.7'	01°44.70	13.0'	54.3'
4	239°51.87	19.56	330°56.22	16.7'	01°57.66	13.0'	54.3'
5	254°51.74	19.66	345°31.95	16.7'	02°10.62	12.9'	54.3'
6	269°51.61	N23°19.75	0°7.67	16.7'	N02°23.57	12.9'	54.3'
7 8	284°51.47 299°51.34	19.85 19.94	14°43.38 29°19.07	16.7' 16.7'	02°36.51 02°49.45	12.9' 12.9'	54.3' 54.3'
9	314°51.20	20.04	43°54.74	16.7'	02 49.45 03°2.38	12.9'	54.3'
10	329°51.07	20.13	58°30.39	16.6'	03°15.31	12.9'	54.3'
11	344°50.93	20.22	73°6.02	16.6'	03°28.22	12.9'	54.3'
12	359°50.80	N23°20.32	87°41.63	16.6'	N03°41.13	12.9'	54.3'
13	14°50.67	20.41	102°17.21	16.6'	03°54.03	12.9'	54.3'
14	29°50.53	20.50	116°52.78	16.5'	04°6.92	12.9'	54.3'
15 16	44°50.40 59°50.26	· · 20.59 20.68	131°28.31 146°3.83	16.5' 16.5'	04°19.80 04°32.67	12.9' 12.9'	54.4' 54.4'
17	74°50.13	20.08	160°39.31	16.5'	04° 45.53	12.9	54.4
18	89°49.99	N23°20.85	175°14.77	16.4	N04°58.38	12.8'	54.4'
19	104°49.86	20.94	189°50.20	16.4'	05°11.21	12.8'	54.4'
20	119°49.72	21.03	204°25.60	16.4'	05°24.03	12.8'	54.4'
21	134°49.59	• • 21.11	219°0.96	16.3'	05°36.84	12.8'	54.4'
22	149°49.45 164°49.32	21.20	233°36.30 248°11.60	16.3'	05°49.63 06°2.40	12.8'	54.4'
23		21.28	248 11.60	16.3'		12.8'	54.4'
	SD = 15.7'	d = 0.1'		SI	D = 14.8'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°49.18	N23°21.37	262°46.87	16.2'	N06°15.16	12.7'	54.5'
1	194°49.05	21.45	277°22.10	16.2'	06°27.90	12.7'	54.5'
2	209°48.91	21.53	291°57.29	16.2'	06°40.62	12.7'	54.5'
3 4	224°48.78 239°48.64	· · 21.61 21.69	306°32.45 321°7.57	16.1' 16.1'	06°53.33 07°6.01	12.7' 12.7'	54.5' 54.5'
5	254°48.51	21.77	335°42.65	16.1	07 0.01 07°18.68	12.7	54.5'
6	269°48.37	N23°21.85	350°17.68	16.0'	N07°31.33	12.6'	54.5'
7	284°48.24	21.93	4°52.68	16.0'	07°43.95	12.6'	54.6'
8	299°48.10	22.01	$19^{\circ}27.63$	15.9'	$07^{\circ}56.55$	12.6'	54.6'
9	314°47.97	• • 22.09	34°2.54	15.9'	08°9.13	12.6'	54.6'
10	329°47.83	22.16	48°37.40	15.8'	08°21.69	12.5'	54.6'
11 12	344°47.70 359°47.56	22.24 N23°22.31	63°12.21 77°46.98	15.8' 15.7'	08°34.22 N08°46.72	12.5' 12.5'	54.6' 54.6'
13	14°47.43	22.39	92°21.70	15.7'	08°59.20	12.5'	54.7'
14	29°47.29	22.46	106°56.37	15.6'	00° 39.20 09° 11.66	12.4	54.7'
15	44°47.15	• • 22.53	121°30.99	15.6'	09°24.08	12.4'	54.7'
16	59°47.02	22.61	136°5.55	15.5'	09°36.48	12.4'	54.7'
17	74°46.88	22.68	150°40.07	15.5'	09°48.85	12.3'	54.7'
	89°46.75	N23°22.75	165°14.52	15.4'	N10°1.19	12.3'	54.7'
18	104°46.61	22.82	179°48.93 194°23.28	15.3' 15.3'	10°13.50 10°25.78	12.3'	54.8'
19	110046 40		194 73 78	15.3	10-72.18	12.2'	54.8'
19 20	119°46.48	22.89			10°38 03	12 2'	5/10'
19 20 21	134°46.34	• • 22.96	208°57.57	15.2'	10°38.02 10°50.23	12.2' 12.2'	54.8' 54.8'
19 20					10°38.02 10°50.23 11°2.41	12.2' 12.2' 12.1'	54.8' 54.8' 54.8'
19 20 21 22	134°46.34 149°46.21	· · 22.96 23.02	208°57.57 223°31.80	15.2' 15.2' 15.1'	10°50.23	12.2'	54.8'

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	61-42%	
14	00:18	00:24	12:00	05:20	17:40		
15	00:30	00:37	12:01	05:59	18:20		
16	00:43	00:50	12:01	06:40	19:01		

		== 0 . (0	,,	,						
h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	-
0 0	265° 46.56	203°24.54	N18°27.48	201°3.87	N21°28.26	95°10.47	N05°25.93	229°39.90	N11°54.38	
1	280°49.03	203 24.54 218°27.53	26.96	201 3.67 216°4.46	28.58	95 10.47 110°12.71	25.83	244°42.12	54.46	_ A
2	200 49.03 295°51.49	216 27.55 233°30.51	26.45	231°5.06	28.91	110 12.71 125°14.96	25.63	259°44.35	54.40	İ
3	310°53.95	233 30.51 248°33.50	25.94	231 5.00 246°5.65		140°17.21	25.63	259 44.55 274°46.57		
3 4	310 53.95 325°56.42	248 33.50 263°36.47	25.43	240 5.05 261°6.25	· · 29.24 29.56	140 17.21 155°19.46	25.53	274 46.57 289°48.80	• • 54.60	
									54.68	
5	340°58.88 356°1.35	278°39.45 293°42.42	24.92	276°6.84 291°7.44	29.89	170°21.70 185°23.95	25.43 N05°25.32	304°51.02	54.75	
6	350 1.35 11°3.81		N18°24.41		N21°30.22			319°53.25	N11°54.82	
7		308°45.38 323°48.34	23.91	306°8.03	30.54	200°26.19	25.22	334°55.47	54.89	
8	26°6.28		23.40	321°8.63	30.87	215°28.44	25.12	349°57.69	54.97	
9	41°8.74	338°51.30	• • 22.90	336°9.22	• • 31.19	230°30.69	• • 25.02	4°59.92	• • 55.04	
10	56°11.20	353°54.25	22.40	351°9.82	31.52	245°32.93	24.92	20°2.14	55.11	A
11	71° 13.67	8°57.20	21.90	6° 10.41	31.84	260°35.18	24.82	35°4.37	55.18	
12	86° 16.13	24°0.14	N18°21.40	21°11.01	N21°32.17	275°37.42	N05°24.71	50°6.59	N11°55.26	
13	101°18.60	39°3.08	20.91	36°11.60	32.49	290°39.67	24.61	65°8.82	55.33	
14	116°21.06	54°6.02	20.41	51°12.20	32.81	305°41.91	24.51	80°11.04	55.40	
15	131°23.52	69°8.95	• • 19.92	66°12.79	• • 33.14	320°44.15	• • 24.41	95°13.27	• • 55.47	
16	146°25.99	84°11.88	19.43	81°13.39	33.46	335°46.40	24.31	110°15.49	55.55	В
17	161°28.45	99°14.80	18.94	96°13.98	33.78	350°48.64	24.20	125°17.72	55.62	
18	176° 30.92	114° 17.72	N18° 18.45	111°14.58	N21°34.10	5°50.89	N05°24.10	140°19.94	N11°55.69	
19	191°33.38	129°20.64	17.96	126° 15.17	34.42	20°53.13	24.00	155°22.17	55.76	
20	206° 35.84	144°23.55	17.48	141° 15.76	34.74	35°55.37	23.89	170°24.39	55.84	
21	221°38.31	159°26.45	• • 17.00	156° 16.36	• • 35.06	50°57.61	• • 23.79	185°26.62	• • 55.91	
22	236° 40.77	174°29.35	16.51	171°16.95	35.38	65°59.86	23.69	200°28.85	55.98	
23	251°43.24	189°32.25	16.03	186° 17.55	35.70	81°2.10	23.59	215°31.07	56.05	
Mer	pass. 06:16	$\nu$ 3.0′ d-0	.5′ m-4.45	$\nu 0.6' d0$	.3′ m1.42	$\nu$ 2.2' d-0	.1′ m-1.96	$\nu$ 2.2' d0	0.1' m0.48	Mia
										-   "
c	CHV	CH 4	Daa	GHA	Daa	GHA	Daa	GHA	Daz	
Sun	GHA	GHA	Dec		Dec		Dec		Dec	
0	266° 45.70 281° 48.17	204°35.15 219°38.04	N18° 15.56	201°18.14 216°18.74	N21°36.02	96° 4.34 111° 6.58	N05°23.48	230°33.30 245°35.52	N11°56.12	[
1			15.08		36.34		23.38		56.20	
2	296° 50.63	234°40.92	14.60	231°19.33	36.66	126°8.82	23.28	260°37.75	56.27	İ
3	311°53.09	249°43.80	• • 14.13	246°19.92	• • 36.98	141°11.07	• • 23.17	275°39.98	• • 56.34	
4	326°55.56	264°46.68	13.66	261°20.52	37.30	156°13.31	23.07	290°42.20	56.41	
5	341°58.02	279°49.55	13.19	276°21.11	37.62	171°15.55	22.96	305°44.43	56.48	
6	357°0.49	294°52.42	N18°12.72	291°21.71	N21°37.93	186°17.79	N05°22.86	320°46.66	N11°56.56	
7	12°2.95	309°55.28	12.25	306°22.30	38.25	201°20.03	22.76	335°48.88	56.63	
8	27°5.41	324°58.14	11.78	321°22.90	38.57	216°22.27	22.65	350°51.11	56.70	
9	42°7.88	340°1.00	• • 11.32	336°23.49	• • 38.88	231°24.51	• • 22.55	5°53.34	• • 56.77	
10	57° 10.34	355°3.85	10.86	351°24.08	39.20	246°26.75	22.44	20°55.56	56.84	Ri
11	72° 12.81	10°6.70	10.39	6°24.68	39.52	261°28.99	22.34	35°57.79	56.91	
12	87° 15.27	25°9.54	N18° 9.94	21°25.27	N21°39.83	276°31.23	N05°22.24	51°0.02	N11°56.99	Z
13	102° 17.73	40°12.38	9.48	36°25.86	40.15	291°33.47	22.13	66°2.25	57.06	
14	117°20.20	55° 15.22	9.02	51°26.46	40.46	306°35.71	22.03	81°4.47	57.13	İ
15	132°22.66	70°18.05	• • 8.57	66°27.05	• • 40.77	321°37.95	• • 21.92	96°6.70	• • 57.20	
16	147°25.13	85°20.87	8.11	81°27.65	41.09	336°40.18	21.82	111°8.93	57.27	
17	162°27.59	100°23.70	7.66	96°28.24	41.40	351°42.42	21.71	126°11.16	57.34	
18	177°30.06	115°26.51	N18°7.21	111°28.83	N21°41.71	6°44.66	N05°21.61	141°13.38	N11°57.41	Ra
19	192°32.52	130°29.33	6.76	126°29.43	42.03	21°46.90	21.50	156°15.61	57.48	
20	207°34.98	145°32.14	6.32	141°30.02	42.34	36°49.13	21.40	171°17.84	57.56	Ka
21	222° 37.45	160°34.94	• • 5.87	156° 30.61	• • 42.65	51°51.37	• • 21.29	186°20.07	• • 57.63	
22	237°39.91	175°37.75	5.43	171°31.21	42.96	66°53.61	21.19	201°22.30	57.70	
23	252°42.38	190°40.54	4.98	186°31.80	43.27	81°55.85	21.08	216°24.52	57.77	4
Mer.	pass. 06:12	$\nu$ 2.9′ d-0	.5′ m-4.49	$ u 0.6' \ d0$	.3′ m1.43	$\nu$ 2.2′ d-0	$.1^\prime$ m-1.95	$\nu$ 2.2′ d0	$0.1' \; { m m0.47}$	
										-
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	267° 44.84	205°43.34	N18° 4.54	201°32.39		96°58.08	N05°20.98	231°26.75	N11° 57.84	_
1	282°47.30	205 45.34 220°46.13	4.10	201 32.39 216°32.99	43.89	90 56.06 112° 0.32	20.87	231 20.75 246°28.98	57.04	Fo
2	202 47.30 297°49.77	235°48.91	3.67	210 32.99 231°33.58	44.20	112 0.32 127° 2.55	20.87	240 26.96 261°31.21	57.91 57.98	
3	312°52.23	250°51.69	3.23	231 33.30 246°34.17	• 44.51	142° 4.79	20.66	201 31.21 276°33.44	. 58.05	
4	312 52.23 327°54.70	265°54.47	2.80	261°34.77	44.82	157° 7.03	20.55	291°35.67	58.12	Jui
5	342° 57.16	280° 57.24	2.36	201 34.77 276°35.36	45.13	172° 9.26	20.55	306°37.90	58.12	34
6	357° 59.62	296°0.01	N18° 1.93	291°35.95	N21°45.44		N05°20.34	321°40.12	N11°58.27	
7	13°2.09	311°2.77	1.50	306° 36.55	45.75	202°13.73	20.23	336°42.35	58.34	
8	28°4.55	326°5.53	1.08	300 30.33 321°37.14	46.06	202 13.73 217°15.97	20.23	351°44.58	58.41	
9	43°7.02	320 3.33 341°8.29	• • 0.65	336° 37.73	• • 46.37	232°18.20	. 20.13	6°46.81	• 58.48	
10	58° 9.48	356°11.04	18° 0.23	351°38.33	46.67	247°20.44	19.92	21°49.04	58.55	Jur
11	73° 11.95	11°13.78	17°59.80	6°38.92	46.98	262°22.67	19.92	36°51.27	58.62	
12	88° 14.41	26°16.53	N17°59.38	21°39.51			N05°19.70	51°53.50	N11°58.69	1
13	103° 16.87	41° 19.27	58.96	36° 40.10	47.59	292°27.14	19.60	66°55.73	58.76	
14	118° 19.34	56°22.00	58.54	51°40.70	47.90	307°29.37	19.49	81°57.96	58.83	
15	133° 21.80	71°24.73	58.13	66°41.29	• • 48.20	322°31.60	19.38	97°0.19	• • 58.90	Jun
16	148° 24.27	86°27.46	57.71	81°41.88	48.51	337°33.84	19.37	112°2.42	58.97	Jun
17	163° 26.73	101°30.18	57.71	96° 42.48	48.81	352°36.07	19.27	112 2.42 127°4.65	59.04	
18	103 20.73 178°29.19	101 30.16 116°32.90	N17°56.89	90 42.46 111°43.07	N21°49.12		N05°19.06	142°6.88	N11°59.11	
19	178 29.19 193°31.66	131°35.61	56.48	126° 43.66	49.42	22°40.53	18.95	157°9.11	59.18	
20	208° 34.12	146°38.32	56.07	141°44.25	49.72	37°42.77	18.85	172°11.34	59.25	
21	223° 36.59	161°41.03	• • 55.66	156° 44.85	50.03	52°45.00	18.74	187°13.57	• • 59.32	
22	238° 39.05	176°43.73	55.25	171° 45.44	50.33	67°47.23	18.63	202°15.80	59.39	
23	253°41.52	191°46.43	54.85	186° 46.03	50.63	82°49.46	18.52	217°18.03	59.46	
										<u> </u>
Mer.	pass. 06:08	$\nu$ 2.8′ <i>d</i> -0	.4′ m-4.52	u0.6′ d0	.3′ m1.43	$\nu$ 2.2′ d-0	.1′ m-1.94	$\nu$ 2.2′ d0	).1′ m0.47	
										-

	Stars	
	SHA	Dec
Alpheratz	357°31.85	29°14.78
Ankaa	353° 4.53	-42°8.76
Schedar	349°27.84	56°41.41
Diphda	348°44.59	-17°49.65 -57°5.22
Achernar Hamal	335°18.49 327°48.20	-57 5.22 23°35.74
Polaris	312°53.68	89°22.74
Acamar	315°10.01	-40°11.26
Menkar	$314^{\circ}3.46$	$4^{\circ}12.07$
Mirfak	308°24.58	49°57.55
Aldebaran	290°36.72 281°1.51	16°33.90 -8°10.18
Rigel Capella	281°1.51 280°18.21	-8°10.18 46°1.46
Bellatrix	278°20.21	6°22.44
Elnath	277°58.70	28°37.77
Alnilam	$275^{\circ}35.22$	-1°11.10
Betelgeuse	270°49.39	7°24.65
Canopus	263°51.69	-52°42.73
Sirius Adhara	258°24.11 255°4.02	-16°45.43
Procyon	244°48.21	5°9.01
Pollux	243°14.24	27°57.38
Avior	$234^{\circ}14.05$	-59°36.30
Suhail	222°44.50	-43°33.13
Miaplacidus	221°38.17	-69°50.37
Alphard	217°45.19	-8°47.09 11°49.61
Regulus Dubhe	207°31.62 193°37.88	61°36.02
Denebola	182°22.11	14°24.75
Gienah	175°40.63	-17°42.20
Acrux	$172^{\circ}56.67$	$-63^{\circ}15.80$
Gacrux	171°48.27	-57°16.72
Alioth	166°10.46	55°48.50
Spica	158°19.18 152°49.62	-11°18.72 49°10.42
Alkaid Hadar	152°49.62 148°31.49	-60°30.88
Menkent	147°54.01	-36°30.80
Arcturus	145°45.15	19°2.09
Rigil Kent.	$139^{\circ}35.85$	-60°57.41
Kochab	137°19.20	74°2.46
Zuben'ubi	136°52.64	-16°9.68
Alphecca Antares	126° 1.07 112° 12.02	26°37.20 -26°29.70
Atria	107° 3.08	-69°4.69
Sabik	101°59.21	-15°45.55
Shaula	$96^{\circ}6.12$	-37°7.38
Rasalhague	95°55.60	12°32.42
Eltanin Kaus Aust.	90°40.33 83°28.39	51°29.13 -34°22.12
Vega	80°30.89	-34 22.12 38°48.62
Nunki	75°43.93	-26°15.51
Altair	61°56.92	8°56.69
Peacock	$53^{\circ}0.92$	-56°38.28
Deneb	49°23.49	45°22.85
Enif	33°35.85	10°0.40
Al Na'ir Fomalhaut	27°29.27 15°11.39	-46°49.03 -29°28.01
Scheat	15 11.39 13°42.36	-29 28.01 28°14.18
Markab	13° 42.30	15°21.52
Jun 17 Sat Venus	<b>SHA</b> 297°37.97	Mer.pass
Venus Mars	297°37.97 295°17.31	10:24 10:35
Jupiter	189°23.91	17:37
Saturn	323°53.34	08:40
Jun 18 Sun	SHA	Mer.pass
Venus	297°49.44	10:20
Mars	294°32.44	10:34
Jupiter	$189^{\circ}18.64$	17:33
Saturn	323°47.60	08:37
Jun 19 Mon	SHA	Mer.pass
Venus	297°58.50	10:15
Mars	293°47.55	10:33
Jupiter	189°13.24	17:30
Saturn	323°41.91	08:33
Horizon	ıtal parallax	
	Venus:	0.4
	Mars:	0.1

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°45.93	N23°23.16	252°40.09	15.1'	N11° 14.55	12.1'	54.8'
1	194°45.80	23.22	267° 14.14	15.0'	11°26.66	12.1'	54.9'
2	209°45.66	23.29	281°48.13	14.9'	11°38.73	12.0'	54.9'
3	224°45.53	• • 23.35	296°22.05	14.9'	11°50.77	12.0'	54.9'
4	239°45.39	23.42	310°55.91	14.8'	12°2.76	12.0'	54.9'
5	254°45.25	23.48	325°29.71	14.7'	12°14.72	11.9'	54.9'
6	269°45.12 284°44.98	N23°23.54	340°3.44 354°37.10	14.7'	N12°26.63 12°38.51	11.9'	55.0'
7 8	284 44.98 299°44.85	23.60 23.66	9°10.69	14.6' 14.5'	12 38.51 12°50.34	11.8' 11.8'	55.0' 55.0'
9	314°44.71	. 23.72	23°44.21	14.5'	13°2.13	11.7'	55.0'
10	329°44.57	23.78	38° 17.67	14.4'	13° 13.88	11.7'	55.1'
11	344°44.44	23.84	52°51.05	14.3'	13°25.58	11.7'	55.1'
12	359°44.30	N23°23.90	67°24.35	14.2'	N13°37.24	11.6'	55.1'
13	14°44.16	23.96	81°57.59	14.2'	13° 48.85	11.6'	55.1'
14	29°44.03	24.01	96°30.75	14.1'	14°0.41	11.5'	55.1'
15 16	44°43.89 59°43.76	· · 24.07 24.12	111°3.84 125°36.85	14.0' 13.9'	14° 11.92 14° 23.38	11.5' 11.4'	55.2' 55.2'
17	74°43.62	24.12	140°9.78	13.9'	14 23.36 14°34.80	11.4	55.2'
18	89°43.48	N23°24.23	154° 42.63	13.8'	N14°46.16	11.4	55.2'
19	104°43.35	24.28	169° 15.41	13.7'	14° 57.47	11.3'	55.3'
20	119°43.21	24.33	183°48.10	13.6'	15°8.72	11.2'	55.3'
21	134°43.07	• • 24.39	198°20.71	13.5'	$15^{\circ}19.92$	11.1'	55.3'
22	149°42.94	24.44	212°53.25	13.4'	15°31.07	11.1'	55.3'
23	164°42.80	24.49	227°25.69	13.4'	15° 42.16	11.0'	55.4'
	SD = 15.7'	d = 0.1'		SE	O = 15.0'		
_			Cur			,	110
Sun 0	<b>GHA</b> 179°42.66	<b>Dec</b> N23°24.54	<b>GHA</b> 241°58.06	u  13.3'	<b>Dec</b> N15°53.19	<i>d</i> 11.0'	<b>HP</b> 55.4'
1	179 42.00 194°42.53	24.58	256° 30.34	13.2'	16°4.16	10.9'	55.4'
2	209°42.39	24.63	271°2.54	13.1'	16° 15.07	10.9	55.4'
3	224°42.25	• • 24.68	285° 34.65	13.0'	16°25.92	10.8	55.5'
4	239°42.12	24.73	300°6.67	12.9'	16°36.71	10.7'	55.5'
5	254°41.98	24.77	314°38.61	12.8'	16°47.43	10.7'	55.5'
6	269°41.84	N23°24.82	329°10.46	12.8'	N16°58.09	10.6'	55.5'
7	284°41.71	24.86	343° 42.22 358° 13.88	12.7'	17°8.69	10.5'	55.6'
8 9	299°41.57 314°41.43	24.90 •• 24.95	358° 13.88 12° 45.46	12.6' 12.5'	17° 19.21 17° 29.67	10.5' 10.4'	55.6' 55.6'
10	314 41.43 329°41.30	24.95	27° 16.95	12.5	17° 29.67 17° 40.06	10.4	55.6'
11	344°41.16	25.03	41°48.34	12.4	17 40.00 17°50.38	10.3	55.7'
12	359°41.02	N23°25.07	56° 19.65	12.2'	N18°0.63	10.2	55.7'
13	14°40.89	25.11	70°50.86	12.1'	18° 10.81	10.1'	55.7'
14	29°40.75	25.15	85°21.97	12.0'	18°20.91	10.0'	55.8'
15	44°40.61	• • 25.19	99°52.99	11.9'	18° 30.94	10.0'	55.8'
16	59°40.48	25.22 25.26	114°23.92	11.8'	18° 40.89	9.9'	55.8'
17 18	74°40.34 89°40.20	25.26 N23°25.30	128° 54.75 143° 25.48	11.7' 11.6'	18°50.76 N19°0.56	9.8' 9.7'	55.8' 55.9'
19	104°40.07	25.33	143 25.46 157°56.12	11.5'	19° 10.27	9.7 9.6'	55.9'
20	119°39.93	25.37	172°26.66	11.4'	19° 19.91	9.6'	55.9'
21	134°39.79	• • 25.40	186°57.10	11.3'	19°29.46	9.5'	55.9'
22	149°39.66	25.44	201°27.44	11.2'	$19^{\circ}38.93$	9.4'	56.0'
23	164°39.52	25.47	215°57.69	11.1'	19°48.31	9.3'	56.0'
	SD = 15.7'	d = 0.0'		SE	O = 15.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	179°39.38	N23°25.50	230° 27.83	ν 11.0'	N19° 57.60	9.2'	56.0'
1	194°39.24	25.53	244° 57.88	10.9'	20°6.81	9.1	56.1'
2	209°39.11	25.56	259°27.82	10.8'	20° 15.93	9.0'	56.1'
3	224°38.97	•• 25.59	273°57.67	10.7'	20°24.96	8.9'	56.1'
4	239°38.83	25.62	288° 27.42	10.6'	20°33.90	8.8'	56.2'
5	254°38.70	25.65	302°57.06	10.5'	20°42.75	8.8'	56.2'
6	269°38.56	N23° 25.68	317°26.61	10.4'	N20°51.50	8.7'	56.2'
7 8	284°38.42 299°38.29	25.70 25.73	331°56.05 346°25.39	10.3' 10.2'	21°0.15 21°8.71	8.6' 8.5'	56.2' 56.3'
9	299 38.29 314°38.15	25.73	0°54.63	10.2	21 8.71 21°17.17	8.4'	56.3
10	329°38.01	25.78	15°23.77	10.0'	21°25.53	8.3	56.3'
11	344°37.87	25.80	29°52.80	9.9'	21°33.80	8.2'	56.4'
12	359°37.74	N23°25.83	44°21.74	9.8'	N21°41.95	8.1'	56.4'
13	14°37.60	25.85	58° 50.57	9.7'	21°50.01	8.0'	56.4'
14	29°37.46	25.87	73° 19.30	9.6'	21°57.96	7.8'	56.5'
15	44°37.33	• • 25.89	87°47.93	9.5'	22°5.80	7.7'	56.5'
16 17	59°37.19 74°37.05	25.91 25.93	102° 16.45 116° 44.88	9.4' 9.3'	22°13.54 22°21.17	7.6' 7.5'	56.5' 56.5'
18	89°36.91	25.93 N23°25.95	110 44.88 131°13.20	9.3	N22°28.69	7.5 7.4'	56.6
19	104°36.78	25.97	131 13.20 145°41.42	9.2	22°36.09	7.4	56.6'
20	119°36.64	25.99	160°9.54	9.0'	22°43.39	7.2'	56.6'
21	134°36.50	• • 26.00	$174^{\circ}37.56$	8.9'	22°50.56	7.1'	56.7'
22	149°36.37	26.02	189°5.48	8.8'	22°57.63	6.9'	56.7'
23	164°36.23	26.04	203°33.30	8.7'	23°4.57	6.8'	56.7'
	SD = 15.7'	d = 0.0'		SE	O = 15.3'		
	_		_				

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

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
T	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
Tue			201°46.63 N21°50.93			
0	268° 43.98 283° 46.44					Alpheratz 357°31.82
1	283 46.44 298°48.91					Ankaa 353°4.50
2		236°54.49 53.65	231°47.81 51.54	127°56.15 18.20	262°24.73 59.67 277°26.96 · · 59.74	Schedar 349°27.80
3	313°51.37	251°57.17 · · 53.25	246°48.40 · · 51.84	142°58.38 · · 18.09		Diphda 348° 44.57
4	328° 53.84	266°59.85 52.86	261°49.00 52.14	158° 0.61 17.98	292°29.19 59.81	Achernar 335°18.46
5	343°56.30	282°2.52 52.46	276°49.59 52.44	173°2.84 17.87	307°31.42 11°59.88	Hamal 327°48.18
6	358° 58.76	297°5.19 N17°52.07	291°50.18 N21°52.74	188° 5.07 N05° 17.77	322°33.65 N11°59.95	Polaris 312° 52.27
7	14°1.23	312°7.86 51.68	306°50.77 53.04	203°7.30 17.66	337°35.88 0.02	Acamar 315° 9.99
8	29°3.69	327°10.52 51.29	321°51.37 53.34	218° 9.53 17.55	352°38.11 0.09	Menkar 314°3.44
9	44°6.16	342°13.17 · · 50.90	336°51.96 · · 53.64	233°11.76 · · 17.44	7°40.35 · · 0.16	Mirfak 308°24.55
10	59°8.62	357° 15.82 50.51	351°52.55 53.94	248°13.99 17.33	22°42.58 0.23	Aldebaran 290°36.71
11	74° 11.09	12°18.47 50.13	6°53.14 54.23	263°16.22 17.22	37°44.81 0.30	Rigel 281°1.50
12	89° 13.55	27°21.11 N17°49.75	21°53.73 N21°54.53	278°18.45 N05°17.11	52°47.04 N12°0.37	Capella 280° 18.19
13	104°16.01	42°23.75 49.36	36°54.33 54.83	293°20.68 17.00	67°49.27 0.44	Bellatrix 278°20.19
14	119° 18.48	57°26.39 48.98	51°54.92 55.13	308°22.90 16.89	82°51.51 0.51	Elnath 277° 58.68
15	134°20.94	72°29.02 · · 48.61	$66^{\circ}55.51 \cdot \cdot 55.42$	323°25.13 · · 16.79	97°53.74 · · 0.58	Alnilam 275°35.21
16	149°23.41	87°31.65 48.23	81°56.10 55.72	338°27.36 16.68	112°55.97 0.65	Betelgeuse 270°49.38
17	164°25.87	102°34.27 47.85	96°56.70 56.01	353°29.59 16.57	127°58.20 0.72	Canopus 263°51.69
18	179°28.34	117°36.89 N17°47.48	111°57.29 N21°56.31	8°31.81 N05°16.46	143°0.44 N12°0.79	Sirius 258°24.10
19	194°30.80	132°39.50 47.11	126° 57.88 56.60	23°34.04 16.35	158°2.67 0.85	Adhara 255°4.02
20	209°33.26	147°42.11 46.74	141°58.47 56.90	38°36.27 16.24	173°4.90 0.92	1
21	224°35.73	162°44.72 · · 46.37	156°59.06 · · 57.19	53°38.49 · · 16.13	188°7.13 · · 0.99	Procyon 244°48.21 Pollux 243°14.24
22	239°38.19	177° 47.32 46.00	171°59.66 57.49	68°40.72 16.02	203°9.37 1.06	
23	254°40.66	192°49.92 45.64	187°0.25 57.78	83°42.95 15.91	218°11.60 1.13	Avior 234°14.06
	06 04	ν2.7' d-0.4' m-4.55	ν0.6' d0.3' m1.44	ν2.2' d-0.1' m-1.94		Suhail 222°44.51
Mer.p	pass. 06:04	ν2.7 d-0.4 m-4.55	ν0.6′ d0.3′ m1.44	ν2.2′ d-0.1′ m-1.94	$\nu 2.2' \ d0.1' \ m0.47$	Miaplacidus 221°38.20
						Alphard 217° 45.20
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.63
0	269°43.12	207°52.51 N17°45.27	202°0.84 N21°58.08	98°45.17 N05°15.80	233°13.83 N12°1.20	Dubhe 193°37.90
1	284° 45.58	222°55.10 44.91	217°1.43 58.37	113°47.40 15.69	248°16.07 1.27	Denebola 182°22.12
2	299° 48.05	237°57.69 44.55	232°2.02 58.66	128°49.62 15.58	263°18.30 1.34	Gienah 175° 40.64
3	314°50.51	253°0.27 · · 44.19	247°2.62 · · 58.95	143°51.85 · · 15.47	278°20.53 · · 1.41	Acrux 172°56.69
4	329°52.98	268°2.85 43.83	262°3.21 59.24	158°54.07 15.36	293°22.77 1.48	Gacrux 171°48.29
5	344°55.44	283°5.42 43.47	202 3.21 59.24 277°3.80 59.54	173° 56.30 15.25	308°25.00 1.54	Alioth 166°10.48
6	359° 57.91	298°7.99 N17°43.12	292°4.39 N21°59.83	188°58.52 N05°15.14	323°27.24 N12°1.61	Spica 158° 19.19
7	15°0.37	313°10.56 42.77	307°4.98 22°0.12	204° 0.74 15.02	338°29.47 1.68	Alkaid 152°49.64
	30°2.83					Hadar 148°31.50
8	30 2.83 45°5.30	328°13.12 42.42 343°15.68 • 42.07			353°31.70 1.75 8°33.94 · · 1.82	Menkent 147°54.01
9	45 5.30 60°7.76					Arcturus 145°45.16
10		358°18.23 41.72	352°6.76 0.99	249°7.42 14.69		Rigil Kent. 139°35.86
11	75° 10.23	13°20.78 41.37	7°7.35 1.28	264° 9.64 14.58		Kochab 137°19.25
12	90° 12.69	28°23.33 N17°41.03	22°7.94 N22°1.57	279°11.86 N05°14.47	53°40.64 N12°2.02	Zuben'ubi 136° 52.64
13	105° 15.16	43°25.87 40.68	37°8.53 1.85	294°14.08 14.36	68°42.88 2.09	Alphecca 126°1.07
14	120° 17.62	58°28.40 40.34	52°9.12 2.14	309°16.31 14.25	83°45.11 2.16	Antares 112° 12.01
15	135°20.08	73°30.94 · · 40.00	67°9.72 · · 2.43	324°18.53 · · 14.13	98°47.35 · · 2.23	Atria 107°3.07
16	150°22.55	88°33.47 39.66	82°10.31 2.72	339°20.75 14.02	113°49.58 2.30	Sabik 101°59.20
17	165°25.01	103°35.99 39.32	97°10.90 3.01	354°22.97 13.91	128°51.82 2.37	Shaula 96°6.11
18	180°27.48	118°38.51 N17°38.99	112°11.49 N22°3.29	9°25.20 N05°13.80	143°54.05 N12°2.43	Rasalhague 95°55.59
19	195°29.94	133°41.03 38.65	127°12.08 3.58	24°27.42 13.69	158°56.29 2.50	Eltanin 90°40.33
20	210°32.40	148° 43.54 38.32	142° 12.67 3.86	39°29.64 13.58	173°58.52 2.57	Kaus Aust. 83°28.38
21	225°34.87	163°46.05 · · 37.99	157°13.27 · · 4.15	54°31.86 · · 13.46	189°0.76 · · 2.64	Vega 80°30.88
22	240°37.33	178° 48.56 37.66	172° 13.86 4.44	69°34.08 13.35	204°2.99 2.71	Nunki 75°43.92
23	255°39.80	193°51.06 37.33	187° 14.45 4.72	84°36.30 13.24	219°5.23 2.77	Altair 61° 56.91
Merr	pass. 06:00	ν2.6' d-0.4' m-4.58	$\nu$ 0.6' d0.3' m1.44	ν2.2' d-0.1' m-1.93	$\nu$ 2.2' d0.1' m0.47	Peacock 53°0.90
						Deneb 49°23.47
						Enif 33°35.83
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.24
0	270°42.26	208°53.55 N17°37.01	202°15.04 N22°5.00	99°38.52 N05°13.13	234°7.46 N12°2.84	Fomalhaut 15°11.36
1	285° 44.73	223°56.05 36.68	217° 15.63 5.29	114°40.74 13.01	249°9.70 2.91	Scheat 13°42.34
2	$300^{\circ}47.19$	238° 58.53 36.36	232°16.22 5.57	129°42.96 12.90	264°11.94 2.98	Markab 13°26.99
3	$315^{\circ}49.65$	254°1.02 · · 36.04	247°16.81 • • 5.86	144°45.18 · · 12.79	279°14.17 · · 3.05	
4	$330^{\circ}52.12$	269°3.50 35.72	262°17.40 6.14	159°47.40 12.68	294°16.41 3.11	Jun 20 Tue SHA
5	$345^{\circ}54.58$	284°5.98 35.40	277° 18.00 6.42	174°49.62 12.56	309°18.64 3.18	Venus 298°5.14
6	0°57.05	299°8.45 N17°35.08	292°18.59 N22°6.70	189°51.84 N05°12.45	324°20.88 N12°3.25	Mars 293°2.65
7	$15^{\circ}59.51$	314° 10.92 34.77	307°19.18 6.99	204°54.06 12.34	339°23.12 3.32	Jupiter 189°7.71
8	$31^{\circ}1.98$	329°13.38 34.45	322°19.77 7.27	219°56.28 12.22	354°25.35 3.38	Saturn 323°36.28
9	46°4.44	344°15.84 · · 34.14	337°20.36 · · 7.55	234°58.49 · · 12.11	9°27.59 · · 3.45	Jun 21 Wed SHA
10	61°6.90	359°18.30 33.83	352°20.95 7.83	250°0.71 12.00	24°29.83 3.52	Venus 298°9.39
11	76°9.37	14°20.75 33.52	7°21.54 8.11	265°2.93 11.88	39°32.06 3.59	Mars 292°17.72
12	91°11.83	29°23.20 N17°33.21	22°22.13 N22°8.39	280°5.15 N05°11.77	54°34.30 N12°3.65	
13	$106^{\circ}14.30$	44°25.64 32.91	37°22.73 8.67	295°7.37 11.66	69°36.54 3.72	·
14	$121^{\circ}16.76$	59°28.08 32.60	52°23.32 8.95	$310^{\circ} 9.58$ $11.54$	84°38.78 3.79	Saturn 323°30.71
15	$136^{\circ}19.23$	74°30.52 · · 32.30	67°23.91 · · 9.23	325°11.80 · · 11.43	99°41.01 · · 3.86	Jun 22 Thu SHA
16	151°21.69	89°32.95 32.00	82°24.50 9.51	340°14.02 11.32	114°43.25 3.92	Venus 298°11.29
17	$166^{\circ}24.15$	104°35.38 31.70	97°25.09 9.79	355°16.23 11.20	129°45.49 3.99	Mars 291°32.78
18	181°26.62	119°37.81 N17°31.40	112°25.68 N22°10.06	10°18.45 N05°11.09	144°47.73 N12°4.06	Jupiter 188° 56.26
19	$196^{\circ}29.08$	134°40.23 31.10	127°26.27 10.34	25°20.67 10.97	159°49.96 4.12	Saturn 323°25.20
20	211°31.55	149°42.64 30.81	142°26.86 10.62	40°22.88 10.86	174°52.20 4.19	
21	$226^{\circ}34.01$	164°45.05 · · 30.52	157°27.45 · · 10.90	55°25.10 · · 10.75	189°54.44 • • 4.26	Horizontal parallax
22	241°36.47	179° 47.46 30.22	172°28.04 11.17	70°27.31 10.63	204°56.68 4.33	Venus:
23	256° 38.94	194°49.87 29.93	187°28.64 11.45	85°29.53 10.52	219°58.92 4.39	Mars:
Merr	pass. 05:56	ν2.5' d-0.3' m-4.60	ν0.6' d0.3' m1.44	ν2.2' d-0.1' m-1.93	$\nu 2.2' \ d0.1' \ m0.47$	
14161.1		ν2.5 G-0.5 HI-4.00		ν Δ.Ζ. Δ-U.1 III-1.93	ν Δ.Δ. UU.1 IIIU.41	

Dec

29°14.79 -42°8.75

56°41.41

-17°49.64

 $\text{-}57^{\circ}5.20$ 

23°35.74

 $89^{\circ}22.73$ 

-40°11.25 4°12.07

49°57.54 16°33.90

-8°10.17

 $46^{\circ}1.45$ 

 $6^{\circ}22.45$ 

28°37.77

-1°11.10 7°24.65 -52°42.72

-16°45.42 -29°0.77

5°9.01 27°57.37

-59°36.29

-43°33.13 -69°50.36

-8°47.09

11°49.61

61°36.01

 $14^{\circ}24.75$ 

 $-17^{\circ}42.20$ 

-63° 15.80 -57° 16.72

55°48.50 -11°18.72

49°10.43 -60°30.89

-36°30.80

 $19^{\circ}2.10$ 

-60°57.42

74°2.47 -16°9.68

26° 37.21 -26° 29.70

-69°4.70

 $-37^{\circ}7.38$ 

 $12^{\circ}32.43$ 

51°29.14 -34°22.12

38°48.63

-26° 15.51

8°56.71

-56°38.28

 $45^{\circ}22.86$ 

 $10^{\circ}0.41$ 

-46°49.03 -29°28.00

28°14.20 15°21.54

Mer.pass

10:11

10:32

17:26

08:29 Mer.pass

10:07

10:32 17:22

08:26

10:31

17:19

08:22

Mer.pass 10:03

0.4

0.1

-15°45.55

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.09	N23°26.05	218°1.02	8.6'	N23°11.40	6.7'	56.8'
1	194°35.95	26.06	232°28.64	8.5'	23° 18.11	6.6'	56.8'
2	209°35.82 224°35.68	26.08	246°56.16	8.4'	23°24.70	6.5'	56.8'
3 4	224 35.68 239°35.54	· · 26.09 26.10	261°23.58 275°50.91	8.3' 8.2'	23°31.16 23°37.50	6.3' 6.2'	56.9' 56.9'
5	254° 35.41	26.11	290°18.13	8.1'	23°43.72	6.1	56.9
6	269°35.27	N23°26.12	304°45.26	8.0'	N23°49.81	6.0'	56.9'
7	284°35.13	26.13	$319^{\circ}12.30$	7.9'	23°55.77	5.8'	57.0'
8	299°35.00	26.14	333°39.23	7.8'	24°1.60	5.7'	57.0'
9 10	314°34.86 329°34.72	· · 26.15 26.16	348°6.08 2°32.83	7.7' 7.7'	24°7.31 24°12.88	5.6' 5.4'	57.0' 57.1'
11	344°34.58	26.16	16°59.48	7.6'	24° 12.30	5.3	57.1'
12	359°34.45	N23°26.17	31°26.04	7.5'	N24°23.62	5.2'	57.1'
13	14°34.31	26.18	45°52.52	7.4'	24°28.79	5.0'	57.2'
14	29°34.17	26.18	60°18.90	7.3'	24° 33.82	4.9'	57.2'
15 16	44°34.04 59°33.90	· · 26.18 26.19	74°45.19 89°11.39	7.2' 7.1'	24°38.71 24°43.47	4.8' 4.6'	57.2' 57.3'
17	74°33.76	26.19	103°37.51	7.0'	24° 48.08	4.5'	57.3'
18	89°33.62	N23°26.19	118°3.54	6.9'	N24°52.56	4.3'	57.3'
19	104°33.49	26.19	132°29.48	6.9'	24°56.89	4.2'	57.4'
20	119°33.35	26.19	146°55.34	6.8'	25°1.07	4.0'	57.4
21 22	134°33.21 149°33.08	· · 26.19 26.19	161°21.12 175°46.81	6.7' 6.6'	25°5.11 25°9.01	3.9' 3.7'	57.4' 57.5'
23	164° 32.94	26.19	175 40.61 190°12.43	6.5	25° 12.75	3. <i>1</i> 3.6'	57.5'
	SD = 15.7'	d = 0.0'			O = 15.5'		
	JD — 13.1	u — 0.0		اد	J — 1J.J		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°32.80	N23°26.19	204°37.96	6.5'	N25° 16.35	3.4'	57.5'
1 2	194°32.67 209°32.53	26.18 26.18	219°3.42 233°28.80	6.4' 6.3'	25°19.80 25°23.10	3.3' 3.1'	57.5' 57.6'
3	209 32.33 224°32.39	. 26.17	247°54.11	6.2'	25° 26.25	3.0'	57.6'
4	239°32.26	26.17	262°19.34	6.2'	25° 29.24	2.8'	57.6'
5	254°32.12	26.16	276°44.51	6.1'	$25^{\circ}32.08$	2.7'	57.7'
6	269°31.98	N23°26.16	291°9.60	6.0'	N25°34.76	2.5'	57.7'
7 8	284°31.84 299°31.71	26.15 26.14	305°34.62 319°59.58	6.0' 5.9'	25°37.29 25°39.66	2.4' 2.2'	57.7' 57.8'
9	314°31.57	. 26.13	334°24.47	5.8'	25°41.88	2.1'	57.8'
10	329°31.43	26.12	348°49.30	5.8'	25°43.93	1.9'	57.8'
11	344°31.30	26.11	3°14.06	5.7'	25°45.83	1.7'	57.8'
12	359°31.16	N23°26.10	17°38.77	5.6'	N25° 47.57	1.6'	57.9'
13 14	14°31.02 29°30.89	26.09 26.08	32°3.42 46°28.01	5.6' 5.5'	25°49.14 25°50.56	1.4' 1.3'	57.9' 57.9'
15	44°30.75	. 26.06	60°52.55	5.5'	25°51.81	1.1'	58.0'
16	59°30.61	26.05	75°17.03	5.4'	25°52.89	0.9'	58.0'
17	74°30.48	26.03	89°41.47	5.4'	25°53.82	0.8'	58.0'
18	89°30.34	N23°26.02	104°5.85	5.3'	N25° 54.57	0.6'	58.1'
19 20	104°30.20 119°30.07	26.00 25.98	118°30.19 132°54.49	5.3' 5.3'	25°55.17 25°55.59	0.4' 0.3'	58.1' 58.1'
21	134° 29.93	25.97	132 34.49 147°18.74	5.2'	25°55.85	0.3	58.1
22	149°29.79	25.95	161°42.95	5.2'	25°55.95	-0.1'	58.2'
23	164°29.66	25.93	176°7.12	5.1'	25°55.87	-0.2'	58.2'
	SD = 15.7'	d = -0.0'		SI	O = 15.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	179°29.52	N23°25.91	190°31.26	υ 5.1'	N25° 55.63	-0.4'	58.2'
1	194°29.38	25.89	204°55.36	5.1'	25°55.22	-0.6'	58.3'
2	209°29.25	25.87	219°19.43	5.0'	25°54.64	-0.8'	58.3'
3 4	224°29.11 239°28.97	· · 25.85 25.82	233°43.46 248°7.47	5.0' 5.0'	25°53.89 25°52.97	-0.9' -1.1'	58.3' 58.3'
4 5	254°28.84	25.82 25.80	248 7.47 262°31.46	5.0'	25 52.97 25°51.87	-1.1 -1.3'	58.4'
6	269°28.70	N23°25.78	276°55.42	4.9'	N25°50.61	-1.4'	58.4'
7	284°28.57	25.75	291°19.35	4.9'	25°49.18	-1.6'	58.4'
8	299°28.43 314°28.29	25.72	305°43.27 320°7.17	4.9'	25°47.58 25°45.81	-1.8'	58.4'
9 10	314°28.29 329°28.16	· · 25.70 25.67	320°7.17 334°31.06	4.9' 4.9'	25°45.81 25°43.86	-1.9' -2.1'	58.5' 58.5'
11	344°28.02	25.64	348°54.93	4.9'	25°41.74	-2.1 -2.3'	58.5'
12	359°27.88	N23°25.62	3°18.79	4.9'	N25°39.46	-2.5'	58.6'
13	14°27.75	25.59	17°42.64	4.8'	25°37.00	-2.6'	58.6'
14	29°27.61 44°27.48	25.56 •• 25.53	32°6.48 46°30.32	4.8' 4.8'	25°34.36 25°31.56	-2.8' -3.0'	58.6' 58.6'
15 16	44°27.48 59°27.34	25.49	46°30.32 60°54.16	4.8'	25°31.56 25°28.59	-3.0° -3.1'	58.6° 58.7'
17	74°27.20	25.49	75°18.00	4.8'	25° 25.44	-3.1 -3.3'	58.7'
18	89°27.07	N23°25.43	89°41.84	4.8'	N25°22.13	-3.5'	58.7'
19	104°26.93	25.40	104°5.68	4.8'	25°18.64	-3.7'	58.7'
20	119°26.80 134°26.66	25.36	118°29.53	4.9' 4.9'	25°14.98 25°11.15	-3.8'	58.8'
21 22	134°26.66 149°26.52	· · 25.33 25.29	132°53.38 147°17.25	4.9' 4.9'	25°11.15 25°7.15	-4.0' -4.2'	58.8' 58.8'
23	164° 26.39	25.29	161°41.13	4.9'	25°2.98	-4.2'	58.8'
	SD = 15.7'	d = -0.0'			D = 15.9'		
	JD — 13.1			JI			

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°	////	00:49	02:36	21:28	23:14	////
N 58°	////	01:41	02:56	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°	01:32	02:51	03:40	20:24	21:13	22:31
50°	02:00	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:50	20:28	21:18
N 40°	03:17	03:59	04:31	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:50	05:18	05:41	18:23	18:46	19:13
0°	05:09	05:36	05:58	18:06	18:28	18:54
<b>S</b> 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:17	06:52	07:22	16:42	17:12	17:46
45°	06:28	07:05	07:39	16:25	16:59	17:36
<b>S</b> 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
<b>S</b> 60°	07:11	80:80	09:06	14:58	15:56	16:53

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-1%	
20	01:36	01:42	12:02	09:49	22:18		
21	01:49	01:55	12:02	10:47	23:16		
22	02:02	02:08	12:02	11:46	-:-		

June 23, 24, 25 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	271°41.40	209°52.27 N17°29.64	202°29.23 N22°11.72	100°31.74 N05°10.40	235°1.15 N12°4.46	
1	286°43.87	224°54.67 29.36	217°29.82 12.00	115°33.96 10.29	250°3.39 4.53	Alpheratz 357°31.79 29°14.80
2	$301^{\circ}46.33$	239°57.06 29.07	232°30.41 12.27	130°36.17 10.17	265°5.63 4.59	Ankaa 353°4.46 -42°8.74 Schedar 349°27.76 56°41.42
3	316°48.80	254°59.45 · · 28.79	247°31.00 · · 12.55	145°38.39 · · 10.06	280°7.87 · · 4.66	Diphda 348°44.54 -17°49.62
4	331°51.26	270°1.83 28.50	262°31.59 12.82	160°40.60 9.94	295°10.11 4.73	Achernar 335°18.43 -57°5.19
5 6	346° 53.72 1° 56.19	285°4.21 28.22 300°6.59 N17°27.94	277°32.18 13.10 292°32.77 N22°13.37	175°42.82 9.83 190°45.03 N05°9.71	310°12.35 4.79 325°14.59 N12°4.86	Hamal 327°48.15 23°35.75
7	16°58.65	315°8.96 27.66	307°33.36 13.64	205°47.24 9.60	340°16.83 4.93	Polaris 312°50.82 89°22.72
8	$32^{\circ}1.12$	330°11.33 27.39	322° 33.95 13.92	220°49.46 9.48	355°19.07 4.99	Acamar 315°9.97 -40°11.23 Menkar 314°3.41 4°12.08
9	47°3.58	345°13.70 · · 27.11	337°34.54 · · 14.19	235°51.67 · · 9.37	10°21.30 · · 5.06	Menkar 314°3.41 4°12.08 Mirfak 308°24.52 49°57.54
10	62°6.05	0°16.06 26.84	352°35.13 14.46	250°53.88 9.25	25°23.54 5.13	Aldebaran 290°36.68 16°33.90
11	77°8.51	15°18.42 26.57 30°20.77 N17°26.30	7°35.73 14.73	265°56.10 9.14 280°58.31 N05°9.02	40°25.78 5.19 55°28.02 N12°5.26	Rigel 281°1.48 -8°10.16
12 13	92° 10.97 107° 13.44	30°20.77 N17°26.30 45°23.12 26.03	22°36.32 N22°15.00 37°36.91 15.27	280°58.31 N05°9.02 296°0.52 8.90	55°28.02 N12°5.26 70°30.26 5.33	Capella 280°18.16 46°1.44
14	122° 15.90	60°25.46 25.76	52°37.50 15.54	311°2.73 8.79	85°32.50 5.39	Bellatrix 278°20.18 6°22.45
15	$137^{\circ}18.37$	75°27.81 •• 25.49	67°38.09 · · 15.81	326° 4.94 · · 8.67	100°34.74 · · 5.46	Elnath 277°58.66 28°37.76 Alnilam 275°35.19 -1°11.09
16	152° 20.83	90°30.14 25.23	82°38.68 16.08	341°7.16 8.56	115°36.98 5.52	Betelgeuse 270°49.36 7°24.66
17	167°23.30	105°32.48 24.97	97°39.27 16.35	356° 9.37 8.44	130°39.22 5.59	Canopus 263°51.69 -52°42.70
18 19	182° 25.76 197° 28.22	120°34.81 N17°24.71 135°37.13 24.45	112°39.86 N22°16.62 127°40.45 16.89	11°11.58 N05°8.32 26°13.79 8.21	145°41.46 N12°5.66 160°43.70 5.72	Sirius 258°24.09 -16°45.41
20	212° 30.69	135° 37.13 24.45 150° 39.46 24.19	142°41.04 17.16	41°16.00 8.09	160°43.70 5.72 175°45.94 5.79	Adhara 255°4.01 -29°0.76
21	227°33.15	165°41.77 · · 23.93	157°41.63 · · 17.43	56°18.21 · · 7.97	190°48.19 · · 5.85	Procyon 244°48.20 5°9.01
22	242°35.62	180°44.09 23.68	172° 42.22 17.70	71°20.42 7.86	205°50.43 5.92	Pollux 243°14.23 27°57.37 Avior 234°14.08 -59°36.28
23	257° 38.08	195°46.40 23.42	187°42.81 17.96	86°22.63 7.74	220°52.67 5.99	Suhail 222°44.51 -43°33.12
Mer.	pass. 05:52	ν2.4' d-0.3' m-4.62	$\nu 0.6' \ d0.3' \ m1.45$	ν2.2' d-0.1' m-1.92	$\nu$ 2.2' d0.1' m0.46	Miaplacidus 221°38.23 -69°50.35
						Alphard 217°45.19 -8°47.09
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.63 11°49.61
0	272° 40.54	210°48.71 N17°23.17	202°43.40 N22°18.23	101°24.84 N05°7.62	235°54.91 N12°6.05	Dubhe 193°37.92 61°36.01
1	287°43.01	225°51.01 22.92	217°43.99 18.50	116°27.05 7.51	250°57.15 6.12	Denebola 182°22.12 14°24.76 Gienah 175°40.64 -17°42.20
2	$302^{\circ}45.47$	240°53.31 22.67	232°44.58 18.76	131°29.26 7.39	265°59.39 6.18	Acrux 172°56.71 -63°15.80
3	317° 47.94	255°55.60 · · 22.42	247°45.17 · · 19.03	146°31.47 · · 7.27	281°1.63 · · 6.25	Gacrux 171°48.30 -57°16.73
4	332°50.40	270°57.89 22.18	262°45.77 19.29	161°33.68 7.16	296°3.87 6.31	Alioth 166°10.50 55°48.50
5 6	347°52.87 2°55.33	286°0.18 21.93 301°2.46 N17°21.69	277° 46.36 19.56 292° 46.95 N22° 19.82	176°35.89 7.04 191°38.09 N05°6.92	311°6.11 6.38 326°8.36 N12°6.45	Spica 158°19.19 -11°18.72
7	17° 57.79	316°4.74 21.45	307°47.54 20.09	206°40.30 6.80	341°10.60 6.51	Alkaid 152°49.65 49°10.43
8	33°0.26	331°7.02 21.21	322°48.13 20.35	221°42.51 6.69	356°12.84 6.58	Hadar 148°31.51 -60°30.90 Menkent 147°54.01 -36°30.81
9	48°2.72	346°9.29 · · 20.97	337°48.72 · · 20.62	236°44.72 · · 6.57	11°15.08 · · 6.64	Menkent 147°54.01 -36°30.81 Arcturus 145°45.16 19°2.10
10	63°5.19	1°11.56 20.73	352°49.31 20.88	251°46.93 6.45	26°17.32 6.71	Rigil Kent. 139°35.86 -60°57.43
11	78°7.65	16°13.82 20.49	7°49.90 21.14	266°49.13 6.33	41°19.57 6.77	Kochab 137°19.29 74°2.48
12 13	93° 10.12 108° 12.58	31°16.08 N17°20.26 46°18.34 20.03	22°50.49 N22°21.40 37°51.08 21.67	281°51.34 N05°6.22 296°53.55 6.10	56°21.81 N12°6.84 71°24.05 6.90	Zuben'ubi 136°52.63 -16°9.68
14	123° 15.04	61°20.59 19.80	52°51.67 21.93	311°55.76 5.98	86°26.29 6.97	Alphecca 126°1.07 26°37.22
15	138° 17.51	76°22.84 · · 19.57	67°52.26 · · 22.19	326°57.96 · · 5.86	101°28.54 · · 7.03	Antares 112°12.00 -26°29.71 Atria 107°3.06 -69°4.72
16	$153^{\circ}19.97$	91°25.09 19.34	82°52.85 22.45	342°0.17 5.74	116°30.78 7.10	Sabik 101°59.19 -15°45.55
17	168° 22.44	106°27.33 19.11	97°53.44 22.71	357°2.37 5.63	131°33.02 7.16	Shaula 96°6.10 -37°7.39
18	183° 24.90	121°29.57 N17°18.89	112°54.03 N22°22.97	12°4.58 N05°5.51	146°35.26 N12°7.23	Rasalhague 95°55.58 12°32.44
19 20	198° 27.36 213° 29.83	136°31.80 18.66 151°34.03 18.44	127° 54.62 23.23 142° 55.21 23.49	27° 6.79 5.39 42° 8.99 5.27	161°37.51 7.29 176°39.75 7.36	Eltanin 90°40.32 51°29.16
21	228° 32.29	166°36.25 · · 18.22	157°55.80 · · 23.75	57°11.20 · · 5.15	191°41.99 · · 7.42	Kaus Aust. 83°28.36 -34°22.12
22	243°34.76	181°38.48 18.00	172°56.39 24.01	72°13.40 5.03	206°44.24 7.49	Vega 80°30.87 38°48.65 Nunki 75°43.90 -26°15.51
23	258° 37.22	196°40.69 17.78	187°56.98 24.27	87°15.61 4.91	221°46.48 7.55	Altair 61°56.89 8°56.72
Mer.	pass. 05:48	ν2.3' d-0.3' m-4.64	$\nu$ 0.6' d0.3' m1.45	ν2.2' d-0.1' m-1.92	ν2.2' d0.1' m0.46	Peacock 53°0.86 -56°38.28
						Deneb 49°23.44 45°22.88
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.80 10°0.42
0 0	273° 39.69	211°42.91 N17°17.56	202°57.57 N22°24.52	102°17.81 N05°4.79	236°48.72 N12°7.62	Al Na'ir 27°29.20 -46°49.02 Fomalhaut 15°11.33 -29°27.99
1	288° 42.15	226°45.12 17.35	217°58.16 24.78	117°20.02 4.68	251°50.97 7.68	Fomalhaut 15°11.33 -29°27.99 Scheat 13°42.30 28°14.21
2	303°44.61	241° 47.33 17.14	232°58.75 25.04	132°22.22 4.56	266°53.21 7.75	Markab 13°26.96 15°21.55
3	318° 47.08	256°49.53 · · 16.92	247°59.34 · · 25.30	147°24.43 · · 4.44	281°55.46 · · 7.81	
4	333° 49.54	271°51.73 16.71	262°59.93 25.55	162°26.63 4.32	296°57.70 7.88	Jun 23 Fri SHA Mer.pass
5 6	348°52.01 3°54.47	286°53.93 16.50 301°56.12 N17°16.30	278° 0.52 25.81 293° 1.11 N22° 26.06	177°28.83 4.20 192°31.04 N05°4.08	311°59.94 7.94 327°2.19 N12°8.01	Venus 298°10.87 09:59 Mars 290°47.82 10:30
7	18° 56.93	316°58.31 16.09	308°1.70 26.32	207°33.24 3.96	342°4.43 8.07	Jupiter 188°50.34 17:15
8	33° 59.40	332°0.49 15.89	323°2.29 26.57	222°35.44 3.84	357°6.68 8.13	Saturn 323°19.75 08:19
9	49°1.86	347°2.67 · · 15.68	338°2.88 · · 26.83	237°37.64 · · 3.72	12°8.92 · · 8.20	Jun 24 Sat SHA Mer.pass
10	64°4.33	2°4.85 15.48	353°3.48 27.08	252°39.85 3.60	27°11.17 8.26	Venus 298°8.16 09:55
11 12	79°6.79 94°9.26	17°7.02 15.28 32°9.19 N17°15.08	8°4.07 27.34 23°4.66 N22°27.59	267°42.05 3.48 282°44.25 N05°3.36	42°13.41 8.33 57°15.66 N12°8.39	Mars 290°2.86 10:29
13	94 9.26 109° 11.72	47°11.36 14.88	38°5.25 27.84	282 44.25 NUS 3.30 297°46.45 3.24	72°17.90 N12 8.46	Jupiter 188°44.30 17:12
14	124° 14.18	62°13.52 14.69	53°5.84 28.10	312°48.66 3.12	87°20.15 8.52	Saturn 323°14.36 08:15
15	139° 16.65	77°15.68 · · 14.49	68°6.43 · · 28.35	327°50.86 · · 3.00	102°22.39 · · 8.58	Jun 25 Sun SHA Mer.pass
16	154° 19.11	92°17.83 14.30	83°7.02 28.60	342°53.06 2.88	117°24.64 8.65	Venus 298°3.22 09:52
17	169°21.58	107°19.98 14.11	98°7.61 28.85	357°55.26 2.76	132°26.88 8.71	Mars 289°17.89 10:28
18 19	184° 24.04 199° 26.50	122°22.13 N17°13.92 137°24.27 13.73	113°8.20 N22°29.10 128°8.79 29.35	12°57.46 N05°2.64 27°59.66 2.52	147°29.13 N12°8.78 162°31.38 8.84	Jupiter 188°38.13 17:08
20	214° 28.97	157 24.27 13.73 152°26.41 13.54	143°9.38 29.61	43°1.86 2.40	177°33.62 8.90	Saturn 323°9.04 08:12
21	229° 31.43	167°28.55 · · 13.36	158°9.97 · · 29.86	58°4.06 · · 2.28	192°35.87 · · 8.97	Horizontal parallax
22	244° 33.90	182°30.68 13.17	173°10.56 30.11	73°6.26 2.16	207°38.11 9.03	Venus: 0.4
23	259°36.36	197°32.81 12.99	188°11.15 30.36	88°8.46 2.03	222°40.36 9.09	Mars: 0.1
Mer.	pass. 05:44	ν2.2' d-0.2' m-4.66	$ u 0.6' \ d0.3' \ m1.45$	ν2.2' d-0.1' m-1.91	$\nu 2.2' \ d0.1' \ \text{m}0.46$	

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°26.25	N23°25.22	176°5.02	4.9'	N24°58.64	-4.5'	58.8'
1	194°26.12	25.18	190°28.93	4.9'	24°54.14	-4.7'	58.9'
2	209°25.98	25.14	204°52.86	4.9'	24°49.46	-4.8'	58.9'
3	224°25.85	• • 25.10	219°16.81	5.0'	24°44.61	-5.0'	58.9'
4 5	239°25.71 254°25.57	25.06 25.02	233°40.78 248°4.77	5.0' 5.0'	24°39.60 24°34.42	-5.2' -5.3'	58.9' 59.0'
6	269°25.44	N23°24.98	262°28.79	5.0'	N24°29.07	-5.5'	59.0'
7	284°25.30	24.94	276°52.84	5.1'	24°23.56	-5.7'	59.0'
8	299°25.17	24.90	291°16.91	5.1'	24° 17.88	-5.8'	59.0'
9	314°25.03	• • 24.85	305°41.02	5.1'	24°12.04	-6.0'	59.0'
10	329°24.90	24.81	320°5.16	5.2'	24°6.03	-6.2'	59.1'
11	344°24.76	24.76	334°29.34	5.2'	23°59.86	-6.3' -6.5'	59.1'
12 13	359°24.63 14°24.49	N23°24.72 24.67	348°53.55 3°17.80	5.3' 5.3'	N23°53.53 23°47.03	-6.5°	59.1' 59.1'
14	29°24.36	24.62	17°42.09	5.3'	23°40.38	-6.8'	59.1
15	44°24.22	• • 24.58	32°6.42	5.4'	23°33.56	-7.0'	59.2'
16	59°24.08	24.53	46°30.80	5.4'	23°26.59	-7.1'	59.2'
17	74°23.95	24.48	60°55.22	5.5'	23° 19.45	-7.3'	59.2'
18	89°23.81	N23°24.43	75°19.69	5.5'	N23°12.16	-7.4'	59.2'
19 20	104°23.68 119°23.54	24.38 24.33	89°44.20 104°8.76	5.6' 5.6'	23°4.72 22°57.11	-7.6' -7.8'	59.2' 59.3'
21	134°23.41	24.28	118°33.38	5.0 5.7'	22°49.36	-7.0 -7.9'	59.3'
22	149°23.27	24.22	132°58.04	5.7'	22°41.45	-8.1	59.3'
23	164°23.14	24.17	147°22.76	5.8'	22°33.38	-8.2'	59.3'
	SD = 15.7'	d = -0.0'		S	D = 16.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	179°23.01	Dec N23°24.11	161°47.53	ν 5.8'	N22°25.17	a -8.4'	пР 59.3'
1	194°22.87	24.06	176°12.36	5.9'	22°16.81	-8.5'	59.3'
2	209°22.74	24.00	190°37.25	5.9'	22°8.29	-8.7'	59.4'
3	224°22.60	• • 23.95	205°2.19	6.0'	21°59.63	-8.8'	59.4
4 5	239°22.47 254°22.33	23.89 23.83	219°27.19 233°52.25	6.1' 6.1'	21°50.83 21°41.88	-9.0' -9.1'	59.4' 59.4'
6	269°22.20	N23°23.77	248°17.38	6.2'	N21°32.78	-9.1 -9.2'	59.4
7	284°22.06	23.72	262°42.56	6.2'	21°23.55	-9.4	59.4'
8	299°21.93	23.66	277°7.81	6.3'	21° 14.17	-9.5'	59.4'
9	314°21.79	• • 23.59	291°33.12	6.4'	21°4.65	-9.7'	59.5'
10 11	329°21.66 344°21.53	23.53 23.47	305°58.50 320°23.94	6.4' 6.5'	20°54.99 20°45.20	-9.8' -9.9'	59.5' 59.5'
12	359°21.39	N23°23.41	334°49.44	6.6'	N20°35.27	-10.1	59.5'
13	14°21.26	23.35	349°15.02	6.6'	20°25.20	-10.2	59.5'
14	29°21.12	23.28	3°40.66	6.7'	$20^{\circ}15.00$	-10.3'	59.5'
15	44°20.99	• • 23.22	18°6.37	6.8'	20°4.68	-10.5'	59.5'
16 17	59°20.86 74°20.72	23.15 23.08	32°32.15 46°58.00	6.8' 6.9'	19°54.22 19°43.63	-10.6' -10.7'	59.5' 59.6'
18	89°20.59	N23°23.02	61°23.92	7.0'	N19°32.91	-10.7	59.6'
19	104°20.45	22.95	75°49.90	7.1'	19°22.07	-11.0'	59.6'
20	119°20.32	22.88	90°15.96	7.1'	$19^{\circ}11.11$	-11.1'	59.6'
21	134°20.19	• • 22.81	104°42.09	7.2'	19°0.02	-11.2'	59.6'
22 23	149°20.05 164°19.92	22.74 22.67	119°8.29 133°34.57	7.3' 7.3'	18°48.81 18°37.48	-11.3' -11.4'	59.6' 59.6'
23			133 34.57			-11.4	59.0
	SD = 15.7'	d = -0.1'			D = 16.2'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°19.79 194°19.65	N23°22.60	148°0.91 162°27.33	7.4'	N18°26.04 18°14.47	-11.6'	59.6'
1 2	194° 19.65 209° 19.52	22.53 22.45	162°27.33 176°53.82	7.5' 7.6'	18° 14.47 18° 2.79	-11.7' -11.8'	59.6' 59.6'
3	224°19.39	22.38	191°20.38	7.6'	17°51.00	-11.9	59.6'
4	239°19.25	22.31	205°47.01	7.7'	$17^{\circ}39.10$	-12.0'	59.7'
5	254°19.12	22.23	220°13.72	7.8'	17°27.09	-12.1'	59.7'
6 7	269°18.99 284°18.85	N23°22.16 22.08	234°40.50 249°7.35	7.9' 7.9'	N17°14.97 17°2.74	-12.2' -12.3'	59.7' 59.7'
8	284°18.85 299°18.72	22.08	249°7.35 263°34.27	7.9° 8.0'	17°2.74 16°50.41	-12.3 -12.4'	59.7' 59.7'
9	314°18.59	21.93	278°1.27	8.1'	16°37.97	-12.5'	59.7'
10	329°18.46	21.85	292°28.33	8.1'	$16^{\circ}25.43$	-12.6'	59.7'
11	344°18.32	21.77	306°55.47	8.2'	16°12.79	-12.7'	59.7'
12 13	359°18.19 14°18.06	N23°21.69 21.61	321°22.69 335°49.97	8.3' 8.4'	N16°0.05 15°47.22	-12.8' -12.9'	59.7' 59.7'
13 14	29°17.93	21.61	350°17.33	8.4	15° 47.22 15° 34.29	-12.9 -13.0'	59.7' 59.7'
15	44°17.79	• • 21.44	4°44.75	8.5	15°21.26	-13.1	59.7'
16	59°17.66	21.36	19°12.25	8.6'	15°8.15	-13.2'	59.7'
17	74°17.53	21.28	33°39.82	8.6'	14°54.94	-13.3'	59.7'
18 19	89°17.40 104°17.26	N23°21.19 21.11	48°7.45 62°35.16	8.7' 8.8'	N14°41.65 14°28.27	-13.4' -13.5'	59.7' 59.7'
20	104°17.26 119°17.13	21.11	77°2.94	8.8'	14° 28.27 14° 14.80	-13.5' -13.6'	59.7' 59.7'
21	134°17.00	. 20.94	91°30.78	8.9'	14°1.25	-13.6'	59.7'
22	149°16.87	20.85	105°58.69	9.0'	13°47.62	-13.7'	59.7'
23	164°16.74	20.76	120°26.67	9.0'	13°33.90	-13.8'	59.7'
	SD = 15.7'	d = -0.1'		S	D = 16.3'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-7%	
23	02:15	02:21	12:02	12:46	00:16		
24	02:28	02:34	12:03	13:45	01:16		
25	02:41	02:47	12:03	14:40	02:13		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	274°38.83	212°34.93	N17°12.81	203°11.74	N22°30.60	103°10.66	N05°1.91	237°42.61	N12°9.16		
1	289°41.29	212 34.93 227°37.05	12.63	218° 12.33	30.85	118°12.86	1.79	252°44.85	9.22	Alpheratz	357°31.76
2	304° 43.75	242°39.17	12.45	233° 12.92	31.10	133°15.06	1.67	267°47.10	9.28	Ankaa	353°4.43
3	319°46.22	257°41.28	• • 12.27	248° 13.51	• • 31.35	148°17.26	. 1.55	282°49.35	9.35	Schedar	349°27.72
4	334°48.68	272°43.39	12.09	263°14.10	31.60	163°19.46	1.43	297°51.59	9.41	Diphda	348°44.51
5	349°51.15	287°45.50	11.92	278°14.69	31.84	178°21.66	1.31	312°53.84	9.48	Achernar	335°18.39
6	4°53.61	302°47.60	$N17^{\circ}11.75$	293° 15.28	N22°32.09	193°23.85	N05°1.19	327°56.09	N12°9.54	Hamal Polaris	327°48.12 312°49.61
7	19°56.07	317°49.70	11.57	$308^{\circ}15.87$	32.34	208°26.05	1.06	342°58.33	9.60	Acamar	315°9.95
8	34°58.54	332°51.79	11.40	323°16.46	32.58	223°28.25	0.94	358°0.58	9.67	Menkar	314°3.39
9	50°1.00	347°53.89	• • 11.24	338° 17.05	• • 32.83	238°30.45	• • 0.82	13°2.83	• • 9.73	Mirfak	308°24.49
10	65°3.47	2°55.97	11.07	353°17.64	33.07	253°32.65	0.70	28°5.08	9.79	Aldebaran	290°36.67
11	80°5.93	17°58.06	10.90	8° 18.23	33.32	268°34.84	0.58	43°7.32	9.85	Rigel	281°1.47
12	95°8.39	33°0.14	N17°10.74	23° 18.82	N22°33.56	283°37.04	N05°0.45	58°9.57	N12°9.92	Capella	280°18.14
13	110°10.86	48°2.22 63°4.29	10.57	38° 19.41 53° 20.00	33.81	298°39.24	0.33	73°11.82 88°14.07	9.98	Bellatrix	278°20.16
14 15	125° 13.32 140° 15.79	78° 6.36	10.41 •• 10.25	68° 20.59	34.05 •• 34.30	313°41.43 328°43.63	0.21 · · 0.09	103°16.31	10.04 •• 10.11	Elnath	277°58.65
16	155° 18.25	93°8.42	10.23	83°21.18	34.54	343°45.83	0.09 04°59.97	118° 18.56	10.11	Alnilam	275°35.18
17	170° 20.72	108° 10.49	9.94	98°21.77	34.78	358°48.02	04°59.84	133°20.81	10.17	Betelgeuse	270°49.35
18	185°23.18	123°12.55	N17° 9.78	113°22.36	N22°35.02	13°50.22	N04°59.72	148°23.06	N12° 10.30	Canopus	263°51.68
19	200°25.64	138°14.60	9.62	128°22.95	35.27	28°52.41	59.60	163°25.31	10.36	Sirius	258°24.09
20	215°28.11	153° 16.65	9.47	143°23.54	35.51	43°54.61	59.47	178°27.56	10.42	Adhara	255°4.01
21	230°30.57	168° 18.70	• • 9.32	158°24.13	• • 35.75	58°56.80	• • 59.35	193°29.81	• • 10.48	Procyon	244°48.19
22	245°33.04	183°20.74	9.17	173°24.72	35.99	73°59.00	59.23	208°32.05	10.55	Pollux Avior	243°14.22 234°14.09
23	260°35.50	198°22.78	9.02	188°25.31	36.23	$89^{\circ}1.19$	59.11	223°34.30	10.61	Suhail	234 14.09 222°44.52
Merr	pass. 05:40	u2 1′ d-0	.2′ m-4.67	ν0 6' d0	.2′ m1.46	1/2 2' d-0	.1′ m-1.91	u2 2' d0	.1′ m0.46	Miaplacidus	221°38.26
IVICI.	Jass. 03.40	ν2.1 <b>u</b> -0	.2 111-4.07	νο.ο αο	.2 1111.40	ν2.2 <b>u</b> -0		ν2.2 do	.1 1110.40	Alphard	217°45.20
										Regulus	207°31.63
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.93
0	275°37.96	213°24.82	N17°8.87	203°25.90	N22°36.47	104°3.39	N04°58.98	238°36.55	N12° 10.67	Denebola	182°22.13
1	290°40.43	228° 26.85	8.72	218°26.49	36.71	119°5.58	58.86	253°38.80	10.73	Gienah	175°40.65
2	305° 42.89	243°28.88	8.58	233°27.08	36.95	134°7.78	58.74	268°41.05	10.80	Acrux	172°56.74
3 4	320° 45.36 335° 47.82	258°30.91 273°32.93	· · 8.44	248°27.67 263°28.26	· · 37.19 37.43	149°9.97 164°12.17	58.61	283°43.30 298°45.55	10.86	Gacrux	171°48.32
5	350°50.28	273 32.93 288°34.95	8.29 8.15	203 26.20 278°28.85	37.43 37.67	104 12.17 179°14.36	58.49 58.37	313°47.80	10.92 10.98	Alioth	$166^{\circ}10.51$
6	5° 52.75	303° 36.97	N17°8.01	293°29.44	N22°37.90	179 14.50 194°16.55	N04°58.24	328°50.05	N12° 11.04	Spica	158°19.20
7	20°55.21	318° 38.98	7.87	308°30.03	38.14	209° 18.75	58.12	343°52.30	11.11	Alkaid	152°49.66
8	35° 57.68	333°40.99	7.74	323°30.62	38.38	224°20.94	57.99	358°54.55	11.17	Hadar	148°31.53
9	51°0.14	348°42.99	• • 7.60	338°31.21	• • 38.62	239°23.13	57.87	13°56.80	. 11.23		147°54.02
10	66°2.61	3°44.99	7.47	353°31.80	38.85	254°25.32	57.75	28°59.05	11.29	Arcturus	145°45.17
11	81°5.07	18°46.99	7.33	8°32.39	39.09	269°27.52	57.62	44°1.30	11.36	Rigil Kent. Kochab	139°35.88 137°19.33
12	96°7.53	33°48.98	N17°7.20	23°32.98	N22°39.32	284°29.71	N04°57.50	59°3.55	N12°11.42	Zuben'ubi	136°52.64
13	$111^{\circ}10.00$	48°50.97	7.07	38°33.57	39.56	299°31.90	57.37	74°5.80	11.48	Alphecca	126°1.08
14	126° 12.46	63°52.96	6.94	53°34.16	39.79	314°34.09	57.25	89°8.05	11.54	Antares	112° 12.00
15	141° 14.93	78°54.94	• • 6.82	68°34.75	• • 40.03	329°36.28	• • 57.12	104°10.30	• • 11.60	Atria	107° 3.06
16	156° 17.39	93°56.92	6.69	83°35.34	40.26	344°38.47	57.00	119°12.55	11.66	Sabik	101°59.18
17	171°19.85	108°58.90	6.57	98°35.93	40.50	359°40.67	56.88	134°14.80	11.73	Shaula	96°6.09
18	186°22.32	124°0.87	N17° 6.44	113°36.52	N22°40.73	14°42.86	N04°56.75	149°17.06	N12°11.79	Rasalhague	95°55.58
19	201°24.78 216°27.25	139°2.84 154°4.81	6.32	128°37.11 143°37.70	40.96	29°45.05 44°47.24	56.63	164°19.31 179°21.56	11.85	Eltanin	90°40.32
20 21	231°29.71	169°6.77	6.20 • • 6.08	158° 38.29	41.20 •• 41.43	59°49.43	56.50 •• 56.38	179 21.50 194°23.81	11.91 •• 11.97	Kaus Aust.	83°28.35
22	246°32.17	184°8.73	5.96	173°38.88	41.45	74°51.62	56.25	209°26.06	12.03	Vega	80°30.86
23	261°34.64	199°10.68	5.85	188°39.47	41.89	89°53.81	56.13	224°28.31	12.10	Nunki	75°43.88
						_				Altair	61°56.87
Mer.p	bass. 05:37	$\nu$ 2.0′ d-0	.1′ m-4.68	$\nu$ 0.6′ d0	.2′ m1.46	$\nu 2.2' \ d-0$	.1' m-1.90	$\nu$ 2.2′ d0	.1' m0.45	Peacock	53°0.83
										Deneb Enif	49°23.43 33°35.78
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.17
0	$276^{\circ}37.10$	214°12.63	$N17^{\circ}5.73$	203°40.06	N22°42.12	104°56.00	N04°56.00	239°30.57		Fomalhaut	15°11.30
1	291°39.57	$229^{\circ}14.58$	5.62	$218^{\circ}40.65$	42.35	119°58.19	55.88	254°32.82	12.22	Scheat	13°42.28
2	306° 42.03	244°16.52	5.50	233°41.24	42.58	135°0.38	55.75	269°35.07	12.28	Markab	13°26.93
3	321°44.49	259° 18.47	• • 5.39	248°41.83	• • 42.81	150° 2.57	• • 55.62	284°37.32	• • 12.34	1 26.11	
4	336° 46.96	274°20.40	5.28	263° 42.42	43.04	165° 4.75	55.50	299°39.57	12.40	Jun 26 Mon	<b>SHA</b> 297°56.11
5	351°49.42	289°22.34	5.17 N17°5.07	278° 43.01	43.27	180°6.94	55.37	314°41.83	12.46		297°56.11 288°32.91
6	6°51.89 21°54.35	304°24.27 319°26.19	N17°5.07	293°43.60 308°44.19	N22°43.50	195° 9.13 210° 11.32	N04°55.25		N12°12.52		288° 32.91 188° 31.84
7 8	21°54.35 36°56.81	319°26.19 334°28.12	4.96 4.86	308°44.19 323°44.78	43.73 43.96	210°11.32 225°13.51	55.12 55.00	344°46.33 359°48.58	12.59 12.65	Saturn	323°3.78
9	50°50.81 51°59.28	349°30.04	• • 4.75	338° 45.37	• • 44.19	240°15.70	• • 54.87	14°50.84	•• 12.71		
10	67°1.74	4°31.95	4.65	353° 45.96	44.41	255°17.88	54.74	29°53.09	12.77	Jun 27 Tue	SHA
11	82°4.21	19°33.87	4.55	8°46.55	44.64	270°20.07	54.62	44°55.34	12.83		297°46.86
12	97°6.67	34°35.78	N17°4.45	23°47.14	N22°44.87	285°22.26	N04°54.49	59°57.60	N12° 12.89		287°47.94
13	$112^{\circ}9.14$	49°37.68	4.35	38°47.73	45.09	300°24.44	54.37	74°59.85	12.95	Jupiter Saturn	188°25.43 322°58.59
14	127° 11.60	64°39.58	4.25	53°48.32	45.32	315°26.63	54.24	90°2.10	13.01	Saturn	J22 J0.39
15	142°14.06	79°41.48	• • 4.16	68°48.91	• • 45.55	330°28.82	• • 54.11	105°4.36	· · 13.07	Jun 28 Wed	SHA
16	157° 16.53	94°43.38	4.06	83°49.50	45.77	345°31.00	53.99	120°6.61	13.13		297°35.53
17	172° 18.99	109°45.27	3.97	98°50.09	46.00	0°33.19	53.86	135°8.86	13.19	Mars	287°2.96
18	187°21.46 202°23.92	124°47.16 139°49.04	N17° 3.88	113°50.68 128°51.27	N22°46.22	15°35.38 30°37.56	N04°53.73	150°11.12 165°13.37	N12° 13.25		188°18.90
19 20	202°23.92 217°26.38	139°49.04 154°50.93	3.79 3.70	128°51.27 143°51.86	46.44 46.67	30°37.56 45°39.75	53.61 53.48	165°13.37 180°15.63	13.31 13.38	Saturn	322°53.46
20	217 20.38 232°28.85	169° 52.80	3.70 · · 3.61	143 51.86 158° 52.45	46.87	45 39.75 60°41.93	53.48	180 15.63 195°17.88	13.38	Horizoi	ntal parallax
22	247°31.31	184° 54.68	3.53	173° 53.04	47.11	75°44.12	53.22	210°20.14	13.50		Venus:
23	262°33.78	199°56.55	3.44	188° 53.63	47.34	90°46.30	53.10	225°22.39	13.56		Mars:
			.1′ m-4.69		.2′ m1.46		.1′ m-1.89		.1′ m0.45		
ivier.p	pass. 05:33	ν1.9 α-0	.111-4.09	νο.σ· ασ	.∠ 1111.40	ν2.2 α-0	.1 111-1.09	ν2.3 d0	.1 1110.45		

Dec

29°14.81

-42°8.73

56°41.43

-17°49.61  $\text{-}57^{\circ}5.18$ 

 $23^{\circ}35.76$ 

89°22.72

-40°11.21

4°12.09 49°57.54

16°33.91 -8°10.15

 $46^{\circ}1.44$ 

 $6^{\circ}22.46$ 

28°37.77

 $-1^{\circ}11.08$ 

 $7^{\circ}24.66$ 

-52°42.69

-16°45.40

-29°0.74  $5^{\circ}9.02$ 

 $27^{\circ}57.37$ 

-59°36.27

-43°33.11

-69°50.34

-8°47.08

11°49.61

61°36.00

14°24.76

 $-17^{\circ}42.19$ 

-63°15.80

 $-57^{\circ}16.73$ 

55°48.51

-11°18.72

49°10.44

-60°30.91

-36°30.81

 $19^{\circ}2.10$ 

-60°57.44

 $74^{\circ}2.49$ 

-16°9.68

26°37.23

-26°29.71

 $-69^{\circ}4.73$ 

 $-37^{\circ}7.39$ 

 $12^{\circ}32.45$ 

51°29.18

-34°22.12

38°48.66

 $-26^{\circ}15.51$ 

 $8^{\circ}56.73$ 

-56°38.29

45°22.90

 $10^{\circ}0.44$ 

-46°49.02

-29°27.98 28°14.22

15°21.56

Mer.pass

09:48

10:27

17:05

80:80

09:45

10:26

17:01

08:04

10:25

16:58 08:01

Mer.pass 09:42

0.4

0.1

Mer.pass

 $-15^{\circ}45.55$ 

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°16.60	N23°20.67	134° 54.72	9.1'	N13°20.11	-13.9'	59.7'
1 2	194°16.47 209°16.34	20.58 20.49	149°22.84 163°51.02	9.2' 9.2'	13°6.24 12°52.30	-13.9'	59.7' 59.7'
3	209 16.34 224°16.21	. 20.49	103 51.02 178°19.26	9.2 9.3'	12 52.30 12°38.28	-14.0' -14.1'	59.7' 59.7'
4	239°16.08	20.31	192°47.57	9.4'	12°24.19	-14.2'	59.7'
5	254°15.95	20.22	207° 15.95	9.4'	12° 10.04	-14.2'	59.7'
6	269°15.81 284°15.68	N23°20.13 20.03	221°44.38 236°12.88	9.5' 9.6'	N11°55.81 11°41.51	-14.3' -14.4'	59.7' 59.7'
7 8	299°15.55	19.94	250° 41.44	9.6'	11°27.15	-14.4'	59.7'
9	314°15.42	• • 19.84	$265^{\circ}10.07$	9.7'	$11^{\circ}12.73$	-14.5'	59.7'
10	329°15.29	19.75	279°38.75	9.7'	10°58.24	-14.5'	59.7'
11 12	344°15.16 359°15.03	19.65 N23° 19.56	294°7.49 308°36.29	9.8' 9.9'	10°43.70 N10°29.10	-14.6' -14.7'	59.7' 59.7'
13	14°14.90	19.46	323°5.15	9.9'	10° 14.43	-14.7'	59.7'
14	29°14.77	19.36	$337^{\circ}34.07$	10.0'	$09^{\circ}59.72$	-14.8'	59.7'
15	44°14.64 59°14.51	19.26	352°3.04	10.0'	09°44.95 09°30.13	-14.8'	59.7'
16 17	59 14.51 74°14.37	19.16 19.06	6°32.07 21°1.15	10.1' 10.1'	09 30.13 09°15.25	-14.9' -14.9'	59.7' 59.7'
18	89°14.24	N23° 18.96	35° 30.28	10.2'	N09°0.33	-15.0'	59.7'
19	104°14.11	18.86	49°59.47	10.2'	08°45.37	-15.0'	59.7'
20 21	119°13.98 134°13.85	18.75 •• 18.65	64°28.71 78°57.99	10.3' 10.3'	08° 30.35 08° 15.30	-15.1' -15.1'	59.7' 59.7'
22	134 13.85 149°13.72	18.55	93°27.33	10.3	08 15.30 08°0.20	-15.1'	59.7' 59.7'
23	164°13.59	18.44	107°56.72	10.4	07°45.06	-15.2	59.7'
	SD = 15.7'	d = -0.1'		SI	D = 16.3'		
_							
Tue 0	<b>GHA</b> 179°13.46	<b>Dec</b> N23° 18.34	<b>GHA</b> 122° 26.15	u 10.5'	<b>Dec</b> N07° 29.88	d -15.2'	<b>HP</b> 59.7'
1	179 13.46 194°13.33	18.23	122 20.15 136° 55.63	10.5'	07° 14.66	-15.2 -15.3'	59.7' 59.7'
2	209°13.20	18.12	$151^{\circ}25.16$	10.6'	$06^{\circ}59.41$	-15.3'	59.7'
3	224°13.07	• • 18.01	165°54.73	10.6'	06°44.12	-15.3'	59.7'
4 5	239°12.95 254°12.82	17.91 17.80	180°24.34 194°54.00	10.7' 10.7'	06°28.81 06°13.46	-15.3' -15.4'	59.7' 59.7'
6	269°12.69	N23°17.69	209° 23.70	10.7	N05°58.08	-15.4	59.7'
7	284°12.56	17.58	223°53.43	10.8'	$05^{\circ}42.67$	-15.4'	59.6'
8	299°12.43	17.47	238°23.21	10.8'	05°27.24	-15.5'	59.6'
9 10	314°12.30 329°12.17	· · 17.35 17.24	252°53.02 267°22.87	10.9' 10.9'	05°11.78 04°56.30	-15.5' -15.5'	59.6' 59.6'
11	344°12.04	17.13	281°52.76	10.9	04° 40.79	-15.5'	59.6'
12	359°11.91	N23°17.01	296°22.68	11.0'	N04°25.27	-15.5'	59.6'
13	14°11.78 29°11.65	16.90	310°52.64	11.0'	04°9.73	-15.6'	59.6'
14 15	29°11.65 44°11.53	16.78 •• 16.67	325°22.62 339°52.64	11.0' 11.0'	03°54.17 03°38.59	-15.6' -15.6'	59.6' 59.6'
16	59°11.40	16.55	354°22.69	11.1'	03°23.01	-15.6'	59.6'
17	74°11.27	16.43	8°52.77	11.1'	03°7.40	-15.6'	59.6'
18 19	89°11.14 104°11.01	N23°16.31 16.20	23°22.87 37°53.00	11.1' 11.2'	N02°51.79 02°36.17	-15.6' -15.6'	59.6' 59.5'
20	119°10.88	16.08	52° 23.16		02° 20.54		59.5'
21	134°10.76	• • 15.95	66°53.34	11.2'	$02^{\circ}4.91$	-15.6'	59.5'
22	149°10.63	15.83	81°23.55	11.2'	01°49.26	-15.6'	59.5'
23	164°10.50	15.71	95°53.77	11.2'	01°33.62	-15.6'	59.5'
	SD = 15.7'	d = -0.1'		51	D = 16.3'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°10.37	N23° 15.59	110°24.02	11.3'	N01°17.97	-15.6'	59.5'
1 2	194°10.25 209°10.12	15.47 15.34	124° 54.29 139° 24.57	11.3' 11.3'	01°2.33 00°46.68	-15.6' -15.6'	59.5' 59.5'
3	224°9.99	•• 15.22	153°54.87	11.3'	00°31.04	-15.6'	59.5'
4	239°9.86	15.09	168°25.19	11.3'	N00°15.40	-15.6'	59.5'
5 6	254°9.74 269°9.61	14.97 N23°14.84	182°55.53 197°25.87	11.3' 11.4'	\$00°0.24 \$00°15.87	15.6' 15.6'	59.4' 59.4'
7	269 9.61 284°9.48	N23 14.84 14.71	211° 56.23	11.4 11.4'	00°31.49	15.6'	59.4 59.4'
8	299°9.35	14.58	226°26.60	11.4'	$00^{\circ}47.10$	15.6'	59.4'
9	314°9.23	• • 14.45	240°56.98	11.4'	01°2.70	15.6'	59.4'
10 11	329°9.10 344°8.97	14.32 14.19	255°27.37 269°57.77	11.4' 11.4'	01°18.29 01°33.86	15.6' 15.6'	59.4' 59.4'
12	359°8.85	N23°14.06	284° 28.18	11.4	501°49.42	15.5	59.4
13	14°8.72	13.93	298°58.59	11.4'	$02^{\circ}4.96$	15.5'	59.3'
14	29°8.59	13.80	313°29.00	11.4'	02°20.48	15.5'	59.3'
15 16	44°8.47 59°8.34	· · 13.67 13.53	327°59.42 342°29.84	11.4' 11.4'	02°35.99 02°51.47	15.5' 15.5'	59.3' 59.3'
17	74°8.22	13.40	357°0.26	11.4'	02 51.47 03°6.93	15.5' 15.4'	59.3'
18	89°8.09	N23°13.26	11°30.68	11.4'	S03°22.37	15.4'	59.3'
19	104°7.96	13.13	26°1.10	11.4'	03°37.78	15.4'	59.3'
20 21	119°7.84 134°7.71	12.99 •• 12.85	40°31.51 55°1.92	11.4' 11.4'	03°53.17 04°8.53	15.4' 15.3'	59.2' 59.2'
22	134 7.71 149°7.59	12.71	69° 32.33	11.4'	04° 0.55 04° 23.86	15.3'	59.2'
23	164°7.46	12.57	84°2.73	11.4'	04°39.16	15.3'	59.2'
	SD = 15.7'	d = -0.1'		SI	D = 16.2'		

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

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

h	Aries	` Venus	, Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	277°36.24	214°58.42 N17°3.36	203°54.23 N22°47.56	105°48.49 N04°52.97	240°24.64 N12°13.62	
1	292°38.70	230°0.28 3.27	218°54.82 47.78	120°50.67 52.84	255°26.90 13.68	Alpheratz 357°31.74 29°14.82
2	307°41.17	245°2.14 3.19	233°55.41 48.00	135°52.86 52.72	270°29.15 13.74	Ankaa 353°4.41 -42°8.72
3	322°43.63	260°4.00 · · 3.11	248°56.00 · · 48.22	150°55.04 · · 52.59	285°31.41 · · 13.80	Schedar 349°27.69 56°41.43
4	337°46.10	275°5.86 3.03	263°56.59 48.44	165°57.23 52.46	300°33.66 13.86	Diphda 348°44.49 -17°49.61
5	352°48.56	290°7.71 2.95	278°57.18 48.67	180°59.41 52.33	315°35.92 13.92	Achernar 335°18.36 -57°5.17   Hamal 327°48.10 23°35.76
6	7°51.02	305°9.56 N17°2.88	293°57.77 N22°48.89	196°1.59 N04°52.21	330°38.18 N12°13.98	Polaris 312°48.36 89°22.71
7	22°53.49	320°11.40 2.80	308°58.36 49.11	211°3.78 52.08	345°40.43 14.04	Acamar 315°9.93 -40°11.20
8	37°55.95	335°13.24 2.73	323°58.95 49.32	226°5.96 51.95	0°42.69 14.10	Menkar 314°3.37 4°12.10
9	52° 58.42	350°15.08 · · 2.66	338°59.54 · · 49.54	241°8.14 · · 51.82	15°44.94 · · 14.16	Mirfak 308°24.47 49°57.54
10 11	68°0.88 83°3.34	5°16.91 2.59 20°18.74 2.52	354° 0.13 49.76 9° 0.72 49.98	256°10.33 51.69 271°12.51 51.57	30°47.20 14.22 45°49.45 14.28	Aldebaran 290°36.65 16°33.91
12	98°5.81	35°20.57 N17°2.45	24°1.31 N22°50.20	286°14.69 N04°51.44	60°51.71 N12°14.34	Rigel 281°1.46 -8°10.14
13	113°8.27	50°22.39 2.38	39°1.90 50.42	301°16.87 51.31	75°53.97 14.40	Capella 280°18.13 46°1.43
14	128° 10.74	65°24.21 2.31	54°2.49 50.63	316°19.05 51.18	90° 56.22 14.46	Bellatrix 278°20.15 6°22.47
15	143° 13.20	80°26.03 · · 2.25	69°3.08 · · 50.85	331°21.24 · · 51.05	105°58.48 · · 14.51	Elnath 277°58.64 28°37.76
16	158° 15.67	95°27.84 2.18	84°3.67 51.07	346°23.42 50.92	121°0.74 14.57	Alnilam 275°35.17 -1°11.07
17	173°18.13	110°29.66 2.12	99°4.26 51.28	1°25.60 50.79	136°2.99 14.63	Betelgeuse 270°49.35 7°24.67 Canopus 263°51.68 -52°42.67
18	188° 20.59	125°31.46 N17°2.06	114°4.85 N22°51.50	16°27.78 N04°50.67	151°5.25 N12°14.69	Sirius 258°24.08 -16°45.39
19	203°23.06	140°33.27 2.00	129° 5.44 51.71	31°29.96 50.54	166°7.51 14.75	Adhara 255°4.01 -29°0.73
20	218° 25.52	155°35.07 1.94	144°6.03 51.93	46°32.14 50.41	181°9.76 14.81	Procyon 244°48.19 5°9.02
21	233°27.99	170°36.86 · · 1.88	159°6.62 · · 52.14	61°34.32 · · 50.28	196°12.02 · · 14.87	Pollux 243°14.22 27°57.37
22	248°30.45	185°38.66 1.83	174° 7.21 52.35	76°36.50 50.15	211°14.28 14.93	Avior 234°14.10 -59°36.25
23	263°32.91	200°40.45 1.77	189°7.80 52.57	91°38.68 50.02	226°16.54 14.99	Suhail 222°44.53 -43°33.09
Mer. <sub>I</sub>	pass. 05:29	$\nu 1.9' \; d ext{-}0.1' \;  ext{m-}4.70$	$ u 0.6' \ d0.2' \ m1.47$	$ u 2.2' \ d\text{-}0.1' \ \text{m-}1.89$	$\nu 2.3' \ d0.1' \ \text{m}0.45$	Miaplacidus 221°38.29 -69°50.33
						Alphard 217°45.21 -8°47.07
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.64 11°49.62 Dubhe 193°37.96 61°36.00
0	278°35.38	215°42.23 N17°1.72	204°8.39 N22°52.78	106°40.86 N04°49.89	241°18.79 N12°15.05	Dubhe 193°37.96 61°36.00 Denebola 182°22.14 14°24.76
1	293°37.84	230°44.02 1.67	219°8.98 52.99	121°43.04 49.76	256°21.05 15.11	Gienah 175°40.66 -17°42.19
2	308°40.31	245°45.80 1.61	234°9.57 53.21	136°45.22 49.63	271°23.31 15.17	Acrux 172°56.77 -63°15.80
3	323° 42.77	260°47.57 · · 1.56	249°10.16 · · 53.42	151°47.40 · · 49.50	286°25.57 · · 15.23	Gacrux 171°48.35 -57°16.73
4	338° 45.23	275°49.35 1.51	264°10.75 53.63	166°49.58 49.37	301°27.82 15.28	Alioth 166°10.54 55°48.51
5 6	353° 47.70 8° 50.16	290°51.12 1.47 305°52.89 N17°1.42	279°11.34 53.84 294°11.94 N22°54.05	181°51.76 49.24 196°53.94 N04°49.11	316°30.08 15.34 331°32.34 N12°15.40	Spica 158°19.21 -11°18.71
7	23°52.63	320°54.65 1.37	309°12.53 54.26	211°56.12 48.98	346°34.60 15.46	Alkaid 152°49.68 49°10.44
8	38°55.09	335°56.41 1.33	324°13.12 54.47	226°58.30 48.85	1°36.86 15.52	Hadar 148°31.55 -60°30.91
9	53°57.55	350°58.17 · · 1.29	339°13.71 · · 54.68	242°0.47 · · 48.72	16°39.12 · · 15.58	Menkent 147°54.03 -36°30.81
10	69°0.02	5°59.92 1.25	354°14.30 54.89	257°2.65 48.59	31°41.37 15.64	Arcturus 145°45.18 19°2.11 Rigil Kent. 139°35.90 -60°57.44
11	84°2.48	21°1.67 1.20	9°14.89 55.10	272°4.83 48.46	46°43.63 15.70	Kochab 137°19.38 74°2.49
12	99°4.95	36°3.42 N17°1.16	24°15.48 N22°55.31	287°7.01 N04°48.33	61°45.89 N12°15.75	Zuben'ubi 136°52.65 -16°9.68
13	114°7.41	51°5.16 1.13	39°16.07 55.52	302°9.19 48.20	76°48.15 15.81	Alphecca 126°1.09 26°37.24
14	129°9.88	66°6.90 1.09	54°16.66 55.73	317°11.36 48.07	91°50.41 15.87	Antares 112°12.00 -26°29.71
15 16	144° 12.34 159° 14.80	81°8.64 · · 1.05 96°10.38 1.02	69°17.25 · · 55.94 84°17.84 56.14	332°13.54 · · 47.94 347°15.72 47.81	106°52.67 · · 15.93 121°54.93	Atria 107°3.07 -69°4.74
17	174° 17.27	111°12.11 0.99	99°18.43 56.35	2°17.89 47.68	136°57.19 16.05	Sabik 101°59.19 -15°45.55
18	189° 19.73	126°13.83 N17°0.95	114°19.02 N22°56.56	17°20.07 N04°47.55	151°59.45 N12°16.11	Shaula 96°6.09 -37°7.40 Rasalhague 95°55.58 12°32.46
19	204°22.20	141°15.56 0.92	129°19.61 56.76	32°22.25 47.42	167°1.71 16.16	Rasalhague 95°55.58 12°32.46   Eltanin 90°40.32 51°29.19
20	219°24.66	156°17.28 0.89	144°20.20 56.97	47°24.42 47.29	182°3.97 16.22	Kaus Aust. 83°28.34 -34°22.13
21	234°27.12	171°19.00 · · 0.86	159°20.79 · · 57.17	62°26.60 · · 47.16	197°6.23 · · 16.28	Vega 80°30.86 38°48.68
22	249°29.59	186°20.71 0.84	174°21.38 57.38	77°28.77 47.03	212°8.49 16.34	Nunki 75°43.88 -26°15.51
23	264°32.05	201°22.42 0.81	189°21.97 57.58	92°30.95 46.89	227°10.75 16.40	Altair 61°56.86 8°56.74
Mer.	pass. 05:25	$\nu 1.8' \ d$ -0.1' m-4.70	$ u 0.6' \ d0.2' \ m1.47$	$\nu 2.2' \ d$ -0.1' m-1.88	$ u 2.3' \ d0.1' \ \text{m}0.45$	Peacock 53°0.81 -56°38.29
						Deneb 49°23.41 45°22.91
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.77 10°0.45
0	279°34.52	216°24.13 N17°0.78	204°22.57 N22°57.79	107°33.12 N04°46.76	242°13.01 N12°16.45	Al Na'ir 27°29.15 -46°49.02
1	294° 36.98	231°25.84 0.76	219°23.16 57.99	122°35.30 46.63	257°15.27 16.51	Fomalhaut 15°11.28 -29°27.98   Scheat 13°42.26 28°14.23
2	309°39.44	246°27.54 0.74	234°23.75 58.20	137°37.47 46.50	272°17.53 16.57	Markab 13°26.92 15°21.57
3	324°41.91	261°29.24 · · 0.72	249°24.34 · · 58.40	152°39.65 · · 46.37	287°19.79 · · 16.63	
4	339°44.37	276°30.93 0.69	264°24.93 58.60	167°41.82 46.24	302°22.05 16.69	Jun 29 Thu SHA Mer.pass
5	354° 46.84	291°32.62 0.68	279°25.52 58.81	182°44.00 46.11	317°24.31 16.74	Venus 297°22.18 09:39
6	9°49.30	306°34.31 N17°0.66	294°26.11 N22°59.01	197°46.17 N04°45.97	332°26.57 N12°16.80	Mars 286°17.98 10:24
7	24°51.77	321°36.00 0.64	309°26.70 59.21	212°48.35 45.84 227°50.52 45.71	347°28.84 16.86	Jupiter 188°12.25 16:54   Saturn 322°48.40 07:57
8 9	39° 54.23 54° 56.69	336°37.68 0.62 351°39.36 · 0.61	324°27.29 59.41 339°27.88 • 59.61	227°50.52 45.71 242°52.69 • 45.58	2°31.10 16.92 17°33.36 · · 16.97	
10	69°59.16	6°41.04 0.60	354°28.47 22°59.81	257°54.87 45.45	32°35.62 17.03	Jun 30 Fri SHA Mer.pass
11	85°1.62	21°42.71 0.58	9°29.06 23°0.01	272°57.04 45.31	47°37.88 17.09	Venus 297°6.86 09:36
12	100°4.09	36°44.38 N17°0.57	24°29.65 N23°0.21	287°59.21 N04°45.18	62°40.14 N12°17.15	Mars 285°33.01 10:23   Jupiter 188°5.49 16:51
13	115°6.55	51°46.04 0.56	39°30.25 0.41	303°1.38 45.05	77° 42.41 17.20	Jupiter 188° 5.49 16:51   Saturn 322° 43.41 07:54
14	130°9.01	66°47.71 0.55	54°30.84 0.61	318° 3.56 44.92	92°44.67 17.26	
15 16	145°11.48	81°49.37 · · 0.54	69°31.43 · · 0.81	333°5.73 · · 44.78	107°46.93 · · 17.32	Jul 01 Sat SHA Mer.pass
16 17	160° 13.94 175° 16.41	96°51.02 0.54 111°52.68 0.53	84°32.02 1.01 99°32.61 1.21	348°7.90 44.65 3°10.07 44.52	122°49.19 17.38 137°51.46 17.43	Venus 296°49.61 09:33
18	175 16.41 190°18.87	126°54.33 N17°0.53	114°33.20 N23°1.40	18°12.25 N04°44.39	152°53.72 N12°17.49	Mars 284°48.05 10:22 Jupiter 187°58.61 16:47
19	205°21.34	141°55.98 0.52	129°33.79 1.60	33°14.42 44.25	167°55.98 17.55	Saturn 322°38.49 07:50
20	220°23.80	156°57.62 0.52	144°34.38 1.80	48°16.59 44.12	182°58.24 17.60	
21	235° 26.26	171°59.26 · · 0.52	159°34.97 · · 1.99	63°18.76 · · 43.99	198°0.51 · · 17.66	Horizontal parallax
22	250°28.73	187°0.90 0.52	174°35.56 2.19	78°20.93 43.85	213°2.77 17.72	Venus: 0.4
23	265°31.19	202°2.53 0.52	189°36.15 2.39	93°23.10 43.72	228°5.03 17.78	Mars: 0.1
Mer. <sub>ا</sub>	pass. 05:21	$\nu 1.7' \; d\text{-}0.0' \; \text{m-}4.71$	$ u 0.6' \ d0.2' \ m1.47$	$\nu 2.2' \ d$ -0.1' m-1.88	$ u 2.3' \ d0.1' \ \text{m}0.44$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°7.34	N23°12.44	98°33.13	11.4'	S04°54.43	15.2'	59.2'
1 2	194°7.21 209°7.09	12.29 12.15	113°3.51 127°33.89	11.4' 11.4'	05°9.66 05°24.86	15.2' 15.2'	59.2' 59.2'
3	224°6.96	• • 12.01	142° 4.25	11.4'	05°40.02	15.1'	59.1
4	239°6.84	11.87	156°34.61	11.3'	05°55.15	15.1'	59.1'
5 6	254° 6.71 269° 6.59	11.73 N23°11.58	171°4.95 185°35.28	11.3' 11.3'	06°10.24 \$06°25.29	15.0' 15.0'	59.1' 59.1'
7	269 6.59 284°6.46	11.44	200° 5.59	11.3	06°40.29	15.0'	59.1'
8	299°6.34	11.29	214°35.89	11.3'	06°55.26	14.9'	59.1'
9	314°6.21	• • 11.15	229°6.17	11.3'	07°10.18	14.9'	59.1'
10 11	329°6.09 344°5.97	11.00 10.85	243°36.43 258°6.67	11.2' 11.2'	07°25.05 07°39.88	14.8' 14.8'	59.0' 59.0'
12	359°5.84	N23°10.71	272°36.89	11.2'	S07°54.66	14.7'	59.0'
13	14°5.72	10.56	287°7.09	11.2'	08°9.40	14.7'	59.0'
14 15	29°5.59 44°5.47	10.41 •• 10.26	301°37.27 316°7.43	11.2' 11.1'	08°24.08 08°38.71	14.6' 14.6'	59.0' 59.0'
16	59°5.35	10.11	330°37.56	11.1'	08°53.28	14.5'	58.9'
17	74°5.22	9.96	345°7.67	11.1'	09°7.80	14.5'	58.9'
18 19	89°5.10 104°4.98	N23° 9.80 9.65	359°37.75 14°7.80	11.1' 11.0'	\$09°22.27 09°36.68	14.4' 14.4'	58.9' 58.9'
20	104 4.98 119°4.85	9.65 9.50	28°37.83	11.0'	09 30.08 09°51.03	14.4	58.9'
21	134°4.73	• • 9.34	43°7.82	11.0'	10°5.32	14.2'	58.9'
22	149°4.61	9.19	57°37.79	10.9'	10°19.55	14.2'	58.8'
23	164°4.48	9.03	72°7.72	10.9'	10°33.72	14.1'	58.8'
	SD = 15.7'	d = -0.1'		SE	0 = 16.1'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°4.36	N23°8.87	86°37.63	10.9'	S10°47.83	14.0'	58.8'
1 2	194°4.24 209°4.12	8.72 8.56	101°7.50 115°37.34	10.8' 10.8'	11°1.87 11°15.84	14.0' 13.9'	58.8' 58.8'
3	209 4.12 224°3.99	· · 8.40	115 37.34 130°7.14	10.8	11 15.64 11°29.75	13.8'	58.8'
4	239°3.87	8.24	144°36.91	10.7'	11°43.59	13.8'	58.7'
5	254°3.75 269°3.63	8.08 N23°7.92	159° 6.64 173° 36.34	10.7'	11°57.36 \$12°11.05	13.7'	58.7'
6 7	269 3.63 284°3.51	N23 7.92 7.76	173 30.34 188° 5.99	10.7' 10.6'	12°24.68	13.6' 13.6'	58.7' 58.7'
8	299°3.39	7.60	202°35.61	10.6'	12°38.23	13.5'	58.7'
9	314°3.26	• • 7.44	217°5.19	10.5'	12°51.71	13.4'	58.7'
10 11	329°3.14 344°3.02	7.27 7.11	231°34.74 246°4.24	10.5' 10.5'	13°5.11 13°18.43	13.3' 13.2'	58.6' 58.6'
12	359°2.90	N23° 6.94	260°33.69	10.4'	S13°31.68	13.2'	58.6'
13	14°2.78	6.78	275°3.11	10.4'	13°44.84	13.1'	58.6'
14 15	29°2.66 44°2.54	6.61 •• 6.44	289°32.49 304°1.82	10.3' 10.3'	13°57.93 14°10.93	13.0' 12.9'	58.6' 58.6'
16	59°2.42	6.28	318°31.10	10.2'	14°23.85	12.8'	58.5
17	74°2.29	6.11	333° 0.35	10.2'	14°36.68	12.7'	58.5'
18 19	89°2.17 104°2.05	N23° 5.94 5.77	347°29.54 1°58.70	10.2' 10.1'	\$14°49.43 15°2.09	12.7' 12.6'	58.5' 58.5'
20	119°1.93	5.60	16°27.80		15°14.66		58.5
21	134°1.81	• • 5.43	30°56.86	10.0'	15°27.14	12.4'	58.4'
22 23	149°1.69 164°1.57	5.26 5.08	45°25.87 59°54.84	10.0' 9.9'	15°39.53 15°51.83	12.3' 12.2'	58.4' 58.4'
23	SD = 15.7'	d = -0.2'			0 = 16.0'	12.2	J0.4 ——
		<u>u = -0.2</u>		JL	7 = 10.0		
Sat	GHA 170°1 45	<b>Dec</b> N23° 4.91	<b>GHA</b> 74°23.75	u 9.9'	Dec \$16° 4.04	d 12.1'	HP
0 1	179°1.45 194°1.33	N23 4.91 4.74	74°23.75 88°52.62	9.9'	16°16.15	12.1	58.4' 58.4'
2	209°1.21	4.56	103°21.44	9.8'	$16^{\circ}28.17$	11.9'	58.3'
3 4	224°1.10 239°0.98	· · 4.39 4.21	117°50.21 132°18.93	9.7' 9.7'	16°40.09 16°51.91	11.8' 11.7'	58.3' 58.3'
4 5	239°0.98 254°0.86	4.21	132°18.93 146°47.60	9.7	16°51.91 17°3.63	11.7	58.3'
6	269°0.74	N23°3.86	161°16.22	9.6'	S17°15.25	11.5'	58.3'
7	284°0.62 299°0.50	3.68 3.50	175°44.79 190°13.30	9.5' 9.5'	17°26.77 17°38.19	11.4' 11.3'	58.3' 58.2'
8 9	299 0.50 314°0.38	· · 3.32	190 13.30 204°41.77	9.5 9.4'	17 38.19 17°49.51	11.3	58.2'
10	329°0.26	3.14	219°10.19	9.4'	$18^{\circ}0.71$	11.1'	58.2'
11	344°0.14	2.96	233°38.55	9.3'	18°11.82	11.0'	58.2'
12 13	359°0.03 13°59.91	N23°2.78 2.59	248° 6.86 262° 35.12	9.3' 9.2'	\$18°22.81 18°33.70	10.9' 10.8'	58.2' 58.1'
14	28°59.79	2.41	277°3.33	9.2'	18°44.48	10.7	58.1'
15	43°59.67	• • 2.23	291°31.49	9.1'	18°55.15	10.6'	58.1'
16 17	58° 59.55 73° 59.44	2.04 1.86	305°59.59 320°27.65	9.1' 9.0'	19°5.70 19°16.15	10.4' 10.3'	58.1' 58.1'
18	88° 59.32	N23° 1.67	334°55.65	8.9'	\$19°26.48	10.3	58.0'
19	103° 59.20	1.49	349°23.60	8.9'	19°36.69	10.1'	58.0'
20 21	118° 59.08 133° 58.97	1.30 · · 1.11	3°51.49 18°19.34	8.8' 8.8'	19°46.79 19°56.77	10.0' 9.9'	58.0' 58.0'
22	133 58.97 148° 58.85	0.92	32°47.13	8.7'	20° 6.63	9.9 9.7'	58.0'
23	163°58.73	0.73	47°14.88	8.7'	20°16.38	9.6'	57.9'
	SD = 15.7'	d = -0.2'		SE	0 = 15.9'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	44-67%	
29	03:31	03:37	12:04	18:02	05:37		
30	03:43	03:48	12:04	18:52	06:26		
01	03:54	04:00	12:04	19:44	07:18		

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA [	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	280°33.66		7°0.52	204°36.75	N23°2.58	108°25.27	N04° 43.59	243°7.30	N12°17.83			
1	295°36.12	232°5.79	0.53	219°37.34	2.78	123°27.44	43.45	258°9.56	17.89	Alpheratz	357°31.72 353°4.38	29°14.83 -42°8.72
2	$310^{\circ}38.58$	247°7.42	0.53	234°37.93	2.97	$138^{\circ}29.61$	43.32	273°11.82	17.95	Ankaa Schedar	353 4.38 349°27.65	-42 8.72 56°41.44
3	325°41.05		0.54	249°38.52	· · 3.17	153°31.78	• • 43.19	288°14.09	• • 18.00	Diphda	348°44.47	-17°49.60
4	340°43.51	277°10.66	0.54	264°39.11	3.36	168°33.95	43.05	303°16.35	18.06	Achernar	335°18.33	-57°5.16
5 6	355° 45.98 10° 48.44	292°12.28 307°13.89 N17	0.55 7°0.56	279°39.70 294°40.29	3.55 N23°3.75	183°36.12 198°38.29	42.92 N04° 42.79	318° 18.61 333° 20.88	18.12 N12°18.17	Hamal	327°48.08	23°35.77
7	25°50.90	322°15.50	0.57	309°40.88	3.94	213°40.46	42.65	348°23.14	18.23	Polaris	312°46.80	89°22.70
8	40°53.37	337°17.10	0.58	324°41.47	4.13	228°42.63	42.52	3°25.41	18.29	Acamar	315°9.90	-40°11.19
9	55°55.83	352°18.71 · ·	0.59	339°42.07	• • 4.32	243°44.80	• • 42.38	18°27.67	• 18.34	Menkar Mirfak	314°3.35 308°24.43	4°12.11 49°57.54
10	70°58.30	7°20.31	0.60	354°42.66	4.51	258°46.97	42.25	33°29.94	18.40	Aldebaran	290°36.64	16° 33.91
11	86°0.76	22°21.90	0.62	9°43.25	4.71	273°49.14	42.12	48°32.20	18.46	Rigel	281°1.45	-8° 10.13
12	101°3.23		7°0.63	24°43.84	N23°4.90	288°51.30	N04°41.98	63°34.47	N12°18.51	Capella	280°18.11	46°1.42
13 14	116°5.69 131°8.15	52°25.09 67°26.68	0.65 0.67	39°44.43 54°45.02	5.09 5.28	303°53.47 318°55.64	41.85 41.71	78°36.73 93°39.00	18.57 18.62	Bellatrix	$278^{\circ}20.14$	6°22.47
15	146° 10.62		. 0.69	69°45.61	· · 5.47	333°57.81	• • 41.58	108° 41.26	. 18.68	Elnath	277°58.62	28°37.76
16	161°13.08	97°29.84	0.70	84°46.20	5.66	348°59.97	41.44	123°43.53	18.74	Alnilam	275°35.16	-1°11.07
17	$176^{\circ}15.55$	112°31.42	0.73	99°46.80	5.85	4°2.14	41.31	138°45.79	18.79	Betelgeuse Canopus	270°49.33 263°51.68	7°24.67 -52°42.66
18	191° 18.01		7°0.75	114°47.39	N23°6.03	19°4.31	N04°41.17	153° 48.06	N12°18.85	Sirius	258°24.08	-16° 45.38
19	206°20.48	142°34.57	0.77	129°47.98	6.22	34°6.48	41.04	168°50.32	18.90	Adhara	255°4.00	-29°0.72
20	221°22.94	157°36.14 172°37.71	0.79	144°48.57	6.41	49°8.64	40.91	183°52.59	18.96	Procyon	244°48.19	5°9.02
21 22	236°25.40 251°27.87	172 37.71 · · · 187°39.27	0.82 0.84	159°49.16 174°49.75	· · 6.60 6.79	64°10.81 79°12.98	•• 40.77 40.64	198°54.85 213°57.12	· · 19.02 19.07	Pollux	243°14.22	27°57.36
23	266°30.33	202°40.83	0.87	189°50.34	6.97	94°15.14	40.50	213° 57.12 228° 59.39	19.07	Avior	234°14.11	-59°36.24
		-								Suhail	222°44.54	-43°33.09
Mer.	pass. 05:17	ν1.6′ d0.0′ m	-4.71	$\nu$ 0.6′ d0.	.2′ m1.48	$\nu^{2.2'} d$ -0	.1′ m-1.87	$\nu^{2.3'} d0$	.1′ m0.44	Miaplacidus Alphard	221°38.31 217°45.21	-69°50.32 -8°47.07
										Regulus	217 45.21 207°31.65	-6 47.07 11°49.62
Mon	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.99	61°35.99
0	281°32.80		7°0.90	204°50.94	N23°7.16	109°17.31	N04°40.36	244°1.65	N12°19.18	Denebola	$182^{\circ}22.15$	14°24.76
1 2	296°35.26 311°37.72	232°43.94 247°45.49	0.93 0.96	219°51.53 234°52.12	7.34	124°19.47 139°21.64	40.23	259°3.92 274°6.19	19.24	Gienah	$175^{\circ}40.67$	-17°42.18
3	326° 40.19		0.90	234 52.12 249°52.71	7.53 • • 7.72	159 21.04 154°23.80	40.09 •• 39.96	289°8.45	19.30 •• 19.35		172°56.79	-63°15.80
4	341° 42.65	277°48.58	1.02	264°53.30	7.90	169°25.97	39.82	304° 10.72	19.41	Gacrux	171°48.36	-57°16.72
5	356° 45.12	292°50.13	1.05	279°53.89	8.09	184°28.14	39.69	319° 12.99	19.46	Alioth Spica	166°10.56 158°19.21	55°48.51 -11°18.71
6	11°47.58	307°51.66 N17	7°1.09	294°54.48	N23°8.27	199°30.30	N04°39.55	334°15.25	N12°19.52	Alkaid	150 19.21 152°49.70	49° 10.45
7	26°50.05	322°53.20	1.12	309°55.08	8.45	214°32.46	39.42	349° 17.52	19.57	Hadar	148°31.57	-60°30.91
8	41°52.51	337°54.73	1.16	324°55.67	8.64	229°34.63	39.28	4°19.79	19.63	Menkent	147°54.04	-36°30.81
9	56° 54.97 71° 57.44	352°56.26 · · · · · · · · · · · · · · · · · · ·	1.20	339°56.26 354°56.85	• • 8.82	244°36.79 259°38.96	39.14	19°22.06 34°24.32	19.68	Arcturus	$145^{\circ}45.19$	19°2.12
10 11	86° 59.90	22°59.31	1.24 1.28	9°57.44	9.00 9.19	259 36.90 274°41.12	39.01 38.87	49° 26.59	19.74 19.79	Rigil Kent.	139°35.92	-60°57.45
12	102°2.37		7°1.32	24°58.03	N23°9.37	289°43.29	N04°38.74	64°28.86	N12°19.85	Kochab	137°19.44	74°2.50
13	117°4.83	53°2.35	1.36	39°58.63	9.55	304°45.45	38.60	79°31.13	19.90	Zuben'ubi Alphecca	136°52.65 126°1.09	-16°9.68 26°37.25
14	132°7.29	68°3.87	1.40	54°59.22	9.73	319°47.61	38.46	94°33.39	19.96	Antares	112° 12.00	-26°29.71
15	147°9.76		1.44	69°59.81	• • 9.91	334°49.78	• • 38.33	109°35.66	• • 20.01	Atria	107°3.07	-69°4.75
16	162° 12.22	98°6.89	1.49	85° 0.40	10.09	349°51.94	38.19	124° 37.93	20.07	Sabik	$101^{\circ}59.18$	-15°45.54
17 18	177° 14.69 192° 17.15	113°8.39 128°9.89 N17	1.53 7°1.58	100° 0.99 115° 1.58	10.27 N23°10.45	4°54.10 19°56.26	38.05 N04°37.92	139°40.20 154°42.47	20.12 N12°20.18	Shaula	96°6.08	-37°7.40
19	207° 19.62	143°11.39	1.63	130°2.18	10.63	34°58.43	37.78	169° 44.74	20.23	Rasalhague	95°55.57	12°32.47
20	222°22.08	158° 12.89	1.68	145°2.77	10.81	50°0.59	37.64	184°47.01	20.29	Eltanin	90°40.33	51°29.21
21	237°24.54		1.73	160°3.36	• • 10.99	65°2.75	• • 37.51	199°49.27	• • 20.34	Kaus Aust. Vega	83°28.33 80°30.85	-34°22.13 38°48.70
22	252°27.01	188°15.88	1.78	175° 3.95	11.17	80°4.91	37.37	214°51.54	20.40	Nunki	75°43.87	-26° 15.51
23	267°29.47	203°17.36	1.83	190°4.54	11.34	95°7.07	37.23	229°53.81	20.45	Altair	61°56.85	8°56.75
Mer.	pass. 05:13	u1.6′ $d$ 0.0′ $m$	-4.71	$\nu$ 0.6′ d0.	.2′ m1.48	$\nu$ 2.2′ d-0	.1' m-1.87	$\nu 2.3' \ d0$	.1′ m0.44	Peacock	53°0.79	-56°38.30
	·									Deneb	49°23.39	45°22.93
Tue	GHA	GHA [	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.75	10°0.46
0	282°31.94	218° 18.85 N17			N23°11.52	110°9.24		244°56.08	N12°20.51	Al Na'ir Fomalhaut	27°29.12 15°11.26	-46°49.02 -29°27.97
1	297°34.40	233°20.33	1.93	$220^{\circ}5.73$	11.70	125°11.40	36.96	259° 58.35	20.56	Scheat	13°42.24	28° 14.24
2	312°36.87	248°21.81	1.99	235°6.32	11.88	140°13.56	36.82	275°0.62	20.62	Markab	13°26.89	15°21.58
3	327°39.33		2.04	250°6.91	12.05	155°15.72	· · 36.68	290°2.89	• • 20.67	Jul 02 Sun	CUV	Mer.pass
4 5	342° 41.79 357° 44.26	278°24.76 293°26.23	2.10 2.16	265°7.50 280°8.10	12.23 12.40	170°17.88 185°20.04	36.55 36.41	305°5.16 320°7.43	20.73 20.78		<b>SHA</b> 296°30.51	09:31
6	357 44.26 12°46.72		7°2.22	280 8.10 295°8.69	N23°12.58	200°22.20		320 7.43 335°9.70	20.78 N12°20.83	Mars	284°3.09	10:21
7	27°49.19	323°29.16	2.27	310° 9.28	12.75	215°24.36	36.13	350° 11.97	20.89		187°51.62	16:44
8	42°51.65	338°30.62	2.34	325°9.87	12.93	230°26.52	36.00	5°14.24	20.94	Saturn	322°33.64	07:46
9	57°54.11		2.40	340°10.46	• • 13.10	245°28.68	• • 35.86	20° 16.51	• • 21.00	Jul 03 Mon	SHA	Mer.pass
10	72°56.58	8°33.53	2.46	355°11.06	13.28	260°30.84	35.72	35°18.78	21.05	Venus	296°9.59	09:28
11 12	87°59.04 103°1.51	23°34.99 38°36.44 N17	2.52 7°2.59	10°11.65 25°12.24	13.45 N23°13.62	275°33.00 290°35.16	35.58 N04°35.44	50°21.05 65°23.32	21.11 N12°21.16		283°18.14	10:20
13	103 1.51 118°3.97	53° 37.88	2.65	25 12.24 40°12.83	13.79	305°37.32	35.31	80° 25.59	21.21		187°44.51	16:40
14	133°6.44	68°39.33	2.72	55°13.43	13.97	320°39.48	35.17	95° 27.87	21.27	Saturn	322°28.86	07:43
15	148°8.90		2.78	70°14.02	• 14.14	335°41.63	• • 35.03	110°30.14	• • 21.32	Jul 04 Tue	SHA	Mer.pass
16	163°11.36	98°42.20	2.85	85°14.61	14.31	350°43.79	34.89	125° 32.41	21.38		295°46.91	09:26
17	178° 13.83	113°43.64	2.92	100°15.20	14.48	5°45.95	34.75	140°34.68	21.43		282°33.20	10:19
18	193°16.29	128° 45.07 N17		115°15.80	N23°14.65	20°48.11		155° 36.95	N12°21.48		187°37.30	16:37
19 20	208° 18.76 223° 21.22	143°46.50 158°47.93	3.06 3.13	130°16.39 145°16.98	14.82 14.99	35°50.27 50°52.43	34.48 34.34	170°39.22 185°41.49	21.54 21.59	Saturn	322°24.15	07:39
20	238°23.69		3.13 · 3.21	145 10.96 160°17.57	14.99	65°54.58	34.20	200° 43.77	. 21.59	Horizoi	ital parallax	
22	253°26.15	188°50.77	3.28	175°18.16	15.33	80°56.74	34.06	215° 46.04	21.70		Venus:	0.3
23	268°28.61	203°52.19	3.36	190°18.76	15.50	95°58.90	33.92	230°48.31	21.75		Mars:	0.1
Mer	pass. 05:09	$\nu 1.5' \ d0.1' \ {\rm m}$	-4.71	$\nu_{0.6' d0}$	.2′ m1.48	ν2.2' d-0	.1′ m-1.86	ν2.3′ dΩ	.1′ m0.44			
							2.00					

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.62	N23°0.54	61°42.57	8.6'	S20°26.00	9.5'	57.9'
1	193°58.50	0.35	76° 10.21	8.6'	20°35.51	9.4'	57.9'
2 3	208°58.38 223°58.27	0.16 22°59.97	90°37.80 105°5.34	8.5' 8.5'	20°44.89 20°54.15	9.3' 9.1'	57.9' 57.9'
4	238°58.15	22°59.78	119°32.83	8.4'	21°3.28	9.0'	57.8'
5	253°58.03	59.58	134°0.27	8.4'	21°12.29	8.9'	57.8'
6	268°57.92 283°57.80	N22°59.39 59.19	148°27.66 162°55.01	8.3' 8.3'	\$21°21.17 21°29.93	8.8' 8.6'	57.8' 57.8'
7 8	298°57.69	59.19	102 55.01 177°22.30	6.3 8.2'	21 29.93 21°38.56	8.5'	57.8'
9	313°57.57	• • 58.80	191°49.55	8.2'	21°47.05	8.4'	57.7'
10	328°57.46	58.60	206° 16.75	8.2'	21°55.42	8.2'	57.7'
11 12	343°57.34 358°57.23	58.41 N22°58.21	220°43.90 235°11.01	8.1' 8.1'	22°3.66 522°11.77	8.1' 8.0'	57.7' 57.7'
13	13°57.11	58.01	249°38.07	8.0'	22°19.74	7.8'	57.7'
14	28°57.00	57.81	264°5.08	8.0'	22°27.58	7.7'	57.6'
15 16	43°56.88 58°56.77	· · 57.61 57.41	278°32.05 292°58.98	7.9' 7.9'	22°35.29 22°42.86	7.6' 7.4'	57.6' 57.6'
17	73°56.65	57.41 57.21	292 36.96 307°25.87	7.9 7.8'	22°50.30	7.4	57.6'
18	88°56.54	N22° 57.00	321°52.71	7.8'	S22°57.60	7.2'	57.6'
19	103°56.42	56.80	336° 19.52	7.8'	23°4.76	7.0'	57.5'
20 21	118°56.31 133°56.20	56.60 •• 56.39	350°46.28 5°13.00	7.7' 7.7'	23°11.79 23°18.67	6.9' 6.7'	57.5' 57.5'
22	148°56.08	56.19	19°39.68	7.6'	23°25.42	6.6	57.5'
23	163°55.97	55.98	34°6.33	7.6'	23°32.02	6.5'	57.5'
	SD = 15.7'	d = -0.2'		SI	D = 15.8'		
Man	GHA	Doc	GHA		Dec	d	НР
Mon 0	178°55.86	<b>Dec</b> N22° 55.77	48°32.94	ν 7.6'	S23°38.49	a 6.3'	<b>нР</b> 57.4'
1	193°55.74	55.57	62°59.51	7.5'	23°44.81	6.2'	57.4'
2	208°55.63	55.36	77°26.05	7.5'	23°50.99	6.0'	57.4
3 4	223°55.52 238°55.40	· · 55.15 54.94	91°52.56 106°19.03	7.5' 7.4'	23°57.03 24°2.93	5.9' 5.8'	57.4' 57.4'
5	253°55.29	54.73	120°45.47	7.4'	24°8.68	5.6'	57.3'
6	268°55.18	N22° 54.52	135°11.89	7.4'	S24°14.28	5.5'	57.3'
7	283°55.06 298°54.95	54.31	149°38.27 164°4.62	7.4'	24°19.74 24°25.06	5.3'	57.3'
8 9	298 54.95 313°54.84	54.10 •• 53.88	164°4.62 178°30.95	7.3' 7.3'	24°25.06 24°30.23	5.2' 5.0'	57.3' 57.3'
10	328°54.73	53.67	192°57.25	7.3'	24°35.25	4.9'	57.2'
11	343°54.62	53.46	207°23.53	7.3'	24°40.12	4.7'	57.2'
12 13	358°54.50 13°54.39	N22°53.24 53.03	221°49.78 236°16.01	7.2' 7.2'	\$24°44.85 24°49.43	4.6' 4.4'	57.2' 57.2'
14	28°54.28	52.81	250° 42.23	7.2'	24 49.43 24°53.86	4.4	57.2'
15	43°54.17	• • 52.59	265°8.42	7.2'	24°58.14	4.1'	57.1'
16	58°54.06	52.37	279°34.59	7.2'	25° 2.27	4.0'	57.1'
17 18	73°53.95 88°53.84	52.16 N22° 51.94	294°0.75 308°26.90	7.1' 7.1'	25°6.25 \$25°10.08	3.8' 3.7'	57.1' 57.1'
19	103°53.73	51.72	322°53.03	7.1'	25°13.76	3.5'	57.1
20	118°53.61	51.50	337°19.14		25°17.29	3.4'	57.0'
21 22	133°53.50 148°53.39	•• 51.28 51.05	351°45.25 6°11.35	7.1' 7.1'	25°20.68 25°23.90	3.2' 3.1'	57.0' 57.0'
23	163°53.28	50.83	20°37.44	7.1'	25°26.98	2.9'	57.0'
	SD = 15.7'	d = -0.2'		SI	D = 15.7'		
_							
Tue 0	<b>GHA</b> 178°53.17	<b>Dec</b> N22° 50.61	<b>GHA</b> 35°3.52	u 7.1'	<b>Dec</b> \$25°29.91	d 2.8'	<b>HP</b> 57.0'
1	193°53.06	50.38	49°29.60	7.1'	25°32.68	2.6'	56.9'
2	208°52.95	50.16	63°55.68	7.1'	$25^{\circ}35.31$	2.5'	56.9'
3 4	223°52.84 238°52.74	· · 49.93 49.71	78°21.75 92°47.83	7.1' 7.1'	25°37.78 25°40.10	2.3' 2.2'	56.9' 56.9'
4 5	238 52.74 253 52.63	49.71 49.48	92°47.83 107°13.90	7.1' 7.1'	25°40.10 25°42.27	2.2'	56.9'
6	268°52.52	N22°49.25	121°39.98	7.1'	S25°44.28	1.9'	56.8'
7	283°52.41	49.03	136°6.06	7.1'	25°46.15	1.7'	56.8'
8 9	298°52.30 313°52.19	48.80 •• 48.57	150°32.15 164°58.25	7.1' 7.1'	25°47.86 25°49.42	1.6' 1.4'	56.8' 56.8'
10	328°52.08	48.34	179° 24.35	7.1'	25°50.82	1.3'	56.7'
11	343°51.97	48.11	193°50.47	7.1'	25°52.08	1.1'	56.7'
12	358°51.86 13°51.76	N22°47.88	208° 16.60 222° 42.74	7.1' 7.2'	\$25°53.19	1.0'	56.7'
13 14	13°51.76 28°51.65	47.64 47.41	222°42.74 237°8.90	7.2'	25°54.14 25°54.94	0.8' 0.7'	56.7' 56.7'
15	43°51.54	• • 47.18	251°35.08	7.2'	$25^{\circ}55.59$	0.5'	56.6'
16	58°51.43	46.94	266°1.27	7.2'	25°56.09	0.3'	56.6'
17 18	73°51.33 88°51.22	46.71 N22°46.47	280°27.48 294°53.72	7.2' 7.3'	25°56.44 \$25°56.64	0.2' 0.0'	56.6' 56.6'
19	103°51.11	46.24	309° 19.98	7.3'	25°56.68	-0.1	56.6'
20	118°51.00	46.00	323°46.27	7.3'	$25^{\circ}56.58$	-0.3'	56.5'
21	133°50.90 148°50.79	· · 45.76	338°12.58 352°38.92	7.3'	25°56.33 25°55.93	-0.4' -0.6'	56.5'
22 23	148°50.79 163°50.68	45.52 45.28	352°38.92 7°5.29	7.4' 7.4'	25°55.93 25°55.38	-0.6° -0.7'	56.5' 56.5'
_5	SD = 15.7'	d = -0.2'	3.29		D = 15.5'	J.,	- 0.0
	JD — 15.1	u — -U.Z	-	اد	<i>-</i> 10.5		

			2028	July 02	to Jul	. 04 L
Lat.	Twi	light	Sunrise	Sunset	Twi	light
	Naut.	Civil			Civil	Naut.
N $72^{\circ}$						
<b>N</b> 70°						
68°						
66°	////	////	00:39	23:25	////	////
64°	////	////	01:46	22:21	////	////
62°	////	////	02:20	21:47	////	////
60°	////	01:10	02:45	21:23	22:57	////
<b>N</b> 58°	////	01:52	03:05	21:03	22:15	////
56°	11111	02:20	03:03	20:48	21:48	////
54°	01:04	02:20	03:21	20:46	21:46	23:02
52°	01:04	02:41	03:46	20:34	21:10	22:24
50°	02:09	02:38		20:22		21:59
45°	!		03:57	!	20:55	
	02:53	03:42	04:19	19:50	20:27	21:16
N 40°	03:22	04:04	04:36	19:32	20:05	20:46
$35^{\circ}$	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
$20^{\circ}$	04:31	05:01	05:25	18:44	19:08	19:37
N $10^{\circ}$	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:30	18:57
<b>S</b> 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
<b>S</b> 50°	06:39	07:21	07:59	16:10	16:48	17:30
52°		07:21		!		17:30
54°	06:44 06:50	07:26	08:08	16:01 15:50	16:41 16:33	
56°	l		08:19	l		17:19
50°	06:56	07:45	08:31	15:38	16:24	17:13
<b>S</b> 60°	07:02	07:54	08:45	15:24	16:15	17:07
3 00	07:09	08:06	09:02	15:07	16:03	17:00
Lat.		Moonris	e		Moonset	:
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°	19:36			21:30		
64°	18:39	20:42		22:28	22:22	
62°	18:06	19:43	20:54	23:02	23:21	
60°	17:42	19:10	20:17	23:26	23:55	
<b>N</b> 58°	17:23	18:45	19:51	23:46		00:20
56°	17:23	18:25	19:31	23.40	00:03	00:20
54°	1					
	16:53	18:09	19:12		00:17	00:56
52°	16:41	17:55	18:58	00.07	00:29	01:10
50°	16:30	17:43	18:45	00:07	00:40	01:23
450	16⋅08	17.17	10.10	00.35	01.03	01.40

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

			Sun		Moon			
Day		Eqn.of	Time	Mer.	Mer.Pass.		Age	
		00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-1	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	77-92	
	02	04:06	04:11	12:04	20:38	08:11		
	03	04:17	04:22	12:04	21:34	09:06		
	04	04:27	04:33	12:05	22:31	10:02		

h	Aries	Ver	านร	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	283°31.08	218°53.60	N17°3.43	205° 19.35	N23°15.67	111° 1.05	N04°33.78	245°50.58	N12°21.81			
1	298°33.54	233°55.01	3.51	$220^{\circ}19.94$	15.84	126°3.21	33.64	260°52.86	21.86	Alpheratz	357°31.69 353°4.35	29°14.84 -42°8.71
2	$313^{\circ}36.01$	248°56.42	3.58	$235^{\circ}20.54$	16.01	141°5.37	33.50	275°55.13	21.91	Ankaa Schedar	353 4.35 349°27.60	-42 8.71 56°41.45
3	328°38.47	263°57.83	• • 3.66	250°21.13	• • 16.17	156° 7.52	• • 33.36	290°57.40	• • 21.97	Diphda	348°44.44	-17° 49.58
4	343°40.93	278°59.23	3.74	265°21.72	16.34	171°9.68	33.22	305°59.67	22.02	Achernar	335°18.29	-57°5.15
5 6	358° 43.40 13° 45.86	294°0.63 309°2.03	3.82 N17°3.90	280°22.31 295°22.91	16.51 N23°16.67	186°11.84 201°13.99	33.09 N04°32.95	321°1.95 336°4.22	22.07 N12°22.13	Hamal	327°48.05	23°35.78
7	28° 48.33	309 2.03 324°3.43	3.99	310°23.50	16.84	201 13.99 216°16.15	32.81	351°6.49	22.18	Polaris	312°45.16	89°22.69
8	43°50.79	339°4.82	4.07	325°24.09	17.00	231°18.30	32.67	6°8.77	22.23	Acamar	315°9.88	-40°11.18
9	58° 53.26	354°6.21	• • 4.15	340°24.68	• • 17.17	246°20.46	• • 32.53	21°11.04	• • 22.28	Menkar	314°3.33 308°24.40	4°12.12
10	73°55.72	9°7.59	4.24	355°25.28	17.33	261°22.61	32.39	$36^{\circ}13.31$	22.34	Mirfak Aldebaran	290°36.61	49°57.54 16°33.92
11	88°58.18	24°8.98	4.32	10°25.87	17.50	276°24.77	32.25	51°15.59	22.39	Rigel	281°1.43	-8° 10.13
12	104°0.65	39°10.36	N17°4.41	25°26.46	N23°17.66	291°26.92	N04°32.11	66°17.86	N12°22.44	Capella	280°18.08	46°1.42
13 14	119°3.11 134°5.58	54°11.73 69°13.11	4.50 4.58	40°27.06 55°27.65	17.83 17.99	306°29.08 321°31.23	31.97 31.83	81°20.13 96°22.41	22.50	Bellatrix	278°20.12	6°22.47
15	149°8.04	84°14.48	• • 4.67	70°28.24	18.15	336°33.39	31.69	111°24.68	22.55 •• 22.60	Elnath	277°58.60	28° 37.76
16	164° 10.51	99°15.85	4.76	85°28.83	18.32	351°35.54	31.55	126°26.96	22.65	Alnilam	275°35.14	-1°11.06
17	$179^{\circ}12.97$	$114^{\circ}17.22$	4.85	100°29.43	18.48	6°37.69	31.41	141°29.23	22.71	Betelgeuse	270°49.32	7°24.67 -52°42.64
18	194° 15.43	129° 18.58	N17° 4.95	115°30.02	N23°18.64	21°39.85	N04°31.27	156°31.51	N12°22.76	Canopus Sirius	263°51.67 258°24.06	-52 42.04 -16° 45.37
19	209°17.90	144°19.94	5.04	130°30.61	18.80	36°42.00	31.13	171°33.78	22.81	Adhara	255°3.99	-29°0.71
20	224°20.36	159°21.30	5.13	145°31.21	18.96	51°44.16	30.99	186°36.06	22.86	Procyon	244°48.18	5°9.02
21 22	239°22.83 254°25.29	174°22.65 189°24.01	· · 5.23 5.32	160°31.80 175°32.39	· · 19.12 19.28	66°46.31 81°48.46	· · 30.84 30.70	201°38.33 216°40.61	· · 22.92 22.97	Pollux	243°14.21	27°57.36
23	269° 27.75	204°25.35	5.42	175 32.39 190°32.99	19.44	96°50.61	30.76	231°42.88	23.02	Avior	234°14.12	-59°36.23
										Suhail	222°44.54	-43°33.08
Mer.	pass. 05:05	$\nu$ 1.4′ d0.3	1′ m-4.71	$\nu$ 0.6′ d0	.2′ m1.49	$\nu^{2.2'} d-0$	.1′ m-1.86	$\nu^{2.3'} d0$	.1′ m0.43	Miaplacidus	221°38.33	-69°50.31
										Alphard Regulus	217°45.21 207°31.65	-8°47.06 11°49.62
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.00	61° 35.98
0	284°30.22	219°26.70	N17°5.52	205°33.58	N23°19.60	111°52.77	N04°30.42	246°45.16	N12°23.07	Denebola	182°22.15	14° 24.76
1	299° 32.68	234°28.05	5.61	220°34.17	19.76	126°54.92	30.28	261°47.43	23.13	Gienah	175°40.67	-17°42.18
2	314°35.15 329°37.61	249°29.39 264°30.72	5.71 •• 5.81	235°34.76 250°35.36	19.92 •• 20.08	141°57.07 156°59.22	30.14 · · 30.00	276°49.71 291°51.98	23.18 23.23	Acrux	172°56.81	-63° 15.80
4	344° 40.08	279°32.06	5.91	265°35.95	20.00	172°1.38	29.86	306°54.26	23.28	Gacrux		-57°16.72
5	359° 42.54	294°33.39	6.01	280°36.54	20.39	187° 3.53	29.72	321°56.54	23.34	Alioth	166°10.58	55°48.51
6	14°45.00	309°34.72	N17° 6.12	295°37.14	N23°20.55	202°5.68	N04°29.58	336°58.81	N12°23.39	Spica Alkaid	158°19.22 152°49.71	-11° 18.71 49° 10.45
7	29° 47.47	$324^{\circ}36.05$	6.22	310° 37.73	20.71	217°7.83	29.43	$352^{\circ}1.09$	23.44	Hadar	148°31.58	-60° 30.92
8	44°49.93	339°37.37	6.32	325°38.32	20.87	232° 9.98	29.29	7°3.36	23.49		147°54.05	-36° 30.81
9	59° 52.40	354°38.70	. 6.43	340°38.92	• • 21.02	247°12.13	• • 29.15	22°5.64	• • 23.54	Arcturus	145°45.19	19°2.12
10 11	74°54.86 89°57.33	9°40.02 24°41.33	6.53 6.64	355°39.51 10°40.11	21.18 21.33	262°14.28 277°16.43	29.01 28.87	37°7.92 52°10.19	23.60 23.65	Rigil Kent.		-60° 57.45
12	104° 59.79	39°42.65	N17° 6.75	25°40.70	N23°21.49	292°18.58	N04°28.73	67°12.47	N12°23.70	Kochab	137°19.49	74°2.51
13	120°2.25	54° 43.96	6.86	40°41.29	21.64	307°20.73	28.58	82°14.75	23.75	Zuben'ubi Alphecca	136°52.65	-16°9.68 26°37.26
14	135°4.72	69°45.26	6.97	55°41.89	21.80	322°22.88	28.44	97°17.03	23.80	Antares	126°1.10 112°12.00	-26°29.71
15	$150^{\circ}7.18$	84°46.57	• • 7.08	70°42.48	• • 21.95	337°25.03	• • 28.30	$112^{\circ}19.30$	• • 23.85	Atria	107°3.07	-69°4.76
16	165°9.65	99°47.87	7.19	85°43.07	22.11	352°27.18	28.16	127°21.58	23.91	Sabik	101°59.18	-15° 45.54
17 18	180°12.11	114°49.17	7.30 N17°7.41	100° 43.67	22.26	7°29.33 22°31.48	28.02 N04°27.87	142°23.86 157°26.14	23.96	Shaula	96°6.07	-37°7.40
19	195° 14.57 210° 17.04	129°50.47 144°51.76	7.52	115° 44.26 130° 44.85	N23°22.41 22.56	37°33.63	27.73	172°28.41	N12°24.01 24.06	Rasalhague	95°55.57	12°32.48
20	225° 19.50	159°53.05	7.64	145°45.45	22.72	52°35.78	27.59	187°30.69	24.11	Eltanin	90°40.33	51°29.23
21	240°21.97	174°54.34	• • 7.75	160°46.04	• • 22.87	67°37.93	• • 27.45	202°32.97	• • 24.16	Kaus Aust. Vega	83°28.32 80°30.84	-34°22.13 38°48.71
22	255° 24.43	189°55.63	7.87	175°46.64	23.02	82°40.08	27.30	217°35.25	24.21	Nunki	75°43.85	-26° 15.51
23	270°26.90	204°56.91	7.98	190°47.23	23.17	97°42.23	27.16	232°37.53	24.27	Altair	61°56.83	8°56.76
Mer.	pass. 05:01	$\nu$ 1.3' d0.3	1′ m-4.70	$-\nu$ 0.6' d0	.2′ m1.49	$\nu$ 2.2' d-0	.1' m-1.85	$\nu 2.3' d0$	.1′ m0.43	Peacock	53°0.76	-56° 38.30
				-						Deneb	49°23.37	45° 22.95
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.73	10°0.47
0	285° 29.36	219°58.19	N17°8.10	205° 47.82	N23°23.32	112°44.37		247°39.81		Al Na'ir	27°29.09	-46°49.02 -29°27.97
1	300°31.82	234°59.47	8.22	220° 48.42	23.47	127°46.52	26.88	262°42.08	24.37	Fomalhaut Scheat	15°11.23 13°42.21	-29° 27.97 28° 14.26
2	$315^{\circ}34.29$	250°0.75	8.34	$235^{\circ}49.01$	23.62	142°48.67	26.73	277°44.36	24.42	Markab	13°26.87	15° 21.60
3	330°36.75	265°2.02	• • 8.46	250°49.61	• • 23.77	157°50.82	• • 26.59	292°46.64	• • 24.47			
4	345°39.22	280°3.29	8.58	265°50.20	23.92	172°52.96	26.45	307°48.92	24.52	Jul 05 Wed	<b>SHA</b> 295°22.53	Mer.pass 09:24
5 6	0°41.68 15°44.14	295°4.56 310°5.82	8.70 N17°8.82	280°50.79 295°51.39	24.07	187°55.11 202°57.26	26.30	322°51.20 337°53.48	24.57		295 22.55 281°48.27	10:18
7	30°46.61	310 5.82 325°7.08	N17 8.82 8.94	295 51.39 310°51.98	N23°24.22 24.36	202 57.26 217°59.41	N04°26.16 26.02	352°55.76	N12°24.62 24.67		187°29.98	16:34
8	45° 49.07	340°8.34	9.07	325°52.58	24.51	233° 1.55	25.87	7°58.04	24.72	Saturn	322°19.50	07:35
9	60°51.54	355°9.60	• • 9.19	340°53.17	• • 24.66	248° 3.70	25.73	23°0.32	• • 24.77			
10	75°54.00	10° 10.85	9.32	355°53.76	24.81	263° 5.85	25.59	38°2.60	24.83	Jul 06 Thu Venus	<b>SHA</b> 294°56.48	Mer.pass 09:21
11	90°56.47	25°12.10	9.44	10°54.36	24.95	278°7.99	25.44	53°4.88	24.88	Mars	294 50.46 281°3.36	10:17
12	105°58.93	40°13.35	N17° 9.57	25°54.95	N23°25.10	293°10.14	N04°25.30	68°7.16	N12°24.93		187°22.55	16:30
13 14	121°1.39 136°3.86	55°14.60 70°15.84	9.70 9.83	40°55.55 55°56.14	25.25 25.39	308°12.28 323°14.43	25.16 25.01	83°9.44 98°11.72	24.98 25.03	Saturn	322°14.94	07:32
15	150° 5.80 151° 6.32	85°17.08	• • 9.96	70°56.74	25.54	338°16.58	24.87	113°14.00	• • 25.08	Jul 07 Fri	SHA	Mer.pass
16	166°8.79	100°18.32	10.09	85° 57.33	25.68	353°18.72	24.73	128°16.28	25.13		294°28.83	09:19
17	181°11.25	115° 19.56	10.22	100°57.92	25.82	8°20.87	24.58	143°18.56	25.18		280°18.46	10:16
18	196° 13.71		N17°10.35	115° 58.52	N23°25.97	23°23.01	N04°24.44	158°20.84	N12°25.23		187°15.01	16:27
19	211°16.18	145°22.02	10.48	130°59.11	26.11	38°25.16	24.29	173°23.12	25.28	Saturn	322°10.45	07:28
20	226° 18.64	160°23.25	10.61	145°59.71	26.26	53°27.30	24.15	188°25.40	25.33	Horizo	ntal parallax	
21 22	241°21.11 256°23.57	175°24.47 190°25.69	· · 10.75 10.88	161°0.30 176°0.90	· · 26.40 26.54	68°29.44 83°31.59	· · 24.01 23.86	203°27.68 218°29.97	· · 25.38 25.43	11011201	Venus:	0.3
23	271° 26.04	205°26.91	11.02	191°1.49	26.68	98°33.73	23.72	233°32.25	25.48		Mars:	0.1
		$\nu 1.3' \ d0.1$			.2′ m1.49		.1' m-1.85		.1′ m0.43			
ivier.p	bass. 04:57	ν1.3 αυ	111-4.70	νο.σ d0	.∠ 1111.49	ν∠.1 U-U	.111-1.05	ν2.3 d0	.1110.43			

h	Su	n		!	Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.58	N22°45.04	21°31.69	7.4'	S25°54.68	-0.8'	56.5'
1	193°50.47	44.80	35°58.12	7.5'	25°53.83	-1.0'	56.4
2	208°50.36 223°50.26	44.56 •• 44.32	50°24.59 64°51.09	7.5' 7.5'	25°52.84 25°51.70	-1.1' -1.3'	56.4' 56.4'
4	238°50.15	44.08	79°17.63	7.6'	25°50.41	-1.4	56.4'
5	253°50.05	43.84	93°44.21	7.6'	25°48.97	-1.6'	56.3'
6	268°49.94 283°49.84	N22°43.59 43.35	108°10.83 122°37.49	7.7' 7.7'	\$25°47.39 25°45.67	-1.7' -1.9'	56.3' 56.3'
7 8	283 49.84 298°49.73	43.35 43.10	122 37.49 137°4.19	7.7'	25 45.07 25°43.80	-1.9 -2.0'	56.3'
9	313°49.63	• • 42.86	151°30.94	7.8'	25°41.78	-2.2'	56.3'
10	328°49.52	42.61	165°57.73	7.8'	25°39.63	-2.3'	56.2'
11 12	343°49.42 358°49.31	42.36 N22°42.12	180°24.57 194°51.46	7.9' 7.9'	25°37.32 \$25°34.88	-2.4' -2.6'	56.2' 56.2'
13	13°49.21	41.87	209°18.40	8.0'	25°32.30	-2.0 -2.7'	56.2'
14	28°49.10	41.62	223°45.39	8.0'	25°29.57	-2.9'	56.2'
15	43°49.00	• • 41.37	238°12.44	8.1'	25°26.71	-3.0'	56.1'
16 17	58°48.89 73°48.79	41.12 40.87	252°39.53 267°6.68	8.2' 8.2'	25°23.70 25°20.56	-3.1' -3.3'	56.1' 56.1'
18	88°48.69	N22°40.61	281°33.89	8.3'	S25°17.28	-3.4'	56.1
19	103°48.58	40.36	296°1.16	8.3'	25°13.86	-3.6'	56.1'
20	118°48.48	40.11	310°28.48	8.4'	25°10.31	-3.7'	56.0'
21 22	133°48.38 148°48.27	· · 39.85 39.60	324°55.86 339°23.31	8.4' 8.5'	25°6.62 25°2.79	-3.8' -4.0'	56.0' 56.0'
23	163°48.17	39.34	353° 50.81	o.5 8.6'	25 2.79 24°58.84	-4.0 -4.1'	56.0'
-	SD = 15.7'	d = -0.2'			0 = 15.4'		
	- 13.1				_ 13.4		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°48.07 193°47.97	N22°39.09 38.83	8°18.38 22°46.01	8.6' 8.7'	\$24°54.74 24°50.52	-4.2' -4.4'	56.0' 55.9'
2	193°47.97 208°47.86	38.83 38.57	22°46.01 37°13.71	8.7° 8.8'	24°50.52 24°46.17	-4.4° -4.5°	55.9'
3	223°47.76	• • 38.32	51°41.47	8.8'	24°41.68	-4.6'	55.9'
4	238°47.66	38.06	66°9.30	8.9'	24°37.07	-4.7'	55.9'
5 6	253°47.56 268°47.46	37.80 N22°37.54	80°37.20 95°5.17	9.0' 9.0'	24°32.32 \$24°27.45	-4.9' -5.0'	55.9' 55.8'
7	283°47.35	37.28	109°33.20	9.0	24°22.45	-5.0 -5.1'	55.8'
8	298°47.25	37.02	124°1.31	9.2'	24°17.33	-5.2'	55.8'
9	313°47.15	• • 36.75	138°29.49	9.2'	24°12.08	-5.4'	55.8'
10 11	328°47.05 343°46.95	36.49 36.23	152°57.74 167°26.06	9.3' 9.4'	24°6.71 24°1.21	-5.5' -5.6'	55.8' 55.7'
12	358°46.85	N22°35.96	181°54.46	9.5	\$23°55.59	-5.7	55.7'
13	13°46.75	35.70	196°22.93	9.5'	23°49.86	-5.9'	55.7'
14	28°46.65	35.43	210°51.47	9.6'	23°44.00 23°38.02	-6.0'	55.7'
15 16	43°46.55 58°46.45	· · 35.17 34.90	225°20.09 239°48.79	9.7' 9.8'	23°31.93	-6.1' -6.2'	55.7' 55.6'
17	73°46.35	34.63	254°17.56	9.9'	23°25.71	-6.3	55.6'
18	88°46.25	N22°34.36	268°46.41	9.9'	S23°19.39	-6.4'	55.6'
19 20	103°46.15 118°46.05	34.09 33.82	283°15.34 297°44.35	10.0' 10.1'	23°12.94 23°6.39	-6.6' -6.7'	55.6' 55.6'
21	133°45.95	· · 33.55	312°13.43	10.1	23 0.39 22°59.72	-6.8'	55.5'
22	148°45.85	33.28	326°42.59	10.2'	22°52.94	-6.9'	55.5'
23	163°45.75	33.01	341°11.84	10.3'	22°46.05	-7.0'	55.5'
	SD = 15.7'	d = -0.3'		SD	= 15.3'		
E!	СПУ	Dee	CHA		Doo	٠.	шп
Fri 0	<b>GHA</b> 178°45.65	<b>Dec</b> N22°32.74	<b>GHA</b> 355°41.16	u 10.4'	<b>Dec</b> \$22°39.05	d -7.1'	<b>HP</b> 55.5'
1	193°45.55	32.47	$10^{\circ}10.56$	10.5'	22°31.94	-7.2'	55.5'
2	208°45.45	32.19	24°40.05	10.6'	22°24.73	-7.3'	55.4'
3 4	223°45.36 238°45.26	· · 31.92 31.64	39°9.61 53°39.26	10.6' 10.7'	22°17.40 22°9.98	-7.4' -7.5'	55.4' 55.4'
5	253°45.16	31.37	68°8.99	10.7	22°2.45	-7.6'	55.4'
6	268°45.06	N22°31.09	82°38.79	10.9'	S21°54.81	-7.7'	55.4'
7	283°44.96	30.81	97°8.68	11.0'	21°47.08	-7.8'	55.3'
8 9	298°44.87 313°44.77	30.54 •• 30.26	111°38.66 126°8.71	11.1' 11.1'	21°39.24 21°31.31	-7.9' -8.0'	55.3' 55.3'
10	328°44.67	29.98	140°38.85	11.2'	21°23.27	-8.1	55.3'
11	343°44.58	29.70	155°9.07	11.3'	21°15.14	-8.2'	55.3'
12	358°44.48 13°44.38	N22°29.42	169°39.37 184°9.75	11.4'	\$21°6.91 20°58.59	-8.3'	55.2'
13 14	13°44.38 28°44.29	29.14 28.86	184°9.75 198°40.21	11.5' 11.5'	20°58.59 20°50.17	-8.4' -8.5'	55.2' 55.2'
15	43°44.19	28.57	213° 10.76	11.6'	20°41.66	-8.6'	55.2'
16	58°44.09	28.29	227°41.39	11.7'	20°33.06	-8.7'	55.2'
17	73°44.00	28.01 N22°27.72	242°12.10	11.8'	20°24.37	-8.8'	55.2'
18 19	88°43.90 103°43.81	N22°27.72 27.44	256°42.89 271°13.77	11.9' 12.0'	\$20°15.59 20°6.72	-8.9' -9.0'	55.1' 55.1'
20	118°43.71	27.44	271 13.77 285°44.72	12.0'	19°57.76	-9.0'	55.1
21	133°43.62	• • 26.86	300°15.76	12.1'	19°48.72	-9.1'	55.1'
22	148°43.52 163°43.43	26.58	314°46.88 329°18.08	12.2' 12.3'	19°39.59 19°30.37	-9.2' -9.3'	55.1' 55.0'
23		26.29	J∠9 18.U8			-9.3	55.0
	SD = 15.7'	d = -0.3'		SD	0 = 15.1'		

			2020	July 05	to Jui.	07 01
Lat.	Twi	light	Sunrise	Sunset	Twi	ilight
	Naut.	Civil	Cumoe	Cumber	Civil	Naut.
N $72^{\circ}$						
N 70°						
68°						
66°	////	////	00:55	23:10	////	////
64°	////	////	01:53	22:15	////	////
62°	////	////	02:25	21:43	////	////
60°	////	01:18	02:49	21:20	22:49	////
N $58^{\circ}$	////	01:58	03:08	21:01	22:11	////
56°	////	02:24	03:24	20:45	21:45	////
54°	01:12	02:45	03:37	20:32	21:24	22:56
52°	01:48	03:01	03:49	20:20	21:08	22:20
50°	02:13	03:16	03:59	20:10	20:54	21:56
45°	02:55	03:44	04:21	19:49	20:25	21:14
<b>N</b> 40°	03:24	04:05	04:38	19:32	20:04	20:45
35°	03:47	04:23	04:52	19:17	19:47	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N $10^{\circ}$	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
<b>S</b> 10°	05:29	05:55	06:18	17:52	18:14	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:09
35°	06:09	06:40	07:08	17:02	17:30	18:01
40°	06:18	06:51	07:22	16:48	17:18	17:52
45°	06:27	07:04	07:38	16:32	17:06	17:43
<b>S</b> 50°	06:38	07:20	07:58	16:12	16:50	17:32
52°	06:43	07:27	08:07	16:03	16:43	17:27
54°	06:49	07:34	08:17	15:53	16:36	17:21
56°	06:55	07:43	08:29	15:41	16:27	17:16
58°	07:01	07:53	08:43	15:27	16:17	17:09
<b>S</b> 60°	07:08	08:04	08:59	15:11	16:06	17:02
		Moonris			Moonse	
Lat.	Wed	Thu	Fri	Wed	Thu	ι Fri
N 72°						
<b>N</b> 70°						
68°			23:10			
66°		23:01	22:36			01:46
64°	22:20	22:15	22:11		00:37	02:31

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-100%	
05	04:38	04:43	12:05	23:26	10:58		
06	04:48	04:53	12:05	-:-	11:52		
07	04:57	05:02	12:05	00:18	12:43		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	286°28.50	220°28.13 N17°11.15	206°2.09 N23°26.82	113°35.88 N04°23.57	248°34.53 N12°25.53	Alpheratz 357°31.66 29°14.86
1	301°30.96	235°29.34 11.29	221°2.68 26.97	128°38.02 23.43	263°36.81 25.58	1 '
2	$316^{\circ}33.43$	250°30.56 11.43	236°3.28 27.11	143°40.16 23.28	278°39.09 25.63	Ankaa 353°4.32 -42°8.70 Schedar 349°27.57 56°41.46
3	$331^{\circ}35.89$	265°31.76 · · 11.56	251°3.87 · · 27.25	158°42.31 · · 23.14	293°41.37 · · 25.68	Diphda 348°44.41 -17°49.57
4	346°38.36	280°32.97 11.70	266°4.47 27.39	173°44.45 22.99	308°43.66 25.73	Achernar 335°18.26 -57°5.14
5	1°40.82	295°34.17 11.84	281°5.06 27.53	188°46.59 22.85	323°45.94 25.78	Hamal 327°48.02 23°35.78
6	16°43.28	310°35.38 N17°11.98	296°5.66 N23°27.67	203°48.74 N04°22.70	338°48.22 N12°25.83	Polaris 312°43.73 89°22.69
7	31° 45.75	325°36.57 12.12	311°6.25 27.81	218°50.88 22.56	353°50.50 25.88	Acamar 315°9.85 -40°11.16
8	46° 48.21	340°37.77 12.27	326°6.85 27.94	233°53.02 22.41	8°52.79 25.93	Menkar 314°3.30 4°12.13
9	61°50.68	355°38.96 · · 12.41	341°7.44 · · 28.08	248°55.16 · · 22.27 263°57.31 22.12	23°55.07 · · 25.98	Mirfak 308°24.36 49°57.54
10 11	76°53.14 91°55.61	10° 40.16 12.55 25° 41.34 12.70	356°8.04 28.22 11°8.63 28.36	263°57.31 22.12 278°59.45 21.98	38°57.35 26.03 53°59.64 26.08	Aldebaran 290°36.59 16°33.92
12	106° 58.07	40°42.53 N17°12.84	26°9.23 N23°28.50	294°1.59 N04°21.83	69°1.92 N12°26.13	Rigel 281°1.41 -8°10.11
13	122°0.53	55°43.71 12.99	41°9.82 28.63	309° 3.73 21.69	84°4.20 26.17	Capella 280°18.06 46°1.42
14	137°3.00	70°44.89 13.13	56°10.42 28.77	324° 5.87 21.54	99°6.49 26.22	Bellatrix 278°20.10 6°22.48
15	152°5.46	85°46.07 · · 13.28	71°11.01 · · 28.90	339°8.01 · · 21.40	114°8.77 · · 26.27	Elnath 277°58.58 28°37.76
16	167°7.93	100°47.25 13.43	86°11.61 29.04	354°10.16 21.25	129°11.05 26.32	Alnilam 275°35.13 -1°11.05
17	$182^{\circ}10.39$	115°48.42 13.58	101°12.20 29.18	9°12.30 21.10	144°13.34 26.37	Betelgeuse 270°49.30 7°24.68
18	197°12.85	130°49.59 N17°13.72	116°12.80 N23°29.31	24°14.44 N04°20.96	159°15.62 N12°26.42	Canopus 263°51.66 -52°42.62 Sirius 258°24.05 -16°45.36
19	$212^{\circ}15.32$	145°50.76 13.87	131°13.39 29.45	39°16.58 20.81	174°17.91 26.47	Adhara 255°3.98 -29°0.69
20	227° 17.78	160°51.92 14.02	146°13.99 29.58	54°18.72 20.67	189°20.19 26.52	Procyon 244°48.17 5°9.03
21	242°20.25	175°53.09 · · 14.18	161°14.58 · · 29.71	69°20.86 · · 20.52	204°22.47 · · 26.57	Pollux 243°14.20 27°57.36
22	257° 22.71	190°54.25 14.33	176° 15.18 29.85	84°23.00 20.37	219°24.76 26.62	Avior 234°14.12 -59°36.21
23	272°25.18	205°55.40 14.48	191°15.78 29.98	99°25.14 20.23	234°27.04 26.67	Suhail 222°44.55 -43°33.06
Mer	pass. 04:53	ν1.2' d0.1' m-4.70	$\nu$ 0.6' d0.1' m1.49	$\nu 2.1' \ d$ -0.1' m-1.85	$\nu 2.3' \ d0.0' \ m0.42$	Miaplacidus 221°38.36 -69°50.30
						Alphard 217°45.21 -8°47.06
c	CHV	CUA D	CUA D	CUA D	CHA D	Regulus 207°31.65 11°49.62
Sun	GHA 287° 27 64	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.01 61°35.98
0 1	287° 27.64 302° 30.10	220°56.56 N17°14.63 235°57.71 14.79	206°16.37 N23°30.11 221°16.97 30.25	114°27.28 N04°20.08 129°29.42 19.94	249°29.33 N12°26.71 264°31.61 26.76	Denebola 182°22.16 14°24.76
2	302 30.10 317°32.57	250°58.86 14.94	236°17.56 30.38	144°31.56 19.79	279°33.90 26.81	Gienah 175°40.68 -17°42.18
3	332°35.03	266°0.01 · · 15.10	251°18.16 · · 30.51	159°33.70 · · 19.64	294°36.18 · · 26.86	Acrux 172°56.83 -63°15.80
4	347° 37.50	281°1.15 15.25	266° 18.75 30.64	174°35.84 19.50	309°38.47 26.91	Gacrux 171°48.40 -57°16.72
5	2°39.96	296°2.29 15.41	281°19.35 30.77	189°37.97 19.35	324°40.75 26.96	Alioth 166°10.60 55°48.51
6	17° 42.42	311°3.43 N17°15.57	296°19.95 N23°30.90	204°40.11 N04°19.20	339°43.04 N12°27.01	Spica 158°19.22 -11°18.71
7	32°44.89	326°4.57 15.72	311°20.54 31.03	219°42.25 19.06	354°45.33 27.05	Alkaid 152°49.73 49°10.45 Hadar 148°31.60 -60°30.92
8	47° 47.35	341°5.71 15.88	326°21.14 31.16	234°44.39 18.91	9°47.61 27.10	Hadar 148°31.60 -60°30.92 Menkent 147°54.05 -36°30.81
9	62°49.82	356°6.84 · · 16.04	341°21.73 · · 31.29	249°46.53 · · 18.76	24°49.90 · · 27.15	Arcturus 145°45.20 19°2.12
10	77°52.28	11°7.97 16.20	356°22.33 31.42	264°48.67 18.62	39°52.18 27.20	Rigil Kent. 139°35.95 -60°57.46
11	92°54.74	26°9.10 16.36	11°22.93 31.55	279°50.80 18.47	54°54.47 27.25	Kochab 137°19.54 74°2.51
12	107°57.21	41°10.22 N17°16.52	26°23.52 N23°31.68	294°52.94 N04°18.32	69°56.76 N12°27.30	Zuben'ubi 136°52.66 -16°9.68
13	122°59.67	56°11.34 16.69	41°24.12 31.80	309°55.08 18.17	84°59.04 27.34	Alphecca 126°1.10 26°37.26
14	138°2.14	71°12.46 16.85	56°24.71 31.93	324°57.22 18.03	100°1.33 27.39	Antares 112°12.00 -26°29.71
15 16	153°4.60 168°7.07	86°13.58 ·· 17.01 101°14.70 17.18	71°25.31 · · 32.06 86°25.91 32.19	339°59.35 · · 17.88 355°1.49 17.73	115°3.62 · · 27.44	Atria 107°3.07 -69°4.78
16 17	183° 9.53	101°14.70 17.18 116°15.81 17.34	86°25.91 32.19 101°26.50 32.31	355°1.49 17.73 10°3.63 17.58	130°5.90 27.49 145°8.19 27.54	Sabik 101°59.17 -15°45.54
18	198° 11.99	131°16.92 N17°17.51	116°27.10 N23°32.44	25°5.76 N04°17.44	160°10.48 N12°27.58	Shaula 96°6.07 -37°7.41
19	213° 14.46	146° 18.03 17.67	131°27.70 32.56	40°7.90 17.29	175°12.77 27.63	Rasalhague 95°55.57 12°32.49
20	228° 16.92	161°19.13 17.84	146°28.29 32.69	55°10.04 17.14	190°15.05 27.68	Eltanin 90°40.33 51°29.24
21	243° 19.39	176°20.23 · · 18.01	161°28.89 · · 32.81	70°12.17 · · 16.99	205°17.34 · · 27.73	Kaus Aust. 83°28.31 -34°22.13 Vega 80°30.84 38°48.73
22	258°21.85	191°21.33 18.17	176°29.49 32.94	85°14.31 16.85	220°19.63 27.78	Vega 80°30.84 38°48.73 Nunki 75°43.84 -26°15.51
23	273°24.31	206°22.43 18.34	191°30.08 33.06	100°16.44 16.70	235°21.92 27.82	Altair 61°56.82 8°56.77
Mor	pass. 04:49	ν1.2' d0.2' m-4.69	ν0.6' d0.1' m1.50	ν2.1' d-0.1' m-1.84	$\nu 2.3' \ d0.0' \ m0.42$	Peacock 53°0.73 -56°38.31
- IVIEL.	pass. 04.49	ν 1.2 UU.2 III-4.U9	νο.υ αυ.1 III1.30	ν Δ.1 U-U.1 III-1.04	ν Δ.Ο UU.U IIIU.4Δ	Deneb 49°23.36 45°22.96
						Enif 33°35.71 10°0.48
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.06 -46°49.02
0	288° 26.78	221°23.53 N17°18.51	206°30.68 N23°33.19	115°18.58 N04°16.55	250°24.20 N12°27.87	Fomalhaut 15°11.20 -29°27.96
1	303°29.24	236°24.62 18.68	221°31.28 33.31	130°20.71 16.40	265°26.49 27.92	Scheat 13°42.18 28°14.27
2	318°31.71 333°34.17	251°25.71 18.85 266°26.80 · · 19.02	236° 31.87 33.43 251° 32.47 · · · 33.56	145°22.85 16.25	280°28.78 27.97 295°31.07 •• 28.01	Markab 13°26.84 15°21.61
3 4	333°34.17 348°36.63	281°27.88 19.19	251°32.47 · · 33.56 266°33.07 33.68	160°24.98 · · 16.11 175°27.12 15.96	295°31.07 · · 28.01 310°33.36 28.06	Jul 08 Sat SHA Mer.pass
5	3°39.10	296°28.96 19.37	281°33.66 33.80	190°29.25 15.81	325°35.65 28.11	Venus 293°59.63 09:17
6	18° 41.56	311°30.04 N17°19.54	296°34.26 N23°33.92	205°31.39 N04°15.66	340°37.94 N12°28.16	Mars 279°33.59 10:15
7	33° 44.03	326°31.12 19.71	311°34.86 34.04	220°33.52 15.51	355°40.22 28.20	Jupiter 187° 7.38 16:23
8	48° 46.49	341°32.20 19.89	326°35.45 34.16	235°35.66 15.36	10°42.51 28.25	Saturn 322°6.03 07:25
9	63°48.96	356°33.27 · · 20.06	341°36.05 · · 34.28	250°37.79 · · 15.21	25°44.80 · · 28.30	
10	78°51.42	11°34.34 20.24	356°36.65 34.40	265°39.92 15.07	40°47.09 28.34	Jul 09 Sun         SHA         Mer.pass           Venus         293°28.92         09:16
11	93°53.88	26° 35.41 20.41	11° 37.24 34.52	280°42.06 14.92	55°49.38 28.39	Venus 293°28.92 09:16 Mars 278°48.73 10:15
12	108° 56.35	41°36.48 N17°20.59	26°37.84 N23°34.64	295°44.19 N04°14.77	70°51.67 N12°28.44	Jupiter 186°59.64 16:20
13	123°58.81	56°37.54 20.77	41°38.44 34.76	310°46.32 14.62	85°53.96 28.48	Saturn 322°1.69 07:21
14	139°1.28	71°38.60 20.94	56°39.04 34.88	325°48.46 14.47	100°56.25 28.53	
15	154°3.74	86°39.66 · · 21.12	71°39.63 · · 35.00	340°50.59 · · 14.32	115°58.54 · · 28.58	Jul 10 Mon SHA Mer.pass
16	169°6.20	101°40.72 21.30	86°40.23 35.12	355°52.72 14.17	131°0.83 28.63	Venus 292°56.75 09:14
17	184°8.67 199°11.13	116°41.77 21.48 131°42.82 N17°21.66	101° 40.83 35.23 116° 41.43 N23° 35.35	10°54.86 14.02 25°56.99 N04°13.87	146°3.12 28.67 161°5.41 N12°28.72	Mars 278°3.90 10:14
18 19	214° 13.60	146°43.87 21.84	131° 42.02 35.47	40°59.12 13.72	176° 7.70 28.77	Jupiter 186°51.80 16:16
20	214 15.00 229° 16.06	161°44.92 22.02	146° 42.62 35.58	56° 1.25 13.57	191°9.99 28.81	Saturn 321°57.43 07:17
21	244° 18.52	176°45.96 · · 22.20	161° 43.22 · · · 35.70	71°3.38 · · 13.42	206°12.28 · · 28.86	Horizontal parallax
22	259° 20.99	191°47.00 22.39	176° 43.82 35.82	86°5.52 13.27	221°14.58 28.90	Venus: 0.3
23	274° 23.45	206°48.04 22.57	191°44.41 35.93	101°7.65 13.13	236°16.87 28.95	Mars: 0.1
		ν1.1' d0.2' m-4.69	ν0.6' d0.1' m1.50	ν2.1' d-0.1' m-1.84	ν2.3' d0.0' m0.42	
ivier.	pass. 04:45	ν1.1 αυ.∠ m-4.09	νο.υ αυ.1 m1.50	ν∠.1 α-υ.1 m-1.δ4	ν2.3 αυ.υ mu.42	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.33	N22°26.00	$343^{\circ}49.36$	12.4'	<b>S</b> 19°21.08	-9.4'	55.0'
1	193°43.24	25.71	358° 20.72	12.4'	19°11.70	-9.5'	55.0'
2	208°43.14 223°43.05	25.42 •• 25.13	12°52.16 27°23.68	12.5' 12.6'	19°2.24 18°52.70	-9.5' -9.6'	55.0' 55.0'
4	238°42.95	24.84	41°55.28	12.7'	18° 43.08	-9.0 -9.7'	55.0'
5	253°42.86	24.55	56°26.96	12.8'	18° 33.38	-9.8'	54.9'
6	268°42.77	N22°24.26	70°58.72	12.8'	\$18°23.61	-9.8'	54.9'
7	283°42.67 298°42.58	23.96	85°30.56 100°2.47	12.9'	18° 13.77 18° 3.84	-9.9'	54.9'
8 9	298 42.58 313°42.49	23.67 •• 23.37	100 2.47 114°34.46	13.0' 13.1'	18 3.84 17°53.85	-10.0' -10.1'	54.9' 54.9'
10	328°42.39	23.08	129°6.53	13.1	17° 43.78	-10.1	54.9'
11	343°42.30	22.78	143°38.68	13.2'	$17^{\circ}33.64$	-10.2'	54.8'
12	358°42.21	N22°22.49	158° 10.90	13.3'	\$17°23.43	-10.3'	54.8'
13 14	13°42.11 28°42.02	22.19 21.89	172° 43.20 187° 15.58	13.4' 13.4'	17°13.15 17°2.81	-10.3' -10.4'	54.8' 54.8'
15	43°41.93	21.59	201°48.03	13.5'	16°52.39	-10.4 -10.5'	54.8'
16	58°41.84	21.29	$216^{\circ}20.55$	13.6'	16°41.92	-10.5'	54.8'
17	73°41.75	20.99	230°53.15	13.7'	16°31.37	-10.6'	54.7'
18	88°41.66 103°41.56	N22°20.69 20.39	245°25.82 259°58.56	13.7'	\$16°20.76 16°10.09	-10.7'	54.7'
19 20	103°41.56 118°41.47	20.39	259°58.56 274°31.37	13.8' 13.9'	15° 10.09 15° 59.36	-10.7' -10.8'	54.7' 54.7'
21	133°41.38	. 19.79	289°4.26	14.0'	15° 48.56	-10.0	54.7'
22	148°41.29	19.48	303°37.22	14.0'	15°37.71	-10.9'	54.7'
23	163°41.20	19.18	318° 10.24	14.1'	15°26.80	-11.0'	54.7'
	SD = 15.7'	d = -0.3'		SI	O = 15.0'		
_						,	
Sun 0	<b>GHA</b> 178°41.11	<b>Dec</b> N22° 18.88	<b>GHA</b> 332° 43.34	u 14.2'	Dec \$15° 15.82	d -11.0'	<b>HP</b> 54.6'
1	193°41.02	18.57	347° 16.50	14.2'	15°4.80	-11.1'	54.6'
2	208°40.93	18.26	1°49.74	14.3'	14°53.71	-11.1'	54.6'
3	223°40.84	• • 17.96	16°23.04	14.4'	14° 42.57	-11.2'	54.6'
4	238°40.75	17.65	30°56.40	14.4'	14°31.38	-11.2'	54.6'
5 6	253°40.66 268°40.57	17.34 N22° 17.03	45°29.84 60°3.33	14.5' 14.6'	14°20.13 \$14°8.83	-11.3' -11.4'	54.6' 54.6'
7	283°40.48	16.72	74°36.90	14.6'	13° 57.48	-11.4'	54.5'
8	298°40.39	16.42	89° 10.52	14.7'	13°46.08	-11.5'	54.5'
9	313°40.30	• • 16.10	103°44.21	14.8'	13°34.63	-11.5'	54.5'
10 11	328°40.21 343°40.13	15.79 15.48	118° 17.97 132° 51.78	14.8' 14.9'	13°23.13 13°11.58	-11.5' -11.6'	54.5' 54.5'
12	358°40.04	N22° 15.17	132 31.76 147°25.65	14.9	\$12°59.99	-11.6'	54.5
13	13°39.95	14.86	161°59.59	15.0'	12°48.35	-11.7'	54.5'
14	28°39.86	14.54	176°33.58	15.1'	$12^{\circ}36.67$	-11.7'	54.5'
15	43°39.77	• • 14.23	191°7.63	15.1'	12°24.94	-11.8'	54.4'
16 17	58°39.68 73°39.60	13.91 13.60	205° 41.74 220° 15.91	15.2' 15.2'	12°13.17 12°1.36	-11.8' -11.9'	54.4' 54.4'
18	88°39.51	N22°13.28	234°50.13	15.3'	\$11°49.50	-11.9'	54.4'
19	103°39.42	12.96	$249^{\circ}24.41$	15.3'	$11^{\circ}37.61$	-11.9'	54.4'
20	118°39.34	12.64	263°58.74		11°25.67		54.4'
21 22	133°39.25 148°39.16	· · 12.33 12.01	278°33.13 293°7.56	15.4' 15.5'	11°13.70 11°1.69	-12.0' -12.0'	54.4' 54.4'
23	163°39.08	11.69	307° 42.05	15.5'	10°49.64	-12.1'	54.4'
	SD = 15.7'	d = -0.3'		SI	D = 14.9'		
Mon 0	<b>GHA</b> 178°38.99	<b>Dec</b> N22° 11.37	<b>GHA</b> 322° 16.59	u 15.6'	<b>Dec</b> \$10° 37.56	d -12.1'	<b>HP</b> 54.3'
1	178 38.99 193°38.90	11.04	336°51.18	15.6'	10° 25.44	-12.1	54.3'
2	208°38.82	10.72	$351^{\circ}25.82$	15.7'	$10^{\circ}13.28$	-12.2'	54.3'
3	223°38.73 238°38.65	• 10.40	6°0.51	15.7'	10°1.10	-12.2'	54.3'
4 5	238°38.65 253°38.56	10.08 9.75	20°35.24 35°10.02	15.8' 15.8'	09°48.87 09°36.62	-12.3' -12.3'	54.3' 54.3'
6	268°38.48	N22°9.43	49° 44.85	15.9'	509°24.34	-12.3'	54.3'
7	283°38.39	9.10	$64^{\circ}19.72$	15.9'	09°12.02	-12.3'	54.3'
8	298°38.31	8.78	78° 54.63	16.0'	08°59.68	-12.4'	54.3'
9 10	313°38.22 328°38.14	· · 8.45 8.12	93°29.59 108°4.59	16.0' 16.0'	08°47.30 08°34.90	-12.4' -12.4'	54.3' 54.2'
11	343°38.05	7.80	108 4.59 122°39.63	16.1	08° 34.90	-12.4 -12.5'	54.2'
12	358°37.97	N22°7.47	137° 14.71	16.1'	S08°10.02	-12.5'	54.2'
13	13°37.89	7.14	151°49.83	16.2'	07°57.53	-12.5'	54.2'
14 15	28°37.80 43°37.72	6.81 · · 6.48	166°24.98 181°0.18	16.2' 16.2'	07°45.03 07°32.50	-12.5' -12.6'	54.2' 54.2'
15 16	43°37.72 58°37.64	6.15	181°0.18 195°35.41	16.2	07° 32.50 07° 19.94	-12.6'	54.2'
17	73°37.55	5.81	210° 10.67	16.3	07°7.36	-12.6'	54.2'
18	88°37.47	N22°5.48	224° 45.97	16.3'	S06° 54.76	-12.6'	54.2'
19	103°37.39	5.15	239°21.31	16.4	06°42.14	-12.6'	54.2'
20 21	118°37.31 133°37.22	4.82 •• 4.48	253°56.67 268°32.07	16.4' 16.4'	06°29.50 06°16.84	-12.7' -12.7'	54.2' 54.2'
22	148°37.14	4.15	283°7.49	16.5	06°4.16	-12.7'	54.2'
23	163°37.06	3.81	297° 42.95	16.5'	05°51.46	-12.7'	54.2'
	SD = 15.7'	d = -0.3'		SI	D = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-90%
08	05:07	05:11	12:05	01:07	13:30	
09	05:16	05:20	12:05	01:52	14:14	
10	05:24	05:28	12:05	02:35	14:56	

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	289°25.92	221°49.08 N17°22.75	206°45.01 N23°36.05	116° 9.78 N04° 12.98	251°19.16 N12°29.00	
1	304°28.38	236°50.11 22.94	221°45.61 36.16	131°11.91 12.83	266°21.45 29.04	Alpheratz 357°31.64 29°14.87
2	319°30.84	251°51.15 23.12	236°46.21 36.27	146°14.04 12.68	281°23.74 29.09	Ankaa 353°4.29 -42°8.70
3	334°33.31	266°52.18 · · 23.31	251°46.80 · · 36.39	161°16.17 · · 12.53	296°26.03 · · 29.14	Schedar 349°27.54 56°41.47 Diphda 348°44.39 -17°49.57
4	349°35.77	281°53.20 23.49	266° 47.40 36.50	176°18.30 12.38	311°28.32 29.18	Achernar 335°18.22 -57°5.13
5	4°38.24	296°54.23 23.68	281°48.00 36.61	191°20.43 12.23	326°30.62 29.23	Hamal 327°48.00 23°35.79
6	19° 40.70	311°55.25 N17°23.86	296°48.60 N23°36.73	206°22.56 N04°12.08 221°24.69 11.93	341°32.91 N12°29.27	Polaris 312°42.40 89°22.69
7 8	34° 43.16 49° 45.63	326°56.27 24.05 341°57.29 24.24	311°49.20 36.84 326°49.79 36.95	221°24.69 11.93 236°26.82 11.77	356°35.20 29.32 11°37.49 29.37	Acamar 315°9.83 -40°11.15
9	64° 48.09	356°58.31 · · 24.43	341°50.39 · · 37.06	251°28.95 · · 11.62	26°39.79 · · 29.41	Menkar 314°3.28 4°12.14
10	79°50.56	11°59.32 24.62	356°50.99 37.17	266°31.08 11.47	41°42.08 29.46	Mirfak 308°24.34 49°57.54
11	94°53.02	27°0.33 24.81	11°51.59 37.28	281°33.21 11.32	56°44.37 29.50	Aldebaran 290°36.58 16°33.93
12	109°55.49	42°1.34 N17°25.00	26°52.19 N23°37.39	296°35.34 N04°11.17	71°46.66 N12°29.55	Rigel 281°1.40 -8°10.10 Capella 280°18.04 46°1.41
13	124°57.95	57°2.35 25.19	41°52.78 37.50	311°37.47 11.02	86°48.96 29.60	Bellatrix 278°20.09 6°22.49
14	140°0.41	72°3.35 25.38	56°53.38 37.61	326°39.60 10.87	101°51.25 29.64	Elnath 277°58.56 28°37.76
15	155°2.88	87°4.35 · · 25.57	71°53.98 · · 37.72	341°41.73 · · 10.72	116°53.54 · · 29.69	Alnilam 275°35.12 -1°11.04
16 17	170°5.34 185°7.81	102°5.35 25.76 117°6.35 25.96	86°54.58 37.83 101°55.18 37.94	356°43.86 10.57 11°45.99 10.42	131°55.84 29.73 146°58.13 29.78	Betelgeuse 270°49.29 7°24.69
18	200° 10.27	132°7.34 N17°26.15	116°55.78 N23°38.05	26°48.11 N04°10.27	162°0.43 N12°29.82	Canopus 263°51.65 -52°42.61
19	215° 12.73	147°8.34 1017 20.15	131° 56.38 38.16	41°50.24 10.12	102 0.43 N12 29.82 177°2.72 29.87	Sirius 258°24.05 -16°45.35
20	230° 15.20	162°9.33 26.54	146°56.97 38.26	56°52.37 9.97	192°5.01 29.91	Adhara 255°3.98 -29°0.68
21	245° 17.66	177°10.31 · · 26.73	161°57.57 · · 38.37	71°54.50 · · 9.81	207°7.31 · · 29.96	Procyon 244°48.17 5°9.03
22	260°20.13	192°11.30 26.93	176°58.17 38.48	86°56.63 9.66	222°9.60 30.01	Pollux 243°14.19 27°57.36 Avior 234°14.13 -59°36.20
23	275°22.59	207° 12.28 27.13	191°58.77 38.58	101°58.75 9.51	237°11.90 30.05	Avior 234°14.13 -59°36.20 Suhail 222°44.55 -43°33.05
Meri	pass. 04:42	$\nu 1.0' \ d0.2' \ \text{m-4.68}$	$\nu$ 0.6' d0.1' m1.50	ν2.1' d-0.1' m-1.83	ν2.3' d0.0' m0.42	Miaplacidus 221°38.38 -69°50.28
- IVIEL.	puss. U4.42	ν 1.0	νο.ο αυ.1 III1.30	ν Δ.1 U-U.1 III-1.03	ν Δ.3 UU.U IIIU.42	Alphard 217°45.21 -8°47.05
						Regulus 207°31.65 11°49.62
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.03 61°35.97
0	290°25.05	222°13.26 N17°27.32	206°59.37 N23°38.69	117°0.88 N04°9.36	252°14.19 N12°30.10	Denebola 182°22.17 14°24.77
1 2	305° 27.52 320° 29.98	237°14.24 27.52 252°15.22 27.72	221°59.97 38.80 237°0.57 38.90	132° 3.01 9.21 147° 5.13 9.06	267°16.49 30.14 282°18.78 30.19	Gienah 175°40.69 -17°42.18
3	320 29.90 335°32.45	267°16.19 · · 27.91	252°1.17 · · 39.01	162°7.26 · · 8.90	297°21.08 · · 30.23	Acrux 172°56.87 -63°15.80
4	350°34.91	282°17.17 28.11	267°1.77 39.11	177° 9.39 8.75	312°23.37 30.28	Gacrux 171°48.42 -57°16.72
5	5°37.37	297°18.13 28.31	282°2.36 39.21	192°11.51 8.60	327°25.67 30.32	Alioth 166°10.62 55°48.51
6	20°39.84	312°19.10 N17°28.51	297°2.96 N23°39.32	207°13.64 N04°8.45	342°27.96 N12°30.37	Spica 158°19.23 -11°18.70 Alkaid 152°49.75 49°10.46
7	35°42.30	327°20.07 28.71	312°3.56 39.42	222°15.77 8.30	357°30.26 30.41	Hadar 148°31.63 -60°30.93
8	50° 44.77	342°21.03 28.91	327°4.16 39.52	237°17.89 8.15	12°32.55 30.46	Menkent 147°54.07 -36°30.81
9	65° 47.23	357°21.99 · · 29.11	342°4.76 · · 39.63	252°20.02 · · 7.99	27°34.85 · · 30.50	Arcturus 145°45.21 19°2.13
10	80°49.69	12°22.95 29.32	357°5.36 39.73	267°22.14 7.84	42°37.14 30.54	Rigil Kent. 139°35.97 -60°57.46
11	95°52.16	27°23.90 29.52	12°5.96 39.83	282°24.27 7.69	57°39.44 30.59	Kochab 137°19.58 74°2.52
12 13	110° 54.62 125° 57.09	42°24.86 N17°29.72 57°25.81 29.92	27°6.56 N23°39.93 42°7.16 40.03	297°26.39 N04°7.54 312°28.52 7.38	72°41.74 N12°30.63 87°44.03 30.68	Zuben'ubi 136°52.67 -16°9.67
14	140°59.55	72°26.76 30.13	57°7.76 40.13	327°30.64 7.23	102°46.33 30.72	Alphecca 126°1.11 26°37.27
15	156°2.02	87°27.70 · · 30.33	72°8.36 · · 40.23	342°32.77 · · 7.08	117°48.63 · · 30.77	Antares 112°12.00 -26°29.72
16	171°4.48	102°28.65 30.54	87°8.96 40.33	357°34.89 6.93	132°50.92 30.81	Atria 107°3.09 -69°4.79
17	$186^{\circ}6.94$	117°29.59 30.74	102°9.56 40.43	12°37.02 6.77	147°53.22 30.86	Sabik 101°59.18 -15°45.54 Shaula 96°6.07 -37°7.41
18	201°9.41	132°30.53 N17°30.95	117°10.16 N23°40.53	27°39.14 N04°6.62	162°55.52 N12°30.90	Rasalhague 95°55.57 12°32.49
19	216° 11.87	147°31.47 31.15	132° 10.76 40.63	42°41.27 6.47	177°57.81 30.94	Eltanin 90°40.34 51°29.25
20	231°14.34	162°32.41 31.36	147° 11.36 40.73	57°43.39 6.31	193°0.11 30.99	Kaus Aust. 83°28.31 -34°22.14
21	246° 16.80	177°33.34 · · 31.57	162°11.96 · · 40.83	72°45.51 · · 6.16	208°2.41 · · 31.03	Vega 80°30.84 38°48.74
22 23	261° 19.26 276° 21.73	192°34.27 31.77 207°35.20 31.98	177°12.56 40.93 192°13.16 41.02	87°47.64 6.01 102°49.76 5.86	223°4.71 31.08 238°7.00 31.12	Nunki 75°43.84 -26°15.51
				-		Altair 61°56.82 8°56.78
Mer. <sub>I</sub>	pass. 04:38	$ u 1.0' \ d0.2' \ \text{m-4.67}$	$ u 0.6' \; d0.1' \; \mathrm{m}1.51$	$\nu 2.1' \ d$ -0.2' m-1.83	$ u 2.3' \ d0.0' \ m0.41$	Peacock 53°0.71 -56°38.32
						Deneb 49°23.35 45°22.98
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.69 10°0.49 Al Na'ir 27°29.04 -46°49.02
0	291°24.19	222°36.13 N17°32.19	207°13.76 N23°41.12	117°51.88 N04°5.70	253°9.30 N12°31.16	Fomalhaut 15°11.18 -29°27.96
1	306° 26.66	237° 37.05 32.40	222°14.36 41.22	132°54.01 5.55	268°11.60 31.21	Scheat 13°42.17 28°14.28
2	321°29.12	252°37.97 32.61	237°14.96 41.31	147°56.13 5.40	283°13.90 31.25	Markab 13°26.82 15°21.62
3	336°31.58	267°38.89 · · 32.82	252°15.56 · · 41.41	162°58.25 · · 5.24	298°16.20 · · 31.30	
4	351°34.05	282°39.81 33.03	267°16.16 41.50	178° 0.38 5.09	313°18.50 31.34	Jul 11 Tue SHA Mer.pass
5 6	6°36.51 21°38.98	297°40.73 33.24 312°41.64 N17°33.45	282°16.76 41.60 297°17.36 N23°41.69	193°2.50 4.94 208°4.62 N04°4.78	328°20.79 31.38 343°23.09 N12°31.43	Venus 292°23.16 09:12 Mars 277°19.09 10:13
7	21 38.98 36°41.44	312 41.04 N17 33.45 327°42.55 33.66	312°17.96	208 4.62 N04 4.78 223°6.74 4.63	358°25.39 N12 31.43	Jupiter 186°43.86 16:13
8	51° 43.90	342°43.46 33.87	327°18.56 41.88	238° 8.86 4.47	13°27.69 31.51	Saturn 321°53.24 07:14
9	66° 46.37	357°44.37 · · 34.08	342°19.16 · · 41.98	253°10.99 · · 4.32	28°29.99 · · 31.56	
10	81°48.83	12°45.27 34.30	357°19.76 42.07	268°13.11 4.17	43°32.29 31.60	Jul 12 Wed SHA Mer.pass
11	$96^{\circ}51.30$	27°46.17 34.51	12°20.36 42.16	283°15.23 4.01	58°34.59 31.64	Venus 291°48.21 09:11 Mars 276°34.32 10:12
12	111°53.76	42°47.07 N17°34.72	27°20.96 N23°42.26	298°17.35 N04°3.86	73°36.89 N12°31.69	Jupiter 186°35.83 16:10
13	126° 56.22	57°47.97 34.94	42°21.56 42.35	313°19.47 3.70	88°39.19 31.73	Saturn 321°49.14 07:10
14 15	141°58.69	72°48.87 35.15	57°22.17 42.44	328°21.59 3.55	103°41.49 31.77	
15 16	157°1.15 172°3.62	87°49.76 · · 35.37 102°50.65 35.58	72°22.77 · · · 42.53 87°23.37	343°23.71 · · 3.40 358°25.83 3.24	118°43.79 · · 31.82 133°46.09 31.86	Jul 13 Thu SHA Mer.pass
10 17	172 3.62 187°6.08	102 50.65 35.58 117°51.54 35.80	102°23.97 42.71	13°27.95 3.09	148°48.39 31.90	Venus 291°11.93 09:09 Mars 275°49.57 10:11
18	202°8.55	132°52.43 N17°36.02	117°24.57 N23°42.80	28°30.07 N04°2.93	163°50.69 N12°31.95	Mars 275°49.57 10:11 Jupiter 186°27.69 16:06
19	217° 11.01	147°53.31 36.23	132°25.17 42.89	43°32.19 2.78	178°52.99 31.99	Saturn 321°45.11 07:06
20	232° 13.47	162°54.19 36.45	147°25.77 42.98	58°34.31 2.62	193°55.29 32.03	
21	247° 15.94	177°55.08 · · 36.67	162°26.37 · · 43.07	73°36.43 · · 2.47	208°57.59 · · 32.07	Horizontal parallax
22	262°18.40	192°55.95 36.89	177°26.97 43.16	88°38.55 2.31	223°59.89 32.12	Venus: 0.3
23	277° 20.87	207°56.83 37.10	192°27.58 43.25	103°40.67 2.16	239°2.19 32.16	Mars: 0.1
Mer.	pass. 04:34	ν0.9' d0.2' m-4.67	ν0.6' d0.1' m1.51	ν2.1' d-0.2' m-1.82	ν2.3' d0.0' m0.41	

h	Sun Moon					Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	178°36.98	N22°3.47	312°18.44	16.5'	S05°38.74	-12.7'	54.1'		
1	193°36.90	3.14	$326^{\circ}53.95$	16.5'	$05^{\circ}26.01$	-12.8'	54.1'		
2	208°36.81	2.80	341°29.49	16.6'	05°13.26	-12.8'	54.1'		
3	223°36.73	• • 2.46	356°5.05	16.6'	05°0.49	-12.8'	54.1'		
4 5	238°36.65 253°36.57	2.12 1.78	10°40.64 25°16.25	16.6' 16.6'	04°47.71 04°34.91	-12.8' -12.8'	54.1' 54.1'		
6	268°36.49	N22°1.44	39°51.89	16.7	504°22.10	-12.8'	54.1		
7	283°36.41	1.10	54°27.55	16.7	04°9.28	-12.8'	54.1'		
8	298°36.33	0.76	69°3.22	16.7'	03°56.45	-12.8'	54.1'		
9	313°36.25	• • 0.42	83°38.92	16.7'	03°43.60	-12.9'	54.1'		
10	328°36.17	22°0.07	98°14.64	16.7'	03°30.74	-12.9'	54.1'		
11	343°36.09	21°59.73	112°50.37	16.7'	03°17.88	-12.9'	54.1'		
12 13	358°36.01 13°35.93	N21°59.38 59.04	127°26.12 142°1.88	16.8' 16.8'	\$03°5.00 02°52.12	-12.9' -12.9'	54.1' 54.1'		
14	28°35.85	59.0 <del>4</del> 58.69	156°37.66	16.8	02°39.22	-12.9'	54.1		
15	43°35.78	• • 58.35	171°13.46	16.8'	02°26.32	-12.9'	54.1'		
16	58°35.70	58.00	185°49.26	16.8'	02°13.41	-12.9'	54.1'		
17	73°35.62	57.65	$200^{\circ}25.08$	16.8'	$02^{\circ}0.50$	-12.9'	54.1'		
18	88°35.54	N21°57.31	215°0.91	16.8'	S01°47.58	-12.9'	54.1'		
19	103°35.46	56.96	229°36.75	16.8'	01°34.66	-12.9'	54.1'		
20	118°35.38 133°35.31	56.61	244°12.59	16.9'	01°21.73 01°8.79	-12.9'	54.1'		
21 22	133°35.31 148°35.23	· · 56.26 55.91	258°48.45 273°24.31	16.9' 16.9'	01°8.79 00°55.86	-12.9' -12.9'	54.1' 54.1'		
23	148 35.23 163°35.15	55.55 55.55	273 24.31 288°0.17	16.9'	00°55.86	-12.9'	54.1'		
23							J 1.1		
	SD = 15.7'	d = -0.3'		SI	D = 14.8'				
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP		
0	178°35.07	N21°55.20	302°36.04	16.9'	S00°29.98	-12.9'	54.1'		
1	193°35.00	54.85	317°11.91	16.9'	00°17.04	-12.9'	54.1'		
2	208°34.92 223°34.84	54.50	331°47.79 346°23.67	16.9'	\$00°4.10 N00°8.84	-12.9'	54.1'		
3 4	238°34.77	· · 54.14 53.79	0°59.54	16.9' 16.9'	00°21.78	12.9' 12.9'	54.1' 54.1'		
5	253°34.69	53.43	15°35.42	16.9	00°21.70	12.9'	54.1'		
6	268°34.62	N21°53.08	30°11.29	16.9'	N00°47.65	12.9'	54.1'		
7	283°34.54	52.72	44°47.17	16.9'	01°0.58	12.9'	54.1'		
8	298°34.46	52.36	59°23.03	16.9'	01°13.51	12.9'	54.1'		
9	313°34.39	• • 52.00	73°58.90	16.9'	01°26.44	12.9'	54.1'		
10	328°34.31	51.64	88°34.75	16.8'	01°39.36	12.9'	54.1'		
11	343°34.24 358°34.16	51.28 N21°50.92	103°10.60 117°46.45	16.8'	01°52.28 N02°5.19	12.9' 12.9'	54.1' 54.1'		
12 13	13°34.16	N21 50.92 50.56	117°46.45 132°22.28	16.8' 16.8'	02°18.09	12.9'	54.1'		
14	28°34.02	50.20	146°58.10	16.8	02°30.98	12.9'	54.1'		
15	43°33.94	• • 49.84	161°33.91	16.8'	02°43.87	12.9'	54.1'		
16	58°33.87	49.48	$176^{\circ}9.71$	16.8'	02°56.75	12.9'	54.1'		
17	73°33.79	49.11	190°45.50	16.8'	03°9.62	12.9'	54.1'		
18	88°33.72	N21°48.75	205°21.27	16.8'	N03°22.48	12.8'	54.1'		
19 20	103°33.65 118°33.57	48.39 48.02	219°57.03 234°32.77	16.7' 16.7'	03°35.33 03°48.17	12.8' 12.8'	54.1'		
21	133°33.50	47.66	249°8.49	16.7'	03 46.17 04°0.99	12.8'	54.1' 54.2'		
22	148°33.43	47.29	263°44.19	16.7	04°13.81	12.8'	54.2'		
23	163°33.36	46.92	$278^{\circ}19.88$	16.7'	$04^{\circ}26.61$	12.8'	54.2'		
	SD = 15.7'	d = -0.4'		SI	D = 14.8'				
Thu	GHA	Dec	GHA		Dec	d	HP		
1 nu 0	ла 178°33.28	Dec N21°46.55	292°55.54	u 16.6'	N04°39.40	<i>a</i> 12.8'	пР 54.2'		
1	193°33.21	46.19	307°31.18	16.6'	04°52.17	12.8'	54.2'		
2	208°33.14	45.82	322°6.80	16.6'	$05^{\circ}4.93$	12.7'	54.2'		
3	223°33.07	•• 45.45	336°42.40	16.6'	05°17.67	12.7'	54.2'		
4	238°33.00	45.08	351°17.97	16.5'	05°30.40	12.7'	54.2'		
5	253°32.93	44.71 N21°44.33	5°53.52	16.5'	05°43.11 N05°55.80	12.7'	54.2'		
6 7	268°32.85 283°32.78	N21°44.33 43.96	20°29.04 35°4.53	16.5' 16.5'	N05°55.80 06°8.47	12.7' 12.7'	54.2' 54.2'		
8	298°32.71	43.59	49°39.99	16.4	06°21.13	12.7	54.2'		
9	313°32.64	• • 43.21	64°15.42	16.4	06°33.76	12.6'	54.2'		
10	328°32.57	42.84	78°50.82	16.4'	06°46.38	12.6'	54.3'		
11	343°32.50	42.47	93°26.19	16.3'	06°58.97	12.6'	54.3'		
12	358°32.43	N21°42.09	108°1.52	16.3'	N07°11.54	12.5'	54.3'		
13	13°32.36	41.71	122°36.82	16.3'	07°24.09	12.5'	54.3'		
14 15	28°32.29 43°32.22	41.34 •• 40.96	137°12.09 151°47.32	16.2' 16.2'	07°36.62 07°49.12	12.5' 12.5'	54.3' 54.3'		
16	58°32.15	40.58	166°22.51	16.2'	07 49.12 08°1.60	12.5'	54.3'		
17	73°32.09	40.20	180°57.66	16.1'	08°14.05	12.4	54.3'		
18	88°32.02	N21°39.82	195°32.77	16.1'	N08°26.48	12.4'	54.3'		
19	103°31.95	39.44	210°7.85	16.0'	08°38.88	12.4'	54.4'		
20	118°31.88	39.06	224°42.88	16.0'	08°51.25	12.3'	54.4'		
21 22	133°31.81 148°31.74	· · 38.68 38.30	239°17.87 253°52.81	15.9' 15.9'	09°3.60 09°15.92	12.3' 12.3'	54.4' 54.4'		
23	148°31.74 163°31.68	38.30 37.92	253°52.81 268°27.71	15.9'	09°15.92 09°28.21	12.3'	54.4' 54.4'		
2.5	SD = 15.7'	d = -0.4'	200 21.11		D = 14.8'	12.5	J 1.T		
	3D = 15.7	<u>u = -0.4</u>		31	<i>J</i> — 14.δ				

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-68%
11	05:32	05:36	12:06	03:16	15:36	
12	05:40	05:43	12:06	03:56	16:16	
13	05:47	05:50	12:06	04:36	16:56	

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	292°23.33	222°57.70 N17°37.32	207°28.18 N23°43.34	118°42.79 N04°2.00	254°4.50 N12°32.20	
1	307°25.79	237°58.58 37.54	222°28.78 43.42	133°44.91 1.85	269°6.80 32.25	Alpheratz 357°31.62 29°14.87 Ankaa 353°4.27 -42°8.69
2	322°28.26	252°59.45 37.76	237°29.38 43.51	148°47.03 1.70	284°9.10 32.29	Schedar 349°27.50 56°41.47
3	337°30.72	268°0.31 · · 37.98	252°29.98 · · 43.60	163°49.15 · · 1.54	299°11.40 · · 32.33	Diphda 348°44.37 -17°49.56
4	352°33.19	283°1.18 38.20	267°30.58 43.69	178°51.27 1.38	314°13.70 32.37	Achernar 335°18.19 -57°5.13
5 6	7°35.65 22°38.11	298°2.04 38.42 313°2.90 N17°38.64	282°31.19 43.77 297°31.79 N23°43.86	193°53.39 1.23 208°55.51 N04°1.07	329°16.00 32.42 344°18.31 N12°32.46	Hamal 327°47.98 23°35.80
7	37°40.58	328°3.76 38.87	312°32.39 43.94	223°57.62 0.92	359°20.61 32.50	Polaris 312°40.94 89°22.68
8	52°43.04	343°4.62 39.09	327°32.99 44.03	238°59.74 0.76	14°22.91 32.54	Acamar 315°9.81 -40°11.14
9	67°45.51	358°5.47 · · 39.31	342°33.59 · · 44.11	254°1.86 · · 0.61	29°25.21 · · 32.59	Menkar 314°3.27 4°12.14 Mirfak 308°24.31 49°57.54
10	82°47.97	13°6.33 39.53	357°34.20 44.20	269° 3.98 0.45	44°27.52 32.63	Aldebaran 290°36.56 16°33.93
11	97°50.43	28°7.18 39.76	12°34.80 44.28	284° 6.09 0.30	59°29.82 32.67	Rigel 281°1.39 -8°10.10
12 13	112° 52.90 127° 55.36	43°8.03 N17°39.98 58°8.87 40.20	27°35.40 N23°44.37 42°36.00 44.45	299°8.21 N04°0.14 314°10.33 03°59.99	74°32.12 N12°32.71 89°34.43 32.75	Capella 280°18.02 46°1.41
14	142° 57.83	58°8.87 40.20 73°9.72 40.43	42°36.00 44.45 57°36.60 44.53	329°12.45 03°59.83	89°34.43 32.75 104°36.73 32.80	Bellatrix 278°20.08 6°22.49
15	158°0.29	88°10.56 · · 40.65	72°37.21 · · 44.61	344°14.56 · · 59.67	119°39.03 · · 32.84	Elnath 277°58.55 28°37.76
16	173°2.75	103°11.40 40.88	87°37.81 44.70	359°16.68 59.52	134°41.34 32.88	Alnilam 275°35.11 -1°11.04 Betelgeuse 270°49.28 7°24.69
17	188°5.22	118°12.24 41.10	102°38.41 44.78	14°18.80 59.36	149°43.64 32.92	Betelgeuse 270°49.28 7°24.69 Canopus 263°51.64 -52°42.59
18	203°7.68	133°13.07 N17°41.33	117°39.01 N23°44.86	29°20.91 N03°59.21	164°45.94 N12°32.96	Sirius 258°24.04 -16°45.34
19	218° 10.15	148°13.91 41.55	132°39.62 44.94	44°23.03 59.05	179°48.25 33.00	Adhara 255°3.97 -29°0.67
20	233° 12.61	163°14.74 41.78	147° 40.22 45.02	59°25.14 58.89	194°50.55 33.05	Procyon 244°48.16 5°9.04
21 22	248° 15.08 263° 17.54	178°15.57 · · 42.01 193°16.39 42.24	162°40.82 · · 45.10 177°41.43 45.18	74°27.26 · · 58.74 89°29.38 58.58	209°52.86 · · 33.09 224°55.16	Pollux 243°14.19 27°57.35
23	278° 20.00	208° 17.22 42.46	192°42.03 45.26	104°31.49 58.42	239°57.47 33.17	Avior 234°14.14 -59°36.18
						Suhail 222°44.56 -43°33.04
Wer.	pass. 04:30	ν0.9' d0.2' m-4.66	$\nu 0.6' \ d0.1' \ m1.51$	ν2.1' d-0.2' m-1.82	$\nu 2.3' \ d0.0' \ m0.41$	Miaplacidus 221°38.40 -69°50.27 Alphard 217°45.21 -8°47.04
						Regulus 207°31.66 11°49.62
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.06 61°35.96
0	293°22.47	223°18.04 N17°42.69	207° 42.63 N23° 45.34	119°33.61 N03°58.27	254°59.77 N12°33.21	Denebola 182°22.18 14°24.77
1	308° 24.93	238° 18.86 42.92	222°43.23 45.42 237°43.84 45.50	134°35.72 58.11 149°37.84 57.95	270°2.07 33.25 285°4.38 33.30	Gienah 175°40.70 -17°42.17
2	323°27.40 338°29.86	253°19.68 43.15 268°20.50 • 43.38	237° 43.84 45.50 252° 44.44 • 45.58	149°37.84 57.95 164°39.95 • 57.80	285°4.38 33.30 300°6.69 · · 33.34	Acrux 172°56.90 -63°15.79
4	353° 32.32	283°21.32 43.61	267° 45.04 45.65	179°42.07 57.64	315°8.99 33.38	Gacrux 171°48.45 -57°16.71
5	8°34.79	298°22.13 43.84	282°45.65 45.73	194°44.18 57.48	330°11.30 33.42	Alioth 166° 10.64 55° 48.51 Spica 158° 19.25 -11° 18.70
6	23°37.25	313°22.94 N17°44.07	297°46.25 N23°45.81	209°46.30 N03°57.33	345°13.60 N12°33.46	Spica 158°19.25 -11°18.70 Alkaid 152°49.77 49°10.46
7	$38^{\circ}39.72$	328°23.75 44.30	312°46.85 45.88	224°48.41 57.17	0°15.91 33.50	Hadar 148°31.65 -60°30.93
8	53°42.18	343°24.55 44.53	327° 47.46 45.96	239°50.52 57.01	15°18.21 33.54	Menkent 147°54.08 -36°30.81
9	68° 44.64	358°25.36 · · 44.76	342°48.06 · · 46.04	254°52.64 · · 56.86	30°20.52 · · 33.58	Arcturus 145°45.22 19°2.13
10 11	83° 47.11 98° 49.57	13°26.16 44.99 28°26.96 45.22	357°48.66 46.11 12°49.27 46.19	269°54.75 56.70 284°56.86 56.54	45°22.83 33.62 60°25.13 33.67	Rigil Kent. 139°36.00 -60°57.46
12	113°52.04	43°27.76 N17°45.45	27°49.87 N23°46.26	299°58.98 N03°56.38	75°27.44 N12°33.71	Kochab 137°19.64 74°2.52
13	128° 54.50	58°28.56 45.69	42°50.48 46.34	315°1.09 56.23	90°29.74 33.75	Zuben'ubi 136°52.68 -16°9.67
14	143°56.97	73°29.35 45.92	57°51.08 46.41	330° 3.20 56.07	105°32.05 33.79	Alphecca 126°1.12 26°37.28 Antares 112°12.01 -26°29.71
15	$158^{\circ}59.43$	88°30.14 · · 46.15	72°51.68 · · 46.48	345°5.32 · · 55.91	120°34.36 · · 33.83	Atria 107°3.11 -69°4.80
16	174°1.89	103°30.93 46.39	87°52.29 46.56	0°7.43 55.75	135°36.67 33.87	Sabik 101°59.18 -15°45.54
17	189°4.36	118°31.72 46.62	102°52.89 46.63	15° 9.54 55.60	150°38.97 33.91	Shaula 96°6.08 -37°7.42
18 19	204°6.82 219°9.29	133°32.51 N17°46.85 148°33.29 47.09	117°53.50 N23°46.70 132°54.10 46.77	30°11.66 N03°55.44 45°13.77 55.28	165°41.28 N12°33.95 180°43.59 33.99	Rasalhague 95°55.57 12°32.50
20	234° 11.75	163°34.07 47.32	147° 54.70 46.85	60°15.88 55.12	195°45.89 34.03	Eltanin 90°40.34 51°29.27
21	249° 14.21	178°34.85 · · 47.56	162°55.31 · · 46.92	75°17.99 · · 54.96	210°48.20 · · 34.07	Kaus Aust. 83°28.31 -34°22.14 Vega 80°30.84 38°48.76
22	$264^{\circ}16.68$	193°35.63 47.79	177°55.91 46.99	90°20.10 54.81	225°50.51 34.11	Vega 80°30.84 38°48.76 Nunki 75°43.83 -26°15.51
23	279°19.14	208°36.41 48.03	192°56.52 47.06	105°22.22 54.65	240°52.82 34.15	Altair 61°56.81 8°56.79
Mer.	pass. 04:26	ν0.8' d0.2' m-4.65	$\nu$ 0.6' d0.1' m1.51	ν2.1' d-0.2' m-1.81	ν2.3' d0.0' m0.40	Peacock 53°0.70 -56°38.33
						Deneb 49°23.34 45°23.00
S	CHV	CHA Dos	CHA Dos	GHA Dec	GHA Dec	Enif 33°35.68 10°0.50
Sun 0	<b>GHA</b> 294°21.61	<b>GHA Dec</b> 223°37.18 N17°48.26	<b>GHA Dec</b> 207°57.12 N23°47.13	<b>GHA Dec</b> 120°24.33 N03°54.49	<b>GHA Dec</b> 255°55.13 N12°34.19	Al Na'ir 27°29.02 -46°49.03
1	309° 24.07	238°37.95 48.50	222°57.73 47.20	135°26.44 54.33	270°57.44 34.23	Fomalhaut 15°11.16 -29°27.96 Scheat 13°42.15 28°14.30
2	$324^{\circ}26.53$	253°38.72 48.74	237°58.33 47.27	150°28.55 54.17	285°59.74 34.27	Markab 13°26.81 15°21.63
3	339°29.00	268°39.49 · · 48.97	252°58.94 · · 47.34	165°30.66 · · 54.01	301°2.05 · · 34.31	
4	354°31.46	283°40.26 49.21	267°59.54 47.41	180°32.77 53.86	316°4.36 34.35	Jul 14 Fri SHA Mer.pass
5	9°33.93 24°36.39	298°41.02 49.45 313°41.78 N17°49.69	283°0.15 47.48 298°0.75 N23°47.54	195°34.88 53.70 210°36.99 N03°53.54	331°6.67 34.39 346°8.98 N12°34.43	Venus 290° 34.37 09:08 Mars 275° 4.85 10:10
6 7	24 36.39 39°38.86	313 41.78 N17 49.09 328°42.54 49.92	313°1.36 47.61	210 36.99 NO3 53.54 225°39.10 53.38	1°11.29 34.47	Jupiter 186°19.46 16:03
8	54°41.32	343°43.30 50.16	328°1.96 47.68	240°41.21 53.22	16°13.60 34.51	Saturn 321°41.17 07:03
9	69° 43.78	358°44.06 · · 50.40	343°2.57 · · 47.75	255°43.32 · · 53.06	31°15.91 · · 34.55	
10	84° 46.25	13°44.81 50.64	358°3.17 47.81	270°45.43 52.90	46°18.22 34.59	Jul 15 Sat         SHA         Mer.pass           Venus         289° 55.58         09:06
11	99°48.71	28° 45.56 50.88	13°3.78 47.88	285°47.54 52.74	61°20.53 34.63	Mars 274°20.16 10:09
12	114°51.18	43°46.31 N17°51.12	28°4.38 N23°47.95	300°49.65 N03°52.59	76°22.84 N12°34.67	Jupiter 186°11.14 16:00
13 14	129° 53.64 144° 56.10	58°47.06 51.36 73°47.81 51.60	43°4.99 48.01 58°5.59 48.08	315°51.76 52.43 330°53.87 52.27	91°25.15 34.71 106°27.46 34.75	Saturn 321°37.30 06:59
15	159° 58.57	88°48.55 · · 51.84	73°6.20 · · 48.14	345°55.98 · · 52.11	121°29.77 · · 34.79	Jul 16 Sun SHA Mer.pass
16	175°1.03	103°49.29 52.08	88°6.80 48.21	0°58.09 51.95	136°32.08 34.83	Venus 289°15.58 09:05
17	190°3.50	118° 50.03 52.32	103°7.41 48.27	16°0.20 51.79	151°34.39 34.87	Mars 273°35.52 10:08
18	205°5.96	133°50.77 N17°52.56	118°8.02 N23°48.33	31°2.31 N03°51.63	166°36.70 N12°34.91	Jupiter 186°2.72 15:56
19	220°8.42	148°51.51 52.80	133°8.62 48.40	46° 4.41 51.47	181°39.01 34.95	Saturn 321°33.52 06:55
20 21	235° 10.89 250° 13.35	163°52.24 53.04 178°52.97 · · 53.29	148°9.23 48.46 163°9.83 • 48.52	61°6.52 51.31 76°8.63 · · 51.15	196°41.32 34.99 211°43.63 · · 35.03	Horizontal parallax
22	265° 15.82	193°53.71 53.53	178° 10.44 48.58	91°10.74 50.99	226°45.94 35.06	Venus: 0.3
23	280° 18.28	208° 54.43 53.77	193°11.05 48.65	106°12.85 50.83	241°48.26 35.10	Mars: 0.1
	pass. 04:22	ν0.8' d0.2' m-4.64	ν0.6' d0.1' m1.52	ν2.1' d-0.2' m-1.81	ν2.3' d0.0' m0.40	
ivier.	pass. 04:22	νυ.υ αυ.∠ m-4.04	νο.υ αυ.1 III1.52	ν∠.1 U-U.∠ III-1.01	ν Δ.Ο ΔΟ.Ο IIIΟ.40	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.61	N21°37.53	283°2.57	15.8'	N09°40.46	12.2'	54.4'
1	193°31.54	37.15	297°37.37	15.8'	09°52.69	12.2'	54.4'
2	208°31.48	36.76	312°12.13	15.7'	10°4.88	12.2'	54.5'
3	223°31.41	• • 36.38	326°46.84	15.7'	10°17.05	12.1'	54.5'
4 5	238°31.34 253°31.28	35.99 35.61	341°21.50 355°56.11	15.6' 15.6'	10°29.18 10°41.27	12.1' 12.1'	54.5' 54.5'
6	268°31.21	N21°35.22	10° 30.67	15.5'	N10°53.33	12.1	54.5
7	283°31.14	34.83	25°5.17	15.4	11°5.36	12.0'	54.5'
8	298°31.08	34.44	39°39.62	15.4'	11°17.35	12.0'	54.5'
9	313°31.01	• • 34.05	54°14.02	15.3'	11°29.30	11.9'	54.6'
10	328°30.95	33.66	68°48.35	15.3'	11°41.21	11.9'	54.6'
11	343°30.88 358°30.82	33.27 N21°32.88	83°22.63 97°56.86	15.2' 15.2'	11°53.09 N12°4.93	11.8' 11.8'	54.6' 54.6'
12 13	13°30.75	N21 32.88 32.49	97 50.80 112°31.02	15.2 15.1'	12°16.72	11.8	54.6'
14	28°30.69	32.10	127°5.12	15.0'	12°28.48	11.7'	54.6'
15	43°30.62	• • 31.71	141°39.17	15.0'	12°40.19	11.7'	54.7'
16	58°30.56	31.31	$156^{\circ}13.15$	14.9'	12°51.86	11.6'	54.7'
17	73°30.50	30.92	170°47.06	14.9'	13°3.49	11.6'	54.7'
18	88°30.43 103°30.37	N21°30.52	185°20.91 199°54.70	14.8' 14.7'	N13°15.07 13°26.61	11.5' 11.5'	54.7'
19 20	103 30.37 118°30.31	30.13 29.73	199 54.70 214°28.42	14.7'	13°28.10	11.5 11.4'	54.7' 54.8'
21	133°30.24	29.34	229°2.08	14.6'	13°49.55	11.4	54.8'
22	148°30.18	28.94	243°35.66	14.5'	14°0.94	11.3'	54.8'
23	163°30.12	28.54	258°9.18	14.4'	14°12.29	11.3'	54.8'
	SD = 15.7'	d = -0.4'		SE	O = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.05	N21°28.14	272°42.62	14.4'	N14°23.59	11.2'	54.8'
1	193°29.99	27.74	287°16.00	14.3'	14°34.84	11.2'	54.9'
2	208°29.93	27.34	301°49.30	14.2'	14°46.03	11.1'	54.9'
3 4	223°29.87 238°29.81	· · 26.94 26.54	316°22.53 330°55.69	14.2' 14.1'	14°57.18 15°8.27	11.1' 11.0'	54.9' 54.9'
5	253°29.75	26.14	345°28.77	14.1	15° 19.31	11.0'	54.9'
6	268°29.68	N21°25.74	0°1.77	13.9'	N15°30.29	10.9'	55.0'
7	283°29.62	25.33	14°34.70	13.9'	$15^{\circ}41.21$	10.9'	55.0'
8	298°29.56	24.93	29°7.55	13.8'	15°52.08	10.8'	55.0'
9	313°29.50 328°29.44	· · 24.52 24.12	43°40.33 58°13.02	13.7' 13.6'	16°2.89 16°13.64	10.8' 10.7'	55.0' 55.1'
10 11	328 29.44 343°29.38	24.12	58°13.02 72°45.63	13.5'	16°13.64 16°24.33	10.7	55.1'
12	358°29.32	N21°23.31	87°18.17	13.5'	N16°34.96	10.6'	55.1'
13	13°29.26	22.90	101°50.62	13.4'	16°45.53	10.5'	55.1'
14	28°29.20	22.49	116°22.99	13.3'	16°56.04	10.4'	55.2'
15 16	43°29.14 58°29.09	· · 22.09 21.68	130°55.27 145°27.47	13.2' 13.1'	17°6.48 17°16.86	10.4' 10.3'	55.2' 55.2'
17	73°29.03	21.06	159° 59.59	13.1	17 10.80 17°27.17	10.3	55.2'
18	88°28.97	N21°20.86	174°31.62	12.9'	N17°37.41	10.2	55.3'
19	103°28.91	20.45	189°3.56	12.9'	$17^{\circ}47.58$	10.1'	55.3'
20	118°28.85	20.04	203°35.41	12.8'	17°57.69	10.0'	55.3'
21 22	133°28.79 148°28.74	· · 19.62 19.21	218°7.18 232°38.86	12.7' 12.6'	18°7.72 18°17.69	10.0' 9.9'	55.3' 55.4'
23	148 28.74 163°28.68	19.21	232 38.86 247°10.45	12.5'	18 17.09 18°27.58	9.9 9.8'	55.4'
	SD = 15.7'	d = -0.4'			0 = 15.0'	3.0	
Sun 0	<b>GHA</b> 178°28.62	<b>Dec</b> N21°18.38	<b>GHA</b> 261°41.95	u 12.4'	<b>Dec</b> N18°37.40	d 9.7'	<b>HP</b> 55.4'
1	176 28.52 193°28.56	17.97	201 41.95 276°13.35	12.4	18°47.14	9.7 9.7'	55.4'
2	208°28.51	17.55	290°44.67	12.2'	$18^{\circ}56.81$	9.6'	55.5'
3	223°28.45	• • 17.14	305°15.89	12.1'	19°6.40	9.5'	55.5'
4	238°28.40 253°28.34	16.72 16.30	319°47.02 334°18.06	12.0' 11.9'	19°15.91 19°25.34	9.4' 9.4'	55.5'
5 6	253°28.34 268°28.28	16.30 N21°15.89	334°18.06 348°49.00	11.9'	19°25.34 N19°34.69	9.4'	55.6' 55.6'
7	283°28.23	15.47	3°19.85	11.8'	19°43.96	9.2'	55.6'
8	298°28.17	15.05	17°50.61	11.7'	$19^{\circ}53.15$	9.1'	55.6'
9	313°28.12	• • 14.63	32°21.26	11.6'	20°2.26	9.0'	55.7'
10 11	328°28.06 343°28.01	14.21 13.79	46°51.83 61°22.29	11.5' 11.4'	20°11.28 20°20.21	8.9' 8.8'	55.7' 55.7'
12	358°27.95	N21°13.37	75°52.66	11.4	20 20.21 N20°29.05	8.8'	55.8'
13	13°27.90	12.95	90°22.93	11.2'	20°37.81	8.7'	55.8'
14	28°27.84	12.52	104°53.10	11.1'	20°46.48	8.6'	55.8'
15	43°27.79	• 12.10	119°23.17	11.0'	20°55.05	8.5'	55.9'
16 17	58°27.74 73°27.68	11.68 11.25	133°53.15 148°23.02	10.9' 10.8'	21°3.54 21°11.93	8.4' 8.3'	55.9' 55.9'
17	73°27.68 88°27.63	11.25 N21°10.83	148°23.02 162°52.80	10.8	21°11.93 N21°20.22	8.3'	55.9'
19	103°27.58	10.40	102 52.60 177°22.47	10.7	21°28.42	8.1	56.0'
20	118°27.52	9.97	191°52.05	10.5'	$21^{\circ}36.52$	8.0'	56.0'
21	133°27.47	• • 9.55	206°21.53	10.4'	21°44.53	7.9'	56.0'
22 23	148°27.42 163°27.37	9.12 8.69	220°50.90 235°20.18	10.3' 10.2'	21°52.43 22°0.23	7.8'	56.1'
23			∠35 ∠0.18			7.7'	56.1'
	SD = 15.7'	d = -0.4'		SE	D = 15.1'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-39%		
14	05:54	05:57	12:06	05:17	17:38			
15	06:00	06:03	12:06	06:00	18:23			
16	06:06	06:08	12:06	06:46	19:11			

July 17, 18, 19 UT (Mon., Tue., Wed.)

h	Aries	Venus		М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA D	— ес	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	295°20.75	223°55.16 N17°		08° 11.65	N23°48.71	121°14.95	N03°50.67	256°50.57	N12°35.14			
1	$310^{\circ}23.21$	238°55.88		23°12.26	48.77	$136^{\circ}17.06$	50.51	$271^{\circ}52.88$	35.18	Alpheratz	357°31.59 353°4.24	29°14.89 -42°8.69
2	$325^{\circ}25.67$	253°56.61	54.50 2	.38°12.86	48.83	$151^{\circ}19.17$	50.35	286°55.19	35.22	Ankaa Schedar	349°27.46	56°41.48
3	340°28.14			253° 13.47	• • 48.89	166°21.28	• • 50.19	301°57.50	• • 35.26	Diphda	348°44.35	-17°49.55
4	355°30.60	283°58.05		268° 14.08	48.95	181°23.38	50.03	316°59.82	35.30	Achernar	$335^{\circ}18.16$	-57°5.12
5 6	10°33.07 25°35.53	298°58.76 313°59.48 N17°		283° 14.68 298° 15.29	49.01 N23°49.07	196°25.49 211°27.60	49.87 N03°49.71	332°2.13 347°4.44	35.34 N12°35.38	Hamal	$327^{\circ}47.95$	23°35.80
7	40°37.99	329°0.19		313° 15.29	49.13	226°29.70	49.55	2°6.75	35.41	Polaris	312°39.22	89°22.68
8	55° 40.46	344°0.90		328° 16.50	49.19	241°31.81	49.39	17°9.07	35.45	Acamar	315°9.78	-40°11.13
9	70°42.92	359°1.61 · ·	56.21 3	343° 17.11	• • 49.24	256°33.92	• • 49.23	$32^{\circ}11.38$	• • 35.49	Menkar Mirfak	314°3.24 308°24.28	4°12.15 49°57.54
10	85° 45.39	14°2.32		358° 17.72	49.30	271°36.02	49.07	47°13.69	35.53	Aldebaran	290°36.54	16°33.93
11	100° 47.85	29°3.02		13° 18.32	49.36	286°38.13	48.91	62°16.01	35.57	Rigel	281°1.37	-8°10.09
12 13	115°50.32 130°52.78	44°3.73 N17° 59°4.43		28° 18.93 43° 19.54	N23°49.42 49.47	301°40.23 316°42.34	N03°48.75 48.59	77°18.32 92°20.63	N12°35.61 35.64	Capella	$280^{\circ}18.00$	46°1.40
14	145° 55.24	74°5.13		58° 20.15	49.53	331°44.45	48.43	107°22.95	35.68	Bellatrix	278°20.06	6°22.50
15	160°57.71			73°20.75	• • 49.59	346°46.55	• • 48.27	122°25.26	35.72	Elnath	277°58.53	28°37.76
16	176°0.17	104°6.52	57.93	88°21.36	49.64	1°48.66	48.11	$137^{\circ}27.57$	35.76	Alnilam	275°35.09 270°49.27	-1°11.03 7°24.69
17	191°2.64	119°7.21		.03°21.97	49.70	16°50.76	47.94	152°29.89	35.80	Betelgeuse Canopus	263°51.63	-52°42.58
18	206°5.10	134°7.90 N17°		.18°22.58	N23°49.75	31°52.87	N03°47.78	167°32.20	N12°35.84	Sirius	258°24.03	-16°45.33
19	221°7.56	149°8.59		.33°23.18	49.81	46°54.97	47.62	182°34.52	35.87	Adhara	255°3.96	-29°0.66
20 21	236° 10.03 251° 12.49	164°9.28 179°9.97		.48°23.79 .63°24.40	49.86 •• 49.91	61°57.08 76°59.18	47.46 •• 47.30	197°36.83 212°39.15	35.91 •• 35.95	Procyon	$244^{\circ}48.16$	5°9.04
22	266° 14.96	179 9.97 194° 10.65		.78°25.01	49.97	92°1.28	47.14	212 39.13 227°41.46	35.99	Pollux	243°14.18	27°57.35
23	281° 17.42	209°11.33		.93°25.61	50.02	107°3.39	46.98	242°43.78	36.03	Avior	234°14.14	-59°36.17
	pass. 04:18	ν0.7' d0.2' m-			.1′ m1.52		.2′ m-1.81	$\nu 2.3' d0.$		Suhail	222°44.56 221°38.41	-43°33.03 -69°50.25
ivier.p	Jass. U4:18	νυ. <i>Γ α</i> υ. <i>Σ</i> m-	<del>4</del> .03 ————	νυ.σ αυ	.1 1111.52	ν2.1 α-0	.∠ III-1.ŏ1	ν2.3 a0.	U 111U.4U	Miaplacidus Alphard	221°38.41 217°45.21	-69°50.25 -8°47.04
_	e				_		_		_	Regulus	207°31.66	11°49.62
Tue	GHA		ec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.08	61°35.95
0 1	296° 19.89 311° 22.35	224°12.02 N17° 239°12.69 18		208° 26.22 23° 26.83	N23°50.07 50.13	122°5.49 137°7.60	N03°46.82 46.65	257°46.09 272°48.41	N12°36.06 36.10	Denebola	182°22.19	14°24.77
2	326°24.81	254°13.37		23°27.44	50.18	152° 9.70	46.49	287°50.72	36.14	Gienah	175°40.71	-17°42.16
3	341°27.28			253°28.05	50.23	167°11.80	• • 46.33	302°53.04	36.18	Acrux Gacrux	172°56.92 171°48.46	-63°15.79 -57°16.71
4	$356^{\circ}29.74$	284° 14.72	0.90 2	.68°28.66	50.28	$182^{\circ}13.91$	46.17	$317^{\circ}55.35$	36.21	Alioth	166° 10.67	55°48.51
5	11°32.21	299° 15.39		.83°29.26	50.33	197°16.01	46.01	332°57.67	36.25	Spica	158° 19.25	-11°18.69
6	26°34.67			.98°29.87	N23°50.38	212°18.11	N03°45.85	347°59.99	N12°36.29	Alkaid	152°49.79	49°10.46
7 8	41°37.14 56°39.60	329°16.73 344°17.39		313°30.48 328°31.09	50.43	227°20.21 242°22.32	45.68	3°2.30	36.33	Hadar	$148^{\circ}31.67$	-60°30.93
9	71° 42.06			343°31.70	50.48 •• 50.53	242 22.32 257°24.42	45.52 •• 45.36	18°4.62 33°6.94	36.36 · · 36.40	Menkent	147°54.09	-36°30.81
10	86° 44.53	14° 18.72		358°32.31	50.58	272°26.52	45.20	48°9.25	36.44	Arcturus	145°45.23	19°2.14
11	101°46.99	29° 19.38		13°32.92	50.63	287°28.62	45.04	63°11.57	36.47	Rigil Kent. Kochab	139°36.02 137°19.70	-60°57.47 74°2.53
12	116°49.46	44°20.03 N18		28°33.53	N23°50.68	302°30.73	N03°44.87	$78^{\circ}13.89$	N12°36.51	Zuben'ubi	136°52.68	-16°9.67
13	131°51.92	59°20.69		43°34.13	50.73	317°32.83	44.71	93°16.20	36.55	Alphecca	126°1.13	26°37.29
14	146°54.38	74°21.34		58°34.74	50.77 •• 50.82	332°34.93	44.55	108° 18.52	36.59	Antares	$112^{\circ}12.01$	-26°29.71
15 16	161°56.85 176°59.31	89°22.00 · · · 104°22.65		73°35.35 88°35.96	50.87	347°37.03 2°39.13	· · 44.39 44.22	123°20.84 138°23.16	· · 36.62 36.66	Atria	107°3.12	-69°4.80
17	192°1.78	119°23.29		.03°36.57	50.91	17°41.23	44.06	153°25.47	36.70	Sabik	101°59.18	-15°45.53
18	207°4.24			.18°37.18	N23°50.96	32°43.34	N03°43.90	168°27.79	N12°36.73	Shaula Rasalhague	96°6.08 95°55.58	-37°7.42 12°32.51
19	$222^{\circ}6.71$	149°24.59		.33°37.79	51.01	47°45.44	43.74	183°30.11	36.77	Eltanin	90°40.35	51°29.29
20	237°9.17	164°25.23		.48°38.40	51.05	62°47.54	43.57	198°32.43	36.81	Kaus Aust.	83°28.31	-34°22.14
21	252°11.63 267°14.10			.63°39.01 .78°39.62	• • 51.10	77°49.64 92°51.74	• • 43.41	213°34.75 228°37.07	. 36.84	Vega	$80^{\circ}30.85$	38°48.77
22 23	282° 16.56	194°26.51 209°27.15		.76 39.02 .93°40.23	51.14 51.18	92 51.74 107°53.84	43.25 43.09	243°39.38	36.88 36.92	Nunki	75°43.83	-26°15.51
										Altair	61°56.80	8°56.80
Mer.p	pass. 04:14	$\nu$ 0.7′ $d$ 0.2′ m-	4.62	$\nu$ 0.6′ $d0$	.1′ m1.52	$\nu$ 2.1′ d-0	.2′ m-1.80	$\nu 2.3' d0.$	u′ m0.39	Peacock Deneb	53°0.68 49°23.33	-56°38.33 45°23.02
										Enif	33°35.66	10°0.51
Wed	GHA		ec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.00	-46°49.03
0	297°19.03			208°40.84	N23°51.23	122°55.94	N03°42.92	258°41.70	N12° 36.95	Fomalhaut	15°11.14	-29°27.95
1 2	312°21.49 327°23.95	239°28.42 254°29.05		23°41.45 238°42.06	51.27 51.32	137°58.04 153°0.14	42.76 42.60	273°44.02 288°46.34	36.99 37.03	Scheat	13°42.13	28°14.31
3	342° 26.42			253°42.67	51.36	168° 2.24	• • 42.43	303°48.66	• • 37.06	Markab	13°26.79	15°21.64
4	357° 28.88	284° 30.31		68°43.28	51.40	183° 4.34	42.27	318°50.98	37.10	Jul 17 Mon	SHA	Mer.pass
5	12°31.35	299°30.94	7.19 2	.83°43.89	51.44	198°6.44	42.11	333°53.30	37.14	Venus		09:04
6	27° 33.81			98°44.50	N23°51.48	213°8.54	N03°41.94	348°55.62	N12°37.17		272°50.91	10:07
7	42°36.28	329°32.18		313°45.11	51.53	228°10.64	41.78	3°57.94	37.21		185°54.21	15:53
8 9	57°38.74 72°41.20	344°32.81 359°33.43 · ·		328° 45.72 343° 46.33	51.57 •• 51.61	243°12.74 258°14.83	41.62 •• 41.45	19°0.26 34°2.58	37.24 · · 37.28	Saturn	321°29.82	06:52
10	72 41.20 87°43.67	14°34.04		343 46.33 358°46.94	51.65	258 14.83 273°16.93	41.45	34 2.58 49°4.90	37.32	Jul 18 Tue	SHA	Mer.pass
11	102°46.13	29°34.66		13° 47.55	51.69	288°19.03	41.12	64°7.22	37.35	Venus		09:03
12	117°48.60	44°35.27 N18	°8.97	28°48.16	N23°51.73	$303^{\circ}21.13$	N03°40.96	79°9.54	N12°37.39	Mars Jupiter	272°6.34 185°45.61	10:06 15:49
13	132°51.06	59° 35.89		43°48.78	51.77	318°23.23	40.80	94°11.86	37.42	Jupiter	321°26.21	06:48
14	147°53.53	74°36.50		58°49.39	51.81	333°25.33	40.63	109°14.18	37.46			
15 16	162°55.99 177°58.45	89°37.10 · · · 104°37.71		73°50.00 88°50.61	•• 51.84 51.88	348°27.42 3°29.52	· · 40.47 40.30	124°16.50 139°18.82	· · 37.49 37.53	Jul 19 Wed	SHA	Mer.pass
17	177 56.45 193°0.92			.03°51.22	51.00	3 29.52 18°31.62	40.30	159 16.62 154°21.15	37.53 37.57	Venus Mars	287°8.76 271°21.81	09:02 10:05
18	208°3.38	134°38.92 N18°		.18°51.83	N23°51.96	33°33.72	N03°39.98	169°23.47	N12°37.60	1	185°36.91	15:46
19	223°5.85	149°39.52	10.75 1	.33°52.44	51.99	48°35.81	39.81	$184^{\circ}25.79$	37.64	Saturn	321°22.68	06:44
20	238°8.31			.48°53.06	52.03	63°37.91	39.65	199°28.11	37.67	Liania	tal paralla.	
21	253°10.78			.63°53.67	· · 52.07	78°40.01	• • 39.48	214°30.43	•• 37.71	Horizor	ital parallax Venus:	0.3
22 23	268° 13.24 283° 15.70			.78°54.28 .93°54.89	52.10 52.14	93°42.10 108°44.20	39.32 39.15	229°32.76 244°35.08	37.74 37.78		Mars:	0.3
Mer.p	bass. 04:10	$\nu$ 0.6′ $d$ 0.3′ m-	4.02	$\nu$ 0.6′ $d$ 0	.0′ m1.52	$\nu 2.1' \ d-0$	.2′ m-1.80	$\nu 2.3' \ d0.$	u′ m0.39			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.31	N21°8.26	249°49.35	10.1'	N22°7.93	7.6'	56.1'
1	193°27.26	7.83	264°18.42	10.0'	$22^{\circ}15.53$	7.5'	56.2'
2	208°27.21	7.40	278°47.40	9.9'	22°23.02	7.4'	56.2'
3 4	223°27.16 238°27.11	· · 6.97 6.54	293°16.27 307°45.04	9.8' 9.7'	22°30.41 22°37.69	7.3' 7.2'	56.2' 56.3'
5	253°27.06	6.11	307 45.04 322°13.71	9.6'	22°44.86	7.1'	56.3
6	268°27.01	N21°5.68	336°42.28	9.5'	N22°51.92	6.9'	56.3'
7	283°26.96	5.24	351°10.75	9.4'	22°58.87	6.8'	56.4'
8	298°26.91	4.81	5°39.11	9.3'	23°5.70	6.7'	56.4'
9 10	313°26.86 328°26.81	· · 4.37 3.94	20°7.38 34°35.54	9.2' 9.1'	23°12.43 23°19.03	6.6' 6.5'	56.4' 56.5'
11	343°26.76	3.50	49°3.61	9.1	23°25.53	6.4	56.5
12	358°26.71	N21°3.07	63°31.58	8.9'	N23°31.90	6.3'	56.5'
13	13°26.66	2.63	77°59.44	8.8'	$23^{\circ}38.15$	6.1'	56.6'
14	28°26.61	2.19	92°27.21	8.7'	23°44.29	6.0'	56.6'
15 16	43°26.56 58°26.51	· · 1.75 1.32	106°54.88 121°22.45	8.6' 8.5'	23°50.30 23°56.19	5.9' 5.8'	56.6' 56.7'
17	73°26.47	0.88	135°49.92	8.4'	23 30.19 24°1.96	5.6'	56.7'
18	88°26.42	N21°0.44	150°17.29	8.3'	N24°7.60	5.5'	56.7'
19	103°26.37	21°0.00	164°44.57	8.2'	$24^{\circ}13.11$	5.4'	56.8'
20	118°26.32	20°59.55	179°11.75	8.1'	24°18.50	5.3'	56.8'
21	133°26.28	• • 59.11	193°38.83	8.0'	24°23.75	5.1'	56.9'
22 23	148°26.23 163°26.18	58.67 58.23	208°5.82 222°32.71	7.9' 7.8'	24°28.88 24°33.87	5.0' 4.9'	56.9' 56.9'
23			92.11			т. Э	30.3
	SD = 15.7'	d = -0.4'		SD	0 = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.14	N20°57.78	$236^\circ 59.51$	7.7'	N24°38.73	4.7'	57.0'
1	193°26.09	57.34	251°26.22	7.6'	24°43.46	4.6'	57.0'
2	208°26.04	56.89	265°52.83	7.5'	24°48.05	4.5'	57.0'
3 4	223°26.00 238°25.95	· · 56.45 56.00	280°19.35 294°45.78	7.4' 7.3'	24°52.51 24°56.83	4.3' 4.2'	57.1' 57.1'
5	258 25.95 253°25.91	55.55	309°12.12	7.3'	24 30.83 25°1.00	4.0'	57.1'
6	268°25.86	N20°55.11	323°38.38	7.2'	N25°5.04	3.9'	57.2'
7	283°25.82	54.66	338°4.54	7.1'	25°8.94	3.8'	57.2'
8	298°25.77	54.21	352°30.62	7.0'	25°12.69	3.6'	57.3'
9	313°25.73	• • 53.76	6°56.61 21°22.51	6.9'	25°16.30 25°19.77	3.5'	57.3'
10 11	328°25.68 343°25.64	53.31 52.86	21 22.51 35°48.34	6.8' 6.7'	25 19.77 25°23.09	3.3' 3.2'	57.3' 57.4'
12	358°25.60	N20°52.41	50°14.08	6.7	N25°26.26	3.0'	57.4
13	13°25.55	51.96	64°39.74	6.6'	25°29.28	2.9'	57.4'
14	28°25.51	51.50	79°5.31	6.5'	25°32.16	2.7'	57.5'
15	43°25.47 58°25.42	• • 51.05	93°30.81 107°56.24	6.4'	25°34.88	2.6'	57.5'
16 17	73°25.38	50.60 50.14	107°56.24 122°21.58	6.3' 6.3'	25°37.45 25°39.87	2.4' 2.3'	57.5' 57.6'
18	88°25.34	N20°49.69	136°46.86	6.2'	N25°42.14	2.1'	57.6'
19	103°25.30	49.23	151°12.06	6.1'	$25^{\circ}44.25$	2.0'	57.7'
20	118°25.25	48.78	165°37.18	6.1'	25°46.20	1.8'	57.7'
21	133°25.21	• • 48.32	180°2.24	6.0'	25°48.00	1.6'	57.7'
22 23	148°25.17 163°25.13	47.86 47.41	194°27.23 208°52.15	5.9' 5.9'	25°49.65 25°51.13	1.5' 1.3'	57.8' 57.8'
23	SD = 15.7'	d = -0.4'			0 = 15.5'	1.5	37.0
	<u> </u>	u = 0.+					
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°25.09 193°25.05	N20°46.95 46.49	223°17.00 237°41.80	5.8' 5.7'	N25°52.45 25°53.62	1.2' 1.0'	57.8' 57.9'
2	208°25.01	46.49	252°6.53	5.7'	25°54.62	0.8	57.9'
3	223°24.97	• • 45.57	266°31.20	5.6'	25°55.46	0.7'	57.9'
4	238°24.93	45.11	280°55.81	5.6'	25°56.14	0.5'	58.0'
5	253°24.89	44.65	295°20.36	5.5'	25°56.66	0.4'	58.0'
6 7	268°24.85 283°24.81	N20°44.18 43.72	309°44.86 324°9.30	5.4' 5.4'	N25°57.01 25°57.19	0.2' 0.0'	58.1' 58.1'
8	283 24.81 298°24.77	43.72	324 9.30 338°33.69	5.4 5.3'	25°57.19	-0.1	58.1
9	313°24.73	• • 42.79	352°58.04	5.3'	25°57.07	-0.3	58.2'
10	328°24.69	42.33	7°22.33	5.2'	25°56.76	-0.5'	58.2'
11	343°24.65	41.86	21°46.58	5.2'	25°56.28	-0.6'	58.2'
12 13	358°24.61 13°24.58	N20°41.40 40.93	36°10.79 50°34.95	5.2' 5.1'	N25°55.63 25°54.82	-0.8' -1.0'	58.3' 58.3'
13 14	13°24.58 28°24.54	40.93 40.46	64°59.07	5.1' 5.1'	25°54.82 25°53.83	-1.0 -1.2'	58.3'
15	43°24.50	• • 40.00	79°23.16	5.0'	25°52.68	-1.3'	58.4'
16	58°24.46	39.53	93°47.21	5.0'	$25^{\circ}51.35$	-1.5'	58.4'
17	73°24.43	39.06	108°11.22	5.0'	25°49.86	-1.7'	58.5'
18	88°24.39	N20°38.59	122°35.20	5.0'	N25°48.19	-1.8'	58.5'
19 20	103°24.35 118°24.32	38.12 37.65	136°59.16 151°23.08	4.9' 4.9'	25°46.35 25°44.35	-2.0' -2.2'	58.5' 58.6'
21	133°24.28	37.05	165°46.98	4.9' 4.9'	25 44.35 25°42.17	-2.2 -2.4'	58.6'
22	148°24.25	36.71	180°10.85	4.9'	25°39.81	-2.5'	58.6'
23	163°24.21	36.23	194°34.70	4.8'	25°37.29	-2.7'	58.7'
	SD = 15.7'	d = -0.5'	_	SD	0 = 15.8'		
		_					

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer. Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	30-13%	
17	06:11	06:13	12:06	07:37	20:03		
18	06:15	06:18	12:06	08:31	21:00		
19	06:20	06:22	12:06	09:29	21:59		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	298° 18.17	224°42.50 N18°12.03	208°55.50 N23°52.17	123°46.30 N03°38.99	259°37.40 N12°37.81	
1	313°20.63	239° 43.09 12.29	223°56.11 52.21	138°48.39 38.83	274°39.72 37.85	Alpheratz 357°31.56 29°14.90
2	328°23.10	254° 43.68 12.54	238° 56.73 52.24	153°50.49 38.66	289°42.05 37.88	Ankaa 353°4.21 -42°8.68
3	343°25.56	269°44.27 · · 12.80	253° 57.34 · · 52.28	168°52.59 · · 38.50	304°44.37 · · 37.92	Schedar 349°27.42 56°41.50
4	358°28.02	284°44.86 13.05	268° 57.95 52.31	183°54.68 38.33	319°46.69 37.95	Diphda 348°44.32 -17°49.54
5	13° 30.49	299°45.44 13.31	283°58.56 52.34	198°56.78 38.17	334°49.01 37.99	Achernar 335°18.12 -57°5.12
6	28° 32.95	314°46.02 N18°13.57	298°59.18 N23°52.38	213°58.87 N03°38.00	349°51.34 N12°38.02	Hamal 327°47.92 23°35.81
7	43°35.42					Polaris 312°37.43 89°22.67
			313°59.79 52.41			Acamar 315°9.75 -40°11.12
8	58° 37.88	344°47.18 14.08	329°0.40 52.44		19°55.98 38.09	Menkar 314°3.21 4°12.16
9	73°40.35	359°47.76 · · 14.34	344°1.01 · · 52.47	259°5.16 · · 37.51	34°58.31 · · 38.13	Mirfak 308°24.24 49°57.54
10	88°42.81	14°48.33 14.59	359°1.63 52.51	274°7.25 37.34	50°0.63 38.16	Aldebaran 290°36.51 16°33.94
11	103°45.27	29°48.91 14.85	14°2.24 52.54	289° 9.35 37.18	65°2.96 38.20	Rigel 281°1.35 -8°10.08
12	118° 47.74	44°49.48 N18°15.11	29°2.85 N23°52.57	304°11.44 N03°37.01	80°5.28 N12°38.23	Capella 280°17.96 46°1.40
13	133° 50.20	59°50.05 15.37	44°3.47 52.60	319°13.54 36.85	95°7.61 38.27	Bellatrix 278°20.04 6°22.50
14	148°52.67	74°50.62 15.62	59°4.08 52.63	334°15.63 36.68	110°9.93 38.30	Elnath 277°58.50 28°37.76
15	163°55.13	89°51.18 · · 15.88	74°4.69 · · 52.66	349°17.73 · · 36.51	125°12.25 · · 38.34	Alnilam 275°35.07 -1°11.02
16	178° 57.60	104°51.75 16.14	89°5.31 52.69	4°19.82 36.35	140°14.58 38.37	Betelgeuse 270°49.24 7°24.70
17	194°0.06	119°52.31 16.40	104°5.92 52.72	19°21.92 36.18	155°16.90 38.40	Canopus 263°51.61 -52°42.56
18	209°2.52	134°52.87 N18°16.65	119°6.53 N23°52.75	34°24.01 N03°36.02	170°19.23 N12°38.44	Sirius 258°24.01 -16°45.32
19	224°4.99	149°53.43 16.91	134°7.15 52.77	49°26.10 35.85	185°21.56 38.47	Adhara 255°3.95 -29°0.65
20	239°7.45	164°53.99 17.17	149°7.76 52.80	64°28.20 35.69	200°23.88 38.51	Procyon 244°48.14 5°9.04
21	254°9.92	179°54.55 · · 17.43	164°8.37 · · 52.83	79°30.29 · · 35.52	215°26.21 · · 38.54	Pollux 243°14.17 27°57.34
22	269° 12.38	194°55.10 17.69	179°8.99 52.86	94°32.38 35.35	230°28.53 38.58	Avior 234°14.14 -59°36.16
23	$284^{\circ}14.84$	209°55.66 17.94	194°9.60 52.88	109°34.48 35.19	245°30.86 38.61	Suhail 222°44.56 -43°33.02
1/10==	pass. 04:06	ν0.6' d0.3' m-4.61	ν0.6' d0.0' m1.53	ν2.1' d-0.2' m-1.79	ν2.3' d0.0' m0.38	Miaplacidus 221°38.43 -69°50.24
ivier.	Jass. U4:UU	νυ.υ αυ.ο m-4.01	νο.υ αυ.υ III1.55	ν∠.1 u-υ.∠ III-1.19	ν <sub>2.3</sub> αυ.υ iiiυ.30	Alphard 217°45.21 -8°47.04
						Regulus 207°31.66 11°49.62
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.08 61°35.94
0	299° 17.31	224°56.21 N18°18.20	209°10.22 N23°52.91	124°36.57 N03°35.02	260°33.18 N12°38.64	Dublie 193 36.06 01 33.94 Denebola 182°22.19 14°24.77
1	$314^{\circ}19.77$	239°56.76 18.46	224°10.83 52.94	139°38.66 34.86	275°35.51 38.68	
2	329°22.24	254°57.30 18.72	239°11.45 52.96	154°40.76 34.69	290°37.84 38.71	Gienah 175°40.71 -17°42.16
3	344°24.70	269°57.85 · · 18.98	254°12.06 · · 52.99	169°42.85 · · 34.52	305°40.16 · · 38.75	Acrux 172°56.94 -63°15.79
4	359°27.17	284°58.39 19.24	269° 12.67 53.01	184°44.94 34.36	320°42.49 38.78	Gacrux 171°48.48 -57°16.71
5	14°29.63	299°58.94 19.49	284°13.29 53.04	199°47.03 34.19	335°44.82 38.81	Alioth 166°10.68 55°48.50
6	29°32.09	314°59.48 N18°19.75	299°13.90 N23°53.06	214°49.12 N03°34.02	350°47.14 N12°38.85	Spica 158°19.26 -11°18.69
7	44°34.56	330°0.02 20.01	314°14.52 53.09	229°51.22 33.86	5°49.47 38.88	Alkaid 152°49.80 49°10.46
8	59°37.02	345°0.55 20.27	329° 15.13 53.11	244°53.31 33.69	20°51.80 38.91	Hadar 148°31.69 -60°30.93
9	74°39.49	0°1.09 · · 20.53	344°15.75 · · 53.13	259°55.40 · · 33.52	35°54.13 · · 38.95	Menkent 147°54.10 -36°30.81
10	89°41.95	15°1.62 20.79	359°16.36 53.15	274°57.49 33.36	50°56.45 38.98	Arcturus 145°45.24 19°2.14
11	104° 44.42	30°2.16 21.05	14°16.98 53.18	289°59.58 33.19	65°58.78 39.01	Rigil Kent. 139°36.03 -60°57.47
12	119° 46.88	45°2.69 N18°21.31	29°17.59 N23°53.20	305°1.67 N03°33.02	81°1.11 N12°39.05	Kochab 137°19.76 74°2.53
13	134° 49.34			320° 3.76 32.86	96°3.44 39.08	Zuben'ubi 136°52.69 -16°9.67
14	134 49.34 149°51.81	60°3.22 21.56 75°3.74 21.82	44° 18.21 53.22 59° 18.82 53.24	335° 5.86 32.69	111°5.77 39.11	Alphecca 126°1.14 26°37.29
						Antares 112°12.01 -26°29.71
15	164°54.27		74°19.44 · · 53.26 89°20.06 53.28	350°7.95 · · 32.52	126°8.09 · · 39.15	Atria 107°3.13 -69°4.81
16	179°56.74	105°4.79 22.34		5°10.04 32.36	141°10.42 39.18	Sabik 101°59.18 -15°45.53
17	194°59.20 210°1.66	120°5.32 22.60 135°5.84 N18°22.86	104°20.67 53.30 119°21.29 N23°53.32	20°12.13 32.19 35°14.22 N03°32.02	156°12.75 39.21	Shaula 96°6.07 -37°7.42
18					171°15.08 N12°39.25	Rasalhague 95°55.57 12°32.52
19	225°4.13	150°6.36 23.12	134°21.90 53.34	50°16.31 31.85	186°17.41 39.28	Eltanin 90°40.36 51°29.30
20	240°6.59 255°9.06	165°6.87 23.38	149°22.52 53.36	65°18.40 31.69	201°19.74 39.31	Kaus Aust. 83°28.30 -34°22.15
21		180°7.39 · · 23.64	164°23.14 · · 53.38	80°20.49 · · 31.52	216°22.07 · · 39.34	Vega 80°30.84 38°48.79
22	270°11.52	195°7.90 23.90	179°23.75 53.40	95°22.58 31.35	231°24.40 39.38	Nunki 75°43.82 -26°15.51
23	285°13.99	210°8.42 24.16	194°24.37 53.42	110°24.67 31.18	246°26.73 39.41	Altair 61°56.79 8°56.81
Mer.r	pass. 04:02	ν0.5' d0.3' m-4.60	ν0.6' d0.0' m1.53	ν2.1' d-0.2' m-1.79	ν2.3' d0.0' m0.38	Peacock 53°0.66 -56°38.34
						Deneb 49°23.32 45°23.03
_						Enif 33°35.64 10°0.53
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.97 -46°49.03
0	300° 16.45	225°8.93 N18°24.42	209°24.98 N23°53.44	125°26.76 N03°31.02	261°29.06 N12°39.44	Fomalhaut 15°11.11 -29°27.95
1	315° 18.91	240°9.44 24.67	224°25.60 53.45	140°28.84 30.85	276°31.39 39.48	Scheat 13°42.10 28°14.33
2	330°21.38	255°9.94 24.93	239° 26.22 53.47	155°30.93 30.68	291°33.72 39.51	Markab 13°26.76 15°21.66
3	345°23.84	270°10.45 · · 25.19	254°26.83 · · 53.49	170°33.02 · · 30.51	306°36.05 · · 39.54	
4	0°26.31	285°10.95 25.45	269°27.45 53.51	185°35.11 30.35	321°38.38 39.57	Jul 20 Thu SHA Mer.pass
5	15°28.77	300°11.46 25.71	284°28.07 53.52	200°37.20 30.18	336°40.71 39.61	Venus 286°24.34 09:01
6	30°31.23	315°11.96 N18°25.97	299° 28.68 N23° 53.54	215°39.29 N03°30.01	351°43.04 N12°39.64	Mars 270° 37.33 10:04
7	45°33.70	330°12.46 26.23	314°29.30 53.55	230°41.38 29.84	6°45.37 39.67	Jupiter 185°28.13 15:43
8	60°36.16	345°12.96 26.49	329°29.92 53.57	245°43.47 29.67	21°47.70 39.70	Saturn 321°19.23 06:40
9	75°38.63	0°13.45 · · 26.75	344°30.54 · · 53.58	260°45.55 · · 29.51	36°50.03 · · 39.73	Jul 21 Fri SHA Mer.pass
10	90°41.09	15° 13.95 27.01	359°31.15 53.60	275°47.64 29.34	51°52.36 39.77	Venus 285°38.90 09:00
11	105°43.56	30° 14.44 27.27	14°31.77 53.61	290°49.73 29.17	66°54.70 39.80	Mars 269°52.91 10:03
12	120°46.02	45°14.93 N18°27.53	29°32.39 N23°53.62	305°51.82 N03°29.00	81°57.03 N12°39.83	Jupiter 185°19.26 15:39
13	135° 48.48	60° 15.42 27.79	44°33.01 53.64	320°53.90 28.83	96°59.36 39.86	Saturn 321°15.88 06:37
14	$150^{\circ}50.95$	75°15.91 28.05	59°33.62 53.65	335°55.99 28.67	112°1.69 39.90	Jatum 321 13.00 00:37
15	$165^{\circ}53.41$	90°16.39 · · 28.31	74°34.24 · · 53.66	350°58.08 · · 28.50	127°4.02 · · 39.93	Jul 22 Sat SHA Mer.pass
16	$180^{\circ}55.88$	105°16.88 28.57	89°34.86 53.67	6°0.17 28.33	142°6.36 39.96	Venus 284°52.48 08:59
17	195°58.34	120°17.36 28.83	104°35.48 53.69	21°2.25 28.16	157°8.69 39.99	Mars 269°8.53 10:02
18	211°0.80	135°17.84 N18°29.09	119°36.10 N23°53.70	36°4.34 N03°27.99	172°11.02 N12°40.02	Jupiter 185° 10.31 15:36
19	226°3.27	150° 18.32 29.35	134° 36.72 53.71	51°6.43 27.82	187°13.35 40.05	Saturn 321°12.61 06:33
20	241°5.73	165°18.80 29.61	149° 37.33 53.72	66° 8.51 27.65	202°15.69 40.09	
21	256°8.20	180°19.28 · · 29.87	164°37.95 · · 53.73	81°10.60 · · 27.48	217°18.02 · · 40.12	Horizontal parallax
22	271° 10.66	195° 19.75 30.13	179°38.57 53.74	96°12.69 27.32	232°20.35 40.15	Venus: 0.3
23	$286^{\circ}13.13$	210°20.23 30.38	194°39.19 53.75	111°14.77 27.15	247°22.69 40.18	Mars: 0.1
1/100	pass. 03:58	ν0.5′ d0.3′ m-4.59	ν0.6' d0.0' m1.53	ν2.1' d-0.2' m-1.79	ν2.3' d0.0' m0.38	
iviei.	Juss. US.30	νυ.ο αυ.ο III-4.09	vo.o uo.o III1.33	ν Δ.1 U-U.Δ III-1.19	ν Δ.Ο UU.U IIIU.30	

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.18	N20°35.76	208°58.53	4.8'	N25°34.59	-2.9'	58.7'
1	193°24.14	35.29	223°22.35	4.8'	25°31.72	-3.0'	58.7'
2	208°24.11 223°24.07	34.81 •• 34.34	237°46.14 252°9.93	4.8' 4.8'	25°28.68 25°25.47	-3.2' -3.4'	58.8' 58.8'
4	238°24.04	33.86	266°33.70	4.8'	25°22.08	-3.6'	58.8'
5	253°24.00	33.39	280°57.46	4.8'	$25^{\circ}18.52$	-3.7'	58.9'
6	268°23.97	N20°32.91	295°21.21	4.7'	N25° 14.79	-3.9'	58.9'
7 8	283°23.93 298°23.90	32.43 31.95	309°44.96 324°8.71	4.7' 4.7'	25°10.88 25°6.80	-4.1' -4.3'	58.9' 59.0'
9	296 23.90 313°23.87	31.48	338°32.45	4.7'	25 0.60 25°2.55	-4.3 -4.4'	59.0'
10	328°23.84	31.00	352°56.19	4.7'	24°58.13	-4.6'	59.0'
11	343°23.80	30.52	7°19.94	4.8'	24°53.53	-4.8'	59.1'
12	358°23.77 13°23.74	N20°30.04	21°43.69	4.8'	N24° 48.77	-4.9'	59.1'
13 14	13°23.74 28°23.71	29.56 29.08	36°7.45 50°31.21	4.8' 4.8'	24°43.83 24°38.72	-5.1' -5.3'	59.1' 59.2'
15	43°23.67	28.59	64°54.99	4.8'	24° 33.44	-5.5'	59.2'
16	58°23.64	28.11	79°18.78	4.8'	$24^{\circ}27.99$	-5.6'	59.2'
17	73°23.61	27.63	93°42.58	4.8'	24°22.36	-5.8'	59.3'
18 19	88°23.58 103°23.55	N20°27.14 26.66	108°6.40 122°30.23	4.8' 4.9'	N24° 16.57 24° 10.61	-6.0' -6.1'	59.3' 59.3'
20	103 23.55 118°23.52	26.00	122 30.23 136°54.09	4.9'	24 10.61 24°4.49	-6.1 -6.3	59.3 59.4'
21	133°23.49	25.69	151°17.96	4.9'	23°58.19	-6.5	59.4'
22	148°23.46	25.20	165°41.86	4.9'	23°51.73	-6.6'	59.4'
23	163°23.43	24.72	180°5.79	5.0'	23°45.10	-6.8'	59.4'
	SD = 15.7'	d = -0.5'		S	D = 16.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.40	N20°24.23	194°29.74	5.0'	N23°38.30	-7.0'	59.5'
1	193°23.37	23.74	208°53.72	5.0'	23°31.34	-7.1'	59.5'
2	208°23.34	23.25	223°17.73	5.0'	23°24.21	-7.3'	59.5'
3 4	223°23.31 238°23.28	· · 22.76 22.27	237°41.77 252°5.84	5.1' 5.1'	23°16.92 23°9.47	-7.5' -7.6'	59.6' 59.6'
5	253°23.26	21.78	266°29.95	5.1'	23°1.85	-7.8'	59.6'
6	268°23.23	N20°21.29	280°54.10	5.2'	N22°54.08	-7.9'	59.6'
7	283°23.20	20.80	295°18.28	5.2'	22°46.14	-8.1'	59.7'
8 9	298°23.17 313°23.15	20.31	309°42.50 324°6.77	5.3' 5.3'	22°38.04 22°29.79	-8.3' -8.4'	59.7' 59.7'
10	313 23.15 328°23.12	19.81	324 0.77 338°31.07	5.3'	22°21.38	-8.4 -8.6'	59.7'
11	343°23.09	18.83	352°55.42	5.4'	22°12.81	-8.7'	59.8'
12	358°23.07	N20°18.33	7°19.81	5.4'	N22°4.09	-8.9'	59.8'
13	13°23.04 28°23.01	17.84	21°44.25 36°8.74	5.5' 5.5'	21°55.21 21°46.18	-9.0' -9.2'	59.8'
14 15	28 23.01 43°22 99	17.34 •• 16.85	50° 33.28	5.5 5.6'	21 40.18 21°37.00	-9.2 -9.3'	59.8' 59.9'
16	58°22.96	16.35	64°57.86	5.6'	21°27.66	-9.5'	59.9'
17	73°22.94	15.85	79°22.50	5.7'	21° 18.18	-9.6'	59.9'
18	88°22.91 103°22.89	N20°15.35	93°47.19 108°11.93	5.7'	N21°8.55 20°58.77	-9.8' -9.9'	59.9'
19 20	103 22.89 118°22.86	14.86 14.36	108 11.93 122°36.72	5.8' 5.8'	20° 48.85	-9.9 -10.1'	60.0' 60.0'
21	133°22.84	• • 13.86	137°1.57	5.9'	20°38.78	-10.1	60.0'
22	148°22.81	13.36	151°26.48	6.0'	$20^{\circ}28.57$	-10.4'	60.0'
23	163°22.79	12.85	165°51.44	6.0'	20°18.22	-10.5'	60.0'
	SD = 15.7'	d = -0.5'		S	D = 16.2'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°22.77	N20°12.35	180°16.46	6.1'	N20°7.72	-10.6'	60.1
1 2	193°22.74 208°22.72	11.85 11.35	194°41.54 209°6.68	6.1' 6.2'	19°57.09 19°46.32	-10.8' -10.9'	60.1' 60.1'
3	223°22.70	. 10.84	223°31.87	6.3	19°35.42	-11.0'	60.1
4	238°22.67	10.34	237°57.13	6.3'	19°24.38	-11.2'	60.1'
5 6	253°22.65 268°22.63	9.84 N20° 9.33	252°22.45 266°47.83	6.4' 6.4'	19°13.21 N19°1.90	-11.3' -11.4'	60.2' 60.2'
6 7	268°22.63 283°22.61	N20°9.33 8.83	266°47.83 281°13.27	6.4	N19°1.90 18°50.47	-11.4° -11.6'	60.2'
8	298°22.59	8.32	295°38.78	6.6'	18° 38.91	-11.7	60.2
9	313°22.57	• • 7.81	310°4.35	6.6'	18°27.22	-11.8'	60.2'
10	328°22.54 343°22.52	7.31	324°29.98 338°55.68	6.7' 6.8'	18° 15.41 18° 3.47	-11.9'	60.3'
11 12	343°22.52 358°22.50	6.80 N20°6.29	338°55.68 353°21.44	6.8'	18°3.47 N17°51.41	-12.1' -12.2'	60.3' 60.3'
13	13°22.48	5.78	7°47.26	6.9'	17°39.23	-12.3	60.3
14	28°22.46	5.27	22°13.15	7.0'	17°26.93	-12.4'	60.3'
15	43°22.44	• • 4.76	36°39.11	7.0'	17°14.52	-12.5'	60.3'
16 17	58°22.42 73°22.40	4.25 3.74	51°5.13 65°31.22	7.1' 7.2'	17°1.99 16°49.34	-12.6' -12.8'	60.3' 60.4'
18	88°22.38	N20°3.22	79°57.37	7.2'	N16° 36.59	-12.0	60.4
19	103°22.37	2.71	94°23.59	7.3'	$16^{\circ}23.72$	-13.0'	60.4'
20	118°22.35	2.20	108°49.87	7.4'	16° 10.75	-13.1'	60.4
21 22	133°22.33 148°22.31	· · 1.69 1.17	123°16.22 137°42.64	7.4' 7.5'	15°57.67 15°44.48	-13.2' -13.3'	60.4' 60.4'
23	146 22.31 163°22.29	0.66	157 42.04 152°9.12	7.5'	15° 44.46 15° 31.19	-13.4'	60.4
	SD = 15.7'	d = -0.5'			D = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%	
20	06:23	06:25	12:06	10:29	23:00		
21	06:26	06:28	12:06	11:29	23:59		
22	06:29	06:30	12:06	12:28	-:-		

July 23, 24, 25 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	301° 15.59	225°20.70 N18°30.64	209°39.81 N23°53.76	126°16.86 N03°26.98	262°25.02 N12°40.21	
1	$316^{\circ}18.05$	240°21.17 30.90	224° 40.43 53.77	141°18.94 26.81	277°27.35 40.24	Alpheratz 357°31.54 29°14.91 Ankaa 353°4.18 -42°8.68
2	$331^{\circ}20.52$	255°21.64 31.16	239°41.05 53.77	156°21.03 26.64	292°29.69 40.27	Ankaa 353°4.18 -42°8.68 Schedar 349°27.39 56°41.51
3	346°22.98	270°22.10 · · 31.42	254°41.67 · · 53.78	171°23.11 · · 26.47	307°32.02 · · 40.31	Diphda 348°44.30 -17°49.53
4	1°25.45	285°22.57 31.68	269° 42.29 53.79	186°25.20 26.30	322°34.36 40.34	Achernar 335°18.08 -57°5.11
5 6	16°27.91 31°30.37	300°23.03 31.94 315°23.50 N18°32.20	284°42.90 53.80 299°43.52 N23°53.80	201°27.28 26.13 216°29.37 N03°25.96	337°36.69 40.37 352°39.02 N12°40.40	Hamal 327°47.89 23°35.83
7	46°32.84	330°23.96 32.46	314°44.14 53.81	231°31.45 25.79	7°41.36 40.43	Polaris 312°35.89 89°22.68
8	61°35.30	345°24.42 32.72	329°44.76 53.82	246°33.54 25.62	22°43.69 40.46	Acamar 315°9.72 -40°11.11
9	76°37.77	0°24.87 · · 32.98	344°45.38 · · 53.82	261°35.62 · · 25.45	37°46.03 · · 40.49	Menkar 314°3.19 4°12.17 Mirfak 308°24.20 49°57.54
10	91°40.23	15°25.33 33.24	359°46.00 53.83	276°37.71 25.28	52°48.36 40.52	Aldebaran 290°36.49 16°33.95
11	106°42.70	30°25.78 33.50	14°46.62 53.83	291°39.79 25.11	67°50.70 40.55	Rigel 281°1.33 -8°10.07
12	121°45.16	45°26.24 N18°33.76	29° 47.24 N23° 53.84	306°41.88 N03°24.95	82°53.04 N12°40.58	Capella 280°17.93 46°1.40
13 14	136° 47.62 151° 50.09	60°26.69 34.02 75°27.14 34.28	44°47.86 53.84 59°48.48 53.85	321°43.96 24.78 336°46.04 24.61	97°55.37 40.61 112°57.71 40.65	Bellatrix 278°20.02 6°22.51
15	166° 52.55	90°27.59 · · 34.53	74°49.10 · · 53.85	351°48.13 · · 24.44	128°0.04 · · 40.68	Elnath 277°58.48 28°37.76
16	181°55.02	105°28.03 34.79	89°49.72 53.86	6°50.21 24.27	143°2.38 40.71	Alnilam 275°35.05 -1°11.02
17	$196^{\circ}57.48$	120°28.48 35.05	104°50.35 53.86	21°52.30 24.10	158°4.71 40.74	Betelgeuse 270°49.22 7°24.70 Canopus 263°51.60 -52°42.54
18	211°59.94	135°28.92 N18°35.31	119°50.97 N23°53.86	36°54.38 N03°23.93	173°7.05 N12°40.77	Sirius 258°24.00 -16°45.31
19	227°2.41	150°29.36 35.57	134°51.59 53.86	51°56.46 23.76	188°9.39 40.80	Adhara 255°3.94 -29°0.63
20	242°4.87	165°29.80 35.83	149° 52.21 53.87	66°58.55 23.59	203°11.72 40.83	Procyon 244°48.13 5°9.05
21 22	257°7.34 272°9.80	180°30.24 · · 36.09 195°30.68 36.35	164°52.83 · · 53.87 179°53.45 53.87	82°0.63 ·· 23.42 97°2.71 23.24	218°14.06 · · 40.86 233°16.40 40.89	Pollux 243°14.15 27°57.34
23	287° 12.26	210°31.12 36.61	194°54.07 53.87	112°4.79 23.07	248°18.74 40.92	Avior 234°14.14 -59°36.14
						Suhail 222°44.56 -43°33.00
Mer.	pass. 03:54	ν0.5′ d0.3′ m-4.58	ν0.6' d0.0' m1.53	ν2.1' d-0.2' m-1.78	$\nu 2.3' \ d0.0' \ m0.37$	Miaplacidus 221°38.44 -69°50.23 Alphard 217°45.20 -8°47.03
						Alphard 217°45.20 -8°47.03 Regulus 207°31.65 11°49.62
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.09 61°35.93
0	302°14.73	225°31.55 N18°36.87	209°54.69 N23°53.87	127°6.88 N03°22.90	263°21.07 N12°40.95	Denebola 182°22.19 14°24.77
1	317° 17.19	240°31.98 37.12	224°55.31 53.87	142°8.96 22.73	278°23.41 40.98	Gienah 175°40.72 -17°42.16
2 3	332° 19.66 347° 22.12	255°32.41 37.38 270°32.84 · · 37.64	239°55.94 53.87 254°56.56 • 53.87	157°11.04 22.56 172°13.12 · · 22.39	293°25.75 41.01 308°28.09 · · 41.04	Acrux 172°56.96 -63°15.78
4	2°24.59	285°33.27 37.90	269° 57.18 53.87	187°15.20 22.22	323°30.42 41.07	Gacrux 171°48.50 -57°16.70
5	17° 27.05	300°33.70 38.16	284°57.80 53.87	202°17.29 22.05	338°32.76 41.10	Alioth 166°10.70 55°48.49
6	$32^{\circ}29.51$	315°34.12 N18°38.42	299°58.42 N23°53.87	217°19.37 N03°21.88	353°35.10 N12°41.13	Spica 158°19.26 -11°18.69 Alkaid 152°49.82 49°10.46
7	$47^{\circ}31.98$	330°34.55 38.67	314°59.05 53.86	232°21.45 21.71	8°37.44 41.16	Hadar 148°31.71 -60°30.93
8	62°34.44	345°34.97 38.93	329°59.67 53.86	247°23.53 21.54	23°39.78 41.19	Menkent 147°54.11 -36°30.81
9	77°36.91	0°35.39 · · 39.19	345°0.29 · · 53.86	262°25.61 · · 21.37	38°42.12 · · 41.22	Arcturus 145°45.25 19°2.14
10 11	92°39.37 107°41.83	15°35.81 39.45 30°36.22 39.71	0°0.91 53.86 15°1.54 53.85	277°27.69 21.20 292°29.77 21.03	53°44.46 41.25 68°46.79 41.28	Rigil Kent. 139°36.06 -60°57.47
12	122°44.30	45°36.64 N18°39.97	30°2.16 N23°53.85	307°31.86 N03°20.85	83°49.13 N12°41.30	Kochab 137°19.81 74°2.53
13	137° 46.76	60°37.05 40.22	45°2.78 53.84	322°33.94 20.68	98°51.47 41.33	Zuben'ubi 136°52.69 -16°9.67 Alphecca 126°1.15 26°37.29
14	$152^{\circ}49.23$	75°37.47 40.48	60°3.40 53.84	337°36.02 20.51	113°53.81 41.36	Antares 112°12.02 -26°29.72
15	$167^{\circ}51.69$	90°37.88 · · 40.74	75°4.03 · · 53.84	352°38.10 · · 20.34	128°56.15 · · 41.39	Atria 107°3.15 -69°4.83
16	182°54.15	105°38.29 41.00	90°4.65 53.83	7°40.18 20.17	143°58.49 41.42	Sabik 101°59.18 -15°45.53
17 18	197° 56.62 212° 59.08	120°38.70 41.25	105°5.27 53.83 120°5.90 N23°53.82	22°42.26 20.00 37°44.34 N03°19.83	159°0.83 41.45	Shaula 96° 6.07 -37° 7.43
19	212 59.06 228°1.55	135°39.10 N18°41.51 150°39.51 41.77	120°5.90 N23°53.82 135°6.52 53.81	37°44.34 N03°19.83 52°46.42 19.65	174°3.17 N12°41.48 189°5.51 41.51	Rasalhague 95°55.57 12°32.53
20	243°4.01	165°39.91 42.03	150°7.14 53.81	67°48.50 19.48	204°7.85 41.54	Eltanin 90°40.37 51°29.31
21	258°6.47	180°40.31 · · 42.28	165°7.77 · · 53.80	82°50.58 · · 19.31	219°10.19 · · 41.57	Kaus Aust. 83°28.29 -34°22.15 Vega 80°30.85 38°48.80
22	273°8.94	195°40.71 42.54	180°8.39 53.79	97°52.66 19.14	234°12.53 41.60	Nunki 75°43.81 -26°15.52
23	288°11.40	210°41.11 42.80	195°9.01 53.78	112°54.73 18.97	249°14.88 41.62	Altair 61°56.78 8°56.82
Mer.	pass. 03:50	ν0.4' d0.3' m-4.57	$\nu$ 0.6' d0.0' m1.54	ν2.1' d-0.2' m-1.78	$\nu$ 2.3' d0.0' m0.37	Peacock 53°0.64 -56°38.35
						Deneb 49°23.31 45°23.05
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.63 10°0.54
o 0	303° 13.87	225°41.51 N18°43.06	210°9.64 N23°53.78	127°56.81 N03°18.80	264°17.22 N12°41.65	Al Na'ir 27°28.94 -46°49.03 Fomalhaut 15°11.09 -29°27.95
1	318° 16.33	240°41.91 43.31	225°10.26 53.77	142°58.89 18.62	279°19.56 41.68	Fomalhaut 15°11.09 -29°27.95 Scheat 13°42.08 28°14.34
2	$333^{\circ}18.79$	255°42.30 43.57	240°10.89 53.76	158° 0.97 18.45	294°21.90 41.71	Markab 13°26.74 15°21.67
3	348°21.26	270° 42.69 · · 43.83	255°11.51 · · 53.75	173°3.05 · · 18.28	309°24.24 · · 41.74	
4	3°23.72	285°43.09 44.08	270°12.14 53.74	188° 5.13 18.11	324°26.58 41.77	Jul 23 Sun         SHA         Mer.pass           Venus         284°5.11         08:58
5 6	18° 26.19 33° 28.65	300°43.48 44.34 315°43.86 N18°44.59	285°12.76 53.73 300°13.39 N23°53.72	203°7.21 17.94 218°9.29 N03°17.76	339°28.92 41.80 354°31.27 N12°41.83	Venus 284°5.11 08:58 Mars 268°24.22 10:01
7	48°31.12	330°44.25 44.85	315°14.01 53.71	233°11.36 17.59	9°33.61 41.85	Jupiter 185°1.27 15:33
8	63°33.58	345°44.64 45.11	330°14.64 53.70	248°13.44 17.42	24°35.95 41.88	Saturn 321°9.43 06:29
9	78°36.04	0°45.02 · · 45.36	345°15.26 · · 53.69	263°15.52 · · 17.25	39°38.29 · · 41.91	
10	93°38.51	15° 45.40 45.62	0°15.89 53.68	278°17.60 17.07	54°40.64 41.94	Jul 24 Mon         SHA         Mer.pass           Venus         283°16.82         08:58
11	108° 40.97	30° 45.79 45.88	15° 16.51 53.67	293°19.68 16.90	69°42.98 41.97	Mars 267°39.96 10:00
12 13	123° 43.44 138° 45.90	45°46.17 N18°46.13 60°46.54 46.39	30°17.14 N23°53.65 45°17.76 53.64	308°21.75 N03°16.73 323°23.83 16.56	84°45.32 N12°41.99 99°47.67 42.02	Jupiter 184°52.15 15:29
13 14	138° 45.90 153° 48.36	75°46.92 46.64	45°17.76 53.64 60°18.39 53.63	323°23.83 16.56 338°25.91 16.38	114°50.01 42.05	Saturn 321°6.34 06:26
15	168° 50.83	90°47.30 · · 46.90	75°19.01 · · 53.61	353°27.98 · · 16.21	129°52.35 · · 42.08	Jul 25 Tue SHA Mer.pass
16	183°53.29	105°47.67 47.15	90° 19.64 53.60	8°30.06 16.04	144°54.70 42.11	Venus 282°27.64 08:57
17	198°55.76	120°48.04 47.41	105°20.27 53.59	23°32.14 15.87	159°57.04 42.13	Mars 266°55.77 09:59
18	213°58.22	135°48.41 N18°47.66	120°20.89 N23°53.57	38°34.21 N03°15.69	174°59.38 N12°42.16	Jupiter 184°42.95 15:26
19	229°0.68	150°48.78 47.92	135°21.52 53.56	53°36.29 15.52	190°1.73 42.19	Saturn 321°3.35 06:22
20 21	244°3.15 259°5.61	165°49.15 48.17 180°49.52 •• 48.43	150°22.14 53.54 165°22.77 · · 53.53	68°38.37 15.35 83°40.44 · · 15.17	205°4.07 42.22 220°6.42 • 42.24	Horizontal parallax
22	274°8.08	195°49.88 48.68	180°23.40 53.51	98°42.52 15.00	235°8.76 42.27	Venus: 0.3
23	289° 10.54	210° 50.24 48.94	195°24.02 53.49	113°44.60 14.83	250°11.11 42.30	Mars: 0.1
Mar	pass. 03:46	ν0.4' d0.3' m-4.56	ν0.6' d-0.0' m1.54	ν2.1' d-0.2' m-1.78	ν2.3' d0.0' m0.37	
	pass. 05.40	νο.¬ αυ.ο ΠΙ-4.ου	νο.ο α-ο.ο III1.J4	ν Δ.1 U=0.Δ III=1.10	ν Δ.Ο UU.U IIIU.J1	

011 —	011-010 =	+0.1331 360	Δ. –	-011 -	- 103.0303	300	
h	Su	n			Moon		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°22.28	N20°0.14	166° 35.67	7.6'	N15° 17.80	-13.5'	60.4'
1	193°22.26	19°59.62	181°2.28	7.7'	15°4.31	-13.6'	60.5
2	208°22.24 223°22.23	59.11 •• 58.59	195°28.96 209°55.70	7.7' 7.8'	14°50.73 14°37.05	-13.7' -13.8'	60.5' 60.5'
3 4	223 22.23 238°22.21	58.07	209 55.70 224°22.51	7.0 7.9'	14° 23.27	-13.0'	60.5
5	253°22.19	57.55	238° 49.39	7.9' 7.9'	14° 23.27	-13.9 -14.0'	60.5
6	268°22.18	N19°57.04	253° 16.32	8.0'	N13°55.44	-14.0'	60.5'
7	283°22.16	56.52	267°43.33	8.1'	13°41.39	-14.1'	60.5'
8	298°22.15	56.00	282°10.39	8.1'	13°27.26	-14.2'	60.5'
9	313°22.13	• • 55.47	296°37.52	8.2'	13°13.04	-14.3'	60.5'
10	328°22.12 343°22.10	54.95	311°4.71	8.3' 8.3'	12°58.74	-14.4'	60.5'
11 12	343°22.10 358°22.09	54.43 N19°53.91	325°31.97 339°59.28	8.4	12°44.36 N12°29.89	-14.5' -14.5'	60.5' 60.5'
13	13°22.07	53.39	354°26.66	8.4'	12° 15.35	-14.5 -14.6'	60.5
14	28°22.06	52.86	8°54.10	8.5'	12°0.74	-14.7'	60.5'
15	43°22.04	• • 52.34	23°21.60	8.6'	11°46.05	-14.8'	60.5'
16	58°22.03	51.81	37°49.16	8.6'	11°31.29	-14.8'	60.5'
17	73°22.02	51.29	52°16.78	8.7'	11°16.46	-14.9'	60.5
18	88°22.01	N19°50.76	66° 44.46 81° 12.20	8.7'	N11°1.56	-15.0'	60.6'
19 20	103°21.99 118°21.98	50.24 49.71	81°12.20 95°39.99	8.8' 8.9'	10°46.60 10°31.57	-15.0' -15.1'	60.6' 60.6'
20	118 21.98 133°21.97	49.71 •• 49.18	95 39.99 110°7.84	8.9'	10 31.57 10°16.47	-15.1 -15.2'	60.6
22	148°21.96	48.65	124° 35.75	9.0'	10°10.47	-15.2'	60.6
23	163°21.94	48.12	139°3.71	9.0'	09°46.11	-15.3'	60.6'
	SD = 15.7'	d = -0.5'		ÇI	O = 16.5'		
		<u>u = 0.5</u>		JI	_ 10.5		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°21.93	N19° 47.59	153°31.73	9.1'	N09°30.85	-15.3'	60.6'
1 2	193°21.92 208°21.91	47.06 46.53	167°59.80 182°27.93	9.1' 9.2'	09°15.52 09°0.15	-15.4' -15.4'	60.6' 60.6'
3	208°21.91 223°21.90	46.53 •• 46.00	182° 27.93 196° 56.11	9.2' 9.2'	09°0.15	-15.4 -15.5'	60.5
4	238°21.89	45.47	211°24.34	9.3'	08° 29.25	-15.5'	60.5'
5	253°21.88	44.94	225°52.62	9.3'	08° 13.72	-15.6'	60.5'
6	268°21.87	N19°44.41	240°20.95	9.4'	N07°58.15	-15.6'	60.5'
7	283°21.86	43.87	254°49.33	9.4'	07°42.54	-15.7'	60.5'
8	298°21.85	43.34	269° 17.75	9.5'	07°26.89	-15.7'	60.5
9 10	313°21.84 328°21.83	•• 42.81 42.27	283°46.23 298°14.75	9.5' 9.6'	07°11.19 06°55.46	-15.7' -15.8'	60.5' 60.5'
11	343°21.83	42.27	312° 43.32	9.6'	06°39.69	-15.8'	60.5
12	358°21.82	N19°41.20	312 43.32 327°11.93	9.7	N06°23.89	-15.8'	60.5
13	13°21.81	40.66	341°40.58	9.7'	06°8.05	-15.9	60.5
14	28°21.80	40.12	$356^{\circ}9.28$	9.7'	$05^{\circ}52.18$	-15.9'	60.5'
15	43°21.80	• • 39.59	10°38.02	9.8'	05°36.29	-15.9'	60.5
16	58°21.79 73°21.78	39.05	25°6.80 39°35.62	9.8'	05°20.36 05°4.42	-15.9'	60.5'
17 18	73°21.78 88°21.78	38.51 N19°37.97	39°35.62 54°4.48	9.9' 9.9'	05°4.42 N04°48.44	-16.0' -16.0'	60.5' 60.5'
19	103°21.77	37.43	68° 33.38	9.9'	04° 32.45		60.5
20	118°21.76	36.89	83°2.32	10.0'	04°16.44	-16.0'	60.5'
21	133°21.76	• • 36.35	97°31.29	10.0'	$04^{\circ}0.40$	-16.0'	60.4'
22	148°21.75	35.81	112°0.29	10.0'	03°44.35	-16.1'	60.4'
23	163°21.75	35.26	126°29.33	10.1'	03°28.29	-16.1'	60.4'
	SD = 15.7'	d = -0.5'		SI	O = 16.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.74	N19°34.72	140°58.40	10.1'	N03° 12.21	-16.1'	60.4
1	193°21.74	34.18	155° 27.51	10.1'	02°56.13	-16.1	60.4
2	208°21.73	33.63	169° 56.64	10.2'	02°40.03	-16.1'	60.4'
3	223°21.73	• • 33.09	184° 25.80	10.2'	02°23.93	-16.1'	60.4
4	238°21.72 253°21.72	32.54 32.00	198°55.00 213°24.22	10.2' 10.2'	02°7.82 01°51.70	-16.1' -16.1'	60.4' 60.4'
5 6	253°21.72 268°21.72	32.00 N19°31.45	213°24.22 227°53.46	10.2	01°51.70 N01°35.58	-16.1'	60.4
7	283°21.71	30.90	242° 22.73	10.3	01° 19.47	-16.1	60.3
8	298°21.71	30.36	256° 52.03	10.3'	01°3.35	-16.1	60.3'
9	313°21.71	• • 29.81	$271^{\circ}21.35$	10.3'	00°47.23	-16.1'	60.3'
10	328°21.71	29.26	285°50.69	10.4'	00°31.13	-16.1'	60.3'
11	343°21.70	28.71	300°20.05	10.4	N00°15.02	-16.1'	60.3'
12 13	358°21.70 13°21.70	N19°28.16 27.61	314°49.44 329°18.84	10.4' 10.4'	\$00°1.07 00°17.16	16.1' 16.1'	60.3' 60.2'
13 14	28°21.70	27.61	329° 18.84 343° 48.26	10.4	00°17.16 00°33.24	16.1	60.2'
15	43°21.70	26.51	358° 17.69	10.5	00° 49.30	16.0'	60.2
16	58°21.70	25.96	12°47.14	10.5'	01°5.35	16.0'	60.2'
17	73°21.70	25.40	$27^{\circ}16.61$	10.5'	$01^{\circ}21.38$	16.0'	60.2'
18	88°21.70	N19°24.85	41°46.09	10.5'	S01°37.40	16.0'	60.2'
19	103°21.70	24.30	56° 15.58	10.5'	01°53.39	16.0'	60.1
20	118°21.70	23.74	70°45.08	10.5'	02°9.37	16.0'	60.1'
21 22	133°21.70 148°21.70	· · 23.19 22.63	85°14.59 99°44.12	10.5' 10.5'	02°25.32 02°41.25	15.9' 15.9'	60.1' 60.1'
23	163°21.70	22.03	99 44.12 114°13.65	10.5	02° 41.25	15.9'	60.1
5	SD = 15.7'	d = -0.5'			D = 16.5'		
		$u = -0.5^{\circ}$		51	$rac{10.5}{1}$		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-12%
23	06:31	06:32	12:07	13:23	00:56	
24	06:32	06:33	12:07	14:16	01:50	
25	06:33	06:33	12:07	15:07	02:42	

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	$304^{\circ}13.00$	225°50.61	N18°49.19	$210^{\circ}24.65$	N23°53.48	128°46.67	N03°14.66	265°13.45	N12°42.33	Alpheratz	357°31.52	29°14.92
1	$319^{\circ}15.47$	240°50.97	49.45	225°25.28	53.46	143°48.75	14.48	$280^{\circ}15.80$	42.35	Ankaa	353° 4.15	-42°8.68
2	334° 17.93	255°51.33	49.70	240°25.90	53.44	158°50.82	14.31	295°18.14	42.38	Schedar	349°27.36	56° 41.52
3	349°20.40	270°51.68	• • 49.95	255° 26.53	• • 53.43	173°52.90	14.14	310°20.49	• • 42.41	Diphda	348°44.28	-17°49.53
4 5	4°22.86 19°25.32	285°52.04 300°52.40	50.21 50.46	270°27.16 285°27.79	53.41 53.39	188°54.97 203°57.05	13.96 13.79	325°22.83 340°25.18	42.44 42.46	Achernar	$335^{\circ}18.05$	-57°5.11
6	34°27.79	315°52.75	N18°50.71	300°28.41	N23°53.37	218°59.12	N03°13.61	355°27.53	N12°42.49	Hamal	327°47.87	23°35.83
7	49° 30.25	330°53.10	50.97	315° 29.04	53.35	234°1.20	13.44	10°29.87	42.52	Polaris	312°34.41	89°22.67
8	64°32.72	345°53.45	51.22	330°29.67	53.33	249°3.27	13.27	25°32.22	42.54	Acamar Menkar	315°9.70 314°3.17	-40°11.10 4°12.18
9	$79^{\circ}35.18$	0°53.80	•• 51.47	345°30.30	• • 53.31	264° 5.35	•• 13.09	40°34.56	• • 42.57	Mirfak	308°24.17	49°57.55
10	94°37.64	15°54.15	51.73	0°30.92	53.29	279°7.42	12.92	55°36.91	42.60	Aldebaran	290°36.47	16° 33.95
11	109° 40.11	30°54.49	51.98	15°31.55	53.27	294° 9.50	12.75	70°39.26	42.63	Rigel	281°1.31	-8° 10.06
12 13	124° 42.57 139° 45.04	45°54.84 60°55.18	N18°52.23 52.48	30°32.18 45°32.81	N23°53.25 53.23	309°11.57 324°13.65	N03°12.57 12.40	85°41.60 100°43.95	N12°42.65 42.68	Capella	$280^{\circ}17.91$	46°1.39
14	154° 47.50	75°55.52	52.46	60°33.44	53.23	339°15.72	12.40	115°46.30	42.71	Bellatrix	278°20.00	6°22.52
15	169°49.96	90°55.87	• • 52.99	75°34.07	53.19	354°17.79	• • 12.05	130°48.65	42.73	Elnath	277°58.46	28°37.76
16	$184^{\circ}52.43$	105°56.20	53.24	90°34.70	53.17	9°19.87	11.88	145°50.99	42.76	Alnilam Betelgeuse	275°35.03 270°49.21	-1°11.01 7°24.71
17	199°54.89	120°56.54	53.49	105°35.32	53.14	24°21.94	11.70	160°53.34	42.79	Canopus	263°51.58	-52° 42.53
18	214°57.36	135°56.88	N18°53.74	120°35.95	N23°53.12	39°24.01	N03°11.53	175°55.69	N12°42.81	Sirius	258°23.99	-16°45.30
19	229°59.82 245°2.29	150°57.21 165°57.55	54.00	135° 36.58	53.10	54°26.09 69°28.16	11.35	190°58.04 206°0.39	42.84	Adhara	255°3.93	-29°0.62
20 21	245 2.29 260°4.75	180° 57.88	54.25 •• 54.50	150° 37.21 165° 37.84	53.07 •• 53.05	84°30.23	11.18 •• 11.00	200 0.39 221°2.73	42.86 •• 42.89	Procyon	$244^{\circ}48.12$	5°9.05
22	275°7.21	195°58.21	54.75	180° 38.47	53.02	99°32.31	10.83	236°5.08	42.92	Pollux	243°14.15	27°57.34
23	290°9.68	210°58.54	55.00	195° 39.10	53.00	114°34.38	10.66	251°7.43	42.94	Avior	234°14.14	-59°36.12
Marr	225 02:42	··0 4′ d0	.3′ m-4.55	0.6/ 4.0	0.0' m1.54		.2′ m-1.77		.0′ m0.36	Suhail Miaplacidus	222°44.56 221°38.45	-43°32.99 -69°50.21
ivier.p	bass. 03:43	νο.4 αυ.	.5 111-4.55	νο.ο <i>α</i> -υ	7.0 m1.54	ν2.1 α-0	.2 m-1.//	ν2.3 d0	.U mu.su	Alphard	221 36.45 217°45.21	-8° 47.02
										Regulus	207°31.66	11°49.62
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.11	61°35.92
0	305°12.14	225°58.87	N18°55.25	210°39.73 225°40.36	N23°52.97	129°36.45 144°38.52	N03°10.48	266°9.78	N12°42.97	Denebola	$182^{\circ}22.20$	14°24.77
1 2	320° 14.61 335° 17.07	240°59.19 255°59.52	55.50 55.75	240°40.99	52.95 52.92	144 38.52 159°40.60	10.31 10.13	281°12.13 296°14.48	43.00 43.02	Gienah	175°40.73	-17° 42.15
3	350° 19.53	270°59.84	• • 56.00	255°41.62	52.90	174°42.67	9.96	311°16.83	• • 43.05	Acrux	172°56.99	-63° 15.77
4	5°22.00	286°0.16	56.25	270° 42.25	52.87	189°44.74	9.78	326°19.18	43.07	Gacrux	171°48.52 166°10.72	-57°16.70 55°48.49
5	$20^{\circ}24.46$	301°0.48	56.50	285°42.88	52.84	204°46.81	9.61	341°21.53	43.10	Alioth Spica	158° 19.28	-11° 18.69
6	35°26.93	316°0.80	N18°56.75	300°43.51	N23°52.82	219°48.88	N03°9.43	356°23.88	N12°43.13	Alkaid	152°49.84	49° 10.46
7	50°29.39	331°1.12	57.00	315°44.14	52.79	234°50.96	9.26	11°26.23	43.15	Hadar	148°31.74	-60° 30.93
8	65°31.85	346°1.44	57.25	330°44.77	52.76	249°53.03	9.08	26°28.58	43.18	Menkent	$147^{\circ}54.13$	-36°30.80
9 10	80°34.32 95°36.78	1°1.75 16°2.06	• • 57.50 57.75	345°45.40 0°46.03	· · 52.73 52.71	264°55.10 279°57.17	· · 8.91 8.73	41°30.93 56°33.28	· · 43.20 43.23	Arcturus	145°45.26	19°2.14
11	110°39.25	31°2.38	58.00	15°46.66	52.68	294°59.24	8.56	71°35.63	43.25	Rigil Kent.		-60°57.47
12	125° 41.71	46°2.69	N18°58.25	30° 47.29	N23°52.65	310°1.31	N03°8.38	86°37.98	N12°43.28	Kochab	137°19.86	74°2.53 -16°9.66
13	$140^{\circ}44.17$	61°3.00	58.50	45°47.93	52.62	325°3.38	8.21	101°40.33	43.30	Zuben'ubi Alphecca	136°52.71 126°1.16	-10 9.00 26°37.30
14	155° 46.64	76°3.31	58.74	60°48.56	52.59	340° 5.45	8.03	$116^{\circ}42.68$	43.33	Antares	112° 12.03	-26° 29.72
15	170°49.10	91°3.61	• • 58.99	75°49.19	• • 52.56	355°7.52	• • 7.86	131°45.03	• • 43.35	Atria	107°3.18	-69°4.83
16	185°51.57	106°3.92	59.24	90°49.82	52.53	10°9.60	7.68	146°47.38	43.38	Sabik	$101^{\circ}59.19$	-15°45.53
17 18	200° 54.03 215° 56.49	121°4.22	59.49 N18°59.73	105° 50.45 120° 51.08	52.50 N23°52.46	25°11.67 40°13.74	7.51 N03°7.33	161°49.73 176°52.09	43.41 N12°43.43	Shaula	96°6.08	-37°7.43
19	230°58.96	151°4.83	18°59.98	135°51.72	52.43	55° 15.81	7.15	191°54.44	43.46	Rasalhague	95°55.58	12°32.53
20	246°1.42	166°5.12	0.23	150° 52.35	52.40	70°17.88	6.98	206°56.79	43.48	Eltanin	90°40.38 83°28.30	51°29.33 -34°22.16
21	261°3.89	181°5.42	• • 0.48	165°52.98	• • 52.37	85°19.95	• • 6.80	221°59.14	• • 43.51	Kaus Aust. Vega	80°30.85	-34 22.16 38°48.81
22	276°6.35	196°5.72	0.72	180°53.61	52.34	100°22.02	6.63	237°1.49	43.53	Nunki	75°43.81	-26° 15.52
23	291°8.82	211°6.02	0.97	195°54.24	52.30	115°24.08	6.45	252°3.85	43.56	Altair	61°56.78	8°56.83
Mer.p	pass. 03:39	$\nu$ 0.3′ d0.	.3′ m-4.54	$\nu$ 0.6′ d-0	0.0′ m1.54	$\nu 2.1' \ d-0$	.2′ m-1.77	$\nu 2.3' \ d0$	.0′ m0.36	Peacock	53°0.64	-56°38.36
										Deneb	49°23.31	45°23.07
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.62	10°0.55
0	306°11.28	226°6.31	N19°1.22	210°54.88	N23°52.27	130°26.15	N03°6.28	267°6.20	N12°43.58	Al Na'ir Fomalhaut	27°28.93 15°11.08	-46°49.04 -29°27.95
1	321°13.74	241°6.60	1.46	225°55.51	52.24	145°28.22	6.10	282°8.55	43.60	Scheat	13°42.07	-29 27.95 28° 14.35
2	336° 16.21	256°6.89	1.71	240°56.14	52.20	160°30.29	5.92	297°10.91	43.63	Markab	13°26.73	15°21.68
3	351° 18.67	271°7.18	• • 1.95	255°56.78	• • 52.17	175°32.36	• • 5.75	312°13.26	• • 43.65	1 1 26 14/ 1	CLIA	
4 5	6°21.14 21°23.60	286°7.47 301°7.76	2.20	270° 57.41 285° 58.04	52.13 52.10	190°34.43 205°36.50	5.57 5.40	327°15.61 342°17.97	43.68 43.70	Jul 26 Wed	<b>SHA</b> 281°37.60	Mer.pass 08:56
6	36°26.06	301°7.76 316°8.05	2.44 N19° 2.69	285°58.04 300°58.68	52.10 N23°52.06	205°36.50 220°38.57	5.40 N03°5.22	342°17.97 357°20.32	43.70 N12°43.73	Mars		09:58
7	50°20.00 51°28.53	331° 8.33	2.93	315° 59.31	52.02	235°40.64	5.04	12°22.67	43.75	I	184°33.67	15:23
8	66°30.99	346°8.61	3.18	330° 59.94	51.99	250°42.71	4.87	27°25.03	43.78	Saturn	321°0.45	06:18
9	81°33.46	1°8.90	• • 3.42	346°0.58	• • 51.95	265°44.77	• • 4.69	42°27.38	• • 43.80	Jul 27 Thu	SHA	Mor noss
10	96°35.92	$16^{\circ}9.18$	3.67	1°1.21	51.92	280°46.84	4.51	57°29.74	43.83	Venus		Mer.pass 08:56
11	111°38.38	31°9.46	3.91	16°1.84	51.88	295°48.91	4.34	72°32.09	43.85	Mars		09:57
12 13	126° 40.85 141° 43.31	46°9.73 61°10.01	N19°4.15 4.40	31°2.48 46°3.11	N23°51.84	310°50.98 325°53.05	N03°4.16	87°34.44 102°36.80	N12° 43.87 43.90		184°24.31	15:19
13 14	141° 43.31 156° 45.78	76° 10.01	4.40 4.64	46° 3.11 61° 3.75	51.80 51.76	325°53.05 340°55.11	3.98 3.81	102°36.80 117°39.15	43.90 43.92	Saturn	320°57.64	06:14
15	171° 48.24	91° 10.56	• 4.88	76°4.38	51.72	355°57.18	3.63	132°41.51	• • 43.95	Jul 28 Fri	SHA	Mer.pass
16	186° 50.71	106° 10.83	5.13	91°5.02	51.69	10°59.25	3.45	147°43.86	43.97		279°55.03	08:55
17	$201^{\circ}53.17$	121°11.10	5.37	106°5.65	51.65	$26^{\circ}1.32$	3.28	162°46.22	43.99	I	264°43.60	09:56
18	216°55.63	136°11.37	N19°5.61	121°6.28	N23°51.61	41°3.38	N03°3.10	177°48.58	N12°44.02		$184^{\circ}14.87$	15:16
19	231°58.10	151°11.64	5.86	136°6.92	51.57	56° 5.45	2.92	192°50.93	44.04	Saturn	320°54.92	06:11
20	247°0.56	166°11.91	6.10	151°7.55	51.53	71°7.52 86°9.58	2.75	207°53.29 222°55.64	44.07	Horizor	ntal parallax	
21 22	262°3.03 277°5.49	181°12.17 196°12.44	• • 6.34 6.58	166°8.19 181°8.83	•• 51.49 51.44	86° 9.58 101° 11.65	· · 2.57 2.39	222°55.64 237°58.00	•• 44.09 44.11	11011201	Venus:	0.2
23	292°7.95	211° 12.70	6.82	196°9.46	51.44	116° 13.72	2.39	253° 0.36	44.11		Mars:	0.1
ivier.p	pass. 03:35	νυ.3' <b>α</b> υ.	.2′ m-4.53	νυ.ο΄ <i>α</i> -υ	0.0′ m1.54	ν2.1° α-0	.2′ m-1.77	ν2.4' d0	.0′ m0.35			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.70	N19°21.52	$128^{\circ}43.18$	10.5'	S03°13.03	15.8'	60.0'
1	193°21.70	20.97	143°12.73	10.5'	03°28.87	15.8'	60.0'
2	208°21.70 223°21.71	20.41 •• 19.85	157°42.27 172°11.82	10.6' 10.6'	03°44.69 04°0.47	15.8' 15.8'	60.0' 60.0'
4	238°21.71	19.29	186°41.38	10.6'	04°16.23	15.7'	60.0'
5	253°21.71	18.73	201°10.93	10.6'	04°31.94	15.7'	59.9'
6	268°21.71	N19° 18.17	215°40.49	10.6'	S04°47.62	15.6'	59.9'
7	283°21.72	17.61	230°10.05	10.6'	05°3.26	15.6'	59.9'
8 9	298°21.72 313°21.73	17.05 •• 16.49	244°39.60 259°9.15	10.6' 10.5'	05°18.87 05°34.43	15.6' 15.5'	59.9' 59.9'
10	328°21.73	15.93	273°38.70	10.5	05°49.95	15.5'	59.8'
11	343°21.73	15.37	288°8.24	10.5'	$06^{\circ}5.42$	15.4'	59.8'
12	358°21.74	N19°14.80	302°37.78	10.5'	S06°20.85	15.4'	59.8'
13 14	13°21.74 28°21.75	14.24 13.68	317°7.31 331°36.84	10.5' 10.5'	06°36.23 06°51.57	15.3' 15.3'	59.8' 59.8'
14 15	28 21.75 43°21.75	13.08	331 30.84 346°6.35	10.5	06 51.57 07°6.85	15.3 15.2'	59.8 59.7'
16	58°21.76	12.55	0°35.86	10.5'	07°22.08	15.2'	59.7'
17	73°21.77	11.98	$15^{\circ}5.35$	10.5'	$07^{\circ}37.26$	15.1'	59.7'
18	88°21.77	N19° 11.41	29°34.83	10.5'	S07°52.39	15.1'	59.7'
19 20	103°21.78 118°21.79	10.85 10.28	44°4.31 58°33.76	10.5' 10.4'	08°7.46 08°22.47	15.0' 15.0'	59.6' 59.6'
21	133°21.79	9.71	73°3.21	10.4	08°37.42	14.9'	59.6'
22	148°21.80	9.14	87°32.63	10.4	08°52.32	14.8'	59.6'
23	163°21.81	8.57	102°2.05	10.4'	09°7.15	14.8'	59.5'
	SD = 15.7'	d = -0.6'		SE	0 = 16.4'		
						,	110
Thu 0	<b>GHA</b> 178°21.82	<b>Dec</b> N19°8.00	<b>GHA</b> 116°31.44	u 10.4	<b>Dec</b> 509° 21.92	d 14.7'	<b>HP</b> 59.5'
1	176 21.62 193°21.82	7.43	131°0.82	10.4	09° 36.63	14.7 14.6'	59.5'
2	208°21.83	6.86	145°30.17	10.3'	09°51.27	14.6'	59.5'
3	223°21.84	• • 6.29	159°59.51	10.3'	10°5.85	14.5'	59.4'
4	238°21.85	5.72	174°28.83 188°58.12	10.3'	10°20.35 10°34.79	14.4	59.4'
5 6	253°21.86 268°21.87	5.15 N19°4.58	203°27.40	10.3' 10.3'	10° 34.79 \$10° 49.16	14.4' 14.3'	59.4' 59.4'
7	283°21.88	4.00	217°56.65	10.2'	11°3.45	14.2'	59.3'
8	298°21.89	3.43	232°25.88	10.2'	11°17.67	14.1'	59.3'
9	313°21.90	• • 2.85	246°55.08	10.2'	11°31.82	14.1'	59.3'
10 11	328°21.91 343°21.92	2.28 1.70	261°24.25 275°53.41	10.2' 10.1'	11°45.89 11°59.88	14.0' 13.9'	59.3' 59.2'
12	358°21.93	N19°1.13	275 53.41 290°22.53	10.1	\$12°13.80	13.8'	59.2'
13	13°21.94	0.55	304°51.62	10.1	12°27.63	13.8'	59.2'
14	28°21.95	$18^{\circ}59.97$	$319^{\circ}20.69$	10.0'	$12^{\circ}41.39$	13.7'	59.2'
15	43°21.97	18°59.40	333°49.73	10.0'	12°55.06	13.6'	59.1'
16 17	58°21.98 73°21.99	58.82 58.24	348°18.74 2°47.72	10.0' 9.9'	13°8.65 13°22.15	13.5' 13.4'	59.1' 59.1'
18	88°22.00	N18° 57.66	17°16.67	9.9'	\$13°35.57	13.4	59.1'
19	103°22.02	57.08	31°45.58	9.9'	13°48.90	13.2'	59.0'
20	118°22.03	56.50	$46^{\circ}14.47$		$14^{\circ}2.14$	13.2'	59.0'
21	133°22.04	• • 55.92	60°43.32	9.8'	14° 15.29	13.1'	59.0'
22 23	148°22.06 163°22.07	55.34 54.76	75°12.14 89°40.92	9.8' 9.7'	14°28.35 14°41.32	13.0' 12.9'	58.9' 58.9'
25	SD = 15.7'	d = -0.6'	09 40.92		0 = 16.2'	12.9	30.9
	<u> </u>	<u>u = -0.0</u>		JL	7 — 10.2		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°22.08 193°22.10	N18°54.17 53.59	104°9.67 118°38.38	9.7' 9.7'	\$14°54.19 15°6.98	12.8' 12.7'	58.9' 58.9'
2	208°22.11	53.59 53.01	118 38.38 133°7.06	9.7 9.6'	15 0.98 15°19.66	12.7	58.8'
3	223°22.13	• • 52.42	147°35.71	9.6'	15°32.25	12.5'	58.8'
4	238°22.14	51.84	162°4.31	9.6'	15°44.74	12.4'	58.8'
5	253°22.16 268°22.18	51.25 N18° 50.67	176°32.88 191°1.42	9.5' 9.5'	15°57.13 \$16°9.42	12.3' 12.2'	58.8' 58.7'
6 7	268°22.18 283°22.19	50.08	191°1.42 205°29.91	9.5° 9.5°	16° 21.61	12.1'	58.7' 58.7'
8	298°22.21	49.49	219°58.37	9.4'	16°33.70	12.0'	58.7'
9	313°22.23	•• 48.91	234°26.79	9.4'	16° 45.68	11.9'	58.6'
10	328°22.24	48.32	248°55.17	9.3'	16°57.56	11.8'	58.6'
11 12	343°22.26 358°22.28	47.73 N18° 47.14	263°23.51 277°51.81	9.3' 9.3'	17°9.33 \$17°21.00	11.7' 11.6'	58.6' 58.6'
13	13°22.30	46.55	277 51.61 292°20.08	9.3 9.2'	17°32.56	11.4	58.5'
14	28°22.31	45.96	306°48.30	9.2'	$17^{\circ}44.01$	11.3'	58.5'
15	43°22.33	• • 45.37	321°16.49	9.1'	17°55.35	11.2'	58.5'
16	58°22.35	44.78	335°44.63	9.1'	18°6.58	11.1'	58.4'
17 18	73°22.37 88°22.39	44.19 N18°43.60	350°12.74 4°40.80	9.1' 9.0'	18° 17.69 \$18° 28.70	11.0' 10.9'	58.4' 58.4'
19	103°22.41	43.00	4 40.80 19°8.83	9.0'	18° 39.59	10.9	58.4'
20	118°22.43	42.41	$33^{\circ}36.81$	8.9'	$18^{\circ}50.36$	10.7'	58.3'
21	133°22.45	• • 41.82	48°4.75	8.9'	19°1.02	10.5'	58.3'
22 23	148°22.47 163°22.49	41.22 40.63	62°32.66 77°0.52	8.9' 8.8'	19°11.56 19°21.98	10.4' 10.3'	58.3' 58.3'
23			11 0.52			10.3	50.5
	SD = 15.7'	d = -0.6'		SL	0 = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	21-42%	
26	06:33	06:33	12:07	15:58	03:32		
27	06:33	06:32	12:07	16:48	04:23		
28	06:32	06:31	12.07	17.41	05.14		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars		
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec		
0	307° 10.42	226°12.96 N19°7.0		131°15.78 N03°2.04	268°2.71 N12°44.16			
1	322° 12.88	241°13.22 7.3		146°17.85 1.86	283°5.07 44.18	Alpheratz 357°31.50 29°14.94		
2	337° 15.35	256°13.48 7.5		161°19.91 1.68	298°7.43 44.21	Ankaa 353°4.13 -42°8.68		
3	352° 17.81	271°13.74 · · 7.7	8 256°12.00 · · 51.23	176°21.98 · · 1.51	313°9.78 · · 44.23	Schedar 349°27.33 56°41.53 Diphda 348°44.26 -17°49.52		
4	7°20.27	286°14.00 8.0	2 271°12.64 51.19	191°24.05 1.33	328°12.14 44.25	Achernar 335°18.01 -57°5.11		
5	22°22.74	301°14.25 8.2	6 286°13.28 51.15	206°26.11 1.15	343°14.50 44.28	Hamal 327°47.85 23°35.84		
6	37°25.20	316°14.51 N19°8.5		221°28.18 N03°0.97	358°16.86 N12°44.30	Polaris 312°32.63 89°22.67		
7	52°27.67	331°14.76 8.7		236°30.24 0.80	13°19.21 44.32	Acamar 315°9.67 -40°11.10		
8	67°30.13	346°15.01 8.9		251°32.31 0.62	28°21.57 44.35	Menkar 314°3.15 4°12.18		
9	82°32.60	1°15.26 · · 9.2		266°34.37 · · 0.44	43°23.93 · · 44.37	Mirfak 308°24.14 49°57.55		
10 11	97°35.06 112°37.52	16° 15.51 9.4 31° 15.75 9.7		281°36.44 0.26 296°38.50 03°0.08	58°26.29 44.39 73°28.65 44.41	Aldebaran 290°36.45 16°33.95		
12	127°39.99	46°16.00 N19°9.9		311°40.57 N02°59.91	88°31.01 N12°44.44	Rigel 281°1.29 -8°10.06		
13	142° 42.45	61°16.25 10.1		326°42.63 59.73	103°33.36 44.46	Capella 280°17.89 46°1.39		
14	157° 44.92	76°16.49 10.4	_	341°44.70 59.55	118°35.72 44.48	Bellatrix 278°19.99 6°22.52		
15	172°47.38	91°16.73 · · 10.6	5 76°19.65 · · 50.69	356°46.76 · · 59.37	133°38.08 · · 44.51	Elnath 277°58.44 28°37.76		
16	187°49.84	106°16.97 10.8	9 91°20.28 50.64	11°48.83 59.19	148° 40.44 44.53	Alnilam 275°35.02 -1°11.00   Betelgeuse 270°49.20 7°24.71		
17	202°52.31	121°17.21 11.1		26°50.89 59.02	163°42.80 44.55	Canopus 263°51.56 -52°42.52		
18	217°54.77	136°17.45 N19°11.3		41°52.95 N02°58.84	178°45.16 N12°44.57	Sirius 258°23.98 -16°45.29		
19	232°57.24	151°17.68 11.6		56°55.02 58.66	193°47.52 44.60	Adhara 255°3.92 -29°0.61		
20	247°59.70	166°17.92 11.8		71°57.08 58.48	208°49.88 44.62	Procyon 244°48.11 5°9.05		
21	263°2.17	181°18.15 · · 12.0		86°59.15 · · 58.30	223°52.24 · · 44.64	Pollux 243°14.14 27°57.33		
22 23	278°4.63 293°7.09	196°18.39 12.3 211°18.62 12.5		102°1.21 58.13 117°3.27 57.95	238°54.60 44.66 253°56.96 44.69	Avior 234°14.13 -59°36.11		
23	293 7.09			-	253°56.96 44.69	Suhail 222°44.56 -43°32.97		
Mer.p	pass. 03:31	$ u 0.3' \ d0.2' \ \text{m-4.52} $	$ u 0.6' \ d$ -0.0' m1.54	$ u 2.1' \ d$ -0.2' m-1.76	$\nu 2.4' \ d0.0' \ m0.35$	Miaplacidus 221°38.46 -69°50.20		
						Alphard 217°45.20 -8°47.02		
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.66 11°49.62 Dubhe 193°38.13 61°35.91		
0	308°9.56	226°18.85 N19°12.7		132°5.34 N02°57.77	268°59.32 N12°44.71	Dubhe 193°38.13 61°35.91 Denebola 182°22.21 14°24.77		
1	$323^{\circ}12.02$	241°19.08 13.0	1 226°26.03 50.20	147° 7.40 57.59	284°1.68 44.73	Gienah 175°40.74 -17°42.15		
2	338° 14.49	256° 19.30 13.2		162° 9.46 57.41	299°4.04 44.75	Acrux 172°57.01 -63°15.77		
3	353° 16.95	271°19.53 · · 13.4		177°11.53 · · · 57.23	314°6.40 · · 44.77	Gacrux 171°48.54 -57°16.69		
4	8° 19.41	286°19.76 13.7 301°19.98 13.9		192°13.59 57.05 207°15.65 56.88	329°8.76 44.80	Alioth 166°10.74 55°48.49		
5 6	23°21.88 38°24.34	301°19.98 13.9 316°20.20 N19°14.1		207°15.65 56.88 222°17.71 N02°56.70	344°11.13 44.82 359°13.49 N12°44.84	Spica 158°19.29 -11°18.68		
7	53°26.81	331°20.42 14.4	_	237°19.78 56.52	14°15.85 44.86	Alkaid 152°49.86 49°10.46		
8	68° 29.27	346°20.64 14.6		252°21.84 56.34	29°18.21 44.88	Hadar 148°31.76 -60°30.92		
9	83°31.74	1°20.86 · · 14.8		267°23.90 · · 56.16	44°20.57 · · 44.91	Menkent 147°54.14 -36°30.80 Arcturus 145°45.27 19°2.15		
10	98°34.20	16°21.08 15.1	1 1°31.78 49.73	282°25.96 55.98	59°22.93 44.93	Rigil Kent. 139°36.11 -60°57.47		
11	113°36.66	31°21.29 15.3		297°28.02 55.80	74°25.30 44.95	Kochab 137°19.93 74°2.53		
12	128°39.13	46°21.51 N19°15.5		312°30.09 N02°55.62	89°27.66 N12°44.97	Zuben'ubi 136°52.72 -16°9.66		
13 14	143° 41.59 158° 44.06	61°21.72 15.8 76°21.93 16.0		327°32.15 55.44 342°34.21 55.26	104°30.02 44.99 119°32.39 45.01	Alphecca 126°1.18 26°37.31		
15	173° 46.52	91°22.15 · · 16.2		357°36.27 · · 55.08	134°34.75 · · 45.03	Antares 112°12.04 -26°29.72		
16	188° 48.98	106°22.35 16.4		12°38.33 54.91	149°37.11 45.06	Atria 107°3.20 -69°4.84		
17	203°51.45	121°22.56 16.7		27°40.39 54.73	164°39.47 45.08	Sabik 101°59.20 -15°45.53 Shaula 96°6.09 -37°7.43		
18	218°53.91	136°22.77 N19°16.9		42°42.45 N02°54.55	179°41.84 N12°45.10	Rasalhague 95°55.59 12°32.54		
19	233°56.38	151°22.98 17.1		57°44.52 54.37	194°44.20 45.12	Eltanin 90°40.40 51°29.34		
20	248°58.84	166°23.18 17.4		72°46.58 54.19	209°46.57 45.14	Kaus Aust. 83°28.30 -34°22.16		
21	264°1.31	181°23.38 · · 17.6		87°48.64 · · 54.01	224°48.93 · · 45.16	Vega 80°30.86 38°48.83		
22 23	279°3.77 294°6.23	196°23.59 17.8 211°23.79 18.1		102°50.70 53.83 117°52.76 53.65	239°51.29 45.18 254°53.66 45.20	Nunki 75°43.81 -26°15.52		
		-				Altair 61°56.78 8°56.84		
Mer.p	bass. 03:27	$\nu 0.2' \ d0.2' \ \text{m-4.51}$	$ u 0.6' \ d$ -0.1' m1.55	$\nu 2.1' \ d$ -0.2' m-1.76	$ u 2.4' \ d0.0' \ m0.35$	Peacock 53°0.63 -56°38.37		
						Deneb 49°23.30 45°23.08 Enif 33°35.61 10°0.56		
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.91 -46°49.04		
0	309°8.70	226°23.99 N19°18.3	3 211°40.76 N23°48.94	132°54.82 N02°53.47	269°56.02 N12°45.23	Fomalhaut 15°11.06 -29°27.94		
1	324°11.16	241°24.18 18.5	6 226°41.40 48.89	147°56.88 53.29	284°58.39 45.25	Scheat 13°42.05 28°14.37		
2	339° 13.63	256°24.38 18.7		162°58.94 53.11	300°0.75 45.27	Markab 13°26.71 15°21.69		
3	354° 16.09	271°24.58 · · 19.0		178°1.00 · · 52.93	315°3.12 · · 45.29			
4	9° 18.55	286°24.77 19.2		193°3.06 52.75	330°5.48 45.31	Jul 29 Sat SHA Mer.pass		
5 6	24°21.02 39°23.48	301°24.96 19.4 316°25.16 N19°19.6		208° 5.12 52.57 223° 7.18 N02° 52.39	345°7.85 45.33 0°10.21 N12°45.35	Venus 279°2.55 08:55 Mars 263°59.68 09:55		
7	59 25.46 54°25.95	331°25.35 19.9		238° 9.24 52.21	15°12.58 45.37	Jupiter 184° 5.36 15:13		
8	69°28.41	346°25.54 20.1		253°11.30 52.03	30°14.94 45.39	Saturn 320°52.29 06:07		
9	84°30.88	1°25.72 · · 20.3		268°13.36 · · 51.85	45°17.31 · · 45.41			
10	99° 33.34	16°25.91 20.5		283°15.41 51.67	60°19.68 45.43	Jul 30 Sun         SHA         Mer.pass           Venus         278° 9.29         08:55		
11	114°35.80	31°26.10 20.8		298°17.47 51.49	75°22.04 45.45	Mars 263°15.83 09:54		
12	129°38.27	46°26.28 N19°21.0		313°19.53 N02°51.31	90°24.41 N12°45.47	Jupiter 183°55.78 15:10		
13 14	144° 40.73 159° 43.20	61°26.46 21.2 76°26.65 21.4		328°21.59 51.13 343°23.65 50.95	105°26.78 45.49 120°29.14 45.51	Saturn 320°49.76 06:03		
15	174° 45.66	91°26.83 · · 21.7		358°25.71 · · 50.77	135°31.51 · · 45.53	Jul 31 Mon SHA Mer.pass		
16	189° 48.12	106°27.01 21.9	_	13°27.77 50.59	150°33.88 45.55	Venus 277°15.29 08:54		
17	204°50.59	121°27.18 22.1		28°29.82 50.41	165°36.24 45.57	Mars 262°32.06 09:53		
18	219°53.05	136°27.36 N19°22.3		43°31.88 N02°50.22	180°38.61 N12°45.59	Jupiter 183°46.12 15:06		
19	234°55.52	151°27.54 22.6		58°33.94 50.04	195°40.98 45.61	Saturn 320°47.32 05:59		
20	249°57.98	166°27.71 22.8		73°36.00 49.86	210°43.35 45.63	Horizontal parallax		
21 22	265°0.45 280°2.91	181°27.88 · · 23.0 196°28.06 23.2		88°38.06 · · 49.68 103°40.11 49.50	225°45.71 · · 45.65 240°48.08 45.67	Venus: 0.2		
23	295°5.37	211°28.23 23.4		118°42.17 49.32	255°50.45 45.69	Mars: 0.1		
ivier.p	pass. 03:23	$\nu$ 0.2′ $d$ 0.2′ $m$ -4.50	$ u 0.6' \; d$ -0.1' m1.55	$ u 2.1' \ d$ -0.2' m-1.76	$\nu$ 2.4′ $d$ 0.0′ $m$ 0.34			

h	Su	Moon					
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.51	N18° 40.03	91°28.34	8.8'	\$19°32.29	10.2'	58.2'
1 2	193°22.53 208°22.55	39.44 38.84	105°56.13 120°23.87	8.7' 8.7'	19°42.47 19°52.53	10.1' 9.9'	58.2' 58.2'
3	223°22.57	38.24	134°51.57	8.7'	20°2.47	9.8'	58.1
4	238°22.60	37.64	149° 19.23	8.6'	20°12.29	9.7'	58.1'
5	253°22.62	37.05	163°46.86	8.6'	20°21.99 \$20°31.56	9.6'	58.1'
6 7	268°22.64 283°22.66	N18° 36.45 35.85	178° 14.44 192° 41.99	8.5' 8.5'	520°31.56 20°41.00	9.4' 9.3'	58.1' 58.0'
8	298°22.69	35.25	207°9.49	8.5'	20°50.32	9.2'	58.0'
9	313°22.71	• • 34.65	221°36.96	8.4'	$20^{\circ}59.52$	9.1'	58.0'
10	328°22.73 343°22.76	34.05 33.45	236°4.39 250°31.78	8.4' 8.4'	21°8.58 21°17.52	8.9' 8.8'	57.9' 57.9'
11 12	358°22.78	33.45 N18°32.85	264° 59.13	8.3	S21°26.32	8.7'	57.9'
13	13°22.81	32.24	279° 26.44	8.3'	21°35.00	8.5'	57.9'
14	28°22.83	31.64	293°53.72	8.2'	21°43.54	8.4'	57.8'
15 16	43°22.86 58°22.88	· · 31.04 30.43	308° 20.97 322° 48.17	8.2' 8.2'	21°51.96 22°0.24	8.3' 8.1'	57.8' 57.8'
17	73°22.91	29.83	337° 15.34	8.1	22° 8.38	8.0'	57.8'
18	88°22.93	N18°29.22	351°42.48	8.1'	S22°16.40	7.9'	57.7'
19	103°22.96	28.62	6°9.58	8.1'	22°24.27	7.7'	57.7'
20 21	118°22.98 133°23.01	28.01 •• 27.41	20°36.65 35°3.68	8.0' 8.0'	22°32.02 22°39.62	7.6' 7.5'	57.7' 57.6'
22	148°23.04	26.80	49° 30.69	8.0'	22°47.09	7.3	57.6'
23	163°23.07	26.19	63°57.66	7.9'	22°54.42	7.2'	57.6'
	SD = 15.7'	d = -0.6'		SI	D = 15.9'		
Sun	<b>GHA</b> 178°23.09	<b>Dec</b> N18° 25.58	<b>GHA</b> 78° 24.60	ν 7.0'	<b>Dec</b> \$23° 1.62	d 7.1'	HP
0 1	178°23.09 193°23.12	N18°25.58 24.98	78°24.60 92°51.51	7.9' 7.9'	23° 1.62 23° 8.67	7.1° 6.9'	57.6' 57.5'
2	208°23.15	24.37	107° 18.39	7.9'	23°15.59	6.8'	57.5'
3	223°23.18	• • 23.76	121° 45.24	7.8'	23°22.37	6.6'	57.5'
4 5	238°23.21 253°23.23	23.15 22.54	136° 12.06 150° 38.86	7.8' 7.8'	23°29.00 23°35.50	6.5' 6.4'	57.5' 57.4'
6	268°23.26	N18° 21.93	165° 5.63	7.7'	\$23°41.85	6.2	57.4
7	283°23.29	21.31	179°32.37	7.7'	23°48.06	6.1'	57.4'
8	298°23.32	20.70	193°59.09	7.7'	23°54.13	5.9'	57.3'
9 10	313°23.35 328°23.38	· · 20.09 19.48	208° 25.78 222° 52.46	7.7' 7.7'	24° 0.06 24° 5.84	5.8' 5.6'	57.3' 57.3'
11	343°23.41	18.86	237° 19.11	7.6'	24° 11.48	5.5'	57.3'
12	358°23.44	N18° 18.25	251°45.74	7.6'	\$24°16.97	5.3'	57.2'
13	13°23.47	17.63	266° 12.35	7.6'	24°22.32 24°27.52	5.2'	57.2'
14 15	28°23.50 43°23.54	17.02 •• 16.40	280°38.94 295°5.52	7.6' 7.6'	24°27.52 24°32.58	5.1' 4.9'	57.2' 57.2'
16	58°23.57	15.79	309° 32.07	7.5'	24°37.49	4.8'	57.1
17	73°23.60	15.17	323°58.62	7.5'	24°42.26	4.6'	57.1'
18 19	88°23.63 103°23.66	N18° 14.55 13.93	338°25.14 352°51.66	7.5' 7.5'	\$24°46.88 24°51.35	4.5' 4.3'	57.1' 57.1'
20	118°23.70	13.32	7° 18.16	7.5'	24°55.68	4.3 4.2'	57.1°
21	133°23.73	• • 12.70	21°44.65	7.5'	24°59.86	4.0'	57.0'
22	148°23.76	12.08	36°11.13	7.5'	25°3.89	3.9'	57.0'
23	163°23.80	11.46	50°37.61	7.5'	25°7.77	3.7'	57.0'
	SD = 15.7'	d = -0.6'		SI	O = 15.7'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°23.83	N18° 10.84	65°4.07	7.5'	S25°11.51	3.6'	56.9'
1	193°23.87 208°23.90	10.22	79°30.53	7.5'	25°15.09	3.4'	56.9'
2	208°23.90 223°23.94	9.60 •• 8.97	93° 56.99 108° 23.44	7.5' 7.4'	25°18.53 25°21.82	3.3' 3.1'	56.9' 56.8'
4	238°23.97	8.35	122°49.89	7.4	25°24.96	3.0'	56.8
5	253°24.01	7.73	137° 16.34	7.4'	25°27.95	2.8'	56.8'
6 7	268°24.04 283°24.08	N18°7.10 6.48	151°42.79 166°9.24	7.4' 7.5'	\$25°30.80 25°33.49	2.7' 2.5'	56.8' 56.7'
<i>7</i> 8	283°24.08 298°24.11	6.48 5.86	166°9.24 180°35.69	7.5' 7.5'	25°33.49 25°36.04	2.5'	56.7' 56.7'
9	313°24.15	• • 5.23	195°2.15	7.5'	25°38.44	2.2'	56.7'
10	328°24.19	4.61	209°28.61	7.5'	25°40.68	2.1'	56.7'
11 12	343°24.22 358°24.26	3.98 N18°3.35	223°55.08 238°21.55	7.5' 7.5'	25°42.78 \$25°44.73	2.0' 1.8'	56.6' 56.6'
13	13°24.30	2.73	250° 21.55 252° 48.04	7.5'	25°46.54	1.7'	56.6
14	28°24.33	2.10	267° 14.54	7.5'	25°48.19	1.5'	56.6'
15	43°24.37	• • 1.47	281°41.05	7.5'	25°49.69	1.4'	56.6'
16 17	58°24.41 73°24.45	0.84 18°0.21	296°7.57 310°34.11	7.5' 7.6'	25°51.05 25°52.26	1.2' 1.1'	56.5' 56.5'
18	88°24.49	N17°59.58	325° 0.67	7.6'	\$25°53.32	0.9'	56.5
19	103°24.53	58.95	339°27.24	7.6'	25°54.23	0.8'	56.5'
20	118°24.57	58.32	353°53.83	7.6'	25°54.99	0.6'	56.4'
21 22	133°24.61 148°24.65	• • 57.69 57.06	8°20.45 22°47.08	7.6' 7.7'	25°55.61 25°56.08	0.5' 0.3'	56.4' 56.4'
23	163°24.69	56.43	37° 13.74	7.7'	25°56.40	0.2	56.4
	SD = 15.7'	d = -0.6'		SI	D = 15.5'		

Lat.	Twi	light	Sunrise	Sunset	Twilight	
Lut.	Naut.	Civil	Jamise	Junioce	Civil	Naut.
<b>N</b> 72°						
<b>N</b> 70°	////	////	01:12	22:52	////	////
68°	////	////	02:07	22:01	////	////
66°	////	////	02:40	21:30	////	////
64°	////	01:30	03:03	21:07	22:37	////
62°	////	02:09	03:22	20:49	22:00	////
60°	////	02:35	03:37	20:34	21:35	////
<b>N</b> 58°	01:22	02:56	03:50	20:21	21:15	22:46
56°	01:57	03:12	04:01	20:10	20:59	22:12
54°	02:22	03:26	04:11	20:01	20:46	21:49
52°	02:41	03:38	04:19	19:52	20:34	21:30
50°	02:56	03:48	04:27	19:45	20:24	21:15
45°	03:27	04:10	04:44	19:29	20:02	20:45
<b>N</b> 40°	03:49	04:26	04:57	19:15	19:46	20:23
35°	04:06	04:40	05:08	19:04	19:32	20:06
30°	04:21	04:52	05:18	18:54	19:20	19:52
20°	04:44	05:11	05:35	18:38	19:01	19:29
N $10^{\circ}$	05:01	05:27	05:49	18:23	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
<b>S</b> 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:41	06:07	06:30	17:43	18:06	18:32
30°	05:52	06:21	06:47	17:27	17:52	18:21
35°	05:58	06:29	06:56	17:17	17:44	18:15
40°	06:05	06:37	07:06	17:07	17:36	18:09
45°	06:12	06:47	07:19	16:55	17:26	18:02
<b>S</b> 50°	06:19	06:58	07:34	16:40	17:15	17:54
52°	06:22	07:03	07:41	16:33	17:10	17:51
54°	06:26	07:09	07:48	16:25	17:05	17:48
56°	06:29	07:15	07:57	16:16	16:58	17:44
58°	06:34	07:22	08:07	16:07	16:52	17:40
<b>S</b> 60°	06:38	07:29	08:18	15:55	16:44	17:36
1-4		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
<b>N</b> 72°						
<b>N</b> 70°						
68°						
66°	16:58			19:59		
64°	16:16	18:16		20:42	20:37	
600	15.40	17.00	10.40	01.11	21.26	00.00

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	53-74%
29	06:30	06:29	12:06	18:34	06:07	
30	06:28	06:26	12:06	19:30	07:02	
21	06.25	06.23	12.06	20.25	07.58	

h	Aries	Venus		M	ars	Jup	oiter	Sat	curn	_
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	- [
0	310°7.84		9°23.71	211°56.20	N23°47.44	133°44.23	N02°49.14	270°52.82	N12° 45.71	
1	325°10.30	241°28.56	23.93	226° 56.85	47.37	148°46.29	48.96	285°55.19	45.73	
2	340° 12.77	256°28.73	24.15	241°57.49	47.30	163°48.34	48.78	300°57.56	45.75	
3	355° 15.23		24.37	$256^{\circ}58.14$	• • 47.24	178°50.40	• • 48.60	$315^{\circ}59.93$	• • 45.77	
4	10° 17.70	286°29.06	24.59	271°58.78	47.17	193°52.46	48.42	331°2.30	45.79	
5	25°20.16	301°29.23	24.80	$286^{\circ}59.43$	47.10	$208^{\circ}54.51$	48.23	346°4.66	45.81	
6	40°22.62	316°29.39 N19	9°25.02	302°0.08	N23°47.03	223°56.57	N02°48.05	1°7.03	N12°45.83	
7	55°25.09	331°29.55	25.24	317°0.72	46.96	238°58.63	47.87	16°9.40	45.85	
8	70°27.55	346°29.71	25.46	332°1.37	46.89	254° 0.68	47.69	$31^{\circ}11.77$	45.87	
9	85°30.02		25.68	347°2.01	• • 46.82	269° 2.74	• • 47.51	$46^{\circ}14.14$	• • 45.89	
10	100°32.48	16°30.02	25.89	2°2.66	46.75	284°4.80	47.33	61°16.51	45.90	
11	115°34.94	31°30.18	26.11	17°3.31	46.68	299° 6.85	47.15	$76^{\circ}18.88$	45.92	
12	130°37.41		9°26.33	32°3.95	N23°46.61	$314^{\circ}8.91$	N02°46.96		N12°45.94	
13	145°39.87	61°30.49	26.54	47°4.60	46.54	$329^{\circ}10.96$	46.78	$106^{\circ}23.62$	45.96	
14	160°42.34	76°30.64	26.76	62°5.25	46.47	344°13.02	46.60	121°26.00	45.98	
15	175°44.80		26.97	77°5.89	• • 46.40	359°15.08	• • 46.42	136°28.37	• • 46.00	
16	190°47.27	106°30.94	27.19	92°6.54	46.33	14°17.13	46.24	151°30.74	46.02	
17	205°49.73	121°31.09	27.40	107°7.19	46.25	29°19.19	46.06	166°33.11	46.04	
18	220°52.19		9°27.62	122°7.84	N23°46.18	44°21.24	N02°45.87	181°35.48	N12°46.06	
19	235° 54.66	151°31.39	27.83	137°8.48	46.11	59°23.30	45.69	196°37.85	46.07	
20	250°57.12	166°31.53	28.04	152°9.13	46.03	74°25.35	45.51	211°40.22	46.09	
21	$265^{\circ}59.59$	181°31.68 •		167°9.78	• • 45.96	89°27.41	• • 45.33	226°42.60	• • 46.11	
22	281°2.05	196°31.82	28.47	182° 10.43	45.89	104°29.46	45.15	241°44.97	46.13	
23	296°4.51	211°31.96	28.68	$197^{\circ}11.08$	45.81	119°31.52	44.96	256°47.34	46.15	
Mer.p	bass. 03:19	ν0.2′ d0.2′ m	1-4.49	$\nu$ 0.6′ d-0	0.1′ m1.55	$\nu 2.1' \ d-0$	.2′ m-1.75	ν2.4′ d0	.0′ m0.34	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
oved 0	311°6.98		9°28.89	212°11.73	N23°45.74	134°33.57	N02°44.78	271°49.71	N12° 46.17	
1	311 6.98 326°9.44	241°32.24	28.89	212 11.73 227°12.37	N23 45.74 45.66	134 33.57 149°35.62	44.60	271 49.71 286°52.09	46.17 46.18	
2	341°11.91	256° 32.38	29.11	242° 13.02	45.59	149 33.02 164°37.68	44.42	301°54.46	46.20	
3	356° 14.37		29.52	242 13.02 257°13.67	· · 45.51	179°39.73	• • 44.23	316°56.83	• • 46.22	
3 4	11° 16.84	286° 32.65	29.53	272° 14.32	45.43	179 39.73 194°41.79	44.25	331°59.20	46.24	
5	26° 19.30	301°32.79	29.74	287° 14.97	45.36	209°43.84	43.87	347°1.58	46.26	
6	41°21.76		9°30.16		N23°45.28	224°45.89	N02°43.69	2°3.95	N12°46.27	
7	56°24.23	331°33.05	30.37	317° 16.27	45.20	239°47.95	43.50	17°6.32	46.29	
8	71°26.69	346°33.18	30.58	332°16.92	45.20	254°50.00	43.32	32°8.70	46.29	
9	86°29.16		30.78	347° 17.57	• • 45.05	269°52.06	• • 43.14	47°11.07	• • 46.33	
10	101°31.62	16°33.44	30.99	2°18.22	44.97	284°54.11	42.96	62°13.45	46.35	
11	116° 34.09	31°33.57	31.20	17° 18.87	44.89	299°56.16	42.77	77°15.82	46.36	
12	131°36.55		9°31.41		N23°44.81	314°58.21	N02°42.59		N12°46.38	4
13	146°39.01	61°33.82	31.62	47° 20.17	44.73	330° 0.27	42.41	107°20.57	46.40	
14	161°41.48	76°33.94	31.82	62°20.82	44.65	345° 2.32	42.23	122°22.94	46.42	
15	176° 43.94		32.03	77° 21.47	• • 44.57	0°4.37	42.04	137°25.32	• • 46.43	
16	191°46.41	106°34.19	32.23	92°22.12	44.49	15° 6.43	41.86	152°27.69	46.45	
17	206° 48.87	121°34.31	32.44	107°22.77	44.41	30°8.48	41.68	167°30.07	46.47	
18	221°51.33	136°34.43 N19	9°32.64	122°23.42		45°10.53	N02°41.49	182°32.45	N12°46.49	
19	236° 53.80	151°34.55	32.85	137°24.07	44.25	60°12.58	41.31	197°34.82	46.50	
20	251°56.26	166°34.66	33.05	152° 24.72	44.17	75°14.64	41.13	212°37.20	46.52	
21	266° 58.73		33.26	167°25.37	• • 44.09	90°16.69	• • 40.94	227°39.57	• • 46.54	
22	282°1.19	196°34.89	33.46	182°26.03	44.00	105°18.74	40.76	242°41.95	46.56	
23	297°3.66	211°35.01	33.66	197° 26.68	43.92	120°20.79	40.58	257°44.33	46.57	
	pass. 03:15	$\nu 0.1' \ d0.2' \ m$			0.1' m1.55		.2′ m-1.75		.0′ m0.33	-
										-
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	$312^{\circ}6.12$	226°35.12 N19		212°27.33	N23°43.84		N02°40.39		N12°46.59	
1	327°8.58	241°35.23	34.07	227°27.98	43.76	150°24.89	40.21	287°49.08	46.61	
2	$342^{\circ}11.05$	256°35.34	34.27	242°28.63	43.67	165°26.95	40.03	302°51.45	46.62	
3	$357^{\circ}13.51$	271°35.45 •	34.47	257°29.28	• • 43.59	180°29.00	• • 39.84	317°53.83	• • 46.64	Ļ
4	12° 15.98	286°35.56	34.67	272°29.94	43.50	195°31.05	39.66	332°56.21	46.66	
5	$27^{\circ}18.44$	301°35.66	34.88	287°30.59	43.42	210°33.10	39.48	347°58.59	46.67	
6	42°20.90		9°35.08	302°31.24	N23°43.33		N02°39.29		N12°46.69	
7	57°23.37	331°35.87	35.28	317°31.89	43.25	240°37.20	39.11	18°3.34	46.71	
8	72°25.83	346°35.98	35.48	332°32.55	43.16	255°39.25	38.93	33°5.72	46.72	
9	87°28.30	1°36.08 •	35.67	347°33.20	• • 43.08	270°41.30	• • 38.74	48°8.10	• • 46.74	Ī
10	102°30.76	16°36.18	35.87	2°33.85	42.99	285°43.35	38.56	63°10.48	46.76	
11	117°33.23	31°36.28	36.07	17°34.51	42.90	300°45.40	38.37	78°12.85	46.77	
12	132°35.69		9°36.27		N23°42.82		N02°38.19		N12°46.79	-
13	$147^{\circ}38.15$	61°36.48	36.47	47°35.81	42.73	330°49.50	38.01	$108^{\circ}17.61$	46.81	
14	162°40.62	76°36.57	36.66	62°36.47	42.64	345°51.55	37.82	123°19.99	46.82	L
15	177°43.08		36.86	$77^{\circ}37.12$	• • 42.55	0°53.60	• • 37.64	138°22.37	• • 46.84	Γ
16	192° 45.55	106°36.76	37.06	92°37.78	42.47	15°55.65	37.45	153°24.75	46.85	
17	207°48.01	121°36.85	37.25	107° 38.43	42.38	30°57.70	37.27	168°27.13	46.87	
18	222°50.47		9°37.45		N23°42.29		N02°37.09		N12°46.89	
19	237°52.94	151°37.04	37.64	137°39.74	42.20	61°1.80	36.90	198°31.89	46.90	
20	252°55.40	166°37.13	37.84	152°40.39	42.11	76° 3.85	36.72	213°34.27	46.92	Ļ
21	267° 57.87		38.03	167°41.05	• • 42.02	91°5.90	36.53	228°36.65	• • 46.93	
22	283°0.33	196°37.30	38.23	182°41.70	41.93	106° 7.95	36.35	243°39.03	46.95	
23	298°2.80	211°37.39	38.42	197° 42.36	41.84	121°10.00	36.16	258°41.41	46.97	
Wer.p	pass. 03:11	ν0.1′ d0.2′ m	1-4.4/	$\nu$ 0. $l'$ $d$ -0	0.1′ m1.55	$\nu$ 2.1′ $d$ -0	.2′ m-1.75	$\nu$ 2.4′ $d0$	.0′ m0.33	-

	Stars	
	SHA	Dec
Alpheratz	357°31.47	29°14.95
Ankaa Schedar	353°4.10 349°27.29	-42°8.68 56°41.55
Diphda	349 27.29 348°44.23	-17°49.52
Achernar	$335^{\circ}17.98$	-57°5.10
Hamal	327°47.82	23°35.85
Polaris Acamar	312°30.78 315°9.65	89°22.67 -40°11.09
Menkar	314°3.12	4°12.19
Mirfak	$308^{\circ}24.10$	49°57.55
Aldebaran	290°36.42	16°33.96
Rigel Capella	281°1.27 280°17.85	-8°10.05 46°1.39
Bellatrix	278°19.96	6°22.52
Elnath	277°58.42	28°37.76
Alnilam	275°34.99	-1°11.00
Betelgeuse Canopus	270°49.17 263°51.54	7°24.71 -52°42.50
Sirius	258°23.96	-16°45.28
Adhara	255°3.90	-29°0.60
Procyon	244°48.10	5°9.05
Pollux Avior	243°14.12 234°14.12	27°57.33 -59°36.09
Suhail	222°44.56	-43°32.96
Miaplacidus	221°38.46	-69°50.18
Alphard	217°45.20	-8°47.01
Regulus Dubhe	207°31.65 193°38.13	11°49.62 61°35.90
Dubne	193 36.13 182°22.21	14°24.77
Gienah	175°40.74	-17°42.14
Acrux	172°57.03	-63°15.76
Gacrux	171°48.55 166°10.76	-57°16.68 55°48.48
Alioth Spica	158° 19.29	-11°18.68
Alkaid	152°49.88	49°10.46
Hadar	148°31.78	-60°30.92
Menkent	147°54.15	-36°30.80
Arcturus Rigil Kent.	145°45.28 139°36.13	19°2.15 -60°57.47
Kochab	137°19.99	74° 2.53
Zuben'ubi	136°52.72	-16°9.66
Alphecca	126°1.18 112°12.04	26°37.31 -26°29.72
Antares Atria	112°12.04 107°3.22	-26° 29.72 -69° 4.85
Sabik	101°59.20	-15°45.53
Shaula	96°6.09	-37°7.43
Rasalhague	95°55.59	12°32.55
Eltanin Kaus Aust.	90°40.41 83°28.30	51°29.35 -34°22.16
Vega	80°30.86	38°48.84
Nunki	75°43.81	-26°15.52
Altair	61°56.77 53°0.61	8°56.85 -56°38.38
Peacock Deneb	49°23.29	-50 38.38 45°23.10
Enif	33°35.60	10° 0.57
Al Na'ir	27°28.89	-46°49.05
Fomalhaut Scheat	15°11.04 13°42.03	-29°27.94 28°14.38
Markab	13 42.03 13°26.69	28 14.38 15°21.70
Aug 01 Tue Venus	<b>SHA</b> 276°20.56	Mer.pass 08:54
Mars	261°48.36	09:52
Jupiter	183°36.39	15:03
Saturn	320°44.98	05:56
Aug 02 Wed	SHA	Mer.pass
Venus	275°25.12	08:54
Mars Jupiter	261°4.75 183°26.59	09:51 15:00
Saturn	320°42.73	05:52
Aug 03 Thu	SHA	Mer.pass
Venus	274°29.00	08:54
Mars	260°21.21	09:50
Jupiter	183°16.72	14:56
Saturn	320°40.58	05:48

Horizontal parallax

Venus: Mars: 0.2 0.1

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h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.73	N17°55.80	51°40.42	7.7'	\$25°56.58	0.0'	56.3'
1	193°24.77	55.16	66°7.13	7.7'	25°56.61	-0.1'	56.3'
2	208°24.81 223°24.85	54.53 •• 53.90	80°33.86 95°0.62	7.8' 7.8'	25° 56.49 25° 56.23	-0.3' -0.4'	56.3' 56.3'
4	238°24.89	53.26	109°27.42	7.8'	25°55.82	-0.6'	56.2'
5	253°24.93	52.63	123°54.24	7.9'	$25^{\circ}55.26$	-0.7'	56.2'
6	268°24.97	N17°51.99	138°21.10	7.9'	\$25°54.57	-0.8'	56.2'
7 8	283°25.02 298°25.06	51.35 50.72	152°47.99 167°14.91	7.9' 8.0'	25°53.72 25°52.74	-1.0' -1.1'	56.2' 56.2'
9	313°25.10	. 50.08	181°41.87	8.0'	25°51.61	-1.3'	56.1
10	328°25.15	49.44	196°8.87	8.0'	$25^{\circ}50.34$	-1.4'	56.1'
11	343°25.19	48.80	210°35.91 225°2.99	8.1'	25°48.92	-1.6'	56.1'
12 13	358°25.23 13°25.28	N17° 48.17 47.53	225°2.99 239°30.11	8.1' 8.2'	\$25°47.37 25°45.67	-1.7' -1.8'	56.1' 56.0'
14	28°25.32	46.89	253° 57.27	8.2'	25°43.83	-2.0'	56.0'
15	43°25.36	• • 46.25	268°24.47	8.3'	25°41.86	-2.1'	56.0'
16	58°25.41	45.61	282°51.72	8.3'	25°39.74	-2.3'	56.0'
17 18	73°25.45 88°25.50	44.97 N17°44.32	297°19.02 311°46.36	8.3' 8.4'	25° 37.48 \$25° 35.09	-2.4' -2.5'	56.0' 55.9'
19	103°25.55	43.68	326° 13.76	8.4	25°32.55	-2.5' -2.7'	55.9'
20	118°25.59	43.04	340°41.20	8.5'	25°29.88	-2.8'	55.9'
21	133°25.64	• • 42.40	355°8.69	8.5'	$25^{\circ}27.08$	-2.9'	55.9'
22	148°25.68	41.75	9°36.23	8.6'	25°24.14	-3.1'	55.9'
23	163°25.73	41.11	24°3.83	8.6'	25°21.06	-3.2'	55.8'
	SD = 15.8'	d = -0.6'		SD	0 = 15.4'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°25.78	N17°40.46	38°31.48	8.7'	S25°17.85	-3.3'	55.8'
1	193°25.82	39.82	52°59.18	8.8'	25°14.50	-3.5'	55.8'
2	208°25.87 223°25.92	39.17 •• 38.53	67°26.94 81°54.76	8.8' 8.9'	25°11.02 25°7.41	-3.6' -3.7'	55.8' 55.7'
4	238°25.97	37.88	96° 22.64	8.9'	25°3.67	-3.7 -3.9'	55.7'
5	253°26.02	37.23	110°50.57	9.0'	24°59.80	-4.0'	55.7'
6	268°26.06	N17°36.59	125° 18.56	9.1'	S24°55.80	-4.1'	55.7'
7	283°26.11	35.94	139°46.61	9.1'	24°51.66	-4.3'	55.7'
8 9	298°26.16 313°26.21	35.29 •• 34.64	154° 14.73 168° 42.91	9.2' 9.2'	24°47.40 24°43.02	-4.4' -4.5'	55.6' 55.6'
10	328°26.26	33.99	183° 11.15	9.2	24° 43.02 24° 38.50	-4.6'	55.6'
11	343°26.31	33.34	197°39.45	9.4'	24°33.86	-4.8'	55.6'
12	358°26.36	N17°32.69	212°7.82	9.4'	S24°29.10	-4.9'	55.6'
13 14	13°26.41 28°26.46	32.04 31.39	226°36.25 241°4.75	9.5' 9.6'	24°24.21 24°19.20	-5.0' -5.1'	55.5' 55.5'
15	43°26.51	30.74	255° 33.32	9.6'	24 19.20 24°14.06	-5.1 -5.3'	55.5'
16	58°26.56	30.08	270°1.95	9.7'	24°8.81	-5.4	55.5'
17	73°26.61	29.43	284°30.65	9.8'	$24^{\circ}3.43$	-5.5'	55.5'
18	88°26.67	N17°28.78	298°59.42	9.8'	\$23°57.93	-5.6'	55.4'
19 20	103°26.72 118°26.77	28.12 27.47	313°28.26 327°57.17	9.9'	23°52.32 23°46.59	-5.7' -5.8'	55.4' 55.4'
21	133°26.82	. 26.81	342° 26.15	10.0'	23°40.74	-6.0'	55.4'
22	148°26.88	26.16	356°55.20	10.1'	23°34.77	-6.1'	55.4'
23	163°26.93	25.50	11°24.32	10.2'	23°28.69	-6.2'	55.4'
	SD = 15.8'	d = -0.6'		SD	0 = 15.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.98	N17°24.85	25°53.51	10.3'	S23°22.49	-6.3'	55.3'
1	193°27.03 208°27.09	24.19	40°22.78	10.3'	23°16.19	-6.4'	55.3'
2	208°27.09 223°27.14	23.53	54°52.11 69°21.53	10.4' 10.5'	23°9.77 23°3.23	-6.5' -6.6'	55.3' 55.3'
4	238°27.20	22.21	83°51.01	10.5	23° 56.59	-6.8'	55.3'
5	253°27.25	21.56	98°20.57	10.6'	22°49.84	-6.9'	55.2'
6	268°27.31	N17°20.90	112°50.20	10.7'	522°42.98	-7.0'	55.2'
7 8	283°27.36 298°27.42	20.24 19.58	127°19.91 141°49.69	10.8' 10.9'	22°36.02 22°28.94	-7.1' -7.2'	55.2' 55.2'
9	313°27.47	19.56	141 49.09 156° 19.55	10.9'	22°21.77	-7.2 -7.3	55.2'
10	328°27.53	18.25	170°49.48	11.0'	22°14.49	-7.4'	55.2'
11	343°27.58	17.59	185° 19.49	11.1'	22°7.10	-7.5'	55.1'
12 13	358°27.64 13°27.70	N17° 16.93 16.27	199° 49.57 214° 19.73	11.2' 11.2'	\$21°59.61 21°52.02	-7.6' -7.7'	55.1' 55.1'
13 14	28°27.75	15.60	214° 19.73 228° 49.96	11.2	21° 52.02 21° 44.34	-7.7°	55.1' 55.1'
15	43°27.81	• • 14.94	243°20.28	11.4'	21°36.55	-7.9'	55.1'
16	58°27.87	14.28	257°50.66	11.5'	21°28.66	-8.0'	55.1'
17	73°27.93	13.61	272°21.13	11.5'	21°20.68	-8.1'	55.0'
18 19	88°27.99 103°28.04	N17° 12.95 12.28	286°51.67 301°22.28	11.6' 11.7'	\$21°12.60 21°4.42	-8.2' -8.3'	55.0' 55.0'
20	103 28.04 118°28.10	12.28	301 22.28 315°52.97	11.7	21 4.42 20°56.16	-8.4'	55.0'
21	133°28.16	•• 10.95	330°23.74	11.8'	20°47.79	-8.5'	55.0'
22	148°28.22	10.28	344°54.58	11.9'	20°39.34	-8.5'	55.0'
23	163°28.28	9.61	359°25.51	12.0'	20°30.80	-8.6'	54.9'
	SD = 15.8'	d = -0.7'		SD	0 = 15.1'		

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

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

## August 04, 05, 06 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri .	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	313°5.26	226°37.47 N19°38.61	212°43.01 N23°41.75	136°12.05 N02°35.98	273°43.79 N12°46.98	
1	328°7.72	241°37.56 38.81	227° 43.67 41.66	151°14.10 35.80	288°46.17 47.00	Alpheratz 357°31.45 29°14.97
2	$343^{\circ}10.19$	256° 37.64 39.00	242°44.32 41.56	166°16.15 35.61	303°48.55 47.01	Ankaa 353°4.07 -42°8.67
3	$358^{\circ}12.65$	271°37.72 · · 39.19	257°44.98 · · 41.47	181°18.19 · · 35.43	318°50.93 · · 47.03	Schedar 349°27.26 56°41.56 Diphda 348°44.21 -17°49.51
4	$13^{\circ}15.12$	286° 37.80 39.38	272° 45.64 41.38	196°20.24 35.24	333°53.31 47.04	Achernar 335°17.94 -57°5.10
5	28° 17.58	301°37.88 39.57	287° 46.29 41.29	211°22.29 35.06	348°55.69 47.06	Hamal 327°47.79 23°35.86
6	43° 20.04	316°37.96 N19°39.76	302°46.95 N23°41.19	226°24.34 N02°34.87	3°58.07 N12°47.07	Polaris 312°29.14 89°22.68
7	58° 22.51	331°38.04 39.95	317° 47.60 41.10	241°26.39 34.69	19°0.46 47.09	Acamar 315°9.62 -40°11.08
8	73°24.97 88°27.44	346°38.11 40.14 1°38.19 · · 40.33	332°48.26 41.01 347°48.92 • 40.91	256°28.43 34.50 271°30.48 · · 34.32	34°2.84 47.10 49°5.22 · · 47.12	Menkar 314°3.10 4°12.20
10	103°29.90	16°38.26 40.52	2°49.57 40.82	286°32.53 34.13	64°7.60 47.13	Mirfak 308°24.06 49°57.56
11	118° 32.36	31°38.33 40.71	17°50.23 40.72	301°34.58 33.95	79°9.98 47.15	Aldebaran 290°36.40 16°33.96
12	133° 34.83	46°38.40 N19°40.89	32°50.89 N23°40.63	316°36.63 N02°33.76	94°12.37 N12°47.16	Rigel 281°1.25 -8°10.04
13	148°37.29	61°38.47 41.08	47°51.54 40.53	331°38.67 33.58	109°14.75 47.18	Capella 280°17.82 46°1.39
14	$163^{\circ}39.76$	76°38.54 41.27	62°52.20 40.44	346°40.72 33.39	124°17.13 47.19	Bellatrix 278°19.94 6°22.53 Elnath 277°58.39 28°37.76
15	178°42.22	91°38.61 · · 41.45	77°52.86 · · 40.34	1°42.77 · · 33.21	139°19.52 · · 47.21	Alnilam 275°34.97 -1°10.99
16	193°44.69	106°38.68 41.64	92°53.52 40.24	16°44.81 33.02	154°21.90 47.22	Betelgeuse 270°49.15 7°24.72
17	208° 47.15	121°38.75 41.83	107°54.17 40.15	31°46.86 32.84	169°24.28 47.24	Canopus 263°51.52 -52°42.49
18	223°49.61	136°38.81 N19°42.01	122°54.83 N23°40.05	46°48.91 N02°32.65	184°26.67 N12°47.25	Sirius 258°23.94 -16°45.27
19 20	238° 52.08 253° 54.54	151°38.87 42.19 166°38.94 42.38	137° 55.49 39.95 152° 56.15 39.86	61°50.96 32.47 76°53.00 32.28	199°29.05 47.27 214°31.43 47.28	Adhara 255°3.88 -29°0.59
21	268° 57.01	181°39.00 · · 42.56	167° 56.81 · · 39.76	91°55.05 · · 32.10	229°33.82 · · 47.30	Procyon 244°48.08 5°9.06
22	283° 59.47	196°39.06 42.75	182° 57.47 39.66	106°57.09 31.91	244°36.20 47.31	Pollux 243°14.10 27°57.33
23	299°1.93	211°39.12 42.93	197° 58.12 39.56	121°59.14 31.72	259°38.59 47.33	Avior 234°14.12 -59°36.08
	pass. 03:07	ν0.1' d0.2' m-4.46	ν0.7' d-0.1' m1.55	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.32	Suhail 222°44.55 -43°32.95 Miaplacidus 221°38.47 -69°50.17
ivier.	pass. US:UI	νυ.1 uυ.∠ III-4.40	νυ.ι u-υ.1 III1.33	ν Δ.υ u-υ.∠ III-1./4	ν Δ.Ψ UU.U IIIU.3Z	Alphard 217°45.19 -8°47.01
						Regulus 207°31.65 11°49.62
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.14 61°35.88
0 1	314°4.40 329°6.86	226°39.18 N19°43.11 241°39.23 43.29	212°58.78 N23°39.46 227°59.44 39.36	137°1.19 N02°31.54 152°3.23 31.35	274°40.97 N12°47.34 289°43.35 47.35	Denebola 182°22.21 14°24.76
2	344°9.33	256°39.29 43.47	243°0.10 39.26	152° 3.23 31.35 167° 5.28 31.17	304°45.74 47.37	Gienah 175°40.74 -17°42.14
3	359° 11.79	271°39.35 · · 43.66	258°0.76 · · 39.16	182°7.32 · · 30.98	319°48.12 · · 47.38	Acrux 172°57.05 -63°15.75
4	14° 14.25	286°39.40 43.84	273°1.42 39.06	197° 9.37 30.80	334°50.51 47.40	Gacrux 171°48.57 -57°16.68 Alioth 166°10.78 55°48.47
5	$29^{\circ}16.72$	301°39.45 44.02	288°2.08 38.96	212°11.42 30.61	349°52.90 47.41	Alioth 166°10.78 55°48.47 Spica 158°19.30 -11°18.68
6	$44^{\circ}19.18$	316°39.50 N19°44.20	303°2.74 N23°38.86	227°13.46 N02°30.42	4°55.28 N12°47.43	Alkaid 152°49.89 49°10.45
7	59°21.65	331°39.56 44.37	318°3.40 38.76	242°15.51 30.24	19°57.67 47.44	Hadar 148°31.80 -60°30.92
8	74°24.11	346°39.61 44.55	333°4.06 38.66	257°17.55 30.05	35°0.05 47.45	Menkent 147°54.16 -36°30.80
9	89°26.58	1°39.65 · · 44.73 16°39.70 44.91	348°4.72 · · 38.55	272°19.60 · · 29.87	50°2.44 · · 47.47	Arcturus 145°45.29 19°2.15
10 11	104° 29.04 119° 31.50	16°39.70 44.91 31°39.75 45.09	3°5.38 38.45 18°6.04 38.35	287°21.64 29.68 302°23.69 29.49	65°4.83 47.48 80°7.21 47.49	Rigil Kent. 139°36.15 -60°57.47
12	134°33.97	46°39.79 N19°45.26	33°6.70 N23°38.25	317°25.73 N02°29.31	95°9.60 N12°47.51	Kochab 137°20.04 74°2.53
13	149°36.43	61°39.84 45.44	48°7.36 38.14	332°27.78 29.12	110°11.99 47.52	Zuben'ubi 136°52.73 -16°9.66 Alphecca 126°1.19 26°37.31
14	164°38.90	76°39.88 45.61	63°8.02 38.04	347°29.82 28.94	125°14.37 47.54	Alphecca 126°1.19 26°37.31 Antares 112°12.05 -26°29.72
15	$179^{\circ}41.36$	91°39.92 · · 45.79	78°8.68 · · 37.94	2°31.87 · · 28.75	140°16.76 · · 47.55	Atria 107°3.24 -69°4.86
16	194°43.82	106°39.96 45.96	93°9.34 37.83	17°33.91 28.56	155°19.15 47.56	Sabik 101°59.20 -15°45.53
17	209° 46.29	121°40.00 46.14	108°10.00 37.73	32°35.95 28.38	170°21.53 47.58	Shaula 96°6.09 -37°7.44
18 19	224° 48.75 239° 51.22	136°40.04 N19°46.31 151°40.08 46.49	123°10.67 N23°37.62 138°11.33 37.52	47°38.00 N02°28.19 62°40.04 28.00	185°23.92 N12°47.59 200°26.31 47.60	Rasalhague 95°55.60 12°32.55
20	254° 53.68	166°40.12 46.66	138° 11.33 37.52 153° 11.99 37.41	77°42.09 27.82	200°26.31 47.60 215°28.70 47.62	Eltanin 90°40.42 51°29.36
21	269°56.14	181°40.15 · · 46.83	168° 12.65 · · 37.30	92°44.13 · · 27.63	230°31.09 · · 47.63	Kaus Aust. 83°28.30 -34°22.16
22	284°58.61	196°40.19 47.00	183°13.31 37.20	107°46.17 27.44	245°33.47 47.64	Vega 80°30.87 38°48.85 Nunki 75°43.81 -26°15.52
23	$300^{\circ}1.07$	211°40.22 47.18	198°13.97 37.09	122°48.22 27.26	260°35.86 47.65	Nunki 75°43.81 -26°15.52 Altair 61°56.77 8°56.85
Mer	pass. 03:03	ν0.1' d0.2' m-4.45	ν0.7' d-0.1' m1.56	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.32	Peacock 53°0.60 -56°38.39
- IVICI.					- V2.4 do.0 1110.32	Deneb 49°23.29 45°23.12
_						Enif 33°35.58 10°0.58
Sun	GHA 215°2 54	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.87 -46°49.05
0 1	315°3.54 330°6.00	226°40.26 N19°47.35 241°40.29 47.52	213°14.64 N23°36.98 228°15.30 36.88	137°50.26 N02°27.07 152°52.30 26.88	275°38.25 N12°47.67 290°40.64 47.68	Fomalhaut 15°11.02 -29°27.94
2	345°8.47	256°40.32 47.69	243°15.96 36.77	167°54.35 26.70	305°43.03 47.69	Scheat 13°42.01 28°14.40
3	0° 10.93	271°40.35 · · 47.86	258° 16.62 · · 36.66	182°56.39 · · 26.51	320°45.42 · · 47.71	Markab 13°26.67 15°21.71
4	15° 13.39	286°40.38 48.03	273°17.29 36.55	197°58.43 26.32	335°47.81 47.72	Aug 04 Fri SHA Mer.pass
5	$30^{\circ}15.86$	301°40.40 48.19	288°17.95 36.44	213°0.48 26.14	350°50.20 47.73	Venus 273°32.21 08:53
6	45° 18.32	316°40.43 N19°48.36	303°18.61 N23°36.33	228°2.52 N02°25.95	5°52.59 N12°47.74	Mars 259°37.75 09:49
7	60°20.79	331°40.45 48.53	318°19.28 36.23	243° 4.56 25.76	20°54.98 47.76	Jupiter 183°6.79 14:53
8	75°23.25	346°40.48 48.70	333°19.94 36.12	258° 6.61 25.57	35°57.37 47.77	Saturn 320°38.53 05:44
9 10	90°25.71 105°28.18	1°40.50 · · 48.86 16°40.52 49.03	348°20.60 · · 36.01 3°21.27 35.90	273°8.65 · · 25.39 288°10.69 25.20	$50^{\circ}59.76  \cdot  47.78$ $66^{\circ}2.15 \qquad 47.79$	Aug 05 Sat SHA Mer.pass
11	105 26.16 120°30.64	31°40.55 49.20	18°21.93 35.78	303°12.73 25.01	81°4.54 47.81	Venus 272°34.78 08:53
12	135° 33.11	46°40.57 N19°49.36	33°22.60 N23°35.67	318°14.77 N02°24.83	96°6.93 N12°47.82	Mars 258°54.38 09:48
13	150°35.57	61°40.58 49.52	48°23.26 35.56	333°16.82 24.64	111°9.32 47.83	Jupiter 182° 56.79 14:50
14	$165^{\circ}38.03$	76°40.60 49.69	63°23.92 35.45	348°18.86 24.45	126°11.71 47.84	Saturn 320°36.57 05:40
15	180°40.50	91°40.62 · · 49.85	78°24.59 · · 35.34	3°20.90 · · 24.26	141°14.10 · · 47.86	Aug 06 Sun SHA Mer.pass
16	195° 42.96	106°40.64 50.02	93°25.25 35.23	18°22.94 24.08	156°16.49 47.87	Venus 271°36.72 08:53
17	210° 45.43	121°40.65 50.18	108°25.92 35.11	33°24.98 23.89	171°18.88 47.88	Mars 258°11.10 09:47
18 19	225° 47.89 240° 50.35	136°40.66 N19°50.34 151°40.68 50.50	123°26.58 N23°35.00 138°27.25 34.89	48°27.02 N02°23.70 63°29.07 23.51	186°21.28 N12°47.89 201°23.67 47.90	Jupiter 182°46.72 14:47
20	255° 52.82	166°40.69 50.66	153° 27.91 34.77	78°31.11 23.33	216°26.06 47.92	Saturn 320°34.71 05:37
21	270° 55.28	181°40.70 · · 50.82	168°28.58 · · 34.66	93°33.15 · · 23.14	231°28.45 · · 47.93	Horizontal parallax
22	285° 57.75	196°40.71 50.98	183°29.25 34.55	108°35.19 22.95	246°30.84 47.94	Venus: 0.2
23	301°0.21	211°40.72 51.14	198°29.91 34.43	123°37.23 22.76	261°33.24 47.95	Mars: 0.1
Mer.	pass. 02:59	ν0.0' d0.2' m-4.44	ν0.7' d-0.1' m1.56	ν2.0' d-0.2' m-1.74	ν2.4' d0.0' m0.32	

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.34	$N17^{\circ}8.95$	13°56.50	12.1'	S20°22.16	-8.7'	54.9'
1	193°28.40	8.28	28°27.57	12.1'	20°13.44	-8.8'	54.9'
2	208° 28.46 223° 28.52	7.61 •• 6.94	42°58.72 57°29.95	12.2' 12.3'	20°4.63 19°55.73	-8.9' -9.0'	54.9' 54.9'
4	238° 28.58	6.27	72°1.24	12.4'	19°46.74	-9.1'	54.9'
5	253° 28.64	5.60	86°32.62	12.4'	19°37.67	-9.2'	54.8'
6 7	268°28.70 283°28.76	N17° 4.93 4.26	101°4.07 115°35.59	12.5' 12.6'	\$19°28.52 19°19.29	-9.2' -9.3'	54.8' 54.8'
8	298° 28.83	3.58	130°7.19	12.7'	19 19.29 19°9.97	-9.3 -9.4'	54.8
9	313°28.89	• • 2.91	144°38.86	12.7'	19°0.57	-9.5'	54.8'
10	328°28.95	2.24	159°10.61	12.8'	18°51.09	-9.6'	54.8'
11 12	343°29.01 358°29.07	1.57 N17°0.89	173°42.43 188°14.33	12.9' 13.0'	18°41.54 \$18°31.90	-9.6' -9.7'	54.8' 54.7'
13	13°29.14	17° 0.22	202°46.29	13.0'	18°22.19	-9.8'	54.7'
14	28° 29.20	$16^{\circ}59.54$	217° 18.33	13.1'	18°12.41	-9.9'	54.7'
15 16	43°29.26 58°29.33	• • 58.87 58.19	231°50.45 246°22.63	13.2' 13.3'	18°2.55 17°52.61	-9.9' -10.0'	54.7' 54.7'
17	73° 29.39	57.52	260°54.89	13.3'	17°42.60	-10.0	54.7'
18	88°29.46	N16°56.84	275°27.22	13.4'	S17°32.53	-10.1'	54.7'
19	103°29.52	56.16	289°59.61	13.5'	17°22.38	-10.2'	54.6'
20 21	118° 29.59 133° 29.65	55.48 •• 54.81	304°32.08 319°4.62	13.5' 13.6'	17°12.16 17°1.87	-10.3' -10.4'	54.6' 54.6'
22	148° 29.72	54.13	333°37.23	13.7'	16°51.51	-10.4	54.6'
23	163°29.78	53.45	$348^{\circ}9.91$	13.7'	$16^{\circ}41.09$	-10.5'	54.6'
	SD = 15.8'	d = -0.7'		SI	O = 15.0'		
C.+	GHA	Doc	GHA		Dec	٦	HP
Sat 0	GHA 178°29.85	<b>Dec</b> N16°52.77	<b>GHA</b> 2°42.65	u 13.8'	Dec \$16°30.61	d -10.6'	<b>нР</b> 54.6'
1	193°29.91	52.09	17° 15.47	13.9'	16°20.05	-10.6'	54.6'
2	208°29.98	51.41	31°48.35	13.9'	16°9.44	-10.7'	54.5'
3 4	223°30.05 238°30.11	· · 50.73 50.05	46°21.29 60°54.31	14.0' 14.1'	15°58.76 15°48.02	-10.7' -10.8'	54.5' 54.5'
5	253°30.18	49.36	75°27.39	14.1'	15°37.22	-10.9	54.5
6	268° 30.25	N16°48.68	90°0.53	14.2'	S15°26.36	-10.9'	54.5'
7 8	283°30.32 298°30.38	48.00 47.32	104°33.74 119°7.02	14.3' 14.3'	15°15.44 15°4.46	-11.0' -11.0'	54.5' 54.5'
9	296 30.36 313°30.45	. 46.63	133°40.35	14.4'	15 4.40 14°53.42	-11.0	54.5'
10	328° 30.52	45.95	148°13.75	14.5'	14°42.33	-11.1'	54.4'
11	343°30.59	45.26	162°47.22	14.5'	14°31.19	-11.2'	54.4
12 13	358°30.66 13°30.73	N16°44.58 43.89	177°20.74 191°54.33	14.6' 14.6'	\$14°19.99 14°8.73	-11.3' -11.3'	54.4' 54.4'
14	28° 30.80	43.21	206°27.97	14.7'	13°57.43	-11.4	54.4'
15	43°30.87	• • 42.52	221°1.68	14.8'	13°46.07	-11.4'	54.4'
16 17	58°30.94 73°31.01	41.83 41.15	235°35.44 250°9.26	14.8' 14.9'	13°34.67 13°23.21	-11.5' -11.5'	54.4' 54.4'
18	88° 31.08	N16°40.46	264°43.14	14.9'	\$13°11.70	-11.6'	54.4
19	103°31.15	39.77	279°17.08	15.0'	$13^{\circ}0.15$	-11.6'	54.3'
20	118°31.22	39.08	293°51.07		12°48.55		54.3'
21 22	133°31.29 148°31.36	· · 38.39 37.70	308°25.12 322°59.22	15.1' 15.2'	12°36.90 12°25.21	-11.7' -11.7'	54.3' 54.3'
23	163°31.43	37.01	337°33.38	15.2'	12°13.48	-11.8'	54.3'
	SD = 15.8'	d = -0.7'		SI	O = 14.9'		
C	CUA	D	CHA		D	.,	НР
Sun 0	<b>GHA</b> 178°31.51	<b>Dec</b> N16°36.32	<b>GHA</b> 352°7.59	u 15.3'	<b>Dec</b> \$12° 1.70	d -11.8'	54.3'
1	193°31.58	35.63	6°41.85	15.3'	11°49.88	-11.9'	54.3'
2	208°31.65 223°31.72	34.94	21°16.16	15.4' 15.4'	11°38.02	-11.9'	54.3'
3 4	223°31.72 238°31.80	· · 34.25 33.55	35°50.53 50°24.94	15.4′ 15.5′	11°26.11 11°14.17	-11.9' -12.0'	54.3' 54.3'
5	253°31.87	32.86	64°59.41	15.5'	11°2.19	-12.0'	54.2'
6	268°31.94	N16°32.17	79°33.92	15.6'	\$10°50.17	-12.1'	54.2'
7 8	283°32.02 298°32.09	31.47 30.78	94°8.48 108°43.09	15.6' 15.7'	10°38.11 10°26.02	-12.1' -12.1'	54.2' 54.2'
9	298 32.09 313°32.17	• • 30.08	108 43.09 123°17.75	15.7' 15.7'	10 26.02 10°13.89	-12.1 -12.2'	54.2'
10	328° 32.24	29.39	137°52.45	15.7'	$10^{\circ}1.73$	-12.2'	54.2'
11	343°32.32 358°32.39	28.69 N16°28.00	152°27.19	15.8' 15.8'	09°49.53 \$09°37.30	-12.2'	54.2' 54.2'
12 13	358°32.39 13°32.47	N16°28.00 27.30	167°1.98 181°36.81	15.8° 15.9'	09°37.30	-12.3' -12.3'	54.2' 54.2'
14	28° 32.54	26.60	$196^{\circ}11.69$	15.9'	$09^{\circ}12.75$	-12.3'	54.2'
15	43°32.62	• • 25.90	210°46.60	16.0'	09°0.42	-12.4'	54.2'
16 17	58°32.70 73°32.77	25.21 24.51	225°21.56 239°56.56	16.0' 16.0'	08°48.07 08°35.69	-12.4' -12.4'	54.1' 54.1'
18	88° 32.85	N16°23.81	254°31.59	16.1	S08°23.28	-12.4'	54.1
19	103°32.93	23.11	269°6.67	16.1'	08°10.84	-12.5'	54.1'
20 21	118°33.00 133°33.08	22.41	283°41.78 298°16.92	16.1' 16.2'	07°58.37 07°45.88	-12.5' -12.5'	54.1' 54.1'
21	133°33.08 148°33.16	· · 21.71 21.01	298° 16.92 312° 52.11	16.2'	07°45.88 07°33.37	-12.5' -12.5'	54.1' 54.1'
23	163°33.24	20.31	327°27.32	16.3	07°20.83	-12.6'	54.1'
	SD = 15.8'	d = -0.7'		SI	D = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-100%
04	06:07	06:04	12:06	23:49	11:26	
05	06:01	05:57	12:06	-:-	12:11	
06	05:54	05:50	12:06	00:32	12:53	

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	316°2.67	226°40.73 N19°51.30	213°30.58 N23°34.32	138°39.27 N02°22.58	276°35.63 N12°47.96
1	331°5.14	241°40.73 51.46	228°31.24 34.20	153°41.31 22.39	291°38.02 47.97
2	346°7.60	256° 40.74 51.62	243°31.91 34.08	168°43.35 22.20	306°40.42 47.99
3	1°10.07	271°40.74 · · 51.78	258° 32.58 · · 33.97	183°45.39 · · 22.01	321°42.81 · · 48.00
4	16°12.53	286°40.75 51.93	273°33.24 33.85	198°47.43 21.82	336°45.20 48.01
5	31° 15.00	301°40.75 52.09	288°33.91 33.74	213°49.47 21.64	351°47.60 48.02
	46° 17.46	316°40.75 N19°52.25	303°34.58 N23°33.62	228°51.51 N02°21.45	6°49.99 N12°48.03
6					
7	61°19.92	331°40.75 52.40	318° 35.24 33.50	243°53.55 21.26	21°52.38 48.04
8	76°22.39	346° 40.75 52.56	333°35.91 33.38	258°55.59 21.07	36°54.78 48.05
9	91°24.85	1°40.75 · · 52.71	348°36.58 · · 33.27	273°57.63 · · 20.88	51°57.17 · · 48.07
.0	106°27.32	16°40.75 52.86	3°37.25 33.15	288°59.67 20.70	66°59.57 48.08
.1	121°29.78	31°40.74 53.02	18° 37.91 33.03	304°1.71 20.51	82°1.96 48.09
2	136°32.24	46°40.74 N19°53.17	33°38.58 N23°32.91	319°3.75 N02°20.32	97°4.36 N12°48.10
3	151°34.71	61°40.73 53.32	48° 39.25 32.79	334° 5.79 20.13	112°6.75 48.11
4	166° 37.17	76°40.73 53.48	63°39.92 32.67	349°7.83 19.94	127°9.15 48.12
5	181°39.64	91°40.72 · · 53.63	78°40.59 · · 32.55	4°9.87 · · 19.75	142°11.54 · · 48.13
6	196° 42.10	106° 40.71 53.78	93°41.25 32.43	19°11.91 19.56	157°13.94 48.14
	211° 44.56				
7					
8	226° 47.03	136°40.69 N19°54.08	123°42.59 N23°32.19	49°15.99 N02°19.19	187°18.73 N12°48.16
9	241°49.49	151°40.68 54.23	138°43.26 32.07	64°18.03 19.00	202°21.13 48.17
0	256° 51.96	166°40.67 54.37	153°43.93 31.95	79°20.07 18.81	217°23.52 48.18
1	271°54.42	181°40.65 · · 54.52	168°44.60 · · 31.83	94°22.10 · · 18.62	232°25.92 · · 48.19
2	286°56.88	196°40.64 54.67	183°45.27 31.70	109°24.14 18.43	247°28.31 48.21
23	301°59.35	211°40.62 54.82		124°26.18 18.24	262°30.71 48.22
	pass. 02:55	$\nu$ 0.0′ d0.2′ m-4.43	$\nu 0.7' \ d$ -0.1' m1.56	$\nu 2.0' \ d$ -0.2' m-1.74	$\nu$ 2.4' $d$ 0.0' $m$ 0.31
ue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$317^{\circ}1.81$	226°40.61 N19°54.96	213°46.61 N23°31.46	139°28.22 N02°18.06	277°33.11 N12°48.23
1	332°4.28	241°40.59 55.11	228°47.28 31.34	154°30.26 17.87	292°35.51 48.24
2	347°6.74	256°40.57 55.26	243°47.95 31.21	169°32.30 17.68	307°37.90 48.25
- 3	2°9.20	271°40.55 · · 55.40	258° 48.62 · · 31.09	184°34.33 · · 17.49	322°40.30 · · 48.26
4	17° 11.67	286° 40.53 55.54	273°49.29 30.96	199°36.37 17.30	337°42.70 48.27
5	32° 14.13	301°40.51 55.69	288°49.96 30.84	214°38.41 17.11	352°45.10 48.28
5	47° 16.60	316°40.49 N19°55.83	303°50.63 N23°30.71	229°40.45 N02°16.92	7°47.49 N12°48.29
7	62°19.06	331°40.46 55.97	318°51.30 30.59	244°42.48 16.73	22°49.89 48.30
3	77°21.52	346°40.44 56.12	333°51.97 30.46	259°44.52 16.54	37°52.29 48.31
9	92°23.99	1°40.41 · · 56.26	348°52.64 · · 30.34	274°46.56 · · 16.35	52°54.69 · · 48.32
.0	107°26.45	16°40.39 56.40	3°53.31 30.21	289°48.60 16.16	67°57.09 48.33
1	122°28.92	31°40.36 56.54	18°53.98 30.09	304°50.63 15.97	82°59.49 48.34
2	137°31.38	46°40.33 N19°56.68	33°54.65 N23°29.96	319°52.67 N02°15.79	98°1.88 N12°48.35
3	152°33.84	61°40.30 56.82		334°54.71 15.60	113°4.28 48.35
.3 .4	167°36.31	76°40.27 56.96	63°56.00 29.70	349°56.74 15.41	128° 6.68 48.36
	107 30.31 182°38.77	91°40.24 · · 57.10			
.5			78°56.67 · · 29.58		
6	197°41.24	106° 40.21 57.23	93°57.34 29.45	20° 0.82 15.03	158°11.48 48.38
7	212°43.70	121°40.18 57.37	108°58.01 29.32	35°2.85 14.84	173°13.88 48.39
8	227°46.17	136°40.14 N19°57.51	123°58.69 N23°29.19	50°4.89 N02°14.65	188°16.28 N12°48.40
9	242°48.63	151°40.11 57.64	138°59.36 29.06	65°6.93 14.46	203°18.68 48.41
0	257°51.09	166°40.07 57.78	154°0.03 28.93	80°8.96 14.27	218°21.08 48.42
1	272°53.56	181°40.03 · · 57.91		95°11.00 · · 14.08	233°23.48 · · 48.43
2	287° 56.02	196° 40.00 58.05	184°1.38 28.67	110°13.03 13.89	248°25.88 48.44
3	302°58.49	211°39.96 58.18	199°2.05 28.54	125°15.07 13.70	263°28.28 48.45
	pass. 02:51	$\frac{211 \ 39.90}{\nu - 0.0' \ d0.1' \ m-4.42}$	$-\frac{199\ 2.05}{\nu 0.7'\ d-0.1'\ m1.56}$	$\frac{125 \text{ 13.07}}{\nu 2.0' \text{ d-0.2' m-1.73}}$	$\frac{203 \ 28.28}{\nu 2.4' \ d0.0' \ \text{m}0.31}$
C1 . F	Jass. 02.31	ν-0.0 d0.1 iii-4.42		V2.0 U-0.2 III-1.73	V2.4 00.0 1110.31
ed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
)	318°0.95	226°39.92 N19°58.32		140°17.10 N02°13.51	278°30.69 N12°48.46
L	333°3.41	241°39.88 58.45	229°3.40 28.28	155°19.14 13.32	293°33.09 48.47
2	348°5.88	256°39.84 58.58	244°4.07 28.15	170°21.18 13.13	308°35.49 48.47
3	3°8.34	271°39.79 · · 58.71	259°4.75 · · 28.02	185°23.21 · · 12.94	323°37.89 · · 48.48
1	18° 10.81	286°39.75 58.84	274°5.42 27.89	200°25.25 12.75	338°40.29 48.49
5	33° 13.27	301°39.71 58.97	289°6.10 27.75	215°27.28 12.56	353°42.69 48.50
5 5	48° 15.73	316°39.66 N19°59.10	304°6.77 N23°27.62	230°29.32 N02°12.37	8°45.10 N12°48.51
5 7	63° 18.20	331°39.61 59.23		245°31.35 12.18	23°47.50 48.52
3	78° 20.66	346°39.57 59.36	334°8.12 27.36	260°33.39 11.99	38°49.90 48.53
9	93°23.13	1°39.52 · · 59.49	349°8.79 · · 27.22	275°35.42 · · 11.80	53°52.30 · · 48.53
0	108°25.59	16°39.47 59.62		290°37.46 11.61	68°54.71 48.54
1	123°28.05	31°39.42 59.75	19° 10.14 26.95	305°39.49 11.42	83°57.11 48.55
2	138°30.52	46°39.37 N19°59.87	34°10.82 N23°26.82	320°41.52 N02°11.23	98°59.51 N12°48.56
3	153°32.98	61°39.31 20°0.00	49°11.49 26.69	335°43.56 11.04	114°1.91 48.57
4	168°35.45	76°39.26 0.12		350°45.59 10.85	129°4.32 48.58
5	183°37.91	91°39.21 · · 0.25		5°47.63 · · 10.66	144°6.72 · · 48.58
6	198° 40.37	106°39.15 0.37		20°49.66 10.46	159°9.13 48.59
7	213° 42.84	121°39.10 0.50			
	228° 45.30	136°39.04 N20°0.62		50°53.73 N02°10.08	189°13.93 N12°48.61
8		151°38.98 0.74		65°55.76 9.89	204°16.34 48.62
.7 .8 .9	243° 47.77		154°16.23 25.73	80°57.80 9.70	219°18.74 48.62
8 9 0	$258^{\circ}50.23$	166°38.92 0.86			
8 9 0	258° 50.23 273° 52.69	181°38.86 · · 0.98	169°16.90 · · 25.59	95°59.83 · · 9.51	234°21.15 · · 48.63
8	$258^{\circ}50.23$				
8 9 0	258° 50.23 273° 52.69	181°38.86 · · 0.98	169°16.90 · · 25.59	95°59.83 · · 9.51	234°21.15 · · 48.63

	SHA	Dec
Alpheratz	357°31.43	29°14.98
Ankaa Schedar	353°4.05 349°27.23	-42°8.68 56°41.57
Diphda	349°27.23	-17°49.51
Achernar	$335^{\circ}17.91$	$\text{-57}^{\circ}5.10$
Hamal	327°47.77 312°27.67	23°35.87 89°22.68
Polaris Acamar	312 27.07 315°9.59	-40°11.07
Menkar	314°3.08	$4^{\circ}12.21$
Mirfak	308°24.03 290°36.38	49°57.56 16°33.97
Aldebaran Rigel	290 36.38 281°1.23	-8°10.03
Capella	280°17.80	46°1.38
Bellatrix	278°19.92 277°58.37	6°22.54 28°37.76
Elnath Alnilam	277 58.37 275°34.96	-1°10.98
Betelgeuse	$270^{\circ}49.14$	$7^{\circ}24.73$
Canopus	263°51.51	-52°42.47
Sirius Adhara	258°23.93 255°3.87	-16°45.26 -29°0.57
Procyon	244°48.07	$5^{\circ}9.06$
Pollux	243°14.09	27°57.32
Avior Suhail	234°14.11 222°44.55	-59°36.06 -43°32.93
Miaplacidus	221°38.47	-69°50.15
Alphard	217°45.19	-8°47.00
Regulus Dubhe	207°31.65 193°38.14	11°49.62 61°35.87
Denebola	182°22.22	14°24.76
Gienah	175°40.75	-17°42.13
Acrux Gacrux	172°57.08 171°48.59	-63°15.74 -57°16.67
Alioth	166°10.79	55° 48.46
Spica	$158^{\circ}19.31$	-11° 18.67
Alkaid	152°49.91	49°10.45 -60°30.92
Hadar Menkent	148°31.83 147°54.17	-80° 30.92 -36° 30.79
Arcturus	145°45.30	$19^{\circ}2.15$
Rigil Kent.	139°36.19	-60°57.47
Kochab Zuben'ubi	137°20.09 136°52.74	74°2.52 -16°9.66
Alphecca	126°1.21	26°37.31
Antares	112°12.06	-26°29.72
Atria Sabik	107°3.27 101°59.21	-69°4.86 -15°45.53
Shaula	96°6.10	-37°7.44
Rasalhague	95°55.61	12°32.56
Eltanin Kaus Aust.	90°40.44 83°28.31	51°29.37 -34°22.17
Vega	80°30.88	38°48.86
Nunki	75°43.81	$-26^{\circ}15.52$
Altair Peacock	61°56.77 53°0.60	8°56.86 -56°38.40
Deneb	49°23.29	45°23.13
Enif	$33^{\circ}35.58$	$10^{\circ}0.59$
Al Na'ir	27°28.86	-46°49.06
Fomalhaut Scheat	15°11.00 13°42.00	-29°27.94 28°14.41
Markab	13°26.66	15°21.72
Aug 07 Mon	SHA	Mer.pass
Venus	$270^{\circ}38.05$	08:53
Mars	257°27.90 182°36.60	09:46
Jupiter Saturn	320°32.96	14:43 05:33
Aug 08 Tue	SHA	Mer.pass
Venus Mars	269°38.79 256°44.79	08:53 09:44
Jupiter	250 44.79 182°26.41	14:40
Saturn	320°31.30	05:29
Aug 09 Wed	SHA	Mer.pass
Venus Mars	268°38.97 256°1.78	08:53 09:43
Jupiter	250 1.78 182°16.16	14:37
Saturn	320°29.74	05:25

Horizontal parallax

Venus: Mars: 0.2 0.1

Stars

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.31	N16° 19.60	342°2.58	16.3'	S07°8.26	-12.6'	54.1'
1	193°33.39	18.90	356° 37.86	16.3'	06°55.68	-12.6'	54.1'
2	208°33.47	18.20	11°13.18	16.3'	06°43.07	-12.6'	54.1'
3 4	223°33.55 238°33.63	· · 17.50 16.79	25°48.52 40°23.90	16.4' 16.4'	06°30.44 06°17.79	-12.6' -12.7'	54.1' 54.1'
5	250° 33.71	16.79	54° 59.31	16.4	06°5.13	-12.7'	54.1'
6	268°33.79	N16° 15.38	69°34.75	16.5'	S05°52.44	-12.7'	54.0'
7	283°33.87	14.68	84°10.21	16.5'	05°39.73	-12.7'	54.0'
8	298°33.95	13.97	98°45.70	16.5'	05°27.01	-12.7'	54.0'
9	313°34.03	• • 13.27	113°21.22	16.5'	05°14.27	-12.8'	54.0'
10 11	328°34.11 343°34.19	12.56 11.85	127°56.76 142°32.33	16.6' 16.6'	05°1.52 04°48.75	-12.8' -12.8'	54.0' 54.0'
12	358°34.27	N16° 11.15	157°7.92	16.6'	\$04° 35.96	-12.8'	54.0'
13	13°34.35	10.44	171°43.53	16.6'	04°23.17	-12.8'	54.0'
14	28°34.44	9.73	$186^{\circ}19.16$	16.7'	04°10.35	-12.8'	54.0'
15	43°34.52	• • 9.02	200°54.81	16.7'	03°57.53	-12.8'	54.0'
16 17	58°34.60 73°34.68	8.31 7.60	215°30.49 230°6.18	16.7' 16.7'	03°44.70 03°31.85	-12.8' -12.9'	54.0' 54.0'
18	88°34.77	7.00 N16°6.89	244°41.89	16.7	503°19.00	-12.9'	54.0'
19	103°34.85	6.18	259° 17.62	16.7'	03°6.13	-12.9'	54.0'
20	118°34.93	5.47	273°53.36	16.8'	02°53.26	-12.9'	54.0'
21	133°35.02	• • 4.76	$288^{\circ}29.12$	16.8'	02°40.38	-12.9'	54.0'
22	148°35.10	4.05	303°4.89	16.8'	02°27.49	-12.9'	54.0'
23	163°35.18	3.34	317° 40.68	16.8'	02°14.60	-12.9'	54.0'
	SD = 15.8'	d = -0.7'		SI	O = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0 0	178°35.27	N16°2.62	332° 16.48	u 16.8'	502°1.70	-12.9'	пР 54.0'
1	193°35.35	1.91	346° 52.29	16.8'	01°48.79	-12.9'	54.0'
2	208°35.44	1.20	1°28.11	16.8'	01°35.89	-12.9'	54.0'
3	223°35.52	16°0.48	16°3.94	16.8'	01°22.97	-12.9'	54.0'
4	238°35.61 253°35.69	15°59.77 59.05	30°39.77 45°15.62	16.8' 16.9'	01°10.06 00°57.14	-12.9' -12.9'	54.0' 54.0'
5 6	268°35.78	59.05 N15° 58.34	45 15.02 59°51.47	16.9'	500°44.22	-12.9'	54.0'
7	283°35.86	57.62	74°27.33	16.9'	00° 31.30	-12.9'	54.0'
8	298°35.95	56.91	89°3.20	16.9'	00°18.38	-12.9'	54.0'
9	313°36.04	•• 56.19	103°39.07	16.9'	\$00°5.46	-12.9'	54.0'
10	328°36.12	55.47	118° 14.94	16.9'	N00°7.46	12.9'	54.0'
11	343°36.21 358°36.30	54.76	132°50.81 147°26.69	16.9'	00°20.38 N00°33.29	12.9'	54.0'
12 13	13°36.39	N15°54.04 53.32	147° 26.69 162° 2.56	16.9' 16.9'	00°46.20	12.9' 12.9'	54.0' 54.0'
14	28°36.47	52.60	176° 38.44	16.9	00° 40.20	12.9'	54.0'
15	43°36.56	• • 51.88	191°14.31	16.9'	$01^{\circ}12.01$	12.9'	54.0'
16	58°36.65	51.16	205°50.18	16.9'	01°24.91	12.9'	54.0'
17	73°36.74	50.44 N15°49.72	220°26.05 235°1.91	16.9'	01°37.80	12.9'	54.0'
18 19	88°36.83 103°36.92	49.72 49.00	235°1.91 249°37.77	16.9' 16.9'	N01°50.69 02°3.56	12.9' 12.9'	54.0' 54.0'
20	118°37.00	48.28	264° 13.62	16.8'	02° 16.43		
21	133°37.09	• • 47.56	278°49.46	16.8'	02°29.29	12.9'	54.0'
22	148°37.18	46.83	293°25.30	16.8'	$02^{\circ}42.14$	12.8'	54.0'
23	163°37.27	46.11	308°1.12	16.8'	02°54.99	12.8'	54.0'
	SD = 15.8'	d = -0.7'		SI	O = 14.7'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°37.36	N15° 45.39	322°36.94	16.8'	N03°7.82	12.8'	54.0'
1	193°37.45	44.66	337° 12.74	16.8'	03°20.64	12.8'	54.0'
2	208°37.55	43.94	351°48.54	16.8'	03°33.44	12.8'	54.0'
3 4	223°37.64 238°37.73	· · 43.21 42.49	6°24.32 21°0.08	16.8' 16.8'	03°46.24 03°59.02	12.8' 12.8'	54.0' 54.0'
4 5	258 37.73 253°37.82	42.49 41.76	21 0.08 35°35.84	16.8	03 59.02 04°11.79	12.8	54.0'
6	268°37.91	N15°41.04	50° 11.57	16.7'	N04°24.54	12.7'	54.0'
7	283°38.00	40.31	64°47.29	16.7'	04°37.27	12.7'	54.0'
8	298°38.10	39.58	79°22.99	16.7'	04°50.00	12.7'	54.0'
9	313°38.19	38.86	93°58.68	16.7'	05°2.70	12.7'	54.0'
10 11	328°38.28 343°38.37	38.13 37.40	108°34.34 123°9.98	16.6' 16.6'	05°15.39 05°28.05	12.7' 12.6'	54.0' 54.0'
12	358°38.47	37.40 N15° 36.67	123 9.98 137°45.60	16.6'	N05°40.70	12.6'	54.0'
13	13°38.56	35.94	152°21.20	16.6'	05°53.33	12.6'	54.0'
14	28°38.65	35.21	$166^{\circ}56.78$	16.6'	06°5.94	12.6'	54.0'
15	43°38.75	• • 34.48	181°32.33	16.5'	06°18.53	12.6'	54.0'
16	58°38.84	33.75	196°7.86	16.5'	06°31.10	12.5'	54.0'
17 18	73°38.94 88°39.03	33.02 N15°32.29	210° 43.36 225° 18.83	16.5' 16.4'	06°43.65 N06°56.17	12.5' 12.5'	54.0' 54.1'
18	103°39.13	31.56	225 18.83 239°54.27	16.4	07°8.67	12.5'	54.1'
20	118°39.22	30.83	254°29.69	16.4	07°21.14	12.4	54.1'
21	133°39.32	• • 30.10	$269^{\circ}5.07$	16.4'	07°33.59	12.4'	54.1'
22	148°39.41	29.36	283°40.43	16.3'	07°46.02	12.4'	54.1'
23	163°39.51	28.63	298° 15.75	16.3'	07°58.41	12.4'	54.1'
	SD = 15.8'	d = -0.7'		SI	O = 14.7'		

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

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

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-88%
07	05:47	05:43	12:06	01:14	13:34	
08	05:39	05:35	12:06	01:54	14:14	
09	05:31	05:26	12:05	02:34	14:54	

# August 10, 11, 12 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	319°0.09	226°38.68 N20°1.34		141°5.93 N02°8.94	279°28.36 N12°48.65	Alpheratz 357°31.42 29°14.99
1	334°2.55	241°38.62 1.46		156°7.96 8.75	294°30.77 48.66	Ankaa 353°4.03 -42°8.68
2	349°5.01	256°38.55 1.58		171°10.00 8.56 186°12.03 · · 8.37	309°33.17 48.67	Schedar 349°27.21 56°41.59
3 4	4°7.48 19°9.94	271°38.49 · · 1.70 286°38.42		186°12.03 · · 8.37 201°14.06 8.17	324°35.58 · · 48.68 339°37.98 48.68	Diphda 348°44.17 -17°49.51
5	34° 12.41	301°38.35 1.93		216°16.09 7.98	354°40.39 48.69	Achernar 335°17.88 -57°5.10
6	49° 14.87	316°38.29 N20°2.05	304°23.00 N23°24.34	231°18.13 N02°7.79	9°42.80 N12°48.70	Hamal 327°47.75 23°35.88 Polaris 312°26.11 89°22.68
7	64° 17.33	331°38.22 2.16		246°20.16 7.60	24°45.20 48.71	Acamar 315°9.57 -40°11.07
8 9	79° 19.80 94° 22.26	346°38.15 2.28 1°38.08 · · 2.39		261°22.19 7.41 276°24.22 · · 7.22	39°47.61 48.71	Menkar 314°3.06 4°12.21
10	109° 24.73	1°38.08 · · 2.39 16°38.00 2.51		270 24.22 77.22 291°26.26 7.03	54°50.02 · · 48.72 69°52.42 48.73	Mirfak 308°24.01 49°57.56
11	124°27.19	31°37.93 2.62		306°28.29 6.84	84°54.83 48.73	Aldebaran 290°36.36 16°33.97
12	139° 29.66	46°37.86 N20°2.73		321°30.32 N02°6.64	99°57.24 N12°48.74	Rigel 281°1.21 -8°10.02 Capella 280°17.77 46°1.38
13	154°32.12	61°37.78 2.84		336°32.35 6.45	114°59.65 48.75	Bellatrix 278°19.91 6°22.54
14 15	169° 34.58 184° 37.05	76°37.71 2.96 91°37.63 · · 3.07		351°34.38 6.26 6°36.42 · · 6.07	130°2.05 48.76 145°4.46 •• 48.76	Elnath 277°58.35 28°37.76
16	199°39.51	106°37.56 3.18		21°38.45 5.88	160°6.87 48.77	Alnilam 275°34.94 -1°10.98
17	214°41.98	121°37.48 3.29		36°40.48 5.69	175°9.28 48.78	Betelgeuse 270°49.12 7°24.73 Canopus 263°51.49 -52°42.46
18	229° 44.44	136°37.40 N20°3.39		51°42.51 N02°5.49	190°11.69 N12°48.78	Canopus 263°51.49 -52°42.46 Sirius 258°23.92 -16°45.26
19	244°46.90	151°37.32 3.50		66°44.54 5.30	205°14.09 48.79	Adhara 255°3.86 -29°0.56
20 21	259° 49.37 274° 51.83	166°37.24 3.61 181°37.16 · · 3.72		81°46.57 5.11 96°48.60 · · 4.92	220°16.50 48.80 235°18.91 • 48.80	Procyon 244°48.06 5°9.06
22	289°54.30	196°37.08 3.82		111°50.63 4.73	250°21.32 48.81	Pollux 243°14.08 27°57.32
23	304° 56.76	211°36.99 3.93		126°52.66 4.54	265°23.73 48.81	Avior 234°14.10 -59°36.05 Suhail 222°44.55 -43°32.92
Meri	pass. 02:44	ν-0.1' d0.1' m-4.40	$\nu$ 0.7' d-0.1' m1.56	ν2.0' d-0.2' m-1.73	ν2.4' d0.0' m0.30	Suhail 222°44.55 -43°32.92 Miaplacidus 221°38.47 -69°50.13
	Pa33. 02.44	ν 0.1 do.1 iii 4.40				Alphard 217°45.19 -8°46.99
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.65 11°49.62
0	319°59.22	226°36.91 N20°4.04		141°54.70 N02°4.34	280°26.14 N12°48.82	Dubhe 193°38.16 61°35.86
1	335°1.69	241°36.82 4.14		156°56.73 4.15	295° 28.55 48.83	Denebola 182°22.23 14°24.77 Gienah 175°40.76 -17°42.13
2	$350^{\circ}4.15$	256°36.74 4.24	244°36.60 21.47	171°58.76 3.96	310°30.96 48.83	Acrux 172°57.11 -63°15.73
3	5°6.62	271°36.65 · · 4.35		187°0.79 · · 3.77	325°33.37 · · 48.84	Gacrux 171°48.61 -57°16.66
4 5	20°9.08 35°11.54	286°36.56 4.45 301°36.47 4.55		202°2.82 3.57 217°4.85 3.38	340°35.78 48.85 355°38.19 48.85	Alioth 166°10.82 55°48.46
6	50° 14.01	316°36.38 N20°4.65		232°6.88 N02°3.19	10°40.60 N12°48.86	Spica 158°19.32 -11°18.67
7	65° 16.47	331°36.29 4.75	_	247°8.91 3.00	25°43.01 48.86	Alkaid 152°49.93 49°10.45 Hadar 148°31.86 -60°30.91
8	80° 18.94	346°36.20 4.85		262°10.94 2.81	40°45.42 48.87	Menkent 147°54.19 -36°30.79
9	95°21.40	1°36.11 · · 4.95		277°12.97 · · 2.61	55°47.83 · · 48.87	Arcturus 145°45.32 19°2.15
10 11	110°23.86 125°26.33	16°36.02 5.05 31°35.92 5.15		292°15.00 2.42 307°17.03 2.23	70°50.24 48.88 85°52.65 48.89	Rigil Kent. 139°36.22 -60°57.46
12	140°28.79	46°35.83 N20°5.25		322°19.06 N02°2.04	100°55.07 N12°48.89	Kochab 137°20.15 74°2.52 Zuben'ubi 136°52.76 -16°9.65
13	155°31.26	61°35.73 5.35		337°21.09 1.84	115°57.48 48.90	Zuben'ubi 136°52.76 -16°9.65 Alphecca 126°1.23 26°37.32
14	170°33.72	76°35.64 5.44		352°23.12 1.65	130°59.89 48.90	Antares 112°12.08 -26°29.72
15	185° 36.19 200° 38.65	91°35.54 · · 5.54 106°35.44 5.64	_	7°25.14 ··· 1.46 22°27.17	146°2.30 · · 48.91 161°4.71 48.91	Atria 107°3.31 -69°4.87
16 17	200 36.03 215°41.11	106°35.44 5.64 121°35.34 5.73		22°27.17 1.27 37°29.20 1.07	161°4.71 48.91 176°7.13 48.92	Sabik 101°59.23 -15°45.53
18	230° 43.58	136°35.24 N20°5.82		52°31.23 N02°0.88	191°9.54 N12°48.92	Shaula 96°6.12 -37°7.45 Rasalhague 95°55.62 12°32.57
19	245°46.04	151°35.14 5.92		67°33.26 0.69	206°11.95 48.93	Eltanin 90°40.46 51°29.38
20	260°48.51	166°35.04 6.01		82°35.29 0.49	221°14.36 48.93	Kaus Aust. 83°28.32 -34°22.17
21 22	275°50.97 290°53.43	181°34.94 · · 6.10 196°34.83 6.19		97°37.32 · · 0.30 112°39.35 02°0.11	236°16.78 · · 48.94 251°19.19 48.94	Vega 80°30.89 38°48.87
23	305°55.90	211°34.73 6.29		127°41.37 01°59.92	266°21.60 48.95	Nunki 75°43.82 -26°15.53
	pass. 02:40	ν-0.1' d0.1' m-4.39		ν2.0' d-0.2' m-1.73	ν2.4' d0.0' m0.29	Altair 61°56.78 8°56.87 Peacock 53°0.60 -56°38.41
ivier.	pass. 02:40	ν-0.1 α0.1 m-4.39		ν2.0 α-0.2 m-1.73	ν2.4 αυ.υ mu.29	Deneb 49°23.29 45°23.15
_						Enif 33°35.57 10°0.59
Sat 0	<b>GHA</b> 320° 58.36	<b>GHA Dec</b> 226°34.62 <b>N</b> 20°6.38	<b>GHA Dec</b> 214°51.64 N23°18.16	<b>GHA Dec</b> 142°43.40 N01°59.72	<b>GHA Dec</b> 281°24.02 N12°48.95	Al Na'ir 27°28.85 -46°49.07
1	336°0.83	241°34.52	_	157°45.43 59.53	296°26.43 48.96	Fomalhaut 15°10.99 -29°27.95 Scheat 13°41.99 28°14.42
2	351°3.29	256°34.41 6.55		172°47.46 59.34	311°28.85 48.96	Markab 13°26.65 15°21.73
3	6°5.75	271°34.30 · · 6.64	_	187°49.49 · · 59.14	326°31.26 · · 48.97	
4	21°8.22	286°34.20 6.73		202°51.51 58.95	341°33.67 48.97	Aug 10 Thu         SHA         Mer.pass           Venus         267°38.59         08:53
5 6	36° 10.68 51° 13.15	301°34.09 6.82 316°33.98 N20°6.90		217°53.54 58.76 232°55.57 N01°58.56	356°36.09 48.98 11°38.50 N12°48.98	Venus 267°38.59 08:53 Mars 255°18.85 09:42
7	66° 15.61	331°33.86 6.99		247°57.60 58.37	26°40.92 48.99	Jupiter 182°5.84 14:34
8	81° 18.07	346°33.75 7.08		262°59.63 58.18	41°43.33 48.99	Saturn 320°28.28 05:21
9	96° 20.54	1°33.64 · · 7.16		278°1.65 · · 57.98	56°45.75 · · 49.00	Aug 11 Fri SHA Mer.pass
10	111°23.00 126°25.47	16°33.53 7.24 31°33.41 7.33		293°3.68 57.79 308°5.71 57.60	71°48.16 49.00 86°50.58 49.01	Venus 266° 37.68 08:54
11 12	120 25.47 141°27.93	46°33.30 N20°7.41		308°5.71 57.60 323°7.73 N01°57.40	86°50.58 49.01 101°53.00 N12°49.01	Mars 254°36.02 09:41
13	156° 30.40	61°33.18 7.49		338°9.76 57.21	116°55.41 49.01	Jupiter 181°55.47 14:30
14	171°32.86	76°33.06 7.57		353°11.79 57.02	131°57.83 49.02	Saturn 320°26.92 05:17
15 16	186° 35.32	91°32.95 · · 7.65		8°13.82 · · 56.82	147°0.24 · · 49.02	Aug 12 Sat SHA Mer.pass
16 17	201° 37.79 216° 40.25	106°32.83 7.73 121°32.71 7.81		23°15.84 56.63 38°17.87 56.44	162°2.66 49.03 177°5.08 49.03	Venus 265°36.26 08:54
18	231° 42.72	136°32.59 N20°7.89		53°19.90 N01°56.24	192°7.49 N12°49.03	Mars 253°53.28 09:40 Jupiter 181°45.04 14:27
19	$246^{\circ}45.18$	151°32.47 7.97	140°4.69 15.18	68°21.92 56.05	207°9.91 49.04	Saturn 320°25.66 05:14
20	261°47.64	166°32.34 8.05		83°23.95 55.86	222°12.33 49.04	Horizontal parallax
21 22	276° 50.11 291° 52.57	181°32.22 · · 8.13 196°32.10 8.20		98°25.97 · · 55.66 113°28.00 55.47	237° 14.74 · · · 49.05 252° 17.16	Venus: 0.2
23	291 52.57 306° 55.04	211°31.97 8.28		113 28.00 55.47 128°30.03 55.27	267°19.58 49.05	Mars: 0.1
				$\frac{120 \text{ 30.03}}{\nu 2.0' \text{ d-0.2' m-1.72}}$	$\frac{201 \text{ l} 3.30 \text{ m} 3.03}{\nu 2.4' \ d 0.0' \ \text{m} 0.29}$	
ivier.	pass. 02:36	ν-0.1′ d0.1′ m-4.38		ν∠.υ α-υ.∠ III-1.1∠	ν Δ.Ψ	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.60	$N15^{\circ}27.90$	312°51.04	16.3'	N08° 10.78	12.3'	54.1'
1 2	193°39.70 208°39.80	27.16 26.43	327°26.30 342°1.52	16.2' 16.2'	08°23.13 08°35.44	12.3' 12.3'	54.1' 54.1'
3	200 39.80 223°39.89	25.69	356° 36.70	16.1	08° 47.73	12.3'	54.1'
4	238°39.99	24.96	11°11.85	16.1'	08°59.98	12.2'	54.1'
5	253°40.09	24.22	25°46.96	16.1'	09°12.20	12.2'	54.1'
6 7	268°40.19 283°40.28	N15°23.48 22.75	40°22.03 54°57.07	16.0' 16.0'	N09°24.40 09°36.56	12.2' 12.1'	54.1' 54.2'
8	298°40.38	22.73	69°32.06	16.0'	09° 48.69	12.1'	54.2'
9	313°40.48	• • 21.27	84°7.01	15.9'	10°0.78	12.1'	54.2'
10	328°40.58	20.53	98°41.92	15.9'	10°12.84	12.0'	54.2'
11 12	343°40.68 358°40.78	19.80 N15° 19.06	113° 16.78 127° 51.61	15.8' 15.8'	10°24.86 N10°36.85	12.0' 12.0'	54.2' 54.2'
13	13°40.87	18.32	142°26.38	15.7'	10°48.81	11.9'	54.2'
14	28°40.97	17.58	$157^{\circ}1.11$	15.7'	$11^{\circ}0.72$	11.9'	54.2'
15	43°41.07	• • 16.84	171°35.79	15.6'	11°12.60	11.8'	54.2'
16 17	58°41.17 73°41.27	16.10 15.36	186° 10.43 200° 45.02	15.6' 15.5'	11°24.44 11°36.24	11.8' 11.8'	54.3' 54.3'
18	88°41.37	N15° 14.61	215° 19.55	15.5'	N11°48.00	11.7'	54.3'
19	103°41.48	13.87	229°54.04	15.4'	$11^{\circ}59.71$	11.7'	54.3'
20	118°41.58	13.13	244°28.47	15.4'	12°11.39	11.6'	54.3'
21 22	133°41.68 148°41.78	· · 12.39 11.64	259°2.85 273°37.18	15.3' 15.3'	12°23.02 12°34.61	11.6' 11.5'	54.3' 54.3'
23	163°41.88	10.90	288°11.46	15.2'	12°46.16	11.5'	54.3'
	SD = 15.8'	d = -0.7'			0 = 14.8'		
				J.	10		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°41.98 193°42.08	N15° 10.16 9.41	302°45.67 317°19.84	15.2' 15.1'	N12°57.66 13°9.11	11.5' 11.4'	54.4' 54.4'
2	208°42.19	8.67	331°53.94	15.0'	13° 20.52	11.4	54.4'
3	223°42.29	• • 7.92	346°27.99	15.0'	13°31.88	11.3'	54.4'
4	238°42.39	7.18	1°1.98	14.9'	13°43.20	11.3'	54.4'
5 6	253°42.50 268°42.60	6.43 N15°5.68	15°35.91 30°9.78	14.9' 14.8'	13°54.46 N14°5.67	11.2' 11.2'	54.4' 54.4'
7	283°42.70	4.94	44° 43.58	14.7'	14° 16.84	11.1'	54.5
8	298°42.81	4.19	59° 17.33	14.7'	$14^{\circ}27.95$	11.1'	54.5'
9	313°42.91	• • 3.44	73°51.01	14.6'	14°39.01	11.0'	54.5'
10 11	328°43.01 343°43.12	2.69 1.94	88°24.63 102°58.18	14.6' 14.5'	14°50.01 15°0.96	11.0' 10.9'	54.5' 54.5'
12	358°43.22	N15°1.19	117°31.67	14.4'	N15°11.86	10.8	54.5'
13	13°43.33	15°0.44	132°5.09	14.4'	15°22.70	10.8'	54.6'
14	28°43.43	14°59.69	146°38.44	14.3'	15° 33.49	10.7'	54.6'
15 16	43°43.54 58°43.64	58.94 58.19	161°11.73 175°44.95	14.2' 14.1'	15° 44.21 15° 54.88	10.7' 10.6'	54.6' 54.6'
17	73°43.75	57.44	190° 18.09	14.1'	16°5.49	10.5'	54.6'
18	88°43.86	N14°56.69	204°51.17	14.0'	N16°16.04	10.5'	54.7'
19	103°43.96 118°44.07	55.94 55.19	219°24.17 233°57.11	13.9' 13.9'	16°26.53 16°36.96	10.4	54.7' 54.7'
20 21	118 44.07 133°44.18	55.19	233 57.11 248°29.97	13.8'	16° 47.32	10.4	54.7'
22	148°44.28	53.68	263°2.75	13.7'	16°57.62	10.2'	54.7'
23	163°44.39	52.93	277°35.47	13.6'	17°7.85	10.2'	54.8'
	SD = 15.8'	d = -0.7'		SE	0 = 14.8'		
c - ·	CUA	D	CUA		D	.1	LIP
Sat 0	<b>GHA</b> 178°44.50	Dec N14° 52.17	<b>GHA</b> 292°8.10	u 13.6'	<b>Dec</b> N17° 18.02	d 10.1'	<b>HP</b> 54.8'
1	193°44.61	51.42	306° 40.66	13.5'	17°28.13	10.1	54.8'
2	208°44.71	50.66	321° 13.15	13.4'	17°38.16	10.0'	54.8'
3 4	223°44.82 238°44.93	· · 49.91 49.15	335° 45.56 350° 17.88	13.3' 13.3'	17°48.13 17°58.02	9.9' 9.8'	54.8' 54.9'
4 5	238°44.93 253°45.04	49.15 48.40	4°50.14	13.3'	17°58.02 18°7.85	9.8'	54.9' 54.9'
6	268°45.15	N14°47.64	19°22.31	13.1'	N18°17.61	9.7'	54.9'
7	283°45.26	46.88	33°54.40	13.0'	18° 27.29	9.6'	54.9'
8 9	298°45.37 313°45.48	46.12 •• 45.37	48°26.41 62°58.34	12.9' 12.8'	18° 36.90 18° 46.43	9.5' 9.5'	54.9' 55.0'
10	328°45.59	44.61	77°30.19	12.8'	18° 55.89	9.5 9.4'	55.0'
11	343°45.70	43.85	92°1.95	12.7'	19°5.28	9.3'	55.0'
12	358°45.81	N14°43.09	106° 33.63	12.6'	N19° 14.58	9.2'	55.0'
13 14	13°45.92 28°46.03	42.33 41.57	121°5.23 135°36.75	12.5' 12.4'	19°23.81 19°32.96	9.1' 9.1'	55.1' 55.1'
15	43°46.14	40.81	150°8.18	12.4	19° 42.03	9.1	55.1'
16	58°46.25	40.05	164°39.52	12.3'	19°51.01	8.9'	55.1'
17	73°46.36	39.29 N14° 38.53	179°10.78	12.2'	19°59.92	8.8'	55.2'
18 19	88°46.47 103°46.59	N14°38.53 37.77	193°41.95 208°13.04	12.1' 12.0'	N20°8.74 20°17.47	8.7' 8.7'	55.2' 55.2'
20	118°46.70	37.00	200° 13.04° 222° 44.03	11.9'	20° 26.12	8.6'	55.2'
21	133°46.81	• • 36.24	237° 14.94	11.8'	20°34.69	8.5'	55.3'
22 23	148°46.92 163°47.04	35.48 34.71	251°45.77 266°16.50	11.7' 11.6'	20°43.16 20°51.55	8.4' 8.3'	55.3' 55.3'
23			∠00 10.50			ŏ.3	55.3
	SD = 15.8'	d = -0.8'		SE	0 = 14.9'		

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

Lat.         Thu         Fri         Sat         Thu         Fri         Sa           N 72°         18:59         18:07         11:47         14:08         14:08         14:08         14:08         15:09         16:30	1 7
N 70°   19:19   18:48   17:21   11:29   13:29   16:3	1
	7
68°   19:34   19:16   18:46   11:15   13:02   15:0	0
66°   19:47   19:37   19:24   11:04   12:42   14:3	
64°   19:58 19:54 19:51   10:54 12:26 14:0	- 1
62° 20:07 20:09 20:12 10:46 12:13 13:4	- 1
$60^{\circ}$   20:15   20:21   20:30   10:39   12:01   13:2	6
<b>N</b> 58° 20:22 20:31 20:44 10:33 11:52 13:3	- 1
56° 20:28 20:40 20:57 10:28 11:43 13:0	- 1
54° 20:34 20:48 21:08 10:23 11:36 12:5	- 1
52° 20:39 20:56 21:17 10:19 11:29 12:4	- 1
50° 20:44 21:02 21:26 10:15 11:23 12:3	- 1
45°   20:54 21:17 21:44   10:06 11:10 12:1	- 1
<b>N</b> 40° 21:02 21:28 22:00 09:59 11:00 12:0	- 1
35° 21:09 21:39 22:12 09:54 10:51 11:4	.9
30° 21:15 21:47 22:24 09:48 10:43 11:3	- 1
20° 21:27 22:03 22:43 09:39 10:29 11:2	- 1
N 10° 21:36 22:16 23:00 09:31 10:17 11:0	- 1
0° 21:45 22:29 23:16 09:24 10:06 10:5	1
<b>S</b> 10° 21:55 22:42 23:32 09:16 09:55 10:3	7
20°   22:05   22:56   23:49   09:09   09:43   10:2	- 1
30°   22:16	- 1
35° 22:23 23:21 ···· 08:55 09:22 09:5	. 1
40° 22:30 23:31 ··· 08:49 09:14 09:4	- 1
45°   22:39	9
<b>S</b> 50° 22:50 23:59 ··· 08:34 08:51 09:3	- 1
52°   22:55 ···· 00:06   08:30 08:46 09:0	- 1
54° 23:01 ··· 00:14 08:26 08:39 08:5	- 1
56° 23:07 ··· 00:23 08:22 08:32 08:4	- 1
58° 23:14 ··· 00:34 08:17 08:25 08:3	- 1
<b>S</b> 60° 23:22 ··· 00:46 08:11 08:16 08:2	3

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	81-65%
10	05:22	05:17	12:05	03:14	15:35	
11	05:12	05:07	12:05	03:56	16:18	
12	05:02	04:57	12:05	04:40	17:03	

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

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	321°57.50	226°31.85 N20°8.35	215°8.14 N23°14.38	143°32.05 N01°55.08	282°22.00 N12°49.06
1	336°59.96	241°31.72 8.43	230°8.83 14.22	158°34.08 54.89	297°24.42 49.06
2	352°2.43	256°31.59 8.50	245°9.51 14.06	173°36.10 54.69	312°26.83 49.06
3	7°4.89	271°31.47 · · 8.57	260°10.20 · · 13.89	188°38.13 · · 54.50	
4	22°7.36	286°31.34 8.65	275°10.89 13.73	203°40.15 54.30	342°31.67 49.07
5	37°9.82	301°31.21 8.72	290° 11.58 13.57	218°42.18 54.11	357°34.09 49.07
6	52°12.29	316°31.08 N20°8.79	305°12.27 N23°13.41	233°44.21 N01°53.92	12°36.51 N12°49.08
7	$67^{\circ}14.75$	331°30.95 8.86	320° 12.97 13.24	248°46.23 53.72	27°38.93 49.08
8	$82^{\circ}17.21$	346°30.81 8.93	335°13.66 13.08	263°48.26 53.53	42°41.35 49.08
9	97° 19.68	1°30.68 · · 9.00	350°14.35 · · 12.91	278°50.28 · · 53.33	57°43.77 · · 49.09
10	112°22.14	16°30.55 9.07	5° 15.04 12.75	293°52.31 53.14	72°46.19 49.09
11	127°24.61	31°30.41 9.13	20°15.73 12.59	308°54.33 52.94	87°48.61 49.09
	142° 27.07	46°30.28 N20°9.20	35°16.42 N23°12.42	323°56.36 N01°52.75	102°51.03 N12°49.10
12					
13	157°29.53	61°30.14 9.27	50°17.11 12.26	338°58.38 52.55	117°53.45 49.10
14	172°32.00	76°30.01 9.33	65°17.80 12.09	354° 0.40 52.36	132°55.87 49.10
15	187°34.46	91°29.87 · · 9.40	80°18.50 · · 11.92	9°2.43 · · 52.17	147°58.29 · · 49.10
16	202°36.93	106°29.73 9.46	95°19.19 11.76	24°4.45 51.97	163°0.71 49.11
17	217°39.39	121°29.59 9.53	110°19.88 11.59	39° 6.48 51.78	178°3.13 49.11
18	232°41.85	136°29.45 N20°9.59	125°20.57 N23°11.42	54°8.50 N01°51.58	193°5.55 N12°49.11
19	247° 44.32			69°10.53 51.39	
20	262°46.78	166°29.17 9.71	155°21.96 11.09	84°12.55 51.19	223°10.39 49.12
21	277°49.25	181°29.03 · · 9.78	170°22.65 · · 10.92	99°14.57 · · 51.00	238°12.81 · · 49.12
22	292°51.71	196°28.88 9.84	185°23.34 10.75	114°16.60 50.80	253°15.24 49.12
23	307°54.18	211°28.74 9.90	200° 24.04 10.59	129°18.62 50.61	268°17.66 49.12
	pass. 02:32	ν-0.1' d0.1' m-4.37	ν0.7' d-0.2' m1.56	ν2.0' d-0.2' m-1.72	ν2.4' d0.0' m0.28
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	322°56.64	226°28.59 N20°9.96	215°24.73 N23°10.42	144°20.65 N01°50.41	283°20.08 N12°49.13
1	337°59.10	241°28.45 10.01	230° 25.42 10.25	159°22.67 50.22	298°22.50 49.13
2	353°1.57	256°28.30 10.07	245°26.12 10.08	174°24.69 50.02	313°24.92 49.13
3	8°4.03	271°28.15 · · 10.13	260°26.81 · · 9.91	189°26.72 · · 49.83	328°27.35 · · 49.13
4	23°6.50	286°28.01 10.19	275°27.51 9.74	204°28.74 49.63	343°29.77 49.13
5	38°8.96	301°27.86 10.24	290°28.20 9.57	219°30.76 49.44	358°32.19 49.14
6	53°11.42	316°27.71 N20°10.30	305°28.89 N23°9.40	234°32.78 N01°49.24	13°34.62 N12°49.14
7	68° 13.89	331°27.56 10.35	320°29.59 9.23	249°34.81 49.05	28°37.04 49.14
8	83° 16.35	346°27.41 10.40	335°30.28 9.06	264°36.83 48.85	43°39.46 49.14
9	98° 18.82	1°27.26 · · 10.46	350°30.98 · · 8.88	279°38.85 · · 48.66	58°41.89 · · 49.14
10	113° 21.28	16°27.10 10.51	5°31.67 8.71	294°40.88 48.46	73°44.31 49.15
11	128° 23.75		20°32.37 8.54	309°42.90 48.27	88°46.73 49.15
12	143°26.21	46°26.80 N20°10.61	35°33.07 N23°8.37	324°44.92 N01°48.07	103°49.16 N12°49.15
13	158° 28.67	61°26.64 10.66	50° 33.76 8.20	339°46.94 47.88	118°51.58 49.15
14	173°31.14	76°26.48 10.71	65°34.46 8.02	354°48.97 47.68	133°54.01 49.15
15	188°33.60	91°26.33 · · 10.76	80°35.15 · · 7.85	9°50.99 · · 47.48	148°56.43 · · 49.15
16	203°36.07	106° 26.17 10.81	95° 35.85 7.68	24°53.01 47.29	163°58.86 49.15
17	218° 38.53	121°26.01 10.86	110°36.55 7.50	39°55.03 47.09	179°1.28 49.16
18	233° 40.99	136°25.85 N20°10.90	125°37.24 N23°7.33	54°57.05 N01°46.90	194°3.71 N12°49.16
19	248° 43.46	151°25.69 10.95	140°37.94 7.15	69°59.08 46.70	209°6.13 49.16
	246 45.40 263° 45.92				
20		166°25.53 11.00	155°38.64 6.98	85° 1.10 46.51	224°8.56 49.16
21	278°48.39	181°25.37 · · 11.04	170°39.33 · · 6.80	100°3.12 · · 46.31	239°10.98 · · 49.16
22	293°50.85	196°25.21 11.09	185°40.03 6.63	115°5.14 46.11	254°13.41 49.16
23	308°53.32	211°25.05 11.13	200° 40.73 6.45	130°7.16 45.92	269°15.84 49.16
Mer.	pass. 02:28	ν-0.1' d0.1' m-4.37	ν0.7' d-0.2' m1.56	ν2.0' d-0.2' m-1.72	ν2.4' d0.0' m0.28
	-				
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	323°55.78	226°24.88 N20°11.17	215°41.43 N23°6.28	145°9.18 N01°45.72	284°18.26 N12°49.16
1	338° 58.24	241°24.72 11.21	230° 42.12 6.10	160°11.20 45.53	299°20.69 49.16
2	354°0.71	256°24.56 11.26	245°42.82 5.92	175°13.22 45.33	314°23.12 49.17
3	9°3.17	271°24.39 · · 11.30	260°43.52 · · 5.74	190°15.25 · · 45.14	329°25.54 · · 49.17
3 4	9 3.17 24°5.64	286°24.22 11.34	275° 44.22 5.57	205°17.27 44.94	344°27.97 49.17
5	39°8.10	301°24.06 11.38	290°44.92 5.39	220°19.29 44.74	359°30.40 49.17
6	54° 10.56	316°23.89 N20°11.41	305°45.61 N23°5.21	235°21.31 N01°44.55	14°32.83 N12°49.17
7	69° 13.03	331°23.72 11.45	320°46.31 5.03	250°23.33 44.35	29°35.25 49.17
8	84°15.49	346°23.55 11.49	335°47.01 4.86	265°25.35 44.16	44°37.68 49.17
9	99° 17.96	1°23.38 · · 11.53	350°47.71 · · 4.68	280°27.37 · · 43.96	59°40.11 · · 49.17
10	114°20.42	16°23.21 11.56	5°48.41 4.50	295°29.39 43.76	74°42.54 49.17
11	129° 22.89	31°23.04 11.60	20°49.11 4.32	310°31.41 43.57	89°44.97 49.17
12	144°25.35	46°22.86 N20°11.63	35°49.81 N23°4.14	325°33.43 N01°43.37	104°47.39 N12°49.17
13	159° 27.81	61°22.69 11.67	50°50.51 3.96	340°35.45 43.17	119°49.82 49.17
14	174° 30.28	76°22.52 11.70	65°51.21 3.78	355°37.47 42.98	134°52.25 49.17
15	189°32.74	91°22.34 · · 11.73	80°51.91 · · 3.60	10°39.49 · · 42.78	149°54.68 •• 49.17
16	204°35.21	106°22.17 11.76	95°52.61 3.42	25°41.51 42.58	164°57.11 49.17
17	219°37.67	121°21.99 11.79	110°53.31 3.23	40°43.53 42.39	179°59.54 49.17
18	234°40.13	136°21.81 N20°11.82	125°54.01 N23°3.05	55°45.55 N01°42.19	195°1.97 N12°49.17
19	249° 42.60	151°21.64 11.85	140°54.71 2.87	70°47.57 41.99	210°4.40 49.17
20	264° 45.06	166°21.46 11.88	155°55.42 2.69	85°49.59 41.80	225°6.83 49.17
21	279° 47.53	181°21.28 · · 11.91	170° 56.12 · · 2.51	100°51.61 · · 41.60	240°9.26 · · 49.17
22	294°49.99	196°21.10 11.94	185°56.82 2.32	115°53.63 41.40	255°11.69 49.17
23	309°52.46	211°20.92 11.97	200°57.52 2.14	130°55.65 41.21	270°14.12 49.17
N 4	00.04		-0.7/ 1.0.0/ 1.57	-20/ 400/ 170	-2.4/ -/2.0/ -2.27
Mer.p	pass. 02:24	ν-0.2' d0.0' m-4.36	ν0.7′ d-0.2′ m1.57	ν2.0' d-0.2' m-1.72	ν2.4' d0.0' m0.27

Saturn

 $320^{\circ}22.48$ 

Venus: Mars

Horizontal parallax

Stars

Dec

-42°8.68

-57°5.11

4°12.22

 $-8^{\circ}10.02$ 

46°1.38

6°22.54

 $-1^{\circ}10.98$ 

 $7^{\circ}24.73$ 

-29°0.56

-8°46.99

19°2.15

 $74^{\circ}2.52$ 

-16°9.65

-69°4.87

-37°7.45

8°56.88

 $10^{\circ}0.60$ 

Mer.pass

08:54

09:39

14:24

05:10

08:54

09:38

14:21

05:06

08:54

09:37

14:17

05:02

0.2

0.1

 $5^{\circ}9.07$ 

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h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.15	N14°33.95	280°47.15	11.6'	N20°59.85	8.2'	55.3'
1	193°47.26	33.18	295°17.70	11.5'	21°8.06	8.1'	55.4'
2	208°47.38	32.42	309°48.17	11.4'	21°16.17	8.0'	55.4'
3 4	223°47.49 238°47.60	· · 31.65 30.89	324°18.55 338°48.83	11.3' 11.2'	21°24.19 21°32.12	7.9' 7.8'	55.4' 55.5'
5	253°47.72	30.12	353°19.03	11.1'	21°39.95	7.7'	55.5'
6	268°47.83	N14°29.36	7°49.14	11.0'	N21°47.69	7.6'	55.5'
7	283°47.95	28.59	$22^{\circ}19.15$	10.9'	$21^{\circ}55.33$	7.5'	55.5'
8	298°48.06	27.82	36°49.07	10.8'	22°2.87	7.4'	55.6'
9 10	313°48.18 328°48.29	· · 27.06 26.29	51°18.91 65°48.65	10.7' 10.6'	22°10.31 22°17.64	7.3' 7.2'	55.6' 55.6'
11	343°48.41	25.52	80°18.30	10.6'	22°24.88	7.1	55.7'
12	358°48.52	N14°24.75	94°47.85	10.5'	N22°32.02	7.0'	55.7'
13	13°48.64	23.98	109°17.32	10.4'	22°39.05	6.9'	55.7'
14	28°48.76	23.21	123°46.69	10.3'	22°45.97	6.8'	55.7'
15 16	43°48.87 58°48.99	· · 22.44 21.67	138°15.98 152°45.17	10.2' 10.1'	22°52.79 22°59.50	6.7' 6.6'	55.8' 55.8'
17	73°49.11	20.90	167°14.26	10.0'	23°6.10	6.5	55.8'
18	88°49.22	N14°20.13	181°43.27	9.9'	N23°12.59	6.4	55.9'
19	103°49.34	19.36	196°12.19	9.8'	$23^{\circ}18.97$	6.3'	55.9'
20	118°49.46	18.58	210°41.01	9.7'	23°25.24	6.2'	55.9'
21 22	133°49.58 148°49.70	17.81	225°9.74 239°38.38	9.6' 9.5'	23°31.40 23°37.44	6.0' 5.9'	56.0'
23	148°49.70 163°49.81	17.04 16.27	239°38.38 254°6.93	9.5' 9.5'	23°43.37	5.9 5.8'	56.0' 56.0'
	SD = 15.8'	d = -0.8'			0 = 15.1'	2.0	
	JD — 13.0	u — -0.0		JL	, — 13.1		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°49.93	N14°15.49	268°35.39 283°3.76	9.4'	N23°49.17	5.7'	56.1'
1 2	193°50.05 208°50.17	14.72 13.94	283°3.76 297°32.04	9.3' 9.2'	23°54.87 24°0.44	5.6' 5.5'	56.1' 56.1'
3	208 50.17 223°50.29	. 13.17	312°0.23	9.1	24° 5.89	5.3'	56.2
4	238°50.41	12.39	326°28.32	9.0'	24°11.22	5.2'	56.2
5	253°50.53	11.62	340°56.33	8.9'	$24^{\circ}16.43$	5.1'	56.2'
6	268°50.65	N14°10.84	355°24.25	8.8'	N24°21.52	5.0'	56.3'
7 8	283°50.77 298°50.89	10.07 9.29	9°52.08 24°19.83	8.7' 8.7'	24°26.48 24°31.31	4.8' 4.7'	56.3' 56.3'
9	313°51.01	• • 8.51	24 19.65 38°47.48	8.6'	24°36.02	4.7 4.6'	56.4'
10	328°51.13	7.73	53°15.05	8.5'	24°40.60	4.5'	56.4
11	343°51.25	6.96	67°42.54	8.4'	24°45.05	4.3'	56.4'
12	358°51.37	N14°6.18	82°9.93	8.3'	N24°49.38	4.2'	56.5'
13 14	13°51.50 28°51.62	5.40 4.62	96°37.25 111°4.48	8.2' 8.1'	24°53.57 24°57.63	4.1' 3.9'	56.5' 56.5'
15	43°51.74	• • 3.84	125°31.62	8.1	24 57.05 25°1.55	3.8'	56.6
16	58°51.86	3.06	139°58.68	8.0'	25°5.34	3.7'	56.6'
17	73°51.98	2.28	154°25.66	7.9'	$25^{\circ}9.00$	3.5'	56.6'
18	88°52.11	N14°1.50	168°52.56	7.8'	N25°12.52	3.4'	56.7'
19 20	103°52.23 118°52.35	14°0.72 13°59.94	183°19.37 197°46.11	7.7' 7.7'	25°15.90 25°19.14	3.2' 3.1'	56.7' 56.8'
21	133°52.48	. 59.16	212°12.77	7.6'	25°22.24	3.0'	56.8
22	148°52.60	58.37	226°39.35	7.5'	25°25.21	2.8'	56.8'
23	163°52.72	57.59	241°5.85	7.4'	25°28.03	2.7'	56.9'
	SD = 15.8'	d = -0.8'		SE	0 = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	178°52.85	N13°56.81	255°32.28	ν 7.4'	N25°30.71	2.5'	56.9'
1	193°52.97	56.02	$269^{\circ}58.63$	7.3'	25°33.24	2.4'	56.9'
2	208°53.10	55.24	284°24.91	7.2'	25°35.63	2.2'	57.0'
3 4	223°53.22 238°53.35	•• 54.46 53.67	298°51.12 313°17.25	7.1' 7.1'	25°37.88 25°39.98	2.1' 2.0'	57.0' 57.1'
4 5	258° 53.35° 253° 53.47°	53.67 52.89	313 17.25 327°43.31	7.1 7.0'	25 39.98 25°41.93	2.0 1.8'	57.1'
6	268°53.60	N13°52.10	342°9.31	6.9'	N25°43.73	1.7'	57.1
7	283°53.72	51.32	356°35.23	6.9'	25°45.38	1.5'	57.2'
8	298°53.85	50.53	11°1.09	6.8'	25°46.89	1.4'	57.2'
9 10	313°53.97 328°54.10	· · 49.74 48.96	25°26.88 39°52.61	6.7' 6.7'	25°48.24 25°49.44	1.2' 1.0'	57.2' 57.3'
10	343°54.23	48.96 48.17	54°18.27	6. <i>1</i> 6.6'	25 49.44 25°50.49	0.9'	57.3'
12	358°54.35	N13°47.38	68°43.88	6.5'	N25°51.39	0.7'	57.4'
13	13°54.48	46.59	83°9.42	6.5'	25°52.13	0.6'	57.4'
14	28°54.61	45.80	97°34.90	6.4'	25°52.72	0.4'	57.4'
15 16	43°54.73 58°54.86	· · 45.02 44.23	112°0.33 126°25.70	6.4' 6.3'	25°53.15 25°53.42	0.3' 0.1'	57.5' 57.5'
16 17	73°54.99	44.23 43.44	120 25.70 140°51.01	6.3	25 53.42 25°53.54	-0.0'	57.5' 57.6'
18	88°55.12	N13°42.65	$155^{\circ}16.27$	6.2'	N25°53.50	-0.2'	57.6'
19	103°55.24	41.86	169°41.48	6.2'	25°53.30	-0.4	57.6'
20	118°55.37	41.07	184°6.64	6.1'	25°52.94	-0.5'	57.7'
21 22	133°55.50 148°55.63	· · 40.27 39.48	198°31.75 212°56.81	6.1' 6.0'	25°52.42 25°51.75	-0.7' -0.8'	57.7' 57.8'
23	163°55.76	38.69	212 50.81 227°21.83	6.0'	25°50.91	-1.0'	57.8'
	SD = 15.8'	d = -0.8'			0 = 15.5'		
					10.0		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	55-35%
13	04:51	04:46	12:05	05:28	17:53	
14	04:40	04:35	12:05	06:19	18:46	
15	04:29	04:23	12:04	07:14	19:43	

### August 16, 17, 18 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn
\A/ad	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Wed					1
0	324°54.92	226°20.74 N20°11.99	215°58.22 N23°1.96	145°57.67 N01°41.01	285°16.55 N12°49.17
1	339° 57.38	241°20.56 12.02	230°58.92 1.77	160°59.68 40.81	300°18.98 49.17
2	354° 59.85	256°20.37 12.04	245°59.63 1.59	176° 1.70 40.62	315°21.41 49.17
3	10°2.31	271°20.19 · · 12.07	261°0.33 · · 1.41	191°3.72 · · 40.42	330°23.84 · · 49.17
4	25°4.78	286°20.01 12.09	276°1.03 1.22	206° 5.74 40.22	345°26.27 49.17
5	40°7.24	301°19.82 12.11	291°1.74 1.04	221°7.76 40.03	0°28.71 49.17
6	55°9.71	316°19.64 N20°12.13	306°2.44 N23°0.85	236° 9.78 N01° 39.83	15°31.14 N12°49.17
7	70° 12.17	331°19.45 12.15	321°3.14 0.66	251°11.80 39.63	30°33.57 49.17
8	85° 14.63	346°19.26 12.17	336°3.84 0.48	266°13.81 39.44	45°36.00 49.16
	100° 17.10				
9			351°4.55 · · 0.29	281°15.83 · · 39.24	
10	115° 19.56	16° 18.89 12.21	6°5.25 23°0.11	296°17.85 39.04	75°40.87 49.16
11	130°22.03	31°18.70 12.23	21°5.96 22°59.92	311°19.87 38.84	90°43.30 49.16
12	145°24.49	46°18.51 N20°12.25	36°6.66 N22°59.73	326°21.89 N01°38.65	105°45.73 N12°49.16
13	160°26.95	61°18.32 12.27	51°7.36 59.55	341°23.91 38.45	120°48.17 49.16
14	175°29.42	76°18.13 12.28	66°8.07 59.36	356°25.92 38.25	135°50.60 49.16
15	190°31.88	91°17.93 · · 12.30	81°8.77 · · 59.17	11°27.94 · · 38.06	150°53.03 · · 49.16
16	205°34.35	106° 17.74 12.31	96°9.48 58.98	26°29.96 37.86	165°55.47 49.16
17	220°36.81	121°17.55 12.33	111° 10.18 58.79	41°31.98 37.66	180°57.90 49.15
18	235°39.28	136°17.35 N20°12.34	126°10.89 N22°58.60	56°33.99 N01°37.46	196°0.33 N12°49.15
19	250°41.74	151°17.16 12.35	141°11.59 58.42	71°36.01 37.27	211°2.77 49.15
20	265°44.20	166°16.96 12.36	156°12.30 58.23	86°38.03 37.07	226°5.20 49.15
21	280° 46.67	181°16.77 · · 12.37	171°13.01 · · 58.04	101°40.04 · · 36.87	241°7.64 · · · 49.15
22	280 46.67 295°49.13	196°16.57 12.39		116°42.06 36.67	
23	310°51.60	211°16.37 12.40	201°14.42 57.66	131°44.08 36.48	271°12.51 49.14
Mer.	pass. 02:20	ν-0.2′ d0.0′ m-4.35	ν0.7' d-0.2' m1.57	ν2.0′ d-0.2′ m-1.71	ν2.4' d-0.0' m0.27
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	325°54.06	226°16.17 N20°12.40	216°15.12 N22°57.47	146°46.10 N01°36.28	286°14.94 N12°49.14
1	340° 56.52	241°15.97 12.41	231°15.83 57.27	161°48.11 36.08	301°17.38 49.14
2	355°58.99	256° 15.77 12.42	246°16.54 57.08	176°50.13 35.88	316°19.81 49.14
3	11°1.45	271°15.57 · · 12.43	261°17.24 · · 56.89	191°52.15 · · 35.68	331°22.25 · · 49.14
4	26°3.92	286°15.37 12.43	276°17.95 56.70	206°54.16 35.49	346°24.68 49.14
5	41°6.38	301°15.17 12.44	291°18.66 56.51	200 54.10 35.49 221°56.18 35.29	1°27.12 49.13
6	56°8.85	316°14.97 N20°12.44	306°19.37 N22°56.31	236°58.19 N01°35.09	16°29.55 N12°49.13
	71°11.31		321°20.07 56.12		31°31.99 49.13
7					
8	86° 13.77 101° 16.24		336°20.78 55.93 351°21.49 • 55.74		
9					
10	116° 18.70	16°14.15 12.45	6°22.20 55.54	297° 6.26 34.30	76°39.30 49.12
11	131°21.17	31°13.95 12.45	21°22.91 55.35	312°8.28 34.10	91°41.74 49.12
12	146°23.63	46°13.74 N20°12.45	36°23.62 N22°55.15	327°10.29 N01°33.90	106°44.17 N12°49.12
13	161°26.10	61°13.53 12.45	51°24.32 54.96	342°12.31 33.71	121°46.61 49.12
14	176°28.56	76°13.32 12.45	66°25.03 54.76	357°14.32 33.51	136°49.05 49.11
15	191°31.02	91°13.12 · · 12.45	81°25.74 · · 54.57	12°16.34 · · 33.31	151°51.49 · · 49.11
16	206°33.49	106°12.91 12.45	96°26.45 54.37	27°18.35 33.11	166°53.92 49.11
17	221°35.95	121°12.70 12.45	111°27.16 54.18	42°20.37 32.91	181°56.36 49.11
18	236°38.42	136°12.49 N20°12.44	126°27.87 N22°53.98	57°22.38 N01°32.71	196°58.80 N12°49.10
19	251°40.88	151°12.28 12.44	141°28.58 53.79	72°24.40 32.52	212°1.24 49.10
20	266° 43.34	166°12.06 12.43	156°29.29 53.59	87°26.41 32.32	227°3.68 49.10
21	281°45.81	181°11.85 · · 12.42	171°30.00 · · 53.39	102°28.43 · · 32.12	242°6.12 · · 49.09
22	296° 48.27	196°11.64 12.42	186°30.71 53.20	117°30.44 31.92	257°8.56 49.09
23	311°50.74	211°11.42 12.41	201°31.42 53.00	132°32.46 31.72	272°10.99 49.09
Mer.	pass. 02:16	ν-0.2' d0.0' m-4.34	ν0.7' d-0.2' m1.57	ν2.0' d-0.2' m-1.71	ν2.4' d-0.0' m0.26
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	326°53.20	226°11.21 N20°12.40	216°32.13 N22°52.80	147°34.47 N01°31.52	287°13.43 N12°49.08
1	341°55.67	241°10.99 12.39	231°32.84 52.60	162°36.49 31.33	302°15.87 49.08
2	$356^{\circ}58.13$	256° 10.78 12.38	246°33.56 52.40	177°38.50 31.13	317°18.31 49.08
3	12°0.59	271°10.56 · · 12.37	261°34.27 · · 52.21	192°40.52 · · 30.93	332°20.75 · · 49.08
4	27°3.06	286° 10.34 12.36	276°34.98 52.01	207°42.53 30.73	347°23.19 49.07
5	42°5.52	301°10.13 12.35	291°35.69 51.81	222°44.55 30.53	2°25.63 49.07
6	57°7.99	316°9.91 N20°12.33	306°36.40 N22°51.61	237°46.56 N01°30.33	17°28.07 N12°49.06
7	$72^{\circ}10.45$	331°9.69 12.32	321°37.11 51.41	252°48.57 30.13	32°30.51 49.06
8	$87^{\circ}12.91$	346° 9.47 12.31	336° 37.83 51.21	267°50.59 29.93	47°32.96 49.06
9	$102^{\circ}15.38$	1°9.25 · · 12.29	351°38.54 · · 51.01	282°52.60 · · 29.74	62°35.40 · · 49.05
10	$117^{\circ}17.84$	16°9.03 12.27	6°39.25 50.81	297°54.62 29.54	77°37.84 49.05
11	132°20.31	31°8.81 12.26	21°39.96 50.60	312°56.63 29.34	92°40.28 49.05
12	147°22.77	46°8.58 N20°12.24	36°40.68 N22°50.40	327°58.64 N01°29.14	107°42.72 N12°49.04
13	162°25.24	61°8.36 12.22	51°41.39 50.20	343°0.66 28.94	122°45.16 49.04
14	177°27.70	76°8.14 12.20	66° 42.10 50.00	358° 2.67 28.74	137°47.60 49.04
15	192°30.16	91°7.91 · · 12.18	81°42.82 · · 49.80	13°4.68 · · 28.54	152°50.05 · · 49.03
16	207°32.63	106°7.69 12.16	96°43.53 49.60	28° 6.70 28.34	167°52.49 49.03
17	222°35.09	121°7.46 12.14	111°44.25 49.39	43°8.71 28.14	182°54.93 49.02
18	237° 37.56	136°7.23 N20°12.12	126°44.96 N22°49.19	58°10.72 N01°27.95	197°57.37 N12°49.02
19	252°40.02	150 7.23 N20 12.12 151°7.01 12.10	141°45.67 48.99	73°12.74 27.75	212°59.82 49.02
20	267°42.48	166°6.78 12.07	156°46.39 48.78	88°14.75 27.55	228°2.26 49.01
21	282°44.95	181°6.55 · · 12.05	171°47.10 · · 48.58	103°16.76 · · 27.35	243°4.70 · · 49.01
22	297°47.41	196°6.32 12.02	186° 47.82 48.37	118°18.77 27.15	258°7.14 49.00
23	312°49.88	211°6.09 12.00	201°48.53 48.17	133°20.79 26.95	273° 9.59 49.00
Mer.۱	pass. 02:12	$\nu$ -0.2′ <i>d</i> -0.0′ m-4.33	$ u 0.7' \; d\text{-}0.2' \; \text{m}1.57$	$\nu 2.0' \ d$ -0.2' m-1.71	$ u 2.4' \ d$ -0.0' m0.26

Stars SHA

 $357^{\circ}31.38$ 

353°3.99

349°27 14

348°44.13

 $335^{\circ}17.82$ 

 $327^{\circ}47.70$ 

312°22.46

 $315^{\circ}9.51$ 

314°3.01

308°23.93

290°36.31

281°1.17

280°17.71

 $278^{\circ}19.86$ 

277°58.30

275°34.90

 $270^{\circ}49.08$ 

263°51.44

258°23.88

255°3.82

244°48.03

 $243^{\circ}14.04$ 

234°14.07

222°44.53

221°38.45

217°45.17

207°31.64

193°38.17

182°22.23

175°40.77

 $172^{\circ}57.14$ 

171°48.64

 $166^{\circ}10.85$ 

158°19.33

152°49.97

148°31.90

147°54.21

145°45.34

139°36.26

 $137^{\circ}20.28$ 

 $136^{\circ}52.78$ 126°1.25

112°12 09

107°3.37

101°59.24

 $96^{\circ}6.13$ 

 $95^{\circ}55.63$ 

90°40.50

83°28.33

80°30.91

75°43.83

61°56.78

49°23.29

33°35.56

27°28.83

15°10.96

13°41.96

13°26.62

SHA

261°25.82

251°3.30

 $181^{\circ}2.75$ 

 $320^{\circ}21.63$ 

SHA

 $260^{\circ}22.11$ 

250°21.06

180°52.03

320°20.88

SHA

259°18.01

249°38.93

 $180^{\circ}41.27$ 

 $320^{\circ}20.23$ 

Venus: Mars

 $53^{\circ}\,0.60$ 

Alpheratz

Ankaa Schedar

Diphda Achernar

Hamal

Polaris

Acamar

Menkar

Mirfak

Capella

Bellatrix

Elnath

Alnilam

Betelgeuse

Canopus

Sirius

Adhara

Procyon

Miaplacidus

Alphard

Regulus

Pollux

Avior Suhail

Aldebaran Rigel Dec

29°15.01

-42°8.68

56°41 62 -17°49.50

 $-57^{\circ}5.11$ 

23°35.89

89°22.69 40°11.06

4°12.22

49°57.57

16°33.98

 $-8^{\circ}10.01$ 

46°1.38

 $6^{\circ}22.55$ 

28°37.76

 $-1^{\circ}10.97$ 

 $7^{\circ}24.73$ 

-52°42.44

-16°45.24

-29°0.55

 $27^{\circ}57.31$ 

-59°36.02

-43°32.90

-69°50.11

-8°46.99

11°49.62

61°35.83

 $14^{\circ}24.76$ 

-17°42.12

-63°15.71

-57°16.64

55°48.44 -11°18.66

49°10.43 -60°30.90

-36°30.78

 $19^{\circ}2.15$ 

-60°57.46  $74^{\circ}2.52$ 

-16°9.64

26°37.32

-26°29.71

-69°4.88

-15°45.52

 $-37^{\circ}7.45$ 

 $12^{\circ}32.58$ 

51°29.41

-34°22.17 38°48.90

-26°15.53 8°56.89

-56°38.42

45°23.18

 $10^{\circ}0.62$ 

-46°49.08

-29°27.95

28°14.45

15°21.76

Mer.pass

08:55

09:36

14:14

04:58

08:55

09:35

14:11

04:54

09:33

14:08

04:50

0.2

0.1

Mer.pass 08:55

Mer.pass

 $5^{\circ}9.07$ 

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.89	$N13^{\circ}37.90$	241°46.80	5.9'	$N25^{\circ}49.91$	-1.2'	57.8'
1	193°56.02	37.11	256°11.73	5.9'	25°48.75	-1.3'	57.9'
2 3	208°56.15 223°56.28	36.31 · · 35.52	270°36.62 285°1.47	5.8' 5.8'	25°47.42 25°45.93	-1.5' -1.7'	57.9' 57.9'
4	238°56.41	34.73	299° 26.28	5.8'	25°44.28	-1.8'	58.0'
5	253°56.54	33.93	313°51.06	5.7'	25°42.47	-2.0'	58.0'
6 7	268°56.67 283°56.80	N13° 33.14 32.34	328°15.80 342°40.51	5.7' 5.7'	N25°40.49 25°38.35	-2.1' -2.3'	58.1' 58.1'
8	298°56.93	31.55	357°5.19	5.6'	25°36.04	-2.5'	58.1
9	313°57.06	• • 30.75	11°29.84	5.6'	25°33.56	-2.6'	58.2'
10	328°57.19 343°57.32	29.96	25°54.46	5.6'	25°30.92	-2.8'	58.2'
11 12	343°57.32 358°57.46	29.16 N13°28.36	40° 19.06 54° 43.63	5.6' 5.5'	25°28.12 N25°25.15	-3.0' -3.1'	58.3' 58.3'
13	13°57.59	27.57	69°8.18	5.5'	25°22.01	-3.3'	58.3'
14	28°57.72	26.77	83°32.70	5.5'	25°18.70	-3.5'	58.4'
15 16	43°57.85 58°57.99	· · 25.97 25.17	97°57.21 112°21.70	5.5' 5.5'	25°15.23 25°11.60	-3.6' -3.8'	58.4' 58.5'
17	73°58.12	24.37	112 21.70 126°46.18	5.5'	25°7.79	-3.6 -4.0'	58.5'
18	88°58.25	N13°23.57	141°10.64	5.4'	N25°3.82	-4.1'	58.5'
19	103°58.39	22.78	155°35.09	5.4'	24°59.68	-4.3'	58.6'
20 21	118°58.52 133°58.65	21.98 •• 21.18	169°59.53 184°23.96	5.4' 5.4'	24°55.38 24°50.91	-4.5' -4.6'	58.6' 58.7'
22	148°58.79	20.37	198° 48.39	5.4'	24° 46.27	-4.8'	58.7'
23	163°58.92	19.57	213° 12.80	5.4'	24°41.46	-5.0'	58.7'
	SD = 15.8'	d = -0.8'		S	D = 15.8'		
<b>-</b> .						,	
Thu 0	<b>GHA</b> 178° 59.06	<b>Dec</b> N13° 18.77	<b>GHA</b> 227° 37.22	u 5.4'	<b>Dec</b> N24°36.49	d -5.1'	<b>HP</b> 58.8'
1	193°59.19	17.97	242°1.63	5.4'	24°31.35	-5.3'	58.8'
2	208°59.33	17.17	256° 26.04	5.4'	24°26.05	-5.5'	58.9'
3	223°59.46 238°59.60	16.37	270°50.45 285°14.87	5.4'	24°20.58 24°14.94	-5.6'	58.9'
4 5	253°59.60 253°59.73	15.56 14.76	285 14.87 299°39.28	5.4' 5.4'	24 14.94 24°9.14	-5.8' -6.0'	58.9' 59.0'
6	268°59.87	N13° 13.96	314°3.71	5.4'	N24°3.18	-6.1	59.0'
7	284°0.00	13.15	328°28.14	5.4'	23°57.04	-6.3	59.1'
8 9	299°0.14 314°0.28	12.35 •• 11.55	342°52.58 357°17.03	5.5' 5.5'	23°50.75 23°44.29	-6.5' -6.6'	59.1' 59.1'
10	329°0.41	10.74	11°41.50	5.5'	23°37.67	-0.0 -6.8'	59.1 59.2'
11	344°0.55	9.94	26°5.97	5.5'	23°30.88	-6.9'	59.2'
12	359°0.69	N13°9.13	40°30.47	5.5'	N23°23.93	-7.1'	59.2'
13 14	14°0.82 29°0.96	8.32 7.52	54°54.98 69°19.50	5.5' 5.5'	23°16.82 23°9.55	-7.3' -7.4'	59.3' 59.3'
15	44°1.10	. 6.71	83°44.05	5.6'	23°2.12	-7.6'	59.4'
16	59°1.24	5.90	98°8.61	5.6'	22°54.52	-7.8'	59.4'
17 18	74°1.37 89°1.51	5.10 N13°4.29	112°33.20 126°57.81	5.6' 5.6'	22°46.77 N22°38.86	-7.9' -8.1'	59.4' 59.5'
19	104°1.65	3.48	141°22.45	5.0 5.7'	22°30.79	-8.2'	59.5'
20	119°1.79	2.67	155° 47.11		22°22.56	-8.4'	59.5'
21	134°1.93	• • 1.86	170°11.80	5.7'	22°14.18	-8.5'	59.6'
22 23	149°2.07 164°2.21	1.05 0.24	184°36.51 199°1.26	5.7' 5.8'	22°5.64 21°56.94	-8.7' -8.8'	59.6' 59.6'
	SD = 15.8'	d = -0.8'			D = 16.0'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d 0.0'	HP
0 1	179°2.35 194°2.49	N12°59.43 58.62	213°26.03 227°50.84	5.8' 5.8'	N21°48.09 21°39.09	-9.0' -9.2'	59.7' 59.7'
2	209°2.63	57.81	242°15.68	5.9'	21°29.94	-9.3'	59.7'
3	224°2.77	• • 57.00	256° 40.56	5.9'	21°20.63	-9.5'	59.8'
4 5	239°2.91 254°3.05	56.19 55.38	271°5.47 285°30.41	5.9' 6.0'	21°11.18 21°1.57	-9.6' -9.8'	59.8' 59.8'
6	269°3.19	N12°54.57	299°55.39	6.0'	N20°51.82	-9.9'	59.9'
7	284°3.33	53.76	314°20.41	6.1'	$20^{\circ}41.92$	-10.0'	59.9'
8	299°3.47 314°3.61	52.94	328° 45.47 343° 10.57	6.1'	20°31.87 20°21.68	-10.2'	59.9'
9 10	314°3.61 329°3.75	· · 52.13 51.32	343°10.57 357°35.71	6.1' 6.2'	20°21.68 20°11.34	-10.3' -10.5'	60.0' 60.0'
11	344°3.90	50.50	12°0.88	6.2	20°0.87	-10.6'	60.0
12	359°4.04	N12°49.69	26°26.10	6.3'	N19°50.25	-10.8'	60.1'
13 14	14°4.18 29°4.32	48.87 48.06	40°51.37 55°16.67	6.3' 6.3'	19°39.49 19°28.59	-10.9' -11.0'	60.1' 60.1'
14 15	29°4.32 44°4.46	48.06	69° 42.02	6.4	19°28.59 19°17.55	-11.0 -11.2'	60.1
16	59°4.61	46.43	84°7.42	6.4'	$19^{\circ}6.38$	-11.3'	60.2'
17	74°4.75	45.61	98°32.86	6.5'	18°55.07	-11.4'	60.2'
18 19	89°4.89 104°5.04	N12°44.80 43.98	112°58.34 127°23.87	6.5' 6.6'	N18°43.63 18°32.06	-11.6' -11.7'	60.3' 60.3'
20	104 5.04 119°5.18	43.98	127 23.87 141°49.45	6.6'	18° 32.06 18° 20.35	-11.7 -11.8'	60.3
21	134°5.33	• • 42.34	156° 15.07	6.7'	$18^{\circ}8.52$	-12.0'	60.3'
22 23	149°5.47 164°5.61	41.53	170°40.75 185°6.47	6.7' 6.8'	17°56.56 17°44.47	-12.1'	60.4' 60.4'
23		40.71	100-0.47			-12.2'	00.4
	SD = 15.8'	d = -0.8'		- 5	D = 16.3'		

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

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

		Sun		Moon		
Day	Eqn.of	Eqn.of Time		Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-9%
16	04:16	04:10	12:04	08:12	20:42	
17	04:04	03:57	12:04	09:11	21:41	
18	03:51	03:44	12:04	10:10	22:39	

### August 19, 20, 21 UT (Sat., Sun., Mon.)

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn	
Sat	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	327°52.34		°11.97	216°49.25	N22°47.96	148°22.80	N01°26.75	288°12.03	N12°48.99	
1	342°54.80	241°5.63	11.94	231°49.97	47.76	163°24.81	26.55	303°14.48	48.99	Alpheratz
2	357° 57.27	256°5.40	11.92	246° 50.68	47.55	178°26.82	26.35	318°16.92	48.98	Ankaa
3	12°59.73		11.89	261°51.40	• • 47.35	193°28.84	• • 26.15	333°19.36	• • 48.98	Schedar Diphda
4	28°2.20	286°4.94	11.86	$276^{\circ}52.11$	47.14	208°30.85	25.95	$348^{\circ}21.81$	48.98	Achernar
5	43°4.66	301°4.70	11.83	291°52.83	46.94	223°32.86	25.75	3°24.25	48.97	Hamal
6	58°7.13		°11.80	306°53.55	N22°46.73	238°34.87	N01°25.55	18°26.70	N12°48.97	Polaris
7	73°9.59	331°4.24	11.77	321°54.26	46.52	253°36.89	25.35	33°29.14	48.96	Acamar
8	88° 12.05	346°4.00 1°3.77 · ·	11.73	336°54.98	46.32 •• 46.11	268°38.90 283°40.91	25.15	48°31.59	48.96	Menkar
9 10	103° 14.52 118° 16.98	1 3.77 · · · 16°3.53	11.70 11.67	351°55.70 6°56.41	· · 46.11 45.90	283 40.91 298°42.92	· · 24.95 24.75	63°34.03 78°36.48	· · 48.95 48.95	Mirfak
11	133° 19.45	31°3.29	11.63	21°57.13	45.69	313°44.93	24.75	93°38.92	48.94	Aldebaran
12	148°21.91		°11.60	36° 57.85	N22°45.48	328°46.94	N01°24.36	108°41.37	N12°48.94	Rigel
13	163°24.37	61°2.82	11.56	51°58.57	45.27	343°48.96	24.16	123°43.82	48.93	Capella
14	178° 26.84	76°2.58	11.52	66° 59.29	45.07	358°50.97	23.96	138°46.26	48.93	Bellatrix
15	193°29.30	91°2.34 · ·	11.48	82°0.00	• • 44.86	13°52.98	• • 23.76	153°48.71	• • 48.92	Elnath Alnilam
16	208°31.77	106°2.10	11.45	97°0.72	44.65	28°54.99	23.56	168°51.15	48.92	Betelgeuse
17	223°34.23	121°1.86	11.41	112°1.44	44.44	43°57.00	23.36	183°53.60	48.91	Canopus
18	238° 36.69		°11.37	127°2.16	N22°44.23	58°59.01	N01°23.16	198°56.05	N12°48.90	Sirius
19	253°39.16	151°1.37	11.32	142°2.88	44.02	74° 1.02	22.96	213°58.50	48.90	Adhara
20 21	268° 41.62 283° 44.09	166°1.13 181°0.89 · ·	11.28 11.24	157°3.60 172°4.32	43.81 •• 43.59	89° 3.03 104° 5.04	22.76 •• 22.56	229°0.94 244°3.39	48.89 •• 48.89	Procyon
22	298° 46.55	196° 0.65	11.24	172 4.32 187°5.04	43.38	119° 7.06	22.36	259°5.84	48.88	Pollux
23	313° 49.02	211°0.40	11.15	202°5.76	43.17	134° 9.07	22.16	274°8.29	48.88	Avior
		-				-				Suhail
Mer.p	pass. 02:08	ν-0.2′ d-0.0′ n	1-4.32	$\nu$ 0.7' d-0	0.2′ m1.57	$\nu^{2.0'} d^{-0}$	.2′ m-1.71	$\nu^{2.4'} d^{-0}$	.0′ m0.25	Miaplacidus
										Alphard Regulus
Sun	GHA		Оес	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe
0	328°51.48		°11.11	217°6.48	N22°42.96	149°11.08	N01°21.96	289°10.73	N12°48.87	Denebola
1	343°53.94	240°59.91	11.06	232°7.20	42.75	164°13.09	21.76	304°13.18	48.86	Gienah
2	358° 56.41 13° 58.87	255°59.67 270°59.42	11.02 10.97	247°7.92 262°8.64	42.54 •• 42.32	179°15.10 194°17.11	21.56 •• 21.36	319°15.63 334°18.08	48.86 •• 48.85	Acrux
4	29°1.34	285°59.17	10.97	277°9.36	42.32	209°19.12	21.16	349°20.53	48.85	Gacrux
5	44°3.80	300°58.92	10.87	292°10.08	41.90	224°21.13	20.96	4°22.98	48.84	Alioth
6	59°6.26		°10.82	307° 10.80	N22°41.68	239°23.14	N01°20.75	19°25.43	N12°48.83	Spica Alkaid
7	74°8.73	330°58.43	10.77	$322^{\circ}11.52$	41.47	254°25.15	20.55	34°27.87	48.83	Hadar
8	89°11.19	345°58.18	10.72	337° 12.25	41.25	269°27.16	20.35	49°30.32	48.82	Menkent
9	104° 13.66		10.67	352°12.97	• • 41.04	284°29.17	• • 20.15	64°32.77	• • 48.82	Arcturus
10 11	119° 16.12 134° 18.58	15°57.68 30°57.43	10.62 10.57	7°13.69 22°14.41	40.83 40.61	299°31.18 314°33.19	19.95 19.75	79°35.22 94°37.67	48.81 48.80	Rigil Kent.
12	149°21.05		°10.51	37° 15.13	N22°40.40	329°35.20	N01°19.55	109°40.12	N12°48.80	Kochab
13	164°23.51	60°56.92	10.46	52° 15.86	40.18	344°37.21	19.35	124°42.57	48.79	Zuben'ubi
14	179°25.98	75°56.67	10.40	$67^{\circ}16.58$	39.96	359°39.22	19.15	139°45.02	48.78	Alphecca Antares
15	194°28.44		10.35	82°17.30	• • 39.75	14°41.23	•• 18.95	154°47.48	• • 48.78	Antares
16	209°30.90	105°56.16	10.29	97° 18.03	39.53	29°43.23	18.75	169°49.93	48.77	Sabik
17	224°33.37	120°55.91	10.23	112°18.75	39.31	44°45.24	18.55	184°52.38	48.76	Shaula
18 19	239°35.83 254°38.30	135°55.65 N20 150°55.39	°10.17 10.11	127° 19.47 142° 20.20	N22°39.10 38.88	59°47.25 74°49.26	N01°18.35 18.15	199°54.83 214°57.28	N12°48.76 48.75	Rasalhague
20	269° 40.76	165° 55.14	10.11	157° 20.92	38.66	89°51.27	17.95	214 57.26 229°59.73	48.74	Eltanin
21	284° 43.23		• 9.99	172° 21.64	• • 38.44	104°53.28	17.75	245°2.18	• • 48.74	Kaus Aust.
22	299° 45.69	195°54.62	9.93	187°22.37	38.23	119°55.29	17.55	260°4.64	48.73	Vega
23	314°48.15	210°54.37	9.87	202°23.09	38.01	134°57.30	17.35	275°7.09	48.72	Nunki Altair
Mari	pass. 02:04	ν-0.2' d-0.0' n	. / 21	0 7/ 4.0	0.2′ m1.57		.2′ m-1.70		.0′ m0.25	Peacock
- Ivier.	Dass. 02.04	ν-0.2 α-0.0 II	1-4.31	νο.τ u-0	7.2 1111.57	ν2.0 α-0	.2 111-1.70	ν2.4 u-0	.0 1110.25	Deneb
										Enif
Mon	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir
0	329°50.62		0°9.80	217°23.82	N22°37.79	149°59.31	N01°17.14	290°9.54	N12°48.71	Fomalhaut
1	344°53.08 359°55.55	240° 53.85 255° 53.59	9.74	232°24.54	37.57	165° 1.31 180° 3.32	16.94	305°11.99 320°14.45	48.71	Scheat
2 3	359 55.55 14°58.01		9.68 • 9.61	247°25.27 262°25.99	37.35 · · 37.13	180 3.32 195° 5.33	16.74 •• 16.54	320 14.45 335°16.90	48.70 •• 48.69	Markab
4	30°0.47	285°53.07	9.54	277° 26.72	36.91	210°7.34	16.34	350°19.35	48.69	Aug 19 Sat
5	45°2.94	300°52.80	9.48	292°27.45	36.69	225° 9.35	16.14	5°21.80	48.68	Venus
6	60°5.40	315°52.54 N2	0°9.41	307°28.17	N22°36.47	240°11.35	N01°15.94	20°24.26	N12°48.67	Mars
7	75°7.87	330°52.28	9.34	322°28.90	36.25	255°13.36	15.74	35°26.71	48.66	Jupiter
8	90° 10.33	345°52.02	9.27	337°29.62	36.03	270°15.37	15.54	50°29.17	48.65	Saturn
9	105° 12.79		• 9.20	352°30.35	• • 35.81	285°17.38	• • 15.34	65°31.62	• • 48.65	Aug 20 Sun
10	120° 15.26 135° 17.72	15°51.49 30°51.22	9.13	7°31.08 22°31.80	35.59	300°19.39 315°21.39	15.13 14.93	80°34.07 95°36.53	48.64	Venus
11 12	150°20.19		9.06 0°8.98	37°32.53	35.36 N22°35.14	315 21.39 330°23.40	N01°14.73	95 36.53 110°38.98	48.63 N12°48.62	Mars
13	165° 22.65	60°50.69	8.91	52° 33.26	34.92	345°25.41	14.73	110 38.98 125°41.44	48.62	Jupiter
14	180°25.11	75°50.43	8.84	67° 33.99	34.70	0°27.42	14.33	140°43.89	48.61	Saturn
15	195°27.58		· 8.76	82°34.71	• • 34.47	15°29.42	• • 14.13	155°46.35	• • 48.60	Aug 21 Mon
16	210°30.04	105°49.89	8.69	97°35.44	34.25	30°31.43	13.93	170°48.80	48.59	Venus
17	225°32.51	120°49.62	8.61	112°36.17	34.03	45°33.44	13.72	185°51.26	48.58	Mars
18	240°34.97 255°37.43	135°49.35 N2 150°49.08	0°8.53	127°36.90 142°37.63	N22°33.80	60°35.45 75°37.45	N01°13.52	200°53.71		Jupiter
19 20	255° 37.43 270° 39.90	165°48.81	8.45 8.37	142°37.63 157°38.36	33.58 33.35	75°37.45 90°39.46	13.32 13.12	215°56.17 230°58.62	48.57 48.56	Saturn
21	285° 42.36		· 8.29	172° 39.09	• • 33.13	105°41.47	12.92	246°1.08	• • 48.55	Horizon
22	300° 44.83	195°48.27	8.21	187° 39.82	32.90	120°43.47	12.72	261°3.54	48.54	
23	315°47.29	210°48.00	8.13	202°40.54	32.68	135°45.48	12.52	276°5.99	48.53	
Mer.r	pass. 02:00	ν-0.3' d-0.1' n	n-4.31	$\nu$ 0.7′ d-0	0.2′ m1.57	$\nu 2.0' d-0$	.2′ m-1.70	$\nu 2.5' d-0$	.0′ m0.25	

Stars SHA

 $357^{\circ}31.36$ 

353°3.96

349°27 11

348°44.11

 $335^{\circ}17.78$ 

 $327^{\circ}47.67$ 

 $312^{\circ}20.85$ 

 $315^{\circ}9.48$ 

 $314^{\circ}2.98$ 

308°23.89

290°36.28

 $280^{\circ}17.67$ 

 $278^{\circ}19.84$ 

277°58.27

275°34.87

 $270^{\circ}49.05$ 

263°51.41

258°23.86

255°3.80

 $244^{\circ}48.01$ 

 $243^{\circ}14.02$ 

234°14.06

222°44.52

221°38.45

217°45.16 207°31.63

 $193^{\circ}38.16$ 

182°22.23

175°40.77

 $172^{\circ}57.16$ 

 $171^{\circ}48.65$ 

 $166^{\circ}10.86$ 

158°19.34

152°49.98

148°31.92

147°54.22

145°45.34

139°36.28

 $137^{\circ}20.33$ 136°52.78

126°1.26

107°3.40

 $96^{\circ}6.14$ 

95°55.64

90°40.52

83°28.33

80°30.92

75°43.83

61°56.78

 $53^{\circ}0.59$ 

49°23.30

33°35.55

 $27^{\circ}28.81$ 

15°10.95

13°41.94

13°26.61

SHA

258° 13.52

248°56.91

180°30.46

 $320^{\circ}19.69$ 

SHA

257°8.68

 $248^{\circ}15.00$ 

180°19.60

320°19.25

256°3.49

247°33.20

180°8.69

 $320^{\circ}18.92$ 

Venus: Mars

Horizontal parallax

112°12 10

101°59.25

281°1.15

Dec 29°15.03

-42°8.69

56°41 63 -17°49.49

-57°5.11

 $23^{\circ}35.90$ 

89°22.70

40°11.06

4°12.23

49°57.58

16°33.98

 $-8^{\circ}10.01$ 

46°1.38

 $6^{\circ}22.55$ 

28°37.77

 $-1^{\circ}10.96$ 

 $7^{\circ}24.74$ -52°42.43

-16°45.24

-29°0.54

 $27^{\circ}57.31$ 

-59°36.00

-43°32.88

-69°50.09

-8°46.98

11°49.61

61°35.81

 $14^{\circ}24.76$ 

-17°42.11

-63°15.70

-57°16.63

55°48.43 -11°18.66

49°10.43 -60°30.90

-36°30.78

19°2.14

60°57.45  $74^{\circ}2.51$ 

-16°9.64

26°37.32

-26° 29.72

-69°4.88 -15°45.52

-37°7.45

 $12^{\circ}32.58$ 

51°29.41

-34°22.18 38°48.91

-26°15.53 8°56.89

-56°38.44

45°23.20

 $10^{\circ}0.62$ 

-46°49.09

-29°27.95

28°14.46

15°21.77

Mer.pass

08:56

09:32

14:05

04:46

08:56

09:31

14:01

04:43

08:57

09:30

13:58

04:39

0.2

0.1

Mer.pass

Mer.pass

 $5^{\circ}9.07$ 

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°5.76	$N12^{\circ}39.89$	199°32.23	6.8'	$N17^{\circ}32.25$	-12.3'	60.4'
1	194°5.90 209°6.05	39.07	213°58.05	6.9'	17°19.92	-12.5'	60.5'
2 3	209°6.05 224°6.19	38.25 · · 37.43	228°23.91 242°49.83	6.9' 7.0'	17°7.46 16°54.88	-12.6' -12.7'	60.5' 60.5'
4	239°6.34	36.61	257°15.79	7.0'	16°42.18	-12.8'	60.5
5	254°6.48	35.79	271°41.80	7.1'	$16^{\circ}29.36$	-12.9'	60.6'
6	269°6.63	N12°34.97	286°7.87	7.1'	N16°16.43	-13.0'	60.6'
7 8	284°6.78 299°6.92	34.15 33.33	300°33.98 315°0.14	7.2' 7.2'	16°3.38 15°50.22	-13.2' -13.3'	60.6' 60.6'
9	314°7.07	32.51	329°26.35	7.3'	15°36.95	-13.4	60.6'
10	329°7.21	31.69	343°52.61	7.3'	15°23.57	-13.5'	60.7'
11 12	344°7.36 359°7.51	30.86 N12°30.04	358°18.92 12°45.28	7.4' 7.4'	15°10.09 N14°56.49	-13.6' -13.7'	60.7' 60.7'
13	14°7.66	29.22	27°11.69	7.4 7.5'	14° 42.80	-13. <i>1</i> '	60.7
14	29°7.80	28.40	41°38.15	7.5'	14°29.00	-13.9'	60.8'
15	44°7.95	• • 27.57	56° 4.66	7.6'	14°15.10	-14.0'	60.8'
16 17	59°8.10 74°8.25	26.75 25.92	70°31.22 84°57.82	7.6' 7.7'	14°1.10 13°47.00	-14.1' -14.2'	60.8' 60.8'
18	89°8.40	N12°25.10	99°24.48	7.7'	N13°32.81	-14.3'	60.8
19	104°8.54	24.27	113°51.18	7.8'	$13^{\circ}18.52$	-14.4'	60.9'
20	119°8.69	23.45	128°17.94	7.8'	13°4.14	-14.5'	60.9'
21 22	134°8.84 149°8.99	· · 22.62 21.80	142°44.74 157°11.58	7.8' 7.9'	12°49.68 12°35.12	-14.6' -14.6'	60.9' 60.9'
23	164° 9.14	20.97	171°38.48	7.9'	12° 33.12	-14.7	60.9
	SD = 15.8'	d = -0.8'			D = 16.5'		
	JD — 13.0	<u>u — -0.0</u>					
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°9.29 194°9.44	N12°20.14 19.32	186°5.42 200°32.41	8.0' 8.0'	N12°5.75 11°50.94	-14.8' -14.9'	60.9' 61.0'
2	194 9.44 209°9.59	19.32	200 32.41 214°59.45	8.1'	11 50.94 11°36.05	-14.9 -15.0'	61.0'
3	224°9.74	17.66	229°26.53	8.1'	11°21.09	-15.0'	61.0'
4	239°9.89	16.83	243°53.66	8.2'	11°6.04	-15.1'	61.0'
5	254° 10.04 269° 10.19	16.01 N12°15.18	258°20.83 272°48.05	8.2' 8.3'	10°50.92 N10°35.73	-15.2'	61.0'
6 7	269 10.19 284°10.34	14.35	272 48.05 287°15.31	8.3'	10°20.46	-15.3' -15.3'	61.0' 61.0'
8	299° 10.49	13.52	301°42.61	8.3'	10°5.13	-15.4'	61.0'
9	314° 10.64	•• 12.69	316° 9.95	8.4'	09°49.73	-15.5'	61.1'
10 11	329° 10.80 344° 10.95	11.86 11.03	330°37.34 345°4.77	8.4' 8.5'	09°34.26 09°18.73	-15.5' -15.6'	61.1' 61.1'
12	359° 11.10	N12°10.20	359°32.24	8.5	N09°3.13	-15.7'	61.1
13	14° 11.25	9.37	13°59.75	8.6'	08°47.48	-15.7'	61.1'
14	29°11.40	8.54	28°27.30	8.6'	08°31.77	-15.8'	61.1'
15 16	44° 11.56 59° 11.71	· · 7.70 6.87	42°54.89 57°22.52	8.6' 8.7'	08°16.01 08°0.19	-15.8' -15.9'	61.1' 61.1'
17	74° 11.86	6.04	71°50.18	8.7'	00 0.19 07°44.32	-15.9'	61.1
18	89°12.01	N12° 5.21	86°17.88	8.7'	N07°28.40	-16.0'	61.1'
19	104° 12.17	4.37	100°45.62	8.8'	07°12.43	-16.0'	61.1'
20 21	119° 12.32 134° 12.48	3.54 •• 2.71	115°13.39 129°41.20	8.8' 8.8'	06°56.41 06°40.35	-16.1'	61.1' 61.1'
22	149° 12.63	1.87	144°9.04	8.9'	06°24.25	-16.1	61.1
23	164° 12.78	1.04	158°36.92	8.9'	$06^{\circ}8.11$	-16.2'	61.2'
	SD = 15.8'	d = -0.8'		S	D = 16.6'		
	CUA		CILA		Б.		
Mon 0	<b>GHA</b> 179° 12.94	<b>Dec</b> N12° 0.20	<b>GHA</b> 173° 4.82	ν 8.9'	<b>Dec</b> N05°51.94	d -16.2'	<b>HP</b> 61.2'
1	194°13.09	11°59.37	187°32.76	9.0'	05°35.72	-16.2	61.2
2	209°13.25	58.53	202°0.73	9.0'	05°19.47	-16.3'	61.2'
3 4	224° 13.40 239° 13.56	· · 57.70 56.86	216°28.72 230°56.75	9.0' 9.1'	05°3.19 04°46.88	-16.3' -16.3'	61.2' 61.2'
4 5	254° 13.71	56.03	230 56.75 245°24.80	9.1 9.1'	04 46.88 04°30.54	-16.3 -16.4'	61.2
6	269°13.87	N11°55.19	259°52.88	9.1'	N04°14.18	-16.4'	61.2'
7	284°14.02	54.35	274°20.99	9.1'	03°57.79	-16.4'	61.2'
8 9	299° 14.18 314° 14.34	53.52 •• 52.68	288°49.12 303°17.28	9.2' 9.2'	03°41.38 03°24.95	-16.4' -16.4'	61.2' 61.2'
10	329° 14.49	51.84	317°45.46	9.2' 9.2'	03°8.50	-16.5	61.1
11	344° 14.65	51.00	332°13.66	9.2'	02°52.03	-16.5'	61.1'
12	359° 14.81 14° 14.96	N11°50.16	346°41.89 1°10.13	9.2'	N02°35.55 02°19.06	-16.5'	61.1'
13 14	14°14.96 29°15.12	49.32 48.48	1°10.13 15°38.40	9.3' 9.3'	02°19.06 02°2.56	-16.5' -16.5'	61.1' 61.1'
15	44° 15.28	• • 47.65	30°6.68	9.3'	01°46.05	-16.5	61.1
16	59° 15.43	46.81	44°34.99	9.3'	$01^{\circ}29.53$	-16.5'	61.1'
17	74° 15.59	45.97 N11°45.12	59°3.30	9.3'	01°13.01	-16.5'	61.1'
18 19	89° 15.75 104° 15.91	N11°45.12 44.28	73°31.64 87°59.99	9.4' 9.4'	N00°56.49 00°39.96	-16.5' -16.5'	61.1' 61.1'
20	119° 16.07	43.44	102°28.35	9.4' 9.4'	00°39.90	-16.5'	61.1
21	134° 16.23	• • 42.60	116°56.73	9.4'	N00°6.92	-16.5'	61.1'
22 23	149° 16.38 164° 16.54	41.76 40.92	131°25.12 145°53.52	9.4' 9.4'	\$00°9.59 00°26.10	16.5'	61.1' 61.1'
23			145 53.52			16.5'	01.1
	SD = 15.8'	d = -0.8'		S	D = 16.7'		

Naut.         Civil         Vaut.         Civil         Naut.           N 72°         ////         ////         03:00         21:02         ////         ////           N 70°         ////         01:40         03:24         20:39         22:19         ////           68°         ////         02:21         03:42         20:22         21:41         ////           66°         ////         02:48         03:57         20:07         21:15         ////           60°         01:28         03:09         04:09         19:56         20:555         22:32           60°         02:05         03:25         04:19         19:46         20:39         21:58           60°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         1	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70°         ////         01:40         03:24         20:39         22:19         ////           68°         ////         02:21         03:42         20:22         21:41         ////           66°         ////         02:48         03:57         20:07         21:15         ////           64°         01:28         03:09         04:09         19:56         20:55         22:32           60°         02:05         03:25         04:19         19:46         20:39         21:58           60°         02:30         03:38         04:27         19:37         20:26         21:34           N 58°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37 <td< th=""><th>Lat.</th><th>Naut.</th><th>Civil</th><th>Junise</th><th>Juliset</th><th>Civil</th><th>Naut.</th></td<>	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68°         ////         02:21         03:42         20:22         21:41         ////           66°         ////         02:48         03:57         20:07         21:15         ////           64°         01:28         03:09         04:09         19:56         20:55         22:32           62°         02:05         03:25         04:19         19:46         20:39         21:58           60°         02:30         03:38         04:27         19:37         20:26         21:34           N 58°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48 <t< th=""><th>N 72°</th><th>////</th><th>////</th><th>03:00</th><th>21:02</th><th>////</th><th>////</th></t<>	N 72°	////	////	03:00	21:02	////	////
66°	<b>N</b> 70°	////	01:40	03:24	20:39	22:19	////
64° 01:28 03:09 04:09 19:56 20:55 22:32 62° 02:05 03:25 04:19 19:46 20:39 21:58 60° 02:30 03:38 04:27 19:37 20:26 21:34   N 58° 02:49 03:50 04:35 19:30 20:15 21:15 56° 03:05 04:00 04:42 19:24 20:05 21:00 54° 03:18 04:08 04:48 19:18 19:57 20:47 52° 03:29 04:16 04:53 19:12 19:49 20:36 50° 03:39 04:23 04:58 19:08 19:43 20:26 45° 03:58 04:37 05:08 18:58 19:29 20:07   N 40° 04:14 04:48 05:17 18:49 19:18 19:52 35° 04:26 04:58 05:24 18:42 19:08 19:40 30° 04:36 05:06 05:31 18:36 19:00 19:30 20° 04:52 05:19 05:42 18:25 18:47 19:14   N 10° 05:04 05:30 05:51 18:15 18:37 19:02 0° 05:14 05:39 06:00 18:07 18:28 18:52   S 10° 05:22 05:47 06:09 17:58 18:19 18:44 20° 05:29 05:55 06:18 17:49 18:11 18:37 30° 05:41 06:13 06:41 17:26 17:54 18:28 40° 05:41 06:13 06:41 17:26 17:54 18:28 40° 05:44 06:18 06:49 17:19 17:49 18:23   S 50° 05:47 06:25 06:58 17:09 17:43 18:21 52° 05:49 06:30 07:07 17:01 17:37 18:28 58° 05:51 06:37 07:18 16:50 17:31 18:17	68°	////	02:21	03:42	20:22	21:41	////
62°         02:05         03:25         04:19         19:46         20:39         21:58           60°         02:30         03:38         04:27         19:37         20:26         21:34           N 58°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48         05:17         18:49         19:18         19:52           35°         04:26         04:58         05:24         18:42         19:08         19:40           30°         04:36         05:06         05:31         18:36         19:00         19:30           20°         04:52         05:19		////	02:48	03:57	20:07	21:15	////
60°         02:30         03:38         04:27         19:37         20:26         21:34           N 58°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48         05:17         18:49         19:18         19:52           35°         04:26         04:58         05:24         18:42         19:08         19:40           30°         04:36         05:06         05:31         18:36         19:00         19:30           20°         04:52         05:19         05:42         18:25         18:47         19:14           N 10°         05:04         05:30	-	01:28	03:09	04:09	19:56	20:55	22:32
N 58°         02:49         03:50         04:35         19:30         20:15         21:15           56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48         05:17         18:49         19:18         19:52           35°         04:26         04:58         05:24         18:42         19:08         19:40           30°         04:36         05:06         05:31         18:36         19:00         19:30           20°         04:52         05:19         05:42         18:25         18:47         19:14           N 10°         05:04         05:30         05:51         18:15         18:37         19:02           0°         05:14         05:39				04:19	19:46		
56°         03:05         04:00         04:42         19:24         20:05         21:00           54°         03:18         04:08         04:48         19:18         19:57         20:47           52°         03:29         04:16         04:53         19:12         19:49         20:36           50°         03:39         04:23         04:58         19:08         19:43         20:26           45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48         05:17         18:49         19:18         19:52           35°         04:26         04:58         05:24         18:42         19:08         19:40           30°         04:36         05:06         05:31         18:36         19:00         19:30           20°         04:52         05:19         05:42         18:25         18:47         19:14           N 10°         05:04         05:30         05:51         18:15         18:37         19:02           0°         05:14         05:39         06:00         18:07         18:28         18:52           5 10°         05:22         05:47	60°	02:30	03:38	04:27	19:37	20:26	21:34
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45°         03:58         04:37         05:08         18:58         19:29         20:07           N 40°         04:14         04:48         05:17         18:49         19:18         19:52           35°         04:26         04:58         05:24         18:42         19:08         19:40           30°         04:36         05:06         05:31         18:36         19:00         19:30           20°         04:52         05:19         05:42         18:25         18:47         19:14           N 10°         05:04         05:30         05:51         18:15         18:37         19:02           0°         05:14         05:39         06:00         18:07         18:28         18:52           S 10°         05:22         05:47         06:09         17:58         18:19         18:44           20°         05:22         05:47         06:09         17:58         18:19         18:43           30°         05:36         06:04         06:28         17:39         18:03         18:31           35°         05:39         06:08         06:34         17:33         17:59         18:28           40°         05:41         06:13	52°	03:29	04:16	04:53	19:12	19:49	20:36
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54°         05:49         06:30         07:07         17:01         17:37         18:19           56°         05:50         06:33         07:12         16:55         17:34         18:18           58°         05:51         06:37         07:18         16:50         17:31         18:17	<b>S</b> 50°	05:47	06:25	06:58	17:09	17:43	18:21
56° 05:50 06:33 07:12 16:55 17:34 18:18 58° 05:51 06:37 07:18 16:50 17:31 18:17						17:40	
58° 05:51 06:37 07:18 16:50 17:31 18:17		05:49	06:30		17:01	17:37	18:19
<b>S</b> 60°   05:52 06:41 07:24   16:43 17:27 18:16					l		
	<b>S</b> 60°	05:52	06:41	07:24	16:43	17:27	18:16

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	28-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%
19	03:37	03:30	12:03	11:07	23:35	
20	03:23	03:16	12:03	12:02	-:-	
21	03:08	03:01	12:03	12:55	00:29	

h	Aries	Ver			ars		oiter		turn
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330° 49.75	225°47.73	N20°8.05	217°41.27	N22°32.45	150°47.49	N01°12.31	291°8.45	N12°48.53
1	345°52.22	240°47.46	7.97	232°42.00	32.23	165°49.49	12.11	306° 10.91	48.52
2	0°54.68	255°47.18	7.88	247°42.73	32.00	180°51.50	11.91	321°13.36	48.51
3	$15^{\circ}57.15$	270°46.91	• • 7.80	262°43.46	• • 31.77	195°53.51	• • 11.71	$336^{\circ}15.82$	• • 48.50
4	30°59.61	285°46.64	7.71	277°44.19	31.55	210°55.51	11.51	351° 18.28	48.49
5	46°2.07	300°46.36	7.63	292°44.93	31.32	225°57.52	11.31	6°20.74	48.48
6	61°4.54	315°46.09	N20°7.54	307°45.66	N22°31.09	240°59.52	N01°11.10	21°23.19	N12°48.47
7	76°7.00	330°45.81	7.45	322°46.39	30.86	256°1.53	10.90	36°25.65	48.46
8	91°9.47	345° 45.53	7.43	337°47.12	30.64	271°3.54	10.70	51°28.11	48.46
	91 9.47 106°11.93	0° 45.26		352°47.85		271 3.54 286°5.54		66°30.57	• 48.45
9			• • 7.28		30.41		• • 10.50		
.0	121°14.39	15°44.98	7.19	7°48.58	30.18	301°7.55	10.30	81°33.03	48.44
.1	136° 16.86	30°44.70	7.10	22°49.31	29.95	316°9.55	10.09	96°35.49	48.43
.2	151° 19.32	45°44.42	N20°7.00	37°50.05	N22°29.72	331°11.56	N01°9.89	111°37.94	N12°48.42
13	166°21.79	60°44.15	6.91	52°50.78	29.49	346°13.57	9.69	126°40.40	48.41
.4	181°24.25	75°43.87	6.82	$67^{\circ}51.51$	29.26	1°15.57	9.49	141°42.86	48.40
.5	196°26.71	90°43.59	• • 6.72	82°52.24	• • 29.03	16°17.58	• • 9.29	156°45.32	• • 48.39
6	211°29.18	105°43.31	6.63	97°52.98	28.80	31°19.58	9.08	171°47.78	48.38
7	226°31.64	120°43.03	6.53	112°53.71	28.57	46°21.59	8.88	186°50.24	48.37
8	241°34.11	135°42.74	N20° 6.44	127°54.44	N22°28.34	61°23.59	N01°8.68	201°52.70	N12°48.36
9	256° 36.57	150°42.46	6.34	142°55.18	28.11	76°25.60	8.48	216°55.16	48.35
20	271°39.03	165° 42.18	6.24	157°55.91	27.88	91°27.60	8.28	231°57.62	48.34
1	286° 41.50	180° 41.90	. 6.14	172°56.64	27.65	106°29.61	• • 8.07	247°0.08	• 48.33
				172°56.64 187°57.38		106 29.61 121°31.61			48.33
2	301°43.96	195°41.61	6.04		27.42		7.87	262°2.54	
23	316°46.43	210°41.33	5.94	202°58.11	27.18	136°33.62	7.67	277°5.00	48.31
er r	pass. 01:56	$\nu$ -0.3' d-0	.1' m-4.30	$\nu 0.7' \ d-0$	0.2′ m1.57	ν2.0′ d-0	.2′ m-1.70	$\nu 2.5' \ d-0$	0.0' m0.24
		- 3.5 4 0							
	_		_		_		_	_	
ed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°48.89	$225^{\circ}41.04$	N20°5.84	217°58.85	N22°26.95	151°35.62	N01°7.47	292°7.47	N12°48.30
1	$346^{\circ}51.36$	240°40.76	5.74	232°59.58	26.72	166°37.63	7.26	307°9.93	48.29
2	1°53.82	255°40.47	5.64	248°0.32	26.49	181°39.63	7.06	322°12.39	48.28
3	16°56.28	270°40.19	• • 5.53	263°1.05	• • 26.25	196°41.64	• • 6.86	$337^{\circ}14.85$	• • 48.27
4	31°58.75	285°39.90	5.43	278°1.79	26.02	211°43.64	6.66	352°17.31	48.26
5	47°1.21	300°39.61	5.32	293°2.52	25.79	226°45.64	6.45	7° 19.77	48.25
, 5	62°3.68	315°39.33	N20° 5.22	308° 3.26	N22°25.55	241°47.65	N01°6.25	22°22.24	N12°48.24
7	77°6.14	330° 39.04	5.11	323° 3.99	25.32	256°49.65	6.05	37°24.70	48.23
8	92°8.60	345°38.75	5.00	338° 4.73	25.08	271°51.66	5.85	52°27.16	48.22
9	107°11.07	0°38.46	• • 4.89	353°5.47	• • 24.85	286°53.66	• • 5.64	67° 29.62	• • 48.21
0	122° 13.53	15°38.17	4.78	8°6.20	24.61	301°55.66	5.44	82°32.09	48.20
1	137° 16.00	30°37.88	4.67	23°6.94	24.38	316°57.67	5.24	97°34.55	48.19
2	152° 18.46	45°37.59	N20°4.56	38°7.68	N22°24.14	331°59.67	N01°5.04	112°37.01	N12°48.18
3	$167^{\circ}20.92$	60°37.30	4.45	53°8.41	23.90	347°1.68	4.83	127°39.47	48.17
.4	182°23.39	75°37.01	4.34	$68^{\circ}9.15$	23.67	2°3.68	4.63	142°41.94	48.16
5	197° 25.85	90°36.72	• • 4.23	83° 9.89	• • 23.43	17°5.68	• • 4.43	157°44.40	• • 48.15
6	212°28.32	105°36.42	4.11	98°10.63	23.19	32°7.69	4.23	172°46.87	48.14
7	227° 30.78	120°36.13	4.00	113°11.36	22.96	47°9.69	4.02	187°49.33	48.13
8	242°33.24	135°35.84	N20° 3.88	128°12.10	N22°22.72	62°11.69	N01°3.82		N12°48.12
9	257° 35.71	150° 35.54	3.76	143°12.84	22.48	77°13.70	3.62	202 51.79 217°54.26	48.11
		165° 35.54							
0	272°38.17		3.65	158°13.58	22.24	92°15.70	3.41	232°56.72	48.10
1	287° 40.64	180°34.95	• • 3.53	173°14.32	• • 22.01	107°17.70	3.21	247°59.19	• • 48.08
2	302°43.10	195°34.66	3.41	188°15.06	21.77	122°19.71	3.01	263°1.65	48.07
3	317°45.56	210°34.36	3.29	203°15.80	21.53	137°21.71	2.80	278°4.12	48.06
er r	pass. 01:52	$\nu$ -0.3' d-0	1′ m-4 20	$\nu^{0.7'} d_{-0}$	0.2' m1.57	ν2 0' d-0	.2′ m-1.70	ν25' d-0	0.0' m0.24
۰۰۰۴		- 0.5 0.0		- 50.1 4-0					
hu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°48.03	225°34.07	N20°3.17	218°16.54	N22°21.29	152°23.71	N01°2.60	293°6.58	N12°48.05
1	$347^{\circ}50.49$	240°33.77	3.05	233°17.28	21.05	167°25.72	2.40	308°9.05	48.04
2	$2^{\circ}52.96$	255°33.47	2.92	248°18.02	20.81	182°27.72	2.20	323°11.52	48.03
3	17°55.42	270°33.17	2.80	263°18.76	• • 20.57	197°29.72	• • 1.99	338°13.98	• • 48.02
1	32°57.88	285°32.88	2.68	278°19.50	20.33	212°31.72	1.79	353° 16.45	48.01
5	48° 0.35	300°32.58	2.55	293°20.24	20.09	227°33.73	1.59	8° 18.91	47.99
5	63°2.81	315° 32.28	N20° 2.43	308°20.98	N22°19.85	242°35.73	N01°1.38	23°21.38	N12°47.98
	78° 5.28	330° 31.98	2.30	306 20.96 323°21.72	19.61	242 35.73 257°37.73	1.18	23 21.36 38°23.85	47.97
7 8									
	93°7.74	345°31.68	2.17	338°22.46	19.37	272°39.73	0.98	53°26.31	47.96
9	108° 10.20	0°31.38	• • 2.05	353°23.20	• • 19.13	287°41.74	• • 0.77	68°28.78	• • 47.95
0	123° 12.67	15°31.08	1.92	8°23.94	18.88	302°43.74	0.57	83°31.25	47.94
1	$138^{\circ}15.13$	30°30.77	1.79	23°24.68	18.64	317°45.74	0.37	98°33.71	47.92
2	153° 17.60	45°30.47	N20°1.66	38°25.43	N22°18.40	332°47.74	N01°0.16	113°36.18	N12°47.91
3	$168^{\circ}20.06$	60°30.17	1.53	53°26.17	18.16	347°49.74	$00^{\circ}59.96$	128°38.65	47.90
4	183°22.53	75° 29.87	1.39	68°26.91	17.91	2°51.75	00°59.76	143°41.12	47.89
5	198°24.99	90°29.56	. 1.26	83°27.65	. 17.67	17°53.75	• • 59.55	158°43.59	• • 47.88
6	213° 27.45	105° 29.26	1.13	98°28.40	17.43	32°55.75	59.35	173° 46.05	47.87
7	228°29.92	120°28.95	0.99	113°29.14	17.18	47°57.75	59.15	188° 48.52	47.85
8	243°32.38	135°28.65	N20° 0.86	128°29.88	N22°16.94	62°59.75	N00°58.94	203°50.99	N12°47.84
9	258° 34.85	150°28.34	0.72	143°30.63	16.69	78°1.75	58.74	218°53.46	47.83
	273°37.31	165°28.04	0.58	158°31.37	16.45	93°3.76	58.53	233°55.93	47.82
20		180°27.73	• • 0.45	173°32.11	• • 16.20	108°5.76	• • 58.33	248°58.40	• • 47.80
	288° 39.77								
0	288° 39.77 303° 42.24	195°27.43	0.31	188°32.86	15.96	123°7.76	58.13	264°0.87	47.79
0 1	303°42.24	$195^{\circ}27.43$							
0 1 2			0.31 0.17	188°32.86 203°33.60	15.96 15.71	123°7.76 138°9.76	57.92	264°0.87 279°3.34	47.79 47.78

Alpheratz	357°31.35	29°15.04
Ankaa Schedar	353°3.95 349°27.10	-42°8.69 56°41.65
Diphda	348°44.10	-17°49.49
Achernar	335°17.75	-57°5.11
Hamal	327°47.66 312°19.37	23°35.91 89°22.70
Polaris Acamar	312 19.37 315° 9.46	-40°11.06
Menkar	314° 2.96	4°12.24
Mirfak	308°23.87	49°57.59
Aldebaran Rigel	290°36.26 281°1.13	16°33.99 -8°10.00
Capella	280°17.65	-6 10.00 46°1.38
Bellatrix	278°19.82	$6^{\circ}22.56$
Elnath	277°58.25	28°37.77
Alnilam Betelgeuse	275°34.86 270°49.04	-1°10.96 7°24.74
Canopus	263°51.39	-52°42.42
Sirius	258°23.84	-16°45.23
Adhara	255°3.79	-29°0.53
Procyon Pollux	244°48.00 243°14.01	5°9.07 27°57.30
Avior	234° 14.05	-59°35.99
Suhail	222°44.52	-43°32.87
Miaplacidus	221°38.44	-69°50.07
Alphard Regulus	217°45.16 207°31.63	-8°46.97 11°49.63
Dubhe	207°31.63 193°38.17	61°35.80
Denebola	182°22.23	14°24.75
Gienah	175°40.78	-17°42.11
Acrux	172°57.18 171°48.67	-63°15.69 -57°16.62
Gacrux Alioth	171°48.67 166°10.88	-57°16.62 55°48.42
Spica	158° 19.35	-11°18.66
Alkaid	$152^{\circ}50.00$	49°10.42
Hadar	148°31.95 147°54.24	-60°30.89 -36°30.77
Menkent Arcturus	147°54.24 145°45.36	-36°30.77 19°2.14
Rigil Kent.	139°36.32	-60°57.45
Kochab	$137^{\circ}20.38$	74°2.50
Zuben'ubi	136°52.80 126°1.28	-16°9.64 26°37.32
Alphecca Antares	120 1.28 112°12.12	-26°29.72
Atria	107°3.44	-69°4.89
Sabik	101°59.26	-15°45.52
Shaula Rasalhague	96°6.16 95°55.66	-37°7.46 12°32.58
Eltanin	90°40.54	51°29.42
Kaus Aust.	83°28.35	-34°22.18
Vega	80°30.94	38°48.91
Nunki Altair	75°43.84 61°56.79	-26°15.53 8°56.90
Peacock	53° 0.60	-56°38.45
Deneb	49°23.30	45°23.21
Enif	33°35.55	10°0.63
Al Na'ir Fomalhaut	27°28.81 15°10.94	-46°49.10 -29°27.95
Fomalhaut	15° 10.94 13° 41.94	-29°27.95 28°14.47
Markab	13°26.61	15°21.78
Aug 22 Tue	SHA	Mer.pass
Venus	254°57.98	08:57
Mars	246°51.52	09:29
Jupiter Saturn	179°57.73 320°18.70	13:55 04:35
Aug 23 Wed	<b>SHA</b> 253°52.15	Mer.pass
Venus Mars	253 52.15 246° 9.96	08:57 09:28
Jupiter	179°46.73	13:52
Saturn	320°18.57	04:31
Aug 24 Thu	SHA	Mer.pass
Venus	$252^{\circ}46.04$	08:58
	245°28.51	09:26
Mars	179°35.68 320°18.56	13:49 04:27
Jupiter		U 1.41
Jupiter Saturn		
Jupiter Saturn	ıtal parallax	0.2
Jupiter Saturn		0.2 0.1

Stars SHA

 $\mathsf{Alpheratz} \quad 357^{\circ}31.35$ 

Dec

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°16.70	N11°40.08	160°21.94	9.4'	S00°42.60	16.5'	61.0'
1	194°16.86	39.23	174°50.36	9.4'	00°59.09	16.5	61.0'
2	209°17.02 224°17.18	38.39 •• 37.55	189°18.79 203°47.23	9.4' 9.4'	01°15.56 01°32.02	16.5' 16.4'	61.0' 61.0'
4	239°17.34	36.70	218°15.67	9.4'	01°48.46	16.4	61.0'
5	254°17.50	35.86	232°44.12	9.5'	$02^{\circ}4.89$	16.4'	61.0'
6	269°17.66	N11°35.01	247°12.57	9.5'	S02°21.29	16.4	61.0'
7 8	284°17.82 299°17.98	34.17 33.32	261°41.03 276°9.49	9.5' 9.5'	02°37.67 02°54.03	16.4' 16.3'	61.0' 60.9'
9	314°18.14	• • 32.48	290°37.96	9.5'	02° 34.03	16.3	60.9
10	329°18.30	31.63	305°6.42	9.5'	$03^{\circ}26.66$	16.3'	60.9'
11	344°18.47	30.79	319°34.88	9.5'	03°42.94	16.2'	60.9'
12 13	359°18.63 14°18.79	N11°29.94 29.09	334°3.35 348°31.81	9.5' 9.5'	\$03°59.18 04°15.39	16.2' 16.2'	60.9' 60.9'
14	29°18.95	28.25	3°0.27	9.5'	04°15.59	16.1	60.8
15	44°19.11	• • 27.40	17°28.72	9.5'	04°47.70	16.1'	60.8'
16	59°19.28	26.55	31°57.17	9.4'	05°3.79	16.1'	60.8'
17	74°19.44 89°19.60	25.71 N11°24.86	46°25.62 60°54.06	9.4' 9.4'	05°19.85 \$05°35.86	16.0' 16.0'	60.8' 60.8'
18 19	104°19.76	24.01	75°22.49	9.4 9.4'	05°51.84	15.9'	60.8
20	119°19.93	23.16	89°50.91	9.4'	06°7.76	15.9'	60.7'
21	134°20.09	• • 22.31	104°19.33	9.4'	$06^{\circ}23.64$	15.8'	60.7'
22	149°20.25	21.46	118°47.73	9.4'	06°39.46	15.8'	60.7'
23	164°20.42	20.61	133°16.12	9.4'	06°55.24	15.7'	60.7'
	SD = 15.8'	d = -0.8'		SI	O = 16.6'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°20.58	$N11^{\circ}19.76$	147°44.51	9.4'	S07°10.96	15.7'	60.6
1	194°20.74	18.91	162°12.88	9.4'	07°26.63	15.6'	60.6'
2	209°20.91 224°21.07	18.06 •• 17.21	176°41.23 191°9.58	9.3'	07°42.24 07°57.80	15.6'	60.6'
3 4	239°21.24	16.36	191 9.58 205°37.90	9.3' 9.3'	07 57.80 08°13.29	15.5' 15.4'	60.6' 60.6'
5	254°21.40	15.51	220°6.22	9.3'	08°28.73	15.4	60.5'
6	269°21.57	N11°14.66	234°34.51	9.3'	S08°44.10	15.3'	60.5'
7	284°21.73	13.80	249°2.79	9.3'	08°59.40	15.2'	60.5'
8 9	299°21.90 314°22.06	12.95 •• 12.10	263°31.05 277°59.30	9.2' 9.2'	09°14.64 09°29.82	15.2' 15.1'	60.5' 60.4'
10	329°22.23	11.25	292°27.52	9.2'	09°29.02	15.0'	60.4
11	344°22.40	10.39	306°55.72	9.2'	09°59.95	15.0'	60.4'
12	359°22.56	N11°9.54	321°23.90	9.2'	\$10°14.91	14.9'	60.4'
13 14	14°22.73 29°22.89	8.68 7.83	335°52.07 350°20.20	9.1' 9.1'	10°29.79 10°44.60	14.8' 14.7'	60.3' 60.3'
15	44°23.06	. 6.98	4°48.32	9.1'	10°59.33	14.7'	60.3
16	59°23.23	6.12	$19^{\circ}16.41$	9.1'	$11^{\circ}13.99$	14.6'	60.2'
17	74°23.40	5.27	33°44.48	9.0'	11°28.56	14.5'	60.2'
18 19	89°23.56 104°23.73	N11°4.41 3.55	48°12.53 62°40.55	9.0' 9.0'	\$11°43.05 11°57.46	14.4' 14.3'	60.2' 60.2'
20	119°23.90	2.70	77°8.54		11° 37.40 12° 11.78		60.1
21	134°24.07	• • 1.84	91°36.51	8.9'	12°26.01	14.1'	60.1
22	149°24.23	0.99	106°4.45	8.9'	12°40.16	14.1'	60.1'
23	164°24.40	0.13	120°32.36	8.9'	12°54.22	14.0'	60.0'
	SD = 15.8'	d = -0.9'		SI	O = 16.5'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°24.57 194°24.74	N10°59.27	135°0.24 149°28.10	8.9' 8.8'	\$13°8.19 13°22.06	13.9'	60.0' 60.0'
2	194°24.74 209°24.91	58.41 57.56	149°28.10 163°55.93	8.8'	13° 22.06 13° 35.85	13.8' 13.7'	60.0'
3	224°25.08	56.70	178°23.72	8.8'	13°49.53	13.6'	59.9'
4	239°25.25	55.84	192°51.49	8.7'	14°3.12	13.5'	59.9'
5	254°25.41 269°25.58	54.98 N10°54.12	207°19.23 221°46.94	8.7' 8.7'	14°16.62 \$14°30.01	13.4'	59.9'
6 7	269°25.58 284°25.75	N10°54.12 53.26	221°46.94 236°14.62	8. <i>7</i> ′ 8.6′	14°43.31	13.3' 13.2'	59.8' 59.8'
8	299°25.92	52.40	250°42.26	8.6'	14°56.50	13.1'	59.8'
9	314°26.09	•• 51.54	265°9.88	8.6'	15° 9.59	13.0'	59.7'
10	329°26.26	50.68	279°37.46	8.6'	15°22.57	12.9'	59.7'
11 12	344°26.43 359°26.61	49.82 N10°48.96	294°5.01 308°32.53	8.5' 8.5'	15°35.45 \$15°48.22	12.8' 12.7'	59.7' 59.6'
13	14°26.78	48.10	323°0.01	8.5'	16°0.89	12.6'	59.6'
14	29°26.95	47.24	337°27.47	8.4'	$16^{\circ}13.44$	12.4'	59.6'
15	44°27.12	• • 46.38	351°54.89	8.4'	16°25.88	12.3'	59.5'
16 17	59°27.29 74°27.46	45.51 44.65	6°22.27 20°49.63	8.4' 8.3'	16°38.22 16°50.44	12.2' 12.1'	59.5' 59.5'
18	89°27.63	44.05 N10°43.79	20 49.63 35°16.95	8.3'	517° 2.54	12.1	59.5 59.4'
19	104°27.81	42.93	49°44.24	8.3'	$17^{\circ}14.53$	11.9'	59.4'
20	119°27.98	42.06	64°11.49	8.2'	17°26.40	11.8'	59.4'
21	134°28.15 149°28.32	• • 41.20	78°38.71 93°5.90	8.2'	17°38.16 17°49.80	11.6'	59.3'
22 23	149°28.32 164°28.50	40.34 39.47	93°5.90 107°33.05	8.2' 8.1'	17°49.80 18°1.31	11.5' 11.4'	59.3' 59.3'
	SD = 15.8'	d = -0.9'			D = 16.4'		- 5.5
		<u>u — -0.9</u>		اد	_ 10.4		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-18%	
22	02:53	02:45	12:03	13:48	01:21		
23	02:38	02:30	12:02	14:40	02:14		
24	02:22	02:14	12:02	15:34	03:07		

## August 25, 26, 27 UT (Fri., Sat., Sun.)

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	333°47.17	225°26.81	N20°0.03	218°34.35	N22°15.47	153°11.76	N00°57.72	294°5.81	N12°47.77	Alpheratz	357°31.34	29° 15.05
1	348°49.63	240°26.50	19°59.89	233°35.09	15.22	$168^{\circ}13.76$	57.52	309°8.28	47.75	Ankaa	353°3.93	-42°8.70
2	3°52.09	255°26.19	59.74	248°35.84	14.98	183°15.76	57.31	324°10.75	47.74	Schedar	349°27.07	56°41.66
3	18° 54.56	270°25.89	• • 59.60	263°36.58	• • 14.73	198°17.76	• • 57.11	339°13.22	• • 47.73	Diphda	348°44.08	-17° 49.49
4	33°57.02	285°25.58	59.46	278°37.33	14.48	213°19.76	56.90	354°15.69	47.72	Achernar	335°17.73	-57°5.12
5	48°59.49	300°25.27	59.31	293°38.07	14.24	228°21.76	56.70	9°18.16	47.70	Hamal	327°47.63	23°35.92
6	64°1.95	315°24.96	N19°59.17	308°38.82	N22°13.99	243°23.77	N00°56.50	24°20.63	N12°47.69	Polaris	312°17.63	89°22.71
7	79°4.41	330°24.64	59.02	323°39.56	13.74	258°25.77	56.29	39°23.10	47.68	Acamar	$315^{\circ}9.44$	-40°11.06
8 9	94°6.88 109°9.34	345°24.33 0°24.02	58.87 •• 58.73	338° 40.31 353° 41.05	13.49 •• 13.24	273°27.77 288°29.77	56.09 •• 55.89	54°25.57	47.66 •• 47.65	Menkar	$314^{\circ}2.94$	4° 12.24
10	109 9.34 124° 11.81	15° 23.71	58.58	8°41.80	13.00	303°31.77	55.68	69°28.04 84°30.51	47.64	Mirfak	308°23.83	49°57.59
11	139° 14.27	30° 23.40	58.43	23°42.55	12.75	318°33.77	55.48	99°32.99	47.63	Aldebaran	290°36.24	16°33.99
12	154° 16.74	45° 23.08	N19°58.28	38° 43.30	N22°12.50	333°35.77	N00°55.27	114°35.46	N12° 47.61	Rigel	$281^{\circ}1.11$	-8° 10.00
13	169° 19.20	60°22.77	58.13	53° 44.04	12.25	348°37.77	55.07	129°37.93	47.60	Capella	280°17.62	46°1.38
14	184°21.66	75°22.46	57.98	68° 44.79	12.00	3°39.77	54.86	144°40.40	47.59	Bellatrix	278°19.80	6°22.56
15	199°24.13	90°22.14	• • 57.82	83°45.54	11.75	18°41.77	• • 54.66	159°42.87	47.57	Elnath	277°58.23	28° 37.77
16	214° 26.59	105°21.83	57.67	98°46.29	11.50	33°43.77	54.46	174°45.35	47.56	Alnilam	275°34.84	-1°10.96
17	229° 29.06	120°21.51	57.52	113°47.03	11.25	48°45.77	54.25	189°47.82	47.55	Betelgeuse	270°49.02	7°24.74
18	244°31.52	135°21.20	N19°57.36	128°47.78	N22°11.00	63°47.77	N00°54.05	204°50.29	N12°47.53	Canopus	263°51.36	-52°42.41
19	259°33.98	150° 20.88	57.20	143°48.53	10.75	78°49.77	53.84	219°52.77	47.52	Sirius	258°23.82	-16°45.22 -29°0.52
20	274°36.45	165°20.56	57.05	158°49.28	10.50	93°51.77	53.64	234°55.24	47.51	Adhara	255°3.77	-29°0.52 5°9.07
21	289°38.91	180°20.25	• • 56.89	173°50.03	• • 10.25	108°53.77	• • 53.44	249°57.71	• • 47.49	Procyon Pollux	244°47.99 243°13.99	27° 57.30
22	304°41.38	195°19.93	56.73	188°50.78	9.99	123°55.77	53.23	265°0.19	47.48	Avior	234°14.03	-59°35.98
23	319°43.84	210° 19.61	56.57	203°51.53	9.74	138°57.77	53.03	280°2.66	47.46	Suhail	222°44.51	-43°32.86
Mor	pass. 01:45	1, 0 3' d 0	.1' m-4.28	υ0 7′ d 0	0.2′ m1.57	12 0' d 0	.2' m-1.70	1/2 E/ d (	0.0' m0.23	Miaplacidus	221°38.42	-69° 50.06
IVICI.	pass. 01.43	ν-0.5 u-0	7.1 111-4.20	νο.τ u-c	7.2 1111.57	ν2.0 u-0		ν2.3 u-0	7.0 1110.23	Alphard	217°45.15	-8°46.97
										Regulus	207°31.63	11°49.61
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.18	61°35.79
0	334°46.31	225°19.29	N19°56.41	218°52.27	N22° 9.49	153°59.77	N00°52.82	295°5.13	N12°47.45	Denebola	182°22.24	14° 24.75
1	349° 48.77	240°18.97	56.25	233°53.02	9.24	169° 1.77	52.62	310°7.61	47.44	Gienah	175°40.78	-17°42.10
2	4°51.23	255° 18.66	56.09	248°53.77	8.98	184°3.76	52.41	325°10.08	47.42		172°57.19	-63° 15.68
3	19°53.70	270° 18.34	• • 55.93	263°54.52	• • 8.73	199° 5.76	• • 52.21	340°12.56	• • 47.41		171°48.68	-57° 16.60
4	34°56.16	285° 18.02	55.76	278°55.27	8.48	214°7.76	52.00	355°15.03	47.40	Alioth	166°10.90	55°48.41
5	49°58.63	300°17.70	55.60	293°56.03	8.22	229° 9.76	51.80	10°17.51	47.38	Spica	158°19.36	-11° 18.65
6	65°1.09	315° 17.37	N19°55.43	308° 56.78	N22°7.97	244°11.76	N00°51.60	25°19.98	N12°47.37	Alkaid	152°50.02	49° 10.41
7	80°3.55	330° 17.05	55.27	323°57.53	7.72	259°13.76	51.39	40°22.46	47.35	Hadar	148°31.97	-60°30.88
8	95°6.02	345°16.73	55.10	338° 58.28	7.46	274°15.76	51.19	55°24.93	47.34	Menkent	147°54.25	-36° 30.76
9	110°8.48	0°16.41	• • 54.93	353°59.03	• • 7.21	289°17.76	• • 50.98	70°27.41	• • 47.32	Arcturus	145°45.37	19°2.14
10	125° 10.95	15° 16.09	54.76	8°59.78	6.95	304°19.76	50.78	85°29.88	47.31	Rigil Kent.	139°36.34	-60°57.44
11	140° 13.41	30° 15.76	54.60	24°0.53	6.70	319°21.75	50.57 N00°50.37	100°32.36	47.30	Kochab	137°20.45	74°2.50
12	155° 15.87	45° 15.44	N19°54.42	39°1.28	N22°6.44	334°23.75		115°34.84	N12°47.28	Zuben'ubi	136°52.81	$-16^{\circ}9.64$
13 14	170° 18.34 185° 20.80	60° 15.12 75° 14.79	54.25 54.08	54°2.04 69°2.79	6.19 5.93	349°25.75 4°27.75	50.16 49.96	130°37.31 145°39.79	47.27 47.25	Alphecca	126°1.29	26°37.32
15	200° 23.27	90° 14.47	53.91	84°3.54	5.93 • • 5.67	4 27.75 19°29.75	· · 49.75	145 39.79 160°42.27	• • 47.24	Antares	112°12.13	-26°29.71
16	200 25.27 215°25.73	90 14.47 105°14.14	53.74	99°4.29	5.42	34°31.75	49.75	175°44.74	47.24	Atria	107°3.48	-69°4.89
17	230° 28.20	120° 13.82	53.56	114°5.05	5.16	49°33.75	49.34	190°47.22	47.22	Sabik	101°59.27	-15° 45.52
18	245° 30.66	135° 13.49	N19°53.39	129°5.80	N22°4.90	64°35.74	N00°49.14	205°49.70	N12°47.19	Shaula	96°6.17	-37°7.46
19	260°33.12	150°13.17	53.21	144°6.55	4.65	79°37.74	48.93	220°52.17	47.18	Rasalhague	95°55.67	12°32.59
20	275° 35.59	165°12.84	53.03	159°7.31	4.39	94°39.74	48.73	235°54.65	47.16	Eltanin	90°40.56	51°29.43
21	290°38.05	180°12.51	• • 52.86	174°8.06	. 4.13	109°41.74	• • 48.52	250°57.13	• • 47.15	Kaus Aust.	83°28.36	-34°22.18
22	305°40.52	195°12.18	52.68	189°8.82	3.87	124°43.74	48.32	265°59.61	47.13	Vega	80°30.96	38°48.93
23	320° 42.98	210°11.86	52.50	204°9.57	3.61	139°45.73	48.11	281°2.09	47.12	Nunki	75°43.85	-26° 15.53 8° 56.90
		0.2/ 1.0				2.0/ 1.0				Altair	61°56.79	
Mer.	pass. 01:41	$\nu$ -0.3′ d-0	.2′ m-4.27	$\nu$ 0.7 d-0	0.3′ m1.57	$\nu$ 2.0′ d-0	0.2′ m-1.69	$\nu$ 2.5′ $d$ -0	0.0′ m0.22	Peacock Deneb	53°0.61 49°23.31	-56°38.46 45°23.23
										Enif	33°35.55	10°0.64
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.81	-46°49.10
0	335° 45.44	225°11.53	$N19^{\circ}52.32$	$219^{\circ}10.32$	N22°3.36	154°47.73	N00°47.91	296°4.56	N12°47.10	Fomalhaut	15°10.93	-40° 49.10 -29° 27.96
1	$350^{\circ}47.91$	240°11.20	52.14	234°11.08	3.10	169°49.73	47.70	311°7.04	47.09	Scheat	13°41.93	28° 14.49
2	5°50.37	255° 10.87	51.95	249°11.83	2.84	184°51.73	47.50	$326^{\circ}9.52$	47.07	Markab	13°26.60	15°21.78
3	$20^{\circ}52.84$	270°10.54	• • 51.77	$264^{\circ}12.59$	• • 2.58	199°53.72	• • 47.29	$341^{\circ}12.00$	• • 47.06			10 210
4	35°55.30	285°10.21	51.59	279°13.34	2.32	214°55.72	47.09	356°14.48	47.04	Aug 25 Fri	SHA	Mer.pass
5	50°57.77	300°9.88	51.40	294° 14.10	2.06	229°57.72	46.88	11°16.96	47.03		251°39.64	08:58
6	66°0.23	315°9.55	N19°51.22	309° 14.86	N22°1.80	244°59.72		26°19.44	N12°47.01	1	244°47.18	09:25
7	81°2.69	330°9.22	51.03	324° 15.61	1.54	260° 1.71	46.47	41°21.92	47.00		179°24.59	13:45
8	96°5.16	345°8.89	50.85	339° 16.37	1.28	275°3.71	46.27	56°24.40	46.98	Saturn	320°18.64	04:23
9	111°7.62	0°8.56	• • 50.66	354° 17.12	• • 1.02	290° 5.71	• • 46.06	71°26.88	• • 46.97	Aug 26 Sat	SHA	Mer.pass
10	126° 10.09	15°8.22	50.47	9°17.88	0.75	305°7.70	45.86	86°29.36	46.95		250°32.99	08:59
11	141° 12.55	30°7.89	50.28	24°18.64	0.49	320° 9.70	45.65	101°31.84	46.93	Mars	244°5.97	09:24
12	156° 15.01	45°7.56	N19°50.09	39°19.40	N22°0.23	335°11.70	N00°45.45	116°34.32	N12°46.92		179°13.46	13:42
13	171° 17.48	60°7.22	49.90	54°20.15	21°59.97	350°13.70	45.24	131°36.80	46.90	Saturn	320°18.83	04:19
14	186° 19.94	75°6.89	49.71	69°20.91	21°59.71	5°15.69	45.04	146°39.28	46.89			
15 16	201°22.41	90°6.56	49.51	84°21.67	• • 59.44	20°17.69	· · 44.83	161°41.76	· · 46.87	Aug 27 Sun	SHA	Mer.pass
16 17	216°24.87	105°6.22	49.32	99°22.43	59.18	35°19.69	44.63	176°44.24	46.86 46.84		249°26.08	08:59
17	231°27.34 246°29.80	120°5.89 135°5.55	49.13 N19°48.93	114°23.18 129°23.94	58.92 N21°58.65	50°21.68 65°23.68	44.42 N00°44.21	191°46.72 206°49.20	46.84 N12°46.82		243°24.88	09:23
18 19	240 29.80 261°32.26	150°5.22	48.73	129 23.94 144°24.70	58.39	80°25.68	44.21 44.01	206 49.20 221°51.69	46.81	Jupiter	179°2.29	13:39
20	201 32.20 276°34.73	165°4.88	48.54	159°25.46	58.13	95°27.67	43.80	236°54.17	46.79	Saturn	320°19.12	04:15
21	276 34.73 291°37.19	105 4.88 180°4.54	48.34	159 25.46 174°26.22	58.13	95 27.67 110°29.67	· · 43.60	250 54.17 251°56.65	46.79 • • 46.78	Horizo	ntal parallax	
22	306° 39.66	195°4.21	48.14	189°26.98	57.60	125°31.66	43.39	266°59.13	46.76		Venus:	0.2
23	321°42.12	210°3.87	47.94	204° 27.74	57.33	140°33.66	43.19	282°1.61	46.74		Mars:	0.1
Mer.	pass. 01:37	$\nu$ -0.3′ d-0	.2′ m-4.26	$\nu$ 0.8′ d-0	.3′ m1.57	$\nu$ 2.0′ d-0	.2′ m-1.69	$\nu$ 2.5′ $d$ -0	0.0′ m0.22			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°28.67	N10°38.61	122°0.17	8.1'	\$18°12.71	11.3'	59.2'
1 2	194°28.84 209°29.01	37.74 36.88	136°27.25 150°54.31	8.1' 8.0'	18°23.98 18°35.13	11.2' 11.0'	59.2' 59.2'
3	224°29.19	• • 36.01	165°21.33	8.0'	18°46.16	10.9'	59.1'
4	239°29.36	35.15	179°48.31	8.0'	18°57.06	10.8'	59.1'
5 6	254°29.53 269°29.71	34.28 N10°33.42	194°15.27 208°42.19	7.9' 7.9'	19°7.84 \$19°18.49	10.6' 10.5'	59.1' 59.0'
7	284°29.88	32.55	206 42.19 223°9.08	7.9' 7.9'	19°29.01	10.5	59.0'
8	299°30.06	31.68	237°35.93	7.8'	19°39.40	10.3'	59.0'
9	314°30.23	• • 30.82	252°2.76	7.8'	19°49.66	10.1'	58.9'
10 11	329°30.41 344°30.58	29.95 29.08	266°29.55 280°56.31	7.8' 7.7'	19°59.79 20°9.79	10.0' 9.9'	58.9' 58.8'
12	359°30.76	N10°28.21	295°23.04	7.7'	S20°19.65	9.7'	58.8'
13	14°30.93	27.35	309°49.75	7.7'	20°29.39	9.6'	58.8'
14 15	29°31.11 44°31.28	26.48 •• 25.61	324°16.42 338°43.06	7.6' 7.6'	20°38.98 20°48.45	9.5' 9.3'	58.7' 58.7'
16	59°31.46	24.74	353° 9.67	7.6'	20°57.77	9.2'	58.7'
17	74°31.63	23.87	7°36.25	7.6'	21°6.96	9.1'	58.6'
18	89°31.81 104°31.99	N10°23.00	22°2.80 36°29.33	7.5'	\$21°16.02 21°24.93	8.9'	58.6'
19 20	104°31.99 119°32.16	22.13 21.26	50°55.83	7.5' 7.5'	21°24.93 21°33.71	8.8' 8.6'	58.6' 58.5'
21	134° 32.34	• • 20.39	65°22.30	7.4'	21°42.34	8.5'	58.5'
22	149°32.52	19.52	79°48.75	7.4'	21°50.84	8.4'	58.5'
23	164°32.69	18.65	94°15.17	7.4'	21°59.19	8.2'	58.4'
	SD = 15.8'	d = -0.9'		SI	D = 16.2'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°32.87	N10°17.78	$108^{\circ}41.57$	7.4'	\$22°7.40	8.1'	58.4'
1 2	194°33.05 209°33.23	16.91 16.03	123°7.94 137°34.29	7.3' 7.3'	22°15.47 22°23.40	7.9' 7.8'	58.3' 58.3'
3	209 33.23 224°33.40	15.16	157 34.29 152°0.62	7.3'	22 23.40 22°31.18	7.8 7.6'	58.3'
4	239°33.58	14.29	166°26.92	7.3'	22°38.82	7.5'	58.2'
5	254°33.76	13.42	180°53.21	7.3'	22°46.31	7.3'	58.2'
6 7	269°33.94 284°34.12	N10°12.55 11.67	195°19.47 209°45.72	7.2' 7.2'	\$22°53.66 23°0.86	7.2' 7.1'	58.2' 58.1'
8	299°34.29	10.80	224°11.94	7.2'	23°7.92	6.9'	58.1
9	314° 34.47	• • 9.93	238°38.15	7.2'	23°14.83	6.8'	58.1'
10 11	329°34.65 344°34.83	9.05 8.18	253°4.34 267°30.52	7.2' 7.2'	23°21.59 23°28.21	6.6' 6.5'	58.0' 58.0'
12	359°35.01	N10°7.30	281°56.68	7.1'	\$23°34.67	6.3	58.0'
13	14°35.19	6.43	296°22.83	7.1'	23°40.99	6.2'	57.9'
14 15	29°35.37 44°35.55	5.55 • • 4.68	310°48.96 325°15.09	7.1' 7.1'	23°47.16 23°53.18	6.0' 5.9'	57.9' 57.8'
16	59° 35.73	3.80	339°41.20	7.1'	23°59.05	5.9 5.7'	57.8'
17	$74^{\circ}35.91$	2.93	$354^{\circ}7.30$	7.1'	$24^{\circ}4.77$	5.6'	57.8'
18	89°36.09 104°36.27	N10°2.05	8°33.40 22°59.48	7.1' 7.1'	\$24°10.34 24°15.76	5.4' 5.3'	57.7'
19 20	119° 36.45	1.17 10°0.30	37°25.56	7.1'	24 15.70 24°21.02	5.3 5.1'	57.7' 57.7'
21	134°36.63	09°59.42	51°51.64	7.1'	24°26.14	5.0'	57.6'
22	149°36.81	58.54	66°17.71	7.1'	24°31.11	4.8'	57.6'
23	164°36.99	57.66	80°43.78	7.1'	24°35.92	4.7'	57.6'
	SD = 15.8'	d = -0.9'		51	D = 15.9'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°37.18 194°37.36	N09°56.79 55.91	95°9.84 109°35.90	7.1' 7.1'	\$24°40.58 24°45.10	4.5' 4.4'	57.5' 57.5'
2	194°37.36 209°37.54	55.91 55.03	109 35.90 124° 1.97	7.1° 7.1°	24°45.10 24°49.46	4.4	57.5° 57.5'
3	224°37.72	• • 54.15	138°28.03	7.1'	24°53.66	4.1'	57.4'
4	239°37.90 254°38.09	53.27	152°54.10 167°20.17	7.1'	24°57.72 25°1.62	3.9'	57.4' 57.4'
5 6	254° 38.09 269° 38.27	52.39 N09°51.51	167°20.17 181°46.25	7.1' 7.1'	25°1.62 \$25°5.37	3.8' 3.6'	57.4° 57.3'
7	284°38.45	50.64	$196^{\circ}12.34$	7.1'	25°8.97	3.4'	57.3'
8	299°38.63	49.76	210°38.43	7.1'	25°12.42	3.3'	57.3'
9 10	314°38.82 329°39.00	• • 48.87 47.99	225°4.53 239°30.64	7.1' 7.1'	25°15.71 25°18.86	3.1' 3.0'	57.2' 57.2'
11	344°39.18	47.11	253°56.76	7.1'	25°21.85	2.8'	57.2'
12	359°39.37	N09°46.23	268°22.90	7.1'	S25°24.68	2.7'	57.1'
13 14	14°39.55 29°39.73	45.35 44.47	282°49.04 297°15.21	7.2' 7.2'	25°27.37 25°29.90	2.5' 2.4'	57.1' 57.1'
14 15	29 39.73 44°39.92	• 43.59	311°41.39	7.2'	25° 29.90 25° 32.29	2.4	57.1 57.0'
16	59°40.10	42.71	326°7.58	7.2'	25°34.52	2.1'	57.0'
17	74°40.29	41.82	340°33.80	7.2'	25°36.60	1.9'	57.0'
18 19	89°40.47 104°40.65	N09°40.94 40.06	355°0.04 9°26.30	7.3' 7.3'	\$25°38.53 25°40.31	1.8' 1.6'	56.9' 56.9'
20	119° 40.84	39.18	23°52.58	7.3'	25°41.94	1.5'	56.9'
21	134°41.02	• • 38.29	38°18.88	7.3'	25°43.41	1.3'	56.8'
22 23	149°41.21 164°41.39	37.41 36.52	52°45.22 67°11.57	7.4' 7.4'	25°44.74 25°45.92	1.2' 1.0'	56.8' 56.8'
_5	SD = 15.8'	d = -0.9'			D = 15.7'	1.0	00.0
	<u> </u>	<u>a — -0.9</u>		اد	_ 13.1		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	28-49%	
25	02:05	01:57	12:02	16:28	04:01		
26	01:49	01:40	12:02	17:24	04:56		
27	01:31	01:23	12:01	18:21	05:53		

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	336° 44.58	225°3.53 N19°47.74	219°28.50 N21°57.07	155°35.66 N00°42.98	297°4.10 N12°46.73
1	351° 47.05	240°3.19 47.54	234°29.26 56.80	170°37.65 42.78	312°6.58 46.71
2	6°49.51	255°2.85 47.34	249°30.02 56.54	185°39.65 42.57	327°9.06 46.69
3	21°51.98	270°2.52 · · 47.13	264° 30.78 · · 56.27	200°41.64 · · 42.36	342°11.55 · · 46.68
4	36° 54.44	285°2.18 46.93	279°31.54 56.01	215°43.64 42.16	357°14.03 46.66
5	51° 56.91	300°1.84 46.72	294° 32.30 55.74	230°45.64 41.95	12°16.51 46.64
6	66° 59.37	315°1.50 N19°46.52	309°33.06 N21°55.47	245°47.63 N00°41.75	27°19.00 N12°46.63
7	82°1.83	330°1.16 46.31	324°33.82 55.21	260°49.63 41.54	42°21.48 46.61
8	97°4.30	345°0.82 46.11	339°34.58 54.94	275°51.62 41.34	57°23.96 46.59
9	112°6.76	0°0.47 · · 45.90	354°35.34 · · 54.67	290°53.62 · · 41.13	72°26.45 · · 46.58
10	127°9.23	15°0.13 45.69	9°36.10 54.40	305°55.61 40.92	87°28.93 46.56
11	142° 11.69	29°59.79 45.48	24°36.87 54.14	320°57.61 40.72	102°31.42 46.54
12	157° 14.15	44°59.45 N19°45.27	39°37.63 N21°53.87	335°59.60 N00°40.51	117°33.90 N12°46.53
13	172° 16.62	59°59.11 45.06	54°38.39 53.60	351°1.60 40.31	132°36.39 46.51
14	187° 19.08	74°58.76 44.84	69°39.15 53.33	6°3.60 40.10	147°38.87 46.49
15	202°21.55	89°58.42 · · 44.63	84°39.92 · · 53.06	21°5.59 · · 39.89	162°41.36 · · 46.47
16	217°24.01	104°58.08 44.42	99° 40.68 52.79	36°7.59 39.69	177°43.84 46.46
17	232° 26.48	119°57.73 44.20	114°41.44 52.52	51°9.58 39.48	192°46.33 46.44
18	247°28.94	134°57.39 N19°43.99	129°42.21 N21°52.25	66°11.58 N00°39.28	207°48.81 N12°46.42
19	262°31.40	149°57.04 43.77	144° 42.97 51.98	81°13.57 39.07	222°51.30 46.41
20	277°33.87	164°56.70 43.55	159° 43.73 51.71	96°15.57 38.86	237°53.79 46.39
21	292°36.33	179°56.35 · · 43.33	174°44.50 · · 51.44	111°17.56 · · 38.66	252°56.27 · · 46.37
22	307°38.80	194°56.01 43.11	189°45.26 51.17	126°19.55 38.45	267°58.76 46.35
23	$322^{\circ}41.26$	209°55.66 42.89	204°46.03 50.90	141°21.55 38.24	283°1.25 46.34
Morr	pass. 01:33	ν-0.3' d-0.2' m-4.25	ν0.8' d-0.3' m1.57	ν2.0' d-0.2' m-1.69	ν2.5' d-0.0' m0.21
ivier.	pass. U1:33	ν-υ.ο α-υ.∠ m-4.∠5	νυ.ο <i>u</i> -υ.ο m1.5/	ν∠.υ α-υ.∠ m-1.09	ν2.5' d-0.0' m0.21
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$337^{\circ}43.72$	224°55.31 N19°42.67	219°46.79 N21°50.63	156°23.54 N00°38.04	298°3.73 N12°46.32
1	$352^{\circ}46.19$	239°54.97 42.45	234°47.56 50.36	171°25.54 37.83	313°6.22 46.30
2	$7^{\circ}48.65$	254°54.62 42.23	249°48.32 50.09	186°27.53 37.63	328°8.71 46.28
3	$22^{\circ}51.12$	269°54.27 · · 42.01	264°49.09 · · 49.81	201°29.53 · · 37.42	343°11.20 · · 46.26
4	$37^{\circ}53.58$	284°53.92 41.78	279°49.85 49.54	216°31.52 37.21	358°13.68 46.25
5	$52^{\circ}56.05$	299°53.58 41.56	294°50.62 49.27	231°33.52 37.01	13°16.17 46.23
6	$67^{\circ}58.51$	314°53.23 N19°41.33	309°51.38 N21°49.00	246°35.51 N00°36.80	28°18.66 N12°46.21
7	83°0.97	329°52.88 41.10	324°52.15 48.72	261°37.50 36.59	43°21.15 46.19
8	98°3.44	344°52.53 40.88	339°52.92 48.45	276°39.50 36.39	58°23.64 46.17
9	113°5.90	359°52.18 • • 40.65	354°53.68 · · 48.18	291°41.49 · · 36.18	73°26.12 · · 46.16
10	128°8.37	14°51.83 40.42	9°54.45 47.90	306°43.49 35.98	88°28.61 46.14
11	$143^{\circ}10.83$	29°51.48 40.19	24°55.22 47.63	321°45.48 35.77	103°31.10 46.12
12	$158^{\circ}13.29$	44°51.13 N19°39.96	39°55.98 N21°47.35	336°47.47 N00°35.56	118°33.59 N12°46.10
13	173° 15.76	59°50.78 39.72	54° 56.75 47.08	351°49.47 35.36	133°36.08 46.08
14	$188^{\circ}18.22$	74°50.42 39.49	69°57.52 46.81	6°51.46 35.15	148°38.57 46.07
15	203°20.69	89°50.07 · · 39.26	84°58.29 · · 46.53	21°53.45 · · 34.94	163°41.06 · · 46.05
16	$218^{\circ}23.15$	104°49.72 39.02	99°59.05 46.25	36°55.45 34.74	178°43.55 46.03
17	233°25.62	119°49.37 38.79	114°59.82 45.98	51°57.44 34.53	193°46.04 46.01
18	248° 28.08	134°49.02 N19°38.55	130°0.59 N21°45.70	66°59.43 N00°34.32	208°48.53 N12°45.99
19	263°30.54	149°48.66 38.32	145°1.36 45.43	82°1.43 34.12	223°51.02 45.97
20	278°33.01	164°48.31 38.08	160°2.13 45.15	97° 3.42 33.91	238°53.51 45.95
21	293°35.47	179°47.95 · · 37.84	175°2.90 · · 44.87	112°5.41 · · 33.70	253°56.00 · · 45.94
22	308° 37.94	194°47.60 37.60	190°3.67 44.60	127°7.41 33.50	268°58.49 45.92
23	323°40.40	209° 47.25 37.36	205°4.44 44.32	142° 9.40 33.29	284°0.98 45.90
Mer.r	pass. 01:29	ν-0.3' d-0.2' m-4.25	ν0.8' d-0.3' m1.57	$\nu 2.0' \ d$ -0.2' m-1.69	ν2.5' d-0.0' m0.20
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	338° 42.86	224°46.89 N19°37.12	220°5.21 N21°44.04	157°11.39 N00°33.08	299°3.47 N12°45.88
1	353°45.33	239°46.54 36.87	235°5.98 43.76	172°13.39 32.88	314°5.96 45.86
2	8°47.79	254°46.18 36.63	250°6.75 43.49	187°15.38 32.67	329°8.46 45.84
3	23° 50.26 38° 52.72	269° 45.82 · · · 36.39 284° 45.47	265°7.52 · · 43.21	202°17.37 · · 32.46 217°19.37 32.26	344°10.95 · · 45.82
4			280°8.29 42.93		359°13.44 45.80 <b>A</b>
5	53°55.19 68°57.65	299°45.11 35.90 314°44.75 N19°35.65	295°9.06 42.65 310°9.83 N21°42.37	232°21.36 32.05 247°23.35 N00°31.84	14°15.93 45.78 29°18.42 N12°45.76
6 7	84°0.11	314 44.75 N19 35.65 329 44.40 35.40	310°9.83 N21°42.37 325°10.60 42.09	262°25.34 31.64	29°18.42 N12°45.76 44°20.92 45.74
8	99°2.58	329°44.40 35.40 344°44.04 35.15	325°10.60 42.09 340°11.37 41.81	262°25.34 31.64 277°27.34 31.43	59°23.41 45.73
9	99°2.58 114°5.04	359°43.68 · · 34.90	355° 12.14 · · 41.53	277°27.34 31.43 292°29.33 ·· 31.22	74°25.90 · · 45.71
10	114 5.04 129°7.51	14°43.32 34.65	10°12.92 41.25	307°31.32 31.01	89°28.39 45.69
11	129 7.51 144°9.97	29° 42.97 34.40	25° 13.69 40.97	307 31.32 31.01 322°33.31 30.81	104°30.89 45.67
12	159° 12.43	44°42.61 N19°34.15	40°14.46 N21°40.69	337°35.31 N00°30.60	119°33.38 N12°45.65
13	174° 14.90	59°42.25 33.90	55° 15.23 40.41	352°37.30 30.39	134°35.87 45.63
14	174 14.90 189° 17.36	74°41.89 33.65	70°16.01 40.13	7°39.29 30.19	134 35.87 45.03 149°38.37 45.61
15	204° 19.83	89°41.53 · · 33.39	85°16.78 · · 39.85	22°41.28 · · 29.98	164°40.86 · · 45.59 A
16	219° 22.29	104°41.17 33.14	100°17.55 39.57	37°43.27 29.77	179°43.36 45.57
17	234° 24.76	119°40.81 32.88	115°18.33 39.29	52°45.27 29.57	194°45.85 45.55
18	249° 27.22	134°40.45 N19°32.62	130°19.10 N21°39.01	67°47.26 N00°29.36	209°48.35 N12°45.53
19	264° 29.68	149°40.09 32.37	145°19.87 38.72	82°49.25 29.15	224°50.84 45.51
20	279°32.15	164°39.73 32.11	160°20.65 38.44	97°51.24 28.94	239°53.33 45.49
21	294°34.61	179°39.36 · · 31.85	175°21.42 · · 38.16	112°53.23 · · 28.74	254°55.83 · · 45.47
22	309° 37.08	194°39.00 31.59	190°22.20 37.87	127°55.22 28.53	269°58.32 45.45
23	324°39.54	209°38.64 31.33	205°22.97 37.59	142°57.22 28.32	285°0.82 45.43
Mer.	pass. 01:25	ν-0.4' d-0.2' m-4.24	ν0.8' d-0.3' m1.57	ν2.0′ d-0.2′ m-1.69	ν2.5' d-0.0' m0.20

	Stars	
	SHA	Dec
Alpheratz	357°31.32	29°15.06
Ankaa	353°3.92	-42°8.70
Schedar Diphda	349°27.04 348°44.07	56°41.68 -17°49.49
Achernar	335°17.70	-17 49.49 -57°5.12
Hamal	327°47.61	23°35.93
Polaris	$312^{\circ}15.81$	89°22.71
Acamar	315°9.41	-40°11.06
Menkar	314°2.92	4°12.25 49°57.60
Mirfak Aldebaran	308°23.79 290°36.21	49°57.60 16°33.99
Rigel	281°1.08	-8°9.99
Capella	$280^{\circ}17.58$	46°1.38
Bellatrix	$278^{\circ}19.77$	6°22.56
Elnath	277°58.20	28° 37.77
Alnilam Betelgeuse	275°34.81 270°48.99	-1°10.95 7°24.75
Canopus	263°51.33	-52° 42.40
Sirius	258°23.80	-16°45.22
Adhara	255°3.75	-29°0.51
Procyon	244°47.96	5°9.07
Pollux	243°13.97	27°57.29
Avior Suhail	234°14.01 222°44.49	-59°35.97 -43°32.85
Miaplacidus	221°38.40	-69° 50.05
Alphard	217°45.14	-8°46.97
Regulus	$207^{\circ}31.62$	$11^{\circ}49.61$
Dubhe	193°38.17	61°35.77
Denebola Gienah	182°22.24 175°40.78	14°24.75 -17°42.10
Acrux	175 40.78 172°57.20	-17 42.10 -63° 15.67
Gacrux	171°48.69	-57° 16.59
Alioth	$166^{\circ}10.91$	55°48.39
Spica	158° 19.36	-11°18.65
Alkaid	152°50.03	49° 10.40 -60° 30.87
Hadar Menkent	148°31.99 147°54.26	-80° 30.87 -36° 30.76
Arcturus	145°45.38	19°2.14
Rigil Kent.	139°36.36	-60°57.43
Kochab	137°20.51	74°2.49
Zuben'ubi	136°52.82 126°1.31	-16°9.63
Alphecca Antares	120 1.31 112°12.14	26°37.32 -26°29.71
Atria	107°3.51	-69°4.89
Sabik	$101^{\circ}59.28$	-15°45.52
Shaula	96°6.18	-37°7.46
Rasalhague Eltanin	95°55.68 90°40.58	12°32.59 51°29.44
Kaus Aust.	90 40.58 83°28.37	-34° 22.19
Vega	80°30.97	38° 48.94
Nunki	75°43.85	-26°15.53
Altair	$61^{\circ}56.79$	$8^{\circ}56.91$
Peacock	53°0.61	-56° 38.46
Deneb Enif	49°23.31 33°35.54	45°23.24 10°0.65
Al Na'ir	27°28.80	-46°49.11
Fomalhaut	15°10.92	-29°27.96
Scheat	$13^{\circ}41.92$	$28^{\circ}14.50$
Markab	13°26.59	15°21.80
ug 28 Mon	SHA	Mer.pass
Venus	248°18.95	09:00
Mars	242°43.91	09:22
Jupiter Saturn	178°51.07 320°19.51	13:36 04:11
Aug 29 Tue	SHA 247°11 50	Mer.pass
Venus Mars	247°11.59 242°3.07	09:01 09:20
Jupiter	178°39.82	13:33

Aug 29 Tue	SHA	Mer.pass
Venus	247°11.59	09:01
Mars	242°3.07	09:20
Jupiter	178°39.82	13:33
Saturn	320°20.01	04:07

Aug 30 Wed	SHA	Mer.pass
Venus	246°4.03	09:01
Mars	241°22.34	09:19
Jupiter	178°28.53	13:29
Saturn	320°20.61	04:03

Horizontal parallax Venus: Mars: 0.2 0.1

h	Su	Moon					
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°41.58	N09°35.64	81°37.96	7.4'	\$25°46.95	0.9'	56.7'
1	194°41.76	34.76	96°4.37	7.4'	25°47.82	0.7'	56.7'
2	209°41.95 224°42.14	33.87 · · 32.99	110°30.82 124°57.30	7.5' 7.5'	25°48.55 25°49.14	0.6' 0.4'	56.7' 56.6'
4	239°42.32	32.10	139°23.81	7.5'	25°49.57	0.3	56.6'
5	254° 42.51	31.22	153° 50.35	7.6'	25°49.86	0.1'	56.6'
6 7	269° 42.69 284° 42.88	N09°30.33 29.44	168° 16.93 182° 43.55	7.6' 7.7'	\$25°49.99 25°49.99	-0.0' -0.2'	56.6' 56.5'
8	299°43.07	28.56	197° 10.20	7.7'	25°49.83	-0.2	56.5
9	314°43.25	• • 27.67	211°36.90	7.7'	25°49.53	-0.4'	56.5'
10	329°43.44	26.78	226°3.63	7.8'	25°49.09	-0.6'	56.4
11 12	344° 43.63 359° 43.82	25.90 N09°25.01	240°30.40 254°57.22	7.8' 7.9'	25°48.50 \$25°47.76	-0.7' -0.9'	56.4' 56.4'
13	14°44.00	24.12	269°24.08	7.9'	25°46.88	-1.0'	56.3'
14	29°44.19	23.23	283° 50.99	8.0'	25°45.86	-1.2'	56.3'
15 16	44°44.38 59°44.57	· · 22.35 21.46	298° 17.94 312° 44.94	8.0' 8.0'	25°44.70 25°43.39	-1.3' -1.4'	56.3' 56.3'
17	74° 44.76	20.57	312 44.94 327°11.99	8.1'	25°41.95	-1.6'	56.2
18	89°44.94	N09°19.68	341°39.09	8.1'	S25°40.36	-1.7'	56.2'
19	104°45.13	18.79	356°6.23	8.2'	25°38.63	-1.9'	56.2'
20 21	119° 45.32 134° 45.51	17.90 •• 17.01	10°33.43 25°0.68	8.3' 8.3'	25°36.76 25°34.75	-2.0' -2.1'	56.1' 56.1'
22	149°45.70	16.12	39°27.99	8.4'	25°32.61	-2.3'	56.1
23	164° 45.89	15.23	53°55.34	8.4'	25°30.33	-2.4'	56.1'
	SD = 15.8′	d = -0.9'		SD	0 = 15.5'		
Tue	GHA	Dec	GHA		Dec	d	НР
Tue 0	<b>GHA</b> 179°46.08	Dec N09°14.34	<b>GHA</b> 68°22.76	u 8.5'	Dec \$25°27.91	d -2.6'	<b>нР</b> 56.0'
1	194°46.27	13.45	82°50.23	8.5'	25°25.35	-2.7'	56.0'
2	209°46.45	12.56	97°17.76	8.6'	25°22.66	-2.8'	56.0'
3 4	224° 46.64 239° 46.83	· · 11.67 10.78	111°45.34 126°12.99	8.6' 8.7'	25°19.84 25°16.88	-3.0' -3.1'	55.9' 55.9'
5	254° 47.02	9.89	140°40.69	8.8'	25°13.78	-3.2	55.9'
6	269°47.21	N09° 9.00	155°8.46	8.8'	S25°10.56	-3.4'	55.9'
7	284°47.40	8.10	169°36.29 184°4.18	8.9'	25°7.20 25°3.72	-3.5'	55.8'
8 9	299° 47.60 314° 47.79	7.21 •• 6.32	184°4.18 198°32.13	9.0' 9.0'	25° 3.72 25° 0.10	-3.6' -3.7'	55.8' 55.8'
10	329°47.98	5.43	213°0.15	9.1'	24°56.35	-3.9'	55.8'
11	344°48.17	4.53	227°28.23	9.1'	24°52.48	-4.0'	55.7'
12 13	359° 48.36 14° 48.55	N09° 3.64 2.75	241°56.37 256°24.59	9.2' 9.3'	\$24°48.48 24°44.35	-4.1' -4.3'	55.7' 55.7'
14	29°48.74	1.85	270°52.87	9.3'	24°40.09	-4.4	55.7'
15	44°48.93	• • 0.96	285°21.21	9.4'	24°35.72	-4.5'	55.6'
16 17	59°49.12 74°49.32	09°0.06 08°59.17	299° 49.63 314° 18.11	9.5' 9.6'	24°31.21 24°26.58	-4.6' -4.7'	55.6' 55.6'
18	89° 49.51	N08°58.27	328° 46.66	9.6'	S24°21.84	-4.1' -4.9'	55.6'
19	104°49.70	57.38	343° 15.29	9.7'	24°16.97	-5.0'	55.5'
20	119°49.89	56.48	357°43.98	9.8'	24°11.97 24°6.86	-5.1'	55.5'
21 22	134°50.08 149°50.28	• • 55.59 54.69	12°12.74 26°41.58	9.8' 9.9'	24° 6.86 24° 1.63	-5.2' -5.3'	55.5' 55.5'
23	164° 50.47	53.80	41° 10.49	10.0'	23°56.29	-5.5	55.4'
	SD = 15.8'	d = -0.9'		SD	0 = 15.3'		
Wed	GHA	Dec	GHA		Dec	d	НР
0 0	179° 50.66	N08°52.90	55°39.47	u  10.1'	\$23°50.82	-5.6'	55.4'
1	194°50.86	52.00	70°8.52	10.1'	23°45.24	-5.7'	55.4'
2 3	209°51.05 224°51.24	51.11 •• 50.21	84°37.64 99°6.84	10.2'	23°39.55 23°33.74	-5.8'	55.4'
3 4	224°51.24 239°51.44	49.31	99°6.84 113°36.11	10.3' 10.3'	23°33.74 23°27.81	-5.9' -6.0'	55.4' 55.3'
5	254°51.63	48.42	128°5.46	10.4'	$23^{\circ}21.78$	-6.1'	55.3'
6	269°51.82	N08°47.52	142°34.88	10.5'	\$23°15.63	-6.3'	55.3'
7 8	284°52.02 299°52.21	46.62 45.72	157°4.37 171°33.94	10.6' 10.6'	23° 9.38 23° 3.01	-6.4' -6.5'	55.3' 55.2'
9	314°52.40	• • 44.82	186°3.59	10.0	22°56.53	-6.6'	55.2'
10	329°52.60	43.92	200°33.31	10.8'	22°49.95	-6.7'	55.2'
11 12	344°52.79 359°52.99	43.03 N08°42.13	215°3.10 229°32.97	10.9' 10.9'	22°43.26 <b>S</b> 22°36.47	-6.8' -6.9'	55.2' 55.2'
13	359 52.99 14°53.18	41.23	229 32.97 244°2.92	10.9	22°29.57	-6.9 -7.0'	55.2' 55.1'
14	29°53.38	40.33	258°32.94	11.1'	$22^{\circ}22.57$	-7.1'	55.1'
15	44°53.57	• • 39.43	273°3.04	11.2'	22°15.46	-7.2'	55.1'
16 17	59°53.77 74°53.96	38.53 37.63	287°33.21 302°3.46	11.3' 11.3'	22°8.26 22°0.95	-7.3' -7.4'	55.1' 55.1'
18	89° 54.16	N08°36.73	316°33.79	11.4'	S21°53.54	-7.5'	55.0'
19	104° 54.35	35.83	331°4.19	11.5'	21°46.03	-7.6'	55.0'
20 21	119°54.55 134°54.75	34.92 •• 34.02	345°34.67 0°5.23	11.6' 11.6'	21°38.43 21°30.73	-7.7' -7.8'	55.0' 55.0'
22	134 54.75 149°54.94	33.12	14°35.86	11.7'	21°22.93	-7.0 -7.9'	55.0'
23	164°55.14	32.22	29°6.56	11.8'	21°15.04	-8.0'	54.9'
	SD = 15.8'	d = -0.9'		SD	0 = 15.1'		

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

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

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-79%
28	01:14	01:05	12:01	19:16	06:49	
29	00:56	00:47	12:01	20:09	07:43	
30	00:37	00:28	12:00	21:00	08:35	

## August 31, 01, 02 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	339° 42.00	224°38.28 N19°31.0		157°59.21 N00°28.11	300°3.32 N12°45.41	
1	354°44.47	239°37.91 30.8	0 235°24.52 37.02	173°1.20 27.91	315°5.81 45.39	Alpheratz 357°31.30 29°15.08 Ankaa 353°3.90 -42°8.71
2	9°46.93	254° 37.55 30.5		188° 3.19 27.70	330°8.31 45.37	Schedar 349°27.02 56°41.70
3	24°49.40	269°37.19 · · 30.2		203°5.18 · · 27.49	345°10.80 · · 45.35	Diphda 348°44.05 -17°49.49
4	39°51.86	284°36.82 30.0		218°7.17 27.29	0°13.30 45.33	Achernar 335°17.67 -57°5.13
5 6	54° 54.32 69° 56.79	299°36.46 29.7 314°36.09 N19°29.4		233° 9.16 27.08 248° 11.16 N00° 26.87	15°15.80 45.31 30°18.29 N12°45.29	Hamal 327°47.59 23°35.94
7	84°59.25	329°35.73 29.2		263°13.15 26.66	45°20.79 45.27	Polaris 312°14.22 89°22.72
8	100°1.72	344°35.36 28.9		278°15.14 26.46	60°23.29 45.25	Acamar 315°9.38 -40°11.06
9	115°4.18	359°35.00 · · 28.6		293°17.13 · · · 26.25	75°25.78 · · 45.22	Menkar 314°2.90 4°12.25 Mirfak 308°23.76 49°57.61
10	$130^{\circ}6.65$	14°34.63 28.3		308°19.12 26.04	90°28.28 45.20	Mirfak 308°23.76 49°57.61 Aldebaran 290°36.18 16°34.00
11	145°9.11	29°34.27 28.1		323°21.11 25.83	105°30.78 45.18	Rigel 281°1.06 -8°9.99
12	160°11.57	44°33.90 N19°27.8		338°23.10 N00°25.63	120°33.27 N12°45.16	Capella 280°17.54 46°1.38
13	175° 14.04	59°33.53 27.5		353°25.09 25.42	135°35.77 45.14	Bellatrix 278°19.75 6°22.56
14 15	190° 16.50 205° 18.97	74°33.17 27.3 89°32.80 · · 27.0		8°27.08 25.21 23°29.07 · · 25.00	150°38.27 45.12 165°40.77 • 45.10	Elnath 277°58.17 28°37.77
16	220°21.43	104°32.43 26.7		38°31.06 24.80	180°43.27 45.08	Alnilam 275°34.79 -1°10.95
17	235°23.89	119°32.07 26.4		53°33.05 24.59	195°45.77 45.06	Betelgeuse 270°48.97 7°24.75
18	250°26.36	134°31.70 N19°26.2		68°35.04 N00°24.38	210°48.26 N12°45.04	Canopus 263°51.31 -52°42.39
19	265°28.82	149°31.33 25.9	2 145°38.51 31.87	83°37.04 24.17	225°50.76 45.01	Sirius 258°23.78 -16°45.21 Adhara 255°3.73 -29°0.51
20	280°31.29	164°30.96 25.6		98°39.03 23.96	240°53.26 44.99	Procyon 244°47.94 5°9.07
21	295°33.75	179°30.59 · · 25.3		113°41.02 · · 23.76	255°55.76 · · 44.97	Pollux 243°13.95 27°57.29
22	310°36.21	194°30.22 25.0		128°43.01 23.55	270°58.26 44.95	Avior 234°13.99 -59°35.95
23	325°38.68	209°29.85 24.8	0 205°41.63 30.72	143°45.00 23.34	286°0.76 44.93	Suhail 222°44.48 -43°32.84
Mer.ı	pass. 01:21	$\nu$ -0.4' d-0.3' m-4.2	$\nu 0.8' \ d$ -0.3' m1.57	$\nu 2.0' \ d$ -0.2' m-1.69	$ u 2.5' \ d$ -0.0' m0.19	Miaplacidus 221°38.39 -69°50.03
						Alphard 217°45.12 -8°46.97
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.61 11°49.60
0	340°41.14	224°29.48 N19°24.5		158°46.99 N00°23.13	301°3.26 N12°44.91	Dubhe 193°38.16 61°35.75 Denebola 182°22.23 14°24.74
1	355°43.61	239°29.11 24.2		173°48.98 22.93	316°5.76 44.89	Gienah 175°40.78 -17°42.09
2	$10^{\circ}46.07$	254°28.74 23.9		188°50.97 22.72	331°8.26 44.86	Acrux 172°57.21 -63°15.66
3	25°48.54	269°28.37 · · 23.6		203°52.96 · · 22.51	346°10.76 · · 44.84	Gacrux 171°48.70 -57°16.58
4	40°51.00	284°28.00 23.3		218°54.95 22.30	1°13.26 44.82	Alioth 166°10.91 55°48.38
5	55° 53.46	299°27.63 23.0		233°56.94 22.09	16°15.76 44.80	Spica 158°19.37 -11°18.65
6 7	70° 55.93 85° 58.39	314°27.26 N19°22.8 329°26.89 22.5	_	248°58.93 N00°21.89 264°0.92 21.68	31°18.26 N12°44.78 46°20.76 44.76	Alkaid 152°50.04 49°10.39
8	101°0.86	344°26.52 22.2		279° 2.90 21.47	61°23.26 44.73	Hadar 148°32.01 -60°30.87
9	116°3.32	359°26.14 · · 21.9		294° 4.89 · · 21.26	76°25.76 · · 44.71	Menkent 147°54.26 -36°30.75
10	131°5.78	14°25.77 21.6		309° 6.88 21.06	91°28.27 44.69	Arcturus 145°45.39 19°2.14
11	146°8.25	29°25.40 21.3		324°8.87 20.85	106°30.77 44.67	Rigil Kent. 139°36.38 -60°57.43 Kochab 137°20.56 74°2.48
12	161°10.71	44°25.02 N19°21.0	5 40°51.79 N21°26.93	339°10.86 N00°20.64	121°33.27 N12°44.65	Zuben'ubi 136°52.82 -16°9.63
13	176° 13.18	59°24.65 20.7		354°12.85 20.43	136°35.77 44.62	Alphecca 126°1.32 26°37.32
14	191°15.64	74°24.28 20.4		9°14.84 20.22	151°38.27 44.60	Antares 112°12.15 -26°29.71
15	206° 18.10	89°23.90 · · 20.1		24°16.83 · · 20.01	166°40.78 · · 44.58	Atria 107°3.54 -69°4.89
16 17	221°20.57 236°23.03	104°23.53 19.8 119°23.15 19.5		39°18.82 19.81 54°20.81 19.60	181°43.28 44.56 196°45.78 44.54	Sabik 101°59.29 -15°45.52
18	251°25.50	134°22.78 N19°19.2		69°22.80 N00°19.39	211°48.28 N12°44.51	Shaula 96°6.19 -37°7.46
19	266° 27.96	149°22.40 18.9	_	84°24.79 19.18	226°50.79 44.49	Rasalhague 95°55.69 12°32.59
20	281°30.42	164°22.03 18.6		99°26.78 18.97	241°53.29 44.47	Eltanin 90°40.61 51°29.44 Kaus Aust. 83°28.37 -34°22.19
21	296°32.89	179°21.65 · · 18.3		114°28.76 · · 18.77	256°55.79 · · 44.45	Vega 80°30.98 38°48.94
22	311°35.35	194°21.28 18.0		129°30.75 18.56	271°58.30 44.42	Nunki 75°43.86 -26°15.54
23	326° 37.82	209°20.90 17.7	6 206°0.41 23.70	144°32.74 18.35	287°0.80 44.40	Altair 61°56.80 8°56.92
Mer.	pass. 01:17	ν-0.4' d-0.3' m-4.2	$\nu 0.8' \ d$ -0.3' m1.57	ν2.0' d-0.2' m-1.68	$\nu$ 2.5′ d-0.0′ m0.19	Peacock 53°0.62 -56°38.47
						Deneb 49°23.32 45°23.26
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.54 10°0.66
0 0	341°40.28	224°20.52 N19°17.4		159°34.73 N00°18.14	302°3.31 N12°44.38	Al Na'ir 27°28.79 -46°49.12
1	356° 42.74	239°20.15 17.1		174°36.72 17.93	317°5.81 44.35	Fomalhaut 15°10.91 -29°27.96   Scheat 13°41.91 28°14.51
2	11°45.21	254°19.77 16.8		189°38.71 17.72	332°8.31 44.33	Markab 13°26.58 15°21.81
3	26°47.67	269°19.39 · · 16.5		204°40.70 · · 17.52	347°10.82 · · 44.31	
4	41°50.14	284°19.02 16.2		219°42.69 17.31	2°13.32 44.29	Aug 31 Thu SHA Mer.pass
5	56° 52.60	299°18.64 15.9		234°44.67 17.10	17°15.83 44.26	Venus 244°56.27 09:02
6	71°55.07	314°18.26 N19°15.6		249°46.66 N00°16.89	32°18.33 N12°44.24	Mars 240°41.74 09:18   Jupiter 178°17.20 13:26
7 8	86° 57.53 101° 59.99	329°17.88 15.3 344°17.50 15.0		264°48.65 16.68 279°50.64 16.47	47°20.84 44.22 62°23.34 44.19	Saturn 320°21.31 03:59
9	101 59.99 117°2.46	359°17.13 · · 14.6		294°52.63 · · 16.27	77°25.85 · · 44.17	
10	132°4.92	14°16.75 14.3		309°54.61 16.06	92°28.35 44.15	Sep 01 Fri SHA Mer.pass
11	147°7.39	29°16.37 14.0		324°56.60 15.85	107°30.86 44.12	Venus 243°48.34 09:02
12	162°9.85	44°15.99 N19°13.7		339°58.59 N00°15.64	122°33.37 N12°44.10	Mars 240°1.27 09:17   Jupiter 178°5.84 13:23
13	177° 12.31	59°15.61 13.4		355°0.58 15.43	137°35.87 44.08	Saturn 320°22.12 03:55
14	192° 14.78	74°15.23 13.1		10°2.57 15.22	152°38.38 44.05	
15 16	207° 17.24	89°14.85 · · 12.8		25°4.55 · · 15.02	167°40.89 · · 44.03	Sep 02 Sat SHA Mer.pass
16 17	222° 19.71 237° 22.17	104°14.47 12.4 119°14.09 12.1		40°6.54 14.81 55°8.53 14.60	182°43.39 44.01 197°45.90 43.98	Venus 242°40.24 09:03
17 18	252°24.63	119°14.09 12.1 134°13.71 N19°11.8		55°8.53 14.60 70°10.52 N00°14.39	197°45.90 43.98 212°48.41 N12°43.96	Mars 239°20.92 09:15
19	267°27.10	149°13.32 11.5		85°12.50 14.18	212 48.41 N12 43.90 227°50.91 43.93	Jupiter 177°54.45 13:20 Saturn 320°23.02 03:51
20	282°29.56	164°12.94 11.2		100°14.49 13.97	242°53.42 43.91	
21	297°32.03	179°12.56 · · 10.8		115°16.48 · · 13.76	257°55.93 · · 43.89	Horizontal parallax
22	312°34.49	194°12.18 10.5		130°18.47 13.55	272°58.44 43.86	Venus: 0.2
23	327°36.95	209°11.80 10.2	3 206°19.32 16.54	145°20.45 13.35	288°0.94 43.84	Mars: 0.1
Mer.ı	pass. 01:13	ν-0.4' d-0.3' m-4.2	$\nu 0.8' \ d$ -0.3' m1.56	ν2.0' d-0.2' m-1.68	ν2.5' d-0.0' m0.18	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.33	$N08^{\circ}31.32$	43°37.35	11.9'	<b>S</b> 21°7.05	-8.1'	54.9'
1	194°55.53	30.42	58°8.21	11.9'	20°58.98	-8.2'	54.9'
2	209°55.73 224°55.92	29.51 •• 28.61	72°39.14 87°10.15	12.0' 12.1'	20° 50.81 20° 42.54	-8.3' -8.4'	54.9' 54.9'
4	239°56.12	27.71	101°41.23	12.2'	20° 34.19	-8.4'	54.9'
5	254°56.32	26.80	$116^{\circ}12.39$	12.2'	$20^{\circ}25.75$	-8.5'	54.8'
6	269°56.51	N08°25.90	130°43.63	12.3'	S20° 17.22	-8.6'	54.8'
7 8	284°56.71 299°56.91	25.00 24.09	145° 14.94 159° 46.32	12.4' 12.5'	20°8.61 19°59.91	-8.7' -8.8'	54.8' 54.8'
9	314°57.11	. 23.19	174° 17.78	12.5	19 59.91 19°51.12	-o.o -8.9'	54.8'
10	329°57.30	22.29	188°49.31	12.6'	19°42.25	-9.0'	54.8'
11	344°57.50	21.38	203°20.92	12.7'	19°33.30	-9.0'	54.7'
12	359°57.70	N08°20.48	217°52.60	12.8'	\$19°24.26	-9.1'	54.7'
13 14	14°57.90 29°58.10	19.57 18.67	232°24.35 246°56.18	12.8' 12.9'	19° 15.14 19° 5.95	-9.2' -9.3'	54.7' 54.7'
15	44°58.29	17.76	261°28.07	13.0'	19° 56.67	-9.3 -9.4'	54.7'
16	59°58.49	16.85	276°0.04	13.0'	18°47.31	-9.4'	54.7'
17	74°58.69	15.95	290°32.08	13.1'	18° 37.88	-9.5'	54.6'
18	89°58.89 104°59.09	N08° 15.04	305°4.20 319°36.38	13.2'	\$18°28.37 18°18.79	-9.6'	54.6' 54.6'
19 20	104 59.09 119°59.29	14.14 13.23	319°36.38 334°8.63	13.3' 13.3'	18° 18.79 18° 9.13	-9.7' -9.7'	54.6'
21	134°59.49	. 12.32	348° 40.96	13.4	17°59.40	-9.8'	54.6'
22	149°59.69	11.42	3°13.35	13.5'	$17^{\circ}49.59$	-9.9'	54.6'
23	164°59.89	10.51	17°45.81	13.5'	17°39.71	-9.9'	54.5'
	SD = 15.8'	d = -0.9'		SI	O = 15.0'		
E.:	СП.	Dag			Das	ل	μn
Fri 0	<b>GHA</b> 180°0.09	<b>Dec</b> N08° 9.60	<b>GHA</b> 32°18.34	u 13.6'	Dec \$17° 29.77	<i>d</i> −10.0'	<b>HP</b> 54.5'
1	195°0.29	8.69	46° 50.94	13.7'	17° 19.75	-10.1	54.5'
2	210°0.49	7.79	61°23.60	13.7'	$17^{\circ}9.66$	-10.2'	54.5'
3	225°0.69	• • 6.88	75° 56.34	13.8'	16°59.51	-10.2'	54.5'
4 5	240°0.89 255°1.09	5.97 5.06	90°29.14 105°2.00	13.9' 13.9'	16°49.29 16°39.00	-10.3' -10.4'	54.5' 54.5'
6	270°1.29	N08°4.15	119°34.93	14.0'	\$16° 28.65	-10.4	54.5'
7	285°1.49	3.24	134°7.93	14.1'	16° 18.23	-10.5'	54.4'
8	300°1.69	2.33	148°40.99	14.1'	16°7.75	-10.5'	54.4'
9	315°1.89 330°2.09	· · 1.42 08°0.51	163°14.11 177°47.30	14.2' 14.2'	15°57.20 15°46.60	-10.6'	54.4'
10 11	345°2.29	08 0.51 07°59.60	177 47.30 192°20.55	14.2	15 46.60 15°35.94	-10.7' -10.7'	54.4' 54.4'
12	0°2.49	N07°58.69	206° 53.86	14.4'	S15°25.21	-10.8'	54.4'
13	15°2.69	57.78	221°27.23	14.4'	15°14.43	-10.8'	54.4'
14 15	30°2.89 45°3.09	56.87 •• 55.96	236°0.67 250°34.16	14.5' 14.6'	15°3.59 14°52.69	-10.9' -11.0'	54.4' 54.3'
16	60°3.30	55.05	265°7.71	14.6'	14 52.09 14°41.73	-11.0'	54.3'
17	75°3.50	54.14	279°41.33	14.7'	14°30.72	-11.1'	54.3'
18	90°3.70	N07°53.23	294° 15.00	14.7'	S14°19.66	-11.1'	54.3'
19	105°3.90 120°4.10	52.32	308° 48.72 323° 22.51	14.8'	14°8.54	-11.2'	54.3' 54.3'
20 21	120°4.10 135°4.31	51.40 •• 50.49	323°22.51 337°56.35	14.8' 14.9'	13°57.37 13°46.15	-11.2 -11.3'	54.3'
22	150°4.51	49.58	352°30.24	15.0'	13°34.88	-11.3'	54.3'
23	165°4.71	48.67	7°4.19	15.0'	13°23.55	-11.4'	54.3'
	SD = 15.8'	d = -0.9'		SI	D = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0 0	180°4.91	N07° 47.75	21°38.20	ν 15.1'	\$13° 12.18	-11.4'	54.2'
1	195°5.12	46.84	$36^{\circ}12.26$	15.1'	$13^{\circ}0.76$	-11.5'	54.2'
2	210°5.32	45.93	50°46.37	15.2'	12°49.29	-11.5'	54.2'
3 4	225°5.52 240°5.72	· · 45.01 44.10	65° 20.53 79° 54.75	15.2' 15.3'	12°37.78 12°26.22	-11.6' -11.6'	54.2' 54.2'
4 5	240 5.72 255° 5.93	44.10	79 54.75 94°29.01	15.3'	12 20.22 12°14.61	-11.6'	54.2'
6	270°6.13	N07°42.27	109°3.32	15.4'	S12°2.96	-11.7'	54.2'
7	285°6.33	41.36	123°37.69	15.4'	11°51.27	-11.7'	54.2'
8 9	300°6.54 315°6.74	40.44 •• 39.53	138° 12.10 152° 46.56	15.5' 15.5'	11°39.54 11°27.76	-11.8' -11.8'	54.2' 54.2'
10	315°6.74 330°6.95	38.61	152°46.56 167°21.06	15.6'	11° 27.76 11° 15.95	-11.8 -11.9'	54.2 54.1'
11	345°7.15	37.70	181°55.61	15.6'	11°4.09	-11.9'	54.1'
12	0°7.35	N07°36.78	196°30.21	15.6'	\$10°52.19	-11.9'	54.1'
13 14	15°7.56 30°7.76	35.87 34.95	211°4.85 225°39.54	15.7' 15.7'	10°40.26 10°28.29	-12.0'	54.1' 54.1'
14 15	30°7.76 45°7.97	34.95	225° 39.54 240° 14.27	15.7° 15.8'	10° 28.29 10° 16.28	-12.0' -12.0'	54.1' 54.1'
16	60°8.17	33.12	254°49.04	15.8'	10°4.23	-12.1	54.1'
17	75°8.38	32.20	269°23.85	15.9'	09°52.16	-12.1'	54.1'
18	90°8.58 105°8.78	N07°31.29	283°58.70 298°33.59	15.9'	\$09°40.04 09°27.90	-12.1'	54.1'
19 20	105°8.78 120°8.99	30.37 29.45	298° 33.59 313° 8.52	15.9' 16.0'	09°27.90 09°15.72	-12.2' -12.2'	54.1' 54.1'
21	135°9.19	28.53	327° 43.49	16.0'	09°3.51	-12.2'	54.1'
22	150°9.40	27.62	342° 18.50	16.0'	08°51.26	-12.3'	54.0'
23	165°9.61	26.70	356°53.54	16.1'	08°38.99	-12.3'	54.0'
	SD = 15.8'	d = -0.9'		SI	D = 14.8'		

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

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

		Sun			Moon			
Day	Eqn.of Time Mer. Mer.Pass.		Pass.	Age				
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-96%		
31	00:19	00:09	12:00	21:47	09:24			
01	00:00	00:10	12:00	22:31	10:09			
02	00:20	00:29	12:00	23:13	10:52			

## September 03, 04, 05 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
C	CIIA				CHA
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	342°39.42	224°11.41 N19°9.		160°22.44 N00°13.14	303°3.45 N12°43.82
1	357°41.88	239°11.03 9.		175°24.43 12.93	318°5.96 43.79
2	12°44.35	254° 10.65 9.5		190°26.42 12.72	333°8.47 43.77
3	27°46.81	269° 10.26 · · · 8.9		205°28.40 · · 12.51	348°10.98 · · 43.74
4	42°49.27	284°9.88 8.0		220°30.39 12.30	3°13.49 43.72
5	57°51.74	299°9.50 8.3		235°32.38 12.09	18°16.00 43.69
6	72°54.20	314°9.11 N19°7.		250°34.36 N00°11.88	33°18.51 N12°43.67
7	87°56.67	329°8.73 7.0		265°36.35 11.68	48°21.01 43.65
8	102°59.13	344°8.35 7.3		280°38.34 11.47	63°23.52 43.62
9	$118^{\circ}1.59$	359°7.96 · · 6.9		295°40.33 ·· 11.26	78°26.03 · · 43.60
10	133°4.06	14°7.58 6.0		310°42.31 11.05	93°28.54 43.57
11	148°6.52	29°7.19 6.5		325°44.30 10.84	108°31.05 43.55
12	163°8.99	44°6.81 N19°5.		340°46.29 N00°10.63	123°33.56 N12°43.52
13	$178^{\circ}11.45$	59°6.42 5.0	$0   56^{\circ}30.41   12.30$	355°48.27 10.42	138°36.07 43.50
14	193° 13.91	74°6.03 5.:		10°50.26 10.21	153°38.59 43.47
15	$208^{\circ}16.38$	89°5.65 · · 4.9	3 86°32.00 ·· 11.69	25°52.25 · · 10.00	168°41.10 · · 43.45
16	223°18.84	104°5.26 4.		40°54.23 9.80	183°43.61 43.42
17	238°21.31	119°4.87 4.3		55°56.22 9.59	198°46.12 43.40
18	253°23.77	134°4.49 N19°3.	1 131°34.38 N21°10.77	70°58.20 N00°9.38	213°48.63 N12°43.37
19	268° 26.24	149°4.10 3.	7 146°35.17 10.46	$86^{\circ}0.19$ 9.17	228°51.14 43.35
20	283°28.70	164°3.71 3.	2 161°35.97 10.16	101°2.18 8.96	243°53.65 43.32
21	298°31.16	179°3.33 · · 2.5	8 176°36.76 · · 9.85	116° 4.16 · · 8.75	258°56.16 · · 43.30
22	313°33.63	194°2.94 2.	4 191°37.56 9.54	131° 6.15 8.54	273°58.68 43.27
23	328°36.09	209°2.55 2.	9 206°38.35 9.24	146° 8.14 8.33	289°1.19 43.25
N 4	01.00	ν-0.4' d-0.3' m-4.2	0.0/ 1.0.3/ 1.56	2.0/ 1.0.0/ 1.00	$\nu$ 2.5' d-0.0' m0.18
Mer.p	pass. 01:09	ν-0.4′ d-0.3′ m-4.2	$\nu 0.8' \ d$ -0.3' m1.56	ν2.0' d-0.2' m-1.68	ν2.5' d-0.0' m0.18
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	343°38.56	224°2.16 N19°1.		161°10.12 N00°8.12	304°3.70 N12°43.22
1	358°41.02	239°1.77 1.		176°12.11 7.91	319°6.21 43.20
2	13°43.48	254°1.39 1.		191°14.09 7.70	334°8.73 43.17
3	28° 45.95	269°1.00 · · 0.5		206°16.08 · · 7.50	349°11.24 · · 43.15
4	43°48.41	284°0.61 0.4		221°18.06 7.29	4°13.75 43.12
5	58° 50.88	299°0.22 19°0.		236°20.05 7.08	19°16.27 43.10
6	73°53.34	313°59.83 N18°59.		251°22.04 N00°6.87	34°18.78 N12°43.07
7	88°55.80	328°59.44 59.		266°24.02 6.66	49°21.29 43.05
8	103°58.27	343°59.05 59.		281°26.01 6.45	64°23.81 43.02
9	119°0.73	358° 58.66 · · 58.		296°27.99 · · 6.24	79°26.32 · · 42.99
	119 0.73 134°3.20	13° 58.27 58.3		311°29.98 6.03	94°28.83 42.97
10 11	134 3.20 149°5.66	28° 57.88 57.		326°31.96 5.82	109°31.35 42.94
12	164°8.12	43°57.49 N18°57.		341°33.95 N00°5.61	124°33.86 N12°42.92
	104 6.12 179° 10.59	58° 57.10 57.1		356°35.93 5.40	139°36.38 42.89
13	179 10.59 194° 13.05	73°56.71 56.			I
14					154°38.89 42.86 169°41.41 · · 42.84
15	209° 15.52			26°39.90 · · 4.98	
16	224° 17.98	103°55.92 56.3		41°41.89 4.77	184°43.92 42.81
17	239°20.44	118°55.53 55.5		56°43.87 4.56	199°46.44 42.79
18	254°22.91	133°55.14 N18°55.		71°45.86 N00°4.36	214°48.95 N12°42.76
19	269°25.37	148° 54.75 55.		86°47.84 4.15	229°51.47 42.73
20	284°27.84	163°54.36 54.		101°49.83 3.94	244°53.98 42.71
21	299°30.30	178°53.96 · · 54.3	8 176°55.91 · · 2.42	116°51.81 · · 3.73	259°56.50 · · 42.68
22	314°32.76	193°53.57 54.0		131°53.80 3.52	274°59.02 42.65
23	329° 35.23	208°53.18 53.	5 206° 57.51 1.80	146°55.78 3.31	290°1.53 42.63
Mer.	pass. 01:05	ν-0.4' d-0.3' m-4.2	$\nu$ 0.8' d-0.3' m1.56	ν2.0' d-0.2' m-1.68	ν2.5' d-0.0' m0.17
_			<b></b>		
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	344° 37.69	223°52.79 N18°53.		161°57.77 N00°3.10	305°4.05 N12°42.60
1	359°40.16	238°52.39 52.9		176°59.75 2.89	320°6.57 42.58
2	14°42.62	253°52.00 52.5		192°1.74 2.68	335°9.08 42.55
3	29°45.08	268°51.60 · · 52.		207°3.72 · · 2.47	350°11.60 · · 42.52
4	44° 47.55	283°51.21 51.8		222°5.71 2.26	5°14.12 42.50 <b>S</b>
5	59°50.01	298°50.82 51.4		237°7.69 2.05	20°16.63 42.47
6	74°52.48	313°50.42 N18°51.		252°9.68 N00°1.84	35°19.15 N12°42.44
7	89°54.94	328°50.03 50.0		267°11.66 1.63	50°21.67 42.41
8	104°57.40	343°49.63 50.3		282°13.64 1.42	65°24.19 42.39
9	119°59.87	358°49.24 · · 49.		297°15.63 · · 1.21	80°26.71 · · 42.36
10	135°2.33	13°48.84 49.		312°17.61 1.00	95 29.22 42.33
11	150°4.80	28°48.45 49.		327°19.60 0.79	110°31.74 42.31
12	165°7.26	43°48.05 N18°48.		342°21.58 N00°0.58	125°34.26 N12°42.28
13	180°9.72	58° 47.66 48.4		357°23.57 0.37	140°36.78 42.25
14	$195^{\circ}12.19$	73°47.26 48.0		12°25.55 N00°0.16	155°39.30 42.23
15	$210^{\circ}14.65$	88°46.86 · · 47.		27°27.53 \$00°0.05	170°41.82 · · 42.20 S
16	$225^{\circ}17.12$	103°46.47 47.5		42°29.52 0.26	185°44.34 42.17
17	$240^{\circ}19.58$	118°46.07 46.9	0 117°11.96 56.13	57°31.50 0.47	200°46.86 42.14
18	255°22.04	133°45.68 N18°46.	2 132°12.77 N20°55.81	72°33.48 <b>S</b> 00°0.68	215°49.38 N12°42.12
19	$270^{\circ}24.51$	148°45.28 46.	4 147°13.57 55.50	87°35.47 0.89	230°51.90 42.09
20	285°26.97	163°44.88 45.	5 162°14.38 55.18	102°37.45 1.10	245°54.42 42.06
21	$300^{\circ}29.44$	178°44.48 · · 45.3	7 177°15.18 · · 54.86	117°39.44 · · 1.31	260°56.94 · · 42.03
22	$315^{\circ}31.90$	193°44.09 44.	8 192°15.99 54.54	132°41.42 1.52	275°59.46 42.01
23	330°34.36	208°43.69 44.	9 207°16.80 54.22	147°43.40 1.73	291°1.98 41.98
N 4 a	pass. 01:01	ν-0.4' d-0.4' m-4.2		ν2.0' d-0.2' m-1.68	ν2.5′ d-0.0′ m0.17
ivier.	Jass. UI:UI	ν-0.4 α-0.4 m-4.2	υυ.ο΄ α-υ.3΄ m1.50	ν∠.υ α-υ.∠ m-1.08	ν2.5 α-0.0 mo.17

	Stars	
	SHA	Dec
Alpheratz	357°31.30	29°15.09
Ankaa	353°3.88	-42°8.71
Schedar Diphda	349°27.00 348°44.04	56°41.71 -17°49.49
Achernar	335°17.64	-57°5.14
Hamal	327°47.57	23°35.95
Polaris Acamar	312°12.83 315°9.36	89°22.73 -40°11.06
Menkar	314°2.88	4° 12.26
Mirfak	$308^{\circ}23.73$	49°57.62
Aldebaran	290°36.16 281°1.04	16°34.00
Rigel Capella	281°1.04 280°17.52	-8°9.98 46°1.38
Bellatrix	278°19.73	6° 22.57
Elnath	277°58.15	28° 37.77
Alnilam Betelgeuse	275°34.77 270°48.95	-1°10.94 7°24.75
Canopus	263°51.28	-52°42.39
Sirius	258°23.76	-16°45.21
Adhara	255°3.71 244°47.93	-29°0.50 5°9.07
Procyon Pollux	244 47.93 243°13.93	27°57.29
Avior	234°13.97	-59° 35.94
Suhail	222°44.47	-43°32.82
Miaplacidus Alphard	221°38.37 217°45.12	-69°50.02 -8°46.96
Regulus	207°31.60	11° 49.60
Dubhe	$193^{\circ}38.16$	61°35.74
Denebola	182°22.23	14°24.74
Gienah Acrux	175°40.79 172°57.23	-17° 42.09 -63° 15.64
Gacrux	171°48.71	-57° 16.57
Alioth	166°10.93	55° 48.37
Spica Alkaid	158°19.38 152°50.06	-11° 18.65 49° 10.38
Hadar	148°32.03	-60° 30.86
Menkent	$147^{\circ}54.28$	-36°30.75
Arcturus	145°45.40	19°2.13
Rigil Kent. Kochab	139°36.41 137°20.61	-60°57.42 74°2.47
Zuben'ubi	136°52.84	-16°9.63
Alphecca	126°1.33	26° 37.32
Antares Atria	112°12.17 107°3.58	-26°29.71 -69°4.89
Sabik	101°59.30	-15° 45.52
Shaula	96°6.21	-37°7.46
Rasalhague	95°55.70	12°32.60 51°29.44
Eltanin Kaus Aust.	90°40.63 83°28.39	-34°22.19
Vega	80°31.00	38°48.95
Nunki	75°43.87	-26° 15.54
Altair Peacock	61°56.81 53°0.63	8°56.92 -56°38.48
Deneb	49°23.33	45°23.27
Enif	33°35.54	10°0.66
Al Na'ir Fomalhaut	27°28.79 15°10.91	-46°49.13 -29°27.97
Fomalhaut	15° 10.91 13° 41.91	-29° 27.97 28° 14.52
Markab	13°26.57	15°21.81
Sep 03 Sun	SHA	Mer.pass
Venus	241°32.00	09:03
Mars Jupiter	238°40.69 177°43.02	09:14 13:17
Jupiter Saturn	320°24.03	13:17 03:47
Sep 04 Mon	SHA	Mer.pass
Venus	$240^{\circ}23.61$	09:04
Mars	238°0.59	09:13
Jupiter Saturn	177°31.57 320°25.15	13:14 03:43
Sep 05 Tue	SHA	Mer.pass
Venus	$239^{\circ}15.09$	09:05
Mars	237°20.62	09:12
Jupiter Saturn	177°20.08 320°26.36	13:10 03:39
Jatuiii		03.39

Horizontal parallax

Venus: Mars: 0.2 0.1

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°9.81	N07°25.78	$11^{\circ}28.62$	16.1'	<b>S</b> 08° 26.69	-12.3'	54.0'
1	195°10.02	24.86	26°3.73	16.1'	08°14.36	-12.4	54.0'
2	210°10.22 225°10.43	23.95 •• 23.03	40°38.88 55°14.06	16.2' 16.2'	08°2.00 07°49.62	-12.4' -12.4'	54.0' 54.0'
4	240°10.63	22.11	69°49.27	16.2'	07°37.20	-12.4	54.0'
5	255°10.84	21.19	$84^{\circ}24.52$	16.3'	$07^{\circ}24.77$	-12.5'	54.0'
6	270°11.05	N07°20.27	98°59.79	16.3'	507°12.30	-12.5'	54.0'
7 8	285°11.25 300°11.46	19.35 18.43	113°35.10 128°10.43	16.3' 16.4'	06°59.82 06°47.31	-12.5' -12.5'	54.0' 54.0'
9	315°11.66	17.51	142° 45.79	16.4	06°34.78	-12.6'	54.0'
10	330°11.87	16.59	157°21.19	16.4'	06°22.22	-12.6'	54.0'
11	345°12.08 0°12.28	15.67 N07° 14.75	171°56.60 186°32.05	16.4'	06°9.65 \$05°57.05	-12.6'	54.0'
12 13	0 12.28 15°12.49	13.83	201°7.51	16.5' 16.5'	05°44.44	-12.6' -12.6'	54.0' 54.0'
14	30°12.70	12.91	215°43.01	16.5'	05°31.81	-12.7'	54.0'
15	45°12.91	• • 11.99	230° 18.52	16.5'	05°19.16	-12.7'	54.0'
16 17	60°13.11 75°13.32	11.07 10.15	244°54.06 259°29.62	16.6' 16.6'	05°6.49 04°53.80	-12.7' -12.7'	53.9' 53.9'
18	90°13.53	N07°9.22	274°5.20	16.6'	S04° 41.10	-12.7	53.9'
19	105°13.73	8.30	288°40.80	16.6'	04°28.39	-12.7'	53.9'
20	120°13.94	7.38	303°16.42	16.6'	04° 15.66	-12.7'	53.9'
21 22	135°14.15 150°14.36	· · 6.46 5.54	317°52.06 332°27.71	16.7' 16.7'	04°2.91 03°50.16	-12.8' -12.8'	53.9' 53.9'
23	150 14.36 165°14.57	5.54 4.61	347°3.38	16.7'	03°37.39	-12.8'	53.9'
	SD = 15.8'	d = -0.9'			D = 14.7'		
		<u> </u>		JI	17.1		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°14.77 195°14.98	N07°3.69 2.77	1°39.07 16°14.77	16.7' 16.7'	\$03°24.61 03°11.82	-12.8' -12.8'	53.9' 53.9'
2	195°14.98 210°15.19	2.77 1.84	30° 50.49	16.7'	03°11.82 02°59.02	-12.8'	53.9' 53.9'
3	225°15.40	• • 0.92	45°26.22	16.7'	02°46.21	-12.8'	53.9'
4	240°15.61	07°0.00	60°1.96	16.8'	02°33.39	-12.8'	53.9'
5 6	255°15.82 270°16.02	06°59.07 N06°58.15	74°37.71 89°13.47	16.8' 16.8'	02°20.57 \$02°7.74	-12.8' -12.8'	53.9' 53.9'
7	285°16.23	57.22	103°49.24	16.8	01°54.90	-12.8'	53.9'
8	300°16.44	56.30	118°25.03	16.8'	01°42.05	-12.8'	53.9'
9	315°16.65	• • 55.38	133°0.82	16.8'	01°29.21	-12.9'	53.9'
10 11	330°16.86 345°17.07	54.45 53.53	147°36.61 162°12.41	16.8' 16.8'	01°16.35 01°3.50	-12.9' -12.9'	53.9' 53.9'
12	0°17.28	N06° 52.60	176° 48.22	16.8	500°50.64	-12.9'	53.9
13	15°17.49	51.67	191°24.04	16.8'	$00^{\circ}37.78$	-12.9'	53.9'
14	30°17.70	50.75	205°59.85	16.8'	00°24.92	-12.9'	53.9'
15 16	45°17.91 60°18.12	· · 49.82 48.90	220°35.67 235°11.49	16.8' 16.8'	S00°12.05 N00°0.81	-12.9' 12.9'	53.9' 53.9'
17	75°18.33	47.97	249° 47.31	16.8'	00° 13.67	12.9'	53.9'
18	90°18.54	N06°47.04	264°23.13	16.8'	N00° 26.53	12.9'	53.9'
19 20	105°18.75 120°18.96	46.12 45.19	278° 58.96 293° 34.78	16.8' 16.8'	00°39.38 00°52.24	12.9' 12.8'	53.9' 53.9'
21	135°19.17	• • 44.26	308° 10.59	16.8	00°52.24	12.8'	53.9
22	150°19.38	43.34	$322^{\circ}46.41$	16.8'	$01^{\circ}17.93$	12.8'	53.9'
23	165°19.59	42.41	337°22.22	16.8'	01°30.77	12.8'	53.9'
	SD = 15.9'	d = -0.9'		SI	O = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.80	N06° 41.48	351°58.02	ν 16.8'	N01° 43.61	12.8'	53.9'
1	195°20.01	40.55	6°33.82	16.8'	01°56.44	12.8'	53.9'
2	210°20.22 225°20.43	39.63	21°9.61 35°45.40	16.8'	02°9.26 02°22.07	12.8'	53.9'
3 4	225°20.43 240°20.64	· · 38.70 37.77	35°45.40 50°21.17	16.8' 16.8'	02°22.07 02°34.87	12.8' 12.8'	53.9' 53.9'
5	255°20.85	36.84	64°56.94	16.8'	02°47.67	12.8'	53.9'
6	270°21.06	N06°35.91	79°32.70	16.7	N03°0.45	12.8'	53.9'
7 Ω	285°21.27 300°21.48	34.98 34.06	94°8.44 108°44.18	16.7' 16.7'	03° 13.22 03° 25.98	12.8' 12.7'	53.9' 53.9'
8 9	300°21.48 315°21.70	34.06 · · 33.13	108° 44.18 123° 19.90	16.7'	03°25.98 03°38.73	12.7'	53.9' 53.9'
10	$330^{\circ}21.91$	32.20	137°55.60	16.7'	03°51.47	12.7'	53.9'
11	345°22.12	31.27	152°31.30	16.7	04°4.19	12.7'	53.9'
12 13	0°22.33 15°22.54	N06°30.34 29.41	167°6.97 181°42.63	16.7' 16.6'	N04°16.90 04°29.59	12.7' 12.7'	53.9' 53.9'
14	30°22.75	29.41	196° 18.28	16.6'	04 29.59 04°42.26	12.7'	53.9'
15	45°22.97	•• 27.55	$210^{\circ}53.90$	16.6'	04°54.92	12.6'	53.9'
16	60°23.18	26.62	225°29.51	16.6'	05°7.56	12.6'	53.9'
17 18	75°23.39 90°23.60	25.69 N06° 24.75	240°5.10 254°40.66	16.6' 16.5'	05°20.19 N05°32.79	12.6' 12.6'	53.9' 53.9'
19	90 23.00 105°23.81	23.82	269° 16.21	16.5'	05° 45.38	12.6'	53.9'
20	120°24.03	22.89	$283^{\circ}51.73$	16.5'	05°57.94	12.5'	53.9'
21	135°24.24 150°24.45	•• 21.96	298°27.23	16.5'	06°10.49	12.5'	53.9'
22 23	150°24.45 165°24.66	21.03 20.10	313°2.71 327°38.16	16.5' 16.4'	06°23.01 06°35.51	12.5' 12.5'	53.9' 53.9'
_5	SD = 15.9'	d = -0.9'			D = 14.7'		
	שט = 15.9'	<u>u = -0.9</u>		51	J — 14.1		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-99%
03	00:39	00:49	11:59	23:53	11:33	
04	00:59	01:09	11:59	-:-	12:13	
05	01:19	01:29	11:59	00:33	12:53	

### September 06, 07, 08 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	345°36.83	223°43.29 N18°44.21	222°17.60 N20°53.91	162°45.39	306°4.50 N12°41.95	
1	0°39.29	238° 42.89 43.82	237°18.41 53.59	177°47.37 2.15	321°7.02 41.92	Alpheratz 357°31.29
2	15°41.76	253°42.50 43.43	252°19.22 53.27	192°49.35 2.36	336°9.54 41.89	Ankaa 353° 3.87
3	30°44.22	268°42.10 · · 43.04	267°20.02 · · 52.95	207°51.34 · · 2.57	351°12.06 · · 41.87	Schedar 349°26.99
4	45° 46.68	283°41.70 42.64	282°20.83 52.63	222°53.32 2.78	6°14.58 41.84	Diphda 348°44.03
5	60°49.15	298°41.30 42.25	297°21.64 52.31	237°55.30 2.99	21°17.10 41.81	Achernar 335°17.62
6	75°51.61	313°40.90 N18°41.86	312°22.44 N20°51.99	252°57.29 \$00°3.20	36°19.63 N12°41.78	Hamal 327°47.56
7	90°54.08	328° 40.50 41.46	327°23.25 51.67	267°59.27 3.41	51°22.15 41.75	Polaris 312°11.42
8	105°56.54	343°40.10 41.07	342°24.06 51.35	283°1.25 3.62	66°24.67 41.73	Acamar 315°9.34
9	120°59.00	358°39.71 · · 40.67	357°24.87 · · 51.03	298°3.24 · · 3.83	81°27.19 · · 41.70	Menkar 314°2.86
10	136°1.47	13°39.31 40.28	12°25.68 50.71	313° 5.22 4.04	96°29.71 41.67	Mirfak 308°23.71 Aldebaran 290°36.15
11	151°3.93	28°38.91 39.88	27°26.49 50.39	328°7.20 4.25	111°32.24 41.64	
12	166°6.40	43°38.51 N18°39.48	42°27.29 N20°50.06	343°9.18 S00°4.46	126°34.76 N12°41.61	Rigel 281°1.02 Capella 280°17.49
13	181°8.86	58°38.11 39.08	57°28.10 49.74	358°11.17 4.67	141°37.28 41.58	Capella 280°17.49 Bellatrix 278°19.71
14	196°11.33	73°37.71 38.68	72°28.91 49.42	13°13.15 4.88	156°39.81 41.56	Elnath 277°58.13
15	211° 13.79	88°37.31 · · 38.28	87°29.72 · · 49.10	28°15.13 · · 5.09	171°42.33 · · 41.53	Alnilam 275°34.75
16	226° 16.25	103°36.91 37.88	102°30.53 48.78	43°17.11 5.30	186°44.85 41.50	Betelgeuse 270°48.93
17	241°18.72	118°36.51 37.47	117°31.34 48.45	58°19.10 5.51	201°47.38 41.47	Canopus 263°51.25
18	256°21.18	133°36.10 N18°37.07	132°32.15 N20°48.13	73°21.08	216°49.90 N12°41.44	Sirius 258°23.75
19	271°23.65	148°35.70 36.66	147°32.96 47.81	88°23.06 5.93	231°52.42 41.41	Adhara 255°3.69
20	286°26.11	163°35.30 36.26	162°33.77 47.49	103°25.05 6.14	246°54.95 41.38	Procyon 244°47.92
21	301°28.57	178°34.90 · · 35.85	177°34.58 · · 47.16	118°27.03 · · 6.35	261°57.47 · · 41.36	Pollux 243°13.92
22	316°31.04	193°34.50 35.44	192°35.40 46.84	133°29.01 6.56	277°0.00 41.33	Avior 234°13.95
23	331°33.50	208°34.10 35.04	207°36.21 46.51	148°30.99 6.77	292°2.52 41.30	Suhail 222°44.46
Mer.r	pass. 00:57	ν-0.4' d-0.4' m-4.19	ν0.8' d-0.3' m1.56	ν2.0' d0.2' m-1.68	$\nu$ 2.5′ d-0.0′ m0.16	Miaplacidus 221°38.35
						Alphard 217°45.11
						Regulus 207°31.60
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.16
0	346°35.97	223°33.70 N18°34.63	222°37.02 N20°46.19	163°32.97	307°5.05 N12°41.27	Denebola 182°22.24
1	1°38.43	238°33.29 34.22	237°37.83 45.87	178°34.96 7.19	322°7.57 41.24	Gienah 175°40.79
2	16°40.89	253°32.89 33.81	252° 38.64 45.54	193°36.94 7.40	337°10.10 41.21	Acrux 172°57.24
3	31°43.36	268°32.49 · · 33.39	267°39.45 · · 45.22	208°38.92 · · 7.61	352°12.62 · · 41.18	Gacrux 171°48.72
4	46° 45.82	283°32.09 32.98	282°40.27 44.89	223°40.90 7.82	7°15.15 41.15	Alioth 166°10.94
5	61°48.29	298°31.69 32.57	297°41.08 44.57	238°42.88 8.03	22°17.67 41.12	Spica 158°19.39
6	76°50.75	313°31.28 N18°32.15	312°41.89 N20°44.24	253°44.87	37°20.20 N12°41.09	Alkaid 152°50.07
7	91°53.21	328°30.88 31.74	327° 42.71 43.92	268°46.85 8.46	52°22.73 41.06	Hadar 148°32.06
8	106°55.68	343°30.48 31.32	342°43.52 43.59	283°48.83 8.67	67°25.25 41.04	Menkent 147°54.30
9	121°58.14	358°30.07 · · 30.90	357° 44.33 · · 43.26	298°50.81 · · 8.88	82°27.78 · · 41.01	Arcturus 145°45.41
10	137°0.61	13°29.67 30.49	12° 45.15 42.94 27° 45.96 42.61	313°52.79 9.09	97°30.30 40.98	Rigil Kent. 139°36.44
11 12	152°3.07 167°5.53	28°29.27 30.07 43°28.86 N18°29.65	27° 45.96 42.61 42° 46.77 N20° 42.28	328°54.78 9.30 343°56.76 \$00°9.51	112°32.83 40.95 127°35.36 N12°40.92	Kochab 137°20.66
						Zuben'ubi 136°52.85
13	182°8.00 197°10.46			358°58.74 9.72 14°0.72 9.93		Alphecca 126°1.35
14	212° 12.93					Antares 112°12.18
15 16	212 12.93 227° 15.39	88°27.65 · · 28.38 103°27.25 27.96	87°49.22 · · 41.30 102°50.03 40.97	29°2.70 ··· 10.14 44°4.68		Atria 107° 3.63
17	242° 17.85	118° 26.84 27.54	117° 50.85 40.65	59° 6.67 10.56	187°45.47 40.80 202°48.00 40.77	Sabik 101°59.32
18	257°20.32	133°26.44 N18°27.11	132°51.66 N20°40.32	74°8.65 \$00°10.77	217°50.52 N12°40.74	Shaula 96°6.23
19	272°22.78	148° 26.03 26.68	147°52.48 39.99	89°10.63 10.98	232°53.05 40.71	Rasalhague 95°55.72
20	287°25.25	163°25.63 26.26	162°53.29 39.66	104°12.61 11.19	247°55.58 40.68	Eltanin 90°40.66
21	302°27.71	178°25.23 · · 25.83	177°54.11 · · 39.33	119°14.59 · · 11.40	262°58.11 · · 40.65	Kaus Aust. 83°28.41
22	317°30.17	193°24.82 25.40	192°54.93 39.00	134°16.57 11.61	278°0.64 40.62	Vega 80°31.02
23	332°32.64	208° 24.42 24.97	207°55.74 38.67	149°18.55 11.83	293°3.17 40.59	Nunki 75°43.89
						Altair 61°56.82
Mer.բ	pass. 00:53	u-0.4 $'$ d-0.4 $'$ m-4.19	$ u 0.8' \ d$ -0.3' m1.56	$\nu 2.0' \ d0.2' \ \text{m-}1.68$	$ u 2.5' \ d$ -0.0' m0.16	Peacock 53°0.65
						Deneb 49°23.35
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.55
0	347°35.10	223°24.01 N18°24.54	222°56.56 N20°38.34	164°20.53 \$00°12.04	308°5.69 N12°40.56	Al Na'ir 27°28.79
1	2°37.57	238°23.60 24.11	237°57.38 38.01	179°22.51 12.25	323°8.22 40.53	Fomalhaut 15°10.91 Scheat 13°41.91
2	17° 40.03	253°23.20 23.68	252°58.20 37.68	194°24.50 12.46	338°10.75 40.50	Markab 13 41.91
3	32°42.50	268°22.79 · · 23.25	267°59.01 · · 37.35	209°26.48 · · 12.67	353°13.28 · · 40.47	IVIGINAU IS 20.37
4	47° 44.96	283°22.39 22.81	282°59.83 37.02	224°28.46 12.88	8°15.81 40.44	Sep 06 Wed SHA
5	62°47.42	298°21.98 22.38	298°0.65 36.69	239°30.44 13.09	23°18.34 40.41	Venus 238° 6.46
6	77° 49.89	313°21.58 N18°21.94	313°1.47 N20°36.36	254°32.42 \$00°13.30	38°20.87 N12°40.38	Mars 236°40.77
7	92°52.35	328°21.17 21.50	328°2.28 36.03	269°34.40 13.51	53°23.40 40.35	Jupiter 177°8.56
8	$107^{\circ}54.82$	343°20.76 21.07	343°3.10 35.70	284°36.38 13.72	68°25.93 40.32	Saturn 320°27.67
9	$122^{\circ}57.28$	358°20.36 · · 20.63	358°3.92 · · 35.37	299°38.36 · · 13.93	83°28.46 · · 40.28	Sep 07 Thu SHA
10	$137^{\circ}59.74$	13° 19.95 20.19	13°4.74 35.04	314°40.34 14.15	98°30.99 40.25	Venus 236°57.73
11	153°2.21	28° 19.54 19.75	28°5.56 34.70	329°42.32 14.36	113°33.52 40.22	Mars 236° 1.05
12	168°4.67	43°19.14 N18°19.31	43°6.38 N20°34.37	344°44.30 \$00°14.57	128°36.06 N12°40.19	Jupiter 176°57.01
13	183°7.14	58° 18.73 18.87	58°7.20 34.04	359°46.28 14.78	143°38.59 40.16	Saturn 320°29.08
14	198°9.60	73°18.32 18.42	73°8.02 33.71	14°48.26 14.99	158°41.12 40.13	
15	213°12.06	88°17.91 · · 17.98	88°8.84 · · 33.37	29°50.24 · · 15.20	173°43.65 · · 40.10	Sep 08 Fri SHA
16	228° 14.53	103°17.51 17.54	103°9.66 33.04	44°52.22 15.41	188°46.18 40.07	Venus 235°48.91
17	243°16.99	118° 17.10 17.09	118° 10.48 32.71	59°54.21 15.62	203°48.71 40.04	Mars 235°21.46
18	258° 19.46	133°16.69 N18°16.65	133°11.30 N20°32.37	74°56.19 \$00°15.83	218°51.25 N12°40.01	Jupiter 176°45.43
19	273°21.92	148°16.28 16.20	148°12.12 32.04	89°58.17 16.04	233°53.78 39.98	Saturn 320°30.59
20	288°24.38	163°15.88 15.75	163°12.94 31.70	105° 0.15 16.26	248°56.31 39.94	Horizontal parallax
21	303°26.85	178°15.47 · · 15.30	178°13.76 · · 31.37	120°2.13 · · 16.47	263°58.84 · · 39.91	Venus:
22	318°29.31	193°15.06 14.85	193°14.59 31.04	135° 4.11 16.68	279°1.37 39.88	Mars:
23	333°31.78	208°14.65 14.40	208° 15.41 30.70	150° 6.09 16.89	294°3.91 39.85	iviai5.
Mer.p	pass. 00:50	$\nu$ -0.4' d-0.4' m-4.18	$ u 0.8' \ d  0.3' \ \text{m} 1.56$	$\nu 2.0' \ d0.2' \ \text{m-}1.68$	$\nu 2.5' \ d$ -0.0' m0.15	

Dec

29°15.10 -42°8.72

56°41.72 -17°49.49

-57°5.15

23°35.95 89°22.74

-40°11.06 4°12.26

49°57.62 16°34.01

-8°9.98 46°1.38 6°22.57

28°37.77 -1°10.94

 $7^{\circ}24.75$ -52°42.38

-16°45.21 -29°0.49

 $5^{\circ}9.07$ 

27°57.28 -59°35.93

-43°32.81 -69°50.00

-8°46.96

11°49.60

61°35.72

 $14^{\circ}24.74$ 

-17°42.08 -63°15.63 -57°16.56

55°48.36 -11°18.64

49°10.37 -60°30.85

-36°30.74

-60°57.41

 $19^{\circ}2.13$ 

74°2.46 -16°9.63

26°37.32 -26°29.71

-69°4.89

-15°45.52

-37°7.46

 $12^{\circ}32.60$ 

51°29.45

-34°22.19 38°48.95

-26°15.54 8°56.92

-56°38.50

 $45^{\circ}23.28$ 

-46°49.14 -29°27.97

28°14.53 15°21.82

Mer.pass

09:05

09:10

13:07

03:35 Mer.pass

09:06 09:09

13:04

03:31 Mer.pass

09:07

09:08

13:01

03:27

0.2

0.1

 $10^{\circ}0.67$ 

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	$180^{\circ}24.88$	N06°19.16	$342^{\circ}13.58$	16.4'	N06°47.99	12.5'	54.0'
1	195°25.09	18.23	356°48.98	16.4'	07°0.44	12.4'	54.0'
2 3	210° 25.30 225° 25.51	17.30 •• 16.37	11°24.35 25°59.70	16.3' 16.3'	07°12.87 07°25.27	12.4' 12.4'	54.0' 54.0'
4	240° 25.73	15.43	40°35.01	16.3	07°37.64	12.3'	54.0'
5	255° 25.94	14.50	55°10.30	16.3'	07°49.99	12.3'	54.0'
6	270° 26.15	N06°13.57	69°45.55	16.2'	N08°2.32	12.3'	54.0'
7	285°26.37 300°26.58	12.64	84°20.77	16.2'	08°14.61 08°26.87	12.3'	54.0'
8 9	300°26.58 315°26.79	11.70 •• 10.77	98°55.96 113°31.12	16.2' 16.1'	08°26.87 08°39.11	12.2' 12.2'	54.0' 54.0'
10	330° 27.01	9.83	128° 6.24	16.1	08°51.31	12.2'	54.0'
11	345°27.22	8.90	$142^{\circ}41.33$	16.1'	09°3.48	12.1'	54.0'
12	0°27.43	N06°7.97	157°16.38	16.0'	N09°15.62	12.1'	54.0'
13 14	15°27.65 30°27.86	7.03 6.10	171°51.39 186°26.37	16.0' 15.9'	09°27.73 09°39.80	12.1' 12.0'	54.0' 54.0'
14 15	45° 28.08	· · 5.16	201°1.31	15.9'	09 39.80 09°51.84	12.0'	54.0'
16	60°28.29	4.23	215°36.21	15.9'	10°3.85	12.0'	54.1'
17	75°28.50	3.29	$230^{\circ}11.07$	15.8'	$10^{\circ}15.82$	11.9'	54.1'
18	90°28.72	N06°2.36	244°45.89	15.8'	N10°27.75	11.9'	54.1'
19 20	105°28.93 120°29.15	1.42 06° 0.49	259°20.67 273°55.40	15.7' 15.7'	10°39.64 10°51.50	11.9' 11.8'	54.1' 54.1'
21	135° 29.36	05°59.55	288°30.10	15.6'	10° 31.30	11.8'	54.1
22	150° 29.57	58.61	303°4.74	15.6'	11°15.09	11.7'	54.1'
23	$165^{\circ}29.79$	57.68	$317^{\circ}39.35$	15.6'	11°26.83	11.7'	54.1'
	SD = 15.9'	d = -0.9'		SE	D = 14.7'		
<b>T</b> I.	CUA	D	CUA		D	.1	LIP
Thu 0	<b>GHA</b> 180° 30.00	<b>Dec</b> N05°56.74	<b>GHA</b> 332°13.91	u 15.5'	Dec N11°38.52	d 11.7'	<b>HP</b> 54.1'
1	195°30.22	55.81	346°48.42	15.5'	11°50.17	11.6'	54.1'
2	210°30.43	54.87	1°22.88	15.4'	$12^{\circ}1.78$	11.6'	54.1'
3	225°30.65	• • 53.93	15°57.30	15.4'	12°13.35	11.5'	54.1'
4	240°30.86 255°31.08	53.00	30°31.67 45°5.99	15.3' 15.3'	12°24.87 12°36.35	11.5'	54.2'
5 6	255 31.08 270°31.29	52.06 N05°51.12	45 5.99 59°40.26	15.3	N12°47.78	11.4' 11.4'	54.2' 54.2'
7	285°31.51	50.18	74°14.48	15.2'	12°59.16	11.3'	54.2'
8	300°31.72	49.25	88°48.64	15.1'	13°10.50	11.3'	54.2'
9	315°31.94	• • 48.31	103°22.76	15.1'	13°21.78	11.2'	54.2'
10 11	330° 32.15 345° 32.37	47.37 46.43	117°56.82 132°30.83	15.0' 15.0'	13°33.02 13°44.21	11.2' 11.1'	54.2' 54.2'
12	0°32.58	N05°45.49	147° 4.78	14.9'	N13°55.34	11.1'	54.2'
13	15° 32.80	44.55	161°38.68	14.8'	14°6.43	11.0'	54.3'
14	30°33.02	43.62	$176^{\circ}12.52$	14.8'	$14^{\circ}17.46$	11.0'	54.3'
15	45°33.23	• • 42.68	190°46.30	14.7'	14°28.44	10.9'	54.3'
16 17	60° 33.45 75° 33.66	41.74 40.80	205°20.03 219°53.69	14.7' 14.6'	14°39.36 14°50.23	10.9' 10.8'	54.3' 54.3'
18	90°33.88	N05°39.86	234°27.30	14.5'	N15°1.04	10.8'	54.3'
19	$105^{\circ}34.10$	38.92	$249^{\circ}0.85$	14.5'	$15^{\circ}11.80$	10.7'	54.3'
20	120°34.31	37.98	263°34.34	± 1	15°22.49		54.3'
21 22	135°34.53 150°34.74	· · 37.04 36.10	278°7.77 292°41.14	14.4' 14.3'	15°33.13 15°43.71	10.6' 10.5'	54.3' 54.4'
23	165°34.96	35.16	307°14.44	14.3 14.2'	15 43.71 15°54.23	10.5	54.4'
	SD = 15.9'	d = -0.9'			0 = 14.8'		
Fri	GHA	Dec	GHA	ν 14 2'	Dec	d 10.4	HP
0 1	180°35.18 195°35.39	N05°34.22 33.28	321°47.68 336°20.86	14.2' 14.1'	N16°4.69 16°15.08	10.4' 10.3'	54.4' 54.4'
2	210°35.61	32.34	350° 53.97	14.1	16°25.42	10.3	54.4'
3	225°35.83	• • 31.40	5°27.02	14.0'	16°35.69	10.2'	54.4'
4	240°36.04	30.46	20°0.00	13.9'	16°45.89	10.1	54.4'
5 6	255° 36.26 270° 36.48	29.51 N05°28.57	34°32.92 49°5.77	13.9' 13.8'	16°56.03 N17°6.10	10.1' 10.0'	54.5' 54.5'
7	285° 36.69	27.63	63°38.55	13.7'	17°16.11	9.9'	54.5'
8	300°36.91	26.69	$78^{\circ}11.27$	13.6'	$17^{\circ}26.04$	9.9'	54.5'
9	315° 37.13	• • 25.75	92°43.92	13.6'	17°35.91	9.8'	54.5'
10 11	330° 37.34 345° 37.56	24.81 23.86	107°16.49 121°49.00	13.5' 13.4'	17°45.71 17°55.43	9.7' 9.7'	54.5' 54.6'
11	345°37.56 0°37.78	23.86 N05°22.92	121°49.00 136°21.44	13.4'	17°55.43 N18°5.09	9.6'	54.6'
13	15° 37.99	21.98	150° 53.81	13.4	18°14.67	9.5'	54.6'
14	30°38.21	21.04	$165^{\circ}26.10$	13.2'	18°24.18	9.4'	54.6'
15	45°38.43	• • 20.09	179°58.33	13.2'	18°33.61	9.4'	54.6'
16 17	60° 38.65 75° 38.86	19.15 18.21	194°30.48 209°2.56	13.1' 13.0'	18°42.97 18°52.25	9.3' 9.2'	54.6' 54.7'
18	90°39.08	N05°17.26	209 2.50 223°34.57	12.9'	N19° 1.45	9.2	54.7'
19	105°39.30	16.32	238°6.50	12.9'	19°10.58	9.0'	54.7'
20	120° 39.52	15.38	252°38.36	12.8'	19°19.62	9.0'	54.7'
21	135°39.73 150°39.95	• • 14.43	267°10.15 281°41.86	12.7'	19°28.59 19°37.47	8.9'	54.7'
22 23	150°39.95 165°40.17	13.49 12.55	281°41.86 296°13.49	12.6' 12.6'	19°37.47 19°46.27	8.8' 8.7'	54.7' 54.8'
	SD = 15.9'	d = -0.9'			0 = 14.8'	0.1	23
					1.0		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-86%	
06	01:40	01:50	11:58	01:13	13:34		
07	02:00	02:10	11:58	01:54	14:16		
08	02:21	02:31	11:57	02:38	15:00		

### September 09, 10, 11 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	348°34.24	223°14.24 N18°13.		165°8.07 S00°17.10	309°6.44 N12°39.82	
1	3°36.70	238°13.84 13.		180°10.05 17.31	324°8.97 39.79	Alpheratz 357°31.28
2	18°39.17	253°13.43 13.		195°12.03 17.52	339°11.51 39.76	Ankaa 353°3.86
3	33°41.63	268°13.02 · · 12.		210°14.01 · · 17.73	354°14.04 · · 39.72	Schedar 349°26.97
4	48°44.10	283°12.61 12.		225°15.99 17.94	9°16.57 39.69	Diphda 348°44.02
5	63°46.56	298°12.20 11.		240°17.96 18.16	24°19.11 39.66	Achernar 335°17.60
6	78°49.03	313°11.79 N18°11.	22 313°21.17 N20°28.35	255°19.94 <b>S</b> 00°18.37	39°21.64 N12°39.63	Hamal 327°47.54 Polaris 312°9.81
7	93°51.49	328°11.38 10.	77 328°21.99 28.02	270°21.92 18.58	54°24.18 39.60	Polaris 312°9.81 Acamar 315°9.32
8	108°53.95	343°10.97 10.		285°23.90 18.79	69°26.71 39.57	Menkar 314°2.84
9	123°56.42	358°10.56 · · 9.		300°25.88 ·· 19.00	84°29.25 · · 39.53	Mirfak 308°23.68
10	138°58.88	13° 10.15 9.		315°27.86 19.21	99°31.78 39.50	Aldebaran 290°36.12
11	154°1.35	28°9.74 8.		330°29.84 19.42	114°34.32 39.47	Rigel 281°1.00
12	169°3.81	43°9.33 N18°8.		345°31.82 S00°19.63	129°36.85 N12°39.44	Capella 280°17.46
13	184°6.27	58°8.92 8.		0°33.80 19.85	144°39.39 39.41	Bellatrix 278°19.69
14 15	199°8.74 214°11.20	73°8.51 7. 88°8.10 · · 7.		15°35.78 20.06 30°37.76 · · 20.27	159°41.92 39.37 174°44.46 · · 39.34	Elnath 277°58.10
16	214 11.20 229°13.67	103°7.69 6.		45°39.74 20.48	189°46.99 39.31	Alnilam 275°34.73
17	244° 16.13	118°7.28 6.		60°41.72 20.69	204°49.53 39.28	Betelgeuse 270°48.91
18	259° 18.59	133°6.87 N18°5.		75°43.70 \$00°20.90	219°52.06 N12°39.25	Canopus 263°51.23
19	274°21.06	148°6.46 5.		90°45.68 21.11	234°54.60 39.21	Sirius 258°23.73
20	289°23.52	163°6.05 4.		105°47.66 21.33	249°57.14 39.18	Adhara 255°3.67
21	304°25.99	178°5.64 · · 4.		120°49.63 · · 21.54	264°59.67 · · 39.15	Procyon 244°47.90
22	319°28.45	193°5.23 3.	30 193°34.37 22.94	135°51.61 21.75	280°2.21 39.12	Pollux 243°13.90
23	334°30.92	208°4.82 3.	33 208°35.20 22.60	150°53.59 21.96	295°4.75 39.08	Avior 234°13.92 Suhail 222°44.44
Morr	pass. 00:46	ν-0.4' d-0.5' m-4.2	8 $\nu 0.8' \ d$ -0.3' m1.56	ν2.0' d0.2' m-1.67	$\nu 2.5' \ d$ -0.0' m0.15	Miaplacidus 221°38.32
ivier.	Dass. 00.40	ν-0.4 α-0.5 III-4		ν2.0 d0.2 III-1.07	V2.5 U-0.0 III0.15	Alphard 217°45.10
						Regulus 207°31.59
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.16
0	349° 33.38	223°4.41 N18°2.		165°55.57 \$00°22.17	310°7.29 N12°39.05	Denebola 182°22.24
1	4°35.84	238°4.00 2.		180°57.55 22.38	325°9.82 39.02	Gienah 175°40.80
2	19°38.31	253°3.59 1.		195°59.53 22.59	340°12.36 38.99	Acrux 172°57.25
3	34° 40.77	268°3.18 · · 1.		211°1.51 · · 22.81	355°14.90 · · 38.95	Gacrux 171°48.73
4	49° 43.24	283°2.77 0.		226° 3.49 23.02	10°17.44 38.92	Alioth 166°10.95
5 6	64° 45.70 79° 48.16	298°2.35 0. 313°1.94 N18°0.		241°5.46 23.23 256°7.44 \$00°23.44	25°19.97 38.89 40°22.51 N12°38.86	Spica 158°19.39
7	94°50.63	328°1.53 17°59.		271°9.42 23.65	55°25.05 38.82	Alkaid 152°50.09
8	109° 53.09	343°1.12 59.	_	286°11.40 23.86	70°27.59 38.79	Hadar 148°32.07
9	124°55.56	358°0.71 · · 58.		301°13.38 · · 24.08	85°30.13 · · 38.76	Menkent 147°54.31
10	139°58.02	13°0.29 58.		316°15.36 24.29	100°32.67 38.72	Arcturus 145°45.42
11	155°0.48	27°59.88 57.		331°17.34 24.50	115°35.20 38.69	Rigil Kent. 139°36.46
12	170°2.95	42°59.47 N17°57.		346°19.31 <b>S</b> 00°24.71	130°37.74 N12°38.66	Kochab 137°20.72
13	185°5.41	57°59.06 56.		1°21.29 24.92	145°40.28 38.62	Zuben'ubi 136°52.86
14	200°7.88	72°58.65 56.		16°23.27 25.13	160°42.82 38.59	Alphecca 126°1.37 Antares 112°12.20
15	215° 10.34	87°58.23 · · 55.		31°25.25 · · 25.35	175°45.36 · · 38.56	Antares 112°12.20 Atria 107°3.67
16	$230^{\circ}12.81$	102°57.82 55.	18 103°49.30 16.79	46°27.23 25.56	190°47.90 38.52	Sabik 101°59.34
17	245° 15.27	117°57.41 54.		61°29.20 25.77	205°50.44 38.49	Shaula 96°6.25
18	260° 17.73	132°57.00 N17°54.		76°31.18 S00°25.98	220°52.98 N12°38.46	Rasalhague 95°55.73
19	275°20.20	147°56.58 53.		91°33.16 26.19	235°55.52 38.42	Eltanin 90°40.68
20	290°22.66	162°56.17 53.		106°35.14 26.40	250°58.06 38.39	Kaus Aust. 83°28.42
21	305°25.13	177°55.76 · · 52.		121°37.12 · · 26.62	266°0.60 · · 38.36	Vega 80°31.04
22	320°27.59	192°55.35 52.		136°39.09 26.83	281°3.14 38.32	Nunki 75°43.90
23	335°30.05	207°54.93 51.		151°41.07 27.04	296°5.69 38.29	Altair 61°56.83
Mer.p	pass. 00:42	$\nu$ -0.4' d-0.5' m-4.3	7 $\nu$ 0.8′ $d$ -0.3′ m1.56	$ u 2.0' \ d0.2' \ \text{m-}1.67$	$ u 2.5' \ d$ -0.0' m0.14	Peacock 53°0.67
						Deneb 49°23.36
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.55
0	350°32.52	222°54.52 N17°51.		166°43.05 \$00°27.25	311°8.23 N12°38.26	Al Na'ir 27°28.80
1	5°34.98	237°54.11 50.		181°45.03 27.46	326°10.77 38.22	Fomalhaut 15°10.90 Scheat 13°41.90
2	20°37.45	252°53.69 50.		196°47.01 27.67	341°13.31 38.19	Markab 13°26.57
3	35°39.91	267°53.28 · · 49.	78 268°58.45 · · 12.99	211°48.98 · · 27.89	356°15.85 · · 38.15	IVIAIRAD 13 20.51
4	50°42.37	282°52.87 49.		226°50.96 28.10	11°18.39 38.12	Sep 09 Sat SHA
5	65° 44.84	297°52.45 48.		241°52.94 28.31	26°20.94 38.09	Venus 234°40.00
6	80°47.30	312°52.04 N17°48.		256°54.92 <b>S</b> 00°28.52	41°23.48 N12°38.05	Mars 234°41.99
7	95°49.77	327°51.62 47.		271°56.89 28.73	56°26.02 38.02	Jupiter 176°33.83
8	110°52.23	342°51.21 47.		286°58.87 28.95	71°28.56 37.98	Saturn 320°32.20
9	125°54.70	357°50.80 · · 46.		302°0.85 · · 29.16	86°31.10 · · 37.95	Sep 10 Sun SHA
10	140° 57.16 155° 59.62	12°50.38 46. 27°49.97 45.		317° 2.83 29.37 332° 4.80 29.58	101°33.65 37.92 116°36.19 37.88	Venus 233°31.03
11 12	155° 59.62 171° 2.09	42°49.56 N17°45.		332°4.80 29.58 347°6.78 \$00°29.79	116°36.19 37.88 131°38.73 N12°37.85	Mars 234°2.65
13	171 2.09 186°4.55	57°49.14 44.		2°8.76 30.01	146°41.28 37.81	Jupiter 176°22.19
14	201°7.02	72°48.73 44.		17°10.73 30.22	161°43.82 37.78	Saturn 320°33.91
15	216°9.48	87°48.31 · · 43.		32°12.71 · · · 30.43	176°46.36 · · 37.74	Sep 11 Mon SHA
16	231°11.94	102°47.90 43.		47°14.69 30.64	191°48.91 37.71	Venus 232°22.00
17	246° 14.41	117° 47.48 42.		62°16.67 30.85	206°51.45 37.68	Mars 233°23.43
18	261°16.87	132°47.07 N17°42.		77°18.64 \$00°31.07	221°54.00 N12°37.64	Jupiter 176°10.53
19	$276^{\circ}19.34$	147°46.66 41.		92°20.62 31.28	236°56.54 37.61	Saturn 320°35.71
20	291°21.80	162°46.24 41.		107°22.60 31.49	251°59.09 37.57	Hardware 1 P
21	306°24.27	177° 45.83 · · · 40.		122°24.57 · · 31.70	267°1.63 · · 37.54	Horizontal parallax
22	321°26.73	192°45.41 40.		137°26.55 31.91	282°4.18 37.50	Venus: Mars:
23	336°29.19	207°45.00 39.	58 209°15.17 6.03	152°28.53 32.13	297°6.72 37.47	lvidfS:
Mer.p	bass. 00:38	ν-0.4′ d-0.5′ m-4.2	6 $\nu$ 0.8′ $d$ -0.3′ m1.55	ν2.0′ d0.2′ m-1.67	ν2.5' d-0.0' m0.14	

Dec

29°15.11

-42°8.73

56°41.74

-17°49.50

-57°5.16

 $23^{\circ}35.96$ 

 $89^{\circ}22.75$ 

-40°11.07

49°57.63

16°34.01

 $-8^{\circ}9.98$ 

 $46^{\circ}1.38$ 

 $6^{\circ}22.57$ 

28°37.77

 $-1^{\circ}10.94$ 

 $7^{\circ}24.75$ -52°42.38

-16°45.20

-29°0.49

 $27^{\circ}57.28$ 

-59°35.92

-43°32.80

-69°49.99

-8°46.95 11°49.60

 $61^{\circ}35.71$ 

 $14^{\circ}24.73$ 

 $-17^{\circ}42.08$ 

-63°15.61

-57° 16.54

55°48.34 -11°18.64

49°10.37

-60°30.84

 $-36^{\circ}30.73$ 

 $19^{\circ}2.13$ 

-60°57.40

 $74^{\circ}2.45$ 

-16°9.62

26°37.32

-26°29.70

-69°4.89

 $-37^{\circ}7.46$ 

12°32.60

51°29.45

-34°22.19

38°48.96

-26°15.54

8°56.93

-56°38.50

45°23.29

-46°49.15

-29°27.98

28°14.55

15°21.83

Mer.pass

09:07

09:06

12:58

03:23

09:08

09:05

12:55

03:19

09:09

09:04

12:51

03:15

0.2

0.1

Mer.pass

Mer.pass

 $10^{\circ}0.67$ 

 $-15^{\circ}45.51$ 

5°9.07

4°12.26

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.39	N05°11.60	310°45.06	12.5'	N19°54.99	8.6'	54.8'
1	195°40.61	10.66	325°16.54	12.4'	20°3.63	8.6'	54.8'
2	210°40.82 225°41.04	9.71 • • 8.77	339°47.95 354°19.28	12.3' 12.3'	20°12.18 20°20.64	8.5' 8.4'	54.8' 54.8'
4	240°41.26	7.82	8°50.54	12.2'	20°29.02	8.3	54.9'
5	255°41.48	6.88	23°21.71	12.1'	20°37.31	8.2'	54.9'
6	270°41.70	N05°5.93	37°52.82	12.0'	N20°45.51	8.1'	54.9'
7 8	285°41.91 300°42.13	4.99 4.04	52°23.84 66°54.79	11.9' 11.9'	20°53.62 21°1.64	8.0' 7.9'	54.9' 54.9'
9	315°42.35	3.10	81°25.65	11.8'	21°1.04	7.8'	55.0'
10	330°42.57	2.15	95°56.44	11.7'	21°17.40	7.7'	55.0'
11	345°42.79	1.20	110°27.15	11.6'	21°25.15	7.6'	55.0'
12 13	0°43.01 15°43.23	N05°0.26 04°59.31	124°57.79 139°28.34	11.6' 11.5'	N21°32.79 21°40.34	7.6' 7.5'	55.0' 55.1'
14	30°43.44	58.37	153°58.82	11.4'	21°47.80	7.4'	55.1'
15	45°43.66	•• 57.42	$168^{\circ}29.21$	11.3'	$21^{\circ}55.16$	7.3'	55.1'
16	60°43.88	56.47	182°59.53	11.2'	22°2.42	7.2'	55.1'
17 18	75°44.10 90°44.32	55.53 N04°54.58	197°29.77 211°59.93	11.2' 11.1'	22°9.57 N22°16.63	7.1' 7.0'	55.1' 55.2'
19	105°44.54	53.63	226°30.01	11.0'	22°23.59	6.9'	55.2'
20	120°44.76	52.68	241°0.01	10.9'	22°30.45	6.8'	55.2'
21	135°44.98	• • 51.74	255°29.93	10.8'	22°37.20	6.6'	55.2'
22 23	150°45.19 165°45.41	50.79 49.84	269°59.77 284°29.54	10.8' 10.7'	22°43.84 22°50.39	6.5' 6.4'	55.3' 55.3'
23	SD = 15.9'					J. <del>-1</del>	33.3
	שט = 15.9'	d = -0.9'		50	= 14.9'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°45.63	N04°48.89	298°59.22	10.6'	N22°56.82	6.3'	55.3'
1 2	195°45.85 210°46.07	47.95 47.00	313°28.83 327°58.36	10.5' 10.4'	23°3.15 23°9.37	6.2' 6.1'	55.3' 55.4'
3	225°46.29	. 46.05	342°27.81	10.4	23°15.48	6.0'	55.4'
4	240°46.51	45.10	$356^{\circ}57.18$	10.3'	$23^{\circ}21.48$	5.9'	55.4'
5	255°46.73	44.15	11°26.47	10.2'	23°27.37	5.8'	55.4'
6 7	270°46.95 285°47.17	N04°43.20 42.25	25°55.68 40°24.82	10.1' 10.1'	N23°33.14 23°38.81	5.7' 5.5'	55.5' 55.5'
8	300°47.39	41.31	54°53.88	10.1	23°44.36	5.4'	55.5'
9	315°47.61	• • 40.36	69°22.86	9.9'	23°49.79	5.3'	55.5'
10	330°47.83	39.41	83°51.77	9.8'	23°55.11 24°0.31	5.2'	55.6'
11 12	345°48.05 0°48.27	38.46 N04°37.51	98°20.60 112°49.35	9.8' 9.7'	N24°5.39	5.1' 5.0'	55.6' 55.6'
13	15°48.49	36.56	127°18.03	9.6'	24°10.36	4.8'	55.6'
14	30°48.71	35.61	141°46.63	9.5'	24°15.20	4.7'	55.7'
15	45°48.93 60°49.15	• • 34.66	156°15.16 170°43.62	9.5'	24°19.92 24°24.53	4.6'	55.7'
16 17	75°49.37	33.71 32.76	170 43.02 185°11.99	9.4' 9.3'	24 24.53 24°29.01	4.5' 4.4'	55.7' 55.8'
18	90°49.59	N04°31.81	199°40.30	9.2'	N24°33.36	4.2'	55.8'
19	105°49.81	30.86	214°8.54	9.2'	24°37.59	4.1'	55.8'
20	120°50.03 135°50.25	29.91 •• 28.95	228°36.70 243°4.79	9.1' 9.0'	24°41.70 24°45.68	4.0' 3.9'	55.8' 55.9'
21 22	150°50.47	28.00	243 4.79 257°32.81	9.0 8.9'	24 45.08 24°49.53	3.9 3.7'	55.9'
23	165°50.69	27.05	272°0.75	8.9'	24°53.26	3.6'	55.9'
	SD = 15.9'	d = -0.9'		SD	= 15.1'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°50.91 195°51.13	N04°26.10 25.15	286°28.63 300°56.44	8.8' 8.7'	N24°56.85 25°0.32	3.5' 3.3'	56.0' 56.0'
2	210°51.35	24.20	315°24.19	8.7'	25°3.65	3.2'	56.0'
3	225°51.57	• • 23.25	329°51.86	8.6'	25°6.86	3.1'	56.1'
4 5	240°51.79 255°52.01	22.29 21.34	344°19.47 358°47.01	8.5' 8.5'	25°9.93 25°12.87	2.9' 2.8'	56.1' 56.1'
6	255 52.01 270°52.23	N04°20.39	13°14.48	8.4'	N25°15.67	2.8	56.1
7	285°52.45	19.44	27°41.90	8.3'	25°18.34	2.5'	56.2'
8	300°52.67	18.49	42°9.25	8.3'	25°20.88	2.4'	56.2
9 10	315°52.89 330°53.11	· · 17.53 16.58	56°36.53 71°3.75	8.2' 8.2'	25°23.27 25°25.54	2.3' 2.1'	56.2' 56.3'
11	345°53.33	15.63	85°30.92	8.2 8.1'	25°27.66	2.1	56.3'
12	0°53.55	N04°14.68	99°58.02	8.0'	N25°29.64	1.8'	56.3'
13	15°53.77	13.72	114°25.07	8.0'	25°31.49	1.7'	56.4
14 15	30°53.99 45°54.22	12.77 •• 11.82	128°52.05 143°18.98	7.9' 7.9'	25°33.19 25°34.76	1.6' 1.4'	56.4' 56.4'
16	45 54.22 60°54.44	10.86	145 16.96 157°45.86	7.9 7.8'	25°36.18	1.3	56.5'
17	75°54.66	9.91	172°12.67	7.8'	25°37.46	1.1'	56.5'
18	90°54.88	N04°8.95	186°39.44	7.7'	N25°38.59	1.0'	56.5'
19 20	105°55.10 120°55.32	8.00 7.05	201°6.15 215°32.81	7.7' 7.6'	25°39.59 25°40.44	0.8' 0.7'	56.6' 56.6'
21	135°55.54	. 6.09	215 32.61 229°59.42	7.6'	25°41.14	0.6	56.6
22	150°55.76	5.14	244°25.98	7.5'	25°41.70	0.4'	56.7'
23	165°55.98	4.18	258°52.49	7.5'	25°42.11	0.3'	56.7'
	SD = 15.9'	d = -1.0'		SD	= 15.3'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-61%	
09	02:42	02:52	11:57	03:23	15:48		
10	03:03	03:13	11:57	04:13	16:38		
11	03:24	03:34	11:56	05:05	17:32		

### September 12, 13, 14 UT (Tue., Wed., Thu.)

h	Aries	Venus	•	M	ars	Jup	oiter	Sat	urn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	351°31.66		7°39.17	224° 16.01	N20° 5.68	167°30.50	S00°32.34	312°9.27	N12°37.43	
1	6°34.12	237°44.17	38.65	239° 16.85	5.33	182°32.48	32.55	327°11.81	37.40	Alpheratz
2	21°36.59	252°43.75	38.13	254° 17.68	4.98	197°34.46	32.76	342°14.36	37.36	Ankaa
3	36°39.05		37.62	269° 18.52	• • 4.62	212°36.43	• • 32.97	357°16.90	• • 37.33	Schedar
4	51°41.51	282°42.92	37.10	284°19.36	4.27	227°38.41	33.19	12°19.45	37.29	Diphda
5	66° 43.98	297°42.51	36.58	299°20.20	3.92	242°40.39	33.40	27°21.99	37.26	Achernar
6	81°46.44	312°42.09 N17	7°36.06	314°21.04	N20°3.57	257°42.36	S00°33.61	42°24.54	N12°37.22	Hamal
7	$96^{\circ}48.91$	327°41.68	35.54	329°21.88	3.22	272°44.34	33.82	57°27.09	37.19	Polaris
8	111°51.37	342°41.26	35.02	344°22.72	2.87	287°46.32	34.03	72°29.63	37.15	Acamar Menkar
9	126°53.84	357°40.85	34.50	359°23.56	• • 2.51	302°48.29	• • 34.25	87°32.18	• • 37.12	Mirfak
10	141°56.30	12°40.43	33.98	14°24.40	2.16	317°50.27	34.46	102°34.73	37.08	Aldebaran
11	156° 58.76	27°40.02	33.46	29° 25.24	1.81	332°52.25	34.67	117°37.27	37.05	Rigel
12	172°1.23		7°32.93	44°26.08	N20°1.45	347°54.22	S00°34.88	132°39.82	N12°37.01	Capella
13	187°3.69	57°39.18	32.41	59°26.92	1.10	2°56.20	35.10	147°42.37	36.97	Bellatrix
14	202°6.16	72°38.77	31.88	74°27.76	0.75	17°58.18	35.31	162°44.92	36.94	Elnath
15	217°8.62 232°11.08	87°38.35 • · · · · · · · · · · · · · · · · · ·	31.35	89°28.61 104°29.45	· · 0.39 20°0.04	33°0.15	•• 35.52	177°47.46 192°50.01	· · 36.90	Alnilam
16 17	232 11.08 247° 13.55	102 37.94 117°37.52	30.83 30.30	104 29.45 119°30.29	20 0.04 19°59.69	48° 2.13 63° 4.10	35.73 35.95	207°52.56	36.87 36.83	Betelgeuse
18	262° 16.01		7°29.77	134° 31.13	N19°59.33	78° 6.08	500°36.16	207 52.50 222°55.11	N12° 36.80	Canopus
19	202 10.01 277° 18.48	147°36.69	29.77	149°31.97	58.98	93°8.06	36.37	237°57.66	36.76	Sirius
20	292°20.94	162°36.27	28.71	164°32.82	58.62	108°10.03	36.58	253°0.20	36.72	Adhara
21	307°23.41		28.17	179°33.66	58.27	123°12.01	• • 36.79	268°2.75	36.69	Procyon
22	322°25.87	192°35.44	27.64	194°34.50	57.91	138°13.98	37.01	283°5.30	36.65	Pollux
23	337°28.33	207°35.03	27.11	209°35.35	57.56	153°15.96	37.22	298°7.85	36.62	Avior
N 4 - · · ·	00.24	0.4/ -/ 0.5/ -	4 16	- 0.0/ -1.0	.4′ m1.55		.2′ m-1.67	-2.5/ -1.0	0/ 0 12	Suhail
ivier.	pass. 00:34	$\nu$ -0.4' d-0.5' i	n-4.10	$\nu$ 0.8° $a$ -0	.4 m1.55	$\nu$ 2.0 a0.	.2 m-1.07	$\nu 2.5' d-0$	.0 mu.13	Miaplacidus Alphard
										Regulus
Wed	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe
0	$352^{\circ}30.80$	222°34.61 N1	7°26.57	224°36.19	N19°57.20	168°17.94	500°37.43	313°10.40	N12°36.58	Denebola
1	7°33.26	237°34.19	26.04	239°37.03	56.85	183°19.91	37.64	328°12.95	36.55	Gienah
2	22°35.73	252°33.78	25.50	254° 37.88	56.49	198°21.89	37.86	343°15.50	36.51	Acrux
3	37°38.19		24.96	269°38.72	• • 56.13	213°23.86	• • 38.07	358°18.05	• • 36.47	Gacrux
4	52°40.65	282°32.94	24.43	284°39.57	55.78	228°25.84	38.28	13°20.60	36.44	Alioth
5	67°43.12	297°32.53	23.89	299°40.41	55.42	243°27.81	38.49	28°23.15	36.40	Spica
6	82°45.58		7°23.35	314°41.26	N19°55.06	258°29.79	S00°38.71	43°25.70	N12°36.36	Alkaid
7 8	97° 48.05 112° 50.51	327°31.70 342°31.28	22.81 22.27	329° 42.10 344° 42.95	54.71 54.35	273°31.77 288°33.74	38.92 39.13	58°28.25 73°30.80	36.33 36.29	Hadar
9	112 50.51 127°52.98		22.27	359° 43.79	• • 53.99	303°35.72	39.13	88°33.35	. 36.25	Menkent
10	142°55.44	12°30.45	21.72	14° 44.64	53.64	318° 37.69	39.56	103°35.90	36.22	Arcturus
11	157°57.90	27°30.03	20.64	29°45.48	53.28	333°39.67	39.77	118°38.45	36.18	Rigil Kent.
12	173°0.37		7°20.09	44°46.33	N19°52.92	348°41.64	S00°39.98	133°41.00	N12°36.15	Kochab
13	188°2.83	57°29.20	19.55	59°47.18	52.56	3°43.62	40.19	148°43.55	36.11	Zuben'ubi
14	203°5.30	72°28.78	19.00	74°48.02	52.20	18°45.59	40.41	163°46.11	36.07	Alphecca Antares
15	218°7.76	87°28.36 •	18.45	89°48.87	• • 51.85	33°47.57	• • 40.62	178°48.66	• • 36.04	Antares
16	233° 10.22	102°27.95	17.91	104°49.72	51.49	48°49.54	40.83	193°51.21	36.00	Sabik
17	248° 12.69	117°27.53	17.36	$119^{\circ}50.57$	51.13	63°51.52	41.04	208°53.76	35.96	Shaula
18	263° 15.15		7°16.81	134°51.41	N19°50.77	78°53.49	S00°41.26	223°56.31	N12°35.92	Rasalhague
19	278° 17.62	147°26.70	16.26	149°52.26	50.41	93°55.47	41.47	238°58.87	35.89	Eltanin
20	293°20.08	162°26.28	15.70	164°53.11	50.05	108°57.44	41.68	254°1.42	35.85	Kaus Aust.
21	308° 22.55		15.15	179°53.96	• • 49.69	123°59.42	• • 41.89	269°3.97	• • 35.81	Vega
22	323°25.01	192°25.45 207°25.03	14.60	194°54.81	49.33	139°1.39	42.11	284°6.52 299°9.08	35.78	Nunki
23	338° 27.47		14.04	209°55.65	48.97	154° 3.37	42.32	299 9.08	35.74	Altair
Mer.	pass. 00:30	$ u$ -0.4 $'$ $d$ -0.5 $'$ $_{1}$	n-4.15	$\nu$ 0.8′ d-0	.4′ m1.55	$\nu 2.0' \ d0.$	.2′ m-1.67	$\nu 2.5' \ d-0$	.0'  m0.13	Peacock
										Deneb
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif
0	353°29.94		7°13.49	224°56.50	N19°48.61	169° 5.34	S00°42.53	314°11.63	N12°35.70	Al Na'ir
1	8°32.40	237°24.19	12.93	239° 57.35	48.25	184°7.32	42.74	329°14.18	35.67	Fomalhaut Scheat
2	23°34.87	252°23.78	12.38	254°58.20	47.89	199° 9.29	42.96	344°16.74	35.63	Markab
3	38° 37.33		11.82	269°59.05	• • 47.53	214°11.27	• • 43.17	359°19.29	• • 35.59	
4	53°39.79	282°22.94	11.26	284°59.90	47.17	229°13.24	43.38	14°21.84	35.55	Sep 12 Tue
5	68°42.26	297°22.53	10.70	300°0.75	46.80	244°15.22	43.59	29°24.40	35.52	Venus
6	83°44.72		7°10.14	315°1.60	N19°46.44	259°17.19	S00°43.81	44°26.95	N12°35.48	Mars
7	98°47.19	327°21.69	9.58	330°2.45	46.08	274°19.17	44.02	59°29.51	35.44	Jupiter
8	113°49.65	342°21.28	9.02	345°3.30	45.72	289°21.14	44.23	74°32.06	35.40	Saturn
9	128° 52.12		• 8.46	0°4.16	• • 45.36	304°23.12	• • 44.45	89°34.62	• • 35.37	Sep 13 Wed
10	143°54.58	12°20.44	7.89	15°5.01	44.99	319°25.09	44.66	104°37.17	35.33	Venus
11	158° 57.04 173° 59.51	27°20.02 42°19.61 N	7.33 17°6.76	30°5.86 45°6.71	44.63 N19°44.27	334°27.06 349°29.04	44.87 \$00°45.08	119°39.73 134°42.28	35.29 N12°35.25	Mars
12 13	173°59.51 189°1.97	42°19.61 N. 57°19.19	6.20	45°6.71 60°7.56	43.91	4°31.01	45.30	134°42.28 149°44.84	N12 35.25 35.22	Jupiter
14	204°4.44	72°18.77	5.63	75°8.41	43.54	19°32.99	45.51	164°47.39	35.22	Saturn
15	219°6.90		• 5.06	90°9.27	• • 43.18	34°34.96	• • 45.72	179°49.95	35.14	Sep 14 Thu
16	234°9.36	102°17.94	4.49	105° 10.12	42.82	49°36.94	45.93	194°52.50	35.10	Venus
17	249°11.83	117° 17.52	3.93	120° 10.97	42.45	64°38.91	46.15	209°55.06	35.06	Mars
18	264°14.29		17°3.35	135°11.83	N19°42.09	79°40.88	S00°46.36	224°57.61	N12°35.03	Jupiter
19	$279^{\circ}16.76$	147°16.69	2.78	$150^{\circ}12.68$	41.72	94°42.86	46.57	240°0.17	34.99	Saturn
20	294° 19.22	162° 16.27	2.21	165° 13.53	41.36	109°44.83	46.79	255°2.73	34.95	
21	309°21.69		• 1.64	180° 14.39	• • 40.99	124°46.81	• • 47.00	270°5.28	• • 34.91	Horizo
22	324°24.15	192°15.43	1.07	195° 15.24	40.63	139°48.78	47.21	285°7.84	34.87	
23	339°26.61	207°15.02	0.49	210° 16.09	40.26	154°50.76	47.42	300°10.40	34.84	
Mer.ı	pass. 00:26	ν-0.4' d-0.6' ι	m-4.15	$\nu 0.8' d-0$	.4′ m1.55	$\nu 2.0' d0.$	.2′ m-1.67	$\nu 2.6' d-0$	.0′ m0.12	
	·									

Stars SHA

357°31.27

353°3.85 349°26.95

348°44.00

 $335^{\circ}17.58$ 

 $327^{\circ}47.52$ 

 $312^{\circ}8.13$ 

315°9.30

314°2.82

308°23.64

290°36.10

281°0.97

280°17.42  $278^{\circ}19.66$ 

277°58.07

275°34.70

 $270^{\circ}48.88$ 

263°51.19

258°23.70 255°3.65

244°47.88

 $126^{\circ}1.38$ 

107°3.70

 $96^{\circ}6.26$ 

95°55.74

90°40.71

83°28.43

80°31.05 75°43.91

61°56.84

 $53^{\circ}0.68$ 

49°23.37

33°35.55

27°28.80

15°10.90

13°41.89

13°26.56

SHA

SHA

230°3.81

232°5.39

SHA

Venus: Mars: Dec

29°15.12 -42°8.74

56°41.76

-17°49.50

-57°5.16

 $23^{\circ}35.97$ 

89°22.76

-40°11.07

4°12.27

49°57.64

16°34.01

 $-8^{\circ}9.98$ 46°1.38

 $6^{\circ}22.57$ 

28°37.77

 $-1^{\circ}10.94$ 

 $7^{\circ}24.75$ -52°42.37

-16°45.20

-29°0.49

 $27^{\circ}57.27$ 

-59°35.91

-43°32.80

-69°49.98

-8°46.95

11°49.59  $61^{\circ}35.69$ 

 $14^{\circ}24.73$ 

-17°42.07

-63°15.60 -57°16.53

55°48.33 -11°18.64

49°10.35 -60°30.83

-36°30.72

 $19^{\circ}2.12$ 

 $74^{\circ}2.44$ 

-16°9.62

26°37.31

-26°29.70

-69°4.88

 $-37^{\circ}7.46$ 

12°32.60

51°29.46

-34°22.19 38°48.97

-26°15.54

8°56.93

-56°38.51

45°23.31

 $10^{\circ}0.68$ 

-46°49.16

-29°27.98

28°14.56

15°21.84

Mer.pass

09:09

09:02

12:48

03:11

09:10

09:01

12:45

03:07

09:11

09:00

12:42

03:03

0.2

0.1

Mer.pass

Mer.pass

 $-15^{\circ}45.51$ 

-60°57.39

5°9.07

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°56.20	N04°3.23	273°18.96	7.4'	$N25^{\circ}42.38$	0.1'	56.7'
1	195°56.43	2.28	287°45.38	7.4'	25° 42.50	-0.0'	56.8'
2	210°56.65 225°56.87	1.32 04°0.37	302°11.75 316°38.08	7.3' 7.3'	25° 42.47 25° 42.29	-0.2' -0.3'	56.8' 56.8'
4	240°57.09	03°59.41	331°4.37	7.2'	25°41.96	-0.5	56.9'
5	255°57.31	58.46	$345^{\circ}30.62$	7.2'	$25^{\circ}41.49$	-0.6'	56.9'
6	270°57.53	N03°57.50	359°56.83	7.2'	N25° 40.86 25° 40.09	-0.8'	57.0'
7 8	285°57.75 300°57.97	56.54 55.59	14°23.00 28°49.13	7.1' 7.1'	25°40.09 25°39.16	-0.9' -1.1'	57.0' 57.0'
9	315°58.20	• • 54.63	43°15.23	7.1'	25°38.08	-1.2'	57.1
10	330°58.42	53.68	57°41.29	7.0'	$25^{\circ}36.85$	-1.4'	57.1'
11	345°58.64 0°58.86	52.72 N03°51.77	72°7.31 86°33.31	7.0'	25°35.47 N25°33.93	-1.5'	57.1'
12 13	15°59.08	50.81	86°33.31 100°59.27	7.0' 6.9'	N25° 33.93 25° 32.25	-1.7' -1.8'	57.2' 57.2'
14	30°59.30	49.85	115°25.21	6.9'	25°30.41	-2.0'	57.2'
15	45°59.52	• • 48.90	129°51.12	6.9'	25°28.41	-2.1'	57.3'
16	60°59.75 75°59.97	47.94	144°17.00 158°42.85	6.9' 6.8'	25°26.26 25°23.96	-2.3' -2.5'	57.3'
17 18	91° 0.19	46.98 N03°46.03	158 42.85 173°8.68	6.8	N25°21.51	-2.5 -2.6'	57.4' 57.4'
19	106° 0.41	45.07	187°34.49	6.8	25° 18.90	-2.8'	57.4'
20	121°0.63	44.11	202°0.27	6.8'	25° 16.13	-2.9'	57.5'
21	136° 0.85 151° 1.08	• • 43.16	216°26.04	6.7'	25° 13.21	-3.1'	57.5'
22 23	151°1.08 166°1.30	42.20 41.24	230°51.78 245°17.51	6.7' 6.7'	25°10.14 25°6.91	-3.2' -3.4'	57.5' 57.6'
	SD = 15.9'	d = -1.0'			D = 15.5'		
	JD — 13.9	u = -1.0			בים – בים – בים		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°1.52	N03°40.28	259°43.23	6.7'	N25°3.52	-3.5'	57.6'
1 2	196° 1.74 211° 1.96	39.33 38.37	274°8.92 288°34.61	6.7' 6.7'	24°59.98 24°56.29	-3.7' -3.9'	57.7' 57.7'
3	211 1.90 226° 2.19	37.41	303°0.28	6.7'	24°52.43	-3.9 -4.0'	57.7'
4	241°2.41	36.45	317°25.94	6.7'	24°48.43	-4.2'	57.8'
5	256° 2.63 271° 2.85	35.50 N03°34.54	331°51.59 346°17.23	6.6'	24°44.26 N24°39.95	-4.3'	57.8'
6 7	271 2.85 286°3.07	33.58	0°42.87	6.6' 6.6'	N24 39.95 24°35.47	-4.5' -4.6'	57.8' 57.9'
8	301°3.30	32.62	15°8.49	6.6'	24°30.84	-4.8'	57.9'
9	316° 3.52	• • 31.66	29°34.12	6.6'	$24^{\circ}26.06$	-4.9'	58.0'
10	331°3.74 346°3.96	30.70	43°59.74 58°25.36	6.6'	24°21.12 24°16.02	-5.1'	58.0'
11 12	1°4.18	29.75 N03°28.79	72°50.98	6.6' 6.6'	N24° 10.02	-5.3' -5.4'	58.0' 58.1'
13	16° 4.41	27.83	87°16.59	6.6	24°5.37	-5.6'	58.1'
14	31°4.63	26.87	101°42.21	6.6'	$23^{\circ}59.81$	-5.7'	58.2'
15	46° 4.85 61° 5.07	• • 25.91	116°7.84 130°33.46	6.6'	23°54.09 23°48.23	-5.9'	58.2' 58.2'
16 17	76° 5.29	24.95 23.99	130 33.40 144°59.09	6.6' 6.6'	23 48.23 23°42.20	-6.0' -6.2'	58.2 58.3'
18	91°5.52	N03°23.03	159°24.73	6.6'	N23°36.03	-6.3	58.3'
19	106° 5.74	22.07	173°50.38	6.7'	23°29.70	-6.5	58.4'
20 21	121°5.96 136°6.18	21.11	188°16.03 202°41.69	6.7' 6.7'	23°23.22 23°16.58	-6.6' -6.8'	58.4' 58.4'
22	150 0.16 151° 6.40	19.19	202 41.09 217°7.37	6.7	23°9.80	-6.9'	58.5'
23	166° 6.63	18.23	231°33.05	6.7'	23°2.86	-7.1'	58.5'
	SD = 15.9'	d = -1.0'		S	D = 15.7'		
Thu	<b>GHA</b> 181° 6.85	Dec	GHA	ν	Dec	d 7.2'	HP
0 1	181°6.85 196°7.07	N03°17.27 16.31	245°58.75 260°24.46	6.7' 6.7'	N22°55.77 22°48.53	-7.2' -7.4'	58.5' 58.6'
2	211°7.29	15.35	274°50.19	6.7'	22°41.14	-7.5	58.6'
3	226°7.52	• • 14.39	289°15.93	6.8'	22°33.60	-7.7'	58.7'
4 5	241°7.74 256°7.96	13.43 12.47	303°41.69 318°7.46	6.8' 6.8'	22°25.91 22°18.07	-7.8' -8.0'	58.7' 58.7'
6	250 7.90 271°8.18	N03°11.51	318 7.40 332°33.26	6.8	N22° 10.08	-8.0 -8.1'	58.8'
7	286°8.41	10.55	346°59.07	6.8'	$22^{\circ}1.95$	-8.3'	58.8'
8	301°8.63	9.59	1°24.90	6.9'	21°53.67	-8.4'	58.9'
9 10	316° 8.85 331° 9.07	· · 8.63 7.66	15°50.76 30°16.64	6.9' 6.9'	21°45.24 21°36.67	-8.6' -8.7'	58.9' 58.9'
11	331 9.07 346° 9.29	7.00 6.70	44°42.53	6.9'	21°27.95	-8.7 -8.9'	58.9 59.0'
12	1° 9.52	N03°5.74	59°8.46	6.9'	N21°19.09	-9.0'	59.0'
13	16° 9.74	4.78	73°34.40	7.0'	21°10.08	-9.1'	59.1'
14 15	31°9.96 46°10.18	3.82 •• 2.86	88°0.38 102°26.37	7.0' 7.0'	21°0.93 20°51.64	-9.3' -9.4'	59.1' 59.1'
16	61°10.41	1.89	116°52.40	7.1	20° 42.21	-9.6'	59.2'
17	76°10.63	0.93	131°18.45	7.1'	20°32.64	-9.7'	59.2'
18	91°10.85	N02°59.97	145°44.52	7.1'	N20°22.93 20°13.08	-9.8'	59.2'
19 20	106°11.07 121°11.30	02°59.01 58.05	160°10.63 174°36.76	7.1' 7.2'	20°13.08 20°3.09	-10.0' -10.1'	59.3' 59.3'
21	136°11.52	• • 57.08	189°2.93	7.2	19° 52.97	-10.3	59.4'
22	151°11.74	56.12	203°29.12	7.2'	19°42.71	-10.4'	59.4'
23	166°11.96	55.16	217°55.34	7.3'	19°32.31	-10.5'	59.4'
	SD = 15.9'	d = -1.0'		S	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	50-29%	
12	03:45	03:55	11:56	06:00	18:29		
13	04:06	04:17	11:56	06:57	19:26		
14	04:27	04:38	11:55	07:54	20:22		

# September 15, 16, 17 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	354°29.08	222°14.60 N16°59.92		169°52.73 <b>S</b> 00°47.64	315°12.95 N12°34.80	
1	9°31.54	237°14.18 59.34		184°54.70 47.85	330°15.51 34.76	Alpheratz 357°31.26 29°15.14 Ankaa 353°3.83 -42°8.74
2	24°34.01	252° 13.76 58.76	255°18.66 39.17	199°56.68 48.06	345°18.07 34.72	Ankaa 353°3.83 -42°8.74 Schedar 349°26.93 56°41.78
3	39° 36.47	267° 13.35 · · 58.19		214°58.65 · · 48.28	0°20.63 · · 34.68	Diphda 348°43.99 -17°49.50
4	54°38.93	282°12.93 57.61		230° 0.63 48.49	15°23.18 34.64	Achernar 335°17.55 -57°5.17
5	69°41.40	297°12.51 57.03		245°2.60 48.70	30°25.74 34.61	Hamal 327°47.50 23°35.98
6 7	84° 43.86 99° 46.33	312°12.10 N16°56.45 327°11.68 55.87		260° 4.57 S00° 48.91 275° 6.55 49.13	45°28.30 N12°34.57 60°30.86 34.53	Polaris 312°6.67 89°22.77
8	114° 48.79	342°11.26 55.28		290°8.52 49.34	75°33.42 34.49	Acamar 315°9.27 -40°11.07
9	129°51.25	357°10.84 · · 54.70		305°10.49 · · 49.55	90°35.98 · · 34.45	Menkar 314°2.80 4°12.27
10	144°53.72	12° 10.43 54.12		320°12.47 49.77	105°38.53 34.41	Mirfak 308°23.61 49°57.65
11	$159^{\circ}56.18$	27° 10.01 53.53		335°14.44 49.98	120°41.09 34.37	Aldebaran 290°36.07 16°34.01 Rigel 281°0.95 -8°9.98
12	174° 58.65	42°9.59 N16°52.95		350°16.41 \$00°50.19	135°43.65 N12°34.33	Capella 280°17.39 46°1.38
13	190°1.11	57°9.17 52.36		5°18.39 50.40	150°46.21 34.30	Bellatrix 278°19.64 6°22.57
14 15	205°3.58 220°6.04	72°8.76 51.77 87°8.34 •• 51.19		20°20.36 50.62 35°22.34 · · 50.83	165°48.77 34.26 180°51.33 · · 34.22	Elnath 277°58.04 28°37.78
16	235°8.50	102°7.92 50.60		50°24.31 51.04	195°53.89 34.18	Alnilam 275°34.68 -1°10.94
17	250° 10.97	117°7.50 50.01		65°26.28 51.26	210°56.45 34.14	Betelgeuse 270°48.86 7°24.76
18	265°13.43	132°7.09 N16°49.42		80°28.26 <b>S</b> 00°51.47	225°59.01 N12°34.10	Canopus 263°51.16 -52°42.37
19	$280^{\circ}15.90$	147°6.67 48.83	150° 33.23 32.92	95°30.23 51.68	241°1.57 34.06	Sirius 258°23.68 -16°45.20 Adhara 255°3.62 -29°0.48
20	295° 18.36	162°6.25 48.23		110°32.20 51.89	256°4.13 34.02	Procyon 244°47.85 5°9.07
21	310°20.82	177°5.83 · · 47.64		125°34.18 · · 52.11	271°6.69 · · 33.98	Pollux 243°13.85 27°57.27
22	325°23.29	192°5.42 47.05		140°36.15 52.32	286°9.25 33.94	Avior 234°13.87 -59°35.90
23	340°25.75	207°5.00 46.45		155°38.12 52.53	301°11.81 33.90	Suhail 222°44.40 -43°32.79
Mer.	pass. 00:22	$\nu$ -0.4' d-0.6' m-4.14	u0.9′ $d$ -0.4′ m1.55	$ u 2.0' \ d0.2' \ \text{m-}1.67$	$\nu 2.6' \ d\text{-}0.0' \ \text{m}0.12$	Miaplacidus 221°38.26 -69°49.97
			_			Alphard 217°45.07 -8°46.95
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.56 11°49.59
0	355°28.22	222°4.58 N16°45.86		170°40.09	316°14.37 N12°33.86	Dubhe 193°38.13 61°35.67
1	10°30.68	237°4.16 45.26		185°42.07 52.96	331°16.93 33.83	Denebola 182°22.23 14°24.72 Gienah 175°40.79 -17°42.07
2	25°33.14	252°3.75 44.66	255°39.25 30.34	200°44.04 53.17	346°19.50 33.79	Acrux 172°57.25 -63°15.59
3	40°35.61	267°3.33 · · 44.07		215°46.01 · · 53.39	1°22.06 · · 33.75	Gacrux 171°48.73 -57°16.52
4	55°38.07	282°2.91 43.47		230°47.99 53.60	16°24.62 33.71	Alioth 166°10.96 55°48.31
5	70°40.54	297°2.49 42.87		245°49.96 53.81	31°27.18 33.67	Spica 158°19.39 -11°18.64
6	85° 43.00	312°2.08 N16°42.27 327°1.66 41.67		260°51.93 S00°54.02 275°53.91 54.24	46°29.74 N12°33.63 61°32.30 33.59	Alkaid 152°50.11 49°10.34
7 8	100° 45.47 115° 47.93	327°1.66 41.67 342°1.24 41.07		275°53.91 54.24 290°55.88 54.45	61°32.30 33.59 76°34.87 33.55	Hadar 148°32.10 -60°30.82
9	130°50.39	357°0.83 · · 40.46		305°57.85 · · 54.66	91°37.43 · · 33.51	Menkent 147°54.31 -36°30.72
10	145°52.86	12°0.41 39.86		320°59.82 54.88	106°39.99 33.47	Arcturus 145°45.43 19°2.11
11	$160^{\circ}55.32$	26°59.99 39.25		336° 1.80 55.09	121°42.55 33.43	Rigil Kent. 139°36.49 -60°57.39 Kochab 137°20.81 74°2.43
12	175°57.79	41°59.57 N16°38.65	45°47.86 N19°26.62	351°3.77 S00°55.30	136°45.12 N12°33.39	Zuben'ubi 136°52.87 -16°9.62
13	191°0.25	56°59.16 38.04		6° 5.74 55.52	151°47.68 33.35	Alphecca 126°1.39 26°37.31
14	206°2.71	71°58.74 37.44		21°7.72 55.73	166°50.24 33.31	Antares 112°12.22 -26°29.70
15	221°5.18 236°7.64	86°58.32 · · 36.83 101°57.90 36.22		36°9.69 · · 55.94	181°52.81 · · 33.27 196°55.37	Atria 107°3.73 -69°4.88
16 17	250 7.04 251° 10.11	101°57.90 36.22 116°57.49 35.61		51°11.66 56.16 66°13.63 56.37	196°55.37 33.23 211°57.93 33.19	Sabik 101°59.35 -15°45.51
18	266° 12.57	131°57.07 N16°35.00		81°15.61 S00°56.58	227°0.50 N12°33.15	Shaula 96°6.27 -37°7.46
19	281° 15.03	146° 56.65 34.39		96°17.58 56.79	242°3.06 33.11	Rasalhague 95°55.75 12°32.60 Eltanin 90°40.73 51°29.46
20	296°17.50	161°56.24 33.78	165°54.78 23.64	111°19.55 57.01	257°5.63 33.07	Eltanin 90°40.73 51°29.46 Kaus Aust. 83°28.44 -34°22.20
21	$311^{\circ}19.96$	176°55.82 · · 33.16		126°21.52 · · 57.22	272°8.19 · · 33.03	Vega 80°31.07 38°48.97
22	326°22.43	191°55.40 32.55		141°23.50 57.43	287°10.75 32.99	Nunki 75°43.92 -26°15.55
23	341°24.89	206°54.99 31.94	210°57.37 22.52	156°25.47 57.65	302°13.32 32.95	Altair 61°56.84 8°56.94
Mer.	pass. 00:18	ν-0.4' d-0.6' m-4.14	$ u 0.9' \ d$ -0.4' m1.55	$\nu 2.0' \ d0.2' \ \text{m-}1.67$	$\nu 2.6' \ d\text{-}0.0' \ \text{m}0.11$	Peacock 53°0.68 -56°38.52
			_			Deneb 49°23.38 45°23.32
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.55 10°0.69 Al Na'ir 27°28.79 -46°49.17
0	356° 27.35	221°54.57 N16°31.32		171°27.44 \$00°57.86	317°15.88 N12°32.91	Al Na'ir 27°28.79 -46°49.17 Fomalhaut 15°10.89 -29°27.99
1	11°29.82	236°54.15 30.70		186°29.41 58.07	332°18.45 32.86	Scheat 13°41.89 28°14.57
2	26° 32.28	251°53.73 30.09		201°31.39 58.29	347°21.01 32.82	Markab 13°26.56 15°21.85
3	41°34.75	266°53.32 · · 29.47		216°33.36 · · 58.50	2°23.58 · · 32.78	
4	56°37.21	281°52.90 28.85		231°35.33 58.71	17°26.14 32.74	Sep 15 Fri         SHA         Mer.pass           Venus         227°45.52         09:11
5 6	71°39.67 86°42.14	296°52.48 28.23 311°52.07 N16°27.61		246°37.30 58.93 261°39.27 \$00°59.14	32°28.71 32.70 47°31.28 N12°32.66	Mars 230°47.87 08:58
7	101°44.60	326°51.65 26.99		276°41.25 59.35	62°33.84 32.62	Jupiter 175°23.65 12:39
8	116° 47.07	341°51.23 26.37		291°43.22 59.57	77°36.41 32.58	Saturn 320°43.88 02:59
9	131°49.53	356°50.82 · · 25.75		306°45.19 00°59.78	92°38.97 · · 32.54	
10	146°51.99	11°50.40 25.12		321°47.16 00°59.99	107°41.54 32.50	Sep 16 Sat         SHA         Mer.pass           Venus         226°36.37         09:12
11	161°54.46	26°49.98 24.50		336°49.13 0.21	122°44.11 32.46	Mars 230°9.31 08:57
12	176° 56.92	41°49.57 N16°23.87		351°51.11 S01°0.42	137°46.67 N12°32.42	Jupiter 175°11.88 12:36
13 14	191°59.39 207°1.85	56°49.15 23.25 71°48.73 22.62		6°53.08 0.63 21°55.05 0.85	152°49.24 32.37 167°51.81 32.33	Saturn 320°46.16 02:55
15	207 1.85 222°4.31	86°48.32 · · 21.99		36°57.02 · · 1.06	182°54.38 · · 32.29	Sep 17 Sun SHA Mer.pass
16	237°6.78	101°47.90 21.36		51°58.99 1.27	197°56.94 32.25	Venus 225°27.21 09:13
17	252°9.24	116° 47.48 20.73		67° 0.97 1.48	212°59.51 32.21	Mars 229°30.88 08:56
18	267°11.71	131°47.07 N16°20.10	136°13.86 N19°15.37	82°2.94 <b>S</b> 01°1.70	228°2.08 N12°32.17	Jupiter 175°0.09 12:33
19	282°14.17	146°46.65 19.47		97° 4.91 1.91	243°4.65 32.13	Saturn 320°48.53 02:50
20	297° 16.64	161°46.23 18.84		112° 6.88 2.12	258°7.21 32.09	Horizontal parallax
21 22	312° 19.10 327° 21.56	176°45.82 · · 18.21 191°45.40		127°8.85 · · 2.34 142°10.82 2.55	273°9.78 · · 32.04 288°12.35 32.00	Venus: 0.1
23	342° 24.03	206° 44.98 16.94		142 10.82 2.55 157°12.80 2.76	288°12.35 32.00 303°14.92 31.96	Mars: 0.1
		-				•
Mer.	pass. 00:14	ν-0.4' d-0.6' m-4.13	$\nu$ 0.9' d-0.4' m1.54	ν2.0′ d0.2′ m-1.67	$\nu 2.6' \ d$ -0.0' m0.11	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181° 12.19	N02°54.20	232°21.60	7.3'	N19°21.79	-10.7'	59.5'
1 2	196° 12.41 211° 12.63	53.23 52.27	246°47.88 261°14.20	7.3' 7.3'	19°11.12 19°0.33	-10.8' -10.9'	59.5' 59.5'
3	211 12.03 226° 12.85	. 51.31	275°40.54	7.3 7.4	19 0.33 18°49.41	-10.9	59.5'
4	241°13.08	50.34	290° 6.92	7.4	18°38.35	-11.2'	59.6'
5	256° 13.30	49.38	304°33.33	7.4'	18°27.17	-11.3'	59.6'
6	271°13.52 286°13.74	N02°48.42 47.46	318°59.78 333°26.25	7.5' 7.5'	N18°15.86 18°4.43	-11.4' -11.6'	59.7' 59.7'
7 8	286 13.74 301°13.97	47.46 46.49	347°52.76	7.5'	18 4.43 17°52.86	-11.0 -11.7'	59.7 59.8'
9	316° 14.19	• • 45.53	2°19.31	7.6'	17°41.18	-11.8'	59.8'
10	331° 14.41	44.56	16°45.88	7.6'	17°29.37	-11.9'	59.8'
11	346°14.63 1°14.86	43.60 N02°42.64	31°12.49 45°39.14	7.6' 7.7'	17°17.44 N17°5.39	-12.1' -12.2'	59.9' 59.9'
12 13	1 14.86 16° 15.08	NU2 42.04 41.67	45 39.14 60° 5.81	7.7'	16°53.22	-12.2 -12.3'	59.9' 59.9'
14	31° 15.30	40.71	74°32.52	7.7'	16°40.93	-12.4'	60.0'
15	46° 15.53	• • 39.75	88°59.27	7.8'	16°28.53	-12.5'	60.0'
16	61° 15.75 76° 15.97	38.78	103°26.05 117°52.86	7.8'	16°16.00 16°3.37	-12.6' -12.7'	60.0' 60.1'
17 18	91° 16.19	37.82 N02°36.85	132° 19.71	7.8' 7.9'	N15°50.62	-12.7	60.1
19	106° 16.42	35.89	146°46.59	7.9'	15°37.76	-13.0'	60.1
20	121° 16.64	34.92	161°13.50	7.9'	15°24.80	-13.1'	60.2'
21	136° 16.86 151° 17.08	• • 33.96	175°40.45 190°7.43	8.0'	15°11.72 14°58.53	-13.2'	60.2'
22 23	166° 17.31	32.99 32.03	190 7.43 204°34.44	8.0' 8.0'	14 58.53 14°45.24	-13.3' -13.4'	60.2' 60.3'
	SD = 15.9'	d = -1.0'			D = 16.2'	20	
	<u> </u>	u — -1.0	· -		J — 10.2		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181° 17.53 196° 17.75	N02°31.06 30.10	219°1.49 233°28.57	8.1'	N14°31.85 14°18.35	-13.5'	60.3'
1 2	196°17.75 211°17.97	30.10 29.13	233°28.57 247°55.68	8.1' 8.1'	14° 18.35 14° 4.75	-13.6' -13.7'	60.3' 60.3'
3	226°18.20	. 28.17	262°22.83	8.2'	13°51.05	-13.8'	60.4
4	241°18.42	27.20	276°50.00	8.2'	13°37.25	-13.9'	60.4'
5	256° 18.64 271° 18.86	26.24 N02°25.27	291°17.21 305°44.45	8.2'	13°23.36 N13°9.37	-14.0'	60.4'
6 7	271 18.86 286° 19.09	24.31	305 44.45 320°11.72	8.3' 8.3'	12°55.28	-14.1' -14.2'	60.5' 60.5'
8	301° 19.31	23.34	334°39.02	8.3'	12°41.11	-14.3'	60.5
9	316° 19.53	• • 22.38	349° 6.36	8.4'	12°26.84	-14.4'	60.6'
10 11	331°19.75 346°19.98	21.41 20.45	3°33.72 18°1.11	8.4' 8.4'	12°12.48 11°58.04	-14.4' -14.5'	60.6' 60.6'
12	1°20.20	N02°19.48	32°28.53	8.4	N11°43.51	-14.5	60.6
13	16° 20.42	18.51	46°55.98	8.5'	11°28.89	-14.7'	60.7'
14	31°20.64	17.55	61°23.46	8.5'	11°14.20	-14.8'	60.7'
15 16	46°20.87 61°21.09	· · 16.58 15.62	75°50.97 90°18.50	8.5' 8.6'	10°59.42 10°44.56	-14.9' -14.9'	60.7' 60.7'
17	76°21.31	14.65	104°46.06	8.6'	10° 44.50	-15.0'	60.8
18	91°21.53	N02°13.68	119°13.65	8.6'	$N10^{\circ}14.61$	-15.1'	60.8'
19	106°21.76	12.72	133°41.26 148°8.89	8.6' 8.7'	09°59.53 09°44.37	-15.2'	60.8'
20 21	121°21.98 136°22.20	11.75 •• 10.78	148° 8.89 162° 36.55	8.7' 8.7'	09°44.37 09°29.14	-15.2 -15.3'	60.8' 60.9'
22	151°22.42	9.82	177° 4.24	8.7'	09°13.84	-15.4'	60.9'
23	166° 22.65	8.85	191°31.94	8.7'	08°58.47	-15.4'	60.9'
	SD = 15.9'	d = -1.0'		S	D = 16.4'		
c	CUA	D	CUA		D-:	.1	LIP
Sun 0	<b>GHA</b> 181°22.87	<b>Dec</b> N02° 7.88	<b>GHA</b> 205°59.67	ν 8.8'	<b>Dec</b> N08°43.04	d -15.5'	<b>HP</b> 60.9'
1	196°23.09	6.92	200° 27.42	8.8	08°27.55	-15.6'	60.9
2	211°23.31	5.95	234°55.20	8.8'	08°11.99	-15.6'	61.0'
3 4	226°23.54 241°23.76	· · 4.98 4.02	249°22.99 263°50.80	8.8' 8.8'	07°56.37 07°40.70	-15.7' -15.7'	61.0' 61.0'
4 5	256°23.98	3.05	203 50.80 278°18.63	8.8'	07 40.70 07°24.97	-15.7 -15.8'	61.0'
6	271°24.20	N02°2.08	292°46.48	8.9'	N07°9.18	-15.8'	61.0'
7	286°24.43	1.11	307°14.35	8.9'	06°53.34	-15.9'	61.1'
8 9	301°24.65 316°24.87	02°0.15 01°59.18	321°42.23 336°10.13	8.9' 8.9'	06°37.45 06°21.51	-15.9' -16.0'	61.1' 61.1'
10	331°25.09	58.21	350° 38.05	8.9'	06°21.51	-16.0'	61.1
11	346°25.32	57.24	5°5.98	8.9'	05°49.49	-16.1'	61.1'
12	1°25.54	N01°56.28	19°33.92	9.0'	N05°33.41	-16.1'	61.1'
13 14	16°25.76 31°25.98	55.31 54.34	34°1.88 48°29.85	9.0' 9.0'	05°17.30 05°1.14	-16.2' -16.2'	61.2' 61.2'
15	46°26.21	• • 53.37	62°57.83	9.0'	04°44.94	-16.2'	61.2'
16	61°26.43	52.40	77°25.82	9.0'	04°28.71	-16.3'	61.2'
17	76°26.65	51.44	91°53.82	9.0'	04°12.45	-16.3'	61.2'
18 19	91°26.87 106°27.09	N01°50.47 49.50	106°21.82 120°49.84	9.0' 9.0'	N03°56.15 03°39.82	-16.3' -16.4'	61.2' 61.2'
20	100 27.09 121°27.32	48.53	135°17.86	9.0'	03°39.62	-16.4	61.2'
21	136°27.54	• • 47.56	149°45.89	9.0'	03°7.09	-16.4'	61.2'
22 23	151°27.76 166°27.98	46.59 45.63	164°13.93 178°41.97	9.0' 9.0'	02°50.68 02°34.25	-16.4' -16.4'	61.3' 61.3'
23			1/0 41.9/			-10.4	01.3
	SD = 15.9'	d = -1.0'		S	D = 16.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
2,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-5%	
15	04:49	04:59	11:55	08:50	21:18		
16	05:10	05:21	11:55	09:45	22:12		
17	05:31	05:42	11:54	10:39	23:05		

### September 18, 19, 20 UT (Mon., Tue., Wed.)

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	357° 26.49	221° 44.57	$N16^{\circ}16.31$	226° 19.08	$N19^{\circ}13.10$	172°14.77	S01°2.98	318°17.49	$N12^{\circ}31.92$	Alpheratz	357°31.25
1	12°28.96	236°44.15	15.67	241°19.95	12.72	187°16.74	3.19	333°20.06	31.88	Ankaa	353°3.83
2	27°31.42 42°33.88	251°43.74 266°43.32	15.03 •• 14.40	256°20.82 271°21.70	12.34 •• 11.96	202°18.71 217°20.68	3.40 · · 3.62	348°22.62 3°25.19	31.84 •• 31.79	Schedar	$349^{\circ}26.93$
4	57°36.35	281°42.90	13.76	286°22.57	11.58	232°22.65	3.83	18°27.76	31.75	Diphda	348°43.98
5	$72^{\circ}38.81$	296°42.49	13.12	301°23.44	11.20	247°24.63	4.04	33°30.33	31.71	Achernar Hamal	335°17.54 327°47.48
6	87°41.28	311° 42.07	N16°12.48	316°24.31	N19°10.82	262°26.60	S01°4.26	48°32.90	N12°31.67	Polaris	312°5.44
7	102°43.74	326°41.66	11.84	331°25.19	10.44	277°28.57	4.47	63°35.47	31.63	Acamar	315°9.25
8 9	117° 46.20 132° 48.67	341°41.24 356°40.82	11.20 •• 10.56	346°26.06 1°26.93	10.06 •• 9.68	292°30.54 307°32.51	4.68 • • 4.90	78°38.04 93°40.61	31.58 •• 31.54	Menkar	$314^{\circ}2.78$
10	147°51.13	11°40.41	9.91	16°27.81	9.30	322°34.48	5.11	108°43.18	31.50	Mirfak	308°23.59
11	162°53.60	26°39.99	9.27	31°28.68	8.92	337°36.45	5.32	123°45.75	31.46	Aldebaran Rigel	290°36.05 281°0.93
12	177°56.06	41°39.58	N16°8.62	46°29.55	N19°8.54	352°38.42	S01°5.54	138°48.32	N12°31.42	Capella	280°17.36
13	192°58.52	56°39.16 71°38.74	7.98	61°30.43	8.15	7°40.40	5.75	153°50.89 168°53.46	31.37	Bellatrix	278°19.62
14 15	208°0.99 223°3.45	86°38.33	7.33 •• 6.68	76°31.30 91°32.18	7.77 •• 7.39	22°42.37 37°44.34	5.96 •• 6.18	183°56.03	31.33 · · 31.29	Elnath	277°58.02
16	238°5.92	101°37.91	6.04	106° 33.05	7.01	52°46.31	6.39	198°58.61	31.25	Alnilam	275°34.66
17	253°8.38	116°37.50	5.39	121°33.93	6.63	67°48.28	6.60	214°1.18	31.21	Betelgeuse Canopus	270°48.84 263°51.13
18	268° 10.84	131°37.08	N16° 4.74	136°34.80	N19° 6.24	82°50.25	S01°6.82	229°3.75	N12°31.16	Sirius	258°23.66
19 20	283° 13.31 298° 15.77	146°36.67 161°36.25	4.09 3.44	151°35.68 166°36.55	5.86 5.48	97°52.22 112°54.19	7.03 7.24	244°6.32 259°8.89	31.12 31.08	Adhara	255°3.60
21	313° 18.24	101 30.23 176°35.84	2.78	181° 37.43	. 5.10	112 54.19 127°56.17	· · 7.46	274°11.46	• • 31.04	Procyon	244°47.84
22	328° 20.70	191°35.42	2.13	196°38.31	4.71	142°58.14	7.67	289°14.04	30.99	Pollux	243°13.83
23	343°23.16	206°35.01	1.48	211°39.18	4.33	158°0.11	7.88	304°16.61	30.95	Avior Suhail	234°13.84 222°44.39
Mer.p	pass. 00:10	$\nu$ -0.4' d-0	0.6' m-4.13	$\nu 0.9' \ d-0$	.4′ m1.54	$\nu 2.0' \ d0.2$	2′ m-1.67	$\nu 2.6' d-0$	0.0′ m0.10	Miaplacidus	221°38.24
										Alphard	$217^{\circ}45.06$
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.55
0	358° 25.63	221°34.59	N16° 0.82	226° 40.06	N19° 3.95	173°2.08	S01°8.10	319°19.18	N12°30.91		193°38.12 182°22.23
1	13°28.09	236°34.17	16°0.17	241°40.94	3.56	188°4.05	8.31	334°21.75	30.86	Denebola	182 22.23 175°40.79
2	28°30.56	251°33.76	15°59.51	256°41.81	3.18	203°6.02	8.52	349°24.32	30.82		172°57.26
3	43°33.02	266°33.34	• • 58.86	271°42.69	• • 2.80	218°7.99	• • 8.74	4°26.90	• • 30.78		171°48.74
4 5	58° 35.48 73° 37.95	281°32.93 296°32.51	58.20 57.54	286°43.57 301°44.45	2.41 2.03	233° 9.96 248° 11.93	8.95 9.16	19°29.47 34°32.04	30.74 30.69	Alioth	
6	88° 40.41	311°32.10	N15°56.88	316° 45.33	N19° 1.64	263°13.90	S01°9.38	49°34.62	N12°30.65	Spica	158°19.40
7	103°42.88	$326^{\circ}31.68$	56.22	331°46.20	1.26	278°15.87	9.59	64°37.19	30.61	Alkaid Hadar	152°50.12 148°32.12
8	118° 45.34	341°31.27	55.56	346° 47.08	0.87	293°17.84	9.80	79°39.76	30.56		147°54.33
9	133° 47.80	356°30.86	• • 54.90	1°47.96	· · 0.49	308°19.82 323°21.79	10.02	94°42.34	• • 30.52	Arcturus	145°45.44
10 11	148°50.27 163°52.73	11°30.44 26°30.03	54.24 53.57	16°48.84 31°49.72	19°0.10 18°59.72	323 21.79 338°23.76	10.23 10.45	109°44.91 124°47.49	30.48 30.44	Rigil Kent.	139°36.52
12	178°55.20	41°29.61	N15°52.91	46° 50.60	N18°59.33	353°25.73	S01°10.66	139°50.06	N12°30.39	Kochab Zuben'ubi	137°20.86 136°52.89
13	193°57.66	56°29.20	52.24	61°51.48	58.95	8°27.70	10.87	154°52.63	30.35	Alphecca	130 52.69 126°1.40
14	209°0.12	71°28.78	51.58	76°52.36	58.56	23°29.67	11.09	169°55.21	30.31		112°12.23
15 16	224°2.59 239°5.05	86°28.37 101°27.95	· · 50.91 50.24	91°53.24 106°54.12	· · 58.17 57.79	38°31.64 53°33.61	· · 11.30 11.51	184°57.78 200°0.36	· · 30.26 30.22	Atria	$107^{\circ}3.78$
17	254°7.52	101°27.93 116°27.54	49.58	100 54.12 121°55.00	57.40	68°35.58	11.73	215°2.93	30.18	Sabik	101°59.37
18	269°9.98	131°27.13	N15°48.91	136°55.88	N18°57.01	83°37.55	S01°11.94	230°5.51	N12°30.13	Shaula Rasalhague	96°6.29 95°55.77
19	284° 12.44	$146^{\circ}26.71$	48.24	151°56.76	56.63	98°39.52	12.15	245°8.08	30.09	Eltanin	90°40.76
20	299° 14.91	161°26.30	47.57	166° 57.65	56.24	113°41.49	12.37	260°10.66	30.04	Kaus Aust.	83°28.46
21 22	314° 17.37 329° 19.84	176°25.88 191°25.47	· · 46.89 46.22	181°58.53 196°59.41	• • 55.85 55.47	128°43.46 143°45.43	· · 12.58 12.79	275°13.23 290°15.81	· · 30.00 29.96	Vega	80°31.09
23	344° 22.30	206° 25.06	45.55	212°0.29	55.08	158°47.40	13.01	305°18.39	29.91	Nunki	75°43.94
_			0.7′ m-4.12							Altair Peacock	61°56.86 53°0.70
ivier.p	pass. 00:06	$\nu$ -0.4 a-0	0.7 m-4.12	$\nu$ 0.9 a-0	.4′ m1.54	$\nu 2.0' \ d0.2$	2 m-1.07	$\nu$ 2.6 a-0	0.0′ m0.10	Deneb	49°23.40
			_		_		_		_	Enif	33°35.56
Wed 0	<b>GHA</b> 359°24.76	<b>GHA</b> 221°24.64	<b>Dec</b> N15°44.88	<b>GHA</b> 227°1.18	<b>Dec</b> N18°54.69	<b>GHA</b> 173°49.37	<b>Dec</b> <b>S</b> 01°13.22	<b>GHA</b> 320°20.96	<b>Dec</b> N12° 29.87	Al Na'ir	27°28.80
1	14° 27.23	236° 24.23	44.20	242°2.06	54.30	188°51.34	13.43	335°23.54	29.83	Fomalhaut	15°10.89
2	29°29.69	251°23.81	43.53	257°2.94	53.91	203°53.31	13.65	350°26.11	29.78	Scheat Markab	13°41.89 13°26.56
3	44°32.16	266° 23.40	• • 42.85	272°3.82	• • 53.53	218°55.28	• • 13.86	5°28.69	• • 29.74		
4	59°34.62	281°22.99	42.17	287°4.71	53.14	233°57.25	14.07	20°31.27	29.69	Sep 18 Mon	SHA
5 6	74°37.08 89°39.55	296°22.57	41.50 N15°40.82	302°5.59 317°6.48	52.75 N18°52.36	248°59.22 264°1.19	14.29 \$01°14.50	35°33.84	29.65 N12°29.61	Venus	224°18.08 228°52.59
7	104° 42.01	326° 21.75	40.14	332°7.36	51.97	279° 3.16	14.71	65°39.00	29.56		174°48.28
8	119°44.48	341°21.33	39.46	347°8.24	51.58	294° 5.13	14.93	80°41.57	29.52	Saturn	320°51.00
9	134°46.94	$356^{\circ}20.92$	• • 38.78	2°9.13	•• 51.19	$309^{\circ}7.10$	•• 15.14	95°44.15	• • 29.47	Sep 19 Tue	SHA
10	149°49.40	11°20.51	38.10	17° 10.01	50.80	324° 9.07	15.35	110°46.73	29.43	Venus	223°8.96
11 12	164°51.87 179°54.33	26°20.09 41°19.68	37.41 N15°36.73	32° 10.90 47° 11.78	50.41 N18°50.02	339°11.04 354°13.01	15.57 \$01°15.78	125°49.31 140°51.89	29.39 N12°29.34	Mars	228°14.43
13	179 54.33 194°56.80	56° 19.27	36.05	62° 12.67	49.63	9°14.98	16.00	155° 54.46	29.30	Jupiter	174°36.45
14	209°59.26	71° 18.85	35.36	77° 13.56	49.24	24°16.95	16.21	170°57.04	29.25	Saturn	320°53.55
15	225°1.72	86°18.44	• • 34.68	92°14.44	• • 48.85	39°18.92	• • 16.42	185°59.62	• • 29.21	Sep 20 Wed	SHA
16	240°4.19	101°18.03	33.99	107° 15.33	48.46 48.07	54°20.89	16.64	201°2.20	29.16		221°59.88
17 18	255°6.65 270°9.12	116° 17.62 131° 17.20	33.30 N15°32.61	122° 16.21 137° 17.10	48.07 N18°47.68	69°22.86 84°24.83	16.85 S01°17.06	216°4.78 231°7.36	29.12 N12°29.08		227°36.41 174°24.61
19	285° 11.58	146° 16.79	31.93	152° 17.99	47.29	99°26.80	17.28	246°9.93	29.03		320°56.20
20	$300^{\circ}14.05$	161°16.38	31.24	167° 18.88	46.90	114°28.77	17.49	261°12.51	28.99		
21	315°16.51	176°15.97	• • 30.55	182°19.76	• • 46.51	129°30.74	• • 17.70	276°15.09	• • 28.94	Horizor	ntal parallax
22	330° 18.97 345° 21.44	191°15.55 206°15.14	29.85	197°20.65	46.12 45.72	144°32.71	17.92	291°17.67	28.90		Venus: Mars:
23			29.16	212°21.54	45.72	159°34.68	18.13	306°20.25	28.85		
Mer.p	pass. 23:58	$\nu$ -0.4′ d-0	0.7′ m-4.12	$\nu 0.9' \ d-0$	.4′ m1.54	$\nu 2.0' \ d0.2$	2′ m-1.67	$\nu^{2.6'} d^{-0}$	0.0′ m0.09		

Dec

29°15.15 -42°8.76

56°41 79

-17°49.50

-57°5.18

 $23^{\circ}35.99$ 

 $89^{\circ}22.78$ 

-40°11.08

4°12.28

49°57.66

16°34.02

 $-8^{\circ}9.98$ 46°1.39

 $6^{\circ}22.58$ 

28°37.78

 $-1^{\circ}10.94$ 

 $7^{\circ}24.76$ 

-52°42.36

-16°45.20 -29°0.48

 $5^{\circ}9.07$ 

 $27^{\circ}57.26$ 

-59°35.89

-43°32.78

-69°49.95

-8°46.95

11°49.58

61°35.66

 $14^{\circ}24.72$ 

 $-17^{\circ}42.07$ 

 $-63^{\circ}15.58$ 

-57° 16.51

55°48.30

-11°18.63

49°10.33 -60°30.81

-36°30.71

 $19^{\circ}2.11$ 

 $74^{\circ}2.41$ 

-16°9.62

26°37.30 -26°29.70

-69°4.88

 $-37^{\circ}7.46$ 

 $12^{\circ}32.60$ 

51°29.46

-34°22.20

38°48.97

 $-26^{\circ}15.55$ 

-56°38.53

45°23.33

 $10^{\circ}0.69$ 

-46°49.18

-29°28.00

28°14.58

15°21.85

Mer.pass

09:13

08:54

12:29

02:46

09:14

08:53

12:26

02:42

09:15 08:51

12:23

02:38

0.1

0.1

Mer.pass

Mer.pass

8°56.94

 $-15^{\circ}45.51$ 

-60° 57.38

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°28.21	N01°44.66	193°10.01	9.0'	$N02^{\circ}17.80$	-16.5'	61.3'
1	196°28.43	43.69	207°38.05	9.0'	02°1.34	-16.5'	61.3'
2 3	211°28.65 226°28.87	42.72 •• 41.75	222°6.10 236°34.15	9.0' 9.0'	01°44.85 01°28.36	-16.5' -16.5'	61.3' 61.3'
4	241°29.09	40.78	251°2.20	9.0'	01°11.85	-16.5	61.3'
5	$256^{\circ}29.32$	39.81	265°30.25	9.0'	$00^{\circ}55.33$	-16.5'	61.3'
6	271°29.54	N01°38.84	279°58.29	9.0'	N00°38.80	-16.5'	61.3'
7 8	286°29.76 301°29.98	37.88 36.91	294°26.34 308°54.38	9.0' 9.0'	00°22.26 N00°5.72	-16.5' -16.5'	61.3' 61.3'
9	316°30.21	35.94	323°22.41	9.0'	S00° 10.82	16.5	61.3
10	331°30.43	34.97	337°50.44	9.0'	$00^{\circ}27.36$	16.5'	61.3'
11	346°30.65	34.00	352°18.47	9.0'	00°43.90	16.5	61.3'
12 13	1°30.87 16°31.09	N01°33.03 32.06	6°46.49 21°14.49	9.0' 9.0'	\$01°0.44 01°16.97	16.5' 16.5'	61.3' 61.3'
14	31°31.32	31.09	35°42.50	9.0'	01°33.50	16.5	61.3'
15	46°31.54	• • 30.12	50°10.49	9.0'	01°50.01	16.5'	61.3'
16	61°31.76 76°31.98	29.15	64°38.47 79°6.44	9.0'	02°6.52 02°23.01	16.5	61.3' 61.3'
17 18	91°32.20	28.18 N01°27.21	93°34.39	9.0' 8.9'	502°39.48	16.5' 16.5'	61.3
19	106°32.43	26.24	108°2.34	8.9'	02°55.94	16.4	61.3'
20	121°32.65	25.27	122°30.27	8.9'	$03^{\circ}12.37$	16.4'	61.3'
21	136°32.87	• • 24.30	136°58.18	8.9'	03°28.79	16.4'	61.3'
22 23	151°33.09 166°33.31	23.33 22.36	151°26.08 165°53.97	8.9' 8.9'	03°45.18 04°1.55	16.4' 16.3'	61.3' 61.3'
23	SD = 15.9'	d = -1.0'				10.5	01.3
	วบ = 15.9′	a = -1.0'		5	D = 16.7'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°33.53	N01°21.39	180°21.83	8.8'	<b>S</b> 04°17.89	16.3'	61.3'
1	196°33.76 211°33.98	20.42 19.45	194°49.68 209°17.51	8.8' 8.8'	04°34.20 04°50.47	16.3' 16.2'	61.3' 61.3'
2	211 33.98 226°34.20	19.45	209°17.51 223°45.32	8.8	04°50.47 05°6.72	16.2'	61.3'
4	241°34.42	17.51	238°13.11	8.8'	05°22.93	16.2'	61.3'
5	256°34.64	16.54	252°40.87	8.7'	05°39.10	16.1'	61.3'
6	271°34.86 286°35.09	N01°15.57	267°8.62 281°36.34	8.7'	\$05°55.23 06°11.32	16.1'	61.3'
7 8	301°35.09	14.60 13.63	281°36.34 296°4.04	8.7' 8.7'	06°11.32 06°27.36	16.0' 16.0'	61.3' 61.2'
9	316°35.53	. 12.66	310°31.71	8.6'	06°43.36	16.0'	61.2'
10	331°35.75	11.69	324°59.36	8.6'	06°59.32	15.9'	61.2'
11	346°35.97 1°36.19	10.72	339°26.98 353°54.58	8.6'	07°15.22 \$07°31.08	15.9'	61.2' 61.2'
12 13	16°36.19	N01°9.75 8.78	353°54.58 8°22.15	8.6' 8.5'	07°46.88	15.8' 15.7'	61.2
14	31°36.64	7.81	22°49.69	8.5'	08°2.62	15.7'	61.2'
15	46°36.86	• • 6.84	37°17.20	8.5'	08° 18.31	15.6'	61.2'
16	61°37.08 76°37.30	5.87 4.89	51°44.68 66°12.14	8.5' 8.4'	08°33.94 08°49.50	15.6'	61.1'
17 18	91°37.52	4.89 N01°3.92	80°39.56	8.4	S09°5.01	15.5' 15.4'	61.1' 61.1'
19	106°37.74	2.95	95°6.95	8.4'	09°20.45	15.4'	61.1'
20	121°37.97	1.98	109°34.31		09°35.82		61.1'
21 22	136°38.19 151°38.41	·· 1.01 01°0.04	124°1.64 138°28.93	8.3' 8.3'	09°51.13 10°6.36	15.2' 15.2'	61.1' 61.0'
23	166°38.63	01 0.04 00°59.07	150 20.93 152°56.19	8.2'	10 0.30 10°21.53	15.2 15.1'	61.0'
	SD = 15.9'	d = -1.0'			D = 16.7'		
	<u>JD = 13.9</u>	<u>u = -1.0</u>			D = 10.7		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°38.85 196°39.07	N00°58.10	167°23.42	8.2'	\$10°36.62 10°51.63	15.0'	61.0'
1 2	196°39.07 211°39.29	57.13 56.15	181°50.61 196°17.77	8.2' 8.1'	10°51.63 11°6.56	14.9' 14.9'	61.0' 61.0'
3	226°39.51	• • 55.18	210°44.89	8.1'	11°21.42	14.8'	60.9
4	241°39.74	54.21	225°11.97	8.0'	11°36.19	14.7'	60.9'
5 6	256°39.96 271°40.18	53.24 N00°52.27	239°39.02 254°6.03	8.0' 8.0'	11°50.89 \$12°5.49	14.6' 14.5'	60.9' 60.9'
7	271 40.18 286°40.40	51.30	254°6.03 268°33.01	8.0° 7.9°	12° 20.01	14.5 14.4'	60.9
8	301°40.62	50.33	282°59.94	7.9'	$12^{\circ}34.45$	14.3'	60.8'
9	316°40.84	• • 49.35	297°26.84	7.9'	12°48.79	14.3'	60.8'
10 11	331°41.06 346°41.28	48.38 47.41	311°53.70 326°20.53	7.8' 7.8'	13°3.04 13°17.20	14.2' 14.1'	60.8' 60.8'
11	1°41.50	47.41 N00°46.44	326°20.53 340°47.31	7.8	\$13° 31.26	14.1	60.7
13	16°41.72	45.47	355°14.06	7.7'	$13^{\circ}45.22$	13.9'	60.7'
14	31°41.94	44.50	9°40.76	7.7'	13°59.09	13.8'	60.7'
15 16	46°42.17 61°42.39	· · 43.52 42.55	24°7.43 38°34.05	7.6' 7.6'	14°12.86 14°26.52	13.7' 13.6'	60.7' 60.6'
16 17	76°42.61	42.55 41.58	53° 0.64	7.6° 7.5'	14° 26.52 14° 40.08	13.5	60.6
18	91°42.83	N00°40.61	67°27.19	7.5'	\$14°53.54	13.3'	60.6
19	106°43.05	39.64	81°53.69	7.5'	15°6.89	13.2'	60.6'
20 21	121°43.27 136°43.49	38.66 •• 37.69	96°20.16 110°46.58	7.4' 7.4'	15°20.13 15°33.26	13.1' 13.0'	60.5' 60.5'
21	136°43.49 151°43.71	36.72	110°46.58 125°12.97	7.4° 7.3'	15° 33.26 15° 46.28	13.0° 12.9'	60.5'
23	166°43.93	35.75	139°39.32	7.3'	15°59.19	12.8'	60.4
	SD = 15.9'	d = -1.0'		S	D = 16.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-3%	
18	05:53	06:03	11:54	11:32	23:58		
19	06:14	06:25	11:54	12:25	-:-		
20	06:35	06:46	11:53	13:20	00:52		

# September 21, 22, 23 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	0°23.90	221°14.73 N15°28.47	227°22.43 N18°45.33	174°36.65 <b>S</b> 01°18.34	321°22.83 N12°28.81	Alpheratz 357°31.25 29°15.15
1	15°26.37	236°14.32 27.78	242°23.31 44.94	189°38.62 18.56	336°25.41 28.76	Ankaa 353°3.82 -42°8.77
2	30°28.83	251°13.90 27.08	257°24.20 44.55	204°40.59 18.77	351°27.99 28.72	Schedar 349°26.91 56°41.81
3 4	45°31.29 60°33.76	266°13.49 · · 26.39 281°13.08 25.69	272°25.09 · · 44.16 287°25.98 43.76	219°42.56 · · 18.99 234°44.53 19.20	6°30.57 · · 28.67 21°33.15 28.63	Diphda 348°43.98 -17°49.50
5	75°36.22	296° 12.67 25.00	302°26.87 43.37	249°46.50 19.41	36°35.73 28.58	Achernar 335°17.52 -57°5.20
6	90°38.69	311°12.26 N15°24.30	317°27.76 N18°42.98	264°48.47 S01°19.63	51°38.31 N12°28.54	Hamal 327°47.47 23°35.99
7	$105^{\circ}41.15$	326°11.85 23.60	332°28.65 42.58	279°50.44 19.84	66°40.89 28.49	Polaris 312°3.98 89°22.79 Acamar 315°9.24 -40°11.09
8	120°43.61	341°11.43 22.90	347°29.54 42.19	294°52.41 20.05	81°43.47 28.45	Menkar 314°2.77 4°12.28
9 10	135° 46.08 150° 48.54	356°11.02 · · 22.20 11°10.61 21.50	2°30.43 · · 41.80 17°31.32 41.40	309°54.38 · · 20.27 324°56.35 20.48	96°46.05 · · 28.40 111°48.63 28.36	Mirfak 308°23.56 49°57.67
11	165°51.01	26° 10.20 20.80	32°32.21 41.40	339°58.32 20.69	126°51.22 28.31	Aldebaran 290°36.03 16°34.02
12	180°53.47	41°9.79 N15°20.10	47°33.10 N18°40.62	355°0.29 <b>S</b> 01°20.91	141°53.80 N12°28.27	Rigel 281°0.91 -8°9.98
13	$195^{\circ}55.93$	56°9.38 19.39	62°33.99 40.22	$10^{\circ}2.26$ 21.12	156°56.38 28.22	Capella 280°17.33 46°1.39 Bellatrix 278°19.60 6°22.57
14	210°58.40	71°8.97 18.69	77°34.89 39.83	25° 4.23 21.33	171°58.96 28.18	Elnath 277°58.00 28°37.78
15 16	226°0.86 241°3.33	86°8.56 ·· 17.99 101°8.14 17.28	92°35.78 · · 39.43 107°36.67 39.04	40°6.19 · · 21.55 55°8.16 21.76	187°1.54 · · 28.13 202°4.12 28.09	Alnilam 275°34.64 -1°10.94
17	256°5.79	116°7.73 16.58	122°37.56 38.64	70°10.13 21.98	217°6.71 28.04	Betelgeuse 270°48.82 7°24.76
18	271°8.26	131°7.32 N15°15.87	137°38.45 N18°38.25	85°12.10 <b>S</b> 01°22.19	232°9.29 N12°28.00	Canopus 263°51.10 -52°42.36 Sirius 258°23.64 -16°45.20
19	$286^{\circ}10.72$	146°6.91 15.16	152°39.35 37.85	100°14.07 22.40	247°11.87 27.95	Sirius 258°23.64 -16°45.20 Adhara 255°3.58 -29°0.48
20	301°13.18	161°6.50 14.45	167°40.24 37.46	115°16.04 22.62	262°14.45 27.91	Procyon 244°47.82 5°9.07
21 22	316° 15.65 331° 18.11	176°6.09 · · 13.74 191°5.68	182°41.13 · · 37.06 197°42.03 36.67	130°18.01 · · 22.83 145°19.98 23.04	277°17.04 · · 27.86 292°19.62 27.81	Pollux 243°13.81 27°57.26
23	346° 20.58	206°5.27 12.32	212° 42.92 36.27	160°21.95 23.26	307°22.20 27.77	Avior 234°13.81 -59°35.88
						Suhail 222°44.37 -43°32.77
Mer.p	pass. 23:54	ν-0.4' d-0.7' m-4.11	ν0.9' d-0.4' m1.54	ν2.0′ d0.2′ m-1.67	ν2.6' d-0.0' m0.09	Miaplacidus 221°38.20 -69°49.94 Alphard 217°45.04 -8°46.95
						Regulus 207°31.54 11°49.58
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.12 61°35.64
0 1	1°23.04 16°25.50	221°4.86 N15°11.61 236°4.45 10.90	227°43.81 N18°35.87 242°44.71 35.48	175°23.92 S01°23.47 190°25.89 23.68	322°24.79 N12°27.72 337°27.37 27.68	Denebola 182°22.22 14°24.71
2	31°27.97	251°4.04 10.19	257°45.60 35.08	205°27.86 23.90	352°29.95 27.63	Gienah 175°40.79 -17°42.06
3	46°30.43	266°3.63 · · 9.47	272°46.50 · · 34.68	220°29.83 · · 24.11	7°32.54 · · 27.59	Acrux 172°57.26 -63°15.56 Gacrux 171°48.74 -57°16.49
4	61°32.90	281°3.22 8.76	287°47.39 34.29	235°31.79 24.32	22°35.12 27.54	Alioth 166°10.98 55°48.28
5	76°35.36	296°2.81 8.04	302°48.29 33.89	250°33.76 24.54	37°37.70 27.49	Spica 158°19.40 -11°18.63
6	91°37.82 106°40.29	311°2.40 N15°7.33 326°1.99 6.61	317°49.18 N18°33.49 332°50.08 33.10	265°35.73 S01°24.75 280°37.70 24.97	52°40.29 N12°27.45 67°42.87 27.40	Alkaid 152°50.13 49°10.32
7 8	100 40.29 121° 42.75	326°1.99 6.61 341°1.58 5.89	347°50.97 32.70	295°39.67 25.18	67°42.87 27.40 82°45.46 27.36	Hadar 148°32.13 -60°30.79
9	136° 45.22	356°1.17 · · 5.17	2°51.87 · · 32.30	310°41.64 · · 25.39	97°48.04 · · 27.31	Menkent 147°54.34 -36°30.70 Arcturus 145°45.45 19°2.10
10	151°47.68	11°0.76 4.46	17°52.77 31.90	325°43.61 25.61	112°50.63 27.26	Arcturus 145°45.45 19°2.10 Rigil Kent. 139°36.53 -60°57.36
11	166°50.15	26°0.35 3.74	32°53.66 31.51	340°45.58 25.82	127°53.21 27.22	Kochab 137°20.91 74°2.40
12	181°52.61	40°59.94 N15°3.01	47°54.56 N18°31.11	355°47.55 \$01°26.03	142°55.80 N12°27.17	Zuben'ubi 136°52.90 -16°9.61
13 14	196° 55.07 211° 57.54	55°59.53 2.29 70°59.12 1.57	62°55.46 30.71 77°56.35 30.31	10°49.52 26.25 25°51.48 26.46	157°58.38 27.12 173°0.97 27.08	Alphecca 126°1.42 26°37.30
15	227°0.00	85°58.71 · · 0.85	92°57.25 · · 29.91	40°53.45 · · 26.67	188°3.55 · · 27.03	Antares 112°12.25 -26°29.69
16	242°2.47	100°58.31 15°0.12	107°58.15 29.51	55°55.42 26.89	203°6.14 26.99	Atria 107°3.82 -69°4.87 Sabik 101°59.39 -15°45.51
17	257°4.93	115°57.90 14°59.40	122°59.05 29.11	70°57.39 27.10	218°8.72 26.94	Shaula 96°6.31 -37°7.46
18	272°7.39 287°9.86	130°57.49 N14°58.67	137°59.95 N18°28.72	85°59.36	233°11.31 N12°26.89	Rasalhague 95°55.79 12°32.60
19 20	302° 12.32	145°57.08 57.95 160°56.67 57.22	153°0.84 28.32 168°1.74 27.92	101°1.33 27.53 116°3.30 27.74	248°13.89 26.85 263°16.48 26.80	Eltanin 90°40.79 51°29.46
21	317° 14.79	175°56.26 · · 56.49	183°2.64 · · 27.52	131°5.27 · · 27.96	278°19.07 · · 26.75	Kaus Aust. 83°28.48 -34°22.20 Vega 80°31.11 38°48.98
22	$332^{\circ}17.25$	190°55.85 55.77	198°3.54 27.12	146°7.23 28.17	293°21.65 26.71	Nunki 75°43.95 -26°15.55
23	347° 19.71	205°55.45 55.04	213°4.44 26.72	161°9.20 28.38	308°24.24 26.66	Altair 61°56.87 8°56.94
Mer.	pass. 23:51	ν-0.4' d-0.7' m-4.11	ν0.9' d-0.4' m1.53	ν2.0' d0.2' m-1.67	ν2.6' d-0.0' m0.08	Peacock 53°0.73 -56°38.54
	·					Deneb 49°23.41 45°23.34
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.56 10°0.69
0	2°22.18	220°55.04 N14°54.31	228°5.34 N18°26.32	176°11.17 <b>S</b> 01°28.60	323°26.83 N12°26.61	Al Na'ir 27°28.81 -46°49.19 Fomalhaut 15°10.90 -29°28.00
1	17°24.64	235° 54.63 53.58	243°6.24 25.92	191°13.14 28.81	338°29.41 26.57	Scheat 13°41.89 28°14.59
2	32°27.11	250° 54.22 52.85	258°7.14 25.52	206°15.11 29.02	353°32.00 26.52	Markab 13°26.56 15°21.86
3 4	47° 29.57 62° 32.04	265°53.81 · · 52.11 280°53.41 51.38	273°8.04 · · 25.12 288°8.94	221°17.08 · · 29.24 236°19.05 29.45	8°34.59 · · 26.47 23°37.17 26.43	Sep 21 Thu SHA Mer.pass
5	77°34.50	295°53.00 50.65	303°9.84 24.31	251°21.02 29.67	38°39.76 26.38	Venus 220°50.83 09:15
6	92°36.96	310°52.59 N14°49.91	318°10.74 N18°23.91	266°22.98 <b>S</b> 01°29.88	53°42.35 N12°26.33	Mars 226°58.52 08:50
7	107°39.43	325°52.18 49.18	333°11.64 23.51	281°24.95 30.09	68°44.94 26.29	Jupiter 174°12.75 12:20
8	122°41.89	340°51.77 48.44	348° 12.54 23.11	296°26.92 30.31	83°47.52 26.24	Saturn 320°58.93 02:34
9 10	137° 44.36 152° 46.82	355°51.37 · · 47.70 10°50.96 46.97	3°13.45 · · 22.71 18°14.35	311°28.89 · · 30.52 326°30.86 30.73	98°50.11 · · · 26.19 113°52.70 26.15	Sep 22 Fri SHA Mer.pass
11	167° 49.28	25° 50.55 46.23	33° 15.25 21.91	341°32.83 30.95	128°55.29 26.10	Venus 219°41.82 09:16
12	182°51.75	40°50.15 N14°45.49	48°16.15 N18°21.50	356°34.80 <b>S</b> 01°31.16	143°57.88 N12°26.05	Mars 226°20.77 08:49
13	197°54.21	55° 49.74 44.75	63°17.06 21.10	11°36.76 31.37	159°0.47 26.00	Jupiter 174°0.88 12:17 Saturn 321°1.75 02:30
14	212°56.68	70°49.33 44.01	78° 17.96 20.70	26°38.73 31.59	174°3.05 25.96	
15 16	227°59.14 243°1.61	85°48.93 · · 43.27 100°48.52 42.53	93°18.86 · · 20.30 108°19.76 19.89	41°40.70 · · 31.80 56°42.67 32.02	189°5.64 · · 25.91 204°8.23       25.86	Sep 23 Sat         SHA         Mer.pass           Venus         218°32.86         09:17
17	258°4.07	115° 48.11 41.78	123°20.67 19.49	71°44.64 32.23	219°10.82 25.81	Venus 218°32.86 09:17 Mars 225°43.16 08:47
18	273°6.53	130°47.71 N14°41.04	138°21.57 N18°19.09	86°46.61 <b>S</b> 01°32.44	234°13.41 N12°25.77	Jupiter 173°48.99 12:14
19	288°9.00	145°47.30 40.30	153° 22.48 18.68	101°48.57 32.66	249°16.00 25.72	Saturn 321°4.65 02:26
20	303°11.46	160°46.89 39.55	168° 23.38 18.28	116°50.54 32.87	264°18.59 25.67	Horizontal parallax
21 22	318° 13.93 333° 16.39	175°46.49 · · 38.81 190°46.08 38.06	183°24.29 · · 17.88 198°25.19 17.47	131°52.51 · · 33.08 146°54.48 33.30	279°21.18 · · 25.63 294°23.77 25.58	Venus: 0.1
23	348° 18.85	205° 45.67 37.31	213° 26.10 17.07	161°56.45 33.51	309°26.36 25.53	Mars: 0.1
	pass. 23:47	ν-0.4' d-0.7' m-4.10	ν0.9' d-0.4' m1.53	ν2.0' d0.2' m-1.66	ν2.6' d-0.0' m0.08	
14101.	JUJJ. 20.TI	> 0.1 U 0.1 III-T.10	₽ 0.5 U U.⊤ IIII.JJ	ν Δ.Ο . α Ο.Δ . III-1.00	₽ <b>=</b> .0	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°44.15	N00°34.77	154°5.62	7.3'	<b>S</b> 16°11.98	12.7'	60.4
1 2	196° 44.37 211° 44.59	33.80 32.83	168°31.89 182°58.11	7.2' 7.2'	16°24.66 16°37.22	12.6' 12.4'	60.4' 60.4'
3	226° 44.81	31.86	197°24.30	7.1	16°49.66	12.3'	60.3
4	241°45.03	30.89	211°50.44	7.1'	17°1.98	12.2'	60.3'
5	256° 45.25 271° 45.47	29.91 N00°28.94	226°16.55 240°42.62	7.1'	17°14.19 \$17°26.26	12.1'	60.3'
6 7	271 45.47 286° 45.69	N00 28.94 27.97	240 42.62 255°8.65	7.0' 7.0'	17°38.22	12.0' 11.8'	60.2' 60.2'
8	301°45.91	27.00	269°34.63	7.0'	17°50.05	11.7'	60.2'
9	316°46.13	• • 26.02	284°0.59	6.9'	18°1.75	11.6'	60.1'
10 11	331° 46.35 346° 46.57	25.05 24.08	298°26.50 312°52.37	6.9' 6.8'	18°13.32 18°24.76	11.4' 11.3'	60.1' 60.1'
12	1°46.79	N00°23.11	327°18.21	6.8	\$18°36.08	11.2'	60.0
13	$16^{\circ}47.01$	22.13	$341^{\circ}44.01$	6.8'	18°47.26	11.0'	60.0'
14	31° 47.23	21.16	356°9.77	6.7'	18°58.31	10.9'	60.0'
15 16	46° 47.45 61° 47.67	· · 20.19 19.22	10°35.50 25°1.19	6.7' 6.7'	19°9.22 19°20.00	10.8' 10.6'	59.9' 59.9'
17	76° 47.89	18.24	39°26.85	6.6'	19°30.64	10.5'	59.9'
18	91°48.11	N00°17.27	53°52.47	6.6'	\$19°41.15	10.4'	59.8'
19 20	106°48.33 121°48.55	16.30 15.32	68°18.06 82°43.61	6.6' 6.5'	19°51.52 20°1.74	10.2' 10.1'	59.8' 59.8'
21	136° 48.77	• • 14.35	97°9.13	6.5	20°11.83	9.9'	59.7'
22	151°48.99	13.38	111°34.62	6.5'	$20^{\circ}21.77$	9.8'	59.7'
23	166°49.21	12.41	126°0.08	6.4'	20°31.57	9.7'	59.6'
	SD = 15.9'	d = -1.0'		SI	O = 16.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	181°49.43	N00°11.43	$140^{\circ}25.51$	6.4'	S20°41.23	9.5'	59.6'
1	196°49.65	10.46	154°50.91	6.4'	20°50.74	9.4'	59.6'
2	211° 49.87 226° 50.09	9.49 •• 8.51	169°16.28 183°41.62	6.3' 6.3'	21°0.11 21°9.33	9.2' 9.1'	59.5' 59.5'
4	241°50.31	7.54	198°6.94	6.3	21°18.40	8.9'	59.5'
5	256° 50.53	6.57	$212^{\circ}32.22$	6.3'	$21^{\circ}27.32$	8.8'	59.4'
6	271°50.75 286°50.97	N00° 5.59 4.62	226°57.49 241°22.72	6.2' 6.2'	\$21°36.10 21°44.72	8.6' 8.5'	59.4' 59.3'
7 8	301°51.19	4.62 3.65	241 22.72 255°47.94	6.2'	21 44.72 21°53.20	8.3'	59.3'
9	316°51.41	• • 2.67	270°13.13	6.2'	22°1.52	8.2'	59.3'
10	331°51.62	1.70	284°38.30	6.1'	22°9.69	8.0'	59.2'
11 12	346°51.84 1°52.06	N00°0.73 S00°0.24	299°3.45 313°28.58	6.1' 6.1'	22°17.71 \$22°25.58	7.9' 7.7'	59.2' 59.2'
13	16°52.28	1.22	327°53.69	6.1	22°33.29	7.6'	59.1'
14	31°52.50	2.19	342°18.78	6.1'	22°40.84	7.4'	59.1'
15 16	46°52.72 61°52.94	· · 3.16 4.14	356°43.86 11°8.93	6.1' 6.0'	22°48.24 22°55.49	7.2' 7.1'	59.0' 59.0'
17	76°53.16	5.11	25°33.98	6.0'	22 55.49 23°2.58	6.9'	59.0'
18	91°53.38	S00°6.08	39°59.01	6.0'	S23°9.51	6.8'	58.9'
19	106° 53.59	7.06	54°24.04	6.0'	23°16.28	6.6'	58.9'
20 21	121°53.81 136°54.03	8.03 •• 9.00	68°49.05 83°14.06	6.0' 6.0'	23°22.90 23°29.36	6.5' 6.3'	58.8' 58.8'
22	151° 54.25	9.98	97°39.06	6.0'	23°35.66	6.1	58.8'
23	166°54.47	10.95	112°4.05	6.0'	23°41.80	6.0'	58.7'
	SD = 15.9'	d = -1.0'		SI	D = 16.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	181°54.69	500°11.92	126°29.04	6.0'	S23°47.78	5.8'	58.7'
1	196°54.91	12.90	140°54.03	6.0'	23°53.61	5.7'	58.6'
2	211°55.12 226°55.34	13.87 •• 14.84	155°19.01 169°43.99	6.0' 6.0'	23°59.27 24°4.77	5.5' 5.3'	58.6' 58.6'
4	241°55.56	15.82	184°8.97	6.0'	24° 10.12	5.2'	58.5
5	256°55.78	16.79	198°33.96	6.0'	24°15.30	5.0'	58.5'
6 7	271°56.00 286°56.21	S00°17.76 18.74	212°58.95 227°23.94	6.0' 6.0'	\$24°20.32 24°25.19	4.9' 4.7'	58.4' 58.4'
8	301°56.43	19.74	241°48.94	6.0'	24°29.89	4.7 4.5'	58.4'
9	$316^{\circ}56.65$	• • 20.69	$256^{\circ}13.94$	6.0'	24°34.43	4.4'	58.3'
10	331°56.87	21.66	270°38.96	6.0'	24°38.81	4.2'	58.3'
11 12	346°57.09 1°57.30	22.63 \$00°23.61	285°3.98 299°29.02	6.0' 6.1'	24°43.02 \$24°47.08	4.1' 3.9'	58.2' 58.2'
13	16°57.52	24.58	313°54.07	6.1'	24°50.98	3.7'	58.2
14	31°57.74	25.55	328°19.14	6.1'	24°54.71	3.6'	58.1'
15 16	46° 57.96 61° 58.18	· · 26.53 27.50	342°44.22 357°9.32	6.1' 6.1'	24°58.29 25°1.70	3.4' 3.3'	58.1' 58.0'
17	76°58.39	27.50	357 9.32 11°34.44	6.1	25° 1.70 25° 4.96	3.3 3.1'	58.0'
18	91°58.61	S00°29.45	25°59.58	6.2'	S25°8.05	2.9'	58.0'
19 20	106°58.83 121°59.05	30.42 31.39	40°24.75 54°49.93	6.2' 6.2'	25°10.98 25°13.76	2.8' 2.6'	57.9'
20	121°59.05 136°59.26	31.39 · · 32.37	69°15.15	6.2'	25°13.76 25°16.37	2.5	57.9' 57.8'
22	151°59.48	33.34	83°40.39	6.3'	25°18.82	2.3'	57.8'
23	166°59.70	34.32	98°5.65	6.3'	25°21.12	2.1'	57.8'
	SD = 15.9'	d = 1.0'		SI	O = 16.0'		

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

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

		Sun		Moon		
Day	Eqn.o	Eqn.of Time		Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-24%
21	06:57	07:07	11:53	14:16	01:48	
22	07:18	07:28	11:53	15:14	02:45	
23	07:39	07:49	11:52	16:12	03:43	

# September 24, 25, 26 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	3° 21.32	220°45.27 N14°36.56	228°27.00 N18°16.67	176°58.42 <b>S</b> 01°33.72	324°28.95 N12°25.48
1	18° 23.78	235°44.86 35.81	243°27.91 16.26	192°0.38 33.94	339°31.54 25.43
2	33°26.25	250°44.46 35.07	258° 28.81 15.86	207°2.35 34.15	354°34.13 25.39
3	48°28.71	265°44.05 · · 34.31	273°29.72 · · 15.45	222°4.32 · · 34.36	9°36.72 · · 25.34
4	63°31.18	280°43.64 33.56	288° 30.62 15.05	237° 6.29 34.58	24°39.31 25.29
5	78°33.64	295°43.24 32.81	303°31.53 14.64	252°8.26 34.79	39°41.90 25.24
6	93°36.10	310°42.83 N14°32.06	318°32.44 N18°14.24	267°10.22 <b>S</b> 01°35.01	54°44.49 N12°25.20
7	108°38.57	325°42.43 31.31	333°33.34 13.83	282°12.19 35.22	69°47.08 25.15
8	123°41.03	340°42.02 30.55	348°34.25 13.43	297°14.16 35.43	84°49.67 25.10
9	138°43.50	355°41.62 · · 29.80	3°35.16 · · 13.02	312°16.13 · · 35.65	99°52.27 · · 25.05
10	153° 45.96	10°41.21 29.04	18°36.07 12.62	327°18.10 35.86	114°54.86 25.00
11	168° 48.42	25°40.81 28.29	33°36.97 12.21	342°20.07 36.07	129°57.45 24.96
12	183°50.89	40°40.40 N14°27.53	48°37.88 N18°11.80	357°22.03	145°0.04 N12°24.91
13	198°53.35	55° 40.00 26.77	63°38.79 11.40	12°24.00 36.50	160°2.63 24.86
14	213°55.82 228°58.28	70°39.59 26.01 85°39.19 · · 25.25	78°39.70 10.99 93°40.61 · · 10.59	27°25.97 36.71 42°27.94 · · 36.93	175°5.22 24.81 190°7.82 · · 24.76
15 16	244°0.75	100°38.79 24.49	108°41.52 10.18	42°27.94 · · 36.93 57°29.91 37.14	190°7.82 · · 24.76 205°10.41 24.72
17	259°3.21	115°38.38 23.73	123° 42.43 9.77	72°31.87 37.36	200° 13.00 24.67
18	274°5.67	130°37.98 N14°22.97	138°43.34 N18°9.37	87°33.84 S01°37.57	235°15.59 N12°24.62
19	289°8.14	145°37.57 22.21	153°44.25 8.96	102°35.81 37.78	250°18.19 24.57
20	304° 10.60	160°37.17 21.45	168° 45.16 8.55	117°37.78 38.00	265°20.78 24.52
21	319° 13.07	175°36.77 · · 20.68	183°46.07 · · 8.14	132°39.75 · · 38.21	280°23.37 · · 24.47
22	334° 15.53	190°36.36 19.92	198° 46.98 7.74	147°41.71 38.42	295°25.97 24.43
23	349°17.99	205°35.96 19.15	213° 47.89 7.33	162°43.68 38.64	310°28.56 24.38
Morr	pass. 23:43	ν-0.4' d-0.7' m-4.10	ν0.9' d-0.4' m1.53	ν2.0' d0.2' m-1.66	ν2.6' d-0.0' m0.07
- Ivier.	Jass. 23.43	ν-0.4 <i>u</i> -0.7 III-4.10	00.9 d-0.4 III1.93	ν2.0 d0.2 III-1.00	
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	4°20.46	220°35.55 N14°18.39	228°48.80 N18°6.92	177°45.65 S01°38.85	325°31.15 N12°24.33
1	19°22.92	235°35.15 17.62	243°49.71 6.51	192°47.62 39.06	340°33.75 24.28
2	34°25.39	250°34.75 16.85	258° 50.62 6.10	207°49.58 39.28	355°36.34 24.23
3 4	49°27.85 64°30.32	265°34.34 · · 16.08 280°33.94 15.32	273°51.53 · · 5.70 288°52.44 5.29	222°51.55 · · 39.49 237°53.52 39.70	10°38.93 · · 24.18 25°41.53 24.13
5	79°32.78	295° 33.54 14.55	303°53.36 4.88	257 55.52 59.70 252°55.49 39.92	40°44.12 24.09
6	94° 35.24	310°33.14 N14°13.78	318°54.27 N18°4.47	267°57.46 S01°40.13	55°46.72 N12°24.04
7	109° 37.71	325°32.73 13.00	333°55.18 4.06	282°59.42 40.35	70°49.31 23.99
8	109 37.71 124° 40.17	340°32.33 12.23	348° 56.09 3.65	298°1.39 40.56	85°51.91 23.94
9	139° 42.64	355°31.93 · · 11.46	3°57.01 · · 3.24	313°3.36 · · 40.77	100°54.50 · · 23.89
10	154° 45.10	10°31.52 10.69	18° 57.92 2.83	328° 5.33 40.99	115°57.10 23.84
11	169° 47.56	25°31.12 9.91	33°58.83 2.42	343°7.29 41.20	130°59.69 23.79
12	184°50.03	40°30.72 N14°9.14	48°59.75 N18°2.01	358°9.26 <b>S</b> 01°41.41	146°2.29 N12°23.74
13	199°52.49	55°30.32 8.36	64°0.66 1.60	13°11.23 41.63	161°4.88 23.69
14	214° 54.96	70°29.92 7.59	79°1.58 1.19	28°13.20 41.84	176°7.48 23.65
15	229° 57.42	85°29.51 · · 6.81	94°2.49 · · 0.78	43°15.17 · · 42.05	191°10.07 · · 23.60
16	244°59.89	100°29.11 6.03	109°3.41 0.37	58°17.13 42.27	206°12.67 23.55
17	260°2.35	115°28.71 5.25	124°4.32 17°59.96	73°19.10 42.48	221°15.26 23.50
18	275°4.81	130°28.31 N14°4.47	139°5.24 N17°59.55	88°21.07 S01°42.69	236°17.86 N12°23.45
19	290°7.28	145°27.91 3.69	154°6.15 59.14	103°23.04 42.91	251°20.46 23.40
20	305°9.74 320°12.21	$160^{\circ}27.51$ 2.91 $175^{\circ}27.10$ · · 2.13	169°7.07 58.73	118°25.00 43.12	266°23.05 23.35 281°25.65 · · 23.30
21 22	320 12.21 335°14.67	$175^{\circ}27.10$ · · 2.13 $190^{\circ}26.70$ 1.35	184°7.98 · · 58.32 199°8.90 57.91	133°26.97 · · 43.34 148°28.94 43.55	281°25.65 · · 23.30 296°28.24 23.25
23	350°17.13	205°26.30 0.57	214°9.82 57.50	163°30.91 43.76	311°30.84 23.20
Mer.	pass. 23:39	ν-0.4' d-0.8' m-4.10	ν0.9' d-0.4' m1.52	ν2.0′ d0.2′ m-1.66	ν2.6' d-0.0' m0.07
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	5°19.60	220°25.90 N13°59.78	229°10.73 N17°57.08	178°32.87 <b>S</b> 01°43.98	326°33.44 N12°23.15
1	20°22.06	235°25.50 59.00	244°11.65 56.67	193°34.84 44.19	341°36.03 23.10
2	35°24.53	250°25.10 58.22	259°12.57 56.26	208°36.81 44.40	356° 38.63 23.05
3	50°26.99	265°24.70 · · 57.43	274°13.48 · · 55.85	223°38.78 · · 44.62	11°41.23 · · · 23.00
4	65°29.46	280°24.30 56.64	289°14.40 55.44	238°40.74 44.83	26°43.83 22.96 \$
5	80°31.92	295°23.90 55.86	304°15.32 55.02	253°42.71 45.04	41°46.42 22.91
6 7	95°34.38 110°36.85	310°23.50 N13°55.07 325°23.10 54.28	319°16.24 N17°54.61 334°17.15 54.20	268°44.68 \$01°45.26 283°46.65 45.47	56°49.02 N12°22.86 71°51.62 22.81
8	125°39.31	340°22.70 53.49	349°18.07 53.79	298°48.61 45.68	86°54.22 22.76
9	140°41.78	355°22.30 · · 52.70	4°18.99 · · 53.37	313°50.58 · · 45.90	101°56.81 · · 22.71
10	155° 44.24	10°21.90 51.91	19°19.91 52.96	328°52.55 46.11	116°59.41 22.66
11	170°46.70	25°21.50 51.12	34°20.83 52.55	343°54.52 46.32	132°2.01 22.61
12	185°49.17	40°21.10 N13°50.33	49°21.75 N17°52.13	358°56.48 S01°46.54	147°4.61 N12°22.56
13	200°51.63	55°20.70 49.53	64°22.67 51.72	13°58.45 46.75	162°7.21 22.51
14	$215^{\circ}54.10$	70°20.30 48.74	79°23.59 51.31	29°0.42 46.96	177°9.81 22.46
15	$230^{\circ}56.56$	85°19.90 · · 47.94	94°24.51 · · 50.89	44°2.39 · · 47.18	192°12.41 · · 22.41
16	$245^{\circ}59.02$	100°19.50 47.15	109°25.43 50.48	59°4.35 47.39	207°15.00 22.36
17	261°1.49	115°19.10 46.35	124°26.35 50.06	74°6.32 47.60	222°17.60 22.31
18	276°3.95	130°18.70 N13°45.56	139°27.27 N17°49.65	89°8.29 <b>S</b> 01°47.82	237°20.20 N12°22.26
19	291°6.42	145°18.30 44.76	154°28.19 49.23	104°10.25 48.03	252°22.80 22.21
20	306°8.88	160°17.90 43.96	169°29.11 48.82	119°12.22 48.25	267°25.40 22.16
21	321°11.35	175°17.51 · · 43.16	184°30.04 · · 48.40	134°14.19 · · 48.46	282°28.00 · · 22.11
22 23	336° 13.81 351° 16.27	190°17.11 42.36 205°16.71 41.56	199° 30.96 47.99 214° 31.88 47.57	149°16.16 48.67 164°18.12 48.89	297°30.60 22.06 312°33.20 22.01
Mer.p	pass. 23:35	$\nu$ -0.4′ <i>d</i> -0.8′ m-4.09	$ u 0.9' \ d$ -0.4' m1.52	$ u 2.0' \ d0.2' \ \text{m-}1.66$	$ u 2.6' \ d$ -0.0' m0.06

	SHA	Dec
Alpheratz	357°31.24	29° 15.17
Ankaa	353°3.82	-42°8.77
Schedar	349°26.90	56°41.82
Diphda	348°43.97	-17°49.51
Achernar	335°17.51 327°47.45	-57°5.21
Hamal	327°47.45 312°2.41	23°36.00 89°22.81
Polaris Acamar	312 2.41 315°9.22	-40°11.09
Menkar	314°2.75	4° 12.28
Mirfak	308°23.52	49° 57.67
Aldebaran	290°36.01	16° 34.02
Rigel	281°0.89	-8°9.98
Capella	280°17.30	46°1.39
Bellatrix	$278^{\circ}19.57$	6°22.57
Elnath	277°57.97	28° 37.78
Alnilam	275°34.61	-1°10.94
Betelgeuse	270°48.79	7°24.75
Canopus	263°51.07	-52°42.36
Sirius	258°23.61	-16°45.20
Adhara	255°3.56	-29°0.48
Procyon	244°47.79	5°9.06
Pollux	243°13.78	27°57.25
Avior	234°13.78	-59°35.88 -43°32.77
Suhail	222°44.34	
Miaplacidus	221°38.16 217°45.02	-69°49.93 -8°46.95
Alphard	217°45.02 207°31.52	-8°46.95 11°49.57
Regulus Dubhe	207°31.52 193°38.10	61°35.62
Dubne	193 38.10 182°22.21	01 35.02 14°24.70
Gienah	175°40.78	-17°42.06
Acrux	173 40.78 172°57.25	-63° 15.55
Gacrux	172 37.23 171°48.73	-57° 16.48
Alioth	166°10.98	55° 48.26
Spica	158°19.40	-11° 18.63
Alkaid	152°50.14	49° 10.30
Hadar	148°32.13	-60° 30.78
Menkent	147°54.34	-36° 30.69
Arcturus	145°45.46	19°2.10
Rigil Kent.	139°36.54	-60° 57.35
Kochab	137°20.95	74°2.39
Zuben'ubi	$136^{\circ}52.90$	-16°9.61
Alphecca	126°1.43	26° 37.29
Antares	112°12.26	-26° 29.69
Atria	107°3.85	-69°4.87
Sabik	101°59.39	-15°45.51
Shaula	96°6.32	-37°7.45
Rasalhague	95°55.80 90°40.81	12°32.60
Eltanin	90°40.81 83°28.49	51°29.46 -34°22.20
Kaus Aust.	83 28.49 80°31.13	-34 22.20 38°48.98
Vega Nunki	75°43.96	-26° 15.55
Altair	61°56.88	8° 56.95
Peacock	53°0.74	-56° 38.54
Deneb	49°23.43	45°23.35
Enif	33°35.57	10°0.70
Al Na'ir	27°28.82	-46°49.19
Fomalhaut	15°10.89	-29°28.01
Scheat	13°41.89	28° 14.60
Markab	$13^{\circ}26.55$	15°21.87
Sep 24 Sun	SHA	Mer.pass
Venus	217°23.95	09:17
Mars	225°5.68	08:46
Jupiter	173°37.10	12:11
Saturn	321°7.63	02:22
	SHA	
Sep 25 Mon Venus	216° 15.10	Mer.pass 09:18
Mars	224°28.34	09:10
Jupiter	173°25.19	12:07
Saturn	321°10.69	02:18
Sep 26 Tue	SHA	Mer.pass
	215°6.30	09:19
		08:43
Venus	223°51 13	
	223°51.13 173°13.28	12:04
Venus Mars		12:04 02:13
Venus Mars Jupiter Saturn	173°13.28 321°13.84	
Venus Mars Jupiter Saturn	$173^{\circ}13.28$	

Stars

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°59.91	S00°35.29	$112^{\circ}30.95$	6.3'	\$25°23.26	2.0'	57.7'
1	197°0.13	36.26	126° 56.28	6.4'	25°25.23	1.8'	57.7'
2	212°0.35 227°0.57	37.24 · · 38.21	141°21.64 155°47.03	6.4' 6.4'	25°27.05 25°28.71	1.7' 1.5'	57.6' 57.6'
4	242°0.78	39.18	170° 12.46	6.5'	25°30.22	1.3'	57.6'
5	257°1.00	40.16	184°37.93	6.5'	$25^{\circ}31.57$	1.2'	57.5'
6	272°1.22 287°1.43	S00°41.13	199°3.44	6.5'	\$25°32.76	1.0'	57.5'
7 8	287°1.43 302°1.65	42.10 43.08	213°28.98 227°54.57	6.6' 6.6'	25°33.79 25°34.67	0.9' 0.7'	57.5' 57.4'
9	317°1.87	• • 44.05	242°20.20	6.7'	25°35.39	0.6'	57.4'
10	332°2.08	45.03	256° 45.87	6.7'	25°35.96	0.4'	57.3'
11 12	347°2.30 2°2.52	46.00 \$00° 46.97	271°11.59 285°37.36	6.8' 6.8'	25°36.38 \$25°36.64	0.3' 0.1'	57.3' 57.3'
13	17°2.73	47.95	205 37.30 300°3.17	6.9'	25°36.75	-0.0'	57.3 57.2'
14	32°2.95	48.92	314°29.03	6.9'	25°36.70	-0.2	57.2'
15	47°3.16	• • 49.89	328°54.95	7.0'	25°36.51	-0.3'	57.1'
16 17	62°3.38 77°3.60	50.87 51.84	343°20.91 357°46.93	7.0' 7.1'	25°36.16 25°35.67	-0.5' -0.6'	57.1' 57.1'
18	92°3.81	\$00° 52.81	12° 13.00	7.1	\$25°35.02	-0.8'	57.0'
19	107°4.03	53.79	$26^{\circ}39.13$	7.2'	$25^{\circ}34.23$	-0.9'	57.0'
20	122°4.25	54.76	41°5.31	7.2'	25°33.28	-1.1'	57.0'
21 22	137°4.46 152°4.68	· · 55.74 56.71	55°31.56 69°57.86	7.3' 7.4'	25°32.19 25°30.96	-1.2' -1.4'	56.9' 56.9'
23	152 4.08 167°4.89	50.71 57.68	84° 24.22	7.4 7.4'	25° 30.96 25° 29.57	-1.4 -1.5'	56.9'
	SD = 15.9'	d = 1.0'			0 = 15.7'		
					10.1		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	182°5.11 197°5.32	\$00°58.66 00°59.63	98°50.65 113°17.13	7.5' 7.5'	\$25°28.04 25°26.37	-1.7' -1.8'	56.8' 56.8'
2	212°5.54	00 59.63 01°0.60	113 17.13 127°43.68	7.5 7.6'	25 26.37 25°24.55	-1.8 -2.0'	56.7'
3	227°5.75	• • 1.58	142°10.30	7.7'	25°22.60	-2.1'	56.7'
4	242°5.97	2.55	156° 36.98	7.7'	25°20.49	-2.2'	56.7'
5 6	257°6.19 272°6.40	3.52 \$01°4.50	171°3.72 185°30.54	7.8' 7.9'	25°18.25 \$25°15.87	-2.4' -2.5'	56.6' 56.6'
7	287° 6.62	5.47	199° 57.42	8.0'	25°13.35	-2.7'	56.6
8	302°6.83	6.44	214°24.37	8.0'	25°10.69	-2.8'	56.5'
9	317°7.05	• • 7.42	228°51.39	8.1'	25°7.89	-2.9'	56.5'
10 11	332°7.26 347°7.48	8.39 9.37	243° 18.49 257° 45.65	8.2' 8.2'	25° 4.95 25° 1.88	-3.1' -3.2'	56.5' 56.4'
12	2°7.69	S01°10.34	272°12.89	8.3'	S24°58.68	-3.3'	56.4
13	17°7.91	11.31	286°40.20	8.4'	24°55.34	-3.5'	56.4'
14 15	32°8.12 47°8.34	12.29 •• 13.26	301°7.59 315°35.05	8.5' 8.5'	24°51.87 24°48.26	-3.6' -3.7'	56.3' 56.3'
16	62°8.55	14.23	330°2.59	6.5 8.6'	24 46.20 24°44.53	-3.1 -3.9'	56.3'
17	77°8.76	15.21	344°30.20	8.7'	24°40.66	-4.0'	56.2'
18	92°8.98	S01°16.18	358° 57.89	8.8'	\$24°36.67	-4.1'	56.2'
19 20	107°9.19 122°9.41	17.15 18.13	13°25.66 27°53.51	8.8' 8.9'	24°32.54 24°28.29	-4.3' -4.4'	56.2' 56.1'
21	137°9.62	• • 19.10	42° 21.44	9.0'	24°23.92	-4.5'	56.1'
22	152°9.84	20.07	56°49.44	9.1'	$24^{\circ}19.42$	-4.6'	56.1'
23	167°10.05	21.05	71° 17.53	9.2'	24°14.79	-4.7'	56.0'
	SD = 15.9'	d = 1.0'		SD	0 = 15.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
o 0	182°10.26	S01°22.02	впа 85° 45.69	ν 9.2'	S24°10.04	a -4.9'	56.0'
1	197°10.48	22.99	100°13.94	9.3'	24°5.17	-5.0'	56.0'
2	212°10.69	23.97	114° 42.27	9.4'	24°0.18 23°55.07	-5.1' -5.2'	55.9'
3 4	227°10.90 242°11.12	· · 24.94 25.91	129°10.68 143°39.17	9.5' 9.6'	23°55.07 23°49.84	-5.2' -5.3'	55.9' 55.9'
5	257°11.33	26.89	158°7.75	9.7'	23°44.49	-5.5'	55.8'
6	272°11.55	S01°27.86	172°36.40	9.7'	\$23°39.02	-5.6'	55.8'
7 8	287°11.76 302°11.97	28.83 29.81	187°5.14 201°33.97	9.8' 9.9'	23°33.44 23°27.74	-5.7' -5.8'	55.8' 55.8'
9	302 11.97 317°12.19	30.78	201 33.97 216°2.87	9.9 10.0'	23°21.74 23°21.93	-5.8 -5.9'	55.8 55.7'
10	332°12.40	31.75	$230^{\circ}31.86$	10.1'	23°16.01	-6.0'	55.7'
11	347°12.61	32.73	245°0.94	10.2'	23°9.97	-6.1'	55.7'
12 13	2°12.82 17°13.04	S01°33.70 34.67	259°30.10 273°59.34	10.2' 10.3'	\$23° 3.82 22° 57.57	-6.3' -6.4'	55.6' 55.6'
14	32°13.25	35.64	288° 28.67	10.3	22°51.20	-6.5'	55.6'
15	47°13.46	• • 36.62	$302^{\circ}58.08$	10.5'	22°44.73	-6.6'	55.6'
16	62°13.68	37.59	317°27.58	10.6'	22°38.15	-6.7'	55.5'
17 18	77°13.89 92°14.10	38.56 \$01°39.54	331°57.16 346°26.83	10.7' 10.8'	22°31.47 <b>S</b> 22°24.68	-6.8' -6.9'	55.5' 55.5'
19	107°14.31	40.51	0°56.58	10.8	22°17.78	-7.0'	55.4
20	122°14.53	41.48	15°26.41	10.9'	22°10.79	-7.1'	55.4'
21 22	137°14.74 152°14.95	· · 42.46 43.43	29°56.33 44°26.33	11.0' 11.1'	22°3.69 21°56.50	-7.2' -7.3'	55.4' 55.4'
23	152°14.95 167°15.16	43.43 44.40	44°26.33 58°56.42	11.1	21°56.50 21°49.20	-7.4'	55.4° 55.3'
	SD = 15.9'	d=1.0'			0 = 15.3'		
		- 1.0		- 50	10.0		

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

Lat.		Moonris	e		Moonset	t
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°				_		
66°			17:29			20:33
64°	16:32	16:47	16:47	17:47	19:27	21:15
62°	15:25	16:02	16:18	18:54	20:12	21:43
60°	14:50	15:33	15:56	19:29	20:41	22:04
N 58°	14:25	15:10	15:38	19:54	21:03	22:22
56°	14:05	14:52	15:23	20:14	21:21	22:36
54° 52°	13:48 13:34	14:36 14:23	15:10 14:59	20:31 20:45	21:37 21:50	22:49 23:00
50°	13:34	14:23 14:11	14:59 14:49	20:45	21:50	23:00
45°	12:55	13:46	14:49	21:24	22:26	23:30
N 40°	12:34	13:27	14:10	21:44	22:45	23:47
35°	12:34	13:27	13:55	22:01	23:01	23:41
30°	12:03	12:56	13:42	22:16	23:15	
20°	11:37	12:32	13:42	22:41	23:38	
N 10°	11:16	12:11	13:02	23:03	23:58	
0°	10:56	11:51	12:44	23:23		00:17
<b>S</b> 10°	10:35	11:32	12:26	23:43		00:36
20°	10:14	11:11	12:07		00:04	00:56
30°	09:49	10:46	11:45		00:29	01:19
35°	09:34	10:32	11:32		00:43	01:32
40°	09:17	10:16	11:17	00:03	01:00	01:48
45°	08:57	09:56	10:59	00:23	01:20	02:06
<b>S</b> 50°	08:31	09:31	10:37	00:49	01:46	02:29
52°	08:19	09:19	10:26	01:01	01:58	02:40
54°	08:05	09:05	10:14	01:15	02:12	02:53
56°	07:49	08:49	10:01	01:31	02:28	03:07
58° <b>S</b> 60°	07:29 07:04	08:30	09:44	01:51	02:47 03:11	03:23 03:43
<b>5</b> 00°	07:04	08:06	09:25	02:15	03:11	03:43

			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
		00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	6-8	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	34-55%	
	24	08:00	08:10	11:52	17:09	04:41		
	25	08:20	08:31	11:51	18:04	05:37		
	26	08:41	08:51	11:51	18:56	06:31		

### September 27, 28, 29 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	6° 18.74	220°16.31 N13°40.76	229°32.80 N17°47.16	179°20.09 S01°49.10	327°35.80 N12°21.96	
1	21°21.20	235° 15.91 39.96	244° 33.72 46.74	194°22.06 49.31	342°38.40 21.91	Alpheratz 357°31.23 29°15.18 Ankaa 353°3.81 -42°8.78
2	36° 23.67	250°15.51 39.16	259°34.65 46.33	209°24.03 49.53	357°41.00 21.86	Ankaa 353°3.81 -42°8.78 Schedar 349°26.88 56°41.84
3	51°26.13	265°15.12 · · 38.36	274°35.57 · · 45.91	224°25.99 · · 49.74	12°43.60 · · 21.81	Diphda 348°43.96 -17°49.51
4	66°28.59	280°14.72 37.55 295°14.32 36.75	289°36.49 45.50	239°27.96 49.95 254°29.93 50.17	27°46.20 21.76 42°48.80 21.70	Achernar 335°17.49 -57°5.22
5 6	81°31.06 96°33.52	295°14.32 36.75 310°13.92 N13°35.94	304°37.42 45.08 319°38.34 N17°44.66	254°29.93 50.17 269°31.89 \$01°50.38	42°48.80 21.70 57°51.40 N12°21.65	Hamal 327°47.43 23°36.01
7	111°35.99	325°13.52 35.14	334°39.26 44.25	284°33.86 50.59	72°54.00 21.60	Polaris 312°1.09 89°22.82
8	126°38.45	340°13.13 34.33	349°40.19 43.83	299°35.83 50.81	87°56.61 21.55	Acamar 315°9.19 -40°11.10
9	141°40.92	355°12.73 · · 33.52	4°41.11 · · 43.41	314°37.80 · · 51.02	102°59.21 · · 21.50	Menkar 314°2.73 4°12.28 Mirfak 308°23.49 49°57.69
10	156° 43.38	10°12.33 32.72	19°42.04 43.00	329°39.76 51.23	118°1.81 21.45	Aldebaran 290°35.98 16°34.02
11	171° 45.84	25°11.94 31.91	34°42.96 42.58	344°41.73 51.45	133°4.41 21.40	Rigel 281°0.86 -8°9.98
12 13	186° 48.31 201° 50.77	40°11.54 N13°31.10 55°11.14 30.29	49°43.89 N17°42.16 64°44.81 41.75	359°43.70 S01°51.66 14°45.66 51.87	148°7.01 N12°21.35 163°9.61 21.30	Capella 280°17.26 46°1.39
14	216°53.24	70°10.74 29.48	79°45.74 41.33	29°47.63 52.09	178°12.21 21.25	Bellatrix 278°19.55 6°22.57
15	231°55.70	85°10.35 · · 28.67	94°46.66 · · 40.91	44°49.60 · · 52.30	193°14.82 · · 21.20	Elnath 277°57.94 28°37.78
16	246°58.16	100°9.95 27.85	109°47.59 40.49	59°51.57 52.51	208°17.42 21.15	Alnilam 275°34.59 -1°10.94 Betelgeuse 270°48.77 7°24.75
17	262°0.63	115°9.56 27.04	124°48.52 40.08	74°53.53 52.73	223°20.02 21.10	Betelgeuse 270°48.77 7°24.75 Canopus 263°51.04 -52°42.36
18	277°3.09	130°9.16 N13°26.23	139°49.44 N17°39.66	89°55.50 S01°52.94	238°22.62 N12°21.05	Sirius 258°23.59 -16°45.20
19	292°5.56	145°8.76 25.41	154° 50.37 39.24	104°57.47 53.15	253°25.23 20.99	Adhara 255°3.53 -29°0.48
20 21	307°8.02 322°10.48	160°8.37 24.60 175°7.97 · · 23.78	169°51.30 38.82 184°52.22 · · 38.40	119°59.43 53.37 135°1.40 •• 53.58	268°27.83 20.94 283°30.43 · · 20.89	Procyon 244°47.77 5°9.06
22	337° 12.95	190°7.57 22.96	199° 53.15 37.98	150°3.37 53.79	298°33.03 20.84	Pollux 243°13.75 27°57.25
23	352° 15.41	205°7.18 22.15	214°54.08 37.57	165°5.33 54.01	313°35.64 20.79	Avior 234°13.74 -59°35.87
	pass. 23:31	ν-0.4' d-0.8' m-4.09	ν0.9' d-0.4' m1.52	ν2.0' d0.2' m-1.66	ν2.6' d-0.1' m0.06	Suhail 222°44.32 -43°32.76 Miaplacidus 221°38.12 -69°49.92
ivier.p	Jass. 23:31	ν-υ. <del>+</del> α-υ.ο III-4.09	νυ.σ u-υ.4 III1.32	ν Δ.υ	ν Δ.υ α-υ.1 IIIU.UU	Alphard 217°45.00 -8°46.95
	<b>~</b>			-		Regulus 207°31.51 11°49.57
Thu	GHA 7° 17 00	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°38.08 61°35.60
0 1	7°17.88 22°20.34	220°6.78 N13°21.33 235°6.39 20.51	229°55.01 N17°37.15 244°55.93 36.73	180°7.30 S01°54.22 195°9.27 54.43	328°38.24 N12°20.74 343°40.84 20.69	Denebola 182°22.20 14°24.69
2	37°22.80	250°5.99 19.69	259° 56.86 36.31	210°11.24 54.65	358°43.45 20.64	Gienah 175°40.77 -17°42.06
3	52°25.27	265°5.60 · · 18.87	274°57.79 · · 35.89	225°13.20 · · 54.86	13°46.05 · · 20.59	Acrux 172°57.25 -63°15.54
4	67°27.73	280°5.20 18.05	289°58.72 35.47	240°15.17 55.07	28°48.65 20.53	Gacrux 171°48.72 -57°16.47 Alioth 166°10.98 55°48.25
5	82°30.20	295°4.81 17.23	304°59.65 35.05	255°17.14 55.29	43°51.26 20.48	Spica 158°19.40 -11°18.63
6	97°32.66	310°4.41 N13°16.41	320°0.58 N17°34.63	270°19.10 S01°55.50	58°53.86 N12°20.43	Alkaid 152°50.14 49°10.29
7	112°35.13	325°4.02 15.59	335°1.51 34.21	285°21.07 55.71	73°56.47 20.38	Hadar 148°32.14 -60°30.77
8 9	127°37.59 142°40.05	340°3.62 14.76 355°3.23 · · 13.94	350°2.44 33.79 5°3.37 · · 33.37	300°23.04 55.93 315°25.00 · · 56.14	88°59.07 20.33 104°1.67 · · · 20.28	Menkent 147°54.34 -36°30.69
10	157° 42.52	10°2.83 13.11	20°4.30 32.95	330°26.97 56.35	119°4.28 20.23	Arcturus 145°45.46 19°2.09
11	172° 44.98	25°2.44 12.29	35°5.23 32.53	345°28.94 56.57	134°6.88 20.17	Rigil Kent. 139°36.55 -60°57.34 Kochab 137°20.99 74°2.37
12	187° 47.45	40°2.04 N13°11.46	50°6.16 N17°32.11	0°30.90 <b>S</b> 01°56.78	149°9.49 N12°20.12	Zuben'ubi 136°52.90 -16°9.61
13	202°49.91	55°1.65 10.63	65°7.09 31.69	15°32.87 56.99	164°12.09 20.07	Alphecca 126°1.43 26°37.28
14	217°52.37	70°1.26 9.81	80°8.02 31.27	30°34.84 57.20	179°14.70 20.02	Antares 112°12.27 -26°29.69
15	232°54.84	85°0.86 · · 8.98 100°0.47 8.15	95°8.95 · · 30.85	45°36.80 · · 57.42	194°17.30 · · 19.97 209°19.91 19.92	Atria 107°3.88 -69°4.86
16 17	247° 57.30 262° 59.77	100°0.47 8.15 115°0.08 7.32	110°9.89 30.43 125°10.82 30.00	60°38.77 57.63 75°40.74 57.84	209°19.91 19.92 224°22.51 19.86	Sabik 101°59.40 -15°45.51
18	278°2.23	129°59.68 N13°6.49	140°11.75 N17°29.58	90°42.71 <b>S</b> 01°58.06	239°25.12 N12°19.81	Shaula 96°6.33 -37°7.45
19	293°4.69	144°59.29 5.66	155°12.68 29.16	105°44.67 58.27	254°27.72 19.76	Rasalhague 95°55.81 12°32.60 Eltanin 90°40.84 51°29.46
20	$308^{\circ}7.16$	159°58.90 4.83	170°13.61 28.74	120°46.64 58.48	269°30.33 19.71	Eltanin 90°40.84 51°29.46   Kaus Aust. 83°28.50 -34°22.20
21	323°9.62	174°58.50 · · 3.99	185°14.55 · · 28.32	135°48.61 · · 58.70	284°32.94 · · 19.66	Vega 80°31.14 38°48.98
22	338° 12.09 353° 14.55	189°58.11 3.16	200° 15.48 27.89	150°50.57 58.91	299°35.54 19.60	Nunki 75°43.97 -26°15.55
23		204°57.72 2.33	215°16.41 27.47	165°52.54 59.12	314°38.15 19.55	Altair 61°56.89 8°56.95
Mer.p	pass. 23:27	$\nu$ -0.4' d-0.8' m-4.08	$ u 0.9' \ d$ -0.4' m1.52	$ u 2.0' \ d0.2' \ \text{m-}1.66$	$ u 2.6' \ d$ -0.1' m0.05	Peacock 53°0.76 -56°38.55
						Deneb 49°23.44 45°23.36 Enif 33°35.57 10°0.70
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.82 -46°49.20
0	8° 17.01	219°57.32 N13°1.49	230°17.35 N17°27.05	180°54.51 <b>S</b> 01°59.34	329°40.75 N12°19.50	Fomalhaut 15°10.89 -29°28.01
1	23°19.48	234°56.93 13°0.66	245° 18.28 26.63	195°56.47 59.55	344°43.36 19.45	Scheat 13°41.89 28°14.61
2	38°21.94 53°24.41	249°56.54 12°59.82 264°56.15 • 58.98	260°19.21 26.21 275°20.15 · · 25.78	210°58.44 01°59.76 226°0.41 01°59.98	359°45.97 19.40 14°48.57 •• 19.34	Markab 13°26.55 15°21.87
4	68° 26.87	279°55.75 58.15	290°21.08 25.36	241°2.37 0.19	29°51.18 19.29	Sep 27 Wed SHA Mer.pass
5	83°29.34	294°55.36 57.31	305°22.02 24.94	256° 4.34 0.40	44°53.79 19.24	Venus 213°57.57 09:19
6	98°31.80	309°54.97 N12°56.47	320°22.95 N17°24.51	271°6.31 S02°0.61	59°56.39 N12°19.19	Mars 223°14.06 08:41
7	113°34.26	324°54.58 55.63	335°23.89 24.09	286° 8.27 0.83	74°59.00 19.14	Jupiter 173°1.35 12:01
8	128° 36.73	339°54.19 54.79	350°24.82 23.67	301°10.24 1.04	90°1.61 19.08	Saturn 321°17.06 02:09
9 10	143°39.19 158°41.66	354°53.79 · · 53.95 9°53.40 53.11	5°25.76 · · 23.24 20°26.70 22.82	316°12.21 · · 1.25 331°14.17 1.47	105°4.22 ·· 19.03 120°6.82 18.98	Sep 28 Thu SHA Mer.pass
11	173° 44.12	24°53.01 52.27	35°27.63 22.39	346°16.14 1.68	135°9.43 18.93	Venus 212°48.91 09:20
12	188° 46.58	39°52.62 N12°51.42	50°28.57 N17°21.97	1°18.11 S02°1.89	150°12.04 N12°18.87	Mars 222°37.13 08:40
13	203°49.05	54°52.23 50.58	65°29.50 21.55	16°20.07 2.11	165°14.65 18.82	Jupiter 172°49.42 11:58 Saturn 321°20.36 02:05
14	218°51.51	69°51.84 49.74	80°30.44 21.12	31°22.04 2.32	180°17.25 18.77	
15	233°53.98	84°51.45 · · 48.89	95°31.38 · · 20.70	46°24.01 · · 2.53	195°19.86 · · 18.72	Sep 29 Fri SHA Mer.pass
16 17	248° 56.44 263° 58.90	99°51.05 48.05 114°50.66 47.20	110°32.32 20.27 125°33.25 19.85	61°25.97 2.74 76°27.94 2.96	210°22.47 18.66 225°25.08 18.61	Venus 211°40.31 09:20
18	203 58.90 279°1.37	114 50.00 47.20 129°50.27 N12°46.35	140°34.19 N17°19.42	91°29.91 S02°3.17	225°25.08 18.61 240°27.69 N12°18.56	Mars 222°0.33 08:38   Jupiter 172°37.49 11:55
19	294°3.83	144°49.88 45.51	155°35.13 19.00	106°31.87 3.38	255°30.30 18.51	Saturn 321°23.74 02:01
20	309°6.30	159°49.49 44.66	170°36.07 18.57	121°33.84 3.60	270°32.91 18.45	
21	324°8.76	174°49.10 · · 43.81	185°37.01 · · 18.15	136°35.81 · · 3.81	285°35.51 · · 18.40	Horizontal parallax
22	339°11.22	189° 48.71 42.96	200° 37.94 17.72	151°37.77 4.02	300°38.12 18.35	Venus: 0.1 Mars: 0.1
23	354°13.69	204°48.32 42.11	215°38.88 17.30	166°39.74 4.23	315°40.73 18.30	1910/3. 0.1
Mer.	pass. 23:23	ν-0.4' d-0.8' m-4.08	ν0.9' d-0.4' m1.51	ν2.0′ d0.2′ m-1.66	$\nu 2.6' \ d$ -0.1' m0.05	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 15.37	S01°45.37	73°26.59	11.3'	<b>S</b> 21°41.80	-7.5'	55.3'
1	197° 15.59	46.35	87°56.85	11.3'	21°34.31	-7.6'	55.3'
2 3	212° 15.80 227° 16.01	47.32 •• 48.29	102°27.19 116°57.61	11.4' 11.5'	21°26.72 21°19.04	-7.7' -7.8'	55.3' 55.2'
4	242° 16.22	49.27	131°28.12	11.6'	21°11.26	-7.9'	55.2'
5	257° 16.43	50.24	145°58.71	11.7'	21°3.39	-8.0'	55.2'
6	272° 16.65	501°51.21	160°29.38	11.8'	S20°55.43	-8.1'	55.2'
7	287° 16.86	52.18 53.16	175°0.14 189°30.98	11.8'	20°47.38 20°39.24	-8.1' -8.2'	55.1'
8 9	302°17.07 317°17.28	53.16	204° 1.90	11.9' 12.0'	20°39.24 20°31.00	-8.2' -8.3'	55.1' 55.1'
10	332° 17.49	55.10	218°32.90	12.1'	20° 22.68	-8.4'	55.1'
11	$347^{\circ}17.70$	56.07	233°3.98	12.2'	$20^{\circ}14.27$	-8.5'	55.0'
12	2°17.91	S01°57.05	247°35.15	12.2'	\$20°5.78	-8.6'	55.0'
13 14	17° 18.12 32° 18.33	58.02 01°58.99	262°6.40 276°37.72	12.3' 12.4'	19°57.20 19°48.54	-8.7' -8.7'	55.0' 55.0'
14 15	32 18.33 47°18.55	01 58.99 01°59.96	270 37.72 291°9.13	12.4	19 48.54 19°39.79	-8.8'	55.0'
16	62° 18.76	0.94	305°40.61	12.6'	19°30.97	-8.9'	54.9'
17	77° 18.97	1.91	$320^{\circ}12.18$	12.6'	19°22.06	-9.0'	54.9'
18	92°19.18	S02°2.88	334°43.82	12.7'	\$19°13.07	-9.1'	54.9'
19 20	107° 19.39 122° 19.60	3.85 4.83	349°15.54 3°47.34	12.8' 12.9'	19°4.00 18°54.86	-9.1' -9.2'	54.9' 54.9'
21	137° 19.81	• 5.80	18°19.22	13.0'	18°45.63	-9.2 -9.3	54.8'
22	152° 20.02	6.77	32°51.17	13.0'	18°36.33	-9.4	54.8'
23	167° 20.23	7.74	47°23.20	13.1'	$18^{\circ}26.96$	-9.4'	54.8'
	SD = 16.0'	d = 1.0'		SI	D = 15.1'		
<b>-</b> .						,	
Thu 0	<b>GHA</b> 182° 20.44	<b>Dec</b> \$02°8.71	<b>GHA</b> 61°55.30	u 13.2'	Dec \$18°17.51	<i>d</i> -9.5′	<b>HP</b> 54.8'
1	197°20.65	9.69	76°27.48	13.3'	18°7.99	-9.5'	54.7
2	212° 20.86	10.66	90°59.73	13.3'	17°58.39	-9.7'	54.7'
3	227°21.07	• • 11.63	105°32.06	13.4'	17°48.73	-9.7'	54.7'
4	242°21.28 257°21.49	12.60	120°4.46 134°36.93	13.5'	17°38.99 17°29.19	-9.8' -9.9'	54.7' 54.7'
5 6	257 21.49 272°21.69	13.57 \$02°14.55	134 30.93 149° 9.48	13.5' 13.6'	\$17°29.19	-9.9'	54.7'
7	287°21.90	15.52	163°42.10	13.7'	17°9.37	-10.0'	54.6'
8	302°22.11	16.49	178°14.78	13.8'	16°59.36	-10.1'	54.6'
9	317°22.32	• • 17.46	192°47.54	13.8'	16°49.28	-10.1'	54.6'
10 11	332°22.53 347°22.74	18.43 19.41	207°20.37 221°53.26	13.9' 14.0'	16°39.14 16°28.94	-10.2' -10.3'	54.6' 54.6'
12	2°22.95	S02°20.38	236°26.23	14.0'	\$16°18.67	-10.3	54.6'
13	17°23.16	21.35	250°59.26	14.1'	$16^{\circ}8.34$	-10.4'	54.5'
14	32°23.37	22.32	265°32.36	14.2'	15°57.95	-10.5'	54.5'
15 16	47°23.57 62°23.78	· · 23.29 24.26	280°5.52 294°38.75	14.2' 14.3'	15°47.50 15°36.99	-10.5' -10.6'	54.5' 54.5'
17	77° 23.99	25.23	309°12.04	14.4'	15°26.42	-10.6'	54.5'
18	92°24.20	S02°26.21	323°45.40	14.4'	S15°15.79	-10.7'	54.5'
19	107°24.41	27.18	338°18.82	14.5'	15°5.11	-10.7'	54.4'
20 21	122° 24.61 137° 24.82	28.15 •• 29.12	352°52.31 7°25.85	14.5' 14.6'	14°54.36 14°43.57	-10.8' -10.9'	54.4' 54.4'
22	157 24.02 152° 25.03	30.09	7 25.65 21°59.46	14.7	14 43.57 14°32.72	-10.9'	54.4'
23	167° 25.24	31.06	36°33.12	14.7'	14°21.81	-11.0'	54.4'
	SD = 16.0'	d = 1.0'		SI	O = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	182°25.45	S02°32.03	51° 6.85	ν 14.8'	\$14° 10.85	-11.0'	54.4'
1	$197^{\circ}25.65$	33.00	65°40.63	14.8'	13°59.84	-11.1'	54.4'
2	212°25.86	33.98	80°14.47	14.9'	13°48.78	-11.1'	54.3'
3 4	227°26.07 242°26.27	· · 34.95 35.92	94°48.37 109°22.33	15.0' 15.0'	13°37.67 13°26.51	-11.2' -11.2'	54.3' 54.3'
4 5	242 26.27 257°26.48	35.92 36.89	109 22.33 123°56.34	15.0 15.1'	13 20.51 13°15.30	-11.2 -11.3'	54.3'
6	272°26.69	S02°37.86	138°30.40	15.1'	S13°4.05	-11.3'	54.3'
7	287°26.89	38.83	153° 4.52	15.2'	12°52.74	-11.4'	54.3'
8 9	302°27.10 317°27.31	39.80 •• 40.77	167°38.69 182°12.92	15.2' 15.3'	12°41.39 12°30.00	-11.4' -11.4'	54.3' 54.2'
10	317°27.31 332°27.51	41.74	182°12.92 196°47.19	15.3'	12° 30.00 12° 18.56	-11.4 -11.5'	54.2' 54.2'
11	347°27.72	42.71	211°21.52	15.4'	12°7.07	-11.5'	54.2'
12	2°27.93	S02°43.68	225°55.90	15.4'	S11°55.55	-11.6'	54.2'
13	17°28.13	44.65	240°30.32	15.5'	11°43.98	-11.6'	54.2'
14 15	32°28.34 47°28.55	45.63 •• 46.60	255°4.79 269°39.31	15.5' 15.6'	11°32.37 11°20.71	-11.7' -11.7'	54.2' 54.2'
16	62°28.75	47.57	284°13.88	15.6'	11°9.02	-11.7	54.2'
17	77°28.96	48.54	298°48.49	15.7'	10°57.29	-11.8'	54.2'
18	92°29.16	S02°49.51	313°23.15	15.7'	\$10°45.52	-11.8'	54.2'
19 20	107° 29.37 122° 29.57	50.48 51.45	327°57.85 342°32.59	15.7' 15.8'	10°33.72 10°21.87	-11.8' -11.9'	54.1' 54.1'
20	122°29.57 137°29.78	51.45	342°32.59 357°7.38	15.8'	10°21.87 10°9.99	-11.9' -11.9'	54.1' 54.1'
22	152° 29.98	53.39	11°42.21	15.9'	09°58.08	-11.9	54.1'
23	167°30.19	54.36	26°17.07	15.9'	09°46.13	-12.0'	54.1'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	65-82%	
27	09:01	09:12	11:51	19:44	07:21		
28	09:22	09:32	11:50	20:29	08:07		
29	09:42	09:52	11:50	21:12	08:51		

#### September 30, 01, 02 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	
Sat 0	<b>GНА</b> 9°16.15	GHA 219°47.93	Dec N12°41.26	<b>GHA</b> 230°39.82	Dec N17°16.87	GHA 181°41.71	Dec \$02°4.45	330°43.34 N12°18.24	
1	9 10.15 24° 18.62	219 47.93 234° 47.54	40.41	230 39.62 245°40.76	16.44	196°43.67	4.66	345°45.95 18.19	Alpheratz
2	39°21.08	234 47.34 249°47.15	39.55	245 40.70 260°41.70	16.44	211°45.64	4.00	0°48.56 18.14	Ankaa
3	59°21.08	264° 46.76	• • 38.70	275° 42.64	. 15.59	226°47.61	• • 5.09	15°51.17 · · 18.08	Schedar
4	69°26.01	279° 46.37	37.85	290°43.58	15.17	241°49.57	5.30	30°53.78 18.03	Diphda
5	84°28.47	294° 45.98	36.99	305°44.52	14.74	256°51.54	5.51	45°56.39 17.98	Achernar
6	99°30.94	309°45.59	N12°36.14	320° 45.46	N17°14.31	271°53.51	5.51 S02°5.73	60°59.00 N12°17.92	Hamal
7	114°33.40	324° 45.21	35.28	335°46.40	13.89	286°55.47	5.94	76°1.61 17.87	Polaris
8	129°35.86	339°44.82	34.43	350°47.34	13.46	301°57.44	6.15	91°4.22 17.82	Acamar
9	144°38.33	354°44.43	• • 33.57	5°48.28	. 13.03	316°59.41	. 6.36	106°6.83 · · 17.77	Menkar
10	159° 40.79	9°44.04	32.71	20°49.23	12.60	332° 1.37	6.58	121°9.44 17.71	Mirfak
11	174° 43.26	24°43.65	31.85	35°50.17	12.18	347° 3.34	6.79	136°12.05 17.66	Aldebaran
12	189° 45.72	39°43.26	N12°31.00	50°51.11	N17°11.75	2°5.31	502°7.00	151°14.66 N12°17.61	Rigel
13	204°48.18	54°42.87	30.14	65°52.05	11.32	17°7.27	7.22	166°17.27 17.55	Capella
14	219°50.65	69°42.49	29.28	80°52.99	10.89	32° 9.24	7.43	181°19.88 17.50	Bellatrix
15	234°53.11	84°42.10	• • 28.41	95°53.94	• • 10.47	$47^{\circ}11.21$	• • 7.64	196°22.50 · · 17.45	Elnath
16	249°55.58	99°41.71	27.55	$110^{\circ}54.88$	10.04	62°13.17	7.85	211°25.11 17.39	Alnilam
17	264°58.04	114°41.32	26.69	$125^{\circ}55.82$	9.61	$77^{\circ}15.14$	8.07	226°27.72 17.34	Betelgeuse
18	280°0.51	129°40.93	N12°25.83	140°56.77	N17° 9.18	92°17.11	S02°8.28	241°30.33 N12°17.29	Canopus Sirius
19	295°2.97	144°40.55	24.96	155°57.71	8.75	$107^{\circ}19.07$	8.49	256°32.94 17.23	Adhara
20	310°5.43	159°40.16	24.10	170°58.65	8.33	122°21.04	8.71	271°35.55 17.18	Procyon
21	325°7.90	174°39.77	• • 23.23	185°59.60	• • 7.90	137°23.01	• • 8.92	286°38.16 · · 17.13	Pollux
22	340°10.36	189°39.38	22.37	201°0.54	7.47	152°24.97	9.13	301°40.78 17.07	Avior
23	355° 12.83	204°39.00	21.50	$216^{\circ}1.49$	7.04	167°26.94	9.34	316°43.39 17.02	Suhail
Merr	pass. 23:19	υ-0 Δ' d-0	0.9' m-4.08	νη ο' d-0	).4' m1.51	v2 0' d0	2′ m-1.66	ν2.6' d-0.1' m0.04	Miaplacidus
IVICI.	Jass. 23.19	ν-0.4 α-0	7.9 111-4.00	νο.9 α-0	7.4 1111.51	ν2.0 do.	2 111-1.00	V2.0 U-0.1 1110.04	Alphard
									Regulus
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	Dubhe
0	10° 15.29	$219^{\circ}38.61$	N12°20.64	231°2.43	N17° 6.61	182°28.91	S02°9.56	331°46.00 N12°16.96	Denebola
1	25° 17.75	234°38.22	19.77	246°3.38	6.18	197°30.87	9.77	346°48.61 16.91	Gienah
2	40°20.22	249°37.84	18.90	261°4.32	5.75	212°32.84	9.98	1°51.23 16.86	Acrux
3	55°22.68	264°37.45	• • 18.03	276°5.27	• • 5.32	227°34.81	• • 10.20	16°53.84 · · 16.80	Gacrux
4	70°25.15	279°37.06	17.16	291°6.21	4.89	242°36.77	10.41	31°56.45 16.75	Alioth
5	85°27.61	294°36.68	16.29	306°7.16	4.46	257°38.74	10.62	46°59.06 16.70	Spica
6	100°30.07	309°36.29	N12°15.42	321°8.10	N17°4.03	272°40.71	S02°10.83	62°1.68 N12°16.64	Alkaid
7	115°32.54	324°35.90	14.55	336°9.05	3.60	287°42.67	11.05	77°4.29 16.59	Hadar
8	130°35.00	339°35.52	13.68	351°10.00	3.17	302°44.64	11.26	92°6.90 16.53	Menkent
9	145°37.47	354°35.13	• • 12.80	6° 10.94	• • 2.74	317°46.61	• • 11.47	107°9.52 · · 16.48	Arcturus
10	160°39.93	9°34.75	11.93	21°11.89	2.31	332°48.57	11.69	122°12.13 16.43	Rigil Kent.
11	175° 42.39	24°34.36	11.06	36° 12.84	1.88	347°50.54	11.90	137°14.74 16.37	Kochab
12	190° 44.86	39°33.97	N12°10.18	51°13.79	N17°1.45	2°52.51	S02°12.11	152°17.36 N12°16.32	Zuben'ubi
13	205° 47.32	54°33.59	9.31	66° 14.73	1.02	17°54.47	12.32	167°19.97 16.26	Alphecca
14	220°49.79	69°33.20	8.43	81°15.68	0.59	32°56.44	12.54	182°22.58 16.21	Antares
15	235° 52.25	84°32.82	• • 7.55	96° 16.63	17°0.16	47°58.41	• • 12.75	197°25.20 · · 16.16	Atria
16	250°54.71	99°32.43	6.68	111°17.58	16°59.72	63°0.37 78°2.34	12.96	212°27.81 16.10	Sabik
17	265° 57.18	114°32.05	5.80 N12° 4.92	126° 18.53	59.29	78 2.34 93°4.31	13.18	227°30.43 16.05	Shaula
18	280°59.64	129°31.66 144°31.28		141°19.48	N16°58.86		S02°13.39	242°33.04 N12°15.99	Rasalhague
19	296°2.11		4.04	156°20.43	58.43	108° 6.27	13.60	257°35.66 15.94	Eltanin
20 21	311°4.57 326°7.03	159°30.89 174°30.51	3.16 · · 2.28	171°21.38 186°22.32	58.00 •• 57.57	123°8.24 138°10.20	13.81 •• 14.03	272°38.27 15.89 287°40.89 •• 15.83	Kaus Aust.
22	341°9.50	174 30.51 189°30.12	1.40	201°23.27	57.13	150° 10.20 153° 12.17	14.03		Vega
23	356° 11.96	204° 29.74	0.52	201 23.27 216°24.22	56.70	168°14.14	14.45	302°43.50 15.78 317°46.12 15.72	Nunki
									Altair
Mer.p	pass. 23:15	$\nu$ -0.4' d-0	).9′ m-4.07	$\nu$ 0.9 $^{\prime}$ d-0	$0.4'~{ m m}1.51$	$\nu$ 2.0′ d0.	2′ m-1.66	$ u 2.6' \ d$ -0.1' m0.04	Peacock
									Deneb
Man	CHA	GHA	Doo	GHA	Doo	GHA	Dee	GHA Dec	Enif
Mon	<b>GHA</b> 11°14.43	219°29.36	<b>Dec</b> N11°59.63	231°25.18	<b>Dec</b> N16°56.27	183°16.10	<b>Dec</b> \$02°14.66	<b>GHA Dec</b> 332°48.73 N12°15.67	Al Na'ir
0 1	26° 16.89	219 29.36 234°28.97	N11 59.03 58.75	231 25.18 246°26.13	55.84	183 16.10 198°18.07	14.88	347°51.35 15.61	Fomalhaut
2	41° 19.35	249° 28.59	56.75 57.87	240 20.13 261°27.08	55.40	213°20.04	15.09	2°53.96 15.56	Scheat
3	56°21.82	264° 28.20	• • 56.98	201 27.08 276°28.03	• • 54.97	213 20.04 228°22.00	15.30	17°56.58 · · 15.50	Markab
4	71°24.28	279° 27.82	56.10	291°28.98	54.54	243°23.97	15.52	32°59.19 15.45	Sep 30 Sat
5	86°26.75	294° 27.44	55.21	306°29.93	54.11	258°25.94	15.73	48°1.81 15.40	Venus
6	101°29.21	309°27.05	N11°54.32	321°30.88	N16°53.67	273°27.90	S02°15.94	63°4.42 N12°15.34	Mars
7	116° 31.67	324° 26.67	53.44	336°31.83	53.24	288°29.87	16.15	78°7.04 15.29	Jupiter
8	131° 34.14	339°26.29	52.55	351°32.79	52.81	303°31.84	16.37	93°9.66 15.23	Saturn
9	146°36.60	354°25.90	51.66	6°33.74	52.37	318°33.80	. 16.58	108°12.27 · · 15.18	
10	161°39.07	9°25.52	50.77	21°34.69	51.94	333°35.77	16.79	123°14.89 15.12	Oct 01 Sun
11	176° 41.53	24°25.14	49.88	36° 35.64	51.50	348°37.73	17.00	138°17.50 15.07	Venus
12	191°43.99	39°24.76	N11°48.99	51°36.60	N16°51.07	3°39.70	S02°17.22	153°20.12 N12°15.01	Mars
13	206° 46.46	54°24.37	48.10	66° 37.55	50.64	18°41.67	17.43	168°22.74 14.96	Jupiter
14	221°48.92	69°23.99	47.21	81°38.50	50.20	33°43.63	17.64	183°25.35 14.90	Saturn
15	$236^{\circ}51.39$	84°23.61	• • 46.32	96°39.46	• • 49.77	48°45.60	• • 17.85	198°27.97 · · 14.85	Oct 02 Mon
16	251°53.85	99°23.23	45.42	111°40.41	49.33	63°47.57	18.07	213°30.59 14.79	Venus
17	$266^{\circ}56.31$	114°22.84	44.53	126°41.37	48.90	78°49.53	18.28	228°33.20 14.74	Mars
18	281°58.78	129°22.46	N11°43.64	141°42.32	N16°48.46	93°51.50	S02°18.49	243°35.82 N12°14.68	Jupiter
19	297°1.24	144°22.08	42.74	156°43.28	48.03	108°53.47	18.70	258°38.44 14.63	Saturn
20	$312^{\circ}3.71$	159°21.70	41.85	171°44.23	47.59	123°55.43	18.92	273°41.06 14.57	
21	327°6.17	174°21.32	• • 40.95	186°45.19	• • 47.16	138°57.40	•• 19.13	288°43.67 · · 14.52	Horizon
22	342°8.63	189°20.94	40.05	201°46.14	46.72	153°59.36	19.34	303°46.29 14.46	
23	357°11.10	204°20.55	39.15	216°47.10	46.29	169° 1.33	19.55	318°48.91 14.41	
Merr	pass. 23:11	$\nu$ -0.4' d-0	).9' m-4.07	$\nu$ 1 0' d-0	).4′ m1.50	ν2 0' d0	2′ m-1.66	ν2.6' d-0.1' m0.03	
				- 1.5 4 6					

Stars SHA

 $357^{\circ}31.23$ 

349° 26.88

348°43.95

 $335^{\circ}17.48$ 

 $327^{\circ}47.42$ 

 $312^{\circ}0.03$ 

 $315^{\circ}9.18$ 

 $314^{\circ}2.71$ 

308°23.47 290°35.96

281°0.84

280°17.23

 $278^{\circ}19.53$ 

277°57.92

275°34.57

270°48.75

263°51.01

258°23.57

255°3.51

 $244^{\circ}47.75$ 

 $243^{\circ}13.73$ 

234°13.71

222°44.30

221°38.08

217°44.99 207°31.49

193°38.06

182°22.20

175°40.77

 $172^{\circ}57.25$ 

171°48.72

 $166^{\circ}10.98$ 

158° 19.40

152°50.15

148°32.15 147°54.34

 $145^{\circ}45.46$ 

139°36.57

 $137^{\circ}21.03$ 

136°52.91

126°1.45

112°12 28

107°3.92

 $101^{\circ}59.42$ 

 $96^{\circ}6.35$ 

 $95^{\circ}55.82$ 

90°40.86

83°28.52

80°31.17

75°43.99

 $61^{\circ}56.90$ 

49°23.46

33°35.58

 $27^{\circ}28.83$ 

15°10.90

13°41.89

13°26.56

SHA

210°31.78

221°23.67

 $172^{\circ}25.55$ 

 $321^{\circ}27.19$ 

SHA

209°23.32

220°47.14

172°13.62

321°30.71

SHA

208°14.93

 $220^{\circ}\,10.75$ 

 $172^{\circ}1.68$ 

 $321^{\circ}34.30$ 

Venus: Mars

Horizontal parallax

 $53^{\circ}0.78$ 

353°3.80

Dec 29°15.19

-42°8.79

56°41 86 -17°49.51

 $-57^{\circ}5.23$ 

23°36.02

89°22.84

-40°11.11

 $4^{\circ}12.28$ 49°57.70

16°34.02

 $-8^{\circ}9.98$ 46°1.40

 $6^{\circ}22.57$ 

28°37.78

 $-1^{\circ}10.94$ 

 $7^{\circ}24.75$ 

-52°42.36

-16°45.20

 $-29^{\circ}0.48$ 

 $27^{\circ}57.24$ 

-59°35.86

-43°32.75

-69°49.91

-8°46.95

11°49.56

61°35.59

 $14^{\circ}24.69$ 

-17°42.05

-63°15.52

-57°16.46

55°48.23

-11°18.63

49°10.27 -60°30.76

-36°30.68

 $19^{\circ}2.08$ 

74°2.36

-16°9.61

26°37.28

-26°29.69

-69°4.86

 $-37^{\circ}7.45$ 

12°32.60

51°29.46

-34°22.20

38°48.98

-26°15.55

8°56.95

-56°38.56

45°23.36

 $10^{\circ}\,0.71$ 

-46°49.21

-29°28.02

28°14.62

15°21.88

Mer.pass

09:21

08:37

11:52

01:57

09:22

08:35

11:49

01:53

09:22

08:34

11:45

01:48

0.1

0.1

Mer.pass

Mer.pass

-15°45.51

-60°57.33

h	Sui	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°30.39	S02°55.33	40°51.98	15.9'	<b>S</b> 09°34.15	-12.0'	54.1'
1	197°30.60	56.30	55°26.93	16.0'	09°22.13	-12.0'	54.1'
2 3	212°30.80 227°31.01	57.27 •• 58.24	70°1.91 84°36.93	16.0' 16.1'	09° 10.08 08° 58.00	-12.1' -12.1'	54.1' 54.1'
4	242°31.21	02°59.21	99°11.99	16.1	08° 45.89	-12.1'	54.1'
5	257°31.42	$03^{\circ}0.18$	113°47.08	16.1'	$08^{\circ}33.75$	-12.2'	54.1'
6	272°31.62	S03°1.15	128°22.20	16.2	508°21.58	-12.2'	54.0'
7 8	287°31.82 302°32.03	2.12 3.09	142°57.36 157°32.56	16.2' 16.2'	08°9.38 07°57.16	-12.2' -12.3'	54.0' 54.0'
9	317°32.23	• • 4.05	172°7.78	16.3	07°44.90	-12.3'	54.0'
10	332°32.44	5.02	186° 43.03	16.3'	07°32.62	-12.3'	54.0'
11	347°32.64 2°32.84	5.99 <b>S</b> 03°6.96	201° 18.32 215° 53.63	16.3'	07°20.32 \$07°7.99	-12.3' -12.4'	54.0' 54.0'
12 13	2 32.84 17°33.05	7.93	215 53.03 230°28.97	16.3' 16.4'	06°55.63	-12.4 -12.4'	54.0'
14	32°33.25	8.90	245°4.34	16.4	06°43.25	-12.4	54.0'
15	47°33.45	• • 9.87	259° 39.74	16.4'	06°30.85	-12.4'	54.0'
16 17	62°33.66 77°33.86	10.84 11.81	274° 15.16 288° 50.61	16.4' 16.5'	06°18.43 06°5.98	-12.4' -12.5'	54.0' 54.0'
18	92°34.06	503°12.78	303°26.08	16.5	505°53.52	-12.5'	54.0'
19	107°34.26	13.75	318°1.57	16.5'	05°41.03	-12.5'	54.0'
20	122°34.47	14.71	332° 37.08	16.5'	05°28.53	-12.5'	54.0'
21	137°34.67	• • 15.68	347° 12.62	16.6'	05°16.00 05°3.46	-12.5'	54.0'
22 23	152°34.87 167°35.07	16.65 17.62	1°48.18 16°23.75	16.6' 16.6'	05°3.46 04°50.91	-12.6' -12.6'	54.0' 54.0'
_5	SD = 16.0'	d = 1.0'			D = 14.8'		
		u = 1.0		51	∪ — 14.δ°		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°35.28	S03°18.59	30°59.35	16.6'	S04°38.33	-12.6'	53.9'
1 2	197°35.48 212°35.68	19.56 20.53	45°34.96 60°10.59	16.6' 16.6'	04°25.74 04°13.14	-12.6' -12.6'	53.9' 53.9'
3	212°35.68 227°35.88	20.53	60° 10.59 74° 46.23	16.6	04°13.14 04°0.52	-12.6' -12.6'	53.9' 53.9'
4	242°36.08	22.46	89°21.89	16.7'	03°47.88	-12.6'	53.9'
5	257°36.28	23.43	103° 57.56	16.7'	03°35.24	-12.7'	53.9'
6 7	272°36.48 287°36.69	\$03°24.40 25.37	118°33.25 133°8.95	16.7' 16.7'	\$03°22.58 03°9.91	-12.7' -12.7'	53.9' 53.9'
8	302°36.89	25.3 <i>1</i> 26.34	133 8.95 147°44.66	16.7	03 9.91 02°57.23	-12.7'	53.9'
9	317°37.09	• • 27.30	162° 20.38	16.7'	02°44.54	-12.7'	53.9'
10	332°37.29	28.27	176° 56.11	16.7'	02°31.84	-12.7'	53.9'
11	347°37.49 2°37.69	29.24 <b>S</b> 03°30.21	191°31.85 206°7.60	16.7' 16.8'	02°19.13 \$02°6.41	-12.7' -12.7'	53.9' 53.9'
12 13	2 37.09 17°37.89	31.17	200 7.00 220°43.35	16.8	01°53.69	-12.7'	53.9' 53.9'
14	32°38.09	32.14	235° 19.11	16.8'	01°40.96	-12.7'	53.9'
15	47°38.29	• • 33.11	249°54.88	16.8'	01°28.22	-12.7'	53.9'
16 17	62°38.49 77°38.69	34.08 35.04	264°30.65 279°6.42	16.8' 16.8'	01°15.48 01°2.73	-12.7' -12.8'	53.9' 53.9'
18	92°38.89	\$03°36.01	293° 42.19	16.8	S00°49.98	-12.8'	53.9'
19	107°39.09	36.98	308° 17.97	16.8'	00°37.23	-12.8'	53.9'
20	122°39.29	37.95	322°53.75	16.8'	00°24.47		53.9'
21 22	137°39.49 152°39.69	· · 38.91 39.88	337° 29.53 352° 5.31	16.8' 16.8'	\$00°11.72 N00°1.04	-12.8' 12.8'	53.9' 53.9'
23	167°39.89	40.85	6°41.08	16.8'	00° 13.80	12.8'	53.9'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	182°40.09 197°40.28	\$03°41.81 42.78	21° 16.86 35° 52.63	16.8' 16.8'	N00°26.56 00°39.31	12.8' 12.8'	53.9' 53.9'
2	197°40.28 212°40.48	42.78 43.75	50°28.39	16.8'	00° 39.31 00° 52.07	12.8'	53.9' 53.9'
3	227°40.68	• • 44.72	65°4.15	16.8	01°4.82	12.7'	53.9'
4	242°40.88	45.68	79°39.90	16.7'	01°17.57	12.7'	53.9'
5 6	257°41.08 272°41.28	46.65 \$03°47.61	94° 15.65 108° 51.39	16.7' 16.7'	01°30.32 N01°43.06	12.7' 12.7'	53.9' 53.9'
7	272 41.28 287°41.47	48.58	108 51.39 123°27.12	16.7'	01°55.79	12.7'	53.9'
8	302°41.67	49.55	138°2.84	16.7'	$02^{\circ}8.52$	12.7'	53.9'
9	317°41.87	• • 50.51	152° 38.55	16.7	02°21.24	12.7'	53.9'
10 11	332°42.07 347°42.27	51.48 52.45	167°14.25 181°49.94	16.7' 16.7'	02°33.96 02°46.67	12.7' 12.7'	53.9' 53.9'
12	2°42.46	52.45 \$03°53.41	196° 25.61	16.7	N02° 59.36	12.7'	53.9'
13	17°42.66	54.38	211°1.27	16.6'	$03^{\circ}12.05$	12.7'	53.9'
14	32°42.86	55.34	225°36.92	16.6'	03°24.73	12.7'	53.9'
15 16	47°43.05 62°43.25	· · 56.31 57.28	240°12.55 254°48.16	16.6' 16.6'	03°37.40 03°50.05	12.7' 12.6'	53.9' 53.9'
17	77°43.45	58.24	269°23.76	16.6'	03 50.05 04°2.69	12.6'	53.9'
18	92°43.64	S03°59.21	283°59.33	16.6'	N04° 15.32	12.6'	53.9'
19	107°43.84	04°0.17	298° 34.89	16.5'	04°27.93	12.6'	53.9'
20 21	122°44.04 137°44.23	1.14 · · 2.10	313° 10.43 327° 45.95	16.5' 16.5'	04° 40.53 04° 53.12	12.6' 12.6'	53.9' 54.0'
22	157 44.23 152°44.43	3.07	342°21.45	16.5	05°5.69	12.6'	54.0'
23	167°44.62	4.03	356° 56.92	16.5'	05° 18.24	12.5'	54.0'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-97%	
30	10:02	10:11	11:50	21:53	09:32		
01	10:21	10:31	11:49	22:33	10:13		
02	10:40	10:50	11:49	23:13	10:52		

#### October 03, 04, 05 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	12° 13.56	219°20.17 N11°38.26	231°48.05 N16°45.85	184°3.30 S02°19.77	333°51.53 N12°14.35	
1	27° 16.03	234°19.79 37.36	246°49.01 45.42	199° 5.26 19.98	348°54.15 14.30	Alpheratz
2	42° 18.49	249° 19.41 36.46	261°49.96 44.98	214°7.23 20.19	3°56.76 14.24	Ankaa
3	57° 20.95	264°19.03 · · 35.56	276°50.92 · · 44.54	229° 9.20 · · 20.40	18°59.38 •• 14.19	Schedar
4	$72^{\circ}23.42$	279°18.65 34.66	291°51.88 44.11	244°11.16 20.62	34°2.00 14.13	Diphda
5	87°25.88	294°18.27 33.76	306° 52.83 43.67	259°13.13 20.83	49°4.62 14.08	Achernar
6	102°28.35	309°17.89 N11°32.86	321°53.79 N16°43.24	274°15.10 S02°21.04	64°7.24 N12°14.02	Hamal Polaris
7	$117^{\circ}30.81$	324°17.51 31.95	336°54.75 42.80	289°17.06 21.25	79°9.86 13.97	Acamar
8	$132^{\circ}33.27$	339°17.13 31.05	351°55.71 42.36	304°19.03 21.47	94°12.47 13.91	Menkar
9	147°35.74	354°16.75 · · 30.15	6°56.67 · · 41.93	319°20.99 · · 21.68	109°15.09 · · 13.86	Mirfak
10	162°38.20	9°16.37 29.24	21°57.62 41.49	334°22.96 21.89	124°17.71 13.80	Aldebaran
11	177° 40.67	24°15.99 28.34	36°58.58 41.05	349°24.93 22.10	139°20.33 13.74	Rigel
12	192°43.13	39°15.61 N11°27.43	51°59.54 N16°40.61	4°26.89 <b>S</b> 02°22.32	154°22.95 N12°13.69	Capella
13	207°45.59	54°15.23 26.53	67°0.50 40.18	19°28.86 22.53	169°25.57 13.63	Bellatrix
14	222°48.06	69°14.85 25.62	82°1.46 39.74	34°30.83 22.74	184°28.19 13.58 199°30.81 · · 13.52	Elnath
15 16	237° 50.52 252° 52.99	84°14.47 · · 24.71 99°14.09 23.80	97°2.42 ·· 39.30 112°3.38 38.87	49°32.79 · · 22.95 64°34.76 23.17		Alnilam
16 17	252 52.99 267° 55.45	99°14.09 23.80 114°13.71 22.89	112°3.38 38.87 127°4.34 38.43	64°34.76 23.17 79°36.73 23.38	214°33.43 13.47 229°36.05 13.41	Betelgeuse
18	282° 57.92	129°13.33 N11°21.99	142°5.30 N16°37.99	94°38.69 \$02°23.59	244°38.67 N12°13.36	Canopus
19	298°0.38	144°12.95 21.08	157°6.26 37.55	109°40.66 23.80	259°41.29 13.30	Sirius
20	313°2.84	159°12.57 20.17	172°7.22 37.11	124°42.62 24.01	274°43.91 13.24	Adhara
21	328°5.31	174°12.20 · · 19.25	187°8.18 · · 36.68	139°44.59 · · 24.23	289°46.53 · · 13.19	Procyon
22	343°7.77	189°11.82 18.34	202°9.14 36.24	154°46.56 24.44	304°49.15 13.13	Pollux
23	358° 10.24	204°11.44 17.43	217° 10.10 35.80	169°48.52 24.65	319°51.77 13.08	Avior
	00.07	0.4/ 1.0.0/ 4.06	10/101/150	2.0/ 10.0/ 1.66		Suhail
IVIer.	pass. 23:07	ν-0.4' d-0.9' m-4.06	$\nu 1.0' \ d$ -0.4' m1.50	ν2.0′ d0.2′ m-1.66	ν2.6' d-0.1' m0.03	Miaplacidus
						Alphard Regulus
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe
0	$13^{\circ}12.70$	219°11.06 N11°16.52	232°11.06 N16°35.36	184°50.49 <b>S</b> 02°24.86	334°54.39 N12°13.02	Denebola
1	$28^{\circ}15.16$	234°10.68 15.60	247° 12.02 34.92	199°52.46 25.08	349°57.01 12.96	Gienah
2	43°17.63	249°10.30 14.69	262°12.99 34.48	214°54.42 25.29	4°59.63 12.91	Acrux
3	58° 20.09	264°9.93 · · 13.77	277° 13.95 · · 34.04	229°56.39 · · 25.50	20°2.25 · · 12.85	Gacrux
4	73°22.56	279°9.55 12.86	292°14.91 33.60	244°58.36 25.71	35°4.87 12.80	Alioth
5	88° 25.02	294°9.17 11.94	307°15.87 33.16	260° 0.32 25.92	50°7.50 12.74	Spica
6	103°27.48	309°8.79 N11°11.03	322°16.84 N16°32.72	275°2.29 S02°26.14	65°10.12 N12°12.68	Alkaid
7	118° 29.95	324°8.41 10.11	337°17.80 32.29	290° 4.25 26.35	80°12.74 12.63	Hadar
8	133° 32.41	339°8.04 9.19	352°18.76 31.85	305°6.22 26.56	95°15.36 12.57	Menkent
9	148° 34.88	354°7.66 · · 8.27	7°19.73 · · 31.41	320°8.19 · · 26.77	110°17.98 · · 12.52	Arcturus
10 11	163° 37.34 178° 39.80	9°7.28 7.35 24°6.91 6.43	22°20.69 30.97 37°21.65 30.53	335°10.15 26.99 350°12.12 27.20	125°20.60 12.46 140°23.22 12.40	Rigil Kent.
12	176 39.60 193°42.27	24°6.91 6.43 39°6.53 N11°5.51	52°22.62 N16°30.09	5°14.09 S02°27.41	155°25.85 N12°12.35	Kochab
13	208° 44.73	54°6.15 4.59	67°23.58 29.65	20°16.05 27.62	170°28.47 12.29	Zuben'ubi
14	223° 47.20	69°5.78 3.67	82°24.55 29.20	35°18.02 27.83	185°31.09 12.24	Alphecca
15	238° 49.66	84°5.40 · · 2.75	97°25.51 · · 28.76	50°19.99 · · 28.05	200°33.71 ·· 12.18	Antares
16	253°52.12	99°5.02 1.83	112°26.48 28.32	65°21.95 28.26	215°36.34 12.12	Atria
17	268° 54.59	114°4.65 0.90	127° 27.44 27.88	80°23.92 28.47	230°38.96 12.07	Sabik
18	283°57.05	129°4.27 N10°59.98	142°28.41 N16°27.44	95°25.88	245°41.58 N12°12.01	Shaula
19	298°59.52	144°3.89 10°59.05	157°29.37 27.00	110°27.85 28.89	260°44.20 11.95	Rasalhague Eltanin
20	$314^{\circ}1.98$	159°3.52 58.13	172°30.34 26.56	125°29.82 29.11	275°46.83 11.90	Kaus Aust.
21	329°4.44	174°3.14 · · 57.20	187°31.31 · · 26.12	140°31.78 · · 29.32	290°49.45 · · 11.84	Vega
22	344°6.91	189°2.77 56.28	202° 32.27 25.68	155°33.75 29.53	305°52.07 11.78	Nunki
23	359°9.37	204°2.39 55.35	217° 33.24 25.24	170°35.72 29.74	320°54.69 11.73	Altair
Meri	pass. 23:03	ν-0.4' d-0.9' m-4.06	$\nu 1.0' \ d$ -0.4' m1.49	ν2.0' d0.2' m-1.66	ν2.6' d-0.1' m0.02	Peacock
	Puss. 25.05					Deneb
						Enif
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir
0	14° 11.84	219°2.02 N10°54.42	232°34.21 N16°24.79	185°37.68	335°57.32 N12°11.67	Fomalhaut
1	29° 14.30	234°1.64 53.49	247°35.17 24.35	200°39.65 30.17	350°59.94 11.61	Scheat
2	44° 16.76 59° 19.23	249°1.26 52.56 264°0.89 •• 51.64	262°36.14 23.91 277°37.11 · · · 23.47	215°41.62 30.38 230°43.58 · · · 30.59	6°2.57 11.56 21°5.19 · · 11.50	Markab
3 4	59 19.23 74°21.69	279°0.51 50.71	292°38.08 23.03	245°45.55 30.80	36°7.81 11.44	Oct 03 Tue
5	89° 24.16	294°0.14 49.77	307°39.04 22.58	260°47.51 31.01	51°10.44 11.39	Venus
6	104° 26.62	308°59.76 N10°48.84	322°40.01 N16°22.14	275°49.48 \$02°31.23	66°13.06 N12°11.33	Mars
7	119° 29.08	323°59.39 47.91	337°40.98 21.70	290°51.45 31.44	81°15.68 11.27	Jupiter
8	134° 31.55	338°59.02 46.98	352°41.95 21.26	305°53.41 31.65	96°18.31 11.22	Saturn
9	149° 34.01	353°58.64 · · 46.05	7°42.92 · · 20.81	320°55.38 · · 31.86	111°20.93 · · 11.16	
10	164°36.48	8°58.27 45.11	22°43.89 20.37	335°57.35 32.07	126°23.56 11.10	Oct 04 Wed
11	179°38.94	23°57.89 44.18	37° 44.86 19.93	350°59.31 32.29	141°26.18 11.05	Venus
12	194°41.41	38°57.52 N10°43.24	52°45.83 N16°19.48	6°1.28 <b>S</b> 02°32.50	156°28.81 N12°10.99	Mars Jupiter
13	209°43.87	53°57.14 42.31	67°46.80 19.04	21° 3.25 32.71	171°31.43 10.93	Saturn
14	224°46.33	68°56.77 41.37	82°47.77 18.60	36°5.21 32.92	186°34.06 10.88	
15	239°48.80	83°56.40 · · 40.44	97° 48.74 · · 18.15	51°7.18 · · 33.13	201°36.68 · · 10.82	Oct 05 Thu
16	254°51.26	98°56.02 39.50	112°49.71 17.71	66° 9.14 33.35	216°39.30 10.76	Venus
17	269° 53.73	113°55.65 38.56	127° 50.68 17.27	81°11.11 33.56	231°41.93 10.71	Mars
18	284° 56.19	128°55.28 N10°37.62	142°51.65 N16°16.82	96°13.08	246°44.56 N12°10.65	Jupiter
19	299°58.65	143°54.90 36.68	157°52.62 16.38	111°15.04 33.98	261°47.18 10.59	Saturn
20 21	315°1.12 330°3.58	158° 54.53 35.74 173° 54.16 · · 34.80	172°53.59 15.94 187°54.56 •• 15.49	126°17.01 34.19 141°18.98 · · 34.40	276°49.81 10.53 291°52.43 · · 10.48	Horizon
21	345°6.05	188°53.78 33.86	202°55.54 15.05	156°20.94 34.62	306°55.06 10.42	
23	0°8.51	203°53.41 32.92	217°56.51 14.60	171°22.91 34.83	321°57.68 10.36	
			-			L
Mer. <sub>l</sub>	pass. 22:59	ν-0.4' d-0.9' m-4.06	$\nu 1.0' \ d$ -0.4' m1.49	ν2.0′ d0.2′ m-1.66	ν2.6' d-0.1' m0.02	

Stars SHA

 $357^{\circ}31.23$ 

349° 26 88

348°43.95

 $335^{\circ}17.47$ 

 $327^{\circ}47.41$ 

311°58.97

315°9.16

 $314^{\circ}\,2.70$ 

308°23.45

290°35.95

281°0.83

280°17.21

 $278^{\circ}19.51$ 

277°57.90

275°34.55

270°48.73

263°50.98

258°23.55 255°3.49

 $244^{\circ}47.73$ 

243°13.71

234°13.68

222°44.28

221°38.04

217°44.98

207°31.48

193°38.05

182°22.20

175°40.77

 $172^{\circ}57.24$ 

 $171^{\circ}48.72$ 

 $166^{\circ}10.98$ 

158°19.41

152°50.16

148°32.17

147°54.35

145°45.47

139°36.59

 $137^{\circ}21.06$ 

136°52.92

112°12 30

107°3.96

 $96^{\circ}6.37$ 

95°55.84

90°40.89

83°28.54

80°31.19

75°44.01

61°56.92

 $53^{\circ}0.81$ 

49°23.48

33°35.59

27°28.84

15°10.91

13°41.90

13°26.56

SHA

219°34.49

171°49.74

 $321^{\circ}37.96$ 

SHA

205°58.36

218°58.36

171°37.79

321°41.69

SHA

204°50.18

218°22.37

171°25.85

321°45.48

Venus: Mars

Horizontal parallax

207°6.61

101°59.44

 $126^{\circ}1.46$ 

353°3.80

Dec 29°15.19

-42°8.81

56°41 87

-17°49.52

 $-57^{\circ}5.25$ 

23°36.02

89°22.85

40°11.12

4°12.28

49°57.71

16°34.03

 $-8^{\circ}9.98$ 46°1.40

 $6^{\circ}22.57$ 

28°37.78

 $-1^{\circ}10.94$ 

 $7^{\circ}24.75$ -52°42.37

-16°45.20

-29°0.48

 $27^{\circ}57.24$ 

-59°35.86

-43°32.75

-69°49.90

-8°46.95

11°49.56

61°35.57

 $14^{\circ}24.68$ 

-17°42.05

-63°15.51

-57°16.44

55°48.22

-11°18.63

49°10.26 -60°30.75

-36°30.67

 $19^{\circ}2.07$ 

-60°57.32

 $74^{\circ}2.34$ 

-16°9.61

26°37.27

-26°29.69

-69°4.85

-15°45.51

-37°7.45

12°32.60

51°29.45

-34°22.20

38°48.98

-26°15.55

8°56.95

-56°38.56

45°23.37

 $10^{\circ}0.71$ 

-46°49.22

-29°28.03

28°14.63

15°21.88

Mer.pass

09:23

08:32

11:42

01:44

09:23

08:31

11:39

01:40

09:24

08:29

11:36

01:36

0.1

0.1

Mer.pass

Mer.pass

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°44.82	S04°5.00	11°32.38	16.4'	N05°30.77	12.5'	54.0'
1	197°45.02	5.96	26°7.80	16.4	05°43.29	12.5'	54.0'
2	212°45.21 227°45.41	6.93 • • 7.89	40°43.21 55°18.58	16.4' 16.4'	05°55.78 06°8.26	12.5' 12.5'	54.0' 54.0'
4	242°45.60	8.86	69°53.93	16.3'	06°20.71	12.4	54.0'
5	257°45.80	9.82	84°29.26	16.3'	$06^{\circ}33.14$	12.4'	54.0'
6	272°45.99	S04°10.79	99°4.55	16.3'	N06°45.55	12.4	54.0'
7 8	287°46.18 302°46.38	11.75 12.72	113°39.82 128°15.06	16.2' 16.2'	06°57.94 07°10.31	12.4' 12.3'	54.0' 54.0'
9	317°46.57	. 13.68	142°50.26	16.2'	07°22.65	12.3'	54.0'
10	332°46.77	14.64	157°25.44	16.1'	07°34.96	12.3'	54.0'
11	347°46.96	15.61	172°0.58	16.1'	07°47.25	12.3'	54.0'
12 13	2°47.16 17°47.35	S04°16.57 17.54	186°35.69 201°10.77	16.1' 16.0'	N07°59.51 08°11.74	12.2' 12.2'	54.0' 54.0'
14	32°47.54	18.50	201 10.77 215°45.81	16.0'	08°23.95	12.2'	54.0'
15	47°47.74	• • 19.46	230°20.81	16.0'	08°36.12	12.1'	54.0'
16	62°47.93	20.43	244°55.78	15.9'	08°48.27	12.1'	54.1'
17	77°48.12	21.39 \$04° 22.35	259°30.72	15.9'	09°0.38	12.1'	54.1'
18 19	92°48.32 107°48.51	23.32	274°5.61 288°40.47	15.9' 15.8'	N09°12.47 09°24.52	12.1' 12.0'	54.1' 54.1'
20	122°48.70	24.28	303°15.29	15.8'	09° 24.52	12.0'	54.1'
21	137°48.89	• • 25.24	317°50.06	15.7'	09°48.52	11.9'	54.1'
22	152°49.09	26.21	332°24.80	15.7'	10°0.47	11.9'	54.1'
23	167°49.28	27.17	346°59.50	15.7'	10°12.38	11.9'	54.1'
	SD = 16.0'	d = 1.0'		SE	0 = 14.7'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°49.47	S04°28.13	1°34.15	15.6'	N10°24.26	11.8'	54.1'
1	197°49.66	29.10	16°8.76	15.6'	10°36.10	11.8'	54.1'
2	212°49.85 227°50.05	30.06 •• 31.02	30°43.33 45°17.85	15.5' 15.5'	10°47.90 10°59.67	11.8' 11.7'	54.1' 54.1'
4	242°50.24	31.02	59°52.33	15.4'	10 39.07 11°11.39	11.7'	54.1'
5	257°50.43	32.95	74°26.76	15.4'	11°23.07	11.6'	54.1'
6	272°50.62	S04°33.91	89°1.14	15.3'	N11°34.71	11.6'	54.2'
7	287°50.81	34.87	103°35.48	15.3'	11°46.31	11.6'	54.2'
8 9	302°51.00 317°51.19	35.83 •• 36.80	118°9.77 132°44.01	15.2' 15.2'	11°57.87 12°9.38	11.5' 11.5'	54.2' 54.2'
10	332°51.38	37.76	147° 18.20	15.1'	12° 20.85	11.4	54.2'
11	347°51.57	38.72	161°52.34	15.1'	12°32.27	11.4'	54.2'
12	2°51.76	S04°39.68	176°26.43	15.0'	N12°43.65	11.3'	54.2'
13 14	17°51.95 32°52.14	40.64 41.60	191°0.47 205°34.45	15.0' 14.9'	12°54.98 13°6.26	11.3' 11.2'	54.2' 54.2'
15	47°52.33	42.57	220°8.38	14.9'	13°17.49	11.2'	54.2'
16	62°52.52	43.53	234°42.26	14.8'	$13^{\circ}28.67$	11.1'	54.2'
17	77°52.71	44.49	249°16.09	14.8'	13°39.80	11.1'	54.3'
18 19	92°52.90 107°53.09	\$04°45.45 46.41	263°49.86 278°23.57	14.7' 14.7'	N13°50.88 14°1.91	11.0' 11.0'	54.3' 54.3'
20	122°53.28	47.37	292°57.23	14.6'	14°12.88		
21	137°53.47	• • 48.33	307°30.84	14.5'	14°23.80	10.9'	54.3'
22	152°53.66	49.29	322°4.38	14.5'	14°34.67	10.8'	54.3'
23	167°53.84	50.25	336°37.87	14.4'	14°45.47	10.8'	54.3'
	SD = 16.0'	d = 1.0'		SL	0 = 14.8'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°54.03	S04°51.21	351°11.30	14.4'	N14°56.23	10.7'	54.3'
1 2	197°54.22 212°54.41	52.18 53.14	5°44.67 20°17.98	14.3' 14.2'	15°6.92 15°17.56	10.6' 10.6'	54.3' 54.4'
3	212 54.41 227°54.60	54.10	34°51.23	14.2'	15°28.13	10.5	54.4'
4	242°54.78	55.06	49°24.42	14.1'	15°38.65	10.5'	54.4'
5	257°54.97	56.02	63°57.54	14.1'	15°49.10	10.4	54.4'
6 7	272°55.16 287°55.35	\$04°56.98 57.94	78°30.61 93°3.61	14.0' 13.9'	N15°59.49 16°9.82	10.3' 10.3'	54.4' 54.4'
8	302°55.53	58.90	107°36.56	13.9'	16°20.09	10.3	54.4
9	317°55.72	04°59.86	122°9.43	13.8'	$16^{\circ}30.29$	10.1'	54.4'
10	332°55.91	05°0.82	136°42.25	13.7'	16°40.42	10.1'	54.4'
11 12	347°56.09 2°56.28	1.77 \$05°2.73	151°15.00 165°47.68	13.7' 13.6'	16°50.49 N17°0.49	10.0' 9.9'	54.5' 54.5'
13	2 50.26 17°56.46	3.69	180°20.30	13.6'	17° 10.49	9.9 9.9'	54.5'
14	32°56.65	4.65	194°52.86	13.5'	$17^{\circ}20.28$	9.8'	54.5'
15	47°56.84	5.61	209°25.34	13.4'	17°30.07	9.7'	54.5'
16	62°57.02 77°57.21	6.57 7.53	223°57.77 238°30.12	13.4' 13.3'	17°39.79 17°49.43	9.6'	54.5' 54.5'
17 18	92°57.39	7.53 S05°8.49	238°30.12 253°2.41	13.3'	17°49.43 N17°59.01	9.6' 9.5'	54.6'
19	107°57.58	9.45	267°34.63	13.2'	18°8.51	9.4	54.6'
20	122°57.76	10.41	282°6.78	13.1'	18°17.93	9.3'	54.6'
21	137°57.95	• • 11.36	296°38.86	13.0'	18°27.28	9.3'	54.6'
22 23	152°58.13 167°58.32	12.32 13.28	311°10.88 325°42.83	12.9' 12.9'	18°36.55 18°45.74	9.2' 9.1'	54.6' 54.6'
23	SD = 16.0'	d = 1.0'			0 = 14.8'	9.1	3 F.U
		<u> </u>	-		- 17.0		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%	
03	10:59	11:09	11:49	23:54	11:33		
04	11:18	11:27	11:49	-:-	12:15		
05	11:36	11:45	11:48	00:36	12:59		

# October 06, 07, 08 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri .	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	15° 10.97	218°53.04 N10°31.98	232°57.48 N16°14.16	186°24.88	337°0.31 N12°10.31	
1	30° 13.44	233°52.67 31.04	247°58.45 13.71	201°26.84 35.25	352°2.93 10.25	Alpheratz 357°31.23 29°15.20
2	45° 15.90	248°52.29 30.10	262°59.43 13.27	216°28.81 35.46	7°5.56 10.19	Ankaa 353°3.81 -42°8.82
3	60° 18.37	263°51.92 · · 29.15	278°0.40 · · 12.82	231°30.78 · · 35.67	22°8.19 · · 10.13	Schedar 349°26.87 56°41.88
4	75°20.83	278°51.55 28.21	293°1.37 12.38	246°32.74 35.89	37°10.81 10.08	Diphda 348°43.95 -17°49.53 Achernar 335°17.46 -57°5.26
5	90°23.29	293°51.18 27.26	308°2.35 11.93	261°34.71 36.10	52°13.44 10.02	Hamal 327°47.40 23°36.03
6	105°25.76	308°50.81 N10°26.32	323°3.32 N16°11.49	276°36.67 S02°36.31	67°16.07 N12°9.96	Polaris 311°57.75 89°22.86
7	120°28.22	323°50.43 25.37	338°4.29 11.04	291°38.64 36.52	82°18.69 9.90	Acamar 315°9.15 -40°11.13
8 9	135° 30.69 150° 33.15	338°50.06 24.42 353°49.69 •• 23.48	353°5.27 10.60 8°6.24 · · 10.15	306°40.61 36.73 321°42.57 · · 36.94	97°21.32 9.85 112°23.95 • 9.79	Menkar 314°2.69 4°12.28
10	165°35.61	8°49.32 22.53	23°7.22 9.71	336°44.54 37.16	127°26.57 9.73	Mirfak 308°23.43 49°57.71
11	180°38.08	23°48.95 21.58	38°8.19 9.26	351°46.51 37.37	142°29.20 9.67	Aldebaran 290°35.93 16°34.02
12	195°40.54	38°48.58 N10°20.63	53°9.17 N16°8.81	6°48.47 <b>S</b> 02°37.58	157°31.83 N12°9.62	Rigel 281°0.81 -8°9.99 Capella 280°17.18 46°1.40
13	210°43.01	53°48.20 19.68	68° 10.14 8.37	21°50.44 37.79	172°34.45 9.56	Bellatrix 278°19.49 6°22.57
14	225° 45.47	68°47.83 18.73	83°11.12 7.92	36°52.41 38.00	187°37.08 9.50	Elnath 277°57.88 28°37.78
15	240° 47.94	83°47.46 · · 17.78	98°12.10 · · 7.47	51°54.37 · · 38.21	202°39.71 · · 9.44 217°42.34 9.39	Alnilam 275°34.53 -1°10.95
16 17	255° 50.40 270° 52.86	98°47.09 16.83 113°46.72 15.88	113°13.07 7.03 128°14.05 6.58	66°56.34 38.43 81°58.31 38.64	217°42.34 9.39 232°44.96 9.33	Betelgeuse 270°48.71 7°24.75
18	285°55.33	128°46.35 N10°14.93	143°15.02 N16°6.13	97°0.27 \$02°38.85	247°47.59 N12°9.27	Canopus 263° 50.95 -52° 42.37
19	300° 57.79	143°45.98 13.97	158° 16.00 5.69	112°2.24 39.06	262°50.22 9.21	Sirius 258°23.53 -16°45.21
20	$316^{\circ}0.26$	158°45.61 13.02	173°16.98 5.24	127° 4.21 39.27	277°52.85 9.16	Adhara 255°3.47 -29°0.48 Procyon 244°47.71 5°9.05
21	331°2.72	173°45.24 · · 12.07	188° 17.96 • • 4.79	142°6.17 · · 39.48	292°55.47 · · 9.10	Procyon 244°47.71 5°9.05 Pollux 243°13.69 27°57.23
22	346°5.18	188°44.87 11.11	203° 18.93 4.35	157° 8.14 39.69	307°58.10 9.04	Avior 234°13.65 -59°35.85
23	1°7.65	203°44.50 10.16	218°19.91 3.90	172°10.11 39.91	323°0.73 8.98	Suhail 222°44.26 -43°32.74
Mer.	pass. 22:56	$\nu$ -0.4 $'$ d-0.9 $'$ m-4.05	$ u 1.0' \ d$ -0.4' m1.49	$\nu 2.0' \ d0.2' \ \text{m-}1.67$	$\nu 2.6' \ d\text{-}0.1' \ \text{m}0.02$	Miaplacidus 221°38.00 -69°49.90
						Alphard 217°44.96 -8°46.95
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.47 11°49.55
0	16° 10.11	218°44.13 N10°9.20	233°20.89 N16°3.45	187°12.07 <b>S</b> 02°40.12	338°3.36 N12°8.93	Dubhe 193°38.04 61°35.56
1	31° 12.58	233°43.76 8.25	248°21.87 3.00	202°14.04 40.33	353°5.99 8.87	Denebola 182°22.19 14°24.67
2	46° 15.04	248°43.39 7.29	263°22.85 2.56	217°16.01 40.54	8°8.62 8.81	Gienah 175°40.76 -17°42.05 Acrux 172°57.23 -63°15.49
3	61° 17.50	263°43.02 · · 6.33	278°23.82 · · 2.11	232°17.97 · · 40.75	23°11.25 · · 8.75	Gacrux 171°48.71 -57°16.43
4	76° 19.97	278° 42.65 5.37	293°24.80 1.66	247°19.94 40.96	38°13.87 8.69	Alioth 166°10.99 55°48.20
5	91°22.43	293°42.28 4.42	308°25.78 1.21	262°21.90 41.17	53°16.50 8.64	Spica 158°19.40 -11°18.63
6	106° 24.90 121° 27.36	308°41.91 N10°3.46	323°26.76 N16°0.77 338°27.74 16°0.32	277°23.87 S02°41.39 292°25.84 41.60	68°19.13 N12°8.58	Alkaid 152°50.17 49°10.24
7 8	136°29.83	323°41.54 2.50 338°41.17 1.54	338°27.74 16°0.32 353°28.72 15°59.87	292°25.84 41.60 307°27.80 41.81	83°21.76 8.52 98°24.39 8.46	Hadar 148°32.17 -60°30.73
9	151°32.29	353°40.81 10°0.58	8°29.70 · · 59.42	322°29.77 · · 42.02	113°27.02 · · 8.40	Menkent 147°54.36 -36°30.66
10	166°34.75	8°40.44 09°59.61	23°30.68 58.97	337°31.74 42.23	128°29.65 8.35	Arcturus 145°45.48 19°2.07 Rigil Kent. 139°36.60 -60°57.31
11	181°37.22	23°40.07 58.65	38°31.66 58.52	352°33.70 42.44	143°32.28 8.29	Rigil Kent. 139°36.60 -60°57.31 Kochab 137°21.10 74°2.33
12	196°39.68	38°39.70 N09°57.69	53°32.64 N15°58.07	7°35.67 <b>S</b> 02°42.65	158°34.91 N12°8.23	Zuben'ubi 136°52.93 -16°9.60
13	211° 42.15	53°39.33 56.73	68° 33.62 57.63	22°37.64 42.87	173°37.54 8.17	Alphecca 126°1.47 26°37.27
14	226° 44.61	68°38.96 55.76	83°34.60 57.18	37°39.60 43.08	188°40.17 8.11	Antares 112°12.31 -26°29.68
15 16	241° 47.07 256° 49.54	83°38.59 · · 54.80 98°38.23 53.83	98°35.59 · · 56.73 113°36.57 56.28	52°41.57 · · 43.29 67°43.54	203°42.80 · · 8.05 218°45.43 8.00	Atria 107°4.00 -69°4.84
17	271°52.00	113° 37.86 52.87	128° 37.55 55.83	82°45.50 43.71	233°48.06 7.94	Sabik 101°59.45 -15°45.50
18	286°54.47	128°37.49 N09°51.90	143°38.53 N15°55.38	97°47.47 <b>S</b> 02°43.92	248°50.69 N12°7.88	Shaula 96°6.39 -37°7.45
19	301°56.93	143°37.12 50.94	158°39.51 54.93	112°49.44 44.13	263°53.32 7.82	Rasalhague 95°55.86 12°32.60 Eltanin 90°40.92 51°29.45
20	$316^{\circ}59.39$	158°36.75 49.97	173°40.50 54.48	127°51.40 44.34	278°55.95 7.76	Eltanin 90°40.92 51°29.45 Kaus Aust. 83°28.56 -34°22.20
21	332°1.86	173°36.39 · · 49.00	188° 41.48 · · 54.03	142°53.37 · · 44.56	293°58.58 · · 7.70	Vega 80°31.21 38°48.98
22	347°4.32	188°36.02 48.03	203° 42.46 53.58	157°55.34 44.77	309°1.21 7.65	Nunki 75°44.02 -26°15.55
23	2°6.79	203°35.65 47.07	218° 43.44 53.13	172°57.30 44.98	324°3.84 7.59	Altair 61°56.93 8°56.95
Mer.	pass. 22:52	u-0.4 $'$ d-1.0 $'$ m-4.05	$ u 1.0' \; d$ -0.4' m $1.48$	$\nu 2.0' \ d0.2' \ \text{m-}1.67$	$ u 2.6' \ d  0.1' \ \text{m} 0.01$	Peacock 53°0.84 -56°38.57
						Deneb 49°23.50 45°23.38
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.60 10°0.71 Al Na'ir 27°28.86 -46°49.23
0	17° 9.25	218°35.29 N09°46.10	233°44.43 N15°52.68	187°59.27 \$02°45.19	339°6.47 N12°7.53	Al Na'ir 27°28.86 -46°49.23 Fomalhaut 15°10.91 -29°28.04
1	32° 11.72	233° 34.92 45.13	248°45.41 52.23	203°1.24 45.40	354°9.10 7.47	Scheat 13°41.91 28°14.63
2	47° 14.18	248°34.55 44.16	263°46.40 51.78	218° 3.20 45.61	9°11.73 7.41	Markab 13°26.57 15°21.88
3	62°16.64	263°34.18 · · 43.19	278°47.38 · · 51.33	233°5.17 · · 45.82	24°14.36 · · 7.35 39°16.99 7.30	
4	77° 19.11 92° 21.57	278°33.82 42.21 293°33.45 41.24	293°48.36 50.88	248° 7.14 46.03 263° 9.10 46.24		Oct 06 Fri SHA Mer.pass Venus 203° 42.06 09:25
5 6	92 21.57 107°24.04	293°33.45 41.24 308°33.08 N09°40.27	308°49.35 50.43 323°50.33 N15°49.98	263°9.10 46.24 278°11.07 \$02°46.46	54°19.62 7.24 69°22.26 N12°7.18	Mars 217°46.51 08:28
7	122°26.50	323°32.72 39.30	338°51.32 49.53	293°13.04 46.67	84°24.89 7.12	Jupiter 171°13.90 11:33
8	137°28.96	338°32.35 38.32	353°52.30 49.08	308°15.01 46.88	99°27.52 7.06	Saturn 321°49.33 01:32
9	152°31.43	353°31.99 · · 37.35	8°53.29 · · 48.62	323°16.97 · · 47.09	114°30.15 · · 7.00	Oct 07 Sat SHA Mer.pass
10	167°33.89	8°31.62 36.37	23°54.28 48.17	338°18.94 47.30	129°32.78 6.94	Venus 202°34.02 09:25
11	182°36.36	23°31.25 35.40	38°55.26 47.72	353°20.91 47.51	144°35.41 6.89	Mars 217°10.78 08:26
12 13	197° 38.82 212° 41.29	38°30.89 N09°34.42 53°30.52 33.45	53°56.25 N15°47.27 68°57.23 46.82	8°22.87 S02°47.72 23°24.84 47.93	159°38.05 N12°6.83 174°40.68 6.77	Jupiter 171°1.96 11:30
13 14	212 41.29 227°43.75	68°30.16 32.47	83°58.22 46.37	38°26.81 48.14	174 40.08 6.77 189°43.31 6.71	Saturn 321°53.25 01:28
15	242°46.21	83°29.79 · · 31.49	98°59.21 · · 45.92	53°28.77 · · 48.36	204°45.94 · · 6.65	Oct 08 Sun SHA Mer.pass
16	257° 48.68	98° 29.42 30.51	114°0.19 45.46	68°30.74 48.57	219°48.57 6.59	Venus 201°26.03 09:26
17	272°51.14	113°29.06 29.54	129°1.18 45.01	83°32.71 48.78	234°51.21 6.53	Mars 216°35.18 08:24
18	287°53.61	128°28.69 N09°28.56	144°2.17 N15°44.56	98°34.67 <b>S</b> 02°48.99	249°53.84 N12°6.47	Jupiter 170°50.02 11:27
19	302°56.07	143°28.33 27.58	159°3.16 44.11	113°36.64 49.20	264°56.47 6.41	Saturn 321°57.22 01:23
20	317°58.53 333°1.00	158°27.96 26.60 173°27.60 · · 25.62	174°4.15 43.66 189°5.13 · · 43.20	128°38.61 49.41 143°40.57 • 49.62	279°59.10 6.36 295°1.74 • 6.30	Horizontal parallax
21 22	333 1.00 348°3.46	173°27.60 · · 25.62 188°27.23 24.64	204°6.12 42.75	158°42.54 49.83	310°4.37 6.24	Venus: 0.1
23	3°5.93	203°26.87 23.65	219°7.11 42.30	173°44.51 50.04	325°7.00 6.18	Mars: 0.1
	pass. 22:48	ν-0.4' d-1.0' m-4.05	ν1.0′ d-0.5′ m1.48	ν2.0' d0.2' m-1.67	ν2.6' d-0.1' m0.01	
ivier.	pass. 22:40	ν-0.+ u-1.0 III-4.05	ν1.0 U-0.0 III1.40	ν Δ.υ	ν Δ.Ο U-U.1 IIIU.U1	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 58.50	S05°14.24	340°14.70	12.8'	N18°54.86	9.0'	54.6'
1	197°58.68	15.20	354°46.51	12.7'	$19^{\circ}3.89$	9.0'	54.7'
2	212°58.87	16.15	9°18.25	12.7'	19°12.84	8.9'	54.7'
3 4	227°59.05 242°59.23	· · 17.11 18.07	23°49.91 38°21.51	12.6' 12.5'	19°21.72 19°30.50	8.8' 8.7'	54.7' 54.7'
4 5	242 59.23 257°59.42	18.07	52°53.04	12.5'	19°30.50 19°39.21	8.6'	54.7'
6	272°59.60	S05°19.98	67°24.49	12.4'	N19°47.83	8.5'	54.7'
7	287°59.78	20.94	81°55.88	12.3'	19°56.36	8.4'	54.7'
8	302°59.97	21.90	$96^{\circ}27.19$	12.2'	$20^{\circ}4.81$	8.4'	54.8'
9	318°0.15	• • 22.86	110°58.44	12.2'	20°13.17	8.3'	54.8'
10 11	333°0.33 348°0.51	23.81 24.77	125°29.61 140°0.71	12.1' 12.0'	20°21.45 20°29.63	8.2' 8.1'	54.8' 54.8'
12	3°0.70	505°25.73	154° 31.74	12.0'	N20°37.72	8.0'	54.8
13	18°0.88	26.68	169°2.69	11.9'	20°45.72	7.9'	54.8'
14	33°1.06	27.64	183°33.58	11.8'	20°53.63	7.8'	54.9'
15	48°1.24	•• 28.59	198°4.39	11.7'	21°1.45	7.7'	54.9'
16	63°1.42	29.55	212°35.13	11.7'	21°9.17	7.6'	54.9'
17	78°1.60	30.51	227°5.80	11.6'	21°16.80	7.5'	54.9'
18 19	93°1.79 108°1.97	S05°31.46 32.42	241°36.40 256°6.93	11.5' 11.5'	N21°24.33 21°31.76	7.4' 7.3'	54.9' 54.9'
20	108° 1.97 123° 2.15	32.42 33.37	256° 6.93 270° 37.38	11.5	21°31.76 21°39.10	7.3	54.9° 55.0'
21	138°2.33	• • 34.33	285° 7.76	11.3'	21°46.34	7.1	55.0'
22	153°2.51	35.29	299°38.07	11.2'	21°53.47	7.0'	55.0'
23	168°2.69	36.24	314°8.31	11.2'	22°0.51	6.9'	55.0'
	SD = 16.0'	d = 1.0'		SD	= 14.9'		
				JD	- 17.3		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°2.87	S05°37.20	328°38.48	11.1'	N22°7.45	6.8'	55.0'
1	198°3.05	38.15	343°8.58	11.0'	22°14.28	6.7'	55.0'
2	213°3.23	39.11	357°38.61	11.0'	22°21.01	6.6'	55.1'
3 4	228°3.41 243°3.59	· · 40.06 41.02	12°8.56 26°38.45	10.9' 10.8'	22°27.63 22°34.15	6.5' 6.4'	55.1' 55.1'
4 5	243 3.59 258°3.76	41.02	20 38.45 41°8.26	10.8	22 34.15 22°40.57	6.3	55.1'
6	273°3.94	\$05°42.93	55°38.01	10.7	N22°46.87	6.2	55.1'
7	288°4.12	43.88	70°7.69	10.6'	22°53.07	6.1	55.2'
8	303°4.30	44.83	84°37.29	10.5'	22°59.16	6.0'	55.2'
9	318°4.48	• • 45.79	99°6.83	10.5'	23°5.14	5.9'	55.2'
10	333°4.66	46.74	113°36.30	10.4'	23°11.01	5.8'	55.2'
11	348°4.83	47.70	128° 5.70	10.3'	23°16.77	5.6'	55.2'
12 13	3°5.01 18°5.19	\$05°48.65 49.60	142°35.03 157°4.29	10.3' 10.2'	N23°22.41 23°27.94	5.5' 5.4'	55.2' 55.3'
14	33°5.37	50.56	157 4.29 171°33.49	10.2	23°33.36	5.4	55.3'
15	48°5.54	• • 51.51	186°2.62	10.1	23°38.66	5.2'	55.3'
16	63°5.72	52.46	200°31.69	10.0'	23°43.85	5.1'	55.3'
17	78°5.90	53.42	$215^{\circ}0.69$	9.9'	23°48.92	5.0'	55.3'
18	93°6.07	S05°54.37	229°29.62	9.9'	N23°53.87	4.8'	55.4'
19	108°6.25	55.32	243°58.49	9.8'	23°58.71	4.7'	55.4'
20 21	123°6.43 138°6.60	56.27 •• 57.23	258°27.30 272°56.04	9.7' 9.7'	24°3.42 24°8.01	4.6' 4.5'	55.4' 55.4'
22	150 0.00 153°6.78	58.18	272 50.04 287°24.72	9.7 9.6'	24 0.01 24°12.49	4.5 4.4'	55.5'
23	168° 6.95	59.13	301°53.33	9.6'	24°16.84	4.2'	55.5'
	SD = 16.0'	d = 1.0'			= 15.0'		
	<u> </u>	<u>u — 1.0</u>		JD	13.0		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°7.13	S06°0.08	316°21.89	9.5'	N24°21.07	4.1'	55.5'
1	198°7.30	1.04	330°50.38	9.4'	24°25.17	4.0'	55.5'
2	213°7.48 228°7.65	1.99 •• 2.94	345°18.82 359°47.19	9.4' 9.3'	24°29.16 24°33.01	3.9' 3.7'	55.5' 55.6'
3 4	243°7.83	3.89	359°47.19 14°15.51	9.3'	24°33.01 24°36.74	3.6'	55.6'
5	258°8.00	4.84	28°43.77	9.3 9.2'	24° 40.35	3.5'	55.6'
6	273°8.18	S06° 5.79	43°11.97	9.1'	N24°43.83	3.4'	55.6'
7	288°8.35	6.75	57°40.11	9.1'	24°47.18	3.2'	55.7'
8	303°8.52	7.70	72°8.20	9.0'	24°50.40	3.1'	55.7'
9	318°8.70	• • 8.65	86°36.24	9.0'	24°53.49	3.0'	55.7'
10	333°8.87	9.60	101°4.22	8.9'	24°56.45	2.8'	55.7'
11 12	348° 9.05 3° 9.22	10.55 \$06°11.50	115°32.14 130°0.02	8.9' 8.8'	24°59.29 N25°1.99	2.7' 2.6'	55.7' 55.8'
13	18° 9.39	12.45	130° 0.02 144° 27.84	8.8'	N25° 1.99 25° 4.56	2.6	55.8'
14	33° 9.56	13.40	158°55.62	8.7'	25° 6.99	2.4	55.8'
15	48°9.74	• • 14.35	173°23.34	8.7'	25° 9.30	2.2'	55.8'
16	63°9.91	15.30	187°51.02	8.6'	$25^{\circ}11.47$	2.0'	55.9'
17	78° 10.08	16.25	202°18.64	8.6'	25°13.50	1.9'	55.9'
18	93°10.25	S06°17.20	216°46.23	8.5'	N25°15.40	1.8'	55.9'
19	108° 10.42	18.15	231°13.76	8.5'	25°17.17	1.6'	55.9'
20 21	123°10.60 138°10.77	19.10 •• 20.05	245°41.25 260°8.70	8.4' 8.4'	25°18.80 25°20.29	1.5' 1.4'	56.0' 56.0'
22	138° 10.77 153° 10.94	21.00	260°8.70 274°36.11	8.4' 8.4'	25°20.29 25°21.64	1.4	56.0'
23	168° 11.11	21.95	289°3.47	8.3'	25°22.86	1.1'	56.0'
	SD = 16.0'	d = 1.0'			= 15.1'		
	2D = 10.0,	$u = 1.0^{\circ}$		20	_ 15.1		

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

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

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
Duy	00 <sup>h</sup>	00 <sup>h</sup> 12 <sup>h</sup>		Upper	Lower	18-20		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-83%		
06	11:54	12:03	11:48	01:22	13:45			
07	12:11	12:20	11:48	02:10	14:35			
08	12.20	12.37	11.47	03:01	15.27			

# October 09, 10, 11 UT (Mon., Tue., Wed.)

h	Aries	Vei	nus	М	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	18°8.39	218°26.50	N09°22.67	234°8.10	N15°41.84	188°46.47	S02°50.25	340°9.64	N12°6.12			
1	33° 10.86	233°26.14	21.69	249°9.09	41.39	203°48.44	50.46	355°12.27	6.06	Alpheratz	357°31.23	29°15.21
2	48° 13.32	248°25.78	20.71	264° 10.08	40.94	218°50.41	50.67	10°14.90	6.00	Ankaa	353°3.80	-42°8.83
3	63° 15.78	263°25.41	• • 19.72	279°11.07	• • 40.49	233°52.38	• • 50.89	25°17.54	• • 5.94	Schedar	349°26.86	56°41.90
4	$78^{\circ}18.25$	278°25.05	18.74	294°12.06	40.03	248°54.34	51.10	40°20.17	5.88	Diphda	348°43.94	-17°49.53 -57°5.28
5	93°20.71	293°24.68	17.75	$309^{\circ}13.05$	39.58	263°56.31	51.31	55°22.80	5.82	Achernar Hamal	335°17.45 327°47.39	-57 5.28 23°36.03
6	108°23.18	308°24.32	N09°16.77	324°14.04	N15°39.13	278°58.28	S02°51.52	70°25.44	N12°5.77	Polaris	311°56.47	89°22.88
7	123°25.64	323°23.96	15.78	339° 15.03	38.67	294° 0.24	51.73	85°28.07	5.71	Acamar	315°9.14	-40°11.14
8	138°28.10	338°23.59	14.80	354°16.02	38.22	309°2.21	51.94	100°30.70	5.65	Menkar	314°2.67	4°12.28
9	153°30.57	353°23.23	• • 13.81	9°17.01	• • 37.77	324° 4.18	• • 52.15	115°33.34	• • 5.59	Mirfak	308°23.40	49°57.72
10 11	168°33.03 183°35.50	8°22.86 23°22.50	12.82 11.83	24° 18.00 39° 18.99	37.31 36.86	339°6.14 354°8.11	52.36 52.57	130°35.97 145°38.61	5.53 5.47	Aldebaran	290°35.90	$16^{\circ}34.02$
12	198° 37.96	38°22.14	N09°10.84	54° 19.99	N15°36.40	9°10.08	502°52.78	160°41.24	N12° 5.41	Rigel	281°0.78	-8°9.99
13	213° 40.43	53°21.77	9.86	69°20.98	35.95	24°12.05	52.99	175°43.87	5.35	Capella	280°17.15	46°1.40
14	228° 42.89	68°21.41	8.87	84°21.97	35.50	39°14.01	53.20	190°46.51	5.29	Bellatrix	278°19.47	6°22.57
15	243°45.35	83°21.05	· · 7.88	99°22.96	• • 35.04	54°15.98	• • 53.41	205°49.14	• • 5.23	Elnath Alnilam	277°57.85	28°37.78 -1°10.95
16	258° 47.82	98°20.69	6.88	114°23.95	34.59	69°17.95	53.62	220°51.78	5.17	Betelgeuse	275°34.51 270°48.68	-1 10.95 7°24.75
17	273°50.28	113°20.32	5.89	129°24.95	34.13	84°19.91	53.84	235°54.41	5.11	Canopus	263°50.92	-52°42.38
18	288° 52.75	128° 19.96	N09°4.90	144°25.94	N15°33.68	99°21.88	S02°54.05	250°57.05	N12°5.05	Sirius	258°23.50	-16°45.21
19	303°55.21	143°19.60	3.91	159°26.93	33.22	114°23.85	54.26	265°59.68	4.99	Adhara	255°3.44	-29°0.48
20	318°57.67	158° 19.23	2.92	174°27.93	32.77	129°25.81	54.47	281°2.32	4.94	Procyon	244°47.69	5°9.05
21	334°0.14	173° 18.87	1.92	189°28.92 204°29.92	• • 32.31	144°27.78	• • 54.68	296°4.95	4.88	Pollux	243°13.66	27°57.23
22 23	349°2.60 4°5.07	188° 18.51 203° 18.15	09°0.93 08°59.94	204 29.92 219°30.91	31.86 31.40	159°29.75 174°31.72	54.89 55.10	311°7.59 326°10.22	4.82 4.76	Avior	$234^{\circ}13.61$	-59°35.85
										Suhail	222°44.23	-43°32.74
Mer.p	ass. 22:44	$\nu$ -0.4' d-1	.0′ m-4.04	$\nu 1.0' \ d-0$	0.5′ m1.47	$\nu$ 2.0′ d0.3	2′ m-1.67	$\nu$ 2.6′ d-0.	1′ m0.00	Miaplacidus	221°37.95	-69°49.89
										Alphard	217°44.94	-8°46.96
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.45 193°38.01	11°49.54 61°35.54
0	19°7.53	218° 17.79	N08°58.94	234°31.90	N15°30.95	189°33.68	S02°55.31	341°12.86	$N12^{\circ}4.70$	Dubhe Denebola	193 38.01 182°22.18	14°24.66
1	$34^{\circ}10.00$	233°17.42	57.95	249°32.90	30.49	204°35.65	55.52	356°15.49	4.64	Gienah	175°40.75	-17°42.05
2	49° 12.46	248° 17.06	56.95	264°33.89	30.04	219°37.62	55.73	11°18.13	4.58	Acrux	172°57.21	-63°15.48
3	64° 14.92	263°16.70	• • 55.95	279°34.89	• • 29.58	234°39.58	• • 55.94	26°20.76	• • 4.52	Gacrux	171°48.70	-57°16.42
4	79° 17.39	278°16.34	54.96	294°35.88	29.12	249°41.55	56.15	41°23.40	4.46	Alioth	166°10.98	55°48.18
5	94° 19.85	293°15.98	53.96	309°36.88	28.67	264°43.52	56.36	56°26.04	4.40	Spica	$158^{\circ}19.40$	-11°18.63
6	109°22.32	308° 15.61 323° 15.25	N08°52.96	324°37.88	N15°28.21	279°45.49 294°47.45	S02°56.57	71°28.67	N12°4.34	Alkaid	152°50.17	49°10.23
7 8	124°24.78 139°27.24	323 15.25 338° 14.89	51.96 50.96	339°38.87 354°39.87	27.76 27.30	309°49.42	56.78 56.99	86°31.31 101°33.94	4.28 4.22	Hadar	148°32.17	-60°30.72
9	159°27.24 154°29.71	353° 14.53	• • 49.96	9°40.86	. 26.84	324°51.39	• 57.20	116°36.58	• • 4.16	Menkent	147°54.35	-36°30.66
10	169°32.17	8° 14.17	48.96	24°41.86	26.39	339°53.36	57.41	131°39.22	4.10	Arcturus	145°45.48	19°2.06
11	184°34.64	23° 13.81	47.96	39° 42.86	25.93	354°55.32	57.62	146°41.85	4.04	Rigil Kent. Kochab	139°36.60 137°21.14	-60°57.29 74°2.31
12	199°37.10	38° 13.45	N08°46.96	54°43.86	N15°25.48	9°57.29	S02°57.83	161°44.49	N12°3.98	Zuben'ubi	137 21.14 136°52.93	-16°9.60
13	$214^{\circ}39.57$	53°13.09	45.96	69°44.85	25.02	24°59.26	58.04	176°47.13	3.92	Alphecca	126° 1.48	26°37.26
14	229°42.03	68°12.73	44.96	84°45.85	24.56	40° 1.22	58.25	191°49.76	3.86	Antares	112° 12.31	-26°29.68
15	244° 44.49	83°12.37	• • 43.96	99° 46.85	• • 24.11	55°3.19	• • 58.46	206°52.40	• • 3.80	Atria	107° 4.02	-69°4.83
16	259°46.96	98°12.01	42.95	114° 47.85	23.65	70°5.16	58.67	221°55.04	3.74	Sabik	101°59.46	-15°45.50
17 18	274° 49.42 289° 51.89	113°11.65	41.95 N08°40.95	129°48.85 144°49.84	23.19 N15°22.73	85°7.13 100°9.09	58.88	236°57.67 252°0.31	3.68	Shaula	96°6.40	-37°7.44
19	304°54.35	128° 11.28 143° 10.92	39.94	159° 50.84	22.28	100 9.09 115°11.06	\$02°59.10 59.31	267°2.95	N12° 3.62 3.56	Rasalhague	95°55.86	12°32.60
20	319° 56.81	158° 10.56	38.94	174°51.84	21.82	130°13.03	59.52	282°5.58	3.50	Eltanin	90°40.94	51°29.45
21	334°59.28	173° 10.20	37.93	189°52.84	. 21.36	145°15.00	• • 59.73	297°8.22	• • 3.44	Kaus Aust.		-34°22.20
22	350°1.74	188°9.84	36.92	204°53.84	20.91	160°16.96	02°59.94	312°10.86	3.38	Vega	80°31.22	38°48.98 -26°15.55
23	5°4.21	203°9.48	35.92	219°54.84	20.45	175°18.93	$03^{\circ}0.15$	327°13.49	3.32	Nunki Altair	61°56.94	-20 15.55 8°56.95
Morr	pass. 22:40	0 4' d 1	.0′ m-4.04	··1 0/ d 0	0.5' m1.47		2′ m-1.67	$\nu 2.6' \ d-0.$	1′ m 0 00	Peacock		-56°38.57
ivier.p	Dass. 22.40	ν-0.4 u-1	.0 111-4.04	$\nu_{1.0}$ $u_{-0}$	7.5 1111.47	ν2.0 do	2 111-1.07	ν2.0 <b>u</b> -0.	1 111-0.00	Deneb	49°23.52	45°23.38
										Enif	33°35.60	10°0.71
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.87	-46°49.24
0	20°6.67		N08°34.91	234°55.84	N15°19.99	190°20.90	S03°0.36	342°16.13	N12°3.26	Fomalhaut	$15^{\circ}10.92$	-29°28.04
1	35°9.14	233°8.77	33.90	249°56.84	19.53	205°22.87	0.57	357°18.77	3.20	Scheat	13°41.91	28°14.64
2 3	50° 11.60 65° 14.06	248°8.41 263°8.05	32.90 •• 31.89	264°57.84 279°58.84	19.07 •• 18.62	220°24.83 235°26.80	0.78 • • 0.99	12°21.41 27°24.05	3.14 · · 3.08	Markab	13°26.57	15°21.89
4	80° 16.53	278°7.69	30.88	294°59.84	18.16	250°28.77	1.20	42°26.68	3.02	Oct 09 Mon	SHA	Mer.pass
5	95° 18.99	293°7.33	29.87	310°0.84	17.70	265°30.74	1.41	57°29.32	2.96	1	200°18.11	09:26
6	110°21.46		N08°28.86		N15°17.24	280°32.70	S03°1.62	72°31.96	N12°2.90	I	215°59.71	08:23
7	125°23.92	323°6.61	27.85	340°2.85	16.78	295°34.67	1.83	87°34.60	2.84	Jupiter	170°38.08	11:23
8	140°26.38	338°6.25	26.84	355°3.85	16.32	310°36.64	2.04	102°37.24	2.78	Saturn	322°1.25	01:19
9	155°28.85	353°5.89	• • 25.83	10°4.85	•• 15.87	325°38.61	• • 2.25	117°39.87	• • 2.72	Oct 10 Tue	SHA	Mer.pass
10	170°31.31	8°5.53	24.81	25°5.85	15.41	340°40.57	2.46	132°42.51	2.66	I	199°10.25	09:27
11	185°33.78	23°5.17	23.80	40°6.85	14.95	355°42.54	2.67	147°45.15	2.60	I	215°24.37	08:21
12 13	200°36.24 215°38.70	38°4.82 53°4.46	N08°22.79 21.77	55°7.86 70°8.86	N15°14.49 14.03	10°44.51 25°46.48	\$03°2.88 3.09	162°47.79 177°50.43	N12°2.54 2.48	1	170°26.15	11:20
13 14	215° 38.70 230° 41.17	53°4.46 68°4.10	21.77	70°8.86 85°9.86	14.03 13.57	25°46.48 40°48.44	3.09 3.30	177°50.43 192°53.07	2.48	Saturn	322°5.33	01:15
15	245°43.63	83°3.74	19.75	100° 10.87	13.11	55°50.41	. 3.51	207°55.70	. 2.42	Oct 11 Wed	SHA	Mer.pass
16	260°46.10	98°3.38	18.73	115° 11.87	12.65	70°52.38	3.72	222°58.34	2.30	Venus	3HA 198° 2.45	09:28
17	275°48.56	113°3.03	17.72	130° 12.87	12.19	85°54.35	3.93	238°0.98	2.24		214°49.17	08:20
18	290°51.03	128°2.67	N08°16.70	145° 13.88	N15°11.73	100°56.31	S03°4.14	253°3.62	$N12^{\circ}2.18$	I	170°14.23	11:17
19	305°53.49	143°2.31	15.68	160°14.88	11.28	115°58.28	4.35	268°6.26	2.12	Saturn	322°9.46	01:11
20	320°55.95	158°1.95	14.67	175° 15.89	10.82	131° 0.25	4.55	283°8.90	2.06	Hariza	ıtal parallax	
21	335°58.42	173°1.59 188°1.24	13.65	190°16.89	10.36	146°2.22 161°4.18	· · 4.76	298°11.54	1.04	HOFIZOR	Venus:	0.1
22 23	351°0.88 6°3.35	188° 1.24 203° 0.88	12.63 11.61	205°17.90 220°18.90	9.90 9.44	161°4.18 176°6.15	4.97 5.18	313°14.18 328°16.82	1.94 1.87		Mars:	0.1
ivier.p	bass. 22:36	$\nu$ -0.4 $a$ -1	.0′ m-4.04	$\nu$ 1.0 $a$ -0	1.5'  m 1.47	ν∠.υ αυ	2′ m-1.67	$\nu$ 2.6′ d-0.	T 111-0.01			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183° 11.28	S06°22.90	303°30.80	8.3'	N25°23.94	0.9'	56.1'
1 2	198° 11.45 213° 11.62	23.84 24.79	317°58.08 332°25.33	8.2' 8.2'	25°24.88 25°25.68	0.8' 0.7'	56.1' 56.1'
3	228° 11.79	25.74	346°52.54	8.2'	25°26.34	0.5'	56.1
4	243°11.96	26.69	1°19.72	8.1'	25°26.86	0.4'	56.2'
5	258° 12.13 273° 12.30	27.64 \$06°28.59	15°46.86 30°13.96	8.1' 8.1'	25°27.24 N25°27.48	0.2'	56.2' 56.2'
6 7	273 12.30 288°12.47	29.53	30 13.96 44°41.04	8.1	N25 27.48 25°27.58	-0.0'	56.2'
8	303°12.64	30.48	59°8.08	8.0'	25°27.54	-0.2'	56.3
9	318° 12.81	• • 31.43	73°35.09	8.0'	25°27.35	-0.3'	56.3'
10 11	333° 12.97 348° 13.14	32.38 33.32	88°2.07 102°29.03	8.0' 7.9'	25°27.02 25°26.55	-0.5' -0.6'	56.3' 56.4'
12	3°13.31	S06°34.27	116°55.96	7.9'	N25°25.94	-0.8	56.4
13	18° 13.48	35.22	131°22.86	7.9'	25°25.18	-0.9'	56.4'
14 15	33° 13.65 48° 13.81	36.17 · · · 37.11	145°49.74 160°16.60	7.9' 7.8'	25°24.28 25°23.24	-1.0' -1.2'	56.4' 56.5'
16	63° 13.98	38.06	174°43.43	7.8'	25°22.05	-1.2	56.5
17	78° 14.15	39.01	189°10.25	7.8'	$25^{\circ}20.71$	-1.5'	56.5'
18	93°14.32	S06°39.95	203°37.04 218°3.82	7.8'	N25°19.24	-1.6'	56.5'
19 20	108° 14.48 123° 14.65	40.90 41.84	218° 3.82 232° 30.58	7.8' 7.7'	25°17.61 25°15.85	-1.8' -1.9'	56.6' 56.6'
21	138° 14.81	42.79	246°57.32	7.7'	25°13.93	-2.1'	56.6'
22	153° 14.98	43.73	261°24.05	7.7'	25°11.88	-2.2'	56.7'
23	168° 15.15	44.68	275°50.76	7.7'	25°9.67	-2.3'	56.7'
	SD = 16.0'	d = 0.9'		SI	O = 15.3'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183° 15.31	S06°45.63	290°17.46	7.7'	N25°7.32	-2.5'	56.7'
1 2	198° 15.48 213° 15.64	46.57 47.52	304°44.16 319°10.84	7.7' 7.7'	25°4.83 25°2.19	-2.6' -2.8'	56.7' 56.8'
3	228° 15.81	• 48.46	333°37.51	7.7'	24°59.40	-2.9'	56.8
4	243°15.97	49.41	$348^{\circ}4.17$	7.7'	24°56.47	-3.1'	56.8'
5	258° 16.14 273° 16.30	50.35 \$06°51.29	2°30.83 16°57.48	7.7'	24°53.40 N24°50.17	-3.2'	56.9'
6 7	273 16.30 288°16.47	52.24	31°24.13	7.6' 7.6'	24° 46.80	-3.4' -3.5'	56.9' 56.9'
8	303° 16.63	53.18	45°50.78	7.6'	24°43.29	-3.7'	57.0'
9	318° 16.79	• • 54.13	60°17.42	7.6'	24°39.63	-3.8'	57.0'
10 11	333° 16.96 348° 17.12	55.07 56.01	74°44.06 89°10.70	7.6' 7.6'	24°35.83 24°31.88	-4.0' -4.1'	57.0' 57.0'
12	3° 17.28	S06°56.96	103°37.35	7.6'	N24°27.78	-4.2'	57.1
13	18° 17.45	57.90	118°3.99	7.6'	24°23.54	-4.4'	57.1'
14 15	33° 17.61 48° 17.77	58.84 06°59.79	132°30.64 146°57.30	7.7' 7.7'	24°19.15 24°14.62	-4.5' -4.7'	57.1' 57.2'
16	63° 17.93	00° 39.79	161°23.96	7.7'	24° 9.95	-4.8'	57.2'
17	78° 18.10	1.67	175°50.62	7.7'	24°5.13	-5.0'	57.2'
18 19	93° 18.26 108° 18.42	\$07°2.62 3.56	190°17.29 204°43.98	7.7' 7.7'	N24°0.17 23°55.06	-5.1' -5.3'	57.3' 57.3'
20	123° 18.58	4.50	219°10.67		23°49.81		57.3
21	138° 18.74	• • 5.44	233°37.37	7.7'	23°44.41	-5.5'	57.4'
22 23	153° 18.90 168° 19.06	6.38 7.33	248° 4.08 262° 30.81	7.7' 7.7'	23°38.88 23°33.20	-5.7' -5.8'	57.4' 57.4'
23	SD = 16.0'	d = 0.9'	202 30.01		0 = 15.5'	-3.0	37.4
	3D = 10.0	<u>u = 0.9</u>		- 31	7 = 15.5		
Wed	<b>GHA</b> 183° 19.22	<b>Dec</b> \$07°8.27	<b>GHA</b> 276°57.55	ν 7.8'	Dec N23°27.37	d -6.0'	<b>HP</b> 57.4'
0 1	198° 19.38	9.21	270 57.55 291°24.30	7.8'	23°21.41	-6.1'	57.5'
2	213° 19.54	10.15	$305^{\circ}51.07$	7.8'	$23^{\circ}15.30$	-6.2'	57.5'
3	228° 19.70	• • 11.09	320°17.85	7.8'	23°9.06	-6.4' -6.5'	57.5'
4 5	243° 19.86 258° 20.02	12.03 12.97	334°44.65 349°11.47	7.8' 7.8'	23°2.67 22°56.14	-6.5' -6.7'	57.6' 57.6'
6	273°20.18	S07°13.91	3°38.30	7.9'	N22°49.47	-6.8'	57.6'
7	288°20.34 303°20.50	14.85 15.79	18° 5.16 32° 32.03	7.9' 7.9'	22°42.66 22°35.72	-6.9'	57.7' 57.7'
8 9	303°20.50 318°20.66	15.79	32°32.03 46°58.93	7.9° 7.9°	22°35.72 22°28.63	-7.1' -7.2'	57.7'
10	333° 20.82	17.67	61°25.84	7.9'	22°21.41	-7.4'	57.8'
11	348° 20.97	18.61	75°52.78	8.0'	22°14.05	-7.5'	57.8'
12 13	3°21.13 18°21.29	S07°19.55 20.49	90°19.74 104°46.72	8.0' 8.0'	N22°6.55 21°58.92	-7.6' -7.8'	57.8' 57.9'
14	33°21.45	21.43	119°13.73	8.0'	21°51.14	-7.9'	57.9'
15	48°21.60	• • 22.37	133°40.76	8.1'	21°43.24	-8.0'	57.9'
16 17	63°21.76 78°21.92	23.31 24.25	148°7.82 162°34.90	8.1' 8.1'	21°35.20 21°27.03	-8.2' -8.3'	58.0' 58.0'
18	78°21.92 93°22.07	24.25 \$07°25.19	162°34.90 177°2.00	8.1'	N21°18.72	-8.4'	58.0'
19	108°22.23	26.12	191°29.14	8.2'	21°10.28	-8.6'	58.1'
20 21	123°22.39 138°22.54	27.06 •• 28.00	205°56.30 220°23.49	8.2' 8.2'	21°1.71 20°53.00	-8.7' -8.8'	58.1' 58.1'
21	138°22.54 153°22.70	28.00	220°23.49 234°50.70	8.2'	20°53.00 20°44.17	-8.8° -9.0'	58.1° 58.2'
23	168°22.85	29.88	249°17.95	8.3'	20°35.21	-9.1'	58.2'
	SD = 16.0'	d = 0.9'		SI	D = 15.7'		

Naut.         Civil         Similar         Civil         Naut.           N 72°         04:35         05:54         07:02         16:29         17:38         18:56           N 70°         04:41         05:52         06:54         16:38         17:40         18:50           68°         04:46         05:51         06:47         16:45         17:41         18:45           66°         04:50         05:49         06:41         16:51         17:43         18:42           64°         04:53         05:48         06:36         16:56         17:44         18:39           60°         04:56         05:47         06:32         17:00         17:45         18:36           60°         04:58         05:46         06:22         17:04         17:46         18:34           N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           55°         05:04         05:43         06:17         17:16	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70°         04:41         05:52         06:54         16:38         17:40         18:50           68°         04:46         05:51         06:47         16:45         17:41         18:45           66°         04:50         05:49         06:41         16:51         17:43         18:42           64°         04:53         05:48         06:36         16:56         17:44         18:39           60°         04:56         05:47         06:32         17:00         17:45         18:36           60°         04:58         05:46         06:28         17:04         17:46         18:34           N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:07         05:39	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68°         04:46         05:51         06:47         16:45         17:41         18:45           66°         04:50         05:49         06:41         16:51         17:43         18:42           64°         04:53         05:48         06:36         16:56         17:44         18:39           60°         04:56         05:47         06:32         17:00         17:45         18:36           60°         04:58         05:46         06:28         17:04         17:46         18:34           N 58°         05:00         05:45         06:22         17:11         17:48         18:34           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:35	N 72°	04:35	05:54	07:02	16:29	17:38	18:56
66°         04:50         05:49         06:41         16:51         17:43         18:42           64°         04:53         05:48         06:36         16:56         17:44         18:39           62°         04:56         05:47         06:32         17:00         17:45         18:36           60°         04:58         05:46         06:28         17:04         17:46         18:34           N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           30°         05:07         05:37	N 70°	04:41	05:52	06:54	16:38	17:40	18:50
64° 04:53 05:48 06:36 16:56 17:44 18:39 62° 04:56 05:47 06:32 17:00 17:45 18:36 60° 04:58 05:46 06:28 17:04 17:46 18:34 N 58° 05:00 05:45 06:25 17:08 17:47 18:32 56° 05:02 05:45 06:22 17:11 17:48 18:31 54° 05:03 05:44 06:19 17:13 17:49 18:30 52° 05:04 05:43 06:17 17:16 17:50 18:29 50° 05:05 05:42 06:15 17:18 17:51 18:28 45° 05:06 05:40 06:10 17:23 17:53 18:27 N 40° 05:07 05:37 06:02 17:31 17:56 18:26 35° 05:07 05:37 06:02 17:34 17:56 18:26 20° 05:06 05:43 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° 04:54 05:11 05:33 18:01 18:23 18:49 30° 04:34 05:03 05:27 18:07 18:01 18:23 18:49 30° 04:34 05:03 05:27 18:07 18:11 18:35 S 50° 04:28 04:58 05:24 18:11 18:36 19:07 40° 04:19 04:52 05:19 18:15 18:43 19:15 45° 04:09 04:45 05:15 18:26 18:26 18:26 18:50 19:26 S 50° 03:35 04:36 05:09 18:26 18:50 19:26 S 50° 03:35 04:31 05:63 18:29 19:04 19:47 54° 03:41 04:26 05:03 18:29 19:04 19:47 54° 03:43 04:15 04:56 18:35 19:14 20:03 58° 03:23 04:15 04:56 18:35 19:14 20:03 58° 03:23 04:15 04:56 18:39 19:20 20:13		04:46	05:51	06:47	16:45	17:41	18:45
62°         04:56         05:47         06:32         17:00         17:45         18:36           60°         04:58         05:46         06:28         17:04         17:46         18:34           N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:42         06:15         17:18         17:51         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:58         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31		04:50	05:49	06:41	16:51	17:43	18:42
60°         04:58         05:46         06:28         17:04         17:46         18:34           N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:35         05:59         17:34         17:58         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27		04:53	05:48	06:36	16:56	17:44	18:39
N 58°         05:00         05:45         06:25         17:08         17:47         18:32           56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:53         05:17		04:56			17:00	17:45	
56°         05:02         05:45         06:22         17:11         17:48         18:31           54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:53         05:17         05:39         17:55         18:16         18:41           20°         04:45         05:11	60°	04:58	05:46	06:28	17:04	17:46	18:34
54°         05:03         05:44         06:19         17:13         17:49         18:30           52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:35         05:59         17:31         17:56         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°         04:28         04:58	N 58°	05:00	05:45	06:25	17:08	17:47	18:32
52°         05:04         05:43         06:17         17:16         17:50         18:29           50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         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°         04:24         05:03         05:27         18:07         18:31         19:00           35°         04:28         04:58		05:02	05:45	06:22	17:11	17:48	18:31
50°         05:05         05:42         06:15         17:18         17:51         18:28           45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:59         05:23         05:44         17:50         18:11         18:35           S 10°         04:53         05:17         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°         04:28         04:58		05:03	05:44	06:19	17:13	17:49	18:30
45°         05:06         05:40         06:10         17:23         17:53         18:27           N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:59         05:23         05:44         17:50         18:11         18:35           S 10°         04:43         05:17         05:39         17:55         18:16         18:41           20°         04:45         05:17         05:33         18:01         18:23         18:49           30°         04:34         05:03         05:27         18:07         18:31         19:00           35°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52		05:04	05:43	06:17	17:16	17:50	18:29
N 40°         05:07         05:39         06:06         17:27         17:55         18:26           35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:59         05:23         05:44         17:50         18:11         18:35           S 10°         04:53         05:17         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°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45		05:05	05:42	06:15	17:18	17:51	18:28
35°         05:07         05:37         06:02         17:31         17:56         18:26           30°         05:07         05:35         05:59         17:34         17:58         18:26           20°         05:06         05:31         05:53         17:40         18:02         18:28           N 10°         05:03         05:27         05:48         17:45         18:06         18:31           0°         04:59         05:23         05:44         17:50         18:11         18:35           S 10°         04:53         05:17         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°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45         05:15         18:20         18:50         19:26           \$50°         03:55         04:36	45°	05:06	05:40	06:10	17:23	17:53	18:27
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:07	05:39	06:06	17:27	17:55	18:26
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		05:07	05:37	06:02	17:31	17:56	18:26
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					17:34		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:06	05:31	05:53	17:40	18:02	18:28
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°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45         05:15         18:20         18:50         19:26           S 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13				05:48	17:45	18:06	18:31
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	0°	04:59	05:23	05:44	17:50	18:11	18:35
30°         04:34         05:03         05:27         18:07         18:31         19:00           35°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45         05:15         18:20         18:50         19:26           S 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13		04:53	05:17	05:39	17:55	18:16	18:41
35°         04:28         04:58         05:24         18:11         18:36         19:07           40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45         05:15         18:20         18:50         19:26           S 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13		04:45	05:11	05:33	18:01	18:23	18:49
40°         04:19         04:52         05:19         18:15         18:43         19:15           45°         04:09         04:45         05:15         18:20         18:50         19:26           S 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13					l		
45°         04:09         04:45         05:15         18:20         18:50         19:26           \$ 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13					1		
S 50°         03:55         04:36         05:09         18:26         18:59         19:40           52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13					l		
52°         03:49         04:31         05:06         18:29         19:04         19:47           54°         03:41         04:26         05:03         18:32         19:09         19:54           56°         03:33         04:21         05:00         18:35         19:14         20:03           58°         03:23         04:15         04:56         18:39         19:20         20:13	45°	04:09	04:45	05:15	18:20	18:50	19:26
54°     03:41     04:26     05:03     18:32     19:09     19:54       56°     03:33     04:21     05:00     18:35     19:14     20:03       58°     03:23     04:15     04:56     18:39     19:20     20:13							
56° 03:33 04:21 05:00 18:35 19:14 20:03 58° 03:23 04:15 04:56 18:39 19:20 20:13							
58° 03:23 04:15 04:56 18:39 19:20 20:13							
<b>S</b> 60°   03:12 04:08 04:52   18:43 19:27 20:24					l		
	<b>S</b> 60°	03:12	04:08	04:52	18:43	19:27	20:24

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
<b>N</b> 70°						
68°			19:29			17:09
66°		17:40	20:22		17:02	16:15
64°	17:25	19:03	20:54	15:21	15:39	15:42
62°	18:17	19:39	21:18	14:28	15:02	15:18
60°	18:49	20:06	21:37	13:56	14:35	14:58
N 58°	19:13	20:26	21:52	13:32	14:14	14:42
56°	19:33	20:43	22:06	13:13	13:57	14:28
54°	19:49	20:58	22:17	12:57	13:42	14:16
52°	20:02	21:10	22:27	12:43	13:29	14:06
50°	20:15	21:21	22:36	12:30	13:18	13:56
45°	20:40	21:44	22:55	12:05	12:55	13:36
<b>N</b> 40°	21:00	22:02	23:11	11:45	12:36	13:20
35°	21:16	22:18	23:24	11:28	12:20	13:06
30°	21:31	22:31	23:35	11:14	12:06	12:54
20°	21:55	22:54	23:54	10:49	11:42	12:33
N 10°	22:17	23:13		10:28	11:22	12:15
0°	22:36	23:32		10:08	11:03	11:58
<b>S</b> 10°	22:56	23:50		09:48	10:44	11:41
20°	23:17		00:09	09:26	10:23	11:23
30°	23:42		00:32	09:01	09:59	11:01
35°	23:56	00.10	00:45	08:47	09:45	10:49
40° 45°		00:13 00:33	01:00	08:30 08:09	09:29 09:09	10:34 10:17
			01:18			
<b>S</b> 50°	00:05	00:58	01:40	07:44	08:44	09:56
52°	00:17	01:10	01:51	07:31	08:33	09:45
54°	00:32	01:23	02:03	07:17	08:19	09:34
56°	00:48	01:39	02:17	07:00	08:03	09:21
58° <b>S</b> 60°	01:08	01:58	02:32 02:51	06:41	07:45	09:05
3 60	01:33	02:22	02:51	06:16	07:21	08:47

Sun

Moon

# October 12, 13, 14 UT (Thu., Fri., Sat.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	21°5.81		N08°10.59	235° 19.91	N15°8.98	191°8.12	S03°5.39	343°19.46	N12°1.81	Alabauata	357°31.22	29°15.22
1	36°8.27	233°0.16	9.58	$250^{\circ}20.91$	8.52	206°10.09	5.60	$358^{\circ}22.10$	1.75	Alpheratz Ankaa	353° 3.80	-42°8.84
2	51° 10.74	247°59.81	8.56	265°21.92	8.06	221°12.06	5.81	13°24.74	1.69	Schedar	349°26.86	56°41.92
3 4	66° 13.20 81° 15.67	262°59.45 277°59.09	· · 7.54 6.51	280°22.93 295°23.93	· · 7.60 7.14	236°14.02 251°15.99	· · 6.02 6.23	28°27.38 43°30.02	· · 1.63 1.57	Diphda	348°43.94	$-17^{\circ}49.53$
5	96° 18.13	292°58.74	5.49	310° 24.94	6.67	266°17.96	6.44	58°32.66	1.51	Achernar	335° 17.44	-57°5.29
6	111°20.60	307°58.38	N08° 4.47	325°25.95	N15° 6.21	281°19.93	S03°6.65	73°35.30	N12°1.45	Hamal	327°47.37	23°36.04
7	126°23.06	322°58.02	3.45	$340^{\circ}26.95$	5.75	296°21.89	6.86	88°37.94	1.39	Polaris Acamar	311°55.42 315°9.12	89°22.90 -40°11.15
8	141°25.52	337°57.67	2.43	355° 27.96	5.29	311°23.86	7.07	103°40.58	1.33	Menkar	314°2.66	4°12.28
9 10	156° 27.99 171° 30.45	352°57.31 7°56.95	· · 1.40 08° 0.38	10°28.97 25°29.98	• • 4.83 4.37	326°25.83 341°27.80	· · 7.28 7.49	118°43.22 133°45.86	· · 1.27 1.21	Mirfak	$308^{\circ}23.37$	49°57.74
11	171 30.43 186°32.92	22° 56.60	07°59.36	40° 30.98	3.91	356°29.77	7.49	148°48.50	1.15	Aldebaran	290°35.88	16°34.03
12	201°35.38	37°56.24	N07°58.33	55°31.99	N15°3.45	11°31.73	S03°7.91	163°51.14	N12°1.09	Rigel	281°0.76 280°17.11	-8°9.99 46°1.41
13	216° 37.84	52° 55.88	57.31	70°33.00	2.99	26°33.70	8.12	178°53.78	1.03	Capella Bellatrix	278° 19.44	6°22.57
14	231°40.31	67°55.53	56.28	85°34.01	2.53	41°35.67	8.33	193°56.42	0.96	Elnath	277°57.82	28°37.79
15 16	246° 42.77 261° 45.24	82°55.17 97°54.82	• • 55.26 54.23	100°35.02 115°36.03	· · 2.06 1.60	56°37.64 71°39.61	• • 8.54 8.75	208°59.06 224°1.70	· · 0.90 0.84	Alnilam	275°34.48	-1°10.95
17	276° 47.70	112°54.46	53.20	130°37.04	1.14	86°41.57	8.96	239°4.34	0.78	Betelgeuse	270°48.66	7°24.75
18	291°50.17	127°54.10	N07°52.17	145°38.05	$N15^{\circ}0.68$	101°43.54	S03°9.17	254°6.98	N12°0.72	Canopus Sirius	263°50.89 258°23.48	-52°42.38 -16°45.22
19	306°52.63	142°53.75	51.15	160°39.06	15°0.22	116°45.51	9.37	269°9.62	0.66	Adhara	255°3.41	-29° 0.49
20	321°55.09 336°57.56	157°53.39 172°53.04	50.12 •• 49.09	175°40.07 190°41.08	14°59.76 •• 59.29	131°47.48 146°49.45	9.58	284°12.27 299°14.91	0.60	Procyon	244°47.66	5°9.04
21 22	352°0.02	172 55.04 187°52.68	48.06	205° 42.09	58.83	140 49.45 161°51.41	· · 9.79 10.00	314°17.55	· · 0.54 0.48	Pollux	243°13.63	27°57.22
23	7°2.49	202°52.33	47.03	220°43.10	58.37	176°53.38	10.21	329°20.19	0.42	Avior	234° 13.57	-59°35.85
Meri	pass. 22:32	11-0 A' d-1	0′ m-4.03	11 0' d-0	.5′ m1.46	1/2 0' d0	.2′ m-1.67	√2 6′ d-0	.1′ m-0.01	Suhail Miaplacidus	222°44.21 221°37.91	-43°32.74 -69°49.89
- IVICI.	pass. 22.32	ν-0.4 α-1	0 111-4.03	ν1.0 u-0	.5 1111.40	ν2.0 do.	.2 111-1.07	ν2.0 u-0	.1 111-0.01	Alphard	217°44.92	-8°46.96
F.J	CHA	CHA	D	CHA	D	CIIA	D	CHA	D	Regulus	207°31.43	11°49.53
Fri 0	<b>GHA</b> 22°4.95	<b>GHA</b> 217°51.97	<b>Dec</b> N07°46.00	<b>GHA</b> 235° 44.11	<b>Dec</b> N14°57.91	<b>GHA</b> 191°55.35	Dec \$03° 10.42	<b>GHA</b> 344°22.83	<b>Dec</b> N12°0.36	Dubhe	193°37.98	61°35.52
1	37°7.41	232°51.62	44.97	250° 45.12	57.45	206° 57.32	10.63	359°25.47	0.29	Denebola	182°22.16	14°24.65
2	52°9.88	247°51.26	43.94	$265^{\circ}46.13$	56.98	221°59.29	10.84	14°28.12	0.23	Gienah Acrux	175°40.74 172°57.20	-17°42.05 -63°15.47
3	67° 12.34	262°50.91	• • 42.91	280°47.14	• • 56.52	237° 1.25	•• 11.05	29°30.76	• • 0.17	Gacrux	171°48.68	-57°16.41
4	82°14.81	277°50.55	41.88	295° 48.16	56.06	252° 3.22	11.26	44°33.40	0.11	Alioth	$166^{\circ}10.97$	55°48.16
5 6	97° 17.27 112° 19.73	292°50.20 307°49.84	40.84 N07°39.81	310°49.17 325°50.18	55.60 N14°55.13	267° 5.19 282° 7.16	11.47 \$03°11.68	59°36.04 74°38.68	0.05 N11°59.99	Spica	158° 19.39	-11°18.63
7	127°22.20	322°49.49	38.78	340°51.19	54.67	297°9.13	11.89	89°41.32	11°59.93	Alkaid	152°50.17	49°10.21
8	142°24.66	337°49.13	37.74	$355^{\circ}52.21$	54.21	312°11.10	12.09	104°43.97	59.87	Hadar Menkent	148°32.17 147°54.35	-60°30.71 -36°30.65
9	157°27.13	352°48.78	• • 36.71	10°53.22	• • 53.74	327°13.06	• • 12.30	119°46.61	• • 59.81	Arcturus	145°45.47	19°2.05
10	172° 29.59 187° 32.05	7°48.42	35.67	25°54.23	53.28	342°15.03	12.51	134°49.25 149°51.89	59.74	Rigil Kent.	$139^{\circ}36.60$	-60°57.29
11 12	202°34.52	22°48.07 37°47.72	34.64 N07°33.60	40°55.25 55°56.26	52.82 N14°52.35	357°17.00 12°18.97	12.72 \$03°12.93	164°54.54	59.68 N11°59.62	Kochab	137°21.17	74°2.29
13	217°36.98	52°47.36	32.57	70°57.27	51.89	27°20.94	13.14	179°57.18	59.56	Zuben'ubi Alphecca	136°52.93 126°1.48	-16°9.60 26°37.25
14	$232^{\circ}39.45$	67°47.01	31.53	85°58.29	51.43	42°22.91	13.35	194°59.82	59.50	Antares	112° 12.32	-26°29.68
15	247°41.91	82°46.65	• • 30.49	100°59.30	• • 50.96	57°24.87	• • 13.56	210°2.46	• • 59.44	Atria	107°4.04	-69°4.83
16 17	262° 44.38 277° 46.84	97°46.30 112°45.95	29.46 28.42	116°0.32 131°1.33	50.50 50.04	72°26.84 87°28.81	13.77 13.98	225°5.11 240°7.75	59.38 59.31	Sabik	$101^{\circ}59.46$	$-15^{\circ}45.50$
18	292°49.30	127°45.59	N07°27.38	146°2.35	N14°49.57	102°30.78	S03°14.18	255°10.39	N11°59.25	Shaula	96°6.40	-37°7.44
19	307°51.77	142°45.24	26.34	161°3.36	49.11	117°32.75	14.39	270°13.04	59.19	Rasalhague Eltanin	95°55.87 90°40.96	12°32.59 51°29.44
20	322°54.23	157° 44.89	25.30	176°4.38	48.64	132°34.72	14.60	285°15.68	59.13	Kaus Aust.	83°28.58	-34°22.20
21	337° 56.70	172°44.53	• • 24.26	191°5.40	• • 48.18	147°36.69	• • 14.81	300°18.32	• • 59.07	Vega	80°31.24	38°48.98
22 23	352°59.16 8°1.62	187°44.18 202°43.83	23.22 22.18	206°6.41 221°7.43	47.72 47.25	162°38.65 177°40.62	15.02 15.23	315°20.97 330°23.61	59.01 58.95	Nunki	75°44.04	-26°15.55
						_				Altair	61°56.95	8°56.95
IVIer.	pass. 22:28	$\nu$ -0.4' d-1	0′ m-4.03	$\nu$ 1.0′ $d$ -0	.5′ m1.46	$\nu$ 2.0′ d0.	.2′ m-1.67	$\nu$ 2.6′ d-0	.1′ m-0.02	Peacock Deneb	53°0.87 49°23.53	-56°38.57 45°23.39
										Enif	33°35.61	10° 0.72
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}28.88$	-46°49.25
0 1	23°4.09 38°6.55	217°43.47 232°43.12	N07°21.14 20.10	236°8.44 251°9.46	N14°46.79 46.32	192°42.59 207°44.56	\$03° 15.44 15.65	345°26.25 0°28.90	N11°58.89 58.82	Fomalhaut	15°10.92	-29°28.05
2	53°9.02	247° 42.77	19.06	266° 10.48	45.86	222°46.53	15.86	15°31.54	58.76	Scheat Markab	13°41.91 13°26.57	28°14.65 15°21.90
3	$68^{\circ}11.48$	262°42.41	• • 18.02	281°11.50	• • 45.39	237°48.50	•• 16.06	30°34.18	• • 58.70			
4	83° 13.94	277° 42.06	16.97	296° 12.51	44.93	252°50.47	16.27	45°36.83	58.64	Oct 12 Thu	SHA 106° 54.71	Mer.pass
5 6	98° 16.41 113° 18.87	292°41.71 307°41.36	15.93 N07°14.89	311°13.53 326°14.55	44.46 N14°44.00	267°52.43 282°54.40	16.48 \$03°16.69	60°39.47 75°42.11	58.58 N11°58.52	Venus Mars	196°54.71 214°14.10	09:28 08:18
7	128°21.34	322°41.00	13.84	341° 15.57	43.53	297°56.37	16.90	90°44.76	58.45	Jupiter	170°2.31	11:14
8	143°23.80	337°40.65	12.80	356° 16.59	43.07	312°58.34	17.11	105°47.40	58.39	Saturn	$322^{\circ}13.65$	01:07
9	158° 26.26	352°40.30	• • 11.75	11°17.60	• • 42.60	328°0.31	• • 17.32	120°50.05	• • 58.33	Oct 13 Fri	SHA	Mer.pass
10	173°28.73	7°39.95	10.71	26° 18.62	42.14	343°2.28	17.52	135°52.69	58.27 59.21	Venus	195° 47.02	09:29
11 12	188° 31.19 203° 33.66	22°39.59 37°39.24	9.66 N07°8.62	41° 19.64 56° 20.66	41.67 N14°41.21	358° 4.25 13° 6.21	17.73 \$03°17.94	150°55.34 165°57.98	58.21 N11°58.15	Mars	$213^{\circ}39.16$	08:17
13	218° 36.12	52°38.89	7.57	71°21.68	40.74	28° 8.18	18.15	181°0.62	58.08	Jupiter	169°50.40	11:11
14	233°38.58	67°38.54	6.52	86°22.70	40.28	43°10.15	18.36	196°3.27	58.02	Saturn	322°17.88	01:02
15	248°41.05	82°38.19	• • 5.47	101°23.72	• • 39.81	58°12.12	18.57	211°5.91	• • 57.96	Oct 14 Sat	SHA	Mer.pass
16 17	263° 43.51 278° 45.98	97°37.83 112°37.48	4.43 3.38	116°24.74 131°25.76	39.35 38.88	73°14.09 88°16.06	18.78 18.98	226°8.56 241°11.20	57.90 57.84		194°39.39	09:29
18	293°48.44	112 37.46 127°37.13	N07°2.33	131 25.70 146° 26.78	N14°38.41	103°18.03	503°19.19	256°13.85	N11°57.78	Mars Jupiter	213°4.36 169°38.50	08:15 11:08
19	$308^{\circ}50.91$	142°36.78	1.28	161°27.80	37.95	118°20.00	19.40	271°16.49	57.71	Saturn	322°22.16	00:58
20	323° 53.37	157° 36.43	07°0.23	176° 28.83	37.48	133°21.97	19.61	286°19.14	57.65	Horizo	ıtal parallax	
21 22	338° 55.83 353° 58.30	172°36.08 187°35.73	06°59.18 58.13	191°29.85 206°30.87	· · 37.02 36.55	148°23.93 163°25.90	· · 19.82 20.03	301°21.78 316°24.43	•• 57.59 57.53	inorizoi	Venus:	0.1
23	9°0.76	202°35.37	56.13 57.08	200 30.87 221°31.89	36.08	103 25.90 178°27.87	20.03	310 24.43 331°27.07	57.55 57.47		Mars:	0.1
ıvler.	pass. 22:24	ν-υ.4' d-1	0′ m-4.03	$\nu$ 1.0' $d$ -0	.5′ m1.45	ν2.0′ d0.	.2′ m-1.67	ν2.0' a-0	.1′ m-0.02			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.01	S07°30.81	263°45.22	8.3'	$N20^{\circ}26.11$	-9.2'	58.2'
1	198°23.16	31.75	278°12.52	8.3'	20°16.89	-9.3'	58.3'
2	213°23.32 228°23.47	32.69 · · 33.62	292°39.85 307°7.21	8.4' 8.4'	20°7.54 19°58.07	-9.5' -9.6'	58.3' 58.3'
4	243°23.63	34.56	321°34.60	8.4	19°48.47	-9.7'	58.4'
5	258°23.78	35.50	336°2.02	8.4'	19°38.74	-9.9'	58.4'
6	273°23.93	S07°36.43	350°29.47	8.5'	N19°28.89	-10.0'	58.4'
7 8	288°24.09 303°24.24	37.37 38.31	4°56.94 19°24.46	8.5' 8.5'	19° 18.91 19° 8.81	-10.1' -10.2'	58.5' 58.5'
9	318°24.39	39.24	33°52.00	8.6'	18° 58.59	-10.2	58.5
10	333°24.55	40.18	48°19.57	8.6'	$18^{\circ}48.25$	-10.5'	58.6'
11	348°24.70 3°24.85	41.11 507°42.05	62°47.17 77°14.80	8.6'	18°37.79 N18°27.21	-10.6'	58.6'
12 13	3°24.85 18°25.00	42.98	91°42.47	8.7' 8.7'	18° 16.52	-10.7' -10.8'	58.6' 58.7'
14	33°25.15	43.92	106°10.16	8.7'	18°5.70	-10.9'	58.7'
15	48°25.31	• • 44.85	120°37.89	8.8'	17°54.77	-11.0'	58.7'
16	63°25.46 78°25.61	45.79	135°5.65 149°33.43	8.8' 8.8'	17°43.72 17°32.56	-11.2' -11.3'	58.8'
17 18	93°25.76	46.72 <b>S</b> 07°47.66	164°1.25	8.8	N17°21.28	-11.3	58.8' 58.8'
19	108°25.91	48.59	178°29.10	8.9'	17°9.90	-11.5'	58.9'
20	123°26.06	49.52	192°56.98	8.9'	16°58.40	-11.6'	58.9'
21	138°26.21 153°26.36	• • 50.46	207°24.90 221°52.84	8.9'	16°46.79 16°35.07	-11.7'	58.9'
22 23	168°26.51	51.39 52.32	236°20.81	9.0' 9.0'	16 35.07 16°23.24	-11.8' -11.9'	59.0' 59.0'
	SD = 16.0'	d = 0.9'			D = 15.9'	11.0	
	JD — 10.0	u — 0.9			שים – 13.9		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°26.66 198°26.81	\$07°53.26	250°48.81 265°16.84	9.0' 9.1'	N16°11.31 15°59.27	-12.0' -12.1'	59.0' 59.1'
1 2	213°26.81	54.19 55.12	205°16.84 279°44.90	9.1'	15° 59.27 15° 47.12	-12.1 -12.2'	59.1' 59.1'
3	228°27.11	. 56.06	294°12.99	9.1'	15°34.87	-12.4'	59.1
4	243°27.26	56.99	$308^{\circ}41.11$	9.1'	$15^{\circ}22.52$	-12.5'	59.2'
5	258°27.40 273°27.55	57.92 \$07°58.85	323°9.26 337°37.44	9.2' 9.2'	15° 10.07 N14° 57.51	-12.6' -12.7'	59.2' 59.2'
6 7	273 27.55 288°27.70	07°59.78	352°5.64	9.2' 9.2'	14° 44.86	-12.7 -12.8'	59.2 59.3'
8	303°27.85	08°0.72	6°33.87	9.3	14°32.10	-12.8'	59.3'
9	318°27.99	•• 1.65	21°2.13	9.3'	14° 19.25	-12.9'	59.3'
10 11	333°28.14 348°28.29	2.58 3.51	35°30.42 49°58.73	9.3' 9.3'	14°6.31 13°53.27	-13.0' -13.1'	59.4' 59.4'
12	3°28.43	508°4.44	64°27.07	9.4	N13°40.13	-13.1	59.4
13	18°28.58	5.37	78°55.43	9.4'	13°26.91	-13.3'	59.5'
14	33°28.73	6.30	93°23.82	9.4'	13°13.59	-13.4'	59.5'
15 16	48°28.87 63°29.02	· · 7.23 8.16	107°52.23 122°20.66	9.4' 9.5'	13°0.18 12°46.69	-13.5' -13.6'	59.5' 59.5'
17	78°29.16	9.09	136°49.12	9.5'	12° 33.11	-13.7'	59.6'
18	93°29.31	S08°10.02	151°17.61	9.5'	N12° 19.44	-13.8'	59.6'
19	108°29.45	10.95	165°46.11	9.5'	12°5.68	-13.8'	59.6'
20 21	123°29.60 138°29.74	11.88 •• 12.81	180°14.64 194°43.18	9.5' 9.6'	11°51.85 11°37.93	-13.9° -14.0'	59.7' 59.7'
22	153°29.89	13.74	209°11.75	9.6'	11°23.93	-14.1'	59.7'
23	168°30.03	14.67	223°40.34	9.6'	$11^{\circ}9.85$	-14.2'	59.8'
	SD = 16.0'	d = 0.9'		S	D = 16.1'		
c - ·	CUA	D	CUA		D-:	.1	LIP.
Sat 0	<b>GHA</b> 183°30.18	Dec 508°15.60	<b>GHA</b> 238°8.94	u 9.6'	<b>Dec</b> N10°55.69	d -14.2'	<b>HP</b> 59.8'
1	198°30.32	16.52	252°37.57	9.6'	10° 41.46	-14.2	59.8'
2	213°30.46	17.45	267°6.21	9.7'	10°27.15	-14.4'	59.8'
3 4	228°30.60 243°30.75	· · 18.38 19.31	281°34.87 296°3.54	9.7' 9.7'	10°12.77 09°58.31	-14.5' -14.5'	59.9' 59.9'
4 5	243 30.75 258°30.89	20.23	290 3.54 310°32.24	9.7' 9.7'	09 58.31 09°43.78	-14.5 -14.6'	59.9' 59.9'
6	273°31.03	S08°21.16	325°0.94	9.7'	N09°29.19	-14.7'	60.0'
7	288°31.17	22.09	339°29.66	9.7'	09°14.52	-14.7'	60.0'
8 9	303°31.32 318°31.46	23.02 •• 23.94	353°58.39 8°27.14	9.7' 9.8'	08°59.79 08°45.00	-14.8' -14.9'	60.0' 60.0'
10	333°31.60	24.87	22°55.90	9.8'	08°30.13	-14.9'	60.1
11	348°31.74	25.80	37°24.66	9.8'	$08^{\circ}15.21$	-15.0'	60.1'
12	3°31.88	S08°26.72	51°53.44	9.8'	N08°0.23	-15.0'	60.1'
13 14	18°32.02 33°32.16	27.65 28.57	66°22.23 80°51.03	9.8' 9.8'	07°45.18 07°30.08	-15.1' -15.2'	60.2' 60.2'
15	48°32.30	29.50	95°19.83	9.8'	07° 14.92	-15.2'	60.2
16	63°32.44	30.42	109°48.64	9.8'	06°59.71	-15.3'	60.2'
17	78°32.58	31.35 \$08°32.27	124°17.46	9.8'	06°44.44	-15.3'	60.3'
18 19	93°32.72 108°32.86	\$08°32.27 33.20	138°46.28 153°15.10	9.8' 9.8'	N06°29.13 06°13.76	-15.4' -15.4'	60.3' 60.3'
20	123°33.00	34.12	167°43.93	9.8'	05°58.34	-15.5'	60.3
21	138°33.14	• • 35.05	182°12.77	9.8'	$05^{\circ}42.88$	-15.5'	60.3'
22	153°33.27 168°33.41	35.97	196°41.60 211°10.43	9.8' 9.8'	05°27.37 05°11.81	-15.6'	60.4' 60.4'
23		36.89	Z11 1U.43			-15.6'	00.4
	SD = 16.0'	d = 0.9'		5	5D = 16.3'		

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

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

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-23%		
12	13:32	13:39	11:46	06:39	19:06			
13	13:47	13:54	11:46	07:33	19:59			
14	14:01	14:08	11:46	08:25	20:51			

#### October 15, 16, 17 UT (Sun., Mon., Tue.)

h	Aries	Venus		Ma	ars	Jup	oiter	Sat	urn		Stars
Sun	GHA	GHA [	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	24°3.23		°56.03	236° 32.91	$N14^{\circ}35.62$	193°29.84	503°20.44		N11°57.40	Alpheratz	357°31.23
1	39°5.69	232°34.67	54.98	251°33.94	35.15	208°31.81	20.65	1°32.36	57.34	Ankaa	353°3.80
2	54°8.15 69°10.62	247°34.32 262°33.97 · ·	53.92 52.87	266°34.96 281°35.98	34.68 •• 34.22	223°33.78 238°35.75	20.86 •• 21.07	16°35.01 31°37.65	57.28 •• 57.22	Schedar	$349^{\circ}26.86$
4	84° 13.08	277°33.62	51.82	296°37.00	33.75	253°37.72	21.28	46°40.30	57.16	Diphda	348° 43.94
5	$99^{\circ}15.55$	292°33.27	50.76	311°38.03	33.28	268°39.69	21.48	61°42.94	57.10	Achernar Hamal	335° 17.44 327° 47.37
6	114° 18.01		°49.71	326°39.05	N14°32.82	283°41.66	S03°21.69	76°45.59	N11°57.03	Polaris	311°54.62
7 8	129°20.47 144°22.94	322°32.57 337°32.22	48.66	341°40.08 356°41.10	32.35	298°43.63 313°45.59	21.90	91°48.24 106°50.88	56.97	Acamar	315°9.11
9	159° 25.40		47.60 46.55	11°42.12	31.88 · · 31.42	313 45.59 328°47.56	22.11 •• 22.32	100 50.66 121°53.53	56.91 •• 56.85	Menkar	314°2.65
10	174° 27.87	7°31.52	45.49	26° 43.15	30.95	343°49.53	22.53	136°56.17	56.78	Mirfak	308°23.36
11	189° 30.33	22°31.16	44.43	41°44.17	30.48	358°51.50	22.73	151°58.82	56.72	Aldebaran Rigel	290°35.86 281°0.74
12	204°32.79		°43.38	56° 45.20	N14°30.01	13°53.47	S03°22.94	167°1.47	N11°56.66	Capella	280° 17.09
13 14	219°35.26 234°37.72	52°30.46 67°30.11	42.32 41.26	71°46.22 86°47.25	29.55 29.08	28°55.44 43°57.41	23.15 23.36	182°4.11 197°6.76	56.60 56.54	Bellatrix	$278^{\circ}19.42$
15	249°40.19		40.21	101°48.27	28.61	58°59.38	• • 23.57	212°9.40	• • 56.47	Elnath	277°57.80
16	$264^{\circ}42.65$	97°29.41	39.15	$116^{\circ}49.30$	28.14	74° 1.35	23.77	$227^{\circ}12.05$	56.41	Alnilam Betelgeuse	275°34.47 270°48.64
17	279°45.11	112°29.06	38.09	131°50.33	27.68	89°3.32	23.98	242°14.70	56.35	Canopus	263°50.86
18 19	294° 47.58 309° 50.04	127°28.71 N06 142°28.36	°37.03 35.97	146°51.35 161°52.38	N14°27.21 26.74	104° 5.29 119° 7.26	\$03°24.19 24.40	257°17.34 272°19.99	N11°56.29 56.23	Sirius	$258^{\circ}23.46$
20	324°52.51	157°28.02	34.91	176° 53.41	26.27	134° 9.23	24.60	287°22.64	56.16	Adhara	255°3.39
21	339° 54.97		33.85	191°54.43	• • 25.81	149°11.20	• • 24.81	302°25.28	• • 56.10	Procyon Pollux	244° 47.64 243° 13.61
22	354° 57.43	187°27.32	32.79	206°55.46	25.34	164°13.17	25.02	317°27.93	56.04	Avior	234° 13.54
23	9°59.90	202°26.97	31.73	221°56.49	24.87	179°15.14	25.23	332°30.58	55.98	Suhail	222°44.18
Mer.p	ass. 22:20	$ u$ -0.4 $^{\prime}$ $d$ -1.1 $^{\prime}$ m	า-4.03	$\nu 1.0' \ d$ -0	.5′ m1.45	$\nu 2.0' \ d0.$	2′ m-1.67	$\nu$ 2.6′ d-0.	.1′ m-0.02	Miaplacidus	221°37.86
										Alphard	217°44.90
Mon	GHA	GHA [	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.41 193°37.96
0	25°2.36		°30.67	236° 57.52	N14°24.40	194°17.10	503°25.44	347°33.22	N11°55.91	Denebola	182° 22.15
1	40°4.83	232°26.27	29.61	251°58.54	23.93	209°19.07	25.64	2°35.87	55.85		$175^{\circ}40.73$
2 3	55°7.29 70°9.75	247°25.92 262°25.57	28.54 27.48	266°59.57 282°0.60	23.46 23.00	224°21.04 239°23.01	25.85 •• 26.06	17°38.52 32°41.16	55.79 •• 55.73		172°57.19
4	85° 12.22	277°25.22	26.42	297°1.63	22.53	254°24.98	26.27	47°43.81	55.67	1	171°48.68 166°10.96
5	$100^{\circ}14.68$	292°24.87	25.36	$312^{\circ}2.66$	22.06	269°26.95	26.47	62°46.46	55.60	Alioth Spica	158° 19.39
6	115° 17.15		°24.29	327°3.69	N14°21.59	284°28.92	503°26.68	77°49.11	N11°55.54	Alkaid	152°50.17
7 8	130° 19.61 145° 22.07	322°24.17 337°23.82	23.23 22.16	342°4.72 357°5.75	21.12 20.65	299°30.89 314°32.86	26.89 27.10	92°51.75 107°54.40	55.48 55.42	Hadar	148° 32.17
9	160° 24.54		21.10	12°6.78	• • 20.18	329°34.83	•• 27.31	122°57.05	• • 55.35	1	147°54.35
10	175°27.00	7°23.13	20.03	27°7.81	19.71	344°36.80	27.51	137°59.70	55.29	Arcturus Rigil Kent.	145°45.48 139°36.61
11	190°29.47	22°22.78	18.97	42°8.84	19.24	359°38.77	27.72	153°2.34	55.23	Kochab	137°21.19
12 13	205°31.93 220°34.39	37°22.43 N06 52°22.08	°17.90 16.83	57°9.87 72°10.90	N14°18.77 18.31	14°40.74 29°42.71	\$03°27.93 28.14	168°4.99 183°7.64	N11°55.17 55.10	Zuben'ubi	$136^{\circ}52.93$
14	235° 36.86	67°21.73	15.77	87°11.93	17.84	44°44.68	28.34	198° 10.29	55.04	Alphecca	126°1.49
15	250°39.32		14.70	102° 12.96	• • 17.37	59°46.65	• • 28.55	213°12.93	• • 54.98	Antares Atria	112°12.33 107°4.08
16	265°41.79	97°21.04	13.63	117° 13.99	16.90	74°48.62	28.76	228°15.58	54.92	Sabik	101°59.47
17	280° 44.25 295° 46.71	112°20.69	12.56 °11.50	132° 15.03 147° 16.06	16.43	89°50.59	28.97	243°18.23	54.85	Shaula	96°6.42
18 19	310° 49.18	127°20.34 N06 142°19.99	10.43	162° 17.09	N14°15.96 15.49	104°52.56 119°54.53	\$03°29.17 29.38	258°20.88 273°23.53	N11°54.79 54.73	Rasalhague	95°55.89
20	325°51.64	157° 19.64	9.36	177° 18.12	15.02	134°56.50	29.59	288°26.18	54.67	Eltanin Kaus Aust.	90°40.99 83°28.60
21	340° 54.11		• 8.29	192° 19.16	• • 14.55	149°58.47	• • 29.79	303°28.82	• • 54.60	Vega	80°31.26
22	355°56.57	187° 18.95	7.22	207°20.19	14.08	165° 0.44	30.00	318°31.47	54.54	Nunki	75°44.06
23	10°59.03	202°18.60	6.15	222°21.22	13.61	180°2.41	30.21	333°34.12	54.48	Altair	61°56.97
Mer.p	ass. 22:16	ν-0.3′ d-1.1′ m	า-4.02	$\nu 1.0' d-0$	.5′ m1.44	$\nu 2.0' d0.$	2′ m-1.67	$\nu 2.6' \ d-0$	.1′ m-0.03	Peacock Deneb	53°0.90 49°23.56
										Enif	33° 35.62
Tue	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.89
0 1	26°1.50 41°3.96	217°18.25 N0 232°17.91	6°5.08 4.01	237°22.26 252°23.29	N14°13.14 12.67	195° 4.38 210° 6.35	\$03°30.42 30.62	348°36.77 3°39.42	N11°54.42 54.35	Fomalhaut	15° 10.93
2	56° 6.43	247° 17.56	2.93	267° 24.32	12.20	210 0.33 225°8.32	30.83	18°42.07	54.29	Scheat Markab	13°41.92 13°26.58
3	71°8.89		• 1.86	$282^{\circ}25.36$	• • 11.73	240°10.29	• • 31.04	33°44.71	• • 54.23	IVIARKAD	13 20.30
4	86°11.36		6°0.79	297°26.39	11.26	255°12.26	31.25	48°47.36	54.17	Oct 15 Sun	SHA
5 6	101° 13.82 116° 16.28		°59.72	312°27.43	10.79 N14°10.32	270°14.23 285°16.20	31.45	63°50.01	54.10		193°31.80 212°29.69
7	131° 18.75	322° 15.82	°58.64 57.57	327°28.46 342°29.50	9.85	300°18.17	\$03°31.66 31.87	78°52.66 93°55.31	N11°54.04 53.98		169° 26.62
8	146°21.21	337° 15.47	56.50	357° 30.53	9.37	315°20.14	32.07	108°57.96	53.92	Saturn	322°26.49
9	161° 23.68		55.42	12°31.57	• • 8.90	330°22.11	• • 32.28	124°0.61	• • 53.85	Oct 16 Mon	SHA
10	176°26.14	7°14.78	54.35	27°32.60	8.43	345°24.08	32.49	139°3.26	53.79		192°24.26
11 12	191°28.60 206°31.07	22°14.43 37°14.09 N05	53.27 °52.20	42°33.64 57°34.68	7.96 N14°7.49	0°26.05 15°28.03	32.70 \$03°32.90	154°5.91 169°8.56	53.73 N11°53.66	Mars	211°55.15
13	221°33.53	52°13.74	51.12	72°35.71	7.02	30°30.00	33.11	184°11.20	53.60		169°14.74
14	$236^{\circ}36.00$	67°13.39	50.04	87°36.75	6.55	45°31.97	33.32	199°13.85	53.54	Saturn	322°30.86
15	251° 38.46		48.97	102°37.79	• • 6.08	60°33.94	• • 33.52	214°16.50	• • 53.48	Oct 17 Tue	SHA
16 17	266° 40.92 281° 43.39	97°12.70 112°12.35	47.89 46.81	117°38.82 132°39.86	5.61 5.13	75°35.91 90°37.88	33.73 33.94	229°19.15 244°21.80	53.41 53.35		191°16.75
18	296° 45.85		°45.74	132 39.00 147°40.90	N14° 4.66	90°37.88 105°39.85	503°34.14	259° 24.45	N11°53.29	Mars Jupiter	211°20.76 169°2.88
19	311°48.32	142°11.66	44.66	162°41.94	4.19	120°41.82	34.35	274°27.10	53.22		322°35.27
20	326°50.78	157°11.31	43.58	177° 42.97	3.72	135°43.79	34.56	289°29.75	53.16		
21 22	341°53.24 356°55.71	172°10.97 · · · 187°10.62	42.50 41.42	192° 44.01 207° 45.05	· · 3.25 2.78	150°45.76 165°47.73	· · 34.76 34.97	304°32.40 319°35.05	· · 53.10 53.04	Horizor	ntal parallax Venus:
23	11°58.17	202° 10.27	41.42	207 45.05 222° 46.09	2.78	180°49.70	34.97 35.18	319 35.05 334°37.70	53.04 52.97		Mars:
	pass. 22:12	$\nu$ -0.3' d-1.1' m		$\nu 1.0' d-0$			2′ m-1.67		.1′ m-0.03		
- ivier.p		ν-0.5 α-1.1 Π	i- <del>4</del> .02	ν1.0 u-0	.5 1111.44	ν2.0 d0.		ν2.0 u-0	.1 111-0.03		

**Dec** 29°15.23

-42°8.85

56°41.93

-17°49.54

-57°5.30

 $23^{\circ}36.05$ 

 $89^{\circ}22.91$ 

-40°11.16

4°12.28

49°57.75 16°34.03

-8°10.00

 $46^{\circ}\,1.41$ 

 $6^{\circ}22.57$ 

28°37.79 -1°10.95

7°24.74 -52°42.38

-16°45.22

-29°0.49

 $27^{\circ}57.22$ 

-59°35.85

-43°32.74 -69°49.88

-8°46.96

11°49.53

61°35.50

14°24.65

-17°42.05 -63°15.46 -57°16.40

55°48.14 -11°18.63

49°10.19

-60°30.70

-36°30.65

-60°57.27

 $19^{\circ}2.04$ 

74°2.27 -16°9.60

26°37.24 -26°29.67

-69°4.82

 $-15^{\circ}45.51$ 

-37°7.44

 $12^{\circ}32.59$ 

51°29.44

-34°22.20 38°48.97

-26°15.55 8°56.95

-56°38.58

 $45^{\circ}23.39$ 

-46°49.26 -29°28.06

28°14.66

15°21.90

Mer.pass

09:30

08:13

11:05 00:54

09:30

08:12

11:01

00:50

09:31

08:10

10:58

00:45

0.1

0.1

Mer.pass

Mer.pass

 $10^{\circ}0.72$ 

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.55	S08°37.82	$225^{\circ}39.26$	9.8'	$N04^{\circ}56.22$	-15.6'	60.4'
1	198° 33.69	38.74	240°8.10	9.8'	04°40.58	-15.7'	60.4'
2	213° 33.82 228° 33.96	39.66 •• 40.59	254°36.93 269°5.75	9.8' 9.8'	04°24.90 04°9.19	-15.7' -15.7'	60.5' 60.5'
4	243°34.10	41.51	283°34.57	9.8'	03°53.44	-15.8'	60.5
5	258°34.23	42.43	298°3.39	9.8'	03°37.66	-15.8'	60.5'
6	273°34.37	S08°43.35	312°32.20	9.8'	N03°21.84	-15.8'	60.5'
7 8	288°34.51 303°34.64	44.28 45.20	327°1.01 341°29.80	9.8' 9.8'	03°6.00 02°50.12	-15.9' -15.9'	60.6' 60.6'
9	318° 34.78	• • 46.12	355°58.59	9.8'	02°34.22	-15.9'	60.6'
10	333°34.91	47.04	10°27.37	9.8'	02°18.29	-16.0'	60.6'
11 12	348° 35.05 3° 35.18	47.96 \$08°48.88	24°56.14 39°24.89	9.8' 9.7'	02°2.34 N01°46.36	-16.0' -16.0'	60.6' 60.7'
13	3 35.18 18°35.32	49.80	59 24.89 53°53.63	9.7' 9.7'	01°30.37	-16.0'	60.7'
14	33°35.45	50.73	68°22.36	9.7'	01°14.36	-16.0'	60.7'
15	48° 35.58	• • 51.65	82°51.08	9.7'	00°58.33	-16.0'	60.7'
16 17	63°35.72 78°35.85	52.57 53.49	97°19.78 111°48.46	9.7' 9.7'	00°42.28 00°26.22	-16.1' -16.1'	60.7' 60.7'
18	93°35.99	508°54.41	126°17.12	9.6'	N00°10.15	-16.1	60.8
19	108° 36.12	55.33	140°45.77	9.6'	S00°5.93	16.1'	60.8'
20	123°36.25	56.24	155°14.40	9.6'	00°22.02	16.1'	60.8'
21 22	138° 36.38 153° 36.52	•• 57.16 58.08	169°43.00 184°11.59	9.6' 9.6'	00°38.11 00°54.21	16.1' 16.1'	60.8' 60.8'
23	168° 36.65	59.00	198°40.15	9.0 9.5'	00° 34.21 01° 10.31	16.1	60.8
	SD = 16.0'	d = 0.9'			D = 16.5'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°36.78 198°36.91	\$08°59.92 09°0.84	213°8.69 227°37.21	9.5' 9.5'	\$01°26.41 01°42.52	16.1' 16.1'	60.8' 60.9'
2	213° 37.04	1.76	242° 5.70	9.5' 9.5'	01 42.52 01°58.61	16.1	60.9'
3	228°37.17	• • 2.67	256°34.16	9.4'	02°14.71	16.1	60.9'
4	243°37.30	3.59	271°2.60	9.4'	02°30.79	16.1'	60.9'
5 6	258° 37.43 273° 37.56	4.51 \$09° 5.42	285°31.01 299°59.38	9.4' 9.3'	02°46.87 503°2.94	16.1' 16.1'	60.9' 60.9'
7	288° 37.69	6.34	314°27.73	9.3'	03°18.99	16.1	60.9
8	303°37.82	7.26	328°56.05	9.3'	03°35.03	16.0'	60.9'
9	318° 37.95	• • 8.17	343°24.34	9.3'	03°51.06	16.0'	60.9'
10 11	333°38.08 348°38.21	9.09 10.01	357°52.59 12°20.82	9.2' 9.2'	04°7.06 04°23.05	16.0' 16.0'	60.9' 61.0'
12	3°38.34	S09°10.92	26°49.00	9.2'	504°39.02	15.9'	61.0
13	18° 38.47	11.84	41°17.15	9.1'	04°54.96	15.9'	61.0'
14	33°38.59 48°38.72	12.75	55°45.27 70°13.35	9.1'	05°10.87	15.9'	61.0'
15 16	48° 38.72 63° 38.85	· · 13.67 14.58	70°13.35 84°41.39	9.0' 9.0'	05°26.76 05°42.62	15.9' 15.8'	61.0' 61.0'
17	78° 38.98	15.50	99° 9.39	9.0'	05°58.44	15.8'	61.0'
18	93°39.10	S09°16.41	113°37.35	8.9'	S06°14.24	15.8'	61.0'
19	108° 39.23 123° 39.36	17.33 18.24	128°5.27 142°33.15	8.9' 8.8'	06°30.00 06°45.72	15.7'	61.0'
20 21	123 39.30 138°39.48	18.24	142 33.15 157°0.99	8.8'	06 45.72 07°1.40	15.7' 15.6'	61.0' 61.0'
22	153° 39.61	20.07	171°28.79	8.8'	07°17.04	15.6'	61.0'
23	168°39.73	20.98	185°56.54	8.7'	07°32.64	15.6'	61.0'
	SD = 16.0'	d = 0.9'		S	D = 16.6'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	183°39.86	S09°21.89	200°24.25	8.7'	507°48.19	15.5'	61.0'
1	198°39.98	22.81	214°51.91	8.6'	08°3.70	15.5'	61.0'
2	213°40.11	23.72	229°19.53	8.6'	08°19.15	15.4'	61.0'
3 4	228° 40.23 243° 40.36	· · 24.63 25.54	243°47.10 258°14.62	8.5' 8.5'	08°34.56 08°49.91	15.4' 15.3'	61.0' 61.0'
5	258° 40.48	26.45	272°42.10	8.4'	$09^{\circ}5.21$	15.2'	61.0'
6	273°40.61	S09°27.37	287°9.53	8.4'	S09°20.45	15.2'	61.0'
7 8	288° 40.73 303° 40.85	28.28 29.19	301°36.91 316°4.23	8.3' 8.3'	09°35.63 09°50.76	15.1' 15.1'	61.0' 61.0'
9	303 40.85 318°40.98	30.10	310 4.23 330°31.51	8.2'	10°5.81	15.1 15.0'	61.0'
10	333°41.10	31.01	344°58.74	8.2'	$10^{\circ}20.81$	14.9'	61.0'
11	348°41.22	31.92	359°25.92	8.1'	10°35.74	14.9'	61.0'
12 13	3°41.34 18°41.47	S09°32.83 33.74	13°53.05 28°20.12	8.1' 8.0'	\$10°50.60 11°5.39	14.8' 14.7'	61.0' 61.0'
14	33°41.59	34.65	42°47.14	8.0'	11°20.11	14.6	61.0'
15	48°41.71	• • 35.56	57°14.11	7.9'	$11^{\circ}34.75$	14.6'	60.9'
16	63°41.83	36.47	71°41.02	7.9'	11°49.32	14.5'	60.9'
17 18	78°41.95 93°42.07	37.38 \$09°38.28	86°7.88 100°34.69	7.8' 7.8'	12°3.81 \$12°18.22	14.4' 14.3'	60.9' 60.9'
19	108° 42.19	39.19	115° 1.44	7.7'	12°32.55	14.2'	60.9
20	123° 42.31	40.10	129°28.13	7.6'	12°46.79	14.2'	60.9'
21 22	138° 42.43 153° 42.55	· · 41.01 41.92	143°54.77 158°21.35	7.6' 7.5'	13°0.95 13°15.02	14.1' 14.0'	60.9' 60.9'
23	153° 42.55 168° 42.67	41.92 42.82	158° 21.35 172° 47.88	7.5'	13°15.02 13°29.00	14.0 13.9'	60.9'
	SD = 16.0'	d = 0.9'			D = 16.6'		
					_ 10.0		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-2%	
15	14:14	14:21	11:46	09:17	21:43		
16	14:27	14:33	11:45	10:09	22:35		
17	14:39	14:45	11:45	11:02	23:30		

### October 18, 19, 20 UT (Wed., Thu., Fri.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	27°0.64	217° 9.93	N05°39.26	237° 47.13	N14°1.83	195°51.67	S03°35.38	349°40.35	N11°52.91		
1	42°3.10	232°9.58	38.18	252°48.17	1.36	210°53.64	35.59	4°43.00	52.85	Alpheratz	
2	57°5.56	247°9.23	37.10	267°49.21	0.89	225°55.61	35.80	19°45.65	52.78	Ankaa	353°3.81
3	72°8.03	262°8.89	• • 36.02	282°50.25	14°0.42	240°57.59	36.00	34°48.30	• • 52.72	Schedar	349°26.86
4	87° 10.49	277°8.54	34.94	297°51.29	13°59.95	255°59.56	36.21	49°50.95	52.66	Diphda	348°43.94
5	102°12.96	292°8.20	33.86	$312^{\circ}52.33$	59.47	271°1.53	36.42	64°53.60	52.60	Achernar	335°17.44 327°47.36
6	117° 15.42	307°7.85	N05°32.78	327°53.37	N13°59.00	286° 3.50	S03°36.62	79°56.25	N11°52.53	Hamal Polaris	311°53.68
7	132° 17.88	322°7.50	31.69	342°54.41	58.53	301°5.47	36.83	94°58.90	52.47	Acamar	315° 9.10
8	147°20.35	337°7.16	30.61	357°55.45	58.06	316°7.44	37.04	110°1.55	52.41	Menkar	314° 2.64
9	162°22.81	352°6.81	• • 29.53	12°56.49	• • 57.58	331°9.41	• • 37.24	125°4.20	• • 52.34	Mirfak	308°23.34
10	177°25.28	7°6.47	28.44	27° 57.53	57.11	346°11.38	37.45	140°6.85	52.28	Aldebaran	290°35.85
11 12	192°27.74 207°30.20	22°6.12 37°5.78	27.36 N05°26.28	42° 58.58 57° 59.62	56.64 N13°56.17	1°13.35 16°15.32	37.66 \$03°37.86	155°9.50 170°12.15	52.22 N11°52.15	Rigel	281°0.73
13	207 30.20 222° 32.67	52°5.43	25.19	73°0.66	55.69	31°17.30	38.07	170 12.13 185°14.81	52.09	Capella	$280^{\circ}17.06$
14	237°35.13	67°5.08	24.11	88°1.70	55.22	46°19.27	38.28	200°17.46	52.03	Bellatrix	278°19.41
15	252°37.60	82°4.74	23.02	103°2.75	• • 54.75	61°21.24	• • 38.48	215°20.11	51.97	Elnath	277°57.78
16	267°40.06	97°4.39	21.94	118°3.79	54.27	76°23.21	38.69	230°22.76	51.90	Alnilam	275°34.45
17	282° 42.53	112°4.05	20.85	133°4.83	53.80	91°25.18	38.89	245°25.41	51.84	Betelgeuse	270°48.62
18	297°44.99	127°3.70	N05°19.76	148°5.88	N13°53.33	106°27.15	S03°39.10	260°28.06	N11°51.78	Canopus Sirius	263°50.83 258°23.44
19	312°47.45	142°3.36	18.68	163°6.92	52.85	121°29.12	39.31	275°30.71	51.71	Adhara	255° 3.37
20	327° 49.92	157°3.01	17.59	178°7.96	52.38	136°31.10	39.51	290°33.36	51.65	Procyon	244°47.62
21	342°52.38	172°2.67	• • 16.50	193°9.01	• • 51.91	151°33.07	• • 39.72	305°36.01	• • 51.59	Pollux	
22	357° 54.85	187°2.32	15.41	208° 10.05	51.44	166°35.04	39.93	320°38.66	51.52	Avior	234°13.50
23	12°57.31	202°1.98	14.33	223°11.10	50.96	181°37.01	40.13	335°41.32	51.46	Suhail	222°44.16
Mer.p	pass. 22:08	$\nu$ -0.3' d-1	1′ m-4.02	$\nu 1.0' \ d-0$	.5′ m1.43	$\nu$ 2.0′ d0.	2′ m-1.67	$\nu$ 2.7′ d-0	.1′ m-0.04	Miaplacidus	221°37.81
										Alphard	217°44.88
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.40
0	27°59.77	217°1.63	N05°13.24	238° 12.14	N13°50.49	196°38.98	S03°40.34	350°43.97	N11°51.40	Dubhe	193°37.94
1	43°2.24	232°1.29	12.15	253° 13.19	50.01	211°40.95	40.54	5°46.62	51.33	Denebola	182°22.14
2	58°4.70	247°0.94	11.06	268°14.23	49.54	226°42.92	40.75	20°49.27	51.27		175°40.72 172°57.17
3	73°7.17	262°0.60	• • 9.97	283°15.28	• • 49.07	241°44.90	• • 40.96	$35^{\circ}51.92$	• • 51.21		172 37.17 171°48.66
4	88°9.63	277°0.25	8.88	$298^{\circ}16.32$	48.59	256°46.87	41.16	50°54.57	51.15	Alioth	166°10.96
5	103°12.09	291°59.91	7.79	313°17.37	48.12	271°48.84	41.37	65°57.22	51.08	Spica	158° 19.39
6	118° 14.56	306°59.56	N05°6.70	328° 18.42	N13°47.65	286°50.81	S03°41.57	80°59.88	N11°51.02	Alkaid	152°50.17
7	133° 17.02	321°59.22	5.61	343°19.46	47.17	301°52.78	41.78	96°2.53	50.96	Hadar	$148^{\circ}32.17$
8 9	148° 19.49	336°58.88	4.52	358°20.51	46.70	316°54.75	41.99	111°5.18 126°7.83	50.89 •• 50.83	Menkent	$147^{\circ}54.35$
10	163°21.95 178°24.42	351°58.53 6°58.19	· · 3.43 2.33	13°21.56 28°22.60	•• 46.22 45.75	331°56.73 346°58.70	· · 42.19 42.40	120 7.83 141°10.48	50.83		145°45.48
11	178 24.42 193°26.88	21°57.84	1.24	43°23.65	45.75	2° 0.67	42.40	156°13.13	50.70	Rigil Kent.	139°36.62
12	208° 29.34	36°57.50	N05°0.15	58°24.70	N13°44.80	17°2.64	503°42.81	171°15.79	N11°50.64	Kochab	137°21.22
13	223°31.81	51°57.15	04°59.06	73°25.75	44.33	32°4.61	43.02	186°18.44	50.58	Zuben'ubi	136°52.93 126°1.50
14	238°34.27	66°56.81	57.96	88°26.79	43.85	47° 6.59	43.22	201°21.09	50.51	Alphecca Antares	120 1.50 112°12.34
15	253°36.74	81°56.46	• • 56.87	103°27.84	• • 43.38	62°8.56	• • 43.43	216°23.74	• • 50.45	Atria	107° 4.11
16	268°39.20	96°56.12	55.78	118°28.89	42.90	77°10.53	43.63	231°26.39	50.39	Sabik	101°59.49
17	283°41.66	111°55.78	54.68	133°29.94	42.43	92°12.50	43.84	246°29.05	50.32	Shaula	96° 6.44
18	298°44.13	126°55.43	N04°53.59	148°30.99	N13°41.95	107°14.47	S03°44.04	261°31.70	N11°50.26	Rasalhague	95°55.90
19	313°46.59	141°55.09	52.49	163°32.04	41.48	122°16.45	44.25	276°34.35	50.20	Eltanin	$90^{\circ}41.01$
20	328° 49.06	156°54.74	51.40 •• 50.30	178°33.09	41.00 •• 40.53	137°18.42	44.46 •• 44.66	291°37.00	50.13	Kaus Aust.	83°28.62
21 22	343°51.52 358°53.98	171°54.40 186°54.06	49.21	193°34.14 208°35.19	40.05	152°20.39 167°22.36	44.87	306°39.66 321°42.31	· · 50.07 50.01	Vega	80°31.28
23	13° 56.45	201°53.71	48.11	223°36.24	39.58	182°24.33	45.07	336°44.96	49.94	Nunki	75°44.08
										Altair	61°56.98
Mer.p	pass. 22:04	$\nu$ -0.3′ d-1	1′ m-4.02	$\nu 1.0' d-0$	.5′ m1.42	$\nu 2.0' d0.$	2′ m-1.67	$\nu 2.7' \ d-0$	.1′ m-0.04	Peacock	53°0.93 49°23.58
										Deneb Enif	33°35.64
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.91
0	28°58.91	216°53.37	N04°47.01	238° 37.29	N13°39.10	197°26.31	S03°45.28		N11°49.88	Fomalhaut	15° 10.94
1	44°1.38	231°53.03	45.92	253°38.34	38.63	212°28.28	45.48	6°50.27	49.82	Scheat	13°41.93
2	59°3.84	246°52.68	44.82	268°39.39	38.15	227°30.25	45.69	21°52.92	49.75	Markab	$13^{\circ}26.59$
3	74°6.31	261°52.34	• • 43.72	283°40.44	• • 37.68	242°32.22	• • 45.89	36°55.57	• • 49.69	O-+ 10 W	SHA
4	89°8.77	276°51.99	42.62	298°41.49	37.20	257°34.20 272°36.17	46.10	51°58.22	49.63	Oct 18 Wed Venus	3HA 190°9.29
5 6	104°11.23 119°13.70	291°51.65	41.52 N04°40.43	313°42.55 328°43.60	36.73 N13°36.25	272 30.17 287°38.14	46.31 \$03°46.51	67°0.88	49.56 N11°49.50		210° 46.49
7	119 15.70 134° 16.16	321°50.96	39.33	343°44.65	35.78	302°40.11	46.72	97°6.18	49.44		168°51.04
8	149° 18.63	336°50.62	38.23	358° 45.70	35.30	317°42.09	46.92	112°8.84	49.37		322°39.71
9	164°21.09	351°50.28	37.13	13°46.75	• • 34.83	332°44.06	47.13	127°11.49	• • 49.31		
10	179°23.55	6°49.93	36.03	28°47.81	34.35	347°46.03	47.33	142°14.14	49.25	Oct 19 Thu	SHA
11	194°26.02	21°49.59	34.93	43°48.86	33.88	2°48.00	47.54	157°16.80	49.18	Venus	189°1.86
12	209°28.48	36°49.25	N04°33.83	58°49.91	N13°33.40	17°49.98	S03°47.74	172°19.45	N11°49.12		210°12.37 168°39.21
13	224° 30.95	51°48.90	32.73	73°50.97	32.92	32°51.95	47.95	187°22.10	49.06		322°44.19
14	239°33.41	66°48.56	31.63	88°52.02	32.45	47°53.92	48.15	202°24.76	48.99		
15	254° 35.88	81°48.22	• • 30.53	103°53.08	• • 31.97	62°55.89	• • 48.36	217°27.41	• • 48.93	Oct 20 Fri	SHA
16	269°38.34	96°47.87	29.42	118°54.13 133°55.18	31.50 31.02	77°57.87	48.56	232°30.06 247°32.72	48.87		187°54.46
17 18	284° 40.80 299° 43.27	111°47.53 126°47.19	28.32 N04°27.22	133°55.18 148°56.24	31.02 N13°30.54	92°59.84 108°1.81	48.77 \$03°48.97		48.80 N11°48.74		209°38.38 168°27.39
19	314° 45.73	141°46.84	26.12	163°57.29	30.07	123° 3.79	49.18	277°38.02	48.68		322°48.70
20	329° 48.20	156°46.50	25.01	178° 58.35	29.59	138° 5.76	49.38	292°40.68	48.61		
21	344° 50.66	171°46.16	• • 23.91	193°59.41	• • 29.12	153° 7.73	• • 49.59	307°43.33	• • 48.55	Horizor	ıtal parallax
22	$359^{\circ}53.12$	186°45.81	22.81	209°0.46	28.64	$168^{\circ}9.70$	49.79	322°45.98	48.49		Venus:
23	14°55.59	201°45.47	21.70	224°1.52	28.16	183°11.68	50.00	337°48.64	48.42		Mars:
Mer	pass. 22:00	$\nu$ -0.3' d-1	.1′ m-4.01	$\nu 1.1' d-0$	.5′ m1.42	$\nu 2.0' d0$	2′ m-1.68	$\nu 2.7' d-0$	.1′ m-0.05		

Dec

29°15.24 -42°8.86

56°41.95 -17°49.55

-57°5.32

23°36.05 89°22.93

-40°11.17 4°12.28

49°57.76 16°34.03

-8°10.00

46°1.41 6°22.56

28°37.79 -1°10.96 7°24.74 -52°42.39

-16°45.23 -29°0.50

 $5^{\circ}9.04$ 

27°57.21 -59°35.85

-43°32.74 -69°49.88

-8°46.97

11°49.52

61°35.49

14°24.64

-17°42.04 -63°15.44 -57°16.39

55°48.13 -11°18.63

49°10.18 -60°30.68

-36°30.64

-60°57.26

 $19^{\circ}2.03$ 

74°2.26

-16°9.60

26°37.23 -26°29.67

-69°4.81

-15°45.50

-37°7.43

 $12^{\circ}32.58$ 

51°29.43

-34°22.19 38°48.97

-26°15.55 8°56.95

-56°38.58

45°23.40

 $10^{\circ}0.72$ 

-46°49.26 -29°28.06

28°14.66 15°21.90

Mer.pass

09:32

80:80

10:55

00:41 Mer.pass

09:32 08:07

10:52

00:37 Mer.pass

09:33

08:05

10:49

00:33

0.1

0.1

	011-010 =	+0.1330 sec		-011		0 000	
h	Su	n			Moon		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°42.79	S09°43.73	187°14.35	7.4'	\$13°42.89	13.8'	60.9'
1	198°42.91	44.64	201°40.77	7.4'	13°56.69	13.7'	60.8'
2	213°43.03 228°43.14	45.54 •• 46.45	216°7.13 230°33.43	7.3' 7.2'	14°10.39 14°24.00	13.6' 13.5'	60.8' 60.8'
3 4	243°43.26	47.36	244°59.68	7.2'	14 24.00 14°37.51	13.4	60.8
5	258°43.38	48.26	259°25.87	7.1	14°50.92	13.3'	60.8
6	273°43.50	S09°49.17	273°52.00	7.1'	S15° 4.22	13.2'	60.8
7	288°43.61	50.07	$288^{\circ}18.07$	7.0'	15°17.43	13.1'	60.8'
8	303°43.73	50.98	302°44.09	7.0'	15°30.52	13.0'	60.7'
9	318°43.85	• • 51.88	317°10.05	6.9'	15°43.51	12.9'	60.7'
10	333°43.96 348°44.08	52.79	331°35.96 346°1.81	6.8' 6.8'	15°56.39 16°9.16	12.8' 12.7'	60.7'
11 12	348 44.08 3°44.20	53.69 \$09°54.60	0°27.60	6.7	516°21.82	12.7	60.7' 60.7'
13	18°44.31	55.50	14°53.33	6.7	16°34.36	12.4	60.6
14	33°44.43	56.41	29°19.01	6.6'	16°46.79	12.3'	60.6'
15	48°44.54	• • 57.31	43°44.64	6.6'	16°59.09	12.2'	60.6'
16	63°44.66	58.21	58°10.21	6.5'	17°11.28	12.1'	60.6'
17	78°44.77	09°59.11	72°35.72	6.5'	17°23.35	11.9'	60.6'
18	93°44.89 108°45.00	\$10°0.02	87°1.18	6.4'	\$17°35.30	11.8'	60.5'
19 20	108°45.00 123°45.11	0.92 1.82	101°26.58 115°51.93	6.4' 6.3'	17°47.12 17°58.82	11.7' 11.6'	60.5' 60.5'
21	138°45.23	2.72	130°17.23	6.2	18°10.39	11.4	60.5
22	153°45.34	3.63	144°42.47	6.2	18°21.83	11.3'	60.5
23	168°45.45	4.53	159°7.67	6.1'	18°33.14	11.2'	60.4
	SD = 16.0'	d = 0.9'		Ç	D = 16.6'		
	3D = 10.0	u = 0.9			D = 10.0		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°45.56	S10°5.43	173°32.80	6.1'	\$18°44.32	11.0'	60.4
1	198°45.68	6.33	187°57.89	6.0'	18°55.37	10.9'	60.4
2	213°45.79 228°45.90	7.23 · · 8.13	202°22.93 216°47.92	6.0'	19°6.28 19°17.05	10.8'	60.4'
3 4	243°46.01	9.03	210 47.92 231°12.86	5.9' 5.9'	19 17.05 19°27.69	10.6' 10.5'	60.3' 60.3'
5	258°46.12	9.93	245°37.75	5.8'	19°27.09	10.4	60.3
6	273°46.23	S10° 10.83	260°2.59	5.8'	S19°48.55	10.2'	60.3
7	288°46.34	11.73	274°27.39	5.8'	19°58.77	10.1'	60.2'
8	303°46.45	12.63	288°52.14	5.7'	20°8.85	9.9'	60.2'
9	318°46.56	• • 13.53	303°16.85	5.7'	20°18.78	9.8'	60.2'
10	333°46.67	14.43	317°41.51	5.6'	20°28.57	9.6'	60.1
11 12	348°46.78 3°46.89	15.32 \$10° 16.22	332°6.13 346°30.71	5.6' 5.5'	20°38.21 \$20°47.70	9.5' 9.3'	60.1' 60.1'
13	18°47.00	17.12	0°55.24	5.5'	20°57.04	9.3 9.2'	60.1
14	33°47.11	18.02	15°19.74	5.5'	21°6.24	9.0'	60.0'
15	48°47.22	• • 18.91	29°44.20	5.4'	21°15.28	8.9'	60.0'
16	63°47.33	19.81	44°8.62	5.4'	21°24.18	8.7'	60.0'
17	78°47.44	20.71	58°33.01	5.3'	21°32.91	8.6'	59.9'
18 19	93°47.54 108°47.65	\$10°21.60 22.50	72°57.36 87°21.67	5.3' 5.3'	\$21°41.50 21°49.93	8.4' 8.3'	59.9' 59.9'
20	123°47.76	23.40	101°45.95	5.3'	21°58.20	8.1'	59.8'
21	138°47.86	24.29	116°10.21	5.2'	22°6.32	8.0'	59.8'
22	153°47.97	25.19	130°34.43	5.2'	22°14.28	7.8'	59.8'
23	168°48.08	26.08	144°58.63	5.2'	22°22.08	7.6'	59.7'
	SD = 16.1'	d = 0.9'		S	D = 16.5'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°48.18 198°48.29	\$10°26.98 27.87	159°22.79 173°46.93	5.1' 5.1'	\$22°29.73 22°37.21	7.5' 7.3'	59.7' 59.7'
2	213°48.39	28.77	173 46.93 188°11.05	5.1'	22°44.53	7.3 7.2'	59.7' 59.7'
3	228°48.50	• • 29.66	202°35.15	5.1'	22°51.69	7.0'	59.6'
4	243°48.60	30.55	$216^{\circ}59.22$	5.1'	22°58.69	6.8'	59.6'
5	258°48.71	31.45	231°23.28	5.0'	23°5.52	6.7'	59.5'
6	273°48.81	\$10° 32.34	245°47.32	5.0'	\$23°12.19	6.5'	59.5'
7	288°48.92	33.23	260°11.34	5.0'	23°18.70	6.3'	59.5'
8 9	303°49.02 318°49.12	34.13 · · 35.02	274°35.35 288°59.34	5.0' 5.0'	23°25.04 23°31.22	6.2' 6.0'	59.4' 59.4'
9 10	318°49.12 333°49.23	35.02	288°59.34 303°23.32	5.0'	23°31.22 23°37.23	5.8	59.4' 59.4'
11	348°49.33	36.80	303 23.32 317°47.30	5.0'	23°43.07	5.6 5.7'	59.4 59.3'
12	3°49.43	S10°37.69	332°11.26	5.0'	\$23°48.75	5.5'	59.3
13	18°49.53	38.59	$346^{\circ}35.22$	5.0'	23°54.27	5.3'	59.3'
14	33°49.64	39.48	0°59.18	5.0'	23°59.61	5.2'	59.2'
15	48°49.74	• • 40.37	15°23.13	5.0'	24°4.79	5.0'	59.2'
16 17	63°49.84 78°49.94	41.26	29°47.08	5.0'	24°9.80 24°14.64	4.8'	59.2'
17 18	78°49.94 93°50.04	42.15 \$10°43.04	44°11.03 58°34.99	5.0' 5.0'	24°14.64 S24°19.31	4.7' 4.5'	59.1' 59.1'
19	93 50.04 108°50.14	43.93	58 34.99 72°58.95	5.0'	24°23.82	4.5 4.3'	59.1 59.0'
20	123°50.24	44.82	87°22.92	5.0'	24°28.16	4.2'	59.0'
21	138°50.34	• • 45.71	101°46.89	5.0'	24°32.33	4.0'	59.0'
22	153°50.44	46.59	$116^{\circ}10.88$	5.0'	24°36.33	3.8'	58.9'
23	168°50.54	47.48	130°34.87	5.0'	24°40.16	3.7'	58.9'
	SD = 16.1'	d = 0.9'		S	D = 16.3'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup> 12 <sup>h</sup>		Pass	Upper Lower		0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-5%	
18	14:51	14:57	11:45	11:58	-:-		
19	15:02	15:08	11:45	12:56	00:27		
20	15:13	15:18	11:45	13:56	01:26		

### October 21, 22, 23 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	29° 58.05	216° 45.13	N04°20.60	239°2.57	N13°27.69	198°13.65	S03°50.20	352°51.29	N11°48.36		
1	45°0.52	231°44.79	19.49	254°3.63	27.21	213°15.62	50.41	7°53.94	48.29	Alpheratz	
2	60°2.98	246° 44.44	18.39	269°4.69	26.73	228°17.60	50.61	22°56.60	48.23	Ankaa	353°3.81
3	75°5.45	261°44.10	• • 17.28	284°5.74	26.26	243°19.57	50.82	37°59.25	• • 48.17	Schedar	349°26.86
4	90°7.91	276°43.76	16.18	299°6.80	25.78	258°21.54	51.02	53°1.91	48.10	Diphda	348° 43.94
5	105° 10.37	291°43.41	15.07	314°7.86	25.30	273°23.52	51.23	68°4.56	48.04	Achernar	335° 17.44
6	120°12.84	306°43.07	N04°13.97	329°8.92	N13°24.83	288°25.49	S03°51.43	83°7.21	N11°47.98	Hamal	327° 47.35
7	135° 15.30	321°42.73	12.86	344°9.97	24.35	303°27.46	51.64	98°9.87	47.91	Polaris Acamar	311°52.58 315°9.09
8	150° 17.77	336°42.39	11.75	$359^{\circ}11.03$	23.87	318°29.44	51.84	113°12.52	47.85	Menkar	314°2.62
9	165°20.23	351°42.04	• • 10.65	14°12.09	• • 23.40	333°31.41	• • 52.05	128°15.18	• • 47.79	Mirfak	308°23.31
10	180°22.70	6°41.70	9.54	29° 13.15	22.92	348°33.38	52.25	143°17.83	47.72	Aldebaran	290°35.82
11	195°25.16	21°41.36	8.43	44°14.21	22.44	3°35.36	52.46	158°20.48	47.66	Rigel	281°0.70
12	210°27.62	36°41.02	N04°7.32	59° 15.27	N13°21.96	18°37.33	S03°52.66	173°23.14	N11°47.60	Capella	280° 17.03
13	225°30.09	51°40.67	6.22	74°16.33	21.49	33°39.30	52.87	188°25.79	47.53	Bellatrix	$278^{\circ}19.38$
14 15	240° 32.55 255° 35.02	66°40.33 81°39.99	5.11	89°17.39 104°18.45	21.01 •• 20.53	48°41.28	53.07 •• 53.27	203°28.45 218°31.10	47.47	Elnath	277°57.75
16	255 35.02 270°37.48	96°39.65	· · 4.00 2.89	104 16.45 119° 19.51	20.05	63°43.25 78°45.23	· · 53.27 53.48	233°33.76	· · 47.41 47.34	Alnilam	275°34.42
17	285°39.94	111°39.30	1.78	119 19.51 134°20.57	19.58	93°47.20	53.48	248°36.41	47.28	Betelgeuse	270°48.59
18	300°42.41	126°38.96	N04° 0.67	149°21.63	N13°19.10	108°49.17	S03°53.89	263°39.06	N11°47.21		263°50.80
19	315° 44.87	141°38.62	03°59.56	164°22.69	18.62	123°51.15	54.09	278°41.72	47.15	1	258°23.41
20	330° 47.34	156°38.28	58.45	179°23.75	18.14	138°53.12	54.30	293°44.37	47.09	Adhara	255°3.34
21	345°49.80	171°37.93	• • 57.34	194°24.81	17.67	153°55.09	• • 54.50	308°47.03	• • 47.02	Procyon	244°47.60
22	0°52.27	186°37.59	56.23	209°25.87	17.19	168°57.07	54.71	323°49.68	46.96	Pollux	
23	15°54.73	201°37.25	55.12	224°26.93	16.71	183°59.04	54.91	338°52.34	46.90	Avior	234° 13.46
N/au =	21.57	0 3/ 4 1	.1′ m-4.01	1 1/ ./ 0	0.5' m1.41	2 0/ 40	2′ m-1.68	27/40	.1′ m-0.05	Suhail	222°44.13 221°37.75
ivier.p	pass. 21:57	$\nu$ -0.3 a-1	.1 m-4.01	$\nu_{1.1}$ a-0	0.5 M1.41	ν2.0 au.	2 m-1.08	ν2.Γ a-0	.1 m-0.05	Miaplacidus Alphard	221 37.75 217°44.86
										Regulus	207°31.37
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193° 37.91
0	30°57.19	$216^{\circ}36.91$	N03°54.01	239°27.99	N13°16.23	$199^{\circ}1.02$	S03°55.11	353°54.99	N11°46.83	Denebola	182°22.13
1	45°59.66	231°36.56	52.90	254°29.06	15.76	214° 2.99	55.32	8°57.65	46.77		175°40.71
2	61°2.12	246°36.22	51.78	269°30.12	15.28	229° 4.96	55.52	24°0.30	46.71	1	172°57.14
3	76°4.59	261°35.88	• • 50.67	284°31.18	• • 14.80	244°6.94	• • 55.73	39°2.96	• • 46.64		171°48.64
4	91°7.05	276°35.54	49.56	299°32.24	14.32	259°8.91	55.93	54°5.61	46.58	Alioth	$166^{\circ}10.95$
5	106°9.51	291°35.20	48.45	314°33.31	13.84	274°10.89	56.13	69°8.27	46.51	Spica	$158^{\circ}19.38$
6	121°11.98	306°34.85	N03°47.33	329°34.37	N13°13.37	289°12.86	\$03°56.34	84°10.92	N11°46.45	Alkaid	$152^{\circ}50.17$
7 8	136° 14.44 151° 16.91	321°34.51 336°34.17	46.22	344°35.43 359°36.50	12.89	304°14.84 319°16.81	56.54	99°13.58 114°16.23	46.39	Hadar	$148^{\circ}32.15$
9	166° 19.37	351°33.83	45.11 •• 43.99	14°37.56	12.41 •• 11.93	334°18.78	56.75 •• 56.95	114 10.23 129°18.89	46.32 •• 46.26		147°54.34
10	181°21.84	6°33.48	42.88	29°38.63	11.45	349°20.76	57.15	144°21.54	46.20	1	145° 45.47
11	196°24.30	21°33.14	41.76	44°39.69	10.97	4°22.73	57.36	159°24.20	46.13	Rigil Kent.	139°36.61
12	211°26.76	36°32.80	N03°40.65	59°40.76	N13°10.50	19°24.71	S03°57.56	174°26.85	N11°46.07	Kochab	137°21.24
13	226° 29.23	51°32.46	39.53	74°41.82	10.02	34°26.68	57.77	189°29.51	46.01	Zuben'ubi	136°52.93
14	241°31.69	66°32.12	38.42	89°42.89	9.54	49°28.66	57.97	204°32.16	45.94	Alphecca Antares	126°1.50 112°12.34
15	256°34.16	81°31.77	• • 37.30	104°43.95	· · 9.06	64°30.63	• • 58.17	219°34.82	• • 45.88	Antares	112 12.34 107°4.13
16	271°36.62	96°31.43	36.19	119°45.02	8.58	79°32.60	58.38	234°37.47	45.81	Sabik	107 4.13 101°59.49
17	286°39.08	111°31.09	35.07	134°46.08	8.10	94°34.58	58.58	249°40.13	45.75	Shaula	96°6.44
18	301°41.55	126°30.75	N03°33.95	149°47.15	N13°7.62	109°36.55	S03°58.79	264°42.78	N11°45.69	Rasalhague	95°55.91
19	316°44.01	141°30.41	32.84	164°48.22	7.15	124°38.53	58.99	279°45.44	45.62	Eltanin	90°41.03
20	331°46.48	156°30.06	31.72	179°49.28	6.67	139°40.50	59.19	294°48.10	45.56	Kaus Aust.	83°28.62
21	346°48.94	171°29.72	• • 30.60	194° 50.35	• • 6.19	154°42.48	• • 59.40	309°50.75	• • 45.50	Vega	80°31.30
22	1°51.41	186°29.38	29.49	209°51.42	5.71	169°44.45	59.60	324°53.41	45.43	Nunki	75°44.08
23	16°53.87	201°29.04	28.37	224°52.48	5.23	184°46.43	59.80	339°56.06	45.37	Altair	61°56.99
Mer.p	bass. 21:53	$\nu$ -0.3 $'$ d-1	.1' m-4.01	$\nu 1.1' \ d$ -0	$0.5' \; {\rm m}1.41$	$\nu 2.0' \ d0.$	2′ m-1.68	$\nu 2.7' \ d-0$	.1' m-0.06	Peacock	53°0.95
										Deneb	49°23.59
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.64
0	31°56.33	216°28.70	N03°27.25	239°53.55	N13° 4.75	199°48.40	S04°0.01	354°58.72	N11°45.30	Al Na'ir	27°28.92
1	46°58.80	231°28.35	26.13	254° 54.62	4.27	214°50.38	0.21	10°1.37	45.24	Fomalhaut	15° 10.94 13° 41.93
2	62°1.26	246°28.01	25.01	269° 55.69	3.79	229°52.35	0.41	25°4.03	45.18	Scheat Markab	13° 41.93 13° 26.59
3	77°3.73	261°27.67	• • 23.89	284°56.76	• • 3.31	244°54.33	• • 0.62	40°6.68	• • 45.11		
4	$92^{\circ}6.19$	276°27.33	22.78	299° 57.82	2.83	259°56.30	0.82	55°9.34	45.05	Oct 21 Sat	SHA
5	107°8.65	291°26.99	21.66	314°58.89	2.35	274°58.28	1.03	70°12.00	44.99		186°47.08
6	122°11.12		N03°20.54	329°59.96	N13° 1.88	290° 0.25	S04°1.23		N11°44.92	Mars	209°4.52
7	137° 13.58	321°26.30	19.42	345°1.03	1.40	305°2.23	1.43	100°17.31	44.86		168°15.60
8	152° 16.05	336°25.96	18.30	0°2.10	0.92	320°4.20	1.64	115°19.96	44.79	Saturn	322°53.24
9	167° 18.51	351°25.62	• • 17.18	15°3.17	• • 0.44	335° 6.18	• • 1.84	130°22.62	• • 44.73	Oct 22 Sun	SHA
10	182°20.98	6°25.28 21°24.94	16.06	30°4.24 45°5.31	12°59.96 12°59.48	350°8.15 5°10.13	2.04	145°25.28	44.67 44.60		185°39.71
11 12	197°23.44 212°25.90	36°24.59	14.93 N03°13.81	45°5.31 60°6.38	N12°59.48	5°10.13 20°12.10	2.25 \$04°2.45	160°27.93 175°30.59	44.60 N11°44.54		208°30.80
13	212 25.90 227°28.37	50 24.59 51°24.25	12.69	75°7.45	58.52	20 12.10 35°14.08	2.65	175 30.59 190°33.24	N11 44.54 44.48	Jupiter	168°3.82
14	242°30.83	66°23.91	11.57	90°8.52	58.04	50°16.06	2.85	205°35.90	44.41	Saturn	322°57.80
15	257° 33.30	81°23.57	10.45	105°9.59	• • 57.56	65°18.03	3.06	220°38.56	• • 44.35	Oct 23 Mon	SHA
16	272°35.76	96°23.23	9.33	120° 10.67	57.08	80°20.01	3.26	235°41.21	44.28		184° 32.36
17	287°38.22	111°22.89	8.20	135°11.74	56.60	95°21.98	3.46	250°43.87	44.22	1	207° 57.22
18	302°40.69	126°22.54	N03°7.08	150° 12.81	N12°56.12	110°23.96	S04°3.67				167°52.07
19	$317^{\circ}43.15$	141°22.20	5.96	$165^{\circ}13.88$	55.64	125°25.93	3.87	280°49.18	44.09	Saturn	323°2.38
20	$332^{\circ}45.62$	156°21.86	4.83	$180^{\circ}14.95$	55.16	140°27.91	4.07	295°51.84	44.03		
21	347°48.08	171°21.52	• • 3.71	195° 16.03	• • 54.68	155°29.89	• • 4.28	310°54.49	• • 43.97	Horizor	ntal parallax
22	2°50.55	186°21.18	2.59	210° 17.10	54.20	170°31.86	4.48	325°57.15	43.90		Venus:
23	17°53.01	201°20.83	1.46	225°18.17	53.72	185°33.84	4.68	340°59.81	43.84		Mars:
Mer.	pass. 21:49	$\nu$ -0.3' d-1	.1′ m-4.01	$\nu$ 1.1' d-0	0.5′ m1.40	$\nu 2.0' d0.$	2′ m-1.68	$\nu 2.7' \ d-0$	.1′ m-0.07		

Dec

29°15.24 -42°8.87

56°41.96 -17°49.55

-57°5.33

23°36.06 89°22.94

-40°11.19

4°12.28 49°57.76 16°34.03

-8°10.01

46°1.42 6°22.56

28°37.79 -1°10.97

7°24.73 -52°42.40

-16°45.23 -29°0.50

-59°35.85

-43°32.74 -69°49.88

-8°46.97

11°49.51

61°35.47

14°24.63

-17°42.05 -63°15.43 -57°16.38

55°48.11 -11°18.63

49°10.16 -60°30.67

-36°30.63

-60°57.25

 $19^{\circ}2.02$ 

74°2.24 -16°9.60

26°37.22 -26°29.66

-69°4.80

-37°7.43

 $12^{\circ}32.58$ 

51°29.43

-34°22.19 38°48.97

-26°15.55 8°56.95

-56°38.58

 $45^{\circ}23.40$ 

 $10^{\circ}0.72$ 

-46°49.27

-29°28.07

28°14.67 15°21.91

Mer.pass

09:33

08:03

10:46

00:28 Mer.pass

09:34

08:02

10:43

00:24 Mer.pass

09:34 08:00

10:39

00:20

0.1

0.1

-15°45.50

5°9.03 27°57.20

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.64	S10°48.37	144°58.88	5.0'	S24°43.82	3.5'	58.9'
1 2	198° 50.74 213° 50.84	49.26 50.15	159°22.91 173°46.95	5.0' 5.1'	24°47.31 24°50.64	3.3' 3.2'	58.8' 58.8'
3	228° 50.94	51.03	188°11.02	5.1'	24°53.79	3.0'	58.7'
4	243°51.03	51.92	202°35.10	5.1'	24°56.78	2.8'	58.7'
5	258°51.13 273°51.23	52.81 \$10°53.69	216°59.21 231°23.34	5.1' 5.2'	24°59.60 \$25°2.26	2.7'	58.7' 58.6'
6 7	273 51.23 288°51.33	54.58	231 23.34 245°47.50	5.2' 5.2'	525 2.26 25°4.74	2.5	58.6'
8	303°51.42	55.47	260°11.69	5.2'	25°7.06	2.2'	58.5'
9	318°51.52	• • 56.35	274°35.91	5.3'	25°9.21	2.0'	58.5'
10 11	333°51.62 348°51.71	57.24 58.12	289°0.16 303°24.45	5.3' 5.3'	25°11.19 25°13.01	1.8' 1.7'	58.5' 58.4'
12	3°51.81	\$10°59.01	317°48.77	5.4	\$25°14.66	1.5'	58.4
13	18°51.90	$10^{\circ}59.89$	$332^{\circ}13.13$	5.4'	$25^{\circ}16.14$	1.3'	58.4'
14 15	33°52.00 48°52.09	11°0.78 •• 1.66	346°37.53 1°1.97	5.4' 5.5'	25°17.46 25°18.62	1.2' 1.0'	58.3' 58.3'
16	63°52.19	2.54	15°26.45	5.5'	25°19.61	0.8	58.2'
17	78°52.28	3.43	$29^{\circ}50.98$	5.6'	$25^{\circ}20.44$	0.7'	58.2'
18	93°52.38	S11° 4.31	44°15.55	5.6'	\$25°21.10	0.5'	58.2'
19 20	108° 52.47 123° 52.56	5.19 6.08	58°40.18 73°4.85	5.7' 5.7'	25°21.60 25°21.94	0.3' 0.2'	58.1' 58.1'
21	138° 52.66	. 6.96	87°29.57	5.8'	25°22.12	0.0'	58.0'
22	153° 52.75	7.84	101°54.35	5.8'	25°22.14	-0.1'	58.0'
23	168°52.84	8.72	116°19.18	5.9'	25°22.00	-0.3'	58.0'
	SD = 16.1'	d = 0.9'		SE	0 = 16.1'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°52.94	S11°9.60	$130^{\circ}44.07$	5.9'	S25°21.70	-0.5'	57.9'
1	198° 53.03 213° 53.12	10.48 11.36	145°9.02 159°34.03	6.0'	25°21.24 25°20.62	-0.6'	57.9'
2	213°53.12 228°53.21	11.36	159° 34.03 173° 59.09	6.1' 6.1'	25° 20.62 25° 19.85	-0.8' -0.9'	57.8' 57.8'
4	243°53.30	13.13	188°24.22	6.2'	25°18.92	-1.1'	57.8'
5	258° 53.39	14.01	202°49.42	6.3'	25°17.83	-1.2'	57.7'
6 7	273°53.48 288°53.57	S11°14.88 15.76	217°14.68 231°40.00	6.3' 6.4'	\$25°16.59 25°15.20	-1.4' -1.5'	57.7' 57.6'
8	303°53.66	16.64	246° 5.40	6.5'	25°13.65	-1.7'	57.6'
9	318° 53.75	•• 17.52	260°30.86	6.5'	25°11.95	-1.8'	57.6'
10 11	333° 53.84 348° 53.93	18.40 19.28	274°56.40 289°22.01	6.6' 6.7'	25°10.10 25°8.11	-2.0' -2.1'	57.5' 57.5'
12	3°54.02	\$11°20.16	303°47.69	6.8'	\$25°5.96	-2.3	57.4
13	18°54.11	21.03	318°13.45	6.8'	25°3.66	-2.4'	57.4'
14 15	33°54.20 48°54.29	21.91 •• 22.79	332°39.28 347°5.19	6.9' 7.0'	25°1.22 24°58.63	-2.6' -2.7'	57.4' 57.3'
16	63° 54.37	23.66	1°31.17	7.0 7.1'	24°55.90	-2.1 -2.9'	57.3'
17	78°54.46	24.54	$15^{\circ}57.24$	7.1'	$24^{\circ}53.02$	-3.0'	57.3'
18	93°54.55 108°54.63	\$11°25.42 26.29	30°23.39 44°49.62	7.2' 7.3'	\$24°50.00 24°46.84	-3.2'	57.2'
19 20	106 54.03 123°54.72	20.29	59°15.93	7.3 7.4'	24°43.54	-3.3' -3.4'	57.2' 57.1'
21	138°54.81	• • 28.04	73°42.32	7.5'	$24^{\circ}40.10$	-3.6'	57.1'
22	153° 54.89	28.92 29.79	88°8.80	7.6'	24°36.52	-3.7'	57.1'
23	168°54.98		102°35.36	7.6'	24°32.80	-3.9'	57.0'
	SD = 16.1'	d = 0.9'		SL	D = 15.8'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°55.06 198°55.15	\$11°30.67 31.54	117°2.01 131°28.75	7.7' 7.8'	\$24°28.94 24°24.95	-4.0' -4.1'	57.0' 56.9'
2	213°55.23	32.41	145°55.58	7.0 7.9'	24°20.83	-4.1 -4.3'	56.9'
3	228°55.32	• • 33.29	160°22.49	8.0'	24°16.57	-4.4'	56.9'
4 5	243°55.40 258°55.49	34.16 35.03	174°49.49 189°16.58	8.1' 8.2'	24°12.19 24°7.67	-4.5' -4.6'	56.8' 56.8'
6	258° 55.49 273° 55.57	35.03 \$11°35.90	203°43.76	8.2	524°3.02	-4.6' -4.8'	56.8
7	288°55.65	36.78	218°11.04	8.4'	23°58.24	-4.9'	56.7'
8 9	303°55.74 318°55.82	37.65 •• 38.52	232°38.40 247°5.86	8.5' 8.5'	23°53.34 23°48.31	-5.0' -5.2'	56.7' 56.7'
10	318 55.82 333°55.90	39.39	247 5.80 261°33.41	8.6'	23 48.31 23°43.16	-5.2 -5.3'	56.6'
11	348°55.98	40.26	$276^{\circ}1.05$	8.7'	23°37.88	-5.4'	56.6'
12	3°56.07	\$11°41.13	290°28.78	8.8'	\$23°32.48	-5.5'	56.5'
13 14	18° 56.15 33° 56.23	42.00 42.87	304°56.61 319°24.54	8.9' 9.0'	23°26.96 23°21.32	-5.6' -5.8'	56.5' 56.5'
15	48°56.31	• • 43.74	$333^{\circ}52.56$	9.1'	$23^{\circ}15.56$	-5.9'	56.4'
16	63°56.39	44.61	348°20.67	9.2'	23°9.69	-6.0'	56.4'
17 18	78° 56.47 93° 56.55	45.48 \$11°46.35	2°48.88 17°17.18	9.3' 9.4'	23°3.70 \$22°57.59	-6.1' -6.2'	56.4' 56.3'
19	108° 56.63	47.22	31°45.58	9.5'	22°51.37	-6.3'	56.3'
20	123°56.71	48.08	46°14.07	9.6'	22°45.03	-6.4'	56.3
21 22	138° 56.79 153° 56.87	· · 48.95 49.82	60°42.66 75°11.35	9.7' 9.8'	22°38.59 22°32.03	-6.6' -6.7'	56.2' 56.2'
23	168° 56.95	50.69	89°40.13	9.9'	22°25.37	-6.8'	56.2'
	SD = 16.1'	d = 0.9'		SE	0 = 15.5'		

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

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

	Sun Mod				Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-28%		
21	15:23	15:27	11:45	14:56	02:26			
22	15:32	15:36	11:44	15:54	03:25			
23	15:40	15:44	11:44	16:48	04:21			

#### October 24, 25, 26 UT (Tue., Wed., Thu.)

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	32°55.47	216°20.49	N03° 0.34	240° 19.25	N12°53.24	200°35.81	S04°4.88	356°2.46	N11° 43.77		
1	47°57.94	231°20.15	02°59.21	255°20.32	52.76	215°37.79	5.09	11°5.12	43.71	Alpheratz	
2	63°0.40	246°19.81	58.09	270°21.39	52.28	230°39.76	5.29	26°7.78	43.65	Ankaa	353°3.81
3	78°2.87	261°19.47	• • 56.96	285°22.47	• • 51.80	245°41.74	5.49	41°10.43	• • 43.58	Schedar	349°26.85
4	93°5.33	$276^{\circ}19.13$	55.84	300°23.54	51.32	260°43.72	5.70	56°13.09	43.52	Diphda	348°43.93
5	108°7.79	291°18.78	54.71	$315^{\circ}24.62$	50.84	275°45.69	5.90	71°15.75	43.46	Achernar	335°17.43 327°47.34
6	123° 10.26	306°18.44	N02°53.59	330°25.69	N12°50.36	290°47.67	S04°6.10	86°18.40	N11°43.39	Hamal	311°51.74
7	$138^{\circ}12.72$	321°18.10	52.46	345°26.77	49.88	305°49.65	6.30	101°21.06	43.33	Acamar	315°9.07
8	153° 15.19	336° 17.76	51.34	0°27.84	49.40	320°51.62	6.51	116°23.72	43.26	Menkar	314°2.61
9	168° 17.65	351°17.42	• • 50.21	15°28.92	• • 48.91	335°53.60	• • 6.71	131°26.37	• • 43.20	Mirfak	308°23.29
10	183°20.12	6°17.07	49.08	30°29.99	48.43	350°55.57	6.91	146°29.03	43.14	Aldebaran	290°35.80
11	198°22.58 213°25.04	21°16.73 36°16.39	47.95	45°31.07 60°32.14	47.95 N12°47.47	5°57.55	7.11 \$04°7.32	161°31.69 176°34.34	43.07 N11°43.01	Rigel	281°0.68
12 13	213 25.04 228° 27.51	50 10.59 51°16.05	N02°46.83 45.70	75° 33.22	46.99	20°59.53 36°1.50	7.52	170 34.34 191°37.00	42.94	Capella	$280^{\circ}16.99$
14	243°29.97	66°15.71	45.70 44.57	90°34.30	46.51	50 1.50 51° 3.48	7.52	206°39.66	42.94 42.88	Bellatrix	$278^{\circ}19.36$
15	258° 32.44	81°15.36	• • 43.44	105°35.37	• • 46.03	66° 5.46	7.92	221°42.32	• • 42.82	Elnath	277°57.72
16	273°34.90	96°15.02	42.32	120°36.45	45.55	81°7.43	8.13	236°44.97	42.75	Alnilam	275°34.40
17	288° 37.36	111°14.68	41.19	135°37.53	45.07	96° 9.41	8.33	251°47.63	42.69	Betelgeuse	270°48.57
18	303°39.83		N02°40.06	150°38.61	N12°44.59	111°11.39	S04°8.53	266°50.29	N11°42.63	Canopus	263°50.76
19	318°42.29	141°14.00	38.93	165°39.68	44.11	126°13.36	8.73	281°52.94	42.56	Sirius	258°23.39
20	333°44.76	$156^{\circ}13.66$	37.80	180°40.76	43.62	141°15.34	8.94	296°55.60	42.50	Adhara	255°3.32 244°47.57
21	348°47.22	171°13.31	• • 36.67	195°41.84	• • 43.14	156°17.32	• • 9.14	311°58.26	• • 42.43	Procyon Pollux	244 47.57 243°13.53
22	3°49.69	186° 12.97	35.54	210°42.92	42.66	171°19.29	9.34	327°0.91	42.37	Avior	234°13.42
23	18°52.15	201°12.63	34.41	225°44.00	42.18	186°21.27	9.54	342°3.57	42.31	Suhail	222°44.10
Mer n	ass. 21:45	$\nu$ -0.3' d-1.	1′ m-4 00	$\nu 1.1' d-0$	.5′ m1.40	$\nu^2 0' d0$	2′ m-1.68	$\nu^2 7' d-0$	.1′ m-0.07	Miaplacidus	221°37.70
		- 0.0 4 1.								Alphard	217°44.83
			_		_		_		_	Regulus	207°31.35
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.87
0	33°54.61		N02°33.28	240°45.08	N12°41.70	201°23.25	S04°9.74	357°6.23	N11° 42.24	Denebola	$182^{\circ}22.11$
1	48°57.08	231°11.95	32.15	255°46.16	41.22	216°25.22	9.95	12°8.89	42.18	Gienah	
2 3	63°59.54 79°2.01	246°11.60 261°11.26	31.02 •• 29.89	270°47.23 285°48.31	40.74 •• 40.26	231°27.20 246°29.18	10.15 •• 10.35	27°11.54 42°14.20	42.11		$172^{\circ}57.12$
3 4	79 2.01 94°4.47	276° 10.92	28.76	300°49.39	39.77	261°31.15	10.55	57°16.86	•• 42.05 41.99	1	171°48.61
5	109°6.93	270 10.92 291°10.58	27.63	315°50.47	39.77	276°33.13	10.55	72°19.52	41.99	Alioth	
6	124° 9.40		N02°26.50	330°51.55	N12°38.81	291°35.11	S04°10.96	87°22.17	N11°41.86		158°19.36
7	139°11.86	321°9.89	25.37	345°52.64	38.33	306°37.09	11.16	102°24.83	41.80		152°50.16
8	154° 14.33	336°9.55	24.23	0°53.72	37.85	321°39.06	11.36	117°27.49	41.73	Hadar	148°32.14
9	169° 16.79	351°9.21	23.10	15°54.80	• • 37.37	336°41.04	• • 11.56	132°30.14	• • 41.67	1	147°54.33
10	184° 19.25	6°8.87	21.97	30°55.88	36.88	351°43.02	11.76	147°32.80	41.60	1	145°45.47
11	199°21.72	21°8.52	20.84	45°56.96	36.40	6°45.00	11.97	162°35.46	41.54	Rigil Kent. Kochab	139°36.60 137°21.26
12	214°24.18	36°8.18	N02°19.70	60°58.04	N12°35.92	21°46.97	S04°12.17	177°38.12	N11°41.48	Zuben'ubi	136°52.92
13	229° 26.65	51°7.84	18.57	75°59.12	35.44	36°48.95	12.37	192°40.77	41.41	Alphecca	126°1.50
14	244°29.11	66°7.50	17.44	91°0.21	34.96	51°50.93	12.57	207°43.43	41.35	Antares	112°12.35
15	259°31.58	81°7.16	• • 16.30	106°1.29	• • 34.47	66°52.91	• • 12.77	222°46.09	• • 41.28	Atria	107°4.14
16	274°34.04	96°6.81	15.17	121°2.37	33.99	81°54.88	12.97	237°48.75	41.22	Sabik	101°59.49
17	289°36.50	111°6.47	14.04	136°3.45	33.51	96°56.86	13.18	252°51.40	41.16	Shaula	96°6.45
18	304°38.97 319°41.43	126°6.13 141°5.79	N02°12.90	151°4.54	N12°33.03	111°58.84 127°0.82	S04°13.38	267°54.06 282°56.72	N11°41.09	Rasalhague	$95^{\circ}55.91$
19 20	334° 43.90	141 5.79 156°5.44	11.77 10.63	166°5.62 181°6.70	32.55 32.06	142° 2.79	13.58 13.78	202 50.72 297°59.38	41.03 40.97	Eltanin	90°41.05
21	349° 46.36	171°5.10	• • 9.50	196°7.79	• • 31.58	157° 4.77	• 13.78	313°2.04	• • 40.90	Kaus Aust.	83°28.63
22	4° 48.82	186°4.76	8.36	211°8.87	31.10	172° 6.75	14.18	328°4.69	40.84	Vega	80°31.31
23	19°51.29	201°4.42	7.23	226°9.96	30.62	187°8.73	14.38	343°7.35	40.77	Nunki	75°44.09
										Altair	61°57.00
Mer.p	bass. 21:41	$\nu$ -0.3' d-1.	1′ m-4.00	$\nu$ 1.1' d-0	.5′ m1.39	$\nu 2.0' \ d0.1$	2′ m-1.68	$\nu 2.7' d-0$	.1′ m-0.08	Peacock	53°0.97 49°23.61
										Deneb Enif	33°35.65
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.93
0	34° 53.75	216°4.07	N02°6.09	241°11.04	N12°30.14	202°10.71			N11°40.71	Fomalhaut	15°10.95
1	49°56.22	231°3.73	4.96	256° 12.13	29.65	217°12.68	14.79	13°12.67	40.65	Scheat	13°41.93
2	64°58.68	246°3.39	3.82	271°13.21	29.17	232°14.66	14.99	28°15.32	40.58	Markab	$13^{\circ}26.59$
3	80°1.14	261°3.05	• • 2.69	286°14.30	• • 28.69	247°16.64	• • 15.19	43°17.98	• • 40.52	O-+ 24 T	CIIA
4	95°3.61	276°2.70	1.55	301°15.38	28.21	262°18.62	15.39	58°20.64	40.45	Oct 24 Tue	<b>SHA</b> 183°25.02
5 6	110°6.07	291°2.36	02°0.41	316° 16.47 331° 17.55	27.72 N12°27.24	277°20.60	15.59	73°23.30	40.39 N11° 40.33	I	207°23.77
7	125°8.54 140°11.00	300 2.02 321°1.68	N01°59.28 58.14	346° 18.64	26.76	292°22.58 307°24.55	\$04° 15.79 15.99	103°28.61	40.35	1	167°40.34
8	155° 13.46	336°1.33	57.00	1°19.73	26.28	322°26.53	16.20	118°31.27	40.20	Saturn	323°6.99
9	170° 15.93	351°0.99	• • 55.87	16°20.81	. 25.79	337°28.51	16.40	133°33.93	• • 40.14		
10	185° 18.39	6°0.65	54.73	31°21.90	25.31	352°30.49	16.60	148°36.59	40.07	Oct 25 Wed	SHA
11	200° 20.86	21°0.31	53.59	46°22.99	24.83	7°32.47	16.80	163°39.25	40.01		182°17.67
12	215°23.32		N01°52.45	61°24.08	N12°24.34	22°34.45	S04°17.00	178°41.90	N11°39.94		206°50.46
13	$230^{\circ}25.79$	$50^{\circ}59.62$	51.32	$76^{\circ}25.16$	23.86	37°36.42	17.20	193°44.56	39.88		167°28.63
14	245° 28.25	65°59.28	50.18	91°26.25	23.38	52°38.40	17.40	208°47.22	39.82	Saturn	323°11.62
15	260°30.71	80°58.93	• • 49.04	106°27.34	• • 22.90	67°40.38	•• 17.60	223°49.88	• • 39.75	Oct 26 Thu	SHA
16	275°33.18	95°58.59	47.90	121°28.43	22.41	82°42.36	17.80	238°52.54	39.69	1	$181^{\circ}10.32$
17	290°35.64	110°58.25	46.76	136°29.52	21.93	97°44.34	18.00	253°55.19	39.62		206°17.29
18	305°38.11	125°57.91		151°30.61	N12°21.45	112°46.32	S04°18.20		N11°39.56		167°16.95
19	320° 40.57	140°57.56	44.48	166°31.69	20.96	127°48.30	18.41	284°0.51	39.50	Saturn	323°16.26
20 21	335° 43.03 350° 45.50	155° 57.22 170° 56.88	43.34 •• 42.20	181°32.78 196°33.87	20.48	142°50.28 157°52.25	18.61 •• 18.81	299°3.17 314°5.83	39.43 •• 39.37	Horizor	ıtal parallax
22	5° 47.96	170 56.88 185°56.53	41.06	211°34.96	19.51	157 52.25 172°54.23	19.01	314 5.83 329°8.49	39.37		Venus:
23	20°50.43	200°56.19	39.92	226° 36.05	19.03	187°56.21	19.01	344°11.14	39.31		Mars:
ıvıer.p	bass. 21:37	$\nu$ -0.3′ d-1.	± m-4.00	$\nu_{1.1'}$ a-0	.5′ m1.38	ν2.0' <b>α</b> 0.3	2′ m-1.68	ν2.1° α-0	.1′ m-0.09		

Dec

29°15.25

-42°8.88

56°41.98

-17°49.56

-57°5.35

 $23^{\circ}36.06$ 

89°22.96

40°11.20

4°12.28

49°57.78

16°34.03

-8°10.02

 $46^{\circ}1.42$ 6°22.56

28°37.79

 $-1^{\circ}10.97$ 

 $7^{\circ}24.73$ 

-52°42.41 -16°45.24

-29°0.51

 $27^{\circ}57.20$ 

-59°35.85

-43°32.74

-69°49.88

-8°46.98

11°49.50

 $61^{\circ}35.45$ 

 $14^{\circ}24.62$ 

 $-17^{\circ}42.05$ 

 $-63^{\circ}15.43$ -57°16.37

55°48.09

-11°18.64

49°10.14 -60°30.66

-36°30.63

 $19^{\circ}2.01$ 

 $74^{\circ}2.22$ 

-16°9.60

26°37.21

-26°29.66

-69°4.79

 $-37^{\circ}7.43$ 

 $12^{\circ}32.58$ 

51°29.42

-34°22.19

38°48.96

-26°15.55

8°56.95

-56°38.58

45°23.41

 $10^{\circ}0.72$ 

-46°49.28

-29°28.07

28°14.68

15°21.91

Mer.pass

09:35

07:58

10:36

00:16

09:35

07:56

10:33

00:12

09:36

07:55

10:30

00:07

0.1

0.1

Mer.pass

Mer.pass

-15°45.50

-60°57.24

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.02	S11°51.55	$104^{\circ}9.01$	10.0'	S22°18.60	-6.9'	56.1'
1	198°57.10	52.42	118°37.99	10.1'	22°11.72	-7.0'	56.1'
2 3	213°57.18 228°57.26	53.29 •• 54.15	133°7.06 147°36.22	10.2' 10.3'	22°4.73 21°57.64	-7.1' -7.2'	56.1' 56.0'
4	243°57.33	55.02	162°5.49	10.4	21°50.45	-7.3	56.0'
5	258°57.41	55.88	176°34.84	10.5'	$21^{\circ}43.16$	-7.4'	56.0'
6	273°57.49	S11°56.75	191°4.30	10.5'	\$21°35.77	-7.5'	55.9'
7 8	288° 57.56 303° 57.64	57.61 58.48	205°33.85 220°3.49	10.6' 10.7'	21°28.27 21°20.68	-7.6' -7.7'	55.9' 55.9'
9	318° 57.72	11°59.34	234°33.23	10.8'	21°12.99	-7.8	55.8'
10	333°57.79	$12^{\circ}0.20$	249°3.07	10.9'	$21^{\circ}5.21$	-7.9'	55.8'
11	348°57.87 3°57.94	1.07 \$12°1.93	263°33.00	11.0'	20°57.33	-8.0'	55.8'
12 13	3°57.94 18°58.01	2.79	278°3.02 292°33.14	11.1' 11.2'	\$20°49.36 20°41.29	-8.1' -8.2'	55.7' 55.7'
14	33°58.09	3.65	307°3.35	11.3'	20°33.13	-8.2	55.7'
15	48°58.16	• • 4.52	321°33.65	11.4'	20°24.89	-8.3'	55.6'
16	63° 58.24	5.38	336° 4.05 350° 34.54	11.5'	20°16.55 20°8.13	-8.4'	55.6'
17 18	78° 58.31 93° 58.38	6.24 \$12°7.10	5°5.13	11.6' 11.7'	20°8.13 \$19°59.62	-8.5' -8.6'	55.6' 55.6'
19	108° 58.45	7.96	19°35.80	11.8'	19°51.02	-8.7'	55.5'
20	123°58.53	8.82	34° 6.57	11.9'	19°42.34	-8.8'	55.5'
21	138°58.60	• • 9.68	48°37.42	11.9'	19°33.58	-8.8'	55.5'
22 23	153° 58.67 168° 58.74	10.54 11.40	63°8.37 77°39.41	12.0' 12.1'	19°24.73 19°15.81	-8.9' -9.0'	55.4' 55.4'
23		d = 0.9'	- 17 33.41			.5.0	JJ. <del>1</del>
	SD = 16.1'	a = 0.9'		SI	D = 15.3'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°58.81	S12°12.26	92°10.53	12.2'	\$19°6.80	-9.1'	55.4'
1	198° 58.88 213° 58.95	13.12 13.98	106°41.75 121°13.05	12.3' 12.4'	18°57.71 18°48.55	-9.2' -9.2'	55.4' 55.3'
2 3	213°58.95 228°59.02	13.98	121°13.05 135°44.44	12.4° 12.5'	18°48.55 18°39.31	-9.2° -9.3'	55.3'
4	243°59.09	15.69	150° 15.91	12.6'	18°29.99	-9.4'	55.3'
5	258° 59.16	16.55	164°47.48	12.6'	18°20.60	-9.5'	55.3'
6	273°59.23 288°59.30	\$12°17.41	179°19.13 193°50.86	12.7'	\$18°11.13 18°1.59	-9.5'	55.2'
7 8	288°59.30 303°59.37	18.26 19.12	193°50.86 208°22.68	12.8' 12.9'	18° 1.59 17° 51.98	-9.6' -9.7'	55.2' 55.2'
9	318° 59.44	• • 19.98	222°54.58	13.0'	17°42.30	-9.8'	55.1'
10	333°59.51	20.83	$237^{\circ}26.56$	13.1'	$17^{\circ}32.55$	-9.8'	55.1'
11	348° 59.57	21.69	251°58.63	13.1'	17°22.73	-9.9'	55.1'
12 13	3°59.64 18°59.71	\$12°22.54 23.40	266°30.78 281°3.01	13.2' 13.3'	\$17°12.85 17°2.89	-10.0' -10.0'	55.1' 55.0'
14	33°59.77	24.25	295°35.32	13.4'	16°52.88	-10.1	55.0'
15	48°59.84	• • 25.10	$310^{\circ}7.71$	13.5'	$16^{\circ}42.79$	-10.1'	55.0'
16	63°59.91	25.96	324°40.17	13.5'	16°32.65	-10.2'	55.0'
17 18	78°59.97 94°0.04	26.81 \$12°27.66	339°12.72 353°45.34	13.6' 13.7'	16°22.44 \$16°12.17	-10.3' -10.3'	55.0' 54.9'
19	109°0.10	28.52	8° 18.04	13.8'	16°1.83	-10.4	54.9'
20	124°0.17	29.37	22°50.81		15°51.44		54.9'
21	139°0.23	· · 30.22 31.07	37°23.66	13.9'	15°40.99	-10.5'	54.9'
22 23	154°0.30 169°0.36	31.07 31.92	51°56.58 66°29.57	14.0' 14.1'	15°30.48 15°19.91	-10.6' -10.6'	54.8' 54.8'
25	SD = 16.1'	d = 0.9'			O = 15.1'	10.0	31.0
	3D = 10.1°	u = 0.9		<u>ي</u>	J — 13.1°		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	184°0.42 199°0.49	\$12°32.78	81°2.64	14.1'	\$15°9.29 14°58.61	-10.7'	54.8'
1 2	199°0.49 214°0.55	33.63 34.48	95°35.78 110°8.98	14.2' 14.3'	14°58.61 14°47.88	-10.7' -10.8'	54.8' 54.8'
3	229°0.61	35.33	124°42.26	14.3'	14° 37.10	-10.8	54.7'
4	244°0.68	36.18	139° 15.61	14.4'	14°26.26	-10.9'	54.7'
5	259°0.74 274°0.80	37.03 \$12°37.87	153°49.02 168°22.50	14.5'	14°15.37 \$14°4.43	-10.9'	54.7'
6 7	274°0.80 289°0.86	\$12°37.87 38.72	168°22.50 182°56.04	14.5' 14.6'	\$14°4.43 13°53.44	-11.0' -11.0'	54.7' 54.7'
8	304°0.92	39.57	197°29.65	14.7'	13°42.40	-11.1	54.6'
9	319°0.98	• • 40.42	212°3.33	14.7'	13°31.31	-11.1'	54.6'
10	334°1.04 349°1.10	41.27	226°37.07 241°10.86	14.8'	13°20.17 13°8.99	-11.2'	54.6'
11 12	349°1.10 4°1.16	42.11 \$12°42.96	241°10.86 255°44.73	14.9' 14.9'	13°8.99 \$12°57.76	-11.2' -11.3'	54.6' 54.6'
13	19°1.22	43.81	270°18.65	15.0'	12°46.49	-11.3	54.5
14	34°1.28	44.65	284°52.63	15.0'	12°35.17	-11.4'	54.5'
15	49°1.34	· · 45.50	299°26.67	15.1'	12°23.81	-11.4'	54.5'
16 17	64°1.40 79°1.46	46.35 47.19	314° 0.76 328° 34.92	15.2' 15.2'	12°12.41 12°0.96	-11.4' -11.5'	54.5' 54.5'
18	94°1.52	\$12°48.04	343°9.13	15.3'	S11°49.48	-11.5'	54.5'
19	109°1.57	48.88	357°43.39	15.3'	11°37.95	-11.6'	54.4'
20	124°1.63	49.72	12°17.71	15.4'	11°26.39	-11.6'	54.4'
21 22	139°1.69 154°1.74	· · 50.57 51.41	26°52.08 41°26.50	15.4' 15.5'	11°14.78 11°3.14	-11.6' -11.7'	54.4' 54.4'
23	169°1.80	52.25	56° 0.97	15.5'	10°51.46	-11.7	54.4'
	SD = 16.1'	d = 0.9'		SI	D = 14.9'		

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

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

	Sun				Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	6-8		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-58%		
24	15:48	15:52	11:44	17:39	05:14			
25	15:55	15:59	11:44	18:26	06:03			
26	16:02	16:05	11:44	19:09	06:48			

# October 27, 28, 29 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri -	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	35°52.89	215°55.85 N01°38.78	241°37.14 N12°18.55	202°58.19 \$04°19.41	359°13.80 N11°39.18	
1	50° 55.35	230°55.50 37.64	256°38.23 18.07	218° 0.17 19.61	14°16.46 39.11	Alpheratz 357°31.23 29°15.26
2	65° 57.82	245°55.16 36.50	271°39.32 17.58	233° 2.15 19.81	29°19.12 39.05	Ankaa 353°3.81 -42°8.90
3	81°0.28	260°54.82 · · 35.36	286°40.42 · · 17.10	248° 4.13 · · 20.01	44°21.78 · · 38.99	Schedar 349°26.86 56°41.99
4	96°2.75	275°54.47 34.22	301°41.51 16.62	263°6.11 20.21	59°24.44 38.92	Diphda 348°43.93 -17°49.57 Achernar 335°17.43 -57°5.36
5	111°5.21	290°54.13 33.08	316°42.60 16.13	278° 8.09 20.41	74°27.09 38.86	Hamal 327°47.33 23°36.07
6	126°7.67	305°53.79 N01°31.94	331°43.69 N12°15.65	293°10.07 S04°20.61	89°29.75 N11°38.80	Polaris 311°51.19 89°22.98
7	141°10.14	320°53.44 30.80	346° 44.78 15.16	308°12.05 20.81	104°32.41 38.73	Acamar 315°9.06 -40°11.21
8 9	156° 12.60 171° 15.07	335°53.10 29.66 350°52.76 • 28.51	1°45.87 14.68 16°46.97 •• 14.20	323°14.03 21.01 338°16.01 · · 21.21	119°35.07 38.67 134°37.73 · · 38.60	Menkar 314°2.60 4°12.28
10	186° 17.53	5°52.41 27.37	31°48.06 13.71	353°17.99 21.41	149°40.39 38.54	Mirfak 308°23.27 49°57.79
11	201° 19.99	20°52.07 26.23	46°49.15 13.23	8°19.97 21.61	164°43.04 38.48	Aldebaran 290°35.78 16°34.03
12	216°22.46	35°51.73 N01°25.09	61°50.24 N12°12.75	23°21.95 <b>S</b> 04°21.81	179°45.70 N11°38.41	Rigel 281°0.66 -8°10.02 Capella 280°16.97 46°1.43
13	231°24.92	50°51.38 23.95	76°51.34 12.26	38°23.93 22.01	194°48.36 38.35	Bellatrix 278°19.34 6°22.55
14	246°27.39	65°51.04 22.80	91°52.43 11.78	53°25.90 22.21	209°51.02 38.28	Elnath 277°57.70 28°37.79
15	261°29.85	80°50.69 · · 21.66	106°53.53 ·· 11.30	68°27.88 · · 22.41	224°53.68 · · 38.22 239°56.34 38.16	Alnilam 275°34.38 -1°10.97
16 17	276° 32.32 291° 34.78	95°50.35 20.52 110°50.01 19.37	121°54.62 10.81 136°55.71 10.33	83°29.86 22.61 98°31.84 22.81	239°56.34 38.16 254°59.00 38.09	Betelgeuse 270°48.55 7°24.73
18	306° 37.24	125°49.66 N01°18.23	151°56.81 N12°9.84	113°33.82 \$04°23.01	270°1.65 N11°38.03	Canopus 263°50.74 -52°42.42
19	321°39.71	140°49.32 17.09	166° 57.90 9.36	128°35.80 23.21	285°4.31 37.97	Sirius 258°23.37 -16°45.25
20	$336^{\circ}42.17$	155°48.97 15.94	181°59.00 8.88	143°37.78 23.41	300°6.97 37.90	Adhara 255°3.29 -29°0.52 Procyon 244°47.55 5°9.02
21	351°44.64	170°48.63 · · 14.80	197°0.09 · · 8.39	158°39.77 · · 23.61	315°9.63 · · 37.84	Pollux 243°13.50 27°57.20
22	6°47.10	185° 48.29 13.65	212°1.19 7.91	173°41.75 23.81	330°12.29 37.77	Avior 234°13.39 -59°35.86
23	21°49.56	200° 47.94 12.51	227°2.28 7.42	188°43.73 24.01	345°14.95 37.71	Suhail 222°44.07 -43°32.74
Mer. <sub>I</sub>	pass. 21:33	$\nu$ -0.3 $'$ <i>d</i> -1.1 $'$ m-4.00	$\nu 1.1' \; d\text{-}0.5' \; \text{m}1.38$	$\nu 2.0' \ d0.2' \ \text{m-}1.68$	$\nu 2.7' \ d\text{-}0.1' \ \text{m-}0.10$	Miaplacidus 221°37.66 -69°49.87
						Alphard 217°44.81 -8°46.98
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.33 11°49.49
0	36°52.03	215°47.60 N01°11.36	242°3.38 N12°6.94	203°45.71 S04°24.21	0°17.61 N11°37.65	Dubhe 193°37.84 61°35.44
1	51°54.49	230°47.25 10.22	257°4.48 6.46	218°47.69 24.41	15°20.26 37.58	Denebola 182°22.09 14°24.61 Gienah 175°40.68 -17°42.05
2	66° 56.96	245°46.91 9.08	272°5.57 5.97	233°49.67 24.61	30°22.92 37.52	Acrux 172°57.10 -63°15.42
3	81°59.42	260°46.56 · · 7.93	287°6.67 · · 5.49	248°51.65 · · 24.81	45°25.58 · · 37.46	Gacrux 171°48.60 -57°16.36
4	97°1.88	275°46.22 6.78	302°7.77 5.00	263°53.63 25.01	60°28.24 37.39	Alioth 166°10.92 55°48.07
5 6	112°4.35 127°6.81	290°45.88 5.64 305°45.53 N01°4.49	317°8.86 4.52 332°9.96 N12°4.04	278°55.61 25.21 293°57.59 \$04°25.41	75°30.90 37.33 90°33.56 N11°37.26	Spica 158°19.36 -11°18.64
7	142° 9.28	320°45.19 3.35	347°11.06 3.55	308°59.57 25.61	105°36.22 37.20	Alkaid 152°50.15 49°10.12
8	157° 11.74	335°44.84 2.20	2°12.16 3.07	324°1.55 25.81	120°38.88 37.14	Hadar 148°32.14 -60°30.65
9	172° 14.20	350°44.50 01°1.06	17°13.25 · · 2.58	339° 3.53 · · 26.01	135°41.53 · · 37.07	Menkent 147°54.33 -36°30.62
10	187° 16.67	5°44.15 00°59.91	32°14.35 2.10	354° 5.51 26.21	150°44.19 37.01	Arcturus 145°45.46 19°1.99 Rigil Kent. 139°36.60 -60°57.22
11	202° 19.13	20°43.81 58.76	47°15.45 1.61	9°7.49 26.41	165°46.85 36.95	Kochab 137°21.27 74°2.20
12	217°21.60	35°43.46 N00°57.62	62°16.55 N12°1.13	24°9.47 S04°26.61	180°49.51 N11°36.88	Zuben'ubi 136°52.92 -16°9.60
13	232°24.06	50°43.12 56.47	77°17.65 0.64	39°11.45 26.81	195°52.17 36.82	Alphecca 126°1.51 26°37.19
14 15	247° 26.52 262° 28.99	65°42.77 55.32 80°42.43 •• 54.18	92°18.75 12°0.16 107°19.85 11°59.68	54°13.44 27.01 69°15.42 · · 27.20	210°54.83 36.75 225°57.49 · · 36.69	Antares 112°12.35 -26°29.66
16	202 28.99 277°31.45	95°42.08 53.03	122°20.95 59.19	84°17.40 27.40	241°0.15 36.63	Atria 107°4.16 -69°4.78
17	292°33.92	110°41.74 51.88	137°22.05 58.71	99°19.38 27.60	256°2.80 36.56	Sabik 101°59.50 -15°45.50
18	307°36.38	125°41.39 N00°50.73	152°23.15 N11°58.22	114°21.36	271°5.46 N11°36.50	Shaula 96°6.46 -37°7.42 Rasalhague 95°55.92 12°32.57
19	322°38.84	140°41.05 49.59	167°24.25 57.74	129°23.34 28.00	286°8.12 36.44	Eltanin 90°41.08 51°29.41
20	337°41.31	155°40.70 48.44	182°25.35 57.25	144°25.32 28.20	301°10.78 36.37	Kaus Aust. 83°28.64 -34°22.19
21	352° 43.77	170°40.35 · · 47.29	197°26.45 · · 56.77	159°27.30 · · 28.40	316°13.44 · · 36.31 331°16.10 36.24	Vega 80°31.33 38°48.95
22 23	7° 46.24 22° 48.70	185°40.01 46.14 200°39.66 44.99	212°27.55 56.28 227°28.65 55.80	174°29.29 28.60 189°31.27 28.80	331°16.10 36.24 346°18.76 36.18	Nunki 75°44.11 -26°15.55
						Altair 61°57.01 8°56.94
Mer. <sub>I</sub>	pass. 21:29	$\nu$ -0.3′ <i>d</i> -1.1′ m-4.00	$ u 1.1' \; d ext{-}0.5' \;  ext{m}1.37$	$\nu 2.0' \ d0.2' \ \text{m-}1.69$	$\nu 2.7' \ d$ -0.1' m-0.11	Peacock 53°0.99 -56°38.59
						Deneb 49°23.63 45°23.41 Enif 33°35.66 10°0.72
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.95 -46°49.28
0	37°51.16	215°39.32 N00°43.85	242°29.75 N11°55.31	204°33.25 \$04°29.00	1°21.42 N11°36.12	Fomalhaut 15°10.96 -29°28.08
1	52° 53.63	230°38.97 42.70	257°30.85 54.83	219°35.23 29.19	16°24.08 36.05	Scheat 13°41.94 28°14.68
2	67° 56.09 82° 58.56	245°38.63 41.55 260°38.28 • 40.40	272°31.95 54.34 287°33.06 • 53.86	234°37.21 29.39 249°39.19 · · 29.59	31°26.73 35.99 46°29.39 · · 35.93	Markab 13°26.60 15°21.91
4	98°1.02	275° 37.93 39.25	302°34.16 53.37	264°41.17 29.79	61°32.05 35.86	Oct 27 Fri SHA Mer.pass
5	113°3.49	290° 37.59 38.10	317° 35.26 52.89	279°43.16 29.99	76°34.71 35.80	Venus 180°2.96 09:36
6	128°5.95	305°37.24 N00°36.95	332°36.36 N11°52.40	294°45.14 <b>S</b> 04°30.19	91°37.37 N11°35.74	Mars 205° 44.25 07:53
7	143°8.41	320°36.90 35.80	347° 37.47 51.92	309°47.12 30.39	106°40.03 35.67	Jupiter 167°5.30 10:27
8	158° 10.88	335°36.55 34.65	2°38.57 51.43	324°49.10 30.59	121°42.69 35.61	Saturn 323°20.91 00:03
9	173° 13.34	350°36.20 · · 33.50	17°39.67 · · 50.95	339°51.08 · · 30.78	136°45.35 · · 35.54	Oct 28 Sat SHA Mer.pass
10	188° 15.81 203° 18.27	5°35.86 32.35 20°35.51 31.20	32°40.78 50.46 47°41.88 49.98	354°53.07 30.98 9°55.05 31.18	151°48.01 35.48 166°50.67 35.42	Venus 178°55.57 09:37
11 12	203 18.27 218°20.73	20°35.51 31.20 35°35.16 N00°30.05	62°42.99 N11°49.49	9°55.05 31.18 24°57.03 \$04°31.38	181°53.32 N11°35.35	Mars 205°11.35 07:51
13	233°23.20	50°34.82 28.90	77° 44.09 49.01	39°59.01 31.58	196°55.98 35.29	Jupiter 166°53.68 10:24
14	248°25.66	65°34.47 27.75	92°45.20 48.52	55°1.00 31.78	211°58.64 35.23	Saturn 323°25.58 23:55
15	263°28.13	80°34.12 · · 26.60	107°46.30 · · 48.04	70°2.98 · · 31.98	227°1.30 · · 35.16	Oct 29 Sun SHA Mer.pass
16	278° 30.59	95°33.78 25.45	122° 47.41 47.55	85° 4.96 32.17	242°3.96 35.10	Venus 177°48.15 09:38
17	293°33.05	110°33.43 24.30	137° 48.51 47.07	100°6.94 32.37	257°6.62 35.04	Mars 204°38.59 07:49
18	308°35.52	125°33.08 N00°23.15	152°49.62 N11°46.58	115°8.92 \$04°32.57	272°9.28 N11°34.97 287°11.94 34.91	Jupiter 166°42.08 10:20
19 20	323° 37.98 338° 40.45	140°32.74 22.00 155°32.39 20.85	167°50.72 46.10 182°51.83 45.61	130°10.91 32.77 145°12.89 32.97	287°11.94 34.91 302°14.60 34.84	Saturn 323°30.25 23:50
21	353° 42.91	170°32.04 · · 19.70	197°52.94 · · 45.12	160°14.87 · · 33.17	317°17.26 · · 34.78	Horizontal parallax
22	8° 45.37	185°31.69 18.54	212°54.04 44.64	175°16.86 33.36	332°19.91 34.72	Venus: 0.1
23	23°47.84	200°31.35 17.39	227°55.15 44.15	190°18.84 33.56	347°22.57 34.65	Mars: 0.1
Mer	pass. 21:25	ν-0.3' d-1.1' m-3.99	ν1.1' d-0.5' m1.36	ν2.0' d0.2' m-1.69	ν2.7' d-0.1' m-0.12	

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°1.86	\$12°53.10	70°35.49	15.6'	S10°39.75	-11.8'	54.4'
1	199°1.91 214°1.97	53.94	85°10.07 99°44.68	15.6'	10°28.00 10°16.21	-11.8'	54.4'
2	214 1.97 229°2.02	54.78 •• 55.62	99 44.08 114°19.35	15.7' 15.7'	10 16.21 10°4.39	-11.8' -11.9'	54.3' 54.3'
4	244°2.08	56.46	128°54.06	15.8'	09°52.54	-11.9'	54.3'
5	259°2.13	57.31	$143^{\circ}28.82$	15.8'	09°40.65	-11.9'	54.3'
6	274°2.19	\$12°58.15	158° 3.62	15.8'	S09°28.73	-11.9'	54.3'
7 8	289°2.24 304°2.29	58.99 12°59.83	172°38.47 187°13.35	15.9' 15.9'	09°16.78 09°4.80	-12.0' -12.0'	54.3' 54.3'
9	319°2.35	12 59.65 13°0.67	201°48.28	16.0'	09 4.80 08°52.80	-12.0'	54.3'
10	334°2.40	1.51	216°23.25	16.0'	08°40.76	-12.1'	54.2'
11	349°2.45	2.34	230°58.26	16.0'	$08^{\circ}28.69$	-12.1'	54.2'
12	4°2.50	\$13°3.18	245°33.30	16.1'	S08°16.60	-12.1'	54.2'
13 14	19°2.56 34°2.61	4.02 4.86	260°8.38 274°43.50	16.1' 16.2'	08°4.48 07°52.33	-12.1' -12.2'	54.2' 54.2'
15	49°2.66	• • 5.70	289°18.66	16.2'	07° 40.16	-12.2'	54.2'
16	64°2.71	6.53	303°53.84	16.2'	07°27.96	-12.2'	54.2'
17	79°2.76	7.37	$318^{\circ}29.06$	16.3'	$07^{\circ}15.74$	-12.2'	54.2'
18	94°2.81	\$13°8.21	333°4.32	16.3'	S07°3.49	-12.3'	54.2'
19 20	109°2.86 124°2.91	9.04 9.88	347°39.60 2°14.92	16.3' 16.3'	06°51.23 06°38.94	-12.3' -12.3'	54.2' 54.1'
21	139°2.96	. 10.71	16°50.26	16.4	06°26.63	-12.3'	54.1
22	154°3.01	11.55	31°25.63	16.4	06°14.29	-12.4	54.1'
23	169°3.06	12.38	46°1.03	16.4'	$06^{\circ}1.94$	-12.4'	54.1'
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		
C-+	Спу	Daa	CU^		Dec	اد	НР
Sat 0	<b>GHA</b> 184°3.11	Dec 513°13.22	<b>GHA</b> 60°36.46	u 16.5'	Dec \$05°49.57	d -12.4'	HP 54.1'
1	199°3.15	14.05	75°11.91	16.5	05°37.18	-12.4'	54.1'
2	214°3.20	14.88	89°47.38	16.5'	05°24.77	-12.4'	54.1'
3	229°3.25	• • 15.72	104°22.88	16.5'	05°12.35	-12.4'	54.1'
4 5	244°3.30 259°3.34	16.55 17.38	118°58.40 133°33.95	16.5' 16.6'	04°59.91 04°47.45	-12.5' -12.5'	54.1' 54.1'
6	274°3.39	\$13°18.21	148° 9.51	16.6'	S04°34.97	-12.5'	54.1
7	289°3.44	19.05	162°45.09	16.6'	04°22.49	-12.5'	54.1'
8	304°3.48	19.88	177°20.69	16.6'	04°9.98	-12.5'	54.1'
9	319°3.53	• • 20.71	191°56.31	16.6'	03°57.47	-12.5'	54.1'
10 11	334°3.57 349°3.62	21.54 22.37	206°31.94 221°7.59	16.6' 16.7'	03°44.94 03°32.40	-12.5' -12.6'	54.0' 54.0'
12	4°3.66	\$13°23.20	235°43.26	16.7'	S03°19.85	-12.6'	54.0'
13	19°3.71	24.03	250°18.94	16.7'	03°7.28	-12.6'	54.0'
14	34°3.75	24.86	264°54.63	16.7'	02°54.71	-12.6'	54.0'
15 16	49°3.79 64°3.84	· · 25.69 26.52	279°30.33 294°6.04	16.7' 16.7'	02°42.13 02°29.54	-12.6' -12.6'	54.0' 54.0'
17	79°3.88	27.34	308°41.76	16.7'	02 29.54 02°16.94	-12.6'	54.0'
18	94°3.92	\$13°28.17	323°17.49	16.7'	S02°4.33	-12.6'	54.0'
19	109°3.96	29.00	337°53.23	16.7'	$01^{\circ}51.72$	-12.6'	54.0'
20	124°4.01	29.82	352°28.98			-12.6'	54.0'
21 22	139°4.05 154°4.09	· · 30.65 31.48	7°4.73 21°40.48	16.8' 16.8'	01°26.47 01°13.84	-12.6' -12.6'	54.0' 54.0'
23	169°4.13	32.30	36°16.24	16.8'	01°1.20	-12.6'	54.0'
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		
Sun	<b>GHA</b> 184°4.17	<b>Dec</b> \$13°33.13	<b>GHA</b> 50°52.01	u 16.8'	<b>Dec</b> \$00°48.56	d -12.6'	<b>HP</b> 54.0'
0 1	184 4.17 199°4.21	33.95	65°27.77	16.8	00°35.92	-12.6'	54.0'
2	214°4.25	34.78	80°3.53	16.8'	$00^{\circ}23.28$	-12.6'	54.0'
3	229°4.29	• • 35.60	94°39.30	16.8'	S00°10.63	-12.6'	54.0'
4 5	244°4.33 259°4.37	36.43 37.25	109°15.06 123°50.82	16.8' 16.8'	N00°2.02 00°14.67	12.6' 12.6'	54.0' 54.0'
6	259°4.37 274°4.41	37.25 \$13°38.07	123°50.82 138°26.58	16.8'	N00°27.31	12.6'	54.0'
7	289°4.45	38.90	153° 2.34	16.8'	00°39.96	12.6'	54.0'
8	304°4.48	39.72	167°38.09	16.7'	00°52.61	12.6'	54.0'
9	319°4.52	• • 40.54	182°13.83	16.7'	01°5.25	12.6'	54.0'
10 11	334°4.56 349°4.60	41.36 42.18	196°49.57 211°25.30	16.7' 16.7'	01°17.89 01°30.53	12.6' 12.6'	54.0' 54.0'
12	4°4.63	\$13°43.00	226°1.02	16.7	N01°43.16	12.6'	54.0'
13	19°4.67	43.82	240°36.73	16.7'	$01^{\circ}55.79$	12.6'	54.0'
14	34°4.70	44.65	255°12.43	16.7'	02°8.41	12.6'	54.0'
15 16	49°4.74 64°4.78	• • 45.46 46.28	269°48.12 284°23.80	16.7' 16.7'	02°21.02 02°33.63	12.6' 12.6'	54.0' 54.0'
16 17	79°4.81	46.28 47.10	284 23.80 298° 59.46	16.6'	02°33.63 02°46.24	12.6'	54.0'
18	94°4.84	\$13°47.92	313°35.11	16.6'	N02°58.83	12.6'	54.0'
19	109°4.88	48.74	328°10.75	16.6'	03°11.41	12.6'	54.0'
20	124°4.91	49.56	342°46.37	16.6'	03°23.99	12.6'	54.0'
21 22	139°4.95 154°4.98	· · 50.38 51.19	357°21.97 11°57.55	16.6' 16.6'	03°36.55 03°49.11	12.6' 12.5'	54.0' 54.0'
23	169°5.01	52.01	26°33.11	16.5	03 49.11 04°1.65	12.5'	54.0'
	SD = 16.1'	d = 0.8'			D = 14.7'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	67-83%	
27	16:07	16:10	11:44	19:51	07:30		
28	16:12	16:15	11:44	20:31	08:11		
29	16:17	16:19	11:44	21:11	08:51		

### October 30, 31, 01 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	38° 50.30	215°31.00 N00°16.24	242°56.26 N11°43.67	205°20.82 <b>S</b> 04°33.76	2°25.23 N11°34.59	
1	53° 52.77	230°30.65 15.09	257°57.36 43.18	220°22.80 33.96	17°27.89 34.53	Alpheratz 357°31.24
2	68° 55.23	245°30.30 13.94	272°58.47 42.70	235°24.79 34.16	32°30.55 34.46	Ankaa 353°3.83
3	83° 57.69	260°29.96 · · 12.78	287°59.58 · · 42.21	250°26.77 · · · 34.35	47°33.21 · · 34.40	Schedar 349°26.87
4	99°0.16	275°29.61 11.63	303°0.69 41.73	265°28.75 34.55	62°35.87 34.34	Diphda 348°43.94
5	114°2.62	290°29.26 10.48	318°1.80 41.24	280°30.74 34.75	77°38.53 34.27	Achernar 335°17.44
6	129°5.09	305°28.91 N00°9.33	333°2.90 N11°40.75	295°32.72 S04°34.95	92°41.19 N11°34.21	Hamal 327°47.33
7	144°7.55	320°28.57 8.17	348°4.01 40.27	310°34.70 35.15	107°43.85 34.15	Polaris 311°50.70
8	159° 10.01	335°28.22 7.02	3°5.12 39.78	325°36.69 35.34	122°46.51 34.08	Acamar 315° 9.06
9	174° 12.48	350°27.87 · · 5.87	18°6.23 · · 39.30	340°38.67 · · 35.54	137°49.17 · · 34.02	Menkar 314°2.59
10	189° 14.94	5°27.52 4.72	33°7.34 38.81	355°40.65 35.74	152°51.82 33.96	Mirfak 308°23.26
11	204° 17.41	20°27.17 3.56	48°8.45 38.33	10°42.64 35.94	167°54.48 33.89	Aldebaran 290°35.77
12	219° 19.87	35°26.82 N00°2.41	63°9.56 N11°37.84	25°44.62 <b>S</b> 04°36.13	182°57.14 N11°33.83	Rigel 281°0.65
13	234°22.33	50°26.48 1.26	78°10.67 37.35	40°46.60 36.33	197°59.80 33.76	Capella 280° 16.95
14	249°24.80	65°26.13 N00°0.10	93°11.78 36.87	55°48.59 36.53	213°2.46 33.70	Bellatrix 278°19.33
15	264°27.26	80°25.78 <b>S</b> 00°1.05	108°12.89 · · 36.38	70°50.57 · · 36.73	228°5.12 · · 33.64	Elnath 277°57.69
16	279°29.73	95°25.43 2.21	123°14.00 35.90	85°52.55 36.92	243°7.78 33.57	Alnilam 275°34.37
17	294°32.19	110°25.08 3.36	138° 15.11 35.41	100°54.54 37.12	258°10.44 33.51	Betelgeuse 270°48.53
18	309°34.65	125°24.73 \$00°4.51	153°16.22 N11°34.92	115°56.52 <b>S</b> 04°37.32	273°13.10 N11°33.45	Canopus 263°50.71
19	324°37.12	140°24.38 5.67	168°17.34 34.44	130°58.50 37.52	288°15.76 33.38	Sirius 258°23.35 Adhara 255°3.27
20	339°39.58	155°24.03 6.82	183°18.45 33.95	146°0.49 37.71	303°18.42 33.32	Procyon 244°47.53
21	354°42.05	170°23.68 · · 7.98	198°19.56 · · 33.47	161°2.47 · · 37.91	318°21.07 · · 33.26	Pollux 243°13.48
22	9°44.51	185°23.33 9.13	213°20.67 32.98	176°4.46 38.11	333°23.73 33.19	Avior 234°13.35
23	24°46.98	200°22.99 10.29	228°21.78 32.49	191°6.44 38.31	348°26.39 33.13	Suhail 222°44.05
Merr	pass. 21:21	ν-0.3' d-1.2' m-3.99	ν1.1' d-0.5' m1.36	$\nu 2.0' \ d0.2' \ \text{m-}1.69$	ν2.7' d-0.1' m-0.13	Miaplacidus 221°37.61
14101.		≥ 0.5 G 1.2 III-3.99			ν Δ.1 ΙΙΙ-U.13	Alphard 217°44.79
						Regulus 207°31.31
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.82
0	39°49.44	215°22.64 \$00°11.44	243°22.90 N11°32.01	206°8.42 <b>S</b> 04°38.50	3°29.05 N11°33.07	Denebola 182°22.08
1	54°51.90	230°22.29 12.60	258° 24.01 31.52	221°10.41 38.70	18°31.71 33.00	Gienah 175°40.66
2	69°54.37	245°21.94 13.75	273°25.12 31.04	236°12.39 38.90	33°34.37 32.94	Acrux 172°57.08
3	84° 56.83	260°21.59 · · 14.91	288°26.24 · · 30.55	251°14.38 · · 39.10	48°37.03 · · 32.88	Gacrux 171°48.58
4	99°59.30	275°21.24 16.06	303°27.35 30.06	266°16.36 39.29	63°39.69 32.81	Alioth 166°10.91
5	115°1.76	290°20.89 17.22	318°28.46 29.58	281°18.35 39.49	78°42.35 32.75	Spica 158°19.35
6	130°4.22	305°20.54 S00°18.37	333°29.58 N11°29.09	296°20.33	93°45.01 N11°32.69	Alkaid 152°50.15
7	145°6.69	320°20.19 19.53	348°30.69 28.60	311°22.31 39.88	108°47.67 32.62	Hadar 148°32.13
8	160°9.15	335°19.84 20.68	3°31.81 28.12	326°24.30 40.08 341°26.28 • 40.28	123°50.33 32.56	Menkent 147°54.32
9	175° 11.62 190° 14.08	350°19.49 · · 21.84 5°19.14 22.99	18°32.92 · · 27.63 33°34.04 27.15		138°52.98 · · 32.50	Arcturus 145°45.46
10 11	190 14.08 205°16.54	5°19.14 22.99 20°18.79 24.15	33°34.04 27.15 48°35.15 26.66	356°28.27 40.47 11°30.25 40.67	153°55.64 32.43 168°58.30 32.37	Rigil Kent. 139°36.60
12	205 10.54 220° 19.01	35°18.43 \$00°25.31	63°36.27 N11°26.17	26°32.24 <b>S</b> 04°40.87	184°0.96 N11°32.31	Kochab 137°21.28
13	235°21.47	50°18.08 26.46	78° 37.38 25.69	41°34.22 41.06	199° 3.62 32.24	Zuben'ubi 136° 52.92
14	250°23.94	65°17.73 27.62	93°38.50 25.20	56°36.21 41.26	214°6.28 32.18	Alphecca 126°1.51
15	265°26.40	80°17.38 · · 28.78	108°39.62 · · 24.71	71°38.19 · · 41.46	229°8.94 · · 32.12	Antares 112°12.36
16	280°28.86	95°17.03 29.93	123°40.73 24.23	86°40.18 41.65	244°11.60 32.05	Atria 107° 4.19
17	295°31.33	110° 16.68 31.09	138° 41.85 23.74	101°42.16 41.85	259°14.26 31.99	Sabik 101°59.51
18	310°33.79	125°16.33	153°42.97 N11°23.25	116°44.15	274°16.92 N11°31.93	Shaula 96° 6.48
19	325°36.26	140°15.98 33.40	168° 44.08 22.77	131°46.13 42.24	289°19.58 31.86	Rasalhague 95°55.94
20	340°38.72	155°15.63 34.56	183°45.20 22.28	146°48.12 42.44	304°22.23 31.80	Eltanin 90°41.10
21	355°41.18	170°15.27 · · 35.72	198°46.32 · · 21.79	161°50.10 · · 42.64	319°24.89 · · 31.74	Kaus Aust. 83°28.66 Vega 80°31.35
22	10°43.65	185°14.92 36.87	213°47.44 21.31	176°52.09 42.83	334°27.55 31.67	1
23	25°46.11	200°14.57 38.03	228°48.55 20.82	191°54.08 43.03	349°30.21 31.61	Nunki 75°44.12 Altair 61°57.03
Morr	pass. 21:17	ν-0.3' d1.2' m-3.99	ν1.1' d-0.5' m1.35	ν2.0' d0.2' m-1.69	ν2.7' d-0.1' m-0.13	Peacock 53°1.02
ivier.p	Dass. 21:17	ν-0.3 a1.2 m-3.99	ν1.1 <i>a</i> -0.5 m1.35	ν2.0 d0.2 m-1.09	ν2.7 α-0.1 m-0.13	Deneb 49°23.66
						Enif 33°35.68
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.97
0	40° 48.58	215°14.22 \$00°39.19	243°49.67 N11°20.33	206°56.06 <b>S</b> 04°43.23	4°32.87 N11°31.55	Fomalhaut 15°10.97
1	55°51.04	230°13.87 40.34	258°50.79 19.85	221°58.05 43.42	19°35.53 31.49	Scheat 13°41.96
2	70°53.50	245°13.51 41.50	273°51.91 19.36	237° 0.03 43.62	34°38.19 31.42	Markab 13°26.61
3	85°55.97	260°13.16 · · 42.66	288°53.03 · · 18.87	252°2.02 · · 43.82	49°40.85 · · 31.36	
4	100°58.43	275°12.81 43.82	303°54.15 18.39	267° 4.00 44.01	64°43.51 31.30	Oct 30 Mon SHA
5	116°0.90	290°12.46 44.97	318°55.27 17.90	282°5.99 44.21	79°46.17 31.23	Venus 176°40.70
6	131°3.36	305°12.11	333°56.39 N11°17.41	297°7.97 <b>S</b> 04°44.40	94°48.83 N11°31.17	Mars 204° 5.96 Jupiter 166° 30.52
7	146°5.83	320°11.75 47.29	348°57.51 16.93	312°9.96 44.60	109°51.49 31.11	Saturn 323°34.93
8 9	161°8.29 176°10.75	335°11.40 48.45 350°11.05 • 49.61	3°58.63 16.44 18°59.75 · · 15.95	327°11.95 44.80 342°13.93 •• 44.99	124°54.14 31.04 139°56.80 · · 30.98	Jatum 323 34.93
10	176 10.75 191°13.22	5°10.69 50.76	34°0.87 15.47	342 13.93 · · 44.99 357°15.92 45.19	154°59.46 30.92	Oct 31 Tue SHA
11	206° 15.68	20°10.34 51.92	49°1.99 14.98	12°17.90 45.38	170°2.12 30.85	Venus 175°33.20
12	200 13.08 221°18.15	35°9.99 \$00°53.08	64°3.11 N11°14.49	27°19.89 \$04°45.58	185°4.78 N11°30.79	Mars 203°33.46
13	236°20.61	50°9.63 54.24	79°4.23 14.01	42°21.88 45.78	200°7.44 30.73	Jupiter 166°18.99
14	251°23.07	65°9.28 55.40	94°5.35 13.52	57°23.86 45.97	215°10.10 30.67	Saturn 323°39.61
15	266°25.54	80°8.93 · · 56.56	109°6.47 · · 13.03	72°25.85 · · 46.17	230°12.76 · · 30.60	Nov 01 Wed SHA
16	281°28.00	95°8.57 57.71	124°7.60 12.54	87°27.84 46.36	245°15.42 30.54	Venus 174°25.64
17	296°30.47	110°8.22 00°58.87	139°8.72 12.06	102°29.82 46.56	260°18.08 30.48	Mars 203°1.10
18	311°32.93	125°7.87 <b>S</b> 01°0.03	154°9.84 N11°11.57	117°31.81 <b>S</b> 04°46.75	275°20.73 N11°30.41	Jupiter 166°7.48
19	326°35.39	140°7.51 1.19	169°10.96 11.08	132°33.80 46.95	290°23.39 30.35	Saturn 323°44.29
20	341°37.86	$155^{\circ}7.16$ 2.35	184°12.09 10.60	147°35.78 47.15	305°26.05 30.29	
21	356° 40.32	170°6.80 · · 3.51	199° 13.21 · · 10.11	162°37.77 · · 47.34	320°28.71 · · 30.22	Horizontal parallax
22	11° 42.79	185°6.45 4.67	214°14.33 9.62	177°39.76 47.54	335°31.37 30.16	Venus:
23	26° 45.25	200°6.09 5.83	229°15.46 9.14	192°41.74 47.73	350°34.03 30.10	Mars:
Mer	pass. 21:13	ν-0.4' d1.2' m-3.99	ν1.1' d-0.5' m1.34	ν2.0' d0.2' m-1.69	ν2.7' d-0.1' m-0.13	

Dec

29°15.26 -42°8.91

56°42.00

 $-57^{\circ}5.38$ 

 $23^{\circ}36.07$ 

89°23.00

-40°11.22

4°12.27

49°57.80 16°34.03

-8°10.03 46°1.43

 $6^{\circ}22.55$ 

28°37.79

-1°10.98 7°24.73

-52°42.43

-16°45.25

-29°0.52

5°9.01 27°57.19

-59°35.86

-43°32.74 -69°49.87

-8°46.99

11°49.49

 $61^{\circ}35.43$ 

14°24.60

 $-17^{\circ}42.05$ 

-63°15.40 -57°16.35

55°48.05 -11°18.64

49°10.11 -60°30.64 -36°30.62

19°1.98 -60°57.21

74°2.19 -16°9.60

26°37.18 -26°29.66

-69°4.77

 $-37^{\circ}7.42$ 

 $12^{\circ}32.56$ 

51°29.40

-34°22.19 38°48.95

-26°15.55

-56°38.59

 $45^{\circ}23.41$ 

 $10^{\circ}0.72$ 

-46°49.29 -29°28.09

28°14.69 15°21.91

Mer.pass

09:38

07:48

10:17 23:46 Mer.pass

09:39

07:46

10:14

23:42

07:44

10:11

23:38

0.1

0.1

Mer.pass 09:39

8°56.94

-15°45.50

-17°49.57

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.05	S13°52.83	41°8.66	16.5'	N04°14.18	12.5'	54.0'
1	199°5.08	53.64	55°44.18	16.5'	04° 26.69	12.5'	54.0'
2	214°5.11 229°5.14	54.46 •• 55.27	70° 19.68 84° 55.16	16.5' 16.5'	04°39.20 04°51.69	12.5' 12.5'	54.0' 54.0'
4	244°5.17	56.09	99° 30.62	16.4	05°4.16	12.5'	54.0'
5	259°5.20	56.90	114°6.05	16.4'	05° 16.62	12.4'	54.1'
6	274°5.23	<b>S</b> 13°57.72	128°41.46	16.4'	N05°29.06	12.4'	54.1'
7	289°5.26	58.53	143° 16.84	16.4'	05°41.48	12.4	54.1'
8 9	304°5.29 319°5.32	13°59.34 14°0.16	157° 52.19 172° 27.52	16.3' 16.3'	05°53.89 06°6.27	12.4' 12.4'	54.1' 54.1'
10	334°5.35	0.97	187°2.81	16.3'	06° 18.64	12.3'	54.1'
11	349°5.38	1.78	201°38.08	16.2'	$06^{\circ}30.99$	12.3'	54.1'
12	4°5.41	\$14°2.59	216° 13.31	16.2'	N06° 43.31	12.3'	54.1'
13 14	19°5.44 34°5.47	3.40 4.21	230° 48.52 245° 23.69	16.2' 16.1'	06°55.62 07°7.90	12.3' 12.3'	54.1' 54.1'
14 15	34 5.47 49°5.49	4.21 · · 5.02	245 23.09 259°58.83	16.1	07 7.90 07°20.16	12.3	54.1'
16	64°5.52	5.83	274°33.93	16.1'	07°32.39	12.2'	54.1'
17	79°5.55	6.64	$289^{\circ}9.00$	16.0'	$07^{\circ}44.60$	12.2'	54.1'
18	94°5.58	\$14°7.45	303°44.04	16.0'	N07°56.79	12.2'	54.1'
19 20	109°5.60 124°5.63	8.26 9.07	318° 19.04 332° 54.00	16.0' 15.9'	08°8.95 08°21.08	12.1' 12.1'	54.1' 54.1'
21	139° 5.65	• • 9.88	347°28.92	15.9'	08°33.18	12.1	54.1
22	154°5.68	10.69	2°3.80	15.8'	08°45.26	12.0'	54.2'
23	169°5.70	11.49	$16^{\circ}38.64$	15.8'	08°57.30	12.0'	54.2'
	SD = 16.1'	d = 0.8'		SE	O = 14.7'		
_						,	
Tue 0	<b>GHA</b> 184° 5.73	Dec \$14° 12.30	<b>GHA</b> 31° 13.44	u 15.8'	<b>Dec</b> N09° 9.32	<i>d</i> 12.0'	<b>HP</b> 54.2'
1	199°5.75	13.11	45° 48.20	15.7'	09°21.30	12.0'	54.2'
2	214°5.78	13.91	60°22.92	15.7'	09°33.26	11.9'	54.2'
3	229°5.80	• • 14.72	74°57.60	15.6'	09°45.18	11.9'	54.2'
4 5	244°5.82 259°5.85	15.53 16.33	89°32.23 104°6.81	15.6' 15.5'	09°57.07 10°8.92	11.9' 11.8'	54.2' 54.2'
6	274°5.87	S14° 17.14	118° 41.35	15.5'	N10° 20.74	11.8'	54.2'
7	289°5.89	17.94	133° 15.84	15.4'	10°32.52	11.7'	54.2'
8	304°5.91	18.74	147° 50.29	15.4'	10°44.27	11.7'	54.2'
9	319°5.93	• • 19.55	162°24.69	15.3'	10°55.98	11.7'	54.3'
10 11	334°5.95 349°5.98	20.35 21.15	176°59.03 191°33.33	15.3' 15.2'	11°7.65 11°19.28	11.6' 11.6'	54.3' 54.3'
12	4°6.00	S14°21.95	206°7.58	15.2'	N11°30.87	11.6'	54.3'
13	19°6.02	22.76	220°41.78	15.1'	11°42.42	11.5'	54.3'
14	34°6.04	23.56	235° 15.93	15.1'	11°53.93	11.5'	54.3'
15 16	49°6.06 64°6.07	· · 24.36 25.16	249°50.02 264°24.06	15.0' 15.0'	12°5.40 12°16.82	11.4' 11.4'	54.3' 54.3'
17	79°6.09	25.10	278° 58.05	14.9'	12° 28.20	11.3'	54.3'
18	94°6.11	S14°26.76	293°31.98	14.9'	N12°39.53	11.3'	54.3'
19	109°6.13	27.56	308°5.85	14.8'	12°50.82	11.2'	54.4'
20	124°6.15 139°6.16	28.36 •• 29.16	322°39.67 337°13.44	14.8' 14.7'	13°2.06 13°13.26	11.2' 11.1'	54.4' 54.4'
21 22	154°6.18	29.16	351° 47.14	14.7	13 13.20 13°24.40	11.1	54.4'
23	169°6.20	30.75	6°20.79	14.6'	13°35.50	11.0'	54.4'
	SD = 16.1'	d = 0.8'		SE	0 = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
oved 0	184°6.21	S14°31.55	20°54.38	ν 14.5'	N13° 46.54	11.0'	пР 54.4'
1	199°6.23	32.35	$35^{\circ}27.91$	14.5'	13°57.54	10.9'	54.4'
2	214°6.25	33.14	50°1.37	14.4'	14°8.48	10.9'	54.4'
3 4	229°6.26 244°6.28	· · 33.94 34.74	64°34.78 79°8.13	14.3' 14.3'	14° 19.37 14° 30.20	10.8' 10.8'	54.5' 54.5'
4 5	259°6.29	34.74 35.53	79 8.13 93°41.41	14.3	14 30.20 14°40.98	10.8	54.5'
6	274°6.31	S14°36.33	108° 14.64	14.2'	N14°51.71	10.7'	54.5'
7	289°6.32	37.12	122°47.80	14.1'	15°2.37	10.6'	54.5'
8	304°6.33 319°6.35	37.91	137°20.89 151°53.92	14.0'	15°12.98 15°23.53	10.6'	54.5'
9 10	319°6.35 334°6.36	· · 38.71 39.50	151°53.92 166°26.89	14.0' 13.9'	15°23.53 15°34.02	10.5' 10.4'	54.5' 54.5'
11	349°6.37	40.29	180° 59.79	13.8'	15° 44.45	10.4	54.6'
12	4°6.38	<b>S</b> 14°41.09	195°32.63	13.8'	N15° 54.82	10.3'	54.6'
13	19°6.40	41.88	210°5.40	13.7'	16°5.13	10.2	54.6'
14 15	34°6.41 49°6.42	42.67 •• 43.46	224°38.10 239°10.73	13.6' 13.6'	16° 15.37 16° 25.55	10.2' 10.1'	54.6' 54.6'
16	64°6.43	44.25	253°43.30	13.5'	16° 25.55 16° 35.66	10.1	54.6'
17	79°6.44	45.04	$268^{\circ}15.80$	13.4'	16°45.70	10.0'	54.6'
18	94°6.45	S14°45.83	282°48.23	13.4'	N16°55.68	9.9'	54.7'
19 20	109°6.46 124°6.47	46.62 47.41	297°20.59 311°52.88	13.3' 13.2'	17°5.59 17°15.43	9.8' 9.8'	54.7' 54.7'
20	124°6.47 139°6.48	47.41 •• 48.20	311°52.88 326°25.10	13.2'	17° 15.43 17° 25.21	9.8'	54.7' 54.7'
22	154°6.49	48.99	340° 57.25	13.1'	17°34.90	9.6'	54.7'
23	169°6.49	49.78	355°29.33	13.0'	17°44.53	9.6'	54.7'
	SD = 16.1'	d = 0.8'		SE	0 = 14.8'		

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

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

		Sun		Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-98%
30	16:20	16:22	11:44	21:52	09:31	
31	16:23	16:24	11:44	22:34	10:12	
01	16:25	16:26	11:44	23:19	10:56	

### November 02, 03, 04 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	41°47.71	215°5.74 \$01°6.99	244°16.58 N11°8.65	207°43.73 <b>S</b> 04°47.93	5°36.69 N11°30.04	
1	$56^{\circ}50.18$	230°5.38 8.14	259°17.70 8.16	222°45.72 48.12	20°39.35 29.97	Alpheratz 357°31.25 29°15.27 Ankaa 353°3.84 -42°8.92
2	71°52.64	245°5.03 9.30	274°18.83 7.67	237°47.70 48.32	35°42.01 29.91	Schedar 349°26.88 56°42.01
3	86°55.11	260°4.67 · · 10.46	289°19.95 · · 7.19	252°49.69 · · 48.51	50°44.66 · · 29.85	Diphda 348°43.95 -17°49.58
4	101°57.57	275°4.32 11.62	304°21.08 6.70	267°51.68 48.71	65°47.32 29.78	Achernar 335°17.45 -57°5.39
5 6	117°0.04 132°2.50	290°3.96 12.78 305°3.61 <b>S</b> 01°13.94	319°22.20 6.21 334°23.33 N11°5.73	282°53.67 48.90 297°55.65 \$04°49.10	80°49.98 29.72 95°52.64 N11°29.66	Hamal 327°47.33 23°36.07
7	147°4.96	320°3.25 15.10	349°24.45 5.24	312°57.64 49.30	110°55.30 29.60	Polaris 311°50.08 89°23.01
8	162°7.43	335°2.90 16.26	4°25.58 4.75	327°59.63 49.49	125° 57.96 29.53	Acamar 315°9.06 -40°11.24
9	$177^{\circ}9.89$	350°2.54 · · 17.42	19°26.71 · · 4.26	343°1.61 · · 49.69	141°0.62 · · 29.47	Menkar 314°2.59 4°12.27 Mirfak 308°23.25 49°57.81
10	$192^{\circ}12.36$	5°2.19 18.58	34°27.83 3.78	358° 3.60 49.88	156°3.28 29.41	Aldebaran 290°35.76 16°34.03
11	207° 14.82	20°1.83 19.74	49°28.96 3.29	13° 5.59 50.08	171°5.94 29.34	Rigel 281°0.64 -8°10.04
12 13	222° 17.28 237° 19.75	35°1.47 S01°20.90 50°1.12 22.06	64°30.09 N11°2.80 79°31.21 2.31	28°7.58 <b>S</b> 04°50.27 43°9.57 <b>5</b> 0.47	186°8.59 N11°29.28 201°11.25 29.22	Capella 280°16.93 46°1.44
14	252°22.21	65°0.76 23.22	94°32.34 1.83	58°11.55 50.66	216°13.91 29.16	Bellatrix 278°19.31 6°22.54
15	267°24.68	80°0.40 · · 24.38	109°33.47 · · 1.34	73°13.54 · · 50.86	231°16.57 · · 29.09	Elnath 277°57.67 28°37.79
16	$282^{\circ}27.14$	95°0.05 25.54	124°34.59 0.85	88°15.53 51.05	246°19.23 29.03	Alnilam 275°34.35 -1°10.99 Betelgeuse 270°48.52 7°24.72
17	297° 29.60	109°59.69 26.70	139°35.72 11°0.37	103°17.52 51.25	261°21.89 28.97	Betelgeuse 270°48.52 7°24.72 Canopus 263°50.68 -52°42.44
18	312°32.07	124°59.33 S01°27.86	154°36.85 N10°59.88	118°19.50 S04°51.44	276°24.55 N11°28.90	Sirius 258°23.33 -16°45.26
19	327°34.53	139°58.98 29.02	169°37.98 59.39	133°21.49 51.63	291°27.21 28.84	Adhara 255°3.25 -29°0.54
20 21	342°37.00 357°39.46	154°58.62 30.18 169°58.26 · · 31.34	184°39.11 58.90 199°40.24 • 58.42	148°23.48 51.83 163°25.47 • 52.02	306°29.87 28.78 321°32.52 •• 28.72	Procyon 244°47.51 5°9.00
22	12°41.93	184°57.91 32.50	214°41.36 57.93	178°27.46 52.22	336°35.18 28.65	Pollux 243°13.46 27°57.19
23	27°44.39	199°57.55 33.66	229°42.49 57.44	193°29.45 52.41	351°37.84 28.59	Avior 234°13.31 -59°35.87
			$\frac{1.1' \ d-0.5' \ m1.33}{\nu 1.1' \ d-0.5' \ m1.33}$		$\nu$ 2.7' d-0.1' m-0.12	Suhail 222°44.02 -43°32.75   Miaplacidus 221°37.55 -69°49.87
ivier.	pass. 21:09	ν-0.4' d1.2' m-3.99	ν <sub>1.1</sub> α-υ.5 m1.33	ν2.0′ d0.2′ m-1.69	νζ.ι α-υ.1 m-υ.12	Miaplacidus 221°37.55 -69°49.87 Alphard 217°44.77 -8°47.00
						Regulus 207°31.29 11°49.48
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.79 61°35.41
0 1	42° 46.85 57° 49.32	214°57.19 S01°34.83 229°56.83 35.99	244°43.62 N10°56.95 259°44.75 56.47	208°31.43	6°40.50 N11°28.53 21°43.16 28.47	Denebola 182°22.07 14°24.59
2	57 49.32 72°51.78	229°56.83 35.99 244°56.47 37.15	259°44.75 56.47 274°45.88 55.98	223°33.42 52.80 238°35.41 53.00	21°43.16 28.47 36°45.82 28.40	Gienah 175°40.65 -17°42.05
3	87°54.25	259°56.12 · · 38.31	289°47.01 · · 55.49	253°37.40 · · 53.19	51°48.48 · · 28.34	Acrux 172°57.05 -63°15.39
4	102° 56.71	274°55.76 39.47	304°48.14 55.00	268°39.39 53.39	66°51.13 28.28	Gacrux 171°48.56 -57°16.34   Alioth 166°10.90 55°48.04
5	$117^{\circ}59.17$	289°55.40 40.63	319°49.27 54.52	283°41.38 53.58	81°53.79 28.22	Alioth 166°10.90 55°48.04 Spica 158°19.34 -11°18.64
6	133°1.64	304°55.04 <b>S</b> 01°41.79	334°50.40 N10°54.03	298°43.37 <b>S</b> 04°53.77	96°56.45 N11°28.15	Alkaid 152°50.15 49°10.09
7	148°4.10	319°54.68 42.95	349°51.54 53.54	313°45.35 53.97	111°59.11 28.09	Hadar 148°32.12 -60°30.63
8 9	163°6.57 178°9.03	334°54.32 44.11 349°53.96 • 45.27	4°52.67 53.05 19°53.80 •• 52.57	328°47.34 54.16 343°49.33 · · 54.36	$127^{\circ}1.77$ 28.03 $142^{\circ}4.43$ · · 27.97	Menkent 147°54.31 -36°30.61
10	176 9.03 193°11.49	4°53.60 46.43	34°54.93 52.08	358°51.32 54.55	157°7.09 27.90	Arcturus 145°45.46 19°1.98
11	208° 13.96	19°53.25 47.60	49°56.06 51.59	13°53.31 54.75	172°9.74 27.84	Rigil Kent. 139°36.59 -60°57.20
12	223° 16.42	34°52.89 <b>S</b> 01°48.76	64°57.19 N10°51.10	28°55.30 <b>S</b> 04°54.94	187°12.40 N11°27.78	Kochab 137°21.30 74°2.17 Zuben'ubi 136°52.92 -16°9.60
13	$238^{\circ}18.89$	49°52.53 49.92	79°58.33 50.62	43°57.29 55.13	202°15.06 27.72	Alphecca 126°1.52 26°37.17
14	253°21.35	64°52.17 51.08	94°59.46 50.13	58°59.28 55.33	217° 17.72 27.65	Antares 112°12.37 -26°29.65
15	268° 23.82	79°51.81 · · 52.24	110°0.59 · · 49.64	74°1.27 · · 55.52	232°20.38 · · 27.59	Atria 107°4.21 -69°4.75
16 17	283°26.28 298°28.74	94°51.45 53.40 109°51.09 54.56	125°1.73 49.15 140°2.86 48.66	89° 3.26 55.72 104° 5.25 55.91	247°23.04 27.53 262°25.70 27.47	Sabik 101°59.52 -15°45.50
18	313°31.21	124°50.73 \$01°55.72	155°3.99 N10°48.18	119°7.24 \$04°56.10	277°28.35 N11°27.40	Shaula 96°6.49 -37°7.41
19	328°33.67	139°50.37 56.89	170°5.13 47.69	134° 9.23 56.30	292°31.01 27.34	Rasalhague 95°55.95 12°32.56
20	343°36.14	154°50.01 58.05	185° 6.26 47.20	149°11.21 56.49	307° 33.67 27.28	Eltanin 90°41.12 51°29.39   Kaus Aust. 83°28.67 -34°22.18
21	358° 38.60	169°49.64 01°59.21	200°7.40 · · 46.71	164°13.20 · · 56.68	322°36.33 · · 27.22	Vega 80°31.37 38°48.94
22	13°41.06	184°49.28 02°0.37	215°8.53 46.23	179°15.19 56.88	337°38.99 27.15	Nunki 75°44.14 -26°15.55
23	28°43.53	199°48.92 1.53	230° 9.67 45.74	194°17.18 57.07	352°41.65 27.09	Altair 61°57.04 8°56.94
Mer.	pass. 21:05	$\nu$ -0.4 $'$ $d1.2'$ m-3.98	$\nu 1.1' \ d$ -0.5 $' \ m1.33$	$\nu 2.0' \ d0.2' \ \text{m-}1.70$	$ u 2.7' \ d$ -0.1' m-0.11	Peacock 53°1.05 -56°38.59
						Deneb 49°23.67 45°23.41
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.69 10°0.72 Al Na'ir 27°28.99 -46°49.30
0	43° 45.99	214°48.56	245°10.80 N10°45.25	209°19.17 <b>S</b> 04°57.27	7°44.30 N11°27.03	Fomalhaut 15°10.98 -29°28.10
1	58° 48.46	229°48.20 3.86	260°11.94 44.76	224°21.16 57.46	22°46.96 26.97	Scheat 13°41.97 28°14.69
2	73°50.92	244° 47.84 5.02	275°13.07 44.28	239°23.15 57.65	37°49.62 26.90	Markab 13°26.62 15°21.91
3 4	88° 53.39 103° 55.85	259°47.48 · · 6.18 274°47.12 7.34	290°14.21 · · 43.79 305°15.34 43.30	254°25.14 · · 57.85 269°27.13 58.04	52°52.28 · · 26.84 67°54.94 26.78	Nov 02 Thu SHA Mer.pass
4 5	103 55.85 118°58.31	274°47.12 7.34 289°46.75 8.50	305°15.34 43.30 320°16.48 42.81	284°29.12 58.23	67°54.94 26.78 82°57.60 26.72	Venus 173°18.02 09:40
6	134°0.78	304°46.39 S02°9.66	335°17.62 N10°42.32	299°31.11 <b>S</b> 04°58.43	98°0.25 N11°26.66	Mars 202°28.87 07:42
7	149°3.24	319°46.03 10.83	350°18.75 41.84	314°33.10 58.62	113°2.91 26.59	Jupiter 165°56.02 10:08
8	164°5.71	334°45.67 11.99	5°19.89 41.35	329°35.10 58.81	128°5.57 26.53	Saturn 323°48.97 23:33
9	179°8.17	349°45.30 · · 13.15	20°21.03 · · 40.86	344°37.09 · · 59.01	143°8.23 · · 26.47	Nov 03 Fri SHA Mer.pass
10	194° 10.63	4°44.94 14.31	35°22.16 40.37	359°39.08 59.20	158° 10.89 26.41	Venus 172°10.34 09:40
11 12	209° 13.10 224° 15.56	19°44.58 15.47 34°44.22 \$02°16.64	50°23.30 39.89 65°24.44 N10°39.40	14°41.07 59.39 29°43.06 \$04°59.59	173°13.55 26.34 188°16.20 N11°26.28	Mars 201°56.77 07:41
13	239° 18.03	49° 43.85 17.80	80°25.58 38.91	44°45.05 04°59.78	203°18.86 26.22	Jupiter 165°44.58 10:05
14	254° 20.49	64°43.49 18.96	95°26.72 38.42	59°47.04 04°59.97	218°21.52 26.16	Saturn 323°53.65 23:29
15	$269^{\circ}22.96$	79°43.13 · · · 20.12	110°27.85 · · 37.93	74°49.03 · · 0.17	233°24.18 · · 26.10	Nov 04 Sat SHA Mer.pass
16	284°25.42	94°42.76 21.28	125°28.99 37.45	89°51.02 0.36	248°26.84 26.03	Venus 171°2.57 09:41
17	299°27.88	109° 42.40 22.45	140°30.13 36.96	104°53.01 0.55	263°29.49 25.97	Mars 201°24.81 07:39
18 19	314° 30.35 329° 32.81	124°42.03 S02°23.61 139°41.67 24.77	155°31.27 N10°36.47 170°32.41 35.98	119°55.00 S05°0.74 134°56.99 0.94	278°32.15 N11°25.91 293°34.81 25.85	Jupiter 165°33.18 10:01
20	344°35.28	159 41.07 24.77 154°41.31 25.93	185° 33.55 35.49	149°58.99 1.13	308° 37.47 25.79	Saturn 323°58.31 23:25
21	359° 37.74	169°40.94 · · 27.09	200°34.69 · · 35.01	165° 0.98 · · 1.32	323°40.13 · · 25.72	Horizontal parallax
22	14°40.20	184°40.58 28.26	215°35.83 34.52	180° 2.97 1.52	338°42.78 25.66	Venus: 0.1
23	29° 42.67	199° 40.21 29.42	230°36.97 34.03	195° 4.96 1.71	353°45.44 25.60	Mars: 0.1
Mer.	pass. 21:01	ν-0.4' d1.2' m-3.98	ν1.1' d-0.5' m1.32	ν2.0' d0.2' m-1.70	ν2.7' d-0.1' m-0.09	
	-					

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 6.50	S14°50.57	10°1.34	12.9'	N17°54.09	9.5'	54.7'
1 2	199° 6.51 214° 6.52	51.35 52.14	24°33.28 39°5.15	12.9' 12.8'	18°3.57 18°12.97	9.4' 9.3'	54.8' 54.8'
3	229° 6.52	52.93	53°36.94	12.7'	18°22.30	9.3'	54.8'
4	244°6.53	53.71	68°8.66	12.6'	18°31.55	9.2'	54.8'
5	259° 6.54 274° 6.54	54.50 \$14°55.28	82°40.31 97°11.89	12.6' 12.5'	18°40.72 N18°49.81	9.1' 9.0'	54.8' 54.8'
6 7	274 0.54 289° 6.55	56.07	97 11.89 111°43.39	12.5	18°58.83	9.0 8.9'	54.8'
8	304°6.55	56.85	126°14.82	12.4'	19°7.76	8.8'	54.9'
9	319°6.56	• • 57.63	140°46.18	12.3'	19°16.61 19°25.37	8.8'	54.9'
10 11	334° 6.56 349° 6.57	58.42 14°59.20	155°17.46 169°48.67	12.2' 12.1'	19°25.37 19°34.05	8.7' 8.6'	54.9' 54.9'
12	4° 6.57	S14°59.98	184°19.81	12.1'	N19°42.65	8.5'	54.9'
13	19° 6.57	0.77	198°50.87	12.0'	19°51.16	8.4'	54.9'
14 15	34° 6.58 49° 6.58	1.55 · · 2.33	213°21.86 227°52.78	11.9' 11.8'	19°59.58 20°7.91	8.3' 8.2'	55.0' 55.0'
16	64° 6.58	3.11	242°23.62	11.8'	20°16.16	8.2'	55.0'
17	79°6.58	3.89	256°54.38	11.7'	20°24.31	8.1'	55.0'
18 19	94° 6.59 109° 6.59	\$15°4.67 5.45	271°25.07 285°55.69	11.6' 11.5'	N20°32.37 20°40.34	8.0' 7.9'	55.0' 55.0'
20	109 0.59 124° 6.59	6.23	300°26.23	11.5'	20°48.22	7.9 7.8'	55.0'
21	139°6.59	• • 7.01	314°56.70	11.4'	20°56.00	7.7'	55.1'
22	154° 6.59	7.78	329°27.10	11.3'	21°3.69	7.6'	55.1'
23	169°6.59	8.56	343°57.42	11.2'	21°11.28	7.5'	55.1'
	SD = 16.1'	d = 0.8'		SD	= 14.9'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	184° 6.59 199° 6.59	\$15°9.34 10.12	358°27.67 12°57.84	11.2' 11.1'	N21°18.77 21°26.16	7.4' 7.3'	55.1' 55.1'
2	214° 6.59	10.12	27°27.94	11.1	21°20.10	7.3 7.2'	55.1'
3	229°6.59	•• 11.67	41°57.97	11.0'	$21^{\circ}40.65$	7.1'	55.2'
4	244° 6.58 259° 6.58	12.45 13.22	56°27.93 70°57.81	10.9' 10.8'	21°47.74 21°54.73	7.0' 6.9'	55.2'
5 6	274° 6.58	S15°14.00	85°27.62	10.8	N22°1.62	6.8	55.2' 55.2'
7	289°6.58	14.77	99°57.36	10.7'	22°8.40	6.7'	55.2'
8	304° 6.57 319° 6.57	15.54	114°27.02 128°56.62	10.6'	22°15.08 22°21.65	6.6'	55.3'
9 10	319 6.57 334° 6.56	· · 16.32 17.09	128 50.02 143°26.14	10.5' 10.5'	22°28.11	6.5' 6.4'	55.3' 55.3'
11	349° 6.56	17.86	157°55.59	10.4	22°34.47	6.2'	55.3'
12	4° 6.56	\$15°18.64	172°24.97	10.3'	N22°40.71	6.1'	55.3'
13 14	19° 6.55 34° 6.54	19.41 20.18	186°54.28 201°23.53	10.2' 10.2'	22°46.85 22°52.87	6.0' 5.9'	55.3' 55.4'
15	49° 6.54	• • 20.95	215°52.70	10.1'	22°58.78	5.8'	55.4'
16	64° 6.53	21.72	230°21.81	10.0'	23°4.58	5.7'	55.4'
17 18	79° 6.53 94° 6.52	22.49 \$15°23.26	244°50.84 259°19.81	10.0' 9.9'	23°10.27 N23°15.84	5.6' 5.5'	55.4' 55.4'
19	109°6.51	24.03	273°48.72	9.8'	23°21.29	5.3'	55.4'
20	124° 6.50	24.80	288°17.55	9.8'	23°26.63	5.2'	55.5'
21 22	139° 6.50 154° 6.49	· · 25.57 26.33	302°46.33 317°15.03	9.7' 9.6'	23°31.85 23°36.96	5.1' 5.0'	55.5' 55.5'
23	169° 6.48	27.10	331°43.68	9.6'	23°41.94	4.9'	55.5'
	SD = 16.1'	d = 0.8'	-	SD	= 15.0′		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	184° 6.47	S15°27.87	346°12.26	9.5'	N23°46.80	4.7'	55.5'
1	199°6.46	28.64	0°40.77	9.5'	23°51.54	4.6'	55.6'
2 3	214° 6.45 229° 6.44	29.40 · · 30.17	15°9.23 29°37.62	9.4' 9.3'	23°56.16 24°0.66	4.5' 4.4'	55.6' 55.6'
4	244° 6.43	30.93	44°5.96	9.3'	24°5.04	4.3'	55.6'
5	259° 6.42	31.70	58°34.23	9.2'	24°9.29	4.1'	55.6'
6 7	274° 6.41 289° 6.40	\$15°32.46 33.23	73°2.45 87°30.60	9.2' 9.1'	N24°13.41 24°17.41	4.0' 3.9'	55.7' 55.7'
8	304° 6.38	33.99	101°58.70	9.1	24 17.41 24°21.28	3.7'	55.7'
9	319°6.37	• • 34.75	$116^{\circ}26.75$	9.0'	24°25.03	3.6'	55.7'
10	334° 6.36 349° 6.35	35.51	130°54.74 145°22.67	8.9'	24°28.65 24°32.14	3.5'	55.7'
11 12	349°6.35 4°6.33	36.28 \$15°37.04	145°22.67 159°50.56	8.9' 8.8'	24°32.14 N24°35.50	3.4' 3.2'	55.7' 55.8'
13	19°6.32	37.80	174°18.39	8.8'	24°38.73	3.1'	55.8'
14	34°6.31	38.56	188°46.17	8.7'	24°41.82	3.0'	55.8'
15 16	49° 6.29 64° 6.28	· · 39.32 40.08	203°13.90 217°41.58	8.7' 8.6'	24°44.79 24°47.63	2.8' 2.7'	55.8' 55.8'
17	79°6.26	40.84	$232^{\circ}9.21$	8.6'	24°50.33	2.6'	55.9'
18	94° 6.25	\$15°41.60	246°36.80	8.5'	N24°52.90	2.4'	55.9'
19 20	109° 6.23 124° 6.21	42.36 43.12	261°4.34 275°31.83	8.5' 8.5'	24°55.33 24°57.63	2.3' 2.2'	55.9' 55.9'
21	139°6.20	• • 43.87	289°59.28	8.4'	24°59.80	2.0'	55.9'
22	154° 6.18	44.63	304°26.69	8.4'	25°1.83	1.9'	56.0'
23	169°6.16	45.39	318°54.06	8.3'	25°3.72	1.8'	56.0'
	SD = 16.1'	d = 0.8'		SD	= 15.1'		

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

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

		Sun		Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%
02	16:26	16:26	11:44	-:-	11:42	
03	16:26	16:26	11:44	00:06	12:31	
04	16:26	16:25	11:44	00:57	13:24	

# November 05, 06, 07 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
C		CIIA D	CHA De-	CIIA De-	CUA De-
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	44°45.13	214°39.85 <b>S</b> 02°30.58	245°38.11 N10°33.54	210°6.95 S05°1.90	8°48.10 N11°25.54
1	59°47.60	229°39.48 31.74	260°39.25 33.06	225°8.94 2.09	23°50.76 25.48
2	74°50.06	244°39.12 32.90	275°40.39 32.57	240°10.93 2.29	38°53.41 25.41
3	89°52.53	259°38.75 · · 34.07	290°41.53 · · 32.08	255°12.93 · · 2.48	53°56.07 · · 25.35
4	104°54.99	274°38.39 35.23	305°42.68 31.59	270°14.92 2.67	68°58.73 25.29
5	119°57.45	289°38.02 36.39	320°43.82 31.10	285°16.91 2.86	84°1.39 25.23
6	134°59.92	304°37.65 S02°37.55	335°44.96 N10°30.62	300°18.90 S05°3.06	99°4.05 N11°25.17
7	150°2.38	319°37.29 38.71	350°46.10 30.13	315°20.89 3.25	114°6.70 25.10
8	165°4.85	334°36.92 39.88	5°47.24 29.64	330°22.88 3.44	129°9.36 25.04
9	180°7.31	349°36.55 · · 41.04	20°48.39 · · 29.15	345°24.88 · · 3.63	144°12.02 · · 24.98
10	195°9.77	4°36.19 42.20	35°49.53 28.66	0°26.87 3.83	159° 14.68 24.92
11	210° 12.24	19°35.82 43.36	50°50.67 28.18	15°28.86 4.02	174°17.33 24.86
12	225° 14.70	34°35.45 <b>S</b> 02°44.53	65°51.82 N10°27.69	30°30.85 S05°4.21	189°19.99 N11°24.80
13	240°17.17	49°35.09 45.69	80°52.96 27.20	45°32.85 4.40	204°22.65 24.73
14	255° 19.63	64°34.72 46.85	95°54.10 26.71	60°34.84 4.59	219°25.31 24.67
15	270°22.10	79°34.35 · · 48.01	110°55.25 · · 26.22	75°36.83 · · 4.79	234°27.96 · · 24.61
16	285°24.56	94°33.98 49.17	125°56.39 25.74	90°38.82 4.98	249°30.62 24.55
17	300° 27.02	109°33.62 50.34	140°57.54 25.25	105°40.82 5.17	264°33.28 24.49
18	315° 29.49	124°33.25 S02°51.50	155°58.68 N10°24.76	120°42.81	279°35.94 N11°24.43
	330°31.95	139°32.88 52.66	170°59.83 24.27	135°44.80 5.55	294° 38.59 24.36
19					
20	345°34.42		186°0.97 23.78		309°41.25 24.30
21	0°36.88	169°32.14 · · 54.98	201°2.12 · · 23.30	165°48.79 · · 5.94	324°43.91 · · 24.24
22	15°39.34	184°31.77 56.15	216° 3.26 22.81	180°50.78 6.13	339° 46.57 24.18
23	30°41.81	199°31.41 57.31	231°4.41 22.32	195°52.77 6.32	354°49.22 24.12
Marr	20.50	ν-0.4' d1.2' m-3.98	ν1.1' d-0.5' m1.31	ν2.0' d0.2' m-1.70	ν2.7' d-0.1' m-0.08
ivier.	pass. 20:58	ν-υ. <del>+</del> u1.∠ III-3.98	ν1.1 α-0.5 III1.51	ν Δ.Ο UU.Δ III-1./U	ν2.1 u-0.1 III-0.00
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	45° 44.27	214°31.04 <b>S</b> 02°58.47	246°5.56 N10°21.83	210°54.77	9°51.88 N11°24.06
1	60°46.74	229°30.67 02°59.63	261°6.70 21.34	225°56.76 6.70	24°54.54 23.99
2	75° 49.20	244°30.30 03°0.80	276°7.85 20.86	240°58.75 6.90	39°57.20 23.93
	90°51.67	259°29.93 ·· 1.96	291°9.00 · · 20.37	256° 0.75 · · 7.09	54°59.85 · · 23.87
3					
4	105°54.13	274°29.56 3.12	306°10.14 19.88	271°2.74 7.28	70°2.51 23.81
5	120°56.59	289°29.19 4.28	321°11.29 19.39	286° 4.73 7.47	85°5.17 23.75
6	135°59.06	304°28.82 <b>S</b> 03°5.44	336°12.44 N10°18.91	301°6.73 <b>S</b> 05°7.66	100°7.82 N11°23.69
7	151°1.52	319°28.45 6.60	351°13.59 18.42	316°8.72 7.85	115° 10.48 23.63
8	166°3.99	334°28.08 7.77	6°14.74 17.93	331°10.71 8.05	130°13.14 23.56
9	181°6.45	349°27.71 · · 8.93	21°15.88 · · 17.44	346°12.71 · · 8.24	145°15.80 · · 23.50
10	196°8.92	4°27.33 10.09	36°17.03 16.95	1°14.70 8.43	160° 18.45 23.44
11	211° 11.38	19° 26.96 11.25	51°18.18 16.47	16°16.69 8.62	175°21.11 23.38
12	226° 13.84	34°26.59 S03°12.41	66°19.33 N10°15.98	31°18.69 S05°8.81	190°23.77 N11°23.32
13	241° 16.31	49°26.22 13.58	81°20.48 15.49	46°20.68 9.00	205° 26.42 23.26
14	256° 18.77	64°25.85 14.74	96°21.63 15.00	61°22.68 9.19	220°29.08 23.20
	271°21.24				
15					
16	286°23.70			91°26.66 9.57	250°34.40 23.07
17	301°26.16	109°24.73 18.22	141°25.08 13.54	106°28.66 9.77	265°37.05 23.01
18	316°28.63	124°24.36	156°26.23 N10°13.05	121°30.65 <b>S</b> 05°9.96	280°39.71 N11°22.95
19	331°31.09	139°23.99 20.55	171°27.38 12.56		295° 42.37 22.89
20	346°33.56	154°23.62 21.71	186°28.53 12.07	151°34.64 10.34	310°45.02 22.83
21	1°36.02	169°23.24 · · 22.87	201°29.68 · · 11.59	166°36.64 · · 10.53	325°47.68 · · 22.77
22	$16^{\circ}38.49$	184°22.87 24.03	216°30.83 11.10	181°38.63 10.72	340°50.34 22.71
23	31°40.95	199° 22.50 25.19	231°31.99 10.61	196°40.63 10.91	355°52.99 22.65
1/104	pass. 20:54	ν-0.4' d1.2' m-3.98	ν1.1' d-0.5' m1.30	$\nu 2.0' \ d0.2' \ \text{m-}1.70$	ν2.7' d-0.1' m-0.08
ivier.p	pass. 20:54	ν-0.4 d1.2 m-3.96	ν1.1 <i>a</i> -0.5 m1.50	V2.0 d0.2 HI-1.70	<i>V2.1 d-</i> 0.1 III-0.06
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	46°43.41	214°22.12 <b>S</b> 03°26.35	246°33.14 N10°10.12	211°42.62 \$05°11.10	10°55.65 N11°22.58
1	61°45.88	229°21.75 27.52	261°34.29 9.63	226°44.62 11.29	25°58.31 22.52
2	76°48.34	244°21.37 28.68	276°35.44 9.15	241°46.61 11.48	41°0.96 22.46
3	91°50.81	259°21.00 · · 29.84	291°36.59 · · 8.66	256°48.61 · · 11.67	56°3.62 · · · 22.40
4	106°53.27	274°20.63 31.00	306°37.75 8.17	271°50.60 11.86	71°6.28 22.34 <b>1</b>
5	100 55.27 121°55.73	289° 20.25 32.16	321°38.90 7.68	286°52.60 12.05	86°8.93 22.28
6	121 55.73 136° 58.20	304°19.88 S03°33.32	336°40.05 N10°7.19	301°54.59 S05°12.24	101°11.59 N11°22.22
7	152°0.66	319°19.50 34.48	351°41.21 6.71	316°56.59 12.43	116°14.24 22.16
8	167°3.13	334°19.13 35.65	6°42.36 6.22	331°58.58 12.62	131°16.90 22.10
9	182°5.59	349°18.75 · · 36.81	21°43.51 · · 5.73	347°0.58 · · 12.82	146°19.56 · · 22.03
10	197°8.06	4°18.38 37.97	36°44.67 5.24	2°2.57 13.01	161°22.21 21.97
11	$212^{\circ}10.52$	19°18.00 39.13	51°45.82 4.76	17° 4.57 13.20	176°24.87 21.91
12	227° 12.98	34°17.62 <b>S</b> 03°40.29	66°46.98 N10°4.27	32°6.56 \$05°13.39	191°27.53 N11°21.85
13	242° 15.45	49°17.25 41.45	81°48.13 3.78	47° 8.56 13.58	206°30.18 21.79
14	257° 17.91	64°16.87 42.61	96°49.29 3.29	62°10.55 13.77	221°32.84 21.73
15	272°20.38	79°16.49 · · 43.77	111°50.44 · · 2.80	77°12.55 · · 13.96	236°35.50 · · 21.67
16	287° 22.84	94°16.12 44.93	126°51.60 2.32	92°14.55 14.15	251°38.15 21.61
	302° 25.30	109°15.74 46.09	141°52.76 1.83	107°16.54 14.34	266° 40.81 21.55
17					
18	317°27.77	124°15.36	156°53.91 N10°1.34	122°18.54 \$05°14.53	281°43.46 N11°21.49
19	332° 30.23	139°14.99 48.42	171°55.07 0.85	137°20.53 14.72	296°46.12 21.43
20	347°32.70	154°14.61 49.58	186°56.22 10°0.36	152°22.53 14.91	311°48.78 21.37
21	2°35.16	169°14.23 · · 50.74	201°57.38 09°59.88	167°24.53 · · 15.10	326° 51.43 · · · 21.30
22	17° 37.63	184°13.85 51.90	216°58.54 59.39	182°26.52 15.29	341°54.09 21.24
23	32°40.09	199°13.47 53.06	231°59.70 58.90	197°28.52 15.47	356° 56.74 21.18
More	pass. 20:50	ν-0.4' d1.2' m-3.98	ν1.2' d-0.5' m1.30	ν2.0' d0.2' m-1.70	ν2.7' d-0.1' m-0.07
ivier.	µass. ∠U:5U	ν-υ.4 α1.2 M-3.98	ν1.2 α-0.5 m1.30	ν ∠.υ αυ.∠ m-1./U	ν2.1 α-0.1 III-0.07

		_
Alpheratz	357°31.25	29° 15.27
Ankaa	353°3.84	-42°8.93
Schedar	349°26.88	56°42.03
Diphda	348°43.95	$-17^{\circ}49.59$
Achernar	335°17.45	-57°5.41
Hamal	327°47.32	23°36.08
Polaris	311°49.39	89°23.03
Acamar	315°9.05	-40°11.25
		4° 12.27
Menkar	314°2.57	
Mirfak	308°23.23	49°57.82
Aldebaran	290°35.74	16°34.02
Rigel	$281^{\circ}0.62$	-8°10.05
Capella	280°16.90	46°1.44
Bellatrix	278°19.29	6°22.54
Elnath	277°57.64	28°37.79
Alnilam	275°34.33	-1°10.99
Betelgeuse	270°48.49	7°24.71
	263°50.66	-52°42.46
Canopus	258°23.31	-32 42.40 -16°45.27
Sirius		
Adhara	255°3.23	-29°0.55
Procyon	244°47.48	5°9.00
Pollux	243°13.43	27°57.18
Avior	234°13.27	-59°35.87
Suhail	222°43.98	-43°32.75
Miaplacidus	221°37.49	-69°49.88
Alphard	217°44.74	-8°47.00
	217 44.74 207°31.27	-8 47.00 11°49.47
Regulus		
Dubhe	193°37.75	61°35.40
Denebola	182°22.05	14°24.58
Gienah	$175^{\circ}40.63$	-17°42.06
Acrux	$172^{\circ}57.01$	-63° 15.39
Gacrux	171°48.52	-57° 16.34
Alioth	166°10.88	55°48.02
Spica	158°19.33	-11°18.64
Alkaid	152°50.14	49° 10.07
Hadar	148°32.10	-60°30.62
Menkent	147°54.30	-36°30.61
Arcturus	145°45.45	$19^{\circ}1.96$
Rigil Kent.	139°36.57	-60°57.19
Kochab	137°21.31	$74^{\circ}2.15$
Zuben'ubi	136°52.90	-16°9.60
Alphecca	126°1.51	26°37.16
Antares	112° 12.36	-26°29.65
Atria	107°4.21	-69°4.74
Sabik	101°59.52	-15°45.50
Shaula	96°6.49	-37°7.41
Rasalhague	95°55.95	12° 32.55
Eltanin	90°41.13	51°29.38
Kaus Aust.	83°28.68	-34°22.18
Vega	80°31.38	38°48.94
Nunki	75°44.14	-26° 15.55
Altair	61°57.05	8°56.94
Peacock	53°1.07	-56°38.58
Deneb	49°23.69	45°23.41
	49 23.69 33°35.69	45 23.41 10°0.72
Enif		
Al Na'ir	27°29.01	-46°49.30
Fomalhaut	15°10.99	-29°28.10
Scheat	13°41.97	28° 14.69
Markab	13°26.62	$15^{\circ}21.91$
A1 0= -	<b></b>	
Nov 05 Sun	SHA	Mer.pass
Venus	169°54.71	09:42
Mars	200°52.98	07:37
Jupiter	$165^{\circ}21.82$	09:58
Saturn	324°2.97	23:21
Nov 06 Mon	SHA	Mer.pass
Venus	$168^{\circ}46.76$	09:42
Mars	200°21.28	07:35
Jupiter	165°10.49	09:55
Saturn	324°7.61	23:16
Nov 07 Tue	SHA	Mer.pass
Venus	167°38.71	09:43
Mars	199°49.72	07:33
	164°59.21	09:52
IIIniter	324°12.24	23:12
Jupiter Saturn	J4 14.44	∠3:12
Saturn		
Saturn	tal parallax	
Saturn	ital parallax Venus:	0.1
Saturn	-	0.1 0.1

Stars SHA

Dec

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.14	S15°46.14	333°21.39	8.3'	N25°5.47	1.6'	56.0'
1 2	199°6.13 214°6.11	46.90 47.66	347°48.68 2°15.94	8.3' 8.2'	25°7.09 25°8.57	1.5' 1.3'	56.0' 56.0'
3	229°6.09	• • 48.41	16°43.15	8.2'	25°9.92	1.2'	56.1
4	244°6.07	49.16	31°10.33	8.1'	25°11.12	1.1'	56.1'
5	259°6.05 274°6.03	49.92 \$15°50.67	45°37.48 60°4.60	8.1' 8.1'	25°12.18 N25°13.11	0.9'	56.1' 56.1'
6 7	274 6.03 289°6.01	51.43	74°31.68	8.1' 8.1'	N25 13.11 25°13.89	0.8	56.1
8	304°5.99	52.18	88°58.74	8.0'	25°14.54	0.5'	56.2'
9	319°5.97	• • 52.93	103°25.76	8.0'	25°15.04	0.4'	56.2'
10 11	334°5.95 349°5.93	53.68 54.43	117°52.76 132°19.74	8.0' 7.9'	25°15.40 25°15.62	0.2' 0.1'	56.2' 56.2'
12	4°5.90	\$15°55.18	146°46.69	7.9'	N25°15.70	-0.1	56.2
13	19°5.88	55.94	$161^{\circ}13.61$	7.9'	$25^{\circ}15.64$	-0.2'	56.3'
14 15	34°5.86 49°5.83	56.68 •• 57.43	175°40.51 190°7.40	7.9' 7.9'	25°15.44 25°15.09	-0.3' -0.5'	56.3' 56.3'
16	64° 5.81	58.18	204°34.26	7.8'	25°14.60	-0.5 -0.6'	56.3
17	79°5.79	58.93	$219^{\circ}1.11$	7.8'	25°13.96	-0.8'	56.3'
18	94°5.76	\$15°59.68	233°27.93	7.8'	N25°13.19	-0.9'	56.4
19 20	109°5.74 124°5.71	16° 0.43 1.18	247°54.75 262°21.55	7.8' 7.8'	25°12.27 25°11.20	-1.1' -1.2'	56.4' 56.4'
21	139°5.69	. 1.92	276°48.33	7.8'	25°10.00	-1.4'	56.4
22	154°5.66	2.67	291°15.11	7.8'	25°8.65	-1.5'	56.5'
23	169°5.64	3.41	305°41.88	7.8'	25°7.15	-1.6'	56.5'
	SD = 16.1'	d = 0.8'		SI	O = 15.3'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	184°5.61	S16°4.16	320°8.63	7.7'	N25°5.51	-1.8'	56.5'
1	199°5.58	4.90	334°35.38	7.7'	25°3.73	-1.9'	56.5
2	214°5.56 229°5.53	5.65 •• 6.39	349°2.13 3°28.87	7.7' 7.7'	25°1.80 24°59.73	-2.1' -2.2'	56.5' 56.6'
4	244°5.50	7.14	17°55.60	7.7'	24°57.52	-2.4	56.6'
5	259°5.47	7.88	32°22.34	7.7'	24°55.16	-2.5'	56.6'
6 7	274°5.44 289°5.41	\$16°8.62 9.36	46°49.07 61°15.80	7.7' 7.7'	N24°52.66 24°50.01	-2.6' -2.8'	56.6' 56.6'
8	304°5.38	10.11	75°42.54	7.7'	24° 47.22	-2.9'	56.7'
9	319°5.35	• • 10.85	90° 9.28	7.7'	24°44.29	-3.1'	56.7'
10 11	334°5.32 349°5.29	11.59 12.33	104°36.02 119°2.77	7.7' 7.8'	24°41.22 24°38.00	-3.2' -3.4'	56.7' 56.7'
12	4°5.26	S16°13.07	133°29.53	7.8'	N24°34.63	-3.5'	56.8
13	19°5.23	13.81	147°56.29	7.8'	24°31.13	-3.6'	56.8'
14 15	34°5.20 49°5.17	14.55 •• 15.28	162°23.06 176°49.85	7.8' 7.8'	24°27.48 24°23.69	-3.8' -3.9'	56.8' 56.8'
16	64° 5.13	16.02	170 49.65 191°16.64	7.8'	24 23.09 24°19.75	-3.9 -4.1'	56.8'
17	79°5.10	16.76	$205^{\circ}43.45$	7.8'	$24^{\circ}15.68$	-4.2'	56.9'
18 19	94°5.07 109°5.04	\$16°17.50 18.23	220°10.27 234°37.11	7.8' 7.9'	N24°11.46 24°7.10	-4.4' -4.5'	56.9' 56.9'
20	109 5.04 124° 5.00	18.97	249° 3.96		24 7.10 24°2.61		56.9'
21	139°4.97	• • 19.71	263°30.83	7.9'	23°57.97	-4.8'	57.0'
22	154°4.93	20.44	277°57.72	7.9'	23°53.19	-4.9'	57.0'
23	169°4.90	21.17	292°24.62	7.9'	23°48.27	-5.1'	57.0'
	SD = 16.1'	d = 0.7'		SL	D = 15.4'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	184°4.86 199°4.83	\$16°21.91 22.64	306°51.55 321°18.50	7.9' 8.0'	N23°43.21 23°38.01	-5.2' -5.3'	57.0' 57.0'
2	199 4.83 214°4.79	23.38	321 18.50 335°45.47	8.0'	23°32.67	-5.5'	57.0 57.1'
3	229°4.75	• • 24.11	$350^{\circ}12.47$	8.0'	23°27.19	-5.6'	57.1'
4	244°4.72 259°4.68	24.84	4°39.49 19°6.53	8.0' 8.1'	23°21.58 23°15.83	-5.8'	57.1'
5 6	259°4.68 274°4.64	25.57 \$16°26.30	33°33.60	8.1'	N23°9.94	-5.9' -6.0'	57.1' 57.2'
7	289°4.60	27.03	48°0.70	8.1'	23°3.92	-6.2'	57.2'
8	304°4.57	27.77	62°27.82	8.2'	22°57.76	-6.3	57.2'
9 10	319°4.53 334°4.49	· · 28.50 29.22	76°54.98 91°22.16	8.2' 8.2'	22°51.47 22°45.04	-6.4' -6.6'	57.2' 57.3'
11	349°4.45	29.95	105°49.37	8.2'	22°38.48	-6.7	57.3'
12	4°4.41	S16°30.68	120°16.62	8.3'	N22°31.78	-6.8'	57.3'
13 14	19°4.37 34°4.33	31.41 32.14	134°43.89 149°11.20	8.3' 8.3'	22°24.95 22°17.99	-7.0' -7.1'	57.3' 57.3'
15	49°4.29	32.86	163°38.54	8.4'	22°10.90	-7.1 -7.2'	57.4'
16	64°4.25	33.59	178°5.92	8.4'	22°3.67	-7.4'	57.4'
17 18	79°4.20 94°4.16	34.32 \$16°35.04	192°33.33 207°0.77	8.4' 8.5'	21°56.32 N21°48.84	-7.5' -7.6'	57.4' 57.4'
19	94 4.16 109°4.12	35.77	207 0.77 221°28.25	8.5'	21°41.23	-7.0 -7.7'	57.4 57.5'
20	124°4.08	36.49	235°55.77	8.6'	21°33.49	-7.9'	57.5'
21 22	139°4.03 154°3.99	· · 37.22 37.94	250°23.32 264°50.91	8.6' 8.6'	21°25.62 21°17.63	-8.0' -8.1'	57.5' 57.5'
23	169°3.95	38.66	279°18.53	8.7'	21 17.03 21°9.51	-8.2'	57.6'
	SD = 16.1'	d = 0.7'		SI	D = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-80%	
05	16:25	16:24	11:44	01:51	14:18		
06	16:22	16:21	11:44	02:46	15:13		
07	16:19	16:18	11:44	03:41	16:08		

### November 08, 09, 10 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	47° 42.55	214°13.10 S03°54.22	247°0.85 N09°58.41	212°30.52 \$05°15.66	11°59.40 N11°21.12	
1	62° 45.02	229°12.72 55.38	262°2.01 57.93	227°32.51 15.85	27°2.06 21.06	Alpheratz 357°31.25
2	77° 47.48	244°12.34 56.54	277°3.17 57.44	242°34.51 16.04	42°4.71 21.00	Ankaa 353° 3.85
3	92°49.95	259°11.96 · · 57.70	292°4.33 · · 56.95	257°36.51 · · 16.23	57°7.37 · · 20.94	Schedar 349°26.88
4	107°52.41	274°11.58 03°58.86	307°5.49 56.46	272°38.50 16.42	72°10.02 20.88	Diphda 348°43.95 Achernar 335°17.45
5	122°54.87	289°11.20 04°0.02	322°6.64 55.97	287°40.50 16.61	87°12.68 20.82	Hamal 327°47.31
6	137°57.34	304°10.82 <b>S</b> 04°1.18	337°7.80 N09°55.49	302°42.50 <b>S</b> 05°16.80	102°15.33 N11°20.76	Polaris 311°48.92
7	152° 59.80	319° 10.44 2.34	352° 8.96 55.00	317°44.49 16.99	117°17.99 20.70	Acamar 315° 9.04
8	168°2.27	334°10.06 3.50	7°10.12 54.51	332°46.49 17.18	132°20.65 20.64	Menkar 314° 2.56
9	183°4.73	349°9.68 · · 4.66	22°11.28 · · 54.02	347°48.49 · · 17.37	147°23.30 · · 20.58	Mirfak 308°23.21
10	198°7.20	4°9.30 5.82	37°12.44 53.54	2°50.48 17.56	162°25.96 20.52	Aldebaran 290°35.72
11 12	213°9.66 228°12.12	19°8.92 6.98 34°8.54 <b>S</b> 04°8.14	52°13.60 53.05 67°14.76 N09°52.56	17°52.48 17.75 32°54.48 \$05°17.94	177°28.61 20.46 192°31.27 N11°20.40	Rigel 281° 0.60
13	243° 14.59	49°8.16 9.30	82°15.92 52.07	47°56.48 18.13	207°33.92 20.34	Capella 280°16.87
14	258° 17.05	64°7.78 10.46	97°17.08 51.59	62°58.47 18.31	207 33.92 20.34 222°36.58 20.27	Bellatrix 278°19.27
15	273° 19.52	79°7.39 · · 11.62	112°18.25 · · 51.10	78° 0.47 · · 18.50	237°39.23 · · 20.21	Elnath 277° 57.62
16	288°21.98	94°7.01 12.78	127°19.41 50.61	93° 2.47 18.69	252°41.89 20.15	Alnilam 275°34.31
17	303°24.44	109°6.63 13.94	142°20.57 50.12	108° 4.47 18.88	267°44.54 20.09	Betelgeuse 270°48.47
18	318°26.91	124°6.25 <b>S</b> 04°15.10	157°21.73 N09°49.63	123°6.46	282°47.20 N11°20.03	Canopus 263°50.63
19	333°29.37	139°5.87 16.25	172°22.89 49.15	138° 8.46 19.26	297° 49.85 19.97	Sirius 258°23.28 Adhara 255°3.20
20	348°31.84	154°5.48 17.41	187°24.05 48.66	153°10.46 19.45	312°52.51 19.91	Adhara 255°3.20 Procyon 244°47.45
21	3°34.30	169°5.10 · · 18.57	202°25.22 · · 48.17	168°12.46 · · 19.64	327°55.16 · · 19.85	Pollux 243°13.40
22	18°36.77	184°4.72 19.73	217°26.38 47.68	183°14.46 19.83	342°57.82 19.79	Avior 234°13.24
23	33°39.23	199°4.33 20.89	232°27.54 47.20	198°16.46 20.01	358°0.47 19.73	Suhail 222°43.95
Mer.n	pass. 20:46	ν-0.4' d1.2' m-3.97	ν1.2' d-0.5' m1.29	$\nu 2.0' \ d0.2' \ \text{m-}1.70$	$\nu 2.7' \ d-0.1' \ m-0.06$	Miaplacidus 221°37.44
						Alphard 217°44.72
<b>-</b>	6114	6114	6114	6114	G.1.4 B	Regulus 207°31.24
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.71
0	48°41.69	214°3.95 \$04°22.05	247°28.71 N09°46.71	213°18.45 \$05°20.20	13°3.13 N11°19.67	Denebola 182°22.02
1 2	63° 44.16 78° 46.62	229°3.57 23.21 244°3.18 24.37	262°29.87 46.22 277°31.03 45.73	228°20.45 20.39	28°5.78 19.61 43°8.44 19.55	Gienah 175°40.61
3	78 40.02 93°49.09	244°3.18 24.37 259°2.80 •• 25.53	277°31.03 45.73 292°32.20 • 45.25	243°22.45 20.58 258°24.45 20.77	43°8.44 19.55 58°11.09 · · 19.49	Acrux 172°56.98
4	108° 51.55	274°2.41 26.68	307°33.36 44.76	273°26.45 20.77	73°13.75 19.43	Gacrux 171°48.49
5	123°54.01	289°2.03 27.84	322°34.53 44.27	288°28.45 21.14	88°16.40 19.37	Alioth 166°10.86
6	138° 56.48	304°1.64 S04°29.00	337°35.69 N09°43.78	303°30.44 S05°21.33	103°19.06 N11°19.31	Spica 158°19.31
7	153°58.94	319°1.26 30.16	352°36.86 43.30	318°32.44 21.52	118°21.71 19.25	Alkaid 152°50.12
8	169°1.41	334°0.87 31.32	7°38.02 42.81	333°34.44 21.71	133°24.37 19.19	Hadar 148°32.08
9	184°3.87	349°0.49 · · 32.48	22°39.19 · · 42.32	348°36.44 · · 21.90	148°27.02 · · 19.13	Menkent 147°54.28 Arcturus 145°45.44
10	199°6.34	4°0.10 33.63	37°40.35 41.83	3°38.44 22.09	163°29.68 19.07	Rigil Kent. 139°36.55
11	214°8.80	18°59.72 34.79	52°41.52 41.35	18°40.44 22.27	178° 32.33 19.01	Kochab 137°21.31
12	229°11.26	33°59.33 <b>S</b> 04°35.95	67°42.68 N09°40.86	33°42.44 <b>S</b> 05°22.46	193°34.99 N11°18.95	Zuben'ubi 136°52.90
13	244°13.73	48°58.94 37.11	82°43.85 40.37	48°44.44 22.65	208°37.64 18.89	Alphecca 126° 1.51
14	259° 16.19	63°58.56 38.26	97°45.02 39.88	63°46.44 22.84	223°40.30 18.83	Antares 112°12.36
15	274°18.66	78°58.17 · · 39.42	112°46.18 · · 39.40	78°48.44 · · 23.03	238° 42.95 · · 18.77	Atria 107° 4.21
16	289°21.12	93°57.78 40.58	127° 47.35 38.91	93°50.44 23.21	253°45.60 18.71	Sabik 101°59.52
17 18	304°23.58 319°26.05	108°57.39 41.74 123°57.01 \$04°42.89	142°48.52 38.42 157°49.69 N09°37.94	108°52.44 23.40 123°54.43 \$05°23.59	268° 48.26 18.65 283° 50.91 N11° 18.59	Shaula 96° 6.49
19	319 20.05 334°28.51	138° 56.62 44.05	172°50.85 37.45	123°54.43	298° 53.57 18.53	Rasalhague 95°55.95
20	349°30.98	153°56.23 45.21	187°52.02 36.96	153°58.43 23.96	313°56.22 18.47	Eltanin 90°41.15
21	4°33.44	168°55.84 · · 46.36	202°53.19 · · 36.47	169° 0.43 · · · 24.15	328°58.88 · · 18.41	Kaus Aust. 83°28.68
22	19°35.90	183°55.45 47.52	217°54.36 35.99	184° 2.43 24.34	344°1.53 18.35	Vega 80°31.39
23	34°38.37	198°55.06 48.68	232°55.53 35.50	199° 4.43 24.53	359°4.18 18.29	Nunki 75°44.15
						Altair 61°57.06 Peacock 53°1.08
Mer.p	pass. 20:42	ν-0.4' d1.2' m-3.97	ν1.2' d-0.5' m1.28	ν2.0′ d0.2′ m-1.71	ν2.7' d-0.1' m-0.05	Deneb 49°23.71
						Enif 33°35.70
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.02
0	49° 40.83	213°54.68 <b>S</b> 04°49.84	247°56.70 N09°35.01	214°6.43 \$05°24.71	14°6.84 N11°18.23	Fomalhaut 15°11.00
1	64°43.30	228°54.29 50.99	262°57.87 34.52	229° 8.43 24.90	29°9.49 18.17	Scheat 13°41.98
2	79° 45.76	243°53.90 52.15	277°59.04 34.04	244°10.43 25.09	44°12.15 18.11	Markab 13°26.63
3	94°48.23	258°53.51 · · 53.30	293°0.20 · · 33.55	259°12.43 · · 25.28	59°14.80 · · 18.05	Nov 09 Med CIIA
4	109°50.69	273°53.12 54.46 288°52.73 55.62	308°1.37 33.06	274°14.44 25.46	74°17.45 17.99	Nov 08 Wed SHA Venus 166°30.54
5 6	124° 53.15 139° 55.62	288°52.73 55.62 303°52.34 \$04°56.77	323°2.55 32.58 338°3.72 N09°32.09	289°16.44 25.65 304°18.44 \$05°25.84	89°20.11 17.94 104°22.76 N11°17.88	Mars 199°18.30
7	154°58.08	318°51.95 57.93	353°4.89 31.60	319°20.44 26.03	119°25.42 17.82	Jupiter 164°47.96
8	170°0.55	333°51.55 04°59.08	8° 6.06 31.11	334°22.44 26.21	134°28.07 17.76	Saturn 324°16.85
9	185°3.01	348°51.16 05°0.24	23°7.23 · · 30.63	349°24.44 · · 26.40	149°30.72 · · 17.70	
10	200°5.47	3°50.77 1.40	38°8.40 30.14	4°26.44 26.59	164°33.38 17.64	Nov 09 Thu SHA
11	215°7.94	18° 50.38 2.55	53° 9.57 29.65	19°28.44 26.77	179°36.03 17.58	Venus 165°22.26
12	230° 10.40	33°49.99 <b>S</b> 05°3.71	68°10.74 N09°29.17	34°30.44 \$05°26.96	194°38.68 N11°17.52	Mars 198°47.01
13	$245^{\circ}12.87$	48°49.60 4.86	83°11.92 28.68	49°32.44 27.15	209°41.34 17.46	Jupiter 164°36.76 Saturn 324°21.44
14	260° 15.33	63°49.20 6.02	98°13.09 28.19	64°34.44 27.33	224°43.99 17.40	
15	275° 17.79	78°48.81 · · 7.17	113°14.26 · · 27.71	79°36.45 · · 27.52	239°46.64 · · 17.34	Nov 10 Fri SHA
16	290°20.26	93°48.42 8.33	128°15.43 27.22	94°38.45 27.71	254°49.30 17.28	Venus 164°13.84
17	305°22.72	108°48.02 9.48	143°16.61 26.73	109°40.45 27.89	269°51.95 17.22	Mars 198°15.86
18	320°25.19	123°47.63 \$05°10.64	158°17.78 N09°26.24	124°42.45 \$05°28.08	284°54.60 N11°17.16	Jupiter 164°25.60
19 20	335°27.65 350°30.11	138° 47.24 11.79 153° 46.84 12.95	173°18.95 25.76 188°20.13 25.27	139°44.45 28.27 154°46.45 28.45	299° 57.26 17.10 314° 59.91 17.04	Saturn 324°26.01
21	5° 32.58	168°46.45 · · 14.10	203°21.30 · · 24.78	169°48.45 · · 28.64	330°2.56 · · 16.99	Horizontal parallax
22	20°35.04	183°46.06 15.25	218°22.48 24.30	184°50.46 28.83	345°5.22 16.93	Venus:
23	35°37.51	198°45.66 16.41	233°23.65 23.81	199°52.46 29.01	0°7.87 16.87	Mars:
		ν-0.4' d1.2' m-3.97	$\nu$ 1.2' d-0.5' m1.27	$\nu 2.0' \ d0.2' \ \text{m-}1.71$	ν2.7' d-0.1' m-0.05	
ivier.p	pass. 20:38	ν-υ.4 α1.2 m-3.9/	ν1.∠ α-0.5 M1.∠I	ν ∠.υ αυ.∠ m-1./1	<u>vz.i u-u.1 m-u.u5</u>	

Dec

29°15.28 -42°8.94

56°42.04 -17°49.59

-57°5.42

23°36.08 89°23.05

-40°11.27

4°12.27

49°57.83 16°34.03

-8°10.05

46°1.45

6°22.54

28°37.79 -1°11.00

7°24.71 -52°42.47

-16°45.28 -29°0.56

5°8.99

 $27^{\circ}57.18$ 

-59°35.88

-43°32.76

-69°49.88 -8°47.01

11°49.46

61°35.38

14°24.57

-17°42.06 -63°15.38 -57°16.33

55°48.00 -11°18.65

49°10.05 -60°30.61

-36°30.60

-60°57.18

 $19^{\circ}1.95$ 

 $74^{\circ}2.13$ 

-16°9.60

26°37.15 -26°29.65

-69°4.73

-15°45.50 -37°7.40

 $12^{\circ}32.55$ 

51°29.37

-34°22.17 38°48.93

-26°15.55 8°56.94

-56°38.58

 $45^{\circ}23.41$ 

 $10^{\circ}0.72$ 

-46°49.30

-29°28.11

28°14.70 15°21.92

Mer.pass

09:43

07:31

09:49

23:08 Mer.pass

09:44

07:30

09:45

23:04 Mer.pass

09:45

07:28

09:42

22:59

0.1

0.1

h	Su	Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°3.90	<b>S</b> 16°39.39	293°46.20	8.7'	$N21^{\circ}1.26$	-8.4'	57.6'
1	199° 3.86	40.11	308°13.90	8.7'	20°52.89	-8.5'	57.6'
2 3	214° 3.81 229° 3.77	40.83 •• 41.55	322°41.64 337°9.42	8.8' 8.8'	20°44.40 20°35.79	-8.6' -8.7'	57.6' 57.6'
4	244° 3.72	42.27	351°37.24	8.9'	20°27.05	-8.9'	57.7'
5	259° 3.67	42.99	6°5.10	8.9'	20°18.19	-9.0'	57.7'
6	274° 3.63	\$16°43.71	20°33.00	8.9'	N20° 9.21	-9.1'	57.7'
7 8	289° 3.58 304° 3.53	44.43 45.15	35°0.94 49°28.92	9.0' 9.0'	20°0.12 19°50.90	-9.2' -9.3'	57.7' 57.8'
9	319° 3.49	+5.15 •• 45.87	63°56.94	9.0	19 50.90 19°41.57	-9.5' -9.5'	57.8'
10	334° 3.44	46.59	78°25.00	9.1	19°32.12	-9.6'	57.8'
11	349°3.39	47.30	92°53.10	9.1'	$19^{\circ}22.55$	-9.7'	57.8'
12	4°3.34	\$16°48.02	107°21.25	9.2'	N19°12.87	-9.8'	57.9'
13 14	19°3.29 34°3.24	48.74 49.45	121°49.43 136°17.66	9.2' 9.3'	19°3.07 18°53.17	-9.9' -10.0'	57.9' 57.9'
15	49° 3.19	50.17	150° 45.92	9.3'	18°43.15	-10.1	57.9'
16	64°3.14	50.88	$165^{\circ}14.23$	9.3'	$18^{\circ}33.01$	-10.2'	58.0'
17	79°3.09	51.60	179°42.58	9.4'	18°22.77	-10.4'	58.0'
18 19	94°3.04 109°2.99	\$16°52.31 53.02	194°10.97 208°39.40	9.4' 9.5'	N18°12.42 18°1.96	-10.5' -10.6'	58.0' 58.0'
20	109 2.99 124° 2.94	53.02	206 39.40 223°7.87	9.5' 9.5'	16 1.90 17°51.39	-10.6 -10.7'	58.1'
21	139° 2.88	• • 54.45	237°36.39	9.6'	17°40.72	-10.8'	58.1'
22	154° 2.83	55.16	252°4.94	9.6'	17°29.94	-10.9'	58.1'
23	169°2.78	55.87	266°33.54	9.6'	17°19.06	-11.0'	58.1'
	SD = 16.1'	d = 0.7'		SI	D = 15.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 2.72	S16°56.58	281°2.17	9.7'	N17°8.07	-11.1'	58.1'
1	199° 2.67	57.29	295°30.85	9.7'	16°56.98	-11.2'	58.2'
2 3	214° 2.62 229° 2.56	58.00 •• 58.71	309°59.56 324°28.31	9.8' 9.8'	16°45.79 16°34.50	-11.3' -11.4'	58.2' 58.2'
4	244° 2.51	16°59.42	338°57.11	9.8	16°23.11	-11.4 -11.5'	58.2'
5	259° 2.45	17°0.13	353°25.94	9.9'	16°11.62	-11.6'	58.3'
6	274° 2.40	<b>S</b> 17°0.84	7°54.81	9.9'	N16°0.03	-11.7'	58.3'
7	289°2.34	1.54	22°23.72	9.9'	15°48.35	-11.8'	58.3'
8 9	304°2.28 319°2.23	2.25 •• 2.96	36°52.67 51°21.65	10.0' 10.0'	15°36.57 15°24.70	-11.9' -12.0'	58.3' 58.4'
10	334° 2.17	3.66	65°50.68	10.1	15°12.73	-12.1'	58.4'
11	349°2.11	4.37	80°19.74	10.1'	$15^{\circ}0.68$	-12.1'	58.4'
12	4°2.05	\$17°5.07	94°48.83	10.1'	N14°48.53	-12.2'	58.4'
13 14	19°2.00 34°1.94	5.78 6.48	109°17.96 123°47.13	10.2' 10.2'	14°36.29 14°23.97	-12.3' -12.4'	58.5' 58.5'
15	49° 1.88	7.18	138°16.33	10.2	14°11.55	-12.5'	58.5'
16	64°1.82	7.89	152°45.57	10.3'	$13^{\circ}59.05$	-12.6'	58.5'
17	79°1.76	8.59	167°14.83	10.3'	13°46.47	-12.7'	58.6'
18 19	94°1.70 109°1.64	\$17°9.29 9.99	181°44.14 196°13.47	10.3' 10.4'	N13°33.80 13°21.04	-12.8' -12.8'	58.6' 58.6'
20	124° 1.58	10.69	210°42.84	10.4	13°8.21		58.6'
21	139° 1.52	• • 11.39	225°12.24	10.4	12°55.29	-13.0'	58.6'
22	154° 1.46	12.09	239°41.66	10.5'	12°42.30	-13.1'	58.7'
23	169°1.39	12.79	254°11.12	10.5'	12°29.22	-13.2'	58.7'
	SD = 16.1'	d = 0.7'		51	D = 15.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184° 1.33 199° 1.27	\$17°13.49 14.19	268°40.61 283°10.13	10.5' 10.5'	N12°16.07 12°2.85	-13.2' -13.3'	58.7' 58.7'
2	214° 1.21	14.19	203 10.13 297°39.67	10.5	12 2.65 11°49.54	-13.3 -13.4'	58.8'
3	229°1.14	• 15.59	312°9.24	10.6'	$11^{\circ}36.17$	-13.4'	58.8'
4	244°1.08	16.28	326°38.84	10.6'	11°22.72	-13.5'	58.8'
5 6	259° 1.01 274° 0.95	16.98 \$17°17.67	341°8.46 355°38.11	10.6' 10.7'	11°9.20 N10°55.61	-13.6' -13.7'	58.8' 58.9'
7	274 0.95 289° 0.88	18.37	10°7.78	10.7'	10°41.95	-13.7'	58.9'
8	304° 0.82	19.06	24°37.48	10.7'	10°28.22	-13.8'	58.9'
9	319° 0.75	• • 19.76	39°7.19	10.7'	10°14.43	-13.9'	58.9'
10 11	334° 0.69 349° 0.62	20.45 21.14	53°36.93 68°6.69	10.8' 10.8'	10°0.57 09°46.64	-13.9' -14.0'	59.0' 59.0'
11	4°0.55	21.14 \$17°21.84	82°36.47	10.8	N09° 32.66	-14.0' -14.0'	59.0'
13	19°0.49	22.53	97°6.27	10.8	$09^{\circ}18.61$	-14.1'	59.0'
14	34°0.42	23.22	111°36.09	10.8'	09°4.50	-14.2'	59.0'
15 16	49° 0.35 64° 0.28	• • 23.91	126°5.93 140°35.78	10.9'	08°50.33 08°36.10	-14.2'	59.1'
16 17	64°0.28 79°0.21	24.60 25.29	140°35.78 155°5.64	10.9' 10.9'	08°36.10 08°21.82	-14.3' -14.3'	59.1' 59.1'
18	94°0.14	S17°25.98	169°35.52	10.9	N08°7.48	-14.4'	59.1'
19	109° 0.07	26.67	184°5.42	10.9'	07°53.09	-14.4'	59.2'
20	124° 0.00 138° 59.93	27.36	198°35.33	10.9'	07°38.64 07°24.14	-14.5'	59.2' 59.2'
21 22	138°59.93 153°59.86	· · 28.05 28.73	213°5.25 227°35.18	10.9' 10.9'	07°24.14 07°9.60	-14.5' -14.6'	59.2' 59.2'
23	168°59.79	29.42	242°5.12	10.9	06°55.00	-14.6'	59.2'
	SD = 16.1'	d = 0.7'		SI	D = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Junioce	Civil	Naut.
N 72°	06:39	08:08	09:58	13:28	15:18	16:47
N 70°	06:31	07:50	09:16	14:11	15:37	16:55
68°	06:25	07:35	08:48	14:39	15:51	17:02
66°	06:19	07:23	08:26	15:00	16:04	17:08
64°	06:14	07:13	08:10	15:17	16:14	17:13
62°	06:10	07:04	07:56	15:31	16:23	17:17
60°	06:06	06:57	07:44	15:43	16:30	17:21
N 58°	06:02	06:50	07:34	15:53	16:37	17:25
56°	05:59	06:44	07:25	16:02	16:43	17:28
54°	05:56	06:38	07:17	16:10	16:49	17:31
52°	05:53	06:33	07:10	16:17	16:54	17:34
50°	05:50	06:29	07:04	16:23	16:58	17:37
45°	05:43	06:19	06:50	16:37	17:08	17:44
<b>N</b> 40°	05:38	06:10	06:39	16:49	17:17	17:50
35°	05:32	06:02	06:29	16:58	17:25	17:55
30°	05:27	05:55	06:20	17:07	17:32	18:01
20°	05:16	05:43	06:06	17:22	17:45	18:11
<b>N</b> 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
<b>S</b> 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:24	04:51	05:15	18:13	18:37	19:04
30°	04:03	04:33	04:59	18:29	18:55	19:26
35°	03:49	04:23	04:50	18:38	19:06	19:39
40°	03:33	04:10	04:40	18:49	19:19	19:56
45°	03:13	03:54	04:27	19:01	19:34	20:16
<b>S</b> 50°	02:46	03:35	04:13	19:16	19:54	20:44
52°	02:32	03:25	04:06	19:23	20:04	20:58
54°	02:15	03:15	03:58	19:31	20:15	21:15
56°	01:55	03:02	03:49	19:40	20:27	21:36
58°	01:28	02:48	03:39	19:50	20:42	22:04
<b>S</b> 60°	00:47	02:30	03:28	20:02	21:00	22:49
				l	N4	

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	70-49%	
08	16:16	16:13	11:44	04:35	17:01		
09	16:11	16:08	11:44	05:27	17:53		
10	16:05	16:02	11:44	06:18	18:43		

# November 11, 12, 13 UT (Sat., Sun., Mon.)

h	Aries	Venus		Mars	Jup	oiter	Sat	urn	
Sat	GHA		ec GHA		GHA	Dec	GHA	Dec	
0	50° 39.97		17.56 248°24			<b>S</b> 05° 29.20	15° 10.52		Alp
1	65° 42.44	228° 44.87	18.72 263°26			29.39	30°13.17	16.75	/
2	80° 44.90 95° 47.36	243°44.48 258°44.08	19.87 278°27. 21.02 293°28.	.18 22.35		29.57 •• 29.76	45°15.83 60°18.48	16.69	S
3 4	95 47.30 110°49.83	273° 43.68	21.02 293°28. 22.18 308°29.		275° 2.47	29.76	75°21.13	· · 16.63 16.57	
5	125° 52.29	288°43.29	23.33 323°30		290° 4.47	30.13	90°23.79	16.51	Ac
6	140°54.76		24.48 338°31.		305° 6.47	S05°30.32	105°26.44	N11°16.45	
7	155° 57.22	318°42.49	25.64 353°33.			30.50	120°29.09	16.39	
8	$170^{\circ}59.68$	333°42.10	26.79 8°34		335°10.48	30.69	135°31.74	16.34	Δ N
9	186°2.15		27.94 23°35		350°12.48	• • 30.87	150°34.40	• • 16.28	"
10	201°4.61	3°41.30	29.10 38°36			31.06	165°37.05	16.22	Ald
11	216°7.08 231°9.54	18° 40.91 33° 40.51 S05°	30.25 53°37. 31.40 68°38.		20°16.49 35°18.49	31.25 \$05°31.43	180°39.70 195°42.35	16.16 N11°16.10	
12 13	231 9.54 246°12.00	48°40.11	32.55 83°40		50°20.49	31.62	210° 45.01	16.04	
14	261° 14.47	63°39.71	33.71 98°41.		65°22.50	31.80	225°47.66	15.98	B
15	276° 16.93		34.86 113°42			• • 31.99	240°50.31	• • 15.92	
16	291°19.40	93°38.91	36.01 128°43			32.17	255°52.96	15.86	A Bete
17	306°21.86	108°38.51	37.16 143°44		110°28.51	32.36	270°55.61	15.81	Ca
18	321°24.32		38.31 158°46				285°58.27	N11°15.75	
19 20	336°26.79 351°29.25	138°37.71 153°37.31	39.46 173°47. 40.62 188°48.			32.73 32.92	301°0.92 316°3.57	15.69 15.63	, A
21	6°31.72		41.77 203°49			33.10	331° 6.22	15.03	P
22	21°34.18	183°36.51	42.92 218°50			33.29	346°8.87	15.51	
23	36°36.64	198°36.11	44.07 233°51			33.47	1°11.53	15.45	
Morr	pass. 20:34	ν-0.4' d1.2' m-	3 07 11 2'	d-0.5′ m1.26	1/2 0/ d0	.2′ m-1.71	1/2 7' d 0	.1' m-0.04	Mian
ivier.	Jass. 20:34	ν-0.4 u1.2 m-		u-0.5 IIII.20	- νz.υ αυ.	.∠ 111-1./1	ν2.1 U-U	.111-0.04	Miap A
									R
Sun	GHA		ec GHA		GHA	Dec	GHA	Dec	
0	51°39.11 66°41.57	213°35.71 S05° 228°35.31	45.22 248°53 46.37 263°54		215°42.53 230°44.54	\$05°33.66 33.84	16°14.18 31°16.83	N11°15.40	De
1 2	81°44.04	243°34.91	47.52 278°55			34.03	46°19.48	15.34 15.28	(
3	96°46.50		48.67 293°56		260°48.54	34.21	61°22.13	. 15.22	
4	111°48.96	273°34.10	49.82 308°57.			34.40	76°24.78	15.16	'
5	$126^{\circ}51.43$	288°33.70	50.97 323°59	.00 9.22	290°52.55	34.58	91°27.44	15.10	
6	141°53.89		52.12 339°0.			S05°34.77	106°30.09	N11°15.04	
7	156° 56.36	318° 32.90	53.27 354°1			34.95	121°32.74	14.99	
8 9	171°58.82 187°1.29	333°32.49 348°32.09	54.42 9°2. 55.57 24°3.		335°58.57 351°0.57	35.14 •• 35.32	136°35.39 151°38.04	14.93	M
10	202°3.75	3° 31.69	56.72 39°4			35.52	166° 40.69	· · 14.87 14.81	Ar
11	217°6.21	18°31.28	57.87 54°6.		21°4.58	35.69	181°43.34	14.75	Rigil
12	232°8.68		59.02 69°7.		36° 6.59	S05°35.88	196°45.99	N11°14.69	7h
13	$247^{\circ}11.14$	48°30.47 06	°0.17 84°8	.47 5.33	51°8.59	36.06	211°48.64	14.64	Zub
14	$262^{\circ}13.61$	63°30.07	1.32 99°9			36.24	$226^{\circ}51.30$	14.58	A
15	277° 16.07		2.46 114°10			• • 36.43	241°53.95	• • 14.52	,
16	292° 18.53	93°29.26	3.61 129°12		96°14.61	36.61	256° 56.60	14.46	
17 18	307°21.00 322°23.46	108° 28.85 123° 28.45 S06	4.76 144°13. °5.91 159°14.		111°16.61 126°18.62	36.80 \$05°36.98	271°59.25 287°1.90	14.40 N11°14.35	
19	337°25.93	138°28.04	7.06 174°15		141°20.62	37.17	302°4.55	14.29	Rasa
20	352°28.39	153°27.64	8.20 189°16			37.35	317°7.20	14.23	E IZ-
21	7°30.85	168°27.23 · ·	9.35 204°17.	.95 •• 1.44	171°24.63	• • 37.53	332°9.85	• • 14.17	Kaus
22	22°33.32	183°26.82	10.50 219°19			37.72	347° 12.50	14.11	
23	37°35.78	198°26.41	11.65 234°20	.32 0.47	201°28.65	37.90	2°15.15	14.06	
Mer.p	pass. 20:30	ν-0.4' d1.2' m-	$3.97  \nu 1.2'$	d-0.5' m1.25	$\nu 2.0' \ d0$	.2′ m-1.71	$\nu 2.7' \ d-0$	.1′ m-0.04	P
					_				·
Mon	GHA	GHA D	ec GHA	Dec	GHA	Dec	GHA	Dec	
0	52° 38.25		12.79 249°21	.50 N08°59.99	216°30.65	S05°38.09	17° 17.80	N11°14.00	Fom
1	$67^{\circ}40.71$	228°25.60	13.94 264°22	.69 08°59.50	231°32.66	38.27	32°20.45	13.94	
2	82° 43.17	243°25.19	15.09 279°23		246°34.66	38.46	47°23.10	13.88	l N
3	97°45.64		16.23 294°25			•• 38.64	62°25.75	13.82	Nov
4 5	112° 48.10 127° 50.57	273°24.37 288°23.97	17.38 309°26. 18.53 324°27.			38.82 39.01	77°28.40 92°31.05	13.77 13.71	INOV
6	142° 53.03		19.67 339°28			S05°39.19	92 31.05 107°33.70	N11°13.65	
7	157° 55.49	318°23.15	20.82 354°29.			39.37	122°36.35	13.59	
8	172°57.96	333°22.74	21.96 9°31			39.56	137°39.00	13.54	[ :
9	188°0.42		23.11 24°32			• • 39.74	152°41.65	• • 13.48	Nov 1
10	203°2.89	3°21.92	24.25 39°33			39.92	167°44.30	13.42	1404 ]
11	218°5.35	18° 21.51 33° 21.10 S06°	25.40 54°34. 26.54 69°35.		21°52.72	40.11	182°46.95	13.36	
12 13	233°7.81 248°10.28	48° 20.68	26.54 69°35. 27.69 84°36.		36°54.73 51°56.74	\$05°40.29 40.47	197°49.60 212°52.25	N11°13.30 13.25	
14	246 10.26 263°12.74	63°20.27	28.83 99°38		66°58.75	40.47	212 52.25 227°54.90	13.25	
15	278° 15.21		29.98 114°39		82°0.75	• • 40.84	242°57.55	· · 13.13	Nov 1
16	$293^{\circ}17.67$	93° 19.45	31.12 129°40	.52 52.22	97°2.76	41.02	258°0.20	13.07	
17	308°20.13	108° 19.04	32.27 144°41			41.21	273°2.85	13.02	
18	323°22.60		33.41 159°42		127°6.78	S05°41.39	288°5.50	N11°12.96	.
19	338° 25.06 353° 27.53	138° 18.21 153° 17.80	34.55 174°44. 35.70 189°45.			41.57	303°8.15 318°10.80	12.90	
20 21	353°27.53 8°29.99		36.84 204°46		157° 10.79 172° 12.80	41.76 •• 41.94	318° 10.80 333° 13.45	12.84 · · 12.79	
22	23°32.46	183° 16.97	37.98 219°47.		187°14.81	42.12	348° 16.10	12.73	
23	38°34.92	198°16.56	39.13 234°48			42.31	3°18.75	12.67	
Merr	pass. 20:26	ν-0.4' d1.1' m-	3.97 1/1 2/	<i>d</i> -0.5′ m1.25	ν2 0' d0	.2′ m-1.72	ν2 7' d-Ω	.1′ m-0.03	

	Stars	
	SHA	Dec
Alpheratz	357°31.26	29°15.28
Ankaa	353°3.85	-42°8.95
Schedar	349°26.90 348°43.95	56° 42.05 -17° 49.60
Diphda Achernar	348 43.95 335°17.46	-17 49.60 -57°5.43
Hamal	327°47.31	23°36.09
Polaris	$311^{\circ}48.75$	89°23.07
Acamar	315°9.04 314°2.56	-40°11.28 4°12.26
Menkar Mirfak	314°2.56 308°23.20	4° 12.26 49° 57.84
Aldebaran	290°35.71	16°34.03
Rigel	$281^{\circ}0.58$	-8°10.06
Capella	280°16.85	46°1.46
Bellatrix Elnath	278°19.25 277°57.60	6°22.53 28°37.80
Alnilam	275°34.29	-1°11.00
Betelgeuse	$270^{\circ}48.45$	$7^{\circ}24.71$
Canopus	263°50.61	-52°42.48
Sirius Adhara	258°23.26 255°3.18	-16°45.29 -29°0.56
Procyon	255 3.16 244°47.43	-29 0.30 5°8.98
Pollux	243°13.37	27°57.17
Avior	234°13.20	-59°35.89
Suhail Miaplacidus	222°43.93 221°37.39	-43°32.76 -69°49.88
Miaplacidus Alphard	221°37.39 217°44.70	-69°49.88 -8°47.02
Regulus	207°31.22	11°49.45
Dubhe	193°37.67	61°35.37
Denebola	182°22.01 175°40.59	14°24.56
Gienah Acrux	175°40.59 172°56.95	-17° 42.06 -63° 15.37
Gacrux	172 30.93 171°48.47	-57° 16.33
Alioth	$166^{\circ}10.84$	55°47.98
Spica	158°19.30	-11°18.65
Alkaid Hadar	152°50.11 148°32.06	49°10.04 -60°30.60
Menkent	146 32.00 147°54.27	-36° 30.60
Arcturus	145°45.43	19°1.94
Rigil Kent.	139°36.54	-60°57.17
Kochab	137°21.30 136°52.89	74°2.11 -16°9.60
Zuben'ubi Alphecca	130 52.69 126°1.51	26° 37.13
Antares	112°12.36	-26°29.65
Atria	107°4.23	-69°4.72
Sabik Shaula	101°59.52 96°6.50	-15°45.50 -37°7.40
Rasalhague	95°55.96	12°32.54
Eltanin	90°41.17	51°29.35
Kaus Aust.	83°28.69	-34°22.17
Vega Nunki	80°31.40	38°48.92
Altair	75°44.16 61°57.07	-26°15.55 8°56.93
Peacock	53°1.11	-56°38.58
Deneb	49°23.73	45°23.40
Enif	33°35.71	10°0.72
Al Na'ir Fomalhaut	27°29.04 15°11.01	-46°49.31 -29°28.11
Scheat	13°41.99	-29 26.11 28°14.70
Markab	13°26.64	15°21.92
Nov 11 Sat	SHA	Mer.pass
Venus	163°5.29	09:45
Mars	197°44.85	07:26
Jupiter	164°14.49 324°30.55	09:39
Saturn		22:55
Nov 12 Sun	SHA	Mer.pass
Venus Mars	161°56.60 197°13.99	09:46 07:24
Jupiter	164° 3.42	09:36
Saturn	324°35.07	22:51
Nov 13 Mon	SHA	Mer.pass
Venus	160°47.76	09:47
Mars	$196^{\circ}43.26$	07:22
Jupiter	163°52.41	09:33
Saturn	324°39.56	22:47
Horizor	ntal parallax	
	Venus:	0.1
l	Mars:	0.1

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.72	S17°30.11	256°35.06	11.0'	$N06^{\circ}40.35$	-14.7'	59.3'
1	198°59.65	30.79	271°5.02	11.0'	06°25.66	-14.7'	59.3'
2 3	213°59.58 228°59.50	31.48 · · 32.16	285°34.98 300°4.95	11.0' 11.0'	06° 10.93 05° 56.15	-14.8' -14.8'	59.3' 59.3'
4	243°59.43	32.85	314°34.93	11.0'	05°41.32	-14.9'	59.3'
5	258°59.36	33.53	329°4.90	11.0'	$05^{\circ}26.46$	-14.9'	59.4'
6	273°59.28	S17°34.22	343°34.88	11.0'	N05° 11.55	-14.9'	59.4'
7 8	288°59.21 303°59.13	34.90 35.58	358°4.87 12°34.85	11.0' 11.0'	04°56.61 04°41.63	-15.0' -15.0'	59.4' 59.4'
9	318°59.06	36.26	27°4.83	11.0'	04°26.62	-15.0'	59.4'
10	333°58.98	36.94	41°34.81	11.0'	04°11.57	-15.1'	59.5'
11 12	348°58.91 3°58.83	37.62 \$17°38.30	56°4.79 70°34.77	11.0' 11.0'	03°56.48 N03°41.37	-15.1' -15.1'	59.5' 59.5'
13	18°58.76	38.98	85°4.74	11.0'	03°26.22	-15.1 -15.2'	59.5'
14	33°58.68	39.66	99°34.70	11.0'	03°11.05	-15.2'	59.5'
15	48°58.60	• • 40.34	114°4.66	11.0'	02°55.85	-15.2'	59.6'
16 17	63°58.53 78°58.45	41.02 41.70	128°34.61 143°4.55	10.9' 10.9'	02°40.62 02°25.37	-15.3' -15.3'	59.6' 59.6'
18	93°58.37	\$17°42.37	157°34.48	10.9'	N02°10.09	-15.3'	59.6'
19	108°58.29	43.05	172°4.40	10.9'	$01^{\circ}54.80$	-15.3'	59.6'
20	123°58.21 138°58.13	43.73	186°34.31	10.9'	01°39.48	-15.3'	59.7'
21 22	138°58.13 153°58.05	• • 44.40 45.08	201°4.20 215°34.09	10.9' 10.9'	01°24.14 01°8.79	-15.4' -15.4'	59.7' 59.7'
23	168°57.97	45.75	230°3.95	10.9	01 8.79 00°53.42	-15.4'	59.7'
	SD = 16.1'	d = 0.7'		SI	D = 16.2'		
Sun	GHA	Dec 517° 46 42	GHA	ν 10.0'	Dec	d 15 4'	HP
0 1	183°57.89 198°57.81	\$17°46.42 47.10	244°33.80 259°3.63	10.8' 10.8'	N00°38.04 00°22.64	-15.4' -15.4'	59.7' 59.7'
2	213°57.73	47.77	273° 33.44	10.8'	N00°7.23	-15.4'	59.8'
3	228°57.65	• • 48.44	288°3.23	10.8'	S00°8.19	15.4'	59.8'
4	243°57.57	49.11	302°33.01	10.7'	00°23.62	15.4'	59.8'
5 6	258°57.48 273°57.40	49.78 \$17°50.45	317°2.76 331°32.48	10.7' 10.7'	00°39.05 \$00°54.49	15.4' 15.4'	59.8' 59.8'
7	288°57.32	51.12	346°2.18	10.7'	01°9.94	15.4'	59.8'
8	303°57.23	51.79	0°31.86	10.7'	01°25.38	15.4'	59.9'
9 10	318°57.15 333°57.07	· · 52.46 53.13	15°1.51 29°31.13	10.6' 10.6'	01°40.83 01°56.28	15.4' 15.4'	59.9' 59.9'
11	348°56.98	53.15	29 31.13 44°0.73	10.6'	01 50.26 02°11.72	15.4	59.9'
12	3°56.90	S17°54.47	58° 30.29	10.5'	S02°27.17	15.4'	59.9'
13	18°56.81	55.13	72°59.83	10.5'	02°42.60	15.4'	59.9'
14 15	33°56.72 48°56.64	55.80 •• 56.46	87°29.33 101°58.80	10.5' 10.4'	02°58.03 03°13.45	15.4' 15.4'	59.9' 60.0'
16	63°56.55	57.13	116° 28.23	10.4	03°28.86	15.4	60.0'
17	78°56.46	57.79	$130^{\circ}57.64$	10.4'	$03^{\circ}44.26$	15.4'	60.0'
18	93°56.38 108°56.29	S17°58.46	145°27.00 159°56.33	10.3'	\$03°59.65 04°15.02	15.4'	60.0'
19 20	100 50.29 123°56.20	59.12 17°59.78	174° 25.62	10.3' 10.3'	04° 15.02	15.4' 15.3'	60.0' 60.0'
21	138°56.11	18°0.45	188° 54.87	10.2'	04° 45.71	15.3'	60.0'
22	153°56.02	1.11	203°24.08	10.2'	05°1.03	15.3'	60.0'
23	168°55.94	1.77	217°53.25	10.1'	05°16.32	15.3'	60.1'
	SD = 16.2'	d = 0.7'		SI	D = 16.3'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°55.85	<b>S</b> 18°2.43	232°22.37	10.1'	S05°31.60	15.2'	60.1'
1 2	198°55.76 213°55.67	3.09 3.75	246°51.46 261°20.50	10.0' 10.0'	05°46.84 06°2.07	15.2' 15.2'	60.1' 60.1'
3	213°55.67 228°55.57	3.75 · · 4.41	261°20.50 275°49.49	9.9'	06° 2.07 06° 17.26	15.2' 15.2'	60.1
4	243°55.48	5.07	290°18.44	9.9'	06°32.42	15.1'	60.1
5	258°55.39	5.73	304°47.34	9.9'	06°47.56	15.1'	60.1
6 7	273°55.30 288°55.21	\$18°6.38 7.04	319° 16.19 333° 45.00	9.8' 9.8'	\$07°2.65 07°17.72	15.1' 15.0'	60.1' 60.1'
8	303°55.12	7.04	348° 13.75	9.6 9.7'	07 17.72 07°32.75	15.0'	60.1
9	318°55.02	• • 8.35	2°42.46	9.7'	$07^{\circ}47.74$	15.0'	60.1'
10	333°54.93	9.01	17°11.11	9.6'	08°2.69	14.9'	60.2'
11 12	348°54.84 3°54.74	9.66 \$18°10.32	31°39.71 46°8.25	9.5' 9.5'	08° 17.60 \$08° 32.46	14.9' 14.8'	60.2' 60.2'
13	18°54.65	10.97	60°36.74	9.4'	08° 47.28	14.8'	60.2
14	33°54.55	11.62	75°5.18	9.4'	09°2.05	14.7'	60.2'
15 16	48°54.46 63°54.36	12.28	89°33.56 104°1.89	9.3' 9.3'	09°16.78 09°31.45	14.7'	60.2'
16 17	63°54.36 78°54.27	12.93 13.58	104°1.89 118°30.15	9.3'	09°31.45 09°46.08	14.6' 14.6'	60.2' 60.2'
18	93°54.17	\$18°14.23	132°58.36	9.1'	<b>S</b> 10°0.64	14.5	60.2
19	108°54.07	14.88	147°26.51	9.1'	10°15.16	14.5	60.2'
20 21	123°53.97 138°53.88	15.53 •• 16.18	161°54.60 176°22.63	9.0' 9.0'	10°29.61 10°44.01	14.4' 14.3'	60.2' 60.2'
22	158 55.88 153°53.78	16.83	176 22.63 190°50.60	9.0 8.9'	10 44.01 10°58.35	14.3	60.2
23	168°53.68	17.48	205° 18.50	8.8'	11° 12.62	14.2'	60.2'
	SD = 16.2'	d = 0.7'	-	SI	D = 16.4'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-17%
11	15:59	15:55	11:44	07:08	19:33	
12	15:52	15:48	11:44	07:58	20:23	
13	15:43	15:39	11:44	08:49	21:15	

### November 14, 15, 16 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
	53° 37.38	213°16.14 S06°40.27	249°50.06 N08°48.34	217°18.82 \$05°42.49	18°21.40 N11°12.62
0					
1	68°39.85	228°15.73 41.41	264°51.25 47.86	232°20.83 42.67	33°24.04 12.56
2	83°42.31	243°15.31 42.55	279°52.44 47.37	247°22.84 42.85	48°26.69 12.50
3	98° 44.78	258°14.90 · · 43.70	294°53.64 · · 46.89	262°24.85 · · 43.04	63°29.34 · · 12.44
4	113° 47.24	273°14.48 44.84	309°54.83 46.40	277°26.86 43.22	78°31.99 12.39
5	128°49.70	288°14.07 45.98	324°56.02 45.92	292°28.86 43.40	93°34.64 12.33
6	143°52.17	303°13.65 <b>S</b> 06°47.12	339°57.22 N08°45.43	307°30.87 <b>S</b> 05°43.58	108°37.29 N11°12.27
7	158°54.63	318° 13.24 48.26	354°58.41 44.95	322°32.88 43.77	123°39.94 12.22
8	173°57.10	333°12.82 49.40	9°59.61 44.46	337°34.89 43.95	138° 42.59 12.16
9	$188^{\circ}59.56$	348°12.40 •• 50.55	25°0.80 · · 43.98	352°36.90 · · 44.13	153°45.23 · · 12.10
10	204°2.02	3°11.99 51.69	40°2.00 43.49	7°38.91 44.31	168° 47.88 12.04
11	219°4.49	18°11.57 52.83	55°3.19 43.01	22°40.92 44.50	183°50.53 11.99
12	234°6.95	33°11.15 \$06°53.97	70°4.39 N08°42.52	37°42.93 <b>S</b> 05°44.68	198°53.18 N11°11.93
13	249°9.42	48°10.73 55.11	85°5.58 42.04	52°44.94 44.86	213°55.83 11.87
14	264°11.88	63°10.31 56.25	100°6.78 41.56	67°46.95 45.04	228°58.47 11.82
15	279° 14.34	78°9.90 · · 57.39	115°7.98 · · 41.07	82°48.95 · · 45.22	244°1.12 · · 11.76
16	294° 16.81	93°9.48 58.53	130° 9.17 40.59	97°50.96 45.41	259°3.77 11.70
17	309° 19.27	108°9.06 06°59.67	145°10.37 40.10	112°52.97 45.59	274°6.42 11.65
18	324°21.74	123°8.64 \$07°0.80	160°11.57 N08°39.62	127°54.98 \$05°45.77	289°9.07 N11°11.59
19	339°24.20	138°8.22 1.94	175°12.76 39.13	142°56.99 45.95	304° 11.71 11.53
20	354° 26.67	153°7.80 3.08	190°13.96 38.65	157°59.00 46.13	319° 14.36 11.48
21	9° 29.13	168°7.38 · · 4.22	205°15.16 · · 38.17	173°1.01 · · 46.32	334°17.01 · · 11.42
	24°31.59				
22					
23	39°34.06	198°6.54 6.50	235°17.56 37.20	203°5.03 46.68	4°22.30 11.31
Mer.p	pass. 20:22	$\nu$ -0.4 $'$ $d1.1'$ m-3.96	$ u 1.2' \ d$ -0.5 $' \ m 1.24$	$\nu 2.0' \ d0.2' \ \text{m-}1.72$	ν2.6' d-0.1' m-0.03
	<u>·</u> _				
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	54° 36.52	213°6.11 S07°7.64	250°18.76 N08°36.71	218°7.04 \$05°46.86	19°24.95 N11°11.25
1	69°38.99	228°5.69 8.77	265°19.95 36.23	233°9.05 47.04	34°27.60 11.19
2	84°41.45	243°5.27 9.91	280°21.15 35.75	248°11.06 47.22	49°30.25 11.14
3	99°43.91	258°4.85 · · 11.05	295°22.35 · · 35.26	263°13.08 · · 47.41	64°32.89 · · 11.08
4	114°46.38	273°4.43 12.19	310°23.55 34.78	278°15.09 47.59	79°35.54 11.02
5	129°48.84	288°4.00 13.32	325°24.75 34.29	293°17.10 47.77	94°38.19 10.97
6	144°51.31	303°3.58 <b>S</b> 07°14.46	340°25.95 N08°33.81	308°19.11 <b>S</b> 05°47.95	109°40.84 N11°10.91
7	159°53.77	318° 3.16 15.60	355°27.15 33.33	323°21.12 48.13	124°43.48 10.86
8	174° 56.23	333°2.73 16.73	10°28.35 32.84	338°23.13 48.31	139°46.13 10.80
9	189°58.70	348°2.31 · · 17.87	25°29.55 · · 32.36	353°25.14 · · 48.49	154° 48.78 · · 10.74
10	205°1.16	3°1.89 19.00	40°30.76 31.88	8°27.15 48.67	169°51.42 10.69
11	220°3.63	18°1.46 20.14	55°31.96 31.39	23°29.16 48.86	184°54.07 10.63
12	235°6.09	33°1.04 <b>S</b> 07°21.27	70°33.16 N08°30.91	38°31.17 S05°49.04	199°56.72 N11°10.57
13	250°8.56	48°0.61 22.41	85°34.36 30.42	53°33.19 49.22	214° 59.36 10.52
14	265° 11.02	63°0.18 23.54	100°35.56 29.94	68°35.20 49.40	230°2.01 10.46
	280° 13.48	77°59.76 · · 24.68	115°36.76 · · 29.46	83°37.21 · · 49.58	245°4.66 · · 10.41
15	280 13.48 295°15.95				
16	295 15.95 310°18.41				
17			145°39.17 28.49		275°9.95 10.29
18	325°20.88	122°58.48	160°40.37 N08°28.01	128°43.24 S05°50.12	290°12.60 N11°10.24
19	340°23.34	137°58.05 29.21	175°41.58 27.52	143°45.26 50.30	305°15.24 10.18
20	355° 25.80	152°57.63 30.35	190°42.78 27.04	158°47.27 50.48	320°17.89 10.13
21	10°28.27	167°57.20 · · 31.48	205°43.99 · · 26.56	173°49.28 · · 50.66	335°20.53 · · 10.07
22	25°30.73	182°56.77 32.61	220°45.19 26.07	188°51.29 50.84	350° 23.18 10.01
23	40°33.20	197°56.34 33.75	235°46.39 25.59	203°53.31 51.02	5°25.83 9.96
Mer r	pass. 20:18	ν-0.4' d1.1' m-3.96	ν1.2' d-0.5' m1.23	ν2.0' d0.2' m-1.72	ν2.6' d-0.1' m-0.02
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	55° 35.66	212°55.91 <b>S</b> 07°34.88	250°47.60 N08°25.11	218°55.32 \$05°51.20	20°28.47 N11°9.90
1	70°38.13	227°55.48 36.01	265°48.80 24.63	233°57.33 51.38	35°31.12 9.85
2	85°40.59	242°55.05 37.14	280°50.01 24.14	248°59.34 51.56	50°33.76 9.79
3	100°43.05	257°54.63 · · 38.28	295°51.21 · · 23.66	264°1.36 · · 51.75	65°36.41 · · 9.74
4	$115^{\circ}45.52$	272°54.20 39.41	310°52.42 23.18	279° 3.37 51.93	80°39.05 9.68
5	130°47.98	287°53.77 40.54	325°53.63 22.69	294°5.38 52.11	95°41.70 9.62
6	145°50.45	302°53.33 <b>S</b> 07°41.67	340°54.83 N08°22.21	309°7.39 <b>S</b> 05°52.29	110°44.34 N11°9.57
7	160°52.91	317°52.90 42.80	355°56.04 21.73	324° 9.41 52.47	125° 46.99 9.51
8	175°55.37	332°52.47 43.93	10°57.25 21.25	339°11.42 52.65	140°49.64 9.46
9	190° 57.84	347°52.04 · · 45.06	25°58.45 · · 20.76	354°13.43 · · 52.83	155° 52 28 · · 9 40
10	206°0.30	2°51.61 46.19	40°59.66 20.28	9°15.45 53.01	170°54.93 9.35
11	221°2.77	17°51.18 47.32	56° 0.87 19.80	24°17.46 53.18	185° 57.57 9.29
12	236°5.23	32°50.75 S07°48.45	71°2.08 N08°19.31	39°19.48 \$05°53.36	201°0.22 N11°9.24
13	251°7.70	47°50.31 49.58	86°3.28 18.83	54°21.49 53.54	216°2.86 9.18
14	266° 10.16	62°49.88 50.71	101°4.49 18.35	69°23.50 53.72	231°5.51 9.13
15	281° 12.62	77°49.45 · · 51.84	116° 5.70 · · 17.87	84°25.52 · · 53.90	246°8.15 · · 9.07
16	296° 15.09	92°49.01 52.97	131° 6.91 17.38	99°27.53 54.08	261°10.79 9.01
	290 15.09 311°17.55				
17					
18	326°20.02	122°48.14	161° 9.33 N08° 16.42	129°31.56 \$05°54.44	291°16.08 N11°8.90
19	341°22.48	137°47.71 56.35	176°10.54 15.94	144°33.57 54.62	306°18.73 8.85
20	356° 24.94	152° 47.27 57.48	191°11.75 15.46	159°35.59 54.80	321°21.37 8.79
21	11°27.41	167° 46.84 · · 58.61	206°12.96 · · 14.97	174°37.60 · · 54.98	336°24.02 · · 8.74
22	26°29.87	182°46.40 07°59.73	221°14.17 14.49	189°39.62 55.16	351°26.66 8.68
23	41°32.34	197°45.97 08°0.86	236°15.38 14.01	204°41.63 55.34	6°29.31 8.63
Merr	pass. 20:14	ν-0.4' d1.1' m-3.96	ν1.2' d-0.5' m1.22	$\nu 2.0' \ d0.2' \ \text{m-}1.72$	ν2.6' d-0.1' m-0.02

	SHA	Dec					
Alpheratz	357°31.27	29°15.29					
Ankaa	353°3.87	-42°8.96					
Schedar	$349^{\circ}26.91$	56°42.06					
Diphda	348°43.96	$-17^{\circ}49.61$					
Achernar	335°17.48	-57°5.45					
Hamal	327°47.31	23°36.09					
Polaris	311°48.51	89°23.09					
Acamar	315° 9.04	-40°11.30					
Menkar	314°2.56	4°12.26 49°57.85					
Mirfak Aldebaran	308°23.19 290°35.70	49°57.85 16°34.02					
Rigel	290 35.70 281° 0.57	-8°10.07					
Capella	280°16.83	46°1.46					
Bellatrix	278° 19.24	6°22.53					
Elnath	277°57.59	28°37.80					
Alnilam	275°34.28	-1°11.01					
Betelgeuse	270°48.44	7°24.70					
Canopus	263°50.58	-52°42.49					
Sirius	258°23.25	-16°45.30					
Adhara	255°3.16	-29°0.58					
Procyon	244°47.42	5°8.98					
Pollux	243°13.35	$27^{\circ}57.17$					
Avior	234°13.16	-59°35.90					
Suhail	222°43.90	-43°32.77					
Miaplacidus	221°37.34	-69°49.89					
Alphard	217°44.67	-8°47.03					
Regulus Dubhe	207°31.20 193°37.64	11°49.44 61°35.36					
Dubne	193 37.04 182°21.99	14°24.55					
Gienah	182 21.99 175°40.57	14 24.55 -17°42.07					
Acrux	175 40.57 172°56.91	-17 42.07 -63°15.37					
Gacrux	172 30.91 171°48.44	-57°16.32					
Alioth	166°10.82	55°47.97					
Spica	158°19.29	-11°18.66					
Alkaid	152°50.10	49°10.02					
Hadar	148°32.04	-60°30.59					
Menkent	147°54.26	-36°30.59					
Arcturus	145°45.42	19°1.92					
Rigil Kent.	139°36.53	-60°57.15					
Kochab	137°21.30	74°2.09					
Zuben'ubi	136°52.89	-16°9.60					
Alphecca	126°1.51	26°37.12					
Antares	112°12.36 107°4.24	-26°29.64 -69°4.70					
Atria Sabik	107 4.24 101°59.53	-09 4.70 -15°45.50					
Shaula	96° 6.50	-13 45.30 -37°7.39					
Rasalhague	95°55.97	12°32.53					
Eltanin	90°41.18	51°29.34					
Kaus Aust.	83°28.70	-34°22.17					
Vega	80°31.42	38°48.91					
Nunki	75°44.17	$-26^{\circ}15.54$					
Altair	61°57.08	8°56.93					
Peacock	53°1.13	-56°38.58					
Deneb	49°23.75	45°23.40					
Enif	33°35.73	10°0.71					
Al Na'ir	27°29.06	-46°49.31					
Fomalhaut	15°11.02	-29°28.12					
Scheat	13°42.00	28°14.70					
Markab	13°26.65	15°21.91					
Nov 14 Tue	SHA	Mer.pass					
Venus	$159^{\circ}38.76$	09:47					
Mars	196°12.67	07:20					
Jupiter	163°41.44	09:29					
Saturn	324°44.01	22:43					
Nov 15 Wed	SHA	Mer.pass					
Venus	158°29.59	09:48					
Mars	195°42.23	07:18					
Jupiter	163°30.52	09:26					
Saturn	324°48.43	22:38					
Nov 16 Thu	SHA	Mer.pass					
Venus	3HA 157°20.25	09:49					
Mars	195°11.94	07:16					
Jupiter	163°19.66	09:23					
Saturn	324°52.81	22:34					
Horizon	Horizontal parallax						
	Venus: Mars:	0.1 0.1					
	iviars:	0.1					

Stars

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.58	S18° 18.12	219°46.35	8.8'	S11°26.83	14.1'	60.2'
1 2	198°53.48 213°53.38	18.77 19.42	234°14.13 248°41.84	8.7' 8.7'	11°40.97 11°55.05	14.1' 14.0'	60.2' 60.2'
3	228°53.28	. 20.06	263°9.50	8.6'	12°9.05	13.9'	60.2'
4	243°53.18	20.71	277°37.08	8.5'	12°22.98	13.9'	60.2'
5 6	258°53.08 273°52.98	21.35 \$18°22.00	292°4.61 306°32.06	8.5' 8.4'	12°36.84 \$12°50.63	13.8' 13.7'	60.2' 60.2'
7	288° 52.88	22.64	320° 59.45	8.3'	13° 4.34	13.6'	60.2
8	303°52.78	23.29	$335^{\circ}26.78$	8.3'	$13^{\circ}17.97$	13.5'	60.2'
9 10	318°52.68 333°52.58	• • 23.93	349°54.03 4°21.22	8.2'	13°31.52 13°44.98	13.5'	60.2'
11	348°52.47	24.57 25.21	4 21.22 18°48.34	8.1' 8.1'	13 44.96 13°58.37	13.4' 13.3'	60.2' 60.2'
12	3°52.37	S18°25.85	33°15.40	8.0'	S14°11.66	13.2'	60.2'
13	18°52.27	26.49	47°42.38	7.9'	14°24.87	13.1'	60.2'
14 15	33°52.16 48°52.06	27.13 · · · 27.77	62°9.30 76°36.14	7.8' 7.8'	14°38.00 14°51.03	13.0' 12.9'	60.2' 60.2'
16	63°51.95	28.41	91°2.92	7.7'	15° 3.96	12.8'	60.2'
17	78°51.85	29.05	105°29.63	7.6'	15°16.81	12.7'	60.2'
18 19	93°51.74 108°51.64	\$18° 29.68 30.32	119°56.27 134°22.83	7.6' 7.5'	\$15°29.55 15°42.20	12.6' 12.5'	60.2' 60.2'
20	123°51.53	30.96	148°49.33	7.3 7.4'	15°54.75	12.4	60.2
21	138°51.43	• • 31.59	163°15.76	7.4'	$16^{\circ}7.20$	12.3'	60.2'
22	153°51.32	32.23	177°42.12	7.3'	16°19.54	12.2'	60.2'
23	168°51.21	32.86	192°8.41	7.2'	16°31.78	12.1'	60.2'
	SD = 16.2'	d = 0.6'		SI	D = 16.4'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°51.10	\$18°33.50	206°34.63	7.1'	\$16°43.91	12.0'	60.2'
1 2	198°51.00 213°50.89	34.13 34.76	221°0.78 235°26.86	7.1' 7.0'	16°55.94 17°7.85	11.9' 11.8'	60.2' 60.1'
3	228°50.78	35.40	249°52.87	6.9'	17°19.66	11.7'	60.1
4	243°50.67	36.03	264°18.81	6.9'	17°31.35	11.6'	60.1'
5 6	258°50.56 273°50.45	36.66 \$18° 37.29	278°44.68 293°10.48	6.8' 6.7'	17°42.92 \$17°54.38	11.5' 11.3'	60.1' 60.1'
7	288° 50.34	37.92	307°36.22	6.7'	18° 5.72	11.3	60.1
8	303°50.23	38.55	322°1.89	6.6'	18°16.94	11.1'	60.1'
9	318°50.12	• • 39.18	336°27.49	6.5'	18°28.04	11.0'	60.1'
10 11	333°50.01 348°49.90	39.81 40.43	350°53.02 5°18.49	6.5' 6.4'	18°39.01 18°49.86	10.9' 10.7'	60.1' 60.1'
12	3°49.79	\$18°41.06	19°43.89	6.3'	S19°0.59	10.6'	60.0'
13	18°49.67	41.69	34°9.22	6.3'	19°11.19	10.5'	60.0'
14 15	33°49.56 48°49.45	42.31 •• 42.94	48°34.49 62°59.70	6.2' 6.1'	19°21.66 19°31.99	10.3' 10.2'	60.0' 60.0'
16	63°49.33	43.56	77°24.84	6.1'	19°42.20	10.1	60.0'
17	78°49.22	44.19	91°49.92	6.0'	19°52.27	9.9'	60.0'
18 19	93°49.11 108°48.99	\$18° 44.81 45.44	106°14.94 120°39.89	6.0' 5.9'	\$20°2.21 20°12.01	9.8' 9.7'	60.0' 59.9'
20	123°48.88	46.06	135°4.79		20°21.67	9.5'	59.9'
21	138°48.76	• • 46.68	149°29.63	5.8'	20°31.20	9.4'	59.9'
22 23	153°48.65 168°48.53	47.30 47.92	163°54.40 178°19.12	5.7' 5.7'	20°40.58 20°49.82	9.2' 9.1'	59.9' 59.9'
23	SD = 16.2'	d = 0.6'	170 19.12		D = 16.4'	3.1	
		<u>u = 0.0</u>					
Thu	<b>GHA</b> 183°48.41	<b>Dec</b> \$18° 48.54	<b>GHA</b> 192°43.79	ν 5.6'	<b>Dec</b> 520°58.92	<i>d</i> 9.0'	<b>HP</b> 59.9'
0 1	183°48.41 198°48.30	49.16	207°8.40	5.6'	21°7.87	9.0° 8.8°	59.9° 59.8'
2	213°48.18	49.78	221°32.95	5.5'	21°16.68	8.7'	59.8'
3	228°48.06	· · 50.40	235°57.45	5.4'	21°25.34 21°33.85	8.5'	59.8'
4 5	243°47.94 258°47.83	51.02 51.64	250°21.90 264°46.30	5.4' 5.3'	21°33.85 21°42.21	8.4' 8.2'	59.8' 59.8'
6	273°47.71	S18°52.25	279°10.65	5.3'	S21°50.43	8.1'	59.8'
7	288°47.59	52.87	293°34.95	5.3'	21°58.49	7.9'	59.7'
8 9	303°47.47 318°47.35	53.48 •• 54.10	307°59.21 322°23.42	5.2' 5.2'	22°6.39 22°14.15	7.8' 7.6'	59.7' 59.7'
10	333°47.23	54.71	336°47.58	5.1'	$22^{\circ}21.75$	7.4'	59.7'
11	348°47.11	55.33	351°11.70	5.1'	22°29.19	7.3'	59.7'
12 13	3°46.99 18°46.87	\$18° 55.94 56.55	5°35.79 19°59.83	5.0' 5.0'	\$22°36.48 22°43.61	7.1' 7.0'	59.6' 59.6'
14	33°46.75	57.17	34°23.83	5.0'	22°50.58	6.8'	59.6'
15	48°46.62	• • 57.78	48°47.80	4.9'	22°57.39	6.6'	59.6'
16 17	63°46.50 78°46.38	58.39 59.00	63°11.74 77°35.64	4.9' 4.9'	23°4.04 23°10.52	6.5' 6.3'	59.5' 59.5'
18	93°46.26	S18°59.61	91°59.51	4.8'	S23°16.85	6.2'	59.5'
19	108°46.13	19°0.22	106°23.35	4.8'	23°23.01	6.0'	59.5'
20 21	123°46.01 138°45.89	0.83 •• 1.43	120°47.16 135°10.95	4.8' 4.8'	23°29.01 23°34.85	5.8' 5.7'	59.4' 59.4'
22	153°45.76	2.04	149°34.71	4.7'	23°40.52	5.7 5.5'	59.4
23	168°45.64	2.65	163°58.45	4.7'	23°46.03	5.3'	59.4'
	SD = 16.2'	d = 0.6'		SI	D = 16.3'		

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

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

## November 17, 18, 19 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri -	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	56°34.80	212°45.53 \$08°1.9		219°43.65 \$05°55.52	21°31.95 N11°8.57	
1	71°37.27	227°45.10 3.1		234°45.66 55.70	36°34.59 8.52	Alpheratz 357°31.27 29°15.29
2	86°39.73	242°44.66 4.2		249°47.68 55.88	51°37.24 8.46	Ankaa 353°3.88 -42°8.97
3	101°42.19	257°44.22 · · 5.3		264°49.69 · · 56.05	66°39.88 · · 8.41	Schedar 349°26.91 56°42.07
4	116°44.66	272°43.78 6.4	9 311°21.44 11.60	279°51.71 56.23	81°42.52 8.35	Diphda 348°43.96 -17°49.61
5	131°47.12	287°43.35 7.6	2 326°22.65 11.12	294°53.72 56.41	96°45.17 8.30	Achernar 335°17.49 -57°5.46 Hamal 327°47.30 23°36.09
6	146°49.59	302°42.91 \$08°8.7	4 341°23.86 N08°10.64	309°55.74 <b>S</b> 05°56.59	111°47.81 N11°8.24	Hamal 327°47.30 23°36.09 Polaris 311°48.08 89°23.10
7	161°52.05	317°42.47 9.8		324°57.75 56.77	126° 50.46 8.19	Acamar 315°9.03 -40°11.31
8	176° 54.51	332°42.03 10.9		339°59.77 56.95	141°53.10 8.14	Menkar 314°2.55 4°12.25
9	191°56.98	347°41.59 · · 12.1		355°1.78 · · 57.13	156°55.74 · · 8.08	Mirfak 308°23.17 49°57.86
10	206° 59.44	2°41.15 13.2		10°3.80 57.31	171°58.39 8.03	Aldebaran 290°35.68 16°34.02
11 12	222°1.91 237°4.37	17° 40.71 14.3 32° 40.27 \$08° 15.4		25°5.82 57.48 40°7.83 \$05°57.66	187°1.03 7.97 202°3.67 N11°7.92	Rigel 281°0.55 -8°10.08
13	252°6.84	47°39.83 16.6		55° 9.85 57.84	217°6.32 7.86	Capella 280°16.80 46°1.46
14	267°9.30	62°39.39 17.7		70°11.86 58.02	232°8.96 7.81	Bellatrix 278°19.22 6°22.52
15	282°11.76	77°38.95 · · 18.8		85°13.88 · · 58.20	247°11.60 · · 7.75	Elnath 277°57.56 28°37.79
16	297° 14.23	92°38.51 19.9		100°15.90 58.38	262°14.24 7.70	Alnilam 275°34.26 -1°11.02
17	$312^{\circ}16.69$	107°38.07 21.1		115°17.91 58.55	277°16.89 7.64	Betelgeuse 270°48.42 7°24.69
18	327° 19.16	122°37.62 \$08°22.2		130°19.93 <b>S</b> 05°58.73	292°19.53 N11°7.59	Canopus 263°50.56 -52°42.51 Sirius 258°23.22 -16°45.32
19	$342^{\circ}21.62$	137° 37.18 23.3	4 176°39.65 4.38	145°21.95 58.91	307°22.17 7.54	Adhara 255°3.14 -29°0.59
20	357°24.09	152°36.74 24.4		160°23.96 59.09	322°24.81 7.48	Procyon 244°47.39 5°8.96
21	12°26.55	167°36.30 · · 25.5		175°25.98 · · 59.27	337° 27.46 · · · 7.43	Pollux 243°13.32 27°57.16
22	27°29.01	182°35.85 26.7		190°28.00 59.44	352°30.10 7.37	Avior 234°13.12 -59°35.91
23	42°31.48	197°35.41 27.8	3 236°44.51 2.45	205°30.01 59.62	7°32.74 7.32	Suhail 222°43.87 -43°32.78
Mer.ı	pass. 20:10	ν-0.4' d1.1' m-3.9	$\nu 1.2' \ d$ -0.5' m1.21	ν2.0' d0.2' m-1.73	ν2.6' d-0.1' m-0.01	Miaplacidus 221°37.28 -69°49.90
	·		_ <del></del> _			Alphard 217°44.65 -8°47.04
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.17 11°49.43
0 0	57°33.94	212°34.96 \$08°28.9		220°32.03 S05°59.80	22°35.38 N11°7.26	Dubhe 193°37.60 61°35.34
1	72°36.41	212 34.90 300 20.9 227°34.52 30.0		235°34.05 05°59.98	37°38.03 7.21	Denebola 182°21.97 14°24.53
2	87°38.87	242°34.07 31.1		250°36.07 0.16	52°40.67 7.16	Gienah 175°40.55 -17°42.07
3	102°41.33	257°33.63 · · 32.3		265°38.08 · · 0.33	67°43.31 · · 7.10	Acrux 172°56.87 -63°15.36
4	117° 43.80	272°33.18 33.4		280°40.10 0.51	82°45.95 7.05	Gacrux 171°48.40 -57°16.32
5	132°46.26	287°32.74 34.5		295°42.12 0.69	97°48.59 6.99	Alioth 166°10.80 55°47.95 Spica 158°19.27 -11°18.66
6	147°48.73	302°32.29 \$08°35.6	6 341°53.04 N07°59.09	310°44.14 <b>S</b> 06°0.87	112°51.24 N11°6.94	Alkaid 152°50.08 49°10.00
7	$162^{\circ}51.19$	317°31.85 36.7		325°46.15 1.04	127°53.88 6.89	Hadar 148°32.01 -60°30.58
8	177°53.66	332°31.40 37.9		340°48.17 1.22	142°56.52 6.83	Menkent 147°54.24 -36°30.59
9	192°56.12	347°30.95 · · 39.0		355°50.19 · · 1.40	157°59.16 · · 6.78	Arcturus 145°45.41 19°1.91
10	207° 58.58	2°30.50 40.1		10°52.21 1.58	173°1.80 6.72	Rigil Kent. 139°36.50 -60°57.14
11	223°1.05 238°3.51	17°30.06 41.2 32°29.61 \$08°42.3		25°54.23 1.75 40°56.25 \$06°1.93	188°4.44 6.67 203°7.08 N11°6.62	Kochab 137°21.30 74°2.07
12 13	253°5.98	47°29.16 43.4		55°58.26 2.11	218° 9.73 6.56	Zuben'ubi 136°52.87 -16°9.61
14	268°8.44	62°28.71 44.6		71° 0.28 2.28	233°12.37 6.51	Alphecca 126°1.50 26°37.11
15	283° 10.91	77°28.26 · · 45.7		86°2.30 · · 2.46	248°15.01 · · 6.46	Antares 112°12.35 -26°29.64
16	298° 13.37	92°27.81 46.8		101°4.32 2.64	263°17.65 6.40	Atria 107°4.23 -69°4.69 Sabik 101°59.52 -15°45.50
17	313° 15.83	107°27.36 47.9	5 147°6.46 53.80	116°6.34 2.81	278°20.29 6.35	Shaula 96°6.50 -37°7.39
18	328° 18.30	122°26.91 \$08°49.0	6 162°7.68 N07°53.32	131°8.36 S06°2.99	293°22.93 N11°6.30	Rasalhague 95°55.97 12°32.52
19	343°20.76	137°26.46 50.1	8 177°8.90 52.84	146°10.38 3.17	308° 25.57 6.24	Eltanin 90°41.20 51°29.33
20	358°23.23	152°26.01 51.2		161°12.40 3.35	323°28.21 6.19	Kaus Aust. 83°28.71 -34°22.16
21	13°25.69	167°25.56 · · 52.4		176°14.42 · · 3.52	338°30.85 · · 6.14	Vega 80°31.43 38°48.90
22	28°28.15	182°25.11 53.5		191°16.44 3.70	353°33.49 6.08	Nunki 75°44.17 -26°15.54
23	43°30.62	197°24.66 54.6	3 237°13.79 50.92	206°18.46 3.87	8°36.13 6.03	Altair 61°57.09 8°56.93
Mer. <sub>I</sub>	pass. 20:06	$\nu$ -0.4' $d1.1'$ m-3.9	$\nu 1.2' \ d$ -0.5' m1.20	$ u 2.0' \ d0.2' \ \text{m-}1.73$	$\nu 2.6' \ d$ -0.1' m-0.01	Peacock 53°1.15 -56°38.57
						Deneb 49°23.77 45°23.40
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.74 10°0.71
0 0	58° 33.08	212°24.20 \$08°55.7		221°20.47 \$06°4.05	23°38.77 N11°5.98	Al Na'ir 27°29.07 -46°49.31
1	73°35.55	212 24.20 300 55.7 227°23.75 56.8		236°22.49 4.23	38°41.41 5.92	Fomalhaut 15°11.03 -29°28.12 Scheat 13°42.01 28°14.70
2	88°38.01	242°23.30 57.9		251°24.51 4.40	53°44.05 5.87	Scheat 13°42.01 28°14.70 Markab 13°26.66 15°21.92
3	103°40.48	257°22.84 08°59.0		266°26.53 · · 4.58	68°46.69 · · 5.82	IVIAINAD 13 20.00 15 21.92
4	118°42.94	272°22.39 09°0.1	9 312°19.91 48.53	281°28.55 4.76	83°49.33 5.76	Nov 17 Fri SHA Mer.pass
5	133°45.40	287°21.94 1.3		296°30.57 4.93	98°51.97 5.71	Venus 156°10.73 09:49
6	148° 47.87	302°21.48 <b>S</b> 09°2.4		311°32.59 <b>S</b> 06°5.11	113°54.61 N11°5.66	Mars 194°41.79 07:14
7	163°50.33	317°21.03 3.5		326°34.62 5.29	128° 57.25 5.60	Jupiter 163°8.85 09:20
8	178° 52.80	332°20.57 4.6		341°36.64 5.46	143°59.89 5.55	Saturn 324°57.15 22:30
9	193°55.26	347°20.12 · · 5.7		356°38.66 · · 5.64	159°2.53 · · 5.50	Nov 18 Sat SHA Mer.pass
10 11	208°57.73 224°0.19	2°19.66 6.8 17°19.20 7.9		11°40.68 5.81 26°42.70 5.99	174°5.17 5.44 189°7.81 5.39	Venus 155°1.02 09:50
12	239°2.65	32°18.75 S09°9.0		41°44.72 \$06°6.16	204°10.45 N11°5.34	Mars 194°11.79 07:12
13	254°5.12	47°18.29 10.1		56°46.74 6.34	219° 13.09 5.29	Jupiter 162°58.09 09:17
14	269°7.58	62°17.83 11.3		71°48.76 6.52	234°15.73 5.23	Saturn 325°1.44 22:26
15	$284^{\circ}10.05$	77°17.38 · · 12.4		86°50.78 · · 6.69	249°18.37 · · 5.18	Nov 19 Sun SHA Mer.pass
16	299° 12.51	92°16.92 13.5		101°52.80 6.87	264°21.01 5.13	Venus 153°51.12 09:51
17	314° 14.97	107°16.46 14.6		116°54.82 7.04	279°23.64 5.08	Mars 193°41.93 07:10
18	329° 17.44	122°16.00 \$09°15.7		131°56.85 S06°7.22	294°26.28 N11°5.02	Jupiter 162°47.39 09:13
19	344° 19.90 359° 22.37	137°15.54 16.8 152°15.08 17.9		146°58.87 7.39	309°28.92 4.97	Saturn 325° 5.69 22:21
20 21	359°22.37 14°24.83	152°15.08 17.9 167°14.62 · · 19.0		162°0.89 7.57 177°2.91 · · 7.74	324°31.56 4.92 339°34.20 • 4.86	Horizontal parallax
22	29°27.30	182°14.16 20.1	_	192° 4.93 7.92	354°36.84 4.81	Venus: 0.1
23	44°29.76	197°13.70 21.2		207° 6.96 8.10	9°39.48 4.76	Mars: 0.1
Mer	pass. 20:03	ν-0.5′ d1.1′ m-3.9	$\nu 1.2' \ d$ -0.5' m1.19	ν2.0′ d0.2′ m-1.73	ν2.6' d-0.1' m-0.00	
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h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.51	S19°3.25	178°22.17	4.7'	S23°51.37	5.2'	59.3'
1 2	198° 45.39 213° 45.26	3.86 4.46	192°45.87 207°9.56	4.7' 4.7'	23°56.54 24°1.55	5.0' 4.8'	59.3' 59.3'
3	228° 45.13	• • 5.07	221°33.23	4.7'	24° 6.38	4.7'	59.3'
4	243°45.01	5.67	235°56.89	4.6'	24°11.06	4.5'	59.2'
5 6	258° 44.88 273° 44.75	6.28 \$19°6.88	250°20.54 264°44.18	4.6' 4.6'	24°15.56 \$24°19.89	4.3' 4.2'	59.2' 59.2'
7	288° 44.63	7.48	279° 7.81	4.6'	24°24.05	4.2 4.0'	59.2'
8	303°44.50	8.08	293°31.44	4.6'	24°28.05	3.8'	59.1'
9	318° 44.37	• • 8.68	307°55.06	4.6'	24°31.88	3.7'	59.1'
10 11	333°44.24 348°44.11	9.28 9.88	322°18.69 336°42.31	4.6' 4.6'	24°35.53 24°39.02	3.5' 3.3'	59.1' 59.0'
12	3°43.98	S19°10.48	351° 5.94	4.6'	S24°42.33	3.1'	59.0'
13	18° 43.85	11.08	5°29.58	4.6'	24°45.48	3.0'	59.0'
14 15	33°43.72 48°43.59	11.68 •• 12.28	19°53.22 34°16.88	4.7' 4.7'	24°48.45 24°51.26	2.8' 2.6'	59.0' 58.9'
16	63°43.46	12.87	48°40.54	4.7'	24°53.89	2.5'	58.9'
17	78° 43.33	13.47	63°4.22	4.7'	24°56.36	2.3'	58.9'
18 19	93°43.20 108°43.07	\$19°14.06 14.66	77°27.92 91°51.64	4.7' 4.7'	\$24°58.65 25°0.78	2.1' 2.0'	58.8' 58.8'
20	108 43.07 123° 42.94	14.00 15.25	91 51.04 106°15.37	4. <i>1</i> 4.8'	25 0.78 25°2.73	2.0 1.8'	58.8'
21	138° 42.80	• 15.85	120°39.13	4.8'	25°4.52	1.6'	58.7'
22	153° 42.67	16.44	135°2.91	4.8'	25°6.13	1.4'	58.7'
23	168° 42.54	17.03	149°26.72	4.8'	25°7.58	1.3'	58.7'
	SD = 16.2'	d = 0.6'		SI	O = 16.2'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°42.40	\$19°17.62	163°50.56	4.9'	\$25°8.85 25°9.96	1.1'	58.7'
1 2	198° 42.27 213° 42.13	18.22 18.81	178°14.43 192°38.33	4.9' 4.9'	25°9.96 25°10.90	0.9' 0.8'	58.6' 58.6'
3	228° 42.00	• • 19.40	207° 2.27	5.0'	25°11.68	0.6'	58.6'
4	243°41.86	19.99	221°26.25	5.0'	25°12.28	0.4'	58.5'
5 6	258°41.73 273°41.59	20.58 \$19°21.16	235°50.26 250°14.32	5.1' 5.1'	25°12.72 \$25°13.00	0.3'	58.5' 58.5'
7	273 41.59 288°41.46	21.75	264°38.42	5.1'	25° 13.10	-0.1	58.4'
8	303°41.32	22.34	279°2.56	5.2'	25° 13.04	-0.2	58.4'
9	318°41.18	• • 22.92	293°26.75	5.2'	25°12.82	-0.4	58.4'
10 11	333°41.05 348°40.91	23.51 24.10	307°50.99 322°15.28	5.3' 5.3'	25°12.43 25°11.88	-0.6' -0.7'	58.3' 58.3'
12	3°40.77	S19°24.68	336°39.63	5.4'	S25°11.17	-0.9	58.3'
13	18° 40.63	25.26	351° 4.02	5.5'	25°10.30	-1.0'	58.2'
14 15	33°40.49 48°40.35	25.85 •• 26.43	5°28.48 19°52.99	5.5' 5.6'	25°9.26 25°8.06	-1.2' -1.4'	58.2' 58.2'
16	63° 40.22	27.01	34°17.56	5.6'	25°6.71	-1.5	58.1
17	78°40.08	27.59	48°42.20	5.7'	25°5.19	-1.7'	58.1'
18 19	93°39.94 108°39.80	\$19°28.18 28.76	63°6.90 77°31.66	5.8' 5.8'	\$25°3.52 25°1.69	-1.8' -2.0'	58.1' 58.0'
20	123° 39.65	29.34	91°56.49	5.9'	24°59.71		58.0'
21	138° 39.51	• • 29.91	106°21.39	6.0'	24° 57.56	-2.3'	58.0'
22 23	153°39.37 168°39.23	30.49 31.07	120°46.36 135°11.40	6.0' 6.1'	24°55.27 24°52.82	-2.4' -2.6'	57.9' 57.9'
23	SD = 16.2'	d = 0.6'	133 11.40		O = 16.0'	-2.0	37.9
	<u>JD = 10.2</u>	<u>u = 0.0</u>		JI	7 = 10.0		
Sun	<b>GHA</b> 183°39.09	Dec	<b>GHA</b> 149°36.51	ν 6 2'	Dec	d 2.8'	HP
0 1	183°39.09 198°38.95	\$19°31.65 32.23	149°36.51 164°1.70	6.2' 6.3'	\$24°50.22 24°47.47	-2.8' -2.9'	57.8' 57.8'
2	213°38.80	32.80	178°26.96	6.3'	$24^{\circ}44.57$	-3.1'	57.8'
3	228°38.66	• • 33.38	192°52.31	6.4'	24°41.51	-3.2'	57.7'
4 5	243°38.52 258°38.37	33.95 34.53	207°17.73 221°43.23	6.5' 6.6'	24°38.31 24°34.97	-3.3' -3.5'	57.7' 57.7'
6	273°38.23	S19°35.10	236°8.81	6.7'	S24°31.48	-3.6'	57.6'
7	288°38.08	35.67	250°34.47	6.7'	24° 27.84	-3.8'	57.6'
8 9	303°37.94 318°37.79	36.25 •• 36.82	265°0.22 279°26.05	6.8' 6.9'	24°24.06 24°20.13	-3.9' -4.1'	57.6' 57.5'
10	333° 37.65	37.39	293°51.97	7.0'	24° 16.07	-4.1 -4.2	57.5
11	348°37.50	37.96	308°17.98	7.1'	24°11.86	-4.3'	57.5
12 13	3°37.35 18°37.21	\$19°38.53 39.10	322°44.07 337°10.25	7.2' 7.3'	\$24°7.52 24°3.04	-4.5' -4.6'	57.4' 57.4'
14	33°37.06	39.10	351°36.53	7.4'	24 3.04 23°58.42	-4.0 -4.8'	57.4'
15	48°36.91	• • 40.23	6°2.89	7.5'	23°53.67	-4.9'	57.3'
16	63°36.77 78°36.62	40.80	20°29.35 34°55.90	7.5'	23°48.78 23°43.76	-5.0'	57.3'
17 18	78°36.62 93°36.47	41.37 <b>S</b> 19°41.94	34°55.90 49°22.54	7.6' 7.7'	23°43.76 S23°38.61	-5.2' -5.3'	57.3' 57.2'
19	108°36.32	42.50	63°49.28	7.8'	23°33.33	-5.4'	57.2'
20	123°36.17	43.07	78°16.11	7.9'	23° 27.92	-5.5'	57.1'
21 22	138°36.02 153°35.87	· · 43.63 44.19	92°43.04 107°10.07	8.0' 8.1'	23°22.38 23°16.71	-5.7' -5.8'	57.1' 57.1'
23	168° 35.72	44.76	121°37.19	8.2'	23° 10.93	-5.9'	57.0'
	SD = 16.2'	d = 0.6'		SI	D = 15.8'		

		2028	Noven	nber 17	to No	v. 19
Lat.	<b>Twi</b> Naut.	<b>light</b> Civil	Sunrise	Sunset	<b>Twi</b> Civil	<b>light</b> Naut.
N 72°	07:12	08:51			14:39	16:18
N 70°	07:00	08:25	10:14	13:15	15:04	16:29
68°	06:51	08:06	09:30	14:00	15:24	16:39
66°	06:43	07:50	09:00	14:29	15:40	16:47
64°	06:36	07:37	08:39	14:51	15:53	16:54
62°	06:29	07:26	08:21	15:09	16:04	17:00
60°	06:24	07:16	08:07	15:23	16:13	17:06
<b>N</b> 58°	06:19	07:08	07:54	15:36	16:22	17:11
56°	06:14	07:01	07:44	15:46	16:29	17:16
54°	06:10	06:54	07:34	15:56	16:36	17:20
52°	06:06	06:48	07:26	16:04	16:42	17:24
50°	06:03	06:42	07:18	16:12	16:48	17:27
45°	05:54	06:30	07:02	16:28	17:00	17:36
N 40°	05:47	06:20	06:49	16:41	17:10	17:43
35°	05:40	06:11	06:38	16:52	17:20	17:50
30°	05:33	06:02	06:28	17:02	17:28	17:57
20° <b>N</b> 10°	05:21	05:48	06:11	17:20	17:43	18:10
0°	05:08 04:54	05:34 05:20	05:56 05:42	17:35 17:49	17:57 18:11	18:23 18:36
<b>S</b> 10° 20°	04:39 04:20	05:05 04:48	05:27 05:12	18:03 18:19	18:26 18:42	18:52 19:11
30°	03:56	04:48	04:54	18:37	19:03	19:35
35°	03:41	04:16	04:44	18:47	19:15	19:50
40°	03:23	04:01	04:32	18:59	19:30	20:09
45°	02:59	03:43	04:18	19:14	19:48	20:32
<b>S</b> 50°	02:27	03:21	04:00	19:31	20:11	21:05
52°	02:10	03:09	03:52	19:40	20:22	21:22
54°	01:49	02:57	03:43	19:49	20:35	21:44
$56^{\circ}$	01:21	02:42	03:32	19:59	20:51	22:13
58°	00:35	02:24	03:21	20:12	21:09	23:04
<b>S</b> 60°	////	02:01	03:07	20:26	21:32	////
Lat.		Moonris			Moonset	
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
<b>N</b> 70° 68°						
66°						
64°	11:20	12:38	12:59	13:50	14:37	16:17
62°	10:33	11:44	12:21	14:37	15:31	16:55
60°	10:03	11:12	11:54	15:08	16:04	17:21
N 58°	09:40	10:48	11:33	15:31	16:28	17:42
56°	09:21	10:28	11:16	15:49	16:47	17:59
54°	09:06	10:12	11:01	16:05	17:04	18:14
52°	08:52	09:58	10:48	16:19	17:17	18:26
$50^{\circ}$	08:40	09:46	10:37	16:31	17:30	18:37
45°	08:16	09:20	10:13	16:56	17:55	19:00
<b>N</b> 40°	07:56	09:00	09:54	17:16	18:15	19:19
$35^{\circ}$	07:40	08:43	09:38	17:32	18:32	19:34
30°	07:26	08:29	09:24	17:46	18:46	19:48
20°	07:02	08:04	09:01	18:11	19:11	20:10
N 10°	06:42	07:43	08:40	18:32	19:32	20:30
0°	06:23	07:23	08:21	18:52	19:51	20:48
<b>S</b> 10°	06:04	07:03	08:02	19:11	20:11	21:06
20°	05:43	06:42	07:42	19:32	20:32	21:26
30°	05:20	06:17	07:18	19:57	20:56	21:48
35°	05:06	06:03	07:04	20:11	21:10	22:01

		Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-8%	
17	15:02	14:56	11:45	12:37	00:07		
18	14:50	14:43	11:45	13:37	01:07		
19	14:36	14:29	11:46	14:35	02:06		

06:48

06:29

06:05

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20:47

21:12

21:24

21:38

21:54

22:13

21:27

21:46

22:11

22:22

22:51

23:10

22:16

22:33

22:55

23:06

23:17

23:31

23:46

40°

45°

52°

56°

58°

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

04:50

04:32

04:08

03:57

03:44

03:30

03:13

05:46

05:26

05:01

04:49

04:36

04:20

04:01

03:37

## November 20, 21, 22 UT (Mon., Tue., Wed.)

h	Aries	Venu	ıs	M	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	59°32.22	212°13.24 <b>S</b> (		252°44.46	N07°38.95	222°8.98	S06°8.27	24° 42.11	N11°4.71			
1	74°34.69	227°12.78	23.47	267°45.69	38.47	237°11.00	8.45	39°44.75	4.66	Alpheratz	357°31.27 353°3.89	29°15.30 -42°8.98
2	$89^{\circ}37.15$	$242^{\circ}12.32$	24.58	282°46.92	37.99	$252^{\circ}13.02$	8.62	54°47.39	4.60	Ankaa Schedar	353 3.89 349°26.92	-42 8.98 56°42.08
3	104°39.62		• • 25.68	297°48.15	• • 37.51	267°15.04	• • 8.80	69°50.03	• • 4.55	Diphda	348°43.96	-17°49.62
4 5	119° 42.08 134° 44.55	272°11.39 287°10.93	26.79 27.89	312°49.38 327°50.61	37.04 36.56	282°17.07 297°19.09	8.97 9.15	84°52.67 99°55.30	4.50 4.45	Achernar	$335^{\circ}17.50$	-57° 5.48
6	134 44.55 149° 47.01		09°28.99	342°51.84	N07°36.08	312°21.11	9.15 \$06°9.32	99 55.30 114° 57.94	N11°4.39	Hamal	327°47.30	23°36.10
7	164°49.47	317° 10.01	30.10	357°53.07	35.60	327°23.14	9.49	130°0.58	4.34	Polaris	311°47.87	89°23.12
8	179°51.94	332°9.54	31.20	12°54.30	35.12	342°25.16	9.67	145°3.22	4.29	Acamar Menkar	315°9.03 314°2.54	-40°11.32 4°12.25
9	194°54.40		• • 32.30	27°55.53	• • 34.65	357°27.18	• • 9.84	160°5.85	• • 4.24	Mirfak	308°23.16	49°57.87
10	209° 56.87	2°8.61	33.41	42°56.77	34.17	12°29.20	10.02	175°8.49	4.19	Aldebaran	290°35.66	16°34.02
11 12	224°59.33 240°1.79	17°8.15 32°7.68 S0	34.51 09°35.61	57°58.00 72°59.23	33.69 N07°33.21	27°31.23 42°33.25	10.19 \$06° 10.37	190°11.13 205°13.77	4.13 N11°4.08	Rigel	281°0.53	-8°10.09
13	255°4.26	47°7.22	36.71	88° 0.47	32.74	57°35.27	10.54	220° 16.40	4.03	Capella	280°16.78	46°1.47
14	270°6.72	62°6.75	37.81	103°1.70	32.26	72°37.30	10.72	$235^{\circ}19.04$	3.98	Bellatrix Elnath	278°19.20 277°57.54	6°22.51 28°37.80
15	285°9.19		• • 38.91	118°2.93	• • 31.78	87°39.32	• • 10.89	250°21.68	• • 3.93	Alnilam	275°34.24	-1°11.03
16 17	300°11.65 315°14.12	92°5.82 107°5.35	40.01 41.11	133°4.17 148°5.40	31.30 30.83	102°41.35 117°43.37	11.06 11.24	265°24.31 280°26.95	3.87 3.82	Betelgeuse	270°48.39	$7^{\circ}24.69$
18	330° 16.58		09°42.21	163° 6.63	N07°30.35	117 45.37 132°45.39	S06° 11.41	200 20.95 295°29.59	N11°3.77	Canopus	263°50.54	-52°42.53
19	345° 19.04	137°4.42	43.31	178° 7.87	29.87	147°47.42	11.59	310°32.22	3.72	Sirius	258°23.20	-16°45.33
20	$0^{\circ}21.51$	152°3.95	44.41	193° 9.10	29.39	162°49.44	11.76	325°34.86	3.67	Adhara Procyon	255°3.11 244°47.36	-29°0.61 5°8.96
21	15° 23.97		• • 45.51	208°10.34	• • 28.92	177°51.47	• • 11.94	340° 37.50	• • 3.62	Pollux	244 47.30 243°13.29	27°57.16
22	30°26.44	182°3.01	46.61	223°11.58	28.44	192°53.49	12.11	355°40.13	3.56	Avior	234°13.09	-59°35.92
23	45°28.90	197°2.54	47.70	238°12.81	27.96	207°55.52	12.28	10°42.77	3.51	Suhail	222°43.83	-43°32.79
Mer.p	bass. 19:59	u-0.5' $d1.1'$	m-3.96	$\nu$ 1.2′ d-0	.5'  m1.18	$\nu$ 2.0′ d0.	2′ m-1.73	$\nu$ 2.6′ d-0.	.1′ m0.00	Miaplacidus	221°37.22	-69°49.91
										Alphard	217°44.62	-8°47.05
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.14 193°37.56	11°49.42 61°35.33
0	$60^{\circ}31.36$		09°48.80	253°14.05	N07°27.49	222°57.54	S06°12.46	25°45.40	$N11^{\circ}3.46$	Denebola	182°21.94	14°24.52
1	75°33.83	227°1.60	49.90	268°15.28	27.01	237°59.57	12.63	40°48.04	3.41	Gienah	175°40.52	-17°42.08
2 3	90°36.29 105°38.76	242°1.13 257°0.66	51.00 · · 52.09	283°16.52 298°17.76	26.53 •• 26.06	253° 1.59 268° 3.62	12.80 •• 12.98	55°50.68 70°53.31	3.36 · · 3.31	Acrux	$172^{\circ}56.83$	-63°15.36
3 4	105 36.70 120°41.22	272°0.19	53.19	313°18.99	25.58	200 5.02 283° 5.64	13.15	85° 55.95	3.26	Gacrux	171°48.37	-57°16.31
5	135° 43.69	286°59.72	54.28	328°20.23	25.10	298° 7.67	13.32	100°58.58	3.20	Alioth	166°10.77	55°47.93 -11°18.67
6	150°46.15	301°59.25 S0	09°55.38	343°21.47	N07°24.63	313°9.69	S06°13.50	116°1.22	$N11^{\circ}3.15$	Spica Alkaid	158°19.24 152°50.06	49° 9.98
7	165°48.61	316°58.77	56.47	358°22.71	24.15	328°11.72	13.67	131°3.85	3.10	Hadar	148°31.98	-60°30.57
8 9	180°51.08	331°58.30	57.57	13°23.94 28°25.18	23.67 •• 23.20	343°13.74	13.84	146°6.49	3.05	Menkent	$147^{\circ}54.22$	-36°30.59
10	195°53.54 210°56.01		· · 58.66 09°59.76	43°26.42	· · 23.20 22.72	358° 15.77 13° 17.79	· · 14.02 14.19	161°9.12 176°11.76	· · 3.00 2.95	Arcturus	145°45.39	19°1.90
11	225°58.47	16°56.88	10°0.85	58°27.66	22.24	28°19.82	14.36	191°14.39	2.90	Rigil Kent.	139°36.47	-60°57.14
12	241°0.93		S10°1.94	73°28.90	N07°21.77	43°21.85	S06°14.54	206°17.03	N11°2.85	Kochab Zuben'ubi	137°21.29 136°52.86	74°2.05 -16°9.61
13	256°3.40	46°55.93	3.04	88°30.14	21.29	58°23.87	14.71	221°19.66	2.80	Alphecca	126°1.49	26°37.09
14	271°5.86	61°55.46	4.13	103°31.38	20.82	73°25.90	14.88	236°22.30	2.74	Antares	112°12.34	-26°29.64
15 16	286°8.33 301°10.79	76°54.98 91°54.51	· · 5.22 6.31	118°32.62 133°33.86	· · 20.34 19.86	88°27.92 103°29.95	· · 15.06 15.23	251°24.93 266°27.57	· · 2.69 2.64	Atria	107°4.22	-69°4.67
17	316° 13.26	106°54.03	7.40	148°35.10	19.39	118°31.98	15.23	281°30.20	2.59	Sabik	101°59.52	-15°45.50
18	331° 15.72		S10°8.50	163°36.34	N07°18.91	133°34.00	S06° 15.57	296°32.84	N11°2.54	Shaula Rasalhague	96°6.50 95°55.96	-37°7.38 12°32.52
19	$346^{\circ}18.18$	136°53.08	9.59	178°37.58	18.44	148°36.03	15.75	311°35.47	2.49	Eltanin	90°41.21	51°29.32
20	1°20.65	151°52.60	10.68	193°38.82	17.96	163°38.06	15.92	326°38.11	2.44	Kaus Aust.	83°28.70	-34°22.16
21 22	16°23.11 31°25.58	166°52.12 • 181°51.65	· · 11.77 12.86	208°40.06 223°41.31	· · 17.49 17.01	178°40.09 193°42.11	· · 16.09 16.26	341°40.74 356°43.37	· · 2.39 2.34	Vega	$80^{\circ}31.43$	38°48.89
23	46° 28.04	196°51.17	13.95	238°42.55	16.53	208°44.14	16.20	11°46.01	2.34	Nunki	75°44.17	-26°15.54
		-				-				Altair Peacock	61°57.09 53°1.16	8°56.92 -56°38.57
ivier.p	pass. 19:55	$\nu$ -0.5' $d1.1'$	m-3.95	$\nu$ 1.2 a-0	.5′ m1.17	ν2.0° α0.	2′ m-1.74	$\nu 2.6' \ d-0.$	1' mu.u1	Deneb	49°23.78	45°23.40
										Enif	33°35.74	$10^{\circ}0.71$
Wed	GHA 61° 20 50	GHA	Dec	GHA	Dec N07°16.06	GHA	Dec 506° 16 61	GHA	Dec	Al Na'ir	$27^{\circ}29.08$	-46°49.32
0 1	61°30.50 76°32.97	211°50.69 Si 226°50.21	10°15.03 16.12	253°43.79 268°45.03	N07°16.06 15.58	223°46.17 238°48.19	506° 16.61 16.78	26°48.64 41°51.28	N11°2.24 2.19	Fomalhaut	15°11.04	-29°28.13
2	91°35.43	241°49.73	17.21	283°46.28	15.11	253°50.22	16.95	56°53.91	2.14	Scheat Markab	13°42.02 13°26.66	28°14.71 15°21.92
3	106°37.90		• 18.30	298°47.52	• • 14.63	268°52.25	• • 17.13	71°56.54	• • 2.09	IVIAIKAD	13 20.00	15 21.92
4	121°40.36	271°48.77	19.39	313°48.76	14.16	283°54.28	17.30	86°59.18	2.03	Nov 20 Mon	SHA	Mer.pass
5	136° 42.83	286°48.29	20.47	328°50.01	13.68	298°56.31	17.47	102°1.81	1.98	I	152°41.02 193°12.23	09:51 07:08
6 7	151° 45.29 166° 47.75	301°47.81 Si 316°47.33	22.65	343°51.25 358°52.49	N07°13.21 12.73	313°58.33 329°0.36	506° 17.64 17.81	117°4.44 132°7.08	N11°1.93 1.88	Jupiter		09:10
8	181°50.22	331° 46.84	23.73	13°53.74	12.75	344°2.39	17.99	147°9.71	1.83	Saturn	325°9.89	22:17
9	196° 52.68		• • 24.82	28°54.98	• • 11.78	359° 4.42	• 18.16	162° 12.34	• • 1.78	Nov 21 Tue	SHA	
10	211°55.15	1°45.88	25.90	43°56.23	11.31	14° 6.45	18.33	177° 14.97	1.73		151°30.71	Mer.pass 09:52
11	226° 57.61	16° 45.40	26.99	58°57.47	10.83	29°8.48	18.50	192°17.61	1.68	Mars	192°42.68	07:06
12 13	242°0.07 257°2.54	31°44.91 S: 46°44.43	29.16	73°58.72 88°59.96	N07°10.36 9.88	44°10.50 59°12.53	\$06° 18.67 18.84	207°20.24 222°22.87	N11°1.63 1.58	Jupiter	$162^{\circ}26.18$	09:07
14	272°5.00	61°43.95	30.24	104°1.21	9.41	74°14.56	19.02	237°25.50	1.53	Saturn	325°14.04	22:13
15	287°7.47		• • 31.32	119°2.46	• • 8.94	89°16.59	• 19.19	252°28.14	• • 1.48	Nov 22 Wed	SHA	Mer.pass
16	302°9.93	91°42.98	32.40	134°3.70	8.46	104°18.62	19.36	267°30.77	1.43	Venus	$150^{\circ}20.18$	09:53
17	317°12.39	106°42.49	33.49	149°4.95	7.99	119°20.65	19.53	282°33.40	1.38	I	192°13.29	07:04
18 19	332° 14.86 347° 17.32	121°42.01 Si 136°41.52	10°34.57 35.65	164° 6.20 179° 7.45	N07°7.51 7.04	134°22.68 149°24.71	\$06° 19.70 19.87	297°36.03 312°38.67	N11°1.33 1.28		162°15.66	09:04
20	2° 19.79	150 41.52 151°41.03	36.73	179 7.45 194° 8.69	6.56	164° 26.74	20.04	312 36.07 327°41.30	1.23	Saturn	325°18.14	22:09
21	$17^{\circ}22.25$		• • 37.81	209° 9.94	• • 6.09	179°28.77	• • 20.21	342°43.93	• 1.18	Horizor	ntal parallax	
22	32°24.72	181°40.06	38.89	224°11.19	5.62	194°30.80	20.39	357°46.56	1.13		Venus:	0.1
23	47°27.18	196°39.57	39.97	239°12.44	5.14	209°32.83	20.56	12°49.19	1.08		Mars:	0.1
Mer.p	pass. 19:51	$\nu$ -0.5' $d1.1'$	m-3.95	$\nu 1.2' d-0$	.5′ m1.16	$\nu 2.0' d0.$	2′ m-1.74	$\nu$ 2.6′ d-0.	1′ m0.01			

-	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	183°35.57	S19°45.32	$136^{\circ}4.41$	8.3'	\$23°5.01	-6.0'	57.0
1	198°35.42	45.88	150°31.73	8.4'	22°58.98	-6.2'	57.0
2	213°35.27	46.44	164°59.15	8.5'	22°52.82	-6.3'	56.9
3	228°35.12	• • 47.00	179°26.66	8.6'	22°46.54	-6.4'	56.9
4	243°34.97	47.56	193°54.28	8.7'	22°40.15	-6.5'	56.9
5	258°34.81	48.12	208°22.00	8.8'	22°33.64	-6.6'	56.8
6	273°34.66	S19°48.68	222°49.81	8.9'	S22°27.01	-6.7'	56.8
7	288°34.51	49.24	237°17.73	9.0'	22°20.27	-6.9'	56.8
8	303°34.36	49.80	251°45.75	9.1'	22°13.41	-0.9 -7.0'	56.7
	318° 34.20	. 50.35	266°13.86	9.1	22° 6.44	-7.0 -7.1'	56.7
9							56.7
10	333°34.05	50.91	280°42.08	9.3'	21°59.37	-7.2'	
11	348°33.89	51.47	295°10.41	9.4'	21°52.18	-7.3'	56.6
12	3°33.74	S19°52.02	309°38.83	9.5'	S21°44.89	-7.4'	56.6
13	18°33.58	52.57	324°7.35	9.6'	21°37.49	-7.5'	56.6
14	33°33.43	53.13	338°35.98	9.7'	21°29.98	-7.6'	56.5
15	48°33.27	• • 53.68	353°4.71	9.8'	21°22.37	-7.7'	56.5
16	63°33.12	54.23	7°33.53	9.9'	21°14.66	-7.8'	56.5
17	78°32.96	54.79	22°2.46	10.0'	21°6.84	-7.9'	56.4
18	93°32.80	S19°55.34	36°31.50	10.1	S20°58.93	-8.0'	56.4
19	108° 32.65	55.89	51°0.63	10.1	20°50.92	-8.1	56.4
					20°50.92		
20	123°32.49	56.44	65°29.86	10.3'		-8.2'	56.3
21	138°32.33	• • 56.99	79°59.20	10.4	20°34.60	-8.3'	56.3
22	153°32.17	57.53	94°28.64	10.5'	20°26.30	-8.4'	56.3
23	168°32.01	58.08	108°58.17	10.6'	20°17.91	-8.5'	56.2
	SD = 16.2'	d = 0.6'		SI	D = 15.5'		
	-						
ue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°31.86	S19°58.63	$123^{\circ}27.81$	10.7'	\$20°9.42	-8.6'	56.2
1	198°31.70	59.18	137°57.55	10.8'	20°0.85	-8.7'	56.2
2	213°31.54	19°59.72	152°27.39	10.9'	19°52.18	-8.8'	56.1
3	228°31.38	20°0.27	166°57.32	11.0'	19°43.43	-8.8'	56.1
4	243°31.22	0.81	181°27.36	11.1'	19°34.59	-8.9'	56.1
5	258°31.06	1.36	195°57.49	11.1	19°25.66	-0.9 -9.0'	56.0
	273°30.90		210°27.72	11.2	S19°16.65	-9.0 -9.1'	56.0
6		\$20°1.90					
7	288°30.74	2.44	224°58.05	11.4'	19°7.56	-9.2'	56.0
8	303°30.57	2.99	239°28.48	11.5'	18°58.38	-9.3'	55.9
9	318°30.41	• • 3.53	253°59.01	11.6'	18°49.12	-9.3'	55.9
10	333°30.25	4.07	268°29.63	11.7'	18°39.78	-9.4'	55.9
11	348°30.09	4.61	283°0.34	11.8'	18°30.37	-9.5'	55.8
12	3°29.92	S20°5.15	297°31.15	11.9'	S18°20.88	-9.6'	55.8
13	18°29.76	5.69	312°2.06	12.0'	18°11.31	-9.6'	55.8
14	33°29.60	6.23	326°33.06	12.1'	18°1.67	-9.7'	55.8
15	48°29.43	6.76	341°4.15	12.2'	17°51.95	-9.8'	55.7
16	63°29.27	7.30	355°35.34	12.3'	17°42.16	-9.9'	55.7
17	78°29.11	7.84	10°6.62	12.4	17°32.30	-9.9'	55.7
	93°28.94	520°8.37	24°37.99	12.4	517°22.37		
18						-10.0'	55.6
19	108°28.78	8.91	39°9.45		17°12.37	-10.1'	55.6
20	123°28.61	9.44	53°41.00	12.6'	17°2.30	-10.1'	55.6
21	138°28.44	• • 9.98	68°12.64	12.7'	$16^{\circ}52.17$	-10.2'	55.6
22	153°28.28	10.51	82°44.37	12.8'	$16^{\circ}41.97$	-10.3'	55.5
23	168°28.11	11.04	97°16.18	12.9'	$16^{\circ}31.70$	-10.3'	55.5
	SD = 16.2'	d = 0.5'		SI	D = 15.3'		
/ed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°27.94	S20°11.58	111°48.09	13.0'	S16°21.37	-10.4'	55.5
1	198°27.78	12.11	$126^{\circ}20.07$	13.1'	16°10.98	-10.5'	55.4
2	213°27.61	12.64	$140^{\circ}52.15$	13.2'	16°0.53	-10.5'	55.4
3	228°27.44	• • 13.17	155°24.31	13.2'	15°50.02	-10.6'	55.4
4	243°27.27	13.70	169°56.55	13.3'	15°39.45	-10.6'	55.4
5	258° 27.11	14.23	184°28.88	13.4	15°28.82	-10.7	55.3
6	273°26.94	\$20°14.75	199°1.29	13.4	\$15°18.13	-10.7	55.3
	273 26.94 288°26.77	15.28	213°33.78	13.6'	15°7.39	-10.7 -10.8'	55.3
7							
8	303°26.60	15.81	228°6.35	13.6'	14°56.59	-10.9'	55.3
0	318°26.43	• • 16.33	242°39.00	13.7'	14°45.74	-10.9'	55.2
9	333°26.26	16.86	$257^{\circ}11.72$	13.8'	14°34.83	-11.0'	55.2
		17.38	271°44.53	13.9'	14°23.88	-11.0'	55.2
10	348°26.09	17.50					55.2
10 11	348°26.09 3°25.92	\$20°17.91	286°17.41	14.0'	S14°12.87	-11.1'	
10 11 12				14.0'	\$14°12.87 14°1.81		55.1
10 11 12 13	3°25.92 18°25.75	\$20°17.91 18.43	300°50.37	14.0'	$14^{\circ}1.81$	-11.1'	
10 11 12 13 14	3°25.92 18°25.75 33°25.57	\$20°17.91 18.43 18.96	300°50.37 315°23.41	14.0' 14.1'	14°1.81 13°50.70	-11.1' -11.2'	55.1
10 11 12 13 14	3°25.92 18°25.75 33°25.57 48°25.40	\$20°17.91 18.43 18.96 •• 19.48	300°50.37 315°23.41 329°56.51	14.0' 14.1' 14.2'	14°1.81 13°50.70 13°39.55	-11.1' -11.2' -11.2'	55.1 55.1
10 11 12 13 14 15	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23	\$20°17.91 18.43 18.96 •• 19.48 20.00	300°50.37 315°23.41 329°56.51 344°29.70	14.0' 14.1' 14.2' 14.3'	14°1.81 13°50.70 13°39.55 13°28.34	-11.1' -11.2' -11.2' -11.2'	55.1 55.1 55.1
10 11 12 13 14 15 16	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23 78°25.06	\$20°17.91 18.43 18.96 •• 19.48 20.00 20.52	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95	14.0' 14.1' 14.2' 14.3' 14.3'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10	-11.1' -11.2' -11.2' -11.2' -11.3'	55.1 55.1 55.1 55.0
10 11 12 13 14 15 16 17	3° 25.92 18° 25.75 33° 25.57 48° 25.40 63° 25.23 78° 25.06 93° 24.88	\$20°17.91 18.43 18.96 · 19.48 20.00 20.52 \$20°21.04	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95 13°36.27	14.0' 14.1' 14.2' 14.3' 14.3' 14.4'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80	-11.1' -11.2' -11.2' -11.2' -11.3'	55.1 55.1 55.1 55.0 55.0
10 11 12 13 14 15 16 17	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23 78°25.06	\$20°17.91 18.43 18.96 •• 19.48 20.00 20.52	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95	14.0' 14.1' 14.2' 14.3' 14.3'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80 12°54.46	-11.1' -11.2' -11.2' -11.2' -11.3'	55.1 55.1 55.1 55.0 55.0
10 11 12 13 14 15 16 17 18	3° 25.92 18° 25.75 33° 25.57 48° 25.40 63° 25.23 78° 25.06 93° 24.88	\$20°17.91 18.43 18.96 · 19.48 20.00 20.52 \$20°21.04	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95 13°36.27	14.0' 14.1' 14.2' 14.3' 14.3' 14.4'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80	-11.1' -11.2' -11.2' -11.2' -11.3'	55.1 55.1 55.1 55.0 55.0 55.0
10 11 12 13 14 15 16 17 18 19	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23 78°25.06 93°24.88 108°24.71	\$20°17.91 18.43 18.96 ·· 19.48 20.00 20.52 \$20°21.04 21.56 22.08	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95 13°36.27 28°9.67	14.0' 14.1' 14.2' 14.3' 14.3' 14.4' 14.5'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80 12°54.46	-11.1' -11.2' -11.2' -11.2' -11.3' -11.3' -11.4' -11.4'	55.1 55.1 55.1 55.0 55.0 55.0 55.0 54.9
10 11 12 13 14 15 16 17 18 19 20 21	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23 78°25.06 93°24.88 108°24.71 123°24.54 138°24.36	\$20° 17.91 18.43 18.96 • 19.48 20.00 20.52 \$20° 21.04 21.56 22.08 • 22.60	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95 13°36.27 28°9.67 42°43.13 57°16.66	14.0' 14.1' 14.2' 14.3' 14.3' 14.4' 14.5' 14.5' 14.6'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80 12°54.46 12°43.08 12°31.65	-11.1' -11.2' -11.2' -11.2' -11.3' -11.3' -11.4' -11.4' -11.5'	55.1 55.1 55.0 55.0 55.0 55.0 54.0
10 11 12 13 14 15 16 17 18 19	3°25.92 18°25.75 33°25.57 48°25.40 63°25.23 78°25.06 93°24.88 108°24.71 123°24.54	\$20°17.91 18.43 18.96 ·· 19.48 20.00 20.52 \$20°21.04 21.56 22.08	300°50.37 315°23.41 329°56.51 344°29.70 359°2.95 13°36.27 28°9.67 42°43.13	14.0' 14.1' 14.2' 14.3' 14.3' 14.4' 14.5' 14.5'	14°1.81 13°50.70 13°39.55 13°28.34 13°17.10 \$13°5.80 12°54.46 12°43.08	-11.1' -11.2' -11.2' -11.2' -11.3' -11.3' -11.4' -11.4'	55.1 55.1 55.1 55.0 55.0 55.0

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-31%	
20	14:22	14:15	11:46	15:29	03:02		
21	14:07	14:00	11:46	16:18	03:54		
22	13:52	13:44	11:46	17:04	04:42		

## November 23, 24, 25 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	62°29.64	211°39.08 \$10°41.05	254°13.69 N07°4.67	224°34.86 \$06°20.73	27°51.82 N11°1.04	
1	77°32.11	226°38.59 42.13	269°14.94 4.19	239°36.89 20.90	42°54.45 0.99	Alpheratz 357°31.28 29°15.30 Ankaa 353°3.90 -42°8.99
2	92°34.57	241°38.11 43.21	284°16.18 3.72	254°38.92 21.07	57°57.09 0.94	Schedar 349°26.94 56°42.09
3	107°37.04	256° 37.62 · · 44.29	299°17.43 · · 3.25	269°40.95 · · 21.24	72°59.72 · · 0.89	Diphda 348°43.97 -17°49.63
4	122°39.50	271°37.13 45.37	314°18.68 2.77	284°42.98 21.41 299°45.01 21.58	88°2.35 0.84	Achernar 335°17.51 -57°5.49
5 6	137° 41.96 152° 44.43	286°36.64 46.45 301°36.15 \$10°47.52	329°19.93 2.30 344°21.18 N07°1.83	299°45.01 21.58 314°47.04 \$06°21.75	103°4.98 0.79 118°7.61 N11°0.74	Hamal 327°47.30 23°36.10
7	167° 46.89	316°35.65 48.60	359°22.43 1.35	329°49.07 21.92	133°10.24 0.69	Polaris 311°48.00 89°23.14
8	182°49.36	331°35.16 49.68	14°23.69 0.88	344°51.10 22.09	148° 12.87 0.64	Acamar 315°9.03 -40°11.33
9	$197^{\circ}51.82$	346°34.67 · · 50.75	29°24.94 07°0.41	359°53.13 · · 22.26	163°15.50 · · 0.59	Menkar 314°2.53 4°12.25 Mirfak 308°23.15 49°57.88
10	212°54.28	1°34.18 51.83	44°26.19 06°59.93	14°55.16 22.43	178° 18.13 0.54	Aldebaran 290°35.65 16°34.02
11	227° 56.75	16°33.69 52.90	59°27.44 59.46	29°57.20 22.60	193°20.76 0.49	Rigel 281°0.52 -8°10.09
12 13	242°59.21 258°1.68	31°33.19 \$10°53.98 46°32.70 55.05	74°28.69 N06°58.99 89°29.94 58.51	44°59.23 S06°22.77 60°1.26 22.94	208°23.39 N11°0.44 223°26.02 0.39	Capella 280°16.76 46°1.48
14	273°4.14	46°32.70 55.05 61°32.21 56.13	89°29.94 58.51 104°31.20 58.04	60°1.26 22.94 75°3.29 23.11	223°26.02 0.39 238°28.65 0.35	Bellatrix 278°19.18 6°22.51
15	288°6.60	76°31.71 · · 57.20	119°32.45 · · 57.57	90° 5.32 · · 23.28	253°31.28 · · 0.30	Elnath 277°57.52 28°37.80
16	303°9.07	91°31.22 58.27	134°33.70 57.10	105°7.35 23.45	268°33.91 0.25	Alnilam 275°34.23 -1°11.03 Betelgeuse 270°48.38 7°24.68
17	$318^{\circ}11.53$	$106^{\circ}30.72$ $10^{\circ}59.35$	149°34.96 56.62	120° 9.39 23.62	283°36.54 0.20	Betelgeuse 270°48.38 7°24.68 Canopus 263°50.52 -52°42.54
18	333° 14.00	121°30.23 \$11°0.42	164°36.21 N06°56.15	135°11.42	298°39.17 N11°0.15	Sirius 258°23.18 -16°45.34
19	348° 16.46	136°29.73 1.49	179°37.46 55.68	150°13.45 23.96	313°41.80 0.10	Adhara 255°3.09 -29°0.62
20 21	3° 18.93 18° 21.39	151°29.24 2.56 166°28.74 · · 3.63	194°38.72 55.21 209°39.97 • 54.73	165°15.48 24.13 180°17.52 · · 24.30	328°44.43 0.05 343°47.06 · · 0.00	Procyon 244°47.34 5°8.95
22	33°23.85	181°28.24 4.70	209 39.97 54.73 224°41.23 54.26	195°19.55 24.47	358°49.69 10°59.95	Pollux 243°13.27 27°57.16
23	48° 26.32	196° 27.75 5.77	239° 42.48 53.79	210°21.58 24.64	13°52.32 10°59.91	Avior 234°13.05 -59°35.93
		-			-	Suhail 222°43.81 -43°32.80 Miaplacidus 221°37.18 -69°49.91
ivier.	pass. 19:47	ν-0.5' d1.1' m-3.95	ν1.2' d-0.5' m1.15	ν2.0′ d0.2′ m-1.74	ν2.6' d-0.0' m0.01	Miaplacidus 221°37.18 -69°49.91 Alphard 217°44.59 -8°47.06
	_					Regulus 207°31.12 11°49.41
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.51 61°35.32
0	63°28.78 78°31.25	211° 27.25	254°43.74 N06°53.32 269°44.99 52.84	225°23.61	28°54.95 N10°59.86 43°57.58 59.81	Denebola 182°21.92 14°24.51
1 2	78 31.25 93°33.71	226°26.75 7.91 241°26.25 8.98	269°44.99 52.84 284°46.25 52.37	240°25.65 24.98 255°27.68 25.15	43°57.58 59.81 59°0.21 59.76	Gienah 175°40.50 -17°42.09
3	108° 36.17	256°25.75 · · 10.05	299°47.50 · · 51.90	270°29.71 · · 25.32	74°2.83 · · 59.71	Acrux 172°56.79 -63°15.36
4	123°38.64	271°25.25 11.12	314°48.76 51.43	285°31.75 25.49	89°5.46 59.66	Gacrux 171°48.34 -57°16.31 Alioth 166°10.74 55°47.91
5	$138^{\circ}41.10$	286°24.75 12.19	329°50.02 50.96	300°33.78 25.66	104°8.09 59.61	Alioth 166°10.74 55°47.91 Spica 158°19.23 -11°18.68
6	153° 43.57	301°24.25 \$11°13.25	344°51.27 N06°50.48	315°35.81 \$06°25.83	119°10.72 N10°59.57	Alkaid 152°50.04 49°9.97
7	168° 46.03	316°23.75 14.32	359°52.53 50.01	330°37.85 26.00	134° 13.35 59.52	Hadar 148°31.95 -60°30.56
8	183°48.49	331°23.25 15.39	14°53.79 49.54	345°39.88 26.17	149°15.98 59.47	Menkent 147°54.20 -36°30.59
9 10	198° 50.96 213° 53.42	346°22.75 · · 16.45 1°22.25 17.52	29°55.05 · · 49.07 44°56.30 48.60	0°41.91 · · 26.33 15°43.95 26.50	164°18.60 · · 59.42 179°21.23 59.37	Arcturus 145°45.38 19°1.88
11	228° 55.89	16°21.75 18.59	59°57.56 48.13	30°45.98 26.67	194°23.86 59.33	Rigil Kent. 139°36.45 -60°57.13
12	243°58.35	31°21.24 S11°19.65	74°58.82 N06°47.66	45°48.02 \$06°26.84	209°26.49 N10°59.28	Kochab 137°21.27 74°2.03
13	259°0.81	46°20.74 20.71	90°0.08 47.18	60°50.05 27.01	224°29.12 59.23	Zuben'ubi 136°52.84 -16°9.61 Alphecca 126°1.48 26°37.08
14	274°3.28	61°20.24 21.78	105°1.34 46.71	75°52.09 27.18	239°31.74 59.18	Antares 112°12.34 -26°29.64
15	289°5.74	76°19.73 · · 22.84	120°2.60 · · 46.24	90°54.12 · · 27.35	254°34.37 · · 59.13	Atria 107°4.22 -69°4.66
16	304°8.21	91°19.23 23.91	135°3.86 45.77	105°56.15 27.51	269°37.00 59.09	Sabik 101°59.52 -15°45.51
17 18	319° 10.67 334° 13.14	106°18.72 24.97 121°18.22 \$11°26.03	150°5.12 45.30 165°6.38 N06°44.83	120°58.19 27.68 136°0.22 \$06°27.85	284°39.63 59.04 299°42.25 N10°58.99	Shaula 96°6.50 -37°7.38
19	349° 15.60	136°17.71 27.09	180°7.64 44.36	151° 2.26 28.02	314°44.88 58.94	Rasalhague 95°55.96 12°32.50
20	4° 18.06	151°17.21 28.15	195°8.90 43.89	166° 4.29 28.19	329°47.51 58.89	Eltanin 90°41.22 51°29.30
21	19°20.53	166°16.70 · · 29.21	210°10.16 · · 43.42	181°6.33 · · 28.36	344°50.13 · · 58.85	Kaus Aust. 83°28.71 -34°22.16 Vega 80°31.44 38°48.88
22	34°22.99	181°16.19 30.28	225°11.42 42.95	196° 8.37 28.52	359°52.76 58.80	Nunki 75°44.18 -26°15.54
23	49°25.46	196°15.69 31.34	240°12.68 42.48	211°10.40 28.69	14°55.39 58.75	Altair 61°57.10 8°56.91
Mer.	pass. 19:43	ν-0.5' d1.1' m-3.95	ν1.3' d-0.5' m1.14	ν2.0' d0.2' m-1.75	ν2.6' d-0.0' m0.02	Peacock 53°1.18 -56°38.57
	·					Deneb 49°23.80 45°23.39
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.75 10°0.71
0 0	64°27.92	211°15.18 \$11°32.39	255°13.94 N06°42.00	226°12.44 \$06°28.86	29°58.01 N10°58.70	Al Na'ir 27°29.10 -46°49.32 Fomalhaut 15°11.05 -29°28.13
1	79°30.38	226°14.67 33.45	270°15.20 41.53	241°14.47 29.03	45°0.64 58.66	Scheat 13°42.03 28°14.71
2	94° 32.85	241°14.16 34.51	285°16.47 41.06	256°16.51 29.20	60°3.27 58.61	Markab 13°26.67 15°21.91
3	109°35.31	256°13.65 · · 35.57	300°17.73 · · 40.59	271°18.54 · · 29.36	75°5.89 · · 58.56	
4	124° 37.78 139° 40.24	271°13.14 36.63	315°18.99 40.12	286°20.58 29.53	90°8.52 58.51	Nov 23 Thu SHA Mer.pass Venus 149°9.44 09:54
5 6	139° 40.24 154° 42.70	286°12.63 37.69 301°12.12 \$11°38.74	330°20.25 39.65 345°21.52 N06°39.18	301°22.62 29.70 316°24.65 \$06°29.87	105°11.14 58.47 120°13.77 N10°58.42	Mars 191°44.04 07:03
7	169° 45.17	316°11.61 39.80	0°22.78 38.71	331°26.69 30.03	135°16.40 58.37	Jupiter 162°5.21 09:00
8	184° 47.63	331°11.10 40.86	15°24.05 38.24	346°28.73 30.20	150°19.02 58.32	Saturn 325°22.18 22:05
9	199°50.10	346°10.59 · · 41.91	30°25.31 · · 37.77	1°30.76 · · 30.37	165°21.65 · · 58.28	Nov 24 Fri SHA Mer.pass
10	214° 52.56	1°10.08 42.97	45°26.57 37.30	16°32.80 30.54	180°24.27 58.23	Venus 147°58.47 09:55
11	229°55.02	16°9.57 44.02	60°27.84 36.83	31°34.84 30.70	195°26.90 58.18	Mars 191°14.95 07:00
12 13	244° 57.49 259° 59.95	31°9.05 \$11°45.08 46°8.54 46.13	75°29.10 N06°36.36 90°30.37 35.90	46°36.87	210°29.52 N10°58.14 225°32.15 58.09	Jupiter 161°54.83 08:57
14	259 59.95 275°2.42	61°8.03 47.18	105°31.63 35.43	76°40.95 31.21	240°34.77 58.04	Saturn 325°26.17 22:00
15	290°4.88	76°7.51 · · 48.24	120°32.90 · · 34.96	91°42.99 · · 31.37	255°37.40 · · 57.99	Nov 25 Sat SHA Mer.pass
16	305°7.34	91°7.00 49.29	135°34.17 34.49	106°45.02 31.54	270°40.02 57.95	Venus 146°47.26 09:55
17	320°9.81	106°6.48 50.34	150°35.43 34.02	121°47.06 31.71	285° 42.65 57.90	Mars 190°46.02 06:58
18	335° 12.27	121°5.97 \$11°51.39	165°36.70 N06°33.55	136°49.10 S06°31.87	300°45.27 N10°57.85	Jupiter 161°44.52 08:54
19	350° 14.74 5° 17.20	136°5.45 52.44 151°4.94 53.49	180°37.97 33.08 195°39.23 32.61	151°51.14 32.04 166°53.17 32.21	315° 47.90 57.81	Saturn 325°30.09 21:56
20 21	5° 17.20 20° 19.67	151°4.94 53.49 166°4.42 · · 54.54	195°39.23 32.61 210°40.50 · · 32.14	166°53.17 32.21 181°55.21 · · 32.37	330°50.52 57.76 345°53.14 · · 57.71	Horizontal parallax
22	35°22.13	181°3.90 55.59	225°41.77 31.67	196°57.25 32.54	0°55.77 57.67	Venus: 0.1
23	50°24.59	196°3.38 56.64	240°43.04 31.20	211°59.29 32.71	15°58.39 57.62	Mars: 0.1
Mer	pass. 19:39	ν-0.5′ d1.1′ m-3.95	ν1.3' d-0.5' m1.13	ν2.0′ d0.2′ m-1.75	ν2.6' d-0.0' m0.02	

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.84	S20°24.15	100°57.66	14.8'	<b>S</b> 11°57.13	-11.6'	54.9'
1	198°23.67	24.66	115°31.45	14.9'	11°45.54	-11.6'	54.9'
2	213°23.49 228°23.31	25.18 •• 25.69	130°5.31 144°39.23	14.9' 15.0'	11°33.92 11°22.25	-11.7' -11.7'	54.8' 54.8'
4	243°23.14	26.21	159°13.21	15.0'	11°10.55	-11.7' -11.7'	54.8'
5	258°22.96	26.72	173°47.26	15.1'	10°58.82	-11.8'	54.8'
6	273°22.78	S20°27.23	$188^{\circ}21.36$	15.2'	<b>S</b> 10°47.05	-11.8'	54.8'
7	288°22.61	27.75	202°55.52	15.2'	10°35.24	-11.8'	54.7'
8 9	303°22.43 318°22.25	28.26 •• 28.77	217°29.73 232°4.01	15.3' 15.3'	10°23.40 10°11.53	-11.9' -11.9'	54.7' 54.7'
10	333°22.07	29.28	246°38.34	15.4'	09°59.63	-11.9 -11.9'	54.7'
11	348°21.90	29.79	261°12.72	15.4'	09°47.70	-12.0'	54.7'
12	3°21.72	S20°30.29	275°47.15	15.5'	S09°35.73	-12.0'	54.6'
13	18°21.54	30.80	290°21.64	15.5'	09°23.74	-12.0'	54.6'
14 15	33°21.36 48°21.18	31.31 · · 31.82	304°56.18 319°30.76	15.6' 15.6'	09°11.72 08°59.67	-12.0' -12.1'	54.6' 54.6'
16	63°21.00	32.32	334°5.40	15.7'	08°47.59	-12.1'	54.6'
17	78°20.82	32.83	348°40.08	15.7'	08°35.49	-12.1'	54.6'
18	93°20.64	\$20°33.33	3°14.81	15.8'	S08°23.36	-12.2'	54.5'
19	108°20.46	33.84	17°49.59	15.8'	08°11.21	-12.2'	54.5
20 21	123°20.28 138°20.09	34.34 •• 34.84	32°24.41 46°59.28	15.9' 15.9'	07°59.03 07°46.83	-12.2' -12.2'	54.5' 54.5'
22	150° 20.09 153° 19.91	35.34	61°34.18	15.9'	07 40.63 07°34.60	-12.2'	54.5'
23	168°19.73	35.84	76°9.13	16.0'	07°22.36	-12.3'	54.5'
	SD = 16.2'	d = 0.5'		SI	D = 15.0'		
Fri	GHA	Dec	GHA	ν	Dec	d 12.2'	HP
0 1	183°19.55 198°19.36	\$20°36.35 36.85	90°44.12 105°19.15	16.0' 16.1'	\$07°10.09 06°57.80	-12.3' -12.3'	54.4' 54.4'
2	213°19.18	37.34	119°54.21	16.1	06°45.49	-12.3'	54.4'
3	228°19.00	• • 37.84	134°29.32	16.1'	06°33.17	-12.3'	54.4'
4	243°18.81	38.34	149°4.45	16.2'	06°20.82	-12.4'	54.4'
5	258°18.63	38.84	163°39.63	16.2'	06°8.46	-12.4'	54.4'
6 7	273°18.44 288°18.26	\$20°39.33 39.83	178°14.84 192°50.08	16.2' 16.3'	\$05°56.07 05°43.68	-12.4' -12.4'	54.4' 54.4'
8	303°18.07	40.33	207°25.35	16.3	05°31.26	-12.4'	54.3'
9	318°17.89	• • 40.82	222°0.65	16.3'	05°18.83	-12.4'	54.3'
10	333°17.70	41.31	236°35.98	16.4'	05°6.39	-12.5'	54.3'
11	348°17.52	41.81	251°11.34	16.4	04°53.93	-12.5'	54.3'
12 13	3°17.33 18°17.14	\$20°42.30 42.79	265°46.73 280°22.15	16.4' 16.4'	\$04°41.46 04°28.98	-12.5' -12.5'	54.3' 54.3'
14	33°16.96	43.28	294°57.59	16.5	04° 26.90	-12.5'	54.3'
15	48°16.77	• • 43.77	309°33.05	16.5'	04°3.98	-12.5'	54.3'
16	63°16.58	44.26	324°8.54	16.5'	03°51.46	-12.5'	54.3'
17	78°16.39	44.75 \$20°45.24	338°44.05	16.5'	03°38.94	-12.5'	54.2'
18 19	93°16.20 108°16.01	\$20°45.24 45.73	353°19.58 7°55.13	16.6' 16.6'	\$03°26.40 03°13.85	-12.5' -12.6'	54.2' 54.2'
20	123°15.83	46.22	22°30.70		03°1.30		54.2'
21	138°15.64	• • 46.70	37°6.29	16.6'	02°48.74	-12.6'	54.2'
22	153°15.45	47.19	51°41.89	16.6'	$02^{\circ}36.17$	-12.6'	54.2'
23	168°15.26	47.67	66°17.51	16.6'	02°23.60	-12.6'	54.2'
	SD = 16.2'	d = 0.5'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°15.07	S20°48.16	80°53.15	16.6'	S02°11.02	-12.6'	54.2'
1	198°14.88	48.64	95°28.80	16.7'	$01^{\circ}58.43$	-12.6'	54.2'
2	213°14.68	49.13	110°4.46	16.7'	01°45.84	-12.6'	54.2'
3 4	228°14.49 243°14.30	· · 49.61 50.09	124°40.13 139°15.81	16.7' 16.7'	01°33.25 01°20.66	-12.6' -12.6'	54.2' 54.2'
5	258°14.11	50.57	153°51.50	16.7'	01°20.00	-12.6'	54.2'
6	273°13.92	\$20°51.05	168°27.20	16.7'	S00°55.46	-12.6'	54.2'
7	288°13.73	51.53	183°2.91	16.7'	00°42.86	-12.6'	54.1'
8 9	303°13.53 318°13.34	52.01 •• 52.49	197°38.63 212°14.35	16.7' 16.7'	00°30.25 00°17.65	-12.6' -12.6'	54.1' 54.1'
10	318 13.34 333°13.15	52.49	212 14.35 226°50.07	16.7'	500°5.05	-12.6'	54.1'
11	348°12.95	53.44	241°25.80	16.7	N00°7.55	12.6'	54.1'
12	3°12.76	\$20°53.92	$256^{\circ}1.52$	16.7'	N00°20.15	12.6'	54.1'
13	18°12.56	54.40	270°37.25	16.7'	00°32.75	12.6'	54.1'
14 15	33°12.37 48°12.17	54.87 •• 55.35	285°12.98 299°48.71	16.7' 16.7'	00°45.34 00°57.93	12.6' 12.6'	54.1' 54.1'
16	63°11.98	55.82	314°24.44	16.7'	00°57.93	12.6'	54.1'
17	78°11.78	56.29	$329^{\circ}0.16$	16.7'	01°23.10	12.6'	54.1'
18	93°11.59	S20°56.76	343°35.88	16.7'	N01°35.68	12.6'	54.1'
19 20	108°11.39 123°11.19	57.24 57.71	358°11.59 12°47.30	16.7' 16.7'	01°48.25 02°0.81	12.6'	54.1'
20	123°11.19 138°11.00	57.71 •• 58.18	12°47.30 27°23.00	16.7'	02°0.81 02°13.37	12.6' 12.5'	54.1' 54.1'
22	153°10.80	58.65	41°58.69	16.7	02°25.92	12.5'	54.1'
23	168°10.60	59.12	56°34.38	16.7'	02°38.46	12.5'	54.1'
	SD = 16.2'	d = 0.5'		SI	D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-59%	
23	13:35	13:27	11:47	17:47	05:26		
24	13:18	13:09	11:47	18:27	06:07		
25	13:00	12:51	11:47	19:07	06:47		

### November 26, 27, 28 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	65°27.06	211°2.87 \$11°57	69 255°44.30 N06°30.74	4 227°1.33 <b>S</b> 06°32.87	31°1.02 N10°57.57	A lash a sada
1	80°29.52	226°2.35 58	74 270°45.57 30.2°	7 242°3.37 33.04	46°3.64 57.53	Alpheratz Ankaa
2	95°31.99	241°1.83 11°59			61°6.26 57.48	Schedar
3	110°34.45	256°1.31 12°0			76°8.89 · · 57.43	Diphda
4	125° 36.91		88 315°49.38 28.80		91°11.51 57.39	Achernar
5 6	140°39.38 155°41.84	286°0.27 2 300°59.75 \$12°3	93 330°50.65 28.39 98 345°51.92 N06°27.93		106°14.13 57.34 121°16.76 N10°57.30	Hamal
7	170° 44.31		02 0°53.19 27.40		136° 19.38 57.25	Polaris
8	185° 46.77		07 15°54.46 26.99		151°22.00 57.20	Acamar
9	200° 49.23	345°58.19 · · 7			166°24.63 · · 57.16	Menkar
10	215°51.70	0°57.66 8	16 45°57.00 26.09	5 17°21.72 34.53	181°27.25 57.11	Mirfak Aldebaran
11	230°54.16		20 60°58.27 25.59		196°29.87 57.07	Rigel
12	245°56.63	30°56.62 \$12°10			211°32.49 N10°57.02	Capella
13	260°59.09	45°56.09 11			226°35.12 56.97	Bellatrix
14	276°1.55 291°4.02	60°55.57 12			241°37.74 56.93 256°40.36 · · 56.88	Elnath
15 16	306°6.48	75°55.05 · · 13 90°54.52 14			256° 40.36 · · 56.88 271° 42.98 56.84	Alnilam
17	321°8.95	105°54.00 15			286° 45.60 56.79	Betelgeuse
18	336°11.41	120°53.47 \$12°16			301°48.23 N10°56.74	Canopus
19	351° 13.87	135°52.94 17			316°50.85 56.70	Sirius
20	6°16.34	150°52.42 18		8 167°42.12 36.19	331°53.47 56.65	Adhara
21	21°18.80	165°51.89 · · 19	61 211°11.00 · · 20.9	1 182°44.16 · · 36.36	346°56.09 · · 56.61	Procyon Pollux
22	36°21.27	180°51.36 20			1°58.71 56.56	Avior
23	51°23.73	195°50.83 21	69 241°13.55 19.98	8 212°48.25 36.69	17°1.33 56.52	Suhail
Mer.	pass. 19:35	ν-0.5' d1.0' m-3.9	$\nu 1.3' \ d$ -0.5' m1.12	$\nu 2.0' \ d0.2' \ m-1.75$	$\nu$ 2.6' d-0.0' m0.03	Miaplacidus
						Alphard
Man	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus
Mon 0	66°26.20	210°50.31 S12°22		1 227°50.29 \$06°36.85	<b>GHA Dec</b> 32°3.96 <b>N</b> 10°56.47	Dubhe
1	81°28.66	210 50.31 312 22 225°49.78 23			47°6.58 56.43	Denebola
2	96°31.12	240°49.25 24			62°9.20 56.38	Gienah
3	111°33.59	255°48.72 · · 25			77°11.82 · · 56.33	Acrux
4	126°36.05	270°48.19 26	87 316°19.92 17.69	5 287°58.46 37.51	92°14.44 56.29	Gacrux Alioth
5	141°38.52	285°47.66 27			107°17.06 56.24	Spica
6	156° 40.98	300°47.13 <b>S</b> 12°28			122°19.68 N10°56.20	Alkaid
7	171° 43.44	315°46.60 29	97 $1^{\circ}23.75$ 16.29	5 333° 4.58 38.00	137°22.30 56.15	Hadar
8	186° 45.91	330°46.06 31			152°24.92 56.11	Menkent
9	201°48.37	345°45.53 · · 32			167° 27.54 · · · 56.06	Arcturus
10 11	216°50.84 231°53.30	0°45.00 33 15°44.46 34			182°30.16 56.02 197°32.78 55.97	Rigil Kent.
12	246° 55.76	30°43.93 \$12°35			212°35.40 N10°55.93	Kochab
13	261°58.23	45°43.40 36			227° 38.02 55.88	Zuben'ubi
14	277°0.69	60°42.86 37			242°40.64 55.84	Alphecca
15	292°3.16	75°42.33 · · 38			257°43.26 · · 55.79	Antares Atria
16	307°5.62	90°41.79 39		6 108°22.97 39.48	272°45.88 55.75	Sabik
17	322°8.08	105°41.26 40			287°48.50 55.70	Shaula
18	337° 10.55	120°40.72 \$12°41			302°51.12 N10°55.66	Rasalhague
19	352° 13.01	135°40.18 42		_	317°53.74 55.62	Eltanin
20	7° 15.48 22° 17.94	150°39.65 43 165°39.11 • 44			332°56.35 55.57 347°58.97 • 55.53	Kaus Aust.
21 22	37° 20.40	180°38.57 45			3°1.59 55.48	Vega
23	52°22.87	195°38.03 46			18°4.21 55.44	Nunki
						Altair
Mer.p	pass. 19:31	ν-0.5′ d1.0′ m-3.9	$\nu 1.3' \ d$ -0.5' m1.11	$\nu 2.0' \ d0.2' \ \text{m-}1.75$	ν2.6' d-0.0' m0.03	Peacock Deneb
						Enif
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir
0	67°25.33	210°37.49 <b>S</b> 12°47			33°6.83 N10°55.39	Fomalhaut
1	82°27.80	225°36.95 48			48°9.45 55.35	Scheat
2	97°30.26	240°36.41 49			63°12.07 55.31	Markab
3 4	112°32.73 127°35.19	255°35.87 · · 50 270°35.33 51			78°14.68 · · 55.26 93°17.30 55.22	Nov 26 Sun
4 5	127 35.19 142° 37.65	270 35.33 51 285°34.79 52			93 17.30 55.22 108°19.92 55.17	Venus
6	142 37.03 157°40.12	300°34.25 \$12°53			100 19.92 55.17 123°22.54 N10°55.13	Mars
7	172° 42.58	315°33.71 54			138° 25.15 55.08	Jupiter
8	187° 45.05	330°33.16 55			153°27.77 55.04	Saturn
9	202°47.51	345°32.62 · · 56			168°30.39 · · 55.00	No., 27 M-
10	$217^{\circ}49.97$	0°32.08 57			183°33.01 54.95	Nov 27 Mon Venus
11	232°52.44	15°31.53 58			198° 35.62 54.91	Mars
12	247°54.90	30°30.99 \$12°59			213°38.24 N10°54.87	Jupiter
13	262°57.37	45°30.44 13°0			228°40.86 54.82	Saturn
14 15	277° 59.83 293° 2.29	60°29.90 1 75°29.35 · · 2	78 107°3.47 1.84 80 122°4.75 · · 1.3°		243°43.47 54.78 258°46.09 • 54.73	No. 20 T
16	293 2.29 308°4.76		81 137°6.04 0.9		273°48.71 54.69	Nov 28 Tue Venus
17	323°7.22		83 152°7.33 0.49		288° 51.32 54.65	Mars
18	338°9.69	120°27.71 S13°5			303°53.94 N10°54.60	Jupiter
19	$353^{\circ}12.15$	135°27.16 6	86 182°9.90 05°59.53	2 154°18.19 43.89	318° 56.56 54.56	Saturn
20	8° 14.62		88 197°11.19 59.00		333° 59.17 54.52	
21	23°17.08	165°26.07 · · 8	_	_	349°1.79 · · 54.47	Horizon
22	38° 19.54		91 227°13.76 58.13		4°4.40 54.43	
23	53°22.01	195°24.97 10		_	19°7.02 54.39	
Mer.p	oass. 19:27	$\nu$ -0.5′ $d1.0$ ′ m-3.9	$\nu$ 1.3′ <i>d</i> -0.5′ m1.10	$\nu 2.0' \ d0.2' \ \text{m-}1.76$	$\nu 2.6' \ d$ -0.0' m0.04	

Stars SHA

 $357^{\circ}31.30$ 

349° 26 96

348°43.98

 $335^{\circ}17.53$ 

 $327^{\circ}47.30$ 

311°48.22

315°9.03

 $314^{\circ}2.54$ 308°23.15

290°35.64

281°0.51

 $280^{\circ}16.75$ 

 $278^{\circ}19.18$ 

277°57.51

275°34.22

270°48.37

263°50.50

258°23.17

255°3.08

244°47.32

 $243^{\circ}13.25$ 

234°13.02

222°43.78

221°37.13

217°44.57 207°31.10

193°37.48

182°21.90

 $175^{\circ}40.48$ 

 $172^{\circ}56.75$ 

171°48.31

166°10.72

158°19.21

152°50.03

148°31.93

 $147^{\circ}54.18$ 

145°45.37

139°36.44

137°21.25

136°52.83

126°1.48

112°12 34

107°4.22

 $101^{\circ}59.52$ 

 $96^{\circ}6.50$ 

95°55.97

90°41.23

83°28.71

80°31.46

75°44.19

61°57.11

 $53^{\circ}1.20$ 

49°23.82

33°35.77

 $27^{\circ}29.12$ 

15°11.07

13°42.04

13°26.69

SHA

145°35.81

190°17.25

 $161^{\circ}34.27$ 

 $325^{\circ}33.96$ 

SHA

 $144^{\circ}24.11$ 

189°48.63

161°24.09

325°37.76

SHA

143°12.16

 $189^{\circ}20.17$ 

161°13.99

 $325^{\circ}41.50$ 

Venus: Mars

Horizontal parallax

353°3.91

Dec 29°15.30

-42°9.00

56°42 10

-17°49.63

 $-57^{\circ}5.50$ 

 $23^{\circ}36.10$ 

 $89^{\circ}23.16$ 

-40°11.35

4°12.24

49°57.89

16°34.02

-8°10.10

 $46^{\circ}1.49$ 

 $6^{\circ}22.51$ 

28° 37.80

 $-1^{\circ}11.04$ 

 $7^{\circ}24.68$ -52°42.56

-16°45.35

 $-29^{\circ}0.63$ 

 $27^{\circ}57.15$ 

-59°35.94

-43°32.81

-69°49.92

-8°47.07

11°49.40

61°35.31

14°24.50

-17°42.09

-63°15.35

-57° 16.31

55°47.90

-11°18.68

-60°30.55

-36°30.59

 $19^{\circ}1.87$ 

74°2.01

-16°9.62

26°37.06

-26° 29.64

-69°4.65

 $-37^{\circ}7.37$ 

12°32.50

51°29.29

-34°22.15

38°48.86

-26°15.54

8°56.91

-56°38.56

45°23.38

 $10^{\circ}0.70$ 

-46°49.32

-29°28.14

28°14.70

15°21.91

Mer.pass

09:56

06:56

08:51

21:52

09:57

06:54

08:47

21:48

09:58

06:52

08:44

21:44

0.1

0.1

Mer.pass

Mer.pass

 $-15^{\circ}45.51$ 

-60°57.12

49°9.95

5°8.94

h	Su	n		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°10.40	\$20°59.58	$71^{\circ}10.05$	16.7'	$N02^{\circ}50.99$	12.5'	54.1'
1	198°10.21	21°0.05	85° 45.71	16.6'	03°3.51	12.5'	54.1'
2	213°10.01 228°9.81	0.52	100°21.36 114°56.99	16.6' 16.6'	03°16.02 03°28.52	12.5' 12.5'	54.1' 54.1'
4	243°9.61	1.45	129° 32.61	16.6'	03°41.01	12.5'	54.1'
5	258°9.41	1.91	144°8.21	16.6'	03°53.49	12.5'	54.1'
6	273°9.21	\$21°2.38	158° 43.80	16.6'	N04°5.95	12.4	54.1'
7 8	288°9.01 303°8.81	2.84 3.31	173° 19.37 187° 54.92	16.6' 16.5'	04°18.40 04°30.83	12.4' 12.4'	54.1' 54.1'
9	318°8.61	• • 3.77	202° 30.46	16.5'	04° 43.26	12.4	54.1
10	333°8.41	4.23	$217^{\circ}5.97$	16.5'	04°55.66	12.4'	54.1'
11	348°8.21	4.69	231°41.46	16.5'	05°8.05	12.4'	54.1'
12 13	3°8.00 18°7.80	\$21°5.15 5.61	246° 16.93 260° 52.37	16.4' 16.4'	N05°20.42 05°32.78	12.4' 12.3'	54.1' 54.1'
14	33°7.60	6.07	275° 27.79	16.4	05°45.12	12.3'	54.1'
15	48°7.40	• • 6.53	290°3.18	16.4'	05°57.44	12.3'	54.1'
16	63°7.20 78°6.99	6.98	304° 38.55 319° 13.89	16.3' 16.3'	06°9.74 06°22.01	12.3'	54.1' 54.1'
17 18	93°6.79	7.44 \$21°7.89	319 13.89 333° 49.20	16.3'	N06°34.27	12.3' 12.2'	54.1
19	108°6.58	8.35	348° 24.48	16.3'	06°46.51	12.2'	54.2'
20	123°6.38	8.80	2°59.74	16.2'	06°58.73	12.2'	54.2'
21	138° 6.18 153° 5.97	• • 9.26	17°34.96 32°10.14	16.2'	07° 10.92 07° 23.09	12.2'	54.2'
22 23	153 5.97 168°5.77	9.71 10.16	32 10.14 46° 45.30	16.2' 16.1'	07 23.09 07°35.23	12.1' 12.1'	54.2' 54.2'
	SD = 16.2'	d = 0.5'			0 = 14.8'		
	3D = 10.2	u = 0.5		JL.	y — 14.0°		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°5.56	S21°10.62	61°20.42	16.1'	N07°47.35	12.1'	54.2'
1 2	198°5.36 213°5.15	11.07 11.52	75°55.50 90°30.55	16.0' 16.0'	07°59.45 08°11.52	12.1' 12.0'	54.2' 54.2'
3	228° 4.94	•• 11.97	105°5.56	16.0'	08°23.56	12.0'	54.2'
4	243°4.74	12.42	$119^{\circ}40.53$	15.9'	$08^{\circ}35.58$	12.0'	54.2'
5	258° 4.53	12.86	134° 15.47	15.9'	08° 47.56	12.0'	54.2'
6 7	273°4.32 288°4.12	\$21°13.31 13.76	148° 50.36 163° 25.21	15.9' 15.8'	N08° 59.52 09° 11.45	11.9' 11.9'	54.2' 54.2'
8	303°3.91	14.20	178°0.03	15.8'	09°23.34	11.9'	54.2'
9	318°3.70	•• 14.65	192°34.79	15.7'	$09^{\circ}35.21$	11.8'	54.3'
10	333°3.49	15.09	207°9.52	15.7'	09°47.04	11.8'	54.3'
11 12	348°3.28 3°3.07	15.54 \$21°15.98	221°44.20 236°18.83	15.6' 15.6'	09°58.84 N10°10.61	11.8' 11.7'	54.3' 54.3'
13	18°2.87	16.42	250° 53.42	15.5'	10°22.34	11.7'	54.3'
14	33°2.66	16.87	265° 27.96	15.5'	$10^{\circ}34.04$	11.7'	54.3'
15 16	48°2.45 63°2.24	· · 17.31 17.75	280°2.45 294°36.90	15.4' 15.4'	10°45.70 10°57.33	11.6' 11.6'	54.3' 54.3'
17	78°2.03	18.19	309° 11.29	15.4	10 57.33 11°8.92	11.5'	54.3'
18	93°1.81	S21°18.63	323°45.63	15.3'	N11°20.47	11.5'	54.3'
19	108°1.60	19.07	338° 19.92	15.2'	11°31.98	11.5'	54.4'
20 21	123°1.39 138°1.18	19.50 •• 19.94	352°54.16 7°28.34	15.2' 15.1'	11°43.45 11°54.88	11.4' 11.4'	54.4' 54.4'
22	153°0.97	20.38	7 26.34 22°2.47	15.1'	12°6.27	11.4	54.4
23	168°0.76	20.81	36°36.55	15.0'	$12^{\circ}17.61$	11.3'	54.4'
	SD = 16.2'	d = 0.5'		SE	D = 14.8'		
Tue	<b>GHA</b> 183°0.54	Dec \$21°21.25	<b>GHA</b> 51° 10.57	ν	<b>Dec</b> N12° 28.92	d 11.2'	<b>HP</b> 54.4'
0 1	183°0.54 198°0.33	21.68	65° 44.53	15.0' 14.9'	12° 40.18	11.3' 11.2'	54.4° 54.4°
2	213°0.12	22.12	80° 18.43	14.8'	12°51.39	11.2'	54.4'
3	227°59.90	• • 22.55	94° 52.28	14.8'	13°2.56	11.1'	54.4'
4 5	242°59.69 257°59.48	22.98 23.41	109°26.07 123°59.79	14.7' 14.7'	13° 13.69 13° 24.76	11.1' 11.0'	54.5' 54.5'
6	272°59.26	S21°23.84	138° 33.46	14.6'	N13°35.79	11.0'	54.5'
7	287°59.05	24.27	153°7.06	14.5'	13°46.77	10.9'	54.5'
8	302°58.83	24.70	167°40.61	14.5'	13°57.70	10.9'	54.5'
9 10	317°58.62 332°58.40	· · 25.13 25.56	182° 14.09 196° 47.50	14.4' 14.4'	14°8.58 14°19.40	10.8' 10.8'	54.5' 54.5'
11	347°58.19	25.99	211°20.85	14.4	14 19.40 14°30.18	10.8	54.6'
12	2°57.97	S21°26.41	225°54.14	14.2'	N14°40.90	10.7'	54.6'
13	17°57.75	26.84	240°27.36	14.2'	14°51.56	10.6	54.6'
14 15	32°57.54 47°57.32	27.26 •• 27.69	255°0.51 269°33.60	14.1' 14.0'	15°2.18 15°12.73	10.6' 10.5'	54.6' 54.6'
16	62°57.10	28.11	284°6.61	13.9'	15°23.23	10.4	54.6'
17	77°56.89	28.54	298°39.56	13.9'	15°33.67	10.4'	54.6'
18	92°56.67	\$21°28.96	313° 12.44	13.8'	N15°44.05	10.3	54.7'
19 20	107°56.45 122°56.23	29.38 29.80	327° 45.25 342° 17.99	13.7' 13.7'	15°54.37 16°4.63	10.3' 10.2'	54.7' 54.7'
21	137°56.01	• • 30.22	356° 50.66	13.6'	$16^{\circ}14.82$	10.1	54.7'
22	152°55.79	30.64	11°23.25	13.5'	16°24.96	10.1'	54.7'
23	167°55.57	31.06	25°55.78	13.5'	16°35.03	10.0'	54.7'
	SD = 16.2'	d = 0.4'		SE	0 = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	68-84%	
26	12:42	12:32	11:47	19:48	07:27		
27	12:22	12:12	11:48	20:29	80:80		
28	12:02	11:52	11:48	21:13	08:51		

## November 29, 30, 01 UT (Wed., Thu., Fri.)

h	Aries	Venu	us	М	ars	Jup	iter	Sat	urn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	68°24.47	210°24.42	S13°11.93	257°16.34	N05°57.21	229°28.43	\$06°44.70	34°9.64	N10°54.34	A
1	83°26.94	225°23.87	12.95	272°17.62	56.74	244°30.47	44.86	49° 12.25	54.30	
2	98° 29.40	240°23.32	13.96	287°18.91	56.28	259°32.52	45.02	64°14.87	54.26	
3	113°31.86	255°22.76	• • 14.97	302°20.20	• • 55.82	274°34.57	• 45.18	79° 17.48	• • 54.21	
4 5	128°34.33 143°36.79	270°22.21 285°21.66	15.98 16.99	317°21.49 332°22.78	55.36 54.89	289°36.62 304°38.67	45.34 45.50	94°20.10 109°22.71	54.17 54.13	/
6	158° 39.26		513°18.00	347°24.07	N05°54.43	319°40.71	\$06° 45.67	124°25.33	N10°54.09	
7	173°41.72	315°20.55	19.01	2°25.36	53.97	334°42.76	45.83	139° 27.94	54.04	
8	$188^{\circ}44.18$	$330^{\circ}20.00$	20.02	$17^{\circ}26.65$	53.51	349°44.81	45.99	154°30.56	54.00	
9	203°46.65	345°19.45	• • 21.03	32°27.94	• • 53.05	4°46.86	• • 46.15	169°33.17	• • 53.96	
10	218°49.11	0°18.89	22.04	47°29.23	52.58	19°48.91	46.31	184°35.78	53.91	A
11 12	233°51.58 248°54.04	15°18.34 30°17.78	23.04 \$13°24.05	62°30.52 77°31.81	52.12 N05°51.66	34°50.96 49°53.01	46.47 \$06° 46.63	199°38.40 214°41.01	53.87 N10°53.83	
13	246 54.04 263° 56.51	45° 17.22	25.06	92°33.11	51.20	64°55.06	46.79	214 41.01 229°43.63	53.79	
14	278° 58.97	60°16.67	26.06	107°34.40	50.74	79°57.10	46.96	244°46.24	53.74	
15	294°1.43	75°16.11	• • 27.07	122°35.69	• • 50.28	94°59.15	• • 47.12	259°48.85	• • 53.70	
16	309°3.90	$90^{\circ}15.55$	28.07	137°36.98	49.81	$110^{\circ}1.20$	47.28	274°51.47	53.66	Ве
17	324°6.36	105° 14.99	29.08	152°38.28	49.35	125° 3.25	47.44	289°54.08	53.62	"
18	339°8.83		\$13°30.08	167°39.57	N05°48.89	140°5.30	S06° 47.60	304°56.69	N10°53.57	
19 20	354° 11.29 9° 13.75	135° 13.88 150° 13.32	31.08 32.08	182°40.86 197°42.16	48.43 47.97	155°7.35 170°9.40	47.76 47.92	319°59.31 335°1.92	53.53 53.49	
21	24° 16.22	165° 12.76	33.09	212°43.45	• • 47.51	185°11.45	• 48.08	350°4.53	• • 53.45	
22	39° 18.68	180° 12.20	34.09	227°44.74	47.05	200°13.50	48.24	5°7.15	53.41	
23	54°21.15	$195^{\circ}11.64$	35.09	242°46.04	46.59	215°15.55	48.40	20°9.76	53.36	
Merr	pass. 19:23	$\nu$ -0.6' d1.0	′ m_3 04	v1 3' d-0	0.5' m1.08	v2 0' d0	2′ m-1.76	v2 6' d-0	0.0' m0.04	Mia
	3433. 13.23	ν 0.0 d1.0				- Z.O GO.		- 2.0 4 0		"""
ть	GHA	GHA	D	GHA	D	GHA	D	GHA	Dec	
Thu 0	бпа 69°23.61		<b>Dec</b> \$13°36.09	257°47.33	<b>Dec</b> N05°46.13	230°17.61	<b>Dec</b> <b>S</b> 06° 48.56	35°12.37	N10°53.32	
1	84°26.07	225° 10.51	37.09	272°48.63	45.67	245°19.66	48.72	50°14.98	53.28	
2	99°28.54	240°9.95	38.09	287°49.92	45.21	260°21.71	48.88	65°17.60	53.24	
3	$114^{\circ}31.00$	$255^{\circ}9.39$	• • 39.08	302°51.22	• • 44.75	275°23.76	• • 49.04	80°20.21	• • 53.20	
4	129° 33.47	270°8.83	40.08	317°52.52	44.29	290°25.81	49.20	95°22.82	53.15	
5	144°35.93	285°8.26	41.08	332°53.81	43.83	305°27.86	49.36	110°25.43	53.11	
6 7	159°38.40 174°40.86	300°7.70 315°7.13	513°42.08 43.07	347°55.11 2°56.40	N05°43.37 42.91	320°29.91 335°31.96	\$06° 49.52 49.68	125°28.05 140°30.66	N10°53.07 53.03	
8	189°43.32	330°6.57	44.07	17°57.70	42.45	350°34.02	49.84	155° 33.27	52.99	
9	204°45.79	345°6.00	• • 45.06	32°59.00	• • 41.99	5°36.07	• • 50.00	170°35.88	• • 52.95	
10	219°48.25	0°5.44	46.06	48°0.30	41.53	20°38.12	50.16	185°38.49	52.90	Ri
11	234°50.72	15°4.87	47.05	63° 1.59	41.07	35°40.17	50.32	200°41.10	52.86	.   '``'
12	249°53.18		\$13°48.05	78°2.89	N05°40.61	50°42.22	S06°50.48	215°43.71	N10°52.82	Z
13 14	264° 55.64 279° 58.11	45°3.74 60°3.17	49.04 50.03	93°4.19 108°5.49	40.15 39.69	65°44.28 80°46.33	50.64 50.80	230°46.33 245°48.94	52.78 52.74	/
15	279 56.11 295°0.57	75°2.60	. 51.02	106 5.49 123° 6.79	39.09	95°48.38	. 50.96	245 46.94 260°51.55	• • 52.70	
16	310°3.04	90°2.03	52.01	138°8.09	38.77	110°50.43	51.12	275°54.16	52.66	
17	325°5.50	$105^{\circ}1.46$	53.00	153°9.39	38.31	125°52.49	51.28	290°56.77	52.61	
18	340°7.97	120°0.89	S13°53.99	168°10.69	N05°37.85	140°54.54	S06°51.44	305°59.38	N10°52.57	Ra
19	355° 10.43	135°0.32	54.98	183°11.99	37.39	155°56.59	51.60	321°1.99	52.53	
20 21	10° 12.89 25° 15.36	149°59.75 164°59.18	55.97 •• 56.96	198°13.29 213°14.59	36.94 •• 36.48	170°58.65 186°0.70	51.76 •• 51.91	336°4.60 351°7.21	52.49 •• 52.45	Ka
22	40° 17.82	179°58.61	57.95	213 14.39 228°15.89	36.02	201°2.75	52.07	6°9.82	52.45	
23	55° 20.29	194°58.04	58.94	243°17.19	35.56	216° 4.81	52.23	21°12.43	52.37	
Merr	pass. 19:19	$\nu$ -0.6' d1.0	′ m_3 04	11 3' d-0	0.5' m1.07	v2 1' d0	2′ m-1.76	v2 6' d-0	0.0' m0.05	
	Jass. 15.15	ν 0.0 d1.0		- VI.5 U 0		- VZ.1 UO.				
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	70°22.75		\$13°59.92	258°18.49	N05°35.10	231° 6.86	S06° 52.39	36° 15.04	N10°52.33	_
1	85°25.21	224° 56.89	14°0.91	273°19.79	34.64	246°8.91	52.55	51° 17.65	52.29	Fo
2	$100^{\circ}27.68$	$239^{\circ}56.32$	1.89	288°21.10	34.19	261°10.97	52.71	66°20.26	52.25	
3	115° 30.14	254°55.74	• • 2.88	303°22.40	• • 33.73	276°13.02	• • 52.87	81°22.87	• • 52.20	
4	130°32.61	269°55.17	3.86	318°23.70	33.27	291°15.08	53.03	96°25.48	52.16	Nov
5 6	145° 35.07 160° 37.54	284°54.59 299°54.02	4.85 \$14°5.83	333°25.00 348°26.31	32.81 N05°32.35	306°17.13 321°19.19	53.18 \$06° 53.34	111°28.08 126°30.69	52.12 N10°52.08	
о 7	160° 37.54 175° 40.00	299 54.02 314° 53.44	6.81	348 26.31 3°27.61	31.90	321°19.19 336°21.24	506°53.34 53.50	126° 30.69 141° 33.30	52.04	
8	190°42.46	329°52.86	7.79	18°28.92	31.44	351°23.30	53.66	156°35.91	52.00	
9	205°44.93	344°52.29	• • 8.78	33°30.22	• • 30.98	6°25.35	• • 53.82	171°38.52	• • 51.96	Nov
10	220°47.39	359°51.71	9.76	48°31.52	30.52	21°27.41	53.98	186°41.13	51.92	IVOV
11	235°49.86	14°51.13	10.74	63°32.83	30.07	36°29.46	54.13	201°43.74	51.88	
12 13	250° 52.32 265° 54.79	29°50.55 44°49.97	514°11.72 12.70	78°34.13 93°35.44	N05°29.61 29.15	51°31.52 66°33.57	\$06° 54.29	216°46.34 231°48.95	N10°51.84	
13 14	265°54.79 280°57.25	44 · 49.97 59° 49.39	12.70 13.67	93°35.44 108°36.74	29.15 28.70	81°35.63	54.45 54.61	231 48.95 246° 51.56	51.80 51.76	
15	295°59.71	74°48.81	• • 14.65	123°38.05	. 28.24	96°37.68	• • 54.77	261°54.17	. 51.70	De
16	311°2.18	89°48.23	15.63	138°39.36	27.78	111°39.74	54.92	276°56.77	51.68	
17	326°4.64	104° 47.65	16.61	153°40.66	27.32	126°41.80	55.08	291°59.38	51.64	
18	341°7.11		\$14°17.58	168°41.97	N05°26.87	141°43.85	S06°55.24	307°1.99	N10°51.60	
19	356°9.57	134°46.49	18.56	183°43.28	26.41	156°45.91	55.40	322°4.60 337°7.20	51.56 51.52	
20 21	11° 12.03 26° 14.50	149°45.91 164°45.33	19.53 •• 20.51	198°44.58 213°45.89	25.96 •• 25.50	171°47.96 186°50.02	55.55 •• 55.71	337°7.20 352°9.81	51.52 •• 51.48	
22	41° 16.96	179° 44.74	21.48	213 43.69 228°47.20	25.04	201°52.08	55.87	7°12.42	51.44	
23	56° 19.43	194°44.16	22.45	243°48.51	24.59	216°54.14	56.03	22° 15.02	51.40	
Mer	pass. 19:15	ν-0.6′ d1.0	′ m-3 94	$\nu 1.3' d_{-}0$	0.5′ m1.06	ν2 1' dΩ	2′ m-1.77	ν2 6' d-0	0.0′ m0.05	

	Stars	
	SHA	Dec
Alpheratz	357°31.31	29°15.30
Ankaa	353°3.93	-42°9.00
Schedar Diphda	349°26.97 348°43.99	56°42.11 -17°49.64
Achernar	335°17.55	-17 49.04 -57°5.51
Hamal	327°47.31	23°36.10
Polaris	311°48.33	89°23.18
Acamar Menkar	315° 9.04 314° 2.54	-40°11.37 4°12.24
Mirfak	308°23.15	4 12.24 49°57.90
Aldebaran	290°35.64	16°34.02
Rigel	281°0.51	-8°10.11
Capella Bellatrix	280°16.73 278°19.17	46°1.49 6°22.50
Elnath	277°57.50	28°37.80
Alnilam	$275^{\circ}34.21$	-1°11.05
Betelgeuse	270°48.35	7°24.67
Canopus Sirius	263°50.48 258°23.16	-52°42.58 -16°45.36
Adhara	255°3.06	-29°0.64
Procyon	$244^{\circ}47.31$	5°8.93
Pollux	243°13.23	27°57.15
Avior Suhail	234°12.99 222°43.75	-59°35.96 -43°32.82
Miaplacidus	221°37.07	-43 32.82 -69°49.93
Alphard	$217^{\circ}44.55$	-8°47.08
Regulus	207°31.07	11°49.39 61°35.30
Dubhe Denebola	193°37.44 182°21.88	61°35.30 14°24.49
Gienah	175°40.46	-17°42.10
Acrux	$172^{\circ}56.71$	-63°15.35
Gacrux	171°48.27	-57°16.31
Alioth Spica	166°10.69 158°19.19	55°47.89 -11°18.69
Alkaid	150° 50.01	49°9.93
Hadar	148°31.90	-60°30.55
Menkent	147°54.16	-36°30.58
Arcturus Rigil Kent.	145°45.35 139°36.41	19°1.86 -60°57.11
Kochab	137°21.24	74°2.00
Zuben'ubi	$136^{\circ}52.82$	$-16^{\circ}9.62$
Alphecca	126° 1.47	26°37.05
Antares Atria	112°12.33 107°4.21	-26°29.64 -69°4.63
Sabik	101°59.51	-15°45.51
Shaula	96°6.50	-37°7.37
Rasalhague	95°55.97 90°41.24	12°32.49 51°29.27
Eltanin Kaus Aust.	90 41.24 83°28.72	-34°22.15
Vega	80°31.46	38°48.85
Nunki	$75^{\circ}44.19$	-26°15.54
Altair	61°57.12	8°56.90
Peacock Deneb	53°1.23 49°23.84	-56°38.56 45°23.38
Enif	33°35.78	10°0.70
Al Na'ir	$27^{\circ}29.14$	-46°49.32
Fomalhaut	15°11.08 13°42.06	-29°28.14
Scheat Markab	13°42.06 13°26.70	28°14.70 15°21.91
Nov 29 Wed Venus	<b>SHA</b> 141°59.94	Mer.pass 09:59
Mars	188°51.86	06:50
Jupiter	161°3.95	08:41
Saturn	325°45.16	21:40
Nov 30 Thu	SHA	Mer.pass
Venus Mars	140°47.46 188°23.72	10:00 06:48
Jupiter	160°53.99	08:38
Saturn	325°48.76	21:35
Dec 01 Fri	SHA	Mer.pass
Venus	$139^{\circ}34.71$	10:01
Mars	187°55.74	06:46
Jupiter Saturn	160°44.11 325°52.29	08:34 21:31
		21.31
Horizor	ntal parallax Venus:	0.1
	v Ciius.	
	Mars:	0.1

h	Su	n		-	Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°55.36	S21°31.48	40°28.23	13.4'	N16°45.04	9.9'	54.8'
1	197°55.14	31.89	55°0.61	13.3'	$16^{\circ}54.98$	9.9'	54.8'
2	212°54.92	32.31	69°32.91	13.2'	17°4.85	9.8'	54.8'
3	227°54.69	• • 32.73	84°5.14	13.2'	17°14.66	9.7'	54.8'
4	242°54.47 257°54.25	33.14	98°37.29 113°9.37	13.1'	17°24.39 17°34.06	9.7'	54.8'
5 6	257°54.25 272°54.03	33.56 \$21°33.97	113° 9.37 127° 41.37	13.0' 12.9'	N17°43.66	9.6' 9.5'	54.8' 54.9'
7	287°53.81	34.38	142° 13.30	12.8'	17°53.18	9.5'	54.9'
8	302°53.59	34.80	156° 45.15	12.8'	18°2.63	9.4'	54.9'
9	317°53.37	• • 35.21	171°16.92	12.7'	$18^{\circ}12.01$	9.3'	54.9'
10	332°53.14	35.62	185°48.62	12.6'	$18^{\circ}21.31$	9.2'	54.9'
11	347°52.92	36.03	200°20.23	12.5'	18° 30.54	9.2'	55.0'
12 13	2°52.70 17°52.47	\$21°36.44 36.85	214°51.77 229°23.23	12.5' 12.4'	N18° 39.69 18° 48.76	9.1' 9.0'	55.0' 55.0'
14	32°52.25	37.26	243°54.61	12.4	18°57.76	9.0 8.9'	55.0'
15	47°52.03	37.66	258°25.91	12.2'	19°6.67	8.8'	55.0'
16	62°51.80	38.07	272°57.13	12.1'	19° 15.50	8.7'	55.0'
17	77°51.58	38.48	287°28.27	12.1'	19°24.25	8.7'	55.1'
18	92°51.35	S21°38.88	301°59.33	12.0'	N19°32.92	8.6'	55.1'
19	107°51.13	39.29	316°30.31	11.9'	19°41.50	8.5'	55.1'
20 21	122°50.90 137°50.68	39.69 •• 40.09	331°1.21 345°32.03	11.8' 11.7'	19°50.00 19°58.41	8.4' 8.3'	55.1' 55.1'
21	137 50.68 152°50.45	40.50	345° 32.03 0°2.77	11.7' 11.7'	19°58.41 20°6.73	8.3	55.1° 55.2'
23	167°50.23	40.90	14°33.43	11.6'	20° 14.97	8.1	55.2'
	SD = 16.2'	d = 0.4'			= 14.9'		
	3D = 10.2'	u = 0.4		30	14.9		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°50.00	S21°41.30	29°4.01	11.5'	N20°23.11	8.1'	55.2'
1 2	197°49.77 212°49.55	41.70 42.10	43°34.50 58°4.92	11.4' 11.3'	20°31.17 20°39.13	8.0' 7.9'	55.2' 55.2'
3	212 49.33 227°49.32	• • 42.50	72°35.25	11.3	20° 47.00	7.9 7.8'	55.3'
4	242°49.09	42.89	87°5.50	11.2'	20° 54.77	7.7'	55.3'
5	257°48.86	43.29	101°35.67	11.1'	21°2.45	7.6'	55.3'
6	272°48.63	S21°43.69	116°5.76	11.0'	N21°10.04	7.5'	55.3'
7	287°48.41	44.08	130° 35.77	10.9'	21° 17.53	7.4'	55.3'
8	302°48.18	44.48	145°5.70	10.8'	21°24.92	7.3'	55.4'
9 10	317°47.95 332°47.72	•• 44.87 45.27	159°35.54 174°5.31	10.8' 10.7'	21°32.21 21°39.40	7.2' 7.1'	55.4' 55.4'
10	332 47.72 347°47.49	45.27 45.66	174 5.31 188°35.00	10.7	21 39.40 21°46.48	7.1 7.0'	55.4'
12	2°47.26	\$21°46.05	203°4.60	10.5	N21°53.47	6.9	55.5'
13	17°47.03	46.45	217°34.13	10.4	22°0.35	6.8'	55.5'
14	32°46.80	46.84	232°3.57	10.4'	22°7.13	6.7'	55.5'
15	47°46.57	• • 47.23	246°32.94	10.3'	22°13.80	6.6'	55.5'
16	62°46.34	47.62	261°2.22	10.2'	22°20.37	6.5'	55.5'
17 18	77°46.11 92°45.87	48.00 <b>S</b> 21°48.39	275°31.43 290°0.56	10.1' 10.1'	22°26.82 N22°33.17	6.3' 6.2'	55.6' 55.6'
19	107°45.64	48.78	304°29.61	10.1	22°39.41	6.1	55.6'
20	122°45.41	49.17	318°58.59	9.9'	22°45.54	6.0'	55.6'
21	137°45.18	• • 49.55	333°27.48	9.8'	22°51.55	5.9'	55.6'
22	152°44.95	49.94	347°56.30	9.7'	22°57.46	5.8'	55.7'
23	167°44.71	50.32	2°25.05	9.7'	23°3.25	5.7'	55.7'
	SD = 16.2'	d = 0.4'		SD	= 15.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°44.48	S21°50.71	16°53.71	9.6'	N23°8.92	5.6'	55.7'
1	197°44.25	51.09	$31^{\circ}22.31$	9.5'	23°14.48	5.4'	55.7'
2	212°44.01	51.47	45°50.83	9.4'	23° 19.92	5.3'	55.8'
3	227°43.78	• • 51.85	60°19.27 74°47.64	9.4'	23°25.24	5.2'	55.8'
4 5	242°43.54 257°43.31	52.23 52.61	74° 47.64 89° 15.94	9.3' 9.2'	23°30.44 23°35.53	5.1' 5.0'	55.8' 55.8'
6	257 43.31 272°43.07	52.01 \$21°52.99	103°44.17	9.2'	23 35.53 N23°40.49	4.8'	55.8'
7	287°42.84	53.37	118° 12.33	9.1'	23°45.33	4.7'	55.9'
8	302°42.60	53.75	132°40.42	9.0'	23°50.05	4.6'	55.9'
9	317°42.37	• • 54.13	147°8.43	8.9'	23°54.64	4.5'	55.9'
10	332°42.13	54.50	161°36.38	8.9'	23°59.11	4.3'	55.9'
11 12	347°41.90 2°41.66	54.88 <b>S</b> 21°55.25	176°4.27 190°32.08	8.8' 8.7'	24°3.45 N24°7.67	4.2' 4.1'	56.0' 56.0'
13	2°41.66 17°41.42	55.63	190° 32.08 204° 59.83	8.7' 8.7'	N24° 7.67 24° 11.76	4.1 4.0'	56.0'
14	32°41.19	56.00	219°27.52	8.6'	24° 11.70 24° 15.72	3.8'	56.0'
15	47°40.95	• • 56.37	233°55.14	8.6'	24° 19.55	3.7'	56.0'
16	62°40.71	56.75	$248^{\circ}22.69$	8.5'	24°23.26	3.6'	56.1'
17	77°40.47	57.12	262°50.19	8.4'	24°26.83	3.4'	56.1'
18	92°40.24	S21°57.49	277°17.63	8.4'	N24°30.27	3.3'	56.1'
19 20	107°40.00 122°39.76	57.86 58.23	291°45.00 306°12.32	8.3' 8.3'	24°33.57 24°36.75	3.2' 3.0'	56.1' 56.2'
21	137°39.52	58.59	320° 39.58	8.2'	24°30.79	2.9'	56.2
22	152°39.28	58.96	335°6.79	8.1'	24° 42.69	2.8'	56.2
23	167°39.04	59.33	349°33.93	8.1'	24°45.46	2.6'	56.2'
	SD = 16.2'	d = 0.4'		SD	= 15.2'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	91-99%		
29	11:41	11:31	11:48	22:00	09:36		
30	11:20	11:09	11:49	22:50	10:24		
01	10:58	10:47	11:49	23:43	11:16		

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

h	Aries	Venus		M	ars	Jup	iter	Sat	urn		Stars
Sat	GHA	GHA D	 ес	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	71°21.89		23.43	258°49.82	N05°24.13	231°56.19	S06° 56.18	37° 17.63	N10°51.36		JIIA
1	86°24.36		24.40	273°51.12	23.67	246°58.25	56.34	52°20.24	51.32	Alpheratz	357°31.31
2	101°26.82		25.37	288°52.43	23.22	262° 0.31	56.50	67° 22.84	51.32	Ankaa	353°3.94
3	116° 29.28		26.34	303°53.74	22.76	277° 2.36	. 56.65	82°25.45	51.24	Schedar	349°26.98
4	131° 31.75		27.31	318°55.05	22.70	292° 4.42	56.81	97° 28.06	51.24	Diphda	348°44.00
5	146°34.21		28.28	333°56.36	21.85	307° 6.48	56.97	112°30.66	51.20	Achernar	335° 17.56
6	161°36.68	299°40.06 \$14°		348°57.67	N05°21.40	322°8.54	S06° 57.12	127°33.27	N10°51.13	Hamal	327°47.30
7	176°39.14		30.22	3°58.98	20.94	337°10.60	57.28	142°35.87	51.09	Polaris	311°48.36
8	191°41.60		31.18	19° 0.29	20.49	352°12.65	57.44	157° 38.48	51.05	Acamar	315°9.04
9	206° 44.07		32.15	34° 1.60	20.03	7°14.71	• 57.59	172°41.08	51.01	Menkar	314°2.53
10	221°46.53		33.12	49° 2.92	19.58	22°16.77	57.75	187°43.69	50.97	Mirfak	308°23.14
11	236°49.00		34.08	64° 4.23	19.12	37°18.83	57.91	202°46.29	50.93	Aldebaran	290°35.62
12	251°51.46	29°36.52 \$14°		79°5.54	N05°18.67	52°20.89	S06°58.06	217°48.90	N10°50.89	Rigel	281°0.49
13	266°53.93		36.01	94°6.85	18.21	67°22.95	58.22	232°51.50	50.85	Capella	280° 16.71
14	281°56.39		36.98	109°8.16	17.76	82°25.01	58.38	247°54.11	50.81	Bellatrix	278° 19.15
15	296° 58.85		37.94	124°9.48	· · 17.30	97°27.06	• • 58.53	262°56.71	• • 50.77	Elnath	277°57.48
16	312°1.32	89°34.16	38.90	139°10.79	16.85	112°29.12	58.69	277°59.32	50.74	Alnilam	275°34.19
17	327°3.78	104°33.57	39.87	154°12.10	16.39	127°31.18	58.84	293°1.92	50.70	Betelgeuse	270°48.34
18	342°6.25	119°32.97 \$14°	40.83	169°13.42	N05°15.94	142°33.24	S06°59.00	308°4.53	N10°50.66	Canopus	263°50.46
19	357°8.71	134° 32.38	41.79	184°14.73	15.49	157°35.30	59.16	323°7.13	50.62	Sirius Adhara	258°23.14 255°3.04
20	$12^{\circ}11.18$	149°31.78	42.75	199°16.04	15.03	172°37.36	59.31	338°9.73	50.58	Procyon	255 3.04 244° 47.28
21	27° 13.64	164°31.19 · ·	43.71	214°17.36	• • 14.58	187°39.42	• • 59.47	353°12.34	• • 50.54	Pollux	243°13.20
22	42°16.10	179°30.60	44.67	229°18.67	14.12	202°41.48	59.62	8°14.94	50.50	Avior	234° 12.95
23	57° 18.57	194°30.00	45.63	244°19.99	13.67	217°43.54	59.78	23° 17.55	50.47	Suhail	222°43.72
Mer	pass. 19:11	ν-0.6' d1.0' m-	3 94	v1.3' d-0	0.5' m1.05	$\nu 2.1' \ d0.2$	2′ m-1 77	v2 6' d-0	.0′ m0.06	Miaplacidus	221°37.02
		- 0.0 01.0 111-				- 2.1 00		- 2.0 4-0		Alphard	217°44.53
										Regulus	207°31.05
Sun	GHA		ec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.40
0	72°21.03		46.58	259°21.30	N05°13.22	232°45.60	S06°59.93	38°20.15	N10°50.43	Denebola	$182^{\circ}21.85$
1	87°23.50		47.54	274°22.62	12.76	247°47.66	07°0.09	53°22.75	50.39	Gienah	175°40.43
2	102°25.96			289°23.93	12.31	262°49.72	0.25	68°25.36	50.35	Acrux	$172^{\circ}56.66$
3	117°28.42		49.45	304°25.25	• • 11.86	277°51.78	• • 0.40	83°27.96	• • 50.31	Gacrux	171°48.23
4	132°30.89		50.41	319°26.57	11.40	292°53.85	0.56	98°30.56	50.27	Alioth	$166^{\circ}10.66$
5	147°33.35		51.36	334°27.88	10.95	307°55.91	0.71	113°33.16	50.24	Spica	$158^{\circ}19.17$
6	162°35.82	299°25.82 \$14° 314°25.22		349°29.20 4°30.52	N05°10.50	322°57.97	S07°0.87	128°35.77	N10°50.20	Alkaid	$152^{\circ}49.99$
7	177°38.28		53.27		10.05	338° 0.03	1.02	143°38.37	50.16	Hadar	$148^{\circ}31.86$
8 9	192° 40.75 207° 43.21		54.22 55.18	19°31.84 34°33.15	9.59 •• 9.14	353°2.09 8°4.15	1.18 •• 1.33	158° 40.97 173° 43.57	50.12 •• 50.08		$147^{\circ}54.14$
10	207 45.21 222° 45.67		56.13	49°34.47	8.69	23° 6.21	1.49	173 45.57 188° 46.18	50.05	1	145°45.34
11	237°48.14		57.08	64°35.79	8.23	38° 8.28	1.49	203°48.78	50.03	Rigil Kent.	139°36.37
12	252°50.60		58.03	79°37.11	N05°7.78	53°10.34	\$07°1.80	218°51.38	N10°49.97	Kochab	137°21.22
13	267°53.07		58.98	94°38.43	7.33	68°12.40	1.95	233°53.98	49.93	Zuben'ubi	136°52.80
14	282°55.53		59.93	109°39.75	6.88	83°14.46	2.11	248° 56.58	49.90	Alphecca	126°1.46
15	297°58.00		°0.88	124°41.07	. 6.43	98°16.53	2.26	263°59.18	• • 49.86	Antares	112°12.32
16	313°0.46	89° 19.80		139°42.39	5.97	113°18.59	2.41	279°1.79	49.82	Atria	107°4.19
17	328°2.92	104° 19.19		154°43.71	5.52	128°20.65	2.57	294°4.39	49.78	Sabik	101°59.50
18	343°5.39		°3.72	169°45.03	N05°5.07	143°22.71	S07°2.72	309°6.99	N10°49.75	Shaula	96°6.49 95°55.96
19	358°7.85	134°17.98	4.66	184°46.35	4.62	158°24.78	2.88	324°9.59	49.71	Rasalhague	
20	13° 10.32	149° 17.38	5.61	199°47.67	4.17	173°26.84	3.03	339°12.19	49.67	Eltanin Kaus Aust.	90°41.24 83°28.71
21	28° 12.78	164°16.77 · ·	6.55	214°48.99	• • 3.72	188°28.90	• • 3.19	354° 14.79	• • 49.63	Vega	80°31.47
22	43° 15.25	179° 16.16	7.50	229°50.31	3.27	203°30.97	3.34	9°17.39	49.60	Nunki	75° 44.19
23	58° 17.71	194° 15.56	8.44	244°51.64	2.81	218°33.03	3.49	24° 19.99	49.56	Altair	61°57.12
Merr	pass. 19:07	ν-0.6' d1.0' m-	.3 04	v1 3′ d-0	0.5' m1.04	$\nu 2.1' \ d0.5$	2′ m-1 78	v2 6′ d-0	.0′ m0.06	Peacock	53°1.24
	7433. 19.07	ν-0.0 d1.0 iii-		ν1.5 u-0	7.5 1111.04	ν2.1 do		ν2.0 u-0	.0 1110.00	Deneb	49°23.85
										Enif	33°35.78
Mon	GHA		ec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.16
0	73°20.17			259°52.96	N05°2.36	233°35.09	S07°3.65	39°22.59	N10°49.52	Fomalhaut	$15^{\circ}11.09$
1	88°22.64		10.33	274°54.28	1.91	248°37.16	3.80	54°25.19	49.48	Scheat	$13^{\circ}42.06$
2	103°25.10		11.27	289°55.60	1.46	263°39.22	3.96	69°27.79	49.45	Markab	13°26.70
3	118°27.57		12.21	304°56.93 319°58.25	· · 1.01	278°41.29	4.11	84°30.39 99°32.99	· · 49.41	Dec 02 Sat	SHA
4	133° 30.03 148° 32.49		13.15	319°58.25 334°59.57	0.56 05°0.11	293°43.35	4.26	99°32.99 114°35.59	49.37 49.34		3HA 138° 21.68
5 6	148° 32.49 163° 34.96		14.09 15.03	334°59.57 350°0.90	05°0.11 N04°59.66	308°45.41 323°47.48	4.42 \$07°4.57	114°35.59 129°38.19	49.34 N10°49.30		138 21.08 187° 27.92
7	103 34.90 178°37.42		15.03	5° 2.22	59.21	323 47.48 338°49.54	4.72	129 38.19 144°40.79	49.30 49.26		160°34.30
8	176 37.42 193°39.89		16.90	20° 3.55	59.21	353°51.61	4.72	159° 43.39	49.20	Saturn	325° 55.74
9	208° 42.35		17.84	35°4.87	58.31	8°53.67	• 5.03	174° 45.99	• • 49.19		
10	223° 44.82		18.78	50° 6.20	57.86	23°55.74	5.18	189° 48.59	49.15	Dec 03 Sun	SHA
11	238° 47.28		19.71	65°7.52	57.41	38°57.80	5.34	204°51.18	49.12	Venus	137°8.37
12	253° 49.74	29°7.61 \$15°		80°8.85	N04°56.96	53°59.87	S07°5.49	219°53.78	N10°49.08	Mars	187°0.27
13	268° 52.21		21.58	95°10.18	56.51	69° 1.94	5.64	234°56.38	49.04	Jupiter	160°24.57
14	283°54.67			110°11.50	56.06	84°4.00	5.80	249°58.98	49.01	Saturn	325°59.12
15	298°57.14		23.45	125°12.83	• • 55.61	99° 6.07	• • 5.95	265°1.58	• • 48.97	Dec 04 Mon	SHA
16	$313^{\circ}59.60$		24.38	$140^{\circ}14.16$	55.16	114°8.13	6.10	280°4.18	48.94		135°54.77
17	329°2.07		25.31	155°15.48	54.71	129°10.20	6.25	295°6.77	48.90		186°32.79
18	344°4.53	119°3.92 \$15°		170°16.81	N04°54.26	144°12.27	S07°6.41	310°9.37	N10°48.86		$160^{\circ}14.92$
19	359°6.99		27.17	185°18.14	53.81	159°14.33	6.56	325°11.97	48.83	Saturn	$326^{\circ}2.42$
20	14°9.46		28.10	200°19.47	53.37	174°16.40	6.71	340°14.57	48.79		
21	29°11.92		29.03	215°20.80	• • 52.92	189°18.47	• • 6.86	355° 17.16	• • 48.75	Horizor	ntal parallax
22	44°14.39		29.96	230°22.12	52.47	204°20.53	7.02	10° 19.76	48.72		Venus: Mars:
23	59° 16.85	194°0.82	30.89	245°23.45	52.02	219°22.60	7.17	25°22.36	48.68		iviars:
Mer.	pass. 19:04	ν-0.6' d0.9' m-	3.94	$\nu$ 1.3′ d-0	0.5′ m1.02	$\nu 2.1' \ d0.2$	2′ m-1.78	$\nu 2.6' \ d-0$	.0′ m0.07		

**Dec** 29°15.30 -42°9.01

56°42.11 -17°49.65

 $\textbf{-57}^{\circ}\,5.53$ 

23°36.10 89°23.19 -40°11.38 4°12.24 49°57.91

16°34.01 -8°10.12 46°1.50 6°22.49 28°37.80 -1°11.06

7°24.66 -52°42.60

-16°45.38

-29°0.66

 $27^{\circ}57.14$ 

-59°35.97 -43°32.84 -69°49.94 -8°47.09 11°49.38 61°35.29

 $14^{\circ}24.48$ 

-17°42.11 -63°15.35 -57°16.31

55°47.87 -11°18.70

49° 9.92 -60° 30.54

-36°30.58 19°1.85 -60°57.10 74°1.98 -16°9.62

26°37.04 -26°29.63

-69°4.62

-15°45.51 -37°7.36 12°32.48 51°29.26 -34°22.14 38°48.84

 $-26^{\circ}15.53$  $8^{\circ}56.90$ 

-56°38.55

 $45^{\circ}23.37 \\ 10^{\circ}0.70$ 

-46°49.32 -29°28.14

28°14.70 15°21.91

Mer.pass

10:01

06:44

08:31 21:27 Mer.pass 10:02 06:42 08:28 21:23 Mer.pass 10:03 06:40

08:25 21:19

0.1

0.1

 $5^{\circ}8.92$ 

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	182°38.80	S21°59.70	4°1.03	8.0'	N24°48.09	2.5'	56.2'
1	197°38.56	22°0.06	18°28.07	8.0'	24°50.59	2.4'	56.3'
2	212°38.32	0.43	32°55.07	7.9'	24°52.95	2.2'	56.3'
3	227°38.08	• • 0.79	47°22.01	7.9'	24°55.17	2.1'	56.3'
4	242°37.84 257°37.60	1.15	61°48.90 76°15.75	7.8'	24°57.25 24°59.19	1.9' 1.8'	56.3'
5 6	257 37.00 272°37.36	1.52 \$22°1.88	90°42.55	7.8' 7.8'	N25°0.99	1.8	56.4' 56.4'
7	287° 37.12	2.24	105° 9.30	7.7'	25°2.65	1.5'	56.4
8	302°36.87	2.60	119°36.01	7.7'	25°4.17	1.4'	56.4
9	317°36.63	• • 2.96	134°2.68	7.6'	25°5.55	1.2'	56.4'
10	332°36.39	3.32	148°29.31	7.6'	25°6.78	1.1'	56.5'
11	347°36.15	3.67	162°55.91	7.6'	25°7.87	0.9'	56.5'
12	2°35.90 17°35.66	\$22°4.03 4.39	177°22.46 191°48.98	7.5' 7.5'	N25°8.82 25°9.62	0.8'	56.5'
13 14	32°35.42	4.39 4.74	191 48.98 206°15.46	7.5 7.4'	25 9.02 25°10.28	0.7' 0.5'	56.5' 56.5'
15	47° 35.17	5.10	220°41.91	7.4	25°10.20	0.4	56.6
16	62°34.93	5.45	235°8.33	7.4'	25°11.16	0.2'	56.6'
17	77°34.69	5.81	249°34.71	7.4'	25°11.39	0.1'	56.6'
18	92°34.44	\$22°6.16	264°1.07	7.3'	N25° 11.46	-0.1'	56.6'
19	107°34.20	6.51	278°27.41	7.3'	25°11.39	-0.2	56.7'
20	122°33.95	6.86	292°53.71	7.3'	25°11.18	-0.4'	56.7'
21 22	137°33.71 152°33.46	· · 7.22 7.57	307°19.99 321°46.26	7.3' 7.2'	25°10.81 25°10.30	-0.5' -0.7'	56.7' 56.7'
23	167°33.21	7.57 7.91	321 40.20 336°12.49	7.2'	25 10.30 25°9.64	-0. <i>1</i> -0.8'	56.7'
20						5.5	55.1
	SD = 16.2'	d = 0.4'		SI	O = 15.3'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°32.97 197°32.72	\$22°8.26	350°38.72 5°4.92	7.2'	N25°8.84 25°7.88	-1.0'	56.8'
1 2	197° 32.72 212° 32.48	8.61 8.96	5°4.92 19°31.10	7.2' 7.2'	25° 7.88 25° 6.78	-1.1' -1.3'	56.8' 56.8'
3	227°32.23	9.30	33°57.28	7.2'	25°5.53	-1.4	56.8'
4	242°31.98	9.65	48°23.44	7.1'	25°4.13	-1.5'	56.9'
5	257°31.73	9.99	62°49.58	7.1'	25°2.59	-1.7'	56.9'
6	272°31.49	S22°10.34	77°15.72	7.1'	N25°0.89	-1.8'	56.9'
7	287°31.24	10.68	91°41.85	7.1'	24°59.04	-2.0'	56.9'
8 9	302°30.99 317°30.74	11.02 · · 11.37	106°7.97 120°34.09	7.1' 7.1'	24°57.05 24°54.91	-2.1' -2.3'	56.9' 57.0'
10	332° 30.49	11.71	135° 0.21	7.1'	24°52.62	-2.4'	57.0'
11	347°30.24	12.05	149°26.32	7.1'	24°50.18	-2.6'	57.0'
12	2°30.00	S22°12.39	163°52.43	7.1'	N24°47.59	-2.7'	57.0'
13	17°29.75	12.73	178°18.54	7.1'	24°44.86	-2.9'	57.0'
14 15	32°29.50 47°29.25	13.06 •• 13.40	192°44.66 207°10.78	7.1' 7.1'	24°41.97 24°38.94	-3.0' -3.2'	57.1' 57.1'
16	62° 29.00	13.74	207 10.78 221°36.90	7.1'	24 36.94 24°35.76	-3.2 -3.3'	57.1'
17	77°28.75	14.07	236° 3.04	7.1'	24°32.43	-3.5'	57.1'
18	92°28.50	S22°14.41	250°29.18	7.2'	N24°28.95	-3.6'	57.1'
19	107°28.24	14.74	264°55.33	7.2'	24°25.33	-3.8'	57.2'
20	122°27.99	15.08	279°21.49	7.2'	24°21.56	-3.9'	57.2'
21 22	137°27.74 152°27.49	· · 15.41 15.74	293°47.67 308°13.86	7.2' 7.2'	24°17.64 24°13.58	-4.1' -4.2'	57.2' 57.2'
23	167°27.24	16.07	300 13.00 322°40.06	7.2'	24 13.36 24°9.37	-4.2 -4.4'	57.2'
20	SD = 16.2'	d = 0.3'			D = 15.5'		
Mon	<b>GHA</b> 182° 26.99	<b>Dec</b> \$22°16.40	<b>GHA</b> 337° 6.28	ν 7.2'	<b>Dec</b> N24°5.02	d -4.5'	<b>HP</b> 57.3'
0 1	182°26.99 197°26.73	16.73	351° 32.52	7.2 7.3'	N24°5.02 24°0.51	-4.5' -4.6'	57.3'
2	212° 26.48	17.06	5°58.79	7.3'	23°55.87	-4.8'	57.3'
3	227°26.23	• • 17.39	20°25.07	7.3'	23°51.08	-4.9'	57.3'
4	242°25.98	17.72	34°51.37	7.3'	23°46.15	-5.1'	57.3'
5	257°25.72	18.05	49°17.70	7.4'	23°41.07	-5.2'	57.4
6	272°25.47 287°25.21	\$22°18.37	63°44.06 78°10.44	7.4' 7.4'	N23°35.85 23°30.48	-5.4'	57.4' 57.4'
7 8	302°24.96	18.70 19.02	78° 10.44 92° 36.84	7.4° 7.4°	23° 30.48 23° 24.98	-5.5' -5.6'	57.4° 57.4'
9	317° 24.71	•• 19.35	107° 3.28	7.5'	23° 19.33	-5.8'	57.4'
10	332° 24.45	19.67	121°29.75	7.5'	23° 13.54	-5.9'	57.5'
11	347° 24.20	19.99	135°56.24	7.5'	23°7.62	-6.1'	57.5'
12	2°23.94	S22°20.31	150°22.77	7.6'	N23°1.55	-6.2'	57.5'
13 14	17°23.69 32°23.43	20.64 20.96	164°49.33 179°15.93	7.6' 7.6'	22°55.34 22°49.00	-6.3' -6.5'	57.5' 57.5'
14 15	47° 23.43	20.96	179°15.93 193°42.56	7.6° 7.7'	22° 49.00 22° 42.52	-6.6'	57.5° 57.6'
16	62°22.92	21.59	208° 9.23	7.7'	22° 35.90	-6.8	57.6'
17	77°22.66	21.91	222°35.94	7.7'	$22^{\circ}29.14$	-6.9'	57.6'
18	92°22.40	S22°22.23	237°2.68	7.8'	N22°22.25	-7.0'	57.6'
19	107° 22.15	22.54	251°29.46	7.8' 7.9'	22°15.22 22°8.07	-7.2'	57.6'
20 21	122°21.89 137°21.63	22.86 •• 23.18	265°56.28 280°23.15	7.9° 7.9'	22°8.07 22°0.77	-7.3' -7.4'	57.7' 57.7'
22	152°21.38	23.49	294°50.05	7.9'	21°53.35	-7.4'	57.7'
23	167°21.12	23.80	309°17.00	8.0'	21°45.79	-7.7'	57.7'
	SD = 16.2'	d = 0.3'		SI	O = 15.6'		

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

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

			Sun			Moon				
Day	,	Eqn.of	f Time	Mer.	Mer.	Pass.	Age			
,		00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18			
		mm:ss mm:ss		hh:mm	hh:mm	hh:mm	100-96%			
(	)2	10:35	10:24	11:50	-:-	12:11				
	)3	10:12	10:00	11:50	00:39	13:07				
(	)4	09:48	09:36	11:50	01:35	14:03				

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

h	Aries	Ven	ius	M	ars	Jup	iter	Sat	urn		Stars
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	74° 19.31		\$15°31.81	260°24.78	N04°51.57	234°24.67	507°7.32	40°24.96	N10°48.65		
1	89°21.78	223°59.58	32.74	275°26.11	51.12	249°26.73	7.47	55° 27.55	48.61	Alpheratz	357°31.32
2	104°24.24	238°58.96		275 20.11 290°27.44		264°28.80		70°30.15		Ankaa	353°3.95
3	104 24.24 119°26.71		33.67	305°28.77	50.67		7.62	85° 32.75	48.58 •• 48.54	Schedar	349°26.99
3 4	119 26.71 134°29.17	253°58.34 268°57.72	· · 34.59 35.51	305 28.77 320°30.10	•• 50.23 49.78	279°30.87 294°32.94	· · 7.78 7.93	85 32.75 100°35.34	48.50	Diphda	348°44.00
5	134 29.17 149°31.64			335°31.44				100 35.34 115°37.94		Achernar	335°17.58
6	164° 34.10	283°57.10 298°56.47	36.44 \$15°37.36	350°32.77	49.33 N04°48.88	309°35.00 324°37.07	8.08 \$07°8.23	130°40.53	48.47 N10°48.43	Hamal	327°47.30
7	179°36.56	313°55.85	38.28	5°34.10	48.44	339°39.14	8.38	145° 43.13	48.40	Polaris	311°48.60
8	179 30.30 194°39.03	328° 55.22	39.20	20°35.43	47.99	354°41.21	8.54	160° 45.73	48.36	Acamar	$315^{\circ}9.04$
9	209°41.49	343°54.60	• • 40.13	35°36.76	• • 47.54	9°43.28	• 8.69	175° 48.32	• • 48.33	Menkar	314°2.52
10	224° 43.96	358° 53.97	41.05	50°38.09	47.09	24°45.35	8.84	190° 50.92	48.29	Mirfak	308°23.13
11	239° 46.42	13°53.35	41.03	65°39.43	46.65	39°47.41	8.99	205° 53.51	48.26	Aldebaran	290°35.61
12	254° 48.88		\$15°42.88	80°40.76	N04°46.20	54°49.48	S07°9.14	220°56.11	N10°48.22	Rigel	281°0.48
13	269°51.35	43°52.10	43.80	95°42.09	45.75	69°51.55	9.29	235°58.70	48.19	Capella	280°16.69
14	284°53.81	58°51.47	44.72	110°43.43	45.31	84°53.62	9.44	251°1.30	48.15	Bellatrix	$278^{\circ}19.13$
15	299° 56.28	73°50.84	• • 45.64	125°44.76	• • 44.86	99°55.69	9.60	266°3.89	• • 48.12	Elnath	277°57.46
16	314°58.74	88°50.21	46.55	140°46.10	44.41	114°57.76	9.75	281°6.49	48.08	Alnilam	275°34.17
17	330°1.21	103°49.58	47.47	155°47.43	43.97	129°59.83	9.90	296°9.08	48.05	Betelgeuse	270°48.32
18	345°3.67		S15°48.38	170°48.76	N04°43.52	145°1.90	S07°10.05	311°11.68	N10°48.01	Canopus	263°50.45
19	0°6.13	133°48.32	49.30	185°50.10	43.07	160°3.97	10.20	326° 14.27	47.98	Sirius	258°23.12
20	15°8.60	148° 47.69	50.21	200°51.44	42.63	175° 6.04	10.35	341°16.86	47.94	Adhara	255°3.02
21	30°11.06	163°47.06	• • 51.12	215°52.77	• • 42.18	190°8.11	• • 10.50	356° 19.46	• • 47.91	Procyon	244°47.26
22	45° 13.53	178°46.43	52.04	230°54.11	41.74	205°10.18	10.65	11°22.05	47.87	Pollux	243°13.17
23	60° 15.99	193°45.80	52.95	245°55.44	41.29	220°12.25	10.80	26°24.65	47.84	Avior	234°12.92
	10.00	0.6/ 10.6	_		4/ 1.01		0/ 1.70			Suhail	222°43.69
Mer.p	pass. 19:00	$\nu$ -0.6' d0.9	9′ m-3.94	$\nu$ 1.3' d-0	.4′ m1.01	$\nu$ 2.1′ d0.1	2′ m-1.78	$\nu$ 2.6′ $d$ -0	0.0′ m0.07	Miaplacidus	221°36.97
										Alphard	217°44.50
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.02
0	75° 18.45	208°45.17	S15°53.86	260°56.78	N04°40.84	235°14.32	S07°10.95	41°27.24	N10°47.80	Dubhe Denebola	193°37.35 182°21.82
1	90°20.92	223°44.53	54.77	275°58.12	40.40	250°16.39	11.10	56°29.83	47.77	Gienah	175°40.40
2	105°23.38	238°43.90	55.68	290°59.45	39.95	265°18.46	11.25	71°32.43	47.73		175 40.40 172°56.62
3	120°25.85	253°43.27	• • 56.59	306°0.79	• • 39.51	280°20.53	• • 11.40	86°35.02	• • 47.70		172 50.02 171°48.19
4	135°28.31	268°42.63	57.49	321°2.13	39.06	295°22.61	11.55	101°37.61	47.67	Alioth	166°10.63
5	150°30.78	283°42.00	58.40	336°3.47	38.62	310°24.68	11.70	116°40.21	47.63	Spica	158° 19.14
6	165°33.24	298°41.36	S15°59.31	351°4.81	N04°38.17	325°26.75	S07°11.85	131°42.80	N10°47.60	Alkaid	152°49.96
7	180°35.70	313°40.73	$16^{\circ}0.21$	$6^{\circ}6.15$	37.73	340°28.82	12.00	146°45.39	47.56	Hadar	148°31.82
8	195°38.17	328°40.09	1.12	21°7.48	37.28	355°30.89	12.15	161°47.98	47.53		147°54.11
9	210°40.63	343°39.45	• • 2.02	36°8.82	• • 36.84	10°32.96	• • 12.30	176°50.58	• • 47.49		145°45.31
10	225°43.10	358°38.81	2.93	51°10.16	36.39	25°35.04	12.45	191°53.17	47.46	Rigil Kent.	139°36.34
11	240°45.56	13°38.18	3.83	66°11.50	35.95	40°37.11	12.60	206°55.76	47.43	Kochab	137°21.19
12	255°48.02	28°37.54	\$16°4.73	81°12.84	N04°35.51	55°39.18	S07°12.75	221°58.35	N10°47.39	Zuben'ubi	136°52.78
13	270°50.49	43°36.90	5.63	96°14.18	35.06	70°41.25	12.90	237°0.94	47.36	Alphecca	126°1.44
14	285° 52.95	58° 36.26	6.53	111°15.53	34.62	85°43.33	13.05	252°3.54	47.33	Antares	112°12.30
15	300°55.42	73°35.62	• • 7.43	126°16.87	• • 34.17	100°45.40	• • 13.20	267°6.13	• • 47.29	Atria	107°4.17
16	315°57.88	88°34.98	8.33	141°18.21	33.73	115°47.47	13.35	282°8.72	47.26	Sabik	101°59.49
17	331°0.35	103°34.34	9.23	156°19.55	33.29	130°49.55	13.50	297°11.31	47.22	Shaula	96°6.48
18	346°2.81		\$16°10.13	171°20.89	N04°32.84	145°51.62	S07°13.65	312°13.90	N10°47.19	Rasalhague	95°55.96
19	1°5.27	133°33.05	11.03	186°22.23	32.40	160°53.69	13.80	327°16.49	47.16	Eltanin	90°41.24
20	16°7.74	148°32.41	11.92	201°23.58	31.96	175°55.77	13.95	342°19.08	47.12	Kaus Aust.	83°28.71
21	31° 10.20		• • 12.82	216°24.92	• • 31.51	190°57.84	• • 14.10	357°21.67	• • 47.09	Vega	80°31.47
22	46°12.67	178°31.12	13.72	231°26.26	31.07	205°59.91	14.25	12°24.26	47.06	Nunki	75°44.18
23	61°15.13	193°30.48	14.61	246°27.61	30.63	221°1.99	14.39	27°26.85	47.02	Altair	61°57.12
Mer.p	bass. 18:56	$\nu$ -0.6' d0.9	9′ m-3.94	$\nu$ 1.3′ d-0	.4′ m1.00	$\nu 2.1' \ d0.1$	2′ m-1.79	$\nu$ 2.6′ d-0	0.0′ m0.08	Peacock	53°1.24
										Deneb	49°23.86
	CILA	CHA	Б	CIIA	Б	CIIA	Б.	CIIA	ь.	Enif	33°35.79
Thu	<b>GHA</b> 76° 17.59	<b>GHA</b> 208°29.83	Dec	<b>GHA</b> 261°28.95	<b>Dec</b> N04°30.18	<b>GHA</b> 236° 4.06	<b>Dec</b> \$07° 14.54	<b>GHA</b> 42°29.44	Dec	Al Na'ir	27°29.16
0 1	91°20.06	208° 29.83 223° 29.19	\$16°15.50 16.40	261°28.95 276°30.30	29.74	236° 4.06 251° 6.14	14.69	42°29.44 57°32.03	N10°46.99 46.96	Fomalhaut	15°11.10
2	91 20.00 106°22.52	223 29.19 238°28.54	17.29	270 30.30 291°31.64	29.74	266° 8.21	14.84	72°34.62	46.90 46.92	Scheat	13°42.07
3	100 22.52 121°24.99	250 26.54 253°27.90	17.29	306°32.99	28.86	281°10.29	• 14.99	87° 37.21	· · 46.89	Markab	13°26.71
4	136° 27.45	268° 27.25	19.07	321°34.33	28.41	296°12.36	15.14	102°39.80	46.86	Dec 05 Tue	SHA
5	151°29.92	283°26.60	19.07	336°35.68	27.97	311°14.44	15.14	102 39.00 117°42.39	46.83		134°40.89
6	166° 32.38		S16°20.85	351°37.02	N04°27.53	326°16.51		132° 44.98	N10°46.79	Mars	186°5.47
7	181°34.84	313°25.31	21.74	6°38.37	27.09	341°18.59	15.58	147° 47.57	46.76	Jupiter	160°5.35
8	196° 37.31	328°24.66	22.63	21°39.71	26.65	356°20.66	15.73	162°50.16	46.73	Saturn	326°5.64
9	211°39.77	343°24.01	• • 23.52	36°41.06	26.20	11°22.74	. 15.88	177° 52.75	• • 46.69		
10	226° 42.24	358°23.36	24.40	51°42.41	25.76	26°24.81	16.03	192°55.34	46.66	Dec 06 Wed	SHA
11	241°44.70	13°22.71	25.29	66°43.76	25.32	41°26.89	16.18	207° 57.93	46.63		133°26.71
12	256° 47.16		S16°26.17	81°45.10	N04°24.88	56°28.97	S07°16.32	223°0.51	N10°46.60		185°38.33
13	271°49.63	43°21.41	27.06	96°46.45	24.44	71°31.04	16.47	238°3.10	46.56		159°55.87
14	286°52.09	58°20.75	27.94	111°47.80	24.00	86°33.12	16.62	253°5.69	46.53	Saturn	326°8.78
15	$301^{\circ}54.56$	$73^{\circ}20.10$	• • 28.82	126°49.15	• • 23.56	101°35.19	• • 16.77	268°8.28	• • 46.50	Dec 07 Thu	SHA
16	$316^{\circ}57.02$	$88^{\circ}19.45$	29.71	141°50.50	23.12	116°37.27	16.91	283°10.87	46.47		132°12.24
17	$331^{\circ}59.48$	$103^{\circ}18.79$	30.59	156°51.85	22.68	131°39.35	17.06	298°13.45	46.43		185°11.36
18	347°1.95	118° 18.14		171°53.20	N04°22.24	146°41.43	S07°17.21	313°16.04	N10°46.40	1	159°46.47
19	2°4.41	133°17.49	32.35	186°54.55	21.79	161°43.50	17.36	328° 18.63	46.37	Saturn	$326^{\circ}11.85$
20	17°6.88	148° 16.83	33.23	201°55.90	21.35	176°45.58	17.50	343°21.22	46.34		
21	32°9.34		• • 34.11	216°57.25	• • 20.91	191°47.66	• • 17.65	358° 23.80	• • 46.31	Horizor	ntal parallax
22	47° 11.81	178° 15.52	34.98	231°58.60	20.47	206°49.73	17.80	13°26.39	46.27		Venus:
23	62°14.27	193°14.86	35.86	246°59.95	20.03	221°51.81	17.95	28°28.98	46.24		Mars:
Mer.r	pass. 18:52	$\nu$ -0.6' d0.9	9' m-3.94	$\nu 1.3' \ d-0$	.4′ m0.99	$\nu^{2.1'} d0$	1′ m-1.79	$\nu^{2.6'} d-0$	0.0′ m0.08		

Dec 29°15.30 -42°9.01 56°42.12 -17°49.65 -57°5.53  $23^{\circ}36.11$  $89^{\circ}23.21$ -40°11.39 4°12.23 49°57.92 16°34.01 -8°10.13  $46^{\circ}1.51$  $6^{\circ}22.49$ 28°37.80 -1°11.06 7°24.66 -52°42.61 -16°45.39 -29°0.67 5°8.92 27°57.14 -59°35.99 -43°32.85 -69°49.96 -8°47.10 11°49.37  $61^{\circ}35.28$ 14°24.46 -17°42.12 -63°15.35 -57°16.31 55°47.85 -11°18.71 49°9.90 -60°30.54 -36°30.59  $19^{\circ}1.83$ -60°57.10  $74^{\circ}1.96$ -16°9.63 26°37.02 -26°29.63  $-69^{\circ}4.61$  $\text{-}15^{\circ}45.51$  $-37^{\circ}7.36$  $12^{\circ}32.47$ 51°29.24 -34°22.14 38°48.83 -26°15.53 8°56.89 -56°38.54  $45^{\circ}23.36$  $10^{\circ}0.69$ -46°49.32 -29°28.14 28°14.70 15°21.91 Mer.pass 10:04 06:38 08:21 21:15 Mer.pass 10:05 06:36 08:18 21:11 Mer.pass 10:06 06:33 08:15 21:06

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°20.86	S22°24.12	323°43.99	8.0'	N21°38.11	-7.8'	57.7'
1	197°20.60	24.43	338°11.03	8.1'	21°30.29	-7.9'	57.7'
2	212°20.34	24.74	352°38.11	8.1'	21°22.34	-8.1'	57.8'
3 4	227°20.08 242°19.82	· · 25.05 25.36	7°5.23 21°32.40	8.2' 8.2'	21°14.27 21°6.07	-8.2' -8.3'	57.8' 57.8'
5	257°19.57	25.67	35°59.62	8.3	20°57.74	-8.5'	57.8'
6	272°19.31	S22°25.98	50°26.88	8.3'	N20°49.29	-8.6'	57.8'
7	287°19.05	26.28	64°54.20	8.4'	20°40.71	-8.7'	57.9'
8	302°18.79	26.59	79°21.56	8.4'	20°32.01	-8.8'	57.9'
9 10	317°18.53 332°18.27	· · 26.90 27.20	93°48.97 108°16.42	8.5' 8.5'	20°23.19 20°14.25	-8.9' -9.1'	57.9' 57.9'
11	347°18.00	27.50	122°43.93	8.6'	20°5.19	-9.1 -9.2'	57.9'
12	2°17.74	\$22°27.81	137°11.49	8.6'	N19°56.00	-9.3'	57.9'
13	17°17.48	28.11	151°39.10	8.7'	19°46.70	-9.4'	58.0'
14	32°17.22 47°16.96	28.41 •• 28.71	166°6.76 180°34.47	8.7'	19°37.28 19°27.75	-9.5'	58.0' 58.0'
15 16	62°16.70	29.01	180 34.47 195°2.23	8.8' 8.8'	19 27.75 19°18.10	-9.6' -9.8'	58.0'
17	77°16.44	29.31	209°30.05	8.9'	19°8.34	-9.9'	58.0'
18	92°16.17	S22°29.61	223°57.91	8.9'	N18°58.46	-10.0'	58.0'
19	107°15.91	29.91	238°25.83	9.0'	18°48.47	-10.1'	58.1'
20 21	122°15.65 137°15.38	30.21 · · 30.51	252°53.80 267°21.82	9.0' 9.1'	18°38.37 18°28.16	-10.2'	58.1' 58.1'
21	137° 15.38 152° 15.12	30.80	267°21.82 281°49.89	9.1'	18°28.16 18°17.84	-10.3' -10.4'	58.1'
23	167°14.86	31.10	296°18.02	9.2'	18°7.42	-10.5	58.1
	SD = 16.2'	d = 0.3'			D = 15.7'		
		<u>u = 0.5</u>		ال	J — 13.1		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°14.59	\$22°31.39	310°46.20	9.2'	N17°56.89	-10.6'	58.1'
1 2	197°14.33 212°14.06	31.69 31.98	325°14.43 339°42.71	9.3' 9.3'	17°46.25 17°35.51	-10.7' -10.8'	58.2' 58.2'
3	227°13.80	32.27	354°11.04	9.4'	17°24.67	-10.0	58.2'
4	242°13.54	32.56	8°39.43	9.4'	17°13.72	-11.0'	58.2'
5	257°13.27	32.85	23°7.87	9.5'	17°2.67	-11.1'	58.2'
6	272°13.01	S22°33.14	37°36.36	9.5'	N16°51.53	-11.2'	58.2'
7 8	287°12.74 302°12.47	33.43 33.72	52°4.91 66°33.50	9.6' 9.6'	16°40.28 16°28.94	-11.3' -11.4'	58.2' 58.3'
9	317°12.21	• 34.01	81°2.15	9.7'	16° 17.51	-11.5'	58.3'
10	332°11.94	34.29	95°30.85	9.7'	16°5.98	-11.6'	58.3'
11	347°11.68	34.58	109°59.59	9.8'	15°54.35	-11.7'	58.3'
12	2°11.41	S22°34.87	124°28.39 138°57.24	9.8'	N15°42.63 15°30.83	-11.8'	58.3'
13 14	17°11.14 32°10.88	35.15 35.43	153° 26.14	9.9' 9.9'	15° 30.83 15° 18.93	-11.9' -12.0'	58.3' 58.4'
15	47°10.61	35.72	167°55.09	10.0'	15°6.94	-12.1'	58.4'
16	62°10.34	36.00	182°24.09	10.0'	14°54.87	-12.2'	58.4'
17	77°10.07	36.28	196°53.13	10.1'	14°42.71	-12.2'	58.4'
18 19	92° 9.81 107° 9.54	\$22°36.56 36.84	211°22.23 225°51.37	10.1' 10.2'	N14°30.46 14°18.14	-12.3' -12.4'	58.4' 58.4'
20	107 9.54 122° 9.27	37.12	240°20.56		14 16.14 14°5.72		58.4
21	137° 9.00	37.40	254°49.80	10.3	13°53.23	-12.6'	58.5'
22	152°8.73	37.68	$269^{\circ}19.08$	10.3'	13°40.66	-12.7'	58.5'
23	167°8.46	37.95	283°48.41	10.4'	13°28.01	-12.7'	58.5'
	SD = 16.2'	d = 0.3'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	182°8.19	S22°38.23	298°17.78	10.4	N13°15.28	-12.8'	58.5
1	197°7.92	38.50	312°47.20	10.5'	13°2.48	-12.9'	58.5'
2	212°7.65 227°7.38	38.78	327°16.67 341°46.17	10.5'	12°49.60 12°36.65	-13.0'	58.5'
3 4	227° 7.38 242° 7.11	· · 39.05 39.33	341°46.17 356°15.72	10.5' 10.6'	12°36.65 12°23.62	-13.0' -13.1'	58.5' 58.5'
5	257° 6.84	39.60	10°45.31	10.6'	12°10.52	-13.2'	58.6'
6	272°6.57	S22°39.87	25°14.94	10.7'	N11°57.36	-13.2'	58.6'
7	287°6.30	40.14	39°44.62	10.7'	11°44.12	-13.3'	58.6'
8 9	302° 6.03 317° 5.76	40.41 •• 40.68	54°14.33 68°44.08	10.8' 10.8'	11°30.82 11°17.45	-13.4' -13.4'	58.6' 58.6'
10	332° 5.49	40.08	83°13.87	10.8	11 17.45 11°4.02	-13.4	58.6'
11	347° 5.22	41.21	97°43.70	10.9'	10°50.52	-13.6'	58.6'
12	2°4.94	S22°41.48	112°13.57	10.9'	N10°36.96	-13.6'	58.7'
13	17°4.67	41.75	126°43.47	10.9'	10°23.34	-13.7'	58.7'
14 15	32° 4.40 47° 4.13	42.01 •• 42.28	141°13.41 155°43.38	11.0' 11.0'	10°9.66 09°55.92	-13.7' -13.8'	58.7' 58.7'
16	62° 3.86	42.54	170°13.38	11.0'	09° 42.12	-13.9'	58.7
17	77° 3.58	42.80	184°43.42	11.1'	09°28.27	-13.9'	58.7'
18	92°3.31	S22°43.07	199°13.49	11.1'	N09°14.36	-14.0'	58.7'
19	107°3.04	43.33	213°43.59	11.1'	09°0.40	-14.0'	58.7'
20 21	122°2.76 137°2.49	43.59 •• 43.85	228°13.72 242°43.88	11.2' 11.2'	08°46.39 08°32.32	-14.1' -14.1'	58.8' 58.8'
22	152° 2.21	44.11	242 43.88 257°14.07	11.2'	08 32.32 08°18.21	-14.1 -14.2'	58.8
23	167° 1.94	44.37	271°44.29	11.2'	08°4.05	-14.2'	58.8'
	SD = 16.2'	d = 0.3'		SI	O = 16.0'		

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

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

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
2,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-74%		
05	09:23	09:11	11:51	02:31	14:58			
06	08:58	08:46	11:51	03:24	15:50			
07	08:33	08:20	11:52	04:15	16:40			

# December 08, 09, 10 UT (Fri., Sat., Sun.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	77° 16.73	208° 14.21	S16°36.74	262°1.30	N04°19.59	236°53.89	S07° 18.09	43°31.56	N10°46.21			
1	92° 19.20	223°13.55	37.61	277° 2.65	19.15	251°55.97	18.24	58°34.15	46.18	Alpheratz	357°31.33	29°15.30
2	107°21.66	238°12.89	38.49	292°4.00	18.72	266°58.05	18.39	73°36.74	46.15	Ankaa	353°3.96	-42°9.02
3	122°24.13	253°12.23	• • 39.36	307°5.36	• • 18.28	282°0.13	• • 18.53	88°39.32	• • 46.11	Schedar	349°27.01	56°42.13
4	137° 26.59	268°11.57	40.24	322°6.71	17.84	297° 2.20	18.68	103°41.91	46.08	Diphda	348°44.01	-17°49.66
5	152°29.05	283°10.91	41.11	337°8.06	17.40	312°4.28	18.83	118°44.50	46.05	Achernar	335°17.59	-57°5.54 23°36.11
6	167°31.52	298°10.25	<b>S</b> 16°41.98	352° 9.42	N04°16.96	327° 6.36	507°18.97	133°47.08	N10°46.02	Hamal Polaris	327°47.31 311°49.16	89°23.23
7	182°33.98	313°9.59	42.85	7°10.77	16.52	342°8.44	19.12	148°49.67	45.99	Acamar	315°9.05	-40°11.40
8	197°36.45	328°8.93	43.72	22°12.12	16.08	357°10.52	19.27	163°52.25	45.96	Menkar	314°2.53	4°12.23
9	212°38.91	343°8.27	• • 44.59	37°13.48	•• 15.64	12°12.60	•• 19.41	178° 54.84	• • 45.92	Mirfak	308°23.13	49°57.93
10	227°41.37	358°7.61	45.46	52°14.83	15.20	27°14.68	19.56	193°57.42	45.89	Aldebaran	290°35.60	16°34.01
11 12	242° 43.84 257° 46.30	13°6.94 28°6.28	46.33 \$16°47.20	67°16.19 82°17.54	14.77 N04°14.33	42°16.76 57°18.84	19.70 \$07° 19.85	209°0.01 224°2.59	45.86 N10°45.83	Rigel	281°0.47	-8°10.14
13	272° 48.77	43°5.62	48.06	97°18.90	13.89	72°20.92	20.00	224 2.59 239°5.18	45.80	Capella	280°16.68	$46^{\circ}1.51$
14	287°51.23	58°4.95	48.93	112°20.25	13.45	87°23.00	20.14	254°7.76	45.77	Bellatrix	278°19.12	6°22.48
15	302°53.70	73°4.29	• • 49.79	127°21.61	• • 13.01	102°25.08	20.29	269°10.35	• • 45.74	Elnath	277°57.45	28°37.81
16	317°56.16	88°3.62	50.66	142°22.97	12.58	117°27.16	20.43	284°12.93	45.71	Alnilam	275°34.16	-1°11.07
17	332°58.62	103°2.95	51.52	157°24.32	12.14	132°29.24	20.58	$299^{\circ}15.52$	45.68	Betelgeuse	270°48.31	7°24.66
18	348°1.09	118°2.29	S16°52.39	172°25.68	N04°11.70	147°31.32	S07°20.73	314° 18.10	N10°45.64	Canopus Sirius	263°50.43 258°23.10	-52°42.63 -16°45.40
19	3°3.55	$133^{\circ}1.62$	53.25	187°27.04	11.26	162°33.40	20.87	329°20.68	45.61	Adhara	256 23.10 255°3.01	-10 45.40 -29°0.69
20	18°6.02	148°0.95	54.11	202°28.40	10.83	177°35.48	21.02	344°23.27	45.58	Procyon	244°47.24	5°8.91
21	33°8.48	163°0.29	• • 54.97	217°29.75	• • 10.39	192°37.56	• • 21.16	359°25.85	• • 45.55	Pollux	243°13.15	27°57.14
22	48° 10.94	177°59.62	55.83	232°31.11	9.95	207°39.64	21.31	14°28.44	45.52	Avior	234°12.89	-59°36.00
23	63°13.41	192°58.95	56.69	247°32.47	9.51	222°41.72	21.45	29°31.02	45.49	Suhail	222°43.67	-43°32.86
Mer.	pass. 18:48	$\nu$ -0.7′ d0	.9′ m-3.93	$\nu 1.4' \ d-0$	0.4′ m0.97	$\nu 2.1' \ d0$	.1′ m-1.79	$\nu 2.6' \ d-0$	.0′ m0.09	Miaplacidus	221°36.93	-69°49.97
										Alphard	217°44.48	-8°47.11
C-4	CIIA	CIIA	D	CIIA	D	CIIA	D	CIIA	D	Regulus	207°30.99	$11^{\circ}49.36$
Sat	<b>GHA</b> 78° 15.87	GHA	<b>Dec</b> \$16°57.55	GHA	<b>Dec</b> N04°9.08	GHA	<b>Dec</b> \$07°21.60	GHA	Dec	Dubhe	193°37.30	$61^{\circ}35.28$
0 1	93° 18.34	207°58.28 222°57.61	58.41	262°33.83 277°35.19	8.64	237°43.81 252°45.89	21.74	44°33.60 59°36.18	N10°45.46 45.43	Denebola	182°21.80	14°24.45
2	108° 20.80	237°56.94	16°59.26	292°36.55	8.20	267°47.97	21.74	74°38.77	45.40	Gienah	175°40.38	-17°42.12
3	123°23.26	252°56.27	17°0.12	307°37.91	7.77	282°50.05	22.03	89°41.35	• • 45.37	Acrux	172°56.58	-63°15.35
4	138° 25.73	267°55.59	0.97	322°39.27	7.33	297°52.13	22.18	104°43.93	45.34	Gacrux	171°48.15	-57°16.31
5	153°28.19	282°54.92	1.83	337°40.63	6.90	312°54.22	22.32	119°46.52	45.31	Alioth	166°10.59	55°47.84
6	168° 30.66	297°54.25	S17°2.68	352°41.99	N04°6.46	327°56.30	507°22.47	134°49.10	N10°45.28	Spica Alkaid	158°19.12 152°49.93	-11°18.71 49°9.88
7	183°33.12	$312^{\circ}53.58$	3.54	7°43.35	6.02	342°58.38	22.61	$149^{\circ}51.68$	45.25	Hadar	152 49.93 148°31.79	-60°30.53
8	198° 35.58	327°52.90	4.39	22°44.71	5.59	358° 0.46	22.76	164°54.26	45.22	Menkent	147°54.09	-36°30.59
9	213°38.05	342°52.23	• • 5.24	37°46.08	• • 5.15	13°2.55	• • 22.90	179°56.84	• • 45.19	Arcturus	145°45.30	19°1.82
10	228° 40.51	357°51.55	6.09	52°47.44	4.72	28° 4.63	23.05	194°59.42	45.16	Rigil Kent.	139°36.31	-60°57.09
11	243° 42.98	12°50.88	6.94	67°48.80	4.28	43°6.71	23.19	210°2.01	45.13	Kochab	137°21.15	74°1.94
12	258° 45.44	27°50.20	\$17°7.79	82°50.16	N04°3.85	58°8.80	S07°23.33	225°4.59 240°7.17	N10°45.10	Zuben'ubi	136°52.76	$-16^{\circ}9.63$
13 14	273° 47.90 288° 50.37	42°49.53 57°48.85	8.64 9.49	97°51.53 112°52.89	3.41 2.98	73°10.88 88°12.97	23.48 23.62	255°9.75	45.07 45.04	Alphecca	126°1.43	26°37.00
15	303°52.83	72°48.17	10.33	127°54.25	2.54	103°15.05	• • 23.77	270°12.33	• • 45.01	Antares	112°12.29	-26°29.64
16	318° 55.30	87°47.49	11.18	142°55.62	2.11	118°17.13	23.91	285°14.91	44.98	Atria	107°4.15	-69°4.60
17	333° 57.76	102°46.81	12.02	157°56.98	1.67	133°19.22	24.05	300°17.49	44.95	Sabik	101°59.49	-15°45.52
18	349°0.23	117°46.14	<b>S</b> 17°12.87	172°58.35	N04°1.24	148°21.30	507°24.20	315°20.07	N10°44.92	Shaula Rasalhague	96°6.47 95°55.95	-37°7.35 12°32.46
19	4°2.69	132°45.46	13.71	187°59.71	0.81	163°23.39	24.34	330°22.65	44.89	Eltanin	95 55.95 90°41.25	51°29.22
20	19°5.15	147°44.78	14.55	203°1.08	04°0.37	178°25.47	24.49	345°25.23	44.86	Kaus Aust.	83°28.70	-34°22.14
21	34°7.62	162°44.10	• • 15.40	218°2.44	03°59.94	193°27.56	• • 24.63	0°27.81	• • 44.83	Vega	80°31.47	38°48.81
22	49° 10.08	177°43.41	16.24	233° 3.81	59.50	208°29.64	24.77	15°30.39	44.80	Nunki	75°44.18	-26°15.53
23	64° 12.55	192°42.73	17.08	248°5.18	59.07	223°31.73	24.92	30°32.97	44.77	Altair	61°57.13	8°56.88
Mer.	pass. 18:44	$\nu$ -0.7′ d0	.9′ m-3.93	$\nu$ 1.4' d-0	0.4′ m0.96	$\nu 2.1' \ d0$	.1′ m-1.80	$\nu 2.6' \ d-0$	0.0′ m0.09	Peacock	53°1.26	-56°38.53
	<u>.                                    </u>									Deneb	49°23.88	45°23.35
c	CIIA	CIIA	D	CIIA	D	CIIA	D	CHA	D	Enif	33°35.80	$10^{\circ}0.69$
Sun 0	<b>GHA</b> 79° 15.01	GHA 207°42.05	<b>Dec</b> \$17°17.92	<b>GHA</b> 263° 6.54	<b>Dec</b> N03°58.64	<b>GHA</b> 238°33.81	<b>Dec</b> \$07°25.06	<b>GHA</b> 45°35.55	<b>Dec</b> N10°44.74	Al Na'ir	27°29.18	-46°49.32
1	94° 17.47	207 42.03 222°41.37	18.76	203 0.54 278°7.91	58.20	253°35.90	25.20	60°38.13	44.71	Fomalhaut		-29°28.15
2	109° 19.94	237°40.68	19.60	293° 9.28	57.77	268°37.98	25.35	75°40.71	44.69	Scheat Markab	13°42.08 13°26.72	28°14.70 15°21.90
3	124°22.40	252°40.00	20.43	308°10.65	• • 57.34	283°40.07	25.49	90°43.29	• • 44.66	IVIARKAD	13 20.72	15 21.90
4	139°24.87	$267^{\circ}39.32$	21.27	323°12.01	56.90	298°42.16	25.63	105°45.87	44.63	Dec 08 Fri	SHA	Mer.pass
5	154°27.33	$282^{\circ}38.63$	22.11	338°13.38	56.47	313°44.24	25.78	120°48.45	44.60	Venus	130°57.47	10:07
6	169°29.79		S17°22.94	353°14.75	N03°56.04	328°46.33	S07°25.92	135°51.03	N10°44.57	Mars	184°44.57	06:31
7	184° 32.26	312°37.26	23.78	8°16.12	55.61	343°48.41	26.06	150°53.61	44.54	Jupiter		08:11
8	199°34.72	327°36.57	24.61	23°17.49	55.17	358°50.50	26.20	165°56.18	44.51	Saturn	326°14.83	21:02
9	214°37.19	342°35.89	25.44	38°18.86	• • 54.74	13°52.59	• • 26.35	180°58.76	• • 44.48	Dec 09 Sat	SHA	Mer.pass
10	229°39.65 244°42.11	357°35.20 12°34.51	26.28 27.11	53°20.23 68°21.60	54.31 53.88	28°54.68	26.49 26.63	196°1.34 211°3.92	44.45 44.43	Venus	129°42.41	10:09
11 12	244 42.11 259° 44.58		27.11 \$17°27.94	83°22.97	53.88 N03°53.44	43°56.76 58°58.85	26.63 \$07°26.77	211° 3.92 226° 6.50	44.43 N10°44.40	Mars	$184^{\circ}17.96$	06:29
13	274° 47.04	42°33.14	28.77	98°24.34	53.01	74° 0.94	26.92	241°9.07	44.37	Jupiter	159°27.93	80:80
14	289° 49.51	57°32.45	29.60	113°25.71	52.58	89° 3.03	27.06	256°11.65	44.34	Saturn	326°17.73	20:58
15	304°51.97	72°31.76	30.42	128°27.08	52.15	104° 5.11	27.20	271°14.23	• • 44.31	Dec 10 Sun	SHA	Mer.pass
16	319°54.44	87°31.07	31.25	143°28.46	51.72	119°7.20	27.34	286°16.80	44.28	Venus	128°27.04	10:10
17	334°56.90	$102^{\circ}30.37$	32.08	158°29.83	51.29	134° 9.29	27.49	301°19.38	44.26		183°51.53	06:27
18	349°59.36	117°29.68	<b>S</b> 17°32.90	173°31.20	N03°50.86	149°11.38	S07°27.63	316°21.96	N10°44.23		159°18.80	08:05
19	5°1.83	132°28.99	33.73	188°32.57	50.43	164°13.47	27.77	331°24.54	44.20	Saturn	326°20.54	20:54
20	20°4.29	147°28.30	34.55	203°33.95	49.99	179°15.55	27.91	346°27.11	44.17	Haute -	ntal parallax	
21	35°6.76	162°27.61	· · 35.38	218°35.32	· · 49.56	194°17.64	• • 28.05	1°29.69	44.14	inurizoi	Venus:	0.1
22	50°9.22	177°26.91	36.20	233°36.70	49.13	209°19.73	28.20	16°32.26	44.12		Mars:	0.1
23	65°11.68	192°26.22	37.02	248°38.07	48.70	224°21.82	28.34	31°34.84	44.09		iviais.	0.1
Mer.	pass. 18:40	$\nu$ -0.7′ d0	.8′ m-3.93	$\nu 1.4' \ d-0$	).4′ m0.95	$\nu 2.1' d0$	.1′ m-1.80	$\nu^{2.6'} d^{-0}$	0.0′ m0.10			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°1.67	S22°44.62	286°14.53	11.3'	N07°49.84	-14.3'	58.8'
1	197°1.39	44.88	300°44.80	11.3'	07°35.59	-14.3'	58.8'
2	212°1.12 227°0.84	45.14 •• 45.39	315°15.09 329°45.41	11.3' 11.3'	07°21.29 07°6.95	-14.3' -14.4'	58.8' 58.8'
4	242°0.57	45.65	344°15.74	11.4	06°52.56	-14.4	58.8'
5	257°0.29	45.90	358°46.10	11.4'	06°38.14	-14.5'	58.9'
6	272°0.01	S22°46.15	13°16.48	11.4'	N06°23.67	-14.5'	58.9'
7	286°59.74 301°59.46	46.40	27°46.88 42°17.30	11.4'	06°9.17 05°54.63	-14.5'	58.9'
8 9	301 59.46 316°59.19	46.65 •• 46.91	42 17.30 56°47.74	11.4' 11.5'	05°40.06	-14.6' -14.6'	58.9' 58.9'
10	331°58.91	47.16	71°18.19	11.5'	05°25.45	-14.6'	58.9'
11	346°58.63	47.40	85°48.66	11.5'	$05^{\circ}10.81$	-14.7'	58.9'
12	1°58.36	\$22°47.65	100°19.14	11.5'	N04°56.14	-14.7'	58.9'
13 14	16°58.08 31°57.80	47.90 48.15	114°49.63 129°20.14	11.5' 11.5'	04°41.43 04°26.70	-14.7' -14.8'	58.9' 58.9'
15	46° 57.52	48.15 · · 48.39	129 20.14 143°50.66	11.5'	04 26.70 04°11.94	-14.8'	58.9 59.0'
16	61°57.25	48.64	158°21.19	11.5'	03°57.16	-14.8'	59.0'
17	76°56.97	48.88	$172^{\circ}51.73$	11.5'	03°42.34	-14.8'	59.0'
18	91°56.69	S22°49.13	187°22.27	11.6'	N03°27.51	-14.9'	59.0'
19 20	106° 56.41 121° 56.13	49.37 49.61	201°52.82 216°23.38	11.6' 11.6'	03°12.65 02°57.77	-14.9' -14.9'	59.0' 59.0'
21	136° 55.85	• • 49.85	230°53.94	11.6'	02° 42.87	-14.9'	59.0'
22	151°55.57	50.09	245°24.51	11.6'	02°27.96	-14.9'	59.0'
23	166°55.30	50.33	259°55.08	11.6'	$02^{\circ}13.02$	-15.0'	59.0'
	SD = 16.2'	d = 0.3'		SI	D = 16.0'		
C-+	GHA	Daa			Dec	ل ـ	μn
Sat 0	GHA 181°55.02	Dec \$22°50.57	<b>GHA</b> 274°25.65	u 11.6'	<b>Dec</b> N01°58.07	<i>d</i> −15.0'	<b>HP</b> 59.0'
1	196° 54.74	50.81	288°56.21	11.6'	01°43.11	-15.0'	59.1
2	211°54.46	51.05	303°26.78	11.6'	01°28.13	-15.0'	59.1'
3	226°54.18	• • 51.28	317°57.35	11.6'	01°13.14	-15.0'	59.1'
4 5	241°53.90 256°53.62	51.52 51.75	332°27.91 346°58.47	11.6' 11.6'	00°58.14 00°43.13	-15.0' -15.0'	59.1' 59.1'
6	271°53.34	\$22°51.99	1°29.02	11.5'	N00°28.11	-15.0'	59.1'
7	286° 53.05	52.22	15°59.57	11.5'	N00°13.08	-15.0'	59.1'
8	301°52.77	52.45	30°30.10	11.5'	S00°1.95	15.0'	59.1'
9	316°52.49	• • 52.68	45°0.63	11.5'	00°16.98	15.0'	59.1'
10 11	331°52.21 346°51.93	52.92 53.15	59°31.15 74°1.66	11.5' 11.5'	00°32.02 00°47.05	15.0' 15.0'	59.1' 59.1'
12	1°51.65	\$22°53.38	88°32.15	11.5'	S01°2.09	15.0'	59.1
13	16°51.37	53.60	103°2.63	11.5'	01°17.13	15.0'	59.2'
14	31°51.08	53.83	117°33.10	11.4'	01°32.16	15.0'	59.2'
15 16	46°50.80 61°50.52	•• 54.06 54.29	132°3.55 146°33.98	11.4' 11.4'	01°47.19 02°2.22	15.0' 15.0'	59.2' 59.2'
17	76°50.24	54.29 54.51	140 33.96 161°4.40	11.4	02 2.22 02°17.24	15.0'	59.2'
18	91°49.95	S22°54.74	175°34.79	11.4'	S02°32.25	15.0'	59.2'
19	106°49.67	54.96	190°5.17	11.4'	02°47.25	15.0'	59.2'
20	121°49.39	55.18	204°35.52		03°2.24	15.0'	59.2'
21 22	136°49.10 151°48.82	· · 55.41 55.63	219°5.85 233°36.16	11.3' 11.3'	03°17.22 03°32.18	15.0' 14.9'	59.2' 59.2'
23	166° 48.54	55.85	248° 6.44	11.3'	03°47.13	14.9	59.2'
	SD = 16.2'	d = 0.2'		SI	D = 16.1'		
Sun	<b>GHA</b> 181°48.25	<b>Dec</b> \$22°56.07	<b>GHA</b> 262°36.69	u 11.2'	<b>Dec</b> \$04° 2.06	<i>d</i> 14.9'	<b>HP</b> 59.2'
0 1	181 48.25 196°47.97	56.29	202 30.09 277°6.92	11.2'	04°16.97	14.9'	59.2'
2	211° 47.68	56.51	291°37.12	11.2'	04°31.87	14.9'	59.2'
3	226° 47.40	• • 56.72	306°7.29	11.1'	04°46.75	14.9'	59.2'
4 5	241°47.11 256°46.83	56.94 57.16	320°37.43 335°7.54	11.1' 11.1'	05°1.60 05°16.43	14.8' 14.8'	59.3' 59.3'
6	256 46.83 271° 46.54	57.16 \$22°57.37	335° 7.54 349° 37.62	11.1	505°31.23	14.8	59.3'
7	286° 46.26	57.59	4°7.66	11.0'	$05^{\circ}46.01$	14.8'	59.3
8	301°45.97	57.80	18°37.66	11.0'	06°0.76	14.7'	59.3'
9	316°45.69	58.01	33°7.63	10.9'	06°15.48	14.7'	59.3'
10 11	331°45.40 346°45.11	58.22 58.44	47°37.57 62°7.46	10.9' 10.9'	06°30.18 06°44.84	14.7' 14.6'	59.3' 59.3'
12	1°44.83	S22°58.65	76°37.32	10.9	S06°59.46	14.6'	59.3
13	16°44.54	58.86	91°7.14	10.8'	07°14.05	14.6'	59.3'
14	31°44.26	59.07	105°36.91	10.7'	07°28.61	14.5'	59.3'
15 16	46°43.97 61°43.68	· · 59.27 59.48	120°6.64 134°36.33	10.7' 10.6'	07°43.13 07°57.61	14.5' 14.4'	59.3' 59.3'
17	76°43.39	59.48 59.69	134 30.33 149°5.98	10.6'	07 57.01 08°12.05	14.4' 14.4'	59.3'
18	91°43.11	\$22°59.89	163°35.58	10.6'	S08°26.44	14.4'	59.3'
19	106°42.82	23°0.10	178°5.13	10.5	08°40.80	14.3'	59.3'
20	121°42.53 136°42.24	0.30	192°34.64 207°4.10	10.5' 10.4'	08°55.11 09°9.37	14.3' 14.2'	59.3' 59.3'
21 22	136° 42.24 151° 41.96	· · 0.51 0.71	207° 4.10 221° 33.51	10.4' 10.4'	09° 9.37 09° 23.58	14.2' 14.2'	59.3' 59.3'
23	166°41.67	0.91	236°2.87	10.3	09°37.75	14.1'	59.3'
	SD = 16.2'	d = 0.2'		SI	D = 16.2'		
			-				

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-41%	
08	08:07	07:53	11:52	05:05	17:30		
09	07:40	07:27	11:53	05:54	18:18		
10	07:13	06:59	11:53	06:43	19:08		

#### December 11, 12, 13 UT (Mon., Tue., Wed.)

h	Aries	Venus		Ma	ars	Jup	oiter	Sat	urn		Stars
Mon	GHA	GHA D	 Эес	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	80° 14.15		37.84°	263°39.45	N03°48.27	239°23.91	S07°28.48	46°37.42	N10°44.06		
1	95° 16.61	207 25.52 317 222°24.83	38.66	278°40.82	47.84	254°26.00	28.62	61°39.99	44.03	Alpheratz	357°31.34
2	110° 19.08	237°24.13	39.48	293°42.20	47.41	269°28.09	28.76	76° 42.57	44.00	Ankaa	353°3.98
3	110 19.00 125°21.54		40.30	308°43.57	. 46.98	284°30.18	. 28.90	91°45.14	• • 43.98	Schedar	349°27.03
3 4	140°24.00	267°22.74	41.12	323°44.95						Diphda	348°44.02
					46.55	299°32.27 314°34.36	29.04	106° 47.72	43.95	Achernar	335°17.62
5	155°26.47	282°22.04 297°21.34 \$17°	41.93	338°46.32	46.12		29.19	121°50.29	43.92	Hamal	327°47.32
6	170°28.93	312°20.65	42.75	353°47.70 8°49.08	N03°45.69	329°36.45	S07°29.33	136°52.87	N10°43.89	Polaris	311°49.69
7	185°31.40		43.56		45.27	344°38.54	29.47	151°55.44	43.87	Acamar	315°9.06
8	200°33.86		44.38	23°50.45	44.84	359°40.63	29.61	166° 58.02	43.84	Menkar	314°2.53
9	215°36.32		45.19	38°51.83	• • 44.41	14°42.72	• • 29.75	182°0.59	• • 43.81	Mirfak	308°23.14
10	230°38.79	357° 18.55	46.00	53°53.21	43.98	29°44.81	29.89	197°3.17	43.79	Aldebaran	290°35.60
11	245°41.25	12°17.85	46.82	68°54.59	43.55	44°46.90	30.03	212°5.74	43.76	Rigel	281°0.47
12	260°43.72		47.63	83°55.97	N03°43.12	59°49.00	S07°30.17	227°8.31	N10°43.73	Capella	280°16.67
13	275°46.18	42°16.45	48.44	98°57.35	42.69	74°51.09	30.31	242°10.89	43.70	Bellatrix	$278^{\circ}19.12$
14	290° 48.65 305° 51.11	57° 15.74 72° 15.04	49.25	113°58.73 129°0.11	42.27	89°53.18 104°55.27	30.45 •• 30.59	257° 13.46 272° 16.04	43.68	Elnath	277°57.44
15		87° 14.34	50.06	144° 1.49	• • 41.84			272 10.04 287° 18.61	• • 43.65	Alnilam	275°34.16
16	320° 53.57	102°13.64	50.86	144 1.49 159° 2.87	41.41 40.98	119°57.36 134°59.45	30.73	302°21.18	43.62	Betelgeuse	270°48.30
17	335° 56.04		51.67	174° 4.25			30.87	317°23.76	43.60	Canopus	263°50.42
18 19	350° 58.50 6° 0.97	117 12.93 317 132°12.23	52.48 53.28	174 4.25 189° 5.63	N03°40.55 40.13	150° 1.55 165° 3.64	S07°31.01 31.15	332° 26.33	N10°43.57 43.54	Sirius	258°23.09
20	21°3.43	132 12.23 147°11.52	54.09	204° 7.01	39.70	180° 5.73	31.15	347° 28.90	43.54	Adhara	255°2.99
21	36°5.89		54.89	219°8.39	• • 39.27	195° 7.82	•• 31.43	2°31.47	• • 43.49	Procyon	244°47.23
	50° 5.89 51° 8.36	102 10.82 177°10.11	55.69	219 6.39 234° 9.77	38.84	210° 9.92	31.57	17° 34.05	43.49	Pollux	243°13.13
22 23	66° 10.82	177 10.11 192°9.40	56.50	234 9.77 249°11.16	38.84 38.42	210 9.92 225°12.01	31.57	32° 36.62	43.46	Avior	$234^{\circ}12.87$
23	00 10.82						_			Suhail	222°43.64
Mer.	pass. 18:36	u-0.7 $'$ $d$ 0.8 $'$ m-	-3.93	$\nu$ 1.4′ d-0	.4′ m0.93	$\nu 2.1' \ d0.$	1' m-1.81	$\nu$ 2.6′ d-0	.0′ m0.10	Miaplacidus	$221^{\circ}36.88$
										Alphard	217° 44.46
Tue	GHA	GHA D	)ec	GHA	Dec	GHA	Dec	GHA	Dec	_	207°30.97
o 0	впа 81° 13.29		ес 57.30	264°12.54	N03°37.99	240°14.10	S07°31.85	47°39.19	Dec N10°43.41		193°37.26
1	96° 15.75	207 8.70 317 222°7.99	58.10	279°13.92	37.56	255°16.20	31.99	62°41.76	43.38	Denebola	182°21.78
2	111° 18.21	237°7.28	58.90	279 15.92 294°15.30	37.30	270°18.29	32.13	77°44.33	43.36		175°40.36
3	111 16.21 126° 20.68		56.90	309° 16.69	36.71	270 16.29 285°20.38	32.13	92°46.91	· · 43.33		172°56.53
3 4	141°23.14		39.70 3°0.49	324° 18.07	36.28	300°22.48	32.41	92 40.91 107°49.48	43.31	Gacrux	171°48.12
5	156° 25.61	282°5.15	1.29	339° 19.46	35.86	315°24.57	32.41	107 49.46 122°52.05	43.31	Alioth	
6	171°28.07		3°2.09	354°20.84	N03°35.43	330°26.67	S07° 32.69	137° 54.62	N10°43.25		158° 19.10
7	171 28.07 186° 30.54	312°3.73	2.88	9°22.23	35.01	345°28.76	32.83	157° 54.02 152° 57.19	43.23	Alkaid	$152^{\circ}49.91$
8	201°33.00	312 3.73 327°3.02	3.68	24°23.61	34.58	0°30.86	32.03	167° 59.76	43.23	Hadar	148°31.76
9	201 35.00 216°35.46		4.47	39°25.00	• • 34.16	15°32.95	• • 33.11	183°2.33	• • 43.18	I	147°54.07
10	231°37.93	357°1.60	5.26	54°26.38	33.73	30°35.05	33.25	198°4.90	43.15		145°45.28
11	246°40.39	12°0.89	6.06	69°27.77	33.73	45°37.14	33.38	213°7.47	43.12	Rigil Kent.	139°36.28
12	261°42.86		3°6.85	84°29.16	N03°32.88	60°39.24	S07°33.52	228° 10.04	N10°43.10		137°21.12
13	276° 45.32	41°59.46	7.64	99°30.55	32.46	75°41.33	33.66	243°12.61	43.07		136°52.75
14	291°47.78	56°58.75	8.43	114°31.93	32.03	90°43.43	33.80	258° 15.18	43.05	Alphecca	126°1.42
15	306° 50.25		9.22	129°33.32	31.61	105°45.52	• • 33.94	273°17.75	• • 43.02	Antares	112°12.28
16	321°52.71		10.00	144°34.71	31.18	120°47.62	34.08	288°20.32	43.02	Atria	107°4.14
17	336°55.18		10.79	159°36.10	30.76	135°49.71	34.22	303°22.89	42.97	1	101°59.48
18	351°57.64		11.58	174°37.49	N03°30.33	150°51.81	S07°34.35	318° 25.46	N10°42.95	Shaula	96°6.47
19	7°0.10		12.36	189°38.88	29.91	165°53.91	34.49	333°28.03	42.92	Rasalhague	95°55.95
20	22°2.57		13.15	204°40.27	29.49	180°56.00	34.63	348°30.60	42.90	Eltanin	90°41.25
21	37°5.03		13.93	219°41.66	29.06	195°58.10	• • 34.77	3°33.17	• • 42.87	Kaus Aust.	83°28.71
22	52°7.50		14.71	234°43.05	28.64	211°0.20	34.91	18°35.74	42.85	Vega	80°31.48
23	67°9.96		15.50	249°44.44	28.21	226°2.29	35.04	33°38.31	42.82	Nunki	75°44.19
										Altair	61°57.13
Mer.	pass. 18:32	ν-0.7′ d0.8′ m-	-3.93	$\nu^{1.4'} d-0$	.4′ m0.92	$\nu^{2.1'} d0.$	1′ m-1.81	$\nu^{2.6'} d^{-0}$	.0′ m0.11	Peacock	53°1.27 49°23.89
										Deneb	
Wed	GHA	GHA D	)ес	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.81
0	82° 12.43		16.28	264°45.83	N03°27.79	241°4.39	S07°35.18	48° 40.87	N10°42.80	Al Na'ir	27°29.20
1	97° 14.89		17.06	279°47.22	27.37	256° 6.49	35.32	63°43.44	42.77	Fomalhaut	15°11.12
2	112° 17.35		17.84	294°48.61	26.95	271°8.59	35.46	78°46.01	42.75	Scheat	13° 42.10
3	127° 19.82		18.62	309°50.00	26.52	286°10.68	35.60	93°48.58	• • 42.72	Markab	13°26.73
4	142°22.28		19.39	324°51.39	26.10	301°12.78	35.73	108°51.15	42.70	Dec 11 Mon	SHA
5	157°24.75		20.17	339°52.79	25.68	316°14.88	35.87	123°53.71	42.67	I	127° 11.38
6	172°27.21	296° 47.25 S18°		354°54.18	N03°25.25	331°16.98	S07°36.01	138° 56.28	N10°42.65		183°25.30
7	187°29.67		21.72	9°55.57	24.83	346°19.08	36.14	153°58.85	42.62	Jupiter	159°9.76
8	202°32.14		22.50	24°56.97	24.41	1°21.18	36.28	169°1.42	42.60	Saturn	
9	217°34.60		23.27	39°58.36	• • 23.99	16°23.28	• • 36.42	184°3.98	• • 42.57	D 10 =	CIIA
10	232°37.07	356°44.35	24.04	54°59.76	23.57	31°25.37	36.56	199°6.55	42.55	Dec 12 Tue	SHA 125° 55 41
11	247°39.53		24.82	$70^{\circ}1.15$	23.15	46°27.47	36.69	214°9.12	42.53		125° 55.41
12	262°42.00	26°42.90 <b>S</b> 18°	25.59	85°2.55	N03°22.72	61°29.57	S07°36.83	229°11.68	N10°42.50		182°59.25
13	277°44.46	41°42.18	26.36	100°3.94	22.30	76°31.67	36.97	244°14.25	42.48	Jupiter	159°0.82
14	292°46.92	56°41.45	27.13	$115^{\circ}5.34$	21.88	91°33.77	37.10	$259^{\circ}16.81$	42.45	Saturn	326°25.90
15	$307^{\circ}49.39$	71°40.72 · ·	27.89	$130^{\circ}6.73$	• • 21.46	106°35.87	• • 37.24	274°19.38	• • 42.43	Dec 13 Wed	SHA
16	$322^{\circ}51.85$	86°39.99	28.66	145°8.13	21.04	121°37.97	37.38	$289^{\circ}21.95$	42.41		124°39.15
17	$337^{\circ}54.32$	101°39.27	29.43	$160^{\circ}9.53$	20.62	136°40.07	37.51	304°24.51	42.38		182°33.40
18	352° 56.78	116°38.54 \$18°		175° 10.92	N03°20.20	151°42.17		319° 27.08	N10°42.36	1	$158^{\circ}51.97$
19	7°59.25		30.96	190°12.32	19.78	166°44.27	37.79	334°29.64	42.33	Saturn	$326^{\circ}28.45$
20	23°1.71		31.72	205°13.72	19.36	181°46.37	37.92	349°32.21	42.31		
21	38°4.17		32.49	220°15.12	• • 18.94	196°48.47	• • 38.06	4°34.77	• • 42.29	Horizor	ntal parallax
22	53°6.64		33.25	235°16.52	18.52	211°50.58	38.19	19°37.34	42.26		Venus:
23	68°9.10	191°34.89	34.01	250°17.92	18.10	226°52.68	38.33	34°39.90	42.24		Mars:
Mer	pass. 18:28	ν-0.7' d0.8' m-	-3.93	ν1.4' d-0	.4′ m0.91	ν2.1' dΩ	1′ m-1.81	ν2.6′ d-Ω	.0′ m0.11		
	20.20										

**Dec** 29°15.30

-42° 9.03

56°42.13

-17°49.66

-57° 5.55

 $23^{\circ}36.11$ 

89°23.24

-40°11.42

4°12.22

49°57.94 16°34.01

-8°10.15

46°1.52 6°22.48

28°37.81

 $-1^{\circ}11.08$ 

7°24.65 -52°42.65

 $-16^{\circ}45.41$  $-29^{\circ}0.70$ 

-59°36.02

-43°32.88 -69°49.98

-8°47.12

11°49.35

61°35.27

 $14^{\circ}24.44$ 

 $-17^{\circ}42.13$  $-63^{\circ}15.35$  $-57^{\circ}16.31$ 

55°47.83 -11°18.72

49°9.87

-60°30.53

-36°30.59

 $19^{\circ}1.80$ 

74°1.92 -16°9.64

-60°57.08

26°36.99 -26°29.63

-69°4.58

 $-37^{\circ}7.35$ 

 $12^{\circ}32.45$ 

51°29.21 -34°22.13

38°48.80

 $-26^{\circ}15.53$  $8^{\circ}56.88$ 

-56°38.53

 $45^{\circ}23.34$ 

 $10^{\circ}0.68$ 

-46°49.32 -29°28.15

28°14.70

15°21.90

Mer.pass

Mer.pass

10:11

06:25

08:01

10:12

06:23

07:58

20:46

10:13

06:20

07:55

20:42

0.1

0.1

Mer.pass

 $-15^{\circ}45.52$ 

5°8.90 27°57.14

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°41.38	S23°1.11	$250^{\circ}32.18$	10.3'	S09°51.86	14.1'	59.3'
1	196°41.09	1.31	265°1.43	10.2'	10°5.92	14.0'	59.3'
2	211°40.80 226°40.51	1.51 •• 1.71	279°30.64 293°59.79	10.2' 10.1'	10°19.93 10°33.88	14.0' 13.9'	59.3' 59.3'
4	241°40.22	1.91	308°28.88	10.0'	10°47.78	13.8'	59.3'
5	256°39.93	2.11	$322^{\circ}57.92$	10.0'	$11^{\circ}1.62$	13.8'	59.3'
6	271°39.65	\$23°2.30	337°26.91	9.9'	\$11°15.40	13.7'	59.3'
7 8	286°39.36 301°39.07	2.50 2.69	351°55.84 6°24.71	9.9' 9.8'	11°29.12 11°42.77	13.7' 13.6'	59.3' 59.3'
9	316°38.78	2.89	20°53.52	9.8'	11°56.36	13.5'	59.3'
10	331°38.49	3.08	$35^{\circ}22.27$	9.7'	$12^{\circ}9.89$	13.5'	59.3'
11	346°38.20	3.27	49°50.96	9.6'	12°23.34 \$12°36.73	13.4'	59.3'
12 13	1°37.91 16°37.61	\$23°3.46 3.65	64° 19.60 78° 48.17	9.6' 9.5'	512°36.73 12°50.05	13.3' 13.2'	59.3' 59.3'
14	31°37.32	3.84	93°16.68	9.4'	13° 3.30	13.2'	59.3'
15	46°37.03	• • 4.03	$107^{\circ}45.12$	9.4'	$13^{\circ}16.47$	13.1'	59.3'
16	61°36.74	4.22	122°13.50	9.3'	13°29.57	13.0'	59.3'
17 18	76°36.45 91°36.16	4.41 \$23°4.60	136° 41.82 151° 10.08	9.3' 9.2'	13°42.59 \$13°55.54	12.9' 12.9'	59.3' 59.3'
19	106°35.87	4.78	165°38.27	9.2	14°8.40	12.8'	59.3'
20	121°35.58	4.97	180°6.39	9.1'	14°21.19	12.7'	59.3'
21	136°35.28	• • 5.15	194°34.45	9.0'	14°33.89	12.6'	59.3'
22	151°34.99	5.33	209°2.44 223°30.37	8.9'	14°46.51	12.5'	59.3'
23	166°34.70	5.52	ZZ3 3U.3/	8.9'	14°59.04	12.4'	59.3'
	SD = 16.2'	d = 0.2'		SE	0 = 16.2'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°34.41	\$23°5.70	237°58.23	8.8'	S15°11.49	12.4'	59.3'
1 2	196°34.12 211°33.82	5.88 6.06	252°26.02 266°53.74	8.7' 8.7'	15°23.85 15°36.11	12.3' 12.2'	59.3' 59.3'
3	211 33.82 226°33.53	• • 6.24	200 53.74 281°21.39	8. <i>1</i> 8.6'	15 30.11 15°48.29	12.2	59.3'
4	241°33.24	6.42	295° 48.98	8.5'	16°0.37	12.0'	59.3'
5	256°32.94	6.60	$310^{\circ}16.49$	8.4'	$16^{\circ}12.36$	11.9'	59.3'
6	271°32.65	\$23°6.77	324° 43.94	8.4'	\$16°24.25	11.8'	59.3'
7 8	286°32.36 301°32.06	6.95 7.13	339°11.32 353°38.62	8.3' 8.2'	16°36.05 16°47.74	11.7' 11.6'	59.3' 59.3'
9	301 32.06 316°31.77	7.13 · · 7.30	353 38.02 8°5.86	8.2'	16 47.74 16°59.34	11.5	59.3'
10	331°31.48	7.48	22°33.03	8.1'	17°10.83	11.4'	59.3'
11	346°31.18	7.65	37°0.13	8.0'	17°22.22	11.3'	59.3'
12 13	1°30.89 16°30.59	\$23°7.82 7.99	51°27.15 65°54.11	8.0' 7.9'	\$17°33.51 17°44.69	11.2' 11.1'	59.3' 59.3'
13 14	31°30.30	7.99 8.16	80°21.00	7.9 7.8'	17 44.69 17°55.76	11.1	59.3'
15	46°30.00	8.33	94° 47.82	7.7'	18°6.72	10.9'	59.3'
16	61°29.71	8.50	$109^{\circ}14.56$	7.7'	$18^{\circ}17.57$	10.7'	59.3'
17	76°29.41 91°29.12	8.67 \$23°8.84	123°41.24 138°7.85	7.6'	18°28.31	10.6'	59.3'
18 19	106°28.82	9.01	138° 7.85 152° 34.39	7.5' 7.5'	\$18°38.93 18°49.44	10.5' 10.4'	59.3' 59.2'
20	121°28.53	9.17	167°0.86	7.4'	18°59.83		59.2'
21	136°28.23	• • 9.34	$181^{\circ}27.26$	7.3'	$19^{\circ}10.11$	10.2'	59.2'
22	151°27.94	9.50	195°53.59	7.3'	19°20.26	10.0'	59.2'
23	166°27.64	9.67	210°19.85	7.2'	19°30.30	9.9'	59.2'
	SD = 16.2'	d = 0.2'		SL	0 = 16.2'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°27.34	\$23°9.83	224° 46.05 239° 12.18	7.1'	\$19°40.21	9.8'	59.2'
1 2	196°27.05 211°26.75	9.99 10.15	239° 12.18 253° 38.24	7.1' 7.0'	19°50.00 19°59.66	9.7' 9.5'	59.2' 59.2'
3	211 20.75 226°26.46	10.13	268°4.23	6.9'	20° 9.20	9.4	59.2'
4	241°26.16	10.47	282°30.16	6.9'	$20^{\circ}18.61$	9.3'	59.2'
5	256°25.86	10.63	296° 56.03	6.8'	20°27.89	9.2'	59.2'
6 7	271°25.57 286°25.27	\$23°10.79 10.95	311°21.82 325°47.56	6.7' 6.7'	\$20°37.05 20°46.07	9.0' 8.9'	59.2' 59.1'
8	301°24.97	11.10	340° 13.23	6.6'	20°54.95	8.8'	59.1
9	316°24.67	• • 11.26	354°38.84	6.5'	21°3.71	8.6'	59.1'
10	331°24.38	11.41	9°4.38	6.5'	21°12.32	8.5'	59.1'
11 12	346°24.08 1°23.78	11.57 <b>S</b> 23°11.72	23° 29.87 37° 55.29	6.4' 6.4'	21°20.80 <b>S</b> 21°29.15	8.3' 8.2'	59.1' 59.1'
13	1 23.78 16°23.48	11.87	52° 20.66	6.3'	21°37.35	8.1	59.1'
14	31°23.19	12.02	66° 45.97	6.3	$21^{\circ}45.42$	7.9'	59.1
15	46°22.89	• 12.18	81°11.22	6.2'	21°53.34	7.8'	59.1'
16	61°22.59	12.33	95°36.41	6.1'	22°1.12	7.6'	59.0'
17 18	76°22.29 91°21.99	12.47 \$23°12.62	110°1.55 124°26.63	6.1' 6.0'	22°8.76 \$22°16.25	7.5' 7.3'	59.0' 59.0'
19	106°21.69	12.77	138°51.67	6.0'	22°23.60	7.3 7.2'	59.0'
20	121°21.40	12.92	$153^{\circ}16.65$	5.9'	22°30.80	7.1'	59.0'
21	136°21.10	• • 13.06	167°41.57	5.9'	22°37.86	6.9'	59.0'
22 23	151°20.80 166°20.50	13.21 13.35	182°6.45 196°31.29	5.8' 5.8'	22°44.76 22°51.52	6.8' 6.6'	59.0' 59.0'
23	SD = 16.2'	d = 0.2'	150 31.29		0 = 16.1'	0.0	39.0
	3D = 10.2'	a = 0.2		SL	) = 10.1°		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	30-12%
11	06:46	06:32	11:53	07:33	20:00	
12	06:18	06:04	11:54	08:26	20:54	
13	05:49	05:35	11:54	09:22	21:51	

## December 14, 15, 16 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
0	83°11.57	206°34.16	265°19.32 N03°17.68	241°54.78 <b>S</b> 07°38.47	49°42.47 N10°42.22	A look a see to		
1	$98^{\circ}14.03$	221°33.42 35.53	280°20.72 17.26	256°56.88 38.60	64°45.03 42.19	Alpheratz Ankaa	357°31.35 353°4.00	29°15.30 -42°9.03
2	113° 16.49	236° 32.69 36.29	295°22.12 16.84	271°58.98 38.74	79°47.60 42.17	Schedar	349° 27.05	56°42.13
3	128° 18.96	251°31.96 · · 37.05	310°23.52 · · 16.42	287°1.08 · · 38.87	94°50.16 · · 42.15	Diphda	348°44.03	-17°49.67
4	143°21.42	266°31.22 37.80	325°24.92 16.00	302°3.19 39.01	109°52.72 42.12	Achernar	335°17.64	-57° 5.56
5 6	158° 23.89 173° 26.35	281°30.49 38.56 296°29.75 \$18°39.32	340°26.32 15.58 355°27.72 N03°15.16	317°5.29 39.14 332°7.39 \$07°39.28	124°55.29 42.10 139°57.85 N10°42.08	Hamal	327°47.32	$23^{\circ}36.11$
7	188° 28.82	311°29.02 40.07	10°29.12 14.75	347° 9.49 39.42	155°0.41 42.05	Polaris	311°50.01	89°23.26
8	203°31.28	326°28.28 40.82	25°30.52 14.33	2°11.60 39.55	170°2.98 42.03	Acamar	315°9.06	-40°11.43
9	218° 33.74	341°27.55 · · 41.58	40°31.93 · · 13.91	17°13.70 · · 39.69	185°5.54 · · 42.01	Menkar	314°2.53	4°12.22
10	$233^{\circ}36.21$	356°26.81 42.33	55°33.33 13.49	32°15.80 39.82	200°8.10 41.99	Mirfak Aldebaran	308°23.13 290°35.59	49°57.94 16°34.01
11	248° 38.67	11°26.07 43.08	70°34.73 13.07	47°17.91 39.96	215°10.67 41.96	Rigel	281°0.46	-8°10.16
12	263°41.14	26°25.34 \$18°43.83	85°36.14 N03°12.65	62°20.01 S07°40.09	230°13.23 N10°41.94	Capella	280° 16.65	46°1.52
13	278° 43.60	41°24.60 44.58	100°37.54 12.24	77°22.11 40.23	245°15.79 41.92	Bellatrix	278°19.11	6°22.47
14 15	293°46.06 308°48.53	56°23.86 45.33 71°23.12 · · 46.07	115°38.94 11.82 130°40.35 ·· 11.40	92°24.22 40.36 107°26.32 · · 40.50	260°18.35 41.89 275°20.91 · · 41.87	Elnath	277°57.43	28°37.81
16	323° 50.99	86°22.38 46.82	145°41.75 10.99	122°28.42 40.63	290°23.48 41.85	Alnilam	275°34.15	-1°11.09
17	338° 53.46	101°21.64 47.57	160°43.16 10.57	137°30.53 40.76	305°26.04 41.83	Betelgeuse	270°48.29	7°24.64
18	353°55.92	116°20.90 \$18°48.31	175°44.56 N03°10.15	152°32.63 <b>S</b> 07°40.90	320°28.60 N10°41.80	Canopus	263°50.41	-52°42.67
19	8°58.39	131°20.16 49.06	190°45.97 9.73	167°34.74 41.03	335°31.16 41.78	Sirius Adhara	258°23.08 255°2.98	-16°45.43 -29°0.72
20	24°0.85	146°19.42 49.80	205°47.38 9.32	182°36.84 41.17	350°33.72 41.76	Procyon	235 2.96 244° 47.21	5°8.89
21	39°3.31	161°18.67 · · 50.54	220°48.78 • • 8.90	197°38.95 · · 41.30	5°36.28 · · 41.74	Pollux	243°13.11	27°57.13
22	54°5.78	176°17.93 51.28	235°50.19 8.49	212°41.05 41.44	20°38.84 41.72	Avior	234°12.84	-59°36.03
23	69°8.24	191°17.19 52.02	250°51.60 8.07	227°43.16 41.57	35°41.40 41.69	Suhail	222°43.61	-43°32.89
Mer. <sub>l</sub>	pass. 18:24	$\nu$ -0.7 $'$ d0.8 $'$ m-3.93	$\nu 1.4' \; d\text{-}0.4' \; \text{m}0.89$	$ u 2.1^{\prime}~d0.1^{\prime}~\text{m-}1.82$	$\nu 2.6' \ d$ -0.0' m0.12	Miaplacidus	221°36.83	$-69^{\circ}50.00$
						Alphard	217°44.43	-8°47.14
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus	207°30.94	11°49.34
0	84° 10.71	206°16.44 \$18°52.76	265°53.01 N03°7.65	242°45.26	50°43.97 N10°41.67		193°37.22	61°35.26
1	$99^{\circ}13.17$	221°15.70 53.50	280°54.42 7.24	257°47.37 41.84	65°46.53 41.65	Denebola Gienah	182°21.75 175°40.33	14°24.43 -17°42.14
2	$114^{\circ}15.64$	236°14.95 54.24	295°55.82 6.82	272°49.48 41.97	80°49.09 41.63	1	173° 40.33	-63°15.35
3	129° 18.10	251°14.21 · · 54.97	310°57.23 · · 6.41	287°51.58 · · 42.11	95°51.65 · · 41.61		171°48.07	-57°16.32
4	144° 20.56	266° 13.46 55.71	325°58.64 5.99	302°53.69 42.24	110°54.21 41.59		166°10.53	55°47.81
5	159°23.03	281°12.72 56.45	341°0.05 5.58	317°55.80 42.37	125°56.77 41.56	Spica	$158^{\circ}19.08$	$-11^{\circ}18.73$
6 7	174° 25.49 189° 27.96	296°11.97 \$18°57.18 311°11.22 57.91	356°1.46 N03°5.16 11°2.87 4.75	332°57.90 \$07°42.51 348°0.01 42.64	140°59.33 N10°41.54 156°1.88 41.52	Alkaid	152°49.89	49° 9.85
8	204° 30.42	326°10.48 58.65	26°4.28 4.33	3°2.12 42.77	171°4.44 41.50	Hadar	148°31.71	-60°30.52
9	219° 32.89	341°9.73 18°59.38	41°5.69 · · 3.92	18° 4.22 · · 42.91	186°7.00 · · 41.48		147°54.04	-36°30.59
10	234° 35.35	356°8.98 19°0.11	56°7.11 3.50	33°6.33 43.04	201°9.56 41.46	1	145°45.26	19°1.79
11	249°37.81	11°8.23 0.84	71°8.52 3.09	48°8.44 43.17	216° 12.12 41.43	Rigil Kent. Kochab	139°36.24 137°21.09	-60°57.08 74°1.91
12	264° 40.28	26°7.48 <b>S</b> 19°1.57	86°9.93 N03°2.68	63°10.55 <b>S</b> 07°43.31	231°14.68 N10°41.41		136°52.73	-16° 9.64
13	279°42.74	41°6.73 2.29	101°11.34 2.26	78°12.65 43.44	246°17.24 41.39	Alphecca	126°1.40	26°36.98
14	294°45.21	56°5.98 3.02	116°12.76 1.85	93°14.76 43.57	261°19.80 41.37	Antares	112°12.26	-26°29.63
15	309° 47.67 324° 50.13	71°5.23 · · · 3.75 86°4.47 4.47	131°14.17 · · 1.43 146°15.58 1.02	108°16.87 · · 43.70	276°22.35 · · 41.35 291°24.91 41.33	Atria	$107^{\circ}4.11$	-69°4.57
16 17	324 50.13 339°52.60	101°3.72 5.20	146°15.58 1.02 161°17.00 0.61	123°18.98 43.84 138°21.09 43.97	291°24.91 41.33 306°27.47 41.31		101°59.47	-15°45.52
18	354° 55.06	116°2.97 \$19°5.92	176°18.41 N03°0.20	153°23.20 S07°44.10	321°30.03 N10°41.29	Shaula	96°6.46	-37°7.34
19	9° 57.53	131°2.22 6.64	191°19.83 02°59.78	168°25.31 44.23	336°32.59 41.27	Rasalhague	95°55.94	12°32.44
20	24°59.99	146°1.46 7.36	206°21.24 59.37	183°27.41 44.37	351°35.14 41.25	Eltanin Kaus Aust.	90°41.25 83°28.70	51°29.19 -34°22.13
21	40°2.46	161°0.71 · · 8.08	221°22.66 · · 58.96	198°29.52 · · 44.50	6°37.70 · · 41.23	Vega	80°31.48	38°48.79
22	55°4.92	175°59.95 8.80	236°24.07 58.54	213°31.63 44.63	21°40.26 41.21	Nunki	75°44.18	-26°15.52
23	70°7.38	190°59.20 9.52	251°25.49 58.13	228°33.74 44.76	36°42.81 41.18	Altair	61°57.13	8°56.87
Mer.ı	pass. 18:20	ν-0.7' d0.7' m-3.93	ν1.4' d-0.4' m0.88	ν2.1' d0.1' m-1.82	ν2.6' d-0.0' m0.12	Peacock	53°1.28	-56°38.52
						Deneb	49°23.90	45°23.33
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif	33°35.81	10°0.68
0	85°9.85	205°58.44 \$19°10.24	266°26.91 N02°57.72	243°35.85 \$07°44.90	51°45.37 N10°41.16	Al Na'ir Fomalhaut	27°29.21 15°11.13	-46°49.31 -29°28.15
1	100° 12.31	220°57.69 10.96	281°28.32 57.31	258°37.96 45.03	66° 47.93 41.14	Scheat	15°11.13 13°42.10	-29° 28.15 28° 14.69
2	$115^{\circ}14.78$	235°56.93 11.67	296°29.74 56.90	273°40.07 45.16	81°50.48 41.12	Markab	13° 26.74	15°21.90
3	130° 17.24	250°56.17 · · 12.39	311°31.16 · · 56.49	288°42.18 · · 45.29	96°53.04 · · 41.10			
4	145° 19.71	265°55.41 13.10	326°32.58 56.07	303°44.29 45.42	111°55.59 41.08	Dec 14 Thu	SHA	Mer.pass
5	160°22.17	280°54.66 13.82	341°33.99 55.66	318°46.41 45.55	126°58.15 41.06	Venus Mars	123°22.59 182°7.75	10:14 06:18
6 7	175°24.63 190°27.10	295°53.90 \$19°14.53 310°53.14 15.24	356°35.41 N02°55.25 11°36.83 54.84	333°48.52 \$07°45.69 348°50.63 45.82	142°0.71 N10°41.04 157°3.26 41.02	1	162 7.75 158° 43.21	07:51
8	205° 29.56	325°52.38 15.95	26°38.25 54.43	3°52.74 45.95	172°5.82 41.00	Saturn	326°30.90	20:38
9	220° 32.03	340°51.62 · · 16.66	41°39.67 · · 54.02	18°54.85 · · 46.08	187°8.37 · · 40.98			
10	235°34.49	355°50.86 17.37	56°41.09 53.61	33°56.96 46.21	202°10.93 40.96	Dec 15 Fri	SHA	Mer.pass
11	250° 36.96	10°50.10 18.08	71°42.51 53.20	48°59.07 46.34	217° 13.48 40.94	Venus Mars	122°5.74 181°42.30	10:15 06:16
12	265° 39.42	25°49.33 \$19°18.78	86°43.93 N02°52.79	64°1.19 S07°46.47	232°16.04 N10°40.92	1	158° 34.56	07:48
13	280°41.88	40°48.57 19.49	101°45.36 52.38	79° 3.30 46.60	247° 18.59 40.90	Saturn	326°33.26	20:34
14 15	295° 44.35 310° 46.81	55°47.81 20.19 70°47.05 · · 20.90	116°46.78 51.97 131°48.20 •• 51.56	94° 5.41 46.74 109° 7.52 · · · 46.87	262°21.14 40.88 277°23.70 • 40.86			
16	310 46.81 325°49.28	85°46.28 21.60	146°49.62 51.15	109 7.52 · · 46.87 124° 9.64 47.00	292°26.25 40.85	Dec 16 Sat Venus	<b>SHA</b> 120° 48.59	Mer.pass 10:17
17	340°51.74	100°45.52 22.30	161°51.04 50.74	139°11.75 47.13	307°28.81 40.83	1	120 48.59 181°17.06	06:14
18	355° 54.20	115°44.75 \$19°23.00	176°52.47 N02°50.33	154°13.86 S07°47.26	322°31.36 N10°40.81		158°26.00	07:45
19	10°56.67	130°43.99 23.71	191°53.89 49.92	169°15.98 47.39	337°33.91 40.79		326°35.52	20:29
20	25°59.13	145°43.22 24.40	206°55.32 49.51	184°18.09 47.52	352°36.47 40.77			
21	41°1.60	160°42.46 · · 25.10	221°56.74 · · 49.11	199°20.20 · · 47.65	7°39.02 · · 40.75	Horizon	tal parallax Venus:	0.1
22	56°4.06	175°41.69 25.80	236°58.16 48.70	214°22.32 47.78	22°41.57 40.73		venus: Mars:	0.1 0.1
23	71°6.53	190°40.92 26.50	251°59.59 48.29	229°24.43 47.91	37°44.13 40.71		iviais.	0.1
Mer.	pass. 18:16	ν-0.8′ d0.7′ m-3.93	$\nu$ 1.4′ <i>d</i> -0.4′ m0.86	$\nu 2.1' \ d0.1' \ \text{m-}1.83$	$\nu 2.6' \ d$ -0.0' m0.13			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°20.20	S23°13.50	210°56.07	5.7'	\$22°58.12	6.5'	58.9'
1 2	196° 19.90 211° 19.60	13.64 13.78	225°20.81 239°45.51	5.7' 5.7'	23°4.58 23°10.88	6.3' 6.1'	58.9' 58.9'
3	226° 19.30	• • 13.92	254°10.16	5.6'	23°17.03	6.0'	58.9'
4	241°19.00	14.06	268°34.77	5.6'	23°23.02	5.8'	58.9'
5	256° 18.70 271° 18.40	14.20	282°59.34 297°23.88	5.5' 5.5'	23°28.86 523°34.55	5.7'	58.9'
6 7	271 18.40 286° 18.10	\$23°14.34 14.48	297°23.88 311°48.38	5.5' 5.5'	23°40.08	5.5' 5.4'	58.9' 58.8'
8	301° 17.80	14.62	326°12.84	5.4'	23°45.45	5.2'	58.8'
9	316° 17.50	•• 14.75	340°37.27	5.4'	23°50.66	5.1'	58.8'
10 11	331°17.20 346°16.90	14.89 15.02	355°1.67 9°26.04	5.4' 5.3'	23°55.71 24°0.61	4.9' 4.7'	58.8' 58.8'
12	1° 16.60	S23°15.16	23°50.38	5.3'	\$24°5.35	4.6'	58.8'
13	16° 16.30	15.29	$38^{\circ}14.69$	5.3'	24°9.92	4.4'	58.7'
14	31°16.00	15.42	52°38.98	5.3'	24°14.34	4.3'	58.7'
15 16	46° 15.70 61° 15.39	· · 15.55 15.68	67°3.25 81°27.50	5.2' 5.2'	24°18.59 24°22.68	4.1' 3.9'	58.7' 58.7'
17	76° 15.09	15.81	95°51.73	5.2'	24°26.61	3.8'	58.7'
18	91°14.79	S23°15.94	110°15.94	5.2'	S24°30.38	3.6'	58.7'
19 20	106°14.49 121°14.19	16.07 16.20	124°40.13 139°4.31	5.2' 5.2'	24°33.98 24°37.42	3.4' 3.3'	58.6' 58.6'
21	121 14.19 136°13.89	16.33	159 4.51 153°28.48	5.2'	24 37.42 24°40.70	3.3 3.1'	58.6'
22	151° 13.58	16.45	167°52.64	5.2'	24°43.81	2.9'	58.6'
23	166° 13.28	16.58	182°16.80	5.1'	24°46.76	2.8'	58.6'
	SD = 16.2'	d = 0.1'		SE	O = 16.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	181°12.98	\$23°16.70	196°40.95	υ 5.1'	\$24°49.55	2.6'	58.5'
1	196° 12.68	16.83	211°5.09	5.1'	24°52.17	2.5'	58.5'
2	211° 12.38 226° 12.07	16.95 •• 17.07	225°29.23 239°53.38	5.1' 5.1'	24°54.62 24°56.91	2.3'	58.5'
3 4	226 12.07 241°11.77	· · 17.07 17.19	254°17.52	5.1'	24 56.91 24°59.04	2.1' 2.0'	58.5' 58.5'
5	256° 11.47	17.31	268°41.67	5.2'	25°1.00	1.8'	58.4'
6	271°11.17	S23°17.43	283°5.83	5.2'	S25°2.79	1.6'	58.4'
7 8	286° 10.86 301° 10.56	17.55 17.67	297°29.99 311°54.17	5.2' 5.2'	25°4.42 25°5.88	1.5' 1.3'	58.4' 58.4'
9	316° 10.26	• • 17.78	326°18.36	5.2'	25°7.18	1.1'	58.4
10	331°9.95	17.90	340°42.56	5.2'	25°8.32	1.0'	58.3'
11	346°9.65	18.02	355°6.78	5.2'	25°9.29	0.8'	58.3'
12 13	1°9.35 16°9.04	\$23°18.13 18.24	9°31.02 23°55.28	5.3' 5.3'	\$25°10.10 25°10.74	0.6' 0.5'	58.3' 58.3'
14	31°8.74	18.36	38°19.56	5.3'	25°11.22	0.3	58.2'
15	46°8.44	• • 18.47	52°43.86	5.3'	25°11.53	0.2'	58.2'
16 17	61°8.13 76°7.83	18.58 18.69	67°8.20 81°32.56	5.4' 5.4'	25°11.68 25°11.67	-0.0' -0.2'	58.2' 58.2'
18	91°7.52	\$23°18.80	95°56.95	5.4	\$25°11.49	-0.2	58.2'
19	106°7.22	18.91	$110^{\circ}21.38$	5.5'	$25^{\circ}11.16$	-0.5'	58.1'
20	121°6.92	19.02	124°45.84		25°10.66		58.1'
21 22	136°6.61 151°6.31	· · 19.12 19.23	139°10.34 153°34.87	5.5' 5.6'	25°10.00 25°9.18	-0.8' -1.0'	58.1' 58.1'
23	166°6.00	19.34	167°59.45	5.6'	25°8.20	-1.1'	58.0'
	SD = 16.2'	d = 0.1'		SE	0 = 16.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	181°5.70	S23°19.44	182°24.07	5.7'	S25°7.05	-1.3'	58.0'
1	196°5.39	19.55	196°48.73	5.7'	25°5.75	-1.5'	58.0'
2 3	211°5.09 226°4.78	19.65 •• 19.75	211°13.44 225°38.20	5.8' 5.8'	25°4.30 25°2.68	-1.6' -1.8'	58.0' 57.9'
3 4	220°4.78 241°4.48	19.75	240°3.01	5.8° 5.9'	25° 2.68 25° 0.91	-1.8° -1.9°	57.9° 57.9°
5	256°4.17	19.95	254°27.87	5.9'	24°58.98	-2.1'	57.9'
6	271°3.87 286°3.56	\$23°20.05 20.15	268°52.78	6.0' 6.0'	\$24°56.89 24°54.65	-2.2'	57.9'
7 8	286° 3.56 301° 3.26	20.15	283°17.75 297°42.77	6.0	24°54.65 24°52.26	-2.4' -2.5'	57.8' 57.8'
9	316°2.95	20.35	$312^{\circ}7.86$	6.1'	24°49.71	-2.7'	57.8'
10	331°2.65	20.45	326°33.00	6.2'	24°47.01	-2.9'	57.8'
11 12	346°2.34 1°2.04	20.54 \$23°20.64	340°58.21 355°23.48	6.3' 6.3'	24°44.16 \$24°41.15	-3.0' -3.2'	57.7' 57.7'
13	16°1.73	20.73	9°48.81	6.4	24°38.00	-3.2' -3.3'	57.7'
14	31°1.42	20.83	24°14.21	6.5'	24°34.70	-3.4'	57.6'
15 16	46°1.12 61°0.81	20.92	38°39.68 53°5.22	6.5'	24°31.25 24°27.66	-3.6'	57.6'
16 17	61°0.81 76°0.51	21.01 21.10	53°5.22 67°30.82	6.6' 6.7'	24°27.66 24°23.92	-3.7' -3.9'	57.6' 57.6'
18	91°0.20	S23°21.19	81°56.50	6.8'	S24°20.03	-4.0'	57.5'
19	105°59.89	21.28	96°22.26	6.8'	24°16.00	-4.2'	57.5'
20 21	120°59.59 135°59.28	21.37 •• 21.46	110°48.09 125°13.99	6.9' 7.0'	24°11.83 24°7.51	-4.3' -4.5'	57.5' 57.5'
22	150° 58.97	21.54	139°39.98	7.1	24°3.06	-4.6'	57.4
23	165°58.67	21.63	154° 6.04	7.1'	23°58.46	-4.7'	57.4'
	SD = 16.2'	d = 0.1'		SE	0 = 15.8'		_

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut
<b>N</b> 72°	08:21	10:48			13:02	15:30
<b>N</b> 70°	08:01	09:48			14:02	15:50
68°	07:45	09:14			14:37	16:05
66°	07:32	08:49	10:28	13:22	15:02	16:18
64°	07:21	08:30	09:47	14:04	15:21	16:29
62°	07:12	08:14	09:19	14:32	15:37	16:39
60°	07:03	08:00	08:58	14:53	15:50	16:47
<b>N</b> 58°	06:56	07:49	08:40	15:10	16:02	16:5
56°	06:49	07:38	08:26	15:25	16:12	17:0
54°	06:43	07:29	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
<b>N</b> 40°	06:10	06:44	07:15	16:36	17:06	17:40
35°	06:01	06:33	07:01	16:50	17:18	17:50
$30^{\circ}$	05:52	06:22	06:49	17:02	17:29	17:58
$20^{\circ}$	05:36	06:03	06:27	17:23	17:47	18:1
<b>N</b> 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
<b>S</b> 10°	04:44	05:11	05:34	18:17	18:40	19:07
$20^{\circ}$	04:22	04:51	05:15	18:36	19:00	19:29
$30^{\circ}$	03:53	04:26	04:53	18:57	19:25	19:58
$35^{\circ}$	03:34	04:11	04:40	19:10	19:40	20:17
40°	03:11	03:53	04:25	19:25	19:58	20:40
45°	02:41	03:30	04:08	19:43	20:21	21:10
<b>S</b> 50°	01:56	03:01	03:45	20:06	20:50	21:56
52°	01:28	02:46	03:34	20:17	21:05	22:23
54°	00:44	02:28	03:22	20:29	21:23	23:08
$56^{\circ}$	////	02:06	03:08	20:43	21:45	////
58°	////	01:37	02:51	21:00	22:15	////
<b>S</b> 60°	////	00:49	02:31	21:20	23:04	////
Lat		Moonris	e		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup> 12 <sup>h</sup> Pass Upper Low		Lower	28-0			
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%	
14	05:21	05:06	11:55	10:21	22:51		
15	04:52	04:37	11:55	11:20	23:50		
16	04:23	04:08	11:56	12:19	-:-		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	86°8.99	205°40.16 \$19°27.19	267°1.02 N02°47.88	244°26.55 \$07°48.04	52°46.68 N10°40.69	Alpheratz 357°31.35 29°15.30
1	101°11.45	220°39.39 27.89	282°2.44 47.47	259°28.66 48.17	67°49.23 40.67	Ankaa 353°4.00 -42°9.03
2	116° 13.92 131° 16.38	235°38.62 28.58 250°37.85 •• 29.27	297°3.87 47.07 312°5.29 • 46.66	274°30.77 48.30 289°32.89 · · 48.43	82°51.78 40.65 97°54.34 • 40.64	Schedar 349°27.06 56°42.14
3 4	146° 18.85	265° 37.08 29.97	327°6.72 46.25	304°35.00 48.56	112°56.89 40.62	Diphda 348°44.03 -17°49.67
5	161°21.31	280°36.31 30.66	342°8.15 45.84	319°37.12 48.69	127°59.44 40.60	Achernar 335°17.66 -57°5.57
6	176°23.78	295°35.54 <b>S</b> 19°31.35	357° 9.58 N02° 45.44	334°39.24 <b>S</b> 07°48.82	143°1.99 N10°40.58	Hamal 327°47.32 23°36.11 Polaris 311°50.51 89°23.28
7	191°26.24	310°34.77 32.04	12°11.00 45.03	349°41.35 48.95	158° 4.54 40.56	Acamar 315°9.07 -40°11.44
8	206°28.70	325°34.00 32.73	27°12.43 44.62	4°43.47 49.08	173°7.09 40.54	Menkar 314°2.53 4°12.22
9 10	221°31.17 236°33.63	340°33.23 ·· 33.41 355°32.45 34.10	42°13.86 · · 44.22 57°15.29 43.81	19°45.58 · · 49.21 34°47.70 49.34	188°9.64 · · 40.52 203°12.19 40.51	Mirfak 308°23.13 49°57.95
11	251°36.10	10°31.68 34.78	72°16.72 43.40	49°49.81 49.46	218° 14.75 40.49	Aldebaran 290°35.58 16°34.01
12	266° 38.56	25°30.91 \$19°35.47	87°18.15 N02°43.00	64°51.93 <b>S</b> 07°49.59	233°17.30 N10°40.47	Rigel 281°0.44 -8°10.17
13	281°41.02	40°30.13 36.15	102°19.58 42.59	79°54.05 49.72	248°19.85 40.45	Capella 280°16.64 46°1.53 Bellatrix 278°19.09 6°22.47
14	296° 43.49	55°29.36 36.84	117°21.01 42.19	94°56.17 49.85	263°22.40 40.43	Elnath 277°57.42 28°37.81
15 16	311° 45.95 326° 48.42	70°28.58 ·· 37.52 85°27.81 38.20	132°22.44 · · 41.78 147°23.87 41.38	109°58.28 · · 49.98 125°0.40 50.11	278°24.95 · · 40.42 293°27.50 40.40	Alnilam 275°34.13 -1°11.10
17	341°50.88	100°27.03 38.88	162°25.31 40.97	140° 2.52 50.24	308°30.05 40.38	Betelgeuse 270°48.27 7°24.64
18	356° 53.35	115°26.26	177°26.74 N02°40.57	155°4.63 \$07°50.37	323°32.60 N10°40.36	Canopus 263°50.40 -52°42.69
19	11°55.81	130°25.48 40.23	192°28.17 40.16	170° 6.75 50.49	338°35.15 40.34	Sirius 258°23.06 -16°45.44 Adhara 255°2.96 -29°0.74
20	26°58.27	145°24.70 40.91	207°29.60 39.76	185°8.87 50.62	353°37.69 40.33	Procyon 244°47.18 5°8.88
21 22	42°0.74 57°3.20	160°23.92 · · 41.59 175°23.15 42.26	222°31.04 · · 39.35 237°32.47 38.95	200°10.99 · · 50.75 215°13.11 50.88	8°40.24 · · 40.31 23°42.79 40.29	Pollux 243°13.09 27°57.13
23	72°5.67	190°22.37 42.94	252°33.91 38.54	230°15.23 51.01	38° 45.34 40.27	Avior 234°12.81 -59°36.05
						Suhail 222°43.58 -43°32.91
Mer.	pass. 18:12	ν-0.8′ d0.7′ m-3.93	ν1.4' d-0.4' m0.85	ν2.1' d0.1' m-1.83	$\nu 2.6' \ d$ -0.0' m0.13	Miaplacidus 221°36.79 -69°50.01 Alphard 217°44.40 -8°47.15
						Alphard 217°44.40 -8°47.15 Regulus 207°30.91 11°49.33
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.17 61°35.26
0 1	87°8.13 102°10.60	205°21.59 \$19°43.61 220°20.81 44.28	267°35.34 N02°38.14 282°36.77 37.74	245°17.34 S07°51.14 260°19.46 51.26	53°47.89 N10°40.26 68°50.44 40.24	Denebola 182°21.72 14°24.42
2	102 10.60 117°13.06	220°20.81 44.28 235°20.03 44.95	282°36.77 37.74 297°38.21 37.33	260°19.46 51.26 275°21.58 51.39	68°50.44 40.24 83°52.99 40.22	Gienah 175°40.30 -17°42.15
3	132° 15.52	250°19.25 · · 45.62	312°39.65 · · 36.93	290°23.70 · · 51.52	98°55.53 · · 40.20	Acrux 172°56.43 -63°15.36
4	147° 17.99	265°18.47 46.29	327°41.08 36.53	305°25.82 51.65	113°58.08 40.19	Gacrux 171°48.02 -57°16.32 Alioth 166°10.49 55°47.80
5	162° 20.45	280°17.68 46.96	342°42.52 36.12	320°27.94 51.77	129°0.63 40.17	Spica 158°19.05 -11°18.74
6	177°22.92	295°16.90 \$19°47.63	357°43.95 N02°35.72	335°30.06 \$07°51.90	144°3.18 N10°40.15	Alkaid 152°49.85 49°9.84
7 8	192°25.38 207°27.84	310°16.12 48.29 325°15.34 48.96	12°45.39 35.32 27°46.83 34.91	350°32.18 52.03 5°34.30 52.16	159°5.72 40.14 174°8.27 40.12	Hadar 148°31.66 -60°30.52
9	222°30.31	340°14.55 · · 49.62	42°48.27 · · 34.51	20°36.42 · · 52.28	189°10.82 · · 40.10	Menkent 147°54.01 -36°30.59
10	237°32.77	355°13.77 50.29	57°49.71 34.11	35°38.54 52.41	204° 13.37 40.09	Arcturus 145°45.23 19°1.78 Rigil Kent. 139°36.19 -60°57.08
11	252°35.24	10°12.98 50.95	72°51.14 33.71	50°40.66 52.54	219°15.91 40.07	Kochab 137°21.05 74°1.89
12	267°37.70	25°12.20 \$19°51.61	87°52.58 N02°33.31	65°42.78 S07°52.67	234°18.46 N10°40.05	Zuben'ubi 136°52.70 -16°9.65
13	282° 40.17 297° 42.63	40°11.41 52.27 55°10.63 52.93	102°54.02 32.90 117°55.46 32.50	80°44.90 52.79 95°47.03 52.92	249°21.01 40.04 264°23.55 40.02	Alphecca 126°1.38 26°36.96
14 15	312° 45.09	70°9.84 · · 53.59	117°55.46 32.50 132°56.90 · · 32.10	95°47.03 52.92 110°49.15 · · 53.05	264°23.55 40.02 279°26.10 • • 40.00	Antares 112°12.24 -26°29.63
16	327° 47.56	85°9.05 54.25	147°58.34 31.70	125°51.27 53.17	294°28.64 39.99	Atria 107°4.07 -69°4.56
17	$342^{\circ}50.02$	100°8.27 54.91	162°59.78 31.30	140°53.39 53.30	309°31.19 39.97	Sabik 101°59.45 -15°45.52 Shaula 96°6.44 -37°7.34
18	357° 52.49	115°7.48 \$19°55.56	178°1.23 N02°30.90	155°55.51 \$07°53.43	324°33.73 N10°39.95	Rasalhague 95°55.93 12°32.43
19	12°54.95	130°6.69 56.22	193° 2.67 30.50	170°57.64 53.55	339°36.28 39.94	Eltanin 90°41.24 51°29.18
20 21	27° 57.41 42° 59.88	145°5.90 56.87 160°5.11 · · 57.52	208° 4.11 30.10 223° 5.55 •• 29.70	185°59.76 53.68 201°1.88 • 53.80	354°38.82 39.92 9°41.37 · · 39.90	Kaus Aust. 83°28.68 -34°22.12
22	58°2.34	175° 4.32 58.18	238°6.99 29.30	216°4.00 53.93	24°43.91 39.89	Vega 80°31.47 38°48.77
23	73°4.81	190°3.53 58.83	253°8.44 28.90	231°6.13 54.06	39°46.46 39.87	Nunki 75°44.17 -26°15.52 Altair 61°57.13 8°56.87
Mori	pass. 18:08	ν-0.8' d0.7' m-3.92	ν1.4' d-0.4' m0.84	ν2.1' d0.1' m-1.84	ν2.5' d-0.0' m0.14	Peacock 53°1.28 -56°38.51
- IVIEL.	pass. 10.00	ν-0.0 d0.7 III-3.92	V1.4 U-0.4 III0.04	ν2.1 d0.1 iii-1.04	V2.3 U-0.0 1110.14	Deneb 49°23.91 45°23.33
-	C	CUA -	CHA	CIIA	CHA	Enif 33°35.81 10°0.68
Tue 0	<b>GHA</b> 88°7.27	<b>GHA Dec</b> 205°2.74 \$19°59.48	<b>GHA Dec</b> 268° 9.88 N02° 28.50	<b>GHA Dec</b> 246° 8.25 <b>S</b> 07° 54.18	<b>GHA Dec</b> 54°49.00 N10°39.86	Al Na'ir 27°29.22 -46°49.31
1	88 7.27 103°9.74	205 2.74 519 59.48 220°1.95 20°0.13	283°11.33 28.10	240 8.25 507 54.18 261°10.37 54.31	69°51.55 39.84	Fomalhaut 15°11.14 -29°28.15
2	118° 12.20	235°1.16 0.77	298°12.77 27.70	276°12.50 54.43	84°54.09 39.83	Scheat 13°42.11 28°14.69 Markab 13°26.74 15°21.89
3	$133^{\circ}14.66$	250°0.37 · · 1.42	313°14.22 · · 27.30	291°14.62 · · 54.56	99°56.64 · · 39.81	
4	148° 17.13	264°59.58 2.07	328°15.66 26.90	306°16.74 54.69	114°59.18 39.79	Dec 17 Sun SHA Mer.pass
5	163° 19.59 178° 22.06	279°58.78 2.71 294°57.99 \$20°3.36	343°17.11 26.50 358°18.55 N02°26.10	321°18.87 54.81 336°20.99 \$07°54.94	130°1.72 39.78	Venus 119°31.17 10:18 Mars 180°52.03 06:11
6 7	178° 22.06 193° 24.52	294°57.99 \$20°3.36 309°57.20 4.00	358°18.55 N02°26.10 13°20.00 25.70	336°20.99 S07°54.94 351°23.12 55.06	145°4.27 N10°39.76 160°6.81 39.75	Jupiter 158°17.56 07:41
8	208° 26.98	324°56.40 4.64	28°21.45 25.30	6°25.24 55.19	175°9.35 39.73	Saturn 326° 37.69 20:25
9	223°29.45	339°55.61 · · 5.28	43°22.89 · · 24.91	21°27.37 · · 55.31	190°11.90 · · 39.72	
10	238°31.91	354°54.81 5.92	58°24.34 24.51	36°29.49 55.44	205°14.44 39.70	Dec 18 Mon         SHA         Mer.pass           Venus         118°13.46         10:19
11	253°34.38	9°54.01 6.56	73°25.79 24.11	51°31.62 55.56	220°16.98 39.69	Mars 180°27.21 06:09
12 13	268° 36.84 283° 39.31	24°53.22 \$20°7.20 39°52.42 7.84	88°27.24 N02°23.71 103°28.68 23.31	66°33.74 S07°55.69 81°35.87 55.81	235°19.52 N10°39.67 250°22.07 39.66	Jupiter 158°9.21 07:38
14	298° 41.77	54°51.62 8.48	118°30.13 22.92	96°37.99 55.94	265°24.61 39.64	Saturn 326°39.76 20:21
15	313°44.23	69°50.83 · · 9.11	133°31.58 · · 22.52	111°40.12 · · 56.06	280°27.15 · · 39.63	Dec 19 Tue SHA Mer.pass
16	328° 46.70	84°50.03 9.75	148°33.03 22.12	126°42.25 56.19	295°29.69 39.61	Venus 116°55.47 10:20
17	343°49.16	99°49.23 10.38	163°34.48 21.73	141°44.37 56.31	310°32.23 39.60	Mars 180°2.61 06:07
18 19	358° 51.63 13° 54.09	114°48.43 \$20°11.01 129°47.63 11.64	178°35.93 N02°21.33 193°37.39 20.93	156°46.50 S07°56.44 171°48.63 56.56	325°34.77 N10°39.58 340°37.31 39.57	Jupiter 158° 0.98 07:34
20	28° 56.55	144°46.83 12.27	208°38.84 20.54	186°50.75 56.68	355°39.86 39.55	Saturn 326°41.73 20:17
21	43°59.02	159°46.03 · · 12.90	223°40.29 · · 20.14	201°52.88 · · 56.81	10°42.40 · · 39.54	Horizontal parallax
22	59°1.48	174°45.23 13.53	238°41.74 19.75	216°55.01 56.93	25°44.94 39.52	Venus: 0.1
23	74°3.95	189°44.43 14.16	253°43.19 19.35	231°57.14 57.06	40°47.48 39.51	Mars: 0.1
Mer.	pass. 18:05	ν-0.8' d0.6' m-3.92	ν1.4' d-0.4' m0.82	$\nu 2.1' \ d0.1' \ \text{m-}1.84$	ν2.5′ d-0.0′ m0.14	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°58.36	S23°21.72	168°32.18	7.2'	\$23°53.73	-4.9'	57.4'
1	195°58.05	21.80	182°58.40	7.3'	23°48.86	-5.0'	57.3'
2	210° 57.75	21.88	197°24.71	7.4'	23°43.85	-5.1'	57.3'
3 4	225°57.44 240°57.13	· · 21.97 22.05	211°51.10 226°17.57	7.5' 7.6'	23°38.71 23°33.43	-5.3' -5.4'	57.3' 57.3'
5	255° 56.83	22.13	240°44.12	7.6	23°28.03	-5.5'	57.3'
6	270° 56.52	S23°22.21	255°10.77	7.7'	S23°22.49	-5.7'	57.2'
7	$285^{\circ}56.21$	22.29	269°37.50	7.8'	$23^{\circ}16.82$	-5.8'	57.2'
8	300°55.91	22.37	284°4.32	7.9'	23°11.02	-5.9'	57.2'
9 10	315°55.60 330°55.29	· · 22.45 22.53	298°31.22 312°58.22	8.0' 8.1'	23°5.10 22°59.05	-6.1' -6.2'	57.1' 57.1'
11	345° 54.98	22.60	327°25.30	8.2	22°52.87	-6.3	57.1
12	0°54.68	S23°22.68	341°52.48	8.3'	S22°46.57	-6.4	57.0'
13	15°54.37	22.75	$356^{\circ}19.75$	8.4'	$22^{\circ}40.15$	-6.5'	57.0'
14	30°54.06	22.83	10°47.11	8.5'	22°33.60	-6.7'	57.0'
15 16	45°53.75 60°53.44	· · 22.90 22.97	25°14.57 39°42.11	8.5' 8.6'	22°26.94 22°20.16	-6.8' -6.9'	57.0' 56.9'
17	75°53.14	23.04	54° 9.75	8.7	22°13.26	-7.0'	56.9'
18	90°52.83	S23°23.11	68°37.49	8.8'	S22°6.24	-7.1'	56.9'
19	105°52.52	23.18	83°5.32	8.9'	$21^{\circ}59.11$	-7.2'	56.8'
20	120°52.21	23.25	97°33.25	9.0'	21°51.87	-7.4'	56.8'
21 22	135°51.90 150°51.60	· · 23.32 23.39	112°1.27 126°29.38	9.1' 9.2'	21°44.51 21°37.05	-7.5' -7.6'	56.8' 56.8'
23	165°51.29	23.39	120 29.38 140°57.60	9.2 9.3'	21 37.05 21°29.47	-7.0 -7.7'	56.7
	SD = 16.2'	d = 0.1'			O = 15.6'		
	JD — 10.2	u = 0.1		اد	J = 10.0°		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°50.98	\$23°23.52	155°25.91	9.4'	\$21°21.79	-7.8'	56.7'
1 2	195°50.67 210°50.36	23.59 23.65	169°54.31 184°22.82	9.5' 9.6'	21°14.00 21°6.11	-7.9' -8.0'	56.7' 56.6'
3	225° 50.05	. 23.72	198°51.42	9.7	20°58.11	-8.1'	56.6'
4	240°49.75	23.78	213°20.11	9.8'	20°50.01	-8.2'	56.6'
5	255° 49.44	23.84	227°48.91	9.9'	20°41.80	-8.3'	56.6'
6	270°49.13	S23°23.90	242°17.80	10.0'	\$20°33.50	-8.4'	56.5'
7 8	285°48.82 300°48.51	23.96 24.02	256°46.79 271°15.88	10.1' 10.2'	20°25.10 20°16.60	-8.5' -8.6'	56.5' 56.5'
9	315° 48.20	• • 24.08	285°45.06	10.2	20°10.00	-8.7'	56.4
10	330°47.89	24.14	300°14.34	10.4'	19°59.32	-8.8'	56.4'
11	345° 47.58	24.19	314°43.72	10.5'	19°50.53	-8.9'	56.4'
12	0°47.27	\$23°24.25	329°13.20	10.6'	\$19°41.66	-9.0'	56.4'
13 14	15° 46.97 30° 46.66	24.31 24.36	343°42.77 358°12.44	10.7' 10.8'	19°32.70 19°23.64	-9.1' -9.1'	56.3' 56.3'
15	45° 46.35	24.41	12°42.21	10.0	19°14.50	-9.2'	56.3'
16	60°46.04	24.47	27°12.07	11.0'	19°5.27	-9.3'	56.2'
17	75° 45.73	24.52	41°42.03	11.1'	18°55.96	-9.4'	56.2'
18	90°45.42 105°45.11	\$23°24.57	56°12.08 70°42.23	11.1' 11.2'	\$18°46.56 18°37.08	-9.5'	56.2'
19 20	105 45.11 120°44.80	24.62 24.67	70 42.23 85°12.47		18°27.51	-9.6' -9.6'	56.2' 56.1'
21	135° 44.49	24.72	99°42.81	11.4'	18°17.87	-9.7'	56.1'
22	150°44.18	24.77	114°13.24	11.5'	$18^{\circ} 8.15$	-9.8'	56.1'
23	165°43.87	24.81	128°43.77	11.6'	17°58.35	-9.9'	56.0'
	SD = 16.2'	d=0.1'		SI	O = 15.5'		
Tue	GHA	Doc	GHA	.,	Dec	d	HP
Tue 0	<b>GHA</b> 180°43.56	<b>Dec</b> \$23°24.86	<b>GHA</b> 143°14.39	u 11.7'	<b>S</b> 17°48.47	-10.0'	<b>нР</b> 56.0'
1	195°43.25	24.91	157°45.10	11.8'	$17^{\circ}38.52$	-10.0'	56.0'
2	210° 42.94	24.95	172°15.91	11.9'	17°28.50	-10.1'	56.0'
3	225° 42.63 240° 42.32	• • 24.99	186°46.80	12.0'	17°18.40	-10.2'	55.9'
4 5	240° 42.32 255° 42.01	25.04 25.08	201°17.79 215°48.87	12.1' 12.2'	17°8.23 16°57.99	-10.2' -10.3'	55.9' 55.9'
6	270°41.70	\$23°25.12	230°20.04	12.3'	\$16°47.68	-10.3	55.9'
7	285°41.39	25.16	244°51.30	12.3'	16°37.31	-10.4'	55.8'
8	300°41.08	25.20	259°22.65	12.4'	16°26.87	-10.5'	55.8'
9 10	315°40.77 330°40.46	· · 25.24 25.28	273°54.08 288°25.61	12.5' 12.6'	16°16.36 16°5.78	-10.6' -10.6'	55.8' 55.7'
11	345°40.15	25.28 25.32	302°57.22	12.7	16 5.78 15°55.15	-10.6	55.7'
12	0°39.84	S23°25.35	317°28.92	12.8'	S15°44.45	-10.8	55.7'
13	15° 39.53	25.39	332°0.70	12.9'	15°33.69	-10.8'	55.7'
14	30°39.22	25.42	346°32.57 1°4.52	13.0'	15°22.88	-10.9'	55.6'
15 16	45°38.91 60°38.60	· · 25.46 25.49	1°4.52 15°36.56	13.0' 13.1'	15°12.00 15°1.07	-10.9' -11.0'	55.6' 55.6'
17	75°38.29	25.49	30°8.68	13.1	15 1.07 14°50.08	-11.0'	55.6'
18	90°37.98	S23°25.55	44°40.88	13.3'	S14°39.03	-11.1'	55.5'
19	105°37.67	25.59	59°13.16	13.4'	14°27.93	-11.2'	55.5'
20	120°37.36	25.62	73°45.52	13.4'	14°16.78	-11.2'	55.5'
21 22	135°37.05 150°36.74	· · 25.65 25.67	88°17.97 102°50.49	13.5' 13.6'	14°5.58 13°54.32	-11.3' -11.3'	55.5' 55.4'
23	165° 36.43	25.70	102 50.49 117°23.09	13.7'	13°43.02	-11.3 -11.4'	55.4'
	SD = 16.2'	d = 0.0'		SI	D = 15.3'		

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

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

			Sun		Moon			
I	Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age 1-3	
İ	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	• • •		
ĺ		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-9%	
I	17	03:53	03:39	11:56	13:15	00:48		
İ	18	03:24	03:09	11:57	14:07	01:42		
į	19	02:54	02:39	11:57	14:56	02:32		

#### December 20, 21, 22 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
0	89°6.41	204°43.63	\$20°14.79	268°44.65	N02°18.95	246°59.26	S07°57.18	55°50.02	N10°39.49	Alpheratz	357°31.36
1	104°8.88	219°42.82	15.41	283°46.10	18.56	262°1.39	57.30	70°52.56	39.48	Ankaa	353°4.02
2	119°11.34	234°42.02	16.04	298°47.55	18.16	277° 3.52	57.43	85°55.10	39.47	Schedar	349°27.08
3 4	134° 13.80 149° 16.27	249°41.22 264°40.41	· · 16.66 17.28	313°49.01 328°50.46	· · 17.77 17.37	292°5.65 307°7.78	•• 57.55 57.68	100°57.64 116°0.18	· · 39.45 39.44	Diphda	348°44.04
5	164° 18.73	279°39.61	17.90	343°51.92	16.98	322° 9.91	57.80	131°2.72	39.42	Achernar	335°17.68
6	179°21.20	294°38.81	\$20°18.52	358°53.37	N02°16.58	337°12.04	507°57.92	146°5.26	N10°39.41	Hamal	327°47.32
7	194°23.66	309°38.00	19.14	13°54.83	16.19	$352^{\circ}14.16$	58.05	161°7.79	39.39	Polaris Acamar	311°51.35 315°9.08
8	209°26.12	324°37.20	19.76	28°56.28	15.80	7°16.29	58.17	176° 10.33	39.38	Menkar	314°2.53
9	224°28.59	339°36.39	• • 20.38	43°57.74	• • 15.40	22°18.42	• • 58.29	191°12.87	• • 39.37	Mirfak	308°23.13
10 11	239°31.05 254°33.52	354°35.58 9°34.78	21.00 21.61	58°59.20 74°0.65	15.01 14.61	37°20.55 52°22.68	58.42 58.54	206° 15.41 221° 17.95	39.35 39.34	Aldebaran	290°35.58
12	269° 35.98	24°33.97	\$20°22.23	89°2.11	N02°14.22	67°24.81	S07°58.66	236°20.49	N10°39.33	Rigel	281°0.44
13	284°38.44	39°33.16	22.84	104°3.57	13.83	82°26.94	58.78	251°23.03	39.31	Capella	280°16.63
14	299°40.91	54°32.35	23.45	119°5.03	13.44	97°29.07	58.91	266°25.56	39.30	Bellatrix Elnath	278°19.09 277°57.41
15	314° 43.37	69°31.54	• • 24.06	134°6.49	• • 13.04	112°31.21	• • 59.03	281°28.10	• • 39.29	Alnilam	275°34.13
16	329° 45.84 344° 48.30	84°30.74 99°29.93	24.67	149°7.95 164°9.41	12.65	127°33.34 142°35.47	59.15	296°30.64	39.27	Betelgeuse	270°48.26
17 18	359° 50.77	99 29.93 114° 29.12	25.28 \$20°25.89	104 9.41 179°10.87	12.26 N02°11.87	142 35.47 157°37.60	59.27 \$07°59.40	311°33.18 326°35.71	39.26 N10°39.25	Canopus	263°50.39
19	14°53.23	129°28.30	26.50	194°12.33	11.47	172°39.73	59.52	341°38.25	39.23	Sirius	258°23.05
20	29°55.69	144°27.49	27.11	209°13.79	11.08	187°41.86	59.64	356° 40.79	39.22	Adhara Procyon	255°2.95 244°47.17
21	44°58.16	$159^{\circ}26.68$	• • 27.71	224°15.25	•• 10.69	202°43.99	• • 59.76	11°43.32	• • 39.21	Pollux	244 47.17 243°13.07
22	60°0.62	174°25.87	28.32	239°16.71	10.30	217°46.13	07°59.89	26°45.86	39.19	Avior	234°12.79
23	75°3.09	189°25.06	28.92	254°18.17	9.91	232°48.26	08°0.01	41°48.40	39.18	Suhail	222°43.56
Mer.p	oass. 18:01	$\nu$ -0.8' d0.	.6′ m-3.92	$\nu 1.5' \ d$ -0	.4′ m0.81	$\nu 2.1' \ d0.$	$1^\prime$ m-1.85	$\nu 2.5' \ d$ -0	$0.0' \; \text{m} \\ 0.15$	Miaplacidus	221°36.75
										Alphard	217°44.38
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.89 193°37.12
0	90°5.55	204°24.25	\$20°29.52	269°19.64	N02°9.52	247°50.39	S08°0.13	56°50.93	N10°39.17	Dubne	193 37.12 182°21.69
1	105°8.01	219°23.43	30.12	284°21.10	9.12	262°52.52	0.25	71°53.47	39.15	Gienah	175°40.27
2	120° 10.48	234°22.62	30.72	299°22.56	8.73	277°54.66	0.37	86°56.00	39.14		172°56.38
3 4	135° 12.94 150° 15.41	249°21.80 264°20.99	· · 31.32 31.92	314°24.03 329°25.49	· · 8.34 7.95	292°56.79 307°58.92	· · 0.49 0.62	101°58.54 117°1.07	· · 39.13 39.12	1	171°47.99
5	165° 17.87	279° 20.17	32.52	344°26.95	7.56	323°1.06	0.74	132°3.61	39.10	Alioth	166°10.46
6	180°20.33	294° 19.36	520°33.12	359°28.42	N02°7.17	338° 3.19	508°0.86	147°6.15	N10°39.09	Spica Alkaid	158°19.02 152°49.82
7	$195^{\circ}22.80$	$309^{\circ}18.54$	33.71	$14^{\circ}29.88$	6.78	353° 5.32	0.98	$162^{\circ}8.68$	39.08	Hadar	148°31.63
8	210°25.26	324°17.73	34.31	29°31.35	6.39	8°7.46	1.10	177°11.21	39.07	Menkent	147°53.98
9	225°27.73	339°16.91	• • 34.90	44°32.82	• • 6.00	23° 9.59	. 1.22	192°13.75	• • 39.05	Arcturus	145°45.21
10 11	240°30.19 255°32.66	354° 16.09 9° 15.28	35.49 36.08	59°34.28 74°35.75	5.61 5.22	38°11.73 53°13.86	1.34 1.46	207° 16.28 222° 18.82	39.04 39.03	Rigil Kent.	139°36.15
12	270°35.12	24°14.46	\$20°36.67	89°37.22	N02°4.84	68°16.00	S08°1.58	237°21.35	N10°39.02	Kochab	137°21.00
13	285°37.58	39°13.64	37.26	104°38.68	4.45	83°18.13	1.70	252°23.89	39.01	Zuben'ubi Alphecca	136°52.68 126°1.36
14	300° 40.05	54° 12.82	37.85	119°40.15	4.06	98°20.27	1.83	267°26.42	38.99	Antares	112° 12.23
15	315° 42.51	69°12.00	• • 38.44	134°41.62	• • 3.67	113°22.40	• 1.95	282°28.95	• • 38.98	Atria	107°4.04
16 17	330° 44.98 345° 47.44	84°11.18 99°10.36	39.02 39.61	149°43.09 164°44.56	3.28 2.89	128°24.54 143°26.67	2.07 2.19	297°31.49 312°34.02	38.97 38.96	Sabik	$101^{\circ}59.44$
18	0°49.90	114°9.54	\$20°40.19	179°46.03	N02°2.51	158°28.81	S08°2.31	327°36.55	N10°38.95	Shaula	96°6.42
19	15°52.37	129°8.72	40.78	194°47.50	2.12	173°30.94	2.43	342°39.08	38.94	Rasalhague Eltanin	95°55.92 90°41.24
20	$30^{\circ}54.83$	144°7.90	41.36	209°48.97	1.73	188°33.08	2.55	357°41.62	38.92	Kaus Aust.	83°28.68
21	45°57.30	159°7.07	• • 41.94	224°50.44	• • 1.34	203°35.22	• • 2.67	12°44.15	· · 38.91	Vega	80°31.47
22	60°59.76	174°6.25	42.52	239°51.91	0.96	218°37.35	2.79	27°46.68	38.90	Nunki	75°44.17
23	76°2.22	189°5.43	43.10	254°53.38	0.57	233°39.49	2.91	42°49.21	38.89	Altair	61°57.13
Mer.p	bass. 17:57	$\nu$ -0.8′ d0.	.6′ m-3.92	$\nu 1.5' \ d$ -0	.4′ m0.79	$\nu 2.1' \ d0.$	1′ m-1.85	$\nu 2.5' \ d-0$	0.0′ m0.15	Peacock	53°1.29
										Deneb Enif	49°23.92 33°35.82
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.23
0	91°4.69	204°4.60	S20°43.68	269°54.85	N02°0.18	248°41.63	S08°3.03	57°51.75	N10°38.88	Fomalhaut	$15^{\circ}11.14$
1	106°7.15	219°3.78	44.25	284°56.33	01°59.80	263°43.77	3.15	72°54.28	38.87	Scheat	$13^{\circ}42.12$
2	121°9.62 136°12.08	234°2.96 249°2.13	44.83 •• 45.41	299°57.80 314°59.27	59.41 •• 59.02	278°45.90 293°48.04	3.27 · · 3.38	87°56.81 102°59.34	38.86 •• 38.84	Markab	13°26.75
4	150° 12.00 151° 14.54	264°1.31	45.41	330° 0.75	58.64	308°50.18	3.50	118°1.87	38.83	Dec 20 Wed	SHA
5	$166^{\circ}17.01$	279°0.48	46.55	345°2.22	58.25	323°52.32	3.62	133°4.40	38.82	Venus	115°37.22
6	181° 19.47	293°59.65	520°47.12	0°3.70	N01°57.87	338°54.46	508°3.74	148°6.93	N10°38.81		179°38.23
7	196°21.94	308°58.83	47.70	15°5.17	57.48	353°56.59	3.86	163°9.46	38.80		157°52.85
8 9	211°24.40 226°26.87	323°58.00 338°57.17	48.27 •• 48.83	30° 6.65 45° 8.12	57.10 •• 56.71	8°58.73 24°0.87	3.98 •• 4.10	178° 11.99 193° 14.53	38.79 •• 38.78	Saturn	326°43.61
10	241°29.33	353° 56.35	49.40	60° 9.60	56.33	39° 3.01	4.10	208° 17.06	38.77	Dec 21 Thu	SHA
11	256°31.79	8°55.52	49.97	75°11.07	55.94	54°5.15	4.34	223° 19.59	38.76		114°18.70
12	271°34.26	23°54.69	\$20°50.53	90°12.55	N01°55.56	69°7.29	S08°4.46	238°22.11	N10°38.75	Mars Jupiter	179°14.09 157°44.84
13	286° 36.72	38°53.86	51.10	105°14.03	55.17	84° 9.43	4.57	253°24.64	38.74	Saturn	326°45.38
14	301°39.19	53°53.03	51.66	120°15.51	54.79	99°11.57	4.69	268°27.17	38.73		
15 16	316° 41.65 331° 44.11	68°52.20 83°51.37	• • 52.23 52.79	135°16.98 150°18.46	•• 54.40 54.02	114°13.71 129°15.85	· · 4.81 4.93	283°29.70 298°32.23	· · 38.72 38.71	Dec 22 Fri	SHA 112°50 02
17	346° 46.58	98° 50.54	52.79	165°19.94	53.64	129 15.65 144°17.99	4.93 5.05	313°34.76	38.70		112°59.92 178°50.17
18	1°49.04		S20°53.91	180°21.42	N01°53.25	159°20.13	S08°5.17	328° 37.29	N10°38.69		157°36.94
19	16°51.51	128°48.88	54.46	195°22.90	52.87	174°22.27	5.28	343°39.82	38.68	Saturn	326°47.06
20	31°53.97	143°48.04	55.02	210°24.38	52.49	189°24.41	5.40	358° 42.35	38.67	Horizon	ntal parallax
21 22	46°56.43 61°58.90	158° 47.21 173° 46.38	· · 55.58 56.13	225°25.86 240°27.34	· · 52.10 51.72	204°26.56 219°28.70	· · 5.52 5.64	13°44.87 28°47.40	· · 38.66 38.65	11011201	Venus:
23	77°1.36	173 40.36 188° 45.54	56.69	255°28.82	51.72	234°30.84	5.76	43°49.93	38.64		Mars:
	pass. 17:53		.6′ m-3.92		.4′ m0.77		1′ m-1.86		0.0' m0.16	-	
14161.		ν 0.0 d0.		ν1.5 u-0		ν Δ.1 UU.		ν Δ.J U-U	1110.10		

Dec

29°15.30

-42°9.04

56°42 14

-17°49.67

-57°5.58

 $23^{\circ}36.11$ 

89°23.29

-40°11.45

4°12.21

49°57.96

 $16^{\circ}34.01$ -8°10.18

 $46^{\circ}1.54$ 

 $6^{\circ}22.46$ 

28°37.81

 $-1^{\circ}11.10$ 

 $7^{\circ}24.63$ 

-52°42.70

-16°45.45

-29°0.75

 $27^{\circ}57.13$ 

-59°36.07

-43°32.92

-69°50.03

-8°47.16

11°49.32

 $61^{\circ}35.25$ 

 $14^{\circ}24.41$ 

-17°42.16

 $-63^{\circ}15.37$ 

-57°16.33

55°47.79

-11°18.75

-60°30.52

-36°30.60

-60°57.07

 $19^{\circ}1.76$ 

 $74^{\circ}1.87$ 

-16°9.66

26°36.95 -26°29.64

-69°4.55

-15°45.53

 $-37^{\circ}7.34$ 

 $12^{\circ}32.42$ 

51°29.16

-34°22.12

38°48.76

-26°15.52

8°56.86 -56°38.50

 $45^{\circ}23.31$ 

 $10^{\circ}0.67$ 

-46°49.30

-29°28.15

28°14.69

15°21.89

Mer.pass

10:22

06:04

07:31

20:13

10:23

06:02

07:28

20:09

10:24

06:00

07:24

20:05

0.1

0.1

Mer.pass

Mer.pass

49°9.82

5°8.88

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.12	\$23°25.73	131°55.76	13.8'	\$13°31.67	-11.4'	55.4'
1	195°35.81	25.75	146°28.52	13.8'	13°20.27	-11.4	55.4'
2	210°35.50	25.78	161°1.34	13.9'	13°8.82	-11.5'	55.3'
3	225°35.19	• • 25.80	175°34.25	14.0'	12°57.33	-11.5'	55.3'
4	240°34.88	25.83	190°7.22	14.0'	12°45.79	-11.6'	55.3'
5	255°34.57	25.85	204°40.27	14.1'	12°34.21	-11.6'	55.3'
6	270°34.26	S23°25.87	219°13.40	14.2'	S12°22.59	-11.7'	55.2'
7	285°33.95	25.89	233°46.59	14.3'	12°10.92	-11.7'	55.2'
8	300°33.64	25.91	248°19.85	14.3'	11°59.22	-11.7'	55.2'
9	315°33.32	• • 25.93	262°53.18	14.4'	11°47.48	-11.8'	55.2'
10	330°33.01	25.95	277°26.58	14.5'	11°35.69	-11.8'	55.2'
11	345°32.70	25.97	292°0.05	14.5'	11°23.87	-11.9'	55.1'
12	0°32.39	\$23°25.99	306°33.58	14.6'	S11°12.01	-11.9'	55.1'
13	15°32.08	26.00	321°7.18	14.7'	11°0.12	-11.9'	55.1'
14	30°31.77 45°31.46	26.02	335°40.85 350°14.57	14.7'	10°48.19 10°36.23	-12.0'	55.1'
15 16	45 31.46 60°31.15	· · 26.03 26.05	4°48.36	14.8' 14.9'	10 30.23 10°24.24	-12.0' -12.0'	55.0' 55.0'
17	75°30.84	26.06	19°22.21	14.9'	10° 24.24 10° 12.21	-12.1'	55.0'
18	90°30.53	\$23°26.07	33°56.12	15.0'	S10°0.15	-12.1'	55.0'
19	105°30.22	26.08	48°30.12	15.0'	09°48.06	-12.1'	55.0'
20	105 30.22 120°29.91	26.08	63°4.12	15.1'	09 46.00 09°35.95	-12.1'	54.9'
21	135°29.59	. 26.10	77°38.21	15.1'	09° 23.80	-12.1 -12.2'	54.9'
22	150°29.28	26.11	92°12.35	15.2'	09°11.63	-12.2'	54.9'
23	165°28.97	26.12	106°46.55	15.3'	08°59.43	-12.2'	54.9'
	SD = 16.2'	d = 0.0'		51	O = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.66	\$23°26.13	121°20.81	15.3'	S08°47.20	-12.3'	54.9'
1	195°28.35	26.13	135°55.11	15.4'	08°34.95	-12.3'	54.8'
2	210°28.04	26.14	150°29.47	15.4'	08°22.67	-12.3'	54.8'
3	225°27.73	26.14	165°3.88	15.5'	08°10.37	-12.3'	54.8'
4	240°27.42	26.15	179°38.34	15.5'	07°58.05	-12.3'	54.8'
5	255°27.11	26.15	194°12.85	15.6'	07°45.70	-12.4'	54.8'
6	270°26.79	S23°26.15	208°47.41	15.6'	S07°33.34	-12.4'	54.7'
7	285°26.48	26.15	223°22.02	15.7'	07°20.95	-12.4'	54.7'
8	300°26.17	26.15	237°56.67	15.7'	07°8.54	-12.4'	54.7'
9	315°25.86	• • 26.15	252°31.37	15.7'	06°56.12	-12.4'	54.7'
10	330°25.55	26.15	267°6.11	15.8'	06°43.68	-12.5'	54.7'
11	345°25.24	26.15	281°40.90	15.8'	06°31.22 \$06°18.74	-12.5'	54.7'
12	0°24.93	\$23°26.15 26.14	296°15.72	15.9'	06°6.25	-12.5' -12.5'	54.6'
13 14	15°24.62 30°24.31	26.14 26.14	310°50.59 325°25.50	15.9' 15.9'	05°53.74	-12.5' -12.5'	54.6' 54.6'
15	45°23.99	. 26.13	340° 0.45	16.0'	05°41.22	-12.5'	54.6
16	60°23.68	26.13	354° 35.43	16.0'	05°28.69	-12.5'	54.6'
17	75°23.37	26.12	9°10.45	16.1	05°16.14	-12.6'	54.6'
18	90°23.06	\$23°26.11	23°45.51	16.1	S05°3.58	-12.6'	54.5'
19	105°22.75	26.11	38°20.60	16.1'	04°51.01	-12.6'	54.5'
20	120°22.44	26.10	52°55.73	16.2'	04°38.42	-12.6'	54.5'
21	135°22.13	• • 26.09	67°30.89	16.2'	04°25.83	-12.6'	54.5'
22	150°21.82	26.08	82°6.08	16.2'	04°13.23	-12.6'	54.5'
23	165°21.51	26.06	96°41.30	16.3'	04°0.62	-12.6'	54.5'
	SD = 16.3'	d = 0.0'		SI	D = 15.0'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°21.19	\$23°26.05	111°16.55	16.3'	503°48.00	-12.6'	54.5'
1	195°20.88	26.04	125°51.83	16.3'	03°35.38	-12.6'	54.4'
2	210°20.57	26.02	140°27.14	16.3'	03°22.74	-12.6'	54.4'
3	225°20.26	• • 26.01	155°2.47	16.4'	03°10.11 02°57.46	-12.6'	54.4'
4 5	240°19.95 255°19.64	25.99 25.98	169°37.83 184°13.21	16.4' 16.4'	02°57.46 02°44.82	-12.6' -12.7'	54.4' 54.4'
6	255 19.04 270°19.33	25.98 \$23°25.96	184 13.21 198°48.61	16.4	502°32.16	-12.7'	54.4'
7	270 19.33 285°19.02	25.94	213°24.04	16.4	02°19.51	-12.7'	54.4'
8	300°18.71	25.92	213° 24.04 227° 59.49	16.5	02 19.31 02°6.85	-12.7'	54.4'
9	315°18.39	• • 25.90	242°34.95	16.5	01°54.19	-12.7'	54.3'
10	330°18.08	25.88	257°10.44	16.5'	01°41.53	-12.7'	54.3'
11	345°17.77	25.86	271°45.95	16.5'	01°28.87	-12.7'	54.3'
12	0°17.46	\$23°25.84	286°21.47	16.5'	S01°16.21	-12.7'	54.3'
13	15°17.15	25.82	300°57.00	16.6'	$01^{\circ}3.55$	-12.7'	54.3'
14	30°16.84	25.79	315°32.55	16.6'	00°50.89	-12.7'	54.3'
15	45°16.53	• • 25.77	330°8.12	16.6'	00°38.23	-12.7'	54.3'
16	60°16.22	25.74	344°43.69	16.6'	00°25.57	-12.7'	54.3'
17	75°15.91	25.72	359°19.28	16.6'	00°12.92	-12.6'	54.3'
18	90°15.59	\$23°25.69	13°54.88	16.6'	\$00°0.27	-12.6'	54.3'
19	105°15.28 120°14.97	25.66	28°30.49	16.6'	N00°12.37 00°25.01	12.6'	54.3'
20 21	120°14.97 135°14.66	25.63 •• 25.60	43°6.11 57°41.73	16.6' 16.6'	00°25.01 00°37.65	12.6' 12.6'	54.2' 54.2'
21	135°14.66 150°14.35	25.60 25.57	57°41.73 72°17.36	16.6'	00°37.65 00°50.27	12.6'	54.2' 54.2'
22	165°14.04	25.5 <i>1</i> 25.54	72 17.30 86°52.99	16.6'	00 50.27 01°2.90	12.6'	54.2'
23			- 55 52.33			14.0	J T. Z
	SD = 16.3'	d = -0.0'		SI	O = 14.9'		

	Twi	light			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	08:04	09:02	14:54	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:42	08:30	15:27	16:14	17:03
54°	06:47	07:33	08:17	15:39	16:23	17:10
52°	06:41	07:25	08:06	15:51	16:32	17:15
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:24	07:01	07:35	16:21	16:55	17:32
<b>N</b> 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
<b>N</b> 10°	05:23	05:49	06:12	17:45	18:07	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
<b>S</b> 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°	02:42	03:32	04:10	19:47	20:24	21:14
<b>S</b> 50°	01:57	03:02	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:20	21:09	22:28
54°	00:42	02:29	03:24	20:33	21:27	23:15
56°	////	02:07	03:10	20:47	21:50	////
58°	////	01:37	02:53	21:04	22:20	////
<b>S</b> 60°	////	00:46	02:32	21:24	23:11	////

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

			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
L		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-32%	
	20	02:24	02:10	11:58	15:40	03:18		
	21	01:55	01:40	11:58	16:22	04:01		
	22	01:25	01:10	11:59	17:03	04:43		

## December 23, 24, 25 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	92°3.83	203°44.71 <b>S</b> 20°57.24	270°30.31 N01°50.96	249°32.98	58°52.46 N10°38.63	
1	$107^{\circ}6.29$	218° 43.88 57.79	285°31.79 50.58	264°35.12 5.99	73°54.99 38.62	Alpheratz 357°31.38 29°15.29 Ankaa 353°4.04 -42°9.04
2	122°8.75	233°43.04 58.34	300°33.27 50.19	279°37.27 6.11	88°57.51 38.61	Schedar 349°27.11 56°42.14
3	137°11.22	248° 42.21 · · 58.89	315°34.75 · · 49.81	294°39.41 · · 6.23	104°0.04 · · 38.60	Diphda 348°44.05 -17°49.68
4	152° 13.68	263°41.37 20°59.44	330°36.24 49.43	309°41.55 6.34	119°2.57 38.59	Achernar 335°17.70 -57°5.58
5 6	167° 16.15 182° 18.61	278°40.54 20°59.99 293°39.70 \$21°0.54	345°37.72 49.05 0°39.21 N01°48.67	324°43.69 6.46 339°45.84 \$08°6.58	134°5.09 38.58 149°7.62 N10°38.57	Hamal 327°47.33 23°36.11
7	197°21.08	308°38.86 1.08	15°40.69 48.29	354°47.98 6.69	164°10.15 38.56	Polaris 311°52.31 89°23.31
8	212°23.54	323°38.02 1.63	30°42.18 47.91	9°50.12 6.81	179° 12.67 38.55	Acamar 315°9.09 -40°11.46
9	227°26.00	338°37.19 · · 2.17	45°43.66 · · 47.53	24°52.27 · · 6.93	194° 15.20 · · 38.54	Menkar 314°2.54 4°12.21 Mirfak 308°23.14 49°57.97
10	242°28.47	353°36.35 2.72	60°45.15 47.15	39°54.41 7.04	209° 17.72 38.53	Aldebaran 290°35.58 16°34.01
11	257°30.93	8°35.51 3.26	75°46.63 46.77	54°56.56 7.16	224°20.25 38.52	Rigel 281°0.44 -8°10.19
12	272°33.40 287°35.86	23°34.67 <b>S</b> 21°3.80 38°33.83 4.34	90°48.12 N01°46.39 105°49.61 46.01	69°58.70 \$08°7.28 85°0.85 7.39	239°22.78 N10°38.51 254°25.30 38.50	Capella 280°16.63 46°1.55
13 14	302°38.32	38°33.83 4.34 53°32.99 4.88	105°49.61 46.01 120°51.10 45.63	85°0.85 7.39 100°2.99 7.51	254°25.30 38.50 269°27.83 38.50	Bellatrix 278°19.09 6°22.46
15	317° 40.79	68°32.15 · · 5.41	135°52.58 · · 45.25	115° 5.14 · · 7.63	284°30.35 · · 38.49	Elnath 277°57.40 28°37.81
16	332°43.25	83°31.31 5.95	150°54.07 44.87	130°7.28 7.74	299°32.88 38.48	Alnilam 275°34.12 -1°11.11 Betelgeuse 270°48.26 7°24.63
17	347° 45.72	98°30.47 6.49	165°55.56 44.49	145° 9.43 7.86	314°35.40 38.47	Betelgeuse 270°48.26 7°24.63   Canopus 263°50.39 -52°42.72
18	2°48.18	113°29.63	180°57.05 N01°44.11	160°11.57 S08°7.97	329°37.93 N10°38.46	Sirius 258°23.04 -16°45.46
19	17°50.64	128°28.79 7.55	195°58.54 43.73	175°13.72 8.09	344°40.45 38.45	Adhara 255°2.94 -29°0.76
20 21	32°53.11 47°55.57	143°27.95 8.09 158°27.10 · · 8.62	211° 0.03 43.35 226° 1.52 • 42.98	190°15.86 8.21 205°18.01 • 8.32	359°42.97 38.44 14°45.50 · · 38.44	Procyon 244°47.16 5°8.87
22	62°58.04	173°26.26 9.15	241°3.01 42.60	200°20.16 8.44	29°48.02 38.43	Pollux 243°13.05 27°57.13
23	78° 0.50	188°25.42 9.68	256° 4.50 42.22	235°22.30 8.55	44°50.54 38.42	Avior 234°12.77 -59°36.08
_						Suhail 222°43.54 -43°32.94
ivier.p	pass. 17:49	ν-0.8' d0.6' m-3.92	$\nu 1.5' \ d$ -0.4' m0.76	ν2.1′ d0.1′ m-1.86	ν2.5' d-0.0' m0.16	Miaplacidus 221°36.72 -69°50.04   Alphard 217°44.36 -8°47.17
						Regulus 207°30.87 11°49.31
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°37.08 61°35.25
0	93°2.96	203°24.57	271°5.99 N01°41.84	250°24.45	59°53.07 N10°38.41	Denebola 182°21.67 14°24.40
1 2	108°5.43 123°7.89	218°23.73 10.73 233°22.88 11.26	286°7.49 41.47 301°8.98 41.09	265°26.60 8.78 280°28.74 8.90	74°55.59 38.40 89°58.11 38.39	Gienah 175°40.25 -17°42.17
3	138° 10.36	248°22.04 · · 11.78	316°10.47 · · 40.71	295°30.89 · · 9.01	105°0.64 · · 38.39	Acrux 172°56.34 -63°15.37
4	153° 12.82	263°21.19 12.30	331°11.97 40.33	310°33.04 9.13	120°3.16 38.38	Gacrux 171°47.95 -57°16.33
5	$168^{\circ}15.28$	278°20.35 12.83	346°13.46 39.96	325°35.19 9.24	135°5.68 38.37	Alioth 166°10.42 55°47.78 Spica 158°19.00 -11°18.76
6	183° 17.75	293°19.50 <b>S</b> 21°13.35	1°14.95 N01°39.58	340°37.34 \$08°9.36	150°8.20 N10°38.36	Alkaid 152°49.80 49°9.81
7	198°20.21	308° 18.65 13.87	16°16.45 39.21	355°39.48 9.47	165°10.73 38.36	Hadar 148°31.59 -60°30.52
8 9	213°22.68	323°17.81 14.39	31°17.94 38.83	10°41.63 9.59	180°13.25 38.35 195°15.77 · · 38.34	Menkent 147°53.96 -36°30.60
10	228°25.14 243°27.61	338°16.96 · · 14.91 353°16.11 15.42	46°19.44 · · 38.45 61°20.94 38.08	25°43.78 · · 9.70 40°45.93 9.82	195°15.77 · · 38.34 210°18.29 38.33	Arcturus 145°45.19 19°1.75
11	258° 30.07	8°15.26 15.94	76°22.43 37.70	55°48.08 9.93	225°20.81 38.32	Rigil Kent. 139°36.12 -60°57.07
12	273°32.53	23°14.41 S21°16.46	91°23.93 N01°37.33	70°50.23 \$08°10.05	240°23.33 N10°38.32	Kochab 137°20.96 74°1.86
13	288°35.00	38°13.56 16.97	106°25.43 36.95	85°52.38 10.16	255°25.86 38.31	Zuben'ubi 136°52.66 -16°9.66 Alphecca 126°1.35 26°36.93
14	303°37.46	53°12.71 17.48	121°26.92 36.58	100°54.53 10.28	270°28.38 38.30	Antares 112°12.21 -26°29.64
15	318° 39.93	68°11.86 · · 17.99	136°28.42 · · 36.20	115°56.68 · · 10.39	285°30.90 · · 38.30	Atria 107°4.01 -69°4.54
16 17	333° 42.39 348° 44.85	83°11.01 18.51 98°10.16 19.02	151°29.92 35.83 166°31.42 35.45	130°58.83 10.50 146°0.98 10.62	300°33.42 38.29 315°35.94 38.28	Sabik 101°59.43 -15°45.53
18	3° 47.32	113°9.31 <b>S</b> 21°19.52	181°32.92 N01°35.08	161°3.13 \$08°10.73	330°38.46 N10°38.27	Shaula 96°6.42 -37°7.33
19	18° 49.78	128°8.46 20.03	196°34.42 34.71	176° 5.28 10.85	345°40.98 38.27	Rasalhague 95°55.91 12°32.41
20	33°52.25	143°7.61 20.54	211°35.92 34.33	191°7.43 10.96	0°43.50 38.26	Eltanin 90°41.24 51°29.14 Kaus Aust. 83°28.67 -34°22.12
21	48°54.71	158°6.76 · · 21.04	226°37.42 · · 33.96	206°9.58 · · 11.07	15°46.02 · · 38.25	Vega 80°31.47 38°48.74
22	63°57.17	173°5.90 21.55	241°38.92 33.59	221°11.73 11.19	30° 48.54 38.25	Nunki 75°44.17 -26°15.52
23	78°59.64	188°5.05 22.05	256°40.42 33.21	236°13.88 11.30	45°51.06 38.24	Altair 61°57.13 8°56.85
Mer.p	pass. 17:45	$\nu$ -0.8′ $d$ 0.5′ $m$ -3.92	$ u 1.5' \ d$ -0.4 $' \ { m m} 0.74$	$ u 2.1' \ d0.1' \ \text{m-}1.87$	$ u 2.5' \ d$ -0.0' m0.17	Peacock 53°1.30 -56°38.49
						Deneb 49°23.93 45°23.30
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°35.83 10°0.66 Al Na'ir 27°29.24 -46°49.30
0	94°2.10	203°4.20 <b>S</b> 21°22.55	271°41.92 N01°32.84	251°16.04 \$08°11.41	60°53.57 N10°38.23	Al Na'ir 27°29.24 -46°49.30 Fomalhaut 15°11.16 -29°28.15
1	109°4.57	218°3.34 23.06	286°43.43 32.47	266°18.19 11.53	75°56.09 38.23	Scheat 13°42.14 28°14.68
2	124°7.03	233°2.49 23.56	301°44.93 32.09	281°20.34 11.64	90°58.61 38.22	Markab 13°26.76 15°21.88
3 4	139°9.49 154°11.96	248°1.63 · · 24.05 263°0.78 24.55	316°46.43 · · 31.72 331°47.94 31.35	296°22.49 · · 11.75 311°24.65	106°1.13 · · 38.21 121°3.65 38.21	Dec 23 Sat SHA Mer.pass
5	169° 14.42	203 0.76 24.35 277°59.92 25.05	346°49.44 30.98	326°26.80 11.98	136°6.17 38.20	Venus 111° 40.88 10:26
6	184° 16.89	292°59.07 S21°25.55	1°50.94 N01°30.61	341°28.95 \$08°12.09	151°8.69 N10°38.19	Mars 178° 26.48 05:57
7	$199^{\circ}19.35$	307°58.21 26.04	16°52.45 30.24	356°31.11 12.20	166°11.20 38.19	Jupiter 157°29.16 07:21
8	214°21.82	322°57.35 26.53	31°53.95 29.86	11°33.26 12.32	181°13.72 38.18	Saturn 326°48.63 20:01
9	229°24.28	337°56.50 · · 27.03	46°55.46 · · 29.49	26°35.41 · · 12.43	196°16.24 · · 38.18	Dec 24 Sun SHA Mer.pass
10 11	244°26.74 259°29.21	352°55.64 27.52 7°54.78 28.01	61°56.97 29.12 76°58.47 28.75	41°37.57 12.54 56°39.72 12.65	211°18.76 38.17 226°21.27 38.16	Venus 110°21.61 10:27
12	259 29.21 274°31.67	22°53.92 \$21°28.50	91°59.98 N01°28.38	71°41.87 S08°12.77	241°23.79 N10°38.16	Mars 178° 3.03 05:55
13	289°34.14	37°53.06 28.99	107°1.49 28.01	86°44.03 12.88	256°26.31 38.15	Jupiter 157°21.49 07:17
14	304°36.60	52°52.20 29.47	122°3.00 27.64	101°46.18 12.99	271°28.82 38.15	Saturn 326°50.10 19:57
15	319°39.06	67°51.34 · · 29.96	137°4.50 · · 27.27	116°48.34 · · 13.10	286°31.34 · · 38.14	Dec 25 Mon SHA Mer.pass
16	334° 41.53	82°50.48 30.44	152°6.01 26.90	131°50.49 13.21	301°33.86 38.14	Venus 109°2.09 10:28
17	349° 43.99	97°49.62 30.93 112°48.76 \$21°31.41	167°7.52 26.53	146°52.65 13.33	316°36.37 38.13	Mars 177°39.82 05:53
18 19	4° 46.46 19° 48.92	112°48.76	182°9.03 N01°26.16 197°10.54 25.79	161°54.80 S08°13.44 176°56.96 13.55	331°38.89 N10°38.12 346°41.40 38.12	Jupiter 157°13.93 07:14 Saturn 326°51.47 19:53
20	34°51.38	142°47.04 32.37	212°12.05 25.43	191°59.12 13.66	1°43.92 38.11	Saturn 326°51.47 19:53
21	49°53.85	157°46.18 · · 32.85	227°13.56 · · 25.06	207°1.27 · · 13.77	16°46.43 · · 38.11	Horizontal parallax
22	64°56.31	172°45.32 33.33	242°15.07 24.69	222° 3.43 13.88	31°48.95 38.10	Venus: 0.1
23	79°58.78	187°44.45 33.81	257°16.59 24.32	237° 5.59 13.99	46°51.46 38.10	Mars: 0.1
Mer.p	pass. 17:41	ν-0.9' d0.5' m-3.92	ν1.5' d-0.4' m0.73	ν2.2' d0.1' m-1.87	ν2.5' d-0.0' m0.17	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.73	\$23°25.51	$101^{\circ}28.63$	16.6'	$N01^{\circ}15.51$	12.6'	54.2'
1	195°13.42	25.48	116°4.27	16.6'	01°28.12	12.6'	54.2'
2 3	210°13.11 225°12.80	25.44 •• 25.41	130°39.92 145°15.56	16.6' 16.6'	01°40.71 01°53.30	12.6' 12.6'	54.2' 54.2'
4	240°12.49	25.37	159°51.20	16.6'	02°5.88	12.6'	54.2'
5	255°12.17	25.34	174° 26.85	16.6'	02° 18.45	12.6'	54.2'
6	270°11.86	\$23°25.30	189°2.49	16.6'	N02°31.00	12.5'	54.2'
7	285°11.55	25.26	203°38.12	16.6'	02°43.55	12.5'	54.2'
8 9	300°11.24 315°10.93	25.22 •• 25.18	218° 13.75 232° 49.38	16.6' 16.6'	02°56.08 03°8.60	12.5' 12.5'	54.2' 54.2'
10	330°10.62	25.14	247°25.00	16.6'	03°21.11	12.5'	54.2'
11	345°10.31	25.10	262°0.61	16.6'	03°33.60	12.5'	54.2'
12	0°10.00	\$23°25.06	276°36.22	16.6'	N03°46.08	12.5'	54.2'
13 14	15°9.69 30°9.38	25.02 24.97	291°11.81 305°47.40	16.6' 16.6'	03°58.54 04°10.99	12.4' 12.4'	54.2' 54.2'
14 15	30 9.38 45°9.07	24.93	305 47.40 320°22.97	16.6	04 10.99 04°23.42	12.4	54.2'
16	60°8.76	24.88	334°58.53	16.5'	04°35.83	12.4'	54.2'
17	75°8.45	24.84	349°34.07	16.5'	04°48.23	12.4'	54.2'
18	90°8.14	\$23°24.79	4°9.60	16.5'	N05°0.61	12.4'	54.1'
19 20	105°7.83 120°7.52	24.74 24.70	18° 45.12 33° 20.61	16.5' 16.5'	05° 12.97 05° 25.31	12.3' 12.3'	54.1' 54.1'
21	135°7.20	• • 24.65	47°56.09	16.5'	05°25.51	12.3'	54.1'
22	150°6.89	24.60	62°31.55	16.4'	05°49.92	12.3'	54.1'
23	165°6.58	24.55	77°6.99	16.4'	06°2.20	12.3'	54.1'
	SD = 16.3'	d = -0.0'	_	SE	0 = 14.8'		
Sun	GHA	Dec	GHA		Dec	d	НР
<b>5</b> un 0	180°6.27	<b>S</b> 23°24.49	91°42.41	u 16.4'	Dec N06° 14.46	a 12.2'	пР 54.1'
1	195°5.96	24.44	106° 17.81	16.4'	06°26.69	12.2'	54.2'
2	210°5.65	24.39	120°53.18	16.3'	06°38.90	12.2'	54.2'
3	225°5.34	• • 24.33	135°28.53	16.3'	06°51.09	12.2'	54.2'
4 5	240°5.03 255°4.72	24.28 24.22	150°3.86 164°39.16	16.3' 16.3'	07°3.25 07°15.38	12.1' 12.1'	54.2' 54.2'
6	270° 4.41	\$23°24.17	179° 14.43	16.2'	N07°27.49	12.1'	54.2'
7	285°4.10	24.11	193°49.67	16.2'	$07^{\circ}39.58$	12.1'	54.2'
8	300°3.79	24.05	208°24.88	16.2'	07°51.64	12.0'	54.2'
9	315°3.48 330°3.17	• • 23.99	223°0.07 237°35.22	16.2' 16.1'	08°3.67 08°15.67	12.0'	54.2' 54.2'
10 11	345°2.86	23.93 23.87	257 35.22 252°10.34	16.1	08 15.67 08°27.64	12.0' 11.9'	54.2'
12	0°2.55	\$23°23.81	266° 45.43	16.1'	N08° 39.58	11.9'	54.2'
13	15°2.24	23.75	281°20.48	16.0'	08°51.50	11.9'	54.2'
14	30°1.93	23.68	295°55.50	16.0'	09°3.38 09°15.23	11.9'	54.2'
15 16	45°1.62 60°1.31	· · 23.62 23.56	310°30.48 325°5.42	15.9' 15.9'	09° 15.23 09° 27.05	11.8' 11.8'	54.2' 54.2'
17	75°1.00	23.49	339° 40.33	15.9'	09°38.83	11.8'	54.2'
18	90°0.69	S23°23.42	$354^{\circ}15.19$	15.8'	N09° 50.58	11.7'	54.2'
19	105°0.38	23.36	8°50.02	15.8'	10°2.30	11.7'	54.2'
20 21	120°0.07 134°59.77	23.29 •• 23.22	23°24.81 37°59.55	15.7' 15.7'	10° 13.98 10° 25.63	11.6' 11.6'	54.2' 54.2'
22	149°59.46	23.15	52° 34.25	15.7'	10°25.03 10°37.24	11.6'	54.2'
23	164°59.15	23.08	67°8.91	15.6'	10°48.82	11.5'	54.3'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.84	\$23°23.01	81°43.52	15.6'	N11°0.35	11.5'	54.3'
1	194°58.53	22.94	96°18.09	15.5'	11°11.85	11.5'	54.3'
2	209°58.22 224°57.91	22.86	110°52.60 125°27.08	15.5'	11°23.31 11°34.73	11.4'	54.3'
3 4	224°57.91 239°57.60	· · 22.79 22.72	125°27.08 140°1.50	15.4' 15.4'	11°34.73 11°46.11	11.4' 11.3'	54.3' 54.3'
5	254°57.29	22.64	154° 35.87	15.4	11°57.44	11.3'	54.3'
6	269°56.98	S23°22.56	169°10.19	15.3'	N12°8.74	11.3'	54.3'
7	284°56.67	22.49	183°44.46	15.2'	12° 19.99	11.2'	54.3'
8 9	299°56.36 314°56.05	22.41 •• 22.33	198° 18.68 212° 52.85	15.2' 15.1'	12°31.20 12°42.36	11.2' 11.1'	54.3' 54.3'
10	314 56.05 329 55.75	22.33	212°52.85 227°26.96	15.1' 15.1'	12° 42.36 12° 53.48	11.1	54.4'
11	344°55.44	22.17	242°1.01	15.0'	13°4.55	11.0'	54.4'
12	359°55.13	S23°22.09	256° 35.01	14.9'	N13° 15.58	11.0'	54.4'
13	14°54.82	22.01	271°8.96	14.9'	13°26.56	10.9'	54.4'
14 15	29°54.51 44°54.20	21.93 •• 21.84	285° 42.84 300° 16.67	14.8' 14.8'	13°37.49 13°48.37	10.9' 10.8'	54.4' 54.4'
16	59°53.89	21.76	314° 50.44	14.7	13° 59.20	10.8	54.4
17	74°53.59	21.67	329°24.15	14.6'	14°9.98	10.7'	54.4'
18	89°53.28	S23°21.59	343°57.79	14.6'	N14°20.71	10.7'	54.5'
19 20	104°52.97 119°52.66	21.50 21.41	358°31.38 13°4.90	14.5' 14.5'	14°31.39 14°42.02	10.6' 10.6'	54.5' 54.5'
20	119 52.00 134°52.35	21.41	27°38.35	14.5 14.4'	14° 42.02 14° 52.59	10.5	54.5'
22	149°52.04	21.24	42°11.75	14.3'	15°3.10	10.5	54.5
23	164°51.74	21.15	56°45.08	14.3'	15° 13.56	10.4'	54.5'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		

_	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	08:27	10:58			13:02	15:33
N 70°	08:07	09:55			14:04	15:53
68°	07:51	09:20			14:40	16:09
66°	07:38	08:55	10:35	13:24	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	14:56	15:54	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:58
56°	06:54	07:44	08:31	15:29	16:16	17:05
54°	06:48	07:35	08:18	15:41	16:25	17:11
52°	06:43	07:26	08:07	15:52	16:33	17:17
50°	06:37	07:19	07:57	16:02	16:41	17:22
45°	06:26	07:03	07:37	16:23	16:57	17:34
<b>N</b> 40°	06:15	06:49	07:20	16:40	17:10	17:45
35°	06:06	06:37	07:06	16:54	17:22	17:54
30°	05:57	06:27	06:53	17:06	17:33	18:03
20°	05:41	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
<b>S</b> 10°	04:48	05:15	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	04:57	19:02	19:30	20:03
35° 40°	03:38	04:15	04:44	19:15	19:45	20:22
40° 45°	03:15	03:57	04:29	19:30	20:03	20:45
	02:44	03:34	04:11	19:48	20:26	21:15
<b>S</b> 50°	01:59	03:04	03:49	20:11	20:55	22:01
52° 54°	01:31 00:44	02:49 02:31	03:38 03:26	20:22 20:34	21:10 21:28	22:29 23:15
54°	////	02:31	03:26	20:34	21:28 21:51	23:15 ////
58°	1///	02:09	03:11	20:48	22:20	1111
S 60°	1111	01.39	02:34	21:25	23:10	////
						,

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Mer.Pass.		
- 4,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-60%	
23	00:55	00:40	11:59	17:43	05:23		
24	00:25	00:10	12:00	18:24	06:03		
25	00:05	00:19	12:00	19:06	06:45		

## December 26, 27, 28 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
0	95°1.24	202° 43.59	S21°34.28	272°18.10	N01°23.95	252° 7.74	S08°14.10	61°53.98	N10°38.09		
1	110°3.71	217° 42.73	34.76	287° 19.61	23.58	267° 9.90	14.22	76°56.49	38.09	Alpheratz	$357^{\circ}31.39$
2	125°6.17	232°41.86	35.23	302°21.12	23.22	282°12.06	14.33	91°59.01	38.08	Ankaa	353°4.05
3	140°8.63	247°41.00	35.71	317°22.64	• • 22.85	297°14.21	•• 14.44	107°1.52	• • 38.08	Schedar	349°27.13
4	155° 11.10	262°40.13	36.18	332°24.15	22.48	312°16.37	14.55	122°4.04	38.07	Diphda	348°44.06
5	170° 13.56	277°39.27	36.65	347°25.67	22.11	327°18.53	14.66	137°6.55	38.07	Achernar	335°17.73
6	185° 16.03	292°38.40	S21°37.12	2°27.18	N01°21.75	342°20.69	S08°14.77	152°9.06	N10°38.06	Hamal	327°47.34
7	200° 18.49	307°37.54	37.59	17°28.70	21.38	357°22.85	14.88	167° 11.58	38.06	Polaris	311°53.16
8	215°20.95	322°36.67	38.05	32°30.21	21.02	12°25.00	14.99	182°14.09	38.06	Acamar	315°9.10
9	230°23.42	337°35.81	• • 38.52	47°31.73	20.65	27°27.16	. 15.10	197° 16.60	• • 38.05	Menkar	314°2.54
10	245°25.88	352°34.94	38.99	62°33.24	20.28	42°29.32	15.21	212° 19.12	38.05	Mirfak	308°23.15
11	260° 28.35	7°34.07	39.45	77°34.76	19.92	57°31.48	15.32	227°21.63	38.04	Aldebaran	290°35.58
12	275°30.81	22°33.20	S21°39.91	92°36.28	N01°19.55	72°33.64	508° 15.43	242°24.14	N10°38.04	Rigel	281°0.44
13	290°33.27	37°32.34	40.38	107°37.80	19.19	87°35.80	15.54	257°26.65	38.03	Capella	280°16.62
14	305°35.74	52°31.47	40.84	122°39.31	18.82	102°37.96	15.65	272°29.17	38.03	Bellatrix	278°19.08
15	320°38.20	67°30.60	• • 41.30	137°40.83	· · 18.46	117°40.12	• • 15.76	287°31.68	• • 38.03	Elnath	277°57.40
16	335°40.67	82°29.73	41.76	152°42.35	18.09	132°42.28	15.87	302°34.19	38.02	Alnilam	275°34.12
17	350°43.13	97°28.86	42.21	167°43.87	17.73	147°44.44	15.98	317°36.70	38.02	Betelgeuse	270°48.25
18	5°45.60	112°27.99	S21°42.67	182°45.39	N01°17.36	162°46.60	S08°16.09	332°39.21	N10°38.01	Canopus	263°50.38
19	20°48.06	127°27.12	43.12	197°46.91	17.00	177°48.76	16.20	347°41.72	38.01	Sirius Adhara	258°23.04 255°2.93
20	35°50.52	142°26.25	43.58	212°48.43	16.63	192°50.92	16.31	2°44.23	38.01	1	255 2.95 244° 47.15
21	50°52.99	157°25.38	• • 44.03	227°49.95	• • 16.27	207°53.08	• • 16.42	17°46.75	• • 38.00	Procyon Pollux	
22	65°55.45	172°24.51	44.48	242°51.48	15.91	222°55.25	16.53	$32^{\circ}49.26$	38.00	Avior	234° 12.75
23	80°57.92	187°23.64	44.93	257°53.00	15.54	237°57.41	16.64	47°51.77	38.00	Suhail	222°43.52
Marr	pass. 17:37	11 U U/ 40	.5′ m-3.92	1 E/ d 0	.4′ m0.71		1′ m-1.88		0.0' m0.18	Miaplacidus	221°36.68
ivier.p	Dass. 17:57	ν-0.9 αυ.	.5 111-3.92	$\nu_{1.5}$ $a$ -0	.4 MU./1	ν2.2 d0.	1 111-1.00	ν2.5 <i>α</i> -0	7.0 MO.16	Alphard	221 30.06 217°44.35
										Regulus	217 44.35 207°30.85
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°37.05
0	96°0.38	202°22.76	S21°45.38	272°54.52	$N01^{\circ}15.18$	252°59.57	S08°16.74	62°54.28	N10°37.99	Denebola	182°21.65
1	111°2.84	217°21.89	45.83	287°56.04	14.82	268°1.73	16.85	77°56.79	37.99		175°40.23
2	126°5.31	232°21.02	46.28	302°57.57	14.46	283°3.89	16.96	92°59.30	37.99		173° 40.23
3	141°7.77	247°20.15	• • 46.73	$317^{\circ}59.09$	• • 14.09	298° 6.06	• • 17.07	$108^{\circ}1.81$	• • 37.98		171°47.91
4	156° 10.24	262°19.27	47.17	333°0.62	13.73	313°8.22	17.18	123°4.32	37.98	Alioth	166°10.39
5	171°12.70	277°18.40	47.62	348°2.14	13.37	$328^{\circ}10.38$	17.29	138°6.83	37.98	Spica	158° 18.98
6	$186^{\circ}15.17$	292°17.52	S21°48.06	3°3.67	N01°13.01	343°12.54	508°17.40	153°9.34	N10°37.97	Alkaid	152°49.77
7	201°17.63	307°16.65	48.50	$18^{\circ}5.19$	12.64	358°14.71	17.50	$168^{\circ}11.85$	37.97	Hadar	148°31.55
8	216°20.09	322° 15.77	48.94	33°6.72	12.28	13°16.87	17.61	183°14.35	37.97		147°53.93
9	231°22.56	337°14.90	• • 49.38	48°8.24	•• 11.92	28°19.04	• • 17.72	198° 16.86	• • 37.96		145°45.17
10	246°25.02	352°14.02	49.82	63°9.77	11.56	43°21.20	17.83	213° 19.37	37.96	Rigil Kent.	139°36.08
11	261°27.49	7° 13.15	50.26	78°11.30	11.20	58°23.36	17.94	228°21.88	37.96	Kochab	137°20.91
12	276° 29.95	22°12.27	\$21°50.70	93°12.83	N01°10.84	73°25.53	S08°18.05	243°24.39	N10°37.96	Zuben'ubi	136°52.64
13	291°32.41	37°11.39	51.13	108°14.36	10.48	88°27.69	18.15	258°26.90	37.95	Alphecca	126°1.33
14	306° 34.88	52°10.52	51.57	123°15.88	10.12	103°29.86	18.26	273°29.40	37.95	Antares	112°12.20
15	321°37.34	67°9.64	• • 52.00	138°17.41	• • 9.76	118°32.02	• • 18.37	288°31.91	• • 37.95	Atria	107°3.98
16	336°39.81	82°8.76	52.43	153°18.94	9.40	133°34.19	18.48	303°34.42	37.95	Sabik	101°59.42
17	351° 42.27	97°7.88	52.86	168°20.47	9.04	148°36.35	18.58	318°36.93	37.94	Shaula	96°6.40
18	6°44.74	112°7.01	S21°53.29	183°22.00	N01°8.68	163°38.52	S08° 18.69	333°39.43	N10°37.94	Rasalhague	95°55.91
19	21°47.20	127°6.13	53.72	198°23.54	8.32	178°40.68	18.80	348°41.94	37.94	Eltanin	90°41.23
20	36° 49.66	142°5.25	54.15	213°25.07	7.96	193°42.85	18.90	3°44.45	37.94	Kaus Aust.	83°28.67
21	51°52.13	157°4.37	• • 54.57	228°26.60	• • 7.60	208°45.02	• • 19.01	18° 46.95	• • 37.93	Vega	80°31.47
22	66° 54.59	172°3.49	55.00	243°28.13	7.25	223°47.18	19.12	33°49.46	37.93	Nunki	75°44.16
23	81°57.06	187°2.61	55.42	258°29.66	6.89	238°49.35	19.23	48°51.97	37.93	Altair	61°57.13
Mer.p	pass. 17:33	$\nu$ -0.9' d0.	.4′ m-3.92	$\nu$ 1.5′ d-0	.4′ m0.69	$\nu$ 2.2′ d0.	1'  m-1.88	$\nu 2.5' \ d-0$	0.0'  m 0.18	Peacock	53°1.31
										Deneb	49°23.94
			_		_		_		_	Enif	33°35.84
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.26
0	96° 59.52	202°1.73		273°31.20	N01°6.53	253°51.52	S08°19.33	63°54.47	N10°37.93	Fomalhaut	$15^{\circ}11.17$
1	112°1.98	217°0.85	56.27	288°32.73	6.17	268°53.68	19.44	78°56.98	37.93	Scheat	13°42.15
2	127°4.45 142°6.91	231°59.97	56.69	303°34.27 318°35.80	5.81	283°55.85	19.55	93°59.48	37.92	Markab	13°26.77
3 4	142 6.91 157°9.38	246°59.08 261°58.20	57.11	318 35.80 333°37.34	5.46	298°58.02 314°0.19	19.65	109°1.99 124°4.49	•• 37.92	Dec 26 Tue	SHA
	157 9.36 172°11.84	201 56.20 276°57.32	57.53	333 37.34 348°38.87	5.10	329°2.36	19.76 19.86	139°7.00	37.92		107°42.35
5			57.95 \$21°58.36		4.74 No1°4.29				37.92 N10°37.92		177°16.86
6 7	187° 14.31 202° 16.77	291°56.44 306°55.55	58.78	3°40.41 18°41.94	N01°4.38 4.03	344° 4.52	S08° 19.97	154°9.50 169°12.01		Jupiter	157° 6.50
8	202 10.77 217° 19.23	321° 54.67	59.19	33°43.48	3.67	359° 6.69 14° 8.86	20.08 20.18	184° 14.51	37.92 37.92	Saturn	326°52.74
9	232° 21.70	336° 53.79	21°59.60	48°45.02	• • 3.32	29°11.03	. 20.18	199° 17.02	37.92	Saturn	320 32.14
10	232 21.70 247°24.16	351°52.90	21 59.00 22°0.02	63°46.56	2.96	44°13.20	20.29	214° 19.52	37.91	Dec 27 Wed	SHA
11	247 24.16 262°26.63	6°52.02	0.43	78°48.09	2.90	59°15.37	20.59	214 19.52 229°22.03	37.91 37.91	Venus	$106^{\circ}22.38$
12	202 20.03 277°29.09	21°51.13	522°0.84	93°49.63	N01°2.25	74° 17.54	S08°20.61	244°24.53	N10°37.91		$176^{\circ}54.14$
13	277 29.09 292°31.55	36° 50.25	1.25	93 49.03 108°51.17	1.89	89°19.71	20.71	259°27.03	37.91	Jupiter	$156^{\circ}59.19$
14	307°34.02	50° 50.25 51° 49.36	1.65	106 51.17 123°52.71	1.69	104°21.88	20.71	274°29.54	37.91	Saturn	326°53.90
15	307 34.02 322°36.48	66° 48.48	. 2.06	123 52.71 138°54.25	1.54	104 21.00 119°24.05	. 20.82	274 29.54 289°32.04	37.91	Dec 20 Ti-	CUA
16	337°38.95	81° 47.59	2.46	150° 54.25 153° 55.79	0.83	119 24.05 134°26.22	21.03	304°34.54	37.91	Dec 28 Thu	SHA 105°2 21
17	352° 41.41	96°46.70	2.40	168°57.33	0.63	134 20.22 149°28.39	21.03	319°37.05	37.91	Venus	105°2.21 176°31.68
18	7°43.88	111° 45.82	\$22°3.27	183°58.87	N01°0.12	164°30.56	S08°21.24	334°39.55	N10°37.91		176°31.68 156°52.00
19	22°46.34	126° 44.93	3.67	199° 0.42	00°59.77	179°32.73	21.34	349°42.05	37.90		326°54.95
20	37°48.80	141°44.04	4.07	214° 1.96	59.41	194°34.90	21.45	4°44.55	37.90	Saturn	J2U 34.95
21	52°51.27	156° 43.15	• • 4.47	229°3.50	• • 59.06	209°37.07	•• 21.55	19°47.06	• • 37.90	Horizor	ıtal parallax
22	67°53.73	171°42.27	4.87	244°5.04	58.70	224°39.25	21.66	34°49.56	37.90		Venus:
23	82°56.20	186°41.38	5.27	259° 6.59	58.35	239°41.42	21.76	49°52.06	37.90		Mars:
Wer.p	pass. 17:29	$\nu$ -0.9′ d0.	.4′ m-3.92	$\nu$ 1.5' $d$ -0	.4′ m0.68	$\nu$ 2.2′ d0.	1′ m-1.89	$\nu$ 2.5′ $d$ -0	0.0′ m0.19		

Dec 29°15.29 -42°9.05 56°42.14 -17°49.69 -57°5.59  $23^{\circ}36.11$ 89°23.32 -40°11.47 4°12.20 49°57.97 16°34.00 -8°10.20  $46^{\circ}1.55$  $6^{\circ}22.45$ 28°37.81 -1°11.12 7°24.62 -52°42.74 -16°45.48 -29°0.78 5°8.86 27°57.13 -59°36.10 -43°32.96 -69°50.06 -8°47.18 11°49.31  $61^{\circ}35.25$ 14°24.39 -17°42.18 -63°15.37 -57°16.34 55°47.77 -11°18.76 49°9.80 -60°30.52 -36°30.60  $19^{\circ}1.74$ -60°57.07  $74^{\circ}1.85$ -16°9.67  $26^{\circ}36.92$ -26°29.63 -69°4.52  $-15^{\circ}45.53$  $-37^{\circ}7.33$  $12^{\circ}32.40$ 51°29.12 -34°22.11 38°48.73 -26°15.52 8°56.84 -56°38.48  $45^{\circ}23.29$  $10^{\circ}0.66$ -46°49.30 -29°28.15 28°14.67 15°21.88 Mer.pass 10:30 05:50 07:10 19:49 Mer.pass 10:31 05:48 07:07 19:45 Mer.pass 10:33 05:45 07:04 19:41

h	Su	n					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.43	\$23°21.06	71°18.34	14.2'	$N15^{\circ}23.97$	10.3'	54.5'
1	194°51.12	20.96	85°51.53	14.1'	15°34.32	10.3'	54.6'
2	209°50.81 224°50.50	20.87 •• 20.78	100°24.66 114°57.72	14.1' 14.0'	15°44.60 15°54.83	10.2' 10.2'	54.6' 54.6'
4	239°50.20	20.68	129°30.71	13.9'	16°5.00	10.1	54.6'
5	254°49.89	20.59	144°3.63	13.9'	16°15.11	10.0'	54.6'
6	269°49.58	523°20.49	158°36.48	13.8'	N16°25.16	10.0'	54.6'
7	284°49.27	20.40 20.30	173°9.26	13.7'	16°35.15	9.9'	54.7'
8 9	299°48.96 314°48.66	20.20	187°41.97 202°14.61	13.6' 13.6'	16°45.07 16°54.93	9.9' 9.8'	54.7' 54.7'
10	329°48.35	20.10	216°47.17	13.5'	10° 34.93	9.7	54.7'
11	344°48.04	20.00	231°19.66	13.4'	17°14.44	9.7'	54.7'
12	359°47.74	\$23°19.90	245°52.07	13.3'	N17°24.10	9.6'	54.7'
13 14	14°47.43 29°47.12	19.80 19.70	260°24.41 274°56.67	13.3' 13.2'	17°33.69 17°43.22	9.5' 9.5'	54.8' 54.8'
14 15	29 47.12 44°46.81	19.70	274 50.07 289°28.86	13.1	17 43.22 17°52.67	9.5 9.4'	54.8'
16	59°46.51	19.49	304°0.96	13.0'	18°2.05	9.3'	54.8'
17	74°46.20	19.39	318°33.00	13.0'	$18^{\circ}11.36$	9.2'	54.8'
18	89°45.89	\$23°19.28	333°4.95	12.9'	N18°20.59	9.2'	54.9'
19 20	104°45.59 119°45.28	19.18 19.07	347°36.83 2°8.62	12.8' 12.7'	18°29.76 18°38.84	9.1' 9.0'	54.9' 54.9'
21	134°44.97	• • 18.96	16°40.34	12.6'	18°47.86	9.0 8.9'	54.9'
22	149°44.67	18.85	31°11.97	12.6'	18°56.79	8.9'	54.9'
23	164°44.36	18.74	45°43.53	12.5'	$19^{\circ}5.65$	8.8'	55.0'
	SD = 16.3'	d = -0.1'		SI	0 = 14.9'		
Wed	GHA	Dec	GHA		Dec	d	НР
vvea 0	GHA 179°44.05	S23°18.63	60°15.01	u 12.4'	N19°14.43	a 8.7'	55.0'
1	194°43.75	18.52	74°46.40	12.3'	19°23.13	8.6'	55.0'
2	209°43.44	18.41	89°17.71	12.2'	19°31.74	8.5'	55.0'
3	224°43.13	• • 18.30	103°48.94	12.1'	19°40.28	8.5'	55.0'
4 5	239°42.83 254°42.52	18.18 18.07	118°20.09 132°51.15	12.1' 12.0'	19°48.73 19°57.10	8.4' 8.3'	55.1' 55.1'
6	269° 42.22	\$23°17.96	147°22.13	11.9'	N20°5.39	8.2'	55.1'
7	284°41.91	17.84	161°53.03	11.8'	$20^{\circ}13.59$	8.1'	55.1'
8	299°41.60	17.72	176°23.84	11.7'	20°21.70	8.0'	55.2'
9	314°41.30 329°40.99	17.60	190°54.57 205°25.22	11.6' 11.6'	20°29.72 20°37.66	7.9'	55.2' 55.2'
10 11	329 40.99 344°40.69	17.49 17.37	205 25.22 219°55.78	11.5	20°45.50	7.8' 7.8'	55.2'
12	359°40.38	\$23°17.25	234°26.26	11.4	N20°53.26	7.7'	55.2'
13	14°40.08	17.13	248°56.65	11.3'	21°0.92	7.6'	55.3'
14	29°39.77	17.01	263°26.95	11.2'	21°8.49	7.5'	55.3'
15 16	44°39.47 59°39.16	· · 16.88 16.76	277°57.17 292°27.31	11.1' 11.1'	21°15.96 21°23.34	7.4' 7.3'	55.3' 55.3'
17	74°38.85	16.64	306°57.36	11.0'	21°30.62	7.2	55.4'
18	89°38.55	\$23°16.51	321°27.33	10.9'	N21°37.80	7.1'	55.4'
19	104°38.24	16.39	335°57.21	10.8'	21°44.89	7.0'	55.4'
20	119°37.94	16.26	350°27.00	10.7' 10.6'	21°51.88 21°58.76	6.9'	55.4'
21 22	134°37.64 149°37.33	· · 16.13 16.00	4°56.71 19°26.33	10.5	21 58.76 22°5.54	6.8' 6.7'	55.5' 55.5'
23	164°37.03	15.87	33°55.87	10.5	22°12.22	6.6'	55.5'
	SD = 16.3'	d = -0.1'		SI	O = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	179°36.72	\$23°15.74	48°25.33	10.4'	N22°18.80	6.5'	55.5'
1	194°36.42	15.61	62°54.70	10.3'	22°25.27	6.4'	55.6'
2	209°36.11	15.48	77°23.98	10.2'	22°31.64	6.3'	55.6'
3 4	224°35.81 239°35.50	· · 15.35 15.22	91°53.18 106°22.30	10.1' 10.0'	22°37.89 22°44.04	6.1' 6.0'	55.6' 55.6'
5	254°35.20	15.22	100° 22.30 120° 51.33	9.9'	22°50.08	5.9'	55.7'
6	269°34.90	\$23°14.95	135°20.28	9.9'	N22°56.01	5.8'	55.7'
7	284°34.59	14.81	149°49.15	9.8'	23°1.83	5.7'	55.7'
8 9	299°34.29 314°33.99	14.68 •• 14.54	164°17.93 178°46.63	9.7' 9.6'	23°7.54 23°13.13	5.6' 5.5'	55.7' 55.8'
10	314 33.99 329°33.68	14.54	178° 46.63 193° 15.25	9.5	23°13.13 23°18.61	5.5° 5.4'	55.8'
11	344°33.38	14.26	207°43.79	9.5'	23°23.97	5.2'	55.8'
12	359°33.07	S23°14.13	222°12.24	9.4'	N23°29.21	5.1'	55.9'
13	14°32.77	13.99	236°40.62	9.3'	23°34.34	5.0'	55.9'
14 15	29°32.47 44°32.16	13.84 •• 13.70	251°8.91 265°37.13	9.2' 9.1'	23°39.35 23°44.24	4.9' 4.8'	55.9' 55.9'
16	59°31.86	13.76	280°5.26	9.1	23°49.00	4.6	56.0'
17	74°31.56	13.42	294°33.32	9.0'	23°53.65	4.5'	56.0'
18	89°31.26	\$23°13.27	309°1.30	8.9'	N23°58.17	4.4'	56.0'
19	104°30.95 119°30.65	13.13	323°29.21 337°57.03	8.8'	24°2.57 24°6.84	4.3'	56.0'
20 21	119°30.65 134°30.35	12.98 •• 12.83	337°57.03 352°24.79	8.8' 8.7'	24°6.84 24°10.99	4.1' 4.0'	56.1' 56.1'
22	134 30.35 149°30.05	12.69	6°52.46	8.6'	24°15.01	4.0 3.9'	56.1
23	164°29.74	12.54	21°20.07	8.5'	24°18.90	3.8'	56.2'
	SD = 16.3'	d = -0.1'	_	SI	O = 15.1'		

	Twi	light			Twilight		
Lat.		•	Sunrise	Sunset		_	
	Naut.	Civil			Civil	Naut.	
N 72°	08:27	10:54			13:09	15:36	
<b>N</b> 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	15:27	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	16:53	
<b>N</b> 58°	07:02	07:55	08:46	15:17	16:08	17:01	
56°	06:55	07:44	08:32	15:31	16:18	17:07	
54°	06:49	07:35	08:19	15:44	16:27	17:14	
52°	06:44	07:27	80:80	15:55	16:36	17:19	
50°	06:38	07:20	07:58	16:05	16:43	17:24	
45°	06:27	07:04	07:38	16:25	16:59	17:36	
<b>N</b> 40°	06:16	06:50	07:21	16:42	17:12	17:46	
35°	06:07	06:39	07:07	16:56	17:24	17:56	
30°	05:58	06:28	06:54	17:08	17:35	18:04	
20°	05:42	06:09	06:33	17:29	17:53	18:21	
<b>N</b> 10°	05:26	05:52	06:15	17:48	18:11	18:37	
0°	05:09	05:35	05:58	18:05	18:28	18:54	
<b>S</b> 10°	04:50	05:17	05:40	18:23	18:46	19:13	
20°	04:27	04:57	05:21	18:41	19:06	19:35	
30°	03:58	04:32	04:59	19:03	19:31	20:04	
35°	03:40	04:17	04:46	19:16	19:46	20:23	
40°	03:17	03:59	04:31	19:31	20:04	20:46	
45°	02:46	03:36	04:13	19:49	20:26	21:16	
<b>S</b> 50°	02:01	03:06	03:51	20:11	20:56	22:01	
52°	01:34	02:52	03:40	20:22	21:11	22:28	
54°	00:49	02:34	03:28	20:34	21:29	23:12	
56°	////	02:12	03:14	20:48	21:50	////	
58°	////	01:42	02:57	21:05	22:20	////	
<b>S</b> 60°	////	00:54	02:37	21:25	23:07	////	
	I				N.4		

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup> 12 <sup>h</sup>		Pass	Upper Lower		10-12	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	69-86%	
26	00:34	00:49	12:01	19:51	07:28		
27	01:04	01:18	12:01	20:40	08:15		
28	01:33	01:48	12:02	21:31	09:05		

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

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	97°58.66	201°40.49	S22° 5.66	274°8.13	N00°58.00	254°43.59	S08°21.87	64°54.56	N10°37.90			
1	113°1.12	216°39.60	6.06	289° 9.68	57.65	269°45.76	21.97	79°57.06	37.90	Alpheratz	357°31.40	29°15.29
2	128°3.59	231°38.71	6.45	304°11.22	57.29	284°47.94	22.08	94°59.57	37.90	Ankaa	353°4.07	-42°9.05
3	143°6.05	246°37.82	• • 6.84	319°12.77	• • 56.94	299°50.11	• • 22.18	$110^{\circ}2.07$	• • 37.90	Schedar Diphda	349°27.15 348°44.07	56°42.14 -17°49.69
4	158°8.52	261°36.93	7.24	334°14.31	56.59	314°52.28	22.28	125°4.57	37.90	Achernar	335°17.75	-57° 5.59
5	173° 10.98	276°36.04	7.63	349°15.86	56.24	329°54.45	22.39	140°7.07	37.90	Hamal	327°47.35	23°36.10
6	188° 13.45	291°35.15	\$22°8.02	4°17.41	N00°55.89	344°56.63	S08°22.49	155°9.57	N10°37.90	Polaris	311°53.90	89°23.33
7	203° 15.91	306°34.26	8.40	19°18.95	55.53	359°58.80	22.60	170°12.07	37.90	Acamar	315°9.11	-40°11.48
8	218° 18.37	321°33.37	8.79	34°20.50	55.18	15°0.98	22.70	185°14.57	37.90	Menkar	314°2.54	4°12.20
9 10	233°20.84 248°23.30	336°32.48 351°31.58	• • 9.18 9.56	49°22.05 64°23.60	• • 54.83 54.48	30°3.15 45°5.32	· · 22.80 22.91	200° 17.07 215° 19.57	· · 37.90 37.90	Mirfak	308°23.15	49°57.98
11	263°25.77	6°30.69	9.94	79°25.15	54.46	60°7.50	23.01	230° 22.07	37.90	Aldebaran	290°35.58	16°34.00
12	278° 28.23	21°29.80	S22°10.33	94°26.70	N00°53.78	75° 9.67	S08°23.11	245°24.57	N10°37.90	Rigel	281°0.43	-8°10.21
13	293°30.70	36°28.91	10.71	109°28.25	53.43	90°11.85	23.22	260°27.07	37.90	Capella	280°16.62	46°1.56
14	308°33.16	51°28.01	11.09	124°29.80	53.08	105°14.02	23.32	275°29.57	37.91	Bellatrix	278°19.08	6°22.44
15	323°35.62	66°27.12	• • 11.47	139°31.35	• • 52.73	$120^{\circ}16.20$	• • 23.42	290°32.07	• • 37.91	Elnath Alnilam	277°57.39 275°34.11	28°37.81 -1°11.13
16	338°38.09	81°26.22	11.85	154°32.90	52.38	135°18.38	23.53	305°34.56	37.91	Betelgeuse	270°48.24	7°24.62
17	353° 40.55	96°25.33	12.22	169°34.45	52.03	150°20.55	23.63	320°37.06	37.91	Canopus	263°50.38	-52°42.76
18	8°43.02	111°24.44	S22°12.60	184°36.01	N00°51.68	165°22.73	S08°23.73	335°39.56	N10°37.91	Sirius	258°23.03	-16°45.49
19	23° 45.48	126°23.54	12.97	199°37.56	51.33	180°24.90	23.83	350° 42.06	37.91	Adhara	255°2.92	-29°0.80
20	38° 47.94	141°22.64	13.34	214°39.11	50.98	195°27.08	23.94	5°44.56	37.91	Procyon	244°47.13	5°8.85
21 22	53°50.41 68°52.87	156°21.75 171°20.85	· · 13.72 14.09	229°40.67 244°42.22	50.64 50.29	210°29.26 225°31.43	· · 24.04 24.14	20° 47.06 35° 49.55	· · 37.91 37.91	Pollux	243°13.02	27°57.13
23	83°55.34	171 20.85 186°19.96	14.09	259°43.78	49.94	240°33.61	24.14	50° 52.05	37.91	Avior	234°12.72	-59°36.12
_										Suhail	222°43.50	-43°32.97
Mer.	pass. 17:25	$\nu$ -0.9′ d0.	.4′ m-3.92	$\nu$ 1.5' d-0	0.4′ m0.66	$\nu 2.2' \ d0.$	$.1^\prime$ m-1.89	$\nu 2.5' \ d-0$	0.0′ m0.19	Miaplacidus	221°36.64	-69°50.08
			_						_	Alphard	217°44.32	-8°47.19
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.83 193°37.00	11°49.30 61°35.25
0	98°57.80	$201^{\circ}19.06$	522°14.83	274°45.33	N00°49.59	255°35.79	S08°24.35	65°54.55	N10°37.92	Denebola	182°21.62	14°24.38
1	114°0.27	216° 18.16	15.19	289°46.89	49.24	270°37.97	24.45	80°57.04	37.92	Gienah	175°40.20	-17°42.19
2	129°2.73	231°17.27	15.56	304°48.44	48.90	285°40.14	24.55	95°59.54	37.92	Acrux	172°56.24	-63°15.38
3	144°5.19	246°16.37	15.93	319°50.00	• • 48.55	300°42.32	• • 24.65	111°2.04	• • 37.92	Gacrux	171°47.87	$-57^{\circ}16.35$
4 5	159°7.66 174°10.12	261°15.47 276°14.57	16.29 16.65	334°51.56 349°53.11	48.20 47.86	315°44.50 330°46.68	24.76 24.86	126°4.53 141°7.03	37.92 37.92	Alioth	166°10.35	55°47.76
6	189° 12.59	291°13.67	\$22°17.01	4°54.67	N00°47.51	345°48.86	S08°24.96	156°9.53	N10°37.92	Spica	158°18.95	-11°18.77
7	204° 15.05	306° 12.78	17.37	19°56.23	47.16	0°51.04	25.06	171° 12.02	37.93	Alkaid	152°49.74	49° 9.79
8	219° 17.52	321°11.88	17.73	34°57.79	46.82	15°53.22	25.16	186°14.52	37.93	Hadar Menkent	148°31.50 147°53.90	-60°30.52 -36°30.61
9	234°19.98	336°10.98	• • 18.09	49°59.35	• • 46.47	30°55.40	• • 25.26	$201^{\circ}17.01$	• • 37.93	Arcturus	147 55.90 145°45.15	19° 1.73
10	249°22.44	351°10.08	18.45	65°0.91	46.13	45°57.58	25.36	$216^{\circ}19.51$	37.93	Rigil Kent.	139°36.04	-60°57.06
11	264°24.91	6°9.18	18.80	80°2.47	45.78	60°59.76	25.47	231°22.01	37.93	Kochab	137°20.87	74°1.83
12	279°27.37	21°8.28	S22°19.16	95°4.03	N00°45.44	76° 1.94	S08°25.57	246°24.50	N10°37.94	Zuben'ubi	136°52.61	-16° 9.67
13	294° 29.84	36°7.38	19.51	110°5.59	45.09	91°4.12	25.67	261°27.00	37.94	Alphecca	$126^{\circ}1.31$	$26^{\circ}36.91$
14 15	309°32.30 324°34.76	51°6.48 66°5.58	19.87 •• 20.22	125°7.15 140°8.71	44.75 •• 44.40	106° 6.30 121° 8.48	25.77 •• 25.87	276°29.49 291°31.98	37.94 •• 37.94	Antares	$112^{\circ}12.17$	-26°29.63
16	339° 37.23	81°4.67	20.22	155°10.28	44.40	136°10.66	25.97	306°34.48	37.95	Atria	107°3.94	-69°4.51
17	354° 39.69	96°3.77	20.92	170°11.84	43.71	151°12.84	26.07	321°36.97	37.95	Sabik	101°59.40	-15°45.53
18	9°42.16	111°2.87		185°13.40	N00°43.37	166°15.02	S08°26.17	336°39.47	N10°37.95	Shaula Rasalhague	96°6.38 95°55.89	-37°7.32 12°32.39
19	24°44.62	$126^{\circ}1.97$	21.61	200°14.97	43.03	181°17.20	26.27	351°41.96	37.95	Eltanin	90°41.22	51°29.11
20	39°47.09	141°1.07	21.96	215°16.53	42.68	196°19.38	26.37	6°44.45	37.96	Kaus Aust.	83°28.65	-34°22.10
21	54°49.55	156°0.16	• • 22.30	230°18.10	• • 42.34	211°21.57	• • 26.47	21°46.95	• • 37.96	Vega	80°31.46	38°48.71
22	69°52.01	170°59.26	22.64	245°19.66	42.00	226°23.75	26.57	36°49.44	37.96	Nunki	75°44.15	-26°15.52
23	84°54.48	185°58.36	22.99	260°21.23	41.66	241°25.93	26.67	51°51.93	37.96	Altair	61°57.13	$8^{\circ}56.84$
Mer.	pass. 17:21	$\nu$ -0.9 $'$ d0.	.4′ m-3.91	$\nu$ 1.6 $^{\prime}$ d-0	0.3′ m0.64	$\nu 2.2' \ d0.$	$.1^\prime$ m-1.90	$\nu 2.5' \ d0$	.0′ m0.20	Peacock		-56°38.47
										Deneb	49°23.94	45°23.28
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.84	10°0.65
0	99°56.94		S22°23.33	275°22.80	N00°41.31		S08°26.77	66°54.43	N10°37.97	Al Na'ir	27°29.27	-46°49.29
1	114° 59.41	215°56.55	23.67	290°24.36	40.97	271°30.30	26.87	81°56.92	37.97	Fomalhaut Scheat	15°11.18 13°42.15	-29°28.15 28°14.67
2	130°1.87	230°55.64	24.01	305°25.93	40.63	286°32.48	26.97	96°59.41	37.97	Markab	13°26.78	26 14.07 15°21.87
3	145°4.34	245°54.74	• • 24.34	320°27.50	• • 40.29	301°34.66	• • 27.07	$112^{\circ}1.90$	• • 37.98			
4	160°6.80	260°53.83	24.68	335°29.07	39.95	316°36.85	27.17	127°4.40	37.98	Dec 29 Fri	SHA	Mer.pass
5	175°9.26	275°52.93	25.01	350°30.64	39.60	331°39.03	27.27	142°6.89	37.98	Venus	103°41.83	10:34
6	190°11.73		\$22°25.35	5°32.21	N00°39.26	346°41.22		157°9.38	N10°37.99	Mars	176°9.47	05:43
7	205°14.19 220°16.66	305°51.12 320°50.21	25.68 26.01	20°33.77 35°35.35	38.92 38.58	1°43.40 16°45.59	27.47 27.57	172°11.87 187°14.36	37.99 37.99	Jupiter Saturn	156°44.93 326°55.90	07:00 19:37
8 9	235° 19.12	335°49.30	. 26.34	50°36.92	38.24	31°47.77	•• 27.67	202° 16.85	. 38.00	Saturn	320 33.90	19.51
10	250°21.59	350°48.40	26.67	65°38.49	37.90	46°49.95	27.77	202 10.85 217° 19.35	38.00	Dec 30 Sat	SHA	Mer.pass
11	265°24.05	5° 47.49	27.00	80°40.06	37.56	61°52.14	27.87	232°21.84	38.00	Venus	102°21.26	10:35
12	280°26.51	20°46.58	S22°27.33	95°41.63	N00°37.22	76°54.33	508°27.97	247°24.33	N10°38.01	Mars		05:40
13	295°28.98	35° 45.68	27.65	110°43.20	36.88	91°56.51	28.07	262°26.82	38.01	Jupiter Saturn	156°37.99 326°56.75	06:57 19:33
14	310°31.44	50°44.77	27.98	125°44.78	36.54	106°58.70	28.16	277°29.31	38.01			
15	325°33.91	65°43.86	• • 28.30	140°46.35	36.20	122°0.88	• • 28.26	292°31.80	• • 38.02	Dec 31 Sun	SHA	Mer.pass
16	340°36.37	80°42.95	28.62	155°47.92	35.87	137°3.07	28.36	307°34.29	38.02	Venus	101°0.51	10:37
17 18	355°38.83 10°41.30	95°42.04 110°41.13	28.95 \$22°29.26	170°49.50 185°51.07	35.53 N00°35.19	152° 5.26 167° 7.44	28.46 \$08°28.56	322°36.78 337°39.27	38.03 N10°38.03		175°25.85	05:38
19	25° 43.76	125° 40.22	29.58	200°52.65	34.85	182° 9.63	28.66	352° 41.76	38.03		156°31.17 326°57.48	06:53 19:29
20	40°46.23	140°39.32	29.90	215°54.23	34.51	197°11.82	28.75	7°44.25	38.04			19.29
21	55° 48.69	155°38.41	•• 30.22	230°55.80	• • 34.17	212°14.01	• • 28.85	22°46.73	• • 38.04	Horizoi	ntal parallax	
22	70°51.16	170°37.50	30.53	245°57.38	33.84	227°16.19	28.95	37°49.22	38.05		Venus:	0.1
23	85°53.62	185°36.59	30.85	260°58.96	33.50	242°18.38	29.05	52°51.71	38.05		Mars:	0.1
Mer.	pass. 17:17	$\nu$ -0.9′ d0.	.3′ m-3.91	$\nu$ 1.6′ d-0	0.3′ m0.63	$\nu$ 2.2′ d0.	.1′ m-1.90	$\nu$ 2.5′ d0	.0′ m0.20			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°29.44	S23°12.39	35°47.60	8.5'	N24°22.67	3.6'	56.2'
1 2	194° 29.14 209° 28.84	12.24 12.09	50°15.06 64°42.45	8.4' 8.3'	24°26.30 24°29.80	3.5' 3.4'	56.2' 56.2'
3	224° 28.54	• • 11.94	79° 9.76	8.2'	24°29.80 24°33.17	3.4	56.3
4	239°28.23	11.79	93°37.01	8.2'	$24^{\circ}36.41$	3.1'	56.3'
5	254°27.93	11.63	108°4.19	8.1'	24°39.52	3.0'	56.3'
6 7	269° 27.63 284° 27.33	\$23°11.48 11.32	122°31.31 136°58.36	8.0' 8.0'	N24°42.49 24°45.33	2.8' 2.7'	56.4' 56.4'
8	299° 27.03	11.17	151°25.34	7.9'	24°48.03	2.6'	56.4
9	314° 26.73	• • 11.01	165°52.26	7.9'	24°50.59	2.4'	56.4'
10 11	329°26.42 344°26.12	10.86 10.70	180°19.11 194°45.91	7.8' 7.7'	24°53.02 24°55.30	2.3' 2.1'	56.5' 56.5'
12	359°25.82	523°10.54	209°12.64	7.7'	N24°57.45	2.1	56.5
13	14°25.52	10.38	223°39.32	7.6'	24°59.46	1.9'	56.6'
14	29°25.22	10.22	238° 5.94	7.6'	25°1.33	1.7'	56.6'
15 16	44°24.92 59°24.62	· · 10.06 9.90	252°32.50 266°59.00	7.5' 7.5'	25°3.05 25°4.64	1.6' 1.4'	56.6' 56.6'
17	74°24.32	9.73	281°25.46	7.4'	25°6.08	1.3'	56.7'
18	89°24.02	\$23° 9.57	295°51.86	7.3'	N25°7.37	1.2'	56.7'
19 20	104°23.72 119°23.42	9.41 9.24	310°18.20 324°44.50	7.3' 7.3'	25°8.52 25°9.53	1.0' 0.9'	56.7' 56.8'
21	119 23.42 134°23.12	9.24	324 44.50 339°10.75	7.3 7.2'	25 9.53 25°10.39	0.9	56.8'
22	149°22.82	8.91	353°36.96	7.2'	25°11.11	0.6'	56.8'
23	164°22.52	8.74	8°3.12	7.1'	25°11.68	0.4'	56.9'
	SD = 16.3'	d = -0.1'		SI	D = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	179° 22.22	<b>5</b> 23°8.57	22°29.23	7.1'	N25°12.10	0.3'	56.9'
1	194°21.92	8.40	36°55.30	7.0'	25°12.37	0.1'	56.9'
2	209°21.62 224°21.32	8.23 •• 8.06	51°21.34 65°47.33	7.0' 7.0'	25°12.49 25°12.47	-0.0' -0.2'	56.9' 57.0'
4	239°21.02	7.89	80°13.28	6.9'	25°12.30	-0.2	57.0'
5	254°20.72	7.72	94°39.20	6.9'	$25^{\circ}11.97$	-0.5'	57.0'
6	269°20.42 284°20.12	\$23°7.55 7.37	109°5.08 123°30.94	6.9' 6.8'	N25°11.50 25°10.87	-0.6' -0.8'	57.1' 57.1'
7 8	284 20.12 299° 19.83	7.37 7.20	123 30.94 137°56.75	6.8	25 10.87 25°10.10	-0.8 -0.9'	57.1'
9	314° 19.53	• • 7.02	152°22.54	6.8'	25°9.17	-1.1'	57.1'
10	329°19.23	6.84	166°48.31	6.7'	25°8.09	-1.2'	57.2'
11 12	344° 18.93 359° 18.63	6.67 <b>S</b> 23°6.49	181°14.04 195°39.75	6.7' 6.7'	25°6.86 N25°5.48	-1.4' -1.5'	57.2' 57.2'
13	14° 18.33	6.31	210°5.44	6.7	25°3.94	-1.7'	57.3'
14	29° 18.04	6.13	224°31.10	6.6'	25°2.25	-1.8'	57.3'
15 16	44° 17.74 59° 17.44	· · 5.95 5.77	238°56.75 253°22.37	6.6' 6.6'	25°0.41 24°58.42	-2.0' -2.1'	57.3' 57.3'
17	74°17.14	5.77 5.59	267°47.98	6.6	24°56.42	-2.1 -2.3'	57.4'
18	89° 16.85	\$23°5.40	282°13.58	6.6'	N24°53.97	-2.5'	57.4'
19	104° 16.55	5.22	296°39.16	6.6' 6.6'	24°51.52	-2.6'	57.4
20 21	119° 16.25 134° 15.95	5.04 • • 4.85	311°4.73 325°30.29	6.6'	24°48.91 24°46.15	-2.8' -2.9'	57.4' 57.5'
22	149° 15.66	4.67	339°55.84	6.5	24°43.23	-3.1'	57.5'
23	164° 15.36	4.48	354°21.39	6.5'	24°40.16	-3.2'	57.5'
	SD = 16.3'	d = -0.2'		SI	D = 15.5'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179° 15.06	\$23°4.29	8°46.93	6.5'	N24°36.94	-3.4'	57.6'
1 2	194° 14.77 209° 14.47	4.10 3.91	23°12.47 37°38.00	6.5' 6.5'	24°33.56 24°30.03	-3.5' -3.7'	57.6' 57.6'
3	209° 14.47 224° 14.17	3.91 · · 3.72	52°3.54	6.5	24° 30.03 24° 26.35	-3. <i>1</i> ′ -3.8′	57.6'
4	239° 13.88	3.53	66°29.07	6.5'	24°22.52	-4.0'	57.7'
5	254°13.58	3.34	80°54.61	6.5'	24°18.53	-4.1'	57.7'
6 7	269° 13.28 284° 12.99	\$23°3.15 2.96	95°20.16 109°45.71	6.6' 6.6'	N24°14.39 24°10.09	-4.3' -4.4'	57.7' 57.7'
8	299°12.69	2.76	124°11.27	6.6'	24°5.65	-4.6'	57.8'
9	314°12.40	• • 2.57	138°36.83	6.6'	24°1.05	-4.7'	57.8'
10 11	329°12.10 344°11.81	2.37 2.18	153°2.41 167°28.01	6.6' 6.6'	23°56.30 23°51.40	-4.9' -5.1'	57.8' 57.8'
12	359°11.51	\$23°1.98	181°53.61	6.6	N23°46.35	-5.1 -5.2'	57.9
13	14°11.22	1.78	$196^{\circ}19.23$	6.6'	$23^{\circ}41.15$	-5.4'	57.9'
14 15	29°10.92 44°10.63	1.58 · · 1.38	210°44.87 225°10.53	6.7' 6.7'	23°35.80 23°30.30	-5.5' -5.6'	57.9' 58.0'
15 16	44° 10.63 59° 10.33	1.18	225°10.53 239°36.20	6.7'	23° 24.65	-5.8'	58.0'
17	74°10.04	0.98	254°1.90	6.7'	23°18.85	-5.9'	58.0'
18	89°9.74	\$23° 0.78	268°27.62	6.7'	N23°12.91	-6.1'	58.0'
19 20	104°9.45 119°9.15	0.58 0.37	282°53.37 297°19.14	6.8' 6.8'	23°6.82 23°0.58	-6.2' -6.4'	58.1' 58.1'
21	134°8.86	0.17	311°44.93	6.8	22°54.19	-6.5'	58.1
22	149°8.57	22°59.96	326°10.76	6.9'	22°47.66	-6.7'	58.1'
23	164°8.27	22°59.76	340°36.61	6.9'	22°40.98	-6.8'	58.1'
	SD = 16.3'	d = -0.2'		SI	D = 15.7'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%
29	02:02	02:17	12:02	22:27	09:59	
30	02:31	02:45	12:03	23:23	10:55	
31	03:00	03:14	12:03	-:-	11:52	