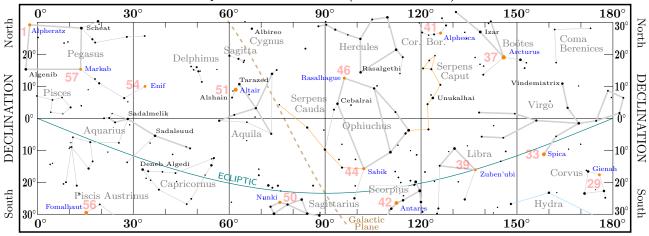
GENERATED USING SKYFIELD

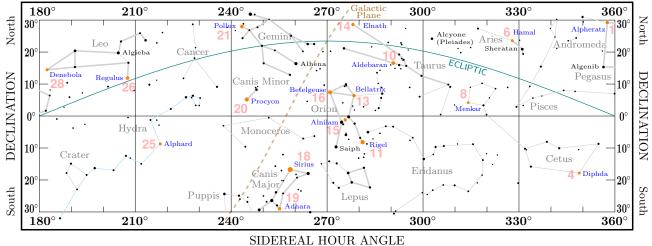
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



THE NAUTICAL ALMANAC

2028

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

September 20, 2025

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

Information in the data page footers

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

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

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

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

IERS Earth Orientation data as of dd-mmm-yyyy

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

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

IERS Earth Orientation predictions end dd-mmm-yyyy

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

No IERS EOP prediction data available

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

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

Brief historical overview

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

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

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

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

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

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

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

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

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10											Saturn	339°33.9	18:38
10											Jan 02 Sun	SHA	Mer.pass
11 267 30.0 306 34.5 09.5 325 21.0 10.0 89 30.1 12.6 247 08.4 53.2 12 282 39.1 321 34.0 \$17 08.5 340 21.4 \$21 15.6 104 32.5 \$102 12.6 \$262 10.8 \$105 53.3 13.19 297 41.5 336 33.4 07.5 355 21.8 15.2 119 34.9 12.5 277 13.3 53.3 14 312 44.0 351 32.8 06.6 10 22.2 14.8 134 37.3 12.5 292 15.7 53.3 15 327 46.5 6 32.3 05.6 25 22.6 14.3 149 39.7 12.5 307 18.1 53.4 16 342 48.9 21 31.7 04.6 40 23.0 13.9 164 42.1 12.5 322 20.5 53.4 17 357 51.4 36 31.2 03.6 55 23.4 13.5 179 44.5 12.5 337 22.9 53.4 18 12 53.9 51 30.6 \$17 02.7 \$70 23.8 \$21 13.1 194 46.9 \$102 12.5 \$32 20.5 53.4 \$19 27 56.3 66 30.0 01.7 85 24.3 12.7 209 49.3 12.4 7 27.8 53.5 20 42 58.8 81 29.5 17 00.7 100 24.7 12.3 224 51.7 12.4 22 30.2 53.5 21 58 01.3 96 28.9 16 59.7 115 25.1 11.8 239 54.1 12.4 37 32.6 53.5 53.6 18 13:19 14 15 25.2 12.6 12.4 52 35.1 53.6 18 13.19 14 15 25.2 12.6 12.4 52 35.1 53.6 18 13.19 14 15 25.2 12.6 12.4 52 35.1 53.6 18 13.19 13.19 14 15 25.2 12.6 12.4 52 35.1 53.6 18 13.19 13.19 13.19 14 15 25.1 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12													•
12 282 39.1 321 34.0 517 08.5 340 21.4 521 15.6 104 32.5 NO2 12.6 262 10.8 NO5 53.3 13 297 41.5 336 33.4 07.5 335 21.8 15.2 119 34.9 12.5 277 13.3 53.3 14 312 44.0 351 32.8 06.6 10 22.2 14.8 134 37.3 12.5 292 15.7 53.3 15 327 46.5 6 32.3 05.6 25 22.6 14.3 149 39.7 12.5 307 18.1 53.4 16 342 48.9 21 31.7 04.6 40 23.0 13.9 164 42.1 12.5 322 20.5 53.4 17 357 51.4 36 31.2 03.6 55 23.4 13.5 179 44.5 12.5 337 22.9 53.4 18 12 53.9 51 30.6 517 02.7 70 23.8 521 13.1 194 46.9 N02 12.5 352 25.4 N05 53.4 19 27 56.3 66 30.0 01.7 85 24.3 12.7 209 49.3 12.4 7 27.8 53.5 20 42 58.8 81 29.5 17 00.7 100 24.7 12.3 224 51.7 12.4 22 30.2 53.5 21 58 01.3 96 28.9 16 59.7 115 25.1 11.8 239 54.1 12.4 37 32.6 53.5 21 58.6 18 05 07.0 13 10 269 58.9 12.4 67 37.5 53.6 18 10 5.0 10 10 10 10 10 10 10 10 10 10 10 10 10													
13 29/41.5 336°33.4 07.5 355°21.8 15.2 119°34.9 12.5 277°13.3 53.3 14 312°44.0 351°32.8 06.6 10°22.2 14.8 134°37.3 12.5 292°15.7 53.3 15 327°46.5 6°32.3 ·· 05.6 25°22.6 ·· 14.3 149°39.7 ·· 12.5 307°18.1 ·· 53.4 16 342°48.9 21°31.7 04.6 40°23.0 13.9 164°42.1 12.5 322°20.5 53.4 17 357°51.4 36°31.2 03.6 55°23.4 13.5 179°44.5 12.5 337°22.9 53.4 18 12°53.9 51°30.6 517°02.7 70°23.8 521°13.1 194°46.9 N02°12.5 352°25.4 N05°53.4 19 27°56.3 66°30.0 01.7 85°24.3 12.7 209°49.3 12.4 7°27.8 53.5 20 42°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 240°30.3 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 23.6													
14 312°44.0 351°32.8 00.6 10°22.2 14.8 134°37.3 12.5 292°15.7 53.3 12.5 292°15.7 53.3 12.5 292°15.7 53.3 12.5 292°15.7 53.4 12.5 320°25.5 12.5 300°18.1 · · · 53.4 12.5 300°18.1 · · · 53.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.5 12.4 12.5 320°25.4 12.5 12.5 320°25.4 12.5 320°25.5 12.4 12.													
16 342°48.9 21°31.7 04.6 40°23.0 13.9 164°42.1 12.5 322°20.5 53.4 Venus 39°31.3 14:34 17 357°51.4 36°31.2 03.6 55°23.4 13.5 179°44.5 12.5 337°22.9 53.4 Mars 58°07.0 13:19 18 12°53.9 51°30.6 S17°02.7 70°23.8 S21°13.1 194°46.9 N02°12.5 352°25.4 N05°53.4 Jupiter 181°54.3 05:03 19 27°56.3 66°30.0 01.7 85°24.3 12.7 209°49.3 12.4 7°27.8 53.5 Saturn 339°32.2 18:30 20 42°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 Saturn 339°32.2 18:30 21 58°01.3 96°28.9 16°59.7 115°25.1 11.8 239°54.1 12.4 37°32.6 53.5 Horizontal parallax 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 Mars: </td <td></td>													
17 357°51.4 36°31.2 03.6 55°23.4 13.5 179°44.5 12.5 337°22.9 53.4 Mars 58°07.0 13:19 18 12°53.9 51°30.6 S17°02.7 70°23.8 S21°13.1 194°46.9 N02°12.5 352°25.4 N05°53.4 19 27°56.3 66°30.0 01.7 85°24.3 12.7 209°49.3 12.4 7°27.8 53.5 20 42°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 21 58°01.3 96°28.9 16°59.7 115°25.1 · 11.8 239°54.1 · 12.4 22°30.2 53.5 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1													
18 12°53.9 51°30.6 \$17°02.7 70°23.8 \$21°13.1 194°46.9 \$N02°12.5 352°25.4 \$N05°53.4 \$Jupiter 181°54.3 05:03 19 27°56.3 66°30.0 01.7 85°24.3 12.7 209°49.3 12.4 7°27.8 53.5 \$Saturn 339°32.2 18:30 20 42°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 \$Saturn 339°32.2 18:30 21 58°01.3 96°28.9 16°59.7 115°25.1 · 11.8 239°54.1 · · 12.4 37°32.6 · · 53.5 Horizontal parallax 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 Venus: 0.1 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1													
19 27°56.3 66°30.0 01.7 85°24.3 12.7 209°49.3 12.4 7°27.8 53.5 240°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 21 58°01.3 96°28.9 16°59.7 115°25.1 18 239°54.1 12.4 22°30.2 53.5 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1													
20 42°58.8 81°29.5 17°00.7 100°24.7 12.3 224°51.7 12.4 22°30.2 53.5 21 58°01.3 96°28.9 16°59.7 115°25.1 · · 11.8 239°54.1 · · 12.4 37°32.6 · · 53.5 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1													
21 58°01.3 96°28.9 16°59.7 115°25.1 · · 11.8 239°54.1 · · 12.4 37°32.6 · · 53.5 Horizontal parallax 22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 Venus: 0.1 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1											Saturn	339°32.2	18:30
22 73°03.7 111°28.4 58.7 130°25.5 11.4 254°56.5 12.4 52°35.1 53.6 Venus: 0.1 23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1											Uniter	al paralla.	
23 88°06.2 126°27.8 57.7 145°25.9 11.0 269°58.9 12.4 67°37.5 53.6 Mars: 0.1											HORIZON	-	0.1
25 00 00.2 120 21.0 51.1 110 20.5 11.0 20.5 00.5 12.1 01 51.0 50.0													
Mer.pass. 17:09 ν -0.6′ d -1.0′ m-3.99 ν 0.4′ d -0.4′ m1.19 ν 2.4′ d -0.0′ m-2.13 ν 2.4′ d 0.0′ m0.47	23	88~06.2	126~27.8	57.7					0/~37.5	53.6		ividi5.	
	Mer.n	ass. 17:09	ν -0.6' d-1	0′ m-3.99	ν 0.4' d-0	.4′ m1.19	$\nu 2.4' d-0$.0′ m-2.13	$\nu 2.4' d0$.0′ m0.47			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	179°13.5	\$23°03.3	133°00.0	16.1'	S 11°00.6	-12.2'	54.0'
1	194°13.2	03.1	147°35.0	16.1'	10°48.4	-12.3'	54.0'
2	209°12.9 224°12.6	02.9 •• 02.7	162°10.2 176°45.3	16.2' 16.2'	10°36.1 10°23.9	-12.3' -12.3'	54.0' 54.0'
4	239°12.3	02.5	191°20.5	16.2'	10°11.5	-12.4'	54.0'
5	254°12.0	02.3	205°55.7	16.3'	$09^{\circ}59.2$	-12.4'	54.0'
6	269°11.7 284°11.4	\$23°02.1	220°31.0	16.3'	509°46.8	-12.4'	54.0'
7 8	284°11.4 299°11.1	01.9 01.7	235°06.3 249°41.6	16.3' 16.4'	09°34.3 09°21.9	-12.5' -12.5'	54.0' 54.0'
9	314°10.8	01.5	264°17.0	16.4	09°09.4	-12.5'	54.0'
10	329°10.5	01.3	278°52.4	16.4'	08°56.8	-12.6'	54.0'
11	344°10.2 359°09.9	01.1	293°27.9	16.5'	08°44.2	-12.6'	54.0'
12 13	359°09.9 14°09.6	\$23°00.9 00.7	308°03.3 322°38.8	16.5' 16.5'	\$08°31.6 08°19.0	-12.6' -12.7'	54.0' 54.0'
14	29°09.3	00.5	337°14.4	16.6'	08°06.4	-12.7'	54.0'
15	44°09.1	• • 00.3	351°49.9	16.6'	07°53.7	-12.7'	54.0'
16	59°08.8 74°08.5	23°00.1 22°59.9	6°25.5 21°01.1	16.6'	07°40.9 07°28.2	-12.7'	54.0'
17 18	89°08.2	522°59.7	21 01.1 35°36.7	16.6' 16.7'	507°15.4	-12.8' -12.8'	54.0' 54.0'
19	104°07.9	59.4	50°12.4	16.7'	07°02.6	-12.8'	54.0'
20	119°07.6	59.2	64°48.1	16.7'	06°49.8	-12.9'	54.0'
21	134°07.3 149°07.0	• • 59.0	79°23.8 93°59.5	16.7' 16.7'	06°36.9 06°24.1	-12.9'	54.0'
22 23	149 07.0 164°06.7	58.8 58.6	93 59.5 108°35.3	16.8'	06°24.1	-12.9' -12.9'	54.0' 54.0'
	SD = 16.3'	d = -0.2'			0 = 14.7'	12.0	
	JD — 10.3	u — -∪.∠		اد	J — 14.1°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°06.4 194°06.1	\$22°58.4 58.2	123°11.0 137°46.8	16.8'	\$05°58.2 05°45.3	-12.9'	54.0'
1 2	209°05.8	58.2 58.0	157 40.8 152°22.6	16.8' 16.8'	05 45.3 05°32.3	-13.0' -13.0'	54.0' 54.0'
3	224°05.5	57.8	166°58.5	16.8'	05°19.3	-13.0'	54.1'
4	239°05.2	57.5	181°34.3	16.8'	$05^{\circ}06.3$	-13.0'	54.1'
5	254°04.9 269°04.6	57.3 \$22°57.1	196°10.1 210°46.0	16.9'	04°53.3 \$04°40.2	-13.1'	54.1' 54.1'
6 7	269 04.6 284°04.3	56.9	210 46.0 225°21.9	16.9' 16.9'	04°27.1	-13.1' -13.1'	54.1'
8	299°04.0	56.7	239°57.8	16.9'	04°14.0	-13.1'	54.1'
9	314°03.8	•• 56.5	254°33.7	16.9'	04°00.9	-13.1'	54.1'
10 11	329°03.5 344°03.2	56.2 56.0	269°09.6 283°45.5	16.9' 16.9'	03°47.8 03°34.7	-13.1' -13.2'	54.1' 54.1'
12	359°02.9	50.0 S22°55.8	203 45.5 298°21.4	16.9	503°21.5	-13.2'	54.1
13	14°02.6	55.6	312°57.3	16.9'	03°08.3	-13.2'	54.1'
14	29°02.3	55.4	327°33.3	16.9'	02°55.2	-13.2'	54.1'
15 16	44°02.0 59°01.7	· · 55.1 54.9	342°09.2 356°45.1	16.9' 16.9'	02°42.0 02°28.7	-13.2' -13.2'	54.1' 54.1'
17	74°01.4	54.7	11°21.1	16.9'	02°15.5	-13.2'	54.2'
18	89°01.1	S22°54.5	25°57.0	16.9'	S02°02.3	-13.2'	54.2'
19	104°00.8	54.2	40°33.0	16.9'	01°49.0	-13.3'	54.2' 54.2'
20 21	119°00.5 134°00.3	54.0 • • 53.8	55°08.9 69°44.8	16.9' 16.9'	01°35.8 01°22.5	-13.3' -13.3'	54.2' 54.2'
22	149°00.0	53.5	84°20.8	16.9'	01°09.2	-13.3'	54.2
23	163°59.7	53.3	98°56.7	16.9'	00°55.9	-13.3'	54.2'
	SD = 16.3'	d = -0.2'		SI	O = 14.7'		
Man	GHA	Doo	CHA	ν	Dee		НР
Mon 0	GHA 178°59.4	Dec \$22°53.1	GHA 113°32.6	u 16.9'	Dec \$00°42.6	d -13.3'	нР 54.2'
1	193°59.1	52.8	128°08.5	16.9'	00°29.3	-13.3'	54.2'
2	208°58.8	52.6	142°44.4	16.9'	00°16.0	-13.3'	54.3'
3 4	223°58.5 238°58.2	· · 52.4 52.2	157°20.3 171°56.2	16.9' 16.9'	S00°02.7 N00°10.6	-13.3' 13.3'	54.3' 54.3'
5	253°57.9	51.9	186°32.1	16.9'	00°23.9	13.3'	54.3'
6	268°57.6	S22°51.7	201°08.0	16.8'	N00°37.3	13.3'	54.3'
7	283°57.3 298°57.1	51.4 51.2	215°43.8 230°19.6	16.8' 16.8'	00°50.6 01°03.9	13.3' 13.3'	54.3' 54.3'
8 9	298°57.1 313°56.8	51.2 · · 51.0	230°19.6 244°55.5	16.8'	01°03.9 01°17.3	13.3'	54.3' 54.3'
10	328°56.5	50.7	259°31.3	16.8'	01°30.6	13.3'	54.4
11	343°56.2	50.5	274°07.0	16.8'	01°44.0	13.3'	54.4'
12 13	358°55.9 13°55.6	\$22°50.3 50.0	288°42.8 303°18.6	16.7' 16.7'	N01°57.3 02°10.6	13.3' 13.3'	54.4' 54.4'
13 14	28°55.3	50.0 49.8	303°18.6 317°54.3	16.7'	02°10.6	13.3'	54.4' 54.4'
15	43°55.0	• • 49.5	332°30.0	16.7'	02°37.3	13.3'	54.4'
16	58°54.7	49.3	347°05.6	16.7'	02°50.7	13.3'	54.5'
17 18	73°54.5 88°54.2	49.0 \$22°48.8	1°41.3 16°16.9	16.6' 16.6'	03°04.0 N03°17.3	13.3' 13.3'	54.5' 54.5'
19	103°53.9	48.5	30°52.5	16.6'	03°30.7	13.3'	54.5'
20	118°53.6	48.3	45°28.1	16.5'	03°44.0	13.3'	54.5'
21	133°53.3 148°53.0	•• 48.1	60°03.6 74°39.1	16.5'	03°57.3 04°10.6	13.3'	54.5'
22 23	148°53.0 163°52.7	47.8 47.6	74°39.1 89°14.6	16.5' 16.4'	04°10.6 04°23.9	13.3' 13.3'	54.6' 54.6'
	SD = 16.3'	d = -0.2'			D = 14.8'	_5.5	
	<u> </u>	u — -0.2		ال	_ 14.0		

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

Lat.		Moonris	e		Moonset	
Lat.	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°	09:31	10:07	10:42	21:38	22:22	23:06
0°	09:24	10:04	10:43	21:43	22:23	23:03
S 10°	09:17	10:01	10:45	21:48	22:24	23:00
20°	09:10	09:58	10:46	21:53	22:24	22:56
30°	09:02	09:55	10:48	21:58	22:25	22:52
35°	08:57	09:53	10:48	22:02	22:26	22:50
40°	08:52	09:51	10:49	22:05	22:26	22:48
45°	08:46	09:48	10:51	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	10:53	22:17	22:28	22:40
54°	08:31	09:42	10:53	22:19	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
S 60°	08:16	09:36	10:56	22:28	22:30	22:32

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	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	Ve	` nus	M	ars	Jup	oiter	Sati	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	103°08.6	141°27.2	\$16° 56.7	160°26.3	S21°10.6	285°01.3	N02° 12.4	82°39.9	N05°53.6		эпа	Dec
0		141 27.2 156° 26.7		100 20.3 175°26.7	10.0	300°03.7		97°42.3		Alpheratz	357°32.3	29°14.9
1 2	118°11.1	171°26.1	55.8	175 20.7 190°27.1		315°06.1	12.3	97 42.3 112°44.7	53.7	Ankaa	353°04.8	-42°09.4
	133°13.6		54.8		09.7		12.3		53.7	Schedar	349°28.2	56°41.8
3	148°16.0	186°25.6	• • 53.8	205°27.5	• • 09.3	330°08.5	• • 12.3	127°47.2	• • 53.7	Diphda	348°44.9	-17°50.0
4	163°18.5	201°25.0	52.8	220°28.0	08.9	345°10.9	12.3	142°49.6	53.7	Achernar	335°18.3	-57°05.9
5 6	178°21.0 193°23.4	216°24.5 231°23.9	51.8 \$16°50.8	235°28.4 250°28.8	08.5 \$21°08.1	0°13.3 15°15.7	12.3 N02°12.3	157°52.0 172°54.4	53.8 N05°53.8	Hamal	327°48.3	23°35.8
7	208°25.9	231 23.9 246°23.4	49.8	265°29.2	07.6	30°18.1	12.3	172 54.4 187°56.9	53.8	Polaris	$312^{\circ}24.0$	89°23.2
8	208 25.9 223°28.4	261°22.8	49.8	280°29.6	07.0	45°20.5	12.3	202°59.3	53.6	Acamar	$315^{\circ}09.7$	-40°11.7
9	238°30.8	276°22.3	• • 47.8	295°30.0	• • 06.8	60°22.9	12.2	202 39.3 218°01.7	• • 53.9	Menkar	314°03.4	4°12.0
10	253°33.3	291°21.7	46.8	310°30.4	06.4	75°25.3	12.2	233°04.1	53.9	Mirfak	308°24.3	49°57.8
11	268°35.8	306°21.2	45.8	325°30.9	05.9	90°27.7	12.2	248°06.5	54.0	Aldebaran	290°36.5	16°33.9
12	283°38.2	321°20.6	S16°44.9	340°31.3	S21°05.5	105°30.1	N02°12.2	263°09.0	N05°54.0	Rigel	281°01.2	-8°10.2
13	298°40.7	336°20.1	43.9	355°31.7	05.1	120°32.5	12.2	278°11.4	54.0	Capella	280°17.8	46°01.6
14	313°43.1	351° 19.5	42.9	10°32.1	04.7	135°34.9	12.2	293°13.8	54.1	Bellatrix	278°19.9	6°22.4
15	328°45.6	6°19.0	• • 41.9	25°32.5	• • 04.2	150°37.3	• • 12.1	308°16.2	• • 54.1	Elnath	277°58.4	28°37.8
16	343°48.1	21°18.4	40.9	40°32.9	03.8	165°39.7	12.1	323°18.6	54.1	Alnilam	275°34.9	-1°11.1
17	358°50.5	36°17.9	39.9	55°33.3	03.4	180°42.1	12.1	338°21.0	54.1	Betelgeuse	270°49.1	7°24.7
18	13°53.0	51°17.3	S16°38.9	70°33.8	S21°03.0	195°44.5	$N02^{\circ}12.1$	353°23.5	N05°54.2	Canopus Sirius	263°50.7 258°23.7	-52°42.7 -16°45.4
19	28°55.5	66°16.8	37.9	85°34.2	02.5	210°46.9	12.1	8°25.9	54.2	Adhara	255°03.5	-10 45.4 -29°00.7
20	43°57.9	81°16.3	36.9	100°34.6	02.1	225°49.3	12.1	23°28.3	54.2	Procyon	244°47.9	5°09.0
21	59°00.4	96° 15.7	• • 35.9	115°35.0	• • 01.7	240°51.7	• • 12.1	38°30.7	• • 54.3	Pollux	243°13.9	27°57.3
22	74°02.9	111°15.2	34.9	130°35.4	01.2	255°54.1	12.0	53°33.1	54.3	Avior	234°13.1	-59°35.9
23	89°05.3	126°14.6	33.9	145°35.8	8.00	270°56.5	12.0	68°35.6	54.3	Suhail	222°44.1	-43°32.7
Mern	ass. 17:05	v-0.6' d-1	.0′ m-3.99	ν0 4' d-0	.4′ m1.18	ν2 4' d-0	.0′ m-2.14	ν 2.4′ d0.0	0′ m0 47	Miaplacidus	221°36.9	-69°49.8
- IVICI.P	ass. 17.05	ν-0.0 α-1	.0 111-3.99	νο. 4 α-ο	.4 1111.10	ν2. 4 α-0	.0 111-2.14	ν2. 4 ασ.		Alphard	217°45.1	-8°46.9
										Regulus	207°31.6	11°49.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°35.6
0	104°07.8	141°14.1	S16°32.9	160°36.2	S21°00.4	285°58.9	N02°12.0	83°38.0	N05°54.4	Denebola	182°22.4	14°24.7
1	119°10.2	156° 13.6	31.8	175°36.7	21°00.0	301°01.3	12.0	98°40.4	54.4	Gienah	175°41.0	-17°41.9
2	134°12.7	171°13.0	30.8	190°37.1	20°59.5	316°03.7	12.0	113°42.8	54.4		172°57.1	-63°15.1
3	149°15.2	186°12.5	• • 29.8	205°37.5	• • 59.1	331°06.1	· · 12.0	128°45.2	• • 54.5	Gacrux	171°48.8	-57°16.0
4	164°17.6	201°11.9	28.8	220°37.9	58.7	346°08.5	12.0	143°47.6	54.5	Alioth	166°10.9	55°48.1
5	179°20.1	216°11.4	27.8	235°38.3	58.2	1°10.9	12.0	158°50.1	54.5	Spica	158°19.7	-11°18.5
6	194°22.6	231°10.9	S16°26.8	250°38.7	S20°57.8	16°13.4	N02°12.0	173°52.5	N05°54.6	Alkaid	152°50.3	49°10.1
7	209°25.0	246°10.3	25.8	265°39.2	57.4	31°15.8	11.9	188°54.9	54.6	Hadar	148°32.6	-60°30.3
8	224°27.5	261°09.8	24.8	280°39.6	56.9	46°18.2	11.9	203°57.3	54.6	Menkent	147°54.8	-36°30.3
9	239°30.0	276°09.3	• • 23.8	295°40.0	56.5	61°20.6	• • 11.9	218°59.7	• • 54.6	Arcturus	$145^{\circ}45.8$	19°02.0
10	254°32.4	291°08.7	22.8	310°40.4	56.1	76°23.0	11.9	234°02.1	54.7	Rigil Kent.	$139^{\circ}37.1$	-60°56.8
11 12	269°34.9 284°37.4	306°08.2 321°07.7	21.8 \$16°20.7	325°40.8 340°41.2	55.6 \$20°55.2	91°25.4 106°27.8	11.9 N02°11.9	249°04.5 264°07.0	54.7 N05°54.7	Kochab	137°20.6	74°02.0
13	299°39.8	336°07.1	19.7	355°41.7	54.8	100°27.8 121°30.2	11.9	279°09.4	54.8	Zuben'ubi	136°53.5	-16°09.5
14	299 39.6 314°42.3	351°06.6	19.7	10°42.1	54.6 54.3	121 30.2 136°32.6	11.9	279 09.4 294°11.8	54.8	Alphecca	126°01.9	26°37.1
15	329°44.7	6°06.1	•• 17.7	25°42.5	• • 53.9	150°35.0	•• 11.9	309°14.2	• • 54.8	Antares	112°13.1	-26°29.6
16	344°47.2	21°05.5	16.7	40°42.9	53.5	166°37.4	11.8	324°16.6	54.9	Atria	107°05.6	-69°04.4
17	359°49.7	36°05.0	15.7	55°43.3	53.0	181°39.9	11.8	339°19.0	54.9	Sabik	102°00.3	-15°45.5
18	14°52.1	51°04.5	\$16°14.6	70°43.8	S20°52.6	196°42.3	N02°11.8	354°21.5	N05°54.9	Shaula	96°07.4	-37°07.3
19	29°54.6	66°03.9	13.6	85°44.2	52.1	211°44.7	11.8	9°23.9	55.0	Rasalhague	95°56.6	12°32.4
20	44°57.1	81°03.4	12.6	100°44.6	51.7	226°47.1	11.8	24°26.3	55.0	Eltanin	90°41.6	51°29.0
21	59°59.5	96°02.9	. 11.6	115°45.0	51.3	241°49.5	. 11.8	39°28.7	• • 55.0	Kaus Aust.	83°29.7	-34°22.2
22	75°02.0	111°02.4	10.6	130°45.4	50.8	256°51.9	11.8	54°31.1	55.1	Vega	80°32.0	38°48.6
23	90°04.5	126°01.8	09.5	145°45.8	50.4	271°54.3	11.8	69°33.5	55.1	Nunki	75°45.1	-26°15.6
										Altair	61°57.9 53°02.5	8°56.6 -56°38.7
ivier.p	ass. 17:01	ν -0.5 d-1	.0′ m-4.00	ν 0.4° a -0	.4′ m1.18	ν 2.4 a-0	.0′ m-2.15	ν 2.4′ d0.0	0° m0.48	Peacock Deneb	49°24.5	45°23.0
										Enif	33°36.6	10°00.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.6
0	105°06.9	141°01.3	S16°08.5	160°46.3	S20°50.0	286°56.7	$N02^{\circ}11.8$	84°35.9	N05°55.1	Fomalhaut	15°12.0	-29°28.5
1	120°09.4	156°00.8	07.5	175°46.7	49.5	$301^{\circ}59.2$	11.8	99°38.3	55.2	Scheat	13°43.0	28°14.3
2	$135^{\circ}11.9$	171°00.3	06.5	190°47.1	49.1	$317^{\circ}01.6$	11.7	114°40.8	55.2	Markab	13°27.6	15°21.5
3	150°14.3	185°59.7	• • 05.5	205°47.5	• • 48.6	332°04.0	• • 11.7	129°43.2	• • 55.2			
4	165°16.8	200°59.2	04.4	220°47.9	48.2	347°06.4	11.7	144°45.6	55.3	Jan 04 Tue	SHA	Mer.pass
5	180°19.2	215°58.7	03.4	235°48.4	47.8	2°08.8	11.7	159°48.0	55.3	Venus	38°18.6	14:35
6	195°21.7	230°58.2	S16°02.4	250°48.8	S20°47.3	17°11.2	N02°11.7	174°50.4	N05°55.3	Mars	57°17.7	13:18
7	210°24.2	245° 57.6	01.3	265°49.2	46.9	32°13.6	11.7	189°52.8	55.4	Jupiter	181°52.6	04:59
8	225°26.6	260°57.1	16°00.3	280°49.6	46.4	47°16.1	11.7	204°55.2	55.4	Saturn	339°31.3	18:26
9	240°29.1	275°56.6	15°59.3	295°50.0	• • 46.0	62°18.5	• • 11.7	219°57.6	• • 55.4	Jan 05 Wed	SHA	Mer.pass
10	255°31.6	290°56.1	58.3	310°50.5	45.5	77°20.9	11.7	235°00.1	55.5	Venus	37°06.3	14:36
11	270°34.0	305°55.6	57.2	325°50.9	45.1	92°23.3	11.7	250°02.5	55.5	Mars	56°28.5	13:17
12	285°36.5	320°55.0	\$15°56.2	340°51.3	\$20°44.7	107°25.7	N02°11.7		N05°55.5		181°51.1	04:55
13	300°39.0	335°54.5	55.2 54.1	355°51.7	44.2	122°28.1	11.6	280°07.3	55.6	Saturn	339°30.2	18:23
14 15	315°41.4	350°54.0	54.1	10°52.1	43.8 •• 43.3	137°30.6	11.6	295°09.7	55.6			
15 16	330°43.9 345°46.3	5°53.5 20°53.0	· · 53.1 52.1	25°52.6 40°53.0	42.9	152°33.0	· · 11.6 11.6	310°12.1 325°14.5	· · 55.6	Jan 06 Thu	SHA	Mer.pass
16 17	345 46.3 0°48.8	20°53.0 35°52.5	52.1 51.0	40°53.0 55°53.4	42.9 42.4	167°35.4 182°37.8	11.6	325°14.5 340°16.9	55.7 55.7	Venus	35°54.4	14:36
17 18	0°48.8 15°51.3	50° 52.0	51.0 \$15°50.0	70°53.8	42.4 \$20°42.0	182°37.8 197°40.2	N02°11.6	340°16.9 355°19.3	55.7 N05°55.7	Mars	55°39.3	13:17
19	30°53.7	65°51.4	49.0	85°54.3	41.5	212°42.6	11.6	10°21.7	55.8		181°49.8	04:51
20	45°56.2	80° 50.9	49.0 47.9	05 54.5 100°54.7	41.5	212 42.0 227°45.1	11.6	25°24.2	55.8	Saturn	339°29.0	18:19
21	45°58.7	95° 50.4	• • 46.9	100 54.7 115°55.1	• • 40.6	242°47.5	• • 11.6	40°26.6	• • 55.8	Horizont	al parallax	
22	76°01.1	110°49.9	45.9	130°55.5	40.0	257°49.9	11.6	55°29.0	55.9		Venus:	0.1
23	91°03.6	125°49.4	44.8	145°55.9	39.7	272°52.3	11.6	70°31.4	55.9		Mars:	0.1
Mer.p	ass. 16:57	$ u$ -0.5 $^{\prime}$ d-1	.0′ m-4.00	ν 0.4′ d -0	.4′ m1.18	ν2.4′ d -0	.0′ m-2.15	$\nu 2.4' \ d0.0$	u′ m0.48			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.4	S22°47.3	103°50.1	16.4'	N04°37.2	13.3'	54.6'
1	193°52.2	47.1	$118^{\circ}25.5$	16.4'	$04^{\circ}50.5$	13.3'	54.6'
2	208°51.9	46.8	133°00.8	16.3'	05°03.8	13.3'	54.6'
3	223°51.6	• • 46.6	147°36.2	16.3'	05°17.0	13.3'	54.7'
4	238° 51.3 253° 51.0	46.3	162°11.5 176°46.7	16.3'	05°30.3 05°43.5	13.2' 13.2'	54.7'
5 6	268° 50.7	46.1 \$22°45.8	176 46.7 191°21.9	16.2' 16.2'	N05°56.7	13.2'	54.7' 54.7'
7	283° 50.4	45.5	205°57.1	16.1	06° 10.0	13.2'	54.7'
8	298°50.2	45.3	220°32.3	16.1'	06°23.2	13.2'	54.8'
9	313°49.9	• • 45.0	235°07.4	16.0'	06°36.4	13.2'	54.8'
10	328°49.6	44.8	249°42.4	16.0'	06°49.5	13.2'	54.8'
11	343°49.3	44.5	264°17.4	16.0'	07°02.7	13.1'	54.8'
12	358°49.0	\$22°44.3	278°52.4	15.9'	N07°15.8	13.1'	54.8'
13 14	13° 48.7 28° 48.5	44.0 43.7	293°27.3 308°02.1	15.9' 15.8'	07°29.0 07°42.1	13.1' 13.1'	54.9' 54.9'
15	43°48.2	• • 43.5	300 02.1 322°36.9	15.8'	07°55.2	13.1	54.9'
16	58° 47.9	43.2	337°11.7	15.7'	08°08.2	13.0'	54.9'
17	73°47.6	42.9	351°46.4	15.6'	08°21.3	13.0'	55.0'
18	88°47.3	S22°42.7	6°21.0	15.6'	N08°34.3	13.0'	55.0'
19	103°47.0	42.4	20°55.6	15.5'	08°47.3	13.0'	55.0'
20	118°46.8	42.2	35°30.1	15.5'	09°00.3	13.0'	55.0'
21	133°46.5	• • 41.9	50°04.6 64°39.0	15.4'	09°13.3 09°26.2	12.9'	55.0'
22 23	148° 46.2 163° 45.9	41.6 41.4	64°39.0 79°13.4	15.4' 15.3'	09°26.2 09°39.1	12.9' 12.9'	55.1' 55.1'
23			- 19 13.4			14.3	55.1
	SD = 16.3'	d = -0.3'		SL	O = 14.9'		
Wed	GHA 178° 45.6	Dec \$22°41.1	GHA 93°47.7	ν 15 2'	Dec N09° 52.0	d 12.0'	HP
0 1	178°45.6 193°45.3	\$22°41.1 40.8	93°47.7 108°21.9	15.2' 15.2'	10°04.9	12.9' 12.8'	55.1' 55.1'
2	208° 45.1	40.5	100°21.9 122°56.1	15.1'	10° 17.7	12.8'	55.2'
3	223°44.8	• • 40.3	137°30.2	15.0'	10°30.5	12.8'	55.2'
4	238°44.5	40.0	$152^{\circ}04.2$	15.0'	10°43.2	12.7'	55.2'
5	253°44.2	39.7	166°38.2	14.9'	10°56.0	12.7'	55.3'
6	268° 43.9 283° 43.7	\$22°39.5	181°12.1 195°45.9	14.8'	N11°08.7 11°21.4	12.7'	55.3'
7 8	283°43.7 298°43.4	39.2 38.9	195°45.9 210°19.7	14.8' 14.7'	11°21.4 11°34.0	12.6' 12.6'	55.3' 55.3'
9	313° 43.1	38.6	224°53.4	14.6'	11°46.6	12.6'	55.4'
10	328° 42.8	38.4	239°27.0	14.5'	11°59.2	12.5'	55.4'
11	343°42.5	38.1	254°00.5	14.5'	$12^{\circ}11.7$	12.5'	55.4'
12	358° 42.3	S22°37.8	268°34.0	14.4'	N12°24.2	12.5'	55.4'
13 14	13° 42.0 28° 41.7	37.5 37.3	283°07.4 297°40.7	14.3' 14.2'	12°36.7 12°49.1	12.4' 12.4'	55.5' 55.5'
15	43°41.4	37.0	312°13 9	14.1'	13°01.5	12.3'	55.5'
16	58°41.1	36.7	326°47.1	14.1'	13° 13.8	12.3'	55.6'
17	73°40.9	36.4	$341^{\circ}20.1$	14.0'	$13^{\circ}26.1$	12.3'	55.6'
18	88°40.6	S22°36.1	355°53.1	13.9'	N13°38.4	12.2'	55.6'
19	103° 40.3 118° 40.0	35.8	10°26.0 24°58.8	13.8'	13°50.6 14°02.7	12.2'	55.7'
20 21	118° 40.0 133° 39.7	35.6 •• 35.3	24°58.8 39°31.6	13.7' 13.6'	14° 02.7 14° 14.8	12.1' 12.1'	55.7' 55.7'
22	148° 39.5	35.0	54°04.2	13.6'	14° 14.8	12.1	55.7'
23	163°39.2	34.7	68°36.8	13.5'	14°38.9	12.0'	55.8'
	SD = 16.3'	d = -0.3'		SI	0 = 15.0'		
Thu	CUA	D	GHA		D-:	.1	LIE
I hu O	GHA 178° 38.9	Dec \$22°34.4	GHA 83°09.2	u 13.4'	Dec N14°50.9	d 11.9'	HP 55.8'
1	193°38.6	34.1	97°41.6	13.3'	15°02.8	11.9'	55.8'
2	208° 38.4	33.8	112°13.9	13.2'	15° 14.7	11.8'	55.9'
3	223°38.1	• • 33.6	126°46.1	13.1'	15°26.5	11.8'	55.9'
4	238° 37.8	33.3	141°18.2	13.0'	15°38.2	11.7'	55.9'
5	253°37.5	33.0	155°50.2 170°22.1	12.9'	15°49.9	11.6'	56.0'
6 7	268° 37.2 283° 37.0	\$22°32.7 32.4	170°22.1 184°53.9	12.8' 12.7'	N16°01.6 16°13.2	11.6' 11.5'	56.0' 56.0'
8	298° 36.7	32.4	104 55.9 199°25.6	12.6'	16°13.2	11.5'	56.1
9	313°36.4	31.8	213°57.2	12.5'	16°36.2	11.4'	56.1
10	328°36.1	31.5	228°28.7	12.4'	$16^{\circ}47.6$	11.3'	56.1'
11	343°35.9	31.2	243°00.1	12.3'	16°58.9	11.3'	56.2'
12	358° 35.6	S22°30.9	257°31.5	12.2'	N17°10.2	11.2'	56.2'
13 14	13°35.3 28°35.0	30.6 30.3	272°02.7 286°33.8	12.1' 12.0'	17°21.4 17°32.5	11.1' 11.1'	56.2' 56.3'
15	43°34.8	• • 30.0	301°04.8	11.9'	17°43.6	11.1	56.3
16	58°34.5	29.7	315°35.7	11.8'	17°54.6	10.9'	56.3'
17	73°34.2	29.4	330°06.4	11.7'	18°05.6	10.9'	56.4'
18	88°33.9	\$22°29.1	344°37.1	11.6'	N18°16.4	10.8'	56.4'
19 20	103°33.7 118°33.4	28.8 28.5	359°07.7 13°38.2	11.5' 11.4'	18°27.2 18°37.9	10.7' 10.6'	56.5' 56.5'
21	118 33.4 133°33.1	28.2	28°08.5	11.4	18° 48.6	10.6	56.5'
22	148° 32.8	27.9	42°38.8	11.1'	18°59.1	10.5'	56.6'
23	163°32.6	27.6	57°08.9	11.0'	19°09.6	10.4'	56.6'
	SD = 16.3'	d = -0.3'	-	SI	O = 15.2'		

Lat.	Twil	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:20	10:31			13:40	15:51
N 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
N 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
N 40°	06:18	06:52	07:22	16:48	17:19	17:53
35°	06:09	06:41	07:08	17:02	17:30	18:01
30°	06:01	06:30	06:57	17:14	17:40	18:10
20°	05:45	06:12	06:36	17:34	17:58	18:26
N 10°	05:29	05:56	06:18	17:52	18:15	18:41
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	04:55	05:22	05:45	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
S 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	////
S 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
N 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
N 10°	11:19	11:57	12:39	23:51		00:39
0°	11:24	12:06	12:52	23:44		00:28
S 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
S 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
S 60°	12:17	13:42	15:12	22:34	22:37	22:42

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Duy	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
- Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	106°06.1	140°48.9	S15°43.8	160° 56.4	\$20°39.3	287°54.7	N02°11.6	85°33.8	N05°56.0		3114	
										Alpheratz	357°32.3	29° 14.9
1	121°08.5	155°48.4	42.7	175°56.8	38.8	302°57.2	11.6	100°36.2	56.0	Ankaa	353°04.8	-42°09.4
2	136°11.0	170°47.9	41.7	190°57.2	38.4	317°59.6	11.6	115°38.6	56.0	Schedar	349°28.2	56°41.8
3	151°13.5	185°47.4	• • 40.7	205° 57.6	• • 37.9	333°02.0	• • 11.6	130°41.0	• • 56.1	Diphda	348°44.9	-17°50.0
4	$166^{\circ}15.9$	200°46.8	39.6	220°58.1	37.5	348°04.4	11.5	145°43.4	56.1	Achernar	335°18.3	-57°05.9
5	181°18.4	215°46.3	38.6	235°58.5	37.0	3°06.8	11.5	160°45.8	56.1	Hamal	327°48.3	23°35.8
6	196°20.8	230°45.8	S15°37.5	250° 58.9	S20°36.6	18°09.3	$N02^{\circ}11.5$	175°48.2	N05°56.2		312°25.0	89°23.2
7	211°23.3	245°45.3	36.5	265°59.3	36.1	33°11.7	11.5	190°50.7	56.2	Polaris		
8	226°25.8	260°44.8	35.4	280° 59.8	35.7	$48^{\circ}14.1$	11.5	205°53.1	56.2	Acamar	315°09.7	-40°11.7
9	241°28.2	275°44.3	• • 34.4	296°00.2	• • 35.2	63°16.5	• • 11.5	220°55.5	• • 56.3	Menkar	314°03.4	4°12.0
10	256°30.7	290°43.8	33.3	311°00.6	34.8	78°19.0	11.5	235°57.9	56.3	Mirfak	308°24.3	49°57.8
11	271°33.2	305°43.3	32.3	326°01.0	34.3	93°21.4	11.5	251°00.3	56.3	Aldebaran	290°36.5	16°33.9
12	286°35.6	320°42.8	S15°31.2	341°01.5	S20°33.9	108°23.8	N02°11.5	266°02.7	N05°56.4	Rigel	$281^{\circ}01.2$	-8°10.3
				356°01.9						Capella	280°17.8	46°01.6
13	301°38.1	335°42.3	30.2		33.4	123°26.2	11.5	281°05.1	56.4	Bellatrix	278°19.9	6°22.4
14	316°40.6	350°41.8	29.1	11°02.3	33.0	138°28.7	11.5	296°07.5	56.4	Elnath	277°58.4	28°37.8
15	331°43.0	5°41.3	• • 28.1	26°02.7	• • 32.5	153°31.1	• • 11.5	311°09.9	• • 56.5	Alnilam	275°34.9	$-1^{\circ}11.1$
16	346°45.5	20°40.8	27.0	41°03.2	32.0	168°33.5	11.5	326° 12.3	56.5	Betelgeuse	270°49.1	7°24.6
17	1°48.0	35°40.3	26.0	56°03.6	31.6	183°35.9	11.5	341°14.7	56.6	Canopus	263°50.7	-52°42.7
18	16°50.4	50°39.8	S15°24.9	71°04.0	S20°31.1	198°38.4	N02°11.5	$356^{\circ}17.1$	N05°56.6	Sirius	258°23.7	-16°45.4
19	31°52.9	65°39.3	23.9	86°04.4	30.7	213°40.8	11.5	11° 19.5	56.6			-10 43.4 -29°00.7
20	46°55.3	80°38.8	22.8	101°04.9	30.2	228°43.2	11.5	26°21.9	56.7	Adhara	255°03.5	
21	61°57.8	95°38.3	• • 21.8	116°05.3	• • 29.8	243°45.6	• • 11.5	41°24.3	• • 56.7	Procyon	244°47.9	5°09.0
22	77°00.3	110°37.8	20.7	131°05.7	29.3	258°48.1	11.5	56°26.7	56.7	Pollux	243°13.9	27°57.3
23	92°02.7	125°37.3	19.7	146°06.1	28.9	273°50.5	11.5	71°29.1	56.8	Avior	234°13.1	-59°35.9
_						-				Suhail	222°44.1	-43°32.7
Mer.p	pass. 16:53	ν -0.5′ d -1	0′ m-4.00	ν 0.4′ d -0	0.4′ m1.18	ν 2.4′ <i>d</i> -0	.0′ m-2.16	ν 2.4′ d0	.0' m0.48	Miaplacidus	221°36.8	-69°49.8
										Alphard	217°45.1	-8°46.9
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
О	107°05.2	140°36.8	\$15°18.6	161°06.6	S20°28.4	288°52.9	N02°11.5	86°31.6	N05°56.8	Dubhe	193°37.8	61°35.6
1	107 03.2 122°07.7	155°36.3	17.6	176° 07.0	27.9	303°55.3	11.5	101°34.0	56.8	Denebola	182°22.3	14°24.7
2				170 07.0 191°07.4						Gienah	$175^{\circ}41.0$	-17°41.9
	137°10.1	170°35.8	16.5		27.5	318°57.8	11.5	116°36.4	56.9	Acrux	$172^{\circ}57.1$	-63°15.1
3	152°12.6	185°35.3	• • 15.4	206° 07.9	• • 27.0	334°00.2	• • 11.5	131°38.8	56.9	Gacrux	171°48.7	-57°16.0
4	167°15.1	200°34.8	14.4	221°08.3	26.6	349°02.6	11.4	146°41.2	57.0	Alioth	$166^{\circ}10.9$	55°48.1
5	182°17.5	215°34.4	13.3	236°08.7	26.1	4°05.1	11.4	161°43.6	57.0	Spica	$158^{\circ}19.7$	-11°18.5
6	197°20.0	230°33.9	S15°12.3	251°09.1	S20°25.6	19°07.5	N02°11.4	176°46.0	N05°57.0	Alkaid	152°50.2	49° 10.0
7	212°22.5	245°33.4	11.2	266°09.6	25.2	34°09.9	11.4	191°48.4	57.1	Hadar	148°32.6	-60°30.3
8	227°24.9	260°32.9	10.1	281°10.0	24.7	49°12.3	11.4	206°50.8	57.1		147°54.8	-36°30.3
9	242°27.4	275°32.4	• • 09.1	296°10.4	• • 24.2	64°14.8	• • 11.4	221°53.2	• • 57.1	Arcturus	145°45.8	19°02.0
10	257°29.8	290°31.9	08.0	311°10.8	23.8	79°17.2	11.4	236°55.6	57.2	Rigil Kent.	139°37.1	-60°56.8
11	272°32.3	305°31.4	07.0	326°11.3	23.3	94°19.6	11.4	251°58.0	57.2	Kochab	137°20.6	74°02.0
12	287°34.8	320°30.9	S15°05.9	341°11.7	S20°22.9	109°22.1	N02°11.4	267°00.4	N05°57.3	Zuben'ubi	136°53.4	-16°09.5
13	302°37.2	335°30.4	04.8	$356^{\circ}12.1$	22.4	124°24.5	11.4	282°02.8	57.3	Alphecca	126°01.9	26°37.0
14	317°39.7	350°29.9	03.8	11°12.6	21.9	139°26.9	11.4	297°05.2	57.3	Antares	112°13.1	-26°29.6
15	332°42.2	5°29.5	• • 02.7	$26^{\circ}13.0$	• • 21.5	154°29.4	• • 11.4	312°07.6	• • 57.4	Atria	107°05.5	-69°04.4
16	347°44.6	20°29.0	01.6	41°13.4	21.0	169°31.8	11.4	$327^{\circ}10.0$	57.4	Sabik	102°00.3	-15°45.5
17	2°47.1	35°28.5	15°00.6	56° 13.8	20.5	184°34.2	11.4	342°12.4	57.4	Shaula	96°07.4	-37°07.3
18	17°49.6	50°28.0	S14°59.5	71° 14.3	S20°20.1	199°36.7	N02°11.4	357° 14.8	N05°57.5	Rasalhague	95°56.6	12°32.3
19	32°52.0	65°27.5	58.4	86°14.7	19.6	214°39.1	11.4	12° 17.2	57.5	Eltanin	90°41.6	51°29.0
20	47°54.5	80°27.0	57.3	101° 15.1	19.1	229°41.5	11.4	27° 19.6	57.6	Kaus Aust.	83°29.7	-34°22.2
21	62°56.9	95°26.6	• • 56.3	$116^{\circ}15.6$	• • 18.7	244°44.0	• • 11.4	42°22.0	• • 57.6	Vega	80°32.0	38° 48.6
22	77°59.4	110°26.1	55.2	131°16.0	18.2	259°46.4	11.4	57°24.4	57.6	_		-26°15.6
23	93°01.9	125°25.6	54.1	146° 16.4	17.7	274°48.8	11.4	72°26.8	57.7	Nunki	75°45.1	-20 15.0 8°56.6
	16.40					0.4/ 1.0	0/ 0.17		0/ 0.40	Altair	61°57.9	-56°38.7
Mer.p	pass. 16:49	ν -0.5′ d -1	1′ m-4.01	ν 0.4′ d-0).5′ m1.17	ν 2.4′ d-0	.0′ m-2.17	ν 2.4′ d0	.0′ m0.49	Peacock	53°02.5	
										Deneb	49°24.5 33°36.6	45°23.0 10°00.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif		
0	108°04.3	140°25.1	S14°53.1	161°16.9	\$20°17.3	289°51.3	N02°11.4	87°29.2		Al Na'ir	27°30.2	-46°49.6
1	123°06.8	155°24.6	52.0	176° 17.3	16.8	304°53.7	11.4	102°31.6	57.7	Fomalhaut	15°12.0	-29°28.5
2	138°09.3	170°24.2	50.9	191° 17.7	16.3	319°56.1	11.4	117°34.0	57.8	Scheat	13°43.0	28°14.3
3	153°11.7	185°23.7	• • 49.8	206° 18.2	15.9	334°58.6	•• 11.4	132° 36.4	• • 57.8	Markab	13°27.6	15°21.5
4	168°14.2	200°23.2	48.8	200°18.2	15.4	350°01.0	11.4	147°38.8	57.9	Jan 07 Fri	SHA	Mer.pass
5	183°16.7	200°23.2 215°22.7	47.7	236° 19.0	14.9	5°03.4	11.4	162°41.2	57.9 57.9	Venus	34°42.8	14:37
6	198°19.1	230°22.2	\$14°46.6	251° 19.4	S20° 14.5	20°05.9	N02°11.4	102 41.2 177°43.6	N05°57.9	Mars	54°50.3	13:16
7	213°21.6	230 22.2 245°21.8	45.5	266° 19.4	14.0	35°08.3	11.4	177 45.0 192°46.0	58.0	Jupiter		04:48
8	213 21.0 228°24.1	245 21.6 260°21.3	45.5 44.5	200 19.9 281°20.3	13.5	50°10.8	11.4	207°48.4	58.0	Saturn	339°27.7	18:15
9	243°26.5	275°20.8	• • 43.4	296° 20.7	· · 13.0	65°13.2	•• 11.4	207 48.4 222° 50.8	• • 58.0	Jutum	JUJ 21.1	20.13
10	243°20.3° 258°29.0	290°20.3	42.3	311°21.2	12.6	80°15.6	11.4	237°53.2	58.1	Jan 08 Sat	SHA	Mer.pass
11	273°31.4	305°19.9	41.2	326°21.6	12.0	95°18.1	11.4	252° 55.6	58.1	Venus	33°31.6	14:38
12	288°33.9	320°19.4	\$14°40.1	341°22.0	\$20°11.6	110°20.5	N02°11.4	267°58.0	N05°58.2	Mars	54°01.4	13:15
13	288 33.9 303°36.4	320 19.4 335°18.9	39.1	341 22.0 356° 22.5	11.1	110 20.5 125°22.9	11.4	283°00.4	58.2	Jupiter	181°47.7	04:44
14	318°38.8	350°18.5	38.0	11°22.9	10.7	125 22.9 140°25.4	11.4	298°02.8	58.2	Saturn	339°26.4	18:11
15	333°41.3		36.9		. 10.7		•• 11.4	313°05.2		1- 00 0	CIIA	N4-
	333°41.3 348°43.8	5°18.0		26°23.3 41°23.8	09.7	155°27.8	11.4	313°05.2 328°07.6	· · 58.3	Jan 09 Sun	SHA	Mer.pass
16 17		20°17.5	35.8			170°30.3			58.3	Venus	32°20.8	14:39
17	3°46.2	35°17.0	34.7	56°24.2	09.3	185°32.7	11.4 N02°11.4	343°10.0	58.4	Mars	53°12.5	13:14
18	18°48.7	50°16.6	\$14°33.6	71°24.6 86°25.1	\$20°08.8	200°35.1	N02°11.4	358° 12.4	N05°58.4	Jupiter		04:40
19	33°51.2	65°16.1	32.6		08.3	215°37.6	11.4	13°14.8	58.4	Saturn	339°24.9	18:07
20	48°53.6	80°15.6	31.5	101°25.5	07.8	230°40.0	11.5	28° 17.2	58.5	Horizont	al parallax	
21	63°56.1	95°15.2	30.4	116°25.9	07.3	245°42.5 260°44.9	• • 11.5	43° 19.6	· · 58.5	1.51125111	Venus:	0.1
22	78°58.6 94°01.0	110°14.7	29.3	131°26.4	06.9		11.5	58°22.0	58.6		Mars:	0.1
23	94 01.0	125°14.2	28.2	146°26.8	06.4	275°47.3	11.5	73°24.4	58.6		141013.	0.1
Mer.p	pass. 16:45	ν -0.5' d-1	1′ m-4.01	ν 0.4′ d-0	0.5′ m1.17	ν 2.4′ d0.	0′ m-2.18	ν 2.4′ d0	.0′ m0.49			

h	Su			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.3	S22°27.3	71°38.9	10.9'	N19°20.0	10.3'	56.6'
1 2	193°32.0 208°31.8	27.0 26.7	86°08.8 100°38.6	10.8' 10.7'	19°30.3 19°40.6	10.2' 10.2'	56.7' 56.7'
3	200 31.0 223°31.5	. 26.4	100 36.0 115°08.3	10.7	19 40.0 19°50.7	10.2	56.7'
4	238°31.2	26.1	129°37.8	10.4'	20°00.8	10.0'	56.8'
5	253°30.9	25.8	144°07.3	10.3'	20°10.8	9.9'	56.8'
6	268°30.7 283°30.4	\$22°25.5 25.1	158°36.6 173°05.8	10.2' 10.1'	N20°20.6 20°30.4	9.8' 9.7'	56.9' 56.9'
7 8	283 30.4 298°30.1	25.1 24.8	173 05.8 187°34.9	10.1	20°30.4	9.7 9.6'	56.9'
9	313°29.9	• • 24.5	202°03.9	9.9'	20°49.7	9.5'	57.0'
10	328°29.6	24.2	216°32.8	9.7'	20°59.3	9.4'	57.0'
11 12	343°29.3 358°29.0	23.9 S 22°23.6	231°01.5 245°30.2	9.6' 9.5'	21°08.7 N21°18.0	9.3' 9.2'	57.0' 57.1'
13	13°28.8	23.3	259°58.7	9.4'	21°27.2	9.1'	57.1
14	28°28.5	22.9	274°27.0	9.3'	21°36.3	9.0'	57.2'
15	43°28.2	• • 22.6	288°55.3	9.1'	21°45.4	8.9'	57.2'
16 17	58°28.0 73°27.7	22.3 22.0	303°23.5 317°51.5	9.0' 8.9'	21°54.3 22°03.1	8.8' 8.7'	57.2' 57.3'
18	88°27.4	S22°21.7	332°19.4	8.8'	N22°11.8	8.6'	57.3'
19	103°27.2	21.4	346°47.2	8.7'	22°20.3	8.5'	57.4'
20	118°26.9 133°26.6	21.0	1°14.8 15°42.4	8.5'	22°28.8 22°37.2	8.4'	57.4'
21 22	133°26.6 148°26.4	· · 20.7 20.4	15°42.4 30°09.8	8.4' 8.3'	22° 45.4	8.2' 8.1'	57.4' 57.5'
23	163°26.1	20.1	44°37.1	8.2'	22°53.6	8.0'	57.5'
	SD = 16.3'	d = -0.3'		SE	0 = 15.4'		
-							
Sat 0	GHA 178°25.8	Dec S 22°19.7	GHA 59°04.3	u 8.1'	Dec N23°01.6	d 7.9'	HP 57.6'
1	178°25.8 193°25.6	19.4	73°31.3	8.1 7.9'	23°09.5	7.9 7.8'	57.6'
2	208°25.3	19.1	87°58.3	7.8'	23°17.2	7.7'	57.6'
3	223°25.0	• • 18.8	102°25.1	7.7'	23°24.9	7.5'	57.7'
4 5	238°24.8 253°24.5	18.4 18.1	116°51.8 131°18.4	7.6' 7.5'	23°32.4 23°39.8	7.4' 7.3'	57.7' 57.8'
6	268°24.2	522°17.8	145°44.8	7.3'	N23°47.1	7.3	57.8
7	283°24.0	17.5	160°11.2	7.2'	23°54.2	7.0'	57.8'
8	298°23.7	17.1	174°37.4	7.1'	24°01.2	6.9'	57.9'
9 10	313°23.4 328°23.2	· · 16.8 16.5	189°03.5 203°29.5	7.0' 6.9'	24°08.1 24°14.9	6.7' 6.6'	57.9' 58.0'
11	343°22.9	16.1	203 29.3 217°55.3	6.8	24°14.9	6.5	58.0'
12	358°22.6	S22°15.8	232°21.1	6.6'	N24°27.9	6.3'	58.0'
13	13°22.4	15.5	246°46.7	6.5'	24°34.3	6.2'	58.1'
14 15	28°22.1 43°21.8	15.1 •• 14.8	261°12.2 275°37.7	6.4' 6.3'	24°40.5 24°46.5	6.1' 5.9'	58.1' 58.2'
16	58°21.6	14.5	290°02.9	6.2'	24°52.4	5.8'	58.2
17	73°21.3	14.1	$304^{\circ}28.1$	6.1'	24°58.2	5.6'	58.2'
18	88°21.0 103°20.8	\$22°13.8	318°53.2 333°18.2	6.0' 5.8'	N25°03.8 25°09.3	5.5'	58.3'
19 20	103 20.8 118°20.5	13.4 13.1	333 18.2 347°43.0	5.8 5.7'	25 09.3 25°14.6	5.3' 5.2'	58.3' 58.4'
21	133°20.3	. 12.8	2°07.7	5.6'	25°19.8	5.0'	58.4
22	148°20.0	12.4	16°32.4	5.5'	25°24.8	4.9'	58.4'
23	163°19.7	12.1	30°56.9	5.4'	25°29.6	4.7'	58.5'
	SD = 16.3'	d = -0.3'		SE	D = 15.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°19.5	\$22°11.7	45°21.3	5.3'	N25°34.3	4.5'	58.5
1 2	193°19.2 208°18.9	11.4 11.1	59°45.7 74°09.9	5.2' 5.1'	25°38.9 25°43.2	4.4' 4.2'	58.5' 58.6'
3	200 10.9 223°18.7	•• 10.7	88°34.0	5.1 5.0'	25°47.5	4.2 4.1'	58.6'
4	238°18.4	10.4	102°58.0	4.9'	25°51.5	3.9'	58.7'
5	253°18.2	10.0	117°21.9	4.8'	25°55.4	3.7'	58.7'
6 7	268°17.9 283°17.6	\$22°09.7 09.3	131°45.8 146°09.5	4.7' 4.6'	N25°59.1 26°02.7	3.6' 3.4'	58.7' 58.8'
8	298°17.4	09.0	160°33.1	4.6'	26°06.1	3.2'	58.8'
9	313°17.1	•• 08.6	174°56.7	4.5'	26°09.3	3.1'	58.9'
10	328°16.9	08.3	189°20.1	4.4'	26°12.4	2.9'	58.9'
11 12	343°16.6 358°16.3	07.9 S 22°07.6	203°43.5 218°06.8	4.3' 4.2'	26°15.3 N26°18.0	2.7' 2.5'	58.9' 59.0'
13	13°16.1	07.2	232°30.0	4.1'	26°20.5	2.4	59.0'
14	28°15.8	06.9	246°53.1	4.0'	26°22.9	2.2'	59.0'
15 16	43°15.6 58°15.3	· · 06.5 06.2	261°16.2 275°39.2	4.0' 3.9'	26°25.1 26°27.1	2.0' 1.8'	59.1' 59.1'
16 17	58° 15.3 73° 15.1	06.2 05.8	275°39.2 290°02.1	3.9'	26°27.1 26°28.9	1.6'	59.1° 59.2'
18	88°14.8	S22°05.5	304°24.9	3.8'	N26°30.5	1.5'	59.2'
19	103°14.5	05.1	318°47.6	3.7'	26°32.0	1.3'	59.2'
20 21	118°14.3 133°14.0	04.7 •• 04.4	333°10.3 347°32.9	3.6' 3.6'	26°33.3 26°34.4	1.1' 0.9'	59.3' 59.3'
21	133°14.0 148°13.8	04.4	1°55.5	3.5'	26°34.4 26°35.3	0.9	59.3'
23	163°13.5	03.7	16°18.0	3.4'	26°36.1	0.5'	59.4
	SD = 16.3'	d = -0.3'		SE	0 = 16.0'		

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

Lat.		Moonris	е		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°	11:29	11:57	12:39	03:19	04:41	06:00
52°	11:39	12:10	12:54	03:09	04:28	05:45
50°	11:48	12:21	13:07	03:01	04:18	05:32
45°	12:07	12:45	13:34	02:42	03:55	05:06
N 40°	12:23	13:04	13:55	02:28	03:36	04:45
35°	12:36	13:20	14:13	02:15	03:21	04:28
30°	12:48	13:34	14:28	02:05	03:08	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
S 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	
S 60°	16:48	18:24	19:49	22:52	23:11	23:53

		Sun		Moon				
Day	Eqn.of	Eqn.of Time		Eqn.of Time		Mer.	Pass.	Age
,	00 ^h	12 ^h	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			
08	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	Ve	nus		ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	109°03.5	140°13.8	\$14°27.1	161°27.2	S20°05.9	290°49.8	N02°11.5	88°26.8	N05°58.6			
1	124°05.9	155° 13.3	26.0	176° 27.7	05.4	305°52.2	11.5	103°29.2	58.7	Alpheratz	357°32.3	29°14.9
2	139°08.4	170° 12.8	25.0	191°28.1	05.0	320°54.7	11.5	118°31.6	58.7	Ankaa	353°04.8	-42°09.4
3	154° 10.9	185° 12.4	• • 23.9	206°28.5	04.5	335°57.1	• • 11.5	133°34.0	• • 58.8	Schedar	349°28.2	56°41.8
4	169°13.3	200°11.9	22.8	221°29.0	04.0	350°59.6	11.5	148°36.4	58.8	Diphda	348°44.9	-17°50.0
5	184°15.8	215° 11.4	21.7	236°29.4	03.5	6°02.0	11.5	163°38.7	58.8	Achernar	335°18.4	-57°05.9
6	199°18.3	230°11.0	S14°20.6	251°29.9	S20°03.0	21°04.4	N02°11.5	178° 41.1	N05°58.9	Hamal	327°48.3	23°35.8
7	214°20.7	245° 10.5	19.5	266°30.3	02.6	36°06.9	11.5	193° 43.5	58.9	Polaris	312°25.9	89°23.2
8	229°23.2	260°10.1	18.4	281°30.7	02.1	51°09.3	11.5	208° 45.9	59.0	Acamar	315°09.7	-40°11.7
9	244°25.7	275°09.6	• • 17.3	296°31.2	• • 01.6	66°11.8	· · 11.5	223°48.3	• • 59.0	Menkar	314°03.4	4°12.0
10	259°28.1	290°09.1	16.2	311°31.6	01.1	81°14.2	11.5	238°50.7	59.0	Mirfak	308°24.4	49°57.8
11	274°30.6	305°08.7	15.1	326°32.0	00.6	96°16.7	11.5	253°53.1	59.1	Aldebaran	290°36.5	16°33.9
12	289°33.1	320°08.2	5 14°14.0	341°32.5	520°00.2	111°19.1	N02°11.5	268° 55.5	N05°59.1	Rigel	281°01.2	-8°10.3
13	304°35.5	335°07.8	12.9	356°32.9	19°59.7	126°21.6	11.5	283°57.9	59.2	Capella	280°17.8	46°01.6
14	319°38.0	350° 07.3	11.8	11°33.3	59.2	141°24.0	11.5	299°00.3	59.2	Bellatrix	278°19.9	6°22.4
15	334°40.4	5°06.9	• • 10.7	26°33.8	• • 58.7	156°26.5	• • 11.5	314°02.7	• • 59.2	Elnath	277°58.4	28°37.8
16	349°42.9	20°06.4	09.6	41°34.2	58.2	171°28.9	11.5	329°05.1	59.3	Alnilam	275°34.9	-1°11.1
17	4°45.4	35°05.9	08.5	56°34.7	57.7	186°31.4	11.5	344°07.5	59.3	Betelgeuse	270°49.1	7°24.6
18	19°47.8	50°05.5	S14°07.4	71°35.1	S19°57.3	201°33.8	N02°11.5	359°09.9	N05°59.4	Canopus	263°50.7	-52°42.7 -16°45.4
19	34°50.3	65°05.0	06.3	86°35.5	56.8	216°36.2	11.5	14°12.3	59.4	Sirius	258°23.7	-10 45.4 -29°00.7
20	49°52.8	80°04.6	05.2	101°36.0	56.3	231°38.7	11.6	29° 14.7	59.4	Adhara	255°03.5	
21	64°55.2	95°04.1	• • 04.1	$116^{\circ}36.4$	• • 55.8	$246^{\circ}41.1$	• • 11.6	44°17.0	• • 59.5	Procyon Pollux	244°47.9 243°13.9	5°09.0 27°57.3
22	79°57.7	110°03.7	03.0	131°36.8	55.3	261°43.6	11.6	59° 19.4	59.5		243°13.9 234°13.0	-59°36.0
23	95°00.2	125°03.2	01.9	146°37.3	54.8	276°46.0	11.6	74°21.8	59.6	Avior Suhail	234°13.0 222°44.0	-59°36.0 -43°32.8
1/10==	ass 16.41	1/_O 5/ d 1	1′ m-4.02	υΩ Λ/ ຝ Ω	0.5' m1.17	1/2 1/ 40	.0′ m-2.18	ν 2.4' d0.	0′ m0 40	Miaplacidus	222°44.0 221°36.8	-43°32.8 -69°49.9
ivier.p	ass. 16:41	ν -0.5 a -1	ı ın-4.U2	ν 0.4° a -0	71.1m c.	ν2.4 α0.	υ III-2.18	ν2.4 a0.	0 1110.49	Miaplacidus	221°36.8 217°45.0	-69°49.9 -8°46.9
											217 45.0 207°31.6	-6 40.9 11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207 31.6 193°37.7	61°35.6
0	$110^{\circ}02.6$	140°02.8	S 14°00.8	161°37.7	S19°54.3	291°48.5	N02°11.6	89°24.2	N05°59.6	Dubne	193°37.7 182°22.3	14°24.7
1	$125^{\circ}05.1$	155°02.3	13°59.7	176°38.2	53.9	$306^{\circ}50.9$	11.6	104°26.6	59.7	Gienah		-17°41.9
2	140°07.6	170°01.9	58.6	191°38.6	53.4	321°53.4	11.6	119°29.0	59.7	Acrux		-17 41.9 -63°15.1
3	155°10.0	185°01.4	• • 57.5	206°39.0	• • 52.9	336°55.8	• • 11.6	134°31.4	• • 59.7	Gacrux		-57°16.0
4	170°12.5	200°01.0	56.4	221°39.5	52.4	351°58.3	11.6	149°33.8	59.8	Alioth	166°10.8	55°48.1
5	$185^{\circ}14.9$	215°00.5	55.3	236°39.9	51.9	7°00.7	11.6	164°36.2	59.8	Spica	158° 19.7	-11°18.5
6	200°17.4	230°00.1	S13°54.2	251°40.4	S19°51.4	22°03.2	N02°11.6	179°38.6	N05°59.9	Alkaid	150° 19.7 152° 50.2	49°10.0
7	$215^{\circ}19.9$	244°59.6	53.1	266°40.8	50.9	$37^{\circ}05.6$	11.6	$194^{\circ}41.0$	59.9	Hadar	148°32.5	-60°30.3
8	230°22.3	259°59.2	52.0	281°41.2	50.4	52°08.1	11.6	209°43.4	05°59.9	Menkent	140°54.7	-36°30.4
9	245°24.8	274°58.7	• • 50.9	296°41.7	• • 50.0	67°10.5	• • 11.6	224°45.7	$06^{\circ}00.0$	Arcturus	145°45.8	19°02.0
10	260°27.3	289°58.3	49.8	311°42.1	49.5	82°13.0	11.6	239°48.1	0.00	Rigil Kent.		-60°56.8
11	275°29.7	304°57.8	48.7	326°42.6	49.0	97°15.5	11.7	254°50.5	00.1	Kochab	137°20.5	74°02.0
12	290°32.2	319°57.4	S13°47.5	341°43.0	S19°48.5	112°17.9	N02°11.7	269°52.9	N06°00.1	Zuben'ubi	136°53.4	-16°09.5
13	305°34.7	334°57.0	46.4	356°43.4	48.0	127°20.4	11.7	284°55.3	00.2	Alphecca	126°01.9	26°37.0
14	320°37.1	349°56.5	45.3	11°43.9	47.5	142°22.8	11.7	299°57.7	00.2	Antares	112°13.1	-26°29.6
15	335°39.6	4°56.1	• • 44.2	26°44.3	• • 47.0	157°25.3	•• 11.7	$315^{\circ}00.1$	• • 00.2	Atria	107°05.5	-69°04.4
16	350°42.1	19°55.6	43.1	41°44.8	46.5	172°27.7	11.7	330°02.5	00.3	Sabik	102°00.2	-15°45.5
17	5°44.5	34°55.2	42.0	56°45.2	46.0	187°30.2	11.7	345°04.9	00.3	Shaula	96°07.4	-37°07.3
18	20°47.0	49°54.8	S13°40.9	71°45.6	S19°45.5	202°32.6	N02°11.7	0°07.3	N06°00.4	Rasalhague	95°56.6	12°32.3
19	35°49.4	64°54.3	39.8	86°46.1	45.0	217°35.1	11.7	15°09.6	00.4	Eltanin	90°41.5	51°29.0
20	50°51.9	79°53.9	38.6	101°46.5	44.5	232°37.5	11.7	30° 12.0	00.5	Kaus Aust.	83°29.6	-34°22.2
21	65°54.4	94°53.4	• • 37.5	116°47.0	• • 44.0	247°40.0	• • 11.7	45°14.4	• • 00.5	Vega	80°32.0	38°48.5
22	80°56.8	109°53.0	36.4	131°47.4	43.5	262°42.5	11.7	60° 16.8	00.5	Nunki	75°45.1	-26°15.6
23	95°59.3	124°52.6	35.3	146°47.9	43.1	277°44.9	11.8	75° 19.2	00.6	Altair	61°57.9	8°56.6
Mer.p	ass. 16:37	ν -0.5' d-1	1′ m-4.02	$\nu 0.4' \ d-0$	0.5' m1.17	$\nu 2.4' d0$.0′ m-2.19	ν 2.4′ d0.	0′ m0.50	Peacock	53°02.5	-56°38.7
										Deneb	49°24.5	45°23.0
			_		_		_		_	Enif	33°36.6	10°00.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.6
0	111°01.8	139°52.1	\$13°34.2	161°48.3	\$19°42.6	292°47.4	N02°11.8	90°21.6	N06°00.6	Fomalhaut	15°12.0	-29°28.5
1	126°04.2	154°51.7	33.1	176°48.7	42.1	307°49.8	11.8	105°24.0	00.7	Scheat	13°43.0	28°14.3
2	141°06.7	169°51.2	31.9	191°49.2	41.6	322°52.3	11.8	120°26.4	00.7	Markab	13°27.6	15°21.5
3	156°09.2 171°11.6	184°50.8	30.8	206°49.6	• • 41.1	337°54.7	• • 11.8	135°28.7	00.8	Jan 10 Mon	SHA	Mer.pass
4		199°50.4	29.7	221°50.1	40.6	352°57.2	11.8	150°31.1	00.8	Venus	31°10.3	14:40
5	186°14.1	214°49.9	28.6 \$13°27.5	236°50.5	40.1	7°59.7	11.8 N02°11.8	165°33.5 180°35.9	8.00 N06°00.0	Mars	51 10.3 52°23.8	13:14
6 7	201°16.6 216°19.0	229°49.5 244°49.1	\$13°27.5 26.3	251°51.0 266°51.4	\$19°39.6	23°02.1 38°04.6	N02°11.8 11.8	180° 35.9 195° 38.3	N06°00.9 00.9	Jupiter	181°46.3	04:36
8	216° 19.0 231° 21.5	244 49.1 259° 48.6	26.3 25.2	281°51.8	39.1 38.6	53°07.0	11.8	195° 38.3 210° 40.7	00.9	Saturn	339°23.3	18:03
9	231 21.5 246°23.9	259 48.0 274°48.2	24.1	281 51.8 296°52.3	38.1	68°09.5	11.8	210 40.7 225°43.1	01.0	Jatuill	JJJ 2J.J	10.03
10	240 23.9 261°26.4	274 46.2 289° 47.8	23.0	311°52.7	37.6	83°12.0	11.9	240°45.5	01.0	Jan 11 Tue	SHA	Mer.pass
11	201 20.4 276°28.9	304° 47.4	21.8	326°53.2	37.0	98°14.4	11.9	255° 47.8	01.1	Venus	$30^{\circ}00.1$	14:40
12	291°31.3	319° 46.9	\$13°20.7	341°53.6	\$19°36.6	113°16.9	N02°11.9	270° 50.2	N06°01.1	Mars	51°35.1	13:13
13	306°33.8	334° 46.5	19.6	356°54.1	36.1	128°19.3	11.9	285°52.6	01.2	Jupiter		04:32
14	321°36.3	349°46.1	18.5	11°54.5	35.6	143°21.8	11.9	300°55.0	01.2	Saturn	339°21.6	18:00
15	336°38.7	4° 45.6	17.3	26°55.0	35.1	158°24.3	•• 11.9	315° 57.4	01.3	Jan 12 Wed	SHA	Mer.pass
16	351°41.2	19° 45.2	16.2	41°55.4	34.6	173°26.7	11.9	330°59.8	01.3	Venus	28°50.4	14:41
17	6°43.7	34° 44.8	15.1	56°55.8	34.1	188°29.2	11.9	346°02.2	01.4	Mars	50°46.5	13:12
18	21°46.1	49° 44.4	S13°14.0	71°56.3	S19°33.6	203°31.6	N02°12.0	1°04.5	N06°01.4	Jupiter		04:28
19	36°48.6	64°43.9	12.8	86°56.7	33.1	218°34.1	12.0	16°06.9	01.5	Saturn	339°19.8	17:56
20	51°51.1	79°43.5	11.7	101°57.2	32.6	233°36.6	12.0	31°09.3	01.5	Jatuill	555 15.0	11.50
21	66°53.5	94°43.1	• • 10.6	116°57.6	32.1	248°39.0	• • 12.0	46°11.7	• • 01.5	Horizont	al parallax	
22	81°56.0	109°42.7	09.4	131°58.1	31.6	263°41.5	12.0	61°14.1	01.6		Venus:	0.1
23	96°58.4	124°42.2	08.3	146°58.5	31.1	278°44.0	12.0	$76^{\circ}16.5$	01.6		Mars:	0.1
										<u> </u>		
ivier.p	ass. 16:33	ν -0.4′ a -1	1′ m-4.02	$\nu_{0.4}$ a-0	0.5′ m1.16	ν2.5' a0.	.0′ m-2.20	ν 2.4′ d0.	U 111U.5U			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°13.3	S22°03.3	30°40.4	3.4'	N26°36.6	0.4	59.4
1	193°13.0	03.0	45°02.8	3.3'	26°37.0	0.2'	59.4'
2	208°12.7	02.6	59°25.2	3.3'	26°37.1	-0.0'	59.5'
3	223°12.5	• • 02.2	73°47.4	3.2'	26°37.1	-0.2'	59.5'
4	238°12.2	01.9	88°09.7	3.2'	26°36.9	-0.4'	59.6'
5	253°12.0 268°11.7	01.5 \$22°01.1	102°31.8 116°54.0	3.1' 3.1'	26°36.5 N26°36.0	-0.6'	59.6'
6 7	283°11.7	00.8	110 54.0 131°16.1	3.1'	26°35.2	-0.8' -1.0'	59.6' 59.7'
8	298°11.2	00.4	145°38.2	3.0'	26°34.2	-1.2	59.7'
9	313°11.0	22°00.0	160°00.2	3.0'	26°33.1	-1.3'	59.7'
10	328°10.7	21°59.7	174°22.2	3.0'	26°31.7	-1.5'	59.8'
11	343°10.5	59.3	188°44.2	2.9'	26°30.2	-1.7'	59.8'
12	358°10.2	S21°58.9	203°06.1	2.9'	N26°28.4	-1.9'	59.8'
13	13°09.9	58.6	217°28.0	2.9'	26°26.5	-2.1'	59.9'
14	28°09.7	58.2	231°49.9	2.9'	26°24.4	-2.3'	59.9'
15 16	43°09.4 58°09.2	· · 57.8 57.5	246°11.8 260°33.6	2.9' 2.8'	26°22.1 26°19.6	-2.5' -2.7'	59.9' 59.9'
17	73°08.9	57.5 57.1	274°55.5	2.8'	26°16.9	-2.1 -2.9'	60.0'
18	88°08.7	\$21°56.7	289°17.3	2.8'	N26° 14.0	-3.1'	60.0'
19	103°08.4	56.3	303°39.2	2.8'	26° 10.9	-3.3'	60.0'
20	118°08.2	56.0	318°01.0	2.8'	26°07.6	-3.5'	60.1'
21	133°07.9	• • 55.6	332°22.8	2.8'	26°04.2	-3.7'	60.1'
22	148°07.7	55.2	346°44.6	2.8'	26°00.5	-3.9'	60.1'
23	163°07.4	54.8	1°06.4	2.8'	25°56.7	-4.1'	60.2'
	SD = 16.3'	d = -0.4'		S	D = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°07.2	\$21°54.5	15°28.3	2.8'	N25° 52.6	-4.2'	60.2
1	193°06.9	54.1	29°50.1	2.9'	25°48.4	-4.4	60.2'
2	208°06.7	53.7	44°12.0	2.9'	25°43.9	-4.6'	60.2'
3	223°06.4	• • 53.3	58°33.8	2.9'	25°39.3	-4.8'	60.3'
4	238°06.2	52.9	72°55.7	2.9'	25°34.5	-5.0'	60.3'
5	253°05.9	52.6	87°17.6	2.9'	25°29.5	-5.2'	60.3'
6	268°05.7	S21°52.2	101°39.5	2.9'	N25°24.3	-5.4'	60.3'
7	283°05.4 298°05.2	51.8 51.4	116°01.5 130°23.5	3.0' 3.0'	25°18.9 25°13.3	-5.6' -5.8'	60.4' 60.4'
8 9	298 05.2 313 04.9	51.4	130°23.5 144°45.5	3.0'	25° 13.3 25° 07.5	-5.8° -6.0'	60.4
10	313 04.9 328°04.7	50.6	159°07.5	3.1'	25°01.6	-6.1'	60.4
11	343°04.4	50.2	173°29.5	3.1'	24°55.4	-6.3	60.5
12	358°04.2	S21°49.9	187°51.6	3.1'	N24°49.1	-6.5	60.5
13	13°03.9	49.5	202°13.8	3.2'	24°42.6	-6.7'	60.5'
14	28°03.7	49.1	216°36.0	3.2'	24°35.9	-6.9'	60.5'
15	43°03.5	• • 48.7	230°58.2	3.3'	24°29.0	-7.1'	60.5'
16	58°03.2	48.3	245°20.5	3.3'	24°21.9	-7.2	60.6'
17	73°03.0 88°02.7	47.9 \$21°47.5	259°42.8 274°05.1	3.4' 3.4'	24°14.7 N24°07.3	-7.4'	60.6'
18 19	103°02.5	521 47.5 47.1	274 05.1 288°27.6	3.5'	23°59.7	-7.6' -7.8'	60.6' 60.6'
20	118°02.2	46.7	302°50.0	3.5'	23°51.9	-8.0'	60.7
21	133°02.0	46.3	317°12.6	3.6'	23°43.9	-8.1'	60.7'
22	148°01.7	46.0	331°35.2	3.6'	23°35.8	-8.3'	60.7'
23	163°01.5	45.6	345°57.8	3.7'	23°27.5	-8.5'	60.7'
	SD = 16.3'	d = -0.4'		S	D = 16.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°01.2	\$21°45.2	0°20.5	3.8'	N23° 19.0	-8.7'	60.7'
1	193°01.0	44.8	14°43.3	3.8'	23° 10.3	-8.8'	60.7'
2	208°00.8	44.4	$29^{\circ}06.1$	3.9'	23°01.5	-9.0'	60.8'
3	223°00.5	• • 44.0	43°29.0	4.0'	22°52.5	-9.2'	60.8'
4	238°00.3	43.6	57°52.0	4.0'	22°43.3	-9.3'	60.8'
5	253°00.0	43.2	72°15.0	4.1'	22°34.0	-9.5'	60.8'
6 7	267°59.8 282°59.5	\$21°42.8 42.4	86°38.1 101°01.3	4.2' 4.3'	N22°24.5 22°14.8	-9.7' -9.8'	60.8' 60.8'
8	282°59.5 297°59.3	42.4 42.0	101°01.3 115°24.6	4.3'	22°14.8 22°05.0	-9.8 -10.0'	60.8
9	312°59.1	• • 41.6	115 24.0 129°47.9	4.3 4.4'	22 05.0 21°55.0	-10.0	60.9
10	327°58.8	41.2	144°11.3	4.5'	21°44.9	-10.1	60.9
11	342°58.6	40.8	158°34.8	4.6'	21°34.6	-10.4	60.9'
12	357°58.3	S21°40.4	172°58.3	4.6'	N21°24.2	-10.6'	60.9'
13	12°58.1	40.0	187°22.0	4.7'	21°13.6	-10.8'	60.9'
14	27°57.9	39.6	201°45.7	4.8'	21°02.8	-10.9'	60.9'
15	42°57.6	39.1	216°09.5	4.9'	20°51.9	-11.0'	60.9'
16 17	57°57.4 72°57.1	38.7 38.3	230°33.4 244°57.4	5.0' 5.1'	20°40.9 20°29.7	-11.2' -11.3'	60.9' 60.9'
18	72°57.1 87°56.9	38.3 \$21°37.9	259°21.4	5.1'	20° 29.7 N20° 18.3	-11.5'	60.9
19	102°56.7	37.5	273°45.6	5.2'	20°06.9	-11.6'	61.0'
20	117°56.4	37.1	288°09.8	5.3'	19°55.2	-11.8'	61.0'
21	132°56.2	36.7	302°34.1	5.4'	19°43.5	-11.9'	61.0'
22	147°55.9	36.3	$316^{\circ}58.5$	5.5'	19°31.6	-12.0'	61.0'
23	162°55.7	35.9	331°23.0	5.6'	$19^{\circ}19.5$	-12.2'	61.0'
	SD = 16.3'	d = -0.4'	-	S	D = 16.6'		

N 72° 08:10 10:0 N 70° 07:54 09:3	9 = 30	Sunset	Civil 14:07	Naut. 16:06
	30	_	14:07	16:06
N 70° 07.54 00.5				
14 10 01.54 05.	10.55		14:46	16:22
68° 07:41 09:0	10.55	13:21	15:13	16:35
66° 07:30 08:4	10:06	14:10	15:34	16:46
64° 07:20 08:2	25 09:35	14:41	15:51	16:56
62° 07:12 08:		15:04	16:04	17:04
60° 07:05 08:0	00 08:54	15:22	16:16	17:11
N 58° 06:58 07:4	19 08:39	15:37	16:26	17:18
56° 06:52 07:4	10 08:26	15:50	16:36	17:23
54° 06:47 07:3	32 08:14	16:01	16:44	17:29
52° 06:42 07:2	25 08:04	16:11	16:51	17:34
50° 06:37 07:3	18 07:56	16:20	16:58	17:38
45° 06:27 07:0	07:37	16:39	17:12	17:49
N 40° 06:18 06:	07:21	16:54	17:24	17:58
35° 06:09 06:4	11 07:08	17:07	17:35	18:06
30° 06:01 06:3	31 06:57	17:19	17:45	18:14
20° 05:46 06:3	14 06:37	17:38	18:02	18:29
N 10° 05:32 05:5		17:55	18:18	18:44
0° 05:16 05:4	12 06:04	18:11	18:34	19:00
S 10° 04:58 05:2	25 05:48	18:28	18:50	19:17
20° 04:37 05:0	06 05:30	18:45	19:09	19:38
30° 04:10 04:4		19:05	19:32	20:05
35° 03:53 04:2	29 04:58	19:17	19:46	20:22
40° 03:32 04:3		19:31	20:03	20:43
45° 03:04 03:5	51 04:27	19:48	20:24	21:11
S 50° 02:24 03:2	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 02:5		20:29	21:19	22:42
56° 00:26 02:3		20:41	21:38	23:39
58° //// 02::		20:56	22:01	////
S 60° //// 01::	39 03:01	21:13	22:34	////

Lat.		Moonris	e		Moonse	t
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 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°	13:56	15:16	16:46	06:53	07:45	08:23
50°	14:09	15:28	16:55	06:39	07:33	08:13
45°	14:36	15:52	17:14	06:12	07:08	07:53
N 40°	14:58	16:11	17:30	05:50	06:48	07:36
35°	15:16	16:27	17:43	05:32	06:31	07:22
30°	15:31	16:41	17:54	05:17	06:17	07:10
20°	15:57	17:04	18:13	04:51	05:52	06:49
N 10°	16:19	17:25	18:30	04:28	05:31	06:31
0°	16:40	17:44	18:45	04:07	05:11	06:13
S 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
S 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
S 60°	20:45	21:12	21:25		01:11	02:56

Sun

Moon

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

The Mart	h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
12 12 12 13 13 14 14 15 15 15 15 15 15	Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 1970 1													
1											Alpheratz		
1 1770 03											Ankaa		
1													I
Section Property											Diphda		
Section Control Cont													
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18 24°43.5 49°15.2 S11°51.3 72°28.8 S18°56.4 206°29.7 N02°13.2 3°55.8 N06°04.8 Jupiter 181°45.9 04:16 19 39°46.0 64°14.8 50.1 87°29.3 55.9 221°32.2 13.2 18°58.2 04.8 04:16 Saturn 339°13.9 17:44 20 54°48.5 79°14.4 48.9 102°29.8 55.4 236°34.7 13.2 34°00.5 04.9 04.													
19 39°46.0 64°14.8 50.1 87°29.3 55.9 221°32.2 13.2 18°58.2 04.8 20°54°48.5 79°14.4 48.9 102°29.8 55.4 236°34.7 13.2 34°00.5 04.9 21 69°50.9 94°14.0 47.8 117°30.2 54.8 251°37.2 13.2 49°02.9 04.9 22 84°53.4 109°13.6 46.6 132°30.7 54.3 266°39.7 13.2 64°05.3 05.0 23 99°55.9 124°13.2 45.4 147°31.1 53.8 281°42.2 13.3 79°07.7 05.0 Mars: 0.1													
20 54°48.5 79°14.4 48.9 102°29.8 55.4 236°34.7 13.2 34°00.5 04.9 21 69°50.9 94°14.0 · · 47.8 117°30.2 · · 54.8 251°37.2 · · 13.2 49°02.9 · · 04.9 22 84°53.4 109°13.6 46.6 132°30.7 54.3 266°39.7 13.2 64°05.3 05.0 23 99°55.9 124°13.2 45.4 147°31.1 53.8 281°42.2 13.3 79°07.7 05.0 Horizontal parallax Venus: 0.1 Mars: 0.1													
21 69°50.9 94°14.0 · · 47.8 117°30.2 · · 54.8 251°37.2 · · 13.2 49°02.9 · · 04.9 Horizontal parallax 22 84°53.4 109°13.6 46.6 132°30.7 54.3 266°39.7 13.2 64°05.3 05.0 Venus: 0.1 23 99°55.9 124°13.2 45.4 147°31.1 53.8 281°42.2 13.3 79°07.7 05.0 Mars: 0.1											Jatuin	JJJ 13.9	11.44
22 84°53.4 109°13.6 46.6 132°30.7 54.3 266°39.7 13.2 64°05.3 05.0 Venus: 0.1 23 99°55.9 124°13.2 45.4 147°31.1 53.8 281°42.2 13.3 79°07.7 05.0 Mars: 0.1											Horizont	al parallax	
23 99°55.9 124°13.2 45.4 147°31.1 53.8 281°42.2 13.3 79°07.7 05.0 Mars: 0.1							266°39.7					Venus:	0.1
												Mars:	0.1
ivier.pass. 10:21													
	ivier.p	ass. 10:21	ν-υ.4' α-1	∠ m-4.U3	ν 0.5 a -0	m1.10	ν2.5' α 0.	u m-2.22	ν2.4' d0	.v mv.51			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°55.5	S21°35.5	345°47.6	5.7'	N19°07.4	-12.3'	61.0'
1	192°55.2	35.0	$0^{\circ}12.3$	5.8'	$18^{\circ}55.1$	-12.4'	61.0'
2	207°55.0	34.6	14° 37.1	5.9'	18°42.7	-12.5'	61.0'
3	222°54.8	• • 34.2	29°01.9	5.9'	18°30.1	-12.7'	61.0'
4 5	237°54.5 252°54.3	33.8 33.4	43°26.9 57°51.9	6.0' 6.1'	18°17.5 18°04.7	-12.8' -12.9'	61.0' 61.0'
6	267°54.0	521°33.0	72°17.0	6.2	N17°51.8	-12.9	61.0'
7	282°53.8	32.5	86°42.2	6.3'	17°38.7	-13.1'	61.0'
8	297°53.6	32.1	101°07.5	6.4	17°25.6	-13.3'	61.0'
9	312°53.3	• • 31.7	$115^{\circ}32.9$	6.5'	17°12.3	-13.4'	61.0'
10	327°53.1	31.3	129°58.4	6.6'	16°58.9	-13.5'	61.0'
11	342°52.9	30.9	144°24.0	6.7'	16°45.5 N16°31.9	-13.6'	61.0'
12 13	357°52.6 12°52.4	\$21°30.4 30.0	158° 49.7 173° 15.4	6.8' 6.9'	16°18.2	-13.7' -13.8'	61.0' 61.0'
14	27°52.2	29.6	173 13.4 187°41.3	6.9'	16°04.4	-13.6' -13.9'	61.0'
15	42°51.9	29.2	202°07.2	7.0'	15°50.5	-14.0'	61.0'
16	57°51.7	28.8	216°33.3	7.1'	15°36.5	-14.1'	61.0'
17	72°51.5	28.3	$230^{\circ}59.4$	7.2'	15°22.4	-14.2'	61.0'
18	87°51.2	S21°27.9	245°25.6	7.3'	N15°08.2	-14.3'	61.0'
19	102°51.0 117°50.8	27.5	259°51.9 274°18.3	7.4'	14°53.9 14°39.5	-14.4'	61.0'
20 21	117°50.8 132°50.5	27.0 •• 26.6	274° 18.3 288° 44.8	7.5' 7.6'	14°39.5 14°25.1	-14.5' -14.6'	61.0' 60.9'
22	132 50.5 147°50.3	26.2	303°11.3	7.0 7.7'	14°23.1	-14.6'	60.9
23	162°50.1	25.8	317°38.0	7.7'	13°55.9	-14.7'	60.9'
	SD = 16.3'	d = -0.4'		SI	0 = 16.6'		
				- 51			
Fri	GHA	Dec	GHA	ν 70'	Dec	d 140'	HP
0 1	177°49.8 192°49.6	\$21°25.3 24.9	332°04.7 346°31.6	7.8' 7.9'	N13°41.2 13°26.4	-14.8' -14.9'	60.9' 60.9'
2	207°49.4	24.5	0°58.5	8.0'	13°11.5	-14.9	60.9
3	222°49.1	• • 24.0	15°25.5	8.1'	12°56.5	-15.0'	60.9'
4	237°48.9	23.6	29°52.6	8.2'	12°41.5	-15.1'	60.9'
5	252°48.7	23.2	44° 19.7	8.3'	12°26.4	-15.2'	60.9'
6 7	267°48.4 282°48.2	\$21°22.7 22.3	58° 47.0 73° 14.3	8.3' 8.4'	N12°11.2 11°56.0	-15.2' -15.3'	60.9' 60.9'
8	297°48.0	21.9	73 14.3 87°41.7	8.5'	11°40.7	-15.3 -15.4'	60.8
9	312°47.8	21.4	102°09.2	8.6'	11°25.3	-15.4'	60.8
10	327°47.5	21.0	$116^{\circ}36.8$	8.7'	$11^{\circ}09.9$	-15.5'	60.8'
11	342°47.3	20.6	131°04.5	8.7'	10°54.4	-15.5'	60.8'
12	357°47.1 12°46.8	\$21°20.1 19.7	145°32.2 160°00.0	8.8'	N10°38.9 10°23.3	-15.6' -15.7'	60.8'
13 14	27°46.6	19.7	174°27.9	8.9' 9.0'	10 23.3 10°07.6	-15.7'	60.8' 60.8'
15	42°46.4	. 18.8	188°55.9	9.0'	09°51.9	-15.8'	60.7'
16	57°46.2	18.4	203°23.9	9.1'	09°36.2	-15.8'	60.7'
17	72°45.9	17.9	217°52.1	9.2'	09°20.4	-15.8'	60.7'
18	87°45.7 102°45.5	\$21°17.5 17.0	232°20.3 246°48.5	9.3' 9.3'	N09°04.5 08°48.7	-15.9'	60.7'
19 20	102 45.5 117°45.3	16.6	240 48.5 261°16.8	9.3 9.4'	08°32.7	-15.9' -16.0'	60.7' 60.7'
21	132°45.0	16.1	275°45.2	9.5'	08°16.8	-16.0'	60.6
22	147°44.8	15.7	290°13.7	9.5'	08°00.8	-16.0'	60.6
23	162°44.6	15.2	304°42.3	9.6'	07°44.7	-16.1'	60.6'
	SD = 16.3'	d = -0.4'		SI	O = 16.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°44.4	S21°14.8	319° 10.9	9.7'	N07°28.6	-16.1'	60.6'
1	192°44.1	14.3	333°39.5	9.7'	07°12.5	-16.1'	60.6'
2 3	207°43.9 222°43.7	13.9 •• 13.4	348°08.3 2°37.1	9.8' 9.9'	06°56.4 06°40.2	-16.2' -16.2'	60.5' 60.5'
3 4	222°43.7 237°43.5	13.4	17°05.9	9.9' 9.9'	06°40.2	-16.2'	60.5
5	252°43.2	12.5	31°34.9	10.0'	06° 07.8	-16.2	60.5
6	267°43.0	521°12.1	46°03.8	10.0'	N05°51.6	-16.3	60.5
7	282°42.8	11.6	60°32.9	10.1'	05°35.3	-16.3'	60.4'
8	297°42.6	11.2	75°02.0	10.2'	05°19.1	-16.3'	60.4
9	312°42.3 327°42.1	10.7	89°31.2 104°00.4	10.2' 10.3'	05°02.8 04°46.5	-16.3'	60.4'
10 11	327°42.1 342°41.9	10.3 09.8	104°00.4 118°29.6	10.3'	04°46.5 04°30.2	-16.3' -16.3'	60.4' 60.4'
12	357°41.7	521°09.4	116 29.0 132°59.0	10.3	N04°13.8	-16.3	60.3
13	12°41.5	08.9	147°28.3	10.4'	03°57.5	-16.3	60.3
14	27°41.2	08.5	161°57.7	10.5'	03°41.2	-16.4'	60.3'
15	42°41.0	• • 08.0	176°27.2	10.5'	03°24.8	-16.4'	60.3'
16 17	57°40.8 72°40.6	07.5 07.1	190°56.7 205°26.3	10.6' 10.6'	03°08.4 02°52.1	-16.4' -16.4'	60.2' 60.2'
18	87°40.4	521°06.6	205 26.3 219°55.9	10.6	N02°35.7	-16.4	60.2
19	102°40.1	06.2	234°25.6	10.7'	02°19.4	-16.4	60.2
20	117°39.9	05.7	248°55.3	10.7'	02°03.0	-16.4'	60.1'
21	132°39.7	• • 05.2	263°25.0	10.8'	01°46.7	-16.3'	60.1'
22	147°39.5	04.8	277°54.8	10.8'	01°30.3	-16.3'	60.1'
23	162°39.3	04.3	292°24.6	10.9'	01°14.0	-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
N 40°	06:17	06:51	07:21	16:57	17:27	18:01
35°	06:09	06:40	07:08	17:10	17:38	18:09
30°	06:01	06:31	06:57	17:21	17:47	18:16
20°	05:47	06:14	06:38	17:40	18:04	18:31
N 10°	05:32	05:58	06:21	17:57	18:19	18:45
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:49	18:28	18:51	19:18
20°	04:39	05:08	05:32	18:45	19:10	19:38
30°	04:13	04:45	05:12	19:05	19:32	20:04
35°	03:56	04:32	05:01	19:17	19:46	20:21
40°	03:35	04:15	04:47	19:30	20:02	20:42
45°	03:09	03:55	04:31	19:46	20:22	21:08
S 50°	02:31	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	////
S 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
N 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
N 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
S 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
S 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
S 60°	21:32	21:37	21:40	04:48	06:38	08:23

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-89%	
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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	114°58.3	139° 12.9	\$11°44.3	162°31.6	\$18°53.3	296°44.6	N02°13.3	94° 10.0	N06°05.1		SHA	Dec
	114 56.5 130°00.8	159 12.9 154° 12.5		102 31.0 177°32.0		311°47.1		109°12.4		Alpheratz	357°32.3	29°14.9
1	145°03.3		43.1		52.7		13.3		05.1	Ankaa	353°04.9	-42°09.4
2		169°12.1	41.9	192°32.5	52.2	326°49.6	13.3	124°14.8	05.2	Schedar	349°28.2	56°41.8
3	160°05.7 175°08.2	184°11.7	• • 40.7	207°33.0	• • 51.7	341°52.1	• • 13.4	139° 17.1	• • 05.2	Diphda	348°44.9	-17°50.0
4		199°11.3	39.6	222°33.4	51.1	356°54.6	13.4	154° 19.5	05.3	Achernar	$335^{\circ}18.4$	-57°05.9
5	190°10.6	214°11.0	38.4	237°33.9	50.6	11°57.1	13.4	169°21.9	05.3	Hamal	327°48.3	23°35.8
6	205°13.1	229° 10.6	\$11°37.2	252°34.3	\$18°50.1	26°59.6	N02°13.4	184°24.3	N06°05.4	Polaris	312°28.6	89°23.2
7	220°15.6	244°10.2	36.1	267°34.8	49.5	42°02.0	13.4	199°26.6	05.4	Acamar	315°09.8	-40°11.7
8	235°18.0	259°09.8	34.9	282°35.3	49.0	57°04.5	13.5	214°29.0	05.5	Menkar	314°03.4	4°12.0
9	250°20.5	274°09.5	• • 33.7	297°35.7	• • 48.5	72°07.0	• • 13.5	229°31.4	• • 05.5	Mirfak	308°24.4	49°57.8
10	265°23.0	289°09.1	32.5	312°36.2	47.9	87°09.5	13.5	244°33.7	05.6	Aldebaran	290°36.5	16°33.9
11	280°25.4	304°08.7	31.4	327°36.7	47.4	102°12.0	13.5	259°36.1	05.6	Rigel	281°01.2	-8°10.3
12	295°27.9	319°08.3	S11°30.2	342°37.1	S18°46.9	117°14.5	N02°13.6	274°38.5	N06°05.7	Capella	280°17.8	46°01.6
13	310°30.4	334°07.9	29.0	357°37.6	46.3	132°17.0	13.6	289°40.8	05.7	Bellatrix	278°19.9	6°22.4
14	325°32.8	349°07.6	27.8	12°38.0	45.8	147°19.5	13.6	304°43.2	05.8	Elnath	277°58.4	28°37.8
15	340°35.3	4°07.2	• • 26.6	27°38.5	• • 45.2	162°22.0	• • 13.6	319°45.6	• • 05.8	Alnilam	275°34.9	-1°11.1
16	355°37.7	19°06.8	25.5	42°39.0	44.7	177°24.5	13.7	334°48.0	05.9	Betelgeuse	270°49.1	7°24.6
17	10°40.2	34°06.5	24.3	57°39.4	44.2	192°26.9	13.7	349°50.3	05.9	Canopus	263°50.7	-52°42.8
18	25°42.7	49°06.1	S11°23.1	72°39.9	S18°43.6	207°29.4	N02°13.7	4°52.7	N06°06.0	Sirius	258°23.7	-16°45.4
19	40°45.1	64°05.7	21.9	87°40.3	43.1	222°31.9	13.7	19°55.1	06.0	Adhara	255°03.5	-29°00.7
20	55°47.6	79°05.3	20.7	102°40.8	42.6	237°34.4	13.8	34°57.4	06.1	Procyon	244°47.9	5°09.0
21	70°50.1	94°05.0	• • 19.6	117°41.3	• • 42.0	252°36.9	• • 13.8	49°59.8	• • 06.1	Pollux	243°13.9	27°57.3
22	85°52.5	109°04.6	18.4	132°41.7	41.5	267°39.4	13.8	65°02.2	06.2	Avior	234°13.0	-59°36.0
23	100°55.0	124°04.2	17.2	147°42.2	40.9	282°41.9	13.8	80°04.5	06.2	Suhail	222°44.0	-43°32.8
Mern	ass. 16:17	ν -0 4' d-1	2′ m-4.04	ν0.5′ d-0	.5′ m1.15	ν 25' d0	0′ m-2.23	ν2 4' dΩ	.0′ m0.51	Miaplacidus	221°36.8	-69°49.9
		. J. 1 U-1		- 3.5 4.0	.51.15					Alphard	217°45.0	-8°47.0
										Regulus	207°31.5	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.6	61°35.6
0	115°57.5	139°03.9	S11°16.0	162°42.7	S18°40.4	297°44.4	N02°13.9	95°06.9	N06°06.3	Denebola	182°22.3	14°24.7
1	130°59.9	154°03.5	14.8	177°43.1	39.9	312°46.9	13.9	110°09.3	06.3	Gienah	175°40.9	-17°41.9
2	146°02.4	169°03.1	13.7	192°43.6	39.3	327°49.4	13.9	125°11.6	06.4	1	172°57.0	-63°15.1
3	161°04.9	184°02.8	• • 12.5	207°44.1	• • 38.8	342°51.9	•• 13.9	$140^{\circ}14.0$	• • 06.4		171°48.6	-57°16.1
4	176°07.3	199°02.4	11.3	222°44.5	38.2	357°54.4	14.0	155°16.4	06.5	Alioth	166°10.8	55°48.1
5	191°09.8	214°02.0	10.1	237°45.0	37.7	12°56.9	14.0	170°18.7	06.5	Spica	158°19.6	-11°18.5
6	206°12.2	229°01.7	S 11°08.9	252°45.4	S 18°37.2	27°59.4	N02°14.0	$185^{\circ}21.1$	N06°06.6	Alkaid	152°50.1	49°10.0
7	221°14.7	244°01.3	07.7	267°45.9	36.6	43°01.9	14.0	200°23.5	06.6	Hadar	148°32.4	-60°30.3
8	236°17.2	259°00.9	06.5	282°46.4	36.1	58°04.4	14.1	215°25.8	06.7	Menkent	147°54.7	-36°30.4
9	251°19.6	274°00.6	• • 05.4	297°46.8	• • 35.5	73°06.9	• • 14.1	230°28.2	• • 06.7	Arcturus	145°45.7	19°02.0
10	266°22.1	289°00.2	04.2	312°47.3	35.0	88°09.4	14.1	245°30.6	06.8	Rigil Kent.	139°36.9	-60°56.8
11	281°24.6	303°59.8	03.0	327°47.8	34.4	103°11.8	14.2	260°32.9	06.8	Kochab	137°20.4	74°02.0
12	296°27.0	318°59.5	S11°01.8	342°48.2	S18°33.9	118°14.3	N02°14.2	275°35.3	N06°06.9	Zuben'ubi	136°53.3	-16°09.5
13	311°29.5	333°59.1	11°00.6	357°48.7	33.4	133°16.8	14.2	290°37.7	06.9	Alphecca	126°01.8	26°37.0
14	326°32.0	348°58.7	10°59.4	12°49.2	32.8	148°19.3	14.2	305°40.0	07.0	Antares	112° 13.0	-26°29.6
15	341°34.4	3°58.4	• • 58.2	27°49.6	• • 32.3	163°21.8	• • 14.3	320°42.4	• • 07.0	Antares	112 13.0 107°05.4	-20 29.0 -69°04.4
16	356°36.9	18°58.0	57.0	42°50.1	31.7	178°24.3	14.3	335°44.8	07.1	Sabik	107 03.4 102°00.2	-15°45.5
17	11°39.4	33°57.7	55.9	57°50.6	31.2	193°26.8	14.3	$350^{\circ}47.1$	07.1	Shaula	96°07.3	-15 45.5 -37°07.3
18	26°41.8	48° 57.3	\$10°54.7	72°51.0	S18°30.6	208°29.3	N02°14.3	5°49.5	N06°07.2		95°56.5	12°32.3
19	41°44.3	63°56.9	53.5	87°51.5	30.1	223°31.8	14.4	20°51.9	07.2	Rasalhague		51°29.0
20	56°46.7	78° 56.6	52.3	102°52.0	29.5	238°34.3	14.4	35°54.2	07.3	Eltanin	90°41.5	
21	71°49.2	93°56.2	• • 51.1	117°52.4	• • 29.0	253°36.8	• • 14.4	50° 56.6	• • 07.3	Kaus Aust.	83°29.6	-34°22.2
22	86°51.7	108°55.9	49.9	132°52.9	28.4	268°39.3	14.5	65°58.9	07.4	Vega	80°31.9	38°48.5
23	101°54.1	123°55.5	48.7	147°53.4	27.9	283°41.8	14.5	81°01.3	07.4	Nunki	75°45.0	-26°15.6
					=/ 1.1=	-				Altair	61°57.9	8°56.6
Mer.p	ass. 16:14	ν -0.4′ d-1	2′ m-4.04	ν 0.5′ d -0	.5′ m1.15	ν 2.5′ d0.	0′ m-2.23	$\nu^{2.4'} d0$.1′ m0.52	Peacock	53°02.5	-56°38.6
										Deneb	49°24.5	45°22.9
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.6	10°00.3
0	116°56.6	138°55.2	S10° 47.5	162°53.8	\$18°27.3	298°44.3	N02°14.5	96°03.7	N06°07.5	Al Na'ir	27°30.2	-46°49.6
1	131°59.1	153°54.8	46.3	177°54.3	26.8	313°46.8	14.5	111°06.0	07.5	Fomalhaut	15°12.1 13°43.0	-29°28.5
2	147°01.5	168°54.4	45.1	192°54.8	26.3	328°49.3	14.6	126°08.4	07.6	Scheat		28°14.3
3	162°04.0	183°54.1	• • 43.9	207°55.2	• • 25.7	343°51.8	• • 14.6	141° 10.8	. 07.6	Markab	13°27.6	15°21.5
4	177°06.5	198°53.7	42.7	222°55.7	25.2	358°54.3	14.6	156° 13.1	07.7	Jan 16 Sun	SHA	Mer.pass
5	192°08.9	213°53.4	41.5	237°56.2	24.6	13°56.8	14.7	171° 15.5	07.8	Venus	24°14.5	14:44
6	207°11.4	228°53.0	\$10°40.3	252°56.6	S18°24.1	28°59.3	N02°14.7		N06°07.8	Mars	47°33.3	13:09
7	222°13.8	243°52.7	39.1	267°57.1	23.5	44°01.9	14.7	201°20.2	07.9	Jupiter		04:12
8	237°16.3	258°52.3	37.9	282°57.6	23.0	59°04.4	14.7	216°22.6	07.9	Saturn	339°11.7	17:41
9	252°18.8	273°52.0	• • 36.7	297°58.1	22.4	74°06.9	• • 14.8	231°24.9	. 08.0			
10	267°21.2	288°51.6	35.5	312°58.5	21.9	89°09.4	14.8	246°27.3	08.0	Jan 17 Mon	SHA	Mer.pass
11	282°23.7	303°51.3	34.3	327°59.0	21.3	104°11.9	14.8	261°29.7	08.1	Venus	23°06.4	14:44
12	297°26.2	318°50.9	S10°33.1	342°59.5	S18°20.7	119°14.4	N02°14.9	276°32.0	N06°08.1	Mars	46°45.2	13:09
13	312°28.6	333°50.6	31.9	357°59.9	20.2	134°16.9	14.9	291°34.4	08.2	Jupiter		04:08
14	327°31.1	348°50.2	30.7	13°00.4	19.6	149°19.4	14.9	306°36.7	08.2	Saturn	339°09.4	17:37
15	342°33.6	3°49.9	• • 29.5	28°00.9	• • 19.1	164°21.9	. 15.0	321°39.1	08.3	Jan 18 Tue	SHA	Mer.pass
16	357°36.0	18°49.5	28.3	43°01.3	18.5	179°24.4	15.0	336°41.5	08.3	Venus	21°58.6	14:45
17	12°38.5	33°49.2	27.1	58°01.8	18.0	194°26.9	15.0	351°43.8	08.4	Mars	45°57.2	13:08
18	27°41.0	48° 48.8	S10°25.9	73°02.3	S18°17.4	209°29.4	N02°15.0	6°46.2			181°47.7	04:04
19	42°43.4	63°48.5	24.7	88°02.8	16.9	224°31.9	15.1	21°48.5	08.5	Saturn		17:33
20	57°45.9	78°48.1	23.5	103°03.2	16.3	239°34.4	15.1	36°50.9	08.6	Jatuill	JJJ J1.1	11.55
21	72°48.3	93°47.8	22.3	118°03.7	• • 15.8	254°36.9	• • 15.1	51°53.3	. 08.6	Horizont	al parallax	
22	87°50.8	108°47.4	21.1	133°04.2	15.2	269°39.4	15.2	66°55.6	08.7		Venus:	0.1
23	102°53.3	123°47.1	19.9	148°04.6	14.7	284°41.9	15.2	81°58.0	08.7		Mars:	0.1
										-		
iVler.p	ass. 16:10	$ u$ -0.4 $^{\prime}$ d-1	2′ m-4.05	ν 0.5′ d -0	.5' m1.15	ν 2.5′ d0.	0′ m-2.24	ν2.4′ d0	.1' m 0.52			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°39.0	S21°03.8	306°54.5	10.9'	N00°57.7	-16.3'	60.0'
1 2	192°38.8 207°38.6	03.4 02.9	321°24.4 335°54.3	10.9' 11.0'	00°41.3 00°25.0	-16.3' -16.3'	60.0' 60.0'
3	222°38.4	. 02.4	350°24.3	11.0'	N00°08.7	-16.3'	59.9'
4	237°38.2	02.0	4°54.3	11.0'	S 00°07.5	16.3'	59.9'
5	252°38.0 267°37.7	01.5	19°24.4 33°54.4	11.1'	00°23.8 500°40.0	16.2'	59.9'
6 7	267°37.7 282°37.5	\$21°01.0 00.6	33°54.4 48°24.5	11.1' 11.1'	00°56.2	16.2' 16.2'	59.9' 59.8'
8	297°37.3	21°00.1	62°54.6	11.2'	01°12.4	16.2	59.8'
9	312°37.1	20°59.6	77°24.8	11.2'	01°28.6	16.1'	59.8'
10 11	327°36.9 342°36.7	59.2 58.7	91°55.0 106°25.2	11.2' 11.2'	01°44.8 02°00.9	16.1' 16.1'	59.7' 59.7'
12	357°36.4	\$20°58.2	100°25.2	11.3'	502°17.0	16.1	59.7'
13	12°36.2	57.7	$135^{\circ}25.7$	11.3'	$02^{\circ}33.1$	16.0'	59.6'
14	27°36.0	57.3	149°55.9	11.3'	02°49.1	16.0'	59.6'
15 16	42°35.8 57°35.6	· · 56.8 56.3	164°26.2 178°56.5	11.3' 11.3'	03°05.1 03°21.1	16.0' 15.9'	59.6' 59.6'
17	72°35.4	55.8	193°26.9	11.3'	03°37.0	15.9'	59.5'
18	87°35.2	S20°55.4	207°57.2	11.4'	503°52.9	15.9'	59.5'
19 20	102°35.0 117°34.7	54.9 54.4	222°27.6 236°58.0	11.4' 11.4'	04°08.8 04°24.6	15.8' 15.8'	59.5' 59.4'
21	132°34.5	• • 53.9	251°28.3	11.4'	04°24.0	15.7'	59.4
22	147°34.3	53.5	265°58.7	11.4'	04°56.1	15.7'	59.4'
23	162°34.1	53.0	280°29.2	11.4'	05°11.8	15.7'	59.3'
	SD = 16.3'	d = -0.5'		SI	O = 16.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	177°33.9	\$20°52.5	294°59.6	11.4'	S05°27.4	15.6'	59.3'
1 2	192°33.7 207°33.5	52.0 51.5	309°30.0 324°00.4	11.4' 11.4'	05°43.0 05°58.6	15.6' 15.5'	59.3' 59.2'
3	207°33.5 222°33.3	51.5 · · 51.0	324°00.4 338°30.9	11.4 11.4'	05°58.6 06°14.1	15.5' 15.5'	59.2'
4	237°33.1	50.6	353°01.3	11.5'	06°29.6	15.4	59.2'
5	252°32.8	50.1	7°31.8	11.5'	06°45.0	15.4'	59.1'
6 7	267°32.6 282°32.4	\$20°49.6 49.1	22°02.2 36°32.7	11.5' 11.5'	\$07°00.3 07°15.6	15.3' 15.2'	59.1' 59.1'
8	297°32.2	48.6	51°03.2	11.5'	07°30.9	15.2'	59.1°
9	312°32.0	• • 48.1	65°33.6	11.5'	$07^{\circ}46.1$	15.1'	59.0'
10	327°31.8 342°31.6	47.6	80°04.1 94°34.5	11.5' 11.4'	08°01.2 08°16.3	15.1'	59.0'
11 12	342 31.0 357°31.4	47.2 \$20°46.7	94 34.5 109°05.0	11.4	508°31.3	15.0' 15.0'	58.9' 58.9'
13	12°31.2	46.2	123°35.4	11.4'	08°46.2	14.9'	58.9'
14	27°31.0	45.7	138°05.9	11.4'	09°01.1	14.8'	58.9'
15 16	42°30.8 57°30.6	· · 45.2 44.7	152°36.3 167°06.7	11.4' 11.4'	09°16.0 09°30.7	14.8' 14.7'	58.8' 58.8'
17	72°30.3	44.2	181°37.1	11.4'	09°45.4	14.6'	58.8'
18	87°30.1	\$20°43.7	196°07.5	11.4'	\$10°00.1	14.6'	58.7'
19	102°29.9 117°29.7	43.2 42.7	210°37.9 225°08.3	11.4' 11.4'	10°14.6 10°29.1	14.5' 14.4'	58.7' 58.7'
20 21	132°29.5	• • 42.2	225 06.3 239°38.7	11.4	10°29.1	14.4	58.6'
22	147°29.3	41.7	254°09.1	11.3'	10°57.9	14.3'	58.6'
23	162°29.1	41.2	268°39.4	11.3'	11°12.2	14.2'	58.6'
	SD = 16.3'	d = -0.5'		SI	O = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°28.9	\$20°40.7	283°09.7	11.3'	\$11°26.4	14.1'	58.5'
1 2	192°28.7 207°28.5	40.2 39.7	297°40.0 312°10.3	11.3' 11.3'	11°40.5 11°54.5	14.1' 14.0'	58.5' 58.5'
3	222°28.3	• • 39.2	326°40.6	11.3'	12°08.5	13.9'	58.4'
4	237°28.1	38.7	341°10.9	11.2'	12°22.4	13.8'	58.4'
5 6	252°27.9 267°27.7	38.2 \$20°37.7	355°41.1 10°11.3	11.2' 11.2'	12°36.2 \$12°50.0	13.7' 13.7'	58.4' 58.3'
7	282°27.5	37.2	24°41.5	11.2'	13°03.6	13.6'	58.3'
8	297°27.3	36.7	39°11.7	11.2'	13°17.2	13.5'	58.3'
9	312°27.1	• • 36.2	53°41.9	11.1'	13°30.7	13.4'	58.2'
10 11	327°26.9 342°26.7	35.7 35.2	68°12.0 82°42.1	11.1' 11.1'	13°44.1 13°57.4	13.3' 13.2'	58.2' 58.2'
12	357°26.5	\$20°34.7	97°12.2	11.1'	S14°10.6	13.1'	58.1
13	12°26.3	34.2	111°42.2	11.0'	14°23.8	13.1'	58.1'
14 15	27°26.1 42°25.9	33.7 · · 33.2	126°12.3 140°42.3	11.0' 11.0'	14°36.9 14°49.8	13.0' 12.9'	58.1' 58.0'
16	42 25.9 57°25.7	32.7	140 42.3 155°12.3	10.9'	14 49.8 15°02.7	12.9	58.0'
17	72°25.5	32.2	169°42.2	10.9'	15°15.5	12.7'	58.0'
18	87°25.3 102°25.1	\$20°31.7 31.2	184°12.1 198°42.0	10.9' 10.9'	\$15°28.2 15°40.8	12.6' 12.5'	57.9' 57.9'
19 20	102°25.1 117°24.9	31.2 30.6	198°42.0 213°11.9	10.9'	15°40.8 15°53.3	12.5'	57.9° 57.9°
21	132°24.7	• • 30.1	227°41.7	10.8'	16°05.7	12.3'	57.8'
22	147°24.5	29.6	242°11.5	10.8'	16°18.0	12.2'	57.8'
23	162°24.3	29.1	256°41.3	10.7'	16°30.2	12.1'	57.8'
	SD = 16.3'	d = -0.5'		SI	O = 16.0'		

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

Lat.		Moonris	е		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	23:28		01:55	09:29	08:56	08:14
N 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°	22:21	23:14		09:50	10:34	11:19
0°	22:17	23:06	23:56	09:51	10:40	11:30
S 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°	22:00	22:27	22:56	09:57	11:09	12:20
45°	21:57	22:20	22:45	09:58	11:15	12:30
S 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°	21:45	21:52	22:01	10:02	11:37	13:10
S 60°	21:43	21:46	21:51	10:03	11:41	13:19

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
- \\/ad	CHA	GHA	Dec	GHA	Dec	GHA		GHA			SHA	Doo
Wed 0	GHA 117° 55.7	138° 46.8	\$10°18.7	163°05.1	518°14.1	299°44.4	Dec N02°15.2	97°00.3	Dec N06°08.8			Dec
1	132° 58.2	153° 46.4	17.5	178°05.6	13.5	314°47.0	15.3	112°02.7	08.8	Alpheratz	357°32.3	29°14.9
2	148°00.7	168° 46.1	16.3	193°06.1	13.0	329°49.5	15.3	112 02.7 127°05.1	08.9	Ankaa	353°04.9	-42°09.4
3	163°03.1	183°45.7	. 15.1	208°06.5	. 12.4	344°52.0	. 15.3	142°07.4	. 08.9	Schedar	349°28.3	56°41.8
4	178°05.6	198°45.4	13.9	223°07.0	11.9	359°54.5	15.4	157°09.8	09.0	Diphda	348°44.9	-17°50.0
5	193°08.1	213°45.0	12.7	238°07.5	11.3	14°57.0	15.4	172° 12.1	09.0	Achernar	335°18.4	-57°05.9
6	208° 10.5	228°44.7	\$10°11.5	253°08.0	S 18°10.8	29°59.5	N02°15.4	187° 14.5	N06°09.1	Hamal	327°48.3	23°35.8
7	223°13.0	243°44.4	10.3	268°08.4	10.2	45°02.0	15.5	202°16.9	09.1	Acamar	312°29.8 315°09.8	89°23.2 -40°11.7
8	238°15.5	258°44.0	09.1	283°08.9	09.6	60°04.5	15.5	$217^{\circ}19.2$	09.2	Menkar	314°03.4	4°12.0
9	253° 17.9	273°43.7	• • 07.9	298°09.4	•• 09.1	75°07.0	•• 15.5	232°21.6	• • 09.3	Mirfak	308°24.4	49°57.8
10	268°20.4	288° 43.3	06.7	313°09.8	08.5	90°09.5	15.6	247°23.9	09.3	Aldebaran	290°36.5	16°33.9
11	283°22.8	303°43.0	05.4	328°10.3	0.80	105°12.1	15.6	262°26.3	09.4	Rigel	281°01.2	-8°10.3
12	298°25.3	318° 42.7	\$10°04.2	343°10.8	S18°07.4	120°14.6	N02°15.6	277°28.7	N06°09.4	Capella	280°17.8	46°01.6
13	313°27.8	333°42.3	03.0	358°11.3	06.8	135°17.1	15.7	292°31.0	09.5	Bellatrix	278°19.9	6°22.4
14 15	328°30.2 343°32.7	348°42.0 3°41.7	01.8 10°00.6	13°11.7 28°12.2	06.3 •• 05.7	150°19.6 165°22.1	15.7 •• 15.7	307°33.4 322°35.7	09.5 •• 09.6	Elnath	277°58.4	28°37.8
16	358° 35.2	18° 41.3	09°59.4	43°12.7	05.1	180°24.6	15.8	337°38.1	09.6	Alnilam	275°34.9	-1°11.2
17	13° 37.6	33°41.0	58.2	58°13.2	04.6	195°27.1	15.8	352°40.4	09.7	Betelgeuse	270°49.1	7°24.6
18	28° 40.1	48° 40.7	S09°57.0	73°13.6	S18°04.0	210°29.7	N02°15.8	7°42.8	N06°09.7	Canopus	263°50.8	-52°42.8
19	43° 42.6	63°40.3	55.8	88°14.1	03.5	225°32.2	15.9	22°45.1	09.8	Sirius	258°23.7	-16°45.4
20	58° 45.0	78°40.0	54.5	103°14.6	02.9	240°34.7	15.9	37°47.5	09.9	Adhara	255°03.5	-29°00.8
21	73° 47.5	93°39.7	• • 53.3	118°15.1	• • 02.3	255°37.2	• • 15.9	52°49.9	• • 09.9	Procyon	244°47.9	5°09.0
22	88°49.9	108°39.3	52.1	133°15.5	01.8	270°39.7	16.0	67°52.2	10.0	Pollux	243°13.9 234°13.0	27°57.3
23	103°52.4	123°39.0	50.9	$148^{\circ}16.0$	01.2	285°42.2	16.0	82°54.6	10.0	Avior Suhail	234°13.0 222°44.0	-59°36.0 -43°32.8
Mern	ass. 16:06	ν-0 3' d-1	2′ m-4.05	ν0 5' d-0	.6′ m1.14	v2 5' d0	0′ m-2.25	ν2 4' dΩ	.1′ m0.52	Miaplacidus	222 44.0 221°36.7	-43 32.6 -69°49.9
p	,a33. 10.00	ν-0.5 u-1	111-4.03	νυ.5 u-0	.0 1111.14	ν Δ.J u0.	0 111-2.23	ν Δ.Ψ UU	.1110.32	Alphard	221 30.7 217°45.0	-8°47.0
										Regulus	207°31.5	11°49.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.6	61°35.6
0	118° 54.9	138°38.7	\$09°49.7	163°16.5	\$18°00.6	300°44.7	N02°16.0	97°56.9	N06°10.1	Denebola	$182^{\circ}22.2$	14°24.7
1	133°57.3	153°38.3	48.5	178°17.0	18°00.1	315°47.3	16.1	112°59.3	10.1	Gienah	$175^{\circ}40.9$	-17°41.9
2 3	148° 59.8 164° 02.3	168°38.0 183°37.7	47.3 •• 46.0	193°17.5 208°17.9	17°59.5 •• 58.9	330°49.8 345°52.3	16.1 •• 16.1	128°01.6 143°04.0	10.2 · · 10.2		172°56.9	-63°15.1
3 4	104 02.3 179°04.7	103 37.7 198° 37.3	44.8	206 17.9 223°18.4	58.4	0°54.8	16.2	143 04.0 158°06.3	10.2		171°48.6	-57°16.1
5	194° 07.2	213° 37.0	43.6	238°18.9	57.8	15°57.3	16.2	173° 08.7	10.4	1	166°10.7	55°48.1
6	209°09.7	213° 37.0° 228° 36.7	S09°42.4	253°19.4	\$17°57.3	30°59.8	N02°16.2	188°11.1	N06°10.4	Spica	158°19.6	-11°18.5
7	224°12.1	243°36.3	41.2	268°19.8	56.7	46°02.4	16.3	203°13.4	10.5	Alkaid	152°50.1	49°10.0
8	239° 14.6	258° 36.0	40.0	283°20.3	56.1	61°04.9	16.3	218° 15.8	10.5	Hadar	148°32.4	-60°30.3
9	254° 17.1	273°35.7	• • 38.7	298°20.8	• • 55.5	76°07.4	• • 16.4	233° 18.1	• • 10.6		147°54.7	-36°30.4
10	269° 19.5	288°35.4	37.5	313°21.3	55.0	91°09.9	16.4	248° 20.5	10.6	Arcturus Rigil Kent.	145°45.7 139°36.9	19°01.9 -60°56.8
11	284°22.0	303°35.0	36.3	328°21.7	54.4	$106^{\circ}12.4$	16.4	263°22.8	10.7	Kochab	139°30.9	74°02.0
12	299°24.4	318°34.7	S09°35.1	343°22.2	S17°53.8	121°15.0	N02°16.5	278°25.2	N06°10.7	Zuben'ubi	136°53.3	-16°09.5
13	314°26.9	333°34.4	33.9	358°22.7	53.3	$136^{\circ}17.5$	16.5	293°27.5	10.8	Alphecca	126°01.8	26°37.0
14	329°29.4	348°34.1	32.6	13°23.2	52.7	151°20.0	16.5	308°29.9	10.9	Antares	112°13.0	-26°29.6
15	344°31.8	3°33.7	• • 31.4	28°23.7	• • 52.1	166°22.5	• • 16.6	323°32.2	• • 10.9	Atria	107°05.3	-69°04.4
16	359°34.3	18°33.4	30.2	43°24.1	51.6	181°25.0	16.6	338°34.6	11.0	Sabik	102°00.2	-15°45.5
17	14°36.8	33°33.1	29.0	58°24.6	51.0	196°27.6	16.6	353°36.9	11.0	Shaula	96°07.3	-37°07.3
18	29°39.2 44°41.7	48°32.8	S09°27.8	73°25.1	\$17°50.4	211°30.1	N02°16.7	8°39.3	N06°11.1	Rasalhague	95°56.5	12°32.3
19	44 41.7 59°44.2	63°32.4 78°32.1	26.5	88°25.6 103°26.1	49.9	226°32.6 241°35.1	16.7	23°41.7 38°44.0	11.1	Eltanin	90°41.5	51°29.0
20 21	74° 46.6	93°31.8	25.3 •• 24.1	103 26.1 118°26.5	49.3 •• 48.7	256° 37.6	16.8 •• 16.8	53°46.4	11.2 · · 11.3	Kaus Aust.	83°29.6	-34°22.2
22	89°49.1	108°31.5	22.9	133°27.0	48.1	271°40.2	16.8	68°48.7	11.3	Vega	80°31.9	38°48.5
23	104°51.6	123°31.2	21.6	148°27.5	47.6	286°42.7	16.9	83°51.1	11.4	Nunki	75°45.0	-26°15.6
										Altair	61°57.9	8°56.6
Mer.p	ass. 16:02	ν -0.3′ d-1	2′ m-4.06	ν 0.5′ d-0	.6′ m1.14	ν 2.5′ d0.	0′ m-2.25	$\nu^{2.4'} d0$.1′ m0.53	Peacock Deneb	53°02.5 49°24.5	-56°38.6 45°22.9
										Enif	33°36.6	10°00.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.6
0	119° 54.0	138° 30.8	509°20.4	163°28.0	S17°47.0	301°45.2	$N02^{\circ}16.9$	98°53.4	N06°11.4	Fomalhaut	15°12.1	-29°28.5
1	134°56.5	153°30.5	19.2	178°28.5	46.4	316°47.7	16.9	113°55.8	11.5	Scheat	13°43.0	28°14.3
2	149°58.9	168°30.2	18.0	193°28.9	45.9	331°50.3	17.0	128°58.1	11.5	Markab	$13^{\circ}27.6$	15°21.5
3	165°01.4	183°29.9	• • 16.7	208°29.4	• • 45.3	346°52.8	•• 17.0	144°00.5	• • 11.6	lan 10 M- 1	CHA	Ma: ::
4	180°03.9	198°29.6	15.5	223°29.9	44.7	1°55.3	17.1	159°02.8	11.6	Jan 19 Wed Venus	SHA 20°51.0	Mer.pass 14:45
5 6	195°06.3 210°08.8	213°29.2 228°28.9	14.3 S09°13.1	238°30.4 253°30.9	44.1 \$17°43.6	16°57.8 32°00.4	17.1 N02°17.1	174°05.2	11.7 N06°11.8	Mars	45°09.4	13:07
7	210 08.8 225°11.3	243°28.6	11.8	253 30.9 268°31.4	43.0	47°02.9	NU2 17.1 17.2	204°09.9	11.8	Jupiter		04:00
8	240° 13.7	258° 28.3	10.6	283°31.8	42.4	62°05.4	17.2	219° 12.2	11.0	Saturn	339°04.6	17:29
9	255°16.2	273°28.0	09.4	298°32.3	• • 41.8	77°07.9	17.3	234° 14.6	. 11.9			
10	270° 18.7	288° 27.7	08.1	313°32.8	41.3	92° 10.5	17.3	249° 16.9	12.0	Jan 20 Thu	SHA	Mer.pass
11	285°21.1	303°27.3	06.9	328°33.3	40.7	107°13.0	17.3	264°19.3	12.0	Venus	19°43.8	14:46
12	300°23.6	318°27.0	S09°05.7	343°33.8	S17°40.1	122°15.5	N02°17.4	279°21.6	N06°12.1	Mars Jupiter	44°21.6 181°49.9	13:06 03:56
13	315°26.1	333° 26.7	04.5	358°34.2	39.5	137° 18.0	17.4	294°24.0	12.2	Jupiter	339°02.1	17:25
14	330°28.5	348° 26.4	03.2	13°34.7	38.9	152°20.6	17.5	309°26.3	12.2	Jatuin	JJJ U4.1	11.23
15	345°31.0	3°26.1	• • 02.0	28°35.2	• • 38.4	167°23.1	• • 17.5	324°28.7	· · 12.3	Jan 21 Fri	SHA	Mer.pass
16	0°33.4	18°25.8	09°00.8	43°35.7	37.8	182°25.6	17.5	339°31.0	12.3	Venus	18°36.8	14:46
17	15°35.9	33°25.5	08°59.5	58°36.2	37.2	197°28.1	17.6	354°33.4	12.4	Mars	43°34.0	13:06
18	30°38.4	48°25.2	\$08°58.3	73°36.7	\$17°36.6	212°30.7	N02°17.6		N06°12.5		181°51.2	03:52
19 20	45°40.8 60°43.3	63°24.8 78°24.5	57.1 55.8	88°37.1 103°37.6	36.1 35.5	227°33.2 242°35.7	17.7 17.7	24°38.1 39°40.4	12.5 12.6	Saturn	338°59.4	17:22
20 21	60°43.3 75°45.8	78° 24.5 93° 24.2	55.8 •• 54.6	103°37.6 118°38.1	35.5	242°35.7 257°38.3	17.7	54° 42.8	12.6	Horizont	al parallax	
22	90° 48.2	108° 23.9	53.4	133°38.6	34.3	272°40.8	17.7	69°45.1	12.7		Venus:	0.1
23	105° 50.7	123°23.6	52.1	148°39.1	33.7	287°43.3	17.8	84° 47.5	12.7		Mars:	0.1
										•		
ivier.p	Mer.pass. 15:58 ν -0.3' d -1.2' m-4.06		ν 0.5' d -0	.6′ m1.14	ν 2.5′ $d0$.	0′ m-2.26	ν2.4′ d0	.1′ m0.53				

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 24.1	S20°28.6	271°11.0	10.7'	S16°42.3	12.0'	57.7'
1 2	192°23.9 207°23.7	28.1 27.6	285°40.7 300°10.4	10.7' 10.6'	16°54.3 17°06.3	11.9' 11.8'	57.7' 57.7'
3	207 23.7 222° 23.5	• • 27.0	314°40.0	10.6'	17° 18.1	11.7	57.6'
4	237°23.3	26.5	329°09.6	10.6'	$17^{\circ}29.8$	11.6'	57.6'
5	252°23.1	26.0	343°39.2	10.5'	17°41.4	11.5'	57.6'
6 7	267°22.9 282°22.7	\$20°25.5 25.0	358°08.7 12°38.2	10.5' 10.5'	\$17°52.9 18°04.3	11.4' 11.3'	57.5' 57.5'
8	297° 22.5	24.5	27°07.7	10.4	18°15.6	11.2'	57.5'
9	312°22.3	• • 23.9	41°37.1	10.4'	18°26.8	11.1'	57.4'
10	327°22.1	23.4	56°06.5	10.4'	18°37.9	11.0'	57.4
11 12	342°22.0 357°21.8	22.9 \$20°22.4	70°35.9 85°05.2	10.3' 10.3'	18°48.9 \$18°59.7	10.9' 10.8'	57.4' 57.3'
13	12°21.6	21.9	99°34.5	10.2'	19°10.5	10.6'	57.3'
14	27°21.4	21.3	114°03.7	10.2'	19°21.1	10.5'	57.3'
15 16	42°21.2 57°21.0	· · 20.8 20.3	128°32.9 143°02.1	10.2' 10.1'	19°31.7 19°42.1	10.4' 10.3'	57.3' 57.2'
17	72° 20.8	19.8	157°31.2	10.1	19°52.4	10.3	57.2'
18	87°20.6	S20°19.2	172°00.3	10.1'	S20°02.6	10.1'	57.2'
19	102°20.4	18.7	186°29.4	10.0'	20°12.6	10.0'	57.1'
20 21	117°20.2 132°20.0	18.2 •• 17.6	200°58.4 215°27.4	10.0' 10.0'	20°22.6 20°32.5	9.8' 9.7'	57.1' 57.1'
22	147° 19.8	17.1	229°56.4	9.9'	20°42.2	9.6'	57.0'
23	162° 19.7	16.6	244°25.3	9.9'	20°51.8	9.5'	57.0'
	SD = 16.2'	d = -0.5'		SE	0 = 15.7'		
Thu	GHA	Dec	GHA	.,	Dec	d	НР
1 nu 0	GHA 177°19.5	S20°16.1	258°54.1	u 9.8'	S21°01.3	a 9.4'	пР 57.0'
1	192°19.3	15.5	273°23.0	9.8'	21°10.7	9.3'	56.9'
2	207°19.1	15.0	287°51.8	9.8'	21°19.9	9.1'	56.9'
3 4	222°18.9 237°18.7	· · 14.5 13.9	302°20.5 316°49.3	9.7' 9.7'	21°29.0 21°38.1	9.0' 8.9'	56.9' 56.9'
5	252° 18.5	13.4	331°18.0	9.7'	21°46.9	8.8'	56.8'
6	267° 18.3	S20°12.9	345°46.6	9.6'	S21°55.7	8.6'	56.8'
7	282°18.1 297°18.0	12.3	0°15.2 14°43.8	9.6'	22°04.3 22°12.9	8.5'	56.8'
8 9	297° 18.0 312° 17.8	11.8 •• 11.3	14°43.8 29°12.4	9.5' 9.5'	22°12.9 22°21.2	8.4' 8.3'	56.7' 56.7'
10	327° 17.6	10.7	43°40.9	9.5'	22°29.5	8.1'	56.7'
11	342° 17.4	10.2	58°09.4	9.4'	22°37.6	8.0'	56.7'
12 13	357° 17.2 12° 17.0	\$20°09.6 09.1	72°37.8 87°06.2	9.4' 9.4'	\$22°45.7 22°53.5	7.9' 7.8'	56.6' 56.6'
14	27°16.8	08.6	101°34.6	9.4	22 55.5 23°01.3	7.6'	56.6'
15	42°16.7	• • 08.0	$116^{\circ}02.9$	9.3'	23°08.9	7.5'	56.5'
16	57° 16.5	07.5	130°31.3	9.3'	23°16.4	7.4'	56.5'
17 18	72°16.3 87°16.1	06.9 \$20°06.4	144°59.5 159°27.8	9.2' 9.2'	23°23.8 S 23°31.0	7.2' 7.1'	56.5' 56.5'
19	102° 15.9	05.9	173°56.0	9.2'	23°38.1	7.0'	56.4
20	117° 15.7	05.3	188°24.2	9.2'	23°45.1	6.8'	56.4'
21 22	132° 15.6 147° 15.4	· · 04.8 04.2	202°52.3 217°20.5	9.1' 9.1'	23°51.9 23°58.7	6.7' 6.6'	56.4' 56.4'
23	162° 15.2	04.2	217 20.5 231°48.6	9.1'	24°05.2	6.4	56.3
	SD = 16.2'	d = -0.5'		SE	0 = 15.5'		
Fri 0	GHA 177° 15.0	Dec \$20°03.1	GHA 246°16.6	u 9.0'	Dec \$24°11.7	d 6.3'	HP 56.3'
1	192°14.8	02.6	260°44.7	9.0'	24°18.0	6.2	56.3
2	207°14.6	02.0	275°12.7	9.0'	24°24.1	6.0'	56.2'
3 4	222°14.5 237°14.3	· · 01.5 01.0	289°40.7 304°08.6	9.0' 8.9'	24°30.2 24°36.1	5.9' 5.8'	56.2' 56.2'
5	257 14.3 252° 14.1	20°00.4	318°36.6	8.9'	24° 41.8	5.6'	56.2'
6	267°13.9	S19°59.9	333°04.5	8.9'	S24°47.5	5.5'	56.1'
7	282°13.7	59.3	347°32.4 2°00.2	8.9' 8.8'	24°53.0 24°58.3	5.4' 5.2'	56.1'
8 9	297° 13.6 312° 13.4	58.7 •• 58.2	2°00.2 16°28.1	8.8'	24°58.3 25°03.5	5.2	56.1' 56.1'
10	327° 13.2	57.6	30°55.9	8.8'	25°08.6	4.9'	56.0'
11	342°13.0	57.1	45°23.7	8.8'	25°13.6	4.8'	56.0'
12 13	357° 12.9 12° 12.7	\$19°56.5 56.0	59°51.5 74°19.3	8.8' 8.8'	\$25°18.4 25°23.0	4.7' 4.5'	56.0' 56.0'
14	27° 12.5	55.4	88°47.0	8.7'	25°27.5	4.4'	55.9'
15	42° 12.3	•• 54.9	103°14.8	8.7'	25°31.9	4.2'	55.9'
16	57° 12.1	54.3	117°42.5	8.7'	25°36.2	4.1'	55.9'
17 18	72°12.0 87°11.8	53.8 \$19°53.2	132°10.2 146°37.9	8.7' 8.7'	25°40.3 \$25°44.2	4.0' 3.8'	55.9' 55.9'
19	102°11.6	52.6	$161^{\circ}05.6$	8.7'	25°48.1	3.7'	55.8'
20	117°11.4	52.1	175°33.3	8.7'	25°51.7	3.5'	55.8'
21 22	132°11.3 147°11.1	· · 51.5 51.0	190°01.0 204°28.6	8.7' 8.7'	25°55.3 25°58.7	3.4' 3.3'	55.8' 55.8'
23	162° 10.9	50.4	218°56.3	8.6'	26°01.9	3.1'	55.7'
	SD = 16.2'	d = -0.5'		SE) = 15.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Ldl.	Naut.	Civil	Sunrise	Junset	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
N 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
N 40°	06:15	06:48	07:18	17:04	17:34	18:07
35°	06:08	06:39	07:06	17:16	17:43	18:14
30°	06:01	06:30	06:56	17:26	17:52	18:21
20°	05:47	06:14	06:38	17:44	18:08	18:34
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:14	18:36	19:02
S 10°	05:03	05:30	05:52	18:29	18:52	19:18
20°	04:44	05:12	05:36	18:45	19:09	19:37
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
S 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	////
S 60°	////	02:13	03:23	20:57	22:06	////
Lat.		Moonris	ie		Moonset	
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°	04:07			07:48		
68°	03:28			08:29		
66°	03:01	05:14	_	08:57	08:31	

Lat.		Moonris	е		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	_			_		_
N 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
N 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
N 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
S 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
S 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
S 60°	21:58	22:11	22:34	14:56	16:31	17:58

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-28%		
19	10:24	10:33	12:11	06:08	18:33			
20	10:42	10:51	12:11	06:59	19:25			
21	11:00	11:09	12:11	07:52	20:18			

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

h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	120°53.2	138° 23.3	S08° 50.9	163°39.6	S17°33.2	302°45.9	N02°17.9	99°49.8	N06°12.8			
1	135°55.6	158° 23.3° 153° 23.0	49.7	178°40.1	32.6	317°48.4	17.9	114°52.2	12.9	Alpheratz	357°32.3	29°14.9
2	150°58.1	168° 22.7	48.4	178° 40.1	32.0	332°50.9	17.9	129°54.5	12.9	Ankaa	353°04.9	-42°09.4
3	166°00.6	183° 22.4	• • 47.2	208°41.0	31.4	347°53.4	18.0	144° 56.8	• • 13.0	Schedar	349°28.3	56°41.8
3 4						2°56.0				Diphda	348°44.9	-17°50.0
	181°03.0 196°05.5	198°22.1	46.0	223°41.5 238°42.0	30.8		18.0	159°59.2	13.0	Achernar	$335^{\circ}18.5$	-57°05.9
5		213°21.8	44.7		30.3	17°58.5	18.1	175°01.5	13.1	Hamal	327°48.3	23°35.8
6	211°07.9	228°21.5	S08°43.5	253°42.5	S17°29.7	33°01.0	N02°18.1	190°03.9	N06°13.2	Polaris	312°31.0	89°23.2
7	226°10.4	243°21.1	42.3	268°43.0	29.1	48°03.6	18.1	205°06.2	13.2	Acamar	315°09.8	-40°11.7
8	241°12.9	258° 20.8	41.0	283°43.5	28.5	63°06.1	18.2	220°08.6	13.3	Menkar	314°03.4	4°12.0
9	256°15.3	273°20.5	• • 39.8	298°43.9	• • 27.9	78°08.6	• • 18.2	235° 10.9	· · 13.3	Mirfak	308°24.4	49°57.8
10	271°17.8	288°20.2	38.6	313°44.4	27.3	93°11.2	18.3	250° 13.3	13.4	Aldebaran	290°36.5	16°33.9
11	286°20.3	303°19.9	37.3	328°44.9	26.8	108°13.7	18.3	265° 15.6	13.4	Rigel	281°01.2	-8°10.3
12	301°22.7	318° 19.6	S08°36.1	343°45.4	S17°26.2	123°16.2	N02°18.4	280° 18.0	N06°13.5	Capella	280°17.8	46°01.6
13	316°25.2	333°19.3	34.8	358°45.9	25.6	138°18.8	18.4	295°20.3	13.6	Bellatrix	278°19.9	6°22.4
14	331°27.7	348°19.0	33.6	13°46.4	25.0	153°21.3	18.4	310°22.7	13.6	Elnath	277°58.4	28°37.8
15	346°30.1	3°18.7	• • 32.4	28°46.9	• • 24.4	168°23.8	• • 18.5	325°25.0	• • 13.7	Alnilam	275°34.9	-1°11.2
16	1°32.6	18° 18.4	31.1	43°47.4	23.8	183°26.4	18.5	340°27.3	13.7		270°49.1	7°24.6
17	16°35.0	33°18.1	29.9	58°47.8	23.2	198°28.9	18.6	355°29.7	13.8	Betelgeuse		
18	31°37.5	48°17.8	S08°28.6	73°48.3	S17°22.7	213°31.5	N02°18.6	10°32.0	N06°13.9	Canopus	263°50.8	-52°42.8 -16°45.4
19	46°40.0	63° 17.5	27.4	88°48.8	22.1	228°34.0	18.7	25°34.4	13.9	Sirius	258°23.7	
20	61°42.4	78° 17.2	26.2	103°49.3	21.5	243°36.5	18.7	40°36.7	14.0	Adhara	255°03.5	-29°00.8
21	76°44.9	93°16.9	24.9	118°49.8	20.9	258°39.1	• • 18.7	55°39.1	14.0	Procyon	244°47.9	5°09.0
22	91°47.4	108° 16.6	23.7	133°50.3	20.3	273°41.6	18.8	70°41.4	14.1	Pollux	243°13.9	27°57.3
23	106°49.8	123° 16.3	22.4	148°50.8	19.7	288°44.1	18.8	85°43.8	14.2	Avior	234°13.0	-59°36.0
_		-								Suhail	222°44.0	-43°32.8
Mer.p	ass. 15:54	ν -0.3' d-1	2′ m-4.06	ν 0.5 $^{\prime}$ d-0	.6′ m1.14	$\nu 2.5' \ d0.$	0′ m-2.27	$\nu 2.3' \ d0$.1' m 0.53	Miaplacidus	221°36.7	-69°49.9
									_	Alphard	217°45.0	-8°47.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.5	11°49.6
										Dubhe	193°37.6	61°35.6
0	121°52.3	138°16.0	\$08°21.2	163°51.3 178°51.8	\$17°19.1	303°46.7 318°49.2	N02°18.9	100°46.1 115°48.4	N06°14.2	Denebola	182°22.2	14°24.7
1	136°54.8	153° 15.7	19.9		18.5		18.9		14.3	Gienah	175°40.8	-17°41.9
2	151°57.2	168° 15.4	18.7	193°52.2	18.0	333°51.8	19.0	130°50.8	14.3	Acrux	172°56.9	-63°15.1
3	166°59.7	183°15.1	• • 17.5	208°52.7	• • 17.4	348°54.3	• • 19.0	145°53.1	• • 14.4	Gacrux	171°48.5	-57°16.1
4	182°02.2	198°14.8	16.2	223°53.2	16.8	3°56.8	19.1	160°55.5	14.5	Alioth	166°10.7	55°48.0
5	197°04.6	213° 14.5	15.0	238°53.7	16.2	18°59.4	19.1	175°57.8	14.5	Spica	158°19.6	-11°18.5
6	212°07.1	228° 14.3	S08°13.7	253°54.2	S17°15.6	34°01.9	N02°19.1	191°00.2	N06°14.6	Alkaid	152°50.1	49°10.0
7	227°09.5	243°14.0	12.5	268°54.7	15.0	49°04.4	19.2	206°02.5	14.6	Hadar	148°32.3	-60°30.3
8	242°12.0	258° 13.7	11.2	283°55.2	14.4	64°07.0	19.2	221°04.8	14.7	Menkent	147°54.6	-36°30.4
9	257°14.5	273°13.4	• • 10.0	298°55.7	• • 13.8	79°09.5	• • 19.3	236°07.2	• • 14.8	Arcturus	145°45.7	19°01.9
10	272°16.9	288°13.1	08.7	313°56.2	13.2	94°12.1	19.3	251°09.5	14.8	Rigil Kent.		-60°56.9
11	287°19.4	303°12.8	07.5	328°56.7	12.6	109°14.6	19.4	266°11.9	14.9	Kochab	137°20.3	74°02.0
12	302°21.9	318° 12.5	S08°06.3	343°57.2	S17°12.1	124°17.2	N02°19.4	281°14.2	N06°14.9		136°53.3	-16°09.5
13	317°24.3	333° 12.2	05.0	358°57.6	11.5	139°19.7	19.5	296°16.6	15.0	Zuben'ubi		
14	332°26.8	348°11.9	03.8	13°58.1	10.9	154°22.2	19.5	311°18.9	15.1	Alphecca	126°01.8	26°37.0
15	347°29.3	3°11.6	• • 02.5	28°58.6	• • 10.3	169°24.8	• • 19.6	326°21.2	• • 15.1	Antares	112°13.0	-26°29.6
16	2°31.7	18° 11.3	01.3	43°59.1	09.7	184°27.3	19.6	341°23.6	15.2	Atria	107°05.3	-69°04.4
17	17°34.2	33°11.0	0.00°80	58°59.6	09.1	199°29.9	19.6	356°25.9	15.2	Sabik	102°00.2	-15°45.5
18	32°36.7	48° 10.8	S07°58.8	74°00.1	\$17°08.5	214°32.4	N02°19.7	11°28.3	N06°15.3	Shaula	96°07.3	-37°07.3
19	47°39.1	63° 10.5	57.5	89°00.6	07.9	229°34.9	19.7	26° 30.6	15.4	Rasalhague	95°56.5	12°32.3
20	62°41.6	78° 10.2	56.3	104°01.1	07.3	244°37.5	19.8	41°32.9	15.4	Eltanin	90°41.5	51°28.9
21	77°44.0	93°09.9	• • 55.0	119°01.6	• • 06.7	259°40.0	• • 19.8	56°35.3	. 15.5	Kaus Aust.	83°29.6	-34°22.2
22	92°46.5	108° 09.6	53.8	134°02.1	06.1	274°42.6	19.8	71°37.6		Vega	80°31.9	38°48.5
									15.5	Nunki	75°45.0	-26°15.6
23	107°49.0	123°09.3	52.5	149°02.6	05.5	289°45.1	19.9	86°40.0	15.6	Altair	$61^{\circ}57.8$	8°56.6
Mer.p	ass. 15:50	ν -0.3' d-1	2′ m-4.07	ν 0.5' d-0	.6′ m1.13	$\nu 2.5' \ d0.$	0′ m-2.28	$\nu 2.3' \ d0$.1' m0.53	Peacock	53°02.4	-56°38.6
										Deneb	49°24.5	45°22.9
	s	 -	_	 -	_	 -	_	 -		Enif	33°36.6	10°00.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.6
0	122°51.4	138°09.0	S07°51.3	164°03.1	S17°04.9	304°47.7	N02°20.0	101°42.3	N06°15.7	Fomalhaut	$15^{\circ}12.1$	-29°28.5
1	137°53.9	153°08.7	50.0	179°03.6	04.3	319°50.2	20.0	116°44.6	15.7	Scheat	13°43.0	28°14.3
2	152°56.4	168°08.5	48.8	194°04.1	03.7	334°52.8	20.1	131°47.0	15.8	Markab	13°27.6	15°21.5
3	167°58.8	183°08.2	• • 47.5	209°04.6	• • 03.1	349°55.3	• • 20.1	146°49.3	• • 15.9			
4	183°01.3	198°07.9	46.3	224°05.0	02.5	4°57.9	20.2	161°51.7	15.9	Jan 22 Sat	SHA	Mer.pass
5	198°03.8	213°07.6	45.0	239°05.5	01.9	20°00.4	20.2	176°54.0	16.0	Venus	17°30.1	14:47
6	213°06.2	228°07.3	S07°43.8	254°06.0	S17°01.3	35°02.9	N02°20.3	191°56.3	N06°16.0	Mars	42°46.4	13:05
7	228°08.7	243°07.0	42.5	269°06.5	00.7	50°05.5	20.3	206°58.7	16.1	Jupiter		03:48
8	243°11.2	258°06.8	41.3	284°07.0	17°00.2	65°08.0	20.4	222°01.0	16.2	Saturn	338°56.6	17:18
9	258°13.6	273°06.5	• • 40.0	299°07.5	16°59.6	80°10.6	• • 20.4	237°03.4	• • 16.2	Jan 23 Sun	SHA	Mer.pass
10	$273^{\circ}16.1$	288°06.2	38.7	314°08.0	59.0	95°13.1	20.5	252°05.7	16.3	Venus	16°23.7	14:47
11	$288^{\circ}18.5$	303°05.9	37.5	329°08.5	58.4	110°15.7	20.5	267°08.0	16.3	Mars	10 23.7 41°59.0	
12	303°21.0	318°05.6	S07°36.2	344°09.0	S16°57.8	$125^{\circ}18.2$	N02°20.6	282°10.4	N06°16.4	Jupiter	41 59.0 181°54.4	13:04
13	$318^{\circ}23.5$	333°05.3	35.0	359°09.5	57.2	140°20.8	20.6	$297^{\circ}12.7$	16.5			03:44
14	333°25.9	348°05.1	33.7	14°10.0	56.6	155°23.3	20.7	$312^{\circ}15.0$	16.5	Saturn	338°53.8	17:14
15	348°28.4	3°04.8	• • 32.5	29°10.5	• • 56.0	$170^{\circ}25.9$	• • 20.7	$327^{\circ}17.4$	• • 16.6	Jan 24 Mon	SHA	Mer.pass
16	3°30.9	18°04.5	31.2	44°11.0	55.4	185°28.4	20.7	$342^{\circ}19.7$	16.7	Venus	15°17.6	14:48
17	18°33.3	33°04.2	30.0	59°11.5	54.8	200°31.0	20.8	357°22.1	16.7	Mars	41°11.6	13:03
18	33°35.8	48°03.9	S07°28.7	74°12.0	S16°54.2	215°33.5	N02°20.8	12°24.4	N06°16.8	Jupiter		03:40
19	48°38.3	63°03.7	27.5	89°12.5	53.5	230°36.1	20.9	27° 26.7	16.8	Saturn	338°50.9	17:11
20	63°40.7	78°03.4	26.2	104°13.0	52.9	245°38.6	20.9	42°29.1	16.9	Jacarii	300 30.9	-1.11
21	78°43.2	93°03.1	24.9	119°13.5	52.3	260°41.2	· · 21.0	57°31.4	17.0	Horizont	al parallax	
22	93°45.7	108°02.8	23.7	134°14.0	51.7	275°43.7	21.0	72°33.7	17.0		Venus:	0.1
23	108°48.1	123°02.6	22.4	149°14.5	51.1	290°46.3	21.1	87°36.1	17.1		Mars:	0.1
										-		
Mer.p	ass. 15:46	ν -0.3' d-1	3′ m-4.07	ν 0.5′ d -0	.6′ m1.13	$\nu 2.5' \ d0.$	0′ m-2.28	$\nu^{2.3'} d0$.1′ m0.54			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°10.7	S 19°49.8	233°23.9	8.6'	\$26°05.1	3.0'	55.7'
1	192°10.6	49.3	247°51.6 262°19.2	8.6'	26°08.0	2.8'	55.7'
2	207°10.4 222°10.2	48.7 •• 48.2	262 19.2 276°46.9	8.6' 8.6'	26°10.9 26°13.6	2.7' 2.6'	55.7' 55.6'
4	237°10.0	47.6	291°14.5	8.6'	26°16.1	2.4'	55.6'
5	252°09.9	47.0	$305^{\circ}42.1$	8.6'	$26^{\circ}18.5$	2.3'	55.6'
6	267°09.7 282°09.5	\$19°46.5	320°09.8 334°37.4	8.6'	\$26°20.8 26°22.9	2.1'	55.6'
7 8	282 09.5 297°09.4	45.9 45.3	334 37.4 349°05.0	8.6' 8.6'	26°24.9	2.0' 1.8'	55.6' 55.5'
9	312°09.2	• • 44.8	3°32.7	8.7'	26°26.7	1.7'	55.5'
10	327°09.0	44.2	18°00.4	8.7'	26°28.4	1.6'	55.5'
11 12	342°08.8 357°08.7	43.6 \$19°43.1	32°28.0 46°55.7	8.7' 8.7'	26°30.0 S 26°31.4	1.4' 1.3'	55.5' 55.4'
13	12°08.5	42.5	40 55.7 61°23.4	8.7'	26°32.7	1.1'	55.4'
14	27°08.3	41.9	75°51.0	8.7'	26°33.8	1.0'	55.4'
15	42°08.2	• • 41.3	90°18.7	8.7'	26°34.8	0.9'	55.4'
16 17	57°08.0 72°07.8	40.8 40.2	104°46.5 119°14.2	8.7' 8.7'	26°35.7 26°36.4	0.7' 0.6'	55.4' 55.3'
18	87°07.7	\$19°39.6	119 14.2 133°41.9	8.8'	526°36.9	0.6	55.3'
19	102°07.5	39.1	148°09.7	8.8'	26°37.4	0.3'	55.3'
20	117°07.3	38.5	162°37.5	8.8'	26°37.7	0.1'	55.3'
21	132°07.2 147°07.0	• • 37.9	177°05.3	8.8'	26°37.8	0.0'	55.3'
22 23	147°07.0 162°06.8	37.3 36.8	191°33.1 206°00.9	8.8' 8.9'	26°37.8 26°37.7	-0.1' -0.3'	55.2' 55.2'
	SD = 16.2'	d = -0.6'			0 = 15.2'		
	3D = 10.2'	u = -0.0		20	15.2		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°06.7	S19°36.2	220°28.8	8.9'	\$26°37.4	-0.4'	55.2'
1 2	192°06.5 207°06.3	35.6 35.0	234°56.7 249°24.6	8.9' 8.9'	26°37.0 26°36.4	-0.6' -0.7'	55.2' 55.2'
3	222°06.2	• • 34.4	263°52.5	9.0'	26°35.8	-0.7	55.2'
4	237°06.0	33.9	278°20.5	9.0'	$26^{\circ}34.9$	-1.0'	55.1'
5	252°05.8	33.3	292°48.5	9.0'	26°34.0	-1.1'	55.1'
6 7	267°05.7 282°05.5	\$19°32.7 32.1	307°16.5 321°44.6	9.1' 9.1'	\$26°32.9 26°31.6	-1.2' -1.4'	55.1' 55.1'
8	297°05.3	31.5	336°12.7	9.1	26°30.2	-1.5'	55.1'
9	312°05.2	• • 31.0	350°40.8	9.2'	$26^{\circ}28.7$	-1.6'	55.0'
10	327°05.0	30.4	5°09.0	9.2'	26°27.1	-1.8'	55.0'
11 12	342°04.8 357°04.7	29.8 \$19°29.2	19°37.1 34°05.4	9.2' 9.3'	26°25.3 S 26°23.4	-1.9' -2.1'	55.0' 55.0'
13	12°04.5	28.6	48°33.7	9.3'	26°21.3	-2.2'	55.0'
14	27°04.4	28.0	63°02.0	9.4'	$26^{\circ}19.1$	-2.3'	55.0'
15	42°04.2 57°04.0	• • 27.5	77°30.3 91°58.7	9.4'	26°16.8 26°14.4	-2.5' -2.6'	54.9' 54.9'
16 17	72°03.9	26.9 26.3	91 58.7 106°27.1	9.4' 9.5'	26 14.4 26°11.8	-2.0 -2.7'	54.9'
18	87°03.7	S19°25.7	120°55.6	9.5'	S26°09.1	-2.8'	54.9'
19	102°03.6	25.1	135°24.1	9.6'	26°06.2	-3.0'	54.9'
20	117°03.4 132°03.2	24.5	149°52.7 164°21.3	9.6' 9.7'	26°03.2 26°00.1	-3.1' -3.2'	54.9'
21 22	147°03.1	· · 23.9 23.3	104 21.3 178°50.0	9.7 9.7'	25°56.9	-3.2 -3.4'	54.8' 54.8'
23	162°02.9	22.7	193°18.7	9.8'	25°53.5	-3.5'	54.8'
	SD = 16.2'	d = -0.6'		SD	= 15.1'		
Mon	GHA	Dec	GHA	ν	Dec	d 2.6'	HP
0 1	177°02.8 192°02.6	\$19°22.1 21.6	207°47.5 222°16.3	9.8' 9.9'	\$25°50.0 25°46.4	-3.6' -3.8'	54.8' 54.8'
2	207°02.4	21.0	236°45.1	9.9'	25°42.6	-3.9	54.8'
3	222°02.3	• • 20.4	251°14.0	10.0'	25°38.8	-4.0'	54.7'
4 5	237°02.1 252°02.0	19.8 19.2	265°43.0 280°12.0	10.0' 10.1'	25°34.8 25°30.6	-4.1' -4.3'	54.7' 54.7'
6	267°01.8	519°18.6	280 12.0 294°41.1	10.1	\$25°26.4	-4.3 -4.4'	54.7'
7	282°01.7	18.0	$309^{\circ}10.2$	10.2'	$25^{\circ}22.0$	-4.5'	54.7'
8	297°01.5	17.4	323°39.4	10.2'	25°17.5	-4.6'	54.7'
9 10	312°01.3 327°01.2	· · 16.8 16.2	338°08.7 352°38.0	10.3' 10.4'	25°12.9 25°08.1	-4.7' -4.9'	54.7' 54.6'
11	342°01.0	15.6	7°07.3	10.4	25°03.3	-4.9 -5.0'	54.6'
12	357°00.9	S 19°15.0	21°36.7	10.5'	S24°58.3	-5.1'	54.6'
13	12°00.7	14.4	36°06.2	10.5'	24°53.2	-5.2'	54.6'
14 15	27°00.6 42°00.4	13.8 •• 13.2	50°35.8 65°05.4	10.6' 10.7'	24°48.0 24°42.6	-5.3' -5.5'	54.6' 54.6'
16	57°00.3	12.6	79°35.0	10.7'	24°37.2	-5.6'	54.6'
17	72°00.1	12.0	94°04.7	10.8'	24°31.6	-5.7'	54.5'
18	87°00.0 101°59.8	\$19°11.4	108°34.5 123°04.4	10.9'	\$24°25.9 24°20.1	-5.8'	54.5'
19 20	101°59.8 116°59.7	10.8 10.2	123°04.4 137°34.3	10.9' 11.0'	24°20.1 24°14.2	-5.9' -6.0'	54.5' 54.5'
21	131°59.5	09.6	152°04.3	11.0'	24°08.2	-6.1'	54.5'
22	146°59.4	09.0	166°34.3	11.1'	24°02.0	-6.2'	54.5'
23	161°59.2	08.4	181°04.4	11.2'	23°55.8	-6.4'	54.5'
	SD = 16.2'	d = -0.6'		SD	= 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
N 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
N 58°	06:47	07:36	08:22	16:02	16:48	17:38
56°	06:42	07:28	08:11	16:13	16:56	17:42
54°	06:38	07:21	08:02	16:22	17:03	17:46
52°	06:34	07:15	07:53	16:31	17:09	17:50
50°	06:30	07:10	07:46	16:38	17:14	17:54
45°	06:21	06:57	07:29	16:54	17:27	18:02
N 40°	06:14	06:47	07:16	17:08	17:37	18:10
35°	06:07	06:38	07:05	17:19	17:46	18:17
30°	06:00	06:29	06:55	17:29	17:54	18:23
20°	05:47	06:14	06:38	17:46	18:09	18:36
N 10°	05:34	06:00	06:22	18:01	18:23	18:49
0°	05:21	05:46	06:08	18:15	18:37	19:03
S 10°	05:05	05:31	05:54	18:30	18:52	19:18
20°	04:46	05:14	05:38	18:45	19:09	19:37
30°	04:22	04:54	05:20	19:03	19:29	20:01
35°	04:07	04:41	05:10	19:13	19:42	20:16
40°	03:48	04:26	04:57	19:25	19:56	20:34
45°	03:24	04:08	04:43	19:40	20:14	20:58
S 50°	02:51	03:45	04:25	19:57	20:37	21:30
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
S 60°	////	02:24	03:30	20:51	21:57	////
Lat.		Moonris			Moonset	
NI 70°	Sat	Sun	Mon	Sat	Sun	Mon
N 72°		_				
N 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
N 58°			07:43			13:24
N 56°	06:11 05:49	07:07 06:45	07:43 07:24	11:17 11:39	12:13 12:34	13:24
54°	05:49	06:27	07:24	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
N 40°	04:14	05:09	05:56	13:15	14:10	15:09
35°	03:56	05:09	05:30	13:15	14:10	15:09
30°	03:41	04:36	05:39	13:49	14:43	15:39
JU	03:41	04:09	05:24	14:15	15:08	16:03
20°		01.03		!		
20° N 10°		03:47	04:38	14:37	15:31	In:24
N 10°	02:53	03:47 03:26	04:38 04:18	14:37 14:58	15:31 15:51	16:24 16:43
N 10° 0°	02:53 02:32	03:26	04:18	14:58	15:51	16:43
N 10° 0° S 10°	02:53 02:32 02:12	03:26 03:05	04:18 03:58	14:58 15:19	15:51 16:12	16:43 17:02
N 10° 0°	02:53 02:32	03:26	04:18	14:58	15:51	

30	l	00.00	01.10	10.11	19.04	19.50
58°	23:46		00:49	18:38	19:24	19:53
S 60°	23:17		00:24	19:07	19:50	20:14
		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Age	
,	00 ^h	12 ^h	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	

02:57

02:40

02:19

01:53

01:41

01:26

01:10

16:23

16:41

17:03

17:30

17:43

17:59

18:17

17:15

17:32

17:53

18:19

18:32

18:47

19:04

02:01

01:43

01:21

00:54

00:41

00:26

80:00

35°

40°

45°

52°

54°

56°

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

01:09

00:52

00:31

00:05

.. ..

17:59

18:15

18:34

18:57

19:09

19:21

19:36

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

17 19 32.5 32.5 1.7 06.59.7 59.23.5 40.2 201.32.3 22.0 388 18.1 18.2 18 34°34.9 47°57.4 506°58.5 74°24.0 516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°55.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 11 13°55.8 506°50.9 164°27.0 516°36.0 306°50.2 N02°22.4 103°34.4 N06°18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 · 47.1 209°28.5 · 34.1 351°57.9 · 22.6 148°41.4 · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 228°50.8 19.1 82.2 23°55.7 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 506°35.7 344°33.0 516°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 56°28.0 142°23.5 23.1 299°04.7 19.5	Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	SHA 357° 32.3 353° 04.9 349° 28.3 348° 44.9 335° 18.5 327° 48.3 312° 32.3 315° 09.8 314° 03.4 290° 36.5 281° 01.2 280° 17.8 278° 19.9 277° 58.4 275° 34.9 270° 49.1 263° 50.8 258° 23.7 255° 03.5 244° 47.9 243° 13.0 222° 44.0 221° 36.7 217° 45.0 207° 31.5 182° 22.2 175° 40.8 171° 48.5 166° 10.6 158° 19.6 152° 50.0	Dec 29°14.9 -42°09.4 56°41.8 -17°50.0 -57°05.9 23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
0 123°50.6 138°02.3 507°21.2 164°15.0 516°60.5 305°48.8 N02°21.1 102°38.4 N06°17.2 1 138°53.0 153°02.0 19.9 179°15.5 49.9 320°51.4 21.2 117°40.7 17.2 1 138°53.0 153°02.0 19.9 179°15.5 49.9 320°51.4 21.2 117°40.7 17.2 1 136°35.5 168°01.7 18.6 194′16.0 49.3 335′53.9 21.2 132°43.1 17.3 1 168°550.0 183°01.5 ··· 17.4 209°16.5 ··· 48.7 350′55.5 ··· 21.3 147°45.4 ··· 17.3 1 168°550.0 183°01.5 ··· 17.4 209°16.5 ··· 48.7 350′55.5 ··· 21.3 147°45.4 ··· 17.3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Ankaa Schedar Diphda Achernar Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	357° 32.3 353° 04.9 349° 28.3 348° 44.9 335° 18.5 327° 48.3 312° 32.3 315° 09.8 314° 03.4 290° 36.5 281° 01.2 280° 17.8 278° 19.9 277° 58.4 275° 34.9 276° 49.1 263° 50.8 258° 23.7 255° 03.5 244° 47.9 243° 13.9 234° 13.0 222° 44.0 221° 36.7 217° 45.0 207° 31.5 193° 37.5 182° 22.2 175° 40.8 175° 40.8 175° 40.8 175° 40.8 175° 40.8 175° 40.8 175° 40.6 158° 19.6	29°14.9 -42°09.4 -56°41.8 -17°50.0 -57°05.9 23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
1 138"53.0 153"02.0 19.9 179"155 49.9 320"51.4 21.2 117"40.7 17.2 153"55.5 168"01.7 18.6 194"16.0 49.3 335"53.9 21.2 132"431 17.3 3 168"58.0 183"01.5 \cdot 17.4 \cdot 209"16.5 \cdot 48.7 3350"56.5 \cdot 21.3 147"45.4 \cdot 17.3 14 184"00.4 198"01.2 16.1 224"17.0 48.1 5"59.1 21.3 162"47.8 17.4 159"02.9 213"00.9 14.9 239"17.5 47.5 21"01.6 21.4 177"50.1 17.5 6 214"05.4 228"00.6 507"13.6 254"18.0 516"46.9 36"04.2 \cdot 202"21.5 192"52.4 \cdot N06"17.5 6 214"05.4 228"00.6 507"13.6 254"18.0 516"46.9 36"04.2 \cdot 202"21.5 192"52.4 \cdot N06"17.5 6 244"30.0 4 12.3 269"18.5 46.3 51"06.7 21.5 192"52.4 \cdot N06"17.5 17.6 17.5 17.6 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5	Ankaa Schedar Diphda Achernar Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	353°04.9 349°28.3 348°44.9 335°18.5 327°48.3 312°32.3 315°09.8 314°03.4 280°17.8 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 172°56.8 172°56.8	-42°09.4 56°41.8 -17°50.0 -57°05.9 23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
2 153°55.5 168°01.7 18.6 194°16.0 49.3 335°53.9 21.2 132°43.1 17.3 168°58.0 183°01.5 · 17.4 209°16.5 · 48.7 350°56.5 · 21.3 147°45.4 · 17.3 4 184°00.4 198°01.2 16.1 224°17.0 48.1 5°59.1 21.3 162°47.8 17.4 5 199°02.9 213°00.9 14.9 239°17.5 47.5 21°01.6 21.4 177°50.1 17.5 17.5 199°02.9 213°00.9 14.9 239°17.5 47.5 21°01.6 21.4 177°50.1 17.5 17.5 17.5 17.5 17.5 17.5 21°01.6 21.4 177°50.1 17.5 17.5 17.5 17.5 17.5 17.5 21°01.6 21.4 177°50.1 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17	Schedar Diphda Achernar Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	349° 28.3 348° 44.9 335° 18.5 327° 48.3 315° 09.8 314° 03.4 290° 36.5 281° 01.2 280° 17.8 270° 49.1 263° 50.8 258° 23.7 243° 13.0 222° 44.0 221° 36.7 217° 45.0 207° 31.5 193° 37.5 182° 22.2 175° 40.8 172° 56.8 172° 56.8	56° 41.8 -17° 50.0 -57° 05.9 23° 35.8 89° 23.2 -40° 11.7 4° 12.0 49° 57.8 16° 33.9 -8° 10.3 46° 01.6 6° 22.4 28° 37.8 -1° 11.2 7° 24.6 -52° 42.8 -16° 45.5 -29° 00.8 5° 09.0 27° 57.3 -59° 36.1 -43° 32.8 -69° 50.0 -8° 47.0 11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
3 168°58.0 183°01.5 · · · 17.4 · 209°16.5 · · · 48.7 · 350°66.5 · · · 21.3 · 147°45.4 · · · 17.3 · 4 184°00.4 · 198°01.2 · 16.1 · 224°17.0 · 48.1 · 5°59.1 · 21.3 · 162°47.8 · 17.4 · 17.5 · 199°02.9 · 213°00.9 · 14.9 · 239°17.5 · 47.5 · 21°01.6 · 21.4 · 177°50.1 · 17.5 · 17.	Diphda Achernar Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	348° 44.9 335° 18.5 327° 48.3 312° 32.3 315° 09.8 314° 03.4 290° 36.5 281° 01.2 280° 17.8 278° 19.9 277° 58.4 275° 34.9 236° 50.8 258° 23.7 255° 03.5 244° 47.9 243° 13.9 234° 13.0 222° 44.0 221° 36.7 217° 45.0 207° 31.5 193° 37.5 182° 22.2 175° 40.8 172° 58.8 172° 58.8 172° 58.8 172° 58.8 172° 45.0 207° 31.5 182° 22.2 175° 40.8 172° 56.8 171° 48.5 166° 10.6 158° 19.6	-17°50.0 -57°05.9 23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
4 184°00.4 198°01.2 16.1 224°17.0 48.1 5°59.1 21.3 162°47.8 17.4 5 199°02.9 213°00.9 14.9 239°17.5 47.5 21°01.6 21.4 177°50.1 17.5 6 214°05.4 228°00.6 \$07°13.6 254°18.0 \$16°46.9 36°04.2 \$N02°21.5 192°52.4 \$N06°17.5 7 229°07.8 243°00.4 12.3 269°18.5 46.3 51°06.7 21.5 207°54.8 17.6 8 244°10.3 258°00.1 11.1 284°19.0 45.7 66°09.3 21.6 222°57.1 17.7 9 259°12.8 272°59.8 · 09.8 299°19.5 · 45.1 81°11.8 · 21.6 237°59.4 · 17.7 10 274°15.2 287°59.5 08.6 314°20.0 44.5 96°14.4 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 268°04.1 17.9 12 304°20.2 317°59.0 \$07°06.0 344°21.0 \$16°43.3 126°19.5 \$N02°21.8 283°06.4 \$N06°17.9 13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 21.8 288°08.8 18.0 14 334°25.1 347°85.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · 02.3 29°22.5 · 41.5 171°27.2 · 21.9 328°13.4 · 18.1 16.4 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 343°15.8 18.2 18.3 434.9 47°57.4 \$06°58.5 74°424.0 \$16°39.6 216°34.8 \$N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 \$56°2.8 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 22.0 40.1 139°52.2 152°55.5 49.6 179°27.5 35.4 26°40.1 m.2.2 21.2 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21.7 9742.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22.9 49°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 21.5 44°49.7 137°55.8 \$06°50.9 164°27.0 \$16°36.0 30°50.2 \$N02°22.4 118°36.8 18.7 22.1 139°52.5 35°5.3 49.6 179°27.5 35.4 321°52.7 N02°22.4 118°36.8 18.7 22.1 139°50.4 N06°18.7 18.6 22.1 139°50.4 N06°18.7 18.6 22.1 139°50.4 N06°19.1 18.6 246°57.1 22.3 37°29.8 18.6 18.6 18.7 18.9 18.6 18.9 18.6 18.7 18.9 18.6 18.9 18.6 18.7 18.9 18.6 18.9 18.0 18.8 18.9 18.9 18.6 18.9 18.0 18.9 18.0 18.0 18.0 18.0 18.0 18.0 18.0 18.0	Achernar Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	335° 18.5 327° 48.3 312° 32.3 315° 09.8 314° 03.4 290° 36.5 281° 01.2 280° 17.8 278° 19.9 270° 49.1 263° 50.8 258° 23.7 255° 03.5 244° 47.9 243° 13.9 234° 13.0 221° 36.7 217° 45.0 207° 31.5 193° 37.5 182° 22.2 175° 40.8 172° 56.8 172° 56.8 171° 48.5 166° 10.6 158° 19.6	-57°05.9 23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
5 199°02.9 213°00.9 14.9 239°17.5 47.5 21°01.6 21.4 177°50.1 17.5	Hamal Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	327° 48.3 312° 32.3 315° 09.8 314° 03.4 308° 24.4 290° 36.5 281° 01.2 280° 17.8 278° 19.9 277° 58.4 275° 34.9 270° 49.1 263° 50.8 258° 23.7 255° 03.5 244° 47.9 243° 13.9 234° 13.0 222° 44.0 207° 31.5 193° 37.5 182° 22.2 175° 40.8 172° 56.8 171° 48.5 166° 10.6 158° 19.6	23°35.8 89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
6 214°05.4 228°00.6 507°13.6 254°18.0 516°46.9 36°04.2 N02°21.5 102°52.4 N06°17.5 7 229°07.8 243°00.4 12.3 269°18.5 46.3 51°06.7 21.5 207°54.8 17.6 8 244°10.3 258°00.1 11.1 284°19.0 45.7 66°09.3 21.6 222°57.1 17.7 9 259°12.8 272°59.8 · 09.8 299°19.5 · · 45.1 81°11.8 · 21.6 237°59.4 · · 17.7 10 274°15.2 287°59.5 08.6 314°20.0 44.5 96°14.4 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 268°04.1 17.9 12 304°20.2 317°59.0 507°06.0 344°21.0 516°43.3 126°19.5 N02°21.8 283°06.4 N06°17.9 12 304°20.2 317°59.0 507°06.0 344°21.0 516°43.3 126°19.5 N02°21.8 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · · 02.3 29°22.5 · · 41.5 171°27.2 · · 21.9 328°13.4 · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 338°18.1 18.2 18 34°34.9 47°57.4 506°58.5 74°24.0 516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 559.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 19°42.3 29°56.6 54.7 119°25.5 37.8 261°42.5 · 22.2 58°7.4 · · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 88°32.1 18.6 18.5 21 149°25.2 53.6 40.2 201°47.6 22.3 88°32.1 18.6 18.7 11.9 52.5 55.5 49.6 179°27.5 35.4 31°52.7 22.4 118°36.8 18.7 11.9 52.5 55.5 49.6 179°27.5 35.4 31°52.7 22.4 118°36.8 18.7 11.8 18.9 11.8 11.8 11.8 11.8 11.8 11.8	Polaris Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	312°32.3 315°09.8 314°03.4 290°36.5 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 270°49.1 263°50.8 263°50.8 244°47.9 243°13.9 224°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 172°56.8 172°56.8	89°23.2 -40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
7 229°07.8 243°00.4 12.3 269°18.5 46.3 51°06.7 21.5 207°54.8 17.6 8 244°10.3 258°00.1 11.1 284°19.0 45.7 66°09.3 21.6 222°57.1 17.7 9 259°12.8 272°59.8 · 0.9.8 299°19.5 · 45.1 81°11.8 · 21.6 237°59.4 · 17.7 10 274°15.2 287°59.5 08.6 314°20.0 44.5 96°14.4 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 268°04.1 17.9 12 304°20.2 317°59.0 \$07°06.0 344°21.0 \$16°43.3 126°19.5 \$N02°21.8 283°06.4 \$N06°17.9 12 304°20.2 317°59.0 \$07°06.0 344°21.0 \$16°43.3 126°19.5 \$N02°21.8 283°06.4 \$N06°17.9 13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 21.8 298°08.8 18.0 14 334°251.5 2°58.2 · 0.2.3 29°22.5 · 41.5 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · 0.2.3 29°22.5 · 41.5 171°27.2 · 21.9 328°13.4 · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 \$59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 \$506°88.5 74°24.0 \$516°39.6 210°33.3 22.0 358°18.1 18.2 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 49°44.8 107°56.3 53.4 114°26.5 36.6 291°47.6 22.3 88°32.1 18.6 18.7 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 148°45.6 167°55.3 48.3 194°28.0 34.7 336°55.2 \$N02°22.4 103°34.4 \$N06°18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 170°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.5 14.4 230°2.5 14.4	Acamar Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	315°09.8 314°03.4 308°24.4 290°36.5 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 263°50.8 258°23.7 255°03.5 244°47.9 243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 171°48.5 166°10.6 158°19.6	-40°11.7 4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
8 244°10.3 258°00.1 11.1 284°19.0 45.7 66°09.3 21.6 222°57.1 17.7 9 259°12.8 272°59.8 · 0.9.8 299°19.5 · 45.1 81°11.8 · 21.6 237°59.4 · · 17.7 10 274°15.2 287°59.5 · 08.6 314°20.0 44.5 96°14.4 · 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 268°04.1 17.9 12 304°20.2 317°59.0 S07°06.0 344°21.0 S16°43.3 126°19.5 N02°21.8 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · 02.3 2°22.5 · 41.5 171°27.2 · 21.9 328°13.4 · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 338°13.4 · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 358°18.1 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 S06°58.5 74°24.0 516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°55.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 20 64°39.9 77°55.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 19°42.3 92°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 21 19°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.0 306°50.2 N02°22.4 118°36.8 18.7 18.9 49.8 18.9 18.9 18.9 18.9 18.9 18.9 18.9 1	Menkar Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	314°03.4 308°24.4 290°36.5 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 171°48.5 166°10.6 158°19.6	4°12.0 49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
9 259°12.8 272°59.8 · · · · 09.8 299°19.5 · · · 45.1 81°11.8 · · · 21.6 237°59.4 · · · 17.7 10 274°15.2 287°59.5 08.6 314°20.0 44.5 96°14.4 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 253°01.8 17.9 12 304°20.2 317°59.0 507°06.0 344°21.0 \$16°43.3 126°19.5 N02°21.8 283°06.4 N06°17.9 13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 21.8 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · · 02.3 29°22.5 · · 41.5 171°27.2 · · · 21.9 328°13.4 · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 348°15.8 18.2 18 34°34.9 47°57.4 \$06°58.5 74°24.0 \$16°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · · 37.8 261°42.5 · · · 22.2 58°27.4 · · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°55.0 · · 47.1 209°28.5 · · · 34.1 321°57.7 22.4 118°36.8 18.7 22.5 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 · · · 47.1 209°28.5 · · · · · · · · · · · · · · · · · · ·	Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	308°24.4 290°36.5 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	49°57.8 16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
10 274°15.2 287°59.5 08.6 314°20.0 44.5 96°14.4 21.7 253°01.8 17.8 11 289°17.7 302°59.3 07.3 329°20.5 43.9 111°16.9 21.7 268°04.1 17.9 12 304°20.2 317°59.0 507°06.0 344°21.0 516°34.3 126°19.5 N02°21.8 283°06.4 N06°17.9 13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 21.8 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · 02.3 29°22.5 · 41.5 171°27.2 · 21.9 332°13.4 · 18.1 16. 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 388°18.1 18.2 18 34°34.9 47°57.4 506°58.5 74°24.0 516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 29°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 18.7 22.1 18°55.8 506°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.7 22.1 54°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.7 21.5 46°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.7 21.5 46°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.7 21.5 46°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.7 21.5 46°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 18.9 18.9 25.0 20°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 22.7 188°46.1 19.0 236°50.1 182°50.5 192°21.5 506°33.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 22.7 236°4.1 4.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 23°51.4 19.0 24°51.4 19.0 24°51.5 10.2 24°53.9 42.0 269°30.5 31.7 52°08.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.8 28°50.8 19.1 22.9 226°51.4 226°53.7 22.9 226°51.9 227°54.4 28°53.2 38.2 314°32.0 29.8 97°15.8 22.9 238°55.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23	Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	290°36.5 281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 234°13.9 234°13.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 171°45.0 172°45.0 173°40	16°33.9 -8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
11	Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	281°01.2 280°17.8 278°19.9 277°58.4 275°34.9 263°50.8 258°23.7 255°03.5 244°47.9 234°13.9 234°13.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-8°10.3 46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
12 304°9.0.2 317°59.0 \$07°06.0 344°21.0 \$16°43.3 126°19.5 \$N02°21.8 283°06.4 \$N06°17.9 13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 2.18 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 ···02.3 29°22.5 ···41.5 171°27.2 ···21.9 328°13.4 ···18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 338°13.4 ···18.1 18.2 18 34°34.9 47°57.4 \$506°58.5 74°24.0 \$516°39.6 216°34.8 \$N02°22.1 13°20.4 \$N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 ··· 54.7 119°25.5 ··· 37.8 261°42.5 ··· 22.2 58°27.4 ··· 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 36°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 ··· 47.1 209°28.5 ·· 34.1 351°57.9 ·· 22.6 148°41.4 ·· 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 220°00.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 212°04.5 527°54.2 \$506°34.3 325°5.3 32.5 133°39.1 18.8 18.9 1484°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 18.9 189°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 18.9 18.9 18.9 18.9 18.9 18.9 18	Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	280°17.8 278°19.9 277°58.4 275°34.9 263°50.8 258°23.7 255°03.5 244°47.9 243°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 172°56.8 171°48.5 166°10.6 158°19.6	46°01.6 6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
13 319°22.6 332°58.7 04.8 359°21.5 42.7 141°22.0 21.8 298°08.8 18.0 14 334°25.1 347°58.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 · · · 02.3 29°22.5 · · · 41.5 171°27.2 · · · 21.9 328°13.4 · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 506°58.5 74°24.0 516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · · 37.8 261°42.5 · · · 22.2 58°27.4 · · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 Mer.pass. 15:42 ν-0.3′ d-1.3′ m-4.08 ν0.5′ d-0.6′ m1.13 ν2.6′ d0.1′ m-2.29 ν2.3′ d0.1′ m0.54 No.6°18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.2 N02°22.4 103°34.4 N06°18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.2 2.5 133°39.1 18.8 3 169°57.1 182°55.0 · · · 47.1 209°28.5 · · · · · · · · · · · · · · · · · · ·	Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	278°19.9 277°58.4 275°34.9 270°49.1 263°503.5 255°03.5 244°47.9 243°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	6°22.4 28°37.8 -1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
14 334°25.1 347°88.5 03.5 14°22.0 42.1 156°24.6 21.9 313°11.1 18.0 15 349°27.5 2°58.2 ··· 02.3 29°22.5 ··· 41.5 171°27.2 ··· 21.9 328°13.4 ··· 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 506°58.5 74°24.0 \$516°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 ·· 54.7 119°25.5 ·· 37.8 261°42.5 ·· 22.2 58°27.4 ·· 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°55.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 137°55.8 506°50.9 164°27.0 \$16°36.0 306°50.2 N02°22.4 103°34.4 N06°18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 1 189°55.0 ·· 47.1 209°28.5 ·· 34.1 351°57.9 ·· 22.6 148°41.4 ·· 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 178°46.1 19.0 19.0 19.4 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0	Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	277°58.4 275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	28° 37.8 -1° 11.2 7° 24.6 -52° 42.8 -16° 45.5 -29° 00.8 5° 09.0 27° 57.3 -59° 36.1 -43° 32.8 -69° 50.0 -8° 47.0 11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
15 349°27.5 2°58.2 · · · 02.3 29°22.5 · · · 41.5 171°27.2 · · 21.9 328°13.4 · · · 18.1 16 4°30.0 17°57.9 07°01.0 44°23.0 40.8 186°29.7 22.0 343°15.8 18.2 17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 \$06°58.5 74°24.0 \$16°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · · 54.7 119°25.5 · · · 37.8 261°42.5 · · · 22.2 58°27.4 · · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°55.5 40.6 169°27.0 \$164°27.0 \$16°36.0 306°50.2 N02°22.4 103°34.4 N06°18.7 11 39°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 · · 47.1 209°28.5 · · 34.1 351°57.9 · · · 22.6 148°41.4 · · · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 \$06°43.3 254°30.0 \$16°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · · · 39.5 299°31.5 · · · · 30.5 82°13.2 · · · · · · · · · · · · · · · · · · ·	Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	275°34.9 270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 243°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 171°48.5 166°10.6 158°19.6	-1°11.2 7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
16	Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	270°49.1 263°50.8 258°23.7 255°03.5 244°47.9 243°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	7°24.6 -52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
17 19°32.5 32°57.7 06°59.7 59°23.5 40.2 201°32.3 22.0 358°18.1 18.2 18 34°34.9 47°57.4 S06°58.5 74°24.0 S16°39.6 216°34.8 N02°22.1 13°20.4 N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 Mer.pass. 15:42 ν-0.3′ d-1.3′ m-4.08 ν0.5′ d-0.6′ m1.13 ν2.6′ d0.1′ m-2.29 ν2.3′ d0.1′ m0.54 Wed GHA GHA Dec GHA Dec GHA Dec GHA Dec 133°65.3 43.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 · 47.1 209°28.5 · 34.1 351°57.9 · 22.6 148°41.4 · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 148°41.4 · 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 S06°43.3 254°30.0 S16°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°55.4 · 19.3 10 275°14.4 287°53.2 38.2 31.1 299°04.7 19.5 10 275°14.4 287°53.2 38.2 31.4°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.8 332°52.4 34.4 359°33.5 S16°28.6 127°20.9 N02°23.0 224°0.7 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5	Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	263°50.8 258°23.7 255°03.5 244°47.9 234°13.9 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 171°48.5 166°10.6 158°19.6	-52°42.8 -16°45.5 -29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
18 34°34.9 47°57.4 506°58.5 74°24.0 \$16°39.6 216°34.8 \$N02°22.1 13°20.4 \$N06°18.3 19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · · · · · · · · · · · · · · · · · · ·	Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	258°23.7 255°03.5 244°47.9 234°13.9 234°13.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 171°48.5 166°10.6 158°19.6	-16° 45.5 -29° 00.8 5° 09.0 27° 57.3 -59° 36.1 -43° 32.8 -69° 50.0 -8° 47.0 11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
19 49°37.4 62°57.1 57.2 89°24.5 39.0 231°37.4 22.1 28°22.8 18.4 20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · 54.7 119°25.5 · 37.8 261°42.5 · 22.2 58°27.4 · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 137°55.8 \$06°50.9 164°27.0 \$16°36.0 306°50.2 \$N02°22.4 \$103°34.4 \$N06°18.7 1 139°52.2 152°55.5 49.6 179°27.5 35.4 321°52.7 22.4 118°36.8 18.7 2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 3 169°57.1 182°55.0 · 47.1 209°28.5 · 34.1 351°57.9 · 22.6 148°41.4 · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 \$06°43.3 254°30.0 \$16°32.3 37°05.5 \$N02°22.7 193°48.4 \$N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · 39.5 299°31.5 · 30.5 82°13.2 · 22.9 238°55.4 · 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 238°55.4 · 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 1200°18.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	255°03.5 244°47.9 243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-29°00.8 5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
20 64°39.9 77°56.9 55.9 104°25.0 38.4 246°39.9 22.2 43°25.1 18.4 21 79°42.3 92°56.6 · · 54.7 119°25.5 · · 37.8 261°42.5 · · · 22.2 58°27.4 · · · 18.5 22 94°44.8 107°56.3 53.4 134°26.0 37.2 276°45.1 22.3 73°29.8 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 23 109°47.3 122°56.1 52.1 149°26.5 36.6 291°47.6 22.3 88°32.1 18.6 24.6 24.9 24.1 22°56.1 52.1 149°26.5 36.6 291°47.6 22.3 22.3 24.1 22°57.1 22	Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	244°47.9 243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	5°09.0 27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
21 79° 42.3 92° 56.6 · · 54.7 119° 25.5 · · 37.8 261° 42.5 · · · 22.2 58° 27.4 · · 18.5 22 94° 44.8 107° 56.3 53.4 134° 26.0 37.2 276° 45.1 22.3 73° 29.8 18.6 23 109° 47.3 122° 56.1 52.1 149° 26.5 36.6 291° 47.6 22.3 88° 32.1 18.6 Mer.pass. 15:42 ν-0.3′ d-1.3′ m-4.08 ν0.5′ d-0.6′ m1.13 ν2.6′ d0.1′ m-2.29 ν2.3′ d0.1′ m0.54 No.5′ Wed GHA GHA Dec GHA	Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	243°13.9 234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	27°57.3 -59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	234°13.0 222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-59°36.1 -43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	222°44.0 221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-43°32.8 -69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
Wed GHA Dec GHA Dec <td>Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent</td> <td>221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6</td> <td>-69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6</td>	Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	221°36.7 217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-69°50.0 -8°47.0 11°49.6 61°35.6 14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
Wed GHA GHA Dec GHA <td>Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent</td> <td>217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6</td> <td>-8° 47.0 11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6</td>	Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	217°45.0 207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-8° 47.0 11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	207°31.5 193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	11° 49.6 61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	193°37.5 182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	61° 35.6 14° 24.7 -17° 42.0 -63° 15.1 -57° 16.1 55° 48.0 -11° 18.6
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	182°22.2 175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	14°24.7 -17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	175°40.8 172°56.8 171°48.5 166°10.6 158°19.6	-17°42.0 -63°15.1 -57°16.1 55°48.0 -11°18.6
2 154°54.6 167°55.3 48.3 194°28.0 34.7 336°55.3 22.5 133°39.1 18.8 169°57.1 182°55.0 · 47.1 209°28.5 · · 34.1 351°57.9 · · · 22.6 148°41.4 · · · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 S06°43.3 254°30.0 S16°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · · · 39.5 299°31.5 · · · 30.5 82°13.2 · · · 22.9 238°55.4 · · 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Acrux Gacrux Alioth Spica Alkaid Hadar Menkent	172°56.8 171°48.5 166°10.6 158°19.6	-63°15.1 -57°16.1 55°48.0 -11°18.6
3 169°57.1 182°55.0 · · · 47.1 209°28.5 · · · 34.1 351°57.9 · · · 22.6 148°41.4 · · · 18.9 4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 S06°43.3 254°30.0 S16°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · · · 39.5 299°31.5 · · · 30.5 82°13.2 · · · 22.9 238°55.4 · · 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 238°55.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Gacrux Alioth Spica Alkaid Hadar Menkent	171°48.5 166°10.6 158°19.6	-57°16.1 55°48.0 -11°18.6
4 184°59.6 197°54.7 45.8 224°29.0 33.5 7°00.4 22.6 163°43.8 18.9 5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 506°43.3 254°30.0 516°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 39.5 299°31.5 30.5 82°13.2 22.9 238°55.4 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 506°35.7 344°33.0 516	Alioth Spica Alkaid Hadar Menkent	166°10.6 158°19.6	55°48.0 -11°18.6
5 200°02.0 212°54.5 44.5 239°29.5 32.9 22°03.0 22.7 178°46.1 19.0 6 215°04.5 227°54.2 S06°43.3 254°30.0 S16°32.3 37°05.5 N02°22.7 193°48.4 N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · 39.5 299°31.5 · 30.5 82°13.2 · 22.9 238°55.4 · 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°	Spica Alkaid Hadar Menkent	$158^{\circ}19.6$	-11°18.6
6 215°04.5 227°54.2 \$06°43.3 254°30.0 \$16°32.3 37°05.5 \$N02°22.7 193°48.4 \$N06°19.1 7 230°07.0 242°53.9 42.0 269°30.5 31.7 52°08.1 22.8 208°50.8 19.1 8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 ··· 39.5 299°31.5 ··· 30.5 82°13.2 ··· 22.9 238°55.4 ··· 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 12 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 \$06°35.7 344°33.0 \$16°28.6 127°20.9 \$N02°23.0 284°02.4 \$N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Alkaid Hadar Menkent		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Hadar Menkent	152°50.0	
8 245°09.4 257°53.7 40.7 284°31.0 31.1 67°10.7 22.8 223°53.1 19.2 9 260°11.9 272°53.4 · · 39.5 299°31.5 · · 30.5 82°13.2 · · 22.9 238°55.4 · · 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Menkent	440000	49°10.0
9 260°11.9 272°53.4 ··· 39.5 299°31.5 ··· 30.5 82°13.2 ··· 22.9 238°55.4 ··· 19.3 10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 506°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5		148°32.3	-60°30.3
10 275°14.4 287°53.2 38.2 314°32.0 29.8 97°15.8 22.9 253°57.7 19.3 11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 506°35.7 344°33.0 516°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Arcturus		-36°30.4
11 290°16.8 302°52.9 36.9 329°32.5 29.2 112°18.4 23.0 269°00.1 19.4 12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	D: 11 1/2 .	145°45.6	19°01.9
12 305°19.3 317°52.6 S06°35.7 344°33.0 S16°28.6 127°20.9 N02°23.0 284°02.4 N06°19.5 13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5	Rigil Kent.		-60°56.9
13 320°21.8 332°52.4 34.4 359°33.5 28.0 142°23.5 23.1 299°04.7 19.5		137°20.2	74°02.0
	Zuben'ubi		-16°09.5
14 335°24.2 347°52.1 33.1 14°34.0 27.4 157°26.0 23.2 314°07.1 19.6		126°01.8	26°37.0
15 350°26.7 2°51.9 ··· 31.9 29°34.6 ··· 26.8 172°28.6 ··· 23.2 329°09.4 ··· 19.6		112°12.9	-26°29.6
16 5°29.1 17°51.6 30.6 44°35.1 26.2 187°31.2 23.3 344°11.7 19.7	Atria	107°05.2 102°00.1	-69°04.4 -15°45.5
17 20°31.6 32°51.3 29.3 59°35.6 25.5 202°33.7 23.3 359°14.1 19.8	Sabik Shaula	96°07.3	-15 45.5 -37°07.3
18 35°34.1 47°51.1 S06°28.1 74°36.1 S16°24.9 217°36.3 N02°23.4 14°16.4 N06°19.8	Rasalhague	95°56.5	12°32.3
19 50°36.5 62°50.8 26.8 89°36.6 24.3 232°38.9 23.4 29°18.7 19.9	_	90°41.5	51°28.9
20 65°39.0 77°50.6 25.5 104°37.1 23.7 247°41.4 23.5 44°21.0 20.0	Eltanin Kaus Aust.	83°29.5	-34°22.2
21 80°41.5 92°50.3 · · 24.2 119°37.6 · · · 23.1 262°44.0 · · · 23.5 59°23.4 · · · 20.0	Vega	80°31.9	38°48.5
22 95°43.9 107°50.0 23.0 134°38.1 22.5 277°46.6 23.6 74°25.7 20.1	Nunki	75°45.0	-26°15.6
23 110°46.4 122°49.8 21.7 149°38.6 21.8 292°49.1 23.7 89°28.0 20.2	Altair	61°57.8	8°56.6
Mer.pass. 15:38 ν -0.3' d-1.3' m-4.08 ν 0.5' d-0.6' m1.13 ν 2.6' d0.1' m-2.30 ν 2.3' d0.1' m0.54	Peacock	53°02.4	-56°38.6
Mer.pass. 15:50	Deneb	49°24.5	45°22.9
	Enif	33°36.6	10°00.3
Thu GHA GHA Dec GHA Dec GHA Dec	Al Na'ir	27°30.2	-46°49.5
0 125°48.9 137°49.5 S06°20.4 164°39.1 S16°21.2 307°51.7 N02°23.7 104°30.4 N06°20.2	Fomalhaut	15°12.1	-40° 43.5
1 140°51.3 152°49.3 19.2 179°39.6 20.6 322°54.3 23.8 119°32.7 20.3	Scheat	13°43.0	28°14.3
2 155°53.8 167°49.0 17.9 194°40.1 20.0 337°56.8 23.8 134°35.0 20.4	Markab	13°27.6	15°21.5
3 170°56.3 182°48.8 ·· 16.6 209°40.6 ·· 19.4 352°59.4 ·· 23.9 149°37.3 ·· 20.4			
	Jan 25 Tue	SHA	Mer.pass
5 201°01.2 212°48.3 14.1 239°41.7 18.1 23°04.5 24.0 179°42.0 20.6	Venus	14°11.7	14:48
6 216°03.6 227°48.0 S06°12.8 254°42.2 S16°17.5 38°07.1 N02°24.1 194°44.3 N06°20.6	Mars	40°24.4	13:03
7 231°06.1 242°47.8 11.5 269°42.7 16.9 53°09.7 24.1 209°46.7 20.7	Jupiter		03:36
8 246°08.6 257°47.5 10.2 284°43.2 16.3 68°12.2 24.2 224°49.0 20.8	Saturn	338°47.8	17:07
9 261°11.0 272°47.3 ··· 09.0 299°43.7 ··· 15.7 83°14.8 ··· 24.2 239°51.3 ··· 20.8	Jan 26 Wed	SHA	Mer.pass
10 270 13.5 287 47.0 07.7 314 44.2 15.0 98 17.4 24.3 254 53.0 20.9	Venus	13°06.1	14:49
11 291°16.0 302°46.8 06.4 329°44.7 14.4 113°20.0 24.3 269°56.0 21.0	Mars	39°37.3	13:02
12 306°18.4 317°46.5 \$06°05.2 344°45.2 \$16°13.8 128°22.5 \$N02°24.4 284°58.3 \$N06°21.0		182°00.5	03:32
13 321°20.9 332°46.2 03.9 359°45.7 13.2 143°25.1 24.5 300°00.6 21.1	Saturn	338°44.7	17:03
14 336°23.4 347°46.0 02.6 14°46.2 12.6 158°27.7 24.5 315°02.9 21.2 \(\sqrt{15} \)			
	Jan 27 Thu	SHA	Mer.pass
16 6°28.3 17°45.5 06°00.1 44°47.3 11.3 188°32.8 24.6 345°07.6 21.3	Venus	12°00.7	14:49
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Mars	38°50.3	13:01
18 36°33.2 47°45.0 S05°57.5 74°48.3 S16°10.1 218°38.0 N02°24.7 15°12.2 N06°21.4		182°02.8	03:28
19 51°35.7 62°44.8 56.2 89°48.8 09.4 233°40.5 24.8 30°14.6 21.5	Saturn	338°41.5	16:59
20 66°38.1 77°44.5 54.9 104°49.3 08.8 248°43.1 24.9 45°16.9 21.6	Horizont	al parallax	
21 01040 6 02044 2 52.7 110040 0 00.2 262045 7 24.0 60010 2	. 10.12011	Paranax	0.1
21 81°40.6 92°44.3 $\cdot \cdot \cdot 53.7$ 119°49.8 $\cdot \cdot \cdot 08.2$ 263°45.7 $\cdot \cdot \cdot 24.9$ 60°19.2 $\cdot \cdot \cdot 21.6$		Venus:	
22 96°43.1 107°44.0 52.4 134°50.3 07.6 278°48.2 25.0 75°21.5 21.7		Venus: Mars:	
		Venus: Mars:	0.1

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°59.1	S 19°07.8	$195^{\circ}34.6$	11.2'	\$23°49.4	-6.5'	54.5'
1	191°58.9	07.2	210°04.8	11.3'	23°43.0	-6.6'	54.4
2	206°58.8 221°58.6	06.5 •• 05.9	224°35.1 239°05.5	11.4' 11.4'	23°36.4 23°29.7	-6.7' -6.8'	54.4' 54.4'
4	236° 58.5	05.3	253°36.0	11.5'	23°22.9	-6.9'	54.4'
5	251°58.3	04.7	268°06.5	11.6'	$23^{\circ}16.0$	-7.0'	54.4'
6	266°58.2	S19°04.1	282°37.0	11.6'	\$23°09.0	-7.1'	54.4'
7 8	281°58.0 296°57.9	03.5 02.9	297°07.7 311°38.4	11.7' 11.8'	23°01.9 22°54.7	-7.2' -7.3'	54.4' 54.4'
9	311°57.7	02.3	326°09.2	11.8'	22°47.4	-7.3 -7.4	54.4'
10	326° 57.6	01.7	340°40.0	11.9'	22°40.0	-7.5'	54.3'
11	341°57.4	01.0	355°10.9	12.0'	22°32.5	-7.6'	54.3'
12 13	356° 57.3 11° 57.1	\$19°00.4 18°59.8	9°41.9 24°13.0	12.1' 12.1'	\$22°24.9 22°17.1	-7.7' -7.8'	54.3' 54.3'
14	26° 57.0	59.2	38°44.1	12.2'	22°09.3	-7.9'	54.3'
15	41°56.8	• • 58.6	53°15.3	12.3'	22°01.4	-8.0'	54.3'
16	56° 56.7	58.0	67°46.6	12.3'	21°53.4	-8.1'	54.3'
17 18	71°56.6 86°56.4	57.4 \$18°56.7	82°17.9 96°49.3	12.4' 12.5'	21°45.3 S21°37.1	-8.2' -8.3'	54.3' 54.3'
19	101°56.3	56.1	111°20.8	12.5'	21°28.9	-8.4	54.2'
20	116°56.1	55.5	$125^{\circ}52.3$	12.6'	$21^{\circ}20.5$	-8.5'	54.2'
21	131°56.0	• • 54.9	140°23.9	12.7'	21°12.0	-8.6'	54.2'
22 23	146°55.8 161°55.7	54.3 53.6	154°55.6 169°27.4	12.7' 12.8'	21°03.5 20°54.8	-8.6' -8.7'	54.2' 54.2'
23	SD = 16.2'		100 21.4			-0.1	J T. Z
	3D = 10.2′	d = -0.6'		SI	O = 14.9'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°55.5	\$18°53.0	183°59.2	12.9'	\$20°46.1	-8.8'	54.2'
1 2	191°55.4 206°55.3	52.4 51.8	198°31.1 213°03.0	13.0' 13.0'	20°37.3 20°28.4	-8.9' -9.0'	54.2' 54.2'
3	206°55.3 221°55.1	51.8	213°03.0 227°35.0	13.1'	20°28.4 20°19.4	-9.0 -9.1'	54.2'
4	236° 55.0	50.5	242°07.1	13.2'	20°10.3	-9.2	54.2'
5	251°54.8	49.9	256°39.3	13.2'	20°01.1	-9.2'	54.2'
6	266° 54.7 281° 54.6	\$18°49.3	271°11.5 285°43.8	13.3' 13.4'	\$19°51.9 19°42.5	-9.3' -9.4'	54.1' 54.1'
7 8	281 54.0 296°54.4	48.7 48.0	285 43.8 300°16.2	13.4	19 42.5 19°33.1	-9.4 -9.5'	54.1'
9	311°54.3	• • 47.4	314°48.6	13.5'	19°23.6	-9.6'	54.1'
10	326° 54.1	46.8	329°21.1	13.6'	19°14.1	-9.6'	54.1'
11	341°54.0 356°53.9	46.1 \$18°45.5	343°53.7 358°26.3	13.6' 13.7'	19°04.4 \$18°54.7	-9.7' -9.8'	54.1' 54.1'
12 13	350 53.9 11°53.7	518 45.5 44.9	358 20.3 12°59.0	13.7	18°44.9	-9.8 -9.9'	54.1'
14	26° 53.6	44.3	27°31.8	13.8'	18°35.0	-10.0'	54.1'
15	41°53.5	• • 43.6	42°04.6	13.9'	18°25.1	-10.0'	54.1'
16 17	56°53.3 71°53.2	43.0 42.4	56°37.5 71°10.5	14.0' 14.0'	18°15.1 18°05.0	-10.1' -10.2'	54.1' 54.1'
18	86°53.1	\$18°41.7	85°43.5	14.1'	\$17°54.8	-10.2	54.1
19	101°52.9	41.1	100°16.6	14.2'	17°44.5	-10.3'	54.0'
20	116°52.8	40.5	114°49.8		17°34.2		54.0'
21 22	131°52.6 146°52.5	· · 39.8 39.2	129°23.0 143°56.2	14.3' 14.3'	17°23.9 17°13.4	-10.4' -10.5'	54.0' 54.0'
23	161°52.4	39.2	143 50.2 158°29.6	14.3 14.4'	17 13.4 17°02.9	-10.5	54.0'
	SD = 16.2'	d = -0.6'			O = 14.8'		
	<u> </u>	u — -0.0		اد			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.2	\$18°37.9	173°03.0	14.5'	\$16°52.3	-10.6'	54.0'
1 2	191°52.1 206°52.0	37.3 36.7	187°36.5 202°10.0	14.5' 14.6'	16°41.7 16°31.0	-10.7' -10.8'	54.0' 54.0'
3	221°51.8	36.0	216°43.6	14.6'	16°20.2	-10.8	54.0'
4	236°51.7	35.4	231°17.2	14.7'	16°09.3	-10.9'	54.0'
5 6	251°51.6 266°51.4	34.8 \$18°34.1	245°50.9 260°24.7	14.8' 14.8'	15°58.4 \$15°47.5	-11.0' -11.0'	54.0' 54.0'
6 7	281°51.4	33.5	260°24.7 274°58.5	14.8 14.9'	15°36.5	-11.0 -11.1'	54.0'
8	296°51.2	32.8	289°32.4	14.9'	$15^{\circ}25.4$	-11.1'	54.0'
9	311°51.1	• • 32.2	304°06.3	15.0'	15°14.2	-11.2'	54.0'
10 11	326°50.9 341°50.8	31.5 30.9	318°40.3 333°14.3	15.0' 15.1'	15°03.0 14°51.8	-11.3' -11.3'	54.0' 54.0'
11	341°50.8 356°50.7	30.9 \$18°30.3	333°14.3 347°48.4	15.1	\$14°51.8 \$14°40.5	-11.4	54.0
13	11° 50.5	29.6	2°22.6	15.2'	14°29.1	-11.4	53.9'
14	26°50.4	29.0	16°56.8	15.3'	14°17.7	-11.5'	53.9'
15 16	41°50.3 56°50.1	· · 28.3 27.7	31°31.1 46°05.4	15.3' 15.4'	14°06.2 13°54.7	-11.5' -11.6'	53.9' 53.9'
16 17	71°50.1	27.7	46°05.4 60°39.8	15.4' 15.4'	13°54.7 13°43.1	-11.6'	53.9' 53.9'
18	86°49.9	S18°26.4	75°14.2	15.5'	S13°31.5	-11.7	53.9'
19	101°49.8	25.8	89°48.6	15.5'	13°19.8	-11.7'	53.9'
20	116° 49.6 131° 49.5	25.1 •• 24.5	104°23.2 118°57.7	15.6'	13°08.1 12°56.3	-11.8'	53.9' 53.9'
21 22	131°49.5 146°49.4	23.8	118°57.7 133°32.3	15.6' 15.7'	12°56.3 12°44.5	-11.8' -11.9'	53.9' 53.9'
23	161°49.3	23.2	148°07.0	15.7'	12°32.6	-11.9'	53.9'
	SD = 16.2'	d = -0.6'		SI	D = 14.7'		
		<u> </u>		J.			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lut.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	07:31	09:07	11:51	12:35	15:19	16:55
N 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
N 40°	06:12	06:45	07:14	17:11	17:40	18:13
35°	06:06	06:36	07:03	17:22	17:49	18:20
30°	05:59	06:28	06:54	17:32	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:11	18:38
N 10°	05:35	06:00	06:23	18:02	18:24	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:48	05:16	05:40	18:45	19:08	19:36
30°	04:25	04:57	05:23	19:02	19:28	19:59
35°	04:10	04:45	05:13	19:12	19:40	20:14
40°	03:52	04:30	05:01	19:23	19:54	20:31
45°	03:30	04:13	04:47	19:37	20:11	20:54
S 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
S 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
N 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
N 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
N 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
S 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
S 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
S 60°	01:45	03:12	04:37	20:26	20:33	20:37

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Upper Lower		
	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	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	126°48.0	137°43.5	S05°49.8	164°51.3	S16°06.3	308°53.4	N02°25.1	105°26.2	N06°21.8			
1	141°50.5	152°43.3	48.6	179°51.9	05.7	323°56.0	25.2	120°28.5	21.9	Alpheratz	357°32.3	29°14.9
2	156°52.9	167°43.0	47.3	194°52.4	05.1	338°58.5	25.2	135°30.8	22.0	Ankaa	353°04.9	-42°09.4
3	171°55.4	182°42.8	• • 46.0	209°52.9	04.4	354°01.1	25.3	150°33.2	22.0	Schedar	349°28.3	56°41.8
4	186°57.9	197°42.5	44.7	224°53.4	03.8	9°03.7	25.3	165°35.5	22.1	Diphda	348°44.9	-17°50.0
5	202°00.3	212°42.3	43.4	239°53.9	03.2	24°06.3	25.4	180°37.8	22.2	Achernar	335°18.5	-57°05.9
6	217°02.8	227°42.1	S05°42.2	254° 54.4	S16°02.6	39°08.8	N02°25.5	195°40.1	N06°22.2	Hamal	327°48.3	23°35.8
7	232°05.2	242°41.8	40.9	269° 54.9	01.9	54°11.4	25.5	210°42.5	22.3	Polaris Acamar	312°33.9 315°09.8	89°23.2 -40°11.8
8	247°07.7	257°41.6	39.6	284°55.4	01.3	69°14.0	25.6	225°44.8	22.4	Menkar	314°03.4	4°12.0
9	262°10.2	272°41.3	• • 38.3	299°56.0	• • 00.7	84°16.6	• • 25.6	240°47.1	• • 22.4	Mirfak	308° 24.4	49°57.8
10	277°12.6	287°41.1	37.0	314° 56.5	16°00.1	99°19.1	25.7	255°49.4	22.5	Aldebaran	290°36.5	16°33.9
11	292°15.1	302°40.8	35.8	329°57.0	15°59.4	114°21.7	25.8	270°51.8	22.6	Rigel	281°01.2	-8°10.3
12	307°17.6	317°40.6	S05°34.5	344°57.5	S15°58.8	129°24.3	N02°25.8	285°54.1	N06°22.6	Capella	280°17.8	46°01.6
13	322°20.0	332°40.4	33.2	359°58.0	58.2	144°26.9	25.9	300°56.4	22.7	Bellatrix	278°19.9	6°22.4
14 15	337°22.5 352°25.0	347°40.1 2°39.9	31.9 · · 30.6	14°58.5 29°59.0	57.5 •• 56.9	159°29.5 174°32.0	25.9 •• 26.0	315°58.7 331°01.1	22.8 •• 22.8	Elnath	277°58.4	28°37.8
16	7°27.4	17°39.6	29.4	44° 59.6	56.3	189°34.6	26.1	346°03.4	22.9	Alnilam	275°34.9	-1°11.2
17	22°29.9	32°39.4	28.1	60°00.1	55.7	204°37.2	26.1	1°05.7	23.0	Betelgeuse	270°49.1	7°24.6
18	37°32.4	47°39.2	S05°26.8	75°00.6	S15°55.0	219°39.8	N02°26.2	16°08.0	N06°23.0	Canopus	263°50.8	-52°42.8
19	52°34.8	62°38.9	25.5	90°01.1	54.4	234°42.3	26.2	31°10.3	23.1	Sirius	258°23.7	-16°45.5
20	67°37.3	77°38.7	24.2	105°01.6	53.8	249°44.9	26.3	46°12.7	23.2	Adhara	255°03.5	-29°00.8
21	82°39.7	92°38.4	• • 23.0	120°02.1	• • 53.1	264°47.5	• • 26.4	61°15.0	• • 23.2	Procyon	244°47.9	5°09.0
22	97°42.2	107°38.2	21.7	135°02.7	52.5	$279^{\circ}50.1$	26.4	76°17.3	23.3	Pollux	243°13.9 234°13.0	27°57.3 -59°36.1
23	112°44.7	122°38.0	20.4	150°03.2	51.9	294°52.7	26.5	91°19.6	23.4	Avior Suhail	234 13.0 222°44.0	-39 30.1 -43°32.9
Mern	ass. 15:30	v-0.2′ d-1	3′ m-4.09	ν0.5' d-0	.6′ m1.12	v2 6' d0	.1′ m-2.31	v2 3' d0	.1′ m0.55	Miaplacidus	221°36.7	-69°50.0
- Iviei.p	Jass. 13.30	ν-0.2 u-1		νο.5 α-0	.0 1111.12	ν2.0 do.	.1 111-2.51	ν2.5 d0	.1 1110.55	Alphard	217°44.9	-8°47.0
										Regulus	207°31.5	11°49.6
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°35.6
0	127°47.1	137°37.7	S05°19.1	165°03.7	S15°51.2	309°55.2	N02°26.6	106°21.9	N06°23.4	Denebola	182°22.2	14°24.7
1	142°49.6	152°37.5	17.8	180°04.2	50.6	324°57.8	26.6	121°24.3	23.5	Gienah	175°40.8	-17°42.0
2	157°52.1	167°37.3	16.5	195°04.7	50.0	340°00.4	26.7	136°26.6	23.6	Acrux	$172^{\circ}56.8$	-63°15.2
3 4	172°54.5 187°57.0	182°37.0 197°36.8	15.3	210°05.2	• • 49.3	355°03.0	• • 26.7	151°28.9 166°31.2	• • 23.6	Gacrux	171°48.4	-57°16.1
5	202°59.5	212°36.6	14.0 12.7	225°05.8 240°06.3	48.7 48.1	10°05.6 25°08.2	26.8 26.9	181°33.6	23.7 23.8	Alioth	$166^{\circ}10.6$	55°48.0
6	202 59.5 218°01.9	212 30.0 227°36.3	S05°11.4	255°06.8	\$15° 47.4	40°10.7	N02°26.9	196°35.9	N06°23.8	Spica	158° 19.5	-11°18.6
7	233°04.4	242°36.1	10.1	270°07.3	46.8	55°13.3	27.0	211°38.2	23.9	Alkaid	152°50.0	49°10.0
8	248°06.8	257°35.9	08.8	285°07.8	46.2	70°15.9	27.1	226°40.5	24.0	Hadar	148°32.3	-60°30.3
9	263°09.3	272°35.6	• • 07.5	300°08.3	• • 45.5	85°18.5	27.1	241°42.8	• • 24.1		147°54.6	-36°30.4
10	278°11.8	287°35.4	06.3	315°08.9	44.9	100°21.1	27.2	256°45.2	24.1	Arcturus	145°45.6	19°01.9
11	293°14.2	302°35.2	05.0	330°09.4	44.3	115°23.7	27.3	271°47.5	24.2	Rigil Kent. Kochab	139°36.7 137°20.1	-60°56.9 74°02.0
12	308°16.7	317°34.9	S05°03.7	345°09.9	S15°43.6	130°26.2	N02°27.3	286°49.8	N06°24.3	Zuben'ubi	137 20.1 136°53.2	-16°09.5
13	323°19.2	332°34.7	02.4	0°10.4	43.0	145°28.8	27.4	301°52.1	24.3	Alphecca	130° 55.2 126° 01.7	26°37.0
14	338°21.6	347°34.5	05°01.1	15° 10.9	42.4	160°31.4	27.4	316°54.4	24.4	Antares	112° 12.9	-26°29.6
15	353°24.1	2°34.2	04°59.8	$30^{\circ}11.5$	• • 41.7	175°34.0	• • 27.5	331°56.7	• • 24.5	Atria	107°05.2	-69°04.4
16	8°26.6	17°34.0	58.5	45° 12.0	41.1	190°36.6	27.6	346°59.1	24.5	Sabik	102°00.1	-15°45.5
17	23°29.0	32°33.8	57.3	60°12.5	40.5	205°39.2	27.6	2°01.4	24.6	Shaula	96°07.2	-37°07.3
18	38°31.5	47°33.5	S04°56.0	75°13.0	S15°39.8	220°41.7	N02°27.7		N06°24.7	Rasalhague	95°56.5	12°32.3
19	53°34.0	62°33.3	54.7	90°13.5	39.2	235°44.3	27.8	32°06.0	24.7	Eltanin	90°41.4	51°28.9
20 21	68°36.4 83°38.9	77°33.1 92°32.9	53.4 •• 52.1	105°14.0 120°14.6	38.5 •• 37.9	250°46.9 265°49.5	27.8 • • 27.9	47°08.3 62°10.7	24.8 •• 24.9	Kaus Aust.	83°29.5	-34°22.2
22	98°41.3	107°32.6	50.8	135° 15.1	37.3	280°52.1	28.0	77°13.0	25.0	Vega	80°31.9	38°48.5
23	113°43.8	122°32.4	49.5	150° 15.6	36.6	295°54.7	28.0	92°15.3	25.0	Nunki	75°45.0	-26°15.6
_				-						Altair	61°57.8	8°56.5
Mer.p	bass. 15:26	ν -0.2' d-1	3′ m-4.10	$\nu 0.5' d-0$.6′ m1.12	ν 2.6′ d0.	.1′ m-2.32	$\nu 2.3' d0$.1′ m0.55	Peacock	53°02.4	-56°38.6
										Deneb Enif	49°24.5 33°36.6	45°22.9 10°00.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 30.2	-46°49.5
0	128°46.3	137°32.2	S04°48.2	$165^{\circ}16.1$	S 15°36.0	$310^{\circ}57.3$	N02°28.1	$107^{\circ}17.6$	$N06^{\circ}25.1$	Fomalhaut	15° 12.1	-40 49.5 -29°28.5
1	143°48.7	152°31.9	47.0	180°16.7	35.4	325°59.9	28.2	122°19.9	25.2	Scheat	13°43.0	28°14.2
2	158°51.2	167°31.7	45.7	195° 17.2	34.7	341°02.4	28.2	137°22.2	25.2	Markab	13° 27.6	15°21.5
3	173°53.7	182°31.5	• • 44.4	210°17.7	• • 34.1	356°05.0	• • 28.3	152°24.6	• • 25.3			
4	188°56.1	197°31.3	43.1	225°18.2	33.4	11°07.6	28.4	167°26.9	25.4	Jan 28 Fri	SHA 10° 55.5	Mer.pass
5	203°58.6	212°31.0	41.8	240°18.7	32.8	26°10.2	28.4 N02°29 5	182°29.2	25.4 N06°25.5	Venus Mars	10°55.5 38°03.3	14:49 13:00
6 7	219°01.1	227°30.8	\$04°40.5	255°19.3	\$15°32.2	41°12.8 56°15.4	N02°28.5	197°31.5 212°33.8			38 03.3 182°05.4	03:24
8	234°03.5 249°06.0	242°30.6 257°30.4	39.2 37.9	270°19.8 285°20.3	31.5 30.9	71°18.0	28.6 28.6	212°33.8 227°36.1	25.6 25.6	Saturn	338° 38.2	16:56
9	264° 08.5	272°30.4	• • 36.6	300°20.8	• • 30.2	86°20.6	28.7	242°38.5	25.7			
10	279°10.9	287°29.9	35.4	315°21.4	29.6	101°23.2	28.7	257°40.8	25.8	Jan 29 Sat	SHA	Mer.pass
11	294°13.4	302°29.7	34.1	330°21.9	29.0	116°25.8	28.8	272°43.1	25.9	Venus	9°50.6	14:50
12	309°15.8	317°29.5	504°32.8	345°22.4	S15°28.3	131°28.3	N02°28.9	287°45.4	N06°25.9	Mars	37°16.5	12:59
13	324°18.3	332°29.2	31.5	$0^{\circ}22.9$	27.7	146°30.9	28.9	$302^{\circ}47.7$	26.0	Jupiter Saturn	182°08.1 338°34.8	03:20 16:52
14	339°20.8	347°29.0	30.2	15°23.4	27.0	161°33.5	29.0	317°50.0	26.1	Jatuin	JJU J4.0	10.32
15	354°23.2	2°28.8	• • 28.9	30°24.0	• • 26.4	176°36.1	• • 29.1	332°52.4	26.1	Jan 30 Sun	SHA	Mer.pass
16	9°25.7	17°28.6	27.6	45°24.5	25.7	191°38.7	29.2	347°54.7	26.2	Venus	8°45.9	14:50
17	24°28.2	32°28.4	26.3	60°25.0	25.1	206°41.3	29.2	2°57.0	26.3	Mars	36°29.9	12:58
18	39°30.6	47°28.1	\$04°25.0	75°25.5	\$15°24.5	221°43.9	N02°29.3	17°59.3 33°01.6			182°11.0	03:16
19 20	54°33.1 69°35.6	62°27.9 77°27.7	23.7 22.4	90°26.1 105°26.6	23.8 23.2	236°46.5 251°49.1	29.4 29.4	48°03.9	26.4 26.5	Saturn	338°31.3	16:48
20	69 35.0 84°38.0	92°27.5	21.1	105 26.6 120°27.1	. 22.5	251 49.1 266°51.7	. 29.4	48 03.9 63°06.2	26.5	Horizont	al parallax	
22	99°40.5	107°27.3	19.9	135°27.6	21.9	281°54.3	29.6	78°08.6	26.6		Venus:	0.1
23	114°42.9	122°27.0	18.6	150°28.2	21.2	296°56.9	29.6	93°10.9	26.7		Mars:	0.1
					.6′ m1.12							
ivier.p	bass. 15:22	ν -0.2' d -1	3′ m-4.10	ν 0.5' a -0	.u m1.12	ν 2.0° $d0$.1′ m-2.32	ν2.3' d0	.1′ m0.55			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.1	\$18°22.5	162°41.7	15.8'	S12°20.7	-12.0'	53.9'
1 2	191°49.0 206°48.9	21.9 21.2	177°16.5 191°51.3	15.8' 15.8'	12°08.8 11°56.7	-12.0' -12.0'	53.9' 53.9'
3	221°48.8	20.6	206°26.1	15.9'	11°44.7	-12.1'	53.9'
4	236°48.6	19.9	221°01.0	15.9'	11°32.6	-12.1'	53.9'
5	251°48.5 266°48.4	19.3 \$18° 18.6	235°35.9 250°10.9	16.0'	11°20.5 \$11°08.3	-12.2' -12.2'	53.9'
6 7	266 48.4 281°48.3	18.0	264°45.9	16.0' 16.1'	10°56.1	-12.2 -12.3'	53.9' 53.9'
8	296°48.1	17.3	279°21.0	16.1'	10°43.8	-12.3'	53.9'
9	311°48.0	• • 16.6	293°56.1	16.1'	10°31.6	-12.3'	53.9'
10 11	326°47.9 341°47.8	16.0 15.3	308°31.2 323°06.4	16.2' 16.2'	10°19.2 10°06.9	-12.4' -12.4'	53.9' 53.9'
12	356°47.7	S18° 14.7	337°41.6	16.2'	S09°54.5	-12.4	53.9'
13	11°47.5	14.0	352°16.8	16.3'	09°42.0	-12.5'	53.9'
14 15	26°47.4 41°47.3	13.4 •• 12.7	6°52.1 21°27.4	16.3' 16.4'	09°29.6 09°17.0	-12.5' -12.5'	53.9' 53.9'
16	56°47.2	12.7	36°02.8	16.4	09°17.0	-12.6'	53.9'
17	71°47.1	11.4	50°38.2	16.4'	$08^{\circ}51.9$	-12.6'	53.9'
18	86°46.9	S18° 10.7	65°13.6	16.4'	\$08°39.3	-12.6'	53.9'
19 20	101°46.8 116°46.7	10.1 09.4	79°49.0 94°24.5	16.5' 16.5'	08°26.7 08°14.0	-12.7' -12.7'	53.9' 53.9'
21	131°46.6	08.7	109°00.0	16.5	08°01.3	-12.7'	53.9'
22	146°46.5	08.1	123°35.6	16.6'	07°48.6	-12.8'	53.9'
23	161°46.4	07.4	138°11.1	16.6'	07°35.9	-12.8'	53.9'
	SD = 16.2'	d = -0.6'		SI	O = 14.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°46.2	S 18°06.8	152°46.7	16.6'	507°23.1	-12.8'	53.9'
1 2	191°46.1 206°46.0	06.1 05.4	167°22.3 181°58.0	16.6' 16.7'	07°10.3 06°57.5	-12.8' -12.9'	53.9' 53.9'
3	200 40.0 221°45.9	• • 04.8	101 50.0 196°33.7	16.7	06°44.6	-12.9'	53.9'
4	236°45.8	04.1	211°09.4	16.7'	06°31.7	-12.9'	53.9'
5	251°45.7	03.4	225°45.1	16.7'	06°18.8	-12.9'	53.9'
6 7	266°45.5 281°45.4	\$18°02.8 02.1	240°20.8 254°56.6	16.8' 16.8'	\$06°05.9 05°52.9	-12.9' -13.0'	53.9' 53.9'
8	296°45.3	01.4	269°32.4	16.8'	05°40.0	-13.0'	53.9'
9	311°45.2	• • 00.8	284°08.2	16.8'	05°27.0	-13.0'	53.9'
10 11	326°45.1 341°45.0	18°00.1 17°59.4	298°44.0 313°19.8	16.8' 16.9'	05°14.0 05°01.0	-13.0' -13.0'	53.9' 53.9'
12	356°44.9	\$17°58.8	327°55.7	16.9	504°47.9	-13.1	53.9'
13	11°44.7	58.1	342°31.5	16.9'	04°34.8	-13.1'	53.9'
14 15	26°44.6 41°44.5	57.4 • • 56.7	357°07.4 11°43.3	16.9' 16.9'	04°21.8 04°08.7	-13.1' -13.1'	53.9' 53.9'
16	56°44.4	56.1	26°19.2	16.9'	04 06.7 03°55.5	-13.1'	53.9'
17	71°44.3	55.4	40°55.1	16.9'	03°42.4	-13.1'	53.9'
18	86°44.2	S17°54.7	55°31.1 70°07.0	16.9'	\$03°29.3	-13.2'	53.9'
19 20	101°44.1 116°44.0	54.1 53.4	70°07.0 84°43.0	16.9' 17.0'	03°16.1 03°02.9	-13.2' -13.2'	54.0' 54.0'
21	131°43.9	52.7	99°18.9	17.0'	02°49.8	-13.2	54.0'
22	146°43.8	52.0	113°54.9	17.0'	02°36.6	-13.2'	54.0'
23	161°43.6	51.4	128°30.8	17.0'	02°23.4	-13.2'	54.0'
	SD = 16.2'	d = -0.7'		SI	O = 14.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°43.5 191°43.4	\$17°50.7 50.0	143°06.8 157°42.8	17.0' 17.0'	\$02°10.2 01°56.9	-13.2' -13.2'	54.0' 54.0'
2	191°43.4 206°43.3	50.0 49.3	157°42.8 172°18.8	17.0' 17.0'	01°56.9 01°43.7	-13.2' -13.2'	54.0' 54.0'
3	221°43.2	• • 48.6	$186^{\circ}54.8$	17.0'	01°30.5	-13.2'	54.0'
4	236°43.1	48.0	201°30.8 216°06.7	17.0'	01°17.2 01°03.9	-13.3'	54.0' 54.0'
5 6	251°43.0 266°42.9	47.3 \$17°46.6	216°06.7 230°42.7	17.0' 17.0'	01°03.9 \$00°50.7	-13.3' -13.3'	54.0′ 54.0′
7	281°42.8	45.9	245°18.7	17.0'	00°37.4	-13.3'	54.0'
8	296°42.7	45.2	259°54.7	17.0'	00°24.2	-13.3'	54.0'
9 10	311°42.6 326°42.5	· · 44.6 43.9	274°30.7 289°06.6	17.0' 17.0'	S00°10.9 N00°02.4	-13.3' 13.3'	54.0' 54.1'
11	341°42.4	43.2	303°42.6	17.0'	00°15.7	13.3'	54.1'
12	356°42.3	S17°42.5	318°18.6	17.0'	N00°29.0	13.3'	54.1'
13 14	11°42.2 26°42.1	41.8 41.1	332°54.5 347°30.5	16.9' 16.9'	00°42.2 00°55.5	13.3' 13.3'	54.1' 54.1'
15	41°42.0	• • 40.5	$2^{\circ}06.4$	16.9'	01°08.8	13.3'	54.1'
16	56°41.9	39.8	16°42.3	16.9'	01°22.1	13.3'	54.1'
17 18	71°41.7 86°41.6	39.1 \$17°38.4	31°18.2 45°54.1	16.9' 16.9'	01°35.4 N01°48.7	13.3' 13.3'	54.1' 54.1'
19	101°41.5	37.7	45 54.1 60°30.0	16.9'	02°01.9	13.3'	54.1'
20	116°41.4	37.0	75°05.9	16.9'	02°15.2	13.3'	54.1'
21 22	131°41.3 146°41.2	· · 36.3 35.7	89°41.7 104°17.6	16.8' 16.8'	02°28.5 02°41.7	13.3' 13.3'	54.2' 54.2'
23	146 41.2 161°41.1	35. <i>1</i> 35.0	104 17.6 118°53.4	16.8	02°41.7 02°55.0	13.3'	54.2'
	SD = 16.2'	d = -0.7'			D = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:21	08:54	11:00	13:27	15:34	17:06
N 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
N 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
N 40°	06:10	06:43	07:12	17:15	17:44	18:16
35°	06:04	06:35	07:01	17:25	17:52	18:22
30°	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
S 10°	05:08	05:34	05:56	18:30	18:52	19:18
20°	04:51	05:18	05:42	18:44	19:07	19:35
30°	04:28	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
S 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
S 60°	////	02:46	03:47	20:38	21:37	23:49

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	09:44	09:13	08:46	17:45	19:41	21:33
N 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
N 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
S 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
S 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
S 60°	06:00	07:21	08:40	20:40	20:42	20:43

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

h	Aries	Ve	nus	M	, ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	129°45.4	137° 26.8	S04°17.3	165°28.7	S15°20.6	311°59.5	N02°29.7	108° 13.2	N06°26.8			
1	144°47.9	152°26.6	16.0	180°29.2	19.9	327°02.1	29.8	123° 15.5	26.8	Alpheratz	357°32.3	29°14.9
2	159°50.3	167°26.4	14.7	195°29.7	19.3	342°04.7	29.8	138° 17.8	26.9	Ankaa	353°04.9	-42°09.4
3	174°52.8	182°26.2	. 13.4	210°30.3	. 18.7	357°07.2	29.9	153° 20.1	27.0	Schedar	349°28.3	56°41.8
4	189°55.3	197°25.9	12.1	225°30.8	18.0	12°09.8	30.0	168° 22.4	27.1	Diphda	348°44.9	-17°50.0
5	204°57.7	212°25.7	10.8	240°31.3	17.4	27°12.4	30.0	183°24.7	27.1	Achernar	335°18.5	-57°05.9
6	220°00.2	227°25.5	S04°09.5	255°31.8	\$15°16.7	42°15.0	N02°30.1	198° 27.1	N06°27.2	Hamal	327°48.4	23°35.8
7	235°02.7	242°25.3	08.2	270°32.4	16.1	57°17.6	30.2	213°29.4	27.3	Polaris	312°35.5	89°23.2
8	250°05.1	257°25.1	06.9	285°32.9	15.4	72°20.2	30.2	228°31.7	27.3	Acamar	315°09.8	-40°11.8
9	265°07.6	272°24.9	05.6	300°33.4	• • 14.8	87°22.8	30.3	243°34.0	27.4	Menkar	314°03.5	4°12.0
10	280°10.1	287°24.6	04.3	315°34.0	14.1	102°25.4	30.4	258° 36.3	27.5	Mirfak	308°24.5	49°57.8
11	295°12.5	302°24.4	03.0	330°34.5	13.5	117°28.0	30.4	273°38.6	27.6	Aldebaran	290°36.5	16°33.9
12	310°15.0	317°24.2	S04°01.7	345°35.0	S15°12.8	132°30.6	N02°30.5	288°40.9	N06°27.6	Rigel	281°01.2	-8°10.3
13	325°17.4	332°24.0	04°00.5	0°35.5	12.2	147°33.2	30.6	303°43.2	27.7	Capella Bellatrix	280°17.8 278°19.9	46°01.6 6°22.4
14	$340^{\circ}19.9$	347° 23.8	03°59.2	$15^{\circ}36.1$	11.5	162°35.8	30.7	318°45.6	27.8	Elnath	277°58.4	28°37.8
15	355°22.4	2°23.6	• • 57.9	30°36.6	• • 10.9	177°38.4	• • 30.7	333°47.9	· · 27.8	Alnilam	277 36.4 275°34.9	-1°11.2
16	10°24.8	17°23.4	56.6	45°37.1	10.2	192°41.0	30.8	348°50.2	27.9	Betelgeuse	270°49.1	7°24.6
17	25°27.3	32°23.2	55.3	60°37.7	09.6	207°43.6	30.9	3°52.5	28.0	Canopus	263°50.8	-52°42.8
18	40°29.8	47°22.9	S03°54.0	75°38.2	S15°08.9	222°46.2	N02°30.9	18° 54.8	N06°28.1	Sirius	258°23.7	-16°45.5
19	55°32.2	62°22.7	52.7	90°38.7	08.3	237°48.8	31.0	33°57.1	28.1	Adhara	255°03.5	-29°00.8
20	70°34.7	77°22.5	51.4	105°39.2	07.6	252°51.4	31.1	48°59.4	28.2	Procyon	244°47.9	5°09.0
21	85°37.2	92°22.3	• • 50.1	120°39.8	• • 07.0	267°54.0	· · 31.1	64°01.7	• • 28.3	Pollux	243°13.9	27°57.3
22	100°39.6	107°22.1	48.8	135°40.3	06.3	282°56.6	31.2	79°04.0	28.3	Avior	234°13.0	-59°36.1
23	115°42.1	122°21.9	47.5	150°40.8	05.7	297°59.2	31.3	94°06.4	28.4	Suhail	222°44.0	-43°32.9
Mer.p	ass. 15:18	ν -0.2' d-1	3′ m-4.11	ν 0.5′ d-0	.6′ m1.12	$\nu 2.6' \ d0.$.1′ m-2.33	$\nu 2.3' \ d0$.1′ m0.55	Miaplacidus	221°36.7	-69°50.0
<u>.</u>										Alphard	$217^{\circ}44.9$	-8°47.0
-	CIIA	CIIA	Б.	CILA		CILA	Б	CILA		Regulus	$207^{\circ}31.5$	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°35.6
0	130°44.5	137°21.7	S03°46.2	165°41.4	S15°05.0	313°01.8	N02°31.4	109°08.7	N06°28.5	Denebola	182°22.2	14°24.6
1	145°47.0 160°49.5	152°21.5	44.9	180°41.9 195°42.4	04.4	328°04.4	31.4	124°11.0	28.6	Gienah	175°40.8	-17°42.0
2 3	100 49.5 175°51.9	167°21.3 182°21.0	43.6 •• 42.3	195 42.4 210°42.9	03.7 · · 03.1	343°07.0 358°09.6	31.5 · · 31.6	139° 13.3 154° 15.6	28.6 •• 28.7		172°56.8	-63°15.2
3 4	175 51.9 190°54.4	197° 20.8	41.0	210 42.9 225°43.5	02.4	13°12.2	31.6	169° 17.9	28.8	Gacrux	171°48.4	-57°16.1
5	205°56.9	212° 20.6	39.7	240°44.0	02.4	28°14.8	31.7	184° 20.2	28.8	Alioth	$166^{\circ}10.6$	55°48.0
6	205°59.3	212 20.0 227° 20.4	503°38.4	255°44.5	\$15°01.1	43°17.4	N02°31.8	199° 22.5	N06°28.9	Spica	$158^{\circ}19.5$	-11°18.6
7	236°01.8	242°20.2	37.1	270°45.1	15°00.5	58°20.0	31.9	214° 24.8	29.0	Alkaid	152°50.0	49°10.0
8	251°04.3	257° 20.0	35.8	285°45.6	14°59.8	73°22.6	31.9	229° 27.1	29.1	Hadar	148°32.2	-60°30.3
9	266°06.7	272° 19.8	34.5	300°46.1	• • 59.2	88°25.2	32.0	244°29.5	29.1		147°54.5	-36°30.4
10	281°09.2	287° 19.6	33.2	315°46.7	58.5	103°27.8	32.1	259°31.8	29.2	Arcturus	145°45.6	19°01.9
11	296°11.7	302° 19.4	31.9	330°47.2	57.8	118°30.4	32.1	274°34.1	29.3	Rigil Kent.	139°36.7	-60°56.9
12	311°14.1	317° 19.2	S03°30.6	345°47.7	S14°57.2	133°33.1	N02°32.2	289°36.4	N06°29.4	Kochab	137°20.1	74°02.0
13	326°16.6	332°19.0	29.3	0°48.3	56.5	148°35.7	32.3	304°38.7	29.4	Zuben'ubi	136°53.2	-16°09.5
14	341°19.0	347° 18.8	28.0	15°48.8	55.9	163°38.3	32.4	319°41.0	29.5	Alphecca	126°01.7	26°36.9
15	356°21.5	2°18.6	26.7	30°49.3	• • 55.2	178°40.9	• • 32.4	334°43.3	29.6	Antares	112°12.9	-26°29.6
16	11°24.0	$17^{\circ}18.4$	25.4	45°49.9	54.6	193°43.5	32.5	349° 45.6	29.6	Atria Sabik	107°05.1 102°00.1	-69°04.4 -15°45.6
17	26°26.4	32°18.2	24.1	60°50.4	53.9	$208^{\circ}46.1$	32.6	4°47.9	29.7	Shaula	96°07.2	-15 45.0 -37°07.3
18	41°28.9	47° 17.9	S03°22.8	75°50.9	S14°53.3	223°48.7	N02°32.7	19°50.2	N06°29.8	Rasalhague	95°56.4	12°32.3
19	56°31.4	62° 17.7	21.5	90°51.5	52.6	238°51.3	32.7	34°52.5	29.9	Eltanin	90°41.4	51°28.9
20	71°33.8	77° 17.5	20.2	105°52.0	51.9	253°53.9	32.8	49°54.8	29.9	Kaus Aust.	83°29.5	-34°22.2
21	86°36.3	92° 17.3	• • 18.9	120°52.5	• • 51.3	268°56.5	• • 32.9	64°57.1	• • 30.0	Vega	80°31.9	38°48.4
22	101°38.8	107° 17.1	17.6	135°53.1	50.6	283°59.1	32.9	79°59.5	30.1	Nunki	75°45.0	-26°15.6
23	116°41.2	122°16.9	16.3	150°53.6	50.0	299°01.7	33.0	95°01.8	30.2	Altair	61°57.8	8°56.5
Mer.p	ass. 15:15	ν -0.2' d-1	.3′ m-4.11	$\nu 0.5' \ d-0$.7′ m1.11	$\nu 2.6' d0$.1′ m-2.34	$\nu 2.3' d0$.1′ m0.55	Peacock	53°02.4	-56°38.6
										Deneb	49°24.5	45°22.9
			_		_		_		_	Enif	33°36.6	10°00.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}30.2$	-46°49.5
0	131°43.7	137° 16.7 152° 16.5	\$03°15.0	165°54.1	\$14°49.3	314°04.3 329°06.9	N02°33.1	110°04.1 125°06.4		Fomalhaut	15°12.1	-29°28.5
1 2	146°46.2 161°48.6	152° 16.5 167° 16.3	13.7 12.4	180°54.7 195°55.2	48.7 48.0	329°06.9 344°09.6	33.2 33.2	125°06.4 140°08.7	30.3 30.4	Scheat	13°43.0	28°14.2
3	176°51.1		. 11.1	210°55.7	. 47.3	359°12.2	33.3	155° 11.0	30.4	Markab	13°27.6	15°21.5
4	170 51.1 191°53.5	182° 16.1 197° 15.9	09.8	210 55.7 225°56.3	46.7	14°14.8	33.4	170° 13.3	30.5	Jan 31 Mon	SHA	Mer.pass
5	206°56.0	212° 15.7	08.5	240°56.8	46.0	29°17.4	33.5	185° 15.6	30.6	Venus	7°41.4	14:50
6	221°58.5	212 15.7 227°15.5	S03°07.2	255°57.3	\$14°45.4	44°20.0	N02°33.5	200° 17.9	N06°30.7	Mars	35°43.3	12:58
7	237°00.9	242° 15.3	05.9	270°57.9	44.7	59°22.6	33.6	215° 20.2	30.7	Jupiter		03:11
8	252°03.4	257° 15.1	04.6	285°58.4	44.0	74°25.2	33.7	230°22.5	30.8	Saturn	338°27.8	16:45
9	267°05.9	272°14.9	03.3	300°59.0	• • 43.4	89°27.8	• • 33.8	245° 24.8	30.9			
10	282°08.3	287° 14.7	02.0	315°59.5	42.7	104°30.4	33.8	260°27.1	31.0	Feb 01 Tue	SHA	Mer.pass
11	297°10.8	302° 14.5	03°00.7	331°00.0	42.1	119°33.0	33.9	275° 29.4	31.0	Venus	6°37.1	14:51
12	312°13.3	317° 14.3	502°59.4	346°00.6	S 14°41.4	134°35.7	N02°34.0	290°31.7		Mars	34°56.8	12:57
13	$327^{\circ}15.7$	$332^{\circ}14.1$	58.1	$1^{\circ}01.1$	40.7	149°38.3	34.1	305°34.0	31.2		182°17.3	03:07
14	342°18.2	$347^{\circ}13.9$	56.8	$16^{\circ}01.6$	40.1	164°40.9	34.1	320°36.3	31.3	Saturn	338°24.1	16:41
15	357°20.6	2°13.7	• • 55.5	$31^{\circ}02.2$	• • 39.4	179°43.5	• • 34.2	$335^{\circ}38.7$	• • 31.3	Feb 02 Wed	SHA	Mer.pass
16	12°23.1	$17^{\circ}13.5$	54.2	$46^{\circ}02.7$	38.8	194°46.1	34.3	350°41.0	31.4	Venus	5°33.0	14:51
17	27°25.6	32° 13.3	52.9	61°03.2	38.1	209°48.7	34.4	5°43.3	31.5	Mars	$34^{\circ}10.4$	12:56
18	42°28.0	47° 13.1	S02°51.6	76°03.8	S14°37.4	224°51.3	N02°34.4	20°45.6	N06°31.6	Jupiter	$182^{\circ}20.6$	03:03
19	57°30.5	62°13.0	50.3	91°04.3	36.8	239°53.9	34.5	35°47.9	31.6	Saturn	338°20.4	16:37
20	72°33.0	77° 12.8	49.0	106°04.9	36.1	254°56.6	34.6	50° 50.2	31.7	Usui-st	al parallax	
21	87°35.4	92°12.6	• • 47.7	121°05.4	• • 35.4	269°59.2	• • 34.7	65°52.5	• • 31.8	norizont	Venus:	0.1
22	102°37.9	107°12.4	46.4	136°05.9	34.8	285°01.8	34.7	80°54.8	31.9		venus: Mars:	0.1
23	117°40.4	122°12.2	45.1	151°06.5	34.1	300°04.4	34.8	95°57.1	31.9		ividi S.	0.1
Mer.p	ass. 15:11	ν -0.2′ d-1	.3′ m-4.12	ν 0.5′ d-0	.7′ m1.11	ν 2.6′ d0.	.1′ m-2.34	ν 2.3 $^{\prime}$ d0	.1′ m0.56			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.0	\$17°34.3	133°29.2	ν 16.8'	N03°08.3	13.2'	54.2'
1	191°40.9	33.6	148°05.0	16.8	03°21.5	13.2'	54.2'
2	206°40.8	32.9	162°40.7	16.7	03°34.7	13.2'	54.2'
3	221°40.7	32.2	177°16.5	16.7'	03°48.0	13.2'	54.2'
4	236°40.6	31.5	191°52.2	16.7'	04°01.2	13.2'	54.2'
5	251°40.6	30.8	206°27.9	16.7'	04°14.4	13.2'	54.2'
6	266°40.5	\$17°30.1	221°03.6	16.6'	N04°27.6	13.2'	54.3'
7	281°40.4	29.4	235°39.2	16.6'	04°40.8	13.2'	54.3'
8	296°40.3	28.7	250°14.8	16.6'	04°54.0	13.2'	54.3'
9	311°40.2	• • 28.0	264°50.4	16.6'	05°07.1	13.1'	54.3'
10	326°40.1	27.4	279°25.9	16.5'	05°20.3	13.1'	54.3'
11	341°40.0	26.7	294°01.5	16.5'	05°33.4	13.1'	54.3'
12	356°39.9	S17°26.0	308°37.0	16.5'	N05°46.5	13.1'	54.3'
13	11°39.8	25.3	323°12.4	16.4'	05°59.6	13.1'	54.4'
14	26°39.7	24.6	337°47.9	16.4'	$06^{\circ}12.7$	13.1'	54.4'
15	41°39.6	• • 23.9	352°23.2	16.4'	06°25.8	13.1'	54.4'
16	56°39.5	23.2	6°58.6	16.3'	06°38.8	13.0'	54.4'
17	71°39.4	22.5	21°33.9	16.3'	06°51.9	13.0'	54.4'
18	86°39.3	\$17°21.8	36°09.2	16.2'	N07°04.9	13.0'	54.4'
19	101°39.2	21.1	50°44.5	16.2'	07°17.9	13.0'	54.4'
20	116°39.1	20.4	65°19.7	16.2'	07°30.9	13.0'	54.5'
21	131°39.0 146°38.9	• • 19.7	79°54.8	16.1'	07°43.8	12.9'	54.5'
22 23	146°38.9 161°38.9	19.0	94°29.9 109°05.0	16.1'	07°56.7 08°09.7	12.9'	54.5'
23		18.3	109 05.0	16.0'		12.9'	54.5'
	SD = 16.2'	d = -0.7'		SI	0 = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	176°38.8	\$17°17.6	123°40.1	16.0'	N08°22.5	12.9'	54.5
1	191°38.7	16.9	138°15.0	15.9'	08°35.4	12.8'	54.5'
2	206°38.6	16.2	152°50.0	15.9'	08°48.2	12.8'	54.6'
3	221°38.5	• • 15.5	167°24.9	15.8'	$09^{\circ}01.0$	12.8'	54.6'
4	236°38.4	14.8	181°59.7	15.8'	$09^{\circ}13.8$	12.8'	54.6'
5	251°38.3	14.0	196°34.5	15.7'	09°26.6	12.7'	54.6'
6	266°38.2	S17°13.3	211°09.3	15.7'	N09°39.3	12.7'	54.6'
7	281°38.1	12.6	225°44.0	15.6'	09°52.0	12.7'	54.7'
8	296°38.0	11.9	240°18.6	15.6'	10°04.7	12.6'	54.7'
9	311°38.0	• • 11.2	254°53.2	15.5'	10°17.3	12.6'	54.7'
10	326°37.9	10.5	269°27.7	15.5'	10°29.9	12.6'	54.7'
11	341°37.8	09.8	284°02.2	15.4'	10°42.5	12.5'	54.7'
12	356°37.7	\$17°09.1	298°36.6	15.4'	N10°55.0 11°07.5	12.5'	54.7'
13 14	11°37.6 26°37.5	08.4 07.7	313°11.0 327°45.3	15.3' 15.2'	11°07.5 11°20.0	12.5' 12.4'	54.8' 54.8'
15	41°37.4	•• 07.0	342°19.5	15.2'	11°32.4	12.4	54.8'
16	56°37.4	06.3	356°53.7	15.1	11°44.8	12.4	54.8'
17	71°37.3	05.5	11°27.8	15.1'	11°57.1	12.3'	54.9'
18	86°37.2	S17°04.8	26°01.9	15.0'	N12°09.5	12.3'	54.9'
19	101°37.1	04.1	40°35.9	14.9'	12°21.7		54.9'
20	116°37.0	03.4	55°09.8	14.9'	12°34.0	12.2'	54.9'
21	131°36.9	• • 02.7	69°43.7	14.8'	12°46.2	12.2'	54.9'
22	146°36.8	02.0	84°17.5	14.7'	12°58.3	12.1'	55.0'
23	161°36.8	01.3	98°51.2	14.7'	13°10.4	12.1'	55.0'
	SD = 16.2'	d = -0.7'		SI	0 = 14.9'		
Wed	GHA	Dec	GHA		Dec	d	НР
vvea 0	GПА 176°36.7	S17°00.6	GПА 113°24.8	u 14.6'	N13°22.5	<i>a</i> 12.0'	55.0'
1	176 36.7 191°36.6	16°59.8	113 24.8 127°58.4	14.5	13°34.5	12.0'	55.0'
2	206°36.5	59.1	142°31.9	14.4	13°46.5	11.9'	55.1'
3	221°36.4	58.4	157°05.4	14.4'	13°58.4	11.9'	55.1'
4	236°36.4	57.7	171°38.8	14.3'	14°10.3	11.8'	55.1'
5	251°36.3	57.0	186°12.0	14.2'	14°22.1	11.8'	55.1'
6	266°36.2	S16°56.3	200°45.3	14.1'	N14°33.9	11.7'	55.2'
7	281°36.1	55.5	215°18.4	14.1'	14°45.6	11.7'	55.2'
8	296°36.0	54.8	229°51.5	14.0'	14°57.3	11.6'	55.2'
9	311°36.0	• • 54.1	244°24.4	13.9'	15°08.9	11.6'	55.2'
10	326°35.9	53.4	258°57.3	13.8'	15°20.5	11.5'	55.3'
11	341°35.8	52.7	273°30.2	13.7'	15°32.0	11.5'	55.3'
12	356°35.7	\$16°51.9	288°02.9	13.7'	N15°43.5	11.4'	55.3'
13	11°35.6	51.2	302°35.6	13.6'	15°54.9	11.3'	55.3'
14 15	26°35.6 41°35.5	50.5 •• 49.8	317°08.1 331°40.6	13.5' 13.4'	16°06.2 16°17.5	11.3' 11.2'	55.4' 55.4'
15 16	41 35.5 56°35.4	49.8	331°40.6 346°13.0	13.4	16°17.5 16°28.8	11.2'	55.4' 55.4'
16 17	50°35.4 71°35.3	49.0 48.3	0°45.3	13.3	16°28.8 16°39.9	11.2	55.4'
18	86°35.3	46.3 \$16°47.6	15°17.6	13.1'	N16°51.0	11.1	55.5'
19	101°35.2	46.9	29°49.7	13.1	17°02.1	11.0'	55.5'
20	116°35.1	46.1	44°21.8	13.0'	17°13.0	10.9	55.5'
21	131°35.0	• • 45.4	58°53.7	12.9'	17°24.0	10.8	55.6'
22	146°35.0	44.7	73°25.6	12.8'	17°34.8	10.8'	55.6'
23	161°34.9	44.0	87°57.4	12.7'	17°45.6	10.7'	55.6'
	SD = 16.2'	d = -0.7'		SI	O = 15.0'		

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

Lat.		Moonris	e		Moonset	:
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
S 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
S 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
S 60°	10:00	11:22	12:48	20:45	20:48	20:52

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	132°42.8	137° 12.0	S02°43.8	166°07.0	S14°33.5	315°07.0	N02°34.9	110° 59.4	N06°32.0			
1	147°45.3	152° 11.8	42.5	181°07.6	32.8	330°09.6	35.0	126°01.7	32.1	Alpheratz	357°32.4	29°14.9
2	162°47.8	167° 11.6	41.2	196°08.1	32.1	345°12.2	35.0	141°04.0	32.2	Ankaa	353°05.0	-42°09.3
3	177°50.2	$182^{\circ}11.4$	• • 39.9	211°08.6	• • 31.5	0°14.9	• • 35.1	156°06.3	• • 32.2	Schedar	349°28.4	56°41.8
4	192°52.7	197°11.2	38.6	226°09.2	30.8	15°17.5	35.2	171°08.6	32.3	Diphda	348°45.0	-17°50.0
5	207°55.1	212°11.0	37.3	241°09.7	30.1	30°20.1	35.3	186° 10.9	32.4	Achernar	335°18.6	-57°05.9
6	222°57.6	227° 10.8	S02°36.0	256°10.3	S14°29.5	45°22.7	N02°35.4	201°13.2	N06°32.5	Hamal	327°48.4	23°35.8
7	238°00.1	242°10.6	34.7	271°10.8	28.8	60°25.3	35.4	$216^{\circ}15.5$	32.5	Polaris	312°36.9	89°23.2
8	253°02.5	257° 10.4	33.4	286°11.3	28.1	75°27.9	35.5	231°17.8	32.6	Acamar	315°09.9	-40°11.8
9	268°05.0	272°10.2	• • 32.1	301°11.9	• • 27.5	90°30.6	• • 35.6	$246^{\circ}20.1$	• • 32.7	Menkar	314°03.5 308°24.5	4°12.0
10	283°07.5	$287^{\circ}10.1$	30.8	316°12.4	26.8	105°33.2	35.7	261°22.4	32.8	Mirfak		49°57.8
11	298°09.9	302°09.9	29.5	331°13.0	26.1	120°35.8	35.7	276°24.7	32.8	Aldebaran	290°36.5	16°33.9
12	313°12.4	317°09.7	S02°28.2	346°13.5	S14°25.5	135°38.4	N02°35.8	291°27.0	N06°32.9	Rigel	281°01.2	-8°10.3
13	328°14.9	332°09.5	26.9	1°14.0	24.8	150°41.0	35.9	306°29.3	33.0	Capella Bellatrix	280°17.8 278°19.9	46°01.6 6°22.4
14	343°17.3	347°09.3	25.6	16°14.6	24.1	165°43.6	36.0	321°31.6	33.1	Elnath	277°58.4	28°37.8
15	$358^{\circ}19.8$	$2^{\circ}09.1$	· · 24.3	31°15.1	• • 23.5	180°46.3	• • 36.1	336° 33.9	• • 33.1	Alnilam	277 36.4 275°34.9	-1°11.2
16	13°22.3	17°08.9	23.0	46°15.7	22.8	195°48.9	36.1	$351^{\circ}36.2$	33.2	I	270°49.1	7°24.6
17	28°24.7	32°08.7	21.6	61°16.2	22.1	210°51.5	36.2	6°38.5	33.3	Betelgeuse Canopus	263°50.8	-52°42.9
18	43°27.2	47° 08.5	502°20.3	76°16.8	S14°21.5	225°54.1	N02°36.3	21°40.8	N06°33.4	Sirius	258°23.7	-32 42.9 -16°45.5
19	58°29.6	62°08.3	19.0	91°17.3	20.8	240°56.7	36.4	$36^{\circ}43.1$	33.4	Adhara	255°03.5	-10° 45.5 -29° 00.8
20	73°32.1	77°08.2	17.7	106°17.8	20.1	255°59.4	36.4	51°45.4	33.5	Procyon	244°47.9	5°09.0
21	88°34.6	92°08.0	• • 16.4	121°18.4	•• 19.5	271°02.0	• • 36.5	66° 47.7	• • 33.6	Pollux	243°13.9	27°57.3
22	103°37.0	$107^{\circ}07.8$	15.1	136°18.9	18.8	286°04.6	36.6	81°50.0	33.7	Avior	245 13.9 234°13.0	-59°36.1
23	118°39.5	122°07.6	13.8	151°19.5	18.1	301°07.2	36.7	96°52.3	33.7	Suhail	234 13.0 222°44.0	-39 30.1 -43°32.9
Mern	pass. 15:07	ν-0.2/ d.1	3′ m-4.12	ν0.5 ⁷ d.0	0.7′ m1.11	v2 6' d0	1' m-2.35	1/2 3/ 40	.1′ m0.56	Miaplacidus	221°36.7	-43 32.9 -69°50.0
- ivier.p	Juss. 1J.UI	ν-0.2 U-1	111-4.12	νυ.σ u-0		ν∠.υ u∪.	111-2.33	ν2.3 d0		Alphard	221 30.7 217°44.9	-8°47.0
										Regulus	207°31.4	11°49.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°35.6
0	133°42.0	137°07.4	S02°12.5	$166^{\circ}20.0$	S 14°17.4	$316^{\circ}09.8$	$N02^{\circ}36.8$	$111^{\circ}54.6$	$N06^{\circ}33.8$	Denebola	182°22.1	14°24.6
1	148°44.4	$152^{\circ}07.2$	11.2	181°20.6	16.8	$331^{\circ}12.5$	36.8	$126^{\circ}56.9$	33.9	Gienah	175°40.7	-17°42.0
2	163°46.9	167° 07.0	09.9	196°21.1	16.1	346° 15.1	36.9	141°59.2	34.0	Acrux	173° 40.7	-63°15.2
3	178°49.4	182°06.9	•• 08.6	211°21.6	• • 15.4	1°17.7	• • 37.0	$157^{\circ}01.5$	• • 34.0		171°48.4	-57°16.1
4	193°51.8	197°06.7	07.3	226°22.2	14.8	16°20.3	37.1	172°03.8	34.1	Alioth	166°10.5	55°48.1
5	208°54.3	212°06.5	06.0	241°22.7	14.1	31°23.0	37.2	$187^{\circ}06.1$	34.2	Spica	158° 19.5	-11°18.6
6	223°56.7	227°06.3	S02°04.7	256°23.3	S14°13.4	46°25.6	N02°37.2	202°08.4	N06°34.3	Alkaid	152°49.9	49°10.0
7	238°59.2	242°06.1	03.4	271°23.8	12.7	61°28.2	37.3	217° 10.7	34.3	Hadar	148°32.2	-60°30.3
8	254°01.7	257°05.9	02.1	286°24.4	12.1	76°30.8	37.4	232° 13.0	34.4	Menkent	147°54.5	-36°30.4
9	269°04.1	272°05.7	02°00.8	301°24.9	• • 11.4	91°33.5	• • 37.5	247° 15.3	• • 34.5	Arcturus	145°45.6	19°01.9
10	284°06.6	287° 05.6	01°59.5	316°25.5	10.7	106°36.1	37.6	262° 17.6	34.6	Rigil Kent.	139°36.7	-60°56.9
11	299°09.1	302°05.4	58.2	331°26.0	10.1	121°38.7	37.6	277°19.9	34.6	Kochab	137°20.0	74°02.0
12	314°11.5	317°05.2	S01°56.8	346°26.5	S14°09.4	136°41.3	N02°37.7	292°22.2	N06°34.7	Zuben'ubi	136°53.2	$-16^{\circ}09.5$
13	329°14.0	332°05.0	55.5	1°27.1	08.7	151°44.0	37.8	307°24.5	34.8	Alphecca	126°01.7	26°36.9
14	344°16.5	347°04.8	54.2	16°27.6	08.0	166°46.6	37.9	322° 26.8	34.9	Antares	112°12.9	-26°29.6
15	359°18.9	2°04.7	• • 52.9	31°28.2	• • 07.4	181°49.2	• • 38.0	337°29.1	• • 35.0	Atria	107°05.1	-69°04.4
16	14°21.4	17°04.5	51.6	46°28.7	06.7	196°51.8	38.0	352°31.4	35.0	Sabik	102°00.1	-15°45.6
17	29°23.9	32°04.3	50.3	61°29.3	06.0	211°54.5	38.1	7°33.7	35.1	Shaula	96°07.2	-37°07.3
18	44°26.3	47°04.1	S01°49.0	76°29.8	\$14°05.3	226°57.1	N02°38.2	22°36.0	N06°35.2	Rasalhague	95°56.4	12°32.3
19	59°28.8	62°03.9	47.7	91°30.4	04.7	241°59.7	38.3	37°38.3	35.3	Eltanin	90°41.4	51°28.9
20	74°31.2	77°03.7	46.4	106°30.9	04.0	257°02.3	38.4	52°40.6	35.3	Kaus Aust.	83°29.5	-34°22.1
21	89°33.7	92°03.6	• • 45.1	121°31.5	• • 03.3	272°05.0	• • 38.4	67°42.9	• • 35.4	Vega	80°31.9	38°48.4
22	104°36.2	107°03.4	43.8	136°32.0	02.6	287°07.6	38.5	82°45.2	35.5	Nunki	75°45.0	-26°15.6
23	119°38.6	122°03.2	42.5	151°32.6	02.0	302°10.2	38.6	97°47.5	35.6	Altair	61°57.8	8°56.5
Mer.p	bass. 15:03	ν -0.2' d-1	3′ m-4.13	ν 0.5′ d-0).7′ m1.11	$\nu 2.6' \ d0.$	1' m-2.35	$\nu 2.3' \ d0$.1′ m0.56	Peacock	53°02.4	-56°38.6
										Deneb	49°24.5	45°22.8
_	C		-		-	a	-		-	Enif	33°36.6	10°00.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.5
0	134°41.1	137°03.0	S01°41.2	166°33.1	\$14°01.3	317°12.8	N02°38.7	112°49.8		Fomalhaut	$15^{\circ}12.1$	-29°28.5
1	149°43.6	152°02.8	39.9	181°33.7	14°00.6	332°15.5	38.8	127°52.1	35.7	Scheat	13°43.0	28°14.2
2	164°46.0	167°02.7	38.6	196°34.2	13°59.9	347°18.1	38.9	142°54.4	35.8	Markab	13°27.6	15°21.5
3 4	179°48.5 194°51.0	182°02.5 197°02.3	· · 37.2	211°34.8 226°35.3	· · 59.3	2°20.7 17°23.4	· · 38.9	157° 56.7 172° 59.0	· · 35.9	Feb 03 Thu	SHA	Mer.pass
4 5	194°51.0 209°53.4	197°02.3 212°02.1	35.9 34.6	220°35.3 241°35.9	58.6 57.0	32°26.0	39.0 30.1	172°59.0 188°01.2	36.0	Venus	эпа 4°29.2	14:51
6	209°53.4 224°55.9	212°02.1 227°02.0	34.6	241 35.9 256° 36.4	57.9 \$13°57.2	47°28.6	39.1 N02°39.2	203°03.5	36.0 N06°36.1	Mars	4 29.2 33°24.2	12:55
б 7	224°55.9 239°58.4	242°01.8	S01°33.3 32.0	250° 30.4 271° 37.0	\$13°57.2 56.6	47°28.6 62°31.2	39.2 39.3	203°03.5 218°05.8	N06°36.1 36.2	Jupiter		02:59
8	239°58.4 255°00.8	242°01.8 257°01.6	32.0 30.7	271 37.0 286° 37.5	56.6 55.9	77°33.9	39.3 39.3	218°05.8 233°08.1		Saturn	338°16.6	16:34
9	255 00.8 270°03.3	257 01.6 272°01.4	. 29.4	280 37.5 301°38.1	55.9	92°36.5	39.4	248° 10.4	36.3 · · 36.3	Jatuill	555 10.0	10.54
10	270 03.3 285°05.7	272 01.4 287°01.3	28.1	316°38.6	54.5	92 30.5 107°39.1	39.5	263° 12.7	36.4	Feb 04 Fri	SHA	Mer.pass
10	300°08.2	302°01.1	26.1	310 38.0 331°39.2	54.5 53.8	107 39.1 122°41.8	39.5 39.6	203 12.7 278°15.0	36.4 36.5	Venus	3°25.5	14:52
12	300 06.2 315°10.7	317°00.9	501°25.5	331 39.2 346°39.7	\$13°53.2	137°44.4	N02°39.7	276 15.0 293°17.3	N06°36.6	Mars	32°38.0	12:54
13	315 10.7 330°13.1	317 00.9 332°00.7	24.2	1°40.3	52.5	157 44.4 152°47.0	39.8	293 17.3 308°19.6	36.6	Jupiter	182°27.9	02:55
13	345°15.6	347°00.5	24.2	1 40.3 16°40.8	52.5 51.8	152 47.0 167°49.7	39.8 39.8	308 19.6 323°21.9	36.7	Saturn	338°12.7	16:30
15	0°18.1	2°00.4	• • 21.6	31°41.4	. 51.0	182°52.3	39.9	338°24.2	36.8	Eat OF Co.	CH A	Me: =:
16	15°20.5	17° 00.2	20.2	46°41.9	50.4	102 52.5 197°54.9	40.0	353° 26.5	36.9	Feb 05 Sat	SHA 2°21.0	Mer.pass
17	30°23.0	32°00.0	18.9	61°42.5	49.8	212°57.6	40.0	8°28.8	37.0	Venus	2°21.9	14:52
18	45°25.5	46° 59.9	501°17.6	76°43.0	\$13°49.1	212 57.0 228°00.2	N02°40.2	23°31.1	N06°37.0	Mars	31°52.0 182°31.7	12:53
19	60°27.9	61°59.7	16.3	91°43.6	48.4	243°02.8	40.3	38° 33.4	37.1	Saturn	338°08.7	02:51 16:26
20	75°30.4	76° 59.5	15.0	106°44.1	47.7	258°05.5	40.3	53° 35.4	37.1	Saturn	JJ0 U8./	10:20
21	90°32.9	91°59.3	13.7	100°44.1	• • 47.0	273°08.1	• • 40.4	68°38.0	37.3	Horizont	al parallax	
22	105°35.3	106°59.2	12.4	136°45.2	46.4	288°10.7	40.5	83°40.2	37.4		Venus:	0.1
23	120°37.8	121°59.0	11.1	151°45.8	45.7	303°13.4	40.6	98° 42.5	37.4		Mars:	0.1
iVler.p	pass. 14:59	ν -0.2' d-1	3′ m-4.13	ν 0.5′ d -0	0.7′ m1.10	ν 2.0′ $d0$.	1′ m-2.36	ν 2.3′ d0	.1′ m0.56			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.8	\$16°43.2	102°29.1	12.6'	N17°56.3	10.6	55.6'
1 2	191°34.7 206°34.7	42.5 41.8	117°00.6 131°32.1	12.5' 12.4'	18°06.9 18°17.5	10.6' 10.5'	55.7' 55.7'
3	221°34.6	. 41.1	146°03.5	12.3'	18°28.0	10.4	55.7'
4	236°34.5	40.3	160°34.9	12.2'	18°38.4	10.3'	55.8'
5	251°34.5 266°34.4	39.6 \$16°38.9	175°06.1 189°37.2	12.1' 12.0'	18°48.7 N18°59.0	10.3' 10.2'	55.8' 55.8'
6 7	281°34.3	38.1	204°08.2	12.0 11.9'	19°09.2	10.2	55.8'
8	296°34.2	37.4	218°39.1	11.8'	19°19.3	10.0'	55.9'
9	311°34.2	• • 36.7	233°09.9 247°40.6	11.7'	19°29.4	10.0'	55.9'
10 11	326°34.1 341°34.0	35.9 35.2	247° 40.6 262° 11.3	11.6' 11.5'	19°39.3 19°49.2	9.9' 9.8'	55.9' 56.0'
12	356°34.0	S16°34.5	276°41.8	11.4'	N19°59.0	9.7'	56.0'
13	11°33.9	33.7	291°12.2	11.3'	20°08.7	9.6'	56.0'
14 15	26°33.8 41°33.8	33.0 · · 32.3	305° 42.5 320° 12.7	11.2' 11.1'	20°18.3 20°27.8	9.5' 9.4'	56.1' 56.1'
16	56°33.7	31.5	334°42.8	11.0'	20°37.3	9.4	56.1'
17	71°33.6	30.8	349° 12.8	10.9'	20°46.6	9.3'	56.2'
18 19	86°33.6 101°33.5	\$16°30.1 29.3	3°42.7 18°12.5	10.8' 10.7'	N20°55.9	9.2' 9.1'	56.2' 56.2'
20	101 33.5 116°33.4	29.3 28.6	32°42.1	10.7	21 05.0 21°14.1	9.1	56.2 56.3'
21	131°33.4	• • 27.9	47° 11.7	10.5'	21°23.1	8.9'	56.3'
22	146°33.3	27.1	61°41.2	10.4'	21°32.0	8.8'	56.3'
23	161°33.2	26.4	76° 10.5	10.2'	21°40.8	8.7'	56.4'
	SD = 16.2'	d = -0.7'		SE	O = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.2 191°33.1	\$16°25.6 24.9	90°39.8 105°08.9	10.1' 10.0'	N21°49.4 21°58.0	8.6' 8.5'	56.4'
1 2	191°33.1 206°33.0	24.9 24.2	105°08.9 119°37.9	9.9'	21°58.0 22°06.5	8.5° 8.4'	56.4' 56.5'
3	221°33.0	• • 23.4	134°06.9	9.8'	22°14.9	8.3'	56.5
4	236°32.9	22.7	148°35.7	9.7'	22°23.2	8.2'	56.5'
5 6	251°32.8 266°32.8	21.9 \$16°21.2	163°04.4 177°33.0	9.6' 9.5'	22°31.3 N22°39.4	8.1' 8.0'	56.6' 56.6'
7	281°32.7	20.4	192°01.5	9.4'	22°47.4	7.8'	56.7'
8	296°32.6	19.7	206° 29.8	9.3'	22°55.2	7.7'	56.7'
9	311°32.6	• • 19.0	220°58.1	9.2'	23°02.9 23°10.6	7.6'	56.7'
10 11	326°32.5 341°32.5	18.2 17.5	235°26.3 249°54.3	9.0' 8.9'	23°10.6 23°18.1	7.5' 7.4'	56.8' 56.8'
12	356°32.4	\$16°16.7	264°22.2	8.8'	N23°25.5	7.3'	56.8'
13	11°32.3 26°32.3	16.0 15.2	278° 50.1 293° 17.8	8.7'	23°32.7 23°39.9	7.2' 7.0'	56.9'
14 15	20 32.3 41°32.2	15.2	293 17.8 307°45.4	8.6' 8.5'	23 39.9 23°46.9	7.0 6.9'	56.9' 57.0'
16	56°32.2	13.7	322° 12.9	8.4'	23°53.8	6.8'	57.0'
17	71°32.1	13.0	336°40.3	8.3'	24°00.6	6.7'	57.0'
18 19	86°32.0 101°32.0	\$16° 12.2 11.5	351°07.5 5°34.7	8.2' 8.1'	N24°07.3 24°13.8	6.5' 6.4'	57.1' 57.1'
20	116°31.9	10.7	20°01.8	8.0'	24°20.2		57.1
21	131°31.9	• • 10.0	34°28.7	7.8'	24°26.5	6.2'	57.2'
22 23	146°31.8 161°31.8	09.3 08.5	48° 55.6 63° 22.3	7.7' 7.6'	24°32.7 24°38.7	6.0' 5.9'	57.2' 57.3'
25	SD = 16.2'	d = -0.7'			0 = 15.4'	3.9	31.5
Sat 0	GHA 176°31.7	Dec \$16°07.7	GHA 77° 49.0	u 7.5'	Dec N24°44.6	<i>d</i> 5.8'	HP 57.3'
1	170 31.7 191°31.6	07.0	92° 15.5	7.5 7.4'	24°50.4	5.6'	57.3'
2	206°31.6	06.2	106°41.9	7.3'	24°56.0	5.5'	57.4'
3 4	221°31.5 236°31.5	· · 05.5 04.7	121°08.2 135°34.4	7.2' 7.1'	25°01.5 25°06.8	5.3' 5.2'	57.4' 57.5'
4 5	230°31.5 251°31.4	04.7 04.0	135° 34.4 150° 00.5	7.1	25°12.0	5.2 5.1'	57.5' 57.5'
6	266°31.4	S16°03.2	164°26.5	6.9'	N25°17.1	4.9'	57.5'
7	281°31.3 296°31.3	02.5 01.7	178° 52.4 193° 18.2	6.8' 6.7'	25°22.0 25°26.8	4.8' 4.6'	57.6'
8 9	296°31.3 311°31.2	01.0	193° 18.2 207° 43.9	6.6'	25°26.8 25°31.4	4.6° 4.5°	57.6' 57.7'
10	326°31.2	$16^{\circ}00.2$	222°09.5	6.5'	25°35.9	4.3'	57.7'
11	341°31.1	15°59.5	236° 35.0	6.4'	25°40.2	4.2'	57.7'
12 13	356°31.1 11°31.0	\$15°58.7 57.9	251°00.4 265°25.8	6.3' 6.2'	N25°44.4 25°48.5	4.0' 3.9'	57.8' 57.8'
14	26°31.0	57.2	279°51.0	6.1'	25°52.3	3.7'	57.9'
15	41°30.9	• • 56.4	294°16.1	6.0'	25°56.1	3.6'	57.9'
16 17	56°30.8 71°30.8	55.7 54.9	308°41.1 323°06.0	5.9' 5.8'	25°59.6 26°03.1	3.4' 3.3'	57.9' 58.0'
18	86°30.7	\$15°54.2	337°30.9	5.8'	N26°06.3	3.1'	58.0'
19	101°30.7	53.4	351°55.6	5.7'	26°09.4	2.9'	58.1'
20 21	116°30.7 131°30.6	52.6 •• 51.9	6°20.3 20°44.9	5.6' 5.5'	26°12.4 26°15.2	2.8' 2.6'	58.1' 58.1'
21	131°30.6 146°30.6	51.1	20°44.9 35°09.4	5.5° 5.4'	26° 15.2 26° 17.8	2.5	58.1° 58.2'
23	161°30.5	50.3	49° 33.8	5.3'	26°20.3	2.3'	58.2'
	SD = 16.2'	d = -0.8'		SE	O = 15.6'		

Lat.	Twil	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
S 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
S 60°	01:31	03:07	04:03	20:23	21:18	22:50

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° 0°	11:18	12:06	12:59		00:14	01:09
	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° 40°	12:34	13:38	14:43	22:50	23:32	
40° 45°	12:47	13:54 14:12	15:00	22:36 22:20	23:16 22:56	23:44
	13:02		15:21			-
S 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
S 60°	14:19	15:53	17:23	20:59	21:13	21:41

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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.)

Sun 0 1	CIIA											
0		GHA	Dec	GHA	Dec	GHA	Doo	GHA	Doo		SHA	Dos
	GHA 135°40.2	136° 58.8	S01°09.8	166°46.3	\$13°45.0	318°16.0	Dec N02°40.7	113°44.8	Dec N06°37.5			Dec
	150°42.7	150 56.6 151°58.6	08.5	181°46.9	44.3	333°18.6	40.8	113 44.6 128°47.1	37.6	Alpheratz	$357^{\circ}32.4$	29°14.9
2	165°45.2	166° 58.5	07.2	196°47.4	43.6	348°21.3	40.0	143°49.4	37.7	Ankaa	353°05.0	-42°09.3
3	180°47.6	181°58.3	05.9	211°48.0	• • 43.0	3°23.9	• • 40.9	158°51.7	• • 37.7	Schedar	349°28.4	56°41.7
4	195°50.1	196°58.1	04.6	226°48.5	42.3	18°26.5	41.0	173°54.0	37.8	Diphda	348°45.0	-17°50.0
5	210°52.6	211°58.0	03.2	241°49.1	41.6	33°29.2	41.1	188° 56.3	37.9	Achernar	335°18.6	-57°05.9
6	225°55.0	226°57.8	S01°01.9	256°49.6	S13°40.9	48°31.8	N02°41.2	203°58.6	N06°38.0	Hamal Polaris	327°48.4 312°38.2	23°35.8 89°23.2
7	240°57.5	241°57.6	01°00.6	271°50.2	40.2	63°34.4	41.3	219°00.9	38.1	Acamar	315°09.9	-40°11.8
8	256°00.0	256° 57.4	00°59.3	286°50.7	39.5	78°37.1	41.4	234°03.2	38.1	Menkar	314°03.5	4°11.9
9	271°02.4	271°57.3	• • 58.0	301°51.3	• • 38.9	93°39.7	• • 41.4	249°05.5	• • 38.2	Mirfak	308°24.5	49°57.8
10	286°04.9	286° 57.1	56.7	316°51.9	38.2	108°42.3	41.5	264°07.8	38.3	Aldebaran	290°36.5	16°33.9
11 12	301°07.3 316°09.8	301°56.9 316°56.8	55.4 \$00°54.1	331°52.4 346°53.0	37.5 \$13°36.8	123°45.0 138°47.6	41.6 N02°41.7	279°10.0 294°12.3	38.4 N06°38.4	Rigel	$281^{\circ}01.2$	-8°10.3
13	331° 12.3	331° 56.6	52.8	1°53.5	36.1	153°50.3	41.8	309°14.6	38.5	Capella	$280^{\circ}17.8$	46°01.6
14	346°14.7	346°56.4	51.5	16°54.1	35.4	168°52.9	41.9	324°16.9	38.6	Bellatrix	278°19.9	6°22.4
15	1°17.2	1°56.3	50.2	31°54.6	• • 34.8	183°55.5	42.0	339° 19.2	38.7	Elnath	277°58.4	28°37.8
16	16°19.7	16°56.1	48.8	46°55.2	34.1	198°58.2	42.0	354°21.5	38.8	Alnilam	275°34.9	-1°11.2
17	31°22.1	31°55.9	47.5	61°55.7	33.4	214°00.8	42.1	9°23.8	38.8	Betelgeuse	270°49.1	7°24.6
18	46°24.6	46°55.8	S00°46.2	76°56.3	S13°32.7	229°03.4	N02°42.2	24°26.1	N06°38.9	Canopus Sirius	263°50.8 258°23.7	-52°42.9 -16°45.5
19	61°27.1	61°55.6	44.9	91°56.9	32.0	$244^{\circ}06.1$	42.3	39°28.4	39.0	Adhara	255°03.5	-10°43.3 -29°00.8
20	76°29.5	76°55.4	43.6	106°57.4	31.3	259°08.7	42.4	54°30.7	39.1	Procyon	244°47.9	5°09.0
21	91°32.0	91°55.3	• • 42.3	121°58.0	• • 30.6	274°11.4	• • 42.5	69°33.0	• • 39.2	Pollux	243°13.9	27°57.3
22	106°34.5	106° 55.1	41.0	136°58.5	29.9	289°14.0	42.6	84°35.2	39.2	Avior	234°13.0	-59°36.1
23	121°36.9	121°54.9	39.7	151°59.1	29.3	304°16.6	42.6	99°37.5	39.3	Suhail	222°44.0	-43°32.9
Mer.p	ass. 14:55	ν -0.2′ d-1	3′ m-4.14	ν 0.6′ d-0	.7′ m1.10	ν 2.6′ d0.	1′ m-2.37	ν 2.3 $^{\prime}$ d0	.1' m 0.56	Miaplacidus	221°36.7	-69°50.0
										Alphard	217°44.9	-8°47.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.4 193°37.4	11°49.6
0	136°39.4	$136^{\circ}54.8$	500°38.4	166°59.6	S13°28.6	$319^{\circ}19.3$	N02°42.7	114°39.8	N06°39.4	Dubhe Denebola	193 37.4 182°22.1	61°35.6 14°24.6
1	151°41.8	151°54.6	37.1	182°00.2	27.9	$334^{\circ}21.9$	42.8	$129^{\circ}42.1$	39.5	Gienah	175°40.7	-17°42.0
2	166°44.3	166°54.4	35.8	197°00.7	27.2	349°24.6	42.9	144°44.4	39.6		172°56.7	-63°15.2
3	181°46.8	181°54.3	• • 34.4	212°01.3	• • 26.5	4°27.2	• • 43.0	159°46.7	• • 39.6	Gacrux		-57°16.2
4	196°49.2	196°54.1	33.1	227°01.9	25.8	19°29.8	43.1	174°49.0	39.7	Alioth	$166^{\circ}10.5$	55°48.1
5 6	211°51.7 226°54.2	211°53.9 226°53.8	31.8 \$00°30.5	242°02.4 257°03.0	25.1 \$13°24.4	34°32.5 49°35.1	43.2 N02°43.3	189°51.3 204°53.6	39.8 N06°39.9	Spica	$158^{\circ}19.5$	-11°18.6
7	241°56.6	241°53.6	29.2	272°03.5	23.8	64°37.8	43.3	219°55.8	40.0	Alkaid	152°49.9	49°10.0
8	256°59.1	256°53.5	27.9	287°04.1	23.1	79°40.4	43.4	234°58.1	40.0	Hadar	148°32.1	-60°30.3
9	272°01.6	271°53.3	26.6	302°04.7	• • 22.4	94°43.1	• • 43.5	250°00.4	• • 40.1	1	147°54.5	-36°30.4
10	287°04.0	$286^{\circ}53.1$	25.3	$317^{\circ}05.2$	21.7	109°45.7	43.6	265°02.7	40.2	Arcturus Rigil Kent.	145°45.5 139°36.6	19°01.9 -60°56.9
11	$302^{\circ}06.5$	301°53.0	24.0	332°05.8	21.0	124°48.3	43.7	280°05.0	40.3	Kochab	137°20.0	74°02.0
12	317°09.0	316°52.8	S00°22.7	347°06.3	S13°20.3	139°51.0	N02°43.8	295°07.3	N06°40.4	Zuben'ubi	136°53.2	-16°09.5
13	332°11.4	331°52.6	21.4	2°06.9	19.6	154°53.6	43.9	310°09.6	40.4	Alphecca	126°01.7	26°36.9
14	347°13.9	346°52.5	20.0	17°07.5	18.9	169°56.3	44.0	325°11.9	40.5	Antares	$112^{\circ}12.8$	-26°29.6
15 16	2°16.3 17°18.8	1°52.3 16°52.2	· · 18.7 17.4	32°08.0 47°08.6	· · 18.2 17.6	184°58.9 200°01.6	· · 44.1 44.1	340°14.1 355°16.4	· · 40.6 40.7	Atria	107°05.0	-69°04.4
17	32°21.3	31°52.0	16.1	62°09.1	16.9	215°04.2	44.2	10°18.7	40.8	Sabik	102°00.0	-15°45.6
18	47°23.7	46°51.8	S00°14.8	77°09.7	S13°16.2	230°06.9	N02°44.3	25°21.0	N06°40.8	Shaula	96°07.2	-37°07.3
19	62°26.2	61°51.7	13.5	92°10.3	15.5	245°09.5	44.4	40°23.3	40.9	Rasalhague	95°56.4 90°41.4	12°32.3 51°28.9
20	77°28.7	$76^{\circ}51.5$	12.2	$107^{\circ}10.8$	14.8	$260^{\circ}12.1$	44.5	55°25.6	41.0	Eltanin Kaus Aust.	83°29.5	-34°22.1
21	92°31.1	91°51.4	• • 10.9	122°11.4	•• 14.1	275°14.8	• • 44.6	$70^{\circ}27.9$	• • 41.1	Vega	80°31.8	38°48.4
22	107°33.6	106°51.2	09.6	137°11.9	13.4	290°17.4	44.7	85°30.2	41.2	Nunki	75°44.9	-26°15.6
23	122°36.1	121°51.0	08.3	152°12.5	12.7	305°20.1	44.8	100°32.4	41.2	Altair	61°57.8	8°56.5
Mer.p	ass. 14:51	ν -0.2' d-1	3′ m-4.14	ν 0.6′ d-0	.7' m1.10	ν 2.6′ d0.	1′ m-2.37	ν 2.3′ d0	.1' m 0.56	Peacock	53°02.4	-56°38.6
										Deneb	49°24.5	45°22.8
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.6	10°00.3
0	137°38.5	136° 50.9	S00°07.0	167°13.1	\$13°12.0	320°22.7	N02°44.8	115°34.7	N06°41.3	Al Na'ir Fomalhaut	27°30.2	-46°49.5 -29°28.5
1	152°41.0	151°50.7	05.6	182°13.6	11.3	335°25.4	44.9	130°37.0	41.4	Scheat	15° 12.1 13° 43.0	-29°28.5 28°14.2
2	167°43.5	166°50.6	04.3	197°14.2	10.6	350°28.0	45.0	145°39.3	41.5	Markab	13° 27.6	26 14.2 15°21.4
3	182°45.9	181°50.4	• • 03.0	212°14.7	• • 09.9	5°30.7	• • 45.1	160°41.6	• • 41.6			
4	197°48.4	196°50.2	01.7	227°15.3	09.2	20°33.3	45.2	175°43.9	41.6	Feb 06 Sun	SHA	Mer.pass
5	212°50.8	211°50.1	S00°00.4	242°15.9	08.6	35°36.0	45.3	190°46.2	41.7	Venus	1°18.6	14:52
6	227°53.3	226°49.9	N00°00.9	257°16.4	\$13°07.9	50°38.6	N02°45.4		N06°41.8	Mars Jupiter	31°06.1 182°35.7	12:52 02:46
7 8	242°55.8 257°58.2	241°49.8 256°49.6	02.2 03.5	272°17.0 287°17.6	07.2 06.5	65°41.3 80°43.9	45.5 45.6	220°50.7 235°53.0	41.9 42.0	Saturn	338°04.6	16:23
9	273°00.7	271°49.5	•• 04.8	302°18.1	• • 05.8	95°46.6	• • 45.7	250°55.3	• • 42.0			
10	288°03.2	286° 49.3	06.1	317°18.7	05.1	110°49.2	45.7	265°57.6	42.1	Feb 07 Mon	SHA	Mer.pass
11	$303^{\circ}05.6$	$301^{\circ}49.1$	07.4	$332^{\circ}19.2$	04.4	$125^{\circ}51.9$	45.8	280°59.9	42.2	Venus Mars	0°15.4 30°20.3	14:53 12:52
12	318°08.1	316°49.0	N00°08.8	347°19.8	S13°03.7	140°54.5	N02°45.9	296°02.2	N06°42.3		30 20.3 182°39.9	02:42
13	333°10.6	331°48.8	10.1	2°20.4	03.0	155°57.2	46.0	311°04.4	42.4	Saturn	338°00.4	16:19
14	348°13.0	346°48.7	11.4	17°20.9	02.3	170°59.8	46.1	326°06.7	42.5			
15 16	3°15.5 18°18.0	1°48.5 16°48.4	· · 12.7 14.0	32°21.5 47°22.1	· · 01.6 00.9	186°02.5 201°05.1	· · 46.2 46.3	341°09.0 356°11.3	•• 42.5 42.6	Feb 08 Tue	SHA 250° 12 4	Mer.pass
17	33°20.4	31°48.2	15.3	47 22.1 62°22.6	13°00.2	201 05.1 216°07.8	46.3 46.4	350 11.3 11°13.6	42.0 42.7	Venus Mars	359° 12.4 29° 34.5	14:53 12:51
18	48°22.9	46°48.1	N00° 16.6	77°23.2	\$12°59.5	231°10.4	N02°46.5	26° 15.9	N06°42.8		29 34.5 182°44.2	02:38
19	63°25.3	61°47.9	17.9	92°23.8	58.8	246°13.1	46.6	41°18.1	42.9	Saturn		16:15
20	78°27.8	76° 47.8	19.2	$107^{\circ}24.3$	58.1	$261^{\circ}15.7$	46.7	$56^{\circ}20.4$	42.9			
21	93°30.3	91°47.6	• • 20.5	122°24.9	• • 57.4	276°18.4	• • 46.7	71°22.7	• • 43.0	Horizont	al parallax	0.1
22	108°32.7	106° 47.4	21.9	137°25.5	56.7	291°21.0	46.8	86°25.0	43.1		Venus: Mars:	0.1 0.1
23	123°35.2	121°47.3	23.2	152°26.0	56.0	306°23.7	46.9	101°27.3	43.2		111013.	V.1
Mer.n	ass. 14:47	ν -0.2' d-1	3′ m-4.15	ν 0.6′ d-0	.7′ m1.10	$\nu 2.6' \ d0.$	1′ m-2.38	ν 2.3′ d0	.1' m 0.57			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.5	S15°49.6	63°58.1	5.3'	N26°22.6	2.1'	58.3'
1	191°30.4	48.8	78°22.4	5.2'	26°24.7	2.0'	58.3'
2	206°30.4	48.1	92°46.6	5.1'	26°26.6	1.8'	58.3'
3	221°30.3	• • 47.3	107°10.6	5.0'	26°28.4	1.6'	58.4'
4	236°30.3	46.5	121°34.7	4.9'	26°30.1	1.5'	58.4'
5	251°30.2	45.8	135°58.6	4.9'	26°31.5	1.3'	58.5'
6 7	266°30.2 281°30.1	\$15°45.0 44.2	150°22.5 164°46.3	4.8' 4.7'	N26° 32.8 26° 33.9	1.1' 0.9'	58.5' 58.5'
8	296°30.1	43.5	179°10.0	4.7'	26°34.9	0.8	58.6'
9	311°30.0	42.7	193°33.7	4.6'	26°35.6	0.6'	58.6'
10	326°30.0	41.9	207°57.3	4.5'	26°36.2	0.4'	58.7'
11	341°30.0	41.2	222°20.8	4.5'	26°36.7	0.2'	58.7'
12	356°29.9	S15°40.4	236°44.3	4.4'	N26°36.9	0.1'	58.7'
13	11°29.9	39.6	251°07.8	4.4'	26°37.0	-0.1'	58.8'
14 15	26°29.8 41°29.8	38.9 · · 38.1	265°31.1 279°54.4	4.3' 4.3'	26°36.9 26°36.6	-0.3' -0.5'	58.8' 58.9'
16	56°29.7	37.3	279 54.4 294°17.7	4.3 4.2'	26°36.1	-0.5 -0.6'	58.9'
17	71°29.7	36.6	308°40.9	4.2'	26° 35.5	-0.8'	58.9'
18	86°29.7	S15°35.8	323°04.1	4.1'	N26° 34.6	-1.0'	59.0'
19	101°29.6	35.0	337°27.2	4.1'	26° 33.6	-1.2'	59.0'
20	116°29.6	34.2	351°50.3	4.0'	26°32.4	-1.4'	59.1'
21	131°29.5	• • 33.5	6°13.3	4.0'	26°31.0	-1.6'	59.1'
22	146°29.5	32.7	20°36.3	4.0'	26°29.5	-1.7'	59.1'
23	161°29.5	31.9	34°59.2	3.9'	26°27.7	-1.9'	59.2'
	SD = 16.2'	d = -0.8'		S	D = 15.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	176°29.4	\$15°31.2	49°22.2	3.9'	N26°25.8	-2.1'	59.2'
1	191°29.4	30.4	63°45.1	3.9'	26°23.7	-2.3'	59.3'
2	206°29.3	29.6	78°07.9	3.8'	26°21.4	-2.5'	59.3'
3	221°29.3	• • 28.8	92°30.7	3.8'	26°18.9	-2.7'	59.3'
4	236°29.3	28.1	106°53.5	3.8'	26°16.3	-2.8'	59.4'
5 6	251°29.2 266°29.2	27.3 \$15°26.5	121°16.3 135°39.1	3.8' 3.7'	26°13.4 N26°10.4	-3.0' -3.2'	59.4' 59.5'
7	266°29.2 281°29.2	25.7	135°39.1 150°01.8	3.7'	26° 07.2	-3.2' -3.4'	59.5'
8	296°29.1	24.9	164°24.5	3.7'	26°07.2	-3.4 -3.6'	59.5'
9	311°29.1	24.2	178°47.3	3.7'	26°00.2	-3.8'	59.6'
10	326°29.0	23.4	193°10.0	3.7'	25°56.4	-4.0'	59.6'
11	341°29.0	22.6	207°32.6	3.7'	25°52.4	-4.2'	59.7'
12	356°29.0	S15°21.8	221°55.3	3.7'	N25°48.3	-4.3'	59.7'
13	11°28.9	21.1	236°18.0	3.7'	25°43.9	-4.5'	59.7'
14 15	26°28.9 41°28.9	20.3	250°40.7 265°03.3	3.7' 3.7'	25°39.4 25°34.7	-4.7' -4.9'	59.8' 59.8'
15 16	41 28.9 56°28.8	18.7	205 03.3 279°26.0	3.7'	25 34.7 25°29.8	-4.9 -5.1'	59.8'
17	71°28.8	17.9	293°48.7	3.7'	25°24.7	-5.3'	59.9'
18	86°28.8	S 15°17.2	308°11.4	3.7'	N25°19.5	-5.4'	59.9'
19	101°28.7	16.4	322°34.1	3.7'	25°14.0	-5.6'	59.9'
20	116°28.7	15.6	336°56.8	3.7'	25°08.4	-5.8'	60.0'
21	131°28.7	• • 14.8	351°19.5	3.7'	25°02.6	-6.0'	60.0'
22 23	146°28.6 161°28.6	14.0 13.2	5°42.2 20°05.0	3.7' 3.8'	24°56.6 24°50.4	-6.2' -6.4'	60.0' 60.1'
23			20 05.0			-0.4	00.1
	SD = 16.2'	d = -0.8'			D = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.6	S 15°12.5	34°27.7	3.8'	N24°44.0	-6.5'	60.1'
1	191°28.5	11.7	48°50.5	3.8'	24°37.5	-6.7'	60.2'
2	206°28.5	10.9	63°13.3	3.8'	24°30.8	-6.9'	60.2'
3 4	221°28.5 236°28.5	· · 10.1 09.3	77°36.1 91°59.0	3.9' 3.9'	24°23.8 24°16.8	-7.1' -7.3'	60.2' 60.3'
4 5	250 28.5 251°28.4	09.3	91 59.0 106°21.9	3.9'	24 10.8 24°09.5	-7.4'	60.3
6	266°28.4	\$15°07.7	120°44.8	4.0'	N24°02.0	-7.6'	60.3
7	281°28.4	07.0	135°07.8	4.0'	23°54.4	-7.8'	60.3'
8	296°28.3	06.2	149°30.7	4.0'	23°46.6	-8.0'	60.4'
9	311°28.3	•• 05.4	163°53.8	4.1'	23°38.6	-8.2'	60.4'
10	326°28.3	04.6	178°16.8	4.1'	23°30.5	-8.3'	60.4'
11 12	341°28.3 356°28.2	03.8 \$15°03.0	192°39.9 207°03.1	4.1' 4.2'	23°22.2 N23°13.7	-8.5' -8.7'	60.5' 60.5'
13	356 28.2 11°28.2	02.2	207°03.1 221°26.3	4.2'	N23° 13.7 23° 05.0	-8. <i>1</i> '	60.5
14	26°28.2	02.2	221 20.3 235°49.5	4.3'	23 05.0 22°56.2	-o.o -9.0'	60.6
15	41°28.2	15°00.6	250°12.8	4.3'	22°47.2	-9.2	60.6
16	56°28.1	14°59.9	$264^{\circ}36.1$	4.4'	22°38.0	-9.3'	60.6'
17	71°28.1	59.1	278°59.4	4.4'	22°28.6	-9.5'	60.6'
18	86°28.1	\$14°58.3	293°22.9	4.5'	N22°19.1	-9.7'	60.7'
19	101°28.1	57.5	307°46.3	4.5'	22°09.4	-9.8'	60.7'
20 21	116°28.0 131°28.0	56.7 •• 55.9	322°09.9 336°33.4	4.6' 4.6'	21°59.6 21°49.6	-10.0' -10.2'	60.7' 60.8'
22	131°28.0 146°28.0	55.1	350°57.1	4.6 4.7'	21°49.6 21°39.4	-10.2 -10.3'	60.8
23	161°28.0	54.3	5°20.8	4.8'	21°29.1	-10.5'	60.8
	SD = 16.2'	d = -0.8'			D = 16.4'		
	JD — 10.2	u — -0.0			D — 10.4		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Junioci	Civil	Naut.
N 72°	06:49	08:13	09:46	14:43	16:16	17:41
N 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
N 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
S 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
S 50°	03:27	04:14	04:51	19:36	20:12	20:59
52°	03:15	04:06	04:45	19:42	20:21	21:11
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
S 60°	01:51	03:17	04:12	20:15	21:08	22:32

Lat.		Moonris	е		Moonset	t
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 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
N 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
S 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
S 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
S 60°	18:32	19:11	19:31	22:38		00:09

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
oved 0	138°37.7	136°47.1	N00°24.5	167° 26.6	\$12°55.3	321°26.3	N02°47.0	116°29.6	N06°43.3			
1	153°40.1	150°47.1 151°47.0	25.8	182° 27.1	54.6	336°29.0	47.1	131°31.8	43.3	Alpheratz	357°32.4	29°14.9
2	168°42.6	166°46.8	27.1	197° 27.7	53.9	351°31.6	47.2	146°34.1	43.4	Ankaa	353°05.0	-42°09.3
3	183°45.1	181°46.7	28.4	212°28.3	53.2	6°34.3	• • 47.3	161°36.4	• • 43.5	Schedar	349°28.4	56°41.7
4	198°47.5	196°46.5	29.7	227° 28.8	52.5	21°36.9	47.4	176°38.7	43.6	Diphda	348°45.0	-17°50.0
5	213°50.0	211°46.4	31.0	242°29.4	51.8	36°39.6	47.5	191°41.0	43.7	Achernar	335°18.6	-57°05.9
6	228°52.5	226°46.2	N00°32.3	257°30.0	S12°51.1	51°42.2	N02°47.6	206°43.3	N06°43.8	Hamal	327°48.4	23°35.8
7	243°54.9	241°46.1	33.6	272°30.5	50.4	66°44.9	47.7	221°45.5	43.8	Polaris	312°39.6	89°23.2
8	258°57.4	256°45.9	34.9	287°31.1	49.7	81°47.6	47.8	236°47.8	43.9	Acamar	315°09.9	-40°11.8
9	273°59.8	271°45.8	36.3	302°31.7	• • 49.0	96°50.2	• • 47.9	251°50.1	• • 44.0	Menkar	314°03.5	4°12.0
10	289°02.3	286° 45.6	37.6	317°32.2	48.3	111°52.9	47.9	266°52.4	44.1	Mirfak	308°24.5	49°57.8
11	304°04.8	301°45.5	38.9	332°32.8	47.6	126°55.5	48.0	281°54.7	44.2	Aldebaran	290°36.6	16°33.9
12	319°07.2	316° 45.3	N00°40.2	347°33.4	S12°46.9	141°58.2	N02°48.1	296°56.9	N06°44.2	Rigel	281°01.2	-8°10.3
13	334°09.7	331°45.2	41.5	2°34.0	46.2	157°00.8	48.2	311°59.2	44.3	Capella	280°17.9	46°01.6
14	349°12.2	346°45.0	42.8	17°34.5	45.5	172°03.5	48.3	327°01.5	44.4	Bellatrix	278°20.0	6°22.4
15	4°14.6	1°44.9	44.1	32°35.1	• • 44.8	187°06.1	• • 48.4	342°03.8	• • 44.5	Elnath	277°58.4	28°37.8
16	19°17.1	16°44.7	45.4	47°35.7	44.1	202°08.8	48.5	357°06.1	44.6	Alnilam	275°34.9	-1°11.2
17	34°19.6	31°44.6	46.7	62°36.2	43.4	217°11.5	48.6	12°08.4	44.7	Betelgeuse	270°49.1	7°24.6
18	49°22.0	46°44.4	N00°48.0	77°36.8	S12°42.7	232°14.1	N02°48.7	27°10.6	N06°44.7	Canopus	263°50.9	-52°42.9
19	64°24.5	61°44.3	49.3	92°37.4	42.0	247°16.8	48.8	42°12.9	44.8	Sirius	258°23.7	-16°45.5
20	79°26.9	76°44.1	50.7	107°37.9	41.3	262°19.4	48.9	57°15.2	44.9	Adhara	255°03.5	-29°00.8
21	94°29.4	91°44.0	52.0	122°38.5	40.6	277°22.1	• • 49.0	72°17.5	• • 45.0	Procyon	244°47.9	5°09.0
22	109°31.9	106° 43.8	53.3	137°39.1	39.9	292°24.7	49.1	87°19.8	45.1	Pollux	243°13.9	27°57.3
23	124°34.3	121°43.7	54.6	152°39.6	39.2	307°27.4	49.2	102°22.0	45.2	Avior	234°13.0	-59°36.1
									_	Suhail	222°44.0	-43°32.9
ivler.p	ass. 14:43	ν -0.2' d1	.3′ m-4.15	ν 0.6′ d -0	.7′ m1.09	ν 2.1' d0.	.1′ m-2.38	ν 2.3′ d0	.1′ m0.57	Miaplacidus	221°36.7	-69°50.1
										Alphard	217°44.9	-8°47.0
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.4	11°49.5
0	139°36.8	136° 43.5	N00°55.9	167° 40.2	S12°38.5	322°30.1	N02°49.3	117°24.3	N06°45.2	Dubhe	193°37.4	61°35.7
1	154°39.3	151°43.4	57.2	182°40.8	37.8	337°32.7	49.3	132°26.6	45.3	Denebola	182°22.1	14°24.6
2	169°41.7	166°43.3	58.5	197°41.4	37.1	352°35.4	49.4	147°28.9	45.4	Gienah	175°40.7	-17°42.0 -63°15.2
3	184°44.2	181°43.1	00°59.8	212°41.9	• • 36.4	7°38.0	• • 49.5	162°31.2	• • 45.5		172°56.7	
4	199°46.7	196°43.0	$01^{\circ}01.1$	227° 42.5	35.7	22°40.7	49.6	177°33.4	45.6		171°48.3	-57°16.2
5	214°49.1	211°42.8	02.4	242°43.1	35.0	37°43.4	49.7	192°35.7	45.7	Alioth	166°10.5 158°19.4	55°48.1 -11°18.6
6	229°51.6	226° 42.7	N01°03.7	257° 43.6	S12°34.3	52°46.0	N02°49.8	207°38.0	N06°45.7	Spica	158 19.4 152°49.9	-11 18.6 49°10.0
7	244°54.1	241°42.5	05.0	272°44.2	33.6	67°48.7	49.9	222°40.3	45.8	Alkaid Hadar	152 49.9 148°32.1	-60°30.3
8	259°56.5	256° 42.4	06.4	287°44.8	32.9	82°51.3	50.0	237°42.5	45.9		146 32.1 147°54.4	-36°30.4
9	274°59.0	271°42.2	• • 07.7	302°45.3	• • 32.2	97°54.0	• • 50.1	252°44.8	• • 46.0	Arcturus	147 54.4 145°45.5	19°01.9
10	290°01.4	$286^{\circ}42.1$	09.0	317° 45.9	31.5	112°56.7	50.2	$267^{\circ}47.1$	46.1	Rigil Kent.	145 45.5 139°36.6	-60°56.9
11	305°03.9	301°41.9	10.3	332°46.5	30.8	127°59.3	50.3	282°49.4	46.2	Kochab	137°19.9	74°02.0
12	320°06.4	316°41.8	N01°11.6	347°47.1	S12°30.1	143°02.0	N02°50.4	297°51.7	N06°46.2	Zuben'ubi	136°53.1	-16°09.6
13	335°08.8	331°41.7	12.9	2°47.6	29.4	158°04.6	50.5	312°53.9	46.3	Alphecca	126°01.6	26°36.9
14	350°11.3	$346^{\circ}41.5$	14.2	17°48.2	28.7	173°07.3	50.6	327°56.2	46.4	Antares	112° 12.8	-26°29.6
15	5°13.8	1°41.4	• • 15.5	32°48.8	• • 27.9	$188^{\circ}10.0$	• • 50.7	342°58.5	• • 46.5	Antares	112 12.8 107°04.9	-20°29.0 -69°04.4
16	20°16.2	$16^{\circ}41.2$	16.8	47° 49.4	27.2	203°12.6	50.8	358°00.8	46.6	Sabik	102°00.0	-15°45.6
17	35°18.7	$31^{\circ}41.1$	18.1	62°49.9	26.5	218°15.3	50.9	13°03.0	46.7	Shaula	96°07.1	-37°07.3
18	50°21.2	46°40.9	N01°19.4	77° 50.5	S12°25.8	233°18.0	N02°51.0	28°05.3	N06°46.7	Rasalhague	95°56.4	12°32.2
19	65°23.6	61°40.8	20.7	92°51.1	25.1	248°20.6	51.1	43°07.6	46.8	Eltanin	90°41.3	51°28.9
20	80°26.1	76° 40.7	22.0	107°51.6	24.4	263°23.3	51.2	58°09.9	46.9	Kaus Aust.	83°29.4	-34°22.1
21	95°28.6	91°40.5	• • 23.4	122°52.2	• • 23.7	278°25.9	• • 51.3	73°12.2	• • 47.0	Vega	80°31.8	38°48.4
22	110°31.0	106°40.4	24.7	137°52.8	23.0	293°28.6	51.3	88°14.4	47.1	Nunki	75°44.9	-26°15.6
23	125°33.5	121°40.2	26.0	152°53.4	22.3	308°31.3	51.4	103°16.7	47.2	Altair	61°57.8	8°56.5
Mern	ass. 14:39	v-0.1′ d1	.3′ m-4.16	ν0 6' d-0	.7′ m1.09	1/2 7' d0	.1′ m-2.39	1/2 3' d0	.1′ m0.57	Peacock	53°02.4	-56°38.5
- iviei.p		ν U.1 UI	.5 111-7.10	ν υ.υ · u-υ	., 1111.09	ν2.1 u0.	111-4.33	- Z.J UU		Deneb	49°24.5	45°22.8
										Enif	33°36.6	10°00.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.5
0	140°35.9	136° 40.1	N01°27.3	167°53.9	S12°21.6	323°33.9	N02°51.5	118°19.0	N06°47.2	Fomalhaut	15°12.1	-29°28.4
1	155°38.4	151°39.9	28.6	182° 54.5	20.9	338°36.6	51.6	133°21.3	47.3	Scheat	13°43.0	28°14.2
2	170°40.9	166° 39.8	29.9	197°55.1	20.2	353°39.3	51.7	148°23.5	47.4	Markab	13°27.6	15°21.4
3	185°43.3	181°39.7	· · 31.2	212°55.7	• • 19.5	8°41.9	• • 51.8	163°25.8	• • 47.5			
4	200°45.8	196°39.5	32.5	227°56.2	18.7	23°44.6	51.9	178°28.1	47.6	Feb 09 Wed	SHA	Mer.pass
5	215°48.3	211°39.4	33.8	242°56.8	18.0	38°47.3	52.0	193°30.4	47.7	Venus		14:53
6	230°50.7	226° 39.2	N01°35.1	257°57.4	S12°17.3	53°49.9	N02°52.1	208°32.6	N06°47.7	Mars	28°48.9	12:50
7	245°53.2	241°39.1	36.4	272°58.0	16.6	68°52.6	52.2	223°34.9	47.8		182°48.7	02:34
8	260°55.7	256°39.0	37.7	287°58.5	15.9	83°55.3	52.3	238°37.2	47.9	Saturn	337°51.9	16:12
9	275°58.1	271°38.8	• • 39.0	302°59.1	. 15.2	98°57.9	• • 52.4	253°39.5	• • 48.0	Feb 10 Thu	SHA	Mer.pass
10	291°00.6	286°38.7	40.3	317°59.7	14.5	114°00.6	52.5	268°41.7	48.1	Venus	357°06.7	14:53
11	306°03.0	301°38.5	41.7	333°00.3	13.8	129°03.3	52.6	283°44.0	48.2	Mars	28°03.4	12:49
12	321°05.5	316°38.4	N01°43.0	348°00.8	S12°13.1	144°05.9	N02°52.7	298°46.3	N06°48.2		182°53.3	02:30
13	336°08.0	331°38.3	44.3	3°01.4	12.4	159°08.6	52.8	313°48.6	48.3	Saturn	337°47.5	16:08
14	351°10.4	346°38.1	45.6	18°02.0	11.7	174°11.3	52.9	328°50.8	48.4			
15	6°12.9	1°38.0	• • 46.9	33°02.6	• • 10.9	189°13.9	• • 53.0	343°53.1	• • 48.5	Feb 11 Fri	SHA	Mer.pass
16	21°15.4	16°37.9	48.2	48°03.2	10.2	204°16.6	53.1	358°55.4	48.6	Venus		14:53
17	36°17.8	31°37.7	49.5	63°03.7	09.5	219°19.3	53.2	13°57.7	48.7	Mars	27°18.0	12:48
18	51°20.3	46°37.6	N01°50.8	78°04.3	\$12°08.8	234°21.9	N02°53.3	28°59.9	N06°48.8		182°58.0	02:25
19	66°22.8	61°37.4	52.1	93°04.9	08.1	249°24.6	53.4	44°02.2	48.8	Saturn	337°43.0	16:04
20	81°25.2	76°37.3	53.4	108°05.5	07.4	264°27.3	53.5	59°04.5	48.9 •• 49.0	Horizon	al parallax	
21	96°27.7	91°37.2	· · 54.7	123°06.0	· · 06.7	279°29.9	· · 53.6	74°06.8		1.51120111	Venus:	0.1
22	111°30.2	106°37.0	56.0	138°06.6	06.0	294°32.6	53.7	89°09.0	49.1		Mars:	0.1
23	126°32.6	121°36.9	57.3	153°07.2	05.2	309°35.3	53.8	104°11.3	49.2		141013.	V.1
Mer.p	ass. 14:35	$ u$ -0.1 $^{\prime}$ d1	.3′ m-4.17	ν 0.6′ d-0	.7′ m1.09	ν 2.7′ d0.	.1′ m-2.40	ν 2.3 $^{\prime}$ d0	.1′ m0.57			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.9	S 14°53.5	$19^{\circ}44.5$	4.8'	$N21^{\circ}18.6$	-10.6'	60.8'
1	191°27.9 206°27.9	52.7	34°08.3 48°32.2	4.9' 4.9'	21°08.0 20°57.2	-10.8'	60.9'
2	206 27.9 221°27.9	51.9 •• 51.1	48 32.2 62°56.1	4.9 5.0'	20° 46.3	-10.9' -11.1'	60.9' 60.9'
4	236°27.9	50.3	77° 20.1	5.1'	20°35.2	-11.2'	60.9'
5	251°27.8	49.5	91°44.2	5.1'	20°23.9	-11.4'	60.9'
6	266°27.8	\$14°48.7	106°08.3	5.2'	N20°12.5	-11.5'	61.0'
7 8	281°27.8 296°27.8	47.9 47.1	120°32.5 134°56.8	5.3' 5.3'	20°01.0 19°49.3	-11.7' -11.8'	61.0' 61.0'
9	311°27.8	. 46.3	149°21.1	5.4'	19° 37.5	-12.0'	61.0'
10	326°27.7	45.5	163°45.5	5.5'	19°25.5	-12.1'	61.1'
11	341°27.7	44.7	178°09.9	5.5'	19°13.4	-12.2'	61.1'
12 13	356°27.7 11°27.7	\$14°43.9 43.1	192°34.4 206°59.0	5.6' 5.7'	N19°01.2 18°48.8	-12.4' -12.5'	61.1' 61.1'
14	26°27.7	42.3	200 59.0 221°23.7	5.7'	18°36.3	-12.5 -12.7'	61.1
15	41°27.6	• • 41.5	235°48.4	5.8'	18°23.6	-12.8'	61.1'
16	56°27.6	40.7	250° 13.2	5.9'	18° 10.8	-12.9'	61.2'
17	71°27.6 86°27.6	39.9 \$14°39.1	264°38.1 279°03.0	5.9'	17°57.9 N17°44.9	-13.0'	61.2' 61.2'
18 19	86°27.6 101°27.6	38.3	279°03.0 293°28.1	6.0' 6.1'	17°31.7	-13.2' -13.3'	61.2
20	116°27.6	37.5	307°53.1	6.2'	17° 18.4	-13.4'	61.2'
21	131°27.6	• • 36.7	322°18.3	6.2'	17°05.0	-13.5'	61.2'
22	146°27.5	35.9	336°43.5	6.3'	16°51.5	-13.7'	61.3'
23	161°27.5	35.1	351°08.8	6.4'	16°37.8	-13.8'	61.3'
	SD = 16.2'	d = -0.8'		S	D = 16.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	176°27.5	S14°34.3	5°34.2	6.4'	$N16^{\circ}24.0$	-13.9'	61.3'
1	191°27.5	33.5	19°59.7	6.5'	16°10.2	-14.0'	61.3'
2	206°27.5	32.7	34°25.2	6.6'	15°56.2	-14.1'	61.3'
3 4	221°27.5 236°27.5	· · 31.9 31.1	48°50.8 63°16.4	6.7' 6.7'	15°42.1 15°27.9	-14.2' -14.3'	61.3' 61.3'
5	250 27.5 251°27.4	30.3	77°42.2	6.8'	15 27.9 15°13.5	-14.5 -14.4'	61.3
6	266°27.4	S14° 29.5	92°08.0	6.9'	N14°59.1	-14.5'	61.3'
7	281°27.4	28.7	106°33.9	7.0'	14°44.6	-14.6'	61.3'
8	296°27.4	27.8	120°59.8	7.0'	14°30.0	-14.7'	61.4'
9 10	311°27.4 326°27.4	· · 27.0 26.2	135°25.8 149°51.9	7.1' 7.2'	14°15.3 14°00.5	-14.8' -14.9'	61.4' 61.4'
10	320 27.4 341°27.4	25.4	149 51.9 164° 18.1	7.2'	14 00.5 13°45.6	-14.9 -15.0'	61.4
12	356°27.4	S14°24.6	178° 44.3	7.3'	N13°30.6	-15.1'	61.4
13	11°27.4	23.8	193° 10.7	7.4'	$13^{\circ}15.5$	-15.2'	61.4'
14	26°27.3	23.0	207°37.0	7.4'	13°00.3	-15.3'	61.4'
15 16	41°27.3 56°27.3	· · 22.2 21.4	222°03.5 236°30.0	7.5' 7.6'	12°45.1 12°29.7	-15.3' -15.4'	61.4' 61.4'
17	71°27.3	20.6	250° 56.6	7.7'	12° 14.3	-15.5'	61.4
18	86°27.3	\$14° 19.7	265°23.2	7.7'	N11°58.8	-15.6'	61.4'
19	101°27.3	18.9	279°49.9	7.8'	11°43.2	-15.6'	61.4'
20	116°27.3 131°27.3	18.1	294°16.7 308°43.6		11°27.6 11°11.9		61.4'
21 22	131°27.3 146°27.3	· · 17.3 16.5	308°43.6 323°10.5	7.9' 8.0'	11°11.9 10°56.1	-15.8' -15.9'	61.4' 61.4'
23	161°27.3	15.7	337°37.5	8.0'	10° 40.2	-15.9'	61.4
	SD = 16.2'	d = -0.8'		S	D = 16.7'		
Fri 0	GHA 176°27.3	Dec \$14° 14.9	GHA 352°04.5	u 8.1'	Dec N10°24.3	d -16.0'	HP 61.4'
1	191°27.3	14.0	6°31.6	8.2'	10°08.3	-16.0'	61.4
2	206°27.3	13.2	20°58.8	8.2'	09°52.3	-16.1'	61.4'
3	221°27.3	• • 12.4	35°26.1	8.3'	09°36.2	-16.2'	61.4'
4 5	236°27.2 251°27.2	11.6 10.8	49°53.3 64°20.7	8.4' 8.4'	09°20.0 09°03.8	-16.2' -16.3'	61.4' 61.4'
6	266°27.2	\$14° 10.0	78°48.1	8.5	N08° 47.5	-16.3	61.4
7	281°27.2	09.1	93° 15.6	8.5'	08°31.2	-16.4'	61.4'
8	296°27.2	08.3	107°43.1	8.6'	08°14.9	-16.4	61.4'
9 10	311°27.2 326°27.2	· · 07.5 06.7	122°10.7 136°38.4	8.6' 8.7'	07°58.5 07°42.0	-16.5' -16.5'	61.3' 61.3'
10	326 27.2 341°27.2	06.7 05.9	130 38.4 151°06.1	8.8'	07 42.0 07°25.5	-16.5'	61.3'
12	356°27.2	\$14°05.0	165° 33.8	8.8	N07°09.0	-16.6	61.3
13	11°27.2	04.2	180°01.6	8.9'	06°52.4	-16.6'	61.3'
14	26°27.2	03.4	194°29.5	8.9'	06°35.8	-16.6'	61.3'
15 16	41°27.2 56°27.2	· · 02.6 01.8	208° 57.4 223° 25.4	9.0' 9.0'	06°19.2 06°02.5	-16.7' -16.7'	61.3' 61.3'
10 17	71°27.2	00.9	223 25.4 237°53.4	9.0 9.1'	05°45.8	-16.7'	61.3
18	86°27.2	\$14°00.1	252°21.5	9.1'	N05°29.1	-16.8	61.3
19	101°27.2	$13^{\circ}59.3$	266°49.6	9.2'	05°12.3	-16.8'	61.2'
20	116°27.2	58.5	281°17.8	9.2'	04°55.5	-16.8'	61.2'
21 22	131°27.2 146°27.2	· · 57.7 56.8	295°46.0 310°14.2	9.3' 9.3'	04°38.7 04°21.9	-16.8' -16.8'	61.2' 61.2'
23	146 27.2 161°27.2	56.0	310 14.2 324°42.5	9.3'	04 21.9 04°05.1	-16.8'	61.2
	SD = 16.2'	d = -0.8'			D = 16.7'		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junisc	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
N 40°	06:00	06:32	07:00	17:29	17:57	18:29
35°	05:56	06:25	06:52	17:37	18:03	18:33
30°	05:52	06:20	06:44	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
S 10°	05:13	05:38	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:41	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
S 50°	03:34	04:20	04:57	19:31	20:07	20:53
52°	03:23	04:12	04:51	19:36	20:15	21:04
54°	03:09	04:03	04:44	19:43	20:23	21:17
56°	02:53	03:53	04:37	19:50	20:33	21:32
58°	02:34	03:41	04:29	19:58	20:45	21:51
S 60°	02:08	03:28	04:20	20:07	20:58	22:16
		Moonrie			Moonso	

Lat.		Moonris	е		Moonse	t
Lut.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°		15:21	18:05		09:19	08:32
N 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	80:80	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
N 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
S 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
S 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
S 60°	19:41	19:47	19:51	01:58	03:50	05:40

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
,	00 ^h 12 ^h		Pass	Upper	Lower	14-16
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	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		M:	' ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	141°35.1		1°58.6	168°07.8	\$12°04.5	324° 37.9	N02°53.9	119°13.6	N06° 49.3			
1	156° 37.5		1°59.9	183°08.4	03.8	339°40.6	54.0	134° 15.0	49.3	Alpheratz	357°32.4	29°14.9
2	171°40.0		2°01.2	198°08.9	03.0	354° 43.3	54.1	134 13.9 149°18.1	49.3	Ankaa	353°05.0	-42°09.3
3	186°42.5		· 02.6	213°09.5	02.4	9°46.0	• • 54.2	164° 20.4	• • 49.5	Schedar	349°28.4	56°41.7
4	201°44.9	196° 36.2	03.9	213 09.3 228°10.1	01.7	24°48.6	54.3	179°22.7	49.6	Diphda	348°45.0	-17°50.0
5	216°47.4	211° 36.1	05.9	243°10.7	01.7	39°51.3	54.4	194°25.0	49.7	Achernar	$335^{\circ}18.6$	-57°05.9
6	231°49.9		2°06.5	258°11.2	\$12°00.3	54°54.0	N02°54.5	209°27.2	N06°49.8	Hamal	327°48.4	23°35.8
7	246°52.3	241°35.8	07.8	273°11.8	11°59.5	69°56.6	54.6	224°29.5	49.9	Polaris	312°41.3	89°23.2
8	261°54.8	256°35.7	09.1	288°12.4	58.8	84°59.3	54.7	239°31.8	49.9	Acamar	315°09.9	-40°11.8
9	276°57.3		• 10.4	303°13.0	• • 58.1	100°02.0	• • 54.8	254°34.0	• • 50.0	Menkar	314°03.5	4°11.9
10	291°59.7	286° 35.4	11.7	318°13.6	57.4	115°04.7	54.9	269°36.3	50.1	Mirfak	308°24.5	49°57.8
11	307°02.2	301°35.3	13.0	333°14.1	56.7	130°07.3	55.0	284°38.6	50.2	Aldebaran	290°36.6	16°33.9
12	322°04.7		2°14.3	348°14.7	S11°56.0	145°10.0	N02°55.1	299°40.9	N06° 50.3	Rigel	281°01.3	-8°10.3
13	337°07.1	331°35.0	15.6	3°15.3	55.2	160°12.7	55.2	314°43.1	50.4	Capella	280°17.9	46°01.6
14	352°09.6	346°34.9	16.9	18°15.9	54.5	175° 15.4	55.3	329°45.4	50.5	Bellatrix	278°20.0	6°22.4
15	7°12.0	1°34.7 •	· 18.2	33°16.5	• • 53.8	190°18.0	• • 55.4	344°47.7	• • 50.5	Elnath	277°58.4	28°37.8
16	22°14.5	16°34.6	19.5	48°17.0	53.1	205°20.7	55.5	359°49.9	50.6	Alnilam	275°35.0	-1°11.2
17	37°17.0	31°34.5	20.8	63°17.6	52.4	220°23.4	55.6	14°52.2	50.7	Betelgeuse	270°49.1	7°24.6
18	52°19.4	46°34.3 NO	2°22.1	78°18.2	S11°51.7	235°26.0	N02°55.7	29°54.5	N06°50.8	Canopus	263°50.9 258°23.7	-52°42.9 -16°45.5
19	67°21.9	61°34.2	23.4	93°18.8	50.9	250°28.7	55.8	44°56.8	50.9	Sirius		-10 45.5 -29°00.9
20	82°24.4	76°34.1	24.7	108°19.4	50.2	265°31.4	55.9	59°59.0	51.0	Adhara	255°03.5	
21	97°26.8	91°33.9 •	• 26.0	123°20.0	• • 49.5	280°34.1	• • 56.0	75°01.3	• • 51.1	Procyon Pollux	244°47.9 243°13.9	5°09.0 27°57.3
22	$112^{\circ}29.3$	106°33.8	27.3	138°20.5	48.8	295°36.7	56.1	90°03.6	51.1	1	243°13.9 234°13.0	-59°36.2
23	127°31.8	121°33.7	28.6	153°21.1	48.1	310°39.4	56.2	105°05.8	51.2	Avior Suhail	234°13.0 222°44.0	-59°36.2 -43°32.9
1/10==	ass 11.21	ν-0.1' d1.3' r	n_/ 17	-	.7′ m1.09	1/2 7/ 40	.1′ m-2.40	1/2 3/ An	.1′ m0.57	Miaplacidus	222°44.0 221°36.7	-43°32.9 -69°50.1
ivier.p	ass. 14:31	ν-υ.1 d1.3 r	11-4.1/	νυ.σ' α -0	.ı ını.09	ν2.1 a0.	.ı ın-∠.4U	ν2.3 d0	.1 IIIU.5/	Miaplacidus	221°36.7 217°44.9	-69°50.1 -8°47.0
											217 44.9 207°31.4	-6 47.0 11°49.5
Sun	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207 31.4 193°37.4	61°35.7
0	142°34.2		2°30.0	168°21.7	S11°47.4	$325^{\circ}42.1$	N02°56.3	120°08.1	N06°51.3	Denebola	193 37.4 182°22.1	14°24.6
1	157°36.7	151°33.4	31.3	183°22.3	46.6	340°44.8	56.4	135°10.4	51.4	Gienah	182 22.1 175°40.7	-17°42.0
2	172°39.1	166°33.3	32.6	198°22.9	45.9	355°47.4	56.5	150°12.7	51.5		173° 40.7	-63°15.2
3	187°41.6	181°33.2 •	• 33.9	213°23.5	• • 45.2	10°50.1	• • 56.6	165°14.9	• • 51.6		172 30.0 171°48.3	-03 15.2 -57°16.2
4	202°44.1	196°33.0	35.2	228°24.0	44.5	25°52.8	56.7	180°17.2	51.7	Alioth	166° 10.4	55°48.1
5	217°46.5	211°32.9	36.5	243°24.6	43.8	40°55.5	56.8	195°19.5	51.7	Spica	158° 19.4	-11°18.6
6	232°49.0	226°32.8 NO	2°37.8	258°25.2	S11°43.1	55°58.2	N02°56.9	210°21.7	N06°51.8	Alkaid	150° 19.4° 152° 49.8	49°10.0
7	$247^{\circ}51.5$	241°32.6	39.1	273°25.8	42.3	71°00.8	57.0	225°24.0	51.9	Hadar	148°32.1	-60°30.3
8	262°53.9	256° 32.5	40.4	288°26.4	41.6	86°03.5	57.1	240°26.3	52.0		140°54.4	-36°30.5
9	277°56.4	271°32.4 •	• 41.7	303°27.0	• • 40.9	101°06.2	• • 57.2	255°28.5	• • 52.1		145°45.5	19°01.9
10	292°58.9	286°32.2	43.0	318°27.5	40.2	116°08.9	57.3	270°30.8	52.2	Rigil Kent.		-60°56.9
11	308°01.3	301°32.1	44.3	333°28.1	39.5	131°11.5	57.4	285°33.1	52.3	Kochab	137°19.8	74°02.0
12	323°03.8	316° 32.0 NO	2°45.6	348°28.7	S11°38.7	146°14.2	N02°57.5	300°35.3	N06°52.3	Zuben'ubi		-16°09.6
13	338°06.3	331°31.9	46.9	3°29.3	38.0	$161^{\circ}16.9$	57.6	315°37.6	52.4	Alphecca	126°01.6	26°36.9
14	353°08.7	346°31.7	48.2	18°29.9	37.3	176° 19.6	57.7	330°39.9	52.5	Antares	112°12.8	-26°29.6
15	8°11.2		• 49.5	33°30.5	• • 36.6	191°22.3	• • 57.8	345°42.2	• • 52.6	Atria	107°04.9	-69°04.4
16	23°13.6	16° 31.5	50.8	48°31.0	35.9	206°24.9	57.9	0°44.4	52.7	Sabik	102°00.0	-15°45.6
17	38°16.1	31°31.3	52.1	63°31.6	35.1	221°27.6	58.0	15°46.7	52.8	Shaula	96°07.1	-37°07.3
18	53°18.6		2°53.4	78°32.2	S11°34.4	236°30.3	N02°58.1	30°49.0	N06° 52.9	Rasalhague	95°56.4	12°32.2
19	68°21.0	61°31.1	54.7	93°32.8	33.7	251°33.0	58.2	45°51.2	53.0	Eltanin	90°41.3	51°28.8
20	83°23.5	76°31.0	56.0	108°33.4	33.0	266° 35.7	58.3	60°53.5	53.0	Kaus Aust.	83°29.4	-34°22.1
21	98°26.0		• 57.3	123°34.0	• • 32.2	281°38.3	• • 58.4	75°55.8	• • 53.1	Vega	80°31.8	38°48.4
22	113°28.4	106°30.7	58.6	138°34.6	31.5	296°41.0	58.5	90°58.0	53.2	Nunki	75°44.9	-26°15.6
23	128°30.9	121°30.6	59.9	153°35.1	30.8	311°43.7	58.6	106°00.3	53.3	Altair	61°57.8	8°56.5
Mer.p	ass. 14:27	ν -0.1' d1.3' r	n-4.18	$\nu 0.6' d-0$.7′ m1.08	$\nu 2.7' d0.$.1′ m-2.41	$\nu 2.3' d0$.1′ m0.57	Peacock	53°02.3	-56°38.5
										Deneb	49°24.5	45°22.8
			_		_		_		_	Enif	33°36.6	10°00.2
Mon	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.5
0	143°33.4		3°01.2	168°35.7	\$11°30.1	326°46.4	N02°58.7	121°02.6	N06° 53.4	Fomalhaut	15°12.1	-29°28.4
1	158°35.8	151°30.3	02.5	183°36.3	29.4	341°49.1	58.8	136°04.8	53.5	Scheat	13°43.0	28°14.2
2	173°38.3	166°30.2	03.8	198°36.9	28.6	356°51.7	58.9	151°07.1	53.6	Markab	13°27.6	15°21.4
3	188°40.7		05.1	213°37.5	• • 27.9	11°54.4	· · 59.0	166°09.4	· · 53.6	Feb 12 Sat	SHA	Mer.pass
4	203°43.2	196°30.0	06.4	228°38.1	27.2	26°57.1	59.1	181°11.6	53.7	Venus		14:54
5	218°45.7	211°29.8	07.7	243°38.7	26.5 \$11°25.7	41°59.8	59.2 N02°50.3	196°13.9	53.8 N06° 53.0	Mars	26°32.7	14:54
6	233°48.1		3°09.0	258°39.3	S11°25.7	57°02.5	N02°59.3		N06°53.9	Jupiter		02:21
7	248°50.6	241°29.6	10.3	273°39.8	25.0	72°05.2 87°07.8	59.5 50.6	226°18.4 241°20.7	54.0 54.1	Saturn	337°38.5	16:01
8 9	263°53.1 278°55.5	256°29.5 271°29.3	11.6 · 12.9	288°40.4 303°41.0	24.3 · · 23.6	87°07.8 102°10.5	59.6 •• 59.7	241°20.7 256°23.0	54.1 •• 54.2	Jatuffi	JJ1 J0.3	10.01
9 10	278 55.5 293°58.0	271 29.3 • 286° 29.2	14.2	318°41.6	22.9	102 10.5 117°13.2	59.7 59.8	250 23.0 271°25.2	54.2	Feb 13 Sun	SHA	Mer.pass
11	309°00.5	301°29.1	15.5	333°42.2	22.9	117 13.2 132° 15.9	02° 59.9	271 25.2 286° 27.5	54.3	Venus	353°59.3	14:54
12	309 00.5 324°02.9		3°16.8	348°42.8	\$11°21.4	132 13.9 147°18.6	N03°00.0	301°29.8	N06° 54.4	Mars	25°47.5	12:46
13	339°05.4	331° 28.8	18.1	3°43.4	20.7	162°21.3	00.1	316°32.0	54.5		183°07.9	02:17
14	354°07.9	346°28.7	19.4	18°44.0	20.7	102 21.3 177°23.9	00.1	331° 34.3	54.6	Saturn	337°33.9	15:57
15	9°10.3		20.7	33°44.5	19.2	177 23.9 192°26.6	. 00.2	346° 36.6	• • 54.7	Fob 14 Mac-	C LI V	Mor noss
16	24°12.8	16°28.5	22.0	48°45.1	18.5	207° 29.3	00.4	1°38.8	54.7	Feb 14 Mon	SHA 352°57.1	Mer.pass
17	24 12.6 39°15.2	31°28.3	23.3	63°45.7	17.8	207 29.3 222° 32.0	00.4	1 30.0 16°41.1	54.6 54.9	Venus		14:54
18	54°17.7		3°24.6	78°46.3	\$11°17.1	237° 34.7	N03° 00.6	31°43.4	N06° 55.0	Mars	25°02.4 183°13.0	12:45 02:13
19	69°20.2	61°28.1	25.9	93°46.9	16.3	252° 37.4	00.7	46°45.6	55.0	Saturn	183°13.0 337°29.2	
20	84°22.6	76°28.0	27.2	108°47.5	15.6	267° 40.0	00.7	61°47.9	55.1	Saturn	JJ1 29.2	15:53
21	99°25.1		· 28.5	123°48.1	. 14.9	282°42.7	• • 00.9	76°50.2	• • 55.2	Horizont	al parallax	ļ
22	114°27.6	106°27.7	29.8	138°48.7	14.1	297°45.4	01.0	91°52.4	55.3		Venus:	0.1
23	129°30.0	121°27.6	31.1	153°49.3	13.4	312°48.1	01.1	106°54.7	55.4		Mars:	0.1
Mer.p	ass. 14:23	u-0.1 $'$ d 1.3 $'$ r	n-4.18	ν 0.6′ d-0	.7′ m1.08	$\nu 2.7' d0.$.1′ m-2.41	ν 2.3′ d0	.1' m 0.57			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.2	S13°55.2	339°10.9	9.4'	N03°48.3	-16.9'	61.2'
1	191°27.2	54.4	353°39.2	9.4'	03°31.4	-16.9'	61.1'
2	206°27.2	53.5	8°07.7	9.5'	03°14.5	-16.9'	61.1'
3 4	221°27.2 236°27.2	•• 52.7 51.9	22°36.1 37°04.6	9.5' 9.5'	02°57.7 02°40.8	-16.9' -16.9'	61.1' 61.1'
4 5	250 27.2 251°27.2	51.9 51.0	51°33.2	9.5 9.6'	02°40.8	-16.9'	61.1
6	266°27.2	\$13°50.2	66°01.7	9.6'	N02°07.0	-16.9	61.1
7	281°27.2	49.4	80°30.4	9.6'	01°50.1	-16.9'	61.0'
8	296°27.2	48.6	94°59.0	9.7'	01°33.2	-16.9'	61.0'
9	311°27.3 326°27.3	• • 47.7	109°27.7 123°56.4	9.7'	01°16.3 00°59.5	-16.9'	61.0'
10 11	320 27.3 341°27.3	46.9 46.1	123 50.4 138°25.1	9.7' 9.8'	00°59.5	-16.9' -16.9'	61.0' 61.0'
12	356°27.3	\$13°45.2	152°53.9	9.8'	N00°25.7	-16.9	60.9
13	11°27.3	44.4	167°22.7	9.8'	N00°08.9	-16.8'	60.9'
14	26°27.3	43.6	181°51.5	9.9'	S00°08.0	16.8'	60.9'
15 16	41°27.3 56°27.3	· · 42.8 41.9	196°20.4 210°49.3	9.9' 9.9'	00°24.8 00°41.6	16.8' 16.8'	60.9' 60.8'
17	71°27.3	41.9	210 49.3 225°18.2	9.9' 9.9'	00°41.0	16.8	60.8
18	86°27.3	\$13°40.3	239°47.1	10.0'	S01°15.2	16.7	60.8'
19	101°27.3	39.4	254°16.1	10.0'	01°31.9	16.7'	60.8'
20	116°27.3	38.6	268°45.1	10.0'	01°48.6	16.7'	60.7'
21	131°27.3	• • 37.8	283°14.1	10.0'	02°05.3	16.7'	60.7'
22 23	146°27.3 161°27.4	36.9 36.1	297°43.1 312°12.1	10.0' 10.1'	02°22.0 02°38.6	16.6' 16.6'	60.7' 60.7'
23			J1Z 1Z.1			10.0	00.7
	SD = 16.2'	d = -0.8'		SI	O = 16.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.4	\$13°35.3	$326^{\circ}41.2$	10.1'	S02°55.2	16.6'	60.6
1	191°27.4	34.4	341°10.2	10.1'	03°11.8	16.5'	60.6'
2	206°27.4	33.6	355°39.3	10.1'	03°28.3 03°44.8	16.5'	60.6'
3 4	221°27.4 236°27.4	· · 32.8 31.9	10°08.4 24°37.5	10.1' 10.1'	03°44.8 04°01.3	16.5' 16.4'	60.5' 60.5'
5	251°27.4	31.1	39°06.7	10.1	04°17.7	16.4	60.5
6	266°27.4	S13°30.3	53°35.8	10.1'	S04°34.1	16.3'	60.5'
7	281°27.4	29.4	68°04.9	10.2'	04°50.5	16.3'	60.4'
8	296°27.5	28.6	82°34.1	10.2'	05°06.8	16.2'	60.4
9	311°27.5 326°27.5	• • 27.7	97°03.3 111°32.4	10.2' 10.2'	05°23.0 05°39.2	16.2' 16.2'	60.4' 60.3'
10 11	326°27.5 341°27.5	26.9 26.1	111° 32.4 126° 01.6	10.2'	05° 39.2 05° 55.4	16.2	60.3
12	356°27.5	\$13°25.2	140°30.8	10.2'	S06°11.5	16.0'	60.3
13	11°27.5	24.4	155°00.0	10.2'	06°27.5	16.0'	60.2'
14	26°27.5	23.5	169°29.2	10.2'	06°43.5	15.9'	60.2'
15	41°27.5 56°27.6	• • 22.7	183°58.3 198°27.5	10.2'	06°59.4	15.9'	60.2'
16 17	50°27.6 71°27.6	21.9 21.0	198°27.5 212°56.7	10.2' 10.2'	07°15.3 07°31.1	15.8' 15.8'	60.1' 60.1'
18	86°27.6	\$13°20.2	227°25.9	10.2'	S07°46.9	15.7'	60.1
19	101°27.6	19.3	241°55.1	10.2'	08°02.6	15.6'	60.0'
20	116°27.6	18.5	256°24.3	10.2'	08°18.2	15.6'	60.0'
21	131°27.6	• • 17.7	270°53.5	10.2'	08°33.8	15.5'	60.0'
22 23	146°27.7 161°27.7	16.8 16.0	285°22.7 299°51.8	10.2' 10.2'	08°49.3 09°04.7	15.4' 15.4'	59.9' 59.9'
23	SD = 16.2'	d = -0.8'	299 51.0		$09^{-04.7}$ 0 = 16.5'	13.4	39.9
	3D = 10.2	<u>u = -0.6</u>		31	J = 10.5		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.7	\$13° 15.1	314°21.0	10.2'	509°20.1	15.3'	59.9'
1 2	191°27.7 206°27.7	14.3 13.4	328°50.2 343°19.3	10.2' 10.1'	09°35.4 09°50.6	15.2' 15.1'	59.8' 59.8'
3	200 27.7 221°27.7	. 12.6	357°48.5	10.1	10°05.7	15.1	59.8'
4	236°27.8	11.7	$12^{\circ}17.6$	10.1'	10°20.8	15.0'	59.7'
5	251°27.8	10.9	26°46.7	10.1'	10°35.8	14.9'	59.7'
6	266°27.8	\$13°10.1	41°15.8	10.1'	\$10°50.7	14.8'	59.6'
7 8	281°27.8 296°27.8	09.2 08.4	55°45.0 70°14.0	10.1' 10.1'	11°05.5 11°20.3	14.8' 14.7'	59.6' 59.6'
9	296 27.8 311°27.9	07.5	70 14.0 84°43.1	10.1	11 20.3 11°35.0	14.7 14.6'	59.6 59.5'
10	326°27.9	06.7	99°12.2	10.0'	11°49.6	14.5'	59.5'
11	341°27.9	05.8	113°41.2	10.0'	12°04.1	14.4'	59.5'
12	356°27.9	S13°05.0	128°10.3	10.0'	\$12°18.5	14.3'	59.4
13 14	11°27.9 26°28.0	04.1 03.3	142°39.3 157°08.3	10.0' 10.0'	12°32.8 12°47.1	14.2' 14.2'	59.4' 59.4'
14 15	41°28.0	02.4	157°08.3 171°37.3	10.0'	12°47.1 13°01.2	14.2 14.1'	59.4 59.3'
16	56°28.0	01.6	186°06.2	9.9'	13°15.3	14.0'	59.3'
17	71°28.0	13°00.7	200°35.2	9.9'	13°29.3	13.9'	59.2'
18	86°28.1	S12°59.9	215°04.1	9.9'	\$13°43.1	13.8'	59.2'
19	101°28.1 116°28.1	59.0 58.2	229°33.0 244°01.9	9.9'	13°56.9 14°10.6	13.7' 13.6'	59.2'
20 21	116°28.1 131°28.1	58.2 •• 57.3	244°01.9 258°30.8	9.9' 9.8'	14°10.6 14°24.2	13.6'	59.1' 59.1'
22	131 28.1 146°28.1	56.5	272°59.6	9.8'	14°24.2 14°37.7	13.4	59.1 59.0'
23	161°28.2	55.6	287°28.4	9.8'	14°51.1	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
N 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
N 40°	05:56	06:28	06:56	17:33	18:01	18:33
35°	05:53	06:23	06:49	17:40	18:06	18:36
30°	05:49	06:18	06:42	17:47	18:11	18:39
20°	05:42	06:08	06:31	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:49	06:11	18:18	18:39	19:03
S 10°	05:14	05:39	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:50	18:38	19:00	19:27
30°	04:43	05:13	05:38	18:50	19:15	19:44
35°	04:32	05:04	05:31	18:57	19:23	19:55
40°	04:19	04:54	05:23	19:05	19:33	20:08
45°	04:03	04:42	05:14	19:14	19:46	20:24
S 50°	03:41	04:26	05:02	19:25	20:01	20:46
52°	03:30	04:19	04:57	19:31	20:08	20:56
54°	03:18	04:10	04:51	19:36	20:16	21:08
56°	03:03	04:01	04:44	19:43	20:26	21:22
58°	02:46	03:50	04:37	19:50	20:36	21:40
S 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
S 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
S 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
S 60°	19:54	19:57	20:01	07:26	09:09	10:50

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	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			
14	14:09	14:08	12:14	03:09	15:35			

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	144°32.5	136°27.5	N03°32.4	168° 49.9	\$11°12.7	327°50.8	N03°01.2	121°56.9	N06°55.5			
1	159°35.0	150°27.5 151°27.4	33.7	106 49.9 183°50.4	12.0	342°53.5	01.3	136°59.2	55.6	Alpheratz	357°32.4	29°14.8
2	174°37.4	166°27.2	35. <i>1</i> 35.0	103 50.4 198°51.0	11.2	357°56.2	01.3	150° 59.2 152° 01.5	55.7	Ankaa	353°05.0	-42°09.3
3	189°39.9	181°27.1	• • 36.3	213°51.6	. 10.5	12°58.9	01.5	167°03.7	• • 55.7	Schedar	349°28.4	56°41.7
4	204°42.4	196°27.0	37.6	213°51.0° 228°52.2	09.8	28°01.5	01.7	182°06.0	55.8	Diphda	348°45.0	-17°50.0
5	219°44.8	211°26.9	38.9	243° 52.8	09.0	43°04.2	01.7	197°08.3	55.9	Achernar	335°18.6	-57°05.9
6	234°47.3	226°26.7	N03°40.2	258°53.4	S11°08.3	58°06.9	N03°01.9	212°10.5	N06°56.0	Hamal	327°48.4	23°35.8
7	249°49.7	241°26.6	41.5	273°54.0	07.6	73°09.6	02.0	227°12.8	56.1	Polaris	312°42.7	89°23.2
8	264°52.2	256° 26.5	42.8	288°54.6	06.9	88°12.3	02.1	242°15.1	56.2	Acamar	315°09.9	-40°11.8
9	279°54.7	271°26.4	• • 44.1	303°55.2	06.1	103°15.0	02.2	257°17.3	• • 56.3	Menkar	314°03.5	4°11.9
10	294°57.1	286° 26.3	45.4	318°55.8	05.4	118°17.7	02.3	272°19.6	56.4	Mirfak	308°24.5	49°57.8
11	309°59.6	301°26.1	46.7	333°56.4	04.7	133°20.4	02.4	287°21.8	56.5	Aldebaran	290°36.6	16°33.9
12	325°02.1	316° 26.0	N03°48.0	348° 56.9	S11°04.0	148°23.0	N03°02.5	302°24.1	N06°56.5	Rigel	281°01.3	-8°10.3
13	340°04.5	331°25.9	49.3	3°57.5	03.2	163°25.7	02.6	317°26.4	56.6	Capella	280°17.9	46°01.6
14	355°07.0	346° 25.8	50.6	18°58.1	02.5	178°28.4	02.7	332°28.6	56.7	Bellatrix	278°20.0	6°22.4
15	10°09.5	1°25.7	• • 51.9	33°58.7	• • 01.8	193°31.1	• • 02.8	347°30.9	• • 56.8	Elnath	277°58.4	28°37.8
16	25°11.9	16° 25.5	53.2	48° 59.3	01.0	208°33.8	02.9	2°33.2	56.9	Alnilam	275°35.0	-1°11.2
17	40°14.4	31°25.4	54.5	63°59.9	11°00.3	223°36.5	03.0	17°35.4	57.0	Betelgeuse	270°49.1	7°24.6
18	55°16.8	46°25.3	N03°55.8	79°00.5	S10°59.6	238°39.2	N03°03.1	32°37.7	N06°57.1	Canopus	263°50.9	-52°42.9
19	$70^{\circ}19.3$	61°25.2	57.1	94°01.1	58.9	253°41.9	03.2	47°39.9	57.2	Sirius	258°23.7	-16°45.5
20	85°21.8	$76^{\circ}25.1$	58.4	109°01.7	58.1	268°44.6	03.4	62°42.2	57.3	Adhara	255°03.6	-29°00.9
21	100°24.2	91°24.9	03°59.6	124°02.3	• • 57.4	283°47.3	• • 03.5	77°44.5	• • 57.3	Procyon	244°47.9	5°09.0
22	$115^{\circ}26.7$	106°24.8	04°00.9	139°02.9	56.7	298°49.9	03.6	92°46.7	57.4	Pollux	243°13.9	27°57.3
23	$130^{\circ}29.2$	121°24.7	02.2	154°03.5	55.9	313°52.6	03.7	107°49.0	57.5	Avior	234°13.0 222°44.0	-59°36.2 -43°33.0
				10 6/ J 0	.7′ m1.08					Suhail	222°44.0 221°36.7	
ivier.p	ass. 14:19	ν -0.1' d1	.3′ m-4.19	ν 0.0 d -0	. <i>I</i> m1.08	ν2.1' d0.	.1′ m-2.42	ν2.3′ d0	.1′ m0.57	Miaplacidus Alphard	221°36.7 217°44.9	-69°50.1 -8°47.1
											217 44.9 207°31.4	-8 47.1 11°49.5
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.4 193°37.4	61°35.7
0	145°31.6	$136^{\circ}24.6$	N04°03.5	169°04.1	S10°55.2	328°55.3	N03°03.8	122°51.3	N06°57.6	Dubne	193°37.4 182°22.1	14°24.6
1	160°34.1	151°24.5	04.8	184°04.7	54.5	343°58.0	03.9	137°53.5	57.7	Gienah	182°22.1 175°40.7	-17°42.0
2	175°36.6	166°24.4	06.1	199°05.3	53.7	359°00.7	04.0	152°55.8	57.8	1	175 40.7 172°56.6	-17 42.0 -63°15.2
3	190°39.0	181°24.2	• • 07.4	214°05.9	• • 53.0	14°03.4	• • 04.1	167°58.0	• • 57.9		172 50.0 171°48.3	-03 15.2 -57°16.2
4	205°41.5	$196^{\circ}24.1$	08.7	229°06.4	52.3	$29^{\circ}06.1$	04.2	183°00.3	58.0	Alioth	166°10.4	55°48.1
5	220°44.0	$211^{\circ}24.0$	10.0	244°07.0	51.5	44°08.8	04.3	198°02.6	58.1	Spica	158° 19.4	-11°18.6
6	235°46.4	226°23.9	N04°11.3	259°07.6	S10°50.8	59°11.5	N03°04.4	213°04.8	N06°58.1	Alkaid	150° 19.4° 152° 49.8	49°10.0
7	250°48.9	241°23.8	12.6	274°08.2	50.1	$74^{\circ}14.2$	04.5	$228^{\circ}07.1$	58.2	Hadar	148°32.0	-60°30.4
8	265°51.3	256°23.6	13.9	289°08.8	49.3	89°16.9	04.6	243°09.3	58.3		140°52.0	-36°30.5
9	280°53.8	271°23.5	•• 15.2	304°09.4	• • 48.6	104°19.6	• • 04.7	$258^{\circ}11.6$	• • 58.4		145°45.5	19°01.9
10	295°56.3	286°23.4	16.5	319°10.0	47.9	119°22.3	04.9	273°13.9	58.5		139°36.5	-60°56.9
11	310°58.7	301°23.3	17.8	334°10.6	47.1	134°25.0	05.0	$288^{\circ}16.1$	58.6	Kochab	137°19.8	74°02.0
12	$326^{\circ}01.2$	$316^{\circ}23.2$	N04°19.1	349°11.2	\$10°46.4	149°27.6	N03°05.1	303°18.4	N06°58.7	Zuben'ubi	136°53.1	-16°09.6
13	341°03.7	331°23.1	20.4	4°11.8	45.7	164°30.3	05.2	318°20.6	58.8	Alphecca	126°01.6	26°36.9
14	$356^{\circ}06.1$	$346^{\circ}22.9$	21.6	19° 12.4	44.9	179°33.0	05.3	333°22.9	58.9	Antares	112° 12.8	-26°29.6
15	$11^{\circ}08.6$	1°22.8	• • 22.9	34° 13.0	• • 44.2	194°35.7	• • 05.4	348°25.2	• • 58.9	Atria	107°04.8	-69°04.4
16	$26^{\circ}11.1$	$16^{\circ}22.7$	24.2	49°13.6	43.5	209°38.4	05.5	3°27.4	59.0	Sabik	102°00.0	-15°45.6
17	41°13.5	31°22.6	25.5	64°14.2	42.7	224°41.1	05.6	18°29.7	59.1	Shaula	96°07.1	-37°07.3
18	56°16.0	46°22.5	N04°26.8	79°14.8	S10°42.0	239°43.8	N03°05.7	33°31.9	N06°59.2	Rasalhague	95°56.3	12°32.2
19	71°18.5	61°22.4	28.1	94° 15.4	41.3	254°46.5	05.8	48°34.2	59.3	Eltanin	90°41.3	51°28.8
20	86°20.9	76°22.3	29.4	109° 16.0	40.5	269°49.2	05.9	63°36.5	59.4	Kaus Aust.	83°29.4	-34°22.1
21	101°23.4	91°22.1	• • 30.7	124° 16.6	• • 39.8	284°51.9	• • 06.0	78°38.7	• • 59.5	Vega	80°31.8	38°48.4
22	116°25.8	106°22.0	32.0	139° 17.2	39.1	299°54.6	06.2	93°41.0	59.6	Nunki	75°44.9	-26°15.6
23	131°28.3	121°21.9	33.3	154° 17.8	38.3	314°57.3	06.3	108°43.2	59.7	Altair	61°57.8	8°56.5
Mer n	ass. 14:16	ν -0.1' d1	.3′ m-4.20	$\nu 0.6' d-0$.7′ m1.08	$v^{2} 7' d0$.1′ m-2.42	v2 3' d0	.1′ m0.58	Peacock	53°02.3	-56°38.5
- Wici.p		- U.I UI		- V 0.0 U 0						Deneb	49°24.5	45°22.8
										Enif	33°36.6	10°00.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.5
0	146°30.8	136°21.8	N04°34.6	169° 18.4	S10°37.6	330°00.0	N03°06.4	123°45.5	N06°59.8	Fomalhaut	15°12.1	-29°28.4
1	161°33.2	151°21.7	35.9	184° 19.0	36.9	345°02.7	06.5	138°47.7	59.8	Scheat	13°43.0	28°14.2
2	176°35.7	166°21.6	37.2	199°19.6	36.1	0°05.4	06.6	153°50.0	06°59.9	Markab	13°27.6	15°21.4
3	191°38.2	181°21.5	• • 38.4	214°20.2	35.4	15°08.1	• • 06.7	168°52.3	07°00.0	Est 15 T	CIIA	Me:: ::
4	206°40.6	196°21.3	39.7	229°20.8	34.7	30°10.8	06.8	183°54.5	00.1	Feb 15 Tue	SHA 351°55.0	Mer.pass
5	221°43.1	211°21.2	41.0	244°21.4	33.9	45°13.5	06.9	198°56.8	00.2	Venus	351 55.0 24°17.4	14:54 12:44
6	236°45.6	226°21.1	N04°42.3	259°22.0	\$10°33.2	60°16.2	N03°07.0	213°59.0	N07°00.3		24°17.4 183°18.3	02:08
7	251°48.0	241°21.0	43.6	274°22.6	32.4	75°18.9	07.1	229°01.3	00.4	Jupiter	183°18.3 337°24.5	15:50
8	266°50.5	256°20.9	44.9	289°23.2	31.7	90°21.6 105°24.3	07.3	244°03.5 259°05.8	00.5	Saturn	JJ1 24.3	15:50
9	281°52.9	271°20.8	· · 46.2	304°23.8	31.0		07.4			Feb 16 Wed	SHA	Mer.pass
10	296°55.4	286°20.7	47.5	319°24.4	30.2	120°27.0	07.5 07.6	274°08.1	00.7	Venus	350°53.0	14:54
11	311°57.9	301°20.5	48.8	334°25.0	29.5	135°29.7	07.6	289°10.3	00.7	Mars	23°32.4	12:43
12	327°00.3	316°20.4	N04°50.0	349°25.6	\$10°28.8	150°32.4	N03°07.7	304°12.6	N07°00.8		183°23.7	02:04
13	342°02.8 357°05.3	331°20.3 346°20.2	51.3 52.6	4°26.2	28.0 27.3	165°35.1 180°37.8	07.8 07.0	319°14.8 334°17.1	00.9	Saturn	$337^{\circ}19.6$	15:46
14 15				19°26.8			07.9	334°17.1 349°19.3	01.0	F-1 17 T	CIII	
15 16	12°07.7	1°20.1	· · 53.9	34°27.4	· · 26.5	195°40.5	08.0	349°19.3 4°21.6	01.1	Feb 17 Thu	SHA	Mer.pass
16 17	27°10.2	16°20.0	55.2	49°28.0	25.8	210°43.2	08.1		01.2	Venus		14:55
17	42°12.7 57°15.1	31° 19.9 46° 19.8	56.5 N04°57.8	64°28.6	25.1 \$10°24.3	225°45.9	08.2	19°23.9	01.3 N07°01.4	Mars	22°47.6	12:42
18 19	57°15.1 72°17.6	46° 19.8 61° 19.6	04°59.1	79°29.2 94°29.8	\$10°24.3 23.6	240°48.6 255°51.3	N03°08.4 08.5	49°28.4			183°29.2	02:00
	72 17.6 87°20.1	76° 19.5	04 59.1 05°00.4	94 29.8 109°30.4	23.0			49 28.4 64°30.6	01.5	Saturn	337°14.7	15:43
20 21	87°20.1 102°22.5	76° 19.5 91° 19.4	05°00.4 •• 01.6	109°30.4 124°31.0	• • 22.1	270°54.0 285°56.7	08.6 •• 08.7	64°30.6 79°32.9	01.6 · · 01.7	Horizont	al parallax	
22	102 22.5 117°25.0	91 19.4 106° 19.3	02.9	124 31.0 139° 31.6	21.4	285 50.7 300°59.4	08.7	79 32.9 94°35.1	01.7		Venus:	0.2
23	117 25.0 132°27.4	100 19.3 121°19.2	02.9	159° 31.0 154° 32.2	20.6	316°02.1	08.9	94 35.1 109°37.4	01.7		Mars:	0.1
Mer.p	ass. 14:12	u-0.1' $d1$.3′ m-4.20	ν 0.6′ d-0	.7′ m1.08	ν 2.7′ d0.	.1′ m-2.43	ν 2.3′ d0	.1' m 0.58			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.2	S12°54.8	$301^{\circ}57.2$	9.8'	S 15°04.4	13.2'	59.0'
1	191°28.2	53.9	316°26.0	9.8'	15°17.6	13.1'	58.9'
2	206°28.2 221°28.3	53.1 •• 52.2	330°54.7 345°23.5	9.7' 9.7'	15°30.7 15°43.6	13.0' 12.9'	58.9' 58.8'
4	236° 28.3	51.4	359°52.2	9.7'	15°56.5	12.8'	58.8'
5	251°28.3	50.5	14°20.9	9.7'	$16^{\circ}09.3$	12.7'	58.8'
6	266°28.4	\$12°49.6	28°49.5	9.6'	\$16°22.0	12.6'	58.7'
7 8	281°28.4 296°28.4	48.8 47.9	43°18.1 57°46.7	9.6' 9.6'	16°34.5 16°47.0	12.5' 12.3'	58.7' 58.7'
9	311°28.4	• • 47.1	72°15.3	9.6'	16°59.3	12.2'	58.6'
10	326°28.5	46.2	86°43.9	9.5'	$17^{\circ}11.6$	12.1'	58.6'
11	341°28.5	45.4	101°12.4	9.5'	17°23.7	12.0'	58.5'
12 13	356°28.5 11°28.5	\$12°44.5 43.7	115°40.9 130°09.4	9.5' 9.4'	\$17°35.7 17°47.6	11.9' 11.8'	58.5' 58.5'
14	26° 28.6	42.8	130 09.4 144°37.8	9.4' 9.4'	17°59.3	11.7	58.4'
15	41°28.6	• • 41.9	159°06.2	9.4'	18°11.0	11.5'	58.4'
16	56° 28.6	41.1	173°34.6	9.4'	18°22.6	11.4'	58.3'
17	71°28.7	40.2	188°03.0	9.3'	18°34.0	11.3'	58.3'
18 19	86°28.7 101°28.7	\$12°39.4 38.5	202°31.3 216°59.6	9.3' 9.3'	\$18°45.3 18°56.5	11.2' 11.1'	58.3' 58.2'
20	116° 28.8	37.6	231°27.9	9.2'	10° 07.6	11.0'	58.2'
21	131°28.8	• • 36.8	245°56.1	9.2'	19°18.5	10.8'	58.1'
22	146° 28.8	35.9	260°24.4	9.2'	19°29.3	10.7'	58.1'
23	161°28.9	35.1	274°52.6	9.2'	19°40.1	10.6'	58.1'
	SD = 16.2'	d = -0.9'		SI	D = 16.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 28.9	5 12°34.2	289°20.7	9.1'	S19°50.6	10.5'	58.0'
1	191°28.9	33.3	303°48.9	9.1'	20°01.1	10.3'	58.0'
2	206°28.9 221°29.0	32.5 · · 31.6	318°17.0 332°45.0	9.1' 9.1'	20°11.4 20°21.6	10.2' 10.1'	57.9'
3 4	236° 29.0	· · 31.6 30.8	332 45.0 347°13.1	9.1 9.0'	20°21.6	10.1	57.9' 57.9'
5	251°29.0	29.9	1°41.1	9.0'	20°41.7	9.8'	57.8'
6	266°29.1	S12°29.0	$16^{\circ}09.1$	9.0'	S20°51.5	9.7'	57.8'
7	281°29.1	28.2	30°37.1	8.9'	21°01.2	9.6'	57.7'
8 9	296°29.2 311°29.2	27.3 •• 26.4	45°05.0 59°33.0	8.9' 8.9'	21°10.8 21°20.2	9.4' 9.3'	57.7' 57.7'
10	326° 29.2	25.6	74°00.8	8.9'	21°29.5	9.2'	57.6'
11	341°29.3	24.7	88°28.7	8.8'	21°38.7	9.0'	57.6'
12	356°29.3	S12°23.8	102°56.6	8.8'	S21°47.7	8.9'	57.6'
13 14	11°29.3 26°29.4	23.0 22.1	117°24.4 131°52.2	8.8' 8.8'	21°56.7 22°05.4	8.8' 8.6'	57.5' 57.5'
15	41° 29.4	21.2	146°19.9	8.7'	22°14.1	8.5	57.4'
16	56°29.4	20.4	160°47.7	8.7'	22°22.6	8.4'	57.4'
17	71°29.5	19.5	175°15.4	8.7'	22°31.0	8.2'	57.4'
18 19	86°29.5 101°29.6	\$12°18.6 17.8	189°43.1 204°10.7	8.7' 8.6'	\$22°39.2 22°47.3	8.1' 8.0'	57.3' 57.3'
20	101 29.0 116°29.6	16.9	218°38.4		22 47.3 22°55.3	7.8'	57.3'
21	131° 29.6	. 16.0	233°06.0	8.6'	23°03.1	7.7'	57.2'
22	146° 29.7	15.2	247°33.6	8.6'	23°10.8	7.6'	57.2'
23	161°29.7	14.3	262°01.2	8.6'	23°18.4	7.4'	57.1'
	SD = 16.2'	d = -0.9'		SI	D = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.7	\$12°13.4	276°28.8	8.5'	\$23°25.8	7.3'	57.1'
1 2	191°29.8 206°29.8	12.6 11.7	290°56.3 305°23.8	8.5' 8.5'	23°33.1 23°40.2	7.1' 7.0'	57.1' 57.0'
3	200°29.8 221°29.9	• • 10.8	319°51.3	8.5'	23°47.2	6.9'	57.0'
4	236°29.9	10.0	334°18.8	8.5'	23°54.1	6.7'	57.0'
5	251°29.9	09.1	348°46.3	8.5'	24°00.8	6.6'	56.9'
6 7	266°30.0 281°30.0	\$12°08.2 07.3	3°13.8 17°41.2	8.4' 8.4'	\$24°07.4 24°13.8	6.4' 6.3'	56.9' 56.9'
8	296° 30.1	06.5	32°08.6	8.4'	24°13.8	6.2	56.8'
9	311°30.1	• • 05.6	$46^{\circ}36.1$	8.4'	24°26.3	6.0'	56.8'
10	326° 30.2	04.7	61°03.5	8.4'	24°32.3	5.9'	56.7'
11 12	341°30.2 356°30.2	03.8 \$12°03.0	75°30.8 89°58.2	8.4' 8.4'	24°38.2 S 24°43.9	5.7' 5.6'	56.7' 56.7'
13	11°30.3	02.1	104°25.6	8.4'	24°49.5	5.4'	56.6'
14	26°30.3	01.2	$118^{\circ}52.9$	8.3'	24°54.9	5.3'	56.6'
15	41°30.4	12°00.3	133°20.3	8.3'	25°00.2	5.2'	56.6'
16 17	56° 30.4 71° 30.5	11°59.5 58.6	147°47.6 162°15.0	8.3' 8.3'	25°05.4 25°10.4	5.0' 4.9'	56.5' 56.5'
18	86°30.5	58.0 \$11°57.7	102 15.0 176°42.3	8.3'	25 10.4 \$25°15.2	4.9	56.5
19	101°30.5	56.8	191°09.6	8.3'	25°20.0	4.6'	56.4'
20	116°30.6	56.0	205°36.9	8.3'	25°24.5	4.4'	56.4
21 22	131°30.6 146°30.7	· · 55.1 54.2	220°04.2 234°31.5	8.3' 8.3'	25°29.0 25°33.3	4.3' 4.1'	56.4' 56.3'
23	140°30.7	53.3	248°58.9	o.s 8.3'	25°37.4	4.1	56.3'
	SD = 16.2'	d = -0.9'			D = 15.6'		

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

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		
S 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°	21:29	22:06	22:50	11:16	12:27	13:34		
45°	21:15	21:49	22:29	11:29	12:44	13:54		
S 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°	20:32	20:52	21:22	12:09	13:38	15:00		
58°	20:21	20:37	21:02	12:19	13:53	15:19		
S 60°	20:08	20:19	20:39	12:31	14:10	15:43		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-54%	
15	14:07	14:06	12:14	04:01	16:27		
16	14:04	14:03	12:14	04:53	17:20		
17	14:01	13:59	12:14	05:47	18:14		

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

Fri 0 1 2 3 4 5 6 7 8	GHA 147°29.9 162°32.4 177°34.8	GHA 136° 19.1	Dec N05°05.5	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 2 3 4 5 6 7	147°29.9 162°32.4	$136^{\circ}19.1$										
1 2 3 4 5 6 7	162°32.4			169°32.8	S10°19.9	331°04.8	$N03^{\circ}09.0$	124°39.7	$N07^{\circ}01.9$			
2 3 4 5 6 7		$151^{\circ}19.0$	06.8	184°33.4	19.2	346°07.5	09.1	139°41.9	02.0	Alpheratz	357°32.4	29° 14.8
3 4 5 6 7	177°34.8									Ankaa	353°05.0	-42°09.3
4 5 6 7		166° 18.9	08.1	199°34.0	18.4	1°10.2	09.2	154°44.2	02.1	Schedar	349°28.4	56°41.7
5 6 7	192°37.3	$181^{\circ}18.8$	• • 09.4	214°34.6	• • 17.7	$16^{\circ}12.9$	• • 09.4	169°46.4	•• 02.2	Diphda	348°45.0	-17°50.0
6 7	207°39.8	196° 18.6	10.7	229°35.2	16.9	31° 15.6	09.5	184°48.7	02.3	Achernar	335°18.7	-57°05.8
7	222°42.2	211° 18.5	11.9	244°35.8	16.2	46°18.3	09.6	199°50.9	02.4			
7	237°44.7	226° 18.4	N05°13.2	259°36.4	S10° 15.5	61°21.0	N03°09.7	214°53.2	$N07^{\circ}02.5$	Hamal	327°48.4	23°35.8
	252°47.2	241°18.3	14.5	274°37.0	14.7	76°23.7	09.8	229°55.4	02.6	Polaris	312°44.0	89°23.2
	267°49.6	256° 18.2	15.8	289°37.6	14.0	91°26.4	09.9	244°57.7	02.7	Acamar	$315^{\circ}09.9$	-40°11.8
9	282°52.1	271°18.1	17.1	304°38.2		106°29.1		259°59.9		Menkar	314°03.5	4° 11.9
					• • 13.2		• • 10.0		• • 02.7	Mirfak	308°24.6	49°57.8
10	297°54.6	286° 18.0	18.4	319°38.8	12.5	121°31.8	10.1	275°02.2	02.8	Aldebaran	290°36.6	16°33.9
11	312°57.0	301°17.9	19.6	334°39.4	11.8	136°34.5	10.2	290°04.5	02.9	Rigel	281°01.3	-8° 10.3
12	327°59.5	316° 17.8	N05°20.9	349°40.0	S10°11.0	151°37.2	N03° 10.4	305°06.7	$N07^{\circ}03.0$	Capella	280°17.9	46°01.6
13	343°01.9	331°17.7	22.2	4°40.6	10.3	166°39.9	10.5	320°09.0	03.1			
14	358°04.4	$346^{\circ}17.5$	23.5	19°41.2	09.5	181°42.6	10.6	335°11.2	03.2	Bellatrix	278°20.0	6°22.4
15	13°06.9	1°17.4	• • 24.8	34°41.8	08.8	196°45.3	• • 10.7	$350^{\circ}13.5$	• • 03.3	Elnath	277°58.5	28° 37.8
16	28°09.3	16° 17.3	26.1	49°42.4	08.1	211°48.0	10.8	5°15.7	03.4	Alnilam	275°35.0	-1°11.2
										Betelgeuse	$270^{\circ}49.1$	7°24.6
17	43°11.8	31°17.2	27.4	64°43.0	07.3	226°50.7	10.9	20°18.0	03.5	Canopus	263°50.9	-52°42.9
18	58°14.3	46° 17.1	N05°28.6	79°43.6	S10°06.6	241°53.4	N03°11.0	35°20.2	N07°03.6	Sirius	258°23.7	-16°45.5
19	73°16.7	$61^{\circ}17.0$	29.9	94° 44.2	05.8	256° 56.1	11.1	50°22.5	03.7	Adhara	255°03.6	-29°00.9
20	88°19.2	76° 16.9	31.2	109°44.8	05.1	271°58.8	11.3	65°24.7	03.8		244°47.9	5°09.0
21	103°21.7	$91^{\circ}16.8$	• • 32.5	124°45.4	• • 04.3	287°01.5	• • 11.4	80°27.0	• • 03.8	Procyon		
22	118°24.1	106° 16.7	33.8	139°46.0	03.6	302°04.3	11.5	95°29.2	03.9	Pollux	243°13.9	27°57.4
23	133°26.6	121°16.6	35.1	154°46.7	02.9	317°07.0	11.6	110°31.5	04.0	Avior	234°13.1	-59° 36.2
20	133 20.0									Suhail	222°44.0	-43°33.0
Mer.pa	ass. 14:08	ν -0.1' d1	.3′ m-4.21	ν 0.6′ d-0	.7′ m1.07	$\nu 2.7' \ d0.$	1' m-2.43	$\nu 2.3' \ d0$.1′ m0.58	Miaplacidus	221°36.7	-69°50.1
										Alphard	217°44.9	-8°47.1
										Regulus	207°31.4	11°49.5
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_		
0	148°29.1	136° 16.5	N05°36.3	169°47.3	S10°02.1	332°09.7	N03°11.7	125°33.7	N07°04.1	Dubhe	193°37.3	61°35.7
1	163°31.5	151° 16.4	37.6	184°47.9	01.4	347° 12.4	11.8	140°36.0	04.2	Denebola	182°22.1	14°24.6
2	178°34.0	166° 16.2	38.9	199°48.5	10°00.6	2°15.1	11.9	155°38.3	04.3	Gienah	175°40.7	-17°42.0
										Acrux	172°56.6	-63° 15.3
3	193°36.4	181°16.1	• • 40.2	214°49.1	09°59.9	17° 17.8	• • 12.0	170°40.5	• • 04.4	Gacrux	171°48.2	-57° 16.2
4	208°38.9	$196^{\circ}16.0$	41.5	229°49.7	59.1	32°20.5	12.2	185°42.8	04.5	Alioth	166°10.4	55°48.1
5	223°41.4	$211^{\circ}15.9$	42.7	244°50.3	58.4	47°23.2	12.3	200°45.0	04.6	Spica	158°19.4	-11° 18.6
6	238°43.8	226° 15.8	N05°44.0	259°50.9	S09°57.6	62°25.9	N03°12.4	215°47.3	N07°04.7	Alkaid	152°49.8	49° 10.0
7	253°46.3	$241^{\circ}15.7$	45.3	$274^{\circ}51.5$	56.9	77°28.6	12.5	230°49.5	04.8			
8	268°48.8	256° 15.6	46.6	289°52.1	56.2	92°31.3	12.6	245°51.8	04.9	Hadar	148°32.0	-60°30.4
9	283°51.2	271° 15.5	• • 47.9	304°52.7	55.4	107°34.0	. 12.7	260°54.0	• • 04.9	Menkent	147°54.4	-36°30.5
										Arcturus	145°45.4	19°01.9
10	298°53.7	286° 15.4	49.1	319°53.3	54.7	122°36.7	12.8	275°56.3	05.0	Rigil Kent.	139°36.4	-60°56.9
11	313°56.2	301°15.3	50.4	334°53.9	53.9	137°39.5	13.0	290°58.5	05.1	Kochab	$137^{\circ}19.7$	74°02.0
12	328°58.6	$316^{\circ}15.2$	N05°51.7	349°54.5	S09°53.2	152° 42.2	N03° 13.1	306°00.8	$N07^{\circ}05.2$	Zuben'ubi	136°53.1	-16°09.6
13	$344^{\circ}01.1$	331°15.1	53.0	$4^{\circ}55.1$	52.4	167°44.9	13.2	321°03.0	05.3	Alphecca	126°01.6	26°36.9
14	359°03.5	346° 15.0	54.3	19°55.8	51.7	182°47.6	13.3	336°05.3	05.4			-26° 29.6
15	14°06.0	1°14.9	• • 55.5	34°56.4	• • 50.9	197°50.3	• • 13.4	351°07.5	• • 05.5	Antares	112°12.7	
16	29°08.5	16° 14.8	56.8	49°57.0	50.2	212°53.0	13.5	6°09.8	05.6	Atria	107°04.8	-69°04.4
17	44°10.9	31° 14.6	58.1	64°57.6	49.5	227°55.7	13.6	21°12.0	05.7	Sabik	101°59.9	-15°45.6
							N03° 13.7			Shaula	$96^{\circ}07.1$	-37°07.3
18	59°13.4	46° 14.5	N05°59.4	79°58.2	S09°48.7	242°58.4		36°14.3	N07°05.8	Rasalhague	95°56.3	12° 32.2
19	74°15.9	61°14.4	06°00.7	94° 58.8	48.0	258°01.1	13.9	51°16.5	05.9	Eltanin	90°41.3	51°28.8
20	89°18.3	76° 14.3	01.9	109°59.4	47.2	273°03.8	14.0	66°18.8	06.0	Kaus Aust.	83°29.4	-34°22.1
21	104°20.8	91°14.2	• • 03.2	$125^{\circ}00.0$	• • 46.5	288°06.5	• • 14.1	81°21.0	•• 06.1	Vega	80°31.8	38°48.4
22	119°23.3	$106^{\circ}14.1$	04.5	140°00.6	45.7	303°09.3	14.2	96°23.3	06.2	_		
23	134°25.7	121°14.0	05.8	155°01.2	45.0	$318^{\circ}12.0$	14.3	111°25.5	06.2	Nunki	75°44.8	-26° 15.6
										Altair	61°57.7	8°56.5
Mer.pa	ass. 14:04	ν -0.1' d1	.3′ m-4.21	ν 0.6′ d-0	.7′ m1.07	ν 2.7 $^{\prime}$ d0.	.1′ m-2.43	ν 2.3 $^{\prime}$ d0	.1' m 0.58	Peacock	53°02.3	-56°38.5
										Deneb	49°24.5	45°22.8
										Enif	33°36.6	10°00.2
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.5
0	149°28.2	$136^{\circ}13.9$	N06°07.0	$170^{\circ}01.8$	S09°44.2	333° 14.7	N03° 14.4	126°27.8	$N07^{\circ}06.3$	Fomalhaut	$15^{\circ}12.1$	-29°28.4
1	164°30.7	$151^{\circ}13.8$	08.3	185°02.4	43.5	348° 17.4	14.5	141°30.0	06.4	Scheat	13°43.0	28° 14.2
2	179°33.1	$166^{\circ}13.7$	09.6	200°03.1	42.7	3°20.1	14.7	156°32.3	06.5	Markab	13°27.6	15°21.4
3	194°35.6	181°13.6	• • 10.9	215°03.7	• • 42.0	18°22.8	• • 14.8	171°34.5	• • 06.6	ividikdD	13 21.0	19 21.4
4	209°38.0	196° 13.5	12.1	230°04.3	41.2	33°25.5	14.9	186°36.8	06.7	Feb 18 Fri	SHA	Mer.pass
5	224°40.5	211° 13.4	13.4	245°04.9	40.5	48°28.2	15.0	201°39.0	06.8	Venus	348°49.2	14:55
							N03° 15.1			Mars	22°02.9	12:41
6	239°43.0	226°13.3	N06°14.7	260°05.5	S09°39.7	63°30.9		216°41.3	N07°06.9			
7	254°45.4	241°13.2	16.0	275°06.1	39.0	78°33.7	15.2	231°43.5	07.0	Jupiter		01:55
8	269°47.9	256° 13.1	17.2	290°06.7	38.2	93°36.4	15.4	246°45.8	07.1	Saturn	337°09.7	15:39
9	284°50.4	271°13.0	• • 18.5	305°07.3	• • 37.5	$108^{\circ}39.1$	•• 15.5	261°48.0	• • 07.2	E-L 10.0	CIIA	N4
10	299°52.8	$286^{\circ}12.9$	19.8	320°07.9	36.7	123°41.8	15.6	276°50.3	07.3	Feb 19 Sat	SHA	Mer.pass
11	314°55.3	301°12.8	21.1	335°08.5	36.0	138°44.5	15.7	291°52.5	07.4	Venus	347°47.4	14:55
12	329°57.8	316°12.7	N06°22.3	350°09.2	S09°35.3	153° 47.2	N03° 15.8	306°54.8	N07°07.5	Mars	21°18.2	12:40
	345°00.2	331° 12.7		5°09.8	34.5	168° 49.9		321°57.0		Jupiter	183°40.6	01:51
13			23.6				15.9		07.5	Saturn	337°04.7	15:35
14	0°02.7	346°12.5	24.9	20°10.4	33.8	183°52.6	16.0	336°59.3	07.6			
15	15°05.2	1°12.4	• • 26.2	35° 11.0	• • 33.0	198°55.4	• • 16.2	352°01.5	• • 07.7	Feb 20 Sun	SHA	Mer.pass
16	30°07.6	$16^{\circ}12.2$	27.4	$50^{\circ}11.6$	32.3	$213^{\circ}58.1$	16.3	7°03.8	07.8	Venus	346°45.7	14:55
17	45°10.1	$31^{\circ}12.1$	28.7	65°12.2	31.5	229°00.8	16.4	22°06.0	07.9	Mars	20°33.6	12:39
18	60°12.5	46° 12.0	N06°30.0	80°12.8	S09°30.8	244°03.5	N03° 16.5	37°08.2	N07°08.0		183°46.5	01:47
19	75°15.0	61°11.9	31.3	95° 13.4	30.0	259°06.2	16.6	52°10.5	08.1			
										Saturn	336°59.6	15:32
20	90°17.5	76°11.8	32.5	110°14.0	29.3	274°08.9	16.7	67°12.7	08.2	Horizont	tal parallax	
21	105°19.9	91°11.7	• • 33.8	125° 14.7	• • 28.5	289°11.6	• • 16.9	82°15.0	• • 08.3	norizoni	-	0.0
22	120°22.4	$106^{\circ}11.6$	35.1	140° 15.3	27.8	304° 14.4	17.0	97°17.2	08.4		Venus:	0.2
22	135°24.9	$121^{\circ}11.5$	36.3	$155^{\circ}15.9$	27.0	$319^{\circ}17.1$	17.1	112°19.5	08.5		Mars:	0.1
23	ass. 14:00	- 0 1/ /-	.3′ m-4.22	-0.6/ 1.5	.7′ m1.07	-0.7/ 10	1′ m-2.44	- 0.01 10	.1′ m0.58			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.8	S11°52.5	263°26.2	8.3'	S25°41.4	3.9'	56.3'
1	191°30.8	51.6	277°53.5	8.3'	25°45.3	3.7'	56.2'
2	206°30.9	50.7	292°20.8	8.3'	25°49.0	3.6'	56.2'
3 4	221°30.9 236°31.0	· · 49.8 48.9	306°48.1 321°15.4	8.3' 8.3'	25°52.5 25°56.0	3.4' 3.3'	56.2' 56.1'
5	251°31.0	48.1	335°42.8	8.3	25°59.2	3.1'	56.1
6	266°31.1	S11°47.2	350°10.1	8.3'	S26°02.4	3.0'	56.1'
7	281°31.1	46.3	4°37.4	8.3'	$26^{\circ}05.3$	2.8'	56.1'
8	296°31.2	45.4	19°04.8	8.4'	26°08.2	2.7'	56.0'
9 10	311°31.2 326°31.3	· · 44.6 43.7	33°32.1 47°59.5	8.4' 8.4'	26°10.9 26°13.4	2.6' 2.4'	56.0' 56.0'
11	341°31.3	42.8	62°26.9	8.4	26°15.4	2.3	55.9'
12	356°31.4	S11°41.9	76°54.3	8.4'	S26°18.1	2.1'	55.9'
13	11°31.4	41.0	91°21.7	8.4'	$26^{\circ}20.2$	2.0'	55.9'
14	26°31.5	40.1	105°49.1	8.4'	26°22.2	1.8'	55.8'
15 16	41°31.5 56°31.6	· · 39.3 38.4	120°16.5 134°44.0	8.5' 8.5'	26°24.0 26°25.7	1.7' 1.5'	55.8' 55.8'
17	71°31.6	37.5	149°11.4	8.5	26°27.3	1.4	55.8'
18	86°31.7	S11°36.6	163°38.9	8.5'	S26°28.7	1.3'	55.7'
19	101°31.7	35.7	178°06.4	8.5'	26°29.9	1.1'	55.7'
20	116°31.8	34.8	192°34.0	8.6'	26°31.0	1.0'	55.7'
21 22	131°31.8 146°31.9	· · 34.0	207°01.5 221°29.1	8.6' 8.6'	26°32.0 26°32.8	0.8' 0.7'	55.6' 55.6'
23	161°31.9	32.2	235°56.7	8.6'	26°33.5	0.7	55.6'
	SD = 16.2'	d = -0.9'			0 = 15.3'		
	<u> </u>	<u>u — -0.9</u>		JL	13.3		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.0 191°32.0	\$11°31.3 30.4	250°24.3 264°52.0	8.7' 8.7'	\$26°34.1 26°34.5	0.4'	55.6' 55.5'
1 2	191°32.0 206°32.1	30.4 29.5	264°52.0 279°19.7	8.7° 8.7'	26°34.5 26°34.7	0.3' 0.1'	55.5' 55.5'
3	221°32.1	28.6	293°47.4	8.7'	26°34.8	-0.0'	55.5'
4	236°32.2	27.8	308°15.1	8.8'	26°34.8	-0.2	55.5'
5	251°32.3	26.9	322°42.9	8.8'	26°34.7	-0.3'	55.4'
6	266°32.3	S11°26.0	337°10.7	8.8'	\$26°34.4	-0.4'	55.4'
7 8	281°32.4 296°32.4	25.1 24.2	351°38.6 6°06.4	8.9' 8.9'	26°33.9 26°33.3	-0.6' -0.7'	55.4' 55.4'
9	311°32.5	23.3	20°34.3	8.9'	26°32.6	-0.9	55.3'
10	326°32.5	22.4	35°02.3	9.0'	26°31.8	-1.0'	55.3'
11	341°32.6	21.5	49°30.3	9.0'	26°30.8	-1.1'	55.3'
12	356°32.6 11°32.7	\$11°20.7 19.8	63°58.3 78°26.4	9.1' 9.1'	\$26°29.7 26°28.4	-1.3' -1.4'	55.3' 55.2'
13 14	26°32.8	19.8	78 20.4 92°54.5	9.1 9.1'	26°27.0	-1.4 -1.5'	55.2'
15	41°32.8	. 18.0	107°22.6	9.2'	26°25.5	-1.7'	55.2'
16	56°32.9	17.1	121°50.8	9.2'	$26^{\circ}23.8$	-1.8'	55.2'
17	71°32.9	16.2	136°19.0	9.3'	26°22.0	-1.9'	55.1'
18 19	86°33.0 101°33.1	\$11°15.3 14.4	150°47.3 165°15.6	9.3' 9.4'	\$26°20.0 26°18.0	-2.1' -2.2'	55.1' 55.1'
20	116°33.1	13.5	179°44.0	9.4' 9.4'	26°15.8		55.1
21	131°33.2	12.6	194°12.4	9.5'	26°13.4	-2.5	55.0'
22	146°33.2	11.7	208°40.9	9.5'	$26^{\circ}11.0$	-2.6'	55.0'
23	161°33.3	10.9	223°09.4	9.6'	26°08.4	-2.7'	55.0'
	SD = 16.2'	d = -0.9'		SD	0 = 15.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.4	S 11°10.0	237°38.0	9.6'	S26°05.6	-2.9'	55.0'
1	191°33.4	09.1	252°06.6	9.7'	26°02.8	-3.0'	55.0'
2	206°33.5 221°33.5	08.2 •• 07.3	266°35.3 281°04.0	9.7' 9.8'	25°59.8 25°56.7	-3.1' -3.2'	54.9' 54.9'
4	236°33.6	06.4	295°32.8	9.8'	25°53.4	-3.4'	54.9
5	251°33.7	05.5	310°01.6	9.9'	$25^{\circ}50.0$	-3.5'	54.9'
6	266°33.7	S11°04.6	324°30.5	9.9'	\$25°46.5	-3.6'	54.9'
7	281°33.8 296°33.8	03.7 02.8	338°59.4 353°28.4	10.0' 10.0'	25°42.9 25°39.2	-3.8' -3.9'	54.8' 54.8'
8 9	296 33.8 311°33.9	· · 01.9	353°28.4 7°57.4	10.0	25°39.2 25°35.3	-3.9 -4.0'	54.8'
10	326°34.0	01.0	22°26.5	10.2'	25°31.3	-4.1'	54.8'
11	341°34.0	11°00.1	36°55.7	10.2'	25°27.2	-4.2'	54.8'
12	356°34.1	\$10°59.2	51°24.9	10.3'	\$25°22.9	-4.4'	54.7'
13 14	11°34.2 26°34.2	58.3 57.4	65°54.2 80°23.5	10.3' 10.4'	25°18.6 25°14.1	-4.5' -4.6'	54.7' 54.7'
15	41°34.3	56.5	94°52.9	10.4	25°09.5	-4.7'	54.7
16	56°34.4	55.6	109°22.4	10.5'	25°04.7	-4.8'	54.7'
17	71°34.4	54.7	123°51.9	10.6'	24°59.9	-5.0'	54.7'
18	86°34.5 101°34.6	\$10°53.8 52.9	138°21.5 152°51.2	10.6' 10.7'	\$24°54.9 24°49.9	-5.1' -5.2'	54.6' 54.6'
19 20	101°34.6 116°34.6	52.9 52.0	152°51.2 167°20.9	10.7	24°49.9 24°44.7	-5.2° -5.3'	54.6'
21	131°34.7	51.1	181°50.7	10.8	24°39.3	-5.4'	54.6'
22	146°34.7	50.2	$196^{\circ}20.5$	10.9'	24°33.9	-5.5'	54.6'
23	161°34.8	49.3	210°50.4	11.0'	24°28.4	-5.7'	54.6'
	SD = 16.2'	d = -0.9'		SD	0 = 15.0'		

		20)28 Febi	ruary 18	d to Fe	b. 20	
Lat.	Twi	light	Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.	
N 72°	05:59	07:18	08:34	15:56	17:12	18:31	
N 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	
N 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°	05:32	05:57	06:19	18:09	18:31	18:55	
0°	05:25	05:49	06:10	18:17	18:38	19:03	
S 10°	05:16	05:41	06:02	18:25	18:47	19:12	
20°	05:04	05:31	05:53	18:34	18:57	19:23	
30°	04:49	05:18	05:43	18:44	19:09	19:38	
35°	04:39	05:11	05:37	18:50	19:16	19:48	
40°	04:28	05:02	05:30	18:57	19:25	19:59	
45°	04:13	04:51	05:22	19:05	19:36	20:13	
S 50°	03:54	04:38	05:13	19:14	19:49	20:32	
52°	03:45	04:31	05:08	19:18	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	
S 60°	02:50	03:56	04:44	19:42	20:29	21:34	
Lat.	Moonrise				Moonset	t	
	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	
600	04.00	05.22	06.11	00.50	00.20	10.40	

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Luy	00 ^h	12 ^h	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	Ve	enus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	150°27.3	136° 11.4	N06°37.6	170°16.5	S09°26.3	334°19.8	N03° 17.2	127°21.7	N07°08.6			
1	165°29.8	151°11.3	38.9	185°17.1	25.5	349°22.5	17.3	142°24.0	08.7	Alpheratz	$357^{\circ}32.4$	29°14.8
2	180°32.3	166° 11.2	40.2	200°17.7	24.8	4°25.2	17.4	157°26.2	08.8	Ankaa	353°05.0	-42°09.3
3	195°34.7	181°11.1	• • 41.4	215°18.3	24.0	19°27.9	. 17.6	172°28.5	. 08.9	Schedar	349°28.5	56°41.7
4	210°37.2	196° 11.0	42.7	230°18.9	23.2	34°30.7	17.7	187°30.7	08.9	Diphda	348°45.0	-17°50.0
5	225°39.7	211° 10.9	44.0	245°19.6	22.5	49°33.4	17.8	202°33.0	09.0	Achernar	335°18.7	-57°05.8
6	240°42.1	226° 10.8	N06°45.2	260°20.2	S09°21.7	64°36.1	N03° 17.9	217°35.2	N07°09.1	Hamal	327°48.4	23°35.8
7	255°44.6	241°10.7	46.5	275°20.8	21.0	79°38.8	18.0	232°37.5	09.2	Polaris	312°45.4	89°23.2
8	270°47.0	256° 10.6	47.8	290°21.4	20.2	94°41.5	18.1	247°39.7	09.3	Acamar	315°10.0	-40°11.7
9	285°49.5	$271^{\circ}10.5$	• • 49.0	305°22.0	• • 19.5	109°44.2	• • 18.3	262°41.9	• • 09.4	Menkar	314°03.5	4°11.9
10	300°52.0	286°10.4	50.3	320°22.6	18.7	124°47.0	18.4	277°44.2	09.5	Mirfak	308°24.6 290°36.6	49°57.8 16°33.9
11	$315^{\circ}54.4$	301°10.3	51.6	335°23.2	18.0	139°49.7	18.5	292°46.4	09.6	Aldebaran	290 36.6 281°01.3	-8°10.3
12	330°56.9	316° 10.2	N06°52.8	350°23.9	S09°17.2	154° 52.4	N03°18.6	307°48.7	N07°09.7	Rigel Capella	281 01.3 280°17.9	-8 10.3 46°01.6
13	345°59.4	331°10.1	54.1	5°24.5	16.5	$169^{\circ}55.1$	18.7	322°50.9	09.8	Bellatrix	278°20.0	6°22.4
14	1°01.8	$346^{\circ}10.0$	55.4	20°25.1	15.7	184°57.8	18.8	337°53.2	09.9	Elnath	277°58.5	28°37.8
15	16°04.3	1°09.9	• • 56.7	35°25.7	• • 15.0	200°00.5	• • 19.0	352°55.4	• • 10.0	Alnilam	275°35.0	-1°11.2
16	31°06.8	16°09.8	57.9	50°26.3	14.2	215°03.3	19.1	7°57.7	10.1	Betelgeuse	270°49.1	7°24.6
17	46°09.2	31°09.7	06°59.2	65°26.9	13.5	230°06.0	19.2	22°59.9	10.2	Canopus	263°50.9	-52°42.9
18	61°11.7	46°09.6	N07°00.5	80°27.6	S09°12.7	245°08.7	N03°19.3	38°02.2	N07° 10.3	Sirius	258°23.7	-16°45.5
19	76°14.2	61°09.5	01.7	95°28.2	12.0	260°11.4	19.4	53°04.4	10.4	Adhara	255°03.6	-29°00.9
20	91°16.6	76°09.4	03.0	110°28.8	11.2	275°14.1	19.5	68°06.6	10.5	Procyon	244°47.9	5°09.0
21	106°19.1	91°09.3	• • 04.3	125°29.4	• • 10.5	290°16.9	• • 19.7	83°08.9	• • 10.6	Pollux	243°13.9	27°57.4
22	121°21.5	106°09.2	05.5	140°30.0	09.7	305°19.6	19.8	98°11.1	10.6	Avior	234°13.1	-59°36.2
23	136°24.0	121°09.1	06.8	155°30.6	09.0	320°22.3	19.9	113°13.4	10.7	Suhail	222°44.0	-43°33.0
Mer.p	ass. 13:56	$ u$ -0.1 $^{\prime}$ d1	3′ m-4.23	ν 0.6′ d-0	.8′ m1.07	ν 2.7′ d0.	.1′ m-2.44	ν 2.2 $^{\prime}$ d0	.1′ m0.58	Miaplacidus	221°36.7	-69°50.1
		-		-		-		-		Alphard	$217^{\circ}44.9$	-8°47.1
т	СПV	CUA	Doc	CUA	Doc	CUA	Doc	CUA	Doc	Regulus	$207^{\circ}31.4$	11°49.5
Tue	GHA 151°26.5	GHA 136°09.0	Dec N07°08.0	GHA 170°31.2	Dec \$09°08.2	GHA 335° 25 0	Dec N03° 20.0	GHA 128°15.6	Dec N07° 10.8	Dubhe	193°37.3	61°35.7
0 1	151°26.5 166°28.9	136°09.0 151°08.9	09.3	170°31.2 185°31.9	07.4	335°25.0 350°27.7	20.1	128° 15.6 143° 17.9	10.9	Denebola	182°22.0	14°24.6
2	166°28.9 181°31.4	151°08.9 166°08.8	09.3 10.6	185°31.9 200°32.5	07.4 06.7	5°30.5	20.1	143°17.9 158°20.1	10.9	Gienah	175°40.6	-17°42.1
3	196°33.9	181°08.7	• • 11.8	200 32.5 215°33.1	• • 05.9	20°33.2	. 20.3	173°22.4	•• 11.1		172°56.5	-63°15.3
3 4	211°36.3	196° 08.6	13.1	230°33.7	05.9	20 33.2 35°35.9	20.4	173 22.4 188°24.6	11.2	1	171°48.2	-57°16.2
5	211 30.3 226°38.8	211°08.5	14.4	245°34.3	04.4	50°38.6	20.5	203°26.8	11.3	Alioth	166°10.4	55°48.1
6	241°41.3	211 08.5 226°08.4	N07°15.6	260°34.9	S09°03.7	65°41.3	N03° 20.7	218°29.1	N07°11.4	Spica	158°19.4	-11°18.6
7	256°43.7	241°08.3	16.9	275°35.6	02.9	80°44.1	20.8	233°31.3	11.5	Alkaid	152°49.8	49°10.0
8	271°46.2	256°08.2	18.2	290°36.2	02.2	95°46.8	21.0	248°33.6	11.6	Hadar	148°31.9	-60°30.4
9	286°48.6	271°08.1	• • 19.4	305°36.8	•• 01.4	110°49.5	21.1	263°35.8	. 11.7	1	147°54.3	-36°30.5
10	301°51.1	286°08.0	20.7	320°37.4	09°00.7	125°52.2	21.2	278°38.1	11.8	Arcturus	145°45.4	19°01.9
11	316°53.6	301°07.9	21.9	335°38.0	08°59.9	140°54.9	21.3	293°40.3	11.9	Rigil Kent.	139°36.4	-60°56.9
12	331°56.0	316° 07.8	N07°23.2	350°38.7	S08°59.1	155° 57.7	N03°21.4	308°42.5	N07° 12.0	Kochab	137°19.6	74°02.0
13	346°58.5	331°07.7	24.5	5°39.3	58.4	171°00.4	21.6	323°44.8	12.1	Zuben'ubi	136°53.0	-16°09.6
14	2°01.0	346° 07.6	25.7	20°39.9	57.6	186°03.1	21.7	338°47.0	12.2	Alphecca	126°01.5	26°36.9
15	17°03.4	1°07.5	• • 27.0	35°40.5	• • 56.9	201°05.8	• • 21.8	353°49.3	• • 12.3	Antares	112°12.7	-26°29.6
16	32°05.9	16°07.4	28.3	50°41.1	56.1	216°08.6	21.9	8°51.5	12.4	Atria Sabik	107°04.7 101°59.9	-69°04.4 -15°45.6
17	47°08.4	31°07.3	29.5	65°41.7	55.4	231°11.3	22.0	23°53.8	12.4	Shaula	96°07.0	-15 45.0 -37°07.3
18	62°10.8	46°07.2	N07°30.8	80°42.4	S08°54.6	246°14.0	N03°22.1	38°56.0	$N07^{\circ}12.5$	Rasalhague	95°56.3	12°32.2
19	77°13.3	$61^{\circ}07.1$	32.0	95°43.0	53.8	$261^{\circ}16.7$	22.3	53°58.2	12.6	Eltanin	90°41.2	51°28.8
20	92°15.8	76°07.0	33.3	110°43.6	53.1	$276^{\circ}19.4$	22.4	69°00.5	12.7	Kaus Aust.	83°29.3	-34°22.1
21	$107^{\circ}18.2$	91°07.0	• • 34.6	125°44.2	• • 52.3	291°22.2	• • 22.5	84°02.7	• • 12.8	Vega	80°31.7	38°48.4
22	122°20.7	$106^{\circ}06.9$	35.8	140°44.8	51.6	306°24.9	22.6	99°05.0	12.9	Nunki	75°44.8	-26°15.6
23	137°23.1	121°06.8	37.1	155°45.5	50.8	321°27.6	22.7	114°07.2	13.0	Altair	61°57.7	8°56.5
Mern	ass. 13:52	v-0.1′ d1	3′ m-4.23	ν0.6′ d-0	.8′ m1.06	v2 7' d0	.1′ m-2.45	v2 2' d0	.1′ m0.58	Peacock	53°02.3	-56°38.5
- IVICI.P	ass. 15.52	ν-0.1 α1		νο.σ α-σ	.0 1111.00	ν2.1 do.	.1 111-2.43	VZ.Z UO	.1 1110.50	Deneb	49°24.4	45°22.8
										Enif	33°36.6	10°00.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.4
0	152°25.6	136°06.7	N07°38.3	170°46.1	S08°50.1	336°30.3	N03°22.9	129°09.5	N07° 13.1	Fomalhaut	15°12.1	-29°28.4
1	167°28.1	151°06.6	39.6	185°46.7	49.3	351°33.1	23.0	144°11.7	13.2	Scheat	13°43.0	28°14.2
2	182°30.5	166°06.5	40.8	200°47.3	48.5	6°35.8	23.1	159°13.9	13.3	Markab	13°27.6	15°21.4
3	197°33.0	181°06.4	• • 42.1	215°47.9	• • 47.8	21°38.5	• • 23.2	174°16.2	13.4	Feb 21 Mon	SHA	Me:: ====
4	212°35.5	196°06.3	43.4	230°48.6	47.0 46.3	36°41.2	23.3	189°18.4	13.5	Venus		Mer.pass 14:55
5	227°37.9 242°40.4	211°06.2	44.6 No7°45.0	245°49.2	46.3	51°44.0 66°46.7	23.5 No3°23.6	204°20.7	13.6 N07° 13.7	Mars	19°49.2	12:38
6 7	242°40.4 257°42.9	226°06.1 241°06.0	N07°45.9 47.1	260°49.8 275°50.4	\$08°45.5 44.8	81°49.4	N03°23.6 23.7	219°22.9 234°25.1	13.7 13.8	I	19 49.2 183°52.5	01:42
8	257 42.9 272°45.3	241°06.0 256°05.9	47.1 48.4	275°50.4 290°51.0	44.8 44.0	96°52.1	23.7	234°25.1 249°27.4	13.8	Saturn	336°54.4	15:28
9	212 45.3 287°47.8	271°05.8	• • 49.6	305°51.7	• • 43.2	90 52.1 111°54.9	23.9	264°29.6	. 14.0			15.20
10	302°50.3	271 05.8 286°05.7	50.9	320°52.3	42.5	111 54.9 126° 57.6	24.1	279°31.9	14.1	Feb 22 Tue	SHA	Mer.pass
11	302 50.3 317°52.7	301°05.6	52.1	335°52.9	42.5	142° 00.3	24.1	279 31.9 294°34.1	14.1	Venus		14:55
12	332°55.2	316° 05.5	N07°53.4	350°53.5	S08°41.0	157°03.0	N03°24.3	309°36.3	N07° 14.3	Mars	19°04.8	12:37
13	347°57.6	331° 05.3	54.7	5°54.1	40.2	172°05.8	24.4	324°38.6	14.4		183°58.5	01:38
14	3°00.1	346°05.3	55.9	20°54.8	39.4	187° 08.5	24.5	339°40.8	14.5	Saturn	336°49.2	15:25
15	18°02.6	1°05.2	• • 57.2	35°55.4	• • 38.7	202°11.2	24.7	354°43.1	. 14.5	Feb 23 Wed	SHA	Mer.pass
16	33°05.0	16°05.1	58.4	50°56.0	37.9	217° 13.9	24.8	9°45.3	14.6	I	343°41.1	14:56
17	48°07.5	31°05.0	07°59.7	65°56.6	37.2	232°16.7	24.9	24°47.5	14.7	Mars	18° 20.5	12:36
18	63°10.0	46°04.9	N08°00.9	80°57.3	S08°36.4	247° 19.4	N03°25.0	39°49.8	N07°14.8		184°04.7	01:34
19	78°12.4	61°04.8	02.2	95°57.9	35.6	262°22.1	25.1	54°52.0	14.9	Saturn	336°43.8	15:21
20	93°14.9	$76^{\circ}04.7$	03.4	$110^{\circ}58.5$	34.9	277°24.8	25.3	69°54.3	15.0			
21	$108^{\circ}17.4$	91°04.7	• • 04.7	125°59.1	• • 34.1	292°27.6	• • 25.4	84°56.5	• • 15.1	Horizont	al parallax	
22	123°19.8	$106^{\circ}04.6$	05.9	$140^{\circ}59.7$	33.4	307°30.3	25.5	99°58.7	15.2		Venus:	0.2
23	138°22.3	121°04.5	07.2	156°00.4	32.6	322°33.0	25.6	115°01.0	15.3		Mars:	0.1
Mern	ass. 13:48	v-0 1′ d1	3′ m-4.24	ν0.6' d.0	.8′ m1.06	v2 7' d0	.1′ m-2.45	1/2 2/ d0	.1′ m0.58			
- wier.p		ν U.1 U1	7.27	- J.U U-U	.5 1111.00	- Z.1 UU.		-2.2 00				

	Sun		Moon				
h	Su	n			Moon		
Mon	GHA	Dec \$10°48.4	GHA	ν 11.0'	Dec	d E o'	HP
0 1	176°34.9 191°35.0	\$10°48.4 47.5	225°20.4 239°50.4	11.0' 11.1'	\$24°22.7 24°17.0	-5.8' -5.9'	54.5' 54.5'
2	206°35.0	46.6	254°20.5	11.2'	24°11.1	-6.0'	54.5
3	221°35.1	• • 45.7	268°50.7	11.2'	24°05.1	-6.1'	54.5'
4	236°35.2	44.8	283°20.9	11.3'	23°59.0	-6.2'	54.5'
5	251°35.2	43.9	297°51.2	11.4'	23°52.8	-6.3	54.5'
6 7	266°35.3 281°35.4	\$10°43.0 42.1	312°21.6 326°52.0	11.4' 11.5'	\$23°46.5 23°40.1	-6.4' -6.5'	54.4' 54.4'
8	296°35.4	41.2	341°22.5	11.6'	23°33.5	-6.6'	54.4'
9	311°35.5	• • 40.3	355°53.0	11.6'	23°26.9	-6.7'	54.4'
10	326°35.6	39.4	10°23.7	11.7'	23°20.2	-6.8'	54.4'
11	341°35.6 356°35.7	38.5	24°54.4	11.8'	23°13.3	-6.9'	54.4'
12 13	356°35.7 11°35.8	\$10°37.6 36.7	39°25.1 53°56.0	11.8' 11.9'	\$23°06.4 22°59.3	-7.0' -7.1'	54.4' 54.3'
14	26°35.9	35.8	68°26.9	12.0'	22°52.2	-7.1 -7.2	54.3
15	41°35.9	• • 34.9	82°57.8	12.0'	22°44.9	-7.3'	54.3'
16	56°36.0	34.0	97°28.9	12.1'	22°37.6	-7.4'	54.3'
17 18	71°36.1 86°36.1	33.1 \$10°32.2	112°00.0 126°31.2	12.2' 12.2'	22°30.1 522°22.6	-7.5'	54.3' 54.3'
19	101°36.2	31.3	120 31.2 141°02.4	12.2	22°15.0	-7.6' -7.7'	54.3'
20	116°36.3	30.4	155°33.7	12.4	22°07.2	-7.8'	54.3'
21	131°36.4	• • 29.5	$170^{\circ}05.1$	12.4'	21°59.4	-7.9'	54.2'
22	146°36.4	28.6	184°36.5	12.5'	21°51.5	-8.0'	54.2'
23	161°36.5	27.7	199°08.0	12.6'	21°43.4	-8.1'	54.2'
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Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	176°36.6	\$10°26.8	213°39.6	12.6'	\$21°35.3	-8.2'	54.2'
1	191°36.6	25.8	228°11.3	12.7'	$21^{\circ}27.1$	-8.3'	54.2'
2	206°36.7	24.9	242°43.0	12.8'	21°18.8	-8.4'	54.2'
3	221°36.8	• • 24.0	257°14.8 271°46.6	12.9'	21°10.4	-8.5'	54.2'
4 5	236°36.9 251°36.9	23.1 22.2	271°46.6 286°18.5	12.9' 13.0'	21°01.9 20°53.4	-8.6' -8.7'	54.2' 54.2'
6	266°37.0	\$10°21.3	300°50.5	13.1'	520°44.7	-8.7'	54.1'
7	281°37.1	20.4	$315^{\circ}22.6$	13.1'	20°36.0	-8.8'	54.1'
8	296°37.2	19.5	329°54.7	13.2'	20°27.2	-8.9'	54.1'
9	311°37.2	• • 18.6	344°26.9 358°59.1	13.3'	20°18.2 20°09.3	-9.0'	54.1' 54.1'
10 11	326°37.3 341°37.4	17.7 16.8	358°59.1 13°31.5	13.3' 13.4'	20°09.3 20°00.2	-9.1' -9.2'	54.1' 54.1'
12	356°37.5	\$10°15.8	28°03.8	13.4	\$19°51.0	-9.2'	54.1'
13	11°37.6	14.9	42°36.3	13.5'	19°41.8	-9.3'	54.1'
14	26°37.6	14.0	57°08.8	13.6'	19°32.4	-9.4'	54.1'
15 16	41°37.7 56°37.8	· · 13.1 12.2	71°41.4 86°14.0	13.6' 13.7'	19°23.0 19°13.6	-9.5' -9.6'	54.1' 54.1'
17	71°37.9	11.3	100°46.7	13.8'	19°04.0	-9.6'	54.0'
18	86°37.9	S10° 10.4	115°19.5	13.8'	S18°54.4	-9.7'	54.0'
19	101°38.0	09.5	129°52.3		18°44.7	-9.8'	54.0'
20	116°38.1 131°38.2	08.6 •• 07.6	144°25.2 158°58.2	14.0' 14.0'	18°34.9 18°25.0	-9.9' -9.9'	54.0' 54.0'
21 22	131 36.2 146°38.3	06.7	173°31.2	14.1'	18°15.1	-9.9 -10.0'	54.0'
23	161°38.3	05.8	188°04.3	14.1'	18°05.1	-10.1	54.0'
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Wed	GHA 176°38.4	Dec \$10°04.9	GHA 202°37.4	u 14.2'	Dec \$17°55.0	d 10.2'	HP
0 1	176°38.4 191°38.5	04.0	202°37.4 217°10.6	14.2'	517°55.0 17°44.8	-10.2' -10.2'	54.0' 54.0'
2	206°38.6	03.1	231°43.9	14.3'	17°34.6	-10.3	54.0'
3	221°38.7	•• 02.2	246°17.2	14.4'	17°24.3	-10.4'	54.0'
4	236°38.7	01.2	260°50.6	14.4'	17°13.9	-10.4'	54.0'
5 6	251°38.8 266°38.9	10°00.3 \$09°59.4	275°24.0 289°57.5	14.5' 14.6'	17°03.5 \$16°53.0	-10.5' -10.6'	54.0' 54.0'
7	281°39.0	58.5	304°31.1	14.6'	16°42.5	-10.6'	54.0'
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9	311°39.2	• • 56.7	333°38.4	14.7'	16°21.1	-10.8'	53.9'
10	326°39.2	55.8	348°12.1	14.8'	16°10.4 15°59.6	-10.8'	53.9'
11 12	341°39.3 356°39.4	54.8 \$09°53.9	2°45.9 17°19.7	14.8' 14.9'	15°59.6 \$15°48.7	-10.9' -10.9'	53.9' 53.9'
13	11°39.5	53.0	31°53.6	14.9'	15°37.8	-10.9	53.9'
14	26°39.6	52.1	46°27.6	15.0'	$15^{\circ}26.8$	-11.1'	53.9'
15	41°39.7	• • 51.2	61°01.6	15.1'	15°15.7	-11.1'	53.9'
16 17	56°39.7 71°39.8	50.2 49.3	75°35.6 90°09.7	15.1' 15.2'	15°04.6 14°53.4	-11.2' -11.2'	53.9' 53.9'
18	71°39.8 86°39.9	49.3 \$09°48.4	90°09.7 104°43.9	15.2'	14°53.4 \$14°42.2	-11.2	53.9'
19	101°40.0	47.5	119°18.1	15.3'	14°30.9	-11.3	53.9'
20	116°40.1	46.6	133°52.3	15.3'	14°19.5	-11.4'	53.9'
21	131°40.2	• • 45.7	148°26.6	15.4'	14°08.1	-11.5'	53.9'
22 23	146°40.3 161°40.3	44.7 43.8	163°01.0 177°35.4	15.4' 15.4'	13°56.7 13°45.2	-11.5' -11.6'	53.9' 53.9'
23			111 33.4			-11.0	55.9
	SD = 16.2'	d = -0.9' SD = 14.7'					

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N 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 60° 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 06:30 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 N 40° 05:45 06:17	Lat.	Naut.	Civil	Junisc	Junioci	Civil	Naut.
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 06:35 07:15 17:13 17:54 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 N 40° 05:45 06:17 06:44 17:43 18:11 18:42 30° 05:42 06:10 06:34 17:59 18:02 18:40 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:32 05:56 06:17 18:10 18:31 18:56 0° 05:25 05:49 06:10 18:17 18:31 18:56 0° 05:25 05:41 06:51 06:51 17:37 18:00 18:40 50° 05:42 06:10 06:34 17:54 18:18 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:25 05:49 06:10 18:17 18:31 18:56 0° 05:25 05:49 06:10 18:17 18:33 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 19:10 20° 05:06 05:32 05:55 18:32 18:55 19:21 30° 04:52 05:21 05:45 18:41 19:06 19:35 50° 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 S 50° 04:01 04:43 05:14 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	N 72°	05:46	07:04	08:17	16:12	17:25	18:44
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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 N 40° 05:45 06:17 06:44 17:43 18:11 18:42 35° 05:44 06:13 06:39 17:49 18:14 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 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 S 10° 05:16 05:41 06:03 18:24 18:46 19:10 20° 05:06 05:32 05:55 18:32 18:55 19:21 30° 04:43 05:14	N 58°	05:49	06:35	07:15	17:13	17:54	18:39
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45° 05:47 06:21 06:51 17:37 18:07 18:41 N 40° 05:45 06:17 06:44 17:43 18:11 18:42 35° 05:44 06:13 06:39 17:49 18:14 18:44 30° 05:42 06:10 06:34 17:54 18:18 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:32 05:56 06:17 18:10 18:31 18:56 0° 05:25 05:49 06:10 18:17 18:38 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 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	52°	05:48	06:28	07:02	17:26	18:00	18:40
N 40° 05:45 06:17 06:44 17:43 18:11 18:42 35° 05:44 06:13 06:39 17:49 18:14 18:44 30° 05:42 06:10 06:34 17:54 18:18 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:25 05:49 06:10 18:17 18:38 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 19:10 20° 05:06 05:32 05:55 18:32 18:55 19:21 30° 04:52 05:21 05:45 18:41 19:06 19:35 35° 04:43 05:14 05:40 18:46 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 S 50° 04:01 04:43 05:18 19:08 19:42 20:25 52° 03:52 04:37 05:14 19:12 19:48 20:33 54° 03:43 04:31 05:09 19:16 19:55 20:42 56° 03:31 04:24 05:04 19:27 20:10 21:06	50°	05:48	06:26	06:58	17:29	18:02	18:40
35° 05:44 06:13 06:39 17:49 18:14 18:44 30° 05:42 06:10 06:34 17:54 18:18 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:32 05:56 06:17 18:10 18:31 18:56 0° 05:25 05:49 06:10 18:17 18:38 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 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 50° 04:01 04:43	45°	05:47	06:21	06:51	17:37	18:07	18:41
30° 05:42 06:10 06:34 17:54 18:18 18:46 20° 05:37 06:03 06:25 18:02 18:24 18:50 N 10° 05:32 05:56 06:17 18:10 18:31 18:56 0° 05:25 05:49 06:10 18:17 18:38 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 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 5 50° 04:01 04:43 05:18 19:08 19:42 20:25 52° 03:52 04:37		05:45	06:17	06:44	17:43	18:11	18:42
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:44	06:13		17:49	18:14	18:44
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						18:18	
0° 05:25 05:49 06:10 18:17 18:38 19:02 S 10° 05:16 05:41 06:03 18:24 18:46 19:10 20° 05:06 05:32 05:55 18:32 18:55 19:21 30° 04:52 05:21 05:45 18:41 19:06 19:35 35° 04:43 05:14 05:40 18:46 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 5 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		05:37	06:03	06:25	18:02	18:24	18:50
S 10° 05:16 05:41 06:03 18:24 18:46 19:10 20° 05:06 05:32 05:55 18:32 18:55 19:21 30° 04:52 05:21 05:45 18:41 19:06 19:35 35° 04:43 05:14 05:40 18:46 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 S 50° 04:01 04:43 05:18 19:08 19:42 20:25 52° 03:52 04:37 05:14 19:12 19:48 20:33 56° 03:31 04:24 05:04 19:21 20:02 20:52 58° 03:18 04:15 04:59 19:27 20:10 21:06					18:10	18:31	18:56
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 5 0° 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 19:52 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	0°	05:25	05:49	06:10	18:17	18:38	19:02
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 5 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		05:16	05:41	06:03	18:24	18:46	19:10
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 5 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		05:06	05:32	05:55	18:32	18:55	19:21
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 S 50° 04:01 04:43 05:18 19:08 19:42 20:25 52° 03:52 04:37 05:14 19:12 19:48 20:33 54° 03:43 04:31 05:09 19:16 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					18:41	19:06	
45° 04:18 04:56 05:27 19:00 19:30 20:08 5 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							-
S 50° 04:01 04:43 05:18 19:08 19:42 20:25 52° 03:52 04:37 05:14 19:12 19:48 20:33 54° 03:43 04:31 05:09 19:16 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							
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	45°	04:18	04:56	05:27	19:00	19:30	20:08
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							
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		03:52	04:37	05:14	19:12	19:48	20:33
58° 03:18 04:15 04:59 19:27 20:10 21:06					l		-
					1 -		
S 60° 03:02 04:06 04:52 19:33 20:19 21:22							
	S 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
N 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
N 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
N 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
N 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
S 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
S 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
S 60°		00:57	02:22	18:35	18:44	18:49

ı			Sun			Moon		
	Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	,	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	17-5%	
	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	153°24.7	136°04.4	N08°08.4	171°01.0	S08°31.8	337°35.8	N03°25.7	130°03.2	N07° 15.4			
1	168°27.2	151°04.3	09.7	186°01.6	31.1	352°38.5	25.9	145°05.5	15.5	Alpheratz	357°32.4	29° 14.8
2	183°29.7	166°04.2	10.9	201°02.2	30.3	7°41.2	26.0	160°07.7	15.6	Ankaa	353°05.0	-42°09.3
3	198°32.1	181°04.1	12.2	216°02.9	29.6	22°43.9	26.1	175°09.9	• • 15.7	Schedar	349°28.5	56°41.7
4	213°34.6	196°04.0	13.4	231°03.5	28.8	37°46.7	26.2	190°12.2	15.8	Diphda	348°45.0	-17°50.0
5	228°37.1	211°03.9	14.7	246°04.1	28.0	52°49.4	26.3	205°14.4	15.9	Achernar	335°18.7	-57°05.8
6	243°39.5	226° 03.8	N08°15.9	261°04.7	S08°27.3	67°52.1	N03°26.5	220°16.6	N07°16.0	Hamal	327°48.4	23°35.8
7	258°42.0	241°03.7	17.2	276°05.4	26.5	82°54.9	26.6	235°18.9	16.1	Polaris	312°47.0	89°23.2
8	273°44.5	256°03.6	18.4	291°06.0	25.8	97°57.6	26.7	250°21.1	16.2	Acamar	315°10.0	-40° 11.7
9	288°46.9	271°03.5	19.7	306°06.6	25.0	113°00.3	26.8	265°23.4	. 16.3	Menkar	314°03.5	4°11.9
10	303°49.4	286°03.4	20.9	321°07.2	24.2	128°03.0	27.0	280°25.6	16.4	Mirfak	308°24.6	49°57.8
11	318°51.9	301°03.3	22.2	336°07.9	23.5	143°05.8	27.1	295°27.8	16.5	Aldebaran	290°36.6	16°33.9
12	333°54.3	316°03.2	N08°23.4	351°08.5	S08°22.7	158° 08.5	N03°27.2	310°30.1	N07° 16.6	Rigel	281°01.3	-8° 10.3
13	348°56.8	331°03.1	24.7	6°09.1	22.0	173° 11.2	27.3	325°32.3	16.7	Capella	280°17.9	46°01.6
14	3°59.2	346°03.1	25.9	21°09.7	21.2	173 11.2 188° 14.0	27.3	340°34.5	16.8	Bellatrix	278°20.0	6°22.4
15	19°01.7	1°03.0	27.2	36° 10.4	20.4	203° 16.7	27.6	355°36.8	. 16.9	Elnath	277°58.5	28° 37.8
16	34°04.2	16°02.9	28.4	51°11.0	19.7	218° 19.4	27.7	10°39.0	17.0	Alnilam	275°35.0	$-1^{\circ}11.2$
17	49°06.6	31°02.8	29.7	66°11.6	18.9	233°22.1	27.8	25°41.3	17.0	Betelgeuse	270°49.1	$7^{\circ}24.6$
	64°09.1	46°02.7	N08°30.9	81° 12.2	508° 18.1	248° 24.9	N03°27.9	40°43.5	N07°17.2	Canopus	263°51.0	-52°42.9
18	79°11.6	61°02.6		96° 12.9		246 24.9 263°27.6		55°45.7		Sirius	258°23.8	-16°45.5
19	79 11.6 94°14.0	76°02.5	32.2	96 12.9 111°13.5	17.4 16.6	203 27.0 278°30.3	28.0	55 45.7 70°48.0	17.2	Adhara	255°03.6	-29°00.9
20			33.4				28.2		17.3	Procyon	244°47.9	5°09.0
21	109°16.5	91°02.4	• • 34.6	126°14.1	· · 15.9	293°33.1	•• 28.3	85°50.2	17.4	Pollux	243°13.9	27°57.4
22	124°19.0	106°02.3	35.9	141°14.7	15.1	308°35.8	28.4	100°52.4	17.5	Avior	234°13.1	-59°36.2
23	139°21.4	121°02.2	37.1	156° 15.4	14.3	323°38.5	28.5	115°54.7	17.6	Suhail	222°44.0	-43°33.0
Mer.p	pass. 13:44	$ u$ -0.1 $^{\prime}$ d1	.3′ m-4.25	ν 0.6′ d-0	.8′ m1.06	$\nu 2.7' \ d0.$	1' m-2.45	ν 2.2′ d0	.1′ m0.58	Miaplacidus	221°36.8	-69°50.1
										Alphard	217°44.9	-8°47.1
			_		_		_		_	Regulus	207°31.4	11°49.5
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.7
0	154°23.9	136°02.1	N08°38.4	171°16.0	S08°13.6	338°41.3	N03°28.7	130°56.9	N07° 17.7	Denebola	182°22.0	14°24.6
1	169°26.3	151°02.0	39.6	186°16.6	12.8	353°44.0	28.8	145°59.1	17.8	Gienah	175°40.6	$-17^{\circ}42.1$
2	184°28.8	166°01.9	40.9	201°17.2	12.0	8°46.7	28.9	161°01.4	17.9	Acrux	172°56.5	-63° 15.3
3	199°31.3	181°01.8	• • 42.1	216° 17.9	• • 11.3	23°49.5	• • 29.0	176°03.6	• • 18.0	Gacrux	171°48.2	-57° 16.3
4	214°33.7	196°01.8	43.3	231°18.5	10.5	38°52.2	29.1	191°05.9	18.1	Alioth	166°10.3	55°48.1
5	229°36.2	211°01.7	44.6	246°19.1	09.7	53°54.9	29.3	206°08.1	18.2	Spica	158°19.3	-11°18.6
6	244°38.7	226°01.6	N08°45.8	261°19.7	508°09.0	68° 57.7	N03°29.4	221°10.3	N07°18.3	Alkaid	152°49.7	49° 10.0
7	259°41.1	241°01.5	47.1	276°20.4	08.2	84°00.4	29.5	236°12.6	18.4	Hadar	148°31.9	-60°30.4
8	274°43.6	256°01.4	48.3	291°21.0	07.5	99°03.1	29.6	251°14.8	18.5	Menkent	147°54.3	-36° 30.5
9	289°46.1	271°01.3	• • 49.6	306°21.6	• • 06.7	114°05.9	• • 29.8	266°17.0	• • 18.6	Arcturus	145°45.4	19°01.9
10	304°48.5	286°01.2	50.8	321°22.3	05.9	129°08.6	29.9	281°19.3	18.7	Rigil Kent.	139°36.4	-60° 56.9
11	319°51.0	301°01.1	52.0	336°22.9	05.2	144°11.3	30.0	296°21.5	18.8	Kochab	137°19.6	74°02.0
12	334°53.5	316°01.0	N08°53.3	351°23.5	S08°04.4	159° 14.1	N03°30.1	311°23.7	N07°18.9	Zuben'ubi	136°53.0	-16°09.6
13	349°55.9	331°00.9	54.5	6°24.1	03.6	174° 16.8	30.3	326°26.0	19.0	Alphecca	126°01.5	26°36.9
14	4°58.4	346°00.8	55.8	21°24.8	02.9	189° 19.5	30.4	341°28.2	19.1	Antares	112°12.7	-26°29.6
15	20°00.8	1°00.8	• • 57.0	36°25.4	• • 02.1	204°22.3	• • 30.5	356°30.4	• • 19.2	Atria	107°04.6	-69°04.4
16	35°03.3	16°00.7	58.2	51°26.0	01.3	219°25.0	30.6	11°32.7	19.3	Sabik	101°59.9	-15°45.6
17	50°05.8	31°00.6	08°59.5	66°26.7	08°00.6	234° 27.7	30.7	26°34.9	19.4	Shaula	96°07.0	-37°07.3
18	65°08.2	46°00.5	N09°00.7	81°27.3	S07°59.8	249° 30.5	N03°30.9	41°37.1	N07° 19.5	Rasalhague	95°56.3	12°32.2
19	80°10.7	61°00.4	01.9	96°27.9	59.0	264° 33.2	31.0	56°39.4	19.6	Eltanin	90°41.2	51°28.8
20	95°13.2	76°00.3	03.2	111°28.5	58.3	279°35.9	31.1	71°41.6	19.7	Kaus Aust.	83°29.3	-34°22.1
21	110°15.6	91°00.2	• • 04.4	126°29.2	• • 57.5	294°38.7	• • 31.2	86°43.8	• • 19.8	Vega	80°31.7	38° 48.4
22	125°18.1	106°00.1	05.7	141°29.8	56.7	309°41.4	31.4	101°46.1	19.9	Nunki	75°44.8	-26° 15.6
23	140°20.6	121°00.0	06.9	156°30.4	56.0	324°44.1	31.5	116°48.3	20.0	Altair	61°57.7	8°56.5
Mern	pass. 13:40	$v_{-}0.1' d1$.2′ m-4.25	ν0.6′ d-0	0.8′ m1.06	v2 7' d0	1' m-2.46	1/2 2' d0	.1′ m0.58	Peacock	53°02.2	-56° 38.5
										Deneb	49°24.4	45°22.8
										Enif	33°36.6	10°00.2
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.4
0	155°23.0	135°59.9	N09°08.1	171°31.1	S07°55.2	339°46.9	N03°31.6	131°50.5	N07°20.1	Fomalhaut	15°12.1	-29°28.4
1	170°25.5	150°59.8	09.4	186°31.7	54.4	354°49.6	31.7	146°52.8	20.2	Scheat	13°43.0	28° 14.2
2	185°28.0	165°59.8	10.6	201°32.3	53.7	9°52.3	31.9	161°55.0	20.3	Markab	13°27.6	15°21.4
3	200°30.4	180°59.7	• • 11.8	216°32.9	• • 52.9	24°55.1	• • 32.0	176°57.2	• • 20.4			
4	215°32.9	195° 59.6	13.1	231°33.6	52.1	39°57.8	32.1	191°59.5	20.5	Feb 24 Thu	SHA	Mer.pass
5	230°35.3	210°59.5	14.3	246°34.2	51.4	55°00.5	32.2	207°01.7	20.6	Venus		14:56
6	245°37.8	225°59.4	N09°15.5	261°34.8	S07°50.6	70°03.3	N03°32.3	222°03.9	N07°20.7	Mars	17°36.2	12:35
7	260°40.3	240°59.3	16.8	276°35.5	49.8	85°06.0	32.5	237°06.2	20.8	Jupiter		01:29
8	275°42.7	255° 59.2	18.0	291°36.1	49.1	100°08.7	32.6	252°08.4	20.9	Saturn	336°38.5	15:18
9	290°45.2	270°59.1	• • 19.2	306°36.7	• • 48.3	115° 11.5	• • 32.7	267°10.6	• • 21.0	Feb 25 Fri	SHA	Mer.pass
10	305°47.7	285° 59.0	20.5	321°37.4	47.5	130° 14.2	32.8	282°12.9	21.1	Venus	341°38.2	14:56
11	320°50.1	300°59.0	21.7	336°38.0	46.8	145° 17.0	33.0	297°15.1	21.1	Mars	16°52.1	12:34
12	335°52.6	315°58.9	N09°22.9	351°38.6	S07°46.0	160° 19.7	N03°33.1	312°17.3	N07°21.2		184°17.4	01:25
13	350°55.1	330° 58.8	24.2	6°39.3	45.2	175°22.4	33.2	327°19.6	21.3	Saturn	336°33.0	15:14
14	5°57.5	345° 58.7	25.4	21°39.9	44.5	190°25.2	33.3	342°21.8	21.4			_3.21
15	21°00.0	0°58.6	• • 26.6	36° 40.5	• • 43.7	205°27.9	• • 33.5	357°24.0	• • 21.5	Feb 26 Sat	SHA	Mer.pass
16	36°02.4	15° 58.5	27.8	51°41.2	42.9	220°30.6	33.6	12°26.3	21.6	Venus		14:56
17	51°04.9	30°58.4	29.1	66°41.8	42.2	235°33.4	33.7	27°28.5	21.7	Mars	$16^{\circ}08.0$	12:33
18	66°07.4	45°58.3	N09°30.3	81°42.4	S07°41.4	250°36.1	N03°33.8	42°30.7	N07°21.8	Jupiter	184°23.8	01:21
19	81°09.8	60°58.2	31.5	96°43.0	40.6	265°38.8	34.0	57°33.0	21.9	Saturn	336°27.5	15:10
20	96°12.3	75°58.2	32.8	111°43.7	39.9	280°41.6	34.1	72°35.2	22.0	U! ·	ol novelle:	
21	111°14.8	90°58.1	• • 34.0	126°44.3	• • 39.1	295°44.3	• • 34.2	87°37.4	• • 22.1	Horizoni	al parallax	0.0
22	126°17.2	105°58.0	35.2	141°44.9	38.3	310°47.1	34.3	102°39.7	22.2		Venus:	0.2
23	141°19.7	120°57.9	36.4	156° 45.6	37.6	325°49.8	34.5	117°41.9	22.3		Mars:	0.1
Mern	pass. 13:36	ν -0.1' d1	.2′ m-4.26	$\nu 0.6' d-0$	0.8′ m1.06	$\nu 2.7' d0$	1′ m-2.46	$\nu^{2.2'} d\Omega$.1′ m0.58			

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.4	S09°42.9	192°09.8	15.5'	S13°33.6	-11.6'	53.9'
1	191°40.5	42.0	206°44.3	15.5'	13°22.0	-11.7'	53.9'
2	206°40.6	41.1	221°18.9	15.6'	13°10.4	-11.7'	53.9'
3	221°40.7	• • 40.1	235°53.4	15.6'	12°58.7	-11.8'	53.9'
4 5	236°40.8 251°40.9	39.2 38.3	250°28.1 265°02.7	15.7' 15.7'	12°46.9 12°35.1	-11.8' -11.9'	53.9' 53.9'
6	266°40.9	50.3 S09°37.4	205 02.7 279°37.5	15.7	\$12°23.2	-11.9'	53.9
7	281°41.0	36.5	294° 12.2	15.8'	12°11.4	-11.9'	53.9'
8	296°41.1	35.5	308°47.0	15.8'	11°59.4	-12.0'	53.9'
9	311°41.2	• • 34.6	323°21.9	15.9'	11°47.4	-12.0'	53.9'
10	326°41.3	33.7	337°56.7	15.9'	11°35.4	-12.1'	53.9'
11	341°41.4	32.8 \$09°31.8	352°31.7 7°06.6	16.0'	11°23.3	-12.1'	53.9'
12 13	356°41.5 11°41.6	30.9	7°06.6 21°41.6	16.0' 16.0'	\$11°11.2 10°59.0	-12.2' -12.2'	53.9' 53.9'
14	26°41.7	30.0	36°16.7	16.1	10°46.8	-12.2'	53.9'
15	41°41.8	29.1	50°51.7	16.1	10°34.6	-12.3'	53.9'
16	56°41.8	28.1	65°26.9	16.1'	10°22.3	-12.3'	53.9'
17	71°41.9	27.2	80°02.0	16.2'	$10^{\circ}10.0$	-12.4'	53.9'
18	86°42.0	S09°26.3	94°37.2	16.2'	S09°57.6	-12.4'	53.9'
19	101°42.1	25.4	109° 12.4 123° 47.6	16.2'	09°45.2 09°32.8	-12.4'	53.9'
20 21	116°42.2 131°42.3	24.4 •• 23.5	123°47.6 138°22.9	16.3' 16.3'	09°32.8 09°20.4	-12.5' -12.5'	53.9' 53.9'
22	131 42.3 146°42.4	22.6	150° 58.2	16.3'	09°20.4	-12.5'	53.9
23	161°42.5	21.7	167°33.6	16.4	08°55.3	-12.6'	53.9'
	SD = 16.2'	d = -0.9'		SI	D = 14.7'		
			-	JI	J — 17.1		
Fri	GHA 176°42.6	Dec \$09°20.7	GHA 182° 08.9	ν	Dec 508°42.8	d 12.6'	HP
0 1	176°42.6 191°42.7	19.8	182°08.9 196°44.3	16.4' 16.4'	08°30.2	-12.6' -12.6'	53.9' 53.9'
2	206°42.8	18.9	211° 19.7	16.5	08°17.5	-12.7'	53.9'
3	221°42.9	• • 18.0	225°55.2	16.5'	08°04.9	-12.7'	53.9'
4	236°43.0	17.0	240°30.7	16.5'	$07^{\circ}52.2$	-12.7'	53.9'
5	251°43.0	16.1	255°06.2	16.5'	07°39.5	-12.7'	53.9'
6	266°43.1 281°43.2	S09°15.2	269°41.7 284°17.3	16.6'	\$07°26.7 07°13.9	-12.8'	53.9'
7 8	281 43.2 296°43.3	14.3 13.3	284°17.3 298°52.8	16.6' 16.6'	07°13.9 07°01.1	-12.8' -12.8'	53.9' 53.9'
9	311°43.4	12.4	313°28.4	16.6'	06°48.3	-12.9'	53.9'
10	326°43.5	11.5	328°04.1	16.6'	06°35.4	-12.9'	53.9'
11	341°43.6	10.5	342°39.7	16.7'	$06^{\circ}22.6$	-12.9'	53.9'
12	356°43.7	S09°09.6	357° 15.3	16.7'	S06°09.6	-12.9'	53.9'
13	11°43.8 26°43.9	08.7 07.8	11°51.0 26°26.7	16.7' 16.7'	05°56.7 05°43.8	-13.0'	53.9' 53.9'
14 15	41°44.0	06.8	41°02.4	16.7'	05 43.6 05°30.8	-13.0' -13.0'	53.9'
16	56°44.1	05.9	55°38.2	16.7'	05°17.8	-13.0'	53.9'
17	71°44.2	05.0	70° 13.9	16.8'	$05^{\circ}04.8$	-13.0'	53.9'
18	86°44.3	S09°04.0	84°49.7	16.8'	S04°51.8	-13.1'	53.9'
19	101°44.4	03.1	99°25.4	16.8'	04°38.7	-13.1'	53.9'
20 21	116°44.5 131°44.6	02.2 •• 01.2	114°01.2 128°37.0	16.8' 16.8'	04°25.6 04°12.5	-13.1' -13.1'	53.9' 53.9'
22	146°44.7	09°00.3	143° 12.8	16.8'	04 12.5 03°59.4	-13.1'	53.9
23	161°44.8	08°59.4	157°48.6	16.8'	03°46.3	-13.1'	53.9'
	SD = 16.2'	d = -0.9'		SI	D = 14.7'		
٠.	CUA		CUA		Б.		
Sat 0	GHA 176°44.9	Dec \$08°58.5	GHA 172° 24.5	u 16.8'	Dec \$03°33.2	d -13.2'	HP 53.9'
1	191°45.0	57.5	187°00.3	16.8	03°20.0	-13.2'	53.9'
2	206°45.1	56.6	$201^{\circ}36.2$	16.9'	03°06.9	-13.2'	53.9'
3	221°45.2	• • 55.7	216° 12.0	16.9'	02°53.7	-13.2'	54.0'
4	236°45.3	54.7	230° 47.9	16.9'	02°40.5	-13.2'	54.0'
5 6	251°45.4 266°45.5	53.8 \$08°52.9	245°23.7 259°59.6	16.9' 16.9'	02°27.3 \$02°14.1	-13.2' -13.2'	54.0' 54.0'
7	281°45.6	508 52.9	259 59.6 274°35.5	16.9'	02°00.8	-13.2'	54.0'
8	296°45.7	51.0	289°11.3	16.9'	01°47.6	-13.2'	54.0'
9	311°45.8	• • 50.1	303°47.2	16.9'	01°34.4	-13.2'	54.0'
10	326°45.9	49.1	318°23.1	16.9'	01°21.1	-13.3'	54.0'
11	341°46.0	48.2	332°58.9	16.9'	01°07.9	-13.3'	54.0'
12 13	356°46.1 11°46.2	\$08°47.3 46.3	347°34.8 2°10.7	16.9' 16.9'	\$00°54.6 00°41.3	-13.3' -13.3'	54.0' 54.0'
13	26°46.3	46.3 45.4	2 10.7 16°46.5	16.9'	00°41.3	-13.3'	54.0'
15	41°46.4	• • 44.5	31°22.4	16.9'	00°14.8	-13.3	54.0'
16	56°46.5	43.5	45°58.3	16.9'	500°01.5	-13.3'	54.0'
17	71°46.6	42.6	60°34.1	16.8'	N00°11.8	13.3'	54.0'
18 19	86°46.7 101°46.8	S08°41.6 40.7	75°10.0 89°45.8	16.8' 16.8'	N00°25.1 00°38.4	13.3' 13.3'	54.0' 54.1'
20	101°46.8 116°46.9	40.7 39.8	89°45.8 104°21.6	16.8'	00°38.4 00°51.6	13.3'	54.1'
21	131° 47.0	• • 38.8	118°57.4	16.8'	01°04.9	13.3'	54.1'
22	146°47.1	37.9	133°33.3	16.8'	01°18.2	13.3'	54.1'
23	161°47.2	37.0	148°09.1	16.8'	01°31.5	13.3'	54.1'
	SD = 16.1'	d = -0.9'		SI	O = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Julisce	Civil	Naut.
N 72°	05:32	06:50	08:01	16:27	17:39	18:57
N 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
N 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
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:02
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:07	05:34	05:56	18:30	18:52	19:19
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
S 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° S 60°	03:28 03:14	04:23 04:15	05:06 05:00	19:19 19:24	20:01 20:10	20:56 21:09
3 00	03:14	04:15	05:00	19:24	20:10	21:09

Lat.	Moonrise				Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	08:09	07:35	07:07	15:16	17:16	19:08
N 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
N 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
N 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
S 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
S 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
S 60°	03:46	05:07	06:27	18:52	18:54	18:56

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	156°22.2	135°57.8	N09°37.7	171°46.2	S07°36.8	340°52.5	N03° 34.6	132°44.1	N07°22.4			
1	171°24.6	150°57.7	38.9	186°46.8	36.0	355°55.3	34.7	147°46.4	22.5	Alpheratz	357°32.4	29°14.8
2	186°27.1	165° 57.6	40.1	201°47.5	35.2	10°58.0	34.8	162°48.6	22.6	Ankaa	353°05.0	-42°09.3
3	201°29.6	180° 57.5	• • 41.4	216°48.1	• • 34.5	26°00.8	• • 35.0	177°50.8	22.7	Schedar	349°28.5	56°41.7
4	216°32.0	195° 57.4	42.6	231°48.7	33.7	41°03.5	35.1	192°53.0	22.8	Diphda	348°45.0	-17°50.0
5	231°34.5	210°57.4	43.8	246°49.4	32.9	56°06.2	35.2	207°55.3	22.9	Achernar	335°18.7	-57°05.8
6	246°36.9	225° 57.3	N09°45.0	261°50.0	S07°32.2	71°09.0	N03°35.3	222°57.5	N07°23.0	Hamal	327°48.5	23°35.8
7	261°39.4	240°57.2	46.3	276°50.6	31.4	86°11.7	35.5	237°59.7	23.1	Polaris	312°48.6	89°23.2
8	276°41.9	255° 57.1	47.5	291°51.3	30.6	101°14.4	35.6	253°02.0	23.2	Acamar	315°10.0	-40°11.7
9	291°44.3	270°57.0	• • 48.7	306°51.9	• • 29.9	116° 17.2	• • 35.7	268°04.2	• • 23.3	Menkar	314°03.6	4°11.9
10	306°46.8	285°56.9	49.9	321°52.5	29.1	131° 19.9	35.8	283°06.4	23.4	Mirfak	308°24.6	49°57.8
11	321°49.3	300°56.8	51.1	336°53.2	28.3	146°22.7	35.9	298°08.7	23.5	Aldebaran	290°36.6	16°33.9
12	336°51.7	315°56.7	N09°52.4	351°53.8	S07°27.5	161°25.4	N03°36.1	313°10.9	N07°23.6	Rigel	281°01.3	-8°10.3 46°01.6
13	351°54.2	330°56.7	53.6	6°54.5	26.8	$176^{\circ}28.1$	36.2	328°13.1	23.7	Capella Bellatrix	280°18.0 278°20.0	6°22.4
14	6°56.7	345°56.6	54.8	21°55.1	26.0	191°30.9	36.3	343°15.4	23.8	Elnath	277°58.5	28°37.8
15	21°59.1	0°56.5	• • 56.0	36°55.7	• • 25.2	206°33.6	• • 36.5	358°17.6	• • 23.9	Alnilam	277 36.5 275°35.0	-1°11.2
16	37°01.6	15°56.4	57.3	51°56.4	24.5	221°36.4	36.6	13°19.8	24.0	Betelgeuse	270°49.2	7°24.6
17	52°04.0	$30^{\circ}56.3$	58.5	66°57.0	23.7	$236^{\circ}39.1$	36.7	28°22.0	24.1	Canopus	263°51.0	-52°42.9
18	67°06.5	45°56.2	N09°59.7	81°57.6	S07°22.9	251°41.8	N03°36.8	43°24.3	N07°24.2	Sirius	258°23.8	-16°45.5
19	82°09.0	$60^{\circ}56.1$	10°00.9	96°58.3	22.2	266°44.6	37.0	58°26.5	24.3	Adhara	255°03.6	-29°00.9
20	97°11.4	75°56.1	02.1	111°58.9	21.4	281°47.3	37.1	73°28.7	24.4	Procyon	244°47.9	5°09.0
21	112°13.9	90°56.0	• • 03.4	126°59.5	• • 20.6	296°50.1	• • 37.2	88°31.0	• • 24.5	Pollux	243°13.9	27°57.4
22	127°16.4	105°55.9	04.6	142°00.2	19.8	311°52.8	37.3	103°33.2	24.6	Avior	234°13.1	-59°36.2
23	142°18.8	120°55.8	05.8	157°00.8	19.1	326°55.5	37.5	118°35.4	24.7	Suhail	222°44.0	-43°33.0
Mern	ass. 13:32	ν -0.1' d1	.2′ m-4.27	ν0 6′ d-0	.8′ m1.05	ν2 7' dΩ	.1′ m-2.46	ν2 2' dΩ	.1′ m0.58	Miaplacidus	221°36.8	-69°50.2
сг.р		- 0.1 01	∠1	- 5.5 4-0	.51.05					Alphard	217°44.9	-8°47.1
										Regulus	207°31.4	11°49.5
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.7
0	157°21.3	135°55.7	N10°07.0	172°01.4	S07°18.3	341°58.3	N03°37.6	133°37.6	N07°24.8	Denebola	182°22.0	14°24.6
1	172°23.8	150°55.6	08.2	187°02.1	17.5	357°01.0	37.7	148°39.9	24.9	Gienah	175°40.6	-17°42.1
2	187°26.2	165°55.5	09.5	202°02.7	16.8	12°03.8	37.8	163°42.1	25.0	1	172°56.5	-63°15.3
3	202°28.7	180°55.5	• • 10.7	217°03.3	• • 16.0	27°06.5	• • 38.0	178°44.3	• • 25.1	I	171°48.2	-57°16.3
4	217°31.2	195° 55.4	11.9	232°04.0	15.2	42°09.3	38.1	193°46.6	25.2	Alioth	166°10.3	55°48.1
5	232°33.6	210°55.3	13.1	247°04.6	14.4	57° 12.0	38.2	208°48.8	25.3	Spica	158°19.3	-11°18.7
6	247°36.1	225° 55.2	N10°14.3	262°05.3	S07°13.7	72° 14.7	N03°38.3	223°51.0	N07°25.4	Alkaid	152°49.7	49°10.0
7	262°38.5	240°55.1	15.5	277°05.9	12.9	87° 17.5	38.5	238°53.2	25.5	Hadar	148°31.9	-60°30.4
8	277°41.0	255°55.0	16.7	292°06.5	12.1	102°20.2	38.6	253°55.5	25.6	Menkent	147°54.3	-36°30.5
9	292°43.5	270°54.9	• • 18.0	307°07.2	• • 11.4	117°23.0	• • 38.7	268°57.7	• • 25.7	Arcturus	145°45.4	19°01.9
10	307°45.9	285°54.9	19.2	322°07.8	10.6	132°25.7	38.8	283°59.9	25.8	Rigil Kent.	139°36.3	-60°57.0
11	322°48.4	300°54.8	20.4	337°08.4	09.8	147°28.5	39.0	299°02.1	25.9	Kochab	$137^{\circ}19.5$	74°02.0
12	337°50.9	315°54.7	N10°21.6	352°09.1	S07°09.0	162°31.2	N03°39.1	314°04.4	N07°26.0	Zuben'ubi	136°53.0	-16°09.6
13	352°53.3	330° 54.6	22.8	7°09.7	08.3	177°33.9	39.2	329°06.6	26.1	Alphecca	126°01.5	26°36.9
14	7°55.8	345°54.5	24.0	22°10.4	07.5	192°36.7	39.3	344°08.8	26.2	Antares	112°12.7	-26°29.6
15	22°58.3	0°54.4	• • 25.2	37°11.0	• • 06.7	207°39.4	• • 39.5	359°11.1	• • 26.3	Atria	107°04.6	-69°04.4
16	38°00.7	15°54.3	26.5	52°11.6	05.9	222°42.2	39.6	14°13.3	26.4	Sabik	101°59.9	-15°45.6
17	53°03.2	30°54.3	27.7	67°12.3	05.2	237° 44.9	39.7	29°15.5	26.5	Shaula	96°07.0	-37°07.3
18	68°05.6	45°54.2	N10°28.9	82°12.9	S07°04.4	252° 47.7	N03°39.8		N07°26.6	Rasalhague	95°56.2	12°32.2
19	83°08.1	60°54.1	30.1	97°13.6	03.6	267°50.4	40.0	59°20.0	26.7	Eltanin	90°41.2	51°28.8
20	98°10.6	75°54.0	31.3	112°14.2	02.9	282°53.1	40.1	74°22.2	26.8	Kaus Aust.	83°29.3	-34°22.1
21	113°13.0	90°53.9	• • 32.5	127°14.8 142°15.5	02.1	297°55.9 312°58.6	• • 40.2	89°24.4	• • 26.9	Vega	80°31.7	38°48.3
22	128°15.5	105°53.8	33.7		01.3		40.3	104°26.6	27.0	Nunki	75°44.8	-26°15.6
23	143°18.0	120°53.8	34.9	157°16.1	00.5	328°01.4	40.5	119°28.9	27.1	Altair	61°57.7	8°56.5
Mer.p	ass. 13:28	$ u$ -0.1 $^{\prime}$ d1	.2′ m-4.27	ν 0.6′ d-0	.8′ m1.05	ν 2.7′ d0.	.1′ m-2.47	ν 2.2′ d0	.1' m 0.58	Peacock	53°02.2	-56°38.5
										Deneb	49°24.4	45°22.7
T	CIIA	CIIA	D	CIIA	D	CUA	D	CUA	D	Enif	33°36.6	10°00.2
Tue	GHA 158°20.4	GHA 135° 53.7	Dec N10°36.1	GHA 172°16.7	Dec S 06°59.8	GHA 343°04.1	Dec N03° 40.6	GHA	Dec N07° 27.2	Al Na'ir	27°30.2	-46°49.4
0 1	158° 20.4 173° 22.9	135°53.7 150°53.6	37.3	172°16.7 187°17.4	506 59.8	343°04.1 358°06.9	NU3 40.6 40.7	134°31.1 149°33.3	27.3	Fomalhaut	15°12.1	-29°28.4
2	173 22.9 188°25.4	150 53.6 165° 53.5	37.3 38.6	202°18.0	59.0 58.2	13°09.6	40.7	149 33.3 164°35.5	27.3 27.4	Scheat	13°43.0	28°14.2
3	203°27.8	105 53.5 180°53.4	· · 39.8	202 18.0 217°18.7	58.2	28°12.4	. 41.0	104 35.5 179°37.8	27.5	Markab	13°27.6	15°21.4
3 4	203 27.8 218°30.3	180 53.4 195°53.3	41.0	217 18.7 232°19.3	56.7	28 12.4 43°15.1	41.1	179 37.8 194°40.0	27.6	Feb 27 Sun	SHA	Mer.pass
5	216 30.3 233°32.8	210° 53.2	42.2	232 19.3 247°19.9	50.7 55.9	43 15.1 58°17.8	41.1	209°42.2	27.7	Venus		14:56
6	233 32.0 248°35.2	210 55.2 225°53.2	N10°43.4	262°20.6	506°55.1	73°20.6	N03°41.4	209 42.2 224°44.5	N07°27.8	Mars	15°24.1	12:32
7	246 35.2 263°37.7	240°53.1	44.6	202 20.0 277°21.2	54.3	88°23.3	41.5	239°46.7	27.9		184°30.4	01:16
8	203 37.7 278°40.1	255°53.0	44.0 45.8	277 21.2 292°21.9	54.5 53.6	00 23.3 103°26.1	41.5	259°40.7 254°48.9	28.0	Saturn	336°22.0	15:07
9	293°42.6	270°52.9	• • 47.0	307°22.5	• • 52.8	118° 28.8	• • 41.7	269°51.1	28.1			
10	308°45.1	285°52.8	48.2	322°23.1	52.0	133°31.6	41.9	284°53.4	28.2	Feb 28 Mon	SHA	Mer.pass
11	323°47.5	300°52.7	49.4	337°23.8	51.2	148°34.3	42.0	299°55.6	28.3	Venus	338°34.4	14:56
12	338°50.0	315°52.7	N10°50.6	352°24.4	S06°50.5	163°37.1	N03° 42.1	314°57.8	N07°28.4	Mars	14°40.1	12:31
13	353°52.5	330°52.6	51.8	7°25.1	49.7	178°39.8	42.2	330°00.0	28.5		184°37.0	01:12
14	8°54.9	345°52.5	53.0	22°25.7	48.9	176 39.6 193°42.5	42.4	345°02.3	28.6	Saturn	336°16.3	15:03
15	23°57.4	0°52.4	• • 54.2	37°26.3	• 48.1	208° 45.3	• 42.5	0°04.5	28.7	Feb 29 Tue	SHA	Mer pass
16	38°59.9	15°52.3	55.4	52°27.0	47.4	200° 43.3° 223° 48.0	42.6	15°06.7	28.8	Venus		Mer.pass 14:57
17	54°02.3	30°52.2	56.6	67°27.6	46.6	238° 50.8	42.8	30°08.9	28.9	Mars	13°56.3	14:57
18	69°04.8	45°52.2	N10°57.8	82°28.3	S06°45.8	253°53.5	N03°42.9		N07°29.0		13 50.5 184°43.7	01:08
19	84°07.2	60°52.1	10°59.0	97°28.9	45.0	268° 56.3	43.0	60°13.4	29.1	Saturn	336°10.7	15:00
20	99°09.7	75°52.0	11°00.2	112°29.6	44.3	283°59.0	43.1	75°15.6	29.2	Jatuin	JJU 10.1	13.00
21	114°12.2	90°51.9	01.4	127°30.2	• • 43.5	299°01.8	43.3	90°17.8	29.3	Horizont	al parallax	
22	129°14.6	105°51.8	02.6	142°30.8	42.7	314°04.5	43.4	105°20.0	29.4		Venus:	0.2
23	144°17.1	120°51.8	03.8	157°31.5	41.9	329°07.3	43.5	120°22.3	29.5		Mars:	0.1
ivier.p	ass. 13:24	ν-U.1' d1	.2′ m-4.28	ν 0.0° a -0	.8′ m1.05	ν2.1' α 0.	.1′ m-2.47	ν2.2' d0	.1′ m0.58			

h	Sun				Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.3	S08°36.0	162°44.8	16.8'	N01°44.8	13.3'	54.1'
1 2	191°47.4 206°47.5	35.1 34.2	177°20.6 191°56.4	16.8' 16.7'	01°58.1 02°11.3	13.3' 13.3'	54.1' 54.1'
3	221°47.6	33.2	206°32.1	16.7'	02°24.6	13.3'	54.1'
4	236°47.7	32.3	221°07.8	16.7'	02°37.9	13.3'	54.1'
5	251°47.8 266°48.0	31.3 \$08°30.4	235°43.5 250°19.2	16.7'	02°51.1 N03°04.4	13.3'	54.1'
6 7	266 48.0 281°48.1	508 30.4 29.5	250 19.2 264°54.9	16.7' 16.7'	03°17.6	13.2' 13.2'	54.1' 54.2'
8	296°48.2	28.5	279°30.6	16.6'	03°30.9	13.2'	54.2'
9	311°48.3	• • 27.6	294°06.2	16.6'	03°44.1	13.2'	54.2'
10 11	326°48.4 341°48.5	26.6 25.7	308°41.8 323°17.4	16.6' 16.6'	03°57.3 04°10.5	13.2' 13.2'	54.2' 54.2'
12	356°48.6	S08°24.8	337°53.0	16.5'	N04°23.7	13.2'	54.2'
13	11°48.7	23.8	352°28.5	16.5'	04°36.9	13.2'	54.2'
14 15	26°48.8 41°48.9	22.9 •• 21.9	7°04.0 21°39.5	16.5' 16.5'	04°50.0 05°03.2	13.2' 13.1'	54.2' 54.2'
16	56°49.0	21.0	36°15.0	16.4	05°16.3	13.1	54.2'
17	71°49.1	20.1	50°50.4	16.4'	05°29.5	13.1'	54.3'
18	86°49.2	S08°19.1	65°25.8	16.4'	N05°42.6	13.1'	54.3'
19 20	101°49.4 116°49.5	18.2 17.2	80°01.2 94°36.5	16.3' 16.3'	05°55.7 06°08.7	13.1' 13.1'	54.3' 54.3'
21	131°49.6	16.3	109°11.9	16.3'	06°21.8	13.0'	54.3'
22	146°49.7	15.4	123°47.1	16.2'	06°34.8	13.0'	54.3'
23	161°49.8	14.4	138°22.4	16.2'	06°47.8	13.0'	54.3'
	SD = 16.1'	d = -0.9'		SE	0 = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.9	S08°13.5	152°57.6	16.2'	N07°00.8	13.0'	54.3'
1 2	191°50.0 206°50.1	12.5 11.6	167°32.8 182°07.9	16.1' 16.1'	07°13.8 07°26.8	13.0' 12.9'	54.3' 54.4'
3	200 50.1 221°50.2	. 10.6	196°43.0	16.1	07 20.6 07°39.7	12.9'	54.4'
4	236°50.3	09.7	211°18.1	16.0'	07°52.6	12.9'	54.4'
5	251°50.5	8.80	225°53.1	16.0'	08°05.5	12.9'	54.4'
6 7	266°50.6 281°50.7	\$08° 07.8 06.9	240°28.1 255°03.1	15.9' 15.9'	N08°18.3 08°31.2	12.8' 12.8'	54.4' 54.4'
8	296°50.8	05.9	269°38.0	15.9'	08°43.9	12.8'	54.4'
9	311°50.9	•• 05.0	284°12.8	15.8'	08°56.7	12.7'	54.4'
10 11	326°51.0 341°51.1	04.0 03.1	298°47.6 313°22.4	15.8' 15.7'	09°09.5 09°22.2	12.7' 12.7'	54.5' 54.5'
12	356°51.2	508°02.2	327°57.1	15.7'	N09°34.9	12.6'	54.5
13	11°51.4	01.2	342°31.8	15.6'	09°47.5	12.6'	54.5'
14 15	26°51.5 41°51.6	08°00.3 07°59.3	357°06.5 11°41.0	15.6' 15.5'	10°00.1 10°12.7	12.6' 12.5'	54.5' 54.5'
16	56°51.7	07 59.5 58.4	26°15.6	15.5'	10°12.7 10°25.3	12.5'	54.5'
17	71°51.8	57.4	$40^{\circ}50.1$	15.4'	$10^{\circ}37.8$	12.5'	54.6'
18	86°51.9 101°52.0	S07° 56.5	55°24.5 69°58.9	15.4'	N10°50.2 11°02.7	12.4'	54.6'
19 20	101 52.0 116°52.2	55.5 54.6	84°33.2	15.3' 15.3'	11 02.7 11°15.1	12.4' 12.4'	54.6' 54.6'
21	131°52.3	• • 53.6	99°07.5	15.2'	11°27.5	12.3'	54.6'
22	146°52.4	52.7	113°41.7	15.2'	11°39.8	12.3'	54.6'
23	161°52.5	51.7	128°15.9	15.1'	11°52.1	12.2'	54.7'
	SD = 16.1'	d = -0.9'		SL	D = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°52.6 191°52.7	\$07°50.8 49.9	142°50.0 157°24.0	15.1' 15.0'	N12°04.3 12°16.5	12.2' 12.2'	54.7' 54.7'
2	191 52.7 206°52.9	49.9 48.9	157 24.0 171°58.0	15.0 14.9'	12 10.5 12°28.7	12.2	54.7'
3	221°53.0	• • 48.0	186°32.0	14.9'	12°40.8	12.1'	54.7'
4	236°53.1 251°53.2	47.0	201°05.8	14.8'	12°52.9 13°04.9	12.0' 12.0'	54.7'
5 6	251°53.2 266°53.3	46.1 \$07°45.1	215°39.6 230°13.4	14.7' 14.7'	13°04.9 N13°16.9	12.0° 11.9°	54.8' 54.8'
7	281°53.4	44.2	244°47.1	14.6'	13°28.8	11.9'	54.8'
8	296°53.6	43.2	259°20.7	14.6'	13°40.7	11.8'	54.8'
9 10	311°53.7 326°53.8	· · 42.3 41.3	273°54.3 288°27.8	14.5' 14.4'	13°52.5 14°04.3	11.8' 11.7'	54.8' 54.8'
11	341°53.9	40.4	303°01.2	14.4'	14°16.0	11.7	54.9'
12	356°54.0	S07°39.4	317°34.5	14.3'	N14°27.7	11.6'	54.9'
13 14	11°54.2 26°54.3	38.5 37.5	332°07.8 346°41.1	14.2' 14.2'	14°39.3 14°50.9	11.6' 11.5'	54.9' 54.9'
15	20°54.3 41°54.4	36.6	1°14.2	14.2 14.1'	14 50.9 15°02.4	11.5'	54.9'
16	56°54.5	35.6	15°47.3	14.0'	15°13.9	11.4'	54.9'
17 18	71°54.6 86°54.7	34.7 \$07°33.7	30°20.3 44°53.2	13.9' 13.9'	15°25.3 N15°36.6	11.3' 11.3'	55.0' 55.0'
18 19	86°54.7 101°54.9	32.8	44°53.2 59°26.1	13.9'	N15°36.6 15°47.9	11.3'	55.0° 55.0°
20	116°55.0	31.8	73°58.9	13.7'	15°59.2	11.2'	55.0'
21 22	131°55.1 146°55.2	· · 30.9 29.9	88°31.6 103°04.3	13.6' 13.6'	16°10.3 16°21.4	11.1' 11.0'	55.0' 55.1'
23	140°55.2 161°55.4	29.9 29.0	103°04.3 117°36.8	13.5'	16°21.4 16°32.5	11.0'	55.1'
_,	SD = 16.1'	d = -0.9'			0 = 14.9'		

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

Lat.		Moonris	e		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
N 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
S 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
S 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
S 60°	07:46	09:08	10:32	18:58	19:00	19:04

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

h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	159°19.6	135°51.7	N11°05.0	172°32.1	S 06°41.2	344° 10.0	N03°43.6	135°24.5	$N07^{\circ}29.6$	Alpheratz	357°32.4	29°14.8
1	174°22.0	150°51.6	06.2	187°32.8	40.4	359°12.8	43.8	150°26.7	29.7	Ankaa	353°05.0	-42°09.3
2	189°24.5	165°51.5	07.4	202°33.4	39.6	14° 15.5	43.9	165°28.9	29.8	Schedar	349°28.5	56°41.7
3	204°27.0	180°51.4	• • 08.6	217°34.1	• • 38.8	29°18.3	• • 44.0	180°31.2	• • 29.9	Diphda	348°45.0	-17°50.0
4	219°29.4	195°51.3	09.8	232°34.7	38.1	44°21.0	44.2	195°33.4	30.0	Achernar	335°18.7	-57°05.8
5	234°31.9	210°51.3	11.0	247°35.3	37.3	59°23.7	44.3	210°35.6	30.1	Hamal	327°48.5	23°35.8
6	249°34.4	225°51.2	N11°12.2	262°36.0	S06°36.5	74°26.5	N03°44.4	225°37.8	N07°30.2	Polaris	312°49.9	89°23.2
7	264°36.8	240°51.1	13.4	277°36.6	35.7	89°29.2	44.5	240°40.1	30.3	Acamar	315°10.0	-40°11.7
8	279°39.3	255°51.0	14.6	292°37.3	34.9	104°32.0	44.7	255°42.3	30.4	Menkar	314°03.6	4°11.9
9	294°41.7	270°50.9	• • 15.8	307°37.9	• • 34.2	119°34.7	• • 44.8	270°44.5	• • 30.5	Mirfak	308°24.6	49°57.8
10	309°44.2	285°50.9	17.0	322°38.6	33.4	134°37.5	44.9	285°46.7	30.6	Aldebaran	290°36.6	16°33.9
11	324°46.7	300°50.8	18.2	337°39.2	32.6	149° 40.2	45.0	300°49.0	30.7	Rigel	281°01.3	-8°10.3
12	339°49.1	315°50.7	N11°19.4	352°39.8	S06°31.8	164° 43.0	N03°45.2	315°51.2	N07°30.8	Capella	280°18.0	46°01.6
13	354°51.6	330°50.6	20.6	7°40.5	31.1	179° 45.7	45.3	330°53.4	30.9	Bellatrix	278°20.0	6°22.4
14	9°54.1	345°50.5	21.8	22°41.1	30.3	194°48.5	45.4	345°55.6	31.0	Elnath	277°58.5	28°37.8
15	24°56.5	0°50.4	• • 23.0	37°41.8	• • 29.5	209°51.2	• • 45.6	0°57.8	• • 31.1	Alnilam	275°35.0	-1°11.2
16	39°59.0	15°50.4	24.1	52°42.4	28.7	224°54.0	45.7	16°00.1	31.2	Betelgeuse	270°49.2	7°24.6
17	55°01.5	30°50.3	25.3	67°43.1	28.0	239°56.7	45.8	31°02.3	31.3	Canopus	263°51.0	-52°43.0
18	70°03.9	45°50.2	N11°26.5	82°43.7	S06°27.2	254° 59.5	N03°45.9	46°04.5	N07°31.4	Sirius	258°23.8	-16°45.5
19	85°06.4	60°50.1	27.7	97°44.3	26.4	270°02.2	46.1	61°06.7	31.5	Adhara	255°03.6	-29°00.9
20	100°08.9	75°50.0	28.9	112°45.0	25.6	285°05.0	46.2	76°09.0	31.6	Procyon	244°47.9	5°09.0
21	115°11.3	90°50.0	• • 30.1	127°45.6	• • 24.8	300°07.7	• • 46.3	91°11.2	• • 31.7	Pollux	243°13.9	27°57.4
22	130°13.8	105°49.9	31.3	142°46.3	24.1	315° 10.5	46.5	106°13.4	31.8	Avior	234°13.1	-59°36.3
23	145°16.2	120°49.8	32.5	157°46.9	23.3	330°13.2	46.6	121°15.6	31.9	Suhail	222°44.0	-43°33.0
Mern	ass. 13:21	v-∩ 1/ d1	.2′ m-4.29	ν 0.6' d-0	8' m1 05	1/2 7' d0	1' m-2.47	1/2 2/ 40	.1′ m0.58	Miaplacidus	221°36.8	-43°50.2
.νι c ι.μ		ν-0.1 UI	111-4.29	νσ.σ u-0	.5 1111.05	ν Δ.1 UU.	111-2.41	ν2.2 UU	.1110.30	Alphard	221 30.8 217°44.9	-8°47.1
										Regulus	217 44.9 207°31.4	-8 47.1 11°49.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.7
0	160°18.7	135°49.7	N11°33.7	$172^{\circ}47.6$	S06°22.5	$345^{\circ}16.0$	N03°46.7	136°17.8	N07°32.0	Dubne	193 37.3 182°22.0	14°24.6
1	175°21.2	150°49.6	34.9	187°48.2	21.7	0°18.7	46.8	151°20.1	32.1	Gienah	182 22.0 175°40.6	-17°42.1
2	190°23.6	165°49.6	36.0	202°48.9	20.9	15°21.5	47.0	166°22.3	32.2			-17 42.1 -63°15.3
3	205°26.1	180°49.5	• • 37.2	217°49.5	20.2	30°24.2	• • 47.1	181°24.5	• • 32.3	Acrux		
4	220°28.6	195°49.4	38.4	232°50.2	19.4	45°27.0	47.2	196°26.7	32.4		171°48.2	-57°16.3
5	235°31.0	210°49.3	39.6	247°50.8	18.6	60°29.7	47.4	211°28.9	32.5	Alioth	166°10.3	55°48.1
6	250°33.5	225°49.2	N11°40.8	262°51.4	S06°17.8	75°32.5	N03°47.5	226°31.2	N07°32.6	Spica	158°19.3	-11°18.7
7	265°36.0	240°49.2	42.0	277°52.1	17.1	90°35.2	47.6	241°33.4	32.7	Alkaid	152°49.7	49°10.0
8	280°38.4	255°49.1	43.2	292°52.7	16.3	105°38.0	47.7	256°35.6	32.8	Hadar	148°31.8	-60°30.4
9	295°40.9	270°49.0	44.3	307°53.4	. 15.5	120° 40.7	• • 47.9	271°37.8	32.9	Menkent	147°54.3	-36°30.5
10	310°43.3	285°48.9	45.5	322°54.0	14.7	135° 43.5	48.0	286°40.0	33.0	Arcturus	145°45.4	19°01.9
11	325°45.8	300°48.8	46.7	337°54.7	13.9	150° 46.2	48.1	301°42.3	33.1	Rigil Kent.	139°36.3	-60°57.0
12	340°48.3	315°48.8	N11°47.9	352°55.3	S06°13.2	165° 49.0	N03°48.2	316°44.5	N07°33.3	Kochab	137°19.5	74°02.0
13	355°50.7	330°48.7	49.1	7°56.0	12.4	180°51.7	48.4	331°46.7	33.4	Zuben'ubi	136°53.0	-16°09.6
14	10°53.2	345°48.6	50.3	22°56.6	11.6	195°54.5	48.5	346°48.9	33.5	Alphecca	126°01.5	26°36.9
15	25°55.7	0°48.5	• • 51.4	37°57.3	• • 10.8	210° 57.2	• • 48.6	1°51.2	• • 33.6	Antares	112°12.6	-26°29.6
16	40°58.1	15°48.5	52.6	52°57.9	10.0	210° 57.2 226° 00.0	48.8	16°53.4	33.7	Atria	107°04.5	-69°04.4
17	56°00.6	30°48.4	53.8	67°58.6	09.3	241°02.7	48.9	31°55.6	33.8	Sabik	101°59.9	-15°45.6
18	71°03.1	45°48.3	N11°55.0	82°59.2	S06°08.5	256° 05.5	N03°49.0	46°57.8	N07°33.9	Shaula	96°06.9	-37°07.3
19	86°05.5	60°48.2	56.2	97°59.9	07.7	271°08.2	49.1	62°00.0	34.0	Rasalhague	95°56.2	12°32.2
				97 59.9 113°00.5						Eltanin	90°41.1	51°28.8
20	101°08.0	75°48.1	57.3	113 00.5 128°01.2	06.9	286°11.0	49.3	77°02.2	34.1	Kaus Aust.	83°29.3	-34°22.1
21	116°10.5	90°48.1	· · 58.5		• • 06.1	301°13.7	• • 49.4	92°04.5	• • 34.2	Vega	80°31.7	38°48.3
22	131°12.9	105°48.0	11°59.7	143°01.8	05.4	316° 16.5	49.5	107°06.7	34.3	Nunki	75°44.8	-26°15.6
23	146°15.4	120°47.9	12°00.9	158°02.4	04.6	331°19.2	49.7	122°08.9	34.4	Altair	61°57.7	8°56.5
Mer.p	ass. 13:17	$ u$ -0.1 $^{\prime}$ $d1$.2′ m-4.29	ν 0.6′ d-0	.8′ m1.05	ν 2.7′ d0.	1' m-2.47	ν 2.2 $^{\prime}$ d0	.1′ m0.58	Peacock	53°02.2	-56°38.5
										Deneb	49°24.4	45°22.7
	6111		-	a			-			Enif	33°36.6	10°00.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.4
0	161°17.8	135°47.8	N12°02.1	173°03.1	S06°03.8	346°22.0	N03°49.8	137°11.1		Fomalhaut	$15^{\circ}12.1$	-29°28.4
1	176°20.3	150°47.7	03.2	188°03.7	03.0	1°24.7	49.9	152°13.3	34.6	Scheat	13°43.0	28°14.1
2	191°22.8	165°47.7	04.4	203°04.4	02.2	16°27.5	50.0	167°15.6	34.7	Markab	13°27.6	15°21.4
3	206°25.2	180°47.6	• • 05.6	218°05.0	•• 01.5	31°30.2	50.2	182°17.8	• • 34.8	NA- 01 147 1	CIIA	N4
4	221°27.7	195°47.5	06.8	233°05.7	06°00.7	46°33.0	50.3	197°20.0	34.9	Mar 01 Wed	SHA	Mer.pass
5	236°30.2	210°47.4	07.9	248°06.3	05°59.9	61°35.7	50.4	212°22.2	35.0	Venus	336°32.1	14:57
6	251°32.6	225°47.4	N12°09.1	263°07.0	S05°59.1	76°38.5	N03°50.6	227°24.4	N07°35.1	Mars	13°12.6	12:29
7	266°35.1	240°47.3	10.3	278°07.6	58.3	91°41.2	50.7	242°26.7	35.2	Jupiter	184°50.4	01:03
8	281°37.6	255°47.2	11.5	293°08.3	57.6	106°44.0	50.8	257°28.9	35.3	Saturn	336°04.9	14:56
9	296°40.0	270°47.1	• • 12.6	308°08.9	• • 56.8	121°46.7	• • 50.9	272°31.1	• • 35.4	Mar 02 Thu	SHA	Mer.pass
10	311°42.5	285°47.0	13.8	323°09.6	56.0	136°49.5	51.1	287°33.3	35.5	Venus	335°31.0	14:57
11	326°45.0	300°47.0	15.0	338°10.2	55.2	151°52.3	51.2	302°35.5	35.6	Mars	12°28.9	12:28
12	341°47.4	315°46.9	N12°16.2	353°10.9	S05°54.4	166°55.0	N03°51.3	317°37.7	N07°35.7	Jupiter	184°57.3	00:59
13	356°49.9	330°46.8	17.3	8°11.5	53.7	181°57.8	51.5	332°40.0	35.8	Saturn	335°59.1	14:53
14	11°52.3	345°46.7	18.5	23°12.2	52.9	197°00.5	51.6	347°42.2	35.9	Jatuin	JJJ J9.1	14.53
15	26°54.8	0°46.7	• • 19.7	$38^{\circ}12.8$	• • 52.1	212°03.3	•• 51.7	2°44.4	• • 36.0	Mar 03 Fri	SHA	Mer.pass
16	41°57.3	15°46.6	20.8	53°13.5	51.3	227°06.0	51.9	17°46.6	36.1	Venus	334°30.0	14:57
17	56°59.7	30°46.5	22.0	$68^{\circ}14.1$	50.5	242°08.8	52.0	32°48.8	36.2	Mars	11°45.2	12:27
18	72°02.2	45°46.4	N12°23.2	83°14.8	S05°49.8	257° 11.5	N03°52.1	47°51.1	N07°36.3	1	185°04.1	00:54
19	87°04.7	60°46.4	24.4	98°15.4	49.0	$272^{\circ}14.3$	52.2	62°53.3	36.4	Saturn	335°53.3	14:49
20	102°07.1	75°46.3	25.5	113°16.1	48.2	287° 17.0	52.4	77°55.5	36.5			5
21	117°09.6	90°46.2	• • 26.7	128°16.7	• • 47.4	302° 19.8	• • 52.5	92°57.7	• • 36.6	Horizont	al parallax	
22	132°12.1	105°46.1	27.9	143°17.4	46.6	317°22.5	52.6	107°59.9	36.7		Venus:	0.2
23	147°14.5	120°46.0	29.0	158°18.0	45.8	332°25.3	52.8	123°02.1	36.8		Mars:	0.1
											•	•
	ass. 13:13	$\nu_{-}0.1' d1$.2′ m-4.30	ν 0.6′ d-0	×′ m l ()/l	117 X' d0	1′ m-2.47	コンツ せい	.1' m 0.58			

h	Su	n			Moon		
			CUA			.1	LID
Wed 0	GHA 176°55.5	Dec \$07°28.0	GHA 132°09.3	u 13.4'	Dec N16° 43.4	d 10.9'	HP 55.1'
1	191°55.6	27.1	132 09.3 146°41.8	13.4	16°54.4	10.9	55.1
2	206° 55.7	26.1	161°14.1	13.3'	17°05.2	10.8	55.1'
3	200 55.7 221°55.8	25.2	101 14.1 175°46.4	13.2'	17° 16.0	10.8	55.2
4	236° 56.0	24.2	175 40.4 190°18.5	13.1'	17° 16.0	10.7	55.2'
5	250°56.1	23.3	204°50.6	13.1	17° 20.7	10.6'	55.2'
6	266° 56.2	507°22.3	219°22.6	12.9'	N17°47.9	10.5	55.2'
7	281° 56.3	21.3	219 22.0 233°54.6	12.9'	17° 58.4	10.5	55.3
8	296° 56.5	20.4	248°26.4	12.8'	18°08.8	10.4	55.3'
9	311°56.6	. 19.4	262°58.2	12.7'	18° 19.2	10.4	55.3'
10	326° 56.7	18.5	202 38.2 277°29.9	12.6'	18° 29.5	10.3	55.3'
11	341°56.8	17.5	292°01.5	12.5'	18° 39.7	10.2	55.3'
12	356° 56.9	507°16.6	306°33.0	12.4	N18° 49.8	10.1	55.4
13	11° 57.1	15.6	300 33.0 321°04.5	12.4	18° 59.8	10.0'	55.4'
14	26° 57.2	14.7	335°35.8	12.3'	10° 09.8	9.9'	55.4'
15	41°57.3	. 13.7	350°07.1	12.2'	19° 19.7	9.8'	55.4'
16	56° 57.4	12.8	4°38.3	12.1'	19° 19.7	9.7'	55.5'
17	71°57.6	11.8	19°09.3	12.0'	19° 39.2	9.6'	55.5'
18	86° 57.7	S07°10.9	33°40.3	11.9'	N19°48.9	9.6'	55.5
	101°57.8	09.9	48°11.3	11.8'	19° 58.4	9.5	
19 20	101°57.8 116°57.9	09.9 08.9	48°11.3 62°42.1	11.8	19°58.4 20°07.9	9.5	55.5' 55.6'
21	110 57.9 131°58.1	08.0	77°12.8	11.6'	20° 17.3	9.4 9.3'	55.6'
22	131°58.1 146°58.2	07.0	91°43.5	11.6'	20°17.3 20°26.6	9.3'	55.6'
23	146°58.2 161°58.3	07.0 06.1	91°43.5 106°14.0	11.5	20° 26.6 20° 35.8	9.2'	55.6'
23			100 14.0			9.1	55.0
	SD = 16.1'	d = -1.0'		SI	O = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°58.5	S07°05.1	120°44.5	11.4'	N20°44.9	9.0'	55.7'
1	191°58.6	04.2	135°14.9	11.3'	20°53.9	8.9'	55.7'
2	206°58.7	03.2	149°45.1	11.2'	21°02.8	8.8'	55.7'
3	221°58.8	• • 02.3	164°15.3	11.1'	$21^{\circ}11.7$	8.7'	55.7'
4	236°59.0	01.3	178°45.4	11.0'	21°20.4	8.6'	55.8'
5	251°59.1	$07^{\circ}00.3$	193°15.4	10.9'	$21^{\circ}29.1$	8.5'	55.8'
6	266° 59.2	S06°59.4	207°45.4	10.8'	N21°37.6	8.5'	55.8'
7	281°59.3	58.4	222°15.2	10.7'	21°46.1	8.4'	55.8'
8	296°59.5	57.5	236°44.9	10.6'	21°54.4	8.2'	55.9'
9	311°59.6	• • 56.5	251°14.5	10.5'	22°02.7	8.1'	55.9'
10	326°59.7	55.6	265°44.1	10.5'	22°10.8	8.0'	55.9'
11	341°59.9	54.6	280°13.5	10.4'	22°18.9	7.9'	55.9'
12	357°00.0	S06°53.6	294°42.9	10.3'	N22°26.8	7.8'	56.0'
13	$12^{\circ}00.1$	52.7	$309^{\circ}12.2$	10.2'	22°34.6	7.7'	56.0'
14	27°00.2	51.7	323°41.3	10.1'	22°42.4	7.6'	56.0'
15	42°00.4	• • 50.8	338°10.4	10.0'	22°50.0	7.5'	56.1'
16	57°00.5	49.8	352°39.4	9.9'	22°57.5	7.4'	56.1'
17	$72^{\circ}00.6$	48.8	7°08.3	9.8'	23°04.9	7.3'	56.1'
18	87°00.8	506°47.9	21°37.1	9.7'	N23°12.2	7.2'	56.1'
19	102°00.9	46.9	36°05.8	9.6'	23° 19.3	7.1'	56.2'
20	$117^{\circ}01.0$	46.0	50°34.4	9.5'	23°26.4	6.9'	56.2'
21	132°01.2	• • 45.0	65°02.9	9.4'	23°33.4	6.8'	56.2'
22	147°01.3	44.1	79°31.3	9.3'	23°40.2	6.7'	56.3'
23	162°01.4	43.1	93°59.6	9.2'	23°46.9	6.6'	56.3'
	SD = 16.1'	d = -1.0'		SI	O = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
6 0	GПА 177°01.6	S06°42.1	108°27.9	ν 9.1'	N23° 53.5	<i>a</i> 6.5'	56.3'
1	177 01.6 192°01.7	41.2	108 27.9 122°56.0	9.1 9.1'	24°00.0	6.4'	56.3'
2	192 01.7 207°01.8	41.2	122 50.0 137°24.1	9.1 9.0'	24 00.0 24°06.3	6.2'	56.4'
3	207 01.8 222°02.0	39.3	151°52.0	9.0 8.9'	24 00.3 24°12.5	6.1	56.4'
3 4	237°02.1	38.3	151 52.0 166°19.9	8.8'	24 12.5 24°18.7	6.0'	56.4'
4 5	252°02.2	38.3 37.3	180°47.7	8.8	24° 18.7 24° 24.6	5.9'	56.5
6	252°02.2 267°02.4	37.3 \$06°36.4	180°47.7 195°15.4	8.6'	N24° 30.5	5.9	56.5
7	267°02.4 282°02.5	35.4	195°15.4 209°43.0	8.5	N24° 30.5 24° 36.2	5. <i>1</i> ′ 5.6′	56.5
8	282°02.5 297°02.6	35.4 34.4	209°43.0 224°10.5	8.4	24° 36.2 24° 41.8	5.5	56.6'
9	312°02.8	33.5	224 10.5 238°37.9	8.3'	24 41.8 24°47.3	5.3'	56.6'
10	312 02.8 327°02.9	32.5	258 37.9 253°05.2	8.2'	24 47.3 24°52.6	5.3 5.2'	56.6'
11	327 02.9 342°03.0	32.5 31.6	267°32.5	8.2'	24 52.0 24°57.8	5.2 5.1'	56.7'
11	357°03.2	506°30.6	207 32.5 281°59.6	8.1	24 57.8 N25°02.9	5.1 4.9'	56.7'
13	12°03.2	29.6	281 59.6 296°26.7	8.0'	25°07.8	4.9 4.8'	56.7'
13 14	27°03.4	29.6 28.7	290 20.7 310°53.7	8.0 7.9'	25 07.8 25°12.7	4.8 4.7'	56.7'
14 15	42°03.4	28.7	310°53.7 325°20.6	7.9° 7.8'	25° 12.7 25° 17.3	4.7° 4.5'	56.8'
15 16	42°03.6 57°03.7	26.8	325°20.6 339°47.4	7.8	25°17.3 25°21.9	4.5° 4.4'	56.8
16 17	72°03.8	26.8 25.8	354°14.1	7.7° 7.6'	25°21.9 25°26.2	4.4	56.8
18	72 03.8 87°04.0	25.8 \$06°24.8	354 14.1 8°40.8	7.6'	25 20.2 N25°30.5	4.3	56.9
18 19	87°04.0 102°04.1	23.9	8°40.8 23°07.3	7.6° 7.5'	N25° 30.5 25° 34.6	4.1'	56.9'
20	102 04.1 117°04.2	23.9	23 07.3 37°33.8	7.5 7.4'	25°38.6	4.0 3.8'	56.9'
21	117 04.2 132°04.4	21.9	52°00.2	7.4 7.3'	25 38.0 25°42.4	3.8 3.7'	50.9 57.0'
22	132°04.4 147°04.5	21.0	66°26.5	7.3'	25° 42.4 25° 46.1	3. <i>1</i> ′ 3.5′	57.0° 57.0°
23	147 04.5 162°04.6	20.0	80°52.8	7.2'	25 40.1 25°49.6	3.5 3.4'	57.0'
23			JU J2.0			5.4	51.0
	SD = 16.1'	d = -1.0'		SI	D = 15.4'		

Lat.	Twilight		Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.	
N 72°	05:02	06:20	07:29	16:57	18:06	19:25	
N 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	
N 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	
N 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	
S 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	
S 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	
S 60°	03:35	04:32	05:16	19:06	19:50	20:46	

Lat.		Moonris	е		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
N 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
N 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	
N 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
S 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
S 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
S 60°	12:00	13:31	15:00	19:10	19:21	19:42

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Age		
	00 ^h	12 ^h	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	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	162°17.0	135°46.0	N12°30.2	173°18.7	S05°45.1	347°28.0	N03°52.9	138°04.4	N07°36.9			
1	177°19.5	150°45.9	31.4	188°19.3	44.3	2°30.8	53.0	153°06.6	37.0	Alpheratz	357°32.4	29°14.8
2	192°21.9	165°45.8	32.5	203°20.0	43.5	17°33.6	53.1	168°08.8	37.1	Ankaa	353°05.0	-42°09.3
3	207°24.4	180°45.7	33.7	218°20.6	. 42.7	32°36.3	53.3	183°11.0	37.2	Schedar	349°28.5	56°41.6
4	222°26.8	195°45.7	34.9	233°21.3	41.9	47°39.1	53.4	198° 13.2	37.3	Diphda	348°45.0	-17°50.0
5	237°29.3	210°45.6	36.0	248°21.9	41.2	62°41.8	53.5	213° 15.4	37.4	Achernar	335°18.8	-57°05.8
6	252°31.8	225°45.5	N12°37.2	263°22.6	S05°40.4	77°44.6	N03°53.7	228° 17.7	N07°37.5	Hamal	327°48.5	23°35.8
7	267°34.2	240°45.4	38.3	278°23.2	39.6	92°47.3	53.8	243°19.9	37.7	Polaris	312°51.0	89°23.2
8	282°36.7	255°45.4	39.5	293°23.9	38.8	107°50.1	53.9	258°22.1	37.8	Acamar	315°10.0	-40°11.7
9	297°39.2	270°45.3	• • 40.7	308°24.6	• • 38.0	122°52.8	• • 54.0	273°24.3	• • 37.9	Menkar	314°03.6	4°11.9
10	312°41.6	285°45.2	41.8	323°25.2	37.2	137°55.6	54.2	288° 26.5	38.0	Mirfak	308°24.7	49°57.8
11	327°44.1	300°45.1	43.0	338°25.9	36.5	152°58.3	54.3	303°28.7	38.1	Aldebaran	290°36.7	16°33.9
12	342°46.6	315°45.1	N12°44.2	353°26.5	S05°35.7	168°01.1	N03°54.4	318°31.0	N07°38.2	Rigel	281°01.3	-8°10.3
13	357°49.0	330°45.0	45.3	8°27.2	34.9	183°03.9	54.6	333°33.2	38.3	Capella	280°18.0	46°01.6
14	12°51.5	345°44.9	46.5	23°27.8	34.1	198°06.6	54.7	348° 35.4	38.4	Bellatrix	278°20.0	6°22.4
15	27°53.9	0°44.8	• • 47.6	38°28.5	· · 33.3	213°09.4	• • 54.8	3°37.6	• • 38.5	Elnath	277°58.5	28°37.8
16	42°56.4	15°44.8	48.8	53°29.1	32.5	228°12.1	55.0	18° 39.8	38.6	Alnilam	275°35.0	-1°11.2
17	57°58.9	30°44.7	49.9	68°29.8	31.8	243°14.9	55.1	33°42.0	38.7	Betelgeuse	270°49.2	7°24.6
18	73°01.3	45°44.6	N12°51.1	83°30.4	S05°31.0	258°17.6	N03°55.2	48°44.2	N07°38.8	Canopus	263°51.0	-52°43.0
19	88°03.8	60°44.5	52.3	98°31.1	30.2	273°20.4	55.3	63°46.5	38.9	Sirius	258°23.8	-16°45.6
20	103°06.3	75°44.5	53.4	113°31.7	29.4	288°23.1	55.5	78°48.7	39.0	Adhara	255°03.6	-29°00.9
21	118°08.7	90°44.4	• • 54.6	128°32.4	• • 28.6	303°25.9	• • 55.6	93°50.9	• • 39.1	Procyon	244°47.9	5°09.0
22	133°11.2	105°44.3	55.7	143°33.0	27.8	318°28.6	55.7	108°53.1	39.2	Pollux	243°13.9	27°57.4
23	148°13.7	120°44.2	56.9	158°33.7	27.1	333°31.4	55.9	123°55.3	39.3	Avior	234°13.1	-59°36.3
			_							Suhail	222°44.0	-43°33.1
ivler.p	ass. 13:09	ν -0.1' $d1$.2′ m-4.31	ν 0.7 d-0	.8′ m1.04	ν 2.8′ $d0$.1′ m-2.48	ν 2.2′ d0	.1′ m0.58	Miaplacidus	221°36.8	-69°50.2
										Alphard	217°44.9	-8°47.1
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.4	11°49.5
0	163°16.1	135°44.2	N12°58.0	173°34.3	S05°26.3	348°34.2	N03°56.0	138° 57.5	N07°39.4	Dubhe	193°37.3	61°35.7
1	178°18.6	150°44.1	12°59.2	188°35.0	25.5	3°36.9	56.1	153°59.8	39.5	Denebola	182°22.0	14°24.6
2	193°21.1	165°44.0	13°00.4	203°35.7	24.7	18°39.7	56.3	169°02.0	39.6	Gienah	175°40.6 172°56.4	-17°42.1 -63°15.3
3	208°23.5	180°44.0	• • 01.5	218°36.3	• • 23.9	33°42.4	• • 56.4	184°04.2	• • 39.7	Acrux		
4	223°26.0	195°43.9	02.7	233°37.0	23.1	48°45.2	56.5	199°06.4	39.8	1	171°48.1 166°10.3	-57°16.3
5	238°28.4	210°43.8	03.8	248°37.6	22.4	63°47.9	56.6	214°08.6	39.9	Alioth		55°48.1
6	253°30.9	225°43.7	N13°05.0	263°38.3	S05°21.6	78°50.7	N03°56.8	229° 10.8	N07°40.0	Spica	158°19.3 152°49.7	-11° 18.7 49° 10.0
7	268°33.4	240°43.7	06.1	278°38.9	20.8	93°53.4	56.9	244°13.0	40.1	Alkaid Hadar	152 49.7 148°31.8	-60°30.4
8	283°35.8	255°43.6	07.3	293°39.6	20.0	108°56.2	57.0	259° 15.3	40.2	Menkent	140 51.6 147°54.3	-36°30.5
9	298°38.3	270°43.5	• • 08.4	308°40.2	• • 19.2	123°59.0	• • 57.2	274°17.5	• • 40.3	Arcturus	147 54.3 145°45.3	-30° 30.3 19° 01.9
10	313°40.8	285°43.4	09.6	323°40.9	18.4	139°01.7	57.3	$289^{\circ}19.7$	40.4	Rigil Kent.	139°36.3	-60°57.0
11	328°43.2	300°43.4	10.7	338°41.5	17.7	154°04.5	57.4	$304^{\circ}21.9$	40.5	Kochab	137°19.4	74°02.0
12	343°45.7	315°43.3	N13°11.9	353°42.2	S05°16.9	169°07.2	N03°57.6	$319^{\circ}24.1$	N07°40.6	Zuben'ubi	136°53.0	-16°09.6
13	358°48.2	330°43.2	13.0	8°42.9	16.1	184°10.0	57.7	334°26.3	40.8	Alphecca	126°01.4	26°36.9
14	13°50.6	345°43.1	14.2	23°43.5	15.3	199°12.7	57.8	349°28.5	40.9	Antares	112° 12.6	-26°29.6
15	28°53.1	0°43.1	• • 15.3	38°44.2	• • 14.5	214°15.5	• • 57.9	4°30.7	• • 41.0	Antares	112 12.0 107°04.5	-20°29.0 -69°04.4
16	43°55.6	15°43.0	16.5	53°44.8	13.7	229°18.3	58.1	19°33.0	41.1	Sabik	101°59.8	-15°45.6
17	58°58.0	30°42.9	17.6	68°45.5	12.9	244°21.0	58.2	34°35.2	41.2	Shaula	96°06.9	-37°07.3
18	74°00.5	45°42.9	N13°18.7	83°46.1	S05°12.2	259°23.8	N03°58.3	49°37.4	N07°41.3	Rasalhague	95°56.2	12°32.2
19	89°02.9	60°42.8	19.9	98°46.8	11.4	274°26.5	58.5	64°39.6	41.4	Eltanin	90°41.1	51°28.8
20	104°05.4	75°42.7	21.0	113°47.4	10.6	289°29.3	58.6	79°41.8	41.5	Kaus Aust.	83°29.2	-34°22.1
21	119°07.9	90°42.6	• • 22.2	128°48.1	• • 09.8	304°32.0	• • 58.7	94°44.0	• • 41.6	Vega	80°31.6	38°48.3
22	134°10.3	105°42.6	23.3	143°48.8	09.0	319°34.8	58.9	109°46.2	41.7	Nunki	75°44.7	-26° 15.6
23	149°12.8	120°42.5	24.5	158°49.4	08.2	334°37.6	59.0	124°48.5	41.8	Altair	61°57.7	8°56.5
Marn	ass. 13:05	0 1/ d1	.2′ m-4.32	··0 7′ d 0	.8′ m1.04	1,2 9/ 40	.1′ m-2.48	1,2 2/ 40	.1′ m0.58	Peacock	53°02.2	-56°38.4
ivier.p	vass. 13.05	ν-0.1 41	.4.34	νσ.ι α-0	.0 1111.04	ν2.0 dU	.1 111-2.40	ν 2.2 d0	.1110.30	Deneb	49°24.4	45°22.7
										Enif	33°36.6	10°00.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.4
0	$164^{\circ}15.3$	135°42.4	N13°25.6	173°50.1	S05°07.4	$349^{\circ}40.3$	N03°59.1		N07°41.9	Fomalhaut	15°12.1	-29°28.4
1	179°17.7	150°42.4	26.8	188°50.7	06.7	4°43.1	59.2	154°52.9	42.0	Scheat	13°43.0	28°14.1
2	194°20.2	165°42.3	27.9	203°51.4	05.9	19°45.8	59.4	169°55.1	42.1	Markab	13°27.6	15°21.4
3	209°22.7	180°42.2	• • 29.0	218°52.0	•• 05.1	34°48.6	• • 59.5	184° 57.3	• • 42.2			
4	224°25.1	195°42.1	30.2	233°52.7	04.3	49°51.3	59.6	199°59.5	42.3	Mar 04 Sat	SHA	Mer.pass
5	239°27.6	210°42.1	31.3	248°53.4	03.5	64°54.1	59.8	215°01.7	42.4	Venus		14:57
6	254°30.1	225°42.0	N13°32.5	263°54.0	S05°02.7	79°56.9	N03°59.9	230°03.9	N07°42.5	Mars	11°01.7	12:26
7	269°32.5	240°41.9	33.6	278°54.7	02.0	94°59.6	04°00.0	245°06.2	42.6	Jupiter		00:50
8	284°35.0	255°41.9	34.7	293°55.3	01.2	110°02.4	00.2	260°08.4	42.7	Saturn	335°47.4	14:46
9	299°37.4	270°41.8	• • 35.9	308°56.0	05°00.4	125°05.1	• • 00.3	275°10.6	• • 42.8	Mar 05 Sun	SHA	Mer.pass
10	314°39.9	285°41.7	37.0	323°56.6	04°59.6	140°07.9	00.4	290°12.8	42.9	Venus	332°28.0	14:57
11	329°42.4	300°41.6	38.1	338°57.3	58.8	155°10.6	00.5	305° 15.0	43.0	Mars	10°18.2	12:25
12	344°44.8	315°41.6	N13°39.3	353°58.0	S04°58.0	170°13.4	N04°00.7	320°17.2	N07°43.1		10 10.2 185°18.0	00:46
13	359°47.3	330°41.5	40.4	8°58.6	57.2	185°16.2	8.00	335° 19.4	43.2	Saturn	335°41.4	14:42
14	14°49.8	345°41.4	41.6	23°59.3	56.5	200°18.9	00.9	350°21.6	43.4	Jatuill	333 71.7	17.72
15	29°52.2	0°41.4	• • 42.7	38°59.9	• • 55.7	215°21.7	•• 01.1	5°23.8	• • 43.5	Mar 06 Mon	SHA	Mer.pass
16	44°54.7	15°41.3	43.8	54°00.6	54.9	230°24.4	01.2	20°26.1	43.6	Venus	331°27.2	14:57
17	59°57.2	30°41.2	45.0	69°01.2	54.1	245°27.2	01.3	35°28.3	43.7	Mars	9°34.8	12:24
18	74°59.6	45°41.2	N13°46.1	84°01.9	S04°53.3	260°30.0	N04°01.5	50°30.5	N07°43.8		185°25.0	00:41
19	90°02.1	60°41.1	47.2	99°02.6	52.5	275°32.7	01.6	65°32.7	43.9	Saturn	335°35.4	14:38
20	105°04.6	75°41.0	48.4	114°03.2	51.7	290°35.5	01.7	80°34.9	44.0	Ua::!-a:-4	al parallar	
21	120°07.0	90°40.9	• • 49.5	129°03.9	• • 50.9	305°38.2	• • 01.8	95°37.1	• • 44.1	Horizont	al parallax	0.0
22	135°09.5	105°40.9	50.6	144°04.5	50.2	320°41.0	02.0	110°39.3	44.2		Venus:	0.2
23	150°11.9	120°40.8	51.8	159°05.2	49.4	335°43.7	02.1	125°41.5	44.3		Mars:	0.1
Mer.n	ass. 13:01	ν -0.1' d1	.1′ m-4.32	$\nu 0.7' \ d-0$.8′ m1.04	$\nu 2.8' d0$.1′ m-2.48	ν 2.2' d0	.1′ m0.58			
								0				

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°04.8	S06°19.1	95°18.9	7.1'	N25°53.0	3.2'	57.1'
1	192°04.9	18.1	109°45.0	7.0'	25°56.3	3.1'	57.1'
2	207°05.1	17.1	124°11.0	6.9'	25°59.4	2.9'	57.1'
3	222°05.2	• • 16.2	138°37.0	6.9'	26°02.3	2.8'	57.2'
4	237°05.3	15.2	153°02.8	6.8'	26°05.1	2.6'	57.2'
5	252°05.5	14.2	167°28.6	6.7'	26°07.8 N26°10.3	2.5'	57.2'
6 7	267°05.6 282°05.7	S06°13.3 12.3	181°54.3 196°20.0	6.7' 6.6'	N26 10.3 26°12.6	2.3' 2.2'	57.3' 57.3'
8	297°05.9	11.3	210°45.6	6.5	26°14.8	2.0'	57.4'
9	312°06.0	. 10.4	225°11.1	6.5	26° 16.8	1.9'	57.4
10	327°06.2	09.4	239°36.6	6.4	26°18.7	1.7'	57.4'
11	342°06.3	08.4	254°01.9	6.3'	$26^{\circ}20.4$	1.6'	57.5'
12	357°06.4	S06°07.5	268°27.3	6.3'	N26°22.0	1.4'	57.5'
13	12°06.6	06.5	282°52.5	6.2'	26°23.4	1.2'	57.5'
14	27°06.7	05.5	297°17.7	6.1'	26°24.7	1.1'	57.6'
15 16	42°06.9 57°07.0	· · 04.6 03.6	311°42.9 326°08.0	6.1' 6.0'	26°25.8 26°26.7	0.9' 0.8'	57.6' 57.6'
17	72°07.1	03.0	340°33.0	6.0'	26°27.5	0.6	57.0°
18	87°07.3	S06°01.7	354°58.0	5.9'	N26°28.1	0.4	57.7'
19	102°07.4	06°00.7	9°22.9	5.9'	26°28.5	0.3'	57.7'
20	117°07.6	05°59.7	23°47.8	5.8'	26°28.8	0.1'	57.8'
21	132°07.7	• • 58.8	38°12.6	5.8'	26°28.9	-0.0'	57.8'
22	147°07.8	57.8	52°37.4	5.7'	26°28.9	-0.2'	57.8'
23	162°08.0	56.8	67°02.1	5.7'	26°28.6	-0.4'	57.9'
	SD = 16.1'	d = -1.0'		SI	D = 15.6'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 0	177°08.1	S05°55.9	81°26.8	ν 5.6'	N26°28.3	-0.5'	57.9'
1	192°08.3	54.9	95°51.4	5.6'	26°27.7	-0.7'	58.0'
2	207°08.4	53.9	110°16.0	5.6'	26°27.0	-0.9'	58.0'
3	222°08.5	• • 53.0	124°40.6	5.5'	$26^{\circ}26.1$	-1.0'	58.0'
4	237°08.7	52.0	139°05.1	5.5'	26°25.1	-1.2'	58.1'
5	252°08.8	51.0	153°29.6	5.5'	26°23.9	-1.4'	58.1'
6 7	267°09.0 282°09.1	S05°50.1 49.1	167°54.0 182°18.5	5.4' 5.4'	N26°22.5 26°20.9	-1.6' -1.7'	58.1' 58.2'
8	282 09.1 297°09.3	49.1 48.1	182 18.5 196°42.9	5.4' 5.4'	26° 20.9 26° 19.2	-1.1 -1.9'	58.2'
9	312°09.4	. 47.2	211°07.2	5.3'	26°17.3	-2.1'	58.2'
10	327°09.5	46.2	225°31.5	5.3'	26°15.2	-2.2'	58.3'
11	342°09.7	45.2	239°55.8	5.3'	26°13.0	-2.4'	58.3'
12	357°09.8	S05°44.3	254°20.1	5.3'	$N26^{\circ}10.6$	-2.6'	58.4'
13	12°10.0	43.3	268°44.4	5.2'	26°08.0	-2.7'	58.4'
14	27°10.1	42.3	283°08.6	5.2'	26°05.3	-2.9'	58.4'
15	42°10.3 57°10.4	• • 41.4	297°32.8 311°57.0	5.2' 5.2'	26°02.4 25°59.3	-3.1' -3.3'	58.5' 58.5'
16 17	72°10.4	40.4 39.4	311 57.0 326°21.2	5.2'	25°56.0	-3.3 -3.4'	58.5'
18	87°10.7	S05°38.5	340°45.4	5.2'	N25° 52.6	-3.6'	58.6'
19	102°10.8	37.5	355°09.6	5.2'	25°49.0	-3.8'	58.6'
20	117°11.0	36.5	9°33.7	5.1'	25°45.2	-4.0'	58.7'
21	132°11.1	• • 35.5	23°57.9	5.1'	25°41.2	-4.1'	58.7'
22	147°11.3	34.6	38°22.0	5.1'	25°37.1	-4.3'	58.7'
23	162°11.4	33.6	52°46.1	5.1'	25°32.8	-4.5'	58.8'
	SD = 16.1'	d = -1.0'		SI	D = 15.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°11.6	\$05°32.6	67°10.3	5.1'	N25°28.3	-4.6'	58.8'
1	192°11.7	31.7	81°34.4	5.1'	25°23.7	-4.8'	58.8'
2	207°11.9 222°12.0	30.7	95°58.5	5.1'	25°18.9	-5.0' -5.2'	58.9'
3 4	222°12.0 237°12.2	· · 29.7 28.8	110°22.7 124°46.8	5.1' 5.1'	25°13.9 25°08.7	-5.2' -5.3'	58.9' 58.9'
5	257 12.2 252°12.3	20.0 27.8	139°10.9	5.1'	25°03.4	-5.5'	59.0'
6	267°12.5	S05°26.8	153°35.1	5.2'	N24°57.9	-5.7'	59.0'
7	282°12.6	25.8	167°59.2	5.2'	24° 52.3	-5.8'	59.1'
8	297°12.7	24.9	182°23.4	5.2'	24°46.4	-6.0'	59.1'
9	312°12.9	• • 23.9	196°47.6	5.2'	24°40.4	-6.2'	59.1'
10	327°13.0	22.9	211°11.8	5.2'	24°34.2	-6.3'	59.2'
11	342°13.2 357°13.3	22.0 \$05°21.0	225°36.0 240°00.2	5.2'	24°27.9 N24°21.4	-6.5'	59.2'
12 13	357°13.3 12°13.5	20.0	240°00.2 254°24.4	5.2' 5.3'	N24°21.4 24°14.7	-6.7' -6.8'	59.2' 59.3'
13	27°13.6	20.0 19.0	254 24.4 268°48.7	5.3'	24 14.7 24°07.9	-0.8 -7.0'	59.3'
15	42°13.8	. 18.1	283°13.0	5.3'	24°00.8	-7.2'	59.3'
16	57°13.9	17.1	297°37.3	5.3'	23°53.7	-7.3'	59.4'
17	72°14.1	16.1	$312^{\circ}01.6$	5.4'	23°46.3	-7.5'	59.4'
18	87°14.2	S05°15.2	326°26.0	5.4'	N23°38.8	-7.7'	59.4'
19	102°14.4	14.2	340°50.3	5.4'	23°31.1	-7.8'	59.5'
20	117°14.5	13.2	355°14.7	5.4'	23°23.3	-8.0'	59.5'
21 22	132°14.7 147°14.8	· · 12.2 11.3	9°39.2 24°03.6	5.5' 5.5'	23°15.3 23°07.1	-8.2' -8.3'	59.6' 59.6'
23	162°15.0	10.3	38°28.1	5.5'	23° 58.8	-o.s -8.5'	59.6'
	SD = 16.1'	d = -1.0'			D = 16.0'	5.5	23.0
	JD — 10.1	<u>u — -1.0</u>		اد			

			I			
Lat.	Twi	light	Sunrise	Sunset	Twi	light
	Naut.	Civil			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
S 10°	05:18	05:43	06:04	18:19	18:40	19:04
20°	05:11	05:37	05:59	18:23	18:45	19:11
30°	05:01	05:30	05:54	18:28	18:52	19:21
35°	04:55	05:25	05:51	18:31	18:57	19:27
40°	04:47	05:20	05:47	18:35	19:02	19:34
45°	04:38	05:13	05:43	18:39	19:08	19:44
S 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
S 60°	03:45	04:40	05:24	18:57	19:41	20:35
	1					

Lat.		Moonris	е		Moonset	t
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
S 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	
S 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
S 60°	16:16	17:07	17:33	20:25	21:38	23:16

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	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			

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	165°14.4	135°40.7	N13°52.9	174°05.9	504°48.6	350° 46.5	N04°02.2	140°43.7	N07°44.4		257022.4	000140
1	180°16.9	150°40.7	54.0	189°06.5	47.8	5°49.3	02.4	155°46.0	44.5	Alpheratz	357°32.4	29°14.8
2	195°19.3	165°40.6	55.1	204°07.2	47.0	20°52.0	02.5	170°48.2	44.6	Ankaa	353°05.0	-42°09.2
3	210°21.8	180°40.5	• • 56.3	219°07.8	• • 46.2	35°54.8	• • 02.6	185°50.4	• • 44.7	Schedar	349°28.5	56°41.6
4	225°24.3	195°40.5	57.4	234°08.5	45.4	50° 57.5	02.8	200°52.6	44.8	Diphda	348°45.0	-17°50.0
5	240°26.7	210°40.4	58.5	249°09.2	44.7	66°00.3	02.9	215°54.8	44.9	Achernar	335°18.8	-57°05.8
6	255°29.2	225°40.3	N13°59.7	264°09.8	S04°43.9	81°03.1	N04°03.0	230°57.0	N07°45.0	Hamal	327°48.5	23°35.8
7	270°31.7	240°40.3	14°00.8	279°10.5	43.1	96°05.8	03.1	245°59.2	45.1	Polaris	312°52.3	89°23.2
8	285°34.1	255°40.2	01.9	294°11.1	42.3	111°08.6	03.3	261°01.4	45.2	Acamar	315°10.0	-40°11.7
9	300°36.6	270°40.1	• • 03.0	309°11.8	• • 41.5	126°11.3	• • 03.4	276°03.6	• • 45.3	Menkar	314°03.6	4°11.9
10	315°39.0	285°40.1	04.2	324°12.4	40.7	141°14.1	03.5	291°05.8	45.4	Mirfak	308°24.7	49°57.8
11	330°41.5	300°40.0	05.3	339°13.1	39.9	156° 16.9	03.7	306°08.1	45.5	Aldebaran	290°36.7	16°33.9
12	345°44.0	315°39.9	N14°06.4	354°13.8	504°39.1	171° 19.6	N04°03.8	321°10.3	N07°45.7	Rigel	281°01.4	-8°10.3
13	0°46.4	330°39.8	07.5	9°14.4	38.4	186°22.4	03.9	336°12.5	45.8	Capella	280°18.0	46°01.6
14	15°48.9	345°39.8	08.7	24°15.1	37.6	201°25.1	04.1	351°14.7	45.9	Bellatrix	278°20.1	6°22.4
15	30°51.4	0°39.7	• • 09.8	39°15.8	• • 36.8	$216^{\circ}27.9$	• • 04.2	6°16.9	• • 46.0	Elnath	277°58.5	28°37.8
16	45°53.8	15°39.6	10.9	54°16.4	36.0	231°30.6	04.3	21°19.1	46.1	Alnilam	275°35.0	-1°11.2
17	60°56.3	30°39.6	12.0	69°17.1	35.2	246°33.4	04.5	36°21.3	46.2	Betelgeuse	270°49.2	7°24.6
18	75°58.8	45°39.5	N14°13.1	84°17.7	504°34.4	261°36.2	N04° 04.6	51°23.5	N07°46.3	Canopus	263°51.1	-52°43.0
19	91°01.2	60°39.4	14.3	99°18.4	33.6	276°38.9	04.7	66°25.7	46.4	Sirius	258°23.8	-16°45.6
20	106°03.7	75°39.4	15.4	114°19.1	32.9	291°41.7	04.8	81°27.9	46.5	Adhara	255°03.6	-29°00.9
21	121°06.2	90°39.3	16.5	129°19.7	32.1	306° 44.4	• • 05.0	96°30.1	• • 46.6	Procyon	244°47.9	5°09.0
22	136°08.6	105°39.2	17.6	144°20.4	31.3	321°47.2	05.1	111°32.4	46.7	Pollux	243°13.9	27°57.4
23	151°11.1	120°39.2	18.7	159°21.0	30.5	336° 50.0	05.2	126°34.6	46.8	Avior	234°13.2	-59°36.3
										Suhail	222°44.0	-43°33.1
Mer.p	ass. 12:57	ν -0.1' d1	.1′ m-4.33	ν 0.7′ d-0).8′ m1.04	$\nu^{2.8'} d0$.1′ m-2.48	$\nu^{2.2'} d0$.1′ m0.58	Miaplacidus	221°36.8	-69°50.2
										Alphard	217°44.9	-8°47.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.4	11°49.5
0	166°13.5	135°39.1	N14°19.9	174°21.7	S04°29.7	351°52.7	N04°05.4	141°36.8	N07°46.9	Dubhe	193°37.3	61°35.8
1	181°16.0	150°39.0	21.0	189°22.4	28.9	6°55.5	05.5	156°39.0	47.0	Denebola	182°22.0	14°24.6
2	196°18.5	165°39.0	22.1	204°23.0	28.1	21°58.2	05.6	171°41.2	47.1	Gienah	175°40.6	-17°42.1
3	211°20.9	180°38.9	23.2	219°23.7	27.3	37°01.0	05.8	186°43.4	• • 47.2	Acrux	172°56.4	-63°15.4
4	226°23.4	195°38.8	24.3	234°24.3	26.5	52°03.8	05.9	201°45.6	47.3	Gacrux	171°48.1	-57°16.3
5	241°25.9	210°38.8	25.4	249°25.0	25.8	67°06.5	06.0	216°47.8	47.4	Alioth	166°10.3	55°48.1
6	256°28.3	225°38.7	N14°26.5	264°25.7	S04°25.0	82°09.3	N04°06.2	231°50.0	N07°47.5	Spica	158°19.3	-11°18.7
7	271°30.8	240°38.6	27.7	279°26.3	24.2	97°12.0	06.3	246°52.2	47.6	Alkaid	152°49.6	49°10.0
8	286°33.3	255°38.6	28.8	294°27.0	23.4	112° 14.8	06.4	261°54.4	47.8	Hadar	148°31.8	-60°30.4
9	301°35.7	270°38.5	• • 29.9	309°27.7	• • 22.6	127° 17.6	• • 06.5	276°56.6	• • 47.9	Menkent	147°54.2	-36°30.5
10	316°38.2	285°38.4	31.0	324°28.3	21.8	142°20.3	06.7	291°58.9	48.0	Arcturus	145°45.3	19°01.9
11	331°40.7	300°38.4	32.1	339°29.0	21.0	157° 23.1	06.8	307°01.1	48.1	Rigil Kent.	139°36.2	-60°57.0
12	346°43.1	315°38.3	N14°33.2	354°29.6	504°20.2	172°25.8	N04°06.9	322°03.3	N07°48.2	Kochab	137°19.4	74°02.0
13	1°45.6	330°38.3	34.3	9°30.3	19.5	187°28.6	07.1	337°05.5	48.3	Zuben'ubi	136°52.9	-16°09.6
14	16°48.0	345°38.2	35.4	24°31.0	18.7	202°31.4	07.2	352°07.7	48.4	Alphecca	126°01.4	26°36.9
15	31°50.5	0°38.1	• • 36.5	39°31.6	• • 17.9	$217^{\circ}34.1$	• • 07.3	7°09.9	• • 48.5	Antares	112°12.6 107°04.4	-26°29.6 -69°04.4
16	46°53.0	15°38.1	37.7	54°32.3	17.1	232°36.9	07.5	22°12.1	48.6	Atria Sabik	107 04.4 101°59.8	-09 04.4 -15°45.6
17	61°55.4	30°38.0	38.8	69°33.0	16.3	247°39.6	07.6	37°14.3	48.7		96°06.9	-15 45.0 -37°07.3
18	76°57.9	45°37.9	N14°39.9	84°33.6	S04°15.5	262° 42.4	N04°07.7	52°16.5	N07°48.8	Shaula	95°56.2	-37 07.3 12°32.2
19	92°00.4	60°37.9	41.0	99°34.3	14.7	277°45.2	07.8	67°18.7	48.9	Rasalhague	90°41.1	51°28.8
20	107°02.8	75°37.8	42.1	114°35.0	13.9	292°47.9	08.0	82°20.9	49.0	Eltanin	83°29.2	-34°22.1
21	122°05.3	90°37.7	• • 43.2	129°35.6	• • 13.1	307°50.7	• • 08.1	97°23.1	• • 49.1	Kaus Aust.	80°31.6	-34 22.1 38°48.3
22	137°07.8	105°37.7	44.3	144°36.3	12.4	322°53.5	08.2	112°25.3	49.2	Vega		
23	152°10.2	120°37.6	45.4	159°36.9	11.6	337°56.2	08.4	127°27.5	49.3	Nunki	75°44.7	-26°15.6
	10.52		1/ 4.24	0.7/ 1.0		2.0/_10				Altair	61°57.6	8°56.5
ivier.p	ass. 12:53	ν -0.1' $d1$.1′ m-4.34	ν 0.7° d -0	0.8′ m1.03	ν2.8′ d 0.	.1′ m-2.48	ν2.2' d0	.1′ m0.58	Peacock Deneb	53°02.1 49°24.4	-56°38.4 45°22.7
	_		_		_		_			Enif	49 24.4 33°36.5	45 22.7 10°00.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.2	-46°49.4
0	167°12.7	135°37.5	N14°46.5	174°37.6	504°10.8	352° 59.0	N04° 08.5	142°29.8	N07°49.4	Fomalhaut	15°12.0	-40 49.4 -29°28.4
1	$182^{\circ}15.1$	150°37.5	47.6	189°38.3	10.0	8°01.7	08.6	157°32.0	49.5	Scheat	13°43.0	28°14.1
2	197°17.6	165°37.4	48.7	204°38.9	09.2	23°04.5	08.8	172°34.2	49.7	Markab	13°27.6	15°21.4
3	$212^{\circ}20.1$	180°37.4	• • 49.8	219°39.6	• • 08.4	38°07.3	• • 08.9	187°36.4	• • 49.8	IvidiNaD	10 21.0	10 41.4
4	227°22.5	195°37.3	50.9	234°40.3	07.6	53°10.0	09.0	202°38.6	49.9	Mar 07 Tue	SHA	Mer.pass
5	242°25.0	210°37.2	52.0	249°40.9	06.8	68° 12.8	09.2	217°40.8	50.0	Venus	$330^{\circ}26.3$	14:57
6	257°27.5	225°37.2	N14°53.1	264°41.6	S04°06.0	83° 15.5	N04°09.3	232°43.0	N07°50.1	Mars	8°51.4	12:23
7	272°29.9	240°37.1	54.2	279°42.3	05.3	98° 18.3	09.4	247°45.2	50.2	Jupiter	$185^{\circ}32.1$	00:37
8	287°32.4	255°37.0	55.3	294°42.9	04.5	$113^{\circ}21.1$	09.5	262°47.4	50.3	Saturn	$335^{\circ}29.3$	14:35
9	302°34.9	270°37.0	• • 56.4	309°43.6	• • 03.7	128°23.8	• • 09.7	277°49.6	• • 50.4	Ma:: 00 14/ 1	CIIA	NA
10	317°37.3	285°36.9	57.5	324°44.3	02.9	143° 26.6	09.8	292°51.8	50.5	Mar 08 Wed	SHA	Mer.pass
11	332°39.8	300°36.8	58.6	339°44.9	02.1	$158^{\circ}29.3$	09.9	307°54.0	50.6	Venus	329°25.6	14:57
12	347°42.3	315°36.8	N14°59.7	354°45.6	504°01.3	173°32.1	N04° 10.1	322°56.2	N07° 50.7	Mars	8°08.2	12:22
13	2°44.7	330°36.7	15°00.8	9°46.2	04°00.5	188°34.9	10.2	337°58.4	50.8	Jupiter	185°39.2	00:32
14	17°47.2	345°36.7	01.9	24°46.9	03°59.7	203°37.6	10.3	353°00.6	50.9	Saturn	335°23.2	14:31
15	32°49.6	0°36.6	• • 03.0	39°47.6	• • 58.9	218° 40.4	• • 10.5	8°02.8	• • 51.0	Mar 09 Thu	SHA	Mer.pass
16	47°52.1	15°36.5	04.1	54°48.2	58.2	233°43.2	10.6	23°05.0	51.1	Venus	328°24.9	14:58
17	62°54.6	30°36.5	05.2	69°48.9	57.4	248°45.9	10.7	38°07.2	51.2	Mars	7°24.9	12:21
18	77°57.0	45°36.4	N15°06.3	84°49.6	S03°56.6	263°48.7	N04°10.9	53°09.5	N07°51.3	Jupiter	185°46.3	00:28
19	92°59.5	60°36.4	07.4	99°50.2	55.8	278°51.4	11.0	68°11.7	51.5	Saturn	335°17.1	14:28
20	108°02.0	75°36.3	08.5	114°50.9	55.0	293°54.2	11.1	83°13.9	51.6			0
21	123°04.4	90°36.2	• • 09.6	$129^{\circ}51.6$	• • 54.2	308°57.0	• • 11.2	98°16.1	• • 51.7	Horizont	al parallax	
22	138°06.9	105°36.2	10.7	144°52.2	53.4	323°59.7	11.4	113°18.3	51.8		Venus:	0.2
23	153°09.4	120°36.1	11.7	159°52.9	52.6	339°02.5	11.5	128°20.5	51.9		Mars:	0.1
Mern	ass. 12:49	v-0 1′ d1	.1′ m-4.35	ν0.7' d.0	0.8' m1.03	1/2 8/ dn	.1′ m-2.48	1/2 2/ 40	.1′ m0.57			
ivici.p	,uss. 14.43	ν·0.1 UI		ν υ. ι u-U		ν Δ.Ο UU.	· · · · · · · · · · · · · · · · · · ·	ν ∠.∠ UU				

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 15.1	S05°09.3	52°52.7	5.6'	N22°50.3	-8.6'	59.7'
1	192°15.3	08.3	67°17.2	5.6'	22°41.7	-8.8'	59.7'
2	207° 15.4	07.4	81°41.8	5.6'	22°32.9	-9.0'	59.7'
3	222°15.6	• • 06.4	96°06.5	5.7'	22°23.9	-9.1'	59.8'
4	237° 15.7	05.4	110°31.1	5.7'	22°14.8	-9.3'	59.8'
5	252° 15.9	04.4 \$05°03.5	124°55.9 139°20.6	5.7'	22°05.5 N21°56.1	-9.4'	59.8'
6 7	267° 16.0 282° 16.2	505 03.5 02.5	139 20.6 153°45.4	5.8' 5.8'	N21 50.1 21°46.5	-9.6' -9.7'	59.9' 59.9'
8	297°16.3	02.5	168°10.2	5.0 5.9'	21°40.5 21°36.7	-9.7 -9.9'	59.9'
9	312° 16.5	05°00.6	182°35.1	5.9'	21°26.9	-10.0'	59.9'
10	327°16.6	04°59.6	197°00.0	6.0'	21°16.8	-10.2'	60.0'
11	342°16.8	58.6	211°25.0	6.0'	21°06.6	-10.3'	60.0'
12	357°16.9	S04°57.6	225°50.0	6.0'	N20°56.3	-10.5'	60.0'
13	12° 17.1	56.7	240°15.0	6.1'	20°45.8	-10.6'	60.1'
14	27° 17.3	55.7	254°40.1	6.1'	20°35.2	-10.8'	60.1'
15	42°17.4	• • 54.7	269°05.3	6.2'	20°24.4	-10.9'	60.1'
16	57° 17.6	53.7	283°30.4 297°55.7	6.2'	20°13.5 20°02.4	-11.1'	60.2'
17 18	72°17.7 87°17.9	52.8 \$04°51.8	297°55.7 312°21.0	6.3' 6.3'	N19°51.2	-11.2' -11.3'	60.2' 60.2'
19	102°18.0	50.8	312 21.0 326°46.3	6.4'	19°39.9	-11.5'	60.2
20	102 18.0 117°18.2	49.8	341°11 7	6.4	19° 39.9	-11.6'	60.3
21	132°18.3	48.9	355°37.1	6.5	19°16.7	-11.8'	60.3
22	147° 18.5	47.9	10°02.6	6.5'	19°05.0	-11.9'	60.3
23	162°18.6	46.9	24°28.1	6.6'	18°53.1	-12.0'	60.4
	SD = 16.1'	d = -1.0'		ς	D = 16.3'		
		<u>u = 1.0</u>	-		D = 10.5		
Wed	GHA 177° 10 0	Dec	GHA	ν 6 6'	Dec	d 12.2'	HP
0 1	177° 18.8 192° 18.9	S04°45.9 45.0	38°53.7 53°19.3	6.6' 6.7'	N18°41.1 18°28.9	-12.2' -12.3'	60.4' 60.4'
2	192 18.9 207°19.1	45.0 44.0	53 19.3 67°45.0	6.7'	18°16.6	-12.3 -12.4'	60.4 60.5'
3	222° 19.3	43.0	82°10.8	6.8'	18°04.2	-12.5'	60.5
4	237° 19.4	42.0	96°36.6	6.8	17°51.7	-12.7'	60.5
5	252° 19.6	41.1	111°02.4	6.9'	17°39.0	-12.8'	60.5'
6	267° 19.7	S04°40.1	125°28.3	6.9'	$N17^{\circ}26.2$	-12.9'	60.6'
7	282°19.9	39.1	139°54.3	7.0'	17°13.3	-13.0'	60.6'
8	297°20.0	38.1	154°20.3	7.1'	17°00.3	-13.2'	60.6'
9	312°20.2	• • 37.1	168°46.3	7.1'	16°47.1	-13.3'	60.6'
10	327°20.3	36.2	183°12.4	7.2'	16°33.8	-13.4'	60.7'
11	342°20.5	35.2 \$04°34.2	197°38.6 212°04.8	7.2'	16°20.5 N16°07.0	-13.5'	60.7'
12 13	357°20.7 12°20.8	33.2	212°04.8 226°31.0	7.3' 7.3'	15°53.3	-13.6' -13.7'	60.7' 60.7'
14	27°21.0	32.3	240°57.4	7.3 7.4'	15°39.6	-13.7 -13.8'	60.7
15	42°21.1	31.3	255°23.7	7.4'	15°25.8	-13.9'	60.8
16	57°21.3	30.3	269°50.2	7.5'	15°11.8	-14.0'	60.8'
17	$72^{\circ}21.4$	29.3	$284^{\circ}16.6$	7.5'	14°57.8	-14.2'	60.8'
18	87°21.6	S04°28.4	298°43.2	7.6'	N14°43.6	-14.3'	60.8'
19	102°21.8	27.4	313°09.7	7.6'	14°29.4	-14.4'	60.9'
20	117°21.9	26.4	327°36.4	7.7'	14°15.0	-14.5'	60.9'
21	132°22.1 147°22.2	• • 25.4	342°03.0 356°29.8	7.7'	14°00.6 13°46.0	-14.6'	60.9'
22 23	147 22.2 162°22.4	24.4 23.5	350 29.8 10°56.6	7.8' 7.8'	13 46.0 13°31.4	-14.6' -14.7'	60.9' 60.9'
23			10 30.0		D = 16.5'	-14.7	00.9
	SD = 16.1'	d = -1.0'			$D = 10.5^{\circ}$		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 22.5	S04°22.5	25°23.4	7.9'	N13°16.6	-14.8'	60.9'
1	192°22.7	21.5	39°50.3	7.9'	13°01.8	-14.9'	61.0'
2 3	207°22.9 222°23.0	20.5 •• 19.6	54°17.2 68°44.2	8.0'	12°46.9 12°31.9	-15.0'	61.0' 61.0'
3 4	222°23.0 237°23.2	18.6	68°44.2 83°11.2	8.0' 8.1'	12°31.9 12°16.8	-15.1' -15.2'	61.0'
5	257 23.2 252°23.3	17.6	97°38.3	8.1	12 10.6 12°01.6	-15.2 -15.3'	61.0'
6	267° 23.5	504°16.6	112°05.4	8.2'	N11°46.3	-15.3'	61.0'
7	282°23.7	15.6	126°32.6	8.2'	11°31.0	-15.4'	61.1
8	297°23.8	14.7	140°59.8	8.3'	11°15.6	-15.5'	61.1'
9	312°24.0	• • 13.7	155°27.0	8.3'	11°00.1	-15.6'	61.1'
10	327°24.1	12.7	169°54.3	8.3'	10°44.5	-15.6'	61.1'
11	342°24.3	11.7	184°21.7	8.4'	10°28.9	-15.7'	61.1'
12	357° 24.5	S04°10.7	198°49.1	8.4'	N10°13.1 09°57.4	-15.8'	61.1'
13 14	12°24.6 27°24.8	09.8 08.8	213°16.5 227°44.0	8.5' 8.5'	09°57.4 09°41.5	-15.9' -15.9'	61.1' 61.1'
14 15	42° 24.9	07.8	242°11.5	8.6'	09 41.5 09°25.6	-15.9 -16.0'	61.2
16	57° 25.1	06.8	256°39.1	8.6'	09°23.0	-16.0'	61.2
17	72°25.3	05.8	271°06.7	8.6'	08°53.6	-16.1'	61.2'
18	87° 25.4	S04°04.9	285°34.3	8.7'	N08°37.5	-16.2'	61.2'
19	102°25.6	03.9	300°02.0	8.7'	$08^{\circ}21.3$	-16.2'	61.2'
20	117° 25.7	02.9	314°29.7	8.8'	08°05.1	-16.3'	61.2'
21	132°25.9	• • 01.9	328°57.4	8.8'	07°48.9	-16.3'	61.2'
22	147°26.1	00.9	343°25.2	8.8'	07°32.5	-16.4'	61.2'
23	162°26.2	0.00	357°53.1	8.9'	07°16.2	-16.4'	61.2'
	SD = 16.1'	d = -1.0'		S	D = 16.6'		

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

Lat.		Moonris	e		Moonset	:
Lut.	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
N 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
N 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
N 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
S 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
S 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
S 60°	17:47	17:55	18:00		01:04	02:52

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	11-13		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
- Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
				174° 53.6	S03°51.8						JIIA	Dec
0	168°11.8	135°36.0	N15°12.8			354°05.2	N04°11.6	143°22.7	N07°52.0	Alpheratz	357°32.4	29°14.8
1	183°14.3	150°36.0	13.9	189°54.2	51.0	9°08.0	11.8	158°24.9	52.1	Ankaa	353°05.0	-42°09.2
2	198°16.8	165°35.9	15.0	204°54.9	50.3	24° 10.8	11.9	173°27.1	52.2	Schedar	349°28.5	56°41.6
3	213°19.2	180°35.9	•• 16.1	219°55.6	• • 49.5	$39^{\circ}13.5$	• • 12.0	188°29.3	• • 52.3	Diphda	348°45.0	-17°50.0
4	228°21.7	195°35.8	17.2	234°56.2	48.7	54°16.3	12.2	203°31.5	52.4			
5	243°24.1	210°35.7	18.3	249°56.9	47.9	$69^{\circ}19.1$	12.3	218°33.7	52.5	Achernar	335°18.8	-57°05.8
6	258°26.6	225°35.7	N15°19.4	264°57.6	503°47.1	84°21.8	N04° 12.4	233°35.9	N07°52.6	Hamal	327°48.5	23°35.8
7	273°29.1	240°35.6	20.4	279°58.2	46.3	99°24.6	12.6	248°38.1	52.7	Polaris	312°53.7	89°23.2
										Acamar	$315^{\circ}10.1$	-40°11.7
8	288°31.5	255°35.6	21.5	294°58.9	45.5	114°27.3	12.7	263°40.3	52.8	Menkar	314°03.6	$4^{\circ}11.9$
9	303°34.0	270°35.5	• • 22.6	309°59.6	• • 44.7	129°30.1	• • 12.8	278°42.5	• • 52.9	Mirfak	308°24.7	49°57.8
10	318°36.5	285°35.4	23.7	325°00.2	43.9	144°32.9	12.9	293°44.7	53.0	Aldebaran	290°36.7	16°33.9
11	333°38.9	300°35.4	24.8	340°00.9	43.1	159°35.6	13.1	308°46.9	53.1	Rigel	281°01.4	-8°10.3
12	348°41.4	315°35.3	N15°25.9	$355^{\circ}01.6$	S03°42.4	174°38.4	N04° 13.2	323°49.1	$N07^{\circ}53.3$	_		
13	3°43.9	330°35.3	27.0	10°02.2	41.6	189°41.2	13.3	338°51.3	53.4	Capella	280°18.0	46°01.6
14	18°46.3	345°35.2	28.0	25°02.9	40.8	204°43.9	13.5	353°53.5	53.5	Bellatrix	278°20.1	6°22.4
15	33°48.8	0°35.1	29.1	40°03.6	• • 40.0	219°46.7	• • 13.6	8°55.7	• • 53.6	Elnath	277°58.6	28°37.8
16	48°51.2	15°35.1	30.2	55°04.2	39.2	234°49.4	13.7	23°57.9	53.7	Alnilam	275°35.1	$-1^{\circ}11.2$
				70°04.9		249°52.2	13.7	39°00.1		Betelgeuse	270°49.2	$7^{\circ}24.6$
17	63°53.7	30°35.0	31.3		38.4				53.8	Canopus	263°51.1	-52°43.0
18	78°56.2	45°35.0	N15°32.4	85°05.6	S03°37.6	264°55.0	N04° 14.0	54°02.3	N07°53.9	Sirius	258°23.8	-16°45.6
19	93°58.6	60°34.9	33.4	100°06.2	36.8	279°57.7	14.1	69°04.6	54.0	Adhara	255°03.7	-29°00.9
20	109°01.1	75°34.9	34.5	115°06.9	36.0	295°00.5	14.3	84°06.8	54.1	Procyon	244°47.9	5°09.0
21	124°03.6	90°34.8	• • 35.6	130°07.6	• • 35.2	$310^{\circ}03.2$	• • 14.4	99°09.0	• • 54.2	Pollux	244 47.9 243°13.9	27°57.4
22	139°06.0	105°34.7	36.7	145°08.3	34.5	325°06.0	14.5	114°11.2	54.3			
23	154°08.5	120°34.7	37.7	160°08.9	33.7	340°08.8	14.6	129°13.4	54.4	Avior	234°13.2	-59°36.3
										Suhail	222°44.0	-43°33.1
Mer.p	pass. 12:45	u-0.1' $d1$.1' m-4.36	ν 0.7′ d-0	.8′ m1.03	$\nu 2.8' \ d0.$.1′ m-2.48	ν 2.2′ d0	$.1^\prime$ m 0.57	Miaplacidus	221°36.9	-69°50.2
										Alphard	217°44.9	-8°47.1
_	c	G	-			a	Б.	a	-	Regulus	207°31.4	$11^{\circ}49.5$
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.8
0	169°11.0	135°34.6	N15°38.8	175°09.6	S03°32.9	355° 11.5	N04° 14.8	144°15.6	N07°54.5	Denebola	182°22.0	14°24.6
1	184°13.4	150°34.6	39.9	190°10.3	32.1	10° 14.3	14.9	159°17.8	54.6	Gienah	175°40.6	-17°42.1
2	199°15.9	165°34.5	41.0	205°10.9	31.3	$25^{\circ}17.1$	15.0	174°20.0	54.7	Acrux	173° 40.0	-17 42.1 -63°15.4
3	214°18.4	180°34.5	• • 42.0	220°11.6	• • 30.5	40°19.8	• • 15.2	189°22.2	• • 54.9			
4	229°20.8	195°34.4	43.1	235°12.3	29.7	55°22.6	15.3	204°24.4	55.0		171°48.1	-57°16.3
5	244°23.3	210°34.3	44.2	250°12.9	28.9	70°25.3	15.4	219°26.6	55.1	Alioth	166°10.2	55°48.1
6	259°25.7	225°34.3	N15°45.3	265° 13.6	S03°28.1	85°28.1	N04° 15.6	234°28.8	N07°55.2	Spica	158°19.3	-11°18.7
7	274°28.2	240°34.2		280° 14.3		100°30.9		249°31.0		Alkaid	152°49.6	49°10.0
			46.3		27.3		15.7	249 31.0	55.3	Hadar	148°31.7	-60°30.5
8	289°30.7	255°34.2	47.4	295°14.9	26.5	115°33.6	15.8	264°33.2	55.4	Menkent	147°54.2	-36°30.5
9	304°33.1	270°34.1	• • 48.5	310° 15.6	• • 25.8	130° 36.4	• • 16.0	279°35.4	• • 55.5	Arcturus	145°45.3	19°01.9
10	319°35.6	285°34.1	49.6	325°16.3	25.0	145°39.2	16.1	294°37.6	55.6	Rigil Kent.	139°36.2	-60°57.0
11	334°38.1	300°34.0	50.6	340°16.9	24.2	160°41.9	16.2	309°39.8	55.7	Kochab	137°19.3	74°02.0
12	349°40.5	315°33.9	N15°51.7	355°17.6	S03°23.4	175°44.7	N04°16.3	324°42.0	N07°55.8			
13	4°43.0	330°33.9	52.8	10°18.3	22.6	190°47.4	16.5	339°44.2	55.9	Zuben'ubi	136°52.9	-16°09.6
14	19°45.5	345°33.8	53.8	25° 19.0	21.8	205°50.2	16.6	354°46.4	56.0	Alphecca	126°01.4	26°36.9
	34°47.9	0°33.8						9°48.6		Antares	112°12.6	-26°29.6
15			• • 54.9	40°19.6	· · 21.0	220°53.0	• • 16.7		• • 56.1	Atria	107°04.3	-69°04.4
16	49°50.4	15°33.7	56.0	55°20.3	20.2	235°55.7	16.9	24°50.8	56.2	Sabik	101°59.8	-15°45.6
17	64°52.8	30°33.7	57.0	70°21.0	19.4	250° 58.5	17.0	39°53.0	56.3	Shaula	96°06.9	-37°07.3
18	79°55.3	45°33.6	N15°58.1	85°21.6	S03°18.6	266°01.3	N04° 17.1	54°55.2	N07°56.5	Rasalhague	95°56.2	12°32.2
19	94°57.8	60°33.6	15°59.2	100°22.3	17.8	281°04.0	17.3	69°57.4	56.6	Eltanin	90°41.1	51°28.8
20	110°00.2	75°33.5	16°00.2	115°23.0	17.1	296°06.8	17.4	84°59.6	56.7	Kaus Aust.	83°29.2	-34°22.1
21	125°02.7	90°33.4	• • 01.3	130°23.6	• • 16.3	311°09.5	• • 17.5	100°01.8	• • 56.8		80°31.6	
22	140°05.2	105°33.4	02.3	145°24.3	15.5	326°12.3	17.7	115°04.0	56.9	Vega		38°48.3
23	155°07.6	120°33.3	03.4	160°25.0	14.7	341° 15.1	17.8	130°06.2	57.0	Nunki	75°44.7	-26°15.6
25	155 07.0	120 33.3	05.4	100 25.0	17.7	341 13.1				Altair	61°57.6	8°56.5
Mer.p	oass. 12:41	u-0.1' $d1$.1' m-4.36	ν 0.7′ d-0	.8′ m1.03	$\nu 2.8' \ d0.$	1′ m-2.48	$\nu 2.2' \ d0$.1' m 0.57	Peacock	53°02.1	-56°38.4
										Deneb	49°24.3	45°22.7
										Enif	33°36.5	$10^{\circ}00.2$
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.1	-46°49.4
0	170°10.1	135°33.3	N16°04.5	175°25.7	503°13.9	$356^{\circ}17.8$	N04° 17.9	145°08.4	N07°57.1	Fomalhaut	15°12.0	-29°28.4
1	185°12.6	150°33.2	05.5	190°26.3	13.1	11°20.6	18.0	$160^{\circ}10.6$	57.2	Scheat	13°43.0	28°14.1
2	200°15.0	165°33.2	06.6	205°27.0	12.3	26°23.4	18.2	175°12.8	57.3	Markab	13°27.6	15°21.4
3	215°17.5	180°33.1	• • 07.7	220°27.7	• • 11.5	41°26.1	• • 18.3	190°15.0	• • 57.4	ividikaD	10 21.0	1.7 41.4
4	230°20.0	195°33.1	08.7	235°28.3	10.7	56°28.9	18.4	205°17.2	57.5	Mar 10 Fri	SHA	Mer.pass
5	245°22.4	210°33.0	09.8	250°29.0	09.9	71°31.7	18.6	220°19.4	57.6	Venus	327°24.2	14:58
6	260°24.9	225°33.0	N16°10.8	265° 29.7	S03°09.1	86°34.4	N04° 18.7	235°21.6	N07°57.7	Mars	6°41.7	12:20
								250°23.8			185°53.4	00:24
7	275°27.3	240°32.9	11.9	280°30.4	08.4	101°37.2	18.8		57.8			
8	290°29.8	255°32.8	12.9	295°31.0	07.6	116°39.9	19.0	265°26.0	58.0	Saturn	335°10.9	14:24
9	305°32.3	270°32.8	• • 14.0	310°31.7	• • 06.8	131°42.7	• • 19.1	280°28.2	• • 58.1	Mar 11 Sat	SHA	Mer.pass
10	320°34.7	285°32.7	15.1	325°32.4	06.0	146° 45.5	19.2	295°30.4	58.2	Venus	326°23.7	14:58
11	335°37.2	300°32.7	16.1	340°33.0	05.2	161°48.2	19.3	310°32.6	58.3		5°58.6	
12	350°39.7	315°32.6	N16°17.2	355°33.7	S03°04.4	176°51.0	N04° 19.5	325°34.8	N07°58.4	Mars		12:19
13	5°42.1	330°32.6	18.2	10°34.4	03.6	191°53.8	19.6	340°37.0	58.5		186°00.6	00:19
14	20°44.6	345°32.5	19.3	25°35.1	02.8	206° 56.5	19.7	355°39.2	58.6	Saturn	335°04.6	14:21
15	35°47.1	0°32.5	. 20.3	40°35.7	02.0	221°59.3	•• 19.9	10°41.4	58.7	Mar. 12 C.	CHA	Me:: ====
	50°49.5	15°32.4	21.4	55°36.4	01.2	237°02.0	20.0	25°43.6	58.8	Mar 12 Sun	SHA	Mer.pass
16										Venus		14:58
17	65°52.0	30°32.4	22.4	70°37.1	03°00.4	252°04.8	20.1	40°45.8	58.9	Mars	5°15.6	12:18
18	80°54.4	45°32.3	N16°23.5	85°37.7	S02°59.6	267°07.6	N04°20.3	55°48.0	N07° 59.0		186°07.7	00:15
19	95°56.9	60°32.3	24.5	100°38.4	58.9	282°10.3	20.4	70°50.2	59.1	Saturn	334°58.3	14:17
20	110°59.4	75°32.2	25.6	115°39.1	58.1	$297^{\circ}13.1$	20.5	85°52.4	59.2			
21	126°01.8	90°32.2	• • 26.6	130°39.8	• • 57.3	$312^{\circ}15.9$	• • 20.7	100°54.6	• • 59.3	Horizont	al parallax	
22	141°04.3	105°32.1	27.7	145°40.4	56.5	$327^{\circ}18.6$	20.8	115°56.8	59.5	1	Venus:	0.2
23	156°06.8	120°32.1	28.7	160°41.1	55.7	342°21.4	20.9	130°59.0	59.6	1	Mars:	0.1
Mer.p	pass. 12:37	u-0.1' $d1$.1' m-4.37	ν 0.7′ d-0	0.8′ m1.03	$\nu 2.8' \ d0.$.1′ m-2.48	ν 2.2′ d0	$.1^\prime$ m 0.57			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°26.4	S03°59.0	12°20.9	8.9'	N06°59.8	-16.5'	61.2'
1	192°26.5	58.0	26°48.8	8.9'	06°43.3	-16.5'	61.2'
2	207°26.7	57.0	41°16.7	9.0'	06°26.8	-16.5'	61.2'
3	222°26.9	• • 56.0	55°44.7	9.0'	06° 10.3	-16.6'	61.2'
4	237°27.0	55.1	70°12.7	9.0'	05°53.7	-16.6'	61.2'
5	252°27.2 267°27.4	54.1 \$03°53.1	84°40.7 99°08.7	9.0' 9.1'	05°37.1 N05°20.4	-16.6'	61.2' 61.2'
6 7	282°27.5	503 53.1	99 08.7 113°36.8	9.1 9.1'	05°03.8	-16.7' -16.7'	61.2'
8	297°27.7	51.1	128°04.9	9.1'	04°47.1	-16.7	61.2'
9	312°27.8	50.2	142°33.1	9.2'	04°30.3	-16.8'	61.2'
10	327°28.0	49.2	157°01.2	9.2'	$04^{\circ}13.5$	-16.8'	61.2'
11	342°28.2	48.2	171°29.4	9.2'	03°56.8	-16.8'	61.2'
12	357°28.3	S03°47.2	185°57.6	9.2'	N03°39.9	-16.8'	61.2'
13	12°28.5	46.2	200°25.8	9.3'	03°23.1	-16.9'	61.2'
14 15	27°28.7 42°28.8	45.3 •• 44.3	214°54.1 229°22.4	9.3' 9.3'	03°06.3 02°49.4	-16.9' -16.9'	61.2' 61.2'
16	57°29.0	43.3	243°50.7	9.3'	02° 49.4	-16.9'	61.2
17	72°29.2	42.3	258°19.0	9.3'	02°15.6	-16.9'	61.2'
18	87°29.3	S03°41.3	272°47.3	9.3'	N01°58.7	-16.9'	61.2'
19	102°29.5	40.3	287°15.6	9.4'	$01^{\circ}41.8$	-16.9'	61.2'
20	117°29.7	39.4	301°44.0	9.4'	01°24.9	-16.9'	61.2'
21	132°29.8	• • 38.4	316°12.4	9.4'	01°07.9	-16.9'	61.2'
22	147°30.0	37.4 36.4	330°40.8 345°09.2	9.4'	00°51.0	-16.9'	61.2'
23	162°30.1	36.4	345 09.2	9.4'	00°34.1	-16.9'	61.2'
	SD = 16.1'	d = -1.0'		S	D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°30.3 192°30.5	\$03°35.4 34.5	359°37.6 14°06.0	9.4' 9.4'	N00°17.1 N00°00.2	-16.9' -16.9'	61.2' 61.2'
2	192°30.5 207°30.6	34.5 33.5	28°34.5	9.4° 9.5'	S00°16.7	-16.9'	61.2
3	222°30.8	• • 32.5	43°02.9	9.5'	00°33.6	16.9	61.1'
4	237°31.0	31.5	57°31.4	9.5'	00°50.5	16.9'	61.1'
5	252°31.1	30.5	71°59.9	9.5'	01°07.4	16.9'	61.1'
6	267°31.3	S03°29.5	86°28.3	9.5'	S01°24.3	16.9'	61.1'
7	282°31.5	28.6	100°56.8	9.5'	01°41.1	16.8'	61.1'
8 9	297°31.6 312°31.8	27.6 •• 26.6	115°25.3 129°53.8	9.5' 9.5'	01°58.0 02°14.8	16.8' 16.8'	61.1' 61.1'
10	312 31.8 327°32.0	25.6	129 53.8 144°22.3	9.5' 9.5'	02 14.8 02°31.6	16.8	61.1
11	342°32.1	24.6	158°50.8	9.5'	02°48.4	16.8	61.0'
12	357°32.3	S03°23.6	173°19.3	9.5'	S03°05.1	16.7'	61.0'
13	12°32.5	22.7	187°47.8	9.5'	03°21.9	16.7'	61.0'
14	27°32.6	21.7	202°16.3	9.5'	03°38.6	16.7'	61.0'
15	42°32.8	• • 20.7	216°44.7	9.5'	03°55.2	16.6'	61.0'
16 17	57°33.0 72°33.1	19.7 18.7	231°13.2 245°41.7	9.5' 9.5'	04°11.9 04°28.5	16.6' 16.6'	61.0' 60.9'
18	87°33.3	503°17.8	260°10.2	9.5'	S04°45.0	16.5	60.9
19	102°33.5	16.8	274°38.7	9.5'	05°01.6	16.5	60.9'
20	117°33.6	15.8	289°07.1	9.5'	05°18.0	16.4'	60.9'
21	132°33.8	• • 14.8	303°35.6	9.5'	05°34.5	16.4'	60.9'
22	147°34.0	13.8	318°04.1	9.4'	05°50.9	16.3'	60.8'
23	162°34.1	12.8	332°32.5	9.4'	06°07.2	16.3'	60.8'
	SD = 16.1'	d = -1.0'		S	D = 16.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°34.3	503°11.8	347°00.9	9.4'	S06°23.5	16.3'	60.8'
1	192°34.5	10.9	1°29.4	9.4'	06°39.8	16.2'	60.8'
2	207°34.7	09.9	15°57.8	9.4'	06°56.0	16.1'	60.8'
3	222°34.8 237°35.0	· · 08.9	30°26.2 44°54.6	9.4' 9.4'	07°12.1 07°28.2	16.1'	60.7'
4 5	237°35.0 252°35.2	07.9 06.9	44°54.6 59°22.9	9.4'	07°28.2 07°44.2	16.0' 16.0'	60.7' 60.7'
6	267°35.3	S03°05.9	73°51.3	9.4	508° 00.2	15.9	60.7
7	282°35.5	05.0	88°19.6	9.3'	08° 16.1	15.9'	60.6
8	297°35.7	04.0	102°48.0	9.3'	08°32.0	15.8'	60.6'
9	312°35.8	•• 03.0	117°16.3	9.3'	08°47.8	15.7'	60.6'
10	327°36.0	02.0	131°44.6	9.3'	09°03.5	15.7'	60.6'
11 12	342°36.2 357°36.3	01.0 \$03°00.0	146°12.8 160°41.1	9.3' 9.2'	09°19.1 \$09°34.7	15.6' 15.5'	60.5' 60.5'
13	357°36.3 12°36.5	02°59.1	160°41.1 175°09.3	9.2' 9.2'	09° 50.2	15.5	60.5
14	27°36.7	58.1	175 09.5 189°37.5	9.2'	10° 05.7	15.4	60.4
15	42°36.9	57.1	204°05.7	9.2'	10°21.1	15.3'	60.4
16	57°37.0	56.1	218°33.9	9.1'	10°36.3	15.2'	60.4'
17	72°37.2	55.1	233°02.0	9.1'	10°51.6	15.1'	60.4'
18	87°37.4	S02°54.1	247°30.2	9.1'	\$11°06.7	15.1'	60.3'
19	102°37.5	53.1 52.2	261°58.3 276°26.4	9.1' 9.1'	11°21.7 11°36.7	15.0' 14.9'	60.3'
20 21	117°37.7 132°37.9	52.2 •• 51.2	276°26.4 290°54.4	9.1'	11° 36.7 11° 51.6	14.9'	60.3' 60.2'
22	132 37.9 147°38.1	50.2	305°22.4	9.0' 9.0'	11 51.0 12°06.4	14.6	60.2
23	162°38.2	49.2	319°50.4	9.0'	12°21.1	14.6'	60.2'
	SD = 16.1'	d = -1.0'		S	D = 16.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:14	05:35	06:42	17:40	18:47	20:09
N 70°	04:26	05:38	06:39	17:43	18:44	19:57
68°	04:35	05:40	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
N 40°	05:19	05:50	06:17	18:03	18:30	19:01
35°	05:21	05:50	06:16	18:05	18:30	18:59
30°	05:23	05:50	06:14	18:06	18:30	18:58
20°	05:24	05:49	06:11	18:09	18:31	18:56
N 10°	05:24	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:15	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
S 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
S 60°	04:04	04:56	05:39	18:39	19:22	20:14

Lat.		Moonris	е		Moonset	t
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
S 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
S 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
S 60°	18:04	18:08	18:12	04:39	06:24	80:80

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
	00 ^h	12 ^h	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	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	171°09.2	135°32.0	N16°29.8	175°41.8	S02°54.9	357°24.1	N04°21.0	146°01.2	N07°59.7			
1	186°11.7	150°32.0	30.8	190°42.4	54.1	12°26.9	21.2	161°03.4	59.8	Alpheratz	357°32.4	29°14.8
2	201°14.2	165°31.9	31.9	205°43.1	53.3	27°29.7	21.3	176°05.6	07°59.9	Ankaa	353°05.0	-42°09.2
3	216°16.6	180°31.9	• • 32.9	220°43.8	• • 52.5	42°32.4	• • 21.4	191°07.8	0.00°80	Schedar	349°28.5	56°41.6
4	231°19.1	195°31.8	34.0	235°44.5	51.7	57°35.2	21.6	206° 10.0	00.1	Diphda	348°45.0	-17°50.0
5	246°21.6	210°31.8	35.0	250°45.1	50.9	72°38.0	21.7	221°12.2	00.2	Achernar	335°18.8	-57°05.7
6	261°24.0	225°31.7	N16°36.0	265°45.8	S02°50.1	87°40.7	N04°21.8	236° 14.4	N08°00.3	Hamal	327°48.5	23°35.8
7	276°26.5	240°31.7	37.1	280°46.5	49.3	102°43.5	22.0	251°16.6	00.4	Polaris	312°54.9	89°23.2
8	291°28.9	255°31.6	38.1	295°47.2	48.6	117°46.3	22.1	266°18.8	00.5	Acamar Menkar	315°10.1 314°03.6	-40°11.7 4°11.9
9	306°31.4	270°31.6	• • 39.2	310°47.8	• • 47.8	132°49.0	• • 22.2	281°21.0	• • 00.6	Mirfak	308°24.7	49°57.8
10	321°33.9	285°31.5	40.2	325°48.5	47.0	147°51.8	22.3	296°23.2	00.7	Aldebaran	290°36.7	16°33.9
11	336°36.3	300°31.5	41.2	340°49.2	46.2	162°54.5	22.5	311°25.4	00.9	Rigel	281°01.4	-8° 10.3
12	351°38.8	315°31.4	N16°42.3	355°49.9	S02°45.4	177°57.3	N04°22.6	326° 27.6	N08°01.0	Capella	280°18.0	46°01.6
13	6°41.3	330°31.4	43.3	10°50.5	44.6	193°00.1	22.7	341°29.8	01.1	Bellatrix	278°20.1	6°22.4
14	21°43.7	345°31.3	44.4	25°51.2	43.8	208°02.8	22.9	356°32.0	01.2	Elnath	277°58.6	28°37.8
15	36°46.2	0°31.3	• • 45.4	40°51.9	• • 43.0	223°05.6	• • 23.0	11°34.2	•• 01.3	Alnilam	275°35.1	-1°11.2
16	51°48.7	15°31.2	46.4	55°52.5	42.2	238°08.4	23.1	26°36.4	01.4	Betelgeuse	270°49.2	7°24.6
17	66°51.1	30°31.2	47.5	70°53.2	41.4	253°11.1	23.3	41°38.6	01.5	Canopus	263°51.1	-52°43.0
18	81°53.6	45°31.1	N16°48.5	85°53.9	S02°40.6	268°13.9	N04°23.4	56° 40.8	N08°01.6	Sirius	258°23.8	-16°45.6
19	96°56.1	60°31.1	49.5	100°54.6	39.8	283°16.6	23.5	71°43.0	01.7	Adhara	255°03.7	-29°00.9
20	111°58.5	75°31.0	50.6	115°55.2	39.0	298°19.4	23.6	86°45.2	01.8	Procyon	244°47.9	5°09.0
21	127°01.0	90°31.0	• • 51.6	130°55.9	• • 38.3	313°22.2	• • 23.8	101°47.4	• • 01.9	Pollux	243°13.9	27°57.4
22	142°03.4	105°30.9	52.6	145°56.6	37.5	328°24.9	23.9	116°49.6	02.0	Avior	234°13.2	-59°36.3
23	157°05.9	120°30.9	53.7	160°57.3	36.7	343°27.7	24.0	131°51.8	02.1	Suhail	222°44.0	-43°33.1
Mer.p	ass. 12:33	ν -0.1' $d1$.0′ m-4.38	ν 0.7′ d-0	.8′ m1.03	$\nu 2.8' \ d0$.1′ m-2.48	ν 2.2' d0	.1′ m0.57	Miaplacidus	221°36.9	-69°50.2
										Alphard	217°44.9	-8°47.1
_	6114	6114	_	6114	-	~ .	_	6114	_	Regulus	207°31.4	11°49.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.8
0	172°08.4	135°30.8	N16°54.7	175°57.9	S02°35.9	358°30.5	N04°24.2	146°54.0	N08°02.3	Denebola	182°22.0	14°24.6
1	187°10.8	150°30.8	55.7	190°58.6	35.1	13°33.2	24.3	161°56.1	02.4	Gienah	175°40.6	$-17^{\circ}42.1$
2	202°13.3	165°30.7	56.8	205°59.3	34.3	28°36.0	24.4	176°58.3	02.5	Acrux	172°56.4	-63°15.4
3	217°15.8	180°30.7	• • 57.8	221°00.0	• • 33.5	43°38.7	• • 24.6	192°00.5	•• 02.6	Gacrux	$171^{\circ}48.1$	-57°16.4
4	232°18.2	195°30.7	58.8	236°00.6	32.7	58°41.5	24.7	207°02.7	02.7	Alioth	$166^{\circ}10.2$	55°48.1
5	247°20.7	210°30.6	16°59.9	251°01.3	31.9	73°44.3	24.8	222°04.9	02.8	Spica	$158^{\circ}19.3$	-11°18.7
6	262°23.2	225°30.6	N17°00.9	266°02.0	S02°31.1	88°47.0	N04°24.9	237°07.1	N08°02.9	Alkaid	152°49.6	49°10.0
7	277°25.6	240°30.5	01.9	281°02.7	30.3	103°49.8	25.1	252°09.3	03.0	Hadar	148°31.7	-60°30.5
8	292°28.1	255°30.5	02.9	296°03.3	29.5	118°52.6	25.2	267°11.5	03.1	Menkent	$147^{\circ}54.2$	-36°30.6
9	307°30.5	270°30.4	• • 04.0	311°04.0	• • 28.7	133°55.3 148°58.1	• • 25.3	282°13.7	• • 03.2	Arcturus	145°45.3	$19^{\circ}01.9$
10	322°33.0	285°30.4	05.0	326°04.7	28.0		25.5	297°15.9	03.3	Rigil Kent.	139°36.2	-60°57.0
11	337°35.5	300°30.3 315°30.3	06.0	341°05.4	27.2	164°00.9	25.6 N04°25.7	312°18.1 327°20.3	03.4	Kochab	$137^{\circ}19.3$	74°02.0
12	352°37.9		N17°07.0	356°06.0	S02°26.4	179°03.6			N08°03.6	Zuben'ubi	136°52.9	$-16^{\circ}09.6$
13	7°40.4 22°42.9	330°30.2 345°30.2	08.1	11°06.7 26°07.4	25.6	194°06.4 209°09.1	25.9	342°22.5 357°24.7	03.7	Alphecca	126°01.4	26°36.9
14	22 42.9 37°45.3	0°30.2	09.1	41°08.1	24.8		26.0	12°26.9	03.8 · · 03.9	Antares	$112^{\circ}12.5$	-26°29.6
15 16	57 45.3 52°47.8	15°30.1	• • 10.1	41 08.1 56°08.7	· · 24.0 23.2	224°11.9 239°14.7	• • 26.1	12 26.9 27°29.1	04.0	Atria	107°04.3	-69°04.4
16 17	67°50.3	30°30.1	11.1 12.1	71°09.4	23.2	259 14.7 254°17.4	26.2 26.4	42°31.3	04.0	Sabik	101°59.8	-15°45.6
18	82°52.7	45°30.0	N17°13.2	86°10.1	S02°21.6	269°20.2	N04°26.5	57° 33.5	N08°04.2	Shaula	96°06.8	-37°07.3
19		60°30.0	440	101°10.8		284°23.0		72°35.7	0.1.0	Rasalhague	95°56.1	12°32.2
20	97°55.2 112°57.7	75°29.9	14.2 15.2	101 10.8 116°11.4	20.8 20.0	299°25.7	26.6 26.8	87° 37.9	04.3 04.4	Eltanin	90°41.0	51°28.8
21	112 37.7 128°00.1	90°29.9	16.2	131°12.1	. 19.2	314°28.5	. 26.9	102°40.1	• • 04.5	Kaus Aust.	83°29.1	-34°22.1
22	143°02.6	105°29.8	17.2	146°12.8	18.4	329°31.2	27.0	102 40.1 117°42.3	04.5	Vega	80°31.6	38°48.3
23	158°05.0	120°29.8	18.3	161°13.5	17.6	344°34.0	27.0	132° 44.5	04.0	Nunki	75°44.7	-26°15.6
	130 03.0									Altair	61°57.6	8°56.5
Mer.p	ass. 12:29	$ u$ -0.0 $^{\prime}$ d1	.0′ m-4.39	ν 0.7′ d-0	.8′ m1.02	$\nu 2.8' \ d0$.1′ m-2.48	ν 2.2′ d0	.1' m 0.57	Peacock	53°02.1	-56°38.4
										Deneb	49°24.3	45°22.7
Wed	GHA	GHA	Doc	GHA	Dos	GHA	Doc	GHA	Doc	Enif	33°36.5	10°00.2
oved 0	173°07.5	135°29.8	Dec N17°19.3	176°14.2	Dec \$02°16.9	359°36.8	Dec N04°27.3	147° 46.7	Dec N08°04.9	Al Na'ir	27°30.1	-46°49.4
1	173 07.5 188°10.0	150°29.7	20.3	170 14.2 191°14.8	16.1	14°39.5	27.4	162°48.9	05.0	Fomalhaut	15°12.0	-29°28.4
2	203°12.4	165°29.7	21.3	206°15.5	15.3	29°42.3	27.5	102 40.9 177°51.1	05.0	Scheat	13°43.0	28°14.1
3	218°14.9	180°29.6	22.3	200°15.3 221°16.2	• • 14.5	44°45.1	. 27.7	192°53.2	05.2	Markab	13°27.6	15°21.4
4	233°17.4	195°29.6	23.3	236°16.9	13.7	59°47.8	27.8	207°55.4	05.2	Mar 13 Mon	SHA	Mer.pass
5	248°19.8	210°29.5	24.3	251°17.5	12.9	74°50.6	27.9	222° 57.6	05.4	Venus	324°22.8	14:58
6	263°22.3	225°29.5	N17°25.4	266°18.2	S02°12.1	89°53.3	N04°28.1	237°59.8	N08°05.5	Mars	4°32.5	12:17
7	278°24.8	240°29.5	26.4	281°18.9	11.3	104°56.1	28.2	253°02.0	05.6		186°14.9	00:10
8	293°27.2	255°29.4	27.4	296°19.6	10.5	119°58.9	28.3	268° 04.2	05.7	Saturn	334°52.0	14:14
9	308°29.7	270°29.4	• • 28.4	311°20.2	• • 09.7	135°01.6	• • 28.4	283°06.4	05.8			
10	323°32.2	285°29.3	29.4	326°20.9	08.9	150°04.4	28.6	298°08.6	05.9	Mar 14 Tue	SHA	Mer.pass
11	338°34.6	300°29.3	30.4	341°21.6	08.1	165°07.2	28.7	313° 10.8	06.0	Venus	323°22.5	14:58
12	353°37.1	315°29.3	N17°31.4	356°22.3	S02°07.3	180°09.9	N04°28.8	328° 13.0	N08°06.2	Mars	3°49.6	12:16
13	8°39.5	330°29.2	32.4	11°22.9	06.5	195°12.7	29.0	343° 15.2	06.3		186°22.1	00:06
14	23°42.0	345°29.2	33.4	26°23.6	05.8	210°15.4	29.1	358° 17.4	06.4	Saturn	334°45.6	14:10
15	38°44.5	0°29.1	• • 34.4	41°24.3	• • 05.0	225°18.2	• • 29.2	13° 19.6	• • 06.5	Mar 15 Wed	SHA	Mer.pass
16	53°46.9	15°29.1	35.4	56°25.0	04.2	$240^{\circ}21.0$	29.3	28°21.8	06.6	Venus	322°22.3	14:58
17	68°49.4	$30^{\circ}29.1$	36.4	$71^{\circ}25.7$	03.4	255°23.7	29.5	43°24.0	06.7	Mars	3°06.6	12:15
18	83°51.9	45°29.0	N17°37.4	86°26.3	S02°02.6	270°26.5	N04°29.6	58°26.2	N08°06.8		186°29.3	00:02
19	98°54.3	60°29.0	38.5	$101^{\circ}27.0$	01.8	$285^{\circ}29.3$	29.7	73°28.4	06.9	Saturn	334°39.2	14:07
20	113°56.8	75°28.9	39.5	$116^{\circ}27.7$	01.0	300°32.0	29.9	88°30.6	07.0			
21	128°59.3	90°28.9	• • 40.5	131°28.4	02°00.2	315°34.8	• • 30.0	103° 32.7	•• 07.1	Horizont	al parallax	
22	144°01.7	105°28.9	41.5	146°29.0	$01^{\circ}59.4$	330°37.5	30.1	118° 34.9	07.2		Venus:	0.2
23	159°04.2	120°28.8	42.5	161°29.7	58.6	345°40.3	30.3	133°37.1	07.3		Mars:	0.1
Mern	ass. 12:25	ν-0 0' d1	.0′ m-4.40	νη 7' d-Ω	.8′ m1.02	1/2 8/ d0	.1′ m-2.48	ν2 2' dΩ	.1′ m0.57			
p				2 3.1 4-0								

h	Su	n					
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°38.4	S02°48.2	334°18.4	8.9'	\$12°35.7	14.5'	60.1'
1	192°38.6	47.2	348°46.4	8.9'	12°50.3	14.4'	60.1
2 3	207°38.7 222°38.9	46.2 •• 45.3	3°14.3 17°42.2	8.9' 8.9'	13°04.7 13°19.1	14.3' 14.3'	60.1' 60.0'
4	237°39.1	44.3	32°10.0	8.8'	13°33.3	14.2'	60.0'
5	252°39.3	43.3	46°37.9	8.8'	13°47.5	14.1'	60.0'
6	267°39.4	S02°42.3	61°05.7	8.8'	S14°01.5	14.0'	59.9'
7	282°39.6 297°39.8	41.3	75°33.5	8.7'	14° 15.5 14° 29.4	13.9'	59.9'
8 9	297°39.8 312°39.9	40.3 · · 39.4	90°01.2 104°28.9	8.7' 8.7'	14° 29.4 14° 43.1	13.8' 13.7'	59.9' 59.8'
10	327°40.1	38.4	118°56.6	8.7'	14° 56.8	13.5'	59.8'
11	342°40.3	37.4	133°24.3	8.6'	15°10.3	13.4'	59.8'
12	357°40.5	S02°36.4	147°51.9	8.6'	S15°23.8	13.3'	59.7'
13 14	12°40.6 27°40.8	35.4 34.4	162°19.5 176°47.1	8.6' 8.5'	15°37.1 15°50.3	13.2' 13.1'	59.7' 59.7'
14 15	42°41.0	33.4	176 47.1 191°14.6	8.5'	15° 50.3 16° 03.5	13.1	59. <i>1</i> 59.6'
16	57°41.1	32.5	205°42.1	8.5'	16° 16.5	12.9'	59.6'
17	72°41.3	31.5	220°09.6	8.4'	$16^{\circ}29.3$	12.8'	59.6'
18	87°41.5	S02°30.5	234°37.0	8.4'	516°42.1	12.7'	59.5'
19 20	102°41.7 117°41.8	29.5 28.5	249°04.4 263°31.8	8.4' 8.3'	16°54.8 17°07.3	12.5' 12.4'	59.5' 59.4'
21	132°42.0	27.5	203 31.6 277°59.1	o.s 8.3'	17 07.3 17°19.8	12.4	59.4'
22	147°42.2	26.5	292°26.5	8.3'	17°32.1	12.2'	59.4'
23	162°42.4	25.5	306°53.7	8.2'	17°44.3	12.1'	59.3'
	SD = 16.1'	d = -1.0'		SI	D = 16.4'		
-	CUA	D:	GHA			,	
Tue 0	GHA 177°42.5	Dec 502°24.6	321°21.0	ν 8.2'	Dec \$17° 56.3	d 11.9'	HP 59.3'
1	192°42.7	23.6	335°48.2	8.2'	18°08.3	11.8'	59.3
2	207°42.9	22.6	$350^{\circ}15.4$	8.2'	$18^{\circ}20.1$	11.7'	59.2'
3	222°43.1	• • 21.6	4°42.5	8.1'	18°31.8	11.6'	59.2'
4 5	237°43.2 252°43.4	20.6 19.6	19°09.7 33°36.7	8.1' 8.1'	18° 43.4 18° 54.8	11.4' 11.3'	59.1' 59.1'
6	267°43.6	502° 18.6	48°03.8	8.0'	\$19°06.1	11.3	59.1
7	282°43.8	17.7	62°30.8	8.0'	19° 17.3	11.1'	59.0'
8	297°43.9	16.7	76°57.8	8.0'	19°28.4	10.9'	59.0'
9	312°44.1	• • 15.7	91°24.8	7.9'	19°39.3	10.8'	58.9'
10 11	327°44.3 342°44.5	14.7 13.7	105°51.7 120°18.7	7.9' 7.9'	19°50.1 20°00.8	10.7' 10.5'	58.9' 58.9'
12	357°44.6	S02°12.7	134°45.5	7.9'	S20°11.3	10.4	58.8'
13	12°44.8	11.7	$149^{\circ}12.4$	7.8'	$20^{\circ}21.7$	10.3'	58.8'
14	27°45.0	10.7	163°39.2	7.8'	20°31.9	10.1'	58.7'
15 16	42°45.2 57°45.3	· · 09.8 08.8	178°06.0 192°32.8	7.8' 7.7'	20°42.1 20°52.0	10.0' 9.8'	58.7' 58.7'
17	72°45.5	07.8	206°59.5	7.7'	20° 32.0 21° 01.9	9.7'	58.6'
18	87°45.7	S02°06.8	221°26.2	7.7'	S21°11.6	9.6'	58.6'
19	102°45.9	05.8	235°52.9	7.7'	21°21.2	9.4'	58.5'
20	117°46.0 132°46.2	04.8 •• 03.8	250°19.6 264°46.2	7.6' 7.6'	21°30.6 21°39.9	9.3' 9.1'	58.5' 58.5'
21 22	147°46.4	02.8	204 40.2 279°12.8	7.6'	21 39.9 21°49.0	9.1	58.4'
23	162°46.6	01.9	293°39.4	7.6'	21°58.0	8.9'	58.4'
	SD = 16.1'	d = -1.0'		SI	D = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	177°46.7	S02°00.9	308°06.0	7.5'	S22°06.9	8.7'	58.3'
1	192°46.9	01°59.9	322°32.5	7.5'	22°15.6	8.6'	58.3'
2 3	207°47.1 222°47.3	58.9 •• 57.9	336°59.1 351°25.6	7.5' 7.5'	22°24.2 22°32.6	8.4' 8.3'	58.3' 58.2'
4	237°47.4	56.9	5°52.1	7.5'	22°40.9	8.1'	58.2
5	252°47.6	55.9	20°18.5	7.4'	22°49.0	8.0'	58.1'
6	267°47.8	S01°54.9	34°45.0	7.4'	\$22°57.0	7.8'	58.1'
7 8	282°48.0 297°48.1	54.0 53.0	49°11.4 63°37.8	7.4' 7.4'	23°04.8 23°12.5	7.7' 7.5'	58.1' 58.0'
9	312°48.3	52.0	78°04.2	7.4 7.4'	23 12.5 23°20.1	7.5 7.4'	58.0'
10	327°48.5	51.0	92°30.6	7.4'	$23^{\circ}27.5$	7.2'	57.9'
11	342°48.7	50.0	106°57.0	7.4'	23°34.7	7.1'	57.9'
12 13	357°48.9 12°49.0	S01°49.0 48.0	121°23.3 135°49.7	7.3' 7.3'	\$23°41.8 23°48.8	6.9' 6.8'	57.9' 57.8'
13 14	27°49.0	48.0 47.0	135°49.7 150°16.0	7.3'	23° 48.8 23° 55.6	6.6'	57.8'
15	42°49.4	• • 46.1	164°42.3	7.3	24°02.2	6.5	57.7'
16	57°49.6	45.1	179°08.6	7.3'	24°08.7	6.3'	57.7'
17	72°49.7	44.1	193°34.9	7.3'	24° 15.0	6.2'	57.7'
18 19	87°49.9 102°50.1	S01°43.1 42.1	208°01.2 222°27.5	7.3' 7.3'	\$24°21.2 24°27.3	6.0' 5.9'	57.6' 57.6'
20	102 50.1 117°50.3	42.1	222 27.5 236°53.8	7.3'	24 27.3 24°33.1	5.9 5.7'	57.5'
21	132°50.5	• • 40.1	251°20.1	7.3'	24°38.9	5.6'	57.5'
22	147°50.6	39.1	265°46.4	7.3'	24°44.5	5.4'	57.5'
23	162°50.8	38.2	280°12.7	7.3'	24°49.9	5.3'	57.4'
	SD = 16.1'	d = -1.0'		SI	D = 15.9'		

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

Lat.		Moonris	e		Moonset	ŧ
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
N 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
S 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
S 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
S 60°	18:18	18:27	18:44	09:52	11:36	13:15

		Sun				
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	174°06.6	135°28.8	N17°43.5	176°30.4	S01°57.8	0°43.1	N04°30.4	148°39.3	N08° 07.5			
1	189°09.1	150°28.7	44.5	191°31.1	57.0	15°45.8	30.5	163°41.5	07.6	Alpheratz	357° 32.4	29°14.8
2	204°11.6	165°28.7	45.5	206°31.8	56.2	30°48.6	30.6	178°43.7	07.7	Ankaa	353°05.0	-42°09.2
3	219°14.0	180°28.7	46.5	221°32.4	• • 55.4	45°51.4	• • 30.8	193°45.9	• • 07.8	Schedar	349°28.5	56°41.6
4	234°16.5	195°28.6	47.5	236°33.1	54.7	60°54.1	30.9	208°48.1	07.9	Diphda	348°45.0	-17°50.0
5	249°19.0	210°28.6	48.4	251°33.8	53.9	75° 56.9	31.0	223°50.3	08.0	Achernar	335°18.8	-57°05.7
6	264°21.4	225°28.6	N17°49.4	266°34.5	S01°53.1	90°59.6	N04°31.2	238°52.5	N08°08.1	Hamal	327°48.5	23°35.7
7	279°23.9	240°28.5	50.4	281°35.1	52.3	106°02.4	31.3	253°54.7	08.2	Polaris	312°55.8	89°23.2
8	294°26.4	255°28.5	51.4	296°35.8	51.5	121°05.2	31.4	268°56.9	08.3	Acamar	315°10.1	-40°11.7
9	309°28.8	270°28.4	• • 52.4	311°36.5	• • 50.7	136°07.9	• • 31.5	283°59.1	• • 08.4	Menkar	314°03.6	4°11.9
10	324°31.3	285°28.4	53.4	326°37.2	49.9	151° 10.7	31.7	299°01.3	08.5	Mirfak	308°24.7 290°36.7	49°57.8 16°33.9
11	339°33.8	300°28.4	54.4	341°37.9	49.1	$166^{\circ}13.5$	31.8	314°03.5	08.7	Aldebaran Rigel	290 30.7 281°01.4	-8°10.3
12	354°36.2	$315^{\circ}28.3$	N17°55.4	356°38.5	S01°48.3	181°16.2	N04°31.9	329°05.6	N08°08.8	Capella	280° 18.1	46°01.6
13	9°38.7	330°28.3	56.4	11°39.2	47.5	196° 19.0	32.1	344°07.8	08.9	Bellatrix	278° 20.1	6°22.4
14	24°41.1	345°28.3	57.4	26°39.9	46.7	$211^{\circ}21.7$	32.2	359°10.0	09.0	Elnath	277°58.6	28°37.8
15	39°43.6	0°28.2	• • 58.4	41°40.6	• • 45.9	226°24.5	• • 32.3	14°12.2	•• 09.1	Alnilam	275°35.1	-1°11.2
16	54°46.1	15°28.2	17°59.4	56°41.3	45.1	241°27.3	32.4	29°14.4	09.2	Betelgeuse	270°49.2	7°24.6
17	69°48.5	30°28.2	18°00.4	71°41.9	44.3	256°30.0	32.6	44°16.6	09.3	Canopus	263°51.1	-52°43.0
18	84°51.0	45°28.1	N18°01.3	86°42.6	S01°43.5	271°32.8	N04°32.7	59°18.8	N08°09.4	Sirius	258°23.9	-16°45.6
19	99°53.5	60°28.1	02.3	101°43.3	42.8	286°35.5	32.8	74°21.0	09.5	Adhara	255°03.7	-29°00.9
20	114°55.9	75°28.1	03.3	116°44.0	42.0	301°38.3	33.0	89°23.2	09.6	Procyon	244°48.0	5°09.0
21	129°58.4	90°28.0	•• 04.3	131°44.7	• • 41.2	316°41.1	· · 33.1	104°25.4	09.7	Pollux	243°14.0	27°57.4
22	145°00.9	105°28.0	05.3	146°45.3	40.4	331°43.8	33.2	119°27.6	09.9	Avior	234°13.2	-59°36.3
23	160°03.3	120°27.9	06.3	161°46.0	39.6	346°46.6	33.3	134°29.8	10.0	Suhail	222°44.0	-43°33.1
Mer.p	ass. 12:22	ν -0.0′ d1	.0′ m-4.40	ν 0.7′ d-0	0.8′ m1.02	ν 2.8′ d0.	.1′ m-2.48	ν 2.2 $^{\prime}$ d0	.1' m 0.57	Miaplacidus	221°36.9	-69°50.3
										Alphard	217°44.9	-8°47.1
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.4	11°49.5
0 0	GПА 175°05.8	135°27.9	N18°07.3	дна 176°46.7	S01°38.8	GПА 1°49.4	N04° 33.5	149°32.0	N08° 10.1	Dubhe	193°37.3	61°35.8
1	190°08.3	150°27.9	08.2	191°47.4	38.0	16°52.1	33.6	164°34.1	10.2	Denebola	182°22.0	14°24.6
2	205°10.7	165°27.8	09.2	206°48.1	37.2	31°54.9	33.7	179°36.3	10.2	Gienah	175°40.6	-17°42.1
3	200°13.2	180°27.8	• 10.2	200°48.7	36.4	46° 57.6	• • 33.9	179 30.5 194°38.5	. 10.4		172°56.4	-63°15.4
4	235°15.6	195°27.8	11.2	236°49.4	35.6	62°00.4	34.0	209°40.7	10.5		171°48.1	-57°16.4
5	250°18.1	210°27.7	12.2	251°50.1	34.8	77°03.2	34.1	224°42.9	10.6	Alioth	166°10.2	55°48.2
6	265°20.6	225°27.7	N18°13.2	266°50.8	S01°34.0	92°05.9	N04°34.2	239°45.1	N08° 10.7	Spica	158° 19.2	-11°18.7
7	280°23.0	240°27.7	14.1	281°51.5	33.2	107°08.7	34.4	254°47.3	10.8	Alkaid	152°49.6	49°10.1
8	295°25.5	255° 27.6	15.1	296°52.1	32.4	122°11.5	34.5	269°49.5	10.9	Hadar	148°31.7	-60°30.5
9	310°28.0	270°27.6	16.1	311°52.8	31.7	137° 14.2	• • 34.6	284°51.7	. 11.1		147°54.2	-36°30.6
10	325°30.4	285°27.6	17.1	326°53.5	30.9	152° 17.0	34.7	299°53.9	11.2	Arcturus	145°45.3 139°36.1	19°01.9 -60°57.0
11	340°32.9	300°27.6	18.0	341°54.2	30.1	167° 19.7	34.9	$314^{\circ}56.1$	11.3	Rigil Kent. Kochab	139° 30.1 137° 19.2	74°02.0
12	355°35.4	315°27.5	N18°19.0	356°54.9	S01°29.3	182°22.5	N04°35.0	329°58.2	N08°11.4	Zuben'ubi	136°52.9	-16°09.6
13	10°37.8	$330^{\circ}27.5$	20.0	11°55.5	28.5	197°25.3	35.1	345°00.4	11.5	Alphecca	130° 52.9 126° 01.4	26°36.9
14	25°40.3	345°27.5	21.0	26°56.2	27.7	212°28.0	35.3	0°02.6	11.6	Antares	112° 12.5	-26°29.6
15	40°42.8	0°27.4	• • 21.9	41°56.9	• • 26.9	227°30.8	• • 35.4	15°04.8	• • 11.7	Atria	107°04.2	-69°04.4
16	55°45.2	$15^{\circ}27.4$	22.9	56°57.6	26.1	242°33.5	35.5	30°07.0	11.8	Sabik	101°59.7	-15°45.6
17	70°47.7	30°27.4	23.9	71°58.3	25.3	257°36.3	35.6	45°09.2	11.9	Shaula	96°06.8	-37°07.3
18	85°50.1	45° 27.3	N18°24.9	86°58.9	S01°24.5	272°39.1	N04°35.8	60°11.4	N08°12.0	Rasalhague	95°56.1	12°32.2
19	100°52.6	60°27.3	25.8	101°59.6	23.7	287°41.8	35.9	75°13.6	12.2	Eltanin	90°41.0	51°28.8
20	115°55.1	75°27.3	26.8	117°00.3	22.9	302°44.6	36.0	90°15.8	12.3	Kaus Aust.	83°29.1	-34°22.1
21	130°57.5	90°27.3	• • 27.8	132°01.0	• • 22.1	317°47.3	36.2	105°18.0	• • 12.4	Vega	80°31.5	38°48.3
22	146°00.0	105°27.2	28.7	147°01.7	21.3	332°50.1	36.3	120°20.2	12.5	Nunki	75°44.6	-26°15.6
23	161°02.5	120°27.2	29.7	162°02.3	20.5	347°52.9	36.4	135°22.3	12.6	Altair	$61^{\circ}57.6$	8°56.5
Mer.p	ass. 12:18	ν -0.0 $'$ d1	.0′ m-4.41	ν 0.7′ d-0	0.8′ m1.02	ν 2.8′ d0.	.1′ m-2.48	ν 2.2′ d0	.1' m 0.57	Peacock	53°02.0	-56°38.4
										Deneb	49°24.3	45°22.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.5	10°00.2
0 0	GПА 176°04.9	135°27.2	N18°30.7	ла 177°03.0	S01°19.8	2°55.6	N04° 36.5	150°24.5	N08° 12.7	Al Na'ir	27°30.1	-46°49.3
1	170 04.9 191°07.4	150°27.1	31.6	177 03.0 192°03.7	19.0	17°58.4	36.7	165°26.7	12.8	Fomalhaut	15°12.0	-29°28.3
2	206°09.9	165°27.1	32.6	207°04.4	18.2	33°01.2	36.8	180°28.9	12.0	Scheat	13°43.0	28°14.1
3	221°12.3	180°27.1	33.6	222°05.1	. 17.4	48°03.9	36.9	195°31.1	• • 13.0	Markab	13°27.6	15°21.4
4	236°14.8	195°27.1	34.5	237°05.7	16.6	63°06.7	37.0	210°33.3	13.1	Mar 16 Thu	SHA	Mer.pass
5	251°17.2	210°27.0	35.5	252°06.4	15.8	78°09.4	37.2	225°35.5	13.2	l .	321°22.1	14:58
6	266°19.7	225°27.0	N18°36.5	267°07.1	S01°15.0	93°12.2	N04°37.3	240°37.7	N08° 13.4	Mars	2°23.8	12:13
7	281°22.2	240°27.0	37.4	282°07.8	14.2	$108^{\circ}15.0$	37.4	255°39.9	13.5	Jupiter	$186^{\circ}36.4$	23:53
8	296°24.6	255°26.9	38.4	297°08.5	13.4	$123^{\circ}17.7$	37.6	270°42.1	13.6	Saturn	334°32.7	14:03
9	$311^{\circ}27.1$	270°26.9	• • 39.3	$312^{\circ}09.2$	• • 12.6	$138^{\circ}20.5$	• • 37.7	285°44.2	• • 13.7	Mar 17 Fri	SHA	Mer.pass
10	326° 29.6	285° 26.9	40.3	327°09.8	11.8	153°23.2	37.8	300°46.4	13.8	Venus		14:58
11	341°32.0	300°26.9	41.3	342°10.5	11.0	168°26.0	37.9	315°48.6	13.9	Mars	1°40.9	12:12
12	356°34.5	315°26.8	N18°42.2	357°11.2	S01°10.2	183°28.8	N04°38.1	330°50.8	N08°14.0		186°43.6	23:48
13	11°37.0	330°26.8	43.2	12°11.9	09.4	198°31.5	38.2	345°53.0	14.1	Saturn	334°26.2	14:00
14	26°39.4	345°26.8	44.1	27°12.6	08.7	213°34.3	38.3	0°55.2	14.2			
15	41°41.9	0°26.8	• • 45.1	42°13.2	•• 07.9	228°37.0	· · 38.5	15°57.4	• • 14.3	Mar 18 Sat	SHA	Mer.pass
16	56°44.4	15°26.7	46.1	57°13.9	07.1	243°39.8	38.6	30°59.6	14.5		319°22.2	14:58
17	71°46.8 86°49.3	30°26.7	47.0	72°14.6	06.3	258° 42.6	38.7	46°01.8	14.6	Mars	0°58.1	12:11
18 19	86°49.3 101°51.7	45°26.7 60°26.7	N18°48.0 48.9	87°15.3 102°16.0	\$01°05.5 04.7	273°45.3 288°48.1	N04°38.8 39.0	61°04.0 76°06.1	N08° 14.7 14.8		186°50.7	23:44
20	101 51.7 116°54.2	75°26.6	40.9 49.9	102 16.0 117°16.7	03.9	303°50.8	39.0	91°08.3	14.0	Saturn	334°19.6	13:56
21	110 54.2 131°56.7	90°26.6	• • 50.8	117 10.7 132°17.3	03.1	318° 53.6	39.1	91 06.3 106°10.5	14.9	Horizont	al parallax	
22	146°59.1	105°26.6	51.8	147°18.0	02.3	333°56.4	39.2	100 10.3 121°12.7	15.0		Venus:	0.2
23	162°01.6	120°26.6	52.7	162°18.7	01.5	348°59.1	39.5	136°14.9	15.2		Mars:	0.1
										•		
Mer.p	ass. 12:14	u-0.0' $d1$.0′ m-4.42	ν 0.7′ d -0	0.8′ m1.02	ν 2.8′ d0.	.1′ m-2.48	ν 2.2′ d0	$.1^\prime$ m 0.56			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.0	S01°37.2	294°39.0	7.3'	S24°55.2	5.1'	57.4'
1	192°51.2	36.2	309°05.2	7.3'	25°00.3	5.0'	57.3'
2	207°51.3	35.2	323°31.5	7.3'	25°05.3	4.8'	57.3'
3	222°51.5	• • 34.2	337° 57.8	7.3'	$25^{\circ}10.1$	4.7'	57.3'
4	237°51.7	33.2	352°24.1	7.3'	25°14.7	4.5'	57.2'
5	252°51.9	32.2	6°50.4	7.3'	25°19.2	4.4'	57.2'
6	267°52.1	S01°31.2	21° 16.7	7.3'	\$25°23.6	4.2'	57.1'
7	282°52.2 297°52.4	30.2 29.3	35°43.0 50°09.4	7.3' 7.3'	25°27.8 25°31.8	4.0' 3.9'	57.1' 57.1'
8 9	312°52.4	28.3	64°35.7	7.3'	25 31.8 25°35.7	3.9 3.7'	57.1 57.0'
10	312 52.0 327°52.8	27.3	79°02.1	7.4'	25°39.5	3.6'	57.0'
11	342°52.9	26.3	93°28.4	7.4	25°43.1	3.4	57.0'
12	357°53.1	S01°25.3	107°54.8	7.4'	\$25°46.5	3.3'	56.9'
13	12°53.3	24.3	122°21.2	7.4'	25°49.8	3.1'	56.9'
14	27°53.5	23.3	136°47.6	7.4'	25°52.9	3.0'	56.8'
15	42°53.7	• • 22.3	151°14.0	7.4'	25°55.9	2.8'	56.8'
16	57°53.8	21.4	165° 40.5	7.5'	25°58.7	2.7'	56.8'
17	72°54.0	20.4	180°06.9	7.5'	26°01.4	2.5'	56.7'
18	87°54.2 102°54.4	S01°19.4 18.4	194°33.4 208°59.9	7.5'	\$26°03.9	2.4'	56.7'
19 20	102°54.4 117°54.6	18.4 17.4	208°59.9 223°26.5	7.5' 7.6'	26°06.3	2.2' 2.1'	56.7' 56.6'
21	132°54.7	16.4	223 20.5 237°53.0	7.6'	26°10.5	2.1 1.9'	56.6
22	147°54.9	15.4	252° 19.6	7.6'	26°12.5	1.8'	56.5'
23	162°55.1	14.4	266° 46.2	7.6'	26°14.2	1.6'	56.5'
	SD = 16.1'	d = -1.0'			0 = 15.6'		
	JD = 10.1′	<i>u</i> = -1.0°		3L	v — 15.0°		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°55.3	S01°13.4	281°12.9	7.7'	\$26°15.8	1.5'	56.5'
1	192°55.5 207°55.6	12.5	295°39.5 310°06.3	7.7' 7.7'	26°17.3 26°18.6	1.3' 1.2'	56.4'
2	207°55.6 222°55.8	11.5 •• 10.5	310°06.3 324°33.0	7.7° 7.8'	26°18.6 26°19.8	1.0'	56.4' 56.4'
3 4	222 55.8 237°56.0	09.5	324 33.0 338°59.8	7.8' 7.8'	26°19.8	0.9'	56.4 56.3'
5	252°56.2	08.5	353° 26.6	7.8'	26°21.6	0.9	56.3
6	267°56.4	S01°07.5	7°53.4	7.9'	S26°22.4	0.6'	56.3'
7	282°56.5	06.5	22°20.3	7.9'	26°22.9	0.4	56.2'
8	297°56.7	05.5	36°47.2	8.0'	26°23.4	0.3'	56.2'
9	312°56.9	• • 04.5	51° 14.2	8.0'	26°23.6	0.1'	56.2'
10	327°57.1	03.6	65°41.2	8.1'	26°23.8	-0.0'	56.1'
11	342°57.3	02.6	80°08.3	8.1'	26°23.7	-0.2'	56.1'
12	357°57.4	S01°01.6	94°35.4	8.1'	S26°23.6	-0.3	56.1'
13	12°57.6 27°57.8	01°00.6 00°59.6	109°02.5 123°29.7	8.2'	26°23.3 26°22.8	-0.4'	56.0'
14 15	42°58.0	58.6	123 29.7 137°56.9	8.2' 8.3'	26°22.2	-0.6' -0.7'	56.0' 56.0'
16	57°58.2	57.6	152° 24.2	8.3'	26°21.5	-0.1' -0.9'	55.9'
17	72°58.4	56.6	166°51.5	8.4'	26°20.6	-1.0'	55.9'
18	87°58.5	S00°55.6	181° 18.9	8.4'	S26°19.6	-1.2'	55.9'
19	102°58.7	54.7	195°46.3	8.5'	26°18.5	-1.3'	55.8'
20	117°58.9	53.7	210°13.8	8.5'	26°17.2	-1.4'	55.8'
21	132°59.1	• • 52.7	224°41.4	8.6'	26°15.7	-1.6'	55.8'
22	147°59.3	51.7	239°08.9	8.6'	26°14.1	-1.7'	55.7'
23	162°59.4	50.7	253°36.6	8.7'	26°12.4	-1.9'	55.7'
	SD = 16.1'	d = -1.0'		SD	0 = 15.4'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	177°59.6	S00°49.7	268° 04.3	ν 8.8'	\$26°10.6	-2.0'	55.7'
1	192°59.8	48.7	282°32.1	8.8	26°08.6	-2.1'	55.6'
2	208°00.0	47.7	296°59.9	8.9'	26°06.4	-2.3'	55.6'
3	223°00.2	• • 46.8	$311^{\circ}27.7$	8.9'	$26^{\circ}04.2$	-2.4'	55.6'
4	238°00.4	45.8	325°55.7	9.0'	26°01.8	-2.5'	55.6'
5	253°00.5	44.8	340°23.7	9.1'	25°59.3	-2.7'	55.5'
6	268°00.7	S00°43.8	354°51.7	9.1'	\$25°56.6	-2.8'	55.5'
7	283°00.9 298°01.1	42.8	9° 19.8 23° 48.0	9.2' 9.2'	25°53.8 25°50.9	-2.9'	55.5'
8 9	298°01.1 313°01.3	41.8 •• 40.8	23°48.0 38°16.3	9.2'	25°50.9 25°47.8	-3.1' -3.2'	55.4' 55.4'
10	313 01.3 328°01.4	39.8	50° 10.5	9.3 9.4'	25 41.6 25°44.6	-3.2 -3.3'	55.4'
11	343°01.6	38.8	67° 12.9	9.4' 9.4'	25°41.3	-3.4'	55.4'
12	358°01.8	500°37.9	81°41.4	9.5'	S25°37.9	-3.6'	55.3'
13	13°02.0	36.9	96°09.9	9.6'	25°34.3	-3.7'	55.3'
14	28°02.2	35.9	110°38.5	9.6'	25°30.6	-3.8'	55.3'
15	43°02.4	• • 34.9	125°07.1	9.7'	25°26.8	-4.0'	55.3'
16	58°02.5	33.9	139°35.8	9.8'	25°22.8	-4.1'	55.2'
17	73°02.7	32.9	154°04.6	9.8'	25°18.7	-4.2'	55.2'
18	88°02.9	S00°31.9	168°33.4	9.9'	\$25°14.5	-4.3'	55.2'
19	103°03.1 118°03.3	30.9 29.9	183°02.3 197°31.3	10.0' 10.1'	25°10.2 25°05.8	-4.4'	55.1'
20 21	118°03.3 133°03.5	29.9	197°31.3 212°00.4	10.1'	25°05.8 25°01.2	-4.6' -4.7'	55.1' 55.1'
22	148°03.6	28.0	212 00.4 226°29.5	10.1	24°56.5	-4.1'	55.1'
23	163°03.8	27.0	240°58.7	10.3'	24°51.7	-4.9'	55.0'
	SD = 16.1'	d = -1.0'			0 = 15.2'		
	2D = 10.1.	u = -1.0		3L	· — 15.2		

		•	2020 141	arcii 10	to ivia	. 10
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lut.	Naut.	Civil	Jamise	Janset	Civil	Naut.
N 72°	03:38	05:04	06:11	18:07	19:15	20:43
N 70°	03:54	05:10	06:11	18:08	19:09	20:26
68°	04:07	05:15	06:10	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
N 40°	05:09	05:41	06:08	18:09	18:36	19:08
35°	05:13	05:42	06:07	18:10	18:35	19:04
30°	05:15	05:43	06:07	18:10	18:34	19:01
20°	05:19	05:44	06:06	18:10	18:32	18:58
$N 10^{\circ}$	05:20	05:45	06:06	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:57
20°	05:15	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
S 50°	04:47	05:25	05:58	18:18	18:50	19:28
52°	04:43	05:23	05:57	18:18	18:52	19:32
54°	04:39	05:21	05:56	18:19	18:54	19:36
56°	04:34	05:18	05:56	18:20	18:57	19:41
58°	04:28	05:15	05:55	18:20	19:00	19:47
S 60°	04:21	05:12	05:54	18:21	19:03	19:53
Lat.		Moonris	ie		Moonset	i.
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						

Lat.		Moonris	е		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°	03:34			05:23		
62°	02:38	04:02	04:47	06:20	06:52	08:00
60°	02:05	03:21	04:09	06:53	07:33	08:37
N 58°	01:41	02:53	03:43	07:17	08:01	09:03
56°	01:21	02:31	03:22	07:37	08:23	09:24
54°	01:05	02:13	03:05	07:54	08:41	09:41
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
S 10°	22:53	23:48		11:05	12:01	12:54
20°	22:31	23:26	•• ••	11:27	12:24	13:15
30°	22:05	23:00	23:57	11:52	12:49	13:40
35°	21:50	22:45	23:43	12:07	13:05	13:55
40° 45°	21:33	22:27	23:26	12:24	13:22	14:12
	21:12	22:06	23:07	12:45	13:44	14:32
S 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° S 60°	19:40 19:14	20:33 20:06	21:42 21:19	14:16 14:42	15:17 15:44	15:58 16:21
3 00	19:14	∠0:00	21:19	14:42	15:44	10:21

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	$177^{\circ}04.1$	135°26.5	N18°53.7	177°19.4	S01°00.7	4°01.9	N04°39.6	$151^{\circ}17.1$	N08°15.3	Almh austr	357°32.4	29°14.8
1	192°06.5	150°26.5	54.6	192°20.1	00°59.9	19°04.6	39.7	$166^{\circ}19.3$	15.4	Alpheratz Ankaa	357 32.4 353°05.0	-42°09.2
2	$207^{\circ}09.0$	165°26.5	55.6	207°20.7	59.1	34°07.4	39.8	181°21.5	15.6	Schedar	349°28.5	56°41.6
3	222°11.5	$180^{\circ}26.5$	• • 56.5	222°21.4	• • 58.3	49°10.2	• • 40.0	$196^{\circ}23.6$	• • 15.7	Diphda	349° 26.5	-17° 50.0
4	$237^{\circ}13.9$	195°26.5	57.5	$237^{\circ}22.1$	57.6	64°12.9	40.1	211°25.8	15.8	Achernar	335°18.8	-17 30.0 -57°05.7
5	$252^{\circ}16.4$	210°26.4	58.4	252°22.8	56.8	79°15.7	40.2	$226^{\circ}28.0$	15.9	Hamal	327°48.5	23°35.7
6	$267^{\circ}18.9$	225°26.4	N18°59.4	267°23.5	S00°56.0	94°18.4	N04°40.4	241°30.2	N08°16.0	Polaris	312°56.8	89°23.2
7	282°21.3	240°26.4	19°00.3	282°24.2	55.2	109°21.2	40.5	256°32.4	16.1	Acamar	315°10.1	-40°11.7
8	297°23.8	255°26.4	01.3	297°24.8	54.4	124°24.0	40.6	271°34.6	16.2	Menkar	314°03.6	4° 11.9
9	312°26.2	270°26.3	• • 02.2	312°25.5	• • 53.6	139°26.7	• • 40.7	286° 36.8	• • 16.3	Mirfak	308°24.7	49°57.8
10	327°28.7	285°26.3	03.1	327°26.2	52.8	154°29.5	40.9	301°39.0	16.4	Aldebaran	290°36.7	16°33.9
11	342°31.2	300°26.3	04.1	342°26.9	52.0	169°32.2	41.0	316°41.2	16.5	Rigel	281°01.4	-8°10.3
12	357°33.6	315°26.3	N19°05.0	357°27.6	S00°51.2	184°35.0	N04°41.1	331°43.3	N08°16.7	Capella	280°18.1	46°01.6
13	12°36.1	330°26.3	06.0	12°28.3	50.4	199°37.8	41.2	346° 45.5	16.8	Bellatrix	278°20.1	6°22.4
14	27°38.6	345°26.2	06.9	27°28.9	49.6	214°40.5	41.4	1°47.7	16.9	Elnath	277°58.6	28°37.8
15	42°41.0	0°26.2	• • 07.8	42°29.6	• • 48.8	229°43.3	• • 41.5	16°49.9	• • 17.0	Alnilam	275°35.1	-1°11.2
16	57°43.5	15°26.2	08.8	57°30.3	48.0	244°46.0	41.6	31°52.1	17.1	Betelgeuse	270°49.2	7°24.6
17	72°46.0	30°26.2	09.7	72°31.0	47.2	259°48.8	41.7	46°54.3	17.2	Canopus	263°51.2	-52°43.0
18	87°48.4	45°26.2	N19°10.7	87°31.7	S00°46.5	274°51.6	N04°41.9	61°56.5	N08°17.3	Sirius	258°23.9	-16°45.6
19	102°50.9	60°26.2	11.6	102°32.4	45.7	289°54.3	42.0	76°58.7	17.4	Adhara	255°03.7	-29°00.9
20	117°53.4	75°26.1	12.5	117°33.0	44.9	304°57.1	42.1	92°00.8	17.5	Procyon	244°48.0	5°09.0
21	132°55.8	90°26.1	• • 13.5	132°33.7	• • 44.1	319°59.8	• • 42.3	107°03.0	• • 17.6	Pollux	243°14.0	27°57.4
22	147°58.3	105°26.1	14.4	147°34.4	43.3	335°02.6	42.4	122°05.2	17.8	Avior	234°13.3	-59°36.3
23	163°00.7	120°26.1	15.3	162°35.1	42.5	350°05.3	42.5	137°07.4	17.9	Suhail	222°44.0	-43°33.1
Mer.p	ass. 12:10	ν -0.0' d0	.9′ m-4.43	ν 0.7′ d-0	.8′ m1.02	$\nu 2.8' \ d0.$	1' m-2.48	ν 2.2 $^{\prime}$ d0	.1′ m0.56	Miaplacidus	221°37.0	-69°50.3
										Alphard	217°44.9	-8°47.1
	6114	6114	_	6114	_	6114	_	6114	-	Regulus	207°31.4	$11^{\circ}49.5$
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.8
0	178°03.2	135°26.1	N19°16.3	177°35.8	S00°41.7	5°08.1	N04°42.6	152°09.6	N08°18.0	Denebola	182°22.0	14°24.6
1	193°05.7	150°26.0	17.2	192°36.5	40.9	20°10.9	42.8	167°11.8	18.1	Gienah	175°40.5	$-17^{\circ}42.1$
2	208°08.1	165°26.0	18.1	207°37.1	40.1	35°13.6	42.9	182°14.0	18.2	Acrux	172°56.4	-63°15.4
3	223°10.6	180°26.0	• • 19.1	222°37.8	• • 39.3	50°16.4	• • 43.0	197°16.2	• • 18.3	Gacrux	171°48.1	-57°16.4
4	238°13.1	195°26.0	20.0	237°38.5	38.5	65°19.1	43.1	212°18.3	18.4	Alioth	$166^{\circ}10.2$	55°48.2
5	253°15.5	210°26.0	20.9	252°39.2	37.7	80°21.9	43.3	227°20.5	18.5	Spica	$158^{\circ}19.2$	$-11^{\circ}18.7$
6	268°18.0	225°26.0	N19°21.9	267°39.9	S00°36.9	95°24.7	N04°43.4	242°22.7	N08°18.6	Alkaid	152°49.6	49°10.1
7	283°20.5	240°26.0	22.8	282°40.6	36.1	110°27.4	43.5	257°24.9	18.7	Hadar	148°31.6	-60°30.5
8	298°22.9	255°25.9	23.7	297°41.3	35.4	125°30.2	43.6	272°27.1	18.9	Menkent	147°54.2	-36°30.6
9	313°25.4	270°25.9	• • 24.6	312°41.9	• • 34.6	140°32.9	• • 43.8	287°29.3	• • 19.0	Arcturus	145°45.3	$19^{\circ}01.9$
10	328°27.8	285°25.9	25.6	327°42.6	33.8	155°35.7	43.9	302°31.5	19.1	Rigil Kent.	$139^{\circ}36.1$	-60°57.0
11	343°30.3	300°25.9	26.5	342°43.3	33.0	170°38.4	44.0	317°33.6	19.2	Kochab	$137^{\circ}19.2$	74°02.0
12	358°32.8	315°25.9	N19°27.4	357°44.0	500°32.2	185°41.2	N04°44.1	332°35.8	N08°19.3	Zuben'ubi	$136^{\circ}52.9$	-16°09.6
13	13°35.2	330°25.9	28.3	12°44.7	31.4	200°44.0 215°46.7	44.3	347°38.0	19.4	Alphecca	126°01.3	26°36.9
14	28°37.7	345°25.9	29.3	27°45.4	30.6		44.4	2°40.2	19.5	Antares	$112^{\circ}12.5$	-26°29.6
15	43°40.2	0°25.8	30.2	42°46.0	• • 29.8	230°49.5	• • 44.5	17° 42.4 32° 44.6	• • 19.6	Atria	$107^{\circ}04.2$	-69°04.4
16	58°42.6	15°25.8 30°25.8	31.1	57°46.7	29.0	245°52.2	44.6	32 44.6 47°46.8	19.7	Sabik	$101^{\circ}59.7$	-15°45.6
17 18	73°45.1 88°47.6	45°25.8	32.0 N19°32.9	72°47.4 87°48.1	28.2 \$00°27.4	260°55.0 275°57.7	44.8 N04°44.9	62°48.9	19.9 N08°20.0	Shaula	96°06.8	-37°07.3
										Rasalhague	95°56.1	12°32.2
19	103°50.0 118°52.5	60°25.8 75°25.8	33.9	102°48.8 117°49.5	26.6	291°00.5 306°03.3	45.0	77°51.1 92°53.3	20.1	Eltanin	90°41.0	51°28.8
20	110 52.5 133°55.0		34.8	117 49.5 132°50.2	25.8 •• 25.1	300 03.3 321°06.0	45.1	92 55.5 107°55.5	20.2	Kaus Aust.	83°29.1	-34°22.1
21 22	133 55.0 148°57.4	90°25.8 105°25.8	· · 35.7 36.6	132 50.2 147°50.8	24.3	336°08.8	· · 45.3	107 55.5 122°57.7	• • 20.3	Vega	80°31.5	38°48.3
23	163°59.9	105°25.7		162°51.5		351°11.5	45.4	137°59.9	20.4	Nunki	75°44.6	-26°15.6
23	105 59.9	120 25.7	37.5	102 51.5	23.5	351 11.5	45.5	157 59.9	20.5	Altair	61°57.5	8°56.5
Mer.p	ass. 12:06	ν -0.0' d0	.9′ m-4.44	ν 0.7′ d-0	.8′ m1.02	$\nu 2.8' \ d0.$	1' m-2.48	$\nu 2.2' \ d0$.1' m 0.56	Peacock	53°02.0	-56°38.4
										Deneb	49°24.3	45°22.7
т	CHA	CIIA	D	CHA	D	CIIA	D	CIIA	D	Enif	33°36.5	10°00.2
Tue	GHA 179°02.3	GHA 135°25.7	Dec N19°38.5	GHA 177°52.2	Dec \$00°22.7	GHA 6°14.3	Dec N04 ^o 45.6	GHA 153°02.1	Dec N08°20.6	Al Na'ir	27°30.1	-46°49.3
0 1	179°02.3 194°04.8	135°25.7 150°25.7	N19 38.5 39.4	177°52.2 192°52.9	21.9	6°14.3 21°17.0	45.8	153°02.1 168°04.2	20.7	Fomalhaut	15°12.0	-29°28.3
2	194 04.8 209°07.3	150 25.7 165°25.7	39.4 40.3	192 52.9 207°53.6	21.9	36°19.8	45.8 45.9	183°06.4	20.7	Scheat	13°43.0	28°14.1
3	209 07.3 224°09.7	105 25.7 180°25.7	40.3 •• 41.2	207 53.0 222°54.3	. 20.3	50 19.8 51°22.6	45.9 •• 46.0	183 06.4 198°08.6	21.0	Markab	13°27.6	15°21.4
3 4	224 09.7 239°12.2	180 25.7 195°25.7	42.1	222 54.3 237°55.0	19.5	66°25.3	46.1	213° 10.8	21.1	Mar 19 Sun	SHA	Mer.pass
5	254°14.7	210°25.7	43.0	252°55.6	18.7	81°28.1	46.3	213 10.8 228°13.0	21.1	Venus	318°22.5	14:58
6	269°17.1	210 25.7 225°25.7	N19°43.9	267°56.3	500°17.9	96°30.8	N04°46.4	243° 15.2	N08°21.3	Mars	0°15.3	12:10
7	284°19.6	240°25.7	44.8	282°57.0	17.1	111°33.6	46.5	258° 17.4	21.4	Jupiter		23:40
8	299°22.1	255°25.7	45.7	297°57.7	16.3	111 33.0 126°36.3	46.6	273° 19.5	21.4	Saturn	334°13.0	13:53
9	314°24.5	270°25.7	• • 46.7	312°58.4	• • 15.6	141°39.1	46.8	288°21.7	21.6			
10	329°27.0	285°25.7	47.6	327°59.1	14.8	156°41.9	46.9	303°23.9	21.7	Mar 20 Mon	SHA	Mer.pass
11	344°29.5	300°25.6	48.5	342°59.7	14.0	171°44.6	47.0	318° 26.1	21.8	Venus	317°22.9	14:58
12	359°31.9	315°25.6	N19°49.4	358°00.4	500°13.2	186°47.4	N04°47.1	333°28.3	N08°22.0	Mars	359°32.6	12:09
13	14°34.4	330°25.6	50.3	13°01.1	12.4	201°50.1	47.3	348° 30.5	22.1	Jupiter	187°04.9	23:35
14	29°36.8	345°25.6	51.2	28°01.8	11.6	216°52.9	47.4	3°32.7	22.2	Saturn	334°06.4	13:49
15	44°39.3	0°25.6	52.1	43°02.5	• • 10.8	231°55.6	• • 47.5	18° 34.8	22.3	Mar 21 Tue	SHA	Mer.pass
16	59°41.8	15°25.6	53.0	58°03.2	10.0	246°58.4	47.6	33°37.0	22.4	Venus		14:58
17	74°44.2	30°25.6	53.9	73°03.9	09.2	262°01.2	47.8	48° 39.2	22.5	Mars		12:08
18	89°46.7	45°25.6	N19°54.8	88°04.6	S00°08.4	277°03.9	N04°47.9	63°41.4	N08°22.6		187°11.9	23:31
19	104°49.2	60°25.6	55.7	103°05.2	07.6	292°06.7	48.0	78°43.6	22.7	Saturn	333°59.7	13:46
20	119°51.6	75°25.6	56.6	118°05.9	06.8	307°09.4	48.1	93°45.8	22.8	Jatuill	JJJ J7.1	13.40
21	134°54.1	90°25.6	• • 57.5	133°06.6	06.1	322°12.2	• • 48.3	108°47.9	22.9	Horizont	al parallax	
22	149°56.6	105°25.6	58.4	148°07.3	05.3	337°14.9	48.4	123°50.1	23.1		Venus:	0.2
23	164°59.0	120°25.6	59.3	163°08.0	04.5	352°17.7	48.5	138°52.3	23.2		Mars:	0.1
ivier.p	ass. 12:02	ν -0.0′ $d0$.9′ m-4.45	νυ. <i>ι' d-</i> 0	.8′ m1.02	ν2.8′ d0.	1′ m-2.48	ν2.2′ d0	.1' m 0.56			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°04.0	S 00°26.0	255° 28.0	10.3'	S 24°46.8	-5.0'	55.0'
1	193°04.2 208°04.4	25.0	269°57.3 284°26.7	10.4'	24°41.7 24°36.6	-5.2'	55.0'
2 3	208 04.4 223°04.6	24.0	284 26.7 298°56.2	10.5' 10.6'	24 30.0 24°31.3	-5.3' -5.4'	55.0' 55.0'
4	238°04.7	22.0	313°25.8	10.6'	24°25.9	-5.5'	54.9'
5	253°04.9	21.0	327°55.4	10.7'	24°20.4	-5.6'	54.9'
6	268°05.1 283°05.3	S00°20.1	342°25.1 356°54.9	10.8'	\$24°14.8 24°09.1	-5.7'	54.9'
7 8	283°05.3 298°05.5	19.1 18.1	356 54.9 11°24.7	10.9' 10.9'	24°09.1 24°03.2	-5.8' -5.9'	54.9' 54.8'
9	313°05.7	17.1	25°54.7	11.0'	23°57.3	-6.1	54.8'
10	328°05.8	16.1	40°24.7	11.1'	23°51.2	-6.2'	54.8'
11 12	343°06.0 358°06.2	15.1 \$00°14.1	54°54.8 69°24.9	11.2' 11.2'	23°45.1 523°38.8	-6.3' -6.4'	54.8' 54.8'
13	13°06.4	13.1	83°55.1	11.3'	23°32.4	-6.5'	54.7
14	28°06.6	12.1	98°25.4	11.4'	23°25.9	-6.6'	54.7'
15	43°06.8	• • 11.2	112°55.8	11.5'	23°19.3	-6.7'	54.7'
16 17	58°06.9 73°07.1	10.2 09.2	127°26.3 141°56.8	11.5' 11.6'	23°12.6 23°05.8	-6.8' -6.9'	54.7' 54.7'
18	88°07.3	S00°08.2	156° 27.4	11.7'	\$22°58.9	-0.9 -7.0'	54.6'
19	103°07.5	07.2	170°58.1	11.8'	22°51.9	-7.1'	54.6'
20	118°07.7	06.2	185°28.8	11.8'	22°44.8	-7.2'	54.6'
21	133°07.9 148°08.0	· · 05.2 04.2	199°59.6 214°30.5	11.9' 12.0'	22°37.6 22°30.3	-7.3'	54.6' 54.6'
22 23	148 08.0 163 08.2	04.2	214° 30.5 229° 01.5	12.1'	22°30.3 22°22.9	-7.4' -7.5'	54.5°
-	SD = 16.1'	d = -1.0'			O = 15.0'		
				JI			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°08.4 193°08.6	\$00°02.3 01.3	243°32.6 258°03.7	12.1' 12.2'	\$22°15.4 22°07.8	-7.6' -7.7'	54.5' 54.5'
2	193°08.6 208°08.8	01.3 \$00°00.3	258° 03.7 272° 34.9	12.2	22°07.8 22°00.2	-7.7° -7.8°	54.5°
3	223°09.0	N00°00.7	287°06.2	12.3'	21°52.4	-7.9'	54.5
4	238°09.2	01.7	301°37.5	12.4'	21°44.5	-8.0'	54.5'
5	253°09.3 268°09.5	02.7 N00°03.7	316°08.9 330°40.4	12.5' 12.6'	21°36.5 S21°28.5	-8.1' -8.1'	54.4' 54.4'
6 7	268 09.5 283°09.7	04.7	330 40.4 345°12.0	12.6'	21°20.3	-8.1 -8.2'	54.4'
8	298°09.9	05.6	359°43.6	12.7'	21°12.1	-8.3	54.4'
9	313°10.1	•• 06.6	14° 15.4	12.8'	21°03.8	-8.4'	54.4'
10 11	328°10.3 343°10.4	07.6 08.6	28° 47.1 43° 19.0	12.9' 12.9'	20°55.4 20°46.9	-8.5' -8.6'	54.4' 54.3'
12	358°10.4	N00°09.6	57°50.9	13.0'	\$20°38.3	-8.7	54.3
13	13°10.8	10.6	72°22.9	13.1'	20°29.6	-8.8'	54.3'
14	28°11.0	11.6	86°55.0	13.1'	20°20.8	-8.8'	54.3'
15 16	43°11.2 58°11.4	· · 12.6 13.5	101°27.1 115°59.4	13.2' 13.3'	20°12.0 20°03.1	-8.9' -9.0'	54.3' 54.3'
17	73°11.6	14.5	130°31.6	13.4'	19°54.1	-9.0 -9.1'	54.3'
18	88°11.7	N00°15.5	145°04.0	13.4'	S19°45.0	-9.2'	54.3'
19	103°11.9	16.5	159°36.4	13.5'	19°35.8	-9.2'	54.2'
20 21	118°12.1 133°12.3	17.5 •• 18.5	174°08.9 188°41.4	13.6' 13.6'	19°26.6 19°17.3	-9.3' -9.4'	54.2' 54.2'
22	148°12.5	19.5	203° 14.1	13.7'	19°17.3	-9.4 -9.5'	54.2'
23	163°12.7	20.5	217°46.8	13.8'	18°58.4	-9.6'	54.2'
	SD = 16.1'	d = -1.0'		SI	O = 14.9'		
_						,	
Tue 0	GHA 178°12.9	Dec N00°21.5	GHA 232° 19.5	u 13.8'	Dec \$18°48.8	d -9.6'	HP 54.2'
1	176 12.9 193°13.0	22.4	232 19.5 246° 52.3	13.9'	18°39.2	-9.0 -9.7'	54.2'
2	208°13.2	23.4	261°25.2	14.0'	18°29.5	-9.8'	54.2'
3	223°13.4 238°13.6	•• 24.4	275°58.2 290°31.2	14.0'	18°19.7	-9.8'	54.2'
4 5	238°13.6 253°13.8	25.4 26.4	290°31.2 305°04.3	14.1' 14.1'	18°09.9 18°00.0	-9.9' -10.0'	54.1' 54.1'
6	268°14.0	N00°27.4	319°37.4	14.2'	S17°50.0	-10.1	54.1'
7	283°14.2	28.4	334°10.6	14.3'	17°39.9	-10.1'	54.1'
8 9	298°14.3 313°14.5	29.4 •• 30.3	348°43.9 3°17.2	14.3' 14.4'	17°29.8 17°19.6	-10.2' -10.3'	54.1' 54.1'
10	313°14.5 328°14.7	31.3	17°50.6	14.4	17°19.6 17°09.3	-10.3'	54.1'
11	343°14.9	32.3	$32^{\circ}24.1$	14.5'	$16^{\circ}59.0$	-10.4'	54.1'
12	358°15.1	N00°33.3	46°57.6	14.6'	\$16°48.6	-10.5'	54.1'
13 14	13°15.3 28°15.5	34.3 35.3	61°31.1 76°04.8	14.6' 14.7'	16°38.1 16°27.6	-10.5' -10.6'	54.1' 54.1'
14 15	43°15.6	36.3	90°38.5	14.7' 14.7'	16° 27.0	-10.6 -10.7'	54.1 54.0'
16	58°15.8	37.3	$105^{\circ}12.2$	14.8'	$16^{\circ}06.4$	-10.7'	54.0'
17	73°16.0	38.2	119°46.0	14.9'	15°55.7	-10.8'	54.0'
18 19	88°16.2 103°16.4	N00°39.2 40.2	134° 19.9 148° 53.8	14.9' 15.0'	\$15°44.9 15°34.1	-10.8' -10.9'	54.0' 54.0'
20	118°16.6	41.2	163°27.7	15.0'	15°23.2	-10.9	54.0'
21	133°16.8	• • 42.2	178°01.7	15.1'	$15^{\circ}12.2$	-11.0'	54.0'
22	148°16.9	43.2	192°35.8	15.1' 15.2'	15°01.2	-11.1'	54.0'
23	163°17.1	44.2	207°09.9		14°50.1	-11.1'	54.0'
	SD = 16.0'	d = 1.0'	-	SI	O = 14.8'		

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

Lat.		Moonris	e		Moonset	<u> </u>
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°			07:55			09:57
N 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°	02:04	02:45	03:21	12:24	13:21	14:17
20°	01:40	02:25	03:04	12:47	13:40	14:32
N 10°	01:20	02:07	02:50	13:06	13:57	14:45
0°	01:01	01:50	02:36	13:25	14:12	14:57
S 10°	00:41	01:33	02:22	13:43	14:28	15:09
20°	00:21	01:15	02:07	14:02	14:44	15:22
30°	••••	00:54	01:50	14:24	15:03	15:37
35°	•• ••	00:41	01:40	14:37	15:14	15:45
40° 45°		00:27 00:10	01:28	14:52	15:26	15:55
		00:10	01:15	15:10	15:41	16:06
S 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
S 60°	22:42		00:07	16:41	16:52	16:59

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

20	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1 99°839 199°266 101 198°104 0.90 22°23. 488 188°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.4 488°1567 23.6 488°15	Wed	GHA	GHA	Dec	GHA	Dec	GHA		GHA	Dec		SHA	Dec
2 2017/08 2017/25 0.00 0.01 2017/08 0.01 2017	0	$180^{\circ}01.5$	135°25.6	N20°00.2	178°08.7	S00°03.7	$7^{\circ}20.4$	N04°48.6	153°54.5	N08°23.3	Alphoratz	357°32 4	29°14.8
1													-42°09.2
1.											1		56°41.6
39-181												348°45.0	-17°50.0
The color of th												335°18.8	-57°05.7
8 200°12 220°75.6 0.01° 0.05 0.02° 0.05°												327°48.5	23°35.7
Martin												312°58.0	89°23.1
19 315°217 277°2556												315°10.1	-40°11.7
10 380"26.1 288"26.5 00.1 328"15.5 0.22 157"48.0 49.9 30"13.3 24.4 11 345"26.5 00"05.8 10.0 343"16.2 05.0 10"15.5 24.5 12 12 12 13 15"33.5 00"25.5 10.0 343"16.2 05.0 10"15.5 0.3 10"15.5 24.5 12 12 13 15"33.5 30"26.5 11.8 13"16.3 06.6 20"25.3 50.2 3 50.2 3 47"2.2 3 24"2.5 24"1.8 15"3.5 14"3.4 0"25.6 11.5 4"31.9 0"25.2 22"0"1.8 50.5 10"27.3 .2.4 9 14.5 15.6 0.0 40.9 15"25.6 11.5 4"31.9 0"25.0											Menkar	$314^{\circ}03.6$	$4^{\circ}11.9$
14 147 156 159											Mirfak	308°24.8	49°57.8
12 0°21.1 31°25.6 NOO*10.9 388°16.9 NOO*68.8 187°85.8 NOO*50.1 348°20.7 NOO*24.6 Control												290°36.7	16°33.9
13 15°335 30°256 11.8 13°170 00.6 202°863 50.2 38°22.9 24.7 1 15 45°364 036′256 1.36 47°100 00.2 231°01.8 50.5 19°727 24.0 1 15 45°364 03 15°256 1.36 47°100 00.2 231°01.8 50.5 19°727 2.2 0.0 1 16 66°40.0 15°256 1.36 47°100 00.2 231°01.8 50.5 19°727 2.2 0.0 1 18 90°458 3 6°256 N20°162 85°10 N0°10.6 228°10 N0°50.9 44°33.8 N0°25.2 1 18 90°458 3 60°256 1.80 118°22.4 12.1 306°15.5 5.1.1 94°38.2 2.55 4 Adhara 20°21.1 10°21.1											_	281°01.4	-8°10.3
14												280°18.1	46°01.6
15											I		6°22.4
Beregons 19	15	45°38.4	0°25.6	• • 13.6	43°19.0	• • 08.2	233°01.8	• • 50.5	19°27.3		I		28°37.8 -1°11.2
19	16	60°40.9	15°25.6	14.5		09.0	248°04.5	50.6	34°29.4	25.1			7°24.6
18	17												-52°43.0
100-88.3 100-88.5												258°23.9	-16°45.6
24 103 303 305											1	255°03.7	-29°00.9
15 15 15 15 15 15 15 15												244°48.0	5°09.0
23 150°5962 120°256 206 150°256 206 150°256 206 206°225 206°256											,	243°14.0	27°57.4
Mer. pass. 11:58												$234^{\circ}13.3$	-59°36.3
Thu GHA GHA Dec GHA D	23	100 58.2									Suhail	222°44.0	-43°33.1
The CHA CHA CHA CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec De	Mer.p	ass. 11:58	ν -0.0' d0	.9′ m-4.46	$ u$ 0.7 $^{\prime}$ d-0	0.8′ m1.02	$\nu 2.8' \ d0.$.1′ m-2.47	ν 2.2′ d0	.1' m0.56		221°37.0	-69°50.3
Dec												217°44.9	-8°47.1
181°00.6 183°26.6 182°21.5 178°25.2 180°15.3 8°26.6 104°31.6 184°46.9 106°25.9 201 20	Thu	GHA	GHΔ	Dec	GHΔ	Dec	GHΔ	Dec	GHΔ	Dec		207°31.4	11°49.5
1 196°03.1 196°03.6 22.4 193°25.8 16.1 23°29.3 51.7 169°41.1 26.1 General J. J. S. 1. 22°19.1 196°35.5 165°26.6 23.3 020°26.5 16.9 38°32.1 51.8 184°51.3 26.2 G. General J. J. S. 1. 22°29.27°10.1 196°35.5 165°26.6 23.3 020°26.5 16.9 38°32.1 51.8 184°51.3 26.2 24 1475.6 26.4 Alichi 166°10.5 195°25.6 1250°2.5 25°28.6 19.3 85°40.7 52.2 124°55.6 26.4 Alichi 166°10.5 126°27.1 197°25.6 120°26.8 268°29.3 N00°20.1 98°43.1 N04°52.3 22°20.0 22°20.7 8 26.5 Spical 188°10.6 27°11.5 4 225°25.6 120°26.8 268°29.3 N00°20.1 98°43.1 N04°52.3 22°20.0 22°20.2 26.7 Hada 182°24.1 13°45.8 19.2 12°25.6 120°26.8 268°29.3 N00°20.1 198°43.1 N04°52.3 26°00.0 N08°26.6 Alkaid 182°24.1 13°36.3 255°25.7 28.5 268°30.7 21.6 128°48.6 52.6 275°00.4 26.8 Hada 188°31.0 13°32.3 255°25.7 28.5 268°30.7 21.6 128°48.6 52.6 275°00.4 26.8 Hada 188°31.0 13°32.3 255°25.7 120°25.7 120°32.0 330°32.2 158°44.1 52.8 305°00.5 2.2 26.7 Hada 188°31.3 1.2 12°32.1 13°45°27.7 130°2.3 25°25.7 130°3.3 238°32.0 22°2.2 158°44.1 52.8 305°00.7 27.1 148°30.3 13°31.3 140°32.7 130°25.7 120°32.0 330°32.7 130°32.3 13°33.1 134°32.7 240°10.1 13°35.8 52.9 320°10.9 27.2 140°30.2 13													61°35.8
2 11°0.5.5 166°25.6 23.3 206°2.6.5 16.9 38°32.1 15.8 184°51.3 20.2 20.3 20.3													14°24.6
226°08.0 180°25.6 24.2 233°27.2 1.17.7 53°34.8 5.20 199°53.5 26.4 4 241°10.5 199°25.6 25.0 238°27.9 18.5 68°37.6 52.1 24°85.6 26.4 5 256°12.9 210°25.6 25.9 238°27.8 19.3 83°40.3 52.2 22°97.8 26.5 6 271°15.4 225°25.6 N20°26.8 268°29.3 N0°20.1 98°43.1 N04°25.3 245°00.0 N08°26.6 7 286°17.9 240°25.7 27.7 283°30.0 20.8 113°45.8 52.5 260°02.2 26.7 8 301°03. 25°55.7 25.5 298°30.7 21.6 128°48.6 52.6 275°04.6 6.8 10 331°25.3 288°25.7 20.3 339°31.3 22.4 143°51.3 52.7 290°06.5 6.9 11 340°27.7 300°25.7 31.1 343°32.7 24.0 173°56.8 52.9 320°10.9 27.2 12 1°30.2 315°25.7 702°32.0 328°32.0 306°24.8 188°59.6 N04°31.3 338°13.1 32°44.1 25.6 204°02.3 53.2 350°15.3 27.4 13 16°32.7 330°25.7 33.9 33°41.1 25.6 204°02.3 53.2 350°15.3 27.4 14 31°35.1 345°35.7 33.8 23°44.8 25.6 24°07.8 53.4 20°19.6 27.6 Antares 112°12.4 15 46°37.6 0°25.7 33.6 43°35.5 27.2 234°07.8 53.4 20°19.6 27.6 Antares 112°12.4 17 76°42.5 30°25.7 35.5 83°34.8 20°39.5 20°39.1 30°32.7 34.1 31°32.1 34°32.1 3													-17°42.1
4 241°10.9 210°25.6 25.0 238°27.9 18.5 68°37.6 52.1 211°55.6 26.4 Alioth 166°10.5 256°12.9 210°25.6 25.9 253°28.6 19.3 83°40.3 5.2 22°29°57.8 26.5 Spica 18.8°10.6 21.0 22°25.5 N20°26.8 268°29.3 N00°20.1 98°43.1 N04°52.3 248°00.0 N08°26.6 Alkaid 152°49.8 301°20.3 25°25.7 27.7 28.5 298°30.7 21.6 128°48.6 5.2 6 27°04.4 26.8 Menkent 152°49.1 136°22.8 270°25.7 · 224. 313°31.3 22.4 143°51.3 · 5.27 · 200°66.5 · 26.9 44.2 6.8 N08°26.1 134°22.8 25°25.7 · 204. 313°31.3 · 224. 143°51.3 · 5.27 · 200°66.5 · 26.9 44.2 6.8 N08°27.1 1346°27.7 300°25.7 · 31.1 346°27.7 300°25.7 · 31.1 346°27.7 300°25.7 · 31.1 343°32.7 · 32.0 · 23.2 158°54.1 · 52.8 30°08.7 · 27.1 131.3 16°32.7 · 30.3 328°32.0 · 23.2 158°54.1 · 52.8 30°08.7 · 27.1 131.3 16°32.7 · 30.3 328°32.0 · 23.2 158°54.1 · 52.8 30°08.7 · 27.1 12 · 1°30.2 · 31.1 345°25.7 · 33.4 · 34°32.5 · 27.4 · 173°56.8 · 52.9 · 320°10.9 · 27.2 · 246°11.3 13°51.3 15°25.7 · N0°20.2 · 356°33.4 · N0°248. 188°59.6 · N04°53.1 · 335°13.1 · N08°27.3 · 27.4 · 143°35.5 · 27.2 · 234°05.8 · 20.2 · 335°13.1 · N08°27.3 · 27.4 · 143°40.1 · 143°40.3 · 27.2 · 246°10.5 · 33.3 · 51°13.5 · 27.5 ·													-63°15.5 -57°16.4
5 256°129. 210°25.6 N20°26.8 25.9 253°28.6 19.3 83°40.3 52.2 229°57.8 26.5 Spica 158°19.7 226°17.9 240°25.7 27.7 283°30.0 20.8 113°45.8 52.5 260°02.2 26.7 34.6 14.6 15.2 24.6 14.6 15.2 24.6 24.6 15.6 24.6 14.6 15.2 24.6 15.2 24.6 14.6 15.2 24.6 15.2 24.6 14.6 15.2 24.6 24.6 24.6 24.6 24.6 24.6 24.6 24											1		-57 16.4 55°48.2
6 271°15.4 9 226°25.6 208°29.3 NO0°20.1 98°43.1 NO4°52.3 245°00.0 NO8°26.6 Alkaid IS52°48 8 301°20.3 256°25.7 27. 283°30.7 21.6 128°48.6 52.6 275°04.4 26.8 Hadar 148°31 93°10.2 22.6 275°04.4 26.8 Park 275°25.7 290°05.5 26.9 300°02.2 26.7 Park 275°25.7 290°05.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 26.9 300°02.5 27.1 Park 275°05.5 25°00°05.5 26.9 300°02.5 27.1 Park 275°05.5 25°00.0 °05.0	5	$256^{\circ}12.9$	$210^{\circ}25.6$	25.9	253°28.6	19.3	83°40.3	52.2	229°57.8	26.5	I		-11°18.7
7 286°17.9 240°25.7 287.7 283°30.0 20.8 113°45.8 52.5 260°02.2 26.7 Hadat 148°35.4 30.3 26°22.8 270°25.7 29.4 313°31.3 ··· 22.4 143°51.3 ··· 52.7 290°06.5 ·· 26.9 Hadat 148°35.4 10 331°25.3 285°25.7 30.3 328°32.0 ·· 23.2 158°54.1 52.8 305°06.5 ·· 26.9 4.7 11 34°27.7 300°25.7 31.1 343°32.7 24.0 173°56.8 52.9 320°10.9 27.2 7.2 131°346°27.7 300°25.7 N20°32.0 358°33.4 N00°24.8 188°59.6 N04°35.1 335°31.1 N08°27.3 24.0 173°56.8 52.9 320°10.9 27.2 24.0 13°36°3.1 335°31.1 N08°27.3 24.0 13°36.1 335°35.1 346°27.7 32.9 13°34.1 25.6 204°02.3 53.2 550°15.3 27.4 Alpheccs 126°01.6 61°40.0 15°25.7 33.6 43°35.5 ·· 27.2 234°07.8 ·· 53.4 20°19.6 ·· 27.6 Alpheccs 126°01.6 61°40.0 15°25.7 35.6 83°36.2 28.0 249°10.6 53.6 35°24.0 27.8 Alpheccs 126°01.1 7°6°42.5 30°25.7 36.4 73°36.8 28.8 264°13.4 53.7 50°24.0 27.8 Shalus 91.0 106°47.4 60°25.8 38.1 103°38.2 30.3 244°18.9 53.9 80°22.4 28.1 100°47.4 60°25.8 38.1 103°38.2 30.3 244°18.9 53.9 80°22.4 28.1 100°47.4 60°25.8 38.1 103°38.2 30.3 244°18.9 53.9 80°22.4 28.1 10°50.5 24.0 27.8 Shalus 90°40.1 106°47.4 60°25.8 40.7 148°40.3 32.7 338°27.1 54.3 125°34.9 224.4 28.1 10°52.8 40.7 148°40.3 32.7 338°27.1 54.3 125°34.9 224.4 148°31.4 286°40.1 15°25.8 40.7 148°40.3 32.7 338°27.1 54.3 125°34.9 224.4 148°31.4 286°40.1 15°25.8 40.7 148°40.3 32.7 338°27.1 54.3 125°34.9 224.4 148°31.4 286°40.1 15°34.2 110°32.7 28.3 126°37.3 120°25.8 41.5 163°41.0 33.5 358°42.9 54.4 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.1 28.5 44.1 140°37.3 120°3.2 140°3.2 1	6	271°15.4	225°25.6	N20°26.8	268°29.3	N00°20.1	98°43.1	N04°52.3	245°00.0	N08° 26.6			49°10.1
8 301°20.2 8 270°25.7 . 294 313°31.3 . 224 143°51.3 . 5.2.7 290°6.5 . 2.6 8 Mankett 147°54 10 331°25.3 285°25.7 . 294 313°31.0 . 224 143°51.3 . 5.2.7 290°6.5 . 2.6.9 11 346°27.7 300°25.7 31.1 343°32.7 24.0 173°5.6 8 5.2.9 320°10.8 7 27.1 12 1°30.2 315°25.7 100°32.0 388°33.4 100°24.8 188°59.6 104°3.1 335°13.1 108°27.3 13 16°32.7 330°25.7 32.9 13°34.1 25.6 204°02.3 5.3.2 350°13.2 7.4 14 31°35.1 345°25.7 33.8 28°34.8 26.4 219°05.1 53.3 5°17.5 27.5 15 46°37.6 0°25.7 3.3.6 43°33.5 . 27.2 240°18.5 3.3 5°17.5 27.5 16 61°40.0 15°25.7 36.4 43°33.5 . 27.2 240°18.5 3.3 5°17.5 27.5 17 76°42.5 30°25.7 36.4 773°6.8 28.8 264°13.4 53.7 50°24.0 27.8 18 91°45.0 45°25.8 102°37.2 88°37.5 100°29.5 270°16.1 100°45.3 8 60°26.2 108°27.9 19 100°47.4 60°25.8 38.1 103°38.2 30.3 294°18.9 53.9 80°28.4 28.1 20 121°49.9 75°25.8 38.9 118°38.9 31.1 309°21.6 54.0 95°30.5 28.2 21 130°52.4 990°25.8 40.5 108°41.0 33.5 344°29.9 54.4 140°37.1 28.5 22 151°54.8 105°25.8 40.7 148°40.3 33.5 334°29.9 54.4 140°37.1 28.5 22 151°54.8 105°25.8 40.7 148°40.3 33.5 334°29.9 54.4 140°37.1 28.5 22 151°54.8 105°25.8 40.7 148°40.3 35.9 39°38.1 54.8 185°43.6 28.6 22 151°54.8 105°25.8 40.7 24.4 178°41.7 100°34.3 9°32.6 10°45.5 155°39.3 100°25.9 22 151°54.9 105°25.9 45.8 238°44.4 37.4 60°43.6 55.0 2515°48.0 29.1 24 242°09.6 156°25.9 45.8 238°44.4 37.4 60°43.6 55.0 2515°48.0 29.1 25 25°71.2 1 210°25.9 45.8 238°44.4 37.4 60°43.6 55.5 225°48.8 29.9 25 25°71.2 1 210°25.9 45.8 238°44.4 37.4 60°43.6 55.5 25°5.8 20°5.9 29.0 29.2 26 272°14.5 225°25.9 100°47.5 266°48.8 100°30.0 99°49.1 100°45.5 29.2 27 287°17.0 240°25.9 48.8 283°46.5 39.8 114°51.9 55.4 200°48.8 29.9 28 31°21.9 270°26.0 50.1 338°48.6 42.2 160°00.1 55.7 306°01.1 29.7 28 31°21.9 270°26.0 50.1 338°48.6 42.2 160°00.1 55.7 306°01.1 29.7 28 31°21.9 270°26.0 50.1 338°48.6 42.2 160°00.1 55.7 306°01.1 29.7 28 31°21.9 270°26.0 50.1 338°48.6 42.2 160°00.1 55.7 306°01.1 29.7 29 31°21.9 270°26.0 50.1 338°48.9 40.3 20°11.1 56.6 50.9 6°09.8 30.2 31 31°44.4 38°26.1 54.4												148°31.6	-60°30.5
9 316°22.8 270°25.7 · 29.4 313°31.3 · 22.4 143°51.3 · 52.8 305°08.7 · 20.9 10 331°25.3 288°25.7 · 30.3 328°32.0 · 23.2 158°54.1 · 52.8 305°08.7 · 27.1 134°36°27.7 · 300°25.7 · 31.1 343°32.7 · 24.0 173°56.8 · 52.9 320°10.9 · 27.2 131°31.3 10°32.7 · 31.3 143°32.7 · 24.0 173°56.8 · 52.9 320°10.9 · 27.2 131°31.3 10°32.7 · 31.3 143°32.7 · 24.0 173°56.8 · 52.9 320°10.9 · 27.2 131°31.3 10°32.7 · 31.3 143°32.7 · 32.9 · 13°34.1 · 25.6 204°02.3 · 53.3 · 59°13.1 N08°27.3 · Alpheca 136°51.1 · 30°25.7 · 32.9 · 13°34.1 · 25.6 204°02.3 · 53.3 · 59°15.5 · 27.4 · Alpheca 156 · 61°40.0 · 15°25.7 · 35.6 · 58°35.5 · 27.2 · 234°07.8 · 53.4 · 20°19.6 · 27.6 · Alpheca 16 · 61°40.0 · 15°25.7 · 35.6 · 58°35.2 · 28.0 · 249°10.6 · 53.6 · 53°21.8 · 27.7 · 53bil. · 107°04 · 17 · 76°42.5 · 30°25.7 · 36.4 · 73°36.8 · 28.8 · 264°13.4 · 53.7 · 50°24.0 · 27.8 · Sabil. · 107°04 · Sabil. · 107°32.7 · 28.3 · 30°25.1 · 30°25.8 · 30°												147°54.1	-36°30.6
11											1	145°45.2	19°01.9
12 1°30.2 315°25.7 N20°32.0 386°33.4 N00°24.8 188°90.6 N04°53.1 335°13.1 N08°27.3 210°13.1 316°32.7 330°25.7 32.9 13°34.1 25.6 204°02.3 53.2 350°15.3 27.4 Zuberia 130°52.1 14 31°35.1 345°25.7 33.8 28°34.8 26.4 219°05.1 53.3 52.2 350°15.3 27.4 Zuberia 15 60°40.0 15°25.7 35.5 58°36.2 28.0 249°10.6 53.6 35°21.8 27.7 Sabik 101°90.1 16 61°40.0 15°25.7 35.5 58°36.2 28.0 249°10.6 53.6 35°21.8 27.7 Sabik 101°90.1 17 76°42.5 30°25.7 36.4 73°36.8 28.8 264°13.4 53.7 50°24.0 27.8 Sabik 101°90.1 190.1 106°47.4 60°25.8 N20°37.2 88°37.5 N00°29.5 279°16.1 N04°53.8 66°26.2 N08°27.9 Sabik 101°90.2 10 106°47.4 60°25.8 33.1 103°38.2 30.3 294°18.9 53.9 80°28.4 28.1 Eltanin 90°40.2 120°49.9 75°25.8 38.9 118°38.9 31.1 300°21.6 54.0 99°30.5 28.2 Eltanin 90°40.2 121°49.9 75°25.8 38.9 118°38.9 31.1 300°21.6 54.0 99°30.5 28.2 Eltanin 90°40.2 121°49.9 75°25.8 34.9 118°38.9 31.3 332°9.6 31.9 334°24.4 54.2 110°32.7 3.8 28.4 Vega 80°38.4 32.3 160°57.3 120°25.8 40.7 148°40.3 33.5 354°29.9 54.4 140°37.1 28.5 Altair 61°57.3 120°25.8 40.7 148°40.3 33.5 354°29.9 54.4 140°37.1 28.5 Altair 61°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Altair 61°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Altair 61°57.3 120°25.8 43.3 193°42.4 35.1 24°35.4 54.8 188°43.6 28.8 Marka 11°7°02.2 150°25.8 43.3 193°42.4 35.1 24°35.4 54.8 188°43.6 28.8 Marka 13°37.3 120°25.9 45.8 223°43.7 36.7 54°40.9 54.9 200°45.8 28.8 Marka 13°37.3 120°25.9 45.8 23°44.4 37.4 60°43.5 55.0 120°45.8 28.9 Marka 13°47.9 54.9 14.4 144°57.4 55.6 290°58.9 30.2 29.2 Marx 28°40.9 55.9 45.0 120°45.8 120°45.9 14.1 140°45.1 14											Rigil Kent.	$139^{\circ}36.1$	-60°57.1
13 16°32.7 330°25.7 32.9 13°34.1 25.6 204°02.3 55.2 350°15.3 27.4 Alpheca 12°05.1 4 31°35.1 348°25.7 338. 28°34.8 26.4 219°05.1 53.3 5°17.5 2.7.5 Alpheca 12°0.1 15°46°37.6 0°25.7 · 34.6 43°35.5 · 27.2 234°07.8 · 53.4 20°19.6 · 27.6 Alpheca 12°0.1 16°64°0.0 15°25.7 35.5 58°05.2 28.0 249°10.6 · 53.6 35°21.8 27.7 Alfa 10°70.4 11°7 76°42.5 30°25.7 35.5 58°05.2 28.0 249°10.6 · 53.6 35°21.8 27.7 Alfa 10°50.1											Kochab	$137^{\circ}19.1$	74°02.0
14 31°35.1 345°25.7 33.8 28°34.8 26.4 219°05.1 53.3 5°17.5 27.5 Aphrecia 120°04 15 46°76 0°25.7 3.6.4 33°25.5 0.27.2 234°07.8 5.3 5.4 20°19.6 0.27.6 Artira 10°04 16 61°40.0 15°25.7 35.5 58°36.2 28.0 249°10.6 53.6 35°21.8 27.7 53.6 10°0°04 17 76°42.5 30°25.7 35.4 73°36.8 28.8 264°13.4 53.7 50°24.0 27.8 53.6 10°0°06 18 91°45.0 48°25.8 N20°37.2 88°37.5 N00°29.5 279°16.1 N04°53.8 65°26.2 N08°27.9 85.6 10°0°06 19 106°47.4 60°25.8 38.1 103°38.2 30.3 294°18.9 53.9 80°28.4 28.1 28.2 11.0 106°27.0 21.2 14.9 75°25.8 38.9 118°38.9 31.1 300°21.6 54.0 99°30.5 28.2 Eltanin 90°40 21 149.9 75°25.8 38.9 118°38.9 31.1 300°21.6 54.0 99°30.5 28.2 Eltanin 90°40 21 15°4.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 1125°34.9 28.4 Vega 80°31.2 115°4.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 1125°34.9 28.4 Nunki 75°44 23 166°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Altanic 16°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Altanic 16°57.3 120°25.8 43.3 193°42.4 35.1 2.4 35.4 10.2 11.0 18.2 1.0 1											Zuben'ubi	136°52.8	-16°09.6
15												126°01.3	26°36.9
16 61°40.0 15°25.7 35.5 58°36.2 28.0 249°10.6 53.6 35°21.8 27.7 76°42.5 30°25.7 36.4 73°36.8 28.8 264°13.4 53.7 50°24.0 27.8 18 91°45.0 45°25.8 N20°37.2 88°37.5 N00°29.5 279°16.1 N04°53.8 65°26.2 N08°27.9 19 106°47.4 60°25.8 38.1 103°38.2 30.3 24°18.9 53.9 80°28.4 28.1 20 121°49.9 75°25.8 38.9 118°38.9 31.1 309°21.6 540.9 95°30.5 28.2 21 136°52.4 90°25.8 40.7 148°40.3 32.7 339°77.1 54.3 125°34.9 28.4 23 166°57.3 120°25.8 41.5 163°41.0 33.5 35°21.9 54.3 125°34.9 28.4 23 166°57.3 120°25.8 41.5 163°41.0 33.5 35°29.9 54.4 140°37.1 28.5 Mer.pass. 11:54 \(\nu \)0.0′ \(d\)0.9′ \(mu \)-4.6 \(\nu \)0.7′ \(d\)0.8′ \(mu \)1.0 33.5 35°2.6 \(\nu \)0.7′ \(d\)0.8′ \(mu \)-2.8′ \(d\)0.1′ \(mu \)-2.47 \(\nu \)2.2′ \(d\)0.1′ \(mu \).56 \(\nu \) Mill 15°52.8 N20°42.4 178°41.7 N00°34.3 9°32.6 N04°54.5 155°39.3 N08°28.6 Emil 3°3°5.6 N20°29.9 \(\nu \)4.4 1288°43.0 35.9 39°38.1 54.8 128°43.6 28.8 \(\nu \)4.4 1288°43.0 35.9 39°38.1 54.8 128°43.6 28.8 \(\nu \)4.4 242°06.6 195°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 \(\nu \)5.27°1.1 210°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 \(\nu \)5.27°1.0 29.9 44.8 228°46.5 38.8 114°51.9 55.4 200°54.8 29.4 \(\nu \)5.27°1.9 27°1.9 27°2.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 \(\nu \)4.5 4.1 88°2.6 1 33°2.2 4.2 4.2 88°2.6 0 49.3 288°47.2 40.6 129°54.6 55.5 275°56.7 29.5 \(\nu \)5.27°1.9 270°2.0 51.8 343°49.9 N00°34.8 190°56.6 N04°56.3 31°07.6 30.1 31°27.9 \(\nu \)4.1 144°57.4 55.6 290°58.9 29.6 \(\nu \)3.27°2.9 300°26.0 51.8 343°49.9 N00°48.1 140°51.9 55.9 321°03.3 29.8 \(\nu \)4.8 33°52.1 13°3.4 47.7 265°19.4 56.6 55.5 36°0.8 30.2 \(\nu \)5.2 41.8 33°36.1 13°37.9 \(\nu \)4.1 144°57.4 55.6 290°58.9 29.6 \(\nu \)5.2 41.9 34°52.0 15°26.1 56.1 58°52.7 46.9 25°016.6 56.5 36°04.8 29.9 \(\nu \)5.2 41.9 316°2.0 N20°57.8 88°49.9 N00°43.8 190°05.6 N04°56.7 66°18.5 N08°30.6 \(\nu \)5.2 41.9 316°2.0 15°26.1 56.1 58°52.7 46.9 25°16.6 56.5 36°14.2 30.4 \(\nu \)5.2 41.1 310°26.6 60°28.2 15°66. 97°56.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 \(\nu \)5.2 41.1 310°26.6											1	112°12.5	-26°29.6
18 91°45.0 45°5.8 N20°37.2 88°37.5 N00°29.5 279°16.1 N04°53.8 65°26.2 N08°27.9 86°00°27.9 19 106°47.4 60°25.8 38.1 103°38.2 30.3 294°18.9 53.9 80°28.4 28.1 28.1 20°12749.9 75°25.8 38.9 118°38.9 31.1 309°21.6 54.0 95°30.5 28.2 21 136°52.4 90°5.8 4.9 8.8 138°39.6 31.9 324°44. 54.2 110°32.7 · 28.3 Vega 80°31 Nulli 75°44.5 110°32.7 · 28.3 Nulli 75°44.5 Nulli													-69°04.4
18											1		-15°45.6
19 106°47.4 60°25.8 38.1 103°38.2 30.3 294°18.9 53.9 80°28.4 28.1 g8'28.4 28.1 g9'20.1 2194.9 75°25.8 38.9 118°38.9 31.1 309°1.6 54.0 95°30.5 28.2 21 136°52.4 90°25.8 · 39.8 133°30.6 · 31.9 324°24.4 · 54.2 110°32.7 · 28.3 Vega 80°31 22 151°54.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 125°34.9 28.4 Alta in 61°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Mink in 75°44 Altair 61°57 Mer.pass. 11:54													-37°07.3 12°32.2
20 121°49.9 75°25.8 38.9 118°38.9 31.1 309°21.6 54.0 95°30.5 28.2 Vega 80°31 22 151°54.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 125°34.9 28.4 Vega 80°31 23 166°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Vega 80°31 Mer.pass. 11:54 ν0.0′ d0.9′ m-4.46 ν0.7′ d0.8′ m1.03 ν2.8′ d0.1′ m-2.47 ν2.2′ d0.1′ m0.56 Fri GHA GHA CHA Dec 181°59.8 135°25.8 N20°42.4 178°41.7 N00°34.3 9°32.6 N04°54.5 155°39.3 N08°28.6 Fomalhaut 15°12 1 197°02.2 150°25.8 43.3 193°42.4 35.1 24°55.4 54.6 170°41.5 28.7 Cega 80°31 3 227°07.2 180°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 322°07.2 180°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 40°48.2 212°14.5 225°25.9 N20°47.5 268°45.8 N00°39.0 99°49.1 N04°55.3 245°524.4 N08°93.6 Markab 13°27 7 287°17.0 240°25.9 48.4 283°46.5 39.8 114°51.9 25.0 290°58.9 29.6 10 332°24.4 285°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 Shuth 13 347°26.9 300°26.0 51.8 343°49.2 44.0 140°51.9 55.9 321°03.3 29.8 11 347°36.9 300°26.0 51.8 343°49.2 44.0 140°51.9 55.9 321°03.3 29.8 11 347°36.9 300°26.0 51.8 343°49.2 44.0 140°51.9 55.9 321°03.3 29.8 11 347°36.9 300°26.0 51.8 343°49.2 44.0 175°02.9 55.9 321°03.3 29.8 11 347°36.9 300°26.0 51.8 343°49.2 44.0 175°02.9 55.9 321°03.3 29.8 11 347°31.8 330°26.0 N20°52.7 388°49.9 N00°43.8 190°05.6 N04°56.0 336°05.4 N08°29.9 131 17°31.8 330°26.0 N20°52.7 388°49.9 N00°43.8 190°05.6 N04°56.0 336°05.4 N08°29.9 131 17°31.8 330°26.0 N20°52.7 388°49.9 N00°43.8 190°05.6 N04°56.0 51°16.3 30.5 Mars 357°24 1910.0 130°2.4 140°2.5 10°2.5	19	106°47.4	60°25.8	38.1	103°38.2	30.3	294°18.9	53.9	80°28.4	28.1			51°28.8
21 136°52.4 90°25.8 · 39.8 133°39.6 · 31.9 324°24.4 · 54.2 110°32.7 · · · 28.3 22 151°54.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 125°34.9 28.4 23 166°57.3 120°25.8 41.5 163°41.0 33.5 354°29.9 54.4 140°37.1 28.5 Mer.pass. 11:54	20	121°49.9	75°25.8	38.9	118°38.9	31.1	$309^{\circ}21.6$	54.0	95°30.5	28.2			-34°22.1
22 151°54.8 105°25.8 40.7 148°40.3 32.7 339°27.1 54.3 125°34.9 28.4 Altair 61°57 Mer.pass. 11:54 ν0.0′ d0.9′ m-4.46 ν0.7′ d0.8′ m1.03 ν2.8′ d0.1′ m-2.47 ν2.2′ d0.1′ m0.56 Peacock 53°02 Deneb 49°24 Enif 33°36 1 19°70.2 150°25.8 N20°42.4 178°41.7 N00°34.3 9°32.6 N04°54.5 155°39.3 N08°26.6 1 19°70.2 150°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 212°04.7 165°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 212°04.7 165°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 Markab 13°27 d2.4 24°09.6 195°25.9 45.0 223°43.7 · 36.7 54°40.9 · 54.9 00°45.8 · 28.9 42.2 00.6 195°25.9 45.0 223°43.7 · 36.7 54°40.9 · 54.9 00°45.8 · 28.9 42.2 00.6 195°25.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 40.4 55 257°12.1 210°25.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 40.4 56 272°14.5 225°25.9 N20°47.5 268°45.8 N00°39.0 99°49.1 N04°55.3 245°52.4 N08°29.3 40.3 330°30.2 9.9 317°21.9 270°26.0 · 50.1 313°47.9 · 41.4 144°57.4 · 55.6 290°58.9 · 29.6 40.3 328°48.6 4.2 160°00.1 55.7 306°01.1 29.7 11 347°26.9 300°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 11 347°26.9 300°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 11 347°26.9 300°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 14 32°34.3 345°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 Venus 313°26.1 56.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 Venus 313°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 Venus 313°26.1 19 10°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 Saturn 333°36.1 19 10°46.6 60°26.2 258.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 Saturn 333°36.1 110°27.6 56.9 96°22.9 30.8 110°251.5 410°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 University 110°25.1 31.0 University 120°25.9 110°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 University 120°25.9 110°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 University 120°25.9 110°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 University 120°25.9 110°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 University 120°25.9 30.8 140°25.5 340°35.5 52.4 355°3												80°31.5	38°48.3
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Fri GHA CHA CHA Dec GHA Dec CHA Dec CH											Deneb	49°24.3	45°22.7
0 181°59.8 135°25.8 N20°42.4 178°41.7 N00°34.3 9°32.6 N04°54.5 155°39.3 N08°28.6 170°41.5 28.7 197°02.2 150°25.8 43.3 193°42.4 35.1 24°35.4 54.6 170°41.5 28.7 24°27.7 160°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 28.9 44.2 242°09.6 195°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 210°25.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 24.6 225°25.9 N20°47.5 268°45.8 N00°39.0 99°49.1 N04°55.3 245°52.4 N08°29.3 7 287°17.0 240°25.9 48.4 283°46.5 39.8 114°51.9 55.4 260°54.5 29.4 332°24.4 285°26.0 49.3 298°47.2 40.6 129°54.6 55.5 275°56.7 29.5 317°21.9 270°26.0 ⋅ 50.1 313°47.9 ⋅ 41.4 144°57.4 ⋅ 55.6 290°58.9 ⋅ 29.6 10 332°24.4 285°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 13.8 330°26.0 55.8 343°49.2 43.0 175°02.9 55.9 321°03.3 29.8 Mars 357°24.9 13°47.9 × 41.4 144°57.4 ⋅ 55.6 290°58.9 ⋅ 29.6 13 17°31.8 330°26.0 55.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 14°25.4 14°25.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 14°22.4 14°25.1 30°26.1 56.1 55.2 43°52.0 ⋅ 46.1 235°19.4 56.6 51°16.3 30.5 Mars 356°41 190°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 ⋅ 50.9 325°30.4 ⋅ 57.1 111°25.1 ⋅ 31.0 40°33.1 57.2 126°27.2 31.1 20°26.2 00.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Horizontal paralle venue. Mars 310°27.6 56.9 96°22.9 30.8 116°56.4 120°26.2 00.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Horizontal paralle venue. Mars 310°27.6 56.9 96°22.9 30.8 116°56.4 120°26.2 00.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Horizontal paralle venue. Mars 310°27.6 56.9 96°22.9 30.8 116°56.4 120°26.2 00.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Horizontal paralle venue. Mars 310°27.6 56.9 96°22.9 30.8 118°56.1 55.9 325°30.4 ⋅ 57.1 111°25.1 ⋅ 31.0 40°30.1 4	F!	CIIA	CHA	D	CIIA	D	CIIA	D	CIIA	D	1	33°36.5	10°00.2
1 197°02.2 150°25.8 43.3 193°42.4 35.1 24°35.4 54.6 170°41.5 28.7 28.7 212°04.7 165°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 Markab 13°27 24°209.6 195°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 21°025.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 2 22°07.2 14.5 225°25.9 N20°47.5 268°45.8 N00°39.0 99°49.1 N04°55.3 245°52.4 N08°29.3 315°24 No8°29.3 48.4 283°46.5 39.8 114°51.9 55.4 260°54.5 29.4 302°19.5 255°26.0 49.3 298°47.2 40.6 129°54.6 55.5 275°56.7 29.5 317°21.9 270°26.0 50.1 313°47.9 · 41.4 144°57.4 · 55.6 290°88.9 · 29.6 10 332°24.4 285°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 29.1 347°26.9 300°26.0 51.8 343°49.2 43.0 175°02.9 55.9 321°03.3 29.8 13°22.9 330°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 313°37°24 13°33°346 26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 Venus 313°26.1 77°41.6 30°26.1 56.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 No8°30.6 1 39°24.4 145°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 1 Jujiter 187°32 Saturn 333°39 33°39°38.1 54.8 14°29.4 31.2 14°29												27°30.1	-46°49.3
2 212°04.7 165°25.9 44.1 208°43.0 35.9 39°38.1 54.8 185°43.6 28.8 Markab 13°27 3 227°07.2 180°25.9 45.8 238°44.4 37.4 69°43.6 55.0 215°48.0 29.1 525°45.1 210°25.9 46.7 253°45.1 38.2 84°46.4 55.1 230°50.2 29.2 6 272°14.5 225°25.9 N20°47.5 268°45.8 N00°39.0 99°49.1 N04°55.3 245°52.4 N08°29.3 7 287°17.0 240°25.9 48.4 283°46.5 39.8 114°51.9 55.4 260°54.5 29.4 8302°19.5 255°26.0 49.3 298°47.2 40.6 129°54.6 55.5 275°56.7 29.5 9 317°21.9 270°26.0 · 50.1 313°47.9 · 41.4 144°57.4 · 55.6 290°58.9 · 29.6 10 332°24.4 285°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 11 347°26.9 300°26.0 51.8 343°49.2 43.0 175°02.9 55.9 321°03.3 29.8 114°31.8 330°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 14 32°34.3 345°26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 16°26.2 15°0.6 15°0.5 18°0.5 18°0.5 18°0.6 44.5 205°08.4 56.1 351°0.7 6 30.1 16°23°9.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 17°7°41.6 30°26.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 Mars 356°41 1910°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20°12°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9												15°12.0	-29°28.3
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8 302°19.5 255°26.0 49.3 298°47.2 40.6 129°54.6 55.5 275°56.7 29.5 9 317°21.9 270°26.0 · 50.1 313°47.9 · 41.4 144°57.4 · 55.6 290°58.9 · 29.6 10 332°24.4 285°26.0 51.0 328°48.6 42.2 160°00.1 55.7 306°01.1 29.7 11 347°26.9 300°26.0 51.8 343°49.2 43.0 175°02.9 55.9 321°03.3 29.8 12 2°29.3 315°26.0 N20°52.7 358°49.9 N00°43.8 190°05.6 N04°56.0 336°05.4 N08°29.9 13 17°31.8 330°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 14 32°34.3 345°26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15 47°36.7 0°26.1 · 55.2 43°52.0 · 46.1 235°13.9 · 56.3 21°12.0 · 30.3 16 62°39.2 15°26.1 56.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 21 11°25.1 · 31.0 21 11°25.1 · 31.0 21 11°25.4 · 31.2 11°25.1 · 31.0 21°27.0 · 30.7 21°	6			N20°47.5	268°45.8	N00°39.0		N04°55.3		N08°29.3	1	358°07.2	12:07
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11 347°26.9 300°26.0 51.8 343°49.2 43.0 175°02.9 55.9 321°03.3 29.8 12 2°29.3 315°26.0 N20°52.7 358°49.9 N00°43.8 190°05.6 N04°56.0 336°05.4 N08°29.9 13 17°31.8 330°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 4 32°34.3 345°26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15°40.7 0°26.1 55.2 43°52.0 · 46.1 235°13.9 · 56.3 21°12.0 · 30.3 16 62°39.2 15°26.1 56.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 100°31.2 Mars 310°27.6 56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mars 310°27.6 Mars 310°27.0 Mars 310°27.0 57.0 111°29.1 · 31.0 110°20.1 110°20.2 11.1 110°20.1 · 31.0 110°20.1 111°20.1 · 31.0 110°20.1 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 31.0 110°20.1 110°20.1 · 31.0 110°20.1 110°20.1 · 31.0 110°20.2 11.1 110°20.1 · 30.3 110°20.1 · 30.2 11.1 110°20.1 · 30.3 11.1 110°20.1 · 30.3 110°20.1 · 30.2 11.1 110°20.1 · 30.3 11.1 110°20.1 · 30.3 110°20.1 · 30.2 11.1 110°20.1 · 30.3 11.1 110°20.1 · 30.3 110°20.1 · 30.2 11.1 110°20.1 · 30.3 11.1 110°20.1 · 30.2 11.1 110°											Mar 23 Thu	SHA	Mer.pass
12 2°29.3 315°26.0 N20°52.7 358°49.9 N00°43.8 190°05.6 N04°56.0 336°05.4 N08°29.9 13 17°31.8 330°26.0 53.5 13°50.6 44.5 205°08.4 56.1 351°07.6 30.1 14 32°34.3 345°26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°99.8 30.2 15°40.7 0°26.1 ·· 55.2 43°52.0 ·· 46.1 235°13.9 ·· 56.3 21°12.0 ·· 30.3 33°46 16 62°39.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 17 77°41.6 30°26.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 ·· 50.9 325°30.4 ·· 57.1 111°25.1 ·· 31.0 10°27.6 56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar												314°25.0	14:58
12 2 29.3 315 26.0 N20 52.7 358 49.9 N00 43.8 190 05.6 N04 56.0 350 05.4 N08 29.9 1 13 17° 31.8 330° 26.0 53.5 13° 50.6 44.5 205° 08.4 56.1 351° 07.6 30.1 1 14 32° 34.3 345° 26.1 54.4 28° 51.3 45.3 220° 11.1 56.2 6° 09.8 30.2 1 15 47° 36.7 0° 26.1 · · 55.2 43° 52.0 · · 46.1 235° 13.9 · · 56.3 21° 12.0 · · 30.3 1 16 62° 39.2 15° 26.1 56.1 58° 52.7 46.9 250° 16.6 56.5 36° 14.2 30.4 1 17 77° 41.6 30° 26.1 56.9 73° 53.4 47.7 265° 19.4 56.6 51° 16.3 30.5 1 18 92° 44.1 45° 26.1 N20° 57.8 88° 54.1 N00° 48.5 280° 22.1 N04° 56.7 66° 18.5 N08° 30.6 1 19 107° 46.6 60° 26.2 58.6 103° 54.8 49.3 295° 24.9 56.8 81° 20.7 30.7 20 122° 49.0 75° 26.2 20° 59.5 118° 55.4 50.1 310° 27.6 56.9 96° 22.9 30.8 21 137° 51.5 90° 26.2 21° 00.3 133° 56.1 · · 50.9 325° 30.4 · · 57.1 111° 25.1 · · 31.0 21 110° 25.4 10° 26.2 02.0 163° 57.5 52.4 355° 35.9 57.3 141° 29.4 31.2 Mar												357°24.5	12:06
13 17 31.8 330 26.0 53.5 13 50.6 44.5 205 08.4 56.1 351 07.6 30.1 Saturn 333°46 14 32°34.3 345°26.1 54.4 28°51.3 45.3 220°11.1 56.2 6°09.8 30.2 15 47°36.7 0°26.1 · 55.2 43°52.0 · 46.1 235°13.9 · 56.3 21°12.0 · 30.3 16 62°39.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 17 77°41.6 30°26.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 22 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar												187°25.9	23:22
15											Saturn	333°46.3	13:39
16 62°39.2 15°26.1 56.1 58°52.7 46.9 250°16.6 56.5 36°14.2 30.4 Venus 313°26 17 77°41.6 30°26.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · · 50.9 325°30.4 · · 57.1 111°25.1 · · 31.0 22 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mars 35°41 Venus 313°26 Mars 356°41 Jupiter 187°32 Saturn 333°39 Horizontal paralla Venus 313°26 Mars 356°41 Jupiter 187°32 Saturn 333°39 111°25.1 · · 31.0 11°25.1 · · · 31.0 11°25.1 · · · · · · · · · · · · · · · · · · ·											N40" 24 F :	ÇU A	Ma
17 77°41.6 30°26.1 56.9 73°53.4 47.7 265°19.4 56.6 51°16.3 30.5 18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 22 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar													Mer.pass
18 92°44.1 45°26.1 N20°57.8 88°54.1 N00°48.5 280°22.1 N04°56.7 66°18.5 N08°30.6 19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 22 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar											1		14:58 12:05
19 107°46.6 60°26.2 58.6 103°54.8 49.3 295°24.9 56.8 81°20.7 30.7 20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 50.9 325°30.4 57.1 111°25.1 31.0 21 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar													23:18
20 122°49.0 75°26.2 20°59.5 118°55.4 50.1 310°27.6 56.9 96°22.9 30.8 21 137°51.5 90°26.2 21°00.3 133°56.1 · 50.9 325°30.4 · 57.1 111°25.1 · 31.0 22 152°54.0 105°26.2 01.1 148°56.8 51.7 340°33.1 57.2 126°27.2 31.1 23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar												333°39.5	13:35
21 137°51.5 90°26.2 21°00.3 133°56.1 · · · 50.9 325°30.4 · · · 57.1 111°25.1 · · · 31.0													
23 167°56.4 120°26.2 02.0 163°57.5 52.4 355°35.9 57.3 141°29.4 31.2 Mar											Horizont	•	
25 107 50.1 120 20.2 52.0 105 57.5 52.1 555 55.5 57.5 57.5												Venus:	0.2
NA 1150 001 1001 147 071 1001 100 001 1011 007	23	167°56.4	120°26.2	02.0	163°57.5	52.4	355° 35.9	57.3	141°29.4	31.2		Mars:	0.1
Mer.pass. 11:50 $\nu 0.0' \ d0.9' \ \text{m-}4.47$ $\nu 0.7' \ d0.8' \ \text{m}1.03$ $\nu 2.8' \ d0.1' \ \text{m-}2.47$ $\nu 2.2' \ d0.1' \ \text{m}0.55$	Mer.p	ass. 11:50	ν 0.0' d 0.	9′ m-4.47	ν 0.7' d0	.8′ m1.03	$\nu 2.8' \ d0.$.1′ m-2.47	ν 2.2′ d0	.1′ m0.55			

h	Sui	า			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 17.3	N00°45.1	221°44.1	15.2'	S14°39.0	-11.2'	54.0'
1 2	193° 17.5 208° 17.7	46.1 47.1	236°18.3 250°52.6	15.3' 15.3'	14°27.8 14°16.6	-11.2' -11.3'	54.0' 54.0'
3	223° 17.9	48.1	265°26.9	15.4'	14° 10.0	-11.3'	54.0'
4	238°18.1	49.1	280°01.3	15.4'	$13^{\circ}54.0$	-11.4'	54.0'
5	253°18.2	50.1	294°35.7	15.5'	13°42.6	-11.4'	54.0'
6 7	268° 18.4 283° 18.6	N00°51.1 52.1	309°10.2 323°44.7	15.5' 15.6'	\$13°31.1 13°19.7	-11.5' -11.5'	54.0' 54.0'
8	298° 18.8	53.0	338° 19.3	15.6'	13°08.1	-11.6'	54.0'
9	313° 19.0	• • 54.0	352°53.9	15.6'	12°56.5	-11.6'	54.0'
10 11	328° 19.2 343° 19.4	55.0 56.0	7°28.5 22°03.2	15.7' 15.7'	12°44.9 12°33.2	-11.7' -11.7'	54.0' 53.9'
12	358° 19.6	N00°57.0	36°37.9	15.7	512°21.4	-11.7	53.9'
13	13° 19.7	58.0	51°12.7	15.8'	12°09.7	-11.8'	53.9'
14	28°19.9	59.0	65°47.5	15.9'	11°57.8	-11.9'	53.9'
15 16	43°20.1 58°20.3	00°59.9 01°00.9	80°22.4 94°57.2	15.9' 15.9'	11°46.0 11°34.0	-11.9' -12.0'	53.9' 53.9'
17	73°20.5	01.9	109°32.2	16.0'	11°22.1	-12.0'	53.9'
18	88°20.7	N01°02.9	$124^{\circ}07.1$	16.0'	S 11°10.1	-12.0'	53.9'
19	103°20.9 118°21.0	03.9	138° 42.1 153° 17.2	16.0'	10°58.0 10°45.9	-12.1'	53.9'
20 21	118°21.0 133°21.2	04.9 •• 05.9	167°52.3	16.1' 16.1'	10°45.9 10°33.8	-12.1' -12.2'	53.9' 53.9'
22	148°21.4	06.8	182°27.4	16.1'	10°21.6	-12.2'	53.9'
23	163°21.6	07.8	$197^{\circ}02.5$	16.2'	10°09.4	-12.2'	53.9'
	SD = 16.0'	d = 1.0'		SI	O = 14.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 21.8	N01°08.8	211°37.7	16.2'	509°57.2	-12.3'	53.9'
1	193°22.0	09.8	226°12.9	16.2'	09°44.9	-12.3'	53.9'
2	208°22.2 223°22.4	10.8	240°48.1 255°23.4	16.3'	09°32.6 09°20.2	-12.4'	53.9'
3 4	223° 22.4 238° 22.5	· · 11.8 12.8	255° 23.4 269° 58.7	16.3' 16.3'	09°20.2	-12.4' -12.4'	53.9' 53.9'
5	253°22.7	13.7	284°34.0	16.4'	08°55.4	-12.5'	53.9'
6	268°22.9	N01°14.7	299°09.4	16.4'	508°42.9	-12.5'	53.9'
7 8	283°23.1 298°23.3	15.7 16.7	313°44.7 328°20.1	16.4' 16.4'	08°30.4 08°17.9	-12.5' -12.6'	53.9' 53.9'
9	313°23.5	•• 17.7	342°55.6	16.5'	08°05.4	-12.6'	53.9'
10	328°23.7	18.7	357°31.0	16.5'	$07^{\circ}52.8$	-12.6'	53.9'
11	343°23.9	19.7 N01° 20.6	12°06.5 26°42.0	16.5'	07°40.1	-12.7'	53.9'
12 13	358°24.0 13°24.2	21.6	26° 42.0 41° 17.5	16.5' 16.5'	\$07°27.5 07°14.8	-12.7' -12.7'	53.9' 53.9'
14	28° 24.4	22.6	55° 53.0	16.6'	07°02.1	-12.7'	54.0'
15	43°24.6	• • 23.6	70°28.6	16.6'	06°49.4	-12.8'	54.0'
16 17	58° 24.8 73° 25.0	24.6 25.6	85°04.2 99°39.8	16.6' 16.6'	06°36.6 06°23.8	-12.8' -12.8'	54.0' 54.0'
18	88°25.2	N01°26.6	114° 15.4	16.6'	S06°11.0	-12.8'	54.0'
19	103°25.4	27.5	$128^{\circ}51.0$	16.6'	$05^{\circ}58.2$	-12.9'	54.0'
20	118° 25.5 133° 25.7	28.5 • • 29.5	143°26.7 158°02.3	16.7' 16.7'	05°45.3 05°32.4	-12.9' -12.9'	54.0' 54.0'
21 22	133 25.7 148°25.9	30.5	158 02.3 172°38.0	16.7'	05 32.4 05°19.5	-12.9' -12.9'	54.0'
23	163°26.1	31.5	187° 13.7	16.7'	05°06.6	-13.0'	54.0'
	SD = 16.0'	d = 1.0'		SI	O = 14.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	178°26.3	N01°32.5	201°49.4	16.7'	S04°53.6	-13.0'	54.0'
1	193°26.5	33.4	216°25.1	16.7	04°40.7	-13.0'	54.0'
2	208° 26.7 223° 26.9	34.4 •• 35.4	231°00.8 245°36.5	16.7' 16.7'	04°27.7 04°14.7	-13.0' -13.0'	54.0' 54.0'
3 4	223 26.9 238°27.0	36.4	245 30.5 260°12.2	16.7'	04 14.7 04°01.6	-13.0'	54.0'
5	253°27.2	37.4	274°48.0	16.7'	03°48.6	-13.1'	54.0'
6	268° 27.4 283° 27.6	N01°38.4	289°23.7 303°59.5	16.8'	\$03°35.5 03°22.4	-13.1'	54.0'
7 8	283°27.6 298°27.8	39.4 40.3	303°59.5 318°35.2	16.8' 16.8'	03°22.4 03°09.3	-13.1' -13.1'	54.0' 54.0'
9	313°28.0	• • 41.3	333°11.0	16.8'	02°56.2	-13.1	54.0'
10	328°28.2	42.3	347°46.7	16.8'	02°43.1	-13.1'	54.0'
11 12	343°28.4 358°28.5	43.3 N01°44.3	2°22.5 16°58.3	16.8' 16.8'	02°30.0 \$02°16.8	-13.1' -13.2'	54.1' 54.1'
13	13° 28.7	45.3	31°34.0	16.8	02°03.7	-13.2'	54.1
14	28°28.9	46.2	46°09.8	16.8'	01°50.5	-13.2'	54.1'
15	43°29.1	• • 47.2	60°45.6	16.8'	01°37.3	-13.2'	54.1'
16 17	58° 29.3 73° 29.5	48.2 49.2	75°21.3 89°57.1	16.8' 16.8'	01°24.1 01°10.9	-13.2' -13.2'	54.1' 54.1'
18	88°29.7	N01°50.2	104°32.8	16.7	S00°57.7	-13.2'	54.1'
19	103°29.9	51.2	119°08.6	16.7'	00°44.5	-13.2'	54.1'
20 21	118°30.0 133°30.2	52.1 •• 53.1	133°44.3 148°20.0	16.7' 16.7'	00°31.3 00°18.0	-13.2' -13.2'	54.1' 54.1'
22	133°30.2 148°30.4	54.1	148° 20.0 162° 55.8	16.7'	500°04.8	-13.2' -13.2'	54.1'
23	163°30.6	55.1	177°31.5	16.7'	N00°08.4	13.2'	54.1'
	SD = 16.0'	d = 1.0'		SI	O = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:57	04:31	05:40	18:35	19:45	21:22
N 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
N 40°	04:59	05:31	05:58	18:16	18:43	19:14
35°	05:04	05:34	05:59	18:14	18:40	19:09
30°	05:08	05:36	06:00	18:14	18:37	19:05
20°	05:14	05:39	06:01	18:12	18:34	19:00
N 10°	05:17	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:10	18:30	18:54
S 10°	05:19	05:43	06:04	18:09	18:30	18:54
20°	05:17	05:43	06:05	18:08	18:30	18:55
30°	05:14	05:42	06:06	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
S 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
S 60°	04:37	05:27	06:08	18:03	18:44	19:34

Lat.		Moonris	е	Moonset			
Lat.	Wed	Thu	Fri	Wed	Thu	Fri	
N 72°	06:35	05:57	05:29	12:46	14:50	16:43	
N 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° 50°	04:35	04:49	05:01	14:35	15:44	16:53	
45°	04:29 04:18	04:45 04:38	05:00 04:57	14:40 14:49	15:47 15:52	16:54 16:55	
_							
N 40°	04:08	04:32	04:54	14:58	15:57	16:56	
35° 30°	04:00 03:53	04:27 04:22	04:52 04:50	15:05 15:11	16:01 16:04	16:56 16:57	
20°	03:53	04:22	04:50	15:11	16:04	16:58	
N 10°	03:41	04:14	04:43	15:31	16:15	16:59	
0°	03:19	04:00	04:41	15:39	16:20	17:00	
S 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	
S 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	
S 60°	01:31	02:53	04:13	17:03	17:05	17:08	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

3 250 103 307 206 107 20 20 20 20 20 20 20 20 20 20 20 20 20	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1 196 197	Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1 10 10 10 10 10 10 10 10 10 10 10 10 10							
2 2373 03 8 105703 0 105 0 24703 0 247							1
3 229'0.5 109'2.5 0.03 209'0.0 0.04 0.04 209'0.0 0.04 0.04 209'0.0 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.04 0.							l .
2 25 0.5 15 25 0.5							
5 286*11.2 20*0*A.6 0.00 29*13.7 57.2 85*52.4 50.2 21*25.5 1.86*							Diphda 348°45.0 -17°50.0
2 271 137 225 264 Na1" 079 269" 023 NO" 500 010" 511 715" 09 582 246" 447" No" 240" 24							Achernar 335°18.8 -57°05.7
2 98"161 249"264 087 295"305 087 119"79"0 983 261"469 321							Hamal 327°48.5 23°35.7
19 3037186 25525 095 2997037 007905 1317006 3840 276140 322 Morthal 1317018 4 1117019 3337335 285725 112 337018 011 317018 112 337335 285725 112 337018 011 317018 011 317018 112 337335 285725 112 337018 011 317018 011 317018 112 337335 285725 112 337018 011 317018 011 317018 011 317018 112 337335 285725 112 337018 011 317018 01						240 44.7 1000 32.0	Polaris 312°59.2 89°23.1
19 1881 11 270 270 5 10.4 31 270 30 30 30 30 30 30 30							Acamar 315°10.1 -40°11.7
10 340°205 000°266 0.21°129 390°065 0.10°127 191°116 0.04°569 315°578 100°126 6.20°137 100°33. 12 31°265 315°266 0.21°129 390°065 0.01°027 191°116 0.04°589 316°578 100°32. 13 18°30 30°266 1.45 20°170 0.43 20°171 191°116 0.04°589 316°578 100°32. 14 31°3314 346°266 1.46 20°170 0.43 20°171 191°116 0.04°589 316°578 100°32. 15 31°3314 346°266 1.46 20°170 0.43 20°171 191°116 0.04°589 316°578 100°32. 16 31°3314 346°266 1.46 20°170 0.43 20°171 191°116 0.04°589 316°59 3.7 65°33. 17 78°408 30°267 1.70 74°090 0.06 0.00°263 310 191°10 100°1							
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1.0	13	18°30.9	330°26.6 13.7	14°07.2 03.5	206°14.3 59.0	351°59.9 32.7	
15 68 "39.9 0"6.7" 1.14.4 4"08.5 0.01 296" 18.9 19.9 2 22"0.3 0.330 0 1.00 19.0 19.0 19.0 19.0 19.0 19.0 1	14	33°33.4	345°26.6 14.5	29°07.9 04.3	221°17.1 59.1	7°02.1 32.8	l .
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17 8°8-49.8 99°6.7 17.0 7.4°999 60.6 206°25.3 59.5 52°08 7 33.2 Company 17.2°24.1 18 89°14.2 45°6.8 11.0°11.3 60.0 10°17.4 21.0°11.3 60.0 10°17.4 21.0°11.3 60.0 10°17.4 21.0°11.3 60.0 10°17.4 21.0°11.3 60.0 10°17.4 21.0°17.5 10°17.3 10°1							
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20 123°480 75°68 19.5 19°120 09.00 311°316 59.8 9"15.2 33.5 Adhara 29.01 7.2°9107 7							Sirius 258°23.9 -16°45.6
11 138*50.6 90*06.9 • 20.3 134*12.7 • 09.8 366*36.3 04*59.9 112*17.4 • 33.6							Adhara 255°03.7 -29°00.9
2							Procyon 244°48.0 5°09.0
Mer.pass. 11.46							
16							l .
Mer. pass. 11-46	23	168°55.6	120°26.9 22.0	164°14.1 11.4	356°41.8 00.2	142°21.7 33.9	
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Sun GHA GHA Dec GHA DE							- I
183°860 N21°228 79°148 N01°121 11°446 N05°003 157°230 N06°340 180°271 230°175 180°271 251°261 341 41°501 00.5 187°283 34.2 44°079 180°271 251 239°175 153 71°556 00.8 217°326 34.4 424°079 180°271 261 239°175 153 71°556 00.8 217°326 34.4 430°172 251°262 238°18 34.5 55°28.8 36.9 232°34.8 34.5 55°28.8 36.9 232°34.8 34.5 55°28.8 36.9 232°34.8 34.5 55°28.8 36.9 232°34.8 34.5 55°28.8 36.9 322°34.8 34.5 34.9 3	Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 199°00.5 150°27.0 23.6 194°15.5 12.9 26'47.3 00.4 172'20.1 34.1 Genal 195°00.5 187°20.3 34.2 21'00.3 165°27.0 24.4 200°16.1 13.7 14'50.1 00.5 187°23.3 34.2 Genal 195°40.5 17.2 3.5 32.2 11.2 11.2 11.2 11.2 11.2 11.2 11.2							
2 214°03.0 fieb?72.0 24.4 209°16.1 137 41°50.1 00.5 187°28.3 34.2 Acris 17.2°56.4 6.3°15.5 40.2°40.7°7 180°27.1 26.1 239°17.5 15.3 17.2°56.6 0.08 217°32.6 34.4 Acris 17.2°56.6 26.0°10.4 210°27.1 26.0 239°17.5 15.3 17.2°56.6 0.08 217°32.6 34.4 Acris 17.2°56.6 26.0°8.2 17.2°2.6 34.4 Acris 17.2°56.6 26.0°8.2 17.2°2.6 34.4 Acris 17.2°2.6 24.0°2.7 26.0°18.9 10.1°16.9 10.2°2.3 4.8 34.5 Acris 17.2°2.8 24.0°2.7 28.5 28.1°2.6 16.1 66°58.0 0.0 22.3°3.8 34.5 Acris 17.2°2.8 28.7 28.0°2.8 28.1°2.0°2.7 28.5 28.1°2.6 10.1°2.0 10.0°2.0							
3 29°05.4 180°27.1							
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5 299"10.4 20"27.1 20.9 254"18.2 16.1 86"83.3 0.9 232"34.8 34.5							Gacrux 171°48.1 -57°16.4
6 24**12.8 25**27.2 N21**27.7 269**18, N01**16.9 102**01.0 N05**01.0 247**37.0 N08**34.6 Alcald 152**49.5 449**10.7 7 289**18.3 240**27.2 28.5 284**19.6 17.7 117**08.8 0.11.2 262**39.2 34.7 Alcald 152**49.5 4.9**20.1 8 304**17.7 525**27.2 29.4 299**20.3 18.5 132**06.5 0.12 277**41.3 34.9 Alcald 152**49.5 34.7 Alcald 15							Alioth 166°10.2 55°48.2
7 289°15.3 240°27.2 285 284°19.6 17.7 117°03.8 30-11 266°39.2 34.7 19.0 34.9 34.9 464at 148°31.6 6.9°27.1 34.9 319°20.2 270°27.3 3.0 2 314°21.0 · 19.2 147°09.3 · 01.4 292°34.5 · 35.0 464°21.3 · 36°30.0 6.9°27.1 10 334°22.7 285°27.3 31.0 320°21.7 20.0 162°12.0 · 01.5 307°45.7 35.1 Right Ren 137°54.1 · 36°30.0 6.9°27.1 11 349°25.1 316°27.4 121°32.6 39°23.0 N10°12.6 192°17.5 N05°01.7 5 N05°01.3 37°50.1 N80°35.3 Kobal 137°10.1 37°10.1 31°10.1 31°30.1 330°27.4 31.0 31.0 42.2 222°21.0 2.0 0 .0 7°54.4 35.5 Alpheco 186°01.2 26°36.6 43°35.0 60°27.5 31.0 40°25.1 · 24.0 237°25.8 · 02.1 22°56.6 · 35.6 Alpheco 186°28.4 - 16°02.1 15°04.2 15°04.							Spica 158°19.2 -11°18.7
7 289-15.3 240-27.2 285. 284-19.6 17.7 117-03.8 341-265-39.2 34.7 147-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 17-03.8 349-147-03.1 18-04-03.1							
8 304"17" 3 34" 34" 34" 34" 34" 34" 34" 34" 34"	7	289°15.3	240°27.2 28.5	284°19.6 17.7	$117^{\circ}03.8$ 01.1	262°39.2 34.7	
9 319°20.7 285°27.3 31.0 329°21.7 0.0 162°12.0 1.15 307°45.7 35.1 11 349°25.1 300°27.3 31.8 344°22.4 20.0 167°12.0 1.15 307°45.7 35.1 11 349°25.1 300°27.3 31.8 344°22.4 20.0 179°14.8 01.6 322°47.9 35.2 186 137°19.1 74°02.1 11 349°25.1 330°27.4 121°32.6 359°23.0 N01°21.6 192°17.5 N05°01.7 337°50.1 N06°35.3 187°30.1 330°27.4 33.4 14°23.7 22.4 207°20.3 01.8 352°52.2 35.6 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3	8	304°17.7	255°27.2 29.4	299°20.3 18.5	132°06.5 01.2		
10 334*22.5 380*27.3 31.8 329*21.7 20.0 162*12.0 01.5 307*45.7 35.1 349*27.5 350*27.4 371*32.6 359*23.0 N01*21.6 192*17.5 N05*01.7 337*50.1 N06*35.3 319*30.1 330*27.4 334. 14*23.7 22.4 207*20.3 01.8 352*52.5 35.4 44*27.5 34*27.5 34*2.2 34*2.2 22*2*2.0 02.0 7*54.4 35.5 549*35.0 0*27.5 35.0 34*25.1 24.0 237*28.8 02.1 22*56.6 35.6 64*37.5 15*27.5 35.9 59*25.8 24.7 252*28.5 02.2 37*58.8 35.6 79*39.9 30*27.6 36.7 7*26.5 25.5 26*73.1 02.3 53*09 35.9 18 94*42.4 48*67.6 07.7 38.3 104*27.9 77.1 297*36.7 02.5 33*05.3 36.1 19 109*44.8 60*27.7 38.3 104*27.9 77.1 297*36.7 02.5 33*05.3 36.1 21 139*49.8 90*27.8 33.9 134*29.3 28.7 327*42.2 02.8 113*09.7 36.3 22 154*52.2 105*27.8 41.5 164*30.6 30.3 35*47.7 30.3 139*14.8 36.4 Mer.pass. 11:42 \(\nu0.00'\) d0.6" m-4.9 \(\nu0.70'\) d0.6" m1.0 \(\nu0.70'\) d0.6" m2.4 33.2 23*34.8 33.4 33*4 33*4 33*4 33*4 34*4 23*2 31.8 27*55.9 30.5 23*27.7 33.3 33*4 33*4 34*4 23*2 31.8 27*55.9 30.5 32*37.1 35.6	9	319°20.2	270°27.3 · · 30.2	314°21.0 · · 19.2	147°09.3 · · 01.4	292°43.5 · · 35.0	
11 349°551 300°27.3 31.8 344°22.4 20.8 177°14.8 01.6 322°47.9 35.5 13 19°30.1 330°27.4 321°32.6 359°23.0 3012.1 6 102°17.5 NDS°01.7 337°50.1 NDS°35.3 1 13 19°30.1 330°27.4 33.4 14°33.7 22.4 207°20.3 01.8 352°52.2 35.4 15 49°35.0 0°27.5 33.0 44°55.1 2.40 237°28.8 0.02.1 22°56.6 35.6 16 64°37.5 15°27.5 33.0 44°55.1 2.40 237°28.8 0.02.1 22°56.6 35.6 16 48°37.5 15°27.5 33.0 44°55.1 2.40 237°28.8 0.02.1 22°56.6 35.6 17 70°39.9 30°27.6 36.7 74°66.5 25.5 267°31.2 0.23 53°0.9 35.9 18 94°22.4 45°27.6 N21°37.5 36°27.2 N01°26.3 282°34.0 N05°02.4 68°03.1 N08°36.0 18 94°42.4 45°27.6 N21°37.5 38°97.2 N01°26.3 282°34.0 N05°02.4 68°03.1 N08°36.0 19 109°4.8 6 60°27.7 30.3 104°27.9 27.1 297°36.7 0.25 83°05.3 36.1 12 130°48.8 90°27.8 30.9 31.1 19°28.6 27.9 312°39.5 0.27 98°07.5 36.3 12 130°48.8 90°27.8 30.9 31.4°29.3 2.82 34.0 N05°02.4 68°03.1 N08°36.0 18 47°47.9 105°27.8 41.5 164°30.6 30.3 357′47.7 30.3 143°14.0 36.5 18 47°47.1 100°27.8 41.5 164°30.6 30.3 357′47.7 30.3 143°14.0 36.5 18 47°47.9 100°47.8 100°47.8 100°47.8 100°47.8 100°47.8 100°47.1 100°47.8 100°47.8 100°47.1 100°47.8 100°47.1 100°4	10	334°22.7	285°27.3 31.0	329°21.7 20.0	162°12.0 01.5	307°45.7 35.1	
12 4°27.6 315°27.4 N21°32.6 359°23.0 N01°21.6 192°17.5 N05°01.7 337°50.1 N08°35.3 Zuben iub 130°52.8 16°09.1 14 36°32.5 345°27.5 34.2 29°24.4 32.2 222°23.0 0.20 7°64.4 35.5 Antares 120°01.3 26°36.6 15 49°35.0 0°27.5 35.9 59°25.8 24.7 252°28.5 02.2 37°58.8 35.8 Antares 101°99.7 120°21.1 16 49°37.5 15°27.5 35.9 59°25.8 24.7 252°28.5 02.2 37°58.8 35.8 Sabik 101°99.7 120°24.1 00°44.5 Sabik 101°99.7 120°24.1 00°44.5 Sabik 101°99.7 120°24.1 00°44.5 Sabik 01°99.7 120°24.1 00°44.5 Sabik 01°99.7 120°24.1 020°4.5 Sabik 01°99.7 120°24.5 Sabik 01°99	11	349°25.1	300°27.3 31.8		177°14.8 01.6		1 -
13 19°30.1 330°27.4 33.4 14°27.7 22.4 207°20.3 01.8 352°52.2 35.4 Alpheca 126°01.3 26°30.5 11 4 34°32.5 346°27.5 34.2 29°24.4 23.2 22°23.0 0.0 7°64.4 35.5 Alpheca 126°01.3 26°30.5 15 40°35.0 0°27.5 3.50 44°25.1 2.40 237°25.8 0.21 22°66.6 35.6 Alpheca 110°12.4 25°26.1 10°19.7 10°0.1							
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21 140°48.9 90°28.9 · · 59.0 134°45.9 · · 47.5 328°48.0 · · 05.6 114°01.9 · · 39.0 Horizontal parallax 22 155°51.4 105°29.0 21°59.8 149°46.6 48.3 343°50.8 05.7 129°04.1 39.1 Venus: 0.2 23 170°53.8 120°29.0 22°00.6 164°47.2 49.1 358°53.5 05.8 144°06.3 39.2 Mars: 0.1							
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25 170 33.0 120 25.0 22 30.0 101 11.2 15.1 330 33.5 35.5 111 33.5 35.2							
Mer.pass. 11:38 $\nu 0.0' \ d0.8' \ m-4.50$ $\nu 0.7' \ d0.8' \ m1.04$ $\nu 2.7' \ d0.1' \ m-2.46$ $\nu 2.2' \ d0.1' \ m0.55$							
	Mer.p	ass. 11:38	$ u 0.0' \ d0.8' \ \text{m-4.50}$	$ u 0.7' \; d0.8' \; { m m} 1.04$	$\nu 2.7' \ d0.1' \ \text{m-}2.46$	$ u 2.2' \ d0.1' \ m0.55$	

h	Sur	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.8	N01°56.1	192°07.2	16.7'	N00°21.7	13.2'	54.1'
1 2	193°31.0 208°31.2	57.1 58.0	206°42.9 221°18.6	16.7' 16.7'	00°34.9 00°48.2	13.2' 13.2'	54.2' 54.2'
3	223°31.4	01°59.0	235°54.2	16.7'	01°01.4	13.2'	54.2'
4	238°31.5	$02^{\circ}00.0$	250°29.9	16.6'	01° 14.7	13.2'	54.2'
5	253°31.7 268°31.9	01.0 N02°02.0	265°05.5 279°41.2	16.6'	01°27.9	13.2'	54.2'
6 7	268°31.9 283°32.1	N02 02.0 02.9	279°41.2 294°16.8	16.6' 16.6'	N01°41.2 01°54.4	13.2' 13.2'	54.2' 54.2'
8	298°32.3	03.9	308°52.4	16.6'	02°07.7	13.2'	54.2'
9	313°32.5	• • 04.9	323°27.9	16.6'	02°20.9	13.2'	54.2'
10 11	328°32.7 343°32.9	05.9 06.9	338°03.5 352°39.0	16.5' 16.5'	02°34.2 02°47.4	13.2' 13.2'	54.2' 54.2'
12	358°33.0	N02°07.9	7°14.5	16.5	N03°00.6	13.2'	54.3
13	13°33.2	8.80	21°50.0	16.5'	03°13.8	13.2'	54.3'
14	28°33.4	09.8	36°25.5	16.4	03°27.0	13.2'	54.3'
15 16	43°33.6 58°33.8	· · 10.8 11.8	51°00.9 65°36.4	16.4' 16.4'	03°40.3 03°53.5	13.2' 13.2'	54.3' 54.3'
17	73°34.0	12.8	80°11.8	16.4'	04°06.6	13.2'	54.3'
18	88°34.2	N02°13.7	94°47.1	16.3'	N04° 19.8	13.2'	54.3'
19 20	103°34.4 118°34.5	14.7 15.7	109°22.5 123°57.8	16.3' 16.3'	04°33.0 04°46.1	13.2' 13.1'	54.3' 54.3'
21	133°34.7	16.7	138°33.1	16.3'	04° 59.3	13.1	54.4'
22	148°34.9	17.7	153°08.3	16.2'	05°12.4	13.1'	54.4'
23	163°35.1	18.7	167°43.6	16.2'	05°25.5	13.1'	54.4'
	SD = 16.0'	d = 1.0'		SE	0 = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	178°35.3	N02°19.6	182°18.8	16.2'	N05°38.6	13.1'	54.4'
1	193°35.5	20.6	196°53.9	16.1'	05°51.7	13.1'	54.4'
2	208°35.7 223°35.9	21.6 •• 22.6	211°29.0 226°04.1	16.1' 16.1'	06°04.8 06°17.8	13.1' 13.0'	54.4' 54.4'
4	238°36.1	23.6	240°39.2	16.0'	06°30.9	13.0'	54.4'
5	253°36.2	24.5	$255^{\circ}14.2$	16.0'	06°43.9	13.0'	54.4'
6	268°36.4 283°36.6	N02°25.5	269°49.2 284°24.2	15.9'	N06° 56.9 07° 09.8	13.0'	54.5'
7 8	283°36.6 298°36.8	26.5 27.5	284 24.2 298°59.1	15.9' 15.9'	07°09.8 07°22.8	12.9' 12.9'	54.5' 54.5'
9	313°37.0	• • 28.5	313°33.9	15.8'	07°35.7	12.9'	54.5'
10	328°37.2	29.4	328°08.8	15.8'	07°48.6	12.9'	54.5'
11 12	343°37.4 358°37.6	30.4 N02°31.4	342°43.5 357°18.3	15.7' 15.7'	08° 01.5 N08° 14.4	12.9' 12.8'	54.5' 54.5'
13	13°37.7	32.4	11°53.0	15.7'	08°27.2	12.8'	54.5'
14	28°37.9	33.4	26°27.7	15.6'	08°40.0	12.8'	54.6'
15	43°38.1 58°38.3	• • 34.3	41°02.3 55°36.8	15.6'	08°52.8 09°05.5	12.7'	54.6'
16 17	58 38.3 73°38.5	35.3 36.3	55 30.8 70°11.4	15.5' 15.5'	09 05.5 09°18.2	12.7' 12.7'	54.6' 54.6'
18	88°38.7	N02°37.3	84°45.8	15.4'	N09°30.9	12.7'	54.6'
19	103°38.9	38.3	99°20.2	15.4'	09°43.5	12.6'	54.6'
20 21	118°39.1 133°39.2	39.2 •• 40.2	113°54.6 128°28.9	15.3' 15.3'	09°56.2 10°08.8	12.6' 12.6'	54.6' 54.7'
22	148°39.4	41.2	143°03.2	15.2'	10° 00.0	12.5'	54.7'
23	163°39.6	42.2	157°37.4	15.2'	10°33.8	12.5'	54.7'
	SD = 16.0'	d = 1.0'		SE	0 = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.8	N02°43.1	172°11.6	15.1'	N10°46.3	12.4'	54.7'
1	193°40.0 208°40.2	44.1	186°45.7 201°19.8	15.1'	10°58.7 11°11.2	12.4'	54.7'
2	208°40.2 223°40.4	45.1 •• 46.1	201°19.8 215°53.8	15.0' 15.0'	11°11.2 11°23.5	12.4' 12.3'	54.7' 54.7'
4	238°40.6	47.1	230°27.8	14.9'	11°35.9	12.3'	54.8'
5	253°40.7	48.0	245°01.6	14.8'	11°48.1	12.2'	54.8'
6 7	268°40.9 283°41.1	N02°49.0 50.0	259°35.5 274°09.3	14.8' 14.7'	N12°00.4 12°12.6	12.2' 12.2'	54.8' 54.8'
8	298°41.3	51.0	288°43.0	14.7'	12°24.7	12.1'	54.8'
9	313°41.5	• • 51.9	303°16.6	14.6'	12°36.9	12.1'	54.8'
10 11	328°41.7 343°41.9	52.9 53.9	317°50.2 332°23.8	14.5' 14.5'	12°48.9 13°00.9	12.0' 12.0'	54.8' 54.9'
12	358°42.1	N02°54.9	346°57.3	14.4'	N13°12.9	11.9'	54.9'
13	13°42.2	55.9	1°30.7	14.4'	13°24.8	11.9'	54.9'
14 15	28° 42.4 43° 42.6	56.8 • • 57.8	16°04.0 30°37.3	14.3' 14.2'	13°36.7 13°48.5	11.8' 11.8'	54.9' 54.9'
15 16	43°42.6 58°42.8	58.8	30°37.3 45°10.5	14.2'	13°48.5 14°00.3	11.8	54.9' 54.9'
17	73°43.0	02°59.8	59°43.7	14.1'	14° 12.0	11.7'	55.0'
18	88°43.2	N03°00.7	74°16.8	14.0'	N14°23.7	11.6'	55.0'
19 20	103°43.4 118°43.6	01.7 02.7	88°49.8 103°22.8	14.0' 13.9'	14°35.3 14°46.9	11.6' 11.5'	55.0' 55.0'
21	133°43.7	• • 03.7	103 22.6 117°55.6	13.8'	14° 58.4	11.4	55.0'
22	148°43.9	04.7	132°28.5	13.7'	15°09.8	11.4'	55.0'
23	163°44.1	05.6	147°01.2	13.7'	15°21.2	11.3'	55.1'
	SD = 16.0'	d = 1.0'		SE	0 = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	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
N 40°	04:54	05:26	05:53	18:19	18:46	19:18
35°	05:00	05:29	05:55	18:17	18:42	19:12
30°	05:04	05:32	05:56	18:15	18:39	19:07
20°	05:11	05:36	05:58	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
S 10°	05:19	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:05	18:27	18:53
30°	05:16	05:43	06:07	18:03	18:27	18:55
35°	05:14	05:43	06:08	18:02	18:27	18:57
40°	05:11	05:42	06:09	18:01	18:28	18:59
45°	05:07	05:41	06:11	18:00	18:29	19:03
S 50°	05:02	05:40	06:12	17:58	18:30	19:08
52°	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
S 60°	04:45	05:34	06:16	17:54	18:35	19:24

Lat.		Moonris	e	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	
S 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	
S 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	
S 60°	05:32	06:53	08:17	17:10	17:13	17:16	

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	185°56.3	$135^{\circ}29.1$	N22°01.4	179°47.9	N01°49.9	13°56.3	N05°05.9	159°08.4	N08°39.3	Alpheratz	357°32.4	29°14.7
1	200°58.8	150°29.2	02.1	194°48.6	50.7	28°59.0	06.1	174°10.6	39.4	Ankaa	353°05.0	-42°09.1
2	216°01.2	165°29.2	02.9	209°49.3	51.5	44°01.8	06.2	189°12.8	39.6	Schedar	349° 28.5	56°41.5
3	231°03.7	180°29.3	• • 03.7	224°50.0	• • 52.3	59°04.5	• • 06.3	204°15.0	• • 39.7	Diphda	348° 45.0	-17°49.9
4	246°06.2	195°29.3	04.5	239°50.7	53.0	74°07.2	06.4	219°17.1	39.8	Achernar	335°18.9	-57°05.7
5	261°08.6	210°29.4	05.3	254°51.4	53.8	89°10.0	06.5	234°19.3	39.9	Hamal	327°48.5	23°35.7
6	276°11.1	225°29.4	N22°06.0	269°52.1	N01°54.6	104°12.7	N05°06.6	249°21.5	N08°40.0	Polaris	313°00.0	89°23.1
7	291°13.6	240°29.5	06.8	284°52.8	55.4	119°15.5	06.7	264°23.7	40.1	Acamar	315°10.1	-40°11.7
8	306°16.0	255°29.6	07.6	299°53.5	56.2	134°18.2	06.9	279°25.8	40.2	Menkar	314°03.6	4°11.9
9	321°18.5	270°29.6	• • 08.4	314°54.2	• • 57.0	149°20.9	• • 07.0	294°28.0	• • 40.3	Mirfak	308°24.8	49°57.8
10	336°20.9	285°29.7	09.2	329°54.9	57.8	164°23.7	07.1	309°30.2	40.5	Aldebaran	290°36.8	16°33.9
11	351°23.4	300°29.8	09.9	344°55.5	58.5	179°26.4	07.2	324°32.4	40.6	Rigel	281°01.5	-8°10.3
12	6°25.9	315°29.8	N22° 10.7	359°56.2	N01°59.3	194°29.2	N05°07.3	339°34.5	N08°40.7	Capella	280°18.1	46°01.6
13	21°28.3	330°29.9	11.5	14°56.9	02°00.1	209°31.9	07.4	354°36.7	40.8	Bellatrix	278°20.2	6°22.4
14	36°30.8	345°29.9	12.2	29°57.6	00.9	224°34.6	07.5	9°38.9	40.9	Elnath	277°58.6	28°37.8
15	51°33.3	0°30.0	• • 13.0	44°58.3	•• 01.7	239°37.4	• • 07.7	24°41.1	• • 41.0	Alnilam	275°35.1	-1°11.2
16	66°35.7	15°30.1	13.8	59°59.0	02.5	254°40.1	07.8	39°43.2	41.1	Betelgeuse	270°49.3	7°24.6
17	81°38.2	30°30.1	14.6	74°59.7	03.2	269°42.8	07.9	54°45.4	41.2	Canopus	263°51.2	-52°43.0
18	96°40.7	45°30.2	N22°15.3	90°00.4	N02°04.0	284°45.6	N05°08.0	69°47.6	N08°41.4	Sirius	258°23.9	-16°45.6
19	111°43.1	60°30.3	16.1	105°01.1	04.8	299°48.3	08.1	84°49.8	41.5	Adhara	255°03.8	-29°00.9
20	126°45.6	75°30.3	16.9	120°01.8	05.6	314°51.1	08.2	99°51.9	41.6	Procyon	244°48.0	5°09.0
21	141°48.1	90°30.4	17.6	135°02.5	06.4	329°53.8	•• 08.4	114°54.1	• • 41.7	Pollux	243°14.0	27°57.4
22	156°50.5	105°30.5	18.4	150°03.2	07.2	344°56.5	08.5	129°56.3	41.8	Avior	234°13.3	-59°36.4
23	171°53.0	120°30.5	19.2	165°03.9	07.9	359°59.3	08.6	144°58.5	41.9	Suhail	222°44.1	-43°33.1
Mer.p	ass. 11:34	ν 0.1′ d0.	8′ m-4.51	$ u$ 0.7 $^{\prime}$ d0	.8′ m1.05	$\nu 2.7' \ d0.$.1′ m-2.46	ν 2.2 $^{\prime}$ d0	$.1' \; {\sf m0.55}$	Miaplacidus	221°37.1	-69°50.3
										Alphard	217°45.0	-8°47.1
ا ۱۸۸	CHA	СПА	Daa	CUA	Dan	CUA	Daz	CHA	Dee	Regulus	$207^{\circ}31.4$	$11^{\circ}49.5$
Wed	GHA 186°55.4	GHA	Dec N22° 19.9	GHA	Dec N02°08.7	GHA 15°02.0	Dec N05°08.7	GHA	Dec	Dubhe	193°37.3	61°35.9
0		135°30.6		180°04.6		15°02.0		160°00.6	N08°42.0	Denebola	182°22.0	14°24.6
1	201°57.9	150°30.7	20.7	195°05.2	09.5	30°04.8	8.80	175°02.8	42.1	Gienah	175°40.5	$-17^{\circ}42.1$
2	217°00.4	165°30.8	21.5	210°05.9	10.3	45°07.5	08.9	190°05.0	42.3	Acrux	$172^{\circ}56.4$	-63°15.5
3	232°02.8	180°30.8	• • 22.2	225°06.6	• • 11.1	60°10.2	• • 09.0	205°07.2	• • 42.4	Gacrux	171°48.0	-57°16.4
4	247°05.3	195°30.9	23.0	240°07.3	11.9	75°13.0 90°15.7	09.1	220°09.3 235°11.5	42.5	Alioth	$166^{\circ}10.2$	55°48.2
5	262°07.8	210°31.0	23.7	255°08.0	12.6		09.3		42.6	Spica	$158^{\circ}19.2$	-11°18.7
6	277°10.2	225°31.0	N22°24.5	270°08.7	N02°13.4	105°18.4	N05°09.4	250°13.7	N08°42.7	Alkaid	152°49.5	49°10.1
7	292°12.7	240°31.1	25.3	285°09.4	14.2	120°21.2	09.5	265°15.9	42.8	Hadar	$148^{\circ}31.6$	-60°30.5
8 9	307°15.2 322°17.6	255°31.2 270°31.3	26.0	300°10.1 315°10.8	15.0 •• 15.8	135°23.9 150°26.7	09.6 •• 09.7	280°18.0 295°20.2	42.9 •• 43.0	Menkent	$147^{\circ}54.1$	-36°30.6
	337°20.1	270 31.3 285°31.3	• • 26.8	330°11.5		165°29.4		310°22.4		Arcturus	145°45.2	19°01.9
10 11	352°22.5	205 31.3 300°31.4	27.5 28.3	345°12.2	16.6 17.3	180°32.1	09.8 09.9	325°24.6	43.1	Rigil Kent.	139°36.0	-60°57.1
12	7°25.0	315°31.5	N22° 29.0	0°12.9	N02°18.1	100 32.1 195°34.9	N05°10.1	340°26.7	43.3 N08°43.4	Kochab	$137^{\circ}19.0$	74°02.1
13	22°27.5	330°31.6	29.8	15°13.6	18.9	210°37.6	10.2	355°28.9	43.5	Zuben'ubi	136°52.8	-16°09.7
14	37°29.9	345°31.6	30.5	30°14.3	19.7	210 37.0 225°40.3	10.2	10°31.1	43.5	Alphecca	126°01.3	26°36.9
15	52°32.4	0°31.7	31.3	45°14.9	. 20.5	240°43.1	. 10.3	25°33.3	• • 43.7	Antares	112°12.4	-26°29.6
16	67°34.9	15°31.8	32.0	60°15.6	21.3	255°45.8	10.4	40°35.4	43.7	Atria	$107^{\circ}04.0$	-69°04.4
17	82°37.3	30°31.9	32.8	75°16.3	22.0	270°48.5	10.5	55°37.6	43.9	Sabik	101°59.6	-15°45.6
18	97°39.8	45° 32.0	N22°33.5	90°17.0	N02°22.8	285°51.3	N05° 10.7	70°39.8	N08°44.0	Shaula	96°06.7	-37°07.3
19	112°42.3	60°32.0	34.3	105°17.7	23.6	300°54.0	10.8	85°42.0	44.2	Rasalhague	95°56.0	12°32.2
20	112 42.3 127°44.7	75°32.1	35.0	100°18.4	24.4	315°56.7	11.0	100°44.1	44.3	Eltanin	90°40.9	51°28.8
21	142°47.2	90°32.2	• • 35.8	135°19.1	• • 25.2	330°59.5	11.1	115°46.3	• • 44.4	Kaus Aust.	83°29.0	-34°22.1
22	157°49.7	105° 32.3	36.5	150°19.8	26.0	346°02.2	11.1	130°48.5	44.4	Vega	80°31.4	38°48.3
23	172°52.1	120°32.4	37.3	165°20.5	26.7	1°05.0	11.3	145°50.7	44.6	Nunki	75°44.5	-26°15.6
23	172 32.1									Altair	61°57.5	8°56.5
Mer.p	ass. 11:30	$\nu 0.1' \ d0.$	8′ m-4.52	$ u$ 0.7 $^{\prime}$ d0	.8′ m1.05	$\nu 2.7' \ d0.$.1′ m-2.46	ν 2.2′ d0	.1' m 0.54	Peacock	53°01.9	-56°38.4
										Deneb	49°24.2	45°22.7
Thu	GHA	CHV	Doc	CHV	Doc	CHV	Doc	CHV	Dec	Enif	33°36.4	10°00.2
0	187°54.6	GHA 135°32.5	Dec N22° 38.0	GHA 180°21.2	Dec N02°27.5	GHA 16°07.7	Dec N05°11.4	GHA 160°52.8	N08°44.7	Al Na'ir	27°30.0	-46°49.3
1	202°57.0	150°32.5	38.8	195°21.9	28.3	31°10.4	11.5	175°55.0	44.8	Fomalhaut	15°12.0	-29°28.3
2	202 57.0 217°59.5	165° 32.6	39.5	210°22.6	29.1	46°13.2	11.6	175°55.0	44.0	Scheat	13°43.0	28°14.1
3	233°02.0	180°32.7	40.2	225°23.3	29.9	61°15.9	. 11.7	205°59.4	• • 45.1	Markab	13°27.6	15°21.4
4	248°04.4	195°32.8	41.0	240°24.0	30.6	76°18.6	11.7	203 59.4 221°01.5	45.1	Mar 28 Tue	SHA	Mer.pass
5	263°06.9	210°32.9	41.7	255°24.6	31.4	91°21.4	12.0	236°03.7	45.3	Venus	309°32.8	14:58
6	278°09.4	210 32.9 225°33.0	N22°42.5	270°25.3	N02°32.2	106°24.1	N05°12.1	251°05.9	N08°45.4	Mars		12:00
7	293°11.8	240°33.1	43.2	285°26.0	33.0	121°26.8	12.2	266°08.1	45.5	Jupiter	188°00.0	23:00
8	308°14.3	255°33.1	43.9	300°26.7	33.8	136°29.6	12.3	281°10.2	45.6	Saturn	333°12.1	13:22
9	323°16.8	270°33.2	• • 44.7	315°27.4	• • 34.6	151°32.3	. 12.4	296°12.4	• • 45.7			
10	338°19.2	285°33.3	45.4	330°28.1	35.3	166°35.0	12.5	311°14.6	45.8	Mar 29 Wed	SHA	Mer.pass
11	353°21.7	300°33.4	46.1	345°28.8	36.1	181°37.8	12.6	326°16.7	46.0	Venus	308°35.2	14:58
12	8°24.2	315°33.5	N22°46.9	0°29.5	N02°36.9	196°40.5	N05°12.8	341°18.9	N08°46.1	Mars	353°09.1	11:59
13	23°26.6	330°33.6	47.6	15°30.2	37.7	211°43.2	12.9	356°21.1	46.2	Jupiter		22:56
14	38°29.1	345°33.7	48.3	30°30.9	38.5	226°46.0	13.0	11°23.3	46.3	Saturn	333°05.2	13:18
15	53°31.5	0°33.8	• • 49.1	45°31.6	• • 39.2	241°48.7	· · 13.1	26°25.4	• • 46.4	Mar 30 Thu	SHA	Mer.pass
16	68°34.0	15°33.9	49.8	60°32.3	40.0	256°51.4	13.2	41°27.6	46.5	Venus		14:58
17	83°36.5	30°34.0	50.5	75°33.0	40.8	271°54.2	13.2	56°29.8	46.6	Mars		14:58
18	98°38.9	45°34.1	N22°51.3	90°33.7	N02°41.6	286°56.9	N05°13.4	71°32.0	N08°46.7	1	352 20.0 188° 13.1	22:51
19	113°41.4	60°34.2	52.0	105°34.4	42.4	301°59.6	13.5	86°34.1	46.9	Saturn	332°58.3	
20	128°43.9	75°34.3	52.7	120°35.1	43.1	317°02.3	13.6	101°36.3	47.0	Saturn	JJ∠ 58.3	13:15
21	143°46.3	90°34.4	• • 53.4	135°35.7	• • 43.9	332°05.1	· · 13.8	116°38.5	• • 47.1	Horizont	al parallax	
22	158°48.8	105°34.4	54.2	150°36.4	44.7	347°07.8	13.9	131°40.7	47.2		Venus:	0.2
23	173°51.3	120°34.5	54.9	165°37.1	45.5	2°10.5	14.0	146°42.8	47.3		Mars:	0.1
										•		
Mer n	ass. 11:26	$\nu 0.1' d0.$	7′ m-4.53	ν 0.7′ d0	.8′ m1.06	$\nu 2.7' d0$.1′ m-2.45	$\nu 2.2' \ d0$	$.1' \; {\sf m0.54}$			

h	Sui	า			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.3	N03°06.6	161°33.9	13.6'	N15°32.5	11.3'	55.1'
1	193°44.5	07.6	$176^{\circ}06.5$	13.5'	15°43.8	11.2'	55.1'
2	208°44.7	08.6	190°39.0	13.5'	15°55.0	11.1'	55.1'
3	223°44.9	• • 09.5	205°11.5	13.4'	16°06.1	11.1'	55.1'
4	238° 45.1 253° 45.2	10.5 11.5	219°43.8 234°16.2	13.3'	16°17.2 16°28.2	11.0'	55.1'
5 6	253 45.2 268° 45.4	N03° 12.5	234 10.2 248°48.4	13.2' 13.2'	N16°39.2	10.9' 10.9'	55.2' 55.2'
7	283°45.6	13.4	263°20.6	13.1'	16°50.0	10.8	55.2'
8	298°45.8	14.4	277°52.6	13.0'	17°00.8	10.7'	55.2'
9	313°46.0	• • 15.4	292°24.7	12.9'	17°11.6	10.7'	55.2'
10	328°46.2	16.4	$306^{\circ}56.6$	12.9'	17°22.2	10.6'	55.2'
11	343°46.4	17.3	321°28.4	12.8'	17°32.8	10.5'	55.3'
12	358° 46.6	N03°18.3	336°00.2	12.7'	N17°43.4	10.4	55.3'
13 14	13°46.7 28°46.9	19.3 20.3	350°31.9 5°03.6	12.6' 12.5'	17°53.8 18°04.2	10.4' 10.3'	55.3' 55.3'
15	43°47.1	. 21.2	19°35.1	12.5'	18°14.5	10.3	55.3'
16	58°47.3	22.2	34°06.6	12.4'	18°24.7	10.1	55.4'
17	73°47.5	23.2	48°37.9	12.3'	18°34.8	10.1'	55.4'
18	88°47.7	N03°24.2	63°09.2	12.2'	N18°44.9	10.0'	55.4'
19	103°47.9	25.1	77° 40.5	12.1'	18°54.9	9.9'	55.4'
20	118°48.1	26.1	92°11.6	12.1'	19°04.8	9.8'	55.4'
21	133° 48.2 148° 48.4	• • 27.1	106°42.7	12.0'	19°14.6 19°24.4	9.7'	55.5'
22 23	148°48.4 163°48.6	28.1 29.0	121°13.7 135°44.5	11.9' 11.8'	19°24.4 19°34.0	9.6' 9.6'	55.5' 55.5'
23						9.0	33.3
	SD = 16.0'	d = 1.0'		SL	O = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178° 48.8 193° 49.0	N03°30.0 31.0	150° 15.4 164° 46.1	11.7' 11.6'	N19°43.6 19°53.0	9.5' 9.4'	55.5' 55.5'
2	208° 49.2	31.9	179° 16.7	11.6'	20°02.4	9.4	55.5'
3	223°49.4	• • 32.9	193°47.3	11.5'	20°11.7	9.2'	55.6'
4	238°49.6	33.9	$208^{\circ}17.8$	11.4'	20°20.9	9.1'	55.6'
5	253°49.7	34.9	222°48.2	11.3'	20°30.1	9.0'	55.6'
6	268° 49.9	N03°35.8	237° 18.5	11.2'	N20°39.1	8.9'	55.6'
7	283°50.1 298°50.3	36.8 37.8	251°48.7 266°18.9	11.1' 11.1'	20°48.0 20°56.8	8.8' 8.7'	55.6' 55.7'
8 9	298 50.3 313°50.5	38.8	200 18.9 280°48.9	11.1	20 56.8 21°05.6	8. <i>1</i> 8.6'	55.7'
10	328° 50.7	39.7	295° 18.9	10.9'	21°14.2	8.5'	55.7'
11	343°50.9	40.7	309°48.8	10.8'	21°22.8	8.4'	55.7'
12	358°51.1	N03°41.7	324°18.6	10.7'	N21°31.2	8.3'	55.7'
13	13°51.2	42.6	338°48.3	10.6'	21°39.5	8.2'	55.8'
14	28°51.4	43.6	353°18.0	10.6'	21°47.8	8.1'	55.8'
15 16	43°51.6 58°51.8	· · 44.6 45.6	7° 47.5 22° 17.0	10.5' 10.4'	21°55.9 22°03.9	8.0' 7.9'	55.8' 55.8'
17	73°52.0	45.0 46.5	36°46.4	10.4	22 03.9 22°11.9	7.9 7.8'	55.9'
18	88°52.2	N03° 47.5	51°15.7	10.2	N22°19.7	7.7'	55.9'
19	103°52.4	48.5	65°44.9	10.1'	22°27.4	7.6'	55.9'
20	118°52.5	49.4	$80^{\circ}14.0$	10.0'	22°35.0	7.5'	55.9'
21	133°52.7	• • 50.4	94°43.1	10.0'	22°42.5	7.4'	55.9'
22	148°52.9	51.4	109°12.0	9.9'	22°49.9 22°57.1	7.3'	56.0'
23	163°53.1	52.4	123°40.9	9.8'		7.2'	56.0'
	SD = 16.0'	d = 1.0'		51	O = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.3	N03°53.3	138°09.7	9.7'	N23°04.3	7.0'	56.0'
1 2	193°53.5 208°53.7	54.3 55.3	152°38.4 167°07.1	9.6'	23°11.3 23°18.3	6.9' 6.8'	56.0'
3	208°53.7 223°53.9	55.3 •• 56.2	167°07.1 181°35.6	9.6' 9.5'	23°18.3 23°25.1	6.8	56.0' 56.1'
3 4	223 53.9 238° 54.0	57.2	196°04.1	9.5 9.4'	23°31.8	6.6'	56.1
5	253° 54.2	58.2	$210^{\circ}32.5$	9.3'	23°38.3	6.5	56.1'
6	268°54.4	N03°59.2	225°00.8	9.2'	N23°44.8	6.3'	56.1'
7	283°54.6	04°00.1	239°29.0	9.1'	23°51.1	6.2'	56.2'
8	298°54.8	01.1	253°57.2	9.1'	23°57.3	6.1'	56.2'
9 10	313°55.0 328°55.2	· · 02.1 03.0	268°25.2 282°53.2	9.0' 8.9'	24°03.4 24°09.4	6.0' 5.8'	56.2' 56.2'
11	328 55.2 343°55.3	03.0	282 53.2 297°21.1	8.8'	24 09.4 24°15.2	5.8 5.7'	56.2'
12	358° 55.5	N04°05.0	311°48.9	8.8'	N24°20.9	5.6'	56.3
13	13°55.7	05.9	$326^{\circ}16.7$	8.7'	$24^{\circ}26.5$	5.5'	56.3'
14	28° 55.9	06.9	340°44.4	8.6'	24°31.9	5.3'	56.3'
15	43°56.1	• • 07.9	355°12.0	8.5'	24°37.3	5.2'	56.3'
16	58° 56.3 73° 56.5	8.80	9°39.5 24°07.0	8.5'	24°42.5	5.1'	56.4'
17 18	73°56.5 88°56.6	09.8 N04° 10.8	24°07.0 38°34.3	8.4' 8.3'	24°47.5 N24°52.4	4.9' 4.8'	56.4' 56.4'
19	103° 56.8	11.8	50° 54.5	8.2'	24°57.2	4.0 4.7'	56.4'
20	118° 57.0	12.7	67°28.9	8.2	25°01.9	4.5'	56.5
21	133°57.2	• • 13.7	81°56.0	8.1'	25°06.4	4.4'	56.5'
22	148°57.4	14.7	96°23.1	8.0'	25°10.8	4.3'	56.5'
23	163°57.6	15.6	110°50.1	8.0'	25°15.1	4.1'	56.5'
	SD = 16.0'	d = 1.0'		SI	O = 15.3'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	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
S 10°	05:18	05:43	06:04	18:05	18:26	18:51
20°	05:19	05:44	06:06	18:03	18:25	18:50
30°	05:18	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
S 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
S 60°	04:53	05:42	06:23	17:45	18:26	19:15

Lat.		Moonris	е	Moonset				
Lat.	Tue	Wed	Thu	Tue	Wed	Thu		
N 72°	03:11							
N 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		
N 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		
N 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		
S 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		
S 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		
S 60°	09:44	11:14	12:43	17:22	17:32	17:50		

		Sun		Moon				
Day	Eqn.o	f Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	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			

h	Aries	Venus	,	M	ars	Jup	oiter	Sat	urn		Stars
Fri	GHA	GHA De	ec (GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	188°53.7	135°34.6 N22°		0°37.8	N02°46.3	17°13.3	N05°14.1	161°45.0	N08°47.4		
1	203°56.2	150°34.7		5°38.5	47.0	32°16.0	14.2	176°47.2	47.5	Alpheratz	357°32.4
2	218°58.6	165°34.8		0°39.2	47.8	47°18.7	14.3	191°49.3	47.6	Ankaa	353°05.0
3	234°01.1	180°34.9 · ·	57.8 22	5°39.9	• • 48.6	62°21.5	• • 14.4	206°51.5	• • 47.8	Schedar	349°28.5
4	249°03.6	195°35.0	58.5 240	0°40.6	49.4	77°24.2	14.5	221°53.7	47.9	Diphda Achernar	348°45.0 335°18.9
5	264°06.0	210°35.2		5°41.3	50.2	92°26.9	14.6	236°55.9	48.0	Hamal	327°48.5
6	279°08.5	225°35.3 N22°		0°42.0	N02°50.9	107°29.7	N05°14.7	251°58.0	N08°48.1	Polaris	313°00.7
7	294°11.0			5°42.7	51.7	122°32.4	14.9	267°00.2	48.2	Acamar	315°10.1
8	309°13.4	255°35.5		0°43.4	52.5	137°35.1	15.0	282°02.4	48.3	Menkar	314°03.6
9	324°15.9			5°44.1 0°44.8	53.3	152°37.8	• • 15.1	297°04.6	• • 48.4	Mirfak	308°24.8
10 11	339°18.4 354°20.8	285°35.7 300°35.8		0 44.8 5°45.5	54.1 54.8	167°40.6 182°43.3	15.2 15.3	312°06.7 327°08.9	48.5 48.7	Aldebaran	290°36.8
12	9°23.3	315°35.9 N23°		0°46.2	N02°55.6	197°46.0	N05°15.4	342°11.1	N08°48.8	Rigel	281°01.5
13	24°25.8	330°36.0		5°46.8	56.4	212°48.8	15.5	357°13.2	48.9	Capella	280°18.2
14	39°28.2	345°36.1		0°47.5	57.2	227°51.5	15.6	12°15.4	49.0	Bellatrix	278°20.2
15	54°30.7			5°48.2	• • 58.0	242°54.2	• • 15.7	27°17.6	• • 49.1	Elnath	277°58.7
16	69°33.1	15°36.3	07.1 60	0°48.9	58.7	257°56.9	15.8	42°19.8	49.2	Alnilam	275°35.2
17	84°35.6	30°36.4	07.8 7	5°49.6	02°59.5	272°59.7	16.0	57°21.9	49.3	Betelgeuse Canopus	270°49.3 263°51.3
18	99°38.1	45°36.5 N23°		0°50.3	N03°00.3	288°02.4	$N05^{\circ}16.1$	72°24.1	N08°49.4	Sirius	258°23.9
19	114°40.5	60°36.7		5°51.0	01.1	303°05.1	16.2	87°26.3	49.6	Adhara	255°03.8
20	129°43.0	75°36.8		0°51.7	01.8	318°07.9	16.3	102°28.5	49.7	Procyon	244°48.0
21	144°45.5			5°52.4	• • 02.6	333°10.6	• • 16.4	117°30.6	• • 49.8	Pollux	243°14.0
22 23	159°47.9 174°50.4			0°53.1 5°53.8	03.4 04.2	348°13.3 3°16.0	16.5 16.6	132°32.8 147°35.0	49.9 50.0	Avior	234°13.4
		-								Suhail	222°44.1
Mer.p	ass. 11:23	$ u 0.1' \ d0.7' \ { m m}$	4.54ν	0.7' d0.	.8′ m1.06	$\nu 2.7' \ d0.$	1′ m-2.45	$\nu 2.2' \ d0$.1′ m0.54	Miaplacidus	221°37.1
										Alphard	217°45.0
Sat	GHA	GHA De	ec (GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.4 193°37.3
0	189°52.9	135° 37.2 N23°	12.7	0°54.5	N03°05.0	18°18.8	N05°16.7	162°37.1	N08°50.1	Denebola	182°22.0
1	204°55.3	150°37.3		5°55.2	05.7	$33^{\circ}21.5$	16.8	177°39.3	50.2	Gienah	175°40.5
2	219°57.8	165° 37.5		0°55.9	06.5	48°24.2	16.9	192°41.5	50.3	Acrux	
3	235°00.3			5°56.6	• • 07.3	63°27.0	• • 17.0	207°43.7	• • 50.5	Gacrux	171°48.0
4 5	250°02.7 265°05.2			0°57.3 5°58.0	08.1 08.9	78°29.7 93°32.4	17.2 17.3	222°45.8 237°48.0	50.6 50.7	Alioth	$166^{\circ}10.2$
6	280°07.6	225° 37.9 N23°		0°58.6	N03°09.6	108°35.1	N05°17.4	252°50.2	N08°50.8	Spica	158° 19.2
7	295°10.1			5°59.3	10.4	123°37.9	17.5	267°52.3	50.9	Alkaid	152°49.5
8	310°12.6	255°38.2		1°00.0	11.2	138°40.6	17.6	282°54.5	51.0	Hadar	148°31.6
9	325°15.0	270°38.3 · ·		6°00.7	• • 12.0	153°43.3	• • 17.7	297°56.7	• • 51.1	Menkent Arcturus	147°54.1 145°45.2
10	340°17.5	285°38.4	19.7 33	1°01.4	12.7	168°46.0	17.8	312°58.9	51.2	Rigil Kent.	145 45.2 139°36.0
11	355°20.0	300°38.5		6°02.1	13.5	183°48.8	17.9	328°01.0	51.4	Kochab	137°19.0
12	10°22.4	315°38.7 N23°		1°02.8	N03°14.3	198°51.5	N05°18.0	343°03.2	N08°51.5	Zuben'ubi	136°52.8
13	25°24.9	330°38.8 345°38.9		6°03.5	15.1	213°54.2	18.1	358°05.4	51.6	Alphecca	126°01.3
14 15	40°27.4 55°29.8			1°04.2 6°04.9	15.9 •• 16.6	228°56.9 243°59.7	18.2 •• 18.3	13°07.5 28°09.7	51.7 •• 51.8	Antares	$112^{\circ}12.4$
16	70°32.3	15°39.2		0 04.9 1°05.6	17.4	243 59.7 259°02.4	18.4	43°11.9	51.9	Atria	107°04.0
17	85°34.8	30°39.3		6°06.3	18.2	274°05.1	18.6	58°14.1	52.0	Sabik	101°59.6
18	100°37.2	45°39.4 N23°		1°07.0	N03°19.0	289°07.8	N05°18.7	73°16.2	N08°52.1	Shaula	96°06.7 95°56.0
19	115°39.7	60°39.6	25.9 100	6°07.7	19.7	304°10.6	18.8	88°18.4	52.3	Rasalhague Eltanin	90°40.8
20	$130^{\circ}42.1$	75°39.7		1°08.4	20.5	319°13.3	18.9	103°20.6	52.4	Kaus Aust.	83°29.0
21	145°44.6			6°09.1	• • 21.3	334°16.0	• • 19.0	118°22.7	• • 52.5	Vega	80°31.4
22	160°47.1	105°39.9		1°09.8	22.1	349°18.7	19.1	133°24.9	52.6	Nunki	75°44.5
23	175°49.5	120°40.1	28.7 160	6°10.5	22.8	4°21.5	19.2	148°27.1	52.7	Altair	61°57.5
Mer.p	ass. 11:19	$ u 0.1' \ d0.7' \ {\rm m}$	4.55ν 0	0.7′ d0.	.8′ m1.07	ν 2.7′ d0.	1′ m-2.45	ν 2.2′ d0	.1' m0.54	Peacock	53°01.9
										Deneb	49°24.2
Sun	GHA	GHA De	oc (GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.4
0	190°52.0	135°40.2 N23°		1°11.2		19°24.2	N05°19.3	163°29.3	N08°52.8	Al Na'ir	27°30.0
1	205°54.5	150° 40.3		6°11.8	24.4	34°26.9	19.4	178°31.4	52.9	Fomalhaut	15°12.0
2	220°56.9	165°40.5		1°12.5	25.2	49°29.6	19.5	193°33.6	53.0	Scheat Markab	13°42.9 13°27.6
3	235°59.4			6°13.2	• • 25.9	64°32.3	• • 19.6	208°35.8	• • 53.2		
4	251°01.9	195°40.8		1°13.9	26.7	$79^{\circ}35.1$	19.7	223°37.9	53.3	Mar 31 Fri	SHA
5	266°04.3	210°40.9		6°14.6	27.5	94°37.8	19.8	238°40.1	53.4	Venus	
6	281°06.8	225°41.0 N23°		1°15.3	N03°28.3	109°40.5	N05°19.9	253°42.3	N08°53.5	Mars	351°44.1
7	296°09.3	240°41.2		6°16.0	29.0	124°43.2	20.0	268°44.5	53.6	Jupiter	188°19.6 332°51.3
8 9	311°11.7 326°14.2	255°41.3 270°41.4		1°16.7 6°17.4	29.8 · · 30.6	139°46.0 154°48.7	20.2	283°46.6 298°48.8	53.7 •• 53.8	Saturn	332 31.3
10	341°16.6	285°41.6		1°18.1	31.4	169°51.4	20.4	313°51.0	53.9	Apr 01 Sat	SHA
11	356°19.1	300°41.7		6°18.8	32.2	184°54.1	20.5	328°53.1	54.1	Venus	
12	11°21.6	315°41.9 N23°		1°19.5	N03°32.9	199°56.8	N05°20.6	343°55.3	N08°54.2	Mars	
13	26°24.0	330°42.0		6°20.2	33.7	214°59.6	20.7	358°57.5	54.3	Jupiter Saturn	188°25.9 332°44.3
14	41°26.5	345°42.2		1°20.9	34.5	230°02.3	20.8	13°59.7	54.4	Jaturn	
15	56°29.0			6°21.6	• • 35.3	245°05.0	• • 20.9	29°01.8	• • 54.5	Apr 02 Sun	SHA
16	71°31.4	15° 42.5		1°22.3	36.0	260°07.7	21.0	44°04.0	54.6		304°48.2
17 18	86°33.9 101°36.4	30°42.6 45°42.7 N23°		6°23.0 1°23.7	36.8 N03°37.6	275°10.5 290°13.2	21.1 N05°21.2	59°06.2 74°08.3	54.7 N08°54.8	Mars	
19	101 30.4 116°38.8	60°42.9		1 23.7 6°24.4	38.4	305°15.9	21.3	89°10.5	55.0	Jupiter Saturn	
20	131°41.3			1°25.0	39.1	320°18.6	21.4	104°12.7	55.0	Jaturn	JJZ 31.3
21	146°43.7			6°25.7	• • 39.9	335°21.3	• • 21.5	119°14.8	• • 55.2	Horizont	al parallax
22	161°46.2	105°43.3	44.2 15	1°26.4	40.7	$350^{\circ}24.1$	21.6	$134^{\circ}17.0$	55.3		Venus:
23	176°48.7	120°43.5	44.8 160	6°27.1	41.4	5°26.8	21.7	149°19.2	55.4		Mars:
Mer.	pass. 11:15	ν0.1' d0.7' m-	4.56ν	0.7' d0.	.8′ m1.07	$\nu 2.7' \ d0.$	1′ m-2.44	$\nu^{2.2'} d0$.1′ m0.53		

Dec

29°14.7 -42°09.1

56°41.5

-17°49.9 -57°05.7

 $23^{\circ}35.7$

89°23.1

-40°11.6

4°11.9

49°57.7

16°33.9 -8°10.3

 $46^{\circ}01.6$

 $6^{\circ}22.4$

28°37.8

 $-1^{\circ}11.2$

7°24.6

-52°43.0

-16°45.6

-29°00.9

 $5^{\circ}09.0$

 $27^{\circ}57.4$ -59°36.4

-43°33.2

-69°50.3

 $-8^{\circ}47.1$

11°49.5 61°35.9

 $14^{\circ}24.6$

-17°42.2

 $-63^{\circ}15.5$

 $\textbf{-57}^{\circ}\,16.5$

55°48.2

-11° 18.7

49°10.1

-60°30.6 -36°30.6

 $19^{\circ}01.9$

-60°57.1

 $74^{\circ}02.1$

-16°09.7

26°36.9 -26°29.6

-69°04.4

-15°45.6 -37°07.3

 $12^{\circ}32.2$

51°28.8

-34°22.1

38°48.3

-26°15.6

-56°38.4

 $45^{\circ}22.7$

 $10^{\circ}00.2$

-46°49.3

-29°28.3

28°14.1

15°21.4

Mer.pass

14:58

11:57

22:47

13:11

14:57

11:56

22:43

13:08

11:55

22:38

13:04

0.2

0.1

Mer.pass 14:57

Mer.pass

8°56.5

h	Sui	า			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.8	$N04^{\circ}16.6$	$125^{\circ}17.1$	7.9'	$N25^{\circ}19.2$	4.0'	56.6'
1	193°57.9	17.6	139°44.0	7.8'	25°23.2	3.8'	56.6'
2	208°58.1 223°58.3	18.5 •• 19.5	154°10.8 168°37.6	7.8' 7.7'	25°27.0 25°30.7	3.7' 3.6'	56.6' 56.6'
4	238°58.5	20.5	183°04.3	7.6'	25°34.2	3.4'	56.7'
5	253°58.7	21.4	197°30.9	7.6'	25°37.6	3.3'	56.7'
6	268°58.9	N04°22.4	211°57.4	7.5'	N25°40.9	3.1'	56.7'
7 8	283°59.1 298°59.2	23.4 24.3	226°24.0 240°50.4	7.4' 7.4'	25°44.0 25°47.0	3.0' 2.8'	56.7' 56.8'
9	313°59.4	25.3	255°16.8	7.3'	25°49.8	2.7'	56.8'
10	328°59.6	26.3	$269^{\circ}43.1$	7.3'	25°52.5	2.5'	56.8'
11	343°59.8	27.2 N04°28.2	284°09.4 298°35.6	7.2'	25°55.1 N25°57.4	2.4'	56.8'
12 13	359°00.0 14°00.2	29.2	298°35.6 313°01.8	7.2' 7.1'	N25°57.4 25°59.7	2.2' 2.1'	56.9' 56.9'
14	29°00.4	30.1	327°27.9	7.1'	26°01.8	1.9'	56.9'
15	44°00.5	•• 31.1	341°53.9	7.0'	26°03.7	1.8'	56.9'
16	59°00.7 74°00.9	32.0	356°19.9 10°45.9	7.0'	26°05.5 26°07.1	1.6' 1.5'	57.0'
17 18	89°01.1	33.0 N04°34.0	25°11.8	6.9' 6.9'	26 07.1 N26°08.6	1.3'	57.0' 57.0'
19	104°01.3	34.9	39°37.7	6.8'	26°09.9	1.2'	57.0'
20	119°01.5	35.9	54°03.5	6.8'	26°11.1	1.0'	57.1'
21	134°01.7 149°01.8	• • 36.9	68°29.3	6.7'	26°12.1 26°13.0	0.9'	57.1'
22 23	149°01.8 164°02.0	37.8 38.8	82°55.0 97°20.7	6.7' 6.7'	26°13.0 26°13.7	0.7' 0.6'	57.1' 57.1'
	SD = 16.0'	d = 1.0'			D = 15.4'		
	JD — 10.0°	u — 1.0		اد			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°02.2 194°02.4	N04°39.8	111°46.4	6.6'	N26°14.3	0.4'	57.2'
1 2	194°02.4 209°02.6	40.7 41.7	126°12.0 140°37.6	6.6' 6.6'	26°14.7 26°14.9	0.2' 0.1'	57.2' 57.2'
3	224°02.8	• • 42.7	155°03.2	6.5	26°15.0	-0.1	57.2'
4	239°02.9	43.6	$169^{\circ}28.7$	6.5'	$26^{\circ}15.0$	-0.2'	57.3'
5	254°03.1	44.6	183°54.2	6.5'	26°14.7	-0.4'	57.3'
6 7	269°03.3 284°03.5	N04°45.5 46.5	198°19.6 212°45.1	6.4' 6.4'	N26°14.3 26°13.8	-0.5' -0.7'	57.3' 57.4'
8	299°03.7	47.5	212 43.1 227°10.5	6.4	26°13.1	-0.7	57.4'
9	314°03.9	• • 48.4	241°35.8	6.4'	26°12.2	-1.0'	57.4'
10	329°04.1	49.4	256°01.2	6.3'	26°11.2	-1.2'	57.4'
11 12	344°04.2 359°04.4	50.4 N04°51.3	270°26.5 284°51.9	6.3' 6.3'	26°10.0 N26°08.7	-1.3' -1.5'	57.5' 57.5'
13	14°04.6	52.3	299°17.2	6.3	26°07.2	-1.7'	57.5'
14	29°04.8	53.2	313°42.4	6.3'	$26^{\circ}05.5$	-1.8'	57.5'
15	44°05.0	• • 54.2	328°07.7	6.3'	26°03.7	-2.0'	57.6'
16 17	59°05.2 74°05.3	55.2 56.1	342°32.9 356°58.2	6.2' 6.2'	26°01.7 25°59.6	-2.1' -2.3'	57.6' 57.6'
18	89°05.5	N04°57.1	11°23.4	6.2'	N25°57.3	-2.5'	57.7'
19	104°05.7	58.1	25°48.6	6.2'	25°54.8	-2.6'	57.7'
20	119°05.9	04°59.0	40°13.8 54°39.0		25°52.2	2.0	57.7'
21 22	134°06.1 149°06.3	05°00.0 00.9	69°04.2	6.2' 6.2'	25°49.4 25°46.4	-3.0' -3.1'	57.7' 57.8'
23	164°06.4	01.9	83°29.4	6.2'	25°43.3	-3.3'	57.8'
	SD = 16.0'	d = 1.0'		SI	D = 15.6'		
					20.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°06.6 194°06.8	N05°02.9 03.8	97°54.6 112°19.8	6.2' 6.2'	N25°40.0 25°36.6	-3.4' -3.6'	57.8' 57.8'
2	209°07.0	04.8	112 19.8 126°45.0	6.2	25°33.0	-3.8'	57.8°
3	224°07.2	• • 05.7	141°10.2	6.2'	25°29.3	-3.9'	57.9'
4	239°07.4 254°07.5	06.7	155°35.4 170°00.6	6.2' 6.2'	25°25.3 25°21.3	-4.1' -4.2'	57.9'
5 6	254°07.5 269°07.7	07.7 N05°08.6	170°00.6 184°25.8	6.2'	25°21.3 N25°17.0	-4.2' -4.4'	58.0' 58.0'
7	284°07.9	09.6	198°51.1	6.2'	25°12.6	-4.6'	58.0'
8	299°08.1	10.5	213°16.3	6.2'	25°08.1	-4.7'	58.0'
9 10	314°08.3 329°08.5	· · 11.5	227°41.5 242°06.8	6.3' 6.3'	25°03.4 24°58.5	-4.9' -5.0'	58.1' 58.1'
10 11	329°08.5 344°08.6	12.5 13.4	242°06.8 256°32.1	6.3'	24°58.5 24°53.4	-5.0° -5.2'	58.1' 58.1'
12	359°08.8	N05°14.4	270°57.4	6.3'	N24°48.3	-5.4'	58.2'
13	14°09.0	15.3	285°22.7	6.3'	24°42.9	-5.5'	58.2'
14 15	29°09.2 44°09.4	16.3 •• 17.2	299°48.0 314°13.3	6.3' 6.4'	24°37.4 24°31.7	-5.7' -5.8'	58.2' 58.2'
15 16	44°09.4 59°09.6	18.2	314°13.3 328°38.7	6.4	24°31.7 24°25.9	-5.8° -6.0'	58.2 58.3'
17	74°09.7	19.2	343°04.1	6.4	24°19.9	-6.1	58.3
18	89°09.9	N05°20.1	357°29.5	6.4'	N24°13.8	-6.3'	58.3'
19 20	104°10.1 119°10.3	21.1 22.0	11°54.9 26°20.4	6.5' 6.5'	24°07.5 24°01.1	-6.4' -6.6'	58.4' 58.4'
20	119°10.3 134°10.5	• • 23.0	26° 20.4 40° 45.8	6.5	24°01.1 23°54.5	-6.8'	58.4' 58.4'
22	149°10.7	23.9	55°11.4	6.5	23°47.7	-6.9'	58.4
23	164°10.8	24.9	69°36.9	6.6'	23°40.8	-7.1'	58.5'
	SD = 16.0'	d = 1.0'		SI	D = 15.8'		

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

Lat.		Moonris	е		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 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
N 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
N 10°	09:41	10:38	11:37	22:50	23:47	
0°	10:02	10:59	11:57	22:29	23:26	
S 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
S 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
S 60°	14:03	15:01	15:35	18:25	19:27	20:54

		Sun		Moon			
Day	Eqn.o	f Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-41%	
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	nus	,	ars	Jup	oiter	Sat	turn		Stars
Mon -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	-	SHA
0	191°51.1	135°43.6	N23° 45.5	181°27.8	N03° 42.2	20°29.5	N05°21.8	164°21.4	N08°55.5		
1	206°53.6	150°43.8	46.1	196°28.5	43.0	35°32.2	21.9	179°23.5	55.6	Alpheratz	357°32.4
2	221°56.1	165°44.0	46.8	211°29.2	43.8	50°34.9	22.0	194°25.7	55.8	Ankaa	353°05.0
3	236°58.5	180°44.1	• • 47.5	226°29.9	• • 44.5	65°37.7	22.2	209°27.9	• • 55.9	Schedar	349°28.5
4	252°01.0	195°44.3	48.1	241°30.6	45.3	80°40.4	22.3	224°30.0	56.0	Diphda	348°45.0
5	267°03.5	210°44.4	48.8	256°31.3	46.1	95°43.1	22.4	239°32.2	56.1	Achernar	335°18.9 327°48.5
6	282°05.9	225°44.6	N23°49.4	271°32.0	N03°46.9	110°45.8	N05°22.5	254°34.4	N08°56.2	Hamal Polaris	313°01.3
7	297°08.4	240°44.7	50.1	286°32.7	47.6	125°48.5	22.6	269°36.5	56.3	Acamar	315°10.2
8	312°10.9	255° 44.9	50.8	301°33.4	48.4	140°51.2	22.7	284°38.7	56.4	Menkar	314°03.6
9	327°13.3	270°45.1	• • 51.4	316°34.1	• • 49.2	155°54.0	• • 22.8	299°40.9	• • 56.5	Mirfak	308°24.8
10	342°15.8 357°18.2	285° 45.2 300° 45.4	52.1	331°34.8 346°35.5	50.0 50.7	170°56.7 185°59.4	22.9	314°43.1 329°45.2	56.7	Aldebaran	290°36.8
11 12	12°20.7	300 45.4 315°45.5	52.7 N23°53.4	1°36.2	N03°51.5	201°02.1	23.0 N05°23.1	329 45.2 344°47.4	56.8 N08°56.9	Rigel	281°01.5
13	27°23.2	330°45.7	54.0	16°36.9	52.3	216°04.8	23.2	359°49.6	57.0	Capella	280°18.2
14	42°25.6	345°45.9	54.7	31°37.6	53.1	231°07.5	23.3	14°51.7	57.1	Bellatrix	278°20.2
15	57°28.1	0°46.0	• • 55.3	46°38.3	• • 53.8	246°10.3	• • 23.4	29°53.9	• • 57.2	Elnath	277°58.7
16	72°30.6	15°46.2	56.0	61°39.0	54.6	261°13.0	23.5	44°56.1	57.3	Alnilam	275°35.2
17	87°33.0	30°46.4	56.6	76°39.6	55.4	$276^{\circ}15.7$	23.6	59°58.2	57.4	Betelgeuse Canopus	270°49.3 263°51.3
18	102°35.5	45°46.5	N23°57.2	91°40.3	N03°56.1	291°18.4	N05°23.7	75°00.4	N08°57.6	Sirius	258°23.9
19	117°38.0	60°46.7	57.9	106°41.0	56.9	306°21.1	23.8	90°02.6	57.7	Adhara	255°03.8
20	132°40.4 147°42.9	75°46.9	58.5	121°41.7	57.7	321°23.8	23.9	105°04.8	57.8	Procyon	244°48.0
21 22	147°42.9 162°45.4	90°47.0 105°47.2	· · 59.2 23°59.8	136°42.4 151°43.1	· · 58.5 03°59.2	336°26.6 351°29.3	· · 24.0 24.1	120°06.9 135°09.1	· · 57.9 58.0	Pollux	243°14.0
23	102 45.4 177°47.8	105 47.2 120°47.4	24° 00.5	166°43.8	03 39.2 04°00.0	6°32.0	24.1	150°11.3	58.1	Avior	234°13.4
-										Suhail	222°44.1
Mer.p	ass. 11:11	ν 0.2′ d0.	/′ m-4.5/	ν 0.7′ d0	.8′ m1.08	ν 2.7′ d0.	1′ m-2.44	$\nu^{2.2'} d0$.1′ m0.53	Miaplacidus	221°37.1
										Alphard Regulus	217°45.0 207°31.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3
0	192°50.3	135° 47.6	N24°01.1	181°44.5	N04°00.8	21°34.7	N05°24.3	165°13.4	N08°58.2	Denebola	182°22.0
1	207°52.7	150°47.7	01.7	196°45.2	01.5	36°37.4	24.4	180°15.6	58.3	Gienah	175°40.5
2	222°55.2	165°47.9	02.4	211°45.9	02.3	51°40.1	24.5	195°17.8	58.5		172°56.3
3 4	237°57.7 253°00.1	180° 48.1 195° 48.3	· · 03.0 03.7	226°46.6 241°47.3	· · 03.1 03.9	66°42.9 81°45.6	· · 24.6 24.7	210°19.9 225°22.1	· · 58.6 58.7	Gacrux	171°48.0
5	268°02.6	210°48.4	04.3	256°48.0	03.9	96°48.3	24.7	240°24.3	58.8	Alioth	166°10.2
6	283°05.1	225°48.6	N24°04.9	271°48.7	N04°05.4	111°51.0	N05°24.9	255°26.4	N08°58.9	Spica	158°19.2
7	298°07.5	240°48.8	05.6	286°49.4	06.2	126°53.7	25.0	270°28.6	59.0	Alkaid Hadar	152°49.5 148°31.5
8	$313^{\circ}10.0$	255°49.0	06.2	301°50.1	06.9	141°56.4	25.1	285°30.8	59.1		146 31.5 147°54.1
9	$328^{\circ}12.5$	270°49.2	• • 06.8	316°50.8	• • 07.7	$156^{\circ}59.1$	• • 25.2	300°33.0	•• 59.2	Arcturus	145°45.2
10	343°14.9	285°49.3	07.5	331°51.5	08.5	172°01.9	25.3	315°35.1	59.4	Rigil Kent.	139°36.0
11	358°17.4	300°49.5 315°49.7	08.1 N24°08.7	346°52.2	09.3	187°04.6	25.5	330°37.3 345°39.5	59.5	Kochab	$137^{\circ}19.0$
12 13	13°19.9 28°22.3	315 49.7 330°49.9	N24 08.7 09.4	1°52.9 16°53.6	N04° 10.0 10.8	202°07.3 217°10.0	N05°25.6 25.7	345 39.5 0°41.6	N08°59.6 59.7	Zuben'ubi	$136^{\circ}52.8$
14	20 22.3 43°24.8	345°50.1	10.0	31°54.2	11.6	232°12.7	25.7 25.8	15°43.8	59.7 59.8	Alphecca	126°01.2
15	58°27.2	0°50.3	. 10.6	46°54.9	12.3	247°15.4	• • 25.9	30°46.0	08°59.9	Antares	112°12.4
16	73°29.7	15°50.4	11.2	61°55.6	13.1	262°18.1	26.0	45°48.1	09°00.0	Atria Sabik	107°03.9 101°59.6
17	88°32.2	30°50.6	11.9	$76^{\circ}56.3$	13.9	277°20.8	26.1	60°50.3	00.1	Shaula	96°06.6
18	103°34.6	45°50.8	N24°12.5	91°57.0	N04°14.6	292°23.6	N05°26.2	75°52.5	N09°00.3	Rasalhague	95°56.0
19	118°37.1	60°51.0	13.1	106°57.7	15.4	307°26.3	26.3	90°54.6	00.4	Eltanin	90°40.8
20	133°39.6	75°51.2	13.7	121°58.4	16.2	322°29.0	26.4	105°56.8	00.5	Kaus Aust.	83°28.9
21	148°42.0 163°44.5	90°51.4 105°51.6	· · 14.4 15.0	136°59.1 151°59.8	· · 17.0 17.7	337°31.7 352°34.4	· · 26.5 26.6	120°59.0 136°01.1	· · 00.6 00.7	Vega	80°31.4
22 23	103 44.5 178°47.0	105 51.0 120°51.8	15.6	167°00.5	18.5	7°37.1	26.7	150 01.1 151°03.3	00.7	Nunki	75°44.5
										Altair	61°57.4
Mer.p	ass. 11:07	ν 0.2′ d0.0	6′ m-4.58	ν 0.7′ d0	.8′ m1.08	$\nu 2.7' d0.$	1′ m-2.44	$\nu^{2.2'} d0$.1′ m0.53	Peacock	53°01.8 49°24.2
										Deneb Enif	49 24.2 33°36.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.0
0	193°49.4	135°52.0	N24°16.2	182°01.2	$N04^{\circ}19.3$	22°39.8	N05°26.8	$166^{\circ}05.5$	N09°00.9	Fomalhaut	15°11.9
1	208°51.9	150°52.2	16.8	197°01.9	20.0	37°42.5	26.9	181°07.7	01.0	Scheat	13°42.9
2	223°54.3	165°52.4	17.5	212°02.6	20.8	52°45.2	27.0	196°09.8	01.2	Markab	$13^{\circ}27.5$
3	238°56.8 253°59.3	180° 52.6 195° 52.8	· · 18.1 18.7	227°03.3 242°04.0	• • 21.6	67°48.0 82°50.7	· · 27.1 27.2	211°12.0 226°14.2	01.3	Apr 03 Mon	SHA
4 5	269°01.7	210°53.0	19.3	242 04.0 257°04.7	22.3 23.1	97°53.4	27.2	241°16.3	01.4 01.5	Venus	
6	284°04.2	225°53.2	N24° 19.9	272°05.4	N04°23.9	112°56.1	N05°27.4	256°18.5	N09°01.6	Mars	
7	299°06.7	240°53.4	20.5	287°06.1	24.6	127°58.8	27.5	271°20.7	01.7		188°38.4
8	$314^{\circ}09.1$	255°53.6	21.1	302°06.8	25.4	143°01.5	27.6	286°22.8	01.8	Saturn	332°30.2
9	$329^{\circ}11.6$	270°53.8	• • 21.8	$317^{\circ}07.5$	• • 26.2	158°04.2	• • 27.7	301°25.0	•• 02.0	Apr 04 Tue	SHA
10	344°14.1	285°54.0	22.4	332°08.2	27.0	173°06.9	27.8	316°27.2	02.1		302°57.3
11	359°16.5	300°54.2	23.0	347°08.9	27.7	188°09.6	27.9	331°29.3	02.2		348°54.2
12	14°19.0	315°54.4	N24°23.6	2°09.5	N04°28.5	203°12.3	N05°28.0	346°31.5	N09°02.3		188°44.4
13 14	29°21.5 44°23.9	330° 54.6 345° 54.8	24.2 24.8	17°10.2 32°10.9	29.3 30.0	218°15.0 233°17.8	28.1 28.2	1°33.7 16°35.8	02.4 02.5		$332^{\circ}23.1$
15	59°26.4	0°55.0	25.4	47°11.6	30.8	248°20.5	28.3	31°38.0	02.6	Apr 05 Wed	SHA
16	74°28.8	15°55.2	26.0	62°12.3	31.6	263°23.2	28.4	46°40.2	02.7		302°02.6
17	89°31.3	30°55.4	26.6	77°13.0	32.3	278°25.9	28.5	61°42.3	02.9		348°11.8
18	104°33.8	45° 55.6	N24° 27.2		N04°33.1	293°28.6	N05°28.6	76°44.5	N09°03.0		188°50.4
19	119°36.2	60°55.9	27.8	107°14.4	33.9	308°31.3	28.7	91°46.7	03.1	Saturn	332°16.1
20	134°38.7	75°56.1	28.4	122°15.1	34.6	323°34.0	28.8	106°48.8	03.2	Horizont	al parallax
21 22	149°41.2 164°43.6	90° 56.3 105° 56.5	· · 29.0 29.6	137°15.8 152°16.5	· · 35.4 36.2	338°36.7 353°39.4	· · 28.9 29.0	121°51.0 136°53.2	· · 03.3 03.4	1101120111	Venus:
23	179°46.1	105°56.7	30.2	167°17.2	36.2	8°42.1	29.0	150°55.4	03.4		Mars:
							1′ m-2.43				
ivier.p	ass. 11:03	ν 0.2′ d0.0	υ III-4.5ŏ	ν 0.1' d0	.8′ m1.09	ν2.1' αU.	.1 m-2.43	ν2.2' d 0	.1′ m0.53	-	

Dec

29°14.7 -42°09.1

56°41.5

-17°49.9

-57°05.6

 $23^{\circ}35.7$

 $89^{\circ}23.1$

-40°11.6

 $4^{\circ}11.9$

49°57.7 16°33.9

-8°10.3

 $46^{\circ}01.6$

 $28^{\circ}37.8$

 $-1^{\circ}11.2$

7°24.6 -52°43.0

-16°45.6 -29°00.9

 $5^{\circ}09.0$

 $27^{\circ}57.4$

-59°36.4

-43°33.2

-69°50.3 -8°47.1

11°49.5

 $61^{\circ}35.9$

 $14^{\circ}24.6$

-17°42.2

 $-63^{\circ} 15.5$ $-57^{\circ} 16.5$

55°48.2 -11°18.7

49° 10.1 -60° 30.6 -36° 30.6

 $19^{\circ}01.9$

-60°57.1

74°02.1 -16°09.7

26°36.9 -26°29.7

-69°04.4

-15°45.6

 $\text{-37}^{\circ}\text{07.3}$

 $12^{\circ}32.2$

51°28.8

-34°22.1

38°48.3 -26°15.6

8°56.5

-56°38.3

45°22.7

 $10^{\circ}00.2$

 $-46^{\circ}49.3$

-29°28.3

28°14.1

15°21.4

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

 $6^{\circ}22.4$

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.0	N05°25.9	84°02.5	6.6'	N23°33.7	-7.2'	58.5
1 2	194°11.2 209°11.4	26.8 27.8	98°28.1 112°53.7	6.6' 6.7'	23°26.5 23°19.2	-7.4' -7.5'	58.5' 58.6'
3	209 11.4 224°11.6	28.7	112 55.7 127°19.4	6.7	23°11.6	-7.3 -7.7'	58.6
4	239°11.8	29.7	141°45.0	6.7'	23°04.0	-7.8'	58.6'
5	254°11.9	30.6	156°10.8	6.8'	22°56.2	-8.0'	58.6'
6 7	269°12.1 284°12.3	N05°31.6 32.5	170°36.5 185°02.3	6.8' 6.8'	N22°48.2 22°40.1	-8.1' -8.3'	58.7' 58.7'
8	299°12.5	33.5	199°28.2	6.9'	22°31.8	-8.4	58.7'
9	314°12.7	• • 34.5	213°54.1	6.9'	22°23.4	-8.5'	58.8'
10 11	329°12.8 344°13.0	35.4 36.4	228°20.0 242°45.9	7.0' 7.0'	22°14.9 22°06.2	-8.7' -8.8'	58.8' 58.8'
12	359°13.2	N05°37.3	242 45.9 257°11.9	7.0'	N21°57.4	-0.0 -9.0'	58.8
13	14°13.4	38.3	271°38.0	7.1'	21°48.4	-9.1'	58.9'
14	29°13.6	39.2	286°04.0	7.1'	21°39.3	-9.3'	58.9'
15 16	44°13.8 59°13.9	· · 40.2 41.1	300°30.2 314°56.3	7.2' 7.2'	21°30.0 21°20.6	-9.4' -9.5'	58.9' 59.0'
17	74°14.1	42.1	329°22.5	7.2'	21°11.1	-9.7'	59.0'
18	89°14.3	N05°43.0	343°48.8	7.3'	N21°01.4	-9.8'	59.0'
19 20	104°14.5 119°14.7	44.0 44.9	358°15.1 12°41.4	7.3' 7.4'	20°51.6 20°41.6	-9.9' -10.1'	59.0' 59.1'
20	119 14.7 134°14.8	· · 45.9	12 41.4 27°07.8	7.4 7.4'	20 41.6 20°31.6	-10.1 -10.2'	59.1'
22	149°15.0	46.9	41°34.2	7.5'	20°21.3	-10.4	59.1
23	164°15.2	47.8	56°00.7	7.5'	20°11.0	-10.5'	59.1'
	SD = 16.0'	d = 1.0'		S	D = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.4	N05°48.8	70°27.2	ν 7.6'	N20°00.5	-10.6'	59.2'
1	194°15.6	49.7	$84^{\circ}53.8$	7.6'	19°49.9	-10.7'	59.2'
2	209°15.7	50.7	99°20.4	7.7'	19°39.1	-10.9'	59.2'
3 4	224°15.9 239°16.1	• • 51.6 52.6	113°47.0 128°13.7	7.7' 7.8'	19°28.3 19°17.3	-11.0' -11.1'	59.2' 59.3'
5	254°16.3	53.5	142°40.5	7.8'	19°06.2	-11.2'	59.3'
6	269°16.5	N05°54.5	157°07.3	7.8'	N18°54.9	-11.4'	59.3'
7 8	284°16.7 299°16.8	55.4 56.4	171°34.1 186°01.0	7.9' 7.9'	18°43.5 18°32.0	-11.5' -11.6'	59.4' 59.4'
9	314°17.0	57.3	200°28.0	7.9 8.0'	18°20.4	-11.0	59.4'
10	329°17.2	58.3	214°55.0	8.0'	18°08.7	-11.9'	59.4'
11	344°17.4	05°59.2	229°22.0	8.1'	17°56.8	-12.0'	59.5'
12 13	359°17.6 14°17.7	N06°00.2 01.1	243°49.1 258°16.2	8.1' 8.2'	N17°44.9 17°32.8	-12.1' -12.2'	59.5' 59.5'
14	29°17.9	02.1	272°43.4	8.2'	17°20.6	-12.3'	59.5'
15	44°18.1	• • 03.0	287°10.6	8.3'	17°08.3	-12.4'	59.6'
16 17	59°18.3 74°18.5	04.0 04.9	301°37.9 316°05.2	8.3' 8.4'	16°55.8 16°43.3	-12.5' -12.7'	59.6' 59.6'
18	89°18.6	N06°05.9	330°32.5	8.4	N16°30.6	-12.7	59.6'
19	104°18.8	06.8	345°00.0	8.5'	16°17.9	-12.9'	59.7'
20	119°19.0 134°19.2	07.8	359°27.4 13°54.9	8.5'	16°05.0		
21 22	134°19.2 149°19.4	· · 08.7 09.7	28°22.5	8.5' 8.6'	15°52.0 15°39.0	-13.1' -13.2'	59.7' 59.7'
23	164°19.5	10.6	42°50.0	8.6'	15°25.8	-13.3	59.8'
	SD = 16.0'	d = 1.0'		S	D = 16.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.7	N06°11.6	57°17.7	8.7'	N15°12.5	-13.4'	59.8'
1	194°19.9	12.5	71°45.4	8.7'	14°59.1	-13.5'	59.8'
2	209°20.1 224°20.2	13.5 •• 14.4	86°13.1 100°40.9	8.8' 8.8'	14°45.6 14°32.1	-13.6' -13.7'	59.8' 59.8'
3 4	224 20.2 239°20.4	15.3	100 40.9 115°08.7	8.9'	14 32.1 14°18.4	-13.7 -13.8'	59.8 59.9'
5	254°20.6	16.3	129°36.5	8.9'	14°04.6	-13.9'	59.9'
6	269°20.8 284°21.0	N06°17.2 18.2	144°04.4 158°32.4	8.9'	N13°50.8 13°36.8	-14.0'	59.9'
7 8	284°21.0 299°21.1	18.2 19.1	158°32.4 173°00.3	9.0' 9.0'	13°36.8 13°22.8	-14.0' -14.1'	59.9' 60.0'
9	314°21.3	• • 20.1	$187^{\circ}28.4$	9.1'	13°08.6	-14.2'	60.0'
10	329°21.5	21.0	201°56.4	9.1'	12°54.4	-14.3'	60.0'
11 12	344°21.7 359°21.9	22.0 N06°22.9	216°24.5 230°52.7	9.1' 9.2'	12°40.1 N12°25.7	-14.4' -14.5'	60.0' 60.0'
13	14°22.0	23.9	245°20.8	9.2'	12°11.3	-14.5'	60.1
14	29°22.2	24.8	259°49.0	9.2'	11°56.7	-14.6'	60.1'
15	44°22.4	• • 25.8	274°17.3	9.3'	11°42.1	-14.7'	60.1'
16 17	59°22.6 74°22.7	26.7 27.6	288°45.6 303°13.9	9.3' 9.4'	11°27.4 11°12.6	-14.8' -14.9'	60.1' 60.1'
18	89°22.9	N06°28.6	317°42.3	9.4	N10°57.8	-14.9'	60.1
19	104°23.1	29.5	332°10.6	9.4'	10°42.8	-15.0'	60.2'
20 21	119°23.3 134°23.5	30.5 · · 31.4	346°39.1 1°07.5	9.5' 9.5'	10°27.8 10°12.8	-15.1' -15.1'	60.2' 60.2'
22	134 23.5 149°23.6	32.4	15°36.0	9.5° 9.5°	10°12.8 09°57.6	-15.1 -15.2'	60.2'
23	164°23.8	33.3	30°04.5	9.5'	09°42.4	-15.3'	60.2
	SD = 16.0'	d = 0.9'		S	D = 16.3'		
	_						

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	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
S 50°	05:16	05:54	06:26	17:39	18:11	18:48
52°	05:15	05:54	06:28	17:37	18:11	18:49
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
S 60°	05:08	05:56	06:37	17:27	18:08	18:57
				1		

Lat.		Moonris	е		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
N 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
N 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
N 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
S 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° 45°	14:15	14:52	15:24	02.51	00:06	01:21
-	14:31	15:04	15:32	23:51		01:10
S 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°	15:23	15:42	15:56	23:03	•• ••	00:37
58° S 60°	15:36	15:51 16:02	16:02	22:50 22:34		00:28 00:18
3 00	15:52	10:02	16:09	22:34	•••••	00:10

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

The Girs G	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1	Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1													
2 294*55 1069*57 306 277*201 400 600 200											Alpheratz		
3 287/589 1887-77 6 250 2727-200 400 687-59 297-70 6 2011 400											Ankaa		
1											I		
5 287°00 210°30 310°30 328 30°30 40°4 4 277°21 1 Mort 23 11°10°11 10°29 7 277°10°10 80°10 31 30°30 20°32 11°30 20°32 11°30 30°30 4 30°30 30°30 30°30 4 30°30 30°30 4 30°30 30°30 30°30 4 30°30 3											Diphda		
See 1988 1											I		
7											Hamal		
8 815'083 295'87 36 6 207'285 438 144"065 2.000 396"149 0.45 446 197'092 2.000 390"175 0.67 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
10 389*19.7 270*19.8 -3.02 317*24.2 -4.46 150*19.0 2.000 300*17.10 -0.04 4.000*17.10 -0.04 1.000*17.10 -0.04 -													
10											I		
11 0 15 7 300 94 93 34 72 5 401 180 180 180 30 382 21 4 0.49 4 0.49 20 11 2 15 15 13 15 96 72 73 74 72 28 74 74 74 74 74 74 74 7													
19 19:181 315*96 New 1979 2'202 NoP*409 20*11.9 NoP*303 347*235 NoP*00.0 Complex 1979 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1											Aldebaran		
39 20 20 30 99 9 35 1 1726											Rigel		
15 00000 00000 00000 00000 00000 00000 000											Capella		
15 67°25.5 1"00.3 397 4"783 3"40.2 244"5.6 30.6 32"80.0 0.63 3"10.0 3											Bellatrix	278°20.2	6°22.4
16											Elnath	277°58.7	28°37.8
17 90°304 41°010 31°08 40°10 77°29° 50°7 279°308 308 62°344 0.6.6 68*** 68**											Alnilam	275°35.2	$-1^{\circ}11.2$
18 105*32.9 de 10*32.9 de 10*32.0 de 10*32.1 de 10*32.9											Betelgeuse	270°49.3	
19 120°354 170°103 420 107°311 523 390°362 310 92°387 0.58 Allium 25°393 390°302 20°102 20°103 20											Canopus	263°51.3	-52°43.0
20											Sirius	258°23.9	
150 40.3 150											Adhara	255°03.8	-29°00.9
165-9428 105-902 44.3 152-933.2 54.5 384-94.3 31.3 137-94.2 06.1 157-94.5 157-95.3 359-94.6 37-94.5 31.4 152-94.7 66.1 157-94.5 34.5 359-94.6 34.5 359-94.6 34.5											Procyon	244°48.0	5°09.0
Mer. pass. 10:59												243°14.0	27°57.4
Mer. Pass. 10.59											Avior	234°13.4	-59°36.4
Mer. pass. 10.59	23	180 45.2	121-02.2	44.3					152-47.4	06.2	Suhail	222°44.1	
Fir GHA CHA	Mer.p	ass. 10:59	ν 0.2′ d0.	.6′ m-4.59	ν 0.7 $^{\prime}$ d0	.8′ m1.09	$\nu 2.7' \ d0.$	1' m-2.43	$\nu 2.2' \ d0$.1′ m0.52			
Fig. 6HA													
The CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec				_		_		_		_			
1 20"502 11"00.7 45.5 19"35.3 56.8 39"52.4 31.6 192"51.7 00.5 66.8 18"00.7 17"6.9 06.5 18"10"0.7 18"10"0.												193°37.3	61°35.9
2 225°526 166°03.0 46.1 212°36.0 57.6 58°55.1 31°03.2 40°56.5 181°03.2 406°03.5 40°76.											I		
2 225°5.26 166 03.0 46.1 212°3.0 57.6 54°5.1 31.7 197°53 0.66 32.2 225°5.6 166 03.0 4.7 2.7 30.7 3													
3 240°551 101°032 0.466 227°367 0.584 0.5784 0.5786											I		
\$\$ 271".00 211".07.7 47.8 \$\$ 277".38.1 \ \text{orange}\$ 0.5 \$\$ 31.9 \$\$ 227".58.2 \ \text{orange}\$ 0.8 \$\$ 31.9 \$\$ 227".58.2 \ \text{orange}\$ 0.8 \$\$ 31.9 \$\$ 227".58.2 \ \text{orange}\$ 0.8 \$\$ 247".004 \ \text{orange}\$ 0.9 \$\$ 21.0 \$\$ 247".004 \ \text{orange}\$ 0.9 \$\$ 21.0 \$\$ 247".004 \ \text{orange}\$ 0.9 \$\$ 21.0 \$\$ 247".004 \ \text{orange}\$ 0.0 \$\$ 247".004 \ \text{orange}\$ 0.0 \$\$ 22.0 \$\$ 1.15".005 \ \text{orange}\$ 0.0 \$\$ 2.2 \$\$ 1.00".005 \ \text{orange}\$ 0.0 \$\$ 2.0 \$\$ 1.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00 \$\$ 1.00".005 \ \text{orange}\$ 0.0 \$\$ 1.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00".005 \ \text{orange}\$ 0.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00".005 \ \text{orange}\$ 0.00".005 \ \text{orange}\$ 0.0 \$\$ 2.00".005 \ \text{orange}\$ 0.00".005 \ \text{orange}\$ 0.000 \ \text{orange}\$ 0.0000 \ \text{orange}\$ 0.0000 \ \text{orange}\$ 0.0000											I		
5 271°00.0 271°00.7 478 257°38.1 04°50.9 100°03.2 33.0 243°00.4 06.9 05°10.6 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5 268°10.5 368°10.5													
6 286°025 226°040 N24"844 272"388 N05"007 115"059 N05"321 225"05 N09"07.0 71 7 301"049 241"04											I		
7 301°049 241°042 489 287°395 01.4 130°08.6 32.2 273°40.7 07.1 8 316°07 425°6045 495 302°40.2 0.2 145°11.3 32.3 288°06.9 07.2 9 331°097 25°6045 495 302°40.2 0.2 145°11.3 32.3 308°09.0 07.2 10 346°12.3 286°65.0 50.6 320°40.2 0.2 145°11.3 32.3 308°09.0 07.5 11 1 1°14.8 301°65.2 51.2 347°42.2 04.5 190°19.4 32.5 333°13.4 07.6 11 1 1°14.8 301°65.5 N24°51.8 24°2.9 N50°62. 20°22.1 N50°32.6 348°15.5 N90°07.7 13 31°19.7 316°65.5 N24°51.8 2°42.9 N50°62. 20°22.1 N50°32.6 348°15.5 N90°07.7 13 31°19.7 316°65.5 N24°51.8 2°42.9 N50°62. 20°22.1 N50°32.6 348°15.5 N90°07.7 13 31°19.0 31°66.0 52.9 32°44.3 N6.8 235°75. 32.8 18°19.9 07.9 14 46°2.2 346°60.0 52.9 32°44.3 N6.8 235°75. 32.8 18°19.9 07.9 15 61°24.7 1°66.3 53.5 47°45.0 ···0.75 250°30.2 ···3.29 33°22.0 ···0.80 16 76°27.1 16°6.5 540.0 62°45.7 N6.8 256°32.9 33.0 48°24.2 08.1 18 106°32.0 46°07.1 N24°551. 90°47.1 N05°08.2 95°38.3 N50°33.2 **78°28.5 N90°08.4 18 106°32.0 46°07.1 N24°551. 90°47.1 N05°08.2 95°38.3 N50°33.2 **78°28.5 N90°08.4 19 121°345. 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 93°30.7 08.5 19 121°345. 61°07.6 56.3 137°49.2 ···12.1 340°46.4 ···33.5 123°35.0 ···08.7 Mer.pass. 10·55. V.O.2 d0.6 m-4.60 V.O.7 d 0.8 m1.0 V.2.7 d0.1 m-2.2 v.2.2 d0.1 m0.52 Sat GHA CHA CHA CHA CHA CHA CHA CHA	6			N24°48.4		N05°00.7		N05°32.1		N09°07.0			
8 316°07.4 26°04.5 49.5 302°40.2 02.2 146°11.3 32.3 288°06.9 07.2 10 346°12.3 286°05.0 50.6 332°41.5 03.7 175°16.7 32.4 318°11.2 07.5 11 1°14.8 301°05.2 51.2 347°42.2 04.5 190°19.4 32.5 333°13.6 07.6 12 16°17.3 316°05.5 N24°51.8 2°42.9 N05°05.2 205°22.1 N05°32.6 348°15.5 N09°07.7 13 31°19.7 331°06.5 52.9 32°44.3 06.8 235°27.5 32.8 18°19.9 07.9 14 46°22.2 346°06.0 52.9 32°44.3 06.8 235°27.5 32.8 18°19.9 07.9 15 61°24.7 1°06.3 55.3 47°45.0 07.5 250°30.2 32.9 33°22.0 08.0 16 76°27.1 16°06.5 54.0 62°45.7 08.3 265°32.9 330.0 48°24.2 08.1 17 91°29.6 31°06.8 54.6 77°46.4 09.0 280°5.6 331. 63°26.4 08.3 18 106°32.0 46°07.1 N24°55.1 92°47.1 N05°09.8 19 121°34.5 61°07.8 55.8 132°48.5 11.3 325°43.7 33.4 108°32.9 08.6 19 121°34.5 61°07.8 55.8 132°49.8 11.3 325°43.7 33.4 108°32.9 08.6 19 121°39.4 91°07.8 · 56.8 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 19 121°39.4 91°07.8 · 56.8 132°49.4 11.2 1240.6 4 03.3 181°44.4 121°08.4 57.9 10 121°39.4 91°07.8 · 56.8 132°49.6 11.3 325°43.7 33.4 108°32.9 08.6 10 16°46.8 136°08.7 N24°58.5 182°51.3 N05°14.4 25°54.5 N05°33.8 183°37.2 08.8 12 11°39.4 91°07.6 · 56.3 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 10 16°46.8 136°08.7 N24°58.5 182°51.3 N05°14.4 25°54.5 N05°33.8 168°41.5 N09°09.0 11 21°49.3 151°08.9 59.0 107°57.0 157.5 15.8 33.7 153°39.4 08.9 12 121°49.3 151°08.9 59.0 107°57.0 15.1 40°57.2 33.9 183°43.7 09.2 12 121°49.3 151°08.9 50.0 102°28.6 19.7 131°13.4 34.4 23°55.7 09.3 12 121°49.3 151°08.9 70.7 0.7 42°54.1 11.7 48°50.5 34.1 128°50.9 09.9 13 32°19.0 271°11.0 0.1 225°34.8 18.2 101°08.0 34.2 243°52.4 09.6 13 32°18.9 331°12.3 05.6 18°00.3 24.3 122°3.5 180°4.0 10.3 34°0.0 10.1 10.1 227°4.0 11.1 22°13.9 301°11.7 04.5 347°8.9 22.1 1100.0 N05°3.3 10°3.3 40°0.0 10.1 10.1 10.1 10.1 10.1 10.1 12°13.9 301°11.7 04.5 347°8.9 22.1 1100.0 N05°3.3 12°3.8 340°0.0 10.1 10.1 10.1 10.1 10.1 10.1 10.1	7			48.9		01.4				07.1			
9 331°09.9 271°047 . 50.1 317°40.8 · 02.9 160°14.0 · 32.3 30°30.0 · 0.74 10 346°05.0 50.6 50.6 332°41.5 0.37 175°16.7 32.4 318°11.4 0.76 11 1°14.8 301°05.2 51.2 347°42.2 04.5 190°19.4 32.5 333°13.4 0.76 12 1°17.3 316°05.5 N24°51.8 2°42.9 N05°05.2 205°21. N05°32.6 348°15.5 N09°07.7 13 31°19.7 331°05.7 52.3 17°43.6 06.0 220°24.8 32.7 3°17.7 07.8 14 46°22.2 346°06.0 52.9 32°44.3 06.8 235°27.5 32.8 18°19.0 70.9 15 61°24.7 1°06.3 · 53.5 47°45.0 · 07.5 250°30.2 · 32.9 33.0 33°22.0 · 08.0 16 76°27.1 16°06.5 54.0 62°45.7 08.3 265°32.9 33.0 48°24.2 08.1 17 91°29.6 31°06.8 54.6 77°46.4 09.0 280°35.6 33.1 63°26.4 08.3 581.0 100°32.0 46°07.1 N24°55.1 92°47.1 N05°08.8 295°38.3 N05°33.2 78°25.5 N09°08.4 281.8 100°3.0 0.8 54.6 77°46.4 09.0 280°35.6 33.1 63°26.4 08.3 581.0 100°3.2 10°3.0 0.8 54.6 77°46.4 10.0 1.2 2°43.1 N05°0.0 1.2 2°43.7 33.4 108°32.0 80.6 2.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	8	316°07.4	256°04.5	49.5	302°40.2	02.2	145°11.3	32.3	288°06.9	07.2	I		
10 346°12.3 286°05.0 50.6 332°41.5 03.7 176°16.7 32.4 318°11.2 07.5 07.6 07.6 11 11 14.8 301°05.2 51.2 347°42.2 04.5 109°19.4 32.5 333°13.5 07.6 07.6 07.6 12 16°17.3 316°05.5 N24°51.8 2°42.9 N06°05.2 205°22.1 N06°32.6 348°15.5 N09°07.7 07.8 07.6 07.8 07	9	331°09.9	271°04.7	•• 50.1	317°40.8	• • 02.9	160°14.0	• • 32.3	303°09.0	•• 07.4	I		
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12 16°17.3 316°05.5 52.0 17°43.6 06.0 20°22.1 N05°32.6 348°15.5 N09°07.7 13 31°19.7 331°05.7 52.3 17°43.6 06.0 20°20.2 4.8 3.7 3°17.7 07.8 14 46°22.2 346°06.0 52.9 32°44.3 06.8 235°27.5 32.8 18°19.9 07.9 15 61°24.7 1°06.3 53.5 47°45.0 0.75.5 250°30.2 2.32.9 33°20.2 0.80 16 76°27.1 16°06.5 54.0 62°45.7 08.3 266°32.9 33.0 48°24.2 08.1 17 91°20.6 31°06.8 54.6 77°46.4 09.0 280°35.6 33.1 63°64.0 08.1 18 106°32.0 46°07.1 N24°55.1 92°47.1 N05°08.8 295°38.3 N05°33.2 78°38.5 N09°08.4 19 121°34.5 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 93°0.7 08.5 19 121°34.5 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 93°0.7 08.5 11 51°39.4 91°07.8 56.8 137°49.2 12.1 340°46.4 33.5 123°35.0 0.8.7 12 16°30.0 76°07.6 56.3 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 18 18 444 121°08.4 57.9 167°50.6 13.6 10°51.8 33.7 153°39.4 08.9 18 18 19 18 18 18 18 18 18 18 18 18 18 18 18 18	11	1°14.8	301°05.2	51.2	347°42.2	04.5	190°19.4		333°13.4	07.6	"		
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14 46°22.2 346°66.0 52.9 32°44.3 06.8 235°27.5 32.8 18°19.9 07.9 dAntares 112°12.3 26°29.7 156 61°24.7 16°66.5 54.0 62°45.7 08.3 265°30.2 32.9 33°22.0 0.80.0 Atria 107°03.8 69°04.4 107°03.8 110°03.0 46°07.1 N24°55.1 92°47.1 N05°09.8 295°38.3 N05°33.2 78°28.5 N05°86.4 N3.3 18 106°32.0 46°07.1 N24°55.1 92°47.1 N05°09.8 295°38.3 N05°33.2 78°28.5 N05°86.4 N3.3 Shaula 96°06.6 -37°07.3 115°39.4 91°07.8 · 56.8 137°49.2 · 12.1 340°46.4 33.5 123°35.0 · 0.87 Vega 136°41.9 106°08.1 57.4 152°49.9 12.9 355°49.1 33.6 138°37.2 08.8 Nunki 75°44.5 26°15.6 Ner.pass. 10.55	13	31°19.7	331°05.7	52.3	17°43.6	06.0	220°24.8		3°17.7	07.8			
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16 76°27.1 16°06.5 54.0 62°45.7 08.3 265°32.9 33.0 48°24.2 08.1 17 91°29.6 31°06.8 54.6 77°46.4 09.0 280°35.6 33.1 63°26.4 08.1 18 106°32.0 46°07.1 N24°55.1 92°47.1 N05°9.8 25°38.3 N05°33.2 78°28.5 N09°08.4 19 121°34.5 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 93°30.7 08.5 20 136°37.0 76°07.6 56.3 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 21 151°39.4 91°07.8 · 56.8 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 22 106°41.9 106°08.1 57.4 152°49.9 12.9 355°49.1 33.6 138°37.2 08.8 181°44.4 121°08.4 57.9 167°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 Mer.pa	15	61°24.7	1°06.3	• • 53.5	47°45.0	• • 07.5	250°30.2	· · 32.9	33°22.0	• • 08.0	I		
18	16	76°27.1	$16^{\circ}06.5$	54.0		08.3	265°32.9	33.0	48°24.2	08.1			
18 106°32.0 46°07.1 N24°55.1 92°47.1 N05°09.8 92°538.3 N05°33.2 78°28.5 N09°08.4 Rasalhague 96°55.0 12°32.2 151°34.5 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 97°30.7 08.5 Eltanin 90°40.8 51°28.8 20 136°37.0 76°07.6 56.3 122°48.5 11.3 325°43.7 33.4 108°32.9 08.6 Kaus Aust. 83°28.9 -34°22.1 21°19.9 106°08.1 57.4 152°49.9 12.9 355°49.1 33.6 138°37.2 08.8 Nunki 76°44.5 26°15.6 23°181°44.4 121°08.4 57.9 167°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Nunki 76°44.5 26°15.6 Nunki 76°44.5 26°10.8 Nunki 76°44.5 26°65.7 196°09.7 Nunki 76°20.1 15.1 40°57.2 33.9 183°43.7 09.2 Nunki 76°44.5 26°65.7 196°09.7 Nunki 76°44.5 126°10.9 Nunki 76°45.6 Nunki 76°45.5 Nunki	17	91°29.6	31°06.8	54.6		09.0	280°35.6	33.1	63°26.4	08.3	I		
19 121°34.5 61°07.3 55.7 107°47.8 10.6 310°41.0 33.3 93°30.7 08.5	18	106°32.0	46°07.1	N24°55.1	92°47.1	N05°09.8	295°38.3	N05°33.2	78°28.5	N09°08.4	I		
20 136°37.0 76°07.6 56.3 122°48.5 11.3 325°43.7 33.4 103°35.0 08.5 21 151°39.4 91°07.8 05.6 137°49.2 12.1 340°49.2 33.6 138°37.2 08.8 22 166°41.9 106°08.1 57.4 152°49.9 12.9 355°49.1 33.6 138°37.2 08.8 Mer.pass. 10:55 10.2°07.0°6 m-4.60 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10.2°07.0°6 m-4.60 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10.2°07.0°6 m-4.60 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10.2°07.0°6 m-4.60 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10°50.5 10°50.5 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10°50.5 10°50.5 10°50.6 13.6 10°51.8 33.7 153°39.4 08.9 Mer.pass. 10:55 10°08.7 10°0.2 10°50.5 10°50.5 10°51.8 10°51.8 10°50.2 10 196°46.8 136°08.7 124°55.5 10°50.5 15.1 10°57.2 13.9 180°41.5 10°0.0 180°40.5 13°40.0 09.4 11 2°13.9 10°0.9 10°0.7 1	19	121°34.5	61°07.3	55.7	107°47.8	10.6	310°41.0	33.3	93°30.7	08.5	_		
151°39.4 91°07.8 · · · · · · · · · · · · · · · · · ·	20	136°37.0	76°07.6	56.3	122°48.5	11.3	325°43.7	33.4	108°32.9	08.6	I		
22 166°41.9 106°08.1 57.4 152°49.9 12.9 355°49.1 33.6 138°37.2 08.8 Nunki 75°44.5 26°15.6 Nunki 75°44.5 Nunki 75	21	151°39.4	91°07.8	• • 56.8	137°49.2	• • 12.1	340°46.4	• • 33.5	123°35.0	• • 08.7			
Mer.pass. 10:55 V0.2' d0.6' m-4.60 V0.7' d0.8' m1.10 V2.7' d0.1' m-2.42 V2.2' d0.1' m0.52 Peacock 53°0.18 -56°38.3 Denk 492.41 45°22.7 Markab 13°0.0 46°9.2 46	22	166°41.9	106°08.1	57.4	152°49.9	12.9	355°49.1	33.6	138°37.2	08.8			
Mer.pass. 10:55		181°44.4	121°08.4	57.9	167°50.6	13.6	10°51.8		153°39.4	08.9			
Sat GHA GHA Dec All Naïra All Naïra 27° 30.0 46° 49.2 All Naïra 22° 30.0 46° 49.2 All Naïra 22° 80.0 All Naïra 22° 30.0 46° 49.2 All Naïra 50° 59.9 34.0 198° 45.9 09.3 All Naïra 15° 11.9 29° 28° 3.1 34° 24° 18° 49.2 21° 60° 09.7 00.7 24° 52° 50° 1 17° 10° 60° 50° 3.3 34° 12° 28° 50.2 09.5 50° 59.9 34.0 198° 45.9 09.5 40° 60° 50° 7 00° 7 09° 20° 30° 30° 30° 30° 30° 30° 30° 30° 30° 3		10.55	0.0/	<i>cl</i> 4.60		0/ 1.10	0.7/ 10	1/ 0.10	2.0/	1/ 0.50	I		
Sat GHA CHA Dec GHA Dec A 2 206°51.9 310°0.0 22°590.0 10°2°55.8 10°1°67.8 10°	Mer.p	ass. 10:55	ν 0.2' d0.	.6′ m-4.60	ν 0.7 d0	.8′ m1.10	$\nu 2.7 d0$	1′ m-2.42	ν 2.2' d0	.1′ m0.52			
Sat GHA GHA Dec GHA OP-203 All Na'ir 27°30.0 46°49.2 Pomalhaut 15°08.9 59.0 197°52.0 15.1 40°57.2 33.9 183°43.7 09.2 Chemalhaut 15°11.9 22°28.3 21°25.7 15.9 55°59.9 34.0 198°45.9 09.3 Chemalhaut 15°11.9 22°28.1 15°08.9 34.0 198°45.9 09.3 Chemalhaut 15°11.9 22°29.8 15°21.4 Mars 34.1 228°50.2 09.5 50°12.1 15°25.4 15°21.4 Mars 34°10.0 09.2 09.5 20°1.1 10°0.0 02.2 25°54.8 18.2 10°10.8 34.2 243°52.4 09.6 Mars 34°10.0 09.7 Mars 34°29.0 09.7 09.8 Mars 34°29.0 09.7 <td></td>													
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12 17°16.4 316°12.0 N25°05.1 2°59.6 N05°23.5 206°26.9 N05°34.9 349°07.5 N09°10.4 Jupiter 189°02.0 22:17 14 47°21.3 346°12.6 06.2 33°01.0 25.0 236°32.2 35.1 19°11.9 10.6 15 62°23.8 1°12.8 · 06.7 48°01.7 · · · 25.8 251°34.9 · · 35.2 34°14.0 · · · 10.7 10.5 16 77°26.3 16°13.1 07.2 63°02.4 26.5 266°37.6 35.3 49°16.2 10.8 17°928.7 31°13.4 07.8 78°03.1 27.3 281°40.3 35.3 64°18.4 11.0 107°31.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 21 152°38.6 91°14.6 · · 09.9 138°05.9 · · 30.3 341°51.1 · · · 35.7 124°27.0 · · · 11.4 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Mars: 0.1											I		
13 32°18.9 331°12.3 05.6 18°00.3 24.3 221°29.6 35.0 4°09.7 10.5 144 47°21.3 346°12.6 06.2 33°01.0 25.0 236°32.2 35.1 19°11.9 10.6 15 62°23.8 1°12.8 · · · 06.7 48°01.7 · · · 25.8 251°34.9 · · · 35.2 34°14.0 · · · 10.7 10.5 16 77°26.3 16°13.1 07.2 63°02.4 26.5 266°37.6 35.3 49°16.2 10.8 17°26.7 11.2 18 107°31.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 152°38.6 91°14.6 · · · 09.9 138°05.9 · · 30.3 341°51.1 · · · 35.7 124°27.0 · · · 11.4 12.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Jupiter 189°02.0 22:17													
14 47°21.3 346°12.6 06.2 33°01.0 25.0 236°32.2 35.1 19°11.9 10.6 15 62°23.8 1°12.8 · · 06.7 48°01.7 · · 25.8 251°34.9 · · 35.2 34°14.0 · · 10.7 16 77°26.3 16°13.1 07.2 63°02.4 26.5 266°37.6 35.3 49°16.2 10.8 17 92°28.7 31°13.4 07.8 78°03.1 27.3 281°40.3 35.3 64°18.4 11.0 18 107°31.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 21 152°38.6 91°14.6 · · 09.9 138°05.9 · · 30.3 341°51.1 · · 35.7 124°27.0 · · 11.4 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6													
15 62°23.8 1°12.8 · · · 06.7 48°01.7 · · · 25.8 251°34.9 · · · 35.2 34°14.0 · · · 10.7 10.7 16 7°26.3 16°13.1 07.2 63°02.4 26.5 266°37.6 35.3 49°16.2 10.8 14.55 17 92°28.7 31°13.4 07.8 78°03.1 27.3 281°40.3 35.3 64°18.4 11.0 11.0 11.1 11.0 11.0 168°07.3 1.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 11.0 11.0 11.0 11.0 11.0 11.0 11.0											Saturn	332~01.8	12:47
16 77°26.3 16°13.1 07.2 63°02.4 26.5 266°37.6 35.3 49°16.2 10.8 Venus 299°21.8 14:55 17 92°28.7 31°13.4 07.8 78°03.1 27.3 281°40.3 35.3 64°18.4 11.0 Mars 346°04.5 11:48 18 107°31.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 Jupiter 189°07.7 22:12 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 Saturn 331°54.7 12:43 20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 321 52°38.6 91°14.6 09.9 138°05.9 30.3 341°51.1 35.7 124°27.0 11.4 11.4 40°27.0 11.4 40°27.0 11.4 40°27.0 11.4 40°27.0 11.4 40°27.0 11.5 11.6 11.6 11.6 11.6 11.6 11.6 11.6 11.6 11.6 11.6											Anr 08 Sat	SHA	Mer.nass
17 92°28.7 31°13.4 07.8 78°03.1 27.3 281°40.3 35.3 64°18.4 11.0 Mars 346°04.5 11:48 18 107°31.2 46°13.7 N25°08.3 93°03.8 N05°28.1 296°43.0 N05°35.4 79°20.5 N09°11.1 19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 21 152°38.6 91°14.6 · · 09.9 138°05.9 · · 30.3 341°51.1 · · · 35.7 124°27.0 · · · 11.4 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Mars: 0.1													
18											I		
19 122°33.6 61°14.0 08.9 108°04.5 28.8 311°45.7 35.5 94°22.7 11.2 20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 21 152°38.6 91°14.6 · · · 09.9 138°05.9 · · 30.3 341°51.1 · · · 35.7 124°27.0 · · · 11.4 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6													
20 137°36.1 76°14.3 09.4 123°05.2 29.6 326°48.4 35.6 109°24.9 11.3 21 152°38.6 91°14.6 · · 09.9 138°05.9 · · 30.3 341°51.1 · · · 35.7 124°27.0 · · 11.4 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Horizontal parallax Venus: 0.3 Mars: 0.1													
21 152°38.6 91°14.6 · · · 09.9 138°05.9 · · 30.3 341°51.1 · · 35.7 124°27.0 · · 11.4 Horizontal parallax 22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 Venus: 0.3 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Mars: 0.1											Jatuill	JJ1 J4.1	14.43
22 167°41.0 106°14.9 10.5 153°06.6 31.1 356°53.8 35.8 139°29.2 11.5 Venus: 0.3 23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Mars: 0.1											Horizon	al parallax	
23 182°43.5 121°15.2 11.0 168°07.3 31.9 11°56.5 35.9 154°31.4 11.6 Mars: 0.1												Venus:	0.3
												Mars:	
Mer.pass. 10:51 $\nu 0.3' \ d0.6' \ m-4.61 \ \nu 0.7' \ d0.8' \ m1.10 \ \nu 2.7' \ d0.1' \ m-2.42 \ \nu 2.2' \ d0.1' \ m0.51$													
	Mer.p	ass. 10:51	ν 0.3′ d0.	.o′ m-4.61	u0.7' d 0	.ၓ′ m1.10	ν 2.7′ d0.	1′ m-2.42	ν 2.2′ d0	.1′ m0.51			

h	Sur	า			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.0	N06°34.2	44°33.1	9.6'	N09°27.1	-15.3'	60.3'
1 2	194°24.2 209°24.3	35.2 36.1	59°01.7 73°30.3	9.6' 9.6'	09°11.8 08°56.4	-15.4' -15.5'	60.3' 60.3'
3	209 24.5 224°24.5	37.1	87°58.9	9.0 9.7'	08°41.0	-15.5'	60.3
4	239°24.7	38.0	102°27.6	9.7'	08°25.4	-15.6'	60.3'
5	254°24.9	39.0	116°56.2	9.7'	08°09.9	-15.6'	60.3'
6	269°25.1 284°25.2	N06°39.9 40.8	131°24.9 145°53.7	9.7' 9.8'	N07°54.3 07°38.6	-15.7' -15.7'	60.3' 60.4'
7 8	284 25.2 299°25.4	40.8 41.8	145 53.7 160°22.4	9.8 9.8'	07 38.6 07°22.8	-15.7 -15.8'	60.4'
9	314°25.6	• • 42.7	174°51.2	9.8'	07°07.1	-15.8'	60.4
10	329°25.8	43.7	189°20.0	9.8'	06°51.2	-15.9'	60.4'
11	344°25.9 359°26.1	44.6 N06°45.5	203°48.9 218°17.7	9.8'	06°35.4 N06°19.4	-15.9'	60.4
12 13	359°26.1 14°26.3	46.5	218°17.7 232°46.6	9.9' 9.9'	06°03.5	-16.0' -16.0'	60.4' 60.4'
14	29°26.5	47.4	247°15.4	9.9'	05°47.5	-16.0'	60.4
15	44°26.6	• • 48.4	261°44.3	9.9'	05°31.4	-16.1'	60.5'
16	59°26.8 74°27.0	49.3	276°13.2 290°42.2	9.9'	05° 15.4 04° 59.2	-16.1'	60.5'
17 18	89°27.2	50.2 N06°51.2	305°11.1	9.9' 10.0'	N04° 43.1	-16.2' -16.2'	60.5' 60.5'
19	104°27.3	52.1	319°40.1	10.0'	04°26.9	-16.2'	60.5'
20	119°27.5	53.1	334°09.0	10.0'	$04^{\circ}10.7$	-16.2'	60.5'
21	134°27.7	• • 54.0	348°38.0	10.0'	03°54.4	-16.3'	60.5'
22 23	149°27.9 164°28.0	54.9 55.9	3°07.0 17°36.0	10.0' 10.0'	03°38.2 03°21.9	-16.3' -16.3'	60.5' 60.5'
23		d = 0.9'				10.5	00.0
	SD = 16.0'	$a = 0.9^{\circ}$		51	O = 16.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°28.2	N06°56.8	32°05.0	10.0'	N03°05.5	-16.3'	60.5'
1 2	194°28.4 209°28.6	57.8 58.7	46°34.0 61°03.0	10.0' 10.0'	02°49.2 02°32.8	-16.4' -16.4'	60.5' 60.6'
3	209 28.0 224°28.7	06°59.6	75°32.0	10.0'	02° 32.8	-16.4'	60.6
4	239°28.9	07°00.6	90°01.1	10.0'	02°00.0	-16.4'	60.6'
5	254°29.1	01.5	104°30.1	10.0'	01°43.6	-16.4'	60.6'
6 7	269°29.3 284°29.4	N07°02.4 03.4	118°59.1 133°28.1	10.0' 10.0'	N01°27.2 01°10.8	-16.4' -16.4'	60.6' 60.6'
8	284 29.4 299°29.6	03.4	133 28.1 147°57.2	10.0'	01 10.8 00°54.3	-16.4 -16.5'	60.6
9	314°29.8	05.3	162°26.2	10.0'	00°37.9	-16.5'	60.6'
10	329°30.0	06.2	176°55.2	10.0'	00°21.4	-16.5'	60.6'
11	344°30.1 359°30.3	07.1 N07°08.1	191°24.2 205°53.3	10.0'	N00°04.9 S00°11.5	-16.5'	60.6' 60.6'
12 13	359°30.3 14°30.5	09.0	205°53.3 220°22.3	10.0' 10.0'	00°28.0	16.5' 16.5'	60.6
14	29°30.7	09.9	234°51.3	10.0'	00°44.5	16.5	60.6'
15	44°30.8	• • 10.9	249°20.3	10.0'	01°00.9	16.5'	60.6'
16 17	59°31.0 74°31.2	11.8 12.7	263°49.3 278°18.3	10.0' 10.0'	01°17.4 01°33.9	16.5' 16.4'	60.6' 60.6'
18	89°31.4	N07°13.7	270 10.3 292°47.2	10.0'	501°50.3	16.4	60.6
19	104°31.5	14.6	307°16.2	9.9'	02°06.7	16.4	60.6'
20	119°31.7	15.5	321°45.1		02°23.2	16.4'	60.6'
21 22	134°31.9 149°32.1	· · 16.5 17.4	336°14.1 350°43.0	9.9' 9.9'	02°39.6 02°56.0	16.4' 16.4'	60.6' 60.6'
23	164°32.2	18.3	5°11.9	9.9'	02° 30.0	16.4	60.6
	SD = 16.0'	d = 0.9'			O = 16.5'		
				JI.			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.4 194°32.6	N07°19.3 20.2	19°40.8 34°09.7	9.9' 9.9'	\$03°28.7 03°45.0	16.3'	60.6'
1 2	194°32.6 209°32.7	20.2	48°38.5	9.9 9.8'	03°45.0 04°01.3	16.3' 16.3'	60.6' 60.6'
3	224°32.9	22.1	63°07.4	9.8'	04°17.6	16.3	60.6
4	239°33.1	23.0	77°36.2	9.8'	04°33.9	16.2'	60.6'
5 6	254°33.3 269°33.4	23.9 N07°24.9	92°05.0 106°33.7	9.8' 9.8'	04°50.1 \$05°06.3	16.2' 16.2'	60.6' 60.6'
7	284°33.6	Nu7 24.9 25.8	106 33.7 121°02.5	9.8 9.7'	05°22.5	16.2	60.5
8	299°33.8	26.7	135°31.2	9.7'	05°38.6	16.1'	60.5'
9	314°34.0	• • 27.7	149°59.9	9.7'	05°54.7	16.1'	60.5'
10 11	329°34.1 344°34.3	28.6 29.5	164°28.6 178°57.3	9.7' 9.6'	06° 10.7 06° 26.8	16.0' 16.0'	60.5' 60.5'
12	359°34.5	29.5 N07°30.5	176 57.3 193°25.9	9.6'	506°42.7	15.9	60.5
13	14°34.6	31.4	207°54.5	9.6'	06°58.7	15.9'	60.5'
14	29°34.8	32.3	222°23.1	9.5'	07°14.6	15.8'	60.5'
15 16	44°35.0 59°35.2	· · 33.2 34.2	236°51.6 251°20.1	9.5' 9.5'	07°30.4 07°46.2	15.8' 15.7'	60.5' 60.5'
17	59 35.2 74°35.3	34.2 35.1	265°48.6	9.5 9.4'	07 46.2 08°01.9	15.7' 15.7'	60.5'
18	89°35.5	N07°36.0	280°17.0	9.4'	S08°17.6	15.6'	60.4'
19	104°35.7	37.0	294°45.4	9.4'	08°33.2	15.6'	60.4
20 21	119°35.8 134°36.0	37.9 · · 38.8	309°13.8 323°42.2	9.3' 9.3'	08°48.8 09°04.3	15.5' 15.5'	60.4' 60.4'
21	134°36.0 149°36.2	39.8	323°42.2 338°10.5	9.3'	09°04.3	15.5	60.4
23	164°36.4	40.7	352°38.8	9.2'	09°35.2	15.3'	60.4'
	SD = 16.0'	d = 0.9'		SI	O = 16.5'		

	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	02:58	04:21	19:46	21:11	////
$N 70^{\circ}$	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
N 40°	04:34	05:06	05:34	18:31	18:58	19:31
35°	04:42	05:12	05:38	18:26	18:52	19:23
30°	04:49	05:18	05:42	18:23	18:47	19:15
20°	05:00	05:26	05:48	18:16	18:38	19:04
$N 10^{\circ}$	05:08	05:32	05:54	18:10	18:32	18:56
0°	05:14	05:38	05:59	18:05	18:26	18:50
S 10°	05:18	05:43	06:04	18:00	18:21	18:46
20°	05:21	05:47	06:09	17:55	18:17	18:43
30°	05:23	05:51	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
S 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
S 60°	05:15	06:03	06:45	17:18	18:00	18:48
Lat.		Moonris	e		Moonset	i .

Lat.		Moonris	е		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
N 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
N 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
S 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
S 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
S 60°	16:13	16:17	16:21	02:01	03:44	05:26

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA De	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	197°46.0	136°15.5 N25°		N05°32.6	26°59.2	N05°36.0	169°33.5	N09°11.7			
1	212°48.4		2.1 198°08.7	33.4	42°01.9	36.1	184°35.7	11.9	Alpheratz	357°32.3	29° 14.7
2	227°50.9		2.6 213°09.4	34.1	57°04.6	36.2	199°37.9	12.0	Ankaa	353°05.0	-42°09.1
3	242°53.4	181°16.4 · · ·		• • 34.9	72°07.3	• • 36.3	214°40.0	• • 12.1	Schedar	349°28.5	56°41.5
4	257°55.8		3.7 243°10.8	35.7	87°09.9	36.4	229°42.2	12.2	Diphda	348°45.0	-17°49.9
5	272°58.3		4.2 258°11.4	36.4	102°12.6	36.4	244°44.4	12.3	Achernar	335°18.9	-57°05.6
6	288°00.8	226°17.3 N25°	4.7 273°12.1	N05°37.2	117°15.3	N05°36.5	259°46.5	N09°12.4	Hamal	327°48.5	23°35.7
7	303°03.2	241°17.6	5.2 288°12.8	37.9	132°18.0	36.6	274°48.7	12.5	Polaris	313°02.8	89°23.1 -40°11.6
8	318°05.7	256° 17.9	5.8 303°13.5	38.7	147°20.7	36.7	289°50.8	12.6	Acamar	315°10.2 314°03.7	-40 11.6 4°11.9
9	333°08.1	271°18.2 · · ·	6.3 318°14.2	• • 39.4	162°23.4	• • 36.8	304°53.0	• • 12.8	Menkar	308°24.8	4 11.9 49°57.7
10	348°10.6	286° 18.5	6.8 333°14.9	40.2	177°26.1	36.9	319°55.2	12.9	Mirfak Aldebaran	290°36.8	16°33.9
11	3°13.1	301°18.8	7.3 348°15.6	41.0	192°28.8	37.0	334°57.3	13.0		290 30.8 281°01.5	-8° 10.3
12	18°15.5	316°19.1 N25°	7.9 3°16.3	N05°41.7	207°31.5	N05°37.1	349°59.5	N09°13.1	Rigel Capella	280°18.2	-6 10.3 46°01.6
13	33°18.0	331°19.5	8.4 18°17.0	42.5	222°34.2	37.2	5°01.7	13.2	Bellatrix	278°20.2	6°22.4
14	48°20.5	346° 19.8	8.9 33°17.7	43.2	237°36.8	37.3	20°03.8	13.3	Elnath	277°58.7	28°37.8
15	63°22.9	1°20.1 · · 1	9.4 48°18.4	• • 44.0	252°39.5	• • 37.4	35°06.0	• • 13.4	Alnilam	275°35.2	-1°11.2
16	78°25.4		0.0 63°19.1	44.7	267°42.2	37.4	50°08.2	13.5	Betelgeuse	270°49.3	7°24.6
17	93°27.9	31°20.7	0.5 78°19.8	45.5	282°44.9	37.5	65°10.3	13.7	Canopus	263°51.4	-52°43.0
18	108°30.3	46°21.1 N25°2		N05°46.3	297°47.6	N05°37.6	80°12.5	N09°13.8	Sirius	258°24.0	-16°45.6
19	123°32.8		1.5 108°21.2	47.0	312°50.3	37.7	95°14.7	13.9	Adhara	255°03.8	-29°00.9
20	138°35.2		2.0 123°21.9	47.8	327°53.0	37.8	110°16.8	14.0	Procyon	244°48.1	5°09.0
21	153°37.7	91°22.0 · · 2		• • 48.5	342°55.7	• • 37.9	125°19.0	• • 14.1	Pollux	243°14.1	27°57.4
22	168°40.2		3.0 153°23.3	49.3	357°58.4	38.0	140°21.2	14.2	Avior	234°13.5	-59°36.4
23	183°42.6	121°22.7	3.6 168°24.0	50.0	13°01.0	38.1	155°23.3	14.3	Suhail	234 13.3 222°44.1	-43°33.2
Mern	ass. 10:47	ν0.3' d0.5' m-4	$\frac{1}{62} \frac{1}{v_0} \frac{7'}{40}$.8′ m1.11	v2 7' d0	1' m-2.41	v2 2' d0	.1′ m0.51	Miaplacidus	221°37.2	-69° 50.4
	a33. 10.+1	νο.5 αο.5 III-4	<u>νο.τ ασ.</u>	.0 1111.111	ν2.1 do.	1 111-2.71	VZ.Z UO	.1 1110.51	Alphard	217°45.0	-8°47.1
									Regulus	207°31.4	11°49.6
Mon	GHA	GHA De		Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.9
0	198°45.1	136°23.0 N25°2		N05°50.8	28°03.7	N05°38.2	170°25.5	N09°14.4	Denebola	182°22.0	14°24.7
1	213°47.6		4.6 198°25.4	51.5	43°06.4	38.2	185°27.7	14.6	Gienah	175°40.5	-17°42.2
2	228°50.0		5.1 213°26.0	52.3	58°09.1	38.3	200°29.8	14.7	I	172°56.3	-63° 15.6
3	243°52.5	181°24.0 · · 2		• • 53.1	73°11.8	• • 38.4	215°32.0	• • 14.8		171°48.0	-57° 16.5
4	258°55.0		6.1 243°27.4	53.8	88°14.5	38.5	230°34.2	14.9	Alioth	166°10.2	55°48.3
5	273°57.4		6.6 258°28.1	54.6	103°17.2	38.6	245°36.3	15.0	Spica	158°19.2	-11° 18.7
6	288°59.9	226°25.0 N25°2		N05°55.3	118°19.8	N05°38.7	260°38.5	N09°15.1	Alkaid	152°49.5	49° 10.1
7	304°02.4		7.6 288°29.5	56.1	133°22.5	38.8	275°40.6	15.2	Hadar	148°31.5	-60°30.6
8	319°04.8		8.1 303°30.2	56.8	148°25.2	38.9	290°42.8	15.3	Menkent	147°54.1	-36°30.7
9	334°07.3	271°26.0 · · 2		• • 57.6	163°27.9	• • 39.0	305°45.0	• • 15.5	Arcturus	145°45.2	19°01.9
10	349°09.7		9.1 333°31.6	58.3	178°30.6	39.0	320°47.1	15.6	Rigil Kent.	139°35.9	-60°57.1
11	4°12.2		9.6 348°32.3	59.1	193°33.3	39.1	335°49.3	15.7	Kochab	137°18.9	$74^{\circ}02.1$
12	19°14.7	316°27.0 N25°3		N05°59.9	208°36.0	N05°39.2	350°51.5	N09°15.8	Zuben'ubi	136°52.8	-16°09.7
13	34°17.1		0.6 18°33.7	06°00.6	223°38.6	39.3	5°53.6	15.9	Alphecca	126°01.2	26°37.0
14	49°19.6		1.1 33°34.4	01.4	238°41.3	39.4	20°55.8	16.0	Antares	112°12.3	-26°29.7
15	64°22.1	1°28.1 · · · 3		• • 02.1	253°44.0	• • 39.5	35°58.0	. 16.1	Atria	107°03.8	-69°04.4
16	79°24.5		2.1 63°35.8	02.9	268°46.7	39.6	51°00.1	16.2	Sabik	101°59.6	$-15^{\circ}45.6$
17	94°27.0		2.6 78°36.5	03.6	283°49.4	39.7	66°02.3	16.4	Shaula	96°06.6	-37°07.3
18	109°29.5	46°29.1 N25°3			298°52.1	N05°39.7	81°04.5	N09°16.5	Rasalhague	95°55.9	12°32.2
19	124°31.9		3.6 108°37.9	05.1	313°54.7	39.8	96°06.6	16.6	Eltanin	90°40.8	51°28.8
20	139°34.4		4.1 123°38.6	05.9	328°57.4	39.9	111°08.8	16.7	Kaus Aust.	83°28.9	$-34^{\circ}22.1$
21	154°36.9	91°30.2 · · 3		• • 06.6	344°00.1	• • 40.0	126°11.0	16.8	Vega	80°31.3	38°48.3
22	169°39.3		5.1 153°39.9	07.4	359°02.8	40.1	141°13.1	16.9	Nunki	75°44.4	-26° 15.6
23	184°41.8	121°30.9	5.6 168°40.6	08.1	14°05.5	40.2	156°15.3	17.0	Altair	$61^{\circ}57.4$	8°56.5
Mer.p	ass. 10:43	ν 0.3′ d0.5′ m-4	63 $\nu 0.7' d0$.8' m 1.11	$\nu 2.7' \ d0.$	1' m-2.41	$\nu 2.2' \ d0$.1' m0.50	Peacock	53°01.8	-56°38.3
									Deneb	49°24.1	45°22.6
_	G114	GU 14 B	6114	-	6114	_	6114	-	Enif	33°36.4	$10^{\circ}00.2$
Tue	GHA 100°44.2	GHA Dec		Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°30.0	-46°49.2
0	199°44.2	136°31.3 N25°3 151°31.6		N06°08.9	29°08.2 44°10.8	N05°40.3	171°17.4 186°19.6	N09°17.1	Fomalhaut	15°11.9	-29°28.3
1	214°46.7 229°49.2		6.6 198°42.0	09.6		40.4		17.3	Scheat	13°42.9	28°14.1
2	229°49.2 244°51.6	166°32.0 3 181°32.3 ••• 3	7.1 213°42.7 7.6 228°43.4	10.4 •• 11.1	59°13.5 74°16.2	40.4 • • 40.5	201°21.8 216°23.9	17.4	Markab	13°27.5	15°21.4
3 4	244 51.6 259°54.1		7.6 228 43.4 8.0 243°44.1	11.9	74°16.2 89°18.9	40.6	216°23.9 231°26.1	· · 17.5 17.6	Apr 09 Sun	SHA	Mer.pass
5	274°56.6		8.5 258°44.8	12.7	104°21.6	40.0	246°28.3	17.0	Venus	298°29.5	14:55
6	274°50.6 289°59.0	211°33.1 226°33.4 N25°3		12.7 N06°13.4	104°21.6 119°24.2	40.7 N05°40.8	246°28.3 261°30.4	17.7 N09°17.8	Mars	345°22.0	11:47
7	289 59.0 305°01.5		9.0 273 45.5 9.5 288°46.2	14.2	119 24.2 134°26.9	40.9	201 30.4 276°32.6	17.9	Jupiter	189°13.2	22:08
8	305 01.5 320°04.0		9.5 288 46.2 0.0 303°46.9	14.2 14.9	134 20.9 149°29.6	40.9	270 32.0 291°34.8	17.9	Saturn	331°47.6	12:40
9	335°06.4	271°34.6 · · ·		14.9	149 29.0 164°32.3	• • 41.0	306°36.9	18.2	Jatuill		
10	350°08.9		0.9 333°48.3	16.4	104 32.3 179°35.0	41.1	300 30.9 321°39.1	18.3	Apr 10 Mon	SHA	Mer.pass
11	5°11.3		1.4 348°49.0	17.2	179 35.0 194°37.6	41.1	336°41.3	18.4	Venus	297°37.9	14:54
12	20°13.8	316°35.7 N25°4		N06° 17.9	209°40.3	N05°41.3	351°43.4	N09°18.5	Mars	344°39.5	11:46
13	35°16.3		2.4 18°50.4	18.7	209°40.3 224°43.0	41.4	6°45.6	18.6	Jupiter	189°18.6	22:04
14	50°18.7		2.9 33°51.1	19.4	239°45.7	41.4	21°47.7	18.7	Saturn	331°40.4	12:36
15	65°21.2	1°36.8 · · ·		. 20.2	254°48.4	41.6	36°49.9	• • 18.8	Apr 11 Tue	SHA	Mornan
16	80°23.7		3.8 63°52.4	20.2	269°51.0	41.6	51°52.1	18.9			Mer.pass
17	95°26.1		4.3 78°53.1	20.9	284°53.7	41.0	66°54.2	19.1	Venus		14:54
18	95 20.1 110°28.6	46°38.0 N25°4		N06°22.4	299°56.4	N05°41.8	81°56.4	N09°19.2		343°57.1	11:45
19	125°31.1		5.2 108°54.5	23.2	314°59.1	41.9	96°58.6	19.3	Jupiter		22:00
20	140°33.5		5.7 123°55.2	23.2	330°01.7	42.0	112°00.7	19.4	Saturn	331°33.2	12:33
21	155°36.0	91°39.1 · · ·		• • 24.7	345°04.4	• • 42.1	112 00.7 127°02.9	19.5	Horizont	al parallax	
22	170°38.5		6.6 153°56.6	25.4	0°07.1	42.1	142°05.1	19.6		Venus:	0.3
23	185°40.9		7.1 168°57.3	26.2	15°09.8	42.2	157°07.2	19.7		Mars:	0.1
Mer.p	ass. 10:39	ν 0.4 $'$ d 0.5 $'$ m-4	64 $\nu 0.7' \ d0$.8′ m1.12	ν 2.7′ d0.	1′ m-2.40	u 2.2' d0	$.1' \; m0.50$			

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.5	N07°41.6	7°07.0	9.2'	S09°50.5	15.3'	60.4'
1 2	194°36.7 209°36.9	42.5 43.5	21°35.2 36°03.4	9.2' 9.1'	10°05.8 10°21.0	15.2' 15.1'	60.3' 60.3'
3	209 30.9 224°37.0	43.5 •• 44.4	50°31.5	9.1' 9.1'	10°21.0	15.1	60.3
4	239°37.2	45.3	64°59.6	9.1'	10°51.2	15.0'	60.3'
5	254°37.4	46.2	79°27.6	9.0'	11°06.2	14.9'	60.3'
6 7	269°37.5 284°37.7	N07°47.2 48.1	93°55.7 108°23.6	9.0' 8.9'	\$11°21.1 11°35.9	14.8' 14.8'	60.3' 60.3'
8	299°37.9	49.0	122°51.6	8.9'	11°50.7	14.7'	60.2'
9	314°38.1	• • 49.9	137°19.5	8.8'	12°05.4	14.6'	60.2'
10 11	329°38.2 344°38.4	50.9 51.8	151°47.3 166°15.1	8.8' 8.8'	12°20.0 12°34.5	14.5' 14.4'	60.2' 60.2'
12	359°38.6	N07°52.7	180°42.9	8.7'	\$12°48.9	14.4	60.2
13	14°38.7	53.7	195°10.6	8.7'	13°03.3	14.3'	60.1'
14	29°38.9	54.6	209°38.3 224°05.9	8.6'	13°17.6 13°31.7	14.2'	60.1
15 16	44°39.1 59°39.2	• • 55.5 56.4	224°05.9 238°33.5	8.6' 8.5'	13° 45.8	14.1' 14.0'	60.1' 60.1'
17	74°39.4	57.3	253°01.0	8.5'	13°59.8	13.9'	60.1'
18	89°39.6	N07°58.3	267°28.5	8.5'	\$14°13.7	13.8'	60.0'
19 20	104°39.7 119°39.9	07°59.2 08°00.1	281°56.0 296°23.4	8.4' 8.4'	14°27.5 14°41.2	13.7' 13.6'	60.0' 60.0'
21	134°40.1	. 01.0	310°50.8	8.3'	14°54.8	13.5'	60.0'
22	149°40.2	02.0	325°18.1	8.3'	15°08.3	13.4'	59.9'
23	164°40.4	02.9	339°45.3	8.2'	15°21.7	13.3'	59.9'
	SD = 16.0'	d = 0.9'		SI	D = 16.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.6	N08°03.8	$354^{\circ}12.6$	8.2'	S 15°35.0	13.2'	59.9'
1	194°40.7 209°40.9	04.7 05.7	8°39.8 23°06.9	8.1' 8.1'	15°48.2 16°01.3	13.1' 13.0'	59.9' 59.8'
2	209 40.9 224°41.1	06.6	23 06.9 37°34.0	8.0'	16 01.3 16°14.3	12.9'	59.8'
4	239°41.2	07.5	52°01.0	8.0'	16°27.1	12.8'	59.8'
5	254°41.4	08.4	66°28.0	7.9'	16°39.9	12.6'	59.8'
6 7	269°41.6 284°41.8	N08°09.3 10.3	80°55.0 95°21.9	7.9' 7.9'	\$16°52.5 17°05.1	12.5' 12.4'	59.7' 59.7'
8	299°41.9	11.2	109°48.7	7.8'	17°17.5	12.3'	59.7'
9	314°42.1	•• 12.1	124°15.5	7.8'	17°29.8	12.2'	59.6'
10 11	329°42.3 344°42.4	13.0 13.9	138°42.3 153°09.0	7.7' 7.7'	17°41.9 17°54.0	12.1' 11.9'	59.6' 59.6'
12	359°42.6	N08°14.9	167°35.7	7.6'	\$18°05.9	11.8'	59.6'
13	14°42.7	15.8	182°02.3	7.6'	18°17.8	11.7'	59.5'
14	29°42.9 44°43.1	16.7 •• 17.6	196°28.9 210°55.5	7.5' 7.5'	18°29.4 18°41.0	11.6' 11.4'	59.5' 59.5'
15 16	59°43.2	18.5	210 55.5 225°22.0	7.5'	18°52.4	11.4	59.5 59.4'
17	74°43.4	19.5	239°48.4	7.4'	$19^{\circ}03.8$	11.2'	59.4'
18 19	89°43.6 104°43.7	N08°20.4 21.3	254°14.8 268°41.2	7.4' 7.3'	\$19°14.9 19°26.0	11.1' 10.9'	59.4' 59.4'
20	104 43.7 119°43.9	22.2	283°07.5		19°26.0		59.4 59.3'
21	134°44.1	• • 23.1	297°33.8	7.2'	19°47.7	10.7'	59.3'
22 23	149°44.2 164°44.4	24.0	312°00.0 326°26.2	7.2' 7.2'	19°58.4 20°08.9	10.5'	59.3'
23	SD = 16.0'	25.0	320 20.2			10.4'	59.2'
	$SD = 10.0^{\circ}$	d = 0.9'		51	D = 16.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°44.6 194°44.7	N08°25.9 26.8	340°52.4 355°18.5	7.1' 7.1'	\$20°19.3 20°29.5	10.2' 10.1'	59.2' 59.2'
2	209°44.9	27.7	9°44.6	7.0'	20°29.5 20°39.6	10.1	59.2'
3	224°45.1	• • 28.6	24°10.6	7.0'	20°49.6	9.8'	59.1'
4 5	239°45.2 254°45.4	29.5 30.5	38°36.6 53°02.6	7.0' 6.9'	20°59.4 21°09.1	9.7' 9.5'	59.1' 59.0'
6	269°45.6	N08°31.4	67°28.6	6.9'	\$21°18.6	9.4	59.0'
7	284°45.7	32.3	81°54.5	6.9'	21°28.0	9.3'	59.0'
8 9	299°45.9 314°46.0	33.2 · · 34.1	96°20.3 110°46.1	6.8' 6.8'	21°37.3 21°46.4	9.1' 9.0'	58.9' 58.9'
10	329°46.2	35.0	125°11.9	6.8	21°55.4	9.0 8.8'	58.9'
11	344°46.4	35.9	$139^{\circ}37.7$	6.7'	22°04.2	8.7'	58.8'
12	359°46.5	N08°36.9	154°03.5	6.7'	\$22°12.9	8.5'	58.8'
13 14	14°46.7 29°46.9	37.8 38.7	168°29.2 182°54.8	6.7' 6.7'	22°21.4 22°29.8	8.4' 8.2'	58.8' 58.7'
15	44°47.0	• • 39.6	$197^{\circ}20.5$	6.6'	22°38.0	8.1'	58.7'
16	59°47.2	40.5	211°46.1	6.6'	22°46.1	7.9'	58.7'
17 18	74°47.3 89°47.5	41.4 N08°42.3	226°11.7 240°37.3	6.6' 6.6'	22°54.0 \$23°01.8	7.8' 7.6'	58.6' 58.6'
19	104°47.7	43.2	255°02.8	6.5'	23°09.4	7.6 7.5'	58.5'
20	119°47.8	44.2	269°28.4	6.5'	23°16.8	7.3'	58.5'
21 22	134°48.0 149°48.2	· · 45.1 46.0	283°53.9 298°19.4	6.5' 6.5'	23°24.1 23°31.3	7.2' 7.0'	58.5' 58.4'
23	164°48.3	46.0	312°44.9	6.5	23°38.3	6.8	58.4'
	SD = 16.0'	d = 0.9'		SI	D = 16.1'		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:36	04:05	20:01	21:32	////
N 70°	////	03:04	04:18	19:47	21:03	////
68°	01:38	03:24	04:29	19:36	20:42	22:33
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
N 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
N 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°	05:06	05:31	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:50
S 10°	05:18	05:42	06:04	17:59	18:20	18:44
20°	05:22	05:47	06:10	17:52	18:15	18:40
30°	05:24	05:52	06:16	17:46	18:10	18:37
35°	05:25	05:55	06:20	17:42	18:07	18:36
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
S 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
S 60°	05:22	06:10	06:52	17:09	17:51	18:39

Lat.		Moonris	e	Moonset			
Lat.	Sun	Mon	Tue	Sun	Mon	Tue	
N 72°	22:09			03:14	02:14		
N 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	
N 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	
S 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	
S 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	
S 60°	16:27	16:35	16:49	07:09	08:53	10:37	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
24,5	00 ^h	12 ^h	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		

April 12, 13, 14 UT (Wed., Thu., Fri.)

h	Aries	Venu	IS	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	200°43.4		125° 47.6	183°58.0	N06°26.9	30°12.5	N05°42.3	172°09.4	N09°19.8			
1	215°45.8	151°40.7	48.0	198°58.7	27.7	45°15.1	42.4	187°11.6	20.0	Alpheratz	357°32.3	29°14.7
2	230°48.3	$166^{\circ}41.1$	48.5	$213^{\circ}59.4$	28.4	60°17.8	42.5	202°13.7	20.1	Ankaa Schedar	353°05.0 349°28.5	-42°09.1 56°41.5
3	245°50.8		• • 49.0	229°00.1	• • 29.2	75°20.5	• • 42.6	$217^{\circ}15.9$	• • 20.2	Diphda	348°45.0	-17°49.9
4	260°53.2	196°41.9	49.4	244°00.8	29.9	90°23.2	42.7	232°18.0	20.3	Achernar	335°18.9	-57°05.6
5	275°55.7	211°42.3	49.9	259°01.5	30.7	105°25.8	42.7	247°20.2	20.4	Hamal	327°48.5	23°35.7
6 7	290°58.2 306°00.6	226°42.7 N 241°43.1	125°50.4 50.8	274°02.2 289°02.9	N06°31.4 32.2	120°28.5 135°31.2	N05°42.8 42.9	262°22.4 277°24.5	N09°20.5 20.6	Polaris	$313^{\circ}03.1$	89°23.0
8	300 00.0 321°03.1	256° 43.5	51.3	304°03.5	32.2	150°33.9	43.0	292°26.7	20.0	Acamar	$315^{\circ}10.2$	-40°11.6
9	336°05.6		• • 51.8	319°04.2	• • 33.7	165°36.5	• • 43.1	307°28.9	. 20.9	Menkar	314°03.7	4°11.9
10	351°08.0	286°44.3	52.2	334°04.9	34.4	180°39.2	43.2	322°31.0	21.0	Mirfak	308°24.8	49°57.7
11	$6^{\circ}10.5$	301°44.7	52.7	349°05.6	35.2	195°41.9	43.2	337°33.2	21.1	Aldebaran	290°36.8	16°33.9
12	21°13.0	316°45.1	√25°53.1	4°06.3	N06°35.9	210°44.6	N05°43.3	352°35.4	N09°21.2	Rigel Capella	281°01.5 280°18.2	-8°10.3 46°01.6
13	36°15.4	331°45.5	53.6	19°07.0	36.6	225°47.2	43.4	7°37.5	21.3	Bellatrix	278°20.2	6°22.4
14	51°17.9	346° 45.9	54.0	34°07.7	37.4	240°49.9	43.5	22°39.7	21.4	Elnath	277°58.7	28°37.8
15	66°20.3		• • 54.5	49°08.4	• • 38.1	255°52.6	• • 43.6	37°41.8	• • 21.5	Alnilam	275°35.2	-1°11.2
16 17	81°22.8 96°25.3	16° 46.8 31° 47.2	55.0 55.4	64°09.1 79°09.8	38.9 39.6	270°55.3 285°57.9	43.7 43.7	52°44.0 67°46.2	21.6 21.8	Betelgeuse	$270^{\circ}49.3$	7°24.6
18	111°27.7		125°55.9	94°10.5	N06° 40.4	301°00.6	N05°43.8	82°48.3	N09°21.9	Canopus	263°51.4	-52°43.0
19	126°30.2	61°48.0	56.3	109°11.2	41.1	316°03.3	43.9	97°50.5	22.0	Sirius	258°24.0	-16°45.6
20	141°32.7	76°48.5	56.8	124°11.9	41.9	331°05.9	44.0	112°52.7	22.1	Adhara	255°03.8	-29°00.9
21	$156^{\circ}35.1$		• • 57.2	139°12.6	• • 42.6	346°08.6	• • 44.1	127°54.8	• • 22.2	Procyon Pollux	244°48.1 243°14.1	5°09.0 27°57.4
22	171°37.6	106°49.3	57.7	154°13.3	43.4	1°11.3	44.1	142°57.0	22.3	Avior	234° 13.5	-59°36.4
23	186°40.1	121°49.7	58.1	169°14.0	44.1	16°14.0	44.2	157°59.2	22.4	Suhail	222°44.2	-43°33.2
Mer.p	ass. 10:35	ν 0.4' d0.5'	m-4.65	$\nu 0.7' d0$	7′ m1.12	$\nu 2.7' d0.$	1' m-2.40	$\nu 2.2' d0$	1' m0.49	Miaplacidus	221°37.3	-69°50.4
										Alphard	217°45.0	-8°47.1
Thu	CHA	CHA	Dec	CHA	Doo	GHA	Dee	GHA	Dee	Regulus	$207^{\circ}31.4$	11°49.6
1 nu 0	GHA 201°42.5	GHA 136°50.2 N	V25° 58.5	GHA 184°14.7	Dec N06° 44.9	31°16.6	Dec N05°44.3	173°01.3	Dec N09°22.5	Dubhe	193°37.4	61°35.9
1	201 42.5 216°45.0	151°50.6	59.0	199°15.3	45.6	46°19.3	44.4	173 01.3 188°03.5	22.7	Denebola	182°22.0	14°24.7
2	231°47.5	166° 51.0	59.4	214°16.0	46.4	61°22.0	44.5	203°05.6	22.8	Gienah	175°40.5	-17°42.2
3	246°49.9	181°51.5	25°59.9	229°16.7	• • 47.1	76°24.6	• • 44.6	218°07.8	22.9		172°56.3	-63°15.6
4	261°52.4	196°51.9	26°00.3	244°17.4	47.8	91°27.3	44.6	233°10.0	23.0	Gacrux Alioth	171°48.0 166°10.2	-57°16.5 55°48.3
5	276°54.8	211°52.3	8.00	$259^{\circ}18.1$	48.6	106°30.0	44.7	248°12.1	23.1	Spica	158° 19.2	-11°18.7
6	291°57.3		√26°01.2	274°18.8	N06°49.3	121°32.7	N05°44.8	263°14.3	N09°23.2	Alkaid	150° 19.2	49°10.2
7	306°59.8	241°53.2	01.6	289°19.5	50.1	136°35.3	44.9	278°16.5	23.3	Hadar	148°31.5	-60°30.6
8	322°02.2	256°53.6	02.1	304°20.2	50.8	151°38.0	45.0	293°18.6	23.4	Menkent	147°54.0	-36°30.7
9	337°04.7		• • 02.5	319°20.9	51.6	166°40.7	• • 45.0	308°20.8	• • 23.5	Arcturus	$145^{\circ}45.2$	19°01.9
10 11	352°07.2 7°09.6	286°54.5 301°55.0	03.0 03.4	334°21.6 349°22.3	52.3 53.1	181°43.3 196°46.0	45.1 45.2	323°23.0 338°25.1	23.7 23.8	Rigil Kent.	139°35.9	-60°57.1
12	22°12.1		126°03.8	4°23.0	N06°53.8	211°48.7	N05°45.3	353°27.3	N09°23.9	Kochab	137°18.9	74°02.1
13	37°14.6	331°55.9	04.3	19°23.7	54.6	226°51.3	45.4	8°29.4	24.0	Zuben'ubi	136°52.7	-16°09.7
14	52°17.0	346° 56.3	04.7	34°24.4	55.3	241°54.0	45.4	23°31.6	24.1	Alphecca	126°01.2 112°12.3	26°37.0 -26°29.7
15	$67^{\circ}19.5$	1°56.8	•• 05.1	49°25.1	• • 56.0	256°56.7	• • 45.5	38°33.8	• • 24.2	Antares Atria	112 12.3 107°03.7	-26 29.7 -69°04.4
16	82°21.9	$16^{\circ}57.2$	05.6	64°25.7	56.8	271°59.3	45.6	53°35.9	24.3	Sabik	101°59.5	-15°45.6
17	97°24.4	31°57.7	06.0	79°26.4	57.5	287°02.0	45.7	68°38.1	24.4	Shaula	96°06.5	-37°07.3
18	112°26.9		126°06.4	94°27.1		302°04.7	N05°45.8	83°40.3	N09°24.6	Rasalhague	95°55.9	12°32.2
19	127°29.3	61°58.6	06.9	109°27.8	59.0	317°07.3	45.8	98°42.4	24.7	Eltanin	90°40.7	51°28.8
20 21	142°31.8 157°34.3	76°59.0 91°59.5	07.3 · · 07.7	124°28.5 139°29.2	06°59.8 07°00.5	332°10.0 347°12.7	45.9 • • 46.0	113°44.6 128°46.7	24.8 •• 24.9	Kaus Aust.	83°28.9	-34°22.1
22	172°36.7	107° 00.0	08.1	159° 29.2 154° 29.9	01.2	2°15.3	46.1	143°48.9	25.0	Vega	80°31.3	38°48.3
23	187°39.2	122°00.4	08.6	169°30.6	02.0	17°18.0	46.2	158°51.1	25.1	Nunki	75°44.4	-26°15.6
										Altair	61°57.4	8°56.5
Mer.p	ass. 10:31	ν 0.4' d0.4'	m-4.66	ν 0.7' d0.	.7′ m1.13	ν 2.7 d0.	1′ m-2.39	ν 2.2′ d0.	.1′ m0.49	Peacock Deneb	53°01.7 49°24.1	-56°38.3 45°22.7
										Enif	33°36.3	10°00.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.9	-46°49.2
0	202°41.7		√26°09.0		N07°02.7	32°20.7	N05°46.2		N09°25.2	Fomalhaut	15°11.9	-29°28.2
1	217°44.1	152°01.4	09.4	199°32.0	03.5	47°23.3	46.3	188°55.4	25.3	Scheat	$13^{\circ}42.9$	28°14.1
2	232°46.6	167°01.8	09.8	214°32.7	04.2	62°26.0	46.4	203°57.6	25.5	Markab	13°27.5	15°21.4
3 4	247°49.1 262°51.5	182°02.3 197°02.8	· · 10.3 10.7	229°33.4 244°34.1	· · 05.0 05.7	77°28.7 92°31.3	· · 46.5 46.6	218°59.7 234°01.9	· · 25.6 25.7	Apr 12 Wed	SHA	Mer.pass
5	277°54.0	212°03.2	11.1	259°34.8	06.4	107°34.0	46.6	249°04.1	25.8		295°56.9	14:53
6	292°56.4		V26° 11.5		N07°07.2	122°36.7	N05°46.7		N09°25.9		343°14.6	11:44
7	307°58.9	242°04.2	11.9	289°36.1	07.9	137°39.3	46.8	279°08.4	26.0	Jupiter	$189^{\circ}29.1$	21:55
8	323°01.4	257°04.7	12.4	304°36.8	08.7	152°42.0	46.9	294°10.5	26.1	Saturn	331°26.0	12:30
9	338°03.8	272°05.1	• • 12.8	319°37.5	• • 09.4	167°44.7	• • 46.9	309°12.7	• • 26.2	Apr 13 Thu	SHA	Mer.pass
10	353°06.3	287°05.6	13.2	334°38.2	10.2	182°47.3	47.0	324°14.9	26.4		295°07.6	14:52
11	8°08.8	302°06.1	13.6	349°38.9	10.9	197°50.0	47.1	339°17.0	26.5		342°32.1	11:42
12	23°11.2		126° 14.0	4°39.6	N07°11.6	212°52.6	N05°47.2		N09°26.6		189°34.1	21:51
13 14	38°13.7 53°16.2	332°07.1 347°07.6	14.4 14.8	19°40.3 34°41.0	12.4 13.1	227°55.3 242°58.0	47.3 47.3	9°21.4 24°23.5	26.7 26.8	Saturn		12:26
15	68°18.6		. 15.3	49°41.7	13.1	258°00.6	• • 47.4	24 23.5 39°25.7	. 26.9	Apr 14 Fri	SHA	Mer pass
16	83°21.1	17°08.5	15.7	64°42.4	14.6	273°03.3	47.5	54°27.8	27.0		294°19.2	Mer.pass 14:51
17	98°23.6	32°09.0	16.1	79°43.1	15.3	288°06.0	47.6	69°30.0	27.1		341°49.6	11:41
18	113°26.0		126° 16.5	94°43.8	N07°16.1	303°08.6	N05°47.6	84°32.2	N09°27.2		189°39.0	21:47
19	128°28.5	$62^{\circ}10.0$	16.9	109°44.5	16.8	$318^{\circ}11.3$	47.7	99°34.3	27.4		331°11.6	12:23
20	143°30.9	77° 10.5	17.3	124°45.1	17.6	333°13.9	47.8	114°36.5	27.5			
21	158°33.4		• • 17.7	139°45.8	• • 18.3	348°16.6	• • 47.9	129°38.7	• • 27.6	Horizont	al parallax	0.3
22	173°35.9	107° 11.5	18.1	154°46.5	19.0	3°19.3	47.9	144°40.8	27.7		Venus: Mars:	0.3 0.1
23	188°38.3	122°12.0	18.5	169°47.2	19.8	18°21.9	48.0	159°43.0	27.8		ividi5.	0.1
Mer.p	ass. 10:28	$ u 0.5' \ d0.4'$	m-4.67	ν 0.7′ d0.	7′ m1.13	ν 2.7′ d0.	1′ m-2.39	ν 2.2′ d0	1' m0.48			

h	Sui	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.5	N08°47.8	$327^{\circ}10.3$	6.4'	\$23°45.1	6.7'	58.4'
1	194°48.6	48.7	341°35.8	6.4	23°51.8	6.5'	58.3'
2	209° 48.8 224° 49.0	49.6 •• 50.5	356°01.2 10°26.6	6.4' 6.4'	23°58.4 24°04.7	6.4' 6.2'	58.3' 58.3'
4	239°49.1	51.4	24°52.0	6.4	24° 10.9	6.1	58.2'
5	254°49.3	52.4	39°17.4	6.4	24° 17.0	5.9'	58.2'
6	269°49.4	N08°53.3	53°42.8	6.4'	S24°22.9	5.7'	58.1'
7	284° 49.6 299° 49.8	54.2	68°08.2 82°33.5	6.4'	24°28.6 24°34.2	5.6'	58.1'
8 9	299°49.8 314°49.9	55.1 •• 56.0	82°33.5 96°58.9	6.4' 6.4'	24°34.2 24°39.7	5.4' 5.3'	58.1' 58.0'
10	329°50.1	56.9	111°24.3	6.4	24° 44.9	5.1'	58.0'
11	344°50.2	57.8	$125^{\circ}49.6$	6.4'	24°50.0	4.9'	58.0'
12	359°50.4	N08°58.7	140°15.0	6.4'	\$24°55.0	4.8'	57.9'
13 14	14° 50.6 29° 50.7	08°59.6 09°00.5	154°40.4 169°05.7	6.4' 6.4'	24°59.8 25°04.4	4.6' 4.5'	57.9' 57.9'
15	44° 50.9	01.4	183°31.1	6.4	25°08.8	4.3	57.8'
16	59°51.0	02.3	197°56.5	6.4'	25°13.1	4.1'	57.8'
17	74°51.2	03.3	212°21.9	6.4'	25°17.3	4.0'	57.7'
18	89°51.4	N09°04.2	226°47.3 241°12.7	6.4'	\$25°21.3 25°25.1	3.8'	57.7'
19 20	104°51.5 119°51.7	05.1 06.0	241°12.7 255°38.1	6.4' 6.4'	25°25.1 25°28.8	3.7' 3.5'	57.7' 57.6'
21	134°51.8	• • 06.9	270°03.5	6.4	25°32.3	3.3'	57.6'
22	149°52.0	07.8	284°29.0	6.5'	25°35.6	3.2'	57.6'
23	164°52.2	08.7	298°54.4	6.5'	25°38.8	3.0'	57.5'
	SD = 15.9'	d = 0.9'		SI	O = 15.9'		
T L	СП.	Daa	GHA		Das	ال	μп
Thu 0	GHA 179° 52.3	Dec N09°09.6	GНА 313° 19.9	ν 6.5'	Dec \$25°41.8	d 2.9'	HP 57.5'
1	194° 52.5	10.5	327°45.4	6.5	25° 44.7	2.7'	57.4
2	209°52.6	11.4	342°10.9	6.6'	25° 47.4	2.5'	57.4'
3	224°52.8	• • 12.3	356°36.5	6.6'	25°49.9	2.4'	57.4'
4 5	239° 52.9 254° 53.1	13.2 14.1	11°02.1 25°27.7	6.6' 6.6'	25°52.3 25°54.5	2.2' 2.1'	57.3' 57.3'
6	269° 53.3	N09° 15.0	39°53.3	6.7'	\$25° 56.6	1.9'	57.3'
7	284°53.4	15.9	54°19.0	6.7'	25°58.5	1.8'	57.2'
8	299°53.6	16.8	68°44.7	6.7'	26°00.3	1.6'	57.2'
9 10	314°53.7 329°53.9	· · 17.7 18.6	83°10.4 97°36.1	6.8' 6.8'	26°01.9 26°03.3	1.4' 1.3'	57.1' 57.1'
11	344° 54.0	19.5	112°01.9	6.8	26°04.6	1.1'	57.1
12	359° 54.2	N09°20.4	126°27.8	6.9'	S26°05.7	1.0'	57.0'
13	14°54.4	21.3	140°53.6	6.9'	26°06.7	0.8'	57.0'
14	29° 54.5 44° 54.7	22.2 · · 23.1	155° 19.5 169° 45.5	7.0' 7.0'	26°07.5 26°08.1	0.7' 0.5'	57.0' 56.9'
15 16	59° 54.8	24.0	109 45.5 184°11.5	7.0'	26°08.6	0.5	56.9'
17	74°55.0	24.9	198°37.5	7.1'	26°09.0	0.2'	56.9'
18	89°55.1	N09°25.8	213°03.6	7.1'	S26°09.2	0.0'	56.8'
19	104°55.3	26.7	227°29.7	7.2'	26°09.2	-0.1'	56.8'
20 21	119° 55.4 134° 55.6	27.6 •• 28.5	241°55.9 256°22.2	7.2' 7.3'	26°09.1 26°08.9	-0.3' -0.4'	56.7' 56.7'
22	149° 55.8	29.4	270°48.4	7.3'	26°08.5	-0.6'	56.7'
23	164°55.9	30.3	285°14.8	7.4'	26°07.9	-0.7'	56.6'
	SD = 15.9'	d = 0.9'		SI	O = 15.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°56.1	N09°31.2	299°41.2	7.4'	S26°07.2	-0.9'	56.6'
1	194° 56.2 209° 56.4	32.1	314°07.6 328°34.1	7.5'	26°06.3	-1.0'	56.6'
2	209°56.4 224°56.5	33.0 •• 33.9	328° 34.1 343° 00.7	7.6' 7.6'	26°05.3 26°04.2	-1.2' -1.3'	56.5' 56.5'
4	239°56.7	34.8	357°27.3	7.7'	26°02.9	-1.3 -1.4'	56.5
5	254°56.8	35.7	11°54.0	7.7'	26°01.4	-1.6'	56.4'
6	269° 57.0	N09°36.6	26°20.7	7.8'	\$25°59.9	-1.7'	56.4'
7 8	284° 57.1 299° 57.3	37.5 38.4	40°47.5 55°14.4	7.9' 7.9'	25°58.1 25°56.2	-1.9' -2.0'	56.4' 56.3'
9	299 57.3 314°57.4	39.3	69°41.3	7.9 8.0'	25°54.2	-2.0 -2.2'	56.3
10	329°57.6	40.2	84°08.3	8.1'	25°52.1	-2.3'	56.3'
11	344°57.7	41.1	98°35.4	8.1'	25°49.8	-2.4'	56.2'
12 13	359° 57.9 14° 58.1	N09°42.0 42.9	113°02.5 127°29.7	8.2' 8.3'	\$25°47.3 25°44.7	-2.6' -2.7'	56.2' 56.2'
13 14	29°58.2	42.9	127 29.7 141°57.0	8.3'	25 44.7 25°42.0	-2.1 -2.9'	56.2 56.1'
15	44°58.4	• • 44.7	$156^{\circ}24.3$	8.4'	25°39.2	-3.0'	56.1
16	59° 58.5	45.6	170°51.7	8.5'	25°36.2	-3.1'	56.1'
17	74°58.7	46.5	185° 19.2	8.6'	25°33.1	-3.3'	56.0'
18 19	89° 58.8 104° 59.0	N09° 47.3 48.2	199°46.7 214°14.4	8.6' 8.7'	\$25°29.8 25°26.4	-3.4' -3.5'	56.0' 56.0'
20	119°59.1	49.1	214 14.4 228°42.1	8.8'	25°22.9	-3.5' -3.7'	55.9'
21	134°59.3	• • 50.0	243°09.9	8.9'	25°19.2	-3.8'	55.9'
22	149°59.4	50.9	257°37.7	8.9'	25° 15.4	-3.9'	55.9'
23	164°59.6	51.8	272°05.7	9.0'	25°11.5	-4.0'	55.8'
	SD = 15.9'	d = 0.9'		SI	D = 15.4'		

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

Lat.		Moonris	e	Moonset			
Lat.	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	
S 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°	19:23	20:16	21:15	10:05	11:08	12:03	
45°	19:03	19:55	20:55	10:24	11:29	12:23	
S 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°	17:56	18:44	19:47	11:30	12:41	13:32	
58°	17:37	18:23	19:27	11:49	13:01	13:52	
S 60°	17:13	17:57	19:03	12:12	13:28	14:17	

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	00:08	12:00	04:11	16:38		

April 15, 16, 17 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
C-4	GHA	GHA Dec	GHA Dec	<u> </u>		SHA
Sat 0	203°40.8	GHA Dec 137°12.5 N26°18.9	184°47.9 N07°20.5	GHA Dec 33°24.6 N05°48.1	GHA Dec 174°45.1 N09°27.9	
1	203 40.6 218°43.3	157 12.5 N20 18.9 152°13.0 19.3	199°48.6 21.3	48°27.2 48.2	189°47.3 28.0	Alpheratz 357°32.3
2	210 45.3 233°45.7	167°13.5 19.7	214°49.3 22.0	63°29.9 48.3	204°49.5 28.1	Ankaa 353°05.0
3	248°48.2	182°14.1 · · 20.1	229°50.0 · · 22.7	78°32.6 · · 48.3	219°51.6 · · 28.3	Schedar 349°28.4
4	263°50.7	197°14.6 20.5	244°50.7 23.5	93°35.2 48.4	234°53.8 28.4	Diphda 348°45.0
5	278°53.1	212°15.1 20.9	259°51.4 24.2	108°37.9 48.5	249°56.0 28.5	Achernar 335°18.9
6	293°55.6	227°15.6 N26°21.3	274°52.1 N07°25.0	123°40.5 N05°48.6	264°58.1 N09°28.6	Hamal 327°48.5
7	$308^{\circ}58.1$	242°16.1 21.7	289°52.8 25.7	138°43.2 48.6	280°00.3 28.7	Polaris 313°03.4 Acamar 315°10.2
8	324°00.5	257°16.6 22.1	304°53.4 26.4	153°45.9 48.7	295°02.4 28.8	Menkar 314°03.7
9	339°03.0	272°17.1 · · 22.5	319°54.1 · · 27.2	168°48.5 · · 48.8	310°04.6 · · 28.9	Mirfak 308°24.8
10	354°05.4	287°17.7 22.9	334°54.8 27.9	183°51.2 48.9	325°06.8 29.0	Aldebaran 290°36.8
11	9°07.9 24°10.4	302°18.2 23.3 317°18.7 N26°23.7	349°55.5 28.6 4°56.2 N07°29.4	198°53.8 48.9 213°56.5 N05°49.0	340°08.9 29.2 355°11.1 N09°29.3	Rigel 281°01.5
12 13	39°12.8	332°19.2 24.1	19°56.9 30.1	213 50.5 NOS 49.0 228°59.1 49.1	10°13.3 29.4	Capella 280°18.2
14	54°15.3	347°19.8 24.5	34°57.6 30.9	244°01.8 49.2	25°15.4 29.5	Bellatrix 278°20.2
15	69°17.8	2°20.3 · · 24.9	49°58.3 · · 31.6	259°04.5 · · 49.2	40°17.6 · · 29.6	Elnath 277°58.7
16	84°20.2	17°20.8 25.2	64°59.0 32.3	274°07.1 49.3	55°19.7 29.7	Alnilam 275°35.2
17	99°22.7	32°21.4 25.6	79°59.7 33.1	289°09.8 49.4	70°21.9 29.8	Betelgeuse 270°49.4 Canopus 263°51.4
18	114°25.2	47°21.9 N26°26.0	95°00.4 N07°33.8	304°12.4 N05°49.5	85°24.1 N09°29.9	Canopus 263°51.4 Sirius 258°24.0
19	129°27.6	62°22.4 26.4	110°01.1 34.5	319°15.1 49.5	100°26.2 30.0	Adhara 255°03.8
20	144°30.1	77°23.0 26.8	125°01.8 35.3	334°17.7 49.6	115°28.4 30.2	Procyon 244°48.1
21	159°32.6	92°23.5 · · 27.2	140°02.4 · · 36.0	349°20.4 · · 49.7	130°30.6 · · 30.3	Pollux 243°14.1
22 23	174°35.0 189°37.5	107°24.0 27.6	155°03.1 36.7	4°23.0 49.8	145°32.7 30.4 160°34.9 30.5	Avior 234°13.5
23	109 37.5	122°24.6 27.9	170°03.8 37.5	19°25.7 49.8		Suhail 222°44.2
Mer.p	ass. 10:24	$ u 0.5' \ d0.4' \ \text{m-4.67}$	$ u$ 0.7 $^{\prime}$ d 0.7 $^{\prime}$ m1.14	$\nu 2.7'~d0.1'~\text{m-}2.38$	$ u 2.2' \ d0.1' \ m0.47$	Miaplacidus 221°37.3
						Alphard 217°45.0
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.4 Dubhe 193°37.4
0	204°39.9	137°25.1 N26°28.3	185°04.5 N07°38.2	34°28.4 N05°49.9	175°37.0 N09°30.6	Denebola 182°22.0
1	219°42.4	152°25.7 28.7	200°05.2 39.0	49°31.0 50.0	190°39.2 30.7	Gienah 175°40.5
2	234°44.9	167°26.2 29.1	215°05.9 39.7	64°33.7 50.1	205°41.4 30.8	Acrux 172°56.3
3 4	249°47.3 264°49.8	182°26.8 · · 29.5 197°27.3 29.8	230°06.6 · · 40.4 245°07.3 41.2	79°36.3 · · 50.1 94°39.0 50.2	220°43.5 · · · 30.9 235°45.7	Gacrux 171°48.0
5	279°52.3	212°27.9 30.2	260°08.0 41.9	109°41.6 50.3	235°45.7 31.1 250°47.9 31.2	Alioth 166°10.2
6	294°54.7	227°28.4 N26°30.6	275°08.7 N07°42.6	124°44.3 N05°50.3	265°50.0 N09°31.3	Spica 158°19.2
7	309°57.2	242°29.0 31.0	290°09.4 43.4	139°46.9 50.4	280°52.2 31.4	Alkaid 152°49.5 Hadar 148°31.5
8	324°59.7	257°29.6 31.3	305°10.0 44.1	154°49.6 50.5	295°54.3 31.5	Menkent 147°54.0
9	$340^{\circ}02.1$	272°30.1 · · 31.7	320°10.7 · · 44.8	169°52.2 · · 50.6	310°56.5 · · 31.6	Arcturus 145°45.2
10	355°04.6	287°30.7 32.1	335°11.4 45.6	184°54.9 50.6	325°58.7 31.7	Rigil Kent. 139°35.9
11	10°07.0	302°31.3 32.4 317°31.8 N26°32.8	350°12.1 46.3 5°12.8 N07°47.0	199°57.5 50.7 215°00.2 N05°50.8	341°00.8 31.8 356°03.0 N09°31.9	Kochab 137°18.9
12 13	25°09.5 40°12.0	317°31.8 N26°32.8 332°32.4 33.2	5°12.8 N07°47.0 20°13.5 47.8	215°00.2 N05°50.8 230°02.8 50.9	11°05.2 32.1	Zuben'ubi 136°52.7
14	55°14.4	347°33.0 33.6	35°14.2 48.5	245°05.5 50.9	26°07.3 32.2	Alphecca 126°01.2
15	70°16.9	2°33.5 · · 33.9	50°14.9 · · 49.2	260°08.1 · · 51.0	41°09.5 · · 32.3	Antares 112°12.3
16	85°19.4	17°34.1 34.3	65°15.6 50.0	275°10.8 51.1	56°11.6 32.4	Atria 107°03.7 Sabik 101°59.5
17	$100^{\circ}21.8$	32° 34.7 34.7	80°16.3 50.7	290°13.4 51.1	71°13.8 32.5	Shaula 96°06.5
18	115°24.3	47°35.3 N26°35.0	95°17.0 N07°51.4	305°16.1 N05°51.2	86°16.0 N09°32.6	Rasalhague 95°55.9
19	130°26.8	62°35.8 35.4	110°17.7 52.2	320°18.7 51.3	101°18.1 32.7	Eltanin 90°40.7
20	145°29.2	77°36.4 35.7	125°18.3 52.9	335°21.4 51.4	116°20.3 32.8	Kaus Aust. 83°28.8
21 22	160°31.7 175°34.2	92°37.0 · · 36.1 107°37.6 36.5	140°19.0 · · 53.6 155°19.7 54.4	350°24.0 · · 51.4 5°26.7 51.5	131°22.4 · · 33.0 146°24.6 33.1	Vega 80°31.3
23	175 34.2 190°36.6	107 37.0 30.5 122°38.2 36.8	170°20.4 55.1	20°29.3 51.6	161°26.8 33.2	Nunki 75°44.4
			·			Altair 61°57.4
Mer.p	ass. 10:20	ν0.5' d0.4' m-4.68	ν 0.7′ d0.7′ m1.14	ν2.7' d0.1' m-2.38	ν2.2′ d0.1′ m0.46	Peacock 53°01.7 Deneb 49°24.0
						Enif 33°36.3
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.9
0	205°39.1	137°38.8 N26°37.2	185°21.1 N07°55.8	35°32.0 N05°51.6	176°28.9 N09°33.3	Fomalhaut 15°11.9
1	220°41.5	152°39.4 37.5	200°21.8 56.6	50°34.6 51.7	191°31.1 33.4	Scheat 13°42.9
2	235°44.0 250°46.5	167°39.9 37.9 182°40.5 · · 38.3	215°22.5 57.3	65°37.3 51.8	206°33.3 33.5 221°35.4 · · 33.6	Markab 13°27.5
3 4	250°46.5 265°48.9	182°40.5 · · 38.3 197°41.1 38.6	230°23.2 · · 58.0 245°23.9 58.8	80°39.9 · · 51.9 95°42.6 51.9	221°35.4 · · 33.6 236°37.6	Apr 15 Sat SHA
5	280°51.4	212°41.7 39.0	260°24.6 07°59.5	110°45.2 52.0	251°39.7 33.8	Venus 293°31.7
6	295°53.9	227°42.3 N26°39.3	275°25.2 N08°00.2	125°47.9 N05°52.1	266°41.9 N09°34.0	Mars 341°07.1
7	310°56.3	242°42.9 39.7	290°25.9 01.0	140°50.5 52.1	281°44.1 34.1	Jupiter 189°43.8
8	325°58.8	257°43.5 40.0	305°26.6 01.7	155°53.2 52.2	296°46.2 34.2	Saturn 331°04.3
9	341°01.3	272°44.1 · · 40.4	320°27.3 · · · 02.4	170°55.8 · · 52.3	311°48.4 · · 34.3	Apr 16 Sun SHA
10	356°03.7	287°44.7 40.7	335°28.0 03.1	185°58.5 52.4	326°50.6 34.4	Venus 292°45.2
11	11°06.2 26°08.7	302°45.4 41.1 317°46.0 N26°41.4	350°28.7 03.9 5°29.4 N08°04.6	201°01.1 52.4 216°03.7 N05°52.5	341°52.7 34.5 356°54.9 N09°34.6	Mars 340°24.6
12 13	41°11.1	332°46.6 41.8	20°30.1 05.3	231°06.4 52.6	11°57.0 34.7	Jupiter 189°48.4
14	56°13.6	347°47.2 42.1	35°30.8 06.1	246°09.0 52.6	26°59.2 34.8	Saturn 330°57.1
15	71°16.0	2°47.8 · · 42.5	50°31.5 · · 06.8	261°11.7 · · 52.7	42°01.4 · · 35.0	Apr 17 Mon SHA
16	86°18.5	17°48.4 42.8	65°32.2 07.5	276°14.3 52.8	57°03.5 35.1	Venus 291°59.7
17	101°21.0	32°49.1 43.2	80°32.8 08.3	291°17.0 52.8	72°05.7 35.2	Mars 339°42.0
18	116°23.4	47°49.7 N26°43.5	95°33.5 N08°09.0	306°19.6 N05°52.9	87°07.8 N09°35.3	Jupiter 189°52.9
19 20	131°25.9 146°28.4	62°50.3 43.8 77°50.9 44.2	110°34.2 09.7 125°34.9 10.4	321°22.3 53.0 336°24.9 53.0	102°10.0 35.4 117°12.2 35.5	Saturn 330°49.9
20	140 28.4 161°30.8	92°51.6 · · 44.5	125 34.9 10.4 140°35.6 · · 11.2	351°27.5 · · 53.1	117 12.2 35.5 132°14.3 · · 35.6	Horizontal parallax
22	176°33.3	107°52.2 44.9	155°36.3 11.9	6°30.2 53.2	147°16.5 35.7	Venus:
23	191°35.8	122°52.8 45.2	170°37.0 12.6	21°32.8 53.3	162°18.7 35.8	Mars:
Mer.n	ass. 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	

Dec $29^{\circ}14.7$ -42°09.1 56°41.5 -17°49.9 -57°05.6 23°35.7 $89^{\circ}23.0$ -40°11.6 4°11.9 49°57.7 $16^{\circ}33.9$ -8°10.3 $46^{\circ}01.6$ $6^{\circ}22.4$ 28°37.8 -1°11.2 7°24.6 -52°43.0 -16°45.6 -29°00.9 5°09.0 27°57.4 -59°36.4 -43°33.2 -69°50.4 -8°47.1 11°49.6 61°35.9 14°24.7 -17°42.2 $\textbf{-63}^{\circ}\,15.6$ -57°16.5 55°48.3 -11°18.7 49°10.2 -60°30.6 -36°30.7 $19^{\circ}01.9$ -60°57.2 $74^{\circ}02.2$ $-16^{\circ}09.7$ 26°37.0 -26°29.7 -69°04.4 -15°45.6

-37°07.3 12°32.2 51°28.8 -34°22.1 38°48.3

-26° 15.6 8° 56.5 -56° 38.3 45° 22.7

 $10^{\circ}00.2$ $-46^{\circ}49.2$ -29°28.2 $28^{\circ}14.1$ 15°21.4 Mer.pass 14:51 11:40 21:43 12:19 Mer.pass 14:50 11:39 21:38 12:16 Mer.pass 14:49 11:38 21:34 12:12

> 0.3 0.1

h	Sur	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.7	N09°52.7	286°33.7	9.1'	\$25°07.5	-4.2'	55.8'
1 2	194°59.9 210°00.0	53.6 54.5	301°01.8 315°29.9	9.2' 9.2'	25°03.3 24°59.0	-4.3' -4.4'	55.8' 55.8'
3	225°00.2	• • 55.4	329°58.2	9.3'	24°54.5	-4.6'	55.7'
4	240°00.3	56.3	344°26.5	9.4'	24°50.0	-4.7'	55.7'
5	255°00.5 270°00.6	57.2	358°54.9 13°23.4	9.5'	24°45.3 \$24°40.5	-4.8'	55.7'
6 7	270°00.6 285°00.8	N09°58.0 58.9	13°23.4 27°52.0	9.6' 9.7'	524°40.5 24°35.6	-4.9' -5.0'	55.6' 55.6'
8	300°00.9	09°59.8	42°20.6	9.7'	24°30.5	-5.2	55.6'
9	315°01.1	$10^{\circ}00.7$	56°49.4	9.8'	24°25.4	-5.3'	55.5'
10 11	330°01.2 345°01.4	01.6 02.5	71°18.2 85°47.1	9.9' 10.0'	24°20.1 24°14.7	-5.4' -5.5'	55.5' 55.5'
12	0°01.5	N10°03.4	100°16.1	10.0	\$24°14.7	-5.6'	55.5'
13	15°01.7	04.3	114°45.2	10.2'	24°03.6	-5.7'	55.4'
14	30°01.8	05.2	129°14.3	10.2'	23°57.8	-5.9'	55.4'
15 16	45°02.0 60°02.1	· · 06.0 06.9	143°43.6 158°12.9	10.3' 10.4'	23°51.9 23°46.0	-6.0' -6.1'	55.4' 55.4'
17	75°02.3	07.8	172°42.3	10.5'	23°39.9	-6.2	55.3'
18	90°02.4	$N10^{\circ}08.7$	187°11.8	10.6'	S 23°33.7	-6.3'	55.3'
19	105°02.5 120°02.7	09.6 10.5	201°41.3 216°11.0	10.7'	23°27.4 23°21.0	-6.4'	55.3' 55.2'
20 21	120°02.7 135°02.8	10.5	216°11.0 230°40.8	10.7' 10.8'	23° 21.0 23° 14.5	-6.5' -6.6'	55.2' 55.2'
22	150°03.0	12.2	245°10.6	10.9'	23°07.8	-6.7	55.2'
23	165°03.1	13.1	259°40.5	11.0'	23°01.1	-6.8'	55.2'
	SD = 15.9'	d = 0.9'		SI	D = 15.2'		
Sun	CUA	D	CIIA		D	.,	LID
o O	GHA 180°03.3	Dec N10°14.0	GHA 274°10.5	u 11.1'	Dec \$22° 54.3	d -6.9'	HP 55.1'
1	195°03.4	14.9	288°40.6	11.2'	22°47.3	-7.0'	55.1'
2	210°03.6	15.8	303°10.8	11.3'	22°40.3	-7.1'	55.1'
3 4	225°03.7 240°03.9	· · 16.7 17.6	317°41.0 332°11.3	11.3' 11.4'	22°33.1 22°25.9	-7.2' -7.3'	55.1' 55.0'
5	255°04.0	18.4	346°41.8	11.5'	22° 18.5	-7.4'	55.0'
6	270°04.2	N10°19.3	1°12.3	11.6'	S22°11.1	-7.5'	55.0'
7 8	285°04.3 300°04.4	20.2 21.1	15°42.9 30°13.5	11.7' 11.8'	22°03.6 21°55.9	-7.6' -7.7'	55.0' 55.0'
9	300 04.4 315°04.6	22.0	30 13.5 44°44.3	11.8'	21 55.9 21°48.2	-7.7 -7.8'	55.0 54.9'
10	330°04.7	22.8	59°15.2	11.9'	21°40.4	-7.9'	54.9'
11	345°04.9	23.7	73°46.1	12.0'	21°32.5	-8.0'	54.9'
12 13	0°05.0 15°05.2	N10°24.6 25.5	88°17.1 102°48.2	12.1' 12.2'	\$21°24.4 21°16.3	-8.1' -8.2'	54.9' 54.8'
14	30°05.3	26.4	102 40.2 117°19.4	12.3'	21°08.2	-8.3'	54.8'
15	45°05.5	• • 27.3	131°50.6	12.3'	20°59.9	-8.4'	54.8'
16 17	60°05.6 75°05.7	28.1 29.0	146°21.9 160°53.4	12.4' 12.5'	20°51.5 20°43.1	-8.5' -8.5'	54.8' 54.8'
18	90°05.9	N10°29.9	175°24.9	12.6'	\$20°34.5	-8.6'	54.7
19	105°06.0	30.8	189°56.4	12.7'	20°25.9	-8.7'	54.7'
20	120°06.2	31.7	204°28.1		20° 17.2	-8.8'	54.7'
21 22	135°06.3 150°06.5	· · 32.5 33.4	218°59.8 233°31.7	12.8' 12.9'	20°08.4 19°59.5	-8.9' -9.0'	54.7' 54.7'
23	165°06.6	34.3	248°03.6	13.0'	19°50.5	-9.0'	54.6'
	SD = 15.9'	d = 0.9'		SI	O = 15.0'		
Mon 0	GHA 180°06.8	Dec N10°35.2	GHA 262°35.5	u 13.1'	Dec \$19°41.5	d -9.1'	HP 54.6'
1	195°06.9	36.0	277°07.6	13.1'	19°32.4	-9.2'	54.6'
2	210°07.0	36.9	291°39.7	13.2'	19°23.2	-9.3'	54.6'
3 4	225°07.2 240°07.3	· · 37.8 38.7	306°11.9 320°44.2	13.3' 13.4'	19°13.9 19°04.6	-9.4' -9.4'	54.6' 54.6'
5	255°07.5	39.5	335°16.6	13.4'	18°55.1	-9.5'	54.5'
6	270°07.6	N10°40.4	349°49.0	13.5'	\$18°45.6	-9.6'	54.5
7 8	285°07.7 300°07.9	41.3 42.2	4°21.5 18°54.1	13.6' 13.7'	18° 36.1 18° 26.4	-9.7' -9.7'	54.5' 54.5'
9	300 07.9 315°08.0	• • 43.0	33°26.7	13.7'	18° 26.4 18° 16.7	-9.7 -9.8'	54.5'
10	330°08.2	43.9	$47^{\circ}59.4$	13.8'	18°06.9	-9.9'	54.5'
11	345°08.3	44.8 N10°45.7	62°32.2 77°05.1	13.9'	17°57.0 \$17°47.1	-9.9'	54.4'
12 13	0°08.4 15°08.6	N10°45.7 46.5	91°38.0	13.9' 14.0'	17° 47.1	-10.0' -10.1'	54.4' 54.4'
14	30°08.7	47.4	106°11.0	14.1'	17°27.0	-10.1	54.4
15	45°08.9	• • 48.3	120°44.1	14.1'	17°16.9	-10.2'	54.4
16 17	60°09.0 75°09.1	49.2 50.0	135°17.3 149°50.5	14.2' 14.3'	17°06.7 16°56.4	-10.3' -10.3'	54.4' 54.4'
18	90°09.3	N10°50.9	164° 23.7	14.3'	\$16°46.1	-10.3	54.4
19	105°09.4	51.8	178°57.1	14.4'	16°35.7	-10.5'	54.3'
20	120°09.6 135°09.7	52.7	193°30.5	14.5' 14.5'	16°25.2 16°14.7	-10.5'	54.3' 54.3'
21 22	135°09.7 150°09.8	· · 53.5 54.4	208°04.0 222°37.5	14.5' 14.6'	16°14.7 16°04.1	-10.6' -10.6'	54.3' 54.3'
23	165°10.0	55.3	237°11.1	14.7'	15° 53.5	-10.7	54.3'
	SD = 15.9'	d = 0.9'		SI	O = 14.9'		

			2020 P	-piii 13	to Ap	. 11
Lat.	Twi	light	Sunrise	Sunset	Twi	light
	Naut.	Civil	Cumbe	Canoci	Civil	Naut.
N 72°	////	01:43	03:30	20:33	22:26	////
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	03:53	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	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:56	18:17	18:42
20°	05:23	05:49	06:11	17:48	18:10	18:36
30°	05:28	05:56	06:20	17:39	18:03	18:31
35°	05:30	05:59	06:25	17:34	18:00	18:29
40°	05:31	06:03	06:30	17:28	17:56	18:27
45°	05:33	06:07	06:37	17:22	17:52	18:26
S 50°	05:34	06:12	06:45	17:14	17:47	18:24
52°	05:34	06:14	06:48	17:10	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
58°	05:35	06:21	07:01	16:57	17:38	18:23
S 60°	05:35	06:23	07:06	16:52	17:35	18:23
Lat.		Moonris	se .		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°			05:22			08:18
68°			04:34			09:06
66°		04:25	04:02		07:36	09:36

Lat.		Moonris	e	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°	_			_			
N 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°	00.40	00:01	00:46	10:58	11:50	12:40	
1	23:43		00:31	11:17	12:07	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	23:42	•• ••	12:19	13:00	13:36	
40°	22:31 22:17	23:31 23:19		12:32 12:48	13:12 13:25	13:45 13:56	
45°	21:59	23:04		13:07	13:41	14:08	
S 50°			00.55				
52°	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°	21:14	22:26	23:34	14:07	14:19	14:46	
58°	20:44	22:05	23:25	14:24	14:43	14:56	
S 60°	20:24	21:50	23:15	14:44	14:58	15:07	

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
T	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
Tue 0	206°38.2	137°53.4	N26° 45.5	185°37.7	N08° 13.4	36°35.5	N05°53.3	177°20.8	N09°36.0		
1	200 36.2 221°40.7	157 55.4 152°54.1	45.9	200°38.4	14.1	50°38.1	53.4	177 20.8 192°23.0	36.1	Alpheratz	357°32.3
2	236°43.1	167° 54.7	45.9 46.2	200 36.4 215°39.0	14.1	66°40.8	53.4	207°25.1	36.2	Ankaa	353°05.0
3	250°45.1	182° 55.4	. 46.5	215 39.0 230°39.7	15.5	81°43.4	• • 53.5	207 25.1 222°27.3	36.3	Schedar	349°28.4
4	266°48.1	197° 56.0	46.9	245°40.4	16.3	96°46.0	53.6	237°29.5	36.4	Diphda	348°45.0
5	281°50.5	212° 56.6	47.2	260°41.1	17.0	90°40.0 111°48.7	53.7	252°31.6	36.5	Achernar	$335^{\circ}18.9$
6	296°53.0	212 50.0 227° 57.3	N26° 47.5	275°41.8	N08° 17.7	126°51.3	N05°53.7	267°33.8	N09°36.6	Hamal	327°48.5
7	311°55.5	242° 57.9	47.9	290°42.5	18.4	141°54.0	53.8	282°35.9	36.7	Polaris	313°03.8
8	326° 57.9	257°58.6	48.2	305°43.2	19.2	156°56.6	53.9	202 33.9 297°38.1	36.9	Acamar	$315^{\circ}10.2$
9	342°00.4	272°59.2	• • 48.5	320°43.9	19.9	171°59.2	53.9	312°40.3	37.0	Menkar	314°03.7
10	357°02.9	287°59.9	48.9	335°44.6	20.6	187°01.9	54.0	327°42.4	37.1	Mirfak	308°24.8
11	12°05.3	303°00.6	49.2	350°45.3	21.4	202°04.5	54.1	342°44.6	37.2	Aldebaran	290°36.8
12	27°07.8	318°01.2	N26°49.5	5°45.9	N08°22.1	217°07.2	N05°54.1	357°46.8	N09°37.3	Rigel	281°01.5
13	42°10.3	333°01.9	49.8	20°46.6	22.8	232°09.8	54.2	12°48.9	37.4	Capella	280°18.2
14	57°12.7	348°02.5	50.2	35°47.3	23.5	247°12.4	54.3	27°51.1	37.5	Bellatrix	278°20.2
15	72°15.2	3°03.2	• • 50.5	50°48.0	• • 24.3	262°15.1	• • 54.3	42°53.2	• • 37.6	Elnath	277°58.7
16	87°17.6	18°03.9	50.8	65°48.7	25.0	277°17.7	54.4	57°55.4	37.7	Alnilam	275°35.2
17	$102^{\circ}20.1$	33°04.5	51.1	80°49.4	25.7	292°20.4	54.5	72°57.6	37.9	Betelgeuse	270°49.4
18	117°22.6	48°05.2	N26°51.4	95°50.1	N08°26.4	307°23.0	N05°54.5	87°59.7	N09°38.0	Canopus	263°51.4
19	132°25.0	63°05.9	51.8	110°50.8	27.2	322°25.6	54.6	103°01.9	38.1	Sirius	258°24.0 255°03.9
20	147°27.5	78°06.5	52.1	125°51.5	27.9	337°28.3	54.7	118°04.0	38.2	Adhara	255 03.9 244°48.1
21	162°30.0	93°07.2	• • 52.4	140°52.1	• • 28.6	352°30.9	• • 54.7	133°06.2	• • 38.3	Procyon Pollux	244 46.1 243°14.1
22	177°32.4	108°07.9	52.7	155°52.8	29.3	7°33.5	54.8	148°08.4	38.4	Avior	234°13.6
23	192°34.9	123°08.6	53.0	170°53.5	30.1	22°36.2	54.9	163°10.5	38.5	Suhail	222°44.2
Mern	ass. 10:12	ν0 6' d0	.3′ m-4.70	ν0 7' d0	.7′ m1.15	v2 6' d0	1' m-2.36	1/2 2' d0	.1′ m0.44	Miaplacidus	221°37.4
- IVIEL.P	455. 10.12	νο.υ αυ.	.5 111-4.70	νο.τ do		ν2.0 do.	1 111-2.50	νz.z ασ	.1 1110.44	Alphard	217°45.0
										Regulus	207°31.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.4
0	207°37.4	138°09.3	N26°53.4	185°54.2	N08°30.8	37°38.8	N05°54.9	178°12.7	N09°38.6	Denebola	182°22.0
1	222°39.8	153°09.9	53.7	200°54.9	31.5	$52^{\circ}41.5$	55.0	193°14.9	38.7	Gienah	175°40.5
2	237°42.3	$168^{\circ}10.6$	54.0	215°55.6	32.2	67°44.1	55.1	208°17.0	38.9		172°56.3
3	252°44.8	183°11.3	• • 54.3	230°56.3	• • 33.0	82°46.7	• • 55.1	223°19.2	• • 39.0	Gacrux	171°48.0
4	267°47.2	198°12.0	54.6	245°57.0	33.7	97°49.4	55.2	238°21.3	39.1	Alioth	166°10.2
5	282°49.7	213° 12.7	54.9	260°57.7	34.4	112°52.0	55.3	253°23.5	39.2	Spica	158°19.2
6	297°52.1	228° 13.4	N26°55.2	275°58.3	N08°35.1	127°54.6	N05°55.3	268°25.7	N09°39.3	Alkaid	152°49.5
7	312°54.6	243° 14.1	55.5	290°59.0	35.8	142°57.3	55.4	283°27.8	39.4	Hadar	148°31.5
8	327°57.1	258° 14.8	55.8	305°59.7	36.6	157°59.9	55.5	298°30.0	39.5	Menkent	147°54.0
9	342°59.5	273°15.5	• • 56.2	321°00.4	• • 37.3	173°02.5	• • 55.5	313°32.1	• • 39.6	Arcturus	145°45.1
10	358°02.0	288°16.2	56.5	336°01.1	38.0	188°05.2	55.6	328°34.3	39.7	Rigil Kent.	139°35.9
11	13°04.5	303°16.9	56.8	351°01.8	38.7	203°07.8	55.6	343°36.5	39.9	Kochab	$137^{\circ}18.9$
12	28°06.9	318° 17.6	N26°57.1	6°02.5	N08°39.5	218°10.4	N05°55.7	358°38.6	N09°40.0	Zuben'ubi	136°52.7
13	43°09.4	333°18.3	57.4 57.7	21°03.2	40.2	233°13.1	55.8	13°40.8 28°43.0	40.1	Alphecca	$126^{\circ}01.2$
14	58°11.9	348°19.0	57.7	36°03.9	40.9	248°15.7	55.8		40.2	Antares	$112^{\circ}12.3$
15	73°14.3	3°19.7 18°20.5	• • 58.0	51°04.5	• • 41.6	263°18.3	• • 55.9	43°45.1	• • 40.3	Atria	107°03.6
16 17	88°16.8 103°19.2	33°21.2	58.3 58.6	66°05.2 81°05.9	42.3 43.1	278°21.0 293°23.6	56.0 56.0	58°47.3 73°49.4	40.4 40.5	Sabik	101°59.5
18	103 19.2 118°21.7	48° 21.9	N26°58.9	96°06.6	N08°43.8	308°26.2	N05°56.1	88°51.6	N09°40.6	Shaula	96°06.5
19	133°24.2	63°22.6	59.2	111°07.3	44.5	323°28.9	56.2	103°53.8	40 =	Rasalhague	95°55.9
20	148° 26.6	78°23.3	59.5	126°08.0	44.5 45.2	338°31.5	56.2	103°55.0	40. <i>7</i> 40.9	Eltanin	90°40.7
21	163°29.1	93°24.1	26° 59.8	141°08.7	45.9	353°34.1	56.3	133°58.1	• • 41.0	Kaus Aust.	83°28.8
22	178°31.6	108°24.8	20° 39.0 27° 00.1	156°09.4	46.7	8°36.8	56.4	149°00.2	41.1	Vega	80°31.3
23	193°34.0	123°25.5	00.4	171°10.0	47.4	23°39.4	56.4	164°02.4	41.2	Nunki	75°44.4
								_		Altair	61°57.3
Mer.p	ass. 10:08	ν 0.7′ d0.	.3′ m-4.71	$ u$ 0.7 $^{\prime}$ d0	.7' m1.16	$\nu 2.6' \ d0.$	1′ m-2.36	ν 2.2′ d0	.1' m0.44	Peacock	53°01.6
										Deneb	49°24.0
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.3
0	208°36.5	138°26.3	N27° 00.6		N08°48.1	38°42.0	N05°56.5	179°04.6	N09°41.3	Al Na'ir	27°29.9 15°11.9
1	223°39.0	153°27.0	00.9	201°11.4	48.8	53°44.7	56.5	194°06.7	41.4	Fomalhaut Scheat	15°11.9 13°42.8
2	238°41.4	168°27.7	01.2	216°12.1	49.5	68°47.3	56.6	209°08.9	41.5	Markab	13°27.5
3	253°43.9	183°28.5	• • 01.5	231°12.8	• • 50.3	83°49.9	• • 56.7	224°11.0	• • 41.6	IVIAIKAD	
4	268°46.4	198°29.2	01.8	246°13.5	51.0	98°52.5	56.7	239°13.2	41.7	Apr 18 Tue	SHA
5	283°48.8	213°29.9	02.1	261°14.2	51.7	113°55.2	56.8	254°15.4	41.8	Venus	
6	298°51.3	228°30.7	N27°02.4	276°14.9	N08°52.4	128°57.8	N05°56.9	269°17.5	N09°42.0	Mars	
7	313°53.7	243°31.4	02.7	$291^{\circ}15.5$	53.1	144°00.4	56.9	$284^{\circ}19.7$	42.1		189°57.3
8	328°56.2	$258^{\circ}32.2$	03.0	$306^{\circ}16.2$	53.9	159°03.1	57.0	299°21.9	42.2	Saturn	330°42.6
9	343°58.7	273°32.9	•• 03.2	321°16.9	• • 54.6	174°05.7	• • 57.0	314°24.0	• • 42.3	Apr 19 Wed	SHA
10	$359^{\circ}01.1$	288°33.7	03.5	$336^{\circ}17.6$	55.3	189°08.3	57.1	329°26.2	42.4	Venus	
11	14°03.6	303°34.4	03.8	351°18.3	56.0	204°10.9	57.2	344°28.3	42.5	I	338°16.9
12	29°06.1	318° 35.2	N27°04.1	6°19.0	N08°56.7	219°13.6	N05°57.2	359°30.5	N09°42.6	I	190°01.5
13	44°08.5	333°36.0	04.4	21°19.7	57.5	234°16.2	57.3	14°32.7	42.7	Saturn	
14	59°11.0	348°36.7	04.7	36°20.4	58.2	249°18.8	57.3	29°34.8	42.8		
15	74°13.5	3°37.5	• • 04.9	51°21.0	• • 58.9	264°21.4	• • 57.4	44°37.0	• • 43.0	Apr 20 Thu	SHA
16	89°15.9	18°38.3	05.2	66°21.7	08°59.6	279°24.1	57.5	59°39.1	43.1	I	289°49.8
17	104°18.4	33°39.0	05.5	81°22.4	09°00.3	294°26.7	57.5	74°41.3	43.2		337°34.2
18	119°20.8	48°39.8	N27°05.8	96°23.1	N09°01.0	309°29.3	N05°57.6	89°43.5	N09°43.3		190°05.5
19	134°23.3	63°40.6	06.1	111°23.8	01.8	324°31.9	57.7	104°45.6	43.4	Saturn	330°28.1
20	149°25.8	78°41.4	06.3	126°24.5	02.5	339°34.6	57.7	119°47.8	43.5	Under a	tal parallax
21	164°28.2	93°42.1	• • 06.6	141°25.2	• • 03.2	354°37.2	• • 57.8	134°50.0	• • 43.6	Horizon	Venus:
22	179°30.7	108° 42.9	06.9	156°25.9	03.9	9°39.8	57.8 57.0	149°52.1	43.7		venus: Mars:
23	194°33.2	123°43.7	07.1	171°26.5	04.6	24°42.4	57.9	164°54.3	43.8		ividi3.
Mer.p	ass. 10:04	ν 0.7′ d0.	.3′ m-4.71	$ u$ 0.7 $^{\prime}$ d0	.7′ m1.16	ν 2.6′ d0.	1′ m-2.35	ν 2.2′ d0	.1′ m0.43		

Dec $29^{\circ}14.7$ -42°09.0 56°41.5 -17°49.9 -57°05.5 23°35.7 $89^{\circ}23.0$ -40°11.6 4°12.0 49°57.7 $16^{\circ}33.9$ -8°10.3 46°01.6 $6^{\circ}22.4$ 28°37.8 $-1^{\circ}11.2$ 7°24.6 -52°43.0 -16°45.6 -29°00.9 5°09.0 27°57.4 -59°36.4 -43°33.2 -69°50.4 -8°47.1 11°49.6 61°35.9 14°24.7 -17°42.2 $\textbf{-63}^{\circ}15.6$ -57°16.5 55°48.3 -11°18.7 49°10.2 -60°30.7 -36°30.7

19°01.9 -60°57.2 74°02.2 -16°09.7 26°37.0 -26°29.7

-26°29.7 -69°04.5 -15°45.6 -37°07.3 12°32.2 51°28.8

-34°22.1 38°48.4 -26°15.6 8°56.5 -56°38.3 $45^{\circ}22.7$ $10^{\circ}00.2$ $-46^{\circ}49.2$ -29°28.2 $28^{\circ}14.1$ 15°21.4 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	Sui	า			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 10.1	N10°56.1	251°44.7	14.7'	S15°42.7	-10.8'	54.3'
1	195°10.3	57.0	$266^{\circ}18.5$	14.8'	15°32.0	-10.8'	54.3'
2	210° 10.4	57.9	280°52.2	14.8'	15°21.2	-10.9'	54.3'
3	225° 10.5	•• 58.7	295°26.1	14.9'	15°10.3	-10.9'	54.2'
4	240° 10.7 255° 10.8	10°59.6 11°00.5	310°00.0 324°33.9	15.0'	14°59.4 14°48.4	-11.0'	54.2'
5 6	255 10.8 270°10.9	N11°01.4	324 33.9 339°07.9	15.0' 15.1'	514°37.3	-11.0' -11.1'	54.2' 54.2'
7	285°11.1	02.2	353°42.0	15.1'	14°26.2	-11.1	54.2'
8	300°11.2	03.1	8° 16.1	15.2'	14°15.1	-11.2'	54.2'
9	315°11.4	• • 04.0	22°50.3	15.2'	14°03.9	-11.3'	54.2'
10	330°11.5	04.8	37°24.5	15.3'	13°52.6	-11.3'	54.2'
11	345°11.6	05.7	51°58.8	15.3'	13°41.3	-11.4'	54.2'
12	0°11.8 15°11.9	N11°06.6	66°33.1 81°07.5	15.4' 15.4'	\$13°29.9 13°18.5	-11.4'	54.2' 54.2'
13 14	30°12.0	07.4 08.3	95°42.0	15.4 15.5'	13°18.5 13°07.1	-11.5' -11.5'	54.2'
15	45° 12.2	09.2	110° 16.5	15.5'	12°55.6	-11.6'	54.1'
16	60°12.3	10.0	124°51.0	15.6'	12°44.0	-11.6'	54.1'
17	75° 12.4	10.9	139°25.6	15.6'	12°32.4	-11.6'	54.1'
18	90°12.6	N11°11.8	154°00.2	15.7'	S12°20.8	-11.7'	54.1'
19	105° 12.7	12.6	168°34.9	15.7'	12°09.1	-11.7'	54.1'
20	120°12.8	13.5 • • 14.3	183°09.6	15.8'	11°57.4 11°45.6	-11.8'	54.1'
21 22	135° 13.0 150° 13.1	· · 14.3 15.2	197°44.3 212°19.1	15.8' 15.8'	11°45.6 11°33.8	-11.8' -11.9'	54.1' 54.1'
23	165° 13.2	16.1	212 19.1 226°54.0	15.0	11°21.9	-11.9'	54.1'
23						21.9	J 1.1
	SD = 15.9'	d = 0.9'		SI	O = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180° 13.4 195° 13.5	N11°16.9 17.8	241°28.9 256°03.8	15.9' 16.0'	\$11°10.0 10°58.1	-11.9' -12.0'	54.1' 54.1'
2	210° 13.6	18.7	270°38.8	16.0'	10°46.1	-12.0'	54.1'
3	225°13.8	• • 19.5	285°13.8	16.0'	10°34.0	-12.1'	54.1'
4	240°13.9	20.4	299°48.8	16.1'	10°22.0	-12.1'	54.1'
5	255°14.0	21.2	314°23.9	16.1'	10°09.9	-12.1'	54.1'
6	270° 14.2 285° 14.3	N11°22.1	328°59.0 343°34.1	16.1'	\$09°57.7 09°45.6	-12.2'	54.1'
7 8	285°14.3 300°14.4	23.0 23.8	343°34.1 358°09.3	16.2' 16.2'	09°45.6	-12.2' -12.2'	54.1' 54.1'
9	315° 14.6	24.7	12°44.5	16.2	09°33.4	-12.2	54.1'
10	330°14.7	25.5	27° 19.8	16.3'	09°08.8	-12.3'	54.1'
11	345°14.8	26.4	41°55.0	16.3'	$08^{\circ}56.5$	-12.3'	54.1'
12	0°15.0	N11°27.3	56°30.3	16.3'	508°44.2	-12.4'	54.1'
13	15° 15.1 30° 15.2	28.1 29.0	71°05.7 85°41.0	16.4' 16.4'	08°31.8 08°19.4	-12.4' -12.4'	54.1' 54.1'
14 15	45° 15.4	. 29.8	100°16.4	16.4	08°06.9	-12.4 -12.5'	54.1'
16	60° 15.5	30.7	114°51.8	16.4	07°54.5	-12.5'	54.1'
17	75° 15.6	31.5	129°27.3	16.5'	07°42.0	-12.5'	54.1'
18	90°15.8	N11°32.4	144°02.7	16.5'	507°29.4	-12.6'	54.1'
19	105° 15.9	33.3	158° 38.2	16.5	07°16.9	-12.6'	54.1'
20	120° 16.0 135° 16.1	34.1 •• 35.0	173°13.7 187°49.3	16.5' 16.5'	07°04.3 06°51.7	-12.6' -12.6'	54.1' 54.1'
21 22	150°16.3	35.8	187 49.3 202°24.8	16.6	06°39.0	-12.0 -12.7'	54.1'
23	165° 16.4	36.7	217°00.4	16.6'	06°26.4	-12.7'	54.1'
	SD = 15.9'	d = 0.9'		SI	D = 14.8'		
Thu 0	GHA 180° 16.5	Dec N11°37.5	GHA 231° 35.9	u 16.6'	Dec \$06° 13.7	d -12.7'	HP 54.1'
1	195° 16.7	38.4	231 35.9 246°11.5	16.6'	06°01.0	-12.7'	54.1'
2	210° 16.8	39.3	260°47.2	16.6'	05°48.2	-12.8'	54.1'
3	225°16.9	• • 40.1	275°22.8	16.6'	$05^{\circ}35.4$	-12.8'	54.1'
4	240° 17.1	41.0	289°58.4	16.7'	05°22.7	-12.8'	54.1'
5	255° 17.2	41.8	304°34.1	16.7'	05°09.9	-12.8'	54.1'
6 7	270° 17.3 285° 17.4	N11° 42.7 43.5	319°09.8 333°45.5	16.7' 16.7'	\$04°57.0 04°44.2	-12.9' -12.9'	54.1' 54.1'
8	285 17.4 300°17.6	43.5 44.4	348° 21.1	16.7	04 44.2 04°31.3	-12.9'	54.1'
9	315° 17.7	• • 45.2	2°56.9	16.7	04°18.4	-12.9'	54.1'
10	330°17.8	46.1	$17^{\circ}32.6$	16.7'	04°05.5	-12.9'	54.1'
11	345° 17.9	46.9	32°08.3	16.7'	03°52.6	-12.9'	54.1'
12	0°18.1	N11°47.8	46°44.0	16.7'	503°39.6	-13.0'	54.1'
13 14	15° 18.2 30° 18.3	48.6 49.5	61° 19.7 75° 55.5	16.7' 16.7'	03°26.7 03°13.7	-13.0' -13.0'	54.1' 54.1'
14 15	30° 18.3 45° 18.5	49.5 •• 50.3	75°55.5 90°31.2	16.7'	03°13.7 03°00.7	-13.0' -13.0'	54.1'
16	60° 18.6	51.2	105°06.9	16.7	03° 47.7	-13.0'	54.1'
17	75° 18.7	52.0	$119^{\circ}42.7$	16.7'	02°34.7	-13.0'	54.1'
18	90°18.8	N11°52.9	134° 18.4	16.7'	S02°21.6	-13.0'	54.2'
19	105°19.0	53.7	148°54.2	16.7'	02°08.6	-13.1'	54.2'
20 21	120° 19.1 135° 19.2	54.6 • • 55.4	163°29.9 178°05.6	16.7' 16.7'	01°55.5 01°42.5	-13.1' -13.1'	54.2' 54.2'
22	150° 19.3	56.3	178 05.0 192°41.4	16.7	01°29.4	-13.1'	54.2'
23	165° 19.5	57.1	207°17.1	16.7'	01°16.3	-13.1'	54.2'
	SD = 15.9'	d = 0.9'		SI	O = 14.7'		

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-21%	
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		

April 21, 22, 23 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	209°35.6	138°44.5 N27°07.4	186°27.2 N09°05.3	39°45.1 N05°58.0	179°56.4 N09°44.0	
1	224°38.1	153°45.3 07.7	201°27.9 06.1	54°47.7 58.0	194°58.6 44.1	Alpheratz 357°32.3 Ankaa 353°04.9
2	239°40.6	168°46.1 08.0	216°28.6 06.8	69°50.3 58.1	210°00.8 44.2	Ankaa 353°04.9 Schedar 349°28.4
3	254°43.0	183°46.8 · · 08.2	231°29.3 · · 07.5	84°52.9 · · 58.1	225°02.9 · · 44.3	Diphda 348°44.9
4	269°45.5	198° 47.6 08.5	246°30.0 08.2 261°30.7 08.9	99°55.6 58.2	240°05.1 44.4	Achernar 335°18.9
5 6	284°48.0 299°50.4	213°48.4 08.8 228°49.2 N27°09.0	261°30.7 08.9 276°31.3 N09°09.6	114°58.2 58.3 130°00.8 N05°58.3	255°07.2 44.5 270°09.4 N09°44.6	Hamal 327°48.5
7	314°52.9	243°50.0 09.3	291°32.0 10.3	145°03.4 58.4	285°11.6 44.7	Polaris 313°04.3
8	329°55.3	258° 50.8 09.6	306°32.7 11.1	160°06.1 58.4	300°13.7 44.8	Acamar 315°10.2
9	344°57.8	273°51.6 · · 09.8	321°33.4 · · 11.8	175°08.7 · · 58.5	315°15.9 · · 44.9	Menkar 314°03.7 Mirfak 308°24.8
10	0°00.3	288°52.5 10.1	336°34.1 12.5	190°11.3 58.5	330°18.0 45.1	Mirfak 308°24.8 Aldebaran 290°36.8
11	15°02.7	303°53.3 10.3	351°34.8 13.2	205°13.9 58.6	345°20.2 45.2	Rigel 281°01.5
12	30°05.2	318°54.1 N27°10.6	6°35.5 N09°13.9	220°16.5 N05°58.7	0°22.4 N09°45.3	Capella 280°18.2
13	45°07.7 60°10.1	333°54.9 10.9 348°55.7 11.1	21°36.1 14.6	235°19.2 58.7 250°21.8 58.8	15°24.5 45.4 30°26.7 45.5	Bellatrix 278°20.2
14 15	75°12.6	348°55.7 11.1 3°56.5 · · 11.4	36°36.8 15.3 51°37.5 · · 16.1	250°21.8 58.8 265°24.4 · · 58.8	30°26.7 45.5 45°28.8 •• 45.6	Elnath 277°58.7
16	90°15.1	18°57.4 11.6	66°38.2 16.8	280°27.0 58.9	60°31.0 45.7	Alnilam 275°35.2
17	105°17.5	33°58.2 11.9	81°38.9 17.5	295°29.6 59.0	75°33.2 45.8	Betelgeuse 270°49.4
18	120°20.0	48°59.0 N27°12.1	96°39.6 N09°18.2	310°32.3 N05°59.0	90°35.3 N09°45.9	Canopus 263°51.5 Sirius 258°24.0
19	135°22.4	63°59.8 12.4	111°40.3 18.9	325°34.9 59.1	105°37.5 46.1	Adhara 255°03.9
20	150°24.9	79°00.7 12.7	126°41.0 19.6	340°37.5 59.1	120°39.7 46.2	Procyon 244°48.1
21	165°27.4	94°01.5 · · 12.9	141°41.6 · · 20.3	355°40.1 · · 59.2	135°41.8 · · 46.3	Pollux 243°14.1
22 23	180°29.8 195°32.3	109°02.3 13.2 124°03.2 13.4	156°42.3 21.0 171°43.0 21.8	10°42.7 59.2 25°45.4 59.3	150°44.0 46.4 165°46.1 46.5	Avior 234°13.6
						Suhail 222°44.2
Mer.p	ass. 10:00	ν 0.8′ d0.3′ m-4.72	$ u 0.7' \; d0.7' \; m1.17$	$ u 2.6' \ d0.1' \ \text{m-}2.35$	$\nu 2.2' \ d0.1' \ m0.43$	Miaplacidus 221°37.4
						Alphard 217°45.0
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.5 Dubhe 193°37.4
0	210°34.8	139°04.0 N27°13.7	186°43.7 N09°22.5	40°48.0 N05°59.4	180°48.3 N09°46.6	Denebola 182°22.0
1	225°37.2	154°04.9 13.9	201°44.4 23.2	55°50.6 59.4	195°50.5 46.7	Gienah 175°40.5
2	240°39.7	169°05.7 14.2	216°45.1 23.9	70°53.2 59.5	210°52.6 46.8	Acrux 172°56.4
3	255°42.2	184°06.5 · · 14.4	231°45.8 · · 24.6	85°55.8 · · 59.5	225°54.8 · · 46.9	Gacrux 171°48.0
4 5	270°44.6 285°47.1	199°07.4 14.6 214°08.2 14.9	246°46.4 25.3 261°47.1 26.0	100°58.4 59.6 116°01.1 59.6	240°56.9 47.0 255°59.1 47.2	Alioth 166°10.2
6	300°49.6	229°09.1 N27°15.1	276°47.8 N09°26.7	131°03.7 N05°59.7	271°01.3 N09°47.3	Spica 158°19.2
7	315°52.0	244°10.0 15.4	291°48.5 27.4	146°06.3 59.8	286°03.4 47.4	Alkaid 152°49.5
8	330°54.5	259° 10.8 15.6	306°49.2 28.2	161°08.9 59.8	301°05.6 47.5	Hadar 148°31.5 Menkent 147°54.0
9	345°56.9	274°11.7 · · 15.9	321°49.9 · · 28.9	176°11.5 · · 59.9	316°07.7 · · 47.6	Arcturus 145°45.1
10	0°59.4	289° 12.5 16.1	336°50.5 29.6	191°14.1 05°59.9	331°09.9 47.7	Rigil Kent. 139°35.9
11	16°01.9	304°13.4 16.3	351°51.2 30.3	206°16.8 06°00.0	346°12.1 47.8	Kochab 137°18.9
12 13	31°04.3 46°06.8	319°14.3 N27°16.6 334°15.2 16.8	6°51.9 N09°31.0 21°52.6 31.7	221°19.4 N06°00.0 236°22.0 00.1	1°14.2 N09°47.9 16°16.4 48.0	Zuben'ubi 136°52.7
14	61°09.3	349°16.0 17.1	36°53.3 32.4	250°24.6 00.1	31°18.6 48.2	Alphecca 126°01.2
15	76°11.7	4°16.9 · · 17.3	51°54.0 · · 33.1	266°27.2 · · 00.2	46°20.7 · · 48.3	Antares 112°12.2
16	91°14.2	19° 17.8 17.5	66°54.7 33.8	281°29.8 00.3	61°22.9 48.4	Atria 107°03.6 Sabik 101°59.5
17	$106^{\circ}16.7$	34° 18.7 17.8	81°55.3 34.5	296°32.4 00.3	76°25.0 48.5	Shaula 96°06.5
18	121°19.1	49°19.5 N27°18.0	96°56.0 N09°35.2	311°35.0 N06°00.4	91°27.2 N09°48.6	Rasalhague 95°55.9
19	136°21.6	64°20.4 18.2	111°56.7 36.0	326°37.7 00.4	106°29.4 48.7	Eltanin 90°40.6
20	151°24.1 166°26.5	79°21.3 18.5 94°22.2 · · 18.7	126°57.4 36.7 141°58.1 · · · 37.4	341°40.3 00.5 356°42.9 · · 00.5	121°31.5 48.8 136°33.7 · · 48.9	Kaus Aust. 83°28.8
21 22	181°29.0	109°23.1 18.9	156°58.8 38.1	11°45.5 00.6	150° 35.8 49.0	Vega 80°31.2
23	196°31.4	124°24.0 19.1	171°59.5 38.8	26°48.1 00.6	166°38.0 49.1	Nunki 75°44.3 Altair 61°57.3
	pass. 09:56		ν0.7' d0.7' m1.17	ν2.6' d0.1' m-2.34		Altair 61°57.3 Peacock 53°01.6
ivier.p	Dass. 09:50	ν0.8′ d0.2′ m-4.72	νυ. <i>Γ΄ α</i> υ. <i>Γ΄</i> m1.1 <i>Γ</i>	ν2.0 αυ.1 m-2.34	ν2.2' d0.1' m0.44	Deneb 49°24.0
						Enif 33°36.3
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°29.8
0	211°33.9	139°24.9 N27°19.4	187°00.1 N09°39.5	41°50.7 N06°00.7	181°40.2 N09°49.3	Fomalhaut 15°11.8
1 2	226°36.4 241°38.8	154°25.8 19.6 169°26.7 19.8	202°00.8 40.2 217°01.5 40.9	56°53.3 00.8 71°55.9 00.8	196°42.3 49.4 211°44.5 49.5	Scheat 13°42.8
3	256°41.3	184°27.6 · · 20.1	232°02.2 · · 41.6	86°58.6 · · 00.9	226°46.6 · · 49.6	Markab 13°27.4
4	271°43.8	199°28.5 20.3	247°02.9 42.3	102°01.2 00.9	241°48.8 49.7	Apr 21 Fri SHA
5	286°46.2	214°29.4 20.5	262°03.6 43.0	117°03.8 01.0	256°51.0 49.8	Venus 289°08.8
6	301°48.7	229°30.3 N27°20.7	277°04.2 N09°43.7	132°06.4 N06°01.0	271°53.1 N09°49.9	Mars 336°51.6
7	316°51.2	244°31.3 20.9	292°04.9 44.4	147°09.0 01.1	286°55.3 50.0	Jupiter 190°09.4
8	331°53.6 346°56.1	259°32.2 21.2 274°33.1 · · 21.4	307°05.6 45.1	$162^{\circ}11.6$ 01.1 $177^{\circ}14.2$ · · 01.2	301°57.4 50.1	Saturn 330°20.8
9 10	1°58.5	289°34.0 21.6	322°06.3 · · 45.8 337°07.0 46.6	177°14.2 · · · 01.2 192°16.8	316°59.6 · · 50.2 332°01.8 50.4	Apr 22 Sat SHA
11	1 56.5 17°01.0	304°34.9 21.8	352°07.7 47.3	207°19.4 01.3	347°03.9 50.5	Venus 288°29.2
12	32°03.5	319°35.9 N27°22.0	7°08.3 N09°48.0	222°22.0 N06°01.3	2°06.1 N09°50.6	Mars 336°08.9
13	47°05.9	334°36.8 22.2	22°09.0 48.7	237°24.6 01.4	17°08.3 50.7	Jupiter 190°13.2 Saturn 330°13.5
14	62°08.4	349°37.7 22.5	37°09.7 49.4	252°27.2 01.4	32°10.4 50.8	
15	77°10.9	4°38.7 · · 22.7	52°10.4 · · 50.1	267°29.9 · · 01.5	47°12.6 · · 50.9	Apr 23 Sun SHA
16 17	92°13.3 107°15.8	19°39.6 22.9 34°40.6 23.1	67°11.1 50.8 82°11.8 51.5	282°32.5 01.6 297°35.1 01.6	62°14.7 51.0 77°16.9 51.1	Venus 287°51.0
17 18	107°15.8 122°18.3	34°40.6 23.1 49°41.5 N27°23.3	82°11.8 51.5 97°12.4 N09°52.2	297°35.1 01.6 312°37.7 N06°01.7	77°16.9 51.1 92°19.1 N09°51.2	Mars 335°26.2 Jupiter 190°16.8
19	137°20.7	64°42.4 23.5	112°13.1 52.9	327°40.3 01.7	107°21.2 51.3	Saturn 330°06.3
20	152°23.2	79°43.4 23.7	127°13.8 53.6	342°42.9 01.8	122°23.4 51.5	
21	167°25.7	94°44.4 · · 23.9	142°14.5 · · 54.3	357°45.5 · · 01.8	137°25.5 · · 51.6	Horizontal parallax
22	182°28.1	109°45.3 24.1	157°15.2 55.0	12°48.1 01.9	152°27.7 51.7	Venus:
23	197°30.6	124°46.3 24.4	172°15.9 55.7	27°50.7 01.9	167°29.9 51.8	Mars:
Mer.p	ass. 09:52	$ u 0.9' \ d0.2' \ \text{m-4.73}$	u0.7′ d 0.7′ m 1.18	$\nu 2.6'~d0.1'~\text{m-}2.33$	$\nu 2.2' \ d0.1' \ m0.44$	

Dec

29°14.7 -42°09.0

56°41.5 -17°49.9

-57°05.5

 $23^{\circ}35.7$

 $89^{\circ}23.0$

-40°11.6

4°12.0

49°57.7 16°33.9

-8°10.3

 $46^{\circ}01.6$

 $6^{\circ}22.4$

28°37.8

 $-1^{\circ}11.2$

7°24.6

-52°43.0

-16°45.6

-29°00.9

 $5^{\circ}09.0$

 $27^{\circ}57.4$

-59°36.4

-43°33.2

-69°50.4 -8°47.1

11°49.6

61°35.9 14°24.7

 $-17^{\circ}42.2$

 $-63^{\circ}15.6$

 $-57^{\circ}16.6$

55°48.3

-11°18.7 49°10.2 -60°30.7 -36°30.7

 $19^{\circ}01.9$

-60°57.2

 $74^{\circ}02.2$

-16°09.7

26°37.0 -26°29.7

-69°04.5

-15°45.6

 $-37^{\circ}\,07.3$ $12^{\circ}\,32.2$

51°28.8

-34°22.1

38°48.4

-26°15.6 8°56.5

-56°38.3

45°22.7

 $10^{\circ}00.2$

-46°49.2

-29°28.2

28°14.1

15°21.4

Mer.pass

14:44

11:34

21:17

11:59

14:43

11:33

21:13

11:55

11:31

21:09

11:52

0.3

0.1

Mer.pass 14:41

Mer.pass

h	Sui	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.6	N11°58.0	221°52.8	16.7'	S01°03.2	-13.1'	54.2'
1 2	195°19.7 210°19.8	58.8 11°59.7	236°28.5 251°04.3	16.7' 16.7'	00°50.1 00°37.0	-13.1' -13.1'	54.2' 54.2'
3	210 19.8 225°20.0	11 59.7 12°00.5	265°40.0	16.7	00° 37.0	-13.1'	54.2'
4	240°20.1	01.3	280°15.6	16.7'	500°10.7	-13.1'	54.2'
5	255°20.2	02.2	294°51.3	16.7'	N00°02.4	13.1'	54.2'
6	270°20.3 285°20.4	N12°03.0 03.9	309°27.0 324°02.6	16.7' 16.6'	N00°15.5 00°28.7	13.1' 13.1'	54.2' 54.3'
7 8	285 20.4 300°20.6	03.9 04.7	324 02.0 338°38.3	16.6'	00 28.7 00°41.8	13.1	54.3'
9	315°20.7	• • 05.6	353°13.9	16.6'	00°55.0	13.2'	54.3'
10	330°20.8	06.4	7°49.5	16.6'	01°08.1	13.2'	54.3'
11 12	345°20.9 0°21.1	07.3 N12°08.1	22°25.1 37°00.7	16.6' 16.6'	01°21.3 N01°34.4	13.2' 13.2'	54.3' 54.3'
13	15°21.2	08.9	51°36.3	16.5	01°47.6	13.2'	54.3'
14	30°21.3	09.8	$66^{\circ}11.8$	16.5'	$02^{\circ}00.7$	13.2'	54.3'
15	45°21.4	• • 10.6	80°47.3	16.5'	02°13.9	13.1'	54.3'
16 17	60°21.5 75°21.7	11.5 12.3	95°22.8 109°58.3	16.5' 16.5'	02°27.0 02°40.2	13.1' 13.1'	54.3' 54.4'
18	90°21.8	N12°13.1	124°33.8	16.4	N02°53.3	13.1'	54.4'
19	105°21.9	14.0	$139^{\circ}09.2$	16.4'	$03^{\circ}06.5$	13.1'	54.4'
20	120°22.0	14.8	153°44.6	16.4	03°19.6	13.1'	54.4'
21 22	135°22.2 150°22.3	· · 15.7 16.5	168°20.0 182°55.3	16.4' 16.3'	03°32.7 03°45.9	13.1' 13.1'	54.4' 54.4'
23	165°22.4	17.3	197°30.7	16.3	03°59.0	13.1	54.4'
	SD = 15.9'	d = 0.8'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°22.5 195°22.6	N12°18.2 19.0	212°06.0 226°41.2	16.3' 16.2'	N04°12.1 04°25.2	13.1' 13.1'	54.4' 54.5'
2	210°22.8	19.0	241°16.5	16.2	04°23.2	13.1	54.5'
3	225°22.9	• • 20.7	255°51.7	16.2'	04°51.3	13.1'	54.5'
4	240°23.0	21.5	270°26.8	16.1'	05°04.4	13.1'	54.5'
5 6	255°23.1 270°23.2	22.4 N12°23.2	285°02.0 299°37.1	16.1' 16.1'	05°17.4 N05°30.5	13.0' 13.0'	54.5' 54.5'
7	270 23.2 285°23.3	24.0	299 37.1 314°12.1	16.1	05°43.5	13.0'	54.5'
8	300°23.5	24.9	328°47.2	16.0'	05°56.5	13.0'	54.5'
9	315°23.6	• • 25.7	343°22.2	16.0'	06°09.5	13.0'	54.6'
10 11	330°23.7 345°23.8	26.5 27.4	357°57.1 12°32.0	15.9' 15.9'	06°22.5 06°35.5	13.0' 12.9'	54.6' 54.6'
12	0°23.9	N12°28.2	27°06.9	15.8'	N06°48.4	12.9'	54.6
13	15°24.1	29.1	41°41.7	15.8'	07°01.3	12.9'	54.6'
14	30°24.2	29.9	56°16.5	15.7'	07° 14.2	12.9'	54.6'
15 16	45°24.3 60°24.4	· · 30.7	70°51.3 85°26.0	15.7' 15.7'	07°27.1 07°40.0	12.9' 12.8'	54.6' 54.7'
17	75°24.5	32.4	100°00.6	15.6'	07 40.0 07°52.8	12.8'	54.7'
18	90°24.6	N12°33.2	114°35.2	15.6'	N08°05.6	12.8'	54.7'
19	105°24.8	34.0	129°09.8	15.5'	08° 18.4	12.8'	54.7'
20 21	120°24.9 135°25.0	34.9 •• 35.7	143°44.3 158°18.8	15.5' 15.4'	08°31.2 08°44.0	12.7' 12.7'	54.7' 54.7'
22	150°25.1	36.5	172°53.2	15.4	08°56.7	12.7'	54.8'
23	165°25.2	37.4	187°27.6	15.3'	09°09.4	12.7'	54.8'
	SD = 15.9'	d = 0.8'		SI	D = 14.8'		
Sun	GHA 180°25.3	Dec N12°38.2	GHA 202°01.9	u 15.3'	Dec N09° 22.0	<i>d</i> 12.6'	HP 54.8'
0 1	180°25.3 195°25.4	N12°38.2 39.0	202°01.9 216°36.1	15.3' 15.2'	09°34.7	12.6'	54.8'
2	210°25.6	39.9	231°10.3	15.2'	09°47.3	12.6'	54.8'
3	225°25.7	• • 40.7	245°44.5	15.1'	09°59.8	12.5'	54.8'
4 5	240°25.8 255°25.9	41.5 42.3	260°18.6 274°52.6	15.0' 15.0'	10°12.4 10°24.9	12.5' 12.5'	54.9' 54.9'
6	270°26.0	N12°43.2	289°26.6	14.9'	N10°37.3	12.5	54.9'
7	285°26.1	44.0	$304^{\circ}00.5$	14.9'	10°49.8	12.4'	54.9'
8	300°26.2	44.8	318°34.4	14.8'	11°02.2	12.4'	54.9'
9 10	315°26.4 330°26.5	· · 45.7 46.5	333°08.2 347°42.0	14.7' 14.7'	11°14.5 11°26.9	12.3' 12.3'	54.9' 55.0'
11	345°26.6	47.3	2°15.7	14.6'	11°39.2	12.2'	55.0'
12	0°26.7	N12°48.1	16°49.3	14.6'	N11°51.4	12.2'	55.0'
13	15°26.8	49.0	31°22.9	14.5'	12°03.6 12°15.8	12.2'	55.0'
14 15	30°26.9 45°27.0	49.8 •• 50.6	45°56.4 60°29.8	14.4' 14.4'	12°15.8 12°27.9	12.1' 12.1'	55.0' 55.0'
16	60°27.1	51.4	75°03.2	14.3'	12°40.0	12.0'	55.1'
17	75°27.3	52.3	89°36.5	14.2'	12°52.0	12.0'	55.1'
18	90°27.4	N12°53.1	104°09.7 118°42.9	14.2'	N13°04.0 13°15.9	11.9'	55.1'
19 20	105°27.5 120°27.6	53.9 54.7	118°42.9 133°16.0	14.1' 14.0'	13°15.9 13°27.8	11.9' 11.8'	55.1' 55.1'
21	135°27.7	• • 55.6	147°49.0	14.0'	13°39.7	11.8'	55.1'
22	150°27.8	56.4	162°22.0	13.9'	13°51.5	11.7'	55.2'
23	165°27.9	57.2	176°54.8	13.8'	14°03.2	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	////	////
N 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
N 58°	02:44	03:44	04:29	19:29	20:14	21:16
56°	02:59	03:54	04:36	19:22	20:04	21:00
54°	03:12	04:03	04:42	19:16	19:56	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
N 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
N 10°	04:59	05:25	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:53	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:06	18:32
30°	05:31	05:59	06:24	17:33	17:57	18:25
35°	05:34	06:04	06:30	17:27	17:53	18:22
40°	05:37	06:09	06:36	17:20	17:48	18:19
45°	05:40	06:14	06:44	17:12	17:42	18:16
S 50°	05:43	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
S 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	
N 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	
N 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	
N 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	
S 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	
S 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	
S 60°	03:16	04:36	05:59	15:21	15:23	15:27	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

April 24, 25, 26 UT (Mon., Tue., Wed.)

h	Aries	Ve	enus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
Mon 0	212°33.0	139°47.2	N27° 24.6	187°16.5	N09° 56.4	42°53.3	N06°02.0	182°32.0	N09°51.9			
1	212 33.0 227°35.5	154°48.2	24.8	202°17.2	57.1	57°55.9	02.0	197°34.2	52.0	Alpheratz	357°32.3	$29^{\circ}14.7$
2	242°38.0	169°49.1	25.0	202 17.2 217°17.9	57.1	72°58.5	02.0	212°36.3	52.1	Ankaa	353°04.9	-42°09.0
3	257°40.4	184° 50.1	• • 25.2	232°18.6	• • 58.5	88°01.1	•• 02.1	227°38.5	52.2	Schedar	349°28.4	56°41.5
4	272°42.9	199°51.1	25.4	247°19.3	59.2	103°03.7	02.2	242°40.7	52.3	Diphda	348°44.9	-17°49.9
5	287°45.4	214°52.1	25.6	262°20.0	09°59.9	118°06.3	02.2	257°42.8	52.4	Achernar		-57°05.5
6	302°47.8	229°53.0	N27°25.8	277°20.6	N10°00.6	133°08.9	N06°02.3	272°45.0	N09°52.6	Hamal	327°48.5	23°35.7
7	317°50.3	244°54.0	26.0	292°21.3	01.3	148°11.5	02.3	287°47.1	52.7	Polaris		89°23.0
8	332°52.8	259°55.0	26.2	307°22.0	02.0	163°14.1	02.4	302°49.3	52.8	Acamar	315°10.2	-40°11.5
9	347°55.2	274°56.0	• • 26.4	322°22.7	• • 02.7	178°16.7	• • 02.4	317°51.5	• • 52.9	Menkar	314°03.7	4°12.0
10	2°57.7	289°57.0	26.6	337°23.4	03.4	193°19.3	02.5	332°53.6	53.0	Mirfak	308°24.8	49°57.7
11	18°00.1	304°57.9	26.8	352°24.1	04.1	208°21.9	02.5	347°55.8	53.1	Aldebaran	290°36.8	16°33.9
12	33°02.6	319°58.9	N27°27.0	7°24.7	N10°04.8	223°24.5	N06°02.6	2°58.0	N09°53.2	Rigel	281°01.5	-8°10.3 46°01.6
13	48°05.1	334°59.9	27.1	22°25.4	05.5	238°27.1	02.6	18°00.1	53.3	Capella Bellatrix	280°18.3 278°20.2	6°22.4
14	63°07.5	350°00.9	27.3	$37^{\circ}26.1$	06.2	253°29.7	02.7	33°02.3	53.4	Elnath	277°58.7	28°37.8
15	78°10.0	$5^{\circ}01.9$	• • 27.5	52°26.8	• • 06.9	268°32.3	• • 02.7	48°04.4	• • 53.5	Alnilam	277 36.7 275°35.2	-1°11.2
16	93°12.5	20°02.9	27.7	67°27.5	07.6	283°34.9	02.8	63°06.6	53.6	Betelgeuse	270°49.4	7°24.6
17	108°14.9	35°03.9	27.9	82°28.2	08.3	298°37.6	02.8	78°08.8	53.8	Canopus	263°51.5	-52°43.0
18	123°17.4	50°04.9	N27°28.1	97°28.8	N10°09.0	313°40.2	N06°02.9	93°10.9	N09°53.9	Sirius	258°24.0	-16°45.6
19	138°19.9	65°05.9	28.3	112°29.5	09.7	328°42.7	02.9	108°13.1	54.0	Adhara	255°03.9	-29°00.9
20	153°22.3	80°07.0	28.5	127°30.2	10.4	343°45.3	03.0	123°15.2	54.1	Procyon	244°48.1	5°09.0
21	168°24.8	95°08.0	• • 28.7	142°30.9	· · 11.1	358°47.9	• • 03.0	138°17.4	• • 54.2	Pollux		27°57.4
22	183°27.3	110°09.0	28.8	157°31.6	11.8	13°50.5	03.1	153°19.6	54.3	Avior	234°13.6	-59°36.4
23	198°29.7	125°10.0	29.0	172°32.2	12.5	28°53.1	03.1	168°21.7	54.4	Suhail	222°44.2	-43°33.2
Mer.p	ass. 09:48	$\nu 1.0' d0$.2′ m-4.74	$\nu 0.7' d0$.7′ m1.18	$\nu 2.6' d0$.1′ m-2.33	$\nu 2.2' \ d0$.1′ m0.45	Miaplacidus	221°37.4	-69°50.4
										Alphard	217°45.0	-8°47.1
_			_		_		_		_	Regulus	207°31.5	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.4	61°36.0
0	213°32.2	140°11.0	N27°29.2	187°32.9	N10° 13.2	43°55.7	N06°03.2	183°23.9	N09°54.5	Denebola	182°22.0	14°24.7
1	228°34.6	155° 12.1	29.4	202°33.6	13.9	58°58.3	03.2	198°26.0	54.6	Gienah	175°40.5	-17°42.2
2	243°37.1	170°13.1	29.6	217°34.3	14.6	74°00.9	03.3	213°28.2	54.7	Acrux	172°56.4	-63°15.6
3	258°39.6	185°14.1	• • 29.8	232°35.0	• • 15.3	89°03.5	• • 03.3	228°30.4	• • 54.9	Gacrux	171°48.0	-57° 16.6
4	273°42.0	200° 15.2	29.9	247°35.7	16.0	104°06.1	03.4	243°32.5	55.0	Alioth	166°10.2	55°48.3
5	288°44.5	215°16.2	30.1	262°36.3	16.7	119°08.7	03.4	258°34.7	55.1	Spica	158°19.2	-11° 18.7
6	303°47.0	230° 17.2	N27°30.3	277°37.0	N10° 17.4	134°11.3	N06°03.5	273°36.8	N09°55.2	Alkaid	152°49.5	49°10.2
7	318°49.4	245°18.3	30.5	292°37.7	18.1	149°13.9	03.5	288°39.0	55.3	Hadar	148°31.4	-60°30.7
8	333°51.9	260°19.3	30.7	307°38.4	18.8	164°16.5	03.6	303°41.2	55.4	Menkent	147°54.0	-36°30.7
9	348°54.4	275°20.4	30.8	322°39.1	• • 19.5	179°19.1 194°21.7	• • 03.6	318°43.3	• • 55.5	Arcturus	145°45.1	19°02.0
10	3°56.8 18°59.3	290°21.4	31.0	337°39.7 352°40.4	20.2		03.6	333°45.5	55.6	Rigil Kent.	139°35.9	-60° 57.2
11 12	18 59.3 34°01.8	305°22.5 320°23.5	31.2 N27°31.3	7°41.1	20.9 N10°21.6	209°24.3 224°26.9	03.7 N06°03.7	348°47.7 3°49.8	55.7 N09°55.8	Kochab	137°18.9	74°02.2
	49°04.2					239°29.5		3 49.6 18°52.0		Zuben'ubi	136°52.7	$-16^{\circ}09.7$
13	49 04.2 64°06.7	335°24.6 350°25.6	31.5 31.7	22°41.8 37°42.5	22.3 23.0	254°32.1	03.8 03.8	33°54.1	55.9 56.1	Alphecca	126°01.1	26°37.0
14	79°09.1	5°26.7	31.7	52°43.2	23.7	269°34.7	03.9	48°56.3		Antares	$112^{\circ}12.2$	-26°29.7
15 16	79 09.1 94°11.6	20°27.8	32.0	67°43.8	24.4	209 34.7 284°37.3	03.9	63°58.5	· · 56.2 56.3	Atria	107°03.6	-69°04.5
17	109°14.1	35°28.8	32.0	82°44.5	25.0	299°39.9	03.9	79°00.6	56.4	Sabik	101°59.5	-15°45.6
18	124° 16.5	50°29.9	N27° 32.4	97°45.2	N10° 25.7	314°42.5	N06°04.0	94°02.8	N09°56.5	Shaula	96°06.5	-37°07.3
19	139°19.0	65°31.0	32.5	112°45.9	26.4	329°45.1	04.1	109°04.9	56.6	Rasalhague	95°55.8	12°32.2
20	154°21.5	80°32.1	32.7	127°46.6	27.1	344°47.7	04.1	124°07.1	56.7	Eltanin	90°40.6	51°28.9
21	169°23.9	95°33.2	32.9	142°47.2	• • 27.8	359°50.2	• • 04.2	139°09.3	• • 56.8	Kaus Aust.	83°28.8	-34°22.1
22	184°26.4	110°34.2	33.0	157°47.9	28.5	14°52.8	04.2	154°11.4	56.9	Vega	80°31.2	38°48.4
23	199°28.9	125° 35.3	33.2	172°48.6	29.2	29°55.4	04.3	169°13.6	57.0	Nunki	75°44.3	-26°15.6
										Altair	61°57.3	8°56.5
Mer.p	ass. 09:44	ν 1.0′ d0	.2′ m-4.74	$ u$ 0.7 $^{\prime}$ d 0	.7′ m1.19	ν 2.6′ d0.	.0′ m-2.32	ν 2.2′ d0	.1' m0.46	Peacock	53°01.6	-56°38.3
										Deneb	49°24.0	45°22.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.3	10°00.2
0	214°31.3	140°36.4	N27°33.3	187°49.3		44°58.0	N06°04.3		N09°57.1	Al Na'ir	27°29.8	-46°49.2
1	229°33.8	155° 37.5	33.5	202°50.0	30.6	60°00.6	04.3	199°17.9	57.3	Fomalhaut Scheat	15°11.8 13°42.8	-29°28.2 28°14.1
2	244°36.2	170°38.6	33.7	217°50.6	31.3	75°03.2	04.4	214°20.1	57.4	Markab	13°27.4	26 14.1 15°21.4
3	259°38.7	185°39.7	• • 33.8	232°51.3	• • 32.0	90°05.8	• • 04.4	229°22.2	• • 57.5	iviarkab	15 21.4	15 21.4
4	274°41.2	200°40.8	34.0	247°52.0	32.7	105°08.4	04.5	244°24.4	57.6	Apr 24 Mon	SHA	Mer.pass
5	289°43.6	215°41.9	34.1	262°52.7	33.4	120°11.0	04.5	259°26.5	57.7	Venus	287°14.2	14:40
6	304°46.1	230°43.0	N27°34.3	277°53.4	N10°34.1	135°13.6	N06°04.6	274°28.7	N09°57.8	Mars	$334^{\circ}43.5$	11:30
7	319°48.6	245°44.1	34.4	292°54.0	34.8	150°16.2	04.6	289°30.9	57.9	Jupiter	190°20.3	21:05
8	334°51.0	260°45.2	34.6	307°54.7	35.4	165°18.7	04.7	304°33.0	58.0	Saturn	329°59.0	11:48
9	349°53.5	275°46.4	• • 34.8	$322^{\circ}55.4$	• • 36.1	180°21.3	• • 04.7	319°35.2	• • 58.1	A 25 T.	CH A	Me: =
10	4°56.0	290°47.5	34.9	$337^{\circ}56.1$	36.8	195°23.9	04.7	334°37.4	58.2	Apr 25 Tue	SHA 286°38.9	Mer.pass 14:38
11	19°58.4	305°48.6	35.1	352°56.8	37.5	210°26.5	04.8	349°39.5	58.3		334°00.7	11:29
12	35°00.9	320°49.7	N27°35.2	7°57.4	N10°38.2	225°29.1	N06°04.8	4°41.7			190°23.6	21:01
13	50°03.4	335°50.8	35.4	22°58.1	38.9	240°31.7	04.9	19°43.8	58.6	Saturn	329°51.7	11:45
14	65°05.8	350°52.0	35.5	37°58.8	39.6	255°34.3	04.9	34°46.0	58.7	Saturn	J23 J1.1	11.40
15	80°08.3	5°53.1	• • 35.7	52°59.5	• • 40.3	270°36.9	•• 05.0	49°48.2	• • 58.8	Apr 26 Wed	SHA	Mer.pass
16	95°10.7	20°54.2	35.8	68°00.2	41.0	285°39.4	05.0	64°50.3	58.9	Venus	$286^{\circ}05.1$	14:36
17	110°13.2	35°55.4	35.9	83°00.8	41.7	300°42.0	05.1	79°52.5	59.0	Mars	$333^{\circ}18.0$	11:28
18	125°15.7	50°56.5	N27°36.1	98°01.5		315°44.6	N06°05.1	94°54.6	N09°59.1	Jupiter	$190^{\circ}26.7$	20:57
19	140°18.1	65°57.7	36.2	113°02.2	43.0	330°47.2	05.1	109°56.8	59.2	Saturn	329°44.4	11:41
20	155°20.6	80°58.8	36.4	128°02.9	43.7	345°49.8	05.2	124°59.0	59.3	Uaulas	tal parallax	
21	170°23.1	96°00.0	• • 36.5	143°03.6	• • 44.4	0°52.4	• • 05.2	140°01.1	• • 59.4	Horizon	•	0.2
22	185°25.5	111°01.1	36.7	158°04.2	45.1	15°55.0	05.3	155°03.3	59.5		Venus: Mars:	0.3 0.1
23	200°28.0	126°02.3	36.8	173°04.9	45.8	30°57.5	05.3	170°05.4	59.7		iviars:	0.1
Mer.p	ass. 09:40	$\nu 1.1' d0$.2′ m-4.74	ν 0.7' d0	.7′ m1.19	$\nu 2.6' d0$.0′ m-2.31	ν 2.2' d0	.1′ m0.46			

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.0	$N12^{\circ}58.0$	191°27.7	13.7'	$N14^{\circ}14.9$	11.6'	55.2'
1	195°28.1	58.8	206°00.4	13.7'	14°26.5	11.6'	55.2'
2 3	210°28.2 225°28.4	12°59.7 13°00.5	220°33.1 235°05.7	13.6' 13.5'	14°38.1 14°49.6	11.5' 11.5'	55.2' 55.3'
4	240°28.5	01.3	249° 38.2	13.5'	15°01.1	11.4	55.3'
5	255°28.6	02.1	264°10.7	13.4'	15° 12.5	11.4'	55.3'
6	270°28.7	$N13^{\circ}02.9$	278°43.0	13.3'	N15°23.9	11.3'	55.3'
7	285°28.8	03.8	293°15.3	13.2'	15°35.2 15°46.4	11.2' 11.2'	55.3'
8 9	300°28.9 315°29.0	04.6 •• 05.4	307°47.6 322°19.7	13.1' 13.1'	15° 46.4 15° 57.6	11.1'	55.4' 55.4'
10	330°29.1	06.2	336°51.8	13.0'	16°08.7	11.0'	55.4'
11	345°29.2	07.0	351°23.8	12.9'	$16^{\circ}19.7$	11.0'	55.4'
12	0°29.3	N13°07.8	5°55.7	12.8'	N16°30.7	10.9'	55.4'
13 14	15°29.4 30°29.5	08.7 09.5	20°27.5 34°59.3	12.8' 12.7'	16°41.6 16°52.4	10.8' 10.8'	55.5' 55.5'
15	30 29.5 45°29.7	• • 10.3	34 39.3 49°30.9	12.6'	10 52.4 17°03.2	10.6	55.5'
16	60°29.8	11.1	64°02.5	12.5'	17° 13.9	10.6'	55.5'
17	75°29.9	11.9	78°34.0	12.4'	17°24.5	10.6'	55.5'
18	90°30.0	N13°12.7	93°05.5 107°36.8	12.3'	N17°35.1	10.5'	55.5'
19 20	105°30.1 120°30.2	13.5 14.4	107°36.8 122°08.1	12.3' 12.2'	17° 45.6 17° 56.0	10.4' 10.3'	55.6' 55.6'
21	135°30.3	. 15.2	136°39.2	12.1'	18°06.3	10.3	55.6'
22	150°30.4	16.0	151°10.3	12.0'	18°16.6	10.2'	55.6'
23	165°30.5	16.8	165°41.3	11.9'	18°26.8	10.1'	55.6'
	SD = 15.9'	d = 0.8'		SE	0 = 15.1'		
T	CUA	D	CUA		Dec	J	LIP
Tue 0	GHA 180°30.6	Dec N13°17.6	GHA 180°12.3	u 11.8'	Dec N18° 36.9	<i>d</i> 10.0'	HP 55.7'
1	195°30.7	18.4	194°43.1	11.8'	18° 46.9	9.9'	55.7'
2	210°30.8	19.2	209°13.8	11.7'	18°56.8	9.8'	55.7'
3	225°30.9	• • 20.0	223°44.5	11.6'	19°06.6	9.8'	55.7'
4 5	240°31.0 255°31.1	20.9 21.7	238°15.1 252°45.6	11.5' 11.4'	19° 16.4 19° 26.1	9.7' 9.6'	55.7' 55.8'
6	255 31.1 270°31.2	N13°22.5	252 45.0 267°16.0	11.4	N19°35.7	9.6	55.8'
7	285°31.3	23.3	281°46.3	11.2'	19°45.2	9.4'	55.8'
8	300°31.4	24.1	296° 16.5	11.1'	19°54.6	9.3'	55.8'
9	315°31.5	• • 24.9	310°46.7	11.1'	20°03.9	9.2'	55.9'
10 11	330°31.6 345°31.7	25.7 26.5	325°16.8 339°46.7	11.0' 10.9'	20°13.2 20°22.3	9.1' 9.0'	55.9' 55.9'
12	0°31.8	N13°27.3	354°16.6	10.8'	N20°31.3	8.9'	55.9'
13	15°32.0	28.1	8°46.4	10.7'	20°40.3	8.9'	55.9'
14	30°32.1	28.9	23°16.1	10.6'	20°49.1	8.8'	56.0'
15 16	45°32.2 60°32.3	· · 29.8 30.6	37°45.8 52°15.3	10.5' 10.5'	20°57.9 21°06.5	8.7' 8.6'	56.0' 56.0'
17	75°32.4	31.4	66°44.7	10.4	21°15.1	8.5	56.0'
18	90°32.5	N13°32.2	81°14.1	10.3'	N21°23.6	8.3'	56.0'
19	105°32.6	33.0	95°43.4	10.2'	21°31.9	8.2'	56.1'
20 21	120°32.7 135°32.8	33.8 •• 34.6	110°12.6 124°41.7	10.1'	21°40.1 21°48.3	8.1' 8.0'	56.1' 56.1'
22	150°32.9	35.4	139°10.7	9.9'	21°56.3	7.9'	56.1'
23	165°33.0	36.2	153°39.6	9.8'	22°04.2	7.8'	56.1'
	SD = 15.9'	d = 0.8'		SE	0 = 15.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	180°33.1	N13°37.0	168°08.5	9.8'	N22°12.1	7.7'	56.2'
1	195°33.2	37.8	182°37.2	9.7'	22°19.8	7.6'	56.2'
2	210°33.3 225°33.4	38.6 •• 39.4	197°05.9 211°34.5	9.6' 9.5'	22°27.4 22°34.8	7.5' 7.4'	56.2' 56.2'
3 4	225°33.4 240°33.5	40.2	211°34.5 226°03.0	9.5° 9.4'	22° 34.8 22° 42.2	7.4 7.3'	56.2'
5	255°33.6	41.0	240°31.4	9.3'	22°49.5	7.1'	56.3'
6	270°33.7	N13°41.8	254°59.7	9.3'	N22°56.6	7.0'	56.3'
7	285°33.8 300°33.9	42.6 43.4	269°28.0 283°56.2	9.2' 9.1'	23°03.6 23°10.5	6.9' 6.8'	56.3' 56.3'
8 9	300°33.9 315°34.0	43.4 •• 44.2	283°56.2 298°24.2	9.1'	23° 10.5 23° 17.3	6.7	56.3'
10	330°34.0	45.0	312°52.3	8.9'	23°23.9	6.5	56.4
11	345°34.1	45.8	327°20.2	8.8'	23°30.5	6.4'	56.4'
12 13	0°34.2 15°34.3	N13°46.6 47.4	341°48.0 356°15.8	8.8' 8.7'	N23°36.9 23°43.2	6.3' 6.2'	56.4' 56.4'
13 14	30°34.4	47.4 48.2	350°15.8 10°43.5	8.7	23° 43.2 23° 49.4	6.2	56.4'
15	45°34.5	• • 49.0	25°11.1	8.5'	23°55.4	5.9'	56.5
16	60°34.6	49.8	39°38.6	8.4'	24°01.3	5.8'	56.5'
17	75°34.7	50.6	54°06.0	8.4'	24°07.1	5.7'	56.5
18 19	90°34.8 105°34.9	N13°51.4 52.2	68°33.4 83°00.7	8.3' 8.2'	N24°12.7 24°18.3	5.5' 5.4'	56.5' 56.6'
20	120°35.0	53.0	97°27.9	8.2'	24° 23.6	5.3'	56.6
21	135°35.1	• • 53.8	111°55.1	8.1'	24°28.9	5.1'	56.6'
22	150°35.2	54.6	126°22.2	8.0'	24°34.0	5.0'	56.6'
23	165°35.3	55.4	140°49.2	7.9'	24°39.0	4.9'	56.6'
	SD = 15.9'	d = 0.8'	-	SL	0 = 15.3'		

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

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	01:47					
N 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
N 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° 50°	04:02	04:22	04:48	19:27	20:43	21:57
45°	04:08 04:20	04:30 04:47	04:58 05:20	19:19 19:04	20:33 20:13	21:45 21:21
1						
N 40° 35°	04:31	05:01	05:37	18:51	19:56	21:01
35°	04:39 04:47	05:13 05:23	05:51 06:04	18:40 18:30	19:42 19:30	20:45 20:32
20°	05:01	05:23	06:04	18:14	19:30	20:32
N 10°	05:01	05:57	06:45	18:00	18:52	19:47
0°	05:24	06:12	07:03	17:47	18:36	19:28
S 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
S 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° S 60°	07:15 07:25	08:40 08:55	10:05 10:26	15:44 15:33	15:57 15:42	16:18 15:58
3 00	07:25	00:55	10:20	15:33	15:42	10:58

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ver	านร	М	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	215°30.5	141°03.4	N27°36.9	188°05.6	N10°46.5	46°00.1	N06°05.4	185°07.6	N09°59.8			
1	230°32.9	156° 04.6	37.1	203°06.3	47.2	61°02.7	05.4	200°09.8	09°59.9	Alpheratz	357°32.2	29°14.7
2	245°35.4	171°05.8	37.2	218°07.0	47.9	76°05.3	05.4	$215^{\circ}11.9$	$10^{\circ}00.0$	Ankaa	353°04.9 349°28.4	-42°09.0 56°41.4
3	260°37.9	$186^{\circ}06.9$	• • 37.3	233°07.6	• • 48.5	91°07.9	• • 05.5	$230^{\circ}14.1$	•• 00.1	Schedar Diphda	349 20.4 348°44.9	-17°49.8
4	275°40.3	201°08.1	37.5	248°08.3	49.2	106°10.5	05.5	245°16.3	00.2	Achernar	335°18.9	-57°05.5
5	290°42.8	216°09.3	37.6	263°09.0	49.9	121°13.1	05.6	260°18.4	00.3	Hamal	327°48.5	23°35.7
6 7	305°45.2 320°47.7	231°10.4 246°11.6	N27°37.8 37.9	278°09.7 293°10.4	N10°50.6	136°15.6 151°18.2	N06°05.6	275°20.6 290°22.7	N10°00.4	Polaris	313°04.3	89°23.0
8	335°50.2	240 11.0 261°12.8	38.0	308°11.0	51.3 52.0	166°20.8	05.6 05.7	305°24.9	00.5 00.6	Acamar	$315^{\circ}10.2$	-40°11.5
9	350°52.6	276° 14.0	38.1	323°11.7	52.7	181°23.4	• • 05.7	320°27.1	• • 00.7	Menkar	314°03.7	4°12.0
10	5°55.1	291°15.2	38.3	338°12.4	53.4	196°26.0	05.8	335°29.2	00.9	Mirfak	308°24.8	49°57.7
11	20°57.6	306° 16.4	38.4	353°13.1	54.0	211°28.5	05.8	350°31.4	01.0	Aldebaran	290°36.8	16°33.9
12	36°00.0	321°17.6	N27°38.5	8°13.8	N10°54.7	226°31.1	N06°05.9	5°33.5	N10°01.1	Rigel	281°01.5	-8°10.3
13	51°02.5	$336^{\circ}18.8$	38.7	23°14.4	55.4	241°33.7	05.9	20°35.7	01.2	Capella Bellatrix	280°18.3 278°20.2	46°01.6 6°22.4
14	66°05.0	351°20.0	38.8	38°15.1	56.1	256°36.3	05.9	35°37.9	01.3	Elnath	277°58.7	28°37.8
15	81°07.4	6°21.2	• • 38.9	53°15.8	• • 56.8	271°38.9	• • 06.0	50°40.0	•• 01.4	Alnilam	275°35.2	-1°11.2
16	96°09.9	21°22.4	39.0	68°16.5	57.5	286°41.5	06.0	65°42.2	01.5	Betelgeuse	270°49.4	7°24.6
17	111°12.4	36°23.6 51°24.8	39.2	83°17.1	58.2	301°44.0	06.1	80°44.3	01.6	Canopus	263°51.5	-52°42.9
18 19	126°14.8 141°17.3	66°26.0	N27°39.3 39.4	98°17.8 113°18.5	N10°58.8 10°59.5	316°46.6 331°49.2	N06°06.1 06.1	95°46.5 110°48.7	N10°01.7 01.8	Sirius	258°24.0	-16°45.6
20	156°19.7	81°27.2	39.5	128° 19.2	11°00.2	346°51.8	06.2	125°50.8	01.0	Adhara	255°03.9	-29°00.9
21	171°22.2	96°28.5	• • 39.6	143°19.9	00.9	1°54.4	06.2	140°53.0	02.0	Procyon	244°48.1	5°09.0
22	186°24.7	111°29.7	39.8	158°20.5	01.6	16°56.9	06.3	155°55.2	02.2	Pollux	243°14.1	27°57.4
23	201°27.1	126°30.9	39.9	173°21.2	02.3	31°59.5	06.3	170°57.3	02.3	Avior	234°13.6	-59°36.4 -43°33.2
Morn	ass. 09:36	$\nu 1.2' \ d0.1$	1′ m 4.75	υΩ 7′ dΩ	.7′ m1.20	12 6' d0	0′ m-2.31	1/2 2 ¹ d0	.1′ m0.47	Suhail Miaplacidus	222°44.2 221°37.5	-43 33.2 -69°50.4
- ivier.p	Jass. 09.30	ν1.2 d0.1	1 111-4.75	νο.τ αο	.7 1111.20	ν2.0 do.	0 111-2.31	ν2.2 d0	.1 1110.47	Alphard	217°45.1	-8°47.1
										Regulus	207°31.5	11°49.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°36.0
0	216°29.6	141°32.2	N27°40.0	188°21.9	N11°02.9	47°02.1	N06°06.3	185°59.5	N10°02.4	Denebola	182°22.0	14°24.7
1	231°32.1	156°33.4	40.1	203°22.6	03.6	62°04.7	06.4	201°01.6	02.5	Gienah	175°40.5	-17° 42.2
2 3	246°34.5 261°37.0	171°34.6 186°35.9	40.2 •• 40.3	218°23.3 233°23.9	04.3 •• 05.0	77°07.2 92°09.8	06.4 •• 06.5	216°03.8 231°06.0	02.6 · · 02.7	Acrux	172°56.4	-63°15.6
3 4	201 37.0 276°39.5	201°37.1	40.5	233 23.9 248°24.6	05.7	92 09.8 107°12.4	06.5	246°08.1	02.7	Gacrux	171°48.0	-57° 16.6
5	291°41.9	216°38.4	40.6	263°25.3	06.4	122°15.0	06.5	261°10.3	02.9	Alioth	166°10.2	55°48.3
6	306°44.4	231°39.6	N27°40.7	278°26.0	N11°07.0	137°17.5	N06°06.6	276°12.4	N10°03.0	Spica	158°19.1	-11°18.7
7	321°46.9	246°40.9	40.8	293°26.6	07.7	152°20.1	06.6	291°14.6	03.1	Alkaid	152°49.5 148°31.4	49°10.2 -60°30.7
8	336°49.3	261°42.1	40.9	308°27.3	08.4	167°22.7	06.6	$306^{\circ}16.8$	03.2	Hadar Menkent	146 51.4 147°54.0	-36°30.7
9	351°51.8	276°43.4	• • 41.0	323°28.0	•• 09.1	182°25.3	• • 06.7	321°18.9	• • 03.3	Arcturus	147° 34.0	19°02.0
10	6°54.2	291°44.6	41.1	338°28.7	09.8	197°27.9	06.7	336°21.1	03.5	Rigil Kent.	139°35.8	-60°57.2
11	21°56.7	306° 45.9	41.2	353°29.4	10.4	212°30.4	06.8	351°23.3	03.6	Kochab	137°18.9	74°02.2
12	36°59.2	321°47.2	N27°41.3	8°30.0	N11°11.1	227°33.0	N06°06.8	6°25.4	N10°03.7	Zuben'ubi	$136^{\circ}52.7$	-16°09.7
13 14	52°01.6 67°04.1	336° 48.5 351° 49.7	41.4 41.5	23°30.7 38°31.4	11.8 12.5	242°35.6 257°38.1	06.8 06.9	21°27.6 36°29.7	03.8 03.9	Alphecca	$126^{\circ}01.1$	26°37.0
15	82°06.6	6°51.0	41.6	53°32.1	13.2	272°40.7	• • 06.9	51°31.9	• • 04.0	Antares	112°12.2	-26°29.7
16	97°09.0	21°52.3	41.7	68°32.7	13.2	287°43.3	07.0	66°34.1	04.0	Atria	107°03.5	-69°04.5
17	112°11.5	36°53.6	41.8	83°33.4	14.5	302°45.9	07.0	81°36.2	04.2	Sabik	101°59.4	-15°45.6
18	127°14.0	51°54.9	N27°41.9	98°34.1	N11°15.2	317°48.4	N06°07.0	96°38.4	N10°04.3	Shaula	96°06.4 95°55.8	-37°07.3 12°32.3
19	142°16.4	66°56.2	42.0	113°34.8	15.9	332°51.0	07.1	111°40.5	04.4	Rasalhague Eltanin	90°40.6	51°28.9
20	$157^{\circ}18.9$	81°57.5	42.1	128°35.4	16.6	347°53.6	07.1	126°42.7	04.5	Kaus Aust.	83°28.7	-34°22.1
21	172°21.3	96°58.8	• • 42.2	143°36.1	• • 17.2	2°56.2	•• 07.1	141°44.9	• • 04.6	Vega	80°31.2	38°48.4
22	187°23.8	112°00.1	42.3	158°36.8	17.9	17°58.7	07.2	156°47.0	04.8	Nunki	75°44.3	-26° 15.5
23	202°26.3	127°01.4	42.4	173°37.5	18.6	33°01.3	07.2	171°49.2	04.9	Altair	61°57.3	8°56.5
Mer.p	ass. 09:32	$\nu 1.2' \ d0.1$	1′ m-4.75	ν 0.7′ d0	.7′ m1.20	$\nu 2.6' \ d0.$	0′ m-2.30	ν 2.2′ d0	.1′ m0.47	Peacock	53°01.5	-56° 38.3
										Deneb	49°23.9	45°22.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.2	10°00.2
0 0	217°28.7	142°02.7	N27° 42.5		N11° 19.3	48°03.9	N06°07.2		N10°05.0	Al Na'ir	27°29.8	-46°49.2
1	232°31.2	157° 04.0	42.6	203°38.8	20.0	63°06.4	07.3	201°53.5	05.1	Fomalhaut Scheat	15°11.8 13°42.8	-29°28.2 28°14.1
2	247°33.7	172°05.3	42.7	218°39.5	20.6	78°09.0	07.3	216°55.7	05.2	Markab	13 42.8 13°27.4	28 14.1 15°21.4
3	$262^{\circ}36.1$	187°06.6	• • 42.8	233°40.2	• • 21.3	93°11.6	•• 07.4	231°57.8	• • 05.3			
4	277°38.6	202°07.9	42.9	248°40.9	22.0	108°14.2	07.4	247°00.0	05.4	Apr 27 Thu	SHA	Mer.pass
5	292°41.1	217°09.3	43.0	263°41.5	22.7	123°16.7	07.4	262°02.2	05.5		285°33.0	14:35
6	307°43.5	232°10.6	N27°43.1		N11°23.4	138°19.3	N06°07.5		N10°05.6	I	332°35.1	11:27
7	322°46.0	247°11.9	43.2	293°42.9	24.0	153°21.9	07.5	292°06.5	05.7	Jupiter Saturn	190°29.7 329°37.1	20:52
8 9	337°48.5 352°50.9	262°13.2 277°14.6	43.2 •• 43.3	308°43.6 323°44.2	24.7 •• 25.4	168°24.4	07.5 •• 07.6	307°08.6 322°10.8	05.8 •• 05.9	Saturn	J∠9 J1.I	11:38
9 10	352 50.9 7°53.4	277° 14.6 292° 15.9	43.4	323°44.2 338°44.9	26.1	183°27.0 198°29.6	07.6	322°10.8 337°13.0	06.1	Apr 28 Fri	SHA	Mer.pass
11	7 55.4 22°55.8	307° 17.3	43.4	353°45.6	26.7	213°32.1	07.6	352°15.1	06.1		285°02.6	14:33
12	37°58.3	322° 18.6	N27°43.6	8°46.3	N11°27.4	213 32.1 228°34.7	N06°07.7		N10°06.3		331°52.3	11:26
13	53°00.8	337°20.0	43.7	23°46.9	28.1	243°37.3	07.7	22°19.4	06.4		190°32.5	20:48
14	68°03.2	352°21.3	43.7	38°47.6	28.8	258°39.8	07.7	37°21.6	06.5	Saturn	329°29.9	11:34
15	83°05.7	7°22.7	• • 43.8	53°48.3	• • 29.4	273°42.4	• • 07.8	52°23.8	• • 06.6	Apr 29 Sat	SHA	Mer.pass
16	98°08.2	22°24.0	43.9	68°49.0	30.1	288°45.0	07.8	67°25.9	06.7		284°33.9	14:31
17	113°10.6	37°25.4	44.0	83°49.7	30.8	303°47.5	07.9	82°28.1	06.8		$331^{\circ}09.4$	11:25
18	128°13.1	52°26.8	N27°44.1	98°50.3	N11°31.5	318°50.1	N06°07.9		N10°06.9		190°35.1	20:44
19	143°15.6	67°28.1	44.1	113°51.0	32.1	333°52.7	07.9	112°32.4	07.0	Saturn	329°22.6	11:31
20	158°18.0 173°20.5	82°29.5 97°30.9	44.2 •• 44.3	128°51.7 143°52.4	32.8 · · 33.5	348°55.2 3°57.8	08.0	127°34.6 142°36.7	07.1 · · 07.2	Horizont	al parallax	
21 22	173°20.5 188°23.0	97°30.9 112°32.3	44.4	143°52.4 158°53.0	34.2	3°57.8 19°00.4	08.0	142°36.7 157°38.9	07.2		Venus:	0.3
23	203°25.4	112 32.3 127°33.6	44.4	173°53.7	34.2	34°02.9	08.0	172°41.1	07.5		Mars:	0.1
Mer.p	ass. 09:29	ν 1.3′ d0.1	ı′ m-4.75	ν 0.1' d0	.7′ m1.21	ν 2.6′ d0.	0′ m-2.29	ν 2.2′ d0	.1′ m0.48			

h	Sui	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.4	$N13^{\circ}56.1$	$155^{\circ}16.1$	7.9'	N24°43.9	4.7'	56.7'
1	195°35.5	56.9	169°43.0 184°09.8	7.8'	24°48.6	4.6'	56.7'
2	210°35.6 225°35.7	57.7 • • 58.5	184°09.8 198°36.5	7.7' 7.7'	24°53.1 24°57.6	4.4' 4.3'	56.7' 56.7'
4	240°35.8	13°59.3	213°03.2	7.6'	25°01.9	4.2'	56.7'
5	255°35.9	14°00.1	$227^{\circ}29.8$	7.5'	25°06.0	4.0'	56.8'
6	270°36.0	N14°00.9	241°56.3	7.5'	N25°10.0	3.9'	56.8'
7 8	285°36.1 300°36.1	01.7 02.5	256°22.8 270°49.2	7.4' 7.3'	25°13.9 25°17.6	3.7' 3.6'	56.8' 56.8'
9	315°36.2	03.3	285°15.5	7.3'	25°21.2	3.4'	56.8
10	330°36.3	04.1	299°41.8	7.2'	25°24.7	3.3'	56.9'
11	345°36.4 0°36.5	04.9 N14°05.6	314°08.1 328°34.2	7.2'	25°28.0 N25°31.1	3.1'	56.9'
12 13	15°36.6	N14 05.6 06.4	328° 34.2 343° 00.4	7.1' 7.1'	N25°31.1 25°34.1	3.0' 2.9'	56.9' 56.9'
14	30°36.7	07.2	357°26.4	7.0'	25°37.0	2.7'	56.9'
15	45°36.8	• • 08.0	11°52.4	7.0'	25°39.7	2.6'	57.0'
16	60°36.9 75°37.0	8.80	26°18.4 40°44.3	6.9'	25°42.2 25°44.6	2.4'	57.0'
17 18	75°37.0 90°37.1	09.6 N14°10.4	40°44.3 55°10.2	6.9' 6.8'	25°44.6 N25°46.9	2.3' 2.1'	57.0' 57.0'
19	105°37.2	11.1	69°36.0	6.8'	25°49.0	1.9'	57.1
20	120°37.2	11.9	84°01.8	6.7'	25°50.9	1.8'	57.1'
21	135°37.3	• • 12.7	98°27.5	6.7'	25°52.7	1.6'	57.1'
22 23	150°37.4 165°37.5	13.5 14.3	112°53.2 127°18.9	6.7' 6.6'	25°54.3 25°55.8	1.5' 1.3'	57.1' 57.1'
23	SD = 15.9'		121 10.9		D = 15.5'	1.5	J1.1
	JD = 15.9′	d = 0.8'		51	$J = 15.5^{\circ}$		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.6 195°37.7	N14°15.1 15.9	141°44.5 156°10.1	6.6' 6.5'	N25°57.2 25°58.3	1.2' 1.0'	57.2' 57.2'
1 2	195°37.7 210°37.8	15.9 16.6	150°10.1 170°35.6	6.5	25°58.3 25°59.4	0.9'	57.2'
3	225°37.9	. 17.4	185°01.1	6.5	26°00.2	0.7	57.2'
4	240°38.0	18.2	$199^{\circ}26.6$	6.4'	26°00.9	0.6'	57.2'
5	255°38.0 270°38.1	19.0 N14°19.8	213°52.0 228°17.5	6.4'	26°01.5 N26°01.9	0.4'	57.3'
6 7	270 38.1 285°38.2	20.5	242°42.9	6.4' 6.4'	26°02.1	0.2' 0.1'	57.3' 57.3'
8	300°38.3	21.3	257°08.2	6.3'	26°02.2	-0.1	57.3'
9	315°38.4	• • 22.1	271°33.6	6.3'	26°02.1	-0.2'	57.3'
10 11	330°38.5 345°38.6	22.9 23.7	285°58.9 300°24.2	6.3' 6.3'	26°01.9 26°01.5	-0.4' -0.6'	57.4' 57.4'
12	0°38.7	N14°24.4	314°49.5	6.3	N26°00.9	-0.0	57.4
13	15°38.7	25.2	329°14.7	6.3'	26°00.2	-0.9'	57.4'
14	30°38.8	26.0	343°40.0	6.2'	25°59.3	-1.0'	57.4'
15 16	45°38.9 60°39.0	· · 26.8 27.6	358°05.2 12°30.5	6.2' 6.2'	25°58.3 25°57.1	-1.2' -1.4'	57.5' 57.5'
17	75°39.1	28.3	26°55.7	6.2	25°55.7	-1.5'	57.5'
18	90°39.2	N14°29.1	41°20.9	6.2'	N25°54.2	-1.7'	57.5'
19	105°39.3	29.9	55°46.1	6.2'	25°52.6	-1.8'	57.5'
20 21	120°39.3 135°39.4	30.7 •• 31.4	70°11.3 84°36.5	6.2' 6.2'	25°50.7 25°48.7	-2.0' -2.2'	57.6' 57.6'
22	150°39.5	32.2	99°01.7	6.2	25°46.6	-2.3'	57.6'
23	165°39.6	33.0	113°26.9	6.2'	25°44.3	-2.5'	57.6'
	SD = 15.9'	d = 0.8'		SI	O = 15.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	180°39.7	N14°33.8	127°52.1	6.2'	N25°41.8	-2.6'	57.6'
1	195°39.8	34.5	142°17.2	6.2'	25°39.1	-2.8'	57.7'
2	210°39.9 225°39.9	35.3	156°42.5 171°07.7	6.2' 6.2'	25°36.4 25°33.4	-3.0' -3.1'	57.7' 57.7'
4	225°39.9 240°40.0	· · 36.1 36.9	171°07.7 185°32.9	6.2'	25°33.4 25°30.3	-3.1° -3.3'	57.7'
5	255°40.1	37.6	$199^{\circ}58.1$	6.2'	25°27.0	-3.4'	57.7'
6	270°40.2	N14°38.4	214°23.4	6.3'	N25°23.6	-3.6'	57.8'
7 8	285°40.3 300°40.4	39.2 39.9	228°48.6 243°13.9	6.3' 6.3'	25°20.0 25°16.3	-3.7' -3.9'	57.8' 57.8'
9	300 40.4 315°40.4	. 40.7	243 13.9 257°39.2	6.3	25 10.3 25°12.3	-3.9 -4.1'	57.8'
10	330°40.5	41.5	272°04.5	6.3'	25°08.3	-4.2'	57.8'
11	345°40.6	42.2	286°29.8	6.3'	25°04.1	-4.4'	57.9'
12 13	0°40.7 15°40.8	N14°43.0 43.8	300°55.1 315°20.5	6.4' 6.4'	N24°59.7 24°55.2	-4.5' -4.7'	57.9' 57.9'
14	30°40.8	43.6 44.5	329°45.9	6.4	24°50.5	-4.7 -4.8'	57.9'
15	45°40.9	• • 45.3	344°11.3	6.4'	24°45.6	-5.0'	57.9'
16	60°41.0	46.1	358°36.7	6.5'	24°40.6	-5.2'	58.0'
17 18	75°41.1 90°41.2	46.9 N14°47.6	13°02.2 27°27.7	6.5' 6.5'	24°35.5 N24°30.2	-5.3' -5.5'	58.0' 58.0'
19	90°41.2 105°41.2	N14 47.6 48.4	41°53.2	6.6'	24°24.7	-5.6'	58.0'
20	120°41.3	49.1	56°18.8	6.6'	24°19.1	-5.8'	58.0'
21	135°41.4	• • 49.9	70°44.4	6.6'	24°13.3	-5.9'	58.1'
22 23	150°41.5 165°41.6	50.7 51.4	85°10.0 99°35.7	6.7' 6.7'	24°07.4 24°01.3	-6.1' -6.2'	58.1' 58.1'
23	SD = 15.9'	d = 0.8'	- 39 33.1		D = 15.7'	-0.2	50.1
	3D = 15.9°	<i>u</i> = 0.δ		31	J = 13.1°		

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
S 10°	05:18	05:43	06:04	17:50	18:12	18:37
20°	05:26	05:52	06:15	17:39	18:02	18:28
30°	05:34	06:03	06:27	17:27	17:52	18:20
35°	05:38	06:08	06:34	17:20	17:46	18:16
40°	05:42	06:14	06:42	17:12	17:40	18:12
45°	05:46	06:21	06:52	17:03	17:33	18:08
S 50°	05:51	06:29	07:03	16:51	17:25	18:03
52°	05:53	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
S 60°	06:01	06:50	07:35	16:19	17:04	17:53

Lat.		Moonris	e		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	
N 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
S 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
S 60°	11:50	12:56	13:36	16:28	17:22	18:42

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-18%	
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		

h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	218°27.9	142°35.0	N27° 44.5	188°54.4	N11°35.5	49°05.5	N06°08.1	187°43.2	N10°07.6			
1	233°30.3	157°36.4	44.6	203°55.1	36.2	64°08.1	08.1	202°45.4	07.7	Alpheratz	357°32.2	29°14.7
2	248°32.8	172°37.8	44.6	218°55.7	36.8	79°10.6	08.2	217°47.6	07.8	Ankaa	353°04.9	-42°09.0
3	263°35.3	187°39.2	• • 44.7	233°56.4	• • 37.5	94°13.2	08.2	232°49.7	• • 07.9	Schedar	349°28.4	56°41.4
4	203 35.3 278°37.7			233 50.4 248°57.1		94 13.2 109°15.8		232 49.7 247°51.9		Diphda	348°44.9	-17°49.8
		202°40.6	44.8		38.2		08.2		08.0	Achernar	$335^{\circ}18.8$	-57°05.5
5	293°40.2	217° 42.0	44.8	263°57.8	38.9	124°18.3	08.3	262°54.0	08.1	Hamal	327°48.5	23°35.7
6	308°42.7	232°43.4	N27°44.9	278°58.4	N11°39.5	139°20.9	N06°08.3	277°56.2	N10°08.2	Polaris	313°04.2	89°23.0
7	323°45.1	247°44.8	45.0	293°59.1	40.2	154°23.4	08.3	292°58.4	08.3	Acamar	315°10.2	-40°11.5
8	338°47.6	262°46.2	45.0	308°59.8	40.9	169°26.0	08.4	308°00.5	08.4	Menkar	314°03.6	4°12.0
9	353°50.1	277° 47.7	• • 45.1	324°00.5	• • 41.6	184°28.6	•• 08.4	323°02.7	• • 08.5	Mirfak	308°24.8	49°57.7
10	8°52.5	292°49.1	45.2	339°01.1	42.2	199°31.1	08.4	338°04.8	08.6	Aldebaran	290°36.8	16°33.9
11	23°55.0	307°50.5	45.2	354°01.8	42.9	214°33.7	08.4	353°07.0	08.7	Rigel	281°01.5	-8° 10.3
12	38°57.5	322°51.9	N27°45.3	9°02.5	N11°43.6	229°36.2	N06°08.5	8°09.2	$N10^{\circ}08.9$	_	280°18.3	46°01.6
13	53°59.9	337°53.4	45.3	24°03.2	44.2	244°38.8	08.5	23°11.3	09.0	Capella		
14	69°02.4	352°54.8	45.4	39°03.8	44.9	259°41.4	08.5	38°13.5	09.1	Bellatrix	278°20.2	6°22.4
15	84°04.8	7°56.2	• • 45.5	54°04.5	• • 45.6	274°43.9	• • 08.6	53°15.7	• • 09.2	Elnath	277°58.7	28°37.8
16	99°07.3	22°57.7	45.5	69°05.2	46.2	289°46.5	08.6	68°17.8	09.3	Alnilam	275°35.2	-1°11.2
17	114°09.8	37°59.1	45.6	84°05.9	46.9	304°49.0	08.6	83°20.0	09.4	Betelgeuse	270°49.4	7°24.6
18	129°12.2	53°00.6	N27° 45.6	99°06.5	N11°47.6	319°51.6	N06°08.7	98°22.1	N10°09.5	Canopus	263°51.5	-52°42.9
				99 00.5 114°07.2						Sirius	258°24.0	-16°45.5
19	144°14.7	68°02.0	45.7		48.3	334°54.2	08.7	113°24.3	09.6	Adhara	255°03.9	-29°00.9
20	159°17.2	83°03.5	45.7	129°07.9	48.9	349°56.7	08.7	128°26.5	09.7	Procyon	244°48.1	5°09.0
21	174°19.6	98°04.9	• • 45.8	144°08.5	• • 49.6	4°59.3	• • 08.8	143°28.6	• • 09.8	Pollux	243°14.1	27°57.4
22	189°22.1	113°06.4	45.8	159°09.2	50.3	20°01.8	8.80	158°30.8	09.9	Avior	234°13.7	-59°36.4
23	204°24.6	128°07.9	45.9	174°09.9	50.9	35°04.4	8.80	173°33.0	10.0	Suhail	234 13.7 222°44.3	-39 30.4 -43°33.2
Μ	200.25	1,1 4/ -10	.1′ m-4.75	.,0 7/ -/0	.7′ m1.21	1,2 6/ -12	0′ m-2.29	1,0 0/ -10	.1′ m0.48			
ivier.pa	ass. 09:25	ν 1.4 d0.	m-4./5	ν 0.7 d0	. <i>i</i> m1.21	ν 2.0° d 0.	u m-2.29	ν 2.2' $d0$.1 mu.48	Miaplacidus	221°37.5	-69°50.4
										Alphard	217°45.1	-8°47.1
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.5	11°49.6
0	219°27.0	143°09.3	N27° 45.9	189°10.6	N11°51.6	50°07.0	N06°08.9	188°35.1	N10°10.1	Dubhe	193°37.5	61°36.0
1	234°29.5	158° 10.8	46.0	204°11.2	52.3	65°09.5	08.9	203°37.3	10.2	Denebola	182°22.0	14°24.7
										Gienah	175°40.5	-17°42.2
2	249°32.0	173°12.3	46.0	219°11.9	52.9	80°12.1	08.9	218°39.4	10.4	Acrux	172°56.4	-63° 15.7
3	264°34.4	188°13.8	• • 46.1	234°12.6	• • 53.6	95°14.6	• • 08.9	233°41.6	• • 10.5	Gacrux	171°48.0	-57° 16.6
4	279°36.9	203°15.2	46.1	249°13.3	54.3	110°17.2	09.0	248°43.8	10.6	Alioth	166°10.2	55°48.4
5	294°39.3	218° 16.7	46.2	264°13.9	54.9	125°19.7	09.0	263°45.9	10.7	Spica	158°19.1	-11° 18.7
6	309°41.8	233° 18.2	N27°46.2	279°14.6	N11°55.6	140°22.3	N06°09.0	278°48.1	N10°10.8	Alkaid	152°49.5	49°10.2
7	324°44.3	$248^{\circ}19.7$	46.2	294°15.3	56.3	155°24.9	09.1	293°50.2	10.9	Hadar	148°31.4	-60°30.7
8	339°46.7	263°21.2	46.3	309°16.0	56.9	170°27.4	09.1	308°52.4	11.0	Menkent	147°54.0	-36° 30.7
9	354°49.2	278°22.7	• • 46.3	324°16.6	• • 57.6	185°30.0	• • 09.1	323°54.6	• • 11.1	1	147° 34.0	19° 02.0
10	9°51.7	293°24.2	46.4	339°17.3	58.3	200°32.5	09.2	338°56.7	11.2	Arcturus		
11	24°54.1	308°25.7	46.4	354°18.0	58.9	215°35.1	09.2	353°58.9	11.3	Rigil Kent.	139°35.8	-60°57.2
12	39°56.6	323°27.2	N27° 46.4	9°18.7	N11°59.6	230°37.6	N06°09.2	9°01.1	N10°11.4	Kochab	137°18.9	74°02.2
13	54°59.1	338° 28.8	46.5	24°19.3	12°00.3	245°40.2	09.2	24°03.2	11.5	Zuben'ubi	136°52.7	-16°09.7
14	70°01.5	353° 30.3	46.5	39°20.0	00.9	260°42.7	09.2	39°05.4	11.6	Alphecca	$126^{\circ}01.1$	26°37.0
										Antares	$112^{\circ}12.2$	-26°29.7
15	85°04.0	8°31.8	• • 46.5	54°20.7	• • 01.6	275°45.3	• • 09.3	54°07.5	• • 11.7	Atria	107°03.5	-69°04.5
16	100°06.4	23°33.3	46.6	69°21.3	02.3	290°47.8	09.3	69°09.7	11.9	Sabik	101°59.4	-15°45.6
17	115°08.9	38°34.8	46.6	84°22.0	02.9	305°50.4	09.4	84°11.9	12.0	Shaula	96°06.4	-37°07.3
18	130°11.4	53°36.4	N27°46.6	99°22.7	N12°03.6	320°52.9	N06°09.4	99°14.0	N10°12.1	Rasalhague	95°55.8	12°32.3
19	145°13.8	68° 37.9	46.7	114°23.4	04.2	335°55.5	09.4	114°16.2	12.2	Eltanin	90°40.6	51°28.9
20	$160^{\circ}16.3$	83°39.5	46.7	129°24.0	04.9	350°58.0	09.4	129°18.4	12.3	Kaus Aust.	83°28.7	-34°22.1
21	$175^{\circ}18.8$	98°41.0	• • 46.7	144°24.7	• • 05.6	6°00.6	• • 09.5	144°20.5	• • 12.4	Vega	80°31.2	38° 48.4
22	190°21.2	113°42.5	46.8	159°25.4	06.2	21°03.2	09.5	159°22.7	12.5	_	75°44.3	-26° 15.5
23	205°23.7	128°44.1	46.8	174°26.1	06.9	36°05.7	09.5	174°24.8	12.6	Nunki	61°57.2	-26° 15.5 8° 56.5
										Altair		
Mer.pa	ass. 09:21	ν 1.5′ d 0.	.0′ m-4.75	ν 0.7' d0	.7′ m1.22	ν 2.6′ d0.	.0′ m-2.28	$\nu^{2.2'} d0$.1′ m0.49	Peacock	53°01.5	-56°38.3
										Deneb	49°23.9	45°22.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.2	10°00.2
	220°26.2	143°45.7	N27° 46.8	189°26.7	N12°07.6	51°08.3	N06°09.6	189°27.0	N10°12.7	Al Na'ir	27°29.8	-46°49.1
0 1	235°28.6	143 45.7 158° 47.2	46.8	204°27.4	08.2	66°10.8	09.6	204°29.2	12.8	Fomalhaut	15°11.8	-29°28.2
										Scheat	13°42.8	28° 14.1
2	250°31.1	173°48.8	46.9	219°28.1	08.9	81°13.4	09.6	219°31.3	12.9	Markab	13°27.4	15°21.4
3	265°33.6	188°50.3	• • 46.9	234°28.7	• • 09.5	96°15.9	• • 09.6	234°33.5	• • 13.0	A 20 C	CIIA	Mani
4	280°36.0	203°51.9	46.9	249°29.4	10.2	111°18.5	09.7	249°35.7	13.1	Apr 30 Sun	SHA	Mer.pass
5	295°38.5	218°53.5	46.9	264°30.1	10.9	126°21.0	09.7	264°37.8	13.2	Venus	284°07.2	14:28
6	310°40.9	233°55.1	N27°46.9	279°30.8	N12°11.5	141°23.5	N06°09.7	279°40.0	N10°13.3	Mars	330°26.5	11:24
		248°56.6	47.0	294°31.4	12.2	$156^{\circ}26.1$	09.7	294°42.1	13.5	Jupiter	190°37.6	20:40
7	325°43.4	240 30.0	47.0	309°32.1	12.9	171°28.6	09.8	309°44.3	13.6	Saturn	329°15.3	11:27
	325°43.4 340°45.9	263°58.2	47.0	309 32.1			00.0		10.7		_	_
7			47.0 •• 47.0	324°32.8	• • 13.5	186°31.2	• • 09.8	324°46.5	• • 13.7	NA 04	C	
7 8 9	340°45.9	263°58.2			· · 13.5 14.2	186°31.2 201°33.7	09.8	324°46.5 339°48.6	13.7	May 01 Mon	SHA	Mer.pass
7 8 9 10	340°45.9 355°48.3 10°50.8	263° 58.2 278° 59.8 294° 01.4	· · 47.0 47.0	324°32.8 339°33.4	14.2	201°33.7	09.8	339°48.6	13.8	Venus	283°42.3	14:26
7 8 9 10 11	340°45.9 355°48.3 10°50.8 25°53.3	263° 58.2 278° 59.8 294° 01.4 309° 03.0	47.0 47.0 47.0	324°32.8 339°33.4 354°34.1	14.2 14.8	201°33.7 216°36.3	09.8 09.8	339°48.6 354°50.8	13.8 13.9	Venus Mars	283°42.3 329°43.5	14:26 11:23
7 8 9 10 11 12	340°45.9 355°48.3 10°50.8 25°53.3 40°55.7	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6	•• 47.0 47.0 47.0 N27° 47.0	324°32.8 339°33.4 354°34.1 9°34.8	14.2 14.8 N12°15.5	201°33.7 216°36.3 231°38.8	09.8 09.8 N06°09.9	339°48.6 354°50.8 9°53.0	13.8 13.9 N10°14.0	Venus	283°42.3 329°43.5 190°39.9	14:26
7 8 9 10 11 12 13	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2	47.0 47.0 47.0 47.0 N27° 47.0 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5	14.2 14.8 N12° 15.5 16.2	201°33.7 216°36.3 231°38.8 246°41.4	09.8 09.8 N06°09.9 09.9	339°48.6 354°50.8 9°53.0 24°55.1	13.8 13.9 N10°14.0 14.1	Venus Mars	283°42.3 329°43.5	14:26 11:23 20:36
7 8 9 10 11 12 13 14	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8	47.0 47.0 47.0 N27° 47.0 47.1 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1	14.2 14.8 N12°15.5 16.2 16.8	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9	09.8 09.8 N06°09.9 09.9	339°48.6 354°50.8 9°53.0 24°55.1 39°57.3	13.8 13.9 N10°14.0 14.1 14.2	Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1	14:26 11:23 20:36 11:24
7 8 9 10 11 12 13 14 15	340°45.9 355°48.3 10°50.8 25°53.3 40°55.7 55°58.2 71°00.7 86°03.1	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8 9° 09.4	•• 47.0 47.0 47.0 17.0 17.0 17.1 17.1 17.1 17.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8	14.2 14.8 N12° 15.5 16.2 16.8 ••• 17.5	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5	09.8 09.8 N06°09.9 09.9 09.9	339°48.6 354°50.8 9°53.0 24°55.1 39°57.3 54°59.4	13.8 13.9 N10°14.0 14.1 14.2 · · 14.3	Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1	14:26 11:23 20:36 11:24 Mer.pass
7 8 9 10 11 12 13 14 15 16	340°45.9 355°48.3 10°50.8 25°53.3 40°55.7 55°58.2 71°00.7 86°03.1 101°05.6	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8 9° 09.4 24° 11.0	•• 47.0 47.0 47.0 17.0 17.0 17.1 17.1 17.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5	14.2 14.8 N12° 15.5 16.2 16.8 · · 17.5 18.1	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0	09.8 09.8 N06°09.9 09.9 09.9 · · 09.9 10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6	13.8 13.9 N10°14.0 14.1 14.2 · · 14.3 14.4	Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1	14:26 11:23 20:36 11:24
7 8 9 10 11 12 13 14 15	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8 9° 09.4 24° 11.0 39° 12.6	47.0 47.0 47.0 N27° 47.0 47.1 47.1 47.1 47.1	324° 32.8 339° 33.4 354° 34.1 9° 34.8 24° 35.5 39° 36.1 54° 36.8 69° 37.5 84° 38.2	14.2 14.8 N12° 15.5 16.2 16.8 · · 17.5 18.1 18.8	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8	13.8 13.9 N10°14.0 14.1 14.2 · · 14.3 14.4 14.5	Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1	14:26 11:23 20:36 11:24 Mer.pass
7 8 9 10 11 12 13 14 15 16	340°45.9 355°48.3 10°50.8 25°53.3 40°55.7 55°58.2 71°00.7 86°03.1 101°05.6	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6 339°06.2 354°07.8 9°09.4 24°11.0 39°12.6 54°14.3	•• 47.0 47.0 47.0 17.0 17.0 17.1 17.1 17.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5	14.2 14.8 N12° 15.5 16.2 16.8 · · 17.5 18.1	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0	09.8 09.8 N06°09.9 09.9 09.9 · · 09.9 10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6	13.8 13.9 N10°14.0 14.1 14.2 · · 14.3 14.4	Venus Mars Jupiter Saturn May 02 Tue Venus	283°42.3 329°43.5 190°39.9 329°08.1 SHA 283°19.5 329°00.6	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22
7 8 9 10 11 12 13 14 15 16 17	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8 9° 09.4 24° 11.0 39° 12.6	47.0 47.0 47.0 N27° 47.0 47.1 47.1 47.1 47.1	324° 32.8 339° 33.4 354° 34.1 9° 34.8 24° 35.5 39° 36.1 54° 36.8 69° 37.5 84° 38.2	14.2 14.8 N12° 15.5 16.2 16.8 · · 17.5 18.1 18.8	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8	13.8 13.9 N10°14.0 14.1 14.2 · · 14.3 14.4 14.5	Venus Mars Jupiter Saturn May 02 Tue Venus Mars Jupiter	283°42.3 329°43.5 190°39.9 329°08.1 SHA 283°19.5 329°00.6 190°42.1	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22 20:32
7 8 9 10 11 12 13 14 15 16 17 18 19	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1 131° 10.5	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6 339°06.2 354°07.8 9°09.4 24°11.0 39°12.6 54°14.3	••• 47.0 47.0 47.0 N27° 47.0 47.1 47.1 •• 47.1 47.1 47.1 N27° 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5 84°38.2 99°38.8	14.2 14.8 N12° 15.5 16.2 16.8 ·· 17.5 18.1 18.8 N12° 19.4	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6 321°54.1	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0 10.0 N06°10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8 100° 05.9	13.8 13.9 N10°14.0 14.1 14.2 · 14.3 14.4 14.5 N10°14.6	Venus Mars Jupiter Saturn May 02 Tue Venus Mars	283°42.3 329°43.5 190°39.9 329°08.1 SHA 283°19.5 329°00.6	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22 20:32
7 8 9 10 11 12 13 14 15 16 17 18 19 20	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1 131° 10.5 146° 13.0 161° 15.4	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6 339°06.2 354°07.8 9°09.4 24°11.0 39°12.6 54°14.3 69°15.9 84°17.5	· · · 47.0 47.0 47.0 N27° 47.0 47.1 47.1 · · · 47.1 47.1 N27° 47.1 47.1 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5 84°38.2 99°38.8 114°39.5 129°40.2	14.2 14.8 N12° 15.5 16.2 16.8 ·· 17.5 18.1 18.8 N12° 19.4 20.1 20.8	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6 321°54.1 336°56.7 351°59.2	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0 10.0 N06°10.0 10.0	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8 100° 05.9 115° 08.1 130° 10.3	13.8 13.9 N10°14.0 14.1 14.2 · 14.3 14.4 14.5 N10°14.6 14.7 14.8	Venus Mars Jupiter Saturn May 02 Tue Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1 SHA 283°19.5 329°00.6 190°42.1	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22 20:32
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1 131° 10.5 146° 13.0 161° 15.4 176° 17.9	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6 339°06.2 354°07.8 9°09.4 24°11.0 39°12.6 54°14.3 69°15.9 84°17.5	47.0 47.0 47.0 N27° 47.0 47.1 47.1 47.1 47.1 47.1 N27° 47.1 47.1 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5 84°38.2 99°38.8 114°39.5 129°40.2 144°40.8	14.2 14.8 N12°15.5 16.2 16.8 ·· 17.5 18.1 18.8 N12°19.4 20.1 20.8 ·· 21.4	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6 321°54.1 336°56.7 351°59.2 7°01.7	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0 10.0 N06°10.0 10.0 10.1	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8 100° 05.9 115° 08.1 130° 10.3 145° 12.4	13.8 13.9 N10°14.0 14.1 14.2 · 14.3 14.4 14.5 N10°14.6 14.7 14.8 · 14.9	Venus Mars Jupiter Saturn May 02 Tue Venus Mars Jupiter Saturn	283°42.3 329°43.5 190°39.9 329°08.1 SHA 283°19.5 329°00.6 190°42.1 329°00.8	14:26 11:23 20:36 11:24 Mer.pass 14:23
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1 131° 10.5 146° 13.0 161° 15.4 176° 17.9 191° 20.4	263°58.2 278°59.8 294°01.4 309°03.0 324°04.6 339°06.2 354°07.8 9°09.4 24°11.0 39°12.6 54°14.3 69°15.9 84°17.5 99°19.1 114°20.8	· · · 47.0 47.0 47.0 47.1 47.1 47.1 47.1 47.1 47.1 47.1 47.1 47.1 47.1 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5 84°38.2 99°38.8 114°39.5 129°40.2 144°40.8 159°41.5	14.2 14.8 N12°15.5 16.2 16.8 ·· 17.5 18.1 18.8 N12°19.4 20.1 20.8 ·· 21.4 22.1	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6 321°54.1 336°56.7 351°59.2 7°01.7 22°04.3	09.8 09.8 N06°09.9 09.9 09.9 10.0 10.0 N06°10.0 10.1 10.1	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8 100° 05.9 115° 08.1 130° 10.3 145° 12.4 160° 14.6	13.8 13.9 N10°14.0 14.1 14.2 · 14.3 14.4 14.5 N10°14.6 14.7 14.8 · 14.9 15.1	Venus Mars Jupiter Saturn May 02 Tue Venus Mars Jupiter Saturn	283° 42.3 329° 43.5 190° 39.9 329° 08.1 SHA 283° 19.5 329° 00.6 190° 42.1 329° 00.8	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22 20:32 11:21
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	340° 45.9 355° 48.3 10° 50.8 25° 53.3 40° 55.7 55° 58.2 71° 00.7 86° 03.1 101° 05.6 116° 08.1 131° 10.5 146° 13.0 161° 15.4 176° 17.9	263° 58.2 278° 59.8 294° 01.4 309° 03.0 324° 04.6 339° 06.2 354° 07.8 9° 09.4 24° 11.0 39° 12.6 54° 14.3 69° 15.9 84° 17.5 99° 19.1 114° 20.8 129° 22.4	47.0 47.0 47.0 N27° 47.0 47.1 47.1 47.1 47.1 47.1 N27° 47.1 47.1 47.1	324°32.8 339°33.4 354°34.1 9°34.8 24°35.5 39°36.1 54°36.8 69°37.5 84°38.2 99°38.8 114°39.5 129°40.2 144°40.8	14.2 14.8 N12°15.5 16.2 16.8 ·· 17.5 18.1 18.8 N12°19.4 20.1 20.8 ·· 21.4	201°33.7 216°36.3 231°38.8 246°41.4 261°43.9 276°46.5 291°49.0 306°51.6 321°54.1 336°56.7 351°59.2 7°01.7	09.8 09.8 N06°09.9 09.9 09.9 09.9 10.0 10.0 N06°10.0 10.0 10.1	339° 48.6 354° 50.8 9° 53.0 24° 55.1 39° 57.3 54° 59.4 70° 01.6 85° 03.8 100° 05.9 115° 08.1 130° 10.3 145° 12.4 160° 14.6 175° 16.7	13.8 13.9 N10°14.0 14.1 14.2 · 14.3 14.4 14.5 N10°14.6 14.7 14.8 · 14.9	Venus Mars Jupiter Saturn May 02 Tue Venus Mars Jupiter Saturn	283° 42.3 329° 43.5 190° 39.9 329° 08.1 SHA 283° 19.5 329° 00.6 190° 42.1 329° 00.8 tal parallax Venus:	14:26 11:23 20:36 11:24 Mer.pass 14:23 11:22 20:32 11:21

h	Sun				Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.6	$N14^{\circ}52.2$	$114^{\circ}01.4$	6.7'	$N23^{\circ}55.1$	-6.4'	58.1'
1	195°41.7	53.0	128°27.1	6.8'	23°48.8	-6.5'	58.1'
2 3	210°41.8 225°41.9	53.7 • • 54.5	142°52.9 157°18.7	6.8' 6.9'	23°42.2 23°35.6	-6.7' -6.8'	58.1' 58.2'
4	240°42.0	55.3	171°44.6	6.9'	23°28.8	-7.0'	58.2'
5	255°42.0	56.0	186°10.5	6.9'	23°21.8	-7.1'	58.2'
6	270°42.1	N14°56.8	200°36.4	7.0'	N23°14.7	-7.2'	58.2'
7 8	285°42.2 300°42.3	57.5 58.3	215°02.4 229°28.4	7.0' 7.1'	23°07.5 23°00.1	-7.4' -7.5'	58.2' 58.3'
9	315°42.3	59.1	243°54.5	7.1'	22°52.5	-7.7'	58.3
10	330°42.4	14°59.8	258°20.6	7.2'	22°44.8	-7.8'	58.3'
11	345°42.5	15°00.6	272°46.8	7.2'	22°37.0	-8.0'	58.3'
12 13	0°42.6 15°42.6	N15°01.3 02.1	287°13.0 301°39.3	7.3' 7.3'	N22°29.1 22°21.0	-8.1' -8.2'	58.3' 58.4'
14	30°42.7	02.1	316°05.6	7.4'	22°12.7	-8.4'	58.4
15	45°42.8	• • 03.6	330°32.0	7.4'	22°04.3	-8.5'	58.4'
16	60°42.9	04.4	344°58.4	7.5'	21°55.8	-8.7'	58.4'
17 18	75°42.9 90°43.0	05.1 N15°05.9	359°24.9 13°51.4	7.5' 7.6'	21°47.2 N21°38.4	-8.8' -8.9'	58.4' 58.4'
19	105°43.1	06.6	28°18.0	7.6'	21°29.5	-9.1	58.5
20	120°43.2	07.4	42°44.6	7.7'	21°20.4	-9.2'	58.5'
21	135°43.2	•• 08.1	57°11.3	7.7'	21°11.2	-9.3'	58.5'
22 23	150°43.3 165°43.4	08.9 09.7	71°38.0 86°04.8	7.8' 7.8'	21°01.9 20°52.5	-9.4' -9.6'	58.5' 58.5'
23						.5.0	
	SD = 15.9'	d = 0.8'		SI	D = 15.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.5	N15°10.4	100°31.6	7.9'	N20°42.9	-9.7'	58.6'
1 2	195°43.5 210°43.6	11.2 11.9	114°58.5 129°25.5	8.0' 8.0'	20°33.2 20°23.4	-9.8' -10.0'	58.6' 58.6'
3	210 43.6 225°43.7	12.7	129 25.5 143°52.5	8.1'	20°23.4	-10.0 -10.1'	58.6'
4	240°43.8	13.4	158° 19.5	8.1'	20°03.3	-10.2	58.6'
5	255°43.8	14.2	172°46.7	8.2'	19°53.1	-10.3'	58.6'
6 7	270°43.9 285°44.0	N15°14.9 15.7	187°13.8 201°41.1	8.2' 8.3'	N19°42.8 19°32.4	-10.4' -10.6'	58.7' 58.7'
8	285 44.0 300°44.0	15.7 16.4	201 41.1 216°08.3	8.3'	19 32.4 19°21.8	-10.6 -10.7'	58.7'
9	315°44.1	• • 17.2	230°35.7	8.4'	19°11.1	-10.8'	58.7'
10	330°44.2	17.9	245°03.1	8.5'	19°00.3	-10.9'	58.7'
11	345°44.3 0°44.3	18.7 N15°19.4	259°30.5 273°58.1	8.5' 8.6'	18°49.4 N18°38.4	-11.0' -11.1'	58.7' 58.8'
12 13	0 44.3 15°44.4	20.2	273 58.1 288°25.6	8.6'	18° 27.2	-11.1 -11.3'	58.8'
14	30°44.5	20.9	302°53.3	8.7'	18° 16.0	-11.4	58.8'
15	45°44.5	• • 21.7	317°20.9	8.7'	18°04.6	-11.5'	58.8'
16 17	60°44.6 75°44.7	22.4 23.1	331°48.7 346°16.5	8.8' 8.8'	17°53.1 17°41.6	-11.6' -11.7'	58.8' 58.9'
18	90°44.8	N15°23.9	0°44.3	8.9'	N17°29.9	-11.7	58.9
19	105°44.8	24.6	$15^{\circ}12.2$	9.0'	$17^{\circ}18.1$	-11.9'	58.9'
20	120°44.9	25.4	29°40.2	9.0'	17°06.2		58.9'
21 22	135°45.0 150°45.0	· · 26.1 26.9	44°08.2 58°36.3	9.1' 9.1'	16°54.1 16°42.0	-12.1' -12.2'	58.9' 58.9'
23	165°45.1	27.6	73°04.4	9.2'	16° 29.8	-12.3'	58.9'
	SD = 15.9'	d = 0.8'			O = 16.0'		
				JI			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°45.2 195°45.2	N15°28.3 29.1	87°32.6 102°00.8	9.2' 9.3'	N16° 17.5 16° 05.1	-12.4' -12.5'	59.0' 59.0'
2	195°45.2 210°45.3	29.1 29.8	102°00.8 116°29.1	9.3'	15°52.6	-12.5' -12.6'	59.0° 59.0°
3	225°45.4	• • 30.6	130°57.4	9.4'	$15^{\circ}40.0$	-12.7'	59.0'
4	240°45.4	31.3	145°25.8	9.4'	15°27.3	-12.8'	59.0'
5 6	255°45.5 270°45.6	32.1 N15°32.8	159°54.2 174°22.7	9.5' 9.5'	15°14.5 N15°01.6	-12.9' -13.0'	59.0' 59.1'
7	285°45.6	33.5	174 22.7 188°51.3	9.5' 9.6'	14°48.6	-13.1'	59.1'
8	300°45.7	34.3	203°19.9	9.6'	14°35.6	-13.2'	59.1'
9	315°45.8	• • 35.0	217°48.5	9.7'	14°22.4	-13.2'	59.1'
10 11	330°45.8 345°45.9	35.8 36.5	232°17.2 246°45.9	9.7' 9.8'	14°09.2 13°55.8	-13.3' -13.4'	59.1' 59.1'
12	0°46.0	N15°37.2	261°14.7	9.8'	N13° 42.4	-13.5'	59.2'
13	15°46.0	38.0	275°43.6	9.9'	13°28.9	-13.6'	59.2'
14	30°46.1	38.7	290°12.4	9.9'	13° 15.4	-13.7'	59.2'
15 16	45°46.2 60°46.2	· · 39.4 40.2	304°41.4 319°10.3	10.0' 10.0'	13°01.7 12°48.0	-13.7' -13.8'	59.2' 59.2'
17	75°46.3	40.2	333°39.3	10.0	12° 34.2	-13.9	59.2'
18	90°46.4	N15°41.6	348°08.4	10.1'	N12°20.3	-14.0'	59.2'
19	105°46.4 120°46.5	42.4	2°37.5 17°06.6	10.1'	12°06.3 11°52.3	-14.0'	59.3'
20 21	120°46.5 135°46.5	43.1 •• 43.8	17°06.6 31°35.8	10.2' 10.2'	11°52.3 11°38.2	-14.1' -14.2'	59.3' 59.3'
22	150°46.6	44.6	46°05.0	10.2	11°24.0	-14.2'	59.3
23	165°46.7	45.3	60°34.3	10.3'	11°09.8	-14.3'	59.3'
	SD = 15.9'	d = 0.7'		SI	D = 16.1'		

N 72° //// //// 01:48 22:13 //// //// N 70° //// //// 01:48 22:13 //// //// 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<	Lat.	Twi	light	Sunrise	Sunset	Twi	light
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 //// 60° 01:40 03:03 03:45 20:11 21:11 23:11 60° 01:40 03:03 03:45 20:11 21:11 23:11 60° 01:40 03:03 03:75 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:	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
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 //// 60° 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 19:49 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 04:30 05	N 72°	////	////	01:48	22:13	////	////
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 <t< th=""><th>N 70°</th><th>////</th><th>////</th><th>02:28</th><th>21:31</th><th>////</th><th>////</th></t<>	N 70°	////	////	02:28	21:31	////	////
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51	68°	////	01:01	02:55	21:02	23:05	////
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08		////	01:52	03:16	20:41	22:07	////
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08 05:31 18:24 18:47 19:14 N 10° 04:55 05:21		////	02:23			21:35	////
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08 05:31 18:24 18:47 19:14 N 10° 04:55 05:21 05:43 18:12 18:34 18:59 0° 05:07 05:32		00:54			20:11	21:11	-
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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08 05:31 18:24 18:47 19:14 N 10° 04:55 05:21 05:43 18:12 18:34 18:59 0° 05:07 05:32 05:54 18:00 18:22 18:47 5 10° 05:18 05:43	60°	01:40	03:03	03:57	19:59	20:53	22:19
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 N 40° 03:55 04:30 05:00 18:56 19:25 20:00 35° 04:90 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 N 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 5 10° 05:18 05:43 06:05 17:49 18:11 18:36 20° 05:27 05:53	N 58°	02:08	03:18	04:07	19:49	20:38	21:49
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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 N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08 05:31 18:24 18:47 19:14 N 10° 04:55 05:21 05:43 18:12 18:34 18:59 0° 05:07 05:32 05:54 18:00 18:22 18:47 S 10° 05:18 05:43 06:05 17:49 18:11 18:36 20° 05:27 05:53 06:16 17:38 18:00 18:27 30° 05:36 06:04 06:29 17:24 17:49 18:18 35° 05:41 06:11	54°	02:46	03:41	04:23	19:33	20:14	21:10
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N 40° 03:55 04:30 05:00 18:55 19:25 20:00 35° 04:09 04:42 05:09 18:46 19:13 19:46 30° 04:21 04:51 05:17 18:38 19:03 19:33 20° 04:40 05:08 05:31 18:24 18:47 19:14 N 10° 04:55 05:21 05:43 18:12 18:34 18:59 0° 05:07 05:32 05:54 18:00 18:22 18:47 S 10° 05:18 05:43 06:05 17:49 18:11 18:36 20° 05:27 05:53 06:16 17:38 18:00 18:27 30° 05:36 06:04 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		03:12	03:59	04:36	19:19	19:56	20:44
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 N 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 S 10° 05:18 05:43 06:05 17:49 18:11 18:36 20° 05:27 05:53 06:16 17:38 18:00 18:27 30° 05:36 06:04 06:29 17:24 17:49 18:18 35° 05:41 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 S 50° 05:55 06:33	45°	03:36	04:16	04:49	19:06	19:39	20:19
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 N 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 S 10° 05:18 05:43 06:05 17:49 18:11 18:36 20° 05:27 05:53 06:16 17:38 18:00 18:27 30° 05:36 06:04 06:29 17:24 17:49 18:18 35° 05:41 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 \$ 50° 05:55 06:33 07:07 16:46 17:20 17:59 52° 05:57 06:37	N 40°	03:55	04:30	05:00	18:55	19:25	20:00
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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 \$ 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	20°	05:27	05:53	06:16	17:38	18:00	18:27
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 \$ 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	30°	05:36	06:04	06:29	17:24	17:49	18:18
45° 05:50 06:25 06:55 16:58 17:29 18:04 \$ 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			06:11	06:37	17:17	17:43	18:13
S 50° 05:55 06:33 07:07 16:46 17:20 17:59 52° 05:57 06:37 07:13 16:41 17:16 17:56 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		05:45	06:17			17:36	18:09
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	45°	05:50	06:25	06:55	16:58	17:29	18:04
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	S 50°	05:55	06:33	07:07	16:46	17:20	17:59
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58° 06:04 06:51 07:34 16:20 17:02 17:49		05:59	06:41	07:19	16:34	17:12	17:54
S 60° 06·07 06·56 07·42 16·11 16·57 17·47							
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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
S 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	•• ••
S 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
S 60°	13:57	14:09	14:17	20:18	21:59	23:39

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	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		
02	03:01	03:04	11:57	18:49	06:23		

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	221°25.3	144° 24.1	N27°47.1	189° 42.8	N12°23.4	52°09.4	N06° 10.2	190°18.9	N10° 15.3			
1	221 25.3 236°27.8	159° 25.7	47.1 47.1	204° 43.5	24.0	67°11.9	10.2	205°21.1	15.4	Alpheratz	$357^{\circ}32.2$	29°14.7
2	250 27.6 251°30.2	159 25.7 174° 27.4	47.1 47.1	204 43.5 219°44.2	24.0	82°14.5	10.2	205 21.1 220°23.2	15.4	Ankaa	353°04.9	-42°09.0
3	266°32.7	174 27.4 189° 29.0	• • 47.1	219 44.2 234°44.9	25.4	97° 17.0	10.2	235°25.4	15.6	Schedar	349°28.3	56°41.4
4	281°35.2	204°30.7	47.1	249° 45.5	26.0	112° 19.5	10.2	250°27.6	15.7	Diphda	348°44.9	-17°49.8
5	296°37.6	219°32.3	47.1	264° 46.2	26.7	112 13.3 127°22.1	10.3	265°29.7	15.8	Achernar	$335^{\circ}18.8$	-57°05.5
6	311°40.1	234°34.0	N27°47.1	279°46.9	N12°27.3	142°24.6	N06° 10.3	280°31.9	N10° 15.9	Hamal	327°48.5	23°35.7
7	326°42.5	249°35.7	47.1	294°47.5	28.0	157° 27.2	10.3	295°34.1	16.0	Polaris	313°04.3	89°22.9
8	341°45.0	264°37.3	47.1	309°48.2	28.6	172°29.7	10.4	310°36.2	16.1	Acamar	315°10.2	-40°11.5
9	356°47.5	279°39.0	• • 47.1	324°48.9	29.3	187°32.3	. 10.4	325°38.4	. 16.2	Menkar	314°03.6	4°12.0
10	11°49.9	294°40.7	47.1	339°49.6	29.9	202°34.8	10.4	340°40.5	16.3	Mirfak	308°24.8	49°57.6
11	26°52.4	309°42.4	47.1	354° 50.2	30.6	217° 37.3	10.4	355°42.7	16.4	Aldebaran	290°36.8	16°33.9
12	41°54.9	324°44.1	N27°47.1	9°50.9	N12°31.3	232°39.9	N06° 10.5	10°44.9	N10° 16.5	Rigel	281°01.5	-8°10.3
13	56°57.3	339°45.8	47.1	24°51.6	31.9	247° 42.4	10.5	25°47.0	16.6	Capella	280°18.3	46°01.6
14	71°59.8	354° 47.5	47.1	39°52.2	32.6	262°45.0	10.5	40°49.2	16.8	Bellatrix	278°20.2	6°22.4
15	87°02.3	9°49.2	• • 47.1	54° 52.9	• • 33.2	277° 47.5	• • 10.5	55°51.4	• • 16.9	Elnath	277°58.7	28°37.8
16	102°04.7	24°50.9	47.0	69°53.6	33.9	292°50.0	10.5	70°53.5	17.0	Alnilam	275°35.2	-1°11.2
17	117°07.2	39°52.6	47.0	84°54.2	34.5	307°52.6	10.6	85°55.7	17.1	Betelgeuse	270°49.4	7°24.6
18	132°09.7	54° 54.3	N27°47.0	99° 54.9	N12°35.2	322°55.1	N06° 10.6	100°57.8	N10° 17.2	Canopus	263°51.5	-52°42.9
19	$147^{\circ}12.1$	69°56.0	47.0	114°55.6	35.8	337° 57.7	10.6	116°00.0	17.3	Sirius	258°24.1	-16°45.5
20	$162^{\circ}14.6$	84°57.7	47.0	129°56.3	36.5	353°00.2	10.6	131°02.2	17.4	Adhara	255°03.9	-29°00.9
21	177°17.0	99°59.4	• • 47.0	144°56.9	• • 37.1	8°02.7	• • 10.7	146°04.3	• • 17.5	Procyon	244°48.1	5°09.0
22	192°19.5	115°01.2	46.9	159° 57.6	37.8	23°05.3	10.7	161°06.5	17.6	Pollux	243°14.2	27°57.4
23	207°22.0	130°02.9	46.9	174°58.3	38.4	38°07.8	10.7	176°08.7	17.7	Avior	234°13.7	-59°36.4
					.7′ m1.23					Suhail	222°44.3 221°37.6	-43°33.2
ivier.p	ass. 09:13	ν 1.0′ d 0.	.0′ m-4.74	νυ.τ΄ d0	. <i>i</i> m1.23	ν 2.5′ $d0$.	0′ m-2.26	ν2.2' d0	.1′ m0.49	Miaplacidus Alphard	221°37.6 217°45.1	-69°50.4 -8°47.1
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.5 193°37.5	11°49.6 61°36.0
0	222°24.4	145°04.6	N27°46.9	189°58.9	N12°39.1	53° 10.3	N06° 10.7	191°10.8	N10°17.8	Dubhe	193°37.5 182°22.0	61°36.0 14°24.7
1	237°26.9	160°06.4	46.9	204°59.6	39.7	68°12.9	10.7	206°13.0	17.9	Denebola	182°22.0 175°40.5	-17°42.2
2	252°29.4	175°08.1	46.8	220°00.3	40.4	83°15.4	10.8	221°15.1	18.0	Gienah Acrux	175°40.5 172°56.4	-17 42.2 -63°15.7
3	267°31.8	190°09.9	• • 46.8	235°00.9	• • 41.0	98°17.9	• • 10.8	236°17.3	• • 18.1		172 50.4 171°48.1	-03 15.7 -57°16.6
4	282°34.3	$205^{\circ}11.6$	46.8	250°01.6	41.7	113°20.5	10.8	251°19.5	18.2	Alioth	166°10.2	55°48.4
5	297°36.8	220°13.4	46.8	265°02.3	42.3	128°23.0	10.8	$266^{\circ}21.6$	18.3	Spica	158° 19.1	-11°18.7
6	312°39.2	235°15.1	N27°46.7	280°02.9	N12°43.0	143°25.6	N06°10.9	281°23.8	N10° 18.4	Alkaid	150° 19.1 152° 49.5	49°10.3
7	$327^{\circ}41.7$	$250^{\circ}16.9$	46.7	295°03.6	43.6	$158^{\circ}28.1$	10.9	296°26.0	18.6	Hadar	132 49.5 148°31.4	-60°30.7
8	342°44.2	265°18.6	46.7	310°04.3	44.3	173°30.6	10.9	311°28.1	18.7		140°54.0	-36°30.7
9	357°46.6	280°20.4	• • 46.7	325°05.0	• • 44.9	188°33.2	• • 10.9	326°30.3	• • 18.8	Arcturus	145°45.1	19°02.0
10	$12^{\circ}49.1$	295°22.2	46.6	340°05.6	45.6	203°35.7	10.9	341°32.5	18.9	Rigil Kent.		-60°57.2
11	$27^{\circ}51.5$	$310^{\circ}24.0$	46.6	355°06.3	46.2	218°38.2	11.0	356°34.6	19.0	Kochab	137°18.8	74°02.2
12	42°54.0	325° 25.7	N27°46.6	10°07.0	N12°46.9	233°40.8	N06° 11.0	11°36.8	N10° 19.1	Zuben'ubi	136°52.7	-16°09.7
13	57°56.5	340°27.5	46.5	25°07.6	47.5	248°43.3	11.0	26°38.9	19.2	Alphecca	126°01.1	26°37.0
14	72°58.9	$355^{\circ}29.3$	46.5	40°08.3	48.2	263°45.8	11.0	$41^{\circ}41.1$	19.3	Antares	112° 12.2	-26°29.7
15	88°01.4	$10^{\circ}31.1$	• • 46.4	55°09.0	• • 48.8	278°48.4	•• 11.0	56°43.3	• • 19.4	Atria	107°03.4	-69°04.5
16	103°03.9	25°32.9	46.4	70°09.6	49.5	293°50.9	11.1	71°45.4	19.5	Sabik	101°59.4	-15°45.6
17	118°06.3	40°34.7	46.4	85° 10.3	50.1	308°53.4	11.1	86°47.6	19.6	Shaula	96°06.4	-37°07.3
18	133°08.8	55°36.5	N27°46.3	$100^{\circ}11.0$	N12°50.8	323°55.9	$N06^{\circ}11.1$	101°49.8	N10° 19.7	Rasalhague	95°55.8	12°32.3
19	148°11.3	70°38.3	46.3	$115^{\circ}11.6$	51.4	338°58.5	11.1	116°51.9	19.8	Eltanin	90°40.5	51°28.9
20	163°13.7	85°40.1	46.3	130° 12.3	52.1	354°01.0	11.1	131°54.1	19.9	Kaus Aust.	83°28.7	-34°22.1
21	178°16.2	100°42.0	• • 46.2	145° 13.0	• • 52.7	9°03.5	• • 11.1	146°56.3	• • 20.0	Vega	80°31.1	38°48.4
22	193°18.6	115°43.8	46.2	160°13.6	53.4	24°06.1	11.2	161°58.4	20.1	Nunki	75°44.2	-26°15.5
23	208°21.1	130°45.6	46.1	175° 14.3	54.0	39°08.6	11.2	177°00.6	20.2	Altair	61°57.2	8°56.5
Mer n	ass. 09:09	$\nu_1 7' d_{-0}$.0′ m-4.74	$\nu 0.7' d0$.7′ m1.23	$v^{2} 5' d0$	0′ m-2.26	v2 2' d0	.1′ m0.49	Peacock	53°01.5	-56°38.3
- IVICI.P		- III U U						- Z.Z GO		Deneb	49°23.9	45°22.7
										Enif	33°36.2	10°00.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.7	-46°49.1
0	223°23.6	145° 47.4	N27°46.1	190° 15.0		54° 11.1			N10°20.4	Fomalhaut	15°11.8	-29°28.2
1	238°26.0	160°49.3	46.0	205°15.6	55.3	69°13.7	11.2	207°04.9	20.5	Scheat	13°42.7	28°14.1
2	253°28.5	175°51.1	46.0	220°16.3	55.9	84°16.2	11.2	222°07.1	20.6	Markab	13°27.4	15°21.4
3	268°31.0	190°52.9	• • 45.9	235°17.0	• • 56.6	99° 18.7	· · 11.3	237°09.2	• • 20.7	M 02.14/ :	CITA	
4	283°33.4	205°54.8	45.9	250° 17.7	57.2	114°21.2	11.3	252°11.4	20.8	May 03 Wed	SHA	Mer.pass
5	298°35.9	220° 56.6	45.8	265°18.3	57.9	129°23.8	11.3	267°13.6	20.9		282°58.8	14:21
6	313°38.4	235°58.5	N27°45.8	280°19.0	N12°58.5	144°26.3	N06°11.3	282°15.7	N10°21.0	Mars		11:21
7	328°40.8	251°00.3	45.7	295°19.7	59.2	159°28.8	11.3	297°17.9	21.1		190°44.1	20:28
8	343°43.3	266°02.2	45.7	310°20.3	12°59.8	174°31.4	11.3	312°20.1	21.2	Saturn	328°53.6	11:17
9	358°45.8	281°04.1	• • 45.6	325°21.0	13°00.5	189°33.9	• • 11.4	327°22.2	· · 21.3	May 04 Thu	SHA	Mer.pass
10	13°48.2	296°05.9	45.6	340°21.7	01.1	204°36.4	11.4	342°24.4	21.4		282°40.2	14:18
11	28°50.7	311°07.8	45.5	355°22.3	01.7	219°38.9	11.4	357°26.5	21.5	1	327°34.5	11:20
12	43°53.1	326°09.7	N27°45.4	10°23.0	N13°02.4	234°41.5	N06°11.4	12°28.7	N10°21.6		190°45.9	20:24
13	58°55.6	341°11.6	45.4	25°23.7	03.0	249°44.0	11.4	27°30.9	21.7	Saturn	328°46.4	11:14
14	73°58.1	356° 13.5	45.3	40°24.3	03.7	264°46.5	11.4	42°33.0	21.8			
15	89°00.5	11°15.3	• • 45.3	55°25.0	•• 04.3	279°49.0	• • 11.5	57°35.2	• • 21.9	May 05 Fri	SHA	Mer.pass
16	104°03.0	26° 17.2	45.2	70°25.7	05.0	294°51.6	11.5	72°37.4	22.0	1	282°23.9	14:15
17	119°05.5	41°19.1	45.1	85°26.3	05.6	309°54.1	11.5 No6°11.5	87°39.5	22.1	1	326°51.4	11:18
18	134°07.9	56°21.0	N27°45.1	100°27.0	N13°06.2	324°56.6	N06° 11.5	102°41.7 117°43.9	N10°22.2	1	190°47.6	20:20
19	149°10.4	71°22.9	45.0	115°27.7	06.9	339°59.1	11.5	117°43.9 132°46.0	22.3	Saturn	328°39.2	11:10
20	164°12.9 179°15.3	86°24.9 101°26.8	44.9 •• 44.9	130°28.3 145°29.0	07.5 •• 08.2	355°01.7 10°04.2	11.5 •• 11.6	132°46.0 147°48.2	22.5 · · 22.6	Horizont	al parallax	
21 22	179°15.3 194°17.8	101° 26.8 116° 28.7	44.8	145° 29.0 160° 29.7	08.8	25°06.7	11.6	147°48.2 162°50.4	22.7		Venus:	0.4
22	194 17.8 209°20.2				08.8	40°09.2		162 50.4 177°52.5	22.7		Mars:	0.1
23	209 20.2	131°30.6	44.7	175°30.3			11.6			L		V.1
Mer.p	ass. 09:05	ν 1.8′ d-0	.0′ m-4.73	$ u$ 0.7 $^{\prime}$ d0	.6′ m1.24	$\nu 2.5' \ d0.$	0′ m-2.25	ν 2.2′ d0	.1' m 0.49			

h	Sun				Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.7	N15°46.0	75°03.6	10.3'	N10°55.5	-14.4'	59.3'
1 2	195° 46.8 210° 46.9	46.8 47.5	89°32.9 104°02.3	10.4' 10.4'	10°41.1 10°26.6	-14.4' -14.5'	59.3' 59.3'
3	225°46.9	48.2	118°31.7	10.4	10° 12.1	-14.6'	59.4'
4	240°47.0	49.0	133°01.2	10.5'	09°57.6	-14.6'	59.4'
5	255° 47.0 270° 47.1	49.7 N15°50.4	147°30.7 162°00.2	10.5' 10.5'	09°42.9 N09°28.2	-14.7' -14.7'	59.4' 59.4'
6 7	270 47.1 285°47.2	N15 50.4 51.1	162 00.2 176°29.7	10.5	09°13.5	-14.7' -14.8'	59.4' 59.4'
8	300°47.2	51.9	190°59.3	10.6'	08°58.7	-14.9'	59.4'
9	315° 47.3	• • 52.6	205°28.9	10.6'	08°43.8	-14.9'	59.4'
10 11	330° 47.3 345° 47.4	53.3 54.1	219°58.6 234°28.2	10.7' 10.7'	08°28.9 08°14.0	-15.0' -15.0'	59.4' 59.5'
12	0°47.5	N15°54.8	248° 57.9	10.7	N07°59.0	-15.1'	59.5
13	15°47.5	55.5	263°27.6	10.7'	$07^{\circ}43.9$	-15.1'	59.5'
14	30° 47.6	56.2	277°57.4 292°27.1	10.8'	07°28.8	-15.2'	59.5'
15 16	45° 47.6 60° 47.7	· · 57.0 57.7	292 27.1 306°56.9	10.8' 10.8'	07°13.6 06°58.4	-15.2' -15.2'	59.5' 59.5'
17	75°47.8	58.4	321°26.8	10.8'	06°43.2	-15.3'	59.5'
18	90°47.8	N15°59.1	335°56.6	10.9'	N06°27.9	-15.3'	59.5'
19 20	105° 47.9 120° 47.9	15°59.9 16°00.6	350°26.5 4°56.3	10.9' 10.9'	06°12.6 05°57.2	-15.4' -15.4'	59.5' 59.5'
21	135° 48.0	. 01.3	19° 26.2	10.9	05°41.8	-15.4'	59.6'
22	150°48.1	02.0	33°56.1	10.9'	05°26.4	-15.5'	59.6'
23	165°48.1	02.7	48°26.1	10.9'	05°10.9	-15.5'	59.6'
	SD = 15.9'	d = 0.7'		SI	O = 16.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	180°48.2	N16°03.5	$62^{\circ}56.0$	11.0'	N04°55.4	-15.5'	59.6'
1	195°48.2	04.2	77°26.0	11.0'	04°39.9	-15.6'	59.6'
2	210° 48.3 225° 48.3	04.9 •• 05.6	91°55.9 106°25.9	11.0' 11.0'	04°24.3 04°08.7	-15.6' -15.6'	59.6' 59.6'
4	240° 48.4	06.3	120° 55.9	11.0'	03°53.1	-15.6'	59.6'
5	255°48.4	07.1	$135^{\circ}25.9$	11.0'	03°37.4	-15.7'	59.6'
6	270° 48.5 285° 48.6	N16°07.8 08.5	149°55.9 164°25.9	11.0' 11.0'	N03°21.8 03°06.1	-15.7' -15.7'	59.6' 59.6'
7 8	285 48.6 300°48.6	08.5	104 25.9 178°56.0	11.0'	03 06.1 02°50.4	-15.7'	59.6'
9	315°48.7	•• 09.9	193°26.0	11.0'	02°34.6	-15.8'	59.7'
10	330°48.7	10.6	207°56.0	11.0'	02°18.9	-15.8'	59.7'
11 12	345° 48.8 0° 48.8	11.4 N16°12.1	222°26.1 236°56.1	11.0' 11.0'	02°03.1 N01°47.3	-15.8' -15.8'	59.7' 59.7'
13	15°48.9	12.8	251°26.1	11.0'	01°31.5	-15.8'	59.7'
14	30°48.9	13.5	265°56.2	11.0'	01°15.7	-15.8'	59.7'
15 16	45°49.0 60°49.0	· · 14.2 14.9	280°26.2 294°56.2	11.0' 11.0'	00°59.9 00°44.1	-15.8' -15.8'	59.7' 59.7'
17	75°49.1	15.6	309° 26.3	11.0'	00°28.2	-15.8'	59.7'
18	90°49.2	$N16^{\circ}16.4$	323°56.3	11.0'	N00°12.4	-15.8'	59.7'
19 20	105° 49.2 120° 49.3	17.1 17.8	338°26.3 352°56.3	11.0' 11.0'	\$00°03.5 00°19.3	15.9'	59.7' 59.7'
21	135° 49.3	. 18.5	7°26.3	11.0'	00°19.3	15.9'	59.7'
22	150°49.4	19.2	21°56.3	11.0'	00°51.0	15.8'	59.7'
23	165°49.4	19.9	36°26.3	11.0'	01°06.9	15.8'	59.7'
	SD = 15.9'	d = 0.7'		SI	O = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.5	N16°20.6	50°56.3	11.0'	S01°22.7	15.8'	59.7'
1 2	195° 49.5 210° 49.6	21.3 22.0	65°26.2 79°56.2	10.9' 10.9'	01°38.6 01°54.4	15.8' 15.8'	59.7' 59.7'
3	210 49.6 225°49.6	22.7	94° 26.1	10.9'	01 54.4 02°10.2	15.8'	59.7'
4	240°49.7	23.5	108°56.0	10.9'	02°26.0	15.8'	59.7'
5 6	255° 49.7 270° 49.8	24.2 N16°24.9	123°25.9 137°55.8	10.9' 10.9'	02°41.8 \$02°57.6	15.8' 15.8'	59.7' 59.7'
7	270 49.8 285°49.8	25.6	157 55.8 152° 25.6	10.9	03°13.4	15.8'	59.7' 59.7'
8	300°49.9	26.3	$166^{\circ}55.5$	10.8'	03°29.2	15.7'	59.7'
9	315°49.9	• • 27.0	181°25.3	10.8'	03°44.9	15.7'	59.7'
10 11	330°50.0 345°50.0	27.7 28.4	195°55.1 210°24.8	10.8' 10.7'	04°00.6 04°16.3	15.7' 15.7'	59.7' 59.7'
12	0°50.1	N16°29.1	224°54.6	10.7'	S04°32.0	15.7'	59.7'
13	15°50.1	29.8	239°24.3	10.7'	04°47.7	15.6'	59.7'
14 15	30° 50.2 45° 50.2	30.5 · · 31.2	253°54.0 268°23.7	10.7' 10.6'	05°03.3 05°18.9	15.6' 15.6'	59.7' 59.7'
16	60°50.3	31.9	282°53.3	10.6'	05°34.5	15.5'	59.7'
17	75°50.3	32.6	297°22.9	10.6'	05°50.1	15.5'	59.7'
18 19	90° 50.4 105° 50.4	N16°33.3 34.0	311°52.5 326°22.0	10.5' 10.5'	\$06°05.6 06°21.0	15.5' 15.4'	59.7' 59.7'
20	105° 50.4	34.0	340°51.5	10.5'	06°21.0	15.4	59.7'
21	135°50.5	• • 35.4	355°21.0	10.4'	06°51.9	15.4'	59.7'
22 23	150° 50.5 165° 50.6	36.1 36.8	9°50.5 24°19.9	10.4' 10.4'	07°07.3 07°22.6	15.3' 15.3'	59.7' 59.7'
23	SD = 15.9'	d = 0.7'			$07^{22.6}$ $0 = 16.3'$	13.3	59.7
		a = 0.7		51	$\nu = 10.3^{\circ}$		

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
N 40°	03:50	04:26	04:56	18:58	19:28	20:04
35°	04:06	04:38	05:06	18:48	19:16	19:49
30°	04:18	04:49	05:14	18:40	19:05	19:36
20°	04:38	05:06	05:29	18:25	18:48	19:15
N 10°	04:54	05:20	05:42	18:12	18:34	19:00
0°	05:07	05:32	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:36
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
S 50°	05:59	06:37	07:12	16:41	17:16	17:54
52°	06:01	06:41	07:18	16:35	17:11	17:52
54°	06:04	06:46	07:24	16:28	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
S 60°	06:12	07:03	07:49	16:03	16:50	17:40

Lat.		Moonris	е		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
S 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
S 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°			14:36	••••	01:23	02:54
58°	14:18	14:26	14:33	••••	01:20	02:55
S 60°	14:22	14:26	14:31		01:18	02:56

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	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			11:57	20:29	08:04			
UE			11.57	21.10	00.51			

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	224°22.7	$146^{\circ}32.5$	N27°44.7	190°31.0	$N13^{\circ}10.1$	55°11.8	$N06^{\circ}11.6$	192°54.7	N10°22.9	Alpheratz	357°32.2	29°14.7
1	239°25.2	161°34.5	44.6	205°31.7	10.7	$70^{\circ}14.3$	11.6	207°56.8	23.0	Ankaa	353°04.9	-42°08.9
2	254°27.6	176° 36.4	44.5	220°32.3	11.4	85°16.8	11.6	222°59.0	23.1	Schedar	349° 28.3	56°41.4
3	269°30.1	191°38.3	• • 44.5	235°33.0	• • 12.0	100°19.3	• • 11.7	238°01.2	• • 23.2	Diphda	348°44.9	-17°49.8
4	284°32.6	206°40.3	44.4	250°33.7	12.6	115°21.8	11.7	253°03.3	23.3	Achernar	335°18.8	-57°05.4
5	299°35.0	221°42.2	44.3	265°34.3	13.3	130°24.4	11.7	268°05.5	23.4	Hamal	327°48.5	23°35.7
6	314°37.5	236°44.2	N27°44.2	280°35.0	N13°13.9	145°26.9	N06°11.7	283°07.7	N10°23.5	Polaris	313°04.2	89°22.9
7	329°40.0	251°46.1	44.1	295°35.6	14.6	160°29.4	11.7	298°09.8	23.6	Acamar	315°10.2	-40°11.5
8 9	344°42.4 359°44.9	266° 48.1 281° 50.1	44.1 •• 44.0	310°36.3 325°37.0	15.2 •• 15.8	175°31.9 190°34.4	11.7 •• 11.7	313°12.0 328°14.2	23.7	Menkar	$314^{\circ}03.6$	4°12.0
9 10	14°47.4	201 50.1 296°52.0	43.9	340°37.6	16.5	205°37.0	11.8	343°16.3	· · 23.8 23.9	Mirfak	308°24.8	49°57.6
11	29°49.8	311°54.0	43.9	355°38.3	17.1	200°39.5	11.8	358° 18.5	24.0	Aldebaran	290°36.8	16°33.9
12	44°52.3	326°56.0	N27°43.7	10°39.0	N13°17.7	235°42.0	N06°11.8	13°20.7	N10°24.1	Rigel	281°01.6	-8°10.3
13	59°54.7	341°58.0	43.7	25°39.6	18.4	250°44.5	11.8	28°22.8	24.2	Capella	280°18.3	46°01.6
14	74°57.2	356° 59.9	43.6	40°40.3	19.0	265°47.0	11.8	43°25.0	24.3	Bellatrix	278°20.3	6°22.4
15	89°59.7	12°01.9	• • 43.5	55°41.0	19.7	280°49.6	11.8	58°27.1	24.4	Elnath	277°58.8	28°37.8
16	105°02.1	27°03.9	43.4	70°41.6	20.3	295°52.1	11.8	73°29.3	24.5	Alnilam	275°35.3	-1°11.2
17	120°04.6	42°05.9	43.3	85°42.3	20.9	310°54.6	11.9	88°31.5	24.7	Betelgeuse	270°49.4	7°24.6
18	135°07.1	57°07.9	N27°43.2	100°43.0	N13°21.6	325°57.1	N06°11.9	103°33.6	N10°24.8	Canopus	263°51.6	-52°42.9
19	150°09.5	72°09.9	43.1	115°43.6	22.2	340°59.6	11.9	118°35.8	24.9	Sirius	258°24.1	-16°45.5 -29°00.9
20	165°12.0	$87^{\circ}11.9$	43.0	130°44.3	22.8	$356^{\circ}02.1$	11.9	133°38.0	25.0	Adhara Procyon	255°03.9 244°48.2	5°09.0
21	180°14.5	$102^{\circ}14.0$	• • 43.0	145°45.0	• • 23.5	$11^{\circ}04.7$	• • 11.9	$148^{\circ}40.1$	•• 25.1	Pollux	244 46.2 243°14.2	27°57.4
22	$195^{\circ}16.9$	$117^{\circ}16.0$	42.9	160°45.6	24.1	26°07.2	11.9	163°42.3	25.2	Avior	234° 13.7	-59°36.4
23	$210^{\circ}19.4$	132°18.0	42.8	175°46.3	24.7	41°09.7	11.9	178°44.5	25.3	Suhail	222°44.3	-43°33.2
Mer n	ass. 09:01	v1 9' d-0	.1′ m-4.72	ν0 7' d0	.6′ m1.24	v2 5' d0	.0′ m-2.24	v2 2' d0	.1′ m0.50	Miaplacidus	221°37.6	-69°50.4
ivici.p	Mass. 09.01	ν1.9 u-0	.1 111-4.72	νο.τ do	.0 1111.24	ν2.5 do.	.0 111-2.24	ν2.2 do	.1 1110.30	Alphard	217°45.1	-8°47.1
										Regulus	207°31.5	11°49.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°36.0
0	225°21.9	147°20.0	N27°42.7	190°47.0	N13°25.4	56°12.2	N06°11.9	193°46.6	N10°25.4	Denebola	182°22.0	14°24.7
1	240°24.3	162°22.0	42.6	205°47.6	26.0	71°14.7	12.0	208°48.8	25.5	Gienah	175°40.5	-17°42.2
2	255°26.8	177°24.1	42.5	220°48.3	26.6	86°17.2	12.0	223°51.0	25.6	Acrux	172°56.4	-63°15.7
3	270°29.2	192°26.1	• • 42.4	235°48.9	• • 27.3	101°19.8	• • 12.0	238°53.1	• • 25.7	Gacrux	171°48.1	-57°16.6
4	285°31.7	207°28.2	42.3	250°49.6	27.9	116°22.3	12.0	253°55.3	25.8	Alioth	$166^{\circ}10.2$	55°48.4
5	300°34.2	222°30.2	42.2 N27°42.1	265°50.3	28.5	131°24.8	12.0	268° 57.5	25.9	Spica	$158^{\circ}19.1$	-11°18.7
6 7	315°36.6	237°32.3		280°50.9	N13°29.2	146°27.3	N06°12.0	283°59.6	N10°26.0	Alkaid	152°49.5	49°10.3
8	330°39.1 345°41.6	252°34.3 267°36.4	42.0	295°51.6 310°52.3	29.8 30.4	161°29.8 176°32.3	12.0 12.0	299°01.8 314°04.0	26.1	Hadar	148°31.4	-60°30.7
9	0°44.0	282°38.4	41.9 •• 41.8	325°52.9	31.1	170 32.3 191°34.8	12.0	329°06.1	26.2 •• 26.3	Menkent	147°54.0	-36°30.7
10	15°46.5	297°40.5	41.7	340°53.6	31.7	206°37.3	12.0	344°08.3	26.4	Arcturus	145°45.1	19°02.0
11	30°49.0	312°42.6	41.6	355°54.3	32.3	200°37.3 221°39.9	12.1	359° 10.4	26.5	Rigil Kent.	139°35.8	-60°57.3
12	45°51.4	327° 44.7	N27°41.4	10°54.9	N13°33.0	236°42.4	N06°12.1	14°12.6	N10°26.6	Kochab	137°18.9	74°02.3
13	60°53.9	342°46.7	41.3	25°55.6	33.6	251°44.9	12.1	29° 14.8	26.7	Zuben'ubi	136°52.7	-16°09.7
14	75°56.3	357°48.8	41.2	40°56.2	34.2	266°47.4	12.1	44°16.9	26.8	Alphecca	126°01.1	26°37.0
15	90°58.8	12°50.9	• • 41.1	55°56.9	• • 34.9	281°49.9	· · 12.1	59° 19.1	26.9	Antares	112°12.2 107°03.4	-26°29.7
16	106°01.3	27°53.0	41.0	70°57.6	35.5	296°52.4	12.1	74°21.3	27.1	Atria Sabik	107 03.4 101°59.4	-69°04.5 -15°45.6
17	121°03.7	42°55.1	40.9	85°58.2	36.1	311°54.9	12.1	89°23.4	27.2	Shaula	96°06.4	-13° 43.0 -37° 07.3
18	136°06.2	57°57.2	N27°40.8	100°58.9	N13°36.7	326°57.4	N06°12.1	104°25.6	N10°27.3	Rasalhague	95°55.8	12°32.3
19	151°08.7	72°59.3	40.7	115°59.6	37.4	342°00.0	12.2	119°27.8	27.4	Eltanin	90°40.5	51°28.9
20	$166^{\circ}11.1$	88°01.4	40.5	131°00.2	38.0	357°02.5	12.2	134°29.9	27.5	Kaus Aust.	83°28.7	-34°22.1
21	181°13.6	103°03.6	• • 40.4	146°00.9	• • 38.6	12°05.0	• • 12.2	149°32.1	• • 27.6	Vega	80°31.1	38°48.4
22	196°16.1	118°05.7	40.3	161°01.6	39.3	27°07.5	12.2	164°34.3	27.7	Nunki	75°44.2	-26°15.5
23	211°18.5	133°07.8	40.2	176°02.2	39.9	42°10.0	12.2	179°36.4	27.8	Altair	61°57.2	8°56.6
Mer.p	ass. 08:57	$\nu 2.0' d-0$.1' m-4.71	ν 0.7′ d0	.6′ m1.24	$\nu 2.5' \ d0.$.0′ m-2.24	$\nu 2.2' \ d0$.1′ m0.50	Peacock	53°01.4	-56°38.3
- 1										Deneb	49°23.9	45°22.7
			_		_		_		_	Enif	33°36.2	10°00.3
Mon	GHA 226°21.0	GHA 148°00 0	Dec N27°40.1	GHA 191°02.9	Dec N13°40.5	GHA 57°12.5	Dec N06°12.2	GHA 194°38.6	Dec N10°27.9	Al Na'ir	27°29.7	-46°49.1
0 1	241°23.5	148°09.9 163°12.1	N27 40.1 39.9	191°02.9 206°03.5	N13 40.5 41.1	72°15.0	12.2	194° 38.6 209° 40.8	28.0	Fomalhaut	15°11.7	-29°28.1
2	241 23.5 256°25.9	103 12.1 178°14.2	39.9	200 03.5 221°04.2	41.1	72 15.0 87°17.5	12.2	209 40.8 224°42.9	28.1	Scheat	13°42.7	28°14.1
3	250 25.9 271°28.4	178 14.2 193°16.3	· · 39.8	221 04.2 236°04.9	· · 42.4	102°20.0	. 12.2	224 42.9 239°45.1	28.2	Markab	13°27.3	15°21.4
4	286°30.8	208° 18.5	39.6	251°05.5	43.0	102 20.0 117°22.5	12.2	254°47.3	28.3	May 06 Sat	SHA	Mer.pass
5	301°33.3	223°20.6	39.4	266°06.2	43.7	132°25.0	12.2	269°49.4	28.4	Venus	282°09.8	14:12
6	316°35.8	238°22.8	N27°39.3	281°06.9	N13°44.3	147°27.5	N06°12.3	284°51.6	N10°28.5	Mars	326°08.3	11:17
7	331°38.2	253°25.0	39.2	296°07.5	44.9	162°30.1	12.3	299°53.8	28.6	Jupiter	190°49.0	20:16
8	346°40.7	268° 27.1	39.1	311°08.2	45.5	177°32.6	12.3	314°55.9	28.7	Saturn	328°32.0	11:07
9	1°43.2	283°29.3	• • 38.9	326°08.8	• • 46.2	192°35.1	• • 12.3	329°58.1	• • 28.8	NA. 07.0		
10	16°45.6	298°31.5	38.8	341°09.5	46.8	207°37.6	12.3	$345^{\circ}00.2$	28.9	May 07 Sun	SHA	Mer.pass
11	31°48.1	313°33.6	38.7	$356^{\circ}10.2$	47.4	222°40.1	12.3	$0^{\circ}02.4$	29.0	Venus		14:09
12	46°50.6	328°35.8	N27°38.5	11°10.8	N13°48.0	237°42.6	N06°12.3	15°04.6	N10°29.1	Mars Jupiter	325°25.1 190°50.4	11:16 20:12
13	61°53.0	343°38.0	38.4	26°11.5	48.7	252°45.1	12.3	30°06.7	29.2	Saturn	328° 24.8	11:03
14	76°55.5	358° 40.2	38.3	41°12.2	49.3	267°47.6	12.3	45°08.9	29.3	Jatuill	J2U 24.0	11.03
15	91°58.0	13°42.4	· · 38.1	56°12.8	• • 49.9	282°50.1	· · 12.3	60°11.1	• • 29.4	May 08 Mon	SHA	Mer.pass
16	107°00.4	28°44.6	38.0	71°13.5	50.5	297°52.6	12.3	75° 13.2	29.5	Venus		14:05
17	122°02.9	43°46.8	37.8	86°14.1	51.2	312°55.1	12.3	90°15.4	29.6	Mars		11:15
18	137°05.3	58°49.0	N27°37.7	101°14.8	N13°51.8	327°57.6	N06°12.3	105°17.6	N10°29.8		190°51.5	20:08
19	152°07.8	73°51.2	37.6	116°15.5	52.4	343°00.1	12.4	120° 19.7	29.9	Saturn	328°17.6	11:00
20 21	167°10.3 182°12.7	88°53.4 103°55.6	37.4	131°16.1	53.0 •• 53.7	358°02.6 13°05.1	12.4	135°21.9	30.0	Horizont	al parallax	
22	182 12.7 197°15.2	103 55.6 118°57.9	· · 37.3 37.1	146°16.8 161°17.4	54.3	28°07.6	· · 12.4 12.4	150°24.1 165°26.2	· · 30.1 30.2		Venus:	0.4
23	212° 17.7	134°00.1	37.1	176°18.1	54.5	43°10.1	12.4	180°28.4	30.2		Mars:	0.1
Mer.p	ass. 08:53	$\nu 2.1' d-0$.1' m-4.70	$ u 0.7' \; d0$.6′ m1.25	ν 2.5′ d0.	.0′ m-2.23	ν 2.2′ d0	$.1^\prime$ m 0.50			

h	Sun				Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.6	N16°37.5	38°49.2	10.3'	S07°37.9	15.2'	59.7'
1 2	195°50.7 210°50.7	38.2 38.9	53°18.6 67°47.9	10.3' 10.3'	07°53.1 08°08.3	15.2' 15.2'	59.7' 59.7'
3	225°50.8	39.6	82°17.1	10.3	08°23.5	15.1	59.7'
4	240°50.8	40.3	96°46.3	10.2'	$08^{\circ}38.6$	15.1'	59.7'
5	255°50.9	41.0	111°15.5	10.1'	08°53.7	15.0'	59.7'
6 7	270°50.9 285°50.9	N16°41.7 42.4	125°44.7 140°13.7	10.1' 10.0'	\$09°08.7 09°23.6	15.0' 14.9'	59.7' 59.7'
8	300°51.0	43.1	154° 42.8	10.0'	09°23.0	14.8	59.7'
9	315°51.0	• • 43.8	$169^{\circ}11.8$	10.0'	$09^{\circ}53.3$	14.8'	59.7'
10	330°51.1	44.5	183°40.8	9.9'	10°08.1	14.7'	59.7'
11 12	345°51.1 0°51.2	45.1 N16°45.8	198°09.7 212°38.5	9.9' 9.8'	10°22.8 \$10°37.5	14.7' 14.6'	59.7' 59.6'
13	15°51.2	46.5	227°07.4	9.8'	10°52.1	14.5'	59.6'
14	30°51.2	47.2	$241^{\circ}36.1$	9.7'	$11^{\circ}06.6$	14.5'	59.6'
15	45°51.3 60°51.3	• • 47.9	256°04.9	9.7'	11°21.1 11°35.5	14.4'	59.6'
16 17	75°51.4	48.6 49.3	270°33.5 285°02.2	9.6' 9.6'	11° 35.5 11° 49.8	14.3' 14.3'	59.6' 59.6'
18	90°51.4	N16°50.0	299°30.7	9.5'	S12°04.1	14.2'	59.6'
19	105°51.5	50.7	313°59.3	9.5'	12° 18.3	14.1'	59.6'
20	120°51.5 135°51.5	51.4	328°27.7 342°56.2	9.4'	12°32.4 12°46.4	14.0' 14.0'	59.6'
21 22	135°51.5 150°51.6	· · 52.0 52.7	342°56.2 357°24.5	9.4' 9.3'	12°46.4 13°00.4	14.0	59.6' 59.6'
23	165°51.6	53.4	11°52.8	9.3'	13° 14.3	13.8'	59.5'
	SD = 15.8'	d = 0.7'		SE	0 = 16.3'		
				- 52	10.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°51.7 195°51.7	N16°54.1 54.8	26°21.1 40°49.3	9.2' 9.2'	\$13°28.1 13°41.8	13.7' 13.6'	59.5' 59.5'
2	210°51.7	55.5	55°17.5	9.2	13°55.4	13.5	59.5'
3	225°51.8	• • 56.2	69°45.6	9.0'	14°09.0	13.5'	59.5'
4	240°51.8	56.9	84°13.6	9.0'	14°22.4	13.4'	59.5'
5 6	255°51.9 270°51.9	57.5 N16°58.2	98°41.6 113°09.5	8.9' 8.9'	14° 35.8 \$14° 49.1	13.3' 13.2'	59.5' 59.5'
7	285°51.9	58.9	113 09.3 127°37.4	8.8'	15°02.3	13.1'	59.4'
8	300°52.0	16°59.6	142°05.2	8.8'	15° 15.4	13.0'	59.4'
9	315°52.0	17°00.3	156°33.0	8.7'	15°28.4	12.9'	59.4'
10 11	330°52.0 345°52.1	00.9 01.6	171°00.7 185°28.3	8.6' 8.6'	15°41.3 15°54.1	12.8' 12.7'	59.4' 59.4'
12	0°52.1	N17°02.3	199°55.9	8.5'	\$16°06.8	12.6'	59.4
13	15°52.2	03.0	$214^{\circ}23.5$	8.5'	$16^{\circ}19.4$	12.5'	59.4'
14	30°52.2 45°52.2	03.7	228°50.9 243°18.3	8.4'	16°31.9 16°44.3	12.4'	59.3'
15 16	45°52.2 60°52.3	· · 04.3 05.0	243°18.3 257°45.7	8.4' 8.3'	16° 44.3 16° 56.6	12.3' 12.2'	59.3' 59.3'
17	75°52.3	05.7	272°13.0	8.2'	17°08.8	12.1'	59.3'
18	90°52.3	N17°06.4	286°40.3	8.2'	\$17°20.9	12.0'	59.3'
19 20	105°52.4 120°52.4	07.1 07.7	301°07.4 315°34.6	8.1' 8.1'	17°32.9 17°44.7	11.9'	59.3' 59.2'
21	135°52.4	08.4	330°01.6	8.0'	17°56.5	11.6'	59.2'
22	150°52.5	09.1	344°28.6	8.0'	18°08.1	11.5'	59.2'
23	165°52.5	09.8	358°55.6	7.9'	18° 19.6	11.4'	59.2'
	SD = 15.8'	d = 0.7'		SE	0 = 16.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°52.5	N17°10.4	13°22.5	7.8'	\$18°31.0	11.3'	59.2'
1	195°52.6	11.1	27°49.3	7.8'	18°42.3	11.2'	59.1'
2	210°52.6 225°52.6	11.8	42°16.1 56°42.9	7.7'	18° 53.5 19° 04.5	11.0'	59.1' 59.1'
3 4	225°52.6 240°52.7	· · 12.5 13.1	56°42.9 71°09.5	7.7' 7.6'	19°04.5 19°15.4	10.9' 10.8'	59.1' 59.1'
5	255°52.7	13.8	85°36.2	7.6'	$19^{\circ}26.2$	10.7'	59.1'
6	270°52.7	N17°14.5	100°02.7	7.5'	\$19°36.9	10.5'	59.0'
7 8	285°52.8 300°52.8	15.1 15.8	114°29.2 128°55.7	7.5' 7.4'	19° 47.4 19° 57.8	10.4' 10.3'	59.0' 59.0'
9	315°52.8	15.6	143°22.1	7.4	20°08.1	10.3	59.0'
10	330°52.9	17.2	$157^{\circ}48.4$	7.3'	$20^{\circ}18.3$	10.0'	59.0'
11	345°52.9	17.8 N17°18.5	172°14.7 186°41.0	7.2'	20°28.3 5 20°38.2	9.9'	58.9'
12 13	0°52.9 15°53.0	N17°18.5 19.2	186°41.0 201°07.2	7.2' 7.1'	20° 48.0	9.8' 9.6'	58.9' 58.9'
14	30°53.0	19.8	215°33.3	7.1'	20°57.6	9.5'	58.9'
15	45°53.0	• • 20.5	229°59.4	7.0'	21°07.1	9.3'	58.8'
16 17	60°53.1 75°53.1	21.2 21.8	244°25.5 258°51.5	7.0' 7.0'	21°16.4 21°25.6	9.2' 9.1'	58.8' 58.8'
18	75°53.1 90°53.1	21.8 N17°22.5	258°51.5 273°17.4	6.9'	\$21° 34.7	9.1 8.9'	58.8'
19	105°53.1	23.2	287°43.3	6.9'	21°43.6	8.8'	58.7'
20	120°53.2	23.8	302°09.2	6.8'	21°52.4	8.6'	58.7'
21 22	135°53.2 150°53.2	· · 24.5 25.1	316°35.0 331°00.8	6.8' 6.7'	22°01.1 22°09.6	8.5' 8.4'	58.7' 58.7'
23	165°53.3	25.1	345°26.5	6.7'	22°17.9	8.2'	58.6'
	SD = 15.8'	d = 0.7'			0 = 16.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
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
N 40°	03:46	04:23	04:53	19:01	19:31	20:08
35°	04:02	04:35	05:03	18:51	19:18	19:52
30°	04:15	04:46	05:12	18:42	19:07	19:38
20°	04:36	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
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:29	05:55	06:18	17:35	17:58	18:24
30°	05:39	06:08	06:33	17:20	17:45	18:13
35°	05:45	06:15	06:42	17:11	17:38	18:08
40°	05:50	06:23	06:51	17:01	17:30	18:02
45°	05:56	06:31	07:03	16:50	17:21	17:56
S 50°	06:02	06:41	07:16	16:36	17:11	17:50
52°	06:05	06:46	07:22	16:30	17:07	17:47
54°	06:08	06:51	07:30	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
S 60°	06:18	07:09	07:56	15:56	16:43	17:34

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	18:55			01:43	00:59	
N 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
N 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
N 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
N 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
S 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
S 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
S 60°	14:36	14:43	14:54	04:35	06:16	07:59

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	89-99%	
06	03:23	03:25	11:57	22:11	09:45		
07	03:27	03:28	11:57	23:04	10:37		
08	03:30	03:32	11:56	-:-	11:32		

Coling	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
20 227 20 149 149 20 20 20 20 20 20 20 2	Tue -	GHΔ	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 APP 200 166 FM 6													
2 57" 53.1 179" 68											Alpheratz	$357^{\circ}32.2$	29°14.7
2											Ankaa	353°04.9	-42°08.9
287 190 200 11.3 36.2 251 21.4 59.0 116 22.5 12.4 255 30.2 30.6 1.5 1.											Schedar		
Source 1											Diphda	348°44.9	-17°49.8
37.7146													
8 387990 287910 197150													
9 277.58 260.21 336 311.20 1.00 1.													
10													
17 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
10 12 244 2											1		
11 277-52 347-318 347 348 347-327 301-327											1		
19 22°9.22 29 40°13 18 19 19 19 19 19 19 19 19 19 19 19 19 19													
6724. 6 674. 6 674. 6 672. 6 6													
18 12 12 13 14 14 15 15 15 15 15 15													
17 137 107													
Betelegous 270 494 7 724.0 19 13700.5	15			• • 34.5		• • 04.8				· · 31.9	1		
1.125***OLS	16	$107^{\circ}59.6$	29°38.7	34.3		05.4	298°52.6		76°05.2				
Simple S	17	123°02.0	44°41.0		86°30.0	06.1	313°55.1	12.5	91°07.4	32.1			
13 13 13 13 13 13 13 13	18	138°04.5		N27°34.0	101°30.6	N14°06.7		$N06^{\circ}12.5$		N10°32.2			
	19	153°06.9	74°45.6	33.8	116°31.3	07.3	344°00.1	12.5	121°11.7	32.3			
His-Tity 118"-129 33.3 161"-326 1815 14"-051 125 16"-181 32.5 32.5 32.5 33.5 1815 33.5 39.5 34.5	20	168°09.4	89°47.9	33.7	131°32.0	07.9		12.5	136°13.9	32.4			
22 198"14.3 119"\$2.6 33.1 16"33.3 106"23.5 209"7.6 12.5 106"18.2 32.6 106"18.2 32.6 12.5 12.5 106"18.2 32.6 12.5	21	183°11.9	104°50.2	• • 33.5	$146^{\circ}32.6$	• • 08.5	$14^{\circ}05.1$	• • 12.5	$151^{\circ}16.1$	• • 32.5			
Mart Part Mart		198°14.3	119°52.6				29°07.6				1		
Wed GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA		213°16.8			176°33.9								
Wed GHA GHA GHA Dec											1		
Wed CHA CHA Dec GHA Dec CHA Dec Polymer (a) Polymer (b) CHA Dec ChA Dec ChA Dec Doubh 18/39/36 61/39/36 11/40/36 Alf **20.4	Mer.pa	ass. 08:49	ν 2.2′ d-0	.1′ m-4.69	ν 0.1' d0	.o′ m1.25	ν 2.5′ d0.	u′ m-2.22	$\nu^{2.2'} d0$.ı m0.50			
Color Col	_												
228°19.3 149°57.3 129°30.5 101°31.6 114°31.6 114°31.7 129°12.6 100°32.8 129°12.7 149°37.1 149°57.3 149°37.1 149°37.3	Wed	GHA	GHΔ	Dec	GHΔ	Dec	GHΔ	Dec	GHΔ	Dec	_		
2 286°42 2 180°10 9 32.6 22°35 9 11.0 7-6°15.1 12.5 211°247 7 33.0 3.2 278°26.7 199°04.3 23.4 236°36.6 12.2 104°20.1 12.5 241°29.1 3.3.2 4. 286°29.1 210°0.7 32.3 224 236°36.6 12.2 104°20.1 12.5 241°29.1 3.3.2 5. 303°31.6 225°09.0 32.1 266°37.0 13.5 134°52.6 12.5 25°31.2 33.3 5. 303°31.6 225°09.0 32.1 266°37.0 13.5 134°52.6 12.5 25°31.2 33.3 5. 338°36.5 25°12.8 31.7 296°39.2 14.7 164°30.0 12.5 301°37.7 33.6 5. 338°36.5 25°13.8 31.7 296°39.2 14.7 164°30.0 12.5 301°37.7 33.6 5. 348°49.0 270°10.5 3.1 31.7 296°39.2 14.7 164°30.0 12.5 301°37.7 33.6 5. 348°49.0 270°10.5 3.1 31.7 31°99.5 11.7 193.2 12.5 301°37.7 33.6 5. 348°49.0 270°10.5 3.1 31.7 31°99.5 11.7 193.2 12.5 301°37.7 33.6 5. 348°49.0 270°10.5 3.1 31.7 31°99.5 11.7 193.2 12.5 301°37.7 33.6 5. 348°49.0 270°10.5 3.1 31.9 31°99.5 11.7 193.2 12.5 348°4.2 33.9 5. 348°49.0 270°10.5 3.1 31.9 31°99.5 11.7 1224°0.0 12.5 348°4.2 33.9 5. 348°49.1 31.7 1.1 224°0.0 12.5 14°6.6 34.0 14.5 14.6 34.0 14.6 14.6 14.6 14.6 14.6 14.6 14.6 14.6													
2 256°24 2 180°01.9 32.6 221°35.9 11.6 86°17.6 12.5 226°36.9 33.1 327.6 17.8 16.7 16.7 16.7 12.5 226°36.7 195°04.3 32.6 221°35.9 11.6 286°17.0 1.2.5 226°37.0 13.2 12.5 226°37.0 13.5 134°55.0 12.5 271°33.4 33.3 14.6 16.7 12.5 12.6 256°37.0 13.5 134°55.0 12.5 271°33.4 33.4 14.6 16.7 12.5 12.6 12.7 12.7 12.8 11.7 12.7 12.7 12.7 12.7 12.7 12.7 12.7									211°24 7				
277°26.7 199°043 3.24 236°36.6 · 12.2 104°30.1 · 12.5 241°39.1 · 33.2 4 286°36.6 · 12.2 104°30.1 · 12.5 241°39.1 · 33.2 4 286°31.2 33.5 15°16.6 · 30.3 ° 31.6 225°09.6 32.1 266°37.9 13.5 134°25.0 12.5 271°33.4 33.4 6.5 10.5 10.5 10.5 10.5 10.5 10.5 10.5 10													
4 288°29.1 210°66.7 3.3.3 291°37.2 12.8 119°2.25 12.5 256°31.2 33.3 Aich 166°10.2 55°4.84 5. 30°337.6 255°31.6 225°9.0 32.1 4. 312°31.5 134°5.5 12.5 25°31.2 33.4 33.4 5. 31.6 11.6 11.6 11.2 26°32.7 11.5 136°30.2 12.5 316°31.9 33.6 11.4 11.5 11.5 11.5 11.5 11.5 11.5 11.5													
5 303*31.6 225*09.0 321. 266*39.9 13.5 134*25.0 12.5 271*33.4 33.4 Alore 10:10:10:10:10:10:10:10:10:10:10:10:10:1													
5 318*34.1 240*11.4 N27*31.9 281*38.6 N14*31.1 149*27.5 N06*12.5 286*36.6 N10*33.5 N											Alioth	$166^{\circ}10.2$	55°48.4
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19 155°05.2 76°42.1 24.4 117°02.9 36.6 345°59.6 12.5 122°55.8 37.3 20 170°07.7 91°44.7 24.2 132°03.5 37.2 1°02.0 12.5 137°57.9 37.4 21 185°10.2 106°47.2 · 23.9 147°04.2 · 37.9 16°04.5 · 12.5 153°00.1 · 37.5 22 200°12.6 121°49.8 23.7 162°04.8 38.5 31°07.0 12.5 168°02.3 37.6 23 215°15.1 136°52.3 23.5 177°05.5 39.1 46°09.5 12.5 183°04.4 37.7 Saturn 327°56.2 10:49 Horizontal parallax Venus: 0.4 Mars: 0.1	18	140°02.8	61°39.6	N27°24.6	102°02.2	N14°36.0	330°57.1	N06° 12.5	107°53.6	N10°37.2	1		
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												Mars:	0.1
Wer.pass. 08:41 ν 2.5' d -0.2' m-4.05 ν 0.1' d 0.6' m1.26 ν 2.5' d 0.0' m-2.21 ν 2.2' d 0.1' m0.50											-		
	Mer.p	ass. U8:41	ν 2.5′ d -0	.∠′ m-4.65	ν 0.1' d0	.o′ m1.26	ν 2.5′ d 0.	u′ m-2.21	ν 2.2' d0	.1′ m0.50			

h	Sui	า					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N17°26.5	359°52.2	6.6'	\$22°26.2	8.1'	58.6'
1	195°53.3	27.1	14° 17.8	6.6'	22°34.2	7.9'	58.6'
2	210°53.3	27.8	28°43.4	6.6'	22°42.1	7.8'	58.6'
3	225°53.4	• • 28.5	43°09.0	6.5'	$22^{\circ}49.9$	7.6'	58.5'
4	240°53.4	29.1	57°34.6	6.5'	22°57.5	7.5'	58.5'
5	255° 53.4	29.8	72°00.1	6.5'	23°05.0	7.3'	58.5'
6	270°53.5 285°53.5	N17°30.4 31.1	86°25.5 100°51.0	6.4' 6.4'	\$23° 12.3 23° 19.5	7.2' 7.0'	58.5' 58.4'
7 8	285 53.5 300°53.5	31.1	100 51.0 115°16.4	6.4	23 19.5 23°26.5	7.0 6.9'	58.4'
9	315° 53.5	32.4	113 10.4 129°41.7	6.3'	23° 33.4	6.7	58.4
10	330°53.6	33.1	144°07.1	6.3'	23°40.1	6.6	58.4'
11	345°53.6	33.7	158°32.4	6.3'	23°46.7	6.4'	58.3'
12	0°53.6	N17°34.4	172°57.7	6.3'	S23°53.1	6.2'	58.3'
13	15°53.6	35.0	187°23.0	6.2'	23°59.3	6.1'	58.3'
14	30°53.7	35.7	201°48.2	6.2'	24°05.4 24°11.3	5.9'	58.2'
15 16	45°53.7 60°53.7	· · 36.4 37.0	216°13.4 230°38.6	6.2' 6.2'	24°11.3 24°17.1	5.8' 5.6'	58.2' 58.2'
17	75°53.7	37.0 37.7	245°03.8	6.2	24 17.1 24°22.7	5.5'	58.2
18	90°53.8	N17°38.3	259° 29.0	6.2'	524°28.2	5.3'	58.1
19	105°53.8	39.0	273°54.1	6.1'	24°33.5	5.1'	58.1'
20	120°53.8	39.6	$288^{\circ}19.3$	6.1'	24°38.6	5.0'	58.1'
21	135°53.8	• • 40.3	$302^{\circ}44.4$	6.1'	$24^{\circ}43.6$	4.8'	58.0'
22	150°53.9	40.9	317°09.5	6.1'	24°48.5	4.7'	58.0'
23	165°53.9	41.6	331°34.6	6.1'	24°53.1	4.5'	58.0'
	SD = 15.8'	d = 0.7'		SI	O = 16.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	180°53.9	N17°42.2	345°59.7	6.1'	\$24°57.6	4.3'	58.0'
1	195°53.9	42.9	0°24.8	6.1'	25°02.0	4.2'	57.9'
2	210°53.9	43.5	14°49.9	6.1'	25°06.2	4.0'	57.9'
3	225° 54.0	• • 44.2	29°15.0	6.1'	25° 10.2	3.9'	57.9'
4	240°54.0	44.8	43°40.1	6.1'	25°14.0	3.7'	57.8'
5 6	255° 54.0 270° 54.0	45.5 N17°46.1	58°05.2 72°30.3	6.1' 6.1'	25° 17.8 \$25° 21.3	3.5' 3.4'	57.8' 57.8'
7	270 54.0 285°54.0	46.8	86°55.4	6.1	25° 24.7	3.4	57.6 57.7'
8	300°54.1	47.4	101°20.5	6.1	25° 27.9	3.1'	57.7'
9	315°54.1	• • 48.1	115° 45.6	6.1'	25°30.9	2.9'	57.7'
10	330°54.1	48.7	$130^{\circ}10.7$	6.1'	25°33.8	2.7'	57.7'
11	345°54.1	49.3	$144^{\circ}35.8$	6.2'	25°36.6	2.6'	57.6'
12	0°54.1	N17°50.0	159°01.0	6.2'	\$25°39.1	2.4'	57.6'
13	15°54.2	50.6	173°26.2	6.2'	25°41.6	2.3'	57.6'
14 15	30°54.2 45°54.2	51.3 •• 51.9	187°51.3 202°16.5	6.2' 6.2'	25° 43.8 25° 45.9	2.1' 1.9'	57.5' 57.5'
16	60°54.2	52.6	216°41.8	6.2	25°47.8	1.8'	57.5'
17	75°54.2	53.2	231°07.0	6.3	25°49.6	1.6'	57.4
18	90°54.3	N17°53.8	245°32.3	6.3'	S25°51.2	1.4'	57.4'
19	105°54.3	54.5	259°57.6	6.3'	25°52.6	1.3'	57.4'
20	120°54.3	55.1	274°22.9	6.4'	25°53.9	1.1'	57.3'
21	135°54.3	• • 55.8	288°48.3	6.4'	25°55.1	1.0'	57.3'
22 23	150° 54.3 165° 54.3	56.4 57.0	303°13.7 317°39.1	6.4' 6.5'	25° 56.0 25° 56.8	0.8' 0.7'	57.3' 57.3'
23	$\frac{103^{\circ} 54.5}{\text{SD} = 15.8'}$	d = 0.6'	317 39.1		D = 15.8'	0.7	
	JD — 13.0	u — 0.0		اد			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N17°57.7	332°04.6	6.5'	\$25°57.5	0.5'	57.2'
1 2	195°54.4 210°54.4	58.3 58.9	346°30.0 0°55.6	6.5' 6.6'	25° 58.0 25° 58.3	0.3' 0.2'	57.2' 57.2'
3	210 54.4 225°54.4	58.9 17°59.6	0 55.0 15°21.2	6.6'	25 58.5 25°58.5	0.2	57.2 57.1'
4	240°54.4	18°00.2	29°46.8	6.7'	25°58.5	-0.1	57.1
5	255° 54.4	00.9	44° 12.4	6.7'	25°58.4	-0.3	57.1'
6	270° 54.4	$N18^{\circ}01.5$	58°38.1	6.8'	\$25°58.1	-0.4'	57.0'
7	285°54.5	02.1	73°03.9	6.8'	25°57.7	-0.6'	57.0'
8	300°54.5	02.8	87°29.7	6.8'	25°57.1	-0.7'	57.0'
9	315°54.5 330°54.5	· · 03.4 04.0	101°55.5 116°21.4	6.9' 7.0'	25° 56.4 25° 55.5	-0.9' -1.1'	56.9' 56.9'
10 11	330 54.5 345°54.5	04.0 04.7	116 21.4 130°47.4	7.0° 7.0°	25 55.5 25°54.4	-1.1 -1.2'	56.9'
12	0°54.5	N18°05.3	145° 13.4	7.1'	\$25°53.2	-1.4	56.8
13	15° 54.5	05.9	159°39.5	7.1'	25°51.9	-1.5'	56.8'
14	30°54.6	06.5	$174^{\circ}05.6$	7.2'	$25^{\circ}50.3$	-1.7'	56.8'
15	45°54.6	• • 07.2	188°31.8	7.2'	25°48.7	-1.8'	56.8'
16	60°54.6	07.8	202°58.0	7.3'	25°46.9	-1.9'	56.7'
17 18	75°54.6 90°54.6	08.4 N18°09.1	217°24.3 231°50.7	7.4' 7.4'	25°45.0 \$25°42.9	-2.1' -2.2'	56.7' 56.7'
18 19	90°54.6 105°54.6	N18 09.1 09.7	231°50.7 246°17.1	7.4° 7.5'	25°40.6	-2.2' -2.4'	56.6'
20	120°54.6	10.3	260°43.6	7.6'	25°38.2	-2.4 -2.5'	56.6
21	135°54.6	. 10.9	275° 10.2	7.6'	25°35.7	-2.7'	56.6'
22	150°54.6	11.6	289°36.8	7.7'	25°33.0	-2.8'	56.5'
23	165°54.7	12.2	304°03.5	7.8'	25°30.2	-3.0'	56.5'
	SD = 15.8'	d = 0.6'		SI	O = 15.6'		
			-				

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

Lat.		Moonris	e		Moonse	t
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 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
N 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
S 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
S 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
S 60°	15:13	15:48	16:45	09:38	11:04	12:06

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-94%	
09	03:33	03:34	11:56	00:01	12:29		
10	03:36	03:37	11:56	00:58	13:27		
11	03:37	03:38	11.56	01.56	14.25		

0 291775 1317549 1977232 197901 N1*397 0**110 800**125 197906 N1*3786 37.73 297.31 297.31 297.00 1 207.00 207.00 1 207.0	h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1 245 200 165 EPA 2 200 200 200 200 200 200 200 200 200	Fri	GHA	GHA				GHA		GHA	Dec		SHA	Dec
1	0	230°17.5	151°54.9	N27°23.2	$192^{\circ}06.1$	$N14^{\circ}39.7$	61°12.0	N06°12.5	$198^{\circ}06.6$	N10°37.8	Alphoratz	357°32 1	200147
2	1	245°20.0		23.0		40.3	$76^{\circ}14.5$	12.5	213°08.8	37.9			
1													
													-17°49.8
2													-57°05.4
8 3 30°47.3 22°13.5 21.0 3.0 30°10.1 11.4 40 318°13.6 30°10.1 32°10.0 30°10.1 30°10.0 30°10.1													23°35.7
8 89 99'93' 2 22'915 2 24 312'11.4 44.5 187'31.8 12.5 318'23.9 38.6 Melle 32.4'92.5 47.0 197'32.9 32'90' 27'18.1 32'12.1 45.1 32'12.5 45.1 12.5 318'23.9 38.6 Melle 32.4'92.5 47.0 197'32.1 197'													89°22.9
9 9 9 9 97 907 1811 1 21.1 32712.0 45.1 1967 84.3 12.5 3337 65.1 38.7 4 16.0 327 18.2 19.0 347 12.5 3337 65.1 38.7 4 18.0 37 1													-40°11.4
101 2074-22 302°207 20.0 32°127 46.7 211°1968 12.5 348°20.3 3868 36.0 307°10.0 307°11.0 307°10.0 307°1					312-11.4						Menkar	$314^{\circ}03.6$	4°12.0
11. 35°447 317°133 20.6 367°134 4134 229°130 12.5 37°304 38.0 38.0 38.0 38.0 38.0 38.0 38.0 38.0											Mirfak		49°57.6
12													16°33.9
131 66 540.6 347728.5 20.2 2714.7 4.75 286 44.2 12.5 33°44.8 30.1 4.600.0 20.1 1.1 80°52.0 1.2 31.2 19.9 42°15.3 48.1 2714.6 12.5 48°37.0 30.2 Elama 1.2 11.2 15°59.4 1733.8 11.97 9716.0 46.7 286°40.1 12.5 62°39.1 30.2 Elama 1.2 11.2 15°59.4 11.2 12.5 11.2											_		-8°10.3
14													46°01.5
15 65°45 1 17°38 1 197 5°16 0 487 286°49 1 125 63°39 1 933 4 100 110°57 3 27°36 4 10 4 72°16 6 403 30°16 125 67°41 7 125°94 47°31 192 8°17'3 490 310°54 1 125 93°35 935 5 28°14 1 18°40 11 125 93°45 935 955 28°14 1 18°40 11 125 93°45 935 955 28°14 1 18°40 11 125°95 1 124 18°50	14										1		
19 1975/94 47981 192 67917 849 311564 1025 679173 949 311564 1025 67	15												
10	16	110°57.0	32°36.4	19.4	72°16.6	49.3	301°51.6	12.5	78°41.3	39.4			
15	17	125°59.4	47°39.1	19.2	87°17.3	49.9	316°54.1	12.5	93°43.5	39.5	_		
10	18	141°01.9	62°41.7	N27°18.9	102°17.9	N14°50.5	331°56.6	N06°12.4	108°45.6	N10°39.6			
Proc. Proc	19			18.7		51.1		12.4		39.7			
22 201118 107903 107490 -18.1 47199 23 1700 -12.4 10894 3 40.9 40.9 40.9 40.9 40.9 40.9 40.9 40.9	20			18.4									
Mar.	21												27°57.4
Sample 1.00	22										1		-59°36.4
Mer. pass. 08:37	23	216°14.2	137°55.0	17.6	177°21.2	53.5	47°08.9	12.4	183°56.5	40.1			-43°33.2
Sate GHA	Mer.n	pass. 08:37	ν2.6′ d-0	.2′ m-4.63	ν 0.7′ d0	.6′ m1.27	$\nu 2.5' d-0$.0′ m-2.20	$\nu 2.2' \ d0$.1' m0.50			-69°50.4
Second Color													-8°47.1
0 231°16.7 152°76.8 N27°77.4 1992°21.9 N14°54.1 62°11.4 N06°12.4 198°88.6 N10°40.2 N10°40.2 182°20.0 14°20.2 182°20.2 188°00.3 16.1 240°22.5 15.3 171.4 20°22.5 14°77.7 171°40.8 182°25.0 16°20.2 182°20.	٠.	6114	6114	_	6114	_	6114	-	G.1.4	_	Regulus	207°31.5	11°49.6
12 26°192, 166°00,3 17.1 207°225, 54.7 77°130, 12.4 214°00,8 40.3											Dubhe	193°37.6	61°36.0
2 2 261°21.6 183°03.0 16.9 222°33.2 55.3 92°16.4 12.4 229°03.0 40.4 Across 172°56.6 321°30.8 167°32.3 5.5 100°18.8 12.4 24°05.1 .0.6 227°33.8 .0.6 12.4 299°07.3 40.6 Across 172°56.5 16°52.3 10°28.2 11.4 198°05.7 16.6 227°33.8 1.6 1.2 12°13.8 12.4 259°07.3 40.6 Across 172°56.5 16°50.2 12°30.8 1.6 1.2 12°13.8 12.4 27°09.5 40.6 Across 172°56.5 15.5 12°22°13.8 12.4 259°07.3 40.6 Across 172°56.5 16°50.2 12°30.8 12.4 289°11.7 N10°40.8 Across 172°51.5 137°23.8 12.4 27°09.5 40.6 Spiral 182°19.1 11°18.6 Spiral 182°19.5 11°18.8 12.4 12°0.0 12°18.8 12.4 12°0.0 12°18.8 12.4 12°0.0 10°18.8 12°2.1 11°18.8 12°2.6 Spiral 182°19.1 11°18.8 12°19.1 11°19.1 11°18.8 12°19.1 11°19.1											Denebola	182°22.0	14°24.7
3 276°241 5 198°05.7 · 1.66 237°23.8 · 5.59 107°18.8 · 12.4 244°05.1 · 40.5											Gienah		-17°42.2
91 921 926 5 213 98.3 16.3 252 92.4 5 56.5 122 91.3 12.4 259 97.3 40.6 Surgaria											Acrux		-63°15.7
5 306°290 22°11.0 16.1 26°25.1 57.1 13°23.8 12.4 274°05.4 407 6 321°315. 243°137, N27°15.8 26°225.8 N14°27, 152°06.3 No6°12.4 299°11.7 N10°40.8 7 336°339 28916.4 15.5 29°26.4 58.3 16°08.7 12.4 304°13.8 40.9 9 6 6°38.9 28816.8 1.55 29°26.4 58.3 16°28.7 12.4 304°13.8 40.9 9 6 6°38.9 28818.8 1.55 327°27.7 14°59.4 197°33.7 12.4 334°18.2 41.1 10 21°41.3 303°24.6 14.7 342°28.4 15°00.0 212°36.1 12.4 334°18.2 41.1 11 36°43.8 318°27.3 14.4 35°29.0 0.0 6 22°36.6 12.4 34°25.2 41.3 11 36°43.8 318°27.3 14.4 35°29.0 0.0 6 22°36.6 12.4 34°25.5 41.3 12 51°46.3 333°30. N27°14.2 12°29.7 N15°1.2 242°41.1 No6°12.3 14°25.4 41.3 13 66°48.7 348°32.7 13.9 27°30.3 01.8 25°743.5 12.3 34°26.8 41.5 14 81°51.2 3°35.5 13.6 42°31.0 02.4 272°46.0 12.3 49°29.0 41.6 15 111°56.1 33°40.9 13.1 72°23.9 00.6 302°51.0 12.3 79°33.3 41.8 15 96°53.7 1838.2 13.3 5°731.6 .0 30.0 287°49.5 12.3 44°25.4 41.7 16 111°56.1 33°40.9 13.1 72°23.9 00.6 302°51.0 12.3 79°33.3 41.8 16 111°56.1 33°40.9 13.1 72°23.9 00.6 302°51.0 12.3 94°35.5 41.9 17 126°88.6 487.7 12.8 87°32.9 0.42 317°53.4 12.3 94°35.5 41.9 18 147°01.0 63°46.4 N27°12.5 10°23.6 N15°4.8 332°55.9 No6°12.3 139°42.0 42.2 18 18°08.4 108°54.7 11.7 147°35.6 .066 18°03.3 12.3 136°44.2 42.3 19 157°03.5 78°49.2 12.2 11°34.3 05.4 34°58.4 12.3 124°39.9 42.1 19 157°03.5 78°49.2 12.2 11°34.3 05.4 34°58.4 12.3 124°39.9 42.1 20 172°60.0 99°51.0 11.9 132°35.5 N15°08.3 63°0.0 81.2 3 139°42.0 42.2 Kasa Aust. 30°55.7 12°32 21 187°08.4 100°0.0 32°45.4 11.1 177°36.9 0.7 7 48°08.2 12.3 184°45.5 42.5 Numi 72°26.6 33°35.1 110°0.0 123°57.5 11.4 162°36.2 00°7.2 33°05.8 12.3 169°46.4 42.4 23 22°21.8 154°03.0 N27°10.8 10.7 15°08.3 15°08.2 12.3 184°45.5 42.5 Numi 72°26.6 34°3.3 12.3 184°45.5 42.5 Numi 72°26.6 43°3.4 Numi 72°26.6 43°3.8 115°0.0 12.3 180°46.4 42.4 Numi 72°26.6 43°4.9 Numi 72°26.0 12.3 180°46.4 42.4 Numi 72°26.6 43°4.9 Numi 72°29.3 11.1 11.7 11.7 11.7 11.7 11.7 11.1 1													-57°16.6
6 321° 315													55°48.4
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5 307°28.2 229°17.0 09.3 267°40.8 11.3 138°23.0 12.2 275°01.6 43.1 Venus 281°37.3 13:5 6 322°30.6 244°19.8 N27°09.0 282°41.4 N15°11.9 153°25.5 N06°12.2 290°03.7 N10°43.2 Jupiter 190°54.4 19:5 335°33.1 259°22.6 08.7 297°42.1 12.5 168°28.0 12.2 305°05.9 43.3 Jupiter 190°54.4 19:5 327°49.0 10:9 7°38.0 289°28.2 · 08.1 327°43.4 · 13.6 198°32.9 · 12.2 320°08.1 43.4 Saturn 327°49.0 10:9 7°38.0 289°28.2 · 08.1 327°43.4 · 13.6 198°32.9 · 12.2 335°10.2 · 43.5 10 22°40.5 304°31.1 07.8 342°44.0 14.2 213°35.3 12.1 350°12.4 43.6 11 37°42.9 319°33.9 07.5 357°44.7 14.8 228°37.8 12.1 5°14.6 43.7 Venus 281°40.9 13:4 13.6 67°47.9 349°39.6 06.9 27°46.0 16.0 258°42.7 12.1 35°18.9 43.9 14 82°50.3 4°42.4 06.6 42°46.6 16.6 273°45.2 12.1 50°21.1 44.0 15 97°52.8 19°45.2 · 06.3 57°47.3 · 17.2 288°47.7 · 12.1 65°23.3 · 44.1 16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 17 127°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 Mars 320°21.7 11:1 15°31.9 44.5 112°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 Mars 320°21.7 11:1 110°29.8 N10°44.4 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 110°24.9 10:2 110°24.2 110°24.1 110°2													
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8 352°35.5 274°25.4 08.4 312°42.7 13.1 183°30.4 12.2 320°08.1 43.4 9 7°38.0 289°28.2 · · · 08.1 327°43.4 · · · 13.6 198°32.9 · · 12.2 335°10.2 · · 43.5 10 22°40.5 304°31.1 07.8 342°44.0 14.2 213°35.3 12.1 350°12.4 43.6 11 37°42.9 319°33.9 07.5 357°44.7 14.8 228°37.8 12.1 5°14.6 43.7 12 52°45.4 334°36.7 N27°07.2 12°45.3 N15°15.4 243°40.3 N06°12.1 20°16.7 N10°43.8 13 67°47.9 349°39.6 06.9 27°46.0 16.0 258°42.7 12.1 35°18.9 43.9 14 82°50.3 4°42.4 06.6 42°46.6 16.6 273°45.2 12.1 50°21.1 44.0 15 97°52.8 19°45.2 · · · 06.3 57°47.3 · · 17.2 288°47.7 · · · 12.1 65°23.3 · · · 44.1 16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 17 127°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 110°29.8 N10°44.4 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 24.7 12.1 125°31.9 44.5 24.7 12.1 188°07.6 110°02.4 · · · 04.4 147°51.2 · · · 20.7 19°02.4 · · · 12.0 155°36.3 · · · 44.7 14.8 128°30.1 126°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 14.8 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 14.9													11:11
9 7°38.0 289°28.2 ·· 08.1 327°43.4 ·· 13.6 198°32.9 ·· 12.2 335°10.2 ·· 43.5 10 22°40.5 304°31.1 07.8 342°44.0 14.2 213°35.3 12.1 350°12.4 43.6 11 37°42.9 319°33.9 07.5 357°44.7 14.8 228°37.8 12.1 5°14.6 43.7 12 52°45.4 334°36.7 N27°07.2 12°45.3 N15°15.4 243°40.3 N06°12.1 20°16.7 N10°43.8 13 67°47.9 349°39.6 06.9 27°46.0 16.0 258°42.7 12.1 35°18.9 43.9 14 82°50.3 4°42.4 06.6 42°46.6 16.6 273°45.2 12.1 50°21.1 44.0 15 97°52.8 19°45.2 ·· 06.3 57°47.3 ·· 17.2 288°47.7 ·· 12.1 65°23.3 ·· 44.1 16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 17 127°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 18 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 10°29.8 N10°44.4 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 12 188°07.6 110°02.4 ·· 04.4 147°51.2 ·· 20.7 19°02.4 ·· 12.0 155°36.3 ·· 44.7 14.8 188°07.6 110°02.4 ·· 04.4 147°51.2 ·· 20.7 19°02.4 ·· 12.0 155°36.3 ·· 44.7 14.8 188°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 18.5 4.6 14.9 18.5 14.0 14.2 12.0 155°36.3 1.4 4.6 14.9 18.5 4.6 14.9 18.5 14.0 14.9 18.5 14.0 14.9 18.5 14.0 14.9 18.5 14.0 14.9 18.5 14.0 14.9 18.5 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0													19:52
10											Saturn	321~49.0	10:46
10											May 13 Sat	SHA	Mer.pass
11													13:46
13 67° 47.9 349° 39.6 06.9 27° 46.0 16.0 258° 42.7 12.1 35° 18.9 43.9 14.1 44.0 15 97° 52.8 19° 45.2 · · · 06.3 57° 47.3 · · 17.2 288° 47.7 · · 12.1 65° 23.3 · · · 44.1 16 112° 55.3 34° 48.1 06.0 72° 47.9 17.8 303° 50.1 12.1 80° 25.4 44.2 17° 57.7 49° 50.9 05.7 87° 48.6 18.3 318° 52.6 12.1 95° 27.6 44.3 18 143° 00.2 64° 53.8 N27° 05.4 102° 49.2 N15° 18.9 333° 55.0 N06° 12.1 110° 29.8 N10° 44.4 19 158° 02.6 79° 56.7 05.1 117° 49.9 19.5 348° 57.5 12.1 125° 31.9 44.5 20 173° 05.1 94° 59.5 04.8 132° 50.5 20.1 4° 00.0 12.0 140° 34.1 44.6 110° 22.4 · · · 04.4 147° 51.2 · · · 20.7 19° 02.4 · · · 12.0 155° 36.3 · · · 44.7 19 19° 54.7 19° 24.9 10.3 12.0 185° 40.6 44.9 185° 40.6 14.9 185° 0.1											Mars	321°05.2	11:10
14 82°50.3 4°42.4 06.6 42°46.6 16.6 273°45.2 12.1 50°21.1 44.0 15 97°52.8 19°45.2 · · · 06.3 57°47.3 · · · 17.2 288°47.7 · · · 12.1 65°23.3 · · · 44.1 16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 17 127°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 18 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 110°29.8 N10°44.4 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 21 188°07.6 110°02.4 · · · 04.4 147°51.2 · · · 20.7 19°02.4 · · · 12.0 155°36.3 · · · 44.7 22 203°10.0 125°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 May 14 Sun Venus 327 42.0 10°24											Jupiter		19:48
15 97°52.8 19°45.2 · · · 06.3 57°47.3 · · · 17.2 288°47.7 · · · 12.1 65°23.3 · · · 44.1 16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 17 127°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 18 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 110°29.8 N10°44.4 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 21 188°07.6 110°02.4 · · 04.4 147°51.2 · · 20.7 19°02.4 · · 12.0 155°36.3 · · · 44.7 22 203°10.0 125°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 May 14 Sun SHA Mer.pa 18.2 13.3 18°25.4 44.2 12.1 10°29.8 N10°44.4 140°29.8 N10°44.4 140°29.8 N10°44.4 120°29.8 N10°44.4 145°29.8 N10°44.4 145°31.9 10.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 14.5 12.0 125°31.9 12.0 125°31											Saturn	327°42.0	10:43
16 112°55.3 34°48.1 06.0 72°47.9 17.8 303°50.1 12.1 80°25.4 44.2 Venus 281°47.2 13:2 17 12°57.7 49°50.9 05.7 87°48.6 18.3 318°52.6 12.1 95°27.6 44.3 Mars 320°21.7 11:0 18 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 110°29.8 N10°44.4 Jupiter 190°54.9 19:2 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 Saturn 327°34.9 10:3 20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 21 188°07.6 110°02.4 · 04.4 147°51.2 · 20.7 19°02.4 · 12.0 155°36.3 · 44.7 22 203°10.0 125°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3											May 14 S	CHV	Mor pass
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18 143°00.2 64°53.8 N27°05.4 102°49.2 N15°18.9 333°55.0 N06°12.1 110°29.8 N10°44.4 Jupiter 19°54.9 19:2 19 158°02.6 79°56.7 05.1 117°49.9 19.5 348°57.5 12.1 125°31.9 44.5 Saturn 327°34.9 10:3 20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 44.6 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.7 44.8 44.9 44.9 44.9 44.9													11:09
19	18												19:44
20 173°05.1 94°59.5 04.8 132°50.5 20.1 4°00.0 12.0 140°34.1 44.6 21 188°07.6 110°02.4 · · 04.4 147°51.2 · · 20.7 19°02.4 · · 12.0 155°36.3 · · 44.7 22 203°10.0 125°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 Horizontal parallax Venus: 0.4	19												10:39
21 188°07.6 110°02.4 · · · 04.4 147°51.2 · · 20.7 19°02.4 · · · 12.0 155°36.3 · · 44.7 Horizontal parallax 22 203°10.0 125°05.3 04.1 162°51.8 21.3 34°04.9 12.0 170°38.4 44.8 Venus: 0.4 23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 Mars: 0.1	20												20.00
23 218°12.5 140°08.2 03.8 177°52.5 21.9 49°07.3 12.0 185°40.6 44.9 Mars: 0.1	21										Horizont	•	
25 210 12.5 110 00.2 00.0 111 02.5 21.5 15 01.5 12.0 10.0 11.5	22			04.1						44.8			
Mer pass 08:30	23	$218^{\circ}12.5$	140°08.2	03.8	177°52.5	21.9	49°07.3	12.0	185°40.6	44.9		Mars:	0.1
	Mern	ass US·3U	v2 8′ d₋∩	3' m-4 57	νη 7' Α η	6' m1 28	v2 5′ d₋∩	0′ m-2 10	1/2 2/ 40	1′ m0 50			

h	Sui	า	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.7	N18°12.8	$318^{\circ}30.3$	7.8'	S25°27.3	-3.1'	56.5'
1	195°54.7	13.5	332°57.1	7.9'	25°24.2	-3.2'	56.4
2	210°54.7 225°54.7	14.1 •• 14.7	347°24.0 1°51.0	8.0' 8.1'	25°20.9 25°17.6	-3.4' -3.5'	56.4' 56.4'
4	240°54.7	15.3	16°18.1	8.1'	25°14.1	-3.6'	56.4
5	255°54.7	15.9	30°45.2	8.2'	25°10.4	-3.8'	56.3'
6	270°54.7	N18°16.6	45°12.4	8.3'	\$25°06.6	-3.9'	56.3'
7 8	285°54.7 300°54.7	17.2 17.8	59°39.7 74°07.1	8.4' 8.4'	25°02.7 24°58.7	-4.0' -4.2'	56.3' 56.2'
9	315°54.8	. 18.4	88°34.5	8.5	24°54.5	-4.2'	56.2
10	330°54.8	19.0	103°02.1	8.6'	24°50.2	-4.4'	56.2'
11	345°54.8	19.7	117°29.7	8.7'	24°45.7	-4.6'	56.1'
12 13	0°54.8 15°54.8	N18°20.3 20.9	131°57.4 146°25.1	8.8' 8.9'	\$24°41.2 24°36.5	-4.7' -4.8'	56.1' 56.1'
14	30°54.8	21.5	160°53.0	8.9'	24°31.6	-4.0 -5.0'	56.1
15	45°54.8	• • 22.1	175°20.9	9.0'	24°26.7	-5.1'	56.0'
16	60°54.8	22.8	189°48.9	9.1'	24°21.6	-5.2'	56.0'
17 18	75°54.8 90°54.8	23.4 N18°24.0	204°17.1 218°45.3	9.2' 9.3'	24°16.4 \$24°11.1	-5.3' -5.4'	56.0' 55.9'
19	105°54.8	24.6	233°13.5	9.4'	24°05.6	-5.4 -5.6'	55.9'
20	120°54.8	25.2	247°41.9	9.5'	24°00.1	-5.7'	55.9'
21	135°54.8	• • 25.8	262°10.4	9.5'	23°54.4	-5.8'	55.9'
22 23	150°54.8 165°54.8	26.4 27.1	276°38.9 291°07.5	9.6' 9.7'	23°48.6 23°42.6	-5.9' -6.0'	55.8' 55.8'
23			291 07.5			-0.0	55.0
	SD = 15.8'	d = 0.6'		SI	O = 15.4'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N18°27.7	305°36.3	9.8'	\$23°36.6	-6.2'	55.8'
1 2	195°54.8 210°54.8	28.3 28.9	320°05.1 334°34.0	9.9' 10.0'	23°30.4 23°24.2	-6.3' -6.4'	55.7' 55.7'
3	210 54.6 225°54.8	29.5	349°02.9	10.0	23°17.8	-6.5'	55.7'
4	240°54.9	30.1	3°32.0	10.2'	23°11.3	-6.6'	55.7'
5	255°54.9	30.7	18°01.2	10.3'	23°04.7	-6.7'	55.6'
6 7	270°54.9 285°54.9	N18°31.3 31.9	32°30.4 46°59.8	10.3' 10.4'	\$22°58.0 22°51.2	-6.8' -6.9'	55.6' 55.6'
8	300°54.9	32.6	61°29.2	10.4	22°44.3	-0.9 -7.0'	55.6'
9	315°54.9	• • 33.2	75°58.7	10.6'	22°37.2	-7.1'	55.5'
10	330°54.9	33.8	90°28.4	10.7'	22°30.1	-7.2'	55.5'
11 12	345°54.9 0°54.9	34.4 N18°35.0	104°58.1 119°27.9	10.8' 10.9'	22°22.8 \$22°15.5	-7.3' -7.4'	55.5' 55.4'
13	15°54.9	35.6	119 27.9 133°57.7	11.0'	22°08.1	-7.4 -7.5	55.4'
14	30°54.9	36.2	148°27.7	11.1'	22°00.5	-7.6'	55.4'
15	45°54.9	• • 36.8	162°57.8	11.2'	21°52.9	-7.7'	55.4'
16 17	60°54.9 75°54.9	37.4 38.0	177°27.9 191°58.2	11.2' 11.3'	21°45.1 21°37.3	-7.8' -7.9'	55.3' 55.3'
18	90°54.9	N18°38.6	206°28.5	11.4'	S21°29.4	-8.0'	55.3'
19	105°54.9	39.2	220°58.9	11.5'	21°21.3	-8.1'	55.3'
20	120°54.9	39.8	235°29.4		21°13.2		55.3'
21 22	135°54.9 150°54.9	· · 40.4 41.0	250°00.0 264°30.7	11.7' 11.8'	21°05.0 20°56.7	-8.3' -8.4'	55.2' 55.2'
23	165°54.9	41.6	279°01.5	11.9'	20°48.3	-8.5'	55.2'
	SD = 15.8'	d = 0.6'			D = 15.2'		
-							
Sun	GHA 180°54.9	Dec N18°42.2	GHA 293°32.4	u 12.0'	Dec \$20°39.8	d -8.6'	HP 55.2'
0 1	180°54.9 195°54.9	N18 42.2 42.8	293°32.4 308°03.3	12.0'	20°31.2	-8.6 -8.7'	55.2 55.1'
2	210°54.9	43.4	322°34.4	12.1'	20°22.6	-8.7'	55.1'
3	225°54.9	• • 44.0	337°05.5	12.2'	20°13.8	-8.8'	55.1'
4 5	240°54.9 255°54.8	44.6 45.2	351°36.7 6°08.0	12.3' 12.4'	20°05.0 19°56.1	-8.9' -9.0'	55.1' 55.0'
6	270°54.8	45.2 N18°45.8	20°39.4	12.5'	\$19°47.1	-9.0 -9.1'	55.0'
7	285°54.8	46.4	35°10.9	12.6'	19°38.0	-9.2'	55.0'
8	300°54.8	47.0	49°42.4	12.6'	19°28.8	-9.2'	55.0'
9 10	315°54.8 330°54.8	· · 47.6 48.2	64°14.1 78°45.8	12.7' 12.8'	19°19.6 19°10.3	-9.3' -9.4'	55.0' 54.9'
11	345°54.8	48.8	93°17.6	12.9'	19°00.9	-9.5'	54.9'
12	0°54.8	N18°49.4	107°49.5	13.0'	S 18°51.4	-9.5'	54.9'
13	15°54.8	50.0	122°21.4	13.1'	18°41.8 18°32.2	-9.6'	54.9'
14 15	30°54.8 45°54.8	50.5 •• 51.1	136°53.5 151°25.6	13.1' 13.2'	18°32.2 18°22.5	-9.7' -9.8'	54.9' 54.8'
16	60°54.8	51.7	165°57.8	13.3'	18°12.8	-9.8'	54.8'
17	75°54.8	52.3	$180^{\circ}30.1$	13.4'	18°02.9	-9.9'	54.8'
18	90°54.8	N18°52.9	195°02.5	13.4'	\$17°53.0	-10.0'	54.8'
19 20	105°54.8 120°54.8	53.5 54.1	209°34.9 224°07.5	13.5' 13.6'	17°43.0 17°33.0	-10.1' -10.1'	54.8' 54.7'
21	135°54.8	• • 54.7	238°40.1	13.7'	17° 33.0	-10.1	54.7'
22	150°54.8	55.3	253°12.8	13.8'	17°12.7	-10.3'	54.7'
23	165°54.7	55.8	267°45.5	13.8'	17°02.4	-10.3'	54.7'
	SD = 15.8'	d = 0.6'		SI	O = 15.0'		

	ı			,		
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut
N 72°	Italia					
N 70°	1///	////	00:59	23:04	////	////
68°	////	////	01:55	22:02	////	////
66°	7777	7777	02:28	21:28	7777	7///
64°	7777	01:19	02:52	21:03	22:40	7///
62°	////	01:58	03:11	20:44	21:59	////
60°	////	02:24	03:26	20:28	21:31	////
N 58°	01:10	02:44	03:39	20:15	21:10	22:4
56°	01:46	03:01	03:50	20:04	20:53	22:1
54°	02:11	03:15	04:00	19:54	20:39	21:4
52°	02:30	03:27	04:09	19:45	20:27	21:2
50°	02:46	03:37	04:16	19:37	20:17	21:0
45°	03:16	03:59	04:33	19:21	19:55	20:3
N 40°	03:38	04:16	04:46	19:07	19:38	20:1
35°	03:56	04:30	04:58	18:55	19:23	19:5
30°	04:10	04:42	05:08	18:45	19:12	19:4
20° N 10°	04:33	05:01	05:25	18:28	18:52	19:2
0°	04:51 05:06	05:17 05:31	05:39 05:53	18:14 18:00	18:36 18:22	19:0 18:4
S 10°						
20°	05:19 05:31	05:44 05:57	06:06 06:21	17:46 17:32	18:08 17:55	18:3 18:2
30°	05:43	06:12	06:37	17:32	17:41	18:1
35°	05:49	06:19	06:46	17:06	17:33	18:0
40°	05:55	06:28	06:57	16:55	17:24	17:5
45°	06:02	06:38	07:09	16:43	17:15	17:5
S 50°	06:10	06:49	07:25	16:28	17:03	17:4
52°	06:13	06:54	07:32	16:20	16:58	17:3
54°	06:17	07:00	07:40	16:12	16:52	17:3
56°	06:20	07:06	07:48	16:04	16:46	17:3
58°	06:25	07:13	07:58	15:54	16:39	17:2
S 60°	06:29	07:21	08:10	15:42	16:31	17:2
Lat.		Moonris			Moonset	
N 72°	Fri	Sat	Sun	Fri	Sat	Sun
14 / 2				_		
N 70°						
N 70° 68°			02:58			
68°			02:58			06:2
		02:50 01:54				06:2 07:0
68° 66° 64° 62°		02:50	02:58 02:18		04:50	06:2 07:0 07:3
68° 66° 64° 62° 60°	02:01	02:50 01:54	02:58 02:18 01:50	03:49	04:50 05:45	06:2 07:0 07:3 07:5
68° 66° 64° 62° 60° N 58°	02:01 01:04	02:50 01:54 01:21 00:57 00:37	02:58 02:18 01:50 01:28 01:11 00:56	03:49 04:45 05:18 05:42	04:50 05:45 06:18 06:42 07:01	06:2 07:0 07:3 07:5 08:1
68° 66° 64° 62° 60° N 58° 56°	02:01 01:04 00:31 00:06	02:50 01:54 01:21 00:57 00:37 00:21	02:58 02:18 01:50 01:28 01:11 00:56 00:43	03:49 04:45 05:18 05:42 06:02	04:50 05:45 06:18 06:42 07:01 07:17	06:2 07:0 07:3 07:5 08:1 08:2 08:3
68° 66° 64° 62° 60° N 58° 56° 54°	02:01 01:04 00:31 00:06	02:50 01:54 01:21 00:57 00:37	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32	03:49 04:45 05:18 05:42 06:02 06:18	04:50 05:45 06:18 06:42 07:01 07:17 07:31	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4
68° 66° 64° 62° 60° N 58° 56° 54° 52°	02:01 01:04 00:31 00:06 	02:50 01:54 01:21 00:57 00:37 00:21 00:07	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22	03:49 04:45 05:18 05:42 06:02 06:18 06:32	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50°	02:01 01:04 00:31 00:06 23:54 23:44	02:50 01:54 01:21 00:57 00:37 00:21 00:07	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45°	02:01 01:04 00:31 00:06 23:54 23:44 23:21	02:50 01:54 01:21 00:57 00:37 00:21 00:07 	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40° 35°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 23:16	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01	04:50 05:45 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:00	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2 09:3
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34 22:34	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 23:16 22:56	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 23:51 23:36	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01 08:25	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:00 09:21	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2 09:3 09:4 09:5 10:1
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 23:16	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01	04:50 05:45 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:00	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2 09:3 09:4 09:5 10:1 10:3
68° 66° 64° 62° 60° N 58° 56° 54° 52° 45° N 40° 35° 30° 20° N 10°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34 22:11 21:51 21:33	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 23:16 22:56 22:39 22:23	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 23:51 23:36 23:22 23:10	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01 08:25 08:46 09:05	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:00 09:21 09:40 09:58	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 09:5 09:2 09:3 09:4 09:5 10:1 10:3
68° 66° 64° 62° 80° 550° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34 22:11 21:51	02:50 01:54 01:21 00:57 00:37 00:07 23:55 23:40 23:27 23:16 22:56 22:39	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 23:51 23:36 23:22	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01 08:25 08:46	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:00	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2 09:3 09:4 10:3 10:4
68° 66° 64° 62° 50° 54° 52° 50° 8 40° 35° 30° 20° 8 10° 0° 5 10° 20° 30°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:34 22:11 21:51 21:33 21:14	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 22:56 22:39 22:23 22:07	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 23:51 23:36 23:22 23:10 22:57	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01 08:25 08:46 09:05	04:50 05:45 06:18 06:42 07:01 07:31 07:43 07:53 08:15 08:32 08:47 09:00 09:21 09:40 09:58	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 08:5 09:0 09:2 09:3 10:1 10:3 10:4 11:0 11:1 11:3
68° 66° 64° 62° 60° N 58° 54° 52° 45° N 40° 35° 30° 20° N 10° 5 10° 20°	02:01 01:04 00:31 00:06 23:54 23:44 23:21 23:03 22:47 22:31 21:51 21:33 21:14 20:54	02:50 01:54 01:21 00:57 00:37 00:21 00:07 23:55 23:40 23:27 23:16 22:56 22:39 22:23 22:07 21:50	02:58 02:18 01:50 01:28 01:11 00:56 00:43 00:32 00:22 00:14 23:51 23:36 23:22 23:10 22:57 22:43	03:49 04:45 05:18 05:42 06:02 06:18 06:32 06:44 07:10 07:30 07:46 08:01 08:25 08:46 09:05	04:50 05:45 06:18 06:42 07:01 07:17 07:31 07:43 07:53 08:15 08:32 08:47 09:21 09:40 09:58 10:15 10:33	06:2 07:0 07:3 07:5 08:1 08:2 08:3 08:4 09:5 10:1 10:3 10:4 11:0

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

21:40

21:33

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11:35

11:48

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S 50° 52°

54°

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19:09

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18:41

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19:45

12:24 12:32 12:41

12:50

13:01

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

h	Aries	`	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Man -	GHA	CHA	Doo	CHA	Dec	CHA	Dec	GHA	Doo		SHA	Dee
Mon		GHA	Dec	GHA		GHA			Dec		SHA	Dec
0	233°15.0	155°11.1	N27°03.5	192°53.1	N15°22.4	64°09.8	N06° 12.0	200°42.8	N10°45.0	Alpheratz	357°32.1	29°14.7
1	248°17.4	170°14.0	03.2	207°53.8	23.0	79°12.3	12.0	215°45.0	45.1	Ankaa	353°04.8	-42°08.9
2	263°19.9	185°16.9	02.8	222°54.4	23.6	94°14.7	12.0	230°47.1	45.2	Schedar	349°28.2	56°41.4
3	278°22.4	$200^{\circ}19.8$	• • 02.5	237°55.1	• • 24.2	109°17.2	• • 12.0	245°49.3	• • 45.3	Diphda	348°44.8	-17°49.8
4	293°24.8	215°22.7	02.2	252°55.7	24.8	$124^{\circ}19.6$	12.0	260°51.5	45.4	Achernar	335°18.8	-57°05.4
5	308°27.3	230°25.6	01.9	267°56.4	25.4	$139^{\circ}22.1$	11.9	275°53.6	45.5		327°48.4	23°35.7
6	323°29.8	245°28.5	N27°01.5	282°57.0	N15°25.9	154°24.6	N06°11.9	290°55.8	N10°45.6	Hamal		23 33.7 89°22.9
7	338°32.2	260°31.4	01.2	297°57.7	26.5	169°27.0	11.9	305°58.0	45.7	Polaris	313°03.0	
8	353°34.7	275°34.3	00.9	312°58.3	27.1	184°29.5	11.9	321°00.2	45.8	Acamar	315°10.2	-40°11.4
9	8°37.1	290°37.3	• • 00.6	327°59.0	• • 27.7	199°31.9	• • 11.9	336°02.3	• • 45.9	Menkar	314°03.6	4°12.0
10	23°39.6	305°40.2	27°00.2	342°59.6	28.3	214°34.4	11.9	351°04.5	46.0	Mirfak	308°24.8	49°57.6
11	38°42.1	320°43.1	26°59.9	358°00.3	28.9	229°36.8	11.9	6°06.7	46.1	Aldebaran	290°36.8	16°33.9
12	53°44.5	335°46.1	N26°59.6	13°00.9	N15°29.4	244°39.3	N06°11.9	21°08.8	N10°46.2	Rigel	281°01.6	-8°10.3
13	68°47.0	350°49.0	59.2	28°01.6	30.0	259°41.8	11.8	36°11.0	46.3	Capella	280°18.3	$46^{\circ}01.5$
14	83°49.5	5°52.0	58.9	43°02.2	30.6	274°44.2		51°13.2		Bellatrix	278°20.3	6°22.4
	98°51.9	20°54.9		58°02.8		274 44.2 289°46.7	11.8		46.4	Elnath	277°58.8	28°37.8
15			• • 58.5		• • 31.2		• • 11.8	66°15.4	• • 46.5	Alnilam	275°35.3	$-1^{\circ}11.2$
16	113°54.4	35°57.9	58.2	73°03.5	31.8	304°49.1	11.8	81°17.5	46.6	Betelgeuse	270°49.4	$7^{\circ}24.6$
17	128°56.9	51°00.9	57.9	88°04.1	32.3	319°51.6	11.8	96°19.7	46.7	Canopus	263°51.6	-52°42.9
18	143°59.3	66°03.8	N26°57.5	103°04.8	N15°32.9	334°54.0	N06°11.8	111°21.9	N10°46.8	Sirius	258°24.1	-16°45.5
19	159°01.8	81°06.8	57.2	118°05.4	33.5	349°56.5	11.8	126°24.0	46.9	Adhara	255°04.0	-29°00.9
20	174°04.3	96°09.8	56.8	133°06.1	34.1	4°58.9	11.7	141°26.2	47.0		244°48.2	5°09.0
21	189°06.7	111°12.8	• • 56.5	148°06.7	• • 34.7	20°01.4	• • 11.7	156°28.4	• • 47.1	Procyon		5 09.0 27°57.4
22	204°09.2	126°15.8	56.1	163°07.4	35.2	35°03.8	11.7	171°30.6	47.2	Pollux	243°14.2	
23	219°11.6	141°18.8	55.8	178°08.0	35.8	50°06.3	11.7	186°32.7	47.3	Avior	234°13.8	-59°36.4
										Suhail	222°44.3	-43°33.2
Mer.p	ass. 08:26	ν 2.9′ d-0	.3′ m-4.54	u0.6′ d 0	.6′ m1.28	$\nu 2.5' \ d-0$.0′ m-2.18	ν 2.2′ d0	1' m 0.50	Miaplacidus	221°37.7	-69°50.4
										Alphard	217°45.1	-8°47.1
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	$207^{\circ}31.5$	11°49.6
									N10° 47.4	Dubhe	193°37.6	61°36.0
0	234°14.1	156°21.7	N26°55.4	193°08.7	N15°36.4	65°08.8	N06°11.7	201°34.9		Denebola	182°22.0	14°24.7
1	249°16.6	171°24.8	55.1	208°09.3	37.0	80°11.2	11.7	216°37.1	47.5	Gienah	175°40.5	-17°42.2
2	264°19.0	186°27.8	54.7	223°10.0	37.5	95°13.7	11.7	231°39.2	47.6	Acrux	172°56.4	-63°15.7
3	279°21.5	201°30.8	• • 54.4	238°10.6	• • 38.1	110°16.1	• • 11.6	246°41.4	• • 47.7		171°48.1	-57°16.7
4	294°24.0	216°33.8	54.0	253°11.3	38.7	$125^{\circ}18.6$	11.6	261°43.6	47.8	Alioth	166°10.3	55°48.4
5	309°26.4	231°36.8	53.7	268°11.9	39.3	$140^{\circ}21.0$	11.6	276°45.8	47.9	Spica	158° 19.1	-11°18.7
6	324°28.9	246°39.8	N26°53.3	283°12.6	N15°39.8	155°23.5	N06°11.6	291°47.9	N10°48.0	Alkaid	152° 49.5	49°10.3
7	339°31.4	261°42.9	53.0	298°13.2	40.4	170°25.9	11.6	$306^{\circ}50.1$	48.1	Hadar	148° 31.4	-60°30.8
8	354°33.8	276°45.9	52.6	313°13.9	41.0	185°28.4	11.6	321°52.3	48.2			
9	9°36.3	291°48.9	• • 52.2	328°14.5	• • 41.6	200°30.8	• • 11.5	336°54.4	• • 48.3		147°54.0	-36°30.8
10	24°38.7	306°52.0	51.9	343°15.1	42.2	215°33.3	11.5	351°56.6	48.4	Arcturus	145°45.1	19°02.0
11	39°41.2	321°55.0	51.5	358°15.8	42.7	230°35.7	11.5	6°58.8	48.5	Rigil Kent.	139°35.8	-60°57.3
12	54°43.7	336°58.1	N26°51.1	13°16.4	N15°43.3	245°38.2	N06°11.5	22°01.0	N10°48.6	Kochab	137° 18.9	74°02.3
13	69°46.1	352°01.1	50.8	28°17.1	43.9	260°40.6		37°03.1		Zuben'ubi	136°52.6	-16°09.7
							11.5		48.7	Alphecca	$126^{\circ}01.1$	26°37.1
14	84°48.6	7°04.2	50.4	43°17.7	44.4	275°43.1	11.5	52°05.3	48.8	Antares	$112^{\circ}12.1$	-26°29.7
15	99°51.1	22°07.3	• • 50.0	58°18.4	• • 45.0	290°45.5	• • 11.5	67°07.5	• • 48.9	Atria	107°03.3	-69°04.6
16	114°53.5	37°10.3	49.7	73°19.0	45.6	305°48.0	11.4	82°09.6	49.0	Sabik	101°59.3	-15°45.6
17	129°56.0	52°13.4	49.3	88°19.7	46.2	320°50.4	11.4	97°11.8	49.1	Shaula	96°06.3	-37°07.3
18	144°58.5	67°16.5	N26°48.9	103°20.3	N15°46.7	335°52.9	N06°11.4	112°14.0	N10°49.2	Rasalhague	95°55.7	12°32.3
19	160°00.9	$82^{\circ}19.6$	48.5	118°21.0	47.3	350°55.3	11.4	$127^{\circ}16.2$	49.3	Eltanin	90°40.5	51°28.9
20	175°03.4	97°22.6	48.2	133°21.6	47.9	5°57.7	11.4	142°18.3	49.4	Kaus Aust.	83°28.6	-34°22.1
21	190°05.9	112°25.7	• • 47.8	148°22.3	• • 48.5	21°00.2	• • 11.3	157°20.5	• • 49.5	Vega	80°31.1	38°48.5
22	205°08.3	127°28.8	47.4	163°22.9	49.0	36°02.6	11.3	172°22.7	49.6		75°44.1	-26°15.5
23	220°10.8	142°31.9	47.0	178°23.5	49.6	51°05.1	11.3	187°24.9	49.7	Nunki		
										Altair	61°57.1	8°56.6
Mer.p	ass. 08:22	ν 3.0′ d-0	.4′ m-4.50	u0.6′ d 0	.6′ m1.29	$\nu 2.5' \ d-0$.0′ m-2.17	ν 2.2′ d0	1' m 0.50	Peacock	53°01.3	-56°38.3
										Deneb	49°23.8	45°22.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.1	10°00.3
	235°13.2	157°35.0	N26°46.6			66°07.5	N06° 11.3	202°27.0	N10° 49.8	Al Na'ir	27°29.6	-46°49.1
0				193°24.2						Fomalhaut	15°11.7	-29°28.1
1	250°15.7	172°38.2	46.3	208°24.8	50.7	81°10.0	11.3	217°29.2	49.9	Scheat	13°42.6	28°14.1
2	265°18.2	187°41.3	45.9	223°25.5	51.3	96°12.4	11.3	232°31.4	50.0	Markab	13°27.3	15°21.4
3	280°20.6	202°44.4	• • 45.5	238°26.1	• • 51.9	111°14.9	• • 11.2	247°33.5	• • 50.1	NA 15 NA	CIIA	NA
4	295°23.1	217°47.5	45.1	253°26.8	52.5	126°17.3	11.2	262°35.7	50.2	May 15 Mon	SHA	Mer.pass
5	310°25.6	232°50.6	44.7	268°27.4	53.0	141°19.8	11.2	277°37.9	50.3		281°56.1	13:37
6	325°28.0	247°53.8	N26°44.3	283°28.1	N15°53.6	156°22.2	N06°11.2		N10°50.4	Mars		11:08
7	340°30.5	262°56.9	43.9	298°28.7	54.2	171°24.6	11.2	307°42.2	50.5		190°54.8	19:40
8	355°33.0	278°00.0	43.5	313°29.4	54.7	$186^{\circ}27.1$	11.2	322°44.4	50.6	Saturn	327°27.8	10:36
9	10°35.4	293°03.2	• • 43.2	328°30.0	• • 55.3	201°29.5	• • 11.1	337°46.6	• • 50.7	Maii 10 T	CIIA	Ma:: :-
10	25°37.9	308°06.3	42.8	343°30.6	55.9	216°32.0	11.1	352°48.7	50.8	May 16 Tue	SHA	Mer.pass
11	40°40.4	323°09.5	42.4	358°31.3	56.4	231°34.4	11.1	7°50.9	50.9	Venus		13:32
12	55°42.8	338°12.7	N26°42.0	13°31.9	N15°57.0	246°36.9	N06°11.1		N10°51.0		318°54.6	11:07
13	70°45.3	353°15.8	41.6	28°32.6	57.6	261°39.3	11.1	37°55.3	51.1		190°54.6	19:36
14	85°47.7	8°19.0	41.0	43°33.2	58.1	276°41.7	11.1	52°57.4	51.2	Saturn	327°20.8	10:32
										NA-: 17 14/	CIII	NA-
15	100°50.2	23°22.2	• • 40.8	58°33.9	58.7	291°44.2	• • 11.0	67°59.6	• • 51.3	May 17 Wed	SHA	Mer.pass
16	115°52.7	38°25.3	40.4	73°34.5	59.3	306°46.6	11.0	83°01.8	51.4		282°21.8	13:27
17	130°55.1	53°28.5	40.0	88°35.2	15°59.8	321°49.1	11.0	98°04.0	51.5		318°10.9	11:06
18	145°57.6	68°31.7	N26°39.5	103°35.8	N16°00.4	336°51.5	N06°11.0		N10°51.6	Jupiter	190°54.3	19:32
19	161°00.1	83°34.9	39.1	118°36.4	01.0	351°53.9	10.9	128°08.3	51.7	Saturn	$327^{\circ}13.8$	10:29
20	176°02.5	98°38.1	38.7	133°37.1	01.5	6°56.4	10.9	143°10.5	51.8			
21	191°05.0	113°41.3	• • 38.3	148°37.7	• • 02.1	21°58.8	• • 10.9	$158^{\circ}12.7$	• • 51.9	Horizont	al parallax	
22	206°07.5	128°44.5	37.9	163°38.4	02.7	37°01.3	10.9	173°14.8	52.0		Venus:	0.5
23	221°09.9	143°47.7	37.5	178°39.0	03.2	52°03.7	10.9	188°17.0	52.1		Mars:	0.1
										_		
Mer.p	Mer.pass. 08:18 $\nu 3.1' \ d$ -0.4' m-4.46		u0.6′ d 0	.6′ m1.29	ν 2.4′ d-0	.0′ m-2.16	ν 2.2′ d0	1' m 0.50				

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.7	N18°56.4	$282^{\circ}18.3$	13.9'	$516^{\circ}52.1$	-10.4'	54.7'
1	195°54.7	57.0	296°51.2	14.0'	16°41.7	-10.4'	54.7'
2	210°54.7 225°54.7	57.6 •• 58.2	311°24.2 325°57.3	14.0' 14.1'	16°31.3 16°20.8	-10.5' -10.6'	54.6' 54.6'
4	240°54.7	58.8	340°30.4	14.1	16° 20.8	-10.6'	54.6'
5	255°54.7	59.4	355°03.6	14.3'	15°59.6	-10.7	54.6'
6	270°54.7	N18°59.9	9°36.8	14.3'	S 15°48.9	-10.7'	54.6'
7	285°54.7	19°00.5	24°10.2	14.4'	15°38.2	-10.8'	54.6'
8	300°54.7	01.1	38°43.6	14.5'	15°27.3	-10.9'	54.5
9 10	315°54.7 330°54.6	· · 01.7 02.3	53°17.0 67°50.5	14.5' 14.6'	15° 16.5 15° 05.6	-10.9' -11.0'	54.5' 54.5'
11	345°54.6	02.3	82°24.1	14.7'	14°54.6	-11.0'	54.5'
12	0°54.6	N19°03.4	96°57.8	14.7'	S 14°43.6	-11.1'	54.5'
13	15°54.6	04.0	111°31.5	14.8'	14°32.5	-11.1'	54.5'
14	30°54.6	04.6	126°05.3	14.9'	14°21.4	-11.2'	54.5
15 16	45°54.6 60°54.6	· · 05.2 05.7	140°39.2 155°13.1	14.9' 15.0'	14° 10.2 13° 59.0	-11.2' -11.3'	54.5' 54.4'
17	75°54.6	06.3	169°47.1	15.0'	13°47.7	-11.3'	54.4
18	90°54.5	N19°06.9	184°21.1	15.1'	S 13°36.3	-11.4'	54.4'
19	105°54.5	07.5	198°55.2	15.1'	13°25.0	-11.4'	54.4'
20	120°54.5	08.0	213°29.3	15.2'	13° 13.5	-11.5'	54.4'
21	135°54.5 150°54.5	· · 08.6 09.2	228°03.5 242°37.8	15.3'	13°02.1 12°50.5	-11.5' -11.6'	54.4'
22 23	150 54.5 165°54.5	09.2	242 37.8 257°12.1	15.3' 15.4'	12° 39.0	-11.6'	54.4' 54.4'
23						11.0	
	SD = 15.8'	d = 0.6'		51	O = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.5	N19°10.3	271°46.5 286°20.9	15.4'	\$12°27.4 12°15.7	-11.7'	54.3'
1 2	195°54.5 210°54.4	10.9 11.5	286°20.9 300°55.4	15.5' 15.5'	12°15.7 12°04.0	-11.7' -11.7'	54.3' 54.3'
3	210 54.4 225°54.4	. 12.0	315°29.9	15.6'	12 04.0 11°52.3	-11.7	54.3'
4	240°54.4	12.6	330°04.5	15.6'	11°40.5	-11.8'	54.3'
5	255°54.4	13.2	344°39.1	15.7'	11°28.7	-11.9'	54.3'
6	270°54.4	N19°13.8	359°13.8	15.7'	\$11°16.8	-11.9'	54.3'
7	285°54.4 300°54.3	14.3 14.9	13°48.5 28°23.2	15.8' 15.8'	11°04.9 10°53.0	-11.9' -12.0'	54.3' 54.3'
8 9	300 54.3 315°54.3	14.9	28 23.2 42°58.0	15.8 15.9'	10°53.0	-12.0'	54.3'
10	330°54.3	16.0	57°32.9	15.9'	10° 29.0	-12.1'	54.3'
11	345°54.3	16.6	72°07.8	15.9'	10°16.9	-12.1'	54.3'
12	0°54.3	N19°17.2	86°42.7	16.0'	S10°04.8	-12.1'	54.2'
13	15°54.3 30°54.2	17.7 18.3	101°17.7 115°52.7	16.0' 16.1'	09°52.7 09°40.6	-12.2' -12.2'	54.2' 54.2'
14 15	30 54.∠ 45°54.2	18.3	115 52.7 130°27.8	16.1	09°40.6	-12.2'	54.2'
16	60°54.2	19.4	145°02.9	16.1'	09°16.1	-12.3'	54.2'
17	75°54.2	20.0	159°38.0	16.2'	$09^{\circ}03.9$	-12.3'	54.2'
18	90°54.2	N19°20.5	174°13.2	16.2'	S08°51.6	-12.3'	54.2'
19	105°54.2 120°54.1	21.1	188°48.4 203°23.6	16.2'	08° 39.3 08° 26.9	-12.3'	54.2' 54.2'
20 21	120 54.1 135°54.1	21.7	203 23.0 217°58.9	16.3'	08 26.9 08°14.6	-12.4' -12.4'	54.2'
22	150°54.1	22.8	232°34.2	16.3'	08°02.1	-12.4	54.2'
23	165°54.1	23.4	247°09.5	16.4'	$07^{\circ}49.7$	-12.5'	54.2'
	SD = 15.8'	d = 0.6'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	180°54.1	N19°23.9	261°44.9	16.4'	S07°37.2	-12.5'	54.2'
1	195°54.0	24.5	$276^{\circ}20.3$	16.4'	$07^{\circ}24.8$	-12.5'	54.2'
2	210°54.0	25.0	290°55.7	16.4'	07°12.2	-12.5'	54.2'
3	225°54.0	· · 25.6 26.1	305°31.2	16.5'	06° 59.7	-12.6' -12.6'	54.2'
4 5	240°54.0 255°53.9	26.1	320°06.6 334°42.1	16.5' 16.5'	06° 47.1 06° 34.5	-12.6'	54.2' 54.2'
6	270°53.9	N19°27.3	349°17.7	16.5'	S06°21.9	-12.6'	54.2'
7	285°53.9	27.8	3°53.2	16.6'	$06^{\circ}09.3$	-12.7'	54.2'
8	300°53.9	28.4	18°28.8	16.6'	05°56.6	-12.7'	54.2'
9	315°53.9 330°53.8	• • 28.9	33°04.3 47°40.0	16.6'	05°44.0 05°31.3	-12.7' -12.7'	54.2' 54.2'
10 11	330°53.8 345°53.8	29.5 30.0	47°40.0 62°15.6	16.6' 16.6'	05°31.3 05°18.5	-12.7' -12.7'	54.2'
12	0°53.8	N19°30.6	76°51.2	16.7'	S05°05.8	-12.8'	54.2'
13	15°53.8	31.1	$91^{\circ}26.9$	16.7'	$04^{\circ}53.0$	-12.8'	54.2'
14	30°53.7	31.7	106°02.5	16.7'	04°40.3	-12.8'	54.2'
15 16	45°53.7 60°53.7	• • 32.2	120°38.2	16.7'	04°27.5 04°14.6	-12.8'	54.2'
16 17	60°53.7 75°53.7	32.8 33.3	135°13.9 149°49.6	16.7' 16.7'	04°14.6 04°01.8	-12.8' -12.8'	54.2' 54.2'
18	90°53.6	N19°33.9	164°25.4	16.7	S03°49.0	-12.9'	54.2'
19	105°53.6	34.4	$179^{\circ}01.1$	16.7'	03°36.1	-12.9'	54.2'
20	120°53.6	35.0	193°36.8	16.7'	03°23.2	-12.9'	54.2'
21	135°53.6 150°53.5	• • 35.5	208°12.6 222°48.3	16.8'	03° 10.3 02° 57.4	-12.9'	54.2'
22 23	150°53.5 165°53.5	36.1 36.6	222°48.3 237°24.1	16.8' 16.8'	02°57.4 02°44.5	-12.9' -12.9'	54.2' 54.2'
_5	SD = 15.8'	d = 0.6'			O = 14.8'	,	
	JD — 13.0	u = 0.0		31	- 14.0		

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

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
N 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
N 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
N 10°		00:02	00:40	11:20	12:06	12:50
0°	23:53		00:34	11:31	12:13	12:54
S 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
S 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
S 60°	22:18	23:39		13:20	13:24	13:28

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
	00 ^h	12 ^h	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		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	236°12.4	158° 50.9	N26°37.1	193°39.7	N16°03.8	67°06.1	N06°10.8	203°19.2	N10°52.2			
1	251°14.8	173° 54.1	36.7	208°40.3	04.4	82°08.6	10.8	218°21.3	52.3	Alpheratz	$357^{\circ}32.1$	29°14.7
2	266°17.3	173 54.1 188° 57.3	36.2	200° 40.3 223° 40.9	04.4	97°11.0	10.8	233°23.5	52.3	Ankaa	353°04.8	-42°08.9
	200 17.3 281°19.8									Schedar	349°28.2	56°41.4
3		204°00.6	• • 35.8	238°41.6 253°42.2	• • 05.5	112°13.5	• • 10.8	248°25.7	• • 52.5	Diphda	348°44.8	-17°49.8
4	296°22.2	219°03.8	35.4		06.0	127°15.9	10.8	263°27.9	52.6	Achernar	335°18.7	-57°05.4
5	311°24.7	234°07.0	35.0	268°42.9	06.6	142°18.3	10.7	278°30.0	52.7	Hamal	327°48.4	23°35.7
6	326°27.2	249° 10.3	N26°34.6	283°43.5	N16°07.2	157° 20.8	N06°10.7	293°32.2	N10°52.8	Polaris	313°02.7	89°22.9
7	341°29.6	264°13.5	34.1	298°44.2	07.7	172°23.2	10.7	308°34.4	52.8	Acamar	315°10.2	-40°11.4
8	356°32.1	$279^{\circ}16.8$	33.7	313°44.8	08.3	$187^{\circ}25.6$	10.7	323°36.6	52.9	Menkar	314°03.6	4°12.0
9	11°34.6	294° 20.0	• • 33.3	328°45.4	• • 08.9	202°28.1	• • 10.7	338°38.7	• • 53.0	Mirfak	308°24.8	49°57.6
10	26°37.0	309°23.3	32.9	343°46.1	09.4	217°30.5	10.6	353°40.9	53.1			
11	41°39.5	324° 26.5	32.4	358° 46.7	10.0	232°32.9	10.6	8°43.1	53.2	Aldebaran	290°36.8	16°33.9
12	56°42.0	339° 29.8	N26°32.0	13°47.4	N16°10.5	247° 35.4	N06°10.6	23°45.3	N10°53.3	Rigel	281°01.6	-8°10.3
13	71°44.4	354°33.1	31.6	28°48.0	11.1	262°37.8	10.6	38°47.4	53.4	Capella	280°18.3	46°01.5
14	86°46.9	9°36.3	31.1	43°48.7	11.7	277°40.2	10.5	53°49.6	53.5	Bellatrix	278°20.3	6°22.4
15	101°49.3	24°39.6	30.7	58°49.3	12.2	292° 42.7	. 10.5	68°51.8		Elnath	277°58.8	28°37.8
									• • 53.6	Alnilam	275°35.3	-1°11.2
16	116°51.8	39° 42.9	30.3	73°49.9	12.8	307°45.1	10.5	83°54.0	53.7	Betelgeuse	270°49.4	7°24.6
17	131°54.3	54°46.2	29.8	88°50.6	13.3	322°47.6	10.5	98°56.1	53.8	Canopus	263°51.6	-52°42.9
18	146°56.7	69°49.5	N26°29.4	103°51.2	N16°13.9	337°50.0	N06°10.5	113°58.3	N10°53.9	Sirius	258°24.1	-16°45.5
19	161°59.2	84°52.8	29.0	118°51.9	14.5	352°52.4	10.4	129°00.5	54.0			-10 45.5 -29°00.9
20	177°01.7	99°56.1	28.5	133°52.5	15.0	7°54.9	10.4	144°02.7	54.1	Adhara	255°04.0	
21	192°04.1	114°59.4	28.1	148°53.2	• • 15.6	22°57.3	• • 10.4	159°04.8	• • 54.2	Procyon	244°48.2	5°09.0
22	207°06.6	130°02.7	27.6	163°53.8	16.1	37°59.7	10.4	174°07.0	54.3	Pollux	243°14.2	27°57.4
23	207 00.0 222°09.1	145°06.0	27.2	178° 54.4	16.7	53°02.1	10.4	189°09.2	54.4	Avior	234°13.8	-59°36.4
23	222 09.1					JJ UZ.I	10.3			Suhail	222°44.4	-43°33.2
Mer.p	ass. 08:14	ν 3.2′ d-0	.4′ m-4.41	ν 0.6′ d0	.6′ m1.30	ν 2.4′ d-0	.0′ m-2.16	ν 2.2′ d0	.1′ m0.50	Miaplacidus	221°37.8	-69°50.4
										Alphard	217°45.1	-8°47.1
										Regulus	207°31.5	11°49.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.6	61°36.0
0	237°11.5	160°09.3	N26°26.7	193°55.1	$N16^{\circ}17.3$	68°04.6	N06°10.3	204°11.3	N10°54.5		182°22.0	14°24.7
1	252°14.0	175° 12.6	26.3	208°55.7	17.8	83°07.0	10.3	219°13.5	54.6	Denebola		
2	267°16.4	190° 15.9	25.8	223°56.4	18.4	98°09.4	10.3	234°15.7	54.7	Gienah	175°40.6	-17°42.2
3	282°18.9	205° 19.3	. 25.4	238° 57.0	18.9	113° 11.9	. 10.2	249°17.9	• • 54.8	Acrux		-63°15.7
						113 11.9 128°14.3		264°20.0		Gacrux	171°48.1	-57°16.7
4	297°21.4	220°22.6	24.9	253°57.6	19.5		10.2		54.9	Alioth	$166^{\circ}10.3$	55°48.4
5	312°23.8	235°25.9	24.5	268°58.3	20.0	143°16.7	10.2	279°22.2	55.0	Spica	$158^{\circ}19.1$	-11°18.7
6	327°26.3	250°29.3	N26°24.0	283°58.9	N16°20.6	158° 19.2	N06°10.2	294°24.4	N10°55.1	Alkaid	152°49.5	49°10.3
7	342°28.8	265°32.6	23.6	298°59.6	21.1	173°21.6	10.1	309°26.6	55.2	Hadar	148°31.4	-60°30.8
8	357°31.2	280°36.0	23.1	314°00.2	21.7	188°24.0	10.1	324°28.7	55.3		147°54.0	-36°30.8
9	12°33.7	295°39.3	• • 22.7	329°00.8	• • 22.3	203°26.5	• • 10.1	339°30.9	• • 55.4			
10	27°36.2	310°42.7	22.2	344°01.5	22.8	218° 28.9	10.1	354°33.1	55.5	Arcturus	145°45.1	19°02.0
11	42°38.6	325° 46.0	21.7	359°02.1	23.4	233°31.3	10.0	9°35.3	55.6	Rigil Kent.		-60°57.3
12	57°41.1	340°49.4	N26°21.3	14°02.8	N16°23.9	248°33.7	N06°10.0	24°37.4		Kochab	137°18.9	74°02.3
									N10°55.7	Zuben'ubi	$136^{\circ}52.6$	-16°09.7
13	72°43.6	355° 52.8	20.8	29°03.4	24.5	263°36.2	10.0	39°39.6	55.8	Alphecca	$126^{\circ}01.1$	26°37.1
14	87°46.0	10° 56.1	20.3	44°04.0	25.0	278°38.6	10.0	54°41.8	55.9	Antares	112°12.1	-26°29.7
15	102°48.5	$25^{\circ}59.5$	• • 19.9	59°04.7	• • 25.6	293°41.0	• • 09.9	69°44.0	• • 56.0	Atria	107°03.3	-69°04.6
16	$117^{\circ}50.9$	41°02.9	19.4	74°05.3	26.1	308°43.4	09.9	84°46.1	56.1	Sabik	101°59.3	-15°45.6
17	132°53.4	56°06.3	18.9	89°06.0	26.7	323°45.9	09.9	99°48.3	56.2	Shaula	96°06.3	-37°07.3
18	147°55.9	71°09.7	N26°18.5	104°06.6	N16°27.2	338°48.3	N06°09.9	114°50.5	N10°56.3		90°00.3 95°55.7	12°32.3
19	162°58.3	86°13.1	18.0	119°07.2	27.8	353°50.7	09.8	129°52.7	56.4	Rasalhague		
20	178°00.8	101°16.5	17.5	134°07.9	28.3	8°53.2	09.8	144°54.8	56.5	Eltanin	90°40.4	51°29.0
21	193°03.3	116° 19.9	• • 17.0	149°08.5	28.9	23°55.6	09.8	159°57.0	56.5	Kaus Aust.	83°28.6	-34°22.1
22	208°05.7	131°23.3	16.6	164°09.2	29.4	38°58.0	09.8	174°59.2	56.6	Vega	80°31.0	38°48.5
										Nunki	75°44.1	-26°15.5
23	223°08.2	146° 26.7	16.1	179°09.8	30.0	54°00.4	09.7	190°01.4	56.7	Altair	$61^{\circ}57.1$	8°56.6
Mern	pass. 08:10	v3 3' d-0	.4′ m-4.36	ν0 6' d0	.6′ m1.30	v2 4' d₌0	.0′ m-2.15	v2 2' d0	.1′ m0.50	Peacock	53°01.3	-56°38.3
				- V 0.0 ' U 0	.0 1111.50	- Z.1 d 0	.0 111 2.13	- Z.Z GO	.1 1110.00	Deneb	49°23.7	45°22.7
										Enif	33°36.1	10°00.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.6	-46°49.1
0	238°10.7	161°30.1	N26°15.6		N16°30.5	69°02.9	N06°09.7	205°03.6	N10°56.8	Fomalhaut	27 29.0 15°11.6	-40 49.1 -29°28.1
1	253°13.1	176° 33.5	15.1	209°11.1	31.1	84°05.3	09.7	220°05.7	56.9			
2	268°15.6	191°36.9	14.6	224°11.7	31.6	99°07.7	09.7	235°07.9	57.0	Scheat	13°42.6	28°14.1
3	283°18.1	206° 40.4	• • 14.2	239°12.4	32.2	114° 10.1	•• 09.6	250°10.1	57.1	Markab	13°27.3	15°21.4
										May 18 Thu	SHA	Mer.pass
4	298°20.5	221°43.8	13.7	254°13.0	32.7	129°12.6	09.6	265°12.3	57.2	1 -		
5	313°23.0	236° 47.2	13.2	269°13.6	33.3	144°15.0	09.6	280°14.4	57.3		282°38.5	13:22
6	328°25.4	251° 50.7	N26°12.7	284° 14.3	N16°33.8	159° 17.4	N06°09.6	295°16.6	N10°57.4		317°27.3	11:05
7	343°27.9	266° 54.1	12.2	$299^{\circ}14.9$	34.4	174° 19.8	09.5	$310^{\circ}18.8$	57.5		190°53.8	19:28
8	358°30.4	281°57.6	11.7	$314^{\circ}15.6$	34.9	189°22.2	09.5	$325^{\circ}21.0$	57.6	Saturn	$327^{\circ}06.8$	10:25
9	13°32.8	297°01.0	• • 11.2	$329^{\circ}16.2$	• • 35.5	204° 24.7	• • 09.5	340°23.1	• • 57.7		c	
10	28°35.3	312°04.5	10.7	344° 16.8	36.0	219° 27.1	09.4	355°25.3	57.8	May 19 Fri	SHA	Mer.pass
11	43°37.8	327°07.9	10.2	359° 17.5	36.6	234° 29.5	09.4	10°27.5	57.9		282°57.8	13:16
	58°40.2	342°11.4	N26°09.7		N16°37.1	249°31.9	N06°09.4	25°29.7	N10°58.0	Mars	$316^{\circ}43.6$	11:04
12										Jupiter	$190^{\circ}53.1$	19:25
13	73°42.7	357°14.9	09.2	29° 18.8	37.7	264°34.4	09.4	40°31.8	58.1	Saturn	326°59.8	10:22
14	88°45.2	12° 18.3	08.7	44°19.4	38.2	279°36.8	09.3	55°34.0	58.2			
15	103°47.6	27°21.8	• • 08.2	59°20.0	• • 38.8	294° 39.2	• • 09.3	70°36.2	• • 58.3	May 20 Sat	SHA	Mer.pass
16	118°50.1	42°25.3	07.7	74°20.7	39.3	309°41.6	09.3	85°38.4	58.4	Venus	283°19.4	13:11
17	133°52.5	57°28.8	07.2	89°21.3	39.9	324°44.0	09.2	100°40.5	58.5		315°59.8	11:03
18	148°55.0	72°32.3	N26°06.7	104°21.9	N16°40.4	339°46.5	N06°09.2	115°42.7	N10°58.6	1	190°52.2	19:21
19	163°57.5	87° 35.8	06.2	119°22.6	41.0	354°48.9	09.2	130°44.9	58.7	Saturn	326°52.9	10:18
20	178°59.9	102°39.2	05.7	134°23.2	41.5	9°51.3	09.2	145°47.1	58.8	Jatuill	J_U J4.3	10.10
21	170 39.9 194°02.4	102 39.2 117°42.7	05.2	149°23.9	42.0	24°53.7	•• 09.1	160°49.2	• • 58.9	Horizont	al parallax	
	209°04.9	117 42.7 132°46.3	04.7	149 23.9 164°24.5	42.6	39° 56.1	09.1	175°51.4			Venus:	0.5
22									59.0		Mars:	0.5
23	224°07.3	147° 49.8	04.2	179°25.1	43.1	54°58.5	09.1	190°53.6	59.1		ividi S.	0.1
Mern	1255 NR·06	1/3 A/ d.O	5' m-4 31	νη 6/ dη	.6′ m1.31	v2 4' d-∩	.0′ m-2.14	1/2 2/ 40	.1′ m0.50			
- ivier.p	Mer.pass. 08:06 $\nu 3.4' \ d$ -0.5' m-4.31		νο.υ αυ	.0 1111.31	ν Δ.Ψ U-U	111-4.14	ν Δ.Δ UU					

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	180°53.5	$N19^{\circ}37.2$	251°59.9	16.8'	S02°31.6	-12.9'	54.2'
1	195°53.5	37.7	266°35.6	16.8	02°18.6	-13.0'	54.2'
2	210°53.4 225°53.4	38.2 •• 38.8	281°11.4 295°47.2	16.8' 16.8'	02°05.7 01°52.7	-13.0' -13.0'	54.2' 54.2'
4	240°53.4	39.3	310°22.9	16.8'	01°39.7	-13.0'	54.2'
5	255°53.4	39.9	324°58.7	16.8'	$01^{\circ}26.8$	-13.0'	54.2'
6	270°53.3	N19°40.4	339°34.5	16.8'	501°13.8	-13.0'	54.2'
7 8	285°53.3 300°53.3	41.0 41.5	354°10.2 8°46.0	16.8' 16.8'	01°00.8 00°47.8	-13.0' -13.0'	54.2' 54.2'
9	315°53.3	42.0	23°21.8	16.8'	00°34.8	-13.0'	54.3'
10	330°53.2	42.6	37°57.5	16.7'	00°21.7	-13.0'	54.3'
11	345°53.2	43.1	52°33.3	16.7	S00°08.7	-13.0'	54.3'
12 13	0°53.2 15°53.1	N19°43.7 44.2	67°09.0 81°44.7	16.7' 16.7'	N00°04.3 00°17.3	13.0' 13.0'	54.3' 54.3'
14	30°53.1	44.7	96°20.4	16.7	00° 30.4	13.0'	54.3'
15	45°53.1	• • 45.3	$110^{\circ}56.2$	16.7'	00°43.4	13.0'	54.3'
16	60°53.0	45.8	125°31.8	16.7'	00°56.5	13.0'	54.3'
17 18	75°53.0 90°53.0	46.3 N19°46.9	140°07.5 154°43.2	16.7' 16.6'	01°09.5 N01°22.5	13.0' 13.0'	54.3' 54.3'
19	105°53.0	47.4	169°18.8	16.6'	01°35.6	13.0'	54.3'
20	120°52.9	47.9	183°54.5	16.6'	01°48.6	13.0'	54.3'
21	135°52.9	• • 48.5	198°30.1	16.6'	02°01.7	13.0'	54.4'
22	150°52.9 165°52.8	49.0	213°05.7 227°41.3	16.6'	02°14.7 02°27.7	13.0'	54.4'
23		49.5	221 41.3	16.6'		13.0'	54.4'
	SD = 15.8'	d = 0.5'		SI	D = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.8	$N19^{\circ}50.1$	242°16.8	16.5'	N02°40.8	13.0'	54.4'
1	195°52.8	50.6	256°52.3	16.5'	02°53.8	13.0' 13.0'	54.4'
2	210°52.7 225°52.7	51.1 •• 51.7	271°27.8 286°03.3	16.5' 16.5'	03°06.8 03°19.8	13.0′ 13.0′	54.4' 54.4'
4	240°52.7	52.2	300°38.8	16.4	03° 19.8	13.0'	54.4
5	255°52.6	52.7	315°14.2	16.4	03°45.9	13.0'	54.4'
6	270°52.6	$N19^{\circ}53.3$	329°49.6	16.4'	N03°58.9	13.0'	54.5'
7	285°52.6	53.8	344°25.0	16.3	04°11.8	13.0'	54.5'
8 9	300°52.5 315°52.5	54.3 •• 54.8	359°00.4 13°35.7	16.3' 16.3'	04°24.8 04°37.8	13.0' 13.0'	54.5' 54.5'
10	330°52.5	55.4	28°11.0	16.3	04°50.8	13.0'	54.5'
11	345°52.4	55.9	42°46.2	16.2'	05°03.7	12.9'	54.5'
12	0°52.4	N19°56.4	57°21.4	16.2'	N05°16.7	12.9'	54.5'
13 14	15°52.4 30°52.3	56.9 57.5	71°56.6 86°31.8	16.1' 16.1'	05°29.6 05°42.5	12.9' 12.9'	54.5' 54.6'
15	45°52.3	58.0	101°06.9	16.1	05°55.4	12.9'	54.6'
16	60°52.3	58.5	115°41.9	16.0'	06°08.3	12.9'	54.6'
17	75°52.2	59.0	130°17.0	16.0'	06°21.1	12.9'	54.6'
18 19	90°52.2 105°52.1	N19°59.5 20°00.1	144°52.0 159°26.9	16.0' 15.9'	N06°34.0 06°46.8	12.8' 12.8'	54.6' 54.6'
20	105 52.1 120°52.1		159 20.9 174°01.8		06°59.7	12.8'	54.6'
21	135°52.1	01.1	188°36.7	15.8'	07°12.4	12.8'	54.7'
22	150°52.0	01.6	$203^{\circ}11.5$	15.8'	07°25.2	12.8'	54.7'
23	165°52.0	02.1	217°46.3	15.7'	07°38.0	12.7'	54.7'
	SD = 15.8'	d = 0.5'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.0	N20°02.7	232°21.0	15.7'	N07°50.7	12.7'	54.7'
1 2	195°51.9 210°51.9	03.2 03.7	246°55.7 261°30.3	15.6' 15.6'	08°03.4 08°16.1	12.7' 12.7'	54.7' 54.7'
3	210 51.9 225°51.8	04.2	201 30.3 276°04.9	15.5'	08°28.8	12.6'	54.7 54.8'
4	240°51.8	04.7	290°39.5	15.5'	08°41.5	12.6'	54.8'
5	255°51.8	05.2	305°14.0	15.4	08°54.1	12.6'	54.8'
6 7	270°51.7 285°51.7	N20°05.7 06.3	319°48.4 334°22.8	15.4' 15.3'	N09°06.7 09°19.2	12.6' 12.5'	54.8' 54.8'
8	285 51.7 300°51.6	06.8	334 22.8 348°57.1	15.3'	09 19.2 09°31.8	12.5'	54.8'
9	315°51.6	• • 07.3	3°31.4	15.2'	09°44.3	12.5'	54.9'
10	330°51.6	07.8	18°05.6	15.2'	09°56.8	12.5'	54.9'
11	345°51.5 0°51.5	08.3 N20°08.8	32°39.7 47°13.8	15.1'	10°09.2 N10°21.6	12.4'	54.9' 54.9'
12 13	0°51.5 15°51.4	N20 08.8 09.3	47°13.8 61°47.9	15.0' 15.0'	10° 34.0	12.4' 12.4'	54.9' 54.9'
14	30°51.4	09.8	76°21.8	14.9'	10° 46.4	12.3'	55.0'
15	45°51.4	•• 10.3	90°55.7	14.9'	10°58.7	12.3'	55.0'
16	60°51.3	10.8	105°29.6	14.8'	11°11.0	12.3'	55.0'
17 18	75°51.3 90°51.2	11.4 N20°11.9	120°03.4 134°37.1	14.7' 14.7'	11°23.2 N11°35.5	12.2' 12.2'	55.0' 55.0'
19	105°51.2	12.4	149°10.8	14.6	11° 47.6	12.1	55.1'
20	120°51.2	12.9	163°44.4	14.5'	11°59.8	12.1'	55.1'
21	135°51.1	• • 13.4	178°17.9	14.5'	12°11.9	12.1'	55.1'
22 23	150°51.1 165°51.0	13.9 14.4	192°51.4 207°24.7	14.4' 14.3'	12°23.9 12°35.9	12.0' 12.0'	55.1' 55.1'
23	SD = 15.8'	d = 0.5'			D = 14.9'	12.0	JJ.1
	<u>συ = 15.8′</u>	$u = 0.5^{\circ}$		51	J = 14.9°		

Lat.	Naut.	Civil	Sunrise	Sunset		
81 700				Camber	Civil	Naut.
N 72°						
N 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
N 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
N 10°	04:49	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:38	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:33	07:02	16:50	17:20	17:53
45°	06:08	06:44	07:16	16:37	17:09	17:45
S 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
S 60°	06:39	07:32	08:23	15:29	16:20	17:13

Lat.		Moonris	e		Moonset	ŧ
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	01:43	01:18	00:51	13:38	15:31	17:34
N 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
N 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
S 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
S 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
S 60°	00:58	02:17	03:38	13:30	13:33	13:37

		Sun		Moon				
Day	Eqn.o	Time	Mer.	Mer.Pass.		Age		
,	00 ^h	12 ^h	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			

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

h	Aries	Venu	us	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
				194°25.8	N16°43.7				N10° 59.2		ЗПА	Dec
0	239°09.8		N26°03.7			70°01.0	N06°09.0	205°55.8		Alpheratz	357°32.1	29°14.7
1	254°12.3	177°56.8	03.2	209°26.4	44.2	85°03.4	09.0	220°58.0	59.2	Ankaa	353°04.8	-42°08.9
2	269°14.7	193°00.3	02.7	224°27.0	44.8	100°05.8	09.0	236°00.1	59.3	Schedar	349°28.2	56°41.4
3	284°17.2 299°19.7	208°03.8	• • 02.1	239°27.7	• • 45.3	115°08.2	• • 09.0	251°02.3 266°04.5	• • 59.4	Diphda	348°44.8	-17°49.8
4		223°07.3	01.6	254°28.3	45.8	130°10.6	08.9		59.5	Achernar	335°18.7	-57°05.4
5 6	314°22.1 329°24.6	238°10.9 253°14.4	01.1 N26°00.6	269°29.0 284°29.6	46.4 N16°46.9	145°13.0 160°15.5	08.9 N06°08.9	281°06.7 296°08.8	59.6 N10°59.7	Hamal	327°48.4	23°35.7
7	344°27.0	268° 17.9	26°00.1	299°30.2	47.5	175°17.9	08.8	311°11.0	59.8	Polaris	$313^{\circ}02.1$	89°22.9
8	359°29.5	283°21.5	25°59.5	314°30.9	48.0	173 17.9 190°20.3	08.8	326°13.2	10° 59.9	Acamar	$315^{\circ}10.2$	-40°11.4
9	14°32.0	298°25.0	59.0	329°31.5	• • 48.5	205°22.7	• • 08.8	341°15.4	10° 39.9 11° 00.0	Menkar	314°03.6	4°12.0
10	29°34.4	313°28.6	58.5	344°32.1	49.1	220°25.1	08.7	356°17.5	00.1	Mirfak	308°24.8	49°57.6
11	44°36.9	328°32.1	58.0	359°32.8	49.6	235°27.5	08.7	11°19.7	00.2	Aldebaran	290°36.8	16°33.9
12	59°39.4		N25°57.4	14°33.4	N16°50.2	250°30.0	N06°08.7	26°21.9	N11°00.3	Rigel	281°01.6	-8°10.3
13	74°41.8	358°39.3	56.9	29°34.0	50.7	265°32.4	08.7	41°24.1	00.4	Capella	280°18.3	46°01.5
14	89°44.3	13°42.8	56.4	44°34.7	51.2	280°34.8	08.6	56°26.3	00.5	Bellatrix	278°20.3	6°22.4
15	104°46.8	28°46.4	• • 55.8	59°35.3	• • 51.8	295°37.2	• • 08.6	71°28.4	• • 00.6	Elnath	277°58.8	28°37.8
16	119°49.2	43°50.0	55.3	74°36.0	52.3	310°39.6	08.6	86°30.6	00.7	Alnilam	275°35.3	-1°11.2
17	134°51.7	58°53.5	54.8	89°36.6	52.9	325°42.0	08.5	101°32.8	8.00	Betelgeuse	270°49.4	7°24.6
18	149°54.2	73°57.1	N25°54.2	104°37.2	N16°53.4	340°44.4	N06°08.5	116°35.0	N11°00.9	Canopus	263°51.6 258°24.1	-52°42.9 -16°45.5
19	164°56.6	89°00.7	53.7	119°37.9	53.9	355°46.8	08.5	131°37.1	01.0	Sirius Adhara	255°04.0	-10 45.5 -29°00.9
20	179°59.1	104°04.3	53.1	134°38.5	54.5	10°49.3	08.4	146°39.3	01.1	Procyon	244°48.2	5°09.0
21	195°01.5	119°07.9	• • 52.6	149°39.1	• • 55.0	25°51.7	• • 08.4	161°41.5	•• 01.2	Pollux	243°14.2	27°57.4
22	210°04.0	134°11.5	52.1	164°39.8	55.6	40°54.1	08.4	176°43.7	01.3	Avior	234°13.9	-59°36.4
23	225°06.5	$149^{\circ}15.1$	51.5	179°40.4	56.1	55°56.5	08.3	191°45.9	01.4	Suhail	234 13.9 222°44.4	-39 30.4 -43°33.2
Mern	ass. 08:02	ν 3.5′ d-0.5	′ m-4 25	ν0 6′ d0	.5′ m1.31	ν2 4' d-Ω	.0′ m-2.14	v2 2' d0	.1′ m0.50	Miaplacidus	221°37.8	-43 33.2 -69°50.4
ivici.p		ν 5.5 u-0.5	111 T.4J	<i>ν</i> υ.υ αυ.		ν2. τ u-0.	111-4.14	ν Δ.Δ UU	. 1110.50	Alphard	217°45.1	-8°47.1
										Regulus	207°31.6	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.7	61°36.0
0	240°08.9		N25°51.0	194°41.0	N16°56.6	70°58.9	N06°08.3	206°48.0	N11°01.5	Denebola	182°22.0	14°24.7
1	255°11.4	179°22.3	50.4	209°41.7	57.2	86°01.3	08.3	221°50.2	01.5	Gienah	175°40.6	-17°42.2
2	270°13.9	194°25.9	49.9	224°42.3	57.7	101°03.7	08.2	236°52.4	01.6	I	172°56.5	-63°15.7
3	285°16.3	209°29.5	• • 49.3	239°43.0	• • 58.2	116°06.1	• • 08.2	251°54.6	• • 01.7	Gacrux	171°48.1	-57°16.7
4	300°18.8	224°33.1	48.8	254°43.6	58.8	131°08.5	08.2	266°56.7	01.8	Alioth	166° 10.3	55°48.4
5	315°21.3	239°36.7	48.2	269°44.2	59.3	146°11.0	08.1	281°58.9	01.9	Spica	158° 19.1	-11°18.7
6	330°23.7		N25°47.7	284°44.9	N16°59.8	161°13.4	N06°08.1		N11°02.0	Alkaid	152°49.5	49°10.3
7	345°26.2	269°44.0	47.1	299°45.5	17°00.4	176°15.8	08.1	312°03.3	02.1	Hadar	148°31.4	-60°30.8
8	0°28.6	284°47.6	46.6	314°46.1	00.9	191°18.2	08.0	327°05.5	02.2	Menkent	147°54.0	-36°30.8
9	15°31.1	299°51.2	• • 46.0	329°46.8	• • 01.4	206°20.6	• • 08.0	342°07.6	• • 02.3	Arcturus	145°45.1	19°02.0
10	30°33.6	314°54.9	45.4	344°47.4	02.0	221°23.0	08.0	357°09.8	02.4	Rigil Kent.	139°35.8	-60°57.3
11	45°36.0	329°58.5	44.9	359°48.0	02.5	236°25.4	07.9	12°12.0	02.5	Kochab	$137^{\circ}18.9$	74°02.3
12	60°38.5		N25°44.3	14°48.7	N17°03.0	251°27.8	N06°07.9	27°14.2	N11°02.6	Zuben'ubi	136°52.6	-16°09.7
13	75°41.0	0°05.8	43.8	29°49.3	03.6	266°30.2	07.9	42°16.4	02.7	Alphecca	$126^{\circ}01.1$	26°37.1
14	90°43.4	15°09.5	43.2	44°49.9	04.1	281°32.6	07.8	57°18.5	02.8	Antares	$112^{\circ}12.1$	-26°29.7
15	105°45.9	30°13.1	• • 42.6	59°50.6	• • 04.6	296°35.0	• • 07.8	72°20.7	• • 02.9	Atria	$107^{\circ}03.2$	-69°04.6
16	120°48.4	45°16.8	42.1	74°51.2	05.2	311°37.4	07.8	87°22.9	03.0	Sabik	101°59.3	-15°45.6
17 18	135°50.8 150°53.3	60°20.4	41.5 N25°40.9	89°51.8	05.7	326°39.8 341°42.3	07.7 N06° 07.7	102°25.1 117°27.2	03.1	Shaula	96°06.3	-37°07.3
19	165° 55.8	75°24.1 90°27.8	40.3	104°52.5 119°53.1	N17°06.2 06.8	356°44.7	07.7	117 27.2 132°29.4	N11°03.2 03.3	Rasalhague	95°55.7	12°32.3
20	180°58.2	90 27.8 105°31.4	39.8	119 55.1 134°53.7	00.8	11°47.1	07.7 07.6	132 29.4 147°31.6	03.3	Eltanin	90°40.4	51°29.0
21	196°00.7	120°35.1	• • 39.2	149°54.4	07.8	26°49.5	•• 07.6	162°33.8	•• 03.4	Kaus Aust.	83°28.6	-34°22.1
22	211°03.1	135°38.8	38.6	164°55.0	08.3	41°51.9	07.6	102 33.8 177°36.0	03.4	Vega	80°31.0	38°48.5
23	226° 05.6	150°42.5	38.0	179°55.6	08.9	56°54.3	07.5	192°38.1	03.6	Nunki	75°44.1	-26°15.5
				-						Altair	61°57.1	8°56.6
Mer.p	ass. 07:58	ν 3.6′ d-0.5	′ m-4.18	$\nu 0.6' \ d0.$.5′ m1.32	ν 2.4′ d-0.	.0′ m-2.13	$\nu 2.2' \ d0$.1' m 0.50	Peacock	53°01.2	-56°38.3
										Deneb	49°23.7	45°22.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°36.1	10°00.3
0	241°08.1		N25°37.5	194°56.3	N17°09.4	71°56.7	N06°07.5	207°40.3	N11°03.7	Al Na'ir	27°29.6	-46°49.1
1	256°10.5	180°49.8	36.9	209°56.9	09.9	86°59.1	07.5	222°42.5	03.8	Fomalhaut	15°11.6	-29°28.1
2	271°13.0	195°53.5	36.3	224°57.5	10.5	102°01.5	07.4	237°44.7	03.9	Scheat	13°42.6	28°14.1
3	286°15.5	210°57.2	• • 35.7	239°58.2	· · 11.0	117°03.9	• • 07.4	252°46.9	04.0	Markab	13°27.2	15°21.4
4	301°17.9	226°00.9	35.1	254°58.8	11.5	132°06.3	07.4	267°49.0	04.1	May 21 Sun	SHA	Mer.pass
5	316°20.4	241°04.6	34.6	269°59.4	12.0	147°08.7	07.3	282°51.2	04.2		283°43.5	13:05
6	331°22.9		N25°34.0		N17°12.6	162°11.1	N06°07.3		N11°04.3		$315^{\circ}16.0$	11:02
7	$346^{\circ}25.3$	271°12.0	33.4	300°00.7	13.1	$177^{\circ}13.5$	07.2	312°55.6	04.4	Jupiter	$190^{\circ}51.2$	19:17
8	1°27.8	286°15.8	32.8	315°01.3	13.6	192°15.9	07.2	327°57.8	04.5	Saturn	326°46.0	10:15
9	16°30.3	$301^{\circ}19.5$	• • 32.2	$330^{\circ}02.0$	• • 14.2	207°18.3	•• 07.2	342°59.9	• • 04.6	May: 22 M4-	CHA	Monas
10	31°32.7	$316^{\circ}23.2$	31.6	$345^{\circ}02.6$	14.7	222°20.7	07.1	358°02.1	04.7	May 22 Mon	SHA	Mer.pass
11	46°35.2	$331^{\circ}26.9$	31.0	$0^{\circ}03.2$	15.2	237°23.1	07.1	13°04.3	04.8		284°09.7 314°32.1	13:00
12	61°37.6		N25°30.4	15°03.9	$N17^{\circ}15.7$	252°25.5	N06°07.1	28°06.5	N11°04.9	1	314° 32.1 190° 50.0	11:01
13	76°40.1	1°34.4	29.8	30°04.5	16.3	267°27.9	07.0	43°08.7	05.0	Saturn		19:13 10:11
14	91°42.6	16°38.1	29.2	45°05.1	16.8	282°30.3	07.0	58°10.8	05.1	Jaturn	J2U J9.1	10.11
15	106°45.0	31°41.8	• • 28.6	60°05.8	• • 17.3	297°32.7	• • 06.9	73°13.0	• • 05.1	May 23 Tue	SHA	Mer.pass
16	121°47.5	46°45.6	28.0	75°06.4	17.8	312°35.1	06.9	88°15.2	05.2	1	$284^{\circ}38.1$	12:54
17	136°50.0	61°49.3	27.4	90°07.0	18.4	327°37.5	06.9	103°17.4	05.3		$313^{\circ}48.2$	11:00
18	151°52.4		N25°26.8		N17°18.9	342°39.9	N06°06.8		N11°05.4		190°48.6	19:09
19	166°54.9	91°56.8	26.2	120°08.3	19.4	357°42.3	06.8	133°21.7	05.5	Saturn	326° 32.2	10:08
20	181°57.4	107°00.6	25.6	135°08.9	19.9	12°44.7	06.8	148°23.9	05.6	Uaul-at	al parallar	==
21	196°59.8	122°04.3	• • 25.0	150°09.6	• • 20.4	27°47.1	•• 06.7	163°26.1	• • 05.7	norizont	al parallax Venus:	0.5
22	212°02.3	137°08.1	24.4	165°10.2	21.0	42°49.5	06.7	178°28.3	05.8		venus: Mars:	0.5
23	227°04.8	152°11.8	23.8	180°10.8	21.5	57°51.9	06.6	193°30.5	05.9		iviars:	0.1
Mer.p	ass. 07:54	ν 3.7′ <i>d</i> -0.6	′ m-4.10	ν 0.6′ d0.	.5′ m1.32	ν 2.4′ d-0.	.0′ m-2.12	ν 2.2′ d0	.1′ m0.50			

h	Sun				Moon		
			CIIA			.,	LID
Sun 0	GHA 180°51.0	Dec N20°14.9	GHA 221°58.1	u 14.2'	Dec N12° 47.9	<i>d</i> 11.9'	HP 55.2'
1	195°50.9	15.4	$236^{\circ}31.3$	14.2'	12°59.8	11.9'	55.2'
2	210°50.9	15.9	251°04.5	14.1'	13°11.7	11.8'	55.2'
3 4	225°50.8 240°50.8	· · 16.4 16.9	265°37.6 280°10.6	14.0' 14.0'	13°23.6 13°35.4	11.8' 11.7'	55.2' 55.2'
5	255°50.8	10.9 17.4	294°43.6	13.9'	13°47.1	11.7'	55.3'
6	270°50.7	N20°17.9	309°16.5	13.8'	N13°58.8	11.6'	55.3'
7	285°50.7	18.4	323°49.3	13.7'	14° 10.4	11.6'	55.3'
8 9	300°50.6 315°50.6	18.9 •• 19.4	338°22.0 352°54.7	13.7' 13.6'	14°22.0 14°33.6	11.5' 11.5'	55.3' 55.4'
10	330°50.5	19.4	7°27.2	13.5'	14 33.0 14°45.1	11.5	55.4'
11	345°50.5	20.4	21°59.7	13.4'	14° 56.5	11.4'	55.4'
12	0°50.4	N20°20.9	36°32.1	13.3'	N15°07.9	11.3'	55.4'
13 14	15°50.4 30°50.3	21.4 21.9	51°04.5 65°36.7	13.3' 13.2'	15° 19.2 15° 30.5	11.3' 11.2'	55.4' 55.5'
15	45°50.3	22.4	80°08.9	13.1'	15° 41.7	11.1'	55.5'
16	60°50.2	22.9	94°41.0	13.0'	15°52.8	11.1'	55.5'
17	75°50.2	23.3	109°13.0	12.9'	16°03.9	11.0'	55.5'
18 19	90°50.2 105°50.1	N20°23.8 24.3	123°44.9 138°16.8	12.8' 12.7'	N16° 14.9 16° 25.9	11.0' 10.9'	55.6' 55.6'
20	105 50.1 120°50.1	24.3	150 10.6 152°48.5	12.7'	16° 25.9	10.9	55.6'
21	135°50.0	• • 25.3	167°20.2	12.6'	16°47.6	10.8'	55.6'
22	150°50.0	25.8	181°51.7	12.5'	16°58.3	10.7'	55.7'
23	165°49.9	26.3	196°23.2	12.4'	17°09.0	10.6'	55.7'
	SD = 15.8′	d = 0.5'		SE	D = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.9	N20°26.8	210°54.6	12.3'	N17°19.7	10.6'	55.7'
1	195°49.8	27.3	225°25.9	12.2'	17°30.2	10.5'	55.7'
2	210°49.8 225°49.7	27.8 •• 28.2	239°57.2 254°28.3	12.1' 12.0'	17° 40.7 17° 51.1	10.4' 10.3'	55.7' 55.8'
4	240°49.7	28.7	268°59.3	12.0'	18°01.4	10.3	55.8'
5	255°49.6	29.2	283°30.3	11.9'	18° 11.7	10.2'	55.8'
6	270°49.6	N20°29.7	298°01.2	11.8'	N18°21.9	10.1'	55.8'
7 8	285°49.5 300°49.5	30.2 30.7	312°31.9 327°02.6	11.7' 11.6'	18° 32.0 18° 42.0	10.0' 9.9'	55.9' 55.9'
9	315°49.4	31.1	341°33.2	11.5'	18° 52.0	9.9'	55.9'
10	330°49.4	31.6	$356^{\circ}03.7$	11.4'	19°01.8	9.8'	55.9'
11	345°49.3	32.1	10°34.1	11.3'	19°11.6	9.7'	56.0'
12 13	0°49.3 15°49.2	N20°32.6 33.1	25°04.4 39°34.6	11.2' 11.1'	N19°21.3 19°30.9	9.6' 9.5'	56.0' 56.0'
14	30°49.2	33.5	54°04.7	11.0'	19°40.4	9.4	56.0'
15	45°49.1	• • 34.0	68°34.7	10.9'	19°49.9	9.3'	56.1'
16 17	60°49.0 75°49.0	34.5 35.0	83°04.7 97°34.5	10.8' 10.7'	19°59.2 20°08.5	9.3' 9.2'	56.1' 56.1'
18	90°48.9	N20°35.5	97 34.5 112°04.2	10.7	N20° 17.6	9.2	56.1
19	105°48.9	35.9	126°33.9		20°26.7	9.0'	56.2'
20	120°48.8	36.4	141°03.4	10.5'	20°35.7	8.9'	56.2'
21 22	135°48.8 150°48.7	· · 36.9 37.4	155°32.9 170°02.2	10.4' 10.3'	20°44.6 20°53.3	8.8' 8.7'	56.2' 56.2'
23	165°48.7	37.4	184°31.5	10.3	20° 53.3 21° 02.0	8.6'	56.3'
	SD = 15.8'	d = 0.5'			0 = 15.2'		
_							
Tue 0	GHA 180°48.6	Dec N20°38.3	GHA 199°00.6	u 10.1'	Dec N21° 10.6	<i>d</i> 8.5'	HP 56.3'
1	195°48.6	38.8	213°29.7	10.1	21°19.1	8.4	56.3
2	210°48.5	39.3	227°58.7	9.9'	21°27.5	8.3'	56.3'
3	225°48.5	• • 39.7	242°27.5	9.8'	21°35.7	8.2'	56.4'
4 5	240°48.4 255°48.3	40.2 40.7	256°56.3 271°25.0	9.7' 9.6'	21°43.9 21°52.0	8.1' 8.0'	56.4' 56.4'
6	270°48.3	N20°41.1	285°53.6	9.5	N21°59.9	7.8	56.4
7	285°48.2	41.6	$300^{\circ}22.1$	9.4'	22°07.8	7.7'	56.5'
8	300°48.2	42.1	314°50.5	9.3'	22° 15.5	7.6'	56.5'
9 10	315°48.1 330°48.1	· · 42.5 43.0	329°18.8 343°47.0	9.2' 9.1'	22°23.1 22°30.6	7.5' 7.4'	56.5' 56.5'
11	345°48.0	43.5	358°15.1	9.1	22°38.0	7.4	56.6'
12	0°47.9	N20°43.9	12°43.2	8.9'	N22°45.3	7.2'	56.6'
13	15°47.9	44.4	27°11.1	8.8'	22°52.5	7.0'	56.6'
14 15	30°47.8 45°47.8	44.9 •• 45.3	41°39.0 56°06.7	8.8' 8.7'	22°59.5 23°06.4	6.9' 6.8'	56.6' 56.7'
16	45 47.8 60°47.7	45.8	70°34.4	8. <i>1</i> 8.6'	23°13.3	6.7	56.7'
17	75°47.7	46.3	85°01.9	8.5'	23° 19.9	6.6'	56.7'
18	90°47.6	N20°46.7	99°29.4	8.4'	N23°26.5	6.4'	56.7'
19 20	105°47.5 120°47.5	47.2 47.7	113°56.8 128°24.1	8.3' 8.2'	23°32.9 23°39.2	6.3' 6.2'	56.8' 56.8'
21	120 47.5 135°47.4	47.7 • • 48.1	128 24.1 142°51.3	8.2 8.1'	23°45.4	6.1	56.8
22	150°47.4	48.6	157°18.4	8.0'	23°51.5	5.9'	56.8'
23	165°47.3	49.0	171°45.5	8.0'	23°57.4	5.8'	56.9'
	SD = 15.8'	d = 0.5'		SE	0 = 15.4'		

				J		,
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Junset	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°	04:29	04:58	05:22	18:32	18:56	19:24
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:08	18:33
20°	05:34	06:01	06:24	17:29	17:53	18:20
30°	05:47	06:17	06:42	17:11	17:37	18:06
35°	05:55	06:26	06:53	17:00	17:28	17:59
40°	06:02	06:35	07:05	16:48	17:18	17:51
45°	06:10	06:47	07:19	16:34	17:06	17:43
S 50°	06:20	07:00	07:36	16:17	16:53	17:33
52°	06:24	07:06	07:45	16:08	16:47	17:29
54°	06:28	07:13	07:54	15:59	16:40	17:25
56°	06:33	07:20	08:04	15:49	16:33	17:20
58°	06:38	07:28	08:16	15:37	16:25	17:15
S 60°	06:44	07:37	08:29	15:24	16:16	17:09
Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	00:16 23:11			20:14		
N 70°	00:38	00:03		19:23		
68°	00:56	00:35		18.52	21.14	

	Lat.		Moonris	е		Moonset	:
	Lat.	Sun	Mon	Tue	Sun	Mon	Tue
	N 72°	00:16 23:11			20:14		
	N 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
1	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
	S 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
	S 60°	05:03	06:31	08:03	13:42	13:49	14:03

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
/\/cd -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
Wed											SHA	Dec
0	242°07.2	167° 15.6	N25°23.2	195°11.5	N17°22.0	72°54.3	N06°06.6	208°32.6	N11°06.0	Alpheratz	357°32.1	29°14.7
1	257°09.7	182° 19.4	22.6	210°12.1	22.5	87°56.7	06.6	223°34.8	06.1	Ankaa	353°04.7	-42°08.9
2	272°12.1	197°23.1	22.0	225°12.7	23.1	102°59.1	06.5	238°37.0	06.2	Schedar	349°28.1	56°41.4
3	287°14.6	212°26.9	• • 21.4	240°13.3	• • 23.6	118°01.5	• • 06.5	253°39.2	• • 06.3	Diphda	348° 44.8	-17°49.7
4	302°17.1	227°30.7	20.8	255°14.0	24.1	133°03.9	06.5	268°41.4	06.4	Achernar	335°18.7	-57°05.3
5	317°19.5	242°34.5	20.1	270°14.6	24.6	148°06.3	06.4	283°43.5	06.5	Hamal	327°48.4	23°35.7
6	332°22.0	257° 38.2	N25°19.5	285°15.2	N17°25.1	163°08.7	N06°06.4	298°45.7	N11°06.6	Polaris	313°01.3	89°22.8
7	347°24.5	272°42.0	18.9	300°15.9	25.7	178°11.1	06.3	313°47.9	06.7	Acamar	315° 10.1	-40°11.4
8	2°26.9	287° 45.8	18.3	315°16.5	26.2	193°13.5	06.3	328°50.1	06.7	Menkar	314°03.6	4°12.0
9	17°29.4	302°49.6	• • 17.7	330°17.1	• • 26.7	208°15.9	• • 06.3	343°52.3	• • 06.8	Mirfak	308°24.8	49°57.6
10	32°31.9	317°53.4	17.0	345°17.8	27.2	223°18.3	06.2	358°54.4	06.9	Aldebaran	290°36.8	16°33.9
11	47°34.3	332°57.2	16.4	0°18.4	27.7	238°20.6	06.2	13°56.6	07.0	Rigel	281°01.6	-8°10.3
12	62°36.8	348°01.0	N25°15.8	15°19.0	N17°28.3	253°23.0	N06°06.1	28°58.8	N11°07.1	Capella	280° 18.3	46°01.5
13	77°39.2	3°04.8	15.2	30°19.7	28.8	268°25.4	06.1	44°01.0	07.2	Bellatrix	278°20.3	6°22.4
14	92°41.7	18°08.6	14.5	45°20.3	29.3	283°27.8	06.1	59°03.2	07.3	Elnath	277°58.8	28°37.8
15	107°44.2	33°12.4	• • 13.9	60°20.9	• • 29.8	298°30.2	• • 06.0	74°05.3	• • 07.4	Alnilam	275°35.3	-1°11.2
16	122°46.6	48° 16.2	13.3	75°21.6	30.3	313°32.6	06.0	89°07.5	07.5	Betelgeuse	270°49.4	7°24.6
17	137°49.1	63°20.0	12.6	90°22.2	30.8	328°35.0	05.9	104°09.7	07.6	Canopus	263°51.6	-52°42.9
18	152°51.6	78°23.9	N25°12.0	105°22.8	N17°31.4	343°37.4	N06°05.9	119°11.9	N11°07.7	Sirius	258°24.1	-16°45.5
19	167°54.0	93°27.7	11.4	120°23.4	31.9	358°39.8	05.9	$134^{\circ}14.1$	07.8	Adhara	255°04.0	-29°00.9
20	182°56.5	108°31.5	10.7	135°24.1	32.4	13°42.2	05.8	149°16.3	07.9	Procyon	244°48.2	5°09.0
21	197°59.0	123°35.3	• • 10.1	150°24.7	• • 32.9	28°44.6	• • 05.8	164°18.4	• • 08.0	Pollux	243°14.2	27°57.4
22	213°01.4	138°39.2	09.5	165°25.3	33.4	43°47.0	05.7	179°20.6	08.1	Avior	234° 13.9	-59°36.4
23	228°03.9	153°43.0	8.80	180°26.0	33.9	58°49.4	05.7	194°22.8	08.1	Suhail	234 13.9 222°44.4	-59 30.4 -43°33.2
Mar	ass. 07:50	1/3 8/ 4 0	.6′ m-4.02	νη 6/ Αη	.5′ m1.32	1/2 1/ 4 0	.0′ m-2.11	1/2 2/ 40	.1′ m0.50	Miaplacidus	222 44.4 221°37.9	-43 33.2 -69°50.4
ivier.p	ass. 01:30	ν 3.0 a-U	.0 111-4.02	νυ.υ <i>α</i> υ	.5 1111.32	ν Δ.4 u-U	.0 111-2.11	ν2.2 u 0	.1110.30	Alphard	221 37.9 217°45.1	-8°47.1
										Regulus	217 45.1 207°31.6	-6 47.1 11°49.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.7	61°36.0
0	243°06.4	168°46.8	N25°08.2	195°26.6	N17°34.4	73°51.7	N06°05.7	209°25.0	N11°08.2	Dubne	193 37.7 182°22.0	14°24.7
1	258°08.8	183°50.7	07.5	$210^{\circ}27.2$	35.0	88°54.1	05.6	224°27.2	08.3	Gienah	182 22.0 175°40.6	-17°42.2
2	273°11.3	198°54.5	06.9	225°27.8	35.5	103°56.5	05.6	239°29.3	08.4		175°40.6 172°56.5	-17 42.2 -63°15.7
3	288°13.7	213°58.3	• • 06.3	240°28.5	• • 36.0	118°58.9	• • 05.5	254°31.5	• • 08.5		172 50.5 171°48.1	-03 15.7 -57°16.7
4	303°16.2	229°02.2	05.6	255°29.1	36.5	134°01.3	05.5	269°33.7	08.6	1		
5	318°18.7	244°06.0	05.0	270°29.7	37.0	149°03.7	05.5	284°35.9	08.7	Alioth	166°10.3	55°48.4
6	333°21.1	259°09.9	N25°04.3	285°30.4	N17°37.5	164°06.1	N06°05.4	299°38.1	N11°08.8	Spica	158° 19.1	-11°18.7
7	348°23.6	274° 13.7	03.7	300°31.0	38.0	179°08.5	05.4	314°40.3	08.9	Alkaid	152°49.5	49°10.3
8	3°26.1	289° 17.6	03.0	315°31.6	38.6	194°10.9	05.3	329°42.4	09.0	Hadar	148°31.4	-60°30.8
9	18°28.5	304°21.4	02.4	330°32.3	• • 39.1	209°13.2	• • 05.3	344°44.6	09.1		147°54.0	-36°30.8
10	33°31.0	319°25.3	01.7	345°32.9	39.6	224°15.6	05.2	359°46.8	09.2	Arcturus	145°45.1	19°02.0
11	48°33.5	334°29.2	01.1	0°33.5	40.1	239°18.0	05.2	14°49.0	09.3	Rigil Kent.	139°35.8	-60°57.3
12	63°35.9	349°33.0	N25°00.4	15°34.1	N17°40.6	254°20.4	N06°05.2	29°51.2	N11°09.4	Kochab	137°18.9	74°02.4
13	78°38.4	4°36.9	24°59.8	30°34.8	41.1	269°22.8	05.1	44°53.3	09.4	Zuben'ubi	136°52.6	-16°09.7
14	93°40.9	19° 40.8	59.1	45°35.4	41.6	284°25.2	05.1	59°55.5	09.5	Alphecca	126°01.1	26°37.1
15	108°43.3	34°44.7	• • 58.4	60°36.0	• • 42.1	299°27.6	• • 05.0	74°57.7	• • 09.6	Antares	112° 12.1	-26°29.7
16	123°45.8	49° 48.5	57.8	75°36.7	42.6	314°30.0	05.0	89°59.9	09.7	Atria	107°03.2	-69°04.6
17	138°48.2	64°52.4	57.1	90°37.3	43.1	329°32.3	04.9	105°02.1	09.8	Sabik	101°59.3	-15°45.6
18	153°50.7	79°56.3	N24°56.5	105°37.9	N17°43.7	344°34.7	N06°04.9	120°04.3	N11°09.9	Shaula	96°06.2	-37°07.3
19	168°53.2	95°00.2		100°38.5		359°37.1	04.9	135°06.4	10.0	Rasalhague	95°55.7	12°32.3
20	183°55.6	110°04.1	55.8 55.1	135°39.2	44.2 44.7	14°39.5	04.9	150°08.6	10.0	Eltanin	90°40.4	51°29.0
20	105 55.0 198°58.1	110 04.1 125°08.0	• • 54.5	150°39.2	• • 45.2	29°41.9	• • 04.8	165°10.8	. 10.1	Kaus Aust.	83°28.5	-34°22.1
22	214°00.6	140°11.8	53.8	165°40.4	45.7	44°44.3	04.8	180°13.0	10.2	Vega	80°31.0	38°48.5
	214 00.0 229°03.0	155° 15.7		180°41.1		59°46.6		195°15.2		Nunki	75°44.1	-26°15.5
23	229 03.0	155 15.7	53.1	180 41.1	46.2	59 40.0	04.7	195 15.2	10.4	Altair	$61^{\circ}57.1$	8°56.6
Mer.p	ass. 07:46	ν 3.8′ d-0	.6′ m-3.94	ν 0.6′ d0	.5′ m1.33	ν 2.4′ d-0	.0′ m-2.11	ν 2.2′ d0	.1' m 0.50	Peacock	53°01.2	-56°38.3
										Deneb	49°23.7	45°22.7
F'	CIIA	CIIA	D	CUA	D	CIIA	D	CUA	D	Enif	33°36.0	10°00.3
Fri	GHA	GHA	Dec N24°52.5	GHA	Dec	GHA	Dec	GHA	Dec N11°10 F	Al Na'ir	27° 29.5	-46°49.1
0	244°05.5	170°19.6		195°41.7		74°49.0	N06°04.6		N11°10.5	Fomalhaut	15°11.6	-29°28.1
1	259°08.0	185°23.5	51.8	210°42.3	47.2	89°51.4	04.6	225°19.5	10.6	Scheat	13°42.6	28°14.1
2	274°10.4	200°27.4 215°31.3	51.1	225°42.9	47.7	104°53.8	04.6	240°21.7 255°23.9	10.7	Markab	13°27.2	15°21.4
3	289°12.9 304°15.4		. 50.4	240°43.6 255°44.2	· · 48.2	119°56.2 134°58.6	• • 04.5	255°23.9 270°26.1	10.7	May 24 Wed	SHA	Mer.pass
4	304 15.4 319°17.8	230° 35.2 245° 39.2	49.8 40.1	255 44.2 270°44.8	48.7	150°00.9	04.5	270 26.1 285°28.3	10.8	Venus		12:48
5	319°17.8 334°20.3		49.1		49.2 N17°40.7		04.4 N06°04.4		10.9 N11°11.0	Mars		10:59
6	334°20.3 349°22.7	260°43.1	N24°48.4	285°45.4	N17°49.7	165°03.3	N06°04.4	300°30.5			190°47.1	19:05
7	4°25.2	275°47.0	47.7 47.1	300°46.1 315°46.7	50.2 50.7	180°05.7	04.3	315°32.6 330°34.8	11.1	Saturn	326° 25.4	10:04
8	4°25.2 19°27.7	290°50.9	47.1		50.7	195°08.1	04.3		11.2	Saturn	J2U 23.4	10:04
9		305°54.8	· · 46.4	330°47.3	51.3	210°10.5	• • 04.2	345°37.0	• • 11.3	May 25 Thu	SHA	Mer.pass
10	34°30.1	320°58.7	45.7 45.0	345°48.0	51.8	225°12.9	04.2	0°39.2	11.4	Venus		12:42
11	49°32.6	336°02.6	45.0	0°48.6	52.3	240°15.2	04.2	15°41.4	11.5	Mars	$312^{\circ}20.2$	10:58
12	64°35.1	351°06.6	N24°44.3	15°49.2	N17°52.8	255°17.6	N06°04.1	30°43.6	N11°11.6		190°45.4	19:02
13	79°37.5	6°10.5	43.6	30°49.8	53.3	270°20.0	04.1	45°45.7	11.7	Saturn	$326^{\circ}18.6$	10:01
14	94°40.0	21°14.4	43.0	45°50.5	53.8	285°22.4	04.0	60°47.9	11.8			
15	109°42.5	36°18.4	• • 42.3	60°51.1	• • 54.3	300°24.8	• • 04.0	75°50.1	• • 11.9	May 26 Fri	SHA	Mer.pass
16	124°44.9	51°22.3	41.6	75°51.7	54.8	315°27.1	03.9	90°52.3	11.9	Venus		12:35
17	139°47.4	66°26.2	40.9	90°52.3	55.3	330°29.5	03.9	105°54.5	12.0	Mars		10:57
18	154°49.9	81°30.2	N24°40.2	105°53.0	N17°55.8	345°31.9	N06°03.8		N11°12.1	Jupiter		18:58
19	169°52.3	96°34.1	39.5	120°53.6	56.3	0°34.3	03.8	135°58.8	12.2	Saturn	326°11.9	09:57
20	184°54.8	111°38.0	38.8	135°54.2	56.8	15°36.6	03.7	151°01.0	12.3	Horizont	al parallax	
21	199°57.2	126° 42.0	• • 38.1	150°54.9	• • 57.3	30°39.0	• • 03.7	166°03.2	• • 12.4	HORIZON	Venus:	0.5
22	214°59.7	141°45.9	37.4	165°55.5	57.8	45°41.4	03.6	181°05.4	12.5		venus: Mars:	0.5
23	230°02.2	156° 49.9	36.7	180°56.1	58.3	60°43.8	03.6	196°07.6	12.6		iviars:	0.1
Mer n	ass. 07:42	ν3.9' d-0	.7′ m-4.05	$\nu^{0.6'}$ d0	.5′ m1.33	ν2.4' d-0	.0′ m-2.10	$\nu^{2.2'} d\Omega$.1′ m0.50			

J.1 —	011 010 -	T0.1314 Sec			1 — 05.0	J20 30	
h	Sui	า			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	180°47.2	N20°49.5	186° 12.4	7.9'	N24°03.2	5.7'	56.9'
1	195°47.2	50.0	200°39.3	7.8'	24°08.8	5.5'	56.9'
2	210°47.1	50.4	$215^{\circ}06.1$	7.7'	$24^{\circ}14.4$	5.4'	56.9'
3	225°47.1	• • 50.9	229°32.8	7.6'	24°19.8	5.3'	57.0'
4	240°47.0	51.3	243°59.4	7.5'	24°25.0	5.1'	57.0'
5	255°46.9	51.8	258°26.0	7.5'	24°30.1	5.0'	57.0'
6	270°46.9	N20°52.2	272°52.4	7.4'	N24°35.1	4.8'	57.0'
7	285°46.8	52.7	287°18.8	7.3'	24°40.0	4.7'	57.1'
8	300°46.8 315°46.7	53.1	301°45.1 316°11.4	7.2'	24° 44.7 24° 49.2	4.6'	57.1
9 10	315°46.7 330°46.6	· · 53.6 54.0	316°11.4 330°37.5	7.2' 7.1'	24° 49.2 24° 53.6	4.4' 4.3'	57.1' 57.1'
11	345° 46.6	54.5	345°03.6	7.1 7.0'	24°57.9	4.1	57.1 57.2'
12	0°46.5	N20°55.0	359°29.6	6.9	N25°02.0	4.0'	57.2
13	15° 46.4	55.4	13°55.6	6.9'	25°06.0	3.8'	57.2'
14	30°46.4	55.9	28°21.4	6.8'	25°09.9	3.7'	57.2'
15	45°46.3	• • 56.3	42°47.2	6.7'	25°13.6	3.5'	57.3'
16	60°46.3	56.8	57° 13.0	6.7'	$25^{\circ}17.1$	3.4'	57.3'
17	75°46.2	57.2	71°38.6	6.6'	25°20.5	3.2'	57.3'
18	90°46.1	N20° 57.6	86°04.2	6.5'	N25°23.7	3.1'	57.3'
19	105°46.1	58.1	100°29.8	6.5'	25°26.8	2.9'	57.4'
20	120°46.0	58.5	114°55.3	6.4'	25°29.8	2.8'	57.4'
21	135°45.9	• • 59.0	129°20.7	6.4'	25°32.6	2.6'	57.4
22	150° 45.9 165° 45.8	59.4	143°46.1 158°11.4	6.3'	25°35.2	2.5'	57.4'
23		59.9	158-11.4	6.3'	25°37.7	2.3'	57.5'
	SD = 15.8'	d = 0.5'		SI	D = 15.5'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	180° 45.7	N21°00.3	172°36.6	6.2'	N25°40.0	2.2'	57.5'
1	195° 45.7	8.00	187°01.8	6.2'	25°42.2	2.0'	57.5'
2	210°45.6	01.2	201°27.0	6.1'	25°44.2	1.9'	57.5'
3	225° 45.5	• • 01.6	215°52.1	6.1'	25°46.0	1.7'	57.5'
4	240°45.5	02.1	230° 17.1	6.0'	25°47.7	1.5'	57.6'
5	255° 45.4	02.5	244° 42.2	6.0'	25°49.3	1.4'	57.6'
6	270° 45.3 285° 45.3	N21°03.0 03.4	259°07.1 273°32.1	5.9' 5.9'	N25°50.7 25°51.9	1.2' 1.1'	57.6' 57.6'
7 8	285°45.3 300°45.2	03.4 03.8	273° 32.1 287° 56.9	5.9° 5.8'	25°51.9 25°52.9	0.9'	57.0° 57.7'
9	315° 45.1	• • 04.3	302°21.8	5.8'	25°53.8	0.9	57.7'
10	330° 45.1	04.7	316°46.6	5.8'	25°54.6	0.6'	57.7'
11	345°45.0	05.2	331°11.4	5.7'	25°55.1	0.4'	57.7'
12	0°44.9	N21°05.6	345°36.1	5.7'	N25°55.5	0.2'	57.7'
13	15°44.9	06.0	$0^{\circ}00.8$	5.7'	$25^{\circ}55.8$	0.1'	57.8'
14	30°44.8	06.5	14°25.5	5.7'	25°55.9	-0.1'	57.8'
15	45°44.7	• • 06.9	28°50.2	5.6'	25°55.8	-0.2'	57.8'
16	60°44.7	07.3	43°14.8	5.6'	25°55.5	-0.4'	57.8'
17	75°44.6	07.8 N21°08.2	57°39.4	5.6'	25°55.1 N25°54.6	-0.6'	57.8'
18 19	90°44.5 105°44.5	N21 08.2 08.6	72°04.0 86°28.6	5.6' 5.6'	N25°54.6 25°53.8	-0.7' -0.9'	57.9' 57.9'
20	105 44.5 120° 44.4	09.1	100°53.2	5.5'	25°52.9	-0.9 -1.1'	57.9'
21	135° 44.3	•• 09.5	100 55.2 115°17.7	5.5'	25°51.9	-1.1	57.9'
22	150°44.3	09.9	129°42.2	5.5'	25°50.6	-1.4'	57.9'
23	165° 44.2	10.4	144°06.8	5.5'	25°49.2	-1.6'	58.0'
	SD = 15.8'	d = 0.4'			D = 15.7'		
	<u> </u>	u = 0.1					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.1	N21°10.8	158°31.3	5.5'	N25°47.7	-1.7'	58.0'
1	195°44.0	11.2	172°55.8	5.5'	25°45.9 25°44.0	-1.9'	58.0' 58.0'
2	210°44.0 225°43.9	11.6 •• 12.1	187°20.3 201°44.8	5.5' 5.5'	25°44.0 25°42.0	-2.1' -2.2'	58.0° 58.0°
3 4	240° 43.8	12.1	201 44.8 216°09.3	5.5'	25 42.0 25°39.7	-2.2 -2.4'	58.1'
5	255° 43.8	12.9	210 09.3 230°33.8	5.5'	25°37.4	-2.4 -2.6'	58.1
6	270°43.7	N21°13.3	244°58.3	5.5'	N25°34.8	-2.7'	58.1
7	285°43.6	13.8	259°22.8	5.5'	25°32.1	-2.9'	58.1
8	300°43.5	14.2	273°47.3	5.5'	25°29.2	-3.1'	58.1'
9	315°43.5	• • 14.6	$288^{\circ}11.8$	5.5'	$25^{\circ}26.1$	-3.2'	58.2'
10	330° 43.4	15.0	302°36.3	5.5'	25°22.9	-3.4'	58.2'
11	345°43.3	15.5	317°00.9	5.6'	25° 19.5	-3.5'	58.2'
12	0°43.3	N21°15.9	331°25.4	5.6'	N25°16.0	-3.7'	58.2'
13	15°43.2	16.3	345°50.0 0°14.6	5.6'	25°12.3 25°08.4	-3.9'	58.2'
14 15	30°43.1 45°43.0	16.7 •• 17.1	0°14.6 14°39.2	5.6' 5.6'	25°08.4 25°04.4	-4.0' -4.2'	58.3' 58.3'
15 16	45°43.0 60°43.0	17.5	29°03.9	5.6° 5.7'	25°04.4 25°00.2	-4.2 -4.4'	58.3
17	75° 42.9	17.5 18.0	43°28.5	5.7' 5.7'	25 00.2 24°55.8	-4.4 -4.5'	58.3'
18	90° 42.8	N21° 18.4	57°53.2	5.7'	N24°51.3	-4.7'	58.3
19	105° 42.7	18.8	72° 17.9	5.7'	24°46.6	-4.8'	58.3
20	120° 42.7	19.2	86°42.7	5.8'	24°41.8	-5.0'	58.4'
21	135° 42.6	• • 19.6	101°07.4	5.8'	24°36.8	-5.2'	58.4'
22	150° 42.5	20.0	115°32.2	5.8'	24°31.6	-5.3'	58.4
		00 5	129°57.1	5.9'	24°26.3	-5.5'	58.4
23	165°42.4	20.5	129 37.1	3.3		3.3	
	$\frac{165^{\circ}42.4}{SD = 15.8'}$	d = 0.4'	129 37.1		D = 15.8'	3.3	

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
S 10°	05:21	05:46	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:25	17:29	17:52	18:19
30°	05:49	06:18	06:44	17:10	17:35	18:05
35°	05:56	06:28	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
S 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
S 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°						
N 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
S 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
S 60°	09:32	10:46	11:35	14:27	15:14	16:28

		Sun			Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age		
,	00 ^h	12 ^h	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			

Section	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
2	Sat -	CHV	CHV	Dos	CHV	Doc	CHV	Doc		Dos		CHV	Doc
1 9070771 190778 33.3 207574 93.3 007455 035 207100 13.8 257007 20727 13.8 25707 20727 14. 12.9												SHA	Dec
2 207 066 202 017 54.6 22750 17 59.6 107509 03. 207513 05.4 207441 119 6 Acces 30. 30. 4. 207513 1 30. 30. 207513 05.3 207513 05. 207											Alpheratz	357°32.0	29°14.7
3 990*120 27*16*57 - 339 32*20*56 18*03 10*533 - 3.04 20*10.5 13.30 Column 1.00 10*53											Ankaa	353°04.7	-42°08.8
1. 1. 1. 1. 1. 1. 1. 1.											Schedar	$349^{\circ}28.1$	56°41.4
1. Sept. 1.											Diphda	348°44.7	-17°49.7
19											Achernar	$335^{\circ}18.7$	-57°05.3
8													
1.											1		
19											1		
10 10 10 10 10 10 10 10													
11 90°91 1 90°91 2 90°92 3 10°31 90°90 1 10°30 1 10°30 1 11°31 8 10°30 1 11°3													
19	10										1		
19 19 19 19 19 19 19 19	11												
14 90 90 90 90 90 90 90 90 90 90 90 90 90	12			N24°27.6		N18°04.7		N06°03.0		N11°13.8			
19 19-31	13	80°36.7		26.9	31°04.9	05.2	271°17.0	02.9		13.9			
18	14	95°39.1		26.2		05.7		02.9	61°40.4	14.0	I		
1.0 1.0	15	110°41.6	37°53.3	• • 25.5	$61^{\circ}06.1$	• • 06.2	$301^{\circ}21.8$	• • 02.8	76°42.5	• • 14.1	1		
1.0 1.0	16		52°57.3	24.7	76°06.7	06.7	316°24.1	02.8	91°44.7	14.1			
19 1 19 1 19 1 19 1 19 1 19 1 19 1 19	17	140°46.5	68°01.3	24.0	91°07.4	07.2	331°26.5	02.7	106°46.9	14.2			
19 10°615 86°03 226 12°066 682 1°313 026 18°613 144 4700 20°70	18	155°49.0	83°05.3	N24°23.3	106°08.0	N18°07.7	346°28.9	N06°02.7	121°49.1	N11°14.3			
180 180	19	170°51.5	98°09.3	22.6		08.2	1°31.3		136°51.3	14.4	1		
22 213'95 4 128'17.2 · · · · · · · · · · · · · · · · · · ·	20	185°53.9	113°13.2	21.9	136°09.2	08.7	16°33.6	02.6	151°53.5	14.5	1		
22 215°1899 189°282 197 181°11 102 61°407 024 197°000 14.8 14.7													
23 23 10 3 18 25 19 18 11 1 10 10 16 17 7 92 19 10 10 10 10 10 10 10													
Sim GHA Ord													
Sum CHA OR CHA O											I		
Sun GHA GHA Dec GHA Dec GHA Dec CHA Dec CHA Dec Dubble 3973.77 613-60.00 0 246'03.8 173'83.2 N24'19.0 190'11.7 N18'10.7 76'43.1 N06''02.4 212'02.2 N11'14.9 Dubble 3973'77 613'80.2 12'2'04.2 N1'14.9 Dubble 3973'77 613'80.2 N24''04.0 N1'14.9 N2''04.0 N2''04	Mer.pa	ass. 07:38	ν 4.0′ <i>d</i> -0	.7′ m-4.11	u 0.6' d0	.5′ m1.34	ν 2.4′ <i>d</i> -0	.0′ m-2.09	ν 2.2′ d0	.1′ m0.50			
Sun GHA Oce GHA Dec C1°22 N1°1°30 C1°30 C1°30 </td <td></td>													
0 246*03.8 173°29.2 N24*19.0 196*11.7 N18*10.7 0**43.1 N06*02.4 212*02.2 N11*14.9 0 penibols 192*21.1 1 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.2 218*41.3 6 1.12 1 12*50.2 0.22 27*08.8 1.51.1 4 00**13.6 32*45.2 16.1 256*14.2 12.6 13.1 13*50.5 0.22 27*11.0 15.2 6 0.21 28*11.1 15.2 6	Sun	CHV	CHV	Doc	CHV	Doc	CHV	Doc	CHV	Doc			
2 267°06.2 188*33.2 11.5 26713.0 11.7 106*49 0.23 227°04.4 15.0 Geroma 175*46.6 17.4 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2													
2 266°08.7 203'37.2 17.5 226°13.0 11.7 106°47.9 2.3 242°06.6 15.1 3 201'11.2 218°41.											Denebola		
3 991"11.2 218"41.2 . 16.6 241"13.6 . 12.1 121"50.2 . 02.2 25"08.8 . 15.1 4 306"13.0 233"45.2 16.1 26"614.2 16.1 136"52.6 02.2 27"211.0 15.2 5 321"16.1 248"40.2 16.1 26"614.2 11.0 136"52.6 02.2 27"211.0 15.2 5 321"16.1 248"40.2 17.1 13.0 15.5 6 336"16.6 263"53.2 124"46 263"15.1 11.0 16.0 16.1 14.0 187"50.1 02.0 317"17.5 15.5 8 6"23.5 244"01.2 13.2 316"16.7 14.6 187"50.1 02.0 332"19.7 15.6 9 21"26.0 300"05.2 11.7 346"18.0 16.5 27"05.8 9 21"26.0 300"05.2 11.7 346"18.0 15.6 22"05.8 11.7 36"31.1 15"30.9 39"33.3 11.0 1"18.6 16.1 242"09.2 01.8 17"26.3 15.9 11.6 51"30.9 39"33.3 11.0 1"18.6 16.1 242"09.2 01.8 17"26.3 15.9 11.6 51"30.9 39"33.3 11.0 1"18.6 16.2 27"01.8 01.7 47"30.6 16.1 140"63.3 3 24"25.3 08.8 46"20.5 11.7 346"18.0 15.2 15.6 131"14"07.3 38"29.3 08.8 46"20.5 11.7 345"3.0 11.7 47"30.6 16.1 140"64.3 2 54"33.3 08.8 46"20.5 11.7 345"3.0 11.7 47"30.6 16.1 140"64.3 2 54"33.3 08.8 46"20.5 11.7 345"3.0 11.7 47"30.6 16.1 140"64.3 2 54"33.3 07.3 76"21.7 11.5 317"21.0 01.6 92"37.2 16.3 151"14"07.3 3"99.3 08.8 01"21.3 10.0 32"23.4 01.5 10"39.4 16.4 151"14"07.3 3"99.3 08.8 01"21.3 10.0 32"23.4 01.5 10"39.4 16.4 151"14"07.7 35"0.5 16.2 151"14"07.7 39"99.3 08.8 01"21.3 10.0 32"23.4 01.5 10"39.4 16.4 151"14"07.7 35"0.5 16.2 151"14"07.7 35"											Gienah	175°40.6	-17°42.2
4 306°13.6 233°45.2 16.1 266°14.2 12.6 136°92.6 0.2.1 272°11.0 15.2 310cht 16.2 13.3 55°45.6 16.3 36°16.1 248°49.2 15.4 271°4.9 13.1 151°55.0 0.2.1 326°13.1 15.3 55°45.6 16.3 36°16.1 248°49.2 13.4 300°16.1 14.1 181°57.7 0.2.0 332°19.7 15.5 54.3 111°15.4 14.1 181°57.7 0.2.0 332°19.7 15.5 54.3 111°15.4 14.1 181°57.7 0.2.0 332°19.7 15.5 54.3 111°15.4 14.1 181°57.7 0.2.0 332°19.7 15.5 54.3 11°16.0 1.1 181°30.1 181°17.1 15.5 1.2 12°04.4 0.10.9 332°19.7 15.6 14.1 151°30.9 339°13.3 11.0 1°18.6 16.1 242°02.0 18.8 11°26.3 15.9 15.7 15.7 15.7 15.7 15.8 15.2 12°04.4 0.10.9 347°19.1 15.7 15.7 15.7 15.8 15.2 12°04.4 0.10.9 347°19.1 15.7 15.7 15.7 15.8 15.2 12°04.4 0.10.9 347°19.1 15.7 15.7 15.7 15.8 15.2 12°04.4 0.10.9 347°19.1 15.7 15.7 15.7 15.8 15.2 15.2 15.2 15.2 15.2 15.2 15.2 15.2											Acrux	172°56.5	-63°15.8
5 321°16.1 248°49.2 15.4 271°14.9 13.1 151°58.0 02.1 287°13.1 15.3 3 Alleria (19.10) 31°16.0 31°16.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 181°59.7 02.0 31°17.5 15.5 46°18.1 14.1 151°20.0 00°05.2 11.7 31°16.6 15.0 22°06.8 01.9 32°19.7 15.6 46°18.1 151°30.9 33°13.3 11.0 1°18.6 16.1 122°04.6 01.8 17°26.3 15.9 46°18.1 151°30.9 33°13.3 11.0 1°18.6 16.1 124°09.2 01.8 17°26.3 15.9 16.2 15.6 12.6 16°19.2 Nils°16.6 25°11.5 No6°01.8 22°28.1 11′6.0 225°11.3 14.9 6°33.3 354°17.3 N24°10.2 16°19.2 Nils°16.6 25°11.5 No6°01.8 32°28.4 Nil'16.0 225°11.5 No6°01.8 17°26.3 15.9 16.2 16°09.7 Nils°16.6 25°11.5 No6°01.8 10°2.0 180°3.3 15.9 10.1 11′40°4.2 25°3.0 08.8 46°20.5 17.5 287°16.3 01.7 62°32.8 16.1 Antara 112°12.1 26°29.7 Nils°16.1 11′40°4.2 25°4.3 08.8 46°20.5 17.5 287°16.3 01.7 62°32.8 16.1 Antara 112°12.1 26°29.7 Nils°16.1 11′40°4.3 25°4.3 3 0°3.3 0°43.7 0°42.1 15.5 317°21.0 11.6 0.92°37.2 16.3 Spill 11′40°4.2 25°4.3 0°4.3 0°4.3 15°4.5 1.0 14°4.5 11′41′45.5 0°43.4 14.1 N24°05.8 01°23.0 Nils°15.5 347°25.7 No6°01.5 10°79.4 16.4 51.2 14°4.4 14.1 N24°05.8 01°23.0 Nils°15.5 347°25.7 No6°01.5 10°4.3 16°4.1 11′6.5 Spill 11′40°4.4 04.3 136°44.2 10°4.2 11′40°4.2											Gacrux	$171^{\circ}48.1$	$-57^{\circ}16.7$
8 336°18.0 286°53.2 NA4"14.6 286°15.5 N18"13.6 166°57.3 N6°02.1 302°15.3 N11"15.4 1 181°57.7 20.3 137°17.5 15.5 15.5 14.6 197°02.1 31.2 316°16.7 14.1 181°57.7 20.3 137°17.5 15.5 15.5 14.6 197°02.1 302°18.7 15.5 15.5 14.6 197°02.1 317°17.5 15.5 15.5 14.6 197°02.1 302°18.7 15.5 15.5 14.6 197°02.1 302°18.7 15.5 15.5 14.6 197°02.1 317°17.5 15.5 15.5 14.6 15.9 12.0 15.7 15.5 15.5 14.6 15.9 12.0 15.7 15.5 15.5 15.5 15.5 15.5 15.5 15.5											Alioth	$166^{\circ}10.3$	55°48.5
8 6 23.5 294°01.2 13.9 301°16.1 14.1 181°59.7 02.0 337°17.5 15.5 15.8 Action 18.9 9.9 19.0 6.5 10.3 0.2 12.4 331°17.4 15.1 19.0 15.6 227°06.8 0.1.9 32°19.7 15.6 15.7 15.6 15.8 14.0 19.9 12.0 13.2 19.0 15.7 15.6 15.8 15.9 19.0 15.6 15.0 19.0 15.6 15.0 19.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.6 15.0 15.0 15.0 15.0 15.0 15.0 15.0 15.0											Spica	$158^{\circ}19.1$	$-11^{\circ}18.7$
7 \$51°20. 28°672. 3139 \$30°161. 14.1 \$18°59.7 \$0.20 \$31°17.5 \$15.5 \$430°162. 3139 \$30°161. 14.1 \$18°59.7 \$0.20 \$32°19.7 \$15.6 \$42°60.2 \$12°04.4 \$0.19 \$34°21.9 \$15.6 \$42°09.2 \$11.7 \$31°16.7 \$15.6 \$22°06.8 \$0.19 \$32°19.7 \$15.6 \$42°09.2 \$11.7 \$31°16.7 \$15.6 \$22°06.8 \$0.19 \$32°21.9 \$15.7 \$42°10.1 \$15.8 \$11°16.0 \$30°13.3 \$15.9 \$42°11.5 \$18°30.9 \$30°13.3 \$11.0 \$1°18.6 \$16.1 \$22°09.2 \$0.18 \$17°26.3 \$15.9 \$42°11.6 \$11.0 \$10°30.3 \$15.9 \$42°11.5 \$11°10.0 \$10°19.2 \$118°16.6 \$25°11.5 \$10°50.1 \$10°20.3 \$11°10.0 \$10°19.2 \$118°16.6 \$25°11.5 \$10°50.1 \$10°20.3 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$11°10.0 \$10°10.0 \$1											Alkaid	152°49.5	49°10.4
8 6°23.5 294°01.2 13.2 316°16.7 14.6 197°02.1 02.0 332°19.7 15.6 9 21°26.0 30°06.2 · 12.4 331°17.4 15.1 21°20.4 · 01.9 347°21.9 15.7 10 36°28.4 324°09.2 11.7 346°18.0 15.6 227°06.8 01.9 2°24.1 15.8 115°30.9 339°13.3 11.0 1°18.6 16.1 24°09.2 01.8 17°02.3 15.9 115 11°30.9 339°13.3 11.0 1°18.6 16.1 24°09.2 01.8 17°02.2 4 11°16.0 12 66°33.3 354°17.3 724°10.2 16°19.2 N18°16.6 257°11.5 N06°01.8 32°24.4 N11°16.0 13 81°35.8 0°21.3 09.5 31°19.8 17.0 27°1.9 01.7 47°30.6 16.1 14 96°38.3 24°25.3 08.8 46°20.5 17.5 287°16.3 01.7 62°32.8 16.1 15 111°40.7 30°29.3 · 08.0 61°21.1 18.0 30°18.6 01.6 77°35.0 16.2 15 111°40.7 30°29.3 · 08.0 61°21.1 18.0 30°18.6 01.6 77°35.0 16.2 16 126°43.2 56°33.3 07.3 76°21.7 18.5 317°21.0 01.6 92°37.2 16.3 18 156°48.1 84°41.4 N24°05.8 106°32.0 N18°19.5 347°25.7 N06°01.5 122°41.6 N11°16.5 18 156°48.1 84°41.4 N24°05.8 106°23.0 N18°19.5 347°25.7 N06°01.5 122°41.6 N11°16.5 19 117°19.6 99°45.4 05.1 121°23.6 02.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.1 01.4 137°43.8 16.6 19 177°90.6 99°45.4 05.1 121°23.6 20.0 2°28.3 10.1 127°30.5 16.9 N06°01.5 12°29.0 N06°01.5 121°23.6 N06°01.5 121°23.6 N06°01.5 121°23.6 N06°01.5 121°23.6 N06°01.5 121°23.6 N06°01.5 121°23.6 N06°01.5 N02°01.4 152°45.9 16.6 N06°01.5 N02°01.4 N06°01.5 N06°01											1		
9 21°26.0 30°09.52 12.4 331°17.4 · 15.1 212°04.4 · 0.19 34°21.9 · 15.7 15.8 15.0 10 30°24.4 324°09.2 11.7 34°18.0 15.6 22°09.2 01.8 17°26.3 15.9 15.8 15.7 15.9 15.7 15.9 15.7 15.9 15.7 15.9 15.7 15.9 15.8 15.8 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9													
11 15 28 324 105 39 393 313 311 1 17 386 161 242 202 21 8 17 22 241 15 8 15 16 242 202 21 8 17 22 22 28 11 10 28 22 28 11 26 23 30 33 34 17 37 27 27 23 30 31 31 31 31 31 31 3	9			• • 12.4		• • 15.1		• • 01.9		• • 15.7			
11 5 5 9 39 33 39 33 34 11.0	10		324°09.2	11.7		15.6		01.9		15.8	1		
12 66°33.3 354°17.3 NA*10.2 16°19.2 N18°166 257°11.5 N06°01.8 32°28.4 N11°16.0 136°82.6 -16°09.7 114 96°38.3 394°17.3 N24°10.2 16°19.2 N18°166 257°11.5 N06°01.8 14°96°10.6 16.1 14°19.4 196°38.3 24°25.3 08.8 46°20.5 17.5 287°16.3 01.7 4°20.6 16.1 14°19.4 196°38.3 3°3.0 0.3 6°21.7 18.5 31°21.0 01.6 0°2°37.2 16.3 16.1 16.3 16.1 16.3 16.1 16.3 16.1 16.3 16.2 16.3 16.1 16.3 16.2 16.3 16.1 16.3 16.2 16.3 16.2 16.3 16.1 16.3 16.2 16.3 16.1 16.3 16.2 16.3 16.3 16.1 16.3 16.3 16.1 16.3 16.2 16.3 16.1 16.3 16.2 16.2 16.3 16.3 16.1 16.3 16.2 16.3 16.2 16.3 16.2 16.3 16.3 16.1 16.3 16.2 16.2 16.2 16.2 16.2 16.2 16.2 16.2	11	51°30.9	339°13.3				242°09.2	01.8	17°26.3	15.9			
33 81°35.8 9°21.3 0955 31°19.8 46°20.5 17.0 272°13.9 01.7 47°30.6 16.1 141°40.7 39°29.3 0.8.0 46°20.5 17.5 287°16.3 01.7 62°32.8 16.1 11°40.7 39°29.3 0.8.0 61°21.1 018.0 302°18.6 0.01.6 77°35.0 16.2 16.2 16.1 141°45.7 69°37.4 06.6 9°12.3 19.0 332°23.4 01.5 107°39.4 16.4 16.4 17.2 18.5 31°21.0 01.6 92°37.2 16.3 17°10.0 16.9 16.2 16.2 16.2 16.2 16.2 16.2 16.2 16.2	12	66°33.3	354°17.3	N24°10.2	$16^{\circ}19.2$	N18°16.6		N06°01.8	32°28.4	N11°16.0	I		
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wer.pass. 07:31 ν 4.0′ d -0.1′ m -3.97 ν 0.0′ d 0.5′ m 1.35 ν 2.4′ d -0.1′ m -2.08 ν 2.2′ d 0.1′ m 0.50													
	ivier.pa	ass. U/:31	ν4.0′ d-0	.1' m-3.91	νυ.6′ d0	.5′ m1.35	ν2.4′ d-0	.1 m-2.08	ν2.2' d0	.1. MO.50			

h	Sui	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.4	N21°20.9	144°21.9	5.9'	N24°20.8	-5.6'	58.4
1	195°42.3	21.3	158°46.8	5.9'	24° 15.2	-5.8'	58.4'
2	210°42.2	21.7	173°11.8	6.0'	24°09.4	-5.9'	58.5'
3	225°42.1	• • 22.1	187°36.8	6.0'	24°03.4	-6.1'	58.5'
4	240°42.1 255°42.0	22.5 22.9	202°01.8 216°26.9	6.1' 6.1'	23°57.3 23°51.1	-6.3'	58.5'
5 6	255 42.0 270°41.9	N21°23.3	210 20.9 230°52.0	6.2'	23 51.1 N23°44.7	-6.4' -6.6'	58.5' 58.5'
7	285°41.8	23.7	245°17.1	6.2'	23°38.1	-6.7'	58.5'
8	300°41.8	24.2	259°42.4	6.3'	23°31.4	-6.9'	58.5'
9	315°41.7	• • 24.6	274°07.6	6.3'	23°24.5	-7.0'	58.6'
10	330°41.6	25.0	288°32.9	6.4'	23° 17.5	-7.2'	58.6'
11	345°41.5	25.4	302°58.3	6.4'	23°10.4	-7.3'	58.6'
12	0°41.5 15°41.4	N21°25.8 26.2	317°23.7 331°49.1	6.5'	N23°03.1 22°55.6	-7.5'	58.6'
13 14	30°41.3	26.2 26.6	331°49.1 346°14.6	6.5' 6.6'	22°55.6 22°48.0	-7.6' -7.7'	58.6' 58.6'
15	45°41.2	27.0	0°40.2	6.6	22°40.0	-7.7 -7.9'	58.6'
16	60°41.1	27.4	15°05.8	6.7'	22°32.3	-8.0'	58.7'
17	75°41.1	27.8	29°31.5	6.7'	22°24.3	-8.2'	58.7'
18	90°41.0	N21°28.2	43°57.2	6.8'	N22°16.1	-8.3'	58.7'
19	105°40.9	28.6	58°23.0	6.9'	22°07.8	-8.5'	58.7'
20	120°40.8	29.0	72°48.9 87°14.8	6.9'	21°59.4	-8.6'	58.7'
21 22	135°40.8 150°40.7	· · 29.4 29.8	87°14.8 101°40.8	7.0' 7.0'	21°50.8 21°42.0	-8.7' -8.9'	58.7' 58.7'
23	165°40.6	30.2	101 40.8 116°06.8	7.0 7.1'	21°42.0	-0.9 -9.0'	58.8'
	SD = 15.8'	d = 0.4'			O = 15.9'		
	SD = 15.8'	a = 0.4		51	J = 15.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°40.5 195°40.4	N21°30.6 31.0	130°32.9 144°59.1	7.2' 7.2'	N21°24.1 21°15.0	-9.1' -9.3'	58.8' 58.8'
2	210°40.4	31.4	159°25.3	7.3'	21° 15.0	-9.3 -9.4'	58.8'
3	225°40.3	• • 31.8	173°51.6	7.4'	20°56.3	-9.5'	58.8'
4	240°40.2	32.2	188°17.9	7.4'	20°46.8	-9.7'	58.8'
5	255°40.1	32.6	202°44.3	7.5'	20°37.1	-9.8'	58.8'
6	270°40.0 285°40.0	N21°33.0	217°10.8 231°37.4	7.5'	N20°27.3 20°17.4	-9.9'	58.8'
7 8	285°40.0 300°39.9	33.4 33.8	231°37.4 246°04.0	7.6' 7.7'	20°17.4 20°07.4	-10.0' -10.2'	58.8' 58.9'
9	315°39.8	34.1	260°30.7	7.7'	19°57.2	-10.2	58.9'
10	330°39.7	34.5	274°57.4	7.8'	19°46.9	-10.4	58.9'
11	345°39.6	34.9	289°24.2	7.9'	19°36.5	-10.5'	58.9'
12	0°39.5	N21°35.3	303°51.1	8.0'	N19°26.0	-10.6'	58.9'
13 14	15°39.5 30°39.4	35.7 36.1	318°18.1 332°45.1	8.0' 8.1'	19°15.4 19°04.6	-10.8'	58.9' 58.9'
15	45°39.3	36.5	332 45.1 347°12.2	8.2'	19 04.0 18°53.7	-10.9' -11.0'	58.9'
16	60°39.2	36.9	1°39.3	8.2'	18° 42.7	-11.1'	58.9'
17	75°39.1	37.3	$16^{\circ}06.5$	8.3'	18°31.6	-11.2'	58.9'
18	90°39.1	N21°37.6	30°33.8	8.4'	N18°20.4	-11.3'	59.0'
19	105°39.0	38.0	45°01.2	8.4'	18°09.1	-11.4'	59.0'
20 21	120°38.9 135°38.8	38.4 •• 38.8	59°28.6 73°56.1	8.5' 8.6'	17°57.6 17°46.1	-11.5' -11.7'	59.0' 59.0'
22	150°38.7	39.2	88°23.7	8.6'	17 40.1 17°34.4	-11. <i>1</i> -11.8'	59.0'
23	165°38.6	39.6	102°51.3	8.7'	17°22.7	-11.9'	59.0'
	SD = 15.8'	d = 0.4'		SI	O = 16.0'		
Mon 0	GHA 180°38.6	Dec N21°39.9	GHA 117°19.0	ν 8.8'	Dec N17° 10.8	d -12.0'	HP 59.0'
1	195°38.5	40.3	131°46.8	8.8'	16°58.9	-12.1'	59.0'
2	210°38.4	40.7	$146^{\circ}14.6$	8.9'	16°46.8	-12.2'	59.0'
3	225°38.3	• • 41.1	160°42.5	9.0'	16°34.6	-12.3'	59.0'
4	240°38.2	41.5	175°10.4	9.0'	16°22.4	-12.4'	59.0'
5 6	255°38.1 270°38.0	41.9 N21°42.2	189°38.5 204°06.6	9.1' 9.2'	16° 10.0 N15° 57.6	-12.4' -12.5'	59.0' 59.1'
7	270 38.0 285°38.0	N21 42.2 42.6	204 06.6 218°34.7	9.2 9.2'	15° 45.0	-12.5 -12.6'	59.1'
8	300°37.9	43.0	233°02.9	9.3'	15°32.4	-12.7'	59.1'
9	315°37.8	• • 43.4	247°31.2	9.4'	15° 19.7	-12.8'	59.1'
10	330°37.7	43.7	261°59.6	9.4'	15°06.9	-12.9'	59.1'
11	345°37.6 0°37.5	44.1 N21°44.5	276°28.0	9.5' 9.5'	14°54.0 N14°41.0	-13.0' -13.1'	59.1'
12 13	0°37.5 15°37.4	N21 44.5 44.9	290°56.5 305°25.0	9.5'	14° 27.9	-13.1 -13.2'	59.1' 59.1'
14	30°37.4	45.2	319°53.6	9.7'	14° 14.8	-13.2'	59.1
15	45°37.3	• • 45.6	334°22.3	9.7'	14°01.5	-13.3'	59.1'
16	60°37.2	46.0	348°51.0	9.8'	13°48.2	-13.4'	59.1'
17	75°37.1	46.3	3°19.8	9.8'	13°34.8	-13.5'	59.1'
18 19	90°37.0 105°36.9	N21°46.7 47.1	17°48.6 32°17.5	9.9' 10.0'	N13°21.4 13°07.8	-13.5' -13.6'	59.1' 59.1'
20	120°36.8	47.5	46°46.5	10.0'	12°54.2	-13.7	59.1
21	135°36.7	• • 47.8	61°15.5	10.1'	12°40.5	-13.8'	59.1'
22	150°36.7	48.2	75°44.6	10.1'	12°26.8	-13.8'	59.1'
23	165°36.6	48.6	90°13.7	10.2'	12°12.9	-13.9'	59.1'
	SD = 15.8'	d = 0.4'		SI	O = 16.1'		

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

Lat.		Moonris	е		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°			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
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		80:00
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
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
S 60°	12:02	12:17	12:26	18:02	19:43	21:23

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-25%
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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tuo	GHA	GHA	Dec	GHA	Dec	GHA	Doc	GHA	Dec		SHA	Dos
Tue							Dec				ЗПА	Dec
0	248°02.1	176° 42.5	N23°43.2	196°41.6	N18°33.9	78°36.6	N05°59.9	213°47.2	N11°19.2	Alpheratz	357°32.0	29°14.7
1	263°04.5	191°46.6	42.4	211°42.2	34.4	93°38.9	59.8	228°49.4	19.3	Ankaa	353°04.7	-42°08.8
2	278°07.0	206° 50.7	41.7	226°42.9	34.9	108°41.3	59.8	243°51.6	19.4	Schedar	349°28.1	56°41.4
3	293°09.5	221°54.7	• • 40.9	241°43.5	• • 35.3	123°43.6	• • 59.7	258°53.8	• • 19.5	Diphda	348° 44.7	-17°49.7
4	308°11.9	236°58.8	40.1	256°44.1	35.8	138°46.0	59.7	273°56.0	19.6	Achernar	335°18.7	-57°05.3
5	323°14.4	252°02.8	39.4	271°44.7	36.3	153°48.3	59.6	288°58.2	19.6	Hamal	327°48.3	23°35.7
6	338°16.8	267°06.9	N23°38.6	286°45.3	N18°36.8	168°50.7	N05°59.6	304°00.3	N11°19.7	1	312°59.7	89°22.8
7	353°19.3	282°10.9	37.8	301°46.0	37.2	183°53.1	59.5	319°02.5	19.8	Polaris		
8	8°21.8	$297^{\circ}15.0$	37.1	316°46.6	37.7	198°55.4	59.4	334°04.7	19.9	Acamar	315°10.1	-40°11.4
9	23°24.2	$312^{\circ}19.1$	• • 36.3	331°47.2	• • 38.2	213°57.8	• • 59.4	349°06.9	• • 20.0	Menkar	314°03.6	4°12.0
10	38°26.7	327°23.1	35.5	346°47.8	38.7	229°00.1	59.3	4°09.1	20.1	Mirfak	308°24.7	49°57.6
11	53°29.2	342°27.2	34.7	1°48.4	39.1	244°02.5	59.3	19°11.3	20.2	Aldebaran	290°36.8	16°33.9
12	68°31.6	357°31.2	N23°34.0	16°49.1	N18°39.6	259°04.8	N05°59.2	34°13.5	N11°20.3	Rigel	$281^{\circ}01.5$	-8°10.2
13	83°34.1	12°35.3		31°49.7		274°07.2	59.2	49°15.7		Capella	280°18.3	46°01.5
			33.2		40.1	289°09.5			20.4	Bellatrix	278°20.2	6°22.4
14	98°36.6	27°39.4	32.4	46°50.3	40.5	289 09.5 304°11.9	59.1	64°17.9	20.4	Elnath	277°58.7	28°37.8
15	113°39.0	42°43.4	• • 31.6	61°50.9	• • 41.0		• • 59.0	79°20.1	• • 20.5	Alnilam	275°35.3	$-1^{\circ}11.1$
16	128°41.5	57° 47.5	30.9	76°51.5	41.5	319°14.2	59.0	94°22.2	20.6	Betelgeuse	270°49.4	7°24.6
17	143°43.9	72°51.5	30.1	91°52.2	42.0	334°16.6	58.9	109°24.4	20.7	Canopus	263°51.7	-52°42.8
18	158°46.4	87°55.6	N23°29.3	106°52.8	N18°42.4	349°18.9	N05°58.9	124°26.6	N11°20.8	Sirius	258° 24.1	-16°45.5
19	173°48.9	102°59.7	28.5	121°53.4	42.9	4°21.3	58.8	139°28.8	20.9	Adhara	255°04.0	-29°00.8
20	188°51.3	118°03.7	27.7	136°54.0	43.4	19°23.6	58.8	154°31.0	21.0	1	244°48.2	5°09.0
21	203°53.8	133°07.8	• • 27.0	151°54.6	• • 43.8	34°26.0	• • 58.7	169°33.2	• • 21.1	Procyon		
22	218°56.3	148°11.9	26.2	166°55.3	44.3	49°28.3	58.6	184°35.4	21.2	Pollux	243°14.2	27°57.4
23	233°58.7	163° 15.9	25.4	181°55.9	44.8	64°30.7	58.6	199°37.6	21.2	Avior	234°13.9	-59°36.4
										Suhail	222°44.4	-43°33.2
Mer.p	ass. 07:27	ν 4.1′ d-0	.8′ m-3.78	$ u$ 0.6 $^{\prime}$ d0	.5′ m1.35	ν 2.4′ <i>d</i> -0	.1′ m-2.07	ν 2.2′ d0	.1' m 0.50	Miaplacidus	221°38.0	-69°50.4
										Alphard	217°45.1	-8°47.1
Wed	CHA	GHA	Das	GHA	Dee	GHA	Doo	GHA	Doo	Regulus	207°31.6	11°49.6
	GHA		Dec		Dec		Dec		Dec	Dubhe	193°37.7	61°36.0
0	249°01.2	178°20.0	N23°24.6	196°56.5	N18°45.3	79°33.0	N05°58.5	214°39.8	N11°21.3	Denebola	$182^{\circ}22.1$	14°24.7
1	264°03.7	193°24.1	23.8	211°57.1	45.7	94°35.4	58.5	229°42.0	21.4	Gienah	175°40.6	-17°42.2
2	279°06.1	208°28.1	23.1	226°57.7	46.2	109°37.7	58.4	244°44.2	21.5	Acrux	172°56.5	-63°15.8
3	294°08.6	223°32.2	• • 22.3	241°58.4	• • 46.7	124°40.1	• • 58.4	259°46.3	• • 21.6	Gacrux	171°48.2	-57°16.7
4	309°11.1	238°36.3	21.5	256°59.0	47.1	139°42.4	58.3	274°48.5	21.7	Alioth	166° 10.3	55°48.5
5	324°13.5	253°40.3	20.7	271°59.6	47.6	154°44.8	58.2	289°50.7	21.8	Spica	158° 19.2	-11°18.7
6	339°16.0	268°44.4	N23°19.9	287°00.2	N18°48.1	169°47.1	N05°58.2	304°52.9	N11°21.9	Alkaid	150° 19.2	49°10.4
7	354°18.4	283°48.5	19.1	302°00.8	48.5	184°49.5	58.1	319°55.1	21.9	1	132 49.5 148°31.4	
8	9°20.9	298°52.5	18.3	317°01.5	49.0	199°51.8	58.1	334°57.3	22.0	Hadar		-60°30.8
9	24°23.4	313°56.6	17.6	332°02.1	• • 49.5	214°54.2	• • 58.0	349°59.5	22.1	Menkent	147°54.0	-36°30.8
10	39°25.8	329°00.7	16.8	347°02.7	49.9	229°56.5	57.9	5°01.7	22.2	Arcturus	145°45.1	19°02.0
11	54°28.3	344°04.8	16.0	2°03.3	50.4	244°58.9	57.9	20°03.9	22.3	Rigil Kent.	139°35.8	-60°57.4
12	69°30.8	359°08.8	N23°15.2	17°03.9	N18°50.9	260°01.2	N05°57.8	35°06.1	N11°22.4	Kochab	$137^{\circ}19.0$	74°02.4
										Zuben'ubi	$136^{\circ}52.6$	-16°09.7
13	84°33.2	14° 12.9	14.4	32°04.5	51.3	275°03.6	57.8	50°08.3	22.5	Alphecca	$126^{\circ}01.1$	26°37.1
14	99°35.7	29° 17.0	13.6	47°05.2	51.8	290°05.9	57.7	65°10.4	22.6	Antares	$112^{\circ}12.0$	-26°29.7
15	114°38.2	44°21.0	• • 12.8	62°05.8	• • 52.2	305°08.3	• • 57.7	80°12.6	• • 22.7	Atria	107°03.2	-69°04.6
16	129°40.6	59°25.1	12.0	77°06.4	52.7	320°10.6	57.6	95°14.8	22.7	Sabik	101°59.3	-15°45.6
17	144°43.1	74°29.2	11.2	92°07.0	53.2	335°13.0	57.5	110°17.0	22.8	Shaula	96°06.2	-37°07.4
18	159°45.5	89°33.2	N23°10.4	107°07.6	N18°53.6	$350^{\circ}15.3$	N05°57.5	125°19.2	N11°22.9	Rasalhague	95°55.6	12°32.4
19	174°48.0	104°37.3	09.6	122°08.3	54.1	5°17.7	57.4	140°21.4	23.0	_	90°40.4	51°29.0
20	189°50.5	119°41.4	08.8	137°08.9	54.6	20°20.0	57.4	155°23.6	23.1	Eltanin		
21	204°52.9	134°45.5	• • 08.1	152°09.5	• • 55.0	35°22.3	• • 57.3	170°25.8	• • 23.2	Kaus Aust.	83°28.5	-34°22.1
22	219°55.4	149°49.5	07.3	167°10.1	55.5	50°24.7	57.2	185°28.0	23.3	Vega	80°31.0	38°48.5
23	234°57.9	164°53.6	06.5	182°10.7	55.9	65°27.0	57.2	200°30.2	23.4	Nunki	75°44.0	-26°15.5
25	254 51.9									Altair	61°57.0	8°56.6
Mer.p	ass. 07:23	ν 4.1′ d-0	.8′ m-3.51	ν 0.6′ d0	.5' m 1.35	ν 2.4′ d-0	.1′ m-2.07	ν 2.2′ d0	$.1^\prime$ m 0.50	Peacock	$53^{\circ}01.1$	-56°38.3
										Deneb	49°23.6	45°22.8
										Enif	33°36.0	10°00.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.5$	-46°49.1
0	250°00.3	179°57.7	N23°05.7		N18°56.4	80°29.4	N05°57.1	215°32.4		Fomalhaut	$15^{\circ}11.5$	-29°28.1
1	265°02.8	195°01.7	04.9	212°12.0	56.9	95°31.7	57.1	230°34.6	23.5	Scheat	13°42.5	28°14.1
2	280°05.3	210°05.8	04.1	227°12.6	57.3	110°34.1	57.0	245°36.7	23.6	Markab	13°27.2	15°21.5
3	295°07.7	225°09.9	• • 03.3	242°13.2	• • 57.8	125°36.4	• • 56.9	260°38.9	• • 23.7			
4	$310^{\circ}10.2$	240°13.9	02.5	257°13.8	58.2	140°38.7	56.9	275°41.1	23.8	May 30 Tue	SHA	Mer.pass
5	$325^{\circ}12.7$	255°18.0	01.7	272°14.4	58.7	155°41.1	56.8	290°43.3	23.9	Venus		12:10
6	$340^{\circ}15.1$	270°22.1	N23°00.9	287°15.0	N18°59.2	170°43.4	N05°56.7	305°45.5	N11°24.0	Mars	$308^{\circ}39.6$	10:53
7	355°17.6	285°26.1	23°00.1	302°15.7	18°59.6	185°45.8	56.7	320°47.7	24.1	Jupiter	190°34.5	18:43
8	10°20.0	300°30.2	22°59.3	317°16.3	19°00.1	200°48.1	56.6	335°49.9	24.1	Saturn	325°45.2	09:43
9	25°22.5	315°34.3	58.5	332°16.9	. 00.5	215°50.5	• • 56.6	350°52.1	• • 24.2			
	40°25.0	330°38.3		347°17.5	01.0	230°52.8	56.5	5°54.3		May 31 Wed	SHA	Mer.pass
10			57.7 56.0						24.3	Venus	$289^{\circ}18.8$	12:03
11	55°27.4	345°42.4	56.9	2°18.1	01.5	245°55.1	56.4	20°56.5	24.4	Mars	307°55.3	10:52
12	70°29.9	0°46.5	N22°56.1	17°18.7	N19°01.9	260°57.5	N05°56.4	35°58.7	N11°24.5	Jupiter	190°31.8	18:39
13	85°32.4	15°50.5	55.3	32°19.4	02.4	275°59.8	56.3	51°00.9	24.6	Saturn	325°38.6	09:40
14	100°34.8	30° 54.6	54.5	47°20.0	02.8	291°02.2	56.3	66°03.1	24.7	Jutuill	50.0	33.10
15	115°37.3	45°58.7	• • 53.7	62°20.6	• • 03.3	306°04.5	• • 56.2	81°05.3	• • 24.8	Jun 01 Thu	SHA	Mer.pass
16	130°39.8	61°02.7	52.9	77°21.2	03.7	321°06.8	56.1	96°07.4	24.8	Venus	289°57.3	11:57
17	145°42.2	76°06.8	52.1	92°21.8	04.2	336°09.2	56.1	$111^{\circ}09.6$	24.9	Mars	307°11.0	10:51
18	160°44.7	91°10.9	N22°51.3	107°22.4	N19°04.6	351°11.5	N05°56.0	126°11.8	N11°25.0	Jupiter	190°29.0	18:35
19	175°47.2	$106^{\circ}14.9$	50.5	122°23.1	05.1	6°13.9	55.9	141°14.0	25.1	Saturn	325°32.0	09:36
20	190°49.6	121°19.0	49.7	137°23.7	05.6	21°16.2	55.9	156°16.2	25.2	Jutuili	320 32.0	33.30
21	205°52.1	136°23.1	• • 48.9	152°24.3	• • 06.0	36°18.5	• • 55.8	171°18.4	25.3	Horizont	al parallax	
22	220°54.5	151°27.1	48.0	167°24.9	06.5	51°20.9	55.8	186°20.6	25.4		Venus:	0.5
23	235°57.0	166°31.2	47.2	182°25.5	06.9	66°23.2	55.7	201°22.8	25.5		Mars:	0.1
										<u> </u>		
Mer.p	ass. 07:19	ν 4.1′ d-0	.8′ m-3.21	ν 0.6′ d0	.5′ m1.36	$\nu 2.3' \ d-0$.1′ m-2.06	ν 2.2′ d0	.1' m 0.50			

h	Sui	า			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.5	N21°48.9	104°42.9	10.2'	N11°59.0	-14.0'	59.2'
1	195°36.4	49.3	$119^{\circ}12.1$	10.3'	11°45.1	-14.0'	59.2'
2	210°36.3	49.7	133°41.4	10.3'	11°31.0	-14.1'	59.2'
3	225°36.2	• • 50.0	148° 10.7	10.4'	11°16.9	-14.2'	59.2'
4	240°36.1	50.4	162°40.1	10.4'	11°02.8	-14.2'	59.2'
5	255°36.0	50.7	177°09.6	10.5'	10°48.5	-14.3'	59.2'
6	270°35.9 285°35.9	N21°51.1 51.5	191°39.0 206°08.6	10.5' 10.6'	N10°34.3 10°19.9	-14.3' -14.4'	59.2' 59.2'
7 8	205 35.9 300°35.8	51.5 51.8	200 08.0 220°38.2	10.6'	10 19.9 10°05.5	-14.4 -14.5'	59.2'
9	315° 35.7	52.2	235°07.8	10.7	09°51.1	-14.5'	59.2'
10	330°35.6	52.6	249°37.5	10.7'	09°36.6	-14.6'	59.2'
11	345°35.5	52.9	264°07.2	10.8'	09°22.0	-14.6'	59.2'
12	0°35.4	N21°53.3	278°37.0	10.8'	N09°07.4	-14.7'	59.2'
13	15°35.3	53.6	293°06.8	10.8'	08°52.7	-14.7'	59.2'
14	30°35.2	54.0	307°36.6	10.9'	08°38.0	-14.8'	59.2'
15	45°35.1 60°35.0	· · 54.3 54.7	322°06.5 336°36.4	10.9'	08°23.3 08°08.5	-14.8'	59.2' 59.2'
16 17	75°35.0	54. <i>1</i> 55.1	351°06.4	11.0' 11.0'	06 06.5 07°53.6	-14.8' -14.9'	59.2'
18	90°34.9	N21°55.4	5°36.4	11.0'	N07°38.7	-14.9'	59.2'
19	105°34.8	55.8	20°06.4	11.1'	07°23.8	-15.0'	59.2'
20	120°34.7	56.1	34°36.5	11.1'	07°08.9	-15.0'	59.2'
21	135°34.6	• • 56.5	49°06.6	11.1'	06°53.9	-15.0'	59.2'
22	150°34.5	56.8	63°36.8	11.2'	06°38.8	-15.1'	59.2'
23	165°34.4	57.2	78°06.9	11.2'	06°23.7	-15.1'	59.2'
	SD = 15.8'	d = 0.4'		SI	O = 16.1'		
\\/od	GHA	Dan	CHA		Dec		шп
Wed 0	GНА 180°34.3	Dec N21°57.5	GHA 92°37.1	u 11.2'	Dec N06°08.6	d -15.1'	HP 59.2'
1	195° 34.2	57.9	107° 07.4	11.3'	05°53.5	-15.1 -15.2'	59.2'
2	210°34.1	58.2	121°37.7	11.3'	05°38.3	-15.2'	59.2'
3	225°34.0	• • 58.6	136°07.9	11.3'	05°23.1	-15.2'	59.2'
4	240°33.9	58.9	150°38.3	11.3'	05°07.9	-15.3'	59.2'
5	255°33.8	59.3	165°08.6	11.4'	04°52.6	-15.3'	59.2'
6	270°33.8	N21°59.6	179°39.0	11.4'	N04°37.3	-15.3'	59.2'
7	285°33.7	22°00.0	194°09.4	11.4'	04°22.0	-15.3'	59.2'
8 9	300°33.6 315°33.5	00.3	208°39.8 223°10.2	11.4' 11.5'	04°06.7 03°51.3	-15.4' -15.4'	59.2' 59.2'
10	330° 33.4	01.0	223 10.2 237°40.7	11.5'	03°36.0	-15.4'	59.2'
11	345° 33.3	01.0	252°11.1	11.5'	03°20.6	-15.4'	59.2'
12	0°33.2	N22°01.7	266°41.6	11.5'	N03°05.2	-15.4'	59.2'
13	15°33.1	02.0	281°12.1	11.5'	02°49.7	-15.4'	59.2'
14	30°33.0	02.4	295°42.7	11.5'	02°34.3	-15.5'	59.2'
15	45°32.9	• • 02.7	310°13.2	11.5'	02°18.9	-15.5'	59.2'
16	60°32.8	03.0	324°43.7	11.6'	02°03.4	-15.5'	59.2'
17	75°32.7 90°32.6	03.4 N22°03.7	339°14.3 353°44.9	11.6' 11.6'	01°47.9 N01°32.4	-15.5' -15.5'	59.2' 59.2'
18 19	90 32.6 105°32.5	N22 03.7 04.0	353 44.9 8°15.5	11.6'	01°17.0	-15.5'	59.2'
20	103 32.3 120°32.4	04.0	22°46.0	11.6'	01°01.5	-15.5'	59.2'
21	135°32.3	• • 04.7	37°16.6	11.6'	00°46.0	-15.5'	59.2'
22	150°32.2	05.1	51°47.2	11.6'	00°30.5	-15.5'	59.2'
23	165°32.1	05.4	$66^{\circ}17.8$	11.6'	00°15.0	-15.5'	59.2'
	SD = 15.8'	d = 0.3'		SI	D = 16.2'		
	CUA		CIIA		Б.	,	
Thu 0	GHA 180°32.0	Dec N22°05.7	GHA 80°48.4	u 11.6'	Dec \$00°00.5	<i>d</i> 15.5'	HP 59.2'
1	180 32.0 195°31.9	06.1	95°19.0	11.6'	00°16.0	15.5'	59.2'
2	210° 31.9	06.4	109°49.6	11.6'	00°31.5	15.5'	59.2'
3	225°31.8	• • 06.7	$124^{\circ}20.3$	11.6'	00°47.0	15.5'	59.2'
4	240°31.7	07.1	$138^{\circ}50.9$	11.6'	$01^{\circ}02.5$	15.5'	59.2'
5	255°31.6	07.4	153°21.5	11.6'	01°18.0	15.5'	59.2'
6	270°31.5	N22°07.7	167°52.1	11.6'	S01°33.5	15.5'	59.2'
7	285°31.4 300°31.3	08.1 08.4	182°22.7 196°53.2	11.6' 11.6'	01°49.0 02°04.4	15.5' 15.4'	59.2' 59.2'
8 9	300°31.3 315°31.2	08.7	211°23.8	11.6'	02°04.4 02°19.9	15.4' 15.4'	59.2' 59.2'
10	330° 31.1	09.0	225°54.4	11.6'	02 19.9 02°35.3	15.4	59.2'
11	345°31.0	09.4	240°25.0	11.6'	02°50.7	15.4'	59.2'
12	0°30.9	N22°09.7	254°55.5	11.5'	S03°06.1	15.4'	59.2'
13	15°30.8	10.0	$269^{\circ}26.0$	11.5'	$03^{\circ}21.5$	15.4'	59.2'
14	30°30.7	10.3	283°56.6	11.5'	03°36.9	15.3'	59.2'
15	45°30.6	• • 10.7	298°27.1	11.5'	03°52.2	15.3'	59.1'
16	60°30.5	11.0	312°57.6	11.5'	04°07.5	15.3'	59.1'
17	75°30.4 90°30.3	11.3 N22° 11.6	327°28.1 341°58.5	11.5' 11.4'	04°22.8 \$04°38.1	15.3' 15.2'	59.1' 59.1'
18 19	90°30.3 105°30.2	N22°11.6 12.0	341°58.5 356°29.0	11.4'	04°53.3	15.2' 15.2'	59.1' 59.1'
20	105 30.2 120°30.1	12.0	10°59.4	11.4'	04 55.5 05°08.5	15.2'	59.1'
21	135° 30.0	12.6	25°29.8	11.4'	05°23.7	15.2'	59.1
22	150° 29.9	12.9	40°00.2	11.4'	05°38.9	15.1'	59.1'
23	165°29.8	13.2	54°30.5	11.3'	05°54.0	15.1'	59.1'
	SD = 15.8'	d = 0.3'		SI	O = 16.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:15	22:45	////	////
64°	////	////	01:59	21:59	////	////
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
N 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
S 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
S 50°	06:28	07:09	07:47	16:09	16:46	17:27
52°	06:33	07:16	07:56	16:00	16:39	17:22
54°	06:38	07:23	08:06	15:50	16:32	17:17
56°	06:43	07:31	08:17	15:38	16:24	17:12
58°	06:49	07:41	08:30	15:25	16:15	17:06
S 60°	06:56	07:51	08:46	15:10	16:04	16:59

Lat.		Moonris	е		Moonset	
Lat.	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 00:36
45°	10:46	12:02	13:17	••••	00:14	
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
S 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
S 60°	12:32	12:36	12:40	23:02	•• ••	00:38

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	250°59.5	181°35.2	N22°46.4	$197^{\circ}26.1$	$N19^{\circ}07.4$	81°25.5	N05°55.6	$216^{\circ}25.0$	N11°25.5	Alpheratz	357°32.0	29°14.7
1	266°01.9	196°39.3	45.6	212°26.8	07.8	96°27.9	55.6	231°27.2	25.6	Ankaa	353° 04.7	-42°08.8
2	281°04.4	211°43.4	44.8	227°27.4	08.3	111°30.2	55.5	246°29.4	25.7	Schedar	349° 28.0	-42 06.6 56°41.4
3	296°06.9	226°47.4	• • 44.0	242°28.0	• • 08.7	126°32.6	• • 55.4	261°31.6	• • 25.8	Diphda	348°44.7	-17°49.7
4	311°09.3	241°51.5	43.2	257°28.6	09.2	141°34.9	55.4	276°33.8	25.9	Achernar	335° 18.6	-17 49.7 -57°05.3
5	326°11.8	256°55.5	42.4	272°29.2	09.6	156°37.2	55.3	291°36.0	26.0	Hamal	327°48.3	23°35.7
6	341°14.3	271°59.6	N22°41.6	287°29.8	$N19^{\circ}10.1$	171°39.6	N05°55.2	306°38.2	N11°26.1	Polaris	312°59.0	89°22.8
7	356°16.7	287°03.7	40.8	302°30.5	10.5	186°41.9	55.2	321°40.4	26.1	Acamar	315° 10.1	-40°11.3
8	11°19.2	302°07.7	40.0	317°31.1	11.0	201°44.2	55.1	336°42.6	26.2	Menkar	314°03.5	4°12.0
9	26°21.6	$317^{\circ}11.8$	• • 39.2	$332^{\circ}31.7$	• • 11.4	216°46.6	• • 55.1	351°44.7	• • 26.3	Mirfak	308° 24.7	49°57.6
10	41°24.1	$332^{\circ}15.8$	38.4	347°32.3	11.9	231°48.9	55.0	6°46.9	26.4	Aldebaran	290°36.8	16°33.9
11	56°26.6	347°19.9	37.6	2°32.9	12.3	246°51.2	54.9	21°49.1	26.5	Rigel	281°01.5	-8°10.2
12	71°29.0	2°23.9	N22°36.7	17°33.5	N19°12.8	261°53.6	N05°54.9	36°51.3	N11°26.6	Capella	280° 18.3	46°01.5
13	86°31.5	17°28.0	35.9	32°34.1	13.2	276°55.9	54.8	51°53.5	26.7	Bellatrix	278° 20.2	6°22.4
14	101°34.0	32°32.0	35.1	47°34.8	13.7	291°58.2	54.7	66°55.7	26.7	Elnath	277°58.7	28°37.8
15	116°36.4	47°36.1	• • 34.3	62°35.4	•• 14.1	307°00.6	• • 54.7	81°57.9	· · 26.8	Alnilam	275°35.3	-1°11.1
16	131°38.9	62°40.1	33.5	77°36.0	14.6	322°02.9	54.6	97°00.1	26.9	Betelgeuse	270°49.4	7°24.6
17	146°41.4	77°44.2	32.7	92°36.6	15.0	337°05.2	54.5	112°02.3	27.0	Canopus	263°51.7	-52°42.8
18	161°43.8	92°48.2	N22°31.9	107°37.2	N19°15.5	352°07.6	N05° 54.5	127°04.5	N11°27.1	Sirius	258° 24.1	-16°45.5
19	176°46.3	107°52.3	31.1	122°37.8	15.9	7°09.9	54.4	142°06.7	27.2	Adhara	255°04.0	-29°00.8
20	191°48.8	122°56.3	30.3	137°38.5	16.4	22°12.2	54.3	157°08.9	27.3	Procyon	244°48.2	5°09.0
21	206°51.2	138°00.4	• • 29.5	152°39.1	• • 16.8	37°14.6	• • 54.3	172°11.1	• • 27.4	Pollux	243°14.2	27°57.4
22	221°53.7	153°04.4	28.6	167°39.7	17.2	52°16.9	54.2	187°13.3	27.4	Avior	234° 14.2	-59°36.4
23	236°56.1	168°08.5	27.8	182°40.3	17.7	67°19.2	54.1	202°15.5	27.5	Suhail	222°44.4	-43°33.2
Merr	ass. 07:15	ν4 1' d-0	.8′ m-3.25	νη 6' Α η	.5′ m1.36	ν2 3' d-0	.1′ m-2.05	ν2 2' dΩ	.1′ m0.50	Miaplacidus	221°38.0	-45°55.2
IVICI.	7833. 07.13	ν4.1 u-0	.0 111-5.25	νο.ο αο	.5 1111.50	ν2.5 u-0	.1 111-2.03	VZ.Z U0	.1 1110.50	Alphard	217°45.2	-8°47.1
										Regulus	207°31.6	11°49.6
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°36.0
0	251°58.6	183°12.5	N22°27.0	197°40.9	$N19^{\circ}18.1$	82°21.6	N05°54.1	$217^{\circ}17.7$	N11°27.6	Denebola	182°22.1	14°24.7
1	267°01.1	$198^{\circ}16.6$	26.2	212°41.5	18.6	97°23.9	54.0	$232^{\circ}19.9$	27.7	Gienah	175°40.6	-17°42.2
2	282°03.5	213°20.6	25.4	227°42.1	19.0	112°26.2	53.9	$247^{\circ}22.1$	27.8	I	172°56.6	-63°15.8
3	297°06.0	228°24.6	• • 24.6	242°42.8	•• 19.5	$127^{\circ}28.6$	• • 53.9	262°24.3	• • 27.9		171°48.2	-57°16.7
4	312°08.5	243°28.7	23.8	257°43.4	19.9	142°30.9	53.8	277°26.5	28.0	Alioth	166° 10.4	55°48.5
5	327°10.9	258°32.7	23.0	272°44.0	20.4	157°33.2	53.7	292°28.7	28.0	Spica	158° 19.2	-11°18.7
6	342°13.4	273°36.7	N22°22.2	287°44.6	N19°20.8	172°35.5	N05°53.7	307°30.8	N11°28.1	Alkaid	152°49.6	49°10.4
7	357°15.9	288°40.8	21.3	302°45.2	21.2	187°37.9	53.6	322°33.0	28.2	Hadar	148°31.4	-60°30.8
8	12°18.3	303°44.8	20.5	317°45.8	21.7	202°40.2	53.5	337°35.2	28.3	Menkent	147°54.0	-36°30.8
9	27°20.8	318°48.9	• • 19.7	332°46.4	• • 22.1	217°42.5	• • 53.5	352°37.4	• • 28.4	Arcturus	145°45.1	19°02.1
10	42°23.3	333°52.9	18.9	347°47.0	22.6	232°44.9	53.4	7°39.6	28.5	Rigil Kent.	139°35.8	-60°57.4
11	57°25.7	348°56.9	18.1	2°47.7	23.0	247°47.2	53.3	22°41.8	28.6	Kochab	137°19.0	74°02.4
12	72°28.2	4°00.9	N22°17.3	17°48.3	N19°23.5	262°49.5	N05°53.3	37°44.0	N11°28.6	Zuben'ubi	136°52.6	-16°09.7
13	87°30.6	19°05.0	16.5	32°48.9	23.9	277°51.8	53.2	52°46.2	28.7	Alphecca	126°01.1	26°37.1
14	102°33.1	34°09.0	15.6	47°49.5	24.3	292°54.2	53.1	67°48.4	28.8	Antares	112°12.0	-26°29.7
15	117°35.6	49°13.0	• • 14.8	62°50.1	• • 24.8	307°56.5	• • 53.1	82°50.6	• • 28.9	Atria	107°03.1	-69°04.6
16	132°38.0	64°17.0	14.0	77°50.7	25.2	322°58.8	53.0	97°52.8	29.0	Sabik	101°59.3	-15°45.6
17	147°40.5	79°21.1	13.2	92°51.3	25.7	338°01.2	52.9	112°55.0	29.1	Shaula	96°06.2	-37°07.4
18	162°43.0	94°25.1	N22°12.4	107°52.0	N19°26.1	353°03.5	N05°52.9		N11°29.2	Rasalhague	95°55.6	12°32.4
19	177°45.4	109°29.1	11.6	122°52.6	26.5	8°05.8	52.8	142°59.4	29.2	Eltanin	90°40.4	51°29.0
20	192°47.9	124°33.1	10.8	137°53.2	27.0	23°08.1	52.7	158°01.6	29.3	Kaus Aust.	83°28.5	-34°22.1
21	207°50.4	139°37.2	• • 10.0	152°53.8	• • 27.4	38°10.5	• • 52.7	173°03.8	• • 29.4	Vega	80°30.9	38°48.5
22	222°52.8	154°41.2	09.1	167°54.4	27.8	53°12.8	52.6	188°06.0	29.5	Nunki	75°44.0	-26°15.5
23	237°55.3	169°45.2	08.3	182°55.0	28.3	68°15.1	52.5	203°08.2	29.6	Altair	61°57.0	8°56.6
Mer r	pass. 07:11	$\nu 4.0' d-0$.8′ m-3.56	$\nu 0.6' d0$.4′ m1.37	$\nu 2.3' d-0$.1′ m-2.05	$\nu^2 2' d0$.1′ m0.49	Peacock	53°01.1	-56°38.3
										Deneb	49°23.6	45°22.8
										Enif	33°36.0	10°00.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.4$	-46°49.1
0	252°57.7	184°49.2	N22°07.5		N19°28.7	83°17.4	N05°52.5	218°10.4	N11°29.7	Fomalhaut	$15^{\circ}11.5$	-29°28.1
1	268°00.2	199°53.2	06.7	212°56.2	29.2	98°19.8	52.4	233°12.6	29.7	Scheat	$13^{\circ}42.5$	$28^{\circ}14.1$
2	283°02.7	214°57.2	05.9	227°56.9	29.6	113°22.1	52.3	248°14.8	29.8	Markab	$13^{\circ}27.1$	$15^{\circ}21.5$
3	298°05.1	230°01.2	•• 05.1	242°57.5	• • 30.0	128°24.4	• • 52.3	263°17.0	• • 29.9	1 00 5:	CIIA	
4	313°07.6	245°05.2	04.3	257°58.1	30.5	143°26.7	52.2	278°19.2	30.0	Jun 02 Fri	SHA	Mer.pass
5	328°10.1	260°09.2	03.5	272°58.7	30.9	158°29.1	52.1	293°21.4	30.1	Venus	290°35.8	11:50
6	343°12.5	275°13.3	N22°02.6	287°59.3	N19°31.3	173°31.4	N05°52.1	308°23.6	N11°30.2	Mars	306°26.7	10:50
7	358°15.0	290°17.3	01.8	302°59.9	31.8	188°33.7	52.0	323°25.8	30.3	Jupiter	190°26.1	18:31
8	13°17.5	305°21.3	01.0	318°00.5	32.2	203°36.0	51.9	338°28.0	30.3	Saturn	325°25.5	09:33
9	28°19.9	320°25.3	22°00.2	333°01.1	• • 32.6	218°38.3	• • 51.8	353°30.2	30.4	Jun 03 Sat	SHA	Mer.pass
10	43°22.4	335°29.3	21°59.4	348°01.8	33.1	233°40.7	51.8	8°32.4	30.5	Venus		11:44
11	58°24.9	350°33.3	58.6	3°02.4	33.5	248°43.0	51.7	23°34.6	30.6	Mars		10:49
12	73°27.3	5°37.3	N21°57.8	18°03.0	N19°33.9	263°45.3	N05°51.6	38°36.8	N11°30.7	Jupiter	190°23.0	18:28
13	88°29.8	20°41.2	57.0	33°03.6	34.4	278°47.6	51.6	53°39.0	30.8	Saturn	325°19.1	09:29
14	103°32.2	35°45.2	56.1	48°04.2	34.8	293°50.0	51.5	68°41.2	30.8			
15	118°34.7	50°49.2	• • 55.3	63°04.8	35.2	308°52.3	• • 51.4	83°43.4	30.9	Jun 04 Sun	SHA	Mer.pass
16	133°37.2	65°53.2	54.5	78°05.4	35.7	323°54.6	51.4	98°45.6	31.0	Venus		11:38
17	148°39.6	80°57.2	53.7	93°06.0	36.1	338°56.9	51.3	113°47.8	31.1	Mars		10:48
18	163°42.1	96°01.2	N21°52.9	108°06.7	N19°36.5	353°59.2	N05°51.2	128°50.0	N11°31.2		190°19.7	18:24
19	178°44.6	111°05.2	52.1	123°07.3	37.0	9°01.6	51.1	143°52.2	31.3	Saturn	325°12.6	09:26
20	193°47.0	126°09.2	51.3	138°07.9	37.4	24°03.9	51.1	158°54.4	31.4	Horizont	al parallax	
21	208°49.5	141°13.1	• • 50.5	153°08.5	• • 37.8	39°06.2	• • 51.0	173°56.6	• • 31.4	TIOTIZOTT	Venus:	0.5
22	223°52.0	156°17.1	49.6	168°09.1	38.2	54°08.5	50.9	188°58.7	31.5		Mars:	0.3
23	238°54.4	171°21.1	48.8	183°09.7	38.7	69°10.8	50.9	204°00.9	31.6			<u> </u>
Mer.p	ass. 07:07	ν 4.0′ d-0	.8′ m-3.81	ν 0.6′ d0	.4′ m1.37	$\nu 2.3' \ d-0$.1′ m-2.04	ν 2.2′ d0	.1′ m0.49			

h	Sui	า			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.7	N22°13.6	69°00.8	11.3'	506°09.1	15.1'	59.1'
1	195°29.6	13.9	83°31.1	11.3'	$06^{\circ}24.2$	15.0'	59.1'
2	210°29.5	14.2	98°01.4	11.3'	06°39.2	15.0'	59.1'
3	225°29.4	• • 14.5	112°31.7	11.2'	06°54.2	14.9'	59.1'
4 5	240°29.3 255°29.2	14.8 15.1	127°01.9 141°32.1	11.2' 11.2'	07°09.1 07°24.0	14.9' 14.9'	59.1' 59.1'
6	270°29.1	N22°15.4	141 32.1 156°02.2	11.1'	507°38.9	14.9	59.1
7	285°29.0	15.8	170°32.4	11.1'	07°53.7	14.8'	59.1'
8	300°28.9	16.1	185°02.5	11.1'	08°08.5	14.7'	59.0'
9	315°28.8	• • 16.4	199°32.5	11.0'	08°23.3	14.7'	59.0'
10	330°28.7	16.7	214°02.6	11.0'	08°37.9	14.6'	59.0'
11	345°28.6	17.0	228°32.6	11.0'	08°52.6	14.6'	59.0'
12 13	0°28.5 15°28.4	N22°17.3 17.6	243°02.5 257°32.4	10.9' 10.9'	\$09°07.2 09°21.7	14.5' 14.5'	59.0' 59.0'
14	30°28.3	17.0	272°02.3	10.9	09°21.7	14.4	59.0'
15	45°28.2	. 18.2	286°32.1	10.8'	09°50.6	14.4'	59.0'
16	60°28.1	18.6	301°01.9	10.8'	10°05.0	14.3'	59.0'
17	75°28.0	18.9	315°31.7	10.7'	$10^{\circ}19.3$	14.3'	59.0'
18	90°27.9	N22°19.2	330°01.4	10.7'	S10°33.6	14.2'	59.0'
19	105°27.8 120°27.7	19.5	344°31.1 359°00.7	10.6'	10°47.8 11°01.9	14.1'	59.0'
20 21	120°27.7 135°27.6	19.8 •• 20.1	359°00.7 13°30.3	10.6' 10.5'	11°01.9 11°16.0	14.1' 14.0'	58.9' 58.9'
22	150°27.4	20.1	27°59.9	10.5	11°30.0	13.9'	58.9'
23	165°27.3	20.7	42°29.3	10.4	11°43.9	13.9'	58.9'
	SD = 15.8'	d = 0.3'			0 = 16.1'		
	<u>υν – 13.0</u>	u = 0.5		3L	- 10.1		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°27.2 195°27.1	N22°21.0 21.3	56°58.8 71°28.2	10.4' 10.4'	\$11°57.8 12°11.6	13.8' 13.7'	58.9' 58.9'
2	210°27.0	21.6	85°57.5	10.4	12°25.4	13.7'	58.9'
3	225°26.9	• • 21.9	100°26.8	10.3'	12°39.1	13.6'	58.9'
4	240°26.8	22.2	114°56.1	10.2'	$12^{\circ}52.7$	13.5'	58.9'
5	255°26.7	22.5	129°25.3	10.2'	13°06.2	13.4'	58.9'
6	270°26.6 285°26.5	N22°22.8	143°54.5 158°23.5	10.1'	\$13°19.6 13°33.0	13.4'	58.8'
7 8	285°26.5 300°26.4	23.1 23.4	158° 23.5 172° 52.6	10.0' 10.0'	13° 33.0 13° 46.3	13.3' 13.2'	58.8' 58.8'
9	315°26.3	23.7	187°21.6	9.9'	13°59.5	13.1'	58.8'
10	330°26.2	24.0	201°50.5	9.9'	14°12.6	13.1'	58.8'
11	345°26.1	24.3	$216^{\circ}19.4$	9.8'	14°25.7	13.0'	58.8'
12	0°26.0	N22°24.6	230°48.2	9.8'	\$14°38.7	12.9'	58.8'
13 14	15°25.9 30°25.8	24.9 25.1	245°17.0 259°45.7	9.7' 9.7'	14°51.5 15°04.3	12.8' 12.7'	58.8' 58.8'
15	45°25.7	. 25.1	274°14.4	9.6'	15 04.3 15°17 1	12.6'	58.7'
16	60°25.6	25.7	288°43.0	9.6'	15°29.7	12.5'	58.7'
17	75°25.5	26.0	303°11.6	9.5'	$15^{\circ}42.2$	12.4'	58.7'
18	90°25.4	N22°26.3	317°40.1	9.4'	\$15°54.6	12.3'	58.7'
19	105°25.2	26.6	332°08.5	9.4'	16°07.0	12.2'	58.7'
20 21	120°25.1 135°25.0	26.9 •• 27.2	346°36.9 1°05.2	9.3' 9.3'	16°19.2 16°31.4	12.2' 12.1'	58.7' 58.7'
22	150°24.9	27.5	15°33.4	9.3 9.2'	16°43.4	12.1	58.7
23	165°24.8	27.7	30°01.6	9.1'	16°55.4	11.9'	58.6'
	SD = 15.8'	d = 0.3'		SE	0 = 16.1'		
			CUA		Б.		
Sun 0	GHA 180°24.7	Dec N22°28.0	GHA 44°29.8	u 9.1'	Dec \$17°07.3	<i>d</i> 11.8'	HP 58.6'
1	195°24.6	28.3	58°57.9	9.1	17°19.0	11.7	58.6
2	210°24.5	28.6	73°25.9	9.0'	17°30.7	11.5'	58.6'
3	225°24.4	• • 28.9	87°53.9	8.9'	17°42.2	11.4'	58.6'
4	240°24.3	29.2	102°21.8	8.8'	17°53.7	11.3'	58.6'
5	255°24.2 270°24.1	29.5 N22°29.7	116°49.6 131°17.4	8.8'	18°05.0 \$18°16.2	11.2'	58.6'
6 7	270°24.1 285°24.0	N22°29.7 30.0	131°17.4 145°45.1	8.7' 8.7'	18° 27.3	11.1' 11.0'	58.5' 58.5'
8	300°23.9	30.3	160°12.8	8.6'	18°38.4	10.9'	58.5
9	315°23.7	• • 30.6	174°40.4	8.6'	18°49.2	10.8	58.5
10	330°23.6	30.9	$189^{\circ}08.0$	8.5'	$19^{\circ}00.0$	10.7'	58.5'
11	345°23.5	31.1	203°35.5	8.4'	19°10.7	10.6'	58.5'
12	0°23.4 15°23.3	N22°31.4 31.7	218°02.9 232°30.3	8.4' 8.3'	\$19°21.3 19°31.7	10.4' 10.3'	58.5'
13 14	15°23.3 30°23.2	31.7 32.0	232°30.3 246°57.6	8.3'	19°31.7 19°42.0	10.3'	58.4' 58.4'
15	45°23.1	• • 32.2	261°24.8	8.2'	19°52.2	10.2	58.4
16	60°23.0	32.5	275°52.0	8.1'	20°02.3	10.0'	58.4'
17	75°22.9	32.8	290°19.2	8.1'	20°12.2	9.8'	58.4'
18	90°22.8	N22°33.1	304°46.3	8.0'	\$20°22.1	9.7'	58.4'
19 20	105°22.7 120°22.5	33.3 33.6	319°13.3 333°40.3	8.0' 7.9'	20°31.8 20°41.4	9.6' 9.5'	58.3' 58.3'
20	120 22.5 135°22.4	33.9	333 40.3 348°07.2	7.9 7.9'	20°50.8	9.5 9.3'	58.3'
22	150°22.3	34.1	2°34.0	7.8'	21°00.1	9.2'	58.3
23	165°22.2	34.4	17°00.8	7.8'	21°09.3	9.1'	58.3'
	SD = 15.8'	d = 0.3'		SF	0 = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Ldl.	Naut.	Civil	Surrise	Sunset	Civil	Naut.
N 72°						
N 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
S 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
S 60°	06:59	07:55	08:50	15:06	16:01	16:57
		Moonris	se		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
NI 70°	16.10	10.00		00:04	22.20	

Lat.		Moonris	e		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	16:12	19:08	_	00:04 23:28	22:20	_
N 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
N 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
S 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
S 60°	12:45	12:51	13:00	02:14	03:52	05:31

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	253°56.9	186°25.1	N21°48.0	198° 10.3	N19°39.1	84°13.2	N05°50.8	219°03.1	N11°31.7			
1	268°59.4	201°29.0	47.2	213° 10.9	39.5	99° 15.5	50.7	234°05.3	31.8	Alpheratz	357°32.0	29° 14.7
2	284°01.8	216°33.0	46.4	228° 11.5	40.0	114° 17.8	50.6	249°07.5	31.9	Ankaa	353°04.6	-42°08.8
3	299°04.3	231°37.0	• • 45.6	243°12.2	40.4	129° 20.1	50.6	264°09.7	31.9	Schedar	349°28.0	56°41.4
4	314°06.7	246°41.0	44.8	258° 12.8	40.8	144°22.4	50.5	279°11.9	32.0	Diphda	348°44.7	-17°49.7
5	329°09.2	261°44.9	44.0	273° 13.4	41.2	159° 24.7	50.4	294°14.1	32.1	Achernar	335°18.6	-57°05.3
6	344°11.7	276°48.9	N21°43.2	288° 14.0	N19°41.7	174° 27.1	N05°50.4	309° 16.3	N11°32.2	Hamal	327°48.3	23°35.7
7	359° 14.1	291°52.8	42.4	303°14.6	42.1	189° 29.4	50.3	324° 18.5	32.3	Polaris	312°57.9	89°22.8
8	14° 16.6	306°56.8	41.5	318° 15.2	42.5	204°31.7	50.2	339°20.7	32.4	Acamar	315°10.1	-40°11.3
9	$29^{\circ}19.1$	322°00.8	• • 40.7	333° 15.8	• • 43.0	219°34.0	50.1	354° 22.9	• • 32.5	Menkar	314°03.5	4°12.0
10	44°21.5	337°04.7	39.9	348°16.4	43.4	234°36.3	50.1	9°25.1	32.5	Mirfak	308°24.7	49°57.6
11	59°24.0	352°08.7	39.1	3°17.0	43.8	249°38.6	50.0	24°27.3	32.6	Aldebaran	290°36.8	16°33.9
12	74° 26.5	7°12.6	N21°38.3	18° 17.6	N19°44.2	264°41.0	N05°49.9	39° 29.5	N11°32.7	Rigel	281°01.5	-8°10.2
13	89°28.9	$22^{\circ}16.6$	37.5	33°18.3	44.7	279°43.3	49.9	54°31.7	32.8	Capella	280°18.3	46°01.5
14	104°31.4	$37^{\circ}20.5$	36.7	48° 18.9	45.1	294°45.6	49.8	69°33.9	32.9	Bellatrix	278°20.2	6°22.4
15	119°33.9	52°24.5	• • 35.9	$63^{\circ}19.5$	• • 45.5	309°47.9	• • 49.7	84°36.1	• • 33.0	Elnath Alnilam	277°58.7 275°35.2	28°37.8 -1°11.1
16	134°36.3	67°28.4	35.1	$78^{\circ}20.1$	45.9	324°50.2	49.6	99°38.3	33.0	Betelgeuse	270°49.4	7° 24.6
17	149°38.8	82°32.4	34.3	93°20.7	46.3	339°52.5	49.6	$114^{\circ}40.5$	33.1	Canopus	263°51.7	-52°42.8
18	164°41.2	97°36.3	N21°33.5	108°21.3	N19°46.8	354° 54.8	N05°49.5	129°42.7	N11°33.2	Sirius	258°24.1	-32 42.8 -16°45.5
19	179°43.7	112°40.2	32.7	123°21.9	47.2	9°57.2	49.4	144° 44.9	33.3	Adhara	255°04.0	-10° 43.3 -29° 00.8
20	194°46.2	127°44.2	31.9	138°22.5	47.6	24°59.5	49.3	$159^{\circ}47.1$	33.4	Procyon	244°48.2	5°09.0
21	209°48.6	142°48.1	• • 31.1	153°23.1	• • 48.0	$40^{\circ}01.8$	• • 49.3	174°49.3	• • 33.5	Pollux	244 46.2 243°14.2	27° 57.4
22	$224^{\circ}51.1$	157°52.0	30.3	$168^{\circ}23.8$	48.5	55°04.1	49.2	189°51.5	33.5	Avior	245 14.2 234°14.0	-59°36.3
23	239°53.6	172°56.0	29.4	183°24.4	48.9	70°06.4	49.1	204°53.7	33.6	Suhail	234 14.0 222°44.5	-59 30.3 -43°33.2
Mers	ass. 07:03	1/4 N/ A N	.8′ m-3.99	7/U 6/ 40	.4′ m1.38	1/2 3/ d n	.1′ m-2.03	1/2 2/ 40	.1′ m0.49	Miaplacidus	222 44.5 221°38.0	-43 33.2 -69°50.4
- ivier.p		ν+.υ u-υ	.5 111-3.99	νυ.υ <i>α</i> υ	.7 1111.30	ν2.3 u-0	.111-2.03	ν Δ.Δ UU	.1110.49	Alphard	221 36.0 217°45.2	-8°47.1
										Regulus	207°31.6	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°36.0
0	254°56.0	187°59.9	N21°28.6	$198^{\circ}25.0$	N19°49.3	85°08.7	N05°49.0	219°55.9	N11°33.7	Denebola	182°22.1	14° 24.7
1	269°58.5	203°03.8	27.8	$213^{\circ}25.6$	49.7	$100^{\circ}11.0$	49.0	234°58.2	33.8	Gienah	175°40.6	-17°42.2
2	285°01.0	218°07.7	27.0	$228^{\circ}26.2$	50.1	$115^{\circ}13.3$	48.9	250°00.4	33.9	Acrux	172°56.6	-63°15.8
3	300°03.4	233°11.7	• • 26.2	243°26.8	• • 50.6	130° 15.7	• • 48.8	265°02.6	• • 34.0	Gacrux	171°48.2	-57° 16.7
4	315°05.9	248°15.6	25.4	258° 27.4	51.0	$145^{\circ}18.0$	48.8	280°04.8	34.0	Alioth	166°10.4	55° 48.5
5	330°08.3	$263^{\circ}19.5$	24.6	273°28.0	51.4	$160^{\circ}20.3$	48.7	295°07.0	34.1	Spica	158°19.2	-11° 18.7
6	345°10.8	278°23.4	N21°23.8	288°28.6	N19°51.8	175°22.6	N05°48.6	$310^{\circ}09.2$	N11°34.2	Alkaid	152°49.6	49° 10.4
7	0°13.3	293°27.3	23.0	$303^{\circ}29.2$	52.2	$190^{\circ}24.9$	48.5	$325^{\circ}11.4$	34.3	Hadar	148°31.4	-60°30.9
8	15° 15.7	308°31.2	22.2	318°29.8	52.7	205°27.2	48.5	340°13.6	34.4	Menkent	147°54.0	-36° 30.8
9	30°18.2	323°35.1	• • 21.4	333°30.5	• • 53.1	220°29.5	• • 48.4	355°15.8	• • 34.5	Arcturus	145°45.1	19°02.1
10	45°20.7	338°39.0	20.6	348°31.1	53.5	235°31.8	48.3	$10^{\circ}18.0$	34.5	Rigil Kent.	139°35.8	-60°57.4
11	60°23.1	353°42.9	19.8	3°31.7	53.9	250°34.1	48.2	25°20.2	34.6	Kochab	137°19.1	74°02.4
12	75°25.6	8°46.8	N21°19.0	18°32.3	N19°54.3	265°36.4	N05°48.2	40°22.4	N11°34.7	Zuben'ubi	136°52.6	-16°09.7
13	90°28.1	23°50.7	18.2	33°32.9	54.7	280°38.8	48.1	55°24.6	34.8	Alphecca	126°01.1	26° 37.2
14	105°30.5	38°54.6	17.4	48°33.5	55.2	295°41.1	48.0	70°26.8	34.9	Antares	112°12.0	-26°29.7
15	120°33.0	53°58.5	• • 16.6	63°34.1	• • 55.6	310°43.4	• • 47.9	85°29.0	• • 35.0	Atria	107°03.1	-69°04.6
16	135° 35.5	69°02.4	15.8	78°34.7	56.0	325° 45.7	47.9	100°31.2	35.0	Sabik	101°59.2	-15° 45.6
17	150° 37.9	84°06.3	15.0	93°35.3	56.4	340°48.0	47.8	115°33.4	35.1	Shaula	96°06.2	-37°07.4
18	165°40.4	99°10.2	N21°14.2	108° 35.9	N19°56.8	355° 50.3	N05°47.7	130°35.6	N11°35.2	Rasalhague	95°55.6	12°32.4
19	180°42.8	$114^{\circ}14.1$	13.4	123°36.5	57.2	10°52.6	47.6	145°37.8	35.3	Eltanin	90°40.4	51°29.1
20	195° 45.3	129°17.9	12.6	138° 37.1	57.6	25°54.9	47.5	160°40.0	35.4	Kaus Aust.	83°28.5	-34°22.1
21	210°47.8	144°21.8	• • 11.8	153° 37.8	•• 58.1	40°57.2	• • 47.5	175° 42.2	• • 35.4	Vega	80°30.9	38°48.6
22	225°50.2	159°25.7	11.1	168°38.4	58.5	55° 59.5	47.4	190°44.4	35.5	Nunki	75°44.0	-26° 15.5
23	240°52.7	174°29.6	10.3	183°39.0	58.9	71°01.8	47.3	205°46.6	35.6	Altair	61°57.0	8°56.7
Mer n	ass. 06:59	v3 9' d-0	.8′ m-4.09	$\nu 0.6' d0$.4′ m1.38	v2 3' d-0	.1′ m-2.03	v2 2' d0	.1′ m0.49	Peacock	53°01.1	-56°38.3
										Deneb	49°23.6	45°22.8
										Enif	33°35.9	10°00.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.4	-46°49.0
0	255°55.2	189°33.4	N21°09.5	198°39.6	N19°59.3	86°04.1	N05°47.2	220°48.8	N11°35.7	Fomalhaut	$15^{\circ}11.5$	-29°28.0
1	270°57.6	204°37.3	08.7	213°40.2	19°59.7	101°06.4	47.2	235°51.0	35.8	Scheat	13°42.5	$28^{\circ}14.1$
2	286°00.1	219°41.2	07.9	228°40.8	20°00.1	116°08.8	47.1	250°53.2	35.9	Markab	$13^{\circ}27.1$	$15^{\circ}21.5$
3	301°02.6	234°45.0	•• 07.1	243°41.4	• • 00.5	131°11.1	• • 47.0	265°55.4	• • 35.9	1 05	C	
4	316°05.0	249°48.9	06.3	258° 42.0	00.9	146°13.4	46.9	280°57.6	36.0	Jun 05 Mon	SHA	Mer.pass
5	331°07.5	264°52.8	05.5	273°42.6	01.4	161°15.7	46.9	295°59.8	36.1	Venus		11:31
6	346° 10.0	279°56.6	N21°04.7		N20°01.8	176°18.0	N05°46.8	311°02.0	N11°36.2	Mars		10:47
7	1°12.4	295°00.5	03.9	303°43.8	02.2	191°20.3	46.7	326°04.2	36.3		190°16.3	18:20
8	16°14.9	310°04.3	03.1	318°44.4	02.6	206°22.6	46.6	341°06.4	36.4	Saturn	325°06.3	09:22
9	31°17.3	325°08.2	• • 02.4	333°45.1	• • 03.0	221°24.9	• • 46.6	356°08.6	• • 36.4	Jun 06 Tue	SHA	Mer.pass
10	46°19.8	340°12.0	01.6	348°45.7	03.4	236°27.2	46.5	11°10.8	36.5	Venus	293°03.9	11:25
11	61°22.3	355°15.8	8.00	3°46.3	03.8	251°29.5	46.4	26°13.0	36.6	Mars		10:46
12	76°24.7	10°19.7	N21°00.0	18°46.9	N20°04.2	266°31.8	N05°46.3	41°15.2	N11°36.7		190°12.7	18:17
13	91°27.2	25°23.5	20°59.2	33°47.5	04.6	281°34.1	46.2	56° 17.4	36.8	Saturn	324°59.9	09:19
14	106° 29.7	40°27.3	58.4	48°48.1	05.0	296°36.4	46.2	71°19.6	36.8			
15	121°32.1	55°31.2	• • 57.6	63°48.7	• • 05.4	311°38.7	• • 46.1	86°21.8	• • 36.9	Jun 07 Wed	SHA	Mer.pass
16	136°34.6	70°35.0	56.8	78°49.3	05.9	326°41.0	46.0	101°24.1	37.0	Venus		11:19
17	151°37.1	85°38.8	56.1	93°49.9	06.3	341°43.3	45.9	116°26.3	37.1	Mars		10:45
18	166° 39.5	100°42.6	N20°55.3	108° 50.5	N20°06.7	356°45.6	N05°45.9	131°28.5	N11°37.2	Jupiter		18:13
19	181°42.0	115°46.5	54.5	123°51.1	07.1	11°47.9	45.8	146°30.7	37.3	Saturn	324°53.6	09:15
20	196°44.5	130°50.3	53.7	138°51.7	07.5	26°50.2	45.7	161°32.9	37.3	Horizont	al parallax	
21	211°46.9	145°54.1	• • 52.9	153°52.3	•• 07.9	41°52.5	· · 45.6	176°35.1	•• 37.4	1101120111	Venus:	0.5
22	226°49.4 241°51.8	160°57.9	52.2 51.4	168°52.9	08.3	56° 54.8 71° 57.1	45.5 45.5	191°37.3	37.5 37.6		Mars:	0.1
23	∠41 51.8	176°01.7	51.4	183°53.6	08.7	71°57.1	45.5	206°39.5	37.6		141013.	V.1
Mer.p	ass. 06:55	ν 3.9′ d-0	.8′ m-4.10	$ u$ 0.6 $^{\prime}$ d0	.4′ m1.38	ν 2.3′ d-0	.1′ m-2.02	ν 2.2′ d0	.1′ m0.49			

						522 36		
h	Sun		Moon					
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°22.1	N22°34.7	31°27.6	7.7'	S21°18.4	8.9'	58.3'	
1 2	195°22.0 210°21.9	35.0 35.2	45°54.3 60°20.9	7.6' 7.6'	21°27.4 21°36.2	8.8' 8.7'	58.2' 58.2'	
3	210 21.9 225°21.8	35.5	74°47.5	7.5'	21°44.8	8.5'	58.2	
4	240°21.7	35.8	89°14.1	7.5'	21°53.4	8.4'	58.2'	
5	255°21.5	36.0	103°40.5	7.4'	22°01.8	8.3'	58.2'	
6	270°21.4	N22°36.3	118°07.0	7.4'	522°10.0	8.1'	58.1'	
7	285°21.3 300°21.2	36.6	132°33.4	7.3'	22°18.2 22°26.2	8.0' 7.9'	58.1'	
8 9	300 21.2 315°21.1	36.8 · · 37.1	146°59.7 161°26.0	7.3' 7.2'	22 20.2 22°34.0	7.9 7.7'	58.1' 58.1'	
10	330°21.0	37.3	175°52.3	7.2'	22°41.7	7.6'	58.1	
11	345°20.9	37.6	190°18.5	7.2'	22°49.3	7.4'	58.0'	
12	0°20.8	N22°37.9	204°44.6	7.1'	S22°56.7	7.3'	58.0'	
13	15°20.7	38.1	219°10.7	7.1'	23°04.0	7.1'	58.0'	
14 15	30°20.5 45°20.4	38.4 •• 38.6	233°36.8 248°02.9	7.0' 7.0'	23°11.2 23°18.2	7.0' 6.9'	58.0' 58.0'	
16	60°20.3	38.9	262°28.8	7.0'	23°25.0	6.7	57.9	
17	75°20.2	39.2	276°54.8	6.9'	23°31.7	6.6'	57.9'	
18	90°20.1	N22°39.4	291°20.7	6.9'	S23°38.3	6.4'	57.9'	
19	105°20.0	39.7	305°46.6	6.8'	23°44.7	6.3'	57.9'	
20 21	120°19.9 135°19.8	39.9 •• 40.2	320°12.4 334°38.3	6.8' 6.8'	23°51.0 23°57.1	6.1' 6.0'	57.9' 57.8'	
21	150°19.6	40.4	334 38.3 349°04.0	6.7'	23 57.1 24°03.1	5.8'	57.8'	
23	165°19.5	40.7	3°29.8	6.7	24°08.9	5.7'	57.8'	
	SD = 15.8'	d = 0.3'			D = 15.9'			
	JD — 13.0	u = 0.5		JL				
Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°19.4	N22°40.9	17°55.5	6.7'	\$24°14.6	5.5'	57.8'	
1 2	195°19.3 210°19.2	41.2 41.4	32°21.2 46°46.9	6.7' 6.6'	24°20.1 24°25.5	5.4' 5.2'	57.8' 57.7'	
3	225°19.1	• • 41.7	61°12.5	6.6	24°25.5 24°30.7	5.1'	57.7'	
4	240°19.0	41.9	75°38.1	6.6'	24°35.7	4.9'	57.7'	
5	255°18.8	42.2	90°03.7	6.6'	24°40.6	4.8'	57.7'	
6	270°18.7	N22°42.4	104°29.3	6.6'	\$24°45.4	4.6'	57.7'	
7 8	285°18.6 300°18.5	42.7 42.9	118°54.8 133°20.3	6.5' 6.5'	24°50.0 24°54.4	4.4' 4.3'	57.6' 57.6'	
9	300 18.5 315°18.4	· · 43.2	133 20.3 147°45.9	6.5'	24 54.4 24°58.7	4.3 4.1'	57.6'	
10	330°18.3	43.4	162°11.4	6.5	25°02.9	4.0'	57.6'	
11	345°18.2	43.7	176°36.9	6.5'	25°06.8	3.8'	57.5'	
12	0°18.0	N22°43.9	191°02.3	6.5'	S25°10.7	3.7'	57.5'	
13 14	15°17.9 30°17.8	44.2 44.4	205°27.8 219°53.3	6.5' 6.5'	25°14.3 25°17.8	3.5' 3.4'	57.5' 57.5'	
15	30 17.8 45°17.7	• • 44.7	219 55.5 234°18.7	6.4	25 17.6 25°21.2	3.4	57.5'	
16	60°17.6	44.9	248°44.2	6.4'	25°24.4	3.0'	57.4	
17	75°17.5	45.1	$263^{\circ}09.6$	6.4'	25°27.4	2.9'	57.4'	
18	90°17.3	N22°45.4	277°35.1 292°00.5	6.4	\$25°30.3	2.7'	57.4	
19 20	105°17.2 120°17.1	45.6 45.9	292°00.5 306°25.9	6.4' 6.5'	25°33.0 25°35.6	2.6' 2.4'	57.4' 57.3'	
21	135°17.0	• • 46.1	320°51.4	6.5	25°38.0	2.4	57.3'	
22	150°16.9	46.3	335°16.9	6.5'	25°40.2	2.1'	57.3	
23	165°16.8	46.6	349°42.3	6.5'	25°42.3	1.9'	57.3'	
	SD = 15.8'	d = 0.3'		SI	O = 15.8'			
Wed	GHA 180°16.6	Dec N22°46.8	GHA 4°07.8	ν 6 Ε'	Dec \$25°44.3	d 10'	HP	
0 1	180°16.6 195°16.5	N22 46.8 47.0	4°07.8 18°33.3	6.5' 6.5'	525°44.3 25°46.0	1.8' 1.6'	57.2' 57.2'	
2	210°16.4	47.3	32°58.8	6.5	25°47.7	1.5'	57.2'	
3	225°16.3	• • 47.5	47°24.3	6.5'	25°49.1	1.3'	57.2'	
4	240°16.2 255°16.1	47.7	61°49.8	6.5'	25°50.4	1.1'	57.1'	
5 6	255°16.1 270°15.9	48.0 N22°48.2	76°15.4 90°40.9	6.6' 6.6'	25°51.6 \$25°52.6	1.0' 0.8'	57.1' 57.1'	
7	270 15.9 285°15.8	48.4	90° 40.9 105° 06.5	6.6	25°53.4	0.6	57.1'	
8	300°15.7	48.7	119°32.1	6.6'	$25^{\circ}54.1$	0.5'	57.0'	
9	315°15.6	• • 48.9	133°57.8	6.7'	25°54.6	0.4'	57.0'	
10	330°15.5 345°15.4	49.1	148°23.4	6.7'	25°55.0	0.2'	57.0'	
11 12	345°15.4 0°15.2	49.4 N22°49.6	162°49.1 177°14.9	6.7' 6.8'	25°55.2 \$25°55.3	0.1' -0.1'	57.0' 57.0'	
13	15°15.1	49.8	191°40.6	6.8	25°55.2	-0.1	56.9'	
14	30°15.0	50.0	206°06.4	6.8'	25°54.9	-0.4	56.9'	
15	45°14.9	• • 50.3	220°32.2	6.9'	25°54.5	-0.6'	56.9'	
16	60°14.8	50.5	234°58.1	6.9'	25°53.9	-0.7'	56.9'	
17 18	75°14.6 90°14.5	50.7 N22°50.9	249°24.0 263°49.9	6.9' 7.0'	25°53.2 \$25°52.4	-0.9' -1.0'	56.8' 56.8'	
19	90 14.5 105°14.4	N22 50.9 51.2	263 49.9 278°15.9	7.0' 7.0'	25°51.4	-1.0 -1.2'	56.8'	
20	120°14.3	51.4	292°42.0	7.1'	25°50.2	-1.3'	56.8	
21	135°14.2	•• 51.6	307°08.0	7.1'	25°48.9	-1.5'	56.7'	
22	150°14.1	51.8	321°34.2	7.2'	25°47.4	-1.6'	56.7'	
23	165°13.9	52.0	336°00.3	7.2'	25°45.8	-1.8'	56.7'	
	SD = 15.8'	d = 0.2'		SI	O = 15.6'			

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

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

	Sun				Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		

h	Aries	`	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu –	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	256°54.3	191°05.5	N20°50.6	198°54.2	N20°09.1	86°59.4	N05°45.4	221°41.7	N11°37.7			
1	271°56.8	206°09.3	49.8	213°54.8	09.5	102°01.7	45.3	236°43.9	37.7	Alpheratz	357°31.9	29°14.8
2	286°59.2	221°13.1	49.0	228°55.4	09.9	117°04.0	45.2	251°46.1	37.8	Ankaa	353°04.6	-42°08.8
3	302°01.7	236°16.9	• • 48.3	243°56.0	· · 10.3	132°06.3	• • 45.1	266°48.3	• • 37.9	Schedar	349°27.9	56°41.4
4	317°04.2	251°20.7	47.5	258°56.6	10.7	147°08.6	45.1	281°50.5	38.0	Diphda	348°44.7	-17°49.7
5	332°06.6	266°24.5	46.7	273°57.2	11.1	162°10.9	45.0	296° 52.7	38.1	Achernar	335°18.6	-57°05.3
6	347°09.1	281°28.3	N20°45.9	288°57.8	N20°11.5	177°13.2	N05°44.9	311°54.9	N11°38.2	Hamal	327°48.3	23°35.7
7	2°11.6	296°32.1	45.2	303°58.4	11.9	192°15.5	44.8	$326^{\circ}57.1$	38.2	Polaris	312°56.7	89°22.8
8	17°14.0	311°35.9	44.4	318°59.0	12.3	$207^{\circ}17.8$	44.7	341°59.3	38.3	Acamar	315° 10.1 314° 03.5	-40°11.3 4°12.0
9	32°16.5	326°39.6	• • 43.6	333°59.6	• • 12.7	222°20.1	• • 44.7	357°01.5	• • 38.4	Menkar Mirfak	308° 24.6	4 12.0 49°57.6
10	47°19.0	341°43.4	42.8	349°00.2	13.1	237°22.4	44.6	12°03.7	38.5	Aldebaran	290°36.8	16°33.9
11	62°21.4	356°47.2	42.1	4°00.8	13.5	252°24.7	44.5	27°05.9	38.6	Rigel	281°01.5	-8°10.2
12	77°23.9	11°50.9	N20°41.3	19°01.4	N20°13.9	267°27.0	N05°44.4	42°08.2	N11°38.6	Capella	280° 18.2	46°01.5
13	92°26.3	26°54.7	40.5	34°02.0	14.3	282°29.3	44.3	57° 10.4	38.7	Bellatrix	278°20.2	6°22.4
14	107°28.8	41°58.5	39.8	49°02.6	14.7	297°31.6	44.3	72°12.6	38.8	Elnath	277°58.7	28°37.8
15	122°31.3	57°02.2	• • 39.0	64°03.2	• • 15.1	312°33.9	• • 44.2	87° 14.8	• • 38.9	Alnilam	275°35.2	$-1^{\circ}11.1$
16	137°33.7 152°36.2	72°06.0 87°09.8	38.2	79°03.9 94°04.5	15.5 15.9	327°36.2	44.1	102° 17.0 117° 19.2	39.0	Betelgeuse	$270^{\circ}49.4$	7°24.6
17 18	152 36.2 167°38.7	87 09.8 102°13.5	37.5 N20°36.7	94 04.5 109°05.1	N20° 16.3	342°38.5 357°40.8	44.0 N05°43.9	117 19.2 132°21.4	39.0 N11°39.1	Canopus	263°51.7	-52°42.8
19	107 36.7 182°41.1	102 13.5 117°17.2	35.9	109 05.1 124°05.7	16.7	12°43.1	43.9	132 21.4 147°23.6	39.2	Sirius	$258^{\circ}24.1$	-16°45.5
20	197°43.6	132°21.0	35.2	139°06.3	17.1	27°45.4	43.8	162°25.8	39.3	Adhara	255°04.0	-29°00.8
21	212°46.1	132 21.0 147°24.7	• • 34.4	154°06.9	17.5	42°47.7	• • 43.7	102 25.8 177°28.0	39.4	Procyon	244°48.2	5°09.0
22	212 40.1 227°48.5	162°28.5	33.7	169°07.5	17.9	57°50.0	43.6	192°30.2	39.5	Pollux	243°14.2	27°57.4
23	242°51.0	177°32.2	32.9	184°08.1	18.3	72°52.2	43.5	207°32.4	39.5	Avior	234°14.0	-59°36.3
										Suhail	222°44.5	-43°33.2
Mer.p	ass. 06:51	ν 3.8′ d -0	.8′ m-4.03	ν 0.6′ d0	.4′ m1.39	ν 2.3′ d-0	.1′ m-2.01	ν 2.2′ d0	.1′ m0.49	Miaplacidus	221°38.1	-69°50.4
										Alphard	217°45.2	-8°47.1
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.6 193°37.8	11°49.6 61°36.0
0	257°53.5	192°35.9	N20°32.1	199°08.7	$N20^{\circ}18.7$	87°54.5	N05°43.5	222°34.6	N11°39.6	Dubne	193°37.8 182°22.1	14°24.7
1	272°55.9	207°39.7	31.4	214°09.3	19.1	$102^{\circ}56.8$	43.4	237°36.8	39.7	Gienah	182 22.1 175°40.6	-17°42.2
2	287°58.4	222°43.4	30.6	229°09.9	19.5	$117^{\circ}59.1$	43.3	252°39.0	39.8	!	172°56.6	-63°15.8
3	303°00.8	$237^{\circ}47.1$	• • 29.9	244°10.5	• • 19.9	133°01.4	• • 43.2	267°41.2	• • 39.9		171°48.2	-57°16.7
4	318°03.3	252°50.8	29.1	259°11.1	20.3	148°03.7	43.1	282°43.5	39.9	Alioth	166° 10.4	55°48.5
5	333°05.8	267°54.6	28.3	274°11.7	20.7	163°06.0	43.0	297°45.7	40.0	Spica	158° 19.2	-11°18.7
6	348°08.2	282°58.3	N20°27.6	289°12.3	N20°21.1	178°08.3	N05°43.0	312°47.9	N11°40.1	Alkaid	152°49.6	49°10.4
7	3°10.7	298°02.0	26.8	304°12.9	21.5	193°10.6	42.9	327°50.1	40.2	Hadar	148°31.4	-60°30.9
8	18°13.2	313°05.7	26.1	319°13.5	21.9	208°12.9	42.8	342°52.3	40.3	Menkent	$147^{\circ}54.0$	-36°30.8
9	33°15.6	328°09.4	• • 25.3	334°14.1	• • 22.3	223°15.2	• • 42.7	357°54.5	• • 40.3	Arcturus	$145^{\circ}45.1$	19°02.1
10 11	48°18.1 63°20.6	343°13.1	24.6	349°14.7 4°15.4	22.6	238°17.5 253°19.8	42.6	12°56.7 27°58.9	40.4	Rigil Kent.	139°35.8	-60°57.4
12	78°23.0	358°16.8 13°20.5	23.8 N20°23.1	4 15.4 19°16.0	23.0 N20°23.4	253 19.8 268°22.0	42.6 N05°42.5	43°01.1	40.5 N11°40.6	Kochab	$137^{\circ}19.1$	74°02.4
13	93°25.5	28°24.2	22.3	34°16.6	23.8	283°24.3	42.4	58°03.3	40.7	Zuben'ubi	136°52.6	-16°09.7
14	108°28.0	43°27.9	21.6	49°17.2	24.2	203°24.3 298°26.6	42.4	73° 05.5	40.7	Alphecca	126°01.1	26°37.2
15	123°30.4	58°31.5	. 20.8	64°17.8	• • 24.6	313°28.9	• • 42.2	88° 07.7	• • 40.8	Antares	112°12.0	-26°29.7
16	138°32.9	73°35.2	20.1	79°18.4	25.0	328°31.2	42.1	103°09.9	40.9	Atria	107°03.1	-69°04.7
17	153°35.3	88°38.9	19.3	94°19.0	25.4	343°33.5	42.1	118° 12.2	41.0	Sabik	101°59.2	-15°45.6
18	168°37.8	103°42.6	N20° 18.6	109°19.6	N20°25.8	358°35.8	N05°42.0	133° 14.4	N11°41.1	Shaula	96°06.1	-37°07.4
19	183°40.3	118°46.3	17.8	124°20.2	26.2	13°38.1	41.9	148° 16.6	41.1	Rasalhague	95°55.6	12°32.4 51°29.1
20	198°42.7	133°49.9	17.1	139°20.8	26.6	28°40.4	41.8	163°18.8	41.2	Eltanin Kaus Aust.	90°40.4 83°28.4	-34°22.1
21	213°45.2	148°53.6	• • 16.4	154°21.4	• • 26.9	43°42.7	• • 41.7	$178^{\circ}21.0$	• • 41.3	Vega	80°30.9	38°48.6
22	228°47.7	163°57.2	15.6	169°22.0	27.3	58°44.9	41.6	193°23.2	41.4	Nunki	75°44.0	-26°15.5
23	243°50.1	179°00.9	14.9	184°22.6	27.7	73°47.2	41.6	208°25.4	41.5	Altair	61°57.0	8°56.7
Mer n	ass. 06:47	ν3.7' d-0	.8′ m-3.94	ν0 6′ d0	.4′ m1.39	v2 3' d-0	.1′ m-2.01	v2 2' d0	.1′ m0.49	Peacock	53°01.0	-56°38.3
										Deneb	49°23.6	45°22.8
										Enif	33°35.9	10°00.4
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.4$	-46°49.0
0	258°52.6	194°04.6	N20°14.1		N20°28.1	88°49.5	N05°41.5	223°27.6	N11°41.5	Fomalhaut	15°11.5	-29°28.0
1	273°55.1	209°08.2	13.4	214°23.8	28.5	103°51.8	41.4	238°29.8	41.6	Scheat	13°42.4	28°14.2
2	288°57.5 304°00.0	224°11.9 239°15.5	12.7 •• 11.9	229°24.4 244°25.0	28.9 •• 29.3	118°54.1 133°56.4	41.3 · · 41.2	253°32.0 268°34.2	41.7 •• 41.8	Markab	13°27.1	15°21.5
4	304 00.0 319°02.4	254°19.1	11.9	259°25.6	29.3	133 50.4 148°58.7	41.2	283°36.4	41.8	Jun 08 Thu	SHA	Mer.pass
5	334°04.9	269°22.8	10.5	274°26.2	30.0	164°01.0	41.1	298° 38.7	41.9	!	294°11.2	11:13
6	349°07.4	284°26.4	N20°09.7	289°26.8	N20° 30.4	179°03.2	N05°41.0	313°40.9	N11°42.0	Mars		10:44
7	4°09.8	299°30.0	09.0	304°27.4	30.8	194°05.5	40.9	328°43.1	42.1		190°05.1	18:09
8	19°12.3	314°33.7	08.3	319°28.0	31.2	209°07.8	40.8	343°45.3	42.2	Saturn	324°47.4	09:12
9	34°14.8	329°37.3	•• 07.5	334°28.6	• • 31.6	224°10.1	• • 40.7	358° 47.5	• • 42.3	I 00 F :	CIIA	
10	49°17.2	344°40.9	06.8	$349^{\circ}29.2$	32.0	239°12.4	40.6	$13^{\circ}49.7$	42.3	Jun 09 Fri	SHA	Mer.pass
11	64°19.7	359°44.5	06.1	4°29.8	32.3	$254^{\circ}14.7$	40.5	$28^{\circ}51.9$	42.4		294°42.5 301°15.2	11:07 10:43
12	79°22.2	14°48.1	N20°05.4	19°30.4	N20°32.7	269°17.0	N05°40.5	43°54.1	N11°42.5		190°01.1	18:06
13	94°24.6	29°51.7	04.6	34°31.0	33.1	284°19.2	40.4	58° 56.3	42.6	Saturn	324°41.2	09:08
14	109°27.1	44°55.3	03.9	49°31.7	33.5	299°21.5	40.3	73°58.5	42.7			
15	124°29.6	59°58.9	• • 03.2	64°32.3	• • 33.9	314°23.8	• • 40.2	89°00.7	• • 42.7	Jun 10 Sat	SHA	Mer.pass
16	139°32.0	75°02.5	02.5	79°32.9	34.3	329°26.1	40.1	104°03.0	42.8		295°12.0	11:01
17	154°34.5	90°06.1	01.7	94°33.5	34.6	344°28.4	40.0 N05°39.9	119°05.2	42.9		300°30.6	10:42
18 19	169°36.9 184°39.4	105°09.7 120°13.3	N20°01.0 20°00.3	109°34.1 124°34.7	N20°35.0 35.4	359°30.7 14°32.9	39.9	134°07.4 149°09.6	N11°43.0 43.0		189°56.9	18:02
20	104 39.4 199°41.9	120 13.3 135°16.9	20 00.3 19°59.6	139°35.3	35.4 35.8	29°35.2	39.9	149 09.0 164°11.8	43.0	Saturn	324°35.0	09:05
21	214°44.3	150°20.5	• • 58.9	154°35.9	36.2	44°37.5	•• 39.7	179° 14.0	• • 43.2	Horizont	al parallax	
22	214 44.3 229°46.8	165°24.1	58.1	169°36.5	36.5	59°39.8	39.6	179 14.0 194° 16.2	43.2		Venus:	0.5
23	244°49.3	180°27.6	57.4	184°37.1	36.9	74°42.1	39.5	209° 18.4	43.4		Mars:	0.1
ivier.p	ass. 06:43	ν s. i a-0	.7′ m-4.03	ν 0.0' a 0	.4′ m1.40	ν 2.5 a -0	.1′ m-2.00	ν2.2 a0	.1' m 0.49			

h	Sui	า			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.8	N22°52.3	$350^{\circ}26.6$	7.3'	S25°44.0	-1.9'	56.7'
1	195°13.7 210°13.6	52.5	4°52.8 19°19.1	7.3'	25°42.1 25°40.1	-2.1'	56.6'
2	210°13.6 225°13.5	52.7 •• 52.9	19° 19.1 33° 45.5	7.4' 7.4'	25° 40.1 25° 37.9	-2.2' -2.3'	56.6' 56.6'
4	240°13.3	53.1	48°12.0	7.5'	25°35.5	-2.5'	56.6'
5	255°13.2	53.4	62°38.5	7.6'	25°33.0	-2.6'	56.5'
6 7	270°13.1 285°13.0	N22°53.6 53.8	77°05.0 91°31.6	7.6' 7.7'	\$25°30.4 25°27.6	-2.8' -2.9'	56.5' 56.5'
8	300°12.9	54.0	105°58.3	7.7'	25°24.7	-2.9	56.5
9	315°12.7	• • 54.2	120°25.0	7.8'	$25^{\circ}21.6$	-3.2'	56.4'
10	330°12.6 345°12.5	54.4	134°51.8 149°18.7	7.9'	25° 18.4 25° 15.1	-3.3'	56.4
11 12	0°12.4	54.6 N22°54.8	149 16.7 163°45.6	7.9' 8.0'	S25°11.6	-3.5' -3.6'	56.4' 56.4'
13	15°12.3	55.1	178°12.6	8.1'	25°08.0	-3.8'	56.3'
14	30°12.1	55.3	192°39.7	8.1'	25°04.2	-3.9'	56.3'
15 16	45°12.0 60°11.9	· · 55.5 55.7	207°06.8 221°34.0	8.2' 8.3'	25°00.3 24°56.3	-4.0' -4.2'	56.3' 56.3'
17	75°11.8	55.9	236°01.3	8.4'	24°52.1	-4.3'	56.2'
18	90°11.6	N22°56.1	250°28.7	8.4'	S24°47.8	-4.4'	56.2'
19 20	105°11.5 120°11.4	56.3 56.5	264°56.1 279°23.6	8.5' 8.6'	24°43.4 24°38.8	-4.6' -4.7'	56.2' 56.2'
21	135°11.3	56.7	293°51.2	8.7'	24°34.1	-4.1°	56.1
22	150°11.2	56.9	308°18.8	8.7'	$24^{\circ}29.3$	-5.0'	56.1'
23	165°11.0	57.1	322°46.6	8.8'	24°24.3	-5.1'	56.1'
	SD = 15.8'	d = 0.2'		SD	0 = 15.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.9	N22°57.3	337°14.4	8.9'	S24°19.2	-5.2'	56.1'
1	195°10.8	57.5	351°42.3	9.0'	24°14.0	-5.3'	56.0'
2 3	210°10.7 225°10.6	57.7 •• 57.9	6°10.2 20°38.3	9.1' 9.1'	24°08.7 24°03.3	-5.5' -5.6'	56.0' 56.0'
4	240°10.4	58.1	20°36.3	9.1	24 03.3 23°57.7	-5.7'	56.0'
5	255°10.3	58.3	49°34.6	9.3'	$23^{\circ}52.0$	-5.8'	55.9'
6	270°10.2 285°10.1	N22°58.5	64°02.9	9.4'	\$23°46.2 23°40.2	-5.9'	55.9'
7 8	285°10.1 300°09.9	58.7 58.9	78°31.3 92°59.8	9.5' 9.5'	23°40.2 23°34.2	-6.1' -6.2'	55.9' 55.9'
9	315°09.8	• • 59.1	107°28.3	9.6'	23°28.0	-6.3	55.8'
10	330°09.7	59.3	121°57.0	9.7'	23°21.7	-6.4'	55.8'
11 12	345°09.6 0°09.4	59.5 N22°59.7	136°25.7 150°54.5	9.8' 9.9'	23°15.3 523°08.8	-6.5' -6.6'	55.8' 55.8'
13	15°09.3	22°59.9	165°23.4	10.0'	23°02.1	-6.7	55.7'
14	30°09.2	23°00.1	179°52.4	10.1'	22°55.4	-6.9'	55.7'
15 16	45°09.1 60°09.0	· · 00.3 00.5	194°21.4 208°50.6	10.2' 10.2'	22°48.5 22°41.5	-7.0' -7.1'	55.7' 55.7'
17	75°08.8	00.7	200° 30.0 223° 19.8	10.2	22°34.5	-7.1 -7.2'	55.6'
18	90°08.7	N23°00.9	237°49.1	10.4'	S22°27.3	-7.3'	55.6'
19 20	105°08.6 120°08.5	01.0 01.2	252°18.6 266°48.1	10.5' 10.6'	22°20.0 22°12.6	-7.4' -7.5'	55.6' 55.6'
21	120 08.5 135°08.3	01.4	200 48.1 281°17.6	10.6	22 12.0 22°05.1	-7.5' -7.6'	55.5'
22	150°08.2	01.6	295°47.3	10.8'	21°57.5	-7.7'	55.5'
23	165°08.1	01.8	310°17.1	10.9'	21°49.8	-7.8'	55.5'
	SD = 15.7'	d = 0.2'		SD	0 = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.0	N23°02.0	324°46.9	10.9'	\$21°42.0	-7.9'	55.5'
1 2	195°07.8 210°07.7	02.2 02.4	339°16.9 353°46.9	11.0' 11.1'	21°34.1 21°26.1	-8.0' -8.1'	55.5' 55.4'
3	225°07.6	02.5	8°17.0	11.2'	21°18.0	-8.2	55.4'
4	240°07.5	02.7	22°47.2	11.3'	21°09.8	-8.3'	55.4'
5 6	255°07.3 270°07.2	02.9 N23°03.1	37°17.5 51°47.9	11.4' 11.5'	21°01.5 \$20°53.2	-8.4' -8.5'	55.4' 55.3'
7	285°07.1	03.3	66°18.4	11.6'	20°44.7	-8.6'	55.3'
8	300°07.0	03.4	80°49.0	11.6'	20°36.1	-8.7'	55.3'
9 10	315°06.8 330°06.7	· · 03.6 03.8	95°19.6 109°50.3	11.7' 11.8'	20°27.5 20°18.7	-8.7' -8.8'	55.3' 55.3'
11	345°06.6	04.0	124°21.2	11.9'	20°09.9	-8.9'	55.2'
12	0°06.5	N23°04.2	138°52.1	12.0'	S20°01.0	-9.0'	55.2'
13 14	15°06.3 30°06.2	04.3 04.5	153°23.1 167°54.1	12.1' 12.2'	19°52.0 19°42.9	-9.1' -9.2'	55.2' 55.2'
15	45°06.1	• • 04.7	182°25.3	12.3'	19°42.9	-9.2 -9.3'	55.2'
16	60°06.0	04.9	196°56.6	12.3'	19°24.5	-9.3'	55.1'
17 18	75°05.8 90°05.7	05.0 N23°05.2	211°27.9 225°59.3	12.4' 12.5'	19° 15.1 \$19° 05.7	-9.4' -9.5'	55.1' 55.1'
18 19	90°05.7 105°05.6	N23 05.2 05.4	225°59.3 240°30.8	12.6'	18° 56.2	-9.5' -9.6'	55.1'
20	120°05.5	05.6	255°02.4	12.7'	18°46.7	-9.6'	55.1'
21	135°05.3 150°05.2	· · 05.7 05.9	269°34.1 284°05.9	12.8' 12.8'	18°37.0 18°27.3	-9.7' -9.8'	55.0' 55.0'
22 23	150°05.2 165°05.1	05.9 06.1	284°05.9 298°37.7	12.8'	18° 27.3 18° 17.5	-9.8° -9.9'	55.0° 55.0'
	SD = 15.7'	d = 0.2'			0 = 15.1'		

			2028	June 0	8 to Ju	ın. 10
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Julilise	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
S 50°	06:35	07:16	07:54	16:04	16:42	17:24
52°	06:40	07:23	08:04	15:55	16:35	17:19
54°	06:45	07:31	08:15	15:44	16:27	17:13
56°	06:51	07:40	08:27	15:32	16:18	17:07
58°	06:58	07:50	08:41	15:17	16:08	17:01
S 60°	07:05	08:01	08:58	15:00	15:57	16:53
Lat		Moonris	se .		Moonset	<u> </u>
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°			01:38			03:27
66°			00:36			04:27
	00.15	00.06	00:01	0.1.10	00.16	
64°	00:12	00:06	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
N 58°	22:36	22:59	23:14	03:24	04:39	06:01
56°	22.30	22.39	23.1 4 23.04	03.24	04.59	06.01

	Lat.		Moonris	e	Moonset			
	Lat.	Thu	Fri	Sat	Thu	Fri	Sat	
ı	V 72°				_			
ı	√ 70°							
	68°			01:38			03:27	
İ	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	
ı	√ 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	
ı	4 0°	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	
ı	V 10°	19:41	20:31	21:16	06:33	07:29	08:22	
	0°	19:22	20:14	21:02	06:53	07:47	08:38	
:	S 10°	19:02	19:57	20:48	07:13	08:05	08:53	
	20°	18:42	19:38	20:33	07:34	08:25	09:10	
	30°	18:18	19:17	20:16	07:59	08:47	09:29	
	35°	18:03	19:05	20:05	08:14	09:00	09:40	
	40°	17:47	18:50	19:54	08:30	09:15	09:52	
	45°	17:27	18:33	19:40	08:50	09:33	10:07	
!	S 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	
:	S 60°	15:40	17:04	18:32	10:40	11:05	11:20	

		Sun			oon		
Day	Eqn.o	Eqn.of Time		Mer.	Mer.Pass.		
	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
•	CLIA	CIIA		CLIA				CILA			CLLA	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	259°51.7	195°31.2	N19°56.7	199°37.7	N20°37.3	89°44.4	N05°39.4	224°20.6	N11°43.4	Alpheratz	357°31.9	29° 14.8
1	274°54.2	210°34.8	56.0	214°38.3	37.7	104°46.6	39.3	239°22.9	43.5	Ankaa	353°04.6	-42°08.8
2	289°56.7	225°38.3	55.3	229°38.9	38.1	119°48.9	39.3	254°25.1	43.6	Schedar	349°27.9	56°41.4
3	304°59.1	240°41.9	• • 54.6	244°39.5	38.4	134°51.2	• • 39.2	269°27.3	• • 43.7	Diphda	348°44.6	-17°49.7
4	320°01.6	255°45.4	53.9	259°40.1	38.8	149°53.5	39.1	284°29.5	43.8	Achernar	$335^{\circ}18.5$	-57°05.2
5	335°04.1	270°49.0	53.2	274°40.7	39.2	164°55.8	39.0	299°31.7	43.8	Hamal	327°48.2	23°35.7
6 7	350°06.5 5°09.0	285°52.5 300°56.1	N19°52.5 51.8	289°41.3 304°41.9	N20°39.6 40.0	179°58.0 195°00.3	N05°38.9 38.8	314°33.9 329°36.1	N11°43.9 44.0	Polaris	312°55.7	89°22.8
8	20°11.4	315°59.6	51.0	319° 42.5	40.0	210°02.6	38.7	344°38.3	44.0	Acamar	$315^{\circ}10.0$	-40°11.3
9	35° 13.9	331°03.2	50.3	334° 43.1	. 40.3	210 02.0 225°04.9	• • 38.6	359°40.5	• • 44.2	Menkar	314°03.5	4°12.1
10	50° 16.4	346°06.7	49.6	349°43.7	41.1	240°07.2	38.6	14° 42.8	44.2	Mirfak	308°24.6	49° 57.6
11	65° 18.8	1°10.2	48.9	4°44.3	41.5	255°09.4	38.5	29°45.0	44.3	Aldebaran	290°36.7	16°33.9
12	80°21.3	16°13.8	N19°48.2	19°44.9	N20°41.8	270°11.7	N05°38.4	44°47.2	N11°44.4	Rigel	281°01.5	-8°10.2
13	95°23.8	31°17.3	47.5	34° 45.5	42.2	285° 14.0	38.3	59°49.4	44.5	Capella	280°18.2	46°01.5
14	110°26.2	46°20.8	46.8	49°46.1	42.6	300° 16.3	38.2	74°51.6	44.5	Bellatrix	278°20.2	6°22.4
15	125°28.7	61°24.3	• • 46.1	64°46.7	• • 43.0	315° 18.6	38.1	89°53.8	• • 44.6	Elnath	277°58.7	28°37.8
16	140°31.2	76°27.8	45.4	79°47.3	43.3	330° 20.8	38.0	104°56.0	44.7	Alnilam	275°35.2	-1°11.1
17	155°33.6	91°31.3	44.8	94°47.9	43.7	345°23.1	37.9	119°58.2	44.8	Betelgeuse	270°49.4	7°24.6
18	170°36.1	106°34.8	N19°44.1	109°48.5	N20°44.1	0°25.4	N05°37.9	135°00.4	N11°44.9	Canopus	263°51.7	-52°42.8 -16°45.4
19	185°38.6	121°38.3	43.4	124°49.1	44.5	$15^{\circ}27.7$	37.8	150°02.7	44.9	Sirius	258°24.1	
20	200°41.0	136°41.8	42.7	139°49.7	44.8	30°30.0	37.7	165°04.9	45.0	Adhara Procyon	255°04.0 244°48.2	-29°00.8 5°09.0
21	215°43.5	151°45.3	• • 42.0	154°50.3	• • 45.2	45°32.2	• • 37.6	$180^{\circ}07.1$	• • 45.1	Pollux	244 46.2 243°14.2	27° 57.4
22	230°45.9	166°48.8	41.3	169°50.9	45.6	60°34.5	37.5	195°09.3	45.2	Avior	234°14.0	-59°36.3
23	245°48.4	181°52.3	40.6	184°51.5	45.9	75°36.8	37.4	$210^{\circ}11.5$	45.2	Suhail	222°44.5	-43°33.2
Mars	ass. 06:39	1/3 6/ A D	.7′ m-4.10	νη 6' 40	.4′ m1.40	1/2 3/ d 0	.1′ m-1.99	1/2 2/ 40	.1′ m0.48	Miaplacidus	222 44.5 221°38.1	-45 55.2 -69°50.4
ivier.p		ν3.0 u-0		νο.σ ασ	.4 1111.40	ν2.3 u-0	.1 111-1.99	νz.z αυ	.1 1110.46	Alphard	217°45.2	-8° 47.1
										Regulus	207°31.6	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°36.0
0	260°50.9	196°55.8	N19°39.9	199°52.1	N20°46.3	90°39.1	N05°37.3	$225^{\circ}13.7$	N11°45.3	Denebola	182°22.1	14°24.7
1	275°53.3	211°59.3	39.2	214°52.7	46.7	105°41.3	37.2	240°15.9	45.4	Gienah	175°40.6	-17° 42.2
2	290°55.8	227°02.7	38.6	229°53.3	47.1	120°43.6	37.1	255° 18.1	45.5		172°56.6	-63° 15.8
3	305°58.3	242°06.2	• • 37.9	244°53.9	• • 47.4	135° 45.9	• • 37.1	270°20.4	• • 45.6		171°48.2	-57° 16.7
4	321°00.7	257°09.7	37.2	259° 54.5	47.8	150° 48.2	37.0	285°22.6	45.6		166°10.4	55° 48.5
5	336°03.2	272°13.1	36.5	274°55.1	48.2	165°50.4	36.9	300°24.8	45.7	Spica	158°19.2	-11° 18.7
6	351°05.7	287°16.6	N19°35.8	289°55.7	N20°48.5	180°52.7	N05°36.8	315°27.0	N11°45.8	Alkaid	152°49.6	49° 10.4
7	6°08.1	302°20.0	35.2	304°56.3	48.9	195°55.0	36.7	330°29.2	45.9	Hadar	148°31.5	-60° 30.9
8	21°10.6	317°23.5	34.5	319°56.9	49.3	210°57.3	36.6	345°31.4	45.9	Menkent	147°54.0	-36° 30.8
9	36° 13.0	332°26.9	• • 33.8	334°57.5	• • 49.6	225°59.5	• • 36.5	0°33.6	• • 46.0	Arcturus	145°45.1	19°02.1
10	51° 15.5	347°30.4	33.1	349°58.1	50.0	241°01.8	36.4	15°35.9	46.1	Rigil Kent.	139°35.8	-60°57.4
11	66°18.0	2°33.8	32.5	4°58.7	50.4	256°04.1	36.3	30°38.1	46.2	Kochab	$137^{\circ}19.1$	74°02.4
12	81°20.4	17°37.2	N19°31.8	19°59.3	N20°50.7	271°06.4	N05°36.2	45°40.3	N11°46.3	Zuben'ubi	$136^{\circ}52.6$	-16°09.7
13	96°22.9	32°40.7	31.1	34°59.9	51.1	286°08.6	36.2	60°42.5	46.3	Alphecca	$126^{\circ}01.1$	26° 37.2
14	111°25.4	47°44.1	30.5	50°00.5	51.5	301°10.9	36.1	75°44.7	46.4	Antares	$112^{\circ}12.0$	-26°29.7
15	126°27.8	62°47.5	• • 29.8	65°01.1	51.8	316° 13.2	• • 36.0	90°46.9	• • 46.5	Atria	$107^{\circ}03.1$	-69°04.7
16 17	141°30.3 156°32.8	77°50.9 92°54.4	29.1 28.5	80°01.7 95°02.3	52.2 52.6	331°15.4 346°17.7	35.9 35.8	105°49.1 120°51.4	46.6 46.6	Sabik	101°59.2	-15°45.6
18	171° 35.2	107°57.8	N19°27.8	110°02.9	N20°52.9	1°20.0	N05°35.7	135°53.6	N11°46.7	Shaula	96°06.1	-37°07.4
19	186° 37.7	123°01.2	27.1	125°03.5	53.3	16°22.3	35.6	150°55.8	46.8	Rasalhague	95°55.6	12°32.4
20	201°40.2	138°04.6	26.5	140°04.1	53.7	31°24.5	35.5	165°58.0	46.9	Eltanin	90°40.3	51°29.1
21	216° 42.6	153°08.0	25.8	155°04.7	• • 54.0	46°26.8	• • 35.4	181°00.2	• • 47.0	Kaus Aust.	83°28.4	-34°22.1
22	231°45.1	168°11.4	25.2	170°05.3	54.4	61°29.1	35.3	196°02.4	47.0	Vega	80°30.9	38°48.6
23	246° 47.5	183°14.8	24.5	185°05.9	54.7	76°31.3	35.3	211°04.6	47.1	Nunki	75°44.0	-26°15.5
										Altair	61°56.9	8°56.7
Mer.p	ass. 06:36	ν 3.5′ d-0	.7′ m-4.17	u0.6′ d 0	.4′ m1.40	$\nu 2.3' \ d-0$	$.1^\prime$ m-1.99	ν 2.2′ d0	.1' m 0.48	Peacock	53°01.0	-56°38.3
										Deneb	49°23.5	45°22.8
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.9	10°00.4
0	261°50.0	198°18.2	N19°23.8	200°06.5	N20°55.1	91°33.6	N05°35.2	226°06.9	N11°47.2	Al Na'ir Fomalhaut	27°29.3 15°11.4	-46°49.0 -29°28.0
1	276° 52.5	213°21.5	23.2	215°07.1	55.5	106° 35.9	35.1	241°09.1	47.3	Scheat	15 11.4 13°42.4	-29 28.0 28°14.2
2	291°54.9	228°24.9	22.5	230°07.7	55.8	121°38.2	35.0	256°11.3	47.3	Markab	13°27.1	15° 21.5
3	306° 57.4	243°28.3	21.9	245°08.3	• • 56.2	136°40.4	• • 34.9	271°13.5	• • 47.4	iviarkab	13 21.1	10 21.3
4	321°59.9	258°31.7	21.2	260°08.9	56.6	151°42.7	34.8	286°15.7	47.5	Jun 11 Sun	SHA	Mer.pass
5	337°02.3	273°35.0	20.6	275°09.5	56.9	166°45.0	34.7	$301^{\circ}17.9$	47.6	Venus		10:55
6	352°04.8	288°38.4	N19°19.9	290°10.1	N20°57.3	181°47.2	N05°34.6		N11°47.6	Mars	299°45.9	10:41
7	7°07.3	303°41.8	19.3	$305^{\circ}10.7$	57.6	196°49.5	34.5	$331^{\circ}22.4$	47.7		189°52.6	17:58
8	22°09.7	318°45.1	18.6	320°11.3	58.0	211°51.8	34.4	346°24.6	47.8	Saturn	324°28.9	09:01
9	37° 12.2	333°48.5	• • 18.0	335°11.9	• • 58.4	226°54.0	• • 34.3	1°26.8	• • 47.9	Jun 12 Mon	SHA	Mer.pass
10	52° 14.7	348°51.8	17.4	350° 12.5	58.7	241°56.3	34.2	16°29.0	48.0		296°04.9	10:50
11	67° 17.1	3°55.2	16.7	5°13.1	59.1	256° 58.6	34.1	31°31.2	48.0		290°04.9 299°01.2	10:50
12	82°19.6	18°58.5	N19°16.1	20°13.7	N20°59.4	272°00.8	N05°34.1	46°33.4	N11°48.1		189°48.2	17:55
13	97°22.0	34°01.8	15.4	35°14.3	20°59.8	287°03.1	34.0	61°35.7	48.2	Saturn		08:58
14	112°24.5	49°05.2	14.8	50°14.9	21°00.1	302°05.4	33.9	76°37.9	48.3			
15	127°27.0	64°08.5	14.2	65° 15.5	• • 00.5	317°07.6	• • 33.8	91°40.1	• • 48.3	Jun 13 Tue	SHA	Mer.pass
16	142°29.4	79°11.8	13.5	80°16.1	00.9	332°09.9	33.7	106°42.3	48.4		296°28.2	10:44
17	157°31.9	94°15.2	12.9	95°16.7	01.2	347°12.2	33.6	121°44.5	48.5		298°16.5	10:39
18	172°34.4	109°18.5	N19°12.3	110°17.3		2°14.4	N05°33.5		N11°48.6		189°43.6	17:51
19	187°36.8	124°21.8	11.6	125°17.9	01.9	17°16.7	33.4	151°49.0	48.6	Saturn	324°16.8	08:54
20	202°39.3	139°25.1	11.0	140°18.5	02.3	32°19.0	33.3	166°51.2	48.7	Horizont	al parallax	
21	217°41.8	154°28.4	10.4	155° 19.1	02.6	47°21.2	• • 33.2	181°53.4	. 48.8	TIOTIZOTI	Venus:	0.5
22	232°44.2	169°31.7	09.8	170°19.7	03.0	62°23.5	33.1	196°55.6	48.9		Mars:	0.5
23	247°46.7	184°35.0	09.1	185°20.3	03.4	77°25.8	33.0	211°57.8	48.9		141013.	J.1
Mer.p	ass. 06:32	ν 3.4′ d-0	.7′ m-4.24	u0.6′ d0	.4′ m1.41	ν 2.3′ d-0	.1′ m-1.98	ν 2.2′ d0	.1′ m0.48			

h	Sui	n	Moon						
Sun	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°04.9	N23°06.2	313°09.6	13.0'	S18°07.6	-9.9'	55.0'		
1	195°04.8	06.4	327°41.6	13.1'	$17^{\circ}57.7$	-10.0'	55.0'		
2	210°04.7	06.6	342°13.7	13.2'	17° 47.7	-10.1'	54.9'		
3	225°04.6	• • 06.7	356°45.9	13.2'	17°37.6	-10.2'	54.9'		
4	240°04.4	06.9	11°18.1	13.3'	17°27.4	-10.2'	54.9'		
5	255°04.3 270°04.2	07.1 N23°07.2	25°50.4 40°22.8	13.4' 13.5'	17°17.2 \$17°06.9	-10.3'	54.9'		
6 7	270 04.2 285°04.1	N23 07.2 07.4	40 22.8 54°55.3	13.6'	16°56.6	-10.4' -10.4'	54.9' 54.8'		
8	300°03.9	07.4	69°27.9	13.6'	16°46.1	-10.4	54.8'		
9	315°03.8	• • 07.7	84°00.5	13.7'	16° 35.7	-10.5	54.8'		
10	330°03.7	07.9	98°33.2	13.8'	16°25.1	-10.6'	54.8'		
11	345°03.5	08.0	113°06.0	13.9'	16° 14.5	-10.7'	54.8'		
12	0°03.4	N23°08.2	127°38.9	13.9'	S16°03.8	-10.7'	54.8'		
13	15°03.3	08.4	$142^{\circ}11.8$	14.0'	$15^{\circ}53.1$	-10.8'	54.7'		
14	30°03.2	08.5	156°44.8	14.1'	15° 42.3	-10.8'	54.7'		
15	45°03.0	• • 08.7	171°17.9	14.1'	15°31.4	-10.9'	54.7'		
16	60°02.9 75°02.8	08.8 09.0	185°51.0 200°24.2	14.2'	15°20.5 15°09.6	-11.0'	54.7'		
17 18	90°02.6	N23°09.2	200 24.2 214°57.5	14.3' 14.4'	\$14°58.6	-11.0' -11.1'	54.7' 54.7'		
19	105°02.5	09.3	214 37.3 229°30.9	14.4'	14°47.5	-11.1	54.6'		
20	120°02.4	09.5	244°04.3	14.5	14°36.4	-11.2'	54.6'		
21	135°02.3	• • 09.6	258°37.8	14.6'	14°25.2	-11.2'	54.6'		
22	150°02.1	09.8	273°11.4	14.6'	14° 13.9	-11.3'	54.6'		
23	165°02.0	09.9	287°45.0	14.7'	14°02.7	-11.3'	54.6'		
	SD = 15.7'	d = 0.2'		SI	O = 15.0'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP		
0 1	180°01.9 195°01.7	N23°10.1 10.2	302°18.7 316°52.4	14.8' 14.8'	\$13°51.3 13°39.9	-11.4' -11.4'	54.6' 54.6'		
2	210°01.6	10.2	331°26.3	14.0	13 39.9 13°28.5	-11.4 -11.5'	54.5'		
3	225°01.5	. 10.4	346°00.2	14.9'	13° 17.0	-11.5'	54.5		
4	240°01.4	10.7	0°34.1	15.0'	13°05.5	-11.6'	54.5		
5	255°01.2	10.8	15°08.1	15.1'	12°53.9	-11.6'	54.5'		
6	270°01.1	N23°11.0	29°42.2	15.1'	S 12°42.3	-11.7'	54.5'		
7	285°01.0	11.1	44°16.3	15.2'	12°30.7	-11.7'	54.5'		
8	300°00.8	11.3	58°50.5	15.2'	12°19.0	-11.7'	54.5'		
9	315°00.7	•• 11.4	73°24.7	15.3'	12°07.2	-11.8'	54.5'		
10	330°00.6	11.6	87°59.0	15.3'	11°55.4	-11.8'	54.4'		
11	345°00.5	11.7 N23°11.9	102°33.3	15.4'	11°43.6 \$11°31.7	-11.9'	54.4'		
12 13	0°00.3 15°00.2	N23 11.9 12.0	117°07.7 131°42.2	15.5' 15.5'	11° 19.8	-11.9' -11.9'	54.4' 54.4'		
14	30°00.1	12.0	131 42.2 146°16.7	15.6'	11° 19.8	-11.9	54.4		
15	44°59.9	. 12.3	160°51.3	15.6'	10°55.9	-12.0'	54.4'		
16	59°59.8	12.4	175°25.9	15.7'	10°43.9	-12.1'	54.4'		
17	74°59.7	12.6	$190^{\circ}00.5$	15.7'	$10^{\circ}31.8$	-12.1'	54.4'		
18	89°59.5	N23°12.7	204°35.2	15.8'	S10° 19.7	-12.1'	54.4'		
19	104°59.4	12.8	219°10.0	15.8'	10°07.6	-12.2'	54.3'		
20	119°59.3	13.0	233°44.8	15.8'	09°55.5 09°43.3	-12.2'	54.3'		
21 22	134°59.2 149°59.0	· · 13.1 13.2	248°19.7 262°54.5	15.9' 15.9'	09°43.3 09°31.0	-12.2' -12.3'	54.3' 54.3'		
23	149 59.0 164°58.9	13.4	202 54.5 277°29.5	16.0'	09° 18.8	-12.3'	54.3'		
20	SD = 15.7'	d = 0.2'			O = 14.9'	12.0			
	<u> </u>	<u>u = 0.2</u>		JI	J = 14.9				
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°58.8	N23°13.5	292°04.5	16.0'	\$09°06.5	-12.3'	54.3'		
1	194°58.6 209°58.5	13.7	306°39.5 321°14.5	16.1'	08°54.2	-12.3'	54.3'		
2	209°58.5 224°58.4	13.8 • • 13.9	321°14.5 335°49.6	16.1' 16.1'	08°41.8 08°29.5	-12.4' -12.4'	54.3' 54.3'		
3 4	239°58.2	14.1	350°24.8	16.1	08° 17.1	-12.4'	54.3'		
5	254°58.1	14.2	4°59.9	16.2'	08°04.6	-12.5'	54.3'		
6	269°58.0	N23°14.3	19°35.2	16.2'	S07°52.2	-12.5'	54.3'		
7	284°57.8	14.4	$34^{\circ}10.4$	16.3'	07°39.7	-12.5'	54.3'		
8	299°57.7	14.6	48°45.7	16.3'	07°27.2	-12.5'	54.2'		
9	314°57.6	• • 14.7	63°21.0	16.3'	07°14.7	-12.6'	54.2'		
10	329°57.4	14.8	77°56.4	16.4	07°02.1	-12.6'	54.2'		
11	344°57.3 359°57.2	15.0 N23°15.1	92°31.7 107°07.1	16.4'	06°49.6 \$06°37.0	-12.6'	54.2'		
12 13	359°57.2 14°57.1	N23 15.1 15.2	107°07.1 121°42.6	16.4' 16.5'	06°24.3	-12.6' -12.6'	54.2' 54.2'		
14	29°56.9	15.2	136°18.0	16.5	06° 24.3	-12.0 -12.7'	54.2'		
15	44°56.8	. 15.5	150°53.5	16.5'	05°59.0	-12.7'	54.2'		
16	59°56.7	15.6	165°29.1	16.5'	05°46.4	-12.7'	54.2'		
17	74°56.5	15.7	180°04.6	16.6'	05°33.7	-12.7'	54.2'		
18	89°56.4	N23°15.8	194°40.2	16.6'	S05°21.0	-12.7'	54.2'		
19	104°56.3	15.9	209°15.8	16.6'	05°08.2	-12.8'	54.2'		
20	119°56.1	16.1	223°51.4	16.6'	04°55.5	-12.8'	54.2'		
21	134°56.0	• • 16.2	238°27.0	16.7'	04°42.7	-12.8'	54.2'		
22	149°55.9	16.3	253°02.7 267°38.3	16.7'	04°29.9	-12.8'	54.2'		
23	164°55.7	16.4	201-38.3	16.7'	04°17.1	-12.8'	54.2'		
	SD = 15.7'	d = 0.1'		SI	D = 14.8'				

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

Lat.		Moonris	e		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	02:36	01:08	00:31	04:09	07:10	09:14
N 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
N 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
N 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
S 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
S 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
S 60°	19:57	21:19	22:39	11:28	11:33	11:37
	1			1		

			Sun		Moon			
D	Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
-	,	00 ^h	12 ^h	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	80:00	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	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0 0	262°49.1	199°38.3	N19°08.5	200°20.9	N21°03.7	92°28.0	N05° 32.9	227°00.0	N11°49.0			
1	202 49.1 277°51.6	214°41.6	07.9	200° 20.9° 215° 21.5	04.1	107°30.3	32.8	242°02.3	49.0	Alpheratz	357°31.9	29°14.8
2	277 51.0 292°54.1	214 41.0 229°44.9	07.3	230°22.1	04.1	107 30.3 122°32.6	32.8	257°04.5	49.1	Ankaa	353°04.5	-42°08.8
	307°56.5	244°48.1						272°06.7		Schedar	349°27.9	56°41.4
3			•• 06.6	245°22.7	• • 04.8	137°34.8	• • 32.7		• • 49.2	Diphda	348°44.6	-17°49.7
4	322°59.0	259°51.4	06.0	260°23.3	05.1	152°37.1 167°39.4	32.6	287°08.9	49.3	Achernar	$335^{\circ}18.5$	-57° 05.2
5 6	338°01.5 353°03.9	274°54.7 289°58.0	05.4 N19°04.8	275°23.9 290°24.5	05.5 N21°05.8	182°41.6	32.5 N05°32.4	302°11.1 317°13.3	49.4 N11°49.5	Hamal	327°48.2	23°35.7
7	8°06.4	305°01.2	04.8	305°25.1	06.2	102 41.0 197°43.9	32.3	332° 15.6	49.5	Polaris	312°54.8	89°22.8
8	23°08.9	320°04.5		320°25.7		212°46.1	32.3 32.2	347° 17.8		Acamar	$315^{\circ}10.0$	-40°11.3
9	38°11.3	320 04.5 335°07.7	03.6 · · 03.0	335°26.3	06.5 •• 06.9	212 40.1 227°48.4	32.2	2°20.0	49.6 •• 49.7	Menkar	314°03.5	4°12.1
10	53°13.8	350°11.0	02.4	350°26.9	07.2	242°50.7	32.1	17°22.2	49.7	Mirfak	308°24.6	49°57.6
11	68° 16.3	5°14.2	01.7	5°27.5	07.2	257°52.9	31.9	32°24.4	49.8	Aldebaran	290°36.7	16°33.9
12	83° 18.7	20°17.5	N19°01.1	20°28.1	N21°07.9	272°55.2	N05°31.8	47°26.6	N11°49.9	Rigel	281°01.5	-8° 10.2
13	98°21.2	35°20.7	19°00.5	35°28.7	08.3	287°57.5	31.7	62°28.9	50.0	Capella	280°18.2	46°01.5
14	113°23.6	50°24.0	18°59.9	50°29.3	08.6	302°59.7	31.6	77°31.1	50.1	Bellatrix	278°20.2	6°22.4
15	128° 26.1	65°27.2	59.3	65°29.9	• • 09.0	318°02.0	31.5	92°33.3	50.2	Elnath	277°58.7	28° 37.8
16	143°28.6	80°30.4	58.7	80°30.5	09.3	333°04.2	31.4	107°35.5	50.2	Alnilam	275°35.2	-1°11.1
17	158°31.0	95°33.6	58.1	95°31.1	09.7	348°06.5	31.3	122°37.7	50.3	Betelgeuse	270°49.4	7°24.6
18	173°33.5	110°36.9	N18° 57.5	110°31.7	N21° 10.0	3°08.8	N05°31.2	137° 40.0	N11°50.4	Canopus	263°51.7	-52°42.7
19	188°36.0	125°40.1	56.9	125°32.3	10.4	18°11.0	31.1	152° 42.2	50.5	Sirius	258°24.1	-16°45.4
20	203°38.4	140°43.3	56.3	140°32.9	10.7	33°13.3	31.0	167°44.4	50.5	Adhara	255°04.0	-29°00.8
21	218°40.9	155°46.5	• • 55.7	155°33.5	• • 11.1	48°15.5	• • 30.9	182°46.6	• • 50.6	Procyon	244°48.2	5°09.0
22	233°43.4	170°49.7	55.2	170°34.1	11.4	63°17.8	30.9	197°48.8	50.7	Pollux	243°14.2	27°57.4
23	248°45.8	185°52.9	54.6	185°34.7	11.7	78°20.1	30.8	$212^{\circ}51.1$	50.8	Avior	234°14.0	-59°36.3
N/a:: ::	2255 06:29	,,2 2/ J A	.6′ m-4.30	"U E/ JU	.4′ m1.41	1/2 2/ 4 0	.1′ m-1.97	1/2 2/ 40	.1′ m0.48	Suhail	222°44.5 221°38.1	-43°33.1 -69°50.4
ivier.p	bass. 06:28	νs.s a-0	.0 111-4.30	νυ.υ αυ	.4 1111.41	ν2.3 α- 0	.111-1.97	ν2.2 aυ	.1 1110.4δ	Miaplacidus Alphard	221°38.1 217°45.2	-69°50.4 -8°47.1
										Regulus	207°31.6	11°49.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°36.0
0	263°48.3	$200^{\circ}56.1$	N18°54.0	200°35.3	$N21^{\circ}12.1$	93°22.3	N05°30.7	227°53.3	N11°50.8	Denebola	193 37.6 182°22.1	14°24.7
1	278°50.8	215°59.3	53.4	215°35.8	12.4	108°24.6	30.6	242°55.5	50.9	Gienah	175°40.6	-17°42.2
2	293°53.2	231°02.5	52.8	230°36.4	12.8	123°26.8	30.5	257°57.7	51.0	l .	172°56.6	-63°15.8
3	308°55.7	246°05.6	• • 52.2	245°37.0	•• 13.1	$138^{\circ}29.1$	• • 30.4	272°59.9	•• 51.1		171°48.2	-57° 16.7
4	323°58.1	261°08.8	51.6	260°37.6	13.5	153°31.3	30.3	$288^{\circ}02.1$	51.1	Alioth	166°10.4	55°48.5
5	339°00.6	$276^{\circ}12.0$	51.1	275°38.2	13.8	168°33.6	30.2	303°04.4	51.2	Spica	158°19.2	-11° 18.7
6	354°03.1	291°15.2	N18°50.5	290°38.8	N21° 14.2	183°35.9	N05°30.1	318°06.6	N11°51.3	Alkaid	152°49.6	49° 10.4
7	9°05.5	306°18.3	49.9	305°39.4	14.5	198°38.1	30.0	333°08.8	51.4	Hadar	148°31.5	-60° 30.9
8	24°08.0	321°21.5	49.3	320°40.0	14.8	213°40.4	29.9	348°11.0	51.4		147°54.0	-36°30.8
9	39° 10.5	336°24.7	• • 48.7	335°40.6	• • 15.2	228°42.6	• • 29.8	3°13.2	• • 51.5	Arcturus	145°45.1	19°02.1
10	54° 12.9	351°27.8	48.2	350°41.2	15.5	243°44.9	29.7	18° 15.5	51.6	Rigil Kent.	139°35.8	-60° 57.4
11	69° 15.4	6°31.0	47.6	5°41.8	15.9	258°47.1	29.6	33°17.7	51.7	Kochab	$137^{\circ}19.2$	74°02.4
12	84°17.9	21°34.1	N18°47.0	20°42.4	N21°16.2	273°49.4	N05°29.5	48° 19.9	N11°51.7	Zuben'ubi	136°52.6	-16°09.7
13	99°20.3	36°37.2	46.5	35°43.0	16.6	288°51.7	29.4	63°22.1	51.8	Alphecca	$126^{\circ}01.1$	26°37.2
14	114°22.8	51°40.4	45.9	50°43.6	16.9	303°53.9	29.3	78°24.3	51.9	Antares	$112^{\circ}12.0$	-26°29.7
15	129°25.2	66°43.5	• • 45.3	65°44.2	• • 17.2	318°56.2	• • 29.2	93°26.6	• • 52.0	Atria	$107^{\circ}03.1$	-69°04.7
16	144°27.7	81°46.6	44.8	80°44.8	17.6	333°58.4	29.1	108°28.8	52.0	Sabik	$101^{\circ}59.2$	-15°45.6
17	159°30.2	96°49.8	44.2	95°45.4	17.9	349°00.7	29.0	123°31.0	52.1	Shaula	$96^{\circ}06.1$	-37°07.4
18	174°32.6	111°52.9 126°56.0	N18°43.6	110°46.0	N21° 18.3	4°02.9	N05°28.9	138°33.2	N11°52.2	Rasalhague	95°55.6	12°32.4
19	189°35.1		43.1	125°46.6	18.6	19°05.2	28.8	153°35.5	52.2	Eltanin	90°40.3	51°29.1
20 21	204°37.6 219°40.0	141°59.1 157°02.2	42.5 •• 42.0	140°47.2 155°47.8	18.9 · · 19.3	34°07.4 49°09.7	28.7 •• 28.6	168° 37.7 183° 39.9	52.3 •• 52.4	Kaus Aust.	83°28.4	-34°22.1
22	234° 42.5	172°05.3	41.4	170°48.4	19.5	64°12.0	28.5	198° 42.1	52.5	Vega	80°30.9	38°48.6
23	249° 45.0	187°08.4	40.8	185°49.0	19.0	79°14.2	28.4	213°44.3	52.5	Nunki	75°43.9	-26° 15.5
23	249 45.0									Altair	61°56.9	8° 56.7
Mer.p	pass. 06:24	ν 3.2′ d-0	.6′ m-4.35	$ u$ 0.6 $^{\prime}$ d0	.3′ m1.42	$\nu 2.3' \ d-0$	$.1^\prime$ m-1 $.97$	ν 2.2 $^{\prime}$ d0	.1' m 0.48	Peacock	53°00.9	-56° 38.3
										Deneb	49°23.5	45°22.8
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.9	10°00.4
0	264° 47.4	202°11.5	N18° 40.3	200°49.6	N21°20.3	94°16.5	N05° 28.3	228°46.6	N11°52.6	Al Na'ir	27°29.3	-46°49.0
1	279°49.9	217°14.6	39.7	215°50.2	20.6	109°18.7	28.2	243°48.8	52.7	Fomalhaut	15°11.4	-29°28.0
2	294°52.4	232°17.7	39.2	230°50.8	21.0	124°21.0	28.1	258°51.0	52.8	Scheat	13°42.4	28° 14.2
3	309°54.8	247°20.8	38.6	245°51.4	21.3	139°23.2	• • 28.0	273°53.2	• • 52.8	Markab	13°27.0	15°21.5
4	324°57.3	262°23.9	38.1	260°52.0	21.6	154°25.5	27.9	288°55.4	52.9	Jun 14 Wed	SHA	Mer.pass
5	339°59.7	277°26.9	37.5	275°52.6	22.0	169°27.7	27.8	303°57.7	53.0	Venus	296°49.1	10:39
6	355°02.2	292°30.0	N18°37.0		N21°22.3	184°30.0	N05°27.7		N11°53.1	Mars	297°31.8	10:38
7	10°04.7	307°33.1	36.5	305°53.7	22.6	199°32.2	27.6	334°02.1	53.1	Jupiter	189°38.9	17:47
8	25°07.1	322°36.1	35.9	320°54.3	23.0	214°34.5	27.5	349°04.3	53.2	Saturn	$324^{\circ}10.9$	08:51
9	40°09.6	337°39.2	• • 35.4	335°54.9	• • 23.3	229°36.7	• • 27.4	4°06.6	• • 53.3	luc 15 T	CIIA	Marrier
10	55°12.1	352°42.2	34.8	350°55.5	23.6	244°39.0	27.3	19°08.8	53.4	Jun 15 Thu	SHA	Mer.pass
11	$70^{\circ}14.5$	7°45.3	34.3	$5^{\circ}56.1$	24.0	259°41.2	27.2	34°11.0	53.4		297°07.8 296°47.0	10:34
12	85°17.0	22°48.3	N18°33.8	20°56.7	N21°24.3	274°43.5	N05°27.1		N11°53.5		296°47.0 189°34.0	10:37 17:44
13	100° 19.5	37°51.4	33.2	35°57.3	24.6	289°45.7	27.0	64°15.4	53.6	Saturn	324°05.0	08:47
14	$115^{\circ}21.9$	52°54.4	32.7	50°57.9	25.0	304°48.0	26.9	79° 17.7	53.7	Saturn	J24 U3.U	00.41
15	130° 24.4	67°57.4	• • 32.2	65°58.5	• • 25.3	319°50.2	• • 26.8	94°19.9	• • 53.7	Jun 16 Fri	SHA	Mer.pass
16	$145^{\circ}26.8$	83°00.5	31.6	$80^{\circ}59.1$	25.6	334°52.5	26.7	109°22.1	53.8		$297^{\circ}24.1$	10:29
17	160°29.3	98°03.5	31.1	95°59.7	26.0	349°54.7	26.6	124°24.3	53.9		$296^{\circ}02.1$	10:36
18	175°31.8	113°06.5	N18°30.6	111°00.3	N21°26.3	4°57.0	N05° 26.5		N11°53.9	Jupiter	$189^{\circ}29.0$	17:40
19	190°34.2	128°09.5	30.1	126°00.9	26.6	19°59.2	26.4	154°28.8	54.0	Saturn	323°59.1	08:44
20	205°36.7	143°12.5	29.5	141°01.5	26.9	35°01.5	26.3	169°31.0	54.1	U	al nevell-	
21	220°39.2	158° 15.5	• • 29.0	156°02.1	• • 27.3	50°03.7	• • 26.2	184°33.2	• • 54.2	Horizont	al parallax	0.5
22	235°41.6	173°18.5	28.5	171°02.7	27.6	65°06.0	26.1	199°35.5	54.2		Venus: Mars:	0.5 0.1
23	250°44.1	188°21.5	28.0	186°03.3	27.9	80°08.2	26.0	214°37.7	54.3		iviars:	0.1
Mer.p	pass. 06:20	ν 3.1′ d-0	.6′ m-4.40	ν 0.6′ d0	.3′ m1.42	$\nu 2.3' \ d-0$.1′ m-1.96	ν 2.2′ d0	.1′ m0.48			

h	Sun				Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°55.6	N23°16.5	282°14.0	16.7'	S04°04.3	-12.8'	54.2'	
1 2	194° 55.5 209° 55.3	16.7 16.8	296°49.7 311°25.5	16.7' 16.7'	03°51.5 03°38.6	-12.8' -12.9'	54.2' 54.2'	
3	209 55.3 224°55.2	. 16.9	326°01.2	16.8'	03°25.8	-12.9'	54.2'	
4	239°55.1	17.0	340°37.0	16.8'	03°12.9	-12.9'	54.2'	
5	254° 54.9	17.1	355°12.7	16.8'	03°00.1	-12.9'	54.2'	
6 7	269° 54.8 284° 54.7	N23° 17.2 17.4	9°48.5 24°24.3	16.8' 16.8'	\$02°47.2 02°34.3	-12.9' -12.9'	54.2' 54.2'	
8	299° 54.5	17.4 17.5	24 24.3 39°00.1	16.8'	02°34.3	-12.9'	54.2'	
9	314°54.4	•• 17.6	53°35.9	16.8'	02°08.5	-12.9'	54.2'	
10	329°54.3	17.7	68°11.7	16.8'	01°55.6	-12.9'	54.2'	
11 12	344° 54.1 359° 54.0	17.8 N23°17.9	82°47.5 97°23.3	16.8' 16.8'	01°42.6 S01°29.7	-12.9' -12.9'	54.2' 54.2'	
13	14°53.9	18.0	111°59.2	16.8'	01°16.8	-12.9'	54.2'	
14	29°53.7	18.1	126°35.0	16.8'	01°03.8	-13.0'	54.2'	
15 16	44° 53.6 59° 53.5	· · 18.2 18.3	141°10.8 155°46.6	16.8' 16.8'	00°50.9 00°37.9	-13.0' -13.0'	54.2' 54.2'	
17	74°53.3	18.4	170° 22.5	16.8'	00°37.9	-13.0'	54.2'	
18	89°53.2	N23° 18.5	184°58.3	16.8'	S00°12.0	-13.0'	54.2'	
19	104°53.1	18.7	199°34.1	16.8'	N00°01.0	13.0'	54.2'	
20 21	119°52.9 134°52.8	18.8 •• 18.9	214°09.9 228°45.7	16.8' 16.8'	00°13.9 00°26.9	13.0' 13.0'	54.2' 54.2'	
22	149° 52.7	19.0	243°21.6	16.8'	00°20.9	13.0'	54.2'	
23	164°52.5	19.1	257°57.4	16.8'	$00^{\circ}52.8$	13.0'	54.2'	
	SD = 15.7'	d = 0.1'		SI	O = 14.8'			
Thu	GHA	Doc	GHA	••	Dec	d	HP	
I nu O	GHA 179°52.4	Dec N23°19.2	272°33.1	u 16.8'	Dec N01°05.8	<i>a</i> 13.0'	нР 54.2'	
1	194°52.3	19.3	287°08.9	16.8'	$01^{\circ}18.8$	13.0'	54.2'	
2	209°52.1	19.4	301°44.7	16.8'	01°31.7	13.0'	54.3'	
3 4	224°52.0 239°51.9	· · 19.5 19.6	316°20.5 330°56.2	16.7' 16.7'	01°44.7 01°57.7	13.0' 13.0'	54.3' 54.3'	
5	254°51.7	19.0	345°32.0	16.7'	01°37.7	12.9'	54.3	
6	269°51.6	N23°19.8	0°07.7	16.7'	N02°23.6	12.9'	54.3'	
7	284°51.5	19.8	14°43.4	16.7'	02°36.5	12.9'	54.3'	
8 9	299°51.3 314°51.2	19.9 •• 20.0	29° 19.1 43° 54.7	16.7' 16.7'	02°49.4 03°02.4	12.9' 12.9'	54.3' 54.3'	
10	329°51.1	20.1	58°30.4	16.6'	03°15.3	12.9'	54.3'	
11	344°50.9	20.2	73°06.0	16.6'	03°28.2	12.9'	54.3'	
12 13	359° 50.8 14° 50.7	N23°20.3 20.4	87°41.6 102°17.2	16.6' 16.6'	N03°41.1 03°54.0	12.9' 12.9'	54.3' 54.3'	
14	29° 50.5	20.4	102 17.2 116°52.8	16.5	03 54.0 04°06.9	12.9'	54.3'	
15	44°50.4	• • 20.6	131°28.3	16.5'	04°19.8	12.9'	54.4'	
16	59° 50.3	20.7	146°03.8	16.5'	04°32.7	12.9'	54.4'	
17 18	74°50.1 89°50.0	20.8 N23°20.9	160°39.3 175°14.8	16.5' 16.4'	04°45.5 N04°58.4	12.8' 12.8'	54.4' 54.4'	
19	104°49.9	20.9	189°50.2	16.4'	05°11.2	12.8'	54.4'	
20	119°49.7	21.0	204°25.6		05°24.0		54.4'	
21 22	134° 49.6 149° 49.5	· · 21.1 21.2	219°01.0 233°36.3	16.3' 16.3'	05°36.8 05°49.6	12.8' 12.8'	54.4' 54.4'	
23	164° 49.3	21.2	233 30.3 248°11.6	16.3'	05°49.0	12.8'	54.4	
	SD = 15.7'	d = 0.1'		SI	D = 14.8'			
						,		
Fri 0	GHA 179° 49.2	Dec N23°21.4	GHA 262°46.9	u 16.2'	Dec N06°15.2	d 12.7'	HP 54.5'	
1	194° 49.0	21.4	$277^{\circ}22.1$	16.2'	06°27.9	12.7'	54.5	
2	209°48.9	21.5	291°57.3	16.2'	06°40.6	12.7'	54.5'	
3 4	224° 48.8 239° 48.6	· · 21.6 21.7	306° 32.5 321° 07.6	16.1' 16.1'	06°53.3 07°06.0	12.7' 12.7'	54.5' 54.5'	
5	254° 48.5	21.7	335°42.6	16.1	07 00.0 07°18.7	12.6'	54.5'	
6	269°48.4	N23°21.9	350° 17.7	16.0'	N07°31.3	12.6'	54.5'	
7	284° 48.2 299° 48.1	21.9	4°52.7 19°27.6	16.0' 15.9'	07°43.9 07°56.6	12.6'	54.6' 54.6'	
8 9	299°48.1 314°48.0	22.0 •• 22.1	19°27.6 34°02.5	15.9' 15.9'	07°56.6 08°09.1	12.6' 12.6'	54.6' 54.6'	
10	329° 47.8	22.2	48° 37.4	15.8'	08°21.7	12.5'	54.6'	
11	344°47.7	22.2	63°12.2	15.8'	08°34.2	12.5'	54.6'	
12 13	359° 47.6 14° 47.4	N23°22.3 22.4	77°47.0 92°21.7	15.7' 15.7'	N08°46.7 08°59.2	12.5' 12.5'	54.6' 54.7'	
13 14	14 47.4 29°47.3	22.4	92 21.7 106° 56.4	15.7 15.6'	08 59.2 09°11.7	12.5 12.4'	54.7'	
15	44°47.2	• • 22.5	121°31.0	15.6'	$09^{\circ}24.1$	12.4'	54.7'	
16	59°47.0	22.6	136°05.6	15.5'	09°36.5	12.4'	54.7'	
17 18	74° 46.9 89° 46.7	22.7 N23°22.7	150° 40.1 165° 14.5	15.5' 15.4'	09°48.9 N10°01.2	12.3' 12.3'	54.7' 54.7'	
19	104°46.6	22.8	179°48.9	15.3'	10°13.5	12.3'	54.8'	
20	119°46.5	22.9	194°23.3	15.3'	10°25.8	12.2'	54.8'	
21 22	134° 46.3 149° 46.2	· · 23.0 23.0	208°57.6 223°31.8	15.2' 15.2'	10°38.0 10°50.2	12.2' 12.2'	54.8' 54.8'	
23	149 46.2 164°46.1	23.0	223 31.8 238°06.0	15.2 15.1'	10 50.2 11°02.4	12.2	54.8'	
	SD = 15.7'	d = 0.1'			D = 14.9'			
		= 15.7' d = 0.1' SD = 14.9'						

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

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
N 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
N 40°	23:46		00:08	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
N 10°	23:49		00:25	11:28	12:12	12:56
0°	23:50	•• ••	00:30	11:29	12:09	12:50
S 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
S 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
S 60°	23:58		01:17	11:40	11:43	11:46

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
,	00 ^h	12 ^h	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		

June 17, 18, 19 UT (Sat., Sun., Mon.)

Section Color Co	h	Aries	Ver	านร	, Ma	irs	Jup	oiter	Sat	urn		Stars	
0 95° 466 030° 126° 75° 20° 20° 120° 120° 120° 120° 120° 120°	Sat -	CHA	CHV	Doc		Doc	CHV	Doc	CH V	Doc		CHV	Doc
1 2007-56 2007-57 200 2016-55 266 1016-127 2015-56 246-42.] 4.5 5.												SHA	Dec
2 95°51.5 23°50.5 23.6 22°10.1 28 3 12°10.0 28 12°10.7 25.7 29°14.3 5.5 5.6 Among 200°10.1 28 12°10.7 25.7 29°14.3 5.5 5.5 Among 200°10.1 28 12°10.0 28 12°10.7 25.7 29°14.3 5.5 5.5 Among 200°10.1 28 12°10.0 28											Alpheratz	357°31.9	29° 14.8
3 10°510 30°513 5 · 25°5 24°67 7 · 292 Me ³ 112 0 · 25°6 27°469 5 · 516 30°516 30°516 5 · 516											Ankaa	353°04.5	-42°08.8
1.											Schedar	349°27.8	56°41.4
Septiment of the content of the con											Diphda	348°44.6	-17°49.6
8 8 90 3 3 50 2 4 18 24 4 18 24 5 19 10 02 4 12 10 2 10 2 20 20 3 50 20 40 1 2 20 20 20 20 20 20 10 20 20 20 20 20 20 20 20 20 20 20 20 20											Achernar	335°18.5	-57°05.2
9 90 033													
9 4 10 5 33 19 3 22 9 38 90 20 312 20 39 30 20 312 20 39 30 20 312 20 312 30 30 30 30 30 30 30 30 30 30 30 30 30													
10 96112 38°483 29°48 31 29°48 31 29°48 31 39°48 31°48 31 39°48 31 39°48 31 39°48 31°48 3													
13													
11 86 143 7 98722 213 8 9104 1 28701 2132 2136 10 10 12 132 21 21 10 10 11 16 28701 1	9			• • 22.9		• • 31.2		• • 25.0		• • 55.0	1		
1.1 10 1.1 1.2	10	$56^{\circ}11.2$	353°54.3	22.4	351°09.8	31.5	245°32.9	24.9	20°02.1	55.1			
1.5 1.6 1.6 1.7	11			21.9			260°35.2		35°04.4	55.2			
101 101	12	$86^{\circ}16.1$		N18°21.4	$21^{\circ}11.0$	N21°32.2		N05°24.7	50°06.6	N11°55.3			
11 11 12 13 13 13 13 13	13	101°18.6	39°03.1	20.9	$36^{\circ}11.6$	32.5	290°39.7	24.6		55.3			
18 18 18 18 18 18 18 18	14	$116^{\circ}21.1$	54°06.0	20.4	51°12.2	32.8	305°41.9	24.5	80°11.0	55.4			
18 18 18 18 18 18 18 18	15	131°23.5	69°09.0	• • 19.9	66° 12.8	• • 33.1	320°44.2	• • 24.4	95°13.3	• • 55.5	1		
10 10 10 10 10 10 10 10	16	146°26.0	84°11.9	19.4	81°13.4	33.5	335°46.4	24.3	110°15.5	55.5			I
18 176"300	17	161°28.5	99°14.8	18.9	$96^{\circ}14.0$	33.8	350°48.6	24.2	125°17.7	55.6	1		
19 19 334	18	176°30.9	114°17.7	N18°18.5	111°14.6	N21°34.1	5°50.9	N05°24.1	140°19.9				
20 206°358 3 144°255 17.5 141°15.8 34.7 35°55.4 239 170°24.4 55.8 22 227°3403 159°26.5 17.0 150°16.4 35.1 50°57.6 23.8 185°26.6 55.9 23 25°47.2 147°20.4 16.5 171°17.0 55.4 66°59.9 23.7 200°38.8 50.0 247°47.2 2 227°47.2 160°10.7 14.2 15.5 140°10.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1													
22 221°383 310°26.5 · 170 156°16.4 · 35.1 50°57.6 · 23.8 185°26.6 · 55.0 Process 44.4 62.2 3°19.1 22 228°36.8 174°29.4 16.5 11°17.0 33.4 60°59.9 23.7 200°22.8 56.0 Mer.pass. 0616													
22 285°488 147°294 16.5 171°17.0 35.4 66°59.9 23.7 200°288 56.0 February 227°48.2 189°23.2 16.0 180°17.5 35.7 81°02.1 23.6 215°31.1 56.1 Mispacidus 221°38.2 49°33.4 44.7 30°43.1 56.1 Mispacidus 221°38.2 49°33.4 44.7 30°43.1 45.1													
Mer. pass. 06:16											1		
Misple M													
Sun GHA GHA Dec GHA											1		
Sun GHA Oct	Mer.p	ass. 06:16	ν 3.0′ <i>d</i> -0.	5′ m-4.45	ν 0.6' d0.3	3′ m1.42	$\nu 2.2' \ d-0.0$.1′ m-1.96	ν 2.2′ d0	.1' m 0.48			
Sum GHA											Alphard		
0 266°48.7 204°35.1 N18°15.6 201°18.1 N21°36.0 9e°04.3 N05°23.5 230°33.3 N11°56.1 Denumber 1.2 21°37.3 N18°36.1 15.1 21°18.7 3.6 111°06.0 23.4 24°35.5 50.2 334°35.5 50.3 41°36.1 31°36.0 11°06.0 23.4 24°39.5 36.7 12°08.8 23.3 260°37.8 50.3 41°36.1 41°32.1 24°34.8 1.4 1.2 24°19.9 3.7 141°11.1 2.32 27°57.40 . 55.3 41°58.1 24°34.8 1.4 1.2 24°19.9 3.7 141°11.1 2.32 27°57.40 . 55.3 41°58.0 27°34.6 13.2 24°21.3 7.2 141°31.7 23.2 27°57.4 0. 55.3 41°58.0 27°34.6 13.2 24°21.3 7.2 141°31.7 23.2 23°34.4 50°44.4 55.5 14°34.3 14°34.2	c	CIIA	CIIA	D	CHA	D	CIIA	D	CIIA	D	Regulus	207°31.6	11°49.6
2 296°50 0 234°40 14.6 231°19 3 637 126°88 233 426°355 562 2 2 296°50 0 234°40 14.6 231°19 3 637 126°08 233 20°378 563 4 3 31°53 1 29°43 8 11.1 246°19 9 · 37.0 141°11.1 232 275°40 · 563 4 3 296°50 5 264°46 7 13.7 261°20 5 37.3 156°13 3 231 20°42 2 564 4 5 35°30 5 244°52 4 118°12 7 29°21 7 120°27 9 186°18 180°22 2 300°44 4 565 5 5 341°58 0 5 245°24 113 22 20°21 7 120°27 9 186°18 180°22 2 320°46 7 115°6 6 182°40 4 180°10 7 180°40 7 1											Dubhe	193°37.9	61°36.0
2 296°50.0 234°40.9 il.46 231°19.3 36.7 126°08.8 23.3 260°37.8 56.3 3 11°29.43.8 il.41 246°19.9 il.79.56.7 13°2.6 il.79.56.7 13°2.7 13°2.6 il.79.56.7 13°2.7 13°2.7 13°2.7 13°2.7 13°2.7 13°2.7											Denebola	$182^{\circ}22.1$	14°24.8
3 311°53.1 299°43.8											Gienah	175°40.6	-17°42.2
3 311-53. 294-348											Acrux	172°56.7	-63° 15.8
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Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:31	22:32	////	////
62°	////	////	02:09	21:54	////	////
60°	////	00:50	02:36	21:27	23:13	////
N 58°	////	01:40	02:56	21:07	22:22	////
56°	////	02:10	03:13	20:50	21:52	////
54°	00:46	02:33	03:27	20:36	21:30	23:17
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
N 40°	03:16	03:58	04:31	19:32	20:05	20:46
35°	03:39	04:16	04:46	19:17	19:46	20:23
30°	03:58	04:31	04:59	19:04	19:31	20:04
20° N 10°	04:27	04:56	05:21	18:42	19:06	19:35
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S 10°	05:09	05:52	06:15			
20°	05:20	05:52	06:15	17:47 17:29	18:10 17:53	18:37 18:20
20°	05:42	06:10	06:55	17:29	17:33	18:04
35°	06:07	06:39	00.55	16:55	17:34	17:55
40°	06:17	06:51	07:21	16:41	17:12	17:46
45°	06:27	07:04	07:38	16:24	16:58	17:35
S 50°	06:39	07:20	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:42	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:06
58°	07:03	07:55	08:47	15:15	16:07	17:00
S 60°	07:10	08:07	09:05	14:58	15:55	16:52
Lat.		Moonris	e		Moonset	;
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	21:56			17:11		
N 70°	22:31	21:29		16:38	19:17	
68°	22:56	22:28		16:15	18:20	

Lat.		Moonris	e		Moonset	;
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	21:56			17:11		
N 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
S 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
S 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
S 60°	02:39	04:05	05:35	11:50	11:56	12:07

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.			
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-16%		
17	00:56	01:03	12:01	07:22	19:44			
18	01:09	01:16	12:01	08:07	20:31			
19	01:22	01:29	12:01	08:56	21:22			
18	01:09	01:16	12:01	08:07	20:31	6		

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	268°44.0	$206^{\circ}49.1$	N17°54.4	201°46.6	N21°50.9	97°51.7	N05°18.4	232°20.3	N11°59.5	Alpheratz	357°31.8	29° 14.8
1	283°46.4	221°51.8	54.0	216°47.2	51.2	112°53.9	18.3	247°22.5	59.6	Ankaa	353°04.5	-42°08.8
2	298°48.9	236°54.5	53.6	231°47.8	51.5	$127^{\circ}56.2$	18.2	262°24.7	59.7	Schedar	349°27.8	56°41.4
3	313°51.4	251°57.2	• • 53.3	246°48.4	• • 51.8	142°58.4	• • 18.1	277°27.0	•• 59.7	Diphda	348°44.6	-17°49.6
4	328°53.8	266°59.9	52.9	261°49.0	52.1	$158^{\circ}00.6$	18.0	292°29.2	59.8	Achernar	335°18.5	-57° 05.2
5	343°56.3	282°02.5	52.5	276°49.6	52.4	173°02.8	17.9	307°31.4	11°59.9	Hamal	327°48.2	23°35.7
6	358° 58.8	297°05.2	$N17^{\circ}52.1$	291°50.2	N21°52.7	188°05.1	N05° 17.8	322°33.7	N12°00.0	Polaris	312°52.3	89°22.7
7	14°01.2	312°07.9	51.7	306°50.8	53.0	203°07.3	17.7	337°35.9	0.00	Acamar	315°10.0	-40°11.2
8	29°03.7	$327^{\circ}10.5$	51.3	321°51.4	53.3	$218^{\circ}09.5$	17.5	352°38.1	00.1	Menkar	314°03.4	4° 12.1
9	44°06.2	342°13.2	• • 50.9	336°52.0	• • 53.6	233°11.8	• • 17.4	7°40.3	•• 00.2	Mirfak	308°24.6	49°57.5
10	59°08.6	357°15.8	50.5	351°52.6	53.9	248°14.0	17.3	22°42.6	00.2	Aldebaran	290°36.7	16°33.9
11	$74^{\circ}11.1$	12°18.5	50.1	6°53.1	54.2	263°16.2	17.2	37°44.8	00.3		290 30.7 281°01.5	-8° 10.2
12	89° 13.6	27°21.1	N17°49.7	21°53.7	N21°54.5	278°18.4	N05°17.1	52°47.0	N12°00.4	Rigel	280°18.2	-6 10.2 46°01.4
13	104°16.0	42°23.8	49.4	36°54.3	54.8	293°20.7	17.0	67°49.3	00.4	Capella Bellatrix	278°20.2	6°22.4
14	119° 18.5	57°26.4	49.0	51°54.9	55.1	308°22.9	16.9	82°51.5	00.5	1	277°58.7	28° 37.8
15	134°20.9	72°29.0	• • 48.6	66°55.5	• • 55.4	323°25.1	• • 16.8	97°53.7	• • 00.6	Elnath Alnilam	275°35.2	-1°11.1
16	149°23.4	87°31.6	48.2	81°56.1	55.7	338°27.4	16.7	112°56.0	00.6		270°49.4	7°24.7
17	164°25.9	102°34.3	47.9	96°56.7	56.0	353°29.6	16.6	127°58.2	00.7	Betelgeuse	263°51.7	-52° 42.7
18	179°28.3	117°36.9	N17°47.5	111°57.3	N21°56.3	8°31.8	N05° 16.5	143°00.4	N12°00.8	Canopus	258°24.1	-52 42.7 -16°45.4
19	194°30.8	132°39.5	47.1	126°57.9	56.6	23°34.0	16.3	158°02.7	00.9	Sirius		-10 45.4 -29°00.8
20	209°33.3	$147^{\circ}42.1$	46.7	141°58.5	56.9	38°36.3	16.2	173°04.9	00.9	Adhara	255°04.0	
21	224°35.7	162°44.7	• • 46.4	156°59.1	• • 57.2	53°38.5	• • 16.1	188°07.1	• • 01.0	Procyon	244°48.2	5°09.0
22	239°38.2	177°47.3	46.0	171°59.7	57.5	68°40.7	16.0	203°09.4	01.1	Pollux	243°14.2	27°57.4
23	254°40.7	192°49.9	45.6	187°00.2	57.8	83°42.9	15.9	218° 11.6	01.1	Avior	234°14.1	-59°36.3
										Suhail	222°44.5	-43°33.1
vler.p	ass. 06:04	$\nu 2.7' \ d-0$.4′ m-4.55	$\nu_{0.6'} d0$.3′ m1.44	$\nu^{2.2'} d-0$.1′ m-1.94	$\nu^{2.2'} d0$.1′ m0.47	Miaplacidus	221°38.2	-69°50.4
										Alphard	217°45.2	-8°47.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
0	269°43.1	207°52.5	N17°45.3	202°00.8	N21°58.1	98°45.2	N05° 15.8	233°13.8	N12°01.2	Dubhe	193°37.9	61°36.0
1	284°45.6	222°55.1	44.9	217°01.4	58.4	113°47.4	15.7	248° 16.1	01.3	Denebola	182°22.1	14°24.8
2	299°48.0	237°57.7	44.5	232°02.0	58.7	128°49.6	15.6	263°18.3	01.3	Gienah	175°40.6	-17°42.2
3	314°50.5	253°00.3	• • 44.2	247°02.6	• • 59.0	143°51.8	• • 15.5	278° 20.5	01.4		172°56.7	-63° 15.8
4	329°53.0	268°02.9	43.8	262°03.2	59.0	158°54.1	15.4	293°22.8	01.4		171°48.3	-57° 16.7
5	344°55.4	283°05.4	43.5	202 03.2 277°03.8	59.5	173°56.3	15.4	308°25.0	01.5	Alioth	$166^{\circ}10.5$	55° 48.5
6	359° 57.9	298°08.0	43.5 N17°43.1	292°04.4	N21°59.8	173 50.5 188°58.5	N05° 15.1	323°27.2	N12°01.6	Spica	158°19.2	-11° 18.7
7	15°00.4	313°10.6		307°05.0	22°00.1	204°00.7		338°29.5		Alkaid	152°49.6	49°10.4
			42.8				15.0		01.7	Hadar	148°31.5	-60°30.9
8	30°02.8	328°13.1	42.4	322°05.6	00.4	219°03.0	14.9	353°31.7	01.7	Menkent	147°54.0	-36°30.8
9	45°05.3	343°15.7	• • 42.1	337°06.2	00.7	234°05.2	• • 14.8	8°33.9	• • 01.8	Arcturus	145°45.2	19°02.1
10	60°07.8	358°18.2	41.7	352°06.8	01.0	249°07.4	14.7	23°36.2	01.9	Rigil Kent.	139°35.9	-60°57.4
11	75°10.2	13°20.8	41.4	7°07.3	01.3	264°09.6	14.6	38°38.4	02.0	Kochab	$137^{\circ}19.2$	74°02.5
12	90°12.7	28°23.3	N17°41.0	22°07.9	N22°01.6	279°11.9	N05°14.5	53°40.6	N12°02.0	Zuben'ubi	136°52.6	-16°09.7
13	105° 15.2	43°25.9	40.7	37°08.5	01.9	294°14.1	14.4	68°42.9	02.1	Alphecca	$126^{\circ}01.1$	26°37.2
14	120°17.6	58°28.4	40.3	52°09.1	02.1	309°16.3	14.2	83°45.1	02.2	Antares	112°12.0	-26°29.7
15	135°20.1	73°30.9	• • 40.0	67°09.7	• • 02.4	324°18.5	• • 14.1	98°47.3	• • 02.2	Atria	$107^{\circ}03.1$	-69°04.7
16	150°22.5	88°33.5	39.7	82°10.3	02.7	339°20.8	14.0	113°49.6	02.3	Sabik	101°59.2	-15°45.5
17	165°25.0	103°36.0	39.3	97°10.9	03.0	354°23.0	13.9	128°51.8	02.4	Shaula	$96^{\circ}06.1$	-37°07.4
18	180°27.5	118°38.5	N17°39.0	112°11.5	N22°03.3	9°25.2	N05° 13.8		N12°02.4	Rasalhague	95°55.6	12°32.4
19	195°29.9	133°41.0	38.7	127°12.1	03.6	24°27.4	13.7	158°56.3	02.5	Eltanin	90°40.3	51°29.1
20	210°32.4	148°43.5	38.3	142°12.7	03.9	39°29.6	13.6	173°58.5	02.6	Kaus Aust.	83°28.4	-34°22.1
21	225°34.9	163°46.1	• • 38.0	157°13.3	• • 04.2	54°31.9	• • 13.5	189°00.8	• • 02.6	Vega	80°30.9	38°48.6
22	240°37.3	178°48.6	37.7	172°13.9	04.4	69°34.1	13.4	204°03.0	02.7	Nunki	75°43.9	-26°15.5
23	255°39.8	193°51.1	37.3	187°14.4	04.7	84°36.3	13.2	219°05.2	02.8	Altair	61°56.9	8°56.7
Mer n	ass. 06:00	$\nu 2.6' d-0$.4′ m-4.58	ν 0.6' d0	.3′ m1.44	$\nu 2.2' d-0$.1′ m-1.93	$\nu 2.2' d\Omega$.1′ m0.47	Peacock	53°00.9	-56°38.3
Р										Deneb	49°23.5	45°22.9
										Enif	33°35.8	10°00.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.0
0	270°42.3	208°53.6	N17°37.0	202°15.0	N22°05.0	99°38.5	N05°13.1	234°07.5	N12°02.8	Fomalhaut	15°11.4	-29°28.0
1	285°44.7	223°56.0	36.7	217°15.6	05.3	114°40.7	13.0	249°09.7	02.9	Scheat	13°42.3	28°14.2
2	300°47.2	238°58.5	36.4	232°16.2	05.6	129°43.0	12.9	264°11.9	03.0	Markab	13°27.0	15°21.5
3	315°49.7	254°01.0	• • 36.0	247°16.8	•• 05.9	144°45.2	• • 12.8	279°14.2	• • 03.0			
4	330°52.1	269°03.5	35.7	262°17.4	06.1	159°47.4	12.7	294°16.4	03.1	Jun 20 Tue	SHA	Mer.pass
5	345°54.6	284°06.0	35.4	277°18.0	06.4	174°49.6	12.6	309° 18.6	03.2	Venus	298°05.1	10:11
6	0°57.0	299°08.4	N17°35.1	292°18.6	N22°06.7	189°51.8	N05° 12.5	324°20.9	N12°03.2	Mars	293°02.6	10:32
7	$15^{\circ}59.5$	$314^{\circ}10.9$	34.8	$307^{\circ}19.2$	07.0	204°54.1	12.3	339°23.1	03.3	Jupiter	189°07.7	17:26
8	31°02.0	329°13.4	34.5	322°19.8	07.3	219°56.3	12.2	354°25.4	03.4	Saturn	323°36.3	08:29
9	46°04.4	$344^{\circ}15.8$	• • 34.1	337°20.4	•• 07.5	234°58.5	•• 12.1	9°27.6	• • 03.5	Jun 21 Wed	SHA	Mornas
10	$61^{\circ}06.9$	$359^{\circ}18.3$	33.8	$352^{\circ}21.0$	07.8	250°00.7	12.0	$24^{\circ}29.8$	03.5	Venus	298°09.4	Mer.pass
11	$76^{\circ}09.4$	14°20.7	33.5	$7^{\circ}21.5$	08.1	265°02.9	11.9	$39^{\circ}32.1$	03.6		298 09.4 292°17.7	10:07
12	$91^{\circ}11.8$	29°23.2	N17°33.2	22°22.1	N22°08.4	280°05.1	N05°11.8	54°34.3	N12°03.7	Mars Jupiter	292°17.7 189°02.1	10:32
13	$106^{\circ}14.3$	44°25.6	32.9	37°22.7	08.7	295°07.4	11.7	69°36.5	03.7			17:22
14	$121^{\circ}16.8$	59°28.1	32.6	52°23.3	08.9	310°09.6	11.5	84°38.8	03.8	Saturn	323°30.7	08:26
15	$136^{\circ}19.2$	74°30.5	• • 32.3	67°23.9	• • 09.2	$325^{\circ}11.8$	• • 11.4	99°41.0	• • 03.9	Jun 22 Thu	SHA	Mer.pass
16	$151^{\circ}21.7$	89°33.0	32.0	82°24.5	09.5	$340^{\circ}14.0$	11.3	114°43.3	03.9	Venus		10:03
17	166°24.2	104°35.4	31.7	97°25.1	09.8	355°16.2	11.2	129°45.5	04.0	Mars	291°32.8	10:33
18	181°26.6	119°37.8	N17°31.4	112°25.7	N22° 10.1	$10^{\circ}18.4$	N05°11.1	144°47.7	N12°04.1		188°56.3	17:19
19	196°29.1	134°40.2	31.1	127°26.3	10.3	25°20.7	11.0	159°50.0	04.1	Saturn	323°25.2	08:22
20	211°31.5	149°42.6	30.8	142°26.9	10.6	40°22.9	10.9	174°52.2	04.2	Saturii	525 25.2	00.22
21	226°34.0	164°45.1	• • 30.5	157°27.5	• • 10.9	55°25.1	. 10.7	189°54.4	04.3	Horizont	al parallax	
22	241°36.5	179°47.5	30.2	172°28.0	11.2	70°27.3	10.6	204°56.7	04.3		Venus:	0.4
23	256°38.9	194°49.9	29.9	187°28.6	11.4	85°29.5	10.5	219°58.9	04.4		Mars:	0.1
	ass. 05:56	c -/ · ·	.3′ m-4.60	~ ~	.3′ m1.44	~ ~!	.1′ m-1.93	ν 2.2′ d0				

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.1	N23°26.1	218°01.0	8.6'	N23°11.4	6.7'	56.8'
1	194°36.0	26.1	232°28.6	8.5'	23°18.1	6.6'	56.8'
2 3	209° 35.8 224° 35.7	26.1 •• 26.1	246°56.2 261°23.6	8.4' 8.3'	23°24.7 23°31.2	6.5' 6.3'	56.8' 56.9'
4	239° 35.5	26.1	275°50.9	8.2'	23°37.5	6.2	56.9'
5	254°35.4	26.1	290°18.1	8.1'	23°43.7	6.1'	56.9'
6	269°35.3	N23°26.1	304°45.3	8.0'	N23°49.8	6.0'	56.9'
7 8	284°35.1 299°35.0	26.1 26.1	319°12.3 333°39.2	7.9' 7.8'	23°55.8 24°01.6	5.8' 5.7'	57.0' 57.0'
9	314° 34.9	26.2	348°06.1	7.7'	24°07.3	5.6'	57.0'
10	329° 34.7	26.2	2°32.8	7.7'	24°12.9	5.4'	57.1'
11 12	344°34.6 359°34.4	26.2 N23°26.2	16°59.5 31°26.0	7.6' 7.5'	24°18.3 N24°23.6	5.3' 5.2'	57.1' 57.1'
13	14°34.3	26.2	45°52.5	7.3 7.4'	24°28.8	5.2' 5.0'	57.1 57.2'
14	29°34.2	26.2	60°18.9	7.3'	24°33.8	4.9'	57.2'
15	44°34.0	26.2	74°45.2	7.2'	24°38.7	4.8'	57.2'
16 17	59°33.9 74°33.8	26.2 26.2	89°11.4 103°37.5	7.1' 7.0'	24°43.5 24°48.1	4.6' 4.5'	57.3' 57.3'
18	89° 33.6	N23°26.2	118°03.5	6.9	N24°52.6	4.3'	57.3'
19	104°33.5	26.2	132°29.5	6.9'	24°56.9	4.2'	57.4'
20	119°33.4	26.2	146°55.3	6.8'	25°01.1	4.0'	57.4
21 22	134°33.2 149°33.1	· · 26.2 26.2	161°21.1 175°46.8	6.7' 6.6'	25°05.1 25°09.0	3.9' 3.7'	57.4' 57.5'
23	164° 32.9	26.2	190°12.4	6.5	25°12.8	3.6'	57.5'
	SD = 15.7'	d = 0.0'		SI	D = 15.5'		
			-				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°32.8 194°32.7	N23°26.2 26.2	204°38.0 219°03.4	6.5' 6.4'	N25°16.4 25°19.8	3.4' 3.3'	57.5' 57.5'
2	209° 32.5	26.2	219 03.4 233°28.8	6.3	25°19.6	3.1'	57.6'
3	224°32.4	26.2	247°54.1	6.2'	25°26.2	3.0'	57.6'
4	239°32.3	26.2	262°19.3	6.2'	25°29.2	2.8'	57.6'
5 6	254° 32.1 269° 32.0	26.2 N23°26.2	276°44.5 291°09.6	6.1' 6.0'	25°32.1 N25°34.8	2.7' 2.5'	57.7' 57.7'
7	284°31.8	26.1	305°34.6	6.0'	25°37.3	2.4'	57.7'
8	299°31.7	26.1	$319^{\circ}59.6$	5.9'	25°39.7	2.2'	57.8'
9	314°31.6	• • 26.1	334°24.5	5.8'	25°41.9	2.1'	57.8'
10 11	329°31.4 344°31.3	26.1 26.1	348°49.3 3°14.1	5.8' 5.7'	25°43.9 25°45.8	1.9' 1.7'	57.8' 57.8'
12	359°31.2	N23°26.1	17°38.8	5.6'	N25°47.6	1.6'	57.9'
13	14°31.0	26.1	32°03.4	5.6'	25°49.1	1.4'	57.9'
14	29°30.9 44°30.8	26.1 •• 26.1	46°28.0 60°52.5	5.5' 5.5'	25°50.6 25°51.8	1.3' 1.1'	57.9' 58.0'
15 16	59°30.6	26.0	00 5∠.5 75°17.0	5.4'	25°52.9	0.9'	58.0'
17	74°30.5	26.0	89°41.5	5.4'	25°53.8	0.8'	58.0'
18	89°30.3	N23°26.0	104°05.9	5.3'	N25°54.6	0.6'	58.1'
19 20	104°30.2 119°30.1	26.0 26.0	118°30.2 132°54.5	5.3' 5.3'	25°55.2 25°55.6	0.4' 0.3'	58.1' 58.1'
21	134° 29.9	26.0	132 34.3 147°18.7	5.2'	25°55.9	0.1	58.1
22	149°29.8	25.9	161°42.9	5.2'	25°55.9	-0.1'	58.2'
23	164°29.7	25.9	176°07.1	5.1'	25°55.9	-0.2'	58.2'
	SD = 15.7'	d = -0.0'		SI	D = 15.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	179°29.5	N23°25.9	190°31.3	5.1'	N25°55.6	-0.4'	58.2'
1	194°29.4	25.9	204°55.4	5.1'	25°55.2	-0.6'	58.3'
2 3	209°29.2 224°29.1	25.9 •• 25.8	219°19.4 233°43.5	5.0' 5.0'	25°54.6 25°53.9	-0.8' -0.9'	58.3' 58.3'
3 4	224 29.1 239° 29.0	25.8	233°43.5 248°07.5	5.0'	25°53.9 25°53.0	-0.9 -1.1'	58.3'
5	254° 28.8	25.8	262°31.5	5.0'	25°51.9	-1.3'	58.4'
6	269°28.7	N23°25.8	276°55.4	4.9'	N25°50.6	-1.4'	58.4'
7 8	284°28.6 299°28.4	25.8 25.7	291°19.4 305°43.3	4.9' 4.9'	25°49.2 25°47.6	-1.6' -1.8'	58.4' 58.4'
9	314°28.3	25.7	320°07.2	4.9'	25°45.8	-1.0 -1.9'	58.5'
10	329°28.2	25.7	334°31.1	4.9'	25°43.9	-2.1'	58.5'
11	344°28.0 359°27.9	25.6 N23°25.6	348°54.9 3°18.8	4.9'	25°41.7 N25°39.5	-2.3'	58.5'
12 13	359°27.9 14°27.7	N23 25.6 25.6	3°18.8 17°42.6	4.9' 4.8'	N25°39.5 25°37.0	-2.5' -2.6'	58.6' 58.6'
14	29°27.6	25.6	32°06.5	4.8'	25°34.4	-2.8'	58.6'
15	44°27.5	• • 25.5	46°30.3	4.8'	25°31.6	-3.0'	58.6'
16 17	59°27.3 74°27.2	25.5 25.5	60°54.2 75°18.0	4.8' 4.8'	25°28.6 25°25.4	-3.1' -3.3'	58.7' 58.7'
18	89°27.1	25.5 N23°25.4	75 18.0 89°41.8	4.8	25 25.4 N25°22.1	-3.5'	58.7'
19	104°26.9	25.4	104°05.7	4.8'	25°18.6	-3.7'	58.7'
20	119°26.8	25.4	118°29.5	4.9'	25°15.0	-3.8'	58.8'
21 22	134°26.7 149°26.5	· · 25.3 25.3	132°53.4 147°17.3	4.9' 4.9'	25°11.2 25°07.2	-4.0' -4.2'	58.8' 58.8'
23	164° 26.4	25.3	161°41.1	4.9'	25°03.0	-4.2 -4.3'	58.8'
	SD = 15.7'	d = -0.0'		SI	D = 15.9'		
					10.0		

			2028	June 20	0 to Ju	n. 22
Lat.	Twi	light	Sunrise	Sunset	Twi	light
	Naut.	Civil			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	////
$N 58^{\circ}$	////	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
$N 40^{\circ}$	03:17	03:59	04:31	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:50	05:18	05:41	18:23	18:46	19:13
0°	05:09	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:17	06:52	07:22	16:42	17:12	17:46
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53
		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	00:14	01:35	19:45	20:58	21:46
N 58°						
N 58°	00:37	01:09	02:00	19:22	20:32	21:22
	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° 50°	01:18	01:58	02:52	18:34	19:40 10:28	20:34
יוור י	L UII.7X	(17, 11)	113.112	1 IX.77	14.78	70177

Lat.		Moonris	е		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
S 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
S 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
S 60°	07:06	08:29	09:30	12:26	13:02	14:06

		Sun					
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri –	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	271°41.4	209°52.3	N17°29.6	202°29.2	N22°11.7	100°31.7	N05° 10.4	235°01.2	N12°04.5			
1	286°43.9	224°54.7	29.4	217°29.8	12.0	115°34.0	10.3	250°03.4	04.5	Alpheratz	357°31.8	29°14.8
2	301°46.3	239°57.1	29.1	232°30.4	12.3	130°36.2	10.2	265°05.6	04.6	Ankaa	353°04.5	-42°08.7
3	316°48.8	254°59.4	• • 28.8	247°31.0	12.5	145°38.4	· · 10.1	280°07.9	• • 04.7	Schedar	349°27.8	56°41.4
4	331°51.3	270°01.8	28.5	262°31.6	12.8	160°40.6	09.9	295°10.1	04.7	Diphda	348°44.5	-17°49.6
5	346°53.7	285°04.2	28.2	277°32.2	13.1	175°42.8	09.8	310°12.3	04.8	Achernar	335°18.4	-57°05.2
6	1°56.2	300°06.6	N17°27.9	292°32.8	N22°13.4	190°45.0	N05°09.7	325°14.6	N12°04.9	Hamal	327°48.1	23°35.7
7	16°58.7	315°09.0	27.7	307°33.4	13.6	205°47.2	09.6	340°16.8	04.9	Polaris	312°50.8	89°22.7
8	32°01.1	330°11.3	27.4	322°34.0	13.9	220°49.5	09.5	355°19.1	05.0	Acamar	315°10.0 314°03.4	-40°11.2 4°12.1
9	47°03.6	345°13.7	• • 27.1	337°34.5	• • 14.2	235°51.7	• • 09.4	10°21.3	•• 05.1	Menkar	308° 24.5	4 12.1 49°57.5
10	62°06.0	$0^{\circ}16.1$	26.8	352°35.1	14.5	250°53.9	09.3	25°23.5	05.1	Mirfak	308 24.5 290°36.7	49 57.5 16°33.9
11	77°08.5	15°18.4	26.6	7°35.7	14.7	265°56.1	09.1	40°25.8	05.2	Aldebaran	290 30.7 281°01.5	-8°10.2
12	92°11.0	30°20.8	N17°26.3	22°36.3	N22°15.0	280°58.3	N05°09.0	55°28.0	$N12^{\circ}05.3$	Rigel Capella	281 01.5 280°18.2	-8 10.2 46°01.4
13	107°13.4	45°23.1	26.0	37°36.9	15.3	296°00.5	08.9	70°30.3	05.3	Bellatrix	278° 20.2	6°22.5
14	122°15.9	60°25.5	25.8	52°37.5	15.5	311°02.7	8.80	85°32.5	05.4	Elnath	277° 58.7	28°37.8
15	137°18.4	75°27.8	• • 25.5	67°38.1	• • 15.8	326°04.9	• • 08.7	100°34.7	• • 05.5	Alnilam	277 36.7 275°35.2	-1°11.1
16	152°20.8	90°30.1	25.2	82°38.7	16.1	341°07.2	08.6	115°37.0	05.5	Betelgeuse	270°49.4	7°24.7
17	167°23.3	105°32.5	25.0	97°39.3	16.4	356°09.4	08.4	130°39.2	05.6	Canopus	263°51.7	-52°42.7
18	182°25.8	120°34.8	N17°24.7	112°39.9	N22°16.6	$11^{\circ}11.6$	N05°08.3	145°41.5	N12°05.7	Sirius	258° 24.1	-16°45.4
19	197°28.2	135°37.1	24.4	127°40.5	16.9	26°13.8	08.2	160°43.7	05.7	Adhara	255°04.0	-29°00.8
20	212°30.7	150°39.5	24.2	142°41.0	17.2	41°16.0	08.1	175°45.9	05.8	Procyon	244°48.2	5°09.0
21	227°33.2	165°41.8	• • 23.9	157°41.6	• • 17.4	56°18.2	• • 08.0	190°48.2	• • 05.9	Pollux	243°14.2	27°57.4
22	242°35.6	180°44.1	23.7	172°42.2	17.7	71°20.4	07.9	205°50.4	05.9	Avior	234° 14.1	-59°36.3
23	257°38.1	195°46.4	23.4	187°42.8	18.0	86°22.6	07.7	220°52.7	06.0	Suhail	222° 44.5	-43°33.1
Mern	pass. 05:52	ν2 4' d-N	.3′ m-4.62	ν0 6' d0	.3′ m1.45	ν2 2' d-N	.1′ m-1.92	ν2 2' dΩ	.1′ m0.46	Miaplacidus	221°38.2	-69°50.4
.v.ci.,þ		∠¬ u-0	7.02	- U.U UU		u-0	1.92	- 2.2 00		Alphard	217°45.2	-8°47.1
										Regulus	207°31.6	11°49.6
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.9	61°36.0
0	272°40.5	210°48.7	$N17^{\circ}23.2$	202°43.4	N22°18.2	101°24.8	N05°07.6	235°54.9	$N12^{\circ}06.1$	Denebola	182°22.1	14°24.8
1	287°43.0	225°51.0	22.9	217°44.0	18.5	116°27.0	07.5	250°57.1	06.1	Gienah	175° 40.6	-17°42.2
2	302°45.5	240°53.3	22.7	232°44.6	18.8	131°29.3	07.4	265°59.4	06.2		172°56.7	-63°15.8
3	$317^{\circ}47.9$	255°55.6	• • 22.4	247°45.2	• • 19.0	146°31.5	• • 07.3	281°01.6	• • 06.2		171°48.3	-57°16.7
4	332°50.4	270°57.9	22.2	262°45.8	19.3	161°33.7	07.2	296°03.9	06.3	Alioth	166° 10.5	55°48.5
5	347°52.9	286°00.2	21.9	277°46.4	19.6	176°35.9	07.0	311°06.1	06.4	Spica	158° 19.2	-11°18.7
6	2°55.3	301°02.5	N17°21.7	292°46.9	N22°19.8	191°38.1	N05°06.9	326°08.4	N12°06.4	Alkaid	152°49.6	49°10.4
7	17°57.8	316°04.7	21.4	307°47.5	20.1	206°40.3	06.8	341°10.6	06.5	Hadar	148°31.5	-60°30.9
8	33°00.3	331°07.0	21.2	322°48.1	20.4	221°42.5	06.7	356°12.8	06.6		147°54.0	-36°30.8
9	48°02.7	346°09.3	• • 21.0	337°48.7	• • 20.6	236°44.7	• • 06.6	11°15.1	• • 06.6	Arcturus	145°45.2	19°02.1
10	63°05.2	1°11.6	20.7	352°49.3	20.9	251°46.9	06.5	26°17.3	06.7	Rigil Kent.	139°35.9	-60°57.4
11	78°07.7	16°13.8	20.5	7°49.9	21.1	266°49.1	06.3	41°19.6	06.8	Kochab	137° 19.3	74°02.5
12	93°10.1	31°16.1	N17°20.3	22°50.5	N22°21.4	281°51.3	N05°06.2	56°21.8	$N12^{\circ}06.8$	Zuben'ubi	136°52.6	-16°09.7
13	108°12.6	46°18.3	20.0	37°51.1	21.7	296°53.5	06.1	71°24.1	06.9	Alphecca	126°01.1	26°37.2
14	123°15.0	61°20.6	19.8	52°51.7	21.9	311°55.8	06.0	86°26.3	07.0	Antares	112°12.0	-26°29.7
15	138°17.5	76°22.8	• • 19.6	67°52.3	• • 22.2	326°58.0	• • 05.9	101°28.5	• • 07.0	Atria	107°03.1	-69°04.7
16	153°20.0	91°25.1	19.3	82°52.9	22.4	342°00.2	05.7	116°30.8	07.1	Sabik	101°59.2	$-15^{\circ}45.5$
17	168°22.4	106°27.3	19.1	97°53.4	22.7	357°02.4	05.6	131°33.0	07.2	Shaula	$96^{\circ}06.1$	-37°07.4
18	183°24.9	121°29.6	N17°18.9	112°54.0	N22°23.0	12°04.6	N05°05.5	146°35.3	N12°07.2	Rasalhague	95°55.6	12°32.4
19	198°27.4	136°31.8	18.7	127°54.6	23.2	27°06.8	05.4	161°37.5	07.3	Eltanin	90°40.3	51°29.2
20	213°29.8	151°34.0	18.4	142°55.2	23.5	42°09.0	05.3	176°39.8	07.4	Kaus Aust.	83°28.4	-34°22.1
21	228°32.3	166°36.3	• • 18.2	157°55.8	• • 23.7	57°11.2	• • 05.2	191°42.0	•• 07.4	Vega	80°30.9	38°48.7
22	243°34.8	181°38.5	18.0	172°56.4	24.0	72°13.4	05.0	206°44.2	07.5	Nunki	75°43.9	-26°15.5
23	258°37.2	196°40.7	17.8	187°57.0	24.3	87°15.6	04.9	221°46.5	07.6	Altair	$61^{\circ}56.9$	8°56.7
Mer.p	bass. 05:48	$\nu 2.3' \ d-0$.3′ m-4.64	ν 0.6′ d0	.3′ m1.45	$\nu 2.2' \ d-0$.1′ m-1.92	ν 2.2′ d0	.1′ m0.46	Peacock	53°00.9	-56°38.3
										Deneb	49°23.4	45°22.9
•	6114	6114	_	6114	_	6114	_	6114	_	Enif	33°35.8	10°00.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec N12° 07.6	Al Na'ir	27°29.2	-46°49.0
0	273°39.7	211°42.9	N17°17.6		N22°24.5	102°17.8	N05°04.8			Fomalhaut	15°11.3	-29°28.0
1	288°42.1	226°45.1 241°47.3	17.3	217°58.2	24.8	117°20.0	04.7	251°51.0	07.7 07.7	Scheat	13°42.3	28°14.2
2	303°44.6 318°47.1	241°47.3 256°49.5	17.1 •• 16.9	232°58.8 247°59.3	25.0 •• 25.3	132°22.2 147°24.4	04.6 •• 04.4	266°53.2 281°55.5	07.7	Markab	13°27.0	15°21.6
4	318 47.1 333°49.5	250 49.5 271°51.7	16.7	247 59.3 262°59.9	25.6	147 24.4 162°26.6	04.4	281 55.5 296°57.7	· · 07.8 07.9	Jun 23 Fri	SHA	Mer.pass
4 5	333 49.5 348°52.0	271 51.7 286°53.9	16.7	202 59.9 278°00.5	25.0 25.8	102 20.0 177°28.8	04.3	290 57.7 311°59.9	07.9 07.9		298° 10.9	09:59
6	348 52.0 3°54.5	280 53.9 301°56.1	N17°16.3		N22°26.1	177 28.8 192°31.0	N05°04.1	311 59.9 327°02.2		Mars		10:30
7	3 54.5 18°56.9	301 56.1 316°58.3	16.1	293 01.1 308°01.7	26.3	192 31.0 207°33.2	04.0	342°04.4	08.1		188°50.3	17:15
8	33°59.4	310 58.3 332°00.5	15.1	308 01.7 323°02.3	26.3 26.6	207 33.2 222°35.4	04.0	342 04.4 357°06.7	08.1	Saturn	323° 19.8	08:19
9	33 39.4 49°01.9	347°02.7	15.9	338°02.9	26.8	222 35.4 237°37.6	03.7	12°08.9	08.2	Jatuili	J2J 19.0	30.13
10	64°04.3	2°04.8	15.7	353°03.5	27.1	252°39.8	03.6	27°11.2	08.3	Jun 24 Sat	SHA	Mer.pass
11	79°06.8	2 04.8 17°07.0	15.3	8°04.1	27.1	267°42.0	03.0	42°13.4	08.3	Venus	298°08.2	09:55
12	94°09.3	32°09.2	N17°15.1	23°04.7	N22°27.6	282°44.3	N05°03.4	42 13.4 57°15.7	N12°08.4	Mars		10:29
13	94 09.3 109°11.7	47°11.4	14.9	38°05.2	27.8	202 44.3 297°46.5	03.2	72°17.9	08.5		188°44.3	17:12
14	109 11.7 124°14.2	62°13.5	14.9	53°05.8	28.1	312°48.7	03.2	87°20.1	08.5	Saturn	323°14.4	08:15
15	139°16.6	77°15.7	. 14.7	68°06.4	28.3	312 46.7 327°50.9	03.0	102°22.4	08.6	Jum DE C.:	CHA	Ma:: ====
16	154°19.1	92°17.8	14.3	83°07.0	28.6	342°53.1	02.9	102 22.4 117°24.6	08.6	Jun 25 Sun	SHA 298° 03.2	Mer.pass
17	169°21.6	92 17.8 107°20.0	14.3	98°07.6	28.9	357°55.3	02.9	132°26.9	08.7	Venus		09:52
18	184°24.0	107 20.0 122°22.1	N17°13.9		N22°29.1	12°57.5	N05° 02.6	147°29.1		Mars	289° 17.9 188° 38.1	10:28 17:08
19	199°26.5	137°24.3	13.7	128°08.8	29.4	27°59.7	02.5	162°31.4	08.8	Saturn		08:12
20	214°29.0	152°26.4	13.7	143°09.4	29.6	43°01.9	02.4	177°33.6	08.9	Jaturn	J2J U9.U	00:12
21	229°31.4	167°28.5	• • 13.4	158°10.0	29.9	58°04.1	02.3	192°35.9	• • 09.0	Horizont	al parallax	
22	244°33.9	182°30.7	13.2	173°10.6	30.1	73°06.3	02.2	207°38.1	09.0		Venus:	0.4
23	259°36.4	197°32.8	13.0	188°11.1	30.4	88°08.5	02.0	222°40.4	09.1		Mars:	0.1
		_										
ivier.p	oass. 05:44	ν 2.2' d-0	.2′ m-4.66	u0.6′ d 0	.3′ m1.45	ν 2.2' d-0	$.1^\prime$ m-1 $.91$	ν 2.2' $d0$.1' m 0.46			

h	Su	n	Moon						
Fri	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°26.3	N23°25.2	176°05.0	4.9'	N24°58.6	-4.5'	58.8'		
1 2	194°26.1 209°26.0	25.2 25.1	190°28.9 204°52.9	4.9' 4.9'	24°54.1 24°49.5	-4.7' -4.8'	58.9' 58.9'		
3	209 20.0 224°25.8	25.1	204 32.9 219°16.8	5.0'	24°44.6	-4.0 -5.0'	58.9'		
4	239°25.7	25.1	233°40.8	5.0'	24°39.6	-5.2'	58.9'		
5	254°25.6	25.0	248°04.8	5.0'	24°34.4	-5.3'	59.0'		
6 7	269°25.4 284°25.3	N23°25.0 24.9	262°28.8 276°52.8	5.0' 5.1'	N24°29.1 24°23.6	-5.5' -5.7'	59.0' 59.0'		
8	204 25.3 299°25.2	24.9	270 52.8 291°16.9	5.1'	24°23.0 24°17.9	-5.8'	59.0'		
9	314°25.0	• • 24.9	305°41.0	5.1'	24° 12.0	-6.0'	59.0'		
10	329°24.9	24.8	320°05.2	5.2'	24°06.0	-6.2'	59.1'		
11	344°24.8 359°24.6	24.8 N23°24.7	334°29.3 348°53.5	5.2' 5.3'	23°59.9 N23°53.5	-6.3' -6.5'	59.1' 59.1'		
12 13	359 24.0 14°24.5	N23 24.7 24.7	348 53.5 3°17.8	5.3'	N23 53.5 23°47.0	-6.7'	59.1'		
14	29°24.4	24.6	17°42.1	5.3'	23°40.4	-6.8'	59.1'		
15	44°24.2	• • 24.6	$32^{\circ}06.4$	5.4'	23°33.6	-7.0'	59.2'		
16	59°24.1	24.5	46°30.8	5.4'	23°26.6	-7.1'	59.2'		
17 18	74°23.9 89°23.8	24.5 N23°24.4	60°55.2 75°19.7	5.5' 5.5'	23°19.5 N23°12.2	-7.3' -7.4'	59.2' 59.2'		
19	104°23.7	24.4	89°44.2	5.6'	23°04.7	-7.4 -7.6'	59.2'		
20	119°23.5	24.3	104°08.8	5.6'	22°57.1	-7.8'	59.3'		
21	134°23.4	• • 24.3	118°33.4	5.7'	22°49.4	-7.9'	59.3'		
22	149°23.3	24.2	132°58.0	5.7'	22°41.4	-8.1'	59.3'		
23	164°23.1	24.2	147°22.8	5.8'	22°33.4	-8.2'	59.3'		
	SD = 15.7'	d = -0.0'		S	D = 16.0'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°23.0	N23°24.1	$161^{\circ}47.5$	5.8'	N22°25.2	-8.4'	59.3'		
1	194°22.9	24.1	176°12.4	5.9'	22°16.8	-8.5'	59.3'		
2	209°22.7 224°22.6	24.0 •• 23.9	190°37.2 205°02.2	5.9' 6.0'	22°08.3 21°59.6	-8.7' -8.8'	59.4' 59.4'		
3 4	239°22.5	23.9	205 02.2 219°27.2	6.1	21°50.8	-o.o -9.0'	59.4'		
5	254°22.3	23.8	233°52.3	6.1	21°41.9	-9.1	59.4'		
6	269°22.2	N23°23.8	248°17.4	6.2'	N21°32.8	-9.2'	59.4'		
7	284°22.1	23.7	262°42.6	6.2'	21°23.5	-9.4'	59.4'		
8 9	299°21.9 314°21.8	23.7 •• 23.6	277°07.8 291°33.1	6.3' 6.4'	21°14.2 21°04.6	-9.5' -9.7'	59.4' 59.5'		
10	314 21.6 329°21.7	23.5	291 55.1 305°58.5	6.4	21 04.0 20°55.0	-9.1 -9.8'	59.5'		
11	344°21.5	23.5	320°23.9	6.5'	20°45.2	-9.9'	59.5'		
12	359°21.4	N23°23.4	334°49.4	6.6'	N20°35.3	-10.1'	59.5'		
13	14°21.3 29°21.1	23.3	349°15.0 3°40.7	6.6'	20°25.2 20°15.0	-10.2'	59.5'		
14 15	29°21.1 44°21.0	23.3	3°40.7 18°06.4	6.7' 6.8'	20° 15.0 20° 04.7	-10.3' -10.5'	59.5' 59.5'		
16	59°20.9	23.2	32°32.2	6.8	19° 54.2	-10.6'	59.5'		
17	$74^{\circ}20.7$	23.1	$46^{\circ}58.0$	6.9'	19°43.6	-10.7'	59.6'		
18	89°20.6	N23°23.0	61°23.9	7.0'	N19°32.9	-10.8'	59.6'		
19 20	104°20.5 119°20.3	22.9 22.9	75°49.9 90°16.0	7.1' 7.1'	19°22.1 19°11.1	-11.0'	59.6' 59.6'		
21	119 20.3 134°20.2	• • 22.8	90 10.0 104°42.1	7.1 7.2'	19 11.1 19°00.0	-11.1 -11.2'	59.6'		
22	149°20.1	22.7	119°08.3	7.3'	18° 48.8	-11.3'	59.6'		
23	164°19.9	22.7	133°34.6	7.3'	18° 37.5	-11.4'	59.6'		
	SD = 15.7'	d = -0.1'		S	D = 16.2'				
Sun	GHA	Dec	GHA	ν	Dec	d	НР		
0	179°19.8	N23°22.6	148°00.9	7.4'	N18°26.0	-11.6'	59.6'		
1	194°19.7	22.5	162°27.3	7.5'	18° 14.5	-11.7'	59.6'		
2	209°19.5	22.5	176°53.8 191°20.4	7.6' 7.6'	18°02.8	-11.8'	59.6'		
3 4	224°19.4 239°19.3	· · 22.4 22.3	191°20.4 205°47.0	7.6° 7.7'	17°51.0 17°39.1	-11.9' -12.0'	59.6' 59.7'		
5	254°19.1	22.2	220°13.7	7.8'	17°27.1	-12.1'	59.7'		
6	269°19.0	N23°22.2	234°40.5	7.9'	N17° 15.0	-12.2'	59.7'		
7	284°18.9	22.1	249°07.3 263°34.3	7.9'	17°02.7 16°50.4	-12.3'	59.7'		
8 9	299°18.7 314°18.6	22.0 •• 21.9	263°34.3 278°01.3	8.0' 8.1'	16°50.4 16°38.0	-12.4' -12.5'	59.7' 59.7'		
10	329°18.5	21.8	276 01.3 292°28.3	8.1	16°25.4	-12.6'	59.7'		
11	344°18.3	21.8	306°55.5	8.2'	$16^{\circ}12.8$	-12.7'	59.7'		
12	359°18.2	N23°21.7	321°22.7	8.3'	N16°00.1	-12.8'	59.7'		
13	14°18.1 29°17.9	21.6	335°50.0 350°17.3	8.4'	15° 47.2 15° 34.3	-12.9'	59.7'		
14 15	29°17.9 44°17.8	21.5 •• 21.4	350°17.3 4°44.8	8.4' 8.5'	15°34.3 15°21.3	-13.0' -13.1'	59.7' 59.7'		
16	59°17.7	21.4	19°12.2	8.6'	15°08.1	-13.2'	59.7'		
17	74°17.5	21.3	33°39.8	8.6'	14°54.9	-13.3'	59.7'		
18	89°17.4	N23°21.2	48°07.5	8.7'	N14°41.6	-13.4'	59.7'		
19 20	104°17.3 119°17.1	21.1 21.0	62°35.2 77°02.9	8.8' 8.8'	14°28.3 14°14.8	-13.5' -13.6'	59.7' 59.7'		
20	119 17.1 134°17.0	20.9	91°30.8	8.9'	14 14.8 14°01.2	-13.6'	59.7' 59.7'		
22	149°16.9	20.8	105°58.7	9.0'	13° 47.6	-13.7	59.7		
23	164°16.7	20.8	120°26.7	9.0'	13°33.9	-13.8'	59.7'		
	SD = 15.7'	d = -0.1'		S	D = 16.3'				

			2028	June 23	3 to Ju	n. 25
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut.
N 72°	IVaut.	CIVII			CIVII	
N 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
N 40°	03:18	03:59	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:47	19:18	19:47	20:24
30°	03:59	04:33	05:00	19:05	19:32	20:06
20°	04:29	04:58	05:22	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:36	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	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
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:31	16:19	17:08
58°	07:04	07:57	08:49	15:17	16:09	17:01
S 60°	07:11	08:08	09:06	14:59	15:57	16:54
Lat.		Moonris	e		Moonset	:
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°			02:58			01:50
N 70°			04:19			00:27
			04.19			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
N 40°	04:58	06:11	07:26	20:27	21:08	21:42
35°	05:14	06:11	07:26	20:27	20:56	21:42
30°	05:14	06:25	07:36	19:59	20:56	21:34
20°	05:20	06:57	08:01	19:39	20:40	21:27
N 10°	06:13	00:57	08:15	19:37	20:28	21:15
0°	06:32	07:13	08:15	19:00	19:58	20:53
S 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

		Sun			Moon			
Day	Eqn.of Time 00 ^h 12 ^h		Mer.	Mer.	Pass.	Age		
July			Pass	Upper	Upper Lower			
	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			

09:09

09:17 09:28

09:39

09:53

10:00

10:07

10:15

10:24

10:35

07:12 07:35

07:49 08:05

08:24

08:48

08:59

09:12

09:27

09:44

10:05

20°

30°

35°

40° 45°

S 50°

52°

54°

56°

58°

S 60°

08:25

08:37 08:50 09:06

09:25

09:34

09:44

09:56

10:09

10:24

19:09

18:59

18:46

18:32

18:14

18:05

17:56

17:45

17:33

17:18

18:01

17:47 17:32

17:14

16:51

16:40

16:28

16:13

15:56

15:36

20:31 20:18

20:11

20:02

19:52

19:39

19:33

19:27

19:20

19:11

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	274°38.8	212°34.9	N17°12.8	203°11.7	N22°30.6	103° 10.7	N05°01.9	237° 42.6	N12°09.2			
1	289°41.3	227°37.1	12.6	218° 12.3	30.9	118° 12.9	01.8	252°44.9	09.2	Alpheratz	357°31.8	29° 14.8
2	304°43.8	242°39.2	12.4	233° 12.9	31.1	133° 15.1	01.7	267°47.1	09.3	Ankaa	353°04.4	-42°08.7
3	319°46.2	257°41.3	• • 12.3	248°13.5	• • 31.3	148° 17.3	•• 01.6	282°49.3	• • 09.3	Schedar	349°27.7	56°41.4
4	334°48.7	272°43.4	12.1	263°14.1	31.6	163° 19.5	01.4	297°51.6	09.4	Diphda Achernar	348°44.5 335°18.4	-17°49.6 -57°05.2
5	349°51.1	287°45.5	11.9	278°14.7	31.8	$178^{\circ}21.7$	01.3	312°53.8	09.5	Hamal	335 18.4 327°48.1	-57 05.2 23°35.8
6	4°53.6	302°47.6	N17°11.7	293°15.3	N22°32.1	193°23.9	N05°01.2	327°56.1	N12°09.5	Polaris	312°49.6	89°22.7
7	19°56.1	317°49.7	11.6	308° 15.9	32.3	208°26.1	01.1	342°58.3	09.6	Acamar	315°09.9	-40° 11.2
8	34°58.5	332°51.8	11.4	323°16.5	32.6	223°28.3	00.9	358°00.6	09.7	Menkar	314°03.4	4° 12.1
9	50°01.0	347°53.9	· · 11.2	338°17.0	• • 32.8	238° 30.4	00.8	13°02.8	• • 09.7	Mirfak	308°24.5	49° 57.5
10 11	65°03.5 80°05.9	2°56.0 17°58.1	11.1 10.9	353°17.6 8°18.2	33.1 33.3	253°32.6 268°34.8	00.7 00.6	28°05.1 43°07.3	09.8 09.9	Aldebaran	290°36.7	16°33.9
12	95°08.4	33°00.1	N17°10.7	23° 18.8	N22°33.6	283°37.0	N05°00.5	58°09.6	N12°09.9	Rigel	$281^{\circ}01.5$	-8° 10.2
13	110° 10.9	48°02.2	10.6	38° 19.4	33.8	298° 39.2	00.3	73°11.8	10.0	Capella	280°18.1	46°01.4
14	125°13.3	63°04.3	10.4	53°20.0	34.1	313°41.4	00.2	88° 14.1	10.0	Bellatrix	278°20.2	6°22.5
15	140°15.8	78°06.4	10.3	68° 20.6	• • 34.3	328°43.6	00.1	103°16.3	· · 10.1	Elnath	277°58.6	28° 37.8
16	155°18.3	93°08.4	10.1	83°21.2	34.5	343°45.8	05°00.0	118° 18.6	10.2	Alnilam	275°35.2	-1°11.1 7°24.7
17	170°20.7	$108^{\circ}10.5$	09.9	98°21.8	34.8	358°48.0	04°59.8	133°20.8	10.2	Betelgeuse Canopus	270°49.4 263°51.7	-52°42.7
18	185°23.2	123°12.5	N17°09.8	113°22.4	N22°35.0	13°50.2	N04°59.7	148°23.1	N12°10.3	Sirius	258°24.1	-32 42.7 -16°45.4
19	200°25.6	138°14.6	09.6	128° 22.9	35.3	28°52.4	59.6	163°25.3	10.4	Adhara	255°04.0	-29°00.7
20	215°28.1	153°16.7	09.5	143°23.5	35.5	43°54.6	59.5	178° 27.6	10.4	Procyon	244°48.2	5°09.0
21	230°30.6	168°18.7	• • 09.3	158°24.1	• • 35.7	58° 56.8	• • 59.4	193°29.8	• • 10.5	Pollux	243°14.2	27° 57.4
22	245°33.0	183°20.7	09.2	173°24.7	36.0	73°59.0	59.2	208°32.1	10.5	Avior	$234^{\circ}14.1$	-59°36.3
23	260°35.5	198°22.8	09.0	188°25.3	36.2	89°01.2	59.1	223°34.3	10.6	Suhail	222°44.5	-43°33.1
Mer.pa	ass. 05:40	$\nu 2.1' \ d-0.$.2′ m-4.67	ν 0.6' d0.	2′ m1.46	$\nu 2.2' \ d-0.0$	$.1^\prime$ m-1.91	ν 2.2′ d0	.1' m 0.46	Miaplacidus	221°38.3	-69°50.3
										Alphard	217°45.2	-8°47.1
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6 193°37.9	11°49.6
0	275°38.0	213°24.8	N17°08.9	203°25.9	N22°36.5	104°03.4	N04°59.0	238°36.6	N12°10.7	Dubhe Denebola	193 37.9 182°22.1	61°36.0 14°24.8
1	290°40.4	228°26.9	08.7	218° 26.5	36.7	119°05.6	58.9	253°38.8	10.7	Gienah	175°40.6	-17°42.2
2	305°42.9	243°28.9	08.6	233°27.1	36.9	134°07.8	58.7	268°41.1	10.8		172°56.7	-63° 15.8
3	320°45.4	258°30.9	• • 08.4	248°27.7	• • 37.2	149°10.0	• • 58.6	283°43.3	• • 10.9	Gacrux	171°48.3	-57° 16.7
4 5	335° 47.8 350° 50.3	273°32.9 288°35.0	08.3 08.2	263°28.3 278°28.8	37.4	164° 12.2 179° 14.4	58.5 58.4	298°45.5 313°47.8	10.9	Alioth	$166^{\circ}10.5$	55° 48.5
6	5°52.7	303°37.0	N17°08.0	276 20.6 293°29.4	37.7 N22°37.9	179 14.4 194° 16.6	N04°58.2	313 47.8 328°50.0	11.0 N12°11.0	Spica	158°19.2	-11° 18.7
7	20°55.2	318°39.0	07.9	308°30.0	38.1	209° 18.7	58.1	343°52.3	11.1	Alkaid	152°49.7	49° 10.4
8	35°57.7	333°41.0	07.7	323°30.6	38.4	224° 20.9	58.0	358° 54.5	11.2	Hadar	148°31.5	-60°30.9
9	51°00.1	348°43.0	• • 07.6	338°31.2	• • 38.6	239°23.1	• • 57.9	13° 56.8	· · 11.2	Menkent	147°54.0 145°45.2	-36°30.8 19°02.1
10	66°02.6	3°45.0	07.5	353°31.8	38.9	254°25.3	57.7	28°59.0	11.3	Arcturus Rigil Kent.	139°35.9	-60° 57.4
11	81°05.1	18°47.0	07.3	8°32.4	39.1	269° 27.5	57.6	44°01.3	11.4	Kochab	137°19.3	74°02.5
12	96°07.5	33°49.0	N17°07.2	23°33.0	N22°39.3	284° 29.7	N04°57.5	59°03.6	N12°11.4	Zuben'ubi	$136^{\circ}52.6$	-16°09.7
13 14	111° 10.0 126° 12.5	48°51.0 63°53.0	07.1 06.9	38°33.6 53°34.2	39.6 39.8	299°31.9 314°34.1	57.4 57.2	74°05.8 89°08.1	11.5 11.5	Alphecca	$126^{\circ}01.1$	26° 37.2
15	141°14.9	78°54.9	•• 06.8	68° 34.8	40.0	329°36.3	57.2	104° 10.3	11.6	Antares	112°12.0	-26°29.7
16	156° 17.4	93°56.9	06.7	83°35.3	40.3	344° 38.5	57.0	119°12.6	11.7	Atria	107°03.1	-69°04.7
17	171°19.9	108°58.9	06.6	98°35.9	40.5	359° 40.7	56.9	134°14.8	11.7	Sabik Shaula	101°59.2 96°06.1	-15°45.5 -37°07.4
18	186°22.3	124°00.9	N17°06.4	113°36.5	N22°40.7	14°42.9	N04°56.8	149° 17.1	N12°11.8	Rasalhague	95°55.6	12°32.4
19	201°24.8	139°02.8	06.3	128°37.1	41.0	29°45.0	56.6	164° 19.3	11.8	Eltanin	90°40.3	51°29.2
20	216°27.2	154°04.8	06.2	143°37.7	41.2	44°47.2	56.5	179°21.6	11.9	Kaus Aust.	83°28.3	-34°22.1
21 22	231°29.7 246°32.2	169°06.8 184°08.7	· · 06.1 06.0	158°38.3 173°38.9	· · 41.4 41.7	59° 49.4 74° 51.6	· · 56.4 56.3	194°23.8 209°26.1	· · 12.0 12.0	Vega	80°30.9	38°48.7
23	261°34.6	199°10.7	05.8	173 30.9 188° 39.5	41.7	89°53.8	56.1	209 20.1 224°28.3	12.0	Nunki	75°43.9	-26° 15.5
										Altair	61°56.9	8°56.7
Mer.p	ass. 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 Deneb	53°00.8 49°23.4	-56°38.3 45°22.9
										Enif	33°35.8	10°00.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.0
0	276°37.1	214°12.6	$N17^{\circ}05.7$		N22°42.1	104° 56.0	N04°56.0	239° 30.6	N12°12.2	Fomalhaut	15°11.3	-29°28.0
1	291°39.6	229°14.6	05.6	218° 40.7	42.4	119°58.2	55.9	254°32.8	12.2	Scheat	13°42.3	28° 14.2
2	306°42.0	244°16.5	05.5	233°41.2	42.6	135°00.4	55.8	269°35.1	12.3	Markab	$13^{\circ}26.9$	15°21.6
3	321°44.5	259°18.5	•• 05.4	248°41.8	• • 42.8	150°02.6	• • 55.6	284°37.3	•• 12.3	lun 26 Ma-	SHA	Mo: :::
4 5	336°47.0 351°49.4	274°20.4 289°22.3	05.3	263°42.4 278°43.0	43.0	165°04.8 180°06.9	55.5 55.4	299°39.6	12.4	Jun 26 Mon	297°56.1	Mer.pass 09:48
6	6°51.9	289°22.3 304°24.3	05.2 N17°05.1		43.3 N22°43.5	180°06.9 195°09.1	55.4 N04°55.2	314°41.8 329°44.1	12.5 N12°12.5	Mars		10:27
7	21°54.4	319°26.2	05.0	308°44.2	43.7	210°11.3	55.1	344°46.3	12.6	II	188°31.8	17:05
8	36° 56.8	334°28.1	04.9	323°44.8	44.0	225° 13.5	55.0	359°48.6	12.6	Saturn	323°03.8	08:08
9	51°59.3	349°30.0	• • 04.8	338°45.4	• • 44.2	240° 15.7	• • 54.9	14°50.8	. 12.7	I.u. 27 T		
10	67°01.7	4°32.0	04.6	353°46.0	44.4	255° 17.9	54.7	29°53.1	12.8	Jun 27 Tue	SHA 297°46.9	Mer.pass 09:45
11	82°04.2	19°33.9	04.5	8°46.6	44.6	270°20.1	54.6	44°55.3	12.8	Mars		10:26
12	97°06.7	34°35.8	N17°04.4		N22°44.9	285°22.3	N04°54.5	59°57.6	N12°12.9		188°25.4	17:01
13 14	112°09.1 127°11.6	49°37.7 64°39.6	04.4 04.3	38°47.7 53°48.3	45.1 45.3	300°24.4 315°26.6	54.4 54.2	74°59.8 90°02.1	13.0 13.0	Saturn	322°58.6	08:04
15	142° 14.1	79°41.5	04.3	68° 48.9	45.5 •• 45.5	315 20.0 330°28.8	54.2	90 02.1 105°04.4	13.1	Jun 28 Wed	SHA	Mer.pass
16	157° 16.5	94°43.4	04.2	83°49.5	45.8	345°31.0	54.0	120°06.6	13.1		297°35.5	09:42
17	172° 19.0	109°45.3	04.0	98°50.1	46.0	0°33.2	53.9	135°08.9	13.2		287°03.0	10:25
18	187°21.5	124°47.2	N17°03.9		N22°46.2	15° 35.4	N04°53.7		N12°13.3		188°18.9	16:58
19	202°23.9	139°49.0	03.8	128°51.3	46.4	30°37.6	53.6	165°13.4	13.3	Saturn	322°53.5	08:01
20	217°26.4	154°50.9	03.7	143°51.9	46.7	45°39.7	53.5	180°15.6	13.4	Horizont	al parallax	
21 22	232°28.8 247°31.3	169°52.8 184°54.7	· · 03.6 03.5	158°52.5 173°53.0	· · 46.9 47.1	60°41.9 75°44.1	· · 53.4 53.2	195°17.9 210°20.1	· · 13.4 13.5	1101120111	Venus:	0.4
23	262°33.8	199°56.6	03.5	173 55.0 188°53.6	47.1	90°46.3	53.2	210 20.1 225°22.4	13.5		Mars:	0.1
			.1′ m-4.69		2′ m1.46		.1′ m-1.89		.1′ m0.45	,		
ivier.pa	ass. 05:33	ν 1.9 α -0.	.111-4.09	ν 0.0 a 0.	∠ III1.4U	ν Δ.Ζ U-U.	т ш-т.09	ν2.5 UU	.± 1110.43			

h	Su	n	Moon					
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°16.6	N23°20.7	134°54.7	9.1'	N13°20.1	-13.9'	59.7'	
1 2	194°16.5 209°16.3	20.6 20.5	149°22.8 163°51.0	9.2' 9.2'	13°06.2 12°52.3	-13.9' -14.0'	59.7' 59.7'	
3	209 10.3 224°16.2	20.4	103 51.0 178°19.3	9.2 9.3'	12°38.3	-14.0 -14.1'	59.7'	
4	239°16.1	20.3	192°47.6	9.4'	12°24.2	-14.2'	59.7'	
5	254°15.9	20.2	207°15.9	9.4'	12°10.0	-14.2'	59.7'	
6 7	269°15.8 284°15.7	N23°20.1 20.0	221°44.4 236°12.9	9.5' 9.6'	N11°55.8 11°41.5	-14.3' -14.4'	59.7' 59.7'	
8	299°15.6	19.9	250° 41.4	9.6'	11°27.2	-14.4'	59.7'	
9	314°15.4	• • 19.8	265°10.1	9.7'	11°12.7	-14.5'	59.7'	
10	329°15.3	19.7	279°38.7	9.7'	10°58.2	-14.5'	59.7'	
11 12	344°15.2 359°15.0	19.7 N23°19.6	294°07.5 308°36.3	9.8' 9.9'	10°43.7 N10°29.1	-14.6' -14.7'	59.7' 59.7'	
13	14°14.9	19.5	323°05.2	9.9'	10° 14.4	-14.7'	59.7'	
14	29°14.8	19.4	$337^{\circ}34.1$	10.0'	09°59.7	-14.8'	59.7'	
15	44°14.6	• • 19.3	352°03.0	10.0'	09°44.9	-14.8'	59.7'	
16 17	59°14.5 74°14.4	19.2 19.1	6°32.1 21°01.1	10.1' 10.1'	09°30.1 09°15.3	-14.9' -14.9'	59.7' 59.7'	
18	89°14.2	N23° 19.0	35°30.3	10.2'	N09°00.3	-15.0'	59.7'	
19	104°14.1	18.9	49°59.5	10.2'	08°45.4	-15.0'	59.7'	
20	119°14.0	18.8	64°28.7	10.3'	08°30.4	-15.1'	59.7'	
21 22	134°13.9 149°13.7	· · 18.7 18.5	78°58.0 93°27.3	10.3' 10.4'	08°15.3 08°00.2	-15.1' -15.1'	59.7' 59.7'	
23	164°13.6	18.4	107°56.7	10.4	07°45.1	-15.1 -15.2'	59.7'	
	SD = 15.7'	d = -0.1'			D = 16.3'			
					10.0			
Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	179°13.5 194°13.3	N23°18.3 18.2	122°26.2 136°55.6	10.5' 10.5'	N07°29.9 07°14.7	-15.2' -15.3'	59.7' 59.7'	
2	209°13.2	18.1	150° 55.0 151° 25.2	10.6'	07 14.7 06°59.4	-15.3'	59.7'	
3	224°13.1	• 18.0	165°54.7	10.6'	06°44.1	-15.3'	59.7'	
4	239°12.9	17.9	180°24.3	10.7'	06°28.8	-15.3'	59.7'	
5 6	254°12.8 269°12.7	17.8 N23°17.7	194°54.0 209°23.7	10.7' 10.7'	06°13.5 N05°58.1	-15.4' -15.4'	59.7' 59.7'	
7	284°12.6	17.6	203°53.4	10.7	05°42.7	-15.4'	59.6'	
8	299°12.4	17.5	238°23.2	10.8'	05°27.2	-15.5'	59.6'	
9	314°12.3	• • 17.4	252°53.0	10.9'	05°11.8	-15.5'	59.6'	
10 11	329°12.2 344°12.0	17.2 17.1	267°22.9 281°52.8	10.9' 10.9'	04°56.3 04°40.8	-15.5' -15.5'	59.6' 59.6'	
12	359°11.9	N23°17.0	296°22.7	11.0'	N04°25.3	-15.5'	59.6'	
13	14°11.8	16.9	310°52.6	11.0'	04°09.7	-15.6'	59.6'	
14	29°11.7 44°11.5	16.8 •• 16.7	325°22.6 339°52.6	11.0' 11.0'	03°54.2 03°38.6	-15.6' -15.6'	59.6' 59.6'	
15 16	59°11.4	16.6	354°22.7	11.1'	03°23.0	-15.6'	59.6'	
17	74°11.3	16.4	8°52.8	11.1'	03°07.4	-15.6'	59.6'	
18	89°11.1	N23°16.3	23°22.9	11.1'	N02°51.8	-15.6'	59.6'	
19 20	104°11.0 119°10.9	16.2 16.1	37°53.0 52°23.2	11.2' 11.2'	02°36.2 02°20.5	-15.6'	59.5' 59.5'	
21	134°10.8	. 16.0	66°53.3	11.2'	02°04.9	-15.6'	59.5'	
22	149°10.6	15.8	81°23.5	11.2'	01°49.3	-15.6'	59.5'	
23	164°10.5	15.7	95°53.8	11.2'	01°33.6	-15.6'	59.5'	
	SD = 15.7'	d = -0.1'		SI	O = 16.3'			
Wed	GHA	Dec	GHA	ν	Dec	d	НР	
0	179°10.4	N23° 15.6	110°24.0	11.3'	N01°18.0	-15.6'	59.5'	
1	194°10.2	15.5	124°54.3	11.3'	01°02.3	-15.6'	59.5'	
2	209°10.1 224°10.0	15.3	139°24.6 153°54.9	11.3'	00°46.7 00°31.0	-15.6'	59.5'	
3 4	224°10.0 239°09.9	· · 15.2 15.1	153°54.9 168°25.2	11.3' 11.3'	00°31.0 N00°15.4	-15.6' -15.6'	59.5' 59.5'	
5	254°09.7	15.0	182°55.5	11.3'	S00°00.2	15.6'	59.4'	
6	269°09.6	N23° 14.8	197°25.9	11.4'	S00°15.9	15.6'	59.4	
7 8	284°09.5 299°09.4	14.7 14.6	211°56.2 226°26.6	11.4' 11.4'	00°31.5 00°47.1	15.6' 15.6'	59.4' 59.4'	
9	299 09.4 314°09.2	14.6	240°57.0	11.4 11.4'	00 47.1 01°02.7	15.6'	59.4 59.4'	
10	329°09.1	14.3	$255^{\circ}27.4$	11.4'	01°18.3	15.6'	59.4'	
11	344°09.0	14.2	269°57.8	11.4'	01°33.9	15.6'	59.4'	
12 13	359°08.8 14°08.7	N23°14.1 13.9	284°28.2 298°58.6	11.4' 11.4'	\$01°49.4 02°05.0	15.5' 15.5'	59.4' 59.3'	
14	29°08.6	13.8	313°29.0	11.4'	02°20.5	15.5'	59.3'	
15	44°08.5	• • 13.7	$327^{\circ}59.4$	11.4'	02°36.0	15.5'	59.3'	
16	59°08.3	13.5	342°29.8	11.4'	02°51.5	15.5'	59.3'	
17 18	74°08.2 89°08.1	13.4 N23°13.3	357°00.3 11°30.7	11.4' 11.4'	03°06.9 503°22.4	15.4' 15.4'	59.3' 59.3'	
19	104°08.0	13.1	26°01.1	11.4'	03°37.8	15.4	59.3'	
20	119°07.8	13.0	40°31.5	11.4'	03°53.2	15.4'	59.2'	
21 22	134°07.7 149°07.6	· · 12.9 12.7	55°01.9 69°32.3	11.4' 11.4'	04°08.5 04°23.9	15.3' 15.3'	59.2' 59.2'	
22	149°07.6 164°07.5	12.7 12.6	69°32.3 84°02.7	11.4'	04°23.9 04°39.2	15.3' 15.3'	59.2' 59.2'	
	SD = 15.7'	d = -0.1'			O = 16.2'	_3.0		
	<u> </u>	u — -U.1		اد	J — 10.2			

N 72° □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	Civil Naut.
N 70° □ □ □ 68° □ □ □ 66° □ □ □ 64° //// //// //// 02:13 21:53 // 60° //// 00:56 02:39 21:27 23 N 58° //// 01:44 02:59 21:07 22 56° //// 02:14 03:16 20:50 21	
68°	
66°	/// //// /// //// 3:09 //// 2:21 //// 1:52 //// 1:30 23:14
64° //// //// 01:36 22:30 /// 62° //// //// 02:13 21:53 // 60° //// 00:56 02:39 21:27 23 N 58° //// 01:44 02:59 21:07 22 56° //// 02:14 03:16 20:50 21	/// //// 3:09 //// 2:21 //// 1:52 //// 1:30 23:14
62° //// /// 02:13 21:53 / 60° //// 00:56 02:39 21:27 23 N 58° //// 01:44 02:59 21:07 22 56° //// 02:14 03:16 20:50 21	/// //// 3:09 //// 2:21 //// 1:52 //// 1:30 23:14
60° //// 00:56 02:39 21:27 23 N 58° //// 01:44 02:59 21:07 22 56° //// 02:14 03:16 20:50 21	3:09 //// 2:21 //// 1:52 //// 1:30 23:14
N 58° //// 01:44 02:59 21:07 22 56° //// 02:14 03:16 20:50 21	2:21 //// 1:52 //// 1:30 23:14
56° //// 02:14 03:16 20:50 21	1:52 //// 1:30 23:14
	1:30 23:14
54° 00.51 02.36 03.30 20.36 21	
	1.13 22.30
52° 01:36 02:54 03:42 20:24 21	1.13 22.30
	0:58 22:03
45° 02:49 03:38 04:15 19:51 20	0:28 21:18
	0:06 20:47
35° 03:42 04:19 04:48 19:18 19	9:48 20:24
	9:33 20:06
	9:08 19:37
	3:47 19:14
0° 05:11 05:37 06:00 18:07 18	3:29 18:56
	3:12 18:39
	7:55 18:23
	7:36 18:06
	7:26 17:58
	7:14 17:48
45° 06:29 07:06 07:40 16:27 17	7:01 17:38
	5:45 17:26
	5:37 17:21
	5:29 17:15
	5:20 17:09
	5:10 17:03
S 60° 07:11 08:08 09:05 15:01 15	5:59 16:55

Lat.		Moonris	e		Moonset	;
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
S 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
S 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
S 60°	10:41	10:46	10:50	20:44	22:22	23:59

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
5	00 ^h	12 ^h	Pass	Upper	Lower	Age 4-6		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-33%		
26	02:54	03:00	12:03	15:33	03:07			
27	03:06	03:12	12:03	16:23	03:58			
28	03:19	03:25	12:03	17:12	04:48			

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	277°36.2	214°58.4	N17°03.4	203°54.2	N22°47.6	105°48.5	N04°53.0	$240^{\circ}24.6$	$N12^{\circ}13.6$	Alpheratz	357°31.7	29°14.8
1	292°38.7	230°00.3	03.3	218°54.8	47.8	120°50.7	52.8	$255^{\circ}26.9$	13.7	Ankaa	353°04.4	-42°08.7
2	307°41.2	$245^{\circ}02.1$	03.2	233°55.4	48.0	135°52.9	52.7	270°29.2	13.7	Schedar	349° 27.7	56°41.4
3	322°43.6	260°04.0	•• 03.1	248°56.0	• • 48.2	150°55.0	• • 52.6	285°31.4	• • 13.8	Diphda	348° 44.5	-17°49.6
4	337°46.1	275°05.9	03.0	263°56.6	48.4	165°57.2	52.5	300°33.7	13.9	Achernar	335°18.4	-17 49.0 -57°05.2
5	352°48.6	290°07.7	03.0	278°57.2	48.7	180°59.4	52.3	$315^{\circ}35.9$	13.9	Hamal	327°48.1	23°35.8
6	$7^{\circ}51.0$	305°09.6	$N17^{\circ}02.9$	293°57.8	N22°48.9	$196^{\circ}01.6$	N04°52.2	330°38.2	$N12^{\circ}14.0$	Polaris	312°48.4	89°22.7
7	22°53.5	320°11.4	02.8	308°58.4	49.1	211°03.8	52.1	345°40.4	14.0	Acamar	315°09.9	-40°11.2
8	37°56.0	335°13.2	02.7	323°58.9	49.3	226°06.0	51.9	0°42.7	14.1	Menkar	314°03.4	4°12.1
9	52°58.4	350°15.1	• • 02.7	338°59.5	• • 49.5	241°08.1	• • 51.8	15°44.9	• • 14.2	Mirfak	308° 24.5	49°57.5
10	68°00.9	$5^{\circ}16.9$	02.6	354°00.1	49.8	$256^{\circ}10.3$	51.7	30°47.2	14.2	Aldebaran	290°36.7	16°33.9
11	83°03.3	20°18.7	02.5	9°00.7	50.0	271°12.5	51.6	45°49.5	14.3	Rigel	281°01.5	-8°10.1
12	98°05.8	35°20.6	$N17^{\circ}02.4$	24°01.3	N22°50.2	286°14.7	N04°51.4	60°51.7	N12°14.3	Capella	280° 18.1	46°01.4
13	113°08.3	50°22.4	02.4	39°01.9	50.4	301°16.9	51.3	75°54.0	14.4	Bellatrix	278° 20.2	6°22.5
14	128°10.7	65°24.2	02.3	54°02.5	50.6	316°19.1	51.2	90°56.2	14.5	Elnath	277° 58.6	28°37.8
15	143°13.2	80°26.0	• • 02.2	69°03.1	• • 50.8	331°21.2	• • 51.1	105°58.5	• • 14.5	Alnilam	275°35.2	-1°11.1
16	158°15.7	95°27.8	02.2	84°03.7	51.1	346°23.4	50.9	121°00.7	14.6	Betelgeuse	270°49.3	7°24.7
17	$173^{\circ}18.1$	$110^{\circ}29.7$	02.1	99°04.3	51.3	1°25.6	50.8	136°03.0	14.6	Canopus	263°51.7	-52°42.7
18	188°20.6	125°31.5	$N17^{\circ}02.1$	114°04.9	N22°51.5	16°27.8	N04°50.7	151°05.2	N12° 14.7	Sirius	258° 24.1	-16°45.4
19	203°23.1	140°33.3	02.0	129°05.4	51.7	31°30.0	50.5	166° 07.5	14.8	Adhara	255°04.0	-29°00.7
20	218°25.5	155°35.1	01.9	144°06.0	51.9	46°32.1	50.4	181°09.8	14.8	Procyon	244°48.2	5°09.0
21	233°28.0	170°36.9	• • 01.9	159°06.6	• • 52.1	61°34.3	• • 50.3	196° 12.0	• • 14.9	Pollux	243°14.2	27°57.4
22	248°30.4	185°38.7	01.8	174°07.2	52.4	76°36.5	50.1	211°14.3	14.9	Avior	234°14.1	-59°36.3
23	263°32.9	200°40.4	01.8	189°07.8	52.6	91°38.7	50.0	226° 16.5	15.0	Suhail	222°44.5	-43°33.1
Mern	ass. 05:29	11 0' d-0	.1′ m-4.70	ν0 6′ d0	.2′ m1.47	u2 2′ d−0	.1′ m-1.89	1/2 3/ d0	.1′ m0.45	Miaplacidus	221°38.3	-69°50.3
- iviei.p		ν1.9 U-0.		- VO.O UO	1111.41	∠2.∠ U-U		ν 2.5 u0		Alphard	221 36.3 217°45.2	-8°47.1
										Regulus	207°31.6	11°49.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.0	61°36.0
0	278°35.4	215°42.2	$N17^{\circ}01.7$	204°08.4	N22° 52.8	106°40.9	N04°49.9	241°18.8	$N12^{\circ}15.0$	Denebola	182°22.1	14°24.8
1	293°37.8	230°44.0	01.7	$219^{\circ}09.0$	53.0	121°43.0	49.8	$256^{\circ}21.1$	15.1	Gienah	175° 40.7	-17°42.2
2	308°40.3	245°45.8	01.6	234°09.6	53.2	136°45.2	49.6	271°23.3	15.2	Acrux	172°56.8	-63°15.8
3	323°42.8	260°47.6	•• 01.6	249°10.2	• • 53.4	151°47.4	• • 49.5	286°25.6	•• 15.2		171°48.3	-57°16.7
4	338°45.2	275°49.3	01.5	264°10.8	53.6	166°49.6	49.4	301°27.8	15.3	Alioth	166° 10.5	55°48.5
5	353°47.7	290°51.1	01.5	279°11.3	53.8	181°51.8	49.2	$316^{\circ}30.1$	15.3	Spica	158° 19.2	-11°18.7
6	8°50.2	305°52.9	$N17^{\circ}01.4$	294°11.9	N22°54.1	196°53.9	N04°49.1	331°32.3	N12° 15.4	Alkaid	152°49.7	49°10.4
7	23°52.6	320°54.6	01.4	309°12.5	54.3	$211^{\circ}56.1$	49.0	346°34.6	15.5	Hadar	148°31.6	-60°30.9
8	38°55.1	335°56.4	01.3	324°13.1	54.5	226°58.3	48.9	1°36.9	15.5	Menkent	147°54.0	-36°30.8
9	53°57.6	350°58.2	• • 01.3	339°13.7	• • 54.7	242°00.5	• • 48.7	$16^{\circ}39.1$	• • 15.6	Arcturus	145°45.2	19°02.1
10	69°00.0	5°59.9	01.2	354°14.3	54.9	257°02.7	48.6	31°41.4	15.6	Rigil Kent.	139°35.9	-60°57.4
11	84°02.5	21°01.7	01.2	9°14.9	55.1	272°04.8	48.5	46°43.6	15.7	Kochab	137° 19.4	74°02.5
12	99°04.9	36°03.4	N17°01.2	24°15.5	N22°55.3	287°07.0	N04°48.3	61°45.9	N12°15.8	Zuben'ubi	136°52.6	-16°09.7
13	114°07.4	51°05.2	01.1	39°16.1	55.5	302°09.2	48.2	76°48.2	15.8	Alphecca	126°01.1	26°37.2
14	129°09.9	66°06.9	01.1	54°16.7	55.7	317°11.4	48.1	91°50.4	15.9	Antares	112°12.0	-26°29.7
15	144°12.3	81°08.6	•• 01.1	69°17.2	• • 55.9	332°13.5	• • 47.9	106° 52.7	• • 15.9	Atria	107°03.1	-69°04.7
16	159°14.8	96°10.4	01.0	84°17.8	56.1	347°15.7	47.8	121°54.9	16.0	Sabik	101°59.2	-15°45.5
17	174°17.3	111°12.1	01.0	99°18.4	56.4	2°17.9	47.7	136° 57.2	16.0	Shaula	96°06.1	-37°07.4
18	189°19.7	126°13.8	N17°01.0	114°19.0	N22°56.6	17°20.1	N04°47.5	151°59.4	N12°16.1	Rasalhague	95°55.6	12°32.5
19	204°22.2	141°15.6	00.9	129°19.6	56.8	32°22.2	47.4	167°01.7	16.2	Eltanin	90°40.3	51°29.2
20	219°24.7	156° 17.3	00.9	144°20.2	57.0	47°24.4	47.3	182°04.0	16.2	Kaus Aust.	83°28.3	-34°22.1
21	234°27.1	171°19.0	• • 00.9	159°20.8	• • 57.2	62°26.6	• • 47.2	197°06.2	• • 16.3	Vega	80°30.9	38°48.7
22	249°29.6	186°20.7	8.00	174°21.4	57.4	77°28.8	47.0	212°08.5	16.3	Nunki	75°43.9	-26°15.5
23	264°32.1	201°22.4	8.00	189°22.0	57.6	92°30.9	46.9	227° 10.7	16.4	Altair	61°56.9	8°56.7
Mer.p	ass. 05:25	$\nu 1.8' \ d-0.$.1′ m-4.70	$\nu 0.6' d0$.2′ m1.47	$\nu 2.2' \text{ d-0}$.1′ m-1.88	$\nu 2.3' d0$.1′ m0.45	Peacock	53°00.8	-56°38.3
										Deneb	49°23.4	45°22.9
										Enif	33°35.8	10°00.4
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.1$	-46°49.0
0	279°34.5	216°24.1	N17°00.8		N22°57.8	107°33.1	N04°46.8	242°13.0	N12°16.5	Fomalhaut	$15^{\circ}11.3$	-29°28.0
1	294°37.0	231°25.8	8.00	219°23.2	58.0	122°35.3	46.6	257° 15.3	16.5	Scheat	13°42.3	28°14.2
2	309°39.4	246°27.5	00.7	234°23.7	58.2	137°37.5	46.5	272°17.5	16.6	Markab	$13^{\circ}26.9$	15°21.6
3	324°41.9	261°29.2	• • 00.7	249°24.3	• • 58.4	152°39.6	• • 46.4	287° 19.8	16.6	1. 00	CIII	N4.
4	339°44.4	276°30.9	00.7	264°24.9	58.6	167°41.8	46.2	302°22.1	16.7	Jun 29 Thu	SHA	Mer.pass
5	354°46.8	291°32.6	00.7	279°25.5	58.8	182°44.0	46.1	317°24.3	16.7	Venus	297°22.2	09:39
6	9°49.3	306°34.3	N17°00.7	294°26.1	N22°59.0	197°46.2	N04°46.0	332°26.6	N12°16.8	Mars	286°18.0	10:24
7	24°51.8	321°36.0	00.6	309°26.7	59.2	212°48.3	45.8	347°28.8	16.9	Jupiter	188° 12.2	16:54
8	39°54.2	336°37.7	00.6	324°27.3	59.4	227°50.5	45.7	2°31.1	16.9	Saturn	322°48.4	07:57
9	54°56.7	351°39.4	•• 00.6	339°27.9	· · 59.6	242°52.7	• • 45.6	17°33.4	• • 17.0	Jun 30 Fri	SHA	Mer.pass
10	69°59.2	6°41.0	00.6	354°28.5	22°59.8	257°54.9	45.4	32°35.6	17.0	Venus		09:36
11	85°01.6	21°42.7	00.6	9°29.1	23°00.0	272°57.0	45.3	47°37.9	17.1	Mars		10:23
12	100°04.1	36°44.4	N17°00.6	24°29.7	N23°00.2	287°59.2	N04°45.2	62°40.1	N12° 17.1	Jupiter	188°05.5	16:51
13	115°06.6	51°46.0	00.6	39°30.2	00.4	303°01.4	45.0	77°42.4	17.2	Saturn	322°43.4	07:54
14	130°09.0	66°47.7	00.6	54°30.8	00.6	318°03.6	44.9	92°44.7	17.3			
15	145°11.5	81°49.4	• • 00.5	69°31.4	00.8	333°05.7	• • 44.8	107°46.9	• • 17.3	Jul 01 Sat	SHA	Mer.pass
16	160°13.9	96°51.0	00.5	84°32.0	01.0	348°07.9	44.7	122°49.2	17.4	Venus	296°49.6	09:33
17	175°16.4	111°52.7	00.5	99°32.6	01.2	3°10.1	44.5	137°51.5	17.4	Mars		10:22
18	190°18.9	126°54.3	N17°00.5	114°33.2	N23°01.4	18°12.2	N04°44.4	152°53.7	N12° 17.5		187°58.6	16:47
19	205°21.3	141°56.0	00.5	129°33.8	01.6	33°14.4	44.3	167°56.0	17.5	Saturn	322°38.5	07:50
20	220°23.8	156°57.6	00.5	144°34.4	01.8	48°16.6	44.1	182°58.2	17.6	Horizont	al parallax	
21	235°26.3	171°59.3	•• 00.5	159°35.0	02.0	63°18.8	44.0	198°00.5	· · 17.7	1101120111	Venus:	0.4
22	250°28.7	187°00.9	00.5	174°35.6	02.2	78°20.9	43.9 43.7	213°02.8	17.7		Mars:	0.4
23	265°31.2	202°02.5	00.5	189°36.2	02.4	93°23.1	43.7	228°05.0	17.8		141013.	V.1
Mer.p	ass. 05:21	ν 1.7′ d-0.	.0′ m-4.71	$ u$ 0.6 $^{\prime}$ d 0	.2′ m1.47	ν 2.2′ d-0	.1′ m-1.88	$\nu 2.3' \ d0$.1′ m0.44			

h	Su	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°07.3	N23°12.4	98°33.1	11.4'	S04°54.4	15.2'	59.2'	
1	194°07.2	12.3	113°03.5	11.4'	05°09.7	15.2'	59.2'	
2	209°07.1	12.2	127°33.9	11.4'	05°24.9	15.2'	59.2'	
3	224°07.0	• • 12.0	142°04.3	11.4'	05°40.0	15.1'	59.1'	
4	239°06.8 254°06.7	11.9 11.7	156°34.6 171°04.9	11.3'	05°55.2 06°10.2	15.1'	59.1'	
5 6	254 06.7 269°06.6	N23°11.6	171 04.9 185°35.3	11.3' 11.3'	506°25.3	15.0' 15.0'	59.1' 59.1'	
7	284°06.5	11.4	200°05.6	11.3'	06°40.3	15.0'	59.1'	
8	299°06.3	11.3	214°35.9	11.3'	06°55.3	14.9'	59.1'	
9	314°06.2	• • 11.1	229°06.2	11.3'	$07^{\circ}10.2$	14.9'	59.1'	
10	329°06.1	11.0	243°36.4	11.2'	07°25.1	14.8'	59.0'	
11	344°06.0	10.9	258°06.7	11.2'	07°39.9	14.8'	59.0'	
12	359°05.8 14°05.7	N23° 10.7	272°36.9 287°07.1	11.2' 11.2'	\$07°54.7 08°09.4	14.7'	59.0' 59.0'	
13 14	14°05.7 29°05.6	10.6 10.4	301°37.3	11.2'	08°09.4 08°24.1	14.7' 14.6'	59.0' 59.0'	
15	44°05.5	. 10.3	316°07.4	11.1'	08°38.7	14.6'	59.0'	
16	59°05.3	10.1	330°37.6	11.1'	08°53.3	14.5'	58.9'	
17	74°05.2	10.0	345°07.7	11.1'	09°07.8	14.5'	58.9'	
18	89°05.1	N23°09.8	359° 37.7	11.1'	S09°22.3	14.4'	58.9'	
19	104°05.0	09.6	14°07.8	11.0'	09°36.7	14.4'	58.9'	
20	119°04.9 134°04.7	09.5	28° 37.8 43° 07.8	11.0'	09°51.0 10°05.3	14.3'	58.9' 58.9'	
21 22	134 04.7 149°04.6	· · 09.3 09.2	43 07.8 57°37.8	11.0' 10.9'	10 05.3 10°19.6	14.2' 14.2'	58.8'	
23	149 04.6 164°04.5	09.2	57 37.8 72°07.7	10.9'	10 19.6 10°33.7	14.2 14.1'	58.8'	
	SD = 15.7'	d = -0.1'			0 = 16.1'			
		<u>u = -0.1</u>		SL				
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	179°04.4 194°04.2	N23°08.9 08.7	86°37.6 101°07.5	10.9' 10.8'	\$10°47.8 11°01.9	14.0' 14.0'	58.8' 58.8'	
2	209°04.1	08.6	101 07.3 115°37.3	10.8	11°15.8	13.9'	58.8'	
3	224°04.0	• • 08.4	130°07.1	10.8'	11°29.7	13.8'	58.8'	
4	239°03.9	08.2	144°36.9	10.7'	$11^{\circ}43.6$	13.8'	58.7'	
5	254°03.8	08.1	159°06.6	10.7'	11°57.4	13.7'	58.7'	
6	269°03.6 284°03.5	N23°07.9	173°36.3 188°06.0	10.7'	\$12°11.1 12°24.7	13.6'	58.7'	
7 8	284 ° 03.5 299° 03.4	07.8 07.6	202°35.6	10.6' 10.6'	12°24.7 12°38.2	13.6' 13.5'	58.7' 58.7'	
9	314°03.3	• • 07.4	217°05.2	10.5	12°51.7	13.4	58.7'	
10	329°03.1	07.3	231°34.7	10.5'	13°05.1	13.3'	58.6'	
11	344°03.0	07.1	$246^{\circ}04.2$	10.5'	13°18.4	13.2'	58.6'	
12	359°02.9	N23°06.9	260°33.7	10.4'	\$13°31.7	13.2'	58.6'	
13	14°02.8 29°02.7	06.8 06.6	275°03.1 289°32.5	10.4' 10.3'	13°44.8 13°57.9	13.1' 13.0'	58.6' 58.6'	
14 15	44°02.5	06.4	209 32.5 304°01.8	10.3	13 57.9 14°10.9	12.9'	58.6'	
16	59°02.4	06.3	318°31.1	10.2'	14°23.8	12.8'	58.5'	
17	74°02.3	06.1	333°00.3	10.2'	$14^{\circ}36.7$	12.7'	58.5'	
18	89°02.2	N23°05.9	347°29.5	10.2'	\$14°49.4	12.7'	58.5'	
19	104°02.1	05.8	1°58.7	10.1'	15°02.1	12.6'	58.5'	
20 21	119°01.9 134°01.8	05.6 •• 05.4	16°27.8 30°56.9	10.1' 10.0'	15°14.7 15°27.1	12.5' 12.4'	58.5' 58.4'	
22	134 01.8 149°01.7	05.3	45°25.9	10.0'	15 27.1 15°39.5	12.4	58.4'	
23	164°01.6	05.1	59°54.8	9.9'	15°51.8	12.2'	58.4'	
	SD = 15.7'	d = -0.2'		SE	0 = 16.0'			
.	CUA					,		
Sat 0	GHA 179°01.5	Dec N23°04.9	GHA 74°23.8	u 9.9'	Dec 516°04.0	d 12.1'	HP 58.4'	
1	179 01.3 194°01.3	04.7	88° 52.6	9.9 9.8'	16°16.2	12.1	58.4'	
2	209°01.2	04.6	103°21.4	9.8'	16°28.2	11.9'	58.3'	
3	224°01.1	• • 04.4	$117^{\circ}50.2$	9.7'	$16^{\circ}40.1$	11.8'	58.3'	
4	239°01.0	04.2	132° 18.9	9.7'	16°51.9	11.7'	58.3'	
5	254°00.9 269°00.7	04.0 N23°03.9	146°47.6 161°16.2	9.6'	17°03.6 \$17°15.3	11.6'	58.3'	
6 7	269°00.7 284°00.6	N23°03.9 03.7	161° 16.2 175° 44.8	9.6' 9.5'	517°15.3 17°26.8	11.5' 11.4'	58.3' 58.3'	
8	299°00.5	03.7	175 44.8 190°13.3	9.5'	17°20.8	11.4	58.2'	
9	314°00.4	03.3	204°41.8	9.4'	17°49.5	11.2'	58.2'	
10	329°00.3	03.1	$219^{\circ}10.2$	9.4'	$18^{\circ}00.7$	11.1'	58.2'	
11	344°00.1	03.0	233° 38.5	9.3'	18°11.8	11.0'	58.2'	
12	359°00.0	N23°02.8	248°06.9	9.3'	\$18°22.8	10.9'	58.2'	
13 14	13°59.9 28°59.8	02.6 02.4	262°35.1 277°03.3	9.2' 9.2'	18°33.7 18°44.5	10.8' 10.7'	58.1' 58.1'	
15	43°59.7	02.4	277 03.3 291°31.5	9.1'	18°55.1	10.7	58.1'	
16	58°59.6	02.0	305°59.6	9.1'	19°05.7	10.4	58.1'	
17	73°59.4	01.9	$320^{\circ}27.6$	9.0'	$19^{\circ}16.1$	10.3'	58.1'	
18	88°59.3	N23°01.7	334°55.6	8.9'	\$19°26.5	10.2'	58.0'	
19 20	103°59.2 118°59.1	01.5 01.3	349°23.6 3°51.5	8.9' 8.8'	19°36.7 19°46.8	10.1' 10.0'	58.0' 58.0'	
20	118°59.1 133°59.0	01.3	18° 19.3	8.8'	19°46.8 19°56.8	9.9'	58.0'	
22	148°58.9	00.9	32°47.1	8.7'	20°06.6	9.7'	58.0'	
23	163°58.7	00.7	47° 14.9	8.7'	$20^{\circ}16.4$	9.6'	57.9'	
	SD = 15.7'	d = -0.2'		SE	0 = 15.9'			

Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut
N 72°						
N 70°						
68°						
66°		////	00:14	23:43	////	////
64°	'///	////	01:40	22:26	////	////
62°	1////	////	02:16	21:50	////	////
60°	11111	01:02	02:10	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
S 50°	06:40	07:21	08:00	16:08	16:46	17:28
52°	06:45	07:21	08:09	15:58	16:39	17:23
54°	06:51	07:29	08:20	15:48	16:31	17:17
56°	06:57	07:46	08:33	15:35	16:31	17:11
58°	07:03	07:56	08:47	15:33	16:12	17:04
S 60°	07:03	08:07	09:04	15:21	16:12	16:57
-	I			10.0.		
Lat.	Thu	Moonris Fri	s e Sat	Thu	Moonset Fri	Sat
N 72°	13:42	16:20		21:51	20:59	Jut
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°				23:01		
56°	12:45	14:18	15:51		23:11	23:25
54°	12:41	14:10	15:40	23:06	23:20	23:38 23:48
	12:37	14:03	15:29	23:11	23:28	
52° 50°	12:33	13:57	15:20 15:12	23:15	23:35	23:58
45°	12:30	13:51		23:19	23:41	
	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
40° 45°	11:23 11:18	11:52 11:43	12:24 12:11		00:52 01:00	02:03 02:15

11:12	11:32	11:55		01:09	02:30
11:09	11:27	11:48		01:13	02:36
11:06	11:21	11:39		01:18	02:44
11:03	11:15	11:30		01:23	02:52
10:59	11:08	11:20		01:29	03:02
10:55	11:00	11:08		01:35	03:13
	Sun			Moon	
Eqn.of	Time	Mer.	Mer.	Pass.	Age
00 ^h	12 ^h	Pass	Upper	Lower	7-9
mm:cc	mm:cc	hh·mm	hh:mm	hh:mm	44-67%
111111.33	111111.33	11111.11111111	11111.1111111	11111.11111111	TT-01/0
03:31	03:37	12:04	18:02	05:37	11-0770
					17-0176
	11:09 11:06 11:03 10:59 10:55	11:09 11:27 11:06 11:21 11:03 11:15 10:59 11:08 10:55 11:00 Eqn.of Time 00 ^h 12 ^h	11:06 11:21 11:39 11:03 11:15 11:30 10:59 11:08 11:20 10:55 11:00 11:08 Sun Eqn.of Time Mer.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

.. ..

01:09

02:30

S 50° 52° 54°

11:12

11:32

h	Aries	Venus	Mars	Ju	piter	Saturn		Stars
C	CHA	GHA Dec			Doo	GHA Dec		СПУ
Sun	GHA			ec GHA	Dec			SHA
0	280°33.7	217°04.2 N17°00		°02.6 108°25.3	N04°43.6	243°07.3 N12°17.8	Alpheratz	357°31.7
1	295°36.1	232°05.8 00		02.8 123°27.4	43.5	258°09.6 17.9	Ankaa	353°04.4
2	310°38.6	247°07.4 00		03.0 138°29.6	43.3	273°11.8 17.9	Schedar	349°27.6
3	325°41.0	262°09.0 · · 00		03.2 153°31.8	• • 43.2	288° 14.1 · · 18.0	Diphda	348°44.5
4	340°43.5	277°10.7 00		03.4 168°34.0	43.1	303°16.4 18.1	Achernar	335°18.3
5	355°46.0	292°12.3 00		03.6 183°36.1	42.9	318° 18.6 18.1	Hamal	327°48.1
6	10°48.4	307°13.9 N17°00		°03.7 198°38.3	N04°42.8	333°20.9 N12°18.2	Polaris	312°46.8
7	25°50.9	322°15.5 00	6 309°40.9	03.9 213°40.5	42.7	348°23.1 18.2		
8	40°53.4	337°17.1 00	6 324°41.5	04.1 228°42.6	42.5	3°25.4 18.3	Acamar	315°09.9
9	55°55.8	352°18.7 · · 00	6 339°42.1 · ·	04.3 243°44.8	• • 42.4	18°27.7 · · 18.3	Menkar	314°03.4
10	70°58.3	7°20.3 00	6 354°42.7	04.5 258°47.0	42.3	33° 29.9 18.4	Mirfak	308°24.4
11	86°00.8	22°21.9 00		04.7 273°49.1	42.1	48°32.2 18.5	Aldebaran	290°36.6
12	101°03.2	37°23.5 N17°00		°04.9 288°51.3	N04°42.0	63°34.5 N12°18.5	Rigel	281°01.4
13	116°05.7	52°25.1 00		05.1 303°53.5	41.8	78°36.7 18.6	Capella	280°18.1
14	131°08.2	67° 26.7 00		05.3 318°55.6	41.7	93°39.0 18.6	Bellatrix	278°20.1
15	146°10.6	82°28.3 · · 00		05.5 333°57.8	41.6	108°41.3 · · 18.7	Elnath	277°58.6
16	161°13.1	97°29.8 00		05.7 349°00.0	41.4	123°43.5 18.7	Alnilam	275°35.2
	176° 15.5	112°31.4 00		05.7 349 00.0 05.8 4°02.1			Betelgeuse	270°49.3
17					41.3		Canopus	263°51.7
18	191°18.0	127°33.0 N17°00		°06.0 19°04.3	N04°41.2	153°48.1 N12°18.8	Sirius	258°24.1
19	206°20.5	142°34.6 00		06.2 34°06.5	41.0	168°50.3 18.9	Adhara	255°04.0
20	221°22.9	157°36.1 00		06.4 49°08.6	40.9	183°52.6 19.0	Procyon	244°48.2
21	236°25.4	172°37.7 · · 00		06.6 64°10.8	• • 40.8	198°54.9 · · 19.0	Pollux	243°14.2
22	251°27.9	187°39.3 00	8 174°49.8	06.8 79°13.0	40.6	213°57.1 19.1	Avior	234°14.1
23	266°30.3	202°40.8 00	9 189°50.3	07.0 94°15.1	40.5	228°59.4 19.1	Suhail	234 14.1 222°44.5
N 4 -	OF:17	1.6/ -10.0/ 4-	10.6/ ./0.0/	1 40 -0 0/ 14	11/ = 107	0 2/ -10 1/ . 0 44		
ivier.p	ass. 05:17	$\nu 1.6' \ d0.0' \ \text{m-4.7}$	$\frac{1}{1} = \frac{\nu 0.6' \ d0.2' \ m}{\nu 0.6' \ d0.2'}$	11.48 V2.2' d-0	0.1′ m-1.87	ν2.3' d0.1' m0.44	Miaplacidus	221°38.3
							Alphard	217°45.2
Mon	GHA	GHA Dec	GHA D	ec GHA	Dec	GHA Dec	Regulus	207°31.6
0	281°32.8	217°42.4 N17°00		°07.2 109°17.3	N04°40.4	244°01.7 N12°19.2	Dubhe	193°38.0
1	201°32.0 296°35.3	232°43.9 00		07.2 109 17.3 07.3 124°19.5	40.2	259°03.9 19.2	Denebola	182°22.2
							Gienah	175°40.7
2	311°37.7	247° 45.5 01		07.5 139°21.6	40.1	274°06.2 19.3	Acrux	172°56.8
3	326°40.2	262°47.0 · · 01		07.7 154°23.8	• • 40.0	289°08.5 · · 19.4	Gacrux	171°48.4
4	341°42.7	277°48.6 01		07.9 169°26.0	39.8	304°10.7 19.4	Alioth	166°10.6
5	356°45.1	292°50.1 01		08.1 184°28.1	39.7	319°13.0 19.5	Spica	158°19.2
6	11°47.6	307°51.7 N17°01		°08.3 199°30.3	N04°39.6	334°15.3 N12°19.5	Alkaid	152°49.7
7	26°50.0	322°53.2 01		08.5 214°32.5	39.4	349° 17.5 19.6	Hadar	148°31.6
8	41°52.5	337°54.7 01		08.6 229°34.6	39.3	4°19.8 19.6	Menkent	147°54.0
9	56°55.0	352°56.3 · · 01	2 339°56.3 · ·	08.8 244°36.8	• • 39.1	$19^{\circ}22.1$ · · 19.7	Arcturus	145°45.2
10	71°57.4	7°57.8 01	2 354°56.9	09.0 259°39.0	39.0	34°24.3 19.7	Rigil Kent.	139°35.9
11	86°59.9	22°59.3 01	3 9°57.4	09.2 274°41.1	38.9	49°26.6 19.8	Kochab	137°19.4
12	102°02.4	38°00.8 N17°01	3 24°58.0 N23	°09.4 289°43.3	N04°38.7	64°28.9 N12°19.8		136°52.7
13	117°04.8	53°02.4 01		09.5 304°45.4	38.6	79°31.1 19.9	Zuben'ubi	
14	132°07.3	68°03.9 01		09.7 319°47.6	38.5	94°33.4 20.0	Alphecca	126°01.1
15	147°09.8	83°05.4 · · 01		09.9 334°49.8	38.3	109°35.7 · · 20.0	Antares	112°12.0
16	162°12.2	98°06.9 01		10.1 349°51.9	38.2	124°37.9 20.1	Atria	107°03.1
17	102 12.2 177°14.7	113°08.4 01		10.1 549 51.9 10.3 4°54.1	38.1	139°40.2 20.1	Sabik	101°59.2
	177 14.7 192°17.2						Shaula	$96^{\circ}06.1$
18		128°09.9 N17°01		°10.5 19°56.3	N04°37.9	154°42.5 N12°20.2	Rasalhague	95°55.6
19	207°19.6	143°11.4 01		10.6 34°58.4	37.8	169° 44.7 20.2	Eltanin	90°40.3
20	222°22.1	158°12.9 01		10.8 50°00.6	37.6	184°47.0 20.3	Kaus Aust.	83°28.3
21	237°24.5	173°14.4 · · 01		11.0 65°02.8	• • 37.5	199°49.3 · · 20.3	Vega	80°30.9
22	252°27.0	188° 15.9 01		11.2 80°04.9	37.4	214°51.5 20.4	Nunki	75°43.9
23	267°29.5	203° 17.4 01	8 190°04.5	11.3 95°07.1	37.2	229°53.8 20.5	Altair	61°56.9
Morn	ass. 05:13	ν 1.6' d0.0' m-4.7	$\frac{1}{1} \frac{1}{\nu 0.6' \ d0.2' \ m}$	1 18 12 27 4 1	0.1' m-1.87	ν2.3' d0.1' m0.44	Peacock	53°00.8
- Iviei.p	ass. 03.13	ν1.0 d0.0 iii-4.7		VZ.Z U-1	7.1 111-1.07	ν2.3 d0.1 iii0.44	Deneb	49°23.4
							Enif	33°35.7
Tue	GHA	GHA Dec	GHA D	ec GHA	Dec	GHA Dec	Al Na'ir	27°29.1
0	282°31.9	218°18.8 N17°01			N04°37.1	244°56.1 N12°20.5	Fomalhaut	27 29.1 15°11.3
1	297°34.4	233°20.3 01		11.7 125°11.4	37.0	259° 58.4 20.6		15 11.3 13°42.2
2	312°36.9	248°21.8 02		11.9 140°13.6	36.8	275°00.6 20.6	Scheat	
3	327°39.3	263°23.3 · · 02		12.1 155°15.7	36.7	290°02.9 · · 20.7	Markab	13°26.9
4	342°41.8	278° 24.8 02		12.1 133 13.7 12.2 170°17.9	36.5	305°05.2 20.7	Jul 02 Sun	SHA
5	357°44.3	293°26.2 02		12.4 185°20.0	36.4	320°07.4 20.8	Venus	296°30.5
	357 44.3 12°46.7	308°27.7 N17°02		°12.6 200°22.2	N04° 36.3		Mars	284°03.1
6								264 03.1 187°51.6
7	27°49.2	323°29.2 02		12.8 215°24.4	36.1	350°12.0 20.9	Jupiter	
8	42°51.7	338°30.6 02		12.9 230°26.5	36.0	5°14.2 20.9	Saturn	322°33.6
9	57°54.1	353°32.1 · · 02		13.1 245°28.7	• • 35.9	20°16.5 · · 21.0	Jul 03 Mon	SHA
10	72°56.6	8°33.5 02	5 355°11.1	13.3 260°30.8	35.7	35° 18.8 21.1	Venus	296°09.6
11	87°59.0	23°35.0 02		13.4 275°33.0	35.6	$50^{\circ}21.1$ 21.1	Mars	283°18.1
12	103°01.5	38°36.4 N17°02		°13.6 290°35.2	N04°35.4	65°23.3 N12°21.2	Jupiter	283 18.1 187°44.5
13	$118^{\circ}04.0$	53°37.9 02	7 40°12.8	13.8 305°37.3	35.3	80°25.6 21.2		
14	133°06.4	68°39.3 02		14.0 320°39.5	35.2	95°27.9 21.3	Saturn	322°28.9
15	148°08.9	83°40.8 · · 02		14.1 335°41.6	• • 35.0	110°30.1 · · 21.3	Jul 04 Tue	SHA
16	163°11.4	98° 42.2 02		14.3 350°43.8	34.9	125°32.4 21.4	Venus	
17	178°13.8	113°43.6 02		14.5 5°46.0	34.8	140°34.7 21.4	Mars	
18	193°16.3	128°45.1 N17°03		°14.7 20°48.1	N04°34.6	155°37.0 N12°21.5		_
19	208°18.8	143°46.5 03		14.7 20 48.1 14.8 35°50.3	34.5	170°39.2 21.5	Jupiter	
							Saturn	322°24.1
20	223°21.2	158° 47.9 03		15.0 50°52.4	34.3	185°41.5 21.6	Horizont	al parallax
21	238°23.7	173°49.4 · · 03		15.2 65°54.6	• • 34.2	200°43.8 · · 21.6	1101120111	Venus:
22	253°26.1	188° 50.8 03		15.3 80°56.7	34.1	215° 46.0 21.7		Mars:
23	268°28.6	203°52.2 03	4 190°18.8	15.5 95°58.9	33.9	230°48.3 21.8		ividiS:
Mern	ass. 05:09	ν 1.5′ d 0.1′ m -4.7	$\frac{1}{\nu_{0.6'}} \frac{1}{d_{0.2'}}$ m	1.48 1/2 2' d-1	0.1′ m-1.86	ν2.3' d0.1' m0.44		
.vici.p		ν 1.5 d 0.1 iii-4.			1.00			

Dec

29°14.8

-42°08.7

56°41.4

-17°49.6

-57°05.2 23°35.8

 $89^{\circ}22.7$

-40°11.2

4°12.1

49°57.5 16°33.9

-8°10.1

 $46^{\circ}01.4$

 $6^{\circ}22.5$

7°24.7

-52°42.7

-16°45.4 -29°00.7

 $5^{\circ}09.0$

27°57.4 -59°36.2

-43°33.1

-69°50.3

-8°47.1

11°49.6

 $61^{\circ}36.0$

14°24.8

 $-17^{\circ}42.2$

 $-63^{\circ} 15.8$ $-57^{\circ} 16.7$

55°48.5

-11° 18.7

49°10.5 -60°30.9

-36°30.8

 $19^{\circ}02.1$

-60°57.4

 $74^{\circ}02.5$

-16°09.7

26°37.2

-26° 29.7

-69°04.8

-15°45.5 -37°07.4

 $12^{\circ}32.5$

51°29.2

-34°22.1

38°48.7

-26° 15.5 8° 56.7

-56°38.3

45°22.9 10°00.5

-46°49.0

-29°28.0

28°14.2 15°21.6

Mer.pass

09:31

10:21

16:44

07:46

09:28

10:20

16:40

07:43

09:26

10:19

16:37

07:39

0.3

0.1

Mer.pass

Mer.pass

28°37.8 -1°11.1

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.6	N23°00.5	$61^{\circ}42.6$	8.6'	S20°26.0	9.5'	57.9'
1	193°58.5	00.4	76°10.2	8.6'	20°35.5	9.4'	57.9'
2	208°58.4 223°58.3	00.2 23°00.0	90°37.8 105°05.3	8.5' 8.5'	20°44.9 20°54.1	9.3' 9.1'	57.9' 57.9'
3 4	223 58.3 238°58.2	23 00.0 22°59.8	105 05.3 119°32.8	8.4'	20 54.1 21°03.3	9.1	57.9 57.8'
5	253°58.0	59.6	134°00.3	8.4	21°12.3	8.9'	57.8'
6	268°57.9	N22° 59.4	148°27.7	8.3'	S21°21.2	8.8'	57.8'
7	283°57.8	59.2	162°55.0	8.3'	21°29.9	8.6'	57.8'
8	298°57.7	59.0	177°22.3	8.2'	21°38.6	8.5'	57.8'
9 10	313°57.6 328°57.5	· · 58.8 58.6	191°49.5 206°16.7	8.2' 8.2'	21°47.1 21°55.4	8.4' 8.2'	57.7' 57.7'
11	343°57.3	58.4	200 10.7 220°43.9	8.1'	21 55.4 22°03.7	8.1'	57.7'
12	358°57.2	N22°58.2	235°11.0	8.1'	S22°11.8	8.0'	57.7'
13	13°57.1	58.0	249°38.1	8.0'	22°19.7	7.8'	57.7'
14	28°57.0	57.8	264°05.1	8.0'	22°27.6	7.7'	57.6'
15	43°56.9	• • 57.6	278°32.1	7.9'	22°35.3	7.6'	57.6'
16 17	58°56.8 73°56.7	57.4 57.2	292°59.0 307°25.9	7.9' 7.8'	22°42.9 22°50.3	7.4' 7.3'	57.6' 57.6'
18	88° 56.5	57.2 N22°57.0	307 25.9 321°52.7	7.8'	522°57.6	7.3	57.6'
19	103°56.4	56.8	336°19.5	7.8'	23°04.8	7.0'	57.5'
20	118°56.3	56.6	350°46.3	7.7'	23°11.8	6.9'	57.5'
21	133°56.2	• • 56.4	5°13.0	7.7'	23°18.7	6.7'	57.5'
22	148°56.1	56.2	19°39.7	7.6'	23°25.4	6.6'	57.5'
23	163°56.0	56.0	34°06.3	7.6'	23°32.0	6.5'	57.5'
	SD = 15.7'	d = -0.2'		SI	O = 15.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
O	178°55.9	N22°55.8	48°32.9	ν 7.6'	S23°38.5	<i>a</i> 6.3'	пР 57.4'
1	193°55.7	55.6	62°59.5	7.5'	23°44.8	6.2	57.4'
2	208°55.6	55.4	77°26.1	7.5'	23°51.0	6.0'	57.4'
3	223°55.5	• • 55.2	91°52.6	7.5'	23°57.0	5.9'	57.4'
4	238°55.4	54.9	106°19.0	7.4'	24°02.9	5.8'	57.4'
5	253°55.3 268°55.2	54.7 N22°54.5	120°45.5 135°11.9	7.4' 7.4'	24°08.7 S 24°14.3	5.6'	57.3'
6 7	268°55.2 283°55.1	N22 54.5 54.3	135°11.9 149°38.3	7.4° 7.4°	524°14.3 24°19.7	5.5' 5.3'	57.3' 57.3'
8	298°55.0	54.1	164° 04.6	7.4	24° 25.1	5.3'	57.3'
9	313°54.8	53.9	178°30.9	7.3'	24°30.2	5.0'	57.3'
10	328°54.7	53.7	192°57.3	7.3'	24°35.2	4.9'	57.2'
11	343°54.6	53.5	207°23.5	7.3'	24°40.1	4.7'	57.2'
12	358°54.5	N22°53.2	221°49.8	7.2'	524°44.8	4.6'	57.2'
13 14	13°54.4 28°54.3	53.0 52.8	236°16.0 250°42.2	7.2' 7.2'	24°49.4 24°53.9	4.4' 4.3'	57.2' 57.2'
15	43°54.2	52.6	265°08.4	7.2'	24 55.9 24°58 1	4.3 4.1'	57.2 57.1'
16	58°54.1	52.4	279°34.6	7.2'	25°02.3	4.0'	57.1
17	73°53.9	52.2	294°00.8	7.1'	25°06.3	3.8'	57.1'
18	88°53.8	N22°51.9	308°26.9	7.1'	S25°10.1	3.7'	57.1'
19	103°53.7	51.7	322°53.0	7.1'	25°13.8	3.5'	57.1'
20 21	118°53.6 133°53.5	51.5 •• 51.3	337°19.1 351°45.3	7.1' 7.1'	25° 17.3 25° 20.7	3.4' 3.2'	57.0' 57.0'
22	133 53.5 148°53.4	51.1	6°11.3	7.1'	25°23.9	3.1	57.0'
23	163°53.3	50.8	20°37.4	7.1	25°27.0	2.9'	57.0'
	SD = 15.7'	d = -0.2'		SI	D = 15.7'		
_							
Tue	GHA 178°53.2	Dec N22° 50.6	GHA 35°03.5	u 7.1'	Dec \$25° 29.9	d 2.8'	HP 57.0'
0 1	178 53.2 193°53.1	N22 50.6 50.4	49°29.6	7.1'	25° 32.7	2.6'	57.0 56.9'
2	208°53.0	50.2	63°55.7	7.1'	25°35.3	2.5'	56.9
3	223°52.8	• • 49.9	$78^{\circ}21.8$	7.1'	25°37.8	2.3'	56.9'
4	238°52.7	49.7	92°47.8	7.1'	25°40.1	2.2'	56.9'
5	253°52.6	49.5	107°13.9	7.1'	25°42.3	2.0'	56.9'
6 7	268°52.5 283°52.4	N22°49.3 49.0	121°40.0 136°06.1	7.1' 7.1'	\$25°44.3 25°46.1	1.9' 1.7'	56.8' 56.8'
8	283 52.4 298°52.3	49.0 48.8	150 00.1 150°32.2	7.1'	25 40.1 25°47.9	1.6'	56.8
9	313°52.2	• • 48.6	164°58.2	7.1'	25°49.4	1.4'	56.8
10	328°52.1	48.3	179°24.4	7.1'	25°50.8	1.3'	56.7'
11	343°52.0	48.1	193°50.5	7.1'	25°52.1	1.1'	56.7'
12	358°51.9	N22°47.9	208°16.6	7.1'	\$25°53.2	1.0'	56.7'
13	13°51.8 28°51.6	47.6	222°42.7 237°08.9	7.2' 7.2'	25°54.1 25°54.9	0.8'	56.7'
14 15	28°51.6 43°51.5	47.4 •• 47.2	237°08.9 251°35.1	7.2' 7.2'	25°54.9 25°55.6	0.7' 0.5'	56.7' 56.6'
16	58°51.4	46.9	266°01.3	7.2'	25°56.1	0.3	56.6
17	73°51.3	46.7	280°27.5	7.2'	25°56.4	0.2	56.6
18	88°51.2	N22°46.5	294°53.7	7.3'	\$25°56.6	0.0'	56.6'
19	103°51.1	46.2	309°20.0	7.3'	25°56.7	-0.1'	56.6'
20	118°51.0	46.0	323°46.3	7.3'	25°56.6	-0.3'	56.5'
21 22	133°50.9 148°50.8	· · 45.8 45.5	338°12.6 352°38.9	7.3' 7.4'	25°56.3 25°55.9	-0.4' -0.6'	56.5' 56.5'
23	148°50.8 163°50.7	45.5 45.3	352°38.9 7°05.3	7.4° 7.4°	25°55.9 25°55.4	-0.6' -0.7'	56.5
23	SD = 15.7'	d = -0.2'			D = 15.5'	5.1	50.5
	<u> </u>	u — -0.2		اد			

			2028	B July ()2 to J	ul. 04 L
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut.
N 72°						
N 70°						
68°						
66°	7///	7///	00:39	23:25	7///	7///
64°	1777	////	01:46	22:21	////	////
62°	////	////	02:20	21:47	////	////
60°	////	01:10	02:45	21:23	22:57	////
N 58°	////	01:52	03:05	21:03	22:15	////
56°	////	02:20	03:21	20:48	21:48	////
54°	01:04	02:41	03:34	20:34	21:27	23:02
52°	01:43	02:58	03:46	20:22	21:10	22:24
50°	02:09	03:13	03:57	20:12	20:55	21:59
45°	02:53	03:42	04:19	19:50	20:27	21:16
N 40°	03:22	04:04	04:36	19:32	20:05	20:46
35°	03:45	04:21	04:51	19:18	19:47	20:24
30°	04:03	04:36	05:04	19:05	19:32	20:05
20° N 10°	04:31	05:01	05:25	18:44	19:08	19:37
0°	04:54 05:12	05:21	05:44	18:25	18:48	19:15
_		05:38	06:01	18:08	18:30	18:57
S 10° 20°	05:29	05:55	06:18	17:51	18:14	18:40
30°	05:45 06:01	06:12 06:30	06:36 06:57	17:33 17:12	17:57	18:24
35°	06:01	06:30	00:57	17:12	17:39 17:28	18:08 18:00
40°	06:18	06:52	07:09	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:30	17:04	17:41
S 50°	06:39	07:21	07:59	16:10	16:48	17:30
52°	06:44	07:28	08:08	16:01	16:41	17:24
54°	06:50	07:36	08:19	15:50	16:33	17:19
56°	06:56	07:45	08:31	15:38	16:24	17:13
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:06	09:02	15:07	16:03	17:00
Lat.	C	Moonris		C	Moonset	
NI 700	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° N 10°	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
	14:25	15:21	16:17	01:57	02:52	03:48
S 10° 20°	14:08	15:01	15:57	02:13	03:10	04:08
30°	13:49 13:28	14:40 14:16	15:35 15:09	02:30 02:49	03:30 03:54	04:30 04:55
35°	13:20	14:10	14:55	02:49	03:34	04:55

		Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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			

14:55

14:37

14:17

13:51

13:38

13:23

13:07

12:46

03:01

03:14

03:30

03:49

03:59

04:09

04:21

04:35

04:07

04:23

04:42

05:05

05:17

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05:45

06:02

13:16

13:02

12:45

12:24

12:15

12:04

11:52

11:37

14:02

13:46

13:26

13:02

12:51

12:37

12:22

12:04

35°

40°

45°

S 50° 52° 54°

56°

05:10

05:27

05:47

06:13

06:26

06:40

06:57

Color Colo	h _	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars
0 283*31.1 293*536 N17*034 035 2079.0 3 N23*157 N17*01.1 N04*338 24*506 N12*218 1 206*232 233*550 035 26*564 036 235*205 1 100 014*054 33.5 275*551 21.0 N33*350 25*5654 036 235*205 1 100 014*054 33.5 275*551 21.0 N33*350 25*5651 22.0 N33*350 25*561 2	Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
1 298"33.5 238"55.0 035 220"19.9 13.8 120"032 33.6 200"22.9 21.9 1 23 328"35.5 220"57.8 03.7 220"25.1 16.0 14"05.4 33.5 275"55.1 21.9 1 3 328"35.5 200"57.8 03.7 250"25.1 16.0 14"05.4 33.5 275"55.1 220 1 5 358"43.4 239"60.6 013.8 20"22.7 163.3 17"109.7 33.2 30"59.7 22.0 1 5 358"43.4 239"60.6 013.8 20"22.7 163.3 17"109.7 33.2 30"59.7 22.0 1 5 358"43.4 239"60.6 013.8 20"22.7 163.3 17"109.7 33.2 38.8 33.5 16.6 1 20"22.7 16.5 16.5 16.5 16.5 16.5 16.5 16.5 16.5	0	283°31.1	218°53.6	N17°03.4	205°19.3	N23° 15.7	111°01.1	N04°33.8	245°50.6	N12°21.8		057004.7
2 313°30.0 248°56.4 03.6 258°20.5 16.0 141°05.4 33.5 279°59.1 21.9 3 328°31.5 268°57.8 03.7 200°11.1 16.2 150°07.5 03.2 200°59.7 22.0 4 338°40.9 278°99.2 03.7 260°21.1 16.6 117.09.7 33.2 30°59.7 22.0 5 338°44.9 24°00.6 011°06.8 200°22.3 16.5 16.3 117.09.7 33.2 30°59.7 22.0 6 122°48.3 32°40.8 011°40.0 30°22.5 16.5 16.3 117.09.7 33.2 30°59.7 22.0 6 122°48.3 32°40.8 011°40.0 30°22.5 16.5 16.3 117.09.7 33.2 30°59.7 22.0 6 122°48.3 32°40.8 011°40.0 30°22.5 16.5 16.3 117.09.7 33.2 30°59.7 22.0 7 22°48.3 32°40.6 011°40.0 30°22.5 16.5 16.3 117.09.7 33.2 30°59.7 22.0 9 58°53.3 39°40.6 0.4 35°20.3 17.7 20°70.6 02.2 35°20.3 17.3 20°12.2 1.3 11°10.0 16.3 16.3 16.2 22.2 30°22.5 12.3 11°10.0 16.2 36°20.0 0.4 3 10°25.9 17.5 276°24.8 32.2 51°15.6 22.4 11.1 11.1 11.1 11.1 11.1 11.1 11.1											Alpheratz	
3 383"38 5 263"678 037 250"21.1 1.62 156"075 0314 209"674 0.220 14 34"409 278"892 037 265"21.7 16.3 18"110 78 33.1 32"101.9 22.1 15 388"43.4 29"100 6 03.8 280"223 1105 180"118 33.1 32"101.9 22.1 16 113"430 330"020 110"039 250"223 110"51 6 180"118 33.1 32"101.9 22.1 17 283"43.3 33"4"062 040 31"235 16 16 216"161 328 35"10.5 22.2 18 35"53.3 33"4"062 040 31"235 16 16 216"161 328 35"10.5 22.2 10 73"55.7 6 97"6 042 35"25.3 17.3 26"25.6 32.4 36"13.3 22.3 10 73"55.7 6 97"6 042 35"25.3 17.3 26"25.6 32.4 36"13.3 22.3 11 88"58.2 24"69.0 043 10"25.9 17.5 26"24.8 32.2 51"15.6 22.4 12 10"4"0.6 39"1.0 411"0.4 40"25"26.5 1023"1.7 20"122.1 26"13.0 12.2 11.1 110"0.1 54"11.7 0.5 40"27.1 17.6 36"21 32.0 31"30.1 22.3 11"10.6 22.1 12.1 110"0.1 54"11.7 0.5 40"27.1 17.6 36"29.1 32.1 318 96"22.4 22.5 5.1 115.6 40"1.0 54"0.7 17.0 17.0 17.0 17.0 17.0 17.0 17.0 1											Ankaa	353°04.3
43 434" 49 278" 99 2 037 265" 217 16.3 171" 171" 312 230" 972" 221 5											Schedar	349°27.6
5 358°43.4 294'00.6 0.38 280°22.3 16.5 186°18 33.1 321'01.9 22.1 1 7 28°48.3 390'02.0 170'39.9 295'29 0.82"16.7 20"14.0 1 7 28°48.3 390'03.4 0.40 310°23.5 16.8 216"16.1 32.8 351'06.5 22.2 2 9 38°53.3 390'03.6 0.2 0.42 380'247 1.72 246'20.5 0.22 2.7 10.6 9 38°53.3 39'04.8 0.1 33°5'15.5 16.8 216'12.6 32.7 6'06.8 22.2 10 173'55.7 9'07.6 0.2 0.42 380'247 1.72 246'20.5 0.22 31'11.0 2.23 110 73'55.7 9'07.6 0.42 385'25.9 17.7 246'20.5 0.22 2.2 11'11.0 2.3 12 104'00.6 39'10.4 117'04.4 15°5'0.5 123'17.7 291'20.9 10.4 12.2 166'17.9 12.2 2.4 13 119'03.1 34'11.7 0.5 40'7.2 2.1 18.0 306'29.1 31.8 96'22.4 2.2 14 134'05.6 99'13.1 0.6.5 40'7.0 2.2 18.2 31.8 96'22.4 2.2 15 149'08.0 84'14.5 0.47 70'8.2 1.82 3.3 35'35.5 31.5 126'27.0 2.2 16 16'10.5 99'15.8 0.48 85'28.8 18.3 35'35.5 31.5 110'27.0 22.7 17 179'13.0 114'17.2 0.9 100'29.4 18.5 18 194'15.4 129'16.6 117'04.9 100'29.4 18.5 19 209'17.3 144'19.9 0.60 131'30.6 18.8 96'42.0 31.4 141'29.2 2.2 18 194'15.4 129'16.6 117'04.9 105'30.6 18.8 96'42.0 31.4 141'29.2 2.2 19 229'22.8 174'27.7 0.5 2 149'31.8 19.1 66'46.3 0.9 19 209'17.7 144'19.9 0.6 19 209'17.7 144'19.9 0.6 19 209'17.7 144'19.9 0.6 19 209'17.7 144'19.9 0.6 19 209'17.8 189'10.4 0.5 19 209'17.7 0.5 2 0.5 2 149'33.8 0.4 19 209'17.8 1.2 19 209'17.7 0.5 2 0.5 2 149'33.8 0.7 1216.0 19 209'17.7 0.5 2 0.5 2 149'33.8 19.1 1 66'46.3 0.9 19 209'17.0 0.5 2 10'20.7 11.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0											Diphda	348°44.4
1											Achernar	335°18.3
22 28 348 3 39°048 04.1 335°241 17.0 21°183 32° 35° 06.8 222 28 58 533 38°06.2 04.1 335°241 17.0 21°183 32° 37° 06.8 222 29° 58° 533 38° 06.2 04.2 36° 241 17.0 246° 205 325 22′ 30° 30° 30° 30° 30° 30° 30° 30° 30° 30°											Hamal	327°48.0
8 43°608 3370°048 O-14.2 336°241 17.0 221°18.3 327.7 6°068 22.2 19 58°833 38°06.0 0-14.2 336°247 0-17.2 246°205.0 29.5 22°11.0 -22.3 10 73°557 0'07.6 0-14.2 35°5253 17.3 261°22.6 32.4 36°13.3 22.3 11.8 18°061.1 34°117 0-14 17°04.2 25°5.5 17.3 261°22.6 32.4 36°13.3 22.3 11.8 18°061.1 34°117 0-14 15 46°259 17.5 26°26.8 32.2 51°15.6 0-22.4 11.1 190°10.1 34°117 0-14 15 46°27.1 17.0 30°26.9 N04°32.1 66°17.9 N12°22.4 11.1 190°10.1 34°117 0-14 15 46°27.1 17.0 391°26.9 N04°32.1 66°17.9 N12°22.4 11.1 190°10.1 34°117 0-14 15 46°27.1 17.0 391°26.9 N04°32.1 66°17.9 N12°22.4 11.1 190°10.1 34°117 1-14 17.0 14.5 46°27.1 17.0 391°26.9 N04°32.1 66°17.9 N12°22.4 11.1 190°10.1 34°117 1-14 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.1 17.0 14.5 46°17.5 14.1 17.2 14.1 17.2 14.0 14.1 17.2 14.0 16.6 166°10.5 99°18.8 0.48 85°28.8 18.3 31°35.5 31.5 126°22.2 17.1 17.1 17.1 17.1 17.2 14.0 14.1 17.2 14.0 16.0 18.0 18.5 18.3 18.3 18.3 18.3 15.1 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12									350 04.2 351°06 5		Polaris	312°45.2
98 88'83.3 384'00.2 04.2 380'24.7 17.2 246'20.5 32.5 21'11.0											Acamar	$315^{\circ}09.9$
10 73°857 9 70°7.6									6°08.8		Menkar	314°03.3
11 88"6812 24"00.00 04.3 10"25.9 17.5 276"28 32.2 51"15.6 22.4 12 1010"06.00 39"104 N1"04.4 25"26 5 N23"17.5 276"28 30"22.1 65"17.9 N1"2'24.2 131 11"0*03.1 64"11.7 04.5 40"27.1 17.8 306"20.1 32.0 61"20.1 22.5 14 141"0*08.0 64"11.7 04.5 40"27.1 17.8 306"20.1 32.0 61"20.1 22.5 15 140"08.0 64"11.7 04.5 40"27.1 17.8 306"20.1 32.0 61"20.1 22.5 15 140"08.0 64"14.5 04.7 70"28.2 1.82 330"33.4 31.7 111"24.7 22.6 15 140"08.0 91"15.8 04.8 85"28 18.3 31"35.5 31.5 120"27.0 22.7 17 179"13.0 114"17.2 04.8 910"39.4 18.5 6"37.7 31.4 141"29.2 22.8 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0											Mirfak	308°24.4
12 104*00.6 39*10.4 N17*04.4 25*26.5 N23*17.7 2912*09 N04*32.1 66*17.9 N12*22.4 13 119*03.1 59*11.7 04.5 40*07.1 17.8 300*29.1 32.0 81*20.1 22.5 14 134*05.6 06*13.1 04.6 55*27.6 18.0 32*13.1 23*13.1 81.8 96*22.4 22.5 15 149*08.0 89*14.5 0.47 70*28.2 18.2 330*33.4 3.13.7 111*24.7 72.2 5.1 16 104*10.5 99*15.8 0.48 85*28.8 18.3 35*135.5 13.5 126*27.0 22.7 17 179*13.0 114*17.2 0.49 107*94 18.5 6*37.7 31.4 14*12*0.2 22.7 18 194*15.4 17*2 0.49 107*94 18.5 6*37.7 31.4 14*12*0.2 22.7 18 194*15.4 17*2 0.5 0.5 11.8 0.5 0*37.7 31.4 14*12*0.2 22.7 18 194*15.4 17*2 0.5 0.5 11.8 0.5 0*37.7 31.4 14*12*0.2 22.8 19.2 0.5 0*30*10*10*10*10*10*10*10*10*10*10*10*10*10											Aldebaran	290°36.6
13 119°031											Rigel	281°01.4
14 134°05.6 0 86°13.1 04.6 55°27.6 18.0 22°31.2 31.8 96°22.4 22.5 15 149°08.0 86°14.5 · 0.47 70°28.2 18.0 236°34.3 · 31.7 111°24.7 · 22.5 16 16 164°10.5 99°15.8 04.8 85°28.8 18.3 36°34.5 · 31.5 126°27.0 · 22.7 17 179°13.0 114°17.2 04.9 100°29.4 18.5 6°37.7 31.4 141°20.2 22.7 18 194°15.4 12°28.8 N17°04.9 115°30.0 N23°18.6 · 21°39.8 N04°31.3 156°31.5 N12°22.8 19 209°17.9 144°19.9 05.0 130°30.6 18.8 36°42.0 31.1 17°33.8 22.2 2 12°39°28 174°22.7 · 05.2 160°31.8 19.1 66°46.3 30.8 201°38.3 22.9 12 239°28 174°22.7 · 05.2 160°31.8 19.1 66°46.3 30.8 201°38.3 22.9 22 254°25.3 189°24.0 05.3 175°32.4 19.3 181°48.5 30.7 216°40.6 22.0 224°20.4 189°21.3 · 05°41.5 N12°22.8 194°25.2 189°40.4 · 0.53 175°32.4 19.3 1848.5 30.7 216°40.6 22.0 22.2 2284°25.3 189°24.0 · 0.53 175°32.4 19.3 1848.5 30.7 216°40.6 22.0 22.2 228°25.5 188°24.0 · 0.53 175°32.4 19.3 1848.5 30.7 216°40.6 22.0 22.2 228°25.5 188°24.0 · 0.53 175°32.4 19.3 1848.5 30.7 216°40.6 22.0 22.0 22.2 228°25.3 188°24.0 · 0.58 187°32.4 19.3 1848.5 30.3 22.2 24°25.0 187°25.5 0.5 18.2 24°29.2 12.2 24°25.2 188°24.7 187°25.5 0.5 18.3 18°24.0 19.3 18°48.5 30.3 28°47.2 9.2 20.0 24°25.2 18.2 24°25.2 18°25.3 18°24.2 18°											Capella	280° 18.1
15 199'08.0 89"14.5 0.48 85"2.8 18.3 23"33.4 0.31.7 11"24.7 0.22.6 16 164"10.5 99"15.8 0.48 85"2.8 18.3 251"35.5 31.5 162"72.0 22.7 17 179"13.0 114"17.2 0.49 100"29.4 18.5 6"37.7 31.4 141"29.2 22.7 18 194"15.4 129"18.6 137"04.9 115"30.0 123"18.6 21"9.98 104"31.3 156"31.5 112"22.8 19 209"17.9 44"19.9 0.60 130"30.6 18.8 36"42.0 31.1 17"33.8 22.8 19 229"22.8 174"22.7 0.52 160"31.8 0.191 0.6"46.1 31.0 166"36.1 22.9 22 229"25.3 189"24.0 0.53 17"52.4 19.3 81"48.5 30.7 216"40.6 22.9 23 209"27.8 0.0"25.4 0.53 17"52.4 19.3 81"48.5 30.7 216"40.6 22.9 23 209"27.8 0.0"25.4 0.53 17"52.4 19.3 81"48.5 30.7 216"40.6 22.9 24 209"27.8 0.0"25.4 0.54 190"33.0 19.4 90"50.6 30.6 231"42.9 22.0 17 204"30.2 212"26.7 117"65.5 205"33.6 102"19.6 111"52.8 100"30.4 246"45.2 112"21.1 209"32.7 234"28.0 0.66 202"34.2 21]9.8 126"49.0 30.3 26"47.4 22.1 2 3 329"37.6 204"29.4 0.60 205"35.6 0.20 17"61.6 20.9 30.6"45.3 23.3 2 3 34"35.1 240"29.4 0.60 205"35.6 0.20 17"61.6 2.9 30.0 201"52.0 22.2 3 329"37.6 204"30.7 0.68 205"35.6 20.2 17"61.4 2.9 30.0 201"52.0 22.2 4 34"40.1 27"93.1 0.60 205"35.6 20.2 17"61.4 2.9 30.0 201"52.0 22.3 5 359"42.5 294"33.4 0.60 205"35.6 20.4 187"63.5 29.7 30.1 201"52.0 22.3 6 14"45.0 309"34.7 117"66.1 205"37.1 103"30.6 200"06.7 10.9 30.0 205"55.0 20.2 20"06.5 20.2 20"06.5 20.3 20"0.0 20.3 20"0.0 20.5 10 74"54.9 9.7	13			04.5		17.8		32.0		22.5	Bellatrix	278° 20.1
16 164*10.5 99*15.8 04.8 85*28.8 18.3 35*195.5 31.5 126*27.0 22.7	14	134°05.6	$69^{\circ}13.1$	04.6	55°27.6	18.0	321°31.2	31.8	96°22.4	22.5	Elnath	277° 58.6
17 179°130 114°172 0.49 100°294 18.5 6°37.7 31.4 141°292 22.7	15	149°08.0	84° 14.5	• • 04.7	70°28.2	• • 18.2	336°33.4	• • 31.7		• • 22.6	Alnilam	277 36.0 275°35.1
18 194"15.4 129"18.6 N17"04.9 115"30.0 N23"18.6 21"39.8 N04"31.3 156"31.5 N12"22.8	16	$164^{\circ}10.5$	99°15.8	04.8	85°28.8	18.3	351°35.5	31.5	126°27.0	22.7		270°49.3
19 209"179	17	179°13.0	$114^{\circ}17.2$	04.9	100°29.4	18.5	6°37.7	31.4	141°29.2	22.7	Betelgeuse	
99 09°179 144°199 0.50 130°306 18.8 36°420 31.1 171°338 22.8 20 24°240 159°213 30.51 148°31.2 190 51°44.2 31.0 186°36.1 22.9 21 239°228 189°240 0.53 159°324 1913 81°48.5 30.7 216°40.6 23.0 23 269°278 244°25.4 0.54 190°330 194 96°50.6 30.6 231°42.9 23.0 Mer.pass. 05.05 √1.4' d0.1' m-4.71 √0.6' d0.2' m1.49 √2.2' d-0.1' m-1.86 √2.3' d0.1' m0.43 Thu GHA Core	18	194°15.4	129° 18.6	N17°04.9	115°30.0	N23° 18.6	21°39.8	N04°31.3	156°31.5	N12°22.8	Canopus	263°51.7
20 224"20.4 199"21.3 05.1 145"31.2 19.0 51"44.2 31.0 186"36.1 22.9 21 239"28.3 174"27.3 05.2 160"31.8 19.1 66"46.3 3.03.8 201"38.3 22.9 22 254"25.3 189"24.0 05.3 175"32.4 19.3 81"48.5 30.7 216"40.6 23.0 Mer.pass. 05.05 \(\bar{\text{L}}\) \(\bar{\text{L}}\) \(\bar{\text{L}}\) \(\text{L}\) \			144°19.9								Sirius	258°24.1
21 29°228 174°227 0.05.2 160°318 0.0913 66°46.3 0.30.8 201°38.3 0.22.9 23.0 23.0 26°278 204°25.4 0.54 190°33.0 19.4 96°50.6 30.6 231°42.9 23.0 24°25.2 26°278 204°25.4 0.54 190°33.0 19.4 96°50.6 30.6 231°42.9 23.0 24°25.2 25°25.2 2											Adhara	255°04.0
22 254°25.3 189°24.0 05.3 175°32.4 19.3 81°48.5 30.7 216°40.6 23.0											Procyon	244° 48.2
Mer.pass. 05:05											Pollux	243°14.2
Mer.pass. 05:05 ν1.4' d0.1' m-4.71 ν0.6' d0.2' m1.49 ν2.2' d-0.1' m-1.86 ν2.3' d0.1' m0.43											Avior	234° 14.1
Thu GHA CHA Dec GHA GHA Dec GHA GHA <td>23</td> <td>203 21.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Suhail</td> <td>222°44.5</td>	23	203 21.0									Suhail	222°44.5
Thu GHA Dec GHA GHA </td <td>Mer.p</td> <td>ass. 05:05</td> <td>ν1.4′ d0.</td> <td>1′ m-4.71</td> <td>ν0.6′ d0.</td> <td>2′ m1.49</td> <td>ν2.2′ d-0</td> <td>.1' m-1.86</td> <td>ν2.3′ d0</td> <td>.1′ m0.43</td> <td>Miaplacidus</td> <td>221°38.3</td>	Mer.p	ass. 05:05	ν 1.4′ d0.	1′ m-4.71	ν 0.6′ d0.	2′ m1.49	ν 2.2′ d-0	.1' m-1.86	ν 2.3′ d0	.1′ m0.43	Miaplacidus	221°38.3
0 284°30.2 219°267 N17°055 205°33.6 N23°19.6 111°52.8 N04°30.4 246°45.2 N12°23.1 1 29°32.7 234′28.0 0.6 6 220°34.2 19.8 126°54.9 30.3 261′4.4 23.1 1 29°33.7 6 246°30.7 · 0.58 25°34.8 19.9 141°57.1 30.1 276°40.7 23.2 3 33°35°37.6 246°30.7 · 0.58 25°354.8 19.9 141°57.1 30.1 276°40.7 23.2 3 2 34°35.7 6 246°30.7 · 0.58 25°354.8 19.9 141°57.1 30.1 276°40.7 23.2 3 3 320°37.6 246°30.7 · 0.58 25°354.8 19.9 141°57.1 30.1 276°40.7 23.2 3 3 35°42.5 294°33.4 06.0 280°36.5 220.4 187°03.5 29.7 321°56.5 223.3 6 144°45.0 300°34.7 N17°66.1 295°37.1 N23°20.6 202°05.7 N04°29.6 336°58.8 N12°23.4 7 29°47.5 324°35.1 06.2 310°37.7 20.7 217°07.8 29.4 352°01.1 23.4 34.9 339°37.4 06.3 325°38.3 20.9 222°10.0 29.3 7°03.4 23.5 10 74°49.9 339°37.4 06.3 325°38.3 20.9 222°10.0 29.3 7°03.4 23.5 11 74°49.9 340°40.0 66.5 355°39.5 21.2 26°14.3 29.0 30°07.9 23.6 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 11 14 135°04.7 69°45.3 07.0 55°41.9 21.8 20°22.18 N04°28.7 67°10.2 23.6 14 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 22°8.6 0.2 23.6 14 135°04.7 69°45.3 07.0 6.5 91°41.3 21.6 307°20.7 28.6 82°14.7 23.8 15 150°07.2 84°46.6 0.71.1 70°42.5 22.2 0337°25.0 28.3 112°19.3 23.9 16 165°96.9 99°47.9 07.2 85°43.1 22.1 32°27.2 28.2 12°10.0 22°3.5 140°42.9 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 140°12.1 144°40.2 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 140°12.1 144°45.8 07.5 130°44.9 22.6 37°33.6 02°7.7 172°24.1 22.3 23.9 17 180°12.1 144°45.8 07.5 130°44.9 22.6 37°33.6 02°7.7 172°24.1 22.3 24.0 140°12.1 140°40.2 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 142°23.9 24.0 142°34.9 24.0 142°34.9 24.0 142°34.9 24.0 142°45.9 14.0 142°45.8 07.5 130°44.9 22.6 37°33.6 02°7.7 172°24.1 22.3 20°25.9 150°30.3 08.6 25°50.0 180°44.9 22.6 37°33.6 02°7.7 172°24.1 22.3 20°25.5 10.0 14°55.9 10.0 100°47.1 12°44.0 12°4.1 12°44.0 100°47.0 12°4.1 12°44.0 12°4.1 12°44.0 100°47.0 12°4.1 12°44.0 12°4.1 12°44.0 12°4.1 12°4.1 12°4.0 12°4.1 12°4.1 12°4.0 12°4.1 12°4.1 12°4.1 12°4.1 12°4.1 12	•										Alphard	$217^{\circ}45.2$
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1 299°32.7 234°28.0 05.6 20°34.2 19.8 126°54.9 30.3 261°47.4 231 2 316°354.9 30.1 276°49.7 232 2 318°351. 243°29.4 05.7 235°348.1 19.9 141°57.1 30.1 276°49.7 232 2 32 32°37.6 264°30.7 05.8 250°35.4 20.1 156°59.2 30.0 291°52.0 232 2 43°33.4 06.0 280°36.5 20.4 187°03.5 29.7 321°56.5 223 3 5 359°42.5 294°33.4 06.0 280°36.5 20.4 187°03.5 29.7 321°56.5 223 3 6 14°45.0 309°34.7 N17°06.1 295°37.1 N23°20.6 20°20.7 N04°29.6 336°58.8 N12°23.4 8 44°49.9 339°37.4 06.3 305°38.3 20.9 222°10.0 29.3 7°03.4 23.5 9 95°52.4 354°38.7 06.4 340°38.9 21.0 247°12.1 2.9 2 22°6.6 23.5 10 74°54.9 9°40.0 06.5 355°39.5 21.2 262°14.3 29.0 37°07.9 23.6 11. 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 12 104°59.8 39°42.6 N17°06.7 25°40.7 N23°21.5 292°18.6 N04°28.7 67°12.5 N12°32.1 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 11. 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 11. 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 11. 150°07.2 84°46.6 0.0 71 07°42.5 2.20 337°55.0 28.3 112°19.3 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°72.2 28.2 127°21.6 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°72.2 28.2 127°21.6 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°72.2 28.2 127°21.6 23.9 16 165°09.6 204°55.9 08.0 100°47.2 23.2 25°55.0 N04°27.9 157°36.1 N12°24.0 18 195°14.6 129°50.5 N17°07.4 115°44.3 N23°22.4 22°31.5 N04°27.9 157°36.1 N12°24.0 19 210°17.0 144°51.8 07.5 130°44.9 22.6 37°33.6 27.7 172°28.4 24.1 22°2.2 25°4.4 180°55.6 07.9 170°44.9 22.6 37°33.6 27.7 172°28.4 24.1 24.2 20°2.2 14°3.3 07.6 08.8 110°4.4 2.2 07.3 100°43.7 22.3 12°4.2 20°4.2 20°4.2 20°4.5 5.9 08.0 100°47.2 23.2 96°4.2 20°2.2 23°55.5 100°4.2 20°4.5 5.9 08.0 100°47.2 23.2 96°4.2 20°2.2 23°55.5 100°4.2 20°4.2												193°38.0
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6 14°45.0 309°34.7 N17°06.1 295°37.1 N23°20.6 202°05.7 N04°29.6 336°58.8 N12°23.4 7 29°47.5 324°36.1 06.2 310°37.7 20.7 217°07.8 29.4 352°0.11 23.4 8 44°49.9 339°37.4 06.3 325°38.3 20.9 232°10.0 29.3 7°03.4 23.5 9 59°52.4 354°38.7 · 06.4 340°38.9 · 21.0 247°12.1 · 29.2 2°205.6 · 23.5 10 74°54.9 9°40.0 06.5 355°39.5 · 21.0 247°12.1 · 29.2 2°205.6 · 23.5 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 11 130°02.3 54°44.0 06.9 40°41.3 21.6 307°20.7 82.6 82°14.7 23.8 14 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 15 150°07.2 84°46.6 · 0.71.1 70°42.5 · 22.0 337°25.0 · 28.3 112°19.3 · 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 17 180°12.1 114°49.2 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 18 195°14.6 129°50.5 N17°07.4 115°43.3 N23°22.4 22°31.5 N04°27.9 157°261. N12°24.0 19 10°17.0 144°51.8 07.5 130°49.9 22.6 37°33.6 27.7 172°28.4 24.1 20 225°19.5 159°53.1 0.76 145°45.4 22.7 52°358.8 27.6 187°30.7 24.1 21 240°22.0 174°54.3 · 0.78 106°46.0 · 22.9 67°37.9 · 27.4 202°33.0 · 24.2 22.5 52°24.4 189°55.6 07.9 175°46.6 23.0 82°40.1 77.3 217°35.2 24.2 23°27°5.9 204°56.9 08.0 190°47.2 23.2 97°42.2 77.2 232°37.5 24.2 23°27°5.9 204°56.9 08.0 190°47.2 23.2 97°42.2 77.2 232°37.5 24.2 23°27°5.0 1.1 31°05.8 N17°08.1 205°47.8 N23°23.3 127°46.5 26.9 206°42.1 24.4 24.3 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.3 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 4.4 345°39.2 280°03.3 08.6 250°50.2 23.9 172°53.0 26.4 300°42.1 24.4 24.4 24.4 24.4 25.0 355°40.1 20°50.3 35	4	344°40.1	$279^{\circ}32.1$	05.9	265°36.0	20.2	172°01.4	29.9	306°54.3	23.3	Alioth	166° 10.6
7 29°475 324°361 662 310°377 207 217°078 294 352°01.1 23.4 84499 339°374 603 325°383 209 232°10.0 29.3 7°034 23.5 9 59°52.4 354°387 · 06.4 340°38.9 · 21.0 247°12.1 · 29.2 22°05.6 · 23.5 10 74°54.9 9°40.0 6.5 355°39.5 21.2 262°14.3 29.0 37°07.9 23.6 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 12 104°59.8 39°42.6 N17°06.7 25°40.7 N23°21.5 292°18.6 N04°28.7 67°12.5 N12°23.7 13 120°02.3 54°40.0 6.9 40°41.3 21.6 307°20.7 28.6 82.14.7 23.8 14 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 15 156°07.2 84°46.6 · 07.1 70°42.5 · 22.0 337°25.0 · 28.3 112°13 3 · 22.3 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 17 180°12.1 114°49.2 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 18 195°14.6 129°50.5 N17°07.4 115°44.3 N23°22.4 22°31.5 N04°27.9 157°26.1 N12°24.0 19 210°17.0 144°51.8 07.5 130°44.9 22.6 37°33.6 27.7 172°28.4 24.1 12 240°22.0 174°54.3 · 07.8 160°46.0 · 22.9 67°37.9 · 27.4 202°33.0 · 24.2 22°25.2 4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22°25.2 4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22°25.2 4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22°25.2 4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22°35.2 4 189°56.0 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 23°35.0 0.4 12°23.9 24.0 12°40.2 25°40.3 18.3 18.3 18.3 18.3 18.3 18.3 18.3 18	5	359°42.5	294°33.4	06.0	280°36.5	20.4	187°03.5	29.7	321°56.5	23.3		158° 19.2
7 29°47.5 324°36.1 06.2 310°37.7 20.7 217°07.8 29.4 352°01.1 23.4 8 44°49. 333°37.4 06.3 325°38.3 20.9 232°10.0 29.3 7°03.4 23.5 9 59°52.4 354°49.9 °40.0 06.5 355°39.5 21.2 262°14.3 29.0 37°07.9 23.6 10 74°54.9 9°40.0 06.5 355°39.5 21.2 262°14.3 29.0 37°07.9 23.6 11 89°57.3 24°41.3 06.6 10°40.1 21.3 277°16.4 28.9 52°10.2 23.6 12 104°59.8 39°42.6 N17°06.7 225°40.7 N23°21.5 292°18.6 N04°28.7 67°12.5 N12°23.7 13 120°02.3 54°40.0 06.9 40°41.3 21.6 30°7°20.7 28.6 82°14.7 23.8 14 135°04.7 69°45.3 07.0 55°41.9 21.8 322°22.9 28.4 97°17.0 23.8 15 156°07.2 84°66.6 07.1 70°42.5 22.0 337°25.0 28.3 112°19.3 22.3 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 16 165°09.6 99°47.9 07.2 85°43.1 22.1 352°27.2 28.2 127°21.6 23.9 17 180°12.1 114°49.2 07.3 100°43.7 22.3 7°29.3 28.0 142°23.9 24.0 18 195°14.6 129°50.5 N17°07.4 115°44.3 N23°22.4 22°31.5 N04°27.9 157°26.1 N12°24.0 19 210°17.0 144°51.8 07.5 130°44.9 22.6 37°33.6 27.7 172°28.4 24.1 12 240°22.0 174°54.3 07.8 160°46.0 22.9 67°37.9 27.4 202°33.0 24.2 225°24.4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 225°24.4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22 25°24.4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22 25°24.4 189°55.6 07.9 175°46.6 23.0 82°40.1 27.3 217°35.2 24.2 22 25°24.4 189°55.0 08.0 190°47.2 23.2 97°42.2 27.2 232°37.5 24.3 Mer.pass. 05:01	6	14°45.0	309°34.7	$N17^{\circ}06.1$	295°37.1	N23°20.6	202°05.7	N04°29.6	336°58.8	N12°23.4	Spica	
8 44°49,9 339°37,4 06.3 325°38,3 20,9 222°10,0 29,3 7°03,4 23.5 9 59°52,4 354°38,7 06.4 340°38,9 21.0 247°12,1 2.29,2 22°05,6 2.23.5 10 74°54,9 9°40,0 06.5 355°39,5 21,2 262°14,3 29,0 37°07,9 23.6 11 89°57,3 24°41,3 06.6 10°40,1 21.3 27°16,4 28,9 52°10,2 23.6 11 89°57,3 24°41,3 06.6 10°40,1 21.3 27°16,4 28,9 52°10,2 23.6 11 120°02,3 54°44,0 06.9 40°41,3 21.6 30°20,7 28.6 82°14,7 23.8 14 135°04,7 69°45,3 070, 55°41,9 21.8 322°22,9 28.4 682°14,7 23.8 15 150°07,2 84°46,6 0.07,1 70°42,5 22.0 337°20,7 28.6 82°14,7 23.8 15 150°07,2 84°46,6 0.07,1 70°42,5 22.0 337°25,0 28.3 112°19,3 2.23.9 16 165°06, 99°47,9 07.2 85°43,1 22.1 352°27,2 28.2 127°21,6 23.9 17 180°12,1 114°49,2 07.3 100°43,7 22.3 7°29,3 28.0 142°23,9 24.0 18 195°14,6 129°50,5 N17°07,4 115°44,3 N23°22,4 22°31,5 N04°27,9 157°26,1 N12°24,0 19 210°17,0 144°51.8 07.5 130°44,9 22.6 37°33,6 27,7 172°28,4 24.1 20 225°19,5 159°53,1 07.6 145°45,4 22.7 52°38,8 27.6 187°30,7 24.1 21 240°22,0 174°54,3 07.8 160°46,0 22.9 6°737,9 2.27,2 232°37,5 24.3 22.2 255°24,4 189°55,6 07.9 175°46,6 23.0 82°40,1 27.3 217°35,2 24.2 22 255°24,4 189°55,6 07.9 175°46,6 23.0 82°40,1 27.3 217°35,2 24.2 23 270°26,9 204°56,9 08.0 190°47,2 23.2 9°74,2 2 27.2 232°37,5 24.3 32.0 13.0 33.8 234°59,5 08.2 200°48,4 23.5 127°46,5 26.9 262°42,1 24.4 2.3 330°38,8 26°00,7 08.3 235°49,0 23.6 142°48,7 26.7 277°44,4 24.4 2.3 330°38,8 26°00,7 08.3 235°49,0 23.6 142°48,7 26.7 277°44,4 24.4 2.3 330°38,8 26°00,7 08.3 235°49,0 23.6 142°48,7 26.7 277°44,4 24.4 2.3 330°38,8 26°00,7 08.3 235°49,0 23.6 142°48,7 26.7 277°44,4 24.4 2.3 330°38,8 26°00,8 30°00,8 325°49,6 23.8 157°50,8 2-26,6 30°03,3 08.6 256°50,2 23.9 172°53,0 26.4 30°048,9 24.5 50°04,4 217°54,0 35°04,6 23.5 127°46,5 26.9 262°42,1 24.4 24.4 24.4 24.4 24.4 24.4 24.4 24.	7	29°47.5	324°36.1	06.2		20.7	217°07.8	29.4	352°01.1	23.4	Alkaid	152°49.7
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0 285°29.4 219°58.2 N17°08.1 205°47.8 N23°23.3 112°44.4 N04°27.0 247°39.8 N12°24.3 1 300°31.8 234°59.5 08.2 220°48.4 23.5 127°46.5 26.9 262°42.1 24.4 24.3 15°34.3 250°00.7 08.3 235°49.0 23.6 142°48.7 26.7 277°44.4 24.4 3 330°36.8 265°02.0 ·· 08.5 250°49.6 ·· 23.8 157°50.8 ·· 26.6 292°46.6 ·· 24.5 4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 5 0°41.7 295°04.6 08.7 280°50.8 24.1 187°55.1 26.3 322°51.2 24.6 6 15°44.1 310°05.8 N17°08.8 295°51.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 ·· 09.2 340°53.2 ·· 24.7 248°03.7 ·· 25.7 23°00.3 ·· 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N12°24.9 13 121°01.4 55°14.6 09.7 40°55.5 25.2 308°12.3 25.2 83°09.4 25.0 14 136°03.9 70°15.8 09.8 55°56.1 25.4 323°14.4 25.0 98°11.7 25.0 15 151°06.3 85°17.1 ·· 10.0 70°56.7 ·· 25.5 388°18.7 24.7 128°16.3 25.1 17 181°11.3 115°19.6 10.2 100°57.9 25.8 8°20.9 24.6 143°18.6 25.2 18 196°13.7 130°20.8 N17°10.3 115°59.1 26.1 38°25.2 24.3 173°23.1 25.3 21 241°21.1 175°24.5 ·· 10.7 161°00.9 26.5 83°31.6 23.9 218°30.0 25.4 25.3 23°32.2 25.5 25.6 22.5 25.6 22.5 23.0 218°30.0 25.4 25.3 23°32.2 25.5 25.6 24.5 23°30.0 0.0 25.4 24.9 113°14.0 ·· 25.1 161°16.2 145°22.0 10.5 130°59.1 26.1 38°25.2 24.3 173°23.1 25.3 26.2 24.3 173°23.1 25.3 26.2 26°8.6 160°23.2 10.6 145°59.7 26.3 53°27.3 24.1 188°25.4 25.3 21 241°21.1 175°24.5 ·· 10.7 161°00.3 ·· 26.4 68°29.4 ·· 24.0 203°27.7 ·· 25.4 25.6 25.6 25.6 25.6 25.6 25.6 25.5 25.5	Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	
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2 315°34.3 250°00.7 08.3 235°49.0 23.6 142°48.7 26.7 277°44.4 24.4 33°30°36.8 265°02.0 · 08.5 250°49.6 · 23.8 157°50.8 · 26.6 292°46.6 · 24.5 4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 5 0°41.7 295°04.6 08.7 280°50.8 24.1 187°55.1 26.3 322°51.2 24.6 6 15°44.1 310°05.8 N17°08.8 295°51.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 · 09.2 340°53.2 · 24.7 248°03.7 · 25.7 23°00.3 · 24.8 10 75°54.0 10°10.9 09.3 355°53.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N12°24.9 13 121°01.4 55°14.6 09.7 40°55.5 25.2 308°12.3 25.2 83°09.4 25.0 14 136°03.9 70°15.8 09.8 55°56.1 25.4 323°14.4 25.0 98°11.7 25.0 15 151°06.3 85°17.1 · 10.0 70°56.7 · 25.5 338°16.6 · 24.9 113°14.0 · 25.1 16 166°08.8 100°18.3 10.1 85°57.3 25.7 353°18.7 24.7 128°16.3 25.1 17 181°11.3 115°19.6 10.2 100°57.9 25.8 8°20.9 24.6 143°18.6 25.2 183°02.8 N12°25.2 19 211°16.2 145°22.0 10.5 130°59.1 26.1 38°25.2 24.3 173°23.1 25.3 20 226°18.6 160°23.2 10.6 145°59.7 26.3 53°27.3 24.1 188°25.4 25.3 21 241°21.1 175°24.5 · 10.7 161°00.3 · 26.4 68°29.4 · 24.0 203°27.7 · 25.4 22 256°23.6 190°25.7 10.9 176°00.9 26.5 83°31.6 23.9 218°30.0 25.4 23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5											Fomalhaut	15° 11.2
3 330°36.8 265°02.0 · 08.5 250°49.6 · 23.8 157°50.8 · 26.6 292°46.6 · · 24.5 4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 5 0°41.7 295°04.6 08.7 280°50.8 24.1 187°55.1 26.3 322°51.2 24.6 6 15°44.1 310°05.8 N17°08.8 295°51.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 · 09.2 340°53.2 · 24.7 248°03.7 · 25.7 23°00.3 · 24.8 10 75°54.0 10°10.9 09.3 355°55.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 <											Scheat	13°42.2
4 345°39.2 280°03.3 08.6 265°50.2 23.9 172°53.0 26.4 307°48.9 24.5 5 0°41.7 295°04.6 08.7 280°50.8 24.1 187°55.1 26.3 322°51.2 24.6 6 15°44.1 310°05.8 N17°08.8 295°61.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°99.6 0.9.2 340°53.2 24.7 248°03.7 25.7 23°00.3 24.8 10 75°54.0 10°10.9 09.3 355°53.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 <td></td> <td>Markab</td> <td>13°26.9</td>											Markab	13°26.9
5 0°41.7 295°04.6 08.7 280°50.8 24.1 187°55.1 26.3 322°51.2 24.6 6 15°44.1 310°05.8 N17°08.8 295°51.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 0.99.2 340°53.2 24.7 248°03.7 25.7 23°00.3 24.8 10 75°54.0 10°10.9 09.3 355°53.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N1											Jul 05 Wed	SHA
6 15°44.1 310°05.8 N17°08.8 295°51.4 N23°24.2 202°57.3 N04°26.2 337°53.5 N12°24.6 7 30°46.6 325°07.1 08.9 310°52.0 24.4 217°59.4 26.0 352°55.8 24.7 8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 · 09.2 340°53.2 · 24.7 248°03.7 · 25.7 23°00.3 · 24.8 10 75°54.0 10°10.9 09.3 355°53.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N12°24.9 13 121°01.4 55°14.6 09.7 40°55.5 25.2 308°12.3 25.2 83°09.4												
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8 45°49.1 340°08.3 09.1 325°52.6 24.5 233°01.6 25.9 7°58.0 24.7 9 60°51.5 355°09.6 0.09.2 340°53.2 24.7 248°03.7 0.25.7 23°00.3 24.8 10 75°54.0 10°10.9 09.3 355°53.8 24.8 263°05.8 25.6 38°02.6 24.8 11 90°56.5 25°12.1 09.4 10°54.4 25.0 278°08.0 25.4 53°04.9 24.9 12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N12°24.9 13 121°01.4 55°14.6 09.7 40°55.5 25.2 308°12.3 25.2 83°09.4 25.0 14 136°03.9 70°15.8 09.8 55°56.1 25.4 323°14.4 25.0 98°11.7 25.0 15 151°06.3 85°17.1 10.0 70°56.7 25.5 338°16.6 24.9 113°14.0 25.1 16 166°08.8 100°18.3 10.1 85°57.3 25.7											Mars	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$											Jupiter	187°30.0
$\begin{array}{cccccccccccccccccccccccccccccccccccc$											Saturn	322°19.5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$											Jul 06 Thu	SHA
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10		$10^{\circ}10.9$	09.3		24.8	263°05.8	25.6		24.8	Venus	294°56.5
12 105°58.9 40°13.4 N17°09.6 25°55.0 N23°25.1 293°10.1 N04°25.3 68°07.2 N12°24.9 13 121°01.4 55°14.6 09.7 40°55.5 25.2 308°12.3 25.2 83°09.4 25.0 14 136°03.9 70°15.8 09.8 55°56.1 25.4 323°14.4 25.0 98°11.7 25.0 15 151°06.3 85°17.1 · 10.0 70°56.7 · 25.5 338°16.6 · 24.9 113°14.0 · 25.1 16 166°08.8 100°18.3 10.1 85°57.3 25.7 353°18.7 24.7 128°16.3 25.1 17 181°11.3 115°19.6 10.2 100°57.9 25.8 8°20.9 24.6 143°18.6 25.2 18 196°13.7 130°20.8 N17°10.3 115°58.5 N23°26.0 23°23.0 N04°24.4 158°20.8 N12°25.2 19 211°16.2 145°22.0 10.5 130°59.1 26.1 38°25.2 24.3 173°23.1 25.3 20 226°18.6 160°23.2 10.6 145°59.7<	11	90°56.5	$25^{\circ}12.1$	09.4	10°54.4	25.0	278°08.0	25.4		24.9		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	12	105°58.9	40° 13.4	N17°09.6		N23°25.1	293°10.1	N04°25.3	68°07.2	N12°24.9	Mars	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		121°01.4	55° 14.6	09.7	40°55.5	25.2	308°12.3				Jupiter	187°22.5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		136°03.9	$70^{\circ}15.8$	09.8	55°56.1	25.4	323°14.4	25.0	$98^{\circ}11.7$		Saturn	322°14.9
$\begin{array}{cccccccccccccccccccccccccccccccccccc$											Jul 07 Fri	SHA
$\begin{array}{cccccccccccccccccccccccccccccccccccc$												294°28.8
18 196°13.7 130°20.8 N17°10.3 115°58.5 N23°26.0 23°23.0 N04°24.4 158°20.8 N12°25.2 19 211°16.2 145°22.0 10.5 130°59.1 26.1 38°25.2 24.3 173°23.1 25.3 20 226°18.6 160°23.2 10.6 145°59.7 26.3 53°27.3 24.1 188°25.4 25.3 21 241°21.1 175°24.5 · 10.7 161°00.3 · 26.4 68°29.4 · 24.0 203°27.7 · 25.4 22 256°23.6 190°25.7 10.9 176°00.9 26.5 83°31.6 23.9 218°30.0 25.4 23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5											Mars	
19 211°16.2 145°22.0 10.5 130°59.1 26.1 38°25.2 24.3 173°23.1 25.3 20 226°18.6 160°23.2 10.6 145°59.7 26.3 53°27.3 24.1 188°25.4 25.3 21 241°21.1 175°24.5 · 10.7 161°00.3 · 26.4 68°29.4 · 24.0 203°27.7 · 25.4 22 256°23.6 190°25.7 10.9 176°00.9 26.5 83°31.6 23.9 218°30.0 25.4 23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5												
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21 241°21.1 175°24.5 ·· 10.7 161°00.3 ·· 26.4 68°29.4 ·· 24.0 203°27.7 ·· 25.4 22 256°23.6 190°25.7 10.9 176°00.9 26.5 83°31.6 23.9 218°30.0 25.4 23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5									188025.4		Saturn	322°10.4
22 256°23.6 190°25.7 10.9 176°00.9 26.5 83°31.6 23.9 218°30.0 25.4 23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5											Horizont	al parallax
23 271°26.0 205°26.9 11.0 191°01.5 26.7 98°33.7 23.7 233°32.2 25.5											1.02011	Venus:
												Mars:
	23	211 20.0		11.0				23.1				
Mer.pass. $04:57$ $\nu 1.3' \ d0.1' \ m-4.70$ $\nu 0.6' \ d0.2' \ m1.49$ $\nu 2.1' \ d-0.1' \ m-1.85$ $\nu 2.3' \ d0.1' \ m0.43$	Mer.p	ass. 04:57	ν 1.3′ d0.	1′ m-4.70	ν 0.6′ d0.	2′ m1.49	$\nu 2.1' \ d-0$.1′ m-1.85	$\nu 2.3' \ d0$.1′ m0.43		

Dec

29°14.8

-42°08.7

56°41.4

-17°49.6

 $\text{-}57^{\circ}05.1$

 $23^{\circ}35.8$

 $89^{\circ}22.7$

-40°11.2

4°12.1

49°57.5 16°33.9

 $\text{-8}^{\circ}10.1$

 $46^{\circ}01.4$

 $6^{\circ}22.5$

 $28^{\circ}37.8$

 $\text{-}1^{\circ}11.1$

7°24.7

-52°42.6

-16°45.4 -29°00.7

 $5^{\circ}09.0$

 $27^{\circ}57.4$ -59°36.2

-43°33.1

-69°50.3

-8°47.1 11°49.6

 $61^{\circ}36.0$

14°24.8

 $-17^{\circ}42.2$

 $-63^{\circ}15.8$ -57°16.7

55°48.5

-11°18.7

49°10.5 -60°30.9

-36°30.8

 $19^{\circ}02.1$

-60°57.5

 $74^{\circ}02.5$

-16°09.7

26°37.3 -26°29.7

-69°04.8

-15°45.5

 $-37^{\circ}07.4$

 $12^{\circ}32.5$

51°29.2

-34°22.1

38°48.7

 $-26^{\circ}15.5$ 8°56.8

-56°38.3

45°22.9

 $10^{\circ}00.5$

-46°49.0

-29°28.0

28°14.3

15°21.6

Mer.pass

09:24

10:18

16:34

07:35

09:21

10:17

16:30

07:32

09:19

10:16

16:27

07:28

0.3

0.1

Mer.pass

Mer.pass

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 50.6	N22°45.0	21°31.7	7.4'	S25°54.7	-0.8'	56.5'
1	193°50.5	44.8	35°58.1	7.5'	25°53.8	-1.0'	56.4
2 3	208° 50.4 223° 50.3	44.6 • • 44.3	50°24.6 64°51.1	7.5' 7.5'	25°52.8 25°51.7	-1.1' -1.3'	56.4' 56.4'
4	238° 50.2	44.1	79°17.6	7.6'	25°50.4	-1.4	56.4
5	253° 50.0	43.8	93°44.2	7.6'	25°49.0	-1.6'	56.3'
6	268°49.9	N22°43.6	$108^{\circ}10.8$	7.7'	S25°47.4	-1.7'	56.3'
7	283°49.8	43.3	122°37.5	7.7'	25°45.7	-1.9'	56.3'
8	298° 49.7 313° 49.6	43.1 • • 42.9	137°04.2 151°30.9	7.7'	25°43.8 25°41.8	-2.0'	56.3' 56.3'
9 10	313 49.6 328°49.5	42.6	151 30.9 165°57.7	7.8' 7.8'	25 41.8 25°39.6	-2.2' -2.3'	56.2'
11	343°49.4	42.4	180°24.6	7.9'	25°37.3	-2.4	56.2'
12	358°49.3	N22°42.1	194°51.5	7.9'	S25°34.9	-2.6'	56.2'
13	13°49.2	41.9	209°18.4	8.0'	25°32.3	-2.7'	56.2'
14	28°49.1	41.6	223°45.4	8.0'	25°29.6 25°26.7	-2.9'	56.2'
15 16	43°49.0 58°48.9	· · 41.4 41.1	238°12.4 252°39.5	8.1' 8.2'	25° 26.7 25° 23.7	-3.0' -3.1'	56.1' 56.1'
17	73° 48.8	40.9	267°06.7	8.2'	25°20.6	-3.3'	56.1'
18	88°48.7	N22°40.6	281°33.9	8.3'	\$25°17.3	-3.4'	56.1'
19	103°48.6	40.4	296°01.2	8.3'	$25^{\circ}13.9$	-3.6'	56.1'
20	118° 48.5	40.1	310°28.5	8.4'	25°10.3	-3.7'	56.0'
21 22	133° 48.4 148° 48.3	· · 39.9 39.6	324°55.9 339°23.3	8.4' 8.5'	25°06.6 25°02.8	-3.8' -4.0'	56.0' 56.0'
23	148° 48.3 163° 48.2	39.6 39.3	359°23.3 353°50.8	8.6'	25°02.8 24°58.8	-4.0 -4.1'	56.0'
23						1.1	55.5
	SD = 15.7'	d = -0.2'		SD	0 = 15.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.1	N22°39.1	8°18.4	8.6'	\$24°54.7	-4.2'	56.0'
1	193°48.0 208°47.9	38.8 38.6	22°46.0 37°13.7	8.7' 8.8'	24°50.5 24°46.2	-4.4' -4.5'	55.9' 55.9'
2	208°47.9 223°47.8	38.6 •• 38.3	37°13.7 51°41.5	8.8'	24°46.2 24°41.7	-4.5' -4.6'	55.9'
4	238° 47.7	38.1	66°09.3	8.9'	24° 41.7 24° 37.1	-4.7'	55.9'
5	253° 47.6	37.8	80°37.2	9.0'	24°32.3	-4.9'	55.9'
6	268° 47.5	N22°37.5	95°05.2	9.0'	S24°27.5	-5.0'	55.8'
7	283°47.4	37.3	109°33.2	9.1'	24°22.5	-5.1'	55.8'
8 9	298° 47.3 313° 47.2	37.0 •• 36.8	124°01.3 138°29.5	9.2' 9.2'	24°17.3 24°12.1	-5.2' -5.4'	55.8' 55.8'
10	313 47.2 328° 47.1	36.5	150° 29.5 152° 57.7	9.2	24°12.1	-5.4 -5.5'	55.8'
11	343°46.9	36.2	167°26.1	9.4'	24°01.2	-5.6'	55.7'
12	358° 46.8	N22°36.0	181°54.5	9.5'	S23°55.6	-5.7'	55.7'
13	13°46.7	35.7	196°22.9	9.5'	23°49.9	-5.9'	55.7'
14	28° 46.6 43° 46.5	35.4 •• 35.2	210°51.5 225°20.1	9.6' 9.7'	23°44.0 23°38.0	-6.0' -6.1'	55.7' 55.7'
15 16	43 46.5 58°46.4	34.9	225 20.1 239°48.8	9.7 9.8'	23°31.9	-6.1 -6.2'	55.6'
17	73°46.3	34.6	254°17.6	9.9'	23°25.7	-6.3	55.6'
18	88°46.2	N22°34.4	268°46.4	9.9'	S23°19.4	-6.4'	55.6'
19	103°46.1	34.1	283°15.3	10.0'	23°12.9	-6.6'	55.6'
20	118° 46.0 133° 45.9	33.8	297°44.3 312°13.4	10.1' 10.2'	23°06.4 22°59.7	-6.7' -6.8'	55.6'
21 22	133 45.9 148°45.8	· · 33.6 33.3	312 13.4 326°42.6	10.2'	22 59.7 22°52.9	-6.8'	55.5' 55.5'
23	163°45.8	33.0	341°11.8	10.3'	22°46.1	-7.0'	55.5'
	SD = 15.7'	d = -0.3'		SD	0 = 15.3'		
Fri	GHA 178° 45.7	Dec N22°32.7	GHA	ν	Dec 522°39.1	d 7.1	HP 55.5'
0 1	178°45.7 193°45.6	N22°32.7 32.5	355°41.2 10°10.6	10.4' 10.5'	\$22°39.1 22°31.9	-7.1' -7.2'	55.5' 55.5'
2	208° 45.5	32.3	24°40.0	10.6'	22°24.7	-7.3	55.4'
3	223°45.4	• • 31.9	39°09.6	10.6'	22°17.4	-7.4'	55.4'
4	238° 45.3	31.6	53°39.3	10.7'	22°10.0	-7.5'	55.4'
5	253° 45.2 268° 45.1	31.4 N22°31.1	68°09.0 82°38.8	10.8' 10.9'	22°02.4 S 21°54.8	-7.6'	55.4' 55.4'
6 7	268° 45.1 283° 45.0	N22 31.1 30.8	82°38.8 97°08.7	10.9	21°47.1	-7.7' -7.8'	55.4° 55.3'
8	298° 44.9	30.5	111°38.7	11.1'	21°39.2	-7.9'	55.3'
9	313°44.8	• • 30.3	126°08.7	11.1'	21°31.3	-8.0'	55.3'
10	328°44.7	30.0	140°38.8	11.2'	21°23.3	-8.1'	55.3'
11	343° 44.6 358° 44.5	29.7 N22°29.4	155°09.1 169°39.4	11.3' 11.4'	21°15.1 S 21°06.9	-8.2' -8.3'	55.3'
12 13	358 44.5 13°44.4	N22 29.4 29.1	169° 39.4 184° 09.7	11.4	20°58.6	-8.4'	55.2' 55.2'
14	28° 44.3	28.9	198°40.2	11.5'	20°50.2	-8.5'	55.2'
15	43°44.2	• • 28.6	213°10.8	11.6'	$20^{\circ}41.7$	-8.6'	55.2'
16	58°44.1	28.3	227°41.4	11.7'	20°33.1	-8.7'	55.2'
17	73°44.0	28.0 N22°27.7	242°12.1 256°42.9	11.8'	20°24.4	-8.8'	55.2'
18 19	88° 43.9 103° 43.8	N22°27.7 27.4	256°42.9 271°13.8	11.9' 12.0'	\$20°15.6 20°06.7	-8.9' -9.0'	55.1' 55.1'
20	118° 43.7	27.4	271 13.8 285°44.7	12.0'	19°57.8	-9.0'	55.1
21	133° 43.6	• • 26.9	300°15.8	12.1'	$19^{\circ}48.7$	-9.1'	55.1'
22	148° 43.5	26.6	314°46.9	12.2'	19°39.6	-9.2'	55.1'
23	163°43.4	26.3	329°18.1	12.3'	19°30.4	-9.3'	55.0'
	SD = 15.7'	d = -0.3'		SD	0 = 15.1'		

Lat.		light	Sunrise	Sunset		ilight
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:55	23:10	////	////
64°	////	////	01:53	22:15	////	////
62°	////	////	02:25	21:43	////	////
60°	11111	01:18	02:49	21:20	22:49	////
N 58°	////	01:58	03:08	21:01	22:11	////
56°	////	02:24	03:24	20:45	21:45	////
54°	01:12	02:45	03:37	20:32	21:24	22:56
52°	01:48	03:01	03:49	20:20	21:08	22:20
50°	02:13	03:16	03:59	20:10	20:54	21:56
45°	02:55	03:44	04:21	19:49	20:25	21:14
N 40°	03:24	04:05	04:38	19:32	20:04	20:45
35°	03:47	04:03	04:52	I		
	I			19:17	19:47	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:14	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:09
30°	!			!	17:40 17:30	
	06:09	06:40	07:08	17:02		18:01
40°	06:18	06:51	07:22	16:48	17:18	17:52
45°	06:27	07:04	07:38	16:32	17:06	17:43
S 50°	06:38	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
S 60°	07:01	08:04	08:59	15:11	16:06	17:02
3 00	07.00	00.01	00.55	15.11	10.00	17.02
Lat.		Moonris	e		Moonse	t
Lut.						
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	Wed	Thu	Fri	Wed	Thu	Fri
						_
N 70°						
N 70° 68°			23:10			
N 70° 68° 66°		23:01	23:10 22:36			01:46
N 70° 68° 66° 64°	22:20	23:01 22:15	23:10 22:36 22:11		00:37	01:46 02:31
N 70° 68° 66° 64° 62°	22:20 21:30	23:01 22:15 21:45	23:10 22:36 22:11 21:51	00:07	00:37 01:26	01:46 02:31 03:00
N 70° 68° 66° 64°	22:20	23:01 22:15	23:10 22:36 22:11		00:37	01:46 02:31
N 70° 68° 66° 64° 62° 60° N 58°	22:20 21:30	23:01 22:15 21:45	23:10 22:36 22:11 21:51	00:07	00:37 01:26	01:46 02:31 03:00
N 70° 68° 66° 64° 62° 60° N 58°	22:20 21:30 20:59	23:01 22:15 21:45 21:22	23:10 22:36 22:11 21:51 21:35	00:07 00:45	00:37 01:26 01:57	01:46 02:31 03:00 03:22
N 70° 68° 66° 64° 62° 60° N 58° 56°	22:20 21:30 20:59 20:35 20:16	23:01 22:15 21:45 21:22 21:03 20:48	23:10 22:36 22:11 21:51 21:35 21:21 21:09	00:07 00:45 01:11 01:32	00:37 01:26 01:57 02:20 02:39	01:46 02:31 03:00 03:22 03:40 03:56
N 70° 68° 66° 64° 62° 60° N 58° 56° 54°	22:20 21:30 20:59 20:35 20:16 20:00	23:01 22:15 21:45 21:22 21:03 20:48 20:35	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59	00:07 00:45 01:11 01:32 01:49	00:37 01:26 01:57 02:20 02:39 02:55	01:46 02:31 03:00 03:22 03:40 03:56 04:08
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52°	22:20 21:30 20:59 20:35 20:16 20:00 19:47	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49	00:07 00:45 01:11 01:32 01:49 02:04	00:37 01:26 01:57 02:20 02:39 02:55 03:08	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52° 50°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41	00:07 00:45 01:11 01:32 01:49 02:04 02:17	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52° 50° 45° N 40° 35°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22
N 70° 68° 66° 64° 62° 60° N 58° 56° 52° 50° 45° N 40° 35° 30°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33 18:18	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18 19:05	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51
N 70° 68° 66° 64° 62° 55° 54° 52° 50° 45° N 35° 30° 20°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22
N 70° 68° 66° 64° 62° 60° N 58° 56° 52° 50° 45° N 40° 35° 30°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33 18:18	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18 19:05	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35	01:46 02:31 03:00 03:22 03:40 04:08 04:20 04:30 04:51 05:08 05:22
N 70° 68° 66° 64° 62° 55° 54° 52° 50° 45° N 35° 30° 20°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:43 18:18 17:54 17:32	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18 19:05 18:43 18:24	23:10 22:36 22:11 21:51 21:35 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46 19:27 19:11	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36 04:02 04:24	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35 04:59 05:19	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22 05:34 05:55
N 70° 68° 64° 62° N 58° 550° 45° N 40° 30° 20° N 10° 0°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:43 18:18 17:54 17:32 17:13	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:51 19:33 19:18 19:05 18:43 18:24 18:06	23:10 22:36 22:11 21:51 21:35 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46 19:27 19:11 18:55	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36 04:02 04:24 04:44	00:37 01:26 01:57 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35 04:59 05:19	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22 05:34 05:55 06:13
N 70° 68° 64° 62° 60° 55° 54° 52° 50° 45° N 40° 35° 20° N 10° 0° S 10°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33 18:18 17:54 17:32 17:13 16:53	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:12 19:51 19:33 19:18 19:05 18:43 18:24 18:06 17:47	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46 19:27 19:11 18:55 18:40	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36 04:02 04:24 04:44	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35 04:59 05:19 05:38	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22 05:34 05:55 06:13 06:30
N 70° 68° 66° 64° 62° 70° N 58° 52° 52° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33 18:18 17:54 17:32 17:13 16:53 16:31	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:12 19:51 19:33 19:18 19:05 18:43 18:24 18:06 17:47 17:28	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46 19:27 19:11 18:55 18:40 18:24	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:04 03:21 03:36 04:02 04:24 04:44 05:04	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:20 03:45 04:04 04:21 04:35 04:59 05:19 05:38 05:57 06:18	01:46 02:31 03:00 03:22 03:40 03:56 04:08 04:20 04:30 04:51 05:08 05:22 05:34 05:55 06:13 06:30
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N 70° 68° 64° 62° 60° N 58° 54° 52° 50° N 40° 35° 30° 20° S 10° 20° 35° 40° 45° 55° 55° 55° 55° 55° 56° 58° S 60°	22:20 21:30 20:59 20:35 20:16 20:00 19:47 19:35 19:09 18:49 18:33 18:18 17:54 17:32 17:13 16:53 16:31 16:07 15:52 15:35 15:15 14:49 14:37 14:23 14:07 13:47 13:22	23:01 22:15 21:45 21:22 21:03 20:48 20:35 20:23 20:12 19:31 19:33 19:18 19:05 18:43 18:24 18:06 17:47 17:28 17:06 16:52 16:37 16:19 15:56 15:45 15:33 15:19 15:02 14:42 Sun	23:10 22:36 22:11 21:51 21:35 21:21 21:09 20:59 20:49 20:41 20:23 20:09 19:56 19:46 19:27 19:11 18:55 18:40 18:24 18:05 17:54 17:41 17:26 17:07 16:58 16:48 16:37 16:24 16:09	00:07 00:45 01:11 01:32 01:49 02:04 02:17 02:43 03:21 03:36 04:02 04:24 04:24 05:26 05:51 06:06 06:23 06:44 07:09 07:22 07:36 07:53 08:12 08:37	00:37 01:26 01:57 02:20 02:39 02:55 03:08 03:45 04:04 04:21 04:35 04:59 05:19 05:38 05:38 06:41 06:55 07:11 07:30 07:53 08:04 08:17 08:31 08:49 09:09	01:46 02:31 03:00 03:22 03:40 04:08 04:20 04:30 04:51 05:22 05:34 05:55 06:13 06:30 06:47 07:05 07:25 07:25 07:37 07:50 08:06 08:26 08:38 08:42 08:28

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	286°28.5	220°28.1	N17° 11.2	206°02.1	N23°26.8	113°35.9	N04°23.6	248°34.5	N12°25.5		
1	301°31.0	235°29.3	11.3	221°02.7	27.0	128°38.0	23.4	263°36.8	25.6	Alpheratz	357°31.7
2	316°33.4	250°30.6	11.4	236°03.3	27.1	143°40.2	23.3	278°39.1	25.6	Ankaa	353°04.3
3	331°35.9	265°31.8	. 11.6	251°03.9	27.2	158°42.3	23.1	293°41.4	25.7	Schedar	349°27.6
4	346°38.4	280°33.0	11.7	266°04.5	27.4	173°44.5	23.0	308°43.7	25.7	Diphda	348°44.4
5	1°40.8	295°34.2	11.8	281°05.1	27.5	188°46.6	22.8	323°45.9	25.8	Achernar	335°18.3
6	16°43.3	310°35.4	$N17^{\circ}12.0$	296°05.7	N23°27.7	203°48.7	N04°22.7	338°48.2	N12°25.8	Hamal	327°48.0 312°43.7
7	31°45.7	325°36.6	12.1	311°06.3	27.8	218°50.9	22.6	353°50.5	25.9	Polaris Acamar	312 43.7 315°09.9
8	46°48.2	340°37.8	12.3	326°06.8	27.9	233°53.0	22.4	8°52.8	25.9	Menkar	314°03.3
9	61°50.7	355°39.0	• • 12.4	341°07.4	• • 28.1	248°55.2	• • 22.3	23°55.1	• • 26.0	Mirfak	308°24.4
10	76°53.1	10°40.2	12.6	356°08.0	28.2	263°57.3	22.1	38°57.4	26.0	Aldebaran	290°36.6
11	91°55.6	25°41.3	12.7 N17°12.8	11°08.6	28.4	278°59.4	22.0	53°59.6	26.1	Rigel	281°01.4
12	106°58.1 122°00.5	40°42.5 55°43.7		26°09.2 41°09.8	N23°28.5	294°01.6 309°03.7	N04°21.8	69°01.9 84°04.2	N12°26.1	Capella	280°18.1
13 14	137°03.0	70°44.9	13.0 13.1	56°10.4	28.6 28.8	324°05.9	21.7 21.5	99°06.5	26.2 26.2	Bellatrix	278°20.1
15	152°05.5	85°46.1	13.3	71°11.0	28.9	339°08.0	21.4	114°08.8	26.3	Elnath	277°58.6
16	167°07.9	100°47.2	13.4	86°11.6	29.0	354°10.2	21.3	129°11.1	26.3	Alnilam	275°35.1
17	182°10.4	115°48.4	13.6	101°12.2	29.2	9°12.3	21.1	144°13.3	26.4	Betelgeuse	270°49.3
18	197°12.9	130°49.6	N17° 13.7	116°12.8	N23°29.3	24°14.4	N04°21.0	159° 15.6	N12°26.4	Canopus	263°51.7
19	$212^{\circ}15.3$	145°50.8	13.9	131°13.4	29.4	39°16.6	20.8	174° 17.9	26.5	Sirius Adhara	258°24.1 255°04.0
20	$227^{\circ}17.8$	160°51.9	14.0	146°14.0	29.6	54°18.7	20.7	189°20.2	26.5	Procyon	244°48.2
21	242°20.2	175°53.1	• • 14.2	$161^{\circ}14.6$	• • 29.7	69°20.9	• • 20.5	204°22.5	• • 26.6	Pollux	243°14.2
22	257°22.7	190°54.2	14.3	176°15.2	29.8	84°23.0	20.4	219°24.8	26.6	Avior	234°14.1
23	272°25.2	205°55.4	14.5	191°15.8	30.0	99°25.1	20.2	234°27.0	26.7	Suhail	222°44.5
Mer.p	ass. 04:53	$\nu 1.2' \ d0$.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°38.4
<u>.</u>										Alphard	$217^{\circ}45.2$
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6
0	287°27.6	220° 56.6	N17° 14.6	206°16.4	N23°30.1	114°27.3	N04°20.1	249°29.3	N12°26.7	Dubhe	193°38.0
1	302°30.1	235°57.7	14.8	221°17.0	30.2	129°29.4	19.9	264°31.6	26.8	Denebola	182°22.2
2	317°32.6	250°58.9	14.9	236°17.6	30.4	144°31.6	19.8	279°33.9	26.8	Gienah	175°40.7
3	332°35.0	266°00.0	• • 15.1	251°18.2	30.5	159°33.7	• • 19.6	294°36.2	• • 26.9		172°56.8 171°48.4
4	$347^{\circ}37.5$	281°01.2	15.3	$266^{\circ}18.8$	30.6	174°35.8	19.5	309°38.5	26.9	Alioth	166°10.6
5	2°40.0	296°02.3	15.4	281°19.4	30.8	189°38.0	19.3	324°40.8	27.0	Spica	158° 19.2
6	17°42.4	311°03.4	N17° 15.6	296°19.9	N23°30.9	204°40.1	N04° 19.2	339°43.0	N12°27.0	Alkaid	152°49.7
7	32°44.9	326°04.6	15.7	311°20.5	31.0	219°42.3	19.1	354°45.3	27.1	Hadar	148°31.6
8	47°47.4	341°05.7	15.9	326°21.1	31.2	234°44.4	18.9	9°47.6	27.1		147°54.1
9	62°49.8	356°06.8	• • 16.0	341°21.7	· · 31.3	249°46.5	• • 18.8	24°49.9	• • 27.2	Arcturus	145°45.2
10	77°52.3 92°54.7	11°08.0 26°09.1	16.2	356°22.3	31.4	264°48.7	18.6	39°52.2 54°54.5	27.2	Rigil Kent.	139°35.9
11 12	92 54.7 107°57.2	41° 10.2	16.4 N17° 16.5	11°22.9 26°23.5	31.5 N23°31.7	279°50.8 294°52.9	18.5 N04° 18.3	54 54.5 69°56.8	27.2 N12°27.3	Kochab	137°19.5
13	107 57.2 122°59.7	56°11.3	16.7	41°24.1	31.8	309°55.1	18.2	84°59.0	27.3	Zuben'ubi	136°52.7
14	138°02.1	71°12.5	16.8	56°24.7	31.9	324°57.2	18.0	100°01.3	27.4	Alphecca	126°01.1
15	153°04.6	86° 13.6	17.0	71°25.3	32.1	339°59.4	• • 17.9	115°03.6	• • 27.4	Antares	112°12.0 107°03.1
16	$168^{\circ}07.1$	$101^{\circ}14.7$	17.2	86°25.9	32.2	355°01.5	17.7	130°05.9	27.5	Atria Sabik	107 03.1 101°59.2
17	183°09.5	116° 15.8	17.3	101°26.5	32.3	10°03.6	17.6	145°08.2	27.5	Shaula	96°06.1
18	198°12.0	131°16.9	N17° 17.5		N23°32.4	25°05.8	N04° 17.4	160° 10.5	N12°27.6	Rasalhague	95°55.6
19	213°14.5	146°18.0	17.7	131°27.7	32.6	40°07.9	17.3	175°12.8	27.6	Eltanin	90°40.3
20	228°16.9	161°19.1	17.8	146°28.3	32.7	55°10.0	17.1	190°15.1	27.7	Kaus Aust.	83°28.3
21 22	243°19.4 258°21.8	176°20.2 191°21.3	· · 18.0 18.2	161°28.9 176°29.5	· · 32.8 32.9	70°12.2 85°14.3	· · 17.0 16.8	205°17.3 220°19.6	· · 27.7 27.8	Vega	80°30.8
23	273°24.3	206° 22.4	18.3	170 29.5 191°30.1	33.1	05 14.5 100°16.4	16.8	235°21.9	27.8 27.8	Nunki	75°43.8
				-						Altair	61°56.8
Mer.p	ass. 04:49	$\nu 1.2' \ d0$.2′ m-4.69	u0.6′ d0	$.1^\prime$ m 1.50	$\nu 2.1' \ d-0$	$.1^\prime$ m-1.84	ν 2.3′ d0	.0' m0.42	Peacock	53°00.7
										Deneb Enif	49°23.4 33°35.7
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.1
0	$288^{\circ}26.8$	221°23.5	$N17^{\circ}18.5$		$N23^{\circ}33.2$	$115^{\circ}18.6$	N04°16.5	$250^{\circ}24.2$		Fomalhaut	15°11.2
1	303°29.2	236° 24.6	18.7	221°31.3	33.3	130°20.7	16.4	265° 26.5	27.9	Scheat	13°42.2
2	318°31.7	251°25.7	18.9	236°31.9	33.4	145°22.8	16.3	280°28.8	28.0	Markab	13°26.8
3	333°34.2	266°26.8	• • 19.0	251°32.5	• • 33.6	160°25.0	. 16.1	295°31.1	• • 28.0		
4	348°36.6	281°27.9	19.2	266°33.1	33.7	175°27.1	16.0	310°33.4	28.1	Jul 08 Sat	SHA 293°59.6
5	3°39.1 18°41.6	296°29.0 311°30.0	19.4 N17° 19.5	281°33.7	33.8 N23°33.9	190°29.3	15.8 N04° 15.7	325°35.6	28.1	Venus Mars	
6 7	18°41.6 33°44.0	311°30.0 326°31.1	N17 19.5 19.7	296°34.3 311°34.9	N23 33.9 34.0	205°31.4 220°33.5	N04 15.7 15.5	340° 37.9 355° 40.2	N12°28.2 28.2		279 33.0 187°07.4
8	33 44.0 48°46.5	341°32.2	19.7	311 34.9 326°35.5	34.0 34.2	220 33.5 235°35.7	15.5 15.4	355 40.2 10°42.5	28.2	Saturn	322°06.0
9	63°49.0	356°33.3	20.1	341°36.1	• • 34.3	250°37.8	15.2	25°44.8	28.3		
10	78°51.4	11°34.3	20.2	356°36.6	34.4	265°39.9	15.1	40°47.1	28.3	Jul 09 Sun	SHA
11	93°53.9	26°35.4	20.4	11°37.2	34.5	280°42.1	14.9	55°49.4	28.4	Venus	
12	108°56.3	41°36.5	N17°20.6	26°37.8	N23°34.6	295°44.2	N04°14.8		N12°28.4		278°48.7
13	123°58.8	56° 37.5	20.8	41°38.4	34.8	310°46.3	14.6	85°54.0	28.5	Saturn	186°59.6 322°01.7
14	139°01.3	71°38.6	20.9	56°39.0	34.9	325°48.5	14.5	100°56.3	28.5		
15	154°03.7	86°39.7	• • 21.1	71°39.6	35.0	340°50.6	• • 14.3	115°58.5	• • 28.6	Jul 10 Mon	SHA
16	169°06.2	101°40.7	21.3	86°40.2	35.1	355°52.7	14.2	131°00.8	28.6	l l	292°56.7
17 18	184°08.7 199°11.1	116°41.8 131°42.8	21.5 N17°21.7	101°40.8 116°41.4	35.2 N23°35.4	10°54.9 25°57.0	14.0 N04°13.9	146°03.1	28.7 N12°28.7	Mars	
18 19	214° 13.6	131 42.8 146°43.9	21.8	116 41.4 131°42.0	N23 35.4 35.5	25 57.0 40°59.1	13.7	161 05.4 176°07.7	28.8		186°51.8
20	214 15.0 229°16.1	161°44.9	22.0	131 42.0 146°42.6	35.6	56°01.3	13.7	170 07.7 191°10.0	28.8	Saturn	321°57.4
21	244°18.5	176° 46.0	22.2	161°43.2	• • 35.7	71°03.4	. 13.4	206° 12.3	• • 28.9	Horizont	al parallax
22	259°21.0	191°47.0	22.4	176°43.8	35.8	86°05.5	13.3	221°14.6	28.9		Venus:
23	274°23.5	206°48.0	22.6	191°44.4	35.9	101°07.6	13.1	$236^{\circ}16.9$	29.0		Mars:
Mern	ass. 04:45	$\nu 1.1' d0$.2′ m-4.69	ν0 6′ d0	.1′ m1.50	ν2 1' d-Ω	.1′ m-1.84	ν2 3' dΩ	.0′ m0.42		
				- 0.0 40							

Dec

29°14.9 -42°08.7

56°41.5

-17°49.6

-57°05.1

23°35.8 89°22.7

-40°11.2

4°12.1

49°57.5 16°33.9

-8°10.1

 $46^{\circ}01.4$

 $6^{\circ}22.5$

7°24.7 -52°42.6

-16°45.4

-29°00.7

 $5^{\circ}09.0$

27°57.4

-59°36.2

-43°33.1

-69°50.3 -8°47.1

11°49.6

 $61^{\circ}36.0$

14°24.8

 $-17^{\circ}42.2$

 $-63^{\circ} 15.8$ $-57^{\circ} 16.7$

55°48.5 -11°18.7

49°10.5

-60°30.9

-36°30.8

 $19^{\circ}02.1$

-60°57.5

 $74^{\circ}02.5$

-16°09.7

26°37.3 -26°29.7

-69°04.8

-15°45.5

 $-37^{\circ}07.4$

 $12^{\circ}32.5$

51°29.2

-34°22.1 38°48.7

-26°15.5

-56°38.3

 $45^{\circ}\,23.0$

 $10^{\circ}00.5$

-46°49.0

-29°28.0 28°14.3

15°21.6

Mer.pass

09:17

10:15

16:23

07:25

09:16

10:15

16:20

07:21

09:14

10:14

16:16

07:17

0.3

0.1

Mer.pass

Mer.pass

8°56.8

28°37.8 -1°11.1

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.3	N22°26.0	343°49.4	12.4'	S19°21.1	-9.4'	55.0'
1 2	193°43.2 208°43.1	25.7 25.4	358°20.7 12°52.2	12.4' 12.5'	19°11.7 19°02.2	-9.5' -9.5'	55.0' 55.0'
3	206 43.1 223°43.0	25.4	27°23.7	12.6'	19 02.2 18°52.7	-9.5 -9.6'	55.0'
4	238°43.0	24.8	41°55.3	12.7'	18°43.1	-9.7'	55.0'
5	253°42.9	24.5	56°27.0	12.8'	18°33.4	-9.8'	54.9'
6 7	268° 42.8 283° 42.7	N22°24.3 24.0	70°58.7 85°30.6	12.8' 12.9'	\$18°23.6 18°13.8	-9.8' -9.9'	54.9' 54.9'
8	298°42.6	23.7	100°02.5	13.0'	18°03.8	-9.9 -10.0'	54.9
9	313°42.5	• • 23.4	114°34.5	13.1'	17°53.8	-10.1'	54.9'
10	328°42.4	23.1	129°06.5	13.1'	17°43.8	-10.1'	54.9'
11 12	343°42.3 358°42.2	22.8 N22°22.5	143°38.7 158°10.9	13.2' 13.3'	17°33.6 \$17°23.4	-10.2' -10.3'	54.8' 54.8'
13	13°42.1	22.2	172°43.2	13.4'	17°13.2	-10.3'	54.8'
14	28°42.0	21.9	$187^{\circ}15.6$	13.4'	17°02.8	-10.4'	54.8'
15	43°41.9 58°41.8	• • 21.6	201°48.0	13.5'	16°52.4 16°41.9	-10.5'	54.8'
16 17	73°41.7	21.3 21.0	216°20.5 230°53.1	13.6' 13.7'	16 41.9 16°31.4	-10.5' -10.6'	54.8' 54.7'
18	88°41.7	N22°20.7	245°25.8	13.7'	\$16°20.8	-10.7	54.7'
19	103°41.6	20.4	259°58.6	13.8'	16°10.1	-10.7'	54.7'
20	118°41.5 133°41.4	20.1	274°31.4 289°04.3	13.9'	15°59.4 15°48.6	-10.8'	54.7'
21 22	133 41.4 148°41.3	· · 19.8 19.5	289 04.3 303°37.2	14.0' 14.0'	15 48.0 15°37.7	-10.9' -10.9'	54.7' 54.7'
23	163°41.2	19.2	318° 10.2	14.1'	15°26.8	-11.0'	54.7'
	SD = 15.7'	d = -0.3'		SI	O = 15.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°41.1 193°41.0	N22°18.9 18.6	332°43.3 347°16.5	14.2' 14.2'	\$15°15.8 15°04.8	-11.0' -11.1'	54.6' 54.6'
2	208°40.9	18.3	1°49.7	14.3'	14°53.7	-11.1'	54.6'
3	223°40.8	•• 18.0	$16^{\circ}23.0$	14.4'	$14^{\circ}42.6$	-11.2'	54.6'
4	238°40.7	17.7	30°56.4	14.4'	14°31.4	-11.2'	54.6'
5 6	253°40.7 268°40.6	17.3 N22°17.0	45°29.8 60°03.3	14.5' 14.6'	14°20.1 \$14°08.8	-11.3' -11.4'	54.6' 54.6'
7	283°40.5	16.7	74°36.9	14.6'	13°57.5	-11.4'	54.5
8	298°40.4	16.4	$89^{\circ}10.5$	14.7'	$13^{\circ}46.1$	-11.5'	54.5'
9	313°40.3	• • 16.1	103°44.2	14.8'	13°34.6	-11.5'	54.5'
10 11	328°40.2 343°40.1	15.8 15.5	118° 18.0 132° 51.8	14.8' 14.9'	13°23.1 13°11.6	-11.5' -11.6'	54.5' 54.5'
12	358°40.0	N22°15.2	147°25.7	14.9'	\$13°00.0	-11.6'	54.5'
13	13°39.9	14.9	161°59.6	15.0'	12°48.4	-11.7'	54.5'
14 15	28°39.9 43°39.8	14.5 •• 14.2	176°33.6 191°07.6	15.1' 15.1'	12°36.7 12°24.9	-11.7' -11.8'	54.5' 54.4'
16	43 39.6 58°39.7	13.9	205°41.7	15.1	12°24.9	-11.8'	54.4'
17	73°39.6	13.6	220°15.9	15.2'	12°01.4	-11.9'	54.4'
18	88°39.5	N22°13.3	234°50.1	15.3'	S11°49.5	-11.9'	54.4'
19 20	103°39.4 118°39.3	13.0 12.6	249°24.4 263°58.7	15.3'	11°37.6 11°25.7	-11.9'	54.4' 54.4'
21	133°39.2	12.3	278°33.1	15.4'	11°13.7	-12.0'	54.4'
22	148°39.2	12.0	293°07.6	15.5'	$11^{\circ}01.7$	-12.0'	54.4'
23	163°39.1	11.7	307°42.1	15.5'	10°49.6	-12.1'	54.4'
	SD = 15.7'	d = -0.3'		SI	O = 14.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	178°39.0	N22°11.4	322° 16.6	15.6'	\$10°37.6	-12.1'	54.3'
1	193°38.9	11.0	336°51.2	15.6'	10°25.4	-12.2'	54.3'
2	208°38.8 223°38.7	10.7 •• 10.4	351°25.8 6°00.5	15.7' 15.7'	10°13.3 10°01.1	-12.2' -12.2'	54.3' 54.3'
3 4	223° 38.7 238° 38.6	10.4	20°35.2	15.7 15.8'	09°48.9	-12.2' -12.3'	54.3'
5	253°38.6	09.8	$35^{\circ}10.0$	15.8'	09°36.6	-12.3'	54.3'
6	268°38.5	N22°09.4	49°44.8	15.9'	S09°24.3	-12.3'	54.3'
7 8	283°38.4 298°38.3	09.1 08.8	64° 19.7 78° 54.6	15.9' 16.0'	09°12.0 08°59.7	-12.3' -12.4'	54.3' 54.3'
9	313°38.2	• • 08.5	93°29.6	16.0'	08°47.3	-12.4'	54.3'
10	328°38.1	08.1	$108^{\circ}04.6$	16.0'	08°34.9	-12.4'	54.2'
11	343°38.1	07.8 N22°07.5	122°39.6 137°14.7	16.1'	08°22.5	-12.5'	54.2'
12 13	358°38.0 13°37.9	N22°07.5 07.1	137° 14.7 151° 49.8	16.1' 16.2'	\$08°10.0 07°57.5	-12.5' -12.5'	54.2' 54.2'
14	28°37.8	06.8	166°25.0	16.2	07°45.0	-12.5'	54.2'
15	43°37.7	• • 06.5	181°00.2	16.2'	07°32.5	-12.6'	54.2'
16 17	58°37.6 73°37.6	06.1 05.8	195°35.4 210°10.7	16.3' 16.3'	07°19.9 07°07.4	-12.6' -12.6'	54.2' 54.2'
18	73°37.6 88°37.5	05.8 N22°05.5	210° 10.7 224° 46.0	16.3'	506°54.8	-12.6'	54.2'
19	103°37.4	05.1	239°21.3	16.4'	06°42.1	-12.6'	54.2'
20	118°37.3	04.8	253°56.7	16.4	06°29.5	-12.7'	54.2'
21 22	133°37.2 148°37.1	· · 04.5 04.1	268°32.1 283°07.5	16.4' 16.5'	06°16.8 06°04.2	-12.7' -12.7'	54.2' 54.2'
23	148 37.1 163°37.1	04.1	283 07.5 297°43.0	16.5	06 04.2 05°51.5	-12.7'	54.2'
	SD = 15.7'	d = -0.3'			O = 14.8'		
					17.0		

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
N 40°	03:27	04:08	04:40	19:31	20:03	20:43
35°	03:49	04:25	04:54	19:16	19:46	20:22
30°	04:06	04:39	05:06	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:37
N 10°	04:55	05:22	05:45	18:26	18:48	19:15
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:52	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
S 50°	06:37	07:18	07:56	16:15	16:53	17:34
52°	06:42	07:25	08:05	16:06	16:46	17:29
54°	06:47	07:33	08:15	15:56	16:38	17:24
56°	06:53	07:41	08:27	15:44	16:30	17:18
58°	06:59	07:50	08:40	15:31	16:21	17:12
S 60°	07:06	08:01	08:56	15:15	16:10	17:05

Lat.		Moonris	e		Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon		
N 72°	23:41	22:55	22:25		04:25	06:40		
N 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		
N 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		
N 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		
S 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		
S 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		
S 60°	17:36	19:00	20:21	09:37	09:43	09:48		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-90%	
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	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	289°25.9	221°49.1	N17°22.8	206°45.0	N23°36.0	116°09.8	N04° 13.0	251°19.2	N12°29.0			
1	304°28.4	236°50.1	22.9	221°45.6	36.2	131°11.9	12.8	266°21.4	29.0	Alpheratz	357°31.6	29°14.9
2	319°30.8	251°51.1	23.1	236°46.2	36.3	146°14.0	12.7	281°23.7	29.1	Ankaa	353°04.3	-42°08.7
3	334°33.3	266° 52.2	• • 23.3	251°46.8	36.4	161°16.2	· · 12.5	296°26.0	29.1	Schedar	349°27.5	56°41.5
4	349°35.8	281°53.2	23.5	266°47.4	36.5	176°18.3	12.4	311°28.3	29.2	Diphda	348°44.4	-17°49.6
5	4°38.2	296°54.2	23.7	281°48.0	36.6	191°20.4	12.2	326°30.6	29.2	Achernar	335° 18.2 327° 48.0	-57°05.1 23°35.8
6	19°40.7	311°55.3	N17°23.9	296°48.6	N23°36.7	206°22.6	N04°12.1	341°32.9	N12°29.3	Hamal Polaris	312° 42.4	23 35.6 89°22.7
7	34°43.2	326°56.3	24.1	311°49.2	36.8	221°24.7	11.9	356°35.2	29.3	Acamar	315°09.8	-40°11.2
8	49°45.6	341°57.3	24.2	326°49.8	37.0	236°26.8	11.8	11°37.5	29.4	Menkar	314°03.3	4°12.1
9	64°48.1	356° 58.3	• • 24.4	341°50.4	• • 37.1	251°29.0	• • 11.6	26°39.8	• • 29.4	Mirfak	308°24.3	49°57.5
10	79°50.6	11°59.3	24.6	356°51.0	37.2	266°31.1	11.5	41°42.1	29.5	Aldebaran	290°36.6	16°33.9
11	94°53.0	27°00.3	24.8	11°51.6	37.3	281°33.2	11.3 N04°11.2	56°44.4 71°46.7	29.5	Rigel	281°01.4	-8°10.1
12	109°55.5 124°57.9	42°01.3 57°02.3	N17°25.0 25.2	26°52.2 41°52.8	N23°37.4 37.5	296°35.3 311°37.5	11.0	86°49.0	N12°29.6 29.6	Capella	$280^{\circ}18.0$	46°01.4
13 14	140°00.4	72°03.4	25.2 25.4	56°53.4	37.5 37.6	326°39.6	10.9	101°51.3	29.6	Bellatrix	$278^{\circ}20.1$	6°22.5
15	155°02.9	87°04.4	25.6	71°54.0	37.7	341°41.7	. 10.7	116° 53.5	29.7	Elnath	277°58.6	28°37.8
16	170°05.3	102°05.4	25.8	86°54.6	37.8	356°43.9	10.6	131°55.8	29.7	Alnilam	275°35.1	-1°11.0
17	185°07.8	117°06.3	26.0	101°55.2	37.9	11°46.0	10.4	146°58.1	29.8	Betelgeuse	270°49.3	7°24.7
18	200°10.3	132°07.3	N17°26.2	116°55.8	N23°38.0	26°48.1	N04° 10.3	162°00.4	N12°29.8	Canopus	263°51.6	-52°42.6
19	$215^{\circ}12.7$	147°08.3	26.3	131°56.4	38.2	41°50.2	10.1	177°02.7	29.9	Sirius	258° 24.0 255° 04.0	-16°45.3 -29°00.7
20	$230^{\circ}15.2$	162°09.3	26.5	146°57.0	38.3	56°52.4	10.0	192°05.0	29.9	Adhara Procyon	244° 48.2	5°09.0
21	245°17.7	177° 10.3	• • 26.7	161°57.6	• • 38.4	71°54.5	• • 09.8	207°07.3	• • 30.0	Pollux	243°14.2	27°57.4
22	260°20.1	192°11.3	26.9	176°58.2	38.5	86°56.6	09.7	222°09.6	30.0	Avior	234°14.1	-59°36.2
23	275°22.6	207°12.3	27.1	191°58.8	38.6	101°58.8	09.5	237°11.9	30.1	Suhail	222°44.6	-43°33.0
Mer.n	ass. 04:42	$\nu 1.0' \ d0$	2′ m-4.68	$\nu 0.6' d0$.1′ m1.50	ν2.1′ d-0	.1′ m-1.83	$\nu 2.3' d0$.0′ m0.42	Miaplacidus	221°38.4	-69°50.3
										Alphard	217° 45.2	-8°47.1
	6114	6114	-	6114	_	6114		6114	-	Regulus	207°31.7	11°49.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.0	61°36.0
0	290°25.1	222°13.3 237°14.2	N17°27.3 27.5	206°59.4 222°00.0	N23°38.7	117°00.9 132°03.0	N04°09.4	252° 14.2 267° 16.5	N12°30.1 30.1	Denebola	$182^{\circ}22.2$	14°24.8
1 2	305°27.5 320°30.0	252° 15.2	27.5 27.7	222 00.0 237°00.6	38.8 38.9	132 03.0 147°05.1	09.2 09.1	207 10.5 282°18.8	30.1	Gienah	175°40.7	-17°42.2
3	335°32.4	267° 16.2	27.9	252°01.2	39.0	162°07.3	•• 08.9	202 10.0 297°21.1	30.2		172°56.9	-63°15.8
4	350°34.9	282° 17.2	28.1	267°01.8	39.1	102 07.3 177°09.4	08.8	312°23.4	30.2	Gacrux		-57°16.7
5	5°37.4	297°18.1	28.3	282°02.4	39.2	192°11.5	08.6	327°25.7	30.3	Alioth	166°10.6	55°48.5
6	20°39.8	312° 19.1	N17°28.5	297°03.0	N23°39.3	207°13.6	N04°08.4	342°28.0	N12°30.4	Spica	158° 19.2	-11°18.7
7	35°42.3	327°20.1	28.7	312°03.6	39.4	222°15.8	08.3	357°30.3	30.4	Alkaid	152°49.7	49°10.5
8	50°44.8	342°21.0	28.9	327°04.2	39.5	237°17.9	08.1	12°32.6	30.5	Hadar	148°31.6	-60°30.9
9	65°47.2	357° 22.0	• • 29.1	342°04.8	• • 39.6	252°20.0	• • 08.0	27°34.8	• • 30.5	Menkent	147°54.1 145°45.2	-36°30.8 19°02.1
10	80°49.7	12°22.9	29.3	357°05.4	39.7	267°22.1	07.8	42°37.1	30.5	Arcturus Rigil Kent.	139° 36.0	-60°57.5
11	95°52.2	27° 23.9	29.5	12°06.0	39.8	282°24.3	07.7	57°39.4	30.6	Kochab	137° 19.6	74°02.5
12	110°54.6	42°24.9	N17°29.7	27°06.6	N23°39.9	297°26.4	N04°07.5	72°41.7	N12°30.6	Zuben'ubi	136° 52.7	-16°09.7
13	125°57.1	57° 25.8	29.9	42°07.2	40.0	312°28.5	07.4	87°44.0	30.7	Alphecca	126°01.1	26°37.3
14	140°59.6	72°26.8	30.1	57°07.8	40.1	327°30.6	07.2	102°46.3	30.7	Antares	112°12.0	-26°29.7
15	156°02.0	87°27.7	• • 30.3	72°08.4	• • 40.2	342°32.8	07.1	117°48.6	• • 30.8	Atria	107°03.1	-69°04.8
16	171°04.5	102°28.6	30.5	87°09.0	40.3	357°34.9	06.9	132°50.9	30.8	Sabik	$101^{\circ}59.2$	-15°45.5
17	186°06.9 201°09.4	117°29.6	30.7	102°09.6 117°10.2	40.4 N23°40.5	12°37.0	06.8	147°53.2	30.9	Shaula	$96^{\circ}06.1$	-37°07.4
18 19	201 09.4 216°11.9	132°30.5 147°31.5	N17°30.9 31.2	117 10.2 132°10.8	40.6	27°39.1 42°41.3	N04°06.6 06.5	162°55.5 177°57.8	N12°30.9 30.9	Rasalhague	95°55.6	12°32.5
20	231°14.3	162° 32.4	31.4	147°11.4	40.7	57°43.4	06.3	193°00.1	31.0	Eltanin	90°40.3	51°29.3
21	246°16.8	177°33.3	31.6	162°12.0	• • 40.8	72°45.5	• • 06.2	208° 02.4	• • 31.0	Kaus Aust.	83°28.3	-34°22.1
22	261°19.3	192°34.3	31.8	177°12.6	40.9	87°47.6	06.0	223°04.7	31.1	Vega	80°30.8	38°48.7
23	276°21.7	207°35.2	32.0	192°13.2	41.0	102°49.8	05.9	238°07.0	31.1	Nunki	75°43.8	-26°15.5
			0/ 1.67				0/ 1.02			Altair	61°56.8	8°56.8 -56°38.3
ivier.p	ass. 04:38	ν 1.0° a 0	2′ m-4.67	ν 0.6° a 0.	.1′ m1.51	ν 2.1 a-0	.2′ m-1.83	ν 2.3° a_0	.0′ m0.41	Peacock Deneb	53°00.7 49°23.4	-50 36.3 45°23.0
										Enif	33°35.7	10°00.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°49.0
0	291°24.2	222°36.1	N17°32.2	207°13.8	N23°41.1	117°51.9	N04°05.7	253°09.3	N12°31.2	Fomalhaut	15° 11.2	-29°28.0
1	306°26.7	237°37.0	32.4	222°14.4	41.2	132°54.0	05.5	268°11.6	31.2	Scheat	13°42.2	28°14.3
2	321°29.1	252°38.0	32.6	237°15.0	41.3	147°56.1	05.4	283°13.9	31.3	Markab	$13^{\circ}26.8$	15°21.6
3	336°31.6 351°34.0	267° 38.9 282° 39.8	· · 32.8	252°15.6	· · 41.4 41.5	162°58.3 178°00.4	· · 05.2	298° 16.2 313° 18.5	31.3	Jul 11 Tue	SHA	Mer.pass
4 5	6°36.5	282 39.8 297°40.7	33.0 33.2	267°16.2 282°16.8	41.5 41.6	178 00.4 193°02.5	05.1 04.9	313 18.5 328° 20.8	31.3 31.4		292°23.2	09:12
6	0 30.5 21°39.0	312°41.6	33.2 N17°33.4		N23°41.7	208°04.6	04.9 N04°04.8		31.4 N12°31.4		292 23.2 277° 19.1	10:13
7	36°41.4	312 41.0 327°42.5	33.7	312°18.0	41.8	208 04.0 223°06.7	04.6	358° 25.4	31.5		186° 43.9	16:13
8	51°43.9	342°43.5	33.9	327°18.6	41.9	238°08.9	04.5	13°27.7	31.5	Saturn	321°53.2	07:14
9	66°46.4	357° 44.4	• • 34.1	342°19.2	• • 42.0	253°11.0	•• 04.3	28° 30.0	• • 31.6			
10	81°48.8	$12^{\circ}45.3$	34.3	357°19.8	42.1	$268^{\circ}13.1$	04.2	43°32.3	31.6	Jul 12 Wed	SHA	Mer.pass
11	$96^{\circ}51.3$	27°46.2	34.5	$12^{\circ}20.4$	42.2	$283^{\circ}15.2$	04.0	58°34.6	31.6		291°48.2	09:11
12	111°53.8	42°47.1	N17°34.7	27°21.0	N23°42.3	298°17.4	N04°03.9	73°36.9	N12°31.7		276° 34.3 186° 35.8	10:12 16:10
13	126°56.2	57°48.0	34.9	42°21.6	42.3	313°19.5	03.7	88°39.2	31.7	Saturn	321°49.1	07:10
14	141°58.7	72°48.9	35.2	57°22.2	42.4	328°21.6	03.6	103°41.5	31.8			
15	157°01.2	87°49.8	• • 35.4	72°22.8	• • 42.5	343°23.7	• • 03.4	118° 43.8	• • 31.8	Jul 13 Thu	SHA	Mer.pass
16	172°03.6	102°50.7	35.6	87°23.4	42.6	358°25.8	03.2	133°46.1	31.9		291°11.9	09:09
17	187°06.1	117°51.5	35.8 N17°26.0	102°24.0	42.7	13°28.0	03.1	148° 48.4	31.9 N12°21.0		275°49.6	10:11
18 19	202°08.5 217°11.0	132°52.4 147°53.3	N17°36.0 36.2	117°24.6 132°25.2	N23°42.8 42.9	28°30.1 43°32.2	N04°02.9 02.8	163°50.7 178°53.0	N12°31.9 32.0		186° 27.7	16:06
20	217 11.0 232°13.5	147 53.3 162°54.2	36.2 36.5	132 25.2 147°25.8	42.9	43 32.2 58°34.3	02.8 02.6	178 53.0 193°55.3	32.0	Saturn	321°45.1	07:06
21	232 13.3 247°15.9	102 54.2 177°55.1	36.7	162°26.4	43.1	73°36.4	•• 02.5	208° 57.6	• 32.0	Horizont	al parallax	
22	262°18.4	192°56.0	36.9	177°27.0	43.2	88°38.6	02.3	223°59.9	32.1		Venus:	0.3
23	277°20.9	207°56.8	37.1	192°27.6	43.2	103°40.7	02.2	239°02.2	32.2		Mars:	0.1
			2′ m-4.67		.1′ m1.51		.2′ m-1.82		.0′ m0.41			
ivier.p	ass. 04:34	νυ.9 αυ	∠ 111-4.0 <i>1</i>	ν 0.0 a 0.	10.111	ν2.1 U-U	.∠ 111-1.0∠	ν2.3 a0	.0 1110.41			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.0	N22°03.5	312° 18.4	16.5'	S05°38.7	-12.7'	54.1'
1	193°36.9	03.1	$326^{\circ}53.9$	16.5'	$05^{\circ}26.0$	-12.8'	54.1'
2	208°36.8	02.8	341°29.5	16.6'	05°13.3	-12.8'	54.1'
3	223°36.7	• • 02.5	356°05.1	16.6'	05°00.5	-12.8'	54.1'
4 5	238°36.7 253°36.6	02.1 01.8	10° 40.6 25° 16.3	16.6' 16.6'	04°47.7 04°34.9	-12.8' -12.8'	54.1' 54.1'
6	268°36.5	N22°01.4	25 10.3 39°51.9	16.7	504°22.1	-12.8'	54.1
7	283°36.4	01.1	54° 27.5	16.7	04°09.3	-12.8'	54.1
8	298°36.3	00.8	69°03.2	16.7'	03°56.4	-12.8'	54.1'
9	313°36.3	• • 00.4	83°38.9	16.7'	03°43.6	-12.9'	54.1'
10	328°36.2	22°00.1	98° 14.6	16.7'	03°30.7	-12.9'	54.1'
11	343°36.1	21°59.7	112°50.4	16.7'	03°17.9	-12.9'	54.1'
12	358°36.0	N21°59.4	127°26.1	16.8'	S03°05.0	-12.9'	54.1'
13	13°35.9 28°35.9	59.0 58.7	142°01.9 156°37.7	16.8' 16.8'	02°52.1 02°39.2	-12.9' -12.9'	54.1' 54.1'
14 15	28 35.9 43°35.8	58.3	150 37.7 171°13.5	16.8	02 39.2 02°26.3	-12.9' -12.9'	54.1'
16	58°35.7	58.0	185°49.3	16.8'	02°13.4	-12.9'	54.1
17	73°35.6	57.7	200°25.1	16.8'	02°00.5	-12.9'	54.1'
18	88°35.5	N21°57.3	215°00.9	16.8'	S01°47.6	-12.9'	54.1'
19	103°35.5	57.0	229°36.7	16.8'	01°34.7	-12.9'	54.1'
20	118°35.4	56.6	244°12.6	16.9'	01°21.7	-12.9'	54.1'
21	133°35.3	• • 56.3	258° 48.4	16.9'	01°08.8	-12.9'	54.1'
22 23	148°35.2 163°35.2	55.9 55.6	273°24.3 288°00.2	16.9' 16.9'	00°55.9 00°42.9	-12.9' -12.9'	54.1' 54.1'
23			200 00.2			-12.9	J4.1
	SD = 15.7'	d = -0.3'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.1	N21°55.2	302°36.0	16.9'	S 00°30.0	-12.9'	54.1'
1	193°35.0	54.8	317° 11.9	16.9'	00°17.0	-12.9'	54.1'
2	208°34.9	54.5	331°47.8	16.9'	500°04.1	-12.9'	54.1'
3	223°34.8	• • 54.1	346°23.7	16.9'	N00°08.8	12.9'	54.1'
4 5	238°34.8 253°34.7	53.8 53.4	0°59.5 15°35.4	16.9' 16.9'	00°21.8 00°34.7	12.9' 12.9'	54.1' 54.1'
6	268°34.6	N21°53.1	30° 11.3	16.9'	00° 34.7 N00° 47.7	12.9'	54.1
7	283°34.5	52.7	44° 47.2	16.9'	01°00.6	12.9'	54.1
8	298°34.5	52.4	59°23.0	16.9'	01°13.5	12.9'	54.1'
9	313°34.4	• • 52.0	73°58.9	16.9'	$01^{\circ}26.4$	12.9'	54.1'
10	328°34.3	51.6	88°34.8	16.8'	01°39.4	12.9'	54.1'
11	343°34.2	51.3	103° 10.6	16.8'	01°52.3	12.9'	54.1'
12	358°34.2	N21°50.9	117°46.4	16.8'	N02°05.2	12.9'	54.1'
13 14	13°34.1 28°34.0	50.6 50.2	132°22.3 146°58.1	16.8' 16.8'	02°18.1 02°31.0	12.9' 12.9'	54.1' 54.1'
15	43°33.9	• • 49.8	161°33.9	16.8	02°43.9	12.9'	54.1
16	58°33.9	49.5	176°09.7	16.8'	02°56.8	12.9'	54.1'
17	73°33.8	49.1	190°45.5	16.8'	03°09.6	12.9'	54.1'
18	88°33.7	N21°48.8	205°21.3	16.8'	N03°22.5	12.8'	54.1'
19	103°33.6	48.4	219°57.0	16.7'	03°35.3	12.8'	54.1'
20	118°33.6	48.0	234°32.8	16.7'	03°48.2	12.8'	54.1'
21 22	133°33.5 148°33.4	· · 47.7 47.3	249°08.5 263°44.2	16.7' 16.7'	04°01.0 04°13.8	12.8' 12.8'	54.2' 54.2'
23	163°33.4	46.9	203 44.2 278° 19.9	16.7'	04 13.6 04°26.6	12.8	54.2'
	SD = 15.7'	d = -0.4'			O = 14.8'	12.0	
Thu	GHA	Dec	GHA	ν	Dec	d 10.01	HP
0 1	178°33.3 193°33.2	N21°46.6 46.2	292°55.5 307°31.2	16.6' 16.6'	N04°39.4 04°52.2	12.8' 12.8'	54.2' 54.2'
2	193°33.2 208°33.1	46.2 45.8	307°31.2 322°06.8	16.6'	04°52.2 05°04.9	12.8 12.7'	54.2' 54.2'
3	223°33.1	• • 45.4	336°42.4	16.6'	05°17.7	12.7	54.2
4	238°33.0	45.1	351°18.0	16.5'	05°30.4	12.7'	54.2'
5	253°32.9	44.7	5°53.5	16.5'	05°43.1	12.7'	54.2'
6	268°32.9	N21°44.3	20°29.0	16.5	N05°55.8	12.7'	54.2'
7	283°32.8	44.0	35°04.5	16.5'	06°08.5	12.7'	54.2'
8 9	298°32.7 313°32.6	43.6 •• 43.2	49° 40.0 64° 15.4	16.4' 16.4'	06°21.1 06°33.8	12.6' 12.6'	54.2' 54.2'
10	313 32.0 328°32.6	42.8	78°50.8	16.4	00°33.6	12.6'	54.2 54.3'
11	343°32.5	42.5	93°26.2	16.3'	06°59.0	12.6'	54.3'
12	358°32.4	N21°42.1	108°01.5	16.3'	N07°11.5	12.5'	54.3'
13	13°32.4	41.7	122° 36.8	16.3'	07°24.1	12.5'	54.3'
14	28°32.3	41.3	137° 12.1	16.2'	07°36.6	12.5'	54.3
15	43°32.2	• • 41.0	151°47.3	16.2'	07°49.1	12.5'	54.3'
16 17	58°32.2 73°32.1	40.6 40.2	166°22.5 180°57.7	16.2' 16.1'	08°01.6 08°14.1	12.5' 12.4'	54.3' 54.3'
18	88°32.0	40.2 N21°39.8	180 57.7 195°32.8	16.1	08 14.1 N08°26.5	12.4'	54.3
19	103°31.9	39.4	210°07.8	16.0'	08°38.9	12.4'	54.4
20	118°31.9	39.1	224°42.9	16.0'	08°51.3	12.3'	54.4'
21	133°31.8	• • 38.7	239° 17.9	15.9'	09°03.6	12.3'	54.4'
22	148°31.7	38.3	253°52.8	15.9'	09°15.9	12.3'	54.4'
23	163°31.7	37.9	268°27.7	15.9'	09°28.2	12.3'	54.4'
	SD = 15.7'	d = -0.4'		SI	D = 14.8'		
			-				

N 72° □ □ □ □ N 70° □ □ □ □ □ 68° □ □ □ □ □ 66° //// //// 00:25 02:37 21:33 23:35 /// 60° //// 00:25 02:37 21:33 23:35 //// 85° //// 02:10 03:17 20:54 22:00 //// 85° //// 02:10 03:17 20:54 22:00 //// 85° //// 02:210 03:17 20:54 22:00 //// 85° 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 03:29 03:55 20:16 21:02 22:10 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35°	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° □ □ □ □ 68° □ □ □ □ □ 66° //// //// 01:24 22:43 //// //// 64° //// 00:25 02:37 21:33 23:35 //// 60° //// 01:37 02:59 21:11 22:32 //// N 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 N 40° 03:30 04:10 04:42 19:29 20:01 20:41	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68°	N 72°						
66° //// //// 01:24 22:43 //// //// 64° //// //// 02:08 22:01 //// //// 60° //// 00:25 02:37 21:33 23:35 //// 60° //// 01:37 02:59 21:11 22:32 //// N 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 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 <th>N 70°</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	N 70°						
64° //// //// 02:08 22:01 //// //// 62° //// 00:25 02:37 21:33 23:35 //// 60° //// 01:37 02:59 21:11 22:32 //// N 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 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 20:20 30° 04:38 04:41 05:0							
62° //// 00:25 02:37 21:33 23:35 //// 60° //// 01:37 02:59 21:11 22:32 //// N 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 N 40° 03:30 04:10 04:42 19:29 20:01 20:1 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 N 10° 04:56 05:23 <td< th=""><th></th><th>////</th><th>////</th><th>01:24</th><th>22:43</th><th>////</th><th>////</th></td<>		////	////	01:24	22:43	////	////
60° //// 01:37 02:59 21:11 22:32 //// N 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 03:02 04:05 20:06 20:48 21:48 45° 03:02 03:49 04:25 19:46 20:22 21:09 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 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			////		22:01	////	
N 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 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 20:20 30° 04:08 04:41 05:08 19:03 19:30 20:03 20° 04:35 05:04 05:28 18:43 19:07 19:36 N 10° 04:56 05:23 05:46 18:26 18:48 19:15 0° 05:14 05:40							
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 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 20:20 30° 04:08 04:41 05:08 19:03 19:30 20:03 20° 04:35 05:04 05:28 18:43 19:07 19:36 N 10° 04:56 05:23 05:46 18:26 18:48 19:15 0° 05:14 05:40 06:02 18:09 18:32 18:58 S 10° 05:30 05:56	60°	////	01:37	02:59	21:11	22:32	////
54° 01:29 02:53 03:44 20:27 21:17 22:40 52° 02:00 03:09 03:55 20:16 21:02 22:10 50° 02:22 03:22 04:05 20:06 20:48 21:48 45° 03:02 03:49 04:25 19:46 20:22 21:09 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 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	N 58°	////	02:10	03:17	20:54	22:00	////
52° 02:00 03:09 03:55 20:16 21:02 22:10 50° 02:22 03:22 04:05 20:06 20:48 21:48 45° 03:02 03:49 04:25 19:46 20:22 21:09 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 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		00:23	02:34	03:31	20:39	21:36	23:38
50° 02:22 03:22 04:05 20:06 20:48 21:48 45° 03:02 03:49 04:25 19:46 20:22 21:09 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 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		01:29	02:53	03:44	20:27	21:17	22:40
45° 03:02 03:49 04:25 19:46 20:22 21:09 N 40° 03:30 04:10 04:42 19:29 20:01 20:41 35° 03:51 04:27 04:56 19:15 19:44 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 17:37 17:43 18:12 35° 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		02:00	03:09	03:55	20:16	21:02	22:10
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		-		04:05			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	45°	03:02	03:49	04:25	19:46	20:22	21:09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		03:30	04:10	04:42	19:29	20:01	20:41
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	35°	03:51	04:27	04:56	19:15	19:44	20:20
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		04:08	04:41	05:08	19:03	19:30	20:03
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		04:35	05:04	05:28	18:43	19:07	19:36
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 S 50° 06:36 07:16 07:54 16:18 16:55 17:36 52° 06:40 07:23 08:03 16:09 16:49 17:32 54° 06:45 07:30 08:13 15:59 16:41 17:21 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							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0°	05:14	05:40	06:02	18:09	18:32	18:58
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S 10°	05:30	05:56	06:18	17:53	18:16	18:42
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20°	05:45	06:12	06:35	17:36	18:00	18:27
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		06:00	06:29	06:55	17:17	17:43	18:12
45° 06:25 07:02 07:35 16:37 17:10 17:47 \$ 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		06:07	06:39	07:06	17:05		
S 50° 06:36 07:16 07:54 16:18 16:55 17:36 52° 06:40 07:23 08:03 16:09 16:49 17:32 54° 06:45 07:30 08:13 15:59 16:41 17:27 56° 06:51 07:38 08:24 15:48 16:33 17:21 58° 06:57 07:48 08:37 15:35 16:24 17:15		06:16	06:50	07:20	16:52		17:56
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	45°	06:25	07:02	07:35	16:37	17:10	17:47
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		06:36	07:16	07:54	16:18	16:55	17:36
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		06:40	07:23	08:03	16:09	16:49	17:32
58° 06:57 07:48 08:37 15:35 16:24 17:15		06:45	07:30	08:13	15:59	16:41	
		06:51	07:38	08:24	15:48		17:21
S 60° 07:03 07:58 08:52 15:20 16:14 17:09							
	S 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
S 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
S 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
S 60°	21:40	22:58	•• ••	09:51	09:53	09:56

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Upper Lower		
	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	`	enus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri _	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
									N12°32.2		ЗПА	Dec
0	292°23.3	222°57.7	N17° 37.3	207°28.2	N23°43.3	118°42.8	N04°02.0	254°04.5		Alpheratz	357°31.6	29°14.9
1	307°25.8	237°58.6	37.5	222°28.8	43.4	133°44.9	01.9	269°06.8	32.2	Ankaa	353°04.3	-42°08.7
2	322°28.3	252°59.4	37.8	237°29.4	43.5	148°47.0	01.7	$284^{\circ}09.1$	32.3	Schedar	349°27.5	56°41.5
3	337°30.7	268°00.3	• • 38.0	252°30.0	• • 43.6	163°49.1	•• 01.5	299°11.4	• • 32.3	Diphda	348°44.4	-17°49.6
4	352°33.2	283°01.2	38.2	267°30.6	43.7	178°51.3	01.4	314° 13.7	32.4			
5	7°35.7	298°02.0	38.4	282°31.2	43.8	193°53.4	01.2	329°16.0	32.4	Achernar	335°18.2	-57°05.1
6	22°38.1	313°02.9	N17°38.6	297°31.8	N23°43.9	208°55.5	N04°01.1	344°18.3	N12°32.5	Hamal	327°48.0	23°35.8
7	37°40.6	328°03.8	38.9	312°32.4	43.9	223°57.6	00.9	359° 20.6	32.5	Polaris	312°40.9	89°22.7
8	52°43.0	343°04.6	39.1	327°33.0	44.0	238°59.7	00.8	14°22.9	32.5	Acamar	$315^{\circ}09.8$	-40°11.1
										Menkar	314°03.3	4°12.1
9	67°45.5	358°05.5	• • 39.3	342°33.6	• • 44.1	254°01.9	• • 00.6	29°25.2	· · 32.6	Mirfak	308°24.3	49°57.5
10	82°48.0	13°06.3	39.5	357°34.2	44.2	269°04.0	00.5	44°27.5	32.6	Aldebaran	290°36.6	16°33.9
11	97°50.4	28°07.2	39.8	12°34.8	44.3	284°06.1	00.3	59°29.8	32.7	Rigel	281°01.4	-8°10.1
12	112°52.9	43°08.0	N17°40.0	27°35.4	N23°44.4	299°08.2	N04°00.1	74°32.1	N12°32.7	Capella	280°18.0	46°01.4
13	127°55.4	58°08.9	40.2	42°36.0	44.4	314°10.3	04°00.0	89°34.4	32.8	Bellatrix	278°20.1	6°22.5
14	142°57.8	73°09.7	40.4	57°36.6	44.5	329°12.4	03°59.8	104°36.7	32.8			
15	158°00.3	88°10.6	• • 40.7	72°37.2	• • 44.6	344°14.6	• • 59.7	119°39.0	• • 32.8	Elnath	277°58.6	28°37.8
16	173°02.8	103°11.4	40.9	87°37.8	44.7	359°16.7	59.5	134°41.3	32.9	Alnilam	275°35.1	-1°11.0
17	188°05.2	118° 12.2	41.1	102°38.4	44.8	14°18.8	59.4	149°43.6	32.9	Betelgeuse	270°49.3	7°24.7
18	203°07.7	133°13.1	N17°41.3	117°39.0	N23°44.9	29°20.9	N03°59.2	164°45.9	N12°33.0	Canopus	263°51.6	-52°42.6
								179°48.2		Sirius	258°24.0	-16°45.3
19	218°10.1	148°13.9	41.6	132°39.6	44.9	44°23.0	59.0		33.0	Adhara	255°04.0	-29°00.7
20	233°12.6	163°14.7	41.8	147°40.2	45.0	59°25.1	58.9	194°50.6	33.0	Procyon	244°48.2	5°09.0
21	248°15.1	178° 15.6	• • 42.0	162°40.8	• • 45.1	74°27.3	• • 58.7	209°52.9	. 33.1	Pollux	243°14.2	27°57.4
22	263°17.5	193°16.4	42.2	177°41.4	45.2	89°29.4	58.6	224°55.2	33.1	Avior	234°14.1	-59°36.2
23	278°20.0	208° 17.2	42.5	192°42.0	45.3	104°31.5	58.4	239°57.5	33.2	Suhail	234 14.1 222°44.6	-39 30.2 -43°33.0
B 4	04 22	-0.0/ 10	0/ 4.00	-0.61.10	1/ 1 =1	-0.1/ 1.0	0/ 1 00	-0.2/ /2	0/ 0 44			
Mer.p	ass. 04:30	$\nu_{0.9'} d0$.2′ m-4.66	$\nu_{0.6'} d0$.1′ m1.51	$\nu^{2.1'} d-0$.2′ m-1.82	$\nu^{2.3'} d0$.0′ m0.41	Miaplacidus	221°38.4	-69°50.3
										Alphard	217°45.2	-8°47.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.7	11°49.6
0	293°22.5	223°18.0	N17° 42.7	207°42.6	N23°45.3	119°33.6	N03°58.3	254° 59.8	N12°33.2	Dubhe	193°38.1	61°36.0
	308°24.9	238° 18.9		207 42.0 222°43.2		134°35.7		270°02.1		Denebola	182°22.2	14°24.8
1			42.9		45.4		58.1		33.3	Gienah	175°40.7	-17°42.2
2	323°27.4	253°19.7	43.1	237°43.8	45.5	149°37.8	58.0	285°04.4	33.3	Acrux	172°56.9	-63°15.8
3	338°29.9	268° 20.5	• • 43.4	252°44.4	• • 45.6	164°40.0	• • 57.8	300°06.7	• • 33.3	Gacrux	171°48.4	-57°16.7
4	353°32.3	283°21.3	43.6	267°45.0	45.7	179°42.1	57.6	315°09.0	33.4	Alioth	166°10.6	55°48.5
5	8°34.8	298°22.1	43.8	282°45.6	45.7	194°44.2	57.5	330°11.3	33.4	Spica	158° 19.2	-11°18.7
6	23°37.3	313°22.9	$N17^{\circ}44.1$	297°46.3	N23°45.8	209°46.3	N03°57.3	345°13.6	N12°33.5	Alkaid	152°49.8	49°10.5
7	38°39.7	328°23.7	44.3	$312^{\circ}46.9$	45.9	224°48.4	57.2	$0^{\circ}15.9$	33.5		132 49.8 148°31.7	-60°30.9
8	53°42.2	343°24.6	44.5	327°47.5	46.0	239°50.5	57.0	15° 18.2	33.5	Hadar		
9	68°44.6	358° 25.4	• • 44.8	342°48.1	46.0	254°52.6	56.9	30° 20.5	33.6	Menkent	147°54.1	-36°30.8
10	83°47.1	13°26.2	45.0	357°48.7	46.1	269°54.8	56.7	45°22.8	33.6	Arcturus	145°45.2	19°02.1
										Rigil Kent.	139°36.0	-60°57.5
11	98°49.6	28°27.0	45.2	12°49.3	46.2	284°56.9	56.5	60°25.1	33.7	Kochab	$137^{\circ}19.6$	74°02.5
12	113°52.0	43°27.8	N17° 45.5	27°49.9	N23°46.3	299°59.0	N03°56.4	75°27.4	N12°33.7	Zuben'ubi	136°52.7	-16°09.7
13	128°54.5	58° 28.6	45.7	42°50.5	46.3	315°01.1	56.2	90°29.7	33.7	Alphecca	$126^{\circ}01.1$	26°37.3
14	143°57.0	73°29.4	45.9	57°51.1	46.4	330°03.2	56.1	105°32.1	33.8	Antares	112°12.0	-26°29.7
15	158°59.4	88°30.1	• • 46.2	72°51.7	• • 46.5	345°05.3	• • 55.9	120°34.4	• • 33.8	Atria	107°03.1	-69°04.8
16	174°01.9	103°30.9	46.4	87°52.3	46.6	0°07.4	55.8	135°36.7	33.9		107 03.1 101°59.2	-09 04.8 -15°45.5
17	189°04.4	118°31.7	46.6	102°52.9	46.6	$15^{\circ}09.5$	55.6	150°39.0	33.9	Sabik		
18	204°06.8	133°32.5	N17°46.9	117°53.5	N23°46.7	30°11.7	N03°55.4	165°41.3	N12°34.0	Shaula	96°06.1	-37°07.4
19	219°09.3	148°33.3	47.4	132°54.1	16.0	45°13.8	55.3	180°43.6	34.0	Rasalhague	95°55.6	12°32.5
	219 09.3 234°11.7		47.1		46.8					Eltanin	90°40.3	51°29.3
20		163°34.1	47.3	147°54.7	46.8	60°15.9	55.1	195°45.9	34.0	Kaus Aust.	83°28.3	-34°22.1
21	249°14.2	178°34.9	• • 47.6	162°55.3	• • 46.9	75°18.0	• • 55.0	210°48.2	• • 34.1	Vega	80°30.8	38°48.8
22	264°16.7	193°35.6	47.8	177°55.9	47.0	90°20.1	54.8	225°50.5	34.1	Nunki	75°43.8	-26°15.5
23	279°19.1	208°36.4	48.0	192°56.5	47.1	105°22.2	54.6	240°52.8	34.2	Altair	61°56.8	8°56.8
Morn	ass. 04:26	10 8' d0	.2′ m-4.65	υ0 6' d0	.1′ m1.51	1/2 1/ d 0	.2′ m-1.81	1/2 3/ 40	.0′ m0.40	Peacock	53°00.7	-56°38.3
- IVIEL.P	455. 04.20	νο.σ ασ.	.2 111-4.03	νο.ο do	.1 1111.31	ν2.1 u-0	.2 111-1.01	ν2.3 d0	.0 1110.40	Deneb	49°23.3	45°23.0
										Enif	33°35.7	10°00.5
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	294°21.6	223°37.2	N17°48.3		N23°47.1	120°24.3	N03°54.5		N12°34.2	Al Na'ir	27°29.0	-46°49.0
1	309°24.1	238°38.0	48.5	222°57.7	47.2	135°26.4	54.3	270°57.4	34.2	Fomalhaut	15°11.2	-29°28.0
2	324°26.5	253° 38.7	48.7	237°58.3	47.2	150°28.5	54.3	285° 59.7	34.2	Scheat	13°42.1	28°14.3
										Markab	13°26.8	15°21.6
3	339°29.0	268°39.5	• • 49.0	252°58.9	• • 47.3	165°30.7	• • 54.0	301°02.1	• • 34.3	1 14 5 1	Ç LI A	Ma: :
4	354°31.5	283°40.3	49.2	267°59.5	47.4	180°32.8	53.9	316°04.4	34.4	Jul 14 Fri	SHA	Mer.pass
5	9°33.9	298°41.0	49.4	283°00.1	47.5	195°34.9	53.7	331°06.7	34.4		290°34.4	09:08
6	24°36.4	313°41.8	N17°49.7	298°00.8	N23°47.5	210°37.0	N03°53.5	346°09.0	N12°34.4	Mars		10:10
7	39°38.9	328° 42.5	49.9	313°01.4	47.6	225°39.1	53.4	1°11.3	34.5		186°19.5	16:03
8	54°41.3	343°43.3	50.2	328°02.0	47.7	240°41.2	53.2	$16^{\circ}13.6$	34.5	Saturn	321°41.2	07:03
9	69°43.8	$358^{\circ}44.1$	• • 50.4	343°02.6	• • 47.7	255°43.3	• • 53.1	31°15.9	• • 34.6	1.1.15.0	CIIA	N45::::-
10	84°46.2	13°44.8	50.6	358°03.2	47.8	270°45.4	52.9	46°18.2	34.6	Jul 15 Sat	SHA	Mer.pass
11	99°48.7	28°45.6	50.9	13°03.8	47.9	285°47.5	52.7	61°20.5	34.6		289°55.6	09:06
12	114°51.2	43°46.3	N17°51.1	28°04.4	N23°47.9	300°49.7	N03°52.6	76°22.8	N12°34.7		274°20.2	10:09
13	129°53.6	58°47.1	51.4	43°05.0	48.0	315°51.8	52.4	91°25.1	34.7		186°11.1	16:00
14	144°56.1	73°47.8	51.6	58°05.6	48.1	330°53.9	52.3	106°27.5	34.8	Saturn	321°37.3	06:59
15	159°58.6	88°48.6	• • 51.8	73°06.2	• 48.1	345°56.0	52.1	100° 27.3° 121° 29.8	• • 34.8	11.1.0.0	CIIA	Me::::
										Jul 16 Sun	SHA	Mer.pass
16	175°01.0	103°49.3	52.1	88°06.8	48.2	0°58.1	51.9	136°32.1	34.8	Venus		09:05
17	190°03.5	118°50.0	52.3	103°07.4	48.3	16°00.2	51.8	151°34.4	34.9		273°35.5	10:08
18	205°06.0	133°50.8	N17°52.6	118°08.0	N23°48.3	31°02.3	N03°51.6	166°36.7	N12°34.9	Jupiter	186°02.7	15:56
19	220°08.4	148°51.5	52.8	133°08.6	48.4	46°04.4	51.5	181°39.0	34.9	Saturn		06:55
20	$235^{\circ}10.9$	163°52.2	53.0	148°09.2	48.5	$61^{\circ}06.5$	51.3	196°41.3	35.0			
21	250°13.4	178°53.0	• • 53.3	163°09.8	• • 48.5	76°08.6	• • 51.2	211°43.6	• • 35.0	Horizon	al parallax	
22	$265^{\circ}15.8$	193°53.7	53.5	178°10.4	48.6	91°10.7	51.0	226°45.9	35.1		Venus:	0.3
23	280°18.3	208°54.4	53.8	193°11.0	48.6	106°12.8	50.8	241°48.3	35.1		Mars:	0.1
Mer.p	ass. 04:22	ν 0.8′ d 0.	.2′ m-4.64	u0.6′ d 0	.1' m1.52	ν 2.1′ d-0	.2′ m-1.81	ν 2.3′ d0	.0′ m0.40			

1		Moon			n	Su	h
1	d HP	Dec	ν	GHA	Dec	GHA	Fri
2	12.2' 54.4'	N09°40.5	15.8'	283°02.6	N21°37.5	178°31.6	0
3	12.2' 54.4'	09°52.7	15.8'		37.1	193°31.5	1
4	12.2' 54.5'						
5							
6							
7							
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10 328°30.9 33.7 66°48.4 15.3' 11°41.2 11.9' 11 343°30.9 33.3 83°22.6 15.2' 11°53.1 11.8' 12 358°30.8 N21°32.9 97°55.6 15.2' N12°04.9 11.8' 13 13°30.8 32.5 112°31.0 15.1' 12°16.7 11.8' 14 28°30.7 32.1 127°05.1 15.0' 12°28.5 11.7' 15 443°30.6 31.3 156°13.1 14.9' 12°51.9 11.6' 16 58°30.6 31.3 156°13.1 14.9' 12°51.9 11.6' 17 73°30.5 30.9 170°47.1 14.9' 13°03.5 11.6' 18 88°30.4 N21°30.5 185°20.9 14.8' N13°15.1 11.5' 19 103°30.4 30.1 199°54.7 14.7' 13°26.6 11.5' 10 133°30.2 2.93 229°02.1 14.6' 13°49.5 11.4' 22 148°30.2 28.9 243°35.7 14.5' 14°00.9 11.3' 23 163°30.1 28.5 258°09.2 14.4' 14°12.3 11.3' SD = 15.7' d = -0.4' SD = 14.8' Sat GHA Dec GHA V Dec d d d d d d d d d	12.0' 54.5'						
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	11.5' 54.7'				N21°30.5		18
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7	11.0' 54.9'						
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9 313°29.5 ··· 24.5 43°40.3 13.7' 16°02.9 10.8' 10 328°29.4 24.1 58°13.0 13.6' 16°13.6 10.7' 11 343°29.4 23.7 72°45.6 13.5' 16°24.3 10.6' 12 358°29.3 N21°23.3 87°18.2 13.5' N16°35.0 10.6' 13 13°29.3 22.9 101°50.6 13.4' 16°45.5 10.5' 14 28°29.2 22.5 116°23.0 13.3' 16°56.0 10.4' 15 43°29.1 ··· 22.1 130°55.3 13.2' 17°06.5 10.4' 16 58°29.1 21.7 145°27.5 13.1' 17°16.9 10.3' 17 73°29.0 21.3 159°59.6 13.0' 17°27.2 10.2' 18 88°29.0 N21°20.9 174°31.6 12.9' N17°37.4 10.2' 20 118°28.9 20.0 203°35.4 12.8' 17°57.7 10.0' 21 133°28.8 ··· 19.6 218°07.2 12.7' 12.7' 12.5' 18°27.6 9.8' $SD = 15.7'$ $d = -0.4'$ $SD = 15.0'$ Sun GHA Dec GHA ν Dec ν GHA ν Dec ν							
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16 $58^{\circ}29.1$ 21.7 $145^{\circ}27.5$ 13.1 $17^{\circ}16.9$ 10.3 17 $73^{\circ}29.0$ 21.3 $159^{\circ}59.6$ 13.0 $17^{\circ}27.2$ 10.2 18 $88^{\circ}29.0$ N21°20.9 $174^{\circ}31.6$ 12.9 N17°37.4 10.2 19 103°28.9 20.4 189°03.6 12.9 $17^{\circ}47.6$ 10.1 20 $118^{\circ}28.9$ 20.0 203°35.4 12.8 $17^{\circ}57.7$ 10.0 21 $133^{\circ}28.8$ $\cdot \cdot \cdot 19.6$ 218°07.2 12.7 $18^{\circ}07.7$ 10.0 22 $148^{\circ}28.7$ 19.2 232°38.9 12.6 $18^{\circ}17.7$ 9.9 23 $163^{\circ}28.7$ 18.8 $247^{\circ}10.4$ 12.5 $18^{\circ}27.6$ 9.8 $178^{\circ}28.6$ N21°18.4 261°41.9 12.4 N18°37.4 9.7 11 193°28.6 18.0 276°13.4 12.3 $18^{\circ}47.1$ 9.7 2 208°28.5 17.6 290°44.7 12.2 $18^{\circ}56.8$ 9.6 3 223°28.5 $\cdot \cdot \cdot 17.1$ 305°15.9 12.1 $19^{\circ}06.4$ 9.5 4 238°28.4 16.7 319°47.0 12.0 $19^{\circ}15.9$ 9.4 2 238°28.3 N21°15.9 348°49.0 11.8 N19°34.7 9.3 7 283°28.2 15.5 3°19.9 11.8 19°44.0 9.2 19 313°28.1 $\cdot \cdot \cdot 14.6$ 32°21.3 11.6 20°02.3 9.0 10 328°28.1 14.2 46°51.8 11.5 20°11.8 8.9 11 343°28.0 13.8 61°22.3 11.4 20°20.2 8.8 10.2 11.4 20°20.2 8.8 11.4 20°20.2 8.8							
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Sun GHA Dec GHA ν Dec d 0 178°28.6 N21°18.4 261°41.9 12.4' N18°37.4 9.7' 1 193°28.6 18.0 276°13.4 12.3' 18°47.1 9.7' 2 208°28.5 17.6 290°44.7 12.2' 18°56.8 9.6' 3 223°28.5 · · 17.1 305°15.9 12.1' 19°06.4 9.5' 4 238°28.4 16.7 319°47.0 12.0' 19°15.9 9.4' 5 253°28.3 16.3 334°18.1 11.9' 19°25.3 9.4' 6 268°28.3 N21°15.9 348°49.0 11.8' N19°34.7 9.3' 7 283°28.2 15.5 3°19.9 11.8' 19°44.0 9.2' 8 298°28.2 15.1 17°50.6 11.7' 19°53.2 9.1' 9 313°28.1 · · 14.6 32°21.3 11.6' 20°02.3 9.0' 10 328°28	3.0 00.1						20
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	8.9' 55.7'	$20^{\circ}11.3$		46°51.8		328°28.1	
10 250°00 N01°12 / 75°50 7 11 2' N00°00 1 0 0'	8.8' 55.7'						
	8.8' 55.8'	N20°29.1	11.3'	75°52.7	N21°13.4	358°28.0	12
	8.7' 55.8' 8.6' 55.8'						
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17 73°27.7 11.3 148°23.0 10.8' 21°11.9 8.3'	8.3' 55.9'	$21^{\circ}11.9$	10.8'	148°23.0	11.3	73°27.7	17
	8.2' 55.9'						
	8.1' 56.0'						
	8.0' 56.0' 7.9' 56.0'						
	7.9 56.0 7.8' 56.1'						
	7.7' 56.1'						
SD = 15.7' d = -0.4' $SD = 15.1'$		= 15.1'	SE		d = -0.4'	SD = 15.7'	

			2028	July 1	4 to Ju	I. 16 U
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°						
N 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	////
N 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
N 40°	03:32	04:12	04:44	19:28	19:59	20:39
35°	03:53	04:29	04:58	19:14	19:43	20:18
30°	04:10	04:43	05:09	19:02	19:29	20:02
20°	04:37	05:05	05:29	18:43	19:07	19:35
N 10°	04:57	05:24	05:47	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:16	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:18	17:44	18:13
35°	06:07	06:38	07:05	17:07	17:35	18:06
40°	06:15	06:48	07:18	16:54	17:24	17:58
45°	06:24	07:00	07:33	16:39	17:12	17:49
S 50°	06:34	07:14	07:51	16:21	16:58	17:39
52°	06:38	07:21	08:00	16:13	16:52	17:34
54°	06:43	07:28	08:10	16:03	16:45	17:30
56°	06:48	07:36	08:20	15:52	16:37	17:24
58°	06:54	07:44	08:33	15:40	16:28	17:19
S 60°	07:00	07:54	08:48	15:25	16:18	17:13
1 -4		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	20:30	19:07		14:24	17:20	
N 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

Lat.		Moonris	e	Moonset			
Lat.	Fri	Sat	Sun	Fri	Sat	Sun	
N 72°	20:30	19:07		14:24	17:20		
N 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	
N 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	
N 10°	23:39		00:21	11:36	12:23	13:14	
0°	23:49		00:35	11:27	12:11	12:58	
S 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	
S 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	
S 60°	00:18	01:41	03:08	10:00	10:05	10:13	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Mars	Jupiter		Saturn		Stars	
Mon	GHA	GHA Dec	GHA Dec	GHA	Dec	GHA Dec		SHA	Dec
0	295°20.7	223°55.2 N17°54.0	208°11.7 N23°48.7		3°50.7	256°50.6 N12°35.1			
1	310°23.2	238°55.9 54.3	223°12.3 48.8	136°17.1	50.5	271°52.9 35.2		357°31.6	29°14.9
2	325°25.7	253°56.6 54.5	238°12.9 48.8	151°19.2	50.4	286°55.2 35.2		353°04.2	-42°08.7
3	340°28.1	268°57.3 · · 54.7	253°13.5 · · 48.9		• 50.2	301°57.5 · · 35.3		349°27.5	56°41.5
4	355°30.6	283°58.0 55.0	268°14.1 48.9	181°23.4	50.0	316°59.8 35.3		348°44.4	-17°49.6 -57°05.1
5	$10^{\circ}33.1$	298°58.8 55.2	283°14.7 49.0	196°25.5	49.9	332°02.1 35.3		335°18.2 327°47.9	-57 U5.1 23°35.8
6	25°35.5	313°59.5 N17°55.5	298°15.3 N23°49.1		3°49.7	347°04.4 N12°35.4		312°39.2	23 35.6 89°22.7
7	40°38.0	329°00.2 55.7	313°15.9 49.1	226°29.7	49.6	2°06.8 35.4		315°09.8	-40°11.1
8	55°40.5	344°00.9 56.0	328°16.5 49.2	241°31.8	49.4	17°09.1 35.5		314°03.2	4°12.1
9	70°42.9	359°01.6 · · 56.2	343°17.1 · · 49.2		• 49.2	32°11.4 · · 35.5		308°24.3	49°57.5
10	85°45.4	14°02.3 56.5	358°17.7 49.3	271°36.0	49.1	47°13.7 35.5		290°36.5	16°33.9
11	100°47.9	29°03.0 56.7 44°03.7 N17°56.9	13°18.3 49.4	286°38.1	48.9	62°16.0 35.6	Rigel	281°01.4	-8°10.1
12 13	115°50.3 130°52.8	44°03.7 N17°56.9 59°04.4 57.2	28°18.9 N23°49.4 43°19.5 49.5	301°40.2 NO 316°42.3	3°48.7 48.6	77°18.3 N12°35.6 92°20.6 35.6		280°18.0	46°01.4
14	130 52.6 145°55.2	74°05.1 57.4	45 19.5 49.5 58°20.1 49.5	331°44.4	48.4	107°22.9 35.7	Bellatrix	278°20.1	6°22.5
15	160°57.7	89°05.8 · · 57.7	73°20.8 · · 49.6		• 48.3	122°25.3 · · 35.7		277°58.5	28° 37.8
16	176°00.2	104°06.5 57.9	88°21.4 49.6	1°48.7	48.1	137° 27.6 35.8		275°35.1	-1°11.0
17	191°02.6	119°07.2 58.2	103°22.0 49.7	16°50.8	47.9	152°29.9 35.8		270°49.3	7°24.7
18	206°05.1	134°07.9 N17°58.4	118°22.6 N23°49.8		3°47.8	167°32.2 N12°35.8		263°51.6	-52°42.6
19	221°07.6	149°08.6 58.7	133°23.2 49.8	46°55.0	47.6	182°34.5 35.9		258°24.0	-16°45.3 -29°00.7
20	$236^{\circ}10.0$	164°09.3 58.9	148°23.8 49.9	61°57.1	47.5	197°36.8 35.9		255°04.0 244°48.2	5°09.0
21	251°12.5	179°10.0 · · 59.2	163°24.4 · · 49.9	76°59.2 •	• 47.3	212°39.1 · · 35.9	,	244 46.2 243°14.2	27°57.3
22	266°15.0	194° 10.7 59.4	178°25.0 50.0	92°01.3	47.1	227°41.5 36.0		234°14.1	-59°36.2
23	281°17.4	209°11.3 59.7	193°25.6 50.0	107°03.4	47.0	242°43.8 36.0		222°44.6	-43°33.0
Mer.n	ass. 04:18	ν0.7' d0.2' m-4.63	ν0.6' d0.1' m1.52	$\nu 2.1' \ d$ -0.2' r	n-1.81	$\nu 2.3' \ d0.0' \ m0.40$		221°38.4	-69°50.3
сг.р								217°45.2	-8°47.0
_	G114	6114 B	C114 D	6114	_	6114 B		207°31.7	11°49.6
Tue	GHA	GHA Dec	GHA Dec		Dec	GHA Dec	Dubhe	193°38.1	61°36.0
0	296°19.9 311°22.3	224°12.0 N17°59.9 239°12.7 18°00.2	208°26.2 N23°50.1 223°26.8 50.1	122°05.5 NO 137°07.6	3°46.8	257°46.1 N12°36.1 272°48.4 36.1		182°22.2	14°24.8
1 2	311 22.3 326°24.8	_	223°26.8 50.1 238°27.4 50.2	152°09.7	46.7 46.5	287°50.7 36.1		175°40.7	-17°42.2
3	341°27.3	254°13.4 00.4 269°14.0 · · 00.7	253°28.0 · · 50.2		• 46.3	302°53.0 · · 36.2		172°56.9	-63°15.8
4	356°29.7	284°14.7 00.9	268°28.7 50.3	182°13.9	46.2	317°55.4 36.2		171°48.5	-57°16.7
5	11°32.2	299° 15.4 01.2	283°29.3 50.3	197°16.0	46.0	332°57.7 36.3		166°10.7	55°48.5
6	26°34.7	314°16.1 N18°01.4	298°29.9 N23°50.4		3°45.8	348°00.0 N12°36.3		158°19.3	-11°18.7
7	41°37.1	329°16.7 01.7	313°30.5 50.4	227°20.2	45.7	3°02.3 36.3		152°49.8	49° 10.5
8	56°39.6	344°17.4 01.9	328°31.1 50.5	242°22.3	45.5	18°04.6 36.4		148°31.7 147°54.1	-60°30.9 -36°30.8
9	71°42.1	359°18.1 ⋅ ⋅ 02.2	343°31.7 · · 50.5		• 45.4	33°06.9 · · 36.4		147 54.1 145°45.2	-30 30.8 19°02.1
10	86°44.5	14°18.7 02.4	358°32.3 50.6	272°26.5	45.2	48°09.3 36.4		139°36.0	-60° 57.5
11	101°47.0	29°19.4 02.7	13°32.9 50.6	287°28.6	45.0	63°11.6 36.5		137°19.7	74°02.5
12	116°49.5	44°20.0 N18°02.9	28°33.5 N23°50.7		3°44.9	78°13.9 N12°36.5		136°52.7	-16°09.7
13	131°51.9	59°20.7 03.2	43°34.1 50.7	317°32.8	44.7	93°16.2 36.5		126°01.1	26°37.3
14	146°54.4	74°21.3 03.4	58°34.7 50.8	332°34.9	44.5	108°18.5 36.6	Antares	112°12.0	-26°29.7
15	161°56.8	89°22.0 · · 03.7	73°35.4 · · 50.8		• 44.4	123°20.8 · · 36.6	Atria	$107^{\circ}03.1$	-69°04.8
16	176°59.3	104°22.6 03.9	88°36.0 50.9 103°36.6 50.9	2°39.1	44.2	138° 23.2 36.7 153° 25.5 36.7	Sabik	101°59.2	-15°45.5
17 18	192°01.8 207°04.2	119°23.3 04.2 134°23.9 N18°04.4	103°36.6 50.9 118°37.2 N23°51.0	17°41.2 32°43.3 NO	44.1 3°43.9	153°25.5 36.7 168°27.8 N12°36.7	Shaula	$96^{\circ}06.1$	-37°07.4
19	222°06.7	149°24.6 04.7	133°37.8 51.0	47°45.4	43.7	183°30.1 36.8	Rasalhague	95°55.6	12°32.5
20	237°09.2	164°25.2 04.9	148°38.4 51.1	62°47.5	43.6	198°32.4 36.8	Eltanin	90°40.4	51°29.3
21	252°11.6	179°25.9 · · 05.2	163°39.0 · · 51.1		• 43.4	213°34.7 · · 36.8	Kaus Aust.	83°28.3	-34°22.1
22	$267^{\circ}14.1$	194°26.5 05.4	178°39.6 51.1	92°51.7	43.2	228° 37.1 36.9	Vega	80°30.8	38°48.8 -26°15.5
23	$282^{\circ}16.6$	209°27.1 05.7	193°40.2 51.2	107°53.8	43.1	243°39.4 36.9	Nunki Altair	75°43.8 61°56.8	-20 15.5 8°56.8
Morn	ass. 04:14	ν0.7' d0.2' m-4.62	ν 0.6' d0.1' m1.52	$\nu 2.1' \ d$ -0.2' r	n 1 90	$\nu 2.3' \ d0.0' \ m0.39$	Peacock	53°00.7	-56°38.3
- Ivier.p	ass. 04.14	νο.τ αυ.2 III-4.02	νο.υ αυ.1 III1.32	ν2.1 α-0.2 I	11-1.00	V2.3 d0.0 1110.39	Deneb	49°23.3	45°23.0
							Enif	33°35.7	10°00.5
Wed	GHA	GHA Dec	GHA Dec		Dec	GHA Dec	Al Na'ir	27°29.0	-46°49.0
0	297°19.0	224°27.8 N18°05.9	208°40.8 N23°51.2		3°42.9	258°41.7 N12°37.0	Fomalhaut	15°11.1	-29°28.0
1	312°21.5	239°28.4 06.2	223°41.4 51.3	137°58.0	42.8	273°44.0 37.0	Scheat	$13^{\circ}42.1$	28°14.3
2	327°24.0	254°29.1 06.4 269°29.7 · · 06.7	238°42.1 51.3 253°42.7 · · 51.4	153°00.1	42.6	288°46.3 37.0 303°48.7 · · 37.1	Markab	13°26.8	15°21.6
3 4	342°26.4 357°28.9	269°29.7 · · 06.7 284°30.3 06.9	253°42.7 · · 51.4 268°43.3 51.4	168°02.2 • 183°04.3	· 42.4 42.3	303°48.7 · · · 37.1 318°51.0	Jul 17 Mon	SHA	Mer.pass
5	12°31.3	299°30.9 07.2	283°43.9 51.4	198°06.4	42.3	333°53.3 37.1		288°34.4	09:04
6	27°33.8	314°31.6 N18°07.4	298°44.5 N23°51.5		3°41.9	348°55.6 N12°37.2		272°50.9	10:07
7	42°36.3	329°32.2 07.7	313°45.1 51.5	228°10.6	41.8	3°57.9 37.2		185°54.2	15:53
8	57°38.7	344°32.8 07.9	328°45.7 51.6	243°12.7	41.6	19°00.3 37.2		321°29.8	06:52
9	72°41.2	359°33.4 · · 08.2	343°46.3 · · 51.6		• 41.5	34°02.6 · · 37.3			
10	87°43.7	14°34.0 08.5	358°46.9 51.6	273°16.9	41.3	49°04.9 37.3	Jul 18 Tue	SHA 287°52 1	Mer.pass
11	$102^{\circ}46.1$	29°34.7 08.7	13°47.6 51.7	288°19.0	41.1	64°07.2 37.4		287°52.1 272°06.3	09:03 10:06
12	117°48.6	44°35.3 N18°09.0	28°48.2 N23°51.7		3°41.0	79°09.5 N12°37.4		272 06.3 185°45.6	15:49
13	132°51.1	59°35.9 09.2	43°48.8 51.8	318°23.2	40.8	94°11.9 37.4		321°26.2	06:48
14	147°53.5	74°36.5 09.5	58°49.4 51.8	333°25.3	40.6	109°14.2 37.5			
15	162°56.0	89°37.1 · · 09.7	73°50.0 · · 51.8		40.5	124°16.5 · · 37.5	Jul 19 Wed	SHA	Mer.pass
16 17	177°58.5	104°37.7 10.0	88°50.6 51.9	3°29.5	40.3	139°18.8 37.5		287°08.8	09:02
17	193°00.9 208°03.4	119°38.3 10.2	103°51.2 51.9 118°51.8 N23°52.0	18°31.6	40.1	154°21.1 37.6 169°23.5 N12°37.6		271°21.8	10:05
18 19	208°03.4 223°05.8	134°38.9 N18°10.5 149°39.5 10.8	118°51.8 N23°52.0 133°52.4 52.0	33°33.7 NO 48°35.8	3°40.0 39.8	184°25.8 37.6		185°36.9	15:46
20	238°08.3	164° 40.1 11.0	133 52.4 52.0 148°53.1 52.0	63°37.9	39.6	199°28.1 37.7	Saturn	321°22.7	06:44
21	250 06.5 253°10.8	179°40.7 · · 11.3	163°53.7 · · 52.1		· 39.5	214°30.4 · · 37.7	Horizonta	l parallax	
22	268°13.2	194°41.3 11.5	178°54.3 52.1	93°42.1	39.3	229°32.8 37.7		Venus:	0.3
23	283°15.7	209°41.9 11.8	193°54.9 52.1	108°44.2	39.2	244°35.1 37.8		Mars:	0.1
	ass. 04:10	ν0.6' d0.3' m-4.62	ν0.6' d0.0' m1.52	$\nu 2.1' \ d$ -0.2' r		ν2.3' d0.0' m0.39			
- ivier.p	uss. U4.1U	νο.υ αυ. <u>σ III-4.02</u>	νο.υ αυ.υ III1.32	ν2.1 u-U.2 l	11-1.00	ν 2.3 αυ.υ IIIU.39			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.3	N21°08.3	249°49.4	10.1'	N22°07.9	7.6'	56.1'
1	193°27.3	07.8	264°18.4	10.0'	22°15.5	7.5'	56.2'
2	208°27.2 223°27.2	07.4 •• 07.0	278°47.4 293°16.3	9.9' 9.8'	22°23.0 22°30.4	7.4' 7.3'	56.2' 56.2'
4	238°27.1	06.5	307°45.0	9.7'	22°37.7	7.2'	56.3'
5	253°27.1	06.1	$322^{\circ}13.7$	9.6'	22°44.9	7.1'	56.3'
6	268°27.0	N21°05.7	336°42.3	9.5'	N22°51.9	6.9'	56.3'
7 8	283°27.0 298°26.9	05.2 04.8	351°10.7 5°39.1	9.4' 9.3'	22°58.9 23°05.7	6.8' 6.7'	56.4' 56.4'
9	313°26.9	04.4	20°07.4	9.2'	23°12.4	6.6'	56.4
10	328°26.8	03.9	34°35.5	9.1'	23°19.0	6.5'	56.5'
11	343°26.8	03.5	49°03.6	9.0'	23°25.5	6.4'	56.5'
12 13	358°26.7 13°26.7	N21°03.1 02.6	63°31.6 77°59.4	8.9' 8.8'	N23°31.9 23°38.2	6.3' 6.1'	56.5' 56.6'
14	28°26.6	02.0	92°27.2	8.7'	23°44.3	6.0'	56.6
15	43°26.6	• • 01.8	$106^{\circ}54.9$	8.6'	23°50.3	5.9'	56.6'
16	58°26.5	01.3	121°22.4	8.5'	23°56.2	5.8'	56.7'
17 18	73°26.5 88°26.4	00.9 N21°00.4	135°49.9 150°17.3	8.4' 8.3'	24°02.0 N24°07.6	5.6' 5.5'	56.7' 56.7'
19	103°26.4	21°00.0	164°44.6	8.2'	24°13.1	5.4	56.8'
20	118°26.3	$20^{\circ}59.6$	$179^{\circ}11.7$	8.1'	24°18.5	5.3'	56.8'
21	133°26.3	59.1	193°38.8	8.0'	24°23.8	5.1'	56.9'
22 23	148°26.2 163°26.2	58.7 58.2	208°05.8 222°32.7	7.9' 7.8'	24°28.9 24°33.9	5.0' 4.9'	56.9' 56.9'
23						7.9	30.9
	SD = 15.7'	d = -0.4'		SL	0 = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.1	N20° 57.8	236°59.5	7.7'	N24°38.7	4.7'	57.0'
1 2	193°26.1 208°26.0	57.3 56.9	251°26.2 265°52.8	7.6' 7.5'	24°43.5 24°48.1	4.6' 4.5'	57.0' 57.0'
3	208 20.0 223°26.0	56.4	205 52.6 280°19.4	7.3 7.4'	24 46.1 24°52.5	4.3	57.0 57.1'
4	238°26.0	56.0	294°45.8	7.3'	24°56.8	4.2'	57.1'
5	253°25.9	55.6	309°12.1	7.3'	25°01.0	4.0'	57.1'
6 7	268°25.9 283°25.8	N20°55.1 54.7	323°38.4 338°04.5	7.2' 7.1'	N25°05.0 25°08.9	3.9' 3.8'	57.2' 57.2'
8	298°25.8	54.2	352°30.6	7.1	25°12.7	3.6'	57.3'
9	313°25.7	• • 53.8	6°56.6	6.9'	25°16.3	3.5'	57.3'
10	328°25.7	53.3	21°22.5	6.8'	25°19.8	3.3'	57.3'
11 12	343°25.6 358°25.6	52.9 N20° 52.4	35°48.3 50°14.1	6.7' 6.7'	25°23.1 N25°26.3	3.2' 3.0'	57.4' 57.4'
13	13°25.6	52.0	64°39.7	6.6'	25°29.3	2.9'	57.4'
14	28°25.5	51.5	79°05.3	6.5'	25°32.2	2.7'	57.5'
15	43°25.5	51.1	93°30.8	6.4'	25°34.9	2.6'	57.5'
16 17	58°25.4 73°25.4	50.6 50.1	107°56.2 122°21.6	6.3' 6.3'	25°37.5 25°39.9	2.4' 2.3'	57.5' 57.6'
18	88°25.3	N20°49.7	136°46.9	6.2'	N25°42.1	2.1'	57.6'
19	103°25.3	49.2	151°12.1	6.1'	25°44.2	2.0'	57.7'
20	118°25.3	48.8	165°37.2 180°02.2		25°46.2 25°48.0	1.8'	57.7'
21 22	133°25.2 148°25.2	· · 48.3 47.9	180 02.2 194°27.2	6.0' 5.9'	25 48.0 25°49.6	1.6' 1.5'	57.7' 57.8'
23	163°25.1	47.4	208°52.1	5.9'	25°51.1	1.3'	57.8'
	SD = 15.7'	d = -0.4'		SE	0 = 15.5'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°25.1 193°25.0	N20° 46.9 46.5	223°17.0 237°41.8	5.8' 5.7'	N25°52.5 25°53.6	1.2' 1.0'	57.8' 57.9'
2	208°25.0	46.0	$252^{\circ}06.5$	5.7'	25°54.6	0.8'	57.9'
3	223°25.0	• • 45.6	266°31.2	5.6'	25°55.5	0.7'	57.9'
4 5	238°24.9 253°24.9	45.1 44.6	280°55.8 295°20.4	5.6' 5.5'	25°56.1 25°56.7	0.5' 0.4'	58.0' 58.0'
6	268°24.8	N20°44.2	309°44.9	5.4'	N25°57.0	0.4	58.1'
7	283°24.8	43.7	324°09.3	5.4'	25°57.2	0.0'	58.1'
8	298°24.8	43.3	338°33.7	5.3'	25°57.2	-0.1'	58.1'
9 10	313°24.7 328°24.7	· · 42.8 42.3	352°58.0 7°22.3	5.3' 5.2'	25°57.1 25°56.8	-0.3' -0.5'	58.2' 58.2'
11	343°24.7	41.9	21°46.6	5.2'	25°56.3	-0.6'	58.2
12	358°24.6	N20°41.4	$36^{\circ}10.8$	5.2'	N25°55.6	-0.8'	58.3'
13	13°24.6	40.9	50°35.0	5.1'	25°54.8	-1.0'	58.3'
14 15	28°24.5 43°24.5	40.5 •• 40.0	64°59.1 79°23.2	5.1' 5.0'	25°53.8 25°52.7	-1.2' -1.3'	58.3' 58.4'
16	58°24.5	39.5	93°47.2	5.0'	25°51.4	-1.5'	58.4
17	73°24.4	39.1	108°11.2	5.0'	25°49.9	-1.7'	58.5'
18 19	88°24.4 103°24.4	N20°38.6 38.1	122°35.2 136°59.2	5.0' 4.9'	N25°48.2 25°46.4	-1.8' -2.0'	58.5' 58.5'
20	103°24.4 118°24.3	38.1 37.6	136°59.2 151°23.1	4.9° 4.9°	25°46.4 25°44.3	-2.0' -2.2'	58.6'
21	133°24.3	• • 37.2	165°47.0	4.9'	25°42.2	-2.4'	58.6'
22	148°24.2	36.7	180°10.8	4.9'	25°39.8	-2.5'	58.6'
23	163°24.2	36.2	194°34.7	4.8'	25°37.3	-2.7'	58.7'
	SD = 15.7'	d = -0.5'		SE	0 = 15.8'		

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

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 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
N 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
S 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
S 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
S 60°	04:37	06:04	07:16	10:27	10:54	11:43

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Veni	us	M	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
			N18° 12.0		N23°52.2	123°46.3			N12°37.8		JIIA	Dec
0	298°18.2			208°55.5			N03°39.0	259° 37.4		Alpheratz	357°31.6	29°14.9
1	313°20.6	239°43.1	12.3	223°56.1	52.2	138°48.4	38.8	274°39.7	37.8	Ankaa	353°04.2	-42°08.7
2	328°23.1	254° 43.7	12.5	238°56.7	52.2	153°50.5	38.7	289°42.0	37.9	Schedar	349°27.4	56°41.5
3	343°25.6	269°44.3	• • 12.8	253°57.3	• • 52.3	168°52.6	• • 38.5	304°44.4	• • 37.9	Diphda	348°44.3	-17°49.5
4	358°28.0	284°44.9	13.1	268°58.0	52.3	183°54.7	38.3	319°46.7	38.0			
5	13°30.5	299° 45.4	13.3	283°58.6	52.3	198°56.8	38.2	334°49.0	38.0	Achernar	335°18.1	-57°05.1
6	28°33.0		N18° 13.6	298°59.2	N23°52.4	213°58.9	N03°38.0	349°51.3	N12°38.0	Hamal	327°47.9	23°35.8
7	43°35.4	329° 46.6	13.8	313°59.8	52.4	229°01.0	37.8	4°53.7	38.1	Polaris	312°37.4	89°22.7
										Acamar	315°09.8	-40°11.1
8	58°37.9	344° 47.2	14.1	329°00.4	52.4	244°03.1	37.7	19°56.0	38.1	Menkar	314°03.2	4°12.2
9	73°40.3	359° 47.8	• • 14.3	344°01.0	• • 52.5	259°05.2	• • 37.5	34°58.3	•• 38.1	Mirfak	308°24.2	49°57.5
10	88°42.8	14°48.3	14.6	359°01.6	52.5	274°07.3	37.3	50°00.6	38.2	Aldebaran	290°36.5	16°33.9
11	103°45.3	29°48.9	14.9	14°02.2	52.5	289°09.3	37.2	65°03.0	38.2			
12	118°47.7	44°49.5	N18° 15.1	29°02.9	N23°52.6	304°11.4	N03°37.0	80°05.3	N12°38.2	Rigel	281°01.3	-8°10.1
13	133°50.2	59°50.0	15.4	44°03.5	52.6	319°13.5	36.8	95°07.6	38.3	Capella	280°18.0	46°01.4
14	148°52.7	74°50.6	15.6	59°04.1	52.6	334°15.6	36.7	110°09.9	38.3	Bellatrix	278°20.0	6°22.5
15	163°55.1	89°51.2	15.9	74°04.7	• • 52.7	349°17.7	36.5	125°12.3	38.3	Elnath	277°58.5	28°37.8
										Alnilam	275°35.1	$-1^{\circ}11.0$
16	178°57.6	104°51.7	16.1	89°05.3	52.7	4°19.8	36.3	140°14.6	38.4	Betelgeuse	270°49.2	7°24.7
17	194°00.1	119°52.3	16.4	104°05.9	52.7	19°21.9	36.2	155° 16.9	38.4	Canopus	263°51.6	-52°42.6
18	209°02.5	134°52.9	N18° 16.7	119°06.5	N23°52.7	34°24.0	N03°36.0	$170^{\circ}19.2$	N12°38.4	Sirius	258°24.0	-16°45.3
19	224°05.0	149°53.4	16.9	134°07.1	52.8	49°26.1	35.9	185°21.6	38.5			-10° 43.3 -29° 00.6
20	239°07.5	164°54.0	17.2	149°07.8	52.8	64°28.2	35.7	200°23.9	38.5	Adhara	255°03.9	
21	254°09.9	179°54.5	• • 17.4	164°08.4	• • 52.8	79°30.3	• • 35.5	215°26.2	• • 38.5	Procyon	244°48.1	5°09.0
22	269°12.4	194°55.1	17.7	179°09.0	52.0	94°32.4	35.4	230°28.5	38.6	Pollux	243°14.2	27°57.3
										Avior	$234^{\circ}14.1$	-59°36.2
23	284°14.8	209°55.7	17.9	194°09.6	52.9	109°34.5	35.2	245°30.9	38.6	Suhail	222°44.6	-43°33.0
Mern	ass. 04:06	ν 0.6' d0.3'	′ m-4 61	ν 0.6' d0	.0′ m1.53	ν2 1' d-0	.2′ m-1.79	v2 3' d0	.0′ m0.38	Miaplacidus	221°38.4	-69°50.2
- wier.p		ν σ.σ uσ.σ	III - T.UI	ν U.U UU		ν Δ.1 U-U	1.13	ν 2.5 u0		Alphard	221 36.4 217°45.2	-8°47.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.7	11°49.6
0	299°17.3		N18° 18.2	209°10.2	N23°52.9	124°36.6	N03°35.0	260°33.2	N12°38.6	Dubhe	193°38.1	61°35.9
	314°19.8	239° 56.8		209 10.2 224°10.8		139°38.7		275°35.5		Denebola	182°22.2	14°24.8
1			18.5		52.9		34.9		38.7	Gienah	175°40.7	-17°42.2
2	329°22.2	254°57.3	18.7	239°11.4	53.0	154°40.8	34.7	290°37.8	38.7	Acrux	172°56.9	-63°15.8
3	344°24.7	269°57.8	• • 19.0	254°12.1	• • 53.0	169°42.8	• • 34.5	305°40.2	• • 38.7		171°48.5	-57°16.7
4	359°27.2	284°58.4	19.2	$269^{\circ}12.7$	53.0	184°44.9	34.4	320°42.5	38.8	Alioth	166°10.7	55°48.5
5	14°29.6	299°58.9	19.5	284°13.3	53.0	199°47.0	34.2	335°44.8	38.8		158° 19.3	-11°18.7
6	29°32.1	314°59.5	N18° 19.8	299°13.9	N23°53.1	214°49.1	N03°34.0	350°47.1	N12°38.8	Spica		
7	44°34.6	330°00.0	20.0	314°14.5	53.1	229°51.2	33.9	5°49.5	38.9	Alkaid	152°49.8	49°10.5
8	59°37.0	345°00.6		329°15.1	53.1	244°53.3	33.7	20°51.8	38.9	Hadar	148°31.7	-60°30.9
			20.3							Menkent	$147^{\circ}54.1$	-36°30.8
9	74°39.5	0°01.1	• • 20.5	344°15.7	• • 53.1	259°55.4	• • 33.5	35°54.1	• • 38.9	Arcturus	145°45.2	19°02.1
10	89°42.0	15°01.6	20.8	359°16.4	53.2	274°57.5	33.4	50°56.5	39.0	Rigil Kent.	139°36.0	-60°57.5
11	104°44.4	30°02.2	21.0	14°17.0	53.2	289°59.6	33.2	65°58.8	39.0	Kochab	137°19.8	74°02.5
12	119°46.9	45°02.7	N18°21.3	29°17.6	N23°53.2	305°01.7	N03°33.0	81°01.1	N12°39.0		136°52.7	-16°09.7
13	134°49.3	60°03.2	21.6	44°18.2	53.2	320°03.8	32.9	96°03.4	39.1	Zuben'ubi		
14	149°51.8	75°03.7	21.8	59°18.8	53.2	335°05.9	32.7	111°05.8	39.1	Alphecca	126°01.1	26°37.3
15	164°54.3	90°04.3	22.1	74°19.4	• • 53.3	350°07.9	• • 32.5	126°08.1	39.1	Antares	112°12.0	-26°29.7
										Atria	$107^{\circ}03.1$	-69°04.8
16	179°56.7	105°04.8	22.3	89°20.1	53.3	5°10.0	32.4	141°10.4	39.2	Sabik	101°59.2	-15°45.5
17	194°59.2	120°05.3	22.6	104°20.7	53.3	20°12.1	32.2	156° 12.8	39.2	Shaula	$96^{\circ}06.1$	-37°07.4
18	210°01.7		N18°22.9	119°21.3	N23°53.3	35°14.2	N03°32.0		N12°39.2	Rasalhague	95°55.6	12°32.5
19	225°04.1	150°06.4	23.1	134°21.9	53.3	50°16.3	31.9	186° 17.4	39.3	Eltanin	90°40.4	51°29.3
20	240°06.6	165°06.9	23.4	149°22.5	53.4	65°18.4	31.7	201°19.7	39.3	Kaus Aust.	83°28.3	-34°22.1
21	255°09.1	180°07.4	• • 23.6	164°23.1	• • 53.4	80°20.5	• • 31.5	$216^{\circ}22.1$	• • 39.3			
22	270°11.5	195°07.9	23.9	179°23.8	53.4	95°22.6	31.4	231°24.4	39.4	Vega	80°30.8	38°48.8
23	285°14.0	210°08.4	24.2	194°24.4	53.4	110°24.7	31.2	246°26.7	39.4	Nunki	75°43.8	-26°15.5
23	203 14.0	210 00.4	24.2	194 24.4		110 24.7	J1.2	240 20.7	39.4	Altair	61°56.8	8°56.8
Mer.p	ass. 04:02	ν 0.5′ d0.3′	′ m-4.60	ν 0.6′ d0	.0′ m1.53	$\nu 2.1' \ d-0$.2′ m-1.79	$\nu 2.3' \ d0$.0′ m0.38	Peacock	53°00.7	-56°38.3
										Deneb	49°23.3	45°23.0
										Enif	33°35.6	10°00.5
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°49.0
0	$300^{\circ}16.4$	225°08.9	N18° 24.4	209°25.0	N23°53.4	125°26.8	N03°31.0	$261^{\circ}29.1$	$N12^{\circ}39.4$	Fomalhaut	15°11.1	-29°27.9
1	315°18.9	240°09.4	24.7	224°25.6	53.5	140°28.8	30.8	276°31.4	39.5	Scheat	13°42.1	28°14.3
2	330°21.4	255°09.9	24.9	239°26.2	53.5	155°30.9	30.7	291°33.7	39.5			
3	345°23.8	270° 10.5	25.2	254°26.8	• • 53.5	170°33.0	• • 30.5	306°36.0	• • 39.5	Markab	13°26.8	15°21.7
4	0°26.3	285°11.0		269°27.5		185°35.1	30.3	321°38.4		Jul 20 Thu	SHA	Mer.pass
			25.5		53.5				39.6			
5	15°28.8	300°11.5	25.7	284°28.1	53.5	200°37.2	30.2	336°40.7	39.6	Venus		09:01
6	30°31.2		N18°26.0	299°28.7	N23°53.5	215°39.3	N03°30.0	351°43.0	N12°39.6	Mars		10:04
7	45°33.7	330°12.5	26.2	314°29.3	53.6	230°41.4	29.8	6°45.4	39.7		185°28.1	15:43
8	60°36.2	345°13.0	26.5	329°29.9	53.6	245°43.5	29.7	21°47.7	39.7	Saturn	321°19.2	06:40
9	75°38.6	0°13.5	• • 26.8	344°30.5	• • 53.6	260°45.6	• • 29.5	36°50.0	• • 39.7		c	
10	90°41.1	15° 13.9	27.0	359°31.2	53.6	275°47.6	29.3	51°52.4	39.8	Jul 21 Fri	SHA	Mer.pass
11	105°43.6	30° 14.4	27.3	14°31.8	53.6	290°49.7	29.2	66°54.7	39.8	Venus	285°38.9	09:00
										Mars	269°52.9	10:03
12	120°46.0		N18° 27.5	29°32.4	N23°53.6	305°51.8	N03°29.0	81°57.0	N12°39.8		185°19.3	15:39
13	135°48.5	60°15.4	27.8	44°33.0	53.6	320°53.9	28.8	96°59.4	39.9	Saturn	321°15.9	06:37
14	150°50.9	75° 15.9	28.0	59°33.6	53.6	335°56.0	28.7	112°01.7	39.9	Jutuill	10.3	55.51
15	165°53.4	$90^{\circ}16.4$	• • 28.3	74°34.2	• • 53.7	$350^{\circ}58.1$	• • 28.5	$127^{\circ}04.0$	• • 39.9	Jul 22 Sat	SHA	Mer.pass
16	180°55.9	105° 16.9	28.6	89°34.9	53.7	6°00.2	28.3	142°06.4	40.0	Venus		08:59
17	195°58.3	120° 17.4	28.8	104°35.5	53.7	21°02.3	28.2	157°08.7	40.0	Mars		10:02
18	211°00.8		N18° 29.1		N23°53.7	36°04.3	N03°28.0	172°11.0	N12°40.0			
											185°10.3	15:36
19	226°03.3	150° 18.3	29.3	134°36.7	53.7	51°06.4	27.8	187°13.4	40.1	Saturn	321°12.6	06:33
20	241°05.7	165° 18.8	29.6	149°37.3	53.7	66°08.5	27.7	202° 15.7	40.1		-1 "	
21	256°08.2	$180^{\circ}19.3$	• • 29.9	164°38.0	• • 53.7	$81^{\circ}10.6$	• • 27.5	$217^{\circ}18.0$	• • 40.1	Horizont	al parallax	
22	$271^{\circ}10.7$	195° 19.8	30.1	179°38.6	53.7	$96^{\circ}12.7$	27.3	232°20.4	40.1		Venus:	0.3
23	$286^{\circ}13.1$	210°20.2	30.4	194°39.2	53.7	111°14.8	27.1	247°22.7	40.2		Mars:	0.1
Mer.p	ass. 03:58	ν 0.5′ d0.3′	′ m-4.59	u0.6′ d0	.0′ m1.53	$\nu 2.1' \ d-0$.2′ m-1.79	ν 2.3′ d0	.0′ m0.38			

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.2	N20°35.8	$208^{\circ}58.5$	4.8'	$N25^{\circ}34.6$	-2.9'	58.7'
1	193°24.1 208°24.1	35.3 34.8	223°22.3 237°46.1	4.8' 4.8'	25°31.7 25°28.7	-3.0' -3.2'	58.7'
2	208 24.1 223°24.1	· · 34.8	252°09.9	4.8'	25 28.7 25°25.5	-3.2 -3.4'	58.8' 58.8'
4	238°24.0	33.9	266°33.7	4.8'	25°22.1	-3.6'	58.8'
5	253°24.0	33.4	280° 57.5	4.8'	25° 18.5	-3.7'	58.9'
6	268°24.0	N20°32.9	295°21.2 309°45.0	4.7'	N25°14.8 25°10.9	-3.9'	58.9'
7 8	283°23.9 298°23.9	32.4 32.0	309°45.0 324°08.7	4.7' 4.7'	25°10.9 25°06.8	-4.1' -4.3'	58.9' 59.0'
9	313°23.9	• • 31.5	338° 32.5	4.7'	25°02.6	-4.4'	59.0'
10	328°23.8	31.0	$352^{\circ}56.2$	4.7'	24°58.1	-4.6'	59.0'
11	343°23.8 358°23.8	30.5	7°19.9 21°43.7	4.8'	24°53.5 N24°48.8	-4.8'	59.1'
12 13	358°23.8 13°23.7	N20° 30.0 29.6	21°43.7 36°07.4	4.8' 4.8'	N24 48.8 24°43.8	-4.9' -5.1'	59.1' 59.1'
14	28°23.7	29.1	50°31.2	4.8'	24°38.7	-5.3'	59.2'
15	43°23.7	• • 28.6	64°55.0	4.8'	24°33.4	-5.5'	59.2'
16	58°23.6	28.1	79° 18.8	4.8'	24°28.0 24°22.4	-5.6'	59.2'
17 18	73°23.6 88°23.6	27.6 N20°27.1	93°42.6 108°06.4	4.8' 4.8'	N24° 16.6	-5.8' -6.0'	59.3' 59.3'
19	103°23.5	26.7	122°30.2	4.9'	24° 10.6	-6.1'	59.3'
20	118°23.5	26.2	$136^{\circ}54.1$	4.9'	24°04.5	-6.3'	59.4'
21	133°23.5	• • 25.7	151°18.0	4.9'	23°58.2	-6.5'	59.4'
22 23	148°23.5 163°23.4	25.2 24.7	165°41.9 180°05.8	4.9' 5.0'	23°51.7 23°45.1	-6.6' -6.8'	59.4' 59.4'
23						0.0	J.JT
	SD = 15.7'	d = -0.5'		5	D = 16.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.4	N20°24.2	194°29.7	5.0'	N23°38.3	-7.0'	59.5'
1	193°23.4 208°23.3	23.7 23.3	208°53.7 223°17.7	5.0' 5.0'	23°31.3 23°24.2	-7.1' -7.3'	59.5' 59.5'
2	208°23.3 223°23.3	23.3	223°17.7 237°41.8	5.0	23° 24.2 23° 16.9	-7.5'	59.5' 59.6'
4	238°23.3	22.3	252°05.8	5.1'	23°09.5	-7.6'	59.6'
5	253°23.3	21.8	266°30.0	5.1'	23°01.9	-7.8'	59.6'
6	268°23.2 283°23.2	N20°21.3 20.8	280°54.1 295°18.3	5.2' 5.2'	N22°54.1 22°46.1	-7.9' -8.1'	59.6' 59.7'
7 8	283°23.2 298°23.2	20.8	295° 18.3 309° 42.5	5.2	22°46.1 22°38.0	-8.1 -8.3	59.7' 59.7'
9	313°23.1	• • 19.8	324°06.8	5.3'	22°29.8	-8.4	59.7'
10	328°23.1	19.3	338°31.1	5.3'	22°21.4	-8.6'	59.7'
11	343°23.1 358°23.1	18.8 N20°18.3	352°55.4 7°19.8	5.4' 5.4'	22°12.8 N22°04.1	-8.7' -8.9'	59.8' 59.8'
12 13	13°23.1	N20 18.3 17.8	7 19.8 21°44.3	5.4 5.5'	N22 04.1 21°55.2	-8.9 -9.0'	59.8'
14	28°23.0	17.3	36°08.7	5.5'	21°46.2	-9.2	59.8'
15	43°23.0	•• 16.8	50°33.3	5.6'	21°37.0	-9.3'	59.9'
16 17	58°23.0 73°22.9	16.3 15.9	64°57.9 79°22.5	5.6' 5.7'	21°27.7 21°18.2	-9.5' -9.6'	59.9' 59.9'
18	88°22.9	N20° 15.4	93°47.2	5.7'	N21°08.6	-9.8'	59.9'
19	103°22.9	14.9	108°11.9	5.8'	20°58.8	-9.9'	60.0'
20	118°22.9	14.4	122°36.7		20°48.8		60.0'
21 22	133°22.8 148°22.8	· · 13.9 13.4	137°01.6 151°26.5	5.9' 6.0'	20°38.8 20°28.6	-10.2' -10.4'	60.0' 60.0'
23	163°22.8	12.9	165°51.4	6.0'	20° 28.0	-10.4	60.0
	SD = 15.7'	d = -0.5'			D = 16.2'		
		u = -0.5			J — 10.2		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.8	N20°12.4	180° 16.5	6.1'	N20°07.7	-10.6'	60.1'
1 2	193°22.7 208°22.7	11.9 11.3	194°41.5 209°06.7	6.1' 6.2'	19°57.1 19°46.3	-10.8' -10.9'	60.1' 60.1'
3	223°22.7	10.8	223°31.9	6.3	19°35.4	-11.0'	60.1
4	238°22.7	10.3	237°57.1	6.3'	19°24.4	-11.2'	60.1'
5	253°22.7 268°22.6	09.8 N20°09.3	252°22.5 266°47.8	6.4' 6.4'	19°13.2 N19°01.9	-11.3' -11.4'	60.2' 60.2'
6 7	268°22.6 283°22.6	N20°09.3 08.8	266°47.8 281°13.3	6.4	18° 50.5	-11.4° -11.6'	60.2'
8	298°22.6	08.3	295°38.8	6.6'	18°38.9	-11.7'	60.2
9	313°22.6	• • 07.8	310°04.3	6.6'	18°27.2	-11.8'	60.2'
10 11	328°22.5 343°22.5	07.3 06.8	324°30.0 338°55.7	6.7' 6.8'	18° 15.4 18° 03.5	-11.9' -12.1'	60.3' 60.3'
12	343 22.5 358°22.5	N20°06.3	358 55.7 353°21.4	6.8	N17°51.4	-12.1	60.3
13	13°22.5	05.8	7°47.3	6.9'	17°39.2	-12.3'	60.3'
14	28°22.5	05.3	22°13.2	7.0'	17°26.9	-12.4'	60.3'
15 16	43°22.4 58°22.4	· · 04.8 04.2	36°39.1 51°05.1	7.0' 7.1'	17°14.5 17°02.0	-12.5' -12.6'	60.3' 60.3'
16 17	58°22.4 73°22.4	04.2 03.7	65°31.2	7.1° 7.2'	17°02.0 16°49.3	-12.6' -12.8'	60.4
18	88°22.4	N20°03.2	79°57.4	7.2'	N16°36.6	-12.9'	60.4
19	103°22.4	02.7	94°23.6	7.3'	16°23.7	-13.0'	60.4
20	118°22.3 133°22.3	02.2 •• 01.7	108°49.9 123°16.2	7.4' 7.4'	16° 10.7 15° 57.7	-13.1'	60.4'
21 22	133°22.3 148°22.3	· · 01.7 01.2	123°16.2 137°42.6	7.4′ 7.5′	15°57.7 15°44.5	-13.2' -13.3'	60.4' 60.4'
23	163°22.3	00.7	152°09.1	7.5'	15°31.2	-13.4'	60.4
	SD = 15.7'	d = -0.5'		S	D = 16.4'		
					10.7		

			2028	July 2	0 to Ju	ıl. 22
Lat.		light	Sunrise	Sunset		light
	Naut.	Civil			Civil	Naut.
N 72°						
N 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	////
N 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
N 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
N 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
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:43	06:10	06:34	17:39	18:03	18:30
30°	05:57	06:26	06:52	17:21	17:47	18:16
35°	06:04	06:35	07:02	17:11	17:38	18:09
40°	06:11	06:45	07:14	16:59	17:29	18:02
45°	06:20	06:56	07:28	16:45	17:18	17:54
S 50°	06:29	07:09	07:45	16:28	17:05	17:45
52°	06:33	07:15	07:53	16:20	16:59	17:41
54°	06:37	07:21	08:02	16:11	16:52	17:36
56°	06:42	07:28	08:12	16:01	16:45	17:32
58°	06:47	07:37	08:24	15:50	16:37	17:27
S 60°	06:52	07:46	08:37	15:36	16:28	17:21
1 -4		Moonris	ie .		:	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						22:43
N 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
F60	01.00	00.00	04.04	10.00	00.05	20.00

Lat.		Moonris	e		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						22:43
N 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
N 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
N 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
S 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° 40°	05:36 05:52	06:27 06:42	07:12 07:23	15:26	16:37	17:51 17:40
40 45°	05:52	06:42	07:23 07:37	15:10 14:50	16:23 16:07	17:40
1						
S 50°	06:38	07:21	07:53	14:25	15:46	17:13
52° 54°	06:50	07:31 07:42	08:01	14:13	15:37	17:06 16:58
56°	07:04 07:20	07:42 07:55	08:10 08:19	14:00 13:44	15:26 15:13	16:58
58°	07:20	07:55	08:30	13:44	14:59	16:49
S 60°	08:03	08:28	08:42	13:02	14:41	16:28
_ 5 00	00.00	00.20	00.42	15.02	11.71	10.20

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Luy	00 ^h	12 ^h	Pass	Upper	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	`	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	301°15.6	225°20.7	N18° 30.6	209°39.8	N23°53.8	126°16.9	N03°27.0	262°25.0	N12° 40.2			
1	316°18.1	240°21.2	30.9	209° 39.0 224° 40.4	53.8	141°18.9	26.8	202 23.0 277°27.4	40.2	Alpheratz	$357^{\circ}31.5$	29°14.9
	331°20.5	255°21.6	31.2	239°41.0	53.8	156°21.0	26.6	292°29.7	40.2	Ankaa	353°04.2	-42°08.7
2										Schedar	349°27.4	56°41.5
3	346°23.0	270°22.1	• • 31.4	254°41.7	• • 53.8	171°23.1	• • 26.5	307°32.0	• • 40.3	Diphda	348°44.3	-17°49.5
4	1°25.4	285°22.6	31.7	269°42.3	53.8	186°25.2	26.3	322°34.4	40.3	Achernar	335°18.1	-57°05.1
5	16°27.9	300°23.0	31.9	284°42.9	53.8	201°27.3	26.1	337°36.7	40.4	Hamal	327°47.9	23°35.8
6	31°30.4	315°23.5	N18°32.2	299°43.5	N23°53.8	216°29.4	N03°26.0	352°39.0	N12°40.4	Polaris	312°35.9	89°22.7
7	46°32.8	330°24.0	32.5	314°44.1	53.8	231°31.5	25.8	7°41.4	40.4	Acamar	315°09.7	-40°11.1
8	61°35.3	345° 24.4	32.7	329°44.8	53.8	246°33.5	25.6	22°43.7	40.5		314°03.2	4°12.2
9	76°37.8	0°24.9	• • 33.0	344°45.4	• • 53.8	261°35.6	• • 25.5	37°46.0	• • 40.5	Menkar		
10	91°40.2	15°25.3	33.2	359°46.0	53.8	276°37.7	25.3	52°48.4	40.5	Mirfak	308°24.2	49°57.5
11	106°42.7	30°25.8	33.5	14°46.6	53.8	291°39.8	25.1	67°50.7	40.6	Aldebaran	290°36.5	16°33.9
12	121°45.2	45°26.2	N18°33.8	29°47.2	N23°53.8	306°41.9	N03°24.9	82°53.0	N12°40.6	Rigel	281°01.3	-8°10.1
13	136°47.6	60°26.7	34.0	44°47.9	53.8	321°44.0	24.8	97°55.4	40.6	Capella	280°17.9	46°01.4
14	150° 47.0	75°27.1	34.3	59°48.5	53.8	336°46.0	24.6	112°57.7	40.6	Bellatrix	278°20.0	6°22.5
15	166°52.6	90°27.6	34.5	74°49.1	• • 53.9	351°48.1	• • 24.4	112 37.7 128°00.0	40.7	Elnath	277°58.5	28°37.8
										Alnilam	275°35.0	$-1^{\circ}11.0$
16	181°55.0	105°28.0	34.8	89°49.7	53.9	6°50.2	24.3	143°02.4	40.7	Betelgeuse	270°49.2	$7^{\circ}24.7$
17	196°57.5	120°28.5	35.1	104°50.3	53.9	21°52.3	24.1	158°04.7	40.7	Canopus	263°51.6	-52°42.5
18	211°59.9	135°28.9	N18°35.3	119°51.0	N23°53.9	36°54.4	N03°23.9	173°07.1	N12°40.8	Sirius	258°24.0	-16°45.3
19	227°02.4	150°29.4	35.6	134°51.6	53.9	51°56.5	23.8	188°09.4	40.8	Adhara	255°03.9	-29°00.6
20	242°04.9	165°29.8	35.8	149°52.2	53.9	66°58.5	23.6	203°11.7	40.8		244°48.1	5°09.0
21	257°07.3	180°30.2	• • 36.1	164°52.8	• • 53.9	82°00.6	• • 23.4	218°14.1	• • 40.9	Procyon		
22	272°09.8	195°30.7	36.3	179°53.4	53.9	97°02.7	23.2	233°16.4	40.9	Pollux	243°14.2	27°57.3
23	287°12.3	210°31.1	36.6	194°54.1	53.9	112°04.8	23.1	248°18.7	40.9	Avior	234°14.1	-59°36.1
							_			Suhail	222°44.6	-43°33.0
Mer.p	ass. 03:54	ν 0.5′ d0.	.3′ m-4.58	$ u$ 0.6 $^{\prime}$ d0	.0′ m1.53	$\nu 2.1' \ d-0$.2′ m-1.78	$\nu 2.3' \ d0$.0′ m0.37	Miaplacidus	221°38.4	-69°50.2
										Alphard	$217^{\circ}45.2$	-8°47.0
	CIIA	CIIA	Б.	CIIA		CIIA	Б.	CIIA	Б	Regulus	207°31.7	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.9
0	302°14.7	225°31.5	N18°36.9	209°54.7	N23°53.9	127°06.9	N03°22.9	263°21.1	N12°40.9	Denebola	182°22.2	14°24.8
1	$317^{\circ}17.2$	$240^{\circ}32.0$	37.1	224°55.3	53.9	142°09.0	22.7	278°23.4	41.0	Gienah	175°40.7	-17°42.2
2	332°19.7	255°32.4	37.4	239°55.9	53.9	$157^{\circ}11.0$	22.6	293°25.7	41.0		172°57.0	-63°15.8
3	347°22.1	270°32.8	• • 37.6	254°56.6	• • 53.9	172°13.1	• • 22.4	308°28.1	• • 41.0		171°48.5	-57°16.7
4	2°24.6	285°33.3	37.9	269°57.2	53.9	187°15.2	22.2	323°30.4	41.1	Alioth	166° 10.7	55°48.5
5	17°27.0	300°33.7	38.2	284°57.8	53.9	202°17.3	22.1	338°32.8	41.1			
6	32°29.5	315°34.1	N18°38.4	299°58.4	N23°53.9	217°19.4	N03°21.9	353°35.1	N12°41.1	Spica	158° 19.3	-11°18.7
7	47°32.0	330°34.5	38.7	314°59.0	53.9	232°21.4	21.7	8°37.4	41.2	Alkaid	152°49.8	49°10.5
8	62°34.4	345°35.0	38.9	329°59.7	53.9	247°23.5	21.5	23°39.8	41.2	Hadar	148°31.7	-60°30.9
9	77°36.9	0°35.4	39.2	345°00.3	• • 53.9	262°25.6	•• 21.4	38°42.1	• • 41.2	Menkent	$147^{\circ}54.1$	-36°30.8
		15°35.8								Arcturus	145°45.2	19°02.1
10	92°39.4		39.4	0°00.9	53.9	277°27.7	21.2	53°44.5	41.2	Rigil Kent.	$139^{\circ}36.1$	-60°57.5
11	107°41.8	30°36.2	39.7	15°01.5	53.9	292°29.8	21.0	68°46.8	41.3	Kochab	$137^{\circ}19.8$	74°02.5
12	122°44.3	45°36.6	N18°40.0	30°02.2	N23°53.8	307°31.9	N03°20.9	83°49.1	N12°41.3	Zuben'ubi	136°52.7	-16°09.7
13	137°46.8	60°37.1	40.2	45°02.8	53.8	322°33.9	20.7	98°51.5	41.3	Alphecca	$126^{\circ}01.1$	26°37.3
14	$152^{\circ}49.2$	75° 37.5	40.5	60°03.4	53.8	337°36.0	20.5	113°53.8	41.4	Antares	112°12.0	-26°29.7
15	167°51.7	90°37.9	• • 40.7	75°04.0	• • 53.8	352°38.1	• • 20.3	128°56.2	• • 41.4	Atria	107°03.1	-69°04.8
16	182°54.2	105°38.3	41.0	90°04.6	53.8	7°40.2	20.2	143°58.5	41.4	Sabik	101°59.2	-15°45.5
17	197°56.6	120°38.7	41.3	105°05.3	53.8	22°42.3	20.0	159°00.8	41.5		96°06.1	-13 45.5 -37°07.4
18	212°59.1	135°39.1	N18°41.5	120°05.9	N23°53.8	37°44.3	N03°19.8	174°03.2	N12°41.5	Shaula		
19	228°01.5	150°39.5	41.8	135°06.5	53.8	52°46.4	19.7	189°05.5	41.5	Rasalhague	95°55.6	12°32.5
20	243°04.0	165°39.9	42.0	150°07.1	53.8	67°48.5	19.5	204°07.9	41.5	Eltanin	90°40.4	51°29.3
	258°06.5	180°40.3	• • 42.3	165°07.8	• • 53.8	82°50.6		219°10.2	• • 41.6	Kaus Aust.	83°28.3	-34°22.2
21							• • 19.3			Vega	$80^{\circ}30.8$	38°48.8
22	273°08.9	195°40.7	42.5	180°08.4	53.8	97°52.7	19.1	234°12.5	41.6	Nunki	75°43.8	-26°15.5
23	288°11.4	210°41.1	42.8	195°09.0	53.8	112°54.7	19.0	249°14.9	41.6	Altair	61°56.8	8°56.8
Mer n	ass. 03:50	v0.4'.d0	.3′ m-4.57	$\nu 0.6' d0$.0′ m1.54	$\nu^2 1' d-0$.2′ m-1.78	v2 3' d0	.0′ m0.37	Peacock	53°00.6	-56°38.4
- vici.p		<i>ν</i> σ.∓ ασ.	.5 7.51	- 0.0 00	.5 1111.54	u-0	1.70	-2.5 00	.5 1110.51	Deneb	49°23.3	45°23.0
										Enif	33°35.6	10°00.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 28.9	-46°49.0
0	303°13.9	225°41.5	N18°43.1	210°09.6	N23°53.8	127°56.8	N03° 18.8		N12°41.7	Fomalhaut	27 20.9 15°11.1	-40 49.0 -29°27.9
1	318°16.3	240°41.9	43.3	225°10.3	53.8	142°58.9	18.6	279°19.6	41.7			
2	333°18.8	255°42.3	43.6	240°10.9	53.8	158°01.0	18.5	294°21.9	41.7	Scheat	13°42.1	28°14.3
3	348°21.3	270° 42.7	• • 43.8	255°11.5	• • 53.8	173°03.1	•• 18.3	309°24.2	• • 41.7	Markab	13°26.7	15°21.7
4	3°23.7	270 42.7 285°43.1	44.1	270°12.1	53.7	173 03.1 188°05.1	18.1	324°26.6	41.8	Jul 23 Sun	SHA	Mer.pass
		285 43.1 300°43.5								l .	284°05.1	08:58
5	18°26.2		44.3	285°12.8	53.7	203°07.2	17.9	339°28.9	41.8			
6	33°28.7	315°43.9	N18°44.6	300°13.4	N23°53.7	218°09.3	N03°17.8	354°31.3		Mars		10:01
7	48°31.1	330°44.3	44.9	315°14.0	53.7	233°11.4	17.6	9°33.6	41.9		185°01.3	15:33
8	63°33.6	345°44.6	45.1	330°14.6	53.7	248°13.4	17.4	24°36.0	41.9	Saturn	321°09.4	06:29
9	78°36.0	0°45.0	• • 45.4	345°15.3	• • 53.7	263°15.5	• • 17.2	39°38.3	• • 41.9	Jul 24 Mon	SHA	Mer neer
10	93°38.5	15°45.4	45.6	$0^{\circ}15.9$	53.7	278°17.6	17.1	54°40.6	41.9			Mer.pass
11	108°41.0	30°45.8	45.9	$15^{\circ}16.5$	53.7	293°19.7	16.9	69°43.0	42.0	Venus	283°16.8	08:58
12	123°43.4	45°46.2	N18°46.1	30°17.1	N23°53.7	308°21.8	N03° 16.7	84°45.3			267°40.0	10:00
13	138°45.9	60°46.5	46.4	45°17.8	53.6	323°23.8	16.6	99°47.7	42.0		184°52.1	15:29
14	153°48.4	75°46.9	46.6	60°18.4	53.6	338°25.9	16.4	114°50.0	42.1	Saturn	321°06.3	06:26
15	168°50.8	90°47.3	• • 46.9	75°19.0	• • 53.6	353°28.0	. 16.2	129°52.4	• • 42.1	LUDE TO	CHA	Ma:: ====
										Jul 25 Tue	SHA	Mer.pass
16	183°53.3	105° 47.7	47.2	90°19.6	53.6	8°30.1	16.0	144°54.7	42.1		282°27.6	08:57
17	198°55.8	120°48.0	47.4	105°20.3	53.6	23°32.1	15.9	159°57.0	42.1		266°55.8	09:59
18	213°58.2	135°48.4	N18° 47.7	120°20.9	N23°53.6	38°34.2	N03° 15.7		N12°42.2		184°42.9	15:26
19	229°00.7	150°48.8	47.9	135°21.5	53.6	53°36.3	15.5	190°01.7	42.2	Saturn	321°03.4	06:22
20	244°03.1	$165^{\circ}49.1$	48.2	$150^{\circ}22.1$	53.5	68°38.4	15.3	205°04.1	42.2			
21	259°05.6	180°49.5	• • 48.4	$165^{\circ}22.8$	• • 53.5	83°40.4	• • 15.2	220°06.4	• • 42.2	Horizont	al parallax	
22	274°08.1	195°49.9	48.7	180°23.4	53.5	98°42.5	15.0	235°08.8	42.3		Venus:	0.3
23	289°10.5	210°50.2	48.9	195°24.0	53.5	113°44.6	14.8	250°11.1	42.3		Mars:	0.1
										-		
Mer.p	ass. 03:46	ν 0.4′ d0.	.3′ m-4.56	ν 0.6′ d -0	0.0′ m1.54	$\nu 2.1' \ d-0$.2′ m-1.78	ν 2.3′ d0	.0′ m0.37			

h	Su	Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.3	$N20^{\circ}00.1$	$166^{\circ}35.7$	7.6'	$N15^{\circ}17.8$	-13.5'	60.4'
1	193°22.3	19°59.6	181°02.3	7.7'	15°04.3	-13.6'	60.5'
2	208°22.2 223°22.2	59.1 •• 58.6	195°29.0 209°55.7	7.7' 7.8'	14°50.7 14°37.0	-13.7' -13.8'	60.5' 60.5'
4	238°22.2	58.1	224°22.5	7.9'	14°23.3	-13.9'	60.5'
5	253°22.2	57.6	238°49.4	7.9'	14°09.4	-14.0'	60.5'
6	268°22.2	N19°57.0	253°16.3	8.0'	N13°55.4	-14.0'	60.5'
7 8	283°22.2 298°22.1	56.5 56.0	267°43.3 282°10.4	8.1' 8.1'	13°41.4 13°27.3	-14.1' -14.2'	60.5' 60.5'
9	313°22.1	• • 55.5	296°37.5	8.2'	13°13.0	-14.3'	60.5
10	328°22.1	55.0	311°04.7	8.3'	12°58.7	-14.4'	60.5'
11	343°22.1 358°22.1	54.4	325°32.0 339°59.3	8.3' 8.4'	12°44.4 N12°29.9	-14.5'	60.5
12 13	358°22.1 13°22.1	N19° 53.9 53.4	339°59.3 354°26.7	8.4' 8.4'	12°15.4	-14.5' -14.6'	60.5' 60.5'
14	28°22.1	52.9	8°54.1	8.5'	12°00.7	-14.7'	60.5'
15	43°22.0	• • 52.3	23°21.6	8.6'	11°46.0	-14.8'	60.5'
16	58°22.0 73°22.0	51.8	37°49.2 52°16.8	8.6' 8.7'	11°31.3 11°16.5	-14.8'	60.5'
17 18	73 22.0 88°22.0	51.3 N19° 50.8	52 10.8 66°44.5	8.7'	N11°01.6	-14.9' -15.0'	60.5' 60.6'
19	103°22.0	50.2	81°12.2	8.8'	10°46.6	-15.0'	60.6'
20	118°22.0	49.7	95°40.0	8.9'	10°31.6	-15.1'	60.6'
21	133°22.0	• • 49.2	110°07.8 124°35.8	8.9'	10°16.5	-15.2'	60.6'
22 23	148°22.0 163°21.9	48.7 48.1	124°35.8 139°03.7	9.0' 9.0'	10°01.3 09°46.1	-15.2' -15.3'	60.6' 60.6'
	SD = 15.7'	d = -0.5'			O = 16.5'	_0.0	20.0
	JD — 13.7	u — -0.5		31	J — 10.5		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.9	N19° 47.6	153°31.7	9.1'	N09°30.8	-15.3'	60.6'
1 2	193°21.9 208°21.9	47.1 46.5	167°59.8 182°27.9	9.1' 9.2'	09°15.5 09°00.1	-15.4' -15.4'	60.6' 60.6'
3	223°21.9	• • 46.0	196°56.1	9.2'	09°00.1	-15.5'	60.5
4	238°21.9	45.5	211°24.3	9.3'	$08^{\circ}29.2$	-15.5'	60.5'
5	253°21.9	44.9	225°52.6	9.3'	08°13.7 N07°58.2	-15.6'	60.5'
6 7	268°21.9 283°21.9	N19° 44.4 43.9	240°20.9 254°49.3	9.4' 9.4'	07°42.5	-15.6' -15.7'	60.5' 60.5'
8	298°21.9	43.3	269°17.8	9.5'	07°26.9	-15.7'	60.5
9	313°21.8	• • 42.8	283°46.2	9.5'	$07^{\circ}11.2$	-15.7'	60.5'
10	328°21.8	42.3	298°14.7	9.6'	06°55.5	-15.8'	60.5'
11 12	343°21.8 358°21.8	41.7 N19°41.2	312°43.3 327°11.9	9.6' 9.7'	06°39.7 N06°23.9	-15.8' -15.8'	60.5' 60.5'
13	13°21.8	40.7	341°40.6	9.7'	06°08.1	-15.9'	60.5
14	28°21.8	40.1	356°09.3	9.7'	05°52.2	-15.9'	60.5'
15	43°21.8 58°21.8	• • 39.6	10°38.0 25°06.8	9.8'	05°36.3 05°20.4	-15.9'	60.5' 60.5'
16 17	58 21.8 73°21.8	39.0 38.5	25 06.8 39°35.6	9.8' 9.9'	05 20.4 05°04.4	-15.9' -16.0'	60.5
18	88°21.8	N19°38.0	54°04.5	9.9'	N04°48.4	-16.0'	60.5
19	103°21.8	37.4	68°33.4	9.9'	04°32.4	-16.0'	60.5'
20 21	118°21.8 133°21.8	36.9 •• 36.3	83°02.3 97°31.3	10.0' 10.0'	04°16.4 04°00.4	-16.0' -16.0'	60.5' 60.4'
22	148°21.8	35.8	97 31.3 112°00.3	10.0'	04 00.4 03°44.4	-16.1	60.4
23	163°21.7	35.3	126°29.3	10.1'	03°28.3	-16.1'	60.4'
	SD = 15.7'	d = -0.5'		SI	O = 16.5'		
_							
Tue 0	GHA 178°21.7	Dec N19° 34.7	GHA 140°58.4	u 10.1'	Dec N03°12.2	d -16.1'	HP 60.4'
1	176 21.7 193°21.7	34.2	155°27.5	10.1	02°56.1	-16.1	60.4
2	208°21.7	33.6	$169^{\circ}56.6$	10.2'	02°40.0	-16.1'	60.4'
3 4	223°21.7 238°21.7	· · 33.1 32.5	184°25.8 198°55.0	10.2' 10.2'	02°23.9 02°07.8	-16.1'	60.4' 60.4'
4 5	253°21.7	32.5 32.0	198°55.0 213°24.2	10.2'	02°07.8 01°51.7	-16.1' -16.1'	60.4
6	268°21.7	N19°31.5	227°53.5	10.2	N01°35.6	-16.1	60.3
7	283°21.7	30.9	242°22.7	10.3'	01°19.5	-16.1'	60.3'
8 9	298°21.7 313°21.7	30.4 •• 29.8	256°52.0 271°21.3	10.3' 10.3'	01°03.3 00°47.2	-16.1' -16.1'	60.3' 60.3'
9 10	313°21.7 328°21.7	29.8	271°21.3 285°50.7	10.3	00°47.2 00°31.1	-16.1'	60.3
11	343°21.7	28.7	300°20.1	10.4	N00°15.0	-16.1'	60.3
12	358°21.7	N19°28.2	314°49.4	10.4'	S00°01.1	16.1'	60.3
13 14	13°21.7 28°21.7	27.6 27.1	329°18.8 343°48.3	10.4' 10.4'	00°17.2 00°33.2	16.1' 16.1'	60.2' 60.2'
14 15	28°21.7 43°21.7	. 26.5	343°48.3 358°17.7	10.4	00°33.2 00°49.3	16.1	60.2'
16	58°21.7	26.0	12°47.1	10.5'	01°05.3	16.0'	60.2'
17	73°21.7	25.4	27°16.6	10.5'	01°21.4	16.0'	60.2'
18 19	88°21.7 103°21.7	N19°24.9 24.3	41°46.1 56°15.6	10.5' 10.5'	\$01°37.4 01°53.4	16.0' 16.0'	60.2' 60.1'
20	103°21.7 118°21.7	24.3	70°45.1	10.5'	01°53.4 02°09.4	16.0'	60.1
21	133°21.7	• • 23.2	85°14.6	10.5'	02°25.3	15.9'	60.1
22	148°21.7	22.6	99°44.1	10.5'	02°41.2	15.9'	60.1'
23	163°21.7	22.1	114°13.6	10.5'	02°57.2	15.9'	60.1'
	SD = 15.7'	d = -0.5'		SI	O = 16.5'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Junset	Civil	Naut.
N 72°						
N 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	////
N 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
N 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
N 10°	05:00	05:26	05:48	18:25	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:43	06:09	06:33	17:40	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
S 50°	06:26	07:06	07:42	16:32	17:08	17:48
52°	06:30	07:11	07:49	16:24	17:02	17:44
54°	06:34	07:18	07:58	16:16	16:56	17:40
56°	06:38	07:24	80:80	16:06	16:49	17:36
58°	06:43	07:32	08:19	15:55	16:42	17:31
S 60°	06:48	07:41	08:31	15:43	16:33	17:26
	1					

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
N 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° 54°	05:41	07:17	08:51	20:40	20:53	21:04
54°	05:48 05:54	07:20 07:23	08:51 08:51	20:36 20:32	20:51 20:49	21:05 21:06
50°	05:54	07:25	08:51	20:32	20:49	21:00
45°	06:11	07:32	08:52	20:20	20:45	21:09
N 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
S 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° 35°	07:43	08:21	08:57	19:10	20:18	21:25
40°	07:50 07:59	08:25 08:29	08:58 08:58	19:04 18:57	20:16 20:13	21:26 21:28
45°	07:59	08:34	08:59	18:50	20:13	21:20
S 50°						
52°	08:19 08:24	08:40 08:43	08:59 09:00	18:41 18:36	20:07 20:05	21:31 21:32
54°	08:30	08:46	09:00	18:32	20:03	21:32
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
S 60°	08:51	08:57	09:01	18:14	19:57	21:37

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-12%	
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		

1	h	Aries	Ven	nus	M	ars	Jup	iter	Sat	urn		Stars	
3 90 13.0 225 90 140 402 220 220 230 240 141 240 2	Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA			SHA	Dec
1 191155 2407510 694 22523 515 1417487 1145 291158 2.24													
2 341179 259131 497 249289 534 159709 141 301705 -24 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
3 997-004 270*51.7 · 500 270*526 · 534 1175*529 · 1140 310*205 · 4.24													
4 - 22.9 285*25.0 59.2 270*272 53.4 188*59.0 1.00 325*22.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.4 1.00 325*26.8 42.5 1.00 325*2													
5 19753 300°524 955 300°527 9514 200°570 130°313 300°525 4.55 4.55 100°401 120°401													
8 16 17 18 18 18 18 18 18 18											Achernar		-57°05.1
1											Hamal	327°47.9	23°35.8
8 64*30.7 346*38.5 5.12 380*20.7 53.3 .246*03.3 113.3 25*32.2 42.5											Polaris	312°34.4	89°22.7
10											Acamar	315°09.7	-40°11.1
Minch 1997													4°12.2
19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
1.1 1.2	10			51.7		53.3				42.6			
13 13 13 14 15 15 15 15 15 15 15	11				15°31.6	53.3	294°09.5	12.7	70°39.3	42.6			
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14 154-47.5 776-55 5.7 60°334 5.32 330°15.7 12.2 115-46.3 4.7	13	139°45.0	60°55.2	52.5	45°32.8	53.2	324°13.6	12.4	100°44.0	42.7			
15 160 *50.0 90 *50	14		75°55.5	52.7	60°33.4	53.2	339°15.7	12.2	115°46.3	42.7			
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17 1997-549 1207-565 535 1007-353 31 2472.0 11.7 1007-33 428													
18											Betelgeuse		$7^{\circ}24.7$
19 229° 198 156° 157 5 40 138° 36.6 531 54° 26.1 11.4 100° 180 428											Canopus	263°51.6	-52°42.5
20 245°02.3 165°7.5 5.42 150°37.2 5.31 69°28.2 11.2 206°00.4 4.29 1											Sirius	258°24.0	-16°45.3
Proc. Proc											Adhara	255°03.9	-29°00.6
Pollux 1971											1		5°09.1
Mer.pass. 03:43													
Sample 1985													
Mer. pass. 0.3.43 0.0.4 do 3' m. 4.55 ν.0.6 d - 0.0 m 1.54 ν.2.1 d - 0.2 m. 1.77 ν.2.3 d - 0.0 m. 0.36 Malphaced us. 21.3 a.5 6.9 kg. 2 m. 1.7	23	290°09.7	210°58.5	55.0	195°39.1	53.0	114°34.4	10.7	251°07.4	42.9			
	Mar	ass 03.42	1/0 A/ 40 3	8' m 4 F F	ν0 6/ 4 C	10' m1 54	u2 1/ d 0	2' m 1 77	1/2 3/ 40	0' m0 26			
The CHA	ivier.p	ass. US:43	νυ.4 αυ.3	111-4.55	νυ.υ α-υ	.0 1111.54	ν2.1 a -0.	.∠ 111-1.//	ν2.5 aU	.0 1110.30			
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1 320°14.6 240°99.2 55.5 225°40.4 52.9 144°38.5 10.3 281°12.1 43.0 Glenah 175°40.2 174.2 35°99.5 55.8 240°41.0 52.9 159°40.6 10.1 29°14.5 43.0 Glenah 175°40.2 174.3 395°19.5 270°99.8 55.0 255°41.6 52.9 159°40.6 10.1 29°14.5 43.0 Glenah 175°40.2 174.2 1													
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6 35°269 316°008 N18°568 300°435 N23°528 219°489 N30°304 356°239 N12°431 Alkaid 152'499 349°101 0 75 50°294 313°101 570 315°441 528 249°530 0 91 26°28.6 43.2 Alkaid 152'499 30°10 91 26°29 30°10 91 26°											Alioth	$166^{\circ}10.7$	55°48.5
7 50°294 331°01.1 57.0 315°44.1 52.8 234°51.0 09.3 11°26.2 43.2 Hadar 148°3.17 -60°30. 8 65°3.19 346°01.4 57.3 330°44.8 52.8 249°33.0 09.1 26°28.6 43.2 Hadar 148°3.17 -60°30. 90 80°34.3 1°01.8 .57.5 345°45.4 .52.7 264°55.1 .08.9 41°30.9 .43.2 American 110°39.2 31°02.4 58.0 15°46.7 52.7 294°59.2 08.6 71°36.6 43.2 Kight Fent. 1973.6 110°39.2 31°02.4 58.0 15°46.7 52.7 294°59.2 08.6 71°36.6 43.3 Kight Fent. 1973.6 110°39.2 31°02.4 58.0 15°46.7 52.7 294°59.2 08.6 71°36.6 43.3 Kight Fent. 1973.6 110°39.2 31°02.4 58.0 15°46.7 52.7 294°59.2 08.6 71°36.6 43.3 Kight Fent. 1973.6 110°39.2 31°02.4 58.0 15°46.7 52.7 294°59.2 08.6 71°36.6 43.3 Kight Fent. 1973.6 110°39.2 31°02.4 58.0 15°40.7 52.6 320°30.3 402.2 10°40.3 43.3 Kight Fent. 1973.6 110°39.2 13°02.4 58.5 45°47.9 52.6 325°03.4 08.2 10°40.3 43.3 Kight Fent. 1970.3 58.5 45°47.9 52.6 325°03.4 08.2 10°40.3 43.3 Kight Fent. 1970.3 58.5 45°47.9 52.6 325°03.4 08.2 10°40.3 43.3 Kight Fent. 1970.3 59.0 75°49.2 .50.6 355°07.5 .07.9 131°45.0 .43.4 American 10°52.7 1.6°6°40.6 120°03.0 59.2 59.5 125°11.7 07.5 16°49.7 43.4 Saliki 10°52.3 60°40.8 52.5 10°50.5 52.5 25°11.7 07.5 16°49.7 43.4 Saliki 10°52.2 10°50.5 12°23.2 10°50.5 10°50.5 52.5 25°11.7 07.5 16°49.7 43.4 Saliki 10°59.2 13°50.1 13°60.5 10°02.1 13°52.3 50.4 10°50.2 10°50.5 10°50.5 10°50.5 52.5 10°51.8 07.2 19°54.4 42.5 15°23.2 10°50.5 10°50.5 52.5 10°51.8 07.2 19°54.4 42.5 15°23.2 10°50.5 10											Spica	$158^{\circ}19.3$	-11°18.7
8 66*31.9 346*01.4 57.3 315*04.1 52.8 234*51.0 09.3 11*26.2 43.2 43.6 43.2 Market 1.47*54.1 36*30. 9 80*34.3 1*20.3 31*01.1 57.7 036*46.1 52.7 279*57.2 08.6 1*30.9 **41.3 09.													49° 10.5
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9 80°3-3.6 1°01.8 57.5 345°45.4 °52.7 264°55.1 · 0.69.9 41°30.9 ° 43.2 ° 7.5 °	8	65°31.9	$346^{\circ}01.4$	57.3	330°44.8	52.8	249°53.0	09.1	26°28.6	43.2			
10 95°36.8 10°02.1 57.7 0°46.0 52.7 279°57.2 08.7 50°33.3 43.2 11 10°39.3 31°02.4 58.0 15°46.7 52.7 299°57.2 08.7 50°33.3 43.2 12 125°41.7 46°02.7 N18°58.2 30°47.3 N23°52.6 30°00.3 N30°68.4 86°38.0 N12°43.3 14 155°46.6 76°03.3 58.7 60°48.6 52.6 340°05.5 08.0 116°42.7 43.3 15 170°49.1 91°03.6 59.0 59.2 90°49.8 52.5 10°09.6 07.7 146°47.4 43.4 16 186°51.6 106°03.9 59.2 90°49.8 52.5 52.1 50°09.6 07.7 146°47.4 43.4 18 215°56.5 136°04.5 N18°59.7 120°51.1 N23°52.5 52.1 50°10.9 131°46.4 43.5 18 215°56.5 136°04.5 N18°59.7 120°51.1 N23°52.5 52.1 50°10.9 43.4 43.5 19 230°59.0 151°04.8 13°00.0 130°51.5 52.4 55°15.8 07.2 191°44.4 43.5 12 26°03.3 181°65.4 00.2 150°52.3 52.4 70°17.9 07.0 206°56.8 43.5 12 22 276°06.4 196°05.7 00.7 180°53.6 52.3 150°24.0 50°19.5 52°2°3.8 43.6 Mer.pass.0:39 ν.0.3° d.0.3° m-4.54 ν.0.6° d-0.0° m1.54 ν.2.1° d-0.2° m-1.77 ν.2.3° d.00° m.036 Mer.pass.0:39 ν.0.3° d.0.3° m-4.54 ν.0.6° d-0.0° m1.54 ν.2.1° d-0.2° m-1.77 ν.2.3° d.00° m.036 43.7 13 321°13.7 21°07.2 20.0 255°56.8 52.2 155°32.2 155°32.4 00°3.0 30°3.8 3.3° d.3 13 31°18.7 271°07.2 00.2 255°56.8 52.2 155°32.4 00°3.0 30°3.8 34.6 Mer.pass.0:39 ν.0.3° d.0.3° m-4.54 ν.0.6° d-0.0° m1.54 ν.2.1° d-0.2° m-1.77 ν.2.3° d.00° m.0.36 16° d.0 1.3° d	9	80°34.3	1°01.8	• • 57.5	345°45.4	• • 52.7	264°55.1	• • 08.9	41°30.9	• • 43.2			
11 110°392 31°02.4 \$8.0 15°46.7 \$2.7 294°592 08.6 71°35.6 43.1 \$10°392 31°02.7 \$1875.2 \$00°473 31°32.5 \$00°473 193°52.6 \$10°10.3 \$103°68.8 \$6°38.0 \$102°43.3 \$140°44.2 \$61°03.0 \$58.5 \$45°47.9 \$52.6 \$325°03.4 \$08.2 \$110°40.3 \$43.3 \$140°44.2 \$61°03.0 \$58.5 \$45°47.9 \$52.6 \$325°03.4 \$08.2 \$110°40.3 \$43.3 \$140°44.2 \$61°03.0 \$58.5 \$45°47.9 \$52.6 \$325°03.4 \$08.2 \$110°40.3 \$43.3 \$140°44.2 \$61°03.0 \$58.5 \$45°47.9 \$52.6 \$325°03.4 \$08.2 \$110°40.3 \$43.3 \$140°44.2 \$61°03.0 \$58.5 \$45°47.9 \$52.6 \$325°03.4 \$08.2 \$110°40.3 \$43.3 \$140°44.2 \$43.5 \$15°10.0 \$10°10.0 \$15°10.0 \$10°10.0 \$110°40.1 \$43.3 \$140°44.2 \$43.4 \$15°10.0 \$10°10.0 \$15°10.0 \$10°10.0 \$110°40.1 \$44.4 \$44.4 \$15°10.0 \$15°10.0 \$10°10.0 \$15°10.0 \$10°10.	10	95°36.8	$16^{\circ}02.1$	57.7	0°46.0	52.7	279°57.2	08.7	56°33.3	43.2			
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14 155°46 6 76°03 3 58.7 60°48 6 52.6 340°05.5 08.0 116°42.7 43.3 Antare 112°12.0 -26°29. 15 170°49 1 91°03 6 ·59.0 75°49 2 ·52.6 355°07.5 0.70 9 131°45.0 ·43.4 Atria 107°03.2 -69°40. 16 185°51.6 106°03.9 59.2 00°49.8 52.5 10°09.6 07.7 146°47.4 43.4 Sabik 101°59.2 ·15°45. 18 215°56.5 136°04.5 N18°59.7 120°51.1 N23°52.5 40°13.7 N03°07.3 176°52.1 N12°43.4 Atria 107°03.2 -69°40. 19 230°59.0 151°04.8 19°00.0 135°51.7 52.4 55°11.7 07.0 20°56.8 43.5 Etlanin 78.9 12°10.2 15°45.5 10°20.0 246°01.4 16°60.5 1 ·0.2 150°52.3 52.4 55°11.5 07.2 191°54.4 43.5 Etlanin 83°28.3 34°22.2 276°64.4 196°05.7 00.7 180°53.6 52.3 10°09.6 07.7 199.9 ·0.6 8 221°59.1 ·43.5 Vega 80°30.9 38°48.2 2 276°66.4 196°05.7 00.7 180°53.6 52.3 10°09.6 06.6 237°01.5 43.5 Number 1.5°43.8 22.3 291°08.8 211°06.0 01.0 195°54.2 52.3 115°24.1 06.5 252°03.8 43.6 Number 1.5°43.8 26°13.0 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.1 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.8 Number 1.5°43.1 Number 1.5°43.8 Number 1.													
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18											Sabik	101°59.2	-15°45.5
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8 66°31.0 346°08.6 03.2 330°59.9 52.0 250°42.7 04.9 27°25.0 43.8 9 81°33.5 1°08.9 · 03.4 346°00.6 · 52.0 265°44.8 · 04.7 42°27.4 · 43.8 10 96°35.9 16°09.2 03.7 1°01.2 51.9 280°46.8 04.5 57°29.7 43.8 11 11°38.4 31°09.5 03.9 16°01.8 51.9 295°48.9 04.3 72°32.1 43.8 12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 13 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 14 156°45.8 76°10.3 04.6 61°03.7 51.8 340°55.1 03.8 117°39.2 43.9 15 171°48.2 91°10.6 · 04.9 76°04.4 · 51.7 355°57.2 · 03.6 132°41.5 · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 17 240°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 · 06.3 166°08.2 · 51.5 86°09.6 · 02.6 222°55.6 · 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 24.1 Mars: 0.1	6	36°26.1	$316^{\circ}08.0$	$N19^{\circ}02.7$	300°58.7	N23°52.1	220°38.6	N03°05.2	357°20.3	N12°43.7	Mars	266°11.6	09:58
9 81°33.5 1°08.9 · · · 03.4 346°00.6 · · · 52.0 265°44.8 · · · 04.7 42°27.4 · · · 43.8 10 96°35.9 16°09.2 03.7 1°01.2 51.9 280°46.8 04.5 57°29.7 43.8 11 111°38.4 31°09.5 03.9 16°01.8 51.9 295°48.9 04.3 72°32.1 43.8 12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 141°48.2 91°10.6 · · 04.9 76°04.4 · · 51.7 355°57.2 · · · 03.6 132°41.5 · · 43.9 16°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 17°201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 188°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19°201°54.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 19°201°54.9 06:1 151°16.0 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 19°201°54.9 06:1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.6 02.4 237°58.0 44.1 101°11.7 02.2 253°00.4 44.1 101°11.7 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.4 116°13.7 02.2 253°00.4 44.1 101°11.0 10.2 1.1 05.2 110°11.0 10°11.0 10.2 110°11.0 10.2 110°	7	51°28.5	331°08.3	02.9	315°59.3	52.0	235°40.6	05.0	12°22.7	43.8	Jupiter	184°33.7	15:23
9 81°33.5 1°08.9 · · 03.4 346°00.6 · · 52.0 265°44.8 · · 04.7 42°27.4 · · 43.8 10 96°35.9 16°09.2 03.7 1°01.2 51.9 280°46.8 04.5 57°29.7 43.8 11 111°38.4 31°09.5 03.9 16°01.8 51.9 295°48.9 04.3 72°32.1 43.8 12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 141°48.2 91°10.6 · · 04.9 76°04.4 · · 51.7 355°57.2 · · 03.6 132°41.5 · · · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 168°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 192°44.0 1	8	66°31.0	346°08.6	03.2	330°59.9	52.0	250°42.7	04.9	27°25.0	43.8	Saturn	321°00.4	06:18
10 96°35.9 16°09.2 03.7 1°01.2 51.9 280°46.8 04.5 57°29.7 43.8 11 111°38.4 31°09.5 03.9 16°01.8 51.9 295°48.9 04.3 72°32.1 43.8 12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 13 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 14 156°45.8 76°10.3 04.6 61°03.7 51.8 340°55.1 03.8 117°39.2 43.9 15 171°48.2 91°10.6 · 04.9 76°04.4 · 51.7 355°57.2 · 03.6 132°41.5 · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 17 201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 · 06.3 166°08.2 · 51.5 86°09.6 · 02.6 222°55.6 · 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mer.pas Venus 280°46.7 08:5 Mars 265°27.6 09:5 Saturn 320°57.6 06:1 Venus 290°46.7 08:5 Mars 266°40.3 08:5 Ode:10.4 102°43.9 11.0 12°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 10°4.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 1													
11 111°38.4 31°09.5 03.9 16°01.8 51.9 295°48.9 04.3 72°32.1 43.8 12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 13 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 14 156°45.8 76°10.3 04.6 61°03.7 51.8 340°55.1 03.8 117°39.2 43.9 15 171°48.2 91°10.6 · 04.9 76°04.4 · · 51.7 355°57.2 · · 03.6 132°41.5 · · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 17 201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 · · 06.3 166°08.2 · · 51.5 86°09.6 · · 02.6 222°55.6 · · 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1													Mer.pass
12 126°40.8 46°09.7 N19°04.2 31°02.5 N23°51.8 310°51.0 N03°04.2 87°34.4 N12°43.9 131°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 156°45.8 76°10.3 04.6 61°03.7 51.8 340°55.1 03.8 117°39.2 43.9 15 171°48.2 91°10.6 · · 04.9 76°04.4 · · 51.7 355°57.2 · · 03.6 132°41.5 · · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 172°43.9 140.0 186°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 26°01.3 03.3 162°46.2 44.0 188 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 191°40.0													08:56
13 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 141°43.3 61°10.0 04.4 46°03.1 51.8 325°53.0 04.0 102°36.8 43.9 141°43.3 151°11.0 156°45.8 76°10.3 04.6 61°03.7 51.8 340°55.1 03.8 117°39.2 43.9 15 171°48.2 91°10.6 · · 04.9 76°04.4 · · 51.7 355°57.2 · · · 03.6 132°41.5 · · · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 172°10.5 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 182°10.4 192°10.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 192°10.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 192°10.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 192°40.0 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 151°11.6 05.9 136°08.2 · · 51.5 86°09.6 · · · 02.6 222°55.6 · · · 44.1 193°10.5 192°10.9 184°14.9 15:1 192°10.9 184°14.9 192°10.9 192°50.9 192											1		09:57
14											Jupiter	184°24.3	15:19
15 171°48.2 91°10.6 · · 04.9 76°04.4 · · 51.7 355°57.2 · · · 03.6 132°41.5 · · · 43.9 16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 17 201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 19 240°54.9 18 262°03.0 181°12.2 · · 06.3 166°08.2 · · 51.5 86°09.6 · · 02.6 222°55.6 · · 44.1 19 10°11.6 10°11.6 02.4 237°58.0 44.1 10°11.6 02.4 237°58.0 44.1 10°11.6 02.4 237°58.0 44.1 10°11.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 10°1.0 1.0 11.0 11.0 11.0 11.0 11.0 1											Saturn		06:14
16 186°50.7 106°10.8 05.1 91°05.0 51.7 10°59.2 03.5 147°43.9 44.0 Venus 279°55.0 08:5 17 201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 Mars 264°43.6 09:5 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 Jupiter 184°14.9 15:1 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 Saturn 320°54.9 06:1 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 44.1 21 262°03.0 181°12.2 06.3 166°08.2 51.5 86°09.6 02.7 207°53.3 44.1 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 44.1 Venus: 0.2 23 292°08.0 211°12.7													
17 201°53.2 121°11.1 05.4 106°05.7 51.6 26°01.3 03.3 162°46.2 44.0 Mars 264°43.6 09.5 18 216°55.6 136°11.4 N19°05.6 121°06.3 N23°51.6 41°03.4 N03°03.1 177°48.6 N12°44.0 19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 ·· 06.3 166°08.2 ·· 51.5 86°09.6 ·· 02.6 222°55.6 ·· 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1													Mer.pass
18											Venus	279°55.0	08:55
18	17			05.4	106°05.7	51.6	$26^{\circ}01.3$	03.3	162°46.2	44.0	Mars		09:56
19 231°58.1 151°11.6 05.9 136°06.9 51.6 56°05.4 02.9 192°50.9 44.0 20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 · 06.3 166°08.2 · 51.5 86°09.6 · 02.6 222°55.6 · 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1	18	216°55.6	$136^{\circ}11.4$	N19°05.6		N23°51.6		N03°03.1	177°48.6	N12°44.0			15:16
20 247°00.6 166°11.9 06.1 151°07.6 51.5 71°07.5 02.7 207°53.3 44.1 21 262°03.0 181°12.2 · · 06.3 166°08.2 · · 51.5 86°09.6 · · 02.6 222°55.6 · · 44.1 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1		231°58.1	151°11.6	05.9	136°06.9		56°05.4	02.9	192°50.9	44.0			06:11
21 262°03.0 181°12.2 · · · 06.3 166°08.2 · · 51.5 86°09.6 · · · 02.6 222°55.6 · · · 44.1 Horizontal parallax 22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 Venus: 0.2 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1											Jutuill	01.0	55.11
22 277°05.5 196°12.4 06.6 181°08.8 51.4 101°11.6 02.4 237°58.0 44.1 Venus: 0.2 23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1											Horizont	al parallax	
23 292°08.0 211°12.7 06.8 196°09.5 51.4 116°13.7 02.2 253°00.4 44.1 Mars: 0.1												Venus:	0.2
25 252 50.0 211 12.1 50.0 150 55.5 51.1 110 15.1 52.2 255 50.1 11.1													
Mer.pass. 03:35 $\nu 0.3' \ d0.2' \ m-4.53$ $\nu 0.6' \ d-0.0' \ m1.54$ $\nu 2.1' \ d-0.2' \ m-1.77$ $\nu 2.4' \ d0.0' \ m0.35$													
	Mer.p	ass. 03:35	ν 0.3′ d0.2	2′ m-4.53	ν 0.6′ d-0	0.0′ m1.54	$\nu 2.1' \ d-0$.2′ m-1.77	ν 2.4′ d0	.0′ m0.35			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 21.7	N19°21.5	128°43.2	10.5'	\$03°13.0	15.8'	60.0'
1	193°21.7	21.0	143°12.7	10.5	03°28.9	15.8'	60.0'
2	208°21.7	20.4	157°42.3	10.6'	03°44.7	15.8'	60.0'
3	223°21.7	· · 19.8	172°11.8	10.6'	04°00.5	15.8'	60.0'
4	238°21.7	19.3	186°41.4	10.6'	04°16.2	15.7'	60.0'
5	253°21.7	18.7	201°10.9	10.6'	04°31.9	15.7'	59.9'
6	268°21.7	N19°18.2	215°40.5	10.6'	S04°47.6	15.6'	59.9'
7	283°21.7	17.6	230°10.0	10.6'	05°03.3	15.6'	59.9'
8	298°21.7	17.1	244°39.6	10.6'	$05^{\circ}18.9$	15.6'	59.9'
9	313°21.7	• • 16.5	259°09.2	10.5'	05°34.4	15.5'	59.9'
10	328°21.7	15.9	273°38.7	10.5'	05°49.9	15.5'	59.8'
11	343°21.7	15.4	288°08.2	10.5'	06°05.4	15.4'	59.8'
12	358°21.7	N19°14.8	302°37.8	10.5'	506°20.8	15.4'	59.8'
13	13°21.7	14.2	317°07.3	10.5	06°36.2	15.3'	59.8'
14 15	28°21.7 43°21.8	13.7 •• 13.1	331°36.8 346°06.4	10.5' 10.5'	06°51.6 07°06.8	15.3' 15.2'	59.8' 59.7'
15 16	43 21.8 58°21.8	12.5	0°35.9	10.5	07 06.8 07°22.1	15.2'	59.7'
17	73°21.8	12.0	15°05.4	10.5	07°22.1	15.1'	59.7'
18	88° 21.8	N19°11.4	29°34.8	10.5	507°52.4	15.1	59.7'
19	103°21.8	10.8	29° 34.8 44° 04.3	10.5	08°07.5	15.1	59.6'
20	118° 21.8	10.3	58°33.8	10.5	08°22.5	15.0'	59.6'
21	133°21.8	09.7	73°03.2	10.4	08°37.4	14.9'	59.6'
22	148° 21.8	09.1	87°32.6	10.4	08°52.3	14.8'	59.6'
23	163°21.8	08.6	102°02.0	10.4	09°07.2	14.8'	59.5'
	SD = 15.7'	d = -0.6'			0 = 16.4'		
		<u>u = -0.0</u>		JL	7 — 10.4		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.8	N19°08.0	116°31.4	10.4	\$09°21.9	14.7'	59.5'
1 2	193°21.8 208°21.8	07.4 06.9	131°00.8 145°30.2	10.4' 10.3'	09°36.6 09°51.3	14.6' 14.6'	59.5' 59.5'
3	206 21.6 223°21.8	06.3	145 50.2 159°59.5	10.3	10°05.8	14.5	59.5 59.4'
4	238° 21.8	05.7	174°28.8	10.3	10°05.8	14.4	59.4'
5	253°21.9	05.1	188°58.1	10.3	10°20.4	14.4	59.4
6	268°21.9	N19°04.6	203°27.4	10.3	S10°49.2	14.3'	59.4
7	283°21.9	04.0	217°56.6	10.2	11°03.5	14.2'	59.3'
8	298°21.9	03.4	232°25.9	10.2	11°17.7	14.1'	59.3'
9	313°21.9	02.9	246°55.1	10.2'	11°31.8	14.1'	59.3'
10	328°21.9	02.3	261°24.3	10.2'	11°45.9	14.0'	59.3'
11	343°21.9	01.7	275°53.4	10.1'	11°59.9	13.9'	59.2'
12	358°21.9	N19°01.1	290°22.5	10.1'	S12°13.8	13.8'	59.2'
13	13°21.9	00.6	304°51.6	10.1'	12°27.6	13.8'	59.2'
14	28°22.0	19°00.0	319°20.7	10.0'	12°41.4	13.7'	59.2'
15	43°22.0	18°59.4	333°49.7	10.0'	12°55.1	13.6'	59.1'
16	58°22.0	58.8	348°18.7	10.0'	13°08.6	13.5'	59.1'
17	73°22.0 88°22.0	58.2 N18°57.7	2°47.7 17°16.7	9.9'	13°22.1 \$13°35.6	13.4'	59.1'
18 19	103°22.0	N18 57.7 57.1	31°45.6	9.9' 9.9'	13°48.9	13.3' 13.2'	59.1' 59.0'
20	103 22.0 118°22.0	56.5	46°14.5	9.9 9.9'	13 46.9 14°02.1	13.2'	59.0'
21	133° 22.0	• • 55.9	60°43.3	9.8'	14° 15.3	13.1	59.0'
22	148°22.1	55.3	75°12.1	9.8'	14° 13.3	13.1	58.9'
23	163°22.1	54.8	89°40.9	9.7'	14°20.4	12.9'	58.9'
	SD = 15.7'	d = -0.6'			0 = 16.2'	-	
Fri	GHA 178°22.1	Dec N18°54.2	GHA 104°09.7	u 9.7'	Dec \$14°54.2	<i>d</i> 12.8'	HP 58.9'
0 1	178°22.1 193°22.1	N18 54.2 53.6	104°09.7 118°38.4	9.7' 9.7'	15°07.0	12.8	58.9'
2	208° 22.1	53.0	133°07.1	9.1 9.6'	15 07.0 15°19.7	12.6'	58.8'
3	223° 22.1	• • 52.4	147°35.7	9.6'	15°32.2	12.5'	58.8'
4	238°22.1	51.8	162°04.3	9.6'	15°44.7	12.4	58.8'
5	253°22.2	51.3	176°32.9	9.5'	15°57.1	12.3'	58.8'
6	268°22.2	N18°50.7	191°01.4	9.5'	S16°09.4	12.2'	58.7'
7	283°22.2	50.1	205°29.9	9.5'	16°21.6	12.1'	58.7'
8	298°22.2	49.5	219°58.4	9.4'	16°33.7	12.0'	58.7'
9	313°22.2	• • 48.9	234°26.8	9.4'	16°45.7	11.9'	58.6'
10	328° 22.2	48.3	248°55.2	9.3'	16°57.6	11.8'	58.6'
11	343°22.3	47.7	263°23.5	9.3'	17°09.3	11.7'	58.6'
12	358°22.3	N18°47.1	277°51.8	9.3'	\$17°21.0	11.6'	58.6'
13	13°22.3	46.6	292°20.1	9.2'	17°32.6	11.4'	58.5'
14	28°22.3 43°22.3	46.0	306°48.3 321°16.5	9.2' 9.1'	17°44.0 17°55.3	11.3' 11.2'	58.5' 58.5'
15 16	43°22.3 58°22.4	• • 45.4 44.8	321°16.5 335°44.6	9.1'	17°55.3 18°06.6	11.2	58.5° 58.4'
16 17	73° 22.4	44.8 44.2	335°44.6 350°12.7	9.1' 9.1'	18° 17.7	11.1	58.4' 58.4'
18	88° 22.4	N18°43.6	350 12.7 4°40.8	9.1	518°28.7	10.9'	58.4
19	103°22.4	43.0	4 40.8 19°08.8	9.0'	18°39.6	10.9	58.4
20	118° 22.4	42.4	33°36.8	8.9'	18°50.4	10.7	58.3
21	133°22.4	• • 41.8	48°04.8	8.9'	19°01.0	10.5'	58.3'
22	148° 22.5	41.2	62°32.7	8.9'	19°11.6	10.4	58.3'
23	163°22.5	40.6	77°00.5	8.8'	19°22.0	10.3'	58.3'
	SD = 15.7'	d = -0.6'		SE	0 = 16.1'		

Lat.	Twilight		Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 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	////
N 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
N 40°	03:45	04:23	04:54	19:18	19:49	20:27
35°	04:04	04:38	05:06	19:07	19:35	20:09
30°	04:19	04:50	05:16	18:56	19:23	19:54
20°	04:42	05:10	05:34	18:39	19:03	19:31
N 10°	05:00	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:08	06:32	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:50	18:19
35°	06:00	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
S 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
S 60°	06:43	07:35	08:25	15:49	16:39	17:31
	. Moonrise Moonset					

Lat.		Moonris	е		Moonset	t
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
N 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
N 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
N 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
S 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
S 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
S 60°	09:06	09:11	09:18	23:16	•• ••	00:55

		Sun				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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°10.4	226°13.0 N19°07.1	211°10.1 N23°51.4	131°15.8 N03°02.0	268°02.7 N12°44.2	
1	322°12.9	241°13.2 07.3	226°10.7 51.3	146°17.8 01.9	283°05.1 44.2	Alpheratz 357°31.5 29°14.9
2	337°15.3	256° 13.5 07.5	241°11.4 51.3	161°19.9 01.7	298°07.4 44.2	Ankaa 353°04.1 -42°08.7
3	352°17.8	271°13.7 · · 07.8	256°12.0 · · 51.2	176°22.0 · · 01.5	313°09.8 · · 44.2	Schedar 349°27.3 56°41.5
4	7°20.3	286°14.0 08.0	271°12.6 51.2	191°24.0 01.3	328°12.1 44.3	Diphda 348°44.3 -17°49.5
5	22°22.7	301°14.3 08.3	286°13.3 51.1	206°26.1 01.2	343°14.5 44.3	Achernar 335°18.0 -57°05.1
6	37°25.2	316°14.5 N19°08.5	301°13.9 N23°51.1	221°28.2 N03°01.0	358°16.9 N12°44.3	Hamal 327°47.8 23°35.8
7	52°27.7	331°14.8 08.7	316°14.5 51.1	236°30.2 00.8	13°19.2 44.3	Polaris 312°32.6 89°22.7
8	67°30.1	346°15.0 09.0	331°15.2 51.0	251°32.3 00.6	28°21.6 44.3	Acamar 315°09.7 -40°11.1
9	82°32.6	1°15.3 · · 09.2	346°15.8 · · 51.0	266°34.4 · · 00.4	43°23.9 · · 44.4	Menkar 314°03.1 4°12.2
10	97°35.1	16°15.5 09.5	1°16.5 50.9	281°36.4 00.3	58°26.3 44.4	Mirfak 308°24.1 49°57.5 Aldebaran 290°36.4 16°34.0
11	112°37.5	31°15.8 09.7	16°17.1 50.9	296°38.5 03°00.1	73°28.6 44.4	
12	127°40.0	46°16.0 N19°09.9	31°17.7 N23°50.8	311°40.6 N02°59.9	88°31.0 N12°44.4	Rigel 281°01.3 -8°10.1 Capella 280°17.9 46°01.4
13	142°42.5	61°16.2 10.2	46°18.4 50.8	326°42.6 59.7	103°33.4 44.5	Bellatrix 278°20.0 6°22.5
14	$157^{\circ}44.9$	76°16.5 10.4	61°19.0 50.7	341°44.7 59.6	118°35.7 44.5	Elnath 277°58.4 28°37.8
15	172°47.4	$91^{\circ}16.7 \cdots 10.6$	$76^{\circ}19.6 \cdots 50.7$	356°46.8 •• 59.4	133°38.1 • • 44.5	Alnilam 275°35.0 -1°11.0
16	187°49.8	106° 17.0 10.9	91°20.3 50.6	11°48.8 59.2	148°40.4 44.5	Betelgeuse 270°49.2 7°24.7
17	202°52.3	121°17.2 11.1	106°20.9 50.6	26°50.9 59.0	163°42.8 44.6	Canopus 263°51.6 -52°42.5
18	217°54.8	136°17.4 N19°11.4	121°21.6 N23°50.5	41°53.0 N02°58.8	178°45.2 N12°44.6	Sirius 258°24.0 -16°45.3
19	232°57.2	151°17.7 11.6	136°22.2 50.5	56°55.0 58.7	193°47.5 44.6	Adhara 255°03.9 -29°00.6
20	247°59.7	166°17.9 11.8	151°22.8 50.5	71°57.1 58.5	208°49.9 44.6	Procyon 244°48.1 5°09.1
21	263°02.2	181°18.2 · · 12.1	166°23.5 · · 50.4	86°59.1 · · 58.3	223°52.2 · · 44.6	Pollux 243°14.1 27°57.3
22	278°04.6	196°18.4 12.3	181°24.1 50.4	102°01.2 58.1	238°54.6 44.7	Avior 234°14.1 -59°36.1
23	293°07.1	211°18.6 12.5	196°24.8 50.3	117°03.3 57.9	253°57.0 44.7	Suhail 222°44.6 -43°33.0
Mer.p	ass. 03:31	$ u 0.3' \ d0.2' \ \text{m-4.52} $	$ u 0.6' \ d 0.0' \ \text{m} 1.54$	$\nu 2.1' \ d\text{-}0.2' \ \text{m-}1.76$	ν 2.4′ d 0.0′ m 0.35	Miaplacidus 221°38.5 -69°50.2
						Alphard 217°45.2 -8°47.0
c	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°31.7 11°49.6
Sun						Dubhe 193°38.1 61°35.9
0 1	308°09.6 323°12.0	226°18.8 N19°12.8 241°19.1 13.0	211°25.4 N23°50.3 226°26.0 50.2	132°05.3 N02°57.8 147°07.4 57.6	268°59.3 N12°44.7 284°01.7 44.7	Denebola 182°22.2 14°24.8
2	338°14.5	256°19.3 13.2	241°26.7 50.2	162°09.5 57.4	299°04.0 44.8	Gienah 175°40.7 -17°42.1
3	353° 17.0	271°19.5 · · 13.5	256°27.3 · · 50.1	102 09.5 57.4 177°11.5 · · 57.2	314°06.4 · · 44.8	Acrux 172°57.0 -63°15.8
4	8°19.4	286°19.8 13.7	271°27.9 50.0	192°13.6 57.1	329°08.8 44.8	Gacrux 171°48.5 -57°16.7
5	23°21.9	301°20.0 13.9	286°28.6 50.0	207°15.7 56.9	344°11.1 44.8	Alioth 166°10.7 55°48.5
6	38°24.3	316°20.2 N19°14.2	301°29.2 N23°49.9	222°17.7 N02°56.7	359°13.5 N12°44.8	Spica 158°19.3 -11°18.7
7	53°26.8	331°20.4 14.4	316°29.9 49.9	237°19.8 56.5	14°15.8 44.9	Alkaid 152°49.9 49°10.5
8	68°29.3	346°20.6 14.6	331°30.5 49.8	252°21.8 56.3	29°18.2 44.9	Hadar 148°31.8 -60°30.9
9	83°31.7	1°20.9 · · 14.9	346°31.1 · · 49.8	267°23.9 · · 56.2	44°20.6 · · 44.9	Menkent 147°54.1 -36°30.8
10	98°34.2	16°21.1 15.1	1°31.8 49.7	282°26.0 56.0	59°22.9 44.9	Arcturus 145°45.3 19°02.1
11	113°36.7	31°21.3 15.3	16°32.4 49.7	297°28.0 55.8	74°25.3 44.9	Rigil Kent. 139°36.1 -60°57.5
12	128°39.1	46°21.5 N19°15.6	31°33.1 N23°49.6	312°30.1 N02°55.6	89°27.7 N12°45.0	Kochab 137°19.9 74°02.5
13	143°41.6	61°21.7 15.8	46°33.7 49.6	327°32.1 55.4	104°30.0 45.0	Zuben'ubi 136°52.7 -16°09.7
14	158°44.1	76°21.9 16.0	61°34.3 49.5	342°34.2 55.3	119°32.4 45.0	Alphecca 126°01.2 26°37.3
15	173°46.5	91°22.1 · · 16.3	76°35.0 · · 49.5	357°36.3 · · 55.1	134°34.7 · · 45.0	Antares 112°12.0 -26°29.7
16	188°49.0	106°22.4 16.5	91°35.6 49.4	12°38.3 54.9	149°37.1 45.1	Atria 107°03.2 -69°04.8 Sabik 101°59.2 -15°45.5
17	203°51.4	121°22.6 16.7	106°36.3 49.3	27°40.4 54.7	164°39.5 45.1	Shaula 96°06.1 -37°07.4
18	218°53.9	136°22.8 N19°17.0	121°36.9 N23°49.3	42°42.5 N02°54.5	179°41.8 N12°45.1	Rasalhague 95°55.6 12°32.5
19	233°56.4	151°23.0 17.2	136°37.5 49.2	57°44.5 54.4	194°44.2 45.1	Eltanin 90°40.4 51°29.3
20	248°58.8	166°23.2 17.4	151°38.2 49.2	72°46.6 54.2	209°46.6 45.1	Kaus Aust. 83°28.3 -34°22.2
21	264°01.3	181°23.4 · · 17.6	166°38.8 · · 49.1	87°48.6 •• 54.0	224°48.9 · · 45.2	Vega 80°30.9 38°48.8
22	279°03.8	196°23.6 17.9	181°39.5 49.1	102°50.7 53.8	239°51.3 45.2	Nunki 75°43.8 -26°15.5
23	294°06.2	211°23.8 18.1	196°40.1 49.0	117°52.8 53.6	254°53.7 45.2	Altair 61°56.8 8°56.8
Mern	ass. 03:27	ν0.2' d0.2' m-4.51	ν0.6' d-0.1' m1.55	ν2.1' d-0.2' m-1.76	ν 2.4' d 0.0' m 0.35	Peacock 53°00.6 -56°38.4
- Wici.p						Deneb 49°23.3 45°23.1
						Enif 33°35.6 10°00.6
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°28.9 -46°49.0
0	309°08.7	226°24.0 N19°18.3	211°40.8 N23°48.9	132°54.8 N02°53.5	269°56.0 N12°45.2	Fomalhaut 15°11.1 -29°27.9
1	324°11.2	241°24.2 18.6	226°41.4 48.9	147°56.9 53.3	284°58.4 45.2	Scheat 13°42.0 28°14.4
2	339°13.6	256°24.4 18.8	241°42.0 48.8	162°58.9 53.1	300°00.8 45.3	Markab 13°26.7 15°21.7
3	354°16.1	271°24.6 · · 19.0	256°42.7 · · 48.8	178°01.0 · · 52.9	315°03.1 · · 45.3	Jul 29 Sat SHA Mer.pass
4	9°18.6	286°24.8 19.2	271°43.3 48.7	193°03.1 52.7	330°05.5 45.3	Jul 29 Sat SHA Mer.pass Venus 279°02.5 08:55
5	24°21.0 39°23.5	301°25.0 19.5	286°44.0 48.6	208°05.1 52.6	345°07.8 45.3 0°10.2 N12°45.3	Mars 263°59.7 09:55
6 7	39°23.5 54°25.9	316°25.2 N19°19.7 331°25.3 19.9	301°44.6 N23°48.6 316°45.3 48.5	223°07.2 N02°52.4 238°09.2 52.2	0°10.2 N12°45.3 15°12.6 45.4	Jupiter 184°05.4 15:13
8	54 25.9 69°28.4	346°25.5 19.9 346°25.5 20.1	310 45.3 48.5 331°45.9 48.5	253°11.3 52.0	30°14.9 45.4	Saturn 320°52.3 06:07
9	84°30.9	1°25.7 · · 20.4	346°46.5 · · 48.4	268°13.4 · · 51.8	45°17.3 · · 45.4	
10	99°33.3	16°25.9 20.6	1°47.2 48.3	283°15.4 51.7	60°19.7 45.4	Jul 30 Sun SHA Mer.pass
11	114°35.8	31°26.1 20.8	16°47.8 48.3	298°17.5 51.5	75°22.0 45.5	Venus 278°09.3 08:55
12	129°38.3	46°26.3 N19°21.0	31°48.5 N23°48.2	313°19.5 N02°51.3	90°24.4 N12°45.5	Mars 263°15.8 09:54
13	144°40.7	61°26.5 21.3	46°49.1 48.2	328°21.6 51.1	105°26.8 45.5	Jupiter 183°55.8 15:10
14	159°43.2	76°26.6 21.5	61°49.8 48.1	343°23.6 50.9	120°29.1 45.5	Saturn 320°49.8 06:03
15	174°45.7	91°26.8 · · 21.7	76°50.4 · · 48.0	358°25.7 · · 50.8	135°31.5 · · 45.5	Jul 31 Mon SHA Mer.pass
16	189°48.1	106° 27.0 21.9	91°51.0 48.0	13°27.8 50.6	150°33.9 45.6	Venus 277°15.3 08:54
17	204°50.6	121°27.2 22.2	106°51.7 47.9	28°29.8 50.4	165°36.2 45.6	Mars 262°32.1 09:53
18	219°53.1	136°27.4 N19°22.4	121°52.3 N23°47.8	43°31.9 N02°50.2	180°38.6 N12°45.6	Jupiter 183°46.1 15:06
19	234°55.5	151°27.5 22.6	136°53.0 47.8	58°33.9 50.0	195°41.0 45.6	Saturn 320°47.3 05:59
20	249°58.0	166°27.7 22.8	151°53.6 47.7	73°36.0 49.9	210°43.3 45.6	
21	265°00.4	181°27.9 · · 23.0	166°54.3 · · 47.6	88°38.1 · · 49.7	225°45.7 · · 45.7	Horizontal parallax
22	280°02.9	196°28.1 23.3	181°54.9 47.6	103°40.1 49.5	240°48.1 45.7	Venus: 0.2
23	295°05.4	211°28.2 23.5	196°55.6 47.5	118°42.2 49.3	255°50.5 45.7	Mars: 0.1
Mern	ass. 03:23	ν0.2' d0.2' m-4.50	ν0.6' d-0.1' m1.55	ν2.1' d-0.2' m-1.76	ν2.4' d0.0' m0.34	
.т.ст.р		2 3.2 U G.E III 7.30	4 0.1 1111.00	3 0 111 1.10		

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.5	N18°40.0	91°28.3	8.8'	S19°32.3	10.2'	58.2'
1	193°22.5	39.4	105°56.1	8.7'	19°42.5	10.1'	58.2'
2	208°22.6 223°22.6	38.8 •• 38.2	120°23.9 134°51.6	8.7' 8.7'	19°52.5 20°02.5	9.9' 9.8'	58.2' 58.1'
4	238°22.6	37.6	149°19.2	8.6'	20°12.3	9.7'	58.1'
5	253°22.6	37.0	$163^{\circ}46.9$	8.6'	$20^{\circ}22.0$	9.6'	58.1'
6	268°22.6	N18°36.4	178°14.4	8.5'	S20°31.6	9.4'	58.1'
7 8	283°22.7 298°22.7	35.8 35.2	192°42.0 207°09.5	8.5' 8.5'	20°41.0 20°50.3	9.3' 9.2'	58.0' 58.0'
9	313°22.7	• • 34.6	221°37.0	8.4'	20°59.5	9.1	58.0'
10	328°22.7	34.0	236°04.4	8.4'	21°08.6	8.9'	57.9'
11	343°22.8 358°22.8	33.4 N18°32.8	250°31.8 264°59.1	8.4' 8.3'	21°17.5 S 21°26.3	8.8' 8.7'	57.9'
12 13	358 22.8 13°22.8	32.8	204 59.1 279°26.4	8.3'	21°35.0	8. <i>1</i> 8.5'	57.9' 57.9'
14	28°22.8	31.6	293°53.7	8.2'	21°43.5	8.4	57.8'
15	43°22.9	• • 31.0	308°21.0	8.2'	21°52.0	8.3'	57.8'
16	58°22.9 73°22.9	30.4 29.8	322°48.2 337°15.3	8.2' 8.1'	22°00.2 22°08.4	8.1'	57.8'
17 18	88°22.9	29.8 N18°29.2	351°42.5	8.1'	522°16.4	8.0' 7.9'	57.8' 57.7'
19	103°23.0	28.6	6°09.6	8.1'	22°24.3	7.7'	57.7'
20	118°23.0	28.0	20°36.6	8.0'	22°32.0	7.6'	57.7'
21	133°23.0 148°23.0	• • 27.4	35°03.7 49°30.7	8.0' 8.0'	22°39.6 22°47.1	7.5' 7.3'	57.6'
22 23	148 23.0 163°23.1	26.8 26.2	49 30.7 63°57.7	8.0 7.9'	22 47.1 22°54.4	7.3 7.2'	57.6' 57.6'
	SD = 15.7'	d = -0.6'			D = 15.9'		
	<u> </u>	u — -0.0		اد			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.1	N18° 25.6	78°24.6	7.9'	\$23°01.6	7.1'	57.6'
1 2	193°23.1 208°23.1	25.0 24.4	92°51.5 107°18.4	7.9' 7.9'	23°08.7 23°15.6	6.9' 6.8'	57.5' 57.5'
3	223°23.2	. 23.8	107 10.4 121°45.2	7.8'	23°22.4	6.6'	57.5'
4	238°23.2	23.1	$136^{\circ}12.1$	7.8'	$23^{\circ}29.0$	6.5'	57.5'
5	253°23.2	22.5	150°38.9	7.8'	23°35.5	6.4'	57.4
6 7	268°23.3 283°23.3	N18°21.9 21.3	165°05.6 179°32.4	7.7' 7.7'	\$23°41.9 23°48.1	6.2' 6.1'	57.4' 57.4'
8	298°23.3	20.7	193°59.1	7.7'	23°54.1	5.9'	57.3'
9	313°23.4	• • 20.1	$208^{\circ}25.8$	7.7'	24°00.1	5.8'	57.3'
10	328°23.4	19.5	222°52.5 237°19.1	7.7'	24°05.8 24°11.5	5.6'	57.3'
11 12	343°23.4 358°23.4	18.9 N18° 18.2	237°19.1 251°45.7	7.6' 7.6'	24°11.5 S24°17.0	5.5' 5.3'	57.3' 57.2'
13	13°23.5	17.6	266°12.3	7.6'	24°22.3	5.2'	57.2
14	28°23.5	17.0	280°38.9	7.6'	$24^{\circ}27.5$	5.1'	57.2'
15 16	43°23.5 58°23.6	· · 16.4 15.8	295°05.5 309°32.1	7.6' 7.5'	24°32.6 24°37.5	4.9' 4.8'	57.2' 57.1'
17	73°23.6	15.0	323°58.6	7.5'	24° 42.3	4.6'	57.1'
18	88°23.6	N18° 14.6	338°25.1	7.5'	S24°46.9	4.5'	57.1'
19	103°23.7	13.9	352°51.7	7.5'	24°51.4	4.3'	57.1'
20 21	118°23.7 133°23.7	13.3 •• 12.7	7°18.2 21°44.7	7.5' 7.5'	24°55.7 24°59.9	4.2' 4.0'	57.0' 57.0'
22	133 23.7 148°23.8	12.1	36°11.1	7.5'	24 59.9 25°03.9	4.0 3.9'	57.0'
23	163°23.8	11.5	50°37.6	7.5'	25°07.8	3.7'	57.0'
	SD = 15.7'	d = -0.6'		SI	D = 15.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°23.8 193°23.9	N18° 10.8 10.2	65°04.1 79°30.5	7.5' 7.5'	\$25°11.5 25°15.1	3.6' 3.4'	56.9' 56.9'
2	208°23.9	09.6	93°57.0	7.5'	25° 18.5	3.3'	56.9'
3	223°23.9	• • 09.0	108°23.4	7.4'	25°21.8	3.1'	56.8'
4 5	238°24.0 253°24.0	08.4 07.7	122°49.9 137°16.3	7.4' 7.4'	25° 25.0 25° 28.0	3.0' 2.8'	56.8' 56.8'
6	268°24.0	07.7 N18°07.1	151°42.8	7.4	525°30.8	2.8	56.8
7	283°24.1	06.5	$166^{\circ}09.2$	7.5'	25°33.5	2.5'	56.7'
8	298°24.1	05.9	180°35.7	7.5'	25°36.0	2.4'	56.7'
9 10	313°24.1 328°24.2	· · 05.2 04.6	195°02.1 209°28.6	7.5' 7.5'	25°38.4 25°40.7	2.2' 2.1'	56.7' 56.7'
11	328 24.2 343°24.2	04.0	209 28.6 223°55.1	7.5'	25°42.8	2.1	56.6'
12	358°24.3	N18°03.4	238°21.6	7.5'	S25°44.7	1.8'	56.6'
13	13°24.3	02.7	252°48.0	7.5'	25°46.5	1.7'	56.6'
14 15	28°24.3 43°24.4	02.1 •• 01.5	267°14.5 281°41.1	7.5' 7.5'	25°48.2 25°49.7	1.5' 1.4'	56.6' 56.6'
16	43 24.4 58°24.4	00.8	296°07.6	7.5'	25°51.1	1.4	56.5'
17	73°24.4	18°00.2	310°34.1	7.6'	25°52.3	1.1'	56.5'
18	88°24.5	N17°59.6	325°00.7	7.6'	\$25°53.3	0.9'	56.5'
19 20	103°24.5 118°24.6	59.0 58.3	339°27.2 353°53.8	7.6' 7.6'	25°54.2 25°55.0	0.8' 0.6'	56.5' 56.4'
21	133°24.6	57.7	8°20.4	7.6'	25°55.6	0.5	56.4'
22	148°24.6	57.1	22°47.1	7.7'	$25^{\circ}56.1$	0.3'	56.4'
23	163°24.7	56.4	37°13.7	7.7'	25°56.4	0.2'	56.4'
	SD = 15.7'	d = -0.6'		SI	D = 15.5'		

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Luy	00 ^h	12 ^h	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		
31	06:25	06:23	12:06	20:25	07:58		

10:44

02:20

03:49

09:44

10:07

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA [Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	310°07.8	226°28.4 N19	9°23.7	211°56.2	N23°47.4	133°44.2	N02°49.1	270°52.8	N12°45.7	Almh austr	357°31.5	29°15.0
1	325°10.3	241°28.6	23.9	226° 56.8	47.4	148°46.3	49.0	285°55.2	45.7	Alpheratz Ankaa	353°04.1	-42°08.7
2	340°12.8	256°28.7	24.1	241°57.5	47.3	163°48.3	48.8	300°57.6	45.8	Schedar	349°27.3	56°41.5
3	355°15.2	271°28.9 · ·	24.4	$256^{\circ}58.1$	• • 47.2	178°50.4	• • 48.6	$315^{\circ}59.9$	• • 45.8	Diphda	348°44.2	-17°49.5
4	10°17.7	286°29.1	24.6	271°58.8	47.2	193°52.5	48.4	331°02.3	45.8	Achernar	335°18.0	-17 49.5 -57°05.1
5	25°20.2	301°29.2	24.8	286°59.4	47.1	208°54.5	48.2	346°04.7	45.8	Hamal	327°47.8	23°35.8
6	40°22.6		9°25.0	302°00.1	N23°47.0	223°56.6	N02°48.1	1°07.0	N12°45.8	Polaris	312°30.8	89°22.7
7	55°25.1	331°29.5	25.2	$317^{\circ}00.7$	47.0	238°58.6	47.9	$16^{\circ}09.4$	45.8	Acamar	315°09.6	-40°11.1
8	70°27.6	346°29.7	25.5	332°01.4	46.9	254°00.7	47.7	$31^{\circ}11.8$	45.9	Menkar	314°03.1	4°12.2
9	85°30.0	1°29.9 · ·	25.7	347°02.0	• • 46.8	269°02.7	• • 47.5	46°14.1	• • 45.9	Mirfak	308°24.1	49°57.6
10	100°32.5	16°30.0	25.9	2°02.7	46.8	284°04.8	47.3	$61^{\circ}16.5$	45.9	Aldebaran	290°36.4	16°34.0
11	115°34.9	31°30.2	26.1	17°03.3	46.7	299°06.9	47.1	76°18.9	45.9	Rigel	281°01.3	-8°10.0
12	130°37.4	46°30.3 N19	9°26.3	32°04.0	N23°46.6	314°08.9	N02°47.0	91°21.3	N12°45.9	Capella	280°17.9	46°01.4
13	145°39.9	61°30.5	26.5	47°04.6	46.5	$329^{\circ}11.0$	46.8	106°23.6	46.0	Bellatrix	278°20.0	6°22.5
14	160°42.3	76°30.6	26.8	62°05.2	46.5	344°13.0	46.6	121°26.0	46.0	Elnath	277°58.4	28°37.8
15	175°44.8		27.0	77° 05.9	• • 46.4	359°15.1	• • 46.4	136°28.4	• • 46.0	Alnilam	275°35.0	-1°11.0
16	190°47.3	106°30.9	27.2	92°06.5	46.3	$14^{\circ}17.1$	46.2	151°30.7	46.0	Betelgeuse	270°49.2	7°24.7
17	205°49.7	121°31.1	27.4	107°07.2	46.3	29°19.2	46.1	$166^{\circ}33.1$	46.0	Canopus	263°51.5	-52°42.5
18	220°52.2	136°31.2 N19	9°27.6	122°07.8	N23°46.2	44°21.2	N02°45.9	181°35.5	N12°46.1	Sirius	258°24.0	-16°45.3
19	235°54.7	151°31.4	27.8	137°08.5	46.1	59°23.3	45.7	196°37.9	46.1	Adhara	255°03.9	-10° 45.5 -29° 00.6
20	250°57.1	166°31.5	28.0	152°09.1	46.0	74°25.4	45.5	211°40.2	46.1	Procyon	244°48.1	5°09.1
21	265°59.6		28.3	167°09.8	• • 46.0	89°27.4	• • 45.3	226°42.6	• • 46.1	Pollux	244 46.1 243°14.1	27°57.3
22	$281^{\circ}02.1$	196°31.8	28.5	$182^{\circ}10.4$	45.9	104°29.5	45.1	241°45.0	46.1	Avior	245 14.1 234°14.1	-59°36.1
23	296°04.5	211°32.0	28.7	$197^{\circ}11.1$	45.8	119°31.5	45.0	256°47.3	46.1	Suhail	234 14.1 222°44.6	-43°33.0
Marn	ass. 03:19	ν 0.2' d0.2' m	_4 40	νη 6' 4 η	.1′ m1.55	u2 1' d 0	.2′ m-1.75	1/2 A/ 40	.0′ m0.34	Miaplacidus	222 44.0 221°38.5	-43 33.0 -69°50.2
iviei.p		νυ.∠ uu.∠ III	T.+3	νσ.σ α-σ	1111.33	ν2.1 U-U	11-1.13	ν2. 4 d0	.0 1110.54	Alphard	221 36.3 217°45.2	-8°47.0
										Regulus	207°31.7	11°49.6
Wed	GHA		Оес	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.9
0	311°07.0		9°28.9	212° 11.7	N23°45.7	134°33.6	N02°44.8	271°49.7	N12°46.2	Denebola	182°22.2	14°24.8
1	326°09.4	241°32.2	29.1	227° 12.4	45.7	149°35.6	44.6	$286^{\circ}52.1$	46.2	Gienah	175°40.7	-17°42.1
2	341°11.9	256°32.4	29.3	242°13.0	45.6	164°37.7	44.4	301°54.5	46.2	Acrux	172°57.0	-63°15.8
3	356°14.4		29.5	257° 13.7	• • 45.5	179°39.7	• • 44.2	316°56.8	• • 46.2	Gacrux	171°48.6	-57°16.7
4	11°16.8	286°32.7	29.7	272°14.3	45.4	194°41.8	44.1	331°59.2	46.2	Alioth	166°10.8	55°48.5
5	26°19.3	301°32.8	29.9	$287^{\circ}15.0$	45.4	209°43.8	43.9	347°01.6	46.3	Spica	158°19.3	-11°18.7
6	41°21.8		9°30.2	302° 15.6	N23°45.3	224°45.9	N02°43.7	2°04.0	N12°46.3	Alkaid	152°49.9	49°10.5
7	56°24.2	331°33.1	30.4	317° 16.3	45.2	239°47.9	43.5	17°06.3	46.3	Hadar	148°31.8	-60°30.9
8	71°26.7	346°33.2	30.6	332°16.9	45.1	254°50.0	43.3	32°08.7	46.3	Menkent	147°54.1	-36°30.8
9	86°29.2		30.8	347° 17.6	• • 45.0	269°52.1	• • 43.1	$47^{\circ}11.1$	• • 46.3	Arcturus	145°45.3	19°02.1
10	101°31.6	16°33.4	31.0	2°18.2	45.0	284°54.1	43.0	62°13.4	46.3	Rigil Kent.	139°36.1	-60°57.5
11	116°34.1	31°33.6	31.2	17° 18.9	44.9	299°56.2	42.8	77°15.8	46.4	Kochab	137°20.0	74°02.5
12	131°36.5		9°31.4	32° 19.5	N23°44.8	314°58.2	N02°42.6	92°18.2	N12°46.4	Zuben'ubi	136°52.7	-16°09.7
13	146°39.0	61°33.8	31.6	47° 20.2	44.7	330°00.3	42.4	107°20.6	46.4	Alphecca	126°01.2	26°37.3
14	161°41.5	76°33.9	31.8	62°20.8	44.7	345°02.3	42.2	122°22.9	46.4	Antares	112°12.0	-26°29.7
15	176°43.9		32.0	77°21.5	• • 44.6	0°04.4	• • 42.0	137°25.3	• • 46.4	Atria	107°03.2	-69°04.8
16	191°46.4	106°34.2	32.2	92°22.1	44.5	15°06.4	41.9	152°27.7	46.5	Sabik	101°59.2	-15°45.5
17	206°48.9	121°34.3	32.4	107°22.8	44.4	30°08.5	41.7	167°30.1	46.5	Shaula	96°06.1	-37°07.4
18	221°51.3		9°32.6	122°23.4	N23°44.3	45°10.5	N02°41.5	182°32.4	N12°46.5	Rasalhague	95°55.6	12°32.5
19	236°53.8	151°34.5	32.8	137°24.1	44.3	60°12.6	41.3	197°34.8	46.5	Eltanin	90°40.4	51°29.4
20	251°56.3	166°34.7	33.1	152°24.7	44.2	75°14.6	41.1	212°37.2	46.5	Kaus Aust.	83°28.3	-34°22.2
21	266°58.7		33.3	167°25.4	• • 44.1	90°16.7	• • 40.9	227°39.6	• • 46.5	Vega	80°30.9	38°48.8
22	282°01.2	196°34.9	33.5	182°26.0	44.0	105°18.7	40.8	242°41.9	46.6	Nunki	75°43.8	-26°15.5
23	297°03.7	211°35.0	33.7	197°26.7	43.9	120°20.8	40.6	257°44.3	46.6	Altair	61°56.8	8°56.8
Mer n	ass. 03:15	$\nu 0.1' \ d0.2' \ {\rm m}$	-4,48	$\nu_{0.6'} d_{-0}$.1′ m1.55	ν2.1' d-0	.2′ m-1.75	ν2.4' dΩ	.0′ m0.33	Peacock	53°00.6	-56°38.4
ρ										Deneb	49°23.3	45°23.1
			_		_		_		_	Enif	33°35.6	10°00.6
Thu	GHA	GHA [Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.0
0	312°06.1		9°33.9	212°27.3	N23°43.8	135°22.8	N02°40.4	272°46.7	N12°46.6	Fomalhaut	$15^{\circ}11.0$	-29°27.9
1	327°08.6	241°35.2	34.1	227°28.0	43.8	150°24.9	40.2	287°49.1	46.6	Scheat	13°42.0	28°14.4
2	342°11.0	256°35.3	34.3	242°28.6	43.7	165°26.9	40.0	302°51.5	46.6	Markab	13°26.7	$15^{\circ}21.7$
3	357°13.5		34.5	257°29.3	• • 43.6	180°29.0	• • 39.8	317°53.8	• • 46.6	A. 01 -	CIII	N4:
4	12°16.0	286°35.6	34.7	272°29.9	43.5	195°31.0	39.7	332°56.2	46.7	Aug 01 Tue	SHA	Mer.pass
5	27°18.4	301°35.7	34.9	287°30.6	43.4	210°33.1	39.5	347°58.6	46.7	Venus	276°20.6	08:54
6	42°20.9		9°35.1	302°31.2	N23°43.3	225°35.2	N02°39.3	3°01.0	N12°46.7	Mars	261°48.4	09:52
7	57°23.4	331°35.9	35.3	317°31.9	43.2	240°37.2	39.1	18°03.3	46.7	Jupiter	183°36.4	15:03
8	72°25.8	346°36.0	35.5	332°32.5	43.2	255°39.3	38.9	33°05.7	46.7	Saturn	320°45.0	05:56
9	87°28.3		35.7	347°33.2	43.1	270°41.3	• • 38.7	48°08.1	• • 46.7	Aug 02 Wed	SHA	Mer.pass
10	102°30.8	16°36.2	35.9	2°33.9	43.0	285°43.4	38.6	63°10.5	46.8	Venus		08:54
11	117°33.2	31°36.3	36.1	17°34.5	42.9	300°45.4	38.4	78°12.9	46.8	Mars	261°04.7	09:51
12	132°35.7		9°36.3	32°35.2	N23° 42.8	315°47.5	N02°38.2	93°15.2	N12°46.8	Jupiter	183°26.6	15:00
13	147°38.2	61°36.5	36.5	47°35.8	42.7	330°49.5	38.0	108°17.6	46.8	Saturn	320°42.7	05:52
14	162°40.6	76°36.6	36.7	62°36.5	42.6	345°51.6	37.8	123°20.0	46.8			
15	177°43.1		36.9	77°37.1	• • 42.6	0°53.6	•• 37.6	138°22.4	• • 46.8	Aug 03 Thu	SHA	Mer.pass
16	192°45.5	106°36.8	37.1	92°37.8	42.5	15°55.7	37.5	153°24.7	46.9	1	274°29.0	08:54
17	207°48.0	121°36.9	37.3	107°38.4	42.4	30°57.7	37.3	168°27.1	46.9	Mars	260°21.2	09:50
18	222°50.5 237°52.9		9°37.4	122°39.1 137°39.7	N23° 42.3	45°59.8	N02°37.1	183°29.5	N12°46.9	Jupiter		14:56
19		151°37.0	37.6		42.2	61°01.8	36.9	198°31.9	46.9 46.0	Saturn	320°40.6	05:48
20	252°55.4	166°37.1	37.8	152°40.4	42.1	76°03.9	36.7	213°34.3	46.9	Horizont	al parallax	_
21 22	267°57.9 283°00.3	181°37.2 · · · 196°37.3	38.0 38.2	167° 41.0 182° 41.7	· · 42.0 41.9	91°05.9 106°07.9	· · 36.5 36.3	228°36.6 243°39.0	•• 46.9 46.9		Venus:	0.2
23	298°02.8	211°37.4	38.4	102 41.7 197°42.4	41.9	100 07.9 121°10.0	36.2	243 39.0 258°41.4	40.9 47.0		Mars:	0.1
Mer.p	ass. 03:11	$ u 0.1' \ d0.2' \ {\rm m}$	-4.47	ν 0.7′ d-0	.1' m1.55	$\nu 2.1' \ d-0$.2′ m-1.75	ν 2.4′ d0	.0′ m0.33			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.7	N17°55.8	51°40.4	7.7'	S25°56.6	0.0'	56.3'
1	193°24.8	55.2	66°07.1	7.7'	25°56.6	-0.1'	56.3'
2 3	208°24.8 223°24.8	54.5 • • 53.9	80°33.9 95°00.6	7.8' 7.8'	25°56.5 25°56.2	-0.3' -0.4'	56.3' 56.3'
4	238° 24.9	53.3	109°27.4	7.8'	25°55.8	-0.4	56.2
5	253°24.9	52.6	123°54.2	7.9'	25°55.3	-0.7'	56.2'
6	268°25.0	N17°52.0	138°21.1	7.9'	S25°54.6	-0.8'	56.2'
7 8	283°25.0 298°25.1	51.4 50.7	152°48.0 167°14.9	7.9' 8.0'	25°53.7 25°52.7	-1.0' -1.1'	56.2' 56.2'
9	313°25.1	50.1	107 14.9 181°41.9	8.0'	25°51.6	-1.1 -1.3'	56.1'
10	328° 25.1	49.4	196°08.9	8.0'	25°50.3	-1.4'	56.1'
11	343°25.2	48.8	210°35.9	8.1'	25°48.9	-1.6'	56.1'
12	358°25.2 13°25.3	N17°48.2 47.5	225°03.0 239°30.1	8.1' 8.2'	\$25°47.4 25°45.7	-1.7' -1.8'	56.1'
13 14	28° 25.3	47.5 46.9	259°57.3	8.2'	25 45.7 25°43.8	-1.8 -2.0'	56.0' 56.0'
15	43°25.4	• • 46.2	268°24.5	8.3'	25°41.9	-2.1'	56.0'
16	58°25.4	45.6	$282^{\circ}51.7$	8.3'	$25^{\circ}39.7$	-2.3'	56.0'
17	73°25.5	45.0	297°19.0	8.3'	25°37.5	-2.4'	56.0'
18 19	88°25.5 103°25.5	N17°44.3 43.7	311°46.4 326°13.8	8.4' 8.4'	\$25°35.1 25°32.6	-2.5' -2.7'	55.9' 55.9'
19 20	103°25.5 118°25.6	43. <i>1</i> 43.0	326°13.8 340°41.2	8.4° 8.5'	25°32.6 25°29.9	-2.7' -2.8'	55.9' 55.9'
21	133°25.6	• • 42.4	355°08.7	8.5'	25°27.1	-2.9'	55.9'
22	148°25.7	41.8	9°36.2	8.6'	25°24.1	-3.1'	55.9'
23	163°25.7	41.1	24°03.8	8.6'	25°21.1	-3.2'	55.8'
	SD = 15.8'	d = -0.6'		SD	0 = 15.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178°25.8	N17°40.5	38°31.5	8.7'	S25°17.8	-3.3'	55.8'
1	193°25.8	39.8	52°59.2	8.8'	25°14.5	-3.5'	55.8'
2	208°25.9	39.2	67°26.9	8.8'	25°11.0	-3.6'	55.8'
3 4	223°25.9 238°26.0	· · 38.5 37.9	81°54.8 96°22.6	8.9' 8.9'	25°07.4 25°03.7	-3.7' -3.9'	55.7' 55.7'
5	250° 26.0	37.9 37.2	90° 22.0 110° 50.6	6.9 9.0'	25 03.7 24°59.8	-3.9 -4.0'	55.7'
6	268° 26.1	N17°36.6	125°18.6	9.1'	S24°55.8	-4.1'	55.7'
7	283°26.1	35.9	139°46.6	9.1'	$24^{\circ}51.7$	-4.3'	55.7'
8	298°26.2	35.3	154°14.7	9.2'	24°47.4	-4.4'	55.6'
9	313°26.2 328°26.3	· · 34.6 34.0	168°42.9 183°11.1	9.2' 9.3'	24°43.0 24°38.5	-4.5' -4.6'	55.6' 55.6'
10 11	328 26.3 343°26.3	34.0	183 11.1 197°39.4	9.3 9.4'	24 38.5 24°33.9	-4.0 -4.8'	55.6'
12	358° 26.4	N17°32.7	212°07.8	9.4'	S24°29.1	-4.9'	55.6'
13	13°26.4	32.0	226°36.3	9.5'	$24^{\circ}24.2$	-5.0'	55.5'
14	28° 26.5	31.4	241°04.7	9.6'	24°19.2	-5.1'	55.5'
15 16	43°26.5 58°26.6	· · 30.7 30.1	255°33.3 270°01.9	9.6' 9.7'	24°14.1 24°08.8	-5.3' -5.4'	55.5' 55.5'
17	73° 26.6	29.4	284°30.6	9.8'	24°03.4	-5.5'	55.5'
18	88° 26.7	N17°28.8	298°59.4	9.8'	S23°57.9	-5.6'	55.4'
19	103°26.7	28.1	313°28.3	9.9'	23°52.3	-5.7'	55.4'
20	118°26.8 133°26.8	27.5	327°57.2 342°26.1		23°46.6		55.4'
21 22	133° 26.8 148° 26.9	· · 26.8 26.2	342°26.1 356°55.2	10.0' 10.1'	23°40.7 23°34.8	-6.0' -6.1'	55.4' 55.4'
23	163°26.9	25.5	11°24.3	10.2'	23°28.7	-6.2	55.4'
	SD = 15.8'	d = -0.6'		SD	0 = 15.2'		
	CUA		CUA				
Thu 0	GHA 178°27.0	Dec N17°24.8	GHA 25°53.5	u 10.3'	Dec 523°22.5	d -6.3'	HP 55.3'
1	193°27.0	24.2	40°22.8	10.3	23°16.2	-6.4'	55.3'
2	208°27.1	23.5	54°52.1	10.4'	23°09.8	-6.5'	55.3'
3	223°27.1	• • 22.9	69°21.5	10.5'	23°03.2	-6.6'	55.3'
4 5	238° 27.2 253° 27.3	22.2 21.6	83°51.0 98°20.6	10.6' 10.6'	22°56.6 22°49.8	-6.8' -6.9'	55.3' 55.2'
6	268° 27.3	N17°20.9	96 20.0 112°50.2	10.0	\$22°43.0	-0.9 -7.0'	55.2'
7	283°27.4	20.2	$127^{\circ}19.9$	10.8'	22°36.0	-7.1'	55.2'
8	298° 27.4	19.6	141°49.7	10.9'	22°28.9	-7.2'	55.2'
9	313°27.5	• • 18.9	156°19.5	10.9'	22°21.8	-7.3'	55.2'
10 11	328°27.5 343°27.6	18.3 17.6	170°49.5 185°19.5	11.0' 11.1'	22°14.5 22°07.1	-7.4' -7.5'	55.2' 55.1'
12	358°27.6	N17°16.9	199°49.6	11.1	S21°59.6	-7.6'	55.1
13	13°27.7	16.3	214°19.7	11.2'	$21^{\circ}52.0$	-7.7'	55.1'
14	28° 27.8	15.6	228°50.0	11.3'	21°44.3	-7.8'	55.1'
15	43°27.8 58°27.9	• • 14.9	243°20.3	11.4'	21°36.5 21°28.7	-7.9'	55.1'
16 17	58°27.9 73°27.9	14.3 13.6	257°50.7 272°21.1	11.5' 11.5'	21°28.7 21°20.7	-8.0' -8.1'	55.1' 55.0'
18	88° 28.0	N17°12.9	286°51.7	11.6'	S21°12.6	-8.2'	55.0'
19	103°28.0	12.3	301°22.3	11.7'	21°04.4	-8.3'	55.0'
20	118°28.1	11.6	315°53.0	11.8'	20°56.2	-8.4'	55.0'
21 22	133°28.2 148°28.2	· · 10.9 10.3	330°23.7 344°54.6	11.8' 11.9'	20°47.8 20°39.3	-8.5' -8.5'	55.0' 55.0'
22	148°28.2 163°28.3	10.3 09.6	344°54.6 359°25.5	11.9'	20°39.3 20°30.8	-8.5' -8.6'	55.0° 54.9'
	SD = 15.8'	d = -0.7'			0 = 15.1'	5.0	
	10.0	<u> </u>			10.1		

			1	, ,		
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Twi Civil	light Naut
N 72°						
N 70°	7///	////	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	22:0
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
N 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°	05:02	05:28	05:50	18:22	18:45	19:10
0°	05:16	05:41	06:03	18:10	18:31	18:57
S 10°	05:28	05:54	06:16	17:57	18:19	18:4
20°	05:26	06:06	06:10	17:57	18:07	18:33
20°	l	06:06				
	05:51		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	18:1
45°	06:08	06:44	07:15	16:58	17:29	18:0
S 50°	06:15	06:54	07:29	16:44	17:19	17:58
52°	06:18	06:59	07:36	16:37	17:14	17:5
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	17:4
S 60°	06:32	07:23	08:11	16:02	16:50	17:4
-		Moonris			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	20:35	22:10	25.00	00:0!
		20.29			••	
		10.54				
62°	19:34	19:54	20:02	23:10		00:40
60°	19:34 19:00	19:28	19:43	23:44		01:0
60° N 58°	19:34			1		01:0
60°	19:34 19:00	19:28	19:43	23:44		
60° N 58°	19:34 19:00 18:35	19:28 19:08	19:43 19:28	23:44	00:08	01:0! 01:2!
60° N 58° 56°	19:34 19:00 18:35 18:15 17:59 17:45	19:28 19:08 18:51	19:43 19:28 19:15	23:44	00:08 00:28	01:0! 01:2! 01:4: 01:5!
60° N 58° 56° 54°	19:34 19:00 18:35 18:15 17:59 17:45	19:28 19:08 18:51 18:37 18:24	19:43 19:28 19:15 19:04 18:53	23:44	00:08 00:28 00:44 00:59	01:0! 01:2! 01:4: 01:5! 02:0
60° N 58° 56° 54° 52° 50°	19:34 19:00 18:35 18:15 17:59 17:45 17:32	19:28 19:08 18:51 18:37 18:24 18:13	19:43 19:28 19:15 19:04 18:53 18:44	23:44	00:08 00:28 00:44 00:59 01:11	01:0! 01:2! 01:4: 01:5! 02:07 02:18
60° N 58° 56° 54° 52° 50° 45°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06	19:28 19:08 18:51 18:37 18:24 18:13 17:50	19:43 19:28 19:15 19:04 18:53 18:44 18:25	23:44 00:11 00:37	00:08 00:28 00:44 00:59 01:11 01:36	01:0! 01:2! 01:4: 01:5! 02:0! 02:1! 02:40
60° N 58° 56° 54° 52° 50° 45° N 40°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09	23:44 00:11 00:37 00:58	00:08 00:28 00:44 00:59 01:11 01:36 01:56	01:09 01:29 01:4: 01:59 02:07 02:18 02:40 02:58
60° N 58° 56° 54° 52° 50° 45° N 40° 35°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56	23:44 00:11 00:37 00:58 01:16	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13	01:0! 01:2! 01:4: 01:5! 02:0: 02:1! 02:4(02:5! 03:1:
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44	23:44 00:11 00:37 00:58 01:16 01:31	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28	01:09 01:29 01:4: 01:59 02:07 02:18 02:40 02:58 03:13
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56	23:44 00:11 00:37 00:58 01:16 01:31 01:56	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52	01:0! 01:2! 01:4: 01:5! 02:0! 02:1! 02:44 02:58 03:1: 03:26
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44	23:44 00:11 00:37 00:58 01:16 01:31	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28	01:09 01:29 01:4: 01:59 02:07 02:18 02:40 02:58 03:13
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24	23:44 00:11 00:37 00:58 01:16 01:31 01:56	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52	01:0! 01:2! 01:4: 01:5! 02:0! 02:1! 02:44 02:58 03:1: 03:26
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 15:07	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52 03:13 03:33	01:09 01:29 01:4: 01:59 02:07 02:18 02:40 02:58 03:11 03:20 04:07 04:29
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0° S 10°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 15:07 14:47	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52 03:13 03:33 03:53	01:09 01:29 01:44 01:59 02:07 02:18 02:44 02:58 03:13 03:24 04:07 04:29 04:44
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:27 15:07 14:47 14:25	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17	23:44	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14	01:09 01:29 01:44 01:59 02:07 02:18 02:44 02:58 03:13 03:24 04:07 04:29 04:44 05:01
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20° 30°	19:34 19:00 18:35 18:15 17:59 17:45 17:06 16:46 16:29 16:14 15:49 15:27 15:07 14:47 14:25 14:00	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14 04:38	01:0! 01:2! 01:4: 01:5! 02:0' 02:1! 02:4(02:5! 03:1! 03:2(03:4! 04:0' 04:2! 04:4: 05:0: 05:2:
60° N 58° 56° 54° 52° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20° 30° 35°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 14:00 13:45	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58 14:44	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46 04:01	00:08 00:28 00:44 00:59 01:11 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14 04:38 04:52	01:0! 01:2! 01:4: 01:5! 02:0! 02:1! 02:4! 02:5! 03:1: 03:2! 04:4: 04:0! 04:2! 05:0: 05:2: 05:36
60° N 58° 56° 54° 52° 45° N 40° 35° 20° N 10° 0° S 10° 20° 30° 35° 40°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 15:07 14:47 14:25 14:00 13:45 13:28	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 14:58 14:44 14:28	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45 15:31	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46 04:01 04:18	00:08 00:28 00:44 00:59 01:13 01:56 02:13 02:28 02:52 03:13 03:33 03:33 04:14 04:38 04:52 05:08	01:09 01:29 01:41 01:55 02:00 02:14 02:46 03:11 03:26 03:44 04:01 04:29 04:44 05:00 05:23 05:36
60° N 58° 56° 54° 52° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20° 30° 35°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 14:00 13:45	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58 14:44	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46 04:01	00:08 00:28 00:44 00:59 01:11 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14 04:38 04:52	01:0! 01:2! 01:4: 01:5! 02:0! 02:1! 02:4! 02:5! 03:1: 03:2! 04:4: 04:0! 04:2! 05:0: 05:2: 05:36
60° N 58° 56° 54° 52° 45° N 40° 35° 20° N 10° 0° S 10° 20° 30° 35° 40°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 15:07 14:47 14:25 14:00 13:45 13:28	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 14:58 14:44 14:28	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45 15:31	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46 04:01 04:18	00:08 00:28 00:44 00:59 01:13 01:56 02:13 02:28 02:52 03:13 03:33 03:33 04:14 04:38 04:52 05:08	01:09 01:29 01:41 01:55 02:00 02:14 02:46 03:11 03:26 03:44 04:01 04:29 04:44 05:00 05:23 05:36
60° N 58° 56° 54° 52° 45° N 40° 35° 20° N 10° 0° S 10° 20° 30° 30° 35° 40° 45°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:49 15:27 15:07 14:47 14:25 14:00 13:45 13:28 13:08	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58 14:44 14:28 14:09	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45 15:31	23:44 00:11 00:37 00:58 01:16 01:31 01:56 02:18 02:39 02:59 03:21 03:46 04:01 04:18 04:39	00:08 00:28 00:44 00:59 01:13 01:56 02:13 02:28 02:52 03:13 03:33 03:33 04:14 04:38 04:52 05:08 05:28	01:09 01:29 01:4: 01:55 02:00 02:14 02:44 02:56 03:1: 03:20 04:29 04:4: 05:00 05:20 05:30 06:00
60° N 58° 54° 52° 50° 45° N 40° 35° 30° 20° N 10° 0° S 10° 20° 30° 35° 40° 45° S 50° 52°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:27 15:07 14:47 14:25 14:00 13:45 13:28 13:08 12:42 12:29	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58 14:44 14:28 14:09 13:46 13:34	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:07 16:51 16:34 16:17 15:56 15:45 15:45 15:15 14:54 14:45	23:44	00:08 00:28 00:44 00:59 01:11 01:36 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14 04:38 04:52 05:08 05:28 05:52 06:04	01:09 01:29 01:4: 01:51 02:01 02:14: 02:54 03:1: 03:20 03:44 04:01 04:01 05:0: 05:2: 05:36 05:56 06:01
60° N 58° 56° 54° 52° 50° 45° N 40° 35° 30° 0° S 10° 20° 30° 35° 40° 45° S 50°	19:34 19:00 18:35 18:15 17:59 17:45 17:32 17:06 16:46 16:29 16:14 15:27 15:07 14:47 14:25 14:00 13:45 13:28 13:08 12:42	19:28 19:08 18:51 18:37 18:24 18:13 17:50 17:31 17:16 17:02 16:39 16:19 16:00 15:42 15:21 14:58 14:44 14:28 14:09 13:46	19:43 19:28 19:15 19:04 18:53 18:44 18:25 18:09 17:56 17:44 17:24 17:07 16:51 16:34 16:17 15:56 15:45 15:45 15:15 14:54	23:44	00:08 00:28 00:44 00:59 01:11 01:56 02:13 02:28 02:52 03:13 03:33 03:53 04:14 04:52 05:08 05:28 05:52	01:09 01:29 01:4: 01:59 02:07 02:18 02:40 02:58 03:12 03:20 04:42 05:00 05:22 05:36 05:55 06:07

13:51

06:35

07:13

12:26

S 60°

August 04, 05, 06 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	313°05.3	226° 37.5	N19°38.6	212°43.0	N23°41.7	136°12.0	N02°36.0	273°43.8	N12°47.0		057004.5	20045.0
1	328°07.7	241°37.6	38.8	227°43.7	41.7	151°14.1	35.8	288°46.2	47.0	Alpheratz	357°31.5	29°15.0
2	343°10.2	256° 37.6	39.0	242°44.3	41.6	166°16.1	35.6	303°48.5	47.0	Ankaa	353°04.1	-42°08.7
3	358°12.7	271°37.7	39.2	257°45.0	41.5	181°18.2	• • 35.4	318°50.9	• • 47.0	Schedar	349°27.3	56°41.6
4	13°15.1	286° 37.8	39.4	272°45.6	41.4	196°20.2	35.2	333°53.3	47.0	Diphda	348°44.2	-17°49.5
5	28°17.6	301°37.9	39.6	287°46.3	41.3	211°22.3	35.1	348°55.7	47.1	Achernar	335°17.9	-57°05.1
6	43°20.0	316°38.0	N19°39.8	302°46.9	N23°41.2	226°24.3	N02°34.9	3°58.1	N12°47.1	Hamal	327°47.8	23°35.9
7	58°22.5	331° 38.0	40.0	317°47.6	41.1	241°26.4	34.7	19°00.5	47.1	Polaris	312°29.1	89°22.7
8	73°25.0	346°38.1	40.0	332°48.3	41.0	256°28.4	34.7	34°02.8	47.1	Acamar	$315^{\circ}09.6$	-40°11.1
9	88°27.4	1°38.2	• • 40.1	347°48.9	• • 40.9	271°30.5	• • 34.3	49°05.2	• • 47.1	Menkar	$314^{\circ}03.1$	4°12.2
	103°29.9	16°38.3	40.5	2°49.6	40.9	271 30.5 286°32.5		64°07.6		Mirfak	308°24.1	49°57.6
10	103 29.9 118°32.4						34.1		47.1	Aldebaran	290°36.4	16°34.0
11		31°38.3	40.7	17°50.2	40.7 N23°40.6	301°34.6	33.9	79°10.0	47.1	Rigel	281°01.2	-8°10.0
12	133°34.8	46°38.4	N19°40.9	32°50.9		316°36.6	N02°33.8	94°12.4	N12°47.2	Capella	280°17.8	46°01.4
13	148°37.3	61°38.5	41.1	47°51.5	40.5	331°38.7	33.6	109°14.7	47.2	Bellatrix	278°19.9	6°22.5
14	163°39.8	76°38.5	41.3	62°52.2	40.4	346°40.7	33.4	124°17.1	47.2	Elnath	277°58.4	28°37.8
15	178°42.2	91°38.6	• • 41.5	77°52.9	• • 40.3	1°42.8	• • 33.2	139°19.5	• • 47.2	Alnilam	275°35.0	-1°11.0
16	193°44.7	106°38.7	41.6	92°53.5	40.2	16°44.8	33.0	154°21.9	47.2	Betelgeuse	270°49.2	7°24.7
17	208°47.1	121°38.7	41.8	107°54.2	40.1	31°46.9	32.8	169°24.3	47.2	Canopus	263°51.5	-52°42.5
18	223°49.6	136°38.8	N19°42.0	122°54.8	N23°40.1	46°48.9	N02°32.7	184°26.7	N12°47.3	Sirius	258°23.9	-16°45.3
19	238°52.1	151°38.9	42.2	137°55.5	40.0	61°51.0	32.5	199°29.0	47.3	Adhara	255°03.9	-10° 43.5 -29° 00.6
20	253°54.5	166°38.9	42.4	152°56.1	39.9	76°53.0	32.3	214°31.4	47.3		244°48.1	
21	268°57.0	181°39.0	• • 42.6	167°56.8	• • 39.8	91°55.0	• • 32.1	229°33.8	• • 47.3	Procyon		5°09.1
22	283°59.5	196°39.1	42.7	182°57.5	39.7	106°57.1	31.9	244°36.2	47.3	Pollux	243°14.1	27°57.3
23	299°01.9	211°39.1	42.9	197°58.1	39.6	121°59.1	31.7	259°38.6	47.3	Avior	234°14.1	-59°36.1
			_							Suhail	222°44.6	-43°32.9
Mer.p	ass. 03:07	$\nu 0.1' \ d0.$	2′ m-4.46	ν 0.7′ d -0	0.1′ m1.55	$\nu 2.0' \ d-0$.2′ m-1.74	ν 2.4′ d0	.0′ m0.32	Miaplacidus	221°38.5	-69°50.2
										Alphard	217°45.2	-8°47.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
										Dubhe	193°38.1	61°35.9
0	314°04.4 329°06.9	226°39.2 241°39.2	N19°43.1	212°58.8 227°59.4	N23°39.5	137°01.2	N02°31.5	274°41.0 289°43.4	N12°47.3	Denebola	182°22.2	14°24.8
1			43.3		39.4	152°03.2	31.4		47.4	Gienah	175°40.7	$-17^{\circ}42.1$
2	344°09.3	256°39.3	43.5	243°00.1	39.3	167°05.3	31.2	304°45.7	47.4	Acrux	172°57.1	-63°15.8
3	359°11.8	271°39.3	• • 43.7	258°00.8	• • 39.2	182°07.3	• • 31.0	319°48.1	• • 47.4	Gacrux	171°48.6	-57°16.7
4	14°14.3	286°39.4	43.8	273°01.4	39.1	197°09.4	30.8	334°50.5	47.4	Alioth	166°10.8	55°48.5
5	29°16.7	301°39.5	44.0	288°02.1	39.0	212°11.4	30.6	349°52.9	47.4	Spica	158°19.3	-11°18.7
6	44°19.2	316°39.5	N19°44.2	303°02.7	N23°38.9	$227^{\circ}13.5$	N02°30.4	4°55.3	N12°47.4	Alkaid	152°49.9	49°10.5
7	59°21.6	331°39.6	44.4	318°03.4	38.8	$242^{\circ}15.5$	30.2	19°57.7	47.4	Hadar	148°31.8	-60°30.9
8	74°24.1	346°39.6	44.6	333°04.1	38.7	$257^{\circ}17.6$	30.1	35°00.1	47.5		147°54.2	-36°30.8
9	89°26.6	1°39.7	• • 44.7	348°04.7	• • 38.6	$272^{\circ}19.6$	• • 29.9	50°02.4	• • 47.5	Arcturus	145°45.3	19°02.1
10	104°29.0	16°39.7	44.9	3°05.4	38.5	$287^{\circ}21.6$	29.7	65°04.8	47.5	Rigil Kent.	139°36.2	-60°57.5
11	119°31.5	31°39.7	45.1	18°06.0	38.3	302°23.7	29.5	80°07.2	47.5	Kochab	139° 30.2 137° 20.0	74°02.5
12	134°34.0	46°39.8	N19°45.3	33°06.7	N23°38.2	317°25.7	N02°29.3	95°09.6	N12°47.5	1		
13	149°36.4	61°39.8	45.4	48°07.4	38.1	332°27.8	29.1	110°12.0	47.5	Zuben'ubi	136°52.7	-16°09.7
14	164°38.9	76°39.9	45.6	63°08.0	38.0	347°29.8	28.9	125°14.4	47.5	Alphecca	126°01.2	26°37.3
15	179°41.4	91°39.9	• • 45.8	78°08.7	37.9	2°31.9	28.7	140°16.8	• • 47.5	Antares	112°12.0	-26°29.7
16	194°43.8	106° 40.0	46.0	93°09.3	37.8	17°33.9	28.6	155°19.1	47.6	Atria	107°03.2	-69°04.9
17	209°46.3	121°40.0	46.1	108°10.0	37.7	32°36.0	28.4	170°21.5	47.6	Sabik	101°59.2	-15°45.5
18	224°48.8	136° 40.0	N19°46.3	123°10.7	N23°37.6	47°38.0	N02°28.2	185°23.9	N12°47.6	Shaula	96°06.1	-37°07.4
19	239°51.2	151°40.1	46.5	138°11.3	07.5	62°40.0		200°26.3	47.6	Rasalhague	95°55.6	12°32.6
	259°51.2 254°53.7		46.5		37.5		28.0		47.6	Eltanin	90°40.4	$51^{\circ}29.4$
20		166°40.1	46.7	153°12.0	37.4	77°42.1	27.8	215°28.7 230°31.1	47.6	Kaus Aust.	83°28.3	-34°22.2
21	269°56.1	181°40.2	• • 46.8	168°12.7	• • 37.3	92°44.1	• • 27.6		• • 47.6	Vega	80°30.9	38°48.9
22	284°58.6	196°40.2	47.0	183°13.3	37.2	107°46.2	27.4	245°33.5	47.6	Nunki	75°43.8	$-26^{\circ}15.5$
23	300°01.1	211°40.2	47.2	198°14.0	37.1	122°48.2	27.3	260°35.9	47.7	Altair	61°56.8	8°56.9
Mer.n	pass. 03:03	ν 0.1 $^{\prime}$ d0	2′ m-4.45	ν 0.7' d-0	0.1' m1.56	$\nu 2.0' d-0$.2′ m-1.74	ν 2.4' d0	.0′ m0.32	Peacock	53°00.6	-56°38.4
ρ										Deneb	49°23.3	45°23.1
										Enif	33°35.6	10°00.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.1
0	$315^{\circ}03.5$	226°40.3	N19°47.3	213°14.6	N23°37.0	137°50.3	N02°27.1	275°38.3	N12°47.7	Fomalhaut	15°11.0	-29°27.9
1	$330^{\circ}06.0$	241°40.3	47.5	228°15.3	36.9	152°52.3	26.9	290°40.6	47.7	Scheat	13°42.0	28°14.4
2	345°08.5	256°40.3	47.7	243°16.0	36.8	167°54.3	26.7	305°43.0	47.7	Markab	13°26.7	15°21.7
3	$0^{\circ}10.9$	271°40.3	• • 47.9	258°16.6	• • 36.7	182°56.4	• • 26.5	320°45.4	• • 47.7	Iviainab		20 21.1
4	15°13.4	286°40.4	48.0	273°17.3	36.6	197°58.4	26.3	335°47.8	47.7	Aug 04 Fri	SHA	Mer.pass
5	$30^{\circ}15.9$	301°40.4	48.2	288°18.0	36.4	213°00.5	26.1	350°50.2	47.7	Venus	273°32.2	08:53
6	45°18.3	316°40.4	N19°48.4	303°18.6	N23°36.3	228°02.5	N02°25.9	5°52.6	N12°47.7	Mars	259°37.8	09:49
7	60°20.8	331°40.5	48.5	318°19.3	36.2	243°04.6	25.8	20°55.0	47.8	Jupiter	183°06.8	14:53
8	75°23.2	346° 40.5	48.7	333°19.9	36.1	258°06.6	25.6	35°57.4	47.8	Saturn	320°38.5	05:44
9	90°25.7	1°40.5	• • 48.9	348°20.6	36.0	273°08.6	• • 25.4	50°59.8	• • 47.8			
10	105°28.2	16° 40.5	49.0	3°21.3	35.9	288°10.7	25.2	66°02.1	47.8	Aug 05 Sat	SHA	Mer.pass
11	120°30.6	31°40.5	49.2	18°21.9	35.8	303°12.7	25.0	81°04.5	47.8		272°34.8	08:53
12	135°33.1	46° 40.6	N19°49.4	33°22.6	N23°35.7	318°14.8	N02° 24.8	96°06.9	N12°47.8		258°54.4	09:48
13	150°35.6	61°40.6	49.5	48°23.3	35.6	333°16.8	24.6	111°09.3	47.8		182°56.8	14:50
14	165°38.0	76° 40.6	49.5	63°23.9	35.5	348°18.9	24.0	111 09.3 126°11.7	47.8	Saturn	320°36.6	05:40
								120 11.7 141°14.1		A OC C	CIII	N4.
15 16	180°40.5	91°40.6	• • 49.9	78°24.6	• • 35.3	3°20.9	• • 24.3		· · 47.9	Aug 06 Sun	SHA	Mer.pass
16	195°43.0	106°40.6	50.0	93°25.3	35.2	18°22.9	24.1	156°16.5	47.9	1	271°36.7	08:53
17	210°45.4	121°40.7	50.2	108°25.9	35.1	33°25.0	23.9	171°18.9	47.9	Mars		09:47
18	225°47.9	136°40.7	N19°50.3	123°26.6	N23°35.0	48°27.0	N02°23.7	186°21.3	N12°47.9		182°46.7	14:47
19	240°50.4	151°40.7	50.5	138°27.2	34.9	63°29.1	23.5	201°23.7	47.9	Saturn	320°34.7	05:37
20	255°52.8	166°40.7	50.7	153°27.9	34.8	78°31.1	23.3	216°26.1	47.9			
21	270°55.3	181°40.7	• • 50.8	168°28.6	• • 34.7	93°33.1	• • 23.1	231°28.5	• • 47.9	Horizont	al parallax	
22	285°57.7	196°40.7	51.0	183°29.2	34.5	108°35.2	23.0	246°30.8	47.9		Venus:	0.2
23	$301^{\circ}00.2$	211°40.7	51.1	198°29.9	34.4	123°37.2	22.8	261°33.2	48.0		Mars:	0.1
Ν.Δ		10 0/ 10	2/ m 4 44	107/ 10	11/ -1 56		2/ m 1 74	1,0 4/ -/0	0/ 20			
IV/Ier n	ass. 02:59	ν U.U' $d0$.	2′ m-4.44	νυ. <i>ι' d-</i> 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°28.3	N17°08.9	13°56.5	12.1'	S 20°22.2	-8.7'	54.9'	
1	193°28.4	08.3	28°27.6	12.1'	20°13.4	-8.8'	54.9'	
2	208°28.5 223°28.5	07.6	42°58.7 57°29.9	12.2' 12.3'	20°04.6 19°55.7	-8.9'	54.9'	
3 4	223°28.5 238°28.6	· · 06.9 06.3	57°29.9 72°01.2	12.4	19°55.7 19°46.7	-9.0' -9.1'	54.9' 54.9'	
5	253°28.6	05.6	86°32.6	12.4'	19° 40.7 19° 37.7	-9.1 -9.2'	54.8'	
6	268°28.7	N17°04.9	101°04.1	12.5'	\$19°28.5	-9.2'	54.8'	
7	283°28.8	04.3	115°35.6	12.6'	19°19.3	-9.3'	54.8'	
8	298°28.8	03.6	130°07.2	12.7'	19°10.0	-9.4'	54.8'	
9	313°28.9	• • 02.9	144°38.9	12.7'	19°00.6	-9.5'	54.8'	
10	328°28.9 343°29.0	02.2	159°10.6 173°42.4	12.8' 12.9'	18°51.1 18°41.5	-9.6'	54.8' 54.8'	
11 12	343 29.0 358°29.1	01.6 N17°00.9	173 42.4 188°14.3	13.0'	S18°31.9	-9.6' -9.7'	54.8	
13	13°29.1	17°00.2	202°46.3	13.0'	18°22.2	-9.7 -9.8'	54.7'	
14	28°29.2	16°59.5	217°18.3	13.1'	18°12.4	-9.9'	54.7'	
15	43°29.3	• • 58.9	231°50.4	13.2'	$18^{\circ}02.5$	-9.9'	54.7'	
16	58°29.3	58.2	246°22.6	13.3'	17°52.6	-10.0'	54.7'	
17	73°29.4	57.5	260°54.9	13.3'	17°42.6	-10.1'	54.7'	
18	88°29.5 103°29.5	N16° 56.8 56.2	275°27.2 289°59.6	13.4' 13.5'	\$17°32.5 17°22.4	-10.1' -10.2'	54.7' 54.6'	
19 20	103 29.5 118°29.6	50.2 55.5	209 59.0 304°32.1	13.5'	17°12.2	-10.2 -10.3'	54.6'	
21	133°29.7	54.8	319°04.6	13.6'	17°01.9	-10.4	54.6'	
22	148°29.7	54.1	333°37.2	13.7'	16°51.5	-10.4	54.6'	
23	163°29.8	53.4	348°09.9	13.7'	$16^{\circ}41.1$	-10.5'	54.6'	
	SD = 15.8'	d = -0.7'		SI	O = 15.0'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°29.8	N16° 52.8	2°42.7	13.8'	S16°30.6	-10.6'	54.6'	
1	193°29.9	52.1	$17^{\circ}15.5$	13.9'	$16^{\circ}20.1$	-10.6'	54.6'	
2	208°30.0	51.4	31°48.3	13.9'	16°09.4	-10.7'	54.5'	
3	223°30.0	• • 50.7	46°21.3	14.0'	15°58.8	-10.7'	54.5'	
4 5	238°30.1 253°30.2	50.0 49.4	60°54.3 75°27.4	14.1' 14.1'	15°48.0 15°37.2	-10.8' -10.9'	54.5' 54.5'	
6	268°30.2	N16° 48.7	90°00.5	14.1	\$15°26.4	-10.9'	54.5	
7	283°30.3	48.0	104°33.7	14.3'	15°15.4	-11.0'	54.5'	
8	298°30.4	47.3	119°07.0	14.3'	15°04.5	-11.0'	54.5'	
9	313°30.5	• • 46.6	133°40.4	14.4'	14°53.4	-11.1'	54.5'	
10	328°30.5	45.9	148°13.8	14.5'	14°42.3	-11.1'	54.4'	
11	343°30.6	45.3	162°47.2	14.5'	14°31.2	-11.2'	54.4'	
12 13	358°30.7 13°30.7	N16° 44.6 43.9	177°20.7 191°54.3	14.6' 14.6'	\$14°20.0 14°08.7	-11.3' -11.3'	54.4' 54.4'	
14	28°30.8	43.2	206°28.0	14.7	13°57.4	-11.4'	54.4'	
15	43°30.9	• • 42.5	221°01.7	14.8'	13°46.1	-11.4'	54.4'	
16	58°30.9	41.8	235°35.4	14.8'	13°34.7	-11.5'	54.4'	
17	73°31.0	41.1	250°09.3	14.9'	13°23.2	-11.5'	54.4'	
18 19	88°31.1 103°31.1	N16° 40.5 39.8	264°43.1 279°17.1	14.9' 15.0'	\$13°11.7 13°00.2	-11.6' -11.6'	54.4' 54.3'	
20	103 31.1 118°31.2	39.8	279 17.1 293°51.1	15.0'	13 00.2 12°48.6	-11.6'	54.3'	
21	133°31.3	38.4	308°25.1	15.1'	12°36.9	-11.0 -11.7'	54.3'	
22	148°31.4	37.7	322°59.2	15.2'	12°25.2	-11.7'	54.3'	
23	163°31.4	37.0	337°33.4	15.2'	12°13.5	-11.8'	54.3'	
	SD = 15.8'	d = -0.7'		SI	O = 14.9'			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°31.5	$N16^{\circ}36.3$	352°07.6	15.3'	S12°01.7	-11.8'	54.3'	
1	193°31.6	35.6	6°41.8	15.3'	11°49.9	-11.9'	54.3'	
2	208°31.7	34.9	21°16.2	15.4'	11°38.0	-11.9'	54.3' 54.3'	
3 4	223°31.7 238°31.8	· · 34.2 33.6	35°50.5 50°24.9	15.4' 15.5'	11°26.1 11°14.2	-11.9' -12.0'	54.3' 54.3'	
4 5	253°31.8	33.0 32.9	50 24.9 64°59.4	15.5'	11 14.2 11°02.2	-12.0'	54.3 54.2'	
6	268°31.9	N16°32.2	79°33.9	15.6'	\$10°50.2	-12.1'	54.2'	
7	283°32.0	31.5	94°08.5	15.6'	$10^{\circ}38.1$	-12.1'	54.2'	
8	298°32.1	30.8	108°43.1	15.7'	10°26.0	-12.1'	54.2'	
9	313°32.2	30.1	123°17.7	15.7'	10°13.9	-12.2'	54.2'	
10 11	328°32.2 343°32.3	29.4 28.7	137°52.4 152°27.2	15.7' 15.8'	10°01.7 09°49.5	-12.2' -12.2'	54.2' 54.2'	
12	358°32.4	N16°28.0	167°02.0	15.8'	509°37.3	-12.2	54.2'	
13	13°32.5	27.3	181°36.8	15.9'	09°25.0	-12.3'	54.2'	
14	28°32.5	26.6	$196^{\circ}11.7$	15.9'	09°12.7	-12.3'	54.2'	
15	43°32.6	• • 25.9	210°46.6	16.0'	09°00.4	-12.4'	54.2'	
16	58°32.7	25.2	225°21.6	16.0'	08°48.1	-12.4'	54.1'	
17 18	73°32.8 88°32.8	24.5 N16°23.8	239°56.6 254°31.6	16.0' 16.1'	08°35.7 5 08°23.3	-12.4' -12.4'	54.1' 54.1'	
18 19	88° 32.8 103° 32.9	23.1	254°31.6 269°06.7	16.1	08° 10.8	-12.4 -12.5'	54.1'	
20	118°33.0	22.4	283°41.8	16.1	07°58.4	-12.5'	54.1	
21	133°33.1	• • 21.7	298°16.9	16.2'	$07^{\circ}45.9$	-12.5'	54.1'	
22	148°33.2	21.0	312°52.1	16.2'	07°33.4	-12.5'	54.1'	
23	163°33.2	20.3	327°27.3	16.3'	07°20.8	-12.6'	54.1'	
	SD = 15.8'	d = -0.7'		SI	0 = 14.8'			

Las	Twi	light	Sunrise	Ca.t	Tw	ilight
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	////	00:49	23:07	////	////
N 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
N 10°	05:02	05:28	05:50	18:22	18:44	19:09
0°	05:16	05:41	06:03	18:09	18:31	18:56
S 10°	05:27	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
S 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
S 60°	06:26	07:17	08:04	16:09	16:56	17:46
Lat		Moonris	ie .		Moonse	t
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	22:23	21:21	20:48		01:35	04:07
	1					

Lat.		Moonris	e		Moonse	t
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
N 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
S 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
S 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
S 60°	15:17	16:42	18:04	07:46	07:54	07:59

August 07, 08, 09 UT (Mon., Tue., Wed.)

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	316°02.7	226°40.7	N19°51.3	213°30.6	N23°34.3	138°39.3	N02°22.6	276°35.6	N12°48.0		SIIA	
1	331° 05.1	241°40.7	51.5	213 30.0 228°31.2	34.2	150° 59.5 153° 41.3	22.4	270 33.0 291°38.0	48.0	Alpheratz	357°31.4	29°15.0
										Ankaa	353°04.1	-42°08.7
2	346°07.6	256°40.7	51.6	243°31.9	34.1	168°43.4	22.2	306°40.4	48.0	Schedar	349°27.2	56°41.6
3	1°10.1	271°40.7	• • 51.8	258°32.6	• • 34.0	183°45.4	• • 22.0	321°42.8	• • 48.0	Diphda	348°44.2	$-17^{\circ}49.5$
4	16°12.5	286°40.7	51.9	273°33.2	33.9	198°47.4	21.8	336°45.2	48.0	Achernar	335°17.9	-57°05.1
5	31°15.0	301°40.7	52.1	288°33.9	33.7	213°49.5	21.6	351°47.6	48.0	Hamal	327°47.8	23°35.9
6	46°17.5	316°40.8	N19°52.2	303°34.6	N23°33.6	228°51.5	N02°21.4	6°50.0	N12°48.0	Polaris	312°27.7	89°22.7
7	$61^{\circ}19.9$	331°40.8	52.4	318°35.2	33.5	243°53.6	21.3	21°52.4	48.0	Acamar	315°09.6	-40°11.1
8	76°22.4	346°40.8	52.6	333°35.9	33.4	258°55.6	21.1	36°54.8	48.1			
9	91°24.9	1°40.7	• • 52.7	348°36.6	• • 33.3	273°57.6	• • 20.9	51°57.2	• • 48.1	Menkar	314°03.1	4°12.2
10	106°27.3	16°40.7	52.9	3°37.2	33.1	288°59.7	20.7	66°59.6	48.1	Mirfak	308°24.0	49°57.6
11	121°29.8	31°40.7	53.0	18°37.9	33.0	304°01.7	20.5	82°02.0	48.1	Aldebaran	290°36.4	16°34.0
12	136°32.2	46°40.7	N19°53.2	33°38.6	N23°32.9	319°03.8	N02°20.3	97°04.4	N12°48.1	Rigel	281°01.2	-8°10.0
13	151°34.7	61°40.7	53.3	48°39.2	32.8	334°05.8	20.1	112°06.8		Capella	$280^{\circ}17.8$	46°01.4
	166° 37.2	76°40.7		63°39.9	32.7	349°07.8		112 00.8 127°09.1	48.1	Bellatrix	$278^{\circ}19.9$	6°22.5
14			53.5				19.9		48.1	Elnath	277°58.4	28°37.8
15	181°39.6	91°40.7	• • 53.6	78°40.6	• • 32.6	4°09.9	• • 19.8	142°11.5	• • 48.1	Alnilam	275°35.0	$-1^{\circ}11.0$
16	196°42.1	106°40.7	53.8	93°41.3	32.4	19°11.9	19.6	157°13.9	48.1	Betelgeuse	270°49.1	7°24.7
17	211°44.6	121°40.7	53.9	108°41.9	32.3	34°13.9	19.4	172°16.3	48.2	Canopus	263°51.5	-52°42.5
18	226°47.0	136°40.7	N19°54.1	123°42.6	N23°32.2	49°16.0	N02°19.2	187°18.7	N12°48.2	Sirius	258°23.9	-16°45.3
19	241°49.5	151°40.7	54.2	138°43.3	32.1	64°18.0	19.0	202°21.1	48.2			-10 45.5 -29°00.6
20	256°52.0	166°40.7	54.4	153°43.9	31.9	79°20.1	18.8	$217^{\circ}23.5$	48.2	Adhara	255°03.9	
21	271°54.4	181°40.7	• • 54.5	168°44.6	• • 31.8	94°22.1	• • 18.6	232°25.9	• • 48.2	Procyon	244°48.1	5°09.1
22	286°56.9	196°40.6	54.7	183°45.3	31.7	109°24.1	18.4	247°28.3	48.2	Pollux	243°14.1	27°57.3
23	301°59.3	211°40.6	54.8	198°45.9	31.6	124°26.2	18.2	262°30.7	48.2	Avior	234°14.1	-59°36.1
	301 39.3	_								Suhail	222°44.6	-43°32.9
Mer.p	ass. 02:55	ν 0.0′ d0.	2′ m-4.43	ν 0.7′ d-0	$0.1' \; \text{m} 1.56$	ν 2.0′ d-0	.2′ m-1.74	ν 2.4′ d0	.0' m 0.31	Miaplacidus	221°38.5	-69°50.2
										Alphard	217°45.2	-8°47.0
_			_		_		_		_	Regulus	207°31.6	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.9
0	317°01.8	226°40.6	N19°55.0	213°46.6	N23°31.5	139°28.2	N02°18.1	277°33.1	$N12^{\circ}48.2$	Denebola	182°22.2	14°24.8
1	332°04.3	241°40.6	55.1	228°47.3	31.3	154°30.3	17.9	292°35.5	48.2	Gienah	175° 40.8	-17°42.1
2	347°06.7	256°40.6	55.3	243°47.9	31.2	169°32.3	17.7	307°37.9	48.2			-63°15.7
3	2°09.2	271°40.6	• • 55.4	258°48.6	• • 31.1	184°34.3	• • 17.5	322°40.3	• • 48.3		172°57.1	
4	17°11.7	286°40.5	55.5	273°49.3	31.0	199°36.4	17.3	337°42.7	48.3	1	171°48.6	-57°16.7
5	32°14.1	301°40.5	55.7	288°50.0	30.8	214°38.4	17.1	352°45.1	48.3	Alioth	166°10.8	55°48.5
6	47°16.6	316°40.5	N19°55.8	303°50.6	N23°30.7	229°40.4	N02°16.9	7°47.5	N12°48.3	Spica	158° 19.3	-11°18.7
7	62°19.1	331°40.5		318°51.3	30.6	244°42.5	16.7	22°49.9	48.3	Alkaid	152°49.9	49°10.4
			56.0							Hadar	148°31.8	-60°30.9
8	77°21.5	346°40.4	56.1	333°52.0	30.5	259°44.5	16.5	37°52.3	48.3	Menkent	147°54.2	-36°30.8
9	92°24.0	1°40.4	• • 56.3	348°52.6	• • 30.3	274°46.6	• • 16.4	52°54.7	• • 48.3	Arcturus	145°45.3	$19^{\circ}02.1$
10	107°26.5	16°40.4	56.4	3°53.3	30.2	289°48.6	16.2	67°57.1	48.3	Rigil Kent.	139°36.2	-60°57.5
11	122°28.9	31°40.4	56.5	18°54.0	30.1	304°50.6	16.0	82°59.5	48.3	Kochab	137°20.1	74°02.5
12	137°31.4	46°40.3	N19°56.7	33°54.7	N23°30.0	319°52.7	N02°15.8	98°01.9	N12°48.3	Zuben'ubi	136°52.7	-16°09.7
13	152°33.8	61°40.3	56.8	48°55.3	29.8	334°54.7	15.6	113°04.3	48.4	Alphecca	126° 01.2	26°37.3
14	167°36.3	76°40.3	57.0	63°56.0	29.7	349°56.7	15.4	128°06.7	48.4			
15	182°38.8	91°40.2	•• 57.1	78°56.7	• • 29.6	4°58.8	• • 15.2	143°09.1	• • 48.4	Antares	112°12.1	-26°29.7
16	197°41.2	106°40.2	57.2	93°57.3	29.4	20°00.8	15.0	158°11.5	48.4	Atria	107°03.3	-69°04.9
17	212°43.7	121°40.2	57.4	108°58.0	29.3	35°02.9	14.8	173°13.9	48.4	Sabik	101°59.2	-15°45.5
18	227°46.2	136°40.1	N19°57.5	123°58.7	N23°29.2	50°04.9	N02°14.6	188°16.3	N12°48.4	Shaula	96°06.1	-37°07.4
19	242°48.6	151°40.1		138°59.4		65°06.9		203°18.7	48.4	Rasalhague	95°55.6	12°32.6
			57.6		29.1		14.5			Eltanin	90°40.4	51°29.4
20	257°51.1	166°40.1	57.8	154°00.0	28.9	80°09.0	14.3	218°21.1	48.4	Kaus Aust.	83°28.3	-34°22.2
21	272°53.6	181°40.0	• • 57.9	169°00.7	• • 28.8	95°11.0	• • 14.1	233°23.5	• • 48.4	Vega	80°30.9	38°48.9
22	287°56.0	196°40.0	58.0	184°01.4	28.7	110°13.0	13.9	248°25.9	48.4	Nunki	75°43.8	-26°15.5
23	302°58.5	211°40.0	58.2	199°02.1	28.5	$125^{\circ}15.1$	13.7	263°28.3	48.4	Altair	61°56.8	8°56.9
Mar	ass 02.51	1/-O O/ 40	.1′ m-4.42	υΩ 7' Δ C	0.1' m1.56	1/2 n/ 4 n	.2′ m-1.73	1/2 1/ 40	.0′ m0.31	Peacock	53°00.6	-56°38.4
ivier.p	ass. 02:51	ν -0.0° a 0.	.111-4.42	ν 0.1 a -0	m1.50	ν2.0 a -0	.∠ 111-1./3	ν2.4 aU	.0 1110.31	Deneb	49° 23.3	-50 36.4 45°23.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.6	10°00.6
0	318°00.9	226°39.9	N19°58.3	214°02.7	N23°28.4	140°17.1	N02°13.5		N12°48.5	Al Na'ir	27°28.9	-46°49.1
	333°03.4	241°39.9	58.4	214 02.7 229°03.4	28.3	140 17.1 155°19.1	13.3	276 30.7 293°33.1	48.5	Fomalhaut	15°11.0	-29°27.9
1										Scheat	13°42.0	28°14.4
2	348°05.9	256°39.8	58.6	244°04.1	28.2	170°21.2	13.1	308°35.5	48.5	Markab	13°26.7	15°21.7
3	3°08.3	271°39.8	• • 58.7	259°04.7	• • 28.0	185°23.2	• • 12.9	323°37.9	• • 48.5		· · · ·	
4	18°10.8	286°39.7	58.8	274°05.4	27.9	200°25.2	12.7	338°40.3	48.5	Aug 07 Mon	SHA	Mer.pass
5	33°13.3	301°39.7	59.0	289°06.1	27.8	215°27.3	12.6	353°42.7	48.5		270°38.1	08:53
6	48°15.7	316°39.7	N19°59.1	304°06.8	N23°27.6	230°29.3	N02°12.4	8°45.1	N12°48.5	Mars		09:46
7	63°18.2	331°39.6	59.2	319°07.4	27.5	245°31.4	12.2	23°47.5	48.5	Jupiter	182°36.6	14:43
8	78°20.7	346°39.6	59.4	334°08.1	27.4	260°33.4	12.0	38°49.9	48.5	Saturn	320°33.0	05:33
9	93°23.1	1°39.5	• • 59.5	349°08.8	• • 27.2	275°35.4	• • 11.8	53°52.3	• • 48.5		<u></u>	
10	108°25.6	16°39.5	59.6	4°09.5	27.1	290°37.5	11.6	68°54.7	48.5	Aug 08 Tue	SHA	Mer.pass
11	123°28.1	31°39.4	59.7	19°10.1	27.0	305°39.5	11.4	83°57.1	48.6	Venus		08:53
12	123 20.1 138°30.5	46°39.4	N19°59.9	34°10.1	N23°26.8	305 39.5 320°41.5	N02°11.2	98°59.5	N12°48.6	Mars	256°44.8	09:44
										Jupiter	182°26.4	14:40
13	153°33.0	61°39.3	20°00.0	49°11.5	26.7	335°43.6	11.0	114°01.9	48.6	Saturn	320°31.3	05:29
14	168°35.4	76°39.3	00.1	64°12.2	26.5	350°45.6	10.8	129°04.3	48.6			
15	183°37.9	91°39.2	• • 00.2	79°12.8	• • 26.4	5°47.6	• • 10.7	144°06.7	• • 48.6	Aug 09 Wed	SHA	Mer.pass
16	198°40.4	106°39.2	00.4	94°13.5	26.3	20°49.7	10.5	$159^{\circ}09.1$	48.6	Venus	268°39.0	08:53
17	213°42.8	121°39.1	00.5	109°14.2	26.1	35°51.7	10.3	$174^{\circ}11.5$	48.6	Mars		09:43
18	228°45.3	136°39.0	N20°00.6	124°14.9	N23°26.0	50°53.7	N02°10.1	189°13.9	N12°48.6		182°16.2	14:37
19	243°47.8	151°39.0	00.7	139°15.6	25.9	65°55.8	09.9	204°16.3	48.6	Saturn	320° 29.7	05:25
20	258°50.2	166°38.9	00.7	154°16.2	25.7	80°57.8	09.7	219°18.7	48.6	Saturn	J2U 29.1	05:25
21	273°52.7	181°38.9	•• 01.0	169°16.9	. 25.6	95°59.8	•• 09.5	234°21.1	• • 48.6	Horizont	al parallax	
											Venus:	0.2
22	288°55.2	196°38.8	01.1	184°17.6	25.5	111°01.9	09.3	249°23.6	48.6		Mars:	0.1
23	303°57.6	211°38.7	01.2	199°18.3	25.3	126°03.9	09.1	264°26.0	48.6		ividi 3.	V.1
Mars	ass. 02:47	1/=0 0/ d0	.1′ m-4.41	νΩ 7/ d C	0.1′ m1.56	1/2 N/ d N	.2′ m-1.73	1/2 // 40	.0′ m0.30			
.vici.p	UZ.TI	ν 0.0 u0.	1	ν J.1 u-C		₽ 2.0 u-0	1.13	ν Δ.¬ u0				

h	h Sun Moon						
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.3	N16° 19.6	342°02.6	16.3'	S07°08.3	-12.6'	54.1'
1	193°33.4 208°33.5	18.9 18.2	356°37.9 11°13.2	16.3'	06°55.7 06°43.1	-12.6'	54.1' 54.1'
2	206 33.5 223°33.6	10.2	25°48.5	16.3' 16.4'	06°30.4	-12.6' -12.6'	54.1'
4	238°33.6	16.8	40°23.9	16.4'	06°17.8	-12.7'	54.1'
5	253°33.7	16.1	54°59.3	16.4'	06°05.1	-12.7'	54.1'
6	268°33.8 283°33.9	N16° 15.4 14.7	69°34.7 84°10.2	16.5' 16.5'	\$05°52.4 05°39.7	-12.7' -12.7'	54.0' 54.0'
7 8	203 33.9 298°33.9	14.7	98°45.7	16.5	05°27.0	-12.7'	54.0'
9	313°34.0	• • 13.3	113°21.2	16.5'	05°14.3	-12.8'	54.0'
10	328°34.1	12.6	127°56.8	16.6'	05°01.5	-12.8'	54.0'
11 12	343°34.2 358°34.3	11.9 N16°11.1	142°32.3 157°07.9	16.6' 16.6'	04°48.7 \$04°36.0	-12.8' -12.8'	54.0' 54.0'
13	13°34.4	10.4	171°43.5	16.6'	04°23.2	-12.8'	54.0'
14	28°34.4	09.7	186°19.2	16.7'	04°10.4	-12.8'	54.0'
15	43°34.5	• • 09.0	200°54.8	16.7'	03°57.5	-12.8'	54.0'
16 17	58°34.6 73°34.7	08.3 07.6	215°30.5 230°06.2	16.7' 16.7'	03°44.7 03°31.9	-12.8' -12.9'	54.0' 54.0'
18	88°34.8	N16°06.9	244°41.9	16.7	503°19.0	-12.9'	54.0'
19	103°34.8	06.2	259°17.6	16.7'	03°06.1	-12.9'	54.0'
20	118°34.9	05.5	273°53.4	16.8'	02°53.3	-12.9'	54.0'
21 22	133°35.0 148°35.1	· · 04.8	288°29.1 303°04.9	16.8' 16.8'	02°40.4 02°27.5	-12.9' -12.9'	54.0' 54.0'
23	163°35.2	03.3	303 04.9 317°40.7	16.8'	02 27.5 02°14.6	-12.9'	54.0'
	SD = 15.8'	d = -0.7'			O = 14.8'		
	JD — 13.0°	u — -0.1		اد			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.3	N16°02.6	332°16.5 346°52.3	16.8'	\$02°01.7	-12.9'	54.0'
1 2	193°35.4 208°35.4	01.9 01.2	1°28.1	16.8' 16.8'	01°48.8 01°35.9	-12.9' -12.9'	54.0' 54.0'
3	223°35.5	16°00.5	16°03.9	16.8'	01°23.0	-12.9'	54.0'
4	238°35.6	15°59.8	30°39.8	16.8'	$01^{\circ}10.1$	-12.9'	54.0'
5	253°35.7	59.1	45°15.6	16.9'	00°57.1	-12.9'	54.0'
6 7	268°35.8 283°35.9	N15°58.3 57.6	59°51.5 74°27.3	16.9' 16.9'	500°44.2 00°31.3	-12.9' -12.9'	54.0' 54.0'
8	298°36.0	56.9	89°03.2	16.9'	00°18.4	-12.9'	54.0'
9	313°36.0	• • 56.2	103°39.1	16.9'	S00°05.5	-12.9'	54.0'
10	328°36.1	55.5	118°14.9 132°50.8	16.9'	N00°07.5 00°20.4	12.9'	54.0'
11 12	343°36.2 358°36.3	54.8 N15°54.0	132 50.8 147°26.7	16.9' 16.9'	N00°33.3	12.9' 12.9'	54.0' 54.0'
13	13°36.4	53.3	162°02.6	16.9'	00°46.2	12.9'	54.0'
14	28°36.5	52.6	176°38.4	16.9'	$00^{\circ}59.1$	12.9'	54.0'
15	43°36.6 58°36.6	• • 51.9	191°14.3 205°50.2	16.9'	01°12.0 01°24.9	12.9'	54.0'
16 17	73°36.7	51.2 50.4	205° 50.2 220° 26.0	16.9' 16.9'	01°24.9	12.9' 12.9'	54.0' 54.0'
18	88°36.8	N15°49.7	235°01.9	16.9'	N01°50.7	12.9'	54.0'
19	103°36.9	49.0	249°37.8	16.9'	02°03.6	12.9'	54.0'
20 21	118°37.0 133°37.1	48.3 • • 47.6	264°13.6 278°49.5	16.8' 16.8'	02°16.4 02°29.3	12.9' 12.9'	54.0' 54.0'
22	148°37.2	46.8	276 49.5 293°25.3	16.8'	02 29.3 02°42.1	12.9	54.0'
23	163°37.3	46.1	308°01.1	16.8'	02°55.0	12.8'	54.0'
	SD = 15.8'	d = -0.7'	-	SI	D = 14.7'		
Wed	GHA 178°37.4	Dec N15° 45.4	GHA 322°36.9	ν	Dec N03°07.8	d 12.0'	HP 54.0'
0 1	178 37.4 193°37.5	N15 45.4 44.7	322 30.9 337°12.7	16.8' 16.8'	03°20.6	12.8' 12.8'	54.0'
2	208°37.5	43.9	351°48.5	16.8'	03°33.4	12.8'	54.0'
3	223°37.6	• • 43.2	6°24.3	16.8'	03°46.2	12.8'	54.0'
4 5	238°37.7 253°37.8	42.5 41.8	21°00.1 35°35.8	16.8' 16.7'	03°59.0 04°11.8	12.8' 12.8'	54.0' 54.0'
6	268°37.9	N15°41.0	50°11.6	16.7'	N04°24.5	12.7	54.0'
7	283°38.0	40.3	64°47.3	16.7'	04°37.3	12.7'	54.0'
8	298°38.1	39.6	79°23.0	16.7'	04°50.0	12.7'	54.0'
9 10	313°38.2 328°38.3	· · 38.9 38.1	93°58.7 108°34.3	16.7' 16.6'	05°02.7 05°15.4	12.7' 12.7'	54.0' 54.0'
11	343°38.4	37.4	123°10.0	16.6'	05°28.1	12.6'	54.0'
12	358°38.5	N15°36.7	137°45.6	16.6'	N05°40.7	12.6'	54.0'
13	13°38.6 28°38.7	35.9	152°21.2	16.6'	05°53.3 06°05.9	12.6'	54.0'
14 15	28°38.7 43°38.7	35.2 •• 34.5	166°56.8 181°32.3	16.6' 16.5'	06°05.9 06°18.5	12.6' 12.6'	54.0' 54.0'
16	58°38.8	33.8	196°07.9	16.5	06°31.1	12.5'	54.0'
17	73°38.9	33.0	210°43.4	16.5'	06°43.6	12.5'	54.0'
18 19	88°39.0 103°39.1	N15°32.3 31.6	225°18.8 239°54.3	16.4' 16.4'	N06°56.2 07°08.7	12.5' 12.5'	54.1' 54.1'
20	103°39.1 118°39.2	31.6	239°54.3 254°29.7	16.4	07°08.7 07°21.1	12.5	54.1'
21	133°39.3	• • 30.1	269°05.1	16.4'	07°33.6	12.4'	54.1'
22	148°39.4	29.4	283°40.4	16.3'	07°46.0	12.4'	54.1'
23	163°39.5	28.6	298°15.8	16.3'	07°58.4	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	////	////
N 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
N 40°	04:00	04:36	05:05	19:05	19:35	20:11
35°	04:15	04:48	05:15	18:56	19:23	19:56
30°	04:28	04:58	05:23	18:47	19:13	19:43
20°	04:47	05:15	05:38	18:33	18:56	19:23
N 10°	05:03	05:29	05:51	18:21	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:30	18:55
S 10°	05:27	05:52	06:14	17:58	18:19	18:45
20°	05:37	06:03	06:26	17:46	18:08	18:35
30°	05:46	06:15	06:40	17:32	17:57	18:25
35°	05:51	06:21	06:48	17:24	17:50	18:21
40°	05:56	06:28	06:57	17:15	17:43	18:16
45°	06:01	06:36	07:07	17:05	17:36	18:11
S 50°	06:07	06:45	07:20	16:52	17:27	18:05
52°	06:09	06:49	07:25	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
S 60°	06:20	07:10	07:56	16:16	17:02	17:52

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	20:21	19:56	19:30	06:07	07:59	09:50
N 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
N 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°	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
S 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
S 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
S 60°	19:23	20:42	22:01	08:02	08:05	80:80

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
- 4,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	319°00.1	226°38.7	N20°01.3	214°18.9	N23°25.2	141°05.9	N02°08.9	279°28.4	N12°48.7			
1	334°02.6	241°38.6	01.5	229°19.6	25.0	156°08.0	08.7	294°30.8	48.7	Alpheratz	357°31.4	29°15.0
2	349°05.0	256°38.6	01.6	244°20.3	24.9	171° 10.0	08.6	309°33.2		Ankaa	353°04.0	-42°08.7
			01.7						48.7	Schedar	$349^{\circ}27.2$	56°41.6
3	4°07.5	271°38.5		259°21.0	• • 24.8	186° 12.0	• • 08.4	324°35.6	• • 48.7	Diphda	348°44.2	-17°49.5
4	19°09.9	286°38.4	01.8	274°21.6	24.6	201°14.1	08.2	339°38.0	48.7	Achernar	335°17.9	-57°05.1
5	34°12.4	301°38.4	01.9	289°22.3	24.5	$216^{\circ}16.1$	08.0	354°40.4	48.7	Hamal	327°47.7	23°35.9
6	49°14.9	316°38.3	N20°02.0	304°23.0	N23°24.3	231°18.1	N02°07.8	9°42.8	N12°48.7	1		
7	64°17.3	331°38.2	02.2	319°23.7	24.2	246°20.2	07.6	24°45.2	48.7	Polaris	312°26.1	89°22.7
8	79°19.8	346°38.1	02.3	334°24.4	24.1	261°22.2	07.4	39°47.6	48.7	Acamar	315°09.6	-40°11.1
	94°22.3	1°38.1								Menkar	314°03.1	4°12.2
9			• • 02.4	349°25.0	• • 23.9	276° 24.2	• • 07.2	54°50.0	• • 48.7	Mirfak	308°24.0	49°57.6
10	109°24.7	16°38.0	02.5	4°25.7	23.8	291°26.3	07.0	69°52.4	48.7	Aldebaran	290°36.4	16°34.0
11	124°27.2	31°37.9	02.6	19°26.4	23.6	306°28.3	06.8	84°54.8	48.7	Rigel	281°01.2	-8°10.0
12	139°29.7	46°37.9	N20°02.7	34°27.1	N23°23.5	321°30.3	$N02^{\circ}06.6$	99°57.2	$N12^{\circ}48.7$			
13	154°32.1	61°37.8	02.8	49°27.8	23.4	336°32.4	06.5	114°59.6	48.7	Capella	280°17.8	46°01.4
14	169°34.6	76°37.7	03.0	64°28.4	23.2	351°34.4	06.3	130°02.1	48.8	Bellatrix	278°19.9	6°22.5
15	184°37.0	91°37.6	• • 03.1	79°29.1	. 23.1	6°36.4	06.1	145°04.5	• • 48.8	Elnath	277°58.4	28°37.8
										Alnilam	275°34.9	-1°11.0
16	199°39.5	106°37.6	03.2	94°29.8	22.9	21°38.4	05.9	160°06.9	48.8	Betelgeuse	270°49.1	7°24.7
17	214°42.0	121°37.5	03.3	109°30.5	22.8	36°40.5	05.7	175°09.3	48.8	Canopus	263°51.5	-52°42.5
18	229°44.4	136°37.4	N20°03.4	124°31.2	N23°22.6	51°42.5	N02°05.5	190°11.7	N12°48.8	Sirius	258°23.9	-16°45.3
19	244°46.9	151°37.3	03.5	139°31.8	22.5	66°44.5	05.3	205°14.1	48.8	1		
20	259°49.4	166°37.2	03.6	154°32.5	22.3	81°46.6	05.1	220°16.5	48.8	Adhara	255°03.9	-29°00.6
21	274°51.8	181°37.2	• • 03.7	169°33.2	22.2	96°48.6	04.9	235°18.9	• • 48.8	Procyon	244°48.1	5°09.1
	274 51.6 289°54.3					90 46.0 111°50.6				Pollux	243°14.1	27°57.3
22		196°37.1	03.8	184°33.9	22.1		04.7	250°21.3	48.8	Avior	$234^{\circ}14.1$	-59°36.0
23	304°56.8	211°37.0	03.9	199°34.6	21.9	126°52.7	04.5	265°23.7	48.8	Suhail	222°44.5	-43°32.9
Morr	ass 02.44	₁/_∩ 1/ ຝ∩	.1' m-4.40	υΩ 7/ A Ω	0.1′ m1.56	1/2 n/ 4 n	.2′ m-1.73	1/2 A/ do	.0′ m0.30	Miaplacidus	221°38.5	-43°52.3
ivier.p	ass. 02:44	ν-0.1 d0	.111-4.4U	νυ.ι α-υ	7.1 1111.50	ν2.0 a -0	.∠ 111-1./3	ν2.4 aU	.0 1110.30			
										Alphard	217°45.2	-8°47.0
E:	CHA	CHA	Das	CHA	Doo	CHA	Doo	CHA	Dee	Regulus	207°31.7	11°49.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.9
0	319°59.2	226°36.9	N20°04.0	214°35.2	N23°21.8	141°54.7	N02°04.3	280°26.1	N12°48.8	Denebola	182°22.2	14°24.8
1	335°01.7	241°36.8	04.1	229°35.9	21.6	156°56.7	04.2	295°28.5	48.8	Gienah	175°40.8	-17°42.1
2	350°04.2	256°36.7	04.2	244°36.6	21.5	171°58.8	04.0	310°31.0	48.8	1	173° 57.1	-63°15.7
3	5°06.6	271°36.7	• • 04.3	259°37.3	• • 21.3	187°00.8	• • 03.8	325°33.4	• • 48.8			
4	20°09.1	286°36.6	04.5	274°38.0	21.2	202°02.8	03.6	340°35.8	48.8	1	171°48.6	-57°16.7
5	35°11.5	301°36.5	04.6	289°38.6	21.0	217°04.8	03.4	355°38.2	48.9	Alioth	$166^{\circ}10.8$	55°48.5
										Spica	158°19.3	-11°18.7
6	50°14.0	316°36.4	N20°04.7	304°39.3	N23°20.9	232°06.9	N02°03.2	10°40.6	N12°48.9	Alkaid	152°49.9	49°10.4
7	$65^{\circ}16.5$	331°36.3	04.8	319°40.0	20.7	247°08.9	03.0	25°43.0	48.9	Hadar	148°31.9	-60°30.9
8	80°18.9	346°36.2	04.9	334°40.7	20.6	262°10.9	02.8	40°45.4	48.9	Menkent	147°54.2	-36°30.8
9	95°21.4	1°36.1	• • 05.0	349°41.4	• • 20.4	277°13.0	• • 02.6	55°47.8	• • 48.9	1		
10	110°23.9	16°36.0	05.1	4°42.1	20.3	292°15.0	02.4	70°50.2	48.9	Arcturus	145°45.3	19°02.1
11	125°26.3	31°35.9	05.2	19°42.7	20.1	307° 17.0	02.2	85°52.7	48.9	Rigil Kent.	139°36.2	-60°57.5
										Kochab	$137^{\circ}20.2$	74°02.5
12	140°28.8	46°35.8	N20°05.3	34°43.4	N23°20.0	322°19.1	N02°02.0	100°55.1	N12°48.9	Zuben'ubi	136°52.8	-16°09.7
13	155°31.3	61°35.7	05.3	49°44.1	19.8	$337^{\circ}21.1$	01.8	115°57.5	48.9	Alphecca	126°01.2	26°37.3
14	170°33.7	76°35.6	05.4	64°44.8	19.7	352°23.1	01.7	130°59.9	48.9	Antares	112°12.1	-26°29.7
15	185°36.2	91°35.5	• • 05.5	79°45.5	• • 19.5	$7^{\circ}25.1$	• • 01.5	146°02.3	• • 48.9			
16	200°38.6	106°35.4	05.6	94°46.2	19.4	22°27.2	01.3	161°04.7	48.9	Atria	107°03.3	-69°04.9
17	215°41.1	121°35.3	05.7	109°46.8	19.2	37°29.2	01.1	176°07.1	48.9	Sabik	101°59.2	-15°45.5
										Shaula	$96^{\circ}06.1$	-37°07.4
18	230°43.6	136°35.2	N20°05.8	124°47.5	N23°19.1	52°31.2	N02°00.9	191°09.5	N12°48.9	Rasalhague	95°55.6	12°32.6
19	245°46.0	151°35.1	05.9	139°48.2	18.9	67°33.3	00.7	206°12.0	48.9	Eltanin	90°40.5	51°29.4
20	260°48.5	166°35.0	06.0	154°48.9	18.8	82°35.3	00.5	221°14.4	48.9	Kaus Aust.	83°28.3	-34°22.2
21	275°51.0	181°34.9	• • 06.1	169°49.6	• • 18.6	97°37.3	• • 00.3	236°16.8	• • 48.9			
22	290°53.4	196°34.8	06.2	184°50.3	18.5	112°39.3	02°00.1	251°19.2	48.9	Vega	80°30.9	38°48.9
23	305°55.9	211°34.7	06.3	199°51.0	18.3	127°41.4	01°59.9	266°21.6	48.9	Nunki	75°43.8	-26°15.5
23	305 55.9	211 34.7	00.3	199 31.0	10.3	127 41.4	01 59.9	200 21.0	40.9	Altair	61°56.8	8°56.9
Mer.n	ass. 02:40	ν -0.1' d0	.1' m-4.39	ν 0.7' d-0).1' m1.56	$\nu 2.0' \ d-0$.2′ m-1.73	ν 2.4′ d 0	.0′ m0.29	Peacock	53°00.6	-56°38.4
										Deneb	49°23.3	45°23.1
										Enif	33°35.6	10°00.6
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.1
0	320°58.4	226°34.6	N20°06.4	214°51.6	N23°18.2	142°43.4	N01°59.7	281°24.0	N12°49.0	1		
1	336°00.8	241°34.5	06.5	229°52.3	18.0	157°45.4	59.5	296°26.4	49.0	Fomalhaut	15°11.0	-29°27.9
								311°28.8		Scheat	13°42.0	28°14.4
2	351°03.3	256°34.4	06.6	244°53.0	17.9	172°47.5	59.3		49.0	Markab	13°26.7	15°21.7
3	6°05.8	271°34.3	• • 06.6	259°53.7	• • 17.7	187°49.5	• • 59.1	326°31.3	• • 49.0	A 10 -:	6	
4	21°08.2	286°34.2	06.7	274°54.4	17.5	202°51.5	59.0	341°33.7	49.0	Aug 10 Thu	SHA	Mer.pass
5	$36^{\circ}10.7$	301°34.1	06.8	289°55.1	17.4	$217^{\circ}53.5$	58.8	$356^{\circ}36.1$	49.0	Venus		08:53
6	51°13.1	316°34.0	N20°06.9	304°55.8	N23°17.2	232°55.6	N01°58.6	11°38.5	N12°49.0	Mars	$255^{\circ}18.8$	09:42
7	66°15.6	331°33.9	07.0	319°56.4	17.1	247°57.6	58.4	26°40.9	49.0	Jupiter	182°05.8	14:34
8	81°18.1	346°33.8	07.0	334°57.1	16.9	262°59.6	58.2	41°43.3	49.0	Saturn	320°28.3	05:21
										Jatuill	J_J _U.J	03.21
9	96°20.5	1°33.6	• • 07.2	349°57.8	• • 16.8	278°01.7	• • 58.0	56°45.7	• • 49.0	Aug 11 Fri	SHA	Mer.pass
10	111°23.0	16°33.5	07.2	4°58.5	16.6	293°03.7	57.8	71°48.2	49.0	Venus	266°37.7	08:54
11	126°25.5	31°33.4	07.3	19°59.2	16.5	308°05.7	57.6	86°50.6	49.0	1		
12	141°27.9	46°33.3	N20°07.4	34°59.9	N23°16.3	323°07.7	N01°57.4	101°53.0	N12°49.0	Mars		09:41
13	156°30.4	61°33.2	07.5	50°00.6	16.1	338°09.8	57.2	116°55.4	49.0		181°55.5	14:30
14	171°32.9	76°33.1	07.6	65°01.3	16.0	353°11.8	57.2 57.0	131°57.8	49.0	Saturn	320°26.9	05:17
15	186°35.3	91°32.9	• • 07.7	80°01.9	• • 15.8	8°13.8	• • 56.8	147°00.2	• • 49.0	Aug 12 Sat	SHA	Mer.pass
16	201°37.8	106°32.8	07.7	95°02.6	15.7	23°15.8	56.6	162°02.7	49.0	Venus	265°36.3	08:54
17	216°40.3	121°32.7	07.8	110°03.3	15.5	$38^{\circ}17.9$	56.4	177°05.1	49.0	Mars		09:40
18	231°42.7	136°32.6	N20°07.9	125°04.0	N23°15.3	53° 19.9	N01°56.2	192°07.5	N12°49.0	1	181°45.0	14:27
										Saturn	320~25.7	05:14
										Und-a	al parallas	
21										Horizont	•	<u>.</u> -
22	291°52.6	$196^{\circ}32.1$	08.2	185°06.8	14.7	113°28.0	55.5	252°17.2	49.0			0.2
23	306°55.0	211°32.0	08.3	200°07.4	14.5	128°30.0	55.3	$267^{\circ}19.6$	49.1		Mars:	0.1
										_		
Mer.p	ass. 02:36	ν -0.1' d0	.1′ m-4.38	$ u$ 0.7 $^{\prime}$ d-0).2′ m1.56	ν 2.0′ d-0	.2′ m-1.72	ν 2.4′ d0	.0′ m0.29			
22 23		211°32.0		200°07.4		128°30.0		267°19.6				zontal parallax Venus:

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.6	N15°27.9	312°51.0	16.3'	N08°10.8	12.3'	54.1'
1	193°39.7	27.2	327°26.3	16.2'	08°23.1	12.3'	54.1'
2	208°39.8	26.4	342°01.5	16.2'	08°35.4	12.3'	54.1'
3	223°39.9	25.7	356° 36.7	16.1'	08°47.7	12.3'	54.1'
4	238°40.0	25.0	11°11.9	16.1'	09°00.0	12.2'	54.1'
5	253°40.1	24.2	25° 47.0	16.1'	09°12.2	12.2'	54.1'
6	268°40.2	$N15^{\circ}23.5$	40°22.0	16.0'	N09°24.4	12.2'	54.1'
7	283°40.3	22.7	54°57.1	16.0'	09°36.6	12.1'	54.2'
8	298°40.4	22.0	69°32.1	16.0'	09°48.7	12.1'	54.2'
9	313°40.5	• • 21.3	84°07.0	15.9'	10°00.8	12.1'	54.2'
10	328°40.6	20.5	98°41.9	15.9'	$10^{\circ}12.8$	12.0'	54.2'
11	343°40.7	19.8	113° 16.8	15.8'	10°24.9	12.0'	54.2'
12	358°40.8	N15°19.1	127°51.6	15.8'	N10°36.9	12.0'	54.2'
13	13°40.9	18.3	142°26.4	15.7'	10°48.8	11.9'	54.2'
14	28°41.0	17.6	157°01.1	15.7'	11°00.7	11.9'	54.2'
15	43°41.1	• • 16.8	171°35.8	15.6'	11°12.6	11.8'	54.2'
16	58°41.2	16.1	186° 10.4	15.6'	11°24.4	11.8'	54.3'
17	73°41.3 88°41.4	15.4 N15° 14.6	200° 45.0 215° 19.6	15.5'	11°36.2	11.8'	54.3'
18	88 41.4 103 41.5		215° 19.6 229° 54.0	15.5'	N11°48.0	11.7'	54.3'
19 20	103°41.5 118°41.6	13.9 13.1	229°54.0 244°28.5	15.4' 15.4'	11°59.7 12°11.4	11.7' 11.6'	54.3' 54.3'
20	118°41.6 133°41.7	13.1	244 28.5 259°02.9	15.4	12°11.4 12°23.0	11.6'	54.3'
21	133 41.7 148°41.8	11.6	259 02.9 273°37.2	15.3'	12 23.0 12°34.6	11.5	54.3'
23	163°41.9	10.9	273 37.2 288°11.5	15.3'	12°46.2	11.5'	54.3'
23			200 11.3			11.5	J T.J
	SD = 15.8'	d = -0.7'		SE	0 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.0	N15° 10.2	302°45.7	15.2'	N12°57.7	11.5'	54.4'
1	193°42.1	09.4	317° 19.8	15.1'	13°09.1	11.4'	54.4'
2	208°42.2	08.7	331°53.9	15.0'	13°20.5	11.4'	54.4'
3	223°42.3	• • 07.9	346°28.0	15.0'	13°31.9	11.3'	54.4'
4	238°42.4	07.2	1°02.0	14.9'	13°43.2	11.3'	54.4'
5	253°42.5	06.4	15° 35.9	14.9'	13°54.5	11.2'	54.4'
6	268°42.6	N15°05.7	30°09.8	14.8'	N14°05.7	11.2'	54.4'
7	283°42.7	04.9	44°43.6	14.7'	14°16.8	11.1'	54.5'
8	298°42.8	04.2	59° 17.3	14.7'	14°27.9	11.1'	54.5'
9	313°42.9	• • 03.4	73°51.0	14.6'	14°39.0	11.0'	54.5'
10	328°43.0	02.7	88°24.6	14.6'	14°50.0	11.0'	54.5'
11	343°43.1 358°43.2	01.9 N15°01.2	102°58.2 117°31.7	14.5' 14.4'	15°01.0 N15°11.9	10.9' 10.8'	54.5'
12 13	358 43.2 13°43.3	15°01.2	117°31.7 132°05.1	14.4 14.4'	15°22.7	10.8'	54.5' 54.6'
13	13 43.3 28°43.4	15 00.4 14°59.7	132 05.1 146°38.4	14.4	15 22.7 15°33.5	10.8	54.6'
15	43°43.5	• • 58.9	161°11.7	14.2'	15°44.2	10.7	54.6'
16	58°43.6	58.2	175° 44.9	14.1'	15°54.9	10.6	54.6'
17	73°43.8	57.4	190° 18.1	14.1'	16°05.5	10.5	54.6'
18	88°43.9	N14°56.7	204°51.2	14.0'	N16°16.0	10.5'	54.7'
19	103°44.0	55.9	219°24.2	13.9'	16°26.5	10.4'	54.7'
20	118°44.1	55.2	233°57.1	13.9'	16°37.0	10.4'	54.7'
21	133°44.2	• • 54.4	248°30.0	13.8'	16°47.3	10.3'	54.7'
22	148°44.3	53.7	263°02.8	13.7'	16°57.6	10.2'	54.7'
23	163°44.4	52.9	277°35.5	13.6'	17°07.9	10.2'	54.8'
	SD = 15.8'	d = -0.7'		SE	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	178°44.5	N14° 52.2	292°08.1	ν 13.6'	N17°18.0	10.1'	54.8'
1	176 44.5 193°44.6	51.4	306° 40.7	13.5'	17°28.1	10.1	54.8'
2	208°44.7	50.7	321° 13.1	13.4	17° 38.2	10.0'	54.8'
3	223°44.8	• • 49.9	335° 45.6	13.3'	17°48.1	9.9'	54.8'
4	238°44.9	49.2	350° 17.9	13.3'	17°58.0	9.8'	54.9'
5	253°45.0	48.4	4°50.1	13.2'	18°07.8	9.8'	54.9'
6	268°45.1	N14°47.6	19°22.3	13.1'	N18°17.6	9.7'	54.9'
7	283°45.3	46.9	33°54.4	13.0'	18°27.3	9.6'	54.9'
8	298°45.4	46.1	48° 26.4	12.9'	18°36.9	9.5'	54.9'
9	313°45.5	• • 45.4	62°58.3	12.8'	18°46.4	9.5'	55.0'
10	328°45.6	44.6	77°30.2	12.8'	18°55.9	9.4'	55.0'
11	343°45.7	43.8	92°02.0	12.7'	19°05.3	9.3'	55.0'
12	358°45.8	N14°43.1	106°33.6	12.6'	N19°14.6	9.2'	55.0'
13	13°45.9	42.3	121°05.2	12.5'	19°23.8	9.1'	55.1'
14	28°46.0	41.6	135°36.7	12.4'	19°33.0	9.1'	55.1'
15	43°46.1	40.8	150°08.2	12.3'	19°42.0	9.0'	55.1'
16 17	58°46.3 73°46.4	40.0 39.3	164° 39.5 179° 10.8	12.3' 12.2'	19°51.0 19°59.9	8.9' 8.8'	55.1' 55.2'
18	73°46.4 88°46.5	39.3 N14°38.5	179°10.8 193°42.0	12.1'	N20°08.7	8.8	55.2'
18 19	88°46.5 103°46.6	N14 38.5 37.8	193° 42.0 208° 13.0	12.1	20°17.5	8.7' 8.7'	55.2'
20	103 46.6 118°46.7	37.8 37.0	208 13.0 222°44.0	12.0 11.9'	20 17.5 20°26.1	8. <i>1</i> 8.6'	55.2'
21	133°46.8	36.2	222 44.0 237°14.9	11.8'	20°20.1	8.5'	55.3'
22	148°46.9	35.5	251° 45.8	11.7'	20°43.2	8.4	55.3'
23	163°47.0	34.7	266° 16.5	11.6'	20°51.6	8.3	55.3'
-	SD = 15.8'	d = -0.8'			0 = 14.9'		
	JD — 13.0	u — -0.0		JL	- 14.9		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	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
$N 40^{\circ}$	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
$N 10^{\circ}$	05:03	05:29	05:51	18:19	18:41	19:07
0°	05:15	05:40	06:02	18:09	18:30	18:55
S 10°	05:26	05:51	06:13	17:58	18:19	18:45
20°	05:35	06:01	06:24	17:46	18:09	18:35
30°	05:44	06:12	06:37	17:34	17:58	18:27
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
S 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
S 60°	06:14	07:03	07:49	16:22	17:08	17:58
Lat		Moonris	e		Moonset	:

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	19-21		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ven	nus	•	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
					N23°14.4						ЗПА	Dec
0	321°57.5	226°31.8	N20°08.4	215°08.1		143°32.1	N01°55.1	282°22.0	N12°49.1	Alpheratz	357°31.4	29°15.0
1	337°00.0	241°31.7	08.4	230°08.8	14.2	158°34.1	54.9	297°24.4	49.1	Ankaa	353°04.0	-42°08.7
2	352°02.4	256°31.6	08.5	245°09.5	14.1	173°36.1	54.7	312°26.8	49.1	Schedar	349°27.2	56°41.6
3	7°04.9	271°31.5	• • 08.6	260°10.2	• • 13.9	188°38.1	• • 54.5	327°29.3	• • 49.1	Diphda	348°44.2	-17°49.5
4	22°07.4	286°31.3	08.6	$275^{\circ}10.9$	13.7	203°40.2	54.3	342°31.7	49.1	Achernar	335°17.8	-57°05.1
5	37°09.8	301°31.2	08.7	290°11.6	13.6	218°42.2	54.1	357°34.1	49.1			23°35.9
6	52°12.3	316°31.1	N20°08.8	305°12.3	N23°13.4	233°44.2	N01°53.9	12°36.5	N12°49.1	Hamal	327°47.7	
7	67°14.7	331°30.9	08.9	320°13.0	13.2	248°46.2	53.7	27°38.9	49.1	Polaris	312°24.3	89°22.7
8	82°17.2	346°30.8	08.9	335°13.7	13.1	263°48.3	53.5	42°41.3	49.1	Acamar	315°09.5	-40°11.1
9	97°19.7	1°30.7	• • 09.0	350°14.3	. 12.9	278°50.3	• • 53.3	57°43.8	49.1	Menkar	$314^{\circ}03.0$	4°12.2
										Mirfak	308°24.0	49°57.6
10	112°22.1	16°30.5	09.1	5°15.0	12.7	293°52.3	53.1	72°46.2	49.1	Aldebaran	290°36.3	16°34.0
11	127°24.6	31°30.4	09.1	20°15.7	12.6	308°54.3	52.9	87°48.6	49.1	Rigel	281°01.2	-8°10.0
12	142°27.1	46°30.3	N20°09.2	35°16.4	N23°12.4	323°56.4	N01°52.7	102°51.0	N12°49.1	Capella	280° 17.7	46°01.4
13	157°29.5	61°30.1	09.3	$50^{\circ}17.1$	12.3	338°58.4	52.6	117°53.4	49.1	Bellatrix	278° 19.9	6°22.5
14	172°32.0	76°30.0	09.3	65°17.8	12.1	354°00.4	52.4	132°55.9	49.1			
15	187°34.5	91°29.9	• • 09.4	$80^{\circ}18.5$	· · 11.9	9°02.4	• • 52.2	147°58.3	• • 49.1	Elnath	277°58.3	28°37.8
16	202°36.9	106°29.7	09.5	95°19.2	11.8	24°04.5	52.0	163°00.7	49.1	Alnilam	275°34.9	-1°11.0
17	217°39.4	121°29.6	09.5	110°19.9	11.6	39°06.5	51.8	178°03.1	49.1	Betelgeuse	$270^{\circ}49.1$	7°24.7
18	232°41.9	136°29.5	N20°09.6	125°20.6	N23°11.4	54°08.5	N01°51.6	193°05.5	N12°49.1	Canopus	263°51.5	-52°42.5
										Sirius	258°23.9	-16°45.3
19	247°44.3	151°29.3	09.7	140°21.3	11.3	69°10.5	51.4	208°08.0	49.1	Adhara	255°03.8	-29°00.6
20	262°46.8	166°29.2	09.7	155°22.0	11.1	84°12.6	51.2	223°10.4	49.1	Procyon	244°48.1	5°09.1
21	277°49.2	181°29.0	• • 09.8	170°22.7	• • 10.9	99°14.6	• • 51.0	238°12.8	• • 49.1	Pollux	243°14.1	27°57.3
22	292°51.7	196°28.9	09.8	185°23.3	10.8	$114^{\circ}16.6$	50.8	253°15.2	49.1		234° 14.1	-59°36.0
23	307°54.2	211°28.7	09.9	200°24.0	10.6	129°18.6	50.6	268°17.7	49.1	Avior		
										Suhail	222°44.5	-43°32.9
Mer.p	ass. 02:32	ν -0.1' d0.3	1′ m-4.37	$ u$ 0.7 $^{\prime}$ d-0).2′ m1.56	$\nu 2.0' \ d-0$.2′ m-1.72	ν 2.4′ d0	.0′ m0.28	Miaplacidus	221°38.5	-69°50.1
										Alphard	217°45.2	-8°47.0
	CIIA	CIIA	Б	C11.	Б	C	Б	CI14	Б	Regulus	$207^{\circ}31.6$	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.8
0	322°56.6	226°28.6	N20°10.0	215°24.7	N23°10.4	144°20.6	N01°50.4	283°20.1	N12°49.1	Denebola	182°22.2	14°24.8
1	$337^{\circ}59.1$	241°28.4	10.0	230°25.4	10.2	159°22.7	50.2	298°22.5	49.1	Gienah	175°40.8	-17°42.1
2	353°01.6	256°28.3	10.1	245°26.1	10.1	174°24.7	50.0	313°24.9	49.1			
3	8°04.0	271°28.2	• • 10.1	260°26.8	• • 09.9	189°26.7	• • 49.8	328°27.3	• • 49.1		172°57.1	-63°15.7
4	23°06.5	286°28.0	10.2	275°27.5	09.7	204°28.7	49.6	343°29.8	49.1		171°48.6	-57°16.6
5	38°09.0	301°27.9	10.2	290°28.2	09.6	219°30.8	49.4	358°32.2	49.1	Alioth	$166^{\circ}10.8$	55°48.4
										Spica	158° 19.3	-11°18.7
6	53°11.4	316°27.7	N20°10.3	305°28.9	N23°09.4	234°32.8	N01°49.2	13°34.6	N12°49.1	Alkaid	152°50.0	49°10.4
7	68°13.9	331°27.6	10.4	320°29.6	09.2	249°34.8	49.0	28°37.0	49.1	Hadar	148°31.9	-60°30.9
8	83°16.4	346°27.4	10.4	335°30.3	09.1	264°36.8	48.9	43°39.5	49.1		147°54.2	-36°30.8
9	98°18.8	1°27.3	• • 10.5	350°31.0	• • 08.9	279°38.9	• • 48.7	58°41.9	• • 49.1	Arcturus	145°45.3	19°02.2
10	113°21.3	$16^{\circ}27.1$	10.5	5°31.7	08.7	294°40.9	48.5	73°44.3	49.1			
11	128°23.7	31°26.9	10.6	20°32.4	08.5	309°42.9	48.3	88°46.7	49.1	Rigil Kent.	139°36.2	-60°57.5
12	143°26.2	46°26.8	N20°10.6	35°33.1	N23°08.4	324°44.9	N01°48.1	103°49.2	N12°49.1	Kochab	137°20.2	74°02.5
13	158°28.7	61°26.6	10.7	50°33.8	08.2	339°46.9	47.9	118°51.6	49.2	Zuben'ubi	136°52.8	-16°09.6
										Alphecca	$126^{\circ}01.2$	26°37.3
14	173°31.1	76°26.5	10.7	65°34.5	08.0	354°49.0	47.7	133°54.0	49.2	Antares	$112^{\circ}12.1$	-26°29.7
15	188°33.6	91°26.3	• • 10.8	80°35.2	• • 07.8	9°51.0	• • 47.5	148°56.4	• • 49.2	Atria	107°03.3	-69°04.9
16	203°36.1	106°26.2	10.8	95°35.8	07.7	24°53.0	47.3	163°58.9	49.2	Sabik	101°59.2	-15°45.5
17	218°38.5	121°26.0	10.9	110°36.5	07.5	39°55.0	47.1	179°01.3	49.2	Shaula	96°06.1	-37°07.4
18	233°41.0	136°25.9	N20°10.9	125°37.2	N23°07.3	54°57.1	N01°46.9	194°03.7	$N12^{\circ}49.2$	Rasalhague	95°55.6	12°32.6
19	248°43.5	151°25.7	11.0	140°37.9	07.2	69°59.1	46.7	209°06.1	49.2			
20	263°45.9	166°25.5	11.0	155°38.6	07.0	85°01.1	46.5	224°08.6	49.2	Eltanin	90°40.5	51°29.4
21	278°48.4	181°25.4	· · 11.0	170°39.3	. 06.8	100°03.1	46.3	239°11.0	49.2	Kaus Aust.	83°28.3	-34°22.2
	293°50.9	196°25.2		185°40.0		115°05.1		254°13.4		Vega	80°30.9	38°48.9
22			11.1		06.6		46.1		49.2	Nunki	75°43.8	-26°15.5
23	308°53.3	211°25.0	11.1	200°40.7	06.5	130°07.2	45.9	269°15.8	49.2	Altair	$61^{\circ}56.8$	8°56.9
Mer n	ass. 02:28	ν -0.1' d0.3	1′ m-4 37	$\nu 0.7' d-0$).2′ m1.56	$\nu^2 0' d_{-0}$.2′ m-1.72	v2.4' d0	.0′ m0.28	Peacock	53°00.6	-56°38.4
		ν σ.1 ασ		- V 0.1 G C	7.2 1111.50	ν 2.0 α 0	1.72	- Z. T GO	.0 1110.20	Deneb	49°23.3	45°23.2
										Enif	33°35.6	10°00.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.1
0	323°55.8	226°24.9	N20°11.2	215°41.4	N23°06.3	145°09.2	N01°45.7	284°18.3				
1	338°58.2	241°24.7	11.2	230°42.1	06.1	160°11.2	45.5	299°20.7	49.2	Fomalhaut	15°11.0	-29°27.9
2	354°00.7	256°24.6	11.3	245°42.8	05.9	175°13.2	45.3	314°23.1	49.2	Scheat	13°42.0	28°14.4
3	9°03.2	250 24.0 271°24.4	. 11.3	245 42.6 260°43.5	05.7	175 15.2 190°15.2	45.5 •• 45.1	329°25.5	49.2	Markab	13°26.6	15°21.7
	9 03.2 24°05.6									Aug 13 Sun	SHA	Mar nasa
4		286°24.2	11.3	275°44.2	05.6	205°17.3	44.9	344°28.0	49.2			Mer.pass
5	39°08.1	301°24.1	11.4	290°44.9	05.4	220°19.3	44.7	359°30.4	49.2		264°34.3	08:54
6	54°10.6	316°23.9	N20°11.4	305°45.6	N23°05.2	235°21.3	N01°44.5	14°32.8	N12°49.2	Mars		09:39
7	69°13.0	331°23.7	11.5	320°46.3	05.0	250°23.3	44.4	29°35.3	49.2		181°34.6	14:24
8	84°15.5	346°23.6	11.5	335°47.0	04.9	265°25.3	44.2	44°37.7	49.2	Saturn	$320^{\circ}24.5$	05:10
9	99°18.0	1°23.4	• • 11.5	350°47.7	• • 04.7	280°27.4	• • 44.0	59°40.1	• • 49.2		c	
10	114°20.4	16°23.2	11.6	5°48.4	04.5	295°29.4	43.8	74°42.5	49.2	Aug 14 Mon	SHA	Mer.pass
11	129°22.9	31°23.0	11.6	20°49.1	04.3	310°31.4	43.6	89°45.0	49.2		263°32.0	08:54
	144°25.3	46°22.9	N20°11.6	35°49.8	N23°04.1	325°33.4	N01°43.4	104°47.4	N12°49.2	Mars	$252^{\circ}28.1$	09:38
12										Jupiter	$181^{\circ}24.0$	14:21
13	159°27.8	61°22.7	11.7	50°50.5	04.0	340°35.5	43.2	119°49.8	49.2	Saturn	320°23.4	05:06
14	174°30.3	76°22.5	11.7	65°51.2	03.8	355°37.5	43.0	134°52.3	49.2			
15	189°32.7	91°22.3	• • 11.7	80°51.9	• • 03.6	10°39.5	• • 42.8	149°54.7	• • 49.2	Aug 15 Tue	SHA	Mer.pass
16	204°35.2	106°22.2	11.8	95°52.6	03.4	25°41.5	42.6	164°57.1	49.2		262°29.1	08:54
17	219°37.7	121°22.0	11.8	110°53.3	03.2	40°43.5	42.4	179°59.5	49.2	Mars		09:37
18	234°40.1	136°21.8	N20°11.8	125°54.0	N23°03.1	55°45.5	N01°42.2	195°02.0	N12°49.2		181°13.4	14:17
19	249°42.6	150°21.6	11.9	140°54.7	02.9	70°47.6	42.0	210°04.4	49.2			
	249 42.0 264°45.1			155°55.4						Saturn	320°22.5	05:02
20		166°21.5	11.9		02.7	85°49.6	41.8	225°06.8	49.2	Horizont	al parallax	
21	279°47.5	181°21.3	• • 11.9	170°56.1	• • 02.5	100°51.6	• • 41.6	240°09.3	• • 49.2	TIOTIZUIII	-	0.0
22	294°50.0	196°21.1	11.9	185°56.8	02.3	115°53.6	41.4	255°11.7	49.2		Venus:	0.2
23	309°52.5	211°20.9	12.0	200°57.5	02.1	130°55.6	41.2	$270^{\circ}14.1$	49.2		Mars:	0.1
N /	00 04	- 0 0/ 10 /	0/ 4.26	-0.7/ / 0	0/ 1 57	-0.0/ /0	2/ 1 72	-0.4/ 10	0/ 0 27			
ivier.p	ass. 02:24	ν -0.2' d0.0	u m-4.36	ν 0.1' d -C).2′ m1.57	ν2.0′ d -0	.2′ m-1.72	ν 2.4′ $d0$.0′ m0.27			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.1	N14°33.9	280°47.1	11.6'	N20°59.8	8.2'	55.3'
1 2	193°47.3 208°47.4	33.2 32.4	295°17.7 309°48.2	11.5' 11.4'	21°08.1 21°16.2	8.1' 8.0'	55.4' 55.4'
3	208 47.4 223°47.5	31.7	324°18.5	11.4	21°24.2	7.9'	55.4'
4	238°47.6	30.9	338°48.8	11.2'	21°32.1	7.8'	55.5'
5	253°47.7	30.1	353°19.0	11.1'	21°40.0	7.7'	55.5'
6 7	268°47.8 283°47.9	N14°29.4 28.6	7°49.1 22°19.1	11.0' 10.9'	N21°47.7 21°55.3	7.6' 7.5'	55.5' 55.5'
8	298°48.1	27.8	36°49.1	10.9	21°02.9	7.3 7.4'	55.6'
9	313°48.2	•• 27.1	51°18.9	10.7'	22°10.3	7.3'	55.6'
10	328°48.3	26.3	65°48.6	10.6'	22°17.6	7.2'	55.6'
11 12	343°48.4 358°48.5	25.5 N14°24.7	80°18.3 94°47.9	10.6' 10.5'	22°24.9 N22°32.0	7.1' 7.0'	55.7' 55.7'
13	13°48.6	24.0	109°17.3	10.4	22°39.0	6.9	55.7'
14	28°48.8	23.2	123°46.7	10.3'	22°46.0	6.8'	55.7'
15	43°48.9 58°49.0	· · 22.4 21.7	138°16.0 152°45.2	10.2' 10.1'	22°52.8 22°59.5	6.7' 6.6'	55.8' 55.8'
16 17	73°49.1	20.9	167°14.3	10.1	22 59.5 23°06.1	6.5	55.8'
18	88°49.2	N14°20.1	181°43.3	9.9'	N23°12.6	6.4	55.9'
19	103°49.3	19.4	196°12.2	9.8'	23°19.0	6.3'	55.9'
20 21	118°49.5 133°49.6	18.6 •• 17.8	210°41.0 225°09.7	9.7' 9.6'	23°25.2 23°31.4	6.2' 6.0'	55.9' 56.0'
22	148°49.7	17.0	239°38.4	9.5'	23°37.4	5.9'	56.0'
23	163°49.8	16.3	254°06.9	9.5'	23°43.4	5.8'	56.0'
	SD = 15.8'	d = -0.8'		SE	0 = 15.1'		
N.4						,	
Mon 0	GHA 178°49.9	Dec N14°15.5	GHA 268°35.4	u 9.4'	Dec N23°49.2	d 5.7'	HP 56.1'
1	193°50.1	14.7	283°03.8	9.3'	23°54.9	5.6'	56.1
2	208°50.2	13.9	297°32.0	9.2'	24°00.4	5.5'	56.1'
3	223°50.3	• • 13.2	312°00.2	9.1'	24°05.9	5.3'	56.2'
4 5	238°50.4 253°50.5	12.4 11.6	326°28.3 340°56.3	9.0' 8.9'	24°11.2 24°16.4	5.2' 5.1'	56.2' 56.2'
6	268° 50.6	N14° 10.8	355°24.3	8.8'	N24°21.5	5.0'	56.3
7	283°50.8	10.1	9°52.1	8.7'	24°26.5	4.8'	56.3'
8 9	298°50.9 313°51.0	09.3 •• 08.5	24°19.8 38°47.5	8.7' 8.6'	24°31.3 24°36.0	4.7' 4.6'	56.3' 56.4'
10	313 51.0 328°51.1	07.7	53°15.1	8.5'	24 30.0 24°40.6	4.6 4.5'	56.4'
11	343°51.3	07.0	67°42.5	8.4'	24°45.1	4.3'	56.4'
12	358°51.4	N14°06.2	82°09.9	8.3'	N24°49.4	4.2'	56.5'
13 14	13°51.5 28°51.6	05.4 04.6	96°37.2 111°04.5	8.2' 8.1'	24°53.6 24°57.6	4.1' 3.9'	56.5' 56.5'
15	43°51.7	• • 03.8	125°31.6	8.1	25°01.6	3.8'	56.6
16	58°51.9	03.1	139°58.7	8.0'	25°05.3	3.7'	56.6'
17	73°52.0	02.3	154°25.7	7.9'	25°09.0	3.5'	56.6'
18 19	88°52.1 103°52.2	N14°01.5 14°00.7	168°52.6 183°19.4	7.8' 7.7'	N25°12.5 25°15.9	3.4' 3.2'	56.7' 56.7'
20	118°52.4	13°59.9	197°46.1	7.7'	25°19.1	3.1'	56.8'
21	133°52.5	• • 59.2	212°12.8	7.6'	25°22.2	3.0'	56.8'
22 23	148°52.6 163°52.7	58.4 57.6	226°39.3 241°05.9	7.5' 7.4'	25°25.2 25°28.0	2.8' 2.7'	56.8' 56.9'
23	SD = 15.8'	d = -0.8'	241 05.9		0 = 15.3'	2.1	50.9
	3D = 15.0	<i>u</i> = -0.6		JL.	0 = 15.5		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°52.8 193°53.0	N13°56.8 56.0	255°32.3 269°58.6	7.4' 7.3'	N25°30.7 25°33.2	2.5' 2.4'	56.9' 56.9'
2	208°53.1	55.2	284°24.9	7.3 7.2'	25°35.2 25°35.6	2.4	50.9 57.0'
3	223°53.2	• • 54.5	298°51.1	7.1'	25°37.9	2.1'	57.0'
4	238°53.3	53.7	313°17.2	7.1'	25°40.0	2.0'	57.1'
5 6	253°53.5 268°53.6	52.9 N13°52.1	327°43.3 342°09.3	7.0' 6.9'	25°41.9 N25°43.7	1.8' 1.7'	57.1' 57.1'
7	283°53.7	51.3	356°35.2	6.9'	25°45.4	1.5'	57.2'
8	298°53.8	50.5	11°01.1	6.8'	25°46.9	1.4'	57.2'
9 10	313°54.0 328°54.1	· · 49.7 49.0	25°26.9 39°52.6	6.7' 6.7'	25°48.2 25°49.4	1.2' 1.0'	57.2' 57.3'
11	343°54.2	49.0 48.2	59°52.0	6. <i>1</i> '	25° 49.4 25° 50.5	0.9'	57.3'
12	358°54.4	N13°47.4	68°43.9	6.5'	N25°51.4	0.7'	57.4'
13	13°54.5	46.6	83°09.4	6.5'	25°52.1	0.6'	57.4'
14 15	28°54.6 43°54.7	45.8 •• 45.0	97°34.9 112°00.3	6.4' 6.4'	25°52.7 25°53.1	0.4' 0.3'	57.4' 57.5'
16	58°54.9	44.2	126°25.7	6.3'	25°53.4	0.1	57.5'
17	73°55.0	43.4	140°51.0	6.3'	25°53.5	-0.0'	57.6'
18 19	88°55.1 103°55.2	N13° 42.6 41.9	155°16.3 169°41.5	6.2' 6.2'	N25°53.5 25°53.3	-0.2' -0.4'	57.6' 57.6'
20	103°55.2 118°55.4	41.9 41.1	169°41.5 184°06.6	6.2	25°53.3 25°52.9	-0.4 -0.5'	57.0° 57.7'
21	133°55.5	• • 40.3	198°31.8	6.1'	25°52.4	-0.7'	57.7'
22	148°55.6	39.5	212°56.8	6.0'	25°51.7	-0.8'	57.8'
23	163°55.8	38.7	227°21.8	6.0'	25°50.9	-1.0'	57.8'
	SD = 15.8'	d = -0.8'		SE	0 = 15.5'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	02:21	21:43	////	////
N 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
N 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
N 10°	05:04	05:29	05:51	18:18	18:40	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:25	05:50	06:11	17:58	18:20	18:44
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
S 50°	05:57	06:35	07:09	17:01	17:35	18:13
52°	05:59	06:39	07:14	16:56	17:31	18:11
54°	06:01	06:42	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
S 60°	06:07	06:56	07:41	16:29	17:14	18:04

Lat. Sun Mon Tue Sun Mon N 72° — — — — N 70° — — — —	Tue
N 70° □ □ □ □	
68°	
66° 18:58	
64° 19:49	
62° 20:21 20:41 21:27 15:16 16:47	
60° 20:45 21:12 22:02 14:53 16:16	5 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	2 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	2 14:10
N 10° 23:48 · · · · 00:41 11:57 12:51	
0° ··· 00:06 01:01 11:40 12:32	13:28
S 10° ··· 00:25 01:21 11:22 12:13	3 13:07
20° ··· 00:45 01:42 11:04 11:52	2 12:46
30° 00:09 01:08 02:08 10:43 11:28	-
35° 00:21 01:22 02:22 10:30 11:14	
40° 00:34 01:37 02:40 10:16 10:57	
45° 00:50 01:56 03:00 09:59 10:38	3 11:27
S 50° 01:10 02:20 03:26 09:38 10:14	11:01
52° 01:19	
54° 01:30 02:44 03:53 09:18 09:49	
56° 01:42 02:59 04:10 09:05 09:33	
58° 01:56 03:17 04:31 08:51 09:15	
S 60° 02:12 03:39 04:57 08:34 08:53	3 09:30

		Sun		Moon				
Day	Eqn.of	Time	Time Mer.		Pass.	Age		
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	324°54.9	226°20.7	N20° 12.0	215°58.2	N23°02.0	145°57.7	N01°41.0	285°16.6	N12°49.2			
1	339°57.4	241°20.6	12.0	230°58.9	01.8	160°59.7	40.8	300°19.0	49.2	Alpheratz	357°31.4	29°15.0
2	354°59.8	256° 20.4	12.0	245°59.6	01.6	176°01.7	40.6	315°21.4	49.2	Ankaa	353°04.0	-42°08.7
3	10°02.3	271°20.2	• • 12.1	261°00.3	• • 01.4	191°03.7	• • 40.4	330°23.8	• • 49.2	Schedar	349°27.1	56°41.6
4	25°04.8	286°20.0	12.1	276°01.0	01.2	206°05.7	40.2	345°26.3	49.2	Diphda Achernar	348°44.1 335°17.8	-17°49.5 -57°05.1
5	40°07.2	$301^{\circ}19.8$	12.1	291°01.7	01.0	221°07.8	40.0	0°28.7	49.2	Hamal	327°47.7	-37 05.1 23°35.9
6	55°09.7	316° 19.6	N20°12.1	306°02.4	N23°00.9	236°09.8	N01°39.8	15°31.1	N12°49.2	Polaris	312°22.5	89°22.7
7	70°12.2	331°19.4	12.2	321°03.1	00.7	251°11.8	39.6	30°33.6	49.2	Acamar	315°09.5	-40°11.1
8	85°14.6	346°19.3	12.2	336°03.8	00.5	266°13.8	39.4	45°36.0	49.2	Menkar	314°03.0	4°12.2
9	100°17.1 115°19.6	1° 19.1 16° 18.9	• • 12.2	351°04.5 6°05.3	· · 00.3 23°00.1	281°15.8 296°17.9	· · 39.2 39.0	60°38.4 75°40.9	• • 49.2	Mirfak	308°23.9	49°57.6
10 11	115 19.0 130°22.0	31° 18.7	12.2 12.2	21°06.0	23° 59.9	311°19.9	38.8	90°43.3	49.2 49.2	Aldebaran	290°36.3	16°34.0
12	145°24.5	46° 18.5	N20° 12.2	36°06.7	N22°59.7	326°21.9	N01°38.6	105°45.7	N12°49.2	Rigel	281°01.2	-8°10.0
13	160°27.0	61°18.3	12.3	51°07.4	59.5	341°23.9	38.5	120°48.2	49.2	Capella	280°17.7	46°01.4
14	175°29.4	76°18.1	12.3	66°08.1	59.4	356°25.9	38.3	135°50.6	49.2	Bellatrix	278°19.9	6°22.5
15	190°31.9	91°17.9	· · 12.3	81°08.8	• • 59.2	11°27.9	• • 38.1	150°53.0	• • 49.2	Elnath	277°58.3	28°37.8 -1°11.0
16	$205^{\circ}34.3$	$106^{\circ}17.7$	12.3	96°09.5	59.0	26°30.0	37.9	165°55.5	49.2	Alnilam Betelgeuse	275°34.9 270°49.1	-1 11.0 7°24.7
17	220°36.8	121°17.5	12.3	111°10.2	58.8	41°32.0	37.7	180°57.9	49.2	Canopus	263°51.4	-52°42.4
18	235°39.3	136° 17.4	N20°12.3	126°10.9	N22°58.6	56°34.0	N01°37.5	196°00.3	N12°49.2	Sirius	258°23.9	-16°45.2
19	250°41.7	151°17.2	12.4	141°11.6	58.4	71°36.0	37.3	211°02.8	49.2	Adhara	255°03.8	-29°00.5
20	265°44.2 280°46.7	166° 17.0 181° 16.8	12.4 •• 12.4	156°12.3 171°13.0	58.2 •• 58.0	86°38.0 101°40.0	37.1 · · 36.9	226°05.2 241°07.6	49.1	Procyon	244°48.0	5°09.1
21 22	295°49.1	196° 16.6	12.4	171 13.0 186°13.7	57.8	101 40.0 116°42.1	36.7	256°10.1	•• 49.1 49.1	Pollux	243°14.0	27°57.3
23	310°51.6	211° 16.4	12.4	201°14.4	57.0 57.7	131°44.1	36.5	271°12.5	49.1	Avior	234°14.1	-59°36.0
					_					Suhail	222°44.5	-43°32.9
Mer.p	ass. 02:20	ν -0.2′ d0	.0′ m-4.35	ν 0.1' d-0	0.2′ m1.57	ν 2.0′ d-0	.2′ m-1.71	ν 2.4′ d-0	.0′ m0.27	Miaplacidus Alphard	221°38.5 217°45.2	-69°50.1 -8°47.0
										Regulus	217 45.2 207°31.6	-6 47.0 11°49.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.8
0	325°54.1	226°16.2	N20°12.4	216°15.1	N22°57.5	146°46.1	N01°36.3	286°14.9	N12°49.1	Denebola	182°22.2	14°24.8
1	340°56.5	241°16.0	12.4	231°15.8	57.3	161°48.1	36.1	301°17.4	49.1	Gienah	175°40.8	-17°42.1
2	355°59.0 11°01.5	256° 15.8 271° 15.6	12.4 •• 12.4	246°16.5 261°17.2	57.1 •• 56.9	176°50.1 191°52.1	35.9 · · 35.7	316°19.8 331°22.2	49.1 •• 49.1	Acrux	172°57.1	-63°15.7
4	26°03.9	271 15.0 286° 15.4	12.4	276°18.0	56.7	206°54.2	35.7	346°24.7	49.1	Gacrux	171°48.6	-57°16.6
5	41°06.4	301°15.2	12.4	291°18.7	56.5	221°56.2	35.3	1°27.1	49.1	Alioth	166°10.8	55°48.4
6	56°08.8	316° 15.0	N20°12.4	306°19.4	N22°56.3	236°58.2	N01°35.1	16°29.6	N12°49.1	Spica	158° 19.3	-11°18.7
7	71°11.3	331°14.8	12.4	321°20.1	56.1	252°00.2	34.9	31°32.0	49.1	Alkaid Hadar	152°50.0 148°31.9	49°10.4 -60°30.9
8	$86^{\circ}13.8$	$346^{\circ}14.6$	12.4	336°20.8	55.9	267°02.2	34.7	46°34.4	49.1	Menkent	140°51.9	-36°30.8
9	101°16.2	1°14.4	• • 12.5	351°21.5	• • 55.7	282°04.2	• • 34.5	61°36.9	• • 49.1	Arcturus	145°45.3	19°02.1
10	116°18.7	16°14.2	12.5	6°22.2	55.5	297°06.3	34.3	76°39.3	49.1	Rigil Kent.	139°36.3	-60°57.5
11	131°21.2	31°13.9 46°13.7	12.5 N20°12.5	21°22.9 36°23.6	55.3 N22°55.2	312°08.3	34.1	91°41.7 106°44.2	49.1 N12°49.1	Kochab	$137^{\circ}20.3$	74°02.5
12 13	146°23.6 161°26.1	40 13.7 61°13.5	12.5	50°24.3	55.0	327°10.3 342°12.3	N01°33.9 33.7	100° 44.2 121° 46.6	49.1	Zuben'ubi	136°52.8	-16°09.6
14	176°28.6	76° 13.3	12.5	66°25.0	54.8	357°14.3	33.5	136°49.0	49.1	Alphecca	126°01.3	26°37.3
15	191°31.0	91°13.1	12.5	81°25.7	• • 54.6	12°16.3	33.3	151°51.5	• • 49.1	Antares	112°12.1	-26°29.7
16	206°33.5	106°12.9	12.4	96°26.5	54.4	27°18.4	33.1	166°53.9	49.1	Atria Sabik	107°03.4 101°59.2	-69°04.9 -15°45.5
17	221°36.0	121°12.7	12.4	111°27.2	54.2	42°20.4	32.9	181°56.4	49.1	Shaula	96°06.1	-13 45.5 -37°07.4
18	236°38.4	$136^{\circ}12.5$	N20° 12.4	126°27.9	N22°54.0	57°22.4	N01°32.7	196°58.8	N12°49.1	Rasalhague	95°55.6	12°32.6
19	251°40.9	151°12.3	12.4	141°28.6	53.8	72°24.4	32.5	212°01.2	49.1	Eltanin	90°40.5	51°29.4
20	266°43.3	166° 12.1	12.4	156°29.3	53.6	87°26.4	32.3	227°03.7	49.1	Kaus Aust.	83°28.3	-34°22.2
21 22	281°45.8 296°48.3	181°11.9 196°11.6	· · 12.4 12.4	171°30.0 186°30.7	· · 53.4 53.2	102°28.4 117°30.4	· · 32.1 31.9	242°06.1 257°08.6	•• 49.1 49.1	Vega	80°30.9	38°48.9
23	311°50.7	211° 11.4	12.4	201°31.4	53.2	132°32.5	31.9	272°11.0	49.1	Nunki	75°43.8	-26°15.5
		-								Altair	61°56.8	8°56.9
Mer.p	ass. 02:16	ν -0.2' d0	.0′ m-4.34	$\nu 0.7' \ d-0$	0.2′ m1.57	$\nu 2.0' d-0$.2′ m-1.71	$\nu 2.4' \ d-0$.0′ m0.26	Peacock Deneb	53°00.6 49°23.3	-56°38.4 45°23.2
										Enif	33° 35.6	10°00.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.1
0	326°53.2	226°11.2	N20° 12.4	216°32.1	N22°52.8	147°34.5	N01°31.5	287°13.4	N12°49.1	Fomalhaut	15°11.0	-29°27.9
1	341°55.7	241°11.0	12.4	231°32.8	52.6	162°36.5	31.3	302°15.9	49.1	Scheat	$13^{\circ}42.0$	28°14.4
2	356°58.1	256° 10.8	12.4	246°33.6	52.4	177°38.5	31.1	317°18.3	49.1	Markab	13°26.6	15°21.8
3 4	12°00.6 27°03.1	271°10.6 286°10.3	· · 12.4 12.4	261°34.3 276°35.0	· · 52.2 52.0	192°40.5 207°42.5	· · 30.9 30.7	332°20.8 347°23.2	· · 49.1 49.1	Aug 16 Wed	SHA	Mer.pass
5	42°05.5	301°10.1	12.4	270 35.0 291°35.7	51.8	207 42.5 222°44.5	30.7	2°25.6	49.1		261°25.8	08:55
6	57°08.0	316°09.9	N20°12.3	306°36.4		237°46.6	N01°30.3	17°28.1			251°03.3	09:36
7	72°10.5	331°09.7	12.3	321°37.1	51.4	252°48.6	30.1	32°30.5	49.1	Jupiter	181°02.7	14:14
8	$87^{\circ}12.9$	346°09.5	12.3	336°37.8	51.2	267°50.6	29.9	47°33.0	49.1	Saturn	320°21.6	04:58
9	102°15.4	1°09.2	• • 12.3	351°38.5	• • 51.0	282°52.6	• • 29.7	62°35.4	• • 49.1	Aug 17 Thu	SHA	Mer.pass
10	117°17.8	16°09.0	12.3	6°39.3	50.8	297°54.6	29.5	77°37.8	49.1		260°22.1	08:55
11	132°20.3 147°22.8	31°08.8 46°08.6	12.3 N20°12.2	21°40.0 36°40.7	50.6 N22°50.4	312°56.6 327°58.6	29.3 N01°29.1	92°40.3 107°42.7	49.0 N12°49.0		250°21.1	09:35
12 13	147 22.8 162°25.2	46 08.6 61°08.4	N20 12.2 12.2	50 40.7 51°41.4	N22 50.4 50.2	343°00.7	28.9	107 42.7 122°45.2	49.0		180°52.0	14:11
14	102 23.2 177°27.7	76°08.1	12.2	66°42.1	50.2	358°02.7	28.7	137°47.6	49.0	Saturn	320°20.9	04:54
15	192°30.2	91°07.9	. 12.2	81°42.8	• • 49.8	13°04.7	• • 28.5	152°50.0	• • 49.0	Aug 18 Fri	SHA	Mer.pass
16	207°32.6	106°07.7	12.2	96°43.5	49.6	28°06.7	28.3	167°52.5	49.0		259°18.0	08:55
17	222°35.1	121°07.5	12.1	111°44.2	49.4	43°08.7	28.1	182°54.9	49.0		249°38.9	09:33
18	237°37.6	136°07.2	N20° 12.1	126°45.0		58°10.7	N01°27.9	197°57.4	N12°49.0		180°41.3	14:08
19	252°40.0	151°07.0	12.1	141°45.7	49.0	73°12.7	27.7	212°59.8	49.0	Saturn	320°20.2	04:50
20 21	267°42.5 282°44.9	166°06.8 181°06.6	12.1 •• 12.0	156°46.4 171°47.1	48.8 •• 48.6	88°14.7 103°16.8	27.5 •• 27.3	228°02.3 243°04.7	49.0 •• 49.0	Horizont	al parallax	
22	202 44.9 297°47.4	196°06.3	12.0	186°47.8	48.4	118°18.8	27.3	258°07.1	49.0		Venus:	0.2
23	312°49.9	211°06.1	12.0	201°48.5	48.2	133°20.8	26.9	273°09.6	49.0		Mars:	0.1
Mern	ass. 02:12		0.0' m-4.33	ν0 7' d.0	0.2′ m1.57		.2′ m-1.71	ν2 Δ' d.Ω	.0′ m0.26			
- ivici.p	uss. U2.12	ν 0.2 u-0	111-7.33	ν υ. i u-0	1111.31	ν Δ.Ο U-U	11171./1	ν Δ. ¬ U-0	.5 1110.20			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 55.9	N13°37.9	241°46.8	5.9'	N25°49.9	-1.2'	57.8'
1 2	193°56.0 208°56.1	37.1 36.3	256°11.7 270°36.6	5.9' 5.8'	25°48.7 25°47.4	-1.3' -1.5'	57.9' 57.9'
3	223° 56.3	• • 35.5	285°01.5	5.8'	25°45.9	-1.5' -1.7'	57.9'
4	238°56.4	34.7	299°26.3	5.8'	25°44.3	-1.8'	58.0'
5	253°56.5	33.9	313°51.1	5.7'	25°42.5	-2.0'	58.0'
6 7	268° 56.7 283° 56.8	N13°33.1 32.3	328°15.8 342°40.5	5.7' 5.7'	N25°40.5 25°38.3	-2.1' -2.3'	58.1' 58.1'
8	298° 56.9	31.5	357°05.2	5.6'	25°36.0	-2.5'	58.1
9	313°57.1	• • 30.8	11°29.8	5.6'	25°33.6	-2.6'	58.2'
10	328° 57.2 343° 57.3	30.0 29.2	25°54.5 40°19.1	5.6' 5.6'	25°30.9 25°28.1	-2.8' -3.0'	58.2' 58.3'
11 12	358° 57.5	N13°28.4	54° 43.6	5.5'	N25°25.1	-3.1	58.3
13	13° 57.6	27.6	69°08.2	5.5'	25°22.0	-3.3'	58.3'
14	28°57.7	26.8	83°32.7	5.5'	25°18.7	-3.5'	58.4'
15 16	43° 57.9 58° 58.0	· · 26.0 25.2	97°57.2 112°21.7	5.5' 5.5'	25°15.2 25°11.6	-3.6' -3.8'	58.4' 58.5'
17	73°58.1	24.4	126°46.2	5.5'	25°07.8	-4.0'	58.5
18	88° 58.3	N13°23.6	141°10.6	5.4'	N25°03.8	-4.1'	58.5'
19 20	103°58.4 118°58.5	22.8 22.0	155°35.1 169°59.5	5.4' 5.4'	24°59.7 24°55.4	-4.3' -4.5'	58.6' 58.6'
20	118 58.5 133°58.7	21.2	109 59.5 184°24.0	5.4' 5.4'	24 55.4 24°50.9	-4.5 -4.6'	58.7'
22	148°58.8	20.4	198°48.4	5.4'	24°46.3	-4.8'	58.7'
23	163°58.9	19.6	213°12.8	5.4'	24°41.5	-5.0'	58.7'
	SD = 15.8'	d = -0.8'		S	D = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	178°59.1	N13°18.8	227°37.2	5.4'	N24°36.5	-5.1'	58.8'
1	193° 59.2 208° 59.3	18.0	242°01.6 256°26.0	5.4'	24°31.4 24°26.1	-5.3'	58.8' 58.9'
2	208°59.3 223°59.5	17.2 •• 16.4	250° 26.0 270° 50.5	5.4' 5.4'	24°20.1 24°20.6	-5.5' -5.6'	58.9'
4	238° 59.6	15.6	285°14.9	5.4'	24°14.9	-5.8'	58.9'
5	253°59.7	14.8	299°39.3	5.4'	24°09.1	-6.0'	59.0'
6 7	268° 59.9 284° 00.0	N13°14.0 13.2	314°03.7 328°28.1	5.4' 5.4'	N24°03.2 23°57.0	-6.1' -6.3'	59.0' 59.1'
8	299°00.1	12.4	342°52.6	5.5'	23°50.7	-6.5'	59.1
9	314°00.3	• • 11.5	357°17.0	5.5'	23°44.3	-6.6'	59.1'
10	329°00.4 344°00.5	10.7 09.9	11°41.5 26°06.0	5.5' 5.5'	23°37.7 23°30.9	-6.8' -6.9'	59.2' 59.2'
11 12	359°00.7	N13°09.1	40°30.5	5.5'	N23°23.9	-0.9 -7.1'	59.2'
13	14°00.8	08.3	54°55.0	5.5'	23°16.8	-7.3'	59.3'
14	29°01.0	07.5	69°19.5	5.5'	23°09.5	-7.4'	59.3'
15 16	44°01.1 59°01.2	· · 06.7 05.9	83°44.0 98°08.6	5.6' 5.6'	23°02.1 22°54.5	-7.6' -7.8'	59.4' 59.4'
17	74° 01.4	05.1	112°33.2	5.6'	22°46.8	-7.9'	59.4'
18	89°01.5	N13°04.3	126°57.8	5.6'	N22°38.9	-8.1'	59.5'
19 20	104°01.7 119°01.8	03.5 02.7	141°22.4 155°47.1	5.7' 5.7'	22°30.8 22°22.6	-8.2' -8.4'	59.5' 59.5'
21	134°01.9	01.9	170°11.8	5.7'	22°14.2	-8.5'	59.6'
22	149°02.1	01.1	184°36.5	5.7'	22°05.6	-8.7'	59.6'
23	164°02.2	00.2	199°01.3	5.8'	21°56.9	-8.8'	59.6'
	SD = 15.8'	d = -0.8'		S	D = 16.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°02.3	N12°59.4	213°26.0	5.8'	N21°48.1	-9.0'	59.7'
1 2	194° 02.5 209° 02.6	58.6 57.8	227°50.8 242°15.7	5.8' 5.9'	21°39.1 21°29.9	-9.2' -9.3'	59.7' 59.7'
3	224°02.8	• • 57.0	256°40.6	5.9'	21°20.6	-9.5'	59.8'
4	239°02.9	56.2	271°05.5	5.9'	21°11.2	-9.6'	59.8'
5 6	254°03.0 269°03.2	55.4 N12°54.6	285°30.4 299°55.4	6.0' 6.0'	21°01.6 N20°51.8	-9.8' -9.9'	59.8' 59.9'
7	284°03.3	53.8	314°20.4	6.1'	20°41.9	-10.0'	59.9'
8	299°03.5	52.9	328°45.5	6.1'	20°31.9	-10.2'	59.9'
9 10	314°03.6 329°03.8	· · 52.1 51.3	343°10.6 357°35.7	6.1' 6.2'	20°21.7 20°11.3	-10.3' -10.5'	60.0' 60.0'
11	344°03.9	50.5	12°00.9	6.2'	20°11.3	-10.5	60.0
12	359°04.0	N12°49.7	$26^{\circ}26.1$	6.3'	N19°50.2	-10.8'	60.1'
13	14°04.2 29°04.3	48.9 48.1	40°51.4 55°16.7	6.3' 6.3'	19°39.5 19°28.6	-10.9'	60.1' 60.1'
14 15	29°04.3 44°04.5	48.1 •• 47.2	69°42.0	6.4	19°28.6 19°17.6	-11.0' -11.2'	60.1
16	59°04.6	46.4	84°07.4	6.4'	19°06.4	-11.3'	60.2'
17	74°04.8	45.6	98°32.9	6.5'	18°55.1	-11.4'	60.2'
18 19	89°04.9 104°05.0	N12°44.8 44.0	112°58.3 127°23.9	6.5' 6.6'	N18°43.6 18°32.1	-11.6' -11.7'	60.3' 60.3'
20	119°05.2	43.2	141°49.4	6.6'	18°20.4	-11.8'	60.3'
21	134°05.3	• • 42.3	156°15.1	6.7'	18°08.5	-12.0'	60.3
22 23	149°05.5 164°05.6	41.5 40.7	170°40.7 185°06.5	6.7' 6.8'	17°56.6 17°44.5	-12.1' -12.2'	60.4' 60.4'
23	SD = 15.8'	d = -0.8'	103 00.3		D = 16.3'	-12.2	00.4
	JD — 13.0	u — -0.0		3	D — 10.3		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	02:41	21:22	////	////
N 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
N 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
N 10°	05:04	05:29	05:51	18:17	18:38	19:04
0°	05:15	05:39	06:01	18:07	18:29	18:53
S 10°	05:24	05:49	06:10	17:58	18:19	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
S 50°	05:52	06:30	07:04	17:05	17:39	18:17
52°	05:54	06:33	07:08	17:00	17:36	18:15
54°	05:55	06:36	07:13	16:55	17:32	18:14
56°	05:56	06:40	07:19	16:50	17:29	18:12
58°	05:58	06:44	07:25	16:43	17:25	18:11
S 60°	05:59	06:48	07:33	16:36	17:21	18:10

Lat.		Moonris	е		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°			23:40			22:00
N 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
N 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
N 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
S 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
S 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
S 60°	05:54	06:29	06:48	10:33	12:02	13:45

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-9%	
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	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	327°52.3	226°05.9	N20°12.0	216°49.2	N22°48.0	148°22.8	N01°26.7	288°12.0	N12°49.0			
1	342°54.8	241°05.6	11.9	231°50.0	47.8	163°24.8	26.6	303°14.5	49.0	Alpheratz	357°31.4	29°15.0
2	357°57.3	256°05.4	11.9	246°50.7	47.6	178°26.8	26.4	318°16.9	49.0	Ankaa	353°04.0 349°27.1	-42°08.7 56°41.6
3	$12^{\circ}59.7$	271°05.2	• • 11.9	261°51.4	• • 47.3	193°28.8	• • 26.2	333°19.4	• • 49.0	Schedar Diphda	348°44.1	-17°49.5
4	28°02.2	286°04.9	11.9	276°52.1	47.1	208°30.8	26.0	348°21.8	49.0	Achernar	335°17.8	-57°05.1
5	43°04.7	301°04.7	11.8	291°52.8	46.9	223°32.9	25.8	3°24.3	49.0	Hamal	327°47.7	23°35.9
6 7	58°07.1 73°09.6	316°04.5	N20°11.8	306°53.5	N22°46.7	238°34.9 253°36.9	N01°25.6	18°26.7 33°29.1	N12°49.0	Polaris	312°20.8	89°22.7
8	73 09.0 88°12.1	331°04.2 346°04.0	11.8 11.7	321°54.3 336°55.0	46.5 46.3	255 30.9 268°38.9	25.4 25.2	48°31.6	49.0 49.0	Acamar	$315^{\circ}09.5$	-40°11.1
9	103°14.5	1°03.8	• • 11.7	351°55.7	. 46.1	283°40.9	• • 25.0	63°34.0	• • 49.0	Menkar	314°03.0	4°12.2
10	118°17.0	16°03.5	11.7	6°56.4	45.9	298°42.9	24.8	78°36.5	48.9	Mirfak	308°23.9	49°57.6
11	133°19.4	31°03.3	11.6	21°57.1	45.7	313°44.9	24.6	93°38.9	48.9	Aldebaran	290°36.3	16°34.0
12	$148^{\circ}21.9$	46°03.1	N20°11.6	36°57.8	N22°45.5	328°46.9	N01°24.4	108°41.4	N12°48.9	Rigel Capella	281°01.1 280°17.7	-8°10.0 46°01.4
13	163°24.4	61°02.8	11.6	51°58.6	45.3	343°49.0	24.2	123°43.8	48.9	Bellatrix	278°19.8	6°22.6
14	178°26.8	76°02.6	11.5	66°59.3	45.1	358°51.0	24.0	138°46.3	48.9	Elnath	277°58.3	28°37.8
15	193°29.3	91°02.3	• • 11.5	82°00.0	• • 44.9	13°53.0	• • 23.8	153°48.7 168°51.2	• • 48.9	Alnilam	275°34.9	-1°11.0
16 17	208°31.8 223°34.2	106°02.1 121°01.9	11.4 11.4	97°00.7 112°01.4	44.6 44.4	28°55.0 43°57.0	23.6 23.4	183°53.6	48.9 48.9	Betelgeuse	$270^{\circ}49.1$	7°24.7
18	238°36.7	136°01.6	N20°11.4	127°02.2	N22°44.2	58°59.0	N01°23.2	198°56.0	N12°48.9	Canopus	263°51.4	-52°42.4
19	253°39.2	151°01.4	11.3	142°02.9	44.0	74°01.0	23.0	213°58.5	48.9	Sirius	258°23.9	-16°45.2
20	268°41.6	166°01.1	11.3	157°03.6	43.8	89°03.0	22.8	229°00.9	48.9	Adhara	255°03.8	-29°00.5
21	283°44.1	181°00.9	• • 11.2	172°04.3	• • 43.6	104°05.0	• • 22.6	244°03.4	• • 48.9	Procyon Pollux	244°48.0 243°14.0	5°09.1 27°57.3
22	298°46.6	$196^{\circ}00.6$	11.2	187°05.0	43.4	$119^{\circ}07.1$	22.4	259°05.8	48.9	Avior	234°14.1	-59°36.0
23	313°49.0	211°00.4	11.2	202°05.8	43.2	134°09.1	22.2	274°08.3	48.9	Suhail	222°44.5	-43°32.9
Mer.p	ass. 02:08	ν-0.2′ d-0	0.0' m-4.32	ν 0.7′ d-0	.2′ m1.57	$\nu 2.0' \ d-0.0$	2' m-1.71	$\nu 2.4' \ d-0$.0′ m0.25	Miaplacidus	221°38.4	-69°50.1
		- 0.2 0 0								Alphard	217°45.2	-8°47.0
c	GHA	CIIA	D	CHA	D	CIIA	D	CHA	D	Regulus	207°31.6	11°49.6
Sun 0	328°51.5	GHA 226°00.2	Dec N20°11.1	GHA 217°06.5	Dec N22°43.0	GHA 149°11.1	Dec N01°22.0	GHA 289°10.7	Dec N12°48.9	Dubhe	193°38.2	61°35.8
1	343°53.9	240°59.9	11.1	232°07.2	42.7	164° 13.1	21.8	304°13.2	48.9	Denebola	182°22.2	14°24.8
2	358°56.4	255°59.7	11.0	247°07.9	42.5	179°15.1	21.6	319°15.6	48.9	Gienah	175°40.8	-17°42.1
3	13°58.9	270°59.4	. 11.0	262°08.6	42.3	194°17.1	• • 21.4	334°18.1	• • 48.9		172°57.2 171°48.7	-63°15.7 -57°16.6
4	29°01.3	285°59.2	10.9	277°09.4	42.1	209°19.1	21.2	349°20.5	48.8	Gacrux Alioth	171 48.7 166°10.9	-57 10.0 55°48.4
5	44°03.8	300°58.9	10.9	292°10.1	41.9	224°21.1	21.0	4°23.0	48.8	Spica	158°19.3	-11°18.7
6	59°06.3	315°58.7	N20° 10.8	307°10.8	N22°41.7	239°23.1	N01°20.8	19°25.4	N12°48.8	Alkaid	152°50.0	49°10.4
7	74°08.7	330°58.4	10.8	322°11.5	41.5	254°25.1	20.6	34°27.9	48.8	Hadar	148°31.9	-60°30.9
8	89°11.2	345°58.2	10.7	337°12.2	41.3	269°27.2	20.4	49°30.3	48.8	Menkent	$147^{\circ}54.2$	-36°30.8
9 10	104°13.7 119°16.1	0°57.9 15°57.7	· · 10.7 10.6	352°13.0 7°13.7	· · 41.0 40.8	284°29.2 299°31.2	· · 20.2 20.0	64°32.8 79°35.2	. 48.8	Arcturus	145°45.3	19°02.1
11	134°18.6	30° 57.4	10.6	22°14.4	40.6	314°33.2	19.8	94°37.7	48.8 48.8	Rigil Kent.	139°36.3	-60°57.5
12	149°21.0	45°57.2	N20° 10.5	37°15.1	N22°40.4	329°35.2	N01° 19.6	109°40.1	N12°48.8	Kochab	137°20.3	74°02.5
13	164°23.5	60°56.9	10.5	52°15.9	40.2	344°37.2	19.4	124°42.6	48.8	Zuben'ubi	136°52.8	-16°09.6
14	179°26.0	75°56.7	10.4	67°16.6	40.0	359°39.2	19.2	139°45.0	48.8	Alphecca Antares	126°01.3 112°12.1	26°37.3 -26°29.7
15	194°28.4	90°56.4	• • 10.3	82°17.3	• • 39.7	14°41.2	• • 19.0	154°47.5	• • 48.8	Atria	107°03.4	-69°04.9
16	209°30.9	105°56.2	10.3	97°18.0	39.5	29°43.2	18.8	169°49.9	48.8	Sabik	101°59.2	-15°45.5
17	224°33.4	120°55.9	10.2	112°18.7	39.3	44°45.2	18.5	184°52.4	48.8	Shaula	96°06.1	-37°07.5
18	239°35.8	135°55.7	N20° 10.2	127°19.5	N22°39.1	59°47.3	N01°18.3	199°54.8	N12°48.8	Rasalhague	95°55.6	12°32.6
19 20	254°38.3 269°40.8	150°55.4 165°55.1	10.1 10.1	142°20.2 157°20.9	38.9 38.7	74°49.3 89°51.3	18.1 17.9	214°57.3 229°59.7	48.7 48.7	Eltanin	90°40.5	51°29.4
21	284°43.2	180°54.9	. 10.0	172°21.6	• • 38.4	104°53.3	•• 17.7	245°02.2	• • 48.7	Kaus Aust.	83°28.3	-34°22.2
22	299°45.7	195°54.6	09.9	187°22.4	38.2	119°55.3	17.5	260°04.6	48.7	Vega	80°30.9	38°48.9 -26°15.5
23	314°48.2	210°54.4	09.9	202°23.1	38.0	134°57.3	17.3	275°07.1	48.7	Nunki Altair	75°43.8 61°56.8	-20 15.5 8°56.9
Mern	ass. 02:04	₁/-0 2′ d-0	0.0' m-4.31	υ0.7′ d-0	.2′ m1.57	1/2 0' d-0	2′ m-1.70	1/2 A' d-0	.0′ m0.25	Peacock	53°00.6	-56°38.4
- IVICI.P	a33. 02.0+	ν-0.2 u-0	7.0 111-4.51	νο.τ u-0	.2 1111.57	ν2.0 u-0.	2 111-1.70	ν2. - u-0	.0 1110.23	Deneb	49°23.3	45°23.2
										Enif	33°35.5	10°00.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec No1917.1	GHA	Dec	Al Na'ir	$27^{\circ}28.8$	-46°49.1
0 1	329°50.6 344°53.1	225°54.1 240°53.8	N20°09.8 09.7	217°23.8 232°24.5	N22°37.8 37.6	149°59.3 165°01.3	N01° 17.1 16.9	290°09.5 305°12.0	N12°48.7 48.7	Fomalhaut	15°10.9	-29°27.9
2	359°55.5	255° 53.6	09.7	232 24.5 247°25.3	37.0 37.4	180°03.3	16.9	320°14.4	48.7 48.7	Scheat	13°41.9	28°14.5
3	14°58.0	270°53.3	• • 09.6	262°26.0	37.1	195°05.3	16.5	335°16.9	• • 48.7	Markab	13°26.6	15°21.8
4	30°00.5	285°53.1	09.5	277°26.7	36.9	210°07.3	16.3	350°19.4	48.7	Aug 19 Sat	SHA	Mer.pass
5	45°02.9	300°52.8	09.5	292°27.4	36.7	225°09.3	16.1	5°21.8	48.7	Venus	258°13.5	08:56
6	60°05.4	315°52.5	N20°09.4	307°28.2	N22°36.5	240°11.4	N01°15.9	20°24.3	N12°48.7	Mars	248°56.9	09:32
7	75°07.9	330°52.3	09.3	322°28.9	36.2	255°13.4	15.7	35°26.7	48.7	Jupiter	180°30.5	14:05
8	90°10.3	345°52.0	09.3	337°29.6	36.0	270°15.4	15.5	50°29.2	48.7	Saturn	320°19.7	04:46
9	105°12.8	0°51.8	09.2	352°30.4	· · 35.8	285°17.4	· · 15.3	65°31.6	· · 48.6	Aug 20 Sun	SHA	Mer.pass
10 11	120°15.3 135°17.7	15°51.5 30°51.2	09.1 09.1	7°31.1 22°31.8	35.6 35.4	300°19.4 315°21.4	15.1 14.9	80°34.1 95°36.5	48.6 48.6	Venus	$257^{\circ}08.7$	08:56
12	150°20.2	45°51.0	N20°09.0	37°32.5	N22°35.1	330°23.4	N01° 14.7	110°39.0	N12°48.6	Mars	248°15.0	09:31
13	165°22.6	60°50.7	08.9	52°33.3	34.9	345°25.4	14.5	125°41.4	48.6	Jupiter	180°19.6	14:01
14	$180^{\circ}25.1$	75°50.4	08.8	67°34.0	34.7	0°27.4	14.3	140°43.9	48.6	Saturn	320°19.3	04:43
15	195°27.6	90°50.2	• • 08.8	82°34.7	• • 34.5	15°29.4	•• 14.1	155°46.3	• • 48.6	Aug 21 Mon	SHA	Mer.pass
16	210°30.0	105°49.9	08.7	97°35.4	34.2	30°31.4	13.9	170°48.8	48.6	Venus	$256^{\circ}03.5$	08:57
17	225°32.5	120°49.6	08.6	112°36.2	34.0	45°33.4	13.7	185°51.3	48.6	Mars	247°33.2	09:30
18	240°35.0	135°49.4	N20°08.5	127°36.9	N22°33.8	60°35.4	N01° 13.5	200°53.7	N12°48.6	Jupiter	180°08.7	13:58
19 20	255°37.4 270°39.9	150°49.1 165°48.8	08.5 08.4	142°37.6 157°38.4	33.6 33.4	75°37.5 90°39.5	13.3 13.1	215°56.2 230°58.6	48.6 48.6	Saturn	320°18.9	04:39
21	270 39.9 285°42.4	180°48.5	08.3	172°39.1	33.1	90°39.5 105°41.5	12.9	246°01.1	· · 48.6	Horizont	al parallax	
22	300°44.8	195°48.3	08.2	187°39.8	32.9	120°43.5	12.7	261°03.5	48.5		Venus:	0.2
23	$315^{\circ}47.3$	210°48.0	08.1	202°40.5	32.7	$135^{\circ}45.5$	12.5	276°06.0	48.5		Mars:	0.1
Mern	ass. 02:00	ν-0 3/ d.0	0.1' m-4.31	ν0 7' d.0	.2′ m1.57	ν2 0/ d-0	2′ m-1.70	v2 5/ d.0	.0′ m0.25			
.v.cp		. J.J u-0		. J., u-0		u U	1.10	u -0	.5			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°05.8	N12°39.9	199°32.2	6.8'	N17°32.3	-12.3'	60.4'
1	194°05.9	39.1	213°58.0	6.9'	$17^{\circ}19.9$	-12.5'	60.5'
2	209°06.0	38.3	228°23.9	6.9'	17°07.5	-12.6'	60.5'
3	224°06.2	• • 37.4	242°49.8	7.0'	16°54.9	-12.7'	60.5'
4	239°06.3	36.6	257°15.8	7.0'	16°42.2	-12.8'	60.5'
5	254°06.5	35.8	271°41.8	7.1'	16°29.4	-12.9'	60.6'
6 7	269°06.6 284°06.8	N12°35.0 34.2	286°07.9 300°34.0	7.1' 7.2'	N16°16.4 16°03.4	-13.0' -13.2'	60.6' 60.6'
8	299°06.9	33.3	315°00.1	7.2'	15°50.2	-13.2 -13.3'	60.6
9	314°07.1	32.5	329°26.3	7.3	15° 37.0	-13.4'	60.6
10	329°07.2	31.7	343°52.6	7.3'	15°23.6	-13.5'	60.7'
11	344°07.4	30.9	$358^{\circ}18.9$	7.4'	$15^{\circ}10.1$	-13.6'	60.7'
12	359°07.5	N12°30.0	12°45.3	7.4'	$N14^{\circ}56.5$	-13.7'	60.7'
13	14°07.7	29.2	$27^{\circ}11.7$	7.5'	14°42.8	-13.8'	60.7'
14	29°07.8	28.4	41°38.1	7.5	14°29.0	-13.9'	60.8'
15	44°08.0 59°08.1	• • 27.6	56°04.7 70°31.2	7.6' 7.6'	14°15.1 14°01.1	-14.0'	60.8'
16 17	74°08.2	26.7 25.9	70 31.2 84°57.8	7.0 7.7'	14 01.1 13°47.0	-14.1' -14.2'	60.8' 60.8'
18	89°08.4	N12°25.1	99°24.5	7.7'	N13°32.8	-14.2	60.8
19	104°08.5	24.3	113°51.2	7.8'	13° 18.5	-14.4'	60.9'
20	119°08.7	23.4	128°17.9	7.8'	13°04.1	-14.5'	60.9'
21	134°08.8	• • 22.6	142°44.7	7.8'	12°49.7	-14.6'	60.9'
22	149°09.0	21.8	157°11.6	7.9'	12°35.1	-14.6'	60.9'
23	164°09.1	21.0	171°38.5	7.9'	12°20.5	-14.7'	60.9'
	SD = 15.8'	d = -0.8'		S	D = 16.5'		
•							
Sun 0	GHA 179°09.3	Dec N12°20.1	GHA 186°05.4	ν 8.0'	Dec N12°05.8	d -14.8'	HP 60.9'
1	179 09.3 194°09.4	19.3	200°32.4	8.0'	11°50.9	-14.8 -14.9'	61.0'
2	209°09.6	18.5	214°59.4	8.1'	11°36.1	-15.0'	61.0'
3	224°09.7	17.7	229°26.5	8.1'	11°21.1	-15.0'	61.0'
4	239°09.9	16.8	243°53.7	8.2'	$11^{\circ}06.0$	-15.1'	61.0'
5	254°10.0	16.0	258°20.8	8.2'	10°50.9	-15.2'	61.0'
6	269°10.2	N12° 15.2	272°48.0	8.3'	N10°35.7	-15.3'	61.0'
7	284°10.3	14.3	287°15.3	8.3'	10°20.5	-15.3'	61.0'
8	299°10.5 314°10.6	13.5 •• 12.7	301°42.6 316°10.0	8.3'	10°05.1 09°49.7	-15.4' -15.5'	61.0' 61.1'
9 10	314 10.6 329°10.8	11.9	310 10.0 330°37.3	8.4' 8.4'	09 49.7 09°34.3	-15.5'	61.1
11	344°10.9	11.9	345°04.8	8.5	09° 34.3	-15.5'	61.1'
12	359°11.1	N12° 10.2	359°32.2	8.5'	N09°03.1	-15.7'	61.1'
13	14°11.3	09.4	13°59.8	8.6'	08°47.5	-15.7'	61.1'
14	29°11.4	08.5	28°27.3	8.6'	08°31.8	-15.8'	61.1'
15	44°11.6	• • 07.7	42°54.9	8.6'	08°16.0	-15.8'	61.1'
16	59°11.7	06.9	57°22.5	8.7'	08°00.2	-15.9'	61.1'
17	74°11.9 89°12.0	06.0 N12° 05.2	71°50.2 86°17.9	8.7' 8.7'	07°44.3 N07°28.4	-15.9' -16.0'	61.1'
18 19	104°12.2	N12 05.2 04.4	86 17.9 100°45.6	8.8'	07° 12.4	-16.0'	61.1' 61.1'
20	119°12.3	03.5	115°13.4	8.8'	06°56.4	-16.1	61.1
21	134°12.5	02.7	129°41.2	8.8'	06°40.4	-16.1	61.1
22	149°12.6	01.9	144°09.0	8.9'	06°24.3	-16.1'	61.1'
23	164°12.8	01.0	158°36.9	8.9'	$06^{\circ}08.1$	-16.2'	61.2'
	SD = 15.8'	d = -0.8'		S	D = 16.6'		
Mon	GHA	Dec	GHA		Dec	d	HP
O	179°12.9	N12° 00.2	173°04.8	ν 8.9'	N05°51.9	-16.2'	61.2'
1	194°13.1	11°59.4	187°32.8	9.0'	05°35.7	-16.2'	61.2'
2	209°13.2	58.5	202°00.7	9.0'	05°19.5	-16.3	61.2'
3	224°13.4	•• 57.7	$216^{\circ}28.7$	9.0'	$05^{\circ}03.2$	-16.3'	61.2'
4	239°13.6	56.9	230°56.7	9.1'	04°46.9	-16.3'	61.2'
5	254°13.7	56.0	245°24.8	9.1'	04°30.5	-16.4'	61.2'
6 7	269°13.9 284°14.0	N11°55.2 54.4	259°52.9 274°21.0	9.1' 9.1'	N04°14.2 03°57.8	-16.4' -16.4'	61.2' 61.2'
8	284 14.0 299°14.2	54.4 53.5	274 21.0 288°49.1	9.1 9.2'	03°57.8	-16.4'	61.2'
9	314°14.3	• • 52.7	303°17.3	9.2'	03°24.9	-16.4'	61.2
10	329°14.5	51.8	317°45.5	9.2'	03°08.5	-16.5'	61.1
11	344°14.6	51.0	332°13.7	9.2'	$02^{\circ}52.0$	-16.5'	61.1'
12	359°14.8	N11°50.2	346°41.9	9.2'	N02°35.6	-16.5'	61.1'
13	14°15.0	49.3	1°10.1	9.3'	02°19.1	-16.5'	61.1'
14	29°15.1	48.5	15°38.4	9.3'	02°02.6	-16.5'	61.1'
15 16	44°15.3 59°15.4	· · 47.6 46.8	30°06.7 44°35.0	9.3' 9.3'	01°46.0 01°29.5	-16.5' -16.5'	61.1' 61.1'
16 17	59°15.4 74°15.6	46.8 46.0	44°35.0 59°03.3	9.3'	01° 29.5 01° 13.0	-16.5'	61.1
18	89°15.8	N11°45.1	73°31.6	9.4'	N00° 56.5	-16.5'	61.1
19	104°15.9	44.3	88°00.0	9.4'	00°40.0	-16.5'	61.1
20	119°16.1	43.4	102°28.4	9.4'	00°23.4	-16.5'	61.1'
21	134°16.2	• • 42.6	$116^{\circ}56.7$	9.4'	$N00^{\circ}06.9$	-16.5'	61.1'
22	149°16.4	41.8	131°25.1	9.4'	500°09.6	16.5'	61.1'
23	164°16.5	40.9	145°53.5	9.4'	00°26.1	16.5'	61.1'
	SD = 15.8'	d = -0.8'		S	D = 16.7'		

Lat.	Twi	light	Sunrise	c	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	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	////
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°	05:36	06:04	06:28	17:39	18:03	18:31
35°	05:39	06:08	06:34	17:33	17:59	18:28
40°	05:41	06:13	06:41	17:26	17:54	18:26
45°	05:44	06:18	06:49	17:19	17:49	18:23
S 50°	05:47	06:25	06:58	17:09	17:43	18:21
52°	05:48	06:27	07:02	17:05	17:40	18:20
54°	05:49	06:30	07:07	17:01	17:37	18:19
56°	05:50	06:33	07:12	16:55	17:34	18:18
58°	05:51	06:37	07:18	16:50	17:31	18:17
S 60°	05:52	06:41	07:24	16:43	17:27	18:16

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°		03:14	05:49	20:25	19:45	19:14
N 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
N 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
N 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
S 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
S 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
S 60°	06:59	07:06	07:12	15:32	17:18	19:02

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	28-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%	
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		

August 22, 23, 24 UT (Tue., Wed., Thu.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	330°49.8	225°47.7	N20°08.1	217°41.3	N22°32.5	150°47.5	N01°12.3	291°08.5	N12°48.5			
1	345°52.2	240°47.5	08.0	232°42.0	32.2	165°49.5	12.1	306°10.9	48.5	Alpheratz	357°31.4	29°15.0
2	0°54.7	255°47.2	07.9	247°42.7	32.2	180°51.5	11.9	321°13.4	48.5	Ankaa	353°03.9	-42°08.7
3	15°57.1	270°46.9	07.8	262°43.5	31.8	195°53.5	•• 11.7	336°15.8	• • 48.5	Schedar	349°27.1	56°41.6
4	30°59.6	270°46.9 285°46.6	07.8	202 43.3 277°44.2	31.5	210°55.5	11.7	351°18.3	48.5	Diphda	348°44.1	-17°49.5
5	46°02.1	300°46.4	07.6	292°44.9	31.3	210 55.5 225°57.5	11.3	6°20.7	48.5	Achernar	$335^{\circ}17.8$	-57°05.1
6	61°04.5	315°46.1	N20°07.5	307°45.7	N22°31.1	240°59.5	N01°11.1	21°23.2	N12°48.5	Hamal	327°47.7	23°35.9
7	76°07.0	330°45.8	07.5	322°46.4	30.9	256°01.5	10.9	36°25.7		Polaris	$312^{\circ}19.4$	89°22.7
8	91°09.5	345°45.5		337°47.1	30.9	271°03.5	10.9	51°28.1	48.5	Acamar	$315^{\circ}09.5$	-40°11.1
9	91 09.5 106°11.9		07.4	352°47.9					48.5	Menkar	314°03.0	4°12.2
		0°45.3	•• 07.3		30.4	286°05.5	• • 10.5	66°30.6	• • 48.4	Mirfak	308°23.9	49°57.6
10	121°14.4	15°45.0	07.2	7°48.6 22°49.3	30.2	301°07.5	10.3	81°33.0	48.4	Aldebaran	290°36.3	16°34.0
11 12	136°16.9 151°19.3	30°44.7 45°44.4	07.1 N20°07.0	37°50.0	30.0 N22°29.7	316°09.6 331°11.6	10.1 N01°09.9	96°35.5 111°37.9	48.4 N12°48.4	Rigel	281°01.1	-8°10.0
13	166°21.8	60°44.1	06.9	52°50.8	29.5	346°13.6	09.7	111 37.9 126°40.4		Capella	$280^{\circ}17.6$	46°01.4
14	181°24.3	75°43.9	06.8	67°51.5	29.3	1°15.6	09.7	141°42.9	48.4 48.4	Bellatrix	$278^{\circ}19.8$	6°22.6
15	196°26.7	90°43.6	06.7	82°52.2	29.0	16°17.6	09.3	156°45.3	. 48.4	Elnath	277°58.3	28°37.8
16	211°29.2	105°43.3	06.6	97°53.0	28.8	31°19.6	09.1	171°47.8	48.4	Alnilam	275°34.9	$-1^{\circ}11.0$
17	226°31.6	100° 43.0	06.5	112°53.7	28.6	46°21.6	08.9	186°50.2	48.4	Betelgeuse	270°49.0	7°24.7
18	241°34.1	135°42.7	N20°06.4	112 55.7 127°54.4	N22°28.3	61°23.6	N01°08.7	201°52.7	N12°48.4	Canopus	263°51.4	-52°42.4
19	256°36.6	150°42.7	06.3	142°55.2	28.1	76°25.6	08.5	216°55.2	48.4	Sirius	258°23.8	-16°45.2
20	271°39.0	165°42.2	06.2	157°55.9	27.9	91°27.6	08.3	231°57.6	48.3	Adhara	255°03.8	-29°00.5
21	286°41.5	180°41.9	06.1	172°56.6	27.6	106°29.6	08.1	247°00.1	. 48.3	Procyon	244°48.0	$5^{\circ}09.1$
22	301°44.0	195°41.6	06.0	172 50.0 187°57.4	27.4	100°29.0 121°31.6	07.9	262°02.5	48.3	Pollux	243°14.0	27°57.3
23	316°46.4	210°41.3	05.9	202°58.1	27.4	136°33.6	07.7	202 02.3 277°05.0	48.3	Avior	234°14.0	-59°36.0
23	310 40.4									Suhail	222°44.5	-43°32.9
Mer.p	ass. 01:56	ν -0.3' d-0	0.1′ m-4.30	ν 0.7 $^{\prime}$ d-0).2′ m1.57	ν 2.0′ d-0	.2′ m-1.70	$\nu 2.5' \ d-0$.0′ m0.24	Miaplacidus	221°38.4	-69°50.1
		-		-		-		-	-	Alphard	217°45.2	-8°47.0
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
0 0	331°48.9	225°41.0	N20°05.8	217°58.8	N22°27.0	151°35.6	N01° 07.5	292°07.5	N12°48.3	Dubhe	193°38.2	61°35.8
1	346°51.4	240°40.8	05.7	232°59.6	26.7	166°37.6	07.3	307°09.9	48.3	Denebola	182°22.2	14°24.8
2	1°53.8	255°40.5	05.6	248°00.3	26.5	181°39.6	07.3	322°12.4	48.3	Gienah	175°40.8	-17°42.1
3	16°56.3	270°40.2	05.5	263°01.1	26.3	196°41.6	06.9	337°14.8	48.3		172°57.2	-63°15.7
4	31°58.7	285°39.9	05.4	278°01.8	26.0	211°43.6	06.7	352°17.3	48.3		171°48.7	-57°16.6
5	47°01.2	300°39.6	05.4	293°02.5	25.8	211 45.0 226°45.6	06.5	7°19.8	48.3	Alioth	166°10.9	55°48.4
6	62°03.7	315°39.3	N20°05.2	308°03.3	N22°25.6	241°47.6	N01°06.3	22°22.2	N12°48.2	Spica	158° 19.4	-11°18.7
7	77°06.1	330°39.0	05.1	323°04.0	25.3	256°49.7	06.0	37°24.7	48.2	Alkaid	152°50.0	49°10.4
8	92°08.6	345°38.7	05.1	338°04.7	25.3	271°51.7	05.8	52°27.2	48.2	Hadar	148°32.0	-60°30.9
9	107°11.1	0°38.5	•• 04.9	353°05.5	• • 24.8	271 51.7 286°53.7	• • 05.6	67°29.6	• • 48.2	Menkent	147°54.2	-36°30.8
10	107 11.1 122°13.5	15°38.2	04.9	8°06.2	24.6	301°55.7	05.4	82°32.1	48.2	Arcturus		19°02.1
11	137°16.0	30°37.9	04.7	23°06.9	24.4	316°57.7	05.4	97°34.5	48.2	Rigil Kent.		-60°57.4
12	152°18.5	45°37.6	N20°04.6	38°07.7	N22°24.1	331°59.7	N01°05.0	112°37.0	N12°48.2	Kochab	137°20.4	74°02.5
13	167°20.9	60°37.3	04.5	53°08.4	23.9	347°01.7	04.8	127°39.5	48.2	Zuben'ubi	136°52.8	-16°09.6
14	182°23.4	75°37.0	04.3	68°09.2	23.7	2°03.7	04.6	142°41.9	48.2	Alphecca	126°01.3	26°37.3
15	197°25.9	90°36.7	04.2	83°09.9	• • 23.4	17°05.7	• • 04.4	157°44.4	• • 48.1	Antares	112°12.1	-26°29.7
16	212°28.3	105°36.4	04.1	98°10.6	23.2	32°07.7	04.2	172°46.9	48.1	Atria	107°03.4	-69°04.9
17	227°30.8	120°36.1	04.0	113°11.4	23.0	47°09.7	04.0	187°49.3	48.1	Sabik	101°59.3	-15°45.5
18	242°33.2	135°35.8	N20°03.9	128°12.1	N22°22.7	62°11.7	N01°03.8	202°51.8	N12°48.1	Shaula	96°06.2	-37°07.5
19	257°35.7	150°35.5	03.8	143°12.8	22.5	77°13.7	03.6	217°54.3	48.1	Rasalhague	95°55.7	12°32.6
20	272°38.2	165°35.2	03.6	158°13.6	22.2	92°15.7	03.4	232°56.7	48.1	Eltanin	90°40.5	51°29.4
21	287°40.6	180°35.0	03.5	173°14.3	• • 22.0	107°17.7	03.2	247°59.2	• • 48.1	Kaus Aust.	83°28.3	-34°22.2
22	302°43.1	195°34.7	03.4	188°15.1	21.8	122°19.7	03.0	263°01.7	48.1	Vega	80°30.9	38°48.9
23	317°45.6	210°34.4	03.3	203°15.8	21.5	137°21.7	02.8	278°04.1	48.1	Nunki	75°43.8	-26°15.5
										Altair	61°56.8	8°56.9
Mer.p	ass. 01:52	ν -0.3' d-0	0.1′ m-4.29	ν 0.7′ d-0).2′ m1.57	$\nu 2.0' d-0$.2′ m-1.70	ν 2.5′ d-0	.0′ m0.24	Peacock	53°00.6	-56°38.4
										Deneb	49°23.3	45°23.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.5	10°00.6
0	332°48.0	225°34.1	N20°03.2	218°16.5	N22°21.3	152°23.7	N01°02.6	293°06.6	N12°48.1	Al Na'ir	27°28.8	-46°49.1
1	347°50.5	240°33.8	03.0	233°17.3	21.1	167°25.7	02.4	308°09.0	48.0	Fomalhaut	15°10.9	-29°28.0
2	2°53.0	255°33.5	02.9	248°18.0	20.8	182°27.7	02.2	323°11.5	48.0	Scheat	13°41.9	28°14.5
3	17°55.4	270°33.2	02.8	263°18.8	20.6	197°29.7	02.0	338°14.0	• • 48.0	Markab	13°26.6	15°21.8
4	32°57.9	285°32.9	02.7	278°19.5	20.3	212°31.7	01.8	353°16.4	48.0	Aug 22 Tue	SHA	Mer.pass
5	48°00.3	300°32.6	02.6	293°20.2	20.1	227°33.7	01.6	8°18.9	48.0		254°58.0	08:57
6	63°02.8	315°32.3	N20°02.4	308°21.0	N22°19.8	242°35.7	N01°01.4	23°21.4	N12°48.0		246°51.5	09:29
7	78°05.3	330°32.0	02.3	323°21.7	19.6	257°37.7	01.2	38°23.8	48.0		179°57.7	13:55
8	93°07.7	345°31.7	02.2	338°22.5	19.4	272°39.7	01.0	53°26.3	48.0	Saturn	320°18.7	04:35
9	108°10.2	0°31.4	02.0	353°23.2	19.1	287°41.7	00.8	68°28.8	• • 47.9			
10	123°12.7	15°31.1	01.9	8°23.9	18.9	302°43.7	00.6	83°31.2	47.9	Aug 23 Wed	SHA	Mer.pass
11	138°15.1	30°30.8	01.8	23°24.7	18.6	317°45.7	00.4	98°33.7	47.9		253°52.2	08:57
12	153°17.6	45°30.5	N20°01.7	38°25.4	N22°18.4	332°47.7	N01°00.2	113°36.2	N12°47.9		246° 10.0	09:28
13	168°20.1	60°30.2	01.5	53°26.2	18.2	347°49.7	01°00.0	128°38.7	47.9		179°46.7	13:52
14	183°22.5	75°29.9	01.4	68°26.9	17.9	2°51.7	00°59.8	143°41.1	47.9	Saturn	320°18.6	04:31
15	198°25.0	90°29.6	01.3	83°27.7	17.7	17°53.7	• • 59.6	158°43.6	• • 47.9	Aug 24 Thu	SHA	Mer.pass
16	213°27.5	105°29.3	01.1	98°28.4	17.4	32°55.7	59.3	173°46.1	47.9		252°46.0	08:58
17	228°29.9	120°29.0	01.0	113°29.1	17.2	47°57.8	59.1	188°48.5	47.9		245°28.5	09:26
18	243°32.4	135°28.6	N20°00.9	128°29.9	N22°16.9	62°59.8	N00°58.9	203°51.0	N12°47.8	l .	179°35.7	13:49
19	258°34.8	150°28.3	00.7	143°30.6	16.7	78°01.8	58.7	218°53.5	47.8	Saturn		04:27
20	273°37.3	165°28.0	00.6	158°31.4	16.4	93°03.8	58.5	233°55.9	47.8	Jatuill	525 10.0	01.21
21	288°39.8	180°27.7	00.4	173°32.1	. 16.2	108°05.8	58.3	248°58.4	• • 47.8	Horizon	al parallax	
22	303°42.2	195°27.4	00.3	188°32.9	16.0	123°07.8	58.1	264°00.9	47.8		Venus:	0.2
23	318°44.7	210°27.1	00.2	203°33.6	15.7	138°09.8	57.9	279°03.3	47.8		Mars:	0.1
			0.1' m-4.28		0.2′ m1.57		.2′ m-1.70		.0′ m0.23			
- ivier.p	bass. 01:49	ν -0.5 u -0	J.1 III-4.20	νυ.ι α-C	10.1111	ν2.0 α-0	.∠ 111-1./∪	ν2.5 α-C	.0 1110.23			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 16.7	N11°40.1	$160^{\circ}21.9$	9.4'	S 00°42.6	16.5'	61.0'
1	194° 16.9	39.2	174°50.4	9.4'	00°59.1	16.5	61.0'
2 3	209° 17.0 224° 17.2	38.4 •• 37.5	189°18.8 203°47.2	9.4' 9.4'	01°15.6 01°32.0	16.5' 16.4'	61.0' 61.0'
4	239° 17.3	36.7	218°15.7	9.4'	01°48.5	16.4	61.0'
5	254° 17.5	35.9	$232^{\circ}44.1$	9.5'	$02^{\circ}04.9$	16.4'	61.0'
6	269° 17.7	N11°35.0	247°12.6	9.5'	502°21.3	16.4	61.0'
7 8	284°17.8 299°18.0	34.2 33.3	261°41.0 276°09.5	9.5' 9.5'	02°37.7 02°54.0	16.4' 16.3'	61.0' 60.9'
9	314° 18.1	32.5	290°38.0	9.5'	03°10.4	16.3'	60.9'
10	329° 18.3	31.6	305°06.4	9.5'	03°26.7	16.3'	60.9'
11 12	344° 18.5 359° 18.6	30.8 N11°29.9	319°34.9 334°03.3	9.5' 9.5'	03°42.9 \$03°59.2	16.2' 16.2'	60.9' 60.9'
13	14° 18.8	29.1	348°31.8	9.5'	04°15.4	16.2	60.9
14	29° 19.0	28.2	3°00.3	9.5'	04°31.6	16.1'	60.8'
15	44°19.1	• • 27.4	17°28.7	9.5'	04°47.7	16.1'	60.8'
16 17	59° 19.3 74° 19.4	26.6 25.7	31°57.2 46°25.6	9.4' 9.4'	05°03.8 05°19.9	16.1' 16.0'	60.8' 60.8'
18	89° 19.6	N11°24.9	60°54.1	9.4'	S05°35.9	16.0'	60.8
19	104° 19.8	24.0	75°22.5	9.4'	05°51.8	15.9'	60.8'
20	119° 19.9	23.2	89°50.9	9.4'	06°07.8	15.9'	60.7'
21 22	134°20.1 149°20.3	· · 22.3 21.5	104°19.3 118°47.7	9.4' 9.4'	06°23.6 06°39.5	15.8' 15.8'	60.7' 60.7'
23	164° 20.4	20.6	133°16.1	9.4'	06°55.2	15.7'	60.7
	SD = 15.8'	d = -0.8'		SI	D = 16.6'		
			-				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°20.6 194°20.7	N11°19.8 18.9	147°44.5 162°12.9	9.4' 9.4'	\$07°11.0 07°26.6	15.7' 15.6'	60.6' 60.6'
2	209° 20.9	18.1	176°41.2	9.3'	07°42.2	15.6'	60.6
3	224°21.1	• • 17.2	191°09.6	9.3'	07°57.8	15.5'	60.6'
4	239°21.2	16.4	205°37.9	9.3'	08°13.3	15.4'	60.6'
5 6	254°21.4 269°21.6	15.5 N11°14.7	220°06.2 234°34.5	9.3' 9.3'	08°28.7 \$08°44.1	15.4' 15.3'	60.5' 60.5'
7	284°21.7	13.8	249°02.8	9.3'	08°59.4	15.2'	60.5
8	299°21.9	13.0	263°31.1	9.2'	$09^{\circ}14.6$	15.2'	60.5'
9	314°22.1	• • 12.1	277°59.3	9.2'	09°29.8	15.1'	60.4
10 11	329°22.2 344°22.4	11.2 10.4	292°27.5 306°55.7	9.2' 9.2'	09°44.9 09°59.9	15.0' 15.0'	60.4' 60.4'
12	359°22.6	N11°09.5	321°23.9	9.2'	S10°14.9	14.9'	60.4'
13	14°22.7	08.7	335°52.1	9.1'	10°29.8	14.8'	60.3'
14 15	29°22.9 44°23.1	07.8 •• 07.0	350°20.2 4°48.3	9.1' 9.1'	10°44.6 10°59.3	14.7' 14.7'	60.3' 60.3'
16	59°23.2	06.1	19°16.4	9.1'	10° 39.3 11° 14.0	14.6'	60.2
17	74°23.4	05.3	$33^{\circ}44.5$	9.0'	$11^{\circ}28.6$	14.5'	60.2'
18	89°23.6 104°23.7	N11°04.4	48°12.5 62°40.5	9.0' 9.0'	\$11°43.0 11°57.5	14.4'	60.2'
19 20	104 23.7 119°23.9	03.6 02.7	77°08.5		11 57.5 12°11.8	14.3' 14.2'	60.2' 60.1'
21	134° 24.1	01.8	91°36.5	8.9'	12°26.0	14.1'	60.1
22	149° 24.2	01.0	106°04.4	8.9'	12°40.2	14.1'	60.1'
23	164°24.4	00.1	120°32.4	8.9'	12°54.2	14.0'	60.0'
	SD = 15.8'	d = -0.9'		SI	D = 16.5'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.6	N10°59.3	135°00.2	8.9'	S13°08.2	13.9'	60.0'
1	194°24.7 209°24.9	58.4	149°28.1	8.8'	13°22.1	13.8'	60.0'
2 3	209°24.9 224°25.1	57.6 • • 56.7	163°55.9 178°23.7	8.8' 8.8'	13°35.8 13°49.5	13.7' 13.6'	60.0' 59.9'
4	239°25.2	55.8	192°51.5	8.7'	14°03.1	13.5	59.9'
5	254°25.4	55.0	207°19.2	8.7'	14°16.6	13.4'	59.9'
6 7	269°25.6 284°25.8	N10°54.1 53.3	221°46.9 236°14.6	8.7' 8.6'	\$14°30.0 14°43.3	13.3' 13.2'	59.8' 59.8'
8	204 25.0 299° 25.9	53.5 52.4	250°42.3	8.6'	14° 43.3 14° 56.5	13.1	59.8'
9	314°26.1	•• 51.5	265°09.9	8.6'	15°09.6	13.0'	59.7'
10	329°26.3	50.7	279°37.5	8.6'	15°22.6	12.9'	59.7'
11 12	344° 26.4 359° 26.6	49.8 N10°49.0	294°05.0 308°32.5	8.5' 8.5'	15°35.4 \$15°48.2	12.8' 12.7'	59.7' 59.6'
13	14°26.8	48.1	323°00.0	8.5'	16°00.9	12.6'	59.6'
14	29°26.9	47.2	337°27.5	8.4'	16°13.4	12.4'	59.6'
15 16	44°27.1 59°27.3	• • 46.4 45.5	351°54.9 6°22.3	8.4' 8.4'	16°25.9 16°38.2	12.3' 12.2'	59.5' 59.5'
16 17	59°27.3 74°27.5	45.5 44.7	6°22.3 20°49.6	8.4	16° 38.2 16° 50.4	12.2	59.5'
18	89°27.6	N10°43.8	35°16.9	8.3'	S17°02.5	12.0'	59.4'
19	104°27.8	42.9	49°44.2	8.3'	17°14.5	11.9'	59.4'
20 21	119°28.0 134°28.1	42.1 •• 41.2	64°11.5 78°38.7	8.2' 8.2'	17°26.4 17°38.2	11.8' 11.6'	59.4' 59.3'
22	149°28.3	40.3	93°05.9	8.2'	17°49.8	11.5	59.3'
23	164°28.5	39.5	107°33.0	8.1'	18°01.3	11.4'	59.3'
	SD = 15.8'	d = -0.9'		SI	D = 16.4'		

Lat.	Twi	light	Ci	S	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	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
N 40°	04:17	04:51	05:20	18:45	19:13	19:47
35°	04:29	05:00	05:26	18:38	19:04	19:36
30°	04:38	05:08	05:32	18:32	18:57	19:26
20°	04:53	05:20	05:42	18:22	18:45	19:11
N 10°	05:05	05:30	05:51	18:14	18:35	19:00
0°	05:14	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:46	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:16	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
S 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
S 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
N 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
N 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
N 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
N 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
S 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
S 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
S 60°	07:16	07:22	07:28	20:45	22:28	

		Sun			Moon	
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age
	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	333°47.2	225°26.8	N20°00.0	218°34.3	N22°15.5	153°11.8	N00°57.7	294°05.8	N12°47.8	A 1 L .		200151
1	348°49.6	240°26.5	19°59.9	233°35.1	15.2	168°13.8	57.5	309°08.3	47.8	Alpheratz	357°31.3	29° 15.1
2	3°52.1	255°26.2	59.7	248°35.8	15.0	183°15.8	57.3	324°10.7	47.7	Ankaa	353°03.9	-42°08.7
3	18°54.6	270°25.9	• • 59.6	263°36.6	• • 14.7	198°17.8	57.1	339°13.2	• • 47.7	Schedar	349°27.1	56°41.7
4	33°57.0	285°25.6	59.5	278°37.3	14.7	213°19.8	56.9	354°15.7	47.7	Diphda	348°44.1	-17°49.5
										Achernar	335°17.7	-57°05.1
5	48°59.5	300°25.3	59.3	293°38.1	14.2	228°21.8	56.7	9°18.2	47.7	Hamal	327°47.6	23°35.9
6	64°02.0	315°25.0	N19°59.2	308°38.8	N22°14.0	243°23.8	N00° 56.5	24°20.6	N12°47.7	Polaris	312°17.6	89°22.7
7	79°04.4	330°24.6	59.0	323°39.6	13.7	258°25.8	56.3	39°23.1	47.7	Acamar	315°09.4	-40° 11.1
8	94°06.9	345°24.3	58.9	338°40.3	13.5	273°27.8	56.1	54°25.6	47.7	Menkar	314°02.9	4° 12.2
9	109°09.3	0°24.0	• • 58.7	353°41.1	• • 13.2	288°29.8	• • 55.9	69°28.0	• • 47.7	Mirfak	308°23.8	49°57.6
10	124°11.8	15°23.7	58.6	8°41.8	13.0	303°31.8	55.7	84°30.5	47.6	Aldebaran		16°34.0
11	139°14.3	30°23.4	58.4	23°42.5	12.7	318°33.8	55.5	99°33.0	47.6		290°36.2	
12	154°16.7	45°23.1	N19°58.3	38°43.3	N22°12.5	333°35.8	N00°55.3	114°35.5	N12°47.6	Rigel	281°01.1	-8°10.0
13	169°19.2	60°22.8	58.1	53°44.0	12.2	348°37.8	55.1	129°37.9	47.6	Capella	280°17.6	46°01.4
14	184°21.7	75°22.5	58.0	68°44.8	12.0	3°39.8	54.9	144°40.4	47.6	Bellatrix	278°19.8	6°22.6
15	199°24.1	90°22.1	• • 57.8	83°45.5	• • 11.8	18°41.8	• • 54.7	159°42.9	• • 47.6	Elnath	277°58.2	28° 37.8
16	214°26.6	105°21.8	57.7	98°46.3	11.5	33°43.8	54.5	174°45.3	47.6	Alnilam	275°34.8	$-1^{\circ}11.0$
										Betelgeuse	270°49.0	7°24.7
17	229°29.1	120°21.5	57.5	113°47.0	11.2	48°45.8	54.3	189°47.8	47.5	Canopus	263°51.4	-52° 42.4
18	244°31.5	135°21.2	N19°57.4	128°47.8	N22°11.0	63°47.8	N00°54.0	204°50.3	N12°47.5	Sirius	258°23.8	-16°45.2
19	259°34.0	150°20.9	57.2	143°48.5	10.7	78°49.8	53.8	219°52.8	47.5	Adhara	255°03.8	-29°00.5
20	274°36.4	165°20.6	57.0	158°49.3	10.5	93°51.8	53.6	234°55.2	47.5		244°48.0	5°09.1
21	289°38.9	180°20.2	• • 56.9	173°50.0	• • 10.2	108°53.8	• • 53.4	249°57.7	• • 47.5	Procyon Pollux	244 46.0 243°14.0	27°57.3
22	304°41.4	195° 19.9	56.7	188°50.8	10.0	123°55.8	53.2	265°00.2	47.5			
23	319°43.8	210°19.6	56.6	203°51.5	09.7	138°57.8	53.0	280°02.7	47.5	Avior	234°14.0	-59°36.0
						-				Suhail	222°44.5	-43°32.9
Mer.p	oass. 01:45	ν -0.3' d-0).1′ m-4.28	ν 0.7 $^{\prime}$ d-0).2′ m1.57	$\nu 2.0' \ d-0$.2′ m-1.70	ν 2.5 $^{\prime}$ d-0	.0′ m0.23	Miaplacidus	221°38.4	-69°50.1
										Alphard	217°45.2	-8°47.0
٠.	CIIA	CIIA	Б.	CIIA	Б	CILA	Б.	CIIA		Regulus	207°31.6	11°49.6
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.8
0	334°46.3	225°19.3	N19°56.4	218°52.3	N22°09.5	153°59.8	N00°52.8	295°05.1	N12°47.5	Denebola	182°22.2	14°24.8
1	349°48.8	240°19.0	56.3	233°53.0	09.2	169°01.8	52.6	310°07.6	47.4	Gienah	175°40.8	$-17^{\circ}42.1$
2	4°51.2	255° 18.7	56.1	248°53.8	09.0	184°03.8	52.4	325°10.1	47.4	Acrux	172°57.2	-63° 15.7
3	19°53.7	270°18.3	• • 55.9	263°54.5	• • 08.7	199°05.8	• • 52.2	340°12.6	• • 47.4		171°48.7	-57° 16.6
4	34°56.2	285°18.0	55.8	278°55.3	08.5	214°07.8	52.0	355°15.0	47.4	Alioth	166°10.9	55° 48.4
5	49°58.6	300°17.7	55.6	293°56.0	08.2	229°09.8	51.8	10°17.5	47.4		158° 19.4	-11° 18.7
6	65°01.1	315° 17.4	N19°55.4	308°56.8	N22°08.0	244°11.8	N00°51.6	25°20.0	N12°47.4	Spica		
7	80°03.6	$330^{\circ}17.1$	55.3	323°57.5	07.7	259°13.8	51.4	40°22.5	47.4	Alkaid	152°50.0	49° 10.4
8	95°06.0	345°16.7	55.1	338°58.3	07.5	274°15.8	51.2	55°24.9	47.3	Hadar	148°32.0	-60°30.9
9	110°08.5	0°16.4	• • 54.9	353°59.0	07.2	289°17.8	51.0	70°27.4	• • 47.3		147°54.2	-36° 30.8
10	125°10.9	15° 16.1	54.8	8°59.8	07.2	304°19.8	50.8	85°29.9	47.3	Arcturus	145°45.4	19°02.1
										Rigil Kent.	139°36.3	-60°57.4
11	140°13.4	30° 15.8	54.6	24°00.5	06.7	319°21.8	50.6	100°32.4	47.3	Kochab	137°20.4	74°02.5
12	155°15.9	45° 15.4	N19°54.4	39°01.3	N22°06.4	334°23.8	N00° 50.4	115°34.8	N12°47.3	Zuben'ubi	136°52.8	-16°09.6
13	170°18.3	60°15.1	54.3	54°02.0	06.2	349°25.8	50.2	130°37.3	47.3	Alphecca	126°01.3	26°37.3
14	185°20.8	75°14.8	54.1	69°02.8	05.9	4°27.8	50.0	145°39.8	47.3	Antares	$112^{\circ}12.1$	-26°29.7
15	200°23.3	90°14.5	• • 53.9	84°03.5	• • 05.7	19°29.7	• • 49.8	160°42.3	• • 47.2	Atria	107°03.5	-69°04.9
16	215°25.7	$105^{\circ}14.1$	53.7	99°04.3	05.4	34°31.7	49.5	175°44.7	47.2	Sabik	101°59.3	-15°45.5
17	230°28.2	120°13.8	53.6	114°05.0	05.2	49°33.7	49.3	190°47.2	47.2	Shaula	96°06.2	-37°07.5
18	245°30.7	135°13.5	N19°53.4	129°05.8	N22°04.9	64°35.7	N00°49.1	205°49.7	N12°47.2	Rasalhague	95°55.7	12°32.6
19	260°33.1	150°13.2	53.2	144°06.6	04.6	79°37.7	48.9	220°52.2	47.2	_		
20	275°35.6	165°12.8	53.0	159°07.3	04.4	94°39.7	48.7	235°54.7	47.2	Eltanin	90°40.6	51°29.4
21	290°38.1	180°12.5	• • 52.9	174°08.1	• • 04.1	109°41.7	• • 48.5	250°57.1	• • 47.1	Kaus Aust.	83°28.4	-34°22.2
22	305°40.5	195° 12.2	52.7	189°08.8	03.9	124°43.7	48.3	265°59.6	47.1	Vega	80°31.0	38°48.9
	320°43.0	210°11.9		204°09.6		139°45.7		281°02.1		Nunki	75°43.9	-26° 15.5
23	320 43.0	210 11.9	52.5	204 09.0	03.6	139 45.7	48.1	201 02.1	47.1	Altair	61°56.8	8°56.9
Mer.p	bass. 01:41	ν -0.3' d-0).2′ m-4.27	ν 0.7′ d-0).3′ m1.57	$\nu 2.0' \ d-0$.2′ m-1.69	$\nu 2.5' \ d-0$.0′ m0.22	Peacock	53°00.6	-56° 38.5
										Deneb	49°23.3	45°23.2
										Enif	33°35.5	10°00.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.1
0	335°45.4	$225^{\circ}11.5$	N19°52.3	219°10.3	N22°03.4	154°47.7	N00°47.9	296°04.6	$N12^{\circ}47.1$	Fomalhaut	15°10.9	-29°28.0
1	350°47.9	$240^{\circ}11.2$	52.1	234°11.1	03.1	169°49.7	47.7	311°07.0	47.1	Scheat	13°41.9	28° 14.5
2	5°50.4	255°10.9	52.0	249°11.8	02.8	184°51.7	47.5	326°09.5	47.1	Markab	13°26.6	15°21.8
3	20°52.8	$270^{\circ}10.5$	• • 51.8	264°12.6	• • 02.6	199°53.7	• • 47.3	341°12.0	• • 47.1	iviainab	10.0	
4	35°55.3	285°10.2	51.6	279°13.3	02.3	214°55.7	47.1	356°14.5	47.0	Aug 25 Fri	SHA	Mer.pass
5	50°57.8	300°09.9	51.4	294°14.1	02.1	229°57.7	46.9	11°17.0	47.0	_	251°39.6	08:58
6	66°00.2	315°09.6	N19°51.2	309°14.9	N22°01.8	244°59.7	N00° 46.7	26°19.4	N12°47.0	Mars		09:25
7	81°02.7	330°09.0	51.0	324°15.6	01.5	260°01.7	46.5	41°21.9	47.0		179°24.6	13:45
										Saturn	320°18.6	04:23
8	96°05.2	345°08.9	50.8	339°16.4	01.3	275°03.7	46.3	56°24.4	47.0	Saturn	J2U 10.U	04:23
9	111°07.6	0°08.6	• • 50.7	354°17.1	• • 01.0	290°05.7	• • 46.1	71°26.9	• • 47.0	Aug 26 Sat	SHA	Mer.pass
10	126°10.1	15°08.2	50.5	9°17.9	8.00	305°07.7	45.9	86°29.4	47.0		250°33.0	08:59
11	141°12.6	30°07.9	50.3	24°18.6	00.5	320°09.7	45.7	101°31.8	46.9		244°06.0	09:24
12	$156^{\circ}15.0$	45°07.6	N19°50.1	39°19.4	N22°00.2	335°11.7	N00°45.4	116°34.3	N12°46.9		179°13.5	
13	171°17.5	60°07.2	49.9	54°20.2	22°00.0	$350^{\circ}13.7$	45.2	131°36.8	46.9			13:42
14	186°19.9	75°06.9	49.7	69°20.9	21°59.7	5°15.7	45.0	146°39.3	46.9	Saturn	320°18.8	04:19
15	201°22.4	90°06.6	• • 49.5	84°21.7	• • 59.4	20°17.7	• • 44.8	161°41.8	• • 46.9	Aug 27 Sun	SHA	Mer.pass
16	216°24.9	105°06.2	49.3	99°22.4	59.2	35°19.7	44.6	176°44.2	46.9		249°26.1	08:59
	231°27.3	100°05.9		114°23.2	58.9	50°21.7		191°46.7				
17			49.1				44.4 NOO° 44.2		46.8	Mars		09:23
18	246°29.8	135°05.6	N19°48.9	129°23.9	N21°58.7	65°23.7	N00°44.2	206°49.2	N12°46.8		179°02.3	13:39
19	261°32.3	150°05.2	48.7	144°24.7	58.4	80°25.7	44.0	221°51.7	46.8	Saturn	320°19.1	04:15
20	276°34.7	165°04.9	48.5	159°25.5	58.1	95°27.7	43.8	236°54.2	46.8			
21	291°37.2	180°04.5	• • 48.3	174°26.2	• • 57.9	110°29.7	• • 43.6	251°56.6	• • 46.8	Horizont	al parallax	
22	306°39.7	195°04.2	48.1	189°27.0	57.6	125°31.7	43.4	$266^{\circ}59.1$	46.8		Venus:	0.2
23	321°42.1	210°03.9	47.9	204°27.7	57.3	140°33.7	43.2	282°01.6	46.7		Mars:	0.1
										<u> </u>		
N/ler r	oass. 01:37	ν -0.3' d-0).2′ m-4.26	ν 0.8′ d-0).3′ m1.57	ν 2.0′ d-0	.2′ m-1.69	ν 2.5′ d-0	.0' m0.22			

	C	-0.1333 sec		1-01.			
h	Su	n			Moon		
Fri	GHA 179°28.7	Dec N10°38.6	GHA 122°00.2	ν 9 1'	Dec 518° 12.7	d 11.2'	HP
0 1	179°28.7 194°28.8	N10 38.6 37.7	136°27.3	8.1' 8.1'	18° 24.0	11.3' 11.2'	59.2' 59.2'
2	209°29.0	36.9	150°54.3	8.0'	18° 35.1	11.0'	59.2'
3	224°29.2	• • 36.0	$165^{\circ}21.3$	8.0'	18°46.2	10.9'	59.1'
4	239°29.4	35.1	179°48.3	8.0'	18° 57.1	10.8'	59.1'
5	254°29.5 269°29.7	34.3 N10°33.4	194°15.3 208°42.2	7.9'	19° 07.8 \$19° 18.5	10.6'	59.1'
6 7	269 29.7 284°29.9	N10 33.4 32.5	208 42.2 223°09.1	7.9' 7.9'	19°29.0	10.5' 10.4'	59.0' 59.0'
8	299°30.1	31.7	237°35.9	7.8'	19°39.4	10.3	59.0'
9	314°30.2	• • 30.8	252°02.8	7.8'	$19^{\circ}49.7$	10.1'	58.9'
10	329°30.4	29.9	266°29.6	7.8'	19°59.8	10.0'	58.9'
11	344°30.6 359°30.8	29.1 N10°28.2	280°56.3 295°23.0	7.7' 7.7'	20°09.8 520°19.7	9.9' 9.7'	58.8' 58.8'
12 13	359 30.8 14°30.9	27.3	295 23.0 309°49.7	7.7'	20° 29.4	9. <i>1</i> 9.6'	58.8'
14	29°31.1	26.5	324°16.4	7.6'	20°39.0	9.5'	58.7'
15	44°31.3	• • 25.6	$338^{\circ}43.1$	7.6'	20°48.4	9.3'	58.7'
16	59°31.5	24.7	353°09.7	7.6'	20°57.8	9.2'	58.7'
17 18	74°31.6 89°31.8	23.9 N10°23.0	7°36.2 22°02.8	7.6' 7.5'	21°07.0 S 21°16.0	9.1' 8.9'	58.6' 58.6'
19	104°32.0	22.1	36°29.3	7.5'	21°24.9	8.8'	58.6
20	119°32.2	21.3	50°55.8	7.5'	21°33.7	8.6'	58.5'
21	134°32.3	• • 20.4	65°22.3	7.4'	21°42.3	8.5'	58.5'
22	149°32.5	19.5	79°48.7	7.4'	21°50.8 21°59.2	8.4'	58.5'
23	164°32.7	18.6	94°15.2	7.4'		8.2'	58.4'
	SD = 15.8'	d = -0.9'		SI	O = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.9	N10°17.8	108°41.6	7.4'	\$22°07.4	8.1'	58.4'
1	194°33.0 209°33.2	16.9	123°07.9 137°34.3	7.3'	22° 15.5 22° 23.4	7.9'	58.3'
2	209°33.2 224°33.4	16.0 •• 15.2	137°34.3 152°00.6	7.3' 7.3'	22°23.4 22°31.2	7.8' 7.6'	58.3' 58.3'
4	239°33.6	14.3	166°26.9	7.3	22°38.8	7.5	58.2
5	254°33.8	13.4	$180^{\circ}53.2$	7.3'	22°46.3	7.3'	58.2'
6	269°33.9	N10°12.5	195°19.5	7.2'	S22°53.7	7.2'	58.2'
7	284°34.1 299°34.3	11.7	209°45.7 224°11.9	7.2' 7.2'	23°00.9 23°07.9	7.1'	58.1' 58.1'
8 9	299 34.3 314°34.5	10.8 •• 09.9	224 11.9 238°38.2	7.2'	23 07.9 23°14.8	6.9' 6.8'	58.1'
10	329°34.7	09.1	253°04.3	7.2'	23°21.6	6.6'	58.0'
11	344°34.8	08.2	267°30.5	7.2'	23°28.2	6.5'	58.0'
12	359°35.0	N10°07.3	281°56.7	7.1'	523°34.7	6.3'	58.0'
13 14	14°35.2 29°35.4	06.4 05.6	296°22.8 310°49.0	7.1' 7.1'	23°41.0 23°47.2	6.2' 6.0'	57.9' 57.9'
15	44°35.6	• • 04.7	325°15.1	7.1	23°53.2	5.9'	57.8
16	59°35.7	03.8	339°41.2	7.1'	23°59.0	5.7'	57.8'
17	74°35.9	02.9	354°07.3	7.1'	24°04.8	5.6'	57.8'
18 19	89°36.1 104°36.3	N10°02.0 01.2	8°33.4 22°59.5	7.1' 7.1'	\$24° 10.3 24° 15.8	5.4' 5.3'	57.7' 57.7'
20	119°36.5	10°00.3	37°25.6	7.1'	24°13.0	5.3 5.1'	57.7'
21	134°36.6	09°59.4	51°51.6	7.1	24°26.1	5.0'	57.6'
22	149°36.8	58.5	$66^{\circ}17.7$	7.1'	24°31.1	4.8'	57.6'
23	164°37.0	57.7	80°43.8	7.1'	24°35.9	4.7'	57.6'
	SD = 15.8'	d = -0.9'		SI	O = 15.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.2	N09°56.8	95°09.8	7.1'	S24°40.6	4.5'	57.5
1 2	194°37.4 209°37.5	55.9 55.0	109°35.9 124°02.0	7.1' 7.1'	24° 45.1 24° 49.5	4.4' 4.2'	57.5' 57.5'
3	209°37.5 224°37.7	55.0 •• 54.2	124°02.0 138°28.0	7.1° 7.1°	24°49.5 24°53.7	4.2 4.1'	57.5° 57.4'
4	239°37.9	53.3	152°54.1	7.1'	24°57.7	3.9'	57.4°
5	254°38.1	52.4	167°20.2	7.1'	25°01.6	3.8'	57.4'
6	269°38.3	N09°51.5	181°46.3	7.1'	\$25°05.4	3.6'	57.3'
7 8	284°38.5 299°38.6	50.6 49.8	196°12.3 210°38.4	7.1' 7.1'	25°09.0 25°12.4	3.4' 3.3'	57.3' 57.3'
9	314°38.8	. 48.9	225°04.5	7.1'	25°15.7	3.1'	57.2'
10	329°39.0	48.0	239°30.6	7.1'	$25^{\circ}18.9$	3.0'	57.2'
11	344°39.2	47.1	253°56.8	7.1'	25°21.8	2.8'	57.2'
12 13	359°39.4 14°39.5	N09°46.2 45.4	268°22.9 282°49.0	7.1' 7.2'	\$25°24.7 25°27.4	2.7' 2.5'	57.1' 57.1'
13	14 39.5 29°39.7	45.4 44.5	282 49.0 297°15.2	7.2'	25°29.9	2.5 2.4'	57.1'
15	44°39.9	• • 43.6	311°41.4	7.2'	25°32.3	2.2'	57.0'
16	59°40.1	42.7	326°07.6	7.2'	25°34.5	2.1'	57.0'
17	74°40.3	41.8	340°33.8	7.2'	25°36.6	1.9'	57.0'
18 19	89°40.5 104°40.7	N09° 40.9 40.1	355°00.0 9°26.3	7.3' 7.3'	\$25°38.5 25°40.3	1.8' 1.6'	56.9' 56.9'
20	119°40.8	39.2	23°52.6	7.3'	25°41.9	1.5'	56.9
21	134°41.0	• • 38.3	38°18.9	7.3'	25°43.4	1.3'	56.8'
22	149°41.2	37.4	52°45.2	7.4'	25°44.7	1.2'	56.8'
23	164°41.4	36.5	67°11.6	7.4'	25°45.9	1.0'	56.8'
	SD = 15.8'	d = -0.9'		SI	O = 15.7'		

Lat	Twi	light	Cia -	Cumant	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	01:44	03:33	20:26	22:10	////
N 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
N 40°	04:21	04:54	05:22	18:40	19:08	19:42
35°	04:31	05:02	05:29	18:34	19:00	19:31
30°	04:40	05:09	05:34	18:29	18:53	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
S 10°	05:20	05:44	06:06	17:58	18:19	18:44
20°	05:25	05:51	06:13	17:50	18:13	18:38
30°	05:30	05:57	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
S 50°	05:36	06:13	06:46	17:18	17:51	18:29
52°	05:36	06:15	06:49	17:15	17:49	18:28
54°	05:36	06:17	06:53	17:11	17:47	18:28
56°	05:36	06:19	06:57	17:07	17:45	18:28
58°	05:36	06:22	07:02	17:02	17:43	18:28
S 60°	05:36	06:25	07:07	16:57	17:40	18:28

Lat. Fri Sat Sun Fri Sat Sun N 72° ■
N 70° Image: Control of the control of th
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
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
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
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
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
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
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
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
N 40° 11:30
35° 11:17
30° 11:06 12:12 13:14 21:46 22:34 23:27
20° 10:47
N 10° 10:31
0° 10:15
S 10° 10:00
20° 09:44 10:33 11:26 23:17 ··· 00:18
$ 30^{\circ} 09:25 $
35° 09:15 09:58 10:47 23:50 · · · · 00:56
$ 40^{\circ} 09:02 09:43 10:30 \cdots 00:04 01:12$
45° 08:48 09:25 10:10 00:21 01:32
S 50° 08:31 09:03 09:45 00:42 01:56
52° 08:22 08:53 09:33 \cdots 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
S 60° 07:38 07:54 08:21 00:10 01:49 03:19

		Sun			Moon	
Day	Eqn.of	Time	Mer.	r. Mer.Pass.		Age
,	00 ^h	12 ^h	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	Ve	` nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	336°44.6	225°03.5	N19° 47.7	219°28.5	N21°57.1	155°35.7	N00°43.0	297°04.1	N12°46.7			Dec
0										Alpheratz	357°31.3	29°15.1
1	351°47.0	240°03.2	47.5	234°29.3	56.8	170°37.7	42.8	312°06.6	46.7	Ankaa	353°03.9	-42°08.7
2	6°49.5	255°02.9	47.3	249°30.0	56.5	185°39.6	42.6	327°09.1	46.7	Schedar	349°27.0	56°41.7
3	21°52.0	270°02.5	• • 47.1	264°30.8	56.3	200°41.6 215°43.6	• • 42.4	342°11.5	• • 46.7	Diphda	$348^{\circ}44.1$	-17°49.5
4	36°54.4	285°02.2	46.9	279°31.5	56.0		42.2	357°14.0	46.7	Achernar	335°17.7	-57°05.1
5 6	51°56.9 66°59.4	300°01.8 315°01.5	46.7 N19°46.5	294°32.3 309°33.1	55.7 N21°55.5	230°45.6 245°47.6	42.0 N00°41.7	12°16.5 27°19.0	46.6 N12°46.6	Hamal	327°47.6	23°35.9
7	82°01.8	330°01.3	46.3	324°33.8	55.2	260°49.6	41.7	42°21.5	46.6	Polaris	312°15.8	89°22.7
8	97°04.3	345°00.8	46.1	339°34.6	54.9	275°51.6	41.3	57°24.0	46.6	Acamar	$315^{\circ}09.4$	-40°11.1
9	112°06.8	0°00.5	• • 45.9	354°35.3	• • 54.7	290°53.6	• • 41.1	72°26.4	• • 46.6	Menkar	314°02.9	4°12.2
10	127°09.2	15°00.1	45.7	9°36.1	54.4	305°55.6	40.9	87°28.9	46.6	Mirfak	308°23.8	49°57.6
11	142°11.7	29°59.8	45.5	24°36.9	54.1	320°57.6	40.7	102°31.4	46.5	Aldebaran	290°36.2	16°34.0
12	157°14.2	44°59.4	N19°45.3	39°37.6	N21°53.9	335°59.6	N00°40.5	117°33.9	N12°46.5	Rigel	281°01.1	-8°10.0
13	172°16.6	59°59.1	45.1	54°38.4	53.6	351°01.6	40.3	132°36.4	46.5	Capella	280°17.6	46°01.4
14	187°19.1	74°58.8	44.8	69°39.2	53.3	6°03.6	40.1	147°38.9	46.5	Bellatrix	278°19.8	6°22.6
15	202°21.5	89°58.4	• • 44.6	84°39.9	• • 53.1	21°05.6	• • 39.9	162°41.4	• • 46.5	Elnath	277°58.2	28°37.8
16	217°24.0	104°58.1	44.4	99°40.7	52.8	36°07.6	39.7	177°43.8	46.5	Alnilam	275°34.8	-1°11.0
17	232°26.5	119°57.7	44.2	114°41.4	52.5	51°09.6	39.5	192°46.3	46.4	Betelgeuse	270°49.0	7°24.7
18	247°28.9	134°57.4	N19°44.0	129°42.2	N21°52.3	66°11.6	N00°39.3	207°48.8	N12°46.4	Canopus	263°51.3 258°23.8	-52°42.4 -16°45.2
19	262°31.4	149°57.0	43.8	144°43.0	52.0	81°13.6	39.1	222°51.3	46.4	Sirius		-10 45.2 -29°00.5
20	277°33.9	164°56.7	43.6	159°43.7	51.7	96°15.6	38.9	237°53.8	46.4	Adhara	255°03.7 244°48.0	5°09.1
21	292°36.3	179°56.4	• • 43.3	174°44.5	• • 51.4	111°17.6	• • 38.7	252°56.3	• • 46.4	Procyon	244 46.0 243°14.0	27°57.3
22	307°38.8	194°56.0	43.1	189°45.3	51.2	126°19.6	38.5	267°58.8	46.4	Pollux Avior	243 14.0 234°14.0	-59°36.0
23	$322^{\circ}41.3$	209°55.7	42.9	204°46.0	50.9	141°21.5	38.2	283°01.2	46.3	Suhail	234 14.0 222°44.5	-59 36.0 -43°32.8
Morn	ass. 01:33	ν-U 3/ 4 O	0.2' m-4.25	νη α' 4 n	0.3' m1.57	1/2 n/ d n	.2′ m-1.69	u2 5' d 0	.0′ m0.21	Miaplacidus	222 44.5 221°38.4	-43 32.6 -69°50.0
ivier.p	ass. U1.33	ν-0.3 u-0	7.4 III-4.43	νυ.ο α-U	.5 1111.57	ν2.0 <i>α</i> -0	.∠ 111-1.09	ν2.5 u -0	.0 1110.21	Alphard	221 38.4 217°45.1	-8°47.0
										Regulus	207°31.6	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.8
0	337°43.7	224°55.3	N19°42.7	219°46.8	N21°50.6	156°23.5	N00°38.0	298°03.7	N12°46.3	Denebola	182°22.2	14°24.7
1	352°46.2	239°55.0	42.5	234°47.6	50.4	171°25.5	37.8	313°06.2	46.3	Gienah	175°40.8	-17°42.1
2	7°48.7	254°54.6	42.2	249°48.3	50.1	186°27.5	37.6	328°08.7	46.3		172°57.2	-63°15.7
3	22°51.1	269°54.3	• • 42.0	264°49.1	• • 49.8	201°29.5	• • 37.4	343°11.2	• • 46.3	Gacrux	171°48.7	-57°16.6
4	37°53.6	284°53.9	41.8	279°49.9	49.5	216°31.5	37.2	358°13.7	46.2	Alioth	166°10.9	55°48.4
5	52°56.0	299°53.6	41.6	294°50.6	49.3	231°33.5	37.0	13°16.2	46.2	Spica	158°19.4	-11°18.7
6	67°58.5	314°53.2	N19°41.3	309°51.4	N21°49.0	246°35.5	N00°36.8	28°18.7	N12°46.2	Alkaid	152°50.0	49°10.4
7	83°01.0	329°52.9	41.1	324°52.1	48.7	261°37.5	36.6	43°21.1	46.2	Hadar	148°32.0	-60°30.9
8	98°03.4	344°52.5	40.9	339°52.9	48.5	276°39.5	36.4	58°23.6	46.2	Menkent	147°54.3	-36°30.8
9	113°05.9	359°52.2	• • 40.6	354°53.7	• • 48.2	291°41.5	• • 36.2	73°26.1	• • 46.2	Arcturus	145°45.4	19°02.1
10	128°08.4	14°51.8	40.4	9°54.4	47.9	306°43.5	36.0	88°28.6	46.1	Rigil Kent.	139°36.4	-60°57.4
11	143°10.8	29°51.5	40.2	24°55.2	47.6	321°45.5	35.8	103°31.1	46.1	Kochab	$137^{\circ}20.5$	74°02.5
12	158°13.3	44°51.1	N19°40.0	39°56.0	N21°47.4	336°47.5	N00°35.6	118°33.6	N12°46.1	Zuben'ubi	$136^{\circ}52.8$	-16°09.6
13	173°15.8	59°50.8	39.7	54°56.8	47.1	351°49.5	35.4	133°36.1	46.1	Alphecca	$126^{\circ}01.3$	26°37.3
14	188°18.2	74°50.4	39.5	69°57.5	46.8	6°51.5	35.1	148°38.6	46.1	Antares	$112^{\circ}12.1$	-26°29.7
15	203°20.7	89°50.1	• • 39.3	84°58.3	• • 46.5	21°53.5	• • 34.9	163°41.1	• • 46.0	Atria	$107^{\circ}03.5$	-69°04.9
16 17	218°23.2 233°25.6	104°49.7 119°49.4	39.0 38.8	99°59.1 114°59.8	46.3	36°55.4 51°57.4	34.7 34.5	178°43.5 193°46.0	46.0	Sabik	101°59.3	-15°45.5
18	248°28.1	119 49.4 134°49.0	30.0 N19°38.6	114 59.6 130°00.6	46.0 N21°45.7	66°59.4	N00°34.3	208°48.5	46.0 N12°46.0	Shaula	96°06.2	-37°07.5
19	263°30.5	134 49.0 149°48.7	38.3	145°01.4	45.4	82°01.4	34.1	200° 40.5 223° 51.0	46.0	Rasalhague	95°55.7	12°32.6
20	203°33.0	164° 48.3	38.1	160°02.1	45.4	97°03.4	33.9	238°53.5	46.0	Eltanin	90°40.6	51°29.4
21	276 35.0 293°35.5	179° 48.0	•• 37.8	175°02.9	• • 44.9	112°05.4	• • 33.7	253°56.0	• • 45.9	Kaus Aust.	83°28.4	-34°22.2
22	308°37.9	194° 47.6	37.6	190°03.7	44.6	112 03.4 127°07.4	33.5	268°58.5	45.9	Vega	80°31.0	38°48.9
23	323°40.4	209° 47.2	37.4	205°04.4	44.3	142°09.4	33.3	284°01.0	45.9	Nunki	75°43.9	-26°15.5
										Altair	61°56.8	8°56.9
Mer.p	ass. 01:29	ν -0.3′ d-0).2′ m-4.25	ν 0.8′ d-0	1.3' m 1.57	$\nu 2.0' \ d-0$.2′ m-1.69	$\nu 2.5' \ d-0$.0′ m0.20	Peacock	53°00.6	-56°38.5
										Deneb	49°23.3	45°23.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.5	10°00.6
0	338°42.9	224° 46.9	N19° 37.1	220°05.2	N21°44.0	157°11.4	N00°33.1	299°03.5	N12°45.9	Al Na'ir	27°28.8	-46°49.1
1	353°45.3	239° 46.5	36.9	235°06.0	43.8	172°13.4	32.9	314°06.0	45.9	Fomalhaut Scheat	15°10.9 13°41.9	-29°28.0 28°14.5
2	8°47.8	254°46.2	36.6	250°06.7	43.5	187°15.4	32.7	329°08.5	45.8	Scheat	13°41.9 13°26.6	28° 14.5 15° 21.8
3	23°50.3	269°45.8	• • 36.4	265°07.5	• • 43.2	202°17.4	• • 32.5	344°10.9	• • 45.8	iviarkaD	13 20.0	13 21.0
4	38°52.7	284°45.5	36.1	280°08.3	42.9	217°19.4	32.3	359°13.4	45.8	Aug 28 Mon	SHA	Mer.pass
5	53°55.2	299°45.1	35.9	$295^{\circ}09.1$	42.7	232°21.4	32.0	14°15.9	45.8	Venus	248°18.9	09:00
6	68°57.6	314°44.8	N19°35.6	310°09.8	N21°42.4	247°23.4	N00°31.8	29°18.4	N12°45.8		242°43.9	09:22
7	84°00.1	329°44.4	35.4	$325^{\circ}10.6$	42.1	262°25.3	31.6	44°20.9	45.7		178°51.1	13:36
8	99°02.6	344°44.0	35.2	$340^{\circ}11.4$	41.8	277°27.3	31.4	59°23.4	45.7	Saturn	320°19.5	04:11
9	114°05.0	359°43.7	• • 34.9	355°12.1	• • 41.5	292°29.3	• • 31.2	74°25.9	• • 45.7	Aug 29 Tue	SHA	Mer.pass
10	129°07.5	14°43.3	34.7	10°12.9	41.3	307°31.3	31.0	89°28.4	45.7	_	247°11.6	09:01
11	144°10.0	29°43.0	34.4	25°13.7	41.0	322°33.3	30.8	104°30.9	45.7		242°03.1	09:01
12	159°12.4	44°42.6	N19°34.2	40°14.5	N21°40.7	337°35.3	N00°30.6	119°33.4	N12°45.6		178°39.8	13:33
13	174°14.9	59°42.2	33.9	55°15.2	40.4	352°37.3	30.4	134°35.9	45.6	Saturn	320°20.0	04:07
14	189°17.4	74°41.9	33.6	70°16.0	40.1	7°39.3	30.2	149°38.4	45.6			
15	204°19.8	89°41.5	• • 33.4	85°16.8	• • 39.9	22°41.3	30.0	164°40.9	• • 45.6	Aug 30 Wed	SHA	Mer.pass
16	219°22.3	104°41.2	33.1	100°17.6	39.6	37°43.3	29.8	179°43.4	45.6		246°04.0	09:01
17	234°24.8	119°40.8	32.9	115°18.3	39.3	52°45.3	29.6	194°45.9	45.5		241°22.3	09:19
18	249°27.2	134°40.4	N19°32.6	130°19.1		67°47.3	N00°29.4	209°48.3	N12°45.5		178°28.5	13:29
19	264°29.7	149°40.1	32.4	145°19.9	38.7	82°49.2	29.2	224°50.8	45.5	Saturn	320°20.6	04:03
20	279°32.1 294°34.6	164°39.7 179°39.4	32.1 · · 31.8	160°20.6 175°21.4	38.4 •• 38.2	97°51.2	28.9 •• 28.7	239°53.3 254°55.8	45.5 •• 45.5	Horizont	al parallax	
21 22	294°34.6 309°37.1	179°39.4 194°39.0	31.6	175°21.4 190°22.2	37.9	112°53.2 127°55.2	28.7	254 55.8 269 58.3	45.4		Venus:	0.2
23	309 37.1 324°39.5	209°38.6	31.3	205°23.0	37.9 37.6	142°57.2	28.3	209 56.5 285°00.8	45.4 45.4		Mars:	0.1
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Mer.p	ass. 01:25	ν -0.4′ d-0).2′ m-4.24	ν 0.8′ d-0	0.3′ m1.57	ν 2.0′ d-0	.2′ m-1.69	ν 2.5′ <i>d</i> -0	.0′ m0.20			

Mon	h	Sun				Moon				
1	Mon	GHA	Dec	GHA	ν	Dec	d	HP		
2	0		N09°35.6					56.7'		
3										
139°243 321 139°238 7.5° 25°496 0.3° 566° 6 269°42.7 N09°303 168°16.9 7.6° S25°50.0 0.2° 56.6° 7 284°42.9 29.4 182°43.5 7.7° 25°50.0 0.2° 56.6° 8 299°43.1 28.6° 197°10.2 7.7° 25°50.0 0.2° 50.5° 9 314°43.3 0.2° 27.7° 211°36.9 7.7° 25°49.8 0.3° 55.5° 10 329°43.8 N09°50.0 24°03.6 7.8° 25°49.1 0.0° 56.4° 11 344°43.6 25.9 240°30.4 7.8° 25°49.1 0.0° 56.4° 11 344°43.6 25.9 240°30.4 7.8° 25°49.1 0.0° 56.4° 11 344°43.6 25.9 240°30.4 7.8° 25°49.1 0.0° 56.4° 11 344°43.6 25.9 240°30.4 7.8° 25°49.1 0.0° 56.4° 11 344°43.6 25.9 240°30.4 7.8° 25°49.1 0.0° 56.4° 12 56.3° 11 25°49.1 0.1° 56.2° 13 14°44.0 24.1 269°24.1 7.9° 25°45.9 1.2° 56.3° 15 44°44.4 0.23.1 289°24.1 7.9° 25°45.9 1.2° 56.3° 15 56.2° 25°45.9 1.2° 56.3° 15 56.2° 25°44.6 4.1° 56.2° 18 89°44.9 N09°19.7 341°30.1 8.1° 25°40.1 1.1° 56.2° 18 89°44.9 N09°19.7 341°30.1 8.1° 25°40.1 1.1° 56.2° 20° 119°45.3 17.9 10°33.4 8.3° 25°38.8 -20° 56.1° 22° 149°45.7 16.1 39°28.0 8.4° 25°30.3 2.4° 56.1° 22° 149°45.7 16.1 39°28.0 8.4° 25°30.3 2.4° 56.1° 22° 246°45.5 12.6° 97°17.8 8.6° 25°22.7 2.2° 56.1° 22° 209°46.5 12.6° 97°17.8 8.6° 25°25.4 2.7° 56.1° 22° 209°46.5 12.6° 97°17.8 8.6° 25°25.7 2.2° 56.1° 23° 23° 348° 23° 34°										
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18 89°49.5 N08°58.3 328°46.7 9.6' S24°21.8 -4.9' 55.6' 19 104°49.7 57.4 343°15.3 9.7' 24°17.0 -5.0' 55.5' 20 119°49.9 56.5 357°44.0 9.8' 24°12.0 -5.1' 55.5' 21 134°50.1 · · 55.6 12°12.7 9.8' 24°06.9 -5.2' 55.5' 22 149°50.3 54.7 26°41.6 9.9' 24°01.6 -5.3' 55.5' 23 164°50.5 53.8 41°10.5 10.0' 23°56.3 -5.5' 55.4' SD = 15.8'										
19										
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Wed GHA Dec GHA ν Dec d HP 0 179°50.7 N08°52.9 55°39.5 10.1' S23°50.8 -5.6' 55.4' 1 194°50.9 52.0 70°08.5 10.1' 23°45.2 -5.7' 55.4' 2 209°51.0 51.1 84°37.6 10.2' 23°39.5 -5.8' 55.4' 3 224°51.2 · 50.2 99°06.8 10.3' 23°37.8 -6.0' 55.4' 4 239°51.4 49.3 113°36.1 10.3' 23°27.8 -6.0' 55.3' 5 254°51.6 48.4 128°05.5 10.4' 23°21.8 -6.1' 55.3' 6 269°51.8 N08°47.5 142°34.9 10.5' S23°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' <th>20</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>0.0</th> <th></th>	20						0.0			
0 179°50.7 N08°52.9 55°39.5 10.1' S23°50.8 -5.6' 55.4' 1 194°50.9 52.0 70°08.5 10.1' 23°45.2 -5.7' 55.4' 2 209°51.0 51.1 84°37.6 10.2' 23°39.5 -5.8' 55.4' 3 224°51.2 · 50.2 99°06.8 10.3' 23°33.7 -5.9' 55.4' 4 239°51.4 49.3 113°36.1 10.3' 23°27.8 -6.0' 55.3' 5 254°51.6 48.4 128°05.5 10.4' 23°21.8 -6.1' 55.3' 6 269°51.8 N08°47.5 142°34.9 10.5' S23°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.9' 22°43.3 -6.8'		<u>3D = 13.0</u>	u = -0.9		JL	15.5				
1 194°50.9 52.0 70°08.5 10.1' 23°45.2 -5.7' 55.4' 2 209°51.0 51.1 84°37.6 10.2' 23°39.5 -5.8' 55.4' 3 224°51.2 · · 50.2 99°06.8 10.3' 23°33.7 -5.9' 55.4' 4 239°51.4 49.3 113°36.1 10.3' 23°27.8 -6.0' 55.3' 5 254°51.6 48.4 128°05.5 10.4' 23°21.8 -6.1' 55.3' 6 269°51.8 N08°47.5 142°34.9 10.5' 523°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°03.0 -6.5' 55.3' 8 299°52.2 45.7 171°33.9 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°43.3 -6.8' 55.2' 11 344°52.8 43.0 215°03.1 10.9' <										
2 209°51.0 51.1 84°37.6 10.2' 23°39.5 -5.8' 55.4' 3 224°51.2 · · 50.2 99°06.8 10.3' 23°33.7 -5.9' 55.4' 4 239°51.4 49.3 113°36.1 10.3' 23°27.8 -6.0' 55.3' 5 254°51.6 48.4 128°05.5 10.4' 23°21.8 -6.1' 55.3' 6 269°51.8 N08°47.5 142°34.9 10.5' S23°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°03.0 -6.5' 55.3' 8 299°52.2 45.7 171°33.9 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°50.0 -6.7' 55.2' 11 344°52.8 43.0 215°03.1 10.9' 22°43.3 -6.8' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9'										
3 224°51.2 · · 50.2 99°06.8 10.3' 23°33.7 -5.9' 55.4' 4 239°51.4 49.3 113°36.1 10.3' 23°27.8 -6.0' 55.3' 5 254°51.6 48.4 128°05.5 10.4' 23°21.8 -6.1' 55.3' 6 269°51.8 N08°47.5 142°34.9 10.5' S23°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°09.4 -6.4' 55.3' 8 299°52.2 45.7 171°33.9 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°50.0 -6.7' 55.2' 11 344°52.8 43.0 215°03.1 10.9' 22°43.3 -6.8' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9' 522°36.5 -6.9'										
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6 269°51.8 N08°47.5 142°34.9 10.5' \$23°15.6 -6.3' 55.3' 7 284°52.0 46.6 157°04.4 10.6' 23°09.4 -6.4' 55.3' 8 299°52.2 45.7 171°33.9 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°50.0 -6.7' 55.2' 11 344°52.8 43.0 215°03.1 10.9' \$22°36.5 -6.6' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9' \$22°36.5 -6.9' 55.2' 13 14°53.2 41.2 244°02.9 11.0' 22°29.6 -7.0' 55.1' 14 29°53.4 40.3 258°32.9 11.1' 22°215.5 -7.2' 55.1' 15 44°53.6 · 39.4 273°03.0 11.2' 22°15.5 -7.2' </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>										
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8 299°52.2 45.7 171°33.9 10.6' 23°03.0 -6.5' 55.2' 9 314°52.4 · · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°50.0 -6.7' 55.2' 11 344°52.8 43.0 215°03.1 10.9' 22°43.3 -6.8' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9' 522°36.5 -6.9' 55.2' 13 14°53.2 41.2 229°33.0 10.9' 522°36.5 -6.9' 55.2' 14 29°53.4 40.3 258°32.9 11.1' 22°22.6 -7.0' 55.1' 15 44°53.6 · 39.4 273°03.0 11.2' 22°15.5 -7.2' 55.1' 16 59°53.8 38.5 287°33.2 11.3' 22°08.3 -7.3' 55.1' 17 74°54.0 37.6 302°03.5 11.3' 22°00.9 -7.4' 55.0' 18 89°54.2 N08°36.7 316°33.8 11.4'										
9 314°52.4 · · · 44.8 186°03.6 10.7' 22°56.5 -6.6' 55.2' 10 329°52.6 43.9 200°33.3 10.8' 22°50.0 -6.7' 55.2' 11 344°52.8 43.0 215°03.1 10.9' 22°43.3 -6.8' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9' 522°36.5 -6.9' 55.2' 13 14°53.2 41.2 244°02.9 11.0' 22°29.6 -7.0' 55.1' 14 29°53.4 40.3 258°32.9 11.1' 22°22.6 -7.1' 55.1' 15 44°53.6 · · 39.4 273°03.0 11.2' 22°15.5 -7.2' 55.1' 16 59°53.8 38.5 287°33.2 11.3' 22°08.3 -7.3' 55.1' 17 74°54.0 37.6 302°03.5 11.3' 22°08.3 -7.4' 55.1' 18 89°54.2 N08°36.7 316°33.8 11.4' 521°53.5 -7.5' 55.0' 19 104°54.4 35.8 331°04.2 11.5'<										
11 344°52.8 43.0 215°03.1 10.9' 22°43.3 -6.8' 55.2' 12 359°53.0 N08°42.1 229°33.0 10.9' S22°36.5 -6.9' 55.2' 13 14°53.2 41.2 244°02.9 11.0' 22°29.6 -7.0' 55.1' 14 29°53.4 40.3 258°32.9 11.1' 22°22.6 -7.1' 55.1' 15 44°53.6 ··39.4 273°03.0 11.2' 22°15.5 -7.2' 55.1' 16 59°53.8 38.5 287°33.2 11.3' 22°08.3 -7.3' 55.1' 17 74°54.0 37.6 302°03.5 11.3' 22°00.9 -7.4' 55.1' 18 89°54.2 N08°36.7 316°33.8 11.4' 521°53.5 -7.5' 55.0' 19 104°54.4 35.8 331°04.2 11.5' 21°46.0 -7.6' 55.0' 20 119°54.5 34.9 345°34.7 11.6' 21°38.4 -7.7' 55.0' 21 134°54.7 ·· 34.0 0°05.2 11.6'	9			186°03.6	10.7'		-6.6'	55.2'		
12 359°53.0 N08°42.1 229°33.0 10.9' \$22°36.5 -6.9' 55.2' 13 14°53.2 41.2 244°02.9 11.0' 22°29.6 -7.0' 55.1' 14 29°53.4 40.3 258°32.9 11.1' 22°22.6 -7.1' 55.1' 15 44°53.6 · 39.4 273°03.0 11.2' 22°15.5 -7.2' 55.1' 16 59°53.8 38.5 287°33.2 11.3' 22°08.3 -7.3' 55.1' 17 74°54.0 37.6 302°03.5 11.3' 22°00.9 -7.4' 55.1' 18 89°54.2 N08°36.7 316°33.8 11.4' 521°53.5 -7.5' 55.0' 19 104°54.4 35.8 331°04.2 11.5' 21°46.0 -7.6' 55.0' 20 119°54.5 34.9 345°34.7 11.6' 21°38.4 -7.7' 55.0' 21 134°54.7 · 34.0 0°05.2 11.6' 21°30.7 -7.8' 55.0' 22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9' </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>										
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17 74°54.0 37.6 302°03.5 11.3' 22°00.9 -7.4' 55.1' 18 89°54.2 N08°36.7 316°33.8 11.4' \$21°53.5 -7.5' 55.0' 19 104°54.4 35.8 331°04.2 11.5' 21°46.0 -7.6' 55.0' 20 119°54.5 34.9 345°34.7 11.6' 21°38.4 -7.7' 55.0' 21 134°54.7 · · 34.0 0°05.2 11.6' 21°30.7 -7.8' 55.0' 22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'										
18 89°54.2 N08°36.7 316°33.8 11.4' \$21°53.5 -7.5' 55.0' 19 104°54.4 35.8 331°04.2 11.5' 21°46.0 -7.6' 55.0' 20 119°54.5 34.9 345°34.7 11.6' 21°38.4 -7.7' 55.0' 21 134°54.7 · · 34.0 0°05.2 11.6' 21°30.7 -7.8' 55.0' 22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'										
19 104°54.4 35.8 331°04.2 11.5' 21°46.0 -7.6' 55.0' 20 119°54.5 34.9 345°34.7 11.6' 21°38.4 -7.7' 55.0' 21 134°54.7 · · 34.0 0°05.2 11.6' 21°30.7 -7.8' 55.0' 22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'										
21 134°54.7 ··· 34.0 0°05.2 11.6' 21°30.7 -7.8' 55.0' 22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'				331°04.2		21°46.0				
22 149°54.9 33.1 14°35.9 11.7' 21°22.9 -7.9' 55.0' 23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'										
23 164°55.1 32.2 29°06.6 11.8' 21°15.0 -8.0' 54.9'										

Lat.	Twi	light	Sunrise	Sunset	Twi	light	
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.	
N 72°	////	02:12	03:49	20:09	21:43	////	
N 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°	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	
		05:21	05:44	18:17	18:40	19:06	
N 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	
S 10°	05:18	05:43	06:04	17:58	18:19	18:44	
20°	20° 05:23 05:48 30° 05:26 05:54	0° 05:23 05:48 0 0° 05:26 05:54 0	05:48	06:11	17:51	17:51 18:13 17:44 18:08	18:39
				06:18	17:44		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	
S 50°	05:30	06:07	06:40	17:23	17:55	18:33	
52°	05:30	06:09	06:43	17:20	17:54	18:33	
54°	05:30	06:10	06:46	17:16	17:52	18:33	
56°	05:29	06:12	06:50	17:13	17:50	18:33	
58°	05:29	06:14	06:54	17:09	17:49	18:34	
S 60°	05:28	06:16	06:59	17:04	17:46	18:35	
Lat.		Moonris	e		Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed	
N 72°	_						
N 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°	16.50	17.22	17.51	21.26	22.52		

Lat.		MODITIES	е		Moonset	•
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 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
N 40°	14:42	15:31	16:10	23:51		00:52
35°	14:25	15:14	15:56		80:00	01:07
30°	14:10	15:00	15:44		00:23	01:21
20°	13:45	14:37	15:23		00:48	01:44
N 10°	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
S 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
S 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
S 60°	09:08	10:16	11:37	04:29	05:15	05:41

		Sun		Moon				
Day	Eqn.of Time Mer. Mer.Pass.				Pass.	Age		
Duy	00 ^h	12 ^h	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.)

The CHA	h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Section Property	Thu -	CHV	CHV.	Doc	CHV.	Doc	CHV	Doc	CHV	Doc		SHA	Doc
1 93"464 5 299"179												ЗПА	Dec
2 9"40,0 394-876 300 309725 300 300 209735 307 388733 77 398783 45.4 \$Abstract 300 300 30 400 40 17405 5 5 9"543 329"35 5 07 28"578 315 325"02 27 1 15"18 63 43 Abstract 300 300 30 40 40 17405 5 6 0"5163 329"35 7 00 20 300"30 1 150 31 12											Alpheratz	357°31.3	29°15.1
3 2 1 19.4 0 209 7 32											Ankaa	353°03.9	-42°08.7
## 39*51.9 28*58 300 20*72.8 30.2 21*6*7.2 27.3 0*13.3 43.3 ***********************************											Schedar	349°27.0	56°41.7
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10 131'05.8 14'95.8 21.6 10'80.2 27.5 300'80.9 21.1 91'92.3 44.7 11 14'80.2 29'5.4 21.3 25'81.0 27.2 328'80.9 20.8 106'93.4 44.7 11 14'10'10'10'10'10'10'10'10'10'10'10'10'10'											Menkent	147°54.3	-36°30.8
11 146'08.2 29°25.4 21.3 25°51.0 27.2 324'08.9 20.8 106'30.8 44.7 Kochab 137'20.6 74'02.5 13 176'13.2 59°24.7 20.8 5°52.6 26.6 354'01.9 20.4 136'35.8 44.6 Alphecca 156'01.3 26'37.3 176'13.2 59°24.7 20.8 5°52.6 26.6 354'01.9 20.4 136'35.8 44.6 Alphecca 156'01.3 26'37.3 15'20.6 14'23.5 19.9 100'54.9 25.8 39'18.8 19.8 181'34.3 44.6 Alphecca 156'01.3 26'37.3 15'20.6 14'23.5 19.9 100'54.9 25.8 39'18.8 19.8 181'34.3 44.6 Alphecca 150'01.3 26'37.3 19.9 100'54.9 25.8 39'18.8 19.8 181'34.3 44.6 Alphecca 150'01.3 26'37.3 19.9 100'54.9 25.8 39'18.8 19.8 181'34.3 44.6 Sabik 101'59.3 -15'45.5 18.2 23'25.5 134'22.8 199'19.3 130'56.5 N21'25.2 69'22.8 N00'19.4 211'48.3 N12'45.5 Haula 66'06.2 37'0'0.5 5.6 60'06.2 37'0'0'0.5 5.6 60'06.2 37'0'0'0.5 5.6 60'06.2 37'0'0'0.5 5.8 44.5 21.2 26'32.9 10'9'2.7 18.4 175'58.8 24.3 114'28.8 19.8 181'43.3 45.5 Haula 66'06.2 37'0'0'0.5 5.6 60'06.2 37'0'0'0.5 5.8 44.5 21.2 26'32.9 10'9'2.7 18.4 175'58.8 24.3 114'28.8 112'53.3 44.5 44.5 22.3 316'35.8 194'21.3 18.1 190'59.6 24.0 129'30.8 18.6 27'58.3 44.4 Nunki 75'43.9 -26'15.5 44.2 23.3 26'37.8 209'20.9 17.8 20'60'.0 237'114'28.8 125'00.8 44.4 Nunki 75'43.9 -26'15.5 4.4 Nunki 75'43.9 -26'15.5 Alphala 224'20.5 N19'37.5 226'01.2 221'01.2 231'34 150'34.3 414'32.7 18.3 28'70.8 44.4 Nunki 75'43.9 -26'15.5 14'42.2 24'09.5 N19'37.5 226'01.2 221'01.2 231'43'4.7 N00'81.1 302'03.3 N12'44.4 Nunki 75'43.9 -26'15.5 120'40.4 13'40.3 224'20.5 N19'37.5 226'01.2 N21'34.4 150'10.3 44'32.7 18.3 28'40.8 44.3 Nunki 75'43.9 26'15.5 10'00.3 44'47'7. 50'00'91.4 210'28'00.8 44.4 Nunki 75'43.9 26'15.5 10'00.3 44'47'7.5 26'00.9 16.2 28'04.3 22.2 219'42.7 17.3 32'03.3 N12'44.4 Nunki 75'43.9 26'15.5 10'00.3 41'40.3 224'20.5 N19'37.5 26'00.2 231 174'36.7 17.5 347'10.8 44.3 Nunki 75'43.9 26'15.5 10'00.3 41'40.3 224'20.5 N19'37.5 26'00.2 231 176'36.7 17.5 347'10.8 44.3 Nunki 75'43.9 26'00.5 5'38.5 10'00.0 344'17.5 15.0 26'00.5 22.5 200'00.0 344'17.5 15.0 26'00.5 22.5 200'00.0 344'17.5 15.0 26'00.5 22.5 200'00.0 345'17.5 15.0 20'00.0 345'17.5 15.0 20'00.0 345'17.5 15.0 20'00.0											Arcturus	145°45.4	19°02.1
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14 191°15.6 74°24.3 20.5 70°63.4 26.3 9°14.8 20.2 151°38.3 44.6 Alria 107°0.55 e69°0.49 15°20.9 104°32.5 19.9 100°64.9 25.8 39°18.8 19.8 181°43.3 44.6 Sabik 101°59.3 15°45.5 13°42.28 119°23.2 19.6 115°55.7 25.5 54°20.8 19.6 196°45.8 44.5 Sabik 101°59.3 25°45.5 13°42.5 119°23.2 19.0 145°57.3 24.9 84°24.8 19.2 226°50.8 44.5 Sabik 101°59.3 26°0.2 31°0.4 164°22.0 18.7 160°58.1 24.6 99°26.8 19.0 241°53.3 44.5 Sabik 101°59.3 24.9 223 11°35.4 196°2.2 11°32.4 19.0 145°57.3 24.9 84°24.8 19.2 226°50.8 44.5 Eltanin 90°40.6 51°29.4 21 296°32.9 179°21.7 18.4 175°58.8 24.3 114°28.8 18.8 256°55.8 44.4 Vega 80°31.0 38°48.2 23 113°35.4 194°2.3 18.1 190°59.6 24.0 129°30.8 18.6 271°58.3 44.5 Wega 80°31.0 38°48.9 200°20.9 17.8 206°0.4 23.7 144°32.7 18.3 287°00.8 44.4 Nunki 75°43.9 26°15.5 14.9 24.9 13.3 24°40.3 124°2.2 24°10.2 Normalin 1.3 20°0.0 14.9 124°2.5 Normalin 1.3 24°0.0 Normalin 1.3 2											Zuben'ubi	136°52.8	-16°09.6
15 206°18.1 89°23.9											Alphecca	126°01.3	26°37.3
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19 267°27.1 149°13.3 11.5 146°16.2 17.7 85°12.5 14.2 227°50.9 43.9 20 282°29.6 164°12.9 11.2 161°17.0 17.4 100°14.5 14.0 242°53.4 43.9 21 297°32.0 179°12.6 · 10.9 176°17.7 · 17.1 115°16.5 · 13.8 257°55.9 · 43.9 22 312°34.5 194°12.2 10.6 191°18.5 16.8 130°18.5 13.6 272°58.4 43.9 23 327°37.0 209°11.8 10.2 206°19.3 16.5 145°20.5 13.3 288°00.9 43.8 Mars: 0.1													
20 282°29.6 164°12.9 11.2 161°17.0 17.4 100°14.5 14.0 242°53.4 43.9 21 297°32.0 179°12.6 · 10.9 176°17.7 · 17.1 115°16.5 · 13.8 257°55.9 · 43.9 22 312°34.5 194°12.2 10.6 191°18.5 16.8 130°18.5 13.6 272°58.4 43.9 23 327°37.0 209°11.8 10.2 206°19.3 16.5 145°20.5 13.3 288°00.9 43.8 Mars: 0.1													
21 297°32.0 179°12.6 ·· 10.9 176°17.7 ·· 17.1 115°16.5 ·· 13.8 257°55.9 ·· 43.9 Horizontal parallax 22 312°34.5 194°12.2 10.6 191°18.5 16.8 130°18.5 13.6 272°58.4 43.9 Venus: 0.2 23 327°37.0 209°11.8 10.2 206°19.3 16.5 145°20.5 13.3 288°00.9 43.8 Mars: 0.1											Jatuill	J2U 2J.U	05.51
22 312°34.5 194°12.2 10.6 191°18.5 16.8 130°18.5 13.6 272°58.4 43.9 Venus: 0.2 23 327°37.0 209°11.8 10.2 206°19.3 16.5 145°20.5 13.3 288°00.9 43.8 Mars: 0.1											Horizont	al parallax	
23 327°37.0 209°11.8 10.2 206°19.3 16.5 145°20.5 13.3 288°00.9 43.8 Mars: 0.1												Venus:	0.2
												Mars:	0.1
Mer.pass. 01:13 ν -0.4' d -0.3' m-4.22 ν 0.8' d -0.3' m1.56 ν 2.0' d -0.2' m-1.68 ν 2.5' d -0.0' m0.18													
	Mer.p	ass. 01:13	ν -0.4′ d-0	J.3′ m-4.22	ν 0.8′ d -0	1.3′ m1.56	ν 2.0′ d-0	.∠′ m-1.68	ν 2.5′ d-0	v.u′ m0.18			

h	Su	n	Moon						
Thu	GHA	Dec	GHA	ν	Dec	d	HP		
0	179°55.3	N08°31.3	43°37.3	11.9'	S21°07.1	-8.1'	54.9'		
1 2	194°55.5 209°55.7	30.4 29.5	58°08.2 72°39.1	11.9' 12.0'	20°59.0 20°50.8	-8.2' -8.3'	54.9' 54.9'		
3	224°55.9	28.6	87° 10.1	12.1'	20°42.5	-8.4	54.9'		
4	239°56.1	27.7	101°41.2	12.2'	20°34.2	-8.4'	54.9'		
5	254°56.3 269°56.5	26.8 N08°25.9	116° 12.4 130° 43.6	12.2' 12.3'	20°25.8 S20°17.2	-8.5'	54.8' 54.8'		
6 7	269 56.5 284°56.7	NU8 25.9 25.0	130 43.6 145°14.9	12.4'	20°08.6	-8.6' -8.7'	54.8'		
8	299°56.9	24.1	159°46.3	12.5'	19°59.9	-8.8'	54.8'		
9	314°57.1	• • 23.2	174° 17.8	12.5'	19°51.1	-8.9'	54.8'		
10 11	329°57.3 344°57.5	22.3 21.4	188°49.3 203°20.9	12.6' 12.7'	19°42.3 19°33.3	-9.0' -9.0'	54.8' 54.7'		
12	359°57.7	N08° 20.5	217°52.6	12.8'	S19°24.3	-9.1	54.7'		
13	14°57.9	19.6	232°24.4	12.8'	19°15.1	-9.2'	54.7'		
14 15	29°58.1 44°58.3	18.7 •• 17.8	246°56.2 261°28.1	12.9' 13.0'	19°05.9 18°56.7	-9.3' -9.4'	54.7' 54.7'		
16	59°58.5	16.9	276°00.0	13.0'	18°47.3	-9.4' -9.4'	54.7'		
17	74°58.7	15.9	290°32.1	13.1'	18°37.9	-9.5'	54.6'		
18	89°58.9	N08° 15.0	305°04.2 319°36.4	13.2'	\$18°28.4 18°18.8	-9.6'	54.6'		
19 20	104°59.1 119°59.3	14.1 13.2	319°36.4 334°08.6	13.3' 13.3'	18°18.8 18°09.1	-9.7' -9.7'	54.6' 54.6'		
21	134°59.5	12.3	348°41.0	13.4'	17°59.4	-9.8'	54.6'		
22	149°59.7	11.4	3°13.3	13.5'	17°49.6	-9.9'	54.6'		
23	164°59.9	10.5	17°45.8	13.5'	17°39.7	-9.9'	54.5'		
	SD = 15.8′	d = -0.9'		SI	O = 15.0'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°00.1	N08°09.6	$32^{\circ}18.3$	13.6'	S 17°29.8	-10.0'	54.5'		
1	195°00.3 210°00.5	08.7 07.8	46°50.9 61°23.6	13.7' 13.7'	17°19.7 17°09.7	-10.1' -10.2'	54.5'		
2	210°00.5 225°00.7	· · 06.9	75°56.3	13.7	17°09.7 16°59.5	-10.2' -10.2'	54.5' 54.5'		
4	240°00.9	06.0	90°29.1	13.9'	16°49.3	-10.3	54.5'		
5	255°01.1	05.1	105°02.0	13.9'	16°39.0	-10.4	54.5'		
6 7	270°01.3 285°01.5	N08° 04.2 03.2	119°34.9 134°07.9	14.0' 14.1'	\$16°28.6 16°18.2	-10.4' -10.5'	54.5' 54.4'		
8	300°01.7	02.3	148°41.0	14.1'	16°07.7	-10.5'	54.4'		
9	315°01.9	•• 01.4	163° 14.1	14.2'	15°57.2	-10.6'	54.4'		
10 11	330°02.1 345°02.3	08°00.5 07°59.6	177°47.3 192°20.5	14.2' 14.3'	15°46.6 15°35.9	-10.7' -10.7'	54.4' 54.4'		
12	0°02.5	N07°58.7	206°53.9	14.4'	S15°25.2	-10.8	54.4'		
13	15°02.7	57.8	221°27.2	14.4'	15°14.4	-10.8'	54.4'		
14 15	30°02.9 45°03.1	56.9 •• 56.0	236°00.7 250°34.2	14.5' 14.6'	15°03.6 14°52.7	-10.9' -11.0'	54.4' 54.3'		
16	60°03.3	55.1	265° 07.7	14.6'	14 52.7 14°41.7	-11.0' -11.0'	54.3'		
17	75°03.5	54.1	$279^{\circ}41.3$	14.7'	$14^{\circ}30.7$	-11.1'	54.3'		
18	90°03.7 105°03.9	N07°53.2	294°15.0 308°48.7	14.7' 14.8'	\$14°19.7 14°08.5	-11.1'	54.3'		
19 20	105 03.9 120°04.1	52.3 51.4	300 40.7 323°22.5		14 06.5 13°57.4	-11.2' -11.2'	54.3' 54.3'		
21	135°04.3	• • 50.5	337°56.3	14.9'	13°46.1	-11.3'	54.3'		
22	150°04.5	49.6	352°30.2	15.0'	13°34.9	-11.3'	54.3'		
23	165°04.7	48.7	7°04.2	15.0'	13°23.6	-11.4'	54.3'		
	SD = 15.8'	d = -0.9'		SI	O = 14.9'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP		
0 1	180°04.9 195°05.1	N07° 47.8 46.8	21°38.2 36°12.3	15.1' 15.1'	\$13°12.2 13°00.8	-11.4' -11.5'	54.2' 54.2'		
2	210°05.3	45.9	50° 46.4	15.1 15.2'	13 00.8 12°49.3	-11.5'	54.2'		
3	225°05.5	• • 45.0	65° 20.5	15.2'	12°37.8	-11.6'	54.2'		
4 5	240°05.7 255°05.9	44.1 43.2	79°54.7 94°29.0	15.3' 15.3'	12°26.2 12°14.6	-11.6' -11.6'	54.2' 54.2'		
6	270°06.1	43.2 N07°42.3	109°03.3	15.4'	\$12°03.0	-11.0	54.2'		
7	285°06.3	41.4	123°37.7	15.4'	$11^{\circ}51.3$	-11.7'	54.2'		
8 9	300°06.5 315°06.7	40.4 •• 39.5	138° 12.1 152° 46.6	15.5' 15.5'	11°39.5 11°27.8	-11.8' -11.8'	54.2' 54.2'		
10	330°06.9	38.6	167°21.1	15.6'	11°15.9	-11.6 -11.9'	54.2 54.1'		
11	345°07.1	37.7	181°55.6	15.6'	$11^{\circ}04.1$	-11.9'	54.1'		
12	0°07.4	N07°36.8	196°30.2	15.6'	\$10°52.2	-11.9'	54.1'		
13 14	15°07.6 30°07.8	35.9 35.0	211°04.9 225°39.5	15.7' 15.7'	10°40.3 10°28.3	-12.0' -12.0'	54.1' 54.1'		
15	45°08.0	• • 34.0	240°14.3	15.8'	$10^{\circ}16.3$	-12.0'	54.1'		
16	60°08.2	33.1	254°49.0	15.8'	10°04.2	-12.1'	54.1'		
17 18	75°08.4 90°08.6	32.2 N07°31.3	269°23.8 283°58.7	15.9' 15.9'	09°52.2 \$09°40.0	-12.1' -12.1'	54.1' 54.1'		
19	105°08.8	30.4	298°33.6	15.9'	09°27.9	-12.1	54.1		
20	120°09.0	29.5	313°08.5	16.0'	09°15.7	-12.2'	54.1'		
21 22	135°09.2 150°09.4	· · 28.5 27.6	327°43.5 342°18.5	16.0' 16.0'	09°03.5 08°51.3	-12.2' -12.3'	54.1' 54.0'		
23	165°09.6	26.7	356°53.5	16.1	08°39.0	-12.3'	54.0'		
	SD = 15.8'	d = -0.9'		SI	O = 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
S 10°	05:17	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:46	06:08	17:52	18:14	18:40
30°	05:23	05:51	06:15	17:45	18:09	18:37
35°	05:24	05:53	06:19	17:42	18:07	18:36
40°	05:24	05:56	06:23	17:37	18:05	18:36
45°	05:24	05:58	06:28	17:33	18:02	18:36
S 50°	05:24	06:01	06:33	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
S 60°	05:20	06:08	06:50	17:11	17:53	18:41
	I			1		

Lat.		Moonris	е		Moonset	:
Ldl.	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
S 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
S 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
S 60°	13:03	14:27	15:49	05:55	06:04	06:10

ĺ			Sun		Moon			
	Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	,	00 ^h	12 ^h	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		
ı	01	00:00	00:10	12:00	22:31	10:09		
ı	02	00:20	00:29	12:00	23:13	10:52		

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	342°39.4	224°11.4	N19°09.9	221°20.1	N21°16.2	160°22.4	N00°13.1	303°03.5	N12°43.8			
1	357°41.9	239°11.0	09.6	236°20.9	15.9	175°24.4	12.9	318°06.0	43.8	Alpheratz	357°31.3	29°15.1
2	12°44.3	254° 10.6	09.3	251°21.7	15.6	190°26.4	12.7	333°08.5	43.8	Ankaa	353°03.9	-42°08.7
3	12 44.3 27°46.8	269°10.3	08.9	266°22.5	15.3	205°28.4	• 12.7	348°11.0		Schedar	349°27.0	56°41.7
									• • 43.7	Diphda	348°44.0	-17°49.5
4	42°49.3	284°09.9	08.6	281°23.3	15.0	220°30.4	12.3	3°13.5	43.7	Achernar	335°17.6	-57°05.1
5	57°51.7	299°09.5	08.3	296°24.1	14.7	235°32.4	12.1	18°16.0	43.7	Hamal	327°47.6	23°35.9
6	72°54.2	314°09.1	N19°07.9	311°24.9	N21°14.4	250°34.4	N00°11.9	33°18.5	N12°43.7	Polaris	312°12.8	89°22.7
7	87°56.7	329°08.7	07.6	326°25.7	14.1	265°36.4	11.7	48°21.0	43.6	Acamar	315°09.4	-40°11.1
8	102°59.1	344°08.3	07.3	341°26.4	13.8	280°38.3	11.5	63°23.5	43.6		314°02.9	4°12.3
9	$118^{\circ}01.6$	359°08.0	• • 06.9	356°27.2	• • 13.5	295°40.3	• • 11.3	78°26.0	• • 43.6	Menkar		
10	133°04.1	14°07.6	06.6	11°28.0	13.2	310°42.3	11.0	93°28.5	43.6	Mirfak	308°23.7	49°57.6
11	148°06.5	29°07.2	06.3	26°28.8	12.9	325°44.3	10.8	108°31.1	43.5	Aldebaran	290°36.2	16°34.0
	163°09.0	44°06.8	N19°05.9	41°29.6	N21°12.6	340°46.3	N00° 10.6	123°33.6	N12°43.5	Rigel	281°01.0	-8°10.0
12										Capella	280°17.5	46°01.4
13	178°11.5	59°06.4	05.6	56°30.4	12.3	355°48.3	10.4	138°36.1	43.5	Bellatrix	$278^{\circ}19.7$	6°22.6
14	193°13.9	74°06.0	05.3	71°31.2	12.0	10°50.3	10.2	153°38.6	43.5	Elnath	277°58.1	28°37.8
15	208°16.4	89°05.6	• • 04.9	86°32.0	• • 11.7	25°52.2	· · 10.0	$168^{\circ}41.1$	• • 43.4	Alnilam	275°34.8	-1°10.9
16	223°18.8	104°05.3	04.6	101°32.8	11.4	40°54.2	09.8	183°43.6	43.4		270°48.9	7°24.8
17	238°21.3	119°04.9	04.2	116°33.6	11.1	55°56.2	09.6	198°46.1	43.4	Betelgeuse		
18	253°23.8	134°04.5	N19°03.9	131°34.4	N21°10.8	70°58.2	N00°09.4	213°48.6	N12°43.4	Canopus	263°51.3	-52°42.4
19	268°26.2	149°04.1	03.6	146°35.2	10.5	86°00.2	09.2	228°51.1	43.3	Sirius	258°23.8	-16°45.2
20	283°28.7	164°03.7	03.2	161°36.0	10.2	101°02.2	09.0	243°53.7	43.3	Adhara	255°03.7	-29°00.5
										Procyon	244°47.9	5°09.1
21	298°31.2	179°03.3	• • 02.9	176°36.8	• • 09.9	116°04.2	• • 08.8	258°56.2	• • 43.3	Pollux	243°13.9	27°57.3
22	313°33.6	194°02.9	02.5	191°37.6	09.5	131°06.1	08.5	273°58.7	43.3	Avior	234°14.0	-59°35.9
23	328°36.1	209°02.6	02.2	206°38.4	09.2	146°08.1	08.3	289°01.2	43.2	Suhail	222°44.5	-43°32.8
Ma: -	ass. 01:09	1, 0 A/ J O	0.3' m-4.21	,,n o/ J n	0.3′ m1.56	112 U/ 4 V	.2′ m-1.68	10 E/ J C	.0′ m0.18	Miaplacidus	222 44.5 221°38.4	-43 32.0 -69°50.0
ivier.p	ass. 01:09	ν-0.4 a-0	IN-4.21	ν 0.8° a -0	m1.50	ν2.0 a-0	.∠ m-1.08	ν2.5 α-U	.uu.18			
										Alphard	217°45.1	-8°47.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
0	343°38.6	224°02.2	N19°01.8	221°39.1	N21°08.9	161°10.1	N00°08.1	304°03.7	N12°43.2	Dubhe	193°38.2	61°35.7
				221 39.1						Denebola	182°22.2	14°24.7
1	358°41.0	239°01.8	01.5	236°39.9	08.6	176°12.1	07.9	319°06.2	43.2	Gienah	175°40.8	$-17^{\circ}42.1$
2	13°43.5	254°01.4	01.1	251°40.7	08.3	191°14.1	07.7	334°08.7	43.2	Acrux	172°57.2	-63°15.6
3	28°45.9	269°01.0	• • 00.8	266°41.5	• • 08.0	$206^{\circ}16.1$	•• 07.5	349°11.2	• • 43.1	Gacrux	171°48.7	-57°16.6
4	43°48.4	284°00.6	00.5	281°42.3	07.7	221°18.1	07.3	4°13.8	43.1	Alioth	166°10.9	55°48.4
5	58°50.9	299°00.2	$19^{\circ}00.1$	296°43.1	07.4	236°20.1	07.1	19°16.3	43.1			-11°18.6
6	73°53.3	313°59.8	N18° 59.8	311°43.9	N21°07.1	251°22.0	N00°06.9	34°18.8	N12°43.1	Spica	158°19.4	
7	88°55.8	328°59.4	59.4	326°44.7	06.8	266°24.0	06.7	49°21.3	43.0	Alkaid	152°50.1	49°10.4
8	103°58.3	343°59.1	59.0	341°45.5	06.5	281°26.0	06.4	64°23.8	43.0	Hadar	148°32.0	-60°30.9
										Menkent	147°54.3	-36°30.7
9	119°00.7	358°58.7	• • 58.7	356°46.3	• • 06.2	296°28.0	• • 06.2	79°26.3	• • 43.0	Arcturus	145°45.4	19°02.1
10	134°03.2	13°58.3	58.3	11°47.1	05.8	311°30.0	06.0	94°28.8	43.0	Rigil Kent.	139°36.4	-60°57.4
11	149°05.7	28°57.9	58.0	26°47.9	05.5	326°32.0	05.8	109°31.3	42.9	Kochab	137°20.6	74°02.5
12	164°08.1	43°57.5	$N18^{\circ}57.6$	41°48.7	N21°05.2	341°33.9	$N00^{\circ}05.6$	124°33.9	$N12^{\circ}42.9$	Zuben'ubi	136°52.8	-16°09.6
13	179°10.6	58°57.1	57.3	56°49.5	04.9	356°35.9	05.4	139°36.4	42.9			
14	194°13.1	73°56.7	56.9	71°50.3	04.6	11°37.9	05.2	154°38.9	42.9	Alphecca	126°01.3	26°37.3
15	209°15.5	88°56.3	• • 56.5	86°51.1	• • 04.3	26°39.9	• • 05.0	169°41.4	• • 42.8	Antares	112°12.2	-26°29.7
16	224°18.0	103°55.9	56.2	101°51.9	04.0	41°41.9	04.8	184°43.9	42.8	Atria	107°03.6	-69°04.9
17	239°20.4	103 55.9 118°55.5	55.8	116°52.7	04.0	56°43.9	04.6	199°46.4		Sabik	101°59.3	-15°45.5
	254°22.9								42.8	Shaula	96°06.2	-37°07.5
18		133°55.1	N18° 55.5	131°53.5	N21°03.4	71°45.9	N00°04.4	214°49.0	N12°42.8	Rasalhague	95°55.7	12°32.6
19	269°25.4	148°54.7	55.1	146°54.3	03.0	86°47.8	04.1	229°51.5	42.7	Eltanin	90°40.6	51°29.4
20	284°27.8	163°54.4	54.7	161°55.1	02.7	101°49.8	03.9	244°54.0	42.7	Kaus Aust.	83°28.4	-34°22.2
21	299°30.3	178°54.0	• • 54.4	176°55.9	• • 02.4	116°51.8	• • 03.7	259°56.5	• • 42.7	Vega	80°31.0	38°48.9
22	314°32.8	193°53.6	54.0	191°56.7	02.1	131°53.8	03.5	274°59.0	42.7	Nunki	75°43.9	-26°15.5
23	329°35.2	208°53.2	53.6	206°57.5	01.8	146°55.8	03.3	290°01.5	42.6			
						-				Altair	61°56.8	8°56.9
Mer.p	ass. 01:05	ν -0.4′ d-0).3′ m-4.21	ν 0.8′ d-0).3′ m1.56	$\nu 2.0' d-0$.2′ m-1.68	ν 2.5′ d -0	.0' m0.17	Peacock	53°00.6	-56°38.5
										Deneb	49°23.3	45°23.3
_	CIIA	CIII	Б	6114	_	CILA	Б	CIII	Б	Enif	33°35.5	10°00.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.1
0	344°37.7	223°52.8	N18°53.3	221°58.3	N21°01.5	161°57.8	N00°03.1	305°04.0	N12°42.6	Fomalhaut	15°10.9	-29°28.0
1	359°40.2	238°52.4	52.9	236°59.1	01.2	176°59.8	02.9	320°06.6	42.6	Scheat	13°41.9	28°14.5
2	14°42.6	253°52.0	52.5	251°59.9	00.9	192°01.7	02.7	335°09.1	42.5	Markab	13°26.6	15°21.8
3	29°45.1	268°51.6	• • 52.2	267°00.7	• • 00.5	207°03.7	• • 02.5	$350^{\circ}11.6$	• • 42.5			
4	44°47.5	283°51.2	51.8	282°01.5	21°00.2	222°05.7	02.3	5°14.1	42.5	Sep 03 Sun	SHA	Mer.pass
5	59°50.0	298°50.8	51.4	297°02.3	20°59.9	237°07.7	02.0	20°16.6	42.5	Venus	241°32.0	09:03
6	74°52.5	313°50.4	N18°51.1	312°03.1	N20°59.6	252°09.7	N00°01.8	35°19.2	N12°42.4	Mars	238°40.7	09:14
7	89°54.9	328°50.0	50.7	327°03.9	59.3	267°11.7	01.6	50°21.7	42.4		177°43.0	13:17
8	104°57.4	343°49.6	50.7	342°04.7	59.0	282°13.6	01.0	65°24.2	42.4	Saturn	320°24.0	03:47
										Jatuill	J2U 44.U	03.41
9	119°59.9	358° 49.2	• • 49.9	357°05.5	• • 58.7	297°15.6	• • 01.2	80°26.7	• • 42.4	Sep 04 Mon	SHA	Mer.pass
10	135°02.3	13°48.8	49.6	12°06.3	58.3	312°17.6	01.0	95°29.2	42.3	Venus	240°23.6	09:04
11	150°04.8	28° 48.4	49.2	27°07.1	58.0	327°19.6	8.00	110°31.7	42.3	Mars	238°00.6	09:13
12	165°07.3	43°48.1	N18°48.8	42°07.9	N20°57.7	342°21.6	N00°00.6	125°34.3	N12°42.3			
13	180°09.7	58°47.7	48.4	57°08.7	57.4	357°23.6	00.4	140°36.8	42.3	Jupiter	177°31.6	13:14
14	195°12.2	73°47.3	48.0	72°09.6	57.1	12°25.5	N00°00.2	155°39.3	42.2	Saturn	320°25.1	03:43
15	210°14.7	88°46.9	• • 47.7	87°10.4	56.8	27°27.5	S00°00.0	170°41.8	• • 42.2	Son OF Tu-	C LI V	Morpos
										Sep 05 Tue	SHA	Mer.pass
16	225°17.1	103°46.5	47.3	102°11.2	56.4	42°29.5	00.3	185°44.3	42.2		239°15.1	09:05
17	240°19.6	118°46.1	46.9	117°12.0	56.1	57°31.5	00.5	200°46.9	42.1	Mars	237°20.6	09:12
18	255°22.0	133°45.7	N18°46.5	132°12.8	N20°55.8	72°33.5	S00°00.7	215°49.4	N12°42.1	Jupiter	$177^{\circ}20.1$	13:10
19	270°24.5	148°45.3	46.1	147°13.6	55.5	87°35.5	00.9	230°51.9	42.1	Saturn	320°26.4	03:39
20	285°27.0	163°44.9	45.8	162°14.4	55.2	102°37.5	01.1	245°54.4	42.1			
21	300°29.4	178°44.5	• • 45.4	177°15.2	• • 54.9	117°39.4	• • 01.3	260°56.9	• • 42.0	Horizont	al parallax	
22	315°31.9	193°44.1	45.0	192°16.0	54.5	132°41.4	01.5	275°59.5	42.0		Venus:	0.2
23	330°34.4	208°43.7	44.6	207°16.8	54.2	147°43.4	01.7	291°02.0	42.0		Mars:	0.1
	330 34.4									l .		
Mer.n	ass. 01:01	ν -0.4' d-0).4′ m-4.20	ν 0.8′ d-0	0.3′ m1.56	$\nu 2.0' \ d-0$.2′ m-1.68	$\nu 2.5' \ d-0$.0′ m0.17			
	-		-						-			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°09.8	$N07^{\circ}25.8$	$11^{\circ}28.6$	16.1'	S08°26.7	-12.3'	54.0'
1	195°10.0	24.9	26°03.7	16.1'	08°14.4	-12.4'	54.0'
2 3	210° 10.2 225° 10.4	23.9 •• 23.0	40°38.9 55°14.1	16.2' 16.2'	08°02.0 07°49.6	-12.4' -12.4'	54.0' 54.0'
4	240° 10.6	22.1	69°49.3	16.2'	07°37.2	-12.4	54.0'
5	255°10.8	21.2	84°24.5	16.3'	$07^{\circ}24.8$	-12.5'	54.0'
6	270°11.0	N07°20.3	98°59.8	16.3'	507°12.3	-12.5'	54.0'
7 8	285°11.3 300°11.5	19.4 18.4	113°35.1 128°10.4	16.3' 16.4'	06° 59.8 06° 47.3	-12.5' -12.5'	54.0' 54.0'
9	315° 11.7	17.5	142°45.8	16.4	06°34.8	-12.6'	54.0'
10	330°11.9	16.6	$157^{\circ}21.2$	16.4'	$06^{\circ}22.2$	-12.6'	54.0'
11	345°12.1	15.7	171°56.6	16.4'	06°09.6	-12.6'	54.0'
12 13	0°12.3 15°12.5	N07°14.8 13.8	186°32.0 201°07.5	16.5' 16.5'	\$05°57.1 05°44.4	-12.6' -12.6'	54.0' 54.0'
14	30°12.7	12.9	201 07.5 215°43.0	16.5	05°31.8	-12.0 -12.7'	54.0'
15	45° 12.9	12.0	230°18.5	16.5'	05° 19.2	-12.7'	54.0'
16	60° 13.1	11.1	244°54.1	16.6'	05°06.5	-12.7'	53.9'
17	75°13.3	10.1	259°29.6	16.6'	04°53.8	-12.7'	53.9'
18 19	90°13.5 105°13.7	N07°09.2 08.3	274°05.2 288°40.8	16.6' 16.6'	\$04°41.1 04°28.4	-12.7' -12.7'	53.9' 53.9'
20	120° 13.9	07.4	303°16.4	16.6'	04° 25.4° 04° 15.7	-12.7'	53.9
21	135°14.2	• • 06.5	317°52.1	16.7'	04°02.9	-12.8'	53.9'
22	150° 14.4	05.5	332°27.7	16.7'	03°50.2	-12.8'	53.9'
23	165°14.6	04.6	347°03.4	16.7'	03°37.4	-12.8'	53.9'
	SD = 15.8'	d = -0.9'		SI	O = 14.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°14.8	N07°03.7	1°39.1	16.7'	S03°24.6	-12.8'	53.9'
1	195° 15.0	02.8	16°14.8	16.7'	03°11.8	-12.8'	53.9'
2	210° 15.2 225° 15.4	01.8 •• 00.9	30°50.5 45°26.2	16.7'	02°59.0 02°46.2	-12.8'	53.9'
3 4	240° 15.6	07°00.0	45 20.2 60°02.0	16.7' 16.8'	02 46.2 02°33.4	-12.8' -12.8'	53.9' 53.9'
5	255° 15.8	06°59.1	74°37.7	16.8'	02°20.6	-12.8'	53.9'
6	270°16.0	N06°58.1	89°13.5	16.8'	S02°07.7	-12.8'	53.9'
7	285°16.2	57.2	103°49.2	16.8'	01°54.9	-12.8'	53.9'
8 9	300° 16.4 315° 16.7	56.3 • • 55.4	118°25.0 133°00.8	16.8' 16.8'	01°42.1 01°29.2	-12.8' -12.9'	53.9' 53.9'
10	330°16.9	54.5	147°36.6	16.8	01°29.2	-12.9'	53.9
11	345° 17.1	53.5	162°12.4	16.8'	01°03.5	-12.9'	53.9'
12	0°17.3	N06°52.6	176°48.2	16.8'	500°50.6	-12.9'	53.9'
13 14	15° 17.5 30° 17.7	51.7 50.7	191°24.0 205°59.9	16.8' 16.8'	00°37.8 00°24.9	-12.9' -12.9'	53.9' 53.9'
15	45° 17.9	• • 49.8	200°35.7	16.8	S00° 12.1	-12.9'	53.9
16	60° 18.1	48.9	235°11.5	16.8'	N00°00.8	12.9'	53.9'
17	75° 18.3	48.0	249°47.3	16.8'	00°13.7	12.9'	53.9'
18	90° 18.5 105° 18.7	N06°47.0 46.1	264°23.1 278°59.0	16.8' 16.8'	N00°26.5 00°39.4	12.9' 12.9'	53.9' 53.9'
19 20	105 16.7 120° 19.0	45.2	276 59.0 293°34.8		00°52.2	12.9	53.9'
21	135° 19.2	• • 44.3	308°10.6	16.8'	01°05.1	12.8'	53.9'
22	150°19.4	43.3	322°46.4	16.8'	$01^{\circ}17.9$	12.8'	53.9'
23	165°19.6	42.4	337°22.2	16.8'	01°30.8	12.8'	53.9'
	SD = 15.9'	d = -0.9'		SI	O = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 19.8	N06°41.5	351°58.0	16.8'	N01°43.6	12.8'	53.9'
1 2	195°20.0 210°20.2	40.6 39.6	6°33.8 21°09.6	16.8' 16.8'	01°56.4 02°09.3	12.8' 12.8'	53.9' 53.9'
3	225° 20.4	38.7	35°45.4	16.8	02°09.3	12.8'	53.9
4	240°20.6	37.8	50°21.2	16.8'	02°34.9	12.8'	53.9'
5	255°20.9	36.8	64°56.9	16.8'	02°47.7	12.8'	53.9'
6 7	270°21.1 285°21.3	N06°35.9 35.0	79°32.7 94°08.4	16.7' 16.7'	N03°00.4 03°13.2	12.8' 12.8'	53.9' 53.9'
8	300°21.5	34.1	108°44.2	16.7'	03°26.0	12.7	53.9
9	315°21.7	• • 33.1	123°19.9	16.7'	03°38.7	12.7'	53.9'
10	330°21.9	32.2	137°55.6	16.7'	03°51.5	12.7'	53.9'
11 12	345°22.1 0°22.3	31.3 N06°30.3	152°31.3 167°07.0	16.7' 16.7'	04°04.2 N04°16.9	12.7' 12.7'	53.9' 53.9'
13	15° 22.5	29.4	181°42.6	16.6'	04° 29.6	12.7'	53.9'
14	30°22.8	28.5	$196^{\circ}18.3$	16.6'	04°42.3	12.7'	53.9'
15	45°23.0	• • 27.5	210°53.9	16.6'	04°54.9	12.6'	53.9'
16 17	60°23.2 75°23.4	26.6 25.7	225°29.5 240°05.1	16.6' 16.6'	05°07.6 05°20.2	12.6' 12.6'	53.9' 53.9'
17	75°23.4 90°23.6	25.7 N06°24.8	240°05.1 254°40.7	16.5	N05° 32.8	12.6'	53.9'
19	105°23.8	23.8	269°16.2	16.5	05°45.4	12.6'	53.9
20	120°24.0	22.9	283°51.7	16.5'	05°57.9	12.5'	53.9'
21	135°24.2 150°24.5	• • 22.0	298°27.2 313°02.7	16.5'	06° 10.5 06° 23.0	12.5'	53.9'
22 23	150°24.5 165°24.7	21.0 20.1	313°02.7 327°38.2	16.5' 16.4'	06°23.0 06°35.5	12.5' 12.5'	53.9' 53.9'
	SD = 15.9'	d = -0.9'			D = 14.7'	5	20.5
					_ ± r.1		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:55	04:18	19:36	20:58	////
N 70°	01:10	03:18	04:30	19:25	20:36	22:36
68°	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
N 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
N 40°	04:31	05:03	05:31	18:26	18:54	19:26
35°	04:39	05:09	05:35	18:22	18:48	19:18
30°	04:46	05:15	05:39	18:18	18:43	19:11
20°	04:57	05:23	05:45	18:12	18:34	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:53
0°	05:11	05:35	05:56	18:02	18:23	18:47
S 10°	05:15	05:39	06:00	17:57	18:18	18:43
20°	05:18	05:43	06:06	17:52	18:15	18:40
30°	05:20	05:47	06:11	17:47	18:11	18:39
35°	05:20	05:49	06:14	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
S 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
S 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
S 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° 45°	17:27	18:25	19:24	05:48	06:10	06:32 06:30
1	17:24	18:26	19:28	05:52	06:11	
S 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° 58°	17:14	18:27	19:40	06:07	06:15	06:23 06:22
S 60°	17:12 17:09	18:27 18:28	19:43 19:46	06:10 06:14	06:16 06:17	06:22
3 60°	17:09	18:28	19:46	00:14	00:17	06:20

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h 12 ^h		Pass	Upper Lower		14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-99%	
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.)

CHA	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
20 10 10 10 10 10 10 10	Wod -	CHA	CHV.	Doc	CHV.	Doc	CHA	Doc	CHV	Doc		SHA	Doc
1 PS-93													
2 15°4.18													I .
3 97 44.2 266 21. 4.40 807 20. 1.25 207 21. 1 0.05 81 12. 1 4.19 807 20. 20 27 31. 0.05 81 12. 1 4.19 81 207 21. 20 20 27 31 0.00 81 12. 20 14. 4.18 81 207 21. 20 20 27 31 0.00 81 12. 20 14. 4.18 81 207 21. 20 20 27 31 0.00 81 12. 20 14. 4.18 81 207 21. 20 20 27 31 0.00 81 20 20 20 20 20 20 20 20 20 20 20 20 20											1		
4 49'46' 289'47' 420 399'293 50' 297'33 30' 28 0"146 418											1		
5 97-414		45°46.7				52.6							
0. 1956 347-60 411 347-62 412 347-62	5	60°49.1	298°41.3	42.3	297°21.6	52.3	237°55.3	03.0	$21^{\circ}17.1$	41.8	1		
18				N18°41.9		N20°52.0		500°03.2		N12°41.8	1		
10 10 10 10 10 10 10 10											!		
1997-013 399-39 40.3 312-527 50.5													
1919/880											!		
166'06.4 166'06.4											Aldebaran	$290^{\circ}36.1$	16°34.0
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190*11.3 88*373 83.3 87*297 + 494													
10 220*16.3 103*50.9 37.9 102*00.5 48.3 43*17.1 00.3 180*44.9 41.5 Ethalium 7.10*20.1 11.6 11.6 11.6 11.6 11.6 11.6 11.6 1											!		
10											1		
Alt	16	226°16.3	103°36.9	37.9	102°30.5	48.8	43°17.1	05.3	186°44.9	41.5	1		
27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	17	241°18.7	$118^{\circ}36.5$	37.5	117°31.3	48.5	$58^{\circ}19.1$	05.5	201°47.4	41.5			
Adham 285 275 28				N18°37.1		N20°48.1		S00°05.7		N12°41.4			
S01-06.0 103-39.0 303 105-30.0 107-30.0 147-30.0 103-30.0 301-30.0 147											1		
23 317335 38 38 39 39 37 39 40 39 39 39 39 39 39 39 39 39 39 39 39 39													
Mer. pass. 00.57													
Thu CHA CHA Dec CHA											Avior	$234^{\circ}13.9$	-59°35.9
Thu GHA OHA OHA OHA OHA OHA OHA OHA	23	331 33.5	200 34.1	35.0							Suhail	222°44.5	-43°32.8
Thu GHA GHA GHA Dec CHA Dec GHA Dec CHA Dec Dubbe 1933 16 1194.6 19	Mer.p	ass. 00:57	ν -0.4′ d -0).4′ m-4.19	ν 0.8′ d-0	0.3′ m1.56	$\nu 2.0' \ d0.$	2′ m-1.68	ν 2.5′ d -0	0.0′ m0.16			
Thu GHA GHA Dec Dubb 193*38.2 61*35.7 1 336 36 223*33.7 185*36.9 223*37 10*32*46.2 163*33.0 50*07.0 30*07.0 10*2*14.1 12													
9 346°36.0 223°33.7 NB³34.6 222°37.0 N20°46.2 I63°33.0 S00°70.7 030°56.0 NIZ°41.3 1 1°38.4 238°33.3 34.2 22°38.6 455 1978°55.0 °7.2 32°070.6 HIZ°41.3 2 16°40.9 25°32.9 33.8 252°38.6 455 1978°55.0 °7.2 32°070.6 HIZ°41.3 3 31°43.2 288°32.5 33.4 22°38.6 455 193°36.9 °7.4 337°10.1 41.2 4 Acrux 172°57.2 63°35.6 5 61°48.3 298°31.7 32.6 297°41.1 44.6 228°42.0 08.0 22°17.7 41.1 5 67°67.7 313°31.3 NB³32.2 32°41.9 ND°44.2 228°44.9 S00°08.2 23°17.7 41.1 5 97°53.2 328°30.9 31.7 337°42.7 43.9 268°46.8 08.5 52°22.7 41.1 6 101°55.7 343°30.5 31.3 342°41.9 ND°44.2 228°44.9 S00°08.2 37°02.2 NIZ°41.1 6 101°55.7 343°30.5 31.3 342°41.9 ND°44.2 228°44.9 S00°08.2 37°02.2 NIZ°41.1 6 101°37°00.6 13°20.7 30.5 124°45.1 6 101°37°00.6 13°20.7 30.9 337°44.3 43.3 298°50.8 0.9 80.2 22°17.8 4.1 6 11°32°00.6 13°20.7 30.9 337°44.3 43.3 298°50.8 0.9 80.2 22°17.5 4.1 6 11°32°00.6 13°20.7 30.5 12°45.1 6 11°32°07.0 6 13°20.7 30.5 12°45.1 6 11°32°07.0 6 13°20.7 30.5 12°45.1 6 11°32°07.7 10°50.5 43°29.9 NB³20.6 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.0 11°50.5 43°29.9 NB³20.6 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.0 11°50.5 43°29.9 NB³20.6 426 380°40.8 98°68.7 00.9 112°35.4 NB°30.1 130°36.4 00.0 112°32.8 40.9 7 11°45.0 11°50.5 43°29.8 NB³20.6 426 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.0 11°50.5 43°29.8 NB³20.6 426 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.0 11°50.5 43°29.8 NB³20.6 426 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.0 11°50.5 43°29.8 NB³20.6 426 426 328°54.8 00.9 3 112°32.8 40.9 7 11°45.1 12°45.1 12°45.1 12°45.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.5 40.0 48°61.1 12°45.1 12	Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_		
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2 16°40.9 253°32.9 33.8 252°38.6 455 193°36.7 4 337°10.1 412 3 31°34.2 268°35.5 33.4 267°395 - 452 208°38.9 0.76 335°12.6 412 4 6°45.8 283°32.1 33.0 282°40.3 44.9 223°40.9 0.78 7°15.1 412 5 61°48.3 283°31.7 32.6 29°41.1 44.6 238°42.9 08.0 22°17.7 411 6 6°70°50.3 313°33.3 N18°32.2 312°41.1 N20°44.2 258°44.9 08.0 22°17.7 411 6 7 00°52.7 363°30.1 N18°32.2 312°41.1 N20°44.2 258°44.9 08.0 37°22.7 N12°4.1 Hadar 152°93.1 40°10.0 112°68.1 358°30.1 30.0 337°44.3 44.3 288°48.8 0.05.7 82°5.5 41.0 Hadar 168°31.0 60°30.8 Hadar 1152°0.0 112°0.0 137°0.0 132°90.7 30.5 12°45.1 429 313°52.8 00.1 97°50.3 41.0 Hadar 147°54.3 36°30.7 112°22.8 00.3 112°22.8 40.9 Hadar 147°54.3 36°30.7 10°30.3 112°22.8 40.9 Hadar 147°54.3 36°30.7 10°30.3 112°32.8 40.9 Hadar 147°54.3 36°30.7 10°30.3 Hadar 147°52.3 112°32.8 112°32						45.9							
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7 9 9 5 2 38 38 3 1 3 18 18 32 2 31 2 41 9 N20° 44 2 258 34 49 S00° 08 2 37 20 2 N12° 41.1 4											Alioth		
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8 106*55.7 343*30.5 1 31.3 342*45.5 43.6 283*48.8 08.7 67*25.3 41.0 Merkent 147*24.3 3-03.03.0 1 10 137*00.6 13*29.7 30.5 12*45.1 42.9 313*92.8 09.1 97*30.3 41.0 Arcturus 145*24.3 4.0 40.9 11 15*203.1 28*29.3 30.1 27*46.0 42.6 338*94.8 09.3 112*32.8 49.9 49.9 115*20.1 28*29.3 30.1 27*46.0 42.6 338*94.8 09.3 112*32.8 49.9 112*30.4 49.9 113*20.0 58*29.3 20.2 25*40.8 102*0.2 343*56.8 500*00.5 127*35.4 112*0.0 58*29.3 40.0 12*30.1 12*30.1 12*20.0 58*29.3 10.2 24.8 102*0.2 343*56.8 500*00.5 127*35.4 112*0.0 49.9 113*20.0 58*29.3 12*30.1 12*30.1 12*20.0 12*30.1 12*20.1 12*20.0 12*30.1 12*20.1 12*20.1 12*20.1 12*20.1 12*20.1 12*20.1 12*20.0 12*20.0 102*50.0 41.0 44*04.7 10.4 18*745.5 40.8 25*10.1 12*20.2 26*29.7 12*20.2 26*20.2 26*													
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10 137*00.6 137*297 30.5 12*45.1 4.29 313*92.8 09.1 97*30.3 41.0 Kgigikent. 139*36.4 60*95.7 11 152*01.1 28*93 30.1 27*46.0 42.6 326*94.8 09.3 112*35.4 40.9 Kochab 137*20, 7 4*02.5 12 167*05.5 43*28.9 N18*296 4*24.6 8 N20*42.3 343*56.8 50*09.5 127*35.4 N12*40.9 Kochab 137*20, 7 4*02.5 12*10*10*10*10*10*10*10*10*10*10*10*10*10*											1		
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13 182°08.0 58°28.5 29.2 5°°47.6 42.0 358°88.7 09.7 142°37.9 40.9 140°37.0 140°37.7 140°37.9 40.9 150°40.4 40.9 150°10.5 73°28.1 28.8 72°48.4 41.6 14°00.7 09.9 157°40.4 40.9 150°10.5 73°28.1 28.8 72°48.4 41.6 14°00.7 09.9 157°40.4 40.9 40.8 160°27.7 10.0 110°40.2 40.8 160°27.7 10.0 110°40.2 40.8 160°27.7 10.0 110°40.2 40.8 160°27.2 28.0 102°50.0 41.0 40°0.4 10.0 110°24.2 40.8 18°27.9 118°26.8 27.5 117°50.8 40.6 50°6.7 10.6 202°48.0 40.8 217°50.5 112°40.7 18°25.9 18°25.2 163°25.6 26.3 162°53.3 39.7 104°12.6 11.0 232°53.1 40.7 18°25.2 163°25.6 26.3 162°53.3 39.7 104°12.6 11.0 232°53.1 40.7 18°25.2 18°25.2 163°25.6 26.3 162°53.3 39.7 104°12.6 11.0 232°53.1 40.7 18°25.2 18°25.2 18°25.2 18°25.2 18°3°25.6 26.3 12°55.7 38.7 104°12.6 11.6 278°00.6 40.6 11.6 278°00.6 40.6 11.6 278°00.2 18°25.2 18													
14 197°10.5 73°28.1 28.8 72°48.4 41.6 14°00.7 0.99 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.4 40.9 157°40.5 15.0 157°40.7 10.6 220°48.0 40.8 120°20.3 133°26.4 N18°27.1 132°51.7 N20°40.3 74°08.6 500°10.8 217°50.5 N12°40.7 10.0 120°50.1 40.0 120°20.2 81°52.5 162°52.6 26.3 162°53.3 39.7 104°12.6 11.2 247°55.6 40.7 157°50.2 123°51.5 10.0 120°20.7 178°25.2 153°52.6 26.3 162°53.3 39.7 104°12.6 11.6 226°36.1 40.0 15.0 15.0 15.0 15.0 15.0 15.0 15.0 1											!		
16 227°15.4 103°27.2 28.4 87°49.2 · 41.3 29°0.7 · 10.4 137°45.5 40.8 16 227°15.4 103°27.2 28.0 102°50.0 41.0 44°0.4 · 10.4 137°45.5 40.8 17.4 10.9 · 3.1 1											Alphecca	$126^{\circ}01.4$	26°37.3
16 227°15.4 103°27.2 28.0 102°50.0 41.0 44°0.47 10.4 187°45.5 40.8 17°45.1 10°0.3° 10°0.9° 10°0.9° 10°0.9° 10°0.0° 10													
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14 198°09.6 73°18.3 18.4 73°08.0 33.7 14°48.3 15.0 158°41.1 40.1 15 213°12.1 88°17.9 · 18.0 88°08.8 · 33.4 29°50.2 · 15.2 173°43.6 · 40.1 16 228°14.5 103°17.5 17.5 103°09.7 33.0 44°52.2 15.4 188°46.2 40.1 17 243°17.0 118°17.1 17.1 118°10.5 32.7 59°54.2 15.6 203°48.7 40.0 18 258°19.5 133°16.7 N18°16.6 133°11.3 N20°32.4 74°56.2 S00°15.8 218°51.2 N12°40.0 19 273°21.9 148°16.3 16.2 148°12.1 32.0 89°58.2 16.0 233°53.8 40.0 20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · 15.3 178°13.8 · 31.4 120°02.1 · 16.5 263°58.8 · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars: 0.1	12					N20°34.4		S 00°14.6		N12°40.2			
15 213°12.1 88°17.9 · · 18.0 88°08.8 · · 33.4 29°50.2 · · 15.2 173°43.6 · · 40.1 16 228°14.5 103°17.5 17.5 103°09.7 33.0 44°52.2 15.4 188°46.2 40.1 17 243°17.0 118°17.1 17.1 118°10.5 32.7 59°54.2 15.6 203°48.7 40.0 18 258°19.5 133°16.7 N18°16.6 133°11.3 N20°32.4 74°56.2 S00°15.8 218°51.2 N12°40.0 19 273°21.9 148°16.3 16.2 148°12.1 32.0 89°58.2 16.0 233°53.8 40.0 20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · · 15.3 178°13.8 · · · 31.4 120°02.1 · · 16.5 263°58.8 · · · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars: 0.1													
16 228°14.5 103°17.5 17.5 103°09.7 33.0 44°52.2 15.4 188°46.2 40.1 Venus 235°48.9 09:07 17 243°17.0 118°17.1 17.1 118°10.5 32.7 59°54.2 15.6 203°48.7 40.0 Mars 235°21.5 09:08 18 258°19.5 133°16.7 N18°16.6 133°11.3 N20°32.4 74°56.2 500°15.8 218°51.2 N12°40.0 Jupiter 176°45.4 13:01 19 273°21.9 148°16.3 16.2 148°12.1 32.0 89°58.2 16.0 233°53.8 40.0 Saturn 320°30.6 03:27 20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · 15.3 178°13.8 · 31.4 120°02.1 · 16.5 263°58.8 · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 33 333°31.8 208°14.7 14.4 208°15.4 30.7													
17 243°17.0 118°17.1 17.1 118°10.5 32.7 59°54.2 15.6 203°48.7 40.0 18 258°19.5 133°16.7 N18°16.6 133°11.3 N20°32.4 74°56.2 S00°15.8 218°51.2 N12°40.0 19 273°21.9 148°16.3 16.2 148°12.1 32.0 89°58.2 16.0 233°53.8 40.0 20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · 15.3 178°13.8 · 31.4 120°02.1 · 16.5 263°58.8 · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars 235°21.5 09:08 Jupiter 176°45.4 13:01 Saturn 320°30.6 03:27 Horizontal parallax Venus: 0.2 Mars: 0.1													
18													
19 273°21.9 148°16.3 16.2 148°12.1 32.0 89°58.2 16.0 233°53.8 40.0 20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · 15.3 178°13.8 · 31.4 120°02.1 · 16.5 263°58.8 · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars: 0.1													
20 288°24.4 163°15.9 15.8 163°12.9 31.7 105°00.1 16.3 248°56.3 39.9 21 303°26.8 178°15.5 · · 15.3 178°13.8 · · 31.4 120°02.1 · · 16.5 263°58.8 · · 39.9 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Horizontal parallax Venus: 0.2 Mars: 0.1													
21 303°26.8 178°15.5 ·· 15.3 178°13.8 ·· 31.4 120°02.1 ·· 16.5 263°58.8 ·· 39.9 Horizontal parallax 22 318°29.3 193°15.1 14.9 193°14.6 31.0 135°04.1 16.7 279°01.4 39.9 Venus: 0.2 23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars: 0.1													00.21
23 333°31.8 208°14.7 14.4 208°15.4 30.7 150°06.1 16.9 294°03.9 39.9 Mars: 0.1	21	303°26.8			$178^{\circ}13.8$	• • 31.4	$120^{\circ}02.1$		263°58.8	• • 39.9	Horizont	-	
25 555 51.0 250 11.1 11.1 250 15.1 55.1 150 65.1 15.5 251 65.5 55.5													
Mer.pass. 00:50 ν -0.4′ d-0.4′ m-4.18 ν 0.8′ d-0.3′ m1.56 ν 2.0′ d0.2′ m-1.68 ν 2.5′ d-0.0′ m0.15	23	333°31.8	208°14.7	14.4			150°06.1	16.9	294°03.9	39.9		iviars:	0.1
	Mer.p	ass. 00:50	ν -0.4′ d -0	0.4′ m-4.18	ν 0.8′ d-0	.3′ m1.56	ν 2.0′ d0.	2′ m-1.68	ν 2.5′ d -0	.0′ m0.15			

		Sun			Moon					
Wed	GHA	Dec	GHA	ν	Dec	d	HP			
0	180°24.9	N06°19.2	342°13.6	16.4'	N06°48.0	12.5'	54.0'			
1 2	195°25.1 210°25.3	18.2 17.3	356°49.0 11°24.4	16.4' 16.3'	07°00.4 07°12.9	12.4' 12.4'	54.0' 54.0'			
3	225° 25.5	. 16.4	25°59.7	16.3'	07°25.3	12.4'	54.0'			
4	240°25.7	15.4	40°35.0	16.3'	07° 37.6	12.3'	54.0'			
5	255°25.9 270°26.2	14.5 N06°13.6	55°10.3 69°45.5	16.3'	07°50.0 N08°02.3	12.3'	54.0'			
6 7	270 26.2 285°26.4	NU6 13.6 12.6	69 45.5 84°20.8	16.2' 16.2'	08°14.6	12.3' 12.3'	54.0' 54.0'			
8	300°26.6	11.7	98°56.0	16.2'	08°26.9	12.2'	54.0'			
9	315°26.8	• • 10.8	113°31.1	16.1'	08°39.1	12.2'	54.0'			
10 11	330°27.0 345°27.2	09.8 08.9	128°06.2 142°41.3	16.1' 16.1'	08°51.3 09°03.5	12.2' 12.1'	54.0' 54.0'			
12	0°27.4	N06°08.0	157°16.4	16.0'	N09° 15.6	12.1'	54.0'			
13	$15^{\circ}27.6$	07.0	171°51.4	16.0'	09°27.7	12.1'	54.0'			
14 15	30°27.9 45°28.1	06.1 •• 05.2	186°26.4 201°01.3	15.9' 15.9'	09°39.8 09°51.8	12.0' 12.0'	54.0' 54.0'			
16	60°28.3	04.2	201 01.3 215°36.2	15.9'	10° 03.8	12.0'	54.1'			
17	$75^{\circ}28.5$	03.3	230°11.1	15.8'	10°15.8	11.9'	54.1'			
18	90°28.7	N06°02.4	244°45.9 259°20.7	15.8'	N10°27.7	11.9'	54.1'			
19 20	105°28.9 120°29.1	01.4 06°00.5	259°20.7 273°55.4	15.7' 15.7'	10°39.6 10°51.5	11.9' 11.8'	54.1' 54.1'			
21	135°29.4	05°59.6	288°30.1	15.6'	11°03.3	11.8'	54.1			
22	150°29.6	58.6	303°04.7	15.6'	11° 15.1	11.7'	54.1'			
23	165°29.8	57.7	317°39.3	15.6'	11°26.8	11.7'	54.1'			
_:	SD = 15.9'	d = -0.9'		SE	O = 14.7'					
Thu	GHA	Dec	GHA	ν	Dec	d	HP			
0	180°30.0	N05°56.7	332°13.9	15.5'	N11°38.5	11.7'	54.1'			
1 2	195°30.2 210°30.4	55.8 54.9	346°48.4 1°22.9	15.5' 15.4'	11°50.2 12°01.8	11.6' 11.6'	54.1' 54.1'			
3	210 30.4 225°30.6	• • 53.9	1 22.9 15°57.3	15.4'	12°13.4	11.5	54.1'			
4	240°30.9	53.0	30°31.7	15.3'	12°24.9	11.5'	54.2'			
5	255°31.1	52.1 N05°51.1	45°06.0 59°40.3	15.3'	12°36.3 N12°47.8	11.4'	54.2'			
6 7	270°31.3 285°31.5	50.2	59 40.3 74°14.5	15.2' 15.2'	12°59.2	11.4' 11.3'	54.2' 54.2'			
8	300°31.7	49.2	88°48.6	15.1'	13° 10.5	11.3'	54.2'			
9	315°31.9	• • 48.3	103°22.8	15.1'	13°21.8	11.2'	54.2'			
10 11	330°32.2 345°32.4	47.4 46.4	117°56.8 132°30.8	15.0' 15.0'	13°33.0 13°44.2	11.2' 11.1'	54.2' 54.2'			
12	0°32.6	N05°45.5	147°04.8	14.9'	N13°55.3	11.1'	54.2'			
13	15°32.8	44.6	161°38.7	14.8'	14°06.4	11.0'	54.3'			
14 15	30°33.0 45°33.2	43.6 •• 42.7	176°12.5 190°46.3	14.8' 14.7'	14°17.5 14°28.4	11.0' 10.9'	54.3' 54.3'			
16	60°33.4	41.7	205°20.0	14.7'	14° 39.4	10.9	54.3'			
17	75°33.7	40.8	219°53.7	14.6'	14°50.2	10.8'	54.3'			
18 19	90°33.9 105°34.1	N05°39.9 38.9	234°27.3 249°00.9	14.5' 14.5'	N15°01.0 15°11.8	10.8' 10.7'	54.3' 54.3'			
20	105° 34.1	38.0	263°34.3		15° 11.5° 15° 22.5		54.3'			
21	135° 34.5	• • 37.0	278°07.8	14.4'	15°33.1	10.6'	54.3'			
22 23	150°34.7 165°35.0	36.1 35.2	292°41.1 307°14.4	14.3' 14.2'	15°43.7 15°54.2	10.5' 10.5'	54.4' 54.4'			
_	SD = 15.9'	d = -0.9'	307 14.4		0 = 14.8'	10.5	34.4			
	3D = 13.9	<u>u = -0.9</u>		31	7 — 14.0					
Fri	GHA	Dec	GHA	ν	Dec	d	HP			
0 1	180°35.2 195°35.4	N05°34.2 33.3	321°47.7 336°20.9	14.2' 14.1'	N16°04.7 16°15.1	10.4' 10.3'	54.4' 54.4'			
2	210° 35.6	32.3	350°54.0	14.0'	16°25.4	10.3	54.4			
3	225°35.8	• • 31.4	5°27.0	14.0'	16°35.7	10.2'	54.4'			
4 5	240°36.0 255°36.3	30.5 29.5	20°00.0 34°32.9	13.9' 13.9'	16°45.9 16°56.0	10.1' 10.1'	54.4' 54.5'			
6	270° 36.5	N05°28.6	49°05.8	13.8'	N17°06.1	10.1	54.5			
7	285°36.7	27.6	63°38.6	13.7'	17° 16.1	9.9'	54.5'			
8 9	300°36.9 315°37.1	26.7 •• 25.7	78°11.3 92°43.9	13.6' 13.6'	17°26.0 17°35.9	9.9' 9.8'	54.5' 54.5'			
10	330° 37.3	24.8	107°16.5	13.5'	17°45.7	9.7'	54.5			
11	345°37.6	23.9	121°49.0	13.4'	17°55.4	9.7'	54.6'			
12 13	0°37.8 15°38.0	N05°22.9 22.0	136°21.4 150°53.8	13.4' 13.3'	N18°05.1 18°14.7	9.6' 9.5'	54.6' 54.6'			
13	30°38.2	22.0	165°26.1	13.2'	18 14.7 18°24.2	9.5 9.4'	54.6'			
15	45°38.4	• • 20.1	179°58.3	13.2'	18°33.6	9.4'	54.6'			
16 17	60°38.6 75°38.9	19.2 18.2	194°30.5 209°02.6	13.1' 13.0'	18°43.0 18°52.2	9.3' 9.2'	54.6' 54.7'			
17	75°38.9 90°39.1	N05°17.3	209°02.6 223°34.6	13.0	N19°01.5	9.2	54.7'			
19	105°39.3	16.3	238°06.5	12.9'	19° 10.6	9.0'	54.7'			
20	120°39.5 135°39.7	15.4	252°38.4 267°10.1	12.8' 12.7'	19°19.6 19°28.6	9.0' 8.9'	54.7' 54.7'			
21 22	135° 39.7 150° 40.0	· · 14.4 13.5	267°10.1 281°41.9	12.7' 12.6'	19°28.6 19°37.5	8.9° 8.8'	54.7' 54.7'			
23	165°40.2	12.5	296°13.5	12.6'	19°46.3	8.7'	54.8'			
-:	SD = 15.9'	d = -0.9'		SE	0 = 14.8'					

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

Lat.		Moonris	е		Moonset	
Ldl.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	17:25	16:45		09:18	11:26	
N 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
N 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
S 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
S 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
S 60°	21:06	22:28	23:53	06:24	06:28	06:34

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h		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		
80	02:21	02:31	11:57	02:38	15:00		

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
			N18°14.0		N20° 30.4		500°17.1	309°06.4	N12°39.8		ЗПА	Dec
0	348°34.2	223°14.2		223°16.2		165°08.1				Alpheratz	357°31.3	29°15.1
1	3°36.7	238°13.8	13.5	238°17.1	30.0	180°10.0	17.3	324°09.0	39.8	Ankaa	353°03.9	-42°08.7
2	18°39.2	253°13.4	13.0	253°17.9	29.7	195°12.0	17.5	339°11.5	39.8	Schedar	349°27.0	56°41.7
3	33°41.6	268°13.0	• • 12.6	268° 18.7	• • 29.4	210°14.0 225°16.0	•• 17.7	354°14.0 9°16.6	• • 39.7	Diphda	348°44.0	-17°49.5
4	48°44.1	283°12.6	12.1	283°19.5	29.0		17.9	24°19.1	39.7	Achernar	$335^{\circ}17.6$	-57°05.2
5 6	63°46.6 78°49.0	298°12.2 313°11.8	11.7 N18°11.2	298°20.3 313°21.2	28.7 N20°28.4	240°18.0 255°19.9	18.2 \$00°18.4	39°21.6	39.7 N12°39.6	Hamal	327°47.5	23°36.0
7	93°51.5	328°11.4	10.8	328° 22.0	28.0	270°21.9	18.6	54°24.2	39.6	Polaris	312°09.8	89°22.7
8	108°54.0	343°11.0	10.3	343° 22.8	27.7	285°23.9	18.8	69°26.7	39.6	Acamar	315°09.3	-40°11.1
9	123°56.4	358°10.6	09.8	358°23.6	27.3	300°25.9	• • 19.0	84°29.2	• • 39.5	Menkar	314°02.8	4°12.3
10	138°58.9	13°10.2	09.4	13°24.5	27.0	315°27.9	19.2	99°31.8	39.5	Mirfak	308°23.7	49°57.6
11	154°01.3	28°09.7	08.9	28° 25.3	26.7	330°29.8	19.4	114°34.3	39.5	Aldebaran	290°36.1	16°34.0
12	169°03.8	43°09.3	N18°08.5	43°26.1	N20°26.3	345°31.8	500°19.6	129°36.9	N12°39.4	Rigel	281°01.0	-8°10.0
13	184°06.3	58°08.9	08.0	58°26.9	26.0	0°33.8	19.8	144°39.4	39.4	Capella	280°17.5	46°01.4
14	199°08.7	73°08.5	07.5	73°27.8	25.7	15°35.8	20.1	159°41.9	39.4	Bellatrix	278°19.7	6°22.6
15	$214^{\circ}11.2$	88°08.1	•• 07.1	88°28.6	• • 25.3	30°37.8	· · 20.3	174°44.5	• • 39.3	Elnath	277°58.1	28°37.8 -1°10.9
16	229°13.7	103°07.7	06.6	103°29.4	25.0	45°39.7	20.5	189°47.0	39.3	Alnilam Betelgeuse	275°34.7 270°48.9	7°24.8
17	$244^{\circ}16.1$	$118^{\circ}07.3$	06.1	118°30.2	24.6	60°41.7	20.7	204°49.5	39.3	Canopus	263°51.2	-52°42.4
18	259°18.6	133°06.9	N18°05.7	133°31.1	N20°24.3	75°43.7	500°20.9	219°52.1	$N12^{\circ}39.2$	Sirius	258° 23.7	-32 42.4 -16°45.2
19	274°21.1	148°06.5	05.2	148°31.9	24.0	90°45.7	21.1	234°54.6	39.2	Adhara	255° 03.7	-10 43.2 -29°00.5
20	289°23.5	163°06.1	04.7	163°32.7	23.6	105°47.7	21.3	249°57.1	39.2	Procyon	244° 47.9	5°09.1
21	304°26.0	178°05.6	• • 04.3	178°33.5	• • 23.3	120°49.6	• • 21.5	264°59.7	• • 39.1	Pollux	243°13.9	27°57.3
22	319°28.5	193°05.2	03.8	193°34.4	22.9	135°51.6	21.7	280°02.2	39.1	Avior	234°13.9	-59°35.9
23	334°30.9	208°04.8	03.3	208°35.2	22.6	150°53.6	22.0	295°04.7	39.1	Suhail	222°44.4	-43°32.8
Mer.p	ass. 00:46	ν -0.4' d-0).5' m-4.18	$\nu 0.8' \ d-0$	0.3' m1.56	$\nu 2.0' d0.$	2′ m-1.67	$\nu^{2.5'} d-0$.0′ m0.15	Miaplacidus	221°38.3	-69°50.0
		- 0 u								Alphard	217°45.1	-8°47.0
										Regulus	207°31.6	11°49.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.2	61°35.7
0	349°33.4	223°04.4	N18°02.9	223°36.0	N20°22.3	165°55.6	S00°22.2	310°07.3	N12°39.1	Denebola	182°22.2	14°24.7
1	4°35.8	238°04.0	02.4	238°36.9	21.9	180°57.5	22.4	325°09.8	39.0	Gienah	175°40.8	-17°42.1
2	19°38.3	253°03.6	01.9	253°37.7	21.6	195°59.5	22.6	340°12.4	39.0	Acrux	172°57.2	-63°15.6
3	34°40.8	268°03.2	• • 01.4	268°38.5	• • 21.2	211°01.5	• • 22.8	355°14.9	• • 39.0	Gacrux	171°48.7	-57°16.5
4	49°43.2	283°02.8	01.0	283°39.3	20.9	226°03.5	23.0	10°17.4	38.9	Alioth	$166^{\circ}11.0$	55°48.3
5	64°45.7	298°02.4	00.5	298°40.2	20.6	241°05.5	23.2	25°20.0	38.9	Spica	$158^{\circ}19.4$	-11°18.6
6	79°48.2	313°01.9	N18°00.0	313°41.0	N20°20.2	256°07.4	S00°23.4	40°22.5	N12°38.9	Alkaid	$152^{\circ}50.1$	49°10.4
7	94°50.6	328°01.5	17°59.5	328°41.8 343°42.7	19.9	271°09.4	23.7	55°25.0	38.8	Hadar	148°32.1	-60°30.8
8	109°53.1	343°01.1 358°00.7	59.0		19.5	286°11.4 301°13.4	23.9	70°27.6 85°30.1	38.8	Menkent	147°54.3	-36°30.7
9 10	124°55.6 139°58.0	13°00.3	· · 58.6 58.1	358°43.5 13°44.3	· · 19.2 18.8	316°15.4	· · 24.1 24.3	100°32.7	· · 38.8 38.7	Arcturus	145°45.4	19°02.1
11	159° 56.0 155° 00.5	27°59.9	57.6	28° 45.1	18.5	331°17.3	24.5	100 32.7 115°35.2	38.7	Rigil Kent.	139°36.5	-60°57.4
12	170°02.9	42°59.5	N17°57.1	43°46.0	N20° 18.2	346°19.3	S00°24.7	130°37.7	N12°38.7	Kochab	137°20.7	74°02.5
13	185°05.4	57°59.1	56.6	58°46.8	17.8	1°21.3	24.9	145°40.3	38.6	Zuben'ubi	136°52.9	-16°09.6
14	200°07.9	72°58.6	56.2	73°47.6	17.5	16°23.3	25.1	160°42.8	38.6	Alphecca	126°01.4	26°37.3
15	215°10.3	87°58.2	• • 55.7	88° 48.5	. 17.1	31°25.2	25.3	175°45.4	• • 38.6	Antares	112°12.2	-26°29.7
16	230°12.8	102°57.8	55.2	103°49.3	16.8	46°27.2	25.6	190°47.9	38.5	Atria	107°03.7	-69°04.9
17	245°15.3	117°57.4	54.7	118°50.1	16.4	61°29.2	25.8	205°50.4	38.5	Sabik	101°59.3	-15°45.5
18	260°17.7	132°57.0	N17°54.2	133°51.0	N20° 16.1	76°31.2	S00°26.0	220°53.0	N12°38.5	Shaula	96°06.2	-37°07.5 12°32.6
19	275°20.2	147°56.6	53.7	148°51.8	15.8	91°33.2	26.2	235°55.5	38.4	Rasalhague	95°55.7	I
20	290°22.7	162°56.2	53.2	163°52.6	15.4	106°35.1	26.4	250°58.1	38.4	Eltanin Kaus Aust.	90°40.7 83°28.4	51°29.5 -34°22.2
21	305°25.1	177°55.8	• • 52.7	178°53.5	•• 15.1	121°37.1	• • 26.6	266°00.6	• • 38.4	Vega	80°31.0	-34 22.2 38°49.0
22	320°27.6	192°55.3	52.2	193°54.3	14.7	136°39.1	26.8	281°03.1	38.3	Nunki	75°43.9	-26°15.5
23	335°30.1	207°54.9	51.8	208°55.1	14.4	151°41.1	27.0	296°05.7	38.3	Altair	61°56.8	8°56.9
Morp	ass. 00:42	11 0 A' d C).5' m-4.17	ν0 8 ⁷ d 0	.3' m1.56	1/2 0/ d0	2′ m-1.67	12 E' d C	.0′ m0.14	Peacock	53°00.7	-56°38.5
- IVIEL.P	435. 00.42	ν-0.4 α-0	7.5 111-4.17	νο.σ u-σ	.5 1111.50	ν2.0 do.		ν2.5 u-0		Deneb	49°23.4	45°23.3
										Enif	33°35.5	10°00.7
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.1
0	350°32.5	222°54.5	N17°51.3	223°56.0	N20° 14.0	166°43.1	S00°27.3	311°08.2	N12°38.3	Fomalhaut	15°10.9	-29°28.0
1	5°35.0	237°54.1	50.8	238°56.8	13.7	181°45.0	27.5	326°10.8	38.2	Scheat	13°41.9	28°14.5
2	20°37.4	252°53.7	50.3	253°57.6	13.3	196°47.0	27.7	341°13.3	38.2	Markab	$13^{\circ}26.6$	15°21.8
3	35°39.9	267°53.3	• • 49.8	268°58.5	• • 13.0	211°49.0	• • 27.9	356°15.9	• • 38.2	Cor. 00 C :	CLIA	Man :
4	50°42.4	282°52.9	49.3	283°59.3	12.6	226°51.0	28.1	11°18.4	38.1	Sep 09 Sat	SHA 234°40.0	Mer.pass
5	65°44.8	297°52.5	48.8 N17°49.2	299°00.1	12.3	241°52.9	28.3	26°20.9	38.1		234°40.0 234°42.0	09:07 09:06
6	80°47.3	312°52.0	N17°48.3	314°01.0	N20°12.0	256°54.9	\$00°28.5	41°23.5	N12°38.1	1	234 42.0 176°33.8	12:58
7 8	95°49.8 110°52.2	327°51.6 342°51.2	47.8 47.3	329°01.8 344°02.6	11.6 11.3	271°56.9 286°58.9	28.7 28.9	56°26.0 71°28.6	38.0 38.0	Saturn	320° 32.2	03:23
9	110°52.2 125°54.7	342°51.2 357°50.8	47.3 •• 46.8	344°02.6 359°03.5	11.3	302°00.8	29.2	71°28.6 86°31.1	38.0	Saturfi	J2U J2.2	05.23
10	140°57.2	12°50.4	46.3	14°04.3	10.6	302 00.8 317°02.8	29.4	101°33.6	37.9	Sep 10 Sun	SHA	Mer.pass
11	155° 59.6	27°50.0	40.3 45.8	29°05.1	10.0	332°04.8	29.4	101 33.0 116°36.2	37.9 37.9		233°31.0	09:08
12	171°02.1	42°49.6	N17°45.3	44°06.0	N20°09.9	347°06.8	S00°29.8	131°38.7	N12°37.8		234°02.6	09:05
13	186°04.6	57°49.1	44.8	59°06.8	09.5	2°08.8	30.0	146°41.3	37.8		176°22.2	12:55
14	201°07.0	72°48.7	44.3	74°07.6	09.2	17°10.7	30.2	161°43.8	37.8	Saturn	320°33.9	03:19
15	216°09.5	87°48.3	• • 43.8	89°08.5	08.8	32°12.7	30.4	176°46.4	• • 37.7	Sep 11 Mon	SHA	Mer.pass
16	231°11.9	102°47.9	43.3	104°09.3	08.5	47°14.7	30.6	191°48.9	37.7		232°22.0	09:09
17	246°14.4	117°47.5	42.7	119° 10.1	08.1	62°16.7	30.9	206°51.5	37.7		233°23.4	09:04
18	261°16.9	132°47.1	N17°42.2	134°11.0	N20°07.8	77°18.6	S00°31.1	221°54.0	N12°37.6		176° 10.5	12:51
19	$276^{\circ}19.3$	147°46.7	41.7	$149^{\circ}11.8$	07.4	92°20.6	31.3	236°56.5	37.6		320°35.7	03:15
20	291°21.8	162°46.2	41.2	$164^{\circ}12.7$	07.1	107°22.6	31.5	251°59.1	37.6			
21	$306^{\circ}24.3$	177°45.8	• • 40.7	$179^{\circ}13.5$	• • 06.7	$122^{\circ}24.6$	• • 31.7	$267^{\circ}01.6$	• • 37.5	Horizont	al parallax	
22	$321^{\circ}26.7$	192°45.4	40.2	194°14.3	06.4	$137^{\circ}26.6$	31.9	282°04.2	37.5		Venus:	0.2
23	336°29.2	207°45.0	39.7	209°15.2	06.0	152°28.5	32.1	297°06.7	37.5		Mars:	0.1
Mern	ass. 00:38	ν-0 4' d-0).5′ m-4.16	ν0 8' d-0	0.3′ m1.55	ν2 0' d0	2′ m-1.67	ν2 5' d-C	.0′ m0.14			
сг.р		. J. i u-c	1.10		.5	- 2.0 00.	1.01	- 2.5 U-C				

h	Su	n		ı	Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.4	N05°11.6	$310^{\circ}45.1$	12.5'	$N19^{\circ}55.0$	8.6'	54.8'
1	195°40.6	10.7	325°16.5	12.4'	20°03.6	8.6'	54.8'
2	210°40.8 225°41.0	09.7 •• 08.8	339°47.9 354°19.3	12.3' 12.3'	20°12.2 20°20.6	8.5' 8.4'	54.8' 54.8'
4	240°41.3	07.8	8°50.5	12.2'	20°29.0	8.3'	54.9'
5	255°41.5	06.9	23°21.7	12.1'	20°37.3	8.2'	54.9'
6	270°41.7	N05°05.9	37°52.8	12.0'	N20°45.5	8.1'	54.9'
7 8	285°41.9 300°42.1	05.0 04.0	52°23.8 66°54.8	11.9' 11.9'	20°53.6 21°01.6	8.0' 7.9'	54.9' 54.9'
9	315°42.4	•• 03.1	81°25.7	11.8'	21°09.6	7.8'	55.0'
10	330°42.6	02.2	95°56.4	11.7'	21°17.4	7.7'	55.0'
11	345°42.8 0°43.0	01.2 N05°00.3	110°27.2 124°57.8	11.6'	21°25.1 N21°32.8	7.6'	55.0'
12 13	15°43.0	04° 59.3	124°57.8 139°28.3	11.6' 11.5'	N21 32.8 21°40.3	7.6' 7.5'	55.0' 55.1'
14	30°43.4	58.4	153°58.8	11.4'	21°47.8	7.4	55.1'
15	45°43.7	• • 57.4	168°29.2	11.3'	21°55.2	7.3'	55.1'
16	60°43.9 75°44.1	56.5	182°59.5 197°29.8	11.2' 11.2'	22°02.4 22°09.6	7.2' 7.1'	55.1' 55.1'
17 18	90°44.3	55.5 N04° 54.6	211°59.9	11.1'	N22°16.6	7.1	55.2'
19	105°44.5	53.6	226°30.0	11.0'	22°23.6	6.9'	55.2'
20	120°44.8	52.7	241°00.0	10.9'	22°30.4	6.8'	55.2'
21	135°45.0	• • 51.7	255°29.9 269°59.8	10.8'	22°37.2	6.6'	55.2'
22 23	150°45.2 165°45.4	50.8 49.8	269°59.8 284°29.5	10.8' 10.7'	22°43.8 22°50.4	6.5' 6.4'	55.3' 55.3'
	SD = 15.9'	d = -0.9'			= 14.9'		23.3
	Jυ — 13.9'	u — -0.9		3D	_ 14.9		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.6	N04°48.9	298°59.2	10.6'	N22°56.8	6.3'	55.3'
1 2	195°45.9 210°46.1	47.9 47.0	313°28.8 327°58.4	10.5' 10.4'	23°03.1 23°09.4	6.2' 6.1'	55.3' 55.4'
3	225°46.3	• • 46.0	342°27.8	10.4	23°15.5	6.0'	55.4'
4	240°46.5	45.1	$356^{\circ}57.2$	10.3'	$23^{\circ}21.5$	5.9'	55.4'
5	255°46.7	44.2	11°26.5	10.2'	23°27.4 N23°33.1	5.8'	55.4'
6 7	270°46.9 285°47.2	N04°43.2 42.3	25°55.7 40°24.8	10.1' 10.1'	N23°33.1 23°38.8	5.7' 5.5'	55.5' 55.5'
8	300°47.4	41.3	54°53.9	10.0'	23°44.4	5.4'	55.5'
9	315°47.6	• • 40.4	69°22.9	9.9'	23°49.8	5.3'	55.5'
10	330°47.8	39.4	83°51.8	9.8'	23°55.1 24°00.3	5.2'	55.6'
11 12	345°48.0 0°48.3	38.5 N04°37.5	98°20.6 112°49.4	9.8' 9.7'	24°00.3 N24°05.4	5.1' 5.0'	55.6' 55.6'
13	15°48.5	36.6	127°18.0	9.6'	24°10.4	4.8'	55.6'
14	30°48.7	35.6	$141^{\circ}46.6$	9.5'	24°15.2	4.7'	55.7'
15	45°48.9 60°49.1	• • 34.7	156°15.2 170°43.6	9.5'	24°19.9 24°24.5	4.6'	55.7'
16 17	75°49.1	33.7 32.8	170 43.6 185°12.0	9.4' 9.3'	24 24.5 24°29.0	4.5' 4.4'	55.7' 55.8'
18	90°49.6	N04°31.8	199°40.3	9.2'	N24°33.4	4.2'	55.8'
19	105°49.8	30.9	214°08.5	9.2'	24°37.6	4.1'	55.8'
20 21	120°50.0 135°50.2	29.9 •• 29.0	228°36.7 243°04.8	9.1' 9.0'	24°41.7 24°45.7	4.0' 3.9'	55.8' 55.9'
22	150°50.5	28.0	243 04.6 257°32.8	9.0 8.9'	24 45.7 24°49.5	3.9 3.7'	55.9'
23	165°50.7	27.1	272°00.8	8.9'	24°53.3	3.6'	55.9'
	SD = 15.9'	d = -0.9'		SD	= 15.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°50.9 195°51.1	N04° 26.1 25.1	286°28.6 300°56.4	8.8' 8.7'	N24°56.9 25°00.3	3.5' 3.3'	56.0' 56.0'
2	210°51.3	24.2	315°24.2	8.7'	25°03.7	3.2'	56.0'
3	225°51.6	• • 23.2	329°51.9	8.6'	25°06.9	3.1'	56.1'
4 5	240°51.8 255°52.0	22.3 21.3	344°19.5 358°47.0	8.5' 8.5'	25°09.9 25°12.9	2.9' 2.8'	56.1' 56.1'
6	255 52.0 270°52.2	21.3 N04° 20.4	13°14.5	8.4'	N25°15.7	2.8	56.1
7	285°52.4	19.4	27°41.9	8.3'	25°18.3	2.5'	56.2'
8	300°52.7	18.5	42°09.2	8.3'	25°20.9	2.4'	56.2'
9 10	315°52.9 330°53.1	· · 17.5 16.6	56°36.5 71°03.8	8.2' 8.2'	25°23.3 25°25.5	2.3' 2.1'	56.2' 56.3'
11	345°53.3	15.6	71 03.8 85°30.9	8.2 8.1'	25 25.5 25°27.7	2.1	56.3'
12	0°53.6	N04° 14.7	99°58.0	8.0'	N25°29.6	1.8'	56.3'
13	15°53.8	13.7	114°25.1	8.0'	25°31.5	1.7'	56.4'
14 15	30°54.0 45°54.2	12.8 •• 11.8	128°52.1 143°19.0	7.9' 7.9'	25°33.2 25°34.8	1.6' 1.4'	56.4' 56.4'
16	45° 54.2 60° 54.4	10.9	143 19.0 157°45.9	7.9 7.8'	25°36.2	1.4	56.5'
17	75°54.7	09.9	$172^{\circ}12.7$	7.8'	25°37.5	1.1'	56.5'
18	90°54.9	N04°09.0	186°39.4	7.7'	N25°38.6	1.0'	56.5'
19 20	105°55.1 120°55.3	08.0 07.0	201°06.2 215°32.8	7.7' 7.6'	25°39.6 25°40.4	0.8' 0.7'	56.6' 56.6'
21	120 55.5 135°55.5	06.1	215 32.6 229°59.4	7.6'	25°41.1	0.7	56.6'
22	150°55.8	05.1	244°26.0	7.5'	25°41.7	0.4'	56.7'
23	165°56.0	04.2	258°52.5	7.5'	25°42.1	0.3'	56.7'
	SD = 15.9'	d = -1.0'		SD	$=15.3^{\prime}$		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	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
S 10°	05:11	05:36	05:57	17:57	18:18	18:42
20°	05:13	05:38	06:00	17:54	18:16	18:41
30°	05:12	05:40	06:04	17:50	18:14	18:42
35°	05:12	05:41	06:06	17:48	18:13	18:43
40°	05:10	05:41	06:08	17:46	18:13	18:44
45°	05:08	05:42	06:11	17:43	18:13	18:47
S 50°	05:05	05:42	06:14	17:40	18:12	18:50
52°	05:03	05:42	06:16	17:39	18:12	18:52
54°	05:01	05:42	06:17	17:37	18:13	18:54
56°	04:59	05:42	06:19	17:36	18:13	18:56
58°	04:56	05:42	06:21	17:34	18:13	18:59
S 60°	04:53	05:42	06:23	17:32	18:13	19:02

Lat.		Moonris	е	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°							
N 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	
N 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	
S 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	
S 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	
S 60°		01:18	02:38	06:44	07:00	07:28	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	351°31.7	222°44.6	N17°39.2	224°16.0	N20°05.7	167°30.5	500°32.3	312°09.3	N12°37.4		JIIA	
1	6°34.1	237°44.2	38.7	239° 16.8	05.3	182°32.5	32.5	312 09.3 327°11.8	37.4	Alpheratz	357°31.3	29°15.1
2	21°36.6	252°43.8				102 32.5 197°34.5		342°14.4		Ankaa	353°03.8	-42°08.7
	21 30.0 36°39.1		38.1	254°17.7	05.0		32.8		37.4	Schedar	349°26.9	56°41.8
3		267°43.3	• • 37.6	269°18.5	• • 04.6	212°36.4	• • 33.0	357°16.9	• • 37.3	Diphda	348°44.0	-17°49.5
4	51°41.5	282°42.9	37.1	284°19.4	04.3	227°38.4	33.2	12°19.4	37.3	Achernar	335°17.6	-57°05.2
5	66°44.0	297°42.5	36.6	299°20.2	03.9	242°40.4	33.4	27°22.0	37.3	Hamal	327°47.5	23°36.0
6	81°46.4	312°42.1	N17°36.1	314°21.0	N20°03.6	257°42.4	S00°33.6	42°24.5	N12°37.2	Polaris	312°08.1	89°22.8
7	96°48.9	327°41.7	35.5	329°21.9	03.2	272°44.3	33.8	57°27.1	37.2	Acamar	315°09.3	-40°11.1
8	111°51.4	342°41.3	35.0	344°22.7	02.9	287°46.3	34.0	72°29.6	37.2	Menkar	314°02.8	4°12.3
9	126°53.8	357°40.8	• • 34.5	359°23.6	• • 02.5	302°48.3	• • 34.2	87°32.2	• • 37.1	Mirfak	308°23.6	49°57.6
10	141°56.3	12°40.4	34.0	14°24.4	02.2	317°50.3	34.5	102°34.7	37.1	Aldebaran	290°36.1	16°34.0
11	156°58.8	27°40.0	33.5	29°25.2	01.8	332°52.2	34.7	117°37.3	37.0	Rigel	281°01.0	-8°10.0
12	172°01.2	42°39.6	N17°32.9	44°26.1	N20°01.5	347°54.2	S00°34.9	132°39.8	N12°37.0	Capella	$280^{\circ}17.4$	46°01.4
13	187°03.7	57°39.2	32.4	59°26.9	01.1	2°56.2	35.1	147°42.4	37.0	Bellatrix	278°19.7	6°22.6
14	202°06.2	72°38.8	31.9	74°27.8	00.7	17°58.2	35.3	162°44.9	36.9	Elnath	277°58.1	28°37.8
15	217°08.6	87°38.4	• • 31.4	89°28.6	• • 00.4	33°00.2	• • 35.5	177°47.5	• • 36.9	Alnilam	275°34.7	-1°10.9
16	232°11.1	102°37.9	30.8	104°29.4	20°00.0	48°02.1	35.7	192°50.0	36.9	Betelgeuse	270°48.9	7°24.8
17	247°13.5	117°37.5	30.3	119°30.3	19°59.7	63°04.1	35.9	207°52.6	36.8	Canopus	263°51.2	-52°42.4
18	262°16.0	132°37.1	N17°29.8	134°31.1	N19°59.3	78°06.1	S00°36.2	222°55.1	N12°36.8	Sirius	258°23.7	-16°45.2
19	277°18.5	147°36.7	29.2	149°32.0	59.0	93°08.1	36.4	237°57.7	36.8	Adhara	255°03.6	-29°00.5
20	292°20.9	162°36.3	28.7	164°32.8	58.6	108°10.0	36.6	253°00.2	36.7	Procyon	244°47.9	5°09.1
21	307°23.4	177°35.9	• • 28.2	179°33.7	• • 58.3	123°12.0	• • 36.8	268°02.8	• • 36.7	Pollux	243°13.9	27°57.3
22	322°25.9	192°35.4	27.6	194°34.5	57.9	138°14.0	37.0	283°05.3	36.7	Avior	234°13.9	-59°35.9
23	337°28.3	207°35.0	27.1	209°35.3	57.6	153°16.0	37.2	298°07.9	36.6	Suhail	222°44.4	-43°32.8
Mer n	ass. 00:34	ν -0 4' d-0	0.5' m-4.16	$\nu 0.8' d-0$.4′ m1.55	$\nu^2 0' d0$	2′ m-1.67	$\nu^2 5' d-0$.0′ m0.13	Miaplacidus	221°38.3	-69°50.0
		ν σ. r α σ								Alphard	217°45.1	-8°47.0
										Regulus	207°31.6	11°49.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.7
0	352°30.8	222°34.6	N17°26.6	224°36.2	N19°57.2	168°17.9	S00°37.4	313°10.4	N12°36.6	Denebola	182°22.2	14°24.7
1	7°33.3	237°34.2	26.0	239°37.0	56.8	183°19.9	37.6	328°12.9	36.5	Gienah	175°40.8	-17°42.1
2	22°35.7	252°33.8	25.5	254°37.9	56.5	198°21.9	37.9	343°15.5	36.5	Acrux		-63°15.6
3	37°38.2	267°33.4	• • 25.0	269°38.7	•• 56.1	213°23.9	• • 38.1	358°18.0	• • 36.5	Gacrux	171°48.7	-57°16.5
4	52°40.7	282°32.9	24.4	284°39.6	55.8	228°25.8	38.3	13°20.6	36.4	Alioth	166°11.0	55°48.3
5	67°43.1	297°32.5	23.9	299°40.4	55.4	243°27.8	38.5	28°23.1	36.4	Spica	158° 19.4	-11°18.6
6	82°45.6	312°32.1	N17°23.3	314°41.3	$N19^{\circ}55.1$	258°29.8	S00°38.7	43°25.7	N12°36.4	Alkaid	152° 50.1	49°10.4
7	97°48.0	$327^{\circ}31.7$	22.8	$329^{\circ}42.1$	54.7	273°31.8	38.9	58°28.2	36.3	Hadar	148°32.1	-60°30.8
8	112°50.5	342°31.3	22.3	344°42.9	54.4	288°33.7	39.1	73°30.8	36.3	Menkent	147°54.3	-36°30.7
9	127°53.0	357°30.9	• • 21.7	359°43.8	•• 54.0	303°35.7	• • 39.3	88°33.4	• • 36.3	Arcturus	145°45.4	19°02.1
10	142°55.4	12°30.4	21.2	14°44.6	53.6	318°37.7	39.6	103°35.9	36.2	Rigil Kent.	139°36.5	-60°57.4
11	157°57.9	27°30.0	20.6	29°45.5	53.3	333°39.7	39.8	118°38.5	36.2	Kochab	137°20.8	74°02.4
12	173°00.4	42°29.6	N17°20.1	44°46.3	$N19^{\circ}52.9$	348°41.6	S00°40.0	133°41.0	N12°36.1	Zuben'ubi	136°52.9	-16°09.6
13	188°02.8	57°29.2	19.5	59°47.2	52.6	3°43.6	40.2	148°43.6	36.1	Alphecca	126°01.4	26°37.3
14	203°05.3	72°28.8	19.0	74°48.0	52.2	18°45.6	40.4	163°46.1	36.1	Antares	112° 12.2	-26°29.7
15	218°07.8	87°28.4	• • 18.5	89°48.9	• • 51.8	33°47.6	• • 40.6	178°48.7	• • 36.0	Atria	112 12.2 107°03.7	-20 29.7 -69°04.9
16	233°10.2	102°27.9	17.9	104°49.7	51.5	48°49.5	40.8	193°51.2	36.0	Sabik	101°59.3	-15°45.5
17	248°12.7	117°27.5	17.4	119°50.6	51.1	63°51.5	41.0	208°53.8	36.0	Shaula	96°06.3	-13 43.5 -37°07.5
18	263°15.2	132°27.1	N17° 16.8	134°51.4	$N19^{\circ}50.8$	78°53.5	S00°41.3	223°56.3	N12°35.9	Rasalhague	95°55.7	12°32.6
19	278°17.6	147°26.7	16.3	149°52.3	50.4	93°55.5	41.5	238°58.9	35.9	Eltanin	90°40.7	51°29.5
20	293°20.1	162°26.3	15.7	$164^{\circ}53.1$	50.0	108°57.4	41.7	254°01.4	35.9	Kaus Aust.	83°28.4	-34°22.2
21	308°22.5	177°25.9	• • 15.2	179°54.0	• • 49.7	123°59.4	• • 41.9	269°04.0	• • 35.8	Vega	80°31.1	38°49.0
22	323°25.0	192°25.4	14.6	194°54.8	49.3	139°01.4	42.1	284°06.5	35.8	Nunki	75°43.9	-26°15.5
23	338°27.5	207°25.0	14.0	209°55.7	49.0	154°03.4	42.3	299°09.1	35.7	Altair	61°56.8	8°56.9
Marn	ass. 00:30	0 1/ 1 0	0.5' m-4.15	··0 o/ d 0	.4′ m1.55		2′ m-1.67	12 E/ d C	.0′ m0.13	Peacock	53°00.7	-56°38.5
- Ivier.p	ass. 00.30	ν-0.4 u-0	7.5 111-4.15	ν 0.6 u -0	.4 1111.55	ν2.0 do.		ν2.5 α-C	.0 1110.13	Deneb	49° 23.4	45°23.3
										Enif	33°35.5	10°00.7
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 28.8	-46°49.2
0	$353^{\circ}29.9$	222°24.6	$N17^{\circ}13.5$	224°56.5	$N19^{\circ}48.6$	$169^{\circ}05.3$	S00°42.5	$314^{\circ}11.6$	$N12^{\circ}35.7$	Fomalhaut	15° 10.9	-29°28.0
1	8°32.4	237°24.2	12.9	239°57.4	48.2	184°07.3	42.7	$329^{\circ}14.2$	35.7	Scheat	13°41.9	28°14.6
2	23°34.9	252°23.8	12.4	254°58.2	47.9	199°09.3	43.0	$344^{\circ}16.7$	35.6	Markab	13°26.6	15°21.8
3	38°37.3	267°23.4	• • 11.8	$269^{\circ}59.1$	• • 47.5	214°11.3	• • 43.2	$359^{\circ}19.3$	• • 35.6			
4	53°39.8	282°22.9	11.3	284°59.9	47.2	$229^{\circ}13.2$	43.4	$14^{\circ}21.8$	35.6	Sep 12 Tue	SHA	Mer.pass
5	68°42.3	297°22.5	10.7	300°00.8	46.8	$244^{\circ}15.2$	43.6	29°24.4	35.5		231°12.9	09:09
6	83°44.7	312°22.1	$N17^{\circ}10.1$	315°01.6	N19°46.4	259°17.2	S00°43.8	44°27.0	$N12^{\circ}35.5$		232°44.3	09:02
7	98°47.2	327°21.7	09.6	$330^{\circ}02.5$	46.1	$274^{\circ}19.2$	44.0	59°29.5	35.4		175°58.8	12:48
8	113°49.7	$342^{\circ}21.3$	09.0	345°03.3	45.7	$289^{\circ}21.1$	44.2	74°32.1	35.4	Saturn	320° 37.6	03:11
9	128°52.1	357°20.9	• • 08.5	0°04.2	• • 45.4	304°23.1	• • 44.4	89°34.6	• • 35.4	Sep 13 Wed	SHA	Mer.pass
10	143°54.6	12°20.4	07.9	15°05.0	45.0	$319^{\circ}25.1$	44.7	104°37.2	35.3		230°03.8	09:10
11	158°57.0	27°20.0	07.3	30°05.9	44.6	334°27.1	44.9	119°39.7	35.3		230° 05.8 232° 05.4	09:10
12	173°59.5	42°19.6	N17°06.8	45°06.7	N19°44.3	349°29.0	S00°45.1	134°42.3	$N12^{\circ}35.3$		232 05.4 175°47.1	12:45
13	189°02.0	57°19.2	06.2	60°07.6	43.9	4°31.0	45.3	149°44.8	35.2	Saturn		03:07
14	204°04.4	72°18.8	05.6	75°08.4	43.5	19°33.0	45.5	164°47.4	35.2	Saturn	J2U J9.U	05.01
15	$219^{\circ}06.9$	87°18.4	•• 05.1	90°09.3	• • 43.2	34°35.0	• • 45.7	179°49.9	• • 35.1	Sep 14 Thu	SHA	Mer.pass
16	234°09.4	102°17.9	04.5	$105^{\circ}10.1$	42.8	49°36.9	45.9	194°52.5	35.1		228°54.7	09:11
17	$249^{\circ}11.8$	$117^{\circ}17.5$	03.9	$120^{\circ}11.0$	42.5	64°38.9	46.1	209°55.1	35.1	1	231°26.6	09:00
18	264°14.3	132°17.1	N17°03.4	135° 11.8	$N19^{\circ}42.1$	79°40.9	S00°46.4	224°57.6	N12°35.0		175°35.4	12:42
19	$279^{\circ}16.8$	$147^{\circ}16.7$	02.8	150° 12.7	41.7	94°42.9	46.6	240°00.2	35.0		320°41.7	03:03
20	$294^{\circ}19.2$	$162^{\circ}16.3$	02.2	$165^{\circ}13.5$	41.4	109°44.8	46.8	255°02.7	34.9			
21	309°21.7	177°15.9	•• 01.6	180° 14.4	• • 41.0	124°46.8	• • 47.0	270°05.3	• • 34.9	Horizont	al parallax	
22	324°24.1	192°15.4	01.1	195° 15.2	40.6	139°48.8	47.2	285°07.8	34.9		Venus:	0.2
23	339°26.6	207°15.0	00.5	210°16.1	40.3	154°50.8	47.4	300°10.4	34.8		Mars:	0.1
Mern	ass. 00:26	ν-0 4' d.0	0.6' m-4.15	νη 8' Α.Ω	.4′ m1.55	1/2 N/ dn	2′ m-1.67	v26/ d.C	.0′ m0.12			
.vici.p		ν σ.¬ u-0	7.13	- 5.5 u-0		ν 2.0 u0.	1.01	- 2.0 U-C	.5			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°56.2	N04°03.2	273°19.0	7.4'	N25°42.4	0.1'	56.7'
1	195° 56.4	02.3	287°45.4	7.4'	25°42.5	-0.0'	56.8'
2	210° 56.6	01.3	302°11.8	7.3'	25°42.5	-0.2'	56.8'
3 4	225°56.9 240°57.1	04°00.4 03°59.4	316°38.1 331°04.4	7.3' 7.2'	25°42.3 25°42.0	-0.3' -0.5'	56.8' 56.9'
5	255° 57.3	03 59.4 58.5	345°30.6	7.2'	25°41.5	-0.5 -0.6'	56.9'
6	270° 57.5	N03°57.5	359°56.8	7.2'	N25°40.9	-0.8'	57.0'
7	285°57.8	56.5	14°23.0	7.1'	25°40.1	-0.9'	57.0'
8	300°58.0	55.6	28°49.1	7.1'	25°39.2	-1.1'	57.0'
9	315°58.2	• • 54.6	43°15.2	7.1'	25°38.1	-1.2'	57.1'
10	330°58.4	53.7	57°41.3 72°07.3	7.0'	25°36.9	-1.4'	57.1'
11 12	345°58.6 0°58.9	52.7 N03°51.8	86°33.3	7.0' 7.0'	25°35.5 N25°33.9	-1.5' -1.7'	57.1' 57.2'
13	15° 59.1	50.8	100°59.3	6.9'	25°32.2	-1.7	57.2'
14	30°59.3	49.9	115°25.2	6.9'	25°30.4	-2.0'	57.2'
15	45°59.5	• • 48.9	129°51.1	6.9'	25°28.4	-2.1'	57.3'
16	60°59.7	47.9	144°17.0	6.9'	25°26.3	-2.3'	57.3'
17	76°00.0	47.0	158°42.9	6.8'	25°24.0	-2.5'	57.4
18	91°00.2 106°00.4	N03°46.0 45.1	173°08.7 187°34.5	6.8' 6.8'	N25°21.5 25°18.9	-2.6' -2.8'	57.4' 57.4'
19 20	106 00.4 121°00.6	45.1 44.1	202°00.3	6.8	25 18.9 25°16.1	-2.8 -2.9'	57.4 57.5'
21	136°00.9	• • 43.2	216°26.0	6.7	25°13.2	-2.9	57.5'
22	151°01.1	42.2	230°51.8	6.7'	25°10.1	-3.2'	57.5'
23	166°01.3	41.2	245°17.5	6.7'	25°06.9	-3.4'	57.6'
	SD = 15.9'	d = -1.0'		S	D = 15.5'		
Wed 0	GHA 181°01.5	Dec N03°40.3	GHA 259°43.2	ν 6.7'	Dec N25°03.5	d -3.5'	HP 57.6'
1	196° 01.7	39.3	274°08.9	6.7	25°00.0	-3.7'	57.7'
2	211°02.0	38.4	288°34.6	6.7'	24°56.3	-3.9'	57.7'
3	226°02.2	• • 37.4	303°00.3	6.7'	24°52.4	-4.0'	57.7'
4	241°02.4	36.5	317°25.9	6.7'	24°48.4	-4.2'	57.8'
5	256°02.6	35.5	331°51.6	6.6'	24°44.3	-4.3'	57.8'
6 7	271°02.9 286°03.1	N03°34.5 33.6	346°17.2 0°42.9	6.6' 6.6'	N24°39.9 24°35.5	-4.5' -4.6'	57.8' 57.9'
8	301°03.3	32.6	15°08.5	6.6'	24°30.8	-4.8'	57.9'
9	316°03.5	31.7	29°34.1	6.6'	24°26.1	-4.9'	58.0'
10	331°03.7	30.7	43°59.7	6.6'	24°21.1	-5.1'	58.0'
11	346°04.0	29.7	58°25.4	6.6'	24°16.0	-5.3'	58.0'
12	1°04.2	N03°28.8	72°51.0	6.6'	N24°10.8 24°05.4	-5.4'	58.1'
13 14	16°04.4 31°04.6	27.8 26.9	87°16.6 101°42.2	6.6' 6.6'	24 05.4 23°59.8	-5.6' -5.7'	58.1' 58.2'
15	46°04.8	25.9	116°07.8	6.6'	23°54.1	-5.9'	58.2
16	61°05.1	24.9	130°33.5	6.6'	23°48.2	-6.0'	58.2'
17	76°05.3	24.0	144°59.1	6.6'	23°42.2	-6.2'	58.3'
18	91°05.5	N03°23.0	159°24.7	6.6'	N23°36.0 23°29.7	-6.3'	58.3'
19 20	106°05.7 121°06.0	22.1 21.1	173°50.4 188°16.0	6.7' 6.7'	23°29.7 23°23.2	-6.5' -6.6'	58.4' 58.4'
21	136°06.2	. 20.2	202°41.7	6.7'	23°16.6	-6.8'	58.4
22	151°06.4	19.2	217°07.4	6.7	23°09.8	-6.9'	58.5'
23	166°06.6	18.2	231°33.1	6.7'	23°02.9	-7.1'	58.5'
	SD = 15.9'	d = -1.0'		S	D = 15.7'		
Thu	GHA	Dec	GHA		Dec	d	HP
i nu O	дна 181°06.8	N03°17.3	245°58.7	ν 6.7'	N22°55.8	a -7.2'	пР 58.5'
1	196°07.1	16.3	260°24.5	6.7'	22°48.5	-7.4	58.6'
2	211°07.3	15.4	274°50.2	6.7'	22°41.1	-7.5'	58.6'
3	226° 07.5	• • 14.4	289°15.9	6.8'	22°33.6	-7.7'	58.7'
4	241°07.7	13.4	303°41.7	6.8'	22°25.9	-7.8'	58.7'
5 6	256°08.0 271°08.2	12.5 N03°11.5	318°07.5 332°33.3	6.8' 6.8'	22°18.1 N22°10.1	-8.0' -8.1'	58.7' 58.8'
7	271 08.2 286°08.4	10.5	332 33.3 346°59.1	6.8	22°01.9	-8.1 -8.3	58.8'
8	301°08.6	09.6	1°24.9	6.9'	21°53.7	-8.4	58.9'
9	$316^{\circ}08.9$	• • 08.6	15°50.8	6.9'	21°45.2	-8.6'	58.9'
10	331°09.1	07.7	30°16.6	6.9'	21°36.7	-8.7'	58.9'
11	346°09.3	06.7	44°42.5	6.9'	21°28.0	-8.9'	59.0'
12	1°09.5 16°09.7	N03°05.7 04.8	59°08.5 73°34.4	6.9' 7.0'	N21°19.1 21°10.1	-9.0'	59.0'
13 14	16°09.7 31°10.0	04.8 03.8	73°34.4 88°00.4	7.0° 7.0'	21°10.1 21°00.9	-9.1' -9.3'	59.1' 59.1'
15	46° 10.2	•• 02.9	102°26.4	7.0'	20°51.6	-9.3 -9.4'	59.1
16	61° 10.4	01.9	116°52.4	7.1'	20°42.2	-9.6'	59.2'
17	76°10.6	00.9	131°18.4	7.1'	20°32.6	-9.7'	59.2'
18	91°10.9	N03°00.0	145°44.5	7.1'	N20°22.9	-9.8'	59.2'
19	106°11.1	02°59.0	160°10.6	7.1'	20°13.1 20°03.1	-10.0'	59.3' 59.3'
20 21	121°11.3 136°11.5	58.0 •• 57.1	174°36.8 189°02.9	7.2' 7.2'	20°03.1 19°53.0	-10.1' -10.3'	59.3° 59.4'
22	150 11.5 151° 11.7	56.1	203°29.1	7.2'	19° 42.7	-10.3	59.4'
23	166° 12.0	55.2	217°55.3	7.3'	19°32.3	-10.5'	59.4'
	SD = 15.9'	d = -1.0'		S	D = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Junioci	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
N 40°	04:40	05:12	05:39	18:11	18:39	19:11
35°	04:46	05:16	05:42	18:09	18:35	19:04
30°	04:52	05:20	05:44	18:07	18:31	18:59
20°	04:59	05:25	05:47	18:04	18:26	18:52
N 10°	05:04	05:29	05:50	18:01	18:22	18:47
0°	05:08	05:32	05:52	17:59	18:20	18:44
S 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° 35°	05:09	05:36	06:00	17:52	18:16	18:43
40°	05:07 05:05	05:37 05:37	06:02 06:03	17:50 17:49	18:15 18:16	18:45 18:47
45°	05:05	05:36	06:05	17:49	18:16	18:50
S 50°						
5 50°	04:58 04:56	05:36 05:35	06:08 06:09	17:45 17:44	18:17 18:17	18:54 18:57
54°	04:50	05:35	06:09	17:44	18:17	18:57 18:59
56°	04:54	05:34	06:10	17:43	18:19	19:02
58°	04:31	05:33	06:12	17:41	18:19	19:02
S 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°						
N 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
N 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
N 10°		00:24	01:23	12:34	13:29	14:24
0°		00:43	01:41	12:14	13:11	14:08
S 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
S 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
S 60°	03:43	04:26	04:50	08:18	09:34	11:08

		Sun		Moon			
Day	Eqn.o	f Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	50-29%	
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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
- Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	354°29.1	222°14.6	N16°59.9	225°16.9	N19°39.9	169°52.7	S00°47.6	315° 13.0	N12°34.8			
1	9°31.5	237°14.2	59.3	240°17.8	39.5	184°54.7	47.8	330° 15.5	34.8	Alpheratz	357°31.3	29°15.1
2	24°34.0	252° 13.8	58.8	255°18.7	39.2	199°56.7	48.1	345° 18.1	34.7	Ankaa	353°03.8	-42°08.7
3	39°36.5	267° 13.3	• • 58.2	270°19.5	38.8	214°58.7	• • 48.3	0°20.6	• • 34.7	Schedar	349°26.9	56°41.8
4	54°38.9	282° 12.9	57.6	285°20.4	38.4	230°00.6	48.5	15°23.2	34.6	Diphda	348°44.0	-17°49.5
5	69°41.4	202 12.9 297°12.5	57.0 57.0	300°21.2	38.1	245°02.6	48.7	30°25.7	34.6	Achernar	335°17.6	-57°05.2
6	84°43.9							45°28.3		Hamal	327°47.5	23°36.0
	99°46.3	312°12.1 327°11.7	N16°56.4	315°22.1 330°22.9	N19°37.7	260°04.6 275°06.5	S00°48.9	60°30.9	N12°34.6	Polaris	$312^{\circ}06.7$	89°22.8
7			55.9		37.3		49.1		34.5	Acamar	$315^{\circ}09.3$	$-40^{\circ}11.1$
8	114°48.8	342°11.3	55.3	345°23.8	37.0	290°08.5	49.3	75°33.4	34.5	Menkar	314°02.8	4°12.3
9	129°51.3	357° 10.8	• • 54.7	0°24.6	• • 36.6	305°10.5	• • 49.6	90°36.0	• • 34.5	Mirfak	308°23.6	49°57.6
10	144°53.7	12°10.4	54.1	15°25.5	36.2	320°12.5	49.8	105°38.5	34.4	Aldebaran	290°36.1	16°34.0
11	159°56.2	27° 10.0	53.5	30°26.4	35.9	335°14.4	50.0	120°41.1	34.4	Rigel	281°00.9	-8°10.0
12	174°58.6	42°09.6	N16°52.9	45°27.2	N19°35.5	350°16.4	S00°50.2	135°43.7	N12°34.3	Capella	280°17.4	46°01.4
13	190°01.1	57°09.2	52.4	60°28.1	35.1	5°18.4	50.4	150°46.2	34.3	Bellatrix	278°19.6	6°22.6
14	205°03.6	72°08.8	51.8	75°28.9	34.8	20°20.4	50.6	165°48.8	34.3	Elnath	277°58.0	28°37.8
15	220°06.0	87°08.3	• • 51.2	90°29.8	• • 34.4	35°22.3	• • 50.8	180°51.3	• • 34.2	Alnilam	275°34.7	-1°10.9
16	235°08.5	102°07.9	50.6	105°30.7	34.0	50°24.3	51.0	195° 53.9	34.2	Betelgeuse	270°48.9	7°24.8
17	250°11.0	117°07.5	50.0	120°31.5	33.7	65°26.3	51.3	210°56.4	34.1	Canopus	263°51.2	-52°42.4
18	265°13.4	132°07.1	N16°49.4	135°32.4	N19°33.3	80°28.3	S00°51.5	225°59.0	N12°34.1	Sirius	258°23.7	-16°45.2
19	280°15.9	147°06.7	48.8	150°33.2	32.9	95°30.2	51.7	241°01.6	34.1	Adhara	255°03.6	-10° 43.2 -29° 00.5
20	295°18.4	162°06.3	48.2	165°34.1	32.6	110°32.2	51.9	256°04.1	34.0			
21	310°20.8	177°05.8	• • 47.6	180°34.9	• • 32.2	125°34.2	• • 52.1	271°06.7	• • 34.0	Procyon	244°47.9	5°09.1 27°57.3
22	325°23.3	192°05.4	47.0	195°35.8	31.8	$140^{\circ}36.1$	52.3	286°09.3	33.9	Pollux	243°13.8	
23	340°25.8	207°05.0	46.5	210°36.7	31.4	155°38.1	52.5	301°11.8	33.9	Avior	234°13.9	-59°35.9
										Suhail	222°44.4	-43°32.8
Mer.p	pass. 00:22	ν -0.4′ d -0).6′ m-4.14	ν 0.9′ d -0	0.4′ m1.55	ν 2.0′ d0.	2′ m-1.67	ν 2.6′ d -0	0.0′ m0.12	Miaplacidus	221°38.3	-69°50.0
										Alphard	217°45.1	-8°47.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.6	11°49.6
0	355°28.2	222°04.6	N16°45.9	225°37.5	N19°31.1	170°40.1	S00°52.7	316° 14.4	N12°33.9	Dubhe	193°38.1	61°35.7
1	10°30.7	237°04.2	45.3	240°38.4	30.7	185°42.1	53.0	331° 16.9	33.8	Denebola	182°22.2	14°24.7
2	25°33.1	252°03.7	44.7	255°39.2	30.3	200°44.0	53.2	346° 19.5	33.8	Gienah	175°40.8	-17°42.1
3	40°35.6	267° 03.3	• • 44.1	270°40.1	30.0	200°44.0 215°46.0	• • 53.4	1°22.1	• • 33.7	Acrux	172°57.3	-63°15.6
4						230°48.0		16°24.6		Gacrux	171°48.7	-57°16.5
	55°38.1	282°02.9	43.5	285°41.0	29.6		53.6		33.7	Alioth	$166^{\circ}11.0$	55°48.3
5	70°40.5	297°02.5	42.9	300°41.8	29.2	245°50.0	53.8	31°27.2	33.7	Spica	158°19.4	-11°18.6
6	85°43.0	312°02.1	N16°42.3	315°42.7	N19°28.9	260°51.9	S00°54.0	46°29.7	N12°33.6	Alkaid	$152^{\circ}50.1$	49°10.3
7	100°45.5	327°01.7	41.7	330°43.6	28.5	275°53.9	54.2	61°32.3	33.6	Hadar	148°32.1	-60°30.8
8	115°47.9	342°01.2	41.1	345°44.4	28.1	290°55.9	54.5	76°34.9	33.5	Menkent	147°54.3	-36°30.7
9	130°50.4	357°00.8	• • 40.5	0°45.3	• • 27.7	305°57.9	• • 54.7	91°37.4	• • 33.5	Arcturus	145°45.4	19°02.1
10	145°52.9	12°00.4	39.9	15°46.1	27.4	320°59.8	54.9	106°40.0	33.5	Rigil Kent.	139°36.5	-60°57.4
11	160°55.3	27°00.0	39.3	30°47.0	27.0	336°01.8	55.1	121°42.6	33.4	Kochab	137°20.8	74°02.4
12	175°57.8	41°59.6	N16°38.6	45°47.9	N19°26.6	351°03.8	S00°55.3	136°45.1	N12°33.4	Zuben'ubi	136°52.9	-16°09.6
13	191°00.2	56° 59.2	38.0	60°48.7	26.3	6°05.7	55.5	151°47.7	33.3	Alphecca	126°01.4	26°37.3
14	206°02.7	71°58.7	37.4	75°49.6	25.9	21°07.7	55.7	166°50.2	33.3	Antares	112° 12.2	-26°29.7
15	221°05.2	86°58.3	• • 36.8	90°50.5	• • 25.5	36°09.7	• • 55.9	181°52.8	• • 33.3	Atria	107°03.7	-69°04.9
16	236°07.6	101°57.9	36.2	105°51.3	25.1	51°11.7	56.2	$196^{\circ}55.4$	33.2	Sabik	101°59.4	-09 04.9 -15°45.5
17	$251^{\circ}10.1$	116°57.5	35.6	120°52.2	24.8	66°13.6	56.4	211°57.9	33.2		96°06.3	-13 45.5 -37°07.5
18	266°12.6	131°57.1	N16°35.0	135°53.0	N19°24.4	81°15.6	S00°56.6	227°00.5	N12°33.1	Shaula		
19	281°15.0	146°56.7	34.4	150°53.9	24.0	96°17.6	56.8	242°03.1	33.1	Rasalhague	95°55.8	12°32.6
20	296°17.5	161°56.2	33.8	165°54.8	23.6	111°19.6	57.0	257°05.6	33.1	Eltanin	90°40.7	51°29.5
21	311°20.0	176°55.8	• • 33.2	180°55.6	• • 23.3	126°21.5	57.2	272°08.2	• • 33.0	Kaus Aust.	83°28.4	-34°22.2
22	326°22.4	191°55.4	32.5	195°56.5	22.9	141°23.5	57.4	287° 10.8	33.0	Vega	80°31.1	38°49.0
23	341°24.9	206°55.0	31.9	210°57.4	22.5	156°25.5	57.6	302°13.3	32.9	Nunki	75°43.9	-26°15.5
										Altair	61°56.8	8°56.9
Mer.p	oass. 00:18	ν -0.4′ d -0).6′ m-4.14	ν 0.9' d-0	0.4′ m1.55	$\nu 2.0' \ d0.$	2′ m-1.67	ν 2.6′ d-0	0.0' m 0.11	Peacock	53°00.7	-56°38.5
										Deneb	49°23.4	45°23.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.5	10°00.7
Sun 0	356°27.4	221°54.6	N16°31.3	225°58.2	N19°22.1	171°27.4	S00°57.9	317° 15.9	N12° 32.9	Al Na'ir	27°28.8	-46°49.2
1	350 27.4 11°29.8	221 54.0 236°54.2	30.7	225 58.2 240°59.1	21.8	171 27.4 186°29.4	58.1	317 15.9 332°18.4	32.9	Fomalhaut	15°10.9	-29°28.0
2						201°31.4		347°21.0		Scheat	13°41.9	28°14.6
3	26°32.3	251°53.7 266°53.3	30.1	256°00.0	21.4 · · 21.0		58.3	2°23.6	32.8	Markab	13°26.6	15°21.8
3 4	41°34.7 56°37.2	266°53.3 281°52.9	· · 29.5	271°00.8		216°33.4 231°35.3	· · 58.5		•• 32.8	Sep 15 Fri	SHA	Mer.pass
			28.9	286°01.7	20.6		58.7	17°26.1	32.7		227°45.5	09:11
5	71°39.7	296°52.5	28.2	301°02.6	20.3	246°37.3	58.9	32°28.7	32.7	Venus		09:11
6	86°42.1	311°52.1	N16°27.6	316°03.4	N19°19.9	261°39.3	S00°59.1	47°31.3	N12°32.7			
7	101°44.6	326°51.6	27.0	331°04.3	19.5	276°41.2	59.4	62°33.8	32.6		175°23.7	12:39
8	116°47.1	341°51.2	26.4	346°05.2	19.1	291°43.2	59.6	77°36.4	32.6	Saturn	320°43.9	02:59
9	131°49.5	356° 50.8	• • 25.7	1°06.0	• • 18.8	306°45.2	00°59.8	92°39.0	• • 32.5	Sep 16 Sat	SHA	Mer.pass
10	146°52.0	11°50.4	25.1	16°06.9	18.4	321°47.2	01°00.0	107°41.5	32.5		226°36.4	09:12
11	161°54.5	26° 50.0	24.5	31°07.8	18.0	336°49.1	00.2	122°44.1	32.5	Mars		08:57
12	176°56.9	41°49.6	N16°23.9	46°08.6	N19°17.6	351°51.1	S01°00.4	137°46.7	N12°32.4		175°11.9	12:36
13	191°59.4	56°49.1	23.2	61°09.5	17.3	6°53.1	00.6	152°49.2	32.4	Saturn	320°46.2	02:55
14	207°01.9	71°48.7	22.6	76°10.4	16.9	21°55.1	8.00	167°51.8	32.3	Jutuill	0.2	02.00
15	222°04.3	86°48.3	• • 22.0	91°11.2	• • 16.5	36°57.0	•• 01.1	182°54.4	• • 32.3	Sep 17 Sun	SHA	Mer.pass
16	237°06.8	101°47.9	21.4	106°12.1	16.1	51°59.0	01.3	197° 56.9	32.3	Venus		09:13
17	252°09.2	116° 47.5	20.7	121°13.0	15.7	67°01.0	01.5	212°59.5	32.2	Mars		08:56
18	267°11.7	131° 47.1	N16°20.1	136°13.9	N19°15.4	82°02.9	S 01°01.7	228°02.1	N12°32.2	Jupiter	$175^{\circ}00.1$	12:33
19	282°14.2	146°46.6	19.5	151°14.7	15.0	97°04.9	01.9	243°04.6	32.1	Saturn	320°48.5	02:50
20	297°16.6	161°46.2	18.8	166°15.6	14.6	112°06.9	02.1	258° 07.2	32.1			
21	312°19.1	176° 45.8	•• 18.2	181°16.5	• • 14.2	127°08.9	•• 02.3	273°09.8	• • 32.0	Horizont	al parallax	
22	$327^{\circ}21.6$	191°45.4	17.6	196°17.3	13.9	$142^{\circ}10.8$	02.6	$288^{\circ}12.3$	32.0		Venus:	0.1
23	342°24.0	206°45.0	16.9	211°18.2	13.5	157°12.8	02.8	303°14.9	32.0		Mars:	0.1
N A · ·	2000 00:14	0 4/ -1 0	0.6' m-4.13	10 0/ -1 C	0.4′ m1.54		2′ m-1.67	106/ 10	0.0′ m0.11			
ivier.p	oass. 00:14	ν -0.4 a -0	III-4.13	ν 0.9 a -0	v. + 1111.54	ν2.0 a0.	∠ III-1.U/	ν 2.0 a -0	1110.11			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°12.2	N02°54.2	232°21.6	7.3'	N19°21.8	-10.7'	59.5'
1 2	196°12.4 211°12.6	53.2 52.3	246°47.9 261°14.2	7.3' 7.3'	19°11.1 19°00.3	-10.8' -10.9'	59.5' 59.5'
3	226°12.9	51.3	275°40.5	7.4'	18° 49.4	-10.9	59.6'
4	241°13.1	50.3	290°06.9	7.4'	$18^{\circ}38.4$	-11.2'	59.6'
5	256°13.3	49.4	304°33.3	7.4'	18°27.2	-11.3'	59.6'
6 7	271°13.5 286°13.7	N02°48.4 47.5	318°59.8 333°26.3	7.5' 7.5'	N18° 15.9 18° 04.4	-11.4' -11.6'	59.7' 59.7'
8	301°14.0	46.5	347°52.8	7.5'	17°52.9	-11.7'	59.8'
9	316°14.2	• • 45.5	$2^{\circ}19.3$	7.6'	$17^{\circ}41.2$	-11.8'	59.8'
10	331°14.4 346°14.6	44.6 43.6	16°45.9 31°12.5	7.6'	17°29.4 17°17.4	-11.9'	59.8'
11 12	1°14.9	N02°42.6	45°39.1	7.6' 7.7'	N17°05.4	-12.1' -12.2'	59.9' 59.9'
13	16°15.1	41.7	60°05.8	7.7'	16°53.2	-12.3'	59.9'
14	31°15.3	40.7	74°32.5	7.7'	16°40.9	-12.4'	60.0'
15 16	46°15.5 61°15.7	· · 39.7 38.8	88°59.3 103°26.0	7.8' 7.8'	16°28.5 16°16.0	-12.5' -12.6'	60.0' 60.0'
17	76°16.0	37.8	117°52.9	7.8'	16°03.4	-12.7'	60.1
18	91°16.2	N02°36.9	$132^{\circ}19.7$	7.9'	$N15^{\circ}50.6$	-12.9'	60.1'
19 20	106°16.4 121°16.6	35.9 34.9	146°46.6 161°13.5	7.9' 7.9'	15° 37.8 15° 24.8	-13.0' -13.1'	60.1' 60.2'
21	121 16.6 136°16.9	34.9	101 13.5 175°40.4	7.9 8.0'	15 24.8 15°11.7	-13.1 -13.2'	60.2
22	151°17.1	33.0	190°07.4	8.0'	14°58.5	-13.3	60.2
23	166°17.3	32.0	204°34.4	8.0'	14°45.2	-13.4'	60.3'
	SD = 15.9'	d = -1.0'		S	D = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°17.5	N02°31.1	$219^{\circ}01.5$	8.1'	$N14^{\circ}31.8$	-13.5'	60.3'
1	196°17.8	30.1	233°28.6	8.1'	14° 18.4	-13.6'	60.3'
2	211°18.0 226°18.2	29.1 •• 28.2	247°55.7 262°22.8	8.1' 8.2'	14°04.8 13°51.1	-13.7' -13.8'	60.3' 60.4'
4	241°18.4	27.2	276°50.0	8.2'	13°37.3	-13.6' -13.9'	60.4
5	256°18.6	26.2	291°17.2	8.2'	13°23.4	-14.0'	60.4'
6	271°18.9	N02°25.3	305°44.5	8.3'	N13°09.4	-14.1'	60.5
7 8	286°19.1 301°19.3	24.3 23.3	320°11.7 334°39.0	8.3' 8.3'	12°55.3 12°41.1	-14.2' -14.3'	60.5' 60.5'
9	316°19.5	22.4	349°06.4	8.4'	12°26.8	-14.4'	60.6
10	331°19.8	21.4	3°33.7	8.4'	12° 12.5	-14.4'	60.6'
11 12	346°20.0 1°20.2	20.4 N02° 19.5	18°01.1 32°28.5	8.4' 8.4'	11°58.0 N11°43.5	-14.5' -14.6'	60.6' 60.6'
13	16°20.4	18.5	32 20.5 46°56.0	8.5'	11°28.9	-14.0 -14.7'	60.7
14	31°20.6	17.5	61°23.5	8.5'	11°14.2	-14.8'	60.7'
15	46°20.9	• • 16.6	75°51.0	8.5'	10°59.4 10°44.6	-14.9'	60.7'
16 17	61°21.1 76°21.3	15.6 14.6	90°18.5 104°46.1	8.6' 8.6'	10° 44.6 10° 29.6	-14.9' -15.0'	60.7' 60.8'
18	91°21.5	N02° 13.7	119°13.6	8.6'	N10° 14.6	-15.1'	60.8'
19	106°21.8	12.7	133°41.3	8.6'	09°59.5	-15.2'	60.8'
20 21	121°22.0 136°22.2	11.7 •• 10.8	148°08.9 162°36.6	8.7' 8.7'	09°44.4 09°29.1	-15.2' -15.3'	60.8' 60.9'
22	151°22.4	09.8	177°04.2	8.7'	09°13.8	-15.4'	60.9
23	166°22.6	08.8	191°31.9	8.7'	08°58.5	-15.4'	60.9'
	SD = 15.9'	d = -1.0'		S	D = 16.4'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°22.9	N02°07.9	205°59.7	8.8'	N08°43.0	-15.5'	60.9'
1 2	196°23.1 211°23.3	06.9 05.9	220°27.4 234°55.2	8.8' 8.8'	08°27.5 08°12.0	-15.6' -15.6'	60.9'
3	211 23.3 226°23.5	· · 05.0	234°55.2 249°23.0	8.8'	08° 12.0 07° 56.4	-15.6 -15.7'	61.0' 61.0'
4	241°23.8	04.0	263°50.8	8.8'	07°40.7	-15.7'	61.0'
5	256°24.0	03.0	278°18.6	8.8'	07°25.0	-15.8'	61.0'
6 7	271°24.2 286°24.4	N02°02.1 01.1	292°46.5 307°14.4	8.9' 8.9'	N07°09.2 06°53.3	-15.8' -15.9'	61.0' 61.1'
8	301°24.6	$02^{\circ}00.1$	321°42.2	8.9'	06°37.4	-15.9'	61.1
9	316°24.9	01°59.2	336°10.1	8.9'	06°21.5	-16.0'	61.1'
10 11	331°25.1 346°25.3	58.2 57.2	350°38.0 5°06.0	8.9' 8.9'	06°05.5 05°49.5	-16.0' -16.1'	61.1' 61.1'
12	1°25.5	N01°56.3	19°33.9	9.0'	N05°33.4	-16.1	61.1
13	16°25.8	55.3	$34^{\circ}01.9$	9.0'	$05^{\circ}17.3$	-16.2'	61.2'
14 15	31°26.0 46°26.2	54.3	48°29.8 62°57.8	9.0' 9.0'	05°01.1 04°44.9	-16.2'	61.2'
15 16	46°26.2 61°26.4	· · 53.4 52.4	62°57.8 77°25.8	9.0'	04°44.9 04°28.7	-16.2' -16.3'	61.2' 61.2'
17	76°26.7	51.4	91°53.8	9.0'	04°12.4	-16.3	61.2'
18	91°26.9	N01°50.5	106°21.8	9.0'	N03°56.2	-16.3'	61.2'
19 20	106°27.1 121°27.3	49.5 48.5	120°49.8 135°17.9	9.0' 9.0'	03°39.8 03°23.5	-16.4' -16.4'	61.2' 61.2'
21	136°27.5	47.6	149°45.9	9.0'	03° 07.1	-16.4	61.2
22	151°27.8	46.6	164°13.9	9.0'	02°50.7	-16.4'	61.3'
23	166°28.0	45.6	178°42.0	9.0'	02°34.3	-16.4'	61.3'
	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
N 58°	04:05	04:53	05:33	18:15	18:55	19:43
56°	04:11	04:57	05:34	18:14	18:51	19:36
54°	04:17	05:00	05:36	18:12	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
N 40°	04:43	05:15	05:42	18:06	18:33	19:05
35°	04:49	05:19	05:44	18:05	18:30	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
S 10°	05:08	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:33	05:55	17:55	18:17	18:42
30°	05:05	05:33	05:56	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
S 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
S 60°	04:35	05:24	06:05	17:46	18:27	19:16

Lat.		Moonris	se		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	23:55		02:41	19:06	18:15	17:42
N 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°		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
N 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
N 10°		03:22	04:21	15:16	16:06	16:54
0°	02:37	03:32	04:26	15:04	15:58	16:51
S 10°		03:43	04:32	14:51	15:50	16:48
20°		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°		04:21	04:53	14:03	15:19	16:36
45°	03:59	04:30	04:58	13:51	15:11	16:33
S 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°		04:59	05:13	13:12	14:48	16:24
58°		05:06	05:16	13:02	14:42	16:22
S 60°	05:05	05:14	05:20	12:51	14:35	16:19

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
- ",	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	357°26.5	221°44.6	N16°16.3	226° 19.1	N19° 13.1	172°14.8	S01°03.0	318°17.5	N12°31.9		3114	
1	12°29.0	236°44.2	15.7	241°20.0	12.7	187°16.7	03.2	333°20.1	31.9	Alpheratz	357°31.3	29°15.1
2	27°31.4	251°43.7	15.7	256° 20.8	12.7	202°18.7	03.2	348°22.6	31.8	Ankaa	353°03.8	-42°08.8
										Schedar	$349^{\circ}26.9$	56°41.8
3	42°33.9	266°43.3	• • 14.4	271°21.7	• • 12.0	217°20.7	• • 03.6	3°25.2	• • 31.8	Diphda	348°44.0	-17°49.5
4	57°36.3	281°42.9	13.8	286°22.6	11.6	232°22.7	03.8	18°27.8	31.8	Achernar	335°17.5	-57°05.2
5	72°38.8	296°42.5	13.1	301°23.4	11.2	247°24.6	04.0	33°30.3	31.7	Hamal	327°47.5	23°36.0
6	87°41.3	311°42.1	N16°12.5	316°24.3	N19° 10.8	262°26.6	S01°04.3	48°32.9	N12°31.7	Polaris	312°05.4	89°22.8
7	102°43.7	326°41.7	11.8	331°25.2	10.4	277°28.6	04.5	63°35.5	31.6	Acamar	315°09.3	-40°11.1
8	117°46.2	341°41.2	11.2	346°26.1	10.1	292°30.5	04.7	78°38.0	31.6	Menkar	314°02.8	4°12.3
9	132°48.7	356°40.8	• • 10.6	1°26.9	• • 09.7	307°32.5	• • 04.9	93°40.6	• • 31.5	Mirfak	308°23.6	49°57.7
10	147°51.1	11°40.4	09.9	16°27.8	09.3	322°34.5	05.1	108°43.2	31.5	Aldebaran	290°36.1	16°34.0
11	162°53.6	26°40.0	09.3	31°28.7	08.9	337°36.5	05.3	123°45.8	31.5	Rigel	281°00.9	-8°10.0
12	177°56.1	41°39.6	N16°08.6	46°29.6	N19°08.5	352°38.4	S01°05.5	138°48.3	N12°31.4	Capella	280°17.4	46°01.4
13	192°58.5	56°39.2	08.0	61°30.4	08.2	7°40.4	05.8	153°50.9	31.4	Bellatrix	278°19.6	6°22.6
14	208°01.0	71°38.7	07.3	76°31.3	07.8	22°42.4	06.0	168°53.5	31.3	Elnath	277°58.0	28°37.8
15	223°03.5	86°38.3	• • 06.7	91°32.2	• • 07.4	37°44.3	• • 06.2	183°56.0	• • 31.3	Alnilam	275°34.7	-1°10.9
16	238°05.9	101°37.9	06.0	106°33.1	07.0	52°46.3	06.4	198°58.6	31.2	Betelgeuse	270°48.8	7°24.8
17	253°08.4	116°37.5	05.4	121°33.9	06.6	67°48.3	06.6	214°01.2	31.2	Canopus	263°51.1	-52°42.4
18	268°10.8	131°37.1	N16°04.7	136° 34.8	N19°06.2	82°50.3	S01°06.8	229°03.7	N12°31.2	Sirius	258°23.7	-16°45.2
19	283°13.3	146°36.7	04.1	151°35.7	05.9	97°52.2	07.0	244°06.3	31.1	Adhara	255°03.6	-29°00.5
20	298°15.8	161°36.3	03.4	166°36.6	05.5	112°54.2	07.2	259°08.9	31.1	Procyon	244° 47.8	5°09.1
21	313°18.2	176°35.8	• • 02.8	181°37.4	•• 05.1	127°56.2	• • 07.5	274°11.5	• • 31.0	Pollux	243°13.8	27°57.3
22	328°20.7	191°35.4	02.1	196°38.3	04.7	142°58.1	07.7	289°14.0	31.0	Avior	234°13.8	-59°35.9
23	343°23.2	206°35.0	01.5	211°39.2	04.3	158°00.1	07.9	304°16.6	31.0	Suhail	222°44.4	-43°32.8
Mern	ass. 00:10	ν-0 4' d.0	0.6′ m-4.13	ν0 0' d.0).4' m1.54	1/2 N/ d0	2′ m-1.67	v26' d.C	.0′ m0.10	Miaplacidus	221°38.2	-69°50.0
- ivici.p		ν σ. τ u-0	111-4.13	ν σ.σ · u-0	,, T IIII.J4	ν2.0 u0.	_ 111-1.07	ν 2.0 U-C	.5 1110.10	Alphard	221 36.2 217°45.1	-8°46.9
										Regulus	207°31.6	11°49.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.7
0	358°25.6	221°34.6	N16°00.8	226°40.1	N19°03.9	173°02.1	S01°08.1	319°19.2	N12°30.9	Denebola	182°22.2	14°24.7
1	13°28.1	236°34.2	16°00.2	241°40.9	03.6	188°04.0	08.3	334°21.8	30.9	Gienah	175°40.8	-17°42.1
2	28°30.6	251°33.8	15°59.5	256°41.8	03.2	203°06.0	08.5	349°24.3	30.8		175 40.8 172°57.3	-17 42.1 -63°15.6
3	43°33.0	266°33.3	• • 58.9	271°42.7	• • 02.8	218°08.0	• • 08.7	4°26.9	• • 30.8			
4	58°35.5	281°32.9	58.2	286°43.6	02.4	233°10.0	09.0	19°29.5	30.7	Gacrux	171°48.7	-57°16.5
5	73°37.9	296°32.5	57.5	301°44.4	02.0	248°11.9	09.2	34°32.0	30.7	Alioth	166°11.0	55°48.3
6	88°40.4	311°32.1	N15°56.9	316° 45.3	N19°01.6	263°13.9	S01°09.4	49°34.6	N12°30.7	Spica	158° 19.4	-11°18.6
7	103°42.9	326°31.7	56.2	331°46.2	01.3	278°15.9	09.6	64°37.2	30.6	Alkaid	152°50.1	49°10.3
8	118°45.3	341°31.3	55.6	346°47.1	00.9	293°17.8	09.8	79°39.8	30.6	Hadar	148°32.1	-60°30.8
9	133°47.8	356°30.9	• • 54.9	1°48.0	00.5	308°19.8	. 10.0	94°42.3	30.5	Menkent	147°54.3	-36°30.7
10	148°50.3	11°30.4	54.2	16°48.8	19°00.1	323°21.8	10.2	109°44.9	30.5	Arcturus	145°45.4	19°02.1
11	163°52.7	26°30.0	53.6	31°49.7	18°59.7	338°23.8	10.4	124°47.5	30.4	Rigil Kent.	139°36.5	-60°57.4
12	178°55.2	41°29.6	N15°52.9	46°50.6	N18°59.3	353°25.7	S01°10.7	139°50.1	N12°30.4	Kochab	137°20.9	74°02.4
13	193°57.7	56°29.2	52.2	61°51.5	58.9	8°27.7	10.9	154°52.6	30.3	Zuben'ubi	136°52.9	-16°09.6
14	209°00.1	71°28.8	51.6	76°52.4	58.6	23°29.7	11.1	169°55.2	30.3	Alphecca	126°01.4	26°37.3
15	209 00.1 224°02.6	86°28.4	50.9	91°53.2	58.2	38°31.6	•• 11.3	184°57.8	30.3	Antares	$112^{\circ}12.2$	-26°29.7
16	239°05.1	101°28.0	50.9	106°54.1	57.8	53°33.6	11.5	200°00.4	30.2	Atria	107°03.8	-69°04.9
17	254°07.5	101°28.0° 116°27.5	49.6	100 54.1 121°55.0	57.8 57.4	68°35.6	11.7	215°02.9	30.2	Sabik	101°59.4	-15°45.5
18	269°10.0	131°27.1	N15°48.9	136°55.9	N18° 57.0	83°37.6	S01°11.9	230°05.5	N12°30.1	Shaula	$96^{\circ}06.3$	-37°07.5
19	284°12.4	131 27.1 146°26.7		150°55.9		98°39.5		245°08.1		Rasalhague	95°55.8	12°32.6
			48.2		56.6		12.2		30.1	Eltanin	90°40.8	51°29.5
20	299°14.9	161°26.3	47.6	166°57.6	56.2	113°41.5	12.4	260°10.7	30.0	Kaus Aust.	83°28.5	-34°22.2
21	314°17.4 329°19.8	176°25.9 191°25.5	• • 46.9	181°58.5	• • 55.9	128°43.5 143°45.4	• • 12.6	275°13.2 290°15.8	• • 30.0	Vega	80°31.1	38°49.0
22			46.2	196°59.4	55.5		12.8		30.0	Nunki	75°43.9	-26°15.5
23	344°22.3	206°25.1	45.5	212°00.3	55.1	158°47.4	13.0	305°18.4	29.9	Altair	$61^{\circ}56.9$	8°56.9
Mer.p	ass. 00:06	ν -0.4' d-0	.7′ m-4.12	ν 0.9′ d-0).4′ m1.54	$\nu 2.0' d0.$	2′ m-1.67	$\nu 2.6' \ d-0$.0′ m0.10	Peacock	53°00.7	-56°38.5
										Deneb	49°23.4	45°23.3
			_		_		_		_	Enif	33°35.6	10°00.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}28.8$	-46°49.2
0	359°24.8	221°24.6	N15°44.9	227°01.2	N18°54.7	173°49.4	S01°13.2	320°21.0	N12°29.9	Fomalhaut	$15^{\circ}10.9$	-29°28.0
1	14°27.2	236°24.2	44.2	242°02.1	54.3	188°51.3	13.4	335°23.5	29.8	Scheat	$13^{\circ}41.9$	28°14.6
2	29°29.7	251°23.8	43.5	257°02.9	53.9	203°53.3	13.6	350°26.1	29.8	Markab	$13^{\circ}26.6$	15°21.9
3	44°32.2	266°23.4	• • 42.9	272°03.8	• • 53.5	218°55.3	• • 13.9	5°28.7	• • 29.7	Cor 10 14	CIIA	Marrier
4	59°34.6	281°23.0	42.2	287°04.7	53.1	233°57.3	14.1	20°31.3	29.7	Sep 18 Mon	SHA	Mer.pass
5	74°37.1	296°22.6	41.5	302°05.6	52.7	248°59.2	14.3	35°33.8	29.7		224°18.1	09:13
6	89°39.5	311°22.2	N15°40.8	317°06.5	N18°52.4	264°01.2	S01°14.5	50°36.4	N12°29.6		228°52.6	08:54
7	104°42.0	326°21.7	40.1	332°07.4	52.0	279°03.2	14.7	65°39.0	29.6		174°48.3	12:29
8	119°44.5	341°21.3	39.5	347°08.2	51.6	294°05.1	14.9	80°41.6	29.5	Saturn	320°51.0	02:46
9	134°46.9	356°20.9	• • 38.8	2°09.1	• • 51.2	309°07.1	. 15.1	95°44.2	• • 29.5	Sep 19 Tue	SHA	Mer.pass
10	149°49.4	11°20.5	38.1	17°10.0	50.8	324°09.1	15.4	110°46.7	29.4		223°09.0	09:14
11	164°51.9	26°20.1	37.4	32°10.9	50.4	339°11.0	15.6	125°49.3	29.4		228°14.4	08:53
12	179°54.3	41°19.7	N15°36.7	47°11.8	N18°50.0	354°13.0	S01°15.8	140°51.9	N12°29.3		174°36.5	12:26
13	194°56.8	56°19.3	36.0	62°12.7	49.6	9°15.0	16.0	155°54.5	29.3		320°53.6	02:42
14	209°59.3	71°18.9	35.4	77°13.6	49.2	24°17.0	16.2	170°57.0	29.3			
15	225°01.7	86°18.4	• • 34.7	92°14.4	• • 48.9	39°18.9	• • 16.4	185°59.6	• • 29.2	Sep 20 Wed	SHA	Mer.pass
16	240°04.2	101°18.0	34.0	107°15.3	48.5	54°20.9	16.6	201°02.2	29.2		221°59.9	09:15
17	255°06.7	116°17.6	33.3	122°16.2	48.1	69°22.9	16.8	216°04.8	29.1		$227^{\circ}36.4$	08:51
18	270°09.1	131°17.2	N15°32.6	137° 17.1	N18° 47.7	84°24.8	S01°17.1	231°07.4	N12°29.1		174°24.6	12:23
19	285°11.6	146°16.8	31.9	152°18.0	47.3	99°26.8	17.3	246°09.9	29.0	Saturn	320°56.2	02:38
20	300°14.0	161°16.4	31.2	167° 18.9	46.9	114°28.8	17.5	261°12.5	29.0	Uautaa -	al nevelle	
21	315°16.5	176°16.0	• • 30.5	182°19.8	• • 46.5	129°30.7	• • 17.7	276°15.1	• • 28.9	norizont	al parallax	0.1
22	330°19.0	191°15.6	29.9	197°20.7	46.1	144°32.7	17.9	291°17.7	28.9		Venus:	0.1
23	345°21.4	206°15.1	29.2	212°21.5	45.7	159°34.7	18.1	306°20.3	28.9		Mars:	0.1
Mern	ass. 23:58	ν -0.4' d-0	0.7′ m-4.12	$\nu 0.9' d_{-}0$	0.4' m1.54	ν^2 0' d0	2′ m-1.67	ν2 6' d-0	.0′ m0.09			
р				- 3.5 4 0								

h	Su	n	Moon					
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	181°28.2	N01°44.7	193°10.0	9.0'	N02°17.8	-16.5'	61.3'	
1	196°28.4	43.7	207°38.1	9.0'	02°01.3	-16.5'	61.3'	
2	211°28.7	42.7	222°06.1	9.0'	01°44.9	-16.5'	61.3'	
3	226°28.9 241°29.1	· · 41.8 40.8	236°34.2 251°02.2	9.0' 9.0'	01°28.4 01°11.8	-16.5'	61.3' 61.3'	
4 5	256°29.3	40.8 39.8	265°30.2	9.0' 9.0'	01 11.8 00°55.3	-16.5' -16.5'	61.3	
6	271°29.5	N01°38.8	279°58.3	9.0'	N00°38.8	-16.5	61.3	
7	286°29.8	37.9	294°26.3	9.0'	00°22.3	-16.5'	61.3'	
8	301°30.0	36.9	308°54.4	9.0'	N00°05.7	-16.5'	61.3'	
9	316°30.2	• • 35.9	323°22.4	9.0'	S00°10.8	16.5'	61.3'	
10	331°30.4	35.0	337°50.4	9.0'	00°27.4	16.5	61.3'	
11 12	346°30.6 1°30.9	34.0 N01°33.0	352°18.5 6°46.5	9.0' 9.0'	00°43.9 501°00.4	16.5' 16.5'	61.3' 61.3'	
13	16°31.1	32.1	21°14.5	9.0'	01°17.0	16.5	61.3	
14	31°31.3	31.1	35°42.5	9.0'	01°33.5	16.5	61.3	
15	46°31.5	• • 30.1	50°10.5	9.0'	01°50.0	16.5'	61.3'	
16	61°31.8	29.2	64°38.5	9.0'	02°06.5	16.5'	61.3'	
17	76°32.0	28.2	79°06.4	9.0'	02°23.0	16.5'	61.3'	
18	91°32.2	N01°27.2	93°34.4 108°02.3	8.9'	\$02°39.5	16.5'	61.3'	
19 20	106°32.4 121°32.6	26.2 25.3	108°02.3 122°30.3	8.9' 8.9'	02°55.9 03°12.4	16.4' 16.4'	61.3' 61.3'	
21	136°32.9	24.3	136°58.2	8.9'	03°28.8	16.4	61.3	
22	151°33.1	23.3	151°26.1	8.9'	03°45.2	16.4	61.3'	
23	166°33.3	22.4	165°54.0	8.9'	$04^{\circ}01.5$	16.3'	61.3'	
	SD = 15.9'	d = -1.0'		S	D = 16.7'			
_								
Tue 0	GHA 181°33.5	Dec N01°21.4	GHA 180°21.8	ν 8.8'	Dec \$04°17.9	d 16.3'	HP 61.3'	
1	196°33.8	20.4	100 21.6 194°49.7	o.o 8.8'	04°34.2	16.3	61.3	
2	211°34.0	19.5	209°17.5	8.8'	04°50.5	16.2	61.3	
3	226°34.2	•• 18.5	223°45.3	8.8'	05°06.7	16.2'	61.3'	
4	241°34.4	17.5	238°13.1	8.8'	05°22.9	16.2'	61.3'	
5	256°34.6 271°34.9	16.5 N01°15.6	252°40.9 267°08.6	8.7' 8.7'	05°39.1 \$05°55.2	16.1'	61.3'	
6 7	271 34.9 286°35.1	14.6	281°36.3	8.7'	06°11.3	16.1' 16.0'	61.3' 61.3'	
8	301°35.3	13.6	296°04.0	8.7'	06°27.4	16.0'	61.2	
9	316°35.5	. 12.7	310°31.7	8.6'	06°43.4	16.0'	61.2	
10	331°35.8	11.7	324°59.4	8.6'	$06^{\circ}59.3$	15.9'	61.2'	
11	346°36.0	10.7	339°27.0	8.6'	07°15.2	15.9'	61.2'	
12 13	1°36.2 16°36.4	N01°09.7 08.8	353°54.6 8°22.1	8.6' 8.5'	\$07°31.1 07°46.9	15.8' 15.7'	61.2' 61.2'	
14	31°36.6	07.8	22°49.7	8.5'	07 40.9 08°02.6	15.7'	61.2'	
15	46°36.9	06.8	37°17.2	8.5'	08°18.3	15.6'	61.2	
16	61°37.1	05.9	51°44.7	8.5'	08°33.9	15.6'	61.1'	
17	76°37.3	04.9	66°12.1	8.4'	08°49.5	15.5'	61.1'	
18 19	91°37.5 106°37.7	N01°03.9 03.0	80°39.6 95°07.0	8.4' 8.4'	\$09°05.0 09°20.4	15.4' 15.4'	61.1' 61.1'	
20	100 37.7 121°38.0	03.0	109°34.3	8.3'	09°20.4	15.4	61.1	
21	136°38.2	01.0	124°01.6	8.3'	09°51.1	15.2'	61.1	
22	151°38.4	01°00.0	138°28.9	8.3'	10°06.4	15.2'	61.0'	
23	166°38.6	$00^{\circ}59.1$	152°56.2	8.2'	$10^{\circ}21.5$	15.1'	61.0'	
	SD = 15.9'	d = -1.0'		S	D = 16.7'			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
oved 0	181°38.9	N00° 58.1	167°23.4	ν 8.2'	S10°36.6	15.0'	61.0'	
1	196°39.1	57.1	181°50.6	8.2'	10°51.6	14.9'	61.0'	
2	211°39.3	56.2	196°17.8	8.1'	11°06.6	14.9'	61.0'	
3	226°39.5	• • 55.2	210°44.9	8.1'	11°21.4	14.8'	60.9'	
4 5	241°39.7 256°40.0	54.2 53.2	225°12.0 239°39.0	8.0' 8.0'	11°36.2 11°50.9	14.7' 14.6'	60.9' 60.9'	
6	271°40.2	N00° 52.3	254°06.0	8.0'	\$12°05.5	14.5	60.9	
7	286°40.4	51.3	268°33.0	7.9'	12°20.0	14.4'	60.9'	
8	301°40.6	50.3	282°59.9	7.9'	12°34.4	14.3'	60.8'	
9	316°40.8	• • 49.4	297°26.8	7.9'	12°48.8	14.3'	60.8'	
10	331°41.1 346°41.3	48.4	311°53.7	7.8' 7.8'	13°03.0 13°17.2	14.2'	60.8'	
11 12	346°41.3 1°41.5	47.4 N00°46.4	326°20.5 340°47.3	7.8'	13°17.2 \$13°31.3	14.1' 14.0'	60.8' 60.7'	
13	16°41.7	45.5	355°14.1	7.7'	13°45.2	13.9'	60.7	
14	31°41.9	44.5	9°40.8	7.7'	13°59.1	13.8'	60.7'	
15	46°42.2	• • 43.5	24°07.4	7.6'	14°12.9	13.7'	60.7'	
16	61°42.4	42.6	38°34.1	7.6'	14° 26.5	13.6'	60.6'	
17 18	76°42.6 91°42.8	41.6 N00° 40.6	53°00.6 67°27.2	7.5' 7.5'	14°40.1 \$14°53.5	13.5' 13.3'	60.6' 60.6'	
19	91 42.8 106°43.0	39.6	81°53.7	7.5' 7.5'	15°06.9	13.3	60.6	
20	121°43.3	38.7	96°20.2	7.4'	15°20.1	13.1	60.5	
21	136°43.5	• • 37.7	110°46.6	7.4'	15°33.3	13.0'	60.5'	
22	151°43.7	36.7	125°13.0	7.3'	15°46.3	12.9'	60.5'	
23	166°43.9	35.7	139°39.3	7.3'	15°59.2	12.8'	60.4'	
	SD = 15.9'	d = -1.0'		S	D = 16.6'			

N 72° 02:42 04:18 05:27 18:17 19:26 2 N 70° 03:05 04:28 05:30 18:15 19:17 2 68° 03:23 04:36 05:32 18:13 19:09 2 66° 03:37 04:42 05:34 18:11 19:03 2 64° 03:48 04:48 05:36 18:10 18:58 1 62° 03:58 04:52 05:37 18:09 18:53 1 60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 52° 04:23 05:06 05:41 18:05 18:40 1 50° 04:28 05:08 05:42 18:04 18:38 1 50° 04:23 05:06 05:41 18:02	nt
N 70° 03:05 04:28 05:30 18:15 19:17 2 68° 03:23 04:36 05:32 18:13 19:09 2 66° 03:37 04:42 05:34 18:11 19:03 2 64° 03:48 04:48 05:36 18:10 18:58 1 60° 04:05 04:56 05:37 18:09 18:53 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:23 05:06 05:41 18:04 18:38 1 50° 04:28 05:08 05:42 18:04 18:38 1 50° 04:50 05:15 05:44 18:02	laut.
68° 03:23 04:36 05:32 18:13 19:09 2 66° 03:37 04:42 05:34 18:11 19:03 2 64° 03:48 04:48 05:36 18:10 18:58 1 62° 03:58 04:52 05:37 18:09 18:53 1 60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 50° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01	21:00
66° 03:37 04:42 05:34 18:11 19:03 2 64° 03:48 04:48 05:36 18:10 18:58 1 62° 03:58 04:52 05:37 18:09 18:53 1 60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:28 1 30° 04:55 05:23 05:47 18:00 18:24 1	20:38
64° 03:48 04:48 05:36 18:10 18:58 1 62° 03:58 04:52 05:37 18:09 18:53 1 60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00	20:21
62° 03:58 04:52 05:37 18:09 18:53 1 60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:42 18:04 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:28 1 30° 04:55 05:23 05:47 18:00 18:24 1	20:07
60° 04:05 04:56 05:38 18:08 18:49 1 N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:56
N 58° 04:12 05:00 05:39 18:07 18:46 1 56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:47
56° 04:18 05:03 05:40 18:06 18:43 1 54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:40
54° 04:23 05:06 05:41 18:05 18:40 1 52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:33
52° 04:28 05:08 05:42 18:04 18:38 1 50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:27
50° 04:32 05:10 05:42 18:04 18:36 1 45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:23
45° 04:40 05:15 05:44 18:02 18:32 1 N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:18
N 40° 04:46 05:18 05:45 18:01 18:28 1 35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:14
35° 04:51 05:21 05:46 18:01 18:26 1 30° 04:55 05:23 05:47 18:00 18:24 1	9:06
30° 04:55 05:23 05:47 18:00 18:24 1	9:00
	.8:55
	8:52
	8:46
	.8:43
0° 05:06 05:30 05:50 17:57 18:17 1	.8:41
	8:41
	8:43
	8:47
	8:49
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45° 04:51 05:25 05:54 17:54 18:23 1	.8:57
	9:04
	9:07
	.9:10
	.9:14
	9:19
S 60° 04:25 05:14 05:56 17:53 18:34 1	.9:24

Lat.		Moonris	e		Moonset	;
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	05:10	07:38	10:20	17:12	16:39	15:53
N 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
N 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
S 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
S 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° S 60°	05:25 05:26	05:34 05:31	05:45 05:38	18:02 18:03	19:42 19:48	21:23 21:33
5 60°	05:20	05:31	05:38	18:03	19:48	21:33

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

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	0°23.9	221°14.7	N15°28.5	227°22.4	N18°45.3	174°36.7	S01°18.3	321°22.8	N12°28.8			
1	15°26.4	236°14.3	27.8	242°23.3	44.9	189°38.6	18.6	336°25.4	28.8	Alpheratz	357°31.2	29° 15.2
2	30°28.8	251°13.9	27.1	257°24.2	44.5	204°40.6	18.8	351°28.0	28.7	Ankaa	353°03.8	-42°08.8
3	45°31.3	266°13.5	26.4	272°25.1	• • 44.2	219°42.6	. 19.0	6°30.6	28.7	Schedar	349°26.9	56°41.8
4	60°33.8	281°13.1	25.7	287°26.0	43.8	234°44.5	19.2	21°33.2	28.6	Diphda	348°44.0	-17°49.5
5	75°36.2	296°12.7	25.0	302°26.9	43.4	249°46.5	19.4	36°35.7	28.6	Achernar	335°17.5	-57°05.2
6	90°38.7	311°12.3	N15°24.3	317°27.8	N18°43.0	264°48.5	S01°19.6	51°38.3	$N12^{\circ}28.5$	Hamal Polaris	327°47.5 312°04.0	23°36.0 89°22.8
7	$105^{\circ}41.2$	$326^{\circ}11.8$	23.6	332°28.7	42.6	279°50.4	19.8	66°40.9	28.5	Acamar	315°09.2	-40° 11.1
8	120° 43.6	341°11.4	22.9	347°29.5	42.2	294°52.4	20.1	81°43.5	28.4	Menkar	314°02.8	4° 12.3
9	135°46.1	356°11.0	• • 22.2	2°30.4	• • 41.8	309°54.4	• • 20.3	96°46.1	• • 28.4	Mirfak	308°23.6	49°57.7
10	150°48.5	11°10.6	21.5	17°31.3	41.4	324°56.3	20.5	111°48.6	28.4	Aldebaran	290°36.0	16°34.0
11	165°51.0	26°10.2	20.8	32°32.2	41.0	339°58.3	20.7	126°51.2	28.3	Rigel	281°00.9	-8°10.0
12	180°53.5 195°55.9	41°09.8 56°09.4	N15°20.1	47°33.1 62°34.0	N18°40.6	355°00.3 10°02.3	S01°20.9	141°53.8 156°56.4	N12°28.3	Capella	280°17.3	46°01.4
13 14	210° 58.4	71°09.0	19.4 18.7	77°34.9	40.2 39.8	25°04.2	21.1 21.3	171°59.0	28.2 28.2	Bellatrix	$278^{\circ}19.6$	6°22.6
15	226°00.9	86°08.6	18.0	92°35.8	39.4	40°06.2	. 21.5	187°01.5	28.1	Elnath	277°58.0	28° 37.8
16	241°03.3	101°08.1	17.3	107°36.7	39.0	55°08.2	21.8	202°04.1	28.1	Alnilam	275°34.6	-1°10.9
17	256°05.8	116°07.7	16.6	122°37.6	38.6	70° 10.1	22.0	217°06.7	28.0	Betelgeuse	270°48.8	7°24.8
18	271°08.3	131°07.3	N15°15.9	137°38.5	N18°38.2	85°12.1	S01°22.2	232°09.3	N12°28.0	Canopus	263°51.1	-52°42.4
19	286°10.7	$146^{\circ}06.9$	15.2	152°39.3	37.9	$100^{\circ}14.1$	22.4	$247^{\circ}11.9$	28.0	Sirius Adhara	258°23.6	-16°45.2 -29°00.5
20	301°13.2	$161^{\circ}06.5$	14.5	167°40.2	37.5	$115^{\circ}16.0$	22.6	262°14.5	27.9		255°03.6 244°47.8	5°09.1
21	$316^{\circ}15.6$	$176^{\circ}06.1$	• • 13.7	182°41.1	•• 37.1	$130^{\circ}18.0$	• • 22.8	277°17.0	•• 27.9	Procyon Pollux	244° 47.8 243° 13.8	27°57.3
22	331°18.1	191°05.7	13.0	197°42.0	36.7	145°20.0	23.0	292°19.6	27.8	Avior	234°13.8	-59° 35.9
23	346°20.6	206°05.3	12.3	212°42.9	36.3	160°21.9	23.3	307°22.2	27.8	Suhail	222°44.4	-43°32.8
Mer.n	pass. 23:54	ν -0.4' d-0	0.7′ m-4.11	ν 0.9' d-0	.4' m1.54	$\nu 2.0' \ d0.$	2′ m-1.67	$\nu 2.6' \ d-0$.0′ m0.09	Miaplacidus	221°38.2	-69°49.9
										Alphard	217°45.0	-8°46.9
F!	CIIA	CIIA	D	CIIA	D	CHA	D	CHA	D	Regulus	$207^{\circ}31.5$	11°49.6
Fri 0	GHA 1°23.0	GHA 221°04.9	Dec N15°11.6	GHA 227°43.8	Dec N18°35.9	GHA 175°23.9	Dec \$01°23.5	GHA 322°24.8	Dec N12°27.7	Dubhe	193°38.1	61°35.6
1	16° 25.5	236°04.4	10.9	242°44.7	35.5	175 25.9 190°25.9	23.7	337°27.4	27.7	Denebola	182°22.2	14°24.7
2	31°28.0	251°04.0	10.2	257°45.6	35.1	205°27.9	23.9	352°30.0	27.6	Gienah	175°40.8	-17° 42.1
3	46°30.4	266°03.6	09.5	272°46.5	• • 34.7	220°29.8	• • 24.1	7°32.5	• • 27.6		172°57.3	-63°15.6
4	61°32.9	281°03.2	08.8	287°47.4	34.3	235°31.8	24.3	22°35.1	27.5	Gacrux	171°48.7	-57°16.5
5	76° 35.4	296°02.8	08.0	302°48.3	33.9	250°33.8	24.5	37°37.7	27.5	Alioth Spica	166°11.0 158°19.4	55°48.3 -11°18.6
6	91°37.8	311°02.4	N15°07.3	317°49.2	N18°33.5	265°35.7	S01°24.8	52°40.3	$N12^{\circ}27.4$	Alkaid	150° 19.4° 152° 50.1	49° 10.3
7	106°40.3	$326^{\circ}02.0$	06.6	$332^{\circ}50.1$	33.1	280°37.7	25.0	67°42.9	27.4	Hadar	148°32.1	-60° 30.8
8	121°42.8	341°01.6	05.9	347°51.0	32.7	295°39.7	25.2	82°45.5	27.4	Menkent	147°54.3	-36°30.7
9	136° 45.2	356°01.2	• • 05.2	2°51.9	• • 32.3	310°41.6	• • 25.4	97°48.0	• • 27.3	Arcturus	145°45.5	19°02.1
10	151°47.7	11°00.8	04.5	17°52.8	31.9	325°43.6	25.6	112°50.6	27.3	Rigil Kent.	139°36.5	-60° 57.4
11	166° 50.1	26°00.4	03.7	32°53.7	31.5	340°45.6	25.8	127°53.2 142°55.8	27.2	Kochab	$137^{\circ}20.9$	74°02.4
12 13	181°52.6 196°55.1	40°59.9 55°59.5	N15°03.0 02.3	47°54.6 62°55.5	N18°31.1 30.7	355°47.5 10°49.5	\$01°26.0 26.2	142 55.8 157°58.4	N12°27.2 27.1	Zuben'ubi	136°52.9	-16°09.6
14	211° 57.5	70°59.1	02.5	77°56.4	30.7	25°51.5	26.2	173°01.0	27.1	Alphecca	126°01.4	26°37.3
15	227° 00.0	85°58.7	. 00.8	92°57.3	29.9	40°53.5	. 26.7	188°03.6	• • 27.0	Antares	112°12.3	-26°29.7
16	242°02.5	100°58.3	15°00.1	107°58.1	29.5	55°55.4	26.9	203°06.1	27.0	Atria	107°03.8	-69°04.9
17	257°04.9	115°57.9	14°59.4	122°59.0	29.1	70°57.4	27.1	218°08.7	26.9	Sabik	101°59.4	-15°45.5
18	272°07.4	130°57.5	N14°58.7	137°59.9	N18°28.7	85°59.4	S01°27.3	233°11.3	N12°26.9	Shaula	96°06.3 95°55.8	-37°07.5 12°32.6
19	287°09.9	145°57.1	57.9	153°00.8	28.3	101°01.3	27.5	248°13.9	26.8	Rasalhague	90°40.8	51° 29.5
20	$302^{\circ}12.3$	$160^{\circ}56.7$	57.2	168°01.7	27.9	$116^{\circ}03.3$	27.7	$263^{\circ}16.5$	26.8	Eltanin Kaus Aust.	83°28.5	-34° 22.2
21	317°14.8	175°56.3	• • 56.5	183°02.6	• • 27.5	131°05.3	• • 28.0	$278^{\circ}19.1$	• • 26.8	Vega	80°31.1	38°49.0
22	332°17.3	190°55.9	55.8	198°03.5	27.1	146°07.2	28.2	293°21.7	26.7	Nunki	75°44.0	-26° 15.5
23	347° 19.7	205°55.4	55.0	213°04.4	26.7	161°09.2	28.4	308°24.2	26.7	Altair	61°56.9	8° 56.9
Mer.p	ass. 23:51	ν -0.4' d-0	.7′ m-4.11	ν 0.9′ d-0	.4′ m1.53	$\nu 2.0' \ d0.$	2′ m-1.67	$\nu 2.6' \ d-0$.0′ m0.08	Peacock	53°00.7	-56°38.5
										Deneb	49°23.4	45°23.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.6	10°00.7
0 0	2°22.2	220°55.0	N14°54.3	228°05.3	N18°26.3	176°11.2	S01°28.6	323°26.8	N12°26.6	Al Na'ir	27°28.8	-46°49.2
1	17°24.6	235°54.6	53.6	243°06.2	25.9	191°13.1	28.8	338°29.4	26.6	Fomalhaut	15°10.9 13°41.9	-29°28.0
2	32°27.1	250°54.2	52.8	258°07.1	25.5	206° 15.1	29.0	353°32.0	26.5	Scheat Markab	13°41.9 13°26.6	28° 14.6
3	47° 29.6	265°53.8	52.1	273°08.0	25.1	221°17.1	29.2	8°34.6	26.5	iviarkab	13 20.0	15°21.9
4	62°32.0	280°53.4	51.4	288°08.9	24.7	$236^{\circ}19.0$	29.5	23°37.2	26.4	Sep 21 Thu	SHA	Mer.pass
5	77° 34.5	295°53.0	50.6	$303^{\circ}09.8$	24.3	251°21.0	29.7	$38^{\circ}39.8$	26.4		220°50.8	09:15
6	92°37.0	310°52.6	N14°49.9	318°10.7	N18°23.9	266°23.0	S01°29.9	53°42.3	N12°26.3		226°58.5	08:50
7	107°39.4	325°52.2	49.2	333°11.6	23.5	281°25.0	30.1	68°44.9	26.3		174°12.8	12:20
8	122°41.9	340°51.8	48.4	348°12.5	23.1	296°26.9	30.3	83°47.5	26.2	Saturn	320°58.9	02:34
9	137°44.4	355°51.4	· · 47.7	3°13.4	• • 22.7	311°28.9	30.5	98°50.1	• • 26.2	Sep 22 Fri	SHA	Mer.pass
10 11	152°46.8 167°49.3	10°51.0 25°50.6	47.0 46.2	18°14.3 33°15.3	22.3 21.9	326°30.9 341°32.8	30.7 30.9	113°52.7 128°55.3	26.1 26.1		219°41.8	09:16
12	167 49.3 182°51.7	40°50.1	46.2 N14°45.5	48°16.2	N18°21.5	341 32.8 356°34.8	501°31.2	128 55.3 143°57.9	N12°26.1		226°20.8	08:49
13	197°54.2	55°49.7	44.8	63°17.1	21.1	11°36.8	31.4	159°00.5	26.0		174°00.9	12:17
14	212°56.7	70°49.3	44.0	78°18.0	20.7	26°38.7	31.6	174°03.1	26.0	Saturn	321°01.7	02:30
15	227°59.1	85°48.9	• • 43.3	93°18.9	20.3	41°40.7	• • 31.8	189°05.6	• • 25.9	Sep 23 Sat	SHA	Mer.pass
16	243°01.6	100°48.5	42.5	$108^{\circ}19.8$	19.9	56° 42.7	32.0	204°08.2	25.9		218°32.9	09:17
17	258°04.1	$115^{\circ}48.1$	41.8	$123^{\circ}20.7$	19.5	71°44.6	32.2	$219^{\circ}10.8$	25.8		225°43.2	08:47
18	273°06.5	130°47.7	N14°41.0	138°21.6	$N18^{\circ}19.1$	86°46.6	S01°32.4	234°13.4	N12°25.8		173°49.0	12:14
19	288°09.0	145°47.3	40.3	153°22.5	18.7	101°48.6	32.7	249°16.0	25.7		321°04.6	02:26
20	303°11.5	160°46.9	39.6	168°23.4	18.3	116°50.5	32.9	264°18.6	25.7	United to	al parallas	
21	318° 13.9	175°46.5	• • 38.8	183°24.3	• • 17.9	131°52.5	33.1	279°21.2	• • 25.6	Horizoni	al parallax Venus:	0.1
22 23	333° 16.4 348° 18.9	190°46.1 205°45.7	38.1 37.3	198°25.2 213°26.1	17.5 17.1	146°54.5 161°56.4	33.3 33.5	294°23.8 309°26.4	25.6 25.5		Mars:	0.1
												*
Mer.p	bass. 23:47	ν -0.4′ d-0	0.7′ m-4.10	ν 0.9′ d-0	.4′ m1.53	$\nu 2.0' d0.$	2′ m-1.66	$\nu 2.6' d-0$.0′ m0.08			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°44.2	N00°34.8	154°05.6	7.3'	S16°12.0	12.7'	60.4'
1 2	196°44.4 211°44.6	33.8 32.8	168°31.9 182°58.1	7.2' 7.2'	16°24.7 16°37.2	12.6' 12.4'	60.4' 60.4'
3	226°44.8	• • 31.9	197°24.3	7.1'	16°49.7	12.3'	60.3
4	241°45.0	30.9	211°50.4	7.1'	17°02.0	12.2'	60.3'
5	256°45.3 271°45.5	29.9	226° 16.6 240° 42.6	7.1'	17°14.2	12.1'	60.3'
6 7	271°45.5 286°45.7	N00°28.9 28.0	240°42.6 255°08.6	7.0' 7.0'	\$17°26.3 17°38.2	12.0' 11.8'	60.2' 60.2'
8	301°45.9	27.0	269°34.6	7.0'	17°50.0	11.7'	60.2'
9	316°46.1	• • 26.0	284°00.6	6.9'	18°01.7	11.6'	60.1'
10 11	331°46.4 346°46.6	25.1 24.1	298°26.5 312°52.4	6.9' 6.8'	18° 13.3 18° 24.8	11.4' 11.3'	60.1' 60.1'
12	1°46.8	N00°23.1	327° 18.2	6.8	\$18°36.1	11.2'	60.0
13	16°47.0	22.1	$341^{\circ}44.0$	6.8'	18°47.3	11.0'	60.0'
14 15	31°47.2 46°47.5	21.2 · · 20.2	356°09.8 10°35.5	6.7' 6.7'	18°58.3 19°09.2	10.9' 10.8'	60.0' 59.9'
16	61°47.7	19.2	25°01.2	6.7'	19 09.2 19°20.0	10.6	59.9'
17	76°47.9	18.2	$39^{\circ}26.8$	6.6'	19°30.6	10.5'	59.9'
18	91°48.1 106°48.3	N00°17.3	53°52.5 68°18.1	6.6'	\$19°41.1	10.4'	59.8'
19 20	106°48.3 121°48.6	16.3 15.3	68° 18.1 82° 43.6	6.6' 6.5'	19°51.5 20°01.7	10.2' 10.1'	59.8' 59.8'
21	136°48.8	• • 14.4	97°09.1	6.5	20°11.8	9.9'	59.7'
22	151°49.0	13.4	111°34.6	6.5'	20°21.8	9.8'	59.7'
23	166°49.2	12.4	126°00.1	6.4'	20°31.6	9.7'	59.6'
	SD = 15.9'	d = -1.0'		SI	D = 16.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°49.4	N00°11.4	140°25.5	6.4'	S20°41.2	9.5'	59.6'
1 2	196°49.7 211°49.9	10.5 09.5	154° 50.9 169° 16.3	6.4' 6.3'	20°50.7 21°00.1	9.4' 9.2'	59.6' 59.5'
3	226°50.1	•• 08.5	183°41.6	6.3	21°09.3	9.1'	59.5'
4	241°50.3	07.5	$198^{\circ}06.9$	6.3'	$21^{\circ}18.4$	8.9'	59.5'
5	256°50.5 271°50.7	06.6 N00°05.6	212° 32.2 226° 57.5	6.3' 6.2'	21°27.3 S 21°36.1	8.8'	59.4'
6 7	271 50.7 286°51.0	04.6	241°22.7	6.2'	21°44.7	8.6' 8.5'	59.4' 59.3'
8	301°51.2	03.6	255°47.9	6.2'	21°53.2	8.3'	59.3'
9	316°51.4	• • 02.7	270°13.1	6.2'	22°01.5	8.2'	59.3'
10 11	331°51.6 346°51.8	01.7 N00°00.7	284°38.3 299°03.4	6.1' 6.1'	22°09.7 22°17.7	8.0' 7.9'	59.2' 59.2'
12	1°52.1	S00°00.2	313°28.6	6.1'	\$22°25.6	7.7'	59.2'
13	16°52.3 31°52.5	01.2 02.2	327°53.7 342°18.8	6.1' 6.1'	22°33.3 22°40.8	7.6'	59.1' 59.1'
14 15	31 52.5 46°52.7	03.2	342 18.8 356°43.9	6.1	22°48.2	7.4' 7.2'	59.1 59.0'
16	61°52.9	04.1	11°08.9	6.0'	22°55.5	7.1'	59.0'
17	76°53.2	05.1	25°34.0	6.0'	23°02.6	6.9'	59.0'
18 19	91°53.4 106°53.6	\$00°06.1 07.1	39°59.0 54°24.0	6.0' 6.0'	\$23°09.5 23°16.3	6.8' 6.6'	58.9' 58.9'
20	121°53.8	08.0	68°49.1		23°22.9	6.5	58.8'
21	136°54.0	• • 09.0	83°14.1	6.0'	23°29.4	6.3'	58.8'
22 23	151°54.3 166°54.5	10.0 11.0	97°39.1 112°04.1	6.0' 6.0'	23°35.7 23°41.8	6.1' 6.0'	58.8' 58.7'
20	SD = 15.9'	d = -1.0'			D = 16.3'		
Sat 0	GHA 181°54.7	Dec S 00°11.9	GHA 126°29.0	ν 6.0'	Dec \$23° 47.8	<i>d</i> 5.8'	HP 58.7'
1	196°54.9	12.9	140°54.0	6.0'	23°53.6	5.7'	58.6'
2	211°55.1	13.9	155° 19.0	6.0'	23°59.3	5.5'	58.6'
3 4	226°55.3 241°55.6	· · 14.8 15.8	169°44.0 184°09.0	6.0' 6.0'	24°04.8 24°10.1	5.3' 5.2'	58.6' 58.5'
5	256°55.8	16.8	198° 34.0	6.0'	24° 15.3	5.0'	58.5
6	271°56.0	S00°17.8	212°58.9	6.0'	\$24°20.3	4.9'	58.4'
7	286°56.2 301°56.4	18.7 19.7	227°23.9 241°48.9	6.0' 6.0'	24°25.2 24°29.9	4.7' 4.5'	58.4' 58.4'
8 9	301 56.4 316°56.7	20.7	241 48.9 256°13.9	6.0'	24 29.9 24°34.4	4.5 4.4'	58.3
10	331°56.9	21.7	$270^{\circ}39.0$	6.0'	$24^{\circ}38.8$	4.2'	58.3'
11 12	346°57.1 1°57.3	22.6 \$00°23.6	285°04.0 299°29.0	6.0' 6.1'	24°43.0 S 24°47.1	4.1' 3.9'	58.2' 58.2'
13	1 57.3 16°57.5	24.6	299 29.0 313°54.1	6.1	24°51.0	3.9 3.7'	58.2'
14	31°57.7	25.6	$328^{\circ}19.1$	6.1'	24°54.7	3.6'	58.1'
15 16	46°58.0 61°58.2	· · 26.5 27.5	342°44.2 357°09.3	6.1' 6.1'	24°58.3 25°01.7	3.4' 3.3'	58.1' 58.0'
16 17	61°58.2 76°58.4	27.5 28.5	357°09.3 11°34.4	6.1'	25°01.7 25°05.0	3.3'	58.0° 58.0'
18	91°58.6	S00°29.4	25°59.6	6.2'	S25°08.1	2.9'	58.0'
19	106°58.8 121°59.0	30.4	40°24.7	6.2'	25°11.0	2.8'	57.9'
20 21	121°59.0 136°59.3	31.4 •• 32.4	54° 49.9 69° 15.1	6.2' 6.2'	25° 13.8 25° 16.4	2.6' 2.5'	57.9' 57.8'
22	151°59.5	33.3	83°40.4	6.3'	25°18.8	2.3'	57.8'
23	166°59.7	34.3	98°05.7	6.3'	25°21.1	2.1'	57.8'
	SD = 15.9'	d = 1.0'		SI	D = 16.0'		

Lat.	Twilight		C	C	Twilight	
	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	03:01	04:32	05:41	18:02	19:10	20:39
N 70°	03:21	04:40	05:42	18:01	19:02	20:20
68°	03:36	04:47	05:43	18:00	18:56	20:06
66°	03:48	04:52	05:44	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
N 40°	04:49	05:21	05:48	17:56	18:23	18:55
35°	04:54	05:23	05:48	17:56	18:21	18:51
30°	04:57	05:25	05:49	17:56	18:20	18:48
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
S 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
S 60°	04:15	05:05	05:47	18:00	18:41	19:32

Lat.	Moonrise			Moonset		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 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
N 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
N 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
S 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	•• ••
S 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
S 60°	05:47	06:01	06:24	23:17	•• ••	00:55

		Sun			Moon		
Day		Eqn.of Time		Mer.	Mer.Pass.		Age
İ	Duy	00 ^h	12 ^h	Pass	Upper	Lower	3-5
Ĺ		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	
Ĺ	23	07:39	07:49	11:52	16:12	03:43	

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

h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	3°21.3	220°45.3	N14°36.6	228°27.0	N18° 16.7	176°58.4	S01°33.7	324°28.9	N12°25.5			
1	18°23.8	235°44.9	35.8	243°27.9	16.3	192°00.4	33.9	339°31.5	25.4	Alpheratz	357°31.2	29°15.2
2	33°26.2	250°44.5	35.1	258°28.8	15.9	207°02.4	34.2	354°34.1	25.4	Ankaa	353°03.8	-42°08.8
3	48°28.7	265°44.1	• • 34.3	273°29.7	• • 15.5	222°04.3	• • 34.4	9°36.7	• • 25.3	Schedar	349°26.9	56°41.8
4	63°31.2	280°43.6	33.6	288°30.6	15.0	237°06.3	34.6	24°39.3	25.3	Diphda	348°44.0	-17°49.5
5	78°33.6	295°43.2	32.8	303°31.5	14.6	252°08.3	34.8	39°41.9	25.2	Achernar	335°17.5	-57°05.2
6	93°36.1	310°42.8	N14°32.1	318°32.4	N18° 14.2	267°10.2	S01°35.0	54°44.5	N12°25.2	Hamal	327°47.4	23°36.0
7	108°38.6	325°42.4	31.3	333°33.3	13.8	282°12.2	35.2	69°47.1	25.1	Polaris Acamar	312°02.4	89°22.8
8	123°41.0	340°42.0	30.6	348°34.3	13.4	297°14.2	35.4	84°49.7	25.1		315°09.2 314°02.7	-40°11.1 4°12.3
9	138°43.5	355°41.6	• • 29.8	3°35.2	• • 13.0	312°16.1	• • 35.6	99°52.3	• • 25.1	Menkar Mirfak	308° 23.5	4 12.3 49°57.7
10	153°46.0	10°41.2	29.0	18°36.1	12.6	327°18.1	35.9	114°54.9	25.0	Aldebaran	290°36.0	16°34.0
11	168°48.4	25°40.8	28.3	33°37.0	12.2	$342^{\circ}20.1$	36.1	129°57.4	25.0	Rigel	290°30.0 281°00.9	-8°10.0
12	183°50.9	40°40.4	N14°27.5	48°37.9	N18° 11.8	357°22.0	S01°36.3	145°00.0	N12°24.9	Capella	280° 17.3	46°01.4
13	198°53.4	55°40.0	26.8	63°38.8	11.4	12°24.0	36.5	$160^{\circ}02.6$	24.9	Bellatrix	278° 19.6	6°22.6
14	213°55.8	70°39.6	26.0	78°39.7	11.0	27°26.0	36.7	175°05.2	24.8	Elnath	277° 58.0	28°37.8
15	228°58.3	85°39.2	• • 25.3	93°40.6	• • 10.6	42°27.9	• • 36.9	190°07.8	• • 24.8	Alnilam	275°34.6	-1°10.9
16	244°00.7	100°38.8	24.5	108°41.5	10.2	57°29.9	37.1	205°10.4	24.7	Betelgeuse	270°48.8	7°24.8
17	259°03.2	115°38.4	23.7	123°42.4	09.8	72°31.9	37.4	220°13.0	24.7	Canopus	263°51.1	-52°42.4
18	274°05.7	130°38.0	N14°23.0	138° 43.3	N18°09.4	87°33.8	S01°37.6	235°15.6	N12°24.6	Sirius	258°23.6	-16°45.2
19	289°08.1	145°37.6	22.2	153°44.2	09.0	102°35.8	37.8	250°18.2	24.6	Adhara	255°03.6	-29°00.5
20	304°10.6	160°37.2	21.4	168° 45.2	08.6	117°37.8	38.0	265°20.8	24.5	Procyon	244°47.8	5°09.1
21	319°13.1	175°36.8	• • 20.7	183°46.1	08.1	132°39.7	• 38.2	280°23.4	• • 24.5	Pollux	243°13.8	27°57.3
22	334°15.5	190°36.4	19.9	198° 47.0	07.7	147°41.7	38.4	295°26.0	24.4	Avior	234°13.8	-59°35.9
23	349°18.0	205°36.0	19.2	213°47.9	07.3	162°43.7	38.6	310°28.6	24.4	Suhail	222°44.3	-43°32.8
Mer.p	ass. 23:43	ν -0.4' d-0	0.7′ m-4.10	ν 0.9 $^{\prime}$ d-0	0.4' m1.53	$\nu 2.0' \ d0.$	2′ m-1.66	$\nu 2.6' d-0$	0.0' m0.07	Miaplacidus	221°38.2	-69°49.9
										Alphard	217°45.0	-8°47.0
	c		-	611	-			a	-	Regulus	207°31.5	11°49.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.6
0	4°20.5	220°35.6	N14°18.4	228° 48.8	N18°06.9	177°45.6	S01°38.9	325°31.2	N12°24.3	Denebola	$182^{\circ}22.2$	14°24.7
1	19°22.9	235°35.2	17.6	243°49.7	06.5	192°47.6	39.1	340°33.7	24.3	Gienah	175°40.8	-17°42.1
2	34°25.4	250°34.7	16.9	258°50.6	06.1	207°49.6	39.3	355°36.3	24.2	Acrux	172°57.3	-63°15.5
3	49°27.9	265°34.3	• • 16.1	273°51.5	• • 05.7	222°51.6	• • 39.5	10°38.9	• • 24.2	Gacrux	171°48.7	-57°16.5
4	64°30.3	280°33.9	15.3	288°52.4	05.3	237°53.5	39.7	25°41.5	24.1	Alioth	$166^{\circ}11.0$	55°48.3
5	79°32.8	295°33.5	14.5	303°53.4	04.9	252°55.5	39.9	40°44.1	24.1	Spica	158° 19.4	-11°18.6
6	94°35.2	310°33.1	N14°13.8	318°54.3	N18° 04.5	267°57.5	S01°40.1	55°46.7 70°49.3	N12°24.0	Alkaid	152°50.1	49°10.3
7	109°37.7	325°32.7	13.0	333°55.2	04.1	282°59.4	40.3		24.0	Hadar	148°32.1	-60°30.8
8	124°40.2	340°32.3	12.2	348°56.1	03.7	298°01.4	40.6	85°51.9	23.9	Menkent	147°54.3	-36°30.7
9	139°42.6	355°31.9	• • 11.5	3°57.0	• • 03.2	313°03.4	• • 40.8	100°54.5	• • 23.9	Arcturus	145°45.5	$19^{\circ}02.1$
10 11	154°45.1	10°31.5 25°31.1	10.7	18°57.9	02.8	328°05.3	41.0	115°57.1	23.8	Rigil Kent.	139°36.5	-60°57.4
12	169°47.6 184°50.0	25 31.1 40°30.7	09.9 N14°09.1	33°58.8 48°59.7	02.4 N18°02.0	343°07.3	41.2 \$01°41.4	130°59.7 146°02.3	23.8 N12°22.7	Kochab	$137^{\circ}21.0$	74°02.4
13	199°52.5	55°30.3		46 59.7 64°00.7		358°09.3 13°11.2		140 02.3 161°04.9	N12°23.7 23.7	Zuben'ubi	136°52.9	-16°09.6
14	214°55.0	70°29.9	08.4 07.6	79°01.6	01.6 01.2	28°13.2	41.6 41.8	101 04.9 176°07.5	23.6	Alphecca	126°01.4	26°37.3
14 15	214 55.0 229°57.4	70 29.9 85°29.5	06.8	94°02.5	00.8	43°15.2	• • 42.1	170 07.5 191°10.1	. 23.6	Antares	112°12.3	-26°29.7
16	244°59.9	100°29.1	06.0	109°03.4	00.8	58°17.1	42.1	206°12.7	23.5	Atria	107°03.8	-69°04.9
17	260°02.3	115°28.7	05.3	124°04.3	18°00.0	73°19.1	42.5	200 12.7 221°15.3	23.5	Sabik	101°59.4	-15°45.5
18	275°04.8	130°28.3	N14°04.5	139° 05.2	N17°59.6	88°21.1	\$01°42.7	236°17.9	N12°23.4	Shaula	96°06.3	-37°07.5
19	290°07.3	145°27.9	03.7	154°06.2	F0.4	103°23.0	42.9	251°20.5	23.4	Rasalhague	95°55.8	12°32.6
20	305°09.7	160°27.5	02.9	169° 07.1	59.1 58.7	118°25.0	43.1	266°23.1	23.4	Eltanin	90°40.8	51°29.5
21	320°12.2	175°27.1	02.1	184°08.0	• • 58.3	133°27.0	• • 43.3	281°25.6	23.3	Kaus Aust.	83°28.5	-34°22.2
22	335°14.7	190°26.7	01.4	199°08.9	57.9	148°28.9	43.5	296°28.2	23.3	Vega	80°31.1	38°49.0
23	350°17.1	205°26.3	00.6	214°09.8	57.5	163°30.9	43.8	311°30.8	23.2	Nunki	75°44.0	-26°15.5
										Altair	61°56.9	8°56.9
Mer.p	ass. 23:39	ν -0.4' d-0).8′ m-4.10	ν 0.9' d-0).4′ m1.52	$\nu 2.0' d0.$	2′ m-1.66	ν 2.6′ d-0	0.0' m 0.07	Peacock	53°00.7	-56°38.5
										Deneb	49°23.4	45°23.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.6	10°00.7
0	5°19.6	220°25.9	N13°59.8	229°10.7	N17°57.1	178°32.9	S01°44.0	326°33.4	N12°23.2	Al Na'ir	27°28.8	-46°49.2
1	20°22.1	235°25.5	59.0	244°11.6	56.7	193°34.8	44.2	341°36.0	23.1	Fomalhaut	15°10.9	-29°28.0
2	35°24.5	250°25.1	58.2	259°12.6	56.3	208°36.8	44.4	356°38.6	23.1	Scheat	13°41.9	28°14.6 15°21.9
3	50°27.0	265°24.7	• • 57.4	274° 13.5	• • 55.8	223°38.8	• • 44.6	11°41.2	• • 23.0	Markab	13°26.6	15 21.9
4	65°29.5	280°24.3	56.6	289°14.4	55.4	238°40.7	44.8	26°43.8	23.0	Sep 24 Sun	SHA	Mer.pass
5	80°31.9	295°23.9	55.9	304°15.3	55.0	253°42.7	45.0	41°46.4	22.9		217°23.9	09:17
6	95°34.4	310°23.5	N13°55.1	319° 16.2	N17°54.6	268°44.7	S01°45.3	56°49.0	N12°22.9		225°05.7	08:46
7	110°36.8	325°23.1	54.3	334° 17.2	54.2	283°46.6	45.5	71°51.6	22.8	1	173°37.1	12:11
8	125°39.3	340°22.7	53.5	349°18.1	53.8	298°48.6	45.7	86°54.2	22.8	Saturn	$321^{\circ}07.6$	02:22
9	140°41.8	355°22.3	• • 52.7	4°19.0	• • 53.4	313°50.6	• • 45.9	101°56.8	• • 22.7	C- 05 14		
10	155°44.2	10°21.9	51.9	$19^{\circ}19.9$	53.0	328°52.5	46.1	116°59.4	22.7	Sep 25 Mon	SHA	Mer.pass
11	170°46.7	25°21.5	51.1	$34^{\circ}20.8$	52.5	343°54.5	46.3	132°02.0	22.6	1	216° 15.1	09:18
12	185°49.2	40°21.1	N13°50.3	49°21.7	$N17^{\circ}52.1$	358°56.5	S 01°46.5	147°04.6	N12°22.6		224°28.3	08:44
13	200°51.6	55°20.7	49.5	64°22.7	51.7	13°58.5	46.8	$162^{\circ}07.2$	22.5	Saturn	173°25.2 321°10.7	12:07
14	$215^{\circ}54.1$	70°20.3	48.7	79°23.6	51.3	29°00.4	47.0	177°09.8	22.5	Saturn	JZ1 1U./	02:18
15	230°56.6	$85^{\circ}19.9$	• • 47.9	94°24.5	• • 50.9	44°02.4	• • 47.2	192°12.4	• • 22.4	Sep 26 Tue	SHA	Mer.pass
16	$245^{\circ}59.0$	$100^{\circ}19.5$	47.1	109°25.4	50.5	59°04.4	47.4	$207^{\circ}15.0$	22.4		215°06.3	09:19
17	261°01.5	$115^{\circ}19.1$	46.4	124°26.4	50.1	74°06.3	47.6	222°17.6	22.3		223°51.1	08:43
18	276°04.0	130°18.7	N13°45.6	139°27.3	N17°49.6	89°08.3	S01°47.8	237°20.2	N12°22.3		173°13.3	12:04
19	291°06.4	145°18.3	44.8	154°28.2	49.2	104°10.3	48.0	252°22.8	22.2	Saturn	321°13.8	02:13
20	306°08.9	160°17.9	44.0	169°29.1	48.8	119°12.2	48.2	267°25.4	22.2			
21	321°11.3	175°17.5	• • 43.2	184°30.0	• • 48.4	134°14.2	• • 48.5	282°28.0	• • 22.1	Horizont	al parallax	
22	336°13.8	190°17.1	42.4	199°31.0	48.0	149°16.2	48.7	297°30.6	22.1		Venus:	0.1
23	351°16.3	205°16.7	41.6	214°31.9	47.6	164°18.1	48.9	312°33.2	22.0		Mars:	0.1
Mern	ass. 23:35	ν-0 4' d-0	0.8′ m-4.09	ν0 9' d-0	0.4′ m1.52	ν2 0' d0	2′ m-1.66	ν2 6' d-0	0.0′ m0.06			
сг.р		. J. i u-0		. J.J u-C		. <u>_</u> .0 u0.	1.00	u-c				

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°59.9	S 00°35.3	$112^{\circ}30.9$	6.3'	S25°23.3	2.0'	57.7'
1	197°00.1	36.3	126°56.3	6.4'	25°25.2	1.8'	57.7'
2 3	212°00.3 227°00.6	37.2 •• 38.2	141°21.6 155°47.0	6.4' 6.4'	25°27.1 25°28.7	1.7' 1.5'	57.6' 57.6'
4	242°00.8	39.2	170°12.5	6.5'	25°30.2	1.3'	57.6'
5	257°01.0	40.2	184°37.9	6.5'	$25^{\circ}31.6$	1.2'	57.5'
6	272°01.2	500°41.1	199°03.4	6.5'	\$25°32.8	1.0'	57.5'
7 8	287°01.4 302°01.6	42.1 43.1	213°29.0 227°54.6	6.6' 6.6'	25°33.8 25°34.7	0.9' 0.7'	57.5' 57.4'
9	317°01.9	• • 44.1	242°20.2	6.7'	25°35.4	0.6'	57.4'
10	332°02.1	45.0	256°45.9	6.7'	25°36.0	0.4'	57.3'
11 12	347°02.3 2°02.5	46.0 \$00°47.0	271°11.6 285°37.4	6.8' 6.8'	25°36.4 \$25°36.6	0.3' 0.1'	57.3' 57.3'
13	17°02.7	47.9	205 37.4 300°03.2	6.9	25°36.7	-0.0'	57.3 57.2'
14	32°02.9	48.9	314°29.0	6.9'	25°36.7	-0.2	57.2'
15	47°03.2	• • 49.9	328°54.9	7.0'	25°36.5	-0.3	57.1'
16 17	62°03.4 77°03.6	50.9 51.8	343°20.9 357°46.9	7.0' 7.1'	25°36.2 25°35.7	-0.5' -0.6'	57.1' 57.1'
18	92°03.8	500°52.8	12°13.0	7.1'	\$25°35.0	-0.8'	57.1
19	107°04.0	53.8	26°39.1	7.2'	25°34.2	-0.9'	57.0'
20	122°04.2	54.8	41°05.3	7.2'	25°33.3	-1.1'	57.0'
21 22	137°04.5 152°04.7	· · 55.7 56.7	55°31.6 69°57.9	7.3' 7.4'	25°32.2 25°31.0	-1.2' -1.4'	56.9' 56.9'
23	167°04.9	50.7 57.7	84°24.2	7.4'	25° 29.6	-1.5'	56.9
	SD = 15.9'	d = 1.0'			0 = 15.7'		
				JL	_ 13.1		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°05.1 197°05.3	\$00°58.7 00°59.6	98°50.6 113°17.1	7.5' 7.5'	\$25°28.0 25°26.4	-1.7' -1.8'	56.8' 56.8'
2	212°05.5	00°59.6	113 17.1 127°43.7	7.6'	25°24.6	-1.6 -2.0'	56.7'
3	227°05.8	•• 01.6	142°10.3	7.7'	25°22.6	-2.1'	56.7'
4	242°06.0	02.6	156°37.0	7.7'	25°20.5	-2.2'	56.7'
5 6	257°06.2 272°06.4	03.5 S01°04.5	171°03.7 185°30.5	7.8' 7.9'	25° 18.3 \$25° 15.9	-2.4' -2.5'	56.6' 56.6'
7	287°06.6	05.5	199°57.4	8.0'	25° 13.3	-2.5' -2.7'	56.6
8	302°06.8	06.4	214°24.4	8.0'	$25^{\circ}10.7$	-2.8'	56.5'
9	317°07.0	• • 07.4	228°51.4	8.1'	25°07.9	-2.9'	56.5
10 11	332°07.3 347°07.5	08.4 09.4	243°18.5 257°45.7	8.2' 8.2'	25°05.0 25°01.9	-3.1' -3.2'	56.5' 56.4'
12	2°07.7	S01°10.3	272°12.9	8.3'	S24°58.7	-3.3'	56.4
13	17°07.9	11.3	286°40.2	8.4'	24°55.3	-3.5'	56.4'
14 15	32°08.1 47°08.3	12.3 •• 13.3	301°07.6 315°35.1	8.5' 8.5'	24°51.9 24°48.3	-3.6' -3.7'	56.3' 56.3'
16	62°08.5	14.2	330°02.6	8.6'	24 40.3 24°44.5	-3.1 -3.9'	56.3'
17	77°08.8	15.2	344°30.2	8.7'	24°40.7	-4.0'	56.2'
18	92°09.0	501°16.2	358°57.9	8.8'	\$24°36.7	-4.1'	56.2'
19 20	107°09.2 122°09.4	17.2 18.1	13°25.7 27°53.5	8.8' 8.9'	24° 32.5 24° 28.3	-4.3' -4 4'	56.2' 56.1'
21	137°09.6	• 19.1	42°21.4	9.0'	24° 23.9	-4.5'	56.1
22	152°09.8	20.1	56°49.4	9.1'	$24^{\circ}19.4$	-4.6'	56.1'
23	167°10.0	21.0	71°17.5	9.2'	24°14.8	-4.7'	56.0'
	SD = 15.9'	d = 1.0'		SD	0 = 15.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	182°10.3	S01°22.0	85°45.7	9.2'	\$24°10.0	-4.9'	56.0'
1	197°10.5	23.0	100°13.9	9.3'	24°05.2	-5.0'	56.0'
2 3	212°10.7 227°10.9	24.0 •• 24.9	114°42.3 129°10.7	9.4' 9.5'	24°00.2 23°55.1	-5.1' -5.2'	55.9' 55.9'
3 4	242°11.1	25.9	129° 10.7 143° 39.2	9.6'	23° 55.1 23° 49.8	-5.2' -5.3'	55.9°
5	257°11.3	26.9	158°07.7	9.7'	$23^{\circ}44.5$	-5.5'	55.8'
6	272°11.5	S01°27.9	172°36.4	9.7'	\$23°39.0 23°33.4	-5.6'	55.8'
7 8	287°11.8 302°12.0	28.8 29.8	187°05.1 201°34.0	9.8' 9.9'	23°33.4 23°27.7	-5.7' -5.8'	55.8' 55.8'
9	317°12.2	30.8	216°02.9	10.0'	23°21.9	-5.9'	55.7'
10	332°12.4	31.8	230°31.9	10.1'	23° 16.0	-6.0'	55.7'
11 12	347°12.6 2°12.8	32.7 S 01°33.7	245°00.9 259°30.1	10.2' 10.2'	23°10.0 523°03.8	-6.1' -6.3'	55.7' 55.6'
13	2 12.8 17°13.0	34.7	259 30.1 273°59.3	10.2	22° 57.6	-6.4'	55.6'
14	32°13.3	35.6	288°28.7	10.4'	$22^{\circ}51.2$	-6.5	55.6'
15	47°13.5	• • 36.6	302°58.1	10.5'	22°44.7	-6.6'	55.6'
16 17	62°13.7 77°13.9	37.6 38.6	317°27.6 331°57.2	10.6' 10.7'	22°38.2 22°31.5	-6.7' -6.8'	55.5' 55.5'
18	92°14.1	501°39.5	346°26.8	10.7	522°24.7	-6.9'	55.5'
19	107°14.3	40.5	0°56.6	10.8'	22°17.8	-7.0'	55.4'
20	122°14.5	41.5	15°26.4	10.9'	22°10.8	-7.1'	55.4'
21 22	137°14.7 152°15.0	· · 42.5 43.4	29°56.3 44°26.3	11.0' 11.1'	22°03.7 21°56.5	-7.2' -7.3'	55.4' 55.4'
23	167°15.2	44.4	58°56.4	11.2'	21°49.2	-7.4'	55.3'
	SD = 15.9'	d = 1.0'		SD	0 = 15.3'		

1 -4	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	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
$N 40^{\circ}$	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
$N 10^{\circ}$	05:04	05:28	05:49	17:54	18:15	18:39
0°	05:04	05:28	05:48	17:55	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:59	05:24	05:46	17:57	18:19	18:44
30°	04:54	05:21	05:45	17:58	18:22	18:50
35°	04:50	05:19	05:45	17:59	18:24	18:54
40°	04:45	05:17	05:44	18:00	18:27	18:59
45°	04:39	05:13	05:43	18:01	18:31	19:05
S 50°	04:31	05:09	05:41	18:03	18:35	19:13
52°	04:27	05:07	05:41	18:03	18:37	19:17
54°	04:23	05:05	05:40	18:04	18:40	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
S 60°	04:05	04:56	05:38	18:07	18:49	19:40
1 -4		Moonris	se		Moonset	t
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						

Lat.		Moonris	е	Moonset			
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°	13:48	14:36	15:10	20:31	21:37	22:49	
52°	13:34	14:23	14:59	20:45	21:50	23:00	
50°	13:21	14:11	14:49	20:58	22:01	23:10	
45°	12:55	13:46	14:27	21:24	22:26	23:30	
N 40°	12:34	13:27	14:10	21:44	22:45	23:47	
35°	12:17	13:10	13:55	22:01	23:01		
30°	12:03	12:56	13:42	22:16	23:15		
20°	11:37	12:32	13:21	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	
S 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	
S 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°	07:29	08:30	09:44	01:51	02:47	03:23	
S 60°	07:04	08:06	09:25	02:15	03:11	03:43	

		Sun		Moon				
Day	Eqn.of Time		Mer.	Mer.Pass.		ler. Mer.Pass.		Age
,	00 ^h	00 ^h 12 ^h		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.)

CHA	h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars		
0 ° 18.7	\/\od	CHA	CHV	Dos		Doc							Doc	
1 17712 2387159 400 248737 467 348721 467 348721 467 468 367760 477402 218 468740 4												SHA	Dec	
2 80°787											Alpheratz	357°31.2	29°15.2	
Strice Service Servi											Ankaa	353°03.8	-42°08.8	
6 6°250 200°147 370 209°305 455 209°260 500 27'462 218											Schedar	349°26.9	56°41.8	
Section Control Cont											Diphda	348°44.0	-17°49.5	
8 96°35.5 310°139 N13°359 313°353 N17°47 209°315 50°564 57°514 N12°117 Politic July 20°564 11 11 11 11 11 11 11											Achernar	$335^{\circ}17.5$	-57°05.2	
The color of the											Hamal	327°47.4	23°36.0	
Section Part											Polaris	$312^{\circ}01.1$	89°22.8	
19											Acamar	$315^{\circ}09.2$		
10 16 16 16 17 17 18 18 15 18 17 18 18 15 18 18 18 18 18														
11 121"458 3 25"119 31.9 31"439 31"432 34"417 51.4 313"044 21.4 ABROWN MISS 11.2 128"458 40"115 31.3 11.4 97.59 91.1 128"457 51.0 187006 21.1 14 128"457 51.0 187006 21.1											Mirfak			
186 186 363 364 367											I			
13 20°80.0 5°11.1 30.3 64°44.8 41.7 14°457 51.9 1870.6 21.3 11.2 20°10.0 70°10.6 70°10.5 70°10.7 70°10											_			
124 216*33.2 79*10.7 295 79*45.7 4.09 49*45.9 523 127*12.2 2.12 Album 24*25.7 83*10.3 277 94*46.7 4.09 49*59.6 523 29*10.0 2.11 24*25.8 20*25.8 20*25.0 2.7 10.1 130*09.2 2.0 27.0 144*45.5 1.0 2.1 142*10.0 2.0 2.1 142*10.0 144*10														
16 234°652 261°103 207°106 277°10 27							29°47.6							
18 277 10 28 278 28 274 28 28 28 28 28 28 28 2	15	231°55.7	85°10.3	• • 28.7	94°46.7	• • 40.9		• • 52.3	193°14.8	• • 21.2	I .			
19 2070-06 145'08.3 224 154'04 392 105'75.5 507'52.0 268'27.8 201 268'27.8 201 268'27.8 201 268'27.8 201 270'06.2 233'21.05 175'08.0 224.8 186'15.3 38.8 110'89.4 53.4 268'27.8 201 268'27.8 201 270'07.0 23.3 30'15.4 205'07.2 221 241'41 37.6 105'05.3 54.0 208'33.0 20.8 244'47.8 5'03.1 223'35.7 201 270'07.6 23.0 199'83.2 38.0 150'03.4 53.8 208'33.0 20.8 244'47.8 5'03.1 270'07.2 21.1 241'41 37.6 105'05.3 54.0 208'33.0 20.8 244'47.8 5'03.1 224'44.8 244'47.	16	246°58.2	100°10.0	27.9	109°47.6	40.5	59°51.6	52.5	208°17.4	21.1				
22 23 24 25 25 25 25 25 25 25	17	262°00.6	115°09.6	27.0	124°48.5	40.1		52.7	223°20.0	21.1	_			
19 22° 195 196 196 196 196 196 197	18	277°03.1	130°09.2	N13°26.2	139°49.4	$N17^{\circ}39.7$	89°55.5	S01°52.9	238°22.6	$N12^{\circ}21.0$				
23 23 23 24 24 24 24 25 25 25 25	19	292°05.6	145°08.8	25.4	154°50.4	39.2		53.2	253°25.2	21.0				
Polity Part Polity Part Polity Part Polity Part	20	307°08.0	160°08.4	24.6	169°51.3	38.8	119°59.4	53.4	268°27.8	20.9				
23 33 154 205 107 221 214 541 376 105 653 553 653 238 348	21	322°10.5	175°08.0	• • 23.8	184°52.2	• • 38.4	135°01.4	• • 53.6	283°30.4	• • 20.9				
Mar. Subal	22		190°07.6	23.0		38.0	150°03.4	53.8	298°33.0	20.8				
Mapledous 221'891	23	$352^{\circ}15.4$	205°07.2	22.1	$214^{\circ}54.1$	37.6	165°05.3	54.0	313°35.6	20.8	1			
Change	1/10= =	255 22.21	1/_O A' A O	18' m 4 00	1/0 0/ 4 o	1/ m1 52	1/2 0/ 40	2' m 1 66	1/2 6/ A 0	1' m0 06	I			
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Thu GHA CHA Dec GHA Dec GHA Dec CHA Dec CHA Dec Dechal a 18273.7 a 1 22703. a 13721. a 12752. b 187473. b 180°073. S 10°49.2 a 258°32. b 12°40. b														
0 7-11-9 20'0-08 N13'21.3 229'050 N17'37.1 180'07.3 97.49.2 328'38.2 N12'20.7 1 22'0.3 25'00.6 0 197 259'656 36.3 7 195'09.3 54.4 38'4'0.8 20.7 2 37'22.8 250'06.0 197 259'656 36.3 27 195'09.3 54.4 383'4'0.8 20.7 3 4 67'77 250'06.2 181 259'656 36.3 20'112.3 55.1 104'01.7 20.5 5 82'30.2 295'04.8 11.2 304'956 35.1 255'17.1 55.3 43'51.3 20.5 6 97'32.7 310'04.4 N13'16.4 320'00.6 N17'46. 270'19.1 50'55.5 59'83.9 N12'04 7 112'35.1 225'04.0 11.6 335'01.5 42.2 255'11.5 5.7 73'65.5 20.4 8 127'37.6 340'03.6 14.8 350'02.4 31.8 30'02.3 55.9 88'9.9 1 20.4 8 127'37.6 340'03.6 14.8 350'02.4 31.8 30'02.3 55.9 88'9.9 1 20.4 10 157'42.5 10'02.8 13.1 20'04.3 33.8 30'02.3 55.9 88'9.9 1 20.4 10 157'42.5 10'02.8 13.1 20'04.3 33.3 30'27.0 56.1 104'01.7 20.3 11 172'45.0 25'02.4 12.3 35'05.2 32.5 345'28.9 56.6 134'06.9 20.2 11 187'47.4 40'02.0 N13'11.5 50'06.2 N17'22.1 0'30.9 50'56.8 134'09.9 N12'5.1 12 187'47.4 40'02.0 N13'11.5 50'06.2 N17'22.1 0'30.9 50'56.8 134'09.9 N12'5.1 12 187'47.4 40'02.0 N13'11.5 50'06.2 N17'22.1 0'30.9 50'56.8 134'09.9 N12'5.1 12 187'47.4 40'02.0 N13'11.5 0'50'62.5 N17'2.1 13 207'49.9 80'10.3 0.98 80'80.8 0.1 3.1 30'34.8 57.2 10'14.7 20.1 14 217'52.4 70'01.3 0.98 80'80.8 0.1 31.3 30'34.8 57.2 10'14.7 20.1 15 217'52.4 70'01.3 0.98 80'80.8 0.1 3.3 30'34.8 57.2 10'14.7 20.1 15 217'52.4 70'01.3 0.98 80'80.8 0.1 10'09.9 30.4 0'28.8 57.6 20'19.0 19.9 15 207'59.9 115'00.0 0.0 110'03.9 0.0 75'60.4 N17'91.4 20.1 15 217'52.4 70'01.3 0.98 80'80.8 0.1 10'09.9 30.4 0'28.8 57.6 20'19.0 19.9 15 207'59.9 115'00.0 0.0 110'03.3 0.0 75'60.7 N13'06.5 10'01'01.7 N17'92.6 90'04.7 57.8 20'03.3 19.7 16 207'59.9 115'00.0 0.0 3.1 10'09.9 30.4 0'28.8 57.6 20'19.0 19.9 15 207'50.4 118'50.5 0.0 10.0 73 18'04.8 50'0.0 19.9 15 207'50.4 118'50.5 0.0 10.0 73 18'04.8 50'0.0 19.9 15 207'50.8 115'00.0 0.0 30.0 75'00.0 18'00.0 19.9 15 207'50.4 118'50.5 0.0 10.0 73 18'00.0 75'00.0 18'00.0 19.9 16 207'50.4 118'50.5 0.0 10'00.0 110'00.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0	Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_			
2 3 3 2 2 3 5 0 6 0 197 2 3 9 5 9 3 7 19 9 9 3 4 33 4 34 3 9 0 2 0 6 6 6 17 5 4 1 3 1 3 6 1 1	0	7°17.9	220°06.8	N13°21.3	229°55.0	$N17^{\circ}37.1$	180°07.3	S01°54.2	328°38.2	N12°20.7				
2 37°228 290°60.0 1897 259°559 36.3 22°011.2 34.6 396°43.4 20.6 3 52°25.3 205°06.0 1897 274°578 359 225°13.2 549 13°460 20.6 6 6 6 6 72°27 20°06.2 181 289°88.7 355 22°213.2 549 13°460 20.6 6 6 6 72°27 20°06.2 181 289°88.7 355 20°213.2 551 28°48.7 20.5 51 28°59.7 21.5 52.2 21.5 20°06.5 21.5 51 28°48.7 28°59.7 21.5 52.2 21.5 20°06.5 21.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°48.7 20.5 51 28°59.7 21.5 52.5 51 28°49.7 20.5 51 28°59.7 21.5 52.5 51 28°49.7 20.5 51 28°59.7 21.5 52.5 51 28°49.7 20.5 51 28°59.7 21.5 52.5 51 28°49.7 20.5 51 28°59.7 21.5 52.5 51 28°49.7 20.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 51 28°59.7 21.5 52.5 52.5 51 28°59.7 21.5 52.5 52.5 51 28°59.7 21.5 52.5 52.5 52.5 51 28°59.7 21.5 52.5 52.5 52.5 52.5 52.5 52.5 52.5	1	22°20.3	235°06.4	20.5		36.7	195°09.3	54.4	343°40.8	20.7				
3 52°23.7 280°08.6 III.9 274°57.8 * 35.9 22°313.2 * 34.9 13°46.0 * 20.6 4 67°27.7 280°09.2 III.9 289°88.7 3.55 240°15.2 55.1 22°48.7 20.5 5 82°30.2 285°04.8 II.7 2 304°99.6 35.1 25°317.1 55.3 43°51.3 20.5 6 97°32.7 310°04.4 N32°16.4 220°0.0 N17°34.6 270°19.1 50°55.5 \$8°53.9 N12°20.4 7 112°35.1 320°0.6 14.8 335°01.5 34.2 288°21.1 55.7 73°56.5 20.4 8 127°37.6 340°0.6 14.8 350°0.2 4 33.8 300°2.3 55.9 88°59.1 20.3 9 142°40.1 355°0.3 2 13.9 \$5°0.2 4 33.8 300°2.3 55.9 88°59.1 20.3 9 142°40.1 355°0.3 2 13.9 \$5°0.2 4 33.4 31.3 30°2.7 5.6 1 104°0.17 2.0 112°45.1 30°0.8 13.1 20°0.4 21.3 35°0.2 4 33.9 30°2.0 55.9 88°59.1 20.3 112°45.0 10°0.8 13.1 20°0.4 21.3 35°0.2 4 31.3 30°3.0 30°2.7 5.6 1 104°0.17 2.0 12 20°0.4 4 50°0.0 N13°1.0 8 50°0.2 1 31.3 80°0.2 1 112°45.0 1 30°0.8 130°0.0 1 112°45.0 1 30°0.0 1 112	2	37°22.8	250°06.0	19.7	259°56.9	36.3		54.6	358°43.4	20.6				
5 88°30.2 299°04.8 17.2 389°8.7 35.5 240°15.2 55.1 28°48.7 20.5 58°8.2 299°32.7 310°04.8 17.2 304°59.6 35.1 255°17.1 55.3 3.25°16.6 11.9 18.6 320°0.0 811°734.6 320°0.0 811°734.6 320°0.0 811°734.6 320°0.0 811°734.6 320°0.5 5.6 88°9.1 20.3 41.2 41.9 18.6 41.	3	52°25.3	265°05.6	• • 18.9	274°57.8	• • 35.9	225°13.2	• • 54.9		• • 20.6				
Second Second	4	67°27.7	280°05.2	18.1	289°58.7	35.5	240°15.2	55.1	28°48.7	20.5				
7 112°32.7 310°04.4 N13°16.4 320°00.6 N17°34.6 270°19.1 S01°55.5 58°3.9 N12°20.4 Alkiald 152°9.01 49°10.3 8 127°37.6 340°03.6 14.8 350°02.4 33.8 300°32.0 55.9 88°9.1 20.3 Heater 147°54.3 -60°30.8 Heater 147°54.3 -60°30.8 Heater 147°54.3 -36°30.7 10°157°42.5 10°02.8 13.1 20°04.3 33.0 330°37.0 56.4 119°04.3 20.2 Arctum. 145°45.5 19°0.21 11 172°45.0 25°02.4 12.3 35°05.2 32.5 348°28.9 56.6 134°09.5 N12°01.	5	82°30.2	295°04.8	17.2	304°59.6	35.1	255°17.1	55.3	43°51.3	20.5				
7 112*35.1 355*04.0 15.6 335*01.5 34.2 285*21.1 55.7 73*56.5 20.4	6		310°04.4	N13° 16.4	320°00.6	N17°34.6		S01°55.5		N12°20.4				
8 127'37.6 340'03.6 14.8 350'02.4 33.8 300'23.0 55.9 88'50.1 203 9 142'401 395'03.2 13.9 5'03.4 33.8 300'23.0 55.9 88'50.1 203 10 157'42.5 10'02.8 13.1 20'04.3 33.0 330'27.0 56.4 119'04.3 20.2 11 172'45.0 25'02.4 12.3 35'05.2 32.5 345'28.9 56.6 134''06.9 20.2 12 187'47.4 40'02.0 133'11.5 50'06.2 N17'32.1 0'30.9 \$01'56.8 149''05.5 N12''20.1 13 202'49.9 55'01.7 10.6 65'07.1 31.7 153'2.9 57.0 104'12.1 20.1 14 217'52.4 70''01.3 09.8 80''06.0 31.3 30''34.8 57.2 179'14.7 20.0 15 222''34.8 85''00.9 0.90.0 95''00.0 30.8 45'36.8 57.4 194''17.3 20.0 16 247''57.3 100''00.5 06.1 110''09.9 30.4 60''38.8 57.6 29''19.9 19.9 50.0 17 262''95.8 115''00.1 07.3 125''10.8 30.0 75''0.0 75'.8 294''22.5 19.9 18 278''02.2 129''957.7 103''36.5 140''11.7 N17''29.6 99''42.7 \$01''58.1 299''25.1 N12''19.8 15''00.1 07.3 155''12.7 29.2 105''44.7 56.3 294''52.7 19.8 15''00.1 10''3.6 28.7 120''46.6 55.5 269''30.3 19.7 22'' 2338''12.1 189''58.1 303.2 200''15.5 27.9 150''50.6 58.9 299''35.5 19.6 Nunkin' 75''44.0 26''15.5 22'' 338''12.1 189''58.1 303'' 22.2 201''15.5 27.9 150''50.6 58.9 299''35.5 19.6 Nunkin' 75''44.0 26''15.5 27.9 150''50.6 58.9 299''35.5 19.6 Nunkin' 75''44.0 26''15.5 12.3 33'''14.6 204'''57.7 02.3 215''16.4 27.5 165''52.5 95.1 344'''38.1 19.6 Nunkin' 75'''44.0 26'''15.9 8.6 12'''95.9 26'''0.4 20'''m.1.6 b.2.6 d''.0.1''m.0.5 12.3 1.3 30'''22.0 2.2 20'''.7 20.2 215''16.4 27.5 165''52.5 95.1 344'''38.1 19.6 Nunkin' 75'''44.0 26'''.5 33''''35.4 26''''.5 20'''''.5 20'''''.5 20''''''.5 20''''''.5 20''''''.5 20''''''.5 20''''''.5 20''''''.5 20''''''.5 20''''''''.5 20'''''''.5 20'''''''''.5 20''''''''''''''''''''''''''''''''''''	7	112°35.1	325°04.0	15.6	335°01.5	34.2	$285^{\circ}21.1$	55.7	73°56.5	20.4				
142*40.1 355*03.2 13.9 5'03.4 33.0 330.0 330.77.0 56.1 104*01.7 20.3 20.2 11 172*45.0 25*02.4 12.3 35*05.2 32.5 348*28.9 56.6 138*06.9 20.2 12.1 172*45.0 25*02.4 12.3 35*05.2 32.5 348*28.9 56.6 138*06.9 20.2 12.1 12.	8	127°37.6	340°03.6	14.8	350°02.4	33.8	300°23.0	55.9	88°59.1	20.3				
10 157*42.5	9		355°03.2	• • 13.9	5°03.4	• • 33.4	315°25.0	• • 56.1	104°01.7	• • 20.3				
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8 128°36.7 339°54.2 54.8 350°24.8 23.7 301°10.2 01.0 90°01.6 19.1 91.1 143°39.2 354°53.8 · 54.0 5°25.8 · 23.2 316°12.2 · 01.3 105°04.2 · 19.0 105°04.2 · 19.0 105°04.2 · 19.0 11.1 173°44.1 24°53.0 52.3 35°27.6 22.4 346°16.1 01.7 135°09.4 18.9 12 188°46.6 39°52.6 N12°51.4 50°28.6 N17°22.0 1°18.1 S02°01.9 150°12.0 N12°18.9 13 203°49.0 54°52.2 50.6 65°29.5 21.5 16°20.1 02.1 165°14.6 18.8 14 218°51.5 69°51.8 49.7 80°30.4 21.1 31°22.0 02.3 180°17.3 18.8 15 233°54.0 84°51.4 · 48.9 95°31.4 · 20.7 46°24.0 · 02.5 195°19.9 · 18.7 16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 18 279°01.4 129°50.3 N12°46.4 140°34.2 N17°19.4 91°29.9 S02°03.2 240°27.7 N12°18.6 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 · 43.8 185°37.0 · 18.1 136°35.8 · 03.8 285°35.5 · 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 21°20.1 01.0 10.1 18.3							286°08.3							
9 143°39.2 354°53.8 · · 54.0 5°25.8 · · 23.2 316°12.2 · · 01.3 105°04.2 · · 19.0 158°41.7 9°53.4 53.1 20°26.7 22.8 331°14.2 01.5 120°06.8 19.0 11 173°44.1 24°53.0 52.3 35°27.6 22.4 346°16.1 01.7 135°09.4 18.9 12 188°46.6 39°52.6 N12°51.4 50°28.6 N17°22.0 1°18.1 S02°01.9 150°12.0 N12°18.9 13 203°49.0 54°52.2 50.6 65°29.5 21.5 16°20.1 02.1 165°14.6 18.8 14 218°51.5 69°51.8 49.7 80°30.4 21.1 31°22.0 02.3 180°17.3 18.8 15 233°54.0 84°51.4 · · · 48.9 95°31.4 · · · 20.7 46°24.0 · · · 02.5 195°19.9 · · 18.7 16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 15 233°36.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 · · · 43.8 185°37.0 · · 18.1 136°35.8 · · 03.8 285°35.5 · · 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Sep 28 Thu SHA Mer.pass Venus 212°48.9 09:20 150°12.0 N12°18.9 150°12.0 N1													02:09	
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11 173 44.1 24 53.0 52.3 35 27.0 22.4 346 16.1 01.7 135 09.4 18.9 12 188 46.6 39 52.6 N12 51.4 50 28.6 N17 22.0 1°18.1 S02 01.9 150°12.0 N12°18.9 13 203°49.0 54°52.2 50.6 65°29.5 21.5 16°20.1 02.1 165°14.6 18.8 14 218°51.5 69°51.8 49.7 80°30.4 21.1 31°22.0 02.3 180°17.3 18.8 15 233°54.0 84°51.4 ··· 48.9 95°31.4 ··· 20.7 46°24.0 ··· 02.5 195°19.9 ··· 18.7 16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 18 279°01.4 129°50.3 N12°46.4 140°34.2 N17°19.4 91°29.9 S02°03.2 240°27.7 N12°18.6 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 ··· 43.8 185°37.0 ··· 18.1 136°35.8 ··· 03.8 285°35.5 ··· 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Mars: 0.1	10	158°41.7		53.1		22.8		01.5	120°06.8	19.0				
12 188 40.6 39 52.6 N12 51.4 50 28.6 N17 22.0 1 18.1 502 0.9 1150 12.0 N12 18.9 13 203° 49.0 54° 52.2 50.6 65° 29.5 21.5 16° 20.1 02.1 165° 14.6 18.8 14 218° 51.5 69° 51.8 49.7 80° 30.4 21.1 31° 22.0 02.3 180° 17.3 18.8 15 233° 54.0 84° 51.4 · · · 48.9 95° 31.4 · · · 20.7 46° 24.0 · · · 02.5 195° 19.9 · · 18.7 16 248° 56.4 99° 51.1 48.0 110° 32.3 20.3 61° 26.0 02.7 210° 22.5 18.7 17 263° 58.9 114° 50.7 47.2 125° 33.3 19.8 76° 27.9 03.0 225° 25.1 18.6 18 279° 01.4 129° 50.3 N12° 46.4 140° 34.2 N17° 19.4 91° 29.9 502° 03.2 240° 27.7 N12° 18.6 19 294° 03.8 144° 49.9 45.5 155° 35.1 19.0 106° 31.9 03.4 255° 30.3 18.5 155° 30.3 18.5 20 309° 06.3 159° 49.5 44.7 170° 36.1 18.6 121° 33.8 03.6 270° 32.9 18.5 21 324° 08.8 174° 49.1 · · 43.8 185° 37.0 · · 18.1 136° 35.8 · · 03.8 285° 35.5 · · 18.4 22 339° 11.2 189° 48.7 43.0 200° 37.9 17.7 151° 37.8 04.0 300° 38.1 18.3 23 354° 13.7 204° 48.3 42.1 215° 38.9 17.3 166° 39.7 04.2 315° 40.7 18.3		$173^{\circ}44.1$	24°53.0		35°27.6	22.4		01.7	135°09.4	18.9				
13 203°49.0 54°52.2 50.6 65°29.5 21.5 16°20.1 02.1 165°14.6 18.8 14 218°51.5 69°51.8 49.7 80°30.4 21.1 31°22.0 02.3 180°17.3 18.8 15 233°54.0 84°51.4 · · · 48.9 95°31.4 · · · 20.7 46°24.0 · · · 02.5 195°19.9 · · 18.7 16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 18 279°01.4 129°50.3 N12°46.4 140°34.2 N17°19.4 91°29.9 \$02°03.2 240°27.7 N12°18.6 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 · · · 43.8 185°37.0 · · 18.1 136°35.8 · · 03.8 285°35.5 · · 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 23 18.3	12	188°46.6	39°52.6	N12°51.4	50°28.6	$N17^{\circ}22.0$	1°18.1	S02°01.9	150°12.0	$N12^{\circ}18.9$				
14 218 51.5 69 51.8 49.7 80 30.4 21.1 31 22.0 02.3 180 17.3 18.8 185 233 54.0 84 51.4 · · · 48.9 95 31.4 · · · 20.7 46 24.0 · · · 02.5 195 19.9 · · 18.7 16 248 56.4 99 51.1 48.0 110 32.3 20.3 61 26.0 02.7 210 22.5 18.7 17 263 58.9 114 50.7 47.2 125 33.3 19.8 76 27.9 03.0 225 25.1 18.6 18 279 01.4 129 50.3 N12 46.4 140 34.2 N17 19.4 91 29.9 S02 03.2 240 27.7 N12 18.6 19 294 03.8 144 49.9 45.5 155 35.1 19.0 106 31.9 03.4 255 30.3 18.5 20 309 06.3 159 49.5 44.7 170 36.1 18.6 121 33.8 03.6 270 32.9 18.5 21 324 08.8 174 49.1 · · · 43.8 185 37.0 · · 18.1 136 35.8 · · 03.8 285 35.5 · · 18.4 22 339 11.2 189 48.7 43.0 200 37.9 17.7 151 37.8 04.0 300 38.1 18.3 23 354 13.7 204 48.3 42.1 215 38.9 17.3 166 39.7 04.2 315 40.7 18.3														
16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 Venus 211°40.3 09:20 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 Mars 222°00.3 08:38 18 279°01.4 129°50.3 N12°46.4 140°34.2 N17°19.4 91°29.9 S02°03.2 240°27.7 N12°18.6 Jupiter 172°37.5 11:55 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 Saturn 321°23.7 02:01 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 Horizontal parallax 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 Horizontal parallax 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 <td row<="" td=""><td></td><td></td><td></td><td>49.7</td><td></td><td>21.1</td><td></td><td></td><td></td><td>18.8</td><td>Saturn</td><td>JZ1 ZU.4</td><td>02.03</td></td>	<td></td> <td></td> <td></td> <td>49.7</td> <td></td> <td>21.1</td> <td></td> <td></td> <td></td> <td>18.8</td> <td>Saturn</td> <td>JZ1 ZU.4</td> <td>02.03</td>				49.7		21.1				18.8	Saturn	JZ1 ZU.4	02.03
16 248°56.4 99°51.1 48.0 110°32.3 20.3 61°26.0 02.7 210°22.5 18.7 Venus 211°40.3 09:20 17 263°58.9 114°50.7 47.2 125°33.3 19.8 76°27.9 03.0 225°25.1 18.6 Mars 222°00.3 08:38 18 279°01.4 129°50.3 N12°46.4 140°34.2 N17°19.4 91°29.9 S02°03.2 240°27.7 N12°18.6 Jupiter 172°37.5 11:55 19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 Saturn 321°23.7 02:01 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 · 43.8 185°37.0 · 18.1 136°35.8 · 03.8 285°35.5 · 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 23 354°13.7 204°48.3 42.1											Sep 29 Fri	SHA	Mer.pass	
18											Venus			
19 294°03.8 144°49.9 45.5 155°35.1 19.0 106°31.9 03.4 255°30.3 18.5 20 309°06.3 159°49.5 44.7 170°36.1 18.6 121°33.8 03.6 270°32.9 18.5 21 324°08.8 174°49.1 · 43.8 185°37.0 · 18.1 136°35.8 · 03.8 285°35.5 · 18.4 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Saturn 321°23.7 02:01											I			
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21 324°08.8 174°49.1 · · 43.8 185°37.0 · · 18.1 136°35.8 · · 03.8 285°35.5 · · 18.4 Horizontal parallax 22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 Venus: 0.1 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Mars: 0.1											Saturn	321°23.7	02:01	
22 339°11.2 189°48.7 43.0 200°37.9 17.7 151°37.8 04.0 300°38.1 18.3 Venus: 0.1 23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Mars: 0.1											U!	al parallas		
23 354°13.7 204°48.3 42.1 215°38.9 17.3 166°39.7 04.2 315°40.7 18.3 Mars: 0.1											HORIZONI	•	0.1	
25 351 15.11 261 16.5 12.11 21.5 36.5 11.5 160 35.11 01.12 355 16.11 16.5														
Mer.pass. 23:23 ν -0.4′ d -0.8′ m-4.08 ν 0.9′ d -0.4′ m1.51 ν 2.0′ d 0.2′ m-1.66 ν 2.6′ d -0.1′ m0.05	23	354~13.7	204~48.3	42.1	215~38.9	17.3	166~39.7	04.2	315~40.7	18.3		ividi5:	0.1	
	Mer.p	ass. 23:23	ν -0.4' d-0	.8′ m-4.08	ν 0.9′ d-0	.4′ m1.51	$\nu 2.0' \ d0.$	2′ m-1.66	ν 2.6′ d-0	.1′ m0.05				

h	Sui	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 15.4	S01°45.4	73°26.6	11.3'	S21°41.8	-7.5'	55.3'
1 2	197° 15.6 212° 15.8	46.3 47.3	87°56.8 102°27.2	11.3' 11.4'	21°34.3 21°26.7	-7.6' -7.7'	55.3' 55.3'
3	212 15.8 227°16.0	. 48.3	102 27.2 116°57.6	11.5'	21° 19.0	-7.7 -7.8'	55.2'
4	242° 16.2	49.3	131°28.1	11.6'	21°11.3	-7.9'	55.2'
5	257° 16.4	50.2	145°58.7	11.7'	21°03.4	-8.0'	55.2'
6	272°16.6 287°16.9	S01°51.2 52.2	160°29.4 175°00.1	11.8' 11.8'	\$20°55.4 20°47.4	-8.1' -8.1'	55.2' 55.1'
7 8	302°17.1	52.2 53.2	175 00.1 189°31.0	11.8	20 47.4 20°39.2	-8.1 -8.2'	55.1'
9	317° 17.3	54.1	204°01.9	12.0'	20°31.0	-8.3	55.1'
10	332° 17.5	55.1	218°32.9	12.1'	20°22.7	-8.4'	55.1'
11 12	347° 17.7 2° 17.9	56.1 \$01°57.0	233°04.0 247°35.1	12.2' 12.2'	20°14.3 \$20°05.8	-8.5' -8.6'	55.0' 55.0'
13	2 17.9 17°18.1	58.0	247 35.1 262°06.4	12.2	19°57.2	-8.0 -8.7'	55.0'
14	32° 18.3	01°59.0	276°37.7	12.4'	19°48.5	-8.7'	55.0'
15	47° 18.5	02°00.0	291°09.1	12.5'	19°39.8	-8.8'	55.0'
16 17	62° 18.8 77° 19.0	00.9 01.9	305°40.6 320°12.2	12.6' 12.6'	19°31.0 19°22.1	-8.9' -9.0'	54.9' 54.9'
18	92° 19.2	502°02.9	334°43.8	12.7'	\$19°13.1	-9.0 -9.1'	54.9'
19	107° 19.4	03.9	349° 15.5	12.8'	19°04.0	-9.1'	54.9'
20	122° 19.6	04.8	3°47.3	12.9'	18°54.9	-9.2'	54.9'
21	137° 19.8 152° 20.0	· · 05.8 06.8	18° 19.2 32° 51.2	13.0' 13.0'	18°45.6 18°36.3	-9.3' -9.4'	54.8' 54.8'
22 23	167°20.2	06.8 07.7	47°23.2	13.1'	18°27.0	-9.4 -9.4'	54.8'
_5	SD = 16.0'	d = 1.0'	25.2		D = 15.1'	J. I	20
	JD — 10.0°	u — 1.0		31	J — 13.1°		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°20.4	\$02°08.7 09.7	61°55.3	13.2'	\$18°17.5	-9.5'	54.8'
1 2	197°20.6 212°20.9	09.7 10.7	76°27.5 90°59.7	13.3' 13.3'	18°08.0 17°58.4	-9.6' -9.7'	54.7' 54.7'
3	227° 21.1	•• 11.6	105°32.1	13.4'	17°48.7	-9.7'	54.7'
4	242°21.3	12.6	$120^{\circ}04.5$	13.5'	$17^{\circ}39.0$	-9.8'	54.7'
5	257°21.5	13.6	134°36.9	13.5'	17°29.2	-9.9'	54.7'
6 7	272°21.7 287°21.9	S02°14.5 15.5	149°09.5 163°42.1	13.6' 13.7'	\$17°19.3 17°09.4	-9.9' -10.0'	54.7' 54.6'
8	302°22.1	16.5	103 42.1 178°14.8	13.8'	16°59.4	-10.0	54.6'
9	317°22.3	• • 17.5	192°47.5	13.8'	16°49.3	-10.1'	54.6'
10	332°22.5	18.4	207°20.4	13.9'	16°39.1	-10.2'	54.6'
11 12	347°22.7 2°22.9	19.4 \$02°20.4	221°53.3 236°26.2	14.0' 14.0'	16°28.9 \$16°18.7	-10.3' -10.3'	54.6' 54.6'
13	17°23.2	21.3	250° 59.3	14.1'	16°08.3	-10.3	54.5
14	32°23.4	22.3	265°32.4	14.2'	15°58.0	-10.5'	54.5'
15	47°23.6	• • 23.3	280°05.5	14.2'	15°47.5	-10.5'	54.5'
16 17	62°23.8 77°24.0	24.3 25.2	294°38.8 309°12.0	14.3' 14.4'	15°37.0 15°26.4	-10.6' -10.6'	54.5' 54.5'
18	92°24.2	S02°26.2	323°45.4	14.4'	\$15°15.8	-10.7	54.5'
19	107°24.4	27.2	$338^{\circ}18.8$	14.5'	$15^{\circ}05.1$	-10.7'	54.4'
20	122°24.6	28.1	352°52.3		14°54.4		54.4'
21 22	137°24.8 152°25.0	· · 29.1 30.1	7°25.9 21°59.5	14.6' 14.7'	14°43.6 14°32.7	-10.9' -10.9'	54.4' 54.4'
23	167° 25.2	31.1	36°33.1	14.7'	14°21.8	-11.0'	54.4'
	SD = 16.0'	d = 1.0'		SI	0 = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d 11.0'	HP
0 1	182°25.4 197°25.7	\$02°32.0 33.0	51°06.8 65°40.6	14.8' 14.8'	\$14°10.9 13°59.8	-11.0' -11.1'	54.4' 54.4'
2	212°25.9	34.0	80°14.5	14.9'	13°48.8	-11.1	54.3'
3	227° 26.1	• • 34.9	94°48.4	15.0'	13°37.7	-11.2'	54.3'
4	242°26.3 257°26.5	35.9	109°22.3 123°56.3	15.0'	13°26.5	-11.2'	54.3'
5 6	257°26.5 272°26.7	36.9 \$02°37.9	123°56.3 138°30.4	15.1' 15.1'	13°15.3 \$13°04.0	-11.3' -11.3'	54.3' 54.3'
7	287° 26.9	38.8	153° 04.5	15.2'	12°52.7	-11.4'	54.3'
8	302°27.1	39.8	167°38.7	15.2'	12°41.4	-11.4'	54.3'
9	317°27.3	• • 40.8	182°12.9	15.3'	12°30.0	-11.4'	54.2'
10 11	332°27.5 347°27.7	41.7 42.7	196°47.2 211°21.5	15.3' 15.4'	12°18.6 12°07.1	-11.5' -11.5'	54.2' 54.2'
12	2°27.9	S02°43.7	225°55.9	15.4'	S 11°55.5	-11.6'	54.2'
13	17°28.1	44.7	240°30.3	15.5'	11°44.0	-11.6'	54.2'
14 15	32°28.3 47°28.5	45.6 •• 46.6	255°04.8 269°39.3	15.5' 15.6'	11°32.4 11°20.7	-11.7' -11.7'	54.2' 54.2'
15 16	47°28.5 62°28.8	47.6	269°39.3 284°13.9	15.6'	11°20.7 11°09.0	-11.7' -11.7'	54.2'
17	77° 29.0	48.5	298° 48.5	15.7'	10°57.3	-11.8	54.2'
18	92°29.2	S02°49.5	313°23.1	15.7'	\$10°45.5	-11.8'	54.2'
19 20	107°29.4 122°29.6	50.5 51.4	327°57.8 342°32.6	15.7' 15.8'	10°33.7 10°21.9	-11.8' -11.9'	54.1' 54.1'
20	122°29.6 137°29.8	51.4 •• 52.4	342°32.6 357°07.4	15.8'	10°21.9 10°10.0	-11.9' -11.9'	54.1'
22	152°30.0	53.4	11°42.2	15.9'	09°58.1	-11.9'	54.1'
23	167°30.2	54.4	26°17.1	15.9'	09°46.1	-12.0'	54.1'
	SD = 16.0'	d = 1.0'	<u> </u>	SI	O = 14.8'		<u>-</u>

	Twi	light			Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	03:36	05:00	06:07	17:31	18:38	20:01	
N 70°	03:50	05:05	06:06	17:33	18:34	19:48	
68°	03:50	05:05	06:00	17:35	18:30	19:46	
66°	04:01	05:08	06:04	17:35	18:27	19:37	
64°	04:10	05:14	06:01	17:38	18:25	19:21	
62°	04:17	05:14	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	17:41	18:19	19:00	
54°	04:41	05:22	05:57	17:42	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	
S 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	
S 50°	04:24	05:02	05:35	18:07	18:40	19:18	
52°	04:19	05:00	05:34	18:08	18:42	19:23	
54°	04:14	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	
S 60°	03:55	04:46	05:28	18:14	18:56	19:48	
	l .						

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°		18:15	17:32		23:04	
N 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
S 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
S 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
S 60°	10:50	12:14	13:36	04:02	04:13	04:20

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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		11:50	21:12	08:51		

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

h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	9°16.2	219°47.9	N12°41.3	230°39.8	N17°16.9	181°41.7	S02°04.4	330°43.3	N12°18.2		SIIA	
	24° 18.6	219 47.9 234°47.5		230 39.6 245°40.8		196°43.7		345°46.0		Alpheratz	357°31.2	29°15.2
1	39°21.1	234 47.5 249°47.2	40.4		16.4	211°45.6	04.7 04.9	0°48.6	18.2	Ankaa	353°03.8	-42°08.8
2			39.6	260°41.7	16.0				18.1	Schedar	349°26.9	56°41.9
3	54°23.5	264°46.8	• • 38.7	275°42.6	15.6	226° 47.6	05.1	15°51.2	• • 18.1	Diphda	348°44.0	-17°49.5
4	69°26.0	279°46.4	37.8	290°43.6	15.2	241°49.6	05.3	30°53.8	18.0	Achernar	335°17.5	-57°05.2
5	84°28.5	294°46.0	37.0	305°44.5	14.7	256°51.5	05.5	45°56.4	18.0	Hamal	327°47.4	23°36.0
6	99°30.9	309°45.6	N12°36.1	320°45.5	N17°14.3	271°53.5	S02°05.7	60°59.0	N12°17.9	Polaris	312°00.0	89°22.8
7	114°33.4	324°45.2	35.3	335°46.4	13.9	286°55.5	05.9	76°01.6	17.9	Acamar	315°09.2	-40°11.1
8	129°35.9	339°44.8	34.4	350°47.3	13.5	301°57.4	06.2	91°04.2	17.8	Menkar	314°02.7	4°12.3
9	144°38.3	354°44.4	• • 33.6	5°48.3	• • 13.0	316°59.4	• • 06.4	106°06.8	• • 17.8	Mirfak	308°23.5	49°57.7
10	159° 40.8	9°44.0	32.7	20°49.2	12.6	332°01.4	06.6	121°09.4	17.7	Aldebaran	290°36.0	16°34.0
11	174°43.3	24°43.7	31.9	35°50.2	12.2	347°03.3	8.60	136°12.1	17.7	Rigel	281°00.8	-8°10.0
12	189° 45.7	39°43.3	N12°31.0	50°51.1	N17°11.7	2°05.3	S02°07.0	151°14.7	N12°17.6	Capella	280° 17.2	46°01.4
13	204°48.2	54°42.9	30.1	65°52.1	11.3	17°07.3	07.2	166°17.3	17.6	Bellatrix	$278^{\circ}19.5$	6°22.6
14	219°50.6	69°42.5	29.3	80°53.0	10.9	32°09.2	07.4	181°19.9	17.5	Elnath	277° 57.9	28°37.8
15	234°53.1	84°42.1	• • 28.4	95°53.9	• • 10.5	47°11.2	• • 07.6	196°22.5	• • 17.4	Alnilam	275°34.6	-1°10.9
16	249°55.6	99°41.7	27.6	110°54.9	10.0	62°13.2	07.9	211°25.1	17.4	Betelgeuse	270°48.7	7°24.8
17	264°58.0	114°41.3	26.7	125°55.8	09.6	77° 15.1	08.1	226°27.7	17.3	Canopus	263°51.0	-52°42.4
18	280°00.5	129°40.9	N12°25.8	140°56.8	N17°09.2	92°17.1	S02°08.3	241°30.3	N12°17.3	Sirius	258°23.6	-16°45.2
19	295°03.0	144°40.5	25.0	155°57.7	08.8	107° 19.1	08.5	256°32.9	17.2	Adhara	255°03.5	-29°00.5
20	310°05.4	159°40.2	24.1	170°58.7	08.3	122°21.0	08.7	271°35.6	17.2	Procyon	244°47.8	5°09.1
21	325°07.9	174°39.8	• • 23.2	185°59.6	• • 07.9	137°23.0	• • 08.9	286°38.2	• • 17.1	Pollux	243°13.7	27°57.2
22	340° 10.4	189°39.4	22.4	201°00.5	07.5	152°25.0	09.1	301°40.8	17.1	Avior	234°13.7	-59°35.9
23	355°12.8	204°39.0	21.5	216°01.5	07.0	167°26.9	09.3	316°43.4	17.0	Suhail	222°44.3	-43°32.8
Mern	ass. 23:19	ν-0.4' d-0	0.9' m-4.08	ν0.9' d-0	0.4' m1.51	ν 2.0' d0	2′ m-1.66	$\nu^{2.6'} d^{-0}$.1′ m0.04	Miaplacidus	221°38.1	-69°49.9
										Alphard	217°45.0	-8°47.0
										Regulus	207°31.5	11°49.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.1	61°35.6
0	10° 15.3	219°38.6	N12°20.6	231°02.4	$N17^{\circ}06.6$	182°28.9	S02°09.6	331°46.0	N12°17.0	Denebola	182°22.2	14°24.7
1	25° 17.8	234°38.2	19.8	246°03.4	06.2	197° 30.9	09.8	346°48.6	16.9	Gienah	175°40.8	-17°42.1
2	40°20.2	249°37.8	18.9	261°04.3	05.8	212°32.8	10.0	1°51.2	16.9	Acrux	172°57.2	-63°15.5
3	55°22.7	264°37.4	• • 18.0	276°05.3	• • 05.3	227°34.8	• • 10.2	16°53.8	• • 16.8	Gacrux	171°48.7	-57°16.5
4	70°25.1	279°37.1	17.2	291°06.2	04.9	242°36.8	10.4	31°56.5	16.7	Alioth	166°11.0	55°48.2
5	85°27.6	294°36.7	16.3	306°07.2	04.5	257°38.7	10.6	46°59.1	16.7	Spica	158° 19.4	-11°18.6
6	100°30.1	309°36.3	N12°15.4	321°08.1	$N17^{\circ}04.0$	272°40.7	S02°10.8	62°01.7	N12°16.6	Alkaid	152°50.2	49°10.3
7	$115^{\circ}32.5$	324°35.9	14.5	$336^{\circ}09.1$	03.6	287°42.7	11.0	77°04.3	16.6	Hadar	148°32.2	-60°30.8
8	130°35.0	339°35.5	13.7	351°10.0	03.2	$302^{\circ}44.6$	11.3	92°06.9	16.5	Menkent	147°54.3	-36°30.7
9	145°37.5	354°35.1	• • 12.8	6°10.9	•• 02.7	317°46.6	• • 11.5	$107^{\circ}09.5$	•• 16.5	Arcturus	145°45.5	19°02.1
10	160°39.9	9°34.7	11.9	$21^{\circ}11.9$	02.3	332°48.6	11.7	$122^{\circ}12.1$	16.4	Rigil Kent.	139°36.6	-60°57.3
11	175°42.4	24°34.4	11.1	$36^{\circ}12.8$	01.9	347°50.5	11.9	$137^{\circ}14.7$	16.4	Kochab	137°21.0	74°02.4
12	190°44.9	39°34.0	$N12^{\circ}10.2$	51°13.8	$N17^{\circ}01.4$	2°52.5	S02°12.1	152°17.4	$N12^{\circ}16.3$	Zuben'ubi	136°52.9	-16°09.6
13	205°47.3	54°33.6	09.3	66°14.7	01.0	17°54.5	12.3	$167^{\circ}20.0$	16.3	Alphecca	126°01.4	26°37.3
14	220°49.8	69°33.2	08.4	81°15.7	00.6	32°56.4	12.5	182°22.6	16.2	Antares	112° 12.3	-26°29.7
15	235°52.2	84°32.8	•• 07.6	96°16.6	$17^{\circ}00.2$	47°58.4	•• 12.7	197°25.2	• • 16.2	Atria	107°03.9	-69°04.9
16	250°54.7	99°32.4	06.7	$111^{\circ}17.6$	$16^{\circ}59.7$	63°00.4	13.0	212°27.8	16.1	Sabik	101°59.4	-15°45.5
17	265°57.2	114°32.0	05.8	126°18.5	59.3	78°02.3	13.2	227°30.4	16.0	Shaula	96°06.3	-37°07.5
18	280°59.6	129°31.7	$N12^{\circ}04.9$	$141^{\circ}19.5$	$N16^{\circ}58.9$	93°04.3	S02°13.4	242°33.0	$N12^{\circ}16.0$	Rasalhague	95°55.8	12°32.6
19	296°02.1	144°31.3	04.0	156°20.4	58.4	$108^{\circ}06.3$	13.6	257°35.7	15.9	Eltanin	90°40.9	51°29.5
20	311°04.6	159°30.9	03.2	171°21.4	58.0	123°08.2	13.8	272°38.3	15.9	Kaus Aust.	83°28.5	-34°22.2
21	326°07.0	174°30.5	• • 02.3	186°22.3	• • 57.6	138° 10.2	• • 14.0	287°40.9	• • 15.8	Vega	80°31.2	38°49.0
22	341°09.5	189°30.1	01.4	201°23.3	57.1	153° 12.2	14.2	302°43.5	15.8	Nunki	75°44.0	-26°15.6
23	356°12.0	204°29.7	00.5	216°24.2	56.7	168°14.1	14.5	317°46.1	15.7	Altair	61°56.9	8°56.9
Mern	ass. 23:15	ν-0 Δ' d-0).9' m-4.07	υ0 0' d-0	0.4' m1.51	1/2 0' d0	2′ m-1.66	1/2 6' d-0	.1′ m0.04	Peacock	53°00.8	-56°38.6
- IVICI.P	7433. 23.13	ν σ. + α σ	7.5 111 4.07	νο.σ u ο		ν2.0 do.	2 111 1.00	ν2.0 d 0		Deneb	49°23.5	45°23.4
										Enif	33°35.6	10°00.7
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°49.2
0	11° 14.4	219°29.4	N11°59.6	231°25.2	$N16^{\circ}56.3$	183° 16.1	S02° 14.7	332°48.7	N12°15.7	Fomalhaut	15° 10.9	-29°28.0
1	26°16.9	234°29.0	58.7	246°26.1	55.8	198° 18.1	14.9	347°51.3	15.6	Scheat	13°41.9	28°14.6
2	$41^{\circ}19.4$	249°28.6	57.9	261°27.1	55.4	$213^{\circ}20.0$	15.1	2°54.0	15.6	Markab	13°26.6	15°21.9
3	56°21.8	264°28.2	• • 57.0	276°28.0	• • 55.0	228°22.0	• • 15.3	17°56.6	• • 15.5			
4	71°24.3	279°27.8	56.1	291°29.0	54.5	243°24.0	15.5	32°59.2	15.5	Sep 30 Sat	SHA	Mer.pass
5	86° 26.7	294°27.4	55.2	306°29.9	54.1	258° 25.9	15.7	48°01.8	15.4		210°31.8	09:21
6	101°29.2	309°27.1	N11°54.3	321°30.9	N16°53.7	273°27.9	S02°15.9		N12°15.3		221°23.7	08:37
7	116°31.7	324°26.7	53.4	336°31.8	53.2	288°29.9	16.2	78°07.0	15.3		172°25.6	11:52
8	131°34.1	339°26.3	52.5	351°32.8	52.8	303°31.8	16.4	93°09.7	15.2	Saturn	321°27.2	01:57
9	146°36.6	354°25.9	• • 51.7	6°33.7	• • 52.4	318° 33.8	• • 16.6	108°12.3	• • 15.2	Oct 01 Sun	SHA	Mer.pass
10	161°39.1	9°25.5	50.8	21°34.7	51.9	333°35.8	16.8	123°14.9	15.1		209°23.3	09:22
11	176°41.5	24°25.1	49.9	36°35.6	51.5	348° 37.7	17.0	138°17.5	15.1		209° 23.3 220° 47.1	08:35
12	191°44.0	39°24.8	N11°49.0	51°36.6	N16°51.1	3°39.7	S02°17.2	153°20.1	N12°15.0		172°13.6	11:49
13	206°46.5	54°24.4	48.1	66°37.6	50.6	18°41.7	17.4	168°22.7	15.0	Saturn		01:53
14	221°48.9	69°24.0	47.2	81°38.5	50.2	33°43.6	17.6	183°25.4	14.9			31.33
15	236°51.4	84°23.6	• • 46.3	96°39.5	• • 49.8	48°45.6	• • 17.9	198°28.0	• • 14.8	Oct 02 Mon	SHA	Mer.pass
16	251°53.9	99°23.2	45.4	111°40.4	49.3	63°47.6	18.1	213°30.6	14.8		208°14.9	09:22
17	266°56.3	114°22.8	44.5	126°41.4	48.9	78°49.5	18.3	228°33.2	14.7		220° 10.7	08:34
18	281°58.8	129°22.5	N11°43.6	141°42.3	N16°48.5	93°51.5	S02°18.5	243°35.8	N12°14.7		172°01.7	11:45
19	297°01.2	144°22.1	42.7	156°43.3	48.0	108°53.5	18.7	258°38.4	14.6	Saturn	321°34.3	01:48
20	312°03.7	159°21.7	41.8	171°44.2	47.6	123°55.4	18.9	273°41.1	14.6	∐aulaa∵4	al parallax	
21	327°06.2	174°21.3	• • 40.9	186°45.2	• • 47.2	138°57.4	• • 19.1	288°43.7	• • 14.5	norizoni	Venus:	0.1
22	342°08.6	189°20.9	40.1	201°46.1	46.7	153°59.4	19.3	303°46.3	14.5		Venus: Mars:	0.1 0.1
23	357°11.1	204°20.6	39.2	216°47.1	46.3	169°01.3	19.6	318°48.9	14.4		iviars:	0.1
Mer.p	ass. 23:11	ν -0.4' d-0).9′ m-4.07	ν 1.0′ d-0	.4′ m1.50	$\nu 2.0' \ d0.$	2′ m-1.66	$\nu 2.6' \ d-0$.1′ m0.03			

h	Sun				Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°30.4	S02°55.3	40°52.0	15.9'	S09°34.1	-12.0'	54.1'
1	197°30.6	56.3	55°26.9	16.0'	$09^{\circ}22.1$	-12.0'	54.1'
2	212°30.8	57.3	70°01.9	16.0'	09°10.1	-12.1'	54.1'
3	227°31.0	• • 58.2	84°36.9	16.1'	08°58.0	-12.1'	54.1'
4	242°31.2 257°31.4	02°59.2 03°00.2	99°12.0 113°47.1	16.1'	08° 45.9 08° 33.8	-12.1' -12.2'	54.1'
5 6	257 31.4 272°31.6	S03°01.1	113 47.1 128°22.2	16.1' 16.2'	508°21.6	-12.2'	54.1' 54.0'
7	287°31.8	02.1	142°57.4	16.2'	08°09.4	-12.2'	54.0'
8	302°32.0	03.1	157°32.6	16.2'	07°57.2	-12.3'	54.0'
9	317°32.2	• • 04.1	172°07.8	16.3'	07°44.9	-12.3'	54.0'
10	332°32.4	05.0	186°43.0	16.3'	07°32.6	-12.3'	54.0'
11	347°32.6	06.0	201°18.3	16.3'	07°20.3	-12.3'	54.0'
12	2°32.8 17°33.0	S03°07.0	215°53.6 230°29.0	16.3' 16.4'	\$07°08.0 06°55.6	-12.4'	54.0'
13 14	32°33.2	07.9 08.9	230 29.0 245°04.3	16.4	06°43.3	-12.4' -12.4'	54.0' 54.0'
15	47°33.5	09.9	259°39.7	16.4	06°30.9	-12.4'	54.0'
16	62°33.7	10.8	274°15.2	16.4	06° 18.4	-12.4'	54.0'
17	77°33.9	11.8	288°50.6	16.5'	06°06.0	-12.5'	54.0'
18	92°34.1	503°12.8	303°26.1	16.5'	S05°53.5	-12.5'	54.0'
19	107°34.3	13.7	318°01.6	16.5'	05°41.0	-12.5'	54.0'
20	122°34.5 137°34.7	14.7	332°37.1 347°12.6	16.5'	05°28.5	-12.5'	54.0' 54.0'
21 22	157 34.7 152°34.9	· · 15.7 16.7	1°48.2	16.6' 16.6'	05°16.0 05°03.5	-12.5' -12.6'	54.0'
23	167°35.1	17.6	16°23.8	16.6'	05 03.5 04°50.9	-12.6'	54.0
	SD = 16.0'	d = 1.0'		51	D = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°35.3 197°35.5	\$03°18.6 19.6	30°59.3 45°35.0	16.6' 16.6'	\$04°38.3 04°25.7	-12.6' -12.6'	53.9' 53.9'
2	212°35.7	20.5	60°10.6	16.6'	04°23.7	-12.6'	53.9'
3	227°35.9	. 21.5	74°46.2	16.7	04°13.1	-12.6'	53.9'
4	242°36.1	22.5	89°21.9	16.7'	03°47.9	-12.6'	53.9'
5	257°36.3	23.4	103°57.6	16.7'	03°35.2	-12.7'	53.9'
6	272°36.5	S03°24.4	118°33.2	16.7'	S03°22.6	-12.7'	53.9'
7	287°36.7	25.4	133°08.9	16.7'	03°09.9	-12.7'	53.9'
8 9	302°36.9 317°37.1	26.3 •• 27.3	147°44.7 162°20.4	16.7' 16.7'	02°57.2 02°44.5	-12.7' -12.7'	53.9' 53.9'
10	332°37.3	28.3	176°56.1	16.7'	02° 31.8	-12.7'	53.9
11	347°37.5	29.2	191°31.8	16.7'	02°19.1	-12.7'	53.9'
12	2°37.7	S03°30.2	206°07.6	16.8'	S02°06.4	-12.7'	53.9'
13	17°37.9	31.2	220°43.3	16.8'	01°53.7	-12.7'	53.9'
14	32°38.1 47°38.3	32.1	235°19.1 249°54.9	16.8' 16.8'	01°41.0 01°28.2	-12.7'	53.9'
15 16	47°38.3 62°38.5	· · 33.1	249°54.9 264°30.6	16.8	01°28.2 01°15.5	-12.7' -12.7'	53.9' 53.9'
17	77°38.7	35.0	279°06.4	16.8	01°02.7	-12.8'	53.9'
18	92°38.9	503°36.0	293°42.2	16.8'	S00°50.0	-12.8'	53.9'
19	107°39.1	37.0	308°18.0	16.8'	00°37.2	-12.8'	53.9'
20	122°39.3	37.9	322°53.8	16.8'	00°24.5	-12.8'	53.9'
21	137°39.5 152°39.7	• • 38.9	337°29.5 352°05.3	16.8'	S00°11.7 N00°01.0	-12.8'	53.9'
22 23	152°39.7 167°39.9	39.9 40.8	352°05.3 6°41.1	16.8' 16.8'	00°13.8	12.8' 12.8'	53.9' 53.9'
23	SD = 16.0'	d = 1.0'	0 41.1		D = 14.7'	12.0	
Mon	GHA	Dec	GHA	ν	Dec	d 12.0'	HP
0 1	182°40.1 197°40.3	\$03°41.8 42.8	21°16.9 35°52.6	16.8' 16.8'	N00°26.6 00°39.3	12.8' 12.8'	53.9' 53.9'
2	212°40.5	42.6	50°28.4	16.8	00°52.1	12.8	53.9'
3	227°40.7	• • 44.7	65°04.2	16.8'	01°04.8	12.7'	53.9'
4	242°40.9	45.7	79°39.9	16.7'	$01^{\circ}17.6$	12.7'	53.9'
5	257°41.1	46.6	94°15.7	16.7'	01°30.3	12.7'	53.9'
6	272°41.3	S03°47.6	108°51.4	16.7'	N01°43.1	12.7'	53.9'
7 8	287°41.5 302°41.7	48.6 49.5	123°27.1 138°02.8	16.7' 16.7'	01°55.8 02°08.5	12.7' 12.7'	53.9' 53.9'
9	302°41.7 317°41.9	49.5 •• 50.5	138°02.8 152°38.6	16.7'	02°08.5	12.7'	53.9' 53.9'
10	332°42.1	51.5	167°14.3	16.7'	02° 34.0	12.7'	53.9'
11	347°42.3	52.4	181°49.9	16.7'	02°46.7	12.7'	53.9'
12	2°42.5	S03°53.4	196°25.6	16.7'	N02°59.4	12.7'	53.9'
13	17°42.7	54.4	211°01.3	16.6'	03°12.1	12.7'	53.9'
14 15	32°42.9 47°43.1	55.3 •• 56.3	225°36.9 240°12.5	16.6' 16.6'	03°24.7 03°37.4	12.7' 12.7'	53.9' 53.9'
15 16	62°43.3	57.3	240 12.5 254°48.2	16.6'	03 37.4 03°50.0	12.7	53.9'
17	77°43.4	58.2	269°23.8	16.6'	04°02.7	12.6'	53.9
18	92°43.6	S03°59.2	283°59.3	16.6'	N04° 15.3	12.6'	53.9'
19	107°43.8	04°00.2	298°34.9	16.5'	04°27.9	12.6'	53.9'
20	122°44.0	01.1	313°10.4	16.5'	04°40.5	12.6'	53.9'
21 22	137°44.2 152°44.4	· · 02.1 03.1	327°46.0 342°21.4	16.5' 16.5'	04°53.1 05°05.7	12.6' 12.6'	54.0' 54.0'
23	167°44.6	04.0	356°56.9	16.5'	05° 18.2	12.5'	54.0'
	SD = 16.0'	d=1.0'		SI	O = 14.7'		
			-				

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	03:52	05:14	06:21	17:16	18:23	19:44
N 70°	04:03	05:17	06:17	17:20	18:20	19:33
68°	04:13	05:19	06:15	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
N 40°	04:58	05:30	05:57	17:42	18:09	18:40
35°	05:00	05:30	05:55	17:43	18:09	18:38
30°	05:02	05:30	05:54	17:45	18:09	18:37
20°	05:03	05:29	05:51	17:48	18:10	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:36
0°	05:02	05:26	05:46	17:53	18:13	18:37
S 10°	04:58	05:23	05:44	17:55	18:16	18:41
20°	04:53	05:19	05:41	17:58	18:20	18:46
30°	04:46	05:14	05:38	18:02	18:26	18:54
35° 40°	04:41	05:11	05:36	18:04	18:29	18:59
	04:35	05:07	05:34	18:06	18:33	19:05
45°	04:27	05:02	05:31	18:09	18:38	19:13
S 50°	04:17	04:56	05:28	18:12	18:44	19:24
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° 58°	04:00 03:53	04:46 04:42	05:23 05:21	18:17 18:19	18:55 18:59	19:41 19:48
S 60°	03:53 03:45	04:42 04:37	05:21 05:19	18:19	18:59 19:04	19:48 19:56
3 00	03.43	04.31	05.19	10.21	19.04	19.50

Lat.		Moonris	е		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	17:03	16:38	16:14	01:16	03:11	05:00
N 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
N 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
N 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
S 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
S 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
S 60°	14:56	16:15	17:33	04:24	04:28	04:32

		Sun		Moon				
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age		
	00 ^h	12 ^h	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		nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	12°13.6	219°20.2	N11°38.3	231°48.1	N16° 45.9	184°03.3	S02°19.8	333°51.5	N12°14.4			
1	27°16.0	234°19.8	37.4	246°49.0	45.4	199°05.3	20.0	348°54.1	14.3	Alpheratz	357°31.2	29°15.2
2	42°18.5	249°19.4	36.5	261°50.0	45.0	214°07.2	20.2	3°56.8	14.2	Ankaa	353°03.8	-42°08.8
3	57°21.0	264°19.0	35.6	276°50.9	• • 44.5	229°09.2	. 20.4	18°59.4	. 14.2	Schedar	349°26.9	56°41.9
4	72°23.4	279°18.6	34.7	291°51.9	44.1	244°11.2	20.6	34°02.0	14.1	Diphda	348°44.0	-17°49.5
5	87°25.9	294°18.3	33.8	306°52.8	43.7	259°13.1	20.8	49°04.6	14.1	Achernar	335°17.5	-57°05.2
6	102°28.3	309°17.9	N11°32.9	321°53.8	N16°43.2	274°15.1	S02°21.0	64°07.2	N12°14.0	Hamal	327°47.4	23°36.0
7	117°30.8	324°17.5	32.0	336°54.7	42.8	289°17.1	21.3	79°09.9	14.0	Polaris	311°59.0	89°22.9
8	132°33.3	339°17.1	31.1	351°55.7	42.4	304°19.0	21.5	94°12.5	13.9	Acamar	315°09.2	-40°11.1
9	147°35.7	354°16.7	30.1	6°56.7	• • 41.9	319°21.0	• • 21.7	109°15.1	• • 13.9	Menkar	314°02.7	4°12.3
10	162°38.2	9°16.4	29.2	21°57.6	41.5	334°23.0	21.9	124°17.7	13.8	Mirfak	308°23.5	49°57.7
11	177°40.7	24°16.0	28.3	36°58.6	41.1	349°24.9	22.1	139°20.3	13.7	Aldebaran	290°35.9	16°34.0
12	192°43.1	39°15.6	N11°27.4	51°59.5	N16°40.6	4°26.9	S02°22.3	154°23.0	N12°13.7	Rigel	281°00.8	-8°10.0
13	207°45.6	54°15.2	26.5	67°00.5	40.2	19°28.9	22.5	169°25.6	13.6	Capella	280°17.2	46°01.4
14	222°48.1	69°14.8	25.6	82°01.5	39.7	34°30.8	22.7	184°28.2	13.6	Bellatrix Elnath	278° 19.5 277° 57.9	6°22.6 28°37.8
15	237°50.5	84°14.5	• • 24.7	97°02.4	• • 39.3	49°32.8	• • 23.0	199°30.8	• • 13.5	Alnilam	277 57.9 275°34.6	-1°10.9
16	252°53.0	99°14.1	23.8	112°03.4	38.9	64°34.8	23.2	214°33.4	13.5	Betelgeuse	270°48.7	7°24.8
17	267°55.5	114°13.7	22.9	127°04.3	38.4	79°36.7	23.4	229°36.0	13.4	Canopus	263°51.0	-52°42.4
18	282°57.9	129°13.3	N11°22.0	142°05.3	$N16^{\circ}38.0$	94°38.7	502°23.6	244°38.7	N12°13.4	Sirius	258°23.6	-32 42.4 -16°45.2
19	298°00.4	144°13.0	21.1	157°06.3	37.6	109°40.7	23.8	259°41.3	13.3	Adhara	255° 03.5	-10° 45.2 -29° 00.5
20	313°02.8	159°12.6	20.2	172°07.2	37.1	124°42.6	24.0	274°43.9	13.2	Procyon	244° 47.7	5°09.1
21	328°05.3	174°12.2	•• 19.3	187°08.2	• • 36.7	139°44.6	• • 24.2	289°46.5	• • 13.2	Procyon	244 47.7 243°13.7	5 09.1 27°57.2
22	343°07.8	$189^{\circ}11.8$	18.3	202°09.1	36.2	154°46.6	24.4	304°49.1	13.1	Avior	245 13.7 234°13.7	-59°35.9
23	$358^{\circ}10.2$	204°11.4	17.4	$217^{\circ}10.1$	35.8	169°48.5	24.7	$319^{\circ}51.8$	13.1	Suhail	234 13.7 222°44.3	-59 35.9 -43°32.7
Mern	pass. 23:07	-).9' m-4.06	v1 0' d 0	0.4' m1.50	1/2 N/ 40	2′ m-1.66	v2 6' d.0	.1′ m0.03	Miaplacidus	222 44.3 221°38.0	-43 32.7 -69°49.9
- ivier.p	,uss. 23.U1	ν-0.4 u-0	,.9 III- 4 .00	ν 1.0 <i>u</i> -0	, , 1111.30	ν2.0 u0.		ν2.0 U-0	.110.03	Alphard	221 36.0 217°45.0	-8°47.0
										Regulus	207°31.5	11°49.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.0	61°35.6
0	13°12.7	219°11.1	N11°16.5	232°11.1	$N16^{\circ}35.4$	184°50.5	S02°24.9	334°54.4	$N12^{\circ}13.0$	Denebola	182°22.2	14°24.7
1	28°15.2	234°10.7	15.6	247° 12.0	34.9	199°52.5	25.1	349°57.0	13.0	Gienah	175° 40.8	-17°42.0
2	43°17.6	249°10.3	14.7	262°13.0	34.5	214°54.4	25.3	4°59.6	12.9	Acrux	172°57.2	-63°15.5
3	58°20.1	264°09.9	•• 13.8	277°13.9	• • 34.0	229°56.4	• • 25.5	20°02.3	•• 12.9	Gacrux	171°48.7	-57°16.4
4	73°22.6	279°09.5	12.9	292°14.9	33.6	244°58.4	25.7	35°04.9	12.8	Alioth	166°11.0	55°48.2
5	88°25.0	294°09.2	11.9	307° 15.9	33.2	260°00.3	25.9	50°07.5	12.7	Spica	158° 19.4	-11°18.6
6	103°27.5	309°08.8	N11°11.0	322°16.8	N16°32.7	275°02.3	S02°26.1	65°10.1	N12°12.7	Alkaid	152°50.2	49°10.3
7	118°29.9	324°08.4	10.1	337° 17.8	32.3	290°04.3	26.3	80°12.7	12.6	Hadar	148°32.2	-60°30.7
8	133°32.4	339°08.0	09.2	352° 18.8	31.8	305°06.2	26.6	95°15.4	12.6	Menkent	147°54.4	-36°30.7
9	148°34.9	354°07.7	• • 08.3	7° 19.7	• • 31.4	320°08.2	• • 26.8	110°18.0	• • 12.5	Arcturus	145°45.5	19°02.1
10	163°37.3	9°07.3	07.4	22°20.7	31.0	335°10.2	27.0	125°20.6	12.5	Rigil Kent.	139°36.6	-60°57.3
11	178°39.8	24°06.9	06.4	37°21.7	30.5	350°12.1	27.2	140°23.2	12.4	Kochab	137°21.1	74°02.3
12	193°42.3	39°06.5	N11°05.5	52°22.6	N16°30.1	5°14.1	S02°27.4	155°25.8	N12°12.3	Zuben'ubi	136°52.9	-16°09.6
13	208°44.7	54°06.2	04.6	67°23.6	29.6	20°16.1	27.6	170°28.5	12.3	Alphecca	126°01.5	26°37.3
14	223°47.2	69°05.8	03.7	82°24.5	29.2	35°18.0	27.8	185°31.1	12.2	Antares	112°12.3	-26°29.7
15	238°49.7	84°05.4	• • 02.7	97°25.5	• • 28.8	50°20.0	• • 28.0	200°33.7	• • 12.2	Atria	107°04.0	-69°04.9
16	253°52.1	99°05.0	01.8	112°26.5	28.3	65°22.0	28.3	215°36.3	12.1	Sabik	101°59.4	-15°45.5
17	268°54.6	114°04.6	00.9	127°27.4	27.9	80°23.9	28.5	230°39.0	12.1	Shaula	96°06.4	-37°07.5
18	283°57.1	129°04.3	N11°00.0	142°28.4	N16°27.4	95°25.9	S02°28.7	245°41.6	N12°12.0	Rasalhague	95°55.8	12°32.6
19	298°59.5	144°03.9	10°59.1	157°29.4	27.0	110°27.9	28.9	260°44.2	12.0	Eltanin	90°40.9	51°29.5
20	314°02.0	159°03.5	58.1	172°30.3	26.6	125°29.8	29.1	275°46.8	11.9	Kaus Aust.	83°28.5	-34°22.2
21	329°04.4	174°03.1	• • 57.2	187°31.3	• • 26.1	140°31.8	• • 29.3	290°49.4	• • 11.8	Vega	80°31.2	38°49.0
22	344°06.9	189°02.8	56.3	202°32.3	25.7	155°33.7	29.5	305°52.1	11.8	Nunki	75°44.0	-26°15.6
23	359°09.4	204°02.4	55.3	217°33.2	25.2	170°35.7	29.7	320°54.7	11.7	Altair	61°56.9	8°56.9
Mer.p	ass. 23:03	ν -0.4' d-0).9′ m-4.06	$\nu 1.0' \ d-0$).4′ m1.49	$\nu 2.0' \ d0.$	2′ m-1.66	$\nu 2.6' \ d-0$.1′ m0.02	Peacock	53°00.8	-56°38.6
										Deneb	49°23.5	45°23.4
т.	CUA	CILA	D-	CIIA	D.	CIIA	D.	CIIA	ο.	Enif	33°35.6	10°00.7
Thu	GHA 14°11 0	GHA	Dec	GHA	Dec	GHA	Dec	GHA 225°57 2	Dec	Al Na'ir	27°28.8	-46°49.2
0 1	14°11.8 29°14.3	219°02.0 234°01.6	N10°54.4 53.5	232°34.2 247°35.2	N16°24.8 24.4	185°37.7 200°39.6	\$02°30.0 30.2	335°57.3 350°59.9	N12°11.7 11.6	Fomalhaut	15°10.9	-29°28.0
	29°14.3 44°16.8	234°01.6 249°01.3	53.5 52.6	247°35.2 262°36.1	24.4	200°39.6 215°41.6	30.2 30.4	6°02.6		Scheat	13°41.9	28°14.6
2	44°16.8 59°19.2	249°01.3 264°00.9	52.6 · · 51.6	262°36.1 277°37.1	23.9	215°41.6 230°43.6	30.4	21°05.2	11.6 · · 11.5	Markab	13°26.6	15°21.9
4	74°21.7	279°00.5	50.7	277 37.1 292°38.1	23.0	245°45.5	30.8	36°07.8	11.4	Oct 03 Tue	SHA	Mer.pass
5	89°24.2	279 00.5 294°00.1	49.8	307°39.0	22.6	245 45.5 260°47.5	31.0	51°10.4	11.4		207° 06.6	09:23
6	104°26.6	308°59.8	N10°48.8	322° 40.0	N16° 22.1	275°49.5	S02°31.2	66°13.1	N12°11.3		219°34.5	08:32
7	119°29.1	323°59.4	47.9	337°41.0	21.7	275 49.5 290°51.4	31.4	81°15.7	11.3	1	171°49.7	11:42
8	134°31.5	338°59.0	47.9	352°41.9	21.7	305°53.4	31.4	96°18.3	11.3	Saturn	321°38.0	01:44
9	149°34.0	353°58.6	• • 46.0	7°42.9	20.8	320°55.4	• • 31.9	111°20.9	11.2			
10	164°36.5	8°58.3	45.1	22°43.9	20.4	335°57.3	32.1	126°23.6	11.1	Oct 04 Wed	SHA	Mer.pass
11	179°38.9	23°57.9	44.2	37°44.9	19.9	350°59.3	32.3	141°26.2	11.0	Venus	205°58.4	09:23
12	194°41.4	38°57.5	N10°43.2	52°45.8	N16° 19.5	6°01.3	S02°32.5	156°28.8	N12°11.0		218°58.4	08:31
13	209°43.9	53°57.1	42.3	67°46.8	19.0	21°03.2	32.7	171°31.4	10.9		171°37.8	11:39
14	224°46.3	68°56.8	41.4	82°47.8	18.6	36°05.2	32.9	186°34.1	10.9	Saturn	321°41.7	01:40
15	239°48.8	83°56.4	• • 40.4	97°48.7	· · 18.2	51°07.2	33.1	201°36.7	. 10.8	Oct 05 Thu	SHA	Mer.pass
16	254°51.3	98°56.0	39.5	112°49.7	17.7	66°09.1	33.3	216°39.3	10.8	Venus	204° 50.2	09:24
17	269°53.7	113°55.6	38.6	127°50.7	17.3	81°11.1	33.6	231°41.9	10.7	Mars		08:29
18	284°56.2	128°55.3	N10°37.6	142°51.6	N16° 16.8	96°13.1	S02°33.8	246°44.6	N12°10.6		171°25.8	11:36
19	299°58.7	143°54.9	36.7	157°52.6	16.4	111°15.0	34.0	261°47.2	10.6	Saturn	321°45.5	01:36
20	315°01.1	158°54.5	35.7	172°53.6	15.9	126°17.0	34.2	276°49.8	10.5	Jatuill	5_1 15.5	
21	330°03.6	173°54.2	• • 34.8	187°54.6	15.5	141°19.0	• • 34.4	291°52.4	. 10.5	Horizont	al parallax	
22	345°06.0	188°53.8	33.9	202°55.5	15.0	156°20.9	34.6	306°55.1	10.4		Venus:	0.1
23	0°08.5	203°53.4	32.9	$217^{\circ}56.5$	14.6	171°22.9	34.8	321°57.7	10.4		Mars:	0.1
ivier.p	ass. 22:59	ν -0.4' a -0).9′ m-4.06	ν 1.0° a -0).4′ m1.49	ν 2.0′ a 0.	2′ m-1.66	ν 2.0′ a -0	.1′ m0.02			

h	Sui	n					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°44.8	S 04°05.0	$11^{\circ}32.4$	16.4'	N05°30.8	12.5'	54.0'
1	197° 45.0	06.0	26° 07.8	16.4	05°43.3	12.5'	54.0'
2 3	212° 45.2 227° 45.4	06.9 •• 07.9	40°43.2 55°18.6	16.4' 16.4'	05°55.8 06°08.3	12.5' 12.5'	54.0' 54.0'
4	242° 45.6	08.9	69°53.9	16.3	06°20.7	12.4	54.0'
5	257°45.8	09.8	84°29.3	16.3'	$06^{\circ}33.1$	12.4'	54.0'
6	272°46.0	504°10.8	99°04.6	16.3'	N06°45.6	12.4	54.0'
7 8	287° 46.2 302° 46.4	11.8 12.7	113°39.8 128°15.1	16.2' 16.2'	06°57.9 07°10.3	12.4' 12.3'	54.0' 54.0'
9	317° 46.6	• • 13.7	142°50.3	16.2	07°22.6	12.3'	54.0'
10	332°46.8	14.6	$157^{\circ}25.4$	16.1'	07°35.0	12.3'	54.0'
11	347° 47.0 2° 47.2	15.6 \$04°16.6	172°00.6 186°35.7	16.1' 16.1'	07°47.2 N07°59.5	12.3' 12.2'	54.0' 54.0'
12 13	2 47.2 17°47.3	17.5	201°10.8	16.1	08°11.7	12.2'	54.0'
14	32° 47.5	18.5	215°45.8	16.0'	08°23.9	12.2'	54.0'
15	47° 47.7	•• 19.5	230°20.8	16.0'	08°36.1	12.1'	54.0'
16	62°47.9 77°48.1	20.4	244°55.8 259°30.7	15.9'	08°48.3 09°00.4	12.1' 12.1'	54.1' 54.1'
17 18	92°48.3	21.4 \$04°22.4	259 30.7 274°05.6	15.9' 15.9'	N09°12.5	12.1'	54.1
19	107° 48.5	23.3	288°40.5	15.8'	09°24.5	12.0'	54.1'
20	122° 48.7	24.3	303°15.3	15.8'	09°36.5	12.0'	54.1'
21	137° 48.9	• • 25.2	317°50.1 332°24.8	15.7'	09°48.5	11.9'	54.1'
22 23	152°49.1 167°49.3	26.2 27.2	332°24.8 346°59.5	15.7' 15.7'	10°00.5 10°12.4	11.9' 11.9'	54.1' 54.1'
	SD = 16.0'	d = 1.0'			0 = 14.7'		
	JD — 10.0°	u = 1.0)L	J — 14.1°		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°49.5	S04°28.1	1°34.1 16°08.8	15.6'	N10°24.3	11.8'	54.1'
1 2	197° 49.7 212° 49.9	29.1 30.1	16°08.8 30°43.3	15.6' 15.5'	10°36.1 10°47.9	11.8' 11.8'	54.1' 54.1'
3	227°50.0	• • 31.0	45°17.8	15.5'	10° 47.9	11.7'	54.1'
4	242°50.2	32.0	$59^{\circ}52.3$	15.4'	11°11.4	11.7'	54.1'
5	257°50.4	32.9	74°26.8	15.4'	11°23.1	11.6'	54.1'
6 7	272°50.6 287°50.8	\$04°33.9 34.9	89°01.1 103°35.5	15.3' 15.3'	N11°34.7 11°46.3	11.6' 11.6'	54.2' 54.2'
8	302°51.0	35.8	118°09.8	15.2'	11°57.9	11.5'	54.2'
9	317°51.2	• • 36.8	$132^{\circ}44.0$	15.2'	12°09.4	11.5'	54.2'
10	332°51.4	37.8	147°18.2 161°52.3	15.1'	12°20.8 12°32.3	11.4'	54.2'
11 12	347°51.6 2°51.8	38.7 \$04°39.7	161°52.3 176°26.4	15.1' 15.0'	12° 32.3 N12° 43.6	11.4' 11.3'	54.2' 54.2'
13	17°52.0	40.6	191°00.5	15.0'	12°55.0	11.3'	54.2'
14	32°52.1	41.6	$205^{\circ}34.5$	14.9'	13°06.3	11.2'	54.2'
15 16	47°52.3 62°52.5	· · 42.6 43.5	220°08.4 234°42.3	14.9' 14.8'	13°17.5 13°28.7	11.2' 11.1'	54.2' 54.2'
17	77° 52.7	43.5 44.5	234 42.3 249°16.1	14.8	13° 39.8	11.1	54.2 54.3'
18	92° 52.9	S04°45.4	263°49.9	14.7'	N13°50.9	11.0'	54.3'
19	107°53.1	46.4	278°23.6	14.7'	14°01.9	11.0'	54.3'
20 21	122°53.3 137°53.5	47.4 •• 48.3	292°57.2 307°30.8	14.6' 14.5'	14°12.9 14°23.8	10.9' 10.9'	54.3' 54.3'
22	157 55.5 152°53.7	49.3	307 30.6 322°04.4	14.5	14 23.6 14°34.7	10.9	54.3'
23	167°53.8	50.3	336°37.9	14.4'	14°45.5	10.8'	54.3'
	SD = 16.0'	d = 1.0'	-	SI	D = 14.8'		
Thu	GHA 182° 54.0	Dec CO4°F1 2	GHA 351°11.3	u 14.4'	Dec	d 10.7'	HP
0 1	182°54.0 197°54.2	\$04°51.2 52.2	351°11.3 5°44.7	14.4	N14°56.2 15°06.9	10.7' 10.6'	54.3' 54.3'
2	212°54.4	53.1	$20^{\circ}18.0$	14.2'	15°17.6	10.6'	54.4'
3	227°54.6	• • 54.1	34°51.2	14.2'	15°28.1	10.5	54.4'
4 5	242° 54.8 257° 55.0	55.1 56.0	49°24.4 63°57.5	14.1' 14.1'	15°38.6 15°49.1	10.5' 10.4'	54.4' 54.4'
6	272°55.2	S04°57.0	78°30.6	14.1	N15°59.5	10.4	54.4
7	287°55.3	57.9	93°03.6	13.9'	16°09.8	10.3'	54.4'
8	302°55.5	58.9	107°36.6	13.9'	16°20.1	10.2'	54.4'
9 10	317°55.7 332°55.9	04°59.9 05°00.8	122°09.4 136°42.2	13.8' 13.7'	16°30.3 16°40.4	10.1' 10.1'	54.4' 54.4'
11	347°56.1	03 00.8	151°15.0	13.7'	16°50.5	10.1	54.5
12	2°56.3	S05°02.7	165°47.7	13.6'	N17°00.5	9.9'	54.5'
13	17°56.5	03.7	180°20.3 194°52.9	13.6'	17°10.4 17°20.3	9.9'	54.5'
14 15	32°56.7 47°56.8	04.7 •• 05.6	194°52.9 209°25.3	13.5' 13.4'	17°20.3 17°30.1	9.8' 9.7'	54.5' 54.5'
16	62°57.0	06.6	223°57.8	13.4	17°39.8	9.6'	54.5
17	77°57.2	07.5	238°30.1	13.3'	17°49.4	9.6'	54.5'
18 19	92° 57.4 107° 57.6	\$05°08.5 09.4	253°02.4 267°34.6	13.2' 13.2'	N17°59.0 18°08.5	9.5' 9.4'	54.6' 54.6'
19 20	107°57.6 122°57.8	09.4 10.4	267°34.6 282°06.8	13.2	18°08.5 18°17.9	9.4	54.6'
21	137° 57.9	• • 11.4	296°38.9	13.0'	18°27.3	9.3'	54.6'
22	152°58.1	12.3	311°10.9	12.9'	18°36.5	9.2'	54.6'
23	167°58.3	13.3	325°42.8	12.9'	18°45.7	9.1'	54.6'
	SD = 16.0'	d=1.0'		SI	D = 14.8'		

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

1 .	at.		Moonris	e	Moonset			
	и.	Tue	Wed	Thu	Tue	Wed	Thu	
N	72°	15:48	15:14	14:08	06:52	08:53	11:30	
	70°	16:01	15:38	15:04	06:41	08:31	10:36	
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<u>S</u>	60°	18:52	20:14	21:38	04:35	04:40	04:46	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%	
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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
E.;	GHA	GHA	Dec	GHA	Dec	GHA	Dos	CH4	Dec		SHA	Dos
Fri							Dec \$02°35.0	GHA			ЗПА	Dec
0	15°11.0	218°53.0	N10°32.0	232°57.5	N16°14.2	186°24.9		337°00.3	N12° 10.3	Alpheratz	357°31.2	29°15.2
1	30°13.4	233°52.7	31.0	247°58.5	13.7	201°26.8	35.3	352°02.9	10.2	Ankaa	353°03.8	-42°08.8
2	45°15.9	248°52.3	30.1	262°59.4	13.3	216°28.8	35.5	7°05.6	10.2	Schedar	349°26.9	56°41.9
3	60°18.4	263°51.9	29.2	278°00.4	• • 12.8	231°30.8	• • 35.7	22°08.2	• • 10.1	Diphda	348°43.9	-17°49.5
4	75°20.8	278°51.5	28.2	293°01.4	12.4	246°32.7	35.9	37° 10.8	10.1	Achernar	335°17.5	-57°05.3
5	90°23.3	293°51.2	27.3	308°02.3	11.9	261°34.7	36.1	52°13.4	10.0	Hamal	327°47.4	23°36.0
6	105°25.8	308° 50.8	N10°26.3	323°03.3	N16°11.5	276°36.7	S02°36.3	67° 16.1	N12° 10.0	Polaris	311°57.8	89°22.9
7	120°28.2	323°50.4	25.4	338°04.3	11.0	291°38.6	36.5	82° 18.7	09.9	Acamar	315°09.2	-40°11.1
8	135°30.7	338°50.1	24.4	353°05.3	10.6	306°40.6	36.7	97°21.3	09.8	Menkar	314°02.7	4°12.3
9	150°33.2	353°49.7	• • 23.5	8°06.2	• • 10.2	321°42.6	• • 36.9	112°23.9	• • 09.8	Mirfak	308°23.4	49°57.7
10	165°35.6	8°49.3	22.5	23°07.2	09.7	336°44.5	37.2	127°26.6	09.7	Aldebaran	290°35.9	16°34.0
11	180°38.1	23°48.9	21.6	38°08.2	09.3	351°46.5	37.4	142°29.2	09.7	Rigel	281°00.8	-8°10.0
12	195°40.5	38° 48.6	N10°20.6	53°09.2	N16°08.8	6°48.5	S02°37.6	157°31.8	N12°09.6	Capella	280°17.2	46°01.4
13	210°43.0	53°48.2	19.7	68°10.1	08.4	21°50.4	37.8	172°34.5	09.6	Bellatrix	278°19.5	6°22.6
14	225°45.5	68° 47.8	18.7	83°11.1	07.9	36°52.4	38.0	187°37.1	09.5	Elnath	277°57.9	28°37.8
15	240°47.9	83°47.5	• • 17.8	98°12.1	• • 07.5	51°54.4	• • 38.2	202°39.7	• • 09.4	Alnilam	275°34.5	-1°10.9
16	255°50.4	98°47.1	16.8	113°13.1	07.0	66°56.3	38.4	217°42.3 232°45.0	09.4	Betelgeuse	270°48.7	7°24.7
17	270°52.9	113°46.7	15.9	128°14.0	06.6	81°58.3	38.6		09.3	Canopus	263°50.9	-52°42.4
18	285°55.3	128°46.4	N10°14.9	143°15.0	N16°06.1	97°00.3	S02°38.8	247°47.6	N12°09.3	Sirius	258°23.5	-16°45.2
19	300°57.8	143°46.0	14.0	158°16.0	05.7	112°02.2	39.1	262°50.2	09.2	Adhara	255°03.5	-29°00.5
20	316°00.3	158° 45.6 173° 45.2	13.0	173°17.0	05.2	127°04.2	39.3	277°52.8	09.2	Procyon	244°47.7	5°09.1
21	331°02.7	173 45.2 188°44.9	• • 12.1	188°18.0 203°18.9	• • 04.8	142°06.2	• • 39.5	292°55.5 307°58.1	• • 09.1	Pollux	243°13.7	27°57.2
22	346°05.2		11.1		04.3	157°08.1	39.7		09.0	Avior	234°13.6	-59°35.9
23	1°07.6	203°44.5	10.2	218°19.9	03.9	172°10.1	39.9	323°00.7	09.0	Suhail	222°44.3	-43°32.7
Mer.p	pass. 22:56	ν -0.4′ d -0).9′ m-4.05	ν 1.0′ d-0	.4′ m1.49	ν 2.0′ d0.	2′ m-1.67	ν 2.6′ d-0	.1' m0.02	Miaplacidus	221°38.0	-69°49.9
										Alphard	217°45.0	-8°47.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	$207^{\circ}31.5$	11°49.6
0 0	16°10.1	218° 44.1	N10°09.2	233°20.9	N16°03.5	187°12.1	S02°40.1	338°03.4	N12°08.9	Dubhe	193°38.0	61°35.6
1	31°12.6	216 44.1 233°43.8	08.2	233 20.9 248°21.9	03.0	202°14.0	40.1	353°06.0	08.9	Denebola	182°22.2	14°24.7
2	46°15.0	248°43.4	07.3	263°22.8	02.6	217°16.0	40.5	8°08.6	08.8	Gienah	175°40.8	-17°42.0
3	61°17.5	263°43.0	06.3	278°23.8	• • 02.1	232°18.0	• • 40.8	23°11.2	• • 08.8	Acrux	172°57.2	-63°15.5
4	76°20.0	278° 42.7	05.4	293°24.8	01.7	247°19.9	41.0	38° 13.9	08.7	Gacrux	171°48.7	-57°16.4
5	91°22.4	293°42.3	04.4	308°25.8	01.2	262°21.9	41.2	53° 16.5	08.6	Alioth	166°11.0	55°48.2
6	106°24.9	308°41.9	N10°03.5	323°26.8	N16°00.8	277°23.9	S02°41.4	68° 19.1	N12°08.6	Spica	158°19.4	-11°18.6
7	121°27.4	323°41.5	02.5	338°27.7	16°00.3	292°25.8	41.6	83°21.8	08.5	Alkaid	152°50.2	49°10.2
8	136°29.8	338°41.2	01.5	353°28.7	15°59.9	307°27.8	41.8	98° 24.4	08.5	Hadar	148°32.2	-60°30.7
9	151°32.3	353°40.8	10°00.6	8°29.7	• • 59.4	322°29.8	42.0	113°27.0	• • 08.4	Menkent	147°54.4	-36°30.7
10	166°34.8	8°40.4	09°59.6	23°30.7	59.0	337°31.7	42.2	128° 29.6	08.3	Arcturus	145°45.5	19°02.1
11	181°37.2	23°40.1	58.7	38°31.7	58.5	352°33.7	42.4	143°32.3	08.3	Rigil Kent.	139°36.6	-60°57.3
12	196°39.7	38° 39.7	N09°57.7	53°32.6	N15°58.1	7°35.7	S02°42.7	158°34.9	N12°08.2	Kochab	137°21.1	74°02.3
13	211°42.1	53°39.3	56.7	68°33.6	57.6	22°37.6	42.9	173°37.5	08.2	Zuben'ubi	136°52.9 126°01.5	-16°09.6
14	226°44.6	68°39.0	55.8	83°34.6	57.2	37°39.6	43.1	188°40.2	08.1	Alphecca	126°01.5 112°12.3	26°37.3
15	241°47.1	83°38.6	• • 54.8	98°35.6	• • 56.7	52°41.6	• • 43.3	203°42.8	•• 08.1	Antares		-26°29.7
16	256°49.5	98°38.2	53.8	113°36.6	56.3	67°43.5	43.5	218°45.4	0.80	Atria	107°04.0 101°59.4	-69°04.8 -15°45.5
17	271°52.0	113°37.9	52.9	128°37.5	55.8	82°45.5	43.7	233°48.1	07.9	Sabik Shaula	96°06.4	-15 45.5 -37°07.4
18	286°54.5	128°37.5	N09°51.9	143°38.5	N15°55.4	97°47.5	S02°43.9	248°50.7	$N12^{\circ}07.9$	Rasalhague	95°55.9	12°32.6
19	301°56.9	143°37.1	50.9	158°39.5	54.9	112°49.4	44.1	263°53.3	07.8	_	90°40.9	51°29.5
20	316°59.4	158°36.8	50.0	173°40.5	54.5	127°51.4	44.3	278°55.9	07.8	Eltanin Kaus Aust.	83°28.6	-34°22.2
21	332°01.9	173°36.4	• • 49.0	188°41.5	• • 54.0	142°53.4	• • 44.6	293°58.6	• • 07.7	Vega	80°31.2	38°49.0
22	347°04.3	188°36.0	48.0	203°42.5	53.6	157°55.3	44.8	309°01.2	07.6	Nunki	75°44.0	-26°15.6
23	2°06.8	203°35.7	47.1	218°43.4	53.1	172°57.3	45.0	324°03.8	07.6	Altair	61°56.9	8°56.9
N/au ==	pass. 22:52	0 4/ -/ 1	0′ m-4.05	1 0/ -/ 0	.4′ m1.48	2 0/ -40	2′ m-1.67	26/ 40	.1′ m0.01	Peacock	53°00.8	-56°38.6
ivier.p	Dass. 22:52	ν-0.4 α-1	0 111-4.05	$\nu_{1.0}$ a -0	.4 111.40	ν2.0 α0.	2 m-1.07	ν2.0 a-0	.1 mo.01	Deneb	49°23.5	45°23.4
										Enif	33°35.6	10°00.7
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.2
0	17°09.3	218°35.3	N09°46.1	233°44.4	$N15^{\circ}52.7$	$187^{\circ}59.3$	S02°45.2	339°06.5	$N12^{\circ}07.5$	Fomalhaut	15°10.9	-29°28.0
1	32°11.7	233°34.9	45.1	248°45.4	52.2	203°01.2	45.4	354°09.1	07.5	Scheat	13°41.9	28°14.6
2	47°14.2	248°34.6	44.2	263°46.4	51.8	$218^{\circ}03.2$	45.6	9°11.7	07.4	Markab	13°26.6	15°21.9
3	62°16.6	263°34.2	• • 43.2	278°47.4	•• 51.3	233°05.2	• • 45.8	24° 14.4	•• 07.4			
4	$77^{\circ}19.1$	278°33.8	42.2	293°48.4	50.9	$248^{\circ}07.1$	46.0	39° 17.0	07.3	Oct 06 Fri	SHA	Mer.pass
5	92°21.6	293°33.5	41.2	308°49.3	50.4	263°09.1	46.2	54° 19.6	07.2		203°42.1	09:25
6	107°24.0	308°33.1	N09°40.3	323°50.3	N15°50.0	$278^{\circ}11.1$	S02°46.5	69°22.3	$N12^{\circ}07.2$		217°46.5	08:28
7	122°26.5	323°32.7	39.3	338°51.3	49.5	293°13.0	46.7	84°24.9	07.1		171°13.9	11:33
8	137°29.0	338°32.4	38.3	353°52.3	49.1	308°15.0	46.9	99°27.5	07.1	Saturn	321°49.3	01:32
9	152°31.4	353°32.0	• • 37.3	8°53.3	• • 48.6	323°17.0	•• 47.1	114°30.2	• • 07.0	Oct 07 Sat	SHA	Mer.pass
10	167°33.9	8°31.6	36.4	23°54.3	48.2	338°18.9	47.3	129°32.8	06.9		202°34.0	09:25
11	182°36.4	23°31.3	35.4	38°55.3	47.7	353°20.9	47.5	144°35.4	06.9		217°10.8	08:26
12	197°38.8	38°30.9	N09°34.4	53°56.2	N15°47.3	8°22.9	S02°47.7	159°38.0	N12°06.8		171°02.0	11:30
13	212°41.3	53°30.5	33.4	68°57.2	46.8	23°24.8	47.9	174°40.7	06.8		321°53.2	01:28
14	227°43.7	68°30.2	32.5	83°58.2	46.4	38°26.8	48.1	189°43.3	06.7			
15 16	242°46.2	83°29.8	• • 31.5	98°59.2	· · 45.9	53°28.8	· · 48.4	204° 45.9	· · 06.7	Oct 08 Sun	SHA	Mer.pass
16 17	257°48.7	98°29.4	30.5	114°00.2	45.5 45.0	68°30.7	48.6	219°48.6	06.6 06.5		201°26.0	09:26
17 18	272°51.1 287°53.6	113°29.1 128°28.7	29.5 N09°28.6	129°01.2 144°02.2	45.0 N15°44.6	83°32.7 98°34.7	48.8 \$02°49.0	234°51.2 249°53.8	06.5 N12°06.5		216°35.2	08:24
18 19	302°56.1	128° 28.7 143° 28.3	N09 28.6 27.6	144°02.2 159°03.2	N15 44.6 44.1	98°34.7 113°36.6	49.0	249°53.8 264°56.5	06.4		170°50.0	11:27
20	317°58.5	143 26.3 158° 28.0	26.6	174°04.1	44.1	113 30.0 128°38.6	49.2 49.4	204 50.5 279°59.1	06.4	Saturn	321°57.2	01:23
21	333°01.0	173° 27.6	• • 25.6	189°05.1	• • 43.2	143°40.6	• 49.4	279 59.1 295°01.7	06.3	Horizont	al parallax	
22	348°03.5	188° 27.2	24.6	204°06.1	42.8	158°42.5	49.8	310°04.4	06.2		Venus:	0.1
23	3°05.9	203°26.9	23.7	219°07.1	42.3	173°44.5	50.0	325°07.0	06.2		Mars:	0.1
ivier.p	pass. 22:48	ν -0.4′ d -1	0′ m-4.05	ν 1.0' d -0	.5′ m1.48	ν2.0′ d0.	2′ m-1.67	ν2.0′ d-0	.1′ m0.01			

h	Sui	n					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°58.5	S05°14.2	340°14.7	12.8'	N18°54.9	9.0'	54.6'
1	197°58.7	15.2	354°46.5	12.7'	19°03.9	9.0'	54.7'
2	212°58.9	16.2	9°18.2	12.7'	19°12.8 19°21.7	8.9'	54.7'
3 4	227°59.1 242°59.2	· · 17.1 18.1	23°49.9 38°21.5	12.6' 12.5'	19 21.7 19°30.5	8.8' 8.7'	54.7' 54.7'
5	257°59.4	19.0	52°53.0	12.5'	19° 30.3	8.6'	54.7'
6	272°59.6	S05°20.0	67°24.5	12.4'	N19°47.8	8.5'	54.7'
7	287°59.8	20.9	81°55.9	12.3'	19°56.4	8.4'	54.7'
8	303°00.0 318°00.1	21.9	96°27.2 110°58.4	12.2' 12.2'	20°04.8 20°13.2	8.4' 8.3'	54.8' 54.8'
9 10	318 00.1 333°00.3	23.8	110 58.4 125°29.6	12.2	20 13.2 20°21.4	8.2'	54.8'
11	348°00.5	24.8	140°00.7	12.0'	20°29.6	8.1'	54.8'
12	3°00.7	S05°25.7	154°31.7	12.0'	N20°37.7	8.0'	54.8'
13	18°00.9	26.7	169°02.7	11.9'	20°45.7	7.9'	54.8'
14 15	33°01.1 48°01.2	27.6 •• 28.6	183°33.6 198°04.4	11.8' 11.7'	20°53.6 21°01.4	7.8' 7.7'	54.9' 54.9'
16	63°01.4	29.6	212°35.1	11.7'	21°09.2	7.6'	54.9'
17	78°01.6	30.5	227°05.8	11.6'	21°16.8	7.5'	54.9'
18	93°01.8	S05°31.5	241°36.4	11.5'	N21°24.3	7.4'	54.9'
19	108°02.0 123°02.1	32.4	256°06.9 270°37.4	11.5'	21°31.8 21°39.1	7.3'	54.9' 55.0'
20 21	123°02.1 138°02.3	33.4 •• 34.3	270°37.4 285°07.8	11.4' 11.3'	21°39.1 21°46.3	7.2' 7.1'	55.0' 55.0'
22	153°02.5	35.3	299°38.1	11.2'	21°53.5	7.0'	55.0'
23	168°02.7	36.2	314°08.3	11.2'	22°00.5	6.9'	55.0'
	SD = 16.0'	d = 1.0'		SD	= 14.9'		
_							
Sat 0	GHA 183°02.9	Dec \$05°37.2	GHA 328°38.5	u 11.1'	Dec N22° 07.4	d 6.8'	HP 55.0'
1	183 02.9 198°03.0	38.2	328 38.5 343°08.6	11.1	22°14.3	6.7'	55.0'
2	213°03.2	39.1	357°38.6	11.0'	22°21.0	6.6'	55.1'
3	228°03.4	• • 40.1	12°08.6	10.9'	22°27.6	6.5'	55.1'
4	243°03.6 258°03.8	41.0	26°38.4 41°08.3	10.8'	22°34.2 22°40.6	6.4'	55.1'
5 6	258°03.8 273°03.9	42.0 \$05°42.9	41°08.3 55°38.0	10.7' 10.7'	N22°46.9	6.3' 6.2'	55.1' 55.1'
7	288°04.1	43.9	70°07.7	10.6'	22°53.1	6.1	55.2'
8	303°04.3	44.8	84°37.3	10.5'	22°59.2	6.0'	55.2'
9	318°04.5	• • 45.8	99°06.8	10.5'	23°05.1	5.9'	55.2'
10 11	333°04.7 348°04.8	46.7 47.7	113°36.3 128°05.7	10.4' 10.3'	23°11.0 23°16.8	5.8' 5.6'	55.2' 55.2'
12	3°05.0	\$05°48.6	142°35.0	10.3	N23°22.4	5.5'	55.2'
13	18°05.2	49.6	157°04.3	10.2'	23°27.9	5.4'	55.3'
14	33°05.4	50.6	171°33.5	10.1'	23°33.4	5.3'	55.3'
15	48°05.5 63°05.7	• • 51.5	186°02.6 200°31.7	10.1'	23°38.7 23°43.9	5.2' 5.1'	55.3' 55.3'
16 17	78°05.9	52.5 53.4	200 31.7 215°00.7	10.0' 9.9'	23 43.9 23°48.9	5.1 5.0'	55.3'
18	93°06.1	S05°54.4	229°29.6	9.9'	N23°53.9	4.8'	55.4'
19	108°06.3	55.3	243°58.5	9.8'	23°58.7	4.7'	55.4'
20	123°06.4	56.3	258°27.3	9.7'	24°03.4	4.6'	55.4'
21 22	138°06.6 153°06.8	· · 57.2 58.2	272°56.0 287°24.7	9.7' 9.6'	24°08.0 24°12.5	4.5' 4.4'	55.4' 55.5'
23	168°07.0	59.1	301°53.3	9.6'	24°16.8	4.2'	55.5'
	SD = 16.0'	d = 1.0'	-	SD	= 15.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°07.1	506°00.1	316°21.9	ν 9.5'	N24°21.1	4.1'	55.5'
1	198°07.3	01.0	330°50.4	9.4'	24°25.2	4.0'	55.5'
2	213°07.5	02.0	345°18.8	9.4'	24°29.2	3.9'	55.5'
3 4	228°07.7 243°07.8	· · 02.9 03.9	359°47.2 14°15.5	9.3' 9.3'	24°33.0 24°36.7	3.7' 3.6'	55.6' 55.6'
5	258°08.0	03.9	28°43.8	9.3 9.2'	24° 40.3	3.5'	55.6'
6	273°08.2	S 06°05.8	43°12.0	9.1'	N24°43.8	3.4'	55.6'
7	288°08.4	06.7	57°40.1	9.1'	24°47.2	3.2'	55.7'
8 9	303°08.5 318°08.7	07.7	72°08.2 86°36.2	9.0' 9.0'	24°50.4 24°53.5	3.1' 3.0'	55.7' 55.7'
10	318°08.7 333°08.9	· · 08.6 09.6	86°36.2 101°04.2	9.0° 8.9°	24°53.5 24°56.5	3.0° 2.8'	55.7' 55.7'
11	348°09.0	10.5	115°32.1	8.9'	24°59.3	2.7'	55.7'
12	3°09.2	S06°11.5	130°00.0	8.8'	N25°02.0	2.6'	55.8'
13 14	18°09.4 33°09.6	12.5 13.4	144°27.8 158°55.6	8.8' 8.7'	25°04.6 25°07.0	2.4' 2.3'	55.8' 55.8'
14 15	48°09.6	13.4	158°55.6 173°23.3	8.7' 8.7'	25°07.0 25°09.3	2.3'	55.8'
16	63°09.9	15.3	187°51.0	8.6'	25°11.5	2.0'	55.9'
17	78°10.1	16.3	202°18.6	8.6'	25°13.5	1.9'	55.9'
18	93°10.3	S06°17.2	216°46.2	8.5'	N25°15.4	1.8'	55.9'
19 20	108°10.4 123°10.6	18.2 19.1	231°13.8 245°41.3	8.5' 8.4'	25°17.2 25°18.8	1.6' 1.5'	55.9' 56.0'
21	138°10.8	20.0	245 41.3 260°08.7	8.4'	25° 20.3	1.4	56.0'
22	153°10.9	21.0	274°36.1	8.4'	25°21.6	1.2'	56.0'
23	168°11.1	21.9	289°03.5	8.3'	25°22.9	1.1'	56.0'
	SD = 16.0'	d = 1.0'		SD	= 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
N 40°	05:04	05:36	06:03	17:32	17:59	18:30
35°	05:05	05:34	06:00	17:35	18:00	18:30
30°	05:05	05:33	05:57	17:38	18:02	18:29
20°	05:05	05:30	05:53	17:43	18:05	18:30
N 10°	05:03	05:27	05:48	17:47	18:08	18:32
0°	05:00	05:24	05:44	17:51	18:12	18:36
S 10°	04:55	05:19	05:40	17:55	18:16	18:41
20°	04:48	05:14	05:36	18:00	18:22	18:48
30°	04:38	05:07	05:31	18:05	18:29	18:58
35°	04:32	05:02	05:28	18:08	18:34	19:04
40°	04:24	04:57	05:24	18:12	18:39	19:12
45°	04:15	04:50	05:20	18:16	18:46	19:22
S 50°	04:02	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
S 60°	03:23	04:18	05:01	18:36	19:19	20:15

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 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
N 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
N 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
S 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
S 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
S 60°	23:03		00:24	04:55	05:09	05:33

			Sun		Moon					
	Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age			
ĺ	,	00 ^h	12 ^h	Pass	Upper Lower		18-20			
L		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				
	80	12:29	12:37	11:47	03:01	15:27				

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

h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	18°08.4	218°26.5	N09°22.7	234°08.1	N15°41.8	188°46.5	S02°50.3	340°09.6	N12°06.1			
1	33°10.9	233°26.1	21.7	249°09.1	41.4	203°48.4	50.5	355° 12.3	06.1	Alpheratz	357°31.2	29° 15.2
2	48°13.3	248°25.8	20.7	264°10.1	40.9	218°50.4	50.7	10°14.9	06.0	Ankaa	353°03.8	-42°08.8
3	63°15.8	263°25.4	• • 19.7	279°11.1	• • 40.5	233°52.4	• • 50.9	25°17.5	• • 05.9	Schedar Diphda	349°26.9 348°43.9	56° 41.9 -17° 49.5
4	$78^{\circ}18.2$	$278^{\circ}25.0$	18.7	294°12.1	40.0	248°54.3	51.1	40°20.2	05.9	Achernar	335°17.5	-17 49.5 -57°05.3
5	93°20.7	293°24.7	17.8	309°13.0	39.6	263°56.3	51.3	55°22.8	05.8	Hamal	327°47.4	23°36.0
6	108°23.2	308°24.3	N09°16.8	324°14.0	N15°39.1	278°58.3	S02°51.5	70°25.4	N12°05.8	Polaris	311°56.5	89°22.9
7	123°25.6	323°24.0	15.8	339°15.0	38.7	294°00.2	51.7	85°28.1	05.7	Acamar	315°09.1	-40°11.1
8	138°28.1	338°23.6	14.8	354°16.0	38.2	309°02.2 324°04.2	51.9	100°30.7	05.6	Menkar	314°02.7	4°12.3
9 10	153°30.6 168°33.0	353°23.2 8°22.9	· · 13.8 12.8	9°17.0 24°18.0	· · 37.8 37.3	339°06.1	· · 52.1 52.4	115°33.3 130°36.0	· · 05.6 05.5	Mirfak	308°23.4	49°57.7
11	183°35.5	23°22.5	11.8	39°19.0	36.9	354°08.1	52.4	145°38.6	05.5	Aldebaran	290°35.9	16°34.0
12	198°38.0	38°22.1	N09° 10.8	54°20.0	N15°36.4	9°10.1	S02°52.8	160°41.2	N12°05.4	Rigel	281°00.8	-8°10.0
13	213°40.4	53°21.8	09.9	69°21.0	35.9	24°12.0	53.0	175°43.9	05.4	Capella	280°17.1	46°01.4 6°22.6
14	228°42.9	68°21.4	08.9	84°22.0	35.5	39°14.0	53.2	190°46.5	05.3	Bellatrix Elnath	278°19.5 277°57.8	28° 37.8
15	243°45.4	83°21.0	• • 07.9	99°23.0	• • 35.0	54°16.0	• • 53.4	205°49.1	• • 05.2	Alnilam	275°34.5	-1°10.9
16	258°47.8	98°20.7	06.9	114°24.0	34.6	69°17.9	53.6	220°51.8	05.2	Betelgeuse	270°48.7	7°24.7
17	273°50.3	113°20.3	05.9	129°24.9	34.1	84°19.9	53.8	235°54.4	05.1	Canopus	263°50.9	-52°42.4
18	288°52.7	128°20.0 143°19.6	N09°04.9	144°25.9 159°26.9	N15°33.7	99°21.9 114°23.8	S02°54.0	250° 57.0 265° 59.7	N12°05.1	Sirius	258°23.5	-16°45.2
19 20	303°55.2 318°57.7	143 19.0 158°19.2	03.9 02.9	159 20.9 174°27.9	33.2 32.8	114 23.8 129°25.8	54.3 54.5	205 59.7 281°02.3	05.0 04.9	Adhara	255°03.4	-29°00.5
21	334°00.1	173° 18.9	• • 01.9	189°28.9	32.3	144°27.8	• • 54.7	296°05.0	• • 04.9	Procyon	244°47.7	5°09.0
22	349°02.6	188° 18.5	09°00.9	204°29.9	31.9	159°29.7	54.9	311°07.6	04.8	Pollux	243°13.7	27°57.2
23	4°05.1	203°18.1	08°59.9	219°30.9	31.4	174°31.7	55.1	326°10.2	04.8	Avior Suhail	234°13.6 222°44.2	-59°35.9 -43°32.7
Mern	ass. 22:44	ν-0 Δ' d-1	0′ m-4.04	11 0' d-0	0.5' m1.47	v2 0' d0	2′ m-1.67	υ2 6′ d-0	.1′ m0.00	Miaplacidus	222 44.2 221°37.9	-43 32.7 -69°49.9
- Wier.p	22.77	ν-0. 4 u-1		ν1.0 α-0	.5 1111.47	ν2.0 do.	2 111-1.07	ν2.0 u-0	.1 1110.00	Alphard	217°44.9	-8°47.0
_			_		_		_		_	Regulus	207°31.4	11°49.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°38.0	61°35.5
0 1	19°07.5 34°10.0	218° 17.8 233° 17.4	N08° 58.9 57.9	234°31.9 249°32.9	N15°30.9 30.5	189°33.7 204°35.7	\$02°55.3 55.5	341°12.9 356°15.5	N12°04.7 04.6	Denebola	182°22.2	14°24.7
2	49°12.5	248° 17.1	56.9	264° 33.9	30.0	219°37.6	55.5 55.7	11° 18.1	04.6	Gienah	175°40.8	-17°42.0
3	64°14.9	263°16.7	• • 56.0	279°34.9	• • 29.6	234°39.6	• • 55.9	26°20.8	04.5	Acrux	172°57.2	-63°15.5
4	79°17.4	278°16.3	55.0	294°35.9	29.1	249°41.6	56.2	41°23.4	04.5	Gacrux	171°48.7	-57°16.4
5	94°19.9	293°16.0	54.0	309°36.9	28.7	264°43.5	56.4	56°26.0	04.4	Alioth Spica	166°11.0 158°19.4	55°48.2 -11°18.6
6	109°22.3	308°15.6	N08°53.0	324°37.9	N15°28.2	279°45.5	S02°56.6	71°28.7	N12°04.3	Alkaid	150° 19.4° 152° 50.2	49° 10.2
7	124°24.8	323° 15.3	52.0	339°38.9	27.8	294°47.5	56.8	86°31.3	04.3	Hadar	148°32.2	-60°30.7
8	139°27.2	338°14.9	51.0	354°39.9	27.3	309°49.4	57.0	101°33.9	04.2	Menkent	147°54.4	-36°30.7
9	154°29.7	353°14.5	• • 50.0	9°40.9	• • 26.8	324°51.4	• • 57.2	116°36.6	• • 04.2	Arcturus	145°45.5	19°02.1
10 11	169°32.2 184°34.6	8° 14.2 23° 13.8	49.0 48.0	24°41.9 39°42.9	26.4 25.9	339°53.4 354°55.3	57.4 57.6	131°39.2 146°41.9	04.1 04.0	Rigil Kent.	139°36.6	-60°57.3
12	199°37.1	38° 13.4	N08° 47.0	54°43.9	N15°25.5	9°57.3	502°57.8	161°44.5	N12°04.0	Kochab	137°21.1	74°02.3
13	214°39.6	53°13.1	46.0	69°44.9	25.0	24°59.3	58.0	176° 47.1	03.9	Zuben'ubi	136°52.9	-16°09.6
14	229°42.0	68°12.7	45.0	84°45.9	24.6	40°01.2	58.3	191°49.8	03.9	Alphecca	126°01.5 112°12.3	26°37.3 -26°29.7
15	244°44.5	83°12.4	• • 44.0	99°46.8	• • 24.1	55°03.2	• • 58.5	206°52.4	• • 03.8	Antares Atria	112 12.3 107°04.0	-20 29.7 -69°04.8
16	259°47.0	98°12.0	43.0	114°47.8	23.6	70°05.2	58.7	221°55.0	03.7	Sabik	101°59.5	-15° 45.5
17	274°49.4	113°11.6	41.9	129°48.8	23.2	85°07.1	58.9	236° 57.7	03.7	Shaula	96°06.4	-37°07.4
18	289°51.9	128°11.3	N08° 40.9	144°49.8	N15°22.7	100°09.1	S02°59.1	252°00.3	N12°03.6	Rasalhague	95°55.9	12°32.6
19	304°54.4 319°56.8	143°10.9 158°10.6	39.9 38.9	159°50.8 174°51.8	22.3 21.8	115°11.1 130°13.0	59.3 59.5	267°02.9 282°05.6	03.6 03.5	Eltanin	90°40.9	51°29.5
20 21	334°59.3	173° 10.0	37.9	174 51.8 189°52.8	. 21.6	130 13.0 145°15.0	59.5	202 05.0 297°08.2	•• 03.4	Kaus Aust.	83°28.6	-34°22.2
22	350°01.7	188°09.8	36.9	204°53.8	20.9	160°17.0	02°59.9	312° 10.9	03.4	Vega	80°31.2	38°49.0
23	5°04.2	203°09.5	35.9	219°54.8	20.4	175°18.9	03°00.1	327°13.5	03.3	Nunki Altair	75°44.0 61°56.9	-26° 15.6 8° 57.0
Marn	ass. 22:40	11 0 A' d 1	0′ m-4.04	11 0' d C	0.5' m1.47	1,2 0/ 40	2′ m-1.67		.1' m-0.00	Peacock	53°00.9	-56°38.6
- Ivier.p	dass. 22.40	ν-0.4 u-1	0 111-4.04	ν 1.0 u -0	.5 1111.47	ν2.0 do.		ν2.0 <i>u</i> -0	.1 111-0.00	Deneb	49°23.5	45°23.4
										Enif	33°35.6	10°00.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.2
0 1	20°06.7 35°09.1	218°09.1	N08° 34.9	234°55.8 249°56.8	N15°20.0	190°20.9 205°22.9	\$03°00.4	342°16.1	N12°03.3	Fomalhaut	15°10.9	-29°28.0
2	50°11.6	233°08.8 248°08.4	33.9 32.9	249 56.8 264°57.8	19.5 19.1	205 22.9 220°24.8	00.6 00.8	357° 18.8 12° 21.4	03.2 03.1	Scheat	13°41.9	28° 14.6
3	65°14.1	263°08.0	• • 31.9	279°58.8	. 18.6	235°26.8	• • 01.0	27°24.0	03.1	Markab	13°26.6	15°21.9
4	80°16.5	278°07.7	30.9	294°59.8	18.2	250°28.8	01.2	42°26.7	03.0	Oct 09 Mon	SHA	Mer.pass
5	95°19.0	293°07.3	29.9	310°00.8	17.7	265°30.7	01.4	57°29.3	03.0	Venus	200°18.1	09:26
6	$110^{\circ}21.5$	308°07.0	N08°28.9	325°01.8	N15°17.2	280°32.7	S03°01.6	72°32.0	N12°02.9	Mars	215°59.7	08:23
7	125°23.9	323°06.6	27.8	340°02.8	16.8	295°34.7	01.8	87°34.6	02.8	Jupiter	170°38.1	11:23
8	140°26.4	338°06.3	26.8	355°03.8	16.3	310°36.6	02.0	102°37.2	02.8	Saturn	322°01.2	01:19
9	155°28.8	353°05.9 8°05.5	• • 25.8	10°04.9 25°05.9	. 15.9	325°38.6 340°40.6	• • 02.2	117°39.9 132°42.5	• • 02.7	Oct 10 Tue	SHA	Mer.pass
10 11	170°31.3 185°33.8	23°05.2	24.8 23.8	40°06.9	15.4 14.9	355°42.5	02.5 02.7	132 42.5 147°45.2	02.7 02.6	Venus	199°10.3	09:27
12	200°36.2	38°04.8	N08° 22.8	55°07.9	N15°14.5	10°44.5	503°02.9	162°47.8	N12°02.5	Mars	215°24.4	08:21
13	215°38.7	53°04.5	21.8	70°08.9	14.0	25°46.5	03.1	177°50.4	02.5	Jupiter	170°26.2	11:20
14	230°41.2	68°04.1	20.8	85°09.9	13.6	40°48.4	03.3	192°53.1	02.4	Saturn	322°05.3	01:15
15	245°43.6	83°03.7	•• 19.7	100°10.9	• • 13.1	55°50.4	• • 03.5	207°55.7	• • 02.4	Oct 11 Wed	SHA	Mer.pass
16	260°46.1	98°03.4	18.7	115°11.9	12.7	70°52.4	03.7	222°58.3	02.3	Venus	198°02.5	09:28
17	275°48.6	113°03.0	17.7	130°12.9	12.2	85°54.3	03.9	238°01.0	02.2	Mars	214°49.2	08:20
18 19	290°51.0 305°53.5	128°02.7 143°02.3	N08° 16.7 15.7	145°13.9 160°14.9	N15°11.7 11.3	100°56.3 115°58.3	\$03°04.1 04.3	253°03.6 268°06.3	N12°02.2 02.1		170°14.2	11:17
20	320° 56.0	143 02.3 158°02.0	15.7 14.7	175°15.9	10.8	131°00.2	04.5	283°08.9	02.1	Saturn	322°09.5	01:11
21	335°58.4	173° 01.6	• • 13.6	190°16.9	. 10.4	146°02.2	• • 04.8	298°11.5	02.0	Horizont	al parallax	ļ
22	351°00.9	$188^{\circ}01.2$	12.6	$205^{\circ}17.9$	09.9	161°04.2	05.0	313°14.2	01.9		Venus:	0.1
23	6°03.3	203°00.9	11.6	220°18.9	09.4	$176^{\circ}06.2$	05.2	$328^{\circ}16.8$	01.9		Mars:	0.1
Mern	ass. 22:36	ν-0 4' d-1	0′ m-4.04	ν 1 0' d-0	0.5' m1.47	ν 2 0' d0	2′ m-1.67	ν2 6' d-0	.1′ m-0.01			
р				0				0				

		T0.1340 Sec	·						
h	Sur	1			Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP		
0	183°11.3	S06°22.9	303°30.8	8.3'	N25°23.9	0.9'	56.1'		
1 2	198°11.4 213°11.6	23.8 24.8	317°58.1 332°25.3	8.2' 8.2'	25°24.9 25°25.7	0.8' 0.7'	56.1' 56.1'		
3	213 11.0 228°11.8	. 25.7	346°52.5	8.2'	25°26.3	0.7	56.1		
4	243°12.0	26.7	1°19.7	8.1'	25°26.9	0.4'	56.2		
5	258°12.1	27.6	$15^{\circ}46.9$	8.1'	25°27.2	0.2'	56.2'		
6	273°12.3	S06°28.6	30°14.0	8.1'	N25°27.5	0.1'	56.2'		
7	288°12.5	29.5	44°41.0	8.0'	25°27.6 25°27.5	-0.0'	56.2' 56.3'		
8 9	303°12.6 318°12.8	30.5 · · 31.4	59°08.1 73°35.1	8.0' 8.0'	25 27.5 25°27.4	-0.2' -0.3'	56.3'		
10	333°13.0	32.4	88°02.1	8.0'	25°27.0	-0.5'	56.3		
11	348°13.1	33.3	102°29.0	7.9'	25°26.6	-0.6'	56.4'		
12	3°13.3	506°34.3	$116^{\circ}56.0$	7.9'	N25°25.9	-0.8'	56.4'		
13	18°13.5	35.2	131°22.9	7.9'	25°25.2	-0.9'	56.4		
14 15	33°13.6 48°13.8	36.2 · · 37.1	145°49.7 160°16.6	7.9' 7.8'	25°24.3 25°23.2	-1.0' -1.2'	56.4' 56.5'		
16	63°14.0	38.1	174°43.4	7.8'	25°22.0	-1.2 -1.3'	56.5'		
17	78°14.1	39.0	189°10.2	7.8'	25°20.7	-1.5'	56.5		
18	93°14.3	S06°40.0	203°37.0	7.8'	$N25^{\circ}19.2$	-1.6'	56.5'		
19	108°14.5	40.9	218°03.8	7.8'	25°17.6	-1.8'	56.6'		
20	123°14.6	41.8	232°30.6	7.7'	25°15.8	-1.9'	56.6'		
21 22	138°14.8 153°15.0	· · 42.8 43.7	246°57.3 261°24.0	7.7' 7.7'	25°13.9 25°11.9	-2.1' -2.2'	56.6' 56.7'		
23	168°15.1	43. <i>1</i> 44.7	201 24.0 275°50.8	7.7'	25 11.9 25°09.7	-2.2 -2.3'	56.7'		
	SD = 16.0'				D = 15.3'				
	$SD = 16.0^{\circ}$	d = 0.9'		51	D = 15.3'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	183°15.3	S 06°45.6	290°17.5	7.7'	N25°07.3	-2.5'	56.7'		
1	198°15.5	46.6	304°44.2	7.7'	25°04.8	-2.6'	56.7'		
2	213°15.6 228°15.8	47.5 •• 48.5	319°10.8 333°37.5	7.7' 7.7'	25°02.2 24°59.4	-2.8' -2.9'	56.8' 56.8'		
3 4	243°16.0	49.4	348°04.2	7.7'	24 59.4 24°56.5	-2.9 -3.1'	56.8		
5	258°16.1	50.4	2°30.8	7.7'	24°53.4	-3.2'	56.9'		
6	273°16.3	S06°51.3	$16^{\circ}57.5$	7.6'	N24°50.2	-3.4'	56.9'		
7	288°16.5	52.2	31°24.1	7.6'	24°46.8	-3.5'	56.9'		
8	303°16.6 318°16.8	53.2	45°50.8 60°17.4	7.6' 7.6'	24°43.3 24°39.6	-3.7'	57.0'		
9 10	318 10.8 333°17.0	• • 54.1 55.1	74°44.1	7.6'	24 39.0 24°35.8	-3.8' -4.0'	57.0' 57.0'		
11	348°17.1	56.0	89°10.7	7.6'	24°31.9	-4.1'	57.0'		
12	3°17.3	S 06°57.0	103°37.3	7.6'	N24°27.8	-4.2'	57.1'		
13	18°17.4	57.9	$118^{\circ}04.0$	7.6'	24°23.5	-4.4'	57.1'		
14	33°17.6	58.8	132°30.6	7.7'	24°19.2	-4.5'	57.1'		
15 16	48°17.8 63°17.9	06°59.8 07°00.7	146°57.3 161°24.0	7.7' 7.7'	24°14.6 24°09.9	-4.7' -4.8'	57.2' 57.2'		
17	78° 18.1	01.7	175°50.6	7.7'	24°05.1	-5.0'	57.2'		
18	93°18.3	S 07°02.6	190°17.3	7.7'	N24°00.2	-5.1'	57.3'		
19	108°18.4	03.6	204°44.0		$23^{\circ}55.1$		57.3'		
20	123°18.6	04.5	219°10.7	7.7'	23°49.8	-5.4'	57.3		
21 22	138°18.7 153°18.9	· · 05.4 06.4	233°37.4 248°04.1	7.7' 7.7'	23°44.4 23°38.9	-5.5' -5.7'	57.4' 57.4'		
23	168°19.1	07.3	262°30.8	7.7'	23°33.2	-5.8'	57.4		
	SD = 16.0'	d = 0.9'			D = 15.5'				
	<u>JD = 10.0</u>	<u>u = 0.9</u>							
Wed	GHA	Dec	GHA	ν	Dec	d	HP		
0	183°19.2	S 07°08.3	276°57.5	7.8'	N23°27.4	-6.0'	57.4'		
1	198°19.4 213°19.5	09.2	291°24.3 305°51.1	7.8' 7.8'	23°21.4 23°15.3	-6.1'	57.5' 57.5'		
2 3	213 19.5 228°19.7	10.1 •• 11.1	305 51.1 320°17.8	7.8'	23 15.3 23°09.1	-6.2' -6.4'	57.5'		
4	243°19.9	12.0	334°44.6	7.8'	23°02.7	-6.5	57.6		
5	258°20.0	13.0	$349^{\circ}11.5$	7.8'	$22^{\circ}56.1$	-6.7'	57.6'		
6	273°20.2	S07°13.9	3°38.3	7.9'	N22°49.5	-6.8'	57.6'		
7	288°20.3	14.9	18°05.2	7.9'	22°42.7	-6.9'	57.7'		
8 9	303°20.5 318°20.7	15.8 •• 16.7	32°32.0 46°58.9	7.9' 7.9'	22°35.7 22°28.6	-7.1' -7.2'	57.7' 57.7'		
10	333°20.8	17.7	61°25.8	7.9'	22°21.4	-7.4'	57.8		
11	348°21.0	18.6	75°52.8	8.0'	22°14.0	-7.5'	57.8'		
12	3°21.1	S 07°19.6	$90^{\circ}19.7$	8.0'	$N22^{\circ}06.5$	-7.6'	57.8'		
13	18°21.3	20.5	104°46.7	8.0'	21°58.9	-7.8'	57.9'		
14 15	33°21.4 48°21.6	21.4	119°13.7 133°40.8	8.0' 8.1'	21°51.1 21°43.2	-7.9' -8.0'	57.9' 57.9'		
15 16	48°21.6 63°21.8	23.3	133°40.8 148°07.8	8.1'	21°43.2 21°35.2	-8.0' -8.2'	57.9 58.0'		
17	78°21.9	24.2	162°34.9	8.1	21°27.0	-8.3'	58.0'		
18	93°22.1	S07°25.2	177°02.0	8.1'	N21°18.7	-8.4'	58.0'		
19	108°22.2	26.1	191°29.1	8.2'	21°10.3	-8.6'	58.1'		
20	123°22.4	27.1	205°56.3	8.2'	21°01.7	-8.7'	58.1'		
21 22	138°22.5 153°22.7	· · 28.0 28.9	220°23.5 234°50.7	8.2' 8.2'	20°53.0 20°44.2	-8.8' -9.0'	58.1' 58.2'		
23	168°22.9	28.9 29.9	234°50.7 249°17.9	8.2	20°44.2 20°35.2	-9.0 -9.1'	58.2' 58.2'		
23	SD = 16.0'	d = 0.9'			D = 15.7'	J.1	50.2		
	JD — 10.0	u — 0.9	-	اد	_ 13. <i>l</i>				

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	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
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
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
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
S 60°	03:12	04:08	04:52	18:43	19:27	20:24

Lat.		Moonris	e		Moonset	t
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 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
N 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
S 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		00:45	08:47	09:45	10:49
40°		00:13	01:00	08:30	09:29	10:34
45°	•• ••	00:33	01:18	08:09	09:09	10:17
S 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°	01:08	01:58	02:32	06:41	07:45	09:05
S 60°	01:33	02:22	02:51	06:16	07:21	08:47

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-55%
09	12:45	12:53	11:47	03:54	16:22	
10	13:01	13:09	11:47	04:50	17:17	
11	13:17	13:25	11:47	05:45	18:12	

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

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
							503°05.4		N12°01.8		эпа	Dec
0	21°05.8	218°00.5	N08°10.6	235°19.9	N15°09.0	191°08.1		343°19.5		Alpheratz	357°31.2	29°15.2
1	36°08.3	233°00.2	09.6	250°20.9	08.5	206°10.1	05.6	358°22.1	01.8	Ankaa	353°03.8	-42°08.8
2	51°10.7	247°59.8	08.6	265°21.9	08.1	221°12.1	05.8	13°24.7	01.7	Schedar	349°26.9	56°41.9
3	66°13.2	262°59.5	• • 07.5	280°22.9	•• 07.6	236°14.0	• • 06.0	28°27.4	•• 01.6	Diphda	348°43.9	-17°49.5
4	81°15.7	277°59.1	06.5	295°23.9	07.1	251°16.0	06.2	43°30.0	01.6	Achernar	335°17.4	-57°05.3
5	96°18.1	292°58.7	05.5	310°24.9	06.7	266°18.0	06.4	58°32.7	01.5	Hamal	327°47.4	23°36.0
6	111°20.6	307°58.4	N08°04.5	325°25.9	N15°06.2	281°19.9	S03°06.7	73°35.3	N12°01.5	Polaris	311°55.4	89°22.9
7	126°23.1	322°58.0	03.4	340°27.0	05.8	296°21.9	06.9	88°37.9	01.4	Acamar	315°09.1	-40°11.1
8	141°25.5	337°57.7	02.4	355°28.0	05.3	311°23.9	07.1	103°40.6	01.3	Menkar	314°02.7	4°12.3
9	156°28.0	352°57.3	• • 01.4	10°29.0	• • 04.8	326°25.8	• • 07.3	118°43.2	• • 01.3	Mirfak	308°23.4	49°57.7
10	171°30.5	7°57.0	08°00.4	25°30.0	04.4	341°27.8	07.5	133°45.9	01.2	Aldebaran	290°35.9	16°34.0
11	186°32.9	22°56.6	07°59.4	40°31.0	03.9	356°29.8	07.7	148°48.5	01.1	Rigel	281°00.8	-8°10.0
12	201°35.4	37°56.2	N07°58.3	55°32.0	N15°03.4	11°31.7	S03°07.9	163°51.1	N12°01.1	Capella	$280^{\circ}17.1$	46°01.4
13	216°37.8	52°55.9	57.3	70°33.0	03.0	26°33.7	08.1	178°53.8	01.0	Bellatrix	278°19.4	6°22.6
14	231°40.3	67°55.5	56.3	85°34.0	02.5	41°35.7	08.3	193°56.4	01.0	Elnath	277°57.8	28°37.8
15	246°42.8	82°55.2	• • 55.3	100°35.0	• • 02.1	56°37.6	• • 08.5	208°59.1	• • 00.9	Alnilam	275°34.5	-1°11.0
16	261°45.2	97°54.8	54.2	115°36.0	01.6	71°39.6	08.7	224°01.7	8.00	Betelgeuse	270°48.7	7°24.7
17	276°47.7	112°54.5	53.2	130°37.0	01.1	86°41.6	09.0	239°04.3	8.00	Canopus	263°50.9	-52°42.4
18	291°50.2	127°54.1	N07°52.2	145°38.0	N15°00.7	101°43.5	S03°09.2	254°07.0	N12°00.7	Sirius	258°23.5	-16°45.2
19	306°52.6	142°53.7	51.1	160°39.1	15°00.2	116°45.5	09.4	269°09.6 284°12.3	00.7	Adhara	255°03.4	-29°00.5
20	321°55.1	157°53.4	50.1	175°40.1	14°59.8	131°47.5	09.6		00.6	Procyon	244°47.7	5°09.0
21	336°57.6	172°53.0	• • 49.1	190°41.1	59.3	146°49.4	• • 09.8	299°14.9	• • 00.5	Pollux	243°13.6	27°57.2
22	352°00.0 7°02.5	187°52.7	48.1	205° 42.1	58.8 50.4	161°51.4	10.0	314°17.5	00.5	Avior	$234^{\circ}13.6$	-59°35.9
23	7-02.5	202°52.3	47.0	220°43.1	58.4	176°53.4	10.2	329°20.2	00.4	Suhail	222°44.2	-43°32.7
Mer.p	ass. 22:32	ν -0.4' d-1	0′ m-4.03	ν 1.0 $^{\prime}$ d-0	0.5′ m1.46	$\nu 2.0' \ d0.$	2′ m-1.67	ν 2.6′ d-0	.1' m-0.01	Miaplacidus	221°37.9	-69°49.9
										Alphard	$217^{\circ}44.9$	-8°47.0
E!	CHA	CHA	Dec	CHA	Doo	CHA	Doo	CHA	Doo	Regulus	207°31.4	11°49.5
Fri 0	GHA 22°04.9	GHA 217°52.0	N07°46.0	GHA 235° 44.1	Dec N14° 57.9	GHA 191°55.4	Dec \$03°10.4	GHA 344°22.8	Dec N12°00.4	Dubhe	193°38.0	61°35.5
1	37°07.4	232°51.6	45.0	250°45.1	57.4	206°57.3	10.6	359°25.5	00.3	Denebola	182°22.2	14°24.7
2	52°09.9	247°51.3	43.9	265°46.1	57.0	221°59.3	10.8	14°28.1	00.2	Gienah	175°40.7	-17°42.0
3	67°12.3	262°50.9	42.9	280°47.1	• • 56.5	237°01.3	• • 11.0	29°30.8	. 00.2	Acrux	172°57.2	-63°15.5
4	82°14.8	277°50.6	41.9	295°48.2	56.1	252°03.2	11.3	44°33.4	00.1	Gacrux	171°48.7	-57°16.4
5	97°17.3	292°50.2	40.8	310°49.2	55.6	267°05.2	11.5	59°36.0	00.0	Alioth	166°11.0	55°48.2
6	112°19.7	307°49.8	N07°39.8	325°50.2	N14°55.1	282°07.2	S03°11.7	74°38.7	N12°00.0	Spica	158° 19.4	-11°18.6
7	127°22.2	322°49.5	38.8	340°51.2	54.7	297°09.1	11.9	89°41.3	11°59.9	Alkaid	152°50.2	49°10.2
8	142°24.7	337°49.1	37.7	355°52.2	54.2	312°11.1	12.1	104°44.0	59.9	Hadar	148°32.2	-60°30.7
9	157°27.1	352°48.8	• • 36.7	10°53.2	• • 53.7	327°13.1	• • 12.3	119°46.6	• • 59.8	Menkent	147°54.3	-36°30.7
10	172°29.6	7°48.4	35.7	25°54.2	53.3	342°15.0	12.5	134°49.3	59.7	Arcturus	145°45.5	19°02.0
11	187°32.1	22°48.1	34.6	40°55.2	52.8	357°17.0	12.7	149°51.9	59.7	Rigil Kent.	139°36.6	-60°57.3
12	202°34.5	37°47.7	N07°33.6	55° 56.3	N14°52.4	12°19.0	S03°12.9	164°54.5	N11°59.6	Kochab	137°21.2	74°02.3
13	217°37.0	52°47.4	32.6	70°57.3	51.9	27°20.9	13.1	179°57.2	59.6	Zuben'ubi	136°52.9	-16°09.6
14	232°39.4	67°47.0	31.5	85° 58.3	51.4	42°22.9	13.3	194°59.8	59.5	Alphecca	126°01.5	26°37.2
15	247°41.9	82°46.7	• • 30.5	100°59.3	• • 51.0	57°24.9	• • 13.6	210°02.5	• • 59.4	Antares	112°12.3	-26°29.7
16	262°44.4	97°46.3	29.5	116°00.3	50.5	72°26.8	13.8	225°05.1	59.4	Atria Sabik	107°04.0 101°59.5	-69°04.8 -15°45.5
17	277°46.8	112°45.9	28.4	131°01.3	50.0	87°28.8	14.0	240°07.8	59.3	Shaula	96°06.4	-15 45.5 -37°07.4
18	292°49.3	127°45.6	N07°27.4	146°02.3	N14°49.6	102°30.8	S03°14.2	255°10.4	N11°59.3	Rasalhague	95°55.9	12°32.6
19	307°51.8	142°45.2	26.3	161°03.4	49.1	117°32.7	14.4	270°13.0	59.2	Eltanin	90°41.0	51°29.4
20	322°54.2	157°44.9	25.3	176°04.4	48.6	132°34.7	14.6	$285^{\circ}15.7$	59.1	Kaus Aust.	83°28.6	-34°22.2
21	337°56.7	172°44.5	• • 24.3	191°05.4	• • 48.2	147°36.7	• • 14.8	$300^{\circ}18.3$	•• 59.1	Vega	80°31.2	38°49.0
22	352°59.2	187°44.2	23.2	206°06.4	47.7	162°38.7	15.0	$315^{\circ}21.0$	59.0	Nunki	75°44.0	-26°15.6
23	8°01.6	202°43.8	22.2	221°07.4	47.3	177°40.6	15.2	330°23.6	58.9	Altair	61°57.0	8°57.0
Mern	pass. 22:28	υ_0 Δ' d_1	0′ m-4.03	11 0' d-0	0.5' m1.46	1/2 0/ d0	2′ m-1.67	u2 6′ d-0	.1′ m-0.02	Peacock	53°00.9	-56°38.6
- IVICI.P	7433. 22.20	ν σ. + α 1	111 4.05	ν1.0 d 0		ν2.0 do.	2 111 1.07	ν2.0 u σ	.1 111 0.02	Deneb	49°23.5	45°23.4
										Enif	33°35.6	10°00.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.2
0	23°04.1	217°43.5	N07°21.1	236°08.4	N14°46.8	192°42.6	S03°15.4	345°26.3	N11°58.9	Fomalhaut	15° 10.9	-29°28.0
1	38°06.6	232°43.1	20.1	251°09.5	46.3	207°44.6	15.6	0°28.9	58.8	Scheat	13°41.9	28°14.7
2	53°09.0	247°42.8	19.1	266° 10.5	45.9	222°46.5	15.9	15°31.5	58.8	Markab	13°26.6	15°21.9
3	68°11.5	262°42.4	• • 18.0	281°11.5	• • 45.4	237°48.5	•• 16.1	30°34.2	• • 58.7			
4	83°13.9	277°42.1	17.0	296° 12.5	44.9	252°50.5	16.3	45°36.8	58.6	Oct 12 Thu	SHA	Mer.pass
5	98°16.4	292°41.7	15.9	311°13.5	44.5	267°52.4	16.5	60°39.5	58.6		196° 54.7	09:28
6	113°18.9	307°41.4	N07°14.9	326° 14.5	N14°44.0	282°54.4	S03°16.7	75°42.1	N11°58.5		214°14.1	08:18
7	128°21.3	322°41.0	13.8	341° 15.6	43.5	297°56.4	16.9	90°44.8	58.5		170°02.3	11:14
8	143°23.8	337°40.7	12.8	356° 16.6	43.1	312°58.3	17.1	105°47.4	58.4	Saturn	322°13.6	01:07
9	158°26.3	352°40.3	• • 11.8	11°17.6	• • 42.6	328°00.3	• • 17.3	120°50.0	• • 58.3	Oct 13 Fri	SHA	Mer.pass
10	173°28.7	7°39.9	10.7	26°18.6	42.1	343°02.3	17.5	135°52.7	58.3	l l	195°47.0	09:29
11	188°31.2	22°39.6	09.7	41°19.6	41.7	358°04.2	17.7	150°55.3	58.2		213°39.2	08:17
12	203°33.7	37°39.2	N07°08.6	56°20.7	N14°41.2	13°06.2	S03°17.9	165°58.0	N11°58.1		169°50.4	11:11
13	218°36.1	52°38.9	07.6	71°21.7	40.7	28°08.2	18.2	181°00.6	58.1	Saturn		01:02
14 15	233°38.6	67°38.5	06.5	86°22.7	40.3	43°10.2	18.4	196°03.3	58.0			
15 16	248°41.0 263°43.5	82°38.2 97°37.8	· · 05.5 04.4	101°23.7 116°24.7	· · 39.8	58°12.1 73°14.1	· · 18.6	211°05.9 226°08.6	· · 58.0	Oct 14 Sat	SHA 104° 20.4	Mer.pass
16 17	263°43.5 278°46.0	97°37.8 112°37.5	04.4	116° 24.7 131° 25.8	39.3 38.9	73°14.1 88°16.1	18.8 19.0	226°08.6 241°11.2	57.9 57.8		194°39.4	09:29
17 18	278 46.0 293°48.4	112 37.5 127°37.1	N07°02.3	131 25.8 146° 26.8	38.9 N14°38.4	103°18.0	503°19.2	241 11.2 256°13.8	57.8 N11°57.8		213°04.4	08:15
19	308° 50.9	142°36.8	01.3	140 20.8 161°27.8	37.9	118°20.0	19.4	250 15.6 271°16.5	57.7		169°38.5	11:08
20	323°53.4	157°36.4	01.3 07°00.2	176° 28.8	37.5	133°22.0	19.4	271 10.5 286°19.1	57.7 57.7	Saturn	322°22.2	00:58
21	338°55.8	172°36.1	06°59.2	191°29.8	• • 37.0	148°23.9	• • 19.8	301°21.8	• • 57.6	Horizont	al parallax	
22	353°58.3	187°35.7	58.1	206°30.9	36.6	163°25.9	20.0	316°24.4	57.5		Venus:	0.1
23	9°00.8	202°35.4	57.1	221°31.9	36.1	178°27.9	20.2	331°27.1	57.5		Mars:	0.1
			0′ m-4.03								-	
ivier.p	pass. 22:24	ν-0.4° α-1	0 111-4.03	ν1.0 a-0	0.5′ m1.45	ν2.0 a0.	2′ m-1.67	ν2.0° α-0	.1′ m-0.02			

h	Sui	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.0	\$07°30.8	263°45.2	8.3'	N20°26.1	-9.2'	58.2'
1	198°23.2	31.8	$278^{\circ}12.5$	8.3'	20°16.9	-9.3'	58.3'
2	213°23.3	32.7	292°39.8	8.4'	20°07.5	-9.5'	58.3'
3	228°23.5	• • 33.6	307°07.2	8.4'	19°58.1	-9.6'	58.3'
4	243°23.6	34.6	321°34.6	8.4'	19°48.5	-9.7'	58.4'
5	258°23.8 273°23.9	35.5 \$07°36.4	336°02.0 350°29.5	8.4' 8.5'	19°38.7 N19°28.9	-9.9' -10.0'	58.4' 58.4'
6 7	273 23.9 288°24.1	37.4	350 29.5 4°56.9	8.5'	19° 18.9	-10.0 -10.1'	58.5'
8	303°24.2	38.3	19°24.5	8.5'	19°08.8	-10.1	58.5'
9	318°24.4	39.2	33°52.0	8.6'	18°58.6	-10.3'	58.5'
10	333°24.5	40.2	48°19.6	8.6'	18°48.3	-10.5'	58.6'
11	348°24.7	41.1	62°47.2	8.6'	18°37.8	-10.6'	58.6'
12	3°24.9	S07°42.0	77°14.8	8.7'	N18°27.2	-10.7'	58.6'
13	18°25.0	43.0	91°42.5	8.7'	18°16.5	-10.8'	58.7'
14 15	33°25.2 48°25.3	43.9 • • 44.9	106°10.2 120°37.9	8.7' 8.8'	18°05.7 17°54.8	-10.9' -11.0'	58.7' 58.7'
16	63°25.5	45.8	120° 37.9 135° 05.6	o.o 8.8'	17°43.7	-11.0 -11.2'	58.8'
17	78°25.6	46.7	149°33.4	8.8'	17°32.6	-11.3'	58.8'
18	93°25.8	S07°47.7	164°01.3	8.8'	N17°21.3	-11.4'	58.8'
19	108°25.9	48.6	$178^{\circ}29.1$	8.9'	17°09.9	-11.5'	58.9'
20	123°26.1	49.5	192°57.0	8.9'	16°58.4	-11.6'	58.9'
21	138°26.2	• • 50.5	207°24.9	8.9'	16°46.8	-11.7'	58.9'
22	153°26.4	51.4	221°52.8	9.0'	16°35.1	-11.8'	59.0'
23	168°26.5	52.3	236°20.8	9.0'	16°23.2	-11.9'	59.0'
	SD = 16.0'	d = 0.9'		S	D = 15.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°26.7	S07°53.3	250°48.8	9.0'	N16°11.3	-12.0'	59.0'
1	198°26.8	54.2	265°16.8	9.1'	15°59.3	-12.1'	59.1'
2	213°27.0	55.1	279°44.9	9.1'	15°47.1	-12.2'	59.1'
3 4	228°27.1 243°27.3	· · 56.1 57.0	294°13.0 308°41.1	9.1' 9.1'	15°34.9 15°22.5	-12.4' -12.5'	59.1' 59.2'
5	243 27.3 258°27.4	57.0 57.9	323°09.3	9.1 9.2'	15 22.5 15°10.1	-12.5 -12.6'	59.2'
6	273°27.6	507°58.9	337°37.4	9.2'	N14°57.5	-12.7'	59.2'
7	288°27.7	07°59.8	352°05.6	9.2'	14°44.9	-12.8'	59.3'
8	303°27.8	08°00.7	6°33.9	9.3'	14°32.1	-12.8'	59.3'
9	318°28.0	•• 01.6	$21^{\circ}02.1$	9.3'	14°19.3	-12.9'	59.3'
10	333°28.1	02.6	35°30.4	9.3'	14°06.3	-13.0'	59.4'
11	348°28.3 3°28.4	03.5 \$08°04.4	49°58.7	9.3'	13°53.3 N13°40.1	-13.1'	59.4'
12 13	3°28.4 18°28.6	05.4	64°27.1 78°55.4	9.4' 9.4'	13°26.9	-13.2' -13.3'	59.4' 59.5'
14	33°28.7	06.3	93°23.8	9.4 9.4'	13°13.6	-13.4'	59.5'
15	48°28.9	07.2	107°52.2	9.4'	13°00.2	-13.5'	59.5'
16	63°29.0	08.2	122°20.7	9.5'	12°46.7	-13.6'	59.5'
17	78°29.2	09.1	$136^{\circ}49.1$	9.5'	12°33.1	-13.7'	59.6'
18	93°29.3	S08°10.0	151°17.6	9.5'	N12°19.4	-13.8'	59.6'
19	108°29.5	11.0	165°46.1		12°05.7	20.0	59.6'
20 21	123°29.6 138°29.7	11.9 • • 12.8	180°14.6 194°43.2	9.5' 9.6'	11°51.8 11°37.9	-13.9' -14.0'	59.7' 59.7'
22	150 29.7 153°29.9	13.7	209°11.8	9.6'	11°23.9	-14.0 -14.1'	59.7'
23	168°30.0	14.7	223°40.3	9.6'	11°09.8	-14.2'	59.8'
	SD = 16.0'	d = 0.9'			D = 16.1'		
		<u>u = 0.5</u>			D = 10.1		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°30.2 198°30.3	S08°15.6	238°08.9	9.6'	N10°55.7 10°41.5	-14.2'	59.8'
1 2	198°30.3 213°30.5	16.5 17.5	252°37.6 267°06.2	9.6' 9.7'	10°41.5 10°27.1	-14.3' -14.4'	59.8' 59.8'
3	228°30.6	. 18.4	281°34.9	9.7'	10° 12.8	-14.5'	59.9'
4	243°30.7	19.3	296°03.5	9.7'	09°58.3	-14.5'	59.9'
5	258°30.9	20.2	$310^{\circ}32.2$	9.7'	09°43.8	-14.6'	59.9'
6	273°31.0	S08°21.2	325°00.9	9.7'	N09°29.2	-14.7'	60.0'
7	288°31.2	22.1	339°29.7	9.7'	09°14.5	-14.7'	60.0'
8	303°31.3	23.0	353°58.4	9.7'	08°59.8	-14.8'	60.0'
9 10	318°31.5 333°31.6	· · 23.9 24.9	8°27.1 22°55.9	9.8' 9.8'	08°45.0 08°30.1	-14.9' -14.9'	60.0' 60.1'
11	333 31.0 348°31.7	24.9 25.8	22 55.9 37°24.7	9.8' 9.8'	08°15.2	-14.9 -15.0'	60.1
12	3°31.9	S08°26.7	51°53.4	9.8'	N08°00.2	-15.0'	60.1
13	18°32.0	27.6	66°22.2	9.8'	07°45.2	-15.1'	60.2'
14	33°32.2	28.6	80°51.0	9.8'	07°30.1	-15.2'	60.2'
15	48°32.3	• • 29.5	95°19.8	9.8'	07°14.9	-15.2'	60.2'
16	63°32.4	30.4	109°48.6	9.8'	06°59.7	-15.3'	60.2'
17	78°32.6	31.3 \$08°32.3	124°17.5	9.8'	06°44.4	-15.3'	60.3'
18 19	93°32.7 108°32.9	33.2	138°46.3 153°15.1	9.8' 9.8'	N06°29.1 06°13.8	-15.4' -15.4'	60.3' 60.3'
20	106 32.9 123°33.0	34.1	167°43.9	9.8'	00 13.6 05°58.3	-15.4 -15.5'	60.3
21	138°33.1	• • 35.0	182°12.8	9.8'	05°42.9	-15.5'	60.3
22	153°33.3	36.0	196°41.6	9.8'	05°27.4	-15.6'	60.4
23	168°33.4	36.9	211°10.4	9.8'	$05^{\circ}11.8$	-15.6'	60.4'
	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°	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
N 40°	05:10	05:42	06:09	17:23	17:50	18:21
35°	05:10	05:39	06:05	17:27	17:53	18:22
30°	05:09	05:37	06:01	17:31	17:55	18:23
20° N 10°	05:06	05:32	05:54	17:38	18:00	18:25
0°	05:03 04:58	05:27 05:22	05:48 05:43	17:44 17:49	18:05	18:29 18:35
					18:10	
S 10°	04:51	05:16	05:37	17:55	18:17	18:41
20° 30°	04:43	05:09	05:31	18:02	18:24	18:50
30° 35°	04:31 04:23	04:59 04:54	05:24 05:20	18:09 18:13	18:33 18:39	19:02 19:10
40°	04:23	04:54	05:20	18:18	18:46	19:10
45°	04:14	04:47	05:09	18:24	18:54	19:19
S 50° 52°	03:48 03:41	04:29 04:24	05:02 04:59	18:31 18:34	19:04 19:09	19:46 19:53
52 54°	03:41	04:24	04:59 04:56	18:34	19:09	20:01
56°	03:33	04:13	04:50	18:41	19:13	20:01
58°	03:24	04:13	04:32	18:46	19:21	20:10
S 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
N 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
S 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
S 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
S 60°	03:09	03:20	03:28	10:22	12:01	13:41

		Sun				
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.	
u,	00 ^h	12 ^h	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	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	24°03.2	217°35.0	N06° 56.0	236°32.9	N14°35.6	193°29.8	503°20.4	346°29.7	N11°57.4			Dec
1	39°05.7	232°34.7	55.0	251°33.9	35.2	208°31.8	20.7	1°32.4	57.3	Alpheratz	357°31.2	29° 15.2
2	54°08.2	247°34.3	53.9	266°35.0	34.7	223°33.8	20.9	16°35.0	57.3	Ankaa	353°03.8	-42°08.9
3	69°10.6	262°34.0	52.9	281°36.0	• • 34.2	238°35.7	• 21.1	31°37.7	57.2	Schedar	349°26.9	56°41.9
4	84°13.1	277°33.6	51.8	296°37.0	33.8	253°37.7	21.3	46° 40.3	57.2	Diphda	348°43.9	-17°49.5
5	99°15.5	292°33.3	50.8	311°38.0	33.3	268°39.7	21.5	61°42.9	57.1	Achernar	335°17.4	-57°05.3
6	114°18.0	307°32.9	N06°49.7	326°39.1	N14°32.8	283°41.7	S03°21.7	76°45.6	N11°57.0	Hamal Polaris	327°47.4 311°54.6	23°36.0 89°22.9
7	129°20.5	322°32.6	48.7	341°40.1	32.4	298°43.6	21.9	91°48.2	57.0	Acamar	311 54.0 315°09.1	-40°11.2
8	144°22.9	337°32.2	47.6	356°41.1	31.9	313°45.6	22.1	106°50.9	56.9	Menkar	314°02.6	4° 12.3
9	159°25.4	352°31.9	• • 46.5	11°42.1	• • 31.4	328°47.6	• • 22.3	121°53.5	• • 56.8	Mirfak	308°23.4	49°57.7
10	174°27.9	7°31.5	45.5	26°43.1	30.9	343°49.5	22.5	136°56.2	56.8	Aldebaran	290°35.9	16°34.0
11 12	189°30.3 204°32.8	22°31.2 37°30.8	44.4 N06°43.4	41°44.2 56°45.2	30.5 N14°30.0	358°51.5 13°53.5	22.7 \$03°22.9	151°58.8 167°01.5	56.7 N11°56.7	Rigel	281°00.7	-8°10.0
13	219°35.3	52° 30.5	42.3	71°46.2	29.5	28°55.4	23.1	182°04.1	56.6	Capella	280°17.1	46°01.4
14	234°37.7	67°30.1	41.3	86°47.2	29.1	43°57.4	23.4	197°06.8	56.5	Bellatrix	278°19.4	6°22.6
15	249°40.2	82°29.8	40.2	101°48.3	• • 28.6	58°59.4	23.6	212°09.4	56.5	Elnath	277°57.8	28°37.8
16	264°42.6	97°29.4	39.1	116°49.3	28.1	74°01.3	23.8	227°12.1	56.4	Alnilam	275°34.5	-1°11.0
17	279°45.1	$112^{\circ}29.1$	38.1	131°50.3	27.7	89°03.3	24.0	242°14.7	56.4	Betelgeuse	270°48.6	7°24.7
18	294°47.6	127°28.7	N06°37.0	146°51.4	N14°27.2	104°05.3	S03°24.2	257° 17.3	N11°56.3	Canopus Sirius	263°50.9 258°23.5	-52° 42.4 -16° 45.2
19	309°50.0	142°28.4	36.0	161°52.4	26.7	119°07.3	24.4	272°20.0	56.2	Adhara	255°03.4	-10 45.2 -29°00.5
20	324°52.5	157°28.0	34.9	176°53.4	26.3	134°09.2	24.6	287°22.6	56.2	Procyon	244°47.6	5°09.0
21	339°55.0	172°27.7	• • 33.9	191°54.4	• • 25.8	149°11.2	• • 24.8	302°25.3	• • 56.1	Pollux	243°13.6	27°57.2
22	354°57.4	187°27.3	32.8	206°55.5	25.3	164°13.2	25.0	317°27.9	56.0	Avior	234°13.5	-59° 35.8
23	9°59.9	202°27.0	31.7	221°56.5	24.9	179°15.1	25.2	332°30.6	56.0	Suhail	222°44.2	-43°32.7
Mer.p	ass. 22:20	ν -0.4' d-1	1′ m-4.03	$\nu 1.0' \ d-0$	1.5' m 1.45	$\nu 2.0' \ d0.$	2′ m-1.67	ν 2.6′ d-0	.1' m-0.02	Miaplacidus	221°37.9	-69°49.9
										Alphard	217°44.9	-8°47.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.4 193°38.0	11°49.5 61°35.5
0	$25^{\circ}02.4$	$217^{\circ}26.6$	N06°30.7	236°57.5	N14°24.4	$194^{\circ}17.1$	S03°25.4	347°33.2	N11°55.9	Denebola	182°22.2	14° 24.6
1	40°04.8	232°26.3	29.6	251°58.5	23.9	$209^{\circ}19.1$	25.6	2°35.9	55.9	Gienah	175°40.7	-17°42.0
2	55°07.3	247°25.9	28.5	266°59.6	23.5	224°21.0	25.9	17°38.5	55.8	Acrux	172°57.2	-63° 15.5
3	70°09.8	262°25.6	• • 27.5	282°00.6	• • 23.0	239°23.0	• • 26.1	32°41.2	• • 55.7	Gacrux	171°48.7	-57°16.4
4 5	85°12.2 100°14.7	277°25.2 292°24.9	26.4 25.4	297°01.6 312°02.7	22.5 22.1	254°25.0 269°27.0	26.3 26.5	47°43.8 62°46.5	55.7 55.6	Alioth	$166^{\circ}11.0$	55°48.1
6	115° 17.1	307°24.5	N06° 24.3	327°03.7	N14°21.6	284°28.9	S03°26.7	77°49.1	N11°55.5	Spica	158°19.4	-11°18.6
7	130°19.6	322°24.2	23.2	342°04.7	21.1	299°30.9	26.9	92°51.8	55.5	Alkaid	152°50.2	49°10.2
8	145°22.1	337°23.8	22.2	357°05.7	20.7	314°32.9	27.1	107°54.4	55.4	Hadar	148°32.2	-60°30.7
9	$160^{\circ}24.5$	352°23.5	• • 21.1	12°06.8	• • 20.2	329°34.8	• • 27.3	122°57.0	• • 55.4	Menkent Arcturus	147°54.3 145°45.5	-36°30.6 19°02.0
10	$175^{\circ}27.0$	$7^{\circ}23.1$	20.0	27°07.8	19.7	344°36.8	27.5	137°59.7	55.3	Rigil Kent.	139°36.6	-60°57.3
11	190°29.5	22°22.8	19.0	42°08.8	19.2	359°38.8	27.7	153°02.3	55.2	Kochab	137°21.2	74°02.3
12	205°31.9 220°34.4	37°22.4	N06° 17.9	57°09.9	N14°18.8	14°40.7 29°42.7	\$03°27.9	168°05.0 183°07.6	N11°55.2	Zuben'ubi	$136^{\circ}52.9$	-16°09.6
13 14	220 34.4 235°36.9	52°22.1 67°21.7	16.8 15.8	72°10.9 87°11.9	18.3 17.8	29 42.7 44°44.7	28.1 28.3	183 07.6 198°10.3	55.1 55.0	Alphecca	126°01.5	26° 37.2
15	250°39.3	82°21.4	14.7	102°13.0	• • 17.4	59°46.7	. 28.6	213° 12.9	• • 55.0	Antares	112°12.3	-26°29.7
16	265°41.8	97°21.0	13.6	117°14.0	16.9	74°48.6	28.8	228° 15.6	54.9	Atria	107°04.1	-69°04.8 -15°45.5
17	280°44.3	$112^{\circ}20.7$	12.6	132°15.0	16.4	89°50.6	29.0	243°18.2	54.9	Sabik Shaula	101°59.5 96°06.4	-15 45.5 -37°07.4
18	295°46.7	127°20.3	N06°11.5	147°16.1	N14°16.0	104°52.6	S03°29.2	258°20.9	N11°54.8	Rasalhague	95°55.9	12°32.6
19	310°49.2	142°20.0	10.4	162°17.1	15.5	119°54.5	29.4	273°23.5	54.7	Eltanin	90°41.0	51°29.4
20	325°51.6	157° 19.6	09.4	177°18.1	15.0	134°56.5	29.6	288°26.2	54.7	Kaus Aust.	83°28.6	-34°22.2
21	340°54.1 355°56.6	172°19.3 187°18.9	• • 08.3	192°19.2 207°20.2	• • 14.5	149°58.5 165°00.4	• • 29.8	303°28.8	• • 54.6	Vega	80°31.3	38°49.0
22 23	10°59.0	202° 18.6	07.2 06.1	207 20.2 222°21.2	14.1 13.6	180°02.4	30.0 30.2	318°31.5 333°34.1	54.5 54.5	Nunki	75°44.1	-26°15.6
										Altair	61°57.0	8°56.9
Mer.p	ass. 22:16	ν -0.3′ d-1	1′ m-4.02	ν 1.0′ d -0).5′ m1.44	$\nu 2.0' \ d0.$	2′ m-1.67	ν 2.6′ d-0	.1′ m-0.03	Peacock	53°00.9	-56°38.6
										Deneb Enif	49°23.6 33°35.6	45°23.4 10°00.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.3
0	$26^{\circ}01.5$	$217^{\circ}18.3$	N06°05.1	237°22.3	$N14^{\circ}13.1$	195°04.4	S03°30.4	348°36.8	N11°54.4	Fomalhaut	15°10.9	-29°28.1
1	41°04.0	232°17.9	04.0	252°23.3	12.7	210°06.4	30.6	3°39.4	54.4	Scheat	13°41.9	28° 14.7
2	56°06.4	247°17.6	02.9	267°24.3	12.2	225°08.3	30.8	18°42.1	54.3	Markab	13°26.6	15°21.9
3	71°08.9 86°11.4	262°17.2 277°16.9	· · 01.9 06°00.8	282°25.4 297°26.4	• • 11.7	240°10.3 255°12.3	• • 31.0	33°44.7 48°47.4	• • 54.2	Oct 15 Sun	SHA	Managa
4 5	101°13.8	277 10.9 292°16.5	06 00.8 05°59.7	312°27.4	11.3 10.8	270°14.2	31.2 31.5	63°50.0	54.2 54.1		193°31.8	Mer.pass 09:30
6	116° 16.3	307°16.2	N05°58.6	327°28.5	N14°10.3	285°16.2	\$03°31.7	78° 52.7	N11°54.0		212°29.7	08:13
7	131°18.7	322° 15.8	57.6	342°29.5	09.8	300°18.2	31.9	93°55.3	54.0		169°26.6	11:05
8	146°21.2	337° 15.5	56.5	357°30.5	09.4	315°20.1	32.1	108°58.0	53.9	Saturn	322°26.5	00:54
9	161°23.7	$352^{\circ}15.1$	• • 55.4	12°31.6	• • 08.9	$330^{\circ}22.1$	• • 32.3	124°00.6	• • 53.9	0 . 16 14	CLIA	
10	176°26.1	7° 14.8	54.3	27°32.6	08.4	345°24.1	32.5	139°03.3	53.8	Oct 16 Mon	SHA 192°24.3	Mer.pass 09:30
11	191°28.6	22°14.4	53.3	42°33.6	08.0	0°26.1	32.7	154°05.9	53.7		211°55.2	08:12
12	206°31.1	37°14.1	N05°52.2	57°34.7	N14°07.5	15°28.0	\$03°32.9	169°08.6	N11°53.7		169°14.7	11:01
13 14	221°33.5 236°36.0	52°13.7 67°13.4	51.1 50.0	72°35.7 87°36.7	07.0 06.5	30°30.0 45°32.0	33.1 33.3	184°11.2 199°13.9	53.6 53.5		322°30.9	00:50
14 15	250 36.0 251°38.5	82°13.0	• • 49.0	87 30.7 102°37.8	06.1	45 32.0 60°33.9	33.5	199 13.9 214°16.5	53.5	Oct 17 To-	Ç LL A	Mor noss
16	266°40.9	97°12.7	47.9	102 37.8 117°38.8	05.6	75°35.9	33.7	214 10.5 229°19.2	53.4	Oct 17 Tue	SHA 191°16.8	Mer.pass 09:31
17	281°43.4	112°12.4	46.8	132°39.9	05.1	90°37.9	33.9	244°21.8	53.4		211°20.8	09.31
18	296°45.9	127°12.0	N05°45.7	147°40.9	N14°04.7	105°39.8	S03°34.1	259°24.5	N11°53.3		169°02.9	10:58
19	311°48.3	142°11.7	44.7	162°41.9	04.2	120°41.8	34.4	274°27.1	53.2		322°35.3	00:45
20	326°50.8	157°11.3	43.6	177°43.0	03.7	135°43.8	34.6	289°29.8	53.2	Und-a	al parallas	
21	341°53.2	172°11.0	• • 42.5	192°44.0	• • 03.2	150°45.8	• • 34.8	304°32.4	53.1	norizont	al parallax Venus:	0.1
22 23	356°55.7 11°58.2	187°10.6 202°10.3	41.4 40.3	207°45.1 222°46.1	02.8 02.3	165°47.7 180°49.7	35.0 35.2	319°35.1 334°37.7	53.0 53.0		Mars:	0.1
Mer.p	ass. 22:12	ν -0.3′ d-1	1′ m-4.02	ν 1.0′ d -0	0.5′ m1.44	ν 2.0′ d0.	2′ m-1.67	ν 2.6′ d-0	.1′ m-0.03			

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.5	508°37.8	225°39.3	9.8'	N04°56.2	-15.6'	60.4'
1	198°33.7	38.7	$240^{\circ}08.1$	9.8'	04°40.6	-15.7'	60.4'
2	213°33.8	39.7	254°36.9	9.8'	04°24.9	-15.7'	60.5'
3	228°34.0	• • 40.6	269°05.8	9.8'	04°09.2	-15.7'	60.5
4	243°34.1	41.5	283°34.6	9.8'	03°53.4	-15.8'	60.5
5	258°34.2	42.4	298°03.4	9.8'	03°37.7	-15.8'	60.5'
6	273°34.4	508°43.4	312°32.2	9.8'	N03°21.8	-15.8'	60.5
7	288°34.5	44.3	327°01.0	9.8'	03°06.0	-15.9'	60.6'
8	303°34.6 318°34.8	45.2	341°29.8 355°58.6	9.8' 9.8'	02°50.1 02°34.2	-15.9' -15.9'	60.6'
9 10	318 34.8 333°34.9	· · 46.1 47.0	355 58.0 10°27.4	9.8' 9.8'	02 34.2 02°18.3	-15.9 -16.0'	60.6' 60.6'
11	348°35.0	48.0	24°56.1	9.8'	02°10.3	-16.0'	60.6
12	3°35.2	508°48.9	39°24.9	9.7'	N01°46.4	-16.0'	60.7
13	18°35.3	49.8	53°53.6	9.7'	01°30.4	-16.0'	60.7'
14	33°35.5	50.7	68°22.4	9.7'	01°14.4	-16.0'	60.7
15	48°35.6	• • 51.6	82°51.1	9.7'	00°58.3	-16.0'	60.7'
16	63°35.7	52.6	$97^{\circ}19.8$	9.7'	00°42.3	-16.1'	60.7'
17	78°35.9	53.5	111°48.5	9.7'	$00^{\circ}26.2$	-16.1'	60.7'
18	93°36.0	S08°54.4	$126^{\circ}17.1$	9.6'	N00°10.2	-16.1'	60.8'
19	108°36.1	55.3	140°45.8	9.6'	S00°05.9	16.1'	60.8'
20	123°36.3	56.2	155°14.4	9.6'	00°22.0	16.1'	60.8
21	138°36.4	• • 57.2	169°43.0	9.6'	00°38.1	16.1'	60.8
22	153°36.5	58.1	184°11.6	9.6'	00°54.2	16.1'	60.8'
23	168°36.6	59.0	198°40.2	9.5'	01°10.3	16.1'	60.8'
	SD = 16.0'	d = 0.9'		S	D = 16.5'		
Mon	GHA 183°36.8	Dec \$08°59.9	GHA 213°08.7	ν ο ε'	Dec \$01°26.4	d 16.1'	HP 60.8'
0 1	183°36.8 198°36.9	508°59.9 09°00.8	213°08.7 227°37.2	9.5' 9.5'	01°42.5	16.1' 16.1'	60.8°
2	213°37.0	09 00.8	242°05.7	9.5'	01°58.6	16.1	60.9
3	228°37.2	02.7	256°34.2	9.4	02°14.7	16.1	60.9'
4	243°37.3	03.6	271°02.6	9.4	02°30.8	16.1	60.9
5	258°37.4	04.5	285°31.0	9.4'	02°46.9	16.1'	60.9'
6	273°37.6	S09°05.4	299°59.4	9.3'	S03°02.9	16.1'	60.9'
7	288°37.7	06.3	314°27.7	9.3'	03°19.0	16.0'	60.9'
8	303°37.8	07.3	$328^{\circ}56.1$	9.3'	03°35.0	16.0'	60.9'
9	318°38.0	•• 08.2	343°24.3	9.3'	$03^{\circ}51.1$	16.0'	60.9'
10	333°38.1	09.1	357°52.6	9.2'	04°07.1	16.0'	60.9'
11	348°38.2	10.0	12°20.8	9.2'	04°23.1	16.0'	61.0'
12	3°38.3	S09°10.9	26°49.0	9.2'	\$04°39.0	15.9'	61.0'
13 14	18°38.5 33°38.6	11.8 12.8	41°17.2 55°45.3	9.1' 9.1'	04°55.0 05°10.9	15.9' 15.9'	61.0' 61.0'
15	48°38.7	. 13.7	70°13.3	9.0'	05°10.9	15.9'	61.0'
16	63°38.8	14.6	84°41.4	9.0'	05°42.6	15.8'	61.0'
17	78°39.0	15.5	99°09.4	9.0'	05°58.4	15.8'	61.0'
18	93°39.1	S09°16.4	113°37.3	8.9'	506°14.2	15.8'	61.0'
19	108°39.2	17.3	128°05.3	8.9'	06°30.0	15.7'	61.0'
20	123°39.4	18.2	142°33.2	8.8'	06°45.7	15.7'	61.0'
21	138°39.5	• • 19.2	157°01.0	8.8'	07°01.4	15.6'	61.0'
22	153°39.6	20.1	171°28.8	8.8'	07°17.0	15.6'	61.0'
23	168°39.7	21.0	185°56.5	8.7'	07°32.6	15.6'	61.0'
	SD = 16.0'	d = 0.9'		S	D = 16.6'		
_							
Tue	GHA 183°39.9	Dec S 09°21.9	GHA 200°24.2	ν 8.7'	Dec S 07°48.2	d 15.5'	HP 61.0'
0 1	183° 39.9 198° 40.0	22.8	200°24.2 214°51.9	8.6'	08°03.7	15.5'	61.0'
2	213°40.1	23.7	214 51.9 229°19.5	8.6'	08°19.2	15.4	61.0'
3	228°40.2	24.6	243°47.1	8.5	08°34.6	15.4	61.0'
4	243°40.4	25.5	258°14.6	8.5'	08°49.9	15.3'	61.0'
5	258°40.5	26.5	272°42.1	8.4'	09°05.2	15.2'	61.0'
6	273°40.6	S09°27.4	287°09.5	8.4'	S09°20.5	15.2'	61.0'
7	288°40.7	28.3	301°36.9	8.3'	09°35.6	15.1'	61.0'
8	303°40.9	29.2	316°04.2	8.3'	09°50.8	15.1'	61.0'
9	318°41.0	• • 30.1	330°31.5	8.2'	10°05.8	15.0'	61.0'
10	333°41.1	31.0	344°58.7	8.2'	10°20.8	14.9'	61.0'
11	348°41.2 3°41.3	31.9 5 09°32.8	359°25.9	8.1'	10°35.7	14.9'	61.0'
12 13	3°41.3 18°41.5	33.7	13°53.0 28°20.1	8.1' 8.0'	\$10°50.6 11°05.4	14.8' 14.7'	61.0' 61.0'
13 14	33°41.6	33. <i>1</i> 34.6	28 20.1 42°47.1	8.0'	11 05.4 11°20.1	14.7 14.6'	61.0'
15	48°41.7	35.6	57°14.1	7.9'	11°34.8	14.6'	60.9
16	63°41.8	36.5	71°41.0	7.9'	11°49.3	14.5'	60.9
17	78°42.0	37.4	86°07.9	7.8'	12°03.8	14.4'	60.9
18	93°42.1	S09°38.3	100°34.7	7.8'	S12°18.2	14.3'	60.9'
19	108°42.2	39.2	115°01.4	7.7'	12°32.5	14.2'	60.9'
20	123°42.3	40.1	$129^{\circ}28.1$	7.6'	12°46.8	14.2'	60.9'
21	138°42.4	• • 41.0	143°54.8	7.6'	13°00.9	14.1'	60.9'
22	153°42.6	41.9	158°21.4	7.5'	13°15.0	14.0'	60.9'
23	168°42.7	42.8	172°47.9	7.5'	13°29.0	13.9'	60.9'
	SD = 16.0'	d = 0.9'		S	D=16.6'		

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

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	27-29
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	М	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	27°00.6	217° 09.9	N05°39.3	237°47.1	N14°01.8	195°51.7	S03°35.4	349°40.4	N11°52.9			
1	42°03.1	232°09.6	38.2	252°48.2	01.4	210°53.6	35.6	4°43.0	52.8	Alpheratz	357°31.2	29°15.2
2	57°05.6	247°09.2	37.1	267°49.2	00.9	225°55.6	35.8	19° 45.7	52.8	Ankaa	353°03.8	-42°08.9
3	72°08.0	262°08.9	36.0	282°50.2	14°00.4	240°57.6	36.0	34°48.3	52.7	Schedar	349°26.9	56°41.9
4	$87^{\circ}10.5$	277°08.5	34.9	297°51.3	13°59.9	255°59.6	36.2	49°51.0	52.7	Diphda	348°43.9	-17°49.5
5	102°13.0	292°08.2	33.9	312°52.3	59.5	$271^{\circ}01.5$	36.4	64°53.6	52.6	Achernar Hamal	335° 17.4 327° 47.4	-57°05.3 23°36.0
6	117°15.4	307°07.9	N05°32.8	327°53.4	N13°59.0	286°03.5	S03°36.6	79°56.3	N11°52.5	Polaris	311°53.7	89°22.9
7	132°17.9	322°07.5	31.7	342°54.4	58.5	301°05.5	36.8	94°58.9	52.5	Acamar	315°09.1	-40°11.2
8	147°20.3	337°07.2	30.6	357°55.5	58.1	316°07.4	37.0	110°01.6	52.4	Menkar	314°02.6	4°12.3
9	162°22.8 177°25.3	352°06.8 7°06.5	• • 29.5	12°56.5	• • 57.6	331°09.4	• • 37.2	125°04.2 140°06.9	• • 52.3	Mirfak	308°23.3	49°57.8
10 11	177 25.3 192°27.7	22°06.1	28.4 27.4	27°57.5 42°58.6	57.1 56.6	346°11.4 1°13.4	37.5 37.7	155°09.5	52.3 52.2	Aldebaran	290°35.8	16°34.0
12	207°30.2	37°05.8	N05°26.3	57°59.6	N13°56.2	16°15.3	S03°37.9	170° 12.2	N11°52.2	Rigel	281°00.7	-8°10.0
13	222°32.7	52°05.4	25.2	73°00.7	55.7	31°17.3	38.1	185°14.8	52.1	Capella	280°17.1	46°01.4
14	237°35.1	67°05.1	24.1	88°01.7	55.2	46°19.3	38.3	200°17.5	52.0	Bellatrix	278°19.4	6°22.6
15	252°37.6	82°04.7	• • 23.0	103°02.7	• • 54.7	61°21.2	• • 38.5	$215^{\circ}20.1$	• • 52.0	Elnath	277°57.8	28°37.8
16	$267^{\circ}40.1$	97°04.4	21.9	118°03.8	54.3	76°23.2	38.7	230°22.8	51.9	Alnilam Betelgeuse	275°34.4 270°48.6	-1°11.0 7°24.7
17	282°42.5	112°04.0	20.8	133°04.8	53.8	91°25.2	38.9	245°25.4	51.8	Canopus	263°50.8	-52°42.4
18	297°45.0	127°03.7	N05° 19.8	148°05.9	N13°53.3	106°27.2	503°39.1	260°28.1	N11°51.8	Sirius	258° 23.4	-16°45.2
19	312°47.5 327°49.9	142°03.4	18.7	163°06.9	52.9	121°29.1	39.3	275°30.7	51.7	Adhara	255°03.4	-29°00.5
20 21	327 49.9 342°52.4	157°03.0 172°02.7	17.6 •• 16.5	178°08.0 193°09.0	52.4 •• 51.9	136°31.1 151°33.1	39.5 · · 39.7	290°33.4 305°36.0	51.7 •• 51.6	Procyon	244°47.6	5°09.0
22	357°54.8	187°02.3	15.4	208°10.1	51.4	166°35.0	39.9	320°38.7	51.5	Pollux	243°13.6	27°57.2
23	12°57.3	202°02.0	14.3	223°11.1	51.0	181°37.0	40.1	335°41.3	51.5	Avior	234°13.5	-59°35.8
	ass. 22:08	-								Suhail	222°44.2	-43°32.7
ivier.p	ass. 22:08	ν -0.3 a-1	1′ m-4.02	ν 1.0 a-0	0.5′ m1.43	ν2.0 a0.	2′ m-1.67	ν2.Γ a-0	.1′ m-0.04	Miaplacidus Alphard	221°37.8 217°44.9	-69°49.9 -8°47.0
										Regulus	207°31.4	11°49.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.9	61°35.5
0	27°59.8	217°01.6	N05° 13.2	238°12.1	N13°50.5	196°39.0	S03°40.3	350°44.0	N11°51.4	Denebola	$182^{\circ}22.1$	14°24.6
1 2	43°02.2 58°04.7	232°01.3 247°00.9	12.1 11.1	253°13.2 268°14.2	50.0 49.5	211°41.0 226°42.9	40.5 40.8	5°46.6 20°49.3	51.3 51.3	Gienah	175°40.7	-17°42.0
3	73°07.2	262°00.6	• • 10.0	206 14.2 283°15.3	• 49.5	241°44.9	• • 41.0	20 49.3 35°51.9	. 51.3	Acrux	172°57.2	-63°15.4
4	88°09.6	277°00.3	08.9	298°16.3	48.6	256°46.9	41.2	50°54.6	51.2	Gacrux	171°48.7	-57°16.4
5	103°12.1	291°59.9	07.8	313°17.4	48.1	271°48.8	41.4	65°57.2	51.1	Alioth	166°11.0	55°48.1
6	118°14.6	306° 59.6	N05°06.7	328°18.4	N13°47.6	286°50.8	503°41.6	80°59.9	N11°51.0	Spica Alkaid	158° 19.4 152° 50.2	-11°18.6 49°10.2
7	$133^{\circ}17.0$	321°59.2	05.6	343°19.5	47.2	$301^{\circ}52.8$	41.8	96°02.5	51.0	Hadar	148° 32.2	-60°30.7
8	148°19.5	336°58.9	04.5	358°20.5	46.7	316°54.8	42.0	111°05.2	50.9	Menkent	147°54.3	-36°30.6
9	163°22.0	351°58.5	• • 03.4	13°21.6	• • 46.2	331°56.7	• • 42.2	126°07.8	• • 50.8	Arcturus	145°45.5	19°02.0
10	178°24.4	6°58.2 21°57.8	02.3	28°22.6	45.7	346°58.7	42.4	141° 10.5 156° 13.1	50.8	Rigil Kent.	139°36.6	-60°57.3
11 12	193°26.9 208°29.3	21 57.8 36°57.5	01.2 N05°00.1	43°23.7 58°24.7	45.3 N13°44.8	2°00.7 17°02.6	42.6 \$03°42.8	150 13.1 171°15.8	50.7 N11°50.6	Kochab	137°21.2	74°02.3
13	200°29.3 223°31.8	51° 57.2	04°59.1	73°25.7	44.3	32°04.6	43.0	186° 18.4	50.6	Zuben'ubi	136°52.9	-16°09.6
14	238°34.3	66°56.8	58.0	88°26.8	43.9	47°06.6	43.2	201°21.1	50.5	Alphecca	126°01.5	26°37.2
15	253°36.7	81°56.5	• • 56.9	103°27.8	• • 43.4	62°08.6	• • 43.4	216°23.7	• • 50.4	Antares Atria	112°12.3 107°04.1	-26°29.7 -69°04.8
16	268°39.2	$96^{\circ}56.1$	55.8	118°28.9	42.9	$77^{\circ}10.5$	43.6	231°26.4	50.4	Sabik	107 04.1 101°59.5	-09 04.8 -15°45.5
17	283°41.7	111°55.8	54.7	133°29.9	42.4	92°12.5	43.8	246°29.0	50.3	Shaula	96°06.4	-37°07.4
18	298°44.1	126°55.4	N04°53.6	148°31.0	N13°42.0	107°14.5	S03°44.0	261°31.7	N11°50.3	Rasalhague	95°55.9	12°32.6
19	313°46.6	141°55.1	52.5	163°32.0 178°33.1	41.5	122°16.4	44.3	276°34.4 291°37.0	50.2	Eltanin	90°41.0	51°29.4
20 21	328°49.1 343°51.5	156°54.7 171°54.4	51.4 •• 50.3	176 33.1 193°34.1	41.0 • • 40.5	137°18.4 152°20.4	44.5 •• 44.7	306°39.7	50.1 •• 50.1	Kaus Aust.	83°28.6	-34°22.2
22	358°54.0	186°54.1	49.2	208°35.2	40.3	167°22.4	44.9	321°42.3	50.0	Vega	80°31.3	38°49.0
23	13°56.4	201°53.7	48.1	223°36.2	39.6	182°24.3	45.1	336°45.0	49.9	Nunki	75°44.1	-26°15.6
			1′ m-4.02		0.5' m1.42		2′ m-1.67		.1′ m-0.04	Altair Peacock	61°57.0 53°00.9	8°56.9 -56°38.6
ivier.p	ass. 22:04	ν -0.3 a-1	1 m-4.02	ν 1.0 a-0	0.5° M1.42	ν2.0 a0.	2 m-1.07	ν2.Γ a-0	.1 m-0.04	Deneb	49° 23.6	45°23.4
										Enif	33°35.6	10°00.7
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.3
0	28°58.9	216°53.4	N04°47.0	238°37.3	N13°39.1	197°26.3	S03°45.3	351°47.6	N11°49.9	Fomalhaut	$15^{\circ}10.9$	-29°28.1
1	44°01.4 59°03.8	231°53.0 246°52.7	45.9	253°38.3	38.6	212°28.3	45.5 45.7	6°50.3	49.8	Scheat	13°41.9	28°14.7
2 3	59 03.8 74°06.3	240 52.7 261°52.3	44.8 •• 43.7	268°39.4 283°40.4	38.2 · · 37.7	227°30.3 242°32.2	45.7 •• 45.9	21°52.9 36°55.6	49.8 •• 49.7	Markab	13°26.6	15°21.9
4	89°08.8	276°52.0	42.6	298°41.5	37.2	257°34.2	46.1	51°58.2	49.6	Oct 18 Wed	SHA	Mer.pass
5	104°11.2	291°51.7	41.5	313°42.5	36.7	272°36.2	46.3	67°00.9	49.6		190°09.3	09:32
6	119°13.7	306°51.3	N04°40.4	328°43.6	N13°36.3	287°38.1	S03°46.5	82°03.5	N11°49.5	Mars	$210^{\circ}46.5$	80:80
7	$134^{\circ}16.2$	321°51.0	39.3	343°44.6	35.8	$302^{\circ}40.1$	46.7	97°06.2	49.4	Jupiter	168°51.0	10:55
8	149°18.6	336°50.6	38.2	358°45.7	35.3	317°42.1	46.9	112°08.8	49.4	Saturn	322°39.7	00:41
9	164°21.1	351°50.3	37.1	13°46.8	• • 34.8	332°44.1	• • 47.1	127°11.5	• • 49.3	Oct 19 Thu	SHA	Mer.pass
10 11	179°23.6 194°26.0	6°49.9 21°49.6	36.0 34.9	28°47.8 43°48.9	34.4 33.9	347°46.0 2°48.0	47.3 47.5	142°14.1 157°16.8	49.2 49.2	Venus	$189^{\circ}01.9$	09:32
12	209°28.5	36°49.2	N04°33.8	58°49.9	N13°33.4	17°50.0	\$03°47.7	172° 19.4	N11°49.1		210°12.4	08:07
13	224°30.9	51°48.9	32.7	73°51.0	32.9	32°51.9	47.9	187°22.1	49.1		168°39.2	10:52
14	239°33.4	66°48.6	31.6	88°52.0	32.4	47°53.9	48.2	202°24.8	49.0	Saturn	322°44.2	00:37
15	254°35.9	81°48.2	• • 30.5	$103^{\circ}53.1$	• • 32.0	62°55.9	• • 48.4	$217^{\circ}27.4$	• • 48.9	Oct 20 Fri	SHA	Mer.pass
16	269°38.3	96°47.9	29.4	118°54.1	31.5	77°57.9	48.6	232°30.1	48.9	Venus	$187^{\circ}54.5$	09:33
17	284°40.8	111°47.5	28.3	133°55.2	31.0	92°59.8	48.8	247°32.7	48.8		209°38.4	08:05
18	299°43.3	126° 47.2	N04°27.2	148°56.2		108°01.8	\$03°49.0	262°35.4 277°38.0	N11°48.7		168°27.4	10:49
19 20	314°45.7 329°48.2	141°46.8 156°46.5	26.1 25.0	163°57.3 178°58.3	30.1 29.6	123°03.8 138°05.8	49.2 49.4	277°38.0 292°40.7	48.7 48.6	Saturn	322°48.7	00:33
21	344°50.7	171° 46.2	•• 23.9	176 56.5 193°59.4	. 29.0	150 05.6 153°07.7	• • 49.6	307°43.3	46.0 • • 48.5	Horizont	al parallax	
22	359°53.1	186°45.8	22.8	209°00.5	28.6	168°09.7	49.8	322°46.0	48.5		Venus:	0.1
23	14°55.6	201°45.5	21.7	224°01.5	28.2	$183^{\circ}11.7$	50.0	337°48.6	48.4		Mars:	0.1
Mern	ass. 22:00	ν -0.3' d-1	1′ m-4.01	$\nu 1.1' d-0$	0.5′ m1.42	ν 2.0' d0	2′ m-1.68	ν2.7′ d-0	.1′ m-0.05			

	-	T0.1330 Sec				290 30	
h	Sui	1			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°42.8	S09°43.7	$187^{\circ}14.4$	7.4'	S13°42.9	13.8'	60.9'
1	198°42.9	44.6	201°40.8	7.4'	13°56.7	13.7'	60.8'
2	213°43.0	45.5	216°07.1	7.3'	14° 10.4	13.6'	60.8'
3	228°43.1	• • 46.5	230°33.4	7.2'	14°24.0	13.5'	60.8
4	243°43.3 258°43.4	47.4	244°59.7 259°25.9	7.2' 7.1'	14°37.5 14°50.9	13.4' 13.3'	60.8' 60.8'
5 6	258 43.4 273°43.5	48.3 5 09°49.2	259 25.9 273°52.0	7.1'	\$15°04.2	13.3	60.8
7	288° 43.6	50.1	273 32.0 288° 18.1	7.1	15° 17.4	13.1	60.8
8	303°43.7	51.0	302°44.1	7.0'	15°30.5	13.0'	60.7
9	318°43.8	51.9	317°10.1	6.9'	15°43.5	12.9'	60.7'
10	333°44.0	52.8	331°36.0	6.8'	15°56.4	12.8'	60.7'
11	348°44.1	53.7	$346^{\circ}01.8$	6.8'	$16^{\circ}09.2$	12.7'	60.7'
12	3°44.2	S09°54.6	0°27.6	6.7'	S16°21.8	12.5'	60.7'
13	18°44.3	55.5	14°53.3	6.7'	16°34.4	12.4'	60.6'
14	33°44.4	56.4	29° 19.0	6.6'	16°46.8	12.3'	60.6
15	48° 44.5	• • 57.3	43°44.6	6.6'	16°59.1	12.2'	60.6
16	63° 44.7 78° 44.8	58.2 09°59.1	58° 10.2 72° 35.7	6.5' 6.5'	17°11.3 17°23.4	12.1' 11.9'	60.6' 60.6'
17 18	78 44.8 93°44.9	510°00.0	87°01.2	6.4	517°35.3	11.9	60.5
19	108° 45.0	00.9	101°26.6	6.4	17°47.1	11.7	60.5
20	123°45.1	01.8	115°51.9	6.3	17°58.8	11.6'	60.5
21	138° 45.2	02.7	130°17.2	6.2	18° 10.4	11.4	60.5
22	153° 45.3	03.6	144° 42.5	6.2	18°21.8	11.3'	60.5
23	168°45.5	04.5	159°07.7	6.1'	18°33.1	11.2'	60.4'
	SD = 16.0'	d = 0.9'		S	D = 16.6'		
					20.0		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.6	S10°05.4	173°32.8	6.1'	\$18°44.3	11.0'	60.4'
1	198°45.7	06.3	187°57.9	6.0'	18°55.4	10.9'	60.4
2	213° 45.8	07.2	202°22.9	6.0'	19°06.3	10.8'	60.4
3	228° 45.9 243° 46.0	08.1	216°47.9 231°12.9	5.9'	19° 17.1 19° 27.7	10.6'	60.3'
4 5	243 46.0 258°46.1	09.0 09.9	231 12.9 245°37.8	5.9' 5.8'	19 27.7 19°38.2	10.5' 10.4'	60.3' 60.3'
6	273° 46.2	510° 10.8	260°02.6	5.8'	S19°48.6	10.4	60.3
7	288° 46.3	11.7	274° 27.4	5.8'	19°58.8	10.1	60.2
8	303°46.5	12.6	288°52.1	5.7'	20°08.8	9.9'	60.2
9	318°46.6	• • 13.5	303°16.8	5.7'	20°18.8	9.8'	60.2
10	333°46.7	14.4	317°41.5	5.6'	20°28.6	9.6'	60.1'
11	348°46.8	15.3	$332^{\circ}06.1$	5.6'	20°38.2	9.5'	60.1'
12	3°46.9	S 10°16.2	346°30.7	5.5'	S20°47.7	9.3'	60.1'
13	18°47.0	17.1	0°55.2	5.5'	20°57.0	9.2'	60.1'
14	33°47.1	18.0	15° 19.7	5.5'	21°06.2	9.0'	60.0'
15 16	48° 47.2 63° 47.3	· · 18.9 19.8	29°44.2 44°08.6	5.4' 5.4'	21°15.3 21°24.2	8.9' 8.7'	60.0' 60.0'
17	78° 47.4	20.7	58° 33.0	5.3'	21°32.9	8.6'	59.9
18	93°47.5	S10°21.6	72°57.4	5.3'	S21°41.5	8.4'	59.9'
19	108°47.7	22.5	87°21.7		21°49.9	8.3'	59.9'
20	123°47.8	23.4	101°46.0	5.3'	21°58.2	8.1'	59.8'
21	138°47.9	• • 24.3	$116^{\circ}10.2$	5.2'	22°06.3	8.0'	59.8'
22	153°48.0	25.2	130°34.4	5.2'	22°14.3	7.8'	59.8'
23	168°48.1	26.1	144°58.6	5.2'	22°22.1	7.6'	59.7'
	SD = 16.1'	d = 0.9'		S	D = 16.5'		
						,	
Fri	GHA 183° 48.2	Dec 510°27.0	GHA 159°22.8	ν	Dec \$22° 29.7	d 7 F,	HP
0 1	183°48.2 198°48.3	27.9	159° 22.8 173° 46.9	5.1' 5.1'	22° 37.2	7.5' 7.3'	59.7' 59.7'
2	213° 48.4	28.8	173 40.9 188° 11.1	5.1'	22°44.5	7.3 7.2'	59.7'
3	228° 48.5	29.7	202°35.1	5.1'	22°51.7	7.0'	59.6'
4	243°48.6	30.6	216°59.2	5.1'	22°58.7	6.8'	59.6'
5	258°48.7	31.4	231°23.3	5.0'	23°05.5	6.7'	59.5'
6	273°48.8	S10°32.3	245°47.3	5.0'	S23°12.2	6.5'	59.5'
7	288°48.9	33.2	260°11.3	5.0'	23° 18.7	6.3'	59.5'
8	303°49.0	34.1	274°35.3	5.0'	23°25.0	6.2'	59.4
9	318°49.1	•• 35.0	288° 59.3 303° 23.3	5.0'	23°31.2 23°37.2	6.0'	59.4'
10 11	333° 49.2 348° 49.3	35.9 36.8	303°23.3 317°47.3	5.0' 5.0'	23°37.2 23°43.1	5.8' 5.7'	59.4' 59.3'
11	348 49.3 3°49.4	30.8 \$10°37.7	317 47.3 332°11.3	5.0'	23 43.1 523°48.8	5.7 5.5'	59.3
13	18° 49.5	38.6	346°35.2	5.0'	23°54.3	5.3'	59.3'
14	33°49.6	39.5	0°59.2	5.0'	23°59.6	5.2'	59.2'
15	48°49.7	• • 40.4	15°23.1	5.0'	24°04.8	5.0'	59.2'
16	63°49.8	41.3	$29^{\circ}47.1$	5.0'	24°09.8	4.8'	59.2'
17	78°49.9	42.1	44°11.0	5.0'	24° 14.6	4.7'	59.1'
18	93°50.0	S10°43.0	58° 35.0	5.0'	\$24°19.3	4.5'	59.1'
19	108°50.1	43.9	72°58.9	5.0'	24°23.8	4.3'	59.0'
20	123°50.2 138°50.3	44.8	87°22.9 101°46.9	5.0' 5.0'	24°28.2 24°32.3	4.2' 4.0'	59.0'
21 22	138°50.3 153°50.4	• • 45.7 46.6	101°46.9 116°10.9	5.0' 5.0'	24°32.3 24°36.3	4.0′ 3.8′	59.0' 58.9'
23	168° 50.5	40.0 47.5	110 10.9 130°34.9	5.0'	24° 40.2	3.6 3.7'	58.9'
23		d = 0.9'				5.1	50.5
	SD = 16.1'	$a = 0.9^{\circ}$		5	D = 16.3'		

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-5%	
18	14:51	14:57	11:45	11:58	-:-		
19	15:02	15:08	11:45	12:56	00:27	(2,380)	
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	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0 0	29°58.1	216° 45.1	N04° 20.6	239°02.6	N13°27.7	198°13.7	S03°50.2	352°51.3	N11°48.4			Dec
1	45°00.5	210 45.1 231°44.8		254°03.6	27.2	213°15.6	50.4	7°53.9	48.3	Alpheratz	357°31.2	29° 15.2
2	60°03.0	231 44.6 246°44.4	19.5 18.4	269°04.7	26.7	213 15.0 228°17.6	50.4 50.6	7 55.9 22°56.6	48.2	Ankaa	353°03.8	-42°08.9
3	75°05.4	240 44.4 261°44.1		284°05.7	. 26.3	243°19.6	. 50.8	37°59.3	. 48.2	Schedar	349°26.9	56°42.0
4	90°07.9	276° 43.8	· · 17.3 16.2	299°06.8	25.8	243 19.0 258°21.5	51.0	57 59.5 53°01.9	48.1	Diphda	348°43.9	-17°49.6
5	105°10.4	270 43.8 291°43.4	15.1	314°07.9	25.3	273°23.5	51.0	68°04.6	48.0	Achernar	$335^{\circ}17.4$	-57°05.3
6	105 10.4 120°12.8	306°43.1	N04° 14.0	314 07.9 329°08.9	N13°24.8	273 23.5 288°25.5	503°51.4	83°07.2	N11°48.0	Hamal	327°47.3	23°36.1
7	135°15.3	321°42.7	12.9	344°10.0	24.3	303°27.5	51.6	98°09.9	47.9	Polaris	$311^{\circ}52.6$	89°22.9
8	150°17.8	336°42.4	11.8	359°11.0	23.9	318°29.4	51.8	113°12.5	47.9	Acamar	$315^{\circ}09.1$	-40°11.2
9	165°20.2	351°42.0	. 10.6	14°12.1	• • 23.4	333°31.4	• • 52.0	128° 15.2	• • 47.8	Menkar	314°02.6	4°12.3
10	180°22.7	6°41.7	09.5	29°13.1	22.9	348°33.4	52.3	143°17.8	47.7	Mirfak	308°23.3	49°57.8
11	195°25.2	21°41.4	08.4	44°14.2	22.4	3°35.4	52.5	158° 20.5	47.7	Aldebaran	290°35.8	16°34.0
12	210°27.6	36°41.0	N04°07.3	59°15.3	N13°22.0	18°37.3	S03°52.7	173°23.1	N11°47.6	Rigel	281°00.7	-8°10.0
13	225°30.1	51°40.7	06.2	74°16.3	21.5	33°39.3	52.9	188°25.8	47.5	Capella	280°17.0	46°01.4
14	240°32.6	66°40.3	05.1	89°17.4	21.0	48°41.3	53.1	203°28.4	47.5	Bellatrix	278°19.4	6°22.6
15	255°35.0	81°40.0	• • 04.0	104°18.4	• • 20.5	63°43.3	• • 53.3	218°31.1	• • 47.4	Elnath	277°57.8	28°37.8 -1°11.0
16	270°37.5	96°39.6	02.9	119°19.5	20.1	78°45.2	53.5	233°33.8	47.3	Alnilam	275°34.4 270°48.6	7°24.7
17	285°39.9	111°39.3	01.8	134°20.6	19.6	93°47.2	53.7	248°36.4	47.3	Betelgeuse Canopus	263°50.8	-52° 42.4
18	300°42.4	126°39.0	N04°00.7	149°21.6	N13°19.1	108°49.2	S03°53.9	263°39.1	N11°47.2	Sirius	258°23.4	-32 42.4 -16°45.2
19	315°44.9	141°38.6	03°59.6	164°22.7	18.6	123°51.1	54.1	278°41.7	47.2	Adhara	255°03.3	-10 45.2 -29°00.5
20	330°47.3	156°38.3	58.5	179°23.7	18.1	138°53.1	54.3	293°44.4	47.1	Procyon	244°47.6	5°09.0
21	345°49.8	171°37.9	• • 57.3	194°24.8	• • 17.7	153°55.1	• • 54.5	308°47.0	• • 47.0	Pollux	243°13.6	27°57.2
22	0°52.3	186°37.6	56.2	209°25.9	17.2	168°57.1	54.7	323°49.7	47.0	Avior	234°13.5	-59°35.9
23	15°54.7	201°37.2	55.1	224°26.9	16.7	183°59.0	54.9	338°52.3	46.9	Suhail	222°44.1	-43°32.7
Mer.p	ass. 21:57	ν -0.3' d-1	1′ m-4.01	$\nu 1.1' \ d-0$	0.5' m1.41	$\nu 2.0' d0.$	2′ m-1.68	$\nu 2.7' d-0$.1′ m-0.05	Miaplacidus	221°37.8	-69°49.9
										Alphard	217°44.9	-8°47.0
_			_		_		_		_	Regulus	207°31.4	11°49.5
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.9	61°35.5
0	30°57.2	216°36.9	N03°54.0	239°28.0	N13°16.2	199°01.0	S03°55.1	353°55.0	N11°46.8	Denebola	$182^{\circ}22.1$	14°24.6
1	45°59.7	231°36.6	52.9	254°29.1	15.8	214°03.0	55.3	8°57.6	46.8	Gienah	175°40.7	-17°42.0
2	61°02.1	246°36.2	51.8	269°30.1	15.3	229°05.0	55.5	24°00.3	46.7	Acrux	$172^{\circ}57.1$	-63°15.4
3	76°04.6	261°35.9	• • 50.7	284°31.2	• • 14.8	244°06.9	• • 55.7	39°03.0	• • 46.6	Gacrux	171°48.6	-57°16.4
4	91°07.1	276°35.5	49.6	299°32.2	14.3	259°08.9	55.9	54°05.6	46.6	Alioth	$166^{\circ}11.0$	55°48.1
5	106°09.5	291°35.2	48.4	314°33.3	13.8	274°10.9	56.1	69°08.3	46.5 N11°46.5	Spica	$158^{\circ}19.4$	-11° 18.6
6	121°12.0	306°34.9	N03°47.3	329°34.4	N13°13.4	289°12.9	S03°56.3	84°10.9		Alkaid	152°50.2	49° 10.2
7 8	136°14.4 151°16.9	321°34.5 336°34.2	46.2 45.1	344°35.4 359°36.5	12.9 12.4	304°14.8 319°16.8	56.5 56.7	99°13.6 114°16.2	46.4 46.3	Hadar	148°32.2	-60°30.7
9	166° 19.4	351°33.8	• • 44.0	14°37.6	. 11.9	334°18.8	• • 57.0	114 10.2 129°18.9	. 46.3	Menkent	147°54.3	-36°30.6
10	181°21.8	6°33.5	42.9	29°38.6	11.5	349°20.8	57.0	144°21.5	46.2	Arcturus	145°45.5	19°02.0
11	196°24.3	21°33.1	41.8	44°39.7	11.0	4°22.7	57.2 57.4	159°24.2	46.1	Rigil Kent.	139°36.6	-60°57.2
12	211°26.8	36°32.8	N03° 40.6	59°40.8	N13°10.5	19°24.7	S03°57.6	174°26.9	N11°46.1	Kochab	137°21.2	74°02.2
13	226°29.2	51°32.5	39.5	74°41.8	10.0	34°26.7	57.8	189°29.5	46.0	Zuben'ubi	136°52.9	-16°09.6
14	241°31.7	66°32.1	38.4	89°42.9	09.5	49°28.7	58.0	204°32.2	45.9	Alphecca	126°01.5	26°37.2
15	256°34.2	81°31.8	37.3	104°44.0	• • 09.1	64°30.6	58.2	219°34.8	• • 45.9	Antares	112°12.3	-26°29.7
16	271°36.6	96°31.4	36.2	119°45.0	08.6	79°32.6	58.4	234°37.5	45.8	Atria	107°04.1	-69°04.8 -15°45.5
17	286°39.1	111°31.1	35.1	134°46.1	08.1	94°34.6	58.6	249°40.1	45.8	Sabik	101°59.5	-15 45.5 -37°07.4
18	301°41.5	126°30.7	N03°34.0	149°47.1	N13°07.6	109°36.6	S03°58.8	264°42.8	N11°45.7	Shaula Rasalhague	96°06.4 95°55.9	-37 07.4 12°32.6
19	316°44.0	141°30.4	32.8	164°48.2	07.1	124°38.5	59.0	279°45.4	45.6	_	90°41.0	51° 29.4
20	331°46.5	156°30.1	31.7	179°49.3	06.7	139°40.5	59.2	294°48.1	45.6	Eltanin Kaus Aust.	83°28.6	-34°22.2
21	346°48.9	171°29.7	• • 30.6	194°50.3	• • 06.2	154°42.5	• • 59.4	309°50.8	• • 45.5	Vega	80°31.3	38°49.0
22	1°51.4	186°29.4	29.5	209°51.4	05.7	169°44.5	59.6	324°53.4	45.4	Nunki	75°44.1	-26° 15.5
23	$16^{\circ}53.9$	201°29.0	28.4	224°52.5	05.2	184°46.4	59.8	339°56.1	45.4	Altair	61°57.0	8°57.0
Mern	ass. 21:53	v-0 3' d-1	1′ m-4.01	v1 1' d-0	0.5' m1.41	v2 0' d0	2′ m-1.68	v2 7′ d₌0	.1′ m-0.06	Peacock	53°00.9	-56°38.6
- Wici.p		ν 0.5 u i		ν1.1 d 0	.5 1111.41	ν2.0 do.	2 111 1.00	- VZ.1 U O		Deneb	49°23.6	45°23.4
										Enif	33°35.6	10°00.7
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.3
0	31°56.3	216°28.7	N03°27.3	239°53.6	N13°04.8	199°48.4	S04°00.0	354°58.7	N11°45.3	Fomalhaut	15°10.9	-29°28.1
1	46°58.8	231°28.4	26.1	254°54.6	04.3	214°50.4	00.2	10°01.4	45.2	Scheat	13°41.9	28° 14.7
2	62°01.3	246°28.0	25.0	269°55.7	03.8	229°52.4	00.4	25°04.0	45.2	Markab	13°26.6	15°21.9
3	77°03.7	261°27.7	• • 23.9	284°56.8	• • 03.3	244°54.3	00.6	40°06.7	· · 45.1	Oct 21 Sat	SHA	Mor noss
4	92°06.2	276°27.3	22.8	299°57.8	02.8	259°56.3	00.8	55°09.3	45.0			Mer.pass
5	107°08.7 122°11.1	291°27.0	21.7	314°58.9	02.4	274°58.3	01.0	70°12.0	45.0 N11°44.9		186°47.1 209°04.5	09:33 08:03
6		306°26.6	N03°20.5	330°00.0	N13°01.9	290°00.3	S04°01.2	85°14.7		Jupiter	_	10:46
7	137°13.6	321°26.3	19.4	345°01.0	01.4	305°02.2	01.4	100°17.3	44.9	Saturn	322°53.2	00:28
8 9	152°16.0 167°18.5	336°26.0 351°25.6	18.3 · · 17.2	0°02.1 15°03.2	00.9	320°04.2 335°06.2	01.6 •• 01.8	115°20.0 130°22.6	44.8 •• 44.7			00.20
10	182°21.0	6°25.3	16.1	30°04.2	13°00.0	350°08.2	02.0	130°22.0 145°25.3	44.7	Oct 22 Sun	SHA	Mer.pass
11	102 21.0 197°23.4	0 25.3 21°24.9	14.9	45°05.3	13 00.0 12°59.5	5°10.1	02.0	145 25.3 160°27.9	44.7 44.6		185°39.7	09:34
12	212°25.9	36° 24.6	N03°13.8	60°06.4	N12°59.0	20°12.1	504°02.4	175° 30.6	N11°44.5		208°30.8	08:02
13	227°28.4	51°24.3	12.7	75°07.5	58.5	35°14.1	02.7	190°33.2	44.5		168°03.8	10:43
14	242°30.8	66°23.9	11.6	90°08.5	58.0	50°16.1	02.9	205°35.9	44.4	Saturn	322°57.8	00:24
15	257°33.3	81°23.6	. 10.4	105°09.6	• • 57.6	65°18.0	• • 03.1	220°38.6	• • 44.3	Oct 23 Mon	SHA	Mer.pass
16	272°35.8	96°23.2	09.3	120° 10.7	57.1	80°20.0	03.3	235°41.2	44.3		184°32.4	09:34
17	287°38.2	111°22.9	08.2	135°11.7	56.6	95°22.0	03.5	250°43.9	44.2		207°57.2	08:00
18	302°40.7	126°22.5	N03°07.1	150°12.8	N12°56.1	110°24.0	S04°03.7	265°46.5	N11°44.2		167°52.1	10:39
19	317°43.2	141°22.2	06.0	165°13.9	55.6	125°25.9	03.9	280°49.2	44.1		323°02.4	00:20
20	332°45.6	$156^{\circ}21.9$	04.8	180°15.0	55.2	140°27.9	04.1	295°51.8	44.0			
21	$347^{\circ}48.1$	171°21.5	• • 03.7	195°16.0	• • 54.7	155°29.9	• • 04.3	310°54.5	• • 44.0	Horizont	al parallax	
22	2°50.5	$186^{\circ}21.2$	02.6	$210^{\circ}17.1$	54.2	170°31.9	04.5	325°57.2	43.9		Venus:	0.1
23	17°53.0	201°20.8	01.5	225°18.2	53.7	185°33.8	04.7	340°59.8	43.8		Mars:	0.1
Mern	ass. 21:49	ν-0 3' d-1	1′ m-4.01	ν1 1' d-Ω	0.5′ m1.40	ν2 0' d0	2′ m-1.68	ν27' d-Ω	.1′ m-0.07			
		- 0.0 u-1		- 1.1 U-U		- 2.0 00.	1.00					

h	Sui	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.6	S10°48.4	144°58.9	5.0'	S24°43.8	3.5'	58.9'
1 2	198°50.7 213°50.8	49.3 50.1	159°22.9 173°47.0	5.0' 5.1'	24°47.3 24°50.6	3.3' 3.2'	58.8' 58.8'
3	228°50.9	51.0	188°11.0	5.1'	24°53.8	3.0'	58.7
4	243°51.0	51.9	202°35.1	5.1'	24°56.8	2.8'	58.7'
5	258°51.1	52.8 \$10°53.7	216°59.2 231°23.3	5.1'	24°59.6 \$25°02.3	2.7'	58.7'
6 7	273°51.2 288°51.3	510 53.7 54.6	231 23.3 245°47.5	5.2' 5.2'	525 02.3 25°04.7	2.5' 2.3'	58.6' 58.6'
8	303°51.4	55.5	260°11.7	5.2'	25°07.1	2.2'	58.5'
9	318°51.5	• • 56.4	274°35.9	5.3'	25°09.2	2.0'	58.5'
10 11	333°51.6 348°51.7	57.2 58.1	289°00.2 303°24.4	5.3' 5.3'	25°11.2 25°13.0	1.8' 1.7'	58.5' 58.4'
12	3°51.8	\$10°59.0	317°48.8	5.4	\$25°14.7	1.5'	58.4
13	18°51.9	10°59.9	332°13.1	5.4'	25°16.1	1.3'	58.4'
14 15	33°52.0 48°52.1	11°00.8 ·· 01.7	346°37.5 1°02.0	5.4' 5.5'	25°17.5 25°18.6	1.2' 1.0'	58.3' 58.3'
16	63°52.2	02.5	15°26.5	5.5'	25°19.6	0.8'	58.2
17	78°52.3	03.4	29°51.0	5.6'	25°20.4	0.7'	58.2'
18	93°52.4	S11°04.3 05.2	44°15.6	5.6'	\$25°21.1 25°21.6	0.5'	58.2'
19 20	108°52.5 123°52.6	05.2 06.1	58°40.2 73°04.8	5.7' 5.7'	25°21.6 25°21.9	0.3' 0.2'	58.1' 58.1'
21	138°52.7	07.0	87°29.6	5.8'	25°22.1	0.0'	58.0'
22	153°52.8	07.8	101°54.4	5.8'	25°22.1	-0.1'	58.0'
23	168°52.8	08.7	116°19.2	5.9'	25°22.0	-0.3'	58.0'
	SD = 16.1'	d = 0.9'		SI	O = 16.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.9	S11°09.6	$130^{\circ}44.1$	5.9'	S25°21.7	-0.5'	57.9'
1	198°53.0 213°53.1	10.5 11.4	145°09.0 159°34.0	6.0' 6.1'	25°21.2 25°20.6	-0.6' -0.8'	57.9' 57.8'
2	213°53.1 228°53.2	11.4	159°34.0 173°59.1	6.1'	25°20.6 25°19.8	-0.8°	57.8° 57.8'
4	243°53.3	13.1	188°24.2	6.2	25°18.9	-1.1'	57.8'
5	258°53.4	14.0	202°49.4	6.3'	25°17.8	-1.2'	57.7'
6 7	273°53.5 288°53.6	S11°14.9 15.8	217°14.7 231°40.0	6.3' 6.4'	\$25°16.6 25°15.2	-1.4' -1.5'	57.7' 57.6'
8	303°53.7	16.6	246°05.4	6.5	25°13.7	-1.5' -1.7'	57.6'
9	318°53.8	• • 17.5	260°30.9	6.5'	25°12.0	-1.8'	57.6'
10	333°53.8 348°53.9	18.4 19.3	274°56.4 289°22.0	6.6'	25°10.1 25°08.1	-2.0' -2.1'	57.5' 57.5'
11 12	348 53.9 3°54.0	19.3 S11°20.2	289 22.0 303°47.7	6.7' 6.8'	\$25°06.0	-2.1 -2.3'	57.5 57.4'
13	18°54.1	21.0	318°13.4	6.8	25°03.7	-2.4	57.4'
14	33°54.2	21.9	332°39.3	6.9'	25°01.2	-2.6'	57.4'
15 16	48°54.3 63°54.4	· · 22.8 23.7	347°05.2 1°31.2	7.0' 7.1'	24°58.6 24°55.9	-2.7' -2.9'	57.3' 57.3'
17	78°54.5	24.5	15°57.2	7.1'	24°53.0	-3.0'	57.3'
18	93°54.5	S11°25.4	30°23.4	7.2'	\$24°50.0	-3.2'	57.2'
19 20	108°54.6 123°54.7	26.3 27.2	44°49.6 59°15.9	7.3' 7.4'	24°46.8 24°43.5	-3.3' -3.4'	57.2' 57.1'
21	138°54.8	28.0	73°42.3	7.5'	24°40.1	-3.6'	57.1
22	153°54.9	28.9	88°08.8	7.6'	24°36.5	-3.7'	57.1'
23	168°55.0	29.8	102°35.4	7.6'	24°32.8	-3.9'	57.0'
	SD = 16.1'	d = 0.9'		SI	O = 15.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°55.1 198°55.1	\$11°30.7 31.5	117°02.0 131°28.8	7.7' 7.8'	\$24°28.9 24°25.0	-4.0' -4.1'	57.0' 56.9'
2	213°55.2	32.4	131 28.8 145°55.6	7.8 7.9'	24 25.0 24°20.8	-4.1 -4.3'	56.9'
3	228°55.3	• • 33.3	160°22.5	8.0'	24°16.6	-4.4'	56.9'
4 5	243°55.4 258°55.5	34.2 35.0	174°49.5 189°16.6	8.1' 8.2'	24°12.2 24°07.7	-4.5' -4.6'	56.8' 56.8'
6	273°55.6	S11°35.9	203°43.8	8.3'	\$24°03.0	-4.8'	56.8
7	288°55.7	36.8	218°11.0	8.4'	23°58.2	-4.9'	56.7'
8	303°55.7 318°55.8	37.6	232°38.4 247°05.9	8.5' 8.5'	23°53.3 23°48.3	-5.0'	56.7'
9 10	318°55.8 333°55.9	· · 38.5 39.4	247°05.9 261°33.4	8.6'	23°48.3 23°43.2	-5.2' -5.3'	56.7' 56.6'
11	348°56.0	40.3	276°01.0	8.7'	23°37.9	-5.4'	56.6'
12	3°56.1	S11°41.1	290°28.8	8.8'	\$23°32.5	-5.5'	56.5'
13 14	18°56.1 33°56.2	42.0 42.9	304°56.6 319°24.5	8.9' 9.0'	23°27.0 23°21.3	-5.6' -5.8'	56.5' 56.5'
15	48°56.3	• • 43.7	$333^{\circ}52.6$	9.1'	$23^{\circ}15.6$	-5.9'	56.4
16	63°56.4	44.6	348°20.7	9.2'	23°09.7	-6.0'	56.4
17 18	78°56.5 93°56.6	45.5 \$11°46.3	2°48.9 17°17.2	9.3' 9.4'	23°03.7 S 22°57.6	-6.1' -6.2'	56.4' 56.3'
19	108°56.6	47.2	31°45.6	9.4 9.5'	22°51.4	-6.3'	56.3
20	123°56.7	48.1	46°14.1	9.6'	22°45.0	-6.4'	56.3'
21 22	138°56.8 153°56.9	· · 49.0 49.8	60°42.7 75°11.4	9.7' 9.8'	22°38.6 22°32.0	-6.6' -6.7'	56.2' 56.2'
23	168° 56.9	49.8 50.7	75 11.4 89°40.1	9.8 9.9'	22°25.4	-6.8'	56.2'
	SD = 16.1'	d = 0.9'		SI	D = 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
N 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
N 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
N 10°	05:03	05:28	05:49	17:40	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:12	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
S 50°	03:27	04:10	04:44	18:46	19:20	20:04
52°	03:18	04:03	04:40	18:50	19:27	20:13
54°	03:07	03:56	04:35	18:55	19:34	20:23
56°	02:55	03:49	04:30	19:01	19:42	20:36
58°	02:41	03:40	04:24	19:07	19:51	20:50
S 60°	02:24	03:29	04:17	19:14	20:02	21:08

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 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
N 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
N 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
S 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	
S 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
S 60°	04:59	05:53	07:08	••••	00:58	01:41

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	32°55.5		N03°00.3		N12°53.2		504°04.9		N11°43.8		ЗПА	Dec
0		216°20.5		240°19.2		200°35.8		356°02.5		Alpheratz	357°31.2	29°15.3
1	47°57.9	231°20.2	02°59.2	255°20.3	52.8	215°37.8	05.1	11°05.1	43.7	Ankaa	353°03.8	-42°08.9
2	63°00.4 78°02.9	246°19.8	58.1	270°21.4	52.3	230°39.8 245°41.7	05.3	26°07.8 41°10.4	43.6	Schedar	349°26.9	56°42.0
3 4	78 02.9 93°05.3	261°19.5 276°19.1	•• 57.0	285°22.5 300°23.5	· · 51.8 51.3	245 41.7 260°43.7	· · 05.5 05.7	56°13.1	• • 43.6	Diphda	348°43.9	-17°49.6
5	93°05.3 108°07.8	270 19.1 291°18.8	55.8 54.7	315°24.6	50.8	275°45.7	05.7	71° 15.7	43.5 43.5	Achernar	$335^{\circ}17.4$	-57°05.3
6	100 07.8 123°10.3	306°18.4	N02° 53.6	330°25.7	N12°50.4	290°47.7	504°06.1	86° 18.4	43.5 N11°43.4	Hamal	327°47.3	23°36.1
7	138°12.7	321°18.1	52.5	345°26.8	49.9	305°49.6	06.3	101°21.1	43.3	Polaris	$311^{\circ}51.7$	89°23.0
8	153°15.2	336° 17.8	51.3	0°27.8	49.4	320°51.6	06.5	116°23.7	43.3	Acamar	$315^{\circ}09.1$	-40°11.2
9	168°17.7	351°17.4	50.2	15°28.9	• • 48.9	335°53.6	06.7	131°26.4	• • 43.2	Menkar	314°02.6	4°12.3
10	183°20.1	6°17.1	49.1	30°30.0	48.4	350°55.6	06.9	146°29.0	43.1	Mirfak	308°23.3	49°57.8
11	198°22.6	21°16.7	48.0	45°31.1	48.0	5°57.6	07.1	161°31.7	43.1	Aldebaran	290°35.8	16°34.0
12	213°25.0	36°16.4	N02°46.8	60°32.1	N12°47.5	20°59.5	S04°07.3	176°34.3	N11°43.0	Rigel	281°00.7	-8°10.0
13	228°27.5	51°16.0	45.7	75°33.2	47.0	36°01.5	07.5	191°37.0	42.9	Capella	280°17.0	46°01.4
14	243°30.0	66° 15.7	44.6	90°34.3	46.5	51°03.5	07.7	206°39.7	42.9	Bellatrix	278° 19.4	6°22.6
15	258°32.4	81°15.4	• • 43.4	105°35.4	• • 46.0	66°05.5	• • 07.9	221°42.3	• • 42.8	Elnath Alnilam	277°57.7 275°34.4	28°37.8 -1°11.0
16	273°34.9	96°15.0	42.3	120°36.5	45.5	81°07.4	08.1	236°45.0	42.8	Betelgeuse	270°48.6	-1 11.0 7°24.7
17	288°37.4	111°14.7	41.2	135°37.5	45.1	96°09.4	08.3	251°47.6	42.7	Canopus	263°50.8	-52°42.4
18	303°39.8	126°14.3	N02°40.1	150°38.6	N12°44.6	$111^{\circ}11.4$	S04°08.5	266°50.3	N11°42.6	Sirius	258° 23.4	-16°45.2
19	318°42.3	141°14.0	38.9	165°39.7	44.1	126°13.4	08.7	281°52.9	42.6	Adhara	255°03.3	-29°00.5
20	333°44.8	156° 13.7	37.8	180°40.8	43.6	141°15.3	08.9	296°55.6	42.5	Procyon	244° 47.6	5°09.0
21	348°47.2	171°13.3	• • 36.7	195°41.8	• • 43.1	156°17.3	• • 09.1	311°58.3	• • 42.4	Pollux	243°13.5	27°57.2
22	3°49.7	186°13.0	35.5	210°42.9	42.7	171°19.3	09.3	327°00.9	42.4	Avior	234°13.4	-59°35.9
23	18°52.1	201°12.6	34.4	225°44.0	42.2	186°21.3	09.5	342°03.6	42.3	Suhail	222°44.1	-43°32.7
Mer.p	ass. 21:45	ν -0.3' d-1	1′ m-4.00	$\nu 1.1' \ d-0$	0.5′ m1.40	$\nu 2.0' d0.$	2′ m-1.68	$\nu 2.7' \ d-0$.1′ m-0.07	Miaplacidus	221°37.7	-69°49.9
										Alphard	217°44.8	-8°47.0
			_		_		_		_	Regulus	207°31.3	11°49.5
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.9	61°35.5
0	33°54.6	216°12.3	N02°33.3	240°45.1	N12°41.7	201°23.2	S04°09.7	357°06.2	N11°42.2	Denebola	$182^{\circ}22.1$	14°24.6
1	48°57.1	231°11.9	32.2	255°46.2	41.2	216°25.2	09.9	12°08.9	42.2	Gienah	175°40.7	-17°42.0
2	63°59.5	246°11.6	31.0	270°47.2	40.7	231°27.2	10.1	27°11.5	42.1	Acrux	$172^{\circ}57.1$	-63°15.4
3	79°02.0	261°11.3	• • 29.9	285°48.3	• • 40.3	246°29.2	10.4	42°14.2	• • 42.1	Gacrux	171°48.6	-57°16.4
4	94°04.5	276°10.9	28.8	300°49.4	39.8	261°31.2	10.6	57°16.9	42.0	Alioth	$166^{\circ}10.9$	55°48.1
5	109°06.9	291°10.6	27.6	315°50.5	39.3	276°33.1	10.8	72°19.5	41.9 N11°41.9	Spica	158° 19.4	-11°18.6
6 7	124°09.4 139°11.9	306°10.2 321°09.9	N02°26.5 25.4	330°51.6 345°52.6	N12°38.8	291°35.1 306°37.1	\$04°11.0 11.2	87° 22.2 102° 24.8		Alkaid	152°50.2	49°10.1
8	159 11.9 154° 14.3	336°09.6	24.2	0°53.7	38.3 37.8	300 37.1 321°39.1	11.2	102 24.6 117°27.5	41.8 41.7	Hadar	148°32.1	-60°30.7
9	169° 16.8	351°09.0	23.1	15°54.8	• • 37.4	336°41.0	•• 11.4	117 27.5 132°30.1	• • 41.7	Menkent	147°54.3	-36°30.6
10	184° 19.3	6°08.9	22.0	30°55.9	36.9	351°43.0	11.8	147°32.8	41.6	Arcturus	145° 45.5	19°02.0
11	199°21.7	21°08.5	20.8	45°57.0	36.4	6°45.0	12.0	162°35.5	41.5	Rigil Kent.	139°36.6	-60°57.2
12	214°24.2	36°08.2	N02° 19.7	60°58.0	N12°35.9	21°47.0	S04°12.2	177°38.1	N11°41.5	Kochab	137°21.3	74°02.2
13	229°26.6	51°07.8	18.6	75°59.1	35.4	36°49.0	12.4	192°40.8	41.4	Zuben'ubi	136°52.9	-16°09.6
14	244°29.1	66°07.5	17.4	91°00.2	35.0	51°50.9	12.6	207°43.4	41.3	Alphecca	126°01.5	26°37.2
15	259°31.6	81°07.2	· · 16.3	106°01.3	• • 34.5	66°52.9	• • 12.8	222°46.1	• • 41.3	Antares	112°12.3	-26°29.7
16	274°34.0	96°06.8	15.2	121°02.4	34.0	81°54.9	13.0	237°48.7	41.2	Atria	107°04.1 101°59.5	-69°04.8 -15°45.5
17	289°36.5	111°06.5	14.0	136°03.5	33.5	96°56.9	13.2	252°51.4	41.2	Sabik Shaula	96°06.5	-15 45.5 -37°07.4
18	304°39.0	126°06.1	N02°12.9	151°04.5	N12°33.0	111°58.8	S04°13.4	267°54.1	N11°41.1	Rasalhague	90 00.5 95°55.9	-37 07.4 12°32.6
19	319°41.4	141°05.8	11.8	166°05.6	32.5	127°00.8	13.6	282°56.7	41.0	Eltanin	90°41.1	51°29.4
20	334°43.9	156°05.4	10.6	181°06.7	32.1	142°02.8	13.8	297°59.4	41.0	Kaus Aust.	83°28.6	-34°22.2
21	349°46.4	171°05.1	•• 09.5	196°07.8	• • 31.6	157°04.8	•• 14.0	313°02.0	• • 40.9	Vega	80°31.3	38°49.0
22	4°48.8	186°04.8	08.4	211°08.9	31.1	172°06.8	14.2	328°04.7	40.8	Nunki	75°44.1	-26°15.5
23	19°51.3	201°04.4	07.2	226°10.0	30.6	187°08.7	14.4	343°07.4	40.8	Altair	61°57.0	8°56.9
Mer n	ass. 21:41	v-0 3' d-1	1′ m-4.00	$\nu 1.1' d-0$	0.5' m1.39	$v^2 0' d0$	2′ m-1.68	v2 7' d-0	.1′ m-0.08	Peacock	53°01.0	-56°38.6
		- 0.5 d I		ν 1.1 · G · O						Deneb	49°23.6	45°23.4
										Enif	33°35.6	10°00.7
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°49.3
0	34°53.8	216°04.1	N02°06.1	241°11.0	N12°30.1	202°10.7	S04°14.6	358° 10.0	N11°40.7	Fomalhaut	$15^{\circ}10.9$	-29°28.1
1	49°56.2	231°03.7	05.0	256°12.1	29.7	217°12.7	14.8	13°12.7	40.6	Scheat	13°41.9	28°14.7
2	64°58.7 80°01.1	246°03.4 261°03.0	03.8	271°13.2 286°14.3	29.2 •• 28.7	232°14.7 247°16.6	15.0	28° 15.3 43° 18.0	40.6 • • 40.5	Markab	13°26.6	15°21.9
3 4	95°03.6	261°03.0 276°02.7	· · 02.7 01.6	286°14.3 301°15.4	28.7	247°16.6 262°18.6	· · 15.2 15.4	43° 18.0 58° 20.6	40.5	Oct 24 Tue	SHA	Mer.pass
5	95 03.0 110°06.1	270 02.7 291°02.4	01.0 02°00.4	316° 16.5	27.7	202 18.0 277°20.6	15.4	73°23.3	40.5		183°25.0	09:35
6	110 06.1 125°08.5	306°02.0	N01°59.3	310 10.5 331°17.6	N12°27.2	277 20.6 292°22.6	504°15.8	73 23.3 88° 26.0	40.4 N11°40.3		207° 23.8	07:58
7	140°11.0	300 02.0 321°01.7	58.1	346°18.6	26.8	307°24.6	16.0	103°28.6	40.3	l l	167°40.3	10:36
8	155° 13.5	336°01.3	57.0	1°19.7	26.3	322°26.5	16.0	103°28.0	40.3	Saturn	323°07.0	00:16
9	170°15.9	351°01.0	• • 55.9	16°20.8	• • 25.8	337°28.5	16.4	133°33.9	• • 40.2			
10	185°18.4	6°00.6	54.7	31°21.9	25.3	352°30.5	16.6	148°36.6	40.1	Oct 25 Wed	SHA	Mer.pass
11	200°20.9	21°00.3	53.6	46°23.0	24.8	7°32.5	16.8	163°39.2	40.0		182°17.7	09:35
12	215°23.3	36°00.0	N01°52.5	61°24.1	N12°24.3	22°34.4	S04°17.0	178°41.9	N11°39.9		206°50.5	07:56
13	230°25.8	50°59.6	51.3	76°25.2	23.9	37°36.4	17.2	193°44.6	39.9		167°28.6	10:33
14	245°28.2	65°59.3	50.2	$91^{\circ}26.3$	23.4	52°38.4	17.4	208°47.2	39.8	Saturn	323°11.6	00:12
15	260°30.7	80°58.9	• • 49.0	$106^{\circ}27.3$	• • 22.9	67°40.4	• • 17.6	223°49.9	• • 39.8	Oct 26 Thu	SHA	Mer.pass
16	275°33.2	95°58.6	47.9	121°28.4	22.4	82°42.4	17.8	238°52.5	39.7		181°10.3	09:36
17	290°35.6	$110^{\circ}58.2$	46.8	$136^{\circ}29.5$	21.9	97°44.3	18.0	253°55.2	39.6		206°17.3	07:55
18	305°38.1	125° 57.9	N01°45.6	151°30.6	$N12^{\circ}21.4$	112°46.3	S04°18.2	268°57.9	N11°39.6		167°17.0	10:30
19	320°40.6	140°57.6	44.5	166°31.7	21.0	127°48.3	18.4	284°00.5	39.5		323°16.3	00:07
20	335°43.0	155°57.2	43.3	181°32.8	20.5	142°50.3	18.6	299°03.2	39.4		al acII	
21	350°45.5	170°56.9	• • 42.2	196°33.9	• • 20.0	157°52.3	• 18.8	314°05.8	• • 39.4	Horizont	al parallax	0.1
22	5°48.0	185°56.5	41.1	211°35.0	19.5	172°54.2	19.0	329°08.5	39.3		Venus: Mars:	0.1 0.1
23	20°50.4	200°56.2	39.9	226°36.1	19.0	187°56.2	19.2	344°11.1	39.2		iviars:	0.1
Mer.p	ass. 21:37	ν -0.3' d-1	1′ m-4.00	$\nu 1.1' \ d-0$.5′ m1.38	$\nu 2.0' \ d0.$	2′ m-1.68	$\nu 2.7' \ d-0$.1′ m-0.09			

h	Sui						
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.0	S11°51.6	$104^{\circ}09.0$	10.0'	S22°18.6	-6.9'	56.1'
1	198°57.1	52.4	118°38.0	10.1'	22°11.7	-7.0'	56.1'
2 3	213° 57.2 228° 57.3	53.3 •• 54.2	133°07.1 147°36.2	10.2' 10.3'	22°04.7 21°57.6	-7.1' -7.2'	56.1' 56.0'
4	243°57.3	55.0	162°05.5	10.4	21°50.5	-7.2	56.0'
5	258° 57.4	55.9	$176^{\circ}34.8$	10.5'	21°43.2	-7.4'	56.0'
6	273°57.5	S11°56.7	191°04.3	10.5'	S21°35.8	-7.5	55.9'
7 8	288° 57.6 303° 57.6	57.6 58.5	205°33.8 220°03.5	10.6' 10.7'	21°28.3 21°20.7	-7.6' -7.7'	55.9' 55.9'
9	318° 57.7	11°59.3	234°33.2	10.7	21°13.0	-7.7 -7.8'	55.8'
10	333°57.8	12°00.2	249°03.1	10.9'	21°05.2	-7.9'	55.8'
11	348° 57.9	01.1	263°33.0	11.0'	20°57.3	-8.0'	55.8'
12 13	3°57.9 18°58.0	\$12°01.9 02.8	278°03.0 292°33.1	11.1' 11.2'	\$20°49.4 20°41.3	-8.1' -8.2'	55.7' 55.7'
14	33°58.1	02.0	307°03.3	11.3'	20°33.1	-8.2'	55.7'
15	48°58.2	• • 04.5	321°33.7	11.4'	20°24.9	-8.3'	55.6'
16	63°58.2	05.4	336°04.1	11.5'	20°16.6	-8.4'	55.6'
17 18	78° 58.3 93° 58.4	06.2 \$12°07.1	350°34.5 5°05.1	11.6' 11.7'	20°08.1 \$19°59.6	-8.5' -8.6'	55.6' 55.6'
19	108° 58.5	08.0	19°35.8	11.8'	19°51.0	-8.7'	55.5'
20	123°58.5	08.8	34°06.6	11.9'	19°42.3	-8.8'	55.5'
21	138°58.6	• • 09.7	48°37.4	11.9'	19°33.6	-8.8'	55.5'
22	153° 58.7 168° 58.7	10.5	63°08.4 77°39.4	12.0'	19°24.7 19°15.8	-8.9' -9.0'	55.4'
23		11.4	11 39.4	12.1'		-9.0	55.4'
	SD = 16.1'	d = 0.9'		SI	O = 15.3'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.8	S12°12.3	$92^{\circ}10.5$	12.2'	S19°06.8	-9.1'	55.4'
1	198°58.9	13.1	106°41.7	12.3'	18°57.7	-9.2'	55.4'
2 3	213° 59.0 228° 59.0	14.0 •• 14.8	121°13.0 135°44.4	12.4' 12.5'	18°48.5 18°39.3	-9.2' -9.3'	55.3' 55.3'
3 4	243°59.1	15.7	150°15.9	12.6'	16 39.3 18°30.0	-9.3 -9.4'	55.3'
5	258° 59.2	16.5	164°47.5	12.6'	18°20.6	-9.5'	55.3'
6	273°59.2	S12°17.4	179° 19.1	12.7'	S18°11.1	-9.5'	55.2'
7 8	288° 59.3 303° 59.4	18.3 19.1	193°50.9 208°22.7	12.8' 12.9'	18°01.6 17°52.0	-9.6' -9.7'	55.2' 55.2'
9	318° 59.4	. 20.0	208 22.7 222°54.6	13.0'	17 52.0 17°42.3	-9.7 -9.8'	55.2 55.1'
10	333° 59.5	20.8	237°26.6	13.1'	17°32.6	-9.8'	55.1'
11	348° 59.6	21.7	251°58.6	13.1'	17°22.7	-9.9'	55.1'
12	3°59.6 18°59.7	\$12°22.5 23.4	266°30.8 281°03.0	13.2' 13.3'	\$17°12.8 17°02.9	-10.0'	55.1' 55.0'
13 14	18°59.7 33°59.8	23.4	281°03.0 295°35.3	13.3 13.4'	17°02.9 16°52.9	-10.0' -10.1'	55.0' 55.0'
15	48° 59.8	25.1	310°07.7	13.5'	16°42.8	-10.1	55.0'
16	63°59.9	26.0	324°40.2	13.5'	16°32.6	-10.2'	55.0'
17	79°00.0 94°00.0	26.8 \$12°27.7	339°12.7 353°45.3	13.6' 13.7'	16°22.4 \$16°12.2	-10.3'	55.0'
18 19	109°00.1	28.5	353 45.3 8°18.0	13.7	16°01.8	-10.3' -10.4'	54.9' 54.9'
20	124°00.2	29.4	22°50.8		15°51.4		54.9'
21	139°00.2	• • 30.2	37°23.7	13.9'	15°41.0	-10.5'	54.9'
22	154°00.3	31.1	51°56.6	14.0'	15°30.5	-10.6' -10.6'	54.8'
23	169°00.4	31.9	66°29.6	14.1'	15°19.9	-10.6	54.8'
	SD = 16.1'	d = 0.9'		SI	D = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°00.4	S12°32.8	81°02.6	14.1'	S15°09.3	-10.7'	54.8'
1	199°00.5	33.6	95°35.8	14.2'	14°58.6	-10.7'	54.8'
2 3	214°00.6 229°00.6	34.5 •• 35.3	110°09.0 124°42.3	14.3' 14.3'	14°47.9 14°37.1	-10.8' -10.8'	54.8' 54.7'
4	244°00.7	36.2	139° 15.6	14.4	14°26.3	-10.6	54.7'
5	259°00.7	37.0	153°49.0	14.5'	14°15.4	-10.9'	54.7'
6	274°00.8	S12°37.9	168° 22.5	14.5'	\$14°04.4	-11.0'	54.7'
7 8	289°00.9 304°00.9	38.7 39.6	182°56.0 197°29.7	14.6' 14.7'	13°53.4 13°42.4	-11.0' -11.1'	54.7' 54.6'
9	304 00.9 319°01.0	. 40.4	212°03.3	14.7'	13° 42.4 13° 31.3	-11.1 -11.1'	54.6'
10	334°01.0	41.3	$226^{\circ}37.1$	14.8'	13°20.2	-11.2'	54.6'
11	349°01.1	42.1	241°10.9	14.9'	13°09.0	-11.2'	54.6'
12 13	4°01.2 19°01.2	\$12°43.0 43.8	255°44.7 270°18.6	14.9' 15.0'	\$12°57.8 12°46.5	-11.3' -11.3'	54.6' 54.5'
13 14	34°01.3	43.8 44.7	270° 18.6 284° 52.6	15.0' 15.0'	12°46.5 12°35.2	-11.3' -11.4'	54.5'
15	49°01.3	• • 45.5	$299^{\circ}26.7$	15.1'	12°23.8	-11.4	54.5'
16	64°01.4	46.3	314°00.8	15.2'	12°12.4	-11.4'	54.5'
17 18	79°01.5 94°01.5	47.2 \$12°48.0	328°34.9 343°09.1	15.2' 15.3'	12°01.0 \$11°49.5	-11.5' -11.5'	54.5' 54.5'
18 19	94°01.5 109°01.6	\$12°48.0 48.9	343°09.1 357°43.4	15.3' 15.3'	511°49.5 11°38.0	-11.5' -11.6'	54.5° 54.4'
20	124°01.6	49.7	12° 17.7	15.4	11°26.4	-11.6'	54.4
21	139°01.7	• • 50.6	26°52.1	15.4'	11°14.8	-11.6'	54.4'
22	154°01.7	51.4	41°26.5 56°01.0	15.5'	11°03.1 10°51.5	-11.7'	54.4'
23	169°01.8	52.3	0.10	15.5'		-11.7'	54.4'
	SD = 16.1'	d = 0.9'		SI	O = 14.9'		

Naut. Civil Stinise 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	Lat.	Twi	light	Sunrise	Sunset	Twi	light
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 17:55 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	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
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 17:05 17:54 N 58° 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 N 40° 05:22 05:54	N 72°	05:40	07:00	08:19	15:08	16:26	17:46
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 N 40° 05:22 05:54 06:09 17:13 17:38 18:08 30° 05:16 05:45	N 70°	05:39	06:51	07:59	15:27	16:36	17:48
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 N 40° 05:22 05:54 06:22 17:06 17:34 18:05 35° 05:10 05:36 06:09 17:19 17:43 18:11 20° 05:10 05:36	68°	05:37	06:43	07:44	15:42	16:44	17:49
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 N 40° 05:22 05:54 06:22 17:06 17:34 18:05 35° 05:19 05:49 06:15 17:13 17:33 18:08 30° 05:16 05:45 06:09 17:19 17:43 18:11 20° 05:10 05:30		05:36	06:36	07:32	15:55	16:50	17:50
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 N 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 N 10° 05:03 05:28		05:35	06:31	07:22	16:05	16:56	17:51
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 N 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 N 10° 05:03 05:28 05:49 17:39 18:00 18:25 0° 04:45 05:10							
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 N 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 N 10° 05:03 05:28 05:49 17:39 18:00 18:25 0° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:45 05:10	60°	05:33	06:22	07:06	16:21	17:05	17:54
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 N 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 N 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 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00	N 58°	05:32	06:18	06:59	16:28	17:09	17:55
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 N 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 N 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 \$ 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	56°	05:31	06:14	06:53	16:34	17:13	17:56
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 N 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 05:35 05:49 17:39 18:00 18:25 0° 04:55 05:20 05:41 17:47 18:09 18:33 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00 05:22 18:06 18:29 18:56 30° 04:17 04:46 05:11 18:17 18:42 19:12 40° 03:55 04:29 04:57 18:31 19:00 19:34 45° 03:39 04:18		05:30	06:11	06:48	16:39	17:16	17:57
45° 05:25 05:59 06:29 16:58 17:28 18:02 N 40° 05:22 05:54 06:22 17:06 17:34 18:05 35° 05:19 05:49 06:15 17:13 17:38 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 N 10° 05:03 05:28 05:49 17:39 18:00 18:25 0° 04:45 05:10 05:32 17:56 18:18 18:33 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00 05:22 18:06 18:29 18:56 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° 03:39 04:18	52°	05:29	06:08	06:43	16:44	17:19	17:58
N 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 N 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 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:35 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		05:28	06:05	06:39	16:48	17:22	18:00
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 N 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 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00 05:22 18:06 18:29 18:56 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 \$ 50° 03:20 04:03	45°	05:25	05:59	06:29	16:58	17:28	18:02
30° 05:16 05:45 06:09 17:19 17:43 18:11 20° 05:10 05:36 05:59 17:29 17:52 18:18 N 10° 05:03 05:28 05:49 17:39 18:00 18:25 0° 04:55 05:20 05:41 17:47 18:09 18:33 S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00 05:22 18:06 18:29 18:56 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 \$ 50° 03:20 04:03 04:38 18:51 19:26 20:10 52° 03:10 03:57		05:22	05:54	06:22	17:06	17:34	18:05
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	35°	05:19	05:49	06:15	17:13	17:38	18:08
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	30°	05:16	05:45	06:09	17:19	17:43	18:11
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:10	05:36	05:59	17:29	17:52	18:18
S 10° 04:45 05:10 05:32 17:56 18:18 18:43 20° 04:33 05:00 05:22 18:06 18:29 18:56 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 S 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° 02:90 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		05:03	05:28	05:49	17:39	18:00	18:25
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0°	04:55	05:20	05:41	17:47	18:09	18:33
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		04:45	05:10	05:32	17:56	18:18	18:43
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 \$ 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		04:33	05:00	05:22	18:06	18:29	18:56
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 S 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		04:17	04:46	05:11	18:17	18:42	19:12
45° 03:39 04:18 04:49 18:40 19:12 19:50 \$ 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		04:07	04:38	05:05	18:24	18:50	19:22
S 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	-			04:57	18:31		19:34
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	45°	03:39	04:18	04:49	18:40	19:12	19:50
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	S 50°	03:20	04:03	04:38	18:51	19:26	20:10
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		03:10	03:57	04:34	18:56	19:33	20:20
58° 02:30 03:31 04:16 19:14 19:59 21:01			03:49		19:01	19:41	20:31
		02:46	03:41	04:22	19:07	19:49	20:45
S 60° 02:11 03:19 04:08 19:22 20:11 21:20							
	S 60°	02:11	03:19	04:08	19:22	20:11	21:20

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°		16:46	15:53		20:25	22:49
N 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
S 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
S 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
S 60°	08:32	09:58	11:22	02:05	02:19	02:28

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

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
			N01°38.8		N12°18.5	202°58.2	504°19.4		N11°39.2		эпа	Dec
0	35°52.9	215°55.8		241°37.1				359°13.8		Alpheratz	357°31.2	29°15.3
1	50°55.4	230°55.5	37.6	256°38.2	18.1	218°00.2	19.6	14° 16.5	39.1	Ankaa	353°03.8	-42°08.9
2	65°57.8	245°55.2	36.5	271°39.3	17.6	233°02.2	19.8	29°19.1	39.1	Schedar	$349^{\circ}26.9$	56°42.0
3	81°00.3	260°54.8	• • 35.4	286°40.4	• • 17.1	248°04.1 263°06.1	• • 20.0	44°21.8	• • 39.0	Diphda	348°43.9	-17°49.6
4 5	96°02.7 111°05.2	275°54.5 290°54.1	34.2 33.1	301°41.5 316°42.6	16.6	203 00.1 278°08.1	20.2 20.4	59° 24.4 74° 27.1	38.9 38.9	Achernar	$335^{\circ}17.4$	-57°05.4
6	111 05.2 126°07.7	305°53.8	N01°31.9	331°43.7	16.1 N12°15.6	293°10.1	504°20.6	89° 29.8	36.9 N11°38.8	Hamal	327°47.3	23°36.1
7	141°10.1	320° 53.4	30.8	346°44.8	15.2	308°12.0	20.8	104° 32.4	38.7	Polaris	311°51.2	89°23.0
8	156°12.6	335°53.1	29.7	1°45.9	14.7	323°14.0	21.0	119°35.1	38.7	Acamar	$315^{\circ}09.1$	-40°11.2
9	171°15.1	350°52.8	. 28.5	16°47.0	• • 14.2	338°16.0	. 21.2	134° 37.7	• • 38.6	Menkar	314°02.6	4°12.3
10	186°17.5	5°52.4	27.4	31°48.1	13.7	353°18.0	21.4	149°40.4	38.5	Mirfak	308°23.3	49°57.8
11	201°20.0	20°52.1	26.2	46°49.2	13.2	8°20.0	21.6	164° 43.0	38.5	Aldebaran	290°35.8	16°34.0
12	216°22.5	35°51.7	N01°25.1	61°50.2	N12°12.7	23°21.9	S04°21.8	179° 45.7	N11°38.4	Rigel	281°00.7	-8°10.0
13	231°24.9	50°51.4	23.9	76°51.3	12.3	38°23.9	22.0	194°48.4	38.3	Capella	280°17.0	46°01.4
14	246°27.4	65°51.0	22.8	91°52.4	11.8	53°25.9	22.2	209°51.0	38.3	Bellatrix	278°19.3	6°22.6
15	261°29.9	80°50.7	• • 21.7	106°53.5	• • 11.3	68°27.9	• • 22.4	224°53.7	• • 38.2	Elnath Alnilam	277°57.7 275°34.4	28°37.8 -1°11.0
16	276°32.3	95°50.4	20.5	121°54.6	10.8	83°29.9	22.6	239°56.3	38.2	Betelgeuse	270°48.5	7°24.7
17	291°34.8	110°50.0	19.4	136°55.7	10.3	98°31.8	22.8	254°59.0	38.1	Canopus	263°50.7	-52°42.4
18	306°37.2	125°49.7	N01°18.2	151°56.8	N12°09.8	113°33.8	S04°23.0	270°01.7	N11°38.0	Sirius	258°23.4	-16°45.2
19	321°39.7	140°49.3	17.1	166°57.9	09.4	128°35.8	23.2	285°04.3	38.0	Adhara	255°03.3	-29°00.5
20	336°42.2	155° 49.0	15.9	181°59.0	08.9	143°37.8	23.4	300°07.0	37.9	Procyon	244° 47.5	5°09.0
21	351°44.6	170°48.6	• • 14.8	197°00.1	• • 08.4	158°39.8	• • 23.6	315°09.6	• • 37.8	Pollux	243°13.5	27°57.2
22	6°47.1	185°48.3	13.7	212°01.2	07.9	173°41.7	23.8	330° 12.3	37.8	Avior	234°13.4	-59°35.9
23	21°49.6	200°47.9	12.5	227°02.3	07.4	188°43.7	24.0	345°14.9	37.7	Suhail	222°44.1	-43°32.7
Mer.p	ass. 21:33	ν -0.3' d-1	1′ m-4.00	$\nu 1.1' \ d$ -0	.5′ m1.38	ν 2.0′ d0.	2′ m-1.68	$\nu 2.7' \ d-0$.1′ m-0.10	Miaplacidus	221°37.7	-69°49.9
										Alphard	217°44.8	-8°47.0
٠.	CIIA	CIIA	ъ.	CIIA	Б	CIIA		CIIA		Regulus	$207^{\circ}31.3$	11°49.5
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°35.4
0	36°52.0	215° 47.6	N01°11.4	242°03.4	N12°06.9	203°45.7	S04°24.2	0°17.6	N11°37.6	Denebola	$182^{\circ}22.1$	14°24.6
1	51°54.5	230°47.3 245°46.9	10.2	257°04.5	06.5	218°47.7 233°49.7	24.4	15°20.3	37.6	Gienah	175°40.7	-17°42.0
2	66°57.0 81°59.4	245 46.9 260°46.6	09.1 •• 07.9	272°05.6 287°06.7	06.0 •• 05.5	233 49.7 248°51.6	24.6 • • 24.8	30°22.9 45°25.6	37.5 •• 37.5	Acrux	172°57.1	-63°15.4
3 4	97°01.9	275° 46.2	06.8	302°07.8	05.0	263°53.6	25.0	45°25.0°60°28.2	37.4	Gacrux	171°48.6	-57°16.4
5	97 01.9 112°04.3	275 40.2 290°45.9	05.6	302 07.8 317°08.9	04.5	203 55.0 278°55.6	25.0	75°30.9	37.4	Alioth	$166^{\circ}10.9$	55°48.1
6	112 04.3 127°06.8	305° 45.5	N01°04.5	332°10.0	N12°04.0	276 55.0 293°57.6	504°25.4	90°33.6	N11°37.3	Spica	158° 19.4	-11°18.6
7	142°09.3	320° 45.2	03.3	347°11.1	03.6	308°59.6	25.6	105°36.2	37.2	Alkaid	152°50.2	49°10.1
8	157°11.7	335° 44.8	02.2	2°12.2	03.0	324°01.6	25.8	100° 38.9	37.2	Hadar	148°32.1	-60°30.7
9	172°14.2	350°44.5	01°01.1	17°13.3	02.6	339°03.5	. 26.0	135° 41.5	• • 37.1	Menkent	147°54.3	-36°30.6
10	187°16.7	5°44.2	00°59.9	32°14.4	02.1	354°05.5	26.2	150° 44.2	37.0	Arcturus	145°45.5	19°02.0
11	202°19.1	20°43.8	58.8	47°15.4	01.6	9°07.5	26.4	165° 46.9	36.9	Rigil Kent.	139°36.6	-60°57.2
12	217°21.6	35° 43.5	N00°57.6	62°16.5	N12°01.1	24°09.5	S04°26.6	180° 49.5	N11°36.9	Kochab	137°21.3	74°02.2
13	232°24.1	50°43.1	56.5	77°17.6	00.6	39°11.5	26.8	195°52.2	36.8	Zuben'ubi	136°52.9	-16°09.6
14	247°26.5	65°42.8	55.3	92°18.7	12°00.2	54°13.4	27.0	210°54.8	36.8	Alphecca	126°01.5	26°37.2
15	262°29.0	80°42.4	• • 54.2	107°19.8	11°59.7	69°15.4	27.2	225° 57.5	• • 36.7	Antares	112°12.4	-26°29.7
16	277°31.5	95°42.1	53.0	122°20.9	59.2	84°17.4	27.4	241°00.1	36.6	Atria Sabik	107°04.2 101°59.5	-69°04.8 -15°45.5
17	292°33.9	110°41.7	51.9	137°22.0	58.7	99°19.4	27.6	256°02.8	36.6	Shaula	96°06.5	-15 45.5 -37°07.4
18	307°36.4	125°41.4	N00°50.7	152°23.1	N11°58.2	114°21.4	S04°27.8	271°05.5	N11°36.5	Rasalhague	95°55.9	12°32.6
19	322°38.8	140°41.0	49.6	167°24.2	57.7	129°23.3	28.0	286°08.1	36.4	Eltanin	90°41.1	51°29.4
20	337°41.3	155°40.7	48.4	182°25.3	57.3	144°25.3	28.2	301°10.8	36.4	Kaus Aust.	83°28.6	-34°22.2
21	352°43.8	170°40.4	• • 47.3	197°26.4	• • 56.8	159°27.3	• • 28.4	316° 13.4	• • 36.3	Vega	80°31.3	38°49.0
22	7°46.2	185° 40.0	46.1	212°27.5	56.3	174°29.3	28.6	331°16.1	36.2	Nunki	75°44.1	-26°15.6
23	22°48.7	200°39.7	45.0	227°28.6	55.8	189°31.3	28.8	346°18.8	36.2	Altair	61°57.0	8°56.9
Mer.p	ass. 21:29	ν -0.3' d-1	1′ m-4.00	$\nu 1.1' \ d-0$.5' m1.37	$\nu 2.0' d0.$	2′ m-1.69	$\nu 2.7' d-0$.1′ m-0.11	Peacock	53°01.0	-56°38.6
										Deneb	49°23.6	45°23.4
_			_		_		_		_	Enif	33°35.7	10°00.7
Sun	GHA 27° 51 2	GHA	Dec	GHA	Dec	GHA	Dec	GHA 1°21 4	Dec	Al Na'ir	27°28.9	-46°49.3
0	37°51.2	215°39.3	N00°43.8	242°29.8 257°30.9	N11°55.3	204°33.2	S04°29.0	1°21.4	N11°36.1	Fomalhaut	15°11.0	-29°28.1
1	52°53.6 67°56.1	230°39.0 245°38.6	42.7 41.5	257°30.9 272°32.0	54.8 54.3	219°35.2 234°37.2	29.2 29.4	16° 24.1 31° 26.7	36.1 36.0	Scheat	13°41.9	28°14.7
2 3	67°56.1 82°58.6	245°38.6 260°38.3	41.5 •• 40.4	272°32.0 287°33.1	54.3	234°37.2 249°39.2	29.4	31°26.7 46°29.4	36.0 · · 35.9	Markab	13°26.6	15°21.9
4	98°01.0	200 36.3 275°37.9	39.3	302°34.2	53.4	249 39.2 264°41.2	29.8	61°32.1	35.9	Oct 27 Fri	SHA	Mer.pass
5	113°03.5	290° 37.6	38.1	317°35.3	52.9	279°43.2	30.0	76° 34.7	35.8		180°03.0	09:36
6	128°05.9	305°37.2	N00°37.0	332°36.4	N11°52.4	294°45.1	S04°30.2	91°37.4	N11°35.7	Mars		07:53
7	143°08.4	320°36.9	35.8	347°37.5	51.9	309°47.1	30.4	106° 40.0	35.7	Jupiter		10:27
8	158°10.9	335°36.5	34.7	2°38.6	51.4	324°49.1	30.6	121° 42.7	35.6	Saturn	323°20.9	00:03
9	173°13.3	350°36.2	• • 33.5	17°39.7	• • 50.9	339°51.1	• • 30.8	136° 45.3	• • 35.5	0 . 22 2		
10	$188^{\circ}15.8$	5°35.9	32.4	32°40.8	50.5	$354^{\circ}53.1$	31.0	151°48.0	35.5	Oct 28 Sat	SHA	Mer.pass
11	203°18.3	20°35.5	31.2	47°41.9	50.0	9°55.0	31.2	166°50.7	35.4		178°55.6	09:37
12	218°20.7	35°35.2	N00°30.1	62°43.0	N11°49.5	24°57.0	S04°31.4	181°53.3	N11°35.4		205°11.4	07:51 10:24
13	233°23.2	50°34.8	28.9	77°44.1	49.0	39°59.0	31.6	196° 56.0	35.3	Jupiter	166° 53.7 323° 25.6	23:55
14	248°25.7	65°34.5	27.8	92°45.2	48.5	55°01.0	31.8	211°58.6	35.2	Jaturn	J_J _J.U	23.33
15	263°28.1	80°34.1	• • 26.6	107°46.3	• • 48.0	70°03.0	• • 32.0	227°01.3	• • 35.2	Oct 29 Sun	SHA	Mer.pass
16	278°30.6	95°33.8	25.5	122°47.4	47.6	85°05.0	32.2	242°04.0	35.1		$177^{\circ}48.2$	09:38
17	293°33.1	110°33.4	24.3	137°48.5	47.1	100°06.9	32.4	257°06.6	35.0		204°38.6	07:49
18	308°35.5	125°33.1	N00°23.1	152°49.6	N11°46.6	115°08.9	S04°32.6	272°09.3	N11°35.0		166°42.1	10:20
19	323°38.0	140°32.7	22.0	167°50.7	46.1	130°10.9	32.8	287°11.9	34.9	Saturn	323°30.3	23:50
20	338°40.4	155°32.4	20.8	182°51.8	45.6	145°12.9	33.0	302°14.6	34.8	Horizont	al parallax	
21	353°42.9	170°32.0	· · 19.7	197°52.9	· · 45.1	160°14.9	· · 33.2	317°17.3	• • 34.8	1.012011	Venus:	0.1
22 23	8°45.4 23°47.8	185°31.7 200°31.3	18.5 17.4	212°54.0 227°55.1	44.6 44.2	175°16.9 190°18.8	33.4 33.6	332° 19.9 347° 22.6	34.7 34.7		Mars:	0.1
										L		٧.٠
Mer.p	ass. 21:25	ν -0.3′ d-1	1' m-3.99	$\nu 1.1' \ d$ -0	.5′ m1.36	ν 2.0′ d0.	2′ m-1.69	ν 2.7′ d-0	.1′ m-0.12			

h	Sur	า			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.9	S12°53.1	70°35.5	15.6'	S10°39.7	-11.8'	54.4'
1	199°01.9	53.9	$85^{\circ}10.1$	15.6'	$10^{\circ}28.0$	-11.8'	54.4'
2	214°02.0	54.8	99°44.7	15.7'	10° 16.2	-11.8'	54.3'
3	229°02.0 244°02.1	• • 55.6	114°19.4	15.7'	10°04.4 09°52.5	-11.9'	54.3' 54.3'
4 5	244 02.1 259°02.1	56.5 57.3	128°54.1 143°28.8	15.8' 15.8'	09°52.5 09°40.7	-11.9' -11.9'	54.3'
6	274°02.2	\$12°58.1	158°03.6	15.8'	S09°28.7	-11.9'	54.3'
7	289°02.2	59.0	172°38.5	15.9'	09°16.8	-12.0'	54.3'
8	304°02.3	12°59.8	187°13.4	15.9'	09°04.8	-12.0'	54.3'
9	319°02.3	13°00.7	201°48.3	16.0'	08°52.8	-12.0'	54.3'
10 11	334°02.4 349°02.5	01.5 02.3	216°23.2 230°58.3	16.0' 16.0'	08°40.8 08°28.7	-12.1' -12.1'	54.2' 54.2'
12	4°02.5	\$13°03.2	245°33.3	16.1	S08°16.6	-12.1'	54.2'
13	19°02.6	04.0	260°08.4	16.1'	08°04.5	-12.1'	54.2'
14	34°02.6	04.9	274°43.5	16.2'	07°52.3	-12.2'	54.2'
15	49°02.7	• • 05.7	289°18.7	16.2'	07°40.2	-12.2'	54.2'
16 17	64°02.7 79°02.8	06.5 07.4	303°53.8 318°29.1	16.2' 16.3'	07°28.0 07°15.7	-12.2' -12.2'	54.2' 54.2'
18	94°02.8	\$13°08.2	333°04.3	16.3'	S07°03.5	-12.3'	54.2'
19	109°02.9	09.0	347°39.6	16.3'	06°51.2	-12.3'	54.2'
20	124°02.9	09.9	$2^{\circ}14.9$	16.3'	06°38.9	-12.3'	54.1'
21	139°03.0	• • 10.7	16°50.3	16.4'	06°26.6	-12.3'	54.1'
22 23	154°03.0 169°03.1	11.5 12.4	31°25.6 46°01.0	16.4' 16.4'	06°14.3 06°01.9	-12.4' -12.4'	54.1' 54.1'
23			+0 01.0			-12.4	J4.1
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°03.1 199°03.2	\$13°13.2 14.1	60°36.5 75°11.9	16.5' 16.5'	\$05°49.6 05°37.2	-12.4' -12.4'	54.1' 54.1'
2	214°03.2	14.1	75 11.9 89°47.4	16.5'	05°24.8	-12.4'	54.1'
3	229°03.3	15.7	104°22.9	16.5'	05°12.3	-12.4'	54.1'
4	244°03.3	16.6	118°58.4	16.5'	04°59.9	-12.5'	54.1'
5	259°03.3	17.4	133°33.9	16.6'	04°47.4	-12.5'	54.1'
6	274°03.4 289°03.4	\$13°18.2	148°09.5 162°45.1	16.6'	\$04°35.0 04°22.5	-12.5'	54.1'
7 8	289°03.4 304°03.5	19.0 19.9	162°45.1 177°20.7	16.6' 16.6'	04°22.5 04°10.0	-12.5' -12.5'	54.1' 54.1'
9	319°03.5	20.7	191°56.3	16.6'	04° 10.0	-12.5'	54.1'
10	334°03.6	21.5	206°31.9	16.6'	03°44.9	-12.5'	54.0'
11	349°03.6	22.4	221°07.6	16.7'	03°32.4	-12.6'	54.0'
12	4°03.7	\$13°23.2	235°43.3	16.7'	S03°19.8	-12.6'	54.0'
13 14	19°03.7 34°03.8	24.0 24.9	250°18.9 264°54.6	16.7' 16.7'	03°07.3 02°54.7	-12.6' -12.6'	54.0' 54.0'
15	49°03.8	25.7	279°30.3	16.7	02°42.1	-12.6'	54.0'
16	64°03.8	26.5	294°06.0	16.7'	02°29.5	-12.6'	54.0'
17	79°03.9	27.3	$308^{\circ}41.8$	16.7'	$02^{\circ}16.9$	-12.6'	54.0'
18	94°03.9	\$13°28.2	323°17.5	16.7'	S02°04.3	-12.6'	54.0'
19 20	109°04.0 124°04.0	29.0 29.8	337°53.2 352°29.0	16.7' 16.8'	01°51.7 01°39.1	-12.6' -12.6'	54.0' 54.0'
21	139°04.0	30.7	7°04.7	16.8'	01°26.5	-12.6'	54.0'
22	154°04.1	31.5	21°40.5	16.8'	01°13.8	-12.6'	54.0'
23	169°04.1	32.3	$36^{\circ}16.2$	16.8'	$01^{\circ}01.2$	-12.6'	54.0'
	SD = 16.1'	d = 0.8'		SI	D = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.2	S13°33.1	50°52.0	16.8'	S00°48.6	-12.6'	54.0'
1	199°04.2	34.0	65°27.8	16.8'	00°35.9	-12.6'	54.0'
2	214°04.3	34.8	80°03.5	16.8'	00°23.3	-12.6'	54.0'
3 4	229°04.3 244°04.3	· · 35.6 36.4	94°39.3 109°15.1	16.8' 16.8'	\$00°10.6 N00°02.0	-12.6' 12.6'	54.0' 54.0'
5	259°04.4	37.3	109 15.1 123°50.8	16.8'	00° 14.7	12.6'	54.0'
6	274°04.4	S13°38.1	138°26.6	16.8'	N00°27.3	12.6'	54.0'
7	289°04.4	38.9	153°02.3	16.8'	00°40.0	12.6'	54.0'
8	304°04.5	39.7	167°38.1	16.7'	00°52.6	12.6'	54.0'
9 10	319°04.5 334°04.6	· · 40.5 41.4	182°13.8 196°49.6	16.7' 16.7'	01°05.2 01°17.9	12.6' 12.6'	54.0' 54.0'
11	349°04.6	42.2	211°25.3	16.7'	01 17.9 01°30.5	12.6'	54.0'
12	4°04.6	S13°43.0	226°01.0	16.7'	N01°43.2	12.6'	54.0'
13	19°04.7	43.8	240°36.7	16.7'	01°55.8	12.6'	54.0'
14	34°04.7	44.6	255°12.4 269°48.1	16.7'	02°08.4 02°21.0	12.6'	54.0'
15 16	49°04.7 64°04.8	• • 45.5 46.3	269°48.1 284°23.8	16.7' 16.7'	02°21.0 02°33.6	12.6' 12.6'	54.0' 54.0'
17	79°04.8	40.3 47.1	204 23.6 298°59.5	16.6'	02° 46.2	12.6'	54.0'
18	94°04.8	S 13°47.9	313°35.1	16.6'	N02°58.8	12.6'	54.0'
19	109°04.9	48.7	328°10.7	16.6'	03°11.4	12.6'	54.0'
20	124°04.9	49.6	342°46.4	16.6'	03°24.0	12.6'	54.0'
21 22	139°04.9 154°05.0	· · 50.4 51.2	357°22.0 11°57.5	16.6' 16.6'	03°36.6 03°49.1	12.6' 12.5'	54.0' 54.0'
23	169°05.0	52.0	26°33.1	16.5'	04°01.6	12.5'	54.0'
	SD = 16.1'	d = 0.8'		SI	D = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	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°	05:45	06:46	07:43	15:44	16:40	17:41
64°	05:43	06:39	07:31	15:55	16:47	17:43
62°	05:41	06:34	07:21	16:05	16:53	17:45
60°	05:40	06:29	07:13	16:13	16:58	17:47
N 58°	05:38	06:24	07:06	16:21	17:02	17:48
56°	05:37	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
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:31	04:58	05:20	18:07	18:30	18:57
30°	04:14	04:43	05:08	18:20	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
S 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
S 60°	01:57	03:10	04:00	19:30	20:20	21:34

Lat.		Moonris	е		Moonset	;
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	15:22	14:57	14:33		00:47	02:36
N 70°	15:11	14:53	14:36		00:55	02:37
68°	15:02	14:50	14:39		·· ·· 01:02	
66°			14:41		01:08	02:38
64°	-		14:42			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
N 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
N 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
S 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
S 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°			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
S 60°	12:42	14:01	15:19	02:34	02:38	02:42

		Sun		Moon				
Day	Eqn.o	f Time	Mer.	Mer.	Pass.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	9-11		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	38°50.3	215°31.0	N00°16.2	242°56.3	N11°43.7	205°20.8	S04°33.8	2°25.2	N11°34.6			
1	53°52.8	230°30.7	15.1	257°57.4	43.2	220°22.8	34.0	17°27.9	34.5	Alpheratz	357°31.2 353°03.8	29°15.3 -42°08.9
2	68°55.2	245°30.3	13.9	272°58.5	42.7	235°24.8	34.2	32°30.6	34.5	Ankaa Schedar	349°26.9	56°42.0
3	83°57.7	260°30.0	• • 12.8	287°59.6	• • 42.2	250°26.8	• • 34.4	47°33.2	• • 34.4	Diphda	348°43.9	-17°49.6
4	99°00.2	275°29.6	11.6	303°00.7	41.7	265°28.8	34.6	62°35.9	34.3	Achernar	335°17.4	-57°05.4
5 6	114°02.6 129°05.1	290°29.3 305°28.9	10.5 N00°09.3	318°01.8 333°02.9	41.2 N11°40.8	280°30.7 295°32.7	34.8 \$04°34.9	77° 38.5 92° 41.2	34.3 N11°34.2	Hamal	327°47.3	23°36.1
7	144°07.6	320°28.6	08.2	348°04.0	40.3	310°34.7	35.1	107°43.8	34.1	Polaris	311°50.7	89°23.0
8	159°10.0	335°28.2	07.0	3°05.1	39.8	325°36.7	35.3	122°46.5	34.1	Acamar	315°09.1	-40°11.2
9	$174^{\circ}12.5$	350°27.9	• • 05.9	18°06.2	• • 39.3	340°38.7	• • 35.5	137°49.2	• • 34.0	Menkar Mirfak	314°02.6 308°23.3	4°12.3 49°57.8
10	189°14.9	5°27.5	04.7	33°07.3	38.8	355°40.7	35.7	152°51.8	34.0	Aldebaran	290°35.8	16°34.0
11	204°17.4	20°27.2	03.6	48°08.5	38.3	10°42.6	35.9 \$04°36.1	167° 54.5 182° 57.1	33.9	Rigel	281°00.7	-8°10.0
12 13	219°19.9 234°22.3	35°26.8 50°26.5	N00°02.4 01.3	63°09.6 78°10.7	N11°37.8 37.4	25°44.6 40°46.6	36.3	182°57.1 197°59.8	N11°33.8 33.8	Capella	$280^{\circ}17.0$	46°01.4
14	249°24.8	65°26.1	N00°00.1	93°11.8	36.9	55°48.6	36.5	213°02.5	33.7	Bellatrix	278°19.3	6°22.5
15	264°27.3	80°25.8	S00°01.1	108°12.9	36.4	70°50.6	36.7	228°05.1	33.6	Elnath	277°57.7	28°37.8
16	279°29.7	95°25.4	02.2	123°14.0	35.9	85°52.6	36.9	243°07.8	33.6	Alnilam	275°34.4 270°48.5	-1°11.0 7°24.7
17	294°32.2	$110^{\circ}25.1$	03.4	138°15.1	35.4	100°54.5	37.1	258° 10.4	33.5	Betelgeuse Canopus	263°50.7	-52°42.4
18	309°34.7	125°24.7	S00°04.5	153°16.2	N11°34.9	115°56.5	S04°37.3	273°13.1	N11°33.4	Sirius	258°23.4	-16°45.3
19	324°37.1	140°24.4	05.7	168°17.3	34.4	130°58.5	37.5	288°15.8	33.4	Adhara	255°03.3	-29°00.5
20 21	339°39.6 354°42.0	155°24.0 170°23.7	06.8 •• 08.0	183°18.4 198°19.6	34.0 · · 33.5	146°00.5 161°02.5	37.7 · · 37.9	303°18.4 318°21.1	33.3 · · 33.3	Procyon	244°47.5	5°09.0
22	9°44.5	185° 23.3	09.1	213°20.7	33.0	176°04.5	38.1	333°23.7	33.2	Pollux	243° 13.5	27°57.2
23	24°47.0	200°23.0	10.3	228°21.8	32.5	191°06.4	38.3	348°26.4	33.1	Avior	234°13.4	-59°35.9
		-	1.2' m-3.99		.5′ m1.36		2′ m-1.69		.1′ m-0.13	Suhail Miaplacidus	222°44.0 221°37.6	-43°32.7 -69°49.9
ivier.p	ass. 21:21	ν -0.3 a-1	m-3.99	$\nu_{1.1}$ a-0	.5 M1.30	ν 2.0 a0.	2 m-1.09	ν2.Γ a-0	.1 m-0.13	Alphard	221 37.6 217°44.8	-69 49.9 -8°47.0
_			_		_		_		_	Regulus	207°31.3	11°49.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.8	61°35.4
0 1	39°49.4 54°51.9	215°22.6 230°22.3	S00°11.4 12.6	243°22.9 258°24.0	N11°32.0 31.5	206°08.4 221°10.4	\$04°38.5 38.7	3°29.1 18°31.7	N11°33.1 33.0	Denebola	$182^{\circ}22.1$	14°24.6
2	69°54.4	245°21.9	13.8	273°25.1	31.0	236°12.4	38.9	33°34.4	32.9	Gienah	175°40.7	-17°42.0
3	84°56.8	260°21.6	• • 14.9	288°26.2	30.5	251°14.4	39.1	48° 37.0	32.9		172°57.1	-63°15.4
4	99°59.3	275°21.2	16.1	303°27.4	30.1	266°16.4	39.3	63°39.7	32.8	Alioth	171°48.6 166°10.9	-57°16.4 55°48.1
5	$115^{\circ}01.8$	290°20.9	17.2	$318^{\circ}28.5$	29.6	$281^{\circ}18.3$	39.5	78°42.3	32.8	Spica	158° 19.4	-11°18.6
6	130°04.2	305°20.5	S00°18.4	333°29.6	N11°29.1	296°20.3	S04°39.7	93°45.0	N11°32.7	Alkaid	152°50.2	49°10.1
7	145°06.7	320°20.2	19.5	348°30.7	28.6	311°22.3	39.9	108°47.7	32.6	Hadar	148°32.1	-60°30.6
8 9	160°09.2 175°11.6	335°19.8	20.7 •• 21.8	3°31.8 18°32.9	28.1 •• 27.6	326°24.3 341°26.3	40.1 •• 40.3	123°50.3 138°53.0	32.6	Menkent	$147^{\circ}54.3$	-36°30.6
10	175 11.0 190°14.1	350° 19.5 5° 19.1	23.0	33°34.0	27.1	356°28.3	40.5	150°55.0	· · 32.5 32.4	Arcturus	145° 45.5	19°02.0
11	205°16.5	20° 18.8	24.2	48°35.2	26.7	11°30.3	40.7	168°58.3	32.4	Rigil Kent.	139°36.6	-60°57.2
12	220°19.0	35° 18.4	S00°25.3	63°36.3	N11°26.2	26°32.2	S04°40.9	184°01.0	N11°32.3	Kochab	137°21.3 136°52.9	74°02.2
13	235°21.5	50°18.1	26.5	78°37.4	25.7	41°34.2	41.1	199°03.6	32.2	Zuben'ubi Alphecca	136 52.9 126°01.5	-16°09.6 26°37.2
14	250°23.9	65° 17.7	27.6	93°38.5	25.2	56°36.2	41.3	214°06.3	32.2	Antares	112° 12.4	-26°29.7
15	265°26.4	80°17.4	• • 28.8	108°39.6	• • 24.7	71°38.2	• • 41.5	229°08.9	· · 32.1	Atria	107°04.2	-69°04.8
16 17	280°28.9 295°31.3	95°17.0 110°16.7	29.9	123°40.7 138°41.8	24.2 23.7	86°40.2 101°42.2	41.7 41.9	244°11.6 259°14.3	32.1 32.0	Sabik	$101^{\circ}59.5$	-15°45.5
18	295 31.3 310°33.8	110 10.7 125°16.3	31.1 \$00°32.2	150 41.0 153°43.0	N11°23.3	101 42.2 116°44.1	\$04°42.0	274° 16.9	N11°31.9	Shaula	96°06.5	-37°07.4
19	325°36.3	140° 16.0	33.4	168°44.1	22.8	131°46.1	42.2	289° 19.6	31.9	Rasalhague	95°55.9	12°32.6
20	340°38.7	155° 15.6	34.6	183°45.2	22.3	146°48.1	42.4	304°22.2	31.8	Eltanin	90°41.1	51°29.4 -34°22.2
21	$355^{\circ}41.2$	170°15.3	• • 35.7	198°46.3	• • 21.8	161°50.1	• • 42.6	319°24.9	• • 31.7	Kaus Aust. Vega	83°28.7 80°31.3	-34 22.2 38°48.9
22	10°43.6	185°14.9	36.9	213°47.4	21.3	176°52.1	42.8	334°27.6	31.7	Nunki	75°44.1	-26°15.6
23	25°46.1	200°14.6	38.0	228°48.6	20.8	191°54.1	43.0	349°30.2	31.6	Altair	61°57.0	8°56.9
Mer.p	ass. 21:17	ν -0.3′ d1	.2′ m-3.99	$\nu 1.1' \ d$ -0	.5′ m1.35	ν 2.0′ d0.	2′ m-1.69	ν 2.7′ d-0	.1′ m-0.13	Peacock	53°01.0	-56°38.6
										Deneb	49°23.7	45°23.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.7 27°29.0	10°00.7
0	40°48.6	215° 14.2	S00°39.2	243°49.7	N11°20.3	206°56.1	S04°43.2	4°32.9	N11°31.5	Al Na'ir Fomalhaut	27° 29.0 15° 11.0	-46°49.3 -29°28.1
1	55°51.0	230°13.9	40.3	258°50.8	19.8	221°58.0	43.4	19°35.5	31.5	Scheat	13°42.0	28°14.7
2	70°53.5	245°13.5	41.5	273°51.9	19.4	237°00.0	43.6	34°38.2	31.4	Markab	13°26.6	15°21.9
3	85°56.0 100°58.4	260°13.2	• • 42.7	288°53.0	. 18.9	252°02.0	• • 43.8	49° 40.8 64° 43.5	• • 31.4	Oct 30 Mon	SHA	Mor pass
4 5	100 58.4 116°00.9	275°12.8 290°12.5	43.8 45.0	303°54.1 318°55.3	18.4 17.9	267°04.0 282°06.0	44.0 44.2	79°46.2	31.3 31.2	Venus	30A 176°40.7	Mer.pass 09:38
6	131°03.4	305°12.1	\$00°46.1	333°56.4	N11°17.4	297°08.0	S04°44.4	94°48.8	N11°31.2	Mars	204°06.0	07:48
7	146°05.8	320°11.8	47.3	348°57.5	16.9	312°10.0	44.6	109°51.5	31.1	Jupiter		10:17
8	$161^{\circ}08.3$	335°11.4	48.4	$3^{\circ}58.6$	16.4	327°11.9	44.8	124°54.1	31.0	Saturn	323°34.9	23:46
9	176°10.8	350°11.0	• • 49.6	18°59.7	• • 16.0	342°13.9	• • 45.0	139°56.8	• • 31.0	Oct 31 Tue	SHA	Mer.pass
10	191°13.2	5°10.7	50.8	34°00.9	15.5	357°15.9	45.2	154°59.5	30.9		175°33.2	09:39
11 12	206°15.7 221°18.1	20° 10.3 35° 10.0	51.9 \$00°53.1	49°02.0 64°03.1	15.0 N11°14.5	12°17.9 27°19.9	45.4 \$04°45.6	170°02.1 185°04.8	30.9 N11°30.8	Mars	203°33.5	07:46
13	236°20.6	50°09.6	54.2	79°04.2	14.0	42°21.9	45.8	200°07.4	30.7	Jupiter	166°19.0	10:14
14	251°23.1	65°09.3	55.4	94°05.4	13.5	57°23.9	46.0	215° 10.1	30.7	Saturn	323°39.6	23:42
15	$266^{\circ}25.5$	80°08.9	• • 56.6	109°06.5	• • 13.0	$72^{\circ}25.8$	• • 46.2	230°12.8	• • 30.6	Nov 01 Wed	SHA	Mer.pass
16	281°28.0	95°08.6	57.7	124°07.6	12.5	87°27.8	46.4	245°15.4	30.5		174°25.6	09:39
17	296°30.5	110°08.2	00°58.9	139°08.7	12.1	102°29.8	46.6	260°18.1	30.5	Mars	203°01.1	07:44
18 19	311°32.9 326°35.4	125°07.9 140°07.5	S01°00.0 01.2	154°09.8 169°11.0	N11°11.6 11.1	117°31.8 132°33.8	\$04°46.8 47.0	275°20.7 290°23.4	N11°30.4 30.4	Jupiter		10:11
20	341°37.9	155°07.2	01.2	184°12.1	10.6	132 33.6 147°35.8	47.0 47.1	305°26.1	30.4	Saturn	323°44.3	23:38
21	356°40.3	170°06.8	03.5	199°13.2	. 10.1	162°37.8	47.3	320°28.7	30.2	Horizont	al parallax	
22	11°42.8	185°06.4	04.7	214°14.3	09.6	$177^{\circ}39.8$	47.5	335°31.4	30.2		Venus:	0.1
23	26°45.3	200°06.1	05.8	229°15.5	09.1	192°41.7	47.7	350°34.0	30.1		Mars:	0.1
Mer.p	ass. 21:13	ν -0.4' $d1$.2′ m-3.99	$\nu 1.1' \ d-0$.5′ m1.34	ν 2.0′ d0.	2′ m-1.69	ν 2.7′ d-0	.1′ m-0.13			

h	Sun				Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.0	S 13°52.8	41°08.7	16.5'	N04°14.2	12.5'	54.0'
1 2	199°05.1 214°05.1	53.6 54.5	55°44.2 70°19.7	16.5' 16.5'	04°26.7 04°39.2	12.5' 12.5'	54.0' 54.0'
3	229°05.1	55.3	84°55.2	16.5	04 39.2 04°51.7	12.5'	54.0'
4	244°05.2	56.1	99°30.6	16.4	05°04.2	12.5'	54.0'
5	259°05.2	56.9	114°06.1	16.4'	05° 16.6	12.4'	54.1'
6	274°05.2 289°05.3	\$13°57.7 58.5	128°41.5 143°16.8	16.4' 16.4'	N05°29.1 05°41.5	12.4' 12.4'	54.1' 54.1'
7 8	289 05.3 304°05.3	58.5 13°59.3	143 10.8 157°52.2	16.4	05 41.5 05°53.9	12.4	54.1'
9	319°05.3	14°00.2	172°27.5	16.3'	06°06.3	12.4'	54.1'
10	334°05.4	01.0	187°02.8	16.3'	06° 18.6	12.3'	54.1'
11	349°05.4 4°05.4	01.8 \$14°02.6	201°38.1 216°13.3	16.2'	06°31.0 N06°43.3	12.3'	54.1'
12 13	4 05.4 19°05.4	03.4	210 13.3 230°48.5	16.2' 16.2'	06°55.6	12.3' 12.3'	54.1' 54.1'
14	34°05.5	04.2	245°23.7	16.1'	07° 07.9	12.3'	54.1'
15	49°05.5	• • 05.0	259°58.8	16.1'	07°20.2	12.2'	54.1'
16	64°05.5 79°05.5	05.8	274°33.9 289°09.0	16.1'	07°32.4 07°44.6	12.2' 12.2'	54.1' 54.1'
17 18	94°05.6	06.6 \$14°07.5	289 09.0 303°44.0	16.0' 16.0'	N07°56.8	12.2'	54.1
19	109°05.6	08.3	318°19.0	16.0'	08°08.9	12.1'	54.1'
20	124°05.6	09.1	332°54.0	15.9'	08°21.1	12.1'	54.1'
21	139°05.7	• • 09.9	347°28.9	15.9'	08°33.2	12.1'	54.2'
22 23	154°05.7 169°05.7	10.7 11.5	2°03.8 16°38.6	15.8' 15.8'	08° 45.3 08° 57.3	12.0' 12.0'	54.2' 54.2'
23						12.0	57.4
	SD = 16.1'	d = 0.8'		SL	D = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.7	\$14°12.3	31°13.4 45°48.2	15.8'	N09°09.3 09°21.3	12.0'	54.2'
1 2	199°05.8 214°05.8	13.1 13.9	45°48.2 60°22.9	15.7' 15.7'	09°21.3	12.0' 11.9'	54.2' 54.2'
3	229°05.8	•• 14.7	74°57.6	15.6'	09° 45.2	11.9'	54.2'
4	244°05.8	15.5	89°32.2	15.6'	$09^{\circ}57.1$	11.9'	54.2'
5	259°05.8	16.3	104°06.8	15.5'	10°08.9	11.8'	54.2'
6 7	274°05.9 289°05.9	\$14°17.1 17.9	118°41.3 133°15.8	15.5' 15.4'	N10°20.7 10°32.5	11.8' 11.7'	54.2' 54.2'
8	304°05.9	18.7	133 13.8 147°50.3	15.4	10° 32.3	11.7	54.2'
9	319°05.9	• • 19.5	162°24.7	15.3'	10°56.0	11.7'	54.3'
10	334°06.0	20.3	176°59.0	15.3'	11°07.6	11.6'	54.3'
11 12	349°06.0 4°06.0	21.2 \$14°22.0	191°33.3 206°07.6	15.2' 15.2'	11°19.3 N11°30.9	11.6' 11.6'	54.3' 54.3'
13	19°06.0	22.8	220°41.8	15.1'	11° 42.4	11.5	54.3'
14	34°06.0	23.6	235°15.9	15.1'	11°53.9	11.5'	54.3'
15	49°06.1	• • 24.4	249°50.0	15.0'	12°05.4	11.4'	54.3'
16 17	64°06.1 79°06.1	25.2 26.0	264°24.1 278°58.0	15.0' 14.9'	12°16.8 12°28.2	11.4' 11.3'	54.3' 54.3'
18	94°06.1	\$14°26.8	293°32.0	14.9'	N12°39.5	11.3'	54.3'
19	109°06.1	27.6	$308^{\circ}05.9$	14.8'	$12^{\circ}50.8$	11.2'	54.4'
20	124°06.1	28.4	322°39.7		13°02.1		54.4'
21 22	139°06.2 154°06.2	· · 29.2 30.0	337°13.4 351°47.1	14.7' 14.6'	13°13.3 13°24.4	11.1' 11.1'	54.4' 54.4'
23	169°06.2	30.8	6°20.8	14.6'	13°35.5	11.0'	54.4'
	SD = 16.1'	d = 0.8'		SI	0 = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°06.2 199°06.2	\$14°31.6 32.3	20°54.4 35°27.9	14.5' 14.5'	N13°46.5 13°57.5	11.0' 10.9'	54.4' 54.4'
2	214°06.2	33.1	50°01.4	14.4'	14° 08.5	10.9	54.4
3	229°06.3	• • 33.9	64°34.8	14.3'	14° 19.4	10.8'	54.5'
4	244°06.3	34.7	79°08.1	14.3'	14°30.2	10.8'	54.5'
5 6	259°06.3 274°06.3	35.5 \$14°36.3	93°41.4 108°14.6	14.2' 14.2'	14°41.0 N14°51.7	10.7' 10.7'	54.5' 54.5'
7	289°06.3	37.1	100° 14.0° 122° 47.8	14.1'	15°02.4	10.7	54.5
8	304°06.3	37.9	137°20.9	14.0'	15° 13.0	10.6'	54.5'
9	319°06.3	• • 38.7	151°53.9	14.0'	15°23.5	10.5'	54.5'
10 11	334°06.4 349°06.4	39.5 40.3	166°26.9 180°59.8	13.9' 13.8'	15°34.0 15°44.5	10.4' 10.4'	54.5' 54.6'
12	4°06.4	\$14°41.1	195°32.6	13.8'	N15°54.8	10.4	54.6
13	19°06.4	41.9	210°05.4	13.7'	16°05.1	10.2'	54.6'
14	34°06.4	42.7	224°38.1	13.6'	16° 15.4	10.2'	54.6'
15 16	49°06.4 64°06.4	· · 43.5 44.3	239°10.7 253°43.3	13.6' 13.5'	16°25.5 16°35.7	10.1' 10.0'	54.6' 54.6'
17	79°06.4	45.0	268°15.8	13.4	16° 45.7	10.0'	54.6
18	94°06.4	S14°45.8	282°48.2	13.4'	$N16^{\circ}55.7$	9.9'	54.7'
19	109°06.5 124°06.5	46.6	297°20.6	13.3'	17°05.6	9.8'	54.7'
20 21	124°06.5 139°06.5	47.4 • • 48.2	311°52.9 326°25.1	13.2' 13.2'	17° 15.4 17° 25.2	9.8' 9.7'	54.7' 54.7'
22	154°06.5	49.0	340°57.3	13.1'	17°34.9	9.6'	54.7
23	169°06.5	49.8	355°29.3	13.0'	17° 44.5	9.6'	54.7'
	SD = 16.1'	d = 0.8'	-	SI	0 = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Luti	Naut. 06:04	Civil	Junise	Junioce	Civil	Naut.
N 72°	06:04	07:27	08:54	14:32	15:59	17:21
N 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
S 10°	04:43	05:08	05:30	17:57	18:19	18:45
20°	04:29	04:56	05:19	18:09	18:32	18:59
30°	04:11	04:41	05:06	18:22	18:47	19:17
35°	03:59	04:31	04:58	18:29	18:56	19:29
40°	03:45	04:21	04:50	18:38	19:07	19:43
45°	03:28	04:08	04:40	18:48	19:21	20:00
S 50°	03:06	03:51	04:27	19:01	19:37	20:23
52°	02:54	03:44	04:22	19:07	19:45	20:35
54°	02:41	03:35	04:15	19:13	19:54	20:48
56°	02:26	03:25	04:08	19:20	20:04	21:04
58°	02:07	03:13	04:00	19:28	20:16	21:23
S 60°	01:43	03:00	03:51	19:38	20:30	21:49
	ı					

Lat.		Moonris	e		Moonset	į.
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	14:09	13:39	12:52	04:26	06:22	08:40
N 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
N 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
S 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
S 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
S 60°	16:37	17:58	19:21	02:46	02:50	02:56

		Sun		Moon			
Day		Eqn.of Time		Mer.	Pass.	Age	
,	00 ^h	12 ^h	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	Vei	nus	М	ars	Jup	iter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	41°47.7	215°05.7	S01°07.0	244°16.6	N11°08.6	207°43.7	S04°47.9	5°36.7	N11°30.0			
1	56°50.2	230°05.4	08.1	259°17.7	08.2	222°45.7	48.1	20°39.3	30.0	Alpheratz	357°31.2	29° 15.3
2	71°52.6	245°05.0	09.3	274°18.8	07.7	237°47.7	48.3	35° 42.0	29.9	Ankaa	353°03.8	-42°08.9
3	86°55.1	260°04.7	· · 10.5	289°20.0	07.2	252°49.7	• • 48.5	50° 44.7	29.8	Schedar	349°26.9	56°42.0
4	101°57.6	275°04.3	11.6	304°21.1	06.7	267°51.7	48.7	65°47.3	29.8	Diphda	348°43.9	-17°49.6
5	$117^{\circ}00.0$	290°04.0	12.8	319°22.2	06.2	282°53.7	48.9	80°50.0	29.7	Achernar Hamal	335°17.4 327°47.3	-57°05.4 23°36.1
6	132°02.5	305°03.6	S01°13.9	334°23.3	N11°05.7	297°55.7	S04°49.1	95°52.6	N11°29.7	Polaris	311°50.1	89°23.0
7	147°05.0	320°03.3	15.1	349°24.5	05.2	312°57.6	49.3	110°55.3	29.6	Acamar	315°09.1	-40°11.2
8	162°07.4	335°02.9	16.3	4°25.6	04.8	327°59.6	49.5	125°58.0	29.5	Menkar	314°02.6	4°12.3
9	177°09.9	350°02.5	• • 17.4	19°26.7	• • 04.3	343°01.6	• • 49.7	141°00.6	• • 29.5	Mirfak	308°23.2	49°57.8
10 11	192°12.4 207°14.8	5°02.2 20°01.8	18.6 19.7	34°27.8 49°29.0	03.8 03.3	358°03.6 13°05.6	49.9 50.1	156°03.3 171°05.9	29.4 29.3	Aldebaran	290°35.8	16°34.0
12	207 14.8 222°17.3	35°01.5	501°20.9	64°30.1	N11°02.8	28°07.6	50.1 S04°50.3	171 03.9 186°08.6	N11°29.3	Rigel	281°00.6	-8°10.0
13	237°19.7	50°01.1	22.1	79°31.2	02.3	43°09.6	50.5	201°11.3	29.2	Capella	280°16.9	46°01.4
14	252°22.2	65°00.8	23.2	94°32.3	01.8	58°11.6	50.7	216° 13.9	29.2	Bellatrix	278°19.3	6°22.5
15	267°24.7	80°00.4	• • 24.4	109°33.5	• • 01.3	73°13.5	• • 50.9	231°16.6	• • 29.1	Elnath	277°57.7	28°37.8
16	282°27.1	95°00.0	25.5	124°34.6	00.9	88°15.5	51.1	$246^{\circ}19.2$	29.0	Alnilam	275°34.4 270°48.5	-1°11.0 7°24.7
17	297°29.6	$109^{\circ}59.7$	26.7	139°35.7	11°00.4	103°17.5	51.2	261°21.9	29.0	Betelgeuse Canopus	263°50.7	-52°42.4
18	312°32.1	124°59.3	S01°27.9	154°36.9	N10°59.9	118°19.5	S04°51.4	276°24.5	N11°28.9	Sirius	258°23.3	-16°45.3
19	327°34.5	139°59.0	29.0	169°38.0	59.4	133°21.5	51.6	291°27.2	28.8	Adhara	255°03.3	-29°00.5
20	342°37.0	154°58.6	30.2	184°39.1	58.9	148°23.5	51.8	306°29.9	28.8	Procyon	244°47.5	5°09.0
21	357°39.5	169°58.3	· · 31.3	199°40.2	• • 58.4	163°25.5	• • 52.0	321°32.5	· · 28.7	Pollux	243°13.5	27°57.2
22 23	12°41.9 27°44.4	184°57.9 199°57.5	32.5 33.7	214°41.4 229°42.5	57.9 57.4	178°27.5 193°29.4	52.2 52.4	336°35.2 351°37.8	28.7	Avior	234°13.3	-59°35.9
23	21 44.4								28.6	Suhail	222°44.0	-43°32.7
Mer.p	ass. 21:09	ν -0.4′ $d1$.	.2′ m-3.99	$\nu 1.1' \ d$ -0	.5' m1.33	ν 2.0′ d0.	2′ m-1.69	$\nu 2.7' \ d-0$.1′ m-0.12	Miaplacidus	221°37.5	-69°49.9
										Alphard	217°44.8	-8°47.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°31.3 193°37.8	11°49.5 61°35.4
0	42°46.9	214°57.2	S01°34.8	244°43.6	N10°57.0	208°31.4	S04°52.6	6°40.5	N11°28.5	Denebola	182°22.1	14°24.6
1	57°49.3	229°56.8	36.0	259°44.8	56.5	223°33.4	52.8	21°43.2	28.5	Gienah	175°40.7	-17°42.1
2	72°51.8	244°56.5	37.1	274°45.9	56.0	238°35.4	53.0	36°45.8	28.4	Acrux	172°57.0	-63°15.4
3 4	87°54.2 102°56.7	259°56.1 274°55.8	· · 38.3 39.5	289°47.0 304°48.1	• • 55.5 55.0	253°37.4 268°39.4	· · 53.2 53.4	51°48.5 66°51.1	· · 28.3 28.3	Gacrux		-57°16.3
5	102 50.7 117°59.2	289°55.4	40.6	319°49.3	54.5	283°41.4	53.4	81°53.8	28.2	Alioth	166°10.9	55°48.0
6	133°01.6	304°55.0	S01°41.8	334°50.4	N10°54.0	298°43.4	S04°53.8	96° 56.5	N11°28.2	Spica	158°19.3	-11°18.6
7	148°04.1	319°54.7	43.0	349°51.5	53.5	313°45.4	54.0	111°59.1	28.1	Alkaid Hadar	152°50.1 148°32.1	49°10.1 -60°30.6
8	163°06.6	334°54.3	44.1	4°52.7	53.1	328°47.3	54.2	127°01.8	28.0	Menkent	146 52.1 147°54.3	-36° 30.6
9	178°09.0	349°54.0	• • 45.3	19°53.8	• • 52.6	343°49.3	• • 54.4	142°04.4	• • 28.0	Arcturus	145°45.5	19°02.0
10	193°11.5	4°53.6	46.4	34°54.9	52.1	358°51.3	54.6	157°07.1	27.9	Rigil Kent.	139°36.6	-60°57.2
11	208°14.0	19°53.2	47.6 \$01°48.8	49°56.1	51.6 N10°51.1	13°53.3	54.7 504°54.0	172°09.7 187°12.4	27.8 N11°27.8	Kochab	$137^{\circ}21.3$	74°02.2
12 13	223°16.4 238°18.9	34°52.9 49°52.5	49.9	64°57.2 79°58.3	50.6	28°55.3 43°57.3	\$04°54.9 55.1	202° 15.1	27.7	Zuben'ubi	136°52.9	-16°09.6
14	253°21.4	64°52.2	51.1	94°59.5	50.1	58°59.3	55.3	202 13.1 217°17.7	27.7	Alphecca	126°01.5	26°37.2
15	268°23.8	79°51.8	52.2	110°00.6	• • 49.6	74°01.3	55.5	232° 20.4	27.6	Antares	112°12.4	-26°29.7
16	283°26.3	94°51.4	53.4	125°01.7	49.2	89°03.3	55.7	247°23.0	27.5	Atria Sabik	107°04.2 101°59.5	-69°04.8 -15°45.5
17	298°28.7	$109^{\circ}51.1$	54.6	140°02.9	48.7	104°05.2	55.9	262°25.7	27.5	Shaula	96°06.5	-37°07.4
18	313°31.2	124°50.7	S01°55.7	155°04.0	N10°48.2	119°07.2	S04°56.1	277°28.4	N11°27.4	Rasalhague	95°55.9	12°32.6
19	328°33.7	139°50.4	56.9	170°05.1	47.7	134°09.2	56.3	292°31.0	27.3	Eltanin	90°41.1	51°29.4
20	343°36.1	154°50.0	58.0 01°59.2	185°06.3	47.2	149°11.2	56.5	307°33.7	27.3	Kaus Aust.	83°28.7	-34°22.2
21 22	358°38.6 13°41.1	169°49.6 184°49.3	01 59.2 02°00.4	200°07.4 215°08.5	· · 46.7 46.2	164°13.2 179°15.2	· · 56.7 56.9	322°36.3 337°39.0	· · 27.2 27.2	Vega	80°31.4	38°48.9
23	28°43.5	199°48.9	02 00.4	230°09.7	45.7	179 13.2 194°17.2	57.1	352°41.6	27.2	Nunki	75°44.1	-26°15.5
										Altair	61°57.0	8°56.9
Mer.p	ass. 21:05	ν -0.4′ d1.	.2′ m-3.98	ν 1.1′ d-0	.5′ m1.33	$\nu 2.0' d0.$	2′ m-1.70	ν 2.7′ d-0	.1′ m-0.11	Peacock Deneb	53°01.0 49°23.7	-56°38.6 45°23.4
										Enif	33°35.7	10°00.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°49.3
0	43°46.0	214°48.6	S02°02.7	245°10.8	N10°45.3	209°19.2	S04°57.3	7°44.3	N11°27.0	Fomalhaut	$15^{\circ}11.0$	-29°28.1
1	58°48.5	229°48.2	03.9	260°11.9	44.8	224°21.2	57.5	22°47.0	27.0	Scheat	13°42.0	28° 14.7
2	73°50.9 88°53.4	244°47.8 259°47.5	05.0 •• 06.2	275°13.1 290°14.2	44.3 •• 43.8	239°23.2 254°25.1	57.7 •• 57.8	37° 49.6 52° 52.3	26.9 •• 26.8	Markab	13°26.6	15°21.9
4	00 55.4 103°55.8	259 47.5 274°47.1	07.3	305°15.3	43.3	269°27.1	58.0	67° 54.9	26.8	Nov 02 Thu	SHA	Mer.pass
5	118°58.3	289°46.8	08.5	320°16.5	42.8	284°29.1	58.2	82°57.6	26.7		173°18.0	09:40
6	134°00.8	304°46.4	S02°09.7	335°17.6	N10°42.3	299°31.1	S04°58.4	98°00.3	N11°26.7	Mars		07:42
7	149°03.2	319°46.0	10.8	350°18.8	41.8	314°33.1	58.6	113°02.9	26.6		$165^{\circ}56.0$	10:08
8	164°05.7	334°45.7	12.0	5°19.9	41.3	329°35.1	58.8	128°05.6	26.5	Saturn	323°49.0	23:33
9	179°08.2	349°45.3	• • 13.1	20°21.0	• • 40.9	344°37.1	• • 59.0	143°08.2	• • 26.5	Nov 03 Fri	SHA	Mer.pass
10	194°10.6	4°44.9	14.3	35°22.2	40.4	359°39.1	59.2	158° 10.9	26.4		172°10.3	09:40
11 12	209°13.1 224°15.6	19°44.6 34°44.2	15.5 \$02°16.6	50°23.3 65°24.4	39.9 N10°39.4	14°41.1 29°43.1	59.4 \$04°59.6	173°13.5 188°16.2	26.3 N11°26.3	Mars	201°56.8	07:41
13	224 15.0 239°18.0	34 44.2 49°43.9	17.8	80°25.6	38.9	29 43.1 44°45.0	04°59.8	203° 18.9	26.2		165°44.6	10:05
14	254°20.5	64°43.5	19.0	95°26.7	38.4	59°47.0	04° 39.0 05° 00.0	218°21.5	26.2	Saturn	323°53.6	23:29
15	269°23.0	79°43.1	20.1	110°27.9	• • 37.9	74°49.0	00.2	233°24.2	26.1	Nov 04 Sat	SHA	Mer.pass
16	284°25.4	94°42.8	21.3	125°29.0	37.4	89°51.0	00.4	$248^{\circ}26.8$	26.0		171°02.6	09:41
17	299°27.9	109°42.4	22.4	140°30.1	37.0	104°53.0	00.6	263°29.5	26.0		$201^{\circ}24.8$	07:39
18	314°30.3	124°42.0	S02°23.6	155°31.3	N10°36.5	119°55.0	\$05°00.7	278°32.2	N11°25.9		165°33.2	10:01
19	329°32.8	139°41.7	24.8	170°32.4	36.0	134°57.0	00.9	293°34.8	25.8	Saturn	323°58.3	23:25
20 21	344°35.3 359°37.7	154°41.3 169°40.9	25.9 •• 27.1	185°33.6 200°34.7	35.5 · · 35.0	149°59.0 165°01.0	01.1 · · 01.3	308° 37.5 323° 40.1	25.8 •• 25.7	Horizont	al parallax	
22	14°40.2	184°40.6	28.3	215°35.8	34.5	180°03.0	01.5	338°42.8	25.7		Venus:	0.1
23	29°42.7	199°40.2	29.4	230°37.0	34.0	195°05.0	01.7	353°45.4	25.6		Mars:	0.1
Mern	ass. 21:01	ν-0 4' d1	.2′ m-3.98	$\nu^{1.1'} d_{-0}$.5′ m1.32	ν2 0' d0	2′ m-1.70	ν2 7' d-0	.1′ m-0.09			
- vici.p		ν U.¬ UI.	111-3.30	ν 1.1 U-U	.5 1111.34	ν Δ.Ο	_ 111-1.70	ν 2.1 u-0				

h	Sun			Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°06.5	S14°50.6	10°01.3	12.9'	$N17^{\circ}54.1$	9.5'	54.7'	
1	199°06.5	51.4	24°33.3	12.9'	18°03.6	9.4'	54.8'	
2	214°06.5 229°06.5	52.1 •• 52.9	39°05.1 53°36.9	12.8' 12.7'	18°13.0 18°22.3	9.3' 9.3'	54.8' 54.8'	
4	244°06.5	53.7	68°08.7	12.6'	18° 31.5	9.2'	54.8'	
5	259°06.5	54.5	82°40.3	12.6'	18°40.7	9.1'	54.8'	
6	274°06.5	S14°55.3	97°11.9	12.5'	N18°49.8	9.0'	54.8'	
7	289°06.5 304°06.6	56.1 56.9	111°43.4 126°14.8	12.4' 12.4'	18°58.8 19°07.8	8.9' 8.8'	54.8' 54.9'	
8 9	304 06.6 319°06.6	57.6	120 14.8 140°46.2	12.4	19 07.8 19°16.6	8.8'	54.9'	
10	334°06.6	58.4	155°17.5	12.2'	19° 25.4	8.7'	54.9'	
11	349°06.6	$14^{\circ}59.2$	169°48.7	12.1'	19°34.1	8.6'	54.9'	
12	4°06.6	\$15°00.0	184°19.8	12.1'	N19°42.6	8.5'	54.9'	
13 14	19°06.6 34°06.6	00.8 01.5	198°50.9 213°21.9	12.0' 11.9'	19°51.2 19°59.6	8.4' 8.3'	54.9' 55.0'	
15	49°06.6	02.3	213 21.9 227°52.8	11.8'	20°07.9	8.2'	55.0'	
16	64°06.6	03.1	242°23.6	11.8'	20°16.2	8.2'	55.0'	
17	79°06.6	03.9	256° 54.4	11.7'	20°24.3	8.1'	55.0'	
18	94°06.6 109°06.6	\$15°04.7	271°25.1 285°55.7	11.6' 11.5'	N20°32.4 20°40.3	8.0' 7.9'	55.0'	
19 20	109°06.6 124°06.6	05.4 06.2	285°55.7 300°26.2	11.5'	20°40.3 20°48.2	7.9 7.8'	55.0' 55.0'	
21	139°06.6	• • 07.0	314°56.7	11.4'	20° 56.0	7.7'	55.1'	
22	154°06.6	07.8	329°27.1	11.3'	21°03.7	7.6'	55.1'	
23	169°06.6	08.6	343°57.4	11.2'	21°11.3	7.5'	55.1'	
	SD = 16.1'	d = 0.8'		SD	= 14.9'			
۲.	CUA	D-:	CUA		D	.,	LIP	
Fri 0	GHA 184°06.6	Dec \$15°09.3	GHA 358°27.7	u 11.2'	Dec N21° 18.8	d 7.4'	HP 55.1'	
1	199°06.6	10.1	12°57.8	11.1'	21°26.2	7.3'	55.1'	
2	214°06.6	10.9	27°27.9	11.0'	21°33.5	7.2'	55.1'	
3	229°06.6	• • 11.7	41°58.0	11.0'	21°40.7	7.1'	55.2'	
4 5	244°06.6 259°06.6	12.4 13.2	56°27.9 70°57.8	10.9' 10.8'	21°47.7 21°54.7	7.0' 6.9'	55.2' 55.2'	
6	274°06.6	\$15°14.0	85°27.6	10.6	N22°01.6	6.8	55.2'	
7	289°06.6	14.8	99°57.4	10.7'	22°08.4	6.7'	55.2'	
8	304°06.6	15.5	114°27.0	10.6'	$22^{\circ}15.1$	6.6'	55.3'	
9	319°06.6	· · 16.3	128°56.6	10.5'	22°21.6	6.5'	55.3'	
10 11	334°06.6 349°06.6	17.1 17.9	143°26.1 157°55.6	10.5' 10.4'	22°28.1 22°34.5	6.4' 6.2'	55.3' 55.3'	
12	4°06.6	\$15°18.6	172°25.0	10.3	N22°40.7	6.1	55.3'	
13	19°06.6	19.4	186°54.3	10.2'	22°46.8	6.0'	55.3'	
14	34°06.5	20.2	201°23.5	10.2'	22°52.9	5.9'	55.4'	
15 16	49°06.5 64°06.5	· · 20.9 21.7	215°52.7 230°21.8	10.1' 10.0'	22°58.8 23°04.6	5.8' 5.7'	55.4' 55.4'	
17	79°06.5	22.5	244°50.8	10.0'	23°10.3	5.6'	55.4'	
18	94°06.5	S15°23.3	259°19.8	9.9'	N23°15.8	5.5'	55.4'	
19	109°06.5	24.0	273°48.7	9.8'	23°21.3	5.3'	55.4'	
20	124°06.5 139°06.5	24.8 •• 25.6	288°17.6 302°46.3	9.8' 9.7'	23°26.6 23°31.9	5.2' 5.1'	55.5' 55.5'	
21 22	159 00.5 154°06.5	26.3	302 40.3 317°15.0	9.7 9.6'	23°37.0	5.1 5.0'	55.5'	
23	169°06.5	27.1	331°43.7	9.6'	23°41.9	4.9'	55.5'	
	SD = 16.1'	d = 0.8'		SD	0 = 15.0'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°06.5	S 15°27.9	346°12.3	9.5'	N23°46.8	4.7'	55.5'	
1	199°06.5	28.6	0°40.8	9.5'	23°51.5	4.6'	55.6'	
2	214°06.5 229°06.4	29.4 •• 30.2	15°09.2 29°37.6	9.4' 9.3'	23°56.2 24°00.7	4.5' 4.4'	55.6' 55.6'	
4	244°06.4	30.2	44°06.0	9.3'	24°05.0	4.4	55.6'	
5	259°06.4	31.7	58°34.2	9.2'	24°09.3	4.1'	55.6'	
6	274°06.4	\$15°32.5	73°02.4	9.2'	N24°13.4	4.0'	55.7'	
7 8	289°06.4 304°06.4	33.2 34.0	87°30.6 101°58.7	9.1' 9.0'	24°17.4 24°21.3	3.9' 3.7'	55.7' 55.7'	
9	319°06.4	• • 34.8	101 56.7 116°26.7	9.0'	24° 25.0	3.6'	55.7'	
10	334°06.4	35.5	130°54.7	8.9'	24°28.6	3.5'	55.7'	
11	349°06.3	36.3	145°22.7	8.9'	24°32.1	3.4'	55.7'	
12 13	4°06.3 19°06.3	\$15°37.0 37.8	159°50.6 174°18.4	8.8' 8.8'	N24°35.5 24°38.7	3.2' 3.1'	55.8' 55.8'	
13	34°06.3	37.8 38.6	174°18.4 188°46.2	8.8 8.7'	24° 38.7 24° 41.8	3.1	55.8'	
15	49°06.3	• • 39.3	203°13.9	8.7'	24°44.8	2.8'	55.8'	
16	64°06.3	40.1	217°41.6	8.6'	24°47.6	2.7'	55.8'	
17	79°06.3	40.8	232°09.2	8.6'	24°50.3	2.6'	55.9'	
18 19	94°06.2 109°06.2	\$15°41.6 42.4	246°36.8 261°04.3	8.5' 8.5'	N24°52.9 24°55.3	2.4' 2.3'	55.9' 55.9'	
20	124°06.2	43.1	201 04.3 275°31.8	8.5'	24°57.6	2.2'	55.9'	
21	139°06.2	• • 43.9	289°59.3	8.4'	24°59.8	2.0'	55.9'	
22	154°06.2	44.6	304°26.7	8.4'	25°01.8	1.9'	56.0'	
23	169°06.2	45.4	318°54.1	8.3'	25°03.7	1.8'	56.0'	
	SD = 16.1'	d = 0.8'		SD	0 = 15.1'			

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

Lat.		Moonris	e		Moonse	t
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 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
N 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
N 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
N 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
S 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
S 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
S 60°	20:47	22:10	23:23	03:04	03:17	03:39

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Age		
,	00 ^h	12 ^h	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	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	44°45.1	214°39.8	S02°30.6	245°38.1	N10°33.5	210°07.0	S05°01.9	8°48.1	N11°25.5			
1	59°47.6	229°39.5	31.7	260°39.3	33.1	225°08.9	02.1	23°50.8	25.5	Alpheratz	357°31.2	29°15.3
2	74°50.1	244°39.1	32.9	275°40.4	32.6	240° 10.9	02.3	38°53.4	25.4	Ankaa	353°03.8	-42°08.9
3	89°52.5	259°38.8	34.1	290°41.5	32.1	255° 12.9	• • 02.5	53°56.1	. 25.4	Schedar	349°26.9	56°42.0
4	104°55.0	274°38.4	35.2	305°42.7	31.6	270° 14.9	02.7	68°58.7	25.3	Diphda	348°43.9	-17°49.6
5	119°57.5	289°38.0	36.4	320°43.8	31.1	285°16.9	02.9	84°01.4	25.2	Achernar	335° 17.5	-57°05.4
6	134°59.9	304°37.7	S02°37.6	335°45.0	N10°30.6	300° 18.9	S05°03.1	99°04.0	N11°25.2	Hamal	327°47.3	23°36.1
7	150°02.4	319°37.3	38.7	350°46.1	30.1	315°20.9	03.2	114°06.7	25.1	Polaris	311°49.4	89°23.0
8	165°04.8	334°36.9	39.9	5°47.2	29.6	330°22.9	03.4	129°09.4	25.0	Acamar	315°09.0	-40°11.3
9	180°07.3	349°36.6	· · 41.0	20° 48.4	29.2	345°24.9	• • 03.6	144°12.0	25.0	Menkar	314°02.6	4°12.3
10	195°09.8	4°36.2	42.2	35°49.5	28.7	0°26.9	03.8	159°14.7	24.9	Mirfak	308°23.2	49°57.8
11	210°12.2	19°35.8	43.4	50°50.7	28.2	15°28.9	04.0	174°17.3	24.9	Aldebaran	290°35.7	16°34.0
12	225°14.7	34° 35.5	S02°44.5	65°51.8	N10°27.7	30°30.9	S05°04.2	189°20.0	N11°24.8	Rigel	281°00.6	-8°10.0
13	240°17.2	49°35.1	45.7	80°53.0	27.2	45°32.8	04.4	204°22.6	24.7	Capella	280°16.9	46°01.4
14	255°19.6	64°34.7	46.8	95°54.1	26.7	60°34.8	04.6	219°25.3	24.7	Bellatrix	278°19.3	6°22.5
15	270°22.1	79°34.4	48.0	110°55.2	26.2	75°36.8	• • 04.8	234°28.0	• • 24.6	Elnath	277°57.6	28°37.8
16	285°24.6	94°34.0	49.2	125°56.4	25.7	90°38.8	05.0	249°30.6	24.5	Alnilam	275°34.3	-1°11.0
17	300°27.0	109°33.6	50.3	140°57.5	25.2	105°40.8	05.2	264°33.3	24.5	Betelgeuse	270°48.5	7°24.7
18	315°29.5	124°33.2	S02°51.5	155°58.7	N10°24.8	120°42.8	S05°05.4	279°35.9	N11°24.4	Canopus	263°50.7	-52°42.5
19	330°32.0	139°32.9	52.7	170°59.8	24.3	135° 44.8	05.6	294°38.6	24.4	Sirius	258°23.3	-16°45.3
20	345°34.4	154°32.5	53.8	186°01.0	23.8	150° 46.8	05.7	309°41.3	24.3	Adhara	255°03.2	-29°00.5
21	0°36.9	169°32.1	• • 55.0	201°02.1	• • 23.3	165°48.8	• • 05.9	324°43.9	• • 24.2	Procyon	244°47.5	5°09.0
22	15°39.3	184°31.8	56.1	216°03.3	22.8	180°50.8	06.1	339°46.6	24.2	Pollux	243°13.4	27°57.2
23	30°41.8	199°31.4	57.3	231°04.4	22.3	195°52.8	06.3	354°49.2	24.1	Avior	234°13.3	-59°35.9
										Suhail	222°44.0	-43°32.8
ivier.p	ass. 20:58	ν -0.4′ $d1$.2′ m-3.98	ν 1.1 d-0	.5′ m1.31	ν 2.0° d0.	2′ m-1.70	ν2.Γ d-0	.1′ m-0.08	Miaplacidus	221°37.5 217°44.7	-69°49.9 -8°47.0
										Alphard		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.3	11°49.5
0	45°44.3	214°31.0	502°58.5	246°05.6	N10°21.8	210°54.8	S05°06.5	9°51.9	N11°24.1	Dubhe	193°37.8 182°22.0	61°35.4 14°24.6
1	60°46.7	229°30.7	02°59.6	261°06.7	21.3	225° 56.8	06.7	24°54.5	24.0	Denebola		
2	75°49.2	244°30.3	03°00.8	276°07.8	20.9	240°58.8	06.9	39°57.2	23.9	Gienah	175°40.6	-17°42.1 -63°15.4
3	90°51.7	259°29.9	• • 02.0	291°09.0	• • 20.4	256°00.7	• • 07.1	54°59.9	• • 23.9	Acrux	172°57.0 171°48.5	-03 15.4 -57°16.3
4	105°54.1	274°29.6	03.1	$306^{\circ}10.1$	19.9	271°02.7	07.3	70°02.5	23.8	Gacrux Alioth	171 46.5 166° 10.9	-57 10.5 55°48.0
5	120°56.6	289°29.2	04.3	321°11.3	19.4	286°04.7	07.5	85°05.2	23.7	Spica	158° 19.3	-11°18.6
6	135°59.1	304°28.8	S03°05.4	336°12.4	N10°18.9	301°06.7	S05°07.7	100°07.8	N11°23.7	Alkaid	150° 19.5 152° 50.1	49°10.1
7	151°01.5	$319^{\circ}28.4$	06.6	351°13.6	18.4	316°08.7	07.9	$115^{\circ}10.5$	23.6	Hadar	148° 32.1	-60°30.6
8	166°04.0	$334^{\circ}28.1$	07.8	6°14.7	17.9	331°10.7	0.80	130°13.1	23.6	Menkent	140° 52.1	-36°30.6
9	181°06.5	349°27.7	• • 08.9	21°15.9	• • 17.4	346°12.7	• • 08.2	145°15.8	• • 23.5	Arcturus	147 54.5 145°45.5	19°02.0
10	196°08.9	4°27.3	10.1	36°17.0	17.0	1°14.7	08.4	160°18.5	23.4	Rigil Kent.	139° 36.6	-60°57.2
11	211°11.4	$19^{\circ}27.0$	11.3	51°18.2	16.5	$16^{\circ}16.7$	08.6	$175^{\circ}21.1$	23.4	Kochab	137°21.3	74°02.1
12	226°13.8	34°26.6	S03°12.4	66°19.3	N10°16.0	31°18.7	S05°08.8	190°23.8	N11°23.3	Zuben'ubi	136°52.9	-16°09.6
13	241°16.3	49°26.2	13.6	81°20.5	15.5	46°20.7	09.0	205°26.4	23.3	Alphecca	126°01.5	26°37.2
14	256°18.8	64°25.8	14.7	96°21.6	15.0	61°22.7	09.2	220°29.1	23.2	Antares	112° 12.4	-26°29.7
15	271°21.2	79° 25.5	• • 15.9	111°22.8	• • 14.5	76°24.7	• • 09.4	235°31.7	• • 23.1	Atria	107°04.2	-69°04.7
16	286°23.7	94°25.1	17.1	126°23.9	14.0	91°26.7	09.6	250°34.4	23.1	Sabik	101°59.5	-15°45.5
17	301°26.2	109°24.7	18.2	141°25.1	13.5	106°28.7	09.8	$265^{\circ}37.1$	23.0	Shaula	96°06.5	-37°07.4
18	316°28.6	124°24.4	503°19.4	156°26.2	N10°13.0	121°30.7	S05°10.0	280°39.7	N11°23.0	Rasalhague	95°55.9	12°32.6
19	331°31.1	139°24.0	20.5	171°27.4	12.6	136°32.6	10.1	295°42.4	22.9	Eltanin	90°41.1	51°29.4
20	346°33.6	154°23.6	21.7	186°28.5	12.1	151°34.6	10.3	310°45.0	22.8	Kaus Aust.	83°28.7	-34°22.2
21	1°36.0	169°23.2	• • 22.9	201°29.7	• • 11.6	166°36.6	• • 10.5	325°47.7	• • 22.8	Vega	80°31.4	38°48.9
22	16°38.5	184°22.9	24.0	216°30.8	11.1	181°38.6	10.7	340°50.3	22.7	Nunki	75°44.1	-26°15.5
23	31°40.9	199°22.5	25.2	231°32.0	10.6	196°40.6	10.9	355°53.0	22.6	Altair	61°57.1	8°56.9
Mern	ass. 20:54	v=0.4' d1	.2′ m-3.98	v1 1' d-0	.5′ m1.30	v2 0' d0	2′ m-1.70	√2 7′ d-0	.1′ m-0.08	Peacock	53°01.1	-56°38.6
- Wici.p	20.54	ν σ. + α1	.2 111 3.30	ν 1.1 · u · υ	.5 1111.50	ν 2.0 do.		- VZ.1 U U		Deneb	49°23.7	45°23.4
										Enif	33°35.7	10°00.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°49.3
0	46°43.4	214°22.1	S03°26.4	246°33.1	N10°10.1	211°42.6	S05°11.1	10°55.6	N11°22.6	Fomalhaut	15°11.0	-29°28.1
1	61°45.9	229°21.7	27.5	261°34.3	09.6	226° 44.6	11.3	25°58.3	22.5	Scheat	13°42.0	28°14.7
2	76°48.3	244°21.4	28.7	276°35.4	09.1	241°46.6	11.5	41°01.0	22.5	Markab	13°26.6	15°21.9
3	91°50.8	259°21.0	• • 29.8	291°36.6	• • 08.7	256° 48.6	• • 11.7	56°03.6	• • 22.4			
4	106°53.3	274°20.6	31.0	306°37.7	08.2	271°50.6	11.9	71°06.3	22.3	Nov 05 Sun	SHA	Mer.pass
5	121°55.7	289°20.3	32.2	321°38.9	07.7	286°52.6	12.1	86°08.9	22.3		169°54.7	09:42
6	136°58.2	304°19.9	S03°33.3		N10°07.2	301°54.6	S05°12.2	101°11.6	N11°22.2	Mars		07:37
7	152°00.7	319°19.5	34.5	351°41.2	06.7	316°56.6	12.4	116°14.2	22.2	Jupiter		09:58
8	167°03.1	334°19.1	35.6	6°42.4	06.2	331°58.6	12.6	131°16.9	22.1	Saturn	324°03.0	23:21
9	182°05.6	349°18.8	36.8	21°43.5	• • 05.7	347°00.6	• • 12.8	146°19.6	• • 22.0	Nov 06 Mon	SHA	Mer.pass
10	197°08.1	4°18.4	38.0	36°44.7	05.2	2°02.6	13.0	161°22.2	22.0		168°46.8	09:42
11	212°10.5	19°18.0	39.1	51°45.8	04.8	17°04.6	13.2	176°24.9	21.9	Mars		07:35
12	227°13.0	34°17.6	\$03°40.3	66°47.0	N10°04.3	32°06.6	\$05°13.4	191°27.5	N11°21.9		165°10.5	09:55
13	242°15.4	49°17.2	41.5	81°48.1	03.8	47°08.6	13.6	206°30.2 221°32.8	21.8	Saturn	324°07.6	23:16
14 15	257°17.9	64°16.9	42.6	96°49.3	03.3	62° 10.6 77° 12.6	13.8	221 32.8 236°35.5	21.7	NI- 07 T	CIII	
15 16	272°20.4 287°22.8	79°16.5	· · 43.8	111°50.4		92° 14.5	14.0	230°35.5 251°38.2	•• 21.7	Nov 07 Tue	SHA	Mer.pass
16 17		94°16.1	44.9 46.1	126°51.6	02.3		14.1		21.6		167°38.7	09:43
17 18	302°25.3 317°27.8	109° 15.7 124° 15.4	46.1 \$03°47.3	141°52.8 156°53.9	01.8 N10°01.3	107° 16.5 122° 18.5	14.3 \$05°14.5	266°40.8 281°43.5	21.5 N11°21.5		199°49.7	07:33
18 19	317°27.8 332°30.2	124° 15.4 139° 15.0	48.4	150°53.9 171°55.1	00.9	122° 18.5 137° 20.5	14.7	281°43.5 296°46.1	N11 21.5 21.4		164°59.2	09:52
20	332 30.2 347°32.7	159 15.0 154°14.6	48.4 49.6	171 55.1 186° 56.2	10°00.4	157 20.5 152° 22.5	14.7 14.9	290 46.1 311°48.8	21.4	Saturn	324°12.2	23:12
20	2°35.2	169°14.2	49.6 •• 50.7	201°57.4	09°59.9	152 22.5 167°24.5	14.9	311 48.8 326°51.4	21.4	Horizont	al parallax	
22	2 35.2 17°37.6	184°13.9	51.9	201 57.4 216°58.5	59.4	182° 26.5	15.3	341°54.1	21.3		Venus:	0.1
23	32°40.1	199° 13.5	53.1	231°59.7	58.9	197° 28.5	15.5	356°56.7	21.2		Mars:	0.1
Mer.p	ass. 20:50	ν -0.4' d1	.2′ m-3.98	ν 1.2′ d-0	.5′ m1.30	ν 2.0′ d0.	2′ m-1.70	$\nu 2.7' \ d-0$.1′ m-0.07			

h	Sui	Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.1	S15°46.1	333°21.4	8.3'	N25°05.5	1.6'	56.0'
1 2	199°06.1 214°06.1	46.9 47.7	347°48.7 2°15.9	8.3' 8.2'	25°07.1 25°08.6	1.5' 1.3'	56.0' 56.0'
3	229°06.1	• 48.4	16°43.2	8.2'	25°09.9	1.2'	56.1
4	244°06.1	49.2	$31^{\circ}10.3$	8.1'	$25^{\circ}11.1$	1.1'	56.1'
5	259°06.1	49.9	45°37.5 60°04.6	8.1'	25°12.2 N25°13.1	0.9'	56.1'
6 7	274°06.0 289°06.0	\$15°50.7 51.4	60°04.6 74°31.7	8.1' 8.1'	N25°13.1 25°13.9	0.8' 0.6'	56.1' 56.1'
8	304°06.0	52.2	88°58.7	8.0'	25°14.5	0.5	56.2
9	319°06.0	•• 52.9	103°25.8	8.0'	25°15.0	0.4'	56.2'
10 11	334°05.9 349°05.9	53.7 54.4	117°52.8 132°19.7	8.0' 7.9'	25°15.4 25°15.6	0.2' 0.1'	56.2' 56.2'
12	4°05.9	\$15°55.2	132 19.7 146°46.7	7.9'	N25°15.7	-0.1	56.2
13	19°05.9	55.9	$161^{\circ}13.6$	7.9'	$25^{\circ}15.6$	-0.2'	56.3'
14	34°05.9 49°05.8	56.7	175°40.5 190°07.4	7.9'	25°15.4 25°15.1	-0.3'	56.3'
15 16	49 05.8 64°05.8	• • 57.4 58.2	204°34.3	7.9' 7.8'	25 15.1 25°14.6	-0.5' -0.6'	56.3' 56.3'
17	79°05.8	58.9	219°01.1	7.8'	25°14.0	-0.8'	56.3'
18	94°05.8	S15°59.7	233°27.9	7.8'	N25°13.2	-0.9'	56.4'
19 20	109°05.7 124°05.7	16°00.4 01.2	247°54.7 262°21.5	7.8' 7.8'	25°12.3 25°11.2	-1.1' -1.2'	56.4' 56.4'
21	139°05.7	01.2	276°48.3	7.8'	25°10.0	-1.2 -1.4'	56.4
22	154°05.7	02.7	291°15.1	7.8'	25°08.6	-1.5'	56.5'
23	169°05.6	03.4	305°41.9	7.8'	25°07.2	-1.6'	56.5'
	SD = 16.1'	d = 0.8'		SI	D = 15.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.6	\$16°04.2	320°08.6	7.7'	N25°05.5	-1.8'	56.5
1	199°05.6	04.9	334°35.4	7.7'	25°03.7	-1.9'	56.5'
2	214°05.6 229°05.5	05.6 •• 06.4	349°02.1 3°28.9	7.7' 7.7'	25°01.8 24°59.7	-2.1' -2.2'	56.5' 56.6'
3 4	244°05.5	07.1	3 20.9 17°55.6	7.7'	24° 57.5	-2.2 -2.4'	56.6
5	259°05.5	07.9	$32^{\circ}22.3$	7.7'	24°55.2	-2.5'	56.6'
6	274°05.4	S16°08.6	46°49.1	7.7'	N24°52.7	-2.6'	56.6'
7 8	289°05.4 304°05.4	09.4 10.1	61°15.8 75°42.5	7.7' 7.7'	24°50.0 24°47.2	-2.8' -2.9'	56.6' 56.7'
9	319°05.4	• • 10.8	90°09.3	7.7'	24°44.3	-3.1'	56.7'
10	334°05.3	11.6	104°36.0	7.7'	24°41.2	-3.2'	56.7'
11 12	349°05.3 4°05.3	12.3 \$16°13.1	119°02.8 133°29.5	7.8' 7.8'	24°38.0 N24°34.6	-3.4' -3.5'	56.7' 56.8'
13	19°05.2	13.8	147°56.3	7.8'	24°31.1	-3.6'	56.8'
14	34°05.2	14.5	162°23.1	7.8'	24°27.5	-3.8'	56.8'
15 16	49°05.2 64°05.1	· · 15.3 16.0	176°49.8 191°16.6	7.8' 7.8'	24°23.7 24°19.8	-3.9' -4.1'	56.8' 56.8'
17	79°05.1	16.8	205°43.4	7.8'	24° 15.7	-4.1 -4.2'	56.9
18	94°05.1	S16°17.5	220°10.3	7.8'	N24°11.5	-4.4'	56.9'
19	109°05.0 124°05.0	18.2 19.0	234°37.1 249°04.0	7.9' 7.9'	24°07.1 24°02.6	-4.5' -4.6'	56.9' 56.9'
20 21	139°05.0	19.0	263°30.8	7.9' 7.9'	24 02.0 23°58.0	-4.8'	50.9 57.0'
22	154°04.9	20.4	277°57.7	7.9'	23°53.2	-4.9'	57.0'
23	169°04.9	21.2	292°24.6	7.9'	23°48.3	-5.1'	57.0'
	SD = 16.1'	d = 0.7'		SI	D = 15.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.9	\$16°21.9	306°51.6	7.9'	N23°43.2	-5.2'	57.0'
1 2	199°04.8 214°04.8	22.6 23.4	321°18.5 335°45.5	8.0' 8.0'	23°38.0 23°32.7	-5.3' -5.5'	57.0' 57.1'
3	229°04.8	• • 24.1	350°12.5	8.0'	23°27.2	-5.6'	57.1'
4	244°04.7	24.8	4°39.5	8.0'	23°21.6	-5.8'	57.1'
5 6	259°04.7 274°04.6	25.6 \$16°26.3	19°06.5 33°33.6	8.1' 8.1'	23°15.8 N23°09.9	-5.9' -6.0'	57.1' 57.2'
7	289°04.6	27.0	48°00.7	8.1'	23°03.9	-6.2	57.2
8	304°04.6	27.8	62°27.8	8.2'	22°57.8	-6.3'	57.2'
9 10	319°04.5 334°04.5	· · 28.5 29.2	76°55.0 91°22.2	8.2' 8.2'	22°51.5 22°45.0	-6.4' -6.6'	57.2' 57.3'
11	334 04.5 349°04.4	30.0	91 22.2 105°49.4	8.2'	22°45.0 22°38.5	-6.7'	57.3'
12	4°04.4	S16°30.7	120°16.6	8.3'	N22°31.8	-6.8'	57.3'
13	19°04.4 34°04.3	31.4	134°43.9 149°11.2	8.3'	22°25.0 22°18.0	-7.0' -7.1'	57.3'
14 15	34°04.3 49°04.3	32.1 •• 32.9	149°11.2 163°38.5	8.3' 8.4'	22°18.0 22°10.9	-7.1' -7.2'	57.3' 57.4'
16	64°04.2	33.6	$178^{\circ}05.9$	8.4'	22°03.7	-7.4'	57.4'
17	79°04.2	34.3	192°33.3	8.4'	21°56.3	-7.5'	57.4
18 19	94°04.2 109°04.1	\$16°35.0 35.8	207°00.8 221°28.2	8.5' 8.5'	N21°48.8 21°41.2	-7.6' -7.7'	57.4' 57.5'
20	124°04.1	36.5	235°55.8	8.6'	21°33.5	-7.7 -7.9'	57.5
21	139°04.0	• • 37.2	250°23.3	8.6'	21°25.6	-8.0'	57.5
22 23	154°04.0 169°03.9	37.9 38.7	264°50.9 279°18.5	8.6' 8.7'	21°17.6 21°09.5	-8.1' -8.2'	57.5' 57.6'
23	SD = 16.1'	d = 0.7'			D = 15.6'	J.2	51.0
	<u> </u>	<u> </u>		ار	13.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	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
N 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
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:53	05:16	18:12	18:35	19:02
30°	04:05	04:36	05:01	18:27	18:52	19:23
35°	03:52	04:25	04:53	18:35	19:03	19:36
40°	03:37	04:13	04:43	18:45	19:15	19:51
45°	03:18	03:59	04:31	18:57	19:30	20:11
S 50°	02:52	03:40	04:17	19:11	19:49	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
S 60°	01:09	02:40	03:35	19:54	20:50	22:25

Lat.		Moonris	e		Moonset	:
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
N 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
N 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
S 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
S 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
S 60°	•• ••	00:19	00:53	04:16	05:15	06:35

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

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

h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	47° 42.6	214°13.1	S03°54.2	247°00.9	N09°58.4	212°30.5	S05°15.7	11°59.4	N11°21.1			
1	62°45.0	229°12.7	55.4	262°02.0	57.9	227°32.5	15.9	27°02.1	21.1	Alpheratz	357°31.2	29°15.3
2	77° 47.5	244°12.3	56.5	277°03.2	57.4	242°34.5	16.0	42°04.7	21.0	Ankaa	353°03.8	-42°08.9
3	92°49.9	259°12.0	• • 57.7	292°04.3	• • 56.9	257°36.5	. 16.2	57°07.4	20.9	Schedar	349°26.9	56°42.0
4	107°52.4	274°11.6	03°58.9	307°05.5	56.5	272°38.5	16.4	72°10.0	20.9	Diphda	348°43.9	-17°49.6
5	122°54.9	289°11.2	04°00.0	322°06.6	56.0	287°40.5	16.6	87°12.7	20.8	Achernar	335° 17.5	-57°05.4
6	137°57.3	304°10.8	S04°01.2	337°07.8	N09°55.5	302°42.5	S05°16.8	102°15.3	N11°20.8	Hamal	327°47.3	23°36.1
7	152°59.8	319°10.4	02.3	352°09.0	55.0	317°44.5	17.0	117°18.0	20.7	Polaris	311°48.9	89°23.1
8	168°02.3	334°10.1	03.5	7° 10.1	54.5	332°46.5	17.2	132°20.6	20.6	Acamar	315°09.0	-40°11.3
9	183°04.7	349°09.7	• • 04.7	22°11.3	• • 54.0	347°48.5	• • 17.4	147°23.3	20.6	Menkar	314°02.6	4°12.3
10	198°07.2	4°09.3	05.8	37°12.4	53.5	2°50.5	17.6	162°26.0	20.5	Mirfak	308°23.2	49°57.8
11	213°09.7	19°08.9	07.0	52°13.6	53.0	17°52.5	17.7	177°28.6	20.5	Aldebaran	290°35.7	16°34.0
12	228°12.1	34°08.5	S04°08.1	67°14.8	N09°52.6	32°54.5	S05°17.9	192°31.3	N11°20.4	Rigel	281°00.6	-8°10.1
13	243°14.6	49°08.2	09.3	82°15.9	52.1	47°56.5	18.1	207°33.9	20.3	Capella	280°16.9	46°01.4 6°22.5
14	258° 17.1	64°07.8	10.5	97° 17.1	51.6	62°58.5	18.3	222°36.6	20.3	Bellatrix Elnath	278° 19.3 277° 57.6	28°37.8
15	273° 19.5	79°07.4	• • 11.6	112° 18.2	• • 51.1	78°00.5	• • 18.5	237°39.2	• • 20.2	Alnilam	275°34.3	-1°11.0
16	288°22.0	94°07.0	12.8	127° 19.4	50.6	93°02.5	18.7	252°41.9	20.2	Betelgeuse	270°48.5	7°24.7
17	303°24.4	109°06.6	13.9	142°20.6	50.1	108°04.5	18.9	267°44.5	20.1	Canopus	263°50.6	-52°42.5
18	318°26.9	124°06.2	S04°15.1	157°21.7	N09°49.6	123°06.5	S05°19.1	282°47.2	N11°20.0	Sirius	258°23.3	-16°45.3
19	333° 29.4	139°05.9	16.3	172°22.9	49.1	138°08.5	19.3	297°49.9	20.0	Adhara	255°03.2	-29°00.6
20	348°31.8	154°05.5	17.4	187°24.1	48.7	153°10.5	19.4	312°52.5	19.9	Procyon	244°47.5	5°09.0
21	3°34.3	169°05.1	• • 18.6	202°25.2	• • 48.2	168°12.5	• • 19.6	327°55.2	• • 19.9	Pollux	243°13.4	27°57.2
22	18° 36.8	184°04.7	19.7	217°26.4	47.7	183°14.5	19.8	342°57.8	19.8	Avior	234°13.2	-59°35.9
23	33°39.2	199°04.3	20.9	232°27.5	47.2	198°16.5	20.0	358°00.5	19.7	Suhail	222°44.0	-43°32.8
Mer.n	ass. 20:46	ν -0.4' d1	.2′ m-3.97	ν 1.2' d-0	0.5' m1.29	$\nu 2.0' d0$	2′ m-1.70	ν2.7' d-0	.1′ m-0.06	Miaplacidus	221°37.4	-69°49.9
										Alphard	217°44.7	-8°47.0
			_		_		_		_	Regulus	207°31.2	11°49.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.7	61°35.4
0	48°41.7	214°03.9	S04°22.0	247°28.7	N09°46.7	213°18.5	S05°20.2	13°03.1	N11°19.7	Denebola	182°22.0	14°24.6
1	63°44.2	229°03.6	23.2	262°29.9	46.2	228°20.5	20.4	28°05.8	19.6	Gienah	175°40.6	-17°42.1
2	78°46.6	244°03.2	24.4	277°31.0	45.7	243°22.5	20.6	43°08.4	19.6	Acrux	172°57.0	-63°15.4
3	93°49.1	259°02.8	• • 25.5	292°32.2	• • 45.2	258°24.4	• • 20.8	58°11.1 73°13.7	• • 19.5	Gacrux	171°48.5	-57°16.3
4	108°51.6	274°02.4	26.7	307°33.4	44.8	273°26.4	21.0		19.4	Alioth	$166^{\circ}10.9$	55°48.0
5 6	123°54.0	289°02.0	27.8 \$04°29.0	322°34.5	44.3	288°28.4	21.1 \$05°21.3	88°16.4	19.4	Spica	$158^{\circ}19.3$	-11°18.7
	138° 56.5 153° 58.9	304°01.6		337°35.7 352°36.9	N09°43.8	303°30.4 318°32.4		103°19.1 118°21.7	N11°19.3	Alkaid	$152^{\circ}50.1$	49°10.1
7 8	169°01.4	319°01.3 334°00.9	30.2 31.3	7°38.0	43.3 42.8	333°34.4	21.5 21.7	116 21.7 133°24.4	19.3 19.2	Hadar	148°32.1	-60°30.6
9	184°03.9	349°00.5	32.5	22°39.2	• • 42.3	348°36.4	• • 21.7	133 24.4 148°27.0	. 19.2	Menkent	147°54.3	-36°30.6
10	199°06.3	4°00.1	33.6	37° 40.4	41.8	3°38.4	22.1	148° 27.0 163° 29.7	19.1	Arcturus	145°45.4	19°01.9
11	214° 08.8	18°59.7	34.8	52°41.5	41.3	18°40.4	22.1	103 29.7 178°32.3	19.1	Rigil Kent.	139° 36.6	-60°57.2
12	229°11.3	33°59.3	S04°35.9	67° 42.7	N09°40.9	33°42.4	S05°22.5	170 32.3 193°35.0	N11°19.0	Kochab	137°21.3	74°02.1
13	244° 13.7	48°58.9	37.1	82°43.9	40.4	48°44.4	22.6	208°37.6	18.9	Zuben'ubi	136°52.9	-16°09.6
14	259° 16.2	63°58.6	38.3	97°45.0	39.9	63°46.4	22.8	223°40.3	18.8	Alphecca	126°01.5	26°37.1
15	274° 18.7	78°58.2	39.4	112°46.2	• • 39.4	78°48.4	• • 23.0	238°43.0	• • 18.8	Antares	112°12.4	-26°29.6
16	289°21.1	93°57.8	40.6	127° 47.4	38.9	93°50.4	23.2	253°45.6	18.7	Atria	107°04.2	-69°04.7
17	304°23.6	108°57.4	41.7	142°48.5	38.4	108°52.4	23.4	268°48.3	18.7	Sabik	101°59.5	-15°45.5
18	319°26.0	123°57.0	S04°42.9	157° 49.7	N09°37.9	123°54.4	S05°23.6	283°50.9	N11°18.6	Shaula	96°06.5	-37°07.4
19	334° 28.5	138°56.6	44.1	172°50.9	37.4	138°56.4	23.8	298°53.6	18.5	Rasalhague	95°56.0	12°32.5
20	349°31.0	153°56.2	45.2	187°52.0	37.0	153°58.4	24.0	313°56.2	18.5	Eltanin	90°41.2 83°28.7	51°29.4 -34°22.2
21	4°33.4	168°55.8	• • 46.4	202°53.2	• • 36.5	169°00.4	• • 24.2	328°58.9	• • 18.4	Kaus Aust.	83 28.7 80°31.4	-34 22.2 38°48.9
22	19°35.9	183°55.5	47.5	217°54.4	36.0	184°02.4	24.3	344°01.5	18.4	Vega Nunki	75°44.1	-26°15.5
23	34°38.4	198°55.1	48.7	232°55.5	35.5	199°04.4	24.5	359°04.2	18.3	Altair	61°57.1	8°56.9
Morn	20:42	0 4' d1	.2′ m-3.97	11 2/ d C	0.5' m1.28	1/2 0/ 40	2′ m-1.71	1/2 7/ d 0	.1' m-0.05	Peacock	53°01.1	-56°38.6
ivier.p	ass. 20:42	ν-0.4 α1.	.2 111-3.91	ν1.2 α-C	7.5 M1.26	ν2.0 α0.	2 m-1.71	ν2.1 α-0	.1 M-0.05	Deneb	49°23.7	45°23.4
										Enif	33°35.7	10°00.7
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°49.3
0	49° 40.8	213°54.7	504°49.8	247°56.7	N09°35.0	214°06.4	S05°24.7	14°06.8	N11°18.2	Fomalhaut	15°11.0	-29°28.1
1	64°43.3	228°54.3	51.0	262°57.9	34.5	229°08.4	24.9	29°09.5	18.2	Scheat	13°42.0	28°14.7
2	79°45.8	243°53.9	52.1	277°59.0	34.0	244°10.4	25.1	44°12.1	18.1	Markab	13°26.6	15°21.9
3	94°48.2	258°53.5	• • 53.3	293°00.2	• • 33.6	259°12.4	• • 25.3	59°14.8	• • 18.1			
4	109°50.7	273°53.1	54.5	308°01.4	33.1	274°14.4	25.5	74°17.5	18.0	Nov 08 Wed	SHA	Mer.pass
5	124°53.2	288°52.7	55.6	323°02.5	32.6	289°16.4	25.7	89°20.1	17.9		166°30.5	09:43
6	139°55.6	303°52.3	S04°56.8	338°03.7	N09°32.1	304°18.4	S05°25.8	104°22.8	N11°17.9	1	199°18.3	07:31
7	154°58.1	318°51.9	57.9	353°04.9	31.6	319°20.4	26.0	119°25.4	17.8	Jupiter Saturn	164°48.0 324°16.8	09:49 23:08
8 9	170°00.5 185°03.0	333°51.6 348°51.2	04°59.1 05°00.2	8°06.1 23°07.2	31.1 · · 30.6	334°22.4 349°24.4	26.2 •• 26.4	134°28.1 149°30.7	17.8 •• 17.7	Saturn	J24 1U.0	23:00
10	200°05.5	348 51.2 3°50.8	05 00.2	23 07.2 38°08.4	30.1	349 24.4 4°26.4	26.6	149 30.7 164°33.4	17.6	Nov 09 Thu	SHA	Mer.pass
10	200°05.5 215°07.9	3°50.8 18°50.4	01.4 02.6	53°09.6	30.1 29.7	4°26.4 19°28.4	26.6 26.8	164 33.4 179°36.0	17.6 17.6		$165^{\circ}22.3$	09:44
12	215 07.9 230° 10.4	33°50.0	S05°03.7	68° 10.7	N09°29.2	34°30.4	\$05°27.0	179 30.0 194°38.7	N11°17.5	!	198°47.0	07:30
13	245° 12.9	48°49.6	04.9	83°11.9	28.7	49°32.4	27.1	209°41.3	17.5		164°36.8	09:45
14	260° 15.3	63°49.2	06.0	98°13.1	28.2	64°34.4	27.1	209 41.3 224°44.0	17.5	Saturn	324°21.4	23:04
15	275° 17.8	78°48.8	•• 07.2	113° 14.3	• • 27.7	79°36.4	• • 27.5	239°46.6	17.3	Nov 10 Fri	SHA	Mer.pass
16	290°20.3	93°48.4	08.3	113 14.3 128° 15.4	27.2	94°38.4	27.7	254°49.3	17.3		эпа 164°13.8	09:45
17	305°22.7	108°48.0	09.5	143°16.6	26.7	109°40.4	27.9	269°51.9	17.2		104 15.8 198° 15.9	07:28
18	320°25.2	123°47.6	S05°10.6	158° 17.8	N09°26.2	124°42.4	S05°28.1	284°54.6	N11°17.2		164°25.6	09:42
19	335° 27.7	138°47.2	11.8	173°19.0	25.8	139°44.5	28.3	299°57.3	17.1	Saturn		22:59
20	$350^{\circ}30.1$	153°46.8	12.9	$188^{\circ}20.1$	25.3	154°46.5	28.5	314°59.9	17.0			
21	5°32.6	168°46.4	• • 14.1	203°21.3	• • 24.8	169°48.5	• • 28.6	330°02.6	• • 17.0	Horizont	al parallax	
22	20°35.0	183°46.1	15.3	$218^{\circ}22.5$	24.3	184°50.5	28.8	345°05.2	16.9		Venus:	0.1
23	35° 37.5	198°45.7	16.4	233°23.7	23.8	199°52.5	29.0	0°07.9	16.9		Mars:	0.1
Mern	ass. 20:38	ν-0 Δ' d1	.2′ m-3.97	v1 2/ d.C	0.5' m1.27	v2 0/ d0	2′ m-1.71	ν2 7' d-Ω	.1′ m-0.05			
.т.ст.р		- U.I. UI.		- 1.2 0-0		0 00.			0.00			

h	Sui	Moon					
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.9	S16°39.4	293°46.2	8.7'	N21°01.3	-8.4'	57.6'
1 2	199°03.9 214°03.8	40.1 40.8	308°13.9 322°41.6	8.7' 8.8'	20°52.9 20°44.4	-8.5' -8.6'	57.6' 57.6'
3	229°03.8	•• 41.6	337°09.4	8.8'	20°35.8	-8.7'	57.6'
4	244°03.7	42.3	351°37.2	8.9'	20°27.0	-8.9'	57.7'
5	259°03.7	43.0	6°05.1	8.9'	20°18.2	-9.0'	57.7'
6 7	274°03.6 289°03.6	S16°43.7 44.4	20°33.0 35°00.9	8.9' 9.0'	N20°09.2 20°00.1	-9.1' -9.2'	57.7' 57.7'
8	304° 03.5	45.1	49°28.9	9.0'	19°50.9	-9.3'	57.8'
9	319°03.5	• • 45.9	63°56.9	9.1'	19°41.6	-9.5'	57.8'
10	334°03.4 349°03.4	46.6 47.3	78°25.0 92°53.1	9.1' 9.1'	19°32.1 19°22.6	-9.6'	57.8' 57.8'
11 12	4°03.3	516°48.0	92 55.1 107°21 2	9.1	N19°12.9	-9.7' -9.8'	57.9'
13	19°03.3	48.7	121°49.4	9.2'	19°03.1	-9.9'	57.9'
14	34°03.2	49.5	136° 17.7	9.3'	18°53.2	-10.0'	57.9'
15 16	49°03.2 64°03.1	· · 50.2 50.9	150° 45.9 165° 14.2	9.3' 9.3'	18°43.1 18°33.0	-10.1' -10.2'	57.9' 58.0'
17	79°03.1	51.6	179° 42.6	9.4'	18°22.8	-10.2	58.0'
18	94°03.0	S16°52.3	194°11.0	9.4'	N18°12.4	-10.5'	58.0'
19	109°03.0	53.0	208°39.4	9.5'	18°02.0	-10.6'	58.0'
20 21	124°02.9 139°02.9	53.7 • • 54.4	223°07.9 237°36.4	9.5' 9.6'	17°51.4 17°40.7	-10.7' -10.8'	58.1' 58.1'
22	154° 02.8	55.2	252°04.9	9.6'	17°29.9	-10.9'	58.1
23	169°02.8	55.9	266° 33.5	9.6'	$17^{\circ}19.1$	-11.0'	58.1'
	SD = 16.1'	d = 0.7'		SI	O = 15.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 02.7	S16°56.6	281°02.2	ν 9.7'	N17°08.1	-11.1'	58.1'
1	199°02.7	57.3	295°30.8	9.7'	$16^{\circ}57.0$	-11.2'	58.2'
2	214°02.6	58.0	309°59.6	9.8'	16°45.8	-11.3'	58.2'
3 4	229°02.6 244°02.5	·· 58.7 16°59.4	324°28.3 338°57.1	9.8' 9.8'	16°34.5 16°23.1	-11.4' -11.5'	58.2' 58.2'
5	259° 02.5	17°00.1	353°25.9	9.9'	16°11.6	-11.6'	58.3'
6	274°02.4	S17°00.8	7°54.8	9.9'	$N16^{\circ}00.0$	-11.7'	58.3'
7	289°02.3 304°02.3	01.5	22°23.7 36°52.7	9.9'	15°48.3 15°36.6	-11.8'	58.3'
8 9	304°02.3 319°02.2	02.3 · · 03.0	51°21.7	10.0' 10.0'	15°36.6 15°24.7	-11.9' -12.0'	58.3' 58.4'
10	334°02.2	03.7	65°50.7	10.1	15°12.7	-12.1'	58.4'
11	349°02.1	04.4	80° 19.7	10.1'	15°00.7	-12.1'	58.4'
12 13	4°02.1 19°02.0	\$17°05.1 05.8	94°48.8 109°18.0	10.1' 10.2'	N14°48.5 14°36.3	-12.2' -12.3'	58.4' 58.5'
14	34°01.9	06.5	109 16.0 123°47.1	10.2'	14 30.3 14°24.0	-12.3 -12.4'	58.5'
15	49°01.9	• • 07.2	138°16.3	10.2'	14°11.6	-12.5'	58.5'
16	64°01.8	07.9	152°45.6	10.3'	13°59.1	-12.6'	58.5'
17 18	79°01.8 94°01.7	08.6 S 17°09.3	167°14.8 181°44.1	10.3' 10.3'	13°46.5 N13°33.8	-12.7' -12.8'	58.6' 58.6'
19	109°01.6	10.0	196° 13.5	10.4'	13°21.0	-12.8'	58.6'
20	124°01.6	10.7	210° 42.8		13°08.2		58.6'
21 22	139°01.5 154°01.5	· · 11.4 12.1	225°12.2 239°41.7	10.4' 10.5'	12°55.3 12°42.3	-13.0' -13.1'	58.6' 58.7'
23	169°01.4	12.1	259 41.7 254°11.1	10.5'	12° 42.3	-13.1	58.7'
	SD = 16.1'	d = 0.7'			D = 15.9'		
Fri 0	GHA 184°01.3	Dec \$17° 13.5	GHA 268° 40.6	u 10.5'	Dec N12°16.1	d -13.2'	HP 58.7'
1	199°01.3	14.2	283° 10.1	10.5	12°02.8	-13.2'	58.7'
2	214°01.2	14.9	297°39.7	10.6'	11°49.5	-13.4'	58.8'
3 4	229°01.1 244°01.1	· · 15.6	312°09.2	10.6'	11°36.2 11°22.7	-13.4' -13.5'	58.8' 58.8'
4 5	244°01.1 259°01.0	16.3 17.0	326°38.8 341°08.5	10.6' 10.6'	11°22.7 11°09.2	-13.5' -13.6'	58.8'
6	274°00.9	S17°17.7	355°38.1	10.7'	N10°55.6	-13.7'	58.9'
7	289°00.9	18.4	10°07.8	10.7'	10°41.9	-13.7'	58.9'
8 9	304°00.8 319°00.8	19.1 •• 19.8	24°37.5 39°07.2	10.7' 10.7'	10°28.2 10°14.4	-13.8' -13.9'	58.9' 58.9'
10	319 00.8 334°00.7	20.5	59° 07.2	10.7	10°14.4	-13.9'	59.0'
11	349°00.6	21.1	$68^{\circ}06.7$	10.8'	09°46.6	-14.0'	59.0'
12	4°00.6	\$17°21.8	82°36.5	10.8'	N09°32.7	-14.0'	59.0'
13 14	19°00.5 34°00.4	22.5 23.2	97°06.3 111°36.1	10.8' 10.8'	09°18.6 09°04.5	-14.1' -14.2'	59.0' 59.0'
15	49°00.3	23.9	126° 05.9	10.0	08°50.3	-14.2'	59.1
16	64°00.3	24.6	140°35.8	10.9'	08°36.1	-14.3'	59.1'
17 18	79°00.2 94°00.1	25.3 \$17°26.0	155°05.6 169°35.5	10.9' 10.9'	08°21.8 N08°07.5	-14.3' -14.4'	59.1' 59.1'
18 19	109°00.1	26.7	169° 35.5 184° 05.4	10.9'	07°53.1	-14.4' -14.4'	59.1' 59.2'
20	124°00.0	27.4	198°35.3	10.9'	07°38.6	-14.5'	59.2'
21	138° 59.9	• • 28.0	213°05.2	10.9'	07°24.1	-14.5'	59.2'
22 23	153° 59.9 168° 59.8	28.7 29.4	227°35.2 242°05.1	10.9' 10.9'	07°09.6 06°55.0	-14.6' -14.6'	59.2' 59.2'
23	SD = 16.1'	d = 0.7'	2 72 03.1		O = 16.0'	17.0	33.2
	JD — 10.1	u — 0.1		31	J — 10.0		

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

Lat.		Moonris	e	Moonset			
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	
N 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	
N 10°	23:02	23:57	•• ••	11:02	11:51	12:37	
0°	23:15		00:06	10:47	11:39	12:30	
S 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	
S 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	
S 60°	01:14	01:27	01:36	08:06	09:42	11:18	

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	50°40.0	213°45.3	S05°17.6	248° 24.8	N09°23.3	214° 54.5	S05°29.2	15° 10.5	N11°16.8			
1	65°42.4	213 45.3 228°44.9	18.7	263°26.0	22.8	214 54.5 229° 56.5	29.4	30°13.2	16.7	Alpheratz	357°31.3	29°15.3
2	80°44.9	243°44.5	19.9	203°20.0° 278°27.2	22.4	244° 58.5	29.4	45°15.8	16.7	Ankaa	353°03.9	-42°08.9
3	95°47.4	243 44.5 258°44.1			. 21.9	244 56.5 260°00.5		45 15.6 60°18.5		Schedar	$349^{\circ}26.9$	56°42.1
			• • 21.0	293°28.4			• • 29.8	75°21.1	• • 16.6	Diphda	348°44.0	-17°49.6
4	110°49.8	273°43.7	22.2	308°29.5	21.4	275°02.5	29.9		16.6	Achernar	$335^{\circ}17.5$	-57°05.4
5	125°52.3	288°43.3	23.3	323°30.7	20.9	290°04.5	30.1	90°23.8	16.5	Hamal	327°47.3	23°36.1
6	140°54.8	303°42.9	S05°24.5	338°31.9	N09°20.4	305°06.5	S05°30.3	105°26.4	N11°16.5	Polaris	311°48.8	89°23.1
7	155°57.2	318° 42.5	25.6	353°33.1	19.9	320°08.5	30.5	120°29.1	16.4	Acamar	315°09.0	-40°11.3
8	170°59.7	333°42.1	26.8	8°34.2	19.4	335°10.5	30.7	135°31.7	16.3	Menkar	$314^{\circ}02.6$	4°12.3
9	186°02.1	348°41.7	• • 27.9	23°35.4	• • 18.9	350° 12.5	• • 30.9	150°34.4	• • 16.3	Mirfak	308°23.2	49°57.8
10	201°04.6	3°41.3	29.1	38°36.6	18.5	5° 14.5	31.1	165°37.0	16.2	Aldebaran	290°35.7	16°34.0
11	216°07.1	18°40.9	30.2	53°37.8	18.0	20° 16.5	31.2	180°39.7	16.2	Rigel	281°00.6	-8°10.1
12	231°09.5	33°40.5	S05°31.4	68°38.9	N09°17.5	35° 18.5	S05°31.4	195°42.4	N11°16.1	Capella	280° 16.8	46°01.5
13	246°12.0	48°40.1	32.6	83°40.1	17.0	50°20.5	31.6	210°45.0	16.0	Bellatrix	278° 19.3	6°22.5
14	261°14.5	63°39.7	33.7	98°41.3	16.5	65°22.5	31.8	225°47.7	16.0	Elnath	277°57.6	28°37.8
15	276°16.9	78° 39.3	• • 34.9	113°42.5	• • 16.0	80°24.5	• • 32.0	240°50.3	• • 15.9	Alnilam	275°34.3	-1°11.0
16	291°19.4	93°38.9	36.0	128°43.7	15.5	95°26.5	32.2	255°53.0	15.9	Betelgeuse	270°48.5	7°24.7
17	306°21.9	108°38.5	37.2	143°44.8	15.1	110°28.5	32.4	270°55.6	15.8	Canopus	263°50.6	-52°42.5
18	321°24.3	123°38.1	S05°38.3	158°46.0	N09°14.6	125°30.5	S05°32.5	285°58.3	N11° 15.7	Sirius	258°23.3	-16°45.3
19	336°26.8	138°37.7	39.5	173°47.2	14.1	140°32.5	32.7	301°00.9	15.7	Adhara	255°03.2	-10 45.5 -29°00.6
20	351°29.3	153°37.3	40.6	188°48.4	13.6	155°34.5	32.9	$316^{\circ}03.6$	15.6		244°47.4	5°09.0
21	6°31.7	168°36.9	• • 41.8	203°49.6	• • 13.1	170°36.5	• • 33.1	331°06.2	• • 15.6	Procyon		
22	21°34.2	183°36.5	42.9	218°50.7	12.6	185°38.5	33.3	346°08.9	15.5	Pollux	243°13.4	27°57.2
23	36°36.6	198°36.1	44.1	233°51.9	12.1	200°40.5	33.5	1°11.5	15.5	Avior	234°13.2	-59°35.9
										Suhail	222°43.9	-43°32.8
Wer.p	ass. 20:34	ν -0.4′ $d1$.2′ m-3.97	ν 1.2' d-0	0.5′ m1.26	ν 2.0° d 0.	2′ m-1.71	ν2.Γ d-0	.1′ m-0.04	Miaplacidus	221°37.4	-69°49.9
										Alphard	217°44.7	-8°47.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.2	11°49.5
0	51°39.1	213°35.7	S05°45.2	248°53.1	N09°11.6	215° 42.5	S05°33.7	16°14.2	N11° 15.4	Dubhe	193°37.7	61°35.4
1	66°41.6	228° 35.3	46.4	263°54.3	11.2	230°44.5	33.8	31°16.8	15.3	Denebola	182°22.0	14°24.6
2	81°44.0	243°34.9	47.5	278° 55.5	10.7	245° 46.5	34.0	46°19.5	15.3	Gienah	175°40.6	-17°42.1
3	96°46.5	258°34.5	• 48.7	276 55.5 293°56.6	. 10.7	260°48.5	34.2	61°22.1	15.2	Acrux	172°56.9	-63°15.4
3 4	90 40.5 111°49.0					275° 50.5		76°24.8		Gacrux	171°48.5	-57°16.3
		273°34.1	49.8	308° 57.8	09.7		34.4		15.2	Alioth	$166^{\circ}10.8$	55°48.0
5	126°51.4	288°33.7	51.0	323°59.0	09.2	290°52.6	34.6	91°27.4	15.1	Spica	$158^{\circ}19.3$	-11°18.7
6	141°53.9	303°33.3	S05°52.1	339°00.2	N09°08.7	305°54.6	S05°34.8	106°30.1	N11°15.0	Alkaid	$152^{\circ}50.1$	49°10.0
7	156°56.4	318°32.9	53.3	354°01.4	08.2	320°56.6	35.0	121°32.7	15.0	Hadar	$148^{\circ}32.1$	-60°30.6
8	171°58.8	333°32.5	54.4	9°02.5	07.8	335°58.6	35.1	136°35.4	14.9	Menkent	147°54.3	-36°30.6
9	187°01.3	348°32.1	• • 55.6	24°03.7	• • 07.3	351°00.6	• • 35.3	151°38.0	• • 14.9	Arcturus	145°45.4	19°01.9
10	202°03.7	3°31.7	56.7	39°04.9	06.8	6°02.6	35.5	166°40.7	14.8	Rigil Kent.	139°36.5	-60°57.2
11	217°06.2	18°31.3	57.9	54°06.1	06.3	21°04.6	35.7	181°43.3	14.8	Kochab	$137^{\circ}21.3$	74°02.1
12	232°08.7	33°30.9	S05°59.0	69°07.3	N09°05.8	36°06.6	S05°35.9	196°46.0	N11° 14.7	Zuben'ubi	136°52.9	-16°09.6
13	247°11.1	48° 30.5	06°00.2	84°08.5	05.3	51°08.6	36.1	211°48.6	14.6	Alphecca	126°01.5	26°37.1
14	262°13.6	63°30.1	01.3	99°09.6	04.8	66°10.6	36.2	226°51.3	14.6	Antares	112° 12.4	-26°29.6
15	277°16.1	78° 29.7	• • 02.5	114° 10.8	• • 04.4	81°12.6	• • 36.4	241°53.9	•• 14.5	Atria	107°04.2	-69°04.7
16	292°18.5	93°29.3	03.6	$129^{\circ}12.0$	03.9	96°14.6	36.6	256°56.6	14.5	Sabik	101°59.5	-15°45.5
17	307°21.0	$108^{\circ}28.9$	04.8	144°13.2	03.4	$111^{\circ}16.6$	36.8	271°59.2	14.4	Shaula	96°06.5	-37°07.4
18	322°23.5	123°28.4	S06°05.9	$159^{\circ}14.4$	$N09^{\circ}02.9$	$126^{\circ}18.6$	S05°37.0	287°01.9	N11°14.3	Rasalhague	95°56.0	12°32.5
19	337°25.9	$138^{\circ}28.0$	07.1	174° 15.6	02.4	141°20.6	37.2	302°04.5	14.3	Eltanin	90°41.2	51°29.4
20	352°28.4	153°27.6	08.2	189°16.8	01.9	156°22.6	37.4	317°07.2	14.2	Kaus Aust.	83°28.7	-34°22.2
21	7°30.9	$168^{\circ}27.2$	• • 09.4	204°17.9	• • 01.4	171°24.6	• • 37.5	332°09.9	• • 14.2	Vega	80°31.4	38°48.9
22	22°33.3	183°26.8	10.5	$219^{\circ}19.1$	01.0	186°26.6	37.7	347°12.5	14.1	Nunki	75°44.2	-26°15.5
23	37°35.8	198°26.4	11.6	234°20.3	00.5	201°28.6	37.9	2°15.2	14.1	Altair	61°57.1	8°56.9
	20.20	0.4/ /1	0/ 0.07	10/ 10		0.0/	0/ 1.71		1/ 0.04			
Mer.p	ass. 20:30	ν -0.4' d1	.2′ m-3.97	ν 1.2′ d -C	.5′ m1.25	ν 2.0′ d0.	2′ m-1.71	ν 2.7 d-0	.1' m-0.04	Peacock	53°01.1	-56°38.6
										Deneb	49°23.7	45°23.4
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.7	10°00.7
0	52°38.2	213° 26.0	S06°12.8	249°21.5	N09°00.0	216°30.7	S05°38.1	17°17.8	N11°14.0	Al Na'ir	27°29.0	-46°49.3
1	67°40.7	228° 25.6	13.9	264°22.7	08°59.5	231°32.7	38.3	32°20.5	13.9	Fomalhaut	15°11.0	-29°28.1
2	82°43.2	243°25.2	15.1	279°23.9	59.0	246°34.7	38.5	47°23.1	13.9	Scheat	13°42.0	28°14.7
3	97°45.6	258°24.8	16.2	294°25.1	• • 58.5	261°36.7	• • 38.6	62°25.8	. 13.8	Markab	13°26.6	15°21.9
4	112°48.1	273°24.4	17.4	309°26.3	58.0	276°38.7	38.8	77°28.4	13.8	Nov 11 Sat	SHA	Mer.pass
5	127°50.6	288°24.0	18.5	324° 27.4	57.6	291°40.7	39.0	92°31.1	13.7	!	163°05.3	09:45
6	142°53.0	303°23.6	506°19.7	339°28.6	N08°57.1	306° 42.7	S05°39.2	107°33.7	N11° 13.7		197°44.9	07:26
7	157°55.5	318°23.1	20.8	354°29.8	56.6	321° 44.7	39.4	107 35.7 122°36.4	13.6		164°14.5	09:39
8	172°58.0	333°22.7	22.0	9°31.0	56.1	336° 46.7	39.4	137°39.0	13.5	Saturn	324°30.6	22:55
9	188°00.4	348°22.3	•• 23.1	24°32.2	• • 55.6	351°48.7	• • 39.7	157° 59.0 152° 41.7	13.5			
10	203°02.9	3°21.9	24.3	39° 33.4	55.1	6° 50.7	39.7	167°44.3	13.4	Nov 12 Sun	SHA	Mer.pass
	203 02.9 218°05.4	3 21.9 18°21.5	24.3 25.4	59 33.4 54°34.6	55.1 54.6	0 50.7 21°52.7	39.9 40.1	167 44.3 182°47.0	13.4	Venus	$161^{\circ}56.6$	09:46
11		33°21.1	506°26.5	69°35.8	N08°54.2	21 52.7 36°54.7		182 47.0 197°49.6	N11°13.3	Mars	$197^{\circ}14.0$	07:24
12 13	233°07.8 248°10.3	48° 20.7	27.7	69°35.8 84°37.0	53.7	51° 56.7	\$05°40.3	197°49.6 212°52.3	N11 - 13.3 13.2	Jupiter	$164^{\circ}03.4$	09:36
							40.5 40.7			Saturn		22:51
14	263°12.7	63°20.3	28.8	99°38.1	53.2	66°58.7	40.7	227°54.9	13.2			
15	278°15.2	78° 19.9	30.0	114°39.3	• • 52.7	82°00.8	• • 40.8	242°57.6	• • 13.1	Nov 13 Mon	SHA	Mer.pass
16	293°17.7	93°19.4	31.1	129°40.5	52.2	97°02.8	41.0	258°00.2	13.1		160°47.8	09:47
17	308°20.1	108° 19.0	32.3	144°41.7	51.7	112°04.8	41.2	273°02.9	13.0		196°43.3	07:22
18	323°22.6	123°18.6	S06°33.4	159° 42.9	N08°51.2	127°06.8	S05°41.4	288°05.5	N11°13.0		163°52.4	09:33
19	338°25.1	138° 18.2	34.6	174°44.1	50.8	142°08.8	41.6	303°08.1	12.9	Saturn	324°39.6	22:47
20	353°27.5	153° 17.8	35.7	189°45.3	50.3	157° 10.8	41.8	318°10.8	12.8	U! ·	al navall	
21	8°30.0	168° 17.4	• • 36.8	204°46.5	• • 49.8	172°12.8	• • 41.9	333°13.4	• • 12.8	norizont	al parallax	0.1
22	23°32.5	183°17.0	38.0	219°47.7	49.3	187°14.8	42.1	348°16.1	12.7		Venus:	0.1
23	38°34.9	198°16.6	39.1	234°48.9	48.8	202°16.8	42.3	3°18.7	12.7		Mars:	0.1
Mern	ass. 20:26	ν -0 4' d1	.1′ m-3.97	ν1 2' d-0	0.5′ m1.25	$\nu 2.0' d0$	2′ m-1.72	ν2 7' d-Ω	.1′ m-0.03			
		- 0 01							0.00			

h	Sui			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.7	\$17°30.1	256°35.1	11.0'	N06°40.4	-14.7'	59.3'
1	198°59.6	30.8	271°05.0	11.0'	$06^{\circ}25.7$	-14.7'	59.3'
2	213°59.6	31.5	285°35.0	11.0'	06° 10.9	-14.8'	59.3'
3	228°59.5	• • 32.2	300°05.0	11.0'	05°56.1	-14.8'	59.3'
4 5	243°59.4 258°59.4	32.8 33.5	314°34.9 329°04.9	11.0' 11.0'	05°41.3 05°26.5	-14.9' -14.9'	59.3' 59.4'
6	273°59.3	517°34.2	343°34.9	11.0'	N05°11.6	-14.9'	59.4
7	288°59.2	34.9	358°04.9	11.0'	04°56.6	-15.0'	59.4'
8	303°59.1	35.6	12°34.8	11.0'	04°41.6	-15.0'	59.4'
9	318°59.1	• • 36.3	27°04.8	11.0'	04°26.6	-15.0'	59.4'
10	333°59.0	36.9	41°34.8	11.0'	04°11.6	-15.1'	59.5'
11	348°58.9	37.6 \$17°38.3	56°04.8	11.0'	03°56.5	-15.1'	59.5'
12 13	3°58.8 18°58.8	39.0	70°34.8 85°04.7	11.0' 11.0'	N03°41.4 03°26.2	-15.1' -15.2'	59.5' 59.5'
14	33°58.7	39.7	99°34.7	11.0'	03°20.2	-15.2'	59.5'
15	48°58.6	• • 40.3	114°04.7	11.0'	02°55.8	-15.2'	59.6'
16	63°58.5	41.0	128°34.6	10.9'	02°40.6	-15.3'	59.6'
17	78°58.4	41.7	143°04.5	10.9'	02°25.4	-15.3'	59.6'
18	93°58.4	\$17°42.4	157°34.5	10.9'	N02°10.1	-15.3'	59.6'
19 20	108°58.3 123°58.2	43.0 43.7	172°04.4 186°34.3	10.9' 10.9'	01°54.8 01°39.5	-15.3' -15.3'	59.6' 59.7'
21	125 56.2 138°58.1	· · 44.4	201°04.2	10.9'	01 39.5 01°24.1	-15.3 -15.4'	59.7'
22	153°58.1	45.1	215°34.1	10.9	01°08.8	-15.4	59.7'
23	168°58.0	45.7	230°04.0	10.8'	00°53.4	-15.4'	59.7'
	SD = 16.1'	d = 0.7'		SI	D = 16.2'		
c	CUA	De-	CUA		D	1	шп
Sun 0	GHA 183°57.9	Dec \$17°46.4	GHA 244°33.8	u 10.8'	Dec N00° 38.0	d -15.4'	HP 59.7'
1	198°57.8	47.1	259°03.6	10.8'	00°22.6	-15.4'	59.7'
2	213°57.7	47.8	273°33.4	10.8'	N00°07.2	-15.4'	59.8'
3	228°57.6	• • 48.4	288°03.2	10.8'	S00°08.2	15.4'	59.8'
4	243°57.6	49.1	302°33.0	10.7'	00°23.6	15.4	59.8'
5 6	258° 57.5 273° 57.4	49.8 \$17°50.5	317°02.8 331°32.5	10.7' 10.7'	00°39.1 \$00°54.5	15.4' 15.4'	59.8' 59.8'
7	288°57.3	51.1	346°02.2	10.7'	01°09.9	15.4	59.8'
8	303°57.2	51.8	0°31.9	10.7'	01°25.4	15.4	59.9'
9	318°57.1	• • 52.5	15°01.5	10.6'	01°40.8	15.4'	59.9'
10	333°57.1	53.1	29°31.1	10.6'	01°56.3	15.4'	59.9'
11	348°57.0	53.8	44°00.7	10.6'	02°11.7	15.4	59.9'
12 13	3°56.9 18°56.8	\$17°54.5 55.1	58°30.3 72°59.8	10.5' 10.5'	\$02°27.2 02°42.6	15.4' 15.4'	59.9' 59.9'
14	33°56.7	55.8	87°29.3	10.5'	02°58.0	15.4	59.9'
15	48°56.6	• • 56.5	101°58.8	10.4'	03°13.5	15.4'	60.0'
16	63°56.6	57.1	116°28.2	10.4'	03°28.9	15.4'	60.0'
17	78°56.5	57.8	130°57.6	10.4'	03°44.3	15.4	60.0'
18 19	93°56.4 108°56.3	\$17°58.5 59.1	145°27.0 159°56.3	10.3' 10.3'	\$03°59.6 04°15.0	15.4' 15.4'	60.0' 60.0'
20	123°56.2	17°59.8	174°25.6	10.3'	04° 13.0	15.3'	60.0'
21	138°56.1	18°00.4	188°54.9	10.2'	04°45.7	15.3'	60.0'
22	153°56.0	01.1	203°24.1	10.2'	$05^{\circ}01.0$	15.3'	60.0'
23	168°55.9	01.8	217°53.2	10.1'	05°16.3	15.3'	60.1'
	SD = 16.2'	d = 0.7'		SI	D = 16.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	183°55.8	\$18°02.4	232°22.4	10.1'	S05°31.6	15.2'	60.1
1	198°55.8	03.1	246°51.5	10.0'	05°46.8	15.2'	60.1'
2	213°55.7	03.8	261°20.5	10.0'	06°02.1	15.2'	60.1'
3	228°55.6 243°55.5	• • 04.4	275°49.5	9.9'	06°17.3	15.2'	60.1'
4 5	243°55.5 258°55.4	05.1 05.7	290°18.4 304°47.3	9.9' 9.9'	06°32.4 06°47.6	15.1' 15.1'	60.1' 60.1'
6	273°55.3	518°06.4	304 47.3 319°16.2	9.9	507°02.7	15.1	60.1
7	288°55.2	07.0	333°45.0	9.8'	07° 17.7	15.0'	60.1
8	303°55.1	07.7	348°13.8	9.7'	07°32.7	15.0'	60.1'
9	318°55.0	•• 08.4	2°42.5	9.7'	07° 47.7	15.0'	60.1'
10 11	333°54.9 348°54.8	09.0 09.7	17°11.1 31°39.7	9.6' 9.5'	08°02.7 08°17.6	14.9' 14.9'	60.2' 60.2'
11	348 54.8 3°54.7	09.7 \$18°10.3	46°08.3	9.5'	508° 32.5	14.9	60.2'
13	18°54.6	11.0	60°36.7	9.4'	08° 47.3	14.8'	60.2
14	33°54.6	11.6	75°05.2	9.4'	09°02.1	14.7'	60.2'
15	48°54.5	• • 12.3	89°33.6	9.3'	09°16.8	14.7'	60.2'
16	63°54.4	12.9	104°01.9	9.3'	09°31.5	14.6'	60.2'
17 18	78°54.3 93°54.2	13.6 \$18°14.2	118°30.2 132°58.4	9.2' 9.1'	09°46.1 \$10°00.6	14.6' 14.5'	60.2' 60.2'
18	93 54.2 108°54.1	14.9	132 58.4 147°26.5	9.1 9.1'	10° 15.2	14.5'	60.2
20	123°54.0	15.5	161°54.6	9.0'	10°29.6	14.4'	60.2
21	138°53.9	· · 16.2	176°22.6	9.0'	10°44.0	14.3'	60.2'
22	153°53.8	16.8	190°50.6	8.9'	10°58.3	14.3'	60.2'
23	168°53.7	17.5	205°18.5	8.8'	11°12.6	14.2'	60.2'
	SD = 16.2'	d = 0.7'		SI	O = 16.4'		

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

		Sun		Moon				
Day		f Time	Mer.	Mer.	Age			
,	00 ^h	00 ^h 12 ^h		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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	53°37.4	213°16.1	S06°40.3	249°50.1	N08°48.3	217°18.8	S05°42.5	18°21.4	N11°12.6			
1	68°39.8	228°15.7	41.4	264°51.3	47.9	232°20.8	42.7	33°24.0	12.6	Alpheratz	357°31.3	29°15.3
2	83° 42.3	243°15.3	42.6	279°52.4	47.4	247°22.8	42.9	48°26.7	12.5	Ankaa	353°03.9	-42°09.0
3	98°44.8	258°14.9	43.7	294°53.6	• • 46.9	262°24.8	• • 43.0	63°29.3	. 12.4	Schedar	349°26.9	56°42.1
4	113°47.2	273°14.5	44.8	309°54.8	46.4	277°26.9	43.2	78°32.0	12.4	Diphda	348°44.0	-17°49.6
5	128°49.7	288°14.1	46.0	324°56.0	45.9	292°28.9	43.4	93°34.6	12.3	Achernar	335° 17.5	-57°05.5
6	143°52.2	303°13.7	S06°47.1	339°57.2	N08°45.4	307°30.9	S05°43.6	108°37.3	N11°12.3	Hamal	327°47.3	23°36.1
7	158° 54.6	318°13.2	48.3	354°58.4	44.9	322°32.9	43.8	123°39.9	12.2	Polaris	311°48.5	89°23.1
8	173°57.1	333°12.8	49.4	9°59.6	44.5	337°34.9	43.9	138°42.6	12.2	Acamar	315°09.0	-40°11.3
9	188°59.6	348°12.4	50.5	25°00.8	• • 44.0	352°36.9	• • 44.1	153°45.2	• • 12.1	Menkar	314°02.6	4°12.3
10	204°02.0	3°12.0	51.7	40°02.0	43.5	7°38.9	44.3	168°47.9	12.0	Mirfak	308°23.2	49°57.8
11	219°04.5	18°11.6	52.8	55°03.2	43.0	22°40.9	44.5	183°50.5	12.0	Aldebaran	290°35.7	16°34.0
12	234°07.0	33°11.2	506°54.0	70°04.4	N08° 42.5	37°42.9	S05°44.7	198°53.2	N11°11.9	Rigel	281°00.6	-8°10.1
13	249°09.4	48°10.7	55.1	85°05.6	42.0	52°44.9	44.9	213°55.8	11.9	Capella	280°16.8	46°01.5
14	264°11.9	63°10.3	56.2	100°06.8	41.6	67°46.9	45.0	228°58.5	11.8	Bellatrix Elnath	278° 19.2 277° 57.6	6°22.5 28°37.8
15	279°14.3	$78^{\circ}09.9$	• • 57.4	$115^{\circ}08.0$	• • 41.1	82°49.0	• • 45.2	244°01.1	• • 11.8	Alnilam	277 37.0 275°34.3	-1°11.0
16	294°16.8	93°09.5	58.5	130°09.2	40.6	97°51.0	45.4	259°03.8	11.7	Betelgeuse	270°48.4	7°24.7
17	309° 19.3	$108^{\circ}09.1$	06°59.7	145°10.4	40.1	112°53.0	45.6	274°06.4	11.6	Canopus	263°50.6	-52°42.5
18	324°21.7	123°08.6	S 07°00.8	$160^{\circ}11.6$	N08°39.6	127°55.0	S05°45.8	$289^{\circ}09.1$	N11°11.6	Sirius	258° 23.2	-16°45.3
19	339°24.2	138°08.2	01.9	175°12.8	39.1	142°57.0	46.0	304°11.7	11.5	Adhara	255°03.2	-29°00.6
20	354°26.7	153°07.8	03.1	190°14.0	38.6	157°59.0	46.1	319°14.4	11.5	Procyon	244° 47.4	5°09.0
21	9°29.1	168°07.4	• • 04.2	205°15.2	• • 38.2	173°01.0	• • 46.3	334°17.0	• • 11.4	Pollux	243°13.4	27°57.2
22	24°31.6	183°07.0	05.4	220°16.4	37.7	188°03.0	46.5	349°19.7	11.4	Avior	234° 13.2	-59°35.9
23	39°34.1	198°06.5	06.5	235° 17.6	37.2	203°05.0	46.7	4°22.3	11.3	Suhail	222°43.9	-43°32.8
Mern	ass. 20:22	ν -0.4' d1	.1′ m-3.96	$\nu 1.2' d-0$	0.5' m1.24	$\nu 2.0' d0$	2′ m-1.72	ν2.6′ d-0	.1′ m-0.03	Miaplacidus	221°37.3	-69°49.9
- Wici.p		- 0.1 41				ν 2.0 · GO.				Alphard	217°44.7	-8°47.0
										Regulus	207°31.2	11°49.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.6	61°35.4
0	54°36.5	213°06.1	S07°07.6	250° 18.8	N08°36.7	218°07.0	S05°46.9	19°25.0	N11°11.3	Denebola	182°22.0	14°24.5
1	69°39.0	228°05.7	08.8	265°20.0	36.2	233°09.1	47.0	34°27.6	11.2	Gienah	175°40.6	-17°42.1
2	84°41.5	243°05.3	09.9	280°21.2	35.7	248°11.1	47.2	49°30.2	11.1	Acrux	172°56.9	-63°15.4
3	99°43.9	258°04.8	• • 11.0	295°22.4	• • 35.3	263°13.1	• • 47.4	64°32.9	• • 11.1	Gacrux	171°48.4	-57°16.3
4	114°46.4	273°04.4	12.2	310°23.6	34.8	278°15.1	47.6	79°35.5	11.0	Alioth	166°10.8	55°48.0
5	129°48.8	288°04.0	13.3	325°24.8	34.3	293°17.1	47.8	94°38.2	11.0	Spica	$158^{\circ}19.3$	-11°18.7
6	144°51.3	303°03.6	S07°14.5	340°26.0	N08°33.8	308°19.1	S05°47.9	109°40.8	N11°10.9	Alkaid	$152^{\circ}50.1$	49°10.0
7	159°53.8	318°03.2	15.6	355°27.2	33.3	323°21.1	48.1	124°43.5	10.9	Hadar	$148^{\circ}32.0$	-60°30.6
8	174°56.2	333°02.7	16.7	10°28.4	32.8	338°23.1	48.3	139°46.1	10.8	Menkent	$147^{\circ}54.3$	-36°30.6
9	189°58.7	348°02.3	• • 17.9	25°29.6	• • 32.4	353°25.1	• • 48.5	154°48.8	• • 10.7	Arcturus	145°45.4	19°01.9
10	205°01.2	3°01.9	19.0	40°30.8	31.9	8°27.2	48.7	169°51.4	10.7	Rigil Kent.	139°36.5	-60°57.2
11	220°03.6	18°01.5	20.1	55°32.0	31.4 N08°30.9	23°29.2 38°31.2	48.9 \$05°49.0	184°54.1 199°56.7	10.6 N11°10.6	Kochab	$137^{\circ}21.3$	74°02.1
12	235°06.1 250°08.6	33°01.0	S07°21.3	70°33.2 85°34.4		50° 31.2		214°59.4		Zuben'ubi	136°52.9	-16°09.6
13	265°11.0	48°00.6 63°00.2	22.4 23.5	85 34.4 100°35.6	30.4 29.9	68°35.2	49.2	214 59.4 230°02.0	10.5	Alphecca	$126^{\circ}01.5$	26°37.1
14	280° 13.5	77°59.8		115° 36.8		83°37.2	49.4 •• 49.6	245°04.7	10.5 •• 10.4	Antares	112°12.4	-26°29.6
15 16	200 15.5 295° 15.9	92°59.3	· · 24.7 25.8	130°38.0	· · 29.5 29.0	98°39.2		245 04.7 260°07.3	10.4	Atria	107°04.2	-69°04.7
16 17	310° 18.4	92 59.5 107°58.9	26.9	130 36.0 145°39.2	29.0	96 39.2 113°41.2	49.8 49.9	200 07.3 275°09.9	10.3	Sabik	101°59.5	-15°45.5
18	325°20.9	107 58.5 122°58.5	S07°28.1	160° 40.4	N08° 28.0	128°43.2	S05°50.1	290°12.6	N11°10.2	Shaula	96°06.5	-37°07.4
19	340°23.3	137°58.1	29.2	175°41.6	27.5	143°45.3	50.3	305°15.2	10.2	Rasalhague	95°56.0	12°32.5
20	355°25.8	152°57.6	30.3	190°42.8	27.0	158°47.3	50.5	320°17.9	10.1	Eltanin	90°41.2	51°29.3
21	10°28.3	167°57.2	· · 31.5	205°44.0	. 26.6	173°49.3	• • 50.7	335°20.5	. 10.1	Kaus Aust.	83°28.7	-34°22.2
22	25°30.7	182°56.8	32.6	220°45.2	26.1	188°51.3	50.8	350°23.2	10.0	Vega	80°31.4	38°48.9
23	40°33.2	197°56.3	33.7	235°46.4	25.6	203°53.3	51.0	5°25.8	10.0	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
Mer.p	ass. 20:18	ν -0.4' d1	.1' m-3.96	$\nu 1.2' \ d-0$	1.5' m 1.23	$\nu 2.0' d0.$	2′ m-1.72	ν 2.6′ d-0	.1' m-0.02	Peacock	53°01.1	-56°38.6
										Deneb	49°23.8	45°23.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.7	10°00.7
0	55°35.7	212°55.9	S07°34.9	250°47.6	N08°25.1	218°55.3	S05°51.2	20°28.5	N11°09.9	Al Na'ir Fomalhaut	27°29.1	-46°49.3 -29°28.1
1	70°38.1	227°55.5	36.0	265°48.8	24.6	233°57.3	51.4	35°31.1	09.8	Scheat	15°11.0 13°42.0	-29° 28.1 28° 14.7
2	85°40.6	242°55.1	37.1	280° 50.0	24.1	248°59.3	51.6	50°33.8	09.8	Markab	13° 42.0 13° 26.7	28 14.7 15°21.9
3	100°43.1	257°54.6	• • 38.3	295°51.2	• • 23.7	264°01.4	• • 51.7	65°36.4	• • 09.7	IVIdIKaD	13 20.1	13 21.9
4	115°45.5	272°54.2	39.4	310°52.4	23.2	279°03.4	51.9	80°39.1	09.7	Nov 14 Tue	SHA	Mer.pass
5	$130^{\circ}48.0$	287°53.8	40.5	$325^{\circ}53.6$	22.7	294°05.4	52.1	95°41.7	09.6		159°38.8	09:47
6	145°50.4	302°53.3	S07°41.7	340°54.8	N08°22.2	309°07.4	S05°52.3	110°44.3	N11°09.6	Mars	$196^{\circ}12.7$	07:20
7	160°52.9	317°52.9	42.8	355°56.0	21.7	324°09.4	52.5	125°47.0	09.5	Jupiter		09:29
8	175° 55.4	332°52.5	43.9	10°57.2	21.2	339°11.4	52.6	140°49.6	09.5	Saturn	324°44.0	22:43
9	190°57.8	347°52.0	• • 45.1	25°58.5	• • 20.8	354°13.4	• • 52.8	155°52.3	• • 09.4	Nov 15 Wed	SHA	Mer.pass
10	206°00.3	2°51.6	46.2	40°59.7	20.3	9°15.4	53.0	170°54.9	09.3	1	158° 29.6	09:48
11	221°02.8	17°51.2	47.3	56°00.9	19.8	24°17.5	53.2	185°57.6	09.3		195° 42.2	07:18
12	236°05.2	32°50.7	S07°48.5	71°02.1	N08° 19.3	39°19.5	S05°53.4	201°00.2	N11°09.2		163°30.5	09:26
13	251°07.7	47°50.3	49.6	86°03.3	18.8	54°21.5	53.5	216°02.9	09.2	Saturn	324°48.4	22:38
14	266° 10.2	62°49.9	50.7	101°04.5	18.3	69°23.5	53.7	231°05.5	09.1			
15	281°12.6	77°49.4	• • 51.8	116°05.7	•• 17.9	84°25.5	• • 53.9	246°08.2	• • 09.1	Nov 16 Thu	SHA	Mer.pass
16	296° 15.1	92°49.0	53.0	131°06.9	17.4	99°27.5	54.1	261°10.8	09.0	1	157°20.3	09:49
17	311°17.6	107°48.6	54.1	146°08.1	16.9	114°29.5	54.3	276°13.4	09.0		195°11.9	07:16
18	326°20.0	122°48.1	S07°55.2	161°09.3	N08° 16.4	129°31.6	S05°54.4	291°16.1	N11°08.9		163°19.7	09:23
19	341°22.5	137°47.7	56.4	176° 10.5	15.9	144°33.6	54.6	306°18.7	08.8	Saturn	324°52.8	22:34
20	356°24.9	152°47.3	57.5	191°11.7	15.5	159°35.6	54.8	321°21.4	08.8	Horizont	al parallax	
21 22	11°27.4 26°29.9	167°46.8 182°46.4	·· 58.6 07°59.7	206°13.0 221°14.2	· · 15.0 14.5	174°37.6 189°39.6	•• 55.0 55.2	336°24.0 351°26.7	· · 08.7 08.7		Venus:	0.1
23	41°32.3	102 40.4 197°46.0	07 59.7 08°00.9	221 14.2 236° 15.4	14.5	204°41.6	55.2 55.3	6°29.3	08.6		Mars:	0.1
										L	=:=:	-
Mer.p	ass. 20:14	ν -0.4' d1	.1′ m-3.96	ν 1.2′ d-0	0.5′ m1.22	ν 2.0′ d0.	2′ m-1.72	ν 2.6′ d-0	.1′ m-0.02			

h	Sui	า	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.6	S18°18.1	$219^{\circ}46.3$	8.8'	S11°26.8	14.1'	60.2'
1	198° 53.5	18.8	$234^{\circ}14.1$	8.7'	$11^{\circ}41.0$	14.1'	60.2'
2	213°53.4	19.4	248°41.8	8.7'	11°55.0	14.0'	60.2'
3	228° 53.3	20.1	263°09.5	8.6'	12°09.1	13.9'	60.2'
4 5	243°53.2 258°53.1	20.7 21.4	277°37.1 292°04.6	8.5' 8.5'	12°23.0 12°36.8	13.9' 13.8'	60.2' 60.2'
6	258 53.1 273°53.0	\$18°22.0	306°32.1	8.4	S12°50.6	13.8	60.2
7	288° 52.9	22.6	320° 59.5	8.3	13°04.3	13.6'	60.2
8	303°52.8	23.3	335°26.8	8.3'	13° 18.0	13.5'	60.2
9	318°52.7	• • 23.9	349°54.0	8.2'	13°31.5	13.5'	60.2'
10	333°52.6	24.6	4°21.2	8.1'	13°45.0	13.4'	60.2'
11	348°52.5	25.2	18°48.3	8.1'	13°58.4	13.3'	60.2'
12	3°52.4	S18°25.9	33°15.4	8.0'	S 14°11.7	13.2'	60.2'
13	18°52.3	26.5	47°42.4	7.9'	14°24.9	13.1'	60.2'
14 15	33°52.2 48°52.1	27.1 •• 27.8	62°09.3 76°36.1	7.8' 7.8'	14°38.0 14°51.0	13.0' 12.9'	60.2' 60.2'
16	63°52.0	28.4	91°02.9	7.7'	14 51.0 15°04.0	12.8'	60.2
17	78° 51.8	29.0	105° 29.6	7.6'	15°16.8	12.7'	60.2
18	93°51.7	S18°29.7	119°56.3	7.6'	\$15°29.6	12.6'	60.2
19	108°51.6	30.3	134°22.8	7.5'	15°42.2	12.5'	60.2
20	123°51.5	31.0	148°49.3	7.4'	15°54.7	12.4'	60.2'
21	138°51.4	• • 31.6	163° 15.8	7.4'	16°07.2	12.3'	60.2'
22	153°51.3	32.2	177°42.1	7.3'	16° 19.5	12.2'	60.2'
23	168°51.2	32.9	192°08.4	7.2'	16°31.8	12.1'	60.2'
	SD = 16.2'	d = 0.6'		SI	O = 16.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	183°51.1	S18°33.5	206°34.6	7.1'	S 16°43.9	12.0'	60.2'
1	198°51.0	34.1	$221^{\circ}00.8$	7.1'	$16^{\circ}55.9$	11.9'	60.2'
2	213°50.9	34.8	235°26.9	7.0'	17°07.9	11.8'	60.1'
3	228° 50.8	• • 35.4	249°52.9	6.9'	17° 19.7	11.7'	60.1
4	243°50.7 258°50.6	36.0	264°18.8 278°44.7	6.9'	17°31.3 17°42.9	11.6'	60.1
5 6	258° 50.6 273° 50.5	36.7 \$18°37.3	278° 44.7 293° 10.5	6.8' 6.7'	\$17°54.4	11.5' 11.3'	60.1' 60.1'
7	288° 50.3	37.9	307°36.2	6.7'	18° 05.7	11.2'	60.1
8	303°50.2	38.5	322°01.9	6.6'	18° 16.9	11.1'	60.1
9	318°50.1	• • 39.2	336° 27.5	6.5'	18° 28.0	11.0'	60.1
10	333°50.0	39.8	350°53.0	6.5'	18°39.0	10.9'	60.1'
11	348°49.9	40.4	5° 18.5	6.4'	18°49.9	10.7'	60.1'
12	3°49.8	S18°41.1	19°43.9	6.3'	S 19°00.6	10.6'	60.0'
13	18° 49.7	41.7	34°09.2	6.3'	19°11.2	10.5	60.0'
14	33°49.6 48°49.4	42.3	48°34.5 62°59.7	6.2' 6.1'	19°21.7 19°32.0	10.3' 10.2'	60.0' 60.0'
15 16	63°49.3	· · 42.9 43.6	77°24.8	6.1	19° 42.2	10.2	60.0
17	78°49.2	44.2	91°49.9	6.0'	19°52.3	9.9'	60.0'
18	93°49.1	S18°44.8	106° 14.9	6.0'	S20°02.2	9.8'	60.0'
19	108°49.0	45.4	120°39.9	5.9'	20°12.0	9.7'	59.9'
20	123°48.9	46.1	135°04.8	5.8'	$20^{\circ}21.7$	9.5'	59.9'
21	138°48.8	• • 46.7	149°29.6	5.8'	20°31.2	9.4'	59.9'
22	153°48.6	47.3	163°54.4	5.7'	20°40.6	9.2'	59.9'
23	168°48.5	47.9	178°19.1	5.7'	20°49.8	9.1'	59.9'
	SD = 16.2'	d = 0.6'		- 51	D = 16.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°48.4	S 18°48.5	$192^{\circ}43.8$	5.6'	S20°58.9	9.0'	59.9'
1	198°48.3	49.2	207°08.4	5.6'	21°07.9	8.8'	59.8'
2	213°48.2	49.8	221°33.0	5.5'	21°16.7 21°25.3	8.7'	59.8'
3 4	228° 48.1 243° 47.9	· · 50.4 51.0	235°57.5 250°21.9	5.4' 5.4'	21°25.3 21°33.9	8.5' 8.4'	59.8' 59.8'
5	243 47.9 258° 47.8	51.6	264°46.3	5.4	21 33.9 21°42.2	8.2'	59.8'
6	273° 47.7	\$18°52.3	279° 10.7	5.3'	\$21°50.4	8.1	59.8'
7	288° 47.6	52.9	293°35.0	5.3'	21°58.5	7.9'	59.7'
8	303°47.5	53.5	$307^{\circ}59.2$	5.2'	22°06.4	7.8'	59.7'
9	318° 47.4	•• 54.1	322°23.4	5.2'	22°14.1	7.6'	59.7'
10	333° 47.2	54.7	336°47.6	5.1'	22°21.7	7.4'	59.7'
11 12	348° 47.1 3° 47.0	55.3 \$18°55.9	351°11.7 5°35.8	5.1' 5.0'	22°29.2 S 22°36.5	7.3' 7.1'	59.7' 59.6'
13	18° 46.9	518 55.9	5° 35.8 19° 59.8	5.0° 5.0°	22°43.6	7.1° 7.0'	59.6'
13 14	33°46.7	50.0 57.2	19 59.8 34°23.8	5.0'	22° 50.6	7.0 6.8'	59.6'
15	48° 46.6	57.8	48°47.8	4.9'	22°57.4	6.6'	59.6'
16	63°46.5	58.4	63°11.7	4.9'	23°04.0	6.5	59.5'
17	78°46.4	59.0	77°35.6	4.9'	23°10.5	6.3'	59.5'
18	93°46.3	S18°59.6	91°59.5	4.8'	S23°16.9	6.2'	59.5'
19	108°46.1	19°00.2	106°23.3	4.8'	23°23.0	6.0'	59.5'
20	123° 46.0	00.8	120°47.2	4.8'	23°29.0	5.8'	59.4
21 22	138° 45.9 153° 45.8	· · 01.4 02.0	135°10.9 149°34.7	4.8' 4.7'	23°34.9 23°40.5	5.7' 5.5'	59.4' 59.4'
23	153° 45.8 168° 45.6	02.0 02.6	149° 34.7 163° 58.5	4.7' 4.7'	23°40.5 23°46.0	5.5'	59.4° 59.4'
25	SD = 16.2'	d = 0.6'			D = 16.3'	5.5	55.7

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	
N 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	
N 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	
N 40°	05:44	06:17	06:46	16:43	17:12	17:45	
35°	05:37	06:08	06:35	16:54	17:21	17:52	
30°	05:31	06:00	06:25	17:04	17:29	17:58	
20°	05:19	05:46	06:09	17:20	17:43	18:10	
N 10°	05:07	05:33	05:55	17:35	17:57	18:22	
0°	04:54	05:19	05:41	17:48	18:10	18:35	
S 10°	04:39	05:05	05:27	18:02	18:24	18:50	
20°	04:21	04:49	05:13	18:17	18:41	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	
S 50°	02:33	03:25	04:04	19:26	20:06	20:58	
52°	02:17	03:14	03:56	19:34	20:16	21:14	
54°	01:58	03:02	03:47	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	
S 60°	////	02:11	03:13	20:18	21:21	////	

Lat.		Moonris	e	Moonset			
Ldl.	Tue	Wed	Thu	Tue	Wed	Thu	
N 72°	06:39			12:18			
N 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	
N 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	
N 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	
N 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	
S 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	
S 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	
S 60°	02:01	02:11	02:26	17:53	19:36	21:15	

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	27-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-1%
14	15:34	15:29	11:45	09:42	22:10	
15	15:24	15:19	11:45	10:38	23:07	
16	15:14	15:08	11:45	11:37	-:-	

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	curn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	56°34.8	212°45.5	508°02.0	251°16.6	N08°13.5	219°43.6	S05°55.5	21°31.9	N11°08.6			
1	71°37.3	227°45.1	03.1	266°17.8	13.0	234°45.7	55.7	36°34.6	08.5	Alpheratz	357°31.3	29°15.3
2	86°39.7	242°44.7	04.2	281°19.0	12.6	249°47.7	55.9	51°37.2	08.5	Ankaa	353°03.9	-42°09.0
3	101° 42.2	257°44.2			12.1	264°49.7		66°39.9		Schedar	349°26.9	56°42.1
			• • 05.4	296°20.2			56.1		• • 08.4	Diphda	348°44.0	-17°49.6
4	116° 44.7	272°43.8	06.5	311°21.4	11.6	279°51.7	56.2	81°42.5	08.4	Achernar	335°17.5	-57°05.5
5	131°47.1	287°43.3	07.6	326°22.6	11.1	294°53.7	56.4	96°45.2	08.3	Hamal	327°47.3	23°36.1
6	146°49.6	302°42.9	S08°08.7	341°23.9	N08°10.6	309°55.7	S05°56.6	111°47.8	N11°08.2	Polaris	311°48.1	89°23.1
7	161°52.1	317°42.5	09.9	356°25.1	10.2	324°57.8	56.8	126°50.5	08.2	Acamar	315°09.0	-40°11.3
8	176°54.5	332°42.0	11.0	11°26.3	09.7	339°59.8	56.9	141°53.1	08.1			
9	191°57.0	347°41.6	• • 12.1	26°27.5	• • 09.2	355°01.8	•• 57.1	156°55.7	• • 08.1	Menkar	314°02.5	4°12.3
10	206°59.4	2°41.2	13.2	41°28.7	08.7	10°03.8	57.3	171°58.4	08.0	Mirfak	308°23.2	49°57.9
11	222°01.9	17°40.7	14.4	56°29.9	08.2	25°05.8	57.5	187°01.0	08.0	Aldebaran	290°35.7	16°34.0
12	237°04.4	32°40.3	S08° 15.5	71°31.1	N08°07.7	40°07.8	S05°57.7	202°03.7	N11°07.9	Rigel	281°00.6	-8°10.1
13	252°06.8	47°39.8	16.6	86°32.4	07.3	55°09.8	57.8	217°06.3		Capella	$280^{\circ}16.8$	46°01.5
				101°33.6				217 00.3 232°09.0	07.9	Bellatrix	$278^{\circ}19.2$	6°22.5
14	267°09.3	62°39.4	17.7		06.8	70°11.9	58.0		07.8	Elnath	277°57.6	28°37.8
15	282°11.8	77°38.9	• • 18.9	116°34.8	• • 06.3	85°13.9	• • 58.2	247°11.6	• • 07.8	Alnilam	275°34.3	-1°11.0
16	297° 14.2	92°38.5	20.0	131°36.0	05.8	100°15.9	58.4	262°14.2	07.7	Betelgeuse	270°48.4	7°24.7
17	312°16.7	107°38.1	21.1	146°37.2	05.3	115°17.9	58.6	277°16.9	07.6	Canopus	263°50.6	-52°42.5
18	$327^{\circ}19.2$	122°37.6	508°22.2	161°38.4	N08°04.9	130°19.9	S05°58.7	$292^{\circ}19.5$	N11°07.6	Sirius	258°23.2	-16°45.3
19	342°21.6	137°37.2	23.3	176°39.6	04.4	145°21.9	58.9	307°22.2	07.5			-29°00.6
20	357°24.1	152°36.7	24.5	191°40.9	03.9	160°24.0	59.1	322°24.8	07.5	Adhara	255°03.1	
21	12°26.5	167°36.3	• • 25.6	206°42.1	• • 03.4	175°26.0	• • 59.3	337°27.5	• • 07.4	Procyon	244°47.4	5°09.0
22	27°29.0	182°35.9	26.7	221°43.3	02.9	190°28.0	59.4	352°30.1	07.4	Pollux	243°13.3	27°57.2
23	42°31.5	197°35.4	27.8	236°44.5	02.5	205°30.0	59.6	7°32.7	07.3	Avior	234°13.1	-59°35.9
										Suhail	222°43.9	-43°32.8
Mer.p	bass. 20:10	$ u$ -0.4 $^{\prime}$ $d1$.1' m-3.96	ν 1.2' d-0	$0.5'~{ m m}1.21$	ν 2.0′ d0.	2′ m-1.73	ν 2.6′ d-0	$.1^\prime$ m-0.01	Miaplacidus	221°37.3	-69°49.9
						-				Alphard	217°44.6	-8°47.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.2	11°49.4
	57° 33.9	212°35.0	508°28.9	251°45.7	N08°02.0		S05°59.8	22°35.4	N11°07.3	Dubhe	193°37.6	61°35.3
0						220°32.0				Denebola	182°22.0	14°24.5
1	72°36.4	227°34.5	30.1	266°46.9	01.5	235°34.0	06°00.0	37°38.0	07.2	Gienah	175°40.5	-17°42.1
2	87°38.9	242°34.1	31.2	281°48.2	01.0	250°36.1	00.2	52°40.7	07.2	Acrux	172°56.9	-63°15.4
3	102°41.3	257°33.6	• • 32.3	296°49.4	• • 00.5	265°38.1	00.3	67°43.3	• • 07.1	Gacrux	171°48.4	-57°16.3
4	117° 43.8	272°33.2	33.4	311°50.6	0.00°080	280°40.1	00.5	82°46.0	07.0	Alioth	$166^{\circ}10.8$	55°47.9
5	132°46.3	287°32.7	34.5	326°51.8	07°59.6	295°42.1	00.7	97°48.6	07.0	Spica	158° 19.3	-11°18.7
6	147° 48.7	302°32.3	S08°35.7	341°53.0	N07°59.1	310°44.1	S06°00.9	112°51.2	N11°06.9	Alkaid	152°50.1	49°10.0
7	162°51.2	317°31.8	36.8	356°54.3	58.6	325°46.2	01.0	127°53.9	06.9	Hadar	148°32.0	-60°30.6
8	177°53.7	332°31.4	37.9	11°55.5	58.1	340°48.2	01.2	142°56.5	06.8		147°54.2	-36°30.6
9	192°56.1	347°31.0	• • 39.0	26°56.7	• • 57.6	355°50.2	• • 01.4	157°59.2	• • 06.8	Arcturus	145°45.4	19°01.9
10	207°58.6	2°30.5	40.1	41°57.9	57.2	10°52.2	01.6	173°01.8	06.7	Rigil Kent.		-60°57.1
11	223°01.0	$17^{\circ}30.1$	41.3	$56^{\circ}59.1$	56.7	25°54.2	01.8	188°04.4	06.7	Kochab	137°21.3	74°02.1
12	238°03.5	32°29.6	508°42.4	72°00.4	N07°56.2	40°56.2	S06°01.9	203°07.1	N11°06.6	Zuben'ubi	136°52.9	-16°09.6
13	253°06.0	47°29.2	43.5	87°01.6	55.7	55°58.3	02.1	218°09.7	06.6	Alphecca	126°01.5	26°37.1
14	268°08.4	62°28.7	44.6	102°02.8	55.2	71°00.3	02.3	233°12.4	06.5	Antares	112° 12.4	-26°29.6
15	283°10.9	77°28.3	• • 45.7	117°04.0	• • 54.8	86°02.3	• • 02.5	248°15.0	• • 06.5	Atria	107°04.2	-69°04.7
16	298° 13.4	92°27.8	46.8	132°05.2	54.3	101°04.3	02.6	263°17.6	06.4	Sabik	107 04.2 101°59.5	-15°45.5
17	313° 15.8	$107^{\circ}27.4$	47.9	147°06.5	53.8	116°06.3	02.8	278°20.3	06.3	Shaula	96°06.5	-15 45.5 -37°07.4
18	328°18.3	122°26.9	508°49.1	162°07.7	N07°53.3	131°08.4	S06°03.0	293°22.9	N11°06.3		95°56.0	12°32.5
19	343°20.8	137°26.5	50.2	177°08.9	52.8	146°10.4	03.2	308°25.6	06.2	Rasalhague		
20	358°23.2	152°26.0	51.3	192°10.1	52.4	161°12.4	03.3	323°28.2	06.2	Eltanin	90°41.2	51°29.3
21	13°25.7	167°25.6	• • 52.4	207°11.3	• • 51.9	176°14.4	• • 03.5	338°30.9	06.1	Kaus Aust.	83°28.7	-34°22.2
22	28°28.2	182°25.1	53.5	222°12.6	51.4	191°16.4	03.7	353°33.5	06.1	Vega	80°31.4	38°48.9
23	43°30.6	197°24.7	54.6	237°13.8	50.9	206°18.5	03.9	8°36.1	06.0	Nunki	75°44.2	-26°15.5
								-		Altair	61°57.1	8°56.9
Mer.p	pass. 20:06	ν -0.4' d1	$.1^\prime$ m-3.96	ν 1.2' d-0	0.5' m 1.20	ν 2.0′ d0.	2′ m-1.73	ν 2.6′ d-0	$.1^\prime$ m-0.01	Peacock	53°01.2	-56°38.6
										Deneb	49°23.8	45°23.4
S	CHV	GHA	Doc	GHA	Doc	GHA	Doc	GHA	Doc	Enif	33°35.7	10°00.7
Sun	GHA 50° 22 1		Dec \$08° 55.7		Dec		Dec S06°04 1		Dec	Al Na'ir	27°29.1	-46°49.3
0	58°33.1	212°24.2		252°15.0	N07°50.4	221°20.5	S06°04.1	23°38.8	N11°06.0	Fomalhaut	15°11.0	-29°28.1
1	73°35.5	227°23.8	56.9	267°16.2	50.0	236°22.5	04.2	38°41.4	05.9	Scheat	13°42.0	28°14.7
2	88°38.0	242°23.3	58.0	282°17.5	49.5	251°24.5	04.4	53°44.1	05.9	Markab	$13^{\circ}26.7$	15°21.9
3	103°40.5	257°22.8	08°59.1	297°18.7	• • 49.0	266°26.5	• • 04.6	68°46.7	• • 05.8	N: 17.5:	CIIA	N4-
4	118° 42.9	272°22.4	09°00.2	312°19.9	48.5	281°28.6	04.8	83°49.3	05.8	Nov 17 Fri	SHA	Mer.pass
5	133° 45.4	287°21.9	01.3	327°21.1	48.0	296°30.6	04.9	98°52.0	05.7		156° 10.7	09:49
6	148°47.9	302°21.5	S09°02.4	342°22.4	N07°47.6	311°32.6	S06°05.1	113°54.6	N11°05.7		194°41.8	07:14
7	163°50.3	317°21.0	03.5	357°23.6	47.1	326°34.6	05.3	128°57.3	05.6		163°08.8	09:20
8	178°52.8	332°20.6	04.6	12°24.8	46.6	341°36.6	05.5	143°59.9	05.6	Saturn	324°57.1	22:30
9	193°55.3	347°20.1	• • 05.7	27°26.0	• • 46.1	356°38.7	• • 05.6	159°02.5	• • 05.5	Nov 18 Sat	SHA	Mer.pass
10	208° 57.7	2°19.7	06.9	42°27.3	45.7	11°40.7	05.8	174°05.2	05.4		155°01.0	09:50
11	224°00.2	17°19.2	08.0	57°28.5	45.2	26°42.7	06.0	189°07.8	05.4		194°11.8	07:12
12	239°02.7	32°18.7	S09°09.1	72°29.7	N07°44.7	41°44.7	S06°06.2	204°10.4	N11°05.3		162°58.1	07.12
13	254°05.1	47°18.3	10.2	87°30.9	44.2	56°46.7	06.3	219°13.1	05.3	Saturn	325°01.4	22:26
14	269°07.6	62°17.8	11.3	102°32.2	43.7	71°48.8	06.5	234°15.7	05.2	Jatuin	J2J U1.4	22.20
15	284°10.0	77°17.4	• • 12.4	117°33.4	• • 43.3	86°50.8	• • 06.7	249°18.4	• • 05.2	Nov 19 Sun	SHA	Mer.pass
16	$299^{\circ}12.5$	$92^{\circ}16.9$	13.5	132°34.6	42.8	101°52.8	06.9	264°21.0	05.1		153°51.1	09:51
17	314° 15.0	107°16.5	14.6	147°35.9	42.3	116°54.8	07.0	279°23.6	05.1		193°41.9	07:10
18	329° 17.4	122°16.0	S09° 15.7	162°37.1	N07°41.8	131°56.8	\$06°07.2	294°26.3	N11°05.0		162°47.4	09:13
19	344°19.9	137°15.5	16.8	177°38.3	41.3	146°58.9	07.4	309°28.9	05.0	Saturn		22:21
20	359°22.4	152°15.1	17.9	192°39.5	40.9	162°00.9	07.6	324°31.6	04.9	Sutuin		
21	14°24.8	167°14.6	19.0	207°40.8	• • 40.4	177°02.9	07.7	339°34.2	• • 04.9	Horizont	al parallax	
22	29°27.3	182°14.2	20.2	222°42.0	39.9	192°04.9	07.9	354°36.8	04.8		Venus:	0.1
23	44°29.8	197°13.7	21.3	237°43.2	39.4	207°07.0	08.1	9°39.5	04.8		Mars:	0.1
ivier.p	pass. 20:03	ν -0.5′ $d1$.1′ m-3.96	ν 1.2' d -(0.5′ m1.19	ν 2.0° d0.	2′ m-1.73	ν2.0′ d-0	.1′ m-0.00			

h	Sui			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.5	S19°03.3	178°22.2	4.7'	\$23°51.4	5.2'	59.3'
1	198°45.4	03.9	192°45.9	4.7'	23°56.5	5.0'	59.3'
2	213°45.3	04.5	207°09.6	4.7'	24°01.5	4.8'	59.3'
3	228°45.1	•• 05.1	221°33.2	4.7'	24°06.4	4.7'	59.3'
4	243°45.0	05.7	235°56.9	4.6'	24°11.1	4.5'	59.2'
5	258°44.9	06.3	250°20.5	4.6'	24°15.6	4.3'	59.2'
6	273°44.8 288°44.6	\$19°06.9	264°44.2 279°07.8	4.6'	\$24°19.9 24°24.1	4.2'	59.2'
7 8	288 44.0 303°44.5	07.5 08.1	279 07.8 293°31.4	4.6' 4.6'	24 24.1 24°28.0	4.0' 3.8'	59.2' 59.1'
9	318°44.4	08.7	307°55.1	4.6'	24° 31.9	3.7'	59.1'
10	333°44.2	09.3	322°18.7	4.6'	24°35.5	3.5'	59.1'
11	348°44.1	09.9	336°42.3	4.6'	24°39.0	3.3'	59.0'
12	3°44.0	S19°10.5	351°05.9	4.6'	S24°42.3	3.1'	59.0'
13	18°43.9	11.1	5°29.6	4.6'	24°45.5	3.0'	59.0'
14	33°43.7	11.7	19°53.2	4.7'	24°48.5	2.8'	59.0'
15	48°43.6 63°43.5	· · 12.3 12.9	34°16.9 48°40.5	4.7' 4.7'	24°51.3 24°53.9	2.6' 2.5'	58.9'
16 17	78°43.3	12.9	48 40.5 63°04.2	4.7' 4.7'	24 53.9 24°56.4	2.5 2.3'	58.9' 58.9'
18	93°43.2	S19°14.1	77°27.9	4.7	\$24°58.7	2.1'	58.8'
19	108°43.1	14.7	91°51.6	4.7'	25°00.8	2.0'	58.8'
20	123°42.9	15.3	106°15.4	4.8'	25°02.7	1.8'	58.8'
21	138°42.8	• • 15.8	120°39.1	4.8'	25°04.5	1.6'	58.7'
22	153°42.7	16.4	135°02.9	4.8'	25°06.1	1.4'	58.7'
23	168°42.5	17.0	149°26.7	4.8'	25°07.6	1.3'	58.7'
	SD = 16.2'	d = 0.6'		SI	O = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	183°42.4	\$19°17.6	163°50.6	ν 4.9'	\$25°08.9	1.1'	58.7'
1	198°42.3	18.2	178°14.4	4.9'	25°10.0	0.9'	58.6'
2	213°42.1	18.8	192°38.3	4.9'	$25^{\circ}10.9$	0.8'	58.6'
3	228°42.0	• • 19.4	207°02.3	5.0'	25°11.7	0.6'	58.6'
4	243°41.9	20.0	221°26.2	5.0'	25°12.3	0.4'	58.5'
5	258°41.7	20.6	235°50.3	5.1'	25°12.7	0.3'	58.5'
6	273°41.6 288°41.5	\$19°21.2 21.8	250°14.3 264°38.4	5.1' 5.1'	\$25°13.0 25°13.1	0.1' -0.1'	58.5'
7 8	288 41.5 303°41.3	21.8	204 38.4 279°02.6	5.1 5.2'	25 13.1 25°13.0	-0.1 -0.2'	58.4' 58.4'
9	318°41.2	22.9	293°26.8	5.2'	25°13.0	-0.2 -0.4'	58.4
10	333°41.0	23.5	307°51.0	5.3'	25°12.4	-0.6'	58.3'
11	348°40.9	24.1	322°15.3	5.3'	25°11.9	-0.7'	58.3'
12	3°40.8	S19°24.7	336°39.6	5.4'	S25°11.2	-0.9'	58.3'
13	18°40.6	25.3	351°04.0	5.5'	25°10.3	-1.0'	58.2'
14	33°40.5	25.8	5°28.5	5.5'	25°09.3	-1.2'	58.2'
15 16	48°40.4 63°40.2	· · 26.4 27.0	19°53.0 34°17.6	5.6' 5.6'	25°08.1 25°06.7	-1.4'	58.2' 58.1'
17	78°40.2	27.0 27.6	34 17.0 48°42.2	5.0 5.7'	25 06.7 25°05.2	-1.5' -1.7'	58.1'
18	93°39.9	\$19°28.2	63°06.9	5.8'	\$25°03.5	-1.8'	58.1
19	108°39.8	28.8	77°31.7	5.8'	25°01.7	-2.0'	58.0'
20	123°39.7	29.3	91°56.5	5.9'	24°59.7	-2.1'	58.0'
21	138°39.5	• • 29.9	106°21.4	6.0'	24°57.6	-2.3'	58.0'
22	153°39.4	30.5	120°46.4	6.0'	24°55.3	-2.4'	57.9'
23	168°39.2	31.1	135°11.4	6.1'	24°52.8	-2.6'	57.9'
	SD = 16.2'	d = 0.6'		SI	O = 16.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°39.1	S19°31.6	149°36.5	6.2'	\$24°50.2	-2.8'	57.8'
1	198°38.9	32.2	164°01.7	6.3'	24°47.5	-2.9'	57.8'
2	213°38.8 228°38.7	32.8 · · 33.4	178°27.0 192°52.3	6.3' 6.4'	24°44.6 24°41.5	-3.1' -3.2'	57.8' 57.7'
3 4	228°38.7 243°38.5	34.0	192°52.3 207°17.7	6.5	24°41.5 24°38.3	-3.2' -3.3'	57.7'
5	258°38.4	34.5	201°17.7	6.6	24°35.0	-3.5'	57.7'
6	273°38.2	\$19°35.1	236°08.8	6.7'	\$24°31.5	-3.6'	57.6'
7	288°38.1	35.7	250°34.5	6.7'	24°27.8	-3.8'	57.6'
8	303°37.9	36.2	265°00.2	6.8'	24°24.1	-3.9'	57.6'
9	318°37.8	• • 36.8	279°26.1	6.9'	24°20.1	-4.1'	57.5'
10	333°37.6	37.4	293°52.0	7.0'	24°16.1	-4.2'	57.5'
11 12	348°37.5 3°37.4	38.0 \$19°38.5	308°18.0 322°44.1	7.1' 7.2'	24°11.9 \$24°07.5	-4.3' -4.5'	57.5' 57.4'
13	3 37.4 18°37.2	39.1	322 44.1 337°10.3	7.2 7.3'	24°03.0	-4.5 -4.6'	57.4 57.4'
14	33°37.1	39.7	351°36.5	7.4'	24 03.0 23°58.4	-4.8'	57.4'
15	48°36.9	• • 40.2	6°02.9	7.5'	23°53.7	-4.9'	57.3'
16	63°36.8	40.8	$20^{\circ}29.3$	7.5'	23°48.8	-5.0'	57.3'
17	78°36.6	41.4	34°55.9	7.6'	23°43.8	-5.2'	57.3'
18	93°36.5	S19°41.9	49°22.5	7.7'	\$23°38.6	-5.3'	57.2'
19	108°36.3	42.5	63°49.3	7.8'	23°33.3	-5.4'	57.2'
20	123°36.2 138°36.0	43.1	78°16.1 92°43.0	7.9'	23°27.9 23°22.4	-5.5'	57.1'
21 22	138°36.0 153°35.9	· · 43.6 44.2	92°43.0 107°10.1	8.0' 8.1'	23°22.4 23°16.7	-5.7' -5.8'	57.1' 57.1'
23	168°35.7	44.2	107 10.1 121°37.2	8.2'	23°10.7	-5.6' -5.9'	57.1°
	SD = 16.2'	d = 0.6'			D = 15.8'		
	<u> </u>	<u>u = 0.0</u>		JI	13.0		

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

Lat.		Moonris	e		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 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° 54°	09:21 09:06	10:28 10:12	11:16 11:01	15:49	16:47 17:04	17:59 18:14
54 52°	09:06	09:58	10:48	16:05 16:19	17:04	18:14
50°	08:40	09.36	10:48	16:31	17:17	18:37
45°	08:16	09:20	10:13	16:56	17:55	19:00
N 40°	07:56	09:00	09:54	17:16	18:15	19:19
35°	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
S 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° 35°	05:20 05:06	06:17 06:03	07:18 07:04	19:57 20:11	20:56 21:10	21:48 22:01
40°	05:06	05:46	07:04	20:11	21:10	22:01
45°	04:30	05:40	06:29	20:28	21:46	22:33
S 50°	04:08	05:01	06:05	21:12	22:11	22:55
52°	03:57	04:49	05:53	21:24	22:22	23:06
54°	03:44	04:36	05:40	21:38	22:36	23:17
56°	03:30	04:20	05:25	21:54	22:51	23:31
58°	03:13	04:01	05:07	22:13	23:10	23:46
S 60°	02:52	03:37	04:45	22:36	23:32	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-8%	
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		

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	59°32.2	212°13.2	S09°22.4	252°44.5	N07°38.9	222°09.0	S06°08.3	24°42.1	N11°04.7			
1	74°34.7	227°12.8	23.5	267°45.7	38.5	237°11.0	08.4	39°44.8	04.7	Alpheratz	357°31.3	29° 15.3
2	89°37.2	242°12.3	24.6	282°46.9	38.0	252°13.0	08.6	54°47.4	04.6	Ankaa	353°03.9	-42°09.0
3	104°39.6	257°11.9	25.7	297°48.1	• • 37.5	267°15.0	• • 08.8	69°50.0	• • 04.6	Schedar	349°26.9	56° 42.1
4	119°42.1	272°11.4	26.8	312°49.4	37.0	282°17.1	09.0	84°52.7	04.5	Diphda	348°44.0	-17°49.6
5	134°44.5	$287^{\circ}10.9$	27.9	327°50.6	36.6	$297^{\circ}19.1$	09.1	99°55.3	04.4	Achernar	335°17.5	-57° 05.5
6	149°47.0	302°10.5	S09°29.0	342°51.8	N07°36.1	312°21.1	S06°09.3	114° 57.9	N11°04.4	Hamal Polaris	327°47.3 311°47.9	23°36.1 89°23.1
7	164°49.5	$317^{\circ}10.0$	30.1	357°53.1	35.6	327°23.1	09.5	130°00.6	04.3	Acamar	311 47.9 315°09.0	-40° 11.3
8	179°51.9	332°09.5	31.2	12°54.3	35.1	342°25.2	09.7	145°03.2	04.3	Menkar	314°02.5	4° 12.3
9	194°54.4	$347^{\circ}09.1$	• • 32.3	27°55.5	• • 34.6	357°27.2	• • 09.8	160°05.9	• • 04.2	Mirfak	308°23.2	49°57.9
10	209°56.9	2°08.6	33.4	42°56.8	34.2	12°29.2	10.0	175°08.5	04.2	Aldebaran	290°35.7	16°34.0
11	224°59.3	17°08.1	34.5	57°58.0	33.7	27°31.2	10.2	190°11.1	04.1	Rigel	281°00.5	-8° 10.1
12	240°01.8	32°07.7	S09°35.6	72°59.2	N07°33.2	42°33.3	S06°10.4	205°13.8	N11°04.1	Capella	280°16.8	46°01.5
13	255°04.3	47°07.2	36.7	88°00.5	32.7	57°35.3	10.5	220°16.4	04.0	Bellatrix	278°19.2	6°22.5
14	270°06.7	62°06.8 77°06.3	37.8	103°01.7 118°02.9	32.3	72°37.3 87°39.3	10.7	235°19.0 250°21.7	04.0	Elnath	277°57.5	28°37.8
15 16	285°09.2 300°11.7	92°05.8	· · 38.9 40.0	116 02.9 133°04.2	· · 31.8 31.3	07 39.3 102°41.3	· · 10.9 11.1	265°24.3	· · 03.9 03.9	Alnilam	275°34.2	$-1^{\circ}11.0$
17	315°14.1	92 05.8 107°05.4	40.0	133 04.2 148°05.4	30.8	102 41.3 117°43.4	11.1	280°26.9	03.8	Betelgeuse	270°48.4	$7^{\circ}24.7$
18	330°16.6	107 03.4 122°04.9	509°42.2	163°06.6	N07°30.3	132°45.4	S06°11.4	295°29.6	N11°03.8	Canopus	263°50.5	-52° 42.5
19	345°19.0	137°04.4	43.3	178°07.9	29.9	147°47.4	11.6	310°32.2	03.7	Sirius	258°23.2	-16°45.3
20	0°21.5	152°03.9	44.4	193°09.1	29.4	162°49.4	11.8	325°34.9	03.7	Adhara	255°03.1	-29°00.6
21	15°24.0	167°03.5	• • 45.5	208°10.3	• • 28.9	177°51.5	. 11.9	340°37.5	03.6	Procyon	244°47.4	5°09.0
22	30°26.4	182°03.0	46.6	223°11.6	28.4	192°53.5	12.1	355°40.1	03.6	Pollux	243°13.3	27°57.2
23	45°28.9	197°02.5	47.7	238°12.8	28.0	207°55.5	12.3	10°42.8	03.5	Avior	234°13.1	-59°35.9
Maria	10.F0		.1′ m-3.96		0.5' m1.18		2′ m-1.73		0.1' m0.00	Suhail	222°43.8 221°37.2	-43°32.8 -69°49.9
ivier.p	ass. 19:59	ν-υ.5 α1	.1 111-3.90	ν1.2 α-C	7.5 m1.18	ν2.0 a0.	∠ 111-1./3	ν2.0 a-C	0.1 INU.UU	Miaplacidus Alphard	221°37.2 217°44.6	-69°49.9 -8°47.0
										Regulus	217 44.6 207°31.1	-8 47.0 11°49.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.6	61°35.3
0	60°31.4	212°02.1	S09°48.8	253°14.0	$N07^{\circ}27.5$	222°57.5	S06°12.5	25° 45.4	N11°03.5	Denebola	182°21.9	14° 24.5
1	75°33.8	227°01.6	49.9	268°15.3	27.0	237°59.6	12.6	40°48.0	03.4	Gienah	175°40.5	-17°42.1
2	90°36.3	242°01.1	51.0	283°16.5	26.5	253°01.6	12.8	55° 50.7	03.4		172°56.8	-63° 15.4
3	105°38.8	257°00.7	• • 52.1	298°17.8	• • 26.1	268°03.6	• • 13.0	70°53.3	• • 03.3	Gacrux		-57° 16.3
4	120°41.2	272°00.2	53.2	313°19.0	25.6	283°05.6	13.2	85°55.9	03.3	Alioth	166°10.8	55° 47.9
5	135°43.7	286°59.7	54.3	328°20.2	25.1	298°07.7	13.3	100°58.6	03.2	Spica	$158^{\circ}19.2$	-11° 18.7
6	150°46.1	301°59.2	S09°55.4	343°21.5	N07°24.6	313°09.7	S06°13.5	116°01.2	N11°03.2	Alkaid	$152^{\circ}50.1$	49°10.0
7 8	165°48.6	316°58.8	56.5	358°22.7 13°23.9	24.1	328°11.7 343°13.7	13.7	131°03.9 146°06.5	03.1	Hadar	148°32.0	-60°30.6
9	180°51.1 195°53.5	331°58.3 346°57.8	57.6 •• 58.7	28° 25.2	23.7 · · · 23.2	358°15.8	13.8 • • 14.0	140 00.5 161°09.1	03.1	Menkent	147°54.2	-36°30.6
10	210°56.0	1°57.4	09° 59.8	43°26.4	22.7	13°17.8	14.0	176° 11.8	02.9	Arcturus	145°45.4	19°01.9
11	225°58.5	16°56.9	10°00.9	58°27.7	22.2	28°19.8	14.4	191°14.4	02.9	Rigil Kent.	139°36.5	-60°57.1
12	241°00.9	31°56.4	\$10°01.9	73°28.9	N07°21.8	43°21.8	S06°14.5	206° 17.0	N11°02.8	Kochab	137°21.3	74°02.1
13	256°03.4	46°55.9	03.0	88°30.1	21.3	58°23.9	14.7	221°19.7	02.8	Zuben'ubi	136°52.9	-16°09.6
14	271°05.9	61°55.5	04.1	103°31.4	20.8	73°25.9	14.9	236°22.3	02.7	Alphecca	126°01.5 112°12.3	26°37.1
15	286°08.3	76°55.0	05.2	118°32.6	20.3	88°27.9	• • 15.1	251°24.9	• • 02.7	Antares	112°12.3 107°04.2	-26° 29.6 -69° 04.7
16	301°10.8	91°54.5	06.3	133°33.9	19.9	103°30.0	15.2	266°27.6	02.6	Atria Sabik	107 04.2 101°59.5	-09 04.7 -15°45.5
17	316°13.3	106°54.0	07.4	148°35.1	19.4	118°32.0	15.4	281°30.2	02.6	Shaula	96°06.5	-15° 45.5 -37° 07.4
18	331°15.7	121°53.6	S10°08.5	163°36.3	N07°18.9	133°34.0	S06°15.6	296°32.8	N11°02.5	Rasalhague	95°56.0	12°32.5
19	346°18.2	136°53.1	09.6	178°37.6	18.4	148°36.0	15.7	311°35.5	02.5	Eltanin	90°41.2	51°29.3
20	1°20.6	151°52.6	10.7	193°38.8	18.0	163°38.1	15.9	$326^{\circ}38.1$	02.4	Kaus Aust.	83°28.7	-34°22.2
21	16°23.1	166°52.1	• • 11.8	208°40.1	• • 17.5	178°40.1	•• 16.1	341°40.7	• • 02.4	Vega	80°31.4	38° 48.9
22	31°25.6	181°51.6	12.9	223°41.3	17.0	193°42.1	16.3	356°43.4	02.3	Nunki	75°44.2	-26° 15.5
23	46°28.0	196°51.2	13.9	238°42.5	16.5	208°44.1	16.4	11°46.0	02.3	Altair	61°57.1	8°56.9
Mer.p	ass. 19:55	ν -0.5' d1	.1′ m-3.95	$\nu 1.2' \ d-0$.5' m1.17	$\nu 2.0' d0.$	2′ m-1.74	$\nu 2.6' \ d-0$	0.1' m0.01	Peacock	53°01.2	-56°38.6
		-		-		-				Deneb	49°23.8	45°23.4
10/	CIIA	CIIA	Б	CIIA	Б	CIIA	Б	CILA	ъ.	Enif	33°35.7	10°00.7
Wed	GHA 61°30.5	GHA 211°50.7	Dec \$10° 15.0	GHA 253°43.8	Dec N07°16.1	GHA 223°46.2	Dec \$06°16.6	GHA 26°48.6	Dec	Al Na'ir	27°29.1	-46°49.3
0 1	76°33.0	211 50.7 226°50.2	16.1	253 43.8 268°45.0	15.6	223 46.2 238°48.2	16.8	20 48.0 41°51.3	N11°02.2 02.2	Fomalhaut	15°11.0	-29°28.1
2	91°35.4	241°49.7	17.2	283°46.3	15.0	253°50.2	17.0	56°53.9	02.2	Scheat	13°42.0	28° 14.7
3	106°37.9	256°49.2	. 18.3	298°47.5	• • 14.6	268°52.2	17.1	71°56.5	02.1	Markab	13°26.7	15°21.9
4	121°40.4	271°48.8	19.4	313°48.8	14.2	283°54.3	17.3	86°59.2	02.0	Nov 20 Mon	SHA	Mer.pass
5	136°42.8	286°48.3	20.5	328°50.0	13.7	298°56.3	17.5	102°01.8	02.0	1	152°41.0	09:51
6	151°45.3	301°47.8	S10°21.6		N07°13.2	313°58.3	S06°17.6		N11°01.9		193°12.2	07:08
7	166°47.8	$316^{\circ}47.3$	22.6	358°52.5	12.7	329°00.4	17.8	$132^{\circ}07.1$	01.9		$162^{\circ}36.8$	09:10
8	181°50.2	331°46.8	23.7	$13^{\circ}53.7$	12.3	344°02.4	18.0	$147^{\circ}09.7$	01.8	Saturn	325°09.9	22:17
9	196°52.7	346°46.4	• • 24.8	28°55.0	• • 11.8	359°04.4	• • 18.2	162°12.3	•• 01.8	Nov 21 Tue	SHA	Mer.pass
10	211°55.1	1°45.9	25.9	43°56.2	11.3	14°06.4	18.3	177° 15.0	01.7		151°30.7	09:52
11	226°57.6	16°45.4	27.0	58°57.5	10.8	29°08.5	18.5	192°17.6	01.7		192°42.7	07:06
12	242°00.1	31°44.9	\$10°28.1	73°58.7	N07°10.4	44°10.5	S06°18.7	207°20.2	N11°01.6		162°26.2	09:07
13	257°02.5	46°44.4	29.2	89°00.0	09.9	59°12.5	18.8	222°22.9	01.6	Saturn		22:13
14	272°05.0	61°43.9	30.2	104°01.2	09.4	74°14.6	19.0	237°25.5	01.5			
15 16	287°07.5 302°09.9	76°43.5 91°43.0	· · 31.3 32.4	119°02.5	· · 08.9	89°16.6	19.2	252°28.1 267°30.8	01.5	Nov 22 Wed	SHA	Mer.pass
16 17	302°09.9 317°12.4	91°43.0 106°42.5	32.4 33.5	134°03.7 149°05.0	08.5 08.0	104°18.6 119°20.6	19.4 19.5	267°30.8 282°33.4	01.4 01.4		150°20.2	09:53
18	317 12.4 332°14.9	100 42.5 121°42.0	510° 34.6	149 05.0 164°06.2	N07°07.5	119 20.6 134°22.7	19.5 \$06°19.7	282 33.4 297°36.0	N11°01.3		192°13.3	07:04
19	347°17.3	121 42.0 136°41.5	35.7	179°07.4	07.0	134 22.7 149°24.7	19.9	312°38.7	01.3		162°15.7 325°18.1	09:04 22:09
20	2°19.8	151°41.0	36.7	194°08.7	06.6	164°26.7	20.0	327°41.3	01.3	Saturn	J2J 10.1	22:09
21	17°22.3	166°40.5	37.8	209°09.9	06.1	179°28.8	20.2	342°43.9	01.2	Horizont	al parallax	
22	32°24.7	181°40.1	38.9	224°11.2	05.6	194°30.8	20.4	357°46.6	01.1		Venus:	0.1
23	47°27.2	196°39.6	40.0	239°12.4	05.1	209°32.8	20.6	$12^{\circ}49.2$	01.1		Mars:	0.1
Mara	ass. 19:51	7/_O E/ A1	.1′ m-3.95	1/1 2/ 4 0	0.5′ m1.16	1/2 0/ 40	2′ m-1.74	1/2 6/ 4 0	0.1' m0.01			
ivier.p	vass. 19.31	ν-0.5 α1.	.1 111-3.93	ν1.∠ <i>u</i> -0	1111.10	ν2.0 d0.	<u> </u>	ν 2.0 α-C	7.1 1110.01			

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.6	S19°45.3	136°04.4	8.3'	S23°05.0	-6.0'	57.0'
1 2	198°35.4 213°35.3	45.9 46.4	150°31.7 164°59.1	8.4' 8.5'	22°59.0 22°52.8	-6.2' -6.3'	57.0' 56.9'
3	213 35.3 228°35.1	. 47.0	104 59.1 179°26.7	8.6'	22°46.5	-6.4	56.9
4	243°35.0	47.6	193°54.3	8.7'	$22^{\circ}40.1$	-6.5'	56.9'
5	258°34.8	48.1	208°22.0	8.8'	22°33.6	-6.6'	56.8'
6 7	273°34.7 288°34.5	\$19°48.7 49.2	222°49.8 237°17.7	8.9' 9.0'	\$22°27.0 22°20.3	-6.7' -6.9'	56.8' 56.8'
8	303°34.4	49.2	251°45.7	9.1'	22° 13.4	-0.9 -7.0'	56.7'
9	318°34.2	• • 50.4	$266^{\circ}13.9$	9.2'	22°06.4	-7.1'	56.7'
10	333°34.0 348°33.9	50.9 51.5	280°42.1	9.3' 9.4'	21°59.4 21°52.2	-7.2'	56.7'
11 12	348 33.9 3°33.7	51.5 \$19°52.0	295°10.4 309°38.8	9.4	521°44.9	-7.3' -7.4'	56.6' 56.6'
13	18°33.6	52.6	324°07.4	9.6'	21° 37.5	-7.5	56.6'
14	33°33.4	53.1	338°36.0	9.7'	21°30.0	-7.6'	56.5'
15 16	48°33.3 63°33.1	· · 53.7 54.2	353°04.7 7°33.5	9.8' 9.9'	21°22.4 21°14.7	-7.7' -7.8'	56.5' 56.5'
17	78°33.0	54.8	22°02.5	10.0'	21°14.7	-7.9'	56.4
18	93°32.8	S19°55.3	$36^{\circ}31.5$	10.1'	S20°58.9	-8.0'	56.4'
19	108°32.6	55.9	51°00.6	10.2'	20°50.9	-8.1'	56.4
20 21	123°32.5 138°32.3	56.4 • • 57.0	65°29.9 79°59.2	10.3' 10.4'	20°42.8 20°34.6	-8.2' -8.3'	56.3' 56.3'
22	153°32.2	57.5	94°28.6	10.5'	20°26.3	-8.4	56.3
23	168°32.0	58.1	108°58.2	10.6'	$20^{\circ}17.9$	-8.5'	56.2'
	SD = 16.2'	d = 0.6'		SI	D = 15.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
o 0	183°31.9	S19°58.6	123°27.8	u 10.7'	S20°09.4	a -8.6'	56.2'
1	198°31.7	59.2	$137^{\circ}57.5$	10.8'	20°00.8	-8.7'	56.2'
2	213°31.5	19°59.7	152°27.4	10.9'	19°52.2	-8.8'	56.1
3 4	228°31.4 243°31.2	20°00.3 00.8	166°57.3 181°27.4	11.0' 11.1'	19°43.4 19°34.6	-8.8' -8.9'	56.1' 56.1'
5	258°31.1	01.4	195°57.5	11.2'	19° 25.7	-9.0'	56.0'
6	273°30.9	S20°01.9	210°27.7	11.3'	S19°16.6	-9.1'	56.0'
7 8	288°30.7 303°30.6	02.4 03.0	224°58.1 239°28.5	11.4' 11.5'	19° 07.6 18° 58.4	-9.2' -9.3'	56.0' 55.9'
9	318°30.4	03.5	259 26.5 253°59.0	11.6'	16 56.4 18°49.1	-9.3 -9.3	55.9'
10	333°30.2	04.1	268°29.6	11.7'	18°39.8	-9.4'	55.9'
11	348°30.1	04.6	283°00.3	11.8'	18° 30.4	-9.5'	55.8'
12 13	3°29.9 18°29.8	\$20°05.1 05.7	297°31.2 312°02.1	11.9' 12.0'	\$18°20.9 18°11.3	-9.6' -9.6'	55.8' 55.8'
14	33°29.6	06.2	326°33.1	12.1'	18°01.7	-9.7'	55.8'
15	48°29.4	• • 06.8	341°04.2	12.2'	17°51.9	-9.8'	55.7'
16 17	63°29.3 78°29.1	07.3 07.8	355°35.3 10°06.6	12.3' 12.4'	17° 42.2 17° 32.3	-9.9' -9.9'	55.7' 55.7'
18	93°28.9	520°08.4	24°38.0	12.5'	\$17°22.4	-10.0'	55.6'
19	108°28.8	08.9	39°09.4	12.6'	17° 12.4	-10.1'	55.6'
20	123°28.6	09.4	53°41.0		17°02.3		55.6'
21 22	138°28.4 153°28.3	· · 10.0 10.5	68°12.6 82°44.4	12.7' 12.8'	16°52.2 16°42.0	-10.2' -10.3'	55.6' 55.5'
23	168°28.1	11.0	97°16.2	12.9'	16°31.7	-10.3	55.5'
	SD = 16.2'	d = 0.5'	-	SI	D = 15.3'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 0	183°27.9	\$20°11.6	111°48.1	13.0'	S16° 21.4	-10.4'	55.5'
1	198°27.8	12.1	$126^{\circ}20.1$	13.1'	$16^{\circ}11.0$	-10.5'	55.4'
2	213°27.6 228°27.4	12.6	140°52.1	13.2' 13.2'	16°00.5	-10.5'	55.4'
3 4	228°27.4 243°27.3	· · 13.2 13.7	155°24.3 169°56.6	13.2′ 13.3′	15°50.0 15°39.4	-10.6' -10.6'	55.4' 55.4'
5	258°27.1	14.2	184°28.9	13.4'	$15^{\circ}28.8$	-10.7'	55.3'
6	273°26.9	\$20°14.8	199°01.3	13.5'	\$15° 18.1	-10.7'	55.3'
7 8	288°26.8 303°26.6	15.3 15.8	213°33.8 228°06.3	13.6' 13.6'	15°07.4 14°56.6	-10.8' -10.9'	55.3' 55.3'
9	318°26.4	16.3	242°39.0	13.7'	14° 45.7	-10.9	55.2
10	333°26.3	16.9	257°11.7	13.8'	14°34.8	-11.0'	55.2'
11 12	348°26.1 3°25.9	17.4 \$20°17.9	271°44.5 286°17.4	13.9' 14.0'	14°23.9 \$14°12.9	-11.0' -11.1'	55.2' 55.2'
13	3 25.9 18°25.7	18.4	300°50.4	14.0'	14°01.8	-11.1'	55.2'
14	33°25.6	19.0	$315^{\circ}23.4$	14.1'	13°50.7	-11.2'	55.1'
15	48°25.4	• • 19.5	329°56.5	14.2'	13°39.5	-11.2'	55.1'
16 17	63°25.2 78°25.1	20.0 20.5	344°29.7 359°02.9	14.3' 14.3'	13°28.3 13°17.1	-11.2' -11.3'	55.1' 55.0'
18	93°24.9	\$20°21.0	13°36.3	14.4'	S13°05.8	-11.3	55.0'
19	108°24.7	21.6	28°09.7	14.5'	12°54.5	-11.4'	55.0'
20 21	123°24.5 138°24.4	22.1 •• 22.6	42°43.1 57°16.7	14.5' 14.6'	12°43.1 12°31.7	-11.4' -11.5'	55.0' 54.9'
22	150° 24.4 153° 24.2	23.1	71°50.3	14.7'	12° 31.7	-11.5'	54.9'
23	168°24.0	23.6	86°23.9	14.7'	12°08.7	-11.5'	54.9'
	SD = 16.2'	d = 0.5'		SI	O = 15.1'		

Naut. Civil Sinset Civil Naut. N 72° 07:22 09:05 ■ 14:26 16:09 N 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 60° 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 N 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	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 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 60° 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 N 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° 05:50 06:23	Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
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 N 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 N 40° 05:50 06:23	N 72°	07:22	09:05			14:26	16:09
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 N 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 N 40° 05:50 06:23 06:52 16:39 17:09 17:42 35° 05:43 06:13	N 70°	07:09	08:37	10:40	12:51	14:54	16:22
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 N 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 N 40° 05:50 06:23 06:52 16:39 17:09 17:42 35° 05:43 06:13 06:11 17:10 17:27 17:56 20° 05:22 05:49		06:59	08:15	09:45	13:47	15:16	16:32
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 N 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 16:09 16:45 17:25 45° 06:07 06:47 07:23 16:09 16:45 17:25 45° 05:58 06:34 07:06 16:25 16:58 17:34 N 40° 05:50 06:23 06:52 16:39 17:09 17:42 35° 05:43 06:13 06:41 16:51 17:18 17:49 30° 05:36 06:05 06:31 17:01 17:27 17:56 20° 05:22 05:49		06:50	07:58	09:12	14:19	15:33	16:41
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N 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 16:39 17:09 17:42 35° 05:43 06:13 06:51 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 N 10° 05:09 05:35 05:57 17:35 17:57 18:23 0° 04:39 05:05 05:28 18:05 18:27 18:53 20° 04:20 04:48		06:36	07:33	08:29	15:02	15:59	16:56
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 N 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 N 10° 05:09 05:35 05:57 17:35 17:57 18:23 0° 04:25 05:20 05:42 17:50 18:12 18:37 S 10° 04:39 05:05	60°	06:30	07:23	08:14	15:18	16:09	17:02
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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 N 10° 05:09 05:35 05:57 17:35 17:57 18:23 0° 04:55 05:20 05:42 17:50 18:12 18:37 S 10° 04:39 05:05 05:28 18:05 18:27 18:53 20° 04:20 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° 02:26 03:40 04:15 19:18 19:53 20:38 5 0° 02:22 03:16	45°	05:58	06:34	07:06	16:25	16:58	17:34
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 N 10° 05:09 05:35 05:57 17:35 17:57 18:23 0° 04:55 05:20 05:42 17:50 18:12 18:37 S 10° 04:39 05:05 05:28 18:05 18:27 18:53 20° 04:20 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 \$ 50° 02:22 03:16 03:57 19:36 20:17 21:12 52° 02:04 03:05		05:50	06:23	06:52	16:39	17:09	17:42
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:43	06:13	06:41	16:51	17:18	17:49
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:22	05:49	06:13	17:19	17:43	18:10
S 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 S 50° 02:22 03:16 03:57 19:36 20:17 21:12 52° 02:04 03:05 03:48 19:45 20:28 21:30 56° 01:49 02:35 03:28 20:06 20:58 22:27 58° //// 02:16 03:15 20:18 21:18 ////					17:35		18:23
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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 \$ 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 ////		04:20	04:48	05:12	18:21	18:44	19:13
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45° 02:56 03:40 04:15 19:18 19:53 20:38 \$ 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 ////							
S 50° 02:22 03:16 03:57 19:36 20:17 21:12 52° 02:04 03:05 03:48 19:45 20:28 21:30 54° 01:41 02:51 03:39 19:55 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 ////							
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 ////	45°	02:56	03:40	04:15	19:18	19:53	20:38
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 ////							
56° 01:09 02:35 03:28 20:06 20:58 22:27 58° //// 02:16 03:15 20:18 21:18 ////							
58° //// 02:16 03:15 20:18 21:18 ////		-					
S 60° //// 01:52 03:00 20:33 21:43 ////							
	S 60°	////	01:52	03:00	20:33	21:43	////

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
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N 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
N 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
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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
S 10°	08:59	09:53	10:43	21:57	22:42	23:23
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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	
S 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°			09:19	23:57	•• ••	00:15
58°	06:26	07:49	09:11		00:09	00:24
S 60°	06:08	07:36	09:02	00:04	00:23	00:34

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-31%	
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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	62°29.6	211°39.1	\$10°41.1	254°13.7	N07°04.7	224°34.9	S06°20.7	27°51.8	N11°01.0			
	77°32.1					239° 36.9				Alpheratz	357°31.3	29°15.3
1		226°38.6	42.1	269°14.9	04.2		20.9	42°54.5	01.0	Ankaa	353°03.9	-42°09.0
2	92°34.6	241°38.1	43.2	284°16.2	03.7	254°38.9	21.1	57°57.1	00.9	Schedar	349°26.9	56°42.1
3	107°37.0	256° 37.6	• • 44.3	299°17.4	• • 03.2	269°40.9	• • 21.2	72°59.7	• • 00.9	Diphda	348°44.0	-17°49.6
4	122°39.5	271°37.1	45.4	314°18.7	02.8	284°43.0	21.4	88°02.3	8.00	Achernar	335°17.5	-57°05.5
5	137°42.0	286°36.6	46.4	329°19.9	02.3	299°45.0	21.6	103°05.0	8.00	Hamal	327°47.3	23°36.1
6	152°44.4	301°36.1	S10°47.5	344°21.2	$N07^{\circ}01.8$	314°47.0	506°21.8	118°07.6	$N11^{\circ}00.7$	Polaris	311°48.0	89°23.1
7	167°46.9	316°35.7	48.6	359°22.4	01.4	329°49.1	21.9	133°10.2	00.7	Acamar	315°09.0	-40°11.3
8	182°49.4	331°35.2	49.7	14°23.7	00.9	344°51.1	22.1	148° 12.9	00.6	Menkar	314°02.5	4°12.2
9	197°51.8	346°34.7	• • 50.8	29°24.9	07°00.4	359°53.1	• • 22.3	163° 15.5	• • 00.6		308°23.2	49°57.9
10	212°54.3	1°34.2	51.8	44°26.2	06°59.9	14°55.2	22.4	$178^{\circ}18.1$	00.5	Mirfak		
11	227°56.7	16°33.7	52.9	59°27.4	59.5	29°57.2	22.6	193°20.8	00.5	Aldebaran	290°35.7	16°34.0
12	242°59.2	31°33.2	S10°54.0	74°28.7	N06°59.0	44°59.2	S06°22.8	208°23.4	N11°00.4	Rigel	281°00.5	-8°10.1
13	258°01.7	46°32.7	55.1	89°29.9	58.5	60°01.3	22.9	223°26.0	00.4	Capella	280°16.8	46°01.5
14	273°04.1	61°32.2	56.1	104°31.2	58.0	75°03.3	23.1	238°28.7	00.3	Bellatrix	278° 19.2	6°22.5
15	288°06.6	76°31.7	57.2	119°32.4	57.6	90°05.3	• • 23.3	253°31.3	00.3	Elnath	277°57.5	28°37.8
16	303°09.1	91°31.2	58.3	134°33.7	57.1	105°07.4	23.5	268°33.9	00.2	Alnilam	275°34.2	-1°11.0
17	318°11.5	106°30.7	10°59.3	149°35.0	56.6	120°09.4	23.6	283°36.5	00.2	Betelgeuse	270°48.4	7°24.7
18	333°14.0	121°30.2	S11°00.4	164°36.2	N06°56.2	135° 11.4	S06°23.8	298°39.2	N11°00.1	Canopus	263°50.5	-52°42.5
19	348°16.5	136°29.7	01.5	179°37.5	55.7	150°13.5	24.0	313°41.8	00.1	Sirius	258°23.2	-16°45.3
20	3°18.9	150°29.7 151°29.2	02.6	179 37.3 194°38.7	55.7 55.2	165° 15.5	24.0	328° 44.4	00.1	Adhara	255°03.1	-29°00.6
		166°28.7				180° 17.5		343°47.1		Procyon	244°47.3	5°09.0
21	18°21.4 33°23.9	181°28.2	• • 03.6	209°40.0 224°41.2	• • 54.7	180° 17.5 195° 19.5	• • 24.3	343°47.1 358°49.7	· · 00.0	Pollux	$243^{\circ}13.3$	27°57.2
22			04.7		54.3		24.5		11°00.0	Avior	$234^{\circ}13.1$	-59°35.9
23	48°26.3	196°27.7	05.8	239°42.5	53.8	210°21.6	24.6	13°52.3	10°59.9	Suhail	222°43.8	-43°32.8
Mer	pass. 19:47	ν -0.5' d1	.1′ m-3.95	ν 1.2 $^{\prime}$ d-0	0.5' m1.15	$\nu 2.0' d0$	2′ m-1.74	ν 2.6′ d-0	.0' m0.01	Miaplacidus	221°37.2	-69°49.9
										Alphard	217°44.6	-8°47.1
										Regulus	207°31.1	11°49.4
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°35.3
0	63°28.8	211°27.2	S11°06.8	254°43.7	N06°53.3	225°23.6	506°24.8	28°54.9	N10°59.9	Denebola	182°21.9	14°24.5
1	78°31.2	226°26.7	07.9	269°45.0	52.8	240°25.6	25.0	43°57.6	59.8	Gienah	175°40.5	-17°42.1
2	93°33.7	241°26.3	09.0	284°46.2	52.4	255°27.7	25.2	59°00.2	59.8		173° 40.3	-63°15.4
3	108°36.2	256°25.8	• • 10.1	299°47.5	• • 51.9	270°29.7	• • 25.3	74°02.8	• • 59.7		172 30.8 171°48.3	-57°16.3
4	123°38.6	271°25.3	11.1	314°48.8	51.4	285°31.7	25.5	89°05.5	59.7			
5	138°41.1	286°24.8	12.2	329°50.0	51.0	300°33.8	25.7	104°08.1	59.6	Alioth	166°10.7	55°47.9
6	153°43.6	301°24.3	S11°13.3	344°51.3	N06°50.5	315°35.8	S06°25.8	119° 10.7	N10°59.6	Spica	158° 19.2	-11°18.7
7	168°46.0	316°23.8	14.3	359°52.5	50.0	330°37.8	26.0	134°13.3	59.5	Alkaid	152°50.0	49°10.0
8	183°48.5	331°23.3	15.4	14°53.8	49.5	345°39.9	26.2	149° 16.0	59.5	Hadar	148°32.0	-60°30.6
9	198°51.0	346°22.7	16.5	29°55.0	• 49.1	0°41.9	26.3	164° 18.6	59.4		147°54.2	-36°30.6
10	213°53.4	1°22.2	17.5	44°56.3	48.6	15°43.9	26.5	179°21.2	59.4	Arcturus	145°45.4	19°01.9
	213 55.4 228°55.9	16°21.7				30°46.0		179 21.2 194°23.9		Rigil Kent.	139°36.5	-60°57.1
11			18.6	59°57.6	48.1		26.7		59.3	Kochab	137°21.3	74°02.0
12	243°58.4	31°21.2	\$11°19.7	74°58.8	N06°47.7	45°48.0	S06°26.8	209°26.5	N10°59.3	Zuben'ubi	136°52.8	-16°09.6
13	259°00.8	46°20.7	20.7	90°00.1	47.2	60°50.1	27.0	224°29.1	59.2	Alphecca	$126^{\circ}01.5$	26°37.1
14	274°03.3	61°20.2	21.8	105°01.3	46.7	75°52.1	27.2	239°31.7	59.2	Antares	$112^{\circ}12.3$	-26°29.6
15	289°05.7	76°19.7	• • 22.8	120°02.6	• • 46.2	90°54.1	• • 27.3	254° 34.4	• • 59.1	Atria	107°04.2	-69°04.7
16	304°08.2	91°19.2	23.9	135°03.9	45.8	105°56.2	27.5	269°37.0	59.1	Sabik	101°59.5	-15°45.5
17	319°10.7	106°18.7	25.0	150°05.1	45.3	120°58.2	27.7	284°39.6	59.0	Shaula	96°06.5	-37°07.4
18	$334^{\circ}13.1$	121°18.2	S11°26.0	165°06.4	N06°44.8	136°00.2	S06°27.9	299°42.3	N10°59.0	Rasalhague	95°56.0	12°32.5
19	349°15.6	136°17.7	27.1	180°07.6	44.4	151°02.3	28.0	314°44.9	58.9	Eltanin	90°41.2	51°29.3
20	4°18.1	151°17.2	28.2	195°08.9	43.9	166°04.3	28.2	329°47.5	58.9	Kaus Aust.	83°28.7	-34°22.2
21	19°20.5	166°16.7	• • 29.2	210°10.2	• • 43.4	181°06.3	• • 28.4	344°50.1	• • 58.8	Vega	80°31.4	38°48.9
22	34°23.0	181°16.2	30.3	225°11.4	42.9	196°08.4	28.5	359°52.8	58.8	Nunki	75°44.2	-26°15.5
23	49°25.5	$196^{\circ}15.7$	31.3	240°12.7	42.5	211° 10.4	28.7	14°55.4	58.8	l l		
										Altair	61°57.1	8°56.9 -56°38.6
Mer.	pass. 19:43	ν -0.5′ $d1$.1′ m-3.95	$\nu_{1.3'} d_{-0}$	0.5′ m1.14	ν 2.0° d 0.	2′ m-1.75	ν 2.6′ d -0	0.0′ m0.02	Peacock	53°01.2	
										Deneb	49°23.8	45°23.4
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	64°27.9	211°15.2	S11°32.4	255°13.9	N06°42.0	226°12.4	S06°28.9	29°58.0	N10°58.7	Al Na'ir	27°29.1	-46°49.3
1	79°30.4	226°14.7	33.5	270°15.2	41.5	241°14.5	29.0	45°00.6	58.7	Fomalhaut	15°11.1	-29°28.1
2	94°32.8	241°14.2	34.5	285°16.5	41.1	256° 16.5	29.2	60°03.3	58.6	Scheat	13°42.0	28°14.7
3	109°35.3	256°13.7	• • 35.6	300°17.7	• • 40.6	271° 18.5	29.4	75°05.9	• • 58.6	Markab	13°26.7	15°21.9
4	109 35.3 124°37.8	271°13.1	36.6	315°19.0	40.0	271 10.5 286°20.6	29.4	90°08.5	58.5	Nov 23 Thu	SHA	Mer.pass
5	139°40.2	286°12.6	37.7	330°20.3	39.7	301°22.6	29.5	105°11.1	58.5		149°09.4	09:54
6	159° 40.2 154° 42.7	301°12.1	511°38.7	345°21.5	39.7 N06°39.2	301 22.6 316°24.7	506°29.9		58.5 N10°58.4		191°44.0	07:03
											162°05.2	09:00
7	169°45.2	316°11.6	39.8	0°22.8	38.7	331°26.7	30.0	135°16.4	58.4	Saturn	325°22.2	22:05
8	184°47.6	331°11.1	40.9	15°24.0	38.2	346°28.7	30.2	150° 19.0	58.3	Saturn	J2J 22.2	22:05
9	199°50.1	346°10.6	• • 41.9	30°25.3	• • 37.8	1°30.8	30.4	165°21.6	• • 58.3	Nov 24 Fri	SHA	Mer.pass
10	214°52.6	1°10.1	43.0	45°26.6	37.3	16°32.8	30.5	180°24.3	58.2		147°58.5	09:55
11	229°55.0	16°09.6	44.0	60°27.8	36.8	31°34.8	30.7	195°26.9	58.2		191°15.0	07:00
12	244°57.5	31°09.1	S11°45.1	75°29.1	N06°36.4	46°36.9	S06°30.9	210°29.5	N10°58.1		161°54.8	08:57
13	260°00.0	46°08.5	46.1	90°30.4	35.9	61°38.9	31.0	225°32.1	58.1		325°26.2	22:00
14	275°02.4	61°08.0	47.2	105°31.6	35.4	76°40.9	31.2	240°34.8	58.0			00
15	290°04.9	76°07.5	• • 48.2	120°32.9	• • 35.0	91°43.0	• • 31.4	255° 37.4	• • 58.0	Nov 25 Sat	SHA	Mer.pass
16	305°07.3	91°07.0	49.3	135°34.2	34.5	106°45.0	31.5	270°40.0	57.9		$146^{\circ}47.3$	09:55
17	320°09.8	$106^{\circ}06.5$	50.3	150°35.4	34.0	121°47.1	31.7	285°42.6	57.9		190°46.0	06:58
18	$335^{\circ}12.3$	121°06.0	S11°51.4	165°36.7	N06°33.5	136°49.1	S06°31.9	300°45.3	N10°57.9		161°44.5	08:54
19	350°14.7	136°05.5	52.4	180°38.0	33.1	151°51.1	32.0	315°47.9	57.8		325°30.1	21:56
20	5°17.2	151°04.9	53.5	195°39.2	32.6	166°53.2	32.2	330°50.5	57.8			
21	20°19.7	166°04.4	• • 54.5	210°40.5	• • 32.1	181°55.2	• • 32.4	345°53.1	• • 57.7	Horizont	al parallax	
22	35°22.1	181°03.9	55.6	225°41.8	31.7	196° 57.3	32.5	0°55.8	57.7		Venus:	0.1
23	50°24.6	196°03.4	56.6	240°43.0	31.2	211°59.3	32.7	15°58.4	57.6		Mars:	0.1
Mer.	pass. 19:39	ν -0.5′ $d1$.1′ m-3.95	ν 1.3′ d-0	0.5′ m1.13	ν 2.0′ d0.	2′ m-1.75	ν 2.6′ d-0	0.0′ m0.02			

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°23.8	S20°24.1	100°57.7	14.8'	S 11°57.1	-11.6'	54.9'
1 2	198°23.7 213°23.5	24.7 25.2	115°31.5 130°05.3	14.9' 14.9'	11°45.5 11°33.9	-11.6' -11.7'	54.9' 54.8'
3	228°23.3	25.7	144°39.2	15.0'	11°22.3	-11.7'	54.8'
4	243°23.1	26.2	159°13.2	15.0'	$11^{\circ}10.6$	-11.7'	54.8'
5	258°23.0	26.7	173°47.3	15.1'	10°58.8	-11.8'	54.8'
6 7	273°22.8 288°22.6	\$20°27.2 27.7	188°21.4 202°55.5	15.2' 15.2'	\$10°47.0 10°35.2	-11.8' -11.8'	54.8' 54.7'
8	303°22.4	28.3	202 33.3 217°29.7	15.2	10° 33.2	-11.0 -11.9'	54.7'
9	318°22.3	• • 28.8	232°04.0	15.3'	10°11.5	-11.9'	54.7'
10	333°22.1 348°21.9	29.3	246°38.3 261°12.7	15.4'	09°59.6 09°47.7	-11.9'	54.7'
11 12	348 21.9 3°21.7	29.8 \$20°30.3	201 12.7 275°47 2	15.4' 15.5'	509°35.7	-12.0' -12.0'	54.7' 54.6'
13	18°21.5	30.8	290°21.6	15.5'	09°23.7	-12.0'	54.6'
14	33°21.4	31.3	304°56.2	15.6'	09°11.7	-12.0'	54.6'
15 16	48°21.2 63°21.0	· · 31.8 32.3	319°30.8 334°05.4	15.6' 15.7'	08°59.7 08°47.6	-12.1' -12.1'	54.6' 54.6'
17	78°20.8	32.3	348°40.1	15.7'	08°35.5	-12.1'	54.6'
18	93°20.6	S20°33.3	3°14.8	15.8'	S08°23.4	-12.2'	54.5'
19	108°20.5	33.8	17°49.6	15.8'	08°11.2	-12.2'	54.5'
20 21	123°20.3 138°20.1	34.3 •• 34.8	32°24.4 46°59.3	15.9' 15.9'	07°59.0 07°46.8	-12.2' -12.2'	54.5' 54.5'
22	153°19.9	35.3	61°34.2	15.9'	07°34.6	-12.2'	54.5
23	168°19.7	35.8	76°09.1	16.0'	07°22.4	-12.3'	54.5'
	SD = 16.2'	d = 0.5'		SI	D = 15.0'		
F	CUA	D	GHA		D-:	J	LIP
Fri 0	GHA 183°19.5	Dec 520°36.3	GHA 90°44.1	u 16.0'	Dec \$07°10.1	d -12.3'	HP 54.4'
1	198°19.4	36.8	105°19.1	16.1'	06°57.8	-12.3'	54.4'
2	213°19.2	37.3	119°54.2	16.1'	06°45.5	-12.3'	54.4'
3 4	228°19.0 243°18.8	· · 37.8 38.3	134°29.3 149°04.5	16.1' 16.2'	06°33.2 06°20.8	-12.3' -12.4'	54.4' 54.4'
5	243 16.6 258°18.6	38.8	163°39.6	16.2'	06°08.5	-12.4'	54.4'
6	273°18.4	S20°39.3	178°14.8	16.2'	S05°56.1	-12.4'	54.4'
7	288°18.3	39.8	192°50.1	16.3'	05°43.7	-12.4'	54.4'
8 9	303°18.1 318°17.9	40.3 •• 40.8	207°25.3 222°00.7	16.3' 16.3'	05°31.3 05°18.8	-12.4' -12.4'	54.3' 54.3'
10	333°17.7	41.3	236°36.0	16.4	05°06.4	-12.4 -12.5'	54.3'
11	348°17.5	41.8	251°11.3	16.4'	04°53.9	-12.5'	54.3'
12	3°17.3	S20°42.3	265°46.7	16.4'	S04°41.5	-12.5'	54.3'
13 14	18°17.1 33°17.0	42.8 43.3	280°22.1 294°57.6	16.4' 16.5'	04°29.0 04°16.5	-12.5' -12.5'	54.3' 54.3'
15	48°16.8	• • 43.8	309°33.1	16.5	04°04.0	-12.5'	54.3'
16	63°16.6	44.3	324°08.5	16.5'	03°51.5	-12.5'	54.3'
17	78°16.4 93°16.2	44.8 \$20°45.2	338°44.0 353°19.6	16.5'	03°38.9 \$03°26.4	-12.5'	54.2'
18 19	93 16.2 108°16.0	520 45.2 45.7	7°55.1	16.6' 16.6'	03°13.9	-12.5' -12.6'	54.2' 54.2'
20	123°15.8	46.2	22°30.7		03°01.3		54.2'
21	138°15.6	• • 46.7	37°06.3	16.6'	02°48.7	-12.6'	54.2'
22 23	153°15.4 168°15.3	47.2 47.7	51°41.9 66°17.5	16.6' 16.6'	02°36.2 02°23.6	-12.6' -12.6'	54.2' 54.2'
23	SD = 16.2'	$\frac{47.7}{d=0.5'}$			D = 14.8'	-12.0	34.2
	3D = 10.2'	<i>u</i> = 0.5°		31	J — 14.δ'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°15.1 198°14.9	\$20°48.2 48.6	80°53.1 95°28.8	16.6' 16.7'	\$02°11.0 01°58.4	-12.6' -12.6'	54.2' 54.2'
2	213°14.7	49.1	110°04.5	16.7	01°45.8	-12.6'	54.2'
3	228°14.5	• • 49.6	124°40.1	16.7'	01°33.3	-12.6'	54.2'
4	243°14.3 258°14.1	50.1	139°15.8	16.7'	01°20.7 01°08.1	-12.6'	54.2' 54.2'
5 6	258°14.1 273°13.9	50.6 \$20°51.1	153°51.5 168°27.2	16.7' 16.7'	01°08.1 \$00°55.5	-12.6' -12.6'	54.2'
7	288°13.7	51.5	183°02.9	16.7'	00°42.9	-12.6'	54.1'
8	303°13.5	52.0	197°38.6	16.7'	00°30.3	-12.6'	54.1
9 10	318°13.3 333°13.1	· · 52.5 53.0	212°14.3 226°50.1	16.7' 16.7'	00°17.6 \$00°05.0	-12.6' -12.6'	54.1' 54.1'
11	348°13.0	53.0 53.4	241°25.8	16.7'	N00° 07.6	-12.6'	54.1'
12	3°12.8	S20°53.9	256°01.5	16.7'	N00°20.2	12.6'	54.1'
13	18°12.6	54.4	270°37.3	16.7'	00°32.7	12.6'	54.1'
14 15	33°12.4 48°12.2	54.9 •• 55.3	285°13.0 299°48.7	16.7' 16.7'	00°45.3 00°57.9	12.6' 12.6'	54.1' 54.1'
16	63°12.0	55.8	314°24.4	16.7	01°10.5	12.6'	54.1'
17	78°11.8	56.3	329°00.2	16.7'	01°23.1	12.6'	54.1'
18	93°11.6 108°11.4	\$20°56.8 57.2	343°35.9 358°11.6	16.7' 16.7'	N01°35.7 01°48.2	12.6' 12.6'	54.1' 54.1'
19 20	108°11.4 123°11.2	57.2 57.7	358°11.6 12°47.3	16.7'	01°48.2 02°00.8	12.6'	54.1' 54.1'
21	138°11.0	• • 58.2	27°23.0	16.7'	$02^{\circ}13.4$	12.5'	54.1'
22	153°10.8	58.6	41°58.7	16.7'	02°25.9	12.5'	54.1'
23	168°10.6	59.1	56°34.4	16.7'	02°38.5	12.5'	54.1'
	SD = 16.2'	d = 0.5'		SI	O = 14.8'		

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

Lat.		Moonris	е	Moonset			
Lat.	Thu	Fri	Sat	Thu	Fri	Sat	
N 72°	13:42	13:15	12:52	22:17		00:09	
N 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	
N 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	
N 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	
S 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	
S 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	
S 60°	10:24	11:44	13:02	00:42	00:47	00:51	

		Sun				
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	65°27.1	211°02.9	S11°57.7	255°44.3	N06°30.7	227°01.3	S06°32.9	31°01.0	N10° 57.6			
1	80°29.5	226°02.3	58.7	270°45.6	30.3	242°03.4	33.0	46°03.6	57.5	Alpheratz	357°31.3	29° 15.3
2	95°32.0	241°01.8	$11^{\circ}59.8$	285°46.8	29.8	257°05.4	33.2	61°06.3	57.5	Ankaa	353°03.9	-42°09.0
3	110°34.4	256°01.3	12°00.8	300°48.1	• • 29.3	272°07.4	• • 33.4	76°08.9	• • 57.4	Schedar	349°27.0 348°44.0	56°42.1
4	125°36.9	271°00.8	01.9	315°49.4	28.9	287°09.5	33.5	$91^{\circ}11.5$	57.4	Diphda	348 44.0 335°17.5	-17° 49.6 -57° 05.5
5	140°39.4	286°00.3	02.9	330°50.6	28.4	302°11.5	33.7	$106^{\circ}14.1$	57.3	Achernar Hamal	335 17.5 327°47.3	-57 U5.5 23°36.1
6	155°41.8	300°59.8	512°04.0	345°51.9	N06°27.9	317°13.6	506°33.9	121°16.8	N10°57.3	Polaris	321°48.2	89°23.2
7	170°44.3	315°59.2	05.0	0°53.2	27.5	332°15.6	34.0	136° 19.4	57.2	Acamar	315°09.0	-40°11.3
8	185°46.8	330°58.7	06.1	15°54.5	27.0	347°17.6	34.2	151°22.0	57.2	Menkar	314°02.5	4°12.2
9	200°49.2	345°58.2	•• 07.1	30°55.7	• • 26.5	2°19.7	• • 34.4	166°24.6	• • 57.2	Mirfak	308°23.2	49°57.9
10	215°51.7	0°57.7	08.2	45°57.0	26.1	17°21.7	34.5	181°27.2	57.1	Aldebaran	290°35.6	16°34.0
11	230°54.2	15°57.1	09.2	60°58.3	25.6	32°23.8	34.7	196°29.9	57.1	Rigel	281°00.5	-8° 10.1
12	245°56.6	30°56.6	\$12° 10.2	75°59.5	N06°25.1	47°25.8	S06°34.9	211°32.5	N10°57.0	Capella	$280^{\circ}16.7$	46°01.5
13	260°59.1 276°01.6	45°56.1 60°55.6	11.3	91°00.8 106°02.1	24.7 24.2	62°27.8 77°29.9	35.0	226°35.1 241°37.7	57.0	Bellatrix	$278^{\circ}19.2$	6°22.5
14 15	291°04.0	75°55.0	12.3 •• 13.4	100 02.1 121°03.4	23.7	92°31.9	35.2 •• 35.4	256°40.4	56.9 •• 56.9	Elnath	277°57.5	28° 37.8
16	306°06.5	90°54.5	14.4	136°04.6	23.2	107°34.0	35.5	271°43.0	56.8	Alnilam	275°34.2	-1°11.0
17	321°08.9	105°54.0	15.5	151°05.9	22.8	122°36.0	35.7	286°45.6	56.8	Betelgeuse	270°48.4	7°24.7
18	336°11.4	120°53.5	\$12°16.5	166°07.2	N06°22.3	137°38.0	S06°35.9	301°48.2	N10°56.7	Canopus	263°50.5	-52°42.6
19	351°13.9	135°52.9	17.5	181°08.5	21.8	152°40.1	36.0	316°50.8	56.7	Sirius	258°23.2	-16°45.3
20	6°16.3	150°52.4	18.6	196°09.7	21.4	167°42.1	36.2	331°53.5	56.7	Adhara	255°03.1	-29°00.6
21	21°18.8	165°51.9	• • 19.6	211°11.0	• • 20.9	182°44.2	• • 36.4	$346^{\circ}56.1$	• • 56.6	Procyon	244°47.3	5°08.9 27°57.2
22	36°21.3	180°51.4	20.6	226°12.3	20.4	197°46.2	36.5	1°58.7	56.6	Pollux Avior	243°13.2 234°13.0	-59°35.9
23	51°23.7	195°50.8	21.7	241°13.5	20.0	212°48.2	36.7	17°01.3	56.5	Suhail	234 13.0 222°43.8	-39 33.9 -43°32.8
Mern	ass. 19:35	v-0.5′ d1	.0′ m-3.95	11 3' d-C	0.5' m1.12	1/2 0' d0	2′ m-1.75	12 6' d-C	0.0' m0.03	Miaplacidus	221°37.1	-43 32.8 -69°49.9
- IVIEL.P		ν-0.5 α1	.0 111-3.93	ν1.5 u-0	7.5 1111.12	ν2.0 do.		ν2.0 u-0	7.0 1110.03	Alphard	217°44.6	-8°47.1
										Regulus	207°31.1	11°49.4
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.5	61°35.3
0	66°26.2	210°50.3	S12°22.7	256°14.8	N06°19.5	227°50.3	S06°36.9	32°04.0	N10°56.5	Denebola	182°21.9	14°24.5
1	81°28.7	225°49.8	23.8	271°16.1	19.0	242°52.3	37.0	47°06.6	56.4	Gienah	175°40.5	-17°42.1
2	96°31.1	240°49.2	24.8	286°17.4	18.6	257°54.4	37.2	62°09.2	56.4	Acrux	172°56.8	-63° 15.4
3	111°33.6	255°48.7	• • 25.8	301°18.6	· · 18.1	272°56.4	• • 37.3	77°11.8	• • 56.3	Gacrux	171°48.3	-57° 16.3
4	126°36.1	270°48.2	26.9	316°19.9	17.6	287°58.5	37.5	92°14.4	56.3	Alioth	$166^{\circ}10.7$	55° 47.9
5 6	141°38.5 156°41.0	285°47.7 300°47.1	27.9 \$12°28.9	331°21.2 346°22.5	17.2 N06°16.7	303°00.5 318°02.5	37.7 \$06°37.8	107° 17.1 122° 19.7	56.2 N10°56.2	Spica	158°19.2	-11° 18.7
7	171°43.4	315°46.6	30.0	1°23.8	16.2	333°04.6	38.0	137° 22.3	56.2	Alkaid	152°50.0	49°09.9
8	171 45.4 186°45.9	330°46.1	31.0	16°25.0	15.8	348°06.6	38.2	157° 22.5	56.1	Hadar	148°31.9	-60°30.6
9	201°48.4	345°45.5	• • 32.0	31°26.3	. 15.3	3°08.7	38.3	167°27.5	56.1	Menkent	147°54.2	-36°30.6
10	216°50.8	0°45.0	33.1	46°27.6	14.8	18°10.7	38.5	182°30.2	56.0	Arcturus	145°45.4	19°01.9
11	231°53.3	15°44.5	34.1	61°28.9	14.4	33°12.8	38.7	197°32.8	56.0	Rigil Kent.	139°36.4	-60°57.1
12	246°55.8	30°43.9	S12°35.1	76°30.1	N06°13.9	48°14.8	506°38.8	212°35.4	N10°55.9	Kochab	137°21.3 136°52.8	74°02.0 -16°09.6
13	261°58.2	45°43.4	36.2	91°31.4	13.5	63°16.8	39.0	227°38.0	55.9	Zuben'ubi Alphecca	130 52.8 126°01.5	-16 09.6 26°37.1
14	277°00.7	60°42.9	37.2	$106^{\circ}32.7$	13.0	78°18.9	39.2	242°40.6	55.8	Antares	112° 12.3	-26°29.6
15	292°03.2	75°42.3	• • 38.2	121°34.0	• • 12.5	93°20.9	• • 39.3	257°43.3	• • 55.8	Atria	107°04.2	-69°04.6
16	307°05.6	90°41.8	39.3	136°35.3	12.1	108°23.0	39.5	272°45.9	55.7	Sabik	101°59.5	-15° 45.5
17	322°08.1	105°41.3	40.3	151°36.5	11.6	123°25.0	39.6	287°48.5	55.7	Shaula	96°06.5	-37°07.4
18	337°10.5	120°40.7	S12°41.3	166°37.8	N06°11.1	138°27.1	S06°39.8	302°51.1	N10°55.7	Rasalhague	95°56.0	12°32.5
19	352°13.0	135°40.2	42.3	181°39.1	10.7	153°29.1	40.0	317°53.7	55.6	Eltanin	90°41.2	51°29.3
20	7°15.5	150°39.6	43.4	196°40.4	10.2	168°31.1	40.1	332°56.4	55.6	Kaus Aust.	83°28.7	-34°22.2
21 22	22°17.9 37°20.4	165°39.1 180°38.6	• • 44.4 45.4	211°41.7 226°42.9	· · 09.7 09.3	183°33.2 198°35.2	· · 40.3 40.5	347°59.0 3°01.6	• • 55.5	Vega	80°31.5	38°48.9
23	52°22.9	195°38.0	46.4	241°44.2	09.3	213°37.3	40.5	18°04.2	55.5 55.4	Nunki	75°44.2	-26° 15.5
23	52 22.9									Altair	61°57.1	8°56.9
Mer.p	ass. 19:31	ν -0.5' d1.	.0′ m-3.95	ν 1.3 $^{\prime}$ d-0	$0.5' \; { m m} 1.11$	ν 2.0′ d0.	2′ m-1.75	ν 2.6 $^{\prime}$ d-0	0.0′ m0.03	Peacock	53°01.2	-56° 38.6
										Deneb	49°23.8	45°23.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	67°25.3	210°37.5	S12°47.5	256°45.5	N06°08.3	228°39.3	S06°40.8	33°06.8	N10°55.4	Al Na'ir Fomalhaut	27°29.1 15°11.1	-46°49.3 -29°28.1
1	82°27.8	225°37.0	48.5	271°46.8	07.9	243°41.4	41.0	48°09.4	55.3	Scheat	13°42.0	-29 26.1 28°14.7
2	97°30.3	240°36.4	49.5	$286^{\circ}48.1$	07.4	258°43.4	41.1	$63^{\circ}12.1$	55.3	Markab	13°26.7	15°21.9
3	112°32.7	255°35.9	• • 50.5	$301^{\circ}49.3$	• • 06.9	273°45.5	• • 41.3	$78^{\circ}14.7$	• • 55.3			
4	127°35.2	270°35.3	51.6	316°50.6	06.5	288°47.5	41.4	93°17.3	55.2	Nov 26 Sun	SHA	Mer.pass
5	142°37.7	285°34.8	52.6	331°51.9	06.0	303°49.5	41.6	108° 19.9	55.2		145°35.8	09:56
6	157°40.1	300°34.2	S12°53.6	346°53.2	N06°05.5	318°51.6	S06°41.8	123°22.5	N10°55.1	Mars		06:56
7	172°42.6	315°33.7	54.6	1°54.5	05.1	333°53.6	41.9	138°25.2	55.1		161°34.3	08:51
8	187°45.0	330°33.2	55.7	16°55.8	04.6	348°55.7	42.1	153°27.8 168°30.4	55.0	Saturn	325°34.0	21:52
9 10	202°47.5 217°50.0	345°32.6 0°32.1	· · 56.7 57.7	31°57.0 46°58.3	· · 04.2 03.7	3°57.7 18°59.8	· · 42.3 42.4	168° 30.4 183° 33.0	· · 55.0 55.0	Nov 27 Mon	SHA	Mer.pass
10 11	217 50.0 232°52.4	0 32.1 15°31.5	57.7 58.7	40 58.3 61°59.6	03.7	34°01.8	42.4 42.6	183 33.0 198°35.6	55.0 54.9		$144^{\circ}24.1$	09:57
12	232 52.4 247°54.9	30°31.0	50.7 \$12°59.7	77°00.9	N06°02.8	49°03.9	\$06°42.7	213°38.2	N10° 54.9		189°48.6	06:54
13	262°57.4	45°30.4	13°00.8	92°02.2	02.3	64°05.9	42.9	213° 30.2 228° 40.9	54.8		161°24.1	08:47
14	277°59.8	60°29.9	01.8	107°03.5	01.8	79°08.0	43.1	243°43.5	54.8	Saturn	325°37.8	21:48
15	293°02.3	75°29.4	02.8	122°04.8	01.4	94°10.0	43.2	258°46.1	• • 54.7	Nov 28 Tue	SHA	Mer.pass
16	308°04.8	90°28.8	03.8	137°06.0	00.9	109°12.0	43.4	273°48.7	54.7		143°12.2	09:58
17	323°07.2	$105^{\circ}28.3$	04.8	152°07.3	00.4	$124^{\circ}14.1$	43.6	288°51.3	54.6		189°20.2	06:52
18	338°09.7	120°27.7	S 13°05.8	$167^{\circ}08.6$	$N06^{\circ}00.0$	$139^{\circ}16.1$	S06°43.7	303°53.9	N10°54.6	Jupiter		08:44
19	353°12.2	135°27.2	06.9	182°09.9	05°59.5	154°18.2	43.9	318° 56.6	54.6	Saturn	$325^{\circ}41.5$	21:44
20	8°14.6	150°26.6	07.9	197°11.2	59.1	169°20.2	44.0	333°59.2	54.5	Ц!	al navall-	
21	23°17.1	165°26.1	•• 08.9	212°12.5	• • 58.6	184°22.3	• • 44.2	349°01.8	• • 54.5	Horizont	al parallax	0.1
22	38°19.5	180°25.5	09.9	227°13.8	58.1	199°24.3	44.4	4°04.4	54.4		Venus: Mars:	0.1 0.1
23	53°22.0	195°25.0	10.9	242°15.0	57.7	214°26.4	44.5	19°07.0	54.4		ivial 5.	0.1
Mer.p	ass. 19:27	ν -0.5' $d1$.0′ m-3.95	ν 1.3 $^{\prime}$ d-0).5′ m1.10	ν 2.0′ d0.	2′ m-1.76	ν 2.6′ d-0	0.0′ m0.04			
		-										

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°10.4	\$20°59.6	71°10.0	16.7'	N02°51.0	12.5'	54.1'
1 2	198°10.2 213°10.0	21°00.1 00.5	85°45.7 100°21.4	16.6' 16.6'	03°03.5 03°16.0	12.5' 12.5'	54.1' 54.1'
3	228°09.8	. 01.0	100 21.4 114°57.0	16.6'	03°10.0	12.5'	54.1
4	243°09.6	01.4	129°32.6	16.6'	03°41.0	12.5'	54.1'
5	258°09.4	01.9	144°08.2	16.6'	03°53.5	12.5'	54.1'
6 7	273°09.2 288°09.0	\$21°02.4 02.8	158°43.8 173°19.4	16.6' 16.6'	N04°05.9 04°18.4	12.4' 12.4'	54.1' 54.1'
8	303°08.8	03.3	187°54.9	16.5'	04° 10.4° 04° 30.8	12.4'	54.1'
9	318°08.6	• • 03.8	202°30.5	16.5'	04°43.3	12.4'	54.1'
10	333°08.4	04.2	217°06.0	16.5'	04°55.7	12.4	54.1'
11 12	348°08.2 3°08.0	04.7 \$21°05.1	231°41.5 246°16.9	16.5' 16.4'	05°08.1 N05°20.4	12.4' 12.4'	54.1' 54.1'
13	18°07.8	05.6	260°52.4	16.4	05°32.8	12.3'	54.1'
14	33°07.6	06.1	$275^{\circ}27.8$	16.4'	$05^{\circ}45.1$	12.3'	54.1'
15	48°07.4 63°07.2	· · 06.5 07.0	290°03.2 304°38.6	16.4' 16.3'	05°57.4 06°09.7	12.3' 12.3'	54.1' 54.1'
16 17	78°07.0	07.0 07.4	319°13.9	16.3'	06°09.7	12.3'	54.1'
18	93°06.8	S21°07.9	333°49.2	16.3'	N06°34.3	12.2'	54.2'
19	108°06.6	08.3	348°24.5	16.3'	06°46.5	12.2'	54.2'
20 21	123°06.4 138°06.2	08.8 •• 09.3	2°59.7 17°35.0	16.2' 16.2'	06°58.7 07°10.9	12.2' 12.2'	54.2' 54.2'
22	153°06.0	09.7	32°10.1	16.2'	07°10.9	12.1'	54.2'
23	168°05.8	10.2	46°45.3	16.1'	07°35.2	12.1'	54.2'
	SD = 16.2'	d = 0.5'		SE	0 = 14.8'		
					Б.	,	LIE
Mon 0	GHA 183°05.6	Dec \$21°10.6	GHA 61°20.4	u 16.1'	Dec N07° 47.4	d 12.1'	HP 54.2'
1	198°05.4	11.1	75°55.5	16.0'	07°59.4	12.1'	54.2'
2	213°05.1	11.5	90°30.6	16.0'	08°11.5	12.0'	54.2'
3	228°04.9	• • 12.0	105°05.6	16.0'	08°23.6	12.0'	54.2'
4 5	243°04.7 258°04.5	12.4 12.9	119°40.5 134°15.5	15.9' 15.9'	08° 35.6 08° 47.6	12.0' 12.0'	54.2' 54.2'
6	273°04.3	S21°13.3	148°50.4	15.9'	N08° 59.5	11.9'	54.2'
7	288°04.1	13.8	163°25.2	15.8'	09°11.4	11.9'	54.2'
8	303°03.9	14.2	178°00.0	15.8'	09°23.3	11.9'	54.2'
9 10	318°03.7 333°03.5	· · 14.6 15.1	192°34.8 207°09.5	15.7' 15.7'	09°35.2 09°47.0	11.8' 11.8'	54.3' 54.3'
11	348°03.3	15.5	221°44.2	15.6'	09°58.8	11.8'	54.3'
12	3°03.1	S21°16.0	236°18.8	15.6'	N10° 10.6	11.7'	54.3'
13 14	18°02.9 33°02.7	16.4 16.9	250°53.4 265°28.0	15.5' 15.5'	10°22.3 10°34.0	11.7' 11.7'	54.3' 54.3'
15	48°02.4	10.9	280°02.5	15.5 15.4'	10° 45.7	11.6'	54.3'
16	63°02.2	17.7	294°36.9	15.4'	10°57.3	11.6'	54.3'
17	78°02.0	18.2	309°11.3	15.3'	11°08.9	11.5'	54.3'
18 19	93°01.8 108°01.6	\$21°18.6 19.1	323°45.6 338°19.9	15.3' 15.2'	N11°20.5 11°32.0	11.5' 11.5'	54.3' 54.4'
20	123°01.4	19.5	352°54.2		11°43.4		54.4'
21	138°01.2	• • 19.9	7°28.3	15.1'	11°54.9	11.4'	54.4'
22	153°01.0 168°00.8	20.4	22°02.5 36°36.5	15.1'	12°06.3 12°17.6	11.3'	54.4'
23		20.8	30 30.5	15.0'		11.3'	54.4'
	SD = 16.2'	d = 0.5'		SL	D = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°00.5 198°00.3	\$21°21.2 21.7	51°10.6 65°44.5	15.0' 14.9'	N12°28.9 12°40.2	11.3' 11.2'	54.4' 54.4'
2	213°00.1	22.1	80°18.4	14.9 14.8'	12° 51.4	11.2'	54.4' 54.4'
3	227°59.9	• • 22.5	94°52.3	14.8'	13°02.6	11.1'	54.4'
4	242°59.7 257°59.5	23.0	109°26.1	14.7'	13° 13.7	11.1'	54.5'
5 6	257°59.5 272°59.3	23.4 \$21°23.8	123°59.8 138°33.5	14.7' 14.6'	13°24.8 N13°35.8	11.0' 11.0'	54.5' 54.5'
7	287°59.0	24.3	153°07.1	14.5'	13°46.8	10.9	54.5
8	302°58.8	24.7	167°40.6	14.5'	13°57.7	10.9'	54.5'
9 10	317°58.6 332°58.4	· · 25.1 25.6	182°14.1 196°47.5	14.4' 14.4'	14°08.6 14°19.4	10.8' 10.8'	54.5' 54.5'
10	332 58.4 347°58.2	25.6 26.0	196 47.5 211°20.9	14.4	14 19.4 14°30.2	10.8	54.5° 54.6'
12	2°58.0	S21°26.4	225°54.1	14.2'	N14°40.9	10.7'	54.6'
13	17°57.8	26.8	240°27.4	14.2'	14°51.6	10.6'	54.6'
14 15	32°57.5 47°57.3	27.3 •• 27.7	255°00.5 269°33.6	14.1' 14.0'	15°02.2 15°12.7	10.6' 10.5'	54.6' 54.6'
16	62°57.1	28.1	209 33.0 284°06.6	13.9'	15 12.7 15°23.2	10.5	54.6'
17	77°56.9	28.5	298°39.6	13.9'	15°33.7	10.4'	54.6'
18	92°56.7	521°29.0	313°12.4	13.8'	N15°44.0	10.3	54.7'
19 20	107°56.5 122°56.2	29.4 29.8	327°45.3 342°18.0	13.7' 13.7'	15°54.4 16°04.6	10.3' 10.2'	54.7' 54.7'
21	137°56.0	30.2	356°50.7	13.6'	16° 14.8	10.2	54.7'
22	152°55.8	30.6	11°23.3	13.5'	16°25.0	10.1'	54.7'
23	167°55.6	31.1	25°55.8	13.5'	16°35.0	10.0'	54.7'
	SD = 16.2'	d = 0.4'		SE	0 = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Junioce	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
S 10°	04:39	05:06	05:28	18:07	18:30	18:57
20°	04:19	04:47	05:11	18:24	18:48	19:17
30°	03:53	04:25	04:52	18:44	19:11	19:43
35°	03:36	04:11	04:40	18:56	19:25	20:00
40°	03:15	03:55	04:27	19:09	19:41	20:21
45°	02:49	03:35	04:11	19:25	20:01	20:48
S 50°	02:12	03:10	03:51	19:45	20:27	21:25
52°	01:51	02:57	03:42	19:55	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	////
S 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	
N 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	
N 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	
N 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	
S 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	
S 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	
S 60°	14:20	15:40	17:02	00:55	00:59	01:05	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	68°24.5	210°24.4	\$13°11.9	257°16.3	N05°57.2	229°28.4	S06°44.7	34°09.6	N10°54.3			
1	83°26.9	225°23.9	12.9	272°17.6	56.7	244°30.5	44.9	49° 12.3	54.3	Alpheratz	357°31.3	29° 15.3
2	98°29.4	240°23.3	14.0	287°18.9	56.3	259°32.5	45.0	64° 14.9	54.3	Ankaa	353°03.9	-42°09.0
3	113°31.9	255°22.8	· · 15.0	302°20.2	• • 55.8	274°34.6	• • 45.2	79° 17.5	• • 54.2	Schedar	349°27.0	56°42.1
4	128°34.3	270°22.2	16.0	317°21.5	55.4	289°36.6	45.3	$94^{\circ}20.1$	54.2	Diphda	348°44.0	-17°49.6
5	143°36.8	285°21.7	17.0	332°22.8	54.9	304°38.7	45.5	$109^{\circ}22.7$	54.1	Achernar	335°17.5	-57°05.5
6	158°39.3	300°21.1	S13°18.0	347°24.1	N05°54.4	319°40.7	S06°45.7	124°25.3	N10°54.1	Hamal Polaris	327°47.3 311°48.3	23°36.1 89°23.2
7	173°41.7	$315^{\circ}20.6$	19.0	2°25.4	54.0	334°42.8	45.8	139°27.9	54.0	Acamar	311 46.3 315°09.0	-40°11.4
8	188°44.2	330°20.0	20.0	17°26.7	53.5	349°44.8	46.0	154°30.6	54.0	Menkar	314°02.5	4° 12.2
9	203°46.6	345°19.4	• • 21.0	32°27.9	• • 53.0	4°46.9	• • 46.1	169°33.2	• • 54.0	Mirfak	308°23.1	49°57.9
10	218°49.1	0°18.9	22.0	47°29.2	52.6	19°48.9	46.3	184°35.8	53.9	Aldebaran	290°35.6	16°34.0
11	233°51.6	15°18.3	23.0	62°30.5	52.1	34°51.0	46.5	199°38.4	53.9	Rigel	281°00.5	-8°10.1
12	248°54.0	30°17.8	\$13°24.0	77°31.8	N05°51.7	49°53.0	S06°46.6	214°41.0	N10°53.8	Capella	280°16.7	46°01.5
13	263°56.5	45°17.2	25.1	92°33.1	51.2	64°55.1	46.8	229°43.6	53.8	Bellatrix	278°19.2	6°22.5
14 15	278°59.0 294°01.4	60°16.7 75°16.1	26.1 •• 27.1	107°34.4 122°35.7	50.7 •• 50.3	79°57.1 94°59.2	47.0 •• 47.1	244°46.2 259°48.9	53.7 •• 53.7	Elnath	277°57.5	28°37.8
16	309°03.9	90°15.6	28.1	137°37.0	49.8	110°01.2	47.1	274°51.5	53.7	Alnilam	275°34.2	$-1^{\circ}11.0$
17	324°06.4	105°15.0	29.1	152°38.3	49.4	125°03.3	47.4	289°54.1	53.6	Betelgeuse	270°48.4	$7^{\circ}24.7$
18	339°08.8	120°14.4	S13°30.1	167°39.6	N05°48.9	140°05.3	S06°47.6	304°56.7	N10°53.6	Canopus	263°50.5	-52°42.6
19	354°11.3	135°13.9	31.1	182°40.9	48.4	155°07.4	47.8	319°59.3	53.5	Sirius	258°23.2	-16°45.4
20	9°13.8	150°13.3	32.1	197°42.2	48.0	170°09.4	47.9	335°01.9	53.5	Adhara	255°03.1	-29°00.6
21	24°16.2	165°12.8	• • 33.1	212°43.4	• • 47.5	185°11.5	• • 48.1	350°04.5	• • 53.4	Procyon	244°47.3	5°08.9
22	39°18.7	180°12.2	34.1	227°44.7	47.0	200°13.5	48.2	5°07.1	53.4	Pollux	243°13.2	27°57.1
23	54°21.1	195°11.6	35.1	242°46.0	46.6	$215^{\circ}15.6$	48.4	20°09.8	53.4	Avior	234°13.0 222°43.8	-59°36.0 -43°32.8
Mar	pass. 19:23	1/_N 6/ A1	.0′ m-3.94	1/1 2 [/] 4 C).5′ m1.08	1/2 U/ 40	2′ m-1.76	1/2 6/ A C	0.0' m0.04	Suhail Miaplacidus	222°43.8 221°37.1	-43° 32.8 -69° 49.9
ivier.p	Dass. 19:23	ν-υ.υ α1	.0 111-3.94	ν1.5 U-C	J IIIT.UO	ν2.0 a0.	.∠ 111-1./0	ν 2.0 α-C	7.0 1110.04	Alphard	221 37.1 217°44.6	-69 49.9 -8°47.1
										Regulus	217 44.0 207°31.1	-0 47.1 11°49.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.4	61°35.3
0	69°23.6	210°11.1	\$13°36.1	257°47.3	N05°46.1	230° 17.6	S06°48.6	35° 12.4	N10°53.3	Denebola	182°21.9	14°24.5
1	84°26.1	225°10.5	37.1	272°48.6	45.7	245° 19.7	48.7	50° 15.0	53.3	Gienah	175°40.5	-17°42.1
2	99°28.5	240°10.0	38.1	287°49.9	45.2	260°21.7	48.9	65°17.6	53.2	Acrux	172°56.7	-63° 15.3
3	114°31.0	255°09.4	• • 39.1	302°51.2	• • 44.7	275°23.8	• • 49.0	80°20.2	• • 53.2	Gacrux	171°48.3	-57°16.3
4	129°33.5	270°08.8	40.1	317°52.5	44.3	290°25.8	49.2	95°22.8	53.2	Alioth	166°10.7	55°47.9
5	144°35.9	285°08.3	41.1	332°53.8	43.8	305°27.9	49.4	110°25.4	53.1	Spica	$158^{\circ}19.2$	-11° 18.7
6	159°38.4 174°40.9	300°07.7	\$13°42.1	347°55.1	N05°43.4	320°29.9	S06°49.5	125°28.0	N10°53.1	Alkaid	152°50.0	49°09.9
7 8	174 40.9 189°43.3	315°07.1 330°06.6	43.1 44.1	2°56.4 17°57.7	42.9 42.4	335°32.0 350°34.0	49.7 49.8	140°30.7 155°33.3	53.0 53.0	Hadar	148°31.9	-60°30.5
9	204°45.8	345°06.0	• • 45.1	32°59.0	• • 42.4	5°36.1	• • 50.0	170°35.9	• • 52.9	Menkent	147°54.2	-36°30.6
10	219°48.3	0°05.4	46.1	48°00.3	41.5	20°38.1	50.0	185°38.5	52.9	Arcturus	145°45.4	19°01.9
11	234°50.7	15°04.9	47.1	63°01.6	41.1	35°40.2	50.2	200°41.1	52.9	Rigil Kent.	139°36.4	-60°57.1
12	249°53.2	30°04.3	S13°48.0	78°02.9	N05°40.6	50°42.2	S06°50.5	215°43.7	N10°52.8	Kochab	137°21.2	74°02.0
13	264°55.6	45°03.7	49.0	93°04.2	40.1	65°44.3	50.6	230°46.3	52.8	Zuben'ubi	136°52.8	-16°09.6
14	279°58.1	60°03.2	50.0	108°05.5	39.7	80°46.3	50.8	245°48.9	52.7	Alphecca	126°01.5 112°12.3	26°37.1
15	295°00.6	75°02.6	• • 51.0	123°06.8	• • 39.2	95°48.4	• • 51.0	260°51.5	• • 52.7	Antares	112°12.3 107°04.2	-26°29.6 -69°04.6
16	310°03.0	90°02.0	52.0	138°08.1	38.8	110°50.4	51.1	275°54.2	52.7	Atria Sabik	107 04.2 101°59.5	-09 04.0 -15°45.5
17	325°05.5	$105^{\circ}01.5$	53.0	153°09.4	38.3	125°52.5	51.3	290°56.8	52.6	Shaula	96°06.5	-15° 45.5 -37° 07.4
18	340°08.0	120°00.9	S13°54.0	168°10.7	N05°37.9	140°54.5	S06°51.4	305°59.4	N10°52.6	Rasalhague	95°56.0	12°32.5
19	355°10.4	135°00.3	55.0	183°12.0	37.4	155°56.6	51.6	321°02.0	52.5	Eltanin	90°41.2	51°29.3
20	$10^{\circ}12.9$	149°59.8	56.0	198°13.3	36.9	170°58.6	51.8	336°04.6	52.5	Kaus Aust.	83°28.7	-34°22.1
21	25°15.4	164°59.2	• • 57.0	213°14.6	• • 36.5	186°00.7	• • 51.9	351°07.2	• • 52.4	Vega	80°31.5	38°48.9
22	40°17.8	179°58.6	57.9	228°15.9	36.0	201°02.8	52.1	6°09.8	52.4	Nunki	75°44.2	-26° 15.5
23	55°20.3	194°58.0	58.9	243°17.2	35.6	216°04.8	52.2	21°12.4	52.4	Altair	61°57.1	8°56.9
Mer.p	pass. 19:19	ν -0.6' d1	.0′ m-3.94	$\nu 1.3' \ d-0$	0.5′ m1.07	$\nu 2.1' \ d0.$	2′ m-1.76	$\nu 2.6' \ d-0$.0′ m0.05	Peacock	53°01.2	-56°38.6
<u> </u>										Deneb	49°23.8	45°23.4
	G11.4	6114		6114	_	6114	_	G11.4	_	Enif	33°35.8	10°00.7
Fri 0	GHA 70°22.8	GHA 209°57.5	Dec \$13°59.9	GHA 258° 18.5	Dec N05°35.1	GHA 231°06.9	Dec \$06°52.4	GHA 36°15.0	Dec	Al Na'ir	27°29.1	-46°49.3
1	70 22.8 85°25.2	209 57.5 224°56.9	14°00.9	258 18.5 273°19.8	34.6	231 06.9 246°08.9	506 52.4 52.6	51°17.6	N10°52.3 52.3	Fomalhaut	15°11.1	-29°28.1
2	100°27.7	239°56.3	01.9	273 19.8 288°21.1	34.0	240 00.9 261°11.0	52.7	66°20.3	52.3	Scheat	13°42.1	28°14.7
3	115°30.1	254°55.7	•• 02.9	303°22.4	33.7	276°13.0	• • 52.9	81°22.9	• • 52.2	Markab	13°26.7	15°21.9
4	130°32.6	269°55.2	03.9	318°23.7	33.3	291°15.1	53.0	96°25.5	52.2	Nov 29 Wed	SHA	Mer.pass
5	145°35.1	284°54.6	04.8	333°25.0	32.8	306°17.1	53.2	111°28.1	52.1		141°59.9	09:59
6	160°37.5	299°54.0	S14°05.8	348°26.3	N05°32.4	321°19.2	S06°53.3	126°30.7	N10°52.1		188°51.9	06:50
7	175°40.0	$314^{\circ}53.4$	06.8	3°27.6	31.9	$336^{\circ}21.2$	53.5	141°33.3	52.0		161°04.0	08:41
8	190°42.5	329°52.9	07.8	18°28.9	31.4	$351^{\circ}23.3$	53.7	156°35.9	52.0	Saturn	325°45.2	21:40
9	205°44.9	344°52.3	• • 08.8	33°30.2	• • 31.0	6°25.4	• • 53.8	171°38.5	• • 52.0	Nov 30 Thu	SHA	Mer.pass
10	220°47.4	359°51.7	09.8	48°31.5	30.5	21°27.4	54.0	186°41.1	51.9	l .	140°47.5	10:00
11	235°49.9	14°51.1	10.7	63°32.8	30.1	36°29.5	54.1	201°43.7	51.9		188°23.7	06:48
12	250°52.3	29°50.6	\$14°11.7	78°34.1	N05°29.6	51°31.5	S06°54.3	216°46.3	N10°51.8		160°54.0	08:38
13	265°54.8	44°50.0	12.7	93°35.4	29.2	66°33.6	54.4	231°49.0	51.8	Saturn		21:35
14	280°57.2	59°49.4	13.7	108°36.7	28.7	81°35.6	54.6	246°51.6	51.8			
15 16	295°59.7 311°02.2	74°48.8 89°48.2	· · 14.7 15.6	123°38.0 138°39.4	· · 28.2 27.8	96°37.7 111°39.7	• • 54.8	261°54.2 276°56.8	· · 51.7	Dec 01 Fri	SHA	Mer.pass
16 17	311°02.2 326°04.6	89°48.2 104°47.7	15.6 16.6	138° 39.4 153° 40.7	27.8 27.3	111 39.7 126°41.8	54.9 55.1	276°56.8 291°59.4	51.7 51.6		139°34.7	10:01
18	320 04.0 341°07.1	104 47.7 119°47.1	514°17.6	168° 42.0	N05°26.9	120 41.8 141°43.9	55.1 \$06°55.2	307°02.0	N10°51.6		187°55.7	06:46
19	356°09.6	119 47.1 134°46.5	18.6	183°43.3	26.4	141 45.9 156° 45.9	55.4	307 02.0 322°04.6	51.6		160°44.1	08:34 21:31
20	11°12.0	149°45.9	19.5	198°44.6	26.0	171°48.0	55.6	337°07.2	51.5	Saturn	325°52.3	∠1:31
21	26°14.5	164°45.3	20.5	213°45.9	• • 25.5	186°50.0	• • 55.7	352°09.8	51.5	Horizont	al parallax	
22	41°17.0	179°44.7	21.5	228°47.2	25.0	201°52.1	55.9	7°12.4	51.4		Venus:	0.1
23	56°19.4	194°44.2	22.5	243°48.5	24.6	$216^{\circ}54.1$	56.0	$22^{\circ}15.0$	51.4		Mars:	0.1
Mar	pass. 19:15	1/_N 6/ A1	.0′ m-3.94	1/1 2/ 4 ().5′ m1.06	1/2 1/ d0	2′ m-1.77	1/2 6/ 4 0	0.0′ m0.05			
ivier.p	Jass. 19:13	ν-υ.υ α1	.0 111-3.94	ν1.3 <i>u</i> -0	7.5 IIII.UU	ν2.1 a0.		ν 2.0 α-C	.0 1110.05			

h	Sui	า		1	Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°55.4	S21°31.5	40°28.2	13.4'	N16°45.0	9.9'	54.8'
1	197°55.1	31.9	55°00.6	13.3'	16°55.0	9.9'	54.8'
2	212°54.9	32.3	69°32.9	13.2'	17°04.8	9.8'	54.8'
3 4	227° 54.7 242° 54.5	· · 32.7 33.1	84°05.1 98°37.3	13.2' 13.1'	17°14.7 17°24.4	9.7' 9.7'	54.8' 54.8'
5	257° 54.3	33.6	113°09.4	13.1	17°34.1	9.6'	54.8'
6	272°54.0	S21°34.0	127°41.4	12.9'	N17°43.7	9.5'	54.9'
7	287°53.8	34.4	$142^{\circ}13.3$	12.8'	17°53.2	9.5'	54.9'
8	302°53.6	34.8	156°45.1	12.8'	18°02.6	9.4'	54.9'
9 10	317°53.4 332°53.1	· · 35.2	171°16.9 185°48.6	12.7' 12.6'	18°12.0 18°21.3	9.3' 9.2'	54.9' 54.9'
11	347°52.9	36.0	200° 20.2	12.5'	18°30.5	9.2'	55.0'
12	2°52.7	S21°36.4	214°51.8	12.5'	N18°39.7	9.1'	55.0'
13	17°52.5	36.8	229°23.2	12.4'	18°48.8	9.0'	55.0'
14	32°52.3	37.3	243°54.6	12.3'	18°57.8	8.9'	55.0'
15 16	47°52.0 62°51.8	· · 37.7 38.1	258°25.9 272°57.1	12.2' 12.1'	19°06.7 19°15.5	8.8' 8.7'	55.0' 55.0'
17	77°51.6	38.5	287°28.3	12.1'	19°24.3	8.7'	55.1'
18	92°51.4	S21°38.9	301°59.3	12.0'	N19°32.9	8.6'	55.1'
19	107°51.1	39.3	316°30.3	11.9'	19°41.5	8.5'	55.1'
20	122°50.9	39.7	331°01.2	11.8'	19°50.0	8.4'	55.1'
21 22	137° 50.7 152° 50.5	· · 40.1 40.5	345°32.0 0°02.8	11.7' 11.7'	19°58.4 20°06.7	8.3' 8.2'	55.1' 55.2'
23	167° 50.2	40.5	14°33.4	11.6'	20° 15.0	8.1'	55.2'
	SD = 16.2'	d = 0.4'			= 14.9'		
	3D = 10.2	<u>u = 0.4</u>		30	14.9		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°50.0 197°49.8	\$21°41.3 41.7	29°04.0 43°34.5	11.5'	N20°23.1 20°31.2	8.1' 8.0'	55.2'
1 2	197 49.8 212°49.5	41.7 42.1	43 34.5 58°04.9	11.4' 11.3'	20°31.2	8.0 7.9'	55.2' 55.2'
3	212 49.3 227°49.3	. 42.5	72°35.2	11.3'	20°47.0	7.8'	55.3'
4	242°49.1	42.9	87°05.5	11.2'	20°54.8	7.7'	55.3'
5	257° 48.9	43.3	101°35.7	11.1'	21°02.5	7.6'	55.3'
6	272°48.6	S21°43.7	116°05.8	11.0'	N21°10.0	7.5'	55.3'
7 8	287° 48.4 302° 48.2	44.1 44.5	130°35.8 145°05.7	10.9' 10.8'	21°17.5 21°24.9	7.4' 7.3'	55.3' 55.4'
9	317° 47.9	• • 44.9	159°35.5	10.8	21°32.2	7.2'	55.4'
10	332°47.7	45.3	174°05.3	10.7'	21°39.4	7.1'	55.4'
11	347° 47.5	45.7	188°35.0	10.6'	21°46.5	7.0'	55.4'
12	2°47.3 17°47.0	\$21°46.1	203°04.6 217°34.1	10.5'	N21°53.5 22°00.4	6.9'	55.5'
13 14	32°46.8	46.4 46.8	217 34.1 232°03.6	10.4' 10.4'	22°07.1	6.8' 6.7'	55.5' 55.5'
15	47° 46.6	• • 47.2	246°32.9	10.3'	22°13.8	6.6'	55.5'
16	62°46.3	47.6	$261^{\circ}02.2$	10.2'	22°20.4	6.5'	55.5'
17	77°46.1	48.0	275°31.4	10.1'	22°26.8	6.3'	55.6'
18 19	92°45.9 107°45.6	\$21°48.4 48.8	290°00.6 304°29.6	10.1' 10.0'	N22°33.2 22°39.4	6.2' 6.1'	55.6' 55.6'
20	122° 45.4	49.2	318° 58.6	9.9'	22°45.5	6.0'	55.6'
21	137° 45.2	• • 49.6	333°27.5	9.8'	22°51.6	5.9'	55.6'
22	152°44.9	49.9	347°56.3	9.7'	22°57.5	5.8'	55.7'
23	167°44.7	50.3	2°25.0	9.7'	23°03.2	5.7'	55.7'
	SD = 16.2'	d = 0.4'		SD	= 15.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 44.5	S21°50.7	16°53.7	9.6'	N23°08.9	5.6'	55.7'
1 2	197° 44.2 212° 44.0	51.1 51.5	31°22.3 45°50.8	9.5' 9.4'	23°14.5 23°19.9	5.4' 5.3'	55.7' 55.8'
3	212 44.0 227°43.8	51.9	45° 50.8 60° 19.3	9.4' 9.4'	23 19.9 23°25.2	5.3 5.2'	55.8'
4	242° 43.5	52.2	74° 47.6	9.3'	23°30.4	5.1'	55.8'
5	257°43.3	52.6	89°15.9	9.2'	23°35.5	5.0'	55.8'
6	272°43.1	S21°53.0	103°44.2	9.2'	N23°40.5	4.8'	55.8'
7 8	287° 42.8 302° 42.6	53.4 53.7	118° 12.3 132° 40.4	9.1' 9.0'	23°45.3 23°50.0	4.7' 4.6'	55.9' 55.9'
9	317° 42.4	54.1	132 40.4 147°08.4	9.0 8.9'	23°54.6	4.0 4.5'	55.9'
10	332° 42.1	54.5	161°36.4	8.9'	23°59.1	4.3'	55.9'
11	347°41.9	54.9	176°04.3	8.8'	24°03.5	4.2'	56.0'
12	2°41.7	S21°55.3	190°32.1	8.7'	N24°07.7	4.1'	56.0'
13 14	17° 41.4 32° 41.2	55.6 56.0	204°59.8 219°27.5	8.7' 8.6'	24°11.8 24°15.7	4.0' 3.8'	56.0' 56.0'
15	47° 40.9	• • 56.4	219 27.5 233°55.1	8.6'	24°19.6	3.7'	56.0'
16	62°40.7	56.7	$248^{\circ}22.7$	8.5'	24°23.3	3.6'	56.1'
17	77°40.5	57.1	262°50.2	8.4'	24°26.8	3.4'	56.1'
18	92°40.2 107°40.0	\$21°57.5	277°17.6 291°45.0	8.4'	N24°30.3 24°33.6	3.3'	56.1'
19 20	107° 40.0 122° 39.8	57.9 58.2	291°45.0 306°12.3	8.3' 8.3'	24°33.6 24°36.7	3.2' 3.0'	56.1' 56.2'
21	137°39.5	58.6	320°39.6	8.2'	24°39.8	2.9'	56.2'
22	152°39.3	59.0	335°06.8	8.1'	24°42.7	2.8'	56.2'
23	167°39.0	59.3	349°33.9	8.1'	24°45.5	2.6'	56.2'
	SD = 16.2'	d = 0.4'		SD	= 15.2'		

·	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	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
S 10°	04:40	05:06	05:29	18:09	18:32	18:58
20°	04:19	04:47	05:12	18:26	18:51	19:19
30°	03:52	04:24	04:51	18:47	19:14	19:46
35°	03:35	04:10	04:39	18:59	19:28	20:03
40°	03:14	03:54	04:26	19:12	19:44	20:25
45°	02:46	03:33	04:09	19:29	20:05	20:52
S 50°	02:07	03:07	03:49	19:49	20:32	21:32
52°	01:46	02:53	03:39	19:59	20:45	21:54
54°	01:16	02:38	03:28	20:10	21:01	22:24
56° 58°	00:21	02:20	03:16	20:23	21:20	23:25
S 60°	////	01:56 01:24	03:01 02:44	20:37 20:55	21:43 22:16	////
3 00	////	01:24	UZ:44	20:55	22:10	////

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	08:08
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
S 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
S 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
S 60°	18:26	19:51	21:10	01:12	01:23	01:42

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	13-15		
	mm:ss	mm:ss	hh:mm	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	71°21.9	209°43.6	S14°23.4	258°49.8	N05°24.1	231°56.2	S06°56.2	37° 17.6	N10°51.4			29°15.3
1	86°24.4	224°43.0	24.4	273°51.1	23.7	246°58.2	56.3	52°20.2	51.3	Alpheratz Ankaa	357°31.3 353°03.9	-42°09.0
2	101°26.8	239°42.4	25.4	288°52.4	23.2	262°00.3	56.5	67°22.8	51.3	Schedar	349° 27.0	56°42.1
3	116°29.3	254°41.8	• • 26.3	303°53.7	• • 22.8	277°02.4	• • 56.7	82°25.4	• • 51.2	Diphda	348°44.0	-17°49.6
4	131°31.7	269°41.2	27.3	318°55.1	22.3	292°04.4	56.8	97°28.1	51.2	Achernar	335°17.6	-57°05.5
5 6	146°34.2 161°36.7	284°40.6 299°40.1	28.3 \$14°29.2	333°56.4 348°57.7	21.9 N05°21.4	307°06.5 322°08.5	57.0 \$06°57.1	112°30.7 127°33.3	51.2 N10°51.1	Hamal	$327^{\circ}47.3$	23°36.1
7	176°39.1	314°39.5	30.2	3°59.0	20.9	337°10.6	57.3	142° 35.9	51.1	Polaris	311°48.4	89°23.2
8	191°41.6	329°38.9	31.2	19°00.3	20.5	352°12.7	57.4	157° 38.5	51.0	Acamar	315°09.0	-40°11.4
9	206°44.1	344°38.3	• • 32.2	34°01.6	• • 20.0	7°14.7	• • 57.6	$172^{\circ}41.1$	• • 51.0	Menkar Mirfak	314°02.5 308°23.1	4°12.2 49°57.9
10	221°46.5	359°37.7	33.1	49°02.9	19.6	22°16.8	57.8	187°43.7	51.0	Aldebaran	290°35.6	16°34.0
11	236°49.0	14°37.1	34.1	64°04.2	19.1	37°18.8	57.9	202°46.3	50.9	Rigel	281°00.5	-8°10.1
12 13	251°51.5 266°53.9	29°36.5 44°35.9	\$14°35.0 36.0	79°05.5 94°06.9	N05°18.7 18.2	52°20.9 67°22.9	\$06°58.1 58.2	217°48.9 232°51.5	N10°50.9 50.9	Capella	$280^{\circ}16.7$	46°01.5
14	200 55.9 281°56.4	59°35.3	37.0	109°08.2	17.8	82°25.0	58.4	247°54.1	50.8	Bellatrix	278°19.1	6°22.5
15	296°58.9	74°34.8	37.9	124°09.5	17.3	97°27.1	• • 58.5	262° 56.7	• • 50.8	Elnath	277°57.5	28°37.8
16	$312^{\circ}01.3$	89°34.2	38.9	139°10.8	16.8	112°29.1	58.7	277°59.3	50.7	Alnilam	275°34.2 270°48.3	-1°11.1 7°24.7
17	327°03.8	104°33.6	39.9	$154^{\circ}12.1$	16.4	127°31.2	58.8	293°01.9	50.7	Betelgeuse Canopus	263°50.5	-52°42.6
18	342°06.2	119°33.0	S14°40.8	169°13.4	N05°15.9	142°33.2	S06°59.0	308° 04.5	N10°50.7	Sirius	258°23.1	-16°45.4
19	357°08.7	134°32.4	41.8	184°14.7	15.5	157°35.3	59.2	323°07.1	50.6	Adhara	255°03.0	-29°00.7
20 21	12°11.2 27°13.6	149°31.8 164°31.2	42.7 • • 43.7	199°16.0 214°17.4	15.0 •• 14.6	172°37.4 187°39.4	59.3 •• 59.5	338°09.7 353°12.3	50.6 • • 50.5	Procyon	244°47.3	5°08.9
22	42°16.1	179°30.6	44.7	229°18.7	14.0	202°41.5	59.6	8°14.9	50.5	Pollux	243°13.2	27°57.1
23	57°18.6	194°30.0	45.6	244°20.0	13.7	217°43.5	59.8	23° 17.5	50.5	Avior	234°13.0	-59°36.0
Marn	pass. 19:11	0.6' d1	.0′ m-3.94	1 2/ d C	0.5' m1.05	··2 1/ d0	2′ m-1.77	12 6' d 0	.0′ m0.06	Suhail Miaplacidus	222°43.7 221°37.0	-43°32.8 -69°49.9
ivier.p	va55. 19:11	ν-υ.υ α1	.0 111-3.94	ν1.3 U-U	1111.05	ν2.1 α 0.		ν ∠.υ α-υ	.0 1110.00	Alphard	221 37.0 217°44.5	-69 49.9 -8°47.1
_			_		_		_		_	Regulus	207°31.0	11°49.4
Sun	GHA 72°21.0	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec N10° 50.4	Dubhe	193°37.4	61°35.3
0 1	72 21.0 87°23.5	209°29.4 224°28.8	\$14°46.6 47.5	259°21.3 274°22.6	N05°13.2 12.8	232°45.6 247°47.7	\$06°59.9 07°00.1	38°20.1 53°22.8	50.4	Denebola	182°21.8	14°24.5
2	102°26.0	239°28.2	48.5	289°23.9	12.3	262°49.7	00.2	68°25.4	50.4	Gienah	175°40.4	-17°42.1
3	117°28.4	254°27.6	• • 49.5	304°25.3	• • 11.9	277°51.8	00.4	83°28.0	• • 50.3	Acrux Gacrux	172°56.7 171°48.2	-63°15.3 -57°16.3
4	132°30.9	269°27.0	50.4	319°26.6	11.4	292°53.8	00.6	98°30.6	50.3	Alioth	171 46.2 166° 10.7	-57 10.3 55°47.9
5	147°33.4	284°26.4	51.4	334°27.9	11.0	307°55.9	00.7	113°33.2	50.2	Spica	158° 19.2	-11°18.7
6	162°35.8	299°25.8	S14°52.3	349°29.2	N05°10.5	322°58.0	S07°00.9	128°35.8	N10°50.2	Alkaid	152°50.0	49°09.9
7 8	177°38.3 192°40.7	314°25.2 329°24.6	53.3 54.2	4°30.5 19°31.8	10.0 09.6	338°00.0 353°02.1	01.0 01.2	143°38.4 158°41.0	50.2 50.1	Hadar	148°31.9	-60°30.5
9	207°43.2	344°24.0	55.2	34°33.2	•• 09.0	8°04.2	01.3	173° 43.6	50.1	Menkent	147°54.1	-36°30.6
10	222°45.7	359°23.4	56.1	49°34.5	08.7	23°06.2	01.5	188°46.2	50.0	Arcturus	145°45.3	19°01.8
11	237°48.1	14°22.8	57.1	64°35.8	08.2	38°08.3	01.6	203°48.8	50.0	Rigil Kent. Kochab	139°36.4 137°21.2	-60°57.1 74°02.0
12	252°50.6	29°22.2	S14°58.0	79°37.1	N05°07.8	53°10.3	S07°01.8	218°51.4	N10°50.0	Zuben'ubi	136°52.8	-16°09.6
13	267°53.1	44°21.6	59.0	94°38.4	07.3	68°12.4	02.0	233°54.0	49.9	Alphecca	126°01.5	26°37.0
14	282°55.5	59°21.0	14°59.9	109°39.7	06.9	83°14.5	02.1	248° 56.6	49.9	Antares	$112^{\circ}12.3$	-26°29.6
15 16	297°58.0 313°00.5	74°20.4 89°19.8	15°00.9 01.8	124°41.1 139°42.4	· · 06.4 06.0	98°16.5 113°18.6	· · 02.3 02.4	263°59.2 279°01.8	· · 49.9 49.8	Atria	107°04.2	-69°04.6
17	328°02.9	104°19.2	02.8	154°43.7	05.5	128°20.7	02.6	294°04.4	49.8	Sabik	101°59.5	-15°45.5
18	343°05.4	119°18.6	S15°03.7	169°45.0	N05°05.1	143°22.7	S 07°02.7	309°07.0	N10°49.7	Shaula Rasalhague	96°06.5 95°56.0	-37°07.4 12°32.5
19	358°07.9	134°18.0	04.7	184°46.4	04.6	158°24.8	02.9	324°09.6	49.7	Eltanin	90°41.2	51°29.3
20	13°10.3	149°17.4	05.6	199°47.7	04.2	173°26.8	03.0	339° 12.2	49.7	Kaus Aust.	83°28.7	-34°22.1
21	28°12.8	164°16.8	•• 06.6	214°49.0	• • 03.7	188°28.9	03.2	354°14.8	• • 49.6	Vega	80°31.5	38°48.8
22 23	43°15.2 58°17.7	179°16.2 194°15.6	07.5 08.4	229°50.3 244°51.6	03.3 02.8	203°31.0 218°33.0	03.3 03.5	9°17.4 24°20.0	49.6 49.6	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
Mer.p	bass. 19:07	ν -0.6′ d1	.0′ m-3.94	$\nu 1.3' \ d-0$	0.5′ m1.04	$\nu 2.1' d0.$	2′ m-1.78	$\nu 2.6' d-0$.0′ m0.06	Peacock Deneb	53°01.2 49°23.8	-56°38.5 45°23.4
										Enif	33°35.8	10°00.7
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 29.2	-46°49.3
0	73°20.2	209°14.9	\$15°09.4	259°53.0	N05°02.4	233°35.1	S07°03.6	39°22.6	N10°49.5	Fomalhaut	$15^{\circ}11.1$	-29°28.1
1 2	88°22.6 103°25.1	224°14.3 239°13.7	10.3 11.3	274°54.3 289°55.6	01.9 01.5	248°37.2 263°39.2	03.8 04.0	54°25.2 69°27.8	49.5 49.4	Scheat	13°42.1	28°14.7
3	118° 27.6	254°13.1	. 12.2	304°56.9	•• 01.0	203 39.2 278°41.3	•• 04.0	84°30.4	• • 49.4	Markab	13°26.7	15°21.9
4	133°30.0	269°12.5	13.1	319°58.3	00.6	293°43.4	04.3	99°33.0	49.4	Dec 02 Sat	SHA	Mer.pass
5	148°32.5	284°11.9	14.1	334°59.6	$05^{\circ}00.1$	308°45.4	04.4	114° 35.6	49.3	Venus	138°21.7	10:01
6	163°35.0	299°11.3	\$15°15.0	350°00.9	N04°59.7	323°47.5	S07°04.6	129°38.2	N10°49.3	II.	187°27.9	06:44
7	178°37.4	314°10.7	16.0	5°02.2	59.2	338°49.5	04.7	144°40.8	49.3	Jupiter Saturn	160°34.3 325°55.7	08:31 21:27
8 9	193°39.9 208°42.4	329°10.1 344°09.5	16.9 • • 17.8	20°03.5 35°04.9	58.8 •• 58.3	353°51.6 8°53.7	04.9 · · 05.0	159° 43.4 174° 46.0	49.2 •• 49.2			
10	223°44.8	359°08.8	18.8	50°06.2	57.9	23°55.7	05.0	189° 48.6	49.2	Dec 03 Sun	SHA	Mer.pass
11	238°47.3	14°08.2	19.7	65°07.5	57.4	38°57.8	05.3	204°51.2	49.1		137°08.4	10:02
12	253°49.7	29°07.6	S15°20.6	80°08.8	N04°57.0	53°59.9	S07°05.5	219°53.8	N10°49.1		187°00.3 160°24.6	06:42 08:28
13	268°52.2	44°07.0	21.6	95°10.2	56.5	69°01.9	05.6	234°56.4	49.0	Saturn	325°59.1	21:23
14 15	283°54.7 298°57.1	59°06.4 74°05.8	22.5 •• 23.4	110°11.5 125°12.8	56.1 •• 55.6	84°04.0 99°06.1	05.8 •• 05.9	249°59.0 265°01.6	49.0 •• 49.0			
15 16	298 57.1 313°59.6	74 05.8 89°05.2	24.4	125 12.8 140°14.2	55.2	99 06.1 114°08.1	06.1	280°04.2	48.9	Dec 04 Mon	SHA 135° 54.8	Mer.pass 10:03
17	329°02.1	104°04.5	25.3	155°15.5	54.7	129°10.2	06.3	295°06.8	48.9	Mars	186° 32.8	06:40
18	344°04.5	119°03.9	S15°26.2	170°16.8	N04°54.3	144°12.3	S07°06.4	310°09.4	N10°48.9	Jupiter		08:25
19	359°07.0	134°03.3	27.2	185°18.1	53.8	159°14.3	06.6	325°12.0	48.8	Saturn	326°02.4	21:19
20 21	14°09.5 29°11.9	149°02.7 164°02.1	28.1 •• 29.0	200°19.5 215°20.8	53.4 •• 52.9	174°16.4 189°18.5	06.7 •• 06.9	340° 14.6 355° 17.2	48.8 •• 48.8	Horizont	al parallax	
22	29 11.9 44°14.4	164 02.1 179°01.4	30.0	215 20.8 230°22.1	52.5	204°20.5	07.0	355 17.2 10°19.8	48.7		Venus:	0.1
23	59°16.9	194°00.8	30.9	245°23.5	52.0	219°22.6	07.2	25°22.4	48.7		Mars:	0.1
Mern	pass. 19:04	ν-0.6' d0	.9′ m-3.94	ν1 3' d-0	0.5′ m1.02	ν2 1' d0	2′ m-1.78	ν2 6' d-0	.0′ m0.07			
ci.p	15.07	- 0.0 00	5.5-	- 1.5 0-0			1.10					

h	Sur	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°38.8	S21°59.7	4°01.0	8.0'	N24°48.1	2.5'	56.2'
1	197°38.6	$22^{\circ}00.1$	18°28.1	8.0'	24°50.6	2.4'	56.3'
2	212°38.3	00.4	32°55.1	7.9'	24°52.9	2.2'	56.3'
3	227°38.1	8.00	47°22.0	7.9'	24°55.2	2.1'	56.3
4 5	242°37.8 257°37.6	01.2 01.5	61°48.9 76°15.7	7.8' 7.8'	24°57.2 24°59.2	1.9' 1.8'	56.3' 56.4'
6	257 37.0 272°37.4	522°01.9	70 15.7 90°42.5	7.8'	24 59.2 N25°01.0	1.7	56.4
7	287°37.1	02.2	105°09.3	7.7'	25°02.7	1.5'	56.4
8	302°36.9	02.6	119°36.0	7.7'	25°04.2	1.4	56.4
9	317°36.6	• • 03.0	134°02.7	7.6'	25°05.5	1.2'	56.4'
10	332°36.4	03.3	148°29.3	7.6'	25°06.8	1.1'	56.5'
11	347°36.1	03.7	162°55.9	7.6'	25°07.9	0.9'	56.5'
12	2°35.9	\$22°04.0	177°22.5	7.5'	N25°08.8	0.8'	56.5'
13	17°35.7 32°35.4	04.4 04.7	191°49.0 206°15.5	7.5' 7.4'	25°09.6 25°10.3	0.7' 0.5'	56.5' 56.5'
14 15	32 35.4 47°35.2	05.1	200 15.5 220°41.9	7.4 7.4'	25 10.3 25°10.8	0.5 0.4'	56.6'
16	62°34.9	05.5	235°08.3	7.4	25°11.2	0.4	56.6
17	77°34.7	05.8	249°34.7	7.4	25°11.4	0.1'	56.6'
18	92°34.4	S22°06.2	264°01.1	7.3'	N25°11.5	-0.1'	56.6'
19	107°34.2	06.5	278°27.4	7.3'	25°11.4	-0.2'	56.7'
20	122°34.0	06.9	292°53.7	7.3'	25°11.2	-0.4'	56.7'
21	137°33.7	• • 07.2	307°20.0	7.3'	25°10.8	-0.5'	56.7'
22	152°33.5	07.6	321°46.3	7.2'	25°10.3	-0.7'	56.7'
23	167°33.2	07.9	336°12.5	7.2'	25°09.6	-0.8'	56.7'
	SD = 16.2'	d = 0.4'		SI	O = 15.3'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	182°33.0	\$22°08.3	350°38.7	7.2'	N25°08.8	-1.0'	56.8'
1	197°32.7	08.6	5°04.9	7.2'	25°07.9	-1.1'	56.8'
2	212°32.5	09.0	19°31.1	7.2'	25°06.8	-1.3'	56.8'
3	227°32.2	• • 09.3	33°57.3	7.2'	25°05.5	-1.4'	56.8'
4	242°32.0	09.6	48°23.4	7.1'	25°04.1	-1.5'	56.9'
5 6	257°31.7 272°31.5	10.0 \$22°10.3	62°49.6 77°15.7	7.1' 7.1'	25°02.6 N25°00.9	-1.7' -1.8'	56.9' 56.9'
7	287°31.2	10.7	91°41.9	7.1'	24°59.0	-2.0'	56.9
8	302°31.0	11.0	106°08.0	7.1	24°57.1	-2.1'	56.9
9	317°30.7	. 11.4	120°34.1	7.1'	24°54.9	-2.3'	57.0'
10	332°30.5	11.7	135°00.2	7.1'	24°52.6	-2.4'	57.0'
11	347°30.2	12.0	149°26.3	7.1'	24°50.2	-2.6'	57.0'
12	2°30.0	S22°12.4	163°52.4	7.1'	N24°47.6	-2.7'	57.0'
13	17°29.7	12.7	178°18.5	7.1'	24°44.9	-2.9'	57.0'
14	32°29.5 47°29.2	13.1	192°44.7 207°10.8	7.1' 7.1'	24°42.0 24°38.9	-3.0' -3.2'	57.1' 57.1'
15 16	62°29.0	· · 13.4 13.7	207 10.6 221°36.9	7.1'	24 36.9 24°35.8	-3.2 -3.3'	57.1'
17	77°28.7	14.1	236°03.0	7.1	24°32.4	-3.5'	57.1
18	92°28.5	S22°14.4	250°29.2	7.2'	N24°29.0	-3.6'	57.1'
19	107°28.2	14.7	264°55.3	7.2'	24°25.3	-3.8'	57.2'
20	122°28.0	15.1	279°21.5	7.2'	24°21.6	-3.9'	57.2'
21	137°27.7	• • 15.4	293°47.7	7.2'	24°17.6	-4.1'	57.2'
22 23	152°27.5 167°27.2	15.7 16.1	308°13.9 322°40.1	7.2' 7.2'	24°13.6 24°09.4	-4.2' -4.4'	57.2' 57.2'
23		d = 0.3'	322 40.1			-4.4	51.2
	SD = 16.2'	a = 0.3		- 51	O = 15.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°27.0	S22°16.4	337°06.3	7.2'	N24°05.0	-4.5'	57.3'
1	197°26.7	16.7	351°32.5 5°58.8	7.3'	24°00.5 23°55.9	-4.6'	57.3'
2 3	212°26.5 227°26.2	17.1 •• 17.4	5°58.8 20°25.1	7.3' 7.3'	23°55.9 23°51.1	-4.8' -4.9'	57.3' 57.3'
3 4	242°26.0	17.4	34°51.4	7.3'	23°46.1	-4.9 -5.1'	57.3'
5	257°25.7	18.0	49°17.7	7.4'	23°41.1	-5.2	57.4
6	272°25.5	S22°18.4	63°44.1	7.4'	N23°35.8	-5.4'	57.4'
7	287°25.2	18.7	$78^{\circ}10.4$	7.4'	23°30.5	-5.5'	57.4'
8	302°25.0	19.0	92°36.8	7.4'	23°25.0	-5.6'	57.4
9	317°24.7	• • 19.3	107°03.3	7.5'	23°19.3 23°13.5	-5.8'	57.4'
10 11	332°24.5 347°24.2	19.7 20.0	121°29.7 135°56.2	7.5' 7.5'	23°13.5 23°07.6	-5.9' -6.1'	57.5' 57.5'
11	2°23.9	\$22°20.3	135°56.2 150°22.8	7.6'	N23°01.5	-6.1'	57.5
13	17°23.7	20.6	164°49.3	7.6'	22°55.3	-6.3	57.5
14	32°23.4	21.0	179°15.9	7.6'	22°49.0	-6.5	57.5'
15	47°23.2	• • 21.3	193°42.6	7.7'	22°42.5	-6.6'	57.6'
16	62°22.9	21.6	208°09.2	7.7'	22°35.9	-6.8'	57.6'
17	77°22.7	21.9	222°35.9	7.7'	22°29.1	-6.9'	57.6'
18	92°22.4	\$22°22.2	237°02.7 251°29.5	7.8'	N22°22.3 22°15.2	-7.0'	57.6'
19 20	107°22.1 122°21.9	22.5 22.9	251°29.5 265°56.3	7.8' 7.9'	22°15.2 22°08.1	-7.2' -7.3'	57.6' 57.7'
21	137°21.6	. 23.2	205 50.5 280°23.1	7.9'	22°00.1	-7.3 -7.4'	57.7'
22	152°21.4	23.5	294°50.1	7.9'	21°53.3	-7.4 -7.6'	57.7
23	167°21.1	23.8	309°17.0	8.0'	21°45.8	-7.7'	57.7'
	SD = 16.2'	d = 0.3'		SI	O = 15.6'		

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

Lat.		Moonris	е		Moonse	t
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 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
S 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
S 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
S 60°	22:13	22:55	23:20	02:13	03:06	04:21

		Sun				
Day	Eqn.o	f Time	Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%
02	10:35	10:24	11:50	-:-	12:11	
03	10:12	10:00	11:50	00:39	13:07	
04	09:48	09:36	11:50	01:35	14:03	

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	74°19.3	209°00.2	\$15°31.8	260°24.8	N04°51.6	234° 24.7	507° 07.3	40°25.0	N10°48.6		ЗПА	
0	74 19.3 89°21.8	209 00.2 223°59.6		275°26.1		249° 26.7		55°27.6		Alpheratz	357°31.3	29°15.3
1 2	104°24.2		32.7	275 20.1 290°27.4	51.1	249 20.7 264°28.8	07.5	70°30.1	48.6	Ankaa	353°03.9	-42°09.0
		238°59.0	33.7		50.7		07.6		48.6	Schedar	349°27.0	56°42.1
3	119°26.7	253°58.3	• • 34.6	305°28.8	50.2	279°30.9	• • 07.8	85°32.7	• • 48.5	Diphda	348°44.0	-17°49.6
4	134°29.2	268°57.7	35.5	320°30.1	49.8	294°32.9	07.9	100°35.3	48.5	Achernar	335°17.6	-57°05.5
5	149°31.6	283°57.1	36.4	335°31.4	49.3	309°35.0	08.1	115°37.9	48.5	Hamal	327°47.3	23°36.1
6	164°34.1	298°56.5	\$15°37.4	350°32.8	N04°48.9	324°37.1	S07°08.2	130°40.5	N10°48.4	Polaris	311°48.6	89°23.2
7	179°36.6	313°55.8	38.3	5°34.1	48.4	339°39.1	08.4	145°43.1	48.4	Acamar	315°09.0	-40°11.4
8	194°39.0	328°55.2	39.2	20°35.4	48.0	354°41.2	08.5	160°45.7	48.4	Menkar	314°02.5	4°12.2
9	209°41.5	343°54.6	• • 40.1	35°36.8	• • 47.5	9°43.3	• • 08.7	175°48.3	• • 48.3	Mirfak	308°23.1	49°57.9
10	224°44.0	358°54.0	41.0	50°38.1	47.1	24°45.3	8.80	190°50.9	48.3			
11	239°46.4	13°53.3	42.0	65°39.4	46.6	39°47.4	09.0	205°53.5	48.3	Aldebaran	290°35.6	16°34.0
12	254°48.9	28°52.7	S15°42.9	80°40.8	N04°46.2	54° 49.5	507°09.1	220°56.1	N10°48.2	Rigel	281°00.5	-8°10.1
13	269°51.3	43°52.1	43.8	95°42.1	45.8	69°51.6	09.3	235°58.7	48.2	Capella	280°16.7	46°01.5
14	284°53.8	58°51.5	44.7	110°43.4	45.3	84°53.6	09.4	251°01.3	48.2	Bellatrix	278°19.1	6°22.5
15	299°56.3	73°50.8	• • 45.6	125°44.8	• • 44.9	99°55.7	• • 09.6	266°03.9	48.1	Elnath	277°57.5	28°37.8
16	314°58.7	88°50.2	46.6	140°46.1	44.4	114°57.8	09.7	281°06.5	48.1	Alnilam	275°34.2	$-1^{\circ}11.1$
17	330°01.2	103°49.6	47.5	155°47.4	44.0	129°59.8	09.7	296°09.1	48.0	Betelgeuse	270°48.3	7°24.7
										Canopus	263°50.4	-52°42.6
18	345°03.7	118°49.0	\$15°48.4	170°48.8	N04°43.5	145°01.9	S07°10.0	311°11.7	N10°48.0	Sirius	258°23.1	-16°45.4
19	0°06.1	133°48.3	49.3	185°50.1	43.1	160°04.0	10.2	326°14.3	48.0	Adhara	255°03.0	-29°00.7
20	15°08.6	148°47.7	50.2	200°51.4	42.6	175°06.0	10.4	341°16.9	47.9	Procyon	244°47.3	5°08.9
21	30°11.1	163°47.1	• • 51.1	215°52.8	• • 42.2	190°08.1	• • 10.5	356°19.5	• • 47.9	Pollux	243°13.2	27°57.1
22	45°13.5	178°46.4	52.0	230°54.1	41.7	205°10.2	10.7	11°22.1	47.9	Avior	234° 12.9	-59°36.0
23	$60^{\circ}16.0$	193°45.8	52.9	245°55.4	41.3	220°12.3	10.8	26°24.6	47.8	Suhail	234 12.9 222°43.7	-39 30.0 -43°32.9
N 4 a ··	10,00	., 0.6/ -/0	.9′ m-3.94	,,1 2/ -1 0	.4′ m1.01	1/2 1/ -/0	2′ m-1.78	,,2 6/ -1 C	10/ m0 07		222°43.7 221°37.0	
ivier.p	ass. 19:00	ν -0.6 au	.9' m-3.94	ν 1.3 a -0	0.4° m1.01	ν 2.1 d0.	2 m-1.78	ν 2.6° a -0	0.0′ m0.07	Miaplacidus		-69°50.0
										Alphard	217°44.5	-8°47.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.0	11°49.4
0	75°18.5	208°45.2	S15°53.9	260°56.8	N04°40.8	235°14.3	507°11.0	41°27.2	N10°47.8	Dubhe	193°37.3	61°35.3
		200° 45.2 223° 44.5								Denebola	182°21.8	14°24.5
1	90°20.9		54.8	275°58.1	40.4	250°16.4	11.1	56°29.8	47.8	Gienah	175°40.4	-17°42.1
2	105°23.4	238°43.9	55.7	290°59.5	40.0	265°18.5	11.3	71°32.4	47.7	Acrux	172°56.6	-63°15.4
3	120°25.8	253°43.3	• • 56.6	306°00.8	• • 39.5	280°20.5	• • 11.4	86°35.0	• • 47.7	Gacrux	171°48.2	-57°16.3
4	135°28.3	268°42.6	57.5	321°02.1	39.1	295°22.6	11.6	101°37.6	47.7	Alioth	166°10.6	55°47.9
5	150°30.8	283°42.0	58.4	336°03.5	38.6	310°24.7	11.7	116°40.2	47.6	Spica	158° 19.1	-11°18.7
6	165°33.2	298°41.4	S15°59.3	351°04.8	N04°38.2	325°26.7	S07°11.9	131°42.8	N10°47.6	Alkaid	152°50.0	49°09.9
7	180°35.7	313°40.7	$16^{\circ}00.2$	$6^{\circ}06.1$	37.7	340°28.8	12.0	146°45.4	47.6	Hadar	148°31.8	-60°30.5
8	195°38.2	328°40.1	01.1	21°07.5	37.3	355°30.9	12.2	161°48.0	47.5	Menkent	140°51.0	-36°30.6
9	210°40.6	343°39.5	• • 02.0	36°08.8	• • 36.8	10°33.0	• • 12.3	176°50.6	• • 47.5			
10	225°43.1	358°38.8	02.9	51°10.2	36.4	25°35.0	12.5	191°53.2	47.5	Arcturus	145°45.3	19°01.8
11	240°45.6	13°38.2	03.8	66°11.5	35.9	40°37.1	12.6	206°55.8	47.4	Rigil Kent.	139°36.3	-60°57.1
12	255°48.0	28°37.5	\$16°04.7	81°12.8	N04°35.5	55°39.2	S07° 12.8	221°58.4	N10°47.4	Kochab	137°21.2	74°02.0
13	270°50.5	43°36.9	05.6	96°14.2	35.1	70°41.3	12.9	237°00.9		Zuben'ubi	136°52.8	-16°09.6
		58°36.3		90 14.2 111°15.5		85°43.3		252°03.5	47.4	Alphecca	126°01.4	26°37.0
14	285°53.0		06.5		34.6		13.1		47.3	Antares	$112^{\circ}12.3$	-26°29.6
15	300°55.4	73°35.6	• • 07.4	126°16.9	• • 34.2	100°45.4	• • 13.2	267°06.1	• • 47.3	Atria	107°04.2	-69°04.6
16	315°57.9	88°35.0	08.3	141°18.2	33.7	115° 47.5	13.4	282°08.7	47.3	Sabik	101°59.5	-15°45.5
17	331°00.3	103°34.3	09.2	156°19.5	33.3	130°49.5	13.5	297°11.3	47.2	Shaula	96°06.5	-37°07.4
18	346°02.8	118°33.7	S16°10.1	171°20.9	N04°32.8	145°51.6	S07°13.6	312°13.9	N10°47.2	Rasalhague	95°56.0	12°32.5
19	1°05.3	133°33.1	11.0	186°22.2	32.4	160°53.7	13.8	327°16.5	47.2	Eltanin	90°41.2	51°29.2
20	16°07.7	148°32.4	11.9	201°23.6	32.0	175°55.8	13.9	342°19.1	47.1	Kaus Aust.	83°28.7	-34°22.1
21	31°10.2	163°31.8	• • 12.8	216°24.9	• • 31.5	190°57.8	• • 14.1	357°21.7	• • 47.1	Vega	80°31.5	38°48.8
22	46°12.7	178°31.1	13.7	231°26.3	31.1	205°59.9	14.2	12°24.3	47.1	_		
23	61°15.1	193°30.5	14.6	246°27.6	30.6	221°02.0	14.4	27°26.9	47.0	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
Mer.p	ass. 18:56	ν -0.6′ d0	.9′ m-3.94	ν 1.3′ d-0	0.4' m 1.00	$\nu 2.1' d0$.	2′ m-1.79	ν 2.6′ d -0	0.0′ m0.08	Peacock	53°01.2	-56°38.5
										Deneb	49°23.9	45°23.4
Thu	GHA	GHA	Doc	GHA	Doc	GHA	Doc	GHA	Doc	Enif	33°35.8	10°00.7
		208°29.8	Dec	261°29.0	Dec N04°30.2	236°04.1	Dec S 07°14.5	42°29.4	Dec N10°47.0	Al Na'ir	27°29.2	-46°49.3
0	76°17.6	208°29.8 223°29.2	\$16°15.5			251°06.1		42°29.4 57°32.0		Fomalhaut	15°11.1	-29°28.1
1	91°20.1		16.4	276°30.3	29.7		14.7		47.0 46.0	Scheat	13°42.1	28°14.7
2	106°22.5	238°28.5	17.3	291°31.6	29.3	266°08.2	14.8	72°34.6	46.9	Markab	13°26.7	15°21.9
3	121°25.0	253°27.9	• • 18.2	306°33.0	• • 28.9	281°10.3	• • 15.0	87°37.2	• • 46.9	D- 05 T	CIIA	N4-
4	136°27.5	268°27.3	19.1	321°34.3	28.4	296°12.4	15.1	102°39.8	46.9	Dec 05 Tue	SHA	Mer.pass
5	151°29.9	283°26.6	20.0	336°35.7	28.0	311°14.4	15.3	117°42.4	46.8		134°40.9	10:04
6	166°32.4	298°26.0	S16°20.9	351°37.0	N04°27.5	326° 16.5	S07°15.4	132°45.0	N10°46.8		186°05.5	06:38
7	181°34.8	313°25.3	21.7	6°38.4	27.1	341°18.6	15.6	147°47.6	46.8		160°05.4	08:21
8	196°37.3	328°24.7	22.6	21°39.7	26.6	356° 20.7	15.7	$162^{\circ}50.2$	46.7	Saturn	326°05.6	21:15
9	211°39.8	343°24.0	• • 23.5	36°41.1	• • 26.2	11°22.7	• • 15.9	177°52.7	• • 46.7	D 00 111	CIIA	N4-
10	226°42.2	358°23.4	24.4	51°42.4	25.8	26°24.8	16.0	192°55.3	46.7	Dec 06 Wed	SHA	Mer.pass
11	241°44.7	13°22.7	25.3	66°43.8	25.3	41°26.9	16.2	207°57.9	46.6		133°26.7	10:05
12	256°47.2	28°22.1	\$16°26.2	81°45.1	N04°24.9	56°29.0	S07°16.3	223°00.5	N10°46.6		185°38.3	06:36
13	271°49.6	43°21.4	27.1	96°46.5	24.4	71°31.0	16.5	238°03.1	46.6		159°55.9	08:18
14	286°52.1	58°20.8	27.1	90°40.3 111°47.8	24.4	86°33.1	16.6	253°05.7	46.5	Saturn	326°08.8	21:11
										D 07 =:	C	
15 16	301°54.6	73°20.1	• • 28.8	126°49.1	• • 23.6	101°35.2	16.8	268°08.3	· · 46.5	Dec 07 Thu	SHA	Mer.pass
16	316°57.0	88°19.4	29.7	141°50.5	23.1	116°37.3	16.9	283°10.9	46.5		132°12.2	10:06
17	331°59.5	103°18.8	30.6	156°51.8	22.7	131°39.3	17.1	298°13.5	46.4		185°11.4	06:33
18	347°01.9	118°18.1	\$16°31.5	171°53.2	N04°22.2	146°41.4	S07°17.2	313°16.0	N10°46.4	Jupiter	159°46.5	08:15
19	2°04.4	133°17.5	32.3	186°54.5	21.8	161°43.5	17.4	328°18.6	46.4	Saturn	326°11.8	21:06
20	$17^{\circ}06.9$	$148^{\circ}16.8$	33.2	201°55.9	21.4	176°45.6	17.5	343°21.2	46.3			
21	32°09.3	163°16.2	• • 34.1	216°57.2	20.9	191°47.7	• • 17.7	358°23.8	• • 46.3	Horizont	al parallax	
22	47°11.8	$178^{\circ}15.5$	35.0	231°58.6	20.5	206°49.7	17.8	13°26.4	46.3		Venus:	0.1
23	62°14.3	193°14.9	35.9	246°59.9	20.0	221°51.8	17.9	28°29.0	46.2		Mars:	0.1
											•	
Mer.p	ass. 18:52	ν -0.6′ $d0$.9′ m-3.94	ν 1.3′ d-0	.4′ m0.99	ν 2.1′ d0.	1′ m-1.79	$\nu^{2.6'} d^{-0}$	0.0′ m0.08			

h	Sui	n					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°20.9	S22°24.1	323°44.0	8.0'	$N21^{\circ}38.1$	-7.8'	57.7'
1	197°20.6	24.4	338°11.0	8.1'	21°30.3	-7.9'	57.7'
2	212°20.3 227°20.1	24.7 •• 25.0	352°38.1 7°05.2	8.1' 8.2'	21°22.3 21°14.3	-8.1' -8.2'	57.8' 57.8'
4	242° 19.8	25.4	21°32.4	8.2'	21°06.1	-8.3	57.8'
5	257° 19.6	25.7	$35^{\circ}59.6$	8.3'	20°57.7	-8.5'	57.8'
6	272°19.3	S22°26.0	50°26.9	8.3'	N20°49.3	-8.6'	57.8'
7 8	287° 19.0 302° 18.8	26.3 26.6	64°54.2 79°21.6	8.4' 8.4'	20°40.7 20°32.0	-8.7' -8.8'	57.9' 57.9'
9	317° 18.5	26.9	93°49.0	8.5'	20°23.2	-8.9'	57.9'
10	332°18.3	27.2	108°16.4	8.5'	20°14.2	-9.1'	57.9'
11	347° 18.0	27.5	122°43.9	8.6'	20°05.2	-9.2'	57.9'
12 13	2°17.7 17°17.5	\$22°27.8 28.1	137°11.5 151°39.1	8.6' 8.7'	N19°56.0 19°46.7	-9.3' -9.4'	57.9' 58.0'
14	32° 17.2	28.4	166°06.8	8.7'	19° 37.3	-9.4 -9.5'	58.0'
15	47° 17.0	• • 28.7	$180^{\circ}34.5$	8.8'	19°27.7	-9.6'	58.0'
16	62° 16.7	29.0	195°02.2	8.8'	19°18.1	-9.8'	58.0'
17 18	77° 16.4 92° 16.2	29.3 \$22°29.6	209°30.0 223°57.9	8.9' 8.9'	19°08.3 N18°58.5	-9.9' -10.0'	58.0' 58.0'
19	107° 15.9	29.9	238°25.8	9.0'	18°48.5	-10.1	58.1
20	122°15.6	30.2	$252^{\circ}53.8$	9.0'	18°38.4	-10.2'	58.1'
21	137° 15.4	• • 30.5	267°21.8	9.1'	18°28.2	-10.3'	58.1'
22 23	152° 15.1 167° 14.9	30.8 31.1	281°49.9 296°18.0	9.1' 9.2'	18°17.8 18°07.4	-10.4' -10.5'	58.1' 58.1'
23						10.5	55.1
	SD = 16.2'	d = 0.3'		SI	D = 15.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°14.6	S22°31.4	310°46.2	9.2'	N17°56.9	-10.6'	58.1'
1 2	197° 14.3 212° 14.1	31.7 32.0	325°14.4 339°42.7	9.3' 9.3'	17°46.2 17°35.5	-10.7' -10.8'	58.2' 58.2'
3	212 14.1 227°13.8	32.3	354°11.0	9.3 9.4'	17 35.5 17°24.7	-10.8 -10.9'	58.2'
4	242° 13.5	32.6	8°39.4	9.4'	17°13.7	-11.0'	58.2'
5	257° 13.3	32.9	23°07.9	9.5'	17°02.7	-11.1'	58.2'
6 7	272°13.0 287°12.7	\$22°33.1 33.4	37°36.4 52°04.9	9.5' 9.6'	N16°51.5 16°40.3	-11.2' -11.3'	58.2' 58.2'
8	302° 12.7	33.4	66°33.5	9.6' 9.6'	16° 40.3	-11.3 -11.4'	58.3'
9	317° 12.2	• • 34.0	81°02.1	9.7'	16°17.5	-11.5'	58.3'
10	332°11.9	34.3	95°30.8	9.7'	16°06.0	-11.6'	58.3'
11 12	347°11.7 2°11.4	34.6 \$22°34.9	109°59.6 124°28.4	9.8' 9.8'	15°54.4 N15°42.6	-11.7' -11.8'	58.3' 58.3'
13	2 11.4 17°11.1	35.1	124 28.4 138°57.2	9.8 9.9'	15°30.8	-11.8 -11.9'	58.3'
14	32° 10.9	35.4	153°26.1	9.9'	15°18.9	-12.0'	58.4'
15	47° 10.6	• • 35.7	167°55.1	10.0'	15°06.9	-12.1'	58.4'
16 17	62°10.3 77°10.1	36.0 36.3	182°24.1 196°53.1	10.0' 10.1'	14°54.9 14°42.7	-12.2' -12.2'	58.4' 58.4'
18	92°09.8	522°36.6	211°22.2	10.1	N14°30.5	-12.3'	58.4
19	107°09.5	36.8	$225^{\circ}51.4$	10.2'	14°18.1	-12.4'	58.4'
20	122°09.3	37.1	240°20.6		14°05.7		58.4'
21 22	137°09.0 152°08.7	· · 37.4 37.7	254°49.8 269°19.1	10.3' 10.3'	13°53.2 13°40.7	-12.6' -12.7'	58.5' 58.5'
23	167° 08.5	38.0	283°48.4	10.4	13°28.0	-12.7'	58.5
	SD = 16.2'	d = 0.3'		SI	D = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°08.2 197°07.9	\$22°38.2 38.5	298°17.8 312°47.2	10.4' 10.5'	N13°15.3 13°02.5	-12.8' -12.9'	58.5' 58.5'
2	212°07.7	38.8	312 47.2 327°16.7	10.5'	13 02.5 12°49.6	-12.9 -13.0'	58.5'
3	227°07.4	• • 39.1	341°46.2	10.5'	12°36.6	-13.0'	58.5'
4	242°07.1	39.3	356° 15.7	10.6'	12°23.6	-13.1'	58.5'
5 6	257°06.8 272°06.6	39.6 \$22°39.9	10°45.3 25°14.9	10.6' 10.7'	12°10.5 N11°57.4	-13.2' -13.2'	58.6' 58.6'
7	287°06.3	40.1	39°44.6	10.7'	11°44.1	-13.3'	58.6'
8	302°06.0	40.4	54° 14.3	10.8'	11°30.8	-13.4'	58.6'
9	317°05.8	• • 40.7	68°44.1	10.8'	11°17.4	-13.4'	58.6'
10 11	332°05.5 347°05.2	40.9 41.2	83°13.9 97°43.7	10.8' 10.9'	11°04.0 10°50.5	-13.5' -13.6'	58.6' 58.6'
12	2°04.9	\$22°41.5	112°13.6	10.9	N10°37.0	-13.6'	58.7'
13	17°04.7	41.7	126°43.5	10.9'	10°23.3	-13.7'	58.7'
14	32°04.4	42.0	141°13.4 155°43.4	11.0'	10°09.7 09°55.9	-13.7'	58.7'
15 16	47° 04.1 62° 03.9	· · 42.3 42.5	155°43.4 170°13.4	11.0' 11.0'	09°55.9 09°42.1	-13.8' -13.9'	58.7' 58.7'
17	77°03.6	42.8	184°43.4	11.1'	09°28.3	-13.9'	58.7'
18	92°03.3	\$22°43.1	199°13.5	11.1'	N09°14.4	-14.0'	58.7'
19	107°03.0 122°02.8	43.3	213°43.6 228°13.7	11.1' 11.2'	09°00.4 08°46.4	-14.0'	58.7'
20 21	122°02.8 137°02.5	43.6 • • 43.8	228° 13.7 242° 43.9	11.2'	08°46.4 08°32.3	-14.1' -14.1'	58.8' 58.8'
22	152°02.2	44.1	257° 14.1	11.2'	08°18.2	-14.2	58.8'
23	167°01.9	44.4	271°44.3	11.2'	08°04.0	-14.2'	58.8'
	SD = 16.2'	d = 0.3'		SI	O = 16.0'		

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

Lat.		e		Moonset	:	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°		18:30	21:01		13:34	12:49
N 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
N 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
N 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
S 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
S 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
S 60°	23:35	23:44	23:51	05:51	07:27	09:03

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	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			11:52	04:15 16:40		

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Fri –	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	77°16.7	208° 14.2	\$16°36.7	262°01.3	N04° 19.6	236°53.9	S07°18.1	43°31.6	N10°46.2		SIIA	
										Alpheratz	357°31.3	29°15.3
1	92°19.2	223°13.5	37.6	277°02.7	19.2	251°56.0	18.2	58°34.2	46.2	Ankaa	353°04.0	-42°09.0
2	107°21.7	238° 12.9	38.5	292°04.0	18.7	266° 58.0	18.4	73°36.7	46.1	Schedar	349°27.0	56°42.1
3	122°24.1	253° 12.2	• • 39.4	307°05.4	• • 18.3	282°00.1	• • 18.5	88°39.3	• • 46.1	Diphda	348°44.0	-17°49.7
4	137°26.6	268°11.6	40.2	322°06.7	17.8	297°02.2	18.7	103°41.9	46.1	Achernar	335°17.6	-57°05.5
5	152°29.1	$283^{\circ}10.9$	41.1	$337^{\circ}08.1$	17.4	312°04.3	18.8	118°44.5	46.1	Hamal	327°47.3	23°36.1
6	167°31.5	298°10.3	S16°42.0	352°09.4	N04°17.0	327°06.4	507°19.0	133°47.1	N10°46.0		311°49.2	89°23.2
7	182°34.0	$313^{\circ}09.6$	42.9	$7^{\circ}10.8$	16.5	342°08.4	19.1	148°49.7	46.0	Polaris	311 49.2 315°09.0	-40°11.4
8	197°36.4	328°08.9	43.7	22°12.1	16.1	357° 10.5	19.3	163°52.3	46.0	Acamar		
9	212°38.9	343°08.3	• • 44.6	37° 13.5	• • 15.6	12° 12.6	• • 19.4	178°54.8	• • 45.9	Menkar	314°02.5	4°12.2
10	227°41.4	358°07.6	45.5	52° 14.8	15.2	27° 14.7	19.6	193°57.4	45.9	Mirfak	308°23.1	49°57.9
11	242°43.8	13°06.9	46.3	67° 16.2	14.8	42° 16.8	19.7	209°00.0	45.9	Aldebaran	290°35.6	16°34.0
12	257°46.3	28°06.3	\$16°47.2	82° 17.5	N04°14.3	57° 18.8	S07° 19.9	224°02.6	N10°45.8	Rigel	$281^{\circ}00.5$	-8°10.1
	272°48.8	43°05.6		97°18.9		72°20.9		239°05.2		Capella	280°16.7	46°01.5
13			48.1		13.9	87°23.0	20.0		45.8	Bellatrix	$278^{\circ}19.1$	6°22.5
14	287°51.2	58°05.0	48.9	112°20.3	13.5		20.1	254°07.8	45.8	Elnath	277°57.5	28°37.8
15	302°53.7	73°04.3	• • 49.8	127°21.6	• • 13.0	102°25.1	• • 20.3	269°10.3	• • 45.7	Alnilam	275°34.2	-1°11.1
16	317°56.2	88°03.6	50.7	142°23.0	12.6	117°27.2	20.4	284°12.9	45.7	Betelgeuse	270°48.3	7°24.7
17	332°58.6	103°03.0	51.5	157°24.3	12.1	132°29.2	20.6	299°15.5	45.7	Canopus	263°50.4	-52°42.6
18	348°01.1	118°02.3	S16°52.4	172°25.7	N04°11.7	147°31.3	S07°20.7	$314^{\circ}18.1$	N10°45.6	Sirius	258°23.1	-16°45.4
19	3°03.6	$133^{\circ}01.6$	53.2	$187^{\circ}27.0$	11.3	162°33.4	20.9	329°20.7	45.6	Adhara	255°03.0	-29°00.7
20	18°06.0	$148^{\circ}01.0$	54.1	202°28.4	10.8	177° 35.5	21.0	344°23.3	45.6	Procyon	244°47.2	5°08.9
21	33°08.5	163°00.3	• • 55.0	217° 29.8	• • 10.4	192°37.6	• • 21.2	359°25.9	• • 45.6			
22	48°10.9	177°59.6	55.8	232°31.1	10.0	207°39.6	21.3	14°28.4	45.5	Pollux	243°13.2	27°57.1
23	63°13.4	192°58.9	56.7	247°32.5	09.5	222°41.7	21.5	29°31.0	45.5	Avior	234°12.9	-59°36.0
b 4			0/ 2.00							Suhail	222°43.7	-43°32.9
ivier.p	bass. 18:48	ν -0.7 d0	.9′ m-3.93	ν 1.4° d -0	0.4′ m0.97	ν 2.1′ d 0.	1′ m-1.79	ν2.0′ d-0	0.0′ m0.09	Miaplacidus	221°36.9	-69°50.0
										Alphard	217°44.5	-8°47.1
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°31.0	11°49.4
0	78°15.9	207°58.3	S16°57.5	262°33.8	N04°09.1	237° 43.8	S07°21.6	44°33.6	N10°45.5	Dubhe	193°37.3	61°35.3
1	93°18.3	222°57.6	58.4	277°35.2	08.6	252° 45.9	21.7	59°36.2	45.4	Denebola	182°21.8	14°24.5
2	108°20.8	237° 56.9	16°59.3	292°36.5	08.2	267°48.0	21.9	74°38.8	45.4	Gienah		-17°42.1
3	123°23.3	252° 56.3	17°00.1	307°37.9	• • 07.8	282°50.1	22.0	89°41.4	• • 45.4		172°56.6	-63°15.4
4	138°25.7	267°55.6	01.0	322°39.3	07.3	202 50.1 297°52.1	22.2	104°43.9	45.4	Gacrux	171°48.2	-57°16.3
										Alioth	$166^{\circ}10.6$	55°47.8
5	153°28.2	282°54.9	01.8	337°40.6	06.9	312°54.2	22.3	119°46.5	45.3	Spica	$158^{\circ}19.1$	-11°18.7
6	168°30.7	297°54.2	\$17°02.7	352°42.0	N04°06.5	327°56.3	S07°22.5	134°49.1	N10°45.3	Alkaid	152°49.9	49°09.9
7	183°33.1	312°53.6	03.5	7°43.4	06.0	342°58.4	22.6	149°51.7	45.2	Hadar	148°31.8	-60°30.5
8	198°35.6	327°52.9	04.4	22°44.7	05.6	358°00.5	22.8	164°54.3	45.2	Menkent	$147^{\circ}54.1$	-36°30.6
9	213°38.0	342°52.2	• • 05.2	37°46.1	• • 05.2	13°02.5	• • 22.9	179°56.8	• • 45.2	Arcturus	145°45.3	19°01.8
10	228°40.5	357°51.6	06.1	52°47.4	04.7	28°04.6	23.0	194°59.4	45.2	Rigil Kent.	139°36.3	-60°57.1
11	243°43.0	12°50.9	06.9	67°48.8	04.3	43°06.7	23.2	210°02.0	45.1	Kochab	$137^{\circ}21.2$	74°01.9
12	258°45.4	27°50.2	S17°07.8	82°50.2	N04°03.8	58°08.8	S07°23.3	225°04.6	N10°45.1	Zuben'ubi	136°52.8	-16°09.6
13	273°47.9	42°49.5	08.6	97°51.5	03.4	73° 10.9	23.5	240°07.2	45.1	Alphecca	126°01.4	26°37.0
14	288°50.4	57°48.8	09.5	112°52.9	03.0	88° 13.0	23.6	255°09.8	45.0	Antares	112°12.3	-26°29.6
15	303°52.8	72°48.2	• • 10.3	127°54.3	• • 02.5	103° 15.0	• • 23.8	270°12.3	• • 45.0	Atria	107°04.2	-69°04.6
16	318°55.3	87° 47.5	11.2	142°55.6	02.1	$118^{\circ}17.1$	23.9	$285^{\circ}14.9$	45.0	Sabik	101°59.5	-15°45.5
17	333°57.8	102°46.8	12.0	157°57.0	01.7	133° 19.2	24.1	300°17.5	44.9	Shaula	96°06.5	-37°07.4
18	349°00.2	$117^{\circ}46.1$	S 17°12.9	172°58.3	N04°01.2	148°21.3	507°24.2	315°20.1	N10°44.9	Rasalhague	95°56.0	12°32.5
19	4°02.7	132°45.5	13.7	187° 59.7	8.00	163°23.4	24.3	330°22.7	44.9	Eltanin	90°41.2	51°29.2
20	19°05.2	$147^{\circ}44.8$	14.6	203°01.1	04°00.4	178°25.5	24.5	345°25.2	44.9	Kaus Aust.	83°28.7	-34°22.1
21	34°07.6	$162^{\circ}44.1$	• • 15.4	218°02.4	03°59.9	193°27.6	• • 24.6	0°27.8	• • 44.8	Vega	80°31.5	38°48.8
22	49°10.1	177°43.4	16.2	233°03.8	59.5	208°29.6	24.8	15°30.4	44.8			
23	64°12.5	192°42.7	17.1	248°05.2	59.1	223°31.7	24.9	30°33.0	44.8	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
ivler.p	pass. 18:44	ν -0. ℓ' $d0$.9′ m-3.93	ν 1.4′ d -0	0.4′ m0.96	ν 2.1′ d0.	1′ m-1.80	ν 2.0′ d -0	0.0′ m0.09	Peacock	53°01.3	-56°38.5
										Deneb	49°23.9	45°23.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	79°15.0	207°42.1	\$17°17.9	263°06.5	N03°58.6	238°33.8	S07°25.1	45°35.6	N10°44.7	Al Na'ir	27°29.2	-46°49.3
1	94°17.5	222°41.4	18.8	278° 07.9	58.2	253°35.9	25.2	60°38.1	44.7	Fomalhaut	15°11.1	-29°28.1
2	109°19.9	237°40.7	19.6	293°09.3	57.8	268° 38.0	25.3	75°40.7	44.7	Scheat	13°42.1	28°14.7
3	124°22.4	252°40.0	. 20.4	308° 10.6	• • 57.3	283°40.1	. 25.5	90°43.3	• • 44.7	Markab	13°26.7	15°21.9
4	139°24.9	267°39.3	21.3	323°12.0	56.9	298° 42.2	25.6	105°45.9	44.6	Dec 08 Fri	SHA	Mer.pass
5	154°27.3	282°38.6	22.1	338° 13.4	56.5	313° 44.2	25.8	100°48.4	44.6		130°57.5	10:07
6	169°29.8	202 30.0 297°37.9	\$17°22.9	353° 14.8	N03° 56.0	313 44.2 328°46.3	507°25.9	135°51.0	N10°44.6		184°44.6	06:31
7	109 29.6 184°32.3	312°37.3	23.8	8° 16.1	55.6	343°48.4	26.1	150°53.6	44.5	1	159°37.2	08:11
8	104 32.3 199°34.7	312 37.3 327°36.6	23.6 24.6	23° 17.5	55.0	358° 50.5	26.1	165°56.2	44.5 44.5	Saturn		21:02
9	199 34.7 214°37.2	342°35.9	. 25.4	23 17.5 38° 18.9	55.2	13°52.6	26.3	180°58.8	44.5 •• 44.5	Jatuill	J2J 14.0	21.02
10	214 37.2 229°39.7	357°35.2	26.3	50 10.9 53°20.2	54.7	28° 54.7	26.5	196°01.3	44.5	Dec 09 Sat	SHA	Mer.pass
	229 39.7 244°42.1	12°34.5	20.3 27.1	68° 21.6	54.3 53.9	28 54.7 43°56.8	26.5 26.6	211°03.9		Venus	129°42.4	10:09
11									44.4 N10°44.4	Mars	184°18.0	06:29
12	259°44.6	27°33.8	\$17°27.9	83°23.0	N03°53.4	58° 58.9	\$07°26.8	226°06.5	N10°44.4		159°27.9	08:08
13	274°47.0	42°33.1	28.8	98°24.3	53.0 52.6	74°00.9	26.9 27.1	241°09.1	44.4	Saturn	$326^{\circ}17.7$	20:58
14	289°49.5	57°32.4	29.6	113°25.7	52.6	89°03.0	27.1	256°11.7	44.3	D 15 -	<u> </u>	
15	304°52.0	72°31.8	30.4	128°27.1	• • 52.2	104°05.1	• • 27.2	271°14.2	• • 44.3	Dec 10 Sun	SHA	Mer.pass
16	319°54.4	87°31.1	31.3	143°28.5	51.7	119°07.2	27.3	286°16.8	44.3		128°27.0	10:10
17	334°56.9	102°30.4	32.1	158°29.8	51.3	134°09.3	27.5	301°19.4	44.3		183°51.5	06:27
18	349°59.4	117°29.7	\$17°32.9	173°31.2	N03°50.9	149°11.4	S07°27.6	316°22.0	N10°44.2		159°18.8	08:05
19	5°01.8	132°29.0	33.7	188°32.6	50.4	164°13.5	27.8	331°24.5	44.2	Saturn	326°20.5	20:54
20	20°04.3	147°28.3	34.6	203°33.9	50.0	179° 15.6	27.9	346°27.1	44.2	Hautaa	al paralla:	
21	35°06.8	162°27.6	• • 35.4	218°35.3	• • 49.6	194° 17.6	• • 28.1	1°29.7	• • 44.1	Horizoni	tal parallax	0.1
22	50°09.2	177°26.9	36.2	233°36.7	49.1	209°19.7	28.2	16°32.3	44.1		Venus:	0.1
23	65°11.7	192°26.2	37.0	248°38.1	48.7	224°21.8	28.3	31°34.8	44.1		Mars:	0.1
Mern	pass. 18:40	$\nu - 0.7' d0$.8′ m-3.93	$\nu 1.4' d-0$	0.4′ m0.95	$\nu 2.1' d0$	1′ m-1.80	$\nu^{2.6'} d_{-0}$	0.0' m0.10			

h	Sui	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°01.7	\$22°44.6	286°14.5	11.3'	N07°49.8	-14.3'	58.8'
1 2	197°01.4 212°01.1	44.9 45.1	300°44.8 315°15.1	11.3' 11.3'	07°35.6 07°21.3	-14.3' -14.3'	58.8' 58.8'
3	212 01.1 227°00.8	• • 45.4	329°45.4	11.3'	07°21.3	-14.3 -14.4'	58.8'
4	242°00.6	45.6	344°15.7	11.4'	$06^{\circ}52.6$	-14.4'	58.8'
5	257°00.3	45.9	358°46.1	11.4'	06°38.1	-14.5'	58.9'
6 7	272°00.0 286°59.7	\$22°46.2 46.4	13°16.5 27°46.9	11.4' 11.4'	N06°23.7 06°09.2	-14.5' -14.5'	58.9' 58.9'
8	301°59.5	46.7	42°17.3	11.4'	05°54.6	-14.5'	58.9'
9	316°59.2	• • 46.9	56°47.7	11.5'	05°40.1	-14.6'	58.9'
10	331°58.9	47.2	71°18.2	11.5'	05°25.5	-14.6'	58.9'
11 12	346°58.6 1°58.4	47.4 \$22°47.7	85°48.7 100°19.1	11.5' 11.5'	05°10.8 N04°56.1	-14.7' -14.7'	58.9' 58.9'
13	16°58.1	47.9	100 19.1 114°49.6	11.5'	04°41.4	-14.7'	58.9'
14	31°57.8	48.1	129°20.1	11.5'	04°26.7	-14.8'	58.9'
15	46°57.5	• • 48.4	143°50.7	11.5'	04°11.9	-14.8'	59.0'
16	61°57.2 76°57.0	48.6 48.9	158°21.2 172°51.7	11.5' 11.5'	03°57.2 03°42.3	-14.8' -14.8'	59.0'
17 18	91°56.7	48.9 S 22°49.1	172 51.7 187°22.3	11.6'	N03°27.5	-14.8 -14.9'	59.0' 59.0'
19	106°56.4	49.4	201°52.8	11.6'	03°12.7	-14.9'	59.0'
20	121°56.1	49.6	$216^{\circ}23.4$	11.6'	02°57.8	-14.9'	59.0'
21	136°55.9	• • 49.9	230°53.9	11.6'	02°42.9	-14.9'	59.0'
22 23	151°55.6 166°55.3	50.1 50.3	245°24.5 259°55.1	11.6' 11.6'	02°28.0 02°13.0	-14.9' -15.0'	59.0' 59.0'
23						13.0	33.0
	SD = 16.2'	d = 0.3'		51	D = 16.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°55.0	\$22°50.6 50.8	274°25.6	11.6'	N01°58.1	-15.0'	59.0'
1 2	196°54.7 211°54.5	50.8 51.0	288°56.2 303°26.8	11.6' 11.6'	01°43.1 01°28.1	-15.0' -15.0'	59.1' 59.1'
3	226°54.2	51.3	317°57.3	11.6'	01°13.1	-15.0'	59.1'
4	241°53.9	51.5	332°27.9	11.6'	$00^{\circ}58.1$	-15.0'	59.1'
5	256°53.6	51.8	346°58.5	11.6'	00°43.1	-15.0'	59.1'
6 7	271°53.3 286°53.1	\$22°52.0 52.2	1°29.0 15°59.6	11.5' 11.5'	N00°28.1 N00°13.1	-15.0' -15.0'	59.1' 59.1'
8	301°52.8	52.5	30°30.1	11.5'	S00°01.9	15.0'	59.1'
9	316°52.5	• • 52.7	45°00.6	11.5'	00°17.0	15.0'	59.1'
10	331°52.2	52.9	59°31.1	11.5'	00°32.0	15.0'	59.1'
11 12	346°51.9 1°51.6	53.1 \$22°53.4	74°01.7 88°32.2	11.5' 11.5'	00°47.1 S 01°02.1	15.0' 15.0'	59.1' 59.1'
13	16°51.4	53.6	00 32.2 103°02.6	11.5'	01°17.1	15.0'	59.1 59.2'
14	31°51.1	53.8	117°33.1	11.4'	01°32.2	15.0'	59.2'
15	46°50.8	• • 54.1	132°03.5	11.4'	01°47.2	15.0'	59.2'
16 17	61°50.5 76°50.2	54.3 54.5	146°34.0 161°04.4	11.4' 11.4'	02°02.2 02°17.2	15.0' 15.0'	59.2' 59.2'
18	91°50.0	54.5 \$22°54.7	101 04.4 175°34.8	11.4	502°32.2	15.0'	59.2'
19	106°49.7	55.0	190°05.2	11.4'	02°47.2	15.0'	59.2'
20	121°49.4	55.2	204°35.5		03°02.2	10.0	
21 22	136°49.1 151°48.8	• • 55.4 55.6	219°05.8 233°36.2	11.3' 11.3'	03°17.2 03°32.2	15.0' 14.9'	59.2' 59.2'
23	166°48.5	55.0 55.8	233 30.2 248°06.4	11.3'	03°47.1	14.9'	59.2'
	SD = 16.2'	d = 0.2'			D = 16.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°48.3 196°48.0	\$22°56.1 56.3	262°36.7 277°06.9	11.2' 11.2'	\$04°02.1 04°17.0	14.9' 14.9'	59.2' 59.2'
2	211°47.7	56.5	291°37.1	11.2'	04°17.0	14.9'	59.2'
3	226°47.4	• • 56.7	306°07.3	11.1'	04°46.7	14.9'	59.2'
4	241°47.1	56.9	320°37.4 335°07.5	11.1'	05°01.6	14.8'	59.3'
5 6	256°46.8 271°46.5	57.2 \$22°57.4	335°07.5 349°37.6	11.1' 11.0'	05°16.4 \$05°31.2	14.8' 14.8'	59.3' 59.3'
7	286°46.3	57.6	4°07.7	11.0'	05°46.0	14.8	59.3'
8	301°46.0	57.8	18°37.7	11.0'	06°00.8	14.7'	59.3'
9	316°45.7	• • 58.0	33°07.6	10.9'	06°15.5	14.7'	59.3'
10 11	331°45.4 346°45.1	58.2 58.4	47°37.6 62°07.5	10.9' 10.9'	06°30.2 06°44.8	14.7' 14.6'	59.3' 59.3'
12	1°44.8	\$22°58.6	76°37.3	10.9	S06°59.5	14.6	59.3'
13	16°44.5	58.9	91°07.1	10.8'	$07^{\circ}14.1$	14.6'	59.3'
14	31°44.3	59.1	105°36.9	10.7'	07°28.6	14.5'	59.3'
15 16	46°44.0 61°43.7	· · 59.3 59.5	120°06.6 134°36.3	10.7' 10.6'	07°43.1 07°57.6	14.5' 14.4'	59.3' 59.3'
16	61°43.7 76°43.4	59.5 59.7	134°36.3 149°06.0	10.6'	07°57.6 08°12.0	14.4' 14.4'	59.3'
18	91°43.1	S22°59.9	163°35.6	10.6'	S08°26.4	14.4'	59.3'
19	106°42.8	23°00.1	178°05.1	10.5	08°40.8	14.3'	59.3'
20 21	121°42.5 136°42.2	00.3	192°34.6 207°04.1	10.5' 10.4'	08°55.1 09°09.4	14.3' 14.2'	59.3' 59.3'
21	136°42.2 151°42.0	00.5	207°04.1 221°33.5	10.4	09°09.4 09°23.6	14.2'	59.3'
23	166°41.7	00.9	236°02.9	10.3'	09°37.7	14.1'	59.3'
	SD = 16.2'	d = 0.2'		SI	D = 16.2'		

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

Lat.		Moonris	e		Moonset	;
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	23:16		01:29	12:18	11:51	11:23
N 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
N 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
S 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
S 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
S 60°	23:57		00:03	10:38	12:13	13:48

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	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	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	80°14.1	207°25.5	\$17°37.8	263°39.4	N03°48.3	239°23.9	S07°28.5	46°37.4	N10° 44.1			
1	95°16.6	222°24.8	38.7	278°40.8	47.8	254°26.0	28.6	61°40.0	44.0	Alpheratz	357°31.3	29°15.3
2	110°19.1	237°24.1	39.5	293°42.2	47.4	269°28.1	28.8	76° 42.6	44.0	Ankaa	353°04.0	-42°09.0
3	125°21.5	252°23.4	40.3	308°43.6	• • 47.0	284°30.2	28.9	91°45.1	• • 44.0	Schedar	349°27.0	56°42.1
4	140°24.0	267°22.7	41.1	323°44.9	46.6	299°32.3	29.0	106°47.7	43.9	Diphda	348°44.0	-17°49.7
5	155°26.5	282°22.0	41.9	338°46.3	46.1	314°34.4	29.2	121°50.3	43.9	Achernar	335°17.6 327°47.3	-57°05.6 23°36.1
6	170°28.9	297°21.3	S17°42.7	353°47.7	N03°45.7	329°36.5	507°29.3	136°52.9	N10°43.9	Hamal Polaris	321 41.3 311°49.7	89°23.2
7	185°31.4	312°20.6	43.6	8°49.1	45.3	344°38.5	29.5	151°55.4	43.9	Acamar	315°09.1	-40°11.4
8	200°33.9	327°19.9	44.4	23°50.5	44.8	359°40.6	29.6	166°58.0	43.8	Menkar	314°02.5	4°12.2
9	215°36.3	342°19.2	• • 45.2	38°51.8	• • 44.4	14°42.7	• • 29.7	182°00.6	• • 43.8	Mirfak	308°23.1	49°57.9
10	230°38.8	357°18.5	46.0	53°53.2	44.0	29°44.8	29.9	197°03.2	43.8	Aldebaran	290°35.6	16°34.0
11	245°41.3	12°17.8	46.8	68°54.6	43.6	44°46.9	30.0	212°05.7	43.8	Rigel	281°00.5	-8°10.2
12	260°43.7	27°17.1 42°16.4	\$17°47.6	83°56.0	N03°43.1	59°49.0 74°51.1	S07°30.2	227°08.3 242°10.9	N10°43.7	Capella	$280^{\circ}16.7$	46°01.5
13 14	275°46.2 290°48.6	42 16.4 57°15.7	48.4 49.2	98°57.3 113°58.7	42.7 42.3	74 51.1 89°53.2	30.3 30.5	242 10.9 257°13.5	43.7 43.7	Bellatrix	$278^{\circ}19.1$	6°22.5
15	305°51.1	72°15.0	50.1	129°00.1	• • 41.8	104°55.3	30.6	272° 16.0	• • 43.7	Elnath	277°57.4	28°37.8
16	320°53.6	87°14.3	50.9	144°01.5	41.4	119°57.4	30.7	287° 18.6	43.6	Alnilam	275°34.2	-1°11.1
17	335°56.0	102°13.6	51.7	159°02.9	41.0	134°59.5	30.9	302°21.2	43.6	Betelgeuse	270°48.3	7°24.6
18	350°58.5	117°12.9	S17°52.5	174°04.2	N03°40.6	150°01.5	S07°31.0	317°23.8	N10°43.6	Canopus	263°50.4	-52°42.6
19	6°01.0	132°12.2	53.3	189°05.6	40.1	165°03.6	31.2	332°26.3	43.5	Sirius	258°23.1	-16°45.4
20	21°03.4	$147^{\circ}11.5$	54.1	204°07.0	39.7	180°05.7	31.3	347°28.9	43.5	Adhara	255°03.0 244°47.2	-29°00.7
21	$36^{\circ}05.9$	162°10.8	• • 54.9	219°08.4	• • 39.3	195°07.8	• • 31.4	2°31.5	• • 43.5	Procyon Pollux	244 47.2 243°13.1	5°08.9 27°57.1
22	51°08.4	$177^{\circ}10.1$	55.7	234°09.8	38.8	210°09.9	31.6	17°34.0	43.5	Avior	234° 12.9	-59°36.0
23	$66^{\circ}10.8$	192°09.4	56.5	249°11.2	38.4	225°12.0	31.7	32°36.6	43.4	Suhail	222°43.6	-43°32.9
Mer n	ass. 18:36	ν -0.7' d0	.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°36.9	-69°50.0
- Wici.p	433. 10.30	ν σ.τ ασ.	.0 111 3.33	ν1. + α θ		ν Z.1 ασ.		ν2.0 d 0		Alphard	217°44.5	-8°47.1
										Regulus	207°31.0	11°49.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.3
0	81°13.3	207°08.7	S17°57.3	264°12.5	N03°38.0	240°14.1	S07°31.9	47°39.2	N10°43.4	Denebola	$182^{\circ}21.8$	14°24.4
1	96°15.8	222°08.0	58.1	279°13.9	37.6	255°16.2	32.0	62°41.8	43.4	Gienah	$175^{\circ}40.4$	-17°42.1
2	111°18.2 126°20.7	237°07.3 252°06.6	58.9 17°59.7	294°15.3 309°16.7	37.1 · · 36.7	270°18.3 285°20.4	32.1	77° 44.3 92° 46.9	43.4	Acrux	$172^{\circ}56.5$	-63°15.4
3 4	120 20.7 141°23.1	252 06.6 267°05.9	17 59.7 18°00.5	309 16.7 324°18.1	36.3	285 20.4 300°22.5	· · 32.3 32.4	92 46.9 107°49.5	· · 43.3 43.3	Gacrux		-57°16.3
5	156°25.6	282°05.2	01.3	339°19.5	35.9	315°24.6	32.4	107 49.5 122°52.0	43.3	I	166° 10.6	55°47.8
6	171°28.1	297°04.4	\$18°02.1	354°20.8	N03°35.4	330°26.7	S07°32.7	137°54.6	N10°43.3	Spica	158° 19.1	-11°18.7
7	186°30.5	312°03.7	02.9	9°22.2	35.0	345°28.8	32.8	152°57.2	43.2	Alkaid	152°49.9	49°09.9
8	201°33.0	327°03.0	03.7	24°23.6	34.6	0°30.9	33.0	167°59.8	43.2	Hadar	148°31.8	-60°30.5
9	216°35.5	342°02.3	• • 04.5	39°25.0	• • 34.2	15°33.0	33.1	183°02.3	• • 43.2	Menkent	147°54.1	-36°30.6
10	231°37.9	357°01.6	05.3	54°26.4	33.7	30°35.0	33.2	198°04.9	43.2	Arcturus	145°45.3 139°36.3	19°01.8 -60°57.1
11	246°40.4	12°00.9	06.1	69°27.8	33.3	45°37.1	33.4	213°07.5	43.1	Rigil Kent. Kochab	139° 30.3	74°01.9
12	261°42.9	27°00.2	S18°06.8	84°29.2	N03°32.9	60°39.2	S07°33.5	228°10.0	N10°43.1	Zuben'ubi	136°52.7	-16°09.6
13	276°45.3	41°59.5	07.6	99°30.5	32.5	75°41.3	33.7	243°12.6	43.1	Alphecca	126°01.4	26°37.0
14	291°47.8	56°58.7	08.4	114°31.9	32.0	90°43.4	33.8	258° 15.2	43.0	Antares	112° 12.3	-26°29.6
15	306°50.2	71°58.0	• • 09.2	129°33.3	• • 31.6	105°45.5	• • 33.9	273° 17.8	• • 43.0	Atria	107°04.1	-69°04.6
16	321°52.7	86°57.3	10.0	144°34.7	31.2	120°47.6	34.1	288°20.3	43.0	Sabik	101°59.5	-15°45.5
17	336°55.2	101°56.6	10.8	159°36.1	30.8	135°49.7	34.2	303°22.9	43.0	Shaula	96°06.5	-37°07.3
18	351°57.6	116°55.9	\$18°11.6	174°37.5	N03°30.3	150°51.8	S07°34.4	318°25.5	N10°42.9	Rasalhague	95°56.0	12°32.4
19 20	7°00.1 22°02.6	131°55.2 146°54.4	12.4 13.1	189°38.9 204°40.3	29.9 29.5	165°53.9 180°56.0	34.5	333°28.0 348°30.6	42.9 42.9	Eltanin	90°41.2	51°29.2
21	37°05.0	161°53.7	13.1	204 40.3 219°41.7	. 29.3	195°58.1	34.6 •• 34.8	3°33.2	• • 42.9	Kaus Aust.	83°28.7	-34°22.1
22	52°07.5	176°53.0	14.7	234°43.0	28.6	211°00.2	34.9	18° 35.7	42.8	Vega	80°31.5	38°48.8
23	67°10.0	191°52.3	15.5	249°44.4	28.2	226°02.3	35.0	33°38.3	42.8	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
Mer.p	ass. 18:32	ν -0.7' d0.	.8′ m-3.93	ν 1.4′ d-0	.4′ m0.92	$\nu 2.1' d0.$	1′ m-1.81	$\nu 2.6' d-0$.0′ m0.11	Peacock Deneb	53°01.3 49°23.9	-56°38.5 45°23.3
										Enif	33°35.8	10°00.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.3
0	82°12.4	206°51.6	S 18°16.3	264°45.8	N03°27.8	241°04.4	S07°35.2	48°40.9	N10°42.8	Fomalhaut	15°11.1	-29°28.2
1	97°14.9	221°50.9	17.1	279°47.2	27.4	256°06.5	35.3	63°43.4	42.8	Scheat	13°42.1	28°14.7
2	112°17.4	236°50.1	17.8	294°48.6	26.9	271°08.6	35.5	78°46.0	42.7	Markab	$13^{\circ}26.7$	15°21.9
3	127°19.8	251°49.4	• • 18.6	309°50.0	• • 26.5	286°10.7	• • 35.6	93°48.6	• • 42.7	D 11 M	CLIA	N4
4	142°22.3	266°48.7	19.4	324°51.4	26.1	301°12.8	35.7	108°51.1	42.7	Dec 11 Mon	SHA 127°11.4	Mer.pass 10:11
5 6	157°24.7	281°48.0 296°47.2	20.2 \$18°20.0	339°52.8 354°54.2	25.7 N03°25.3	316°14.9	35.9 \$07°36.0	123°53.7 138°56.3	42.7 N10°42.6		127°11.4 183°25.3	06:25
7	172°27.2 187°29.7	296 47.2 311°46.5	\$18°20.9 21.7	9°55.6	N03°25.3 24.8	331°17.0 346°19.1	\$07°36.0 36.1	158 50.3 153°58.8	N10° 42.6 42.6	II.	159°09.8	08:01
8	202°32.1	311 40.5 326°45.8	22.5	9 55.0 24°57.0	24.6	1°21.2	36.3	169°01.4	42.6	Saturn		20:50
9	217°34.6	341°45.1	23.3	39°58.4	• • 24.0	16°23.3	36.4	184°04.0	• • 42.6			
10	232°37.1	356°44.4	24.0	54°59.8	23.6	31°25.4	36.6	199°06.5	42.6	Dec 12 Tue	SHA	Mer.pass
11	247°39.5	11°43.6	24.8	70°01.2	23.1	46°27.5	36.7	214°09.1	42.5		125°55.4	10:12
12	262°42.0	26°42.9	S18°25.6	85°02.5	N03°22.7	61°29.6	S07°36.8	229°11.7	N10°42.5	I .	182°59.3 159°00.8	06:23 07:58
13	277°44.5	41°42.2	26.4	100°03.9	22.3	76°31.7	37.0	244°14.2	42.5		326°25.9	20:46
14	292°46.9	56°41.4	27.1	115°05.3	21.9	91°33.8	37.1	259°16.8	42.5			
15	307°49.4	71°40.7	• • 27.9	130°06.7	• • 21.5	106°35.9	37.2	274°19.4	• • 42.4	Dec 13 Wed	SHA	Mer.pass
16	322°51.9	86°40.0	28.7	145°08.1	21.0	121°38.0	37.4	289°21.9	42.4	l .	124°39.1	10:13
17	337°54.3	101°39.3	29.4	160°09.5	20.6	136°40.1	37.5	304°24.5	42.4		182°33.4	06:20
18 19	352°56.8 7°59.2	116°38.5 131°37.8	\$18°30.2 31.0	175°10.9 190°12.3	N03°20.2 19.8	151°42.2 166°44.3	\$07°37.6 37.8	319°27.1 334°29.6	N10°42.4 42.3		158°52.0	07:55
20	7 59.2 23°01.7	131 37.8 146°37.1	31.0	190 12.3 205°13.7	19.8 19.4	100 44.3 181°46.4	37.8 37.9	334 29.0 349°32.2	42.3 42.3	Saturn	326°28.4	20:42
21	38°04.2	161°36.3	• • 32.5	200° 15.1	• • 18.9	196°48.5	•• 38.1	4° 34.8	• • 42.3	Horizont	al parallax	
22	53°06.6	176°35.6	33.2	235°16.5	18.5	211°50.6	38.2	19°37.3	42.3		Venus:	0.1
23	68°09.1	191°34.9	34.0	250°17.9	18.1	226°52.7	38.3	34°39.9	42.2	L	Mars:	0.1
Mara	255 10.20	7/_O 7/ do	.8′ m-3.93	1/1 A/ A C	.4′ m0.91	1/2 1/ 40	1′ m-1.81	1/2 6/ 4 0	.0′ m0.11			
ivier.p	ass. 18:28	ν -0.1° a 0.	.0 111-3.93	ν1.4 U-U	.+ 1110.91	ν∠.1 <i>α</i> 0.	T 111-T.0T	ν ∠.υ <i>u</i> -υ	.0 1110.11			

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°41.4	S23°01.1	250°32.2	10.3'	S09°51.9	14.1'	59.3'
1 2	196°41.1 211°40.8	01.3 01.5	265°01.4 279°30.6	10.2' 10.2'	10°05.9 10°19.9	14.0' 14.0'	59.3' 59.3'
3	226°40.5	01.7	279 50.0 293°59.8	10.2	10°19.9	13.9'	59.3'
4	241°40.2	01.9	308°28.9	10.0'	$10^{\circ}47.8$	13.8'	59.3'
5	256°39.9	02.1	322°57.9	10.0'	11°01.6	13.8'	59.3'
6 7	271°39.6 286°39.4	\$23°02.3 02.5	337°26.9 351°55.8	9.9' 9.9'	\$11°15.4 11°29.1	13.7' 13.7'	59.3' 59.3'
8	301°39.1	02.7	6°24.7	9.8'	11°42.8	13.6'	59.3'
9	316°38.8	• • 02.9	$20^{\circ}53.5$	9.8'	$11^{\circ}56.4$	13.5'	59.3'
10	331°38.5 346°38.2	03.1	35°22.3 49°51.0	9.7' 9.6'	12°09.9 12°23.3	13.5'	59.3'
11 12	1°37.9	03.3 \$23°03.5	49 51.0 64°19.6	9.6'	12 23.3 S12°36.7	13.4' 13.3'	59.3' 59.3'
13	16°37.6	03.7	78°48.2	9.5'	12°50.1	13.2'	59.3'
14	31°37.3	03.8	93°16.7	9.4'	13°03.3	13.2'	59.3'
15 16	46°37.0 61°36.7	· · 04.0 04.2	107°45.1 122°13.5	9.4' 9.3'	13° 16.5 13° 29.6	13.1' 13.0'	59.3' 59.3'
17	76°36.5	04.2	136°41.8	9.3'	13° 42.6	12.9'	59.3'
18	91°36.2	S23°04.6	151°10.1	9.2'	S 13°55.5	12.9'	59.3'
19	106°35.9	04.8	165°38.3	9.1'	14°08.4	12.8'	59.3'
20 21	121°35.6 136°35.3	05.0 •• 05.2	180°06.4 194°34.5	9.1' 9.0'	14°21.2 14°33.9	12.7' 12.6'	59.3' 59.3'
22	151°35.0	05.2	209°02.4	8.9'	14° 46.5	12.5'	59.3'
23	166°34.7	05.5	223°30.4	8.9'	14°59.0	12.4'	59.3'
	SD = 16.2'	d = 0.2'		SE	0 = 16.2'		
T., -	GHA	Das	CU 4		Das	الـ	μь
Tue 0	GHA 181°34.4	Dec \$23°05.7	GHA 237°58.2	ν 8.8'	Dec \$15° 11.5	d 12.4'	HP 59.3'
1	196°34.1	05.9	252°26.0	8.7'	15°23.8	12.3'	59.3'
2	211°33.8	06.1	266°53.7	8.7'	15°36.1	12.2'	59.3'
3 4	226°33.5 241°33.2	· · 06.2 06.4	281°21.4 295°49.0	8.6' 8.5'	15°48.3 16°00.4	12.1' 12.0'	59.3' 59.3'
5	256°32.9	06.4	295 49.0 310°16.5	8.4'	16° 00.4	11.9'	59.3'
6	271°32.7	S23°06.8	324°43.9	8.4'	S16°24.3	11.8'	59.3'
7	286°32.4	07.0	339°11.3	8.3'	16°36.0	11.7'	59.3'
8 9	301°32.1 316°31.8	07.1 •• 07.3	353°38.6 8°05.9	8.2' 8.2'	16° 47.7 16° 59.3	11.6' 11.5'	59.3' 59.3'
10	331° 31.5	07.5	22°33.0	8.1'	10 39.3 17°10.8	11.4	59.3'
11	346°31.2	07.6	37°00.1	8.0'	17°22.2	11.3'	59.3'
12	1°30.9	S23°07.8	51°27.2	8.0'	S17°33.5	11.2'	59.3'
13 14	16°30.6 31°30.3	08.0 08.2	65°54.1 80°21.0	7.9' 7.8'	17° 44.7 17° 55.8	11.1' 11.0'	59.3' 59.3'
15	46°30.0	08.3	94°47.8	7.7'	18°06.7	10.9'	59.3'
16	61°29.7	08.5	109°14.6	7.7'	18° 17.6	10.7'	59.3'
17	76°29.4 91°29.1	08.7 \$23°08.8	123°41.2 138°07.9	7.6'	18° 28.3 \$18° 38.9	10.6' 10.5'	59.3'
18 19	91 29.1 106°28.8	09.0	158 07.9 152°34.4	7.5' 7.5'	18°49.4	10.5	59.3' 59.2'
20	121°28.5	09.2	167°00.9	7.4'	18°59.8	10.3'	59.2'
21	136°28.2	• • 09.3	181°27.3	7.3'	19° 10.1	10.2'	59.2'
22 23	151°27.9 166°27.6	09.5 09.7	195°53.6 210°19.9	7.3' 7.2'	19° 20.3 19° 30.3	10.0' 9.9'	59.2' 59.2'
23	SD = 16.2'	d = 0.2'	210 19.9		0 = 16.2'	9.9	J9.2
	<u>JD = 10.2</u>	<u>u = 0.2</u>		JL	7 — 10.2		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°27.3 196°27.0	\$23°09.8 10.0	224°46.0 239°12.2	7.1' 7.1'	\$19°40.2 19°50.0	9.8' 9.7'	59.2' 59.2'
2	211°26.8	10.2	253°38.2	7.0'	19°59.7	9.5'	59.2'
3	226°26.5	• • 10.3	268°04.2	6.9'	20°09.2	9.4'	59.2'
4 5	241°26.2 256°25.9	10.5 10.6	282°30.2 296°56.0	6.9' 6.8'	20° 18.6 20° 27.9	9.3' 9.2'	59.2' 59.2'
6	250 25.9 271°25.6	523°10.8	311°21.8	6.7	520°37.0	9.2	59.2'
7	286°25.3	10.9	$325^{\circ}47.6$	6.7'	$20^{\circ}46.1$	8.9'	59.1'
8	301°25.0	11.1	340°13.2	6.6'	20°55.0	8.8'	59.1'
9 10	316°24.7 331°24.4	· · 11.3 11.4	354°38.8 9°04.4	6.5' 6.5'	21°03.7 21°12.3	8.6' 8.5'	59.1' 59.1'
11	346°24.1	11.6	23°29.9	6.4	21°20.8	8.3	59.1'
12	1°23.8	\$23°11.7	37°55.3	6.4'	S21°29.1	8.2'	59.1'
13 14	16°23.5 31°23.2	11.9 12.0	52°20.7 66°46.0	6.3' 6.3'	21°37.4 21°45.4	8.1' 7.9'	59.1' 59.1'
14 15	46°22.9	12.0	81°11.2	6.2	21 45.4 21°53.3	7.9 7.8'	59.1'
16	61°22.6	12.3	95°36.4	6.1'	22°01.1	7.6'	59.0'
17	76°22.3	12.5	110°01.6	6.1'	22°08.8	7.5'	59.0'
18 19	91°22.0 106°21.7	\$23°12.6 12.8	124°26.6 138°51.7	6.0' 6.0'	\$22°16.3 22°23.6	7.3' 7.2'	59.0' 59.0'
20	121°21.4	12.9	153°16.6	5.9'	22°30.8	7.1	59.0'
21	136°21.1	• • 13.1	167°41.6	5.9'	22°37.9	6.9'	59.0'
22 23	151°20.8 166°20.5	13.2 13.4	182°06.5 196°31.3	5.8' 5.8'	22°44.8 22°51.5	6.8' 6.6'	59.0' 59.0'
23	SD = 16.2'	d = 0.2'	190 31.3		0 = 16.1'	0.0	33.0
	JD — 10.2	u — U.Z		JL	. — 10.1		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Junioce	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
S 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	////
S 60°	////	00:54	02:32	21:16	22:56	////

Lat.		Moonris	e		Moonset	į.
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
N 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
S 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
S 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
S 60°	00:09	00:17	00:30	15:26	17:05	18:44

		Sun		Moon			
Day	Eqn.of Time		Eqn.of Time Mer.		Mer.Pass.		
,	00 ^h	12 ^h	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	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	83°11.6	206°34.2	S18°34.8	265°19.3	N03°17.7	241°54.8	S07°38.5	49°42.5	N10°42.2			
1	98°14.0	221°33.4	35.5	280°20.7	17.3	256° 56.9	38.6	64°45.0	42.2	Alpheratz	357°31.3	29°15.3
2	113°16.5	236°32.7	36.3	295°22.1	16.8	271°59.0	38.7	79°47.6	42.2	Ankaa	353°04.0	-42°09.0
3	128°19.0	251°32.0	• • 37.0	310°23.5	. 16.4	287°01.1	• • 38.9	94°50.2	• • 42.1	Schedar	349°27.0	56°42.1
4	143°21.4	266°31.2	37.8	325°24.9	16.0	302°03.2	39.0	109°52.7	42.1	Diphda	348°44.0	-17°49.7
5	158°23.9	281°30.5	38.6	340°26.3	15.6	317°05.3	39.1	124°55.3	42.1	Achernar	335°17.6	-57°05.6
6	173°26.4	296°29.8	S18°39.3	355°27.7	N03°15.2	332°07.4	S07°39.3	139°57.9	N10°42.1	Hamal	327°47.3	23°36.1 89°23.3
7	188°28.8	311°29.0	40.1	10°29.1	14.7	347°09.5	39.4	155°00.4	42.1	Polaris Acamar	311°50.0 315°09.1	-40°11.4
8	203°31.3	326°28.3	40.8	25°30.5	14.3	2°11.6	39.6	170°03.0	42.0	Menkar	314°02.5	4°12.2
9	218°33.7	$341^{\circ}27.5$	• • 41.6	40°31.9	• • 13.9	17° 13.7	• • 39.7	185°05.5	• • 42.0	Mirfak	308°23.1	49°57.9
10	233°36.2	$356^{\circ}26.8$	42.3	55°33.3	13.5	32° 15.8	39.8	200°08.1	42.0	Aldebaran	290°35.6	16°34.0
11	248°38.7	$11^{\circ}26.1$	43.1	70°34.7	13.1	47° 17.9	40.0	$215^{\circ}10.7$	42.0	Rigel	290°35.0 281°00.5	-8°10.2
12	263°41.1	26°25.3	S18°43.8	85°36.1	N03°12.7	62°20.0	S07°40.1	230°13.2	N10°41.9	Capella	280°16.7	46°01.5
13	278°43.6	41°24.6	44.6	100°37.5	12.2	$77^{\circ}22.1$	40.2	245°15.8	41.9	Bellatrix	278°19.1	6°22.5
14	293°46.1	56°23.9	45.3	115°38.9	11.8	92°24.2	40.4	260°18.4	41.9	Elnath	277°57.4	28°37.8
15	308°48.5	71°23.1	• • 46.1	130°40.3	• • 11.4	107°26.3	• • 40.5	275°20.9	• • 41.9	Alnilam	275°34.1	-1°11.1
16	323°51.0	86°22.4	46.8	145°41.8	11.0	122°28.4	40.6	290°23.5	41.8	Betelgeuse	270°48.3	7°24.6
17	338°53.5	101°21.6	47.6	160°43.2	10.6	137°30.5	40.8	305°26.0	41.8	Canopus	263°50.4	-52°42.7
18	353°55.9	116° 20.9	S18°48.3	175°44.6	N03°10.2	152°32.6	S07°40.9	320°28.6	N10°41.8	Sirius	258°23.1	-16°45.4
19	8°58.4	131°20.2	49.1	190°46.0	09.7	167°34.7	41.0	335°31.2	41.8	Adhara	255°03.0	-29°00.7
20	24°00.9	146°19.4	49.8	205°47.4	09.3	182°36.8	41.2	350°33.7	41.8	Procyon	244°47.2	5°08.9
21	39°03.3	161°18.7	• • 50.5	220°48.8	•• 08.9	197°38.9	• • 41.3	5°36.3	• • 41.7	Pollux	243°13.1	27°57.1
22	54°05.8	176° 17.9	51.3	235°50.2	08.5	212°41.1	41.4	20°38.8	41.7	Avior	234°12.8	-59°36.0
23	69°08.2	191°17.2	52.0	250°51.6	08.1	227°43.2	41.6	35°41.4	41.7	Suhail	222°43.6	-43°32.9
Mer.p	ass. 18:24	ν -0.7′ $d0$.8′ m-3.93	ν 1.4 $^{\prime}$ d-0	0.4' m0.89	$\nu 2.1' \ d0.$	1′ m-1.82	$\nu 2.6' \ d-0$	0.0′ m0.12	Miaplacidus	221°36.8	-69°50.0
										Alphard	217°44.4	-8°47.1
	CIIA	CHA	Б	C114	-	CUA	Г.	CUA	Б	Regulus	207°30.9	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA 50°44.0	Dec	Dubhe	193°37.2	61°35.3
0	84°10.7	206°16.4	\$18°52.8	265°53.0	N03°07.7	242°45.3	S07°41.7	50°44.0	N10°41.7	Denebola	$182^{\circ}21.7$	$14^{\circ}24.4$
1	99°13.2	221°15.7	53.5	280°54.4	07.2	257° 47.4	41.8	65°46.5	41.7	Gienah	175°40.3	-17°42.1
2	114°15.6	236°15.0	54.2	295°55.8	06.8	272°49.5	42.0	80°49.1	41.6	Acrux	172°56.5	-63°15.4
3 4	129°18.1 144°20.6	251°14.2 266°13.5	• • 55.0 55.7	310°57.2 325°58.6	· · 06.4 06.0	287°51.6 302°53.7	· · 42.1 42.2	95°51.6 110°54.2	· · 41.6	Gacrux	$171^{\circ}48.1$	$-57^{\circ}16.3$
	144 20.6 159°23.0					302 53.7 317°55.8		110 54.2 125°56.8	41.6	Alioth	$166^{\circ}10.5$	55°47.8
5 6	159°23.0 174°25.5	281°12.7	56.4	341°00.1	05.6		42.4		41.6	Spica	$158^{\circ}19.1$	-11°18.7
	174 25.5 189°28.0	296°12.0	\$18°57.2	356°01.5 11°02.9	N03°05.2	332°57.9 348°00.0	S07°42.5	140°59.3 156°01.9	N10°41.5	Alkaid	152°49.9	49°09.9
7 8	189 28.0 204°30.4	311°11.2 326°10.5	57.9 58.6	26°04.3	04.7 04.3	348 00.0 3°02.1	42.6 42.8	156 01.9 171°04.4	41.5 41.5	Hadar	148°31.7	-60°30.5
9	204 30.4 219°32.9	320 10.5 341°09.7	58.0 18°59.4	20 04.3 41°05.7	03.9	3 02.1 18°04.2	42.8 · · 42.9	171 04.4 186°07.0	41.5 •• 41.5		147°54.0	-36°30.6
10	219 32.9 234°35.3	341 09.7 356°09.0	18 59.4 19°00.1	41 05.7 56°07.1	03.5	33°06.3	43.0	201°09.6	41.5	Arcturus	145°45.3	19°01.8
11	234 35.3 249°37.8	11°08.2	00.1	71°08.5	03.5	48°08.4	43.0	201 09.0 216°12.1	41.5	Rigil Kent.	139°36.2	-60°57.1
12	264° 40.3	26°07.5	\$19°01.6	86°09.9	N03°02.7	63° 10.5	507°43.3	210 12.1 231°14.7	N10°41.4	Kochab	137°21.1	74°01.9
13	279°42.7	41°06.7	02.3	101°11.3	02.3	78° 12.7	43.4	246°17.2	41.4	Zuben'ubi	136°52.7	-16°09.6
14	294°45.2	56°06.0	03.0	116°12.8	01.8	93°14.8	43.6	261°19.8	41.4	Alphecca	126°01.4	26°37.0
15	309°47.7	71°05.2	03.7	131°14.2	01.4	108° 16.9	• • 43.7	276°22.4	• • 41.4	Antares	112°12.3	-26°29.6
16	324°50.1	86°04.5	04.5	146°15.6	01.0	123° 19.0	43.8	291°24.9	41.3	Atria	107°04.1	-69°04.6
17	339°52.6	101°03.7	05.2	161°17.0	00.6	138°21.1	44.0	306°27.5	41.3	Sabik	101°59.5	-15°45.5
18	354°55.1	116°03.0	S19°05.9	176°18.4	N03°00.2	153°23.2	S07°44.1	321°30.0	N10°41.3	Shaula	96°06.5	-37°07.3
19	9°57.5	131°02.2	06.6	191°19.8	02°59.8	168°25.3	44.2	336°32.6	41.3	Rasalhague	95°55.9	12°32.4
20	25°00.0	146°01.5	07.4	206°21.2	59.4	183°27.4	44.4	351°35.1	41.2	Eltanin	90°41.2	51°29.2
21	40°02.5	161°00.7	08.1	221°22.7	• • 59.0	198°29.5	• • 44.5	6°37.7	41.2	Kaus Aust.	83°28.7	-34°22.1
22	55°04.9	176°00.0	08.8	236°24.1	58.5	213°31.6	44.6	21°40.3	41.2	Vega	80°31.5	38°48.8
23	70°07.4	190°59.2	09.5	251°25.5	58.1	228°33.7	44.8	36°42.8	41.2	Nunki	75°44.2	-26°15.5
										Altair	61°57.1	8°56.9
Mer.p	bass. 18:20	ν -0.7′ d0	.7′ m-3.93	ν 1.4′ d-0	0.4′ m0.88	$\nu^{2.1'} d0.$	1′ m-1.82	$\nu^{2.6'} d^{-0}$	0.0′ m0.12	Peacock	53°01.3	-56°38.5
										Deneb	49°23.9	45°23.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	85°09.8	205°58.4	S19°10.2	266°26.9	N02°57.7	243°35.9	S07°44.9	51°45.4	N10°41.2	Al Na'ir Fomalhaut	27°29.2 15°11.1	-46°49.3 -29°28.2
1	100°12.3	220°57.7	11.0	281°28.3	57.3	258°38.0	45.0	66°47.9	41.1	Scheat	15 11.1 13°42.1	-29 28.2 28°14.7
2	115°14.8	235°56.9	11.7	296°29.7	56.9	273°40.1	45.2	81°50.5	41.1	Markab	13°26.7	26 14.7 15°21.9
3	130°17.2	250° 56.2	• • 12.4	311°31.2	56.5	288°42.2	• • 45.3	96°53.0	• • 41.1	iviarkab	13 20.7	13 21.9
4	145°19.7	265°55.4	13.1	326°32.6	56.1	303°44.3	45.4	111°55.6	41.1	Dec 14 Thu	SHA	Mer.pass
5	160°22.2	280°54.7	13.8	341°34.0	55.7	318°46.4	45.6	126°58.2	41.1		123°22.6	10:14
6	175°24.6	295°53.9	S19°14.5	356°35.4	N02°55.3	333°48.5	S07°45.7	142°00.7	N10°41.0	Mars	182°07.7	06:18
7	190°27.1	$310^{\circ}53.1$	15.2	11°36.8	54.8	348°50.6	45.8	157°03.3	41.0	Jupiter	158°43.2	07:51
8	205°29.6	325°52.4	16.0	26°38.3	54.4	3°52.7	45.9	172°05.8	41.0	Saturn	326°30.9	20:38
9	220°32.0	340°51.6	• • 16.7	41°39.7	• • 54.0	18° 54.9	• • 46.1	187°08.4	• • 41.0	Dec 15 Fri	SHA	Mer pass
10	235°34.5	355°50.9	17.4	$56^{\circ}41.1$	53.6	33°57.0	46.2	202°10.9	41.0		3HA 122°05.7	Mer.pass 10:15
11	250°37.0	10°50.1	18.1	71°42.5	53.2	48°59.1	46.3	$217^{\circ}13.5$	40.9		122 05.7 181°42.3	06:16
12	265°39.4	25°49.3	S19°18.8	86°43.9	N02°52.8	64°01.2	S07°46.5	232°16.0	N10°40.9		181 42.3 158°34.6	06:16
13	280°41.9	40°48.6	19.5	101°45.4	52.4	79°03.3	46.6	247°18.6	40.9	Saturn	326°33.3	20:34
14	295°44.3	55° 47.8	20.2	116°46.8	52.0	94°05.4	46.7	262°21.1	40.9	Jatuill	J2U JJ.J	20.34
15	310°46.8	70°47.0	• • 20.9	131°48.2	• • 51.6	109°07.5	• • 46.9	277°23.7	• • 40.9	Dec 16 Sat	SHA	Mer.pass
16	325°49.3	85°46.3	21.6	146°49.6	51.2	124°09.6	47.0	292°26.3	40.8	Venus	120°48.6	10:17
17	340°51.7	100°45.5	22.3	161°51.0	50.7	139° 11.7	47.1	307°28.8	40.8		$181^{\circ}17.1$	06:14
18	355°54.2	115°44.8	S19°23.0	176°52.5	N02°50.3	154° 13.9	S07°47.3	322°31.4	N10°40.8		$158^{\circ}26.0$	07:45
19	10°56.7	130°44.0	23.7	191°53.9	49.9	169°16.0	47.4	337°33.9	40.8	Saturn	326°35.5	20:29
20	25°59.1	145°43.2	24.4	206°55.3	49.5	184° 18.1	47.5	352°36.5	40.8	U.a.daa	ol nevelle	
21	41°01.6	160°42.5	• • 25.1	221°56.7	• • 49.1	199°20.2	• • 47.6	7°39.0	• • 40.7	norizoni	al parallax	0.1
22	56°04.1	175°41.7	25.8	236°58.2	48.7	214°22.3	47.8	22°41.6	40.7		Venus: Mars:	0.1 0.1
23	71°06.5	190°40.9	26.5	251°59.6	48.3	229°24.4	47.9	37°44.1	40.7		ividi5.	0.1
Mer.p	ass. 18:16	ν -0.8' d0	.7′ m-3.93	ν 1.4 $^{\prime}$ d-0	0.4′ m0.86	$\nu 2.1' d0.$	1′ m-1.83	$\nu 2.6' d-0$	0.0′ m0.13			

h	Sui	+0.1339 sec		1-01	Moon)201 S	
Thu	GHA	Dec	GHA	ν	Dec	d C.F.	HP
0 1	181°20.2 196°19.9	\$23°13.5 13.6	210°56.1 225°20.8	5.7' 5.7'	\$22°58.1 23°04.6	6.5' 6.3'	58.9' 58.9'
2	211°19.6	13.8	239°45.5	5.7'	23°10.9	6.1	58.9'
3	226°19.3	13.9	254°10.2	5.6'	23°17.0	6.0'	58.9'
4	241°19.0	14.1	268°34.8	5.6'	23°23.0	5.8'	58.9'
5	256°18.7	14.2	282°59.3	5.5'	23°28.9	5.7'	58.9'
6	271°18.4	\$23°14.3	297°23.9	5.5'	\$23°34.5	5.5'	58.9'
7	286°18.1 301°17.8	14.5	311°48.4	5.5'	23°40.1	5.4'	58.8'
8 9	301°17.8 316°17.5	14.6 •• 14.8	326°12.8 340°37.3	5.4' 5.4'	23°45.4 23°50.7	5.2' 5.1'	58.8' 58.8'
10	331°17.2	14.0	355°01.7	5.4	23°55.7	3.1 4.9'	58.8'
11	346°16.9	15.0	9°26.0	5.3'	24°00.6	4.7'	58.8'
12	1°16.6	\$23°15.2	23°50.4	5.3'	S24°05.3	4.6'	58.8'
13	16°16.3	15.3	38°14.7	5.3'	24°09.9	4.4'	58.7'
14	31°16.0	15.4	52°39.0	5.3'	24°14.3	4.3'	58.7'
15 16	46°15.7 61°15.4	· · 15.6 15.7	67°03.3 81°27.5	5.2' 5.2'	24°18.6 24°22.7	4.1' 3.9'	58.7' 58.7'
17	76°15.1	15.7	95°51.7	5.2'	24°26.6	3.8'	58.7'
18	91°14.8	\$23°15.9	110°15.9	5.2'	\$24°30.4	3.6'	58.7'
19	106°14.5	16.1	124°40.1	5.2'	24°34.0	3.4'	58.6'
20	121°14.2	16.2	139°04.3	5.2'	24°37.4	3.3'	58.6'
21	136°13.9	• • 16.3	153°28.5	5.2'	24°40.7	3.1'	58.6'
22	151°13.6	16.5	167°52.6 182°16.8	5.2'	24°43.8	2.9'	58.6'
23	166°13.3	16.6	182~16.8	5.1'	24°46.8	2.8'	58.6'
	SD = 16.2'	d = 0.1'		SE	O = 16.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°13.0	\$23°16.7	196°40.9	5.1'	S24°49.5	2.6'	58.5'
1	196°12.7 211°12.4	16.8	211°05.1 225°29.2	5.1' 5.1'	24°52.2 24°54.6	2.5' 2.3'	58.5'
2	211°12.4 226°12.1	16.9 •• 17.1	225° 29.2 239° 53.4	5.1'	24°54.6 24°56.9	2.3'	58.5' 58.5'
3 4	241°11.8	17.1	259° 55.4 254° 17.5	5.1'	24°59.0	2.1	58.5'
5	256°11.5	17.3	268°41.7	5.2'	25°01.0	1.8'	58.4'
6	271°11.2	S 23°17.4	283°05.8	5.2'	S25°02.8	1.6'	58.4'
7	286°10.9	17.5	297°30.0	5.2'	25°04.4	1.5'	58.4'
8	301°10.6	17.7	311°54.2	5.2'	25°05.9	1.3'	58.4'
9	316°10.3	• • 17.8	326°18.4	5.2'	25°07.2	1.1'	58.4'
10 11	331°10.0 346°09.7	17.9 18.0	340°42.6 355°06.8	5.2' 5.2'	25°08.3 25°09.3	1.0' 0.8'	58.3' 58.3'
12	1°09.3	S23°18.1	9°31.0	5.3'	\$25°10.1	0.6	58.3
13	16°09.0	18.2	23°55.3	5.3'	25°10.7	0.5'	58.3'
14	31°08.7	18.4	38°19.6	5.3'	$25^{\circ}11.2$	0.3'	58.2'
15	46°08.4	• • 18.5	52°43.9	5.3'	25°11.5	0.2'	58.2'
16 17	61°08.1 76°07.8	18.6 18.7	67°08.2 81°32.6	5.4' 5.4'	25°11.7 25°11.7	-0.0' -0.2'	58.2' 58.2'
18	91°07.5	18.7 S23°18.8	95°57.0	5.4	25 11.7 S25°11.5	-0.2	58.2'
19	106°07.2		110°21.4		25°11.2		58.1'
20	121°06.9	19.0	124°45.8	5.5'	25°10.7	-0.7'	58.1'
21	136°06.6	• • 19.1	139°10.3	5.5'	$25^{\circ}10.0$	-0.8'	58.1'
22	151°06.3	19.2	153°34.9	5.6'	25°09.2	-1.0'	58.1'
23	166°06.0	19.3	167°59.5	5.6'	25°08.2	-1.1'	58.0'
	SD = 16.2'	d = 0.1'		SE	O = 16.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°05.7	S23°19.4	182°24.1	5.7'	\$25°07.1	-1.3'	58.0'
1	196°05.4	19.5	196°48.7	5.7'	25°05.8	-1.5'	58.0'
2 3	211°05.1 226°04.8	19.6 • • 19.8	211°13.4 225°38.2	5.8' 5.8'	25°04.3 25°02.7	-1.6' -1.8'	58.0' 57.9'
3 4	226°04.8 241°04.5	19.8	225° 38.2 240° 03.0	5.8° 5.9'	25°02.7 25°00.9	-1.8 -1.9'	57.9' 57.9'
5	256°04.2	20.0	254°27.9	5.9'	24°59.0	-2.1'	57.9'
6	271°03.9	\$23°20.1	268°52.8	6.0'	S24°56.9	-2.2'	57.9'
7	286°03.6	20.2	283°17.8	6.0'	24°54.7	-2.4'	57.8'
8	301°03.3	20.3	297°42.8	6.1'	24°52.3	-2.5'	57.8'
9 10	316°03.0 331°02.6	· · 20.3 20.4	312°07.9 326°33.0	6.1' 6.2'	24°49.7 24°47.0	-2.7' -2.9'	57.8' 57.8'
10	331 02.6 346°02.3	20.4	326 33.0 340°58.2	6.3'	24 47.0 24°44.2	-2.9 -3.0'	57.8° 57.7'
12	1°02.0	\$23°20.6	355°23.5	6.3'	S24°41.2	-3.2	57.7'
13	16°01.7	20.7	9°48.8	6.4'	$24^{\circ}38.0$	-3.3'	57.7'
14	31°01.4	20.8	24°14.2	6.5'	24°34.7	-3.4'	57.6'
15	46°01.1	• • 20.9	38°39.7	6.5'	24°31.3	-3.6'	57.6'
16 17	61°00.8 76°00.5	21.0 21.1	53°05.2 67°30.8	6.6' 6.7'	24°27.7 24°23.9	-3.7' -3.9'	57.6' 57.6'
18	91°00.2	523°21.2	81°56.5	6.8'	524°20.0	-3.9 -4.0'	57.5'
19	105°59.9	21.3	96°22.3	6.8	24°16.0	-4.2	57.5'
20	120°59.6	21.4	$110^{\circ}48.1$	6.9'	24°11.8	-4.3'	57.5'
21	135°59.3	• • 21.5	125°14.0	7.0'	24°07.5	-4.5'	57.5'
22	150°59.0 165°58.7	21.5	139°40.0 154°06.0	7.1'	24°03.1 23°58.5	-4.6'	57.4'
23		21.6	154 - 06.0	7.1'		-4.7'	57.4'
	SD = 16.2'	d=0.1'		SL	O = 15.8'		

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

Lat.		Moonris	e		Moonset	:
Lat.	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° 60°	08:01 07:34	09:26 08:54	10:18 09:48	12:34 13:01	13:13 13:46	14:25 14:54
N 58°						-
N 58° 56°	07:13 06:56	08:30 08:10	09:25 09:06	13:22 13:40	14:10 14:29	15:17 15:35
54°	06:42	07:54	09.00	13:55	14:46	15:51
52°	06:29	07:40	08:37	14:08	15:00	16:04
50°	06:18	07:28	08:25	14:19	15:12	16:16
45°	05:55	07:03	08:01	14:43	15:37	16:40
N 40°	05:36	06:43	07:41	15:02	15:57	17:00
35°	05:21	06:26	07:24	15:18	16:14	17:16
30°	05:07	06:11	07:10	15:32	16:29	17:30
20°	04:44	05:47	06:46	15:55	16:53	17:53
N 10° 0°	04:25	05:26	06:25	16:16	17:15	18:14
	04:07	05:06	06:05	16:35	17:35	18:33
S 10° 20°	03:48	04:46	05:46	16:54	17:54	18:52
20 30°	03:29 03:07	04:25 04:01	05:25 05:00	17:15 17:38	18:16 18:40	19:12 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
S 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
S 60°	00:50	01:25	02:22	20:13	21:20	22:02

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%	
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	Vei	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	86°09.0	205°40.2	\$19°27.2	267°01.0	N02°47.9	244°26.5	S07°48.0	52°46.7	N10° 40.7			
1	101°11.5	220°39.4	27.9	282°02.4	47.5	259°28.7	48.2	67°49.2	40.7	Alpheratz	357°31.4	29°15.3
2	116°13.9	235°38.6	28.6	297°03.9	47.1	274°30.8	48.3	82°51.8	40.7	Ankaa	353°04.0	-42°09.0
3	131°16.4	250°37.8	29.3	312°05.3	• • 46.7	289°32.9	• 48.4	97°54.3	• • 40.6	Schedar	349°27.1	56°42.1
4	146°18.8	265°37.1	30.0	327°06.7	46.3	304°35.0	48.6	112°56.9	40.6	Diphda	348°44.0	-17°49.7
5	161°21.3	280°36.3	30.7	342°08.1	45.8	319°37.1	48.7	127°59.4	40.6	Achernar	335° 17.7	-57°05.6
6	176°23.8	295°35.5	S19°31.3	357°09.6	N02°45.4	334°39.2	S07°48.8	143°02.0	N10° 40.6	Hamal	327°47.3	23°36.1
7	191°26.2	310°34.8	32.0	12°11.0	45.0	349°41.4	48.9	158°04.5	40.6	Polaris	311°50.5	89°23.3
8	206°28.7	325°34.0	32.7	27°12.4	44.6	4°43.5	49.1	173°07.1	40.5	Acamar	315°09.1	-40°11.4
9	221°31.2	340°33.2	• • 33.4	42°13.9	• • 44.2	19°45.6	49.2	188°09.6	• • 40.5	Menkar	314°02.5	4°12.2
10	236°33.6	355°32.5	34.1	57°15.3	43.8	34°47.7	49.3	203°12.2	40.5	Mirfak	308°23.1	49°58.0
11	$251^{\circ}36.1$	10°31.7	34.8	72°16.7	43.4	49°49.8	49.5	$218^{\circ}14.7$	40.5	Aldebaran Rigel	290°35.6 281°00.4	16°34.0 -8°10.2
12	266°38.6	25°30.9	S19°35.5	87°18.2	N02°43.0	64°51.9	S07°49.6	233° 17.3	N10° 40.5	Capella	281 00.4 280°16.6	-8 10.2 46°01.5
13	281°41.0	40°30.1	36.2	$102^{\circ}19.6$	42.6	79°54.0	49.7	$248^{\circ}19.8$	40.5	Bellatrix	278° 19.1	6°22.5
14	296°43.5	55°29.4	36.8	$117^{\circ}21.0$	42.2	94°56.2	49.9	263°22.4	40.4	Elnath	277°57.4	28°37.8
15	311°46.0	70°28.6	• • 37.5	132°22.4	• • 41.8	109°58.3	• • 50.0	278°24.9	• • 40.4	Alnilam	275°34.1	-1°11.1
16	326°48.4	85°27.8	38.2	147°23.9	41.4	125°00.4	50.1	293°27.5	40.4	Betelgeuse	270°48.3	7°24.6
17	341°50.9	100°27.0	38.9	162°25.3	41.0	140°02.5	50.2	308° 30.0	40.4	Canopus	263°50.4	-52°42.7
18	356°53.3	115°26.3	S19°39.6	177°26.7	N02°40.6	155°04.6	S07°50.4	323°32.6	N10°40.4	Sirius	258°23.1	-16°45.4
19	11°55.8	130°25.5	40.2	192°28.2	40.2	170°06.8	50.5	338° 35.1	40.3	Adhara	255°03.0	-29°00.7
20	26°58.3	145°24.7 160°23.9	40.9	207°29.6	39.8	185°08.9	50.6	353°37.7	40.3	Procyon	244°47.2	5°08.9
21	42°00.7 57°03.2		• • 41.6	222°31.0 237°32.5	· · 39.4 38.9	200°11.0	50.8	8° 40.2 23° 42.8	• • 40.3	Pollux	$243^{\circ}13.1$	27°57.1
22 23	72°05.7	175°23.1 190°22.4	42.3 42.9	257 32.5 252°33.9	38.5	215°13.1 230°15.2	50.9 51.0	23 42.6 38°45.3	40.3 40.3	Avior	234°12.8	-59°36.1
23	12 05.1			252 33.9	30.3			30 43.3	40.3	Suhail	222°43.6	-43°32.9
Mer.p	ass. 18:12	ν -0.8′ d0.	.7′ m-3.93	ν 1.4′ d-0	.4′ m0.85	$\nu 2.1' \ d0.$	1' m-1.83	$\nu 2.6' \ d-0$	0.0′ m0.13	Miaplacidus	221°36.8	-69°50.0
										Alphard	217°44.4	-8°47.1
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.9	11°49.3
0	87°08.1	205°21.6	\$19°43.6	267°35.3	N02°38.1	245°17.3	S07°51.1	53°47.9	N10° 40.3	Dubhe	193°37.2	61°35.3
1	102°10.6	205 21.0 220°20.8	44.3	207 35.3 282°36.8	37.7	245 17.3 260°19.5	51.3	68° 50.4	40.2	Denebola	182°21.7	14°24.4
2	117°13.1	235°20.0	45.0	297°38.2	37.7	275°21.6	51.4	83°53.0	40.2	Gienah	175°40.3	-17°42.2
3	132°15.5	250°19.2	• • 45.6	312°39.6	• • 36.9	290°23.7	• • 51.5	98° 55.5	40.2	II	172°56.4	-63°15.4
4	147°18.0	265°18.5	46.3	327°41.1	36.5	305°25.8	51.6	113°58.1	40.2	Gacrux	171°48.0	-57°16.3
5	162°20.5	280°17.7	47.0	342°42.5	36.1	320°27.9	51.8	129°00.6	40.2	Alioth	166° 10.5	55°47.8
6	177°22.9	295°16.9	S19°47.6	357°44.0	N02°35.7	335°30.1	S07°51.9	144°03.2	N10°40.2	Spica	158° 19.0	-11°18.7
7	192°25.4	310°16.1	48.3	12°45.4	35.3	350°32.2	52.0	159°05.7	40.1	Alkaid	152°49.9	49°09.8
8	207°27.8	325°15.3	49.0	27°46.8	34.9	5°34.3	52.2	174°08.3	40.1	Hadar	148°31.7	-60°30.5
9	222°30.3	340°14.6	• • 49.6	42°48.3	• • 34.5	20°36.4	52.3	189° 10.8	• • 40.1	Menkent	147°54.0	-36°30.6
10	237°32.8	355°13.8	50.3	57°49.7	34.1	35°38.5	52.4	204°13.4	40.1	Arcturus Rigil Kent.	145°45.2 139°36.2	19°01.8 -60°57.1
11	252°35.2	10°13.0	51.0	72°51.1	33.7	50°40.7	52.5	$219^{\circ}15.9$	40.1	Kochab	139 30.2 137°21.1	74°01.9
12	267°37.7	25°12.2	S19°51.6	87°52.6	N02°33.3	65°42.8	S07°52.7	234° 18.5	N10°40.1	Zuben'ubi	136°52.7	-16°09.7
13	282°40.2	40°11.4	52.3	102°54.0	32.9	80°44.9	52.8	$249^{\circ}21.0$	40.0	Alphecca	130° 52.7 126° 01.4	26°37.0
14	297°42.6	55°10.6	52.9	117°55.5	32.5	95°47.0	52.9	264°23.6	40.0	Antares	112° 12.2	-26°29.6
15	312°45.1	70°09.8	• • 53.6	132°56.9	• • 32.1	$110^{\circ}49.1$	• • 53.0	$279^{\circ}26.1$	• • 40.0	Atria	107°04.1	-69°04.6
16	327°47.6	85°09.1	54.2	147°58.3	31.7	125°51.3	53.2	294°28.6	40.0	Sabik	101°59.5	-15°45.5
17	342°50.0	100°08.3	54.9	162°59.8	31.3	140°53.4	53.3	309°31.2	40.0	Shaula	96°06.4	-37°07.3
18	357°52.5	115°07.5	S19°55.6	178°01.2	N02°30.9	155°55.5	S07°53.4	324°33.7	N10° 40.0	Rasalhague	95°55.9	12°32.4
19	12°55.0	130°06.7	56.2	193°02.7	30.5	170°57.6	53.6	339°36.3	39.9	Eltanin	90°41.2	51°29.2
20	27°57.4	145°05.9	56.9	208°04.1	30.1	185°59.8	53.7	354°38.8	39.9	Kaus Aust.	83°28.7	-34°22.1
21	42°59.9	160°05.1	• • 57.5	223°05.6	• • 29.7	201°01.9	• • 53.8	9°41.4	• • 39.9	Vega	$80^{\circ}31.5$	38°48.8
22	58°02.3	175°04.3	58.2	238°07.0 253°08.4	29.3	216°04.0	53.9	24°43.9	39.9	Nunki	75°44.2	-26°15.5
23	73°04.8	190°03.5	58.8	253 08.4	28.9	231°06.1	54.1	39°46.5	39.9	Altair	$61^{\circ}57.1$	8°56.9
Mer.p	ass. 18:08	ν -0.8′ d0.	.7′ m-3.92	ν 1.4′ d-0	.4′ m0.84	$\nu 2.1' \ d0.$	1′ m-1.84	$\nu 2.5' \ d-0$	0.0' m 0.14	Peacock	53°01.3	-56°38.5
										Deneb	49°23.9	45°23.3
Tuo	CHV	CHV	Doc	CHV	Doc	CHV	Dos	CHV	Doc	Enif	33°35.8	10°00.7
Tue 0	GHA 88°07.3	GHA 205°02.7	Dec \$19°59.5	GHA 268°09.9	Dec N02°28.5	GHA 246°08.2	Dec \$07°54.2	GHA 54° 49.0	Dec N10° 39.9	Al Na'ir	27°29.2	-46°49.3
1	103°09.7	200°02.7	20°00.1	283°11.3	28.1	261°10.4	54.3	69°51.5	39.8	Fomalhaut	15°11.1	-29°28.1
2	118°12.2	235°01.2	00.8	298°12.8	27.7	276°12.5	54.4	84°54.1	39.8	Scheat	13°42.1	28°14.7
3	133°14.7	250°00.4	01.4	313°14.2	• • 27.3	291°14.6	• • 54.6	99°56.6	• • 39.8	Markab	13°26.7	15°21.9
4	148°17.1	264°59.6	02.1	328°15.7	26.9	306°16.7	54.7	114°59.2	39.8	Dec 17 Sun	SHA	Mer.pass
5	163°19.6	279°58.8	02.7	343°17.1	26.5	321°18.9	54.8	130°01.7	39.8		$119^{\circ}31.2$	10:18
6	178°22.1	294°58.0	\$20°03.4	358°18.6	N02°26.1	336°21.0	S07°54.9		N10°39.8	Mars	$180^{\circ}52.0$	06:11
7	193°24.5	309°57.2	04.0	13°20.0	25.7	351°23.1	55.1	$160^{\circ}06.8$	39.7		$158^{\circ}17.6$	07:41
8	208°27.0	324°56.4	04.6	28°21.4	25.3	$6^{\circ}25.2$	55.2	$175^{\circ}09.4$	39.7	Saturn	326°37.7	20:25
9	223°29.4	339°55.6	• • 05.3	43°22.9	• • 24.9	21°27.4	• • 55.3	$190^{\circ}11.9$	• • 39.7	Dec 18 Mon	SHA	Mer.pass
10	238°31.9	354°54.8	05.9	58°24.3	24.5	36°29.5	55.4	205° 14.4	39.7		ЗПА 118° 13.5	10:19
11	253°34.4	9°54.0	06.6	73°25.8	24.1	51°31.6	55.6	220° 17.0	39.7		180° 27.2	06:09
12	268°36.8	24°53.2	\$20°07.2	88°27.2	N02°23.7	66°33.7	S07°55.7	235° 19.5	N10°39.7	I .	158°09.2	07:38
13	283°39.3	39°52.4	07.8	103°28.7	23.3	81°35.9	55.8	250°22.1	39.7	Saturn	326°39.8	20:21
14	298°41.8	54°51.6	08.5	118°30.1	22.9	96°38.0	55.9	265°24.6	39.6			
15	313°44.2	69°50.8	09.1	133°31.6	• • 22.5	111°40.1	56.1	280°27.1	•• 39.6	Dec 19 Tue	SHA	Mer.pass
16	328°46.7	84°50.0	09.7	148°33.0	22.1	126°42.2	56.2	295°29.7	39.6	l .	116°55.5	10:20
17	343°49.2	99°49.2	10.4	163°34.5	21.7 No2°21.2	141°44.4	56.3	310°32.2	39.6		180°02.6	06:07
18 19	358°51.6 13°54.1	114°48.4 129°47.6	\$20°11.0 11.6	178°35.9 193°37.4	N02°21.3 20.9	156°46.5 171°48.6	\$07°56.4 56.6	325°34.8 340°37.3	N10°39.6 39.6		158°01.0	07:34
20	13 54.1 28°56.6	129 47.6 144°46.8	12.3	193 37.4 208°38.8	20.9	171 48.6 186°50.8	56.7	340 37.3 355°39.9	39.6 39.6	Saturn	326°41.7	20:17
20	28 50.0 43°59.0	144 46.8 159°46.0	12.3	208 38.8 223°40.3	20.5	201°52.9	56.8	355 39.9 10°42.4	· · 39.5	Horizont	al parallax	
22	59°01.5	174°45.2	13.5	238°41.7	19.7	201 52.9 216°55.0	56.9	25°44.9	39.5		Venus:	0.1
23	74°03.9	189°44.4	14.2	253°43.2	19.7	231°57.1	57.1	40°47.5	39.5		Mars:	0.1
Mer.p	ass. 18:05	ν -0.8′ d0.	.6′ m-3.92	ν 1.4′ d -0	.4′ m0.82	$\nu 2.1' d0.$	1′ m-1.84	ν 2.5′ d -0	0.0′ m0.14			

h	Sur	า			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°58.4	S23°21.7	168°32.2	7.2'	\$23°53.7	-4.9'	57.4
1 2	195°58.1 210°57.7	21.8 21.9	182°58.4 197°24.7	7.3' 7.4'	23°48.9 23°43.9	-5.0' -5.1'	57.3' 57.3'
3	225°57.4	22.0	211°51.1	7.5'	23°38.7	-5.1 -5.3'	57.3'
4	240°57.1	22.0	226°17.6	7.6'	23° 33.4	-5.4'	57.3'
5	255°56.8 270°56.5	22.1	240°44.1 255°10.8	7.6'	23°28.0 523°22.5	-5.5'	57.2'
6 7	270°56.5 285°56.2	\$23°22.2 22.3	255°10.8 269°37.5	7.7' 7.8'	23° 16.8	-5.7' -5.8'	57.2' 57.2'
8	300°55.9	22.4	284°04.3	7.9'	23°11.0	-5.9'	57.2
9	315°55.6	• • 22.4	298°31.2	8.0'	23°05.1	-6.1'	57.1'
10 11	330°55.3 345°55.0	22.5 22.6	312°58.2 327°25.3	8.1' 8.2'	22°59.0 22°52.9	-6.2' -6.3'	57.1' 57.1'
12	0°54.7	S23°22.7	321 25.3 341°52.5	8.3'	\$22°46.6	-0.3 -6.4'	57.0'
13	15°54.4	22.8	356°19.8	8.4'	22°40.1	-6.5	57.0'
14	30°54.1	22.8	10°47.1	8.5'	22°33.6	-6.7'	57.0'
15 16	45°53.8 60°53.4	· · 22.9 23.0	25°14.6 39°42.1	8.5' 8.6'	22°26.9 22°20.2	-6.8' -6.9'	57.0' 56.9'
17	75°53.1	23.0	54°09.8	8.7'	22°13.3	-7.0'	56.9'
18	90°52.8	S23°23.1	68°37.5	8.8'	S22°06.2	-7.1'	56.9'
19	105°52.5	23.2	83°05.3	8.9'	21°59.1	-7.2'	56.8'
20 21	120°52.2 135°51.9	23.3	97°33.2 112°01.3	9.0' 9.1'	21°51.9 21°44.5	-7.4' -7.5'	56.8' 56.8'
22	150°51.6	23.4	126°29.4	9.2'	21°37.0	-7.6'	56.8'
23	165°51.3	23.5	140°57.6	9.3'	$21^{\circ}29.5$	-7.7'	56.7'
	SD = 16.2'	d = 0.1'		SI	O = 15.6'		
N4	GHA	D	CHA		D	.,	LID
Mon 0	180°51.0	Dec \$23°23.5	GHA 155°25.9	u 9.4'	Dec \$21°21.8	d -7.8'	HP 56.7'
1	195°50.7	23.6	$169^{\circ}54.3$	9.5'	$21^{\circ}14.0$	-7.9'	56.7'
2	210°50.4	23.7	184°22.8	9.6'	21°06.1	-8.0'	56.6'
3 4	225°50.1 240°49.7	· · 23.7 23.8	198°51.4 213°20.1	9.7' 9.8'	20°58.1 20°50.0	-8.1' -8.2'	56.6' 56.6'
5	255°49.4	23.8	227°48.9	9.9'	20°41.8	-8.3	56.6
6	270°49.1	S23°23.9	242°17.8	10.0'	S20°33.5	-8.4'	56.5'
7	285°48.8 300°48.5	24.0	256°46.8 271°15.9	10.1' 10.2'	20°25.1 20°16.6	-8.5'	56.5' 56.5'
8 9	315°48.2	24.0 •• 24.1	271 15.9 285°45.1	10.2	20 16.6 20°08.0	-8.6' -8.7'	56.4'
10	330°47.9	24.1	300°14.3	10.4'	19°59.3	-8.8'	56.4'
11	345°47.6	24.2	314°43.7	10.5'	19°50.5	-8.9'	56.4'
12 13	0°47.3 15°47.0	\$23°24.2 24.3	329°13.2 343°42.8	10.6' 10.7'	\$19°41.7 19°32.7	-9.0' -9.1'	56.4' 56.3'
14	30°46.7	24.4	358°12.4	10.7	19° 23.6	-9.1'	56.3
15	45°46.3	• • 24.4	$12^{\circ}42.2$	10.9'	$19^{\circ}14.5$	-9.2'	56.3'
16 17	60°46.0 75°45.7	24.5 24.5	27°12.1 41°42.0	11.0' 11.1'	19°05.3 18°56.0	-9.3' -9.4'	56.2' 56.2'
18	90°45.4	\$23°24.6	56°12.1	11.1'	\$18°46.6	-9.4 -9.5'	56.2
19	105°45.1	24.6	70°42.2	11.2'	18°37.1	-9.6'	56.2'
20	120°44.8	24.7	85°12.5		18° 27.5	-9.6'	56.1
21 22	135°44.5 150°44.2	· · 24.7 24.8	99°42.8 114°13.2	11.4' 11.5'	18° 17.9 18° 08.1	-9.7' -9.8'	56.1' 56.1'
23	165°43.9	24.8	128°43.8	11.6'	17°58.4	-9.9'	56.0'
	SD = 16.2'	d = 0.1'		SI	O = 15.5'		
_							
Tue 0	GHA 180°43.6	Dec \$23°24.9	GHA 143°14.4	u 11.7'	Dec \$17° 48.5	d -10.0'	HP 56.0'
1	195°43.3	24.9	157°45.1	11.8'	$17^{\circ}38.5$	-10.0'	56.0'
2	210°42.9	25.0	172°15.9	11.9'	17°28.5	-10.1'	56.0'
3 4	225°42.6 240°42.3	· · 25.0 25.0	186°46.8 201°17.8	12.0' 12.1'	17° 18.4 17° 08.2	-10.2' -10.2'	55.9' 55.9'
5	240 42.3 255°42.0	25.1	201 17.8 215°48.9	12.1	16°58.0	-10.2	55.9'
6	270°41.7	\$23°25.1	230°20.0	12.3'	S 16°47.7	-10.4'	55.9'
7 8	285°41.4 300°41.1	25.2 25.2	244°51.3 259°22.6	12.3' 12.4'	16° 37.3 16° 26.9	-10.4' -10.5'	55.8' 55.8'
8 9	300°41.1 315°40.8	25.2	259°22.6 273°54.1	12.4	16° 26.9 16° 16.4	-10.5'	55.8'
10	330°40.5	25.3	$288^{\circ}25.6$	12.6'	$16^{\circ}05.8$	-10.6'	55.7'
11	345°40.2	25.3	302°57.2	12.7'	15°55.1	-10.7'	55.7'
12 13	0°39.8 15°39.5	\$23°25.4 25.4	317°28.9 332°00.7	12.8' 12.9'	\$15°44.5 15°33.7	-10.8' -10.8'	55.7' 55.7'
14	30°39.2	25.4	346°32.6	13.0'	15° 33.7	-10.6	55.6'
15	45°38.9	• • 25.5	1°04.5	13.0'	15° 12.0	-10.9'	55.6'
16	60°38.6	25.5	15°36.6	13.1'	15°01.1	-11.0'	55.6'
17 18	75°38.3 90°38.0	25.5 \$23°25.6	30°08.7 44°40.9	13.2' 13.3'	14°50.1 \$14°39.0	-11.0' -11.1'	55.6' 55.5'
19	105°37.7	25.6	59°13.2	13.4'	14°27.9	-11.2'	55.5'
20	120°37.4	25.6	73°45.5	13.4'	14°16.8	-11.2'	55.5'
21 22	135°37.1 150°36.7	· · 25.6 25.7	88°18.0 102°50.5	13.5' 13.6'	14°05.6 13°54.3	-11.3' -11.3'	55.5' 55.4'
23	165°36.4	25.7	102 50.5 117°23.1	13.7'	13°43.0	-11.3 -11.4'	55.4'
	SD = 16.2'	d = 0.0'		SI	O = 15.3'		

Lat.	Twilight		Sunrise	Sunset	Twi	Twilight		
Lat.	Naut.	Civil	Junisc	Julisce	Civil	Naut.		
N 72°	08:24	10:55			12:59	15:30		
N 70°	08:04	09:52			14:01	15:50		
68°	07:48	09:17			14:36	16:06		
66°	07:35	08:52	10:33	13:21	15:02	16:19		
64°	07:24	08:32	09:50	14:03	15:21	16:30		
62°	07:14	08:16	09:22	14:32	15:37	16:39		
60°	07:06	08:03	09:00	14:53	15:51	16:48		
N 58°	06:58	07:51	08:43	15:11	16:03	16:55		
56°	06:51	07:41	08:28	15:26	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		
N 40°	06:12	06:46	07:17	16:37	17:07	17:41		
35°	06:03	06:34	07:03	16:51	17:19	17:51		
30°	05:54	06:24	06:50	17:03	17:30	18:00		
20°	05:38	06:05	06:29	17:25	17:49	18:16		
N 10° 0°	05:21	05:48	06:11	17:43	18:06	18:32		
1	05:04	05:31	05:53	18:01	18:23	18:49		
S 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° 40°	03:35	04:12	04:42 04:26	19:12	19:42	20:19		
40 45°	03:12 02:41	03:54 03:31	04:26	19:27 19:45	20:00 20:23	20:42 21:13		
1	· ·							
S 50°	01:56	03:01	03:46	20:08	20:53	21:58		
52° 54°	01:28 00:42	02:46 02:28	03:35 03:23	20:19 20:31	21:08 21:26	22:26 23:13		
54°	////	02:28	03:23	20:31	21:26 21:48	23:13 ////		
58°	////	02:06	03:08	20:45	21:48	////		
S 60°	////	01:30	02:32	21:02	23:09	1111		
5 00	1777	55.15	02.01	21.29	20.03	1111		

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°			12:51			17:21
N 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
N 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
N 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
N 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
S 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
S 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
S 60°	03:39	05:07	06:36	22:26	22:41	22:50

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper Lower		1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-9%	
17	03:53	03:39	11:56	13:15	00:48		
18	03:24	03:09	11:57	14:07	01:42		
19	02:54	02:39	11:57	14:56	02:32		

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	89°06.4	204°43.6	520°14.8	268°44.6	N02°19.0	246°59.3	S07°57.2	55°50.0	N10°39.5			
1	104°08.9	219°42.8	15.4	283°46.1	18.6	262°01.4	57.3	70°52.6	39.5	Alpheratz	357°31.4	29°15.3
2	119°11.3	219 42.0 234°42.0	16.0	298°47.6	18.2	202 01.4 277°03.5	57.3 57.4	85°55.1	39.5	Ankaa	353°04.0	-42°09.0
						277 03.5 292°05.6		05 55.1 100°57.6		Schedar	$349^{\circ}27.1$	56°42.1
3	134°13.8	249°41.2	16.7	313°49.0	•• 17.8		•• 57.6		39.5	Diphda	348°44.0	-17°49.7
4	149°16.3	264°40.4	17.3	328°50.5	17.4	307°07.8	57.7	116°00.2	39.4	Achernar	$335^{\circ}17.7$	-57°05.6
5	164°18.7	279°39.6	17.9	343°51.9	17.0 N02°16.6	322°09.9	57.8	131°02.7	39.4	Hamal	327°47.3	23°36.1
6	179°21.2 194°23.7	294°38.8	\$20°18.5	358°53.4		337°12.0 352°14.2	S07°57.9	146°05.3 161°07.8	N10°39.4	Polaris	311°51.3	89°23.3
7		309°38.0	19.1	13°54.8	16.2		58.0		39.4	Acamar	$315^{\circ}09.1$	-40°11.4
8	209°26.1	324°37.2	19.8	28°56.3	15.8	7°16.3	58.2	176°10.3	39.4	Menkar	314°02.5	4°12.2
9	224°28.6	339°36.4	• • 20.4	43°57.7	• • 15.4	22°18.4	• • 58.3	191°12.9	• • 39.4	Mirfak	308°23.1	49°58.0
10	239°31.1	354°35.6	21.0	58°59.2	15.0	37°20.6	58.4	206°15.4	39.4	Aldebaran	290°35.6	16°34.0
11	254°33.5	9°34.8	21.6	74°00.7	14.6	52°22.7	58.5	221°17.9	39.3 N10°39.3	Rigel	281°00.4	-8°10.2
12	269°36.0	24°34.0	\$20°22.2	89°02.1	N02°14.2	67°24.8	S07°58.7	236°20.5 251°23.0		Capella	$280^{\circ}16.6$	46°01.5
13	284°38.4 299°40.9	39°33.2	22.8	104°03.6	13.8	82°26.9	58.8		39.3	Bellatrix	$278^{\circ}19.1$	6°22.5
14 15	314°43.4	54°32.4 69°31.5	23.5 •• 24.1	119°05.0 134°06.5	13.4 •• 13.0	97°29.1 112°31.2	58.9 •• 59.0	266°25.6 281°28.1	39.3 •• 39.3	Elnath	277°57.4	28°37.8
16	314 43.4 329°45.8	84°30.7			12.6	112 31.2 127°33.3		296°30.6		Alnilam	$275^{\circ}34.1$	$-1^{\circ}11.1$
	344°48.3	99°29.9	24.7 25.3	149°07.9 164°09.4	12.0	142° 35.5	59.2 59.3	311°33.2	39.3 39.3	Betelgeuse	270°48.3	7°24.6
17					N02°11.9			326°35.7		Canopus	263°50.4	-52°42.7
18 19	359°50.8 14°53.2	114°29.1 129°28.3	\$20°25.9 26.5	179°10.9 194°12.3	11.5	157° 37.6 172° 39.7	\$07°59.4 59.5	341°38.3	N10°39.2 39.2	Sirius	258°23.0	-16°45.5
20	29°55.7	144°27.5	27.1	209°13.8	11.5	172 39.7 187°41.9	59.5	356°40.8	39.2	Adhara	255°02.9	-29°00.7
	44°58.2	159°26.7		209 15.8 224°15.2	. 10.7	202°44.0	• • 59.8	11°43.3	39.2	Procyon	244°47.2	5°08.9
21 22	44 58.2 60°00.6	159 26.7 174°25.9	· · 27.7 28.3	224 15.2 239°16.7	10.7	202 44.0 217°46.1	07°59.8	26°45.9	39.2	Pollux	243°13.1	27°57.1
23	75°03.1	174 25.9 189°25.1	28.9	254°18.2	09.9	217 40.1 232°48.3	07 59.9 08°00.0	41°48.4	39.2	Avior	234°12.8	-59°36.1
		-								Suhail	222°43.6	-43°32.9
Mer.p	ass. 18:01	ν -0.8' d0.	.6′ m-3.92	ν 1.5′ d-0	.4′ m0.81	$\nu 2.1' \ d0.$	1' m-1.85	$\nu 2.5' \ d-0$	0.0' m 0.15	Miaplacidus	221°36.8	-69°50.0
										Alphard	217°44.4	-8°47.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.9	11°49.3
0	90°05.6	204°24.2	S20°29.5	269°19.6	N02°09.5	247° 50.4	508°00.1	56°50.9	N10°39.2	Dubhe	193°37.1	61°35.3
1	105°08.0	219°23.4	30.1	284°21.1	09.1	262°52.5	00.3	71°53.5	39.2	Denebola	182°21.7	14°24.4
2	120°10.5	234°22.6	30.7	299°22.6	08.7	202 52.5 277°54.7	00.3	86°56.0	39.1	Gienah	175°40.3	-17°42.2
3	135°12.9	249°21.8	31.3	314°24.0	08.3	292°56.8	• • 00.5	101°58.5	39.1		172°56.4	-63°15.4
4	150°15.4	264°21.0	31.9	329°25.5	08.0	307°58.9	00.5	101 30.3 117°01.1	39.1	Gacrux	171°48.0	-57°16.3
5	165°17.9	279°20.2	32.5	344°27.0	07.6	323°01.1	00.7	132°03.6	39.1	Alioth	166° 10.5	55°47.8
6	180°20.3	294°19.4	S20°33.1	359°28.4	N02°07.2	338°03.2	S08°00.9	147°06.1	N10°39.1	Spica	158° 19.0	-11°18.7
7	195°22.8	309°18.5	33.7	14°29.9	06.8	353°05.3	01.0	162°08.7	39.1	Alkaid	152°49.8	49°09.8
8	210°25.3	324°17.7	34.3	29°31.3	06.4	8°07.5	01.1	177°11.2	39.1	Hadar	148°31.6	-60°30.5
9	225°27.7	339°16.9	34.9	44°32.8	06.0	23°09.6	• • 01.2	192°13.7	39.1	Menkent	147°54.0	-36°30.6
10	240°30.2	354°16.1	35.5	59°34.3	05.6	38°11.7	01.3	207°16.3	39.0	Arcturus	145°45.2	19°01.8
11	255°32.7	9°15.3	36.1	74°35.7	05.2	53°13.9	01.5	222°18.8	39.0	Rigil Kent.	139°36.2	-60°57.1
12	270°35.1	24°14.5	S20°36.7	89°37.2	N02°04.8	68° 16.0	S08°01.6	237°21.4	N10°39.0	Kochab	137°21.0	74°01.9
13	285°37.6	39°13.6	37.3	104°38.7	04.4	83°18.1	01.7	252°23.9	39.0	Zuben'ubi	136°52.7	-16°09.7
14	300°40.0	54°12.8	37.9	119°40.2	04.1	98°20.3	01.8	267°26.4	39.0	Alphecca	126°01.4 112°12.2	26°36.9
15	315°42.5	69°12.0	• • 38.4	134°41.6	• • 03.7	113°22.4	• • 01.9	282°29.0	• • 39.0	Antares		-26°29.6 -69°04.5
16	330°45.0	84°11.2	39.0	149°43.1	03.3	128°24.5	02.1	297°31.5	39.0	Atria	107°04.0 101°59.4	-09 04.5 -15°45.5
17	345°47.4	99°10.4	39.6	164°44.6	02.9	143°26.7	02.2	312°34.0	39.0	Sabik Shaula	96°06.4	-15 45.5 -37°07.3
18	0°49.9	114°09.5	\$20°40.2	179°46.0	N02°02.5	158°28.8	S08°02.3	327°36.6	N10°38.9	Rasalhague	90 00.4 95°55.9	-37 07.3 12°32.4
19	15°52.4	129°08.7	40.8	194°47.5	02.1	173°30.9	02.4	342°39.1	38.9		90°41.2	51°29.2
20	30°54.8	144°07.9	41.4	209°49.0	01.7	188°33.1	02.5	357°41.6	38.9	Eltanin Kaus Aust.	83° 28.7	-34°22.1
21	45°57.3	$159^{\circ}07.1$	• • 41.9	224°50.4	• • 01.3	203°35.2	• • 02.7	12°44.1	• • 38.9	Vega	80°31.5	38°48.8
22	60°59.8	174°06.3	42.5	239°51.9	01.0	218° 37.4	02.8	27°46.7	38.9	Nunki	75° 44.2	-26°15.5
23	76°02.2	189°05.4	43.1	254°53.4	00.6	233°39.5	02.9	42°49.2	38.9	Altair	61°57.1	8°56.9
Morp	ass. 17:57	11 U 81 40	.6′ m-3.92	11 5' d 0	.4′ m0.79	,,2 1' d0	1′ m-1.85	1/2 E' d C	0.0' m0.15	Peacock	53°01.3	-56°38.5
ivier.p	Dass. 11.31	ν-0.6 α0.	.0 111-3.92	ν 1.5 u -0		ν2.1 d0.	1 111-1.05	ν2.5 u -0	.0 1110.13	Deneb	49°23.9	45°23.3
										Enif	33°35.8	10°00.7
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.3
0	91°04.7	204°04.6	S20°43.7	269°54.9	$N02^{\circ}00.2$	248°41.6	S08°03.0	57°51.7	N10°38.9	Fomalhaut	15°11.1	-40° 43.3° -29° 28.2
1	$106^{\circ}07.2$	219°03.8	44.3	284°56.3	$01^{\circ}59.8$	263°43.8	03.1	72°54.3	38.9	Scheat	13°42.1	28°14.7
2	121°09.6	234°03.0	44.8	299°57.8	59.4	278°45.9	03.3	87°56.8	38.9	Markab	13°26.8	15°21.9
3	136°12.1	249°02.1	• • 45.4	314°59.3	• • 59.0	293°48.0	• • 03.4	102°59.3	• • 38.8			
4	151°14.5	264°01.3	46.0	330°00.7	58.6	308°50.2	03.5	118°01.9	38.8	Dec 20 Wed	SHA	Mer.pass
5	166°17.0	279°00.5	46.6	345°02.2	58.3	323°52.3	03.6	133°04.4	38.8		115°37.2	10:22
6	181°19.5	293°59.7	S20°47.1	0°03.7	N01°57.9	338°54.5	S08°03.7	148°06.9	N10°38.8		179°38.2	06:04
7	196°21.9	308°58.8	47.7	15°05.2	57.5	353°56.6	03.9	163°09.5	38.8		157°52.9	07:31
8	211°24.4	323°58.0	48.3	30°06.6	57.1	8°58.7	04.0	178°12.0	38.8	Saturn	326°43.6	20:13
9	226°26.9	338°57.2	• • 48.8	45°08.1	• • 56.7	24°00.9	• • 04.1	193°14.5	• • 38.8	Dec 21 Thu	SHA	Mer.pass
10	241°29.3	353°56.3	49.4	60°09.6	56.3	39°03.0	04.2	208°17.1	38.8	1	114°18.7	10:23
11	256°31.8	8°55.5	50.0	75°11.1	55.9	54°05.2	04.3	223°19.6	38.8		179°14.1	06:02
12	271°34.3	23°54.7	\$20°50.5	90°12.6	N01°55.6	69°07.3	S08°04.5	238°22.1	N10°38.7	l .	157°44.8	07:28
13	286°36.7	38°53.9	51.1	105°14.0	55.2	84°09.4	04.6	253°24.6	38.7	Saturn	326°45.4	20:09
14	301°39.2	53°53.0	51.7	120°15.5	54.8	99°11.6	04.7	268°27.2	38.7			
15	316°41.6	68°52.2	52.2	135°17.0	• • 54.4	114°13.7	• • 04.8	283°29.7	38.7	Dec 22 Fri	SHA	Mer.pass
16	331°44.1	83°51.4	52.8	150°18.5	54.0	129°15.9	04.9	298°32.2	38.7		112°59.9	10:24
17	346°46.6	98°50.5	53.3	165°19.9	53.6	144°18.0	05.0	313°34.8	38.7		178°50.2	06:00
18	1°49.0	113°49.7	\$20°53.9	180°21.4	N01°53.3	159°20.1	S08°05.2	328°37.3	N10°38.7		157°36.9	07:24
19	16°51.5	128°48.9	54.5	195°22.9	52.9	174°22.3	05.3	343°39.8	38.7	Saturn	326°47.1	20:05
20	31°54.0 46°56.4	143°48.0 158°47.2	55.0 •• 55.6	210°24.4 225°25.9	52.5 •• 52.1	189°24.4 204°26.6	05.4 •• 05.5	358°42.3 13°44.9	38.7 •• 38.7	Horizont	al parallax	
21 22	40 50.4 61°58.9	158 47.2 173°46.4	56.1	240°27.3	51.7	204 26.6 219°28.7	05.6	13 44.9 28°47.4	38.6		Venus:	0.1
23	77°01.4	173 40.4 188°45.5	56.7	240 27.3 255°28.8	51.7	219 20.7 234°30.8	05.8	43°49.9	38.6		Mars:	0.1
										L		
Mer.p	pass. 17:53	ν -0.8′ d0.	.6′ m-3.92	$\nu 1.5' \ d-0$	0.4′ m0.77	$\nu 2.1' \ d0.$	1′ m-1.86	ν 2.5′ d-0	0.0′ m0.16			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.1	S23°25.7	131°55.8	13.8'	\$13°31.7	-11.4'	55.4'
1 2	195°35.8 210°35.5	25.8 25.8	146°28.5 161°01.3	13.8' 13.9'	13°20.3 13°08.8	-11.4' -11.5'	55.4' 55.3'
3	210 35.5 225°35.2	25.8	101 01.3 175°34.2	14.0'	13 06.6 12°57.3	-11.5'	55.3'
4	240°34.9	25.8	190°07.2	14.0'	12°45.8	-11.6'	55.3'
5	255°34.6	25.8	204°40.3	14.1'	12°34.2	-11.6'	55.3'
6 7	270°34.3 285°33.9	\$23°25.9 25.9	219°13.4 233°46.6	14.2' 14.3'	\$12°22.6 12°10.9	-11.7' -11.7'	55.2' 55.2'
8	300°33.6	25.9 25.9	233 40.0 248°19.9	14.3'	12 10.9 11°59.2	-11.7' -11.7'	55.2'
9	315°33.3	• • 25.9	262°53.2	14.4'	11°47.5	-11.8'	55.2'
10	330°33.0	26.0	277°26.6	14.5'	11°35.7	-11.8'	55.2'
11 12	345°32.7 0°32.4	26.0 \$23°26.0	292°00.0 306°33.6	14.5' 14.6'	11°23.9 \$11°12.0	-11.9' -11.9'	55.1' 55.1'
13	15°32.1	26.0	321°07.2	14.7'	11°00.1	-11.9'	55.1'
14	30°31.8	26.0	335°40.8	14.7'	10°48.2	-12.0'	55.1'
15	45°31.5	• • 26.0	350°14.6	14.8'	10°36.2	-12.0'	55.0'
16 17	60°31.1 75°30.8	26.0 26.1	4°48.4 19°22.2	14.9' 14.9'	10°24.2 10°12.2	-12.0' -12.1'	55.0' 55.0'
18	90°30.5	\$23°26.1	33°56.1	15.0'	\$10°00.2	-12.1'	55.0'
19	105°30.2	26.1	48°30.1	15.0'	09°48.1	-12.1'	55.0'
20	120°29.9	26.1	63°04.1	15.1'	09°35.9	-12.1'	54.9'
21 22	135°29.6 150°29.3	· · 26.1 26.1	77°38.2 92°12.4	15.1' 15.2'	09°23.8 09°11.6	-12.2' -12.2'	54.9' 54.9'
23	165°29.0	26.1	106°46.6	15.2	08°59.4	-12.2'	54.9'
	SD = 16.2'	d = 0.0'			D = 15.1'		
	<u> </u>						
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°28.7 195°28.4	\$23°26.1 26.1	121°20.8 135°55.1	15.3' 15.4'	\$08°47.2 08°34.9	-12.3' -12.3'	54.9' 54.8'
2	210°28.0	26.1	150°29.5	15.4	08°22.7	-12.3'	54.8'
3	225°27.7	26.1	165°03.9	15.5'	08°10.4	-12.3'	54.8'
4	240°27.4	26.1	179°38.3	15.5'	07°58.0	-12.3'	54.8'
5 6	255°27.1 270°26.8	26.1 \$23° 26.2	194°12.9 208°47.4	15.6' 15.6'	07°45.7 \$07°33.3	-12.4' -12.4'	54.8' 54.7'
7	285°26.5	26.2	200° 47.4 223° 22.0	15.7'	07°21.0	-12.4'	54.7
8	300°26.2	26.2	237°56.7	15.7'	07°08.5	-12.4'	54.7'
9	315°25.9	• • 26.2	252°31.4	15.7'	06°56.1	-12.4'	54.7'
10 11	330°25.6 345°25.2	26.2 26.2	267°06.1 281°40.9	15.8' 15.8'	06°43.7 06°31.2	-12.5' -12.5'	54.7' 54.7'
12	0°24.9	\$23°26.1	296°15.7	15.9'	S06°18.7	-12.5	54.6'
13	15°24.6	26.1	310°50.6	15.9'	06°06.2	-12.5'	54.6'
14	30°24.3 45°24.0	26.1 •• 26.1	325°25.5 340°00.4	15.9' 16.0'	05°53.7 05°41.2	-12.5' -12.5'	54.6' 54.6'
15 16	60°23.7	26.1	354° 35.4	16.0'	05 41.2 05°28.7	-12.5'	54.6'
17	75°23.4	26.1	9°10.5	16.1'	05°16.1	-12.6'	54.6'
18	90°23.1	S23°26.1	23°45.5	16.1'	S05°03.6	-12.6'	54.5'
19 20	105°22.8 120°22.4	26.1 26.1	38°20.6 52°55.7	16.1'	04°51.0 04°38.4	-12.6'	54.5' 54.5'
21	135°22.1	. 26.1	67°30.9	16.2'	04°25.8	-12.6'	54.5
22	150°21.8	26.1	$82^{\circ}06.1$	16.2'	$04^{\circ}13.2$	-12.6'	54.5'
23	165°21.5	26.1	96°41.3	16.3'	04°00.6	-12.6'	54.5'
	SD = 16.3'	d = 0.0'		SI	0 = 15.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.2	\$23°26.1	111°16.6	16.3'	\$03°48.0	-12.6'	54.5'
1	195°20.9	26.0	125°51.8	16.3'	03°35.4	-12.6'	54.4'
2	210°20.6 225°20.3	26.0	140°27.1 155°02.5	16.3'	03°22.7 03°10.1	-12.6' -12.6'	54.4'
3 4	225°20.3 240°19.9	· · 26.0 26.0	155°02.5 169°37.8	16.4' 16.4'	03°10.1 02°57.5	-12.6' -12.6'	54.4' 54.4'
5	255°19.6	26.0	184°13.2	16.4	02°44.8	-12.7	54.4'
6	270°19.3	S23°26.0	198°48.6	16.4	502°32.2	-12.7'	54.4'
7 8	285°19.0 300°18.7	25.9 25.9	213°24.0 227°59.5	16.4' 16.5'	02°19.5 02°06.9	-12.7' -12.7'	54.4' 54.4'
9	300 18.7 315°18.4	· · 25.9	242° 35.0	16.5	02 06.9 01°54.2	-12.7'	54.4 54.3'
10	330°18.1	25.9	$257^{\circ}10.4$	16.5'	$01^{\circ}41.5$	-12.7'	54.3'
11	345°17.8	25.9	271°45.9	16.5'	01°28.9	-12.7'	54.3'
12 13	0°17.5 15°17.1	\$23°25.8 25.8	286°21.5 300°57.0	16.5' 16.6'	\$01°16.2 01°03.5	-12.7' -12.7'	54.3' 54.3'
14	30°16.8	25.8	315°32.6	16.6'	00°50.9	-12.7'	54.3'
15	45°16.5	• • 25.8	330°08.1	16.6'	00°38.2	-12.7'	54.3'
16	60°16.2	25.7	344°43.7	16.6'	00°25.6	-12.7'	54.3'
17 18	75°15.9 90°15.6	25.7 \$23°25.7	359°19.3 13°54.9	16.6' 16.6'	00°12.9 \$00°00.3	-12.6' -12.6'	54.3' 54.3'
19	105°15.3	25.7	28°30.5	16.6'	N00°12.4	12.6'	54.3'
20	120°15.0	25.6	43°06.1	16.6'	00°25.0	12.6'	54.2'
21 22	135°14.7 150°14.4	· · 25.6 25.6	57°41.7 72°17.4	16.6' 16.6'	00°37.6 00°50.3	12.6' 12.6'	54.2' 54.2'
23	165°14.4	25.6 25.5	72°17.4 86°53.0	16.6'	00°50.3 01°02.9	12.6'	54.2'
-	SD = 16.3'	d = -0.0'			O = 14.9'		
	<u> </u>			JL			

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

Lat.		Moonris	e		Moonset	:
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
N 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
N 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
S 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
S 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
S 60°	08:01	09:23	10:42	22:56	23:00	23:05

	Sun			Moon		
Day	Day Eqn.of T		Mer.	Mer.	Pass.	Age
	00 ^h 12 ^h		Pass	Upper Lower		4-6
	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	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	92°03.8	203°44.7		270°30.3	N01°51.0						эпа	Dec
0			\$20°57.2			249°33.0	S08°05.9	58° 52.5	N10°38.6	Alpheratz	357°31.4	29°15.3
1	107°06.3	218°43.9	57.8	285°31.8 300°33.3	50.6	264°35.1	06.0	73°55.0	38.6	Ankaa	353°04.0	-42°09.0
2	122°08.8 137°11.2	233°43.0 248°42.2	58.3	315°34.8	50.2	279°37.3 294°39.4	06.1	88° 57.5	38.6	Schedar	$349^{\circ}27.1$	56°42.1
3 4			· · 58.9		• • 49.8		• • 06.2	104°00.0	• • 38.6	Diphda	348°44.1	-17°49.7
5	152°13.7 167°16.1	263°41.4 278°40.5	20°59.4 21°00.0	330°36.2 345°37.7	49.4 49.0	309°41.6 324°43.7	06.3 06.5	119°02.6 134°05.1	38.6 38.6	Achernar	$335^{\circ}17.7$	-57°05.6
6	182°18.6	276 40.5 293°39.7	\$21°00.0	0°39.2	49.0 N01°48.7	339°45.8	508°06.6	134 05.1 149°07.6	N10° 38.6	Hamal	327°47.3	23°36.1
7	197°21.1	308°38.9	01.1	15°40.7	48.3	354°48.0	06.7	164° 10.1	38.6	Polaris	311°52.3	89°23.3
8	212°23.5	323°38.0	01.6	30°42.2	47.9	9°50.1	06.8	179° 12.7	38.6	Acamar	$315^{\circ}09.1$	-40°11.5
9	212 25.5 227°26.0	338°37.2	02.2	45°43.7	• • 47.5	24°52.3	• • 06.9	194° 15.2	• • 38.5	Menkar	314°02.5	4°12.2
10	242°28.5	353°36.3	02.7	60°45.1	47.1	39°54.4	07.0	209° 17.7	38.5	Mirfak	308°23.1	49°58.0
11	257°30.9	8°35.5	03.3	75°46.6	46.8	54°56.6	07.2	224°20.3	38.5	Aldebaran	290°35.6	16°34.0
12	272°33.4	23°34.7	S21°03.8	90°48.1	N01°46.4	69°58.7	S08°07.3	239°22.8	N10°38.5	Rigel	281°00.4	-8°10.2
13	287°35.9	38°33.8	04.3	105°49.6	46.0	85°00.8	07.4	254°25.3	38.5	Capella	280°16.6	46°01.5
14	302°38.3	53°33.0	04.9	120°51.1	45.6	100°03.0	07.5	269°27.8	38.5	Bellatrix	278°19.1	6°22.5
15	317°40.8	68°32.2	• • 05.4	135°52.6	• • 45.2	115°05.1	07.6	284° 30.4	38.5	Elnath	277°57.4	28°37.8
16	332°43.3	83°31.3	06.0	150°54.1	44.9	130°07.3	07.7	299°32.9	38.5	Alnilam	275°34.1	-1°11.1
17	347°45.7	98°30.5	06.5	165°55.6	44.5	145°09.4	07.9	314°35.4	38.5	Betelgeuse	270°48.3	7°24.6
18	2°48.2	113°29.6	S21°07.0	180°57.0	N01°44.1	160°11.6	S08°08.0	329°37.9	N10°38.5	Canopus	263°50.4	-52°42.7
19	17°50.6	128°28.8	07.6	195°58.5	43.7	175°13.7	08.1	344°40.4	38.5	Sirius	258°23.0	-16°45.5
20	32°53.1	143°27.9	08.1	211°00.0	43.4	190°15.9	08.2	359°43.0	38.4	Adhara	255°02.9	-29°00.8
21	47°55.6	158°27.1	• • 08.6	226°01.5	• • 43.0	205°18.0	• • 08.3	14°45.5	• • 38.4	Procyon	244°47.2	5°08.9
22	62°58.0	173°26.3	09.1	241°03.0	42.6	220°20.2	08.4	29°48.0	38.4	Pollux	243°13.1	27°57.1
23	78°00.5	188°25.4	09.7	$256^{\circ}04.5$	42.2	235°22.3	08.6	44°50.5	38.4	Avior	234°12.8 222°43.5	-59°36.1 -43°32.9
Maria	255 17.40	1,00/ 40	.6′ m-3.92	,,1 E/ J O	.4′ m0.76	,,2 1/ JO	1′ m-1.86	10 E/ 4 O	.0′ m0.16	Suhail	222°43.5 221°36.7	-43° 32.9 -69° 50.0
ivier.p	ass. 17:49	ν-υ.ο΄ αυ.	.0 111-3.92	ν1.5 a-0	.4 1110.70	ν2.1 aU.	1 111-1.δ0	ν2.5 α- 0	.0 1110.10	Miaplacidus Alphard	221 36.7 217°44.4	-8°47.2
										Regulus	217 44.4 207°30.9	-6 47.2 11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.1	61°35.3
0	93°03.0	203°24.6	S21°10.2	271°06.0	N01°41.8	250°24.5	S08°08.7	59°53.1	N10°38.4	Denebola	182°21.7	14°24.4
1	$108^{\circ}05.4$	218°23.7	10.7	$286^{\circ}07.5$	41.5	265°26.6	8.80	74°55.6	38.4	Gienah	175° 40.3	-17°42.2
2	123°07.9	233°22.9	11.3	301°09.0	41.1	280°28.7	08.9	89°58.1	38.4	1	173° 40.3	-63°15.4
3	138°10.4	248°22.0	• • 11.8	$316^{\circ}10.5$	• • 40.7	295°30.9	•• 09.0	105°00.6	• • 38.4		171°48.0	-57°16.3
4	153°12.8	263°21.2	12.3	331°12.0	40.3	310°33.0	09.1	120°03.2	38.4	II.	166° 10.4	55°47.8
5	168°15.3	278°20.3	12.8	$346^{\circ}13.5$	40.0	325°35.2	09.2	135°05.7	38.4	Spica	158° 19.0	-11°18.8
6	183°17.7	293°19.5	S21°13.3	1°15.0	N01°39.6	340°37.3	S08°09.4	150°08.2	N10°38.4	Alkaid	152°49.8	49°09.8
7	198°20.2	308°18.7	13.9	16°16.4	39.2	355°39.5	09.5	$165^{\circ}10.7$	38.4	Hadar	148°31.6	-60°30.5
8	$213^{\circ}22.7$	323°17.8	14.4	31°17.9	38.8	10°41.6	09.6	180° 13.2	38.3	Menkent	147°54.0	-36°30.6
9	228°25.1	338°17.0	• • 14.9	46°19.4	• • 38.5	25°43.8	• • 09.7	195° 15.8	• • 38.3	Arcturus	145°45.2	19°01.7
10	243°27.6	353°16.1	15.4	61°20.9	38.1	40°45.9	09.8	210° 18.3	38.3	Rigil Kent.	139°36.1	-60°57.1
11	258°30.1	8°15.3	15.9	76°22.4	37.7	55°48.1	09.9	225°20.8	38.3	Kochab	137°21.0	74°01.9
12	273°32.5	23°14.4	S21°16.5	91°23.9	N01°37.3	70°50.2	S08°10.0	240°23.3	N10°38.3	Zuben'ubi	136°52.7	-16°09.7
13	288°35.0	38°13.6	17.0	106°25.4	37.0	85°52.4	10.2	255°25.9	38.3	Alphecca	126°01.3	26°36.9
14	303°37.5	53°12.7	17.5	121°26.9	36.6	100°54.5	10.3	270°28.4	38.3	Antares	112°12.2	-26°29.6
15	318°39.9	68°11.9	• • 18.0	136°28.4	• • 36.2	115°56.7	• • 10.4	285°30.9	• • 38.3	Atria	107°04.0	-69°04.5
16	333°42.4	83°11.0	18.5	151°29.9	35.8	130°58.8	10.5	300°33.4	38.3	Sabik	101°59.4	-15°45.5
17	348°44.9	98°10.2	19.0	166°31.4	35.5	146°01.0	10.6	315°35.9	38.3	Shaula	96°06.4	-37°07.3
18	3°47.3	113°09.3	S21°19.5	181°32.9	N01°35.1	161°03.1	S08°10.7	330°38.5	N10°38.3	Rasalhague	95°55.9	12°32.4
19	18°49.8	128°08.5	20.0	196°34.4	34.7	176°05.3	10.8	345°41.0	38.3	Eltanin	90°41.2	51°29.1
20	33°52.2	143°07.6	20.5	211°35.9	34.3	191°07.4	11.0	0°43.5	38.3	Kaus Aust.	83°28.7	-34°22.1
21	48°54.7	158°06.8 173°05.9	• • 21.0	226°37.4	• • 34.0	206°09.6	• • 11.1	15°46.0	• • 38.3	Vega	80°31.5	38°48.7
22	63°57.2		21.5	241°38.9	33.6	221°11.7	11.2	30°48.5	38.2	Nunki	75°44.2	-26°15.5
23	78°59.6	188°05.0	22.1	256°40.4	33.2	236°13.9	11.3	45°51.1	38.2	Altair	$61^{\circ}57.1$	8°56.8
Mer.p	ass. 17:45	ν -0.8' d0.	.5′ m-3.92	$\nu 1.5' \ d-0$.4′ m0.74	$\nu 2.1' \ d0.$	1' m-1.87	$\nu 2.5' \ d-0$.0′ m0.17	Peacock	53°01.3	-56°38.5
										Deneb	49°23.9	45°23.3
NA	GHA	CHA	Das	CHA	Doo	CHA	Dan	CH 4	Daa	Enif	33°35.8	10°00.7
Mon 0	GHA 94°02.1	GHA 203°04.2	Dec \$21°22.6	GHA 271°41.9	Dec N01°32.8	GHA 251°16.0	Dec \$08°11.4	GHA 60°53.6	Dec N10°38.2	Al Na'ir	27°29.2	-46°49.3
1	94 02.1 109°04.6	203 04.2 218°03.3	23.1	271 41.9 286°43.4	32.5	266°18.2	11.5	75°56.1	38.2	Fomalhaut	15°11.2	-29°28.2
2	109 04.0 124°07.0	233°02.5	23.1	301°44.9	32.5	281°20.3	11.6	90°58.6	38.2	Scheat	13°42.1	28°14.7
3	139°09.5	248°01.6	24.1	316°46.4	31.7	296°22.5	• • 11.8	106°01.1	38.2	Markab	13°26.8	15°21.9
4	154° 12.0	263°00.8	24.1	331°47.9	31.4	311°24.6	11.9	100 01.1 121°03.6	38.2	Dec 23 Sat	SHA	Mer.pass
5	169° 14.4	203 00.0 277°59.9	25.0	346°49.4	31.0	326°26.8	12.0	136°06.2	38.2	1	111°40.9	10:26
6	184° 16.9	292°59.1	\$21°25.5	1°50.9	N01°30.6	341°29.0	508°12.1		N10°38.2		178° 26.5	05:57
7	199°19.4	307°58.2	26.0	16°52.4	30.2	356°31.1	12.2	166°11.2	38.2	II.	157°29.2	07:21
8	214°21.8	322°57.4	26.5	31°54.0	29.9	11°33.3	12.3	181° 13.7	38.2	Saturn		20:01
9	229°24.3	337°56.5	27.0	46°55.5	• • 29.5	26°35.4	. 12.4	196° 16.2	38.2			
10	244°26.7	352°55.6	27.5	61°57.0	29.1	41°37.6	12.5	211° 18.8	38.2	Dec 24 Sun	SHA	Mer.pass
11	259°29.2	7°54.8	28.0	76°58.5	28.8	56°39.7	12.7	226°21.3	38.2		110°21.6	10:27
12	274°31.7	22°53.9	S21°28.5	92°00.0	N01°28.4	71°41.9	S08°12.8	241°23.8	N10°38.2		178°03.0	05:55
13	$289^{\circ}34.1$	$37^{\circ}53.1$	29.0	$107^{\circ}01.5$	28.0	86°44.0	12.9	$256^{\circ}26.3$	38.2		157°21.5	07:17
14	304°36.6	52°52.2	29.5	$122^{\circ}03.0$	27.6	101°46.2	13.0	271°28.8	38.1	Saturn	326°50.1	19:57
15	$319^{\circ}39.1$	67°51.3	• • 30.0	$137^{\circ}04.5$	• • 27.3	116°48.3	• • 13.1	$286^{\circ}31.3$	• • 38.1	Dec 25 Mon	SHA	Mer.pass
16	334°41.5	82°50.5	30.4	$152^{\circ}06.0$	26.9	131°50.5	13.2	301°33.9	38.1		109°02.1	10:28
17	349°44.0	97°49.6	30.9	$167^{\circ}07.5$	26.5	146°52.6	13.3	$316^{\circ}36.4$	38.1	II.	177°39.8	05:53
18	4°46.5	112°48.8	S21°31.4	182°09.0	N01°26.2	161°54.8	S08°13.4	331°38.9	N10°38.1		157°13.9	07:14
19	19°48.9	127°47.9	31.9	197°10.5	25.8	176°57.0	13.5	346°41.4	38.1	Saturn	$326^{\circ}51.5$	19:53
20	34°51.4	142°47.0	32.4	212°12.1	25.4	191°59.1	13.7	1°43.9	38.1			
21	49°53.8	157°46.2	• • 32.9	227°13.6	• • 25.1	207°01.3	• • 13.8	16°46.4	· · 38.1	Horizont	al parallax	0.1
22	64°56.3	172°45.3	33.3	242°15.1	24.7	222°03.4	13.9	31°48.9	38.1		Venus:	0.1
23	79°58.8	187°44.5	33.8	257°16.6	24.3	237°05.6	14.0	46°51.5	38.1		Mars:	0.1
Mer.n	ass. 17:41	ν -0.9' d0	.5′ m-3.92	$\nu 1.5' \ d-0$.4′ m0.73	$\nu 2.2' \ d0$	1′ m-1.87	$\nu^{2.5'} d-0$.0′ m0.17			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.7	S23°25.5	$101^{\circ}28.6$	16.6'	$N01^{\circ}15.5$	12.6'	54.2'
1	195°13.4	25.5	116°04.3	16.6'	01°28.1	12.6'	54.2'
2	210°13.1 225°12.8	25.4 •• 25.4	130°39.9 145°15.6	16.6' 16.6'	01°40.7 01°53.3	12.6' 12.6'	54.2' 54.2'
4	240°12.5	25.4	159°51.2	16.6'	01°05.9	12.6'	54.2'
5	255°12.2	25.3	$174^{\circ}26.8$	16.6'	02°18.4	12.6'	54.2'
6	270°11.9	S23°25.3	189°02.5	16.6'	N02°31.0	12.5'	54.2'
7 8	285°11.6 300°11.2	25.3 25.2	203°38.1 218°13.8	16.6' 16.6'	02°43.5 02°56.1	12.5' 12.5'	54.2' 54.2'
9	315°10.9	. 25.2	232°49.4	16.6'	03°08.6	12.5'	54.2'
10	330°10.6	25.1	247°25.0	16.6'	03°21.1	12.5'	54.2'
11	345°10.3 0°10.0	25.1 \$23°25.1	262°00.6 276°36.2	16.6' 16.6'	03°33.6 N03°46.1	12.5'	54.2'
12 13	15°09.7	25.0	276°36.2 291°11.8	16.6'	03°58.5	12.5' 12.4'	54.2' 54.2'
14	30°09.4	25.0	305°47.4	16.6'	04°11.0	12.4	54.2'
15	45°09.1	• • 24.9	320°23.0	16.6'	04°23.4	12.4'	54.2'
16	60°08.8	24.9	334°58.5	16.5'	04°35.8	12.4	54.2'
17 18	75°08.4 90°08.1	24.8 \$23°24.8	349°34.1 4°09.6	16.5' 16.5'	04°48.2 N05°00.6	12.4' 12.4'	54.2' 54.1'
19	105°07.8	24.7	18°45.1	16.5'	05°13.0	12.3'	54.1'
20	120°07.5	24.7	33°20.6	16.5'	05°25.3	12.3'	54.1'
21	135°07.2	• • 24.6	47°56.1 62°31.6	16.5'	05°37.6	12.3'	54.1'
22 23	150°06.9 165°06.6	24.6 24.5	77°07.0	16.4' 16.4'	05°49.9 06°02.2	12.3' 12.3'	54.1' 54.1'
	SD = 16.3'	d = -0.0'			0 = 14.8'	5	
	3D = 10.3'	$a = -0.0^{\circ}$) SL	<i>j</i> = 14.δ ⁻		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°06.3	S23°24.5	91°42.4	16.4	N06°14.5	12.2'	54.1'
1 2	195°06.0 210°05.7	24.4 24.4	106°17.8 120°53.2	16.4' 16.3'	06°26.7 06°38.9	12.2' 12.2'	54.2' 54.2'
3	225°05.3	24.3	135°28.5	16.3'	06°51.1	12.2'	54.2'
4	240°05.0	24.3	150°03.9	16.3'	07°03.2	12.1'	54.2'
5	255°04.7	24.2	164°39.2 179°14.4	16.3'	07°15.4	12.1'	54.2'
6 7	270°04.4 285°04.1	\$23°24.2 24.1	179°14.4 193°49.7	16.2' 16.2'	N07°27.5 07°39.6	12.1' 12.1'	54.2' 54.2'
8	300°03.8	24.1	208°24.9	16.2'	07°51.6	12.0'	54.2'
9	315°03.5	• • 24.0	223°00.1	16.2'	08°03.7	12.0'	54.2'
10	330°03.2 345°02.9	23.9 23.9	237°35.2 252°10.3	16.1' 16.1'	08°15.7 08°27.6	12.0' 11.9'	54.2' 54.2'
11 12	0°02.6	523°23.8	266°45.4	16.1	N08°39.6	11.9'	54.2'
13	15°02.2	23.7	281°20.5	16.0'	08°51.5	11.9'	54.2'
14	30°01.9	23.7	295°55.5	16.0'	09°03.4	11.9'	54.2'
15 16	45°01.6 60°01.3	· · 23.6 23.6	310°30.5 325°05.4	15.9' 15.9'	09°15.2 09°27.0	11.8' 11.8'	54.2' 54.2'
17	75°01.0	23.5	339°40.3	15.9'	09°27.0	11.8'	54.2'
18	90°00.7	\$23°23.4	354°15.2	15.8'	N09°50.6	11.7'	54.2'
19	105°00.4	23.4	8°50.0	15.8'	10°02.3	11.7'	54.2'
20 21	120°00.1 134°59.8	23.3	23°24.8 37°59.6	15.7' 15.7'	10°14.0 10°25.6	11.6' 11.6'	54.2' 54.2'
22	149°59.5	23.2	52°34.3	15.7'	10°23.0	11.6'	54.2'
23	164°59.1	23.1	67°08.9	15.6'	10°48.8	11.5'	54.3'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		
						,	
Mon 0	GHA 179°58.8	Dec \$23°23.0	GHA 81°43.5	u 15.6'	Dec N11°00.4	d 11.5'	HP 54.3'
1	179 58.6 194°58.5	22.9	96°18.1	15.5'	11°11.9	11.5'	54.3'
2	209°58.2	22.9	110°52.6	15.5'	11°23.3	11.4'	54.3'
3	224°57.9	• • 22.8	125°27.1	15.4'	11°34.7	11.4'	54.3'
4 5	239°57.6 254°57.3	22.7 22.6	140°01.5 154°35.9	15.4' 15.3'	11°46.1 11°57.4	11.3' 11.3'	54.3' 54.3'
6	269°57.0	\$23°22.6	169°10.2	15.3'	N12°08.7	11.3'	54.3'
7	284°56.7	22.5	183°44.5	15.2'	12°20.0	11.2'	54.3'
8 9	299°56.4 314°56.1	22.4 •• 22.3	198°18.7 212°52.8	15.2' 15.1'	12°31.2 12°42.4	11.2' 11.1'	54.3' 54.3'
10	314 56.1 329 55.7	22.3	212°52.8 227°27.0	15.1' 15.1'	12°42.4 12°53.5	11.1	54.4'
11	344°55.4	22.2	242°01.0	15.0'	13°04.6	11.0'	54.4'
12	359°55.1	S23°22.1	256°35.0	14.9'	N13°15.6	11.0'	54.4'
13 14	14°54.8 29°54.5	22.0 21.9	271°09.0 285°42.8	14.9' 14.8'	13°26.6 13°37.5	10.9' 10.9'	54.4' 54.4'
14 15	29 54.5 44°54.2	21.8	285 42.8 300°16.7	14.8'	13°48.4	10.9	54.4' 54.4'
16	59°53.9	21.8	314°50.4	14.7'	13°59.2	10.8'	54.4'
17	74°53.6	21.7	329°24.1	14.6'	14°10.0	10.7	54.4'
18 19	89°53.3 104°53.0	\$23°21.6 21.5	343°57.8 358°31.4	14.6' 14.5'	N14°20.7 14°31.4	10.7' 10.6'	54.5' 54.5'
20	119°52.7	21.4	13°04.9	14.5'	14° 42.0	10.6'	54.5
21	134°52.4	• • 21.3	27°38.4	14.4'	14°52.6	10.5'	54.5'
22	149°52.0	21.2	42°11.7	14.3'	15°03.1	10.5'	54.5'
23	164°51.7	21.1	56°45.1	14.3'	15°13.6	10.4'	54.5'
	SD = 16.3'	d = -0.1'	-	SE	D = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:27	10:58			13:02	15:33
N 70°	08:07	09:55			14:04	15:53
68°	07:51	09:20			14:40	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
N 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
S 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°	03:38	04:15	04:44	19:15	19:45	20:22
40°	03:15	03:57	04:29	19:30	20:03	20:45
45°	02:44	03:34	04:11	19:48	20:26	21:15
S 50°	01:59	03:04	03:49	20:11	20:55	22:01
52°	01:31	02:49	03:38	20:22	21:10	22:29
54°	00:44	02:31	03:26	20:34	21:28	23:15
56°	////	02:09	03:11	20:48	21:51	////
58°	////	01:39	02:55	21:05	22:20	////
S 60°	////	00:48	02:34	21:25	23:10	////

Lat.		Moonris	е		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
S 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	
S 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
S 60°	12:01	13:19	14:39	23:09	23:13	23:20

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-60%
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	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	95°01.2	202°43.6	S21°34.3	272°18.1	N01°24.0	252°07.7	S08° 14.1	61°54.0	N10°38.1		SHA	
0	110°03.7	202 43.0 217°42.7		287°19.6		267°09.9		76°56.5		Alpheratz	357°31.4	29°15.3
1			34.8	302°21.1	23.6		14.2		38.1	Ankaa	353°04.1	-42°09.0
2	125°06.2	232°41.9	35.2		23.2	282°12.1	14.3	91°59.0	38.1	Schedar	$349^{\circ}27.1$	56°42.1
3	140°08.6	247°41.0	• • 35.7	317°22.6	• • 22.8	297°14.2	• • 14.4	107°01.5	• • 38.1	Diphda	348°44.1	-17°49.7
4	155°11.1	262°40.1	36.2	332°24.2	22.5	312°16.4	14.5	122°04.0	38.1	Achernar	335°17.7	-57°05.6
5	170°13.6	277°39.3	36.6	347°25.7	22.1	327°18.5	14.7	137°06.5	38.1	Hamal	327°47.3	23°36.1
6	185°16.0	292°38.4	\$21°37.1	2°27.2	N01°21.7	342°20.7	508°14.8	152°09.1	N10°38.1	Polaris	311°53.2	89°23.3
7	200°18.5	307°37.5	37.6	17°28.7	21.4	357°22.8	14.9	$167^{\circ}11.6$	38.1	Acamar	315°09.1	-40°11.5
8	215°21.0	322°36.7	38.1	32°30.2	21.0	12°25.0	15.0	182°14.1	38.1	Menkar	314°02.5	4°12.2
9	230°23.4	337°35.8	• • 38.5	47°31.7	• • 20.6	27°27.2	• • 15.1	$197^{\circ}16.6$	• • 38.1	Mirfak	308°23.2	49°58.0
10	245°25.9	352°34.9	39.0	62°33.2	20.3	42°29.3	15.2	212°19.1	38.0	Aldebaran	290°35.6	16°34.0
11	260°28.3	7°34.1	39.5	77°34.8	19.9	57°31.5	15.3	227°21.6	38.0			
12	275°30.8	22°33.2	S21°39.9	92°36.3	N01°19.6	72°33.6	S08°15.4	242°24.1	N10°38.0	Rigel	281°00.4	-8°10.2
13	290°33.3	37°32.3	40.4	107°37.8	19.2	87°35.8	15.5	257°26.7	38.0	Capella	280°16.6	46°01.6
14	305°35.7	52°31.5	40.8	122°39.3	18.8	102°38.0	15.7	272°29.2	38.0	Bellatrix	278°19.1	6°22.5
15	320°38.2	67°30.6	• • 41.3	137°40.8	. 18.5	117°40.1	• • 15.8	287°31.7	• • 38.0	Elnath	277°57.4	28°37.8
16	335°40.7	82°29.7	41.8	152°42.4	18.1	132°42.3	15.9	302°34.2	38.0	Alnilam	275°34.1	-1°11.1
17	350°43.1	97°28.9	42.2	167°43.9	17.7	147°44.4	16.0	317°36.7	38.0	Betelgeuse	270°48.3	7°24.6
18	5°45.6	112°28.0	\$21°42.7	182°45.4	N01°17.4	162°46.6	S08° 16.1	332°39.2	N10°38.0	Canopus	263°50.4	-52°42.7
				102 45.4 197°46.9						Sirius	258°23.0	-16°45.5
19	20°48.1	127°27.1	43.1		17.0	177°48.8	16.2	347°41.7	38.0	Adhara	255°02.9	-29°00.8
20	35°50.5	142°26.3	43.6	212°48.4	16.6	192°50.9	16.3	2°44.2	38.0	Procyon	244°47.1	5°08.9
21	50°53.0	157°25.4	• • 44.0	227°50.0	· · 16.3	207°53.1	• • 16.4	17°46.7	• • 38.0	Pollux	243°13.0	27°57.1
22	65°55.5	172°24.5	44.5	242°51.5	15.9	222°55.2	16.5	32°49.3	38.0	Avior	234°12.7	-59°36.1
23	80°57.9	187°23.6	44.9	257°53.0	15.5	237°57.4	16.6	47°51.8	38.0	Suhail	222°43.5	-43°33.0
Mern	ass. 17:37	ν-0 0' d0	.5′ m-3.92	v15' d.C	0.4' m0.71	1/2 2/ d0	1′ m-1.88	v25' d.C	0.0' m0.18	Miaplacidus	221°36.7	-43°50.1
ivier.p	vass. 11.31	ν-0.9 α0	.5 111-3.92	ν1.5 <i>α</i> -0	,.+ IIIU./I	ν Δ. Δ U U.	111-1.00	ν2.5 α -C	1110.10	Alphard	221 30.7 217°44.3	-8°47.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.9	11°49.3
0	96°00.4	202°22.8	S21°45.4	272°54.5	N01°15.2	252° 59.6	508° 16.7	62°54.3	N10°38.0	Dubhe	193°37.0	61°35.3
1	111°02.8	217°21.9	45.8	287°56.0	14.8	268°01.7	16.9	77°56.8	38.0	Denebola	182°21.6	14°24.4
2	126°05.3	232°21.0	46.3	302°57.6	14.5	283°03.9	17.0	92°59.3	38.0	Gienah	175°40.2	-17°42.2
3										Acrux	172°56.3	-63°15.4
	141°07.8	247°20.1	• • 46.7	317°59.1	• • 14.1	298°06.1	• • 17.1	108°01.8	• • 38.0	Gacrux	171°47.9	-57°16.3
4	156°10.2	262°19.3	47.2	333°00.6	13.7	313°08.2	17.2	123°04.3	38.0	Alioth	$166^{\circ}10.4$	55°47.8
5	171°12.7	277°18.4	47.6	348°02.1	13.4	328°10.4	17.3	138°06.8	38.0	Spica	158° 19.0	-11°18.8
6	186° 15.2	292°17.5	S21°48.1	3°03.7	N01°13.0	343° 12.5	508°17.4	153°09.3	N10°38.0	Alkaid	152°49.8	49°09.8
7	201°17.6	$307^{\circ}16.6$	48.5	18°05.2	12.6	358° 14.7	17.5	$168^{\circ}11.8$	38.0	Hadar	148°31.6	-60°30.5
8	216°20.1	322°15.8	48.9	33°06.7	12.3	13° 16.9	17.6	183°14.4	38.0	Menkent	147°53.9	-36°30.6
9	231°22.6	337°14.9	• • 49.4	48°08.2	• • 11.9	$28^{\circ}19.0$	• • 17.7	198°16.9	• • 38.0	Arcturus	145°45.2	19°01.7
10	246°25.0	$352^{\circ}14.0$	49.8	63°09.8	11.6	43°21.2	17.8	213°19.4	38.0	Rigil Kent.	139°36.1	-60°57.1
11	261°27.5	$7^{\circ}13.1$	50.3	78°11.3	11.2	58°23.4	17.9	228°21.9	38.0	_		
12	276°30.0	22°12.3	S21°50.7	93°12.8	N01°10.8	73°25.5	508°18.0	243°24.4	N10°38.0	Kochab	137°20.9	74°01.8
13	291°32.4	37°11.4	51.1	108°14.4	10.5	88°27.7	18.2	258°26.9	38.0	Zuben'ubi	136°52.6	-16°09.7
14	306°34.9	52°10.5	51.6	123°15.9	10.1	103°29.9	18.3	273°29.4	37.9	Alphecca	126°01.3	26°36.9
15	321°37.3	67°09.6	• • 52.0	138°17.4	09.8	118° 32.0	18.4	288°31.9	37.9	Antares	112°12.2	-26°29.6
	336°39.8	82°08.8		153°18.9		133°34.2		303°34.4		Atria	107°04.0	-69°04.5
16			52.4		09.4		18.5		37.9	Sabik	101°59.4	-15°45.5
17	351°42.3	97°07.9	52.9	168°20.5	09.0	148°36.4	18.6	318°36.9	37.9	Shaula	96°06.4	-37°07.3
18	6°44.7	112°07.0	S21°53.3	183°22.0	N01°08.7	163°38.5	S08°18.7	333°39.4	N10°37.9	Rasalhague	95°55.9	12°32.4
19	21°47.2	127°06.1	53.7	198°23.5	08.3	178°40.7	18.8	348°41.9	37.9	Eltanin	90°41.2	51°29.1
20	36°49.7	142°05.2	54.1	213°25.1	08.0	193°42.9	18.9	3°44.4	37.9	Kaus Aust.	83°28.7	-34°22.1
21	51°52.1	157°04.4	• • 54.6	228°26.6	•• 07.6	208°45.0	• • 19.0	18°47.0	• • 37.9	Vega	80°31.5	38°48.7
22	66°54.6	172°03.5	55.0	243°28.1	07.2	223°47.2	19.1	33°49.5	37.9	Nunki	75°44.2	-26°15.5
23	81°57.1	187°02.6	55.4	258°29.7	06.9	238°49.4	19.2	48°52.0	37.9	Altair	61°57.1	8°56.8
N 4	17.22	- 0 0/ -10	4/ 2.00	1 5/ -/ 6	1 1/ 0 60	- 2 2/ -10	1/ 1 00	-2.5/ -1.0	0/ 0 10			-56°38.5
ivier.p	ass. 17:33	ν -0.9′ d0	.4′ m-3.92	ν 1.5' d -(0.4′ m0.69	ν 2.2 d0.	1′ m-1.88	ν 2.5' d -0	0.0′ m0.18	Peacock Deneb	53°01.3 49°23.9	-56° 38.5 45° 23.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	96°59.5	202°01.7	S21°55.8	273°31.2		253°51.5	S08° 19.3	63°54.5	N10°37.9	Al Na'ir	27°29.3	-46°49.3
1	112°02.0	217°00.8	56.3	288°32.7	06.2	268°53.7	19.4	78°57.0	37.9	Fomalhaut	15°11.2	-29°28.2
2	112 02.0 127°04.4	232°00.0	56.7	303°34.3	05.8	283°55.9	19.5	93°59.5	37.9	Scheat	13°42.1	28°14.7
3	142°06.9	232 00.0 246°59.1		318°35.8	05.5	203 55.9 298°58.0		93 59.5 109°02.0	37.9	Markab	13°26.8	15°21.9
	142°06.9 157°09.4		· · 57.1				19.7	109°02.0 124°04.5		Dec 26 Tue	SHA	Mer.pass
4		261°58.2	57.5	333°37.3	05.1	314°00.2	19.8		37.9			
5	172°11.8	276°57.3	57.9	348°38.9	04.7	329°02.4	19.9	139°07.0	37.9		107°42.3	10:30
6	187°14.3	291°56.4	S21°58.4	3°40.4	N01°04.4	344°04.5	S08°20.0	154°09.5	N10°37.9		177°16.9	05:50
7	202°16.8	306°55.6	58.8	18°41.9	04.0	359°06.7	20.1	169°12.0	37.9		157°06.5	07:10
8	217°19.2	321°54.7	59.2	33°43.5	03.7	14°08.9	20.2	184°14.5	37.9	Saturn	326°52.7	19:49
9	232°21.7	336°53.8	21°59.6	48°45.0	• • 03.3	29°11.0	• • 20.3	199°17.0	• • 37.9	Dec 27 Wed	SHA	Mer.pass
10	247°24.2	351°52.9	22°00.0	63°46.6	03.0	44°13.2	20.4	$214^{\circ}19.5$	37.9		3HA 106°22.4	10:31
11	262°26.6	6°52.0	00.4	78°48.1	02.6	59° 15.4	20.5	229°22.0	37.9			
12	277°29.1	21°51.1	\$22°00.8	93°49.6	N01°02.2	74° 17.5	508°20.6	244°24.5	N10°37.9		176°54.1	05:48
13	292°31.6	36°50.2	01.2	108°51.2	01.9	89°19.7	20.7	259°27.0	37.9		156°59.2	07:07
14	307°34.0	51°49.4	01.7	123°52.7	01.5	104°21.9	20.8	274°29.5	37.9	Saturn	326°53.9	19:45
15	322°36.5	66°48.5	• • 02.1	138°54.3	01.2	119°24.0	20.9	289°32.0	37.9	Dec 28 Thu	SHA	Mer pass
16	337°38.9	81°47.6	02.1	153°55.8	00.8	119 24.0 134°26.2	21.0	304°34.5	37.9			Mer.pass
	352°41.4										105°02.2	10:33
17		96°46.7	02.9	168°57.3	00.5	149°28.4	21.1	319°37.0	37.9		176°31.7	05:45
18	7°43.9	111°45.8	\$22°03.3	183°58.9	N01°00.1	164°30.6	S08°21.2	334°39.5	N10°37.9		156°52.0	07:04
19	22°46.3	126°44.9	03.7	199°00.4	00°59.8	179°32.7	21.3	349°42.1	37.9	Saturn	326°55.0	19:41
20	37°48.8	141°44.0	04.1	214°02.0	59.4	194°34.9	21.4	4°44.6	37.9	Uz! ·	al nevell-	
21	52°51.3	156°43.2	• • 04.5	229°03.5	• • 59.1	209°37.1	· · 21.6	19°47.1	• • 37.9	norizont	al parallax	0.1
22	67°53.7	171°42.3	04.9	244°05.0	58.7	224°39.2	21.7	34°49.6	37.9		Venus:	0.1
23	82°56.2	186°41.4	05.3	259°06.6	58.4	239°41.4	21.8	49°52.1	37.9		Mars:	0.1
Mers	ass. 17:29	1/=0 0/ d0	.4′ m-3.92	1/1 5/ d C	0.4′ m0.68	1/2 2/ d0	1′ m-1.89	1/2 5/ d C	0.0' m0.19			
ivier.p	vass. 11.29	ν-0.9 α0	.+ 111-3.92	$\nu_{1.5}$ a -0	7.4 1110.00	ν Δ.Ζ	1 111-1.09	ν2.5 α-C	.0 1110.19			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.4	\$23°21.1	71°18.3	14.2'	N15° 24.0	10.3'	54.5'
1	194°51.1 209°50.8	21.0 20.9	85°51.5 100°24.7	14.1' 14.1'	15°34.3 15°44.6	10.3'	54.6'
2	209 50.8 224°50.5	. 20.9	100 24.7 114°57.7	14.1 14.0'	15 44.6 15°54.8	10.2' 10.2'	54.6' 54.6'
4	239° 50.2	20.7	129°30.7	13.9'	16°05.0	10.1'	54.6'
5	254°49.9	20.6	144°03.6	13.9'	16° 15.1	10.0'	54.6'
6	269° 49.6 284° 49.3	\$23°20.5	158°36.5 173°09.3	13.8'	N16°25.2 16°35.1	10.0'	54.6'
7 8	284 49.3 299°49.0	20.4 20.3	173 09.3 187°42.0	13.7' 13.6'	16°45.1	9.9' 9.9'	54.7' 54.7'
9	314°48.7	20.2	202°14.6	13.6'	16°54.9	9.8'	54.7'
10	329°48.3	20.1	216°47.2	13.5'	17°04.7	9.7'	54.7'
11 12	344°48.0 359°47.7	20.0 \$23°19.9	231°19.7 245°52.1	13.4' 13.3'	17°14.4 N17°24.1	9.7' 9.6'	54.7' 54.7'
13	14° 47.4	19.8	260°24.4	13.3'	17°33.7	9.5	54.7 54.8'
14	29°47.1	19.7	274°56.7	13.2'	17°43.2	9.5'	54.8'
15	44°46.8	• • 19.6	289°28.9	13.1'	17°52.7	9.4'	54.8'
16 17	59° 46.5 74° 46.2	19.5 19.4	304°01.0 318°33.0	13.0' 13.0'	18°02.0 18°11.4	9.3' 9.2'	54.8' 54.8'
18	89°45.9	\$23°19.3	333°05.0	12.9'	N18° 20.6	9.2'	54.9
19	104°45.6	19.2	347°36.8	12.8'	18° 29.8	9.1'	54.9'
20	119°45.3	19.1	2°08.6	12.7'	18°38.8	9.0'	54.9'
21 22	134° 45.0 149° 44.7	· · 19.0 18.9	16°40.3 31°12.0	12.6' 12.6'	18° 47.9 18° 56.8	8.9' 8.9'	54.9' 54.9'
23	164° 44.4	18.7	45°43.5	12.5'	10 50.6 19°05.6	8.8'	55.0'
	SD = 16.3'	d = -0.1'			0 = 14.9'		
			-	J.			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179° 44.1 194° 43.7	\$23°18.6 18.5	60°15.0 74°46.4	12.4' 12.3'	N19°14.4 19°23.1	8.7' 8.6'	55.0' 55.0'
2	209°43.4	18.4	89°17.7	12.2'	19°23.1 19°31.7	8.5'	55.0'
3	224°43.1	• • 18.3	103°48.9	12.1'	19°40.3	8.5'	55.0'
4	239° 42.8	18.2	118°20.1	12.1'	19°48.7	8.4'	55.1'
5 6	254° 42.5 269° 42.2	18.1 \$23°18.0	132°51.2 147°22.1	12.0' 11.9'	19°57.1 N20°05.4	8.3' 8.2'	55.1' 55.1'
7	284°41.9	17.8	161°53.0	11.8'	20° 13.6	8.1'	55.1'
8	299°41.6	17.7	176°23.8	11.7'	20°21.7	8.0'	55.2'
9	314°41.3	• • 17.6	190°54.6	11.6'	20°29.7	7.9'	55.2'
10 11	329°41.0 344°40.7	17.5 17.4	205°25.2 219°55.8	11.6' 11.5'	20°37.7 20°45.5	7.8' 7.8'	55.2' 55.2'
12	359° 40.4	\$23°17.2	234°26.3	11.4	N20° 53.3	7.7'	55.2'
13	14°40.1	17.1	248°56.6	11.3'	21°00.9	7.6'	55.3'
14	29°39.8	17.0	263°27.0	11.2'	21°08.5	7.5'	55.3'
15 16	44°39.5 59°39.2	· · 16.9 16.8	277°57.2 292°27.3	11.1' 11.1'	21°16.0 21°23.3	7.4' 7.3'	55.3' 55.3'
17	74° 38.9	16.6	306°57.4	11.0'	21°30.6	7.2'	55.4'
18	89°38.5	\$23°16.5	321°27.3	10.9'	N21° 37.8	7.1'	55.4'
19	104°38.2	16.4	335°57.2	10.8'	21°44.9	7.0'	55.4'
20 21	119°37.9 134°37.6	16.3 · · 16.1	350°27.0 4°56.7	10.7	21°51.9 21°58.8	6.9' 6.8'	55.4' 55.5'
22	149° 37.3	16.0	19°26.3	10.5'	22°05.5	6.7'	55.5'
23	164°37.0	15.9	33°55.9	10.5'	22°12.2	6.6'	55.5'
	SD = 16.3'	d = -0.1'		SE	0 = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	179°36.7	\$23°15.7	48°25.3	10.4'	N22°18.8	6.5'	55.5'
1	194° 36.4	15.6	62°54.7	10.3'	22°25.3	6.4'	55.6'
2	209°36.1 224°35.8	15.5 •• 15.4	77°24.0 91°53.2	10.2' 10.1'	22°31.6 22°37.9	6.3' 6.1'	55.6' 55.6'
3 4	224° 35.8 239° 35.5	15.4	91°53.2 106°22.3	10.1	22° 37.9 22° 44.0	6.0'	55.6'
5	254°35.2	15.1	120°51.3	9.9'	22°50.1	5.9'	55.7'
6	269°34.9	S23°14.9	135°20.3	9.9'	N22°56.0	5.8'	55.7'
7 8	284°34.6 299°34.3	14.8 14.7	149°49.1 164°17.9	9.8' 9.7'	23°01.8 23°07.5	5.7' 5.6'	55.7' 55.7'
9	299 34.3 314°34.0	14.7	104 17.9 178°46.6	9. <i>1</i> 9.6'	23 07.5 23°13.1	5.5'	55.8'
10	329°33.7	14.4	$193^{\circ}15.2$	9.5'	23°18.6	5.4'	55.8'
11	344°33.4	14.3	207°43.8	9.5'	23°24.0	5.2'	55.8'
12 13	359°33.1 14°32.8	\$23°14.1 14.0	222°12.2 236°40.6	9.4' 9.3'	N23°29.2 23°34.3	5.1' 5.0'	55.9' 55.9'
14	29° 32.5	13.8	250°40.0 251°08.9	9.3 9.2'	23°39.3	4.9'	55.9'
15	44°32.2	• • 13.7	$265^{\circ}37.1$	9.1'	23°44.2	4.8'	55.9'
16	59°31.9	13.6	280°05.3	9.1'	23°49.0	4.6'	56.0'
17 18	74°31.6 89°31.3	13.4 \$23°13.3	294°33.3 309°01.3	9.0' 8.9'	23°53.6 N23°58.2	4.5' 4.4'	56.0' 56.0'
19	89 31.3 104°31.0	13.1	309 01.3 323°29.2	8.9 8.8'	24°02.6	4.4 4.3'	56.0'
20	119°30.7	13.0	337°57.0	8.8'	24°06.8	4.1'	56.1'
21	134°30.3	• • 12.8	352°24.8	8.7'	24°11.0	4.0'	56.1'
22 23	149°30.0 164°29.7	12.7 12.5	6°52.5 21°20.1	8.6' 8.5'	24°15.0 24°18.9	3.9' 3.8'	56.1' 56.2'
23	SD = 16.3'	d = -0.1'			0 = 15.1'	5.0	30.2
	3D = 10.3′	a = -0.1		- SL	ν = 15.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:27	10:54			13:09	15:36
N 70°	08:07	09:54			14:09	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
N 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
N 40°	06:16	06:50	07:21	16:42	17:12	17:46
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:58	06:28	06:54	17:08	17:35	18:04
20°	05:42	06:09	06:33	17:29	17:53	18:21
N 10°	05:26	05:52	06:15	17:48	18:11	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:23	18:46	19:13
20°	04:27	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
S 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	////
S 60°	////	00:54	02:37	21:25	23:07	////

Lat.		Moonris	e		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	08:57			05:41		
N 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
N 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
S 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° 45°	14:45	15:47	16:49	00:21	00:51	01:27
	14:58	16:03	17:08	00:10	00:37	01:10
S 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	22.44	00:01
S 60°	16:02	17:27	18:49	23:29	23:44	

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Age	
Duy	00 ^h	12 ^h	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	iter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	97°58.7	201°40.5	S22°05.7	274°08.1	N00°58.0	254° 43.6	S08°21.9	64°54.6	N10°37.9	.		0
1	113°01.1	216°39.6	06.1	289°09.7	57.6	269° 45.8	22.0	79°57.1	37.9	Alpheratz		29°15.3
2	128°03.6	231°38.7	06.5	304°11.2	57.3	284° 47.9	22.1	94°59.6	37.9	Ankaa	$353^{\circ}04.1$	-42°09.0
3	143°06.1	246° 37.8	06.8	319°12.8	56.9	299°50.1	• • 22.2	110°02.1	37.9	Schedar	349°27.1	56°42.1
										Diphda	348°44.1	-17°49.7
4	158°08.5	261°36.9	07.2	334°14.3	56.6	314°52.3	22.3	125°04.6	37.9	Achernar	$335^{\circ}17.8$	-57°05.6
5	173°11.0	276°36.0	07.6	349°15.9	56.2	329°54.5	22.4	140°07.1	37.9	Hamal	327°47.3	23°36.1
6	188°13.4	291°35.1	S22°08.0	4° 17.4	N00°55.9	344° 56.6	S08°22.5	155°09.6	N10°37.9	Polaris	311°53.9	89°23.3
7	203°15.9	306°34.3	08.4	$19^{\circ}19.0$	55.5	359° 58.8	22.6	$170^{\circ}12.1$	37.9	Acamar	315°09.1	-40°11.5
8	218°18.4	321°33.4	8.80	34°20.5	55.2	15°01.0	22.7	185°14.6	37.9	I	314°02.5	4°12.2
9	233°20.8	336°32.5	• • 09.2	49°22.1	• • 54.8	30°03.1	• • 22.8	200°17.1	• • 37.9	Menkar		
10	248°23.3	351°31.6	09.6	64°23.6	54.5	45°05.3	22.9	215°19.6	37.9	Mirfak	308°23.2	49°58.0
11	263°25.8	6°30.7	09.9	79°25.1	54.1	60°07.5	23.0	230°22.1	37.9	Aldebaran	290°35.6	16°34.0
12	278°28.2	21°29.8	S22°10.3	94°26.7	N00°53.8	75°09.7	S08°23.1	245°24.6	N10°37.9	Rigel	281°00.4	-8°10.2
13	293°30.7	36°28.9		109°28.2	53.4	90°11.8	23.2	260°27.1	37.9	Capella	$280^{\circ}16.6$	46°01.6
	308°33.2	50° 28.9 51° 28.0	10.7	109 20.2 124° 29.8		105° 14.0		275°29.6		Bellatrix	$278^{\circ}19.1$	6°22.4
14			11.1		53.1		23.3		37.9	Elnath	277°57.4	28°37.8
15	323°35.6	66°27.1	• • 11.5	139°31.4	• • 52.7	120°16.2	• • 23.4	290°32.1	• • 37.9	Alnilam	275°34.1	$-1^{\circ}11.1$
16	338°38.1	81°26.2	11.8	154°32.9	52.4	135° 18.4	23.5	305°34.6	37.9	Betelgeuse	270°48.2	7°24.6
17	353°40.6	$96^{\circ}25.3$	12.2	169°34.5	52.0	150°20.6	23.6	320°37.1	37.9	Canopus	263°50.4	-52°42.8
18	8°43.0	111°24.4	S22°12.6	184°36.0	N00°51.7	165°22.7	S08°23.7	335°39.6	$N10^{\circ}37.9$	Sirius	258°23.0	-16°45.5
19	23°45.5	126°23.5	13.0	199°37.6	51.3	180°24.9	23.8	350°42.1	37.9			-10 45.5 -29°00.8
20	38°47.9	141°22.6	13.3	214°39.1	51.0	195°27.1	23.9	5°44.6	37.9	Adhara	255°02.9	
21	53°50.4	156°21.7	• • 13.7	229°40.7	• • 50.6	210°29.3	• • 24.0	20°47.1	• • 37.9	Procyon	244°47.1	5°08.9
22	68°52.9	171°20.9	14.1	244° 42.2	50.3	225°31.4	24.1	35°49.6	37.9	Pollux	243°13.0	27°57.1
23	83°55.3	186° 20.0	14.5	259°43.8	49.9	240°33.6	24.2	50°52.1	37.9	Avior	234°12.7	-59°36.1
20	03 33.3									Suhail	222°43.5	-43°33.0
Mer.p	ass. 17:25	ν -0.9' d0.	.4′ m-3.92	ν 1.5 $^{\prime}$ d-0	0.4′ m0.66	ν 2.2′ d0.	1′ m-1.89	ν 2.5 $'$ d-0	.0′ m0.19	Miaplacidus	221°36.6	-69°50.1
										Alphard	217°44.3	-8°47.2
										Regulus	207°30.8	11°49.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.0	61°35.2
0	98°57.8	201°19.1	S22°14.8	274°45.3	N00°49.6	255° 35.8	508°24.3	65°54.5	$N10^{\circ}37.9$	Denebola	182°21.6	14°24.4
1	114°00.3	216° 18.2	15.2	289°46.9	49.2	270°38.0	24.4	80°57.0	37.9	Gienah	175° 40.2	-17°42.2
2	129°02.7	231°17.3	15.6	304°48.4	48.9	285°40.1	24.6	95°59.5	37.9			
3	144°05.2	246°16.4	• • 15.9	319°50.0	• • 48.6	300°42.3	24.7	111°02.0	• • 37.9	Acrux		-63°15.4
4	159°07.7	261° 15.5	16.3	334°51.6	48.2	315° 44.5	24.8	126°04.5	37.9		171°47.9	-57°16.3
5	174°10.1	276° 14.6	16.7	349°53.1	47.9	330°46.7	24.9	141°07.0	37.9	Alioth	166°10.4	55°47.8
6		291°13.7	\$22°17.0		N00°47.5	345°48.9	S08°25.0	156°09.5	N10°37.9	Spica	$158^{\circ}19.0$	-11°18.8
	189°12.6			4°54.7						Alkaid	152°49.7	49°09.8
7	204°15.1	306°12.8	17.4	19°56.2	47.2	0°51.0	25.1	171°12.0	37.9	Hadar	148°31.5	-60°30.5
8	219°17.5	321°11.9	17.7	34°57.8	46.8	15°53.2	25.2	186°14.5	37.9	Menkent	147°53.9	-36°30.6
9	234°20.0	336°11.0	• • 18.1	49°59.3	• • 46.5	30°55.4	• • 25.3	201°17.0	• • 37.9	Arcturus	145°45.1	19°01.7
10	249°22.4	351°10.1	18.4	65°00.9	46.1	45°57.6	25.4	$216^{\circ}19.5$	37.9	Rigil Kent.	139°36.0	-60°57.1
11	264°24.9	6°09.2	18.8	80°02.5	45.8	60°59.8	25.5	231°22.0	37.9	Kochab	137°20.9	74°01.8
12	279°27.4	21°08.3	S22°19.2	95°04.0	N00°45.4	76°01.9	S08°25.6	246°24.5	N10°37.9	Zuben'ubi	136°52.6	-16°09.7
13	294°29.8	36°07.4	19.5	110°05.6	45.1	91°04.1	25.7	261°27.0	37.9		130° 52.0 126° 01.3	26°36.9
14	309°32.3	51°06.5	19.9	125°07.2	44.7	106°06.3	25.8	276°29.5	37.9	Alphecca		
15	324°34.8	66°05.6	20.2	140°08.7	• • 44.4	121°08.5	25.9	291°32.0	• • 37.9	Antares	112°12.2	-26°29.6
16	339°37.2	81°04.7	20.6	155° 10.3	44.1	136° 10.7	26.0	306°34.5	37.9	Atria	107°03.9	-69°04.5
17	354°39.7	96°03.8	20.9	170°11.8	43.7	151° 12.8	26.1	321°37.0	37.9	Sabik	101°59.4	-15°45.5
18	9°42.2	111°02.9	522°21.3	185° 13.4	N00°43.4	166° 15.0	S08°26.2	336°39.5	N10°38.0	Shaula	96°06.4	-37°07.3
										Rasalhague	95°55.9	12°32.4
19	24°44.6	126°02.0	21.6	200°15.0	43.0	181°17.2	26.3	351°42.0	38.0	Eltanin	90°41.2	$51^{\circ}29.1$
20	39°47.1	141°01.1	22.0	215° 16.5	42.7	196° 19.4	26.4	6°44.5	38.0	Kaus Aust.	83°28.7	-34°22.1
21	54°49.6	156°00.2	• • 22.3	230° 18.1	• • 42.3	211°21.6	• • 26.5	21°46.9	• • 38.0	Vega	80°31.5	38°48.7
22	69°52.0	170°59.3	22.6	245° 19.7	42.0	226°23.7	26.6	36°49.4	38.0	Nunki	75°44.1	-26°15.5
23	84°54.5	185°58.4	23.0	260°21.2	41.7	241°25.9	26.7	51°51.9	38.0	Altair	61°57.1	8°56.8
N 4 - · · · ·	17:01	0 0/ -10	.4′ m-3.91	-16/-16	0.3' m0.64	- 2 2/ -10	1′ m-1.90	2 5/ -10	.0′ m0.20	Peacock	53°01.3	-56°38.5
ivier.p	ass. 17:21	ν -0.9 a0.	.4 m-3.91	ν 1.0 a-0	0.3° mu.04	ν 2.2 au.	1 m-1.90	ν2.5 αυ	.0 mu.20	1	49° 23.9	45°23.3
										Deneb		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.7
0	99°56.9	200° 57.5	S22°23.3	275°22.8	N00°41.3	256°28.1	508°26.8	66°54.4	N10°38.0	Al Na'ir	27°29.3	-46°49.3
1	114°59.4	215° 56.5	23.7	290°24.4	41.0	271°30.3	26.9	81°56.9	38.0	Fomalhaut	15°11.2	-29°28.2
2	114 59.4 130°01.9	215 50.5 230°55.6	24.0	305°25.9	40.6	271 30.3 286°32.5	20.9	96°59.4	38.0	Scheat	13°42.2	28°14.7
										Markab	13°26.8	15°21.9
3	145°04.3	245°54.7	• • 24.3	320°27.5	• • 40.3	301°34.7	• • 27.1	112°01.9	• • 38.0	D 00 5	C114	N4.
4	160°06.8	260°53.8	24.7	335°29.1	39.9	316°36.8	27.2	127°04.4	38.0	Dec 29 Fri	SHA	Mer.pass
5	175°09.3	275°52.9	25.0	350°30.6	39.6	331°39.0	27.3	142°06.9	38.0	Venus	103°41.8	10:34
6	190°11.7	290° 52.0	S22°25.3	5°32.2	N00°39.3	346°41.2	S08°27.4	157°09.4	N10°38.0	Mars		05:43
7	$205^{\circ}14.2$	$305^{\circ}51.1$	25.7	20°33.8	38.9	1°43.4	27.5	172°11.9	38.0	Jupiter	156°44.9	07:00
8	220°16.7	$320^{\circ}50.2$	26.0	35°35.3	38.6	16°45.6	27.6	187°14.4	38.0	Saturn	326°55.9	19:37
9	235°19.1	335°49.3	26.3	50°36.9	• • 38.2	31°47.8	• • 27.7	202°16.9	• • 38.0	D 20.5	C	
10	250°21.6	350°48.4	26.7	65°38.5	37.9	46°50.0	27.8	217°19.3	38.0	Dec 30 Sat	SHA	Mer.pass
11	265°24.0	5° 47.5	27.0	80°40.1	37.6	61°52.1	27.9	232°21.8	38.0	I	102°21.3	10:35
12	280°26.5	20°46.6	\$22°27.3	95°41.6	N00°37.2	76°54.3	S08°28.0	247°24.3	N10°38.0		175°47.5	05:40
13	295°29.0	35° 45.7	27.7	110°43.2	36.9	91°56.5	28.1	262°26.8	38.0		156°38.0	06:57
14	295 29.0 310°31.4	50°44.8	28.0	110 43.2 125°44.8	36.5	91 50.5 106°58.7	28.2	202 20.6 277°29.3		Saturn	326°56.7	19:33
									38.0	D 22 -	<u> </u>	
	325°33.9	65°43.9	• • 28.3	140°46.4	36.2	122°00.9	• • 28.3	292°31.8	• • 38.0	Dec 31 Sun	SHA	Mer.pass
15		80°43.0	28.6	155° 47.9	35.9	137°03.1	28.4	307°34.3	38.0	I	101°00.5	10:37
15 16	340°36.4	95°42.0	28.9	170°49.5	35.5	152°05.3	28.5	322°36.8	38.0	Mars	175°25.9	05:38
15 16 17	355°38.8			$185^{\circ}51.1$	$N00^{\circ}35.2$	167°07.4	S08°28.6	337°39.3	$N10^{\circ}38.0$	I tourismu	156021.0	06:53
15 16 17 18	355°38.8 10°41.3	$110^{\circ}41.1$	S22°29.3							Jupiter	156°31.2	00.00
15 16 17	355°38.8 10°41.3 25°43.8	110°41.1 125°40.2	\$22°29.3 29.6	$200^{\circ}52.7$	34.9	182°09.6	28.7	352°41.8	38.0	Saturn	326° 57.5	19:29
15 16 17 18	355°38.8 10°41.3	$110^{\circ}41.1$			34.9 34.5		28.7 28.8		38.0 38.0	Saturn	326°57.5	
15 16 17 18 19	355°38.8 10°41.3 25°43.8	110°41.1 125°40.2	29.6	$200^{\circ}52.7$		182°09.6		352°41.8		Saturn		
15 16 17 18 19 20	355°38.8 10°41.3 25°43.8 40°46.2	110°41.1 125°40.2 140°39.3	29.6 29.9	200°52.7 215°54.2	34.5	182°09.6 197°11.8	28.8 •• 28.9	352°41.8 7°44.2	38.0	Saturn	326°57.5	
15 16 17 18 19 20 21	355°38.8 10°41.3 25°43.8 40°46.2 55°48.7 70°51.2	110°41.1 125°40.2 140°39.3 155°38.4 170°37.5	29.6 29.9 · · · 30.2 30.5	200° 52.7 215° 54.2 230° 55.8 245° 57.4	34.5 •• 34.2	182°09.6 197°11.8 212°14.0 227°16.2	28.8	352°41.8 7°44.2 22°46.7 37°49.2	38.0 •• 38.0 38.0	Saturn	326°57.5 tal parallax	19:29
15 16 17 18 19 20 21 22 23	355°38.8 10°41.3 25°43.8 40°46.2 55°48.7	110° 41.1 125° 40.2 140° 39.3 155° 38.4 170° 37.5 185° 36.6	29.6 29.9 · · 30.2	200° 52.7 215° 54.2 230° 55.8 245° 57.4 260° 59.0	34.5 · · 34.2 33.8	182°09.6 197°11.8 212°14.0 227°16.2 242°18.4	28.8 •• 28.9 29.0	352°41.8 7°44.2 22°46.7 37°49.2 52°51.7	38.0 · · 38.0	Saturn	326°57.5 tal parallax Venus:	0.1

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°29.4	S23°12.4	35°47.6	8.5'	N24°22.7	3.6'	56.2'
1	194°29.1	12.2	50°15.1	8.4'	$24^{\circ}26.3$	3.5'	56.2'
2	209°28.8	12.1	64°42.4	8.3'	24°29.8	3.4'	56.2'
3	224°28.5	• • 11.9	79°09.8	8.2'	24°33.2	3.2'	56.3'
4	239°28.2	11.8	93°37.0	8.2'	24°36.4	3.1'	56.3'
5	254°27.9	11.6 \$23°11.5	108°04.2 122°31.3	8.1'	24°39.5 N24°42.5	3.0'	56.3'
6 7	269°27.6 284°27.3	523 11.5 11.3	122 31.3 136°58.4	8.0' 8.0'	N24 42.5 24°45.3	2.8' 2.7'	56.4' 56.4'
8	299°27.0	11.3	150° 56.4 151° 25.3	7.9'	24°48.0	2.6'	56.4
9	314°26.7	• • 11.0	165°52.3	7.9'	24° 50.6	2.4	56.4
10	329°26.4	10.9	180°19.1	7.8'	24°53.0	2.3'	56.5'
11	344°26.1	10.7	194°45.9	7.7'	24°55.3	2.1'	56.5'
12	359°25.8	\$23°10.5	209°12.6	7.7'	N24°57.5	2.0'	56.5'
13	14°25.5	10.4	223°39.3	7.6'	24° 59.5	1.9'	56.6'
14	29°25.2	10.2	238°05.9	7.6'	25°01.3	1.7'	56.6'
15 16	44°24.9 59°24.6	· · 10.1 09.9	252°32.5 266°59.0	7.5' 7.5'	25°03.1 25°04.6	1.6' 1.4'	56.6' 56.6'
17	74°24.3	09.7	281°25.5	7.3 7.4'	25°04.0	1.3'	56.7
18	89°24.0	\$23°09.6	295°51.9	7.3'	N25°07.4	1.2'	56.7
19	104°23.7	09.4	310°18.2	7.3'	25°08.5	1.0'	56.7'
20	119°23.4	09.2	324°44.5	7.3'	25°09.5	0.9'	56.8'
21	134°23.1	•• 09.1	339°10.8	7.2'	25°10.4	0.7'	56.8'
22	149°22.8	08.9	353°37.0	7.2'	25°11.1	0.6'	56.8'
23	164°22.5	08.7	8°03.1	7.1'	25°11.7	0.4'	56.9'
	SD = 16.3'	d = -0.1'		SI	O = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0 0	179°22.2	\$23°08.6	22°29.2	7.1'	N25° 12.1	0.3	56.9'
1	194°21.9	08.4	36°55.3	7.0'	25° 12.4	0.1'	56.9'
2	209°21.6	08.2	51°21.3	7.0'	$25^{\circ}12.5$	-0.0'	56.9'
3	224°21.3	•• 08.1	65°47.3	7.0'	25° 12.5	-0.2'	57.0'
4	239°21.0	07.9	80°13.3	6.9'	25°12.3	-0.3	57.0'
5	254°20.7	07.7	94°39.2	6.9'	25°12.0	-0.5'	57.0'
6 7	269°20.4 284°20.1	\$23°07.5 07.4	109°05.1 123°30.9	6.9' 6.8'	N25°11.5 25°10.9	-0.6' -0.8'	57.1' 57.1'
8	284 20.1 299°19.8	07.4 07.2	123 30.9 137°56.8	6.8	25 10.9 25°10.1	-0.8 -0.9'	57.1'
9	314°19.5	• • 07.0	157° 30.8	6.8	25°09.2	-0.9	57.1'
10	329°19.2	06.8	166°48.3	6.7'	25°08.1	-1.2	57.2'
11	344°18.9	06.7	181°14.0	6.7'	25°06.9	-1.4'	57.2'
12	359°18.6	\$23°06.5	195°39.7	6.7'	N25°05.5	-1.5'	57.2'
13	14°18.3	06.3	210°05.4	6.7'	25°03.9	-1.7'	57.3'
14	29°18.0	06.1	224°31.1	6.6'	25°02.3	-1.8'	57.3'
15	44°17.7 59°17.4	· · 06.0 05.8	238°56.7 253°22.4	6.6'	25°00.4 24°58.4	-2.0' -2.1'	57.3' 57.3'
16 17	59 17.4 74°17.1	05.8 05.6	253 22.4 267°48.0	6.6' 6.6'	24 58.4 24°56.3	-2.1 -2.3'	57.3 57.4'
18	89°16.8	S23°05.4	282°13.6	6.6'	N24°54.0	-2.5'	57.4
19	104°16.5	05.2	296°39.2	6.6'	24°51.5	-2.6'	57.4'
20	119°16.3	05.0	311°04.7	6.6'	24°48.9	-2.8'	57.4'
21	134°16.0	• • 04.9	325°30.3	6.6'	$24^{\circ}46.1$	-2.9'	57.5'
22	149°15.7	04.7	339°55.8	6.5'	24°43.2	-3.1'	57.5'
23	164°15.4	04.5	354°21.4	6.5'	24°40.2	-3.2'	57.5'
	SD = 16.3'	d = -0.2'		SI	O = 15.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.1	\$23°04.3	8°46.9	6.5'	N24°36.9	-3.4'	57.6'
1	194°14.8	04.1	23°12.5	6.5'	24°33.6	-3.5'	57.6'
2	209°14.5 224°14.2	03.9 · · 03.7	37°38.0 52°03.5	6.5' 6.5'	24°30.0 24°26.4	-3.7' -3.8'	57.6' 57.6'
3 4	224°14.2 239°13.9	03.7	52°03.5 66°29.1	6.5'	24°26.4 24°22.5	-3.8° -4.0'	57.6° 57.7'
5	254°13.6	03.3	80°54.6	6.5	24° 22.5	-4.1'	57.7'
6	269°13.3	S23°03.1	95°20.2	6.6'	N24°14.4	-4.3	57.7'
7	284°13.0	03.0	109°45.7	6.6'	24° 10.1	-4.4'	57.7'
8	299°12.7	02.8	124°11.3	6.6'	$24^{\circ}05.6$	-4.6'	57.8'
9	314°12.4	•• 02.6	138°36.8	6.6'	24°01.1	-4.7'	57.8'
10	329°12.1	02.4	153°02.4	6.6'	23°56.3	-4.9'	57.8'
11	344°11.8 359°11.5	02.2 \$23°02.0	167°28.0 181°53.6	6.6'	23°51.4	-5.1'	57.8'
12 13	359°11.5 14°11.2	\$23°02.0 01.8	181°53.6 196°19.2	6.6' 6.6'	N23°46.4 23°41.2	-5.2' -5.4'	57.9' 57.9'
13	29°10.9	01.8	210°44.9	6.7'	23° 35.8	-5.4 -5.5'	57.9' 57.9'
15	44°10.6	01.4	225°10.5	6.7	23°30.3	-5.6'	58.0'
16	59°10.3	01.2	239°36.2	6.7'	23°24.7	-5.8'	58.0'
17	74°10.0	01.0	254°01.9	6.7'	23° 18.9	-5.9'	58.0'
18	89°09.7	\$23°00.8	268°27.6	6.7'	N23°12.9	-6.1'	58.0'
19	104°09.4	00.6	282°53.4	6.8'	23°06.8	-6.2'	58.1'
20	119°09.2	00.4	297°19.1	6.8'	23°00.6	-6.4'	58.1'
21 22	134°08.9 149°08.6	· · 00.2 23°00.0	311°44.9 326°10.8	6.8' 6.9'	22°54.2 22°47.7	-6.5' -6.7'	58.1' 58.1'
23	149°08.6 164°08.3	23° 00.0 22° 59.8	320°10.8 340°36.6	6.9'	22°47.7 22°41.0	-6.8'	58.1
20	SD = 16.3'	d = -0.2'			D = 15.7'	3.0	50.1
	3D = 10.3	<i>u</i> = −0.2		51	J — 13.7°		

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

Lat.	Moonrise			Moonset		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 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
N 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
N 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
S 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
S 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
S 60°	20:01	20:52	21:23	00:09	00:52	01:59

ſ		Sun			Moon		
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age
1	,	00 ^h	12 ^h	Pass	Upper	Lower	13-15
L		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%
	29	02:02	02:17	12:02	22:27	09:59	
١	30	02:31	02:45	12:03	23:23	10:55	
-	31	03:00	03:14	12:03	-:-	11:52	