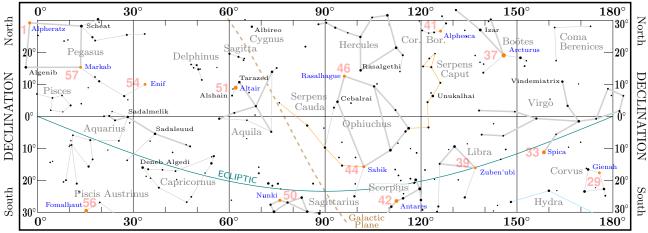
GENERATED USING SKYFIELD

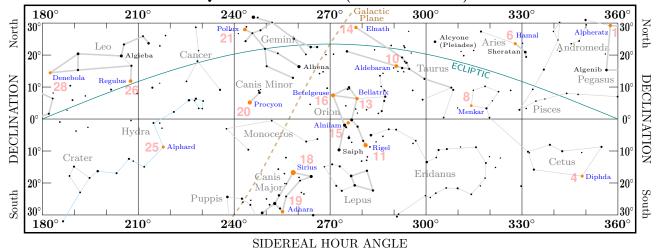
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



THE NAUTICAL ALMANAC

2029

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 (Mon., Tue., Wed.)

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Mer.pass. 17:06 ν -0.9′ d 0.3′ m-3.91 ν 1.6′ d -0.3′ m0.57 ν 2.2′ d 0.1′ m-1.92 ν 2.5′ d 0.0′ m0.22	23	ŏŏ⁻51.U							55-50.4	ა წ.5		ividi 3.	0.1
	Mer.pa	ass. 17:06	ν -0.9 $^{\prime}$ d0.	.3′ m-3.91	ν 1.6′ d-0	.3′ m0.57	ν 2.2′ d0.	1′ m-1.92	ν 2.5′ d0	.0′ m0.22			

h	Sun				Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.0	\$22°59.6	355°02.5	6.9'	N22°34.2	-7.0'	58.2'
1	194°07.7	59.3	9°28.4	6.9'	22°27.2	-7.1'	58.2'
2	209°07.4	59.1	23°54.4	7.0'	22°20.1	-7.2'	58.2'
3 4	224°07.1 239°06.8	· · 58.9 58.7	38°20.3 52°46.4	7.0' 7.1'	22°12.8 22°05.5	-7.4' -7.5'	58.2' 58.3'
5	254°06.5	58.5	67°12.4	7.1 7.1'	22 05.5 21°57.9	-7.5 -7.7'	58.3'
6	269°06.2	S22°58.3	81°38.5	7.1'	N21°50.3	-7.8'	58.3'
7	284°05.9	58.1	96°04.6	7.2'	21°42.5	-7.9'	58.3'
8	299°05.6	57.9	110°30.8	7.2'	21°34.5	-8.1'	58.4'
9 10	314°05.3 329°05.1	· · 57.7 57.4	124°57.0 139°23.3	7.3' 7.3'	21°26.4 21°18.2	-8.2' -8.4'	58.4' 58.4'
11	344°04.8	57.4 57.2	159°25.5	7.3'	21°09.9	-8.5'	58.4
12	359°04.5	S22°57.0	168°15.9	7.4'	N21°01.4	-8.6'	58.4
13	14°04.2	56.8	182°42.3	7.4'	$20^{\circ}52.8$	-8.8'	58.5'
14	29°03.9	56.6	197°08.7	7.5'	20°44.0	-8.9'	58.5'
15 16	44°03.6 59°03.3	· · 56.4 56.1	211°35.2 226°01.7	7.5' 7.6'	20°35.1 20°26.1	-9.0' -9.1'	58.5' 58.5'
17	74°03.0	55.9	240°28.2	7.6'	20° 17.0	-9.1 -9.3'	58.5
18	89°02.7	S22°55.7	254°54.9	7.7'	N20°07.7	-9.4	58.6'
19	104°02.4	55.5	$269^{\circ}21.5$	7.7'	19°58.3	-9.5'	58.6'
20	119°02.1	55.3	283°48.2	7.8'	19°48.8	-9.6'	58.6'
21 22	134°01.8 149°01.6	• • 55.0 54.8	298°15.0 312°41.8	7.8' 7.9'	19°39.1 19°29.4	-9.8' -9.9'	58.6' 58.6'
23	164° 01.3	54.6	312 41.6 327°08.6	7.9' 7.9'	19 29.4 19°19.5	-9.9 -10.0'	58.7'
	SD = 16.3'	d = -0.2'			D = 15.9'		
	JD = 10.3	u — -∪.∠		31	J — 13.9°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°01.0 194°00.7	\$22°54.4 54.1	341°35.5 356°02.5	8.0' 8.0'	N19°09.5 18°59.3	-10.1' -10.2'	58.7' 58.7'
2	194°00.7 209°00.4	54.1 53.9	350°02.5 10°29.5	8.0	18° 59.3 18° 49.1	-10.2 -10.4	58.7' 58.7'
3	224°00.1	53.7	24°56.6	8.1'	18°38.7	-10.5'	58.7'
4	238°59.8	53.4	39°23.7	8.2'	18°28.2	-10.6'	58.8'
5	253°59.5	53.2	53°50.9	8.2'	18° 17.6	-10.7'	58.8'
6	268° 59.2 283° 58.9	\$22°53.0 52.8	68°18.1 82°45.4	8.3' 8.3'	N18°06.9 17°56.1	-10.8' -10.9'	58.8' 58.8'
7 8	283°58.9 298°58.7	52.8 52.5	82°45.4 97°12.7	8.4'	17°55.1 17°45.2	-10.9 -11.0'	58.8'
9	313°58.4	52.3	111°40.1	8.4'	17°34.1	-11.2'	58.8'
10	$328^{\circ}58.1$	52.1	126°07.5	8.5'	17°23.0	-11.3'	58.9'
11	343°57.8	51.8	140°35.0	8.5'	17° 11.7	-11.4'	58.9'
12	358° 57.5 13° 57.2	S22°51.6	155°02.6	8.6'	N17°00.3	-11.5'	58.9'
13 14	28° 56.9	51.3 51.1	169°30.2 183°57.8	8.7' 8.7'	16°48.9 16°37.3	-11.6' -11.7'	58.9' 58.9'
15	43°56.6	50.9	198°25.6	8.8'	16°25.6	-11.8'	58.9'
16	58° 56.4	50.6	212°53.3	8.8'	16°13.8	-11.9'	58.9'
17	73°56.1	50.4	227°21.1	8.9'	16°02.0	-12.0'	59.0'
18	88° 55.8 103° 55.5	\$22°50.2	241°49.0 256°16.9	8.9' 9.0'	N15°50.0 15°37.9	-12.1' -12.2'	59.0' 59.0'
19 20	103 55.5 118°55.2	49.9 49.7	250 10.9 270°44.9	9.0°	15 37.9 15°25.8	-12.2 -12.3'	59.0'
21	133°54.9	49.4	285°13.0	9.1'	15° 13.5	-12.3'	59.0'
22	148°54.6	49.2	299°41.1	9.1'	15°01.2	-12.4'	59.0'
23	163°54.3	48.9	314°09.2	9.2'	14°48.7	-12.5'	59.0'
	SD = 16.3'	d = -0.2'		SI	O = 16.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 54.1	\$22°48.7	328°37.4	9.3'	N14°36.2	-12.6'	59.1'
1	193°53.8	48.5	343°05.7	9.3'	14°23.6	-12.7'	59.1'
2	208° 53.5 223° 53.2	48.2 •• 48.0	357°34.0 12°02.3	9.4' 9.4'	14°10.9 13°58.1	-12.8' -12.9'	59.1' 59.1'
4	238°52.9	47.7	26°30.7	9.4	13°45.2	-12.9	59.1'
5	253°52.6	47.5	40°59.2	9.5'	13°32.3	-13.0'	59.1'
6	268° 52.3	S22°47.2	55°27.7	9.6'	N13°19.2	-13.1'	59.1'
7	283°52.1 298°51.8	47.0 46.7	69°56.3 84°24.9	9.6' 9.7'	13°06.1 12°52.9	-13.2' -13.3'	59.1' 59.1'
8 9	298°51.8 313°51.5	46.7 • • 46.5	98°53.5	9.7' 9.7'	12°52.9 12°39.7	-13.3'	59.1° 59.2'
10	328°51.2	46.2	113°22.3	9.8'	12°26.3	-13.4'	59.2'
11	343°50.9	46.0	127°51.0	9.8'	12° 12.9	-13.5'	59.2'
12	358°50.6	S22°45.7	142°19.8	9.9'	N11°59.4	-13.6'	59.2'
13 14	13°50.3 28°50.1	45.4 45.2	156°48.7 171°17.6	9.9' 10.0'	11°45.9 11°32.3	-13.6' -13.7'	59.2' 59.2'
14 15	43°49.8	45.2 •• 44.9	171 17.6 185°46.6	10.0'	11 32.3 11°18.6	-13.7 -13.8'	59.2'
16	58° 49.5	44.7	200°15.6	10.0'	11°04.8	-13.8'	59.2'
17	73°49.2	44.4	214°44.6	10.1'	10°51.0	-13.9'	59.2'
18	88° 48.9	\$22°44.2	229°13.7	10.1'	N10°37.1	-13.9'	59.2'
19 20	103°48.6 118°48.4	43.9 43.6	243°42.8 258°12.0	10.2' 10.2'	10°23.2 10°09.2	-14.0' -14.1'	59.2' 59.3'
20	118 48.4 133°48.1	43.0 •• 43.4	258 12.0 272°41.2	10.2	10 09.2 09°55.1	-14.1 -14.1'	59.3'
22	148°47.8	43.1	$287^{\circ}10.5$	10.3'	09°41.0	-14.2'	59.3'
23	163°47.5	42.9	301°39.8	10.3'	09°26.8	-14.2'	59.3'
	SD = 16.3'	d = -0.2'		SI	O = 16.1'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 ^h	00 ^h 12 ^h		Upper	Lower	16-18		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-93%		
01	03:28	03:42	12:04	00:21	12:49			
02	03:56	04:10	12:04	01:16	13:44			
03	04:24	04:37	12:05	02:10 14:36				

January 04, 05, 06 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	103°53.5	199°29.4	\$22°50.6	277°55.5	N00°09.5	259°58.7	S08°35.9	70°52.9	N10°38.6			
1	118°56.0	214° 28.5	50.8	292°57.1	09.2	275°00.9	36.0	85°55.4	38.6	Alpheratz	357°31.4	29°15.3
2	133°58.4	229° 27.6	51.0	307°58.7	08.9	290°03.1	36.1	100°57.8	38.6	Ankaa	353°04.1	-42°09.0
3	149°00.9	244° 26.7	51.3	323°00.3	08.6	305°05.3	36.2	116°00.3	38.6	Schedar	349°27.2	56°42.1
4	164°03.4	259° 25.7	51.5	338°01.9	08.2	320°07.5	36.3	131°02.8	38.6	Diphda	348°44.1	-17°49.7
5	179°05.8	274° 24.8	51.7	353°03.5	07.9	335°09.8	36.4	146°05.3	38.6	Achernar	335°17.8	-57°05.6
6	194°08.3	289°23.9	S22°51.9	8°05.1	N00°07.6	350° 12.0	S08°36.5	161°07.7	N10°38.6	Hamal	327°47.4	23°36.1
7	209°10.8	304°22.9	52.1	23°06.8	07.3	5°14.2	36.6	176°10.2	38.6	Polaris	311°56.0	89°23.4
8	224°13.2	319°22.0	52.4	38°08.4	07.0	20° 16.4	36.7	191°12.7	38.6	Acamar	315°09.1	-40°11.5
9	239°15.7	$334^{\circ}21.1$	• • 52.6	53° 10.0	• • 06.7	35° 18.6	• • 36.7	206°15.2	• • 38.6	Menkar	314°02.6	4°12.2
10	254°18.1	349°20.2	52.8	68°11.6	06.3	50°20.8	36.8	221°17.6	38.6	Mirfak	308°23.2 290°35.6	49°58.0
11	269°20.6	4°19.2	53.0	83°13.2	06.0	65°23.0	36.9	236°20.1	38.7	Aldebaran	290 35.6 281°00.4	16°34.0
12	284°23.1	19° 18.3	S22°53.2	98° 14.9	N00°05.7	80°25.2	S08°37.0	251°22.6	N10°38.7	Rigel	281 00.4 280°16.6	-8°10.2 46°01.6
13	299°25.5	$34^{\circ}17.4$	53.4	113° 16.5	05.4	95°27.4	37.1	266°25.0	38.7	Capella Bellatrix	278° 19.1	6°22.4
14	314°28.0	$49^{\circ}16.4$	53.6	$128^{\circ}18.1$	05.1	$110^{\circ}29.6$	37.2	281°27.5	38.7	Elnath	277° 57.4	28°37.8
15	329°30.5	$64^{\circ}15.5$	• • 53.9	143° 19.7	• • 04.8	125°31.8	• • 37.3	296°30.0	· · 38.7	Alnilam	277 37.4 275°34.1	-1°11.1
16	344°32.9	79°14.6	54.1	158°21.3	04.4	140°34.0	37.4	311°32.5	38.7	Betelgeuse	270°48.2	7°24.6
17	359°35.4	$94^{\circ}13.6$	54.3	173°23.0	04.1	155°36.2	37.5	326°34.9	38.7	Canopus	263°50.4	-52°42.8
18	14°37.9	$109^{\circ}12.7$	S22°54.5	188°24.6	N00°03.8	170°38.5	508°37.5	341°37.4	$N10^{\circ}38.7$	Sirius	258° 23.0	-32 42.8 -16°45.5
19	29°40.3	$124^{\circ}11.8$	54.7	203°26.2	03.5	185°40.7	37.6	356°39.9	38.7	Adhara	255°02.9	-10°43.3 -29°00.8
20	44°42.8	139° 10.8	54.9	218°27.8	03.2	200°42.9	37.7	11°42.3	38.7	Procyon	255 02.9 244°47.1	-29 00.8 5°08.8
21	59°45.3	154°09.9	•• 55.1	233°29.5	• • 02.9	215° 45.1	• • 37.8	26°44.8	• • 38.8	Pollux	244 47.1 243°13.0	27°57.1
22	74°47.7	169°09.0	55.3	248°31.1	02.6	230°47.3	37.9	41°47.3	38.8	Avior	243 13.0 234°12.7	-59°36.2
23	89°50.2	184°08.1	55.5	263°32.7	02.2	245°49.5	38.0	56°49.8	38.8	Suhail	234 12.7 222°43.5	-59 30.2 -43°33.0
Mern	pass. 17:02	1/-0 0' d0	.2′ m-3.91	$v^{1.6}$ d.0	0.3′ m0.55	1/2 2/ An	1′ m-1.93	1/2 5/ do	.0′ m0.22	Miaplacidus	222 43.5 221°36.6	-43 33.0 -69°50.1
ivier.p	,uss. 11.UZ	ν-0.9 u0	111-3.91	ν1.0 U-C	,.5 1110.33	ν Δ.Δ UO.	1 111-1.93	ν2.3 u0	.0 1110.22	Alphard	221 30.0 217°44.3	-8°47.2
										Regulus	207°30.8	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.2
0	104°52.6	$199^{\circ}07.1$	\$22°55.7	278°34.3	N00°01.9	260°51.7	508°38.1	71°52.2	$N10^{\circ}38.8$	Denebola	182°21.6	14°24.4
1	$119^{\circ}55.1$	214°06.2	55.9	293°36.0	01.6	275°53.9	38.2	86°54.7	38.8	Gienah	175°40.1	-17°42.2
2	134°57.6	229°05.3	56.1	308°37.6	01.3	290°56.1	38.3	101°57.2	38.8	Acrux	172°56.2	-63°15.4
3	150°00.0	244°04.3	• • 56.3	323°39.2	•• 01.0	305°58.3	• • 38.3	116°59.6	• • 38.8	Gacrux	171°47.8	-57°16.4
4	165°02.5	259°03.4	56.5	338°40.9	00.7	321°00.6	38.4	132°02.1	38.8	Alioth	166°10.3	55°47.7
5	180°05.0	274°02.5	56.7	353°42.5	00.4	336°02.8	38.5	147°04.6	38.8	Spica	158° 18.9	-11°18.8
6	195°07.4	289°01.5	S22°56.8	8°44.1	N00°00.0	351°05.0	S08°38.6	162°07.1	N10°38.9	Alkaid	152°49.7	49°09.8
7	210°09.9	304°00.6	57.0	23°45.7	S00°00.3	6°07.2	38.7	177°09.5	38.9	Hadar	148°31.4	-60°30.5
8	225°12.4	318° 59.7	57.2	38°47.4	00.6	21°09.4	38.8	192°12.0	38.9	Menkent	147°53.8	-36°30.6
9	240°14.8	333°58.7	• • 57.4	53°49.0	• • 00.9	36° 11.6	• • 38.9	207°14.5	• • 38.9	Arcturus	145°45.1	19°01.7
10	255°17.3	348° 57.8	57.6	68°50.6	01.2	51° 13.8	39.0	222°16.9	38.9	Rigil Kent.	139°35.9	-60°57.1
11	270°19.7	3°56.8	57.8	83°52.3	01.5	66° 16.0	39.0	237°19.4	38.9	Kochab	137°20.8	74°01.8
12	285°22.2	18°55.9	S22°58.0	98°53.9	S00°01.8	81° 18.3	S08°39.1	252°21.9	N10°38.9	Zuben'ubi	136°52.6	-16°09.7
13	300°24.7	33°55.0	58.2	113°55.5	02.1	96°20.5	39.2	267°24.3	38.9	Alphecca	126°01.3	26°36.9
14	315°27.1	48° 54.0	58.3	128°57.2	02.4	111°22.7	39.3	282°26.8	38.9	Antares	$112^{\circ}12.1$	-26°29.6
15	330°29.6	63°53.1	• • 58.5	143°58.8	• • 02.7	126°24.9	• • 39.4	297°29.3	• • 39.0	Atria	$107^{\circ}03.9$	-69°04.5
16	345°32.1	78°52.2	58.7	159°00.4	03.1	141°27.1	39.5	312°31.7	39.0	Sabik	101°59.4	-15°45.5
17	0°34.5	93°51.2	58.9	174°02.1	03.4	156°29.3	39.6	327°34.2	39.0	Shaula	96°06.3	-37°07.3
18	15°37.0	108°50.3	\$22°59.0	189°03.7	S00°03.7	171°31.5	S08°39.6	342°36.7	N10°39.0	Rasalhague	95°55.9	12°32.4
19	30°39.5	123°49.4	59.2	204°05.4	04.0	186°33.8	39.7	357°39.1	39.0	Eltanin	90°41.2	51°29.1
20	45°41.9 60°44.4	138° 48.4 153° 47.5	59.4 •• 59.6	219°07.0 234°08.6	04.3 •• 04.6	201°36.0 216°38.2	39.8 •• 39.9	12°41.6 27°44.1	39.0 · · 39.0	Kaus Aust.	83°28.6	-34°22.1
21 22	75°46.9	168°46.6	59.7	249°10.3	04.9	231° 40.4	40.0	42°46.5	39.0	Vega	80°31.4	38°48.7
23	90°49.3	183°45.6	59.7 59.9	249 10.3 264° 11.9	04.9	246° 42.6	40.0	57°49.0	39.0	Nunki	75°44.1	-26°15.5
23	90 49.3			204 11.9	05.2	_				Altair	61°57.1	8°56.8
Mer.p	ass. 16:58	ν -0.9' d0	.2′ m-3.91	ν 1.6' d-0).3′ m0.54	$\nu 2.2' \ d0.$	1' m-1.93	$\nu 2.5' \ d0$.0′ m0.22	Peacock	53°01.3	-56°38.4
										Deneb	49°24.0	45°23.2
Sat.	GHA	GHA	Doc	GHA	Doc	GHA	Doc	GHA	Dec	Enif	33°35.8	10°00.6
Sat 0	105°51.8	198°44.7	Dec \$23°00.1	279° 13.5	Dec \$00°05.5	261°44.8	Dec \$08° 40.2	72°51.5		Al Na'ir	27°29.3	-46°49.3
1	105 51.8 120°54.2	213°43.7	00.2	279 13.3 294° 15.2	05.8	201 44.8 276° 47.1	40.3	87°53.9	39.1	Fomalhaut	15°11.2	-29°28.1
2	135°56.7	213° 43.7 228° 42.8	00.2	309°16.8	06.1	291°49.3	40.3	102°56.4	39.1	Scheat	13°42.2	28°14.7
3	150°59.2	243°41.9	. 00.6	324° 18.5	06.4	306°51.5	• • 40.4	117°58.9	39.1	Markab	13°26.8	15°21.9
4	166°01.6	258°40.9	00.7	339°20.1	06.8	321°53.7	40.4	133°01.3	39.1	Jan 04 Thu	SHA	Mer.pass
5	181°04.1	273°40.0	00.7	354°21.8	07.1	336°55.9	40.6	148°03.8	39.1	Venus	95°35.9	10:43
6	196°06.6	288°39.1	S23°01.1	9°23.4	S00°07.4	351°58.1	S08°40.7	163°06.3	N10°39.1		174°01.9	05:28
7	211°09.0	303°38.1	01.2	24°25.0	07.7	7°00.4	40.8	178°08.7	39.2	Jupiter	156°05.2	06:39
8	226°11.5	318° 37.2	01.4	39°26.7	08.0	22°02.6	40.8	193°11.2	39.2	Saturn	326°59.4	19:13
9	241°14.0	333° 36.2	01.6	54°28.3	08.3	37°04.8	40.9	208°13.7	39.2			
10	256°16.4	348° 35.3	01.7	69°30.0	08.6	52°07.0	41.0	223°16.1	39.2	Jan 05 Fri	SHA	Mer.pass
11	271°18.9	3°34.4	01.9	84°31.6	08.9	67°09.2	41.1	238°18.6	39.2	Venus	94°14.5	10:44
12	286°21.3	18° 33.4	\$23°02.0	99°33.3	500°09.2	82°11.5	S08°41.2	253°21.1			173°41.7	05:25
13	301°23.8	33°32.5	02.2	114°34.9	09.5	97° 13.7	41.3	268°23.5	39.2		155°59.1	06:36
14	316°26.3	48°31.6	02.3	129°36.6	09.8	112° 15.9	41.4	283°26.0	39.2	Saturn	326°59.6	19:09
15	331°28.7	63°30.6	02.5	144°38.2	. 10.1	127° 18.1	• • 41.4	298°28.4	39.3	Jan 06 Sat	SHA	Mer.pass
16	346°31.2	78° 29.7	02.6	159°39.9	10.4	142°20.3	41.5	313°30.9	39.3	Venus	92°52.9	10:46
17	1°33.7	93°28.7	02.8	174°41.5	10.7	157°22.6	41.6	328°33.4	39.3		173°21.8	05:23
18	16°36.1	108° 27.8	S23°02.9	189°43.2	S00°11.0	172°24.8	S08°41.7	343°35.8	N10°39.3		155°53.1	06:32
19	31°38.6	123°26.9	03.1	204°44.8	11.3	187°27.0	41.8	358°38.3	39.3	Saturn	326°59.7	19:05
20	46°41.1	138°25.9	03.2	219°46.5	11.6	202°29.2	41.9	13°40.8	39.3			
21	61°43.5	153°25.0	• • 03.4	234°48.1	• • 11.9	217°31.4	• • 41.9	28°43.2	• • 39.3	Horizont	al parallax	
22	76°46.0	$168^{\circ}24.0$	03.5	249°49.8	12.2	232° 33.7	42.0	43°45.7	39.4		Venus:	0.1
23	91°48.5	183°23.1	03.6	264°51.4	12.5	247°35.9	42.1	58°48.1	39.4		Mars:	0.1
Mar	pass. 16:54	7/-D D/ 4D	.2′ m-3.91	1/1 6/ An	.3′ m0.52	1/2 2/ 40	1′ m-1.94		.0′ m0.23			
ivici.p		ν 0.9 u0.	111-3.31	ν 1.0	.5 1110.52	ν Δ.Ζ UO.		ν 2.3 u0				

h	Su			Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.2	\$22°42.6	316°09.1	10.4'	N09°12.6	-14.3'	59.3'
1 2	193°46.9 208°46.7	42.3 42.1	330°38.5 345°08.0	10.4' 10.5'	08°58.3 08°44.0	-14.3' -14.4'	59.3' 59.3'
3	223°46.4	• • 41.8	359°37.4	10.5'	08°29.6	-14.4'	59.3'
4	238°46.1	41.5	14°06.9	10.5'	08°15.2	-14.5'	59.3'
5	253°45.8 268°45.5	41.3 S 22°41.0	28°36.5 43°06.0	10.6' 10.6'	08°00.7 N07°46.2	-14.5' -14.6'	59.3' 59.3'
6 7	268 45.5 283°45.3	\$22 41.0 40.7	43 06.0 57°35.6	10.6	07°31.6	-14.6'	59.3'
8	298°45.0	40.5	72°05.3	10.7'	07°17.0	-14.6'	59.3'
9	313°44.7	• • 40.2	86°35.0	10.7'	07°02.4	-14.7'	59.3'
10 11	328°44.4 343°44.1	39.9 39.6	101°04.7 115°34.4	10.7' 10.8'	06°47.7 06°33.0	-14.7' -14.8'	59.3' 59.3'
12	358°43.9	\$22°39.4	130°04.2	10.8'	N06°18.2	-14.8'	59.3'
13	13°43.6	39.1	144°34.0	10.8'	06°03.4	-14.8'	59.3'
14 15	28°43.3 43°43.0	38.8 •• 38.5	159°03.8 173°33.7	10.9' 10.9'	05°48.6 05°33.7	-14.9' -14.9'	59.3' 59.3'
16	58°42.7	38.3	188°03.6	10.9	05°18.9	-14.9'	59.4'
17	73°42.5	38.0	$202^{\circ}33.5$	10.9'	05°03.9	-14.9'	59.4'
18	88°42.2 103°41.9	\$22° 37.7	217°03.4	11.0'	N04°49.0 04°34.0	-15.0'	59.4
19 20	103°41.9 118°41.6	37.4 37.2	231°33.4 246°03.3	11.0' 11.0'	04°34.0 04°19.0	-15.0' -15.0'	59.4' 59.4'
21	133°41.3	36.9	260°33.3	11.0'	04°04.0	-15.0'	59.4
22	148°41.1	36.6	275°03.4	11.0'	03°49.0	-15.1'	59.4'
23	163°40.8	36.3	289°33.4	11.1'	03°33.9	-15.1'	59.4'
	SD = 16.3'	d = -0.3'		SI	O = 16.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.5	\$22°36.0	304°03.5	11.1'	N03°18.9	-15.1'	59.4'
1 2	193°40.2 208°39.9	35.7 35.5	318°33.5 333°03.6	11.1' 11.1'	03°03.8 02°48.7	-15.1' -15.1'	59.4' 59.4'
3	223°39.7	35.2	347°33.8	11.1	02°33.5	-15.1'	59.4
4	238°39.4	34.9	$2^{\circ}03.9$	11.1'	$02^{\circ}18.4$	-15.1'	59.4'
5	253°39.1 268°38.8	34.6 S 22°34.3	16°34.0 31°04.2	11.2' 11.2'	02°03.3 N01°48.1	-15.2'	59.4'
6 7	283°38.6	34.0	45°34.3	11.2'	01°32.9	-15.2' -15.2'	59.4' 59.4'
8	298°38.3	33.7	60°04.5	11.2'	01°17.8	-15.2'	59.4'
9	313°38.0	• • 33.5	74°34.7	11.2'	01°02.6	-15.2'	59.4'
10 11	328°37.7 343°37.5	33.2 32.9	89°04.9 103°35.1	11.2' 11.2'	00°47.4 00°32.2	-15.2' -15.2'	59.4' 59.4'
12	358°37.2	S22°32.6	118°05.3	11.2'	N00°17.1	-15.2'	59.4
13	13°36.9	32.3	132°35.5	11.2'	N00°01.9	-15.2'	59.4'
14 15	28°36.6 43°36.3	32.0 · · 31.7	147°05.7 161°36.0	11.2' 11.2'	\$00°13.3 00°28.5	15.2' 15.2'	59.4' 59.4'
16	58°36.1	31.4	176°06.2	11.2'	00°23.7	15.2'	59.4
17	73°35.8	31.1	190°36.4	11.2'	00°58.8	15.2'	59.4'
18 19	88°35.5 103°35.2	\$22°30.8 30.5	205°06.6 219°36.8	11.2' 11.2'	\$01°14.0 01°29.1	15.2' 15.1'	59.3' 59.3'
20	118°35.0	30.5	219 30.8 234°07.1		01°29.1	15.1	59.3'
21	133°34.7	• • 29.9	248°37.3	11.2'	01°59.4	15.1'	59.3'
22	148°34.4	29.6	263°07.5	11.2'	02°14.5	15.1'	59.3'
23	$\frac{163^{\circ}34.2}{SD = 16.3'}$	29.3	277°37.7	11.2'	02°29.6	15.1'	59.3'
	SD = 10.3	d = -0.3'		31	O = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°33.9 193°33.6	\$22°29.0 28.7	292°07.9 306°38.1	11.2' 11.2'	\$02°44.7 02°59.8	15.1' 15.1'	59.3' 59.3'
2	208°33.3	28.4	321°08.3	11.2'	03°14.8	15.0'	59.3
3	223°33.1	• • 28.1	335°38.4	11.2'	03°29.9	15.0'	59.3'
4 5	238°32.8 253°32.5	27.8 27.5	350°08.6 4°38.7	11.1' 11.1'	03°44.9 03°59.9	15.0' 15.0'	59.3' 59.3'
6	268°32.2	\$22°27.2	19°08.9	11.1'	504°14.8	14.9	59.3'
7	283°32.0	26.9	33°39.0	11.1'	04°29.8	14.9'	59.3'
8 9	298°31.7 313°31.4	26.6 •• 26.3	48°09.1 62°39.2	11.1' 11.1'	04°44.7 04°59.6	14.9' 14.9'	59.3' 59.3'
10	328°31.1	26.0	77°09.2	11.1'	04 39.0 05°14.4	14.8'	59.3'
11	343°30.9	25.7	91°39.3	11.0'	05°29.2	14.8'	59.3'
12	358°30.6 13°30.3	\$22°25.4	106°09.3 120°39.3	11.0'	\$05°44.0 05°58.8	14.8'	59.3'
13 14	13°30.3 28°30.1	25.0 24.7	120°39.3 135°09.3	11.0' 11.0'	05°58.8 06°13.5	14.7' 14.7'	59.3' 59.3'
15	43°29.8	• • 24.4	$149^{\circ}39.3$	10.9'	06°28.2	14.6'	59.3'
16	58°29.5	24.1	164°09.2	10.9'	06°42.8	14.6'	59.3'
17 18	73°29.3 88°29.0	23.8 S 22°23.5	178°39.2 193°09.0	10.9' 10.9'	06°57.4 \$07°12.0	14.6' 14.5'	59.2' 59.2'
19	103°28.7	23.2	207°38.9	10.8'	07°26.5	14.5'	59.2'
20	118°28.4	22.8	222°08.7	10.8'	07°41.0	14.4'	59.2'
21 22	133°28.2 148°27.9	· · 22.5 22.2	236°38.6 251°08.3	10.8' 10.7'	07°55.4 08°09.8	14.4' 14.3'	59.2' 59.2'
23	163°27.6	21.9	265°38.1	10.7'	08°24.2	14.3'	59.2
	SD = 16.3'	d = -0.3'		SI	O = 16.2'		
	-						

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
Luy	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-68%	
04	04:51	05:05	12:05	03:02	15:27		
05	05:18	05:31	12:06	03:51	16:16		
06	05:44	05:58	12:06	04:41	17:06		

January 07, 08, 09 UT (Sun., Mon., Tue.)

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	106°50.9	198°22.2	\$23°03.8	279°53.1	500°12.8	262°38.1	S08°42.2	73°50.6	N10°39.4			
1	121°53.4	213°21.2	03.9	294°54.7	13.1	277°40.3	42.3	88°53.1	39.4	Alpheratz	$357^{\circ}31.4$	29°15.3
2	136°55.8	228° 20.3	04.1	309°56.4	13.4	292° 42.5	42.4	103°55.5	39.4	Ankaa	353°04.1	-42°09.0
3	151°58.3	243° 19.3	04.2	324°58.0	13.7	307°44.8	• • 42.4	118°58.0	39.4	Schedar	349°27.2	56°42.1
4	167°00.8	258° 18.4	04.3	339°59.7	14.0	322°47.0	42.5	134°00.5	39.4	Diphda	348°44.1	-17°49.7
5	182°03.2	273° 17.5	04.5	355°01.3	14.3	337°49.2	42.6	149°02.9	39.5	Achernar	335°17.8	-57°05.6
6	197°05.7	288° 16.5	\$23°04.6	10°03.0	S00°14.6	352°51.4	S08°42.7	164°05.4	N10°39.5	Hamal	327°47.4	23°36.1
7	212°08.2	303°15.6	04.7	25°04.6	14.9	7°53.7	42.8	179°07.8	39.5	Polaris	311°57.2	89°23.4
8	227°10.6	318° 14.6	04.9	40°06.3	15.2	22°55.9	42.9	194°10.3	39.5	Acamar	315°09.1	-40°11.5
9	242°13.1	333° 13.7	• • 05.0	55°08.0	• • 15.5	37°58.1	• • 42.9	209°12.8	• • 39.5	Menkar	314°02.6 308°23.2	4°12.2
10	257°15.6	$348^{\circ}12.7$	05.1	70°09.6	15.8	53°00.3	43.0	224°15.2	39.5	Mirfak	308 23.2 290°35.6	49°58.0 16°34.0
11	272°18.0	3°11.8	05.2	85°11.3	16.1	68°02.6	43.1	239°17.7	39.5	Aldebaran Rigel	290 35.0 281°00.4	-8° 10.2
12	287°20.5	$18^{\circ}10.9$	\$23°05.4	100°12.9	S00°16.4	83°04.8	508°43.2	$254^{\circ}20.1$	N10°39.6	Capella	280°16.6	46°01.6
13	302°23.0	$33^{\circ}09.9$	05.5	115°14.6	16.7	98°07.0	43.3	269°22.6	39.6	Bellatrix	278°19.1	6°22.4
14	317°25.4	48°09.0	05.6	130°16.3	17.0	113°09.2	43.4	284°25.1	39.6	Elnath	277°57.4	28°37.8
15	332°27.9	63°08.0	• • 05.7	145° 17.9	• • 17.3	128° 11.5	• • 43.4	299°27.5	• • 39.6	Alnilam	275°34.1	-1°11.1
16	347°30.3	78°07.1	05.9	160° 19.6	17.6	143°13.7	43.5	314°30.0	39.6	Betelgeuse	270°48.2	7°24.6
17	2°32.8	93°06.2	06.0	175°21.2	17.9	158° 15.9	43.6	329°32.4	39.6	Canopus	263°50.4	-52°42.8
18	17°35.3	108°05.2	S23°06.1	190°22.9	500°18.2	173°18.1	508°43.7	344°34.9	N10°39.6	Sirius	258°23.0	-16°45.5
19	32°37.7	123°04.3	06.2	205°24.6	18.5	188°20.4	43.8	359°37.3	39.7	Adhara	255°02.9	-29°00.8
20	47°40.2	138°03.3	06.3	220°26.2	18.8	203°22.6	43.8	14°39.8	39.7	Procyon	244°47.1	5°08.8
21	62°42.7 77°45.1	153°02.4	06.4	235°27.9	19.1	218°24.8	• • 43.9	29°42.3 44°44.7	•• 39.7	Pollux	243°13.0	27°57.1
22		168°01.4	06.6	250°29.6	19.4	233°27.1	44.0		39.7	Avior	$234^{\circ}12.7$	-59°36.2
23	92°47.6	183°00.5	06.7	265°31.2	19.7	248°29.3	44.1	59°47.2	39.7	Suhail	222°43.4	-43°33.0
Mer.p	ass. 16:50	ν -0.9' d0.	.1' m-3.91	ν 1.7′ d0.	.3′ m0.50	ν 2.2′ d0.	1' m-1.94	ν 2.5 $^{\prime}$ d0	.0′ m0.23	Miaplacidus	221°36.6	-69°50.1
									_	Alphard	217°44.3	-8°47.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	107°50.1	197°59.6	\$23°06.8	280° 32.9	S00°20.0	263°31.5	508°44.2	74°49.6	N10°39.7	Dubhe	193°36.9	61°35.2
1	107 50.1 122°52.5	212°58.6	06.9	295°34.6	20.3	278° 33.7	44.2	89°52.1	39.8	Denebola	182°21.5	14°24.4
2	137°55.0	212 50.0 227° 57.7	07.0	310°36.2	20.6	293°36.0	44.3	104°54.5	39.8	Gienah	175°40.1	-17°42.2
3	152°57.4	242°56.7	07.1	325°37.9	20.9	308°38.2	• • 44.4	119°57.0	• • 39.8		172°56.1	-63°15.4
4	167°59.9	257° 55.8	07.2	340°39.6	21.2	323°40.4	44.5	134°59.5	39.8	Gacrux	171°47.7	-57°16.4
5	183°02.4	272°54.8	07.3	355°41.2	21.5	338°42.7	44.6	150°01.9	39.8	Alioth	166°10.2	55°47.7
6	198°04.8	287°53.9	\$23°07.4	10°42.9	S00°21.7	353°44.9	S08°44.7	165°04.4	N10°39.8	Spica	158°18.9	-11°18.8
7	213°07.3	302°52.9	07.5	25°44.6	22.0	8°47.1	44.7	180°06.8	39.9	Alkaid	152°49.6	49°09.8
8	228°09.8	317°52.0	07.6	40°46.2	22.3	23°49.3	44.8	195°09.3	39.9	Hadar	148°31.4	-60°30.5
9	243°12.2	332°51.1	• • 07.7	55° 47.9	22.6	38°51.6	• • 44.9	210°11.7	• • 39.9	Menkent	147°53.8 145°45.1	-36°30.6
10	258°14.7	$347^{\circ}50.1$	07.8	70°49.6	22.9	53°53.8	45.0	225°14.2	39.9	Arcturus Rigil Kent.	145 45.1 139°35.9	19°01.7 -60°57.1
11	273°17.2	2°49.2	07.9	85°51.3	23.2	68°56.0	45.1	$240^{\circ}16.7$	39.9	Kochab	139° 33.9 137° 20.7	74°01.8
12	288°19.6	17°48.2	S23°08.0	100°52.9	S00°23.5	83°58.3	S08°45.1	255°19.1	N10°39.9	Zuben'ubi	136°52.5	-16°09.7
13	303°22.1	32°47.3	08.1	115°54.6	23.8	99°00.5	45.2	270°21.6	39.9	Alphecca	126°01.2	26°36.9
14	318°24.6	47°46.3	08.2	130°56.3	24.1	114°02.7	45.3	285°24.0	40.0	Antares	112° 12.1	-26° 29.6
15	333°27.0	62°45.4	•• 08.3	145°58.0	• • 24.4	129°05.0	• • 45.4	$300^{\circ}26.5$	• • 40.0	Atria	107°03.8	-69°04.5
16	348°29.5	77°44.4	08.4	160°59.6	24.7	144°07.2	45.5	315°28.9	40.0	Sabik	101°59.3	-15°45.5
17	3°31.9	92°43.5	08.5	176°01.3	25.0	159°09.4	45.5	330°31.4	40.0	Shaula	96°06.3	-37°07.3
18	18°34.4	107°42.6	S23°08.6	191°03.0	S00°25.2	174°11.7	S08°45.6	345°33.8	N10°40.0	Rasalhague	95°55.9	12°32.4
19	33°36.9	122°41.6	08.6	206°04.7	25.5	189° 13.9	45.7	0°36.3	40.0	Eltanin	90°41.2	51°29.1
20	48°39.3	137°40.7	08.7	221°06.3	25.8	204° 16.1	45.8	15°38.7	40.1	Kaus Aust.	83°28.6	-34°22.1
21	63°41.8	152°39.7	• • 08.8	236°08.0	· · 26.1	219°18.4	• • 45.8	30°41.2	• • 40.1	Vega	80°31.4	38°48.7
22	78°44.3	167°38.8	08.9	251°09.7	26.4	234°20.6	45.9	45°43.6	40.1	Nunki	$75^{\circ}44.1$	-26° 15.5
23	93°46.7	182°37.8	09.0	266°11.4	26.7	249°22.8	46.0	60°46.1	40.1	Altair	61°57.1	8°56.8
Mer.p	ass. 16:46	ν -0.9' d0.	.1' m-3.91	$\nu 1.7' \ d0$.3′ m0.48	ν 2.2′ d0.	1' m-1.95	ν 2.5′ d0	.0′ m0.24	Peacock	53°01.3	-56° 38.4
										Deneb	49°24.0	45°23.2
т	CHA	CHA	Dee	CHA	Dos	CHA	Doo	CHA	Dee	Enif	33°35.9	10°00.6
Tue 0	GHA 108°49.2	GHA 197°36.9	Dec \$23°09.1	GHA 281°13.1	Dec \$00°27.0	GHA 264° 25.1	Dec S 08°46.1	GHA 75°48.6	Dec N10° 40.1	Al Na'ir	27°29.3	-46°49.3
1	123°51.7	212°35.9	09.1	296°14.7	27.3	279°27.3	46.2	90°51.0	40.1	Fomalhaut	15°11.2	-29°28.1
2	138°54.1	227°35.0	09.2	311°16.4	27.6	294°29.5	46.2	105°53.5	40.2	Scheat	13°42.2	28°14.7
3	153°56.6	242°34.0	09.3	326° 18.1	27.8	309°31.8	• • 46.3	100°55.9	• • 40.2	Markab	13°26.8	15°21.9
4	168°59.1	257°33.1	09.4	341°19.8	28.1	324°34.0	46.4	135°58.4	40.2	Jan 07 Sun	SHA	Mer.pass
5	184°01.5	272°32.2	09.4	356°21.5	28.4	339°36.2	46.5	151°00.8	40.2	Venus	91°31.2	10:47
6	199°04.0	287°31.2	S23°09.5		S00°28.7	354°38.5	508°46.6		N10°40.2	Mars	$173^{\circ}02.1$	05:20
7	214°06.4	302°30.3	09.6	$26^{\circ}24.8$	29.0	9°40.7	46.6	181°05.7	40.3	Jupiter	$155^{\circ}47.2$	06:29
8	229°08.9	$317^{\circ}29.3$	09.7	$41^{\circ}26.5$	29.3	24°42.9	46.7	196°08.2	40.3	Saturn	326°59.7	19:02
9	244°11.4	$332^{\circ}28.4$	•• 09.7	$56^{\circ}28.2$	• • 29.6	39°45.2	• • 46.8	211°10.6	• • 40.3	Jan 08 Mon	SHA	Mer.pass
10	259°13.8	347°27.4	09.8	71°29.9	29.8	54° 47.4	46.9	226°13.1	40.3	Venus	эпа 90°09.5	10:49
11	274°16.3	2°26.5	09.9	86°31.6	30.1	69°49.6	46.9	241°15.5	40.3		172°42.8	05:17
12	289°18.8	17°25.5	\$23°09.9	101°33.3	500°30.4	84°51.9	S08°47.0	256°18.0	N10°40.3		172 42.8 155°41.4	06:25
13	304°21.2	32°24.6	10.0	116°35.0	30.7	99°54.1	47.1	271°20.4	40.4	Saturn	326°59.6	18:58
14	319°23.7	47°23.6	10.1	131°36.6	31.0	114°56.4	47.2	286°22.9	40.4			
15	334°26.2	62°22.7	10.1	146°38.3	· · 31.3	129°58.6	• • 47.2	301°25.3	• • 40.4	Jan 09 Tue	SHA	Mer.pass
16	349°28.6	77°21.7	10.2	161°40.0	31.6	145°00.8	47.3	316°27.8	40.4	Venus	88°47.7	10:50
17	4°31.1	92°20.8	10.2	176°41.7	31.8	160°03.1	47.4	331°30.2	40.4		172°23.9	05:15
18 19	19°33.6 34°36.0	107° 19.9 122° 18.9	\$23°10.3 10.4	191°43.4 206°45.1	\$00°32.1 32.4	175°05.3 190°07.6	\$08° 47.5 47.6	346°32.7 1°35.1	N10° 40.5 40.5		155°35.9	06:21
20	34°36.0 49°38.5	122° 18.9 137° 18.0	10.4 10.4	206°45.1 221°46.8	32.4 32.7	205°09.8	47.6 47.6	16°37.6	40.5 40.5	Saturn	326°59.4	18:54
20	49°38.5 64°40.9	137° 18.0 152° 17.0	10.4	221°46.8 236°48.5	· · 33.0	205°09.8 220°12.0	47.6	31°40.0	40.5 •• 40.5	Horizont	al parallax	
22	79°43.4	167° 16.1	10.5	250 46.5 251°50.2	33.3	235° 14.3	47.7	46°42.5	40.5		Venus:	0.1
23	94°45.9	182° 15.1	10.5	266° 51.9	33.5	250° 16.5	47.8	61°44.9	40.5		Mars:	0.1
Mer.p	pass. 16:42	ν -0.9′ d0.	.1′ m-3.91	ν 1.7′ d0.	.3′ m0.46	ν 2.2′ d0.	1′ m-1.96	$\nu^{2.5'} d0$.0′ m0.24			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.4	\$22°21.6	280°07.8	10.7'	S08°38.5	14.2'	59.2'
1	193°27.1	21.3	294°37.5 309°07.1	10.7'	08°52.7 09°06.9	14.2' 14.1'	59.2'
2 3	208°26.8 223°26.6	20.9 •• 20.6	309 07.1 323°36.8	10.6' 10.6'	09 06.9 09°21.0	14.1'	59.2' 59.2'
4	238°26.3	20.3	338°06.3	10.5'	09°35.1	14.0'	59.2'
5	253°26.0	20.0	352°35.9	10.5'	09°49.2	14.0'	59.2'
6	268°25.8	\$22°19.6	7°05.4 21°34.9	10.5'	\$10°03.1 10°17.0	13.9'	59.2'
7 8	283°25.5 298°25.2	19.3 19.0	21°34.9 36°04.3	10.4' 10.4'	10°17.0 10°30.9	13.9' 13.8'	59.1' 59.1'
9	313°25.0	. 18.7	50°33.7	10.3'	10°44.7	13.7'	59.1'
10	328°24.7	18.3	$65^{\circ}03.0$	10.3'	10°58.4	13.7'	59.1'
11	343°24.4	18.0	79°32.3	10.3'	11°12.1 \$11°25.7	13.6'	59.1'
12 13	358°24.2 13°23.9	\$22°17.7 17.4	94°01.6 108°30.8	10.2' 10.2'	511°25.7 11°39.2	13.5' 13.5'	59.1' 59.1'
14	28°23.6	17.0	100° 50.0	10.1	11°52.7	13.4	59.1'
15	43°23.4	• • 16.7	$137^{\circ}29.1$	10.1'	$12^{\circ}06.1$	13.3'	59.1'
16	58°23.1	16.4	151°58.2	10.0'	12°19.4	13.3'	59.1'
17 18	73°22.8 88°22.6	16.0 \$22°15.7	166°27.3 180°56.3	10.0' 9.9'	12°32.7 \$12°45.9	13.2' 13.1'	59.1' 59.0'
19	00 22.0 103°22.3	15.4	100 50.5 195°25.2	9.9 9.9'	12°59 0	13.1	59.0'
20	118°22.0	15.0	209°54.1	9.9'	13°12.0	13.0'	59.0'
21	133°21.8	• • 14.7	224°23.0	9.8'	13°25.0	12.9'	59.0'
22	148°21.5	14.4	238°51.8	9.8'	13°37.8	12.8'	59.0'
23	163°21.2	14.0	253°20.5	9.7'	13°50.6	12.7'	59.0'
	SD = 16.3'	d = -0.3'		SE	0 = 16.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.0	S22°13.7	267°49.2	9.6'	S 14°03.4	12.6'	59.0'
1	193°20.7	13.3	282°17.9	9.6'	14°16.0	12.6'	59.0'
2	208°20.4 223°20.2	13.0 •• 12.7	296°46.4 311°15.0	9.5' 9.5'	14°28.5 14°41.0	12.5' 12.4'	59.0' 59.0'
3 4	238°19.9	12.7	311 15.0 325°43.5	9.5 9.4'	14 41.0 14°53.4	12.4	59.0 58.9'
5	253°19.7	12.0	340°11.9	9.4'	15°05.7	12.2'	58.9'
6	268°19.4	S22°11.6	354°40.3	9.3'	S 15°17.9	12.1'	58.9'
7	283°19.1	11.3	9°08.6	9.3'	15°30.0	12.0'	58.9'
8 9	298°18.9 313°18.6	11.0 •• 10.6	23°36.9 38°05.1	9.2' 9.2'	15°42.0 15°53.9	11.9' 11.8'	58.9' 58.9'
10	328°18.3	10.3	52°33.3	9.1'	16°05.8	11.7	58.9'
11	343°18.1	09.9	67°01.4	9.1'	16°17.5	11.6'	58.9'
12	358°17.8	S22°09.6	81°29.5	9.0'	S16°29.2	11.5'	58.9'
13	13°17.6	09.2	95°57.4 110°25.4	8.9'	16°40.7 16°52.2	11.4'	58.8'
14 15	28°17.3 43°17.0	08.9 •• 08.5	110°25.4 124°53.3	8.9' 8.8'	16°52.2 17°03.5	11.3' 11.2'	58.8' 58.8'
16	58°16.8	08.2	139°21.1	8.8'	17°14.7	11.1'	58.8'
17	73°16.5	07.8	153°48.8	8.7'	$17^{\circ}25.9$	11.0'	58.8'
18	88°16.3	\$22°07.5	168°16.6	8.6'	\$17°36.9	10.9'	58.8'
19 20	103°16.0 118°15.7	07.1 06.8	182°44.2 197°11.8	8.6' 8.5'	17°47.9 17°58.7	10.8' 10.7'	58.8' 58.8'
21	133°15.5	06.4	211°39.3	8.5'	18°09.4	10.7	58.8'
22	148°15.2	06.1	226°06.8	8.4'	18°20.0	10.5'	58.7'
23	163°15.0	05.7	240°34.2	8.4'	18°30.5	10.4'	58.7'
	SD = 16.3'	d = -0.3'		SE	0 = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°14.7	\$22°05.3	255°01.6	8.3'	S 18°40.9	10.3'	58.7'
1	193°14.4	05.0	269°28.9	8.2'	18°51.1	10.2'	58.7'
2 3	208°14.2 223°13.9	04.6	283°56.1 298°23.3	8.2' 8.1'	19°01.3 19°11.4	10.0'	58.7' 58.7'
3 4	223°13.9 238°13.7	· · 04.3 03.9	298°23.3 312°50.4	8.1'	19°11.4 19°21.3	9.9' 9.8'	58.7' 58.7'
5	253°13.4	03.6	327°17.5	8.0'	19°31.1	9.7'	58.7'
6	268°13.1	S22°03.2	341°44.5	8.0'	S19°40.8	9.6'	58.6'
7	283°12.9	02.8	356°11.5	7.9'	19°50.3	9.4'	58.6'
8 9	298°12.6 313°12.4	02.5 •• 02.1	10°38.3 25°05.2	7.8' 7.8'	19°59.8 20°09.1	9.3' 9.2'	58.6' 58.6'
10	313 12.4 328°12.1	01.7	25 05.2 39°32.0	7.8 7.7'	20 09.1 20°18.3	9.2 9.1'	58.6'
11	343°11.9	01.4	53°58.7	7.7'	20°27.4	9.0'	58.6
12	358°11.6	S22°01.0	68°25.4	7.6'	520°36.4	8.8'	58.6'
13	13°11.4	00.7	82°52.0	7.6'	20°45.2	8.7'	58.5'
14 15	28°11.1 43°10.8	22°00.3 21°59.9	97°18.5 111°45.0	7.5' 7.5'	20°53.9 21°02.5	8.6' 8.4'	58.5' 58.5'
16	58°10.6	21 59.9 59.6	111 45.0 126°11.5	7.5 7.4'	21°102.5	8.3'	58.5'
17	73°10.3	59.2	140°37.9	7.3'	21°19.2	8.2'	58.5'
18	88°10.1	S21°58.8	155°04.2	7.3'	S21°27.4	8.0'	58.5'
19	103°09.8	58.4	169°30.5	7.2'	21°35.4	7.9'	58.5'
20 21	118°09.6 133°09.3	58.1 •• 57.7	183°56.8 198°22.9	7.2' 7.1'	21°43.4 21°51.1	7.8' 7.6'	58.5' 58.4'
22	148°09.1	57.7	212°49.1	7.1'	21°58.8	7.5'	58.4
23	163°08.8	57.0	227°15.2	7.0'	22°06.3	7.4'	58.4'
	SD = 16.3'	d = -0.4'		SE	0 = 16.0'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	22-24		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	57-34%		
07	06:11	06:23	12:06	05:31	17:56			
08	06:36	06:49	12:07	06:22	18:49			
09	07:01	07:14	12:07	07:16	19:44			

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

New GIA	h	Aries	Ve	nus	M	ars	Jup	iter	Sat	turn		Stars	
1 126 126 127	Wed -	GHA	GHA	Dec					GHΔ	Dec		SHA	Dec
1 1949-98 1921-182 107 2007-95 344 2007-10 4.00 1979-98 4.00 5.00 5.00 4.00 1979-98 4.00											1		
1													I
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2	139°53.3	$227^{\circ}12.3$	10.7	311°57.0	34.4	295°23.2	48.1	106°52.3	40.6			
18 190 Sec. 2779 4 100 9 5700 593 50710 453 131790 400 Hamm 37717 57705 7770 7770 1 100 100 Hamm 37717 5770 7770 1 100 100 Hamm 37717 5770 1 100 100 Hamm 37717 5770 1 100 100 Hamm 3770 1 100 2770 1 100 100 Hamm 3770 1 100	3	154°55.7	$242^{\circ}11.3$	• • 10.8	326°58.7	• • 34.7	$310^{\circ}25.5$	• • 48.2	121°54.7	• • 40.6			I
Second 1.00													
To 15 15 15 15 15 15 15 1													
8 200'00.0 317'06.6 11.0 57'08.0 36.3 405.0 29'08.0 40.7 41.7 41.1 57'08.0 36.3 40.0 29'09.0 40.7 41.1 57'08.0 36.3 40.0 29'09.0 40.7 41.1 57'08.0 36.3 40.0 32'08.1 40.7 41.1 17.2 10.5 36.6 55'12.1 40.7 29'11.0 40.7 40.7 41.1 17.2 10.5 36.6 55'12.1 40.7 29'11.0 40.7 40.7 41.1 17.2 10.5 36.6 55'12.1 40.7 40.7 40.7 40.7 40.0 40.8 40.0 40.0 40.0 40.0 40.0 40.0											Polaris	311°58.2	89°23.4
10											Acamar	$315^{\circ}09.2$	-40°11.5
200°130 347°07 111 72°105 366 55°12 487 227°118 468 66702 327°10 11 27°12 1 30°12 2 396 70°12 40°12 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 40°10 30°10 4													
12													
14 200 40.0 1 10 2 20 30 30 30 30 30 30 30 30 30 30 30 30 30	11		2°03.7			36.9		48.8	242°14.3				
15 335°-231 3 27000 11.3 1121'10 3.70 101'40 180 2774'4 5 408	12			S23°11.2		S00°37.2		S08°48.8		N10°40.8			
16													
193 0-273 0 97990 113 1627-08 531 1057-24 - 481 3377-35 409 1079-1079-1079-1079-1079-1079-1079-1079-													
18											Alnilam	$275^{\circ}34.1$	-1°11.2
18 20*32.7 106*57.1 \$22*11.3 102*24.2 \$00*38.8 175*99.1 \$08*49.3 \$37*31.4 \$100*09.0 \$20.0											_		
19 58°382 121°662 114 220°256 39.1 191°014 494 2°338 409 50°166 36°401 35°163 36°301 36°30													
20													
22	20			11.4	222°27.6	39.4	206°03.6	49.4	$17^{\circ}36.3$	40.9			
Mor. pass 16:188													
Property													
Maple Mapl	23	95°45.0	181°52.4	11.5	267°32.7	40.2	251°10.3	49.7	62°43.6	41.0			
This GHA GHA Cor CHA Dec Dubbh 137-368 61*35*2. 10 10 10 10 10 10 10 1	Mer.p	ass. 16:38	ν -0.9' d0.	.1′ m-3.91	ν 1.7′ d0	3′ m0.44	$\nu 2.2' \ d0.$	1′ m-1.96	ν 2.4 $^{\prime}$ d0	.0′ m0.25			-69°50.2
Thu GHA CHA Dec GHA Dec GHA Dec GHA Dec GHA Dec CHA De													
1010*47.5 106*51.4 \$22*11.5 \$22*34.8 \$00*40.5 \$26*12.6 \$508*49.7 \$77*46.1 \$100*41.0	Thu	GHΔ	GHΔ	Dec	GH∆	Dec	GHΔ	Dec	GHΔ	Dec			
1 125°49.9 211°50.5 11.5 297°36.1 40.8 281°41.8 49.8 92°48.5 41.1 41.2 11°50.7 41.1 49.9 10°51.0 41.1 41.2 41.1 41.2 41.2 41.2 41.2 41.2													
2 140°52.4 226°49.5 11.5 312°37.8 41.0 296°17.1 49.9 107°51.0 41.1 311°19.3 · 50.0 137°55.8 41.1 51.6 170°57.3 256°47.6 11.6 342°41.3 41.6 326°21.6 50.0 137°55.8 41.1 51.6 520°36.7 11.6 342°41.3 41.6 326°21.6 50.0 137°55.8 41.1 51.6 520°36.7 11.6 32°42.4 11.9 341°23.8 50.1 135°58.3 41.1 51.6 210°02.3 286°45.7 523°11.6 12°44.7 500°42.1 356°26.1 508°50.2 166°00.7 N10°41.2 41.6 25°47.8 41.6 210°02.3 286°45.7 523°11.6 12°44.7 500°42.1 356°26.1 508°50.2 166°00.7 N10°41.2 41.6 41.6 41.6 41.6 41.6 41.9 341°23.8 50.1 135°58.3 41.1 52°46.4 42°41.2 34.1 52.2 40.1 52.2 40.1 52.2 41.1 51.6 42°48.1 42.7 26°30.6 50.3 198°05.6 41.2 41.2 41.1 52°46.4 42°48.1 42.7 26°30.6 50.3 198°05.6 41.2 41.2 41.1 51.0 42°48.1 42.7 26°30.6 50.3 198°05.6 41.2 41.2 41.1 51.0 42°48.1 42.7 26°30.6 50.3 198°05.6 41.2 41.2 41.1 41.2 41.1 41.2 41.2 41.2													
155°549 241'48.6 11.6 327'395 · · · · · · · · · · · · · · · · · · ·		$140^{\circ}52.4$				41.0	$296^{\circ}17.1$		$107^{\circ}51.0$				
4 170°57.3 256°47.6 11.6 342°41.3 41.6 326°21.6 50.0 137°55.8 41.1 52°83 41.1	3					• • 41.3							
5 185 98 271 467 11.6 357 43 0 41.9 341 23.8 501 152 843 41.1 51.2 44.7 49.007 41.2 49.007 49.00													
8 231°07.2 316°43.8 11.6 27°46.4 42.7 26°30.6 50.3 138°30.2 41.2 Hadra 148°31.3 60°30.5 10.26°12.1 346°4.9 11.6 57°4.9 8 43.0 41°32.8 50.4 213°08.1 41.2 Hadra 148°31.3 60°30.5 10.26°12.1 346°4.9 11.6 57°4.9 8 43.0 41°32.8 50.4 213°08.1 41.2 Hadra 148°31.3 60°30.5 11.2 11.2 76°14.6 1°41.0 11.7 87°33.3 43.5 71°37.3 50.5 243°12.9 41.3 Kochab 137°20.7 74′01.8 12.2 91°10.7 16°40.0 522°11.0 10°55.0 50°3.3 86°9.6 508°50.5 243°12.9 41.3 Kochab 137°20.7 74′01.8 13°306°19.5 31°39.1 11.7 117°66.7 44.0 101°41.8 50.7 273′17.8 41.3 Zuberiubi 136°52.5 1-16°09.7 14.3 12°20.4 46°88.1 11.7 117°66.7 44.0 101°41.8 50.7 273′17.8 41.3 Alphae 126°10.2 20°36.9 44.0 11.3 28°84.4 41.3 116°41.4 150.8 288°20.3 41.3 Alphae 126°10.2 20°36.9 16.3 51°5.6 76°36.3 11.7 148°00.1 44.6 131°46.3 50.8 303°22.7 44.3 Antares 112°12.1 2-6°29.6 16 351°5.6 76°36.3 11.7 178°03.6 45.1 161°90.8 51.0 333°27.6 44.4 Artia 107°03.8 60°90.4 51.0 12°3.8 10°3.8 11.7 178°03.6 45.1 161°90.8 51.0 333°27.6 44.4 Sabik 10°90.3 40°90.5 10°90.3 48°30.0 10°41.4 Sabik 10°90.3 30°50.9 10°30.5 11.7 128°30.6 45.1 161°90.8 51.0 333°37.6 41.4 Sabik 10°90.3 30°90.5 10°90.3 41.5 45.5 12°30.5 10°90.5 10°90.5 10°90.3 41.5 45.5 12°30.5 10°90.5													
8 231°07.2 316°43.8 11.6 42°48.1 427 26°30.6 50.3 198°05.6 41.2 9 246°097 331°42.9 11.6 57°49.8 43.0 41°32.8 50.4 213°08.6 41.2 10 261°12.1 346°41.9 11.6 72°51.5 43.2 56°35.1 50.5 228°10.5 41.2 11 276°14.6 1°41.0 11.7 87°53.3 43.5 71°37.3 50.5 228°10.5 41.3 12 291°17.0 16°40.0 \$23°11.7 10°25.0 \$00°43.8 86°39.6 \$08°50.6 \$28°15.4 \$100°41.3 13 306°195 31°30.1 11.7 132°58.4 44.3 116°44.1 50.8 \$28°15.4 \$100°41.3 13 306°195 31°30.1 11.7 132°58.4 44.3 116°44.1 50.8 \$28°20.3 41.3 15 336°24.4 61°37.2 11.7 148°00.1 44.6 131°46.3 50.8 \$38°20.3 41.3 16 331°26.9 76°36.3 11.7 16°30.8 44.9 146°48.6 50.9 318°25.1 41.4 17 6°24.9 40°35.3 11.7 178°03.6 45.1 16°50.8 51.0 338°25.1 41.4 18 21°31.8 106°34.4 \$22°11.7 193°03. \$00°45.4 176°53.1 \$08°51.0 348°30.0 \$100°41.4 19 36°34.3 121°33.3 11.7 228°10.7 45.9 206°57.6 51.2 18°34.9 41.5 19 36°34.3 121°35.5 11.7 228°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°34.2 11.7 128°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°34.2 11.7 128°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°34.2 11.7 128°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°34.2 11.7 16°30.6 11.7 228°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°34.2 11.7 16°30.6 11.7 228°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°44.7 16°30.6 11.7 228°10.4 *46.2 221°59.8 51.2 18°34.9 41.5 10 36°44.7 16°50.6 51.7 233°11.6 283°15.6 50°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 50°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.1 \$08°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°11.6 283°15.6 \$00°47.0 25°70.6 508°51.5 93°47.1 41.6 10 11°4.6 196°28.7 \$23°10.6 283°15.0 348°30.0 100°41.8 10 11°4.6 196°28.7 \$23°10.6 20°40.8 10 11°4.8 10.8											Alkaid		
9 246°99.7 331°42.9 11.6 57°49.8 43.0 41°32.8 50.4 213°08.1 41.2 50°29.1 12.2 136°64.1 9.11.6 72°51.5 43.2 56°35.1 50.5 228°10.5 41.2 12°20°17.0 16°40.0 523°11.0 102°55.0 50°35.1 50.5 228°10.5 41.2 130°35.3 60°57.1 12°25.0 50°35.1 50.5 228°10.5 41.2 130°35.9 60°57.1 12°25.0 50°35.1 50.5 228°10.5 41.2 130°35.9 60°57.1 12°25.1 11.7 117°56.7 44.0 101°41.8 50.7 273°17.8 41.3 10.6 11.0 11.0 11.0 11.0 11.0 11.0 11.0													
10 261°12.1 346°41.9 11.6 72°51.5 43.2 56°35.1 50.5 288°10.5 41.2 74°10.8													
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Mer.pass. 16:30 ν -0.9′ d -0.0′ m-3.91 ν 1.7′ d 0.3′ m0.40 ν 2.3′ d 0.1′ m-1.97 ν 2.4′ d 0.0′ m0.25	23	9/~43.3	181,06.8	11.1					64~40.7	42.1		ividI5.	0.1
	Mer.p	ass. 16:30	ν -0.9′ d-0	0.0′ m-3.91	ν 1.7′ d0	.3′ m0.40	ν 2.3′ d0.	1′ m-1.97	ν 2.4′ d0	.0′ m0.25			

h	Su	+0.1302 sec			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°08.6	S21°56.6	241°41.2	7.0'	S22°13.7	7.2'	58.4'
1	193°08.3	56.2	256°07.2	6.9'	22°20.9	7.1'	58.4'
2	208°08.0	55.8	270°33.2	6.9'	22°28.0	7.0'	58.4'
3	223°07.8	• • 55.5	$284^{\circ}59.1$	6.9'	22°34.9	6.8'	58.4'
4	238°07.5	55.1	299°24.9	6.8'	22°41.7	6.7'	58.3'
5	253°07.3	54.7	313°50.7	6.8'	22°48.4	6.5'	58.3'
6	268°07.0	S21°54.3	328°16.5	6.7'	S22°54.9	6.4'	58.3'
7	283°06.8	53.9	342°42.2	6.7'	23°01.3	6.2'	58.3'
8	298°06.5	53.6	357°07.9	6.6'	23°07.6	6.1'	58.3'
9	313°06.3 328°06.0	· · 53.2 52.8	11°33.5 25°59.1	6.6'	23°13.6 23°19.6	5.9' 5.8'	58.3' 58.2'
10 11	343°05.8	52.6 52.4	40°24.7	6.6' 6.5'	23°25.4	5.0 5.7'	58.2'
12	358° 05.5	S21°52.0	54°50.2	6.5	S23°31.1	5.5'	58.2
13	13° 05.3	51.7	69°15.7	6.5	23°36.6	5.4	58.2
14	28°05.0	51.3	83°41.2	6.4	23°41.9	5.2'	58.2
15	43°04.8	50.9	98°06.6	6.4'	23°47.1	5.1'	58.2'
16	58°04.5	50.5	112°32.0	6.4'	23°52.2	4.9'	58.2'
17	73°04.3	50.1	126°57.4	6.3'	23°57.1	4.8'	58.1'
18	88°04.0	S21°49.7	141°22.7	6.3'	S24°01.9	4.6'	58.1'
19	103°03.8	49.3	155°48.0	6.3'	24°06.5	4.5'	58.1'
20	118°03.5	49.0	170°13.3	6.3'	24°10.9	4.3'	58.1'
21	133°03.3	• • 48.6	184°38.6	6.2'	24°15.2	4.1'	58.1'
22	148°03.0	48.2	199°03.8	6.2'	24°19.4	4.0'	58.1'
23	163°02.8	47.8	213°29.0	6.2'	24°23.4	3.8'	58.0'
	SD = 16.3'	d = -0.4'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°02.6	S21°47.4	227°54.2	6.2'	\$24°27.2	3.7'	58.0'
1	193°02.3	47.0	242°19.4	6.2'	24°30.9	3.5'	58.0'
2	208°02.1 223°01.8	46.6	256°44.6 271°09.7	6.1'	24°34.4 24°37.8	3.4'	58.0'
3 4	223°01.8 238°01.6	· · 46.2 45.8	271°09.7 285°34.8	6.1' 6.1'	24°37.8 24°41.0	3.2' 3.1'	58.0' 58.0'
5	250 01.0 253°01.3	45.6 45.4	205 34.6 299°59.9	6.1	24°44.1	2.9'	56.0 57.9'
6	268° 01.1	\$21°45.0	314°25.0	6.1	\$24°47.0	2.8'	57.9
7	283°00.8	44.6	328°50.1	6.1	24°49.8	2.6'	57.9
8	298°00.6	44.2	343°15.2	6.1	24°52.4	2.4'	57.9'
9	313°00.3	• • 43.8	357°40.3	6.1'	24°54.8	2.3'	57.9'
10	328°00.1	43.4	12°05.4	6.1'	24°57.1	2.1'	57.9'
11	342°59.8	43.0	26°30.4	6.1'	24°59.2	2.0'	57.8'
12	357° 59.6	S21°42.6	40°55.5	6.1'	S25°01.2	1.8'	57.8'
13	12°59.4	42.2	55°20.6	6.1'	25°03.0	1.7'	57.8'
14	27°59.1	41.8	69°45.7	6.1'	25°04.7	1.5'	57.8'
15	42°58.9	· · 41.4 41.0	84°10.7 98°35.8	6.1'	25°06.2 25°07.5	1.3'	57.8'
16 17	57° 58.6 72° 58.4	41.0 40.6	98°35.8 113°00.9	6.1' 6.1'	25°07.5 25°08.7	1.2' 1.0'	57.7' 57.7'
18	87° 58.1	\$21°40.2	113 00.9 127°26.0	6.1	\$25°09.7	0.9'	57.7'
19	102°57.9	39.8	141°51.1		25°10.6	0.5	57.7'
20	117°57.7	39.4	156°16.2	6.1'	25°11.3	0.6'	57.7'
21	132°57.4	• • 39.0	170°41.4	6.2	25°11.9	0.4	57.7'
22	147° 57.2	38.6	185°06.5	6.2'	25°12.3	0.3'	57.6'
23	162°56.9	38.2	199°31.7	6.2'	25°12.6	0.1'	57.6'
	SD = 16.3'	d = -0.4'		SI	O = 15.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	177°56.7	S21°37.8	213°56.9	6.2'	S25°12.7	-0.1'	57.6'
1	192°56.4	37.4	$228^{\circ}22.1$	6.2'	$25^{\circ}12.6$	-0.2'	57.6'
2	207°56.2	36.9	242°47.3	6.3'	25°12.4	-0.4'	57.6'
3	222°56.0	• • 36.5	257°12.6	6.3'	25°12.0	-0.5'	57.5'
4	237°55.7	36.1	271°37.9	6.3'	25°11.5	-0.7'	57.5'
5	252°55.5	35.7 \$21°35.3	286°03.2	6.3' 6.4'	25°10.8	-0.8'	57.5'
6 7	267° 55.2 282° 55.0	\$21°35.3 34.9	300°28.5 314°53.9	6.4	\$25°10.0 25°09.0	-1.0' -1.1'	57.5' 57.5'
8	282 55.0 297°54.8	34.9 34.5	314 53.9 329°19.3	6.4	25 09.0 25°07.8	-1.1 -1.3'	57.5 57.4'
9	312° 54.5	• • 34.1	343°44.8	6.5	25°06.5	-1.3 -1.4'	57.4'
10	327°54.3	33.6	358°10.2	6.5	25°05.1	-1.6'	57.4
11	342°54.1	33.2	12°35.8	6.6'	25°03.5	-1.7'	57.4'
12	357°53.8	S21°32.8	27°01.3	6.6'	S25°01.7	-1.9'	57.4'
13	12°53.6	32.4	$41^{\circ}26.9$	6.6'	24°59.9	-2.0'	57.3'
14	27°53.3	32.0	55°52.5	6.7'	24°57.8	-2.2'	57.3'
15	42°53.1	• • 31.5	70°18.2	6.7'	24°55.6	-2.3'	57.3'
16	57°52.9	31.1	84°44.0	6.8'	24°53.3	-2.5'	57.3'
17 18	72°52.6 87°52.4	30.7 \$21°30.3	99°09.7 113°35.5	6.8' 6.9'	24°50.8 \$24°48.1	-2.6' -2.8'	57.3'
18 19	87°52.4 102°52.2	\$21°30.3 29.9	113°35.5 128°01.4	6.9'	524°48.1 24°45.3	-2.8° -2.9'	57.3' 57.2'
20	102 52.2 117°51.9	29.9 29.4	128 01.4 142°27.3	6.9 7.0'	24 45.3 24°42.4	-2.9 -3.1'	57.2'
21	132°51.7	29.0	156°53.3	7.0'	24° 42.4 24° 39.3	-3.1 -3.2'	57.2'
22	147°51.4	28.6	171°19.4	7.1'	24°36.1	-3.4'	57.2'
23	162° 51.2	28.2	185°45.4	7.1'	24°32.7	-3.5'	57.1
	SD = 16.3'	d = -0.4'		SI	O = 15.7'		

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

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

			Sun			Moon	
D	av	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	,	00 ^h	12 ^h	Pass	Upper	Lower	25-27
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	24-8%
	10	07:26	07:38	12:08	08:12	20:41	
	11	07:50	08:02	12:08	09:10	21:39	
	12	08:13	08:25	12:08	10:08	22:36	

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	112°45.8	196°05.9	523°11.1	283°57.2	S 00°53.3	268°00.7	S08°53.1	79°43.2	N10°42.1	A 1 1.	357°31.4	29° 15.3
1	127°48.2	211°05.0	11.0	298°58.9	53.6	283°03.0	53.2	94°45.6	42.1	Alpheratz		
2	142°50.7	226°04.0	11.0	314°00.7	53.9	298°05.2	53.3	109°48.0	42.1	Ankaa	353°04.1	-42°09.0
3	157°53.2	241°03.1	• • 11.0	329°02.4	• • 54.1	313°07.5	• • 53.3	124°50.5	• • 42.2	Schedar	349°27.2	56°42.1
4	172°55.6	256°02.1	10.9	344°04.2	54.4	328°09.8	53.4	139°52.9	42.2	Diphda	348°44.1	-17°49.7
5	187°58.1	271°01.2	10.9	359°05.9	54.6	343°12.0	53.5	154°55.3	42.2	Achernar	335°17.9	-57°05.6 23°36.1
6	203°00.5	286°00.2	S23°10.8	14°07.6	S00°54.9	358° 14.3	S08°53.6	169°57.8	N10°42.2	Hamal	327°47.4 311°59.3	23 30.1 89°23.4
7	218°03.0	300°59.3	10.8	29°09.4	55.2	13° 16.5	53.6	185°00.2	42.2	Polaris Acamar	311 59.3 315°09.2	-40°11.5
8	233°05.5	315°58.3	10.7	$44^{\circ}11.1$	55.4	28° 18.8	53.7	200°02.6	42.3	Menkar	314°02.6	4° 12.2
9	248°07.9	330°57.4	• • 10.7	59° 12.9	• • 55.7	43°21.1	• • 53.8	$215^{\circ}05.1$	• • 42.3	Mirfak	308°23.2	49°58.0
10	263°10.4	345°56.4	10.6	74°14.6	55.9	58°23.3	53.8	230°07.5	42.3	Aldebaran	290°35.6	16°34.0
11	278°12.9	0°55.5	10.6	89° 16.4	56.2	73°25.6	53.9	245°09.9	42.3	Rigel	281°00.4	-8°10.2
12	293°15.3	15°54.5	S23°10.5	104° 18.1	S00°56.4	88°27.9	S08°54.0	260°12.4	N10°42.4	Capella	280°16.6	46°01.6
13	308°17.8	30°53.6	10.5	119° 19.9	56.7	103°30.1	54.0	275°14.8	42.4	Bellatrix	278°19.1	6°22.4
14	323°20.3	45°52.6	10.4	134°21.6	57.0	118°32.4	54.1	290°17.2	42.4	Elnath	277°57.4	28° 37.8
15	338°22.7	60°51.7	· · 10.4	149°23.4	• • 57.2	133°34.6	• • 54.2	305°19.7	• • 42.4	Alnilam	275°34.1	-1°11.2
16	353°25.2	75°50.7	10.3	164°25.1	57.5	148°36.9	54.2	320°22.1	42.5	Betelgeuse	270°48.2	7°24.6
17	8°27.7	90°49.8	10.3	179°26.9	57.7	163°39.2	54.3	335°24.5	42.5	Canopus	263°50.4	-52°42.8
18	23°30.1	105°48.8	\$23°10.2	194°28.6	S00°58.0	178°41.4	S08°54.4	350°26.9	N10° 42.5	Sirius	258°23.0	-16°45.6
19	38°32.6	120°47.9	10.1	209°30.4	58.2	193° 43.7	54.4	5°29.4	42.5	Adhara	255°02.9	-29°00.9
20	53°35.0	135°47.0	10.1	224°32.1	58.5	208°46.0	54.5	20°31.8	42.6	Procyon	244°47.1	5°08.8
21	68°37.5	150°46.0	• • 10.0	239°33.9	• • 58.7	223°48.2	• • 54.6	35°34.2	• • 42.6	Pollux	243°12.9	$27^{\circ}57.1$
22	83°40.0	165°45.1	09.9	254°35.6	59.0	238°50.5	54.6	50°36.7	42.6	Avior	234°12.7	-59°36.2
23	98°42.4	180°44.1	09.9	269°37.4	59.3	253°52.8	54.7	65°39.1	42.6	Suhail	222°43.4	-43°33.1
Mer.p	ass. 16:26	ν -0.9' d-0	.0′ m-3.91	ν 1.7 $^{\prime}$ d0	.3′ m0.38	$\nu 2.3' \ d0.$	1′ m-1.98	ν 2.4 $^{\prime}$ d0	.0′ m0.26	Miaplacidus	221°36.5	-69°50.2
									-	Alphard	$217^{\circ}44.2$	-8°47.3
	CIIA	CIIA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Regulus	207°30.7	11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec COO° E4 O	GHA	Dec	Dubhe	193°36.8	$61^{\circ}35.2$
0	113°44.9 128°47.4	195°43.2	\$23°09.8	284°39.1 299°40.9	\$00°59.5	268°55.0	\$08°54.8	80°41.5	N10° 42.7	Denebola	$182^{\circ}21.5$	$14^{\circ}24.3$
1		210°42.2	09.7		00°59.8	283°57.3	54.8	95°44.0	42.7	Gienah	$175^{\circ}40.1$	$-17^{\circ}42.3$
2	143°49.8	225°41.3	09.7	314°42.6	01°00.0	298°59.6	54.9	110°46.4	42.7	Acrux	172°56.0	-63°15.4
3	158°52.3	240°40.3	•• 09.6	329°44.4	• • 00.3	314°01.8	• • 55.0	125°48.8	• • 42.7	Gacrux	171°47.7	-57°16.4
4	173°54.8	255°39.4	09.5	344°46.2	00.5	329°04.1	55.0	140°51.2	42.8	Alioth	$166^{\circ}10.2$	55°47.7
5	188°57.2	270°38.4	09.5	359°47.9	00.8	344°06.3	55.1	155°53.7	42.8	Spica	$158^{\circ}18.8$	$-11^{\circ}18.8$
6	203°59.7	285°37.5	\$23°09.4	14°49.7	S01°01.0	359°08.6	\$08°55.1	170°56.1 185°58.5	N10° 42.8	Alkaid	152°49.6	49°09.7
7	219°02.1	300°36.5	09.3	29°51.4	01.3	14°10.9	55.2		42.8	Hadar	148°31.3	-60°30.5
8 9	234°04.6 249°07.1	315°35.6 330°34.6	09.2 · · 09.1	44°53.2 59°55.0	01.5	29°13.2 44°15.4	55.3 •• 55.3	201°01.0 216°03.4	42.9 •• 42.9	Menkent	147°53.7	-36°30.6
10	264° 09.5	345°33.7		74° 56.7	· · 01.8 02.0	59° 17.7	55.4	210 05.4 231°05.8		Arcturus	145°45.0	$19^{\circ}01.7$
11	204 09.5 279°12.0	0°32.8	09.1 09.0	89° 58.5	02.0	74° 20.0	55.4 55.5	246°08.3	42.9 42.9	Rigil Kent.	139°35.8	$-60^{\circ}57.1$
12	279 12.0 294°14.5	15°31.8	\$23°08.9	105° 00.2	501°02.5	89°22.2	508°55.5	261°10.7	N10°43.0	Kochab	137°20.6	74°01.8
13	309°16.9	30°30.9	08.8	100°00.2	02.8	104° 24.5	55.6	201 10.7 276°13.1	43.0	Zuben'ubi	136°52.5	-16°09.7
14	324°19.4	45°29.9	08.7	135° 03.8	03.0	119° 26.8	55.7	291°15.5	43.0	Alphecca	126°01.2	26°36.8
15	339°21.9	60°29.0	•• 08.7	150° 05.5	• • 03.3	134° 29.0	• • 55.7	306°18.0	• • 43.0	Antares	112°12.1	-26°29.6
16	354°24.3	75°28.0	08.6	165° 07.3	03.5	149°31.3	55.8	321°20.4	43.1	Atria	107°03.7	-69°04.5
17	9°26.8	90°27.1	08.5	180°09.1	03.8	164° 33.6	55.9	336°22.8	43.1	Sabik	101°59.3	-15°45.6
18	24°29.3	105°26.1	\$23°08.4	195° 10.8	S01°04.0	179°35.8	S08°55.9		N10°43.1	Shaula	96°06.3	-37°07.3
19	39°31.7	120°25.2	08.3	210° 12.6	04.3	194°38.1	56.0	6°27.7	43.2	Rasalhague	95°55.8	12°32.3
20	54°34.2	135°24.2	08.2	225° 14.4	04.5	209° 40.4	56.1	21°30.1	43.2	Eltanin	90°41.2	51°29.0
21	69°36.6	150°23.3	08.1	240°16.1	• • 04.8	224° 42.7	56.1	36°32.5	• • 43.2	Kaus Aust.	83°28.6	-34°22.1
22	84°39.1	165°22.3	08.0	255° 17.9	05.0	239° 44.9	56.2	51°35.0	43.2	Vega	80°31.4	38°48.6
23	99°41.6	180°21.4	07.9	270° 19.7	05.3	254° 47.2	56.2	66°37.4	43.3	Nunki	75°44.1	-26° 15.5
										Altair	61°57.1	8°56.8
Mer.p	ass. 16:22	ν -0.9′ d-0	.1' m-3.90	$\nu 1.8' d0$.3′ m0.36	$\nu 2.3' \ d0.$	1^\prime m-1.99	ν 2.4′ d0	.0′ m0.26	Peacock	53°01.3	-56°38.4
										Deneb	49°24.0	45°23.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.6
0	114°44.0	195°20.5	\$23°07.8	285°21.5	S01°05.5	269°49.5	S08° 56.3	81°39.8	N10° 43.3	Al Na'ir	27°29.3	-46°49.3
1	129°46.5	210°19.5	07.7	300°23.2	05.8	284°51.7	56.4	96°42.2	43.3	Fomalhaut	15°11.2	-29°28.1 28°14.6
2	144°49.0	225°18.6	07.6	315°25.0	06.0	299°54.0	56.4	111°44.7	43.3	Scheat	13°42.2	
3	159°51.4	240°17.6	07.5	330°26.8	• • 06.2	314°56.3	• • 56.5	126°47.1	• • 43.4	Markab	13°26.8	15°21.8
4	174°53.9	255°16.7	07.4	345°28.5	06.5	329° 58.6	56.6	141°49.5	43.4	Jan 13 Sat	SHA	Mer.pass
5	189°56.4	270°15.7	07.3	0°30.3	06.7	345°00.8	56.6	156°51.9	43.4	Venus	83°20.1	10:56
6	204°58.8	285°14.8	\$23°07.2	15°32.1	S01°07.0	0°03.1	S08°56.7	171°54.4	N10°43.4	Mars	171°11.4	05:04
7	220°01.3	300°13.8	07.1	30°33.9	07.2	15°05.4	56.7	186°56.8	43.5	Jupiter	155°15.0	06:07
8	235°03.8	315°12.9	07.0	45°35.6	07.5	30°07.7	56.8	201°59.2	43.5	Saturn	326°57.4	18:38
9	250°06.2	330°11.9	• • 06.9	60°37.4	• • 07.7	45°09.9	• • 56.9	217°01.6	• • 43.5	1 155		
10	265°08.7	345°11.0	06.8	75°39.2	08.0	60°12.2	56.9	232°04.1	43.6	Jan 14 Sun	SHA	Mer.pass
11	280°11.1	0°10.1	06.7	90°41.0	08.2	75° 14.5	57.0	247°06.5	43.6	Venus	81°58.3	10:58
12	295°13.6	15°09.1	\$23°06.6	105°42.8	S01°08.4	90°16.8	S08°57.1	262°08.9		1	170°54.2	05:01
13	310°16.1	30°08.2	06.4	120°44.5	08.7	105°19.0	57.1	277°11.3	43.6	Jupiter	155°10.1	06:03
14	325°18.5	45°07.2	06.3	135°46.3	08.9	120°21.3	57.2	292°13.7	43.7	Saturn	326°56.6	18:34
15	340°21.0	60°06.3	06.2	150°48.1	09.2	135°23.6	57.2	307°16.2	• • 43.7	Jan 15 Mon	SHA	Mer.pass
16	355°23.5	75°05.3	06.1	165°49.9	09.4	150°25.9	57.3	322°18.6	43.7	Venus	80°36.4	10:59
17	10°25.9	90°04.4	06.0	180°51.7	09.6	165°28.1	57.4	337°21.0	43.7	Mars		04:58
18	25°28.4	105°03.5	\$23°05.9	195°53.5	S01°09.9	180°30.4	S08°57.4	352°23.4	N10°43.8	Jupiter		06:00
19	40°30.9	120°02.5	05.7	210°55.2	10.1	195°32.7	57.5	7°25.9	43.8	Saturn	326°55.8	18:30
20	55°33.3	135°01.6	05.6	225°57.0	10.4	210°35.0	57.5	22°28.3	43.8			10.00
21	70°35.8	150°00.6	• • 05.5	240°58.8	• 10.6	225°37.2	• • 57.6	37°30.7	• • 43.9	Horizont	al parallax	
22	85°38.3	164°59.7	05.4	$256^{\circ}00.6$	10.8	240°39.5	57.7	52°33.1	43.9		Venus:	0.1
23	$100^{\circ}40.7$	179°58.7	05.2	$271^{\circ}02.4$	11.1	255°41.8	57.7	67°35.5	43.9		Mars:	0.1
Mara	ass. 16:18	1/_O O/ d O	.1′ m-3.90	1/1 Q/ An	.2′ m0.34	1/2 3/ 40	1′ m-1.99	1/2 A/ 40	.0′ m0.27			
ivier.p	ass. 10.10	ν-0.9 α-0	.11-3.90	ν1.0 α0	.∠ 1110.54	ν2.3 a0.	111-1.99	ν2.4 d0	.0 1110.21			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.0	S21°27.7	200°11.6	7.2'	S24°29.2	-3.7'	57.1'
1 2	192°50.7 207°50.5	27.3 26.9	214°37.8 229°04.1	7.3' 7.3'	24°25.6 24°21.8	-3.8' -3.9'	57.1' 57.1'
3	207 50.5 222°50.3	. 26.4	243°30.4	7.3 7.4'	24° 17.8	-3.9 -4.1'	57.1'
4	237°50.0	26.0	257°56.8	7.4'	$24^{\circ}13.7$	-4.2'	57.0'
5	252°49.8	25.6	272°23.2	7.5'	24°09.5	-4.4'	57.0'
6 7	267°49.6 282°49.3	\$21°25.2 24.7	286°49.7 301°16.3	7.6' 7.6'	\$24°05.2 24°00.7	-4.5' -4.6'	57.0' 57.0'
8	297°49.1	24.3	315°43.0	7.7'	23°56.1	-4.8'	57.0'
9	312°48.9	• • 23.9	330°09.7	7.8'	23°51.3	-4.9'	56.9'
10 11	327°48.6 342°48.4	23.4 23.0	344°36.5 359°03.3	7.9' 7.9'	23°46.4 23°41.4	-5.0' -5.2'	56.9' 56.9'
12	357°48.2	\$21°22.6	13°30.2	8.0'	523°36.2	-5.2 -5.3'	56.9
13	12°47.9	22.1	27°57.2	8.1'	23°31.0	-5.4'	56.9'
14	27°47.7	21.7	42°24.3	8.1'	23°25.5	-5.5'	56.8'
15 16	42°47.5 57°47.3	· · 21.2 20.8	56°51.4 71°18.7	8.2' 8.3'	23°20.0 23°14.3	-5.7' -5.8'	56.8' 56.8'
17	72°47.0	20.4	85°46.0	8.4'	23°08.5	-5.9'	56.8'
18	87°46.8	S21°19.9	100°13.3	8.4'	S23°02.6	-6.0'	56.7'
19 20	102°46.6 117°46.3	19.5 19.0	114°40.8 129°08.3	8.5' 8.6'	22°56.5 22°50.4	-6.2' -6.3'	56.7' 56.7'
20	117 46.3 132°46.1	19.0	129 08.3 143°35.9	8.7'	22 50.4 22°44.1	-6.4'	56.7'
22	147°45.9	18.2	158°03.6	8.8'	22°37.7	-6.5'	56.7'
23	162°45.7	17.7	172°31.4	8.8'	22°31.1	-6.7'	56.6'
	SD = 16.3'	d = -0.4'		SI	O = 15.6'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.4	S21°17.3	186°59.2	8.9'	S22°24.5	-6.8'	56.6
1	192°45.2	16.8	201°27.1	9.0'	22°17.7	-6.9'	56.6'
2	207°45.0 222°44.7	16.4 •• 15.9	215°55.1 230°23.2	9.1' 9.2'	22°10.8 22°03.8	-7.0' -7.1'	56.6' 56.6'
4	237°44.5	15.5	230 23.2 244°51.4	9.2	22 03.8 21°56.7	-7.1 -7.2'	56.5
5	252°44.3	15.0	259°19.7	9.3'	21°49.5	-7.3'	56.5'
6	267°44.1	S21°14.6	273°48.0	9.4'	S21°42.1	-7.5'	56.5
7 8	282°43.8 297°43.6	14.2 13.7	288°16.4 302°44.9	9.5' 9.6'	21°34.7 21°27.1	-7.6' -7.7'	56.5' 56.4'
9	312°43.4	• • 13.3	317°13.5	9.7'	21°19.4	-7.8'	56.4
10	327°43.2	12.8	331°42.2	9.8'	21°11.7	-7.9'	56.4'
11 12	342°42.9 357°42.7	12.4 \$21°11.9	346°11.0 0°39.8	9.9' 9.9'	21°03.8 S 20°55.8	-8.0' -8.1'	56.4' 56.4'
13	12°42.5	11.4	0 39.6 15°08.8	10.0'	20°47.7	-8.1 -8.2'	56.3
14	27°42.3	11.0	29°37.8	10.1'	20°39.5	-8.3'	56.3'
15	42°42.0	• • 10.5	44°06.9 58°36.1	10.2'	20°31.2	-8.4'	56.3'
16 17	57°41.8 72°41.6	10.1 09.6	58°36.1 73°05.4	10.3' 10.4'	20°22.8 20°14.3	-8.5' -8.6'	56.3' 56.2'
18	87°41.4	S21°09.2	87°34.8	10.5'	S20°05.8	-8.7'	56.2
19	102°41.1	08.7	102°04.2	10.5'	19°57.1	-8.8'	56.2'
20 21	117°40.9 132°40.7	08.3 •• 07.8	116°33.8 131°03.4	10.6' 10.7'	19°48.3 19°39.4	-8.9' -9.0'	56.2' 56.2'
22	147°40.5	07.3	145°33.1	10.7	19°30.5	-9.0 -9.1'	56.1
23	162°40.3	06.9	160°02.9	10.9'	19°21.4	-9.1'	56.1'
	SD = 16.3'	d = -0.4'		SI	O = 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	177°40.0	S21°06.4	174°32.8	11.0'	S 19°12.3	-9.2'	56.1'
1 2	192°39.8 207°39.6	06.0 05.5	189°02.8 203°32.9	11.1' 11.2'	19°03.0 18°53.7	-9.3' -9.4'	56.1' 56.0'
3	207°39.6 222°39.4	05.5 •• 05.0	203°32.9 218°03.0	11.2'	18°53.7 18°44.3	-9.4° -9.5'	56.0'
4	237°39.1	04.6	232°33.2	11.3'	18°34.8	-9.6'	56.0'
5	252°38.9	04.1	247°03.6	11.4'	18°25.3	-9.7'	56.0'
6 7	267°38.7 282°38.5	\$21°03.6 03.2	261°34.0 276°04.5	11.5' 11.6'	\$18°15.6 18°05.9	-9.7' -9.8'	56.0' 55.9'
8	297°38.3	03.2	290°35.0	11.7'	17°56.1	-9.6' -9.9'	55.9'
9	312°38.1	•• 02.2	305°05.7	11.7'	17°46.2	-10.0'	55.9'
10 11	327°37.8 342°37.6	01.8 01.3	319°36.5 334°07.3	11.8' 11.9'	17°36.2 17°26.2	-10.0' -10.1'	55.9' 55.8'
12	342 37.0 357°37.4	521°00.8	334 07.3 348°38.2	12.0'	\$17°16.1	-10.1	55.8'
13	12°37.2	21°00.4	3°09.2	12.1'	$17^{\circ}05.9$	-10.3'	55.8'
14	27°37.0 42°36.7	20°59.9	17°40.3 32°11.4	12.2'	16°55.6	-10.3'	55.8'
15 16	42°36.7 57°36.5	· · 59.4 58.9	32°11.4 46°42.7	12.2' 12.3'	16°45.3 16°34.9	-10.4' -10.5'	55.8' 55.7'
17	72°36.3	58.5	61°14.0	12.4'	16°24.4	-10.5'	55.7'
18	87°36.1	\$20°58.0	75°45.4	12.5'	\$16°13.9	-10.6'	55.7'
19 20	102°35.9 117°35.7	57.5 57.1	90°16.9 104°48.5	12.6' 12.7'	16°03.3 15°52.6	-10.7' -10.7'	55.7' 55.6'
21	132°35.5	• • 56.6	104 46.5 119°20.1	12.7'	15°41.8	-10.7 -10.8'	55.6'
22	147°35.2	56.1	133°51.9	12.8'	15°31.0	-10.9'	55.6'
23	162°35.0	55.6	148°23.7	12.9'	15°20.2	-10.9'	55.6'
	SD = 16.3'	d = -0.5'		SI	D = 15.3'		

N 72° 08:02 09:54 ■ 14:25 16 N 70° 07:47 09:20 ■ 14:59 16 68° 07:35 08:55 10:36 13:43 15:24 16 66° 07:25 08:36 09:55 14:24 15:43 16 64° 07:16 08:20 09:27 14:52 15:59 17 62° 07:08 08:07 09:06 15:13 16:12 17 60° 07:02 07:56 08:49 15:30 16:23 17 N 58° 06:55 07:46 08:34 15:44 16:33 17 56° 06:50 07:37 08:22 15:57 16:41 17 54° 06:45 07:30 08:11 16:07 16:49 17 50° 06:36 07:16 07:53 16:26 17:03 17 45° 06:26 07:02 07:35 16:44 17:16 17 N 40° 06:17 06:50 07:20 16:58 17:28	Twilight		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ut.		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	17		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	32		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$:44		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	54		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$:03		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$:11		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	17		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	23		
52° 06:40 07:23 08:02 16:17 16:56 17 50° 06:36 07:16 07:53 16:26 17:03 17 45° 06:26 07:02 07:35 16:44 17:16 17 N 40° 06:17 06:50 07:20 16:58 17:28 18 35° 06:09 06:40 07:08 17:11 17:38 18	29		
50° 06:36 07:16 07:53 16:26 17:03 17 45° 06:26 07:02 07:35 16:44 17:16 17 N 40° 06:17 06:50 07:20 16:58 17:28 18 35° 06:09 06:40 07:08 17:11 17:38 18	34		
45° 06:26 07:02 07:35 16:44 17:16 17 N 40° 06:17 06:50 07:20 16:58 17:28 18 35° 06:09 06:40 07:08 17:11 17:38 18	:39		
N 40° 06:17 06:50 07:20 16:58 17:28 18 35° 06:09 06:40 07:08 17:11 17:38 18	:43		
35° 06:09	:53		
10 10000 10000 10000 10000 100	:02		
30° 06:01 06:31 06:57 17:22 17:48 18	10		
	:17		
	:31		
	46		
0° 05:18 05:43 06:05 18:13 18:35 19	:01		
	18		
	:38		
	:04		
35° 03:57 04:32 05:01 19:17 19:45 20			
40° 03:36 04:16 04:48 19:30 20:02 20			
45° 03:10 03:56 04:32 19:46 20:21 21	:08		
	:45		
	:05		
	:32		
	14		
	//		
S 60° /// 01:53 03:10 21:07 22:22 //	//		

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

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

h	Aries	Ve	` nus	М	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	115°43.2	194°57.8	\$23°05.1	286°04.2	S01°11.3	270°44.1	S08°57.8	82°38.0	N10°43.9			
1	130°45.6	209°56.8	05.0	301°06.0	11.6	285°46.4	57.9	97°40.4	44.0	Alpheratz	357°31.5	29°15.3
2	145°48.1	224°55.9	04.9	316°07.7	11.8	300°48.6	57.9	112°42.8	44.0	Ankaa	353°04.1	-42°09.0
3	160°50.6	239°55.0	• • 04.7	331°09.5	• • 12.0	315°50.9	• • 58.0	127°45.2	• • 44.0	Schedar	349°27.3	56°42.1
4	175°53.0	254°54.0	04.6	346°11.3	12.3	330°53.2	58.0	142°47.7	44.1	Diphda	348°44.1	-17°49.7
5	190°55.5	269°53.1	04.5	1°13.1	12.5	345°55.5	58.1	157°50.1	44.1	Achernar	335°17.9	-57°05.6
6	205°58.0	284°52.1	\$23°04.3	16°14.9	S01°12.7	0°57.7	S08°58.2	172°52.5	N10°44.1	Hamal	327°47.4	23°36.1
7	221°00.4	299°51.2	04.2	31°16.7	13.0	16°00.0	58.2	187°54.9	44.1	Polaris	312°00.7	89°23.4
8	236°02.9	314°50.3	04.1	46°18.5	13.2	31°02.3	58.3	202°57.3	44.2	Acamar	315°09.2	-40°11.5
9	251°05.4	329°49.3	• • 03.9	61°20.3	• • 13.5	46°04.6	• • 58.3	217°59.8	• • 44.2	Menkar	314°02.6	4°12.2
10	266°07.8	344°48.4	03.8	76°22.1	13.7	61°06.9	58.4	233°02.2	44.2	Mirfak	308°23.2	49°58.0
11	281°10.3	359°47.4	03.6	91°23.9	13.9	76°09.2	58.5	248°04.6	44.3	Aldebaran	290°35.6	16°34.0
12	296°12.7	14°46.5	S23°03.5	106°25.7	S01°14.2	91°11.4	S08°58.5	263°07.0	N10°44.3	Rigel	281°00.4	-8°10.3
13	311°15.2	29°45.5	03.4	121°27.5	14.4	106°13.7	58.6	278°09.4	44.3	Capella	280°16.6	46°01.6
14	326°17.7	44°44.6	03.2	136°29.3	14.6	121°16.0	58.6	293°11.8	44.3	Bellatrix	278°19.1	6°22.4
15	341°20.1	59°43.7	• • 03.1	151°31.1	• • 14.9	136°18.3	• • 58.7	308°14.3	• • 44.4	Elnath	277°57.4	28°37.8
16	356°22.6	74°42.7	02.9	166°32.9	15.1	151°20.6	58.7	323°16.7	44.4	Alnilam	275°34.1	-1°11.2
17	11°25.1	89°41.8	02.8	181°34.7	15.3	166°22.8	58.8	338°19.1	44.4	Betelgeuse	270°48.2	7°24.6
18	26°27.5	104°40.8	S23°02.6	196°36.5	S01°15.6	181°25.1	S08°58.9	353°21.5	N10°44.5	Canopus	263°50.4	-52°42.9
19	41°30.0	119°39.9	02.5	211°38.3	15.8	196°27.4	58.9	8°23.9	44.5	Sirius	258°23.0	-16°45.6
20	56°32.5	134°39.0	02.3	226°40.1	16.0	211°29.7	59.0	23°26.4	44.5	Adhara	255°02.9	-29°00.9
21	71°34.9	149°38.0	02.3	241°41.9	16.3	226°32.0	• • 59.0	38°28.8	• • 44.5	Procyon	244°47.1	5°08.8
22	86°37.4	164° 37.1	02.2	256°43.7	16.5	241°34.3	59.0	53°31.2	44.6	Pollux	243°12.9	27°57.1
23	101°39.9	179°36.1	01.9	271°45.5	16.7	256°36.5	59.2	68°33.6	44.6	Avior	234°12.6	-59°36.2
								-		Suhail	222°43.4	-43°33.1
Mer.p	ass. 16:14	ν -0.9' d-0	0.1′ m-3.90	$\nu 1.8' \ d0$.2′ m0.32	$\nu 2.3' \ d0.$	1′ m-2.00	ν 2.4 $'$ d0	.0′ m0.27	Miaplacidus	221°36.5	-69°50.2
										Alphard	217°44.2	-8°47.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.3
0	116°42.3	194°35.2	\$23°01.7	286°47.3	S01°17.0	271°38.8	S08°59.2	83°36.0	N10°44.6		193°36.8	61°35.3
1	131°44.8	209°34.3	01.6	301°49.1	17.2	286°41.1	59.3	98°38.4	44.7	Denebola	182°21.5	14°24.3
2	146°47.2	224°33.3	01.4	316°50.9	17.4	301°43.4	59.3	113°40.9	44.7	Gienah	175°40.0	-17°42.3
3	161°49.7	239°32.4	• • 01.2	331°52.7	. 17.6	316°45.7	• • 59.4	128°43.3	• • 44.7		172°56.0	-63°15.4
4	176°52.2	254°31.4	01.1	346°54.5	17.9	331°48.0	59.4	143°45.7	44.7		171°47.6	-57°16.4
5	191°54.6	269°30.5	00.9	1°56.3	18.1	346°50.3	59.5	158°48.1	44.8	Alioth	166°10.1	55°47.7
6	206°57.1	284°29.6	\$23°00.7	16°58.1	S01°18.3	1°52.5	S08°59.6	173°50.5	N10°44.8	Spica	158°18.8	-11°18.8
7	221°59.6	299°28.6	00.6	31°59.9	18.6	16°54.8	59.6	188°52.9	44.8	Alkaid	152°49.5	49°09.7
8	237°02.0	314°27.7	00.4	47°01.7	18.8	31°57.1	59.7	203°55.4	44.9	Hadar	148°31.2	-60°30.5
9	252°04.5	329°26.7	• • 00.2	62°03.5	• • 19.0	46°59.4	• • 59.7	218°57.8	• • 44.9		147°53.7	-36°30.7
10	267°07.0	344°25.8	23°00.1	77°05.4	19.2	62°01.7	59.8	234°00.2	44.9		145°45.0	19°01.7
11	282°09.4	359°24.9	22°59.9	92°07.2	19.5	77°04.0	59.8	249°02.6	45.0	_	139°35.8	-60°57.1
12	297°11.9	14°23.9	S22°59.7	107°09.0	S01° 19.7	92°06.3	S08°59.9	264°05.0	N10°45.0	Kochab	137°20.5	74°01.8
13	312°14.4	29°23.0	59.6	122°10.8	19.9	107°08.6	09°00.0	279°07.4	45.0	Zuben'ubi	136°52.5	-16°09.7
14	327°16.8	44°22.0	59.4	137°12.6	20.2	122°10.9	00.0	294°09.8	45.1	Alphecca	126°01.2	26°36.8
15	342°19.3	59°21.1	• • 59.2	152°14.4	. 20.4	137°13.1	. 00.1	309°12.3	• • 45.1	Antares	112°12.0	-26°29.7
16	357°21.7	74°20.2	59.0	167°16.2	20.4	152°15.4	00.1	324°14.7	45.1	Atria	107°03.7	-69°04.5
17	12°24.2	89°19.2	58.9	182°18.1	20.8	167°17.7	00.2	339°17.1	45.1	Sabik	101°59.3	-15°45.6
18	27°26.7	104°18.3	S22°58.7		S01°21.1	182°20.0	S09°00.2	354°19.5	N10°45.2	Shaula	96°06.3	-37°07.3
19	42°29.1	119°17.4	58.5	212°21.7	21.3	197°22.3	00.3	9°21.9	45.2	Rasalhague	95°55.8	12°32.3
20	57°31.6	134°16.4	58.3	227°23.5	21.5	212°24.6	00.4	24°24.3	45.2	Eltanin	90°41.1	51°29.0
21	72°34.1	149°15.5	• • 58.1	242°25.3	. 21.7	227°26.9	00.4	39°26.7	• • 45.3	Kaus Aust.	83°28.6	-34°22.1
22	87°36.5	164°14.5	58.0	257°27.1	22.0	242°29.2	00.5	54°29.1	45.3	Vega	80°31.4	38°48.6
23	102°39.0	179°13.6	57.8	272°29.0	22.2	257°31.5	00.5	69°31.6	45.3	Nunki	75°44.1	-26°15.5
_										Altair	61°57.1	8°56.8
Mer.p	ass. 16:11	ν -0.9′ d-0	.2′ m-3.90	ν 1.8′ d0	.2′ m0.30	$\nu 2.3' \ d0.$	1′ m-2.01	ν 2.4′ d0	.0′ m0.28	Peacock	53°01.3	-56°38.4
									-	Deneb	49°24.0	45°23.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.6
0	117°41.5	194°12.7	S22°57.6	287°30.8	S01°22.4	272°33.8	S09°00.6	84°34.0	N10°45.4	Al Na'ir	27°29.3	-46°49.2
1	132°43.9	209°11.7	57.4	302°32.6	22.6	287°36.0	00.6	99°36.4	45.4	Fomalhaut	15°11.2 13°42.2	-29°28.1
2	147°46.4	224°10.8	57.2	317°34.4	22.9	302°38.3	00.7	114°38.8	45.4	Scheat		28°14.6 15°21.8
3	162°48.8	239°09.9	• • 57.0	332°36.3	. 23.1	317°40.6	• • 00.7	129°41.2	• • 45.5	Markab	13°26.8	13 Z1.8
4	177°51.3	254°08.9	56.8	347°38.1	23.3	332°42.9	00.8	144°43.6	45.5	Jan 16 Tue	SHA	Mer.pass
5	192°53.8	269°08.0	56.6	2°39.9	23.5	347°45.2	00.9	159°46.0	45.5	Venus	79°14.6	11:01
6	207°56.2	284°07.1	S22°56.4	17°41.7	S01°23.7	2°47.5	S09°00.9	174°48.4	N10°45.5		170°21.0	04:55
7	222°58.7	299°06.1	56.3	32°43.6	24.0	17°49.8	01.0	189°50.9	45.6		155°00.9	05:56
8	238°01.2	314°05.2	56.1	47°45.4	24.2	32°52.1	01.0	204°53.3	45.6	Saturn	326°54.8	18:26
9	253°03.6	329°04.3	• • 55.9	62°47.2	24.4	47°54.4	01.1	219°55.7	• • 45.6			
10	268°06.1	344°03.3	55.7	77°49.0	24.6	62°56.7	01.1	234°58.1	45.7	Jan 17 Wed	SHA	Mer.pass
11	283°08.6	359°02.4	55.5	92°50.9	24.8	77°59.0	01.2	250°00.5	45.7	Venus	77°52.9	11:02
12	298°11.0	14°01.4	S 22°55.3	107°52.7	S01°25.1	93°01.3	S09°01.2	265°02.9	N10°45.7	1	170°05.0	04:52
13	313°13.5	29°00.5	55.1	122°54.5	25.3	108°03.6	01.3	280°05.3	45.8	Jupiter	154°56.5	05:53
14	$328^{\circ}16.0$	43°59.6	54.9	137°56.4	25.5	123°05.9	01.3	295°07.7	45.8	Saturn	326°53.7	18:23
15	343°18.4	58°58.6	• • 54.7	152°58.2	• • 25.7	138°08.2	• • 01.4	$310^{\circ}10.1$	• • 45.8	Jan 18 Thu	SHA	Mer.pass
16	358°20.9	73°57.7	54.4	168°00.0	25.9	$153^{\circ}10.5$	01.5	$325^{\circ}12.5$	45.9	Venus	76°31.2	11:04
17	13°23.3	88°56.8	54.2	183°01.9	26.2	$168^{\circ}12.8$	01.5	$340^{\circ}15.0$	45.9	Mars		04:49
18	28°25.8	103°55.8	S22°54.0	198°03.7	S01°26.4	183°15.0	S09°01.6	355°17.4	N10°45.9	Jupiter		05:49
19	43°28.3	118°54.9	53.8	213°05.5	26.6	198°17.3	01.6	$10^{\circ}19.8$	46.0	Saturn	326°52.5	18:19
20	58°30.7	133°54.0	53.6	228°07.4	26.8	213°19.6	01.7	25°22.2	46.0			
21	73°33.2	148°53.0	• • 53.4	243°09.2	• • 27.0	228°21.9	• • 01.7	40°24.6	• • 46.0	Horizont	al parallax	
22	88°35.7	$163^{\circ}52.1$	53.2	258°11.0	27.2	243°24.2	01.8	55°27.0	46.1		Venus:	0.1
23	103°38.1	178°51.2	53.0	273°12.9	27.5	258°26.5	01.8	70°29.4	46.1		Mars:	0.1
Mern	ass. 16:07	ν-0 0/ d.0	0.2' m-3.90	1/1 8 ¹ d0	.2′ m0.28	1/2 3/ d0	1′ m-2.01	1/2 A/ d0	.0′ m0.28			
- vici.p		- 0.5 u-0		- 1.0 UU		- Z.5 UO.		-2.7 00				

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Thu GHA Dec GHA ν Dec d HP 0 177° 24.9 \$20° 31.4 141° 43.9 15.8' \$05° 34.5 -12.6' 54.6' 1 192° 24.7 30.9 156° 18.7 15.8' 05° 21.9 -12.6' 54.6' 2 207° 24.5 30.4 170° 53.5 15.9' 05° 09.2 -12.7' 54.6' 3 222° 24.3 · 29.9 185° 28.4 15.9' 04° 56.6 -12.7' 54.6' 4 237° 24.1 29.4 200° 03.3 15.9' 04° 43.9 -12.7' 54.6' 5 252° 23.9 28.9 214° 38.2 16.0' 04° 31.3 -12.7' 54.6' 6 267° 23.7 \$20° 28.3 229° 13.2 16.0' 04° 31.3 -12.7' 54.6' 7 282° 23.5 27.8 243° 48.2 16.0' 04° 05.9 -12.7' 54.5' 8 297° 23.3 27.3 258° 23.2 16.1' 03° 34.5 -12	23	162°25.1		127°09.2	15.8'	05°47.1	-12.6'	54.7'	
0 177°24.9 \$20°31.4 141°43.9 15.8' \$05°34.5 -12.6' 54.6' 1 192°24.7 30.9 156°18.7 15.8' 05°21.9 -12.6' 54.6' 2 207°24.5 30.4 170°53.5 15.9' 05°09.2 -12.7' 54.6' 3 222°24.3 ·· 29.9 185°28.4 15.9' 04°56.6 -12.7' 54.6' 4 237°24.1 29.4 200°03.3 15.9' 04°43.9 -12.7' 54.6' 5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 S20°28.3 229°13.2 16.0' 04°05.9 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°40.5 -12.7'		SD = 16.2'	d = -0.5'		SI	O = 15.0'			
1 192°24.7 30.9 156°18.7 15.8' 05°21.9 -12.6' 54.6' 2 207°24.5 30.4 170°53.5 15.9' 05°09.2 -12.7' 54.6' 3 222°24.3 ·· 29.9 185°28.4 15.9' 04°56.6 -12.7' 54.6' 4 237°24.1 29.4 200°03.3 15.9' 04°43.9 -12.7' 54.6' 5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 S20°28.3 229°13.2 16.0' 04°05.9 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 ·· 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' <td>Thu</td> <td>GHA</td> <td>Dec</td> <td>GHA</td> <td>ν</td> <td>Dec</td> <td>d</td> <td>HP</td>	Thu	GHA	Dec	GHA	ν	Dec	d	HP	
2 207°24.5 30.4 170°53.5 15.9' 05°09.2 -12.7' 54.6' 3 222°24.3 ·· 29.9 185°28.4 15.9' 04°56.6 -12.7' 54.6' 4 237°24.1 29.4 200°03.3 15.9' 04°43.9 -12.7' 54.6' 5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 S20°28.3 229°13.2 16.0' 04°31.3 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' S03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2							-12.6'		
3 222°24.3 ··· 29.9 185°28.4 15.9' 04°56.6 -12.7' 54.6' 4 237°24.1 29.4 200°03.3 15.9' 04°43.9 -12.7' 54.6' 5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 S20°28.3 229°13.2 16.0' 504°18.6 -12.7' 54.5' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 ·· 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' 02°49.6									
4 237°24.1 29.4 200°03.3 15.9' 04°43.9 -12.7' 54.6' 5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 520°28.3 229°13.2 16.0' 504°18.6 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°15.0 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' 503°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°49.6 -12.7' 54.5' 14 27°21.7 23.7 0°29.2 16.2' </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
5 252°23.9 28.9 214°38.2 16.0' 04°31.3 -12.7' 54.6' 6 267°23.7 S20°28.3 229°13.2 16.0' S04°18.6 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°40.5 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°27.7 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' S03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°49.6 -12.7' 54.5' 14 27°21.1 24.2 345°54.0 16.2' 02°36.8 -12.									
6 267°23.7 \$20°28.3 229°13.2 16.0' \$04°18.6 -12.7' 54.6' 7 282°23.5 27.8 243°48.2 16.0' 04°05.9 -12.7' 54.5' 8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 · · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 \$20°25.3 316°43.6 16.2' \$03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' \$02°49.6 -12.7' 54.5' 14 27°22.1 24.2 345°54.0 16.2' \$02°36.8 -12.7' 54.4' 15 42°21.9 · · 23.7 0°29.2 16.2' 02°36.8 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
8 297°23.3 27.3 258°23.2 16.1' 03°53.2 -12.7' 54.5' 9 312°23.1 · · · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' 03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°46.6 -12.7' 54.5' 14 27°22.1 24.2 345°54.0 16.2' 02°36.8 -12.7' 54.4' 15 42°21.9 · · 23.7 0°29.2 16.2' 02°24.1 -12.7' 54.4' 16 57°21.7 23.2 15°04.5 16.3' 02°11.4 -12.7' 54.4' 17 72°21.5 22.6 29°39.8 16.3' 02°11.4 -12.7' 54.4' 18 87°21.4 S20°22.1 44°15.0 16.3								54.6'	
9 312°23.1 · · · 26.8 272°58.3 16.1' 03°40.5 -12.7' 54.5' 10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' S03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°49.6 -12.7' 54.5' 14 27°22.1 24.2 345°54.0 16.2' 02°36.8 -12.7' 54.4' 15 42°21.9 · · 23.7 0°29.2 16.2' 02°24.1 -12.7' 54.4' 16 57°21.7 23.2 15°04.5 16.3' 02°11.4 -12.7' 54.4' 17 72°21.5 22.6 29°39.8 16.3' 01°58.6 -12.7' 54.4' 18 87°21.4 S20°22.1 44°15.0 16.3' 501°45.9 -									
10 327°22.9 26.3 287°33.4 16.1' 03°27.7 -12.7' 54.5' 11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' S03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°49.6 -12.7' 54.5' 14 27°22.1 24.2 345°54.0 16.2' 02°36.8 -12.7' 54.4' 15 42°21.9 · 23.7 0°29.2 16.2' 02°24.1 -12.7' 54.4' 16 57°21.7 23.2 15°04.5 16.3' 02°11.4 -12.7' 54.4' 18 87°21.4 520°22.1 44°15.0 16.3' 501°45.6 -12.7' 54.4' 19 102°21.2 21.6 58°50.4 16.3' 501°45.9 -12.7' 54.4' 20 117°21.0 21.1 73°25.7 16.4' 01°20.4 -12.7'<									
11 342°22.7 25.8 302°08.5 16.1' 03°15.0 -12.7' 54.5' 12 357°22.5 S20°25.3 316°43.6 16.2' S03°02.3 -12.7' 54.5' 13 12°22.3 24.7 331°18.8 16.2' 02°49.6 -12.7' 54.5' 14 27°22.1 24.2 345°54.0 16.2' 02°36.8 -12.7' 54.4' 15 42°21.9 · 23.7 0°29.2 16.2' 02°24.1 -12.7' 54.4' 16 57°21.7 23.2 15°04.5 16.3' 02°11.4 -12.7' 54.4' 17 72°21.5 22.6 29°39.8 16.3' 01°58.6 -12.7' 54.4' 18 87°21.4 520°22.1 44°15.0 16.3' 501°45.9 -12.7' 54.4' 19 102°21.2 21.6 58°50.4 16.3' 01°33.2 -12.7' 54.4' 20 117°21.0 21.1 73°25.7 16.4' 01°20.4 -12.7' <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14	27°22.1	24.2	345°54.0	16.2'	02°36.8	-12.7'	54.4'	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$									
19 102°21.2 21.6 58°50.4 16.3' 01°33.2 -12.7' 54.4' 20 117°21.0 21.1 73°25.7 16.4' 01°20.4 -12.7' 54.4' 21 132°20.8 · · 20.6 88°01.0 16.4' 01°07.7 -12.7' 54.4' 22 147°20.6 20.0 102°36.4 16.4' 00°55.0 -12.7' 54.3' 23 162°20.4 19.5 117°11.8 16.4' 00°42.2 -12.7' 54.3'									
20 117°21.0 21.1 73°25.7 16.4' 01°20.4 -12.7' 54.4' 21 132°20.8 20.6 88°01.0 16.4' 01°07.7 -12.7' 54.4' 22 147°20.6 20.0 102°36.4 16.4' 00°55.0 -12.7' 54.3' 23 162°20.4 19.5 117°11.8 16.4' 00°42.2 -12.7' 54.3'									
21 132°20.8 · · · 20.6 88°01.0 16.4' 01°07.7 -12.7' 54.4' 22 147°20.6 20.0 102°36.4 16.4' 00°55.0 -12.7' 54.3' 23 162°20.4 19.5 117°11.8 16.4' 00°42.2 -12.7' 54.3'									
23 162°20.4 19.5 117°11.8 16.4' 00°42.2 -12.7' 54.3'				88°01.0		$01^{\circ}07.7$			
SD = 16.2' d = -0.5' $SD = 14.9'$	23			117°11.8			-12.7'	54.3'	
		SD = 16.2'	d = -0.5'		SI	O = 14.9'			

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-10%	
16	09:41	09:51	12:10	13:33	01:10		
17	10:01	10:11	12:10	14:17	01:55		
18	10:20	10:30	12:10	14:58	02:37		

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

h	Aries	Veni	us	M	ars	Jup	iter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	118°40.6	193°50.2	S22°52.8	288°14.7	S01°27.7	273°28.8	S09°01.9	85°31.8	N10°46.1			
1	133°43.1	208°49.3	52.5	303°16.6	27.9	288°31.1	01.9	100°34.2	46.2	Alpheratz	357°31.5	29°15.3
2	148°45.5	223°48.4	52.3	318°18.4	28.1	303°33.4	02.0	115°36.6	46.2	Ankaa	353°04.2	-42°09.0
3	163°48.0	238° 47.4	• 52.1	333°20.2	28.3	318°35.7	• • 02.0	130°39.0	• • 46.2	Schedar	349°27.3	56°42.1
4	178°50.5	253° 46.5	51.9	348°22.1	28.5	333°38.0	02.1	145°41.4	46.3	Diphda	348°44.1	-17°49.7
5	193°52.9	268° 45.6	51.7	3°23.9	28.7	348°40.3	02.1	160°43.9	46.3	Achernar	$335^{\circ}17.9$	-57°05.6
6	208°55.4	283° 44.7	\$22°51.4	18°25.8	S01°29.0	3°42.6	S09°02.2	175°46.3	N10°46.3	Hamal	327°47.4	23°36.1
7	208 55.4 223°57.8	298° 43.7	51.2	33°27.6	29.2	18°44.9	02.2	175°40.3	46.4	Polaris	$312^{\circ}02.2$	89°23.4
8								205°51.1		Acamar	$315^{\circ}09.2$	-40°11.5
	239°00.3	313°42.8	51.0	48°29.5	29.4	33°47.2	02.3	205 51.1 220°53.5	46.4	Menkar	314°02.6	4°12.2
9	254°02.8	328°41.9	• • 50.8	63°31.3	• • 29.6	48°49.5	• • 02.3		• • 46.4	Mirfak	308°23.2	49°58.0
10	269°05.2	343°40.9	50.5	78°33.1	29.8	63°51.8	02.4	235°55.9	46.5	Aldebaran	290°35.6	16°34.0
11	284°07.7	358° 40.0	50.3	93°35.0	30.0	78°54.1	02.5	250°58.3	46.5	Rigel	281°00.4	-8°10.3
12	299°10.2	13°39.1	S22°50.1	108°36.8	S01°30.2	93°56.4	S09°02.5	266°00.7	N10°46.5	Capella	280°16.6	46°01.6
13	314°12.6	28°38.1	49.9	123°38.7	30.4	108°58.7	02.6	281°03.1	46.6	Bellatrix	278°19.1	6°22.4
14	329°15.1	43°37.2	49.6	138°40.5	30.7	124°01.0	02.6	296°05.5	46.6	Elnath	277°57.4	28°37.8
15	344°17.6	58° 36.3	• • 49.4	153°42.4	• • 30.9	139°03.3	• • 02.7	311°07.9	• • 46.6	Alnilam	275°34.1	-1°11.2
16	359°20.0	73°35.4	49.2	168°44.2	31.1	154°05.6	02.7	326°10.3	46.7	Betelgeuse	270°48.2	7°24.6
17	14°22.5	88°34.4	48.9	183°46.1	31.3	169°07.9	02.8	341°12.7	46.7	Canopus	263°50.4	-52°42.9
18	29°24.9	103°33.5	S22°48.7	198°47.9	S01°31.5	184°10.3	S09°02.8	$356^{\circ}15.1$	N10°46.7	Sirius	258° 23.0	-16°45.6
19	44°27.4	118°32.6	48.4	213°49.8	31.7	199°12.6	02.9	11°17.5	46.8	Adhara	255°02.9	-29°00.9
20	59°29.9	133°31.6	48.2	228°51.6	31.9	214°14.9	02.9	26°19.9	46.8	Procyon	244°47.1	5°08.8
21	74°32.3	148°30.7	• • 48.0	243°53.5	• • 32.1	229°17.2	• • 03.0	41°22.3	• • 46.8	Pollux	244 47.1 243°12.9	27°57.1
22	89°34.8	163°29.8	47.7	258°55.4	32.3	244°19.5	03.0	56°24.7	46.9		243 12.9 234°12.6	
23	104°37.3	178°28.9	47.5	273°57.2	32.5	259°21.8	03.1	71°27.2	46.9	Avior		-59°36.3
	16.02	0.0/ 1.0.0	2 00	1.0/ 10	2/ 0.05	2.2/ 10	1/ 0.00	2.4/ 10	0/ 0.00	Suhail	222°43.4	-43°33.1
Mer.p	bass. 16:03	ν -0.9' d-0.2	2′ m-3.90	ν 1.8' d0	.2′ m0.25	ν 2.3° d0.	1′ m-2.02	ν 2.4′ d0	.0′ m0.28	Miaplacidus	221°36.5	-69°50.2
										Alphard	217°44.2	-8°47.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.2
0	119°39.7	193°27.9	S22°47.2	288°59.1	S01°32.7	274°24.1	509°03.1	86°29.6	N10°46.9	Dubhe	193°36.7	61°35.3
1	134°42.2	208° 27.0	47.0	304°00.9	33.0	289°26.4	03.2	101°32.0	47.0	Denebola	182°21.4	14°24.3
2	149°44.7	223°26.1	46.7	319°02.8	33.2	304°28.7	03.2	116°34.4	47.0	Gienah	175°40.0	-17°42.3
3	164° 47.1	238°25.1	• • 46.5	334°04.6	• • 33.4	319°31.0	• • 03.3	131°36.8	• • 47.0			-63°15.5
3 4	104 47.1 179°49.6	253° 24.2		349°06.5		334°33.3	03.3	131 30.6 146°39.2		Gacrux	171°47.6	-57°16.4
			46.2		33.6				47.1	Alioth	$166^{\circ}10.1$	55°47.7
5	194°52.1	268°23.3	46.0	4°08.4	33.8	349°35.6	03.4	161°41.6	47.1	Spica	$158^{\circ}18.8$	-11°18.8
6	209°54.5	283°22.4	S22°45.7	19°10.2	S01°34.0	4°37.9	S09°03.4	176°44.0	N10°47.1	Alkaid	152°49.5	49°09.7
7	224°57.0	298°21.4	45.5	34°12.1	34.2	19°40.2	03.5	191°46.4	47.2	Hadar	148°31.2	-60°30.5
8	239°59.4	313°20.5	45.2	49°13.9	34.4	34°42.5	03.5	206°48.8	47.2	Menkent	147°53.7	-36°30.7
9	255°01.9	328° 19.6	• • 45.0	64°15.8	• • 34.6	49°44.8	• • 03.6	221°51.2	• • 47.2	Arcturus	145°45.0	19°01.6
10	270°04.4	343°18.7	44.7	79°17.7	34.8	64°47.1	03.6	236°53.6	47.3	Rigil Kent.	139°35.7	-60°57.1
11	285°06.8	358° 17.7	44.5	94°19.5	35.0	79°49.4	03.7	251°56.0	47.3	Kochab	137°20.5	74°01.8
12	300°09.3	13°16.8	S22°44.2	109°21.4	S01°35.2	94°51.8	S09°03.7	266°58.4	N10°47.3	Zuben'ubi	136°52.4	-16°09.7
13	315°11.8	28° 15.9	43.9	124°23.3	35.4	109°54.1	03.8	282°00.8	47.4	Alphecca	126°01.1	26°36.8
14	330°14.2	43°15.0	43.7	139°25.1	35.6	124°56.4	03.8	297°03.2	47.4	Antares	112°12.0	-26°29.7
15	345°16.7	58°14.0	• • 43.4	154°27.0	• • 35.8	139°58.7	• • 03.9	312°05.6	• • 47.4	Atria	107°03.6	-69°04.5
16	0°19.2	73°13.1	43.2	169°28.9	36.0	155°01.0	03.9	327°08.0	47.5	Sabik	101°59.3	-15°45.6
17	15°21.6	88°12.2	42.9	184°30.7	36.2	170°03.3	03.9	342°10.4	47.5	Shaula	96°06.2	-37°07.3
18	30°24.1	103°11.3	S22°42.6	199°32.6	S01°36.4	185°05.6	S09°04.0	357°12.8	N10°47.5	Rasalhague	95°55.8	12°32.3
19	45°26.5	118° 10.3	42.4	214°34.5	36.6	200°07.9	04.0	12°15.2	47.6	Eltanin	90°41.1	51°29.0
20	60°29.0	133°09.4	42.1	229°36.4	36.8	215°10.2	04.1	27°17.6	47.6	Kaus Aust.	83°28.5	-34°22.1
21	75°31.5	148°08.5	• • 41.8	244°38.2	• • 37.0	230°12.5	• • 04.1	42°20.0	• • 47.7	Vega	80°31.4	38°48.6
22	90°33.9	163°07.6	41.5	259°40.1	37.2	245°14.9	04.2	57°22.4	47.7	Nunki		-26°15.5
23	105°36.4	178°06.7	41.3	274°42.0	37.4	260°17.2	04.2	72°24.8	47.7		75°44.1	
										Altair	61°57.1	8°56.8
Mer.p	bass. 15:59	ν -0.9' d-0.2	2′ m-3.90	ν 1.9' d0	.2′ m0.23	ν 2.3° d0.	1′ m-2.03	ν 2.4′ d0	.0′ m0.29	Peacock	53°01.3	-56°38.4
										Deneb	49°24.0	45°23.2
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.9	10°00.6
0	120°38.9	193°05.7	S22°41.0	289°43.8	S01°37.6	275°19.5	S09°04.3	87°27.2	N10°47.8	Al Na'ir	27°29.3	-46°49.2 -29°28.1
1	135°41.3	208° 04.8	40.7	304°45.7	37.8	290°21.8	04.3	102°29.6	47.8	Fomalhaut	15°11.2	
2	150°43.8	223°03.9	40.5	319°47.6	38.0	305°24.1	04.4	117°32.0	47.8	Scheat	13°42.2	28°14.6
3	165°46.3	238° 03.0	• • 40.2	334°49.5	• • 38.2	320°26.4	• • 04.4	132°34.4	• • 47.9	Markab	13°26.8	15°21.8
4	180°48.7	253° 02.0	39.9	349°51.4	38.4	335°28.7	04.5	147°36.8	47.9	Jan 19 Fri	SHA	Mer.pass
5	195°51.2	268° 01.1	39.6	4°53.2	38.6	350°31.0	04.5	162°39.2	47.9	Venus	75°09.7	11:05
6	210°53.7	283°00.2	\$22°39.3	19°55.1	S01°38.8	5°33.4	S09°04.6	102 39.2 177°41.6	N10°48.0		169°34.1	04:46
7	210 55.7 225°56.1	297°59.3	39.1	34°57.0	39.0	20°35.7	04.6	177 41.0 192°44.0	48.0		154° 48.2	05:45
8	240°58.6	312°58.4	38.8	49°58.9	39.0	20 35.7 35°38.0	04.0	207°46.4	48.0	Saturn	326°51.2	18:15
9	256°01.0	327°57.4	30.0 •• 38.5	49 56.9 65°00.8	39.4	50°40.3	• • 04.7	207 40.4 222°48.8	• 48.1	Jatuill	J_J J1.2	10.13
	250 01.0 271°03.5			80°02.6		65°42.6		222 48.8 237°51.2		Jan 20 Sat	SHA	Mer.pass
10	271°03.5 286°06.0	342°56.5	38.2	95°04.5	39.6	80°44.9	04.8	252°53.6	48.1	Venus	73°48.2	11:07
11		357°55.6	37.9		39.8		04.8		48.2	Mars	169°19.3	04:43
12	301°08.4	12°54.7	\$22°37.6	110°06.4	S01°40.0	95°47.2	S09°04.8	267°56.0	N10°48.2		154°44.3	05:42
13	316°10.9	27°53.8	37.3	125°08.3	40.2	110°49.6	04.9	282°58.4	48.2	Saturn	326°49.8	18:11
14	331°13.4	42°52.8	37.0	140°10.2	40.4	125°51.9	04.9	298°00.8	48.3			
15	346°15.8	57°51.9	• • 36.8	155°12.1	• • 40.6	140°54.2	• • 05.0	313°03.2	• • 48.3	Jan 21 Sun	SHA	Mer.pass
16	1°18.3	72°51.0	36.5	170°13.9	40.8	155°56.5	05.0	328°05.5	48.3	Venus	72°26.9	11:08
17	16°20.8	87°50.1	36.2	185°15.8	41.0	170°58.8	05.1	343°07.9	48.4	Mars		04:40
18	31°23.2	102°49.2	S22°35.9	200°17.7	S01°41.2	186°01.1	S09°05.1	358°10.3	N10°48.4	Jupiter	154°40.6	05:38
19	46°25.7	117°48.3	35.6	215°19.6	41.4	201°03.5	05.2	13°12.7	48.4	Saturn	326°48.3	18:07
20	61°28.2	132° 47.3	35.3	230°21.5	41.5	216°05.8	05.2	28°15.1	48.5		al ac::::"	
21	76°30.6	147° 46.4	• • 35.0	245°23.4	• • 41.7	231°08.1	• • 05.3	43°17.5	• • 48.5	Horizont	al parallax	
22	91°33.1	162° 45.5	34.7	260°25.3	41.9	246°10.4	05.3	58°19.9	48.6		Venus:	0.1
23	106°35.5	177° 44.6	34.4	275°27.2	42.1	261°12.7	05.3	73°22.3	48.6		Mars:	0.1
Mern	ass. 15:55	ν -0.9' d-0.3	3′ m-3 an	1/1 Q' d0	.2′ m0.21	1/2 3/ d0	0′ m-2.03	1/2 A/ dn	.0′ m0.29			
		- 5.5 u-0.5	5.90	- 1.5 UU		-2.5 uo.		- Z.7 UU	.5 1110.23			

h	Su			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°20.2	\$20°19.0	131°47.2	16.4'	S00°29.5	-12.7'	54.3'
1	192°20.0	18.5	146°22.6	16.4'	00°16.8	-12.7'	54.3'
2	207°19.8 222°19.6	17.9 •• 17.4	160°58.1 175°33.5	16.4' 16.5'	S00°04.1 N00°08.6	-12.7' 12.7'	54.3' 54.3'
3 4	222 19.6 237°19.4	16.9	175 33.5 190°09.0	16.5	00°21.3	12.7'	54.3'
5	252°19.2	16.3	204°44.4	16.5	00°21.3	12.7'	54.3'
6	267°19.1	S20° 15.8	219°19.9	16.5'	N00°46.7	12.7'	54.3'
7	282°18.9	15.3	233°55.4	16.5'	00°59.4	12.7'	54.3'
8	297°18.7	14.7	248°30.9	16.5'	01°12.1	12.7'	54.2'
9 10	312°18.5 327°18.3	· · 14.2 13.7	263°06.4 277°41.9	16.5' 16.5'	01°24.7 01°37.4	12.6' 12.6'	54.2' 54.2'
11	342°18.1	13.7	277 41.9 292°17.4	16.5	01°50.0	12.6'	54.2'
12	357°17.9	520°12.6	306°52.9	16.5	N02°02.6	12.6'	54.2'
13	12°17.7	12.1	321°28.5	16.5'	02°15.2	12.6'	54.2'
14	27°17.5	11.5	336°04.0	16.5'	02°27.8	12.6'	54.2'
15	42°17.4 57°17.2	•• 11.0	350°39.5 5°15.0	16.5'	02°40.4 02°53.0	12.6'	54.2' 54.2'
16 17	72°17.0	10.5 09.9	5 15.0 19°50.6	16.5' 16.5'	02 53.0 03°05.6	12.6' 12.5'	54.2'
18	87°16.8	S20°09.4	34°26.1	16.5'	N03°18.1	12.5'	54.2'
19	102°16.6	08.9	49°01.6	16.5'	03°30.6	12.5'	54.2'
20	117°16.4	08.3	$63^{\circ}37.1$	16.5'	03°43.1	12.5'	54.2'
21	132°16.2	• • 07.8	78°12.7	16.5'	03°55.6	12.5'	54.1'
22 23	147°16.1 162°15.9	07.2 06.7	92°48.2 107°23.7	16.5' 16.5'	04°08.1 04°20.6	12.5'	54.1' 54.1'
23			107 23.7			12.4'	54.1
	SD = 16.2'	d = -0.5'		SI	D = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°15.7 192°15.5	\$20°06.2	121°59.2	16.5'	N04°33.0 04°45.4	12.4'	54.1'
1 2	192°15.5 207°15.3	05.6 05.1	136°34.7 151°10.1	16.5' 16.5'	04°45.4 04°57.8	12.4' 12.4'	54.1' 54.1'
3	207 15.3 222°15.1	04.5	165°45.6	16.5	04 57.8 05°10.2	12.4	54.1'
4	237°15.0	04.0	180°21.1	16.4	05°22.5	12.3'	54.1'
5	252°14.8	03.4	194°56.5	16.4'	05°34.8	12.3'	54.1'
6	267°14.6	S20°02.9	209°31.9	16.4'	N05°47.1	12.3'	54.1'
7	282°14.4 297°14.2	02.3	224°07.4 238°42.8	16.4	05°59.4 06°11.7	12.3'	54.1'
8 9	297°14.2 312°14.1	01.8 •• 01.2	238°42.8 253°18.1	16.4' 16.4'	06°11.7 06°23.9	12.2' 12.2'	54.1' 54.1'
10	327°13.9	00.7	267°53.5	16.4	06°36.1	12.2'	54.1'
11	342°13.7	20°00.1	282°28.9	16.3'	06°48.3	12.2'	54.1'
12	357°13.5	S19°59.6	297°04.2	16.3'	N07°00.4	12.1'	54.1'
13	12°13.3	59.0	311°39.5	16.3'	07°12.6	12.1'	54.1'
14 15	27°13.2 42°13.0	58.5 •• 57.9	326°14.8 340°50.1	16.3' 16.2'	07°24.7 07°36.7	12.1' 12.0'	54.1' 54.1'
16	57°12.8	57.4	355°25.3	16.2'	07°48.8	12.0'	54.1
17	72°12.6	56.8	10°00.5	16.2'	08°00.8	12.0'	54.1'
18	87°12.4	S19°56.3	24°35.7	16.2'	N08°12.7	11.9'	54.1'
19	102°12.3	55.7	39°10.9	16.1'	08°24.7	11.9'	54.1'
20	117°12.1 132°11.9	55.2	53°46.1 68°21.2	16.1' 16.1'	08°36.6 08°48.5	11.9' 11.8'	54.1' 54.1'
21 22	132 11.9 147°11.7	· · 54.6 54.1	82°56.3	16.1	08 48.5 09°00.3	11.8	54.1'
23	162°11.6	53.5	97°31.3	16.0'	09°12.1	11.8'	54.1'
	SD = 16.2'	d = -0.5'			D = 14.8'		
_							
Sun 0	GHA 177°11.4	Dec \$19°52.9	GHA 112°06.4	u 16.0'	Dec N09°23.9	d 11.7'	HP 54.1'
1	177 11.4 192°11.2	52.4 52.4	112 00.4 126°41.4	16.0'	09°35.6	11.7'	54.1'
2	207°11.0	51.8	$141^{\circ}16.3$	15.9'	09°47.4	11.7'	54.1'
3	222°10.9	• • 51.3	155°51.3	15.9'	09°59.0	11.6'	54.1'
4	237°10.7	50.7	170°26.2	15.9'	10°10.7	11.6'	54.1'
5 6	252°10.5 267°10.3	50.1 \$19°49.6	185°01.0 199°35.9	15.8' 15.8'	10°22.2 N10°33.8	11.6' 11.5'	54.1' 54.1'
7	267°10.3 282°10.2	\$19°49.6 49.0	199°35.9 214°10.7	15.8'	10°45.3	11.5'	54.1'
8	297°10.0	48.5	228°45.4	15.7'	10°56.8	11.4	54.1'
9	312°09.8	• • 47.9	243°20.1	15.7'	11°08.2	11.4'	54.1'
10	327°09.6	47.3	257°54.8	15.6'	11°19.6	11.4'	54.1'
11	342°09.5 357°09.3	46.8 \$19°46.2	272°29.4 287°04.0	15.6' 15.6'	11°31.0 N11°42.3	11.3'	54.1' 54.1'
12 13	357°09.3 12°09.1	\$19°46.2 45.6	287°04.0 301°38.6	15.5'	11°53.6	11.3' 11.2'	54.1'
14	27°09.0	45.0	316°13.1	15.5'	11° 53.0 12° 04.8	11.2	54.1
15	42°08.8	• • 44.5	330°47.6	15.4'	12°16.0	11.1'	54.1'
16	57°08.6	43.9	345°22.0	15.4'	12°27.1	11.1'	54.2'
17	72°08.4	43.4	359°56.4	15.3'	12°38.2	11.0'	54.2'
18 19	87°08.3 102°08.1	\$19°42.8 42.2	14°30.7 29°05.0	15.3' 15.2'	N12°49.2 13°00.2	11.0' 10.9'	54.2' 54.2'
20	102°08.1 117°07.9	42.2 41.7	43°39.2	15.2' 15.2'	13°00.2 13°11.1	10.9'	54.2'
21	132°07.8	• • 41.1	58°13.4	15.1'	13°22.0	10.8	54.2'
22	147°07.6	40.5	72°47.5	15.1'	13°32.9	10.8'	54.2'
23	162°07.4	39.9	87°21.6	15.0'	13°43.7	10.7'	54.2'
	SD = 16.2'	d = -0.6'		SI	D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	17-33%	
19	10:39	10:48	12:11	15:38	03:18		
20	10:57	11:06	12:11	16:19	03:59		
21	11:14	11:23	12:11	17:00	04:39		

January 22, 23, 24 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	121°38.0	192°43.7	\$22°34.1	290°29.1	S01°42.3	276° 15.0	S09°05.4	88°24.7	N10°48.6			
1	136°40.5	207°42.8	33.8	305°31.0	42.5	291°17.4	05.4	103°27.1	48.7	Alpheratz	357°31.5	29° 15.2
2	151°42.9	222°41.8	33.5	320°32.9	42.7	306° 19.7	05.5	118°29.5	48.7	Ankaa	353°04.2	-42°09.0
3	166°45.4	237°40.9	• • 33.2	335°34.8	• • 42.9	321°22.0	• • 05.5	133°31.9	• • 48.7	Schedar	349°27.3	56°42.1
4	181°47.9	252°40.0	32.9	350°36.7	43.1	336°24.3	05.6	148°34.3	48.8	Diphda	348°44.1	-17°49.7
5	196°50.3	267°39.1	32.5	5°38.5	43.3	351°26.6	05.6	163°36.7	48.8	Achernar	335°17.9	-57°05.6
6	211°52.8	282°38.2	\$22°32.2	20°40.4	S01°43.5	6°29.0	S09°05.7	178°39.1	N10°48.9	Hamal	327°47.4	23°36.1
7	226°55.3	297°37.3	31.9	35°42.3	43.6	21°31.3	05.7	193°41.5	48.9	Polaris	312°03.6	89°23.4
8	241°57.7	312°36.3	31.6	50°44.2	43.8	36°33.6	05.7	208°43.9	48.9	Acamar	315°09.2	-40°11.5
9	257°00.2	327°35.4	• • 31.3	65°46.1	• • 44.0	51°35.9	• • 05.8	223°46.3	• • 49.0	Menkar	314°02.6	4°12.2
10	272°02.6	342°34.5	31.0	80°48.0	44.2	66°38.3	05.8	238°48.6	49.0	Mirfak	308°23.2	49°58.0
11	287°05.1	357°33.6	30.7	95°49.9	44.4	81°40.6	05.9	253°51.0	49.0	Aldebaran	290°35.6	16°34.0
12	302°07.6	12°32.7	S22°30.4	110°51.8	S01°44.6	96°42.9	S09°05.9	268°53.4	N10°49.1	Rigel	281°00.4	-8°10.3
13	$317^{\circ}10.0$	27°31.8	30.0	125°53.8	44.8	111°45.2	06.0	283°55.8	49.1	Capella	280°16.6	46°01.6
14	332°12.5	42°30.9	29.7	140°55.7	45.0	126°47.5	06.0	298°58.2	49.2	Bellatrix	278°19.1 277°57.4	6° 22.4 28° 37.8
15	$347^{\circ}15.0$	57°30.0	• • 29.4	155° 57.6	• • 45.1	141°49.9	• • 06.0	$314^{\circ}00.6$	• • 49.2	Elnath Alnilam	277 37.4 275°34.1	-1°11.2
16	2°17.4	72°29.0	29.1	170°59.5	45.3	156° 52.2	06.1	329°03.0	49.2	Betelgeuse	270°48.2	7°24.6
17	$17^{\circ}19.9$	87°28.1	28.8	186°01.4	45.5	171°54.5	06.1	344°05.4	49.3	Canopus	263°50.4	-52°42.9
18	32°22.4	102°27.2	S22°28.4	201°03.3	S01°45.7	186° 56.8	S09°06.2	359°07.8	N10°49.3	Sirius	258°23.0	-16°45.6
19	47°24.8	117°26.3	28.1	216°05.2	45.9	201°59.2	06.2	14°10.2	49.3	Adhara	255°02.9	-29°00.9
20	62°27.3	132°25.4	27.8	231°07.1	46.1	217°01.5	06.3	29°12.6	49.4	Procyon	244°47.1	5°08.8
21	77°29.8	147°24.5	· · 27.5	246°09.0	• • 46.3	232°03.8	• • 06.3	44°15.0	• • 49.4	Pollux	243°12.9	27°57.1
22	92°32.2	162°23.6	27.1	261°10.9	46.4	247°06.1	06.3	59°17.4	49.5	Avior	234°12.6	-59°36.3
23	107°34.7	177°22.7	26.8	276°12.8	46.6	262°08.5	06.4	74°19.7	49.5	Suhail	222°43.4	-43°33.1
Mer n	ass. 15:51	ν-0.9' d-0	.3′ m-3.90	$\nu 1.9' d0$.2′ m0.19	$\nu 2.3' d0$	0′ m-2.04	ν2.4' dΩ	.0′ m0.29	Miaplacidus	221°36.5	-69° 50.2
сг.р			5.50	- 1.5 40						Alphard	217°44.2	-8°47.3
_			_		_		_		_	Regulus	207°30.7	11°49.2
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.7	61°35.3
0	122°37.1	192°21.8	S22°26.5	291°14.7	S01°46.8	277° 10.8	S09°06.4	89°22.1	N10° 49.5	Denebola	182°21.4	14°24.3
1	137°39.6	207°20.8	26.1	306°16.7	47.0	292°13.1	06.5	104°24.5	49.6	Gienah	175°40.0	-17°42.3
2	152°42.1	222°19.9	25.8	321°18.6	47.2	307°15.4	06.5	119°26.9	49.6	Acrux	172°55.9	-63° 15.5
3	167°44.5	237°19.0	25.5	336°20.5	• • 47.4	322°17.8	• • 06.6	134°29.3	• • 49.7	Gacrux	171°47.6	-57° 16.4
4	182°47.0	252°18.1	25.1	351°22.4	47.5	337°20.1	06.6	149°31.7	49.7	Alioth	$166^{\circ}10.1$	55°47.7
5	197°49.5	267°17.2	24.8	6°24.3	47.7	352°22.4	06.6	164°34.1	49.7	Spica	158°18.8	-11°18.9
6	212°51.9	282°16.3	\$22°24.5	21°26.2	S01°47.9	7°24.7	S09°06.7	179°36.5	N10°49.8	Alkaid	152°49.5	49°09.7
7	227°54.4	297°15.4	24.1	36°28.1	48.1	22°27.1	06.7	194°38.9	49.8	Hadar	$148^{\circ}31.1$	-60°30.6
8	242°56.9	312°14.5	23.8	51°30.1	48.3	37°29.4	06.8	209°41.3	49.8	Menkent	147°53.7	-36° 30.7
9	257°59.3	327°13.6	• • 23.4	66°32.0	• • 48.4	52°31.7	. 06.8	224°43.6	• • 49.9	Arcturus	145°44.9	$19^{\circ}01.6$
10	273°01.8	342°12.7	23.1	81°33.9	48.6	67°34.1	06.8	239°46.0	49.9	Rigil Kent.	139°35.7	-60°57.1
11	288°04.3 303°06.7	357°11.8	22.7	96°35.8	48.8 \$01°49.0	82°36.4	06.9	254°48.4	50.0	Kochab	$137^{\circ}20.4$	74°01.8
12		12°10.9	\$22°22.4	111°37.7		97°38.7	\$09°06.9	269°50.8 284°53.2	N10°50.0	Zuben'ubi	136°52.4	-16°09.7
13	318°09.2	27°09.9 42°09.0	22.1	126°39.7 141°41.6	49.2	112°41.0	07.0	284 53.2 299°55.6	50.0	Alphecca	$126^{\circ}01.1$	26°36.8
14	333°11.6		21.7		49.3	127°43.4	07.0		50.1	Antares	$112^{\circ}12.0$	-26°29.7
15	348°14.1 3°16.6	57°08.1 72°07.2	· · 21.4 21.0	156°43.5 171°45.4	· · 49.5	142°45.7 157°48.0	· · 07.0 07.1	314°58.0 330°00.4	· · 50.1 50.2	Atria	107°03.6	-69°04.4
16 17	18° 19.0	87°06.3	20.7	171 45.4 186° 47.4	49.7 49.9	172°50.4	07.1	345°02.7	50.2	Sabik	101°59.2	-15°45.6
18	33°21.5	102°05.4	\$22°20.3	201°49.3	\$01°50.0	172 50.4 187°52.7	509°07.2	0°05.1	N10° 50.2	Shaula	96°06.2	-37°07.3
19	48°24.0	102 03.4 117°04.5	20.0	216°51.2	50.2	202°55.0	07.2	15°07.5	50.0	Rasalhague	95°55.8	12°32.3
20	63°26.4	132°03.6	19.6	231°53.1	50.4	202 55.0 217°57.4	07.2	30°09.9	50.3 50.3	Eltanin	90°41.1	51°29.0
21	78°28.9	147°02.7	• • 19.2	246°55.1	50.4	232°59.7	07.3	45°12.3	• • 50.4	Kaus Aust.	83°28.5	-34°22.1
22	93°31.4	162°01.8	18.9	261°57.0	50.7	248° 02.0	07.3	60°14.7	50.4	Vega	80°31.4	38°48.6
23	108°33.8	177°00.9	18.5	276°58.9	50.9	263°04.3	07.4	75°17.1	50.4	Nunki	75°44.1	-26° 15.5
										Altair	61°57.1	8°56.8
Mer.p	ass. 15:47	ν -0.9' d-0	.3′ m-3.90	$\nu 1.9' \ d0$.2' m0.17	$\nu 2.3' \ d0.$	0′ m-2.05	ν 2.4′ d0	.0′ m0.30	Peacock	53°01.3	-56° 38.4
										Deneb	49°24.0	45°23.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.9	10°00.6
0	123°36.3	192°00.0	S22°18.2	292°00.9		278°06.7	S09°07.4		N10° 50.5	Al Na'ir	27°29.3	-46°49.2
1	138°38.7	206°59.1	17.8	307°02.8	51.3	293°09.0	07.4	105°21.8	50.5	Fomalhaut	15°11.2	-29°28.1
2	153°41.2	221°58.2	17.4	322°04.7	51.4	308°11.3	07.5	120°24.2	50.6	Scheat	13°42.2	28°14.6
3	168°43.7	236°57.3	17.1	337°06.7	• • 51.6	323°13.7	• • 07.5	135°26.6	50.6	Markab	13°26.8	15°21.8
4	183°46.1	251°56.4	16.7	352°08.6	51.8	338° 16.0	07.6	150°29.0	50.6	Jan 22 Mon	SHA	Mer.pass
5	198°48.6	266°55.5	16.4	7° 10.5	52.0	353° 18.3	07.6	165°31.4	50.7	Venus	$71^{\circ}05.7$	11:10
6	213°51.1	281°54.6	\$22°16.0	22°12.5	S01°52.1	8° 20.7	S09°07.6		N10°50.7	Mars		04:37
7	228°53.5	296°53.7	15.6	$37^{\circ}14.4$	52.3	23°23.0	07.7	195°36.1	50.8	Jupiter	$154^{\circ}37.0$	05:34
8	243°56.0	311°52.8	15.2	$52^{\circ}16.3$	52.5	38°25.3	07.7	210°38.5	50.8	Saturn	326°46.7	18:03
9	258°58.5	$326^{\circ}51.9$	• • 14.9	$67^{\circ}18.3$	• • 52.6	53°27.7	• • 07.8	225°40.9	• • 50.8	lan 22 To	CHA	Ma: :
10	274°00.9	341°51.0	14.5	82°20.2	52.8	68°30.0	07.8	240°43.3	50.9	Jan 23 Tue Venus	SHA 69°44.6	Mer.pass 11:11
11	289°03.4	$356^{\circ}50.1$	14.1	97°22.2	53.0	83°32.4	07.8	255°45.7	50.9	l .	168°37.6	04:34
12	304°05.9	11°49.2	522°13.8	112°24.1		98°34.7	S09°07.9		N10°51.0	Jupiter		05:30
13	319°08.3	26°48.3	13.4	127° 26.0	53.3	113°37.0	07.9	285°50.5	51.0	Saturn	326°45.0	18:00
14	334°10.8	41°47.4	13.0	142°28.0	53.5	128°39.4	07.9	300°52.8	51.0	Jatuin	J2U 4J.U	10.00
15	349°13.2	56°46.5	• • 12.6	157°29.9	• • 53.7	143°41.7	• • 08.0	315°55.2	•• 51.1	Jan 24 Wed	SHA	Mer.pass
16	4°15.7	71°45.6	12.3	172°31.9	53.8	158° 44.0	0.80	330°57.6	51.1	Venus	68°23.7	11:13
17	19°18.2	86°44.7	11.9	187°33.8	54.0	173°46.4	08.1	346°00.0	51.2	Mars	$168^{\circ}24.6$	04:31
18	34°20.6	101°43.8	S22°11.5	202°35.8	S01°54.2	188°48.7	S09°08.1	1°02.4		Jupiter	154°30.4	05:27
19	49°23.1	116°42.9	11.1	217°37.7	54.3	203°51.1	08.1	16°04.8	51.2	Saturn	326°43.2	17:56
20	64°25.6	131°42.0	10.7	232°39.7	54.5	218°53.4	08.2	31°07.1	51.3	Це! •	al navall-	
21	79°28.0	146°41.1	. 10.3	247°41.6	• • 54.7	233°55.7	• • 08.2	46°09.5	• • 51.3	Horizont	al parallax	0.1
22	94°30.5	161°40.2	10.0	262°43.6	54.8	248°58.1	08.2	61°11.9	51.4		Venus: Mars:	0.1 0.1
23	109°33.0	176°39.3	09.6	277°45.5	55.0	264°00.4	08.3	76°14.3	51.4		iviars:	0.1
Mer.p	ass. 15:43	ν -0.9 d -0	.4′ m-3.90	ν 1.9 $^{\prime}$ d0	.2′ m0.14	$\nu 2.3' \ d0.$	0′ m-2.05	ν 2.4′ d0	.0′ m0.30			

h	Su			Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.3	\$19°39.4	101°55.7	15.0'	N13°54.4	10.7'	54.2'
1 2	192°07.1 207°06.9	38.8 38.2	116°29.6 131°03.6	14.9' 14.9'	14°05.1 14°15.8	10.6' 10.6'	54.2' 54.2'
3	222°06.8	37.7	145°37.4	14.8	14°15.8	10.5	54.2'
4	237°06.6	37.1	160°11.3	14.8'	14°36.9	10.5'	54.3'
5	252°06.4	36.5	174°45.0	14.7'	14°47.4	10.4	54.3'
6 7	267°06.3 282°06.1	\$19°35.9 35.3	189°18.7 203°52.4	14.6' 14.6'	N14°57.8 15°08.1	10.4' 10.3'	54.3' 54.3'
8	297°05.9	34.8	218°26.0	14.5'	15°18.5	10.3	54.3'
9	312°05.8	• • 34.2	232°59.5	14.5'	15°28.7	10.2'	54.3'
10 11	327°05.6 342°05.4	33.6 33.0	247°33.0 262°06.4	14.4' 14.3'	15°38.9 15°49.0	10.1' 10.1'	54.3' 54.3'
12	357°05.3	\$19°32.4	276°39.7	14.3	N15°59.1	10.1	54.3'
13	12°05.1	31.9	291°13.0	14.2'	16°09.1	10.0'	54.4'
14	27°05.0	31.3	305°46.2	14.2'	16°19.1	9.9'	54.4'
15 16	42°04.8 57°04.6	· · 30.7 30.1	320°19.4 334°52.5	14.1' 14.0'	16°29.0 16°38.8	9.8' 9.8'	54.4' 54.4'
17	72°04.5	29.5	349°25.5	14.0'	16°48.5	9.7'	54.4'
18	87°04.3	S19°29.0	3°58.5	13.9'	N16°58.2	9.6'	54.4'
19 20	102°04.1 117°04.0	28.4 27.8	18°31.4 33°04.2	13.8' 13.8'	17°07.9 17°17.4	9.6' 9.5'	54.4' 54.5'
21	132°03.8	27.2	47°37.0	13.7	17 17.4 17°26.9	9.3 9.4'	54.5
22	147°03.7	26.6	62°09.7	13.6'	$17^{\circ}36.4$	9.4'	54.5'
23	162°03.5	26.0	76°42.3	13.6'	17°45.7	9.3'	54.5'
	SD = 16.2'	d = -0.6'		SI	O = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°03.3	S 19°25.4	91°14.9	13.5'	N17°55.0	9.2'	54.5'
1 2	192°03.2 207°03.0	24.8 24.3	105°47.4 120°19.8	13.4' 13.3'	18°04.2 18°13.4	9.1' 9.1'	54.5' 54.6'
3	207 03.0 222°02.9	23.7	120 19.6 134°52.1	13.3'	16 13.4 18°22.5	9.1	54.6'
4	237°02.7	23.1	149°24.4	13.2'	18°31.5	8.9'	54.6'
5	252°02.6	22.5	163°56.6	13.1'	18°40.4	8.9'	54.6'
6 7	267°02.4 282°02.2	\$19°21.9 21.3	178°28.7 193°00.8	13.1' 13.0'	N18°49.2 18°58.0	8.8' 8.7'	54.6' 54.6'
8	297°02.1	20.7	207°32.8	12.9'	19°06.7	8.6'	54.7'
9	312°01.9	• • 20.1	222°04.7	12.8'	19°15.3	8.5'	54.7'
10 11	327°01.8 342°01.6	19.5 18.9	236°36.5 251°08.3	12.8' 12.7'	19°23.9 19°32.3	8.5' 8.4'	54.7' 54.7'
12	357°01.5	\$19°18.3	265°39.9	12.6'	N19°40.7	8.3'	54.7'
13	12°01.3	17.7	280°11.6	12.5'	19°49.0	8.2'	54.8'
14 15	27°01.2 42°01.0	17.1 •• 16.5	294°43.1 309°14.5	12.4' 12.4'	19°57.2 20°05.4	8.1' 8.1'	54.8' 54.8'
16	57°00.8	15.9	323°45.9	12.4	20°13.4	8.0'	54.8'
17	72°00.7	15.3	$338^{\circ}17.2$	12.2'	$20^{\circ}21.4$	7.9'	54.8'
18	87°00.5 102°00.4	\$19°14.7	352°48.4 7°19.5	12.1' 12.1'	N20°29.3 20°37.1	7.8'	54.9'
19 20	102 00.4 117°00.2	14.1 13.5	7 19.5 21°50.6		20° 37.1	7.7' 7.6'	54.9' 54.9'
21	132°00.1	• • 12.9	36°21.6	11.9'	20°52.4	7.5'	54.9'
22	146°59.9	12.3	50°52.5	11.8'	20°59.9	7.4'	54.9'
23	$\frac{161^{\circ}59.8}{SD = 16.2'}$	$\frac{11.7}{d = -0.6'}$	65°23.3	11.7'	0 = 14.9'	7.3'	55.0'
	5D = 10.2	$a = -0.0^{\circ}$		31	$J = 14.9^{\circ}$		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°59.6 191°59.5	\$19°11.1 10.5	79°54.0 94°24.7	11.7' 11.6'	N21°14.7 21°22.0	7.3' 7.2'	55.0' 55.0'
2	206°59.3	09.9	108°55.3	11.5'	21°29.1	7.1	55.0'
3	221°59.2	• • 09.3	123°25.8	11.4'	21°36.2	7.0'	55.1'
4 5	236°59.0 251°58.9	08.7 08.1	137°56.2 152°26.5	11.3' 11.3'	21°43.1 21°50.0	6.9' 6.8'	55.1' 55.1'
6	266°58.7	\$19°07.5	166°56.8	11.2'	N21°56.8	6.7'	55.1
7	281°58.6	06.9	181°26.9	11.1'	22°03.5	6.6'	55.2'
8 9	296°58.4 311°58.3	06.3 •• 05.7	195°57.0 210°27.0	11.0' 10.9'	22°10.0 22°16.5	6.5' 6.4'	55.2' 55.2'
10	326°58.1	05.1	210° 27.0° 224° 57.0	10.9	22°22.9	6.3	55.2'
11	341°58.0	04.5	239°26.8	10.8'	22°29.2	6.2'	55.3'
12	356°57.8	\$19°03.9	253°56.6 268°26.3	10.7'	N22°35.3	6.1'	55.3'
13 14	11°57.7 26°57.5	03.3 02.6	268°26.3 282°55.9	10.6' 10.5'	22°41.4 22°47.4	6.0' 5.9'	55.3' 55.3'
15	41°57.4	•• 02.0	297°25.4	10.4'	22°53.2	5.7'	55.4'
16	56°57.3	01.4	311°54.8	10.4'	22°59.0	5.6'	55.4'
17 18	71°57.1 86°57.0	00.8 \$19°00.2	326°24.2 340°53.5	10.3' 10.2'	23°04.6 N23°10.1	5.5' 5.4'	55.4' 55.5'
19	101°56.8	18° 59.6	355°22.7	10.2	23°15.5	5.3'	55.5'
20	116°56.7	59.0	9°51.8	10.0'	23°20.8	5.2'	55.5'
21 22	131°56.5 146°56.4	· · 58.3 57.7	24°20.8 38°49.8	10.0' 9.9'	23°26.0 23°31.1	5.1' 5.0'	55.5' 55.6'
23	161°56.2	57.1	53°18.6	9.8'	23°36.1	4.9'	55.6'
	SD = 16.2'	d = -0.6'		SI	O = 15.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-62%	
22	11:31	11:39	12:12	17:44	05:22		
23	11:47	11:54	12:12	18:30	06:06		
24	12:02	12:09	12:12	19:19	06:54		

January 25, 26, 27 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	124°35.4	191° 38.4	\$22°09.2	292°47.5	S01°55.2	279°02.7	S09°08.3	91°16.7	N10°51.5			
1	139°37.9	206° 37.5	08.8	307°49.4	55.3	294°05.1	08.4	106°19.0	51.5	Alpheratz	357°31.5	29°15.2
2	154°40.4	221°36.6	08.4	322°51.4	55.5	309°07.4	08.4	121°21.4	51.5	Ankaa	353°04.2	-42°09.0
3	169°42.8	236° 35.7	• • 08.0	337°53.3	• • 55.7	324°09.8	• • 08.4	136°23.8	• • 51.6	Schedar	349°27.3	56°42.1
4	184°45.3	251°34.8	07.6	352°55.3	55.8	339°12.1	08.5	151°26.2	51.6	Diphda	348°44.2	-17°49.7
5	199°47.7	266°33.9	07.2	7°57.2	56.0	354°14.4	08.5	166°28.6	51.7	Achernar	335°18.0	-57°05.6
6	214°50.2	281°33.1	S22°06.8	22°59.2	S01°56.2	9°16.8	S09°08.5	181°31.0	N10°51.7	Hamal	327°47.4	23°36.1
7	229°52.7	296°32.2	06.4	38°01.1	56.3	24°19.1	08.6	196°33.3	51.7		312°04.8	89°23.4
8	244°55.1	311°31.3	06.0	53°03.1	56.5	39°21.5	08.6	211°35.7	51.8	Acamar	315°09.2	-40°11.5
9	259°57.6	326°30.4	• • 05.6	68°05.1	• • 56.7	54°23.8	08.6	226°38.1	• • 51.8	Menkar	314°02.6	4°12.2
10	275°00.1	341°29.5	05.3	83°07.0	56.8	69°26.2	08.7	241°40.5	51.9	Mirfak	308°23.3	49°58.0
11	290°02.5	356°28.6	04.8	98°09.0	57.0	84°28.5	08.7	256°42.9	51.9	Aldebaran	290°35.6	16°34.0
12	305°05.0	11°27.7	S22°04.4	113°10.9	S01°57.1	99°30.8	S09°08.8	271°45.2	N10°52.0	Rigel	281°00.5	-8°10.3
13	320°07.5	26°26.8	04.0	128°12.9	57.3	114°33.2	08.8	286°47.6	52.0	Capella	280°16.6 278°19.1	46°01.6 6°22.4
14	335°09.9	41°25.9	03.6	143°14.9	57.5	129°35.5	8.80	301°50.0	52.0	Bellatrix Elnath	276 19.1 277°57.4	28°37.8
15	350°12.4	56°25.0	• • 03.2	158°16.8	• • 57.6	144°37.9	• • 08.9	316°52.4	• • 52.1	Alnilam	277 37.4 275°34.1	-1°11.2
16	5°14.9	71°24.1	02.8	173°18.8	57.8	159°40.2	08.9	331°54.7	52.1	Betelgeuse	270°48.2	7°24.6
17	20°17.3	86°23.2	02.4	188°20.8	57.9	174°42.6	08.9	346°57.1	52.2	Canopus	263°50.4	-52°42.9
18	35°19.8	101°22.4	\$22°02.0	203°22.7	S01°58.1	189°44.9	S09°09.0	1°59.5	N10°52.2	Sirius	258°23.0	-16°45.6
19	50°22.2	116°21.5	01.6	218°24.7	58.3	204°47.3	09.0	17°01.9	52.3	Adhara	255°02.9	-29°00.9
20	65°24.7	131°20.6	01.2	233°26.7	58.4	219°49.6	09.0	32°04.3	52.3	Procyon	244°47.1	5°08.8
21	80°27.2	146° 19.7	• • 00.8	248°28.6	• • 58.6	234°51.9	• • 09.1	47°06.6	• • 52.3	Pollux	243°12.9	27°57.1
22	95°29.6	161°18.8	00.4	263°30.6	58.7	249°54.3	09.1	62°09.0	52.4	Avior	234°12.6	-59°36.3
23	110°32.1	176° 17.9	00.0	278°32.6	58.9	264°56.6	09.1	77°11.4	52.4	Suhail	222°43.4	-43°33.1
Mer.n	pass. 15:39	ν -0.9' d-0	0.4′ m-3.90	ν 2.0' d0	.2′ m0.12	$\nu^{2.3'} d0$	0′ m-2.06	$\nu^{2.4'} d0$.0′ m0.30	Miaplacidus	221°36.5	-69°50.2
										Alphard	217°44.2	-8°47.3
			_		_		_		_	Regulus	207°30.7	11°49.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.7	61°35.3
0	125°34.6	191°17.0	S21°59.5	293°34.5	S01°59.1	279°59.0	S09°09.2	92°13.8	N10°52.5	Denebola	$182^{\circ}21.4$	14°24.3
1	140°37.0	206°16.1	59.1	308°36.5	59.2	295°01.3	09.2	107°16.2	52.5	Gienah	175°40.0	-17°42.3
2	155°39.5	221°15.3	58.7	323°38.5	59.4	310°03.7	09.2	122°18.5	52.6	Acrux	172°55.8	-63°15.5
3	170°42.0	236° 14.4	• • 58.3	338°40.5	• • 59.5	325°06.0	• • 09.3	137°20.9	• • 52.6	Gacrux	171°47.5	-57°16.4
4	185°44.4	251°13.5	57.9	353°42.4	59.7	340°08.4	09.3	152°23.3	52.6	Alioth	166°10.0	55°47.7
5	200°46.9	266° 12.6	57.4	8°44.4	01°59.8	355°10.7	09.3	167°25.7	52.7	Spica	$158^{\circ}18.7$	-11°18.9
6	215°49.4	281°11.7	S21°57.0	23°46.4	S02°00.0	10°13.1	S09°09.4	182°28.0	N10°52.7	Alkaid	152°49.5	49°09.7
7	230°51.8	296°10.8	56.6	38°48.4	00.1	25°15.4	09.4	197°30.4	52.8	Hadar	$148^{\circ}31.1$	-60°30.6
8	245°54.3	311°09.9	56.2	53°50.3	00.3	40°17.8	09.4	212°32.8	52.8	Menkent	147°53.6	-36°30.7
9	260°56.7	326°09.1	• • 55.7	68°52.3	• • 00.5	55°20.1	• • 09.5	227°35.2	• • 52.9	Arcturus	145°44.9	19°01.6
10	275°59.2	341°08.2	55.3	83°54.3	00.6	70°22.5	09.5	242°37.5	52.9	Rigil Kent.	139°35.6	-60°57.1
11	291°01.7	356° 07.3	54.9	98°56.3	8.00	85°24.8	09.5	257°39.9	52.9	Kochab	137°20.3	74°01.7
12	306°04.1	11°06.4	\$21°54.5	113°58.3	S02°00.9	100°27.2	S09°09.6	272°42.3	N10°53.0	Zuben'ubi	136°52.4	-16°09.7
13	321°06.6	26°05.5	54.0	129°00.2 144°02.2	01.1	115°29.5 130°31.9	09.6	287°44.7 302°47.0	53.0	Alphecca	$126^{\circ}01.1$	26°36.8
14	336°09.1 351°11.5	41°04.6	53.6	159°04.2	01.2	130 31.9 145°34.2	09.6 •• 09.7	302 47.0 317°49.4	53.1 •• 53.1	Antares	$112^{\circ}12.0$	-26°29.7
15 16	6°14.0	56°03.8 71°02.9	· · 53.2 52.7	174°06.2	· · 01.4 01.5	160°36.6	09.7	317 49.4 332°51.8	· · 53.1 53.2	Atria	107°03.5	-69°04.4
16 17	21°16.5	86°02.0	52.7 52.3	174 00.2 189°08.2	01.5	175°38.9	09.7	347°54.2	53.2	Sabik	101°59.2	-15°45.6
18	36°18.9	101°01.1	S21°51.9	204°10.2		190°41.3	S09°09.8	2°56.5	N10°53.2	Shaula	96°06.2	-37°07.3
19	51°21.4	116° 00.2	51.4	219°12.1	02.0	205°43.6	09.8	17°58.9	53.3	Rasalhague	95°55.7	12°32.3
20	66°23.8	130°59.4	51.0	234°14.1	02.0	220°46.0	09.8	33°01.3	53.3	Eltanin	90°41.1	51°29.0
21	81°26.3	145° 58.5	• • 50.5	249°16.1	. 02.1	235°48.3	• • 09.9	48°03.7	• • 53.4	Kaus Aust.	83°28.5	-34°22.1
22	96°28.8	160°57.6	50.1	264°18.1	02.4	250°50.7	09.9	63°06.0	53.4	Vega	80°31.4	38°48.6
23	111°31.2	175°56.7	49.7	279°20.1	02.6	265°53.0	09.9	78°08.4	53.5	Nunki	75°44.0	-26°15.5
										Altair	61°57.1	8°56.8
Mer.p	pass. 15:35	ν -0.9′ d-0).4′ m-3.90	$\nu 2.0' \ d0$.2′ m0.10	$\nu 2.3' \ d0.$	0′ m-2.07	ν 2.4′ d0	.0' m0.31	Peacock	53°01.3	-56°38.4
										Deneb	49°24.0	45°23.2
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.9	10°00.6
0	126°33.7	190°55.8	S21°49.2	294°22.1	502°02.7	280°55.4	S09°10.0	93°10.8	N10°53.5	Al Na'ir	27°29.3 15°11.2	-46°49.2
1	141°36.2	205°55.0	48.8	309°24.1	02.9	295°57.7	10.0	108°13.2	53.6	Fomalhaut Scheat	15°11.2 13°42.2	-29°28.1
2	156°38.6	220°54.1	48.3	324°26.1	03.0	311°00.1	10.0	123°15.5	53.6	Markab	13°42.2 13°26.8	28°14.6
3	171°41.1	235° 53.2	• • 47.9	339°28.1	• • 03.2	326°02.4	• • 10.0	138°17.9	• • 53.6	iviarkab	13 20.8	15°21.8
4	186°43.6	250° 52.3	47.4	354°30.1	03.3	341°04.8	10.1	153°20.3	53.7	Jan 25 Thu	SHA	Mer.pass
5	201°46.0	$265^{\circ}51.4$	47.0	9°32.1	03.5	356°07.2	10.1	168°22.6	53.7	Venus	67°03.0	11:14
6	216°48.5	280°50.6	S21°46.5	24°34.1		11°09.5	S09°10.1		N10°53.8	Mars	$168^{\circ}12.0$	04:28
7	231°51.0	295°49.7	46.1	39°36.1	03.8	$26^{\circ}11.9$	10.2	198°27.4	53.8		154°27.3	05:23
8	246°53.4	$310^{\circ}48.8$	45.6	54°38.1	03.9	41°14.2	10.2	213°29.8	53.9	Saturn	326°41.2	17:52
9	261°55.9	325°47.9	• • 45.2	69°40.0	• • 04.0	$56^{\circ}16.6$	• 10.2	$228^{\circ}32.1$	• • 53.9	lan 26 E.:	SHA	Mor noss
10	276°58.3	$340^{\circ}47.1$	44.7	84°42.0	04.2	71°18.9	10.3	243°34.5	54.0	Jan 26 Fri Venus	5HA 65°42.5	Mer.pass 11:16
11	292°00.8	355° 46.2	44.3	99°44.1	04.3	86°21.3	10.3	258°36.9	54.0	I	05 42.5 168°00.0	04:25
12	307°03.3	10°45.3	S21°43.8	114°46.1	S02°04.5	101°23.6	S09°10.3	273°39.3	N10°54.0	1	154°24.4	04:25
13	322°05.7	25°44.4	43.4	129°48.1	04.6	116°26.0	10.4	288°41.6	54.1	Saturn		17:48
14	337°08.2	40°43.6	42.9	144°50.1	04.8	131°28.4	10.4	303°44.0	54.1	Jatuill		11.40
15	352°10.7	55° 42.7	• • 42.4	159°52.1	• • 04.9	146°30.7	• • 10.4	318°46.4	• • 54.2	Jan 27 Sat	SHA	Mer.pass
16	7°13.1	70°41.8	42.0	174°54.1	05.1	161°33.1	10.4	333°48.7	54.2	Venus	64°22.1	11:17
17	22°15.6	85°40.9	41.5	189°56.1	05.2	176°35.4	10.5	348°51.1	54.3		167°48.4	04:22
18	37°18.1	100°40.1	S21°41.1	204°58.1		191°37.8	S09°10.5		N10°54.3	1	$154^{\circ}21.7$	05:15
19	52°20.5	115°39.2	40.6	220°00.1	05.5	206°40.2	10.5	18°55.8	54.4	Saturn	326°37.1	17:44
20	67°23.0	130°38.3	40.1	235°02.1	05.6	221°42.5	10.6	33°58.2	54.4	Horizon	al parallax	
21	82°25.5	145°37.5	• • 39.7	250°04.1	• • 05.8	236°44.9	• • 10.6	49°00.6	• • 54.5	norizon	Venus:	0.1
22	97°27.9	160°36.6	39.2	265°06.1	05.9	251°47.2	10.6	64°03.0	54.5		venus: Mars:	0.1
23	112°30.4	175°35.7	38.7	280°08.1	06.0	266°49.6	10.6	79°05.3	54.5	L	ividi5.	0.1
Mer.p	pass. 15:31	ν -0.9' d-0).4′ m-3.90	ν 2.0′ d0	.1′ m0.07	$\nu 2.4' \ d0.$	0′ m-2.07	ν 2.4 $^{\prime}$ d0	.0′ m0.31			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°56.1	\$18°56.5	67°47.4	9.7'	N23°40.9	4.7'	55.6'
1 2	191°56.0 206°55.8	55.9 55.3	82° 16.2 96° 44.8	9.6' 9.6'	23°45.7 23°50.3	4.6' 4.5'	55.7' 55.7'
3	221°55.7	• • 54.6	111° 13.4	9.5'	23°54.8	4.4'	55.7'
4	236°55.5	54.0	125°41.9	9.4'	23°59.2	4.3'	55.7'
5 6	251°55.4 266°55.3	53.4 \$18° 52.8	140° 10.3 154° 38.6	9.3' 9.3'	24°03.4 N24°07.6	4.1' 4.0'	55.8' 55.8'
7	281°55.1	52.2	169°06.9	9.3 9.2'	24°11.6	3.9'	55.8'
8	296°55.0	51.5	183°35.0	9.1'	$24^{\circ}15.5$	3.8'	55.9'
9	311°54.8 326°54.7	• • 50.9	198°03.1 212°31.2	9.0'	24°19.3 24°22.9	3.6'	55.9'
10 11	320 54.7 341°54.6	50.3 49.7	212 31.2 226°59.1	9.0' 8.9'	24 22.9 24°26.4	3.5' 3.4'	55.9' 56.0'
12	356°54.4	S18°49.0	241°27.0	8.8'	N24°29.8	3.3'	56.0'
13	11°54.3	48.4	255°54.8	8.7'	24°33.1	3.1'	56.0'
14 15	26°54.1 41°54.0	47.8 •• 47.2	270°22.6 284°50.3	8.7' 8.6'	24°36.2 24°39.2	3.0' 2.9'	56.0' 56.1'
16	56°53.9	46.5	299°17.9	8.5'	24°42.1	2.7'	56.1'
17	71°53.7	45.9	313°45.4	8.5'	24°44.9	2.6'	56.1'
18 19	86°53.6 101°53.5	\$18°45.3 44.7	328° 12.9 342° 40.3	8.4' 8.3'	N24°47.5 24°50.0	2.5' 2.4'	56.2' 56.2'
20	116°53.3	44.0	357° 07.6	8.3'	24°52.3	2.2'	56.2'
21	131°53.2	• • 43.4	11°34.9	8.2'	24°54.5	2.1'	56.3'
22 23	146°53.1 161°52.9	42.8 42.1	26°02.1 40°29.2	8.1' 8.1'	24°56.6 24°58.6	1.9' 1.8'	56.3' 56.3'
23			40 29.2			1.0	30.3
	SD = 16.2'	d = -0.6'		51	D = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°52.8 191°52.7	\$18°41.5 40.9	54° 56.3 69° 23.3	8.0' 8.0'	N25°00.4 25°02.0	1.7' 1.5'	56.4' 56.4'
2	206°52.5	40.9	83°50.2	7.9'	25°02.0	1.4'	56.4'
3	221°52.4	• • 39.6	98°17.1	7.8'	25°05.0	1.3'	56.5'
4	236°52.3	39.0	112°44.0	7.8'	25°06.2	1.1'	56.5
5 6	251°52.1 266°52.0	38.3 \$18°37.7	127° 10.7 141° 37.5	7.7' 7.7'	25°07.3 N25°08.3	1.0' 0.8'	56.5' 56.6'
7	281°51.9	37.1	156°04.1	7.6'	25°09.1	0.7'	56.6'
8	296°51.7	36.4	170°30.7	7.6'	25°09.8	0.5'	56.6'
9 10	311°51.6 326°51.5	· · 35.8 35.2	184° 57.3 199° 23.8	7.5' 7.5'	25°10.4 25°10.8	0.4' 0.3'	56.7' 56.7'
11	341°51.3	34.5	213°50.3	7.4'	25°11.0	0.1	56.8'
12	356°51.2	\$18°33.9	228°16.7	7.4'	N25°11.1	-0.0'	56.8'
13 14	11°51.1 26°50.9	33.2 32.6	242°43.0 257°09.3	7.3' 7.3'	25°11.1 25°10.9	-0.2' -0.3'	56.8' 56.9'
15	41°50.8	• • 32.0	271°35.6	7.2'	25° 10.6	-0.5	56.9'
16	56°50.7	31.3	286°01.8	7.2'	25°10.1	-0.6'	56.9'
17 18	71°50.6 86°50.4	30.7 \$18°30.0	300°28.0 314°54.2	7.1' 7.1'	25°09.5 N25°08.7	-0.8' -0.9'	57.0' 57.0'
19	101°50.3	29.4	329° 20.3	7.1	25°07.8	-1.1'	57.0'
20	116°50.2	28.8	343°46.3		25°06.8		57.1'
21 22	131°50.1 146°49.9	· · 28.1 27.5	358° 12.4 12° 38.4	7.0' 7.0'	25°05.5 25°04.2	-1.4' -1.5'	57.1' 57.1'
23	161°49.8	26.8	27°04.3	6.9'	25°02.7	-1.7'	57.2'
	SD = 16.2'	d = -0.6'		SI	O = 15.4'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	176°49.7	\$18°26.2	41°30.2	6.9'	N25°01.0	-1.8'	57.2'
1	191°49.6	25.5	55°56.1	6.9'	24°59.2	-2.0'	57.2'
2	206°49.4 221°49.3	24.9 •• 24.2	70°22.0 84°47.8	6.8' 6.8'	24°57.2 24°55.1	-2.1' -2.3'	57.3' 57.3'
4	236°49.2	23.6	99°13.7	6.8	24°52.8	-2.4'	57.4
5	251°49.1	22.9	113° 39.4	6.8'	24°50.4	-2.6'	57.4'
6 7	266°48.9 281°48.8	\$18°22.3 21.6	128° 05.2 142° 30.9	6.7' 6.7'	N24°47.8 24°45.1	-2.7' -2.9'	57.4' 57.5'
8	296°48.7	21.0	156° 56.7	6.7	24° 42.2	-3.0'	57.5'
9	311°48.6	• • 20.3	171°22.4	6.7'	24°39.1	-3.2'	57.5'
10 11	326°48.4 341°48.3	19.7 19.0	185° 48.0 200° 13.7	6.7' 6.6'	24°35.9 24°32.6	-3.3' -3.5'	57.6' 57.6'
12	341 48.3 356°48.2	518° 18.4	200 13.7 214°39.4	6.6	N24°29.1	-3.5 -3.7'	57.6'
13	11°48.1	17.7	229°05.0	6.6'	24°25.5	-3.8'	57.7'
14 15	26°48.0 41°47.8	17.1 •• 16.4	243°30.6 257°56.2	6.6' 6.6'	24°21.7 24°17.7	-4.0' -4.1'	57.7' 57.7'
16	41 47.8 56°47.7	15.8	257 50.2 272°21.8	6.6'	24 17.7 24°13.6	-4.1 -4.3'	57.7 57.8'
17	71°47.6	15.1	286°47.4	6.6'	24°09.3	-4.4'	57.8'
18	86°47.5 101°47.4	\$18° 14.5	301°13.0 315°38.6	6.6'	N24°04.9 24°00.3	-4.6'	57.8'
19 20	101°47.4 116°47.2	13.8 13.1	315°38.6 330°04.2	6.6' 6.6'	24°00.3 23°55.6	-4.7' -4.9'	57.9' 57.9'
21	131°47.1	• • 12.5	344° 29.8	6.6'	23°50.7	-5.0'	58.0'
22	146°47.0	11.8	358° 55.4	6.6'	23°45.7	-5.2'	58.0'
23	$\frac{161^{\circ}46.9}{SD = 16.2'}$	$\frac{11.2}{d = -0.6'}$	13°20.9	6.6'	$23^{\circ}40.5$ D = 15.6'	-5.3'	58.0'
	3D = 10.2'	$a = -0.0^{\circ}$		51	⊃ = 19.0°		

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

Lat.		Moonris	е		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°	09:19	09:48	11:05	06:06	07:30	08:11
62°	09:58	10:38	11:47	05:27	06:41	07:29
60°	10:25	11:09	12:16	05:00	06:10	07:00
N 58°	10:46	11:32	12:38	04:39	05:46	06:38
56°	11:04	11:51	12:56	04:22	05:27	06:20
54° 52°	11:19 11:32	12:07 12:21	13:11 13:24	04:08 03:55	05:11 04:58	06:05 05:51
50°	11:32	12:33	13:24	03:55	04:56	05:51
45°	12:07	12:58	13:59	03:44	04:40	05:15
N 40°	12:26	13:18	14:18	03:02	04:01	04:56
35°	12:42	13:34	14:34	03:02	03:44	04:40
30°	12:56	13:49	14:48	02:33	03:30	04:25
20°	13:19	14:13	15:12	02:10	03:06	04:01
N 10°	13:40	14:34	15:32	01:50	02:45	03:41
0°	13:59	14:54	15:51	01:32	02:25	03:21
S 10°	14:18	15:14	16:10	01:13	02:05	03:01
20°	14:39	15:35	16:30	00:53	01:44	02:41
30°	15:03	15:59	16:53	00:31	01:20	02:16
35°	15:17	16:14	17:07	00:17	01:06	02:02
40°	15:33	16:31	17:23	00:02	00:49	01:45
45°	15:53	16:51	17:42		00:29	01:25
S 50°	16:17	17:16	18:05		00:04	01:00
52°	16:29	17:28	18:16	23:52		00:48
54°	16:43	17:42	18:29	23:39		00:34
56°	16:59	17:58	18:44	23:23	22.50	00:18
58° S 60°	17:17	18:17	19:01 19:22	23:04	23:59	
5 60°	17:40	18:41	19:22	22:41	23:35	

		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	71-87%	
25	12:16	12:22	12:12	20:12	07:45	(0)	
26	12:29	12:35	12:13	21:07	08:39		
27	12:41	12:47	12:13	22:04	09:36		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	127°32.8	190°34.8	S21°38.2	295° 10.1	\$02°06.2	281°52.0	S09°10.7	94°07.7	N10°54.6			
1	142°35.3	205°34.0	37.8	310°12.2	06.3	296°54.3	10.7	109°10.1	54.6	Alpheratz	357°31.5	29° 15.2
2	157°37.8	220°33.1	37.3	325°14.2	06.5	311°56.7	10.7	124°12.4	54.7	Ankaa	353°04.2	-42°09.0
3	172°40.2	235°32.2	36.8	340°16.2	. 06.6	326°59.0	• • 10.8	139°14.8	• • 54.7	Schedar	349°27.4	56° 42.1
4	187°42.7	250°31.4	36.4	355° 18.2	06.7	342°01.4	10.8	154°17.2	54.8	Diphda	348°44.2	-17°49.7
5	202°45.2	265°30.5	35.9	10°20.2	06.9	357°03.8	10.8	169°19.5	54.8	Achernar	335°18.0	-57°05.6
6	217°47.6	280°29.6	S21°35.4	25°22.2	S02°07.0	12°06.1	S09°10.8	184°21.9	N10°54.9	Hamal	327°47.4	23°36.1
7	232°50.1	295°28.8	34.9	40°24.2	07.2	27°08.5	10.9	199°24.3	54.9	Polaris	312°06.1	89°23.4
8	247°52.6	310°27.9	34.4	55°26.3	07.3	42°10.9	10.9	214°26.6	55.0	Acamar	315°09.3	-40°11.5
9	262°55.0	325°27.0	• • 34.0	70°28.3	• • 07.4	57° 13.2	• • 10.9	229°29.0	• • 55.0	Menkar	314°02.6	4°12.2
10	277°57.5	340°26.2	33.5	85°30.3	07.6	72° 15.6	11.0	244°31.4	55.0	Mirfak	308°23.3	49°58.0
11	293°00.0	355°25.3	33.0	100°32.3	07.7	87° 17.9	11.0	259°33.7	55.1	Aldebaran	290°35.6	16°34.0
12	308°02.4	10°24.4	S21°32.5	115°34.4	S02°07.8	102°20.3	S09°11.0	274°36.1	N10°55.1	Rigel	281°00.5	-8°10.3
13	323°04.9	25°23.6	32.0	130°36.4	08.0	$117^{\circ}22.7$	11.0	289°38.5	55.2	Capella	280°16.6	46°01.6
14	338°07.3	40°22.7	31.5	145°38.4	08.1	132°25.0	11.1	304°40.8	55.2	Bellatrix Elnath	278°19.1 277°57.4	6°22.4 28°37.8
15	353°09.8	55°21.8	• • 31.1	160°40.4	• • 08.2	147°27.4	• • 11.1	$319^{\circ}43.2$	•• 55.3	Alnilam	277 37.4 275°34.1	-1°11.2
16	8°12.3	70°21.0	30.6	175°42.5	08.4	$162^{\circ}29.8$	11.1	334°45.6	55.3	Betelgeuse	270°48.2	7° 24.6
17	23°14.7	85°20.1	30.1	190°44.5	08.5	$177^{\circ}32.1$	11.1	349°47.9	55.4	Canopus	263°50.4	-52°42.9
18	38°17.2	100°19.2	S21°29.6	205°46.5	S02°08.6	192°34.5	509°11.2	4°50.3	N10°55.4	Sirius	258°23.0	-32 42.9 -16° 45.6
19	53°19.7	115°18.4	29.1	220°48.5	8.80	207°36.9	11.2	19°52.7	55.5	Adhara	255°02.9	-29°00.9
20	68°22.1	130°17.5	28.6	235°50.6	08.9	222°39.2	11.2	34°55.0	55.5	Procyon	244°47.0	5°08.8
21	83°24.6	145°16.7	•• 28.1	250° 52.6	•• 09.0	237°41.6	• • 11.2	49°57.4	•• 55.6	Pollux	244 47.0 243°12.9	27°57.1
22	98°27.1	160°15.8	27.6	265°54.6	09.2	252°44.0	11.3	64°59.8	55.6	Avior	234°12.6	-59° 36.3
23	113°29.5	175°14.9	27.1	280°56.7	09.3	267°46.3	11.3	80°02.1	55.7	Suhail	222°43.4	-43°33.2
Mars	ass. 15:27	η-0 0' d 0	.5′ m-3.90	1/2 U/ 40	.1′ m0.05	1/2 A/ dn	0′ m-2.08	1/2 // 40	.0′ m0.31	Miaplacidus	222 43.4 221°36.4	-43 33.2 -69°50.3
ivier.p	ass. 13.21	ν-0.9 u-0	.5 111-3.90	ν2.0 d0	.1110.05	ν2.4 a0.	U 111-2.U0	ν2.4 dU	.0 1110.31	Alphard	221 30.4 217°44.2	-69 50.3 -8°47.3
										Regulus	207°30.6	11°49.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.3
0	128° 32.0	190°14.1	S 21°26.6	295°58.7	S02°09.4	282°48.7	S09°11.3	95°04.5	$N10^{\circ}55.7$	Denebola	182°21.4	14° 24.3
1	143°34.5	205°13.2	26.1	311°00.7	09.6	297°51.1	11.4	110°06.9	55.7	Gienah	175°40.0	-17° 42.3
2	158°36.9	220°12.3	25.6	326°02.8	09.7	312°53.4	11.4	$125^{\circ}09.2$	55.8	Acrux	172°55.8	-63° 15.5
3	173°39.4	235°11.5	• • 25.1	341°04.8	• • 09.8	327°55.8	• • 11.4	140°11.6	• • 55.8	Gacrux	171°47.5	-57° 16.5
4	188°41.8	250°10.6	24.6	356°06.8	09.9	342°58.2	11.4	155°14.0	55.9	Alioth	166°10.0	55° 47.7
5	203°44.3	265°09.8	24.1	11°08.9	10.1	358°00.5	11.5	170°16.3	55.9	Spica	158° 18.7	-11°18.9
6	218°46.8	280°08.9	S21°23.6	26° 10.9	S02°10.2	13°02.9	S09°11.5	185° 18.7	N10°56.0	Alkaid	152°49.4	49°09.7
7	233°49.2	295°08.0	23.1	41° 13.0	10.3	28°05.3	11.5	200°21.0	56.0	Hadar	148°31.1	-60°30.6
8	248°51.7	310°07.2	22.6	56° 15.0	10.5	43°07.7	11.5	215°23.4	56.1	Menkent	147°53.6	-36° 30.7
9	263°54.2	325°06.3	• • 22.1	71° 17.0	• • 10.6	58° 10.0	• • 11.6	230°25.8	•• 56.1	Arcturus	145°44.9	19°01.6
10	278°56.6	340°05.5	21.6	86° 19.1	10.7	73°12.4	11.6	245°28.1	56.2	Rigil Kent.	139°35.6	-60°57.1
11	293°59.1	355°04.6	21.1	101°21.1	10.8	88°14.8	11.6	260°30.5	56.2	Kochab	137°20.3	74°01.7
12	309°01.6	10°03.8	S21°20.6	116°23.2	S02°11.0	103°17.1	S09°11.6	275°32.9	N10°56.3	Zuben'ubi	136°52.4	-16°09.8
13	324°04.0	25°02.9	20.1	131°25.2	11.1	118° 19.5	11.7	290°35.2	56.3	Alphecca	126°01.1	26°36.8
14	339°06.5	40°02.1	19.5	146°27.3	11.2	133°21.9	11.7	305°37.6	56.4	Antares	112°11.9	-26° 29.7
15	354°09.0	55°01.2	• • 19.0	161°29.3	· · 11.3	148°24.3	• • 11.7	320°40.0	56.4	Atria	107°03.4	-69°04.4
16	9°11.4	70°00.3	18.5	176°31.4	11.5	163°26.6	11.7	335°42.3	56.5	Sabik	101°59.2	-15°45.6
17	24°13.9	84°59.5	18.0	191°33.4	11.6	178°29.0	11.7	350°44.7	56.5	Shaula	96°06.2	-37°07.3
18	39°16.3	99°58.6	S21°17.5	206°35.4	S02°11.7	193°31.4	S09°11.8	5°47.0	N10°56.6	Rasalhague	95°55.7	12°32.3
19	54°18.8	114°57.8	17.0	221°37.5	11.8	208°33.7	11.8	20°49.4	56.6	Eltanin	90°41.1	51°28.9
20	69°21.3	129°56.9	16.4	236°39.6	12.0	223°36.1	11.8	35°51.8	56.7	Kaus Aust.	83°28.5	-34°22.1
21	84°23.7	144°56.1	• • 15.9	251°41.6	•• 12.1	238° 38.5	• • 11.8	50°54.1	• • 56.7	Vega	80°31.3	38°48.6
22	99°26.2	159°55.2	15.4	266°43.7	12.2	253°40.9	11.9	65°56.5	56.7	Nunki	75°44.0	-26°15.5
23	114°28.7	174°54.4	14.9	281°45.7	12.3	268°43.2	11.9	80°58.8	56.8	Altair	61°57.1	8°56.8
Mer.p	ass. 15:23	ν -0.9' d-0	.5′ m-3.90	$\nu 2.0' \ d0$.1′ m0.03	$\nu 2.4' \ d0.$	0′ m-2.09	$\nu 2.4' \ d0$.0′ m0.32	Peacock	53°01.2	-56°38.3
										Deneb	49°24.0	45°23.1
_	CIIA	CHA	Б	C114	-	C112	-	CUA	-	Enif	33°35.8	10°00.6
Tue	GHA	GHA	Dec CO10143	GHA	Dec 502°12.4	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.2
0	129°31.1	189°53.5	\$21°14.3	296°47.8	\$02°12.4	283°45.6	S09°11.9		N10° 56.8	Fomalhaut	15°11.2	-29°28.1
1	144°33.6	204°52.7	13.8	311°49.8	12.6	298°48.0	11.9	111°03.6	56.9	Scheat	13°42.2	28° 14.6
2 3	159°36.1 174°38.5	219°51.8 234°51.0	13.3 · · 12.8	326°51.9 341°53.9	12.7	313°50.4 328°52.7	12.0 •• 12.0	126°05.9 141°08.3	56.9 •• 57.0	Markab	13°26.8	15°21.8
4	174 38.5 189°41.0	234 51.0 249°50.1	12.8	356° 56.0	· · 12.8 12.9	328 52.7 343°55.1	12.0	141 08.3 156°10.6	57.0	Jan 28 Sun	SHA	Mer.pass
5	204°43.4	249 50.1 264°49.3	11.7	11°58.1	13.0	358° 57.5	12.0	171°13.0	57.0 57.1	Venus	63°02.0	11:18
6	204 45.4 219°45.9	204 49.3 279°48.4	\$21°11.2	27°00.1	502°13.2	13° 59.9	509°12.0		N10°57.1	Mars		04:19
7	219 45.9 234°48.4	279 46.4 294°47.6	10.6	42°02.2	13.3	29°02.2	12.1	201°17.7	57.2	Jupiter		05:12
8	249°50.8	309°46.7	10.0	57° 04.2	13.4	44°04.6	12.1	216°20.1	57.2	Saturn	326°34.8	17:41
9	264°53.3	324°45.9	•• 09.6	72°06.3	. 13.5	59°07.0	•• 12.1	231°22.4	57.3			
10	279°55.8	339°45.0	09.0	87°08.4	13.6	74°09.4	12.1	246°24.8	57.3	Jan 29 Mon	SHA	Mer.pass
11	294°58.2	354°44.2	08.5	102° 10.4	13.8	89°11.8	12.2	261°27.2	57.4	Venus	61°42.1	11:20
12	310°00.7	9°43.3	S21°08.0	117° 12.5	502°13.9	104° 14.1	S09°12.2	276°29.5	N10° 57.4	Mars		04:16
13	325°03.2	24°42.5	07.4	132° 14.6	14.0	119° 16.5	12.2	291°31.9	57.5	Jupiter	154°16.7	05:08
14	340°05.6	39°41.6	06.9	147° 16.6	14.1	134° 18.9	12.2	306°34.2	57.5	Saturn	326°32.5	17:37
15	355°08.1	54°40.8	06.4	162° 18.7	• • 14.2	149°21.3	. 12.2	321°36.6	• • 57.6	Jan 30 Tue	SHA	Mer.pass
16	10°10.6	69°39.9	05.8	177° 20.8	14.3	164°23.7	12.3	336°39.0	57.6	Venus	60°22.4	11:21
17	25°13.0	84°39.1	05.3	192°22.8	14.4	179°26.0	12.3	351°41.3	57.7		167°16.6	04:12
18	40°15.5	99°38.3	S21°04.7	207°24.9	S02°14.6	194°28.4	S09°12.3	6°43.7	N10°57.7	I	154° 14.5	05:04
19	55°17.9	114°37.4	04.2	222°27.0	14.7	209°30.8	12.3	21°46.0	57.8	Saturn	326°30.1	17:33
20	70°20.4	129°36.6	03.6	237°29.1	14.8	224°33.2	12.3	36°48.4	57.8	Jatuill	525 50.1	
21	85°22.9	144°35.7	03.1	252°31.1	• • 14.9	239°35.6	. 12.4	51°50.7	• • 57.9	Horizont	al parallax	
22	100°25.3	159°34.9	02.5	267°33.2	15.0	254°37.9	12.4	66°53.1	57.9		Venus:	0.1
23	115°27.8	174°34.0	02.0	282°35.3	15.1	269°40.3	12.4	81°55.5	58.0		Mars:	0.2
			.5′ m-3.90								-	
ivier.p	ass. 15:19	ν -0.9' a -0	.5 m-5.90	ν2.1′ α 0	.1' m 0.00	ν2.4′ α 0.	0′ m-2.10	ν∠.4′ d0	.0′ m0.32			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°46.8	S 18° 10.5	$27^{\circ}46.5$	6.6'	N23°35.2	-5.5'	58.1'
1	191°46.7	09.9	42°12.1 56°37.7	6.6'	23°29.7	-5.6'	58.1'
2	206°46.5 221°46.4	09.2 •• 08.5	71°03.3	6.6' 6.6'	23°24.1 23°18.3	-5.8' -5.9'	58.1' 58.2'
4	236°46.3	07.9	85°28.9	6.6'	23°12.4	-6.1'	58.2'
5	251°46.2	07.2	99°54.5	6.6'	23°06.3	-6.2'	58.2'
6	266°46.1 281°46.0	\$18°06.5	114°20.2 128°45.8	6.6'	N23°00.0 22°53.6	-6.4'	58.3'
7 8	281 46.0 296°45.8	05.9 05.2	128 45.8 143°11.5	6.7' 6.7'	22° 47.1	-6.5' -6.7'	58.3' 58.3'
9	311°45.7	04.6	157°37.1	6.7'	22°40.4	-6.8'	58.4'
10	326°45.6	03.9	172°02.8	6.7'	22°33.6	-7.0'	58.4'
11 12	341°45.5 356°45.4	03.2 \$18°02.6	186°28.5 200°54.2	6.7' 6.7'	22°26.6 N22°19.5	-7.1' -7.3'	58.4' 58.5'
13	350 45.4 11°45.3	01.9	200 54.2 215°20.0	6.8'	N22 19.5 22°12.2	-7.3 -7.4'	58.5'
14	26°45.2	01.2	229°45.7	6.8'	22°04.8	-7.6'	58.5'
15	41°45.1	18°00.6	244°11.5	6.8'	21°57.2	-7.7'	58.6'
16 17	56°44.9 71°44.8	17° 59.9 59.2	258°37.3 273°03.1	6.8' 6.9'	21°49.5 21°41.7	-7.9' -8.0'	58.6' 58.6'
18	86°44.7	59.2 \$17°58.6	273 03.1 287°29.0	6.9	N21°33.7	-8.1'	58.7'
19	101°44.6	57.9	301°54.9	6.9'	21°25.5	-8.3	58.7'
20	116°44.5	57.2	316°20.8	6.9'	21° 17.3	-8.4'	58.7'
21 22	131°44.4 146°44.3	· · 56.5 55.9	330°46.7 345°12.7	7.0' 7.0'	21°08.8 21°00.3	-8.6' -8.7'	58.8' 58.8'
23	161°44.2	55.9 55.2	359°38.6	7.0' 7.0'	20°51.6	-8.8'	58.8'
	SD = 16.2'	d = -0.7'			D = 15.8'		
	<u> </u>	<u>u — -0.1</u>			<i>D</i> = 13.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°44.1 191°44.0	S17°54.5 53.9	14°04.7 28°30.7	7.1' 7.1'	N20° 42.7 20° 33.8	-9.0' -9.1'	58.9' 58.9'
2	191°44.0 206°43.8	53.9 53.2	28° 30.7 42° 56.8	7.1'	20° 33.8 20° 24.7	-9.1' -9.2'	58.9'
3	221°43.7	• • 52.5	57°22.9	7.2'	20° 15.4	-9.4	58.9'
4	236°43.6	51.8	71°49.1	7.2'	20°06.0	-9.5'	59.0'
5 6	251°43.5 266°43.4	51.2 \$17°50.5	86°15.3 100°41.5	7.2' 7.3'	19°56.5 N19°46.9	-9.6' -9.8'	59.0' 59.0'
7	281°43.3	49.8	100 41.5 115°07.7	7.3'	19°37.1	-9.0 -9.9'	59.0 59.1'
8	296°43.2	49.1	129°34.0	7.3'	19°27.2	-10.0'	59.1'
9	311°43.1	• • 48.4	144°00.4	7.4'	19° 17.2	-10.2'	59.1'
10 11	326°43.0 341°42.9	47.8 47.1	158°26.7 172°53.1	7.4'	19°07.0 18°56.7	-10.3' -10.4'	59.2' 59.2'
11	341 42.9 356°42.8	47.1 \$17°46.4	172 53.1 187°19.6	7.4' 7.5'	N18°46.3	-10.4	59.2'
13	11°42.7	45.7	201°46.1	7.5'	18° 35.7	-10.7	59.2'
14	26°42.6	45.1	216°12.6	7.6'	18°25.1	-10.8'	59.3'
15 16	41°42.5 56°42.4	•• 44.4 43.7	230°39.2 245°05.8	7.6' 7.7'	18°14.3 18°03.4	-10.9' -11.0'	59.3' 59.3'
17	71°42.3	43.7	259°32.4	7.7'	16 03.4 17°52.3	-11.0	59.3'
18	86°42.2	S17°42.3	273°59.1	7.7'	N17°41.2	-11.3'	59.4'
19	101°42.1	41.6	288°25.8	7.8'	17°29.9	-11.4'	59.4'
20 21	116°42.0 131°41.9	41.0 •• 40.3	302°52.6 317°19.4	7.8' 7.9'	17° 18.5 17° 07.0	-11.5' -11.6'	59.4' 59.4'
22	146°41.8	39.6	331°46.3	7.9'	16°55.4	-11.7'	59.4 59.5'
23	161°41.7	38.9	346°13.2	7.9'	16°43.7	-11.8'	59.5'
	SD = 16.2'	d = -0.7'		S	D = 16.1'		
Tue 0	GHA 176°41.6	Dec \$17°38.2	GHA 0°40.2	ν 8.0'	Dec N16°31.9	d -11.9'	HP 59.5'
1	176 41.6 191°41.5	37.5	15°07.2	8.0'	16° 19.9	-11.9 -12.1'	59.5' 59.5'
2	206°41.4	36.8	29°34.2	8.1'	$16^{\circ}07.9$	-12.2'	59.6'
3	221°41.3	• • 36.2	44°01.3	8.1'	15°55.7	-12.3'	59.6'
4 5	236°41.2 251°41.1	35.5 34.8	58°28.4 72°55.6	8.2' 8.2'	15°43.5 15°31.1	-12.4' -12.5'	59.6' 59.6'
6	266°41.0	S17°34.1	87°22.8	8.3'	N15° 18.6	-12.6'	59.7'
7	281°40.9	33.4	101°50.0	8.3'	15°06.0	-12.7'	59.7'
8 9	296°40.8 311°40.7	32.7 •• 32.0	116°17.3 130°44.7	8.3' 8.4'	14°53.4 14°40.6	-12.8' -12.9'	59.7' 59.7'
10	311 40.7 326°40.6	31.3	130 44.7 145°12.1	8.4'	14 40.6 14°27.7	-12.9 -13.0'	59.7' 59.7'
11	341°40.5	30.6	159°39.5	8.5'	14°14.8	-13.1'	59.8'
12	356°40.4	\$17°29.9	174°07.0	8.5'	N14°01.7	-13.1'	59.8'
13 14	11°40.3 26°40.2	29.3 28.6	188°34.5 203°02.1	8.6' 8.6'	13°48.6 13°35.4	-13.2' -13.3'	59.8' 59.8'
15	41°40.1	27.9	203 02.1 217°29.7	8.7'	13° 22.0	-13.4'	59.8'
16	56°40.0	27.2	231°57.3	8.7'	13°08.6	-13.5'	59.9'
17	71°39.9	26.5	246°25.0	8.7'	12°55.1	-13.6'	59.9'
18 19	86°39.8 101°39.7	\$17°25.8 25.1	260°52.8 275°20.5	8.8' 8.8'	N12°41.5 12°27.9	-13.7' -13.7'	59.9' 59.9'
20	116°39.6	24.4	289°48.3	8.9'	12°14.1	-13.8'	59.9'
21	131°39.5	• • 23.7	304°16.2	8.9'	12°00.3	-13.9'	60.0'
22	146°39.5 161°39.4	23.0	318°44.1 333°12.1	8.9' 9.0'	11°46.4 11°32.4	-14.0'	60.0'
23		22.3	333-12.1			-14.1'	60.0'
	SD = 16.2'	d = -0.7'		S	D = 16.2'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.			
,	00 ^h 12 ^h mm:ss mm:ss		Pass	Upper	Lower	14-16		
			hh:mm	hh:mm	hh:mm	94-100%		
28	12:53	12:58	12:13	23:01	10:33			
29	13:04	13:09	12:13	23:57	11:30			
30	13:14	13:18	12:13	-:-	12:24			

January 31, 01, 02 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	130° 30.3	189° 33.2	\$21°01.4	297°37.4	S02°15.2	284°42.7	S09°12.4	96° 57.8	N10°58.0			
1	145° 32.7	204° 32.4	00.9	312°39.4	15.4	299°45.1	12.5	112°00.2	58.1	Alpheratz	357°31.5	29°15.2
2	160°35.2	219°31.5	21°00.3	327°41.5	15.5	314°47.5	12.5	127°02.5	58.1	Ankaa	353°04.2	-42°09.0
3	175° 37.7	234°30.7	20°59.8	342°43.6	15.6	329°49.9	• • 12.5	142°04.9	58.2	Schedar	349°27.4	56°42.1
4	190°40.1	249°29.8	59.2	357°45.7	15.7	344°52.2	12.5	157°07.2	58.2	Diphda	348°44.2	-17°49.7
5	205° 42.6	264°29.0	58.7	12°47.8	15.8	359°54.6	12.5	172°09.6	58.3	Achernar	335°18.0	-57°05.6
6	220°45.1	279°28.2	\$20°58.1	27°49.8	S02°15.9	14°57.0	S09°12.6	187°11.9	N10°58.3	Hamal	327°47.4	23°36.1
7	235° 47.5	294°27.3	57.6	42°51.9	16.0	29°59.4	12.6	202° 14.3	58.4	Polaris	312°07.7	89°23.4
8	250°50.0	309°26.5	57.0	57°54.0	16.1	45°01.8	12.6	217° 16.7	58.4	Acamar	315°09.3	-40°11.5
9	265°52.4	324°25.6	• • 56.4	72°56.1	· · 16.2	60°04.2	• • 12.6	232° 19.0	• • 58.5	Menkar	314°02.6	4°12.2
10	280°54.9	339° 24.8	55.9	87°58.2	16.3	75°06.5	12.6	247°21.4	58.5	Mirfak	308°23.3	49°58.0
11	295°57.4	354°24.0	55.3	103°00.3	16.4	90°08.9	12.6	262°23.7	58.6	Aldebaran	290°35.6	16°34.0
12	310°59.8	9°23.1	S20°54.8	118°02.4	S02°16.6	105°11.3	509°12.7	$277^{\circ}26.1$	N10°58.6	Rigel	281°00.5	-8°10.3
13	326°02.3	24°22.3	54.2	133°04.5	16.7	120°13.7	12.7	292°28.4	58.7	Capella	280°16.6	46°01.6
14	341°04.8	39°21.5	53.6	148°06.5	16.8	$135^{\circ}16.1$	12.7	307°30.8	58.7	Bellatrix	278°19.1 277°57.4	6°22.4 28°37.8
15	356°07.2	54°20.6	• • 53.1	163°08.6	• • 16.9	150° 18.5	• • 12.7	$322^{\circ}33.1$	• • 58.8	Elnath Alnilam	277 37.4 275°34.1	-1°11.2
16	11°09.7	69°19.8	52.5	178°10.7	17.0	165°20.9	12.7	337°35.5	58.8	Betelgeuse	270°48.2	7°24.6
17	26°12.2	84°19.0	51.9	193°12.8	17.1	180°23.2	12.8	352°37.9	58.9	Canopus	263°50.5	-52°42.9
18	41°14.6	99°18.1	\$20°51.3	208°14.9	S02°17.2	195°25.6	S09°12.8	7°40.2	N10°58.9	Sirius	258°23.0	-16°45.6
19	56° 17.1	114° 17.3	50.8	223°17.0	17.3	210°28.0	12.8	22°42.6	59.0	Adhara	255°02.9	-29°01.0
20	71° 19.5	129° 16.5	50.2	238°19.1	17.4	225°30.4	12.8	37°44.9	59.0	Procyon	244°47.0	5°08.8
21	86°22.0	144° 15.6	• • 49.6	253°21.2	• • 17.5	240°32.8	• • 12.8	52°47.3	• • 59.1	Pollux	243°12.9	27°57.1
22	101°24.5	159° 14.8	49.1	268°23.3	17.6	255°35.2	12.8	67°49.6	59.1	Avior	234°12.6	-59°36.3
23	116°26.9	174°14.0	48.5	283°25.4	17.7	270°37.6	12.9	82°52.0	59.2	Suhail	222°43.4	-43°33.2
Mer.n	ass. 15:15	ν -0.8' d-0	0.6′ m-3.90	$\nu 2.1' d0$	1′ m-0.02	$\nu 2.4' \ d0$	0′ m-2.10	$\nu 2.4' \ d0$.0′ m0.32	Miaplacidus	221°36.5	-69°50.3
										Alphard	217°44.2	-8°47.3
- .	C	c	-		-	a	-	a	Б	Regulus	207°30.6	11°49.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.3
0	131°29.4	189°13.1	\$20°47.9	298°27.5	\$02°17.8	285°40.0	S09°12.9	97°54.3	N10°59.2	Denebola	182°21.4	14°24.3
1	146°31.9	204°12.3	47.3	313°29.6	17.9	300°42.4	12.9	112°56.7	59.3	Gienah	175°39.9	-17°42.3
2	161°34.3	219°11.5	46.7	328°31.7	18.0	315°44.7	12.9	127°59.0	59.3	Acrux	$172^{\circ}55.8$	-63°15.5
3	176°36.8	234°10.6	• • 46.2	343°33.8	18.1	330°47.1	• • 12.9	143°01.4	• • 59.4	Gacrux	171°47.5	-57°16.5
4	191°39.3	249°09.8	45.6	358°35.9	18.2	345°49.5	13.0	158°03.7	59.4	Alioth	$166^{\circ}09.9$	55°47.7
5	206°41.7	264°09.0	45.0	13°38.0	18.3	0°51.9	13.0	173°06.1	59.5	Spica	158°18.7	-11°18.9
6	221°44.2 236°46.7	279°08.2	\$20°44.4	28°40.1 43°42.2	S02°18.4	15°54.3	S09°13.0	188°08.4	N10°59.5	Alkaid	152°49.4	49°09.7
7 8	250 46.7 251°49.1	294°07.3 309°06.5	43.8	43 42.2 58°44.3	18.5	30°56.7 45°59.1	13.0 13.0	203° 10.8 218° 13.1	59.6	Hadar	148°31.0	-60°30.6
9	266° 51.6	309 00.5 324°05.7	43.3 • • 42.7	73°46.4	18.6 •• 18.7	61°01.5	•• 13.0	233° 15.5	59.6 •• 59.7	1	147°53.6	-36°30.7
10	281°54.0	339°04.8	42.7	88°48.5	18.8	76°03.9	13.1	248° 17.8	59.7		145°44.9	19°01.6
11	296° 56.5	354° 04.0	41.5	103°50.7	18.9	91°06.3	13.1	263°20.2	59.7	Rigil Kent.		-60°57.1
12	311°59.0	9°03.2	\$20°40.9	118°52.8	502°19.0	106°08.7	S09°13.1	278°22.5	N10°59.8	Kochab	137°20.2	74°01.7
13	327°01.4	24°02.4	40.3	133°54.9	19.1	121°11.1	13.1	293°24.9	59.9	Zuben'ubi		-16°09.8
14	342°03.9	39°01.5	39.7	148°57.0	19.2	136°13.4	13.1	308°27.2	10°59.9	Alphecca	126°01.0	26°36.8
15	357°06.4	54°00.7	39.1	163°59.1	19.3	151°15.8	13.1	323°29.6	11°00.0	Antares	112°11.9	-26°29.7
16	12°08.8	68°59.9	38.5	179°01.2	19.4	166° 18.2	13.1	338°31.9	00.1	Atria	107°03.4	-69°04.4
17	27°11.3	83°59.1	37.9	194°03.3	19.5	181°20.6	13.2	353°34.3	00.1	Sabik	101°59.2	-15°45.6
18	42°13.8	98°58.2	S20°37.3	209°05.5	S02°19.6	196°23.0	S09°13.2	8°36.6	N11°00.2	Shaula	96°06.1	-37°07.3
19	57° 16.2	113°57.4	36.7	224°07.6	19.7	211°25.4	13.2	23°39.0	00.2	Rasalhague	95°55.7	12°32.3
20	72° 18.7	128°56.6	36.2	239°09.7	19.8	226°27.8	13.2	38°41.3	00.3	Eltanin	90°41.0	51°28.9
21	87°21.2	143°55.8	35.6	254°11.8	• • 19.9	241°30.2	13.2	53°43.7	00.3	Kaus Aust.	83°28.5	-34°22.1
22	102°23.6	158°55.0	35.0	269°13.9	20.0	256°32.6	13.2	68°46.0	00.4	Vega	80°31.3	38°48.5
23	117°26.1	173°54.1	34.4	284°16.1	20.1	271°35.0	13.3	83°48.4	00.4	Nunki	75°44.0	-26°15.5
					1′ m-0.05	-				Altair Peacock	61°57.0 53°01.2	8°56.8 -56°38.3
ivier.p	ass. 15:12	ν -0.8° a -0	0.6′ m-3.90	ν 2.1 a0.	1 m-0.05	ν 2.4° a 0.	0′ m-2.11	ν 2.4° a_0	.1′ m0.33	Deneb	49°23.9	-50 36.3 45°23.1
										Enif	33°35.8	10°00.6
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.2
0	$132^{\circ}28.5$	188°53.3	\$20°33.7	299°18.2	S02°20.2	286°37.4	S09°13.3		N11°00.5	Fomalhaut	15°11.2	-29°28.1
1	147°31.0	203° 52.5	33.1	314°20.3	20.2	301°39.8	13.3	113°53.1	00.5	Scheat	13°42.2	28°14.6
2	162°33.5	218°51.7	32.5	329°22.4	20.3	316°42.2	13.3	128°55.4	00.6	Markab	13°26.8	15°21.8
3	177°35.9	233°50.9	· · 31.9	344°24.6	20.4	331°44.6	• • 13.3	143°57.8	• • 00.6			
4	192°38.4	248°50.0	31.3	359°26.7	20.5	346°47.0	13.3	159°00.1	00.7	Jan 31 Wed	SHA	Mer.pass
5	207° 40.9	263°49.2	30.7	14°28.8	20.6	1°49.4	13.3	174°02.5	00.7	Venus	59°02.9	11:22
6	222°43.3	278°48.4	\$20°30.1	29°30.9	S02°20.7	16°51.8	S09°13.4	189°04.8	N11°00.8		167°07.1	04:09
7	237° 45.8	293°47.6	29.5	44°33.1	20.8	31°54.2	13.4	204°07.2	8.00		154°12.4	05:00
8	252°48.3	308°46.8	28.9	59°35.2	20.9	46°56.6	13.4	219°09.5	00.9	Saturn	326°27.5	17:29
9	267°50.7	323°45.9	• • 28.3	74°37.3	• • 21.0	61°59.0	. 13.4	234°11.9	• • 00.9	Feb 01 Thu	SHA	Mer.pass
10	282°53.2	338° 45.1	27.7	89°39.5	21.1	77°01.4	13.4	249°14.2	01.0	Venus	57°43.7	11:24
11	297°55.6 312°58.1	353°44.3 8°43.5	27.1	104°41.6 119°43.7	21.1 \$02°21.2	92°03.8 107°06.2	13.4 \$09°13.4	264°16.6 279°18.9	01.0	1	$166^{\circ}58.1$	04:06
12 13	312°58.1 328°00.6	8° 43.5 23° 42.7	\$20°26.4 25.8	119°43.7 134°45.9	21.3	107°06.2 122°08.6		279°18.9 294°21.2	N11°01.1	Jupiter	$154^{\circ}10.6$	04:57
13 14	328°00.6 343°03.0	23°42.7 38°41.9	25.8 25.2	134 45.9 149 48.0	21.3	122°08.6 137°11.0	13.5 13.5	309°23.6	01.2 01.2	Saturn	$326^{\circ}24.9$	17:26
15	358° 05.5	50 41.9 53°41.1	. 24.6	164° 50.1	21.4	157 11.0 152°13.4	13.5	309 25.0 324°25.9	01.3	Ech 00 F.	CH A	Me:: ::
16	13°08.0	68° 40.2	24.0	179°52.3	21.6	167° 15.8	13.5	339°28.3	01.3	Feb 02 Fri Venus	SHA 56°24.8	Mer.pass
17	28° 10.4	83°39.4	23.4	179 52.3 194°54.4	21.7	182° 18.2	13.5	354°30.6	01.3			11:25
18	43° 12.9	98° 38.6	\$20°22.7	209°56.6	S02°21.8	197°20.6	S09°13.5	9°33.0	N11°01.4	Mars Jupiter		04:02 04:53
19	58° 15.4	113°37.8	22.1	209°58.7	21.8	212°23.0	13.5	24°35.3	01.5	Saturn	326°22.2	17:22
20	73° 17.8	128° 37.0	21.5	240°00.8	21.9	227°25.4	13.5	39°37.7	01.5	Jaturn	J2U 22.2	11.44
21	88° 20.3	143°36.2	20.9	255°03.0	22.0	242°27.8	•• 13.6	54°40.0	01.6	Horizont	al parallax	
22	103°22.8	158° 35.4	20.2	270°05.1	22.1	257°30.2	13.6	69°42.4	01.6		Venus:	0.1
23	118°25.2	173°34.6	19.6	285°07.3	22.2	272°32.6	13.6	84°44.7	01.7		Mars:	0.2
										<u> </u>		
ivier.p	ass. 15:08	ν-υ.ο΄ α-υ	0.6′ m-3.90	ν 2.1 a0.	1′ m-0.07	ν2.4 aU.	0′ m-2.12	ν2.5 aU	.1′ m0.33			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°39.3	S17°21.6	347° 40.0	9.0'	N11°18.4	-14.1'	60.0'
1	191°39.2	20.9	2°08.1	9.1'	11°04.2	-14.2'	60.0'
2	206°39.1	20.2	16° 36.1	9.1'	10°50.0	-14.3'	60.0'
3	221°39.0	• • 19.5	31°04.2	9.1'	10°35.8	-14.3'	60.0'
4	236°38.9	18.8	45°32.4	9.2'	10°21.4	-14.4'	60.1
5 6	251°38.8 266°38.7	18.1 \$17° 17.4	60°00.5 74°28.8	9.2' 9.3'	10°07.0 N09°52.6	-14.5' -14.5'	60.1' 60.1'
7	281°38.6	16.7	88°57.0	9.3'	09°38.0	-14.5 -14.6'	60.1
8	296°38.6	16.0	103°25.3	9.3'	09°38.0	-14.0 -14.7'	60.1
9	311°38.5	. 15.3	117°53.6	9.4'	09°08.8	-14.7'	60.1
10	326°38.4	14.6	132°22.0	9.4'	08°54.1	-14.8'	60.1
11	341°38.3	13.9	146°50.4	9.4'	08°39.3	-14.8'	60.1'
12	356°38.2	S 17°13.2	161°18.8	9.5'	N08°24.5	-14.9'	60.2'
13	11°38.1	12.5	175°47.3	9.5'	$08^{\circ}09.6$	-14.9'	60.2'
14	26°38.0	11.8	190°15.8	9.5'	07°54.7	-15.0'	60.2'
15	41°37.9	• • 11.1	204°44.3	9.6'	07°39.7	-15.0'	60.2'
16	56°37.9	10.3	219°12.8	9.6'	07°24.7	-15.1'	60.2'
17	71°37.8	09.6	233°41.4 248°10.0	9.6'	07°09.6	-15.1'	60.2'
18 19	86°37.7 101°37.6	\$17°08.9 08.2	248 10.0 262°38.7	9.6' 9.7'	N06°54.5 06°39.4	-15.2' -15.2'	60.2' 60.2'
20	116°37.5	07.5	202 30.7 277°07.4	9.7' 9.7'	06°24.2	-15.2'	60.2
21	131°37.4	. 06.8	277 07.4 291°36.1	9.7 9.7'	06°24.2	-15.2 -15.3'	60.2
22	146°37.3	06.1	306° 04.8	9.8'	05°53.7	-15.3'	60.2
23	161°37.3	05.4	320°33.6	9.8'	05°38.4	-15.3'	60.2
	SD = 16.2'	d = -0.7'			D = 16.4'		
		<u>u = -0.1</u>		31	J = 10.4		
Thu	GHA	Dec	GHA	ν	Dec	d 15 4'	HP
0 1	176°37.2 191°37.1	\$17°04.7 04.0	335°02.3 349°31.1	9.8' 9.8'	N05°23.0 05°07.6	-15.4' -15.4'	60.2' 60.3'
2	191°37.1 206°37.0	04.0	4°00.0	9.8° 9.9'	05°07.6	-15.4' -15.4'	60.3
3	221°36.9	• • 02.5	18° 28.8	9.9'	04°36.8	-15.5'	60.3
4	236°36.9	01.8	32°57.7	9.9'	04°21.3	-15.5'	60.3
5	251°36.8	01.1	47°26.6	9.9'	04°05.9	-15.5'	60.3'
6	266°36.7	S17°00.4	61°55.5	9.9'	N03°50.4	-15.5'	60.3'
7	281°36.6	$16^{\circ}59.7$	76°24.4	10.0'	03°34.8	-15.6'	60.3'
8	296°36.5	59.0	90°53.4	10.0'	03°19.3	-15.6'	60.3'
9	311°36.5	• • 58.2	105° 22.4	10.0'	03°03.7	-15.6'	60.3'
10	326°36.4	57.5	119°51.3	10.0'	02°48.1	-15.6'	60.3'
11 12	341°36.3 356°36.2	56.8 \$16°56.1	134° 20.3 148° 49.4	10.0' 10.0'	02°32.5 N02°16.9	-15.6' -15.6'	60.3' 60.3'
13	11°36.1	55.4	146 49.4 163°18.4	10.0'	02°01.3	-15.6'	60.3
14	26°36.1	54.7	177° 47.4	10.1	01°45.6	-15.6'	60.3
15	41°36.0	• • 53.9	192° 16.5	10.1'	01°30.0	-15.7'	60.3'
16	56°35.9	53.2	206°45.6	10.1'	$01^{\circ}14.3$	-15.7'	60.3'
17	71°35.8	52.5	221°14.6	10.1'	00°58.7	-15.7'	60.3'
18	86°35.7	S16°51.8	235° 43.7	10.1'	N00°43.0	-15.7'	60.3
19	101°35.7 116°35.6	51.1 50.3	250°12.8 264°41.9	10.1' 10.1'	00°27.3 N00°11.7	-15.7' -15.7'	60.3' 60.3'
20 21	131°35.5	49.6	204 41.9 279°11.0	10.1	500°04.0	-15.7' 15.7'	60.3
22	146°35.4	48.9	279 11.0 293°40.2	10.1	00°19.6	15.7'	60.3
23	161°35.4	48.2	308° 09.3	10.1	00°35.3	15.6'	60.3
	SD = 16.2'	d = -0.7'			O = 16.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	176°35.3	\$16° 47.4	322°38.4	ν 10.1'	S00°50.9	15.6'	60.3'
1	191°35.2	46.7	337° 07.5	10.1	01°06.6	15.6'	60.2
2	206°35.1	46.0	351°36.7	10.1'	01°22.2	15.6'	60.2
3	221°35.1	• • 45.3	6°05.8	10.1'	01°37.8	15.6'	60.2'
4	236°35.0	44.5	$20^{\circ}34.9$	10.1'	$01^{\circ}53.4$	15.6'	60.2'
5	251°34.9	43.8	35°04.1	10.1'	02°09.0	15.6'	60.2'
6	266°34.9	S16°43.1	49°33.2	10.1'	502°24.6	15.6'	60.2'
7	281°34.8	42.4	64°02.3	10.1'	02°40.1	15.5'	60.2'
8	296°34.7	41.6	78°31.4	10.1'	02°55.7	15.5'	60.2'
9	311°34.6 326°34.6	• • 40.9	93°00.6 107°29.7	10.1' 10.1'	03°11.2 03°26.7	15.5' 15.5'	60.2'
10 11	326°34.6 341°34.5	40.2 39.4	107°29.7 121°58.8	10.1'	03°26.7 03°42.1	15.5' 15.4'	60.2' 60.2'
12	356°34.4	516°38.7	121 56.6 136° 27.9	10.1	503°57.6	15.4	60.2
13	11°34.4	38.0	150° 57.0	10.1	04°13.0	15.4'	60.2
14	26°34.3	37.3	165° 26.0	10.1'	04°28.3	15.3'	60.2'
15	41°34.2	• • 36.5	$179^{\circ}55.1$	10.1'	04°43.7	15.3'	60.1'
16	56°34.1	35.8	194°24.2	10.0'	04°59.0	15.3'	60.1'
17	71°34.1	35.1	208°53.2	10.0'	05°14.3	15.2'	60.1'
18	86°34.0	\$16°34.3	223°22.3	10.0'	\$05°29.5	15.2'	60.1'
19 20	101°33.9 116°33.9	33.6 32.9	237°51.3 252°20.3	10.0' 10.0'	05°44.7 05°59.9	15.2' 15.1'	60.1' 60.1'
21	131°33.8	32.9	266° 49.3	10.0'	05° 59.9	15.1	60.1
22	146°33.7	31.4	281° 18.2	10.0'	06°30.1	15.1 15.0'	60.1
23	161°33.7	30.6	295° 47.2	9.9'	06°45.1	15.0'	60.1
	SD = 16.2'	d = -0.7'		CI	D = 16.4'		
				JI			

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

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

		Sun		Moon				
Day		Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-90%		
31	13:23	13:27	12:13	00:51	13:17			
01	13:31	13:35	12:14	01:43	14:09			
02	13:39	13:42	12:14	02:35	15:00			

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec		SHA	Dec
0	133°27.7	188° 33.7	\$20° 19.0	300°09.4	502°22.3	287°35.0	S09°13.6	99°47.0 N11°01.7			
1	148°30.1	203°32.9	18.4	315°11.6	22.3	302°37.4	13.6	114°49.4 01.8	Alpheratz	357°31.5	29°15.2
2	163°32.6	218°32.1	17.7	330°13.7	22.4	317°39.8	13.6	129°51.7 01.8	Ankaa	353°04.2	-42°09.0
3	178°35.1	233°31.3	17.1	345°15.9	• • 22.5	332°42.2	13.6	144°54.1 · · 01.9	Schedar	349°27.4	56°42.1
4	193°37.5	248°30.5	16.5	0°18.0	22.6	347°44.6	13.6	159°56.4 02.0	Diphda	348°44.2	-17°49.7
5	208°40.0	263°29.7	15.8	15°20.2	22.7	2°47.0	13.6	174°58.8 02.0	Achernar Hamal	335° 18.0 327° 47.5	-57°05.6 23°36.1
6	223°42.5	278°28.9	\$20°15.2	30°22.3	S02°22.7	17°49.4	S 09°13.7	190°01.1 N11°02.1		312°09.3	89°23.4
7	238°44.9	293°28.1	14.6	45°24.5	22.8	32°51.9	13.7	205°03.5 02.1	Acamar	315°09.3	-40°11.5
8	253°47.4	308°27.3	13.9	60°26.6	22.9	47°54.3	13.7	220°05.8 02.2	Menkar	314°02.6	4°12.2
9	268°49.9	323°26.5	• • 13.3	75°28.8	• • 23.0	62°56.7	• • 13.7	235°08.1 · · 02.2	Mirfak	308°23.3	49°58.0
10	283°52.3 298°54.8	338°25.7 353°24.9	12.7 12.0	90°30.9 105°33.1	23.1 23.1	77°59.1 93°01.5	13.7 13.7	250°10.5 02.3 265°12.8 02.3	Aldebaran	290°35.6	16°34.0
11 12	313°57.2	8°24.1	\$20°11.4	105°35.1	502°23.2	108°03.9	509°13.7	280°15.2 N11°02.4	Rigel	$281^{\circ}00.5$	-8°10.3
13	328°59.7	23°23.3	10.7	135°37.4	23.3	123°06.3	13.7	295°17.5 02.4	Capella	280°16.7	46°01.6
14	344°02.2	38°22.5	10.1	150°39.6	23.4	138°08.7	13.7	310° 19.9 02.5	Bellatrix	278°19.1	6°22.4
15	359°04.6	53°21.6	• • 09.4	165°41.7	• • 23.4	153°11.1	• • 13.8	325°22.2 · · 02.5	Elnath	277°57.4	28°37.8
16	14°07.1	68°20.8	8.80	180°43.9	23.5	168°13.5	13.8	340°24.5 02.6	Alnilam	275°34.1 270°48.2	-1°11.2 7°24.6
17	29°09.6	83°20.0	08.2	195°46.1	23.6	$183^{\circ}15.9$	13.8	355°26.9 02.7	Betelgeuse Canopus	263°50.5	-52°42.9
18	44°12.0	$98^{\circ}19.2$	\$20°07.5	210°48.2	S02°23.7	198°18.3	509°13.8	10°29.2 N11°02.7	Sirius	258°23.0	-32 42.9 -16°45.6
19	59°14.5	113° 18.4	06.9	225°50.4	23.8	213°20.7	13.8	25°31.6 02.8	Adhara	255°02.9	-29°01.0
20	74°17.0	128° 17.6	06.2	240°52.6	23.8	228°23.2	13.8	40°33.9 02.8	Procyon	244°47.1	5°08.8
21	89°19.4	143°16.8	•• 05.6	255°54.7	• • 23.9	243°25.6	13.8	55°36.2 · · 02.9	Pollux	243°12.9	27°57.1
22 23	104°21.9 119°24.4	158° 16.0	04.9	270°56.9 285°59.1	24.0 24.0	258°28.0 273°30.4	13.8 13.8	70°38.6 02.9	Avior	$234^{\circ}12.6$	-59°36.4
		173°15.2	04.3			-		85°40.9 03.0	Suhail	222°43.4	-43°33.2
Mer.p	ass. 15:04	ν -0.8' d-0	0.6′ m-3.90	$\nu 2.1' d0.$	1′ m-0.10	$\nu^{2.4'} d0.$	0′ m-2.12	$\nu 2.3' \ d0.1' \ m0.33$	Miaplacidus	221°36.4	-69°50.3
									Alphard	217°44.2	-8°47.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	Regulus Dubhe	207°30.6 193°36.6	11°49.2 61°35.3
0	$134^{\circ}26.8$	$188^{\circ}14.4$	S20°03.6	301°01.2	S02°24.1	288°32.8	509°13.8	100°43.3 N11°03.0	Denebola	182°21.3	14°24.3
1	149°29.3	203°13.6	03.0	316°03.4	24.2	303°35.2	13.9	115° 45.6 03.1	Gienah	175°39.9	-17°42.3
2	164°31.7	218° 12.8	02.3	331°05.6	24.3	318°37.6	13.9	130°47.9 03.2	Acrux	172°55.7	-63°15.5
3	179°34.2 194°36.7	233°12.0	•• 01.7	346°07.8 1°09.9	• • 24.3	333°40.0 348°42.5	· · 13.9 13.9	145°50.3 · · 03.2	Gacrux		-57°16.5
4 5	209°39.1	248°11.2 263°10.5	01.0 20°00.3	1 09.9 16°12.1	24.4 24.5	3°44.9	13.9	160°52.6 03.3 175°55.0 03.3	Alioth	166°09.9	55°47.7
6	224°41.6	278° 09.7	S19°59.7	31°14.3	S02°24.6	18°47.3	S09°13.9	190°57.3 N11°03.4	Spica	158° 18.7	-11°18.9
7	239°44.1	293°08.9	59.0	46°16.5	24.6	33°49.7	13.9	205°59.6 03.4	Alkaid	152°49.4	49°09.7
8	254°46.5	308°08.1	58.4	61°18.6	24.7	48°52.1	13.9	221°02.0 03.5	Hadar	148°31.0 147°53.5	-60°30.6 -36°30.7
9	269°49.0	323°07.3	• • 57.7	76°20.8	• • 24.8	63°54.5	• • 13.9	236°04.3 · · 03.5	Arcturus	147 55.5 145°44.8	19°01.6
10	284°51.5	338°06.5	57.0	91°23.0	24.8	78°56.9	13.9	251°06.7 03.6	Rigil Kent.	139°35.5	-60°57.1
11	299°53.9	353°05.7	56.4	106°25.2	24.9	93°59.3	13.9	266°09.0 03.6	Kochab	$137^{\circ}20.1$	74°01.7
12	314°56.4	8°04.9	\$19°55.7	121°27.4 136°29.5	S02°25.0	109°01.8 124°04.2	S09°13.9	281°11.3 N11°03.7	Zuben'ubi	$136^{\circ}52.3$	-16°09.8
13 14	329°58.9 345°01.3	23°04.1 38°03.3	55.0 54.4	136°29.5 151°31.7	25.0 25.1	124°04.2 139°06.6	14.0 14.0	296°13.7 03.8 311°16.0 03.8	Alphecca	$126^{\circ}01.0$	26°36.8
15	0°03.8	53°02.5	• • 53.7	166°33.9	25.2	154°09.0	• • 14.0	326°18.3 · · 03.9	Antares	112°11.9	-26°29.7
16	15°06.2	68°01.7	53.0	181°36.1	25.2	169°11.4	14.0	341°20.7 03.9	Atria	107°03.3 101°59.2	-69°04.4
17	30°08.7	83°00.9	52.4	196°38.3	25.3	184°13.8	14.0	356°23.0 04.0	Sabik Shaula	96°06.1	-15°45.6 -37°07.3
18	45°11.2	98°00.1	S19°51.7	211°40.5	S02°25.4	$199^{\circ}16.3$	S09°14.0	11°25.4 N11°04.0	Rasalhague	95°55.7	12°32.3
19	60°13.6	112°59.3	51.0	226°42.7	25.4	214°18.7	14.0	26°27.7 04.1	Eltanin	90°41.0	51°28.9
20	75°16.1	127°58.6	50.4	241°44.9	25.5	229°21.1	14.0	41°30.0 04.1	Kaus Aust.	83°28.4	-34°22.1
21	90°18.6	142°57.8	• • 49.7	256°47.1	• • 25.6	244°23.5	• • 14.0	56°32.4 · · 04.2	Vega	$80^{\circ}31.3$	38°48.5
22 23	105°21.0 120°23.5	157° 57.0 172° 56.2	49.0 48.3	271°49.2 286°51.4	25.6 25.7	259°25.9 274°28.3	14.0 14.0	71°34.7 04.3 86°37.0 04.3	Nunki	75°44.0	-26°15.5
									Altair	61°57.0	8°56.7
Mer.p	ass. 15:00	ν -0.8′ d-0	0.7′ m-3.90	ν 2.2′ d0.	1′ m-0.12	ν 2.4′ d0.	0′ m-2.13	$\nu 2.3' \ d0.1' \ m0.34$	Peacock Deneb	53°01.2	-56°38.3
									Enif	49°23.9 33°35.8	45°23.1 10°00.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	Al Na'ir	27°29.3	-46°49.2
0	135°26.0	187°55.4	S 19°47.7	301°53.6	S02°25.7	289°30.8	S09°14.0	101°39.4 N11°04.4	Fomalhaut	15° 11.2	-29°28.1
1	150°28.4	202°54.6	47.0	316°55.8	25.8	304°33.2	14.0	116°41.7 04.4	Scheat	13°42.2	28°14.6
2	165°30.9	217°53.8	46.3	331°58.0	25.9	319°35.6	14.0	131°44.1 04.5	Markab	$13^{\circ}26.8$	15°21.8
3 4	180°33.3 195°35.8	232°53.0 247°52.3	• • 45.6 44.9	347°00.2 2°02.4	· · 25.9 26.0	334°38.0 349°40.4	· · 14.0 14.1	146°46.4 · · · 04.5 161°48.7	Feb 03 Sat	SHA	Mer.pass
4 5	195 35.8 210°38.3	247 52.3 262°51.5	44.9 44.3	2 02.4 17°04.6	26.0	349 40.4 4°42.9	14.1 14.1	161°48.7 04.6 176°51.1 04.7	Venus	55°06.1	11:26
6	210 38.3 225°40.7	202 51.5 277° 50.7	\$19°43.6	32°06.8	S02°26.1	19°45.3	S09°14.1	191°53.4 N11°04.7		166°41.7	03:59
7	240°43.2	292°49.9	42.9	47°09.0	26.2	34°47.7	14.1	206°55.7 04.8	Jupiter		04:49
8	255°45.7	307°49.1	42.2	62°11.2	26.2	49°50.1	14.1	221°58.1 04.8	Saturn	$326^{\circ}19.4$	17:18
9	270°48.1	322°48.3	• • 41.5	77°13.4	• • 26.3	64°52.6	•• 14.1	237°00.4 · · 04.9	Feb 04 Sun	SHA	Mer.pass
10	285°50.6	337° 47.6	40.8	92°15.6	26.4	79°55.0	14.1	252°02.7 04.9	Venus	53°47.6	11:28
11	300°53.1	352°46.8	40.1	107°17.9	26.4	94°57.4	14.1	267°05.1 05.0		166°34.4	03:55
12 13	315°55.5 330°58.0	7°46.0 22°45.2	\$19°39.5 38.8	122°20.1 137°22.3	\$02°26.5 26.5	109°59.8 125°02.2	\$09°14.1 14.1	282°07.4 N11°05.0 297°09.7 05.1	l .	$154^{\circ}06.0$	04:45
13 14	330°58.0 346°00.5	22°45.2 37°44.4	38.8 38.1	137°22.3 152°24.5	26.5 26.6	125°02.2 140°04.7	14.1 14.1	312°12.1 05.2	Saturn	$326^{\circ}16.4$	17:14
15	1°02.9	52° 43.6	37.4	167°26.7	26.6	155°07.1	•• 14.1	327°14.4 · · 05.2	Feb 05 Mon	SHA	Mer.pass
16	16°05.4	67°42.9	36.7	182°28.9	26.7	170°09.5	14.1	342°16.7 05.3	Venus	50°29.4	11:29
17	31°07.8	82°42.1	36.0	197°31.1	26.7	185°11.9	14.1	357°19.1 05.3		166°27.7	03:52
18	46°10.3	97°41.3	S19°35.3	212°33.3	S02°26.8	200°14.4	S09°14.1	12°21.4 N11°05.4		154°04.8	04:41
19	61°12.8	112°40.5	34.6	227°35.5	26.9	215°16.8	14.1	27°23.7 05.4		$326^{\circ}13.4$	17:11
20	76°15.2	127°39.8	33.9	242°37.8	26.9	230°19.2	14.1	42°26.1 05.5	Horizont	al parallax	===
21	91°17.7 106°20.2	142°39.0 157°38.2	· · 33.2	257°40.0 272°42.2	· · 27.0 27.0	245°21.6 260°24.1	· · 14.1 14.1	57°28.4 · · 05.6 72°30.7	TIOTIZUIT	Venus:	0.1
22 23	106 20.2 121°22.6	157 38.2 172°37.4	32.5 31.8	272 42.2 287°44.4	27.0	275°26.5	14.1 14.1	72°30.7 05.6 87°33.1 05.7		Mars:	0.2
ivier.p	ass. 14:56	ν-υ.δ' d-0	0.7′ m-3.90	ν 2.2' d0.	1′ m-0.15	ν2.4′ d0.	0′ m-2.14	ν2.3' d0.1' m0.34			

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.6	S 16°29.9	$310^{\circ}16.1$	9.9'	S 07°00.1	14.9'	60.0'
1	191°33.5	29.2	324°45.1	9.9'	07°15.1	14.9'	60.0'
2 3	206°33.5 221°33.4	28.4 •• 27.7	339°13.9 353°42.8	9.9' 9.9'	07°30.0 07°44.8	14.8' 14.8'	60.0' 60.0'
4	236°33.3	27.0	8°11.7	9.8'	07°59.6	14.7'	60.0'
5	251°33.3	26.2	22°40.5	9.8'	$08^{\circ}14.3$	14.7'	60.0'
6	266°33.2	\$16°25.5	37°09.3	9.8'	508°29.0	14.6'	60.0'
7 8	281°33.2 296°33.1	24.7 24.0	51°38.1 66°06.9	9.8' 9.7'	08°43.7 08°58.2	14.6' 14.5'	59.9' 59.9'
9	311°33.0	. 23.3	80°35.6	9.7'	09°12.7	14.5'	59.9'
10	326°33.0	22.5	95°04.3	9.7'	09°27.2	14.4'	59.9'
11	341°32.9 356°32.8	21.8 \$16°21.0	109°33.0	9.7'	09°41.6	14.3'	59.9'
12 13	356 32.8 11°32.8	20.3	124°01.6 138°30.3	9.6' 9.6'	\$09°55.9 10°10.2	14.3' 14.2'	59.9' 59.8'
14	26°32.7	19.6	152°58.9	9.6'	10° 24.4	14.1'	59.8'
15	41°32.7	• • 18.8	167°27.4	9.5'	10°38.5	14.1'	59.8'
16 17	56°32.6 71°32.5	18.1 17.3	181°56.0 196°24.5	9.5' 9.5'	10°52.5 11°06.5	14.0' 13.9'	59.8' 59.8'
18	86°32.5	S16° 16.6	210°52.9	9.5	\$11°20.4	13.8'	59.8'
19	101°32.4	15.8	225°21.4	9.4'	11°34.3	13.8'	59.7'
20	116°32.4	15.1	239°49.8	9.4'	11°48.0	13.7'	59.7'
21	131°32.3 146°32.2	• • 14.3	254°18.1 268°46.5	9.3'	12°01.7 12°15.3	13.6'	59.7' 59.7'
22 23	140 32.2 161°32.2	13.6 12.8	208 40.5 283°14.8	9.3' 9.3'	12 15.3 12°28.8	13.5' 13.4'	59.7' 59.7'
	SD = 16.2'	d = -0.7'			D = 16.4'		
	JD — 10.2	u — -0.1		اد	J — 10.4°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.1	\$16° 12.1 11.4	297°43.0	9.2'	\$12°42.3 12°55.7	13.4'	59.7'
1 2	191°32.1 206°32.0	11.4	312°11.3 326°39.4	9.2' 9.2'	12°55.7 13°08.9	13.3' 13.2'	59.6' 59.6'
3	221°31.9	09.9	341°07.6	9.1'	13°22.1	13.1'	59.6'
4	236°31.9	09.1	$355^{\circ}35.7$	9.1'	$13^{\circ}35.2$	13.0'	59.6'
5	251°31.8 266°31.8	08.4 \$16° 07.6	10°03.8 24°31.8	9.0' 9.0'	13°48.3 \$14°01.2	12.9' 12.8'	59.6'
6 7	200 31.8 281°31.7	06.9	24 31.8 38°59.8	9.0' 9.0'	14°14.0	12.8	59.5' 59.5'
8	296°31.7	06.1	53°27.8	8.9'	14° 26.8	12.7'	59.5'
9	311°31.6	•• 05.3	67°55.7	8.9'	14°39.4	12.6'	59.5'
10 11	326°31.6 341°31.5	04.6 03.8	82°23.5 96°51.4	8.8' 8.8'	14°52.0 15°04.5	12.5' 12.4'	59.5' 59.4'
12	356°31.4	S16°03.1	111°19.2	8.7'	\$15°16.8	12.4	59.4
13	11°31.4	02.3	125°46.9	8.7'	15°29.1	12.2'	59.4'
14	26°31.3	01.6	140°14.6	8.7'	15°41.3	12.1'	59.4
15 16	41°31.3 56°31.2	· · 00.8 16°00.1	154°42.3 169°09.9	8.6' 8.6'	15°53.3 16°05.3	12.0' 11.9'	59.4' 59.3'
17	71°31.2	15° 59.3	183°37.5	8.5	16° 17.2	11.8'	59.3'
18	86°31.1	S15°58.6	198°05.0	8.5'	S 16°28.9	11.7'	59.3'
19	101°31.1	57.8	212°32.5 227°00.0	8.4'	16°40.6 16°52.1	11.5'	59.3' 59.2'
20 21	116°31.0 131°31.0	57.0 •• 56.3	227°00.0 241°27.4	8.4' 8.4'	16°52.1 17°03.6	11.4' 11.3'	59.2' 59.2'
22	146°30.9	55.5	255°54.7	8.3'	17° 14.9	11.2'	59.2'
23	161°30.9	54.8	270°22.0	8.3'	$17^{\circ}26.1$	11.1'	59.2'
	SD = 16.2'	d = -0.7'		SI	D = 16.3'		
Mon	GHA	Dec	GHA		Dee		НР
0	176°30.8	\$15°54.0	284°49.3	ν 8.2'	Dec \$17° 37.2	<i>d</i> 11.0'	59.2'
1	191°30.8	53.2	$299^{\circ}16.5$	8.2'	17°48.2	10.9'	59.1'
2	206°30.7	52.5	313°43.7	8.1'	17°59.1	10.8'	59.1'
3 4	221°30.7 236°30.6	· · 51.7 51.0	328°10.9 342°38.0	8.1' 8.1'	18° 09.8 18° 20.5	10.6' 10.5'	59.1' 59.1'
5	251°30.6	50.2	357°05.0	8.0'	18°31.0	10.4	59.0'
6	266°30.5	\$15°49.4	11°32.0	8.0'	\$18°41.4	10.3'	59.0'
7 8	281°30.5 296°30.4	48.7 47.9	25°59.0 40°25.9	7.9' 7.9'	18°51.7 19°01.9	10.2' 10.1'	59.0' 59.0'
9	290 30.4 311°30.4	47.9 · · 47.1	40 25.9 54°52.8	7.9 7.8'	19 01.9 19°11.9	9.9'	59.0'
10	326°30.3	46.4	$69^{\circ}19.6$	7.8'	$19^{\circ}21.9$	9.8'	58.9'
11	341°30.3	45.6	83°46.4	7.7'	19°31.7	9.7'	58.9'
12 13	356°30.3 11°30.2	S15°44.9 44.1	98°13.2 112°39.9	7.7' 7.7'	\$19°41.4 19°50.9	9.6' 9.4'	58.9' 58.9'
14	26°30.2	43.3	127°06.5	7.6'	20°00.3	9.3	58.8'
15	41°30.1	• • 42.6	141°33.2	7.6'	20°09.6	9.2'	58.8'
16	56°30.1	41.8	155°59.7	7.5'	20°18.8	9.0'	58.8'
17 18	71°30.0 86°30.0	41.0 \$15°40.2	170°26.3 184°52.8	7.5' 7.5'	20°27.8 \$20°36.8	8.9' 8.8'	58.8' 58.7'
19	101°29.9	39.5	199°19.2	7.4'	20°45.5	8.6'	58.7
20	116°29.9	38.7	213°45.7	7.4'	20°54.2	8.5'	58.7'
21 22	131°29.9 146°29.8	· · · 37.9 37.2	228°12.0 242°38.4	7.3' 7.3'	21°02.7 21°11.1	8.4' 8.2'	58.7' 58.6'
23	146°29.8 161°29.8	37.2 36.4	242°38.4 257°04.7	7.3'	21°11.1 21°19.3	8.2 8.1'	58.6'
	SD = 16.2'	d = -0.8'			D = 16.1'		•
	- 10.2			ار			

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

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

ı	Day		Sun		Moon				
	Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
١	,	00 ^h	12 ^h	Pass	Upper	Lower	20-22		
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	81-60%		
	03	13:46	13:49	12:14	03:26	15:52			
İ	04	13:52	13:54	12:14	04:18	16:45			
	05	13:57	13:59	12:14	05:12	17:40			

February 06, 07, 08 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
	136°25.1	187° 36.6	\$19°31.1	302°46.6	S02°27.1	290°28.9	S09°14.1	102°35.4	N11°05.7		эпа	Dec
0								102 35.4 117°37.7		Alpheratz	$357^{\circ}31.5$	29°15.2
1	151°27.6	202°35.9	30.4	317°48.9	27.2	305°31.3	14.1		05.8	Ankaa	353°04.2	-42°09.0
2 3	166°30.0	217°35.1	29.7	332°51.1	27.2	320°33.8 335°36.2	14.2	132°40.1 147°42.4	05.9 •• 05.9	Schedar	349°27.4	56°42.1
3 4	181°32.5 196°35.0	232°34.3 247°33.5	· · 29.0 28.3	347°53.3 2°55.5	· · 27.3 27.3	350°38.6	· · 14.2 14.2	147 42.4 162°44.7	06.0	Diphda	348°44.2	-17°49.7
5	211°37.4	262° 32.8	27.6	17°57.8	27.4	5°41.0	14.2	177°47.1	06.0	Achernar	$335^{\circ}18.1$	-57°05.6
6	226°39.9	277°32.0	\$19°26.9	33°00.0	S02°27.4	20°43.5	S09°14.2	192°49.4	N11°06.1	Hamal	327°47.5	23°36.1
7	241°42.3	292°31.2	26.2	48°02.2	27.5	35°45.9	14.2	207°51.7	06.1	Polaris	312°10.6	89°23.4
8	256°44.8	307°30.5	25.5	63°04.4	27.5	50°48.3	14.2	222°54.1	06.2	Acamar	315°09.3	-40°11.5
9	271°47.3	322°29.7	• • 24.8	78°06.7	27.6	65°50.8	. 14.2	237°56.4	06.3	Menkar	314°02.7	4°12.2
10	286°49.7	337°28.9	24.1	93°08.9	27.6	80°53.2	14.2	252°58.7	06.3	Mirfak	308°23.3	49°58.0
11	301°52.2	352°28.1	23.3	$108^{\circ}11.1$	27.7	95°55.6	14.2	268°01.1	06.4	Aldebaran	290°35.6 281°00.5	16°34.0
12	316°54.7	7°27.4	S19°22.6	123°13.4	S02°27.7	110°58.1	S09°14.2	283°03.4	N11°06.4	Rigel Capella	280° 16.7	-8°10.3 46°01.6
13	$331^{\circ}57.1$	22°26.6	21.9	$138^{\circ}15.6$	27.8	126°00.5	14.2	298°05.7	06.5	Bellatrix	278° 19.1	6°22.4
14	346°59.6	37°25.8	21.2	153° 17.8	27.8	141°02.9	14.2	313°08.0	06.5	Elnath	277°57.4	28°37.8
15	2°02.1	52°25.1	• • 20.5	168°20.1	• • 27.9	156°05.3	• • 14.2	328°10.4	• • 06.6	Alnilam	275°34.1	-1°11.2
16	17°04.5	67°24.3	19.8	183°22.3	27.9	171°07.8	14.2	343°12.7	06.7	Betelgeuse	270°48.3	7°24.6
17	32°07.0	82°23.5	19.0	198°24.5	28.0	186°10.2	14.2	358°15.0	06.7	Canopus	263°50.5	-52°43.0
18	47°09.4	97°22.8 112°22.0	\$19° 18.3	213°26.8	S02°28.0	201°12.6	S09°14.2	13°17.4	N11°06.8	Sirius	258°23.0	-16°45.6
19 20	62°11.9 77°14.4	112 22.0 127°21.2	17.6 16.9	228°29.0 243°31.3	28.0	216°15.1 231°17.5	14.2	28°19.7 43°22.0	06.8	Adhara	255°02.9	-29°01.0
21	92°16.8	142° 20.5	16.2	243 31.3 258°33.5	28.1 •• 28.1	231 17.5 246°19.9	14.2 •• 14.2	43°24.3	06.9 •• 07.0	Procyon	244°47.1	5°08.8
22	107°19.3	142 20.5 157° 19.7	15.4	273°35.8	28.2	240 19.9 261°22.4	14.2	73°26.7	07.0	Pollux	243°12.9	27°57.1
23	122°21.8	172° 18.9	14.7	288°38.0	28.2	276°24.8	14.2	88°29.0	07.1	Avior	234° 12.7	-59°36.4
										Suhail	222°43.3	-43°33.2
Mer.p	ass. 14:52	ν -0.8′ d-0	0.7′ m-3.90	ν 2.2′ d0.	1^\prime m-0.17	ν 2.4′ d0.	0′ m-2.15	$\nu 2.3' \ d0.$	1′ m0.34	Miaplacidus	221°36.4	-69°50.3
										Alphard	217°44.1	-8°47.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	11°49.2
0	137°24.2	187°18.2	S19°14.0	303°40.2	S02°28.3	291°27.2	509°14.2	103°31.3	N11°07.1	Dubhe	193°36.5 182°21.3	61°35.3 14°24.3
1	152°26.7	202°17.4	13.3	318°42.5	28.3	306°29.7	14.2	118°33.7	07.2	Denebola Gienah	182 21.3 175°39.9	-17°42.3
2	$167^{\circ}29.2$	217°16.6	12.5	333°44.7	28.3	321°32.1	14.2	133°36.0	07.2	1	175 39.9 172°55.7	-17 42.3 -63°15.5
3	$182^{\circ}31.6$	232°15.9	• • 11.8	348°47.0	• • 28.4	336°34.5	• • 14.2	148°38.3	• • 07.3	Gacrux		-57°16.5
4	$197^{\circ}34.1$	$247^{\circ}15.1$	11.1	3°49.2	28.4	351°37.0	14.2	163°40.6	07.4	Alioth	166°09.9	55°47.7
5	212°36.6	$262^{\circ}14.3$	10.4	18°51.5	28.5	6°39.4	14.2	178°43.0	07.4	Spica	158° 18.6	-11°18.9
6	227°39.0	277°13.6	S19°09.6	33°53.7	S02°28.5	21°41.8	S09°14.2	193°45.3	N11°07.5	Alkaid	152°49.3	49°09.7
7	242°41.5	292°12.8	08.9	48°56.0	28.5	36°44.3	14.2	208°47.6	07.5	Hadar	148°30.9	-60°30.6
8	257°43.9	307°12.1	08.2	63°58.2	28.6	51°46.7	14.2	223°50.0	07.6	Menkent	147°53.5	-36°30.7
9	272°46.4	322°11.3	• • 07.4	79°00.5	• • 28.6	66°49.2	• • 14.2	238°52.3	• • 07.7	Arcturus	145°44.8	19°01.6
10	287°48.9	337°10.5	06.7	94°02.8	28.7	81°51.6	14.2	253°54.6	07.7	Rigil Kent.	$139^{\circ}35.5$	-60°57.1
11	302°51.3	352°09.8	06.0	109°05.0	28.7	96°54.0 111°56.5	14.2 \$09°14.2	268°56.9 283°59.3	07.8	Kochab	$137^{\circ}20.1$	74°01.7
12 13	317°53.8 332°56.3	7°09.0 22°08.3	\$19°05.2 04.5	124°07.3 139°09.5	\$02°28.7 28.8	111 50.5 126°58.9	14.2	203 59.5 299°01.6	N11°07.8 07.9	Zuben'ubi	136°52.3	-16°09.8
14	347°58.7	22 06.3 37°07.5	03.8	159 09.5 154°11.8	28.8	142°01.3	14.2	314°03.9	07.9	Alphecca	126°01.0	26°36.8
15	3°01.2	52°06.8	• • 03.0	169°14.1	• • 28.8	157°03.8	. 14.2	329°06.2	. 08.0	Antares	112°11.9	-26°29.7
16	18°03.7	67°06.0	02.3	184°16.3	28.9	172°06.2	14.2	344°08.6	08.1	Atria	107°03.3	-69°04.4
17	33°06.1	82°05.2	01.5	199°18.6	28.9	187°08.7	14.2	359°10.9	08.1	Sabik	101°59.1	-15°45.6
18	48°08.6	97°04.5	S19°00.8	214°20.9	S02°28.9	202°11.1	509°14.2	14°13.2	N11°08.2	Shaula	96°06.1 95°55.7	-37°07.3 12°32.3
19	63°11.1	112°03.7	19°00.1	229°23.1	29.0	$217^{\circ}13.5$	14.2	29°15.5	08.3	Rasalhague	95 55.7 90°41.0	51°28.9
20	$78^{\circ}13.5$	127°03.0	18°59.3	244°25.4	29.0	$232^{\circ}16.0$	14.2	44°17.9	08.3	Eltanin Kaus Aust.	83° 28.4	-34°22.1
21	$93^{\circ}16.0$	142°02.2	• • 58.6	259°27.7	• • 29.0	247°18.4	• • 14.2	59°20.2	• • 08.4	Vega	80°31.3	38°48.5
22	108°18.4	157°01.5	57.8	274°29.9	29.1	262°20.9	14.2	74°22.5	08.4	Nunki	75°44.0	-26°15.5
23	123°20.9	172°00.7	57.1	289°32.2	29.1	277°23.3	14.2	89°24.8	08.5	Altair	61°57.0	8°56.7
Mer n	ass. 14:48	ν -0.8' d-0	0.7′ m-3.90	$\nu^2 2' d0$	0′ m-0.20	$\nu^2 4' d0$	0′ m-2.15	$\nu 2.3' d0.$	1′ m0 34	Peacock	53°01.2	-56°38.3
		- 0.0 4 0								Deneb	49°23.9	45°23.1
			_		_		_		_	Enif	33°35.8	10°00.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.2
0 1	138°23.4 153°25.8	187°00.0 201°59.2	\$18° 56.3 55.6	304°34.5 319°36.7	\$02°29.1 29.2	292°25.7 307°28.2	S09°14.2 14.2	104°27.2 119°29.5	N11°08.6 08.6	Fomalhaut	15°11.2	-29°28.1
2	168°28.3	201 59.2 216°58.5	54.8	334°39.0	29.2	307 20.2 322°30.6	14.2	119 29.5 134°31.8	08.7	Scheat	13°42.2	28°14.6
3	183°30.8	210 56.5 231°57.7	. 54.1	349°41.3	• • 29.2	337°33.1	. 14.2	134 31.6 149°34.1	• • 08.7	Markab	13°26.8	15°21.8
4	198°33.2	246°57.0	53.3	4°43.6	29.3	352°35.5	14.2	164°36.5	08.8	Feb 06 Tue	SHA	Mer.pass
5	213°35.7	261°56.2	52.6	19°45.8	29.3	7°37.9	14.2	179°38.8	08.9	Venus	51°11.5	11:30
6	228°38.2	276°55.5	S18°51.8	34°48.1	S02°29.3	22°40.4	509°14.2	194°41.1			166°21.5	03:48
7	243°40.6	291°54.7	51.1	49°50.4	29.3	37°42.8	14.2	209°43.4	09.0	Jupiter	154°03.8	04:37
8	258°43.1	306°54.0	50.3	64°52.7	29.4	52°45.3	14.2	224°45.8	09.0	Saturn	$326^{\circ}10.3$	17:07
9	273°45.6	321°53.2	• • 49.6	79°55.0	• • 29.4	67°47.7	• • 14.2	239°48.1	• • 09.1	F-1- 07 \\\-1	CIIA	N4
10	288°48.0	336°52.5	48.8	94°57.3	29.4	82°50.2	14.2	254°50.4	09.2	Feb 07 Wed Venus	SHA 49°53.9	Mer.pass 11:31
11	303°50.5	351°51.7	48.0	109°59.5	29.5	97°52.6	14.1	269°52.7	09.2		49 53.9 166°16.0	03:45
12	318°52.9	6°51.0	S18°47.3	125°01.8	S02°29.5	112°55.1	S09°14.1	284°55.1	N11°09.3		154°03.0	04:33
13	333°55.4	21°50.2	46.5	140°04.1	29.5	127°57.5	14.1	299°57.4	09.3	Saturn	326°07.1	17:03
14	348°57.9	36°49.5	45.8	155°06.4	29.5	142°59.9	14.1	314°59.7	09.4			
15	4°00.3	51°48.7	• • 45.0	170°08.7	• • 29.6	158°02.4	. 14.1	330°02.0	• • 09.5	Feb 08 Thu	SHA	Mer.pass
16	19°02.8	66°48.0	44.2	185°11.0	29.6	173°04.8	14.1	345°04.3	09.5	Venus	48°36.6	11:33
17	34°05.3 49°07.7	81°47.2 96°46.5	43.5 \$18°42.7	200°13.3 215°15.6	29.6 \$02°29.6	188°07.3 203°09.7	14.1 S09°14.1	0°06.7	09.6 N11°09.6		166°11.1	03:41
18 19	49 07.7 64°10.2	96 46.5 111°45.8	41.9	215 15.0 230°17.8	29.6	203 09.7 218°12.2	14.1	15°09.0 30°11.3	09.6 09.7		154°02.4	04:30
20	79°12.7	111 45.6 126° 45.0	41.9	245°20.1	29.0	233°14.6	14.1	45°13.6	09.7	Saturn	326°03.8	17:00
21	94°15.1	141°44.3	• • 40.4	260°22.4	• • 29.7	233 14.0 248°17.1	. 14.1	60°15.9	• • 09.8	Horizont	al parallax	
22	109°17.6	156° 43.5	39.6	275°24.7	29.7	263°19.5	14.1	75°18.3	09.9		Venus:	0.1
23	124°20.1	171°42.8	38.9	290°27.0	29.7	278°22.0	14.1	90°20.6	09.9		Mars:	0.2
			0.7′ m-3.90		0′ m-0.22		0′ m-2.16	$\nu 2.3' d0.$			-	
ivier.p	ass. 14:44	ν -0.0 a -0	. 1 111-3.90	$\nu z.5^{\circ} a0.$	U 111-U.ZZ	ν∠.4 α-U.	.∪ III-∠.10	$\nu z.5^{\circ} a0.$	111U.33			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 29.7	S15°35.6	271°30.9	7.2'	S21°27.4	8.0'	58.6'
1	191°29.7	34.9	285°57.2	7.2'	21°35.4	7.8'	58.6'
2	206°29.6	34.1	300°23.4	7.2'	21°43.2	7.7'	58.5'
3	221°29.6	• • 33.3	314°49.5	7.1'	21°50.9	7.6'	58.5'
4	236°29.6	32.5	329°15.6	7.1'	21°58.5	7.4'	58.5'
5	251°29.5 266°29.5	31.8 \$15°31.0	343°41.7 358°07.8	7.1' 7.0'	22°05.9 S 22°13.2	7.3' 7.1'	58.5' 58.4'
6 7	281°29.4	30.2	12°33.8	7.0' 7.0'	22°20.3	7.1	58.4'
8	296°29.4	29.4	26°59.8	7.0'	22°27.3	6.9	58.4
9	311°29.4	28.7	41°25.8	6.9'	22°34.2	6.7'	58.4'
10	326°29.3	27.9	55°51.7	6.9'	22°40.9	6.6'	58.4'
11	341°29.3	27.1	70°17.6	6.9'	22°47.5	6.4'	58.3'
12	356°29.3	S15°26.3	84°43.5	6.8'	S22°53.9	6.3'	58.3'
13	11°29.2	25.6	99°09.3	6.8'	23°00.2	6.1'	58.3'
14 15	26°29.2 41°29.1	24.8 •• 24.0	113°35.1 128°00.9	6.8' 6.8'	23°06.3 23°12.3	6.0' 5.8'	58.3' 58.2'
16	56°29.1	23.2	142°26.7	6.7	23°18.1	5.7'	58.2
17	71°29.1	22.5	156°52.5	6.7'	23°23.8	5.5'	58.2'
18	86°29.0	S 15°21.7	171°18.2	6.7'	S23°29.4	5.4'	58.2'
19	101°29.0	20.9	185°43.9	6.7'	23°34.8	5.2'	58.1'
20	116°29.0	20.1	200°09.6	6.7'	23°40.0	5.1'	58.1'
21	131°28.9	• • 19.3	214°35.2	6.6'	23°45.1	5.0'	58.1'
22	146°28.9 161°28.9	18.6	229°00.9 243°26.5	6.6'	23°50.1 23°54.9	4.8' 4.7'	58.1'
23		17.8	243 20.5	6.6'		4.7	58.0'
	SD = 16.2'	d = -0.8'		SI	O = 16.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.8	S15°17.0	257°52.1	6.6'	S23°59.5	4.5'	58.0'
1	191°28.8	16.2	272°17.7	6.6'	24°04.0	4.3'	58.0'
2	206°28.8	15.4	286°43.3	6.6'	24°08.4	4.2'	58.0'
3	221°28.7	• • 14.6	301°08.9	6.6'	24°12.6	4.0'	57.9'
4 5	236°28.7 251°28.7	13.9 13.1	315°34.5 330°00.0	6.6' 6.6'	24°16.6 24°20.5	3.9' 3.7'	57.9' 57.9'
6	266°28.6	S15°12.3	344°25.6	6.5	\$24°24.2	3.6'	57.9'
7	281°28.6	11.5	358°51.1	6.5	24°27.8	3.4	57.8
8	296° 28.6	10.7	13°16.7	6.5'	24°31.3	3.3'	57.8'
9	311°28.5	• • 09.9	27°42.2	6.5'	24°34.6	3.1'	57.8'
10	326° 28.5	09.1	42°07.7	6.5'	24°37.7	3.0'	57.8'
11	341°28.5	08.4	56°33.3	6.5'	24°40.7	2.8'	57.7'
12	356°28.5	S15°07.6	70°58.8 85°24.3	6.5'	\$24°43.5 24°46.2	2.7'	57.7'
13 14	11°28.4 26°28.4	06.8 06.0	85°24.3 99°49.9	6.5' 6.5'	24°46.2 24°48.7	2.5' 2.4'	57.7' 57.7'
15	41°28.4	. 05.2	114°15.4	6.5	24°51 1	2.4	57.6
16	56° 28.3	04.4	128°40.9	6.6'	24°53.3	2.1'	57.6'
17	71°28.3	03.6	143°06.5	6.6'	24°55.4	1.9'	57.6'
18	86°28.3	S15°02.8	157°32.1	6.6'	524°57.3	1.8'	57.6'
19	101°28.3	02.0	171°57.6	6.6'	24°59.0	1.6'	57.6'
20	116°28.2 131°28.2	01.3 15°00.5	186°23.2 200°48.8	6.6'	25°00.6 25°02.1	1.5' 1.3'	57.5' 57.5'
21 22	131 28.2 146°28.2	15 00.5 14°59.7	200 48.8 215°14.4	6.6' 6.6'	25 02.1 25°03.4	1.3	57.5'
23	161°28.2	58.9	229°40.1	6.6'	25°04.6	1.0'	57.5
	SD = 16.2'	d = -0.8'		SI	O = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.1	\$14°58.1	244°05.7	υ 6.7'	\$25°05.6	0.8'	57.4'
1	191°28.1	57.3	258°31.4	6.7'	25°06.4	0.7	57.4
2	$206^{\circ}28.1$	56.5	272°57.0	6.7'	$25^{\circ}07.1$	0.5'	57.4'
3	221°28.1	• • 55.7	287°22.7	6.7'	25°07.6	0.4'	57.4'
4	236°28.0	54.9	301°48.5	6.8'	25°08.0	0.2'	57.3'
5	251°28.0	54.1 \$14°53.3	316°14.2	6.8'	25°08.3	0.1'	57.3'
6 7	266°28.0 281°28.0	\$14°53.3 52.5	330°40.0 345°05.8	6.8' 6.8'	\$25°08.4 25°08.3	-0.1' -0.2'	57.3' 57.3'
8	296°27.9	52.5 51.7	359°31.6	6.9	25°08.1	-0.2 -0.4'	57.3'
9	311°27.9	• • 50.9	13°57.5	6.9'	25°07.7	-0.5	57.2'
10	326°27.9	50.1	28°23.4	6.9'	25°07.2	-0.7'	57.2'
11	341°27.9	49.3	42°49.3	7.0'	25°06.6	-0.8'	57.2'
12	356°27.8	\$14°48.5	57°15.3	7.0'	\$25°05.8	-1.0'	57.2'
13	11°27.8	47.7	71°41.3	7.0'	25°04.8	-1.1'	57.1'
14 15	26°27.8 41°27.8	46.9 •• 46.1	86°07.3 100°33.4	7.1' 7.1'	25°03.7 25°02.4	-1.2' -1.4'	57.1' 57.1'
16	56°27.8	45.3	100 55.4 114°59.5	7.1 7.2'	25 02.4 25°01.1	-1.4 -1.5'	57.1'
17	71°27.7	44.5	129°25.7	7.2'	24°59.5	-1.7'	57.0'
18	86°27.7	S14°43.7	143°51.9	7.2'	\$24°57.8	-1.8'	57.0'
19	101°27.7	42.9	158° 18.1	7.3'	24°56.0	-2.0'	57.0'
20	116°27.7	42.1	172°44.4	7.3'	24°54.0	-2.1'	57.0'
21	131°27.7	• • 41.3	187°10.7	7.4'	24°51.9 24°49.6	-2.3'	56.9'
22 23	146°27.6 161°27.6	40.5 39.7	201°37.1 216°03.5	7.4' 7.5'	24°49.6 24°47.2	-2.4' -2.5'	56.9' 56.9'
23	SD = 16.2'	d = -0.8'	210 03.3		D = 15.7'	-2.3	30.9
	<u> </u>	<u>u — =0.0</u>		ال	_ 13.1		

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

Lat.		Moonris	е		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°	04:29			07:36		
64°	03:48	05:38	07:01	08:18	08:26	09:03
62°	03:20	04:55	06:08	08:46	09:10	09:56
60°	02:58	04:26	05:36	09:08	09:39	10:28
N 58°	02:41	04:04	05:12	09:26	10:01	10:52
56°	02:26	03:46	04:52	09:42	10:19	11:12
54°	02:13	03:31	04:36	09:55	10:35	11:28
52°	02:02	03:18	04:22	10:06	10:48	11:42
50°	01:53	03:06	04:10	10:16	11:00	11:54
45°	01:32	02:42	03:45	10:38	11:24	12:19
N 40°	01:15	02:23	03:25	10:55	11:44	12:39
35°	01:01	02:07	03:08	11:10	12:00	12:56
30°	00:49	01:54	02:54	11:23	12:14	13:10
20°	00:29	01:30	02:29	11:45	12:38	13:35
N 10°	00:11	01:10	02:08	12:04	12:59	13:56
0°		00:51	01:48	12:21	13:18	14:16
S 10°		00:32	01:29	12:39	13:38	14:35
20°		00:12	01:08	12:58	13:59	14:56
30°	23:49		00:43	13:20	14:23	15:20
35°	23:36		00:29	13:33	14:37	15:35
40°	23:20		00:12	13:48	14:53	15:51
45°	23:02	23:53		14:06	15:13	16:11
S 50°	22:39	23:28		14:28	15:38	16:35
52°	22:28	23:16		14:39	15:49	16:47
54°	22:16	23:02		14:51	16:03	17:01
56°	22:02	22:47	23:46	15:05	16:19	17:16
58°	21:45	22:28	23:28	15:21	16:37	17:35
S 60°	21:25	22:05	23:05	15:40	17:00	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	49-28%		
06	14:01	14:03	12:14	06:08	18:36			
07	14:05	14:06	12:14	07:05	19:33			
80	14:07	14:09	12:14	08:02	20:30	4		

February 09, 10, 11 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	139°22.5	186° 42.0	\$18°38.1	305°29.3	S02°29.8	293°24.4	509°14.1	105°22.9	N11°10.0			
1	154°25.0	201°41.3	37.3	320°31.6	29.8	308° 26.9	14.1	120°25.2	10.1	Alpheratz	357°31.5	29°15.2
2	169°27.4	216° 40.6	36.6	335°33.9	29.8	323°29.3	14.1	135°27.6	10.1	Ankaa	353°04.2	-42°09.0
3	184°29.9	231°39.8	35.8	350°36.2	• • 29.8	338°31.8	14.1	150°29.9	. 10.2	Schedar	349°27.4	56°42.1
4	199°32.4	246°39.1	35.0	5°38.5	29.8	353°34.2	14.1	165°32.2	10.2	Diphda	348°44.2	-17°49.7
5	214°34.8	261°38.4	34.2	20°40.8	29.9	8°36.7	14.1	180°34.5	10.3	Achernar	335°18.1	-57°05.6
6	229°37.3	276°37.6	S18°33.5	$35^{\circ}43.1$	S02°29.9	23°39.1	S09°14.1	195°36.8	N11°10.4	Hamal Polaris	327°47.5 312°11.9	23°36.1 89°23.4
7	244°39.8	291°36.9	32.7	50°45.5	29.9	38°41.6	14.1	210°39.2	10.4	Acamar	315°09.3	-40°11.5
8	259°42.2	306°36.1	31.9	65°47.8	29.9	53°44.0	14.1	225°41.5	10.5	Menkar	314°02.7	4°12.2
9	274°44.7	321°35.4	• • 31.1	80°50.1	• • 29.9	68°46.5	• • 14.0	240°43.8	• • 10.6	Mirfak	308°23.3	49°58.0
10	289°47.2	336°34.7	30.4	95°52.4	29.9	83°48.9	14.0	255°46.1	10.6	Aldebaran	290°35.6	16°34.0
11 12	304°49.6 319°52.1	351°33.9 6°33.2	29.6 \$18°28.8	110°54.7 125°57.0	30.0 \$02°30.0	98°51.4 113°53.8	14.0 \$09°14.0	270°48.4 285°50.7	10.7 N11°10.7	Rigel	281°00.5	-8°10.3
13	334°54.5	21°32.5	28.0	140°59.3	30.0	113 55.6 128° 56.3	14.0	300°53.1	10.8	Capella	280°16.7	46°01.6
14	349°57.0	36°31.7	27.2	156°01.6	30.0	143°58.7	14.0	315°55.4	10.0	Bellatrix	278°19.1	6°22.4
15	4°59.5	51°31.0	26.4	171°03.9	• • 30.0	159°01.2	• • 14.0	330°57.7	. 10.9	Elnath	277°57.4	28°37.8
16	20°01.9	66°30.3	25.7	186°06.3	30.0	174°03.6	14.0	346°00.0	11.0	Alnilam	275°34.1	-1°11.2
17	35°04.4	81°29.5	24.9	201°08.6	30.0	189°06.1	14.0	1°02.3	11.0	Betelgeuse	270°48.3	7°24.6
18	50°06.9	96°28.8	S18°24.1	$216^{\circ}10.9$	502°30.1	204°08.6	S09°14.0	16°04.7	N11°11.1	Canopus Sirius	263°50.5 258°23.0	-52°43.0 -16°45.6
19	65°09.3	111°28.1	23.3	231°13.2	30.1	$219^{\circ}11.0$	14.0	31°07.0	11.2	Adhara	255°02.9	-10 43.0 -29°01.0
20	80°11.8	126°27.3	22.5	246°15.5	30.1	234° 13.5	14.0	46°09.3	11.2	Procyon	244°47.0	5°08.8
21	95°14.3	141°26.6	· · 21.7	261°17.9	• • 30.1	249°15.9	• • 14.0	61°11.6	• • 11.3	Pollux	243°12.9	27°57.1
22	110°16.7	156°25.9	20.9	276°20.2	30.1	264° 18.4	14.0	76°13.9	11.4	Avior	234°12.7	-59°36.4
23	125°19.2	171°25.2	20.1	291°22.5	30.1	279°20.8	14.0	91°16.2	11.4	Suhail	222°43.3	-43°33.2
Mer.p	pass. 14:40	ν -0.7′ d-0	0.8′ m-3.90	ν 2.3′ d0.0	0′ m-0.25	ν 2.4′ d-0	.0′ m-2.17	ν 2.3′ d0	.1′ m0.35	Miaplacidus	$221^{\circ}36.4$	-69°50.3
										Alphard	$217^{\circ}44.1$	-8°47.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	11°49.2
0	140°21.7	186°24.4	\$18° 19.3	306°24.8	S02°30.1	294°23.3	S09°13.9	106° 18.6	N11°11.5	Dubhe	193°36.5	61°35.3
1	155°24.1	201°23.7	18.6	321°27.2	30.1	309°25.7	13.9	121°20.9	11.5	Denebola	182°21.3 175°39.9	14°24.3 -17°42.4
2	170°26.6	216°23.0	17.8	$336^{\circ}29.5$	30.1	324°28.2	13.9	136°23.2	11.6	Gienah	173 39.9 172°55.7	-63°15.6
3	185°29.0	231°22.2	• • 17.0	351°31.8	• • 30.2	339°30.7	•• 13.9	151°25.5	•• 11.7		171°47.4	-57°16.5
4	200°31.5	246°21.5	16.2	6°34.1	30.2	354°33.1	13.9	166°27.8	11.7	Alioth	166°09.9	55°47.7
5	215°34.0	261°20.8	15.4	21°36.5	30.2	9°35.6	13.9	181°30.1	11.8	Spica	158° 18.6	-11°18.9
6	230°36.4	276°20.1	\$18° 14.6	36°38.8	S02°30.2	24°38.0	S09°13.9	196°32.5	N11°11.9	Alkaid	152°49.3	49°09.7
7	245°38.9	291°19.3	13.8	51°41.1	30.2	39°40.5	13.9	211°34.8	11.9	Hadar	148°30.9	-60°30.6
8 9	260°41.4 275°43.8	306°18.6 321°17.9	13.0 •• 12.2	66°43.5 81°45.8	30.2 · · 30.2	54° 42.9 69° 45.4	13.9 •• 13.9	226°37.1 241°39.4	12.0 · · 12.0	Menkent	147°53.5	-36°30.7
10	275 45.6 290°46.3	336° 17.2	11.4	96°48.2	30.2	84° 47.9	13.9	241 39.4 256°41.7	12.1	Arcturus	145°44.8	19°01.6
11	305°48.8	351°16.4	10.6	111°50.5	30.2	99°50.3	13.9	271° 44.0	12.1	Rigil Kent.	139°35.4	-60°57.1
12	320°51.2	6°15.7	\$18°09.8	126°52.8	S02°30.2	114°52.8	S09°13.8	286°46.4	N11°12.2	Kochab	137°20.0	74°01.7
13	335°53.7	21°15.0	09.0	141°55.2	30.2	129°55.2	13.8	301°48.7	12.3	Zuben'ubi	136°52.3 126°01.0	-16°09.8 26°36.8
14	350°56.2	$36^{\circ}14.3$	08.2	156°57.5	30.2	144°57.7	13.8	316°51.0	12.4	Alphecca Antares	120 01.0 112°11.8	-26°29.7
15	5°58.6	51°13.6	• • 07.4	$171^{\circ}59.9$	• • 30.2	160°00.2	• • 13.8	331°53.3	• • 12.4	Atria	107°03.2	-20°29.7 -69°04.4
16	21°01.1	66°12.8	06.5	$187^{\circ}02.2$	30.2	$175^{\circ}02.6$	13.8	346°55.6	12.5	Sabik	101°59.1	-15°45.6
17	36°03.5	81°12.1	05.7	202°04.5	30.2	190°05.1	13.8	1°57.9	12.6	Shaula	96°06.1	-37°07.3
18	51°06.0	96°11.4	\$18°04.9	217°06.9	S02°30.2	205°07.6	S09°13.8	17°00.2	N11°12.6	Rasalhague	95°55.6	12°32.3
19	66°08.5	111°10.7	04.1	232°09.2	30.2	220°10.0	13.8	32°02.6	12.7	Eltanin	90°41.0	51°28.9
20	81°10.9	126°10.0 141°09.2	03.3	247°11.6	30.2	235°12.5	13.8	47°04.9	12.7	Kaus Aust.	83°28.4	-34°22.1
21 22	96°13.4 111°15.9	141 09.2 156°08.5	· · 02.5 01.7	262°13.9 277°16.3	· · 30.2 30.2	250° 14.9 265° 17.4	· · 13.8 13.7	62°07.2 77°09.5	· · 12.8 12.9	Vega	80°31.3	38°48.5
23	111 13.9 126°18.3	171°07.8	00.9	292°18.6	30.2	280° 19.9	13.7	92°11.8	12.9	Nunki	75°43.9	-26°15.5
										Altair	61°57.0	8°56.7
Mer.p	pass. 14:36	ν -0.7′ d-0	0.8′ m-3.90	ν 2.3′ d0.0	0′ m-0.28	$\nu 2.5' \ d-0$.0′ m-2.18	$\nu 2.3' d0$.1′ m0.35	Peacock Deneb	53°01.2 49°23.9	-56°38.3 45°23.1
										Enif	33° 35.8	10°00.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.2
0	141°20.8	$186^{\circ}07.1$	S18°00.1	307°21.0	502°30.2	295°22.3	S09°13.7	$107^{\circ}14.1$	N11°13.0	Fomalhaut	15°11.2	-29°28.1
1	156°23.3	201°06.4	17°59.2	322°23.3	30.2	310°24.8	13.7	122°16.4	13.1	Scheat	13°42.2	28°14.6
2	171°25.7	216°05.7	58.4	337°25.7	30.2	325°27.3	13.7	137° 18.7	13.1	Markab	$13^{\circ}26.8$	15°21.8
3	186°28.2	231°04.9	• • 57.6	352°28.1	30.2	340°29.7	•• 13.7	152°21.1	13.2	E-P 00 E.	CHA	Mor ===
4 5	201°30.7	246°04.2	56.8 56.0	7°30.4	30.2	355°32.2	13.7	167°23.4	13.2	Feb 09 Fri Venus	SHA 47° 19.5	Mer.pass 11:34
5 6	216°33.1 231°35.6	261°03.5 276°02.8	56.0 \$17°55.2	22°32.8 37°35.1	30.2 \$02°30.2	10°34.7 25°37.1	13.7 \$09°13.7	182°25.7 197°28.0	13.3 N11°13.4		47 19.5 166°06.8	03:37
7	246°38.0	270 02.8 291°02.1	54.3	52°37.5	30.2	40°39.6	13.6	212°30.3	13.4	1	154°01.9	04:26
8	240 36.0 261°40.5	306°01.4	54.5 53.5	67°39.9	30.2	55° 42.1	13.6	212 30.3 227°32.6	13.4	Saturn	326°00.4	16:56
9	276°43.0	321°00.7	52.7	82°42.2	30.2	70°44.5	. 13.6	242°34.9	. 13.6			
10	291°45.4	336°00.0	51.9	97°44.6	30.2	85°47.0	13.6	257° 37.2	13.6	Feb 10 Sat	SHA 46°02.0	Mer.pass
11	306°47.9	350°59.3	51.1	112°47.0	30.2	100°49.5	13.6	272°39.6	13.7	Venus	46°02.8	11:35
12	321°50.4	5°58.5	S17°50.2	127°49.3	S 02°30.2	115°51.9	S 09°13.6	287°41.9	$N11^{\circ}13.8$		166°03.2 154°01.6	03:34 04:22
13	336°52.8	20°57.8	49.4	142°51.7	30.2	130°54.4	13.6	302°44.2	13.8	Saturn		16:52
14	351°55.3	35°57.1	48.6	157°54.1	30.2	145°56.9	13.6	317°46.5	13.9			
15 16	6°57.8	50°56.4	· · 47.7	172°56.4	30.2	160°59.3	•• 13.6	332°48.8	14.0	Feb 11 Sun	SHA	Mer.pass
16 17	22°00.2 37°02.7	65°55.7 80°55.0	46.9 46.1	187°58.8 203°01.2	30.2 30.1	176°01.8 191°04.3	13.5 13.5	347°51.1 2°53.4	14.0 14.1	Venus	44°46.3	11:36
18	52°05.1	95° 54.3	40.1 \$17°45.3	218°03.5	502°30.1	206° 06.7	509°13.5	2 53.4 17°55.7	N11°14.1		166°00.2 154°01.5	03:30 04:18
19	67°07.6	110°53.6	44.4	233°05.9	30.1	221°09.2	13.5	32°58.0	14.2		325°53.3	16:48
20	82°10.1	125°52.9	43.6	248°08.3	30.1	236°11.7	13.5	48°00.3	14.3			10.70
21	97°12.5	140°52.2	• • 42.8	263°10.7	• • 30.1	251°14.1	• • 13.5	63°02.7	• • 14.3	Horizont	al parallax	
22	112°15.0	155°51.5	41.9	278°13.1	30.1	266° 16.6	13.5	78°05.0	14.4		Venus:	0.1
23	127°17.5	170°50.8	41.1	293°15.4	30.1	281°19.1	13.4	93°07.3	14.5		Mars:	0.2
Mer.	pass. 14:32	ν -0.7′ d-0	0.8′ m-3.90	ν 2.4′ d-0.	0' m-0.30	$\nu 2.5' \ d-0.5$.0′ m-2.18	$\nu^{2.3'} d0$.1′ m0.35			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.6	S14°38.9	230°30.0	7.5'	S24°44.7	-2.7'	56.9'
1	191°27.6	38.1	244°56.5	7.6'	24°42.0	-2.8'	56.9'
2	206°27.6 221°27.6	37.3	259°23.1 273°49.7	7.6' 7.7'	24°39.2 24°36.2	-3.0'	56.8'
3 4	221°27.6 236°27.5	· · 36.5 35.7	273°49.7 288°16.4	7.7' 7.7'	24°36.2 24°33.1	-3.1' -3.2'	56.8' 56.8'
5	250° 27.5	34.9	302°43.1	7.8'	24° 29.9	-3.4'	56.8'
6	266°27.5	S14°34.1	317°09.9	7.9'	S24°26.5	-3.5'	56.7'
7	281°27.5	33.3	331°36.8	7.9'	24°23.0	-3.7'	56.7'
8	296°27.5	32.5	346°03.7	8.0'	24°19.3	-3.8'	56.7'
9	311°27.5 326°27.5	· · 31.7 30.9	0°30.6 14°57.7	8.0' 8.1'	24°15.5 24°11.6	-3.9' -4.1'	56.7'
10 11	320 27.5 341°27.4	30.9	14 57.7 29°24.8	8.1 8.2'	24 11.6 24°07.5	-4.1 -4.2'	56.7' 56.6'
12	356°27.4	\$14°29.3	43°51.9	8.2'	\$24°03.3	-4.3	56.6'
13	11°27.4	28.5	58°19.1	8.3'	23°59.0	-4.5'	56.6'
14	26°27.4	27.6	72°46.4	8.3'	23°54.6	-4.6'	56.6'
15 16	41°27.4 56°27.4	· · 26.8 26.0	87°13.7 101°41.2	8.4' 8.5'	23°50.0 23°45.3	-4.7' -4.8'	56.5' 56.5'
17	71°27.4	25.2	101 41.2 116°08.6	6.5 8.5'	23°40.4	-4.0 -5.0'	56.5'
18	86°27.4	S14°24.4	130°36.2	8.6'	\$23°35.5	-5.1'	56.5'
19	101°27.3	23.6	145°03.8	8.7'	23°30.4	-5.2'	56.5'
20	116°27.3	22.8	159°31.5	8.7'	23°25.2	-5.3'	56.4'
21 22	131°27.3 146°27.3	· · 22.0 21.2	173°59.2 188°27.0	8.8' 8.9'	23°19.8 23°14.4	-5.5'	56.4' 56.4'
23	146 27.3 161°27.3	20.3	202°54.9	8.9 9.0'	23 14.4 23°08.8	-5.6' -5.7'	56.4'
23	SD = 16.2'	d = -0.8'				J.1	55. F
	$SD = 16.2^{\circ}$	$a = -0.8^{\circ}$		51	O = 15.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.3	\$14° 19.5	217°22.9	9.0'	\$23°03.1	-5.8'	56.4'
1	191°27.3 206°27.3	18.7 17.9	231°50.9 246°19.0	9.1' 9.2'	22°57.2 22°51.3	-5.9' -6.1'	56.3' 56.3'
2	206°27.3 221°27.3	17.9	246°19.0 260°47.2	9.2 9.3'	22°51.3 22°45.2	-6.1' -6.2'	56.3'
4	236°27.3	16.3	275°15.5	9.3'	22°39.0	-6.3	56.3'
5	251°27.3	15.5	289°43.8	9.4'	22°32.7	-6.4	56.2'
6	266°27.2	S14°14.6	304°12.2	9.5'	S22°26.3	-6.5'	56.2'
7	281°27.2 296°27.2	13.8	318°40.7 333°09.2	9.6'	22°19.8 22°13.2	-6.6'	56.2'
8 9	296°27.2 311°27.2	13.0 •• 12.2	333°09.2 347°37.9	9.6' 9.7'	22°13.2 22°06.4	-6.8' -6.9'	56.2' 56.2'
10	326°27.2	11.4	2°06.6	9.8'	21°59.5	-7.0'	56.1
11	341°27.2	10.6	$16^{\circ}35.3$	9.9'	21°52.6	-7.1'	56.1'
12	356°27.2	S 14°09.7	31°04.2	9.9'	S21°45.5	-7.2'	56.1'
13	11°27.2 26°27.2	08.9	45°33.1 60°02.2	10.0' 10.1'	21°38.3 21°31.0	-7.3'	56.1' 56.1'
14 15	20 27.2 41°27.2	08.1 •• 07.3	74°31.2	10.1	21 31.0 21°23.6	-7.4' -7.5'	56.0'
16	56°27.2	06.5	89°00.4	10.2	21°16.1	-7.6'	56.0'
17	71°27.2	05.6	$103^{\circ}29.7$	10.3'	21°08.4	-7.7'	56.0'
18	86°27.2	S14°04.8	117°59.0	10.4'	S21°00.7	-7.8'	56.0'
19	101°27.2 116°27.2	04.0	132°28.4 146°57.9	10.5' 10.6'	20°52.9 20°45.0	-7.9'	56.0'
20 21	131°27.2	03.2 •• 02.4	140 57.9 161°27.4	10.6'	20° 45.0 20° 37.0	-8.0' -8.1'	55.9' 55.9'
22	146°27.2	01.5	175°57.1	10.7	20°28.8	-8.2	55.9'
23	161°27.2	00.7	$190^{\circ}26.8$	10.8'	20°20.6	-8.3'	55.9'
	SD = 16.2'	d = -0.8'		SI	D = 15.4'		
						,	
Sun 0	GHA 176°27.2	Dec \$13°59.9	GHA 204°56.6	u 10.9'	Dec \$20°12.3	d -8.4'	HP 55.9'
1	170 27.2 191°27.2	59.9	204 50.0 219°26.5	11.0'	20°03.9	-0.4 -8.5'	55.8'
2	206°27.2	58.2	233°56.4	11.0'	19°55.4	-8.6'	55.8'
3	221°27.2	• • 57.4	248°26.5	11.1'	19°46.8	-8.7'	55.8'
4	236°27.2 251°27.2	56.6 55.8	262°56.6 277°26.8	11.2' 11.3'	19°38.2 19°29.4	-8.8' -8.9'	55.8' 55.8'
5 6	251°27.2 266°27.2	55.8 \$13°54.9	277°26.8 291°57.1	11.4	19°29.4 \$19°20.5	-8.9'	55.8'
7	281°27.2	54.1	306°27.4	11.4'	19°11.6	-9.0'	55.7'
8	296°27.2	53.3	320°57.8	11.5'	19°02.5	-9.1'	55.7'
9	311°27.2	• • 52.5	335°28.3	11.6'	18°53.4	-9.2'	55.7'
10 11	326°27.2 341°27.2	51.6 50.8	349°58.9 4°29.6	11.7' 11.7'	18°44.2 18°34.9	-9.3' -9.4'	55.7' 55.7'
12	341°27.2 356°27.2	50.8 \$13°50.0	4°29.6 19°00.3	11.7	\$18° 25.5	-9.4° -9.5'	55.6'
13	11°27.2	49.2	33°31.2	11.9'	18°16.1	-9.5'	55.6'
14	26°27.2	48.3	48°02.1	12.0'	18°06.5	-9.6'	55.6'
15	41°27.2	• • 47.5	62°33.0	12.0'	17°56.9	-9.7'	55.6'
16 17	56°27.2 71°27.2	46.7 45.8	77°04.1 91°35.2	12.1' 12.2'	17°47.2 17°37.5	-9.8' -9.8'	55.6' 55.5'
18	86°27.2	45.8 \$13°45.0	91 35.2 106°06.4	12.2	\$17°27.6	-9.8 -9.9'	55.5'
19	101°27.2	44.2	120°37.7	12.4'	17°17.7	-10.0'	55.5'
20	116°27.2	43.3	135°09.0	12.4'	17°07.7	-10.1'	55.5'
21	131°27.2	• • 42.5	149°40.5	12.5'	16°57.6	-10.1'	55.5'
22 23	146°27.2 161°27.2	41.7 40.8	164°12.0 178°43.5	12.6' 12.6'	16°47.5 16°37.3	-10.2' -10.3'	55.4' 55.4'
23	SD = 16.2'	d = -0.8'			D = 15.2'	10.0	55. F
	3D = 10.2	$a = -0.8^{\circ}$		51	ے رے <u>15.2′</u>		

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

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

	Sun			Moon	
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	19-6%
14:10	14:10	12:14	08:58	21:25	
14:11	14:11	12:14	09:51	22:17	
14:11	14:11	12:14	10:41	23:05	
	00 ^h mm:ss 14:10 14:11	Eqn.of Time 00 ^h 12 ^h mm:ss mm:ss 14:10 14:10 14:11 14:11	Eqn. of Time 00h Mer. 12h Pass hh:mm 14:10 14:10 12:14 14:11 14:11 12:14	Eqn. of Time 00h Mer. 12h Mer. Pass hh:mm Mer. Upper hh:mm 14:10 14:10 12:14 08:58 14:11 14:11 12:14 09:51	Eqn. of Time 00h Mer. Pass 12h Mer. Pass Upper hh:mm Lower hh:mm mm:ss mm:ss hh:mm hh:mm hh:mm 14:10 14:10 12:14 08:58 21:25 14:11 14:11 12:14 09:51 22:17

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

h	Aries	Ve	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	142°19.9	185°50.1	S17°40.3	308°17.8	502°30.1	296°21.6	S09°13.4	108°09.6	N11°14.5			
1	$157^{\circ}22.4$	200°49.4	39.4	323°20.2	30.1	311°24.0	13.4	123°11.9	14.6	Alpheratz Ankaa	357°31.5 353°04.2	29°15.2 -42°09.0
2	$172^{\circ}24.9$	$215^{\circ}48.7$	38.6	$338^{\circ}22.6$	30.0	$326^{\circ}26.5$	13.4	$138^{\circ}14.2$	14.7	Schedar	349° 27.4	56°42.1
3	187°27.3	230°48.0	• • 37.8	353°25.0	• • 30.0	341°29.0	• • 13.4	153°16.5	• • 14.7	Diphda	348°44.2	-17°49.7
4	202°29.8	245°47.3 260°46.5	36.9	8°27.3	30.0	356°31.4	13.4	168°18.8	14.8	Achernar	335°18.1	-57°05.6
5 6	217°32.3 232°34.7	275° 45.8	36.1 \$17°35.2	23°29.7 38°32.1	30.0 \$02°30.0	11°33.9 26°36.4	13.4 \$09°13.4	183°21.1 198°23.4	14.9 N11°14.9	Hamal	327°47.5	23°36.1
7	247°37.2	290°45.1	34.4	53°34.5	30.0	41°38.9	13.3	213°25.7	15.0	Polaris	312°13.5	89°23.4
8	262°39.6	305°44.4	33.6	68°36.9	30.0	56°41.3	13.3	228°28.1	15.1	Acamar	315°09.3	-40°11.5
9	$277^{\circ}42.1$	320°43.7	• • 32.7	83°39.3	• • 29.9	71°43.8	• • 13.3	243°30.4	• • 15.1	Menkar Mirfak	314°02.7 308°23.4	4°12.2 49°58.0
10	292°44.6	335°43.1	31.9	98°41.7	29.9	86°46.3	13.3	258°32.7	15.2	Aldebaran	290°35.7	16°34.0
11	307°47.0 322°49.5	350°42.4	31.0	113°44.1	29.9	101°48.8 116°51.2	13.3	273°35.0	15.2	Rigel	281°00.5	-8°10.3
12 13	322°49.5 337°52.0	5°41.7 20°41.0	\$17°30.2 29.3	128°46.5 143°48.9	\$02°29.9 29.9	116°51.2 131°53.7	\$09°13.3 13.3	288°37.3 303°39.6	N11°15.3 15.4	Capella	$280^{\circ}16.7$	46°01.6
14	352°54.4	35° 40.3	28.5	158°51.3	29.9	146° 56.2	13.3	318° 41.9	15.4	Bellatrix	278°19.1	6°22.4
15	7°56.9	50°39.6	27.6	173°53.7	• • 29.8	161°58.7	13.2	333°44.2	• • 15.5	Elnath	277°57.4	28°37.8
16	22°59.4	65°38.9	26.8	$188^{\circ}56.1$	29.8	$177^{\circ}01.1$	13.2	348°46.5	15.6	Alnilam Betelgeuse	275°34.2 270°48.3	-1°11.2 7°24.6
17	38°01.8	80°38.2	25.9	203°58.5	29.8	192°03.6	13.2	3°48.8	15.6	Canopus	263°50.5	-52°43.0
18	53°04.3	95°37.5	\$17°25.1	219°00.9	S02°29.8	207°06.1	S09°13.2	18°51.1	N11°15.7	Sirius	258°23.0	-16°45.6
19	68°06.8	110°36.8	24.2	234°03.3	29.8	222°08.6	13.2	33°53.4	15.8	Adhara	255°02.9	-29°01.0
20 21	83°09.2 98°11.7	125°36.1 140°35.4	23.4 •• 22.5	249°05.7 264°08.1	29.7 • • 29.7	237°11.1 252°13.5	13.1 •• 13.1	48°55.7 63°58.0	15.8 •• 15.9	Procyon	244°47.0	5°08.8
22	113°14.1	155°34.7	21.7	279°10.5	29.7	267°16.0	13.1	79°00.3	16.0	Pollux	243°12.9	27°57.1
23	128°16.6	170°34.0	20.8	294°12.9	29.7	282°18.5	13.1	94°02.7	16.0	Avior	234°12.7	-59°36.4
Morp	ass. 14:28	0 7' d 0	0.8' m-3.89	1/2 1/ 4 0	.0′ m-0.33		0′ m-2.19	ν2.3′ d0.	1/ m0 26	Suhail Miaplacidus	222°43.3 221°36.5	-43°33.2 -69°50.4
ivier.p	uss. 14.40	ν-0.1 u-0	111-3.09	ν2. 4 u-0.		ν2.3 u-0.	.0 111-2.19	ν2.5 UU.	1110.30	Alphard	221 30.5 217°44.1	-8°47.4
_	CILA	CILA		CILA	Б	CIIA	ь.	CIIA	ь.	Regulus	207°30.6	11°49.2
Tue 0	GHA 143°19.1	GHA 185°33.3	Dec \$17°20.0	GHA 309°15.3	Dec \$02°29.7	GHA 297°21.0	Dec S 09°13.1	GHA 109°05.0	Dec N11°16.1	Dubhe	193°36.5	61°35.3
1	158°21.5	200°32.6	19.1	324°17.7	29.6	312°23.4	13.1	124°07.3	16.2	Denebola	182°21.3	14°24.3
2	173°24.0	215°31.9	18.2	$339^{\circ}20.1$	29.6	327°25.9	13.0	139°09.6	16.2	Gienah Acrux	175°39.9 172°55.6	-17°42.4 -63°15.6
3	188°26.5	230°31.3	• • 17.4	354° 22.5	• • 29.6	342°28.4	•• 13.0	154° 11.9	•• 16.3	Gacrux	172 33.0 171°47.3	-57°16.5
4	203°28.9	245°30.6	16.5	9°25.0	29.6	357°30.9	13.0	169°14.2	16.4	Alioth	166°09.8	55°47.7
5 6	218°31.4 233°33.9	260°29.9 275°29.2	15.7 \$17°14.8	24°27.4 39°29.8	29.5 \$02°29.5	12°33.4 27°35.8	13.0 \$09°13.0	184° 16.5 199° 18.8	16.4 N11°16.5	Spica	$158^{\circ}18.6$	-11°18.9
7	233 33.9 248°36.3	275 29.2 290°28.5	13.9	59°29.6 54°32.2	29.5	42°38.3	13.0	214°21.1	16.6	Alkaid	152°49.3	49°09.7
8	263°38.8	305°27.8	13.1	69°34.6	29.5	57°40.8	12.9	229°23.4	16.6	Hadar	148°30.8	-60°30.6
9	278°41.2	$320^{\circ}27.1$	• • 12.2	84°37.0	• • 29.4	72°43.3	• • 12.9	244°25.7	• • 16.7	Menkent Arcturus	147°53.5 145°44.8	-36°30.7 19°01.6
10	293°43.7	335° 26.4	11.4	99°39.5	29.4	87°45.8	12.9	259° 28.0	16.8	Rigil Kent.	139°35.4	-60°57.1
11	308°46.2	350°25.8	10.5	114°41.9	29.4	102°48.3	12.9	274°30.3	16.8 N11°16.9	Kochab	$137^{\circ}20.0$	74°01.7
12 13	323°48.6 338°51.1	5°25.1 20°24.4	\$17°09.6 08.8	129°44.3 144°46.7	\$02°29.3 29.3	117°50.7 132°53.2	509°12.9 12.9	289°32.6 304°34.9	17.0	Zuben'ubi	136°52.2	-16°09.8
14	353°53.6	35°23.7	07.9	159°49.2	29.3	147°55.7	12.8	319°37.2	17.0	Alphecca	126°00.9	26°36.8
15	8°56.0	50°23.0	• • 07.0	174°51.6	• • 29.3	162°58.2	• • 12.8	334°39.5	•• 17.1	Antares Atria	112°11.8 107°03.2	-26°29.7 -69°04.4
16	23°58.5	65°22.3	06.2	189°54.0	29.2	178°00.7	12.8	349°41.8	17.2	Sabik	101°59.1	-15°45.6
17	39°01.0 54°03.4	80°21.6 95°21.0	05.3 \$17°04.4	204°56.4	29.2 \$02°29.2	193°03.2	12.8 \$09°12.8	4°44.1	17.2 N11°17.3	Shaula	96°06.0	-37°07.3
18 19	69°05.9	110° 20.3	03.5	219°58.9 235°01.3	29.1	208°05.6 223°08.1	12.8	19° 46.4 34° 48.7	17.4	Rasalhague	95°55.6	12°32.2
20	84°08.4	125°19.6	02.7	250°03.7	29.1	238° 10.6	12.7	49°51.0	17.4	Eltanin	90°40.9	51°28.9 -34°22.1
21	99°10.8	140°18.9	• • 01.8	265°06.2	• • 29.1	253°13.1	• • 12.7	64°53.3	• • 17.5	Kaus Aust. Vega	83°28.4 80°31.3	38°48.5
22	114°13.3	155° 18.2	00.9	280°08.6	29.0	268° 15.6	12.7	79°55.6	17.6	Nunki	75°43.9	-26°15.5
23	129°15.7	170°17.6	00.0	295°11.0	29.0	283°18.1	12.7	94°57.9	17.6	Altair	61°57.0	8°56.7
Mer.p	ass. 14:24	ν -0.7′ d -0	0.9′ m-3.89	ν 2.4′ d-0.	.0′ m-0.36	$\nu 2.5' \ d-0.0$.0′ m-2.20	ν 2.3′ d0.	1' m0.36	Peacock	53°01.1	-56°38.3
										Deneb	49°23.9	45°23.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°35.8 27°29.3	10°00.6 -46°49.2
0	$144^{\circ}18.2$	$185^{\circ}16.9$	S 16°59.2	$310^{\circ}13.5$	S 02°29.0	$298^{\circ}20.6$	S09°12.7	$110^{\circ}00.2$	$N11^{\circ}17.7$	Fomalhaut	15° 11.2	-40 49.2 -29°28.1
1	159°20.7	200°16.2	58.3	325°15.9	28.9	313°23.0	12.6	125°02.5	17.8	Scheat	13°42.2	28°14.6
2	174°23.1	215° 15.5	57.4	340°18.4	28.9	328°25.5	12.6	140°04.8	17.8	Markab	13°26.8	15°21.8
3 4	189°25.6 204°28.1	230°14.8 245°14.2	• • 56.5 55.7	355°20.8 10°23.2	· · 28.9 28.8	343°28.0 358°30.5	· · 12.6 12.6	155°07.1 170°09.4	· · 17.9 18.0	Feb 12 Mon	SHA	Mer.pass
5	219°30.5	260° 13.5	54.8	25°25.7	28.8	13°33.0	12.6	170 09.4 185°11.7	18.0	Venus	43°30.1	11:37
6	234°33.0	275° 12.8	S16° 53.9	40°28.1	S02°28.8	28°35.5	S09°12.5	200° 14.1	N11°18.1	Mars	$165^{\circ}57.9$	03:26
7	249°35.5	$290^{\circ}12.1$	53.0	55°30.6	28.7	43°38.0	12.5	215° 16.4	18.2	Jupiter	154°01.6	04:14
8	264°37.9	305°11.5	52.1	70°33.0	28.7	58° 40.5	12.5	230°18.7	18.2	Saturn	325°49.6	16:45
9	279°40.4 294°42.9	320°10.8	· · 51.3 50.4	85°35.5 100°37.9	•• 28.6	73°42.9 88°45.4	12.5	245°21.0 260°23.3	18.3	Feb 13 Tue	SHA	Mer.pass
10 11	294 42.9 309°45.3	335°10.1 350°09.4	50.4 49.5	100 37.9 115°40.4	28.6 28.6	88 45.4 103°47.9	12.5 12.4	200 23.3 275°25.6	18.4 18.4	Venus	$42^{\circ}14.3$	11:38
12	324°47.8	5°08.8	\$16°48.6	130°42.8	S02°28.5	118° 50.4	S09°12.4	290°27.9	N11°18.5	Mars	165°56.2	03:22
13	$339^{\circ}50.2$	20°08.1	47.7	$145^{\circ}45.3$	28.5	$133^{\circ}52.9$	12.4	305°30.2	18.6	Jupiter Saturn	154°01.9 325°45.9	04:10 16:41
14	354°52.7	35°07.4	46.8	160°47.7	28.4	148° 55.4	12.4	320°32.5	18.6			
15 16	9°55.2 24°57.6	50°06.8	· · 45.9	175°50.2 190°52.6	28.4	163°57.9 179°00.4	12.4	335°34.8 350°37.1	18.7	Feb 14 Wed	SHA	Mer.pass
16 17	24°57.6 40°00.1	65°06.1 80°05.4	45.0 44.2	190°52.6 205°55.1	28.4 28.3	179°00.4 194°02.9	12.3 12.3	5°39.4	18.8 18.8	Venus Mars	40°58.7 165°55.3	11:39 03:19
18	55°02.6	95°04.7	\$16°43.3	220°57.6	S02°28.3	209°05.4	S09°12.3	20°41.6	N11°18.9	Jupiter	105 55.3 154°02.3	03:19
19	70°05.0	110°04.1	42.4	236°00.0	28.2	224°07.9	12.3	35°43.9	19.0	Saturn	325°42.0	16:37
20	85°07.5	125°03.4	41.5	251°02.5	28.2	239°10.3	12.3	50°46.2	19.0			
21	100°10.0	140°02.7	• • 40.6	266°04.9	•• 28.1	254°12.8	•• 12.2	65°48.5	19.1	Horizont	al parallax Venus:	0.1
22 23	115°12.4 130°14.9	155°02.1 170°01.4	39.7 38.8	281°07.4 296°09.9	28.1 28.1	269°15.3 284°17.8	12.2 12.2	80°50.8 95°53.1	19.2 19.2		Mars:	0.1
												-
Mer.p	ass. 14:20	ν -0. l' d -0).9′ m-3.89	ν 2.4′ d-0.	.0′ m-0.38	ν 2.5′ d -0.	.0′ m-2.21	ν 2.3′ d0.	1′ m0.36			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	176°27.2	S13°40.0	193°15.2	12.7'	S 16°27.0	-10.3'	55.4'
1	191°27.2	39.2	207°46.9	12.8'	16°16.7	-10.4'	55.4'
2 3	206°27.2 221°27.2	38.3 · · 37.5	222°18.7 236°50.6	12.9' 12.9'	16°06.2 15°55.8	-10.5' -10.5'	55.4' 55.4'
4	236°27.2	36.7	251°22.5	13.0'	15°45.2	-10.6'	55.3'
5	251°27.3	35.8	$265^{\circ}54.5$	13.1'	$15^{\circ}34.6$	-10.7'	55.3'
6	266°27.3	\$13°35.0	280°26.6	13.1'	\$15°23.9	-10.7'	55.3'
7 8	281°27.3 296°27.3	34.2 33.3	294°58.7 309°30.9	13.2' 13.3'	15°13.2 15°02.4	-10.8' -10.9'	55.3' 55.3'
9	311°27.3	32.5	324°03.2	13.4'	14°51.6	-10.9'	55.2'
10	326°27.3	31.7	338°35.6	13.4'	14°40.6	-11.0'	55.2'
11 12	341°27.3 356°27.3	30.8 \$13°30.0	353°08.0 7°40.5	13.5' 13.6'	14°29.7 \$14°18.6	-11.0' -11.1'	55.2' 55.2'
13	11°27.3	29.2	22°13.1	13.6'	14°07.6	-11.1'	55.2'
14	26°27.3	28.3	36°45.7	13.7'	13°56.4	-11.2'	55.2'
15	41°27.4	• • 27.5	51°18.4	13.8'	13°45.2	-11.2'	55.1'
16 17	56°27.4 71°27.4	26.6 25.8	65°51.1 80°24.0	13.8' 13.9'	13°34.0 13°22.7	-11.3' -11.3'	55.1' 55.1'
18	86°27.4	\$13°25.0	94°56.8	13.9'	\$13°11.3	-11.4'	55.1
19	101°27.4	24.1	$109^{\circ}29.8$	14.0'	13°00.0	-11.4'	55.1'
20	116°27.4 131°27.4	23.3	124°02.8	14.1'	12°48.5	-11.5'	55.1'
21 22	131°27.4 146°27.4	· · 22.4 21.6	138°35.9 153°09.0	14.1' 14.2'	12°37.0 12°25.5	-11.5' -11.6'	55.0' 55.0'
23	161°27.5	20.8	167°42.2	14.3'	12°13.9	-11.6'	55.0'
	SD = 16.2'	d = -0.8'		SI	D = 15.1'		
Tue	GHA	Dec	GHA	ν 14.2'	Dec	d 11.7'	HP
0 1	176°27.5 191°27.5	\$13° 19.9 19.1	182°15.5 196°48.8	14.3' 14.4'	\$12°02.3 11°50.6	-11.7' -11.7'	55.0' 55.0'
2	206°27.5	18.2	211°22.1	14.4'	11°38.9	-11.8'	55.0'
3	221°27.5	•• 17.4	225°55.6	14.5'	11°27.1	-11.8'	54.9'
4	236°27.5	16.5	240°29.0 255°02.6	14.5'	11°15.3 11°03.5	-11.8'	54.9'
5 6	251°27.5 266°27.6	15.7 \$13° 14.9	269°36.2	14.6' 14.6'	\$10°51.6	-11.9' -11.9'	54.9' 54.9'
7	281°27.6	14.0	284°09.8	14.7'	10°39.7	-11.9'	54.9'
8	296°27.6	13.2	298°43.5	14.8'	10°27.8	-12.0'	54.9'
9	311°27.6	· · 12.3	313°17.3	14.8'	10°15.8	-12.0'	54.9'
10 11	326°27.6 341°27.6	11.5 10.6	327°51.1 342°25.0	14.9' 14.9'	10°03.8 09°51.7	-12.1' -12.1'	54.8' 54.8'
12	356°27.7	S13°09.8	356°58.9	15.0'	S09°39.6	-12.1'	54.8'
13	11°27.7	08.9	11°32.8	15.0'	09°27.5	-12.1'	54.8'
14 15	26°27.7 41°27.7	08.1 •• 07.2	26°06.8 40°40.9	15.1' 15.1'	09°15.4 09°03.2	-12.2' -12.2'	54.8' 54.8'
16	56°27.7	06.4	55°15.0	15.2'	09°51.0	-12.2'	54.7'
17	71°27.8	05.5	$69^{\circ}49.2$	15.2'	$08^{\circ}38.7$	-12.3'	54.7'
18	86°27.8	\$13°04.7	84°23.4	15.2'	S08°26.5	-12.3'	54.7'
19 20	101°27.8 116°27.8	03.9 03.0	98°57.6 113°31.9	15.3' 15.3'	08°14.2 08°01.9	-12.3'	54.7' 54.7'
21	131°27.8	02.2	128°06.2	15.4'	07°49.5	-12.4'	54.7'
22	146°27.9	01.3	142°40.6	15.4'	07°37.2	-12.4'	54.7'
23	161°27.9	00.5	157°15.0	15.5'	07°24.8	-12.4'	54.6'
	SD = 16.2'	d = -0.8'		SI	O = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.9	S12°59.6	171°49.5	15.5'	S07°12.3	-12.4'	54.6'
1	191°27.9	58.7	186°24.0	15.5'	06°59.9	-12.5'	54.6'
2 3	206°27.9 221°28.0	57.9 •• 57.0	200°58.5 215°33.1	15.6' 15.6'	06°47.5 06°35.0	-12.5' -12.5'	54.6' 54.6'
4	236°28.0	56.2	215 33.1 230°07.7	15.7'	06°22.5	-12.5'	54.6'
5	251°28.0	55.3	244°42.4	15.7'	$06^{\circ}10.0$	-12.5'	54.6'
6	266°28.0 281°28.1	\$12°54.5 53.6	259°17.0 273°51.8	15.7' 15.8'	\$05°57.5 05°44.9	-12.5'	54.5' 54.5'
7 8	281°28.1 296°28.1	53.6 52.8	2/3°51.8 288°26.5	15.8' 15.8'	05°44.9 05°32.4	-12.6' -12.6'	54.5' 54.5'
9	311°28.1	• • 51.9	303°01.3	15.8'	$05^{\circ}19.8$	-12.6'	54.5'
10	326°28.1	51.1	317°36.1	15.9'	05°07.2	-12.6'	54.5
11 12	341°28.2 356°28.2	50.2 \$12°49.4	332°11.0 346°45.9	15.9' 15.9'	04°54.6 \$04°42.0	-12.6' -12.6'	54.5' 54.5'
13	11°28.2	48.5	1°20.8	15.9'	04°29.4	-12.6'	54.5'
14	26°28.2	47.7	15°55.8	16.0'	$04^{\circ}16.7$	-12.6'	54.4'
15	41°28.3	• • 46.8	30°30.7	16.0'	04°04.1	-12.7'	54.4'
16 17	56°28.3 71°28.3	45.9 45.1	45°05.7 59°40.8	16.0' 16.1'	03°51.4 03°38.8	-12.7' -12.7'	54.4' 54.4'
18	86°28.3	\$12°44.2	74°15.8	16.1	503°26.1	-12.7'	54.4
19	101°28.4	43.4	88°50.9	16.1'	03°13.4	-12.7'	54.4'
20	116°28.4	42.5	103°26.0	16.1'	03°00.7	-12.7'	54.4'
21 22	131°28.4 146°28.5	· · 41.7 40.8	118°01.1 132°36.3	16.2' 16.2'	02°48.1 02°35.4	-12.7' -12.7'	54.4' 54.3'
23	161°28.5	39.9	147°11.5	16.2'	02°33.4	-12.7'	54.3'
	SD = 16.2'	d = -0.9'		SI	0 = 14.9'		

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

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

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

Discription Discription Discription Discription Service	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1	Thu -	CHA	CHV	Doc	CHV.	Doc	GHA	Doc	CHV.	Doc		SHV	Doc
1 167196 200 201 270 29748 200 201 270 29748 200 200 201 201 201 201 201 201 201 201													
1											Alpheratz		
100 10											I		
2													
200 200													
8 20073 1 000°55.4 0.00°56.5 0.00°5	5												
18	6	235°32.1	274°56.8	\$16°32.5	41°27.2	S02°27.7	29°35.3	S09°12.0	201°09.2	N11°19.7			
0 986 40 334 541 239 010731 725 89748 3 119 927184 200 14466 1478 119 276 277 201 119 120 527 120 1478 119 276 277 201 1478 119 277 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 277 201 1478 119 2	7	250°34.6	289°56.1	31.6	56°29.6	27.7	44°37.8	12.0	$216^{\circ}11.5$	19.8			
10 900 00 00 00 00 00 00 00 00 00 00 00 0	8		304°55.4	30.7	71°32.1	27.6	59°40.3	12.0	231°13.8	19.9			
19	9			• • 29.8		• • 27.6		• • 12.0		• • 19.9			
13 30°40.0													
14 99°949 9 9°22 3 9°50 9 109°443 9 274 119°939 3 119 90°35 3 119 20°35 110 21 3 100°35 110 3 100°35 110 3 100°35 110 3 100°35 110 3 10°3													
14 95°518 97°15 23 101'470 273 109'553 119 321'276 203 15 105'43 47'08 214 176'95 273 109'553 119 321'276 203 16 15 105'43 47'08 214 176'95 273 109'578 118 380'295 203 17 105'10 100'10 118'80 215'10 101'50 277 109'00 118 80'10 20 18 95'01 10 100'10 118'80 207 12 100'00 3 100'10 118 80'10 20 10 870'66 10 100'10 100'10 100'10 100'10 118 80 100'10 118 80'10 20 10 870'66 10 100'10 100'10 100'10 100'10 118 80 100'10 118 80'10 10 10 10 10 10 10 10 10 10 10 10 10 1													
10 10 10 10 10 10 10 10													
Second											Elnath	277°57.5	28°37.8
17											Alnilam		
18											1		
19													
20													
101-1961													
16°116 15°4°62 180 222°669 269 270°153 117 81°460 208 521°123 33°1433 34°333 34°333 34°333 34°477 110°160 16°165 18°464 15°162 110°170 15°160 16°165 18°464 15°1612 110°190 110°165 18°464 110°190 110°165 18°464 110°190 110°165 18°464 110°190 110°160 110°165 18°464 110°160 110°165 110°160 110°16	21	101°09.1	139°46.9	• • 18.9	267°04.4	• • 27.0	$255^{\circ}12.8$	• • 11.7	66°43.7	• • 20.7			
Mer. pass. 14:16													
Maplecide V-0.7' d-0.9' m-3.89	23	131°14.0		17.1	297°09.4	26.8	285°17.8	11.6	96°48.3				
Fri CHA CHA CHA CHA CHA CHA CHA CHA	Mars	nass 1/1·16	v_0 7′ d 0) 0' m-3 80	1/2 5/ 4 0	0' m-0 41	1/2 5/ d O	0' m-2 21	1/2 3/ 40	1′ m0 36			
Fro GHA	- ivier.p	,uss. 14.10	ν-0.1 u -0	7.9 111-3.09	ν2.3 u-0.	0 111-0.41	ν2.5 u-0	.0 111-2.21	ν2.5 u0	1110.30			
Fire GHA CHA CHA CHA CHA CHA CHA CHA													
1 161-169 199'-442 152 312'-119 502'-268 300'-203 300'-103 116'-528 2110 116'-528 2110 126'-528 12													
1 161-189 1 197-442											I		
2 176°21.4 214°33.6 14.3 342°16.9 26.7 330°25.3 11.6 141'55.1 21.1 3.1 347'31.5 12.1 3.1 31'12.9 229'4.9 213.4 345'15.6 431'57.9 4 2.1 2.1 3.1 1.6 156'57.4 21.2 4.2 4.2 4.2 4.2 4.2 12'1.2 2.1 2.2 1.2 2.2 2													
200°263 244°223 125 125°19 266 0°303 11.5 171°59.7 21.2 Alich 166°028 55°47.7 21.5 21.0 187°02.0 21.2 187°02.0 21.2 187°02.0 21.3 187°02.0 21.2 187°02.0 21.3 18.3 18.3 18.3 18.3 18.3 18.3 18.3 1											Acrux	172°55.6	-63°15.6
5 221°28 8 299°416											Gacrux	$171^{\circ}47.3$	-57°16.6
286 31.3 24*41.0 516*10.7 42*269 502*264 30*35.3 500*11.5 202*04.3 N11*21.4 14*04*11.2 14*06.3											Alioth	$166^{\circ}09.8$	55°47.7
7 251°337 289°403 00.7 57°29.4 26.4 45°37.8 11.4 217°06.6 21.4 Alba 26.2 30°39.7 08.8 72°319 06.3 60°40.3 11.4 217°06.6 21.4 Alba 26°31.5 0-0°30.6 9 281°38.7 319°39.0 0.79 87°34.4 .263 75°42.8 .11.4 227°11.2 .21.6 Alba 148°30.8 19°01.6 11.3 310°31.3 319°39.0 0.79 87°34.4 .263 75°42.8 .11.4 227°11.2 .21.6 Alba 148°30.8 19°01.6 11.3 310°31.3 310°39.0 0.79 87°34.4 .263 75°42.8 .11.4 226°13.5 2.16 Alba 148°30.8 19°01.6 11.3 310°31.3 310°39.0 0.07.3 11.3 11°31.6 340°37.7 0.00 117°39.4 261 105°47.8 11.3 277°15.8 21.7 Alba 137°19.7 Alba 137°19.7 Alba 131°31.3 11°31.5 27.5 10°30.8 11.3 310°30.6 11.3 31°36.3 0.0°37.1 13.3 31°36.5 10.3 31°38.8 0.3 31°27.9 2.5 11.3 30°20.4 21.9 Alba 137°19.0 Alba 137°19.0 26°36.7 Alba 137°19.0 Alba											Spica		
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Sat GHA GHA Dec Horizontal parallax Venus Al Na'ir 272 Per 15 Feb 215 Al Na'ir 27° 29.3 46° 9.1 Feb 215 GHA Markab 15° 12.2 29° 28° 14.5 SE0 16° 32.0 16° 32.9 10.9 15° 52.4 22.8 Feb 15 Fb 15 Thu Markab 13° 26.8 15° 21.8 1 1 2° 2° 2° 2.9 24.8 43° 27.3 30° 24.9 31° 35.													
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Mer.pass. 14:09 ν -0.6′ d -0.9′ m-3.89 ν 2.5′ d -0.1′ m-0.47 ν 2.5′ d -0.0′ m-2.23 ν 2.3′ d 0.1′ m0.37											L		-
	Mer.p	ass. 14:09	ν -0.6' d-0).9′ m-3.89	$\nu 2.5' d-0.$.1′ m-0.47	$\nu 2.5' d-0$.0′ m-2.23	$\nu^{2.3'} d0$.1′ m0.37			

h	Su	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°28.5	S12°39.1	161°46.7	16.2'	S02°10.0	-12.7'	54.3'	
1 2	191°28.5 206°28.6	38.2 37.4	176°21.9 190°57.1	16.2' 16.3'	01°57.3 01°44.6	-12.7' -12.7'	54.3' 54.3'	
3	221°28.6	36.5	205°32.4	16.3'	01°31.9	-12.7'	54.3'	
4	236°28.6	35.6	220°07.7	16.3'	01°19.2	-12.7'	54.3'	
5	251°28.7 266°28.7	34.8 \$12°33.9	234° 42.9 249° 18.2	16.3' 16.3'	01°06.5 500°53.8	-12.7' -12.7'	54.3' 54.3'	
6 7	266 28.7 281°28.7	33.9	249 18.2 263°53.6	16.3'	500 53.8 00°41.1	-12.7' -12.7'	54.3' 54.2'	
8	296°28.8	32.2	278°28.9	16.3'	00°28.4	-12.7'	54.2'	
9	311°28.8	• • 31.3	293°04.2	16.4'	00°15.7	-12.7'	54.2'	
10 11	326°28.8 341°28.9	30.5 29.6	307° 39.6 322° 15.0	16.4' 16.4'	S00°03.0 N00°09.7	-12.7' 12.7'	54.2' 54.2'	
12	356°28.9	S12°28.7	336°50.3	16.4	N00°22.3	12.7'	54.2'	
13	11°28.9	27.9	351°25.7	16.4'	00°35.0	12.7'	54.2'	
14 15	26°29.0 41°29.0	27.0 •• 26.1	6°01.1 20°36.5	16.4' 16.4'	00°47.7 01°00.3	12.6' 12.6'	54.2' 54.2'	
16	56°29.0	25.3	35°11.9	16.4	01°00.3	12.6'	54.2	
17	71°29.1	24.4	49°47.4	16.4'	$01^{\circ}25.6$	12.6'	54.2'	
18	86°29.1	\$12°23.5	64° 22.8 78° 58.2	16.4	N01°38.2	12.6'	54.1'	
19 20	101°29.1 116°29.2	22.7 21.8	78°58.2 93°33.7	16.4' 16.4'	01°50.8 02°03.4	12.6' 12.6'	54.1' 54.1'	
21	131°29.2	20.9	108°09.1	16.4	02°16.0	12.6'	54.1'	
22	146°29.2	20.1	122°44.5	16.4'	02°28.6	12.6'	54.1'	
23	161°29.3	19.2	137°20.0	16.4'	02°41.1	12.5'	54.1'	
	SD = 16.2'	d = -0.9'		SI	O = 14.8'			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°29.3	S 12°18.3	151°55.4	16.4'	N02°53.7	12.5'	54.1'	
1 2	191°29.4 206°29.4	17.5 16.6	166°30.8 181°06.3	16.4' 16.4'	03°06.2 03°18.7	12.5' 12.5'	54.1' 54.1'	
3	200 29.4 221°29.4	10.0	101 00.3 195°41.7	16.4	03°31.2	12.5	54.1'	
4	236°29.5	14.9	$210^{\circ}17.1$	16.4'	03°43.7	12.5'	54.1'	
5	251°29.5	14.0	224°52.6	16.4	03°56.1	12.4'	54.1'	
6 7	266°29.5 281°29.6	\$12°13.1 12.3	239° 28.0 254° 03.4	16.4' 16.4'	N04°08.6 04°21.0	12.4' 12.4'	54.1' 54.1'	
8	296°29.6	11.4	268° 38.8	16.4	04°33.4	12.4'	54.0'	
9	311°29.7	• • 10.5	283°14.2	16.4'	04°45.8	12.4'	54.0'	
10 11	326°29.7 341°29.7	09.6 08.8	297°49.6 312°25.0	16.4' 16.4'	04°58.1 05°10.5	12.3' 12.3'	54.0' 54.0'	
12	356°29.8	\$12°07.9	312 23.0 327°00.4	16.4	N05°22.8	12.3'	54.0'	
13	11°29.8	07.0	341°35.7	16.4'	05°35.1	12.3'	54.0'	
14 15	26°29.9 41°29.9	06.2 •• 05.3	356° 11.1 10° 46.4	16.3' 16.3'	05°47.4 05°59.6	12.2' 12.2'	54.0' 54.0'	
16	56°29.9	04.4	25°21.7	16.3'	05°59.0	12.2'	54.0'	
17	71°30.0	03.5	$39^{\circ}57.1$	16.3'	$06^{\circ}24.0$	12.2'	54.0'	
18	86°30.0 101°30.1	\$12°02.7	54° 32.3 69° 07.6	16.3'	N06°36.2 06°48.3	12.1'	54.0'	
19 20	101 30.1 116°30.1	01.8 00.9	83°42.9	16.3' 16.2'	06 48.3 07°00.4	12.1' 12.1'	54.0' 54.0'	
21	131°30.2	12°00.0	98° 18.1	16.2'	$07^{\circ}12.5$	12.0'	54.0'	
22	146°30.2	11°59.2	112°53.4	16.2'	07°24.5	12.0'	54.0'	
23	161°30.2	58.3	127°28.6	16.2'	07°36.5	12.0'	54.0'	
	SD = 16.2'	d = -0.9'		SI	D = 14.8'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	176°30.3 191°30.3	\$11°57.4 56.5	142°03.8 156°38.9	16.2' 16.1'	N07°48.5 08°00.5	12.0' 11.9'	54.0' 54.0'	
2	206°30.4	55.7	171° 14.1	16.1	08°12.4	11.9'	54.0'	
3	221°30.4	• • 54.8	$185^{\circ}49.2$	16.1'	08°24.3	11.9'	54.0'	
4	236°30.5 251°30.5	53.9	200°24.3	16.1'	08°36.1	11.8'	54.0'	
5 6	251°30.5 266°30.6	53.0 \$11°52.2	214°59.4 229°34.4	16.0' 16.0'	08°48.0 N08°59.8	11.8' 11.8'	54.0' 54.0'	
7	281°30.6	51.3	244°09.4	16.0'	$09^{\circ}11.5$	11.7'	54.0'	
8	296°30.7	50.4	258° 44.4	16.0'	09°23.2	11.7'	54.0'	
9 10	311°30.7 326°30.8	· · 49.5 48.6	273° 19.4 287° 54.3	15.9' 15.9'	09°34.9 09°46.5	11.6' 11.6'	54.0' 54.0'	
11	341°30.8	47.8	302° 29.2	15.9'	09°58.1	11.6'	54.0'	
12	356°30.8	S11°46.9	317°04.1	15.8'	N10°09.7	11.5'	54.0'	
13 14	11°30.9 26°30.9	46.0 45.1	331°39.0 346°13.8	15.8' 15.8'	10°21.2 10°32.7	11.5' 11.4'	54.0' 54.0'	
15	41°31.0	• • 44.2	0°48.6	15.8'	10° 32.7 10° 44.1	11.4	54.0'	
16	56°31.0	43.4	15°23.3	15.7'	10°55.5	11.4'	54.0'	
17 18	71°31.1 86°31.1	42.5 \$11°41.6	29°58.0 44°32.7	15.7' 15.6'	11°06.9 N11°18.2	11.3' 11.3'	54.0' 54.0'	
18 19	101°31.1	40.7	44° 32.7 59° 07.4	15.6'	11°29.5	11.3	54.0'	
20	116°31.2	39.8	73°42.0	15.6'	11°40.7	11.2'	54.0'	
21	131°31.3 146°31.3	• • 39.0	88° 16.6 102° 51.1	15.5'	11°51.9 12°03.0	11.1'	54.0'	
22 23	146°31.3 161°31.4	38.1 37.2	102°51.1 117°25.6	15.5' 15.5'	12°03.0 12°14.1	11.1' 11.0'	54.0' 54.0'	
	SD = 16.2'	d = -0.9'			D = 14.7'	0		
	<u> </u>	u — -0.9		اد	14.1			

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

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

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

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	148°14.8	184° 14.1	\$15°31.3	314°13.1	S02°23.5	302°20.7	S09°10.3	113° 40.5	N11°24.3			
1	163°17.2	199° 13.5	30.4	329°15.7	23.5	317°23.2	10.3	128° 42.8	24.4	Alpheratz	357°31.5	29°15.2
2	178° 19.7	214° 12.8	29.4	344°18.2	23.4	332°25.7	10.2	143°45.1	24.5	Ankaa	353°04.3	-42°09.0
3	193°22.2	229°12.2	• • 28.5	359°20.8	23.3	347° 28.3	. 10.2	158° 47.4	• • 24.5	Schedar	349°27.5	56°42.0
4	208°24.6	244°11.6	27.5	14°23.4	23.2	2°30.8	10.2	173°49.7	24.6	Diphda	348°44.2	-17°49.7
5	223°27.1	259°11.0	26.6	29°25.9	23.1	17°33.3	10.1	188°51.9	24.7	Achernar	335°18.2	-57°05.5
6	238°29.5	274°10.3	\$15°25.6	44°28.5	502°23.1	32°35.8	S09°10.1	203°54.2	N11°24.7	Hamal	327°47.5	23°36.1
7	253°32.0	289°09.7	24.7	59°31.0	23.0	47°38.3	10.1	218°56.5	24.8	Polaris Acamar	312°16.7 315°09.4	89°23.4 -40°11.5
8	268°34.5	304°09.1	23.7	74°33.6	22.9	62°40.9	10.1	233°58.8	24.9	Menkar	314°02.7	4°12.1
9	283°36.9	319°08.5	• • 22.7	89°36.2	• • 22.8	77°43.4	• • 10.0	249°01.1	• • 25.0	Mirfak	308° 23.4	49°58.0
10	298°39.4	334°07.8	21.8	104°38.7	22.7	92°45.9	10.0	264°03.4	25.0	Aldebaran	290°35.7	16°34.0
11	313°41.9	349°07.2	20.8	119°41.3	22.6	107°48.4	10.0	279°05.7	25.1	Rigel	281°00.5	-8°10.3
12	328°44.3	4°06.6	S15° 19.9	134°43.9	S02°22.6	122°50.9	S09°09.9	294°07.9	N11°25.2	Capella	280°16.7	46°01.6
13	343°46.8	19°06.0	18.9	149°46.5	22.5	137°53.5	09.9	309°10.2	25.2	Bellatrix	278°19.2	6°22.4
14 15	358°49.3 13°51.7	34°05.3 49°04.7	17.9 •• 17.0	164°49.0 179°51.6	22.4 •• 22.3	152° 56.0 167° 58.5	09.9 •• 09.8	324°12.5 339°14.8	25.3 •• 25.4	Elnath	277°57.5	28°37.8
16	28°54.2	64°04.1	16.0	194°54.2	22.2	183°01.0	09.8	354° 17.1	25.5	Alnilam	275°34.2	-1°11.2
17	43°56.6	79°03.5	15.0	209°56.7	22.1	198°03.5	09.8	9°19.4	25.5	Betelgeuse	270°48.3	7°24.6
18	58°59.1	94°02.9	S15°14.1	224°59.3	S02°22.0	213°06.1	S09°09.7	24°21.7	N11°25.6	Canopus	263°50.6	-52°43.0
19	74°01.6	109°02.2	13.1	240°01.9	21.9	228° 08.6	09.7	39°23.9	25.7	Sirius	258°23.1	-16°45.7
20	89°04.0	124°01.6	12.1	255°04.5	21.9	243°11.1	09.7	54°26.2	25.7	Adhara	255°03.0	-29°01.0
21	104°06.5	139°01.0	• • 11.2	270°07.1	• • 21.8	258° 13.6	• • 09.6	69°28.5	• • 25.8	Procyon	244°47.1	5°08.8
22	$119^{\circ}09.0$	154°00.4	10.2	285°09.6	21.7	$273^{\circ}16.1$	09.6	84°30.8	25.9	Pollux	243°12.9	27°57.2
23	$134^{\circ}11.4$	168°59.8	09.2	$300^{\circ}12.2$	21.6	288°18.7	09.6	99°33.1	26.0	Avior Suhail	234°12.7 222°43.3	-59°36.4 -43°33.3
Mern	ass. 14:05	ν-0.6' d.1	1.0' m-3.89	ν2.6′ d-0.	1′ m-0 40	ν2 5' d-Ω	.0′ m-2.23	1/2 3/ dn	.1′ m0.37	Miaplacidus	222 43.3 221°36.5	-45 55.5 -69°50.4
- Ivier.p	14.05	ν-0.0 <i>u</i> -1	1.0 111-3.09	ν2.0 u-0.	1 111-0.49	ν2.5 u-0	.0 111-2.23	ν2.5 d0	.1 1110.57	Alphard	217°44.1	-8°47.4
										Regulus	207°30.6	11°49.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.3
0	149°13.9	183°59.1	S15°08.3	315°14.8	S02°21.5	303°21.2	S09°09.5	114°35.4	N11°26.0	Denebola	182°21.3	14°24.3
1	164°16.4	198°58.5	07.3	330°17.4	21.4	318°23.7	09.5	129°37.6	26.1	Gienah	175°39.8	-17°42.4
2	179°18.8	213°57.9	06.3	345°20.0	21.3	333°26.2	09.5	144°39.9	26.2	Acrux	172°55.6	-63°15.6
3 4	194°21.3 209°23.8	228°57.3 243°56.7	• • 05.4	0°22.6 15°25.2	• • 21.2	348°28.8 3°31.3	· · 09.4 09.4	159° 42.2 174° 44.5	• • 26.2	Gacrux	171°47.3	-57°16.6
5	209 23.6 224°26.2	243 50.7 258° 56.1	04.4 03.4	30°27.8	21.1 21.0	3 31.3 18°33.8	09.4	174 44.5 189°46.8	26.3 26.4	Alioth	$166^{\circ}09.8$	55°47.7
6	239°28.7	273°55.4	\$15°02.4	45°30.3	S02°21.0	33°36.3	509°09.3	204° 49.1	N11°26.5	Spica	158° 18.6	-11°18.9
7	254°31.1	288°54.8	01.5	60°32.9	20.9	48°38.9	09.3	219°51.3	26.5	Alkaid	152°49.2	49°09.7
8	269°33.6	303°54.2	15°00.5	75°35.5	20.8	63°41.4	09.3	234°53.6	26.6	Hadar	148°30.8	-60°30.6
9	284°36.1	318°53.6	14°59.5	90°38.1	20.7	78° 43.9	09.2	249°55.9	26.7	Menkent	147°53.4	-36°30.8
10	299°38.5	333°53.0	58.5	105°40.7	20.6	93°46.5	09.2	264°58.2	26.8	Arcturus	145°44.7	19°01.6 -60°57.2
11	314°41.0	348°52.4	57.6	120°43.3	20.5	108°49.0	09.2	280°00.5	26.8	Rigil Kent. Kochab	139°35.3 137°19.8	74°01.7
12	329°43.5	3°51.8	S14°56.6	135°45.9	S02°20.4	123°51.5	S09°09.1	295°02.8	N11°26.9	Zuben'ubi	136°52.2	-16°09.8
13	344°45.9	18°51.2	55.6	150°48.5	20.3	138°54.0	09.1	310°05.0	27.0	Alphecca	126° 00.9	26°36.7
14	359°48.4	33°50.6	54.6	$165^{\circ}51.1$	20.2	153°56.6	09.1	325°07.3	27.0	Antares	112°11.8	-26°29.7
15	14°50.9	48°49.9	• • 53.6	180°53.7	• • 20.1	168°59.1	• • 09.0	340°09.6	• • 27.1	Atria	107°03.1	-69°04.4
16	29°53.3	63°49.3	52.7	195°56.3	20.0	184°01.6	09.0	355°11.9	27.2	Sabik	101°59.0	-15°45.6
17	44°55.8	78°48.7	51.7	210°58.9	19.9	199°04.1	09.0	10°14.2	27.3	Shaula	96°06.0	-37°07.3
18	59°58.3	93°48.1	\$14°50.7	226°01.5	S02°19.8	214°06.7 229°09.2	S09°08.9	25°16.4	N11°27.3	Rasalhague	95°55.6	12°32.2
19 20	75°00.7 90°03.2	108°47.5 123°46.9	49.7 48.7	241°04.2 256°06.8	19.7	244°11.7	08.9 08.9	40°18.7 55°21.0	27.4 27.5	Eltanin	90°40.9	51°28.9
21	105°05.6	138° 46.3	• • 47.8	271°09.4	19.6 • • 19.5	259° 14.3	• • 08.8	70°23.3	• • 27.6	Kaus Aust.	83°28.3	-34°22.1
22	120°08.1	153° 45.7	46.8	286°12.0	19.4	274° 16.8	08.8	85°25.6	27.6	Vega	80°31.2	38°48.5
23	135°10.6	168° 45.1	45.8	301°14.6	19.3	289° 19.3	08.8	100°27.9	27.7	Nunki	75°43.9	-26°15.5
_		-								Altair	61°57.0	8°56.7
Mer.p	ass. 14:01	ν -0.6′ d-1	L.0′ m-3.89	ν 2.6′ d-0.	1′ m-0.52	$\nu 2.5' \ d-0$.0′ m-2.24	$\nu 2.3' \ d0$.1′ m0.37	Peacock Deneb	53°01.1 49°23.9	-56°38.3 45°23.0
										Enif	33° 35.8	10°00.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.1
0	$150^{\circ}13.0$	183°44.5	S 14°44.8	$316^{\circ}17.2$	S02°19.2	304°21.9	S09°08.7	$115^{\circ}30.1$	$N11^{\circ}27.8$	Fomalhaut	27 29.3 15°11.2	-40°49.1 -29°28.1
1	165° 15.5	198°43.9	43.8	331°19.8	19.1	319° 24.4	08.7	130°32.4	27.8	Scheat	13°42.2	28°14.5
2	180°18.0	213°43.3	42.8	346°22.4	19.0	334°26.9	08.6	145°34.7	27.9	Markab	13°26.8	15°21.8
3	195°20.4	228°42.7	• • 41.8	1°25.1	• • 18.9	349°29.5	• • 08.6	160°37.0	• • 28.0			
4	210°22.9	243°42.1	40.8	16°27.7	18.8	4°32.0	08.6	175°39.3	28.1	Feb 18 Sun	SHA 35° 59.3	Mer.pass
5	225°25.4	258°41.5	39.9	31°30.3	18.7	19°34.5	08.5	190°41.5	28.1	Venus	35°59.3 165°58.4	11:44 03:03
6 7	240°27.8 255°30.3	273°40.9	\$14°38.9	46°32.9 61°35.6	\$02°18.6	34°37.1 49°39.6	S09°08.5	205°43.8	N11°28.2	Jupiter	105 58.4 154°05.9	03:03
8	255° 30.3 270° 32.7	288°40.3 303°39.6	37.9 36.9	76°38.2	18.5 18.4	49°39.6 64°42.1	08.5 08.4	220°46.1 235°48.4	28.3 28.4	Saturn	325° 25.8	16:23
9	285°35.2	318° 39.0	• • 35.9	91°40.8	18.3	79°44.7	08.4	250° 50.6	. 28.4			
10	300°37.7	333°38.4	34.9	106°43.4	18.2	94°47.2	08.4	265°52.9	28.5	Feb 19 Mon	SHA	Mer.pass
11	315°40.1	348° 37.8	33.9	121°46.1	18.1	109°49.7	08.3	280°55.2	28.6	Venus	34°45.2	11:45
12	330°42.6	3°37.2	S 14°32.9	136°48.7	S02°18.0	124°52.3	S09°08.3	295°57.5	N11°28.7		166°00.9	02:58
13	$345^{\circ}45.1$	18°36.6	31.9	151°51.3	17.8	139°54.8	08.2	$310^{\circ}59.8$	28.7	Jupiter Saturn	154°07.3 325°21.5	03:46 16:19
14	0°47.5	33°36.1	30.9	166°53.9	17.7	154°57.3	08.2	326°02.0	28.8	Jatuin	J2J 21.J	10.19
15	15°50.0	48°35.5	• • 29.9	181°56.6	• • 17.6	169°59.9	• • 08.2	341°04.3	• • 28.9	Feb 20 Tue	SHA	Mer.pass
16	30°52.5	63°34.9	28.9	196°59.2	17.5	185°02.4	08.1	356°06.6	29.0	Venus	33°31.4	11:46
17	45°54.9	78°34.3	27.9	212°01.9	17.4	200°04.9	08.1	11°08.9	29.0		166°04.2	02:54
18	60°57.4	93°33.7	\$14°26.9	227°04.5	\$02°17.3	215° 07.5 230° 10.0	S09°08.1	26°11.2	N11°29.1		154°08.8	03:42
19 20	75°59.9 91°02.3	108°33.1 123°32.5	25.9 24.9	242°07.1 257°09.8	17.2 17.1	230° 10.0 245° 12.6	08.0 08.0	41°13.4 56°15.7	29.2 29.2	Saturn	325°17.1	16:16
20	91 02.3 106°04.8	123 32.5 138°31.9	. 23.9	257 09.8 272°12.4	17.1	245 12.6 260°15.1	07.9	71° 18.0	29.2	Horizont	al parallax	
22	100 04.8 121°07.2	153° 31.3	22.9	287°15.0	16.9	275° 17.6	07.9	86°20.3	29.4		Venus:	0.1
23	136°09.7	168°30.7	21.9	302°17.7	16.7	290°20.2	07.9	101°22.5	29.5		Mars:	0.2
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ivier.p	ass. 13:57	ν-υ.υ d-1	l.0′ m-3.89	ν 2.6′ d-0.	m-0.55	ν 2.5' a -0	.0′ m-2.25	ν2.3' d0	.1′ m0.37			

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8 296°34.8 46.3 226°46.6 12.2' 21°05.3 7.1' 54.6' 9 311°34.9 · · 45.4 241°17.7 12.1' 21°12.4 7.0' 54.6' 10 326°34.9 44.5 255°48.9 12.0' 21°19.5 6.9' 54.6' 11 341°35.0 43.6 270°19.9 12.0' 21°26.4 6.8' 54.6' 12 356°35.1 \$10°42.7 284°50.9 11.9' N21°33.2 6.7' 54.6' 13 11°35.2 41.8 299°21.8 11.8' 21°46.6 6.6' 54.7' 14 26°35.2 40.9 313°52.6 11.8' 21°46.6 6.6' 54.7' 15 41°35.3 · · 40.0 328°23.4 11.7' 21°53.2 6.5' 54.7' 16 56°35.4 39.1 342°54.1 11.6' 21°59.6 6.4' 54.7' 17 71°35.4 38.2 357°24.7 11.6' 22°06.0 6.3' 54.8' 19 101°35.6 36.4 26°25.8 11.4' 22°								
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16 56° 35.4 39.1 342° 54.1 11.6' 21° 59.6 6.4' 54.7' 17 71° 35.4 38.2 357° 24.7 11.6' 22° 06.0 6.3' 54.7' 18 86° 35.5 \$10° 37.3 11° 55.3 11.5' N22° 12.2 6.2' 54.8' 19 101° 35.6 36.4 26° 25.8 11.4' 22° 18.4 6.1' 54.8' 20 116° 35.7 35.5 40° 56.2 11.3' 22° 24.5 6.0' 54.8' 21 131° 35.7 · · 34.6 55° 26.5 11.3' 22° 30.4 5.9' 54.8' 22 146° 35.8 33.7 69° 56.8 11.2' 22° 36.3 5.8' 54.8' 23 161° 35.9 32.8 84° 27.0 11.1' 22° 42.0 5.7' 54.9'								
17 71°35.4 38.2 357°24.7 11.6' 22°06.0 6.3' 54.7' 18 86°35.5 \$10°37.3 11°55.3 11.5' N22°12.2 6.2' 54.8' 19 101°35.6 36.4 26°25.8 11.4' 22°18.4 6.1' 54.8' 20 116°35.7 35.5 40°56.2 11.3' 22°24.5 6.0' 54.8' 21 131°35.7 34.6 55°26.5 11.3' 22°30.4 5.9' 54.8' 22 146°35.8 33.7 69°56.8 11.2' 22°36.3 5.8' 54.8' 23 161°35.9 32.8 84°27.0 11.1' 22°42.0 5.7' 54.9'								
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		SD = 16.2'	d = -0.9'		SI	D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-35%	
18	13:54	13:52	12:14	15:39	03:18		
19	13:49	13:46	12:14	16:24	04:01		
20	13:43	13:40	12:14	17:11	04:47		

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

h	Aries	Ve	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	151°12.2	183°30.1	\$14°20.9	317°20.3	S02°16.6	305°22.7	S09°07.8	116° 24.8	N11°29.5			
1	166°14.6	198° 29.5	19.9	332°23.0	16.5	320°25.2	07.8	131°27.1	29.6	Alpheratz	357°31.5	29°15.2
2	181°17.1	213°28.9	18.9	347°25.6	16.4	335° 27.8	07.8	146°29.4	29.7	Ankaa	353°04.3	-42°09.0
3	196°19.6	228°28.3	• • 17.9	2°28.3	. 16.3	350° 30.3	• • 07.7	161°31.6	29.8	Schedar	349°27.5	56° 42.0
4	211°22.0	243°27.7	16.9	17°30.9	16.2	5°32.9	07.7	176°33.9	29.8	Diphda	348°44.2	-17°49.7
5	226°24.5	258°27.1	15.9	32°33.6	16.1	20°35.4	07.6	191°36.2	29.9	Achernar	335°18.2	-57°05.5
6	241°27.0	273°26.5	S14°14.9	47°36.2	502°16.0	35°37.9	S09°07.6	206°38.5	N11°30.0	Hamal	327°47.5	23°36.0
7	256°29.4	288°26.0	13.9	62°38.9	15.8	50°40.5	07.6	221°40.8	30.1	Polaris Acamar	312°18.0 315°09.4	89°23.4 -40°11.5
8	271°31.9	303°25.4	12.9	77°41.5	15.7	65°43.0	07.5	236°43.0	30.1	Menkar	314°02.7	4° 12.1
9	286°34.4	318°24.8	• • 11.9	92°44.2	•• 15.6	80°45.6	• • 07.5	251°45.3	• • 30.2	Mirfak	308°23.4	49°58.0
10	301°36.8	333°24.2	10.8	107°46.9	15.5	95°48.1	07.4	266° 47.6	30.3	Aldebaran	290°35.7	16°34.0
11	316°39.3	348°23.6	09.8	122°49.5	15.4	110°50.6	07.4	281°49.9	30.4	Rigel	281°00.5	-8°10.3
12	331°41.7	3°23.0	\$14°08.8	137°52.2	S02°15.3	125°53.2	S09°07.4	296°52.1	N11°30.4	Capella	280°16.8	46°01.6
13	346°44.2	18°22.4	07.8	152°54.8	15.1	140°55.7	07.3	311°54.4	30.5	Bellatrix	278°19.2	6°22.4
14 15	1°46.7 16°49.1	33°21.8 48°21.3	06.8 •• 05.8	167°57.5 183°00.2	15.0 •• 14.9	155°58.3 171°00.8	07.3 •• 07.2	326°56.7 341°59.0	30.6 •• 30.7	Elnath	277°57.5	28° 37.8
16	31°51.6	63° 20.7	04.8	198°02.8	14.8	171 00.8 186°03.4	07.2	357°01.2	30.7	Alnilam	275°34.2	-1°11.2
17	46°54.1	78° 20.1	03.8	213°05.5	14.7	201°05.9	07.2	12°03.5	30.7	Betelgeuse	270°48.3	7°24.6
18	61°56.5	93° 19.5	S14°02.7	228°08.2	S02°14.5	216°08.4	S09°07.1	27°05.8	N11°30.9	Canopus	263°50.6	-52°43.0
19	76°59.0	108° 18.9	01.7	243°10.8	14.4	231° 11.0	07.1	42°08.1	31.0	Sirius	258°23.1	-16°45.7
20	92°01.5	123°18.3	14°00.7	258°13.5	14.3	246° 13.5	07.0	57° 10.3	31.0	Adhara	255°03.0	-29°01.0
21	107°03.9	138° 17.7	13°59.7	273°16.2	• • 14.2	261°16.1	• • 07.0	72°12.6	• • 31.1	Procyon	244°47.1	5°08.8
22	122°06.4	153°17.2	58.7	288°18.8	14.0	276°18.6	07.0	87°14.9	31.2	Pollux	243°12.9	27°57.2
23	137°08.8	$168^{\circ}16.6$	57.7	$303^{\circ}21.5$	13.9	291°21.2	06.9	$102^{\circ}17.2$	31.3	Avior Suhail	234°12.7 222°43.4	-59°36.5 -43°33.3
Mern	ass. 13:53	v-0.6′ d 1	1.0′ m-3.89	ν 2.6′ d-0.	1' m-0 50	1/25/ 40	0′ m-2.26	1/3 3/ 40	1′ m0.37	Miaplacidus	222°43.4 221°36.5	-43°33.3 -69°50.4
ivier.p	ass. 13.33	ν-0.0 <i>a</i> -1	111-3.09	ν2.0 U-0.	111-0.30	ν2.5 u -0.	0 111-2.20	ν2.3 d0.	1110.57	Alphard	221 30.5 217°44.1	-8° 47.4
										Regulus	207°30.6	11°49.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.4
0	152°11.3	183°16.0	S13°56.6	318°24.2	S02°13.8	306°23.7	S09°06.9	117° 19.4	N11°31.3	Denebola	182°21.3	14°24.3
1	167°13.8	198°15.4	55.6	333°26.9	13.7	321°26.3	06.8	132°21.7	31.4	Gienah	175°39.8	-17°42.4
2	182°16.2	213°14.8	54.6	348°29.5	13.6	336°28.8	06.8	147°24.0	31.5	Acrux	172°55.6	-63° 15.6
3	197°18.7	228°14.3	• • 53.6	3°32.2	• • 13.4	351°31.4	06.8	162°26.2	· · 31.6	Gacrux	$171^{\circ}47.3$	-57°16.6
4	212°21.2	243°13.7	52.6	18°34.9	13.3	6°33.9	06.7	177°28.5	31.6	Alioth	$166^{\circ}09.8$	55°47.8
5 6	227°23.6 242°26.1	258° 13.1 273° 12.5	51.5 \$13°50.5	33°37.6 48°40.3	13.2 \$02°13.1	21°36.5 36°39.0	06.7 \$09°06.6	192°30.8 207°33.1	31.7 N11°31.8	Spica	158°18.5	-11°18.9
7	242 20.1 257°28.6	273 12.5 288°11.9	49.5	46 40.3 63°42.9	12.9	50° 59.0 51° 41.6	06.6	207 35.1 222°35.3	31.9	Alkaid	152°49.2	49°09.7
8	272°31.0	303°11.4	48.5	78°45.6	12.9	66°44.1	06.6	237° 37.6	31.9	Hadar	148°30.7	-60°30.7
9	287°33.5	318° 10.8	• • 47.4	93°48.3	•• 12.7	81°46.6	• • 06.5	252°39.9	• • 32.0	Menkent	147°53.4	-36°30.8
10	302°36.0	333°10.2	46.4	108°51.0	12.5	96°49.2	06.5	267° 42.2	32.1	Arcturus	145°44.7	19°01.6
11	317°38.4	348°09.6	45.4	123°53.7	12.4	111°51.7	06.4	282°44.4	32.2	Rigil Kent.	139°35.3	-60°57.2
12	332°40.9	3°09.1	\$13°44.4	138°56.4	502°12.3	126° 54.3	S09°06.4	297°46.7	N11°32.2	Kochab	137°19.8	74°01.7
13	347°43.3	18°08.5	43.3	153°59.1	12.2	141°56.8	06.3	312°49.0	32.3	Zuben'ubi Alphecca	136°52.2 126°00.9	-16°09.8 26°36.7
14	2°45.8	33°07.9	42.3	$169^{\circ}01.8$	12.0	$156^{\circ}59.4$	06.3	327°51.2	32.4	Antares	112° 11.7	-26°29.7
15	17°48.3	48°07.3	• • 41.3	$184^{\circ}04.5$	• • 11.9	$172^{\circ}01.9$	• • 06.3	342°53.5	• • 32.5	Atria	107°03.0	-69°04.4
16	32°50.7	63°06.8	40.2	199°07.2	11.8	$187^{\circ}04.5$	06.2	357° 55.8	32.5	Sabik	101°59.0	-15° 45.6
17	47°53.2	78°06.2	39.2	214°09.8	11.6	202°07.0	06.2	12°58.1	32.6	Shaula	96°06.0	-37°07.3
18	62°55.7	93°05.6	\$13°38.2	229°12.5	S02°11.5	217°09.6	S09°06.1	28°00.3	N11°32.7	Rasalhague	95°55.6	12°32.2
19	77°58.1	108°05.0	37.1	244°15.2	11.4	232°12.2	06.1	43°02.6	32.8	Eltanin	90°40.9	51°28.9
20	93°00.6	123°04.5	36.1	259°17.9	11.2	247° 14.7	06.0	58°04.9	32.8	Kaus Aust.	83°28.3	-34°22.0
21 22	108°03.1 123°05.5	138°03.9 153°03.3	· · 35.1 34.0	274°20.6 289°23.3	• • 11.1	262°17.3 277°19.8	06.0	73°07.1 88°09.4	• • 32.9	Vega	80°31.2	38° 48.5
23	138°08.0	168° 02.7	33.0	209 23.3 304°26.1	11.0 10.8	277 19.8 292°22.4	06.0 05.9	103°11.7	33.0 33.1	Nunki	75°43.9	-26° 15.5
										Altair	61°57.0	8°56.7
Mer.p	ass. 13:49	ν -0.6' d-1	l.0′ m-3.89	$\nu 2.7' \ d-0.$	1' m-0.61	$\nu 2.5' \ d-0.$.0′ m-2.26	$\nu 2.3' \ d0.$	1' m0.37	Peacock	53°01.1	-56°38.2
										Deneb	49°23.9	45°23.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8	10°00.5
0	153°10.5	183°02.2	\$13°32.0	319°28.8	S02°10.7	307° 24.9	S09°05.9	118° 14.0	N11°33.1	Al Na'ir Fomalhaut	27°29.3 15°11.2	-46°49.1 -29°28.1
1	168°12.9	198°01.6	30.9	334°31.5	10.6	322°27.5	05.8	133°16.2	33.2	Scheat	13°42.2	-29 26.1 28° 14.5
2	$183^{\circ}15.4$	213°01.0	29.9	$349^{\circ}34.2$	10.4	337°30.0	05.8	$148^{\circ}18.5$	33.3	Markab	13°26.8	15°21.8
3	198°17.8	228°00.5	• • 28.9	4°36.9	• • 10.3	352° 32.6	• • 05.7	163°20.8	• • 33.4			
4	213°20.3	242°59.9	27.8	19°39.6	10.2	7°35.1	05.7	178°23.0	33.5	Feb 21 Wed	SHA	Mer.pass
5	228°22.8	257°59.3	26.8	34°42.3	10.0	22°37.7	05.6	193°25.3	33.5	Venus	32°17.9	11:46
6	243°25.2	272°58.8	\$13°25.8	49°45.0	S02°09.9	37°40.2	S09°05.6	208°27.6	N11°33.6		166°08.2	02:50
7	258°27.7	287°58.2	24.7	64°47.7	09.7	52°42.8	05.6	223°29.8	33.7	Jupiter	154°10.5	03:38
8	273°30.2	302°57.6	23.7	79°50.4	09.6	67°45.3	05.5	238°32.1	33.8	Saturn	325°12.6	16:12
9	288°32.6 303°35.1	317°57.1 332°56.5	• • 22.6	94°53.2 109°55.9	· · 09.5 09.3	82° 47.9 97° 50.5	· · 05.5 05.4	253°34.4 268°36.6	· · 33.8 33.9	Feb 22 Thu	SHA	Mer.pass
10 11	303°35.1 318°37.6	332°56.5 347°55.9	21.6 20.6	109°55.9 124°58.6	09.3 09.2	97°50.5 112°53.0	05.4 05.4	268° 36.6 283° 38.9	33.9 34.0	Venus	$31^{\circ}04.7$	11:47
12	333°40.0	2°55.4	\$13° 19.5	140°01.3	S02°09.0	112 55.0 127°55.6	S09°05.3	298°41.2	N11°34.1		166°12.9	02:46
13	348°42.5	2 55.4 17°54.8	18.5	155°04.0	08.9	142°58.1	05.3	313°43.5	34.1		154°12.4	03:34
14	3°45.0	32°54.2	17.4	170°06.8	08.8	158°00.7	05.2	328° 45.7	34.2	Saturn	325°08.1	16:08
15	18°47.4	47°53.7	• • 16.4	185°09.5	08.6	173°03.2	05.2	343°48.0	34.3	Feb 23 Fri	SHA	Mer.pass
16	33°49.9	62°53.1	15.3	200°12.2	08.5	188°05.8	05.2	358°50.3	34.4	Venus	29°51.7	11:48
17	48°52.3	77°52.6	14.3	$215^{\circ}14.9$	08.3	203°08.4	05.1	$13^{\circ}52.5$	34.4	1	166°18.3	02:42
18	63°54.8	92°52.0	S13°13.2	230°17.7	S02°08.2	218° 10.9	S09°05.1	28° 54.8	N11°34.5		154°14.5	03:30
19	78°57.3	107°51.4	12.2	245°20.4	08.1	233° 13.5	05.0	43°57.1	34.6	Saturn		16:05
20	93°59.7	122°50.9	11.2	260°23.1	07.9	248°16.0	05.0	58°59.3	34.7		المدالة	
21	109°02.2	137°50.3	• • 10.1	275°25.9	• • 07.8	263° 18.6	• • 04.9	74°01.6	• • 34.8	Horizont	al parallax Venus:	0.1
22	124°04.7	152°49.8	09.1	290°28.6	07.6	278°21.2	04.9	89°03.9	34.8		Venus: Mars:	0.1 0.2
23	139°07.1	167°49.2	08.0	305°31.3	07.5	293°23.7	04.8	104°06.1	34.9		ividi 5.	0.2
Mer.p	ass. 13:45	ν -0.6′ d-1	l.0′ m-3.89	ν 2.7′ d-0.	1′ m-0.64	ν 2.6′ d-0.	.0′ m-2.27	$\nu 2.3' \ d0$	1′ m0.38			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 35.9	S 10°31.9	98°57.1	11.1'	N22°47.7	5.5'	54.9'
1 2	191°36.0 206°36.1	31.0 30.1	113°27.2 127°57.2	11.0' 10.9'	22°53.2 22°58.7	5.4' 5.3'	54.9' 54.9'
3	200 30.1 221°36.2	29.2	142°27.1	10.9	22°04.0	5.2'	55.0'
4	236°36.2	28.3	156°57.0	10.8'	23°09.3	5.1'	55.0'
5	251°36.3	27.4	171°26.7	10.7'	23°14.4	5.0'	55.0'
6 7	266°36.4 281°36.5	\$10°26.5 25.6	185°56.4 200°26.1	10.6' 10.6'	N23°19.4 23°24.3	4.9' 4.8'	55.0' 55.0'
8	296° 36.5	24.6	214°55.7	10.5	23°29.1	4.7'	55.1'
9	311°36.6	• • 23.7	229°25.2	10.4'	23°33.8	4.6'	55.1'
10	326°36.7 341°36.8	22.8	243°54.6 258°24.0	10.4'	23°38.3 23°42.8	4.5'	55.1'
11 12	341 30.8 356°36.8	21.9 \$10°21.0	258 24.0 272°53.3	10.3' 10.2'	23 42.8 N23°47.1	4.3' 4.2'	55.2' 55.2'
13	11°36.9	20.1	287°22.5	10.2'	23°51.4	4.1'	55.2'
14	26° 37.0	19.2	301°51.7	10.1'	23°55.5	4.0'	55.2'
15 16	41°37.1 56°37.1	· · 18.3 17.4	316°20.7 330°49.8	10.0' 10.0'	23°59.5 24°03.4	3.9' 3.8'	55.3' 55.3'
17	71° 37.2	16.5	345°18.7	9.9'	24°07.1	3.6'	55.3'
18	86°37.3	S10°15.6	359°47.6	9.8'	N24° 10.8	3.5'	55.3'
19	101°37.4	14.6	14°16.5	9.8'	24°14.3	3.4'	55.4'
20 21	116° 37.5 131° 37.5	13.7 •• 12.8	28°45.2 43°13.9	9.7' 9.6'	24°17.7 24°21.0	3.3' 3.2'	55.4' 55.4'
22	146° 37.6	11.9	57°42.6	9.6'	24°24.2	3.0'	55.5'
23	161°37.7	11.0	72°11.1	9.5'	24°27.2	2.9'	55.5'
	SD = 16.2'	d = -0.9'		SE	0 = 15.0'		
The	СПУ	Dee	CHA		Dec		HP
Thu 0	GHA 176°37.8	Dec \$10°10.1	GHA 86°39.7	u 9.4'	Dec N24°30.1	d 2.8'	HP 55.5'
1	191°37.9	09.2	$101^{\circ}08.1$	9.4'	24°32.9	2.7'	55.5'
2	206° 37.9	08.3	115°36.5	9.3'	24°35.6	2.5'	55.6'
3 4	221°38.0 236°38.1	· · 07.4 06.4	130°04.8 144°33.1	9.3' 9.2'	24°38.1 24°40.6	2.4' 2.3'	55.6' 55.6'
5	250 38.1 251°38.2	05.5	159°01.3	9.2	24° 40.0	2.3	55.7'
6	266°38.3	S10°04.6	173°29.4	9.1'	N24°45.0	2.0'	55.7'
7	281°38.3	03.7	187°57.5	9.0'	24°47.1	1.9'	55.7'
8 9	296°38.4 311°38.5	02.8 •• 01.9	202°25.6 216°53.5	9.0' 8.9'	24°49.0 24°50.8	1.8' 1.7'	55.8' 55.8'
10	326°38.6	01.0	231°21.5	8.9'	24°52.4	1.5'	55.8'
11	341°38.7	10°00.0	245°49.3	8.8'	24°53.9	1.4'	55.8'
12 13	356°38.8 11°38.8	\$09°59.1 58.2	260°17.1 274°44.9	8.8' 8.7'	N24°55.3 24°56.6	1.3' 1.1'	55.9' 55.9'
14	26°38.9	56.2 57.3	274 44.9 289°12.6	8.7'	24°57.7	1.0'	55.9'
15	41°39.0	• • 56.4	303°40.3	8.6'	24°58.7	0.9'	56.0'
16	56°39.1	55.5	318°07.9	8.6'	24°59.5	0.7'	56.0'
17 18	71°39.2 86°39.3	54.6 \$09°53.6	332°35.4 347°02.9	8.5' 8.5'	25°00.3 N25°00.9	0.6' 0.5'	56.0' 56.1'
19	101°39.3	52.7	1°30.4	8.4'	25°01.3	0.3'	56.1'
20	116°39.4	51.8	15°57.8	8.4'	25°01.6	0.2'	56.1'
21 22	131°39.5 146°39.6	· · 50.9 50.0	30°25.1 44°52.5	8.3' 8.3'	25°01.8 25°01.8	0.0' -0.1'	56.2' 56.2'
23	161°39.7	49.1	59°19.7	8.2'	25°01.7	-0.1	56.2
	SD = 16.2'	d = -0.9'		SE	0 = 15.1'		
Fri 0	GHA 176° 39.8	Dec 509°48.1	GHA 73°47.0	ν 8.2'	Dec N25°01.5	d -0.4'	HP 56.3'
1	191°39.9	47.2	88°14.1	8.1	25°01.1	-0.4 -0.5'	56.3
2	206°39.9	46.3	102°41.3	8.1'	25°00.6	-0.7'	56.4'
3 4	221°40.0 236°40.1	• • 45.4 44.5	117°08.4 131°35.4	8.1' 8.0'	25°00.0 24°59.2	-0.8' -0.9'	56.4' 56.4'
4 5	236°40.1 251°40.2	44.5 43.5	131 35.4 146°02.5	8.0'	24°59.2 24°58.2	-0.9 -1.1'	56.5'
6	266° 40.3	S09°42.6	160°29.5	8.0'	N24°57.2	-1.2'	56.5'
7	281°40.4	41.7	174°56.4	7.9'	24°56.0	-1.4'	56.5'
8 9	296° 40.5 311° 40.6	40.8 •• 39.9	189°23.3 203°50.2	7.9' 7.8'	24°54.6 24°53.1	-1.5' -1.6'	56.6' 56.6'
10	326°40.6	38.9	218°17.1	7.8'	24°51.4	-1.8'	56.6'
11	341°40.7	38.0	232°43.9	7.8'	24°49.7	-1.9'	56.7'
12 13	356° 40.8 11° 40.9	S09°37.1 36.2	247°10.7 261°37.4	7.8' 7.7'	N24°47.7 24°45.7	-2.1' -2.2'	56.7' 56.8'
13 14	26°41.0	36.2 35.3	201 37.4 276°04.2	7.7' 7.7'	24 45.7 24°43.4	-2.2 -2.4'	56.8'
15	41°41.1	• • 34.3	290°30.9	7.7'	24°41.1	-2.5'	56.8'
16	56°41.2	33.4	304°57.5	7.7'	24°38.6	-2.7'	56.9'
17 18	71°41.3 86°41.4	32.5 \$09°31.6	319°24.2 333°50.8	7.6' 7.6'	24°35.9 N24°33.1	-2.8' -2.9'	56.9' 56.9'
19	101°41.5	30.7	348°17.4	7.6'	24°30.2	-2.9 -3.1'	50.9 57.0'
20	116°41.5	29.7	2°44.0	7.6'	$24^{\circ}27.1$	-3.2'	57.0'
21	131°41.6 146°41.7	• • 28.8	17°10.6 31°37.1	7.5'	24°23.9 24°20.5	-3.4'	57.1'
22 23	146°41.7 161°41.8	27.9 27.0	31°37.1 46°03.6	7.5' 7.5'	24°20.5 24°17.0	-3.5' -3.7'	57.1' 57.1'
	SD = 16.2'	d = -0.9'			O = 15.4'	7.1	

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

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

		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	44-64%	
21	13:36	13:33	12:14	18:01	05:35		
22	13:29	13:25	12:13	18:54	06:27		
23	13:21	13:17	12:13	19:49	07:21		

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

h	Aries	Ve	nus	Ma	ars	Jup	iter	Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec		SHA	Dec
0	154°09.6	182°48.6	S13°07.0	320°34.1	502°07.3	308° 26.3	S09°04.8	119°08.4 N11°3	5.0		
1	$169^{\circ}12.1$	197°48.1	05.9	335°36.8	07.2	323°28.8	04.7	134°10.7 3	5.1 Alpheratz Ankaa	357°31.5 353°04.3	29°15.2 -42°08.9
2	$184^{\circ}14.5$	$212^{\circ}47.5$	04.9	350°39.5	07.0	338°31.4	04.7		5.1 Schedar	349° 27.5	56°42.0
3	199°17.0	227°47.0	• • 03.8	5°42.3	• • 06.9	353°34.0	• • 04.7	164°15.2 · · 3	5.2 Dinhda	348°44.2	-17°49.7
4	214°19.4	242°46.4 257°45.8	02.8	20°45.0	06.7	8°36.5	04.6		5.3 Achernar	$335^{\circ}18.2$	-57°05.5
5 6	229°21.9 244°24.4	257 45.8 272°45.3	01.7 \$13°00.6	35°47.8 50°50.5	06.6 \$02°06.4	23°39.1 38°41.6	04.6 \$09°04.5	209°22.0 N11°3	5.4 Hamal	327°47.5	23°36.0
7	259°26.8	287° 44.7	12°59.6	65°53.2	06.3	53°44.2	04.5		5.5 Polaris		89°23.4
8	274°29.3	302°44.2	58.5	80°56.0	06.1	68°46.8	04.4		5.6 Acamar	315°09.4	-40°11.5
9	289°31.8	317°43.6	• • 57.5	95°58.7	• • 06.0	83°49.3	• • 04.4	254°28.8 · · 3	5.7 Menkar Mirfak	314°02.7 308°23.4	4°12.1 49°58.0
10	304°34.2	332°43.1	56.4	111°01.5	05.8	98°51.9	04.3		5.8 Aldebaran	290°35.7	16°34.0
11	319°36.7	347°42.5	55.4 \$12°54.3	126°04.2	05.7 \$02°05.5	113°54.5 128°57.0	04.3		5.8 Diggl	281°00.6	-8°10.3
12 13	334°39.2 349°41.6	2°42.0 17°41.4	512-54.3	141°07.0 156°09.7	05.4	128°57.0 143°59.6	\$09°04.2 04.2	299°35.6 N11°3 314°37.9 3	6.0 Capella	$280^{\circ}16.8$	46°01.6
14	4°44.1	32°40.9	52.2	171°12.5	05.4	159°02.2	04.2		6.1 Bellatrix		6°22.4
15	19°46.6	47°40.3	51.1	186°15.2	05.1	174°04.7	• • 04.1	344°42.4 · · 3	6.1 Einath	277°57.5	28°37.8
16	34°49.0	62°39.8	50.1	201°18.0	04.9	189°07.3	04.0		6.2 Alnilam Betelgeuse	275°34.2 270°48.3	-1°11.2 7°24.6
17	49°51.5	77°39.2	49.0	216°20.8	04.8	204°09.9	04.0		0.3		-52°43.0
18	64°53.9	92°38.7	S12°48.0	231°23.5	S02°04.6	219° 12.4	509°03.9	29°49.2 N11°3	6.4 Sirius		-16°45.7
19	79°56.4	107°38.1	46.9	246°26.3	04.5	234°15.0	03.9		0.5 Adhara	255°03.0	-29°01.0
20 21	94°58.9 110°01.3	122°37.6 137°37.0	45.8 •• 44.8	261°29.0 276°31.8	04.3 •• 04.2	249°17.5 264°20.1	03.8 •• 03.8	59°53.7 3 74°56.0 · · 3	6.5 Procyon	$244^{\circ}47.1$	5°08.8
22	125°03.8	152°36.5	43.7	291°34.6	04.2	279°22.7	03.7		6.7 Pollux		27°57.2
23	140°06.3	167°35.9	42.6	306°37.3	03.9	294°25.2	03.7		6.8 Avior		-59°36.5
Mara	ass. 13:41	0 6' d 1	1′ m-3.89	ν2.7′ d-0.	1' m 0 66	·26' d 0	0′ m-2.28	$\nu 2.3' \ d0.1' \ m0.$	Suhail Miaplacidus		-43°33.3 -69°50.4
- Ivier.p	455. 13.41	ν-0.0 u-1	1 111-3.09	$\frac{\nu_{2.1}}{}$ u-0.	1 111-0.00	ν2.0 <i>u</i> -0.	.0 111-2.20	ν2.3 d0.1 iii0.	Alphard	217°44.1	-8°47.4
_	6114	6114	-	6114	_	6114	-	GU4 B	Regulus		11°49.2
Sun 0	GHA 155°08.7	GHA 182° 35.4	Dec \$12°41.6	GHA 321°40.1	Dec \$02°03.7	GHA 309°27.8	Dec \$09°03.7	GHA Dec 120°02.8 N 11°3			61°35.4
1	170°11.2	197°34.8	40.5	336°42.9	03.5	324°30.4	03.6		6 Defiebbla		14°24.3
2	185°13.7	212°34.3	39.4	351°45.6	03.4	339°33.0	03.6		70 Gienan		-17°42.4 -63°15.6
3	$200^{\circ}16.1$	227°33.7	• • 38.4	6°48.4	• • 03.2	354°35.5	• • 03.5	165°09.6 · · 3	I ACTUX		-63 15.6 -57°16.6
4	$215^{\circ}18.6$	242°33.2	37.3	21°51.2	03.1	9°38.1	03.5		7.2 Alioth		55°47.8
5	230°21.1	257°32.6	36.2	36°53.9	02.9	24°40.7	03.4		7.2 Spica		-11°19.0
6	245°23.5 260°26.0	272°32.1 287°31.5	S12°35.2	51°56.7 66°59.5	S02°02.7	39° 43.2 54° 45.8	S09°03.4	210°16.3 N11°3 225°18.6 3	I Alkaid	$152^{\circ}49.2$	49°09.7
7 8	275°28.4	302°31.0	34.1 33.0	82°02.3	02.6 02.4	54 45.8 69°48.4	03.3 03.3		7.4 Hadar		-60°30.7
9	290°30.9	317°30.5	32.0	97°05.0	02.3	84° 50.9	03.2	255°23.1 · · 3	7 5 Ivienkent		-36°30.8
10	305°33.4	332°29.9	30.9	112°07.8	02.1	99°53.5	03.2		7.6 Arcturus Rigil Kent.	145°44.7 139°35.2	19°01.6 -60°57.2
11	$320^{\circ}35.8$	$347^{\circ}29.4$	29.8	$127^{\circ}10.6$	01.9	$114^{\circ}56.1$	03.1		7.7 Kashah		74°01.7
12	335°38.3	2°28.8	S12°28.8	142°13.4	S02°01.8	129°58.6	S09°03.1	300°29.9 N11°3	7.8 Zuben'ubi		-16°09.8
13	350°40.8 5°43.2	17°28.3 32°27.7	27.7	157°16.2 172°18.9	01.6	145°01.2 160°03.8	03.0		7.9 Alphecca	$126^{\circ}00.9$	26°36.7
14 15	20°45.7	47° 27.2	26.6 •• 25.5	172 16.9 187°21.7	01.5 · · 01.3	175°06.4	03.0 •• 02.9	345°36.7 · · 3	7.9 Antares		-26°29.7
16	35°48.2	62°26.7	24.5	202°24.5	01.3	190°08.9	02.9		o 1 Alria	107°02.9	-69°04.4 -15°45.6
17	50°50.6	$77^{\circ}26.1$	23.4	217°27.3	01.0	$205^{\circ}11.5$	02.8		8.2 Sabik	101°59.0 96°05.9	-15 45.0 -37°07.3
18	65°53.1	92°25.6	S12°22.3	232°30.1	S02°00.8	220°14.1	S09°02.8	30°43.5 N11°3	8.3 Rasalhague	95°55.5	12°32.2
19	80°55.6	107°25.0	21.2	247°32.9	00.6	235° 16.7	02.7		8.3 Eltanin	90°40.8	51°28.8
20	95°58.0	122°24.5	20.2	262°35.7	00.5	250° 19.2	02.7		8.4 Kaus Aust	83°28.3	-34°22.0
21 22	111°00.5 126°02.9	137°24.0 152°23.4	· · 19.1 18.0	277°38.5 292°41.3	· · 00.3 00.1	265°21.8 280°24.4	· · 02.6 02.5	75°50.3 · · · 3 90°52.5	8.6 Vega	80°31.2	38°48.5
23	141°05.4	167°22.9	16.9	307°44.0	00.0	295°27.0	02.5		o e INUNKI	75°43.8	-26°15.5
	ass. 13:37		1′ m-3.89		2′ m-0.69		.0′ m-2.28	$\nu 2.3' \ d0.1' \ m0.$	Altali	61°56.9 53°01.1	8°56.7 -56°38.2
- Ivier.p	455. 13.37	ν-0.5 u-1	1 111-3.09	$\frac{\nu_{2.6} \text{ u-o.}}{}$	2 111-0.09	ν2.0 <i>u</i> -0.	.0 111-2.20	ν2.3 d0.1 iii0.	— Deneb	49°23.9	45°23.0
									Enif	33°35.8	10°00.5
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	Al Na'ir	$27^{\circ}29.3$	-46°49.1
0 1	156°07.9 171°10.3	182°22.3 197°21.8	\$12°15.9 14.8	322°46.8 337°49.6	\$01°59.8 59.6	310°29.5 325°32.1	\$09°02.4 02.4	120°57.1 N11°3 135°59.3 3	o l lomamaut	15°11.2	-29°28.1
2	171 10.3 186°12.8	212°21.3	13.7	352°52.4	59.5	340°34.7	02.4		o o	13° 42.2	28°14.5
3	201°15.3	227° 20.7	12.6	7°55.2	59.3	355° 37.3	02.3	166°03.8 · · 3	IVIAINAD	13°26.8	15°21.8
4	$216^{\circ}17.7$	$242^{\circ}20.2$	11.5	22°58.0	59.1	10°39.8	02.2	181°06.1 3	9.0 Feb 24 Sat	SHA	Mer.pass
5	231°20.2	257°19.7	10.5	38°00.8	59.0	25°42.4	02.2		9.1 Venus	28°39.0	11:49
6	246°22.7	272°19.1	\$12°09.4	53°03.6	S01°58.8	40°45.0	S09°02.1	211°10.6 N11°3			02:37 03:26
7 8	261°25.1 276°27.6	287°18.6 302°18.1	08.3 07.2	68°06.5 83°09.3	58.6 58.4	55° 47.6 70° 50.1	02.1 02.0		9.3 Jupiter 9.4 Saturn	154° 16.7 324° 58.8	16:01
9	276 27.6 291°30.0	302 18.1 317° 17.5	06.1	98°12.1	58.3	70 50.1 85°52.7	• • 02.0	256°17.4 · · · 3	9 4		
10	306°32.5	332°17.0	05.0	113°14.9	58.1	100° 55.3	01.9		95 Feb 25 Sun	SHA	Mer.pass
11	321°35.0	$347^{\circ}16.5$	04.0	128°17.7	57.9	115°57.9	01.9		9.6 Venus	27°26.6 166°31.4	11:50
12	336°37.4	2°15.9	S12°02.9	143°20.5	S01°57.8	131°00.4	S09°01.8	301°24.2 N11°3	I Illniter		02:33 03:22
13	351°39.9	17°15.4	01.8	158°23.3	57.6	146°03.0	01.8		9.7 Saturn		15:57
14 15	6°42.4 21°44.8	32°14.9 47°14.3	12°00.7 11°59.6	173°26.1 188°28.9	57.4 •• 57.2	161°05.6 176°08.2	01.7 · · 01.7	331°28.7 3 346°31.0 · · 3	9.8	SHA	
16	36°47.3	62°13.8	58.5	203°31.8	57.2	191° 10.8	01.6		0.0 Feb 20 Mon		Mer.pass 11:51
17	51°49.8	$77^{\circ}13.3$	57.4	218°34.6	56.9	206°13.3	01.6		0.1 Mars		02:28
18	66°52.2	92°12.8	S11°56.4	233°37.4	S01°56.7	221°15.9	S09°01.5	31°37.7 N11°4	0.1 Jupiter		03:17
19	81°54.7	107°12.2	55.3	248°40.2	56.5	236° 18.5	01.5		0.2 Saturn	324°49.2	15:54
20 21	96°57.2 111°59.6	122°11.7 137°11.2	54.2 •• 53.1	263°43.0 278°45.9	56.4 •• 56.2	251°21.1 266°23.7	01.4 · · 01.3	61°42.2 4 76°44.5 • • 4	0.3 Horizor	tal parallax	
22	111 59.0 127°02.1	157 11.2 152° 10.6	52.0	276 45.9 293°48.7	56.0	281°26.2	01.3		0.5	Venus:	0.1
23	142°04.5	167° 10.1	50.9	308°51.5	55.8	296°28.8	01.2		0.5	Mars:	0.2
Mer n	ass. 13:33	ν -0.5' d-1	1′ m-3.89	ν2.8′ d-0.	2′ m-0 72	ν2 6′ d-Ω	1′ m-2.29	ν2.3' d0.1' m0.	38		
р			0.00					30.10.			

h	Su			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.9	S09°26.0	60°30.1	7.5'	N24°13.3	-3.8'	57.2'
1	191°42.0	25.1	74°56.6	7.5'	24°09.5	-4.0'	57.2'
2	206°42.1	24.2	89°23.1	7.5'	24°05.5	-4.1'	57.3'
3	221°42.2	• • 23.3	103°49.6	7.4'	24°01.4	-4.3'	57.3'
4	236°42.3 251°42.4	22.3 21.4	118°16.0 132°42.4	7.4'	23°57.1 23°52.7	-4.4' -4.5'	57.3'
5 6	251 42.4 266°42.5	509°20.5	132 42.4 147°08.9	7.4' 7.4'	23 52.7 N23°48.2	-4.5 -4.7'	57.4' 57.4'
7	281°42.6	19.6	161°35.3	7.4	23°43.5	-4.7 -4.8	57.4°
8	296°42.7	18.6	176°01.7	7.4	23°38.7	-5.0'	57.5'
9	311°42.8	• • 17.7	190°28.1	7.4'	23°33.7	-5.1'	57.5'
10	326°42.9	16.8	204°54.5	7.4'	23°28.6	-5.3'	57.6'
11	341°43.0	15.9	219°20.9	7.4'	23°23.3	-5.4'	57.6'
12	356°43.0 11°43.1	S09°14.9 14.0	233°47.3 248°13.6	7.4'	N23°17.9 23°12.3	-5.6'	57.6'
13 14	26°43.2	14.0	248°13.6 262°40.0	7.4' 7.4'	23°12.3	-5.7' -5.9'	57.7' 57.7'
15	41°43.3	. 12.2	277°06.4	7.4	23°00.7	-6.0'	57.7 57.8'
16	56°43.4	11.2	291°32.8	7.4'	22°54.7	-6.1	57.8'
17	71°43.5	10.3	305°59.2	7.4'	22°48.6	-6.3'	57.8'
18	86°43.6	S09°09.4	320°25.6	7.4'	N22°42.3	-6.4'	57.9'
19	101°43.7	08.4	334°51.9	7.4'	22°35.9	-6.6'	57.9'
20	116°43.8	07.5	349°18.3	7.4'	22°29.3	-6.7'	58.0'
21 22	131°43.9 146°44.0	· · 06.6 05.7	3°44.7 18°11.1	7.4' 7.4'	22°22.6 22°15.7	-6.9' -7.0'	58.0' 58.0'
23	146°44.0 161°44.1	05.7 04.7	18°11.1 32°37.5	7.4°	22°15.7 22°08.7	-7.0° -7.1'	58.0° 58.1'
23			J2 J1.J			.1.1	55.1
	SD = 16.2'	d = -0.9'		S	D = 15.6'		
Sun	GHA 176°44.2	Dec \$09°03.8	GHA 47°04.0	ν 7.4'	Dec N22°01.5	d 7.2'	HP
0 1	176°44.2 191°44.3	509°03.8 02.9	47°04.0 61°30.4	7.4° 7.4°	N22°01.5 21°54.3	-7.3' -7.4'	58.1' 58.2'
2	206°44.4	01.9	75°56.8	7.4	21°46.8	-7.4°	58.2'
3	221°44.5	• • 01.0	90°23.3	7.5'	21°39.3	-7.7'	58.2'
4	236°44.6	$09^{\circ}00.1$	104°49.7	7.5'	21°31.5	-7.9'	58.3'
5	251°44.7	08°59.1	119°16.2	7.5'	21°23.7	-8.0'	58.3'
6	266°44.8 281°44.9	S08° 58.2	133°42.7 148°09.2	7.5'	N21°15.7 21°07.6	-8.1'	58.4'
7 8	281 44.9 296°45.0	57.3 56.4	148°09.2 162°35.7	7.5' 7.5'	21°07.6 20°59.3	-8.3' -8.4'	58.4' 58.4'
9	311°45.1	55.4	177°02.2	7.5'	20°50.9	-8.5'	58.5
10	326°45.2	54.5	191°28.7	7.6'	20°42.4	-8.7'	58.5'
11	341°45.3	53.6	205°55.3	7.6'	20°33.7	-8.8'	58.6'
12	356°45.4	S08°52.6	220°21.9	7.6'	N20°24.9	-8.9'	58.6'
13	11°45.5 26°45.6	51.7 50.8	234°48.5 249°15.1	7.6' 7.6'	20°15.9 20°06.8	-9.1' -9.2'	58.6' 58.7'
14 15	20 45.0 41°45.7	49.8	249 15.1 263°41.7	7.6'	20 00.8 19°57.6	-9.2 -9.3'	58.7'
16	56°45.8	48.9	278°08.4	7.7'	19°48.3	-9.5'	58.8'
17	71°45.9	48.0	292°35.0	7.7'	19°38.8	-9.6'	58.8'
18	86°46.0	S08°47.0	307°01.7	7.7'	N19°29.2	-9.7'	58.8'
19	101°46.1	46.1	321°28.4	7.7'	19° 19.5	-9.9'	58.9'
20	116°46.2 131°46.3	45.2 •• 44.2	335°55.2 350°21.9	7.8' 7.8'	19°09.6 18°59.6	-10.0' -10.1'	58.9' 59.0'
21 22	131 46.3 146°46.5	43.3	350 21.9 4°48.7	7.8'	18° 49.5	-10.1 -10.3'	59.0'
23	161°46.6	42.4	19°15.5	7.8'	18° 39.2	-10.4	59.0'
	SD = 16.2'	d = -0.9'			D = 15.9'		
N4	GHA	D	GHA		D	d	HP
Mon 0	GПА 176°46.7	Dec \$08°41.4	33°42.3	ν 7.8'	Dec N18° 28.8	-10.5'	пР 59.1'
1	191°46.8	40.5	48°09.2	7.9'	18° 18.3	-10.6'	59.1
2	206°46.9	39.5	$62^{\circ}36.0$	7.9'	18°07.7	-10.8'	59.1'
3	221°47.0	• • 38.6	77°02.9	7.9'	17°56.9	-10.9'	59.2'
4	236°47.1	37.7	91°29.9	7.9'	17°46.1	-11.0'	59.2'
5 6	251°47.2 266°47.3	36.7 \$08°35.8	105°56.8 120°23.8	8.0' 8.0'	17°35.1 N17°24.0	-11.1' -11.2'	59.3' 59.3'
7	281°47.4	34.9	120 23.8 134°50.8	8.0'	17° 12.7	-11.2	59.3'
8	296°47.5	33.9	149°17.8	8.1'	17°01.4	-11.5'	59.4'
9	311°47.6	• • 33.0	163°44.9	8.1'	16°49.9	-11.6'	59.4'
10	326°47.7	32.1	178°11.9	8.1'	16°38.3	-11.7'	59.4'
11	341°47.8	31.1 \$08°30.2	192°39.0	8.1'	16°26.6	-11.8'	59.5'
12 13	356°47.9 11°48.0	508°30.2 29.2	207°06.2 221°33.3	8.2' 8.2'	N16°14.8 16°02.9	-11.9' -12.0'	59.5' 59.5'
14	26°48.2	29.2	221 33.3 236°00.5	8.2'	16 02.9 15°50.9	-12.1'	59.5'
15	41°48.3	27.4	250°27.7	8.2'	15°38.7	-12.3'	59.6'
16	56°48.4	26.4	264°54.9	8.3'	15°26.5	-12.4'	59.7'
17	71°48.5	25.5	279°22.2	8.3'	15°14.1	-12.5'	59.7'
18 19	86°48.6 101°48.7	\$08°24.6 23.6	293°49.5 308°16.8	8.3' 8.3'	N15°01.7 14°49.1	-12.6' -12.7'	59.7' 59.8'
20	101°48.7 116°48.8	23.6	308° 16.8 322° 44.2	8.4	14° 49.1 14° 36.4	-12.7' -12.8'	59.8'
21	131°48.9	21.7	337°11.5	8.4	14°23.7	-12.9'	59.8'
22	146°49.0	20.8	351°38.9	8.4'	14° 10.8	-13.0'	59.9'
23	161°49.1	19.9	6°06.3	8.4'	13°57.8	-13.1'	59.9'
	SD = 16.1'	d = -0.9'		S	D = 16.1'		

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

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

		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	73-90%	
24	13:12	13:08	12:13	20:44	08:17		
25	13:03	12:58	12:13	21:40	09:12		
26	12:53	12:48	12:13	22:35	10:07		

February 27, 28, 01 UT (Tue., Wed., Thu.)

h	Aries	Ve	nus	Ma	ars	Jup	iter	Sati	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	157°07.0	182°09.6	S11°49.8	323°54.3	S01°55.6	311°31.4	509°01.2		N11°40.6			
1	172°09.5	197°09.1	48.7	338°57.2	55.5	326°34.0	01.1	136°53.5	40.7	Alpheratz	357°31.6	29° 15.2
2	187°11.9	212°08.5	47.6	354°00.0	55.3	341°36.6	01.1	151°55.8	40.8	Ankaa	353°04.3	-42°08.9
3	202°14.4	227°08.0	• • 46.5	9°02.8	• • 55.1	356°39.1	• • 01.0	166°58.0	• • 40.9	Schedar	349°27.5	56° 42.0
4	$217^{\circ}16.9$	242°07.5	45.4	24°05.6	54.9	11°41.7	01.0	182°00.3	40.9	Diphda	348°44.2	-17°49.7
5	232°19.3	257°07.0	44.3	39°08.5	54.7	26°44.3	00.9	197°02.6	41.0	Achernar	335°18.2	-57°05.5
6	247°21.8	272°06.4	S11°43.3	54°11.3	S01°54.6	41°46.9	S09°00.9	212°04.8	N11°41.1	Hamal	327°47.5	23°36.0
7	262°24.3	287°05.9	42.2	69°14.1	54.4	56° 49.5	8.00	$227^{\circ}07.1$	41.2	Polaris Acamar	312°20.8 315°09.4	89°23.4 -40°11.5
8	277°26.7	302°05.4	41.1	84°17.0	54.2	$71^{\circ}52.1$	00.7	242°09.3	41.3	Menkar	314°02.7	4° 12.1
9	292°29.2	317°04.9	• • 40.0	99°19.8	• • 54.0	86°54.7	• • 00.7	$257^{\circ}11.6$	• • 41.3	Mirfak	308°23.5	49°58.0
10	307°31.7	332°04.4	38.9	114°22.7	53.8	101°57.2	00.6	272°13.8	41.4	Aldebaran	290°35.7	16°34.0
11	322°34.1	347°03.8	37.8	129°25.5	53.7	116°59.8	00.6	287° 16.1	41.5	Rigel	281°00.6	-8° 10.3
12	337°36.6	2°03.3	S11°36.7	144°28.3	S01°53.5	132°02.4	S09°00.5	302°18.4	N11°41.6	Capella	280°16.8	46°01.7
13	352°39.0	17°02.8	35.6	159°31.2	53.3	147°05.0	00.5	317°20.6	41.7	Bellatrix	278°19.2	6°22.4
14	7°41.5	32°02.3	34.5	174°34.0	53.1	162° 07.6 177° 10.2	00.4	332°22.9	41.7	Elnath	277°57.5	28° 37.8
15 16	22°44.0 37°46.4	47°01.8 62°01.2	· · 33.4 32.3	189°36.9 204°39.7	•• 52.9 52.7	177 10.2 192°12.7	· · 00.4 00.3	347°25.1 2°27.4	· · 41.8 41.9	Alnilam	275°34.2	-1°11.2
17	52°48.9	77°00.7	31.2	204 39.7 219°42.6	52.7 52.5	207° 15.3	00.3	2 27.4 17°29.6	41.9	Betelgeuse	270°48.3	7°24.6
18	67°51.4	92°00.2	\$11°30.1	234° 45.4	S01°52.4	207 13.3 222° 17.9	S09°00.2	32°31.9	N11°42.1	Canopus	263°50.6	-52°43.0
19	82°53.8	106°59.7	29.0	249°48.3	52.2	237° 20.5	00.1	47°34.1	42.1	Sirius	258°23.1	-16°45.7
20	97°56.3	121°59.2	27.9	264°51.1	52.0	252°23.1	00.1	62°36.4	42.2	Adhara	255°03.0	-29°01.0
21	112°58.8	136°58.6	26.8	279°54.0	51.8	267°25.7	00.0	77°38.7	42.3	Procyon	244°47.1	5°08.8
22	128°01.2	151°58.1	25.7	294°56.8	51.6	282°28.3	09°00.0	92°40.9	42.4	Pollux	243°12.9	27°57.2
23	143°03.7	166°57.6	24.6	309°59.7	51.4	297°30.9	08°59.9	107°43.2	42.5	Avior	234°12.7	-59°36.5
										Suhail	222°43.4	-43°33.3
ivler.p	ass. 13:29	ν -0.5′ d -1	1′ m-3.89	ν 2.8′ d-0.	∠ m-U./5	ν 2.6′ d-0.	ı m-2.30	ν 2.3′ d0.	m0.38	Miaplacidus	221°36.5	-69°50.5 -8°47.4
										Alphard Regulus	217°44.1 207°30.6	-8 47.4 11°49.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.4	61°35.4
0	$158^{\circ}06.1$	181°57.1	S11°23.4	325°02.5	S01°51.2	312°33.4	S08°59.9	122°45.4	N11°42.5	Denebola	182°21.2	14° 24.3
1	173°08.6	196°56.6	22.3	340°05.4	51.0	327°36.0	59.8	$137^{\circ}47.7$	42.6	Gienah	175°39.8	-17° 42.4
2	$188^{\circ}11.1$	211°56.1	21.2	$355^{\circ}08.2$	50.9	342°38.6	59.7	$152^{\circ}49.9$	42.7		173°55.5	-63° 15.7
3	203°13.5	226°55.5	• • 20.1	$10^{\circ}11.1$	• • 50.7	357°41.2	• • 59.7	$167^{\circ}52.2$	• • 42.8	Gacrux	171°47.2	-57° 16.6
4	218°16.0	241°55.0	19.0	25°14.0	50.5	12°43.8	59.6	182°54.4	42.9	Alioth	166°09.7	55°47.8
5	233°18.5	256° 54.5	17.9	40°16.8	50.3	27° 46.4	59.6	197°56.7	42.9	Spica	158°18.5	-11° 19.0
6	248°20.9	271°54.0	S11°16.8	55°19.7	S01°50.1	42°49.0	S08°59.5	212°58.9	N11°43.0	Alkaid	152°49.1	49°09.7
7	263°23.4	286°53.5	15.7	70°22.6	49.9	57°51.6	59.5	228°01.2	43.1	Hadar	148°30.7	-60°30.7
8	278°25.9	301°53.0	14.6	85°25.4	49.7	72°54.2	59.4	243°03.4	43.2	Menkent	$147^{\circ}53.3$	-36°30.8
9	293°28.3	316°52.5	• • 13.5	100°28.3	• • 49.5	87°56.8	• • 59.3	258°05.7	• • 43.3	Arcturus	$145^{\circ}44.7$	19°01.6
10 11	308°30.8 323°33.3	331°52.0 346°51.4	12.4 11.3	115°31.2 130°34.0	49.3 49.1	102°59.4 118°01.9	59.3 59.2	273°08.0 288°10.2	43.3 43.4	Rigil Kent.	139°35.2	-60° 57.2
12	323 33.3 338°35.7	1°50.9	\$11.3 \$11°10.2	145°36.9	501°48.9	133°04.5	59.2 \$08°59.2	303°12.5	N11°43.5	Kochab	137°19.6	74°01.7
13	353°38.2	16°50.4	09.0	160°39.8	48.7	148° 07.1	59.1	318° 14.7	43.6	Zuben'ubi	136°52.1	-16°09.8
14	8°40.6	31°49.9	07.9	175°42.7	48.5	163°09.7	59.1	333° 17.0	43.7	Alphecca	126°00.8	26°36.7
15	23°43.1	46°49.4	06.8	190°45.5	• 48.3	178° 12.3	• • 59.0	348° 19.2	• • 43.8	Antares	112°11.7	-26°29.7
16	38°45.6	61°48.9	05.7	205°48.4	48.2	193° 14.9	58.9	3°21.5	43.8	Atria	107°02.9	-69°04.4
17	53°48.0	76°48.4	04.6	220°51.3	48.0	208° 17.5	58.9	18°23.7	43.9	Sabik	101°59.0	-15°45.6
18	68°50.5	91°47.9	S11°03.5	235°54.2	S01°47.8	223°20.1	S08°58.8	33°26.0	N11°44.0	Shaula	96°05.9	-37°07.3 12°32.2
19	83°53.0	106°47.4	02.4	250°57.0	47.6	238°22.7	58.8	48°28.2	44.1	Rasalhague	95°55.5 90°40.8	51° 28.8
20	98°55.4	121°46.9	01.2	265°59.9	47.4	253°25.3	58.7	63°30.5	44.2	Eltanin Kaus Aust.	83°28.2	-34°22.0
21	113°57.9	136°46.3	11°00.1	281°02.8	• • 47.2	268°27.9	• • 58.6	78°32.7	• • 44.2	Vega	80°31.1	38° 48.5
22	129°00.4	151°45.8	10°59.0	296°05.7	47.0	283°30.5	58.6	93°35.0	44.3	Nunki	75°43.8	-26° 15.5
23	144°02.8	166°45.3	57.9	311°08.6	46.8	298°33.1	58.5	108°37.2	44.4	Altair	61°56.9	8°56.7
Mer n	ass. 13:25	ν -0.5' d-1	1′ m-3.89	v2 9' d-0	2′ m-0.78	v2 6' d-0	1' m-2.30	$\nu 2.3' d0.$	1′ m0 38	Peacock	53°01.0	-56°38.2
- Wici.p	433. 13.23	V 0.5 U 1		ν2.5 d 0.		ν2.0 d 0.	1 111 2.50	ν2.5 do.	1110.50	Deneb	49°23.8	45°23.0
										Enif	33°35.8	10°00.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.3	-46°49.1
0	159°05.3	181°44.8	\$10°56.8	326°11.5	S01°46.6	313°35.7	S08°58.5		N11°44.5	Fomalhaut	15°11.2	-29°28.1
1 2	174°07.8 189°10.2	196°44.3 211°43.8	55.7 54.5	341°14.3 356°17.2	46.4 46.2	328°38.3 343°40.9	58.4 58.3	138°41.7 153°44.0	44.6 44.6	Scheat	13°42.2	28° 14.5
3	204°12.7	211 43.6 226°43.3	53.4	11°20.1	• • 46.0	358° 43.4	58.3	168° 46.2	• • 44.7	Markab	13°26.8	15°21.8
4	219°15.1	241°42.8	52.3	26°23.0	45.8	13° 46.0	58.2	183°48.5	44.7	Feb 27 Tue	SHA	Mer.pass
5	234°17.6	256° 42.3	51.2	41°25.9	45.6	28° 48.6	58.2	198° 50.7	44.9	Venus	25°02.6	11:52
6	249°20.1	271°41.8	\$10°50.1	56°28.8	S01°45.4	43°51.2	S08°58.1	213°53.0	N11°45.0	I	166°47.3	02:24
7	264°22.5	286°41.3	48.9	71°31.7	45.2	58° 53.8	58.0	228°55.2	45.1	Jupiter	154°24.4	03:13
8	279°25.0	301°40.8	47.8	86°34.6	45.0	73° 56.4	58.0	243°57.5	45.1	Saturn	324°44.3	15:50
9	294°27.5	316°40.3	46.7	101°37.5	• • 44.8	88° 59.0	• • 57.9	258° 59.7	• • 45.2			
10	309°29.9	331°39.8	45.6	116°40.4	44.5	104°01.6	57.9	274°02.0	45.3	Feb 28 Wed	SHA	Mer.pass
11	324°32.4	346°39.3	44.5	131°43.3	44.3	119°04.2	57.8	289°04.2	45.4	Venus	23°50.9	11:53
12	339°34.9	1°38.8	S10°43.3	146°46.2	S01°44.1	134°06.8	S08°57.7	304°06.5	N11°45.5	1	166°56.4	02:19 03:09
13	354°37.3	16°38.3	42.2	161°49.1	43.9	149°09.4	57.7	319°08.7	45.5	Saturn	154°27.3 324°39.3	15:47
14	9°39.8	31°37.8	41.1	176°52.0	43.7	164° 12.0	57.6	334°11.0	45.6	Jatuin	J2+ J9.J	13.41
15	24°42.2	46°37.3	• • 40.0	191°54.9	• • 43.5	179°14.6	• • 57.6	349° 13.2	• • 45.7	Mar 01 Thu	SHA	Mer.pass
16	39°44.7	61°36.8	38.8	206°57.8	43.3	194° 17.2	57.5	4° 15.5	45.8	Venus	22°39.5	11:53
17	54°47.2	76°36.3	37.7	222°00.7	43.1	209° 19.8	57.4	19° 17.7	45.9		167°06.2	02:15
18	69°49.6	91°35.8	\$10°36.6	237°03.6	S01°42.9	224°22.4	S08°57.4	34°20.0	N11°45.9		154°30.4	03:05
19	84°52.1	106°35.3	35.5	252°06.5	42.7	239°25.0	57.3	49°22.2	46.0	Saturn	324°34.2	15:43
20	99°54.6	121°34.8	34.3	267°09.4	42.5	254°27.6	57.3	64°24.5	46.1	Horizont	al parallax	
21 22	114°57.0 129°59.5	136°34.3 151°33.8	· · 33.2 32.1	282°12.4 297°15.3	· · 42.3 42.1	269°30.2 284°32.8	· · 57.2 57.1	79°26.7 94°29.0	· · 46.2 46.3	1.0.12011	Venus:	0.1
22	129 59.5 145°02.0	151 33.8 166°33.3	30.9	297 15.3 312°18.2	42.1 41.9	284 32.8 299°35.4	57.1 57.1	94 29.0 109°31.2	46.3 46.4		Mars:	0.2
										L		-
Mer.p	ass. 13:21	ν -0.5 $'$ d-1	1′ m-3.89	ν 2.9′ d-0.	2′ m-0.81	ν 2.6′ d-0.	1′ m-2.31	ν 2.3′ d0.	1′ m0.38			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.3	S08°18.9	20°33.8	8.5'	N13°44.7	-13.2'	59.9'
1 2	191°49.4 206°49.5	18.0 17.0	35°01.3 49°28.8	8.5' 8.5'	13°31.6 13°18.3	-13.3' -13.4'	60.0' 60.0'
3	200 49.5 221°49.6	16.1	63°56.3	8.6'	13°04.9	-13.4'	60.0'
4	236°49.7	15.2	$78^{\circ}23.8$	8.6'	12°51.5	-13.5'	60.0'
5	251°49.8	14.2	92°51.4	8.6'	12°38.0	-13.6'	60.1'
6 7	266°49.9 281°50.0	S08° 13.3 12.3	107°19.0 121°46.6	8.6' 8.6'	N12°24.3 12°10.6	-13.7' -13.8'	60.1' 60.1'
8	296°50.1	11.4	136° 14.3	8.7'	11°56.8	-13.0' -13.9'	60.2
9	311°50.3	• • 10.4	$150^{\circ}42.0$	8.7'	11°42.9	-14.0'	60.2'
10	326°50.4 341°50.5	09.5	165°09.7 179°37.4	8.7'	11°28.9 11°14.9	-14.1' -14.1'	60.2'
11 12	341 50.5 356°50.6	08.6 S 08°07.6	179 37.4 194°05.1	8.7' 8.8'	N11°00.8	-14.1 -14.2'	60.2' 60.3'
13	11°50.7	06.7	208° 32.9	8.8'	10°46.5	-14.3'	60.3
14	26°50.8	05.7	223°00.7	8.8'	10°32.2	-14.4'	60.3'
15 16	41°50.9 56°51.1	· · 04.8 03.8	237°28.5 251°56.3	8.8' 8.9'	10°17.9 10°03.4	-14.4' -14.5'	60.4' 60.4'
17	71°51.2	02.9	266°24.2	8.9'	09°48.9	-14.6'	60.4
18	86°51.3	S08°02.0	280°52.0	8.9'	N09°34.3	-14.7'	60.4'
19	101°51.4	01.0	295°19.9	8.9'	09°19.7	-14.7'	60.5
20 21	116°51.5 131°51.6	08°00.1 07°59.1	309°47.9 324°15.8	8.9' 8.9'	09°05.0 08°50.2	-14.8' -14.9'	60.5' 60.5'
22	146°51.7	58.2	338°43.7	9.0'	08°35.3	-14.9'	60.5
23	161°51.9	57.2	353°11.7	9.0'	08°20.4	-15.0'	60.6'
	SD = 16.1'	d = -0.9'		S	D = 16.3'		
\\/a=1	CUA	Das	CUA		Das		μn
Wed 0	GHA 176°52.0	Dec 507° 56.3	GHA 7°39.7	u 9.0'	Dec N08°05.4	<i>d</i> −15.0'	HP 60.6'
1	191°52.1	55.3	22°07.7	9.0'	07°50.4	-15.1'	60.6'
2	206°52.2	54.4	36° 35.7	9.0'	07°35.3	-15.1'	60.6'
3 4	221°52.3 236°52.4	· · 53.5 52.5	51°03.7 65°31.8	9.0' 9.1'	07°20.2 07°05.0	-15.2' -15.3'	60.6' 60.7'
5	250 52.4 251°52.6	51.6	79°59.8	9.1'	06°49.7	-15.3'	60.7'
6	266°52.7	S07°50.6	94°27.9	9.1'	N06°34.4	-15.4'	60.7'
7	281°52.8	49.7	108°56.0	9.1'	06°19.0	-15.4'	60.7'
8 9	296°52.9 311°53.0	48.7 •• 47.8	123°24.1 137°52.2	9.1' 9.1'	06°03.6 05°48.2	-15.4' -15.5'	60.7' 60.8'
10	326°53.2	46.8	152°20.3	9.1'	05°32.7	-15.5'	60.8'
11	341°53.3	45.9	$166^{\circ}48.4$	9.1'	05° 17.2	-15.6'	60.8'
12	356°53.4 11°53.5	S07°44.9	181°16.5 195°44.7	9.1'	N05°01.6 04°46.0	-15.6'	60.8'
13 14	26°53.6	44.0 43.0	195°44.7 210°12.8	9.2' 9.2'	04°46.0 04°30.3	-15.6' -15.7'	60.8' 60.8'
15	41°53.8	• • 42.1	224°41.0	9.2'	04°14.7	-15.7'	60.9'
16	56°53.9	41.1	239°09.2	9.2'	03°59.0	-15.7'	60.9'
17 18	71°54.0 86°54.1	40.2 S 07°39.2	253°37.3 268°05.5	9.2' 9.2'	03°43.2 N03°27.4	-15.8' -15.8'	60.9' 60.9'
19	101°54.2	38.3	282°33.7	9.2'	03°11.6	-15.8'	60.9
20	116°54.4	37.4	297°01.9	9.2'	02°55.8		60.9'
21	131°54.5	• • 36.4	311°30.1	9.2'	02°40.0	-15.9'	60.9'
22 23	146°54.6 161°54.7	35.5 34.5	325°58.2 340°26.4	9.2' 9.2'	02°24.1 02°08.2	-15.9' -15.9'	61.0' 61.0'
20	SD = 16.1'	d = -0.9'	J.0 20.4		D = 16.5'	20.5	01.0
Thu	GHA 176° 54 9	Dec S 07°33.6	GHA 354° 54.6	ν	Dec N01°52.3	d 15.0'	HP
0 1	176°54.8 191°55.0	32.6	354°54.6 9°22.8	9.2' 9.2'	01°52.3	-15.9' -15.9'	61.0' 61.0'
2	206°55.1	31.7	23°51.0	9.2'	01°20.4	-15.9'	61.0'
3	221°55.2	• • 30.7	38° 19.2	9.2'	01°04.5	-16.0'	61.0'
4 5	236°55.3 251°55.5	29.8 28.8	52° 47.3 67° 15.5	9.2' 9.2'	00°48.5 00°32.6	-16.0' -16.0'	61.0' 61.0'
6	266°55.6	507°27.9	81°43.7	9.2'	N00° 16.6	-16.0'	61.0'
7	281°55.7	26.9	$96^{\circ}11.9$	9.2'	N00°00.6	-16.0'	61.0'
8 9	296°55.8 311°55.9	25.9 •• 25.0	110°40.0 125°08.2	9.1' 9.1'	\$00°15.4 00°31.4	16.0' 16.0'	61.0' 61.0'
9 10	311 55.9 326 56.1	24.0	125°08.2 139°36.3	9.1'	00°31.4 00°47.3	16.0'	61.0'
11	341°56.2	23.1	154°04.4	9.1'	01°03.3	16.0'	61.1
12	356°56.3	S07°22.1	168° 32.6	9.1'	S01°19.3	16.0'	61.1'
13 14	11°56.4 26°56.6	21.2 20.2	183°00.7 197°28.8	9.1' 9.1'	01°35.3 01°51.2	16.0' 15.9'	61.1' 61.1'
15	41°56.7	19.3	211°56.9	9.1' 9.1'	01° 51.2 02° 07.2	15.9'	61.1
16	56°56.8	18.3	$226^{\circ}24.9$	9.1'	$02^{\circ}23.1$	15.9'	61.1'
17	71°56.9 86°57.1	17.4	240°53.0	9.0'	02°39.0 \$02°54.9	15.9'	61.1'
18 19	86°57.1 101°57.2	S07° 16.4 15.5	255°21.0 269°49.1	9.0' 9.0'	502°54.9 03°10.8	15.9' 15.9'	61.1' 61.1'
20	116°57.3	14.5	$284^{\circ}17.1$	9.0'	03°26.7	15.8'	61.1'
21	131°57.4	• • 13.6	298°45.1	9.0'	03°42.5	15.8'	61.1'
22 23	146°57.6 161°57.7	12.6 11.7	313°13.1 327°41.0	9.0' 8.9'	03°58.3 04°14.1	15.8' 15.8'	61.1' 61.1'
23			321 41.0			13.8	01.1
	SD = 16.1'	d = -0.9'		S	D = 16.6'		

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

١.	₋at.		Moonris	е		Moonse	t
	-at.	Tue	Wed	Thu	Tue	Wed	Thu
l N	1 72°	14:56	17:24	19:47	07:36	07:02	06:34
N	1 70°	15:14	17:29	19:41	07:16	06:53	06:34
	68°	15:27	17:33	19:37	07:00	06:46	06:34
	66°	15:38	17:36	19:34	06:47	06:40	06:34
	64°	15:48	17:39	19:31	06:36	06:35	06:34
	62°	15:56	17:42	19:28	06:27	06:31	06:34
	60°	16:02	17:44	19:26	06:19	06:27	06:34
l N	l 58°	16:08	17:46	19:24	06:12	06:24	06:34
	56°	16:13	17:48	19:22	06:06	06:20	06:34
	54°	16:18	17:49	19:21	06:00	06:18	06:34
	52°	16:22	17:50	19:19	05:55	06:15	06:34
	50°	16:26	17:52	19:18	05:50	06:13	06:34
	45°	16:34	17:54	19:15	05:40	06:08	06:34
l N	I 40°	16:41	17:57	19:13	05:32	06:04	06:34
	35°	16:47	17:59	19:11	05:24	06:00	06:34
	30°	16:52	18:00	19:09	05:18	05:57	06:34
	20°	17:01	18:03	19:06	05:07	05:51	06:34
N	10°	17:08	18:06	19:04	04:57	05:46	06:34
	0°	17:16	18:09	19:01	04:47	05:41	06:34
5	10°	17:23	18:11	18:59	04:38	05:36	06:33
	20°	17:30	18:14	18:57	04:28	05:31	06:33
	30°	17:39	18:17	18:54	04:16	05:24	06:33
	35°	17:44	18:19	18:52	04:09	05:21	06:33
	40°	17:50	18:21	18:51	04:01	05:17	06:33
	45°	17:56	18:23	18:49	03:52	05:12	06:33
5	50°	18:04	18:26	18:46	03:41	05:06	06:33
	52°	18:08	18:27	18:45	03:36	05:04	06:32
	54°	18:12	18:28	18:44	03:30	05:01	06:32
	56°	18:16	18:30	18:43	03:24	04:58	06:32
	58°	18:21	18:31	18:41	03:17	04:54	06:32
_ S	60°	18:26	18:33	18:40	03:08	04:50	06:32

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
Day	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-100%	
27	12:43	12:38	12:13	23:28	11:02		
28	12:32	12:26	12:12	-:-	11:55		
01	12:21	12:15	12:12	00:21	12:48		

March 02, 03, 04 UT (Fri., Sat., Sun.)

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Saturn		Stars	
Fri –	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec		SHA	Dec
0	160°04.4	181°32.8	S10°29.8	327°21.1	S01°41.6	314°38.0	S08°57.0	124°33.5 N11°46.4		JIIA	
1	175°06.9	196°32.3	28.7	342°24.0	41.4	329°40.6	57.0	139°35.7 46.5	Alpheratz	357°31.6	29°15.1
2	175 00.9 190°09.4	211° 31.8	27.6	357°26.9	41.4	344°43.2	56.9		Ankaa	353°04.3	-42°08.9
									Schedar	349°27.5	56°42.0
3	205°11.8	226°31.3	• • 26.4	12°29.9	• • 41.0	359°45.8	56.8		Diphda	348°44.2	-17°49.7
4	220°14.3	241°30.8	25.3	27°32.8	40.8	14°48.4	56.8	184° 42.5 46.8	Achernar	335°18.2	-57°05.5
5	235°16.7	256°30.3	24.2	42°35.7	40.6	29°51.1	56.7	199°44.7 46.9	Hamal	327°47.6	23°36.0
6	250°19.2	271°29.8	\$10°23.0	57°38.6	S01°40.4	44°53.7	S08°56.6	214°47.0 N11°46.9	Polaris	312°22.3	89°23.4
7	265°21.7	286°29.3	21.9	72°41.5	40.2	59°56.3	56.6	229°49.2 47.0	Acamar	315°09.4	-40°11.5
8	280°24.1	301°28.8	20.8	87°44.5	40.0	74°58.9	56.5	244°51.5 47.1	Menkar	314°02.7	4°12.1
9	295°26.6	316°28.4	• • 19.6	102°47.4	• • 39.7	90°01.5	• • 56.5	259°53.7 · · 47.2	Mirfak	308°23.5	49°58.0
10	310°29.1	331°27.9	18.5	117°50.3	39.5	105°04.1	56.4	274°56.0 47.3	Aldebaran	290°35.7	16°34.0
11	325°31.5	346°27.4	17.4	132°53.3	39.3	120°06.7	56.3	289°58.2 47.3	Rigel	281°00.6	-8°10.3
12	340°34.0	1°26.9	\$10° 16.2	147°56.2	S01°39.1	135°09.3	S08°56.3	305°00.5 N11°47.4	Capella	$280^{\circ}16.8$	46°01.7
13	355°36.5	16°26.4	15.1	162°59.1	38.9	150°11.9	56.2	320°02.7 47.5	Bellatrix	278°19.2	6°22.4
14	10°38.9	31°25.9	14.0	178°02.1	38.7	165°14.5	56.1	335°04.9 47.6	Elnath	277°57.5	28°37.8
15	25°41.4	46°25.4	• • 12.8	193°05.0	• • 38.4	180°17.1	56.1	350°07.2 · · 47.7	Alnilam	275°34.2	-1°11.2
16	40°43.8	61°24.9	11.7	208°07.9	38.2	195°19.7	56.0	5°09.4 47.8	Betelgeuse	270°48.3	7°24.6
17	55°46.3	76°24.4	10.5	223°10.9	38.0	210°22.3	56.0	20°11.7 47.8	Canopus	263°50.7	-52°43.0
18	70°48.8	91°23.9	\$10°09.4	238°13.8	S01°37.8	225°24.9	S08°55.9	35°13.9 N11°47.9	Sirius	258°23.1	-16°45.7
19	85°51.2	106°23.4	08.3	253°16.7	37.6	240°27.5	55.8	50°16.2 48.0	Adhara	255°03.0	-29°01.0
20	100°53.7	121°23.0	07.1	268°19.7	37.4	255°30.1	55.8	65°18.4 48.1	Procyon	244°47.1	5°08.8
21	115°56.2	136°22.5	•• 06.0	283°22.6	37.1	270° 32.8 285° 35.4	•• 55.7	80°20.7 · · 48.2	Pollux	243°13.0	27°57.2
22	130°58.6	151°22.0	04.9	298°25.6	36.9		55.6	95°22.9 48.3	Avior	234°12.8	-59°36.5
23	146°01.1	166°21.5	03.7	313°28.5	36.7	300°38.0	55.6	110°25.2 48.3	Suhail	222°43.4	-43°33.3
Mer.p	ass. 13:18	ν -0.5' d-1	1′ m-3.89	ν 2.9′ d-0.	2′ m-0.83	ν 2.6′ d-0	.1′ m-2.32	$\nu 2.2' \ d0.1' \ m0.38$	Miaplacidus	$221^{\circ}36.5$	-69°50.5
		-		-		-		-	Alphard	$217^{\circ}44.1$	-8°47.4
Cat.	CHV	CHA	Daa	CHV	Daa	CHA	Daa	CUA D	Regulus	207°30.6	11°49.2
Sat	GHA 161°02 6	GHA 181°21.0	Dec \$10°02.6	GHA	Dec \$01°26 5	GHA 215° 40 6	Dec	GHA Dec	Dubhe	193°36.4	61°35.4
0	161°03.6 176°06.0	181°21.0 196°20.5	\$10°02.6	328°31.5 343°34.4	S01°36.5	315°40.6 330°43.2	\$08°55.5 55.4	125°27.4 N11°48.4 140°29.7 48.5	Denebola	182°21.2	14°24.3
1 2	176°06.0 191°08.5	196°20.5 211°20.0	01.4 10°00.3	343°34.4 358°37.4	36.3 36.0	330°43.2 345°45.8	55.4 55.4	140° 29.7 48.5 155° 31.9 48.6	Gienah	175°39.8	-17°42.4
3									Acrux	172°55.5	-63°15.7
	206°11.0	226°19.5	09°59.1	13°40.3	35.8	0°48.4	55.3	170°34.1 · · 48.7	Gacrux	171°47.2	-57°16.6
4	221°13.4	241°19.1	58.0	28°43.2	35.6	15°51.0	55.3	185°36.4 48.7	Alioth	$166^{\circ}09.7$	55°47.8
5	236°15.9	256° 18.6	56.9	43°46.2	35.4 \$01°35.2	30°53.6	55.2	200°38.6 48.8 215°40.9 N11°48.9	Spica	$158^{\circ}18.5$	-11°19.0
6	251°18.3	271°18.1	S09°55.7	58°49.2		45°56.2	S08°55.1		Alkaid	$152^{\circ}49.1$	49°09.7
7	266°20.8	286°17.6	54.6	73°52.1	34.9	60°58.8	55.1	230°43.1 49.0	Hadar	148°30.6	-60°30.7
8	281°23.3 296°25.7	301°17.1	53.4	88°55.1	34.7	76°01.5	55.0	245° 45.4 49.1	Menkent	$147^{\circ}53.3$	-36°30.8
9		316°16.6	• • 52.3	103°58.0	• • 34.5	91°04.1	• • 54.9	260°47.6 · · 49.2 275°49.9 49.2	Arcturus	145°44.7	19°01.6
10	311°28.2 326°30.7	331°16.2	51.1	119°01.0 134°03.9	34.3	106°06.7	54.9		Rigil Kent.	$139^{\circ}35.1$	-60°57.2
11	341°33.1	346°15.7	50.0		34.0	121°09.3	54.8	290°52.1 49.3 305°54.3 N11°49.4	Kochab	$137^{\circ}19.6$	74°01.8
12		1°15.2	\$09°48.9	149°06.9	S01°33.8	136°11.9	S08°54.7		Zuben'ubi	$136^{\circ}52.1$	-16°09.8
13	356°35.6	16°14.7	47.7	164°09.9 179°12.8	33.6	151°14.5	54.7	320°56.6 49.5	Alphecca	$126^{\circ}00.8$	26°36.7
14	11°38.1	31°14.2	46.6		33.4	166°17.1	54.6	335°58.8 49.6	Antares	$112^{\circ}11.7$	-26°29.7
15	26°40.5	46° 13.7 61° 13.3	• • 45.4	194°15.8	33.1	181° 19.7 196° 22.4	• • 54.5	351°01.1 · · 49.7	Atria	$107^{\circ}02.8$	-69°04.4
16 17	41°43.0		44.3 43.1	209°18.8	32.9 32.7	211°25.0	54.5 54.4	6°03.3 49.7 21°05.6 49.8	Sabik	101°58.9	-15°45.6
18	56°45.4	76°12.8	\$09° 42.0	224°21.7	S01°32.4		54.4 \$08°54.3		Shaula	96°05.9	-37°07.3
	71°47.9 86°50.4	91°12.3		239°24.7 254°27.7		226°27.6 241°30.2		36°07.8 N11°49.9 51°10.0 50.0	Rasalhague	95°55.5	12°32.2
19	101°52.8	106°11.8	40.8		32.2		54.3		Eltanin	90°40.8	51°28.8
20	101 52.8 116°55.3	121°11.3 136°10.9	39.7 •• 38.5	269°30.6 284°33.6	32.0 · · 31.8	256° 32.8 271° 35.4	54.2 •• 54.1	66°12.3 50.1 81°14.5 · · 50.2	Kaus Aust.	83°28.2	-34°22.0
21 22	131°57.8	150°10.9	37.4	299°36.6	31.5	286°38.0	54.1	81°14.5 · · 50.2 96°16.8 50.2	Vega	80°31.1	38°48.4
23	131 37.8 147°00.2	166°09.9	36.2	314°39.5	31.3	301°40.7	54.1	111°19.0 50.3	Nunki	75°43.8	-26°15.5
23	147 00.2			314 39.3	31.3	301 40.7	34.0	111 19.0 50.5	Altair	61°56.9	8°56.7
Mer.p	ass. 13:14	ν -0.5' d-1	1' m-3.89	$\nu 2.9' \ d-0.$	2′ m-0.86	ν 2.6′ d-0.	.1' m-2.32	$\nu 2.2' \ d0.1' \ m0.38$	Peacock	53°01.0	-56°38.2
									Deneb	49°23.8	45°23.0
Ç	GHA	GHA	Doc	GHA	Doc	GHA	Doc	GHA Dec	Enif	33°35.8	10°00.5
Sun 0	GHA 162°02.7	181°09.4	Dec S 09°35.1	329°42.5	Dec 501°31.1	316°43.3	Dec \$08°53.9	126°21.3 N11°50.4	Al Na'ir	27°29.2	-46°49.1
1	102 02.7 177°05.2	196°08.9	33.9	344° 45.5	30.8	310 45.5 331°45.9	53.9	141°23.5 50.5	Fomalhaut	15°11.2	-29°28.0
2	177 05.2 192°07.6	211°08.5	32.8	359°48.5	30.6	346°48.5	53.9 53.8	141 25.5 50.5 156° 25.7 50.6	Scheat	13°42.2	28°14.5
3	207°10.1	211 08.5 226°08.0	31.6	14°51.4	30.4	1°51.1	53.7	171°28.0 · · 50.7	Markab	13°26.8	15°21.8
4	207 10.1 222°12.6	241°07.5	30.5	29°54.4	30.4	16°53.7	53.7	186°30.2 50.7	Mar 02 Fri	SHA	Mer.pass
5	237°15.0	256° 07.0	29.3	44° 57.4	29.9	31°56.4	53.6	201°32.5 50.8	Venus	21°28.4	11:54
6	252°17.5	271°06.6	\$09° 28.1	60°00.4	S01°29.7	46°59.0	508°53.5	216°34.7 N11°50.9		167°16.7	02:10
7	267°19.9	286°06.1	27.0	75°03.4	29.5	62°01.6	53.5	231°37.0 51.0		154°33.6	03:01
8	282°22.4	301°05.6	25.8	90°06.4	29.3	77°04.2	53.4	246°39.2 51.1	Saturn	324°29.1	15:39
9	297°24.9	316°05.1	• • 24.7	105°09.3	29.0	92°06.8	• • 53.3	261°41.4 · · 51.2			
10	312°27.3	331°04.7	23.5	120°12.3	28.8	107°09.5	53.3	276°43.7 51.3	Mar 03 Sat	SHA	Mer.pass
11	327°29.8	346°04.2	22.4	135°15.3	28.5	122° 12.1	53.2	291°45.9 51.3	Venus	20°17.4	11:55
12	342°32.3	1°03.7	S09°21.2	150°18.3	S01°28.3	137° 14.7	508°53.1	306°48.2 N11°51.4		167°27.9	02:05
13	357°34.7	16°03.2	20.1	165°21.3	28.0	152° 17.3	53.1	321°50.4 51.5		154°37.0	02:57
14	12°37.2	31°02.8	18.9	180°24.3	27.8	167° 19.9	53.0	336°52.6 51.6	Saturn	324°23.8	15:36
15	27°39.7	46°02.3	• • 17.7	195°27.3	• • 27.6	182°22.5	• • 52.9	351°54.9 · · 51.7	Mar 04 Sun	SHA	Mer.pass
16	42°42.1	61°01.8	16.6	210°30.3	27.3	197°25.2	52.9	6°57.1 51.8	Venus	эпа 19°06.7	11:56
17	57°44.6	76°01.4	15.4	225°33.3	27.3	212°27.8	52.8	21°59.4 51.8		19 06.7 167°39.8	02:01
18	72°47.1	91°00.9	S09°14.3	240°36.3	S01°26.9	212 27.0 227°30.4	S08°52.7	37°01.6 N11°51.9		167 39.8 154°40.6	02:01
19	87°49.5	106°00.4	13.1	255°39.3	26.6	242°33.0	52.7	52°03.8 52.0		324° 18.6	15:32
20	102°52.0	120° 59.9	11.9	270°42.3	26.4	257° 35.7	52.6	67°06.1 52.1	Saturfi	J27 10.U	15.52
21	117°54.4	135°59.5	. 10.8	285°45.3	26.1	272°38.3	52.5	82°08.3 · · 52.2	Horizont	al parallax	
22	132°56.9	150°59.0	09.6	300°48.3	25.9	287° 40.9	52.5	97°10.6 52.3		Venus:	0.1
23	147°59.4	165°58.5	08.5	315°51.3	25.7	302°43.5	52.4	112°12.8 52.3		Mars:	0.2
ivier.p	bass. 13:10	ν -0.5' a -1	2′ m-3.89	ν s.0° a -0.	2′ m-0.89	ν 2.0° a -0.	.1′ m-2.33	ν2.2' d0.1' m0.39			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.8	S07°10.7	342°09.0	8.9'	504°29.9	15.7'	61.1'
1	191°58.0	09.8	356°36.9	8.9'	04°45.6	15.7'	61.1'
2	206°58.1	8.80	11°04.8	8.9'	05°01.3	15.7'	61.1'
3	221°58.2	• • 07.8	25°32.7	8.9'	05° 17.0	15.6'	61.0'
4 5	236°58.3 251°58.5	06.9 05.9	40°00.5 54°28.4	8.8' 8.8'	05°32.6 05°48.2	15.6' 15.6'	61.0' 61.0'
6	251 58.5 266°58.6	507°05.0	54 28.4 68°56.2	8.8'	506°03.8	15.5'	61.0'
7	281°58.7	04.0	83°24.0	8.8'	06° 19.3	15.5'	61.0'
8	296°58.9	03.1	97°51.7	8.7'	06°34.8	15.4'	61.0'
9	311°59.0	• • 02.1	112°19.5	8.7'	06°50.2	15.4'	61.0'
10	$326^{\circ}59.1$	01.2	126°47.2	8.7'	07°05.6	15.3'	61.0'
11	341°59.2	07°00.2	141°14.8	8.7'	07°20.9	15.3'	61.0'
12	356°59.4	S06°59.2	155°42.5	8.6'	507°36.2	15.2'	61.0'
13	11°59.5 26°59.6	58.3 57.3	170°10.1 184°37.7	8.6' 8.6'	07°51.5 08°06.6	15.2' 15.1'	61.0' 61.0'
14 15	20 59.0 41°59.8	56.4	184 37.7 199°05.3	8.5'	08 06.6 08°21.8	15.1'	61.0
16	56°59.9	55.4	213°32.8	8.5'	08°36.8	15.0'	60.9'
17	72°00.0	54.5	228°00.3	8.5'	08°51.8	14.9'	60.9
18	87°00.1	S06°53.5	242°27.8	8.4'	S09°06.8	14.9'	60.9'
19	102°00.3	52.5	256°55.2	8.4'	09°21.7	14.8'	60.9'
20	117°00.4	51.6	271°22.6	8.4'	09°36.5	14.8'	60.9'
21	132°00.5	• • 50.6	285°50.0 300°17.3	8.3'	09°51.2	14.7'	60.9'
22 23	147°00.7 162°00.8	49.7 48.7	300°17.3 314°44.6	8.3' 8.3'	10°05.9 10°20.5	14.6' 14.5'	60.9' 60.9'
23			314 44.0			14.5	00.9
	SD = 16.1'	d = -1.0'		SI	D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°00.9	S06°47.8	329°11.9	8.2'	\$10°35.1	14.5'	60.8
1	192°01.1	46.8	343°39.1	8.2'	$10^{\circ}49.5$	14.4'	60.8'
2	207°01.2	45.8	358°06.3	8.2'	11°03.9	14.3'	60.8'
3	222°01.3	• • 44.9	12°33.5	8.1'	11°18.2	14.2'	60.8
4	237°01.5 252°01.6	43.9	27°00.6 41°27.6	8.1'	11°32.5 11°46.6	14.2'	60.8'
5 6	252°01.6 267°01.7	43.0 \$06°42.0	41°27.6 55°54.7	8.0' 8.0'	\$12°00.7	14.1' 14.0'	60.8' 60.7'
7	282°01.9	41.0	70°21.7	8.0'	12°14.7	13.9'	60.7
8	297°02.0	40.1	84°48.7	7.9'	12°28.6	13.8'	60.7'
9	312°02.1	• • 39.1	99°15.6	7.9'	12°42.4	13.7'	60.7'
10	327°02.3	38.2	113°42.5	7.8'	$12^{\circ}56.1$	13.6'	60.7'
11	342°02.4	37.2	128°09.3	7.8'	13°09.8	13.5'	60.6'
12	357°02.5	S06°36.2	142°36.1	7.8'	\$13°23.3	13.5'	60.6
13	12°02.7 27°02.8	35.3	157°02.9 171°29.6	7.7'	13°36.8 13°50.1	13.4'	60.6'
14 15	42°02.8	34.3 •• 33.4	171 29.0 185°56.3	7.7' 7.6'	13 50.1 14°03 4	13.3' 13.2'	60.6' 60.6'
16	57°03.1	32.4	200°22.9	7.6'	14° 16.5	13.1	60.5
17	72°03.2	31.4	214°49.5	7.6'	14°29.6	13.0'	60.5
18	87°03.3	S06°30.5	229°16.1	7.5'	S14°42.6	12.9'	60.5'
19	102°03.5	29.5	243°42.6	7.5'	14°55.4	12.8'	60.5
20	117°03.6	28.6	258°09.1	7.4'	15°08.2	12.6'	60.5
21	132°03.7 147°03.9	• • 27.6	272°35.5	7.4'	15°20.8 15°33.4	12.5'	60.4
22 23	147°03.9 162°04.0	26.6 25.7	287°01.9 301°28.3	7.4' 7.3'	15° 33.4 15° 45.8	12.4' 12.3'	60.4' 60.4'
23	SD = 16.1'	d = -1.0'			D = 16.6'	12.5	00.4
	<u>JD = 10.1</u>	<u>u = -1.0</u>			D = 10.0		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°04.2 192°04.3	\$06°24.7	315°54.6 330°20.9	7.3'	\$15°58.1 16°10.3	12.2'	60.4'
1 2	192°04.3 207°04.4	23.7 22.8	330°20.9 344°47.1	7.2' 7.2'	16° 10.3 16° 22.4	12.1' 12.0'	60.3' 60.3'
3	207 04.4 222°04.6	• • 21.8	359°13.3	7.1'	16° 34.4	11.9'	60.3
4	237°04.7	20.9	13°39.4	7.1	16°46.2	11.7'	60.3
5	252°04.8	19.9	28°05.5	7.1'	16°58.0	11.6'	60.2'
6	267°05.0	S06°18.9	42°31.6	7.0'	S17°09.6	11.5'	60.2'
7	282°05.1	18.0	56°57.6	7.0'	17°21.1	11.4'	60.2'
8	297°05.3 312°05.4	17.0	71°23.6	6.9'	17°32.5	11.3'	60.1'
9 10	312°05.4 327°05.5	· · 16.0 15.1	85°49.5 100°15.4	6.9' 6.9'	17°43.8 17°54.9	11.1' 11.0'	60.1' 60.1'
11	342°05.7	14.1	100 15.4 114°41.3	6.8	17 54.9 18°05.9	10.9	60.1
12	357°05.8	S06°13.1	129°07.1	6.8	\$18° 16.8	10.8	60.0'
13	12°05.9	12.2	143°32.9	6.7'	18°27.6	10.6'	60.0'
14	27°06.1	11.2	157°58.6	6.7'	18°38.2	10.5'	60.0'
15	42°06.2	• • 10.3	172°24.3	6.7'	18°48.7	10.4	60.0'
16	57°06.4 72°06.5	09.3	186°50.0 201°15.6	6.6'	18°59.1 19°09.3	10.2'	59.9'
17 18	72°06.5 87°06.6	08.3 \$06°07.4	201°15.6 215°41.2	6.6' 6.6'	19°09.3 \$19°19.4	10.1' 10.0'	59.9' 59.9'
19	102°06.8	06.4	215 41.2 230°06.8	6.5	19°29.4	9.8'	59.9 59.8'
20	117°06.9	05.4	244°32.3	6.5	19°39.2	9.7'	59.8'
21	132°07.1	• • 04.5	258°57.8	6.4'	19°48.9	9.6'	59.8'
22	147°07.2	03.5	273°23.2	6.4'	19°58.4	9.4'	59.7'
23	162°07.3	02.5	287°48.6	6.4'	20°07.9	9.3'	59.7'
	SD = 16.1'	d = -1.0'		SI	D = 16.5'		

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

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

		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	97-84%		
02	12:09	12:03	12:12	01:14	13:41			
03	11:56	11:50	12:12	02:08	14:35			
04	11:43	11:37	12:12	03:03	15:32			

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	163°01.8	180°58.1	S09°07.3	330°54.3	S01°25.4	317°46.1	508°52.3	127° 15.0	N11°52.4			
1	178°04.3	195°57.6	06.1	345°57.3	25.2	332° 48.8	52.2	142° 17.3	52.5	Alpheratz	357°31.6	29° 15.1
2	193°06.8	210°57.1	05.0	1°00.3	25.0	347°51.4	52.2	157° 19.5	52.6	Ankaa	353°04.3	-42°08.9
3	208°09.2	225°56.7	03.8	16°03.3	24.7	2°54.0	52.1	172°21.8	• • 52.7	Schedar	349°27.5	56°42.0
4	223°11.7	240°56.2	02.6	31°06.3	24.5	17°56.6	52.0	187°24.0	52.8	Diphda	348°44.2	-17°49.7
5	238°14.2	255°55.7	01.5	46°09.3	24.2	32°59.3	52.0	202°26.2	52.8	Achernar	335°18.3	-57°05.5
6	253°16.6	270°55.2	509°00.3	61°12.3	S01°24.0	48°01.9	S08°51.9	$217^{\circ}28.5$	N11°52.9	Hamal	327°47.6	23°36.0 89°23.4
7	268°19.1	285°54.8	$08^{\circ}59.1$	76°15.3	23.7	63°04.5	51.8	232°30.7	53.0	Polaris Acamar	312°23.5 315°09.5	-40°11.5
8	283°21.5	300°54.3	58.0	91°18.3	23.5	78°07.1	51.8	247°33.0	53.1	Menkar	314°02.8	4° 12.1
9	298°24.0	315°53.8	• • 56.8	106°21.4	• • 23.3	93°09.8	• • 51.7	262°35.2	• • 53.2	Mirfak	308°23.5	49°58.0
10	313°26.5	330°53.4	55.7	121°24.4	23.0	108° 12.4	51.6	277°37.4	53.3	Aldebaran	290°35.8	16°34.0
11	328°28.9	345°52.9	54.5	136°27.4	22.8	123°15.0	51.5	292°39.7	53.4	Rigel	281°00.6	-8°10.3
12	343°31.4	0°52.4	S08°53.3	151°30.4	S01°22.5	138° 17.6	S08°51.5	307°41.9	N11°53.4	Capella	280°16.8	$46^{\circ}01.6$
13	358°33.9 13°36.3	15°52.0 30°51.5	52.2	166°33.4 181°36.5	22.3	153°20.3 168°22.9	51.4 51.3	322°44.1 337°46.4	53.5	Bellatrix	278°19.2	6°22.4
14 15	28°38.8	45°51.1	51.0 •• 49.8	196°39.5	22.0 •• 21.8	183°25.5	51.3	352°48.6	53.6 •• 53.7	Elnath	277°57.5	28°37.8
16	43°41.3	60°50.6	48.6	211°42.5	21.5	103°23.3	51.2	7°50.9	53.8	Alnilam	275°34.2	$-1^{\circ}11.2$
17	58°43.7	75°50.1	47.5	226°45.5	21.3	213° 30.8	51.1	22°53.1	53.9	Betelgeuse	270°48.3	7°24.5
18	73°46.2	90°49.7	S08°46.3	241°48.5	S01°21.0	228° 33.4	S08°51.1	37°55.3	N11°54.0	Canopus	263°50.7	-52°43.0
19	88°48.7	105°49.2	45.1	256°51.6	20.8	243°36.0	51.0	52°57.6	54.0	Sirius	258°23.1	-16°45.7
20	103°51.1	120°48.7	44.0	271°54.6	20.6	258°38.6	50.9	67°59.8	54.1	Adhara	255°03.0	-29°01.1
21	118°53.6	135°48.3	• • 42.8	286°57.6	• • 20.3	273°41.3	• • 50.8	83°02.0	• • 54.2	Procyon	244°47.1	5°08.7
22	133°56.0	150°47.8	41.6	$302^{\circ}00.7$	20.1	288°43.9	50.8	98°04.3	54.3	Pollux	243°13.0 234°12.8	27°57.2 -59°36.5
23	148°58.5	$165^{\circ}47.4$	40.5	$317^{\circ}03.7$	19.8	303°46.5	50.7	$113^{\circ}06.5$	54.4	Avior Suhail	234°12.8 222°43.4	-59° 30.5 -43° 33.3
Mern	ass. 13:06	ν-0 5' d 1	L.2′ m-3.89	ν3 Π [/] Α-Π	.2′ m-0.92	v2 6' d-0	.1′ m-2.34	1/2 2/ do	.1′ m0.39	Miaplacidus	222 43.4 221°36.6	-43 33.3 -69°50.5
- ivier.p		ν-0.5 u-1	111-3.09	ν J.U U-U	.2 111-0.92	ν2.0 u-0	.11-2.34	ν Δ.Δ UU	.1110.39	Alphard	221 30.0 217°44.1	-8°47.4
										Regulus	207°30.6	11°49.2
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.4	61°35.4
0	164°01.0	180°46.9	S08°39.3	332°06.7	S01°19.6	318°49.2	S08°50.6	128°08.8	N11°54.5	Denebola	182°21.2	14°24.3
1	179°03.4	195°46.4	38.1	347°09.8	19.3	333°51.8	50.6	143°11.0	54.5	Gienah	175°39.8	-17°42.4
2	194°05.9	210°46.0	36.9	2°12.8	19.1	348°54.4	50.5	158° 13.2	54.6	Acrux	$172^{\circ}55.5$	-63°15.7
3	209°08.4 224°10.8	225°45.5	• • 35.8	17°15.8	• • 18.8	3°57.0	50.4	173° 15.5 188° 17.7	• • 54.7	Gacrux	171°47.2	-57° 16.7
4 5	239°13.3	240°45.0 255°44.6	34.6 33.4	32°18.9 47°21.9	18.6	18°59.7 34°02.3	50.3 50.3	203°19.9	54.8 54.9	Alioth	166°09.7	55°47.8
6	259 15.5 254° 15.8	270°44.1	508° 32.2	62°24.9	18.3 S01°18.1	49°04.9	50.3 \$08°50.2	203 19.9 218°22.2	N11°55.0	Spica	158°18.5	-11°19.0
7	269°18.2	270 44.1 285°43.7	31.1	77°28.0	17.8	64°07.6	50.1	233°24.4	55.1	Alkaid	152°49.1	49°09.7
8	284°20.7	300°43.2	29.9	92°31.0	17.5	79° 10.2	50.1	248°26.6	55.1	Hadar	148°30.6	-60°30.7
9	299°23.2	315°42.8	. 28.7	107°34.1	. 17.3	94° 12.8	50.0	263°28.9	• • 55.2	Menkent	147°53.3	-36°30.8
10	314°25.6	330°42.3	27.5	122°37.1	17.0	109° 15.5	49.9	278°31.1	55.3	Arcturus	145°44.6	19°01.6
11	329°28.1	345°41.8	26.4	137°40.2	16.8	124° 18.1	49.8	293°33.3	55.4	Rigil Kent.	139°35.1	-60°57.2
12	344°30.5	0°41.4	508°25.2	152°43.2	S01°16.5	139° 20.7	S08°49.8	308°35.6	N11°55.5	Kochab Zuben'ubi	137°19.5 136°52.1	74°01.8 -16°09.8
13	359°33.0	15°40.9	24.0	167°46.2	16.3	154°23.4	49.7	323°37.8	55.6	Alphecca	130° 52.1 126° 00.8	26°36.7
14	14°35.5	30°40.5	22.8	182°49.3	16.0	$169^{\circ}26.0$	49.6	$338^{\circ}40.1$	55.7	Antares	112° 11.6	-26° 29.7
15	29°37.9	45°40.0	• • 21.7	197°52.3	• • 15.8	184°28.6	• • 49.5	353°42.3	•• 55.7	Atria	107°02.7	-69°04.4
16	44°40.4	60°39.6	20.5	212°55.4	15.5	199°31.3	49.5	8°44.5	55.8	Sabik	101°58.9	-15°45.6
17	59°42.9	75°39.1	19.3	227°58.5	15.3	214°33.9	49.4	23°46.8	55.9	Shaula	96°05.8	-37°07.3
18	74°45.3	90°38.6	S08° 18.1	243°01.5	S01°15.0	229°36.5	508°49.3	38°49.0	N11°56.0	Rasalhague	95°55.5	12°32.2
19	89°47.8	105°38.2	16.9	258°04.6	14.7	244°39.2	49.3	53°51.2	56.1	Eltanin	90°40.7	51°28.8
20	104°50.3	120°37.7	15.8	273°07.6	14.5	259°41.8	49.2	68°53.5	56.2	Kaus Aust.	83°28.2	-34°22.0
21 22	119°52.7 134°55.2	135°37.3 150°36.8	· · 14.6 13.4	288°10.7 303°13.7	· · 14.2 14.0	274°44.4 289°47.1	· · 49.1 49.0	83°55.7 98°57.9	· · 56.3 56.3	Vega	80°31.1	38°48.4
23	134 55.2 149°57.7	165°36.4	12.2	318° 16.8	13.7	304°49.7	49.0	114°00.2	56.4	Nunki	75°43.8	-26° 15.5
										Altair	61°56.9	8°56.7
Mer.p	ass. 13:02	ν -0.5' d-1	l.2′ m-3.89	ν 3.0′ d-0.	.2′ m-0.95	$\nu 2.6' \ d-0$.1′ m-2.34	ν 2.2′ d0	$.1^\prime$ m0.39	Peacock	53°01.0	-56°38.2
										Deneb	49°23.8	45°23.0
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.8 27°29.2	10°00.5
0	165°00.1	180°35.9	S08°11.0	333°19.8	S01°13.5	319°52.3	S08°48.9	129°02.4	N11°56.5	Al Na'ir Fomalhaut	27°29.2 15°11.2	-46°49.1 -29°28.0
1	180°02.6	195°35.5	09.9	348°22.9	13.2	334°55.0	48.8	144°04.6	56.6	Scheat	13°42.2	-29 26.0 28°14.5
2	195°05.0	210°35.0	08.7	$3^{\circ}26.0$	12.9	349°57.6	48.7	$159^{\circ}06.9$	56.7	Markab	13°26.8	15°21.7
3	$210^{\circ}07.5$	225°34.6	• • 07.5	$18^{\circ}29.0$	• • 12.7	5°00.2	• • 48.7	$174^{\circ}09.1$	• • 56.8			
4	225°10.0	240°34.1	06.3	33°32.1	12.4	20°02.9	48.6	189°11.3	56.9	Mar 05 Mon	SHA	Mer.pass
5	240°12.4	255°33.7	05.1	48°35.2	12.2	35°05.5	48.5	204°13.6	56.9	Venus	17°56.2	11:57
6	255°14.9	270°33.2	S08°03.9	63°38.2	S01°11.9	50°08.2	S08°48.4	219° 15.8	N11°57.0		167°52.4	01:56
7	270°17.4	285°32.8	02.8	78°41.3	11.6	65°10.8	48.4	234°18.0	57.1	Jupiter	154°44.3	02:48
8	285°19.8	300°32.3	01.6	93°44.4	11.4	80°13.4	48.3	249°20.3	57.2	Saturn	324°13.2	15:29
9	300°22.3	315°31.9	08°00.4	108°47.4	11.1	95°16.1	· · 48.2	264°22.5	· · 57.3	Mar 06 Tue	SHA	Mer.pass
10	315°24.8 330°27.2	330°31.4 345°31.0	07°59.2 58.0	123°50.5 138°53.6	10.9 10.6	110° 18.7 125° 21.3	48.1 48.1	279°24.7 294°27.0	57.4 57.5	Venus	16°45.9	11:57
11 12	345°29.7	0°30.5	58.0 \$07°56.8	158° 55.0 153° 56.7	501°10.3	125 21.3 140°24.0	48.1 \$08°48.0	309°29.2	57.5 N11°57.5		$168^{\circ}05.7$	01:51
13	0°32.1	15°30.1	55.6	168°59.7	10.1	140 24.0 155° 26.6	47.9	309 29.2 324°31.4	57.6		154°48.2	02:44
14	15°34.6	30°29.6	54.5	184°02.8	09.8	170°29.3	47.9	339°33.7	57.7	Saturn	324°07.8	15:25
15	30°37.1	45°29.2	53.3	199°05.9	• • 09.5	185°31.9	• • 47.8	354°35.9	• • 57.8	Mar 07 Wed	SHA	Mer.pass
16	45°39.5	60°28.7	52.1	214°09.0	09.3	200° 34.5	47.7	9°38.1	57.9	Venus	15°35.8	11:58
17	60°42.0	75°28.3	50.9	229°12.0	09.0	215° 37.2	47.6	24°40.4	58.0	I	168°19.7	01:46
18	75°44.5	90°27.8	S07°49.7	244°15.1	S01°08.7	230°39.8	S08°47.5	39°42.6	N11°58.1		154°52.2	02:40
19	90°46.9	$105^{\circ}27.4$	48.5	259°18.2	08.5	245°42.5	47.5	54°44.8	58.1		324°02.3	15:22
20	105°49.4	120°26.9	47.3	274°21.3	08.2	260°45.1	47.4	69°47.1	58.2			
21	120°51.9	135°26.5	• • 46.1	289°24.4	• • 07.9	275° 47.7	• • 47.3	84°49.3	• • 58.3	Horizont	al parallax	0.1
22	135°54.3	150°26.0	45.0	304°27.5	07.7	290°50.4	47.2	99°51.5	58.4		Venus:	0.1
23	150°56.8	165°25.6	43.8	319°30.5	07.4	305°53.0	47.2	114°53.7	58.5		Mars:	0.2
Mer.p	ass. 12:58	ν -0.5 d -1	l.2′ m-3.89	$\nu 3.1' d-0$.3′ m-0.98	$\nu 2.6' \ d-0$.1′ m-2.35	ν 2.2' d0	.1′ m0.39			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.5 192°07.6	\$06°01.6 06°00.6	302°14.0 316°39.4	6.3' 6.3'	\$20°17.1 20°26.3	9.1' 9.0'	59.7' 59.7'
1 2	192 07.6 207°07.8	06 00.6 05°59.6	310 39.4 331°04.7	6.3	20°25.3	9.0 8.9'	59.7 59.6'
3	222°07.9	. 58.7	345°30.0	6.3	20° 33.3	8.7'	59.6'
4	237°08.1	57.7	359°55.2	6.2	20°52.9	8.6'	59.6'
5	252°08.2	56.7	14°20.5	6.2	21°01.4	8.4'	59.5'
6	267°08.3	S05°55.8	28°45.7	6.2'	S21°09.8	8.3'	59.5'
7	282°08.5	54.8	43°10.8	6.1'	21°18.1	8.1'	59.5'
8	297°08.6	53.8	57°36.0	6.1'	21°26.3	8.0'	59.4'
9	312°08.8	• • 52.9	72°01.1	6.1'	21°34.2	7.8'	59.4'
10 11	327°08.9 342°09.0	51.9 50.9	86°26.2 100°51.2	6.1' 6.0'	21°42.1 21°49.8	7.7' 7.5'	59.4' 59.3'
12	342 09.0 357°09.2	50.9 \$05°50.0	100 51.2 115°16.3	6.0'	\$21°57.3	7.4	59.3
13	12°09.3	49.0	129°41.3	6.0'	22° 04.7	7.2'	59.3'
14	27°09.5	48.0	144°06.3	6.0'	22°11.9	7.1	59.2'
15	42°09.6	• • 47.1	158°31.3	6.0'	22°19.0	6.9'	59.2'
16	57°09.8	46.1	172°56.3	5.9'	22°25.9	6.8'	59.2'
17	72°09.9	45.1	187°21.2	5.9'	22°32.7	6.6'	59.1'
18	87°10.1	S05°44.1	201°46.1	5.9'	\$22°39.3	6.5'	59.1'
19	102°10.2	43.2	216°11.0 230°35.9	5.9'	22°45.8 22°52.1	6.3'	59.1'
20 21	117°10.3 132°10.5	42.2 •• 41.2	230° 35.9 245° 00.8	5.9' 5.9'	22°52.1 22°58.3	6.2' 6.0'	59.0' 59.0'
21	132 10.5 147°10.6	40.3	245 00.8 259°25.7	5.9'	22 58.3 23°04.3	5.9'	59.0'
23	162°10.8	40.3 39.3	259 25.7 273°50.6	5.9'	23°10.2	5.9 5.7'	59.0 58.9'
						5.1	20.5
	SD = 16.1'	d = -1.0'		SI	O = 16.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°10.9 192°11.1	\$05°38.3	288°15.4 302°40.3	5.8'	\$23°15.9 23°21.4	5.5' 5.4'	58.9'
1 2	192°11.1 207°11.2	37.4 36.4	302°40.3 317°05.1	5.8' 5.8'	23°21.4 23°26.8	5.4′ 5.2′	58.9' 58.8'
3	207 11.2 222°11.4	35.4	311° 05.1 331° 29.9	5.8'	23°32.0	5.2 5.1'	58.8'
4	237°11.5	34.5	345°54.8	5.8'	23°37.1	4.9'	58.8'
5	252°11.6	33.5	0°19.6	5.8'	23°42.0	4.8'	58.7'
6	267°11.8	S05°32.5	14°44.4	5.8'	S23°46.8	4.6'	58.7'
7	282°11.9	31.5	29°09.2	5.8'	23°51.4	4.4'	58.7'
8	297°12.1	30.6	43°34.1	5.8'	23°55.8	4.3'	58.6'
9	312°12.2	• • 29.6	57°58.9	5.8'	24°00.1	4.1'	58.6'
10	327°12.4 342°12.5	28.6	72°23.7 86°48.6	5.8'	24°04.2 24°08.2	4.0'	58.6'
11 12	342 12.5 357°12.7	27.7 S 05°26.7	101°13.4	5.8' 5.9'	524°12.0	3.8' 3.7'	58.5' 58.5'
13	12°12.8	25.7	101 13.4 115°38.3	5.9'	24°15.6	3.5'	58.5'
14	27°13.0	24.8	130°03.1	5.9'	24°19.1	3.3'	58.4'
15	42°13.1	• • 23.8	144°28.0	5.9'	24°22.5	3.2'	58.4'
16	57°13.3	22.8	$158^{\circ}52.9$	5.9'	24°25.6	3.0'	58.4'
17	72°13.4	21.8	173°17.8	5.9'	24°28.7	2.9'	58.3'
18	87°13.6 102°13.7	S05°20.9 19.9	187°42.7 202°07.6	5.9' 6.0'	\$24°31.5 24°34.2	2.7' 2.5'	58.3'
19 20	102°13.7 117°13.9	19.9 18.9	202°07.6 216°32.6	6.0'	24° 34.2 24° 36.8	2.5	58.3' 58.2'
21	117 13.9 132°14.0	10.9	210 32.0 230°57.6	6.0'	24 30.6 24°39.1	2.4	58.2'
22	147°14.2	17.0	245°22.6	6.0'	24°41.4	2.1'	58.1
23	162°14.3	16.0	259°47.6	6.0'	24°43.4	1.9'	58.1'
	SD = 16.1'	d = -1.0'		SI	D = 16.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°14.5 192°14.6	S05° 15.0	274°12.6	6.1'	\$24°45.4	1.8'	58.1'
1 2	192°14.6 207°14.8	14.1 13.1	288°37.7 303°02.8	6.1' 6.1'	24°47.1 24°48.7	1.6' 1.4'	58.0' 58.0'
3	207 14.8 222°14.9	12.1	317°27.9	6.2	24 46.7 24°50.1	1.4	58.0'
4	237°15.1	11.1	331°53.1	6.2	24°51.4	1.1'	57.9'
5	252°15.2	10.2	346°18.2	6.2'	24°52.6	1.0'	57.9'
6	267°15.4	\$05°09.2	0°43.5	6.3'	S24°53.5	0.8'	57.9'
7	282°15.5	08.2	15°08.7	6.3'	24°54.4	0.7'	57.8'
8	297°15.7	07.2	29°34.0	6.3'	24°55.0	0.5'	57.8'
9	312°15.8 327°16.0	•• 06.3	43°59.3 58°24.7	6.4'	24°55.5 24°55.9	0.4' 0.2'	57.8'
10 11	327°16.0 342°16.1	05.3 04.3	58°24.7 72°50.1	6.4' 6.4'	24°55.9 24°56.1	0.2	57.7' 57.7'
12	357°16.3	\$05°03.4	87°15.5	6.5	\$24°56.1	-0.1	57.7'
13	12°16.4	02.4	101°41.0	6.5	24°56.0	-0.3	57.6'
14	27°16.6	01.4	$116^{\circ}06.5$	6.6'	24°55.8	-0.4'	57.6'
15	42°16.7	$05^{\circ}00.4$	$130^{\circ}32.1$	6.6'	$24^{\circ}55.4$	-0.6'	57.6'
16	57°16.9	04° 59.5	144°57.7	6.7'	24°54.8	-0.7'	57.5'
17	72°17.0	58.5	159°23.4	6.7'	24°54.1	-0.9'	57.5'
18	87°17.2	S04°57.5	173°49.1	6.8'	\$24°53.3	-1.0'	57.5'
19 20	102°17.3 117°17.5	56.5 55.6	188°14.9 202°40.7	6.8' 6.9'	24°52.3 24°51.1	-1.2' -1.3'	57.4' 57.4'
20	117 17.5 132°17.6	55.0 •• 54.6	202 40.7 217°06.6	6.9'	24 51.1 24°49.8	-1.3 -1.4'	57.4' 57.4'
22	132 17.0 147°17.8	53.6	231°32.5	7.0'	24° 49.6 24° 48.4	-1.6'	57.4'
23	162°17.9	52.6	245°58.5	7.0'	24°46.8	-1.7'	57.3'
		1 10/		SI	D = 15.8'		
	SD = 16.1'	d = -1.0'			<i>J</i> = 10 0		

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

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

		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	75-54%			
05	11:30	11:23	12:11	04:00	16:29				
06	11:16	11:09	12:11	04:59	17:28				
07	11:02	10:55	12:11	05:57	18:26				

h	Aries	Ver	nus	Ma	ars	Jup	iter	Satı	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	165°59.3	180°25.1	S07°42.6	334°33.6	S01°07.1	320°55.7	S08°47.1		N11°58.6			
1	181°01.7	195°24.7	41.4	349°36.7	06.9	335°58.3	47.0	144°58.2	58.7	Alpheratz	357°31.6	29° 15.1
2	196°04.2	210°24.2	40.2	4°39.8	06.6	351°00.9	46.9	160°00.4	58.8	Ankaa	353°04.3	-42°08.9
3	211°06.6	225°23.8	• • 39.0	19°42.9	06.3	6°03.6	• • 46.9	175°02.7	• • 58.8	Schedar	349°27.5	56° 42.0
4	226°09.1	240°23.4	37.8	34°46.0	06.1	21°06.2	46.8	190°04.9	58.9	Diphda	348°44.2	-17°49.7
5	241°11.6	255°22.9	36.6	49°49.1	05.8	36°08.9	46.7	205°07.1	59.0	Achernar	335°18.3 327°47.6	-57°05.5 23°36.0
6	256°14.0	270°22.5	S07°35.4	64°52.2	S01°05.5	51°11.5	S08°46.6	220°09.4	N11°59.1	Hamal Polaris	312°24.6	89° 23.4
7	$271^{\circ}16.5$	285°22.0	34.2	79°55.3	05.3	66°14.2	46.6	235°11.6	59.2	Acamar	315°09.5	-40°11.5
8	286°19.0	300°21.6	33.0	94°58.4	05.0	81°16.8	46.5	250° 13.8	59.3	Menkar	314°02.8	4°12.1
9	301°21.4	315°21.1	• • 31.9	110°01.5	• • 04.7	96° 19.5	• • 46.4	265°16.1	• • 59.4	Mirfak	308°23.5	49°58.0
10	316°23.9	330°20.7	30.7	125°04.6	04.5	111°22.1	46.3	280° 18.3	59.4	Aldebaran	290°35.8	16°34.0
11	331°26.4	345°20.2	29.5	140°07.7	04.2	126°24.7	46.3 \$08°46.2	295°20.5	59.5	Rigel	281°00.6	-8°10.3
12 13	346°28.8 1°31.3	0° 19.8 15° 19.4	\$07°28.3 27.1	155°10.8 170°13.9	S01°03.9 03.6	141°27.4 156°30.0	46.1	310°22.7 325°25.0	N11°59.6 59.7	Capella	$280^{\circ}16.8$	46°01.6
14	16°33.8	30° 18.9	25.9	170 13.9 185°17.0	03.4	171°32.7	46.0	340° 27.2	59.7 59.8	Bellatrix	278°19.2	6°22.4
15	31°36.2	45° 18.5	24.7	200°20.1	03.1	186°35.3	• • 45.9	355°29.4	11°59.9	Elnath	277°57.5	28° 37.8
16	46°38.7	60°18.0	23.5	215°23.2	02.8	201°38.0	45.9	10°31.7	12°00.0	Alnilam	275°34.3	-1°11.2
17	61°41.1	75°17.6	22.3	230°26.3	02.5	216° 40.6	45.8	25°33.9	00.1	Betelgeuse	270°48.4	7°24.5
18	76°43.6	90°17.2	S07°21.1	245°29.4	S01°02.3	231°43.3	S08°45.7	40°36.1	N12°00.1	Canopus	263°50.7 258°23.1	-52°43.1
19	91°46.1	$105^{\circ}16.7$	19.9	260°32.5	02.0	246°45.9	45.6	55°38.3	00.2	Sirius	256 23.1 255°03.0	-16°45.7 -29°01.1
20	106°48.5	120°16.3	18.7	275°35.6	01.7	261°48.6	45.6	70°40.6	00.3	Adhara Procyon	255 03.0 244°47.1	5°08.7
21	121°51.0	135°15.8	• • 17.5	290°38.7	•• 01.4	276°51.2	• • 45.5	85°42.8	• • 00.4	Pollux	243°13.0	27°57.2
22	136°53.5	150° 15.4	16.3	305°41.8	01.2	291°53.8	45.4	100°45.0	00.5	Avior	234°12.8	-59°36.5
23	151°55.9	165°15.0	15.1	320°45.0	00.9	306° 56.5	45.3	115°47.3	00.6	Suhail	222°43.4	-43°33.4
Mer.p	ass. 12:54	ν -0.4' d-1	.2′ m-3.89	ν 3.1' d-0.	3' m-1.00	ν 2.6′ d-0.	1' m-2.35	$\nu 2.2' \ d0.1$	1' m0.39	Miaplacidus	221°36.6	-69°50.5
										Alphard	217°44.1	-8°47.4
	CIIA	CIIA	Б	CILA		CIIA	Б.	CIIA		Regulus	$207^{\circ}30.6$	11°49.2
Fri 0	GHA 166°58.4	GHA 180° 14.5	Dec S 07°13.9	GHA 335°48.1	Dec \$01°00.6	GHA 321°59.1	Dec \$08°45.2	GHA 130° 49.5	Dec N12°00.7	Dubhe	193°36.4	61°35.4
1	182°00.9	195°14.1	12.7	350°51.2	00.3	337°01.8	45.2	130° 49.5° 145° 51.7	00.7	Denebola	182°21.2	14°24.3
2	197°03.3	210° 13.6	11.5	5°54.3	01°00.1	352°04.4	45.1	160°53.9	00.7	Gienah	175°39.8	-17°42.4
3	212°05.8	225°13.2	. 10.3	20°57.4	00°59.8	7°07.1	• • 45.0	175° 56.2	00.9	Acrux	172°55.4	-63°15.7
4	227°08.3	240°12.8	09.1	36°00.5	59.5	22°09.7	44.9	190°58.4	01.0	Gacrux	171°47.2	-57°16.7
5	242°10.7	255°12.3	07.9	51°03.7	59.2	37°12.4	44.9	206°00.6	01.1	Alioth	166°09.6 158°18.4	55°47.8 -11°19.0
6	257°13.2	270°11.9	S07°06.7	66°06.8	S00°59.0	52°15.0	S08°44.8	221°02.9	N12°01.2	Spica Alkaid	150 16.4 152°49.1	49°09.7
7	$272^{\circ}15.6$	$285^{\circ}11.5$	05.5	$81^{\circ}09.9$	58.7	$67^{\circ}17.7$	44.7	$236^{\circ}05.1$	01.3	Hadar	148°30.6	-60°30.7
8	$287^{\circ}18.1$	300°11.0	04.3	96°13.0	58.4	82°20.3	44.6	251°07.3	01.4	Menkent	147°53.3	-36° 30.8
9	302°20.6	315°10.6	•• 03.1	111°16.1	• • 58.1	97°23.0	• • 44.5	266° 09.5	• • 01.4	Arcturus	145°44.6	19°01.6
10	317°23.0	330°10.1	01.9	126°19.3	57.8	112°25.6	44.5	281°11.8	01.5	Rigil Kent.	139°35.1	-60°57.2
11	332°25.5 347°28.0	345°09.7	07°00.7	141°22.4 156°25.5	57.6	127°28.3 142°30.9	44.4	296°14.0	01.6 N12°01.7	Kochab	$137^{\circ}19.5$	74°01.8
12 13	2°30.4	0°09.3 15°08.8	\$06° 59.5 58.3	150 25.5 171°28.7	\$00°57.3 57.0	142 30.9 157°33.6	508°44.3 44.2	311°16.2 326°18.4	01.8	Zuben'ubi	136°52.1	-16°09.8
14	17°32.9	30°08.4	57.1	186°31.8	56.7	172° 36.2	44.1	341°20.7	01.0	Alphecca	126°00.8	26°36.7
15	32°35.4	45°08.0	55.9	201°34.9	56.4	187°38.9	• • 44.1	356°22.9	02.0	Antares	112°11.6	-26°29.7
16	47°37.8	60°07.5	54.7	216°38.0	56.2	202°41.5	44.0	11°25.1	02.1	Atria	107°02.7	-69°04.4
17	62°40.3	75°07.1	53.5	231°41.2	55.9	217°44.2	43.9	26°27.4	02.1	Sabik Shaula	101°58.9 96°05.8	-15°45.6 -37°07.3
18	77°42.7	90°06.7	S06°52.3	246°44.3	S00°55.6	232°46.9	S08°43.8	41°29.6	N12°02.2	Rasalhague	95°55.4	12°32.2
19	92°45.2	105°06.2	51.1	261°47.4	55.3	247°49.5	43.7	56°31.8	02.3	Eltanin	90°40.7	51°28.8
20	107°47.7	120°05.8	49.9	276°50.6	55.0	262°52.2	43.7	71°34.0	02.4	Kaus Aust.	83°28.2	-34°22.0
21	122°50.1	135°05.4	• • 48.7	291°53.7	• • 54.8	277°54.8	• • 43.6	86°36.3	• • 02.5	Vega	80°31.1	38°48.4
22	137°52.6	150°04.9	47.5	306°56.9	54.5	292°57.5	43.5	101°38.5	02.6	Nunki	75°43.7	-26° 15.5
23	152°55.1	165°04.5	46.3	322°00.0	54.2	308°00.1	43.4	116°40.7	02.7	Altair	61°56.9	8°56.7
Mer.p	ass. 12:50	ν -0.4' d-1	.2′ m-3.89	ν 3.1′ d-0.	3′ m-1.03	ν 2.6′ d-0.	1' m-2.36	ν 2.2′ d0.1	1' m 0.39	Peacock	53°00.9	-56°38.2
										Deneb	49°23.8	45°23.0
Cat	CHA	CHA	Dee	GHA	Dee	CHA	Dee	CHA	Doo	Enif	33°35.8	10°00.5
Sat 0	GHA 167°57.5	GHA 180°04.1	Dec \$06°45.1	337°03.1	Dec \$00°53.9	GHA 323°02.8	Dec \$08°43.3	GHA 131° 42.9	Dec N12°02.8	Al Na'ir	27°29.2	-46°49.0
1	183°00.0	195°03.6	43.8	352°06.3	53.6	338° 05.4	43.3	146° 45.2	02.8	Fomalhaut	15°11.2	-29°28.0
2	198°02.5	210°03.2	42.6	7°09.4	53.3	353°08.1	43.2	161° 47.4	02.9	Scheat	13°42.2	28° 14.5
3	213°04.9	225°02.8	• • 41.4	22°12.6	53.1	8°10.7	• • 43.1	176° 49.6	• • 03.0	Markab	13°26.8	15°21.7
4	228°07.4	240°02.4	40.2	$37^{\circ}15.7$	52.8	23°13.4	43.0	191°51.8	03.1	Mar 08 Thu	SHA	Mer.pass
5	243°09.9	255°01.9	39.0	52°18.9	52.5	38° 16.0	42.9	$206^{\circ}54.1$	03.2	Venus	$14^{\circ}25.9$	11:59
6	258°12.3	270°01.5	S 06°37.8	67°22.0	S00°52.2	53° 18.7	508°42.9	221°56.3	N12°03.3	Mars	168°34.4	01:41
7	273°14.8	285°01.1	36.6	$82^{\circ}25.1$	51.9	68°21.4	42.8	$236^{\circ}58.5$	03.4	Jupiter	154°56.4	02:36
8	288°17.2	300°00.6	35.4	97°28.3	51.6	83°24.0	42.7	252°00.7	03.5	Saturn	323°56.7	15:18
9	303°19.7	315°00.2	• • 34.2	112°31.4	• • 51.3	98°26.7	• • 42.6	267°03.0	• • 03.6	Mar 09 Fri	SHA	Mer.pass
10	318°22.2	329°59.8	33.0	127°34.6	51.0	113°29.3	42.5	282°05.2	03.6	Venus	13°16.1	11:59
11 12	333°24.6 348°27.1	344°59.3 359°58.9	31.8 \$06°30.6	142°37.7 157°40.9	50.8 \$00°50.5	128°32.0 143°34.6	42.5 \$08°42.4	297°07.4 312°09.6	03.7 N12°03.8	Mars	$168^{\circ}49.7$	01:36
13	3°29.6	14°58.5	29.3	172°44.1	50.2	158° 37.3	42.3	312 09.0 327°11.9	03.9	Jupiter	$155^{\circ}00.7$	02:32
14	18°32.0	29°58.1	29.3	172 44.1 187°47.2	49.9	173° 40.0	42.3	342° 14.1	04.0	Saturn	323°51.1	15:14
15	33°34.5	44° 57.6	26.9	202°50.4	• • 49.6	188° 42.6	• • 42.1	357° 16.3	• • 04.1	Mar 10 Sat	SHA	Mer.pass
16	48°37.0	59°57.2	25.7	217°53.5	49.3	203°45.3	42.0	12°18.5	04.2	Venus	12°06.5	12:00
17	63°39.4	74°56.8	24.5	232°56.7	49.0	218°47.9	42.0	27°20.8	04.3	1	169°05.6	01:31
18	78°41.9	89° 56.3	S06°23.3	247°59.8	S00°48.7	233° 50.6	S08°41.9		N12°04.3		155°05.2	02:27
19	93°44.4	104°55.9	22.1	263°03.0	48.5	248°53.2	41.8	57°25.2	04.4	Saturn		15:11
20	108°46.8	119°55.5	20.9	278°06.2	48.2	263°55.9	41.7	72°27.4	04.5	U	al parallar	
21	123°49.3	134°55.1	19.7	293°09.3	· · 47.9	278°58.6	• • 41.6	87°29.6	04.6	norizont	al parallax Venus:	0.1
22 23	138°51.7 153°54.2	149°54.6 164°54.2	18.4 17.2	308°12.5 323°15.6	47.6 47.3	294°01.2 309°03.9	41.6 41.5	102°31.9 117°34.1	04.7 04.8		Mars:	0.1
												*
Mer.p	ass. 12:46	ν -0.4' d-1	.2′ m-3.89	ν 3.1′ <i>d</i> -0.	3′ m-1.06	ν 2.7′ d-0.	1′ m-2.37	ν 2.2′ d0.1	1′ m0.39			

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	$177^{\circ}18.1$	S04°51.7	260°24.5	7.1'	S24°45.1	-1.9'	57.3'
1	192°18.2	50.7	274°50.6	7.2'	24°43.2	-2.0'	57.3'
2	207°18.4	49.7	289° 16.8	7.2'	24°41.1	-2.2'	57.2'
3 4	222°18.5 237°18.7	· · 48.7 47.8	303°43.0 318°09.3	7.3' 7.3'	24°39.0 24°36.7	-2.3' -2.5'	57.2' 57.2'
4 5	252°18.8	47.8 46.8	318 09.3 332°35.6	7.3 7.4'	24 30.7 24°34.2	-2.5 -2.6'	57.2 57.1'
6	267°19.0	S04°45.8	347°02.0	7.5'	524°31.6	-2.7'	57.1'
7	282°19.2	44.8	1°28.5	7.5'	24°28.9	-2.9'	57.1'
8	297°19.3	43.8	15°55.0	7.6'	24°26.0	-3.0'	57.0'
9	312°19.5	• • 42.9	30°21.6	7.7'	24°23.0	-3.1'	57.0'
10	327°19.6	41.9	44° 48.3 59° 15.0	7.7' 7.8'	24°19.9 24°16.6	-3.3' -3.4'	57.0'
11 12	342°19.8 357°19.9	40.9 \$04°39.9	73°41.8	7.8 7.9'	524°13.2	-3.4 -3.6'	56.9' 56.9'
13	12°20.1	39.0	88°08.6	7.9'	24°09.6	-3.7	56.9'
14	27°20.2	38.0	102°35.6	8.0'	24°05.9	-3.8'	56.9'
15	42°20.4	• • 37.0	$117^{\circ}02.6$	8.1'	24°02.1	-3.9'	56.8'
16	57°20.5	36.0	131°29.7	8.1'	23°58.2	-4.1'	56.8'
17	72°20.7	35.1	145°56.8	8.2'	23°54.1	-4.2'	56.8'
18	87°20.9 102°21.0	S04°34.1 33.1	160°24.0 174°51.3	8.3' 8.4'	\$23°49.9 23°45.6	-4.3' -4.5'	56.7' 56.7'
19 20	102 21.0 117°21.2	32.1	174 51.3 189°18.7	8.4'	23 45.0 23°41.1	-4.5 -4.6'	56.7'
21	132°21.3	31.1	203°46.1	8.5'	23°36.5	-4.7'	56.6'
22	147°21.5	30.2	218° 13.7	8.6'	23°31.8	-4.8'	56.6'
23	162°21.6	29.2	232°41.3	8.7'	23°26.9	-5.0'	56.6'
	SD = 16.1'	d = -1.0'		SE) = 15.6 [']		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	177°21.8	S04°28.2	247°08.9	8.8'	\$23°22.0	-5.1'	56.6'
1	192°22.0	27.2	261°36.7	8.8'	23°16.9	-5.2'	56.5'
2	207°22.1	26.3	276°04.5	8.9'	23°11.7	-5.3'	56.5'
3	222°22.3	• • 25.3	290°32.4	9.0'	23°06.3	-5.5'	56.5'
4 5	237°22.4 252°22.6	24.3 23.3	305°00.4 319°28.5	9.1' 9.1'	23°00.9 22°55.3	-5.6' -5.7'	56.4' 56.4'
6	267°22.7	504° 22.3	333°56.6	9.1	\$22°49.6	-5.8'	56.4
7	282°22.9	21.4	348°24.8	9.3'	22°43.8	-5.9'	56.4'
8	297°23.1	20.4	2°53.1	9.4'	22°37.9	-6.0'	56.3'
9	312°23.2	• • 19.4	17°21.5	9.5'	22°31.8	-6.2'	56.3'
10	327°23.4 342°23.5	18.4	31°50.0 46°18.6	9.5'	22°25.7 22°19.4	-6.3'	56.3'
11 12	342 23.5 357°23.7	17.4 \$04°16.5	40 18.0 60°47.2	9.6' 9.7'	522°13.1	-6.4' -6.5'	56.3' 56.2'
13	12°23.8	15.5	75° 15.9	9.8'	22°06.6	-6.6'	56.2'
14	27°24.0	14.5	89°44.7	9.9'	22°00.0	-6.7'	56.2'
15	42°24.2	• • 13.5	104° 13.6	10.0'	21°53.3	-6.8'	56.1'
16	57°24.3	12.5	118° 42.5	10.0'	21°46.5 21°39.6	-6.9'	56.1'
17 18	72°24.5 87°24.6	11.6 S04° 10.6	133°11.6 147°40.7	10.1' 10.2'	21°39.6 S21°32.5	-7.0' -7.1'	56.1' 56.1'
19	102°24.8	09.6	162°09.9	10.2	21°25.4	-7.1 -7.2'	56.0'
20	117°25.0	08.6	176°39.2	10.4'	21°18.2	-7.3'	56.0'
21	132°25.1	• • 07.7	191°08.5	10.5'	21°10.9	-7.4'	56.0'
22	147°25.3	06.7	205°38.0	10.5'	21°03.4	-7.5'	56.0'
23	162°25.4	05.7	220°07.5	10.6'	20°55.9	-7.6'	55.9'
	SD = 16.1'	d = -1.0'	-	SE	0 = 15.4'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.6	S04°04.7	234°37.1	10.7'	S20°48.3	-7.7'	55.9'
1	192°25.8 207°25.9	03.7	249°06.8 263°36.6	10.8'	20°40.5 20°32.7	-7.8'	55.9'
2	207°25.9 222°26.1	02.7 •• 01.8	263°36.6 278°06.5	10.9' 10.9'	20°32.7 20°24.8	-7.9' -8.0'	55.9' 55.8'
4	237°26.2	04°00.8	292°36.4	11.0'	20° 24.8 20° 16.8	-8.1'	55.8'
5	252°26.4	03°59.8	307°06.5	11.1'	20°08.7	-8.2	55.8'
6	267°26.6	S03°58.8	321°36.6	11.2'	\$20°00.5	-8.3'	55.8'
7	282°26.7	57.8	336°06.8	11.3'	19°52.2	-8.4'	55.7'
8 9	297°26.9 312°27.0	56.9 •• 55.9	350°37.0 5°07.4	11.4' 11.4'	19°43.8 19°35.4	-8.5' -8.6'	55.7' 55.7'
10	312 27.0 327°27.2	54.9	19°37.8	11.5'	19° 35.4 19° 26.8	-8.6'	55.7'
11	342°27.4	53.9	34°08.3	11.6'	19°18.2	-8.7	55.6'
12	357°27.5	S 03°52.9	48°38.9	11.7'	S19°09.4	-8.8'	55.6'
13	12°27.7	52.0	63°09.6	11.8'	19°00.6	-8.9'	55.6'
14 15	27°27.8 42°28.0	51.0	77° 40.4 92° 11.2	11.8' 11.9'	18°51.7 18°42.8	-9.0' -9.1'	55.6'
15 16	42°28.0 57°28.2	•• 50.0 49.0	92°11.2 106°42.1	11.9'	18°42.8 18°33.7	-9.1' -9.1'	55.6' 55.5'
17	72°28.3	49.0	100 42.1 121°13.1	12.1'	18°24.6	-9.1 -9.2'	55.5'
18	87°28.5	S03°47.0	135°44.2	12.1'	\$18°15.3	-9.3'	55.5'
19	102°28.7	46.1	150° 15.3	12.2'	18°06.0	-9.4'	55.5'
20	117°28.8	45.1	164°46.5	12.3'	17°56.7	-9.4'	55.4'
21 22	132°29.0 147°29.1	· · 44.1 43.1	179° 17.8 193° 49.2	12.4' 12.5'	17°47.2 17°37.7	-9.5' -9.6'	55.4' 55.4'
23	162°29.3	43.1	208° 20.7	12.5'	17°28.1	-9.0 -9.7'	55.4'
	SD = 16.1'	d = -1.0'			0 = 15.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:27	05:47	06:54	17:29	18:37	19:58
N 70°	04:37	05:48	06:49	17:34	18:35	19:47
68°	04:45	05:50	06:45	17:38	18:33	19:39
66°	04:51	05:51	06:42	17:41	18:32	19:32
64°	04:56	05:52	06:39	17:44	18:31	19:27
62°	05:01	05:52	06:36	17:46	18:30	19:22
60°	05:04	05:53	06:34	17:48	18:29	19:18
N 58°	05:08	05:53	06:32	17:50	18:29	19:15
56°	05:10	05:54	06:30	17:51	18:29	19:12
54°	05:13	05:54	06:29	17:53	18:28	19:09
52°	05:15	05:54	06:27	17:54	18:28	19:07
50°	05:17	05:54	06:26	17:56	18:28	19:05
45°	05:20	05:54	06:23	17:58	18:28	19:02
N 40°	05:23	05:54	06:21	18:01	18:28	18:59
35°	05:24	05:53	06:19	18:03	18:28	18:57
30°	05:25	05:53	06:17	18:05	18:28	18:56
20°	05:26	05:51	06:13	18:08	18:30	18:55
N 10°	05:25	05:49	06:10	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:14	18:34	18:58
S 10°	05:18	05:43	06:04	18:17	18:38	19:02
20°	05:13	05:38	06:01	18:20	18:42	19:08
30°	05:04	05:32	05:57	18:24	18:48	19:16
35°	04:59	05:29	05:54	18:26	18:52	19:21
40°	04:52	05:24	05:51	18:29	18:56	19:28
45°	04:43	05:19	05:48	18:32	19:01	19:37
S 50°	04:32	05:12	05:44	18:35	19:08	19:47
52°	04:27	05:08	05:43	18:37	19:11	19:53
54°	04:21	05:05	05:41	18:39	19:15	19:58
56°	04:14	05:00	05:38	18:41	19:19	20:05
58°	04:06	04:56	05:36	18:43	19:24	20:13
S 60°	60° 03:57 04:50		05:33	18:46	19:29	20:22
Lat.	Moonrise	e		Moonset		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°			08:06	_		09:26
600	l		06.50			10.00

Lat.	Moonrise				Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°			08:06			09:26
68°			06:52			10:39
66°		06:31	06:15		09:13	11:15
64°	05:32	05:45	05:48	08:19	09:59	11:41
62°	04:49	05:15	05:28	09:03	10:29	12:01
60°	04:20	04:52	05:11	09:31	10:52	12:17
N 58°	03:57	04:33	04:56	09:54	11:10	12:31
56°	03:39	04:18	04:44	10:12	11:25	12:43
54°	03:24	04:04	04:33	10:27	11:38	12:53
52°	03:10	03:53	04:24	10:40	11:49	13:02
50°	02:59	03:42	04:15	10:52	11:59	13:10
	45° 02:34 03:20		03:57	11:16	12:21	13:27
N 40°	02:15	03:03	03:42	11:35	12:38	13:41
35°	01:59	02:48	03:29	11:51	12:52	13:53
30°	01:45	02:35	03:18	12:05	13:04	14:03
20°	01:21	02:13	02:59	12:28	13:25	14:21
N 10°	01:00	01:53	02:43	12:48	13:44	14:36
0°	00:40	01:35	02:27	13:07	14:01	14:50
S 10°	00:21	01:17	02:11	13:26	14:17	15:05
20°	00:00	00:58	01:55	13:46	14:35	15:20
30°	•• ••	00:36	01:35	14:09	14:56	15:37
35° 40°	••••	00:23	01:24	14:23	15:08	15:47
40° 45°	23:49	00:07	01:11 00:55	14:38 14:57	15:22 15:38	15:58 16:11
1						
S 50°	23:27		00:36	15:20	15:58	16:27
52°			00:27	15:31	16:07	16:35
	54° 23:04 ····		00:17	15:43	16:18	16:43
	56° 22:50 ···· 58° 22:33 23:52		00:06	15:58 16:14	16:30 16:44	16:52 17:03
S 60°	22:33	23:37		16:14	17:00	17:03
	22.17	23.31		10.55	11.00	11.15

		Sun					
Day	Eqn.of	f Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-24%	
08	10:48	10:40	12:11	06:54	19:21		
09	10:33	10:25	12:10	07:48	20:14		
10	10:18	10:10	12:10	08:39	21:03		

h	Aries	Ve	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	168°56.7	179°53.8	S06° 16.0	338°18.8	S00°47.0	324°06.5	S08°41.4	132°36.3	N12°04.9			
1	183°59.1	194°53.4	14.8	353°22.0	46.7	339°09.2	41.3	147°38.5	05.0	Alpheratz	357°31.6	29°15.1
2	199°01.6	209°52.9	13.6	8°25.1	46.4	354°11.9	41.2	162°40.8	05.1	Ankaa	353°04.3	-42°08.9
3	214°04.1	224°52.5	. 12.4	23°28.3	• • 46.1	9°14.5	• • 41.1	177°43.0	05.1	Schedar	349°27.5	56°42.0
4	229°06.5	239°52.1	11.2	38°31.5	45.8	24°17.2	41.1	192°45.2	05.2	Diphda	348°44.2	-17°49.7
5	244°09.0	254°51.7	09.9	53°34.7	45.5	39°19.9	41.0	207°47.4	05.3	Achernar	335°18.3	-57°05.5
6	259°11.5	269°51.2	S06°08.7	68°37.8	S 00°45.2	54°22.5	508°40.9	222°49.7	N12°05.4	Hamal	327°47.6	23°36.0
7	274°13.9	284°50.8	07.5	83°41.0	45.0	69°25.2	40.8	237°51.9	05.5	Polaris	312°26.0	89°23.4
8	$289^{\circ}16.4$	299°50.4	06.3	98°44.2	44.7	84°27.8	40.7	252°54.1	05.6	Acamar Menkar	315°09.5 314°02.8	-40°11.5 4°12.1
9	304°18.8	314°50.0	•• 05.1	113°47.3	• • 44.4	99°30.5	• • 40.6	267°56.3	• • 05.7	Mirfak	308°23.5	49°58.0
10	319°21.3	329°49.6	03.9	128°50.5	44.1	114°33.2	40.6	282°58.5	05.8	Aldebaran	290°35.8	16° 34.0
11	334°23.8	344°49.1	02.6	143°53.7	43.8	129°35.8	40.5	298° 00.8	05.9	Rigel	281°00.6	-8° 10.3
12	349°26.2	359°48.7	S06°01.4	158°56.9	S00°43.5	144°38.5	508°40.4	313°03.0	N12°05.9	Capella	280°16.9	46°01.7
13	4°28.7	14°48.3	06°00.2	174°00.0	43.2	159°41.2	40.3	328°05.2	06.0	Bellatrix	278°19.2	6°22.4
14	19°31.2	29°47.9	05° 59.0	189°03.2	42.9	174°43.8	40.2	343°07.4	06.1	Elnath	277°57.6	28°37.8
15	34°33.6 49°36.1	44°47.4 59°47.0	• • 57.8 56.6	204°06.4 219°09.6	· · 42.6 42.3	189°46.5 204°49.1	· · 40.1 40.1	358° 09.6 13° 11.9	· · 06.2 06.3	Alnilam	275°34.3	-1°11.2
16 17	64°38.6	74° 46.6	55.3	219 09.0 234°12.8	42.3 42.0	204 49.1 219°51.8	40.1	28° 14.1	06.4	Betelgeuse	270°48.4	7°24.5
18	79°41.0	89° 46.2	S05° 54.1	249°16.0	\$00°41.7	234° 54.5	S08°39.9	43°16.3	N12°06.5	Canopus	263°50.7	-52°43.1
19	94°43.5	104°45.8	52.9	264°19.1	41.4	249°57.1	39.8	58° 18.5	06.6	Sirius	258°23.1	-16°45.7
20	109°46.0	119°45.3	51.7	279°22.3	41.1	264°59.8	39.7	73° 20.8	06.7	Adhara	255°03.0	-29°01.1
21	124°48.4	134°44.9	• • 50.5	294°25.5	• • 40.8	280°02.5	• • 39.6	88°23.0	06.7	Procyon	244°47.1	5°08.7
22	139°50.9	149°44.5	49.2	309°28.7	40.5	295°05.1	39.5	103°25.2	06.8	Pollux	243°13.0	27°57.2
23	154°53.3	164°44.1	48.0	324°31.9	40.2	310°07.8	39.5	118°27.4	06.9	Avior	234°12.8	-59°36.5
			2′ m-3.89	ν 3.2′ d-0.				$\nu 2.2' d0.$		Suhail	222°43.4	-43°33.4
ivier.p	ass. 12:42	ν-0.4 α-1	∠ m-3.89	ν s.2 a -0.	J III-1.U9	$\nu 2.7' \ d-0.$	1 111-2.31	ν2.2´ α0.	ı mu.39	Miaplacidus Alphard	221°36.6 217°44.1	-69°50.5 -8°47.4
										Regulus	217 44.1 207°30.6	-6 47.4 11°49.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.4	61°35.4
0	169°55.8	179°43.7	S 05°46.8	339°35.1	S00°39.9	325° 10.5	S08°39.4	133°29.6	N12°07.0	Denebola	182°21.2	14° 24.3
1	184°58.3	194° 43.2	45.6	354°38.3	39.6	340°13.1	39.3	148°31.9	07.1	Gienah	175°39.7	-17° 42.5
2	200°00.7	209°42.8	44.4	9°41.5	39.3	355° 15.8	39.2	163°34.1	07.2	Acrux	172°55.4	-63° 15.7
3	215°03.2	224°42.4	• • 43.1	24°44.6	• • 39.0	10°18.5	• • 39.1	178°36.3	• • 07.3	Gacrux	171°47.1	-57° 16.7
4	230°05.7	239°42.0	41.9	39°47.8	38.7	25°21.1	39.0	193°38.5	07.4	Alioth	$166^{\circ}09.6$	55°47.8
5	245°08.1	254°41.6	40.7	54°51.0	38.4	40°23.8	39.0	208°40.7	07.5	Spica	$158^{\circ}18.4$	-11° 19.0
6	260°10.6 275°13.1	269°41.1 284°40.7	S05°39.5	69°54.2 84°57.4	S00°38.1	55°26.5 70°29.1	S08°38.9	223°43.0 238°45.2	N12°07.5	Alkaid	$152^{\circ}49.0$	49°09.7
7 8	275 13.1 290°15.5	284 40.7 299°40.3	38.3 37.0	84 57.4 100°00.6	37.8 37.5	70 29.1 85°31.8	38.8 38.7	258 45.2 253°47.4	07.6 07.7	Hadar	148°30.5	-60°30.7
9	290 15.5 305°18.0	299 40.3 314°39.9	35.8	100 00.0 115°03.8	37.3	05 31.6 100°34.5	38.6	268°49.6	•• 07.8	Menkent	147°53.2	-36°30.8
10	320°20.5	329°39.5	34.6	130°07.0	36.9	115° 37.1	38.5	283°51.8	07.9	Arcturus	145°44.6	19°01.6
11	335°22.9	344°39.1	33.4	145°10.2	36.6	130°39.8	38.4	298°54.1	08.0	Rigil Kent.	139°35.0	-60°57.2
12	350°25.4	359°38.6	S05°32.1	160°13.4	500°36.3	145° 42.5	S08°38.4	313°56.3	N12°08.1	Kochab	137°19.4	74°01.8
13	5°27.8	14°38.2	30.9	175°16.6	36.0	160°45.1	38.3	328° 58.5	08.2	Zuben'ubi	136°52.0	-16°09.9 26°36.7
14	20°30.3	29°37.8	29.7	190°19.8	35.7	175°47.8	38.2	344°00.7	08.3	Alphecca Antares	126°00.7 112°11.6	-26° 29.7
15	35°32.8	44°37.4	• • 28.5	205°23.0	• • 35.4	190°50.5	• • 38.1	359°02.9	• • 08.3	Antares	112 11.0 107°02.6	-20 29.7 -69°04.4
16	50°35.2	59°37.0	27.2	220°26.2	35.1	205°53.2	38.0	14°05.1	08.4	Sabik	101°58.9	-15° 45.6
17	65°37.7	74°36.6	26.0	235°29.4	34.8	220°55.8	37.9	29°07.4	08.5	Shaula	96°05.8	-37°07.3
18	80°40.2	89°36.2	S05°24.8	250°32.6	S00°34.5	235° 58.5	S08°37.8	44°09.6	N12°08.6	Rasalhague	95°55.4	12°32.2
19	95°42.6	104°35.7	23.6	265°35.8	34.2	251°01.2	37.8	59°11.8	08.7	Eltanin	90°40.7	51°28.8
20	110°45.1	119°35.3	22.3	280°39.1	33.9	266°03.8	37.7	74°14.0	8.80	Kaus Aust.	83°28.1	-34°22.0
21 22	125°47.6 140°50.0	134°34.9 149°34.5	· · 21.1 19.9	295°42.3 310°45.5	• • 33.6	281°06.5 296°09.2	•• 37.6	89° 16.2 104° 18.5	•• 08.9	Vega	$80^{\circ}31.0$	38°48.4
23	155°52.5	164° 34.1	18.7	325°48.7	33.3 33.0	311°11.9	37.5 37.4	119° 20.7	09.0 09.1	Nunki	75°43.7	-26°15.5
23	155 52.5									Altair	61°56.8	8° 56.7
Mer.p	ass. 12:38	ν -0.4' d-1	2′ m-3.89	ν 3.2′ d-0.	3′ m-1.12	$\nu 2.7' \ d-0.$	1' m-2.38	ν 2.2′ d0.	1' m0.39	Peacock	53°00.9	-56°38.2
										Deneb	49°23.8	45°23.0
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.7	10°00.5
0	170°54.9	179°33.7	S05° 17.4	340°51.9	S00°32.7	326° 14.5	S08°37.3	134°22.9	N12°09.2	Al Na'ir Fomalhaut	27°29.2 15°11.2	-46°49.0 -29°28.0
1	185°57.4	194°33.3	16.2	355°55.1	32.4	341°17.2	37.2	149°25.1	09.2	Scheat	13°42.2	-29 28.0 28° 14.5
2	200°59.9	209°32.8	15.0	$10^{\circ}58.3$	32.1	$356^{\circ}19.9$	37.1	$164^{\circ}27.3$	09.3	Markab	13°26.8	15°21.7
3	$216^{\circ}02.3$	224°32.4	• • 13.8	$26^{\circ}01.5$	• • 31.8	11°22.5	•• 37.1	179° 29.5	• • 09.4			
4	231°04.8	239°32.0	12.5	41°04.7	31.5	26°25.2	37.0	194°31.8	09.5	Mar 11 Sun	SHA	Mer.pass
5	246°07.3	254°31.6	11.3	56°08.0	31.1	41°27.9	36.9	209°34.0	09.6	Venus	10°57.1	12:01
6	261°09.7	269°31.2	S05°10.1	71°11.2	500°30.8	56°30.6	S08°36.8	224°36.2	N12°09.7		169°22.1	01:26
7	276°12.2	284°30.8	08.8	86°14.4	30.5	71°33.2	36.7	239°38.4	09.8	Jupiter Saturn	155°09.9 323°39.6	02:23
8	291°14.7	299°30.4	07.6	101°17.6	30.2	86°35.9	36.6	254°40.6	09.9	Saturn	323 39.0	15:07
9 10	306°17.1 321°19.6	314°30.0 329°29.5	· · 06.4 05.2	116°20.8 131°24.1	· · 29.9 29.6	101°38.6 116°41.3	· · 36.5 36.4	269° 42.9 284° 45.1	· · 10.0 10.0	Mar 12 Mon	SHA	Mer.pass
11	321 19.6 336°22.1	329 29.5 344°29.1	03.9	131 24.1 146°27.3	29.0	110 41.3 131°43.9	36.4 36.4	284 45.1 299°47.3	10.0	Venus	9°47.8	12:01
12	351°24.5	359° 28.7	S05°02.7	140°27.5	500°29.0	131 43.9 146°46.6	S08°36.3	314°49.5	N12°10.2		169°39.3	01:21
13	6°27.0	14° 28.3	01.5	176°33.7	28.7	161°49.3	36.2	329°51.7	10.3		155°14.7	02:19
14	21°29.4	29°27.9	05°00.2	191°37.0	28.4	176° 52.0	36.1	344°53.9	10.4	Saturn	323°33.8	15:04
15	36°31.9	44°27.5	04°59.0	206°40.2	28.1	191°54.6	• • 36.0	359°56.1	. 10.5	Mar 13 Tue	SHA	Mer.pass
16	51°34.4	59°27.1	57.8	221°43.4	27.8	206°57.3	35.9	14°58.4	10.6	Venus	8°38.7	12:02
17	66°36.8	74°26.7	56.6	236°46.6	27.5	222°00.0	35.8	30°00.6	10.7	I	169°56.9	01:16
18	81°39.3	89° 26.3	S04°55.3	251°49.9	S00°27.1	237°02.7	S08°35.7	45°02.8	N12°10.8		$155^{\circ}19.6$	02:15
19	96°41.8	104°25.8	54.1	266°53.1	26.8	252°05.3	35.7	60°05.0	10.9	Saturn	323°27.9	15:00
20	111°44.2	119°25.4	52.9	281°56.3	26.5	267°08.0	35.6	75°07.2	10.9	ш! •	al navall-	
21	126°46.7	134°25.0	• • 51.6	296°59.6	• • 26.2	282°10.7	• • 35.5	90°09.4	• • 11.0	Horizont	al parallax	0.1
22	141°49.2	149°24.6	50.4	312°02.8	25.9	297°13.4	35.4	105°11.7	11.1		Venus: Mars:	0.1 0.2
23	156°51.6	164°24.2	49.2	327°06.0	25.6	312°16.0	35.3	120°13.9	11.2		ividi 5.	0.2
Mer.p	ass. 12:34	ν -0.4′ d-1	2′ m-3.89	ν 3.2′ d-0.	3′ m-1.14	ν 2.7′ d-0.	1′ m-2.38	ν 2.2′ d0.	1' m0.39			

Sum	h	Su			Moon			
1	Sun	GHA	Dec	GHA	ν	Dec	d	HP
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11 342°31.3 30.3 22°43.9 13.4' 15°27.5 -10.5' 55.1' 13 12°31.6 28.4 51°48.7 13.5' 15°06.5 -10.6' 55.1' 13 12°31.8 27.4 66°21.2 13.6' 14°55.9 -10.6' 55.1' 15 42°31.9 -26.4 80°53.8 13.7' 14°45.3 -10.7' 55.1' 16 57°32.1 25.4 95°26.5 13.7' 14°45.3 -10.8' 55.0' 17 72°32.3 24.4 109°59.2 13.8' 14°23.8 -10.8' 55.0' 18 87°32.4 503°23.5 124°32.0 13.9' 514°13.0 -10.9' 55.0' 19 102°32.6 22.5 139°04.9 139' 14°02.1 -10.9' 55.0' 22 147°33.1 19.5 182°43.8 14.1' 13°31.2 -11.0' 55.0' 22 147°33.1 19.5 182°43.8 14.1' 13°31.2 -11.0' 55.0' 22 147°33.1 19.5 182°43.8 14.1' 13°32.2 -11.0' 55.0' 22 147°33.1 19.5 182°43.8 14.1' 13°29.2 -11.1' 54.9' 22 207°33.8 16.6 226°23.3 14.3' 12°55.8 -11.2' 54.9' 22 207°33.8 16.6 226°23.3 14.3' 12°55.8 -11.2' 54.9' 22 207°33.8 15.6 240°55.6 14.3' 12°43.3 -11.3' 54.8' 522°34.3 12.6 284°35.9 14.5' 12°10.6 -11.4' 54.8' 522°34.3 12.6 284°35.9 14.5' 12°10.6 -11.4' 54.8' 522°34.8 09.7' 328°17.6 14.7' 11°36.3 -11.5' 54.8' 10 327°35.1 07.7 357°25.0 14.8' 11°32.2 -11.0' 54.8' 10 327°35.1 07.7 357°25.0 14.8' 11°32.2 -11.5' 54.8' 11°32.3								
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177°33.4 S03°17.6 211°50.1 14.2' S13°07.0 -11.2' 54.9' 1 192°33.6 16.6 226°23.3 14.3' 12°55.8 -11.2' 54.9' 2 207°33.8 15.6 240°55.6 14.3' 12°55.8 -11.2' 54.9' 3 222°33.9 · · · · · · · · · · · · · · · · · ·		JD — 10.1	<u>u — -1.0</u>		اد	J — 1J.1		
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9 312°39.0 · · 45.1 332°33.8 15.8' 06°37.8 -12.3' 54.4' 10 327°39.1 44.1 347°08.6 15.8' 06°25.5 -12.3' 54.4' 11 342°39.3 43.1 1°43.4 15.8' 06°13.2 -12.3' 54.4' 12 357°39.5 502°42.1 16°18.2 15.9' 506°00.9 -12.3' 54.4' 13 12°39.7 41.1 30°53.1 15.9' 05°48.6 -12.4' 54.4' 14 27°39.8 40.1 45°28.0 15.9' 05°36.2 -12.4' 54.4' 15 42°40.0 · 39.1 60°02.9 16.0' 05°36.2 -12.4' 54.3' 16 57°40.2 38.1 74°37.9 16.0' 05°11.4 -12.4' 54.3' 17 72°40.3 37.2 89°12.9 16.0' 04°59.0 -12.4' 54.3' 18 87°40.5 502°36.2 103°47.9 16.0' 504°46.6 -12.4' </td <th>7</th> <td>282°38.6</td> <td></td> <td>303°24.4</td> <td>15.7'</td> <td>$07^{\circ}02.3$</td> <td>-12.2'</td> <td>54.4'</td>	7	282°38.6		303°24.4	15.7'	$07^{\circ}02.3$	-12.2'	54.4'
10 327°39.1 44.1 347°08.6 15.8' 06°25.5 -12.3' 54.4' 11 342°39.3 43.1 1°43.4 15.8' 06°13.2 -12.3' 54.4' 12 357°39.5 S02°42.1 16°18.2 15.9' S06°00.9 -12.3' 54.4' 13 12°39.7 41.1 30°53.1 15.9' 05°48.6 -12.4' 54.4' 14 27°39.8 40.1 45°28.0 15.9' 05°36.2 -12.4' 54.4' 15 42°40.0 · 39.1 60°02.9 16.0' 05°36.2 -12.4' 54.3' 16 57°40.2 38.1 74°37.9 16.0' 05°11.4 -12.4' 54.3' 17 72°40.3 37.2 89°12.9 16.0' 04°59.0 -12.4' 54.3' 18 87°40.5 502°36.2 103°47.9 16.0' 504°46.6 -12.4' 54.3' 19 102°40.7 35.2 118°23.0 16.1' 04°34.2 -12.4'								
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16 57°40.2 38.1 74°37.9 16.0' 05°11.4 -12.4' 54.3' 17 72°40.3 37.2 89°12.9 16.0' 04°59.0 -12.4' 54.3' 18 87°40.5 S02°36.2 103°47.9 16.0' S04°46.6 -12.4' 54.3' 19 102°40.7 35.2 118°23.0 16.1' 04°34.2 -12.4' 54.3' 20 117°40.9 34.2 132°58.0 16.1' 04°21.7 -12.5' 54.3' 21 132°41.0 ·· 33.2 147°33.1 16.1' 04°09.3 -12.5' 54.3' 22 147°41.2 32.2 162°08.2 16.1' 03°56.8 -12.5' 54.3' 23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'								
18 87°40.5 S02°36.2 103°47.9 16.0' S04°46.6 -12.4' 54.3' 19 102°40.7 35.2 118°23.0 16.1' 04°34.2 -12.4' 54.3' 20 117°40.9 34.2 132°58.0 16.1' 04°21.7 -12.5' 54.3' 21 132°41.0 · · 33.2 147°33.1 16.1' 04°09.3 -12.5' 54.3' 22 147°41.2 32.2 162°08.2 16.1' 03°56.8 -12.5' 54.3' 23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'				74°37.9				
19 102°40.7 35.2 118°23.0 16.1' 04°34.2 -12.4' 54.3' 20 117°40.9 34.2 132°58.0 16.1' 04°21.7 -12.5' 54.3' 21 132°41.0 · · 33.2 147°33.1 16.1' 04°09.3 -12.5' 54.3' 22 147°41.2 32.2 162°08.2 16.1' 03°56.8 -12.5' 54.3' 23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'								
20 117°40.9 34.2 132°58.0 16.1' 04°21.7 -12.5' 54.3' 21 132°41.0 · · 33.2 147°33.1 16.1' 04°09.3 -12.5' 54.3' 22 147°41.2 32.2 162°08.2 16.1' 03°56.8 -12.5' 54.3' 23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'								
21 132°41.0 ·· 33.2 147°33.1 16.1' 04°09.3 -12.5' 54.3' 22 147°41.2 32.2 162°08.2 16.1' 03°56.8 -12.5' 54.3' 23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'								
23 162°41.4 31.2 176°43.4 16.2' 03°44.3 -12.5' 54.3'		132°41.0		$147^{\circ}33.1$				
SD = 16.1' d = -1.0' $SD = 14.9'$	23			176°43.4			-12.5'	54.3'
		SD = 16.1'	d = -1.0'		SI	O = 14.9'		

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

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

			Sun			Moon				
	Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.				
	,	00 ^h	00 ^h 12 ^h		Upper	Lower	26-28			
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-4%			
	11	10:02	09:54	12:10	09:26	21:49				
	12	09:46	09:38	12:10	10:11	22:32				
	13	09:30	09:22	12:09	10:53	23:13				

h	Aries	Ve	nus	Ma	ars	Jup	iter	Saturn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	•	SHA	Dec
0	171°54.1	179°23.8	S04°47.9	342°09.2	S00°25.3	327° 18.7	S08°35.2	135°16.1 N12°11.3			
1	186°56.5	194°23.4	46.7	357°12.5	25.0	342°21.4	35.1	150° 18.3 11.4	Alpheratz	357°31.6	29°15.1
2	$201^{\circ}59.0$	$209^{\circ}23.0$	45.5	$12^{\circ}15.7$	24.7	$357^{\circ}24.1$	35.0	165°20.5 11.5	Ankaa Schedar	353°04.3 349°27.6	-42°08.9 56°41.9
3	$217^{\circ}01.5$	$224^{\circ}22.6$	• • 44.2	$27^{\circ}19.0$	• • 24.3	$12^{\circ}26.8$	• • 34.9	180°22.7 · · 11.6	Diphda	349°27.0	-17°49.6
4	232°03.9	239°22.2	43.0	42°22.2	24.0	27°29.4	34.9	195°25.0 11.7	Achernar	335°18.3	-57°05.4
5	247°06.4	254°21.8	41.8	57°25.4	23.7	42°32.1	34.8	210°27.2 11.8	Hamal	327°47.6	23°36.0
6	262°08.9 277°11.3	269°21.4	S04°40.5	72°28.7	S00°23.4	57°34.8	S08°34.7	225°29.4 N12°11.9	Polaris	312°27.4	89°23.4
7 8	277 11.3 292°13.8	284°21.0 299°20.5	39.3 38.1	87°31.9 102°35.1	23.1 22.8	72°37.5 87°40.1	34.6 34.5	240°31.6 11.9 255°33.8 12.0	Acamar	$315^{\circ}09.5$	-40°11.5
9	307°16.3	314° 20.1	36.8	102 33.1 117°38.4	• • 22.5	102° 42.8	34.4	270°36.0 · · 12.1	Menkar	314°02.8	4°12.1
10	322°18.7	329° 19.7	35.6	132°41.6	22.2	117° 45.5	34.3	285°38.2 12.2	Mirfak	308°23.6	49°58.0
11	337°21.2	344° 19.3	34.4	147°44.9	21.8	132°48.2	34.2	300°40.5 12.3	Aldebaran	290°35.8	16°34.0
12	352°23.7	359° 18.9	504°33.1	162°48.1	500°21.5	147°50.9	508°34.1	315°42.7 N12°12.4	Rigel	281°00.6	-8°10.3
13	$7^{\circ}26.1$	$14^{\circ}18.5$	31.9	177°51.4	21.2	162°53.5	34.0	330°44.9 12.5	Capella Bellatrix	280°16.9 278°19.2	46°01.7 6°22.4
14	22°28.6	$29^{\circ}18.1$	30.7	$192^{\circ}54.6$	20.9	$177^{\circ}56.2$	34.0	345°47.1 12.6	Elnath	276 19.2 277°57.6	28°37.8
15	37°31.0	44° 17.7	• • 29.4	207°57.9	• • 20.6	192°58.9	• • 33.9	0°49.3 · · 12.7	Alnilam	275°34.3	-1°11.2
16	52°33.5	59° 17.3	28.2	223°01.1	20.3	208°01.6	33.8	15°51.5 12.8	Betelgeuse	270°48.4	7°24.5
17	67°36.0	74°16.9	27.0	238°04.3	20.0	223°04.3	33.7	30°53.7 12.8	Canopus	263°50.8	-52°43.1
18	82°38.4 97°40.9	89° 16.5 104° 16.1	S04° 25.7	253°07.6 268°10.8	S00°19.6	238° 07.0 253° 09.6	S08°33.6	45°55.9 N12°12.9 60°58.2 13.0	Sirius	$258^{\circ}23.1$	-16°45.7
19 20	97 40.9 112°43.4	104 16.1 119° 15.7	24.5 23.2	200 10.0 283°14.1	19.3 19.0	268° 12.3	33.5 33.4	76°00.4 13.1	Adhara	$255^{\circ}03.1$	-29°01.1
21	112 45.4 127°45.8	134° 15.7	• • 22.0	203°17.1	. 18.7	283° 15.0	33.3	91°02.6 · · 13.2	Procyon	244°47.1	5°08.7
22	142°48.3	149°14.9	20.8	313°20.6	18.4	298° 17.7	33.2	106°04.8 13.3	Pollux	243°13.0	27°57.2
23	157°50.8	164° 14.5	19.5	328°23.9	18.1	313°20.4	33.1	121°07.0 13.4	Avior	234°12.9	-59°36.6
									Suhail	222°43.4	-43°33.4
ivier.p	ass. 12:30	ν -0.4° d -1	.2′ m-3.89	ν 3.2′ d-0.	o m-1.1/	$\nu 2.7' \ d-0.$	ı m-∠.39	$\nu 2.2' \ d0.1' \ m0.39$	Miaplacidus - Alphard	221°36.7 217°44.1	-69°50.5 -8°47.4
									Regulus	207°30.6	11°49.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA Dec	Dubhe	193°36.4	61°35.4
0	172°53.2	179°14.1	S04°18.3	343°27.1	S00°17.8	328°23.0	S08°33.1	136°09.2 N12°13.5	Denebola	182°21.2	14°24.3
1	187°55.7	194°13.7	17.1	358°30.4	17.4	343°25.7	33.0	151°11.4 13.6	Gienah	175°39.7	-17°42.5
2	202°58.1	209°13.3	15.8	13°33.6	17.1	358°28.4	32.9	166°13.7 13.7	Acrux	$172^{\circ}55.4$	-63°15.7
3 4	218°00.6 233°03.1	224° 12.9 239° 12.5	· · 14.6 13.3	28°36.9 43°40.1	· · 16.8 16.5	13°31.1 28°33.8	· · 32.8 32.7	181°15.9 · · 13.8 196°18.1 13.8	Gacrux	171°47.1	-57°16.7
5	248°05.5	254° 12.0	12.1	58°43.4	16.2	43° 36.5	32.6	211°20.3 13.9	Alioth	166°09.6	55°47.8
6	263°08.0	269°11.6	S04° 10.9	73°46.7	S00°15.9	58° 39.2	S08°32.5	226°22.5 N12°14.0	Spica	158°18.4	-11°19.0
7	278° 10.5	284°11.2	09.6	88°49.9	15.5	73°41.8	32.4	241°24.7 14.1	Alkaid	152°49.0	49°09.8
8	293°12.9	299°10.8	08.4	103°53.2	15.2	88°44.5	32.3	256°26.9 14.2	Hadar	148°30.5 147°53.2	-60°30.8 -36°30.8
9	$308^{\circ}15.4$	$314^{\circ}10.4$	• • 07.2	$118^{\circ}56.4$	• • 14.9	103°47.2	• • 32.2	271°29.1 · · 14.3	Menkent Arcturus	147 55.2 145°44.6	-30 30.6 19°01.6
10	$323^{\circ}17.9$	$329^{\circ}10.0$	05.9	133°59.7	14.6	118°49.9	32.1	286°31.3 14.4	Rigil Kent.	139°35.0	-60°57.2
11	338°20.3	344°09.6	04.7	149°03.0	14.3	133°52.6	32.0	301°33.6 14.5	Kochab	137°19.4	74°01.8
12	353°22.8	359°09.2	S04°03.4	164°06.2	S00°13.9	148°55.3	S08°32.0	316°35.8 N12°14.6	Zuben'ubi	136°52.0	-16°09.9
13	8°25.3	14°08.8	02.2	179°09.5	13.6	163°57.9	31.9	331°38.0 14.7	Alphecca	$126^{\circ}00.7$	26°36.7
14	23°27.7	29°08.4	04°01.0	194°12.8	13.3	179°00.6	31.8	346°40.2 14.8	Antares	$112^{\circ}11.5$	-26°29.7
15 16	38°30.2 53°32.6	44°08.0 59°07.6	03°59.7 58.5	209°16.0 224°19.3	· · 13.0 12.7	194°03.3 209°06.0	· · 31.7 31.6	1°42.4 · · 14.8 16°44.6 14.9	Atria	107°02.6	-69°04.4
17	68°35.1	74°07.2	57.2	239°22.6	12.7	224°08.7	31.5	31°46.8 15.0	Sabik	101°58.8	-15°45.6
18	83°37.6	89°06.8	S03°56.0	254°25.8	S00°12.0	239°11.4	S08°31.4	46°49.0 N12°15.1	Shaula	96°05.7	-37°07.3
19	98°40.0	104°06.4	54.7	269°29.1	11.7	254° 14.1	31.3	61°51.3 15.2	Rasalhague	95°55.4	12°32.2
20	113°42.5	119°06.0	53.5	284°32.4	11.4	269° 16.8	31.2	76°53.5 15.3	Eltanin Kaus Aust.	90°40.7 83°28.1	51°28.8 -34°22.0
21	128°45.0	$134^{\circ}05.6$	• • 52.3	299°35.6	• • 11.1	284°19.4	• • 31.1	91°55.7 · · 15.4	Vega	80°31.0	38°48.4
22	143°47.4	$149^{\circ}05.2$	51.0	$314^{\circ}38.9$	10.7	$299^{\circ}22.1$	31.0	106° 57.9 15.5	Nunki	75°43.7	-26°15.5
23	158°49.9	164°04.8	49.8	329°42.2	10.4	314°24.8	30.9	122°00.1 15.6	Altair	61°56.8	8°56.7
Mer.p	ass. 12:26	ν -0.4' d-1	.2′ m-3.89	ν 3.3' d-0.	3′ m-1.20	$\nu 2.7' \ d-0.$	1′ m-2.39	ν2.2' d0.1' m0.39	Peacock	53°00.9	-56°38.2
									Deneb	49°23.8	45°23.0
	6114	6114		G114	_	6114		GU 4 B	Enif	33°35.7	10°00.5
Fri 0	GHA 173°52.4	GHA 179°04.4	Dec \$03°48.5	GHA 344°45.4	Dec \$00°10.1	GHA 329° 27.5	Dec \$08°30.8	GHA Dec 137°02.3 N12°15.7	Al Na'ir	27°29.2	-46°49.0
1	173 52.4 188°54.8	179 04.4 194°04.0	47.3	344 45.4 359°48.7	09.8	329 27.5 344° 30.2	30.8	157 02.3 N12 15.7 152°04.5 15.8	Fomalhaut	15°11.2	-29°28.0
2	203°57.3	209°03.6	46.1	14°52.0	09.5	359°32.9	30.7	167°06.7 15.8	Scheat	13°42.2	28°14.5
3	218°59.8	224°03.2	• • 44.8	29°55.3	09.1	14° 35.6	• • 30.6	182°08.9 · · 15.9	Markab	13°26.8	15°21.7
4	234°02.2	239°02.8	43.6	44°58.5	8.80	29°38.3	30.5	197°11.1 16.0	Mar 14 Wed	SHA	Mer.pass
5	249°04.7	254°02.4	42.3	60°01.8	08.5	44°41.0	30.4	212° 13.4 16.1	Venus	$7^{\circ}29.7$	12:03
6	264°07.1	269°02.0	503°41.1	$75^{\circ}05.1$	500°08.2	59°43.6	508°30.3	227°15.6 N12°16.2	Mars	170°15.2	01:11
7	279°09.6	284°01.6	39.8	90°08.4	07.8	74°46.3	30.2	242°17.8 16.3	Jupiter	155°24.6	02:10
8	294°12.1	299°01.3	38.6	105°11.7	07.5	89°49.0	30.1	257°20.0 16.4	Saturn	323°22.0	14:57
9	309°14.5	314°00.9	• • 37.4	120°14.9	• • 07.2	104°51.7	• • 30.0	272°22.2 · · 16.5	Mar 15 Thu	SHA	Mer.pass
10	324°17.0	329°00.5	36.1	135°18.2	06.9	119°54.4	29.9	287°24.4 16.6	Venus	6°20.8	12:03
11	339°19.5 354°21.9	344°00.1 358°59.7	34.9 \$03°33.6	150°21.5 165°24.8	06.6 \$00°06.2	134°57.1 149°59.8	29.8 \$08°29.7	302°26.6 16.7 317°28.8 N12°16.8		$170^{\circ}33.9$	01:06
12 13	354°21.9 9°24.4	358 59.7 13°59.3	32.4	165°24.8 180°28.1	05.9	149°59.8 165°02.5	29.6	317 28.8 N12 16.8 332°31.0 16.9		155°29.8	02:06
14	24°26.9	28° 58.9	31.1	195°31.4	05.9	180°05.2	29.5	347°33.2 16.9	Saturn	323°16.0	14:53
15	39°29.3	43°58.5	29.9	210°34.6	• • 05.3	195° 07.9	. 29.4	2°35.4 · · 17.0	Mar 16 Fri	SHA	Mer.pass
16	54°31.8	58°58.1	28.6	225°37.9	04.9	210° 10.6	29.4	17°37.7 17.1	Venus	5°12.1	12:04
17	69°34.2	73°57.7	27.4	240°41.2	04.6	225° 13.2	29.3	32°39.9 17.2	l l	170°53.1	01:01
18	84°36.7	88°57.3	S03°26.2	255°44.5	S00°04.3	240°15.9	S08°29.2	47°42.1 N12°17.3		155°35.1	02:02
19	99°39.2	103°56.9	24.9	270°47.8	04.0	255° 18.6	29.1	62°44.3 17.4		323°09.9	14:50
20	114°41.6	118° 56.5	23.7	285°51.1	03.6	270°21.3	29.0	77°46.5 17.5	U! ·	al navall	
21	129°44.1	133°56.1	• • 22.4	300°54.4	• • 03.3	285°24.0	• • 28.9	92°48.7 · · 17.6	Horizont	al parallax Venus:	0.1
22 23	144°46.6	148°55.7	21.2	315°57.6	03.0	300°26.7	28.8	107°50.9 17.7		venus: Mars:	0.1
23	159°49.0	163°55.3	19.9	331°00.9	02.7	315°29.4	28.7	122°53.1 17.8		141013.	0.2
Mer.p	ass. 12:22	ν -0.4′ d-1	.2′ m-3.89	ν 3.3′ <i>d</i> -0.	3′ m-1.22	ν 2.7′ d-0.	1′ m-2.40	$\nu 2.2' \ d0.1' \ m0.39$			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°41.5	S02°30.3	$191^{\circ}18.5$	16.2'	S 03°31.8	-12.5'	54.2'
1	192°41.7	29.3	205°53.7	16.2'	03°19.3	-12.5'	54.2'
2	207° 41.9 222° 42.1	28.3 •• 27.3	220°28.9 235°04.2	16.2' 16.2'	03°06.8 02°54.3	-12.5' -12.5'	54.2' 54.2'
4	237° 42.2	26.3	249°39.4	16.3	02°41.8	-12.5'	54.2'
5	252° 42.4	25.3	264°14.7	16.3'	02°29.3	-12.5'	54.2'
6	267° 42.6	S02°24.3	278°49.9	16.3'	S02°16.7	-12.5'	54.2'
7	282°42.7	23.3	293°25.2	16.3' 16.3'	02°04.2	-12.5'	54.2'
8 9	297° 42.9 312° 43.1	22.4 •• 21.4	308°00.5 322°35.9	16.3'	01°51.6 01°39.1	-12.5' -12.5'	54.2' 54.2'
10	327°43.3	20.4	337°11.2	16.4	01°26.6	-12.5'	54.1'
11	342°43.4	19.4	351°46.5	16.4'	01°14.0	-12.5'	54.1'
12	357° 43.6	S02°18.4	6°21.9	16.4'	S01°01.5	-12.5'	54.1'
13 14	12°43.8 27°44.0	17.4 16.4	20°57.3 35°32.7	16.4' 16.4'	00°48.9 00°36.4	-12.5' -12.5'	54.1' 54.1'
14 15	42° 44.1	10.4	50°08.1	16.4	00°36.4	-12.5'	54.1'
16	57° 44.3	14.5	64°43.5	16.4'	S00°11.3	-12.5'	54.1'
17	72°44.5	13.5	79°18.9	16.4'	N00°01.2	12.5'	54.1'
18	87°44.6	S02°12.5	93°54.3	16.4	N00°13.8	12.5'	54.1'
19 20	102°44.8 117°45.0	11.5 10.5	108°29.7 123°05.2	16.4' 16.4'	00°26.3 00°38.8	12.5' 12.5'	54.1' 54.1'
21	132° 45.2	09.5	123 05.2 137°40.6	16.4	00°51.3	12.5'	54.1
22	147°45.3	08.5	152°16.0	16.4'	01°03.8	12.5'	54.0'
23	162°45.5	07.5	$166^{\circ}51.5$	16.4'	$01^{\circ}16.3$	12.5'	54.0'
	SD = 16.1'	d = -1.0'		SI	D = 14.8'		
TL	СПУ	Dee	СП		Das	اد	µп
Thu 0	GHA 177 [°] 45.7	Dec \$02°06.6	GHA 181°26.9	u 16.4'	Dec N01° 28.8	<i>d</i> 12.5'	HP 54.0'
1	192°45.9	05.6	196°02.4	16.4	01°41.3	12.5'	54.0'
2	207°46.0	04.6	210°37.8	16.4'	01°53.8	12.5'	54.0'
3	222°46.2	• • 03.6	225°13.3	16.4	02°06.2	12.5'	54.0'
4 5	237° 46.4 252° 46.6	02.6 01.6	239°48.7 254°24.2	16.4' 16.4'	02°18.7 02°31.1	12.4' 12.4'	54.0' 54.0'
6	267°46.7	502°00.6	268°59.6	16.4	N02°43.6	12.4	54.0'
7	282°46.9	01°59.6	283°35.0	16.4'	02°56.0	12.4	54.0'
8	297°47.1	58.7	298°10.5	16.4'	03°08.4	12.4'	54.0'
9	312°47.3	• • 57.7	312°45.9	16.4'	03°20.8	12.4'	54.0'
10 11	327° 47.4 342° 47.6	56.7 55.7	327°21.3 341°56.7	16.4' 16.4'	03°33.1 03°45.5	12.4' 12.3'	54.0' 54.0'
12	357° 47.8	S01°54.7	356°32.2	16.4	N03°57.8	12.3	54.0'
13	12°48.0	53.7	11°07.6	16.4'	04°10.2	12.3'	54.0'
14	27°48.1	52.7	25°43.0	16.4'	04°22.5	12.3'	54.0'
15	42° 48.3 57° 48.5	• • 51.7	40°18.3	16.4	04°34.7	12.3'	53.9'
16 17	57°48.5 72°48.7	50.8 49.8	54°53.7 69°29.1	16.4' 16.4'	04°47.0 04°59.2	12.2' 12.2'	53.9' 53.9'
18	87° 48.8	S01°48.8	84°04.4	16.3'	N05°11.5	12.2'	53.9'
19	102°49.0	47.8	98°39.8	16.3'	05°23.7	12.2'	53.9'
20	117°49.2	46.8	113°15.1		05°35.8	12.2'	53.9'
21 22	132° 49.4 147° 49.5	· · 45.8 44.8	127°50.4 142°25.7	16.3' 16.3'	05°48.0 06°00.1	12.1' 12.1'	53.9' 53.9'
23	147 49.5 162°49.7	44.8 43.8	142 25.7 157°01.0	16.3'	06 00.1 06°12.2	12.1'	53.9'
	SD = 16.1'	d = -1.0'			D = 14.7'		
Fri 0	GHA 177° 49.9	Dec \$01°42.8	GHA 171°36.2	u 16.2'	Dec N06° 24.3	d 12.1'	HP 53.9'
1	192° 50.1	41.9	171 30.2 186°11.5	16.2'	06°36.4	12.1	53.9
2	207°50.3	40.9	200°46.7	16.2'	06°48.4	12.0'	53.9'
3	222°50.4	• • 39.9	215°21.9	16.2'	07°00.4	12.0'	53.9'
4 5	237° 50.6 252° 50.8	38.9 37.9	229°57.1 244°32.3	16.2' 16.1'	07°12.3 07°24.3	11.9' 11.9'	53.9' 53.9'
6	267°51.0	501°36.9	259°07.4	16.1	N07°36.2	11.9	53.9
7	282°51.1	35.9	273°42.5	16.1'	07°48.1	11.8'	53.9'
8	297°51.3	34.9	288°17.6	16.1'	07°59.9	11.8'	53.9'
9	312°51.5 327°51.7	· · 34.0 33.0	302°52.7 317°27.8	16.1' 16.0'	08°11.7 08°23.5	11.8' 11.8'	53.9' 53.9'
10 11	327°51.7 342°51.8	33.0 32.0	317°27.8 332°02.8	16.0'	08°23.5 08°35.3	11.8	53.9' 53.9'
12	357°52.0	S01°31.0	346°37.8	16.0'	N08°47.0	11.7	53.9'
13	12°52.2	30.0	1°12.8	16.0'	08°58.7	11.6'	53.9'
14	27°52.4	29.0	15°47.7	15.9'	09°10.3	11.6'	53.9'
15 16	42°52.6 57°52.7	· · 28.0 27.0	30°22.6 44°57.5	15.9' 15.9'	09°21.9 09°33.5	11.6' 11.5'	53.9' 53.9'
16 17	57°52.7 72°52.9	27.0 26.0	44°57.5 59°32.4	15.9 15.8'	09° 33.5 09° 45.1	11.5'	53.9' 53.9'
18	87°53.1	S01°25.1	74°07.2	15.8'	N09°56.6	11.5'	53.9'
19	102°53.3	24.1	88°42.0	15.8'	10°08.0	11.4'	53.9'
20	117°53.4	23.1	103°16.8	15.7'	10°19.4	11.4'	53.9'
21 22	132°53.6 147°53.8	· · 22.1 21.1	117°51.6 132°26.3	15.7' 15.7'	10°30.8 10°42.1	11.3' 11.3'	53.9' 53.9'
23	162°54.0	20.1	132 20.3 147°00.9	15.6'	10° 42.1 10° 53.4	11.3	53.9'
	SD = 16.1'	d = -1.0'		SI	D = 14.7'		

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

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

			Sun		Moon			
Г	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%	
	14	09:14	09:06	12:09	11:34	23:54		
	15	08:57	08:49	12:09	12:14	-:-		
	16	08:40	08:32	12:09	12:55	00:35		

h	Aries	Ver	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	174°51.5	178°54.9	503°18.7	346°04.2	500°02.3	330° 32.1	508°28.6	137°55.3	N12°17.9			Dec
0										Alpheratz	357°31.6	29° 15.1
1	189°54.0	193°54.5	17.4	1°07.5	02.0	345°34.8	28.5	152°57.5	18.0	Ankaa	353°04.3	-42°08.9
2	204°56.4	208°54.1	16.2	16°10.8	01.7	0°37.5	28.4	167°59.7	18.0	Schedar	349°27.6	56°41.9
3	219°58.9	223°53.7	• • 14.9	31°14.1	• • 01.4	15°40.2	• • 28.3	183°01.9	• • 18.1	Diphda	348°44.2	-17°49.6
4	235°01.4	238°53.3	13.7	46°17.4	01.0	30°42.9	28.2	198°04.2	18.2	Achernar	335°18.3	-57°05.4
5	250°03.8	253°52.9	12.4	61°20.7	00.7	45° 45.6	28.1	213°06.4	18.3	Hamal	327°47.6	23°36.0
6	265°06.3	268°52.5	S03°11.2	76°24.0	500°00.4	60°48.3	S08°28.0	228°08.6	N12°18.4	Polaris	312°28.6	89°23.4
7	280°08.7	283°52.2	10.0	91°27.3	500°00.1	75°51.0	27.9	243°10.8	18.5	Acamar	315°09.5	-40°11.5
8	295°11.2	298°51.8	08.7	106°30.6	N00°00.3	90°53.6	27.8	258° 13.0	18.6	Menkar	314°02.8	4°12.1
9	$310^{\circ}13.7$	313°51.4	• • 07.5	121°33.9	• • 00.6	105°56.3	• • 27.7	273° 15.2	• • 18.7	Mirfak	308°23.6	49°58.0
10	325°16.1	328°51.0	06.2	136°37.2	00.9	120°59.0	27.6	288° 17.4	18.8	Aldebaran	290°35.8	16°34.0
11	340°18.6	343°50.6	05.0	151°40.5	01.2	136°01.7	27.6	303°19.6	18.9	Rigel	281°00.7	-8°10.3
12	355°21.1	358°50.2	S03°03.7	166°43.8	N00°01.6	151°04.4	S08°27.5	$318^{\circ}21.8$	N12°19.0	Capella	280°16.9	46°01.6
13	10°23.5	13°49.8	02.5	181°47.1	01.9	$166^{\circ}07.1$	27.4	333°24.0	19.1	Bellatrix	278°19.3	6°22.4
14	25°26.0	28°49.4	01.2	196°50.4	02.2	181°09.8	27.3	348°26.2	19.1	Elnath	277°57.6	28° 37.8
15	40°28.5	43°49.0	03°00.0	211°53.7	• • 02.6	$196^{\circ}12.5$	• • 27.2	3°28.4	· · 19.2	Alnilam	275°34.3	-1°11.2
16	55°30.9	58°48.6	02°58.7	226°57.0	02.9	211°15.2	27.1	$18^{\circ}30.6$	19.3	Betelgeuse	270°48.4	7°24.5
17	70°33.4	73°48.2	57.5	242°00.3	03.2	226° 17.9	27.0	33°32.8	19.4	_		
18	85°35.8	88°47.8	S02°56.2	257°03.6	N00°03.5	241°20.6	S08°26.9	48°35.1	N12°19.5	Canopus	263°50.8 258°23.2	-52°43.1 -16°45.7
19	100°38.3	103°47.4	55.0	272°06.9	03.9	256°23.3	26.8	63°37.3	19.6	Sirius		-10 45.7 -29°01.1
20	115°40.8	118°47.0	53.7	287°10.2	04.2	271°26.0	26.7	78°39.5	19.7	Adhara	255°03.1	
21	130°43.2	133°46.7	• • 52.5	302°13.5	• • 04.5	286°28.7	• • 26.6	93°41.7	• • 19.8	Procyon	244°47.1	5°08.7
22	145°45.7	148°46.3	51.2	317°16.8	04.8	301°31.4	26.5	108°43.9	19.9	Pollux	243°13.0	27°57.2
23	160°48.2	163°45.9	50.0	332°20.1	05.2	316°34.1	26.4	123°46.1	20.0	Avior	234°12.9	-59°36.6
						-				Suhail	222°43.4	-43°33.4
Mer.p	ass. 12:19	ν -0.4' d-1.	.2′ m-3.89	ν 3.3′ d-0.	.3′ m-1.25	$\nu 2.7' \ d-0.$	1′ m-2.40	ν 2.2′ d0.	1′ m0.39	Miaplacidus	221°36.7	-69°50.6
				_						Alphard	217°44.2	-8°47.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	11°49.2
0	175°50.6	178°45.5	S02°48.7	347°23.4	N00°05.5	331° 36.8	S08°26.3	138°48.3	N12°20.1	Dubhe	193°36.4	61°35.5
1	190°53.1	193°45.1	47.5	2°26.7	05.8	346°39.5	26.2	153° 50.5	20.2	Denebola	182°21.2	14°24.3
2	205°55.6	208°44.7	46.2	17°30.0	06.2	1°42.2	26.1	168° 52.7	20.2	Gienah	175°39.7	-17°42.5
3	205°58.0	200° 44.7 223° 44.3	• • 45.0	32°33.3		16°44.9	26.0	183°54.9	. 20.3	Acrux	172°55.4	-63°15.8
	236°00.5			32 33.3 47°36.7	•• 06.5	31° 47.6	25.9			Gacrux	171°47.1	-57° 16.7
4		238° 43.9	43.7		06.8			198°57.1	20.4	Alioth	166°09.6	55° 47.8
5	251°03.0	253°43.5	42.5	62°40.0	07.1	46°50.3	25.8	213°59.3	20.5	Spica	158°18.4	-11°19.0
6	266°05.4	268°43.1	502°41.2	77°43.3	N00°07.5	61°53.0	S08°25.7	229°01.5	N12°20.6	Alkaid	152°49.0	49°09.8
7	281°07.9	283°42.7	40.0	92°46.6	07.8	76°55.7	25.6	244°03.7	20.7	Hadar	148°30.5	-60°30.8
8	296°10.3	298°42.4	38.7	107°49.9	08.1	91°58.4	25.5	259°05.9	20.8	Menkent	147°53.2	-36°30.8
9	311°12.8	313°42.0	• • 37.5	122°53.2	• • 08.5	107°01.1	• • 25.4	274°08.1	• • 20.9	Arcturus	145°44.6	19°01.6
10	326°15.3	328°41.6	36.2	137°56.5	08.8	122°03.8	25.3	289°10.3	21.0	Rigil Kent.	139°35.0	-60°57.3
11	341°17.7	343°41.2	35.0	152°59.8	09.1	137°06.5	25.2	304°12.5	21.1	Kochab	137°19.3	74°01.8
12	356°20.2	358°40.8	S02°33.7	168°03.2	N00°09.5	152°09.2	S08°25.1	319° 14.7	N12°21.2	Zuben'ubi	136°52.0	-16°09.9
13	11°22.7	13°40.4	32.5	183°06.5	09.8	167°11.9	25.0	334° 17.0	21.3	Alphecca	126°00.7	26°36.7
14	26°25.1	28°40.0	31.2	198°09.8	10.1	182°14.6	24.9	349° 19.2	21.4	Antares	112°11.5	-26° 29.7
15	41°27.6	43°39.6	• • 30.0	213°13.1	• • 10.4	197° 17.3	• • 24.9	4°21.4	• • 21.5	Atria	107°02.5	-69°04.4
16	56°30.1	58° 39.2	28.7	228°16.4	10.8	212°20.0	24.8	19°23.6	21.5	Sabik	101°58.8	-15°45.6
17	71°32.5	73°38.8	27.5	243°19.7	11.1	227° 22.7	24.7	34°25.8	21.6	Shaula	96°05.7	-37°07.3
18	86°35.0	88° 38.5	S02°26.2	258°23.1	N00°11.4	242°25.4	S08°24.6	49°28.0	N12°21.7	Rasalhague	95°55.4	12°32.2
19	101°37.4	103°38.1	25.0	273°26.4	11.8	257°28.1	24.5	64°30.2	21.8	Eltanin	90°40.6	51°28.8
20	116°39.9	118°37.7	23.7	288°29.7	12.1	272°30.8	24.4	79°32.4	21.9	Kaus Aust.	83°28.1	-34°22.0
21	131°42.4	133°37.3	• • 22.4	303°33.0	• • 12.4	287°33.5	• • 24.3	94°34.6	• • 22.0	Vega	80°31.0	38°48.4
22	146°44.8	148°36.9	21.2	318°36.3	12.8	302°36.2	24.2	109°36.8	22.1	Nunki	75°43.7	-26° 15.5
23	161°47.3	163°36.5	19.9	333°39.7	13.1	317°38.9	24.1	124°39.0	22.2	Altair	61°56.8	8°56.7
Morn	ass. 12:15	ν -0.4' d-1.	2' m 3 80	1/3 3/ 40	3′ m-1.27	$\nu 2.7' \ d-0.$	1' m 2 /1	ν 2.2' d0.	1′ m0 30	Peacock	53°00.9	-56°38.2
- IVIEL.P	455. 12.13	ν-0.4 U-1.	.2 111-3.09	νσ.σ do.	J III-1.21	ν2.1 u-0.		νz.z do.	1 1110.39	Deneb	49°23.7	45°22.9
										Enif	33°35.7	10°00.5
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.0
0	$176^{\circ}49.8$	$178^{\circ}36.1$	S02°18.7	348°43.0	N00°13.4	332°41.6	S08°24.0	139°41.2	$N12^{\circ}22.3$	Fomalhaut	15°11.2	-40° 49.0 -29° 28.0
1	191°52.2	193°35.7	17.4	3°46.3	13.8	347°44.3	23.9	154°43.4	22.4	Scheat	13°42.2	28° 14.5
2	$206^{\circ}54.7$	208°35.4	16.2	18°49.6	14.1	2°47.0	23.8	169°45.6	22.5	Markab	13°26.8	15°21.7
3	221°57.2	223°35.0	• • 14.9	33°52.9	• • 14.4	17°49.7	• • 23.7	$184^{\circ}47.8$	• • 22.6	IVIditab	13 20.0	15 21.7
4	$236^{\circ}59.6$	238°34.6	13.7	48°56.3	14.8	32°52.4	23.6	199°50.0	22.7	Mar 17 Sat	SHA	Mer.pass
5	252°02.1	253°34.2	12.4	63°59.6	15.1	47°55.1	23.5	214°52.2	22.8	Venus	4°03.4	12:05
6	267°04.6	268°33.8	S02°11.2	79°02.9	N00°15.4	62°57.9	S08°23.4	229°54.4	$N12^{\circ}22.8$	Mars	$171^{\circ}12.7$	00:56
7	282°07.0	283°33.4	09.9	94°06.2	15.7	78°00.6	23.3	244°56.6	22.9	Jupiter	155°40.6	01:58
8	297°09.5	298°33.0	08.7	109°09.6	16.1	93°03.3	23.2	259° 58.8	23.0	Saturn	323°03.8	14:46
9	312°11.9	313°32.6	• • 07.4	124°12.9	• • 16.4	108°06.0	23.1	275°01.0	23.1			
10	327°14.4	328°32.3	06.2	139°16.2	16.7	123°08.7	23.0	290°03.2	23.2	Mar 18 Sun	SHA	Mer.pass
11	342°16.9	343°31.9	04.9	154°19.6	17.1	138° 11.4	22.9	305°05.4	23.3	Venus	2°54.8	12:05
12	357°19.3	358°31.5	S02°03.6	169°22.9	N00°17.4	153° 14.1	508°22.8	320°07.6	N12°23.4		171°32.8	00:50
13	12°21.8	13°31.1	02.4	184°26.2	17.7	168° 16.8	22.7	335°09.8	23.5		155°46.2	01:53
14	27°24.3	28°30.7	02°01.1	199°29.5	18.1	183° 19.5	22.6	350° 12.0	23.6	Saturn	322°57.7	14:43
15	42°26.7	43°30.3	01°59.9	214°32.9	. 18.4	198°22.2	22.5	5° 14.2	23.7	Mar 19 Mon	SHA	Mer.pass
16	57°29.2	58°29.9	58.6	229°36.2	18.7	213°24.9	22.4	20° 16.4	23.8	Venus	1°46.4	12:06
17	72°31.7	73°29.6	57.4	244°39.5	19.1	228° 27.6	22.3	35° 18.6	23.9	1	171°53.2	00:45
18	87°34.1	88°29.2	S01°56.1	259°42.9	N00° 19.4	243°30.3	S08°22.2	50°20.8	N12°24.0		171 55.2 155°51.9	01:49
19	102°36.6	103°28.8	54.9	274°46.2	19.7	258° 33.0	22.1	65°23.0	24.1		322°51.4	14:39
20	117°39.1	118°28.4	53.6	289°49.5	20.1	273°35.7	22.0	80°25.2	24.1	Jaturn	J22 J1.4	14.39
21	132°41.5	133°28.0	• • 52.4	304°52.9	20.4	288° 38.4	21.9	95°27.4	• • 24.2	Horizont	al parallax	
22	147°44.0	148°27.6	51.1	319°56.2	20.7	303°41.2	21.8	110°29.6	24.3		Venus:	0.1
23	162°46.4	163°27.2	49.8	334°59.5	21.1	318°43.9	21.7	125°31.9	24.4		Mars:	0.2
Mer.p	ass. 12:11	ν -0.4′ d-1.	.3′ m-3.89	ν 3.3′ d0.	3′ m-1.30	ν 2.7′ d-0.	1′ m-2.41	ν 2.2′ d0.	1′ m0.39			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°54.2	S 01°19.1	161°35.6	15.6'	$N11^{\circ}04.7$	11.2'	53.9'
1	192°54.3	18.1	176°10.2	15.6'	11°15.9	11.2'	53.9'
2	207°54.5 222°54.7	17.1 •• 16.2	190°44.8 205°19.3	15.5' 15.5'	11°27.1 11°38.2	11.1' 11.1'	53.9' 53.9'
4	237°54.9	15.2	219°53.8	15.5'	11°49.3	11.0'	53.9'
5	252°55.1	14.2	234°28.3	15.4'	12°00.3	11.0'	53.9'
6	267°55.2	S01°13.2	249°02.7	15.4'	N12°11.3	10.9'	53.9'
7 8	282°55.4 297°55.6	12.2 11.2	263°37.1 278°11.4	15.3' 15.3'	12°22.2 12°33.1	10.9' 10.8'	53.9' 53.9'
9	312°55.8	. 10.2	292°45.7	15.3'	12°43.9	10.8	53.9'
10	327°56.0	09.2	307°20.0	15.2'	12°54.7	10.7'	53.9'
11	342°56.1	08.2	321°54.2	15.2'	13°05.5	10.7'	53.9'
12 13	357°56.3 12°56.5	S01°07.3 06.3	336°28.4 351°02.5	15.1' 15.1'	N13°16.1 13°26.8	10.6' 10.6'	53.9' 53.9'
14	27°56.7	05.3	5°36.6	15.1'	13°20.6	10.5	53.9'
15	42°56.9	• • 04.3	$20^{\circ}10.7$	15.0'	13°47.9	10.5'	53.9'
16	57°57.0	03.3	34°44.7	15.0'	13°58.4	10.4	53.9'
17 18	72°57.2 87°57.4	02.3 \$01°01.3	49°18.7 63°52.6	14.9' 14.9'	14°08.8 N14°19.1	10.4' 10.3'	53.9' 53.9'
19	102°57.6	01°00.3	78°26.5	14.8'	14°29.4	10.2	53.9'
20	117°57.8	$00^{\circ}59.3$	93°00.3	14.8'	14°39.7	10.2'	53.9'
21	132°57.9	• • 58.4	107°34.1	14.7'	14°49.9 15°00.0	10.1'	53.9'
22 23	147°58.1 162°58.3	57.4 56.4	122°07.8 136°41.5	14.7' 14.6'	15°10.0	10.1' 10.0'	53.9' 53.9'
_9	SD = 16.1'	d = -1.0'			O = 14.7'	20.0	
	3D — 10.1°	u — -1.0		31	J — 14.1°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°58.5	S00°55.4	151°15.2	14.6'	N15°20.1	9.9'	53.9'
1 2	192°58.7 207°58.8	54.4 53.4	165°48.8 180°22.3	14.5' 14.5'	15°30.0 15°39.9	9.9' 9.8'	53.9' 53.9'
3	222°59.0	52.4	194°55.8	14.4'	15°49.7	9.8'	53.9'
4	237°59.2	51.4	209°29.2	14.4'	15°59.5	9.7'	54.0'
5	252°59.4	50.4	224°02.6	14.3'	16°09.2	9.6'	54.0'
6 7	267°59.6 282°59.7	\$00°49.5 48.5	238°36.0 253°09.2	14.3' 14.2'	N16°18.8 16°28.4	9.6' 9.5'	54.0' 54.0'
8	297°59.9	47.5	267°42.5	14.2'	16°37.9	9.4	54.0'
9	313°00.1	• • 46.5	$282^{\circ}15.7$	14.1'	$16^{\circ}47.3$	9.4'	54.0'
10	328°00.3 343°00.5	45.5 44.5	296°48.8 311°21.9	14.1'	16°56.7 17°06.0	9.3' 9.2'	54.0' 54.0'
11 12	358°00.6	\$00°43.5	311 21.9 325°54.9	14.0' 14.0'	N17°15.2	9.2'	54.0'
13	13°00.8	42.5	340°27.9	13.9'	17°24.4	9.1	54.0'
14	28°01.0	41.5	355°00.8	13.9'	17°33.4	9.0'	54.0'
15 16	43°01.2 58°01.4	· · 40.6 39.6	9°33.6 24°06.4	13.8' 13.7'	17°42.5 17°51.4	8.9' 8.9'	54.0' 54.0'
17	73°01.6	38.6	38°39.2	13.7'	18°00.3	8.8'	54.0'
18	88°01.7	S00°37.6	53°11.9	13.6'	N18°09.1	8.7'	54.0'
19	103°01.9	36.6	67°44.5	13.6'	18°17.8	8.6'	54.1'
20 21	118°02.1 133°02.3	35.6 •• 34.6	82°17.1 96°49.6	13.5' 13.5'	18°26.4 18°35.0	8.6' 8.5'	54.1' 54.1'
22	148°02.5	33.6	111°22.1	13.4	18°43.5	8.4	54.1
23	163°02.6	32.6	125°54.5	13.3'	18°51.9	8.3'	54.1'
	SD = 16.1'	d = -1.0'		SI	D = 14.7'		
			CIIA			,	
Mon 0	GHA 178°02.8	Dec \$00°31.7	GHA 140°26.8	u 13.3'	Dec N19°00.2	d 8.3'	HP 54.1'
1	193°03.0	30.7	154°59.1	13.2	19°08.5	8.2	54.1
2	208°03.2	29.7	169°31.3	13.2'	19°16.6	8.1'	54.1'
3 4	223°03.4 238°03.6	· · 28.7 27.7	184°03.5 198°35.6	13.1' 13.1'	19°24.7 19°32.7	8.0' 7.9'	54.1' 54.1'
4 5	253°03.7	27.7 26.7	213°07.7	13.1	19 32.7 19°40.7	7.9 7.8'	54.1 54.2'
6	268°03.9	S00°25.7	227°39.7	12.9'	N19°48.5	7.8'	54.2'
7	283°04.1	24.7	242°11.6	12.9'	19°56.3	7.7'	54.2'
8 9	298°04.3 313°04.5	23.7 •• 22.8	256°43.5 271°15.3	12.8' 12.8'	20°03.9 20°11.5	7.6' 7.5'	54.2' 54.2'
10	313 °04.5 328°04.7	21.8	285°47.1	12.7	20°19.0	7.3 7.4	54.2'
11	343°04.8	20.8	300°18.8	12.6'	$20^{\circ}26.4$	7.3'	54.2'
12	358°05.0	S00°19.8	314°50.4	12.6'	N20°33.8	7.2'	54.2'
13 14	13°05.2 28°05.4	18.8 17.8	329°22.0 343°53.5	12.5' 12.5'	20°41.0 20°48.2	7.1' 7.1'	54.2' 54.3'
15	43°05.6	16.8	358°24.9	12.4	20°55.2	7.0'	54.3'
16	58°05.8	15.8	12°56.3	12.3'	21°02.2	6.9'	54.3'
17 18	73°05.9 88°06.1	14.9 S00°13.9	27°27.7 41°58.9	12.3' 12.2'	21°09.1 N21°15.8	6.8' 6.7'	54.3' 54.3'
18 19	103°06.3	12.9	41°58.9 56°30.1	12.2	N21°15.8 21°22.5	6.6'	54.3'
20	118°06.5	11.9	71°01.3	12.1'	21°29.1	6.5'	54.3'
21	133°06.7	• • 10.9	85°32.4	12.0'	21°35.6	6.4	54.4'
22 23	148°06.9 163°07.0	09.9 08.9	100°03.4 114°34.4	12.0' 11.9'	21°42.0 21°48.3	6.3' 6.2'	54.4' 54.4'
23						0.2	J+.+
	SD = 16.1'	d = -1.0'		51	O = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-13%	
17	08:23	08:15	12:08	13:37	01:16		
18	08:06	07:57	12:08	14:21	01:58		
19	07:49	07:40	12:08	15:07	02:43		

March 20, 21, 22 UT (Tue., Wed., Thu.)

h	Aries	Ve	nus	M	ars	Jup	oiter	Satı	ırn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	177°48.9	178° 26.9	S01°48.6		N00°21.4		508°21.6				эпа	Dec
0				350°02.9		333°46.6			N12°24.5	Alpheratz	357°31.6	29° 15.1
1	192°51.4 207°53.8	193°26.5	47.3	5°06.2	21.7	348°49.3	21.5	155°36.3	24.6	Ankaa	353°04.3	-42°08.9
2		208°26.1	46.1	20°09.5	22.1	3°52.0	21.4	170°38.5	24.7	Schedar	349°27.6	56°41.9
3	222°56.3	223°25.7	• • 44.8	35°12.9	• • 22.4	18°54.7	• • 21.3	185°40.7 200°42.9	• • 24.8	Diphda	348°44.2	-17°49.6
4	237°58.8	238°25.3	43.6	50°16.2	22.7	33°57.4	21.2		24.9	Achernar	335°18.3	-57°05.4
5 6	253°01.2 268°03.7	253°24.9 268°24.5	42.3 \$01°41.1	65°19.6 80°22.9	23.1 N00°23.4	49°00.1 64°02.8	21.1 \$08°21.0	215°45.1 230°47.3	25.0 N12°25.1	Hamal	327°47.6	23°36.0
7	283°06.2	283°24.2	39.8	95°26.2	23.7	79°05.5	20.9	245°49.5	25.2	Polaris	312°29.5	89°23.4
8	298°08.6	298° 23.8	38.5	110°29.6	24.1	94°08.2	20.9	260°51.7	25.2	Acamar	315°09.5	-40°11.5
9	313°11.1	313°23.4	37.3	125°32.9	24.4	109°11.0	20.7	275°53.9	• • 25.4	Menkar	314°02.8	4°12.1
10	328°13.5	328°23.0	36.0	140°36.3	24.7	124°13.7	20.6	290°56.1	25.5	Mirfak	308°23.6	49°58.0
11	343°16.0	343°22.6	34.8	155°39.6	25.1	139°16.4	20.5	305°58.3	25.5	Aldebaran	290°35.8	16°34.0
12	358°18.5	358°22.2	S01°33.5	170°42.9	N00°25.4	154°19.1	508°20.4		N12°25.6	Rigel	281°00.7	-8°10.3
13	13°20.9	13°21.9	32.3	185°46.3	25.7	169°21.8	20.3	336°02.7	25.7	Capella	280°16.9	46°01.6
14	28°23.4	28°21.5	31.0	200°49.6	26.1	184°24.5	20.2	351°04.9	25.8	Bellatrix	278°19.3	6°22.4
15	43°25.9	43°21.1	• • 29.7	215°53.0	• • 26.4	199°27.2	• • 20.1	6°07.1	• • 25.9	Elnath	277°57.6	28°37.8
16	58°28.3	58°20.7	28.5	230°56.3	26.7	214°29.9	20.0	21°09.3	26.0	Alnilam	275°34.3	-1°11.2
17	73°30.8	73°20.3	27.2	245°59.7	27.1	229°32.6	19.9	$36^{\circ}11.5$	26.1	Betelgeuse	270°48.4	7°24.5
18	88°33.3	88° 19.9	S01°26.0	261°03.0	N00°27.4	244°35.3	S08°19.8	51°13.7	$N12^{\circ}26.2$	Canopus Sirius	263°50.8 258°23.2	-52°43.1 -16°45.7
19	103°35.7	103°19.6	24.7	276°06.3	27.8	259°38.1	19.7	66°15.9	26.3	Adhara	255°03.1	-10 45.7 -29°01.1
20	118°38.2	118° 19.2	23.5	291°09.7	28.1	274°40.8	19.6	$81^{\circ}18.1$	26.4	Procyon	244°47.2	5°08.7
21	133°40.7	133°18.8	• • 22.2	306°13.0	• • 28.4	289°43.5	• • 19.5	96°20.3	• • 26.5	Pollux	243°13.0	27° 57.2
22	148°43.1	148°18.4	20.9	321°16.4	28.8	304°46.2	19.4	111°22.5	26.6	Avior	234°12.9	-59°36.6
23	163°45.6	163°18.0	19.7	336°19.7	29.1	319°48.9	19.3	126°24.7	26.7	Suhail	222°43.4	-43°33.4
Mern	ass. 12:07	ν -0.4' d-1	3′ m-3.89	ν3 3' dΩ	3′ m-1.32	ν2 7' d-0	.1′ m-2.42	ν 2.2′ d0.3	1′ m0 30	Miaplacidus	221°36.7	-69° 50.6
- Wici.p	a33. 12.07	ν σ. + α 1		ν σ.σ · u σ.	J III 1.32	VZ.1 U 0.	.1 111 2.72	ν Z.Z ασ		Alphard	217°44.2	-8° 47.4
										Regulus	207°30.6	11°49.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.4	61°35.5
0	178°48.0	178°17.6	S01°18.4	351°23.1	N00°29.4	334°51.6	508° 19.2		N12°26.8	Denebola	182°21.2	14°24.3
1	193°50.5	193°17.3	17.2	6°26.4	29.8	349°54.3	19.1	156°29.1	26.9	Gienah	175°39.7	-17°42.5
2	208°53.0	208°16.9	15.9	21°29.8	30.1	4°57.0	19.0	171°31.3	27.0		172°55.4	-63° 15.8
3	223°55.4	223°16.5	• • 14.7	36°33.1	• • 30.4	19°59.8	• • 18.9	186°33.4	• • 27.0	Gacrux	171°47.1	-57° 16.7
4	238°57.9	238° 16.1	13.4	51°36.5	30.8	35°02.5	18.8	201°35.6	27.1	Alioth	166°09.6	55° 47.8
5	254°00.4	253°15.7	12.1	66°39.8	31.1	50°05.2	18.7	216°37.8	27.2	Spica	158°18.4	-11° 19.0
6	269°02.8	268° 15.3	501°10.9	81°43.2	N00°31.4	65°07.9	508°18.6		N12°27.3	Alkaid	152°49.0	49°09.8
7	284°05.3	283°15.0	09.6	96°46.5	31.8	80°10.6	18.5	246°42.2	27.4	Hadar	148°30.5	-60°30.8
8	299°07.8	298°14.6	08.4	111°49.9	32.1	95°13.3	18.4	261°44.4	27.5	Menkent	$147^{\circ}53.2$	-36°30.9
9	314°10.2	313°14.2	•• 07.1	126°53.2	• • 32.4	110°16.0	• • 18.3	276°46.6	• • 27.6	Arcturus	145°44.6	19°01.6
10	329°12.7 344°15.2	328°13.8	05.8	141°56.6	32.8	125°18.8	18.2	291°48.8	27.7	Rigil Kent.	139°35.0	-60°57.3
11 12	344 15.2 359°17.6	343°13.4 358°13.1	04.6 \$01°03.3	156°59.9 172°03.3	33.1 N00°33.4	140°21.5 155°24.2	18.1 \$08°18.0	306°51.0 321°53.2	27.8 N12°27.9	Kochab	137°19.3	74°01.8
13	14°20.1	13° 12.7	02.1	172 03.3 187°06.6	33.8	170°26.9	17.9	336°55.4	28.0	Zuben'ubi	136°52.0	-16°09.9
14	29°22.5	28° 12.7	02.1 01°00.8	202°10.0	34.1	170 20.9 185°29.6	17.9 17.8	351°57.6	28.0	Alphecca	126°00.7	26°36.7
15	44°25.0	43°11.9	01° 00.0	202 10.0 217°13.3	34.5	200°32.3	•• 17.7	6°59.8	. 28.2	Antares	112°11.5	-26°29.7
16	59°27.5	58° 11.5	58.3	232°16.7	34.8	215°35.0	17.6	22°02.0	28.3	Atria	107°02.5	-69°04.4
17	74°29.9	73°11.1	57.0	247°20.0	35.1	230°37.8	17.5	37°04.2	28.4	Sabik	101°58.8	-15°45.6
18	89°32.4	88° 10.8	S00°55.8	262°23.4	N00°35.5	245°40.5	S08°17.3		N12°28.5	Shaula	96°05.7	-37°07.3
19	104°34.9	103°10.4	54.5	277°26.7	35.8	260°43.2	17.2	67°08.6	28.5	Rasalhague	95°55.4	12°32.2
20	119°37.3	118°10.0	53.3	292°30.1	36.1	275°45.9	17.1	82°10.8	28.6	Eltanin	90°40.6	51°28.8
21	134°39.8	133°09.6	• • 52.0	307°33.5	• • 36.5	290°48.6	• • 17.0	97°13.0	• • 28.7	Kaus Aust.	83°28.1	-34°22.0 38°48.4
22	149°42.3	148°09.2	50.7	322°36.8	36.8	305°51.3	16.9	112°15.2	28.8	Vega	80°31.0	
23	164°44.7	163°08.9	49.5	337°40.2	37.1	320°54.1	16.8	$127^{\circ}17.4$	28.9	Nunki Altair	75°43.6 61°56.8	-26°15.5 8°56.7
N 4 - · · · ·	12.02	0 4/ -/ 1	2/ 2.00	- 2 2/ -10	3′ m-1.35	- 0.7/ -1.0	1/ 2.42		1/ 0 20	Peacock	53°00.8	-56°38.1
ivier.p	ass. 12:03	ν -0.4 a-1	3′ m-3.89	ν 3.3 au.	3 m-1.35	ν 2.7 a-0.	.1′ m-2.42	ν 2.2′ d0.3	mu.39	Deneb	49°23.7	45°22.9
										Enif	33°35.7	10° 00.5
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.2	-46°49.0
0	179°47.2	178°08.5	S00°48.2	352°43.5	N00°37.5	335°56.8	S08°16.7	$142^{\circ}19.6$	N12°29.0	Fomalhaut	15°11.2	-29°28.0
1	194°49.7	193°08.1	47.0	7°46.9	37.8	350°59.5	16.6	157°21.8	29.1	Scheat	13°42.2	28° 14.5
2	209°52.1	208°07.7	45.7	22°50.2	38.1	6°02.2	16.5	172°24.0	29.2	Markab	13°26.8	15°21.7
3	224°54.6	223°07.3	• • 44.4	37°53.6	• • 38.5	21°04.9	• • 16.4	187°26.2	• • 29.3			
4	239°57.0	238°07.0	43.2	52°57.0	38.8	36°07.6	16.3	202°28.4	29.4	Mar 20 Tue	SHA	Mer.pass
5	254°59.5	253°06.6	41.9	68°00.3	39.2	51°10.4	16.2	217°30.6	29.5	Venus	0°37.9	12:07
6	270°02.0	268°06.2	S00°40.7	83°03.7	N00°39.5	66°13.1	S08°16.1		N12°29.6		172°14.0	00:40
7	285°04.4	283°05.8	39.4	98°07.0	39.8	81°15.8	16.0	247°35.0	29.7	Jupiter	155°57.7	01:45
8	300°06.9	298°05.4	38.1	113°10.4	40.2	96°18.5	15.9	262°37.2	29.8	Saturn	322°45.1	14:36
9	315°09.4	313°05.1	• • 36.9	128°13.8	• • 40.5	111°21.2	• • 15.8	277°39.4	• • 29.9	Mar 21 Wed	SHA	Mer.pass
10	330°11.8	328°04.7	35.6	143°17.1	40.8	126°24.0	15.7	292°41.6	30.0	1	359°29.6	12:07
11	345°14.3	343°04.3	34.4	158°20.5	41.2	141°26.7	15.6	307°43.8	30.1		172°35.0	00:34
12	0°16.8	358°03.9	\$00°33.1	173°23.8	N00°41.5	156°29.4	\$08° 15.5		N12°30.1	1	156°03.6	01:40
13	15°19.2 30°21.7	13°03.5 28°03.2	31.8 30.6	188°27.2	41.8 42.2	171°32.1	15.4 15.3	337°48.2 352°50.4	30.2	Saturn	322°38.8	14:32
14 15		43°02.8		203°30.6		186°34.8		352°50.4 7°52.5	30.3	NA 00 T		
15 16	45°24.1 60°26.6	43°02.8 58°02.4	· · 29.3 28.1	218°33.9	· · 42.5 42.8	201°37.6 216°40.3	· · 15.2	7°52.5 22°54.7	· · 30.4 30.5	Mar 22 Thu	SHA	Mer.pass
16 17	75°29.1	73°02.4	28.1 26.8	233°37.3 248°40.6	42.8	216°40.3 231°43.0	15.1 15.0	22°54.7 37°56.9	30.5 30.6		358°21.3	12:08
17 18	75°29.1 90°31.5	73°02.0 88°01.6	26.8 \$00°25.5	248°40.6 263°44.0	43.2 N00°43.5	231°43.0 246°45.7	508° 14.9	52°59.1		1	172°56.3	00:29
19	90 31.5 105°34.0	103°01.3	24.3	203 44.0 278°47.4	43.8	240 45.7 261°48.4	14.8	68°01.3	30.8		156°09.6	01:36
20	105° 34.0	118° 00.9	23.0	293°50.7	44.2	276°51.2	14.6	83°03.5	30.8	Saturn	322°32.4	14:29
21	135°38.9	133°00.5	21.8	308°54.1	• • 44.5	291°53.9	• • 14.6	98°05.7	• 31.0	Horizont	al parallax	ļ
22	150°41.4	148°00.1	20.5	323°57.5	44.9	306°56.6	14.5	113°07.9	31.1		Venus:	0.1
23	165°43.9	162°59.7	19.2	339°00.8	45.2	321°59.3	14.4	128°10.1	31.2		Mars:	0.2
ıvıer.p	ass. 11:59	$ u$ -0.4 $^{\prime}$ d- 1	3′ m-3.89	ν 3.4 $^{\prime}$ d0.	3′ m-1.37	ν 2.1' d -0.	.1′ m-2.43	ν 2.2′ d0.3	∟ mu.39			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°07.2	S00°07.9	$129^{\circ}05.3$	11.8'	N21°54.5	6.1'	54.4'
1	193°07.4	06.9	143°36.1	11.8'	22°00.7	6.0'	54.4'
2 3	208° 07.6 223° 07.8	06.0 •• 05.0	158°06.9 172°37.6	11.7' 11.7'	22°06.7 22°12.6	5.9' 5.8'	54.4' 54.4'
4	238° 08.0	04.0	187°08.3	11.6'	22°18.4	5.7'	54.5'
5	253°08.1	03.0	201°38.9	11.5'	$22^{\circ}24.1$	5.6'	54.5'
6	268° 08.3 283° 08.5	S00°02.0	216°09.5 230°39.9	11.5'	N22°29.7 22°35.2	5.5'	54.5'
7 8	283 08.5 298°08.7	01.0 S 00°00.0	230 39.9 245°10.4	11.4' 11.4'	22°40.7	5.4' 5.3'	54.5' 54.5'
9	313°08.9	N00°01.0	259°40.7	11.3'	22°46.0	5.2'	54.5'
10	328°09.1	02.0	274°11.0	11.2'	22°51.2	5.1'	54.6'
11 12	343°09.3 358°09.4	02.9 N00°03.9	288°41.3 303°11.5	11.2' 11.1'	22°56.3 N23°01.2	5.0' 4.9'	54.6' 54.6'
13	13°09.6	04.9	317°41.6	11.1'	23°06.1	4.8'	54.6
14	28°09.8	05.9	$332^{\circ}11.7$	11.0'	23°10.9	4.7'	54.6'
15	43° 10.0	• • 06.9	346°41.7	11.0'	23° 15.6	4.6'	54.7'
16 17	58° 10.2 73° 10.4	07.9 08.9	1°11.7 15°41.6	10.9' 10.8'	23°20.1 23°24.6	4.4' 4.3'	54.7' 54.7'
18	88° 10.5	N00°09.9	30°11.4	10.8'	N23°28.9	4.2'	54.7'
19	103° 10.7	10.8	44°41.2	10.7'	23°33.1	4.1'	54.7'
20	118° 10.9 133° 11.1	11.8	59°10.9 73°40.6	10.7'	23°37.3 23°41.3	4.0'	54.7'
21 22	133°11.1 148°11.3	· · 12.8 13.8	73°40.6 88°10.2	10.6' 10.6'	23°41.3 23°45.2	3.9' 3.8'	54.8' 54.8'
23	163°11.5	14.8	102°39.8	10.5'	23° 48.9	3.7'	54.8'
	SD = 16.1'	d = -1.0'		SE	0 = 14.8'		
Wed	GHA 178° 11.7	Dec N00°15.8	GHA 117°09.3	u 10.5'	Dec N23°52.6	d 3.5'	HP
0 1	178°11.7 193°11.8	N00°15.8 16.8	117°09.3 131°38.8	10.5'	N23° 52.6 23° 56.1	3.5'	54.8' 54.9'
2	208° 12.0	17.8	146°08.2	10.4'	23°59.6	3.3'	54.9'
3	223°12.2	• • 18.7	160°37.6	10.3'	24°02.9	3.2'	54.9'
4 5	238° 12.4 253° 12.6	19.7 20.7	175°06.9 189°36.1	10.3' 10.2'	24°06.1 24°09.2	3.1' 3.0'	54.9' 54.9'
6	268° 12.8	N00°21.7	204°05.3	10.2'	N24°12.1	2.8'	55.0'
7	283°13.0	22.7	$218^{\circ}34.5$	10.1'	24°15.0	2.7'	55.0'
8	298°13.1	23.7	233°03.6	10.1'	24° 17.7	2.6'	55.0'
9 10	313° 13.3 328° 13.5	· · 24.7 25.7	247°32.6 262°01.6	10.0' 10.0'	24°20.3 24°22.8	2.5' 2.4'	55.0' 55.1'
11	343° 13.7	26.6	276°30.6	9.9'	24°25.2	2.2'	55.1'
12	358° 13.9	N00°27.6	290°59.5	9.9'	N24°27.4	2.1'	55.1'
13 14	13° 14.1 28° 14.3	28.6 29.6	305°28.4 319°57.2	9.8' 9.8'	24°29.5 24°31.6	2.0' 1.9'	55.1' 55.1'
15	43°14.4	30.6	334°25.9	9.0 9.7'	24°33.4	1.8'	55.2'
16	58°14.6	31.6	348°54.7	9.7'	24°35.2	1.6'	55.2'
17	73°14.8	32.6	3°23.3	9.6'	24°36.8	1.5'	55.2'
18 19	88° 15.0 103° 15.2	N00°33.6 34.5	17°52.0 32°20.6	9.6' 9.6'	N24°38.3 24°39.7	1.4' 1.3'	55.2' 55.3'
20	118° 15.4	35.5	46°49.1	9.5'	24°41.0	1.1'	55.3'
21	133° 15.6	• • 36.5	61°17.6	9.5'	24°42.1	1.0'	55.3'
22 23	148° 15.7 163° 15.9	37.5 38.5	75°46.1 90°14.5	9.4' 9.4'	24°43.1 24°44.0	0.9' 0.7'	55.4' 55.4'
23			90 14.5			0.7	33.4
	SD = 16.0'	d = 1.0'		SE	0 = 15.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 16.1	N00°39.5	104°42.9	9.4'	N24°44.7	0.6'	55.4'
1 2	193° 16.3 208° 16.5	40.5 41.4	119°11.3 133°39.6	9.3' 9.3'	24°45.3 24°45.8	0.5' 0.4'	55.4' 55.5'
3	208 16.5 223°16.7	• • 42.4	133 39.6 148°07.9	9.3 9.2'	24 45.8 24°46.2	0.4	55.5'
4	238°16.9	43.4	162°36.1	9.2'	24°46.4	0.1'	55.5'
5	253°17.1 268°17.2	44.4	177°04.4	9.2'	24°46.5 N24°46.5	-0.0'	55.5'
6 7	268° 17.2 283° 17.4	N00°45.4 46.4	191°32.5 206°00.7	9.1' 9.1'	N24° 46.5 24° 46.3	-0.2' -0.3'	55.6' 55.6'
8	298°17.6	47.4	220°28.8	9.1'	24°46.0	-0.4	55.6'
9	313°17.8	• • 48.4	234°56.9	9.1'	24°45.6	-0.6'	55.7'
10 11	328° 18.0 343° 18.2	49.3 50.3	249°24.9 263°52.9	9.0' 9.0'	24°45.1 24°44.4	-0.7' -0.8'	55.7' 55.7'
12	358° 18.4	N00°51.3	203 52.9 278°20.9	9.0'	N24°43.6	-0.8	55.7'
13	13° 18.5	52.3	292°48.9	8.9'	24°42.6	-1.1'	55.8'
14	28° 18.7	53.3	307°16.8	8.9'	24°41.5	-1.2'	55.8'
15 16	43° 18.9 58° 19.1	• • 54.3 55.3	321°44.7 336°12.6	8.9' 8.9'	24°40.3 24°39.0	-1.3' -1.5'	55.8' 55.9'
17	73° 19.3	56.2	350°40.5	8.8'	24°37.5	-1.6'	55.9'
18	88° 19.5	N00°57.2	5°08.3	8.8'	N24°35.9	-1.7'	55.9'
19 20	103° 19.7 118° 19.9	58.2 00°59.2	19°36.1 34°03.9	8.8' 8.8'	24°34.1 24°32.3	-1.9' -2.0'	56.0' 56.0'
21	118 19.9 133°20.0	00 59.2 01°00.2	48°31.7	8.8'	24 32.3 24°30.3	-2.0 -2.2'	56.0'
22	148°20.2	01.2	62°59.5	8.7'	24°28.1	-2.3'	56.1'
23	163°20.4	02.2	77°27.2	8.7'	24°25.8	-2.4'	56.1'
	SD = 16.0'	d=1.0'		SE	0 = 15.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-37%	
20	07:31	07:22	12:07	15:55	03:30		
21	07:13	07:04	12:07	16:46	04:20		
22	06:56	06:47	12:07	17:39	05:12		

March 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	180°46.3	177°59.4	S00°18.0	354°04.2	N00°45.5	337°02.0	S08°14.2	143°12.3	$N12^{\circ}31.3$	Alphoratz	357°31.5	29°15.1
1	195°48.8	192°59.0	16.7	9°07.6	45.9	352°04.8	14.1	158°14.5	31.4	Alpheratz	357 31.5 353°04.3	-42°08.8
2	210°51.3	207°58.6	15.5	24°10.9	46.2	7°07.5	14.0	173°16.7	31.5	Ankaa Schedar	353 04.3 349°27.6	-42 08.8 56°41.9
3	225°53.7	222°58.2	• • 14.2	39°14.3	• • 46.5	22°10.2	• • 13.9	188°18.9	• • 31.6	Diphda	349° 21.0	-17°49.6
4	240°56.2	237°57.8	12.9	54°17.7	46.9	37° 12.9	13.8	203°21.1	31.7		346 44.2 335°18.3	-17 49.0 -57°05.4
5	255°58.6	252°57.5	11.7	69°21.0	47.2	52° 15.6	13.7	218°23.3	31.8	Achernar Hamal	335 18.3 327°47.6	-57 05.4 23°36.0
6	271°01.1	267°57.1	500°10.4	84°24.4	N00°47.5	67° 18.4	508°13.6	233°25.5	N12°31.8	Polaris	312°30.4	89°23.3
7	286°03.6	282°56.7	09.2	99°27.8	47.9	82°21.1	13.5	248°27.7	31.9	Acamar	312 30.4 315°09.6	-40°11.5
8	301°06.0	297°56.3	07.9	114°31.1	48.2	97°23.8	13.4	263°29.9	32.0	Menkar	314°02.8	4°12.1
9	316°08.5	312°56.0	• • 06.6	129°34.5	• • 48.5	112°26.5	• • 13.3	278°32.1	• • 32.1	Mirfak	308°23.6	49°57.9
10	331°11.0	327°55.6	05.4	144°37.9	48.9	$127^{\circ}29.3$	13.2	293°34.2	32.2	Aldebaran	290°35.8	16°34.0
11	346°13.4	342°55.2	04.1	159°41.2	49.2	142°32.0	13.1	308°36.4	32.3	Rigel	290° 33.0 281° 00.7	-8°10.3
12	1°15.9	357°54.8	S00°02.9	174°44.6	N00°49.6	157°34.7	S08°13.0	323°38.6	$N12^{\circ}32.4$	Capella	280° 16.9	-6°10.3
13	16° 18.4	12°54.4	01.6	189°48.0	49.9	172°37.4	12.9	338°40.8	32.5	Bellatrix	278° 19.3	6°22.4
14	31°20.8	27°54.1	S00°00.3	204°51.3	50.2	187°40.2	12.8	353°43.0	32.6	Elnath	277° 57.6	28°37.8
15	46°23.3	42°53.7	N00°00.9	219°54.7	• • 50.6	202°42.9	• • 12.7	8°45.2	• • 32.7	Alnilam	275°34.3	-1°11.2
16	61°25.8	57°53.3	02.2	234°58.1	50.9	$217^{\circ}45.6$	12.6	23°47.4	32.8	Betelgeuse	270°48.4	7°24.5
17	76°28.2	72°52.9	03.5	250°01.5	51.2	232°48.3	12.5	38°49.6	32.9	Canopus	263°50.8	-52°43.1
18	91°30.7	87°52.5	N00°04.7	265°04.8	N00°51.6	247°51.0	S08°12.4	53°51.8	N12°33.0	Sirius	258° 23.2	-32 45.1 -16°45.7
19	106°33.1	102°52.2	06.0	280°08.2	51.9	262°53.8	12.3	68°54.0	33.1	Adhara	255°03.1	-10° 43.7 -29° 01.1
20	121°35.6	117°51.8	07.2	295°11.6	52.2	277°56.5	12.1	83°56.2	33.2	Procyon	244° 47.2	5°08.7
21	136°38.1	132°51.4	• • 08.5	310°14.9	• • 52.6	292°59.2	• • 12.0	98°58.4	• • 33.3	Pollux	243°13.0	27°57.2
22	151°40.5	147°51.0	09.8	325°18.3	52.9	308°01.9	11.9	114°00.6	33.4	Avior	234° 12.9	-59°36.6
23	166°43.0	162°50.7	11.0	340°21.7	53.2	323°04.7	11.8	129°02.8	33.5	Suhail	222°43.4	-43°33.4
Mars	ass. 11:55	ν_0 Λ' d 1	3′ m-3.89	1/3 1/ 40	3′ m-1.39	1/27' d O	.1′ m-2.43	1/2 2/ do	.1′ m0.39	Miaplacidus	221°36.7	-43°50.6
ivier.p	,433. 11.33	ν-0.4 U-1	111-3.09	ν J.Ψ UU.	O 111-1.39	ν2.1 u-0	.111-2.43	ν Δ.Δ UU	.1110.39	Alphard	221 30.7 217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.4	61°35.5
0	181°45.5	177°50.3	N00°12.3	355°25.1	N00°53.6	338°07.4	508°11.7	144°05.0	$N12^{\circ}33.6$	Denebola	182°21.2	14°24.3
1	196°47.9	192°49.9	13.5	10°28.4	53.9	$353^{\circ}10.1$	11.6	159°07.1	33.6	Gienah	175°39.7	-17°42.5
2	211°50.4	207°49.5	14.8	25°31.8	54.2	8°12.8	11.5	174°09.3	33.7	Acrux	173°55.4	-63°15.8
3	226°52.9	222°49.1	• • 16.1	40°35.2	• • 54.6	23° 15.6	• • 11.4	189°11.5	• • 33.8	Gacrux	171°47.1	-57°16.8
4	241°55.3	237°48.8	17.3	55°38.5	54.9	$38^{\circ}18.3$	11.3	204°13.7	33.9	Alioth	166°09.6	55°47.9
5	256° 57.8	252°48.4	18.6	70°41.9	55.2	53°21.0	11.2	219°15.9	34.0	Spica	158° 18.4	-11°19.0
6	272°00.3	267°48.0	N00°19.8	85°45.3	N00°55.6	68°23.8	508°11.1	234°18.1	N12°34.1	Alkaid	150° 10.4 152° 49.0	49°09.8
7	$287^{\circ}02.7$	282°47.6	21.1	100°48.7	55.9	83°26.5	11.0	249°20.3	34.2	Hadar	148°30.4	-60°30.8
8	302°05.2	297°47.3	22.4	115°52.0	56.2	98°29.2	10.9	264°22.5	34.3	Menkent	147°53.2	-36°30.9
9	317°07.6	312°46.9	• • 23.6	130°55.4	• • 56.6	113°31.9	• • 10.8	279°24.7	• • 34.4	Arcturus	145°44.5	19°01.6
10	332°10.1	327°46.5	24.9	145°58.8	56.9	128°34.7	10.7	294°26.9	34.5	Rigil Kent.	139°34.9	-60°57.3
11	347°12.6	342°46.1	26.2	161°02.2	57.3	143°37.4	10.6	309°29.1	34.6	Kochab	137° 19.3	74°01.8
12	2°15.0	357°45.7	N00°27.4	176°05.5	N00°57.6	$158^{\circ}40.1$	S08°10.5	324°31.3	N12°34.7	Zuben'ubi	136°52.0	-16°09.9
13	$17^{\circ}17.5$	12°45.4	28.7	191°08.9	57.9	173°42.8	10.3	339°33.5	34.8	Alphecca	126° 00.7	26°36.8
14	32°20.0	27°45.0	29.9	206°12.3	58.3	188°45.6	10.2	354°35.6	34.9	Antares	112°11.5	-26°29.7
15	47° 22.4	42°44.6	• • 31.2	221°15.7	• • 58.6	203°48.3	• • 10.1	9°37.8	• • 35.0	Atria	107°02.4	-69°04.4
16	62°24.9	57°44.2	32.5	236°19.0	58.9	218°51.0	10.0	24°40.0	35.1	Sabik	101°58.8	-15°45.6
17	77°27.4	72°43.9	33.7	251°22.4	59.3	233°53.8	09.9	39°42.2	35.2	Shaula	96°05.7	-37°07.3
18	92°29.8	87°43.5	N00°35.0	266°25.8	N00°59.6	248° 56.5	S08°09.8	54° 44.4	N12°35.3	Rasalhague	95°55.3	12°32.2
19	107°32.3	102°43.1	36.2	281°29.2	00°59.9	263°59.2	09.7	69°46.6	35.4	Eltanin	90°40.6	51°28.8
20	122°34.7	117°42.7	37.5	296°32.5	01°00.3	279°01.9	09.6	84°48.8	35.5	Kaus Aust.	83°28.0	-34°22.0
21	137°37.2	132°42.3	• • 38.8	311°35.9	• • 00.6	294°04.7	• • 09.5	99°51.0	• • 35.5	Vega	80°30.9	38°48.4
22	152°39.7	147°42.0	40.0	326°39.3	00.9	309°07.4	09.4	$114^{\circ}53.2$	35.6	Nunki	75°43.6	-26°15.5
23	167°42.1	162°41.6	41.3	341°42.7	01.3	324°10.1	09.3	129°55.4	35.7	Altair	61°56.8	8°56.7
Mer n	ass. 11:51	ν -0.4' d1	.3′ m-3.89	$v^{3} 4' d0$	3′ m-1.40	v2 7' d-0	.1′ m-2.43	v2 2' d0	.1′ m0.39	Peacock	53°00.8	-56°38.1
		- 0.1 01								Deneb	49°23.7	45°22.9
										Enif	33°35.7	10°00.5
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}29.1$	-46°49.0
0	182°44.6	177°41.2	N00°42.5	356°46.0	N01°01.6	339°12.9	S08°09.2	144°57.6	N12°35.8	Fomalhaut	15°11.2	-29°28.0
1	197°47.1	192°40.8	43.8	11°49.4	01.9	354° 15.6	09.1	159°59.7	35.9	Scheat	13°42.2	28°14.4
2	212°49.5	207°40.5	45.1	26°52.8	02.3	9°18.3	09.0	175°01.9	36.0	Markab	13°26.8	15°21.7
3	227°52.0	222°40.1	• • 46.3	41°56.2	• • 02.6	24°21.0	• • 08.9	190°04.1	36.1			
4	242°54.5	237°39.7	47.6	56°59.5	02.9	39°23.8	08.7	205°06.3	36.2	Mar 23 Fri	SHA	Mer.pass
5	257°56.9	252°39.3	48.9	72°02.9	03.3	54° 26.5	08.6	220°08.5	36.3		357°13.0	12:08
6	272°59.4	267°39.0	N00°50.1	87°06.3	N01°03.6	69°29.2	S08°08.5	235°10.7	N12°36.4		173°17.9	00:24
7	288°01.9	282°38.6	51.4	102°09.7	03.9	84°32.0	08.4	250°12.9	36.5		156°15.7	01:32
8	303°04.3	297°38.2	52.6	117°13.1	04.3	99°34.7	08.3	265°15.1	36.6	Saturn	322°26.0	14:25
9	318°06.8	312°37.8	• • 53.9	132°16.4	• • 04.6	114°37.4	•• 08.2	280°17.3	• • 36.7	Mar 24 Sat	SHA	Mer.pass
10	333°09.2	327°37.4	55.2	147°19.8	04.9	129° 40.1	08.1	295°19.5	36.8		356°04.8	12:09
11	348°11.7	342°37.1	56.4	162°23.2	05.3	144° 42.9	0.80	310°21.6	36.9		173°39.6	00:18
12	3°14.2	357°36.7	N00°57.7	177°26.6	N01°05.6	159° 45.6	S08°07.9	325°23.8	N12°37.0		156°21.9	01:27
13	18° 16.6	12°36.3	00°58.9	192°30.0	05.9	174° 48.3	07.8	340°26.0	37.1	Saturn	322°19.5	14:22
14	33°19.1	27°35.9	01°00.2	207°33.3	06.3	189°51.1	07.7	355°28.2	37.2			
15	48°21.6	42°35.6	• • 01.5	222°36.7	• • 06.6	204° 53.8	•• 07.6	10°30.4	• • 37.3	Mar 25 Sun	SHA	Mer.pass
16	63°24.0	57°35.2	02.7	237°40.1	06.9	219° 56.5	07.5	25°32.6	37.4		354°56.6	12:10
17	78°26.5	72°34.8	04.0	252°43.5	07.2	234°59.3	07.3	40°34.8	37.5		174°01.4	00:13
18	93°29.0	87°34.4	N01°05.2	267°46.8	N01°07.6	250°02.0	S08°07.2	55°37.0	N12°37.5		156°28.2	01:23
19	108°31.4	102°34.1	06.5	282°50.2	07.9	265°04.7	07.1	70°39.2	37.6	Saturn	322°13.0	14:18
20	123°33.9	117°33.7	07.8	297°53.6	08.2	280°07.5	07.0	85°41.4	37.7	Havizant	al parallas	
21	138°36.4	132°33.3	• • 09.0	312°57.0	•• 08.6	295° 10.2	• • 06.9	100°43.5	• • 37.8	Horizont	al parallax Venus:	0.1
22	153°38.8	147°32.9	10.3	328°00.4	08.9	310°12.9	06.8	115°45.7	37.9		venus: Mars:	0.1
23	168°41.3	162°32.5	11.6	343°03.7	09.2	325° 15.7	06.7	130°47.9	38.0		ividi5.	0.2
Mern	ass. 11:47	$\nu = 0.4' d1$.3′ m-3.89	ν 3.4' d0	3′ m-1.41	ν2.7' d-Ω	.1′ m-2.44	$\nu^{2.2'} d\Omega$.1′ m0.38			
					· -· ·-	= 0		0				

h	Sui	า			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°20.6	$N01^{\circ}03.1$	$91^{\circ}54.9$	8.7'	N24°23.4	-2.6'	56.1'
1	193°20.8	04.1	106°22.6	8.7'	24°20.8 24°18.1	-2.7'	56.2'
2	208°21.0 223°21.2	05.1 •• 06.1	120°50.3 135°17.9	8.7' 8.7'	24°18.1 24°15.3	-2.8' -3.0'	56.2' 56.2'
4	238°21.4	07.1	149°45.6	8.6'	24°12.4	-3.1'	56.3'
5	253°21.5	08.1	164°13.2	8.6'	24°09.3	-3.2'	56.3'
6 7	268°21.7 283°21.9	N01°09.1 10.0	178°40.9 193°08.5	8.6' 8.6'	N24°06.0 24°02.7	-3.4' -3.5'	56.3' 56.4'
8	298°22.1	11.0	207°36.1	8.6'	24 02.7 23°59.2	-3.6'	56.4
9	313°22.3	• • 12.0	222°03.7	8.6'	23°55.5	-3.8'	56.4'
10	328°22.5	13.0	236°31.2	8.6'	23°51.7	-3.9'	56.5'
11 12	343°22.7 358°22.9	14.0 N01°15.0	250°58.8 265°26.4	8.6' 8.6'	23°47.8 N23°43.8	-4.0' -4.2'	56.5' 56.5'
13	13°23.0	16.0	279°53.9	8.6'	23°39.6	-4.3'	56.6
14	28°23.2	16.9	294°21.5	8.5'	23°35.3	-4.5'	56.6'
15 16	43°23.4 58°23.6	· · 17.9 18.9	308°49.0 323°16.6	8.5' 8.5'	23°30.8 23°26.2	-4.6' -4.7'	56.6' 56.7'
17	73°23.8	19.9	337°44.1	8.5'	23°21.5	-4.7 -4.9'	56.7'
18	88°24.0	N01°20.9	352°11.7	8.5'	N23°16.7	-5.0'	56.7'
19	103°24.2	21.9	6°39.2	8.5'	23°11.7	-5.1'	56.8'
20 21	118°24.4 133°24.6	22.8 •• 23.8	21°06.7 35°34.3	8.5' 8.5'	23°06.5 23°01.3	-5.3' -5.4'	56.8' 56.9'
22	148°24.7	24.8	50°01.8	8.5'	22°55.9	-5.5'	56.9'
23	163°24.9	25.8	64°29.3	8.5'	22°50.3	-5.7'	56.9'
	SD = 16.0'	d = 1.0'		S	D = 15.3'		
						,	115
Sat 0	GHA 178°25.1	Dec N01°26.8	GHA 78°56.9	ν 8.5'	Dec N22°44.7	d -5.8'	HP 57.0'
1	193°25.3	27.8	93°24.4	8.5	22°38.9	-5.9'	57.0'
2	208°25.5	28.7	107°51.9	8.5'	22°32.9	-6.1'	57.0'
3 4	223°25.7 238°25.9	· · 29.7 30.7	122°19.5 136°47.0	8.5' 8.6'	22°26.9 22°20.7	-6.2' -6.3'	57.1' 57.1'
5	250 25.9 253°26.1	31.7	150 47.0 151°14.6	8.6'	22°14.3	-0.5 -6.5	57.1 57.2'
6	268°26.2	N01°32.7	165°42.1	8.6'	N22°07.9	-6.6'	57.2'
7	283°26.4	33.7	180°09.7	8.6'	22°01.3	-6.7'	57.2'
8 9	298°26.6 313°26.8	34.7 •• 35.6	194°37.3 209°04.9	8.6' 8.6'	21°54.5 21°47.7	-6.9' -7.0'	57.3' 57.3'
10	328°27.0	36.6	223°32.5	8.6'	21°40.7	-7.1'	57.3'
11	343°27.2	37.6	238°00.0	8.6'	21°33.5	-7.3'	57.4'
12	358°27.4 13°27.6	N01°38.6 39.6	252°27.7 266°55.3	8.6' 8.6'	N21°26.3 21°18.9	-7.4'	57.4'
13 14	28°27.8	39.6 40.6	200 55.3 281°22.9	8.6'	21 18.9 21°11.4	-7.5' -7.6'	57.5' 57.5'
15	43°27.9	• • 41.5	295°50.5	8.6'	21°03.7	-7.8'	57.5'
16	58°28.1	42.5	310°18.2	8.7'	20°55.9	-7.9'	57.6'
17 18	73°28.3 88°28.5	43.5 N01°44.5	324°45.8 339°13.5	8.7' 8.7'	20°48.0 N20°40.0	-8.0' -8.2'	57.6' 57.7'
19	103°28.7	45.5	353°41.2	8.7'	20°31.8	-8.3'	57.7'
20	118°28.9	46.4	8°08.9		20°23.5	-8.4'	57.7'
21 22	133°29.1 148°29.3	• • 47.4 48.4	22°36.6 37°04.3	8.7' 8.7'	20°15.1 20°06.6	-8.5' -8.7'	57.8' 57.8'
23	163°29.5	49.4	51°32.1	8.8'	19°57.9	-8.8'	57.8°
	SD = 16.0'	d = 1.0'		S	D = 15.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°29.6 193°29.8	N01°50.4 51.4	65°59.8 80°27.6	8.8' 8.8'	N19°49.1 19°40.2	-8.9' -9.0'	57.9' 57.9'
2	208°30.0	52.3	94°55.3	8.8'	19°31.2	-9.2'	58.0'
3	223°30.2	• • 53.3	109°23.1	8.8'	19°22.0	-9.3'	58.0'
4 5	238°30.4 253°30.6	54.3 55.3	123°51.0 138°18.8	8.8' 8.8'	19°12.7 19°03.3	-9.4' -9.5'	58.1' 58.1'
6	268°30.8	N01°56.3	152°46.6	8.9'	N18°53.8	-9.6'	58.1
7	283°31.0	57.3	167°14.5	8.9'	18°44.1	-9.8'	58.2'
8 9	298°31.2 313°31.3	58.2 01°59.2	181°42.4 196°10.2	8.9' 8.9'	18°34.4 18°24.5	-9.9' -10.0'	58.2' 58.3'
10	313 31.3 328°31.5	01 59.2 02°00.2	210°38.2	8.9'	18° 24.5	-10.0 -10.1'	58.3'
11	343°31.7	01.2	$225^{\circ}06.1$	8.9'	18°04.4	-10.2'	58.3'
12	358°31.9	N02°02.2	239°34.0	9.0'	N17°54.1	-10.4'	58.4'
13 14	13°32.1 28°32.3	03.1 04.1	254°02.0 268°30.0	9.0' 9.0'	17°43.8 17°33.3	-10.5' -10.6'	58.4' 58.5'
15	43°32.5	05.1	282°57.9	9.0'	17°22.7	-10.7	58.5
16	58°32.7	06.1	297°25.9	9.0'	17°12.0	-10.8'	58.5'
17 18	73°32.9 88°33.0	07.1 N02°08.1	311°54.0 326°22.0	9.0' 9.1'	17°01.2 N16°50.3	-10.9' -11.0'	58.6' 58.6'
18 19	103°33.2	N02 08.1 09.0	326°22.0 340°50.1	9.1' 9.1'	16°39.2	-11.0 -11.1'	58.6° 58.7'
20	118°33.4	10.0	$355^{\circ}18.1$	9.1'	$16^{\circ}28.1$	-11.3'	58.7'
21	133°33.6	•• 11.0	9°46.2	9.1'	16°16.8	-11.4'	58.7'
22 23	148°33.8 163°34.0	12.0 13.0	24°14.3 38°42.5	9.1' 9.1'	16°05.5 15°54.0	-11.5' -11.6'	58.8' 58.8'
	SD = 16.0'	d = 1.0'			D = 15.8'		20.0
	<u> </u>	<u>u — 1.0</u>			<u> </u>		

Lat.	Twilig	- 1	Sunrise	Sunset	Twili	_	
	laut.	Civil			Civil	Naut.	
N 72° 0	2:51	04:27	05:36	18:39	19:49	21:27	
N 70° 0	3:15	04:37	05:40	18:35	19:38	21:02	
68° 0	3:33	04:46	05:42	18:32	19:29	20:43	
66° 0	3:47	04:52	05:44	18:30	19:22	20:28	
	3:59	04:58	05:46	18:28	19:16	20:16	
	4:08	05:03	05:48	18:26	19:11	20:06	
60° 0	4:16	05:07	05:49	18:25	19:07	19:58	
N 58° 0	4:23	05:11	05:50	18:24	19:03	19:51	
	4:29	05:14	05:51	18:22	19:00	19:45	
	4:34	05:17	05:52	18:21	18:57	19:39	
	4:39	05:19	05:53	18:20	18:54	19:35	
	4:43	05:21	05:54	18:20	18:52	19:31	
	4:51	05:26	05:55	18:18	18:47	19:22	
	4:58	05:30	05:57	18:16	18:43	19:15	
	5:03	05:33	05:58	18:15	18:40	19:10	
	5:07	05:35	05:59	18:14	18:38	19:06	
	5:13	05:38	06:00	18:12	18:34	19:00	
1 1 1	5:16	05:41	06:02	18:11	18:32	18:56	
	5:18	05:42	06:03	18:09	18:30	18:54	
	5:19	05:43	06:04	18:08	18:29	18:54	
	5:17	05:43	06:05	18:07	18:29	18:55	
	5:14	05:42	06:06	18:06	18:30	18:57	
	5:12	05:41	06:07	18:05	18:30	19:00	
1 1 1	5:09	05:40	06:07	18:05	18:32	19:03	
	5:04	05:38	06:08	18:04	18:33	19:07	
	4:58	05:36	06:08	18:03	18:35	19:13	
	4:56	05:35	06:09	18:03	18:36	19:16	
	4:52	05:34	06:09	18:02	18:37	19:19	
	4:49	05:32	06:09	18:02	18:39	19:22	
	4:44	05:31	06:10	18:01	18:40	19:26	
S 60° 0	4:39	05:29	06:10	18:01	18:42	19:31	

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

		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	47-68%	
23	06:38	06:29	12:06	18:32	06:05		
24	06:20	06:10	12:06	19:26	06:59		
25	06:01	05:52	12:06	20:19	07:53		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	183°43.7	177°32.2	N01°12.8	358°07.1	N01°09.6	340°18.4	S08°06.6	145°50.1	N12°38.1			
1	198°46.2	192°31.8	14.1	13°10.5	09.9	355°21.1	06.5	160°52.3	38.2	Alpheratz	357°31.5	29°15.1
2	213°48.7	207°31.4	15.3	28°13.9	10.2	10°23.9	06.4	175°54.5	38.3	Ankaa	353°04.3	-42°08.8
3	228°51.1	222°31.0	16.6	43°17.3	. 10.2	25°26.6	. 06.3	190°56.7	• • 38.4	Schedar	349°27.5	56°41.9
4	243°53.6	237°30.7	17.9	58°20.6	10.0	40°29.3	06.2	205°58.9	38.5	Diphda	348°44.2	-17°49.6
										Achernar	$335^{\circ}18.3$	-57°05.4
5	258°56.1	252°30.3	19.1	73°24.0	11.2	55°32.1	06.0	221°01.1	38.6	Hamal	327°47.6	23°36.0
6	273°58.5	267°29.9	N01°20.4	88°27.4	N01°11.6	70°34.8	S08°05.9	236°03.2	N12°38.7	Polaris	312°31.5	89°23.3
7	289°01.0	282°29.5	21.6	103°30.8	11.9	85°37.5	05.8	251°05.4	38.8	Acamar	315°09.6	-40°11.5
8	304°03.5	297°29.1	22.9	118°34.2	12.2	100°40.3	05.7	266°07.6	38.9	Menkar	314°02.8	4°12.1
9	319°05.9	312°28.8	• • 24.2	133°37.6	• • 12.5	115°43.0	• • 05.6	281°09.8	• • 39.0	Mirfak	308°23.6	49°57.9
10	334°08.4	327°28.4	25.4	148°40.9	12.9	130°45.7	05.5	296°12.0	39.1	Aldebaran	290°35.8	16°34.0
11	349°10.8	342°28.0	26.7	163°44.3	13.2	145°48.5	05.4	311°14.2	39.2	Rigel	281°00.7	-8°10.3
12	4°13.3	357°27.6	N01°27.9	178°47.7	N01°13.5	$160^{\circ}51.2$	S08°05.3	326°16.4	$N12^{\circ}39.3$	Capella	280° 17.0	46°01.6
13	19°15.8	12°27.3	29.2	193°51.1	13.9	175°53.9	05.2	341°18.6	39.4		278° 19.3	6°22.4
14	34°18.2	27°26.9	30.5	208°54.5	14.2	190°56.7	05.1	356°20.7	39.5	Bellatrix		
15	49°20.7	42°26.5	• • 31.7	223°57.8	• • 14.5	205°59.4	• • 05.0	11°22.9	• • 39.6	Elnath	277°57.6	28°37.8
16	64°23.2	57°26.1	33.0	239°01.2	14.9	221°02.1	04.8	26°25.1	39.7	Alnilam	275°34.3	-1°11.2
17	79°25.6	72°25.8	34.2	254°04.6	15.2	236°04.9	04.7	41°27.3	39.7	Betelgeuse	270°48.4	7°24.5
18	94°28.1	87°25.4	N01°35.5	269°08.0	N01°15.5	251°07.6	S08°04.6	56°29.5	N12°39.8	Canopus	263°50.9	-52°43.1
19	109°30.6	102°25.0	36.8	284°11.4	15.8	266°10.3	04.5	71°31.7	39.9	Sirius	258°23.2	-16°45.7
20	109°30.0	102 23.0 117°24.6	38.0	204 11.4 299°14.7	16.2	281°13.1	04.3	86°33.9	40.0	Adhara	255°03.1	-29°01.1
										Procyon	244°47.2	5°08.7
21	139°35.5	132°24.2	• • 39.3	314°18.1	• • 16.5	296°15.8	• • 04.3	101°36.1	• • 40.1	Pollux	243°13.0	27°57.2
22	154°38.0	147°23.9	40.5	329°21.5	16.8	311°18.5	04.2	116°38.2	40.2	Avior	234°13.0	-59°36.6
23	169°40.4	162°23.5	41.8	344°24.9	17.2	326°21.3	04.1	131°40.4	40.3	Suhail	222°43.5	-43°33.4
Mern	ass. 11:43	ν-0 4' d1	.3′ m-3.90	v3 4' d0	3′ m-1.41	ν2 7' d-Ω	.1′ m-2.44	v2 21 40	.1′ m0.38	Miaplacidus	221°36.8	-69°50.6
- IVICI.P	ass. 11. 1 5	ν-0. 4 α1	.5 111-5.90	νσ. τ ασ.	J 111-111	ν2.1 u-0	.1 111-2.77	ν2.2 d0	.1 1110.50	Alphard	217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_		
0	184°42.9	177°23.1	N01°43.1	359°28.3	N01°17.5	341°24.0	508°04.0	146°42.6	N12°40.4	Dubhe	193°36.4 182°21.2	61°35.5
1	199°45.3	192°22.7	44.3	14°31.7	17.8	356°26.8	03.9	161°44.8	40.5	Denebola		14°24.3
2	214°47.8	207°22.4	45.6	29°35.0	18.1	11°29.5	03.8	176°47.0	40.6	Gienah	175°39.7	-17°42.5
3	229°50.3	222°22.0	• • 46.8	44°38.4	•• 18.5	26°32.2	• • 03.6	191°49.2	• • 40.7		172°55.4	-63°15.8
4	244°52.7	237°21.6				41°35.0				Gacrux	$171^{\circ}47.1$	-57°16.8
			48.1	59°41.8	18.8		03.5	206°51.4	40.8	Alioth	$166^{\circ}09.6$	55°47.9
5	259°55.2	252°21.2	49.4	74°45.2	19.1	56°37.7	03.4	221°53.6	40.9	Spica	158° 18.4	-11°19.0
6	274°57.7	267°20.9	N01°50.6	89°48.6	N01°19.5	71°40.4	S08°03.3	236°55.7	N12°41.0	Alkaid	152°49.0	49°09.8
7	290°00.1	282°20.5	51.9	104°51.9	19.8	86°43.2	03.2	251°57.9	41.1	Hadar	148°30.4	-60°30.8
8	305°02.6	297°20.1	53.1	119°55.3	20.1	101°45.9	03.1	267°00.1	41.2		147°53.2	-36°30.9
9	320°05.1	$312^{\circ}19.7$	• • 54.4	134°58.7	• • 20.4	116°48.6	• • 03.0	282°02.3	• • 41.3	Arcturus	145°44.5	19°01.6
10	335°07.5	327°19.3	55.7	150°02.1	20.8	131°51.4	02.9	297°04.5	41.4	Rigil Kent.	139°34.9	-60°57.3
11	$350^{\circ}10.0$	342°19.0	56.9	165°05.5	21.1	$146^{\circ}54.1$	02.8	312°06.7	41.5	Kochab	137° 19.2	74°01.8
12	5°12.5	357°18.6	N01°58.2	180°08.8	N01°21.4	161°56.9	508°02.7	327°08.9	N12°41.6	1		
13	20°14.9	12°18.2	01°59.4	195°12.2	21.7	176°59.6	02.5	342°11.0	41.7	Zuben'ubi	136°51.9	-16°09.9
14	35°17.4	27°17.8	02°00.7	210°15.6	22.1	192°02.3	02.4	357°13.2	41.8	Alphecca	126°00.6	26°36.8
15	50°19.8	42°17.5	• • 02.0	225°19.0	• • 22.4	207°05.1	02.3	12°15.4	• • 41.9	Antares	112°11.5	-26°29.7
16	65°22.3	57°17.1	03.2	240°22.4	22.7	222°07.8	02.3	27°17.6	42.0	Atria	107°02.3	-69°04.5
	80°24.8	72°16.7	03.2	255°25.8	23.1	237°10.6	02.2	42°19.8	42.0	Sabik	101°58.8	-15°45.6
17										Shaula	96°05.6	-37°07.3
18	95°27.2	87°16.3	N02°05.7	270°29.1	N01°23.4	252°13.3	S08°02.0	57°22.0	N12°42.1	Rasalhague	95°55.3	12°32.2
19	110°29.7	102°15.9	07.0	285°32.5	23.7	267°16.0	01.9	72°24.2	42.2	Eltanin	90°40.5	51°28.8
20	125°32.2	117°15.6	08.2	300°35.9	24.0	282°18.8	01.8	87°26.3	42.3	Kaus Aust.	83°28.0	-34°22.0
21	140°34.6	132°15.2	• • 09.5	315°39.3	• • 24.4	297°21.5	• • 01.7	102°28.5	• • 42.4	Vega	80°30.9	38°48.4
22	155°37.1	$147^{\circ}14.8$	10.8	330°42.7	24.7	$312^{\circ}24.2$	01.6	$117^{\circ}30.7$	42.5	Nunki	75°43.6	-26°15.5
23	170°39.6	162°14.4	12.0	345°46.0	25.0	327°27.0	01.4	132°32.9	42.6	Altair	61°56.7	8°56.7
	11.20	0.4/ /1	2/ 2.00	2.4/ 10	2/ 1.41	0.7/ 1.0	1/ 0.44	2.2/ 10	1/ 0.20		53°00.8	-56°38.1
ivier.p	ass. 11:39	ν -0.4 a1	.3′ m-3.90	ν 3.4° a 0.	3′ m-1.41	ν 2.7 a -0	.1′ m-2.44	ν 2.2 au	.1′ m0.38	Peacock		
										Deneb	49°23.7	45°22.9
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.7	10°00.5
0	185°42.0	177°14.1	N02°13.3	0°49.4	N01°25.3	342°29.7	\$08°01.3		N12°42.7	Al Na'ir	27°29.1	-46°49.0
1	200°44.5	192°13.7	14.5	15°52.8	25.7	357°32.5	01.2	162°37.3	42.8	Fomalhaut	15°11.2	-29°28.0
										Scheat	13°42.2	28°14.4
2	215°46.9	207°13.3	15.8	30°56.2	26.0	12°35.2	01.1	177°39.5	42.9	Markab	13°26.8	15°21.7
3	230°49.4	222°12.9	• • 17.1	45°59.6	• • 26.3	27°37.9	• • 01.0	192°41.6	• • 43.0	Mar 26 Mon	CHA	Me:: ====
4	245°51.9	237°12.5	18.3	61°03.0	26.6	42°40.7	00.9	207°43.8	43.1		SHA	Mer.pass
5	260°54.3	252°12.2	19.6	76°06.3	27.0	57°43.4	8.00	222°46.0	43.2		353°48.4	12:10
6	275°56.8	267°11.8	N02°20.8	91°09.7	N01°27.3	72°46.2	S08°00.7	237°48.2			174°23.4	00:07
7	290°59.3	282°11.4	22.1	106°13.1	27.6	87°48.9	00.6	252°50.4	43.4		156°34.6	01:19
8	306°01.7	297°11.0	23.3	$121^{\circ}16.5$	27.9	102°51.6	00.4	267°52.6	43.5	Saturn	322°06.4	14:15
9	321°04.2	312°10.7	• • 24.6	$136^{\circ}19.9$	• • 28.2	117°54.4	• • 00.3	282°54.8	• • 43.6	Me:: 27 T	CIIA	Ma
10	336°06.7	327°10.3	25.9	151°23.2	28.6	132°57.1	00.2	297°56.9	43.7	Mar 27 Tue	SHA	Mer.pass
11	351°09.1	342°09.9	27.1	166°26.6	28.9	147°59.9	00.1	312°59.1	43.8		352°40.2	12:11
12	6°11.6	357°09.5	N02°28.4	181°30.0	N01°29.2	163°02.6	S08°00.0	328°01.3	N12°43.9		174°45.4	00:02
13	21°14.1	12°09.1	29.6	196°33.4	29.5	178°05.3	07°59.9	343°03.5	44.0		156°41.1	01:14
14	36°16.5	27°08.8	30.9	211°36.8	29.9	193°08.1	59.8	358°05.7	44.1	Saturn	321°59.7	14:11
	51°19.0	42°08.4	• • 32.1	211 30.8 226°40.1	30.2	208°10.8	59.7	13°07.9	• • 44.2	Ma:: 20 M/ 1	CIIA	Ma
15 16										Mar 28 Wed	SHA	Mer.pass
16	66°21.4	57°08.0	33.4	241°43.5	30.5	223°13.6	59.6	28°10.0	44.3		351°32.0	12:11
17	81°23.9	72°07.6	34.7	256°46.9	30.8	238°16.3	59.4	43°12.2	44.4		175°07.4	23:51
18	96°26.4	87°07.2	N02°35.9	271°50.3	N01°31.2	253°19.1	S07°59.3	58°14.4	N12°44.5		156°47.7	01:10
19	111°28.8	102°06.9	37.2	286°53.7	31.5	268°21.8	59.2	73°16.6	44.5	Saturn	321°53.1	14:08
20	126°31.3	117°06.5	38.4	301°57.0	31.8	283°24.5	59.1	88°18.8	44.6			
21	141°33.8	$132^{\circ}06.1$	• • 39.7	317°00.4	• • 32.1	298°27.3	• • 59.0	$103^{\circ}21.0$	• • 44.7	Horizont	al parallax	
22	156°36.2	147°05.7	40.9	332°03.8	32.4	313°30.0	58.9	$118^{\circ}23.1$	44.8		Venus:	0.1
23	171°38.7	162°05.4	42.2	347°07.2	32.8	328°32.8	58.8	133°25.3	44.9		Mars:	0.2
Mer.p	ass. 11:35	ν -0.4′ d1	.3′ m-3.90	ν 3.4′ d0.	3′ m-1.40	ν 2.7′ d -0	.1′ m-2.45	$\nu 2.2' \ d0$.1′ m0.38			

h	Sui	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.2	N02°13.9	53°10.6	9.2'	$N15^{\circ}42.4$	-11.7'	58.9'
1	193°34.4	14.9	67°38.8	9.2'	15°30.7	-11.8'	58.9'
2	208°34.6 223°34.8	15.9	82°06.9	9.2'	15°18.9	-11.9'	58.9'
3 4	223 34.8 238°34.9	· · 16.9 17.9	96°35.1 111°03.3	9.2' 9.2'	15°07.1 14°55.1	-12.0' -12.1'	59.0' 59.0'
5	253°35.1	18.8	125°31.6	9.2'	14° 43.0	-12.1	59.1'
6	268°35.3	N02°19.8	139°59.8	9.2'	N14°30.8	-12.3'	59.1'
7	283°35.5	20.8	154°28.0	9.3'	$14^{\circ}18.5$	-12.4'	59.1'
8	298°35.7	21.8	168°56.3	9.3'	14°06.1	-12.5'	59.2'
9 10	313°35.9 328°36.1	· · 22.8 23.7	183°24.6 197°52.9	9.3' 9.3'	13°53.6 13°41.0	-12.6' -12.7'	59.2' 59.3'
11	343°36.3	23.7 24.7	212°21.2	9.3'	13 41.0 13°28.3	-12.7 -12.8'	59.3'
12	358°36.5	N02°25.7	226°49.5	9.3'	N13°15.5	-12.9'	59.3'
13	13°36.6	26.7	241°17.8	9.3'	13°02.7	-13.0'	59.4'
14	28°36.8	27.7	255°46.2	9.4'	12°49.7	-13.1'	59.4'
15 16	43°37.0 58°37.2	· · 28.6 29.6	270°14.5 284°42.9	9.4' 9.4'	12°36.6 12°23.5	-13.1' -13.2'	59.5' 59.5'
17	73°37.4	30.6	204 42.9 299°11.3	9.4 9.4'	12°23.3	-13.2 -13.3'	59.5'
18	88°37.6	N02°31.6	313°39.7	9.4'	N11°56.9	-13.4	59.6'
19	103°37.8	32.6	328°08.1	9.4'	11°43.5	-13.5'	59.6'
20	118°38.0	33.5	342°36.5	9.4'	11°30.0	-13.6'	59.6'
21	133°38.2 148°38.3	• • 34.5	357°04.9	9.4'	11°16.5 11°02.8	-13.7'	59.7'
22 23	148° 38.3 163° 38.5	35.5 36.5	11°33.3 26°01.8	9.4' 9.4'	11°02.8 10°49.1	-13.7' -13.8'	59.7' 59.8'
23			20 01.0			-13.0	33.0
	SD = 16.0'	d = 1.0'		5	D = 16.1'		
Tue 0	GHA 178°38.7	Dec N02°37.4	GHA 40°30.2	u 9.5'	Dec N10°35.3	d -13.9'	HP 59.8'
1	193°38.9	38.4	54°58.7	9.5'	10°21.4	-14.0'	59.8'
2	208°39.1	39.4	69°27.1	9.5'	10°07.4	-14.0'	59.9'
3	223°39.3	• • 40.4	83°55.6	9.5'	09°53.3	-14.1'	59.9'
4	238°39.5	41.4	98°24.1	9.5'	09°39.2	-14.2'	59.9'
5 6	253°39.7 268°39.9	42.3 N02°43.3	112°52.5 127°21.0	9.5' 9.5'	09°25.0 N09°10.8	-14.3' -14.3'	60.0' 60.0'
7	283°40.1	44.3	141°49.5	9.5'	08°56.4	-14.4	60.0'
8	298°40.2	45.3	156°18.0	9.5'	08°42.0	-14.5'	60.1
9	313°40.4	• • 46.2	170°46.5	9.5'	08°27.5	-14.5'	60.1'
10	328°40.6	47.2	185°15.0	9.5'	08°13.0	-14.6'	60.1'
11 12	343°40.8 358°41.0	48.2 N02°49.2	199°43.5 214°12.0	9.5' 9.5'	07°58.4 N07°43.7	-14.7' -14.7'	60.2' 60.2'
13	13°41.2	50.2	228°40.5	9.5'	07°29.0	-14.8'	60.2
14	28°41.4	51.1	243°08.9	9.5'	07°14.2	-14.8'	60.3'
15	43°41.6	• • 52.1	257°37.4	9.5'	06°59.4	-14.9'	60.3'
16	58°41.8 73°41.9	53.1	272°05.9 286°34.4	9.5'	06°44.5 06°29.5	-15.0'	60.3'
17 18	73 41.9 88°42.1	54.1 N02°55.0	286 34.4 301°02.9	9.5' 9.5'	06 29.5 N06°14.5	-15.0' -15.1'	60.4' 60.4'
19	103°42.3	56.0	315°31.4	9.5'	05°59.4	-15.1'	60.4
20	118°42.5	57.0	329°59.8	9.5'	05°44.3	-15.2'	60.5'
21	133°42.7	• • 58.0	344°28.3	9.5'	05°29.1	-15.2'	60.5'
22	148°42.9 163°43.1	58.9	358°56.7 13°25.2	9.4'	05°13.9 04°58.7	-15.3'	60.5'
23		$\frac{59.9}{d = 1.0'}$	13-25.2	9.4'	$\frac{04^{3}58.7}{D = 16.3'}$	-15.3'	60.6'
	SD = 16.0'	a = 1.0			$D = 10.3^{\circ}$		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°43.3 193°43.5	N03°00.9 01.9	27°53.6 42°22.1	9.4' 9.4'	N04°43.4 04°28.0	-15.3' -15.4'	60.6' 60.6'
2	208°43.7	02.8	56°50.5	9.4' 9.4'	04°28.0	-15.4'	60.6
3	223°43.8	• • 03.8	71°18.9	9.4'	03°57.2	-15.5'	60.7'
4	238°44.0	04.8	85°47.3	9.4'	03°41.8	-15.5'	60.7'
5	253°44.2 268°44.4	05.8 N03°06.8	100°15.7 114°44.0	9.4' 9.4'	03°26.3 N03°10.7	-15.5' -15.6'	60.7' 60.7'
6 7	268°44.4 283°44.6	N03°06.8 07.7	114°44.0 129°12.4	9.4	02°55.1	-15.6' -15.6'	60.8
8	298°44.8	08.7	143°40.7	9.3'	02°39.6	-15.6'	60.8
9	313°45.0	•• 09.7	158°09.1	9.3'	02°23.9	-15.7'	60.8'
10	328°45.2	10.7	172°37.4	9.3'	02°08.3	-15.7'	60.8
11	343°45.4 358°45.5	11.6 N03°12.6	187°05.7 201°33.9	9.3' 9.3'	01°52.6 N01°36.9	-15.7'	60.9' 60.9'
12 13	358°45.5 13°45.7	N03°12.6 13.6	201°33.9 216°02.2	9.3'	01°21.2	-15.7' -15.7'	60.9'
14	28°45.9	14.6	230°30.4	9.2'	01°05.4	-15.8'	60.9
15	43°46.1	• • 15.5	244°58.6	9.2'	00°49.6	-15.8'	61.0'
16	58°46.3	16.5	259°26.8	9.2'	00°33.9	-15.8'	61.0'
17	73°46.5 88°46.7	17.5 N03°18.4	273°55.0 288°23.1	9.1' 9.1'	00°18.1 N00°02.3	-15.8'	61.0'
18 19	88°46.7 103°46.9	N03°18.4 19.4	288°23.1 302°51.3	9.1'	S00°13.6	-15.8' 15.8'	61.0' 61.0'
20	118°47.1	20.4	317°19.4	9.1'	00°29.4	15.8'	61.1
21	133°47.2	• • 21.4	331°47.4	9.0'	00°45.2	15.8'	61.1'
22	148°47.4	22.3	346°15.5	9.0'	01°01.1	15.8'	61.1'
23	163°47.6	23.3	0°43.5	9.0'	01°16.9	15.8'	61.1'
	SD = 16.0'	d = 1.0'		S	D = 16.5'		

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

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

		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	77-93%	
26	05:43	05:34	12:06	21:12	08:46		
27	05:25	05:16	12:05	22:04	09:38		
28	05:07	04:58	12:05	22:57	10:31		

h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	186°41.2	177°05.0	N02°43.5	2°10.6	N01°33.1	343°35.5	S07°58.7	148°27.5	N12°45.0	Alpheratz	357°31.5	29°15.1
1	201°43.6	192°04.6	44.7	17°13.9	33.4	358° 38.2	58.6	163°29.7	45.1	Ankaa	353°04.3	-42°08.8
2	216°46.1	207°04.2	46.0	32°17.3	33.7	13°41.0	58.4	178°31.9	45.2	Schedar	349°27.6	56°41.9
3	231°48.5	222°03.8	• • 47.2	47°20.7	• • 34.0	28°43.7	• • 58.3	193°34.1	• • 45.3	Diphda	348°44.2	-17°49.6
4	246°51.0	237°03.5	48.5	62°24.1	34.4	43°46.5	58.2	208°36.2	45.4	Achernar	335°18.3	-57°05.4
5	261°53.5	252°03.1	49.7	77°27.5	34.7	58°49.2	58.1	223°38.4	45.5	Hamal	327°47.6	23°36.0
6	276°55.9	267°02.7	N02°51.0	92°30.8 107°34.2	N01°35.0	73°52.0 88°54.7	S07°58.0	238°40.6 253°42.8	N12°45.6	Polaris	312°32.5	89°23.3
7 8	291°58.4 307°00.9	282°02.3 297°01.9	52.3	107 34.2 122°37.6	35.3 35.6	00 54.7 103°57.4	57.9	268°45.0	45.7	Acamar	$315^{\circ}09.6$	-40°11.4
9	322°03.3	312°01.6	53.5 •• 54.8	137°41.0	36.0	103 57.4 119°00.2	57.8 •• 57.7	200 45.0 283°47.2	45.8 •• 45.9	Menkar	314°02.8	4°12.1
10	337°05.8	327°01.2	56.0	152°44.4	36.3	134°02.9	57.5	298°49.3	46.0	Mirfak	308°23.6	49°57.9
11	352°08.3	342°00.8	57.3	167°47.7	36.6	149°05.7	57.4	313°51.5	46.1	Aldebaran	290°35.9	16°34.0
12	7°10.7	357°00.4	N02°58.5	182°51.1	N01°36.9	164°08.4	S07°57.3	328°53.7	N12°46.2	Rigel	281°00.7	-8°10.3
13	22°13.2	12°00.0	02°59.8	197°54.5	37.2	179°11.2	57.2	343°55.9	46.3	Capella	280°17.0	46°01.6
14	37°15.7	26°59.7	03°01.0	212°57.9	37.6	194°13.9	57.1	$358^{\circ}58.1$	46.4	Bellatrix	278°19.3	6°22.4 28°37.8
15	52°18.1	41°59.3	• • 02.3	228°01.2	• • 37.9	$209^{\circ}16.7$	• • 57.0	14°00.3	• • 46.5	Elnath Alnilam	277°57.7 275°34.3	-1°11.2
16	67°20.6	56°58.9	03.6	243°04.6	38.2	224°19.4	56.9	29°02.4	46.6	Betelgeuse	270°48.4	7°24.5
17	82°23.0	71°58.5	04.8	258°08.0	38.5	239°22.1	56.8	44°04.6	46.7	Canopus	263°50.9	-52°43.1
18	97°25.5	86°58.1	N03°06.1	273°11.4	N01°38.8	254° 24.9	S07°56.6	59°06.8	N12°46.8	Sirius	258°23.2	-16°45.7
19	112°28.0	101°57.8	07.3	288°14.7	39.1	269° 27.6	56.5	74°09.0	46.9	Adhara	255°03.1	-29°01.1
20	127°30.4	116°57.4	08.6	303°18.1	39.5	284°30.4	56.4	89°11.2	47.0	Procyon	244°47.2	5°08.7
21	142°32.9	131°57.0	• • 09.8	318°21.5	39.8	299°33.1	56.3	104°13.3	• • 47.1	Pollux	243°13.1	27°57.2
22	157°35.4	146°56.6	11.1	333°24.9	40.1	314°35.9	56.2	119°15.5	47.2	Avior	234°13.0	-59°36.6
23	172°37.8	161°56.2	12.3	348°28.3	40.4	329°38.6	56.1	134°17.7	47.2	Suhail	222°43.5	-43°33.4
Mer.p	ass. 11:31	ν -0.4 $^{\prime}$ d1	.3′ m-3.90	ν 3.4′ d0.	3′ m-1.39	ν 2.7′ d-0	.1′ m-2.45	ν 2.2 $^{\prime}$ d0	.1′ m0.38	Miaplacidus	$221^{\circ}36.8$	-69°50.6
										Alphard	217°44.2	-8°47.4
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	11°49.2
0	187°40.3	176°55.9	N03°13.6	3°31.6	N01°40.7	344°41.4	S07°56.0	149°19.9	N12°47.3	Dubhe	193°36.4	61°35.5
1	202°42.8	170 55.9 191°55.5	14.8	18°35.0	41.0	359°44.1	55.9	164°22.1	47.4	Denebola	182°21.2	14°24.3
2	217°45.2	206°55.1	16.1	33°38.4	41.4	14°46.8	55.7	179°24.3	47.5	Gienah	175°39.7	-17°42.5
3	232°47.7	221°54.7	17.4	48°41.8	• • 41.7	29°49.6	• • 55.6	194°26.4	47.6		172°55.4	-63°15.8
4	247°50.1	236°54.3	18.6	63°45.1	42.0	44°52.3	55.5	209°28.6	47.7	1	171°47.1	-57°16.8
5	262°52.6	251°54.0	19.9	78°48.5	42.3	59°55.1	55.4	224°30.8	47.8	Alioth	166°09.6	55°47.9
6	277°55.1	266°53.6	N03°21.1	93°51.9	N01°42.6	74°57.8	S07°55.3	239°33.0	N12°47.9	Spica	158°18.4 152°49.0	-11°19.0 49°09.8
7	292°57.5	281°53.2	22.4	108°55.3	42.9	90°00.6	55.2	254°35.2	48.0	Alkaid Hadar	152 49.0 148°30.4	-60°30.8
8	308°00.0	296°52.8	23.6	123°58.6	43.3	105°03.3	55.1	269°37.3	48.1	Menkent	140°53.2	-36°30.9
9	323°02.5	311°52.4	• • 24.9	139°02.0	• • 43.6	$120^{\circ}06.1$	• • 55.0	284°39.5	• • 48.2	Arcturus	145°44.5	19°01.6
10	338°04.9	326°52.1	26.1	154°05.4	43.9	135°08.8	54.8	299°41.7	48.3	Rigil Kent.	139°34.9	-60°57.3
11	353°07.4	341°51.7	27.4	169°08.8	44.2	150° 11.6	54.7	314°43.9	48.4	Kochab	137°19.2	74°01.8
12	8°09.9	356°51.3	N03°28.6	184°12.1	N01°44.5	165° 14.3	S07°54.6	329°46.1	N12°48.5	Zuben'ubi	136°51.9	-16°09.9
13	23°12.3	11°50.9	29.9	199°15.5	44.8	180°17.1	54.5	344°48.2	48.6	Alphecca	$126^{\circ}00.6$	26°36.8
14	38°14.8	26°50.5	31.1	214°18.9	45.1	195° 19.8	54.4	359°50.4	48.7	Antares	$112^{\circ}11.4$	-26°29.7
15 16	53°17.3 68°19.7	41°50.1 56°49.8	· · 32.4 33.6	229°22.3 244°25.6	• • 45.4 45.8	210°22.5 225°25.3	• • 54.3 54.2	14°52.6 29°54.8	• • 48.8 48.9	Atria	107°02.3	-69°04.5
17	83°22.2	71°49.4	34.9	259°29.0	46.1	240°28.0	54.1	44°57.0	49.0	Sabik	101°58.7	-15°45.6
18	98°24.6	86°49.0	N03°36.1	274°32.4	N01°46.4	255°30.8	\$07°53.9	59°59.1	N12°49.1	Shaula	96°05.6	-37°07.3
19	113°27.1	101°48.6	37.4	289°35.7	46.7	270°33.5	53.8	75°01.3	49.2	Rasalhague	95°55.3	12°32.2
20	128°29.6	116°48.2	38.7	304°39.1	47.0	285°36.3	53.7	90°03.5	49.3	Eltanin	90°40.5	51°28.8
21	143°32.0	131°47.9	• • 39.9	319°42.5	• • 47.3	300°39.0	• • 53.6	105°05.7	• • 49.4	Kaus Aust.	83°28.0 80°30.9	-34°22.0 38°48.4
22	158°34.5	146°47.5	41.2	334°45.9	47.6	$315^{\circ}41.8$	53.5	120°07.9	49.5	Vega Nunki	75°43.6	-26°15.5
23	173°37.0	161°47.1	42.4	349°49.2	47.9	330°44.5	53.4	$135^{\circ}10.0$	49.6	Altair	61°56.7	8°56.7
Mern	ass. 11:27	υ-0 Δ' d1	.3′ m-3.90	1/3 A' d0	.3′ m-1.37	u2 7′ d-0	.1′ m-2.45	1/2 2 ¹ d0	.1′ m0.38	Peacock	53°00.7	-56°38.1
iviei.p	Jass. 11.21	ν-0.4 α1	.5 111-5.90	ν _{3.4} α _{0.}	.5 111-1.57	ν2.1 u-0	.1 111-2.43	νz.z ασ	.1 1110.30	Deneb	49°23.6	45°22.9
										Enif	33°35.7	10°00.5
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.1	-46°49.0
0	188°39.4	176°46.7	N03°43.7	4°52.6	N01°48.3	345°47.3	S07°53.3	150°12.2		Fomalhaut	$15^{\circ}11.1$	-29°28.0
1	203°41.9	191°46.3	44.9	19°56.0	48.6	0°50.0	53.1	165°14.4	49.8	Scheat	13°42.2	28°14.4
2 3	218°44.4 233°46.8	206°45.9 221°45.6	46.2 •• 47.4	34°59.3 50°02.7	48.9 • • 49.2	15° 52.8 30° 55.5	53.0 •• 52.9	180°16.6 195°18.8	49.9 • • 50.0	Markab	13°26.8	15°21.7
	233 40.6 248°49.3	221 45.0 236°45.2								Mar 29 Thu	SHA	Mer.pass
4 5	248 49.3 263°51.7	230 45.2 251°44.8	48.7 49.9	65°06.1 80°09.5	49.5 49.8	45°58.3 61°01.0	52.8 52.7	210°20.9 225°23.1	50.1 50.2	Venus	350°23.8	12:12
6	203 51.7 278°54.2	266°44.4	N03°51.2	95°12.8	49.6 N01°50.1	76°03.8	52.7 \$07°52.6	240°25.3	N12°50.3	1	175°29.4	23:46
7	293°56.7	281°44.0	52.4	110°16.2	50.4	91°06.5	52.5	255°27.5	50.3	Jupiter	156°54.3	01:05
8	308°59.1	296°43.6	53.7	125°19.6	50.7	106°09.3	52.4	270°29.7	50.4	Saturn	321°46.4	14:04
9	324°01.6	311°43.3	• • 54.9	140°22.9	51.0	121° 12.0	52.2	285°31.8	50.5			
10	339°04.1	326°42.9	56.2	155°26.3	51.4	136° 14.8	52.1	300°34.0	50.6	Mar 30 Fri	SHA	Mer.pass
11	354°06.5	341°42.5	57.4	170°29.7	51.7	151° 17.5	52.0	315°36.2	50.7	Venus		12:13
12	9°09.0	$356^{\circ}42.1$	N03°58.7	185°33.0	N01°52.0	166°20.3	S07°51.9	330°38.4	N12°50.8	Jupiter	175°51.3 157°01.1	23:41 01:01
13	24°11.5	11°41.7	03°59.9	200°36.4	52.3	181°23.0	51.8	345°40.6	50.9	Saturn	321°39.6	14:01
14	39°13.9	26°41.3	04°01.2	215°39.8	52.6	196°25.8	51.7	0°42.7	51.0			1 1.01
15	54°16.4	41°41.0	02.4	230°43.1	• • 52.9	211°28.5	• • 51.6	15°44.9	• • 51.1	Mar 31 Sat	SHA	Mer.pass
16	69°18.9	56°40.6	03.7	245°46.5	53.2	226°31.3	51.4	30°47.1	51.2		348°07.3	12:13
17	84°21.3	71°40.2	04.9	260°49.9	53.5	241°34.0	51.3	45°49.3	51.3	1	176°13.2	23:35
18	99°23.8	86°39.8	N04°06.2	275°53.2	N01°53.8	256° 36.8	S07°51.2	60°51.5	N12°51.4	1	157°07.8	00:57
19	114°26.2	101°39.4	07.4	290°56.6	54.1	271°39.5	51.1	75°53.6	51.5	Saturn	321°32.8	13:57
20 21	129°28.7 144°31.2	116°39.0 131°38.6	08.7 •• 09.9	306°00.0 321°03.3	54.4	286° 42.3 301° 45.0	51.0	90°55.8 105°58.0	51.6	Horizont	al parallax	
22	144 31.2 159°33.6	131 38.6 146°38.3	11.2	321 03.3 336°06.7	•• 54.7 55.0	301 45.0 316°47.8	• • 50.9 50.8	105 58.0 121°00.2	· · 51.7 51.8		Venus:	0.1
23	174°36.1	161°37.9	12.4	351°10.1	55.3	331° 50.5	50.6	136°02.3	51.6		Mars:	0.2
Mer.p	ass. 11:24	$ u$ -0.4 $^{\prime}$ $d1$.3′ m-3.90	ν 3.4 $^{\prime}$ d0.	.3′ m-1.36	$\nu 2.7' d-0$.1′ m-2.46	ν 2.2′ d0	$.1' \; m0.38$			

Thu GHA Dec GHA V Dec d HP	h	Sui	า			Moon		
1 198" 48 NO3" 24 3 15" 15 9 NO S01" 32 15 16 16 15 15 16 12 12 12 14 15 15 15 16 15 15 16 12 12 12 14 15 15 16 12 15 15 16 12 12 15 16 15 16 12 15 16 16 15 16 12 15 16 16 16 16 16 16 16	Thu	GHA	Dec	GHA	ν	Dec	d	HP
2 2008-48,2 26,2 44*07.4 8,9 02*04.4 15,8 61,2 3 223*48,4 -27,2 58*32, 8,9 02*30,3 15,8 61,2 4 238*48,8 29,2 73*03,1 8,8 02*36,1 15,8 61,2 5 253*48,8 29,2 73*03,1 8,8 02*52,0 15,8 61,2 7 288*49,1 31,1 116*26,5 8,7 03*23,6 15,8 61,2 8 29949,3 32,1 130*54,2 8,7 03*35,1 15,8 61,2 9 313*49,5 -33,0 145*21,9 8,7 03*55,1 15,8 61,3 10 328*49,7 34,0 159*49,6 8,6 04*26,6 15,7 61,3 11 343*49,9 35,0 174*17,2 8,6 04*26,6 15,7 61,3 12 358*50,1 103*36,0 188*48, 8,5 504*24, 15,7 61,3 13 318*50,3 36,9 203*12,3 8,5 04*56,0 15,7 61,3 14 28*50,5 37,9 203*12,3 8,5 04*56,0 15,7 61,3 15 43*50,6 -38,9 222*07,3 8,4 05*45,0 15,7 61,3 16 58*50,8 39,9 246*34,7 8,4 05*45,0 15,7 61,3 17 73*51,0 40,8 261*20,0 8,3 06*16,1 15,5 61,4 19 103*51,4 42,8 298*56,7 8,2 06*47,1 15,5 61,4 20 118*51,6 43,7 304*23,9 33 506*16,1 15,5 61,4 21 133*51,8 -44,7 318*51,1 8,2 06*47,1 15,3 61,4 22 208*52,7 49,6 31*06,4 7,9 08*34,1 15,1 61,4 23 223*52,9 -50,5 45*33,3 7,7 509*04,3 15,0 61,4 24 238*53,1 51,5 60*00,2 7,8 08*34,1 15,1 61,4 25 253*53,3 52,5 74*270,7 7,8 09*04,3 15,0 61,4 27 283*53,7 55,4 103*20,7 7,7 09*34,2 14,9 61,4 28 298*53,4 85*33,7 7,7 09*34,2 14,9 61,4 29 313*54,0 -56,3 132*13,8 7,7 509*04,3 15,0 61,4 29 313*54,0 -56,3 132*13,8 7,7 509*04,3 15,0 61,4 20 118*65,0 00,0 10,0 10,0 10,0 10,0 10,0 328*54,0 -56,3 132*13,8 7,7 509*13,1 14,9 61,4 32 258*53,0 00,0 00,0 138*46,5 0,7 13*50,3 14,4 61,4 32 133*540,0 -56,3 132*13,8 7,7 509*13,1 14,9 61,4 32 358*64,0 00,0 138*46,5 0,7 13*50,3 13,4 61,3 32 268*74,0 00,0 138*46,5 0,7 13*50,3 13,4 61,3 33 223*574,0								61.1'
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10 328°49,7 34.0 159°49,6 8.6 04°10,9 15,7 61,3 11 343°49,9 35.0 174°17,2 8.6 04°26,6 15,7 61,3 12 358°50,1 N03°36,0 188°44,8 8.5 504°42,4 15,7 61,3 13 13°50,3 36.9 203°12,3 8.5 04°88,0 15,7 61,3 14 28°50,5 37,9 217°39,8 8.5 04°88,0 15,7 61,3 15 43°50,6 38,9 232°07,3 8.4 05°29,4 15,6 61,3 16 58°50,8 39,9 246°34,7 8.4 05°29,4 15,6 61,3 17 73°51,0 40,8 261°02,0 8.3 06°00,5 15,5 61,4 19 103°51,4 42.8 289°56,7 8.2 06°31,6 15,5 61,4 20 118°51,6 43,7 304°23,9 8.2 06°31,6 15,5 61,4 21 133°51,8 44,7 318°51,1 8.2 06°31,6 15,5 61,4 22 148°52,0 45,7 333°18,3 8.1 07°17,9 15,3 61,4 22 148°52,0 45,7 333°18,3 8.1 07°17,9 15,3 61,4 23 163°52,2 46,6 347°45,4 8.1 07°17,9 15,3 61,4 24 22 208°52,7 49,6 31°04,7 79,8 93,8 15,2 61,4 25 208°52,7 49,6 31°04,7 98°33,8 15,2 61,4 25 233°52,9 .50,5 45°33,3 7,9 08°34,1 15,1 61,4 25 233°53,3 52,5 74°270,7 8 09°40,3 15,2 61,4 26 268°53,5 N03°33,4 88°38,7 77 09°34,2 14,9 61,4 27 283°53,7 54,4 103°20,5 7,7 09°34,2 14,9 61,4 28 333°54,0 56,3 321°8,8 7,7 10°38,4 14,7 61,4 29 313°54,0 56,3 321°8,7 7,7 109°34,2 14,9 61,4 29 333°54,0 83,3 175°33,3 7,4 10°38,8 14,7 61,4 29 333°54,0 83,3 175°33,3 7,4 10°38,8 14,7 61,4 29 313°54,0 01,2 248°52,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°53,0 01,2 248°54,0 01,3 01,3 01,3 19 103°55,0 06,0 276°37,0 7,0 12°27,9 14,0 61,4 19 133°54,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 01,0 20 118°56,0 00,0 01,0 01,0 01,0 01,0 01,0 01,								
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19 104°00.4 29.2 262°46.1 5.7' 17°35.0 11.4' 61.0' 20 119°00.6 30.2 277°10.8 5.6' 17°46.4 11.2' 61.0' 21 134°00.8 · 31.2 291°35.4 5.6' 17°57.6 11.1' 61.0' 22 149°01.0 32.1 306°00.0 5.5' 18°08.7 11.0' 60.9' 23 164°01.2 33.1 320°24.6 5.5' 18°19.7 10.8' 60.9'								
21 134°00.8 ··· 31.2 291°35.4 5.6' 17°57.6 11.1' 61.0' 22 149°01.0 32.1 306°00.0 5.5' 18°08.7 11.0' 60.9' 23 164°01.2 33.1 320°24.6 5.5' 18°19.7 10.8' 60.9'								
22 149°01.0 32.1 306°00.0 5.5' 18°08.7 11.0' 60.9' 23 164°01.2 33.1 320°24.6 5.5' 18°19.7 10.8' 60.9'								
23 164°01.2 33.1 320°24.6 5.5' 18°19.7 10.8' 60.9'								
SD = 16.0' d = 1.0' $SD = 16.7'$	23			320~24.6			10.8	60.9
		SD = 16.0'	d=1.0'		SI	O = 16.7'		

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

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

		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	98-99%	
29	04:49	04:40	12:05	23:51	11:24		
30	04:31	04:22	12:04	-:-	12:18		
31	04:13	04:04	12:04	00:47	13:15		

h	Aries	Ve	enus	М	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	189°38.6				N01°55.6						SHA	Dec
0		176°37.5	N04°13.6	6°13.4		346°53.3	S07°50.5	151°04.5	N12°52.0	Alpheratz	357°31.5	29° 15.1
1	204°41.0	191°37.1	14.9	21°16.8	55.9	1°56.0	50.4	166°06.7	52.1	Ankaa	353°04.3	-42°08.8
2	219°43.5	206°36.7	16.1	36°20.2	56.3	16°58.8	50.3	181°08.9	52.2	Schedar	349°27.5	56°41.9
3	234°46.0	221°36.3	• • 17.4	51°23.5	• • 56.6	32°01.5	• • 50.2	$196^{\circ}11.1$	• • 52.3	Diphda	348°44.2	-17°49.6
4	249°48.4	236°36.0	18.6	66°26.9	56.9	47°04.3	50.1	211°13.2	52.4	Achernar	_	-57°05.4
5	264°50.9	251°35.6	19.9	81°30.2	57.2	62°07.0	50.0	226°15.4	52.5	Hamal	327°47.6	23°36.0
6	279°53.4	266°35.2	N04°21.1	96°33.6	N01°57.5	77°09.8	507°49.8	241°17.6	N12°52.6		312°33.2	89° 23.3
7	294°55.8	281°34.8	22.4	111°37.0	57.8	92°12.5	49.7	256°19.8	52.7	Polaris		
8	309°58.3	296°34.4	23.6	126° 40.3	58.1	107°15.3	49.6	271°21.9	52.8	Acamar	315°09.6	-40°11.4
9	325°00.7	311°34.0	• • 24.9	141°43.7	• • 58.4	122°18.0	• • 49.5	286°24.1	• • 52.9	Menkar	314°02.8	4°12.1
10	340°03.2	326°33.6	26.1	156° 47.1	58.7	137°20.8	49.4	301°26.3	53.0	Mirfak		49°57.9
11	355°05.7	341°33.2	27.4	171°50.4	59.0	152°23.5	49.3	316°28.5	53.1	Aldebaran	290°35.9	16°34.0
12	10°08.1	356°32.9	N04°28.6	186°53.8	N01°59.3	167°26.3	507°49.2	331°30.7	N12°53.2	Rigel	281°00.7	-8°10.3
										Capella	280°17.0	46°01.6
13	25° 10.6	11°32.5	29.9	201°57.1	59.6	182°29.0	49.0	346°32.8	53.3	Bellatrix	278°19.3	6°22.4
14	40° 13.1	26°32.1	31.1	217°00.5	01°59.9	197°31.8	48.9	1°35.0	53.4	Elnath	277°57.7	28° 37.8
15	55° 15.5	41°31.7	• • 32.4	232°03.9	02°00.2	212°34.5	• • 48.8	16°37.2	• • 53.5	Alnilam	275°34.4	-1°11.2
16	$70^{\circ}18.0$	56°31.3	33.6	247°07.2	00.5	227°37.3	48.7	31°39.4	53.6	Betelgeuse	270°48.5	7°24.5
17	85°20.5	71°30.9	34.8	$262^{\circ}10.6$	8.00	242°40.0	48.6	46°41.5	53.6	Canopus	263°50.9	-52°43.1
18	100°22.9	86°30.5	N04°36.1	277° 13.9	N02°01.1	257°42.8	S07°48.5	61°43.7	N12°53.7		258°23.2	-32 43.1 -16°45.7
19	115°25.4	101°30.2	37.3	292°17.3	01.4	272°45.5	48.3	76°45.9	53.8	Sirius		
20	130°27.8	116°29.8	38.6	307°20.6	01.7	287°48.3	48.2	91°48.1	53.9	Adhara	255°03.2	-29°01.1
21	145°30.3	131°29.4	• • 39.8	322°24.0	• • 02.0	302°51.0	• • 48.1	106°50.2	• • 54.0	Procyon	244°47.2	5°08.7
22	160°32.8	146°29.0	41.1	337°27.4	02.3	317°53.8	48.0	121°52.4	54.1	Pollux		27°57.2
23				352°30.7						Avior	234°13.0	-59° 36.6
23	175°35.2	161°28.6	42.3	352 30.7	02.6	332°56.5	47.9	136°54.6	54.2	Suhail	222°43.5	-43°33.4
Mer.p	ass. 11:20	ν -0.4' d1	2′ m-3.90	ν 3.4′ d0.	3′ m-1.34	$\nu 2.8' \ d-0$.1′ m-2.46	$\nu 2.2' \ d0$.1′ m0.38	Miaplacidus	221°36.9	-69°50.6
										Alphard	217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°36.4	61°35.5
0	190°37.7	176°28.2	N04°43.6	$7^{\circ}34.1$	N02°02.9	347°59.3	507°47.8	151°56.8	N12°54.3	Denebola	182°21.2	14°24.3
1	205°40.2	191°27.8	44.8	22°37.4	03.2	3°02.1	47.7	166°59.0	54.4			
2	220°42.6	206°27.4	46.0	37° 40.8	03.5	18°04.8	47.5	182°01.1	54.5	Gienah		-17°42.5
3	235°45.1	221°27.1	47.3	52°44.1	03.8	33°07.6	• • 47.4	197°03.3	• • 54.6		172°55.4	-63°15.9
4	250°47.6	236°26.7	48.5	67° 47.5	04.1	48°10.3	47.3	212°05.5	54.7		171°47.1	-57°16.8
5	265°50.0	251°26.3	49.8	82°50.8	04.4	63°13.1	47.2	227°07.7	54.8	Alioth	166°09.6	55°47.9
6	280° 52.5	266°25.9	N04° 51.0	97° 54.2	N02°04.7	78°15.8	\$07°47.1	242°09.8	N12°54.9	Spica	158°18.4	-11° 19.0
										Alkaid	152°49.0	49°09.8
7	295°55.0	281°25.5	52.3	112°57.6	05.0	93°18.6	47.0	257°12.0	55.0	Hadar	148°30.4	-60°30.8
8	310°57.4	296°25.1	53.5	128°00.9	05.3	108°21.3	46.9	272°14.2	55.1	Menkent	$147^{\circ}53.1$	-36°30.9
9	325°59.9	311°24.7	• • 54.7	143°04.3	• • 05.6	123°24.1	• • 46.7	287°16.4	• • 55.2	Arcturus	145°44.5	19°01.6
10	341°02.3	326°24.3	56.0	158°07.6	05.8	138°26.8	46.6	302°18.5	55.3	Rigil Kent.		-60°57.3
11	356°04.8	341°23.9	57.2	173°11.0	06.1	153°29.6	46.5	317°20.7	55.4	Kochab	137°19.2	74°01.9
12	11°07.3	356°23.5	N04°58.5	188°14.3	N02°06.4	168°32.3	S07°46.4	332°22.9	N12°55.5			-16°09.9
13	26°09.7	11°23.2	04°59.7	203° 17.7	06.7	183°35.1	46.3	347°25.1	55.6	Zuben'ubi		
14	41°12.2	26°22.8	05°01.0	218°21.0	07.0	198°37.9	46.2	2°27.2	55.7	Alphecca	126°00.6	26°36.8
15	56° 14.7	41°22.4	02.2	233°24.4	• • 07.3	213°40.6	• • 46.0	17°29.4	• • 55.8	Antares	112°11.4	-26°29.7
16	71° 17.1	56°22.0	03.4	248° 27.7	07.6	228°43.4	45.9	32°31.6	55.9	Atria	107°02.2	-69°04.5
17	86° 19.6	71°21.6	04.7	263°31.1	07.0	243°46.1	45.8	47°33.8	56.0	Sabik	101°58.7	-15°45.6
			N05°05.9							Shaula	96°05.6	-37°07.3
18	101°22.1	86°21.2		278°34.4	N02°08.2	258°48.9	S07°45.7	62°35.9	N12°56.1	Rasalhague	95°55.3	12°32.2
19	116°24.5	101°20.8	07.2	293°37.8	08.5	273°51.6	45.6	77°38.1	56.2	Eltanin	90°40.5	51°28.8
20	131°27.0	116°20.4	08.4	308°41.1	8.80	288°54.4	45.5	92°40.3	56.3	Kaus Aust.	83°27.9	-34°22.0
21	146°29.5	131°20.0	• • 09.6	323°44.5	•• 09.1	303°57.1	• • 45.3	107°42.5	• • 56.4	Vega	80°30.9	38° 48.4
22	161°31.9	$146^{\circ}19.6$	10.9	338°47.8	09.4	318°59.9	45.2	122°44.6	56.5	Nunki	75°43.5	-26°15.4
23	176°34.4	161°19.3	12.1	353°51.2	09.7	334°02.6	45.1	137°46.8	56.6	Altair	61°56.7	8°56.7
1/10111	11.16	0 1/ 11	2′ m-3.90	2 4/ 40	3' m-1.32	0/ 40	.1′ m-2.46		.1′ m0.38	Peacock	53°00.7	-56°38.1
ivier.p	ass. 11:16	ν-0.4 α1	2 111-3.90	ν 3.4 a_0 .	3 III-1.32	ν2.ο α-υ	.1 111-2.40	ν2.2 αυ	.1 1110.30	Deneb	49°23.6	45°22.9
										l l		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.6	10°00.5
0	191°36.8	176°18.9	N05° 13.4	8°54.5	N02° 10.0	349°05.4	S07°45.0		N12°56.7	Al Na'ir	27°29.1	-46°48.9
1	206°39.3	191°18.5	14.6	23°57.8	10.2	4°08.2	44.9	167°51.2	56.8	Fomalhaut	15°11.1	-29°27.9
2	200 39.3 221°41.8	206°18.1	15.8	39°01.2	10.2	19°10.9	44.9	182°53.3	56.9	Scheat	13°42.2	28° 14.4
3						34°13.7	44.8 •• 44.7	182 53.3 197°55.5		Markab	13°26.8	15°21.7
	236°44.2	221°17.7	• • 17.1	54°04.5	10.8				•• 57.0	Apr 01 Sun	CH V	Ma:: ====
4	251°46.7	236°17.3	18.3	69°07.9	11.1	49°16.4	44.5	212°57.7	57.1		SHA	Mer.pass
5	266°49.2	251°16.9	19.6	84°11.2	11.4	64°19.2	44.4	227°59.9	57.2		346°58.9	12:14
6	281°51.6	266°16.5	N05°20.8	99°14.6	N02°11.7	79°21.9	S07°44.3	243°02.0	N12°57.3		176°34.9	23:30
7	$296^{\circ}54.1$	281°16.1	22.0	$114^{\circ}17.9$	12.0	94°24.7	44.2	258°04.2	57.4		157°14.7	00:52
8	$311^{\circ}56.6$	296°15.7	23.3	129°21.3	12.3	109°27.4	44.1	273°06.4	57.5	Saturn	321°26.0	13:54
9	326°59.0	311°15.3	• • 24.5	144°24.6	• • 12.6	124°30.2	• • 44.0	288°08.6	• • 57.5		C	
10	342°01.5	326°14.9	25.8	159°27.9	12.9	139°32.9	43.8	303°10.7	57.6	Apr 02 Mon	SHA	Mer.pass
11	357°04.0	341°14.5	27.0	174°31.3	13.1	154°35.7	43.7	318°12.9	57.7		345°50.5	12:14
12	12°06.4	356°14.2	N05°28.2	189° 34.6	N02° 13.4	169°38.5	507°43.6		N12°57.8		176°56.4	23:24
13	27°08.9	11°13.8	29.5	204° 38.0	13.7	184°41.2	43.5	348°17.3	57.9	Jupiter	157°21.6	00:48
										Saturn	$321^{\circ}19.1$	13:50
14	42°11.3	26°13.4	30.7	219°41.3	14.0	199°44.0	43.4	3°19.4	58.0			
15	57° 13.8	41°13.0	• • 31.9	234°44.6	• • 14.3	214°46.7	• • 43.3	18°21.6	• • 58.1	Apr 03 Tue	SHA	Mer.pass
16	72°16.3	56°12.6	33.2	249°48.0	14.6	229°49.5	43.1	33°23.8	58.2	1	344°42.0	12:15
17	87° 18.7	71°12.2	34.4	264°51.3	14.9	244°52.2	43.0	48°26.0	58.3		$177^{\circ}17.7$	23:19
18	102°21.2	86°11.8	N05°35.6	279°54.7	N02° 15.1	259°55.0	S07°42.9	63°28.1	N12°58.4	Jupiter	$157^{\circ}28.5$	00:44
19	$117^{\circ}23.7$	101°11.4	36.9	294°58.0	15.4	274°57.8	42.8	78°30.3	58.5		321°12.1	13:47
20	$132^{\circ}26.1$	116°11.0	38.1	310°01.3	15.7	290°00.5	42.7	93°32.5	58.6			
21	$147^{\circ}28.6$	131°10.6	• • 39.4	325°04.7	• • 16.0	305°03.3	• • 42.6	108°34.7	• • 58.7	Horizont	al parallax	
22	162°31.1	146°10.2	40.6	340°08.0	16.3	320°06.0	42.4	123°36.8	58.8		Venus:	0.1
23	177°33.5	161°09.8	41.8	355°11.3	16.6	335°08.8	42.3	138°39.0	58.9		Mars:	0.2
Mer.p	ass. 11:12	$ u$ -0.4 $^{\prime}$ d1	2′ m-3.90	ν 3.3′ d0.	3′ m-1.30	ν 2.8′ d-0	.1′ m-2.46	ν 2.2′ d0	.1′ m0.37			

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.3	$N04^{\circ}34.1$	334°49.1	5.5'	S18°30.5	10.7'	60.9'
1 2	194°01.5 209°01.7	35.0 36.0	349°13.5 3°37.9	5.4' 5.4'	18°41.2 18°51.7	10.6' 10.4'	60.9' 60.8'
3	209 01.7 224°01.9	37.0	3 37.9 18°02.3	5.4	10 51.7 19°02.2	10.4	60.8
4	239°02.1	37.9	32°26.6	5.3'	19°12.4	10.1'	60.8'
5	254°02.3	38.9	46°50.9	5.2'	19°22.6	10.0'	60.8'
6 7	269°02.5 284°02.6	N04°39.8 40.8	61°15.1 75°39.3	5.2' 5.1'	\$19°32.6 19°42.4	9.9' 9.7'	60.7' 60.7'
8	299°02.8	41.8	90°03.4	5.1'	19°52.1	9.6'	60.7'
9	314°03.0	• • 42.7	104°27.5	5.1'	20°01.7	9.4'	60.7'
10 11	329°03.2 344°03.4	43.7 44.7	118°51.5 133°15.6	5.0' 5.0'	20°11.1 20°20.4	9.3' 9.1'	60.6' 60.6'
12	359°03.6	N04°45.6	133 13.0 147°39.5	4.9'	\$20°29.5	9.1	60.6
13	14°03.8	46.6	$162^{\circ}03.5$	4.9'	20°38.4	8.8'	60.5'
14	29°03.9 44°04.1	47.5 •• 48.5	176°27.4 190°51.3	4.9' 4.8'	20°47.2 20°55.9	8.7' 8.5'	60.5' 60.5'
15 16	59°04.3	49.5	205°15.1	4.8	20 55.9 21°04.4	8.3'	60.5
17	74°04.5	50.4	219°38.9	4.8'	21°12.7	8.2'	60.4'
18	89°04.7	N04°51.4	234°02.7	4.7'	\$21°20.9	8.0'	60.4
19 20	104°04.9 119°05.1	52.4 53.3	248°26.4 262°50.1	4.7' 4.7'	21°29.0 21°36.8	7.9' 7.7'	60.4' 60.3'
21	134°05.2	• • 54.3	277°13.8	4.7'	21°44.6	7.6'	60.3
22	149°05.4	55.2	291°37.5	4.6'	21°52.1	7.4'	60.3'
23	164°05.6	56.2	306°01.1	4.6'	21°59.5	7.2'	60.2'
	SD = 16.0'	d = 1.0'		SI	O = 16.6'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°05.8	N04°57.2	320°24.8	4.6'	S22°06.8	7.1'	60.2'
1 2	194°06.0 209°06.2	58.1 04°59.1	334°48.4 349°11.9	4.6' 4.6'	22°13.8 22°20.8	6.9' 6.8'	60.2' 60.1'
3	224°06.4	04 59.1 05°00.0	3°35.5	4.5	22°27.5	6.6	60.1
4	239°06.5	01.0	17°59.1	4.5'	22°34.1	6.4'	60.1'
5 6	254°06.7 269°06.9	02.0 N05°02.9	32°22.6 46°46.1	4.5' 4.5'	22°40.5 S 22°46.8	6.3' 6.1'	60.0' 60.0'
7	284°07.1	03.9	61°09.6	4.5'	22°52.9	5.9'	60.0'
8	299°07.3	04.8	75°33.1	4.5'	22°58.8	5.8'	59.9'
9	314°07.5	• • 05.8	89°56.6	4.5'	23°04.5	5.6'	59.9'
10 11	329°07.6 344°07.8	06.8 07.7	104°20.1 118°43.6	4.5' 4.5'	23°10.1 23°15.6	5.4' 5.3'	59.9' 59.8'
12	359°08.0	N05°08.7	133°07.1	4.5'	523°20.8	5.1'	59.8'
13	14°08.2 29°08.4	09.6	147°30.5	4.5'	23°25.9	4.9'	59.8'
14 15	29°08.4 44°08.6	10.6 •• 11.6	161°54.0 176°17.5	4.5' 4.5'	23°30.8 23°35.6	4.8' 4.6'	59.7' 59.7'
16	59°08.8	12.5	190°41.0	4.5'	23°40.2	4.4'	59.6'
17	74°08.9	13.5	205°04.5	4.5'	23°44.6	4.2'	59.6'
18 19	89°09.1 104°09.3	N05°14.4 15.4	219°28.0 233°51.5	4.5' 4.5'	\$23°48.8 23°52.9	4.1' 3.9'	59.6' 59.5'
20	119°09.5	16.3	248°15.0		23°56.8	3.7'	59.5'
21	134°09.7	• • 17.3	262°38.5	4.5'	24°00.6	3.6'	59.5'
22 23	149°09.9 164°10.0	18.3 19.2	277°02.1 291°25.6	4.6' 4.6'	24°04.1 24°07.5	3.4' 3.2'	59.4' 59.4'
25	SD = 16.0'	d = 1.0'	291 23.0		D = 16.4'	9.2	33.4
Tue 0	GHA 179°10.2	Dec N05°20.2	GHA 305°49.2	ν 4.6'	Dec 524°10.8	<i>d</i> 3.1'	HP 59.3'
1	194°10.4	21.1	320°12.8	4.6'	24°13.8	2.9'	59.3'
2	209°10.6	22.1	334°36.5	4.7'	24°16.7	2.7'	59.3'
3 4	224°10.8 239°11.0	· · 23.0 24.0	349°00.1 3°23.8	4.7' 4.7'	24°19.5 24°22.0	2.6' 2.4'	59.2' 59.2'
5	254°11.1	25.0	17°47.5	4.7'	24°24.4	2.2'	59.2'
6	269°11.3	N05°25.9	32°11.2	4.8'	S24°26.6	2.1'	59.1'
7 8	284°11.5 299°11.7	26.9 27.8	46°35.0 60°58.8	4.8' 4.8'	24°28.7 24°30.6	1.9' 1.7'	59.1' 59.0'
9	314°11.9	. 28.8	75°22.6	4.0 4.9'	24°32.3	1.6'	59.0'
10	329°12.1	29.7	89°46.5	4.9'	24°33.9	1.4'	59.0'
11 12	344°12.2 359°12.4	30.7 N05°31.7	104°10.4 118°34.4	5.0' 5.0'	24°35.3 S 24°36.5	1.2' 1.1'	58.9' 58.9'
13	14°12.6	32.6	132°58.4	5.0'	24°37.5	0.9'	58.8'
14	29°12.8	33.6	$147^{\circ}22.4$	5.1'	24°38.4	0.7'	58.8'
15 16	44°13.0 59°13.1	· · 34.5 35.5	161°46.5 176°10.6	5.1' 5.2'	24°39.2 24°39.7	0.6' 0.4'	58.8' 58.7'
16 17	74°13.1	35.5 36.4	176°10.6 190°34.8	5.2' 5.2'	24° 39.7 24° 40.2	0.4	58.7' 58.7'
18	89°13.5	N05°37.4	204°59.0	5.3'	S24°40.4	0.1'	58.6'
19	104°13.7	38.3	219°23.3	5.3'	24°40.5	-0.1'	58.6'
20 21	119°13.9 134°14.1	39.3 •• 40.2	233°47.6 248°12.0	5.4' 5.4'	24°40.4 24°40.2	-0.2' -0.4'	58.6' 58.5'
22	149°14.2	41.2	$262^{\circ}36.5$	5.5'	24°39.8	-0.6'	58.5'
23	164°14.4	42.2	277°01.0	5.6'	24°39.2	-0.7'	58.4'
	SD = 16.0'	d = 1.0'		SI	O = 16.2'		

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

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

		Sun			Moon		ı
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	ı
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19	ı
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-79%	ı
01	03:55	03:46	12:04	01:45	14:15		ı
02	03:37	03:28	12:03	02:45	15:15		ı
03	03:19	03:10	12:03	03:46	16:16		ı

h _	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	192°36.0	176°09.4	N05°43.1	10°14.7	N02°16.8	350°11.5	S07°42.2		$N12^{\circ}59.0$	Alpheratz	357°31.5	29° 15.1
1	207°38.5	191°09.0	44.3	25°18.0	17.1	5°14.3	42.1	168°43.3	59.1	Ankaa	353°04.3	-42°08.8
2	222°40.9	206°08.6	45.5	40°21.3	17.4	20°17.1	42.0	183°45.5	59.2	Schedar	349°27.5	56°41.9
3	237°43.4	221°08.2	• • 46.8	55°24.7	• • 17.7	35°19.8	• • 41.9	198°47.7	• • 59.3	Diphda	348°44.2	-17°49.6
4	252°45.8	236°07.8	48.0	70°28.0	18.0	50°22.6	41.8	213°49.9	59.4	Achernar	335°18.4	-57°05.3
5	267°48.3	251°07.4	49.2	85°31.3	18.3	65°25.3	41.6	228°52.0	59.5	Hamal	327°47.6	23°36.0
6	282°50.8	266°07.0	N05°50.5	100°34.7	N02°18.5	80°28.1	S07°41.5	243°54.2	N12°59.6	Polaris	312°33.7	89°23.3
7	297°53.2	281°06.7	51.7	115°38.0	18.8	95°30.8	41.4	258°56.4	59.7	Acamar	$315^{\circ}09.6$	-40°11.4
8 9	312°55.7 327°58.2	296°06.3 311°05.9	52.9 •• 54.2	130°41.3 145°44.7	19.1 • • 19.4	110°33.6 125°36.4	41.3 •• 41.2	273°58.6 289°00.7	59.8 12°59.9	Menkar	314°02.8	4°12.1
9 10	343°00.6	326°05.5	55.4	145 44.7 160°48.0	19.4	140°39.1	41.2	304°02.9	12 59.9 13°00.0	Mirfak	308°23.6	49°57.9
11	358°03.1	341°05.1	56.6	175°51.3	19.7	140 39.1 155°41.9	40.9	319°05.1	00.1	Aldebaran	290°35.9	16°34.0
12	13°05.6	356°04.7	N05° 57.9	175°51.5	N02°20.2	170°44.6	507°40.8	334°07.3	N13°00.2	Rigel	281°00.7	-8°10.3
13	28° 08.0	11°04.3	05°59.1	205°58.0	20.5	185°47.4	40.7	349°09.4	00.3	Capella	280°17.0	46°01.6
14	43° 10.5	26°03.9	06°00.3	221°01.3	20.8	200°50.1	40.6	4°11.6	00.4	Bellatrix	278°19.3	6°22.4
15	58° 12.9	41°03.5	• • 01.6	236°04.6	· · 21.1	215°52.9	• • 40.5	19°13.8	• • 00.5	Elnath	277°57.7	28°37.8
16	73°15.4	56°03.1	02.8	251°08.0	21.3	230°55.7	40.4	$34^{\circ}15.9$	00.6	Alnilam	275°34.4	-1°11.2
17	88°17.9	$71^{\circ}02.7$	04.0	266°11.3	21.6	245°58.4	40.2	49°18.1	00.7	Betelgeuse	270°48.5	7°24.5
18	103°20.3	86°02.3	N06°05.3	281°14.6	N02°21.9	261°01.2	S07°40.1	64°20.3	N13°00.8	Canopus Sirius	263°51.0 258°23.2	-52°43.1 -16°45.7
19	118°22.8	$101^{\circ}01.9$	06.5	296°17.9	22.2	276°03.9	40.0	79°22.5	00.9	Adhara	255°03.2	-10 45.7 -29°01.1
20	133°25.3	$116^{\circ}01.5$	07.7	311°21.3	22.4	291°06.7	39.9	94°24.6	01.0	Procyon	244°47.2	5°08.7
21	148°27.7	131°01.1	•• 08.9	326°24.6	• • 22.7	306°09.5	• • 39.8	109°26.8	•• 01.1	Pollux	244 47.2 243°13.1	27° 57.2
22	163°30.2	146°00.7	10.2	341°27.9	23.0	321°12.2	39.7	124°29.0	01.2	Avior	234°13.1	-59° 36.6
23	178°32.7	161°00.3	11.4	356°31.2	23.3	336°15.0	39.5	139°31.1	01.3	Suhail	234 13.0 222°43.5	-43° 33.5
Mer n	ass. 11:08	ν-0 4' d1	.2′ m-3.90	ν3 3' dΩ	3′ m-1.28	ν2 8' d-Ω	.1′ m-2.46	ν2 2' dΩ	.1′ m0.37	Miaplacidus	221°36.9	-43° 50.6
cip		ν σ. γ α1	5.90	ν J.J UU.	- 111 1.20		2.70	- Z.Z UU		Alphard	217°44.2	-8° 47.4
			_		_		_		_	Regulus	207°30.6	11°49.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.5
0	193°35.1	175°59.9	N06° 12.6	11°34.6	N02°23.6	351°17.7	S07°39.4	154°33.3	N13°01.4	Denebola	182°21.2	14°24.3
1	208° 37.6	190°59.5	13.9	26°37.9	23.8	6°20.5	39.3	169°35.5	01.5	Gienah	175°39.7	-17°42.5
2	223° 40.1	205°59.1	15.1	41°41.2	24.1	21°23.2	39.2	184°37.7	01.6	Acrux	172°55.4	-63°15.9
3	238° 42.5	220°58.7	•• 16.3	56°44.5	• • 24.4	36°26.0	39.1	199°39.8	• • 01.7	Gacrux	$171^{\circ}47.1$	-57°16.8
4	253°45.0 268°47.4	235°58.3	17.6	71°47.8	24.6	51°28.8	39.0 38.8	214°42.0 229°44.2	01.8	Alioth	$166^{\circ}09.6$	55°47.9
5 6	283°49.9	250°57.9 265°57.5	18.8 N06°20.0	86°51.2 101°54.5	24.9 N02°25.2	66°31.5 81°34.3	507°38.7	244°46.3	01.9 N13°02.0	Spica	158°18.3	-11°19.0
7	203 49.9 298°52.4	280°57.1	21.2	101 54.5 116°57.8	25.5	96°37.0	38.6	259°48.5	02.0	Alkaid	152°48.9	49°09.8
8	313°54.8	295°56.7	22.5	132°01.1	25.7	111°39.8	38.5	274°50.7	02.0	Hadar	148°30.3	-60°30.9
9	328° 57.3	310°56.3	23.7	147°04.4	• • 26.0	126°42.6	• • 38.4	289°52.9	• • 02.2	Menkent	147°53.1	-36°30.9
10	343°59.8	325°55.9	24.9	162°07.8	26.3	141°45.3	38.2	304°55.0	02.3	Arcturus	145°44.5	19°01.6
11	359°02.2	340°55.5	26.1	177°11.1	26.6	156°48.1	38.1	319°57.2	02.4	Rigil Kent.	139°34.8	-60°57.3
12	14°04.7	355°55.1	N06°27.4	192°14.4	N02°26.8	171°50.8	S07°38.0	334°59.4	N13°02.5	Kochab	137°19.1	74°01.9 -16°09.9
13	29°07.2	10°54.7	28.6	207°17.7	27.1	186°53.6	37.9	350°01.5	02.6	Zuben'ubi	136°51.9 126°00.6	-16°09.9 26°36.8
14	44°09.6	25°54.3	29.8	222°21.0	27.4	201°56.4	37.8	5°03.7	02.7	Alphecca	120 00.0 112°11.4	-26°29.7
15	59°12.1	40°53.9	• • 31.1	237°24.3	• • 27.6	$216^{\circ}59.1$	• • 37.7	20°05.9	• • 02.8	Antares Atria	112 11.4 107°02.2	-20 29.7 -69°04.5
16	74°14.6	55°53.5	32.3	252°27.6	27.9	232°01.9	37.5	$35^{\circ}08.1$	02.9	Sabik	101°58.7	-15° 45.6
17	89°17.0	70°53.1	33.5	267°31.0	28.2	247°04.6	37.4	50°10.2	03.0	Shaula	96°05.6	-37°07.3
18	104° 19.5	85°52.7	N06°34.7	282°34.3	N02°28.4	262°07.4	S07°37.3	65°12.4	N13°03.1	Rasalhague	95°55.2	12°32.2
19	119°21.9	100°52.3	36.0	297°37.6	28.7	277°10.2	37.2	80°14.6	03.2	Eltanin	90°40.4	51°28.8
20	134°24.4	115°51.9	37.2	312°40.9	29.0	292°12.9	37.1	95°16.7	03.3	Kaus Aust.	83°27.9	-34°22.0
21	149°26.9	130°51.5	• • 38.4	327°44.2	• • 29.2	307°15.7	• • 37.0	110°18.9	• • 03.4	Vega	80°30.8	38°48.4
22	164°29.3	145°51.1	39.6	342°47.5	29.5	322°18.4	36.8	125°21.1	03.5	Nunki	75°43.5	-26°15.4
23	179°31.8	160°50.6	40.9	357°50.8	29.8	337°21.2	36.7	140°23.3	03.6	Altair	$61^{\circ}56.7$	8°56.7
Mer.pa	ass. 11:04	ν -0.4 $^{\prime}$ d1	.2′ m-3.90	ν 3.3′ d0.	3′ m-1.26	ν 2.8′ d-0	.1′ m-2.47	ν 2.2 $^{\prime}$ d0	.1′ m0.37	Peacock	53°00.7	-56°38.1
				-						Deneb	49°23.6	45°22.9
F!	CHA	CIIA	D	CIIA	D	CIIA	D	CIIA	D	Enif	33°35.6	10°00.5
Fri 0	GHA 194°34.3	GHA 175°50.2	Dec N06° 42.1	GHA 12°54.1	Dec N02°30.0	GHA 352°24.0	Dec \$07°36.6	GHA 155°25.4	Dec N13°03.7	Al Na'ir	27°29.1	-46°48.9
1	194 34.3 209°36.7	175 50.2 190°49.8	43.3	12 54.1 27°57.4	30.3	352 24.0 7°26.7	36.5	155 25.4 170°27.6	03.8	Fomalhaut	15°11.1	-29°27.9
2	209 30.7 224°39.2	205°49.4	43.3 44.5	43°00.7	30.5	22°29.5	36.4	170°27.0	03.9	Scheat	13°42.1	28° 14.4
3	239°41.7	200°49.4 220°49.0	• • 45.7	58°04.0	• • 30.8	37°32.2	36.3	200°31.9	• • 04.0	Markab	13°26.7	15°21.7
4	254° 44.1	235°48.6	47.0	73°07.3	31.1	52°35.0	36.1	215°34.1	04.0	Apr 04 Wed	SHA	Mer.pass
5	269°46.6	250°48.2	48.2	88°10.6	31.4	67°37.8	36.0	230°36.3	04.2	Venus		12:16
6	284°49.1	265°47.8	N06°49.4	103°14.0	N02°31.6	82°40.5	S07°35.9	245°38.4	N13°04.3		177°38.7	23:14
7	299°51.5	280°47.4	50.6	118°17.3	31.9	97°43.3	35.8	260°40.6	04.4	Jupiter		00:39
8	314°54.0	295°47.0	51.9	133°20.6	32.2	112°46.0	35.7	275°42.8	04.5	Saturn	321°05.2	13:43
9	329°56.4	310°46.6	• • 53.1	148°23.9	• • 32.4	127°48.8	• • 35.6	290°45.0	• • 04.6	A OF T!	CIIA	Mani
10	344°58.9	325°46.2	54.3	$163^{\circ}27.2$	32.7	142°51.6	35.4	305°47.1	04.7	Apr 05 Thu	SHA 342°24.8	Mer.pass
11	0°01.4	340°45.8	55.5	178°30.5	33.0	157°54.3	35.3	320°49.3	04.8	Venus	342°24.8 177°59.4	12:16 23:09
12	15°03.8	355°45.4	N06° 56.7	193°33.8	N02°33.2	172°57.1	S 07°35.2	335°51.5	N13°04.9	Jupiter	177 59.4 157°42.6	00:35
13	30°06.3	10°45.0	58.0	208°37.1	33.5	187°59.8	35.1	350°53.6	05.0	Saturn	320°58.2	13:40
14	45°08.8	25°44.6	06°59.2	223°40.4	33.7	203°02.6	35.0	5°55.8	05.1	Jatuill		13.40
15	60°11.2	40°44.2	07°00.4	238°43.7	• • 34.0	218°05.4	• • 34.8	20°58.0	• • 05.2	Apr 06 Fri	SHA	Mer.pass
16	75° 13.7	55°43.8	01.6	253°47.0	34.3	233°08.1	34.7	36°00.1	05.3	Venus		12:17
17	90°16.2	70°43.3	02.8	268°50.3	34.5	248°10.9	34.6	51°02.3	05.4	I	178°19.9	23:03
18	105° 18.6	85°42.9	N07°04.1	283°53.5	N02°34.8	263°13.6	S07°34.5	66°04.5	N13°05.5		157°49.7	00:30
19	120°21.1	100°42.5	05.3	298°56.8	35.0	278°16.4	34.4	81°06.7	05.6	Saturn	320°51.2	13:36
20	135°23.5	115°42.1	06.5	314°00.1	35.3	293°19.2	34.3	96°08.8	05.7	Horizont	al parallax	
21	150°26.0	130°41.7	•• 07.7	329°03.4	• • 35.6	308°21.9	• • 34.1	111°11.0	•• 05.8	1101120111	Venus:	0.1
22 23	165°28.5	145°41.3	08.9	344°06.7	35.8 36.1	323°24.7	34.0	126°13.2	05.9 06.0		Mars:	0.1
43	180°30.9	160°40.9	10.2	359°10.0	36.1	338°27.5	33.9	141°15.3	06.0			<u> </u>
	ass. 11:00		.2′ m-3.90		3′ m-1.25		.1′ m-2.47		.1′ m0.37			

h	Sui	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.6	N05°43.1	$291^{\circ}25.6$	5.6'	S24°38.5	-0.9'	58.4'
1	194°14.8	44.1	305°50.2	5.7'	24°37.6	-1.0'	58.4'
2 3	209° 15.0 224° 15.1	45.0 •• 46.0	320°14.9 334°39.6	5.8' 5.8'	24°36.6 24°35.4	-1.2' -1.3'	58.3' 58.3'
4	239° 15.3	46.9	349°04.5	5.9'	24°34.1	-1.5'	58.2'
5	254°15.5	47.9	$3^{\circ}29.4$	6.0'	24°32.6	-1.6'	58.2'
6	269° 15.7	N05°48.8	17°54.3	6.0'	S24°30.9	-1.8'	58.2'
7 8	284°15.9 299°16.1	49.8 50.7	32°19.3 46°44.4	6.1' 6.2'	24°29.1 24°27.2	-1.9' -2.1'	58.1' 58.1'
9	314° 16.2	51.7	61°09.6	6.2'	24°25.1	-2.2	58.0'
10	329°16.4	52.6	75°34.9	6.3'	24°22.8	-2.4'	58.0'
11	344°16.6	53.6	90°00.2	6.4'	24°20.5	-2.5'	58.0'
12 13	359° 16.8 14° 17.0	N05° 54.5 55.5	104°25.6 118°51.1	6.5' 6.6'	\$24°17.9 24°15.2	-2.7' -2.8'	57.9' 57.9'
14	29° 17.1	56.4	133° 16.6	6.6'	24°12.4	-3.0'	57.9'
15	44° 17.3	• • 57.4	147° 42.2	6.7'	24°09.4	-3.1'	57.8'
16	59° 17.5 74° 17.7	58.3 05°59.3	162°08.0 176°33.7	6.8'	24°06.3 24°03.0	-3.3'	57.8'
17 18	89° 17.9	N06° 00.2	176° 33.7 190° 59.6	6.9' 7.0'	523°59.6	-3.4' -3.5'	57.7' 57.7'
19	104° 18.0	01.2	205°25.6	7.0'	23°56.1	-3.7'	57.7'
20	119° 18.2	02.1	$219^{\circ}51.6$	7.1'	23°52.4	-3.8'	57.6'
21	134° 18.4	03.1	234° 17.8	7.2'	23°48.6	-4.0'	57.6'
22 23	149° 18.6 164° 18.8	04.0 05.0	248°44.0 263°10.3	7.3' 7.4'	23°44.6 23°40.5	-4.1' -4.2'	57.5' 57.5'
23	SD = 16.0'	d = 1.0'			0 = 15.9'	7.4	31.3
	JU = 10.0′	u = 1.0)L	_ 15.9		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.9	N06°05.9	277°36.7	7.5'	\$23°36.3	-4.4'	57.5'
1 2	194° 19.1 209° 19.3	06.9 07.8	292°03.1 306°29.7	7.6' 7.7'	23°32.0 23°27.5	-4.5' -4.6'	57.4' 57.4'
3	209 19.5 224°19.5	08.8	320° 56.4	7.7'	23°22.9	-4.7'	57.4'
4	239° 19.7	09.7	335°23.1	7.8'	23°18.1	-4.9'	57.3'
5	254°19.8	10.7	349°49.9	7.9'	23°13.2	-5.0'	57.3'
6 7	269°20.0 284°20.2	N06°11.6 12.6	4°16.9 18°43.9	8.0' 8.1'	\$23°08.2 23°03.1	-5.1' -5.3'	57.2' 57.2'
8	299° 20.4	13.5	33°11.0	8.2'	23 03.1 22°57.9	-5.4'	57.2'
9	314° 20.6	• • 14.5	47°38.2	8.3'	22°52.5	-5.5'	57.1'
10	329° 20.7	15.4	62°05.5	8.4'	22°47.0	-5.6'	57.1'
11 12	344°20.9 359°21.1	16.4 N06°17.3	76°32.9 91°00.4	8.5' 8.6'	22°41.4 5 22°35.6	-5.7' -5.9'	57.1' 57.0'
13	14°21.3	18.3	91 00.4 105°28.0	8.7'	22°29.8	-5.9 -6.0'	57.0'
14	29°21.4	19.2	119°55.6	8.8'	22°23.8	-6.1'	56.9'
15	44°21.6	. 20.1	134°23.4	8.9'	22°17.7	-6.2	56.9'
16 17	59°21.8 74°22.0	21.1 22.0	148°51.3 163°19.2	9.0' 9.1'	22°11.5 22°05.2	-6.3' -6.4'	56.9' 56.8'
18	89°22.2	N06° 23.0	177°47.3	9.1	\$21°58.7	-6.5	56.8
19	104°22.3	23.9	$192^{\circ}15.4$	9.2'	$21^{\circ}52.2$	-6.7'	56.8'
20	119°22.5	24.9	206°43.7	9.3'	21°45.5		56.7'
21 22	134°22.7 149°22.9	· · 25.8 26.8	221°12.0 235°40.4	9.4' 9.5'	21°38.8 21°31.9	-6.9' -7.0'	56.7' 56.7'
23	164° 23.0	27.7	250°09.0	9.6'	21°24.9	-7.1	56.6'
	SD = 16.0'	d = 0.9'		SD	0 = 15.7'		
					20.1		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°23.2 194°23.4	N06°28.7 29.6	264°37.6 279°06.3	9.7' 9.8'	\$21°17.9 21°10.7	-7.2' -7.3'	56.6' 56.6'
2	209°23.6	30.5	293°35.1	9.8 9.9'	21°03.4	-7.4'	56.5
3	224°23.8	• • 31.5	308°04.1	10.0'	20°56.0	-7.5'	56.5'
4	239°23.9 254°24.1	32.4 33.4	322°33.1 337°02.2	10.1'	20°48.5 20°40.9	-7.6'	56.5'
5 6	254°24.1 269°24.3	33.4 N06°34.3	337°02.2 351°31.4	10.2' 10.3'	20°40.9 \$20°33.3	-7.7' -7.8'	56.4' 56.4'
7	284° 24.5	35.3	6°00.7	10.4	20°25.5	-7.9'	56.4
8	299°24.6	36.2	20°30.1	10.5'	20°17.6	-8.0'	56.3'
9	314°24.8 329°25.0	•• 37.1	34°59.5 49°29.1	10.6'	20°09.6 20°01.6	-8.1'	56.3'
10 11	329°25.0 344°25.2	38.1 39.0	49°29.1 63°58.8	10.7' 10.8'	20°01.6 19°53.4	-8.2' -8.2'	56.3' 56.2'
12	359°25.3	N06°40.0	78°28.6	10.9'	S19°45.2	-8.3'	56.2'
13	14°25.5	40.9	92°58.4	11.0'	19°36.8	-8.4'	56.2'
14 15	29°25.7 44°25.9	41.9 •• 42.8	107°28.4 121°58.4	11.0' 11.1'	19°28.4 19°19.9	-8.5' -8.6'	56.1' 56.1'
16	59° 26.0	43.7	121 58.4 136°28.5	11.1	19 19.9 19°11.3	-8.7'	56.1'
17	74° 26.2	44.7	150° 58.8	11.3'	19°02.6	-8.8'	56.0'
18	89°26.4	N06°45.6	165°29.1	11.4'	S18°53.9	-8.8'	56.0'
19	104° 26.6 119° 26.8	46.6 47.5	179°59.5 194°30.0	11.5' 11.6'	18°45.0 18°36.1	-8.9' -9.0'	56.0'
20 21	119°26.8 134°26.9	47.5 •• 48.4	194° 30.0 209° 00.6	11.6	18°36.1 18°27.1	-9.0° -9.1'	55.9' 55.9'
22	149°27.1	49.4	223°31.3	11.8'	18°18.0	-9.2'	55.9'
23	164°27.3	50.3	238°02.0	11.9'	18°08.8	-9.2'	55.9'
	SD = 16.0'	d = 0.9'		SD	0 = 15.4'		

			2029	April 0	4 to Ap	or. 06
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	03:14	04:33	19:35	20:56	////
N 70°	01:43	03:34	04:43	19:25	20:35	22:32
68°	02:21	03:50	04:51	19:16	20:18	21:50
66°	02:46	04:02	04:58	19:09	20:05	21:23
64°	03:06	04:13	05:04	19:04	19:55	21:03
62°	03:21	04:22	05:08	18:59	19:46	20:47
60°	03:34	04:29	05:13	18:54	19:38	20:34
N 58°	03:44	04:35	05:16	18:50	19:31	20:23
56°	03:54	04:41	05:20	18:47	19:26	20:13
54°	04:02	04:46	05:23	18:44	19:20	20:05
52°	04:09	04:51	05:25	18:41	19:16	19:58
50°	04:15	04:55	05:28	18:38	19:12	19:52
45°	04:27	05:03	05:33	18:33	19:03	19:39
N 40°	04:37	05:10	05:37	18:28	18:56	19:29
35°	04:45	05:16	05:41	18:25	18:50	19:21
30°	04:52	05:20	05:44	18:21	18:45	19:14
20°	05:02	05:28	05:50	18:15	18:38	19:04
N 10°	05:09	05:34	05:55	18:10	18:32	18:56
0°	05:14	05:39	05:59	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:01	18:22	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:44
30°	05:21	05:49	06:13	17:52	18:16	18:43
35°	05:21	05:51	06:16	17:49	18:14	18:43
40°	05:21	05:52	06:19	17:45	18:12	18:44
45°	05:19	05:53	06:23	17:42	18:11	18:45
S 50°	05:17	05:55	06:27	17:37	18:09	18:47
52°	05:16	05:55	06:29	17:35	18:09	18:48
54°	05:15	05:56	06:31	17:33	18:08	18:49
56°	05:13	05:56	06:34	17:30	18:08	18:51
58°	05:12	05:57	06:36	17:28	18:07	18:52
S 60°	05:09	05:58	06:39	17:25	18:06	18:54
Lat.		Moonris	e		Moonset	:
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	-					
N 70°						
68°			05:12			08:11
66°		04:44	04:26		06:48	08:55
64°	03:25	03:49	03:56	06:08	07:42	09:25
62°	02:41	03:16	03:34	06:52	08:15	09:47
60°	02:11	02:52	03:15	07:21	08:39	10:04
N 58°	01:49	02:32	03:00	07:44	08:58	10:19
56°	01:31	02:16	02:47	08:02	09:14	10:32
E40	01.15	02.20	02.11	00.02	00.20	10.42

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

1			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
İ		00 ^h	12 ^h	Pass	Upper	Lower	20-22	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	69-48%	
	04	03:02	02:53	12:03	04:45	17:14		
l	05	02:44	02:36	12:03	05:42	18:09		
	06	02:27	02:19	12:02	06:35	19:00		

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	195°33.4	175°40.5	N07°11.4	14°13.3	N02°36.3	353°30.2	S07°33.8	156°17.5	N13°06.1	Alpheratz	357°31.5	29° 15.1
1	210°35.9	190°40.1	12.6	29° 16.6	36.6	8°33.0	33.7	$171^{\circ}19.7$	06.2	Ankaa	353°04.3	-42°08.8
2	225°38.3	205°39.7	13.8	44° 19.9	36.8	23°35.7	33.6	$186^{\circ}21.8$	06.3	Schedar	349°27.5	56°41.8
3	240°40.8	220°39.3	•• 15.0	59°23.2	•• 37.1	38°38.5	• • 33.4	201°24.0	• • 06.4	Diphda	348°44.2	-17°49.6
4	255°43.3	235°38.8	16.2	74° 26.5	37.4	53°41.3	33.3	$216^{\circ}26.2$	06.5	Achernar	335°18.4	-17 49.0 -57°05.3
5	270°45.7	250°38.4	17.5	89°29.8	37.6	68°44.0	33.2	231°28.3	06.6	Hamal	327°47.6	23°36.0
6	285°48.2	265°38.0	N07°18.7	104°33.0	N02°37.9	83°46.8	S07°33.1	246°30.5	N13°06.7	Polaris	312°34.4	89° 23.3
7	300°50.7	280°37.6	19.9	119°36.3	38.1	98°49.5	33.0	261°32.7	06.8	Acamar	315°09.6	-40°11.4
8	$315^{\circ}53.1$	295°37.2	21.1	134°39.6	38.4	113°52.3	32.8	276°34.8	06.9	Menkar	314°02.8	4°12.1
9	$330^{\circ}55.6$	310°36.8	• • 22.3	149°42.9	• • 38.6	128°55.1	• • 32.7	291°37.0	• • 07.0	Mirfak	308°23.7	49°57.9
10	345°58.0	325°36.4	23.5	164°46.2	38.9	143°57.8	32.6	306°39.2	07.1	Aldebaran	290°35.9	16°34.0
11	1°00.5	340°36.0	24.7	179°49.5	39.1	159°00.6	32.5	321°41.4	07.2			
12	$16^{\circ}03.0$	355°35.6	N07°26.0	194°52.8	N02°39.4	174°03.4	S07°32.4	336°43.5	N13°07.3	Rigel	281°00.7	-8°10.3
13	31°05.4	10°35.1	27.2	209°56.0	39.6	$189^{\circ}06.1$	32.3	351°45.7	07.3	Capella	280°17.0	46°01.6
14	46°07.9	25°34.7	28.4	224°59.3	39.9	204°08.9	32.1	6°47.9	07.4	Bellatrix	278°19.3	6°22.4
15	61°10.4	40°34.3	• • 29.6	240°02.6	• • 40.1	$219^{\circ}11.6$	• • 32.0	21°50.0	• • 07.5	Elnath	277°57.7	28° 37.8
16	$76^{\circ}12.8$	55°33.9	30.8	255°05.9	40.4	234°14.4	31.9	36°52.2	07.6	Alnilam	275°34.4	-1°11.2
17	91°15.3	70°33.5	32.0	270°09.2	40.6	249°17.2	31.8	51°54.4	07.7	Betelgeuse	270°48.5	7°24.5
18	106°17.8	85°33.1	N07°33.2	285°12.4	N02°40.9	264°19.9	S07°31.7	66°56.5	N13°07.8	Canopus	263°51.0	-52°43.1
19	121°20.2	100°32.7	34.4	300° 15.7	41.1	279°22.7	31.6	81°58.7	07.9	Sirius	258°23.3	-16°45.7
20	136°22.7	115°32.3	35.7	315° 19.0	41.4	294°25.5	31.4	97°00.9	08.0	Adhara	255°03.2	-29°01.1
21	151°25.2	130°31.8	36.9	330°22.3	• • 41.6	309°28.2	31.3	112°03.0	08.1	Procyon	244°47.2	5°08.7
22	166°27.6	145°31.4	38.1	345°25.6	41.9	324°31.0	31.2	127°05.2	08.2	Pollux	243°13.1	27°57.2
23	181°30.1	160°31.0	39.3	0°28.8	42.1	339°33.7	31.1	142°07.4	08.3	Avior	234°13.1	-59°36.6
										Suhail	222°43.5	-43°33.5
Mer.p	ass. 10:56	ν -0.4 $^{\prime}$ d1	.2′ m-3.90	ν 3.3′ d0.	3′ m-1.22	ν 2.8′ d-0.	.1′ m-2.47	ν 2.2 $^{\prime}$ d0	.1' m 0.37	Miaplacidus	221°36.9	-69°50.6
										Alphard	217°44.2	-8°47.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	$11^{\circ}49.2$
0	196°32.5	175°30.6	N07° 40.5	15°32.1	N02° 42.4	354°36.5	507°31.0	157°09.5	N13°08.4	Dubhe	193°36.5	61°35.5
										Denebola	182°21.2	14°24.3
1	211°35.0	190°30.2	41.7	30°35.4	42.6	9°39.3	30.8	172°11.7	08.5	Gienah	175°39.7	-17°42.5
2	226°37.5	205°29.8	42.9	45°38.7	42.9	24°42.0	30.7	187°13.9	08.6	Acrux	172°55.4	-63°15.9
3	241°39.9	220°29.4	• • 44.1	60°41.9	• • 43.1	39°44.8	• • 30.6	202°16.0	• • 08.7	Gacrux	$171^{\circ}47.1$	$-57^{\circ}16.8$
4	256°42.4	235°28.9	45.3	75°45.2	43.4	54°47.6	30.5	217°18.2	08.8	Alioth	166°09.6	55° 47.9
5	271°44.9	250°28.5	46.6	90°48.5	43.6	69°50.3	30.4	232°20.4	08.9	Spica	158°18.3	-11°19.0
6	286°47.3	265°28.1	N07°47.8	105°51.7	N02°43.8	84°53.1	S07°30.3	247°22.5	N13°09.0	Alkaid	152°48.9	49°09.8
7	301°49.8	280°27.7	49.0	120°55.0	44.1	99°55.8	30.1	262°24.7	09.1	Hadar	148°30.3	-60°30.9
8	316° 52.3	295°27.3	50.2	135° 58.3	44.3	114°58.6	30.0	277°26.9	09.2	Menkent	147°53.1	-36°30.9
9	331°54.7	310°26.9	• • 51.4	151°01.5	• • 44.6	130°01.4	• • 29.9	292°29.0	• • 09.3	Arcturus	145°44.5	19°01.6
10	346°57.2	325°26.4	52.6	166°04.8	44.8	145°04.1	29.8	307°31.2	09.4	Rigil Kent.	139°34.8	-60°57.4
11	1°59.6	340°26.0	53.8	181°08.1	45.1	160°06.9	29.7	322°33.4	09.5	Kochab	137°19.1	74°01.9
12	$17^{\circ}02.1$	355°25.6	N07°55.0	$196^{\circ}11.3$	N02°45.3	175°09.7	S07°29.5	337°35.5	N13°09.6	Zuben'ubi	136°51.9	-16°09.9
13	32°04.6	10°25.2	56.2	211° 14.6	45.6	190°12.4	29.4	352°37.7	09.7	Alphecca	126°00.6	26°36.8
14	47°07.0	25°24.8	57.4	$226^{\circ}17.9$	45.8	205°15.2	29.3	7°39.9	09.8	Antares	112° 11.4	-26° 29.7
15	62°09.5	40°24.4	• • 58.6	241°21.1	• • 46.0	$220^{\circ}18.0$	• • 29.2	22°42.0	• • 09.9	Atria	107°02.1	-20° 29.7 -69° 04.5
16	$77^{\circ}12.0$	55°23.9	07°59.8	256°24.4	46.3	235°20.7	29.1	37°44.2	10.0	Sabik	107 02.1 101°58.7	-09 04.5 -15°45.6
17	92°14.4	70°23.5	$08^{\circ}01.0$	271°27.7	46.5	250°23.5	29.0	52°46.4	10.1	Shaula	96°05.5	-13° 43.0
18	$107^{\circ}16.9$	85°23.1	N08°02.2	286°30.9	N02°46.8	265°26.2	S07°28.8	67°48.5	N13°10.2	Rasalhague	95°55.2	12°32.2
19	122° 19.4	100°22.7	03.4	301°34.2	47.0	280°29.0	28.7	82°50.7	10.3		90°40.4	51° 28.8
20	$137^{\circ}21.8$	115°22.3	04.7	316° 37.4	47.2	295°31.8	28.6	97°52.9	10.4	Eltanin Kaus Aust.	83°27.9	-34°22.0
21	152°24.3	130°21.8	• • 05.9	331°40.7	• • 47.5	310°34.5	• • 28.5	112°55.0	• • 10.5	1	80°30.8	-34 22.0 38°48.4
22	167°26.8	145°21.4	07.1	346°44.0	47.7	325°37.3	28.4	127°57.2	10.6	Vega		
23	182°29.2	160°21.0	08.3	1°47.2	47.9	340°40.1	28.2	142°59.4	10.7	Nunki	75°43.5	-26° 15.4
										Altair	61°56.7	8°56.7
Mer.p	ass. 10:52	ν -0.4′ $d1$.2′ m-3.90	ν 3.3′ d0.	2′ m-1.20	$\nu 2.8' \ d-0.$.1′ m-2.47	ν 2.2′ d0	.1' m 0.37	Peacock	53°00.6	-56°38.1 45°22.9
										Deneb	49°23.6	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.6	10°00.5
0	197°31.7	175°20.6	N08°09.5	16° 50.5	N02°48.2	355°42.8	\$07°28.1	158°01.5	N13° 10.8	Al Na'ir	27°29.0	-46°48.9
1	212°34.1	190°20.2	10.7	31°53.7	48.4	10°45.6	28.0	173°03.7	10.9	Fomalhaut Scheat	15°11.1	-29°27.9
2	227°36.6	205°19.7	11.9	46°57.0	48.7	25°48.4	27.9	188°05.9	11.0		13°42.1 13°26.7	28°14.4
3	242°39.1	220°19.3	· · 13.1	62°00.2	• • 48.9	40°51.1	27.8	203°08.0	· · 11.1	Markab	13 20.7	15°21.7
4	257°41.5	235°18.9	14.3	77°03.5	49.1	55°53.9	27.7	218°10.2	11.2	Apr 07 Sat	SHA	Mer.pass
5	272°44.0	250°18.5	15.5	92°06.7	49.4	70°56.6	27.5	233°12.4	11.3	Venus	340°07.1	12:18
6	287°46.5	265°18.0	N08° 16.7	107° 10.0	N02°49.6	85°59.4	S07°27.4	248°14.5	N13°11.4	l .	178°39.9	22:58
7	302°48.9	280°17.6	17.9	122° 13.2	49.8	101°02.2	27.3	263°16.7	11.5	Jupiter		00:26
8	317°51.4	295°17.2	19.1	137° 16.5	50.1	116°04.9	27.2	278°18.9	11.6	Saturn	320°44.1	13:33
9	332°53.9	310°16.8	20.3	152° 19.7	50.3	131°07.7	27.1	293°21.0	11.7			
10	347°56.3	325°16.4	21.5	167°23.0	50.5	146°10.5	26.9	308°23.2	11.8	Apr 08 Sun	SHA	Mer.pass
11	2°58.8	340°15.9	22.7	182°26.2	50.8	161°13.2	26.8	323°25.4	11.9	Venus		12:18
12	18°01.2	355°15.5	N08°23.9	197°29.5	N02°51.0	176°16.0	S07°26.7	338°27.5	N13°12.0	!	178°59.6	22:53
13	33°03.7	10°15.1	25.1	212°32.7	51.2	191°18.8	26.6	353°29.7	12.1	Jupiter		00:22
14	48°06.2	25°14.7	26.3	227°36.0	51.5	206°21.5	26.5	8°31.9	12.2	Saturn	320°37.0	13:29
15	63°08.6	40°14.2	• • 27.5	242°39.2	51.7	221°24.3	. 26.4	23°34.0	12.3	Apr 09 Mon	SHA	Mornoss
16	78°11.1	55°13.8	28.7	257° 42.4	51.7	236°27.0	26.2	38°36.2	12.4			Mer.pass
17	93°13.6	70°13.4	29.9	272°45.7	52.1	250°27.0° 251°29.8	26.2	53°38.4	12.4	1	337°48.9	12:19
18	93 13.0 108° 16.0	85°13.0	N08° 31.1	272 45.7 287°48.9	N02° 52.4	266°32.6	507°26.0	68°40.5	N13° 12.6	1	179°18.8	22:48
19	100 10.0 123°18.5	100°12.5	32.3	302°52.2	52.6	281°35.3	25.9	83°42.7	12.7		158°11.1	00:17
20	138°21.0	100 12.5 115°12.1	32.5 33.5	302 52.2 317°55.4	52.0 52.8	201 35.3 296°38.1	25.9	98°44.9	12.7	Saturn	320°29.9	13:26
21	158 21.0 153°23.4	115 12.1 130°11.7	· · 34.7	317 55.4 332°58.6	53.1	290 38.1 311°40.9	25.6	98 44.9 113°47.0	12.8	Horizont	al parallax	
22	168° 25.9	130 11.7 145°11.3	35.9	348°01.9	53.3	326°43.6	25.5	113 47.0 128°49.2	13.0		Venus:	0.1
23	183°28.4	145 11.3 160°10.8	35.9 37.0	3°05.1	53.5 53.5	341°46.4	25.5 25.4	126 49.2 143°51.4	13.0		Mars:	0.2
	100 40.4	100 10.0	37.0	3 05.1	33.5	JT1 40.4	20.4	1-10 01.4	15.1			
	ass. 10:48		.2′ m-3.90		2′ m-1.18		.1′ m-2.47		.1′ m0.37			

h	Sur	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.5	N06°51.3	252°32.9	11.9'	\$17°59.6	-9.3'	55.8'
1 2	194°27.6 209°27.8	52.2 53.1	267°03.8 281°34.8	12.0' 12.1'	17°50.3 17°40.9	-9.4' -9.5'	55.8' 55.8'
3	224°28.0	54.1	296°06.0	12.2'	17°31.4	-9.5'	55.7'
4	239°28.2	55.0	310°37.2	12.3'	17°21.9	-9.6'	55.7'
5	254°28.3 269°28.5	56.0 N06°56.9	325°08.4 339°39.8	12.4'	17°12.3 \$17°02.6	-9.7'	55.7'
6 7	269 28.5 284°28.7	NU0 50.9 57.8	339 39.8 354°11.3	12.5' 12.5'	16°52.9	-9.7' -9.8'	55.6' 55.6'
8	299°28.9	58.8	8°42.8	12.6'	16°43.1	-9.9'	55.6'
9	314°29.0	06°59.7	23°14.4	12.7'	16°33.2	-9.9'	55.6'
10 11	329°29.2 344°29.4	07°00.7 01.6	37°46.1 52°17.9	12.8' 12.9'	16°23.2 16°13.2	-10.0' -10.1'	55.5' 55.5'
12	359°29.5	N07°02.5	66°49.8	12.9'	\$16°03.1	-10.1	55.5'
13	14°29.7	03.5	$81^{\circ}21.7$	13.0'	$15^{\circ}53.0$	-10.2'	55.5'
14	29°29.9 44°30.1	04.4	95°53.7 110°25.8	13.1'	15° 42.8	-10.3'	55.4'
15 16	44 30.1 59°30.2	· · 05.3 06.3	110°25.8 124°58.0	13.2' 13.3'	15°32.5 15°22.2	-10.3' -10.4'	55.4' 55.4'
17	74°30.4	07.2	139°30.2	13.3'	15° 11.8	-10.4	55.4'
18	89°30.6	N07°08.2	154°02.6	13.4'	\$15°01.4	-10.5'	55.3'
19 20	104°30.8 119°30.9	09.1 10.0	168°35.0 183°07.4	13.5' 13.5'	14°50.9 14°40.4	-10.6' -10.6'	55.3' 55.3'
21	134°31.1	• • 11.0	197°40.0	13.6'	14° 40.4 14° 29.8	-10.0	55.3'
22	149°31.3	11.9	212°12.6	13.7'	$14^{\circ}19.1$	-10.7'	55.2'
23	164°31.5	12.8	226°45.3	13.8'	14°08.4	-10.8'	55.2'
	SD = 16.0'	d = 0.9'		SI	O = 15.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.6	N07°13.8	241°18.1	13.8'	S 13°57.6	-10.8'	55.2'
1	194°31.8	14.7	255°50.9	13.9'	13°46.8	-10.9'	55.2'
2	209°32.0 224°32.1	15.6 •• 16.6	270°23.8 284°56.8	14.0' 14.0'	13°35.9 13°25.0	-10.9' -11.0'	55.1' 55.1'
4	239°32.3	17.5	299°29.8	14.1'	13° 14.1	-11.0'	55.1'
5	254°32.5	18.4	314°02.9	14.2'	13°03.1	-11.1'	55.1'
6 7	269°32.7 284°32.8	N07°19.4 20.3	328°36.1 343°09.3	14.2' 14.3'	\$12°52.0 12°40.9	-11.1' -11.1'	55.0' 55.0'
8	299°33.0	21.2	357°42.6	14.4'	12° 40.9	-11.1	55.0'
9	314°33.2	• • 22.2	$12^{\circ}16.0$	14.4'	$12^{\circ}18.6$	-11.2'	55.0'
10 11	329°33.3 344°33.5	23.1 24.0	26°49.4 41°22.9	14.5' 14.5'	12°07.3 11°56.0	-11.3' -11.3'	55.0' 54.9'
12	359°33.7	N07°25.0	55°56.4	14.6'	\$11°44.7	-11.3	54.9
13	14°33.9	25.9	70°30.1	14.7'	11°33.4	-11.4	54.9'
14	29°34.0	26.8	85°03.7	14.7'	11°22.0	-11.4'	54.9'
15 16	44°34.2 59°34.4	· · 27.8 28.7	99°37.4 114°11.2	14.8' 14.8'	11° 10.5 10° 59.1	-11.5' -11.5'	54.8' 54.8'
17	74°34.5	29.6	128°45.1	14.9'	10° 47.6	-11.5'	54.8'
18	89°34.7	N07°30.6	143°18.9	14.9'	S 10° 36.0	-11.6'	54.8'
19	104°34.9 119°35.1	31.5 32.4	157°52.9 172°26.9	15.0'	10°24.4 10°12.8	-11.6'	54.8'
20 21	134°35.1	32.4 · · 33.4	172 20.9 187°00.9	15.1' 15.1'	10 12.8 10°01.2	-11.6' -11.7'	54.7' 54.7'
22	149°35.4	34.3	201°35.0	15.2'	09°49.5	-11.7'	54.7'
23	164°35.6	35.2	216°09.2	15.2'	09°37.8	-11.7'	54.7'
	SD = 16.0'	d = 0.9'		SI	O = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.7	N07°36.1	230°43.4	15.3'	S09°26.0	-11.8'	54.7'
1 2	194°35.9 209°36.1	37.1 38.0	245°17.6 259°51.9	15.3' 15.3'	09°14.2 09°02.4	-11.8' -11.8'	54.7' 54.6'
3	209°36.1 224°36.2	38.0 · · 38.9	259°51.9 274°26.3	15.4'	09°02.4 08°50.6	-11.8° -11.9°	54.6'
4	239°36.4	39.9	289°00.7	15.4'	08°38.7	-11.9'	54.6'
5	254°36.6	40.8	303°35.1	15.5'	08°26.9	-11.9'	54.6'
6 7	269°36.7 284°36.9	N07°41.7 42.6	318°09.6 332°44.1	15.5' 15.6'	\$08° 14.9 08° 03.0	-11.9' -12.0'	54.6' 54.5'
8	299°37.1	43.6	347°18.7	15.6'	$07^{\circ}51.0$	-12.0'	54.5
9	314°37.3	• • 44.5	1°53.3	15.6'	07°39.0	-12.0'	54.5'
10 11	329°37.4 344°37.6	45.4 46.4	16°27.9 31°02.6	15.7' 15.7'	07°27.0 07°15.0	-12.0' -12.1'	54.5' 54.5'
12	359°37.8	N07°47.3	45°37.3	15.7	507°02.9	-12.1'	54.5
13	14°37.9	48.2	60°12.1	15.8'	06°50.9	-12.1'	54.5'
14 15	29°38.1 44°38.3	49.1 •• 50.1	74°46.9 89°21.7	15.8' 15.9'	06° 38.8 06° 26.6	-12.1' -12.1'	54.4' 54.4'
15 16	44 38.3 59°38.4	51.0	89°21.7 103°56.6	15.9' 15.9'	06° 26.6 06° 14.5	-12.1 -12.2'	54.4'
17	74°38.6	51.9	118°31.5	15.9'	06°02.3	-12.2'	54.4'
18	89°38.8	N07°52.8	133°06.4	16.0'	\$05°50.2	-12.2'	54.4'
19 20	104°38.9 119°39.1	53.8 54.7	147°41.4 162°16.4	16.0' 16.0'	05°38.0 05°25.8	-12.2' -12.2'	54.4' 54.3'
21	134°39.3	55.6	176°51.4	16.1'	05°13.6	-12.2'	54.3'
22	149°39.4	56.5	191°26.5	16.1'	05°01.3	-12.2'	54.3'
23	164°39.6	57.5	206°01.6	16.1'	04°49.1	-12.3'	54.3'
	SD = 16.0'	d = 0.9'		SI	O = 14.9'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-20%	
07	02:10	02:02	12:02	07:24	19:47		
08	01:54	01:45	12:02	08:09	20:31		
09	01:37	01:29	12:01	08:52	21:13		

April 10, 11, 12 UT (Tue., Wed., Thu.)

h	Aries	Ve	nus	M	ars	Jup	iter	Satur	n		Stars	
T	CHA	GHA	Dec	GHA	Dec	GHA		GHA			SHA	Das
Tue	GHA 198° 30.8		N08° 38.2		N02°53.7	356°49.2	Dec \$07°25.3		Dec		эпа	Dec
0	213° 33.3	175°10.4		18°08.4		350 49.2 11°51.9			13°13.2	Alpheratz	357°31.5	29° 15.1
1	213 33.3 228°35.7	190°10.0 205°09.6	39.4 40.6	33°11.6 48°14.8	54.0 54.2	11 51.9 26°54.7	25.2 25.1	173°55.7 188°57.8	13.3	Ankaa	353°04.3	-42°08.7
2	243° 38.2				54.4	20 54.7 41°57.5			13.4	Schedar	$349^{\circ}27.5$	56°41.8
3 4	243 36.2 258° 40.7	220°09.1 235°08.7	· · 41.8 43.0	63°18.1 78°21.3	54.6	57°00.2	· · 24.9 24.8	219°02.2	13.4 13.5	Diphda	348°44.2	-17°49.6
5	273°43.1	250°08.3	44.2	93°24.5	54.0	72°03.0	24.6	234°04.3	13.6	Achernar	$335^{\circ}18.4$	-57°05.3
6	273 45.1 288°45.6	265°07.8	N08° 45.4	93 24.5 108°27.8	N02°55.1	87°05.7	507° 24.6		13.0 13°13.7	Hamal	327°47.6	23°36.0
7	303°48.1	280°07.4	46.6	123°31.0	55.3	102°08.5	24.5	264°08.7	13.8	Polaris	312°35.2	89°23.3
8	318° 50.5	295°07.0	47.8	138°34.2	55.5	117°11.3	24.3	279°10.8	13.9	Acamar	315°09.6	-40°11.4
9	333°53.0	310°06.6	49.0	153°37.4	• • 55.8	132°14.0	24.2		13.9	Menkar	314°02.8	4°12.1
10	348°55.5	325°06.1	50.2	168°40.7	56.0	147°16.8	24.1	309°15.2	14.1	Mirfak	308°23.7	49°57.9
11	3°57.9	340°05.7	51.4	183°43.9	56.2	162°19.6	24.0	324°17.3	14.2	Aldebaran	290°35.9	16°34.0
12	19°00.4	355°05.3	N08°52.6	198°47.1	N02°56.4	177°22.3	S07°23.9		13°14.3	Rigel	281°00.7	-8° 10.3
13	34°02.9	10°04.8	53.8	213°50.3	56.6	192°25.1	23.8	354°21.7	14.4	Capella	280°17.0	46°01.6
14	49°05.3	25°04.4	54.9	228°53.6	56.9	207°27.9	23.6	9°23.8	14.5	Bellatrix	278°19.4	6°22.4
15	64°07.8	40°04.0	• • 56.1	243°56.8	• • 57.1	222°30.6	• • 23.5		• 14.6	Elnath	277°57.7	28°37.8
16	79°10.2	55°03.5	57.3	259°00.0	57.3	237°33.4	23.4	39°28.1	14.7	Alnilam	275°34.4	-1°11.2
17	94°12.7	70°03.1	58.5	274°03.2	57.5	252°36.2	23.3	54°30.3	14.8	Betelgeuse	270°48.5	7°24.5
18	109° 15.2	85°02.7	N08°59.7	289°06.5	N02°57.7	267°38.9	S07°23.2	69°32.5 N	13° 14.9	Canopus	263°51.0	-52°43.1
19	124°17.6	100°02.3	09°00.9	304°09.7	57.9	282°41.7	23.0	84°34.6	15.0	Sirius	258°23.3	-16°45.7
20	139°20.1	115°01.8	02.1	319°12.9	58.2	297°44.4	22.9	99°36.8	15.1	Adhara	255°03.2 244°47.2	-29°01.1 5°08.7
21	154°22.6	130°01.4	• • 03.3	334°16.1	• • 58.4	312°47.2	• • 22.8	114°39.0 ·	15.2	Procyon		27°57.2
22	$169^{\circ}25.0$	145°01.0	04.5	$349^{\circ}19.3$	58.6	327°50.0	22.7	$129^{\circ}41.1$	15.3	Pollux Avior	243°13.1 234°13.1	-59°36.6
23	$184^{\circ}27.5$	160°00.5	05.6	4°22.5	58.8	342°52.7	22.6	144°43.3	15.4	Suhail	234°13.1 222°43.5	-59° 36.6 -43° 33.5
Mara	ass. 10:44	1/- 0 1/ 11	.2′ m-3.90	1/3 2/ 40	2′ m-1.16	1/2 g/ d 0	.1' m-2.47	ν 2.2' d0.1'	m0 36	Miaplacidus	222 43.5 221°37.0	-43 33.5 -69°50.7
ivier.p	ass. 10:44	ν-0.4 d1		νs.∠ a0.	∠ III-1.10	ν∠.ο a-U	.1 111-2.41	ν Δ.Ζ αυ.1	1110.30	Alphard	221°37.0 217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.6
0	199°30.0	175°00.1	N09°06.8	19°25.8	$N02^{\circ}59.0$	357°55.5	S07°22.5		13° 15.5	Denebola	193 30.5 182°21.2	14°24.3
1	$214^{\circ}32.4$	$189^{\circ}59.7$	0.80	34°29.0	59.2	12°58.3	22.3	174°47.6	15.6	Gienah	175°39.7	-17° 42.5
2	$229^{\circ}34.9$	204°59.2	09.2	49°32.2	59.5	28°01.0	22.2	189°49.8	15.7		173°55.4	-63°15.9
3	244°37.3	219°58.8	• • 10.4	64°35.4	• • 59.7	43°03.8	• • 22.1		15.8	Gacrux		-57°16.8
4	259°39.8	234°58.4	11.6	79°38.6	02°59.9	58°06.6	22.0	219°54.1	15.9	Alioth	166°09.6	55° 47.9
5	274°42.3	249°57.9	12.8	94°41.8	$03^{\circ}00.1$	73°09.3	21.9	234°56.3	16.0	Spica	158°18.3	-11° 19.0
6	289°44.7	264°57.5	N09°13.9	109°45.0	N03°00.3	88°12.1	S07°21.7		13° 16.1	Alkaid	152°48.9	49°09.9
7	304°47.2	279°57.0	15.1	$124^{\circ}48.2$	00.5	103°14.9	21.6	265°00.6	16.2	Hadar	148°30.3	-60°30.9
8	319°49.7	294°56.6	16.3	139°51.4	00.7	$118^{\circ}17.6$	21.5	280°02.8	16.3	Menkent		-36°30.9
9	334°52.1	309°56.2	• • 17.5	154°54.6	• • 00.9	133°20.4	• • 21.4		16.4	Arcturus	145°44.5	19°01.6
10	349°54.6	324°55.7	18.7	169°57.9	01.2	148°23.2	21.3	310°07.1	16.5	Rigil Kent.	139°34.8	-60° 57.4
11	4°57.1	339°55.3	19.9	185°01.1	01.4	163°25.9	21.2	325°09.3	16.6	Kochab	$137^{\circ}19.1$	74°01.9
12	19°59.5	354°54.9	N09°21.0	200°04.3	N03°01.6	178°28.7	S07°21.0		13° 16.7	Zuben'ubi	136°51.9	-16°09.9
13	35°02.0	9°54.4	22.2	215°07.5	01.8	193°31.4	20.9	355°13.6	16.8	Alphecca	126°00.6	26°36.8
14	50°04.5	24°54.0	23.4	230°10.7	02.0	208°34.2	20.8	10°15.7	16.9	Antares	$112^{\circ}11.3$	-26°29.7
15	65°06.9	39°53.6	• • 24.6	245°13.9	• • 02.2	223°37.0	• • 20.7		17.0	Atria	$107^{\circ}02.1$	-69°04.5
16	80°09.4	54°53.1	25.8	260°17.1	02.4	238°39.7	20.6	40°20.1	17.1	Sabik	101°58.6	-15°45.6
17	95°11.8	69°52.7	26.9	275°20.3	02.6	253°42.5	20.4	55°22.2	17.2	Shaula	96°05.5	-37°07.3
18	110°14.3	84°52.2	N09°28.1	290°23.5	N03°02.8	268°45.3	S07°20.3		13° 17.3	Rasalhague	95°55.2	12°32.2
19	125°16.8	99°51.8	29.3	305°26.7	03.0	283°48.0	20.2	85°26.6	17.4	Eltanin	90°40.4	51°28.9
20	140°19.2	114°51.4	30.5	320°29.9	03.2	298°50.8	20.1	100°28.7 115°30.9	17.5	Kaus Aust.	83°27.9	-34°22.0
21 22	155°21.7 170°24.2	129°50.9 144°50.5	· · 31.7 32.8	335°33.1 350°36.2	· · 03.4 03.6	313°53.6 328°56.3	· · 20.0 19.9	130°33.0	17.6	Vega	80°30.8	38°48.4
	170 24.2 185° 26.6	159°50.0		5°39.4		343°59.1		145°35.2	17.7	Nunki	75°43.5	-26° 15.4
23	185 20.0	159 50.0	34.0	5 39.4	03.8		19.7	145 35.2	17.8	Altair	61°56.6	8°56.7
Mer.p	ass. 10:40	$ u$ -0.4 $^{\prime}$ d1	.2′ m-3.90	ν 3.2′ d0.	2′ m-1.14	ν 2.8′ d-0.	.1′ m-2.47	$\nu 2.2' \ d0.1'$	m0.36	Peacock	53°00.6	-56°38.1
										Deneb	49°23.5	45°22.9
TI	CHA	CIIA	D	CHA	D	CIIA	D	CIIA	D	Enif	33°35.6	10°00.5
Thu 0	GHA 200° 29.1	GHA 174°49.6	Dec N09°35.2	GHA 20°42.6	Dec N03°04.0	GHA 359°01.9	Dec S 07° 19.6	GHA 160°37.4 N :	Dec 13° 17.9	Al Na'ir	27°29.0	-46°48.9
1	200 29.1 215°31.6	174 49.6 189°49.2	36.4	20 42.6 35°45.8	04.0	359 01.9 14°04.6	19.5	175°39.5	18.0	Fomalhaut	15°11.1	-29°27.9
2	215 31.0 230°34.0	204°48.7	37.6	50°49.0	04.2	29°07.4	19.5	175 39.5 190°41.7	18.1	Scheat	13°42.1	28°14.4
3	245° 36.5	219°48.3	•• 38.7	65°52.2	• • 04.7	44°10.2	19.3		18.2	Markab	13°26.7	15°21.7
4	260°38.9	219 46.3 234°47.8	39.9	80°55.4	04.7	59°12.9	19.3	220°46.0	18.3	Apr 10 Tue	SHA	Mer.pass
5	275°41.4	249°47.4	41.1	95°58.6	05.1	74°15.7	19.1	235°48.2	18.4		336°39.6	12:20
6	290°43.9	264° 47.4	N09° 42.3	111°01.8	N03°05.3	89°18.5	\$07°18.9	250°50.3 N			179°37.5	22:43
7	305°46.3	279°46.5	43.4	126°05.0	05.5	104°21.2	18.8	265°52.5	18.6	1	158°18.3	00:13
8	320°48.8	294°46.1	44.6	141°08.1	05.7	119°24.0	18.7	280°54.7	18.7	Saturn	320°22.7	13:23
9	335°51.3	309°45.6	• • 45.8	156°11.3	• • 05.9	134°26.7	. 18.6		18.8			
10	350°53.7	324°45.2	47.0	171°14.5	06.1	149°29.5	18.4	310°59.0	18.9	Apr 11 Wed	SHA	Mer.pass
11	5°56.2	339°44.7	48.1	186°17.7	06.3	164°32.3	18.3	326°01.2	19.0	1	335°30.1	12:20
12	20°58.7	354°44.3	N09°49.3	201°20.9	N03°06.5	179°35.0	507°18.2		13° 19.1	!	179°55.8	22:37
13	$36^{\circ}01.1$	9°43.9	50.5	216°24.0	06.6	194°37.8	18.1	356°05.5	19.2		158°25.6	00:08
14	51°03.6	24°43.4	51.6	231°27.2	06.8	209°40.6	18.0	11°07.6	19.3	Saturn	320°15.5	13:19
15	$66^{\circ}06.1$	39°43.0	• • 52.8	246°30.4	• • 07.0	224°43.3	• • 17.8		• 19.4	Apr 12 Thu	SHA	Mer.pass
16	81°08.5	54°42.5	54.0	261°33.6	07.2	239°46.1	17.7	41°12.0	19.5		334°20.5	12:21
17	$96^{\circ}11.0$	69°42.1	55.2	276°36.8	07.4	254°48.9	17.6	$56^{\circ}14.1$	19.6		180°13.5	22:32
18	111° 13.4	84°41.6	N09°56.3	291°39.9	N03°07.6	269°51.6	S07°17.5	71°16.3 N	13° 19.7		158°32.8	00:04
19	$126^{\circ}15.9$	99°41.2	57.5	$306^{\circ}43.1$	07.8	284°54.4	17.4	$86^{\circ}18.5$	19.8		320°08.3	13:16
20	$141^{\circ}18.4$	114°40.7	58.7	321°46.3	08.0	299°57.2	17.3	101°20.6	19.9			
21	$156^{\circ}20.8$	129°40.3	09°59.8	336°49.4	• • 08.2	314°59.9	• • 17.1		• 20.0	Horizont	al parallax	
22	171°23.3	144°39.8	$10^{\circ}01.0$	351°52.6	08.4	330°02.7	17.0	131°24.9	20.1		Venus:	0.1
23	186° 25.8	159°39.4	02.2	6°55.8	08.6	345°05.5	16.9	146°27.1	20.2		Mars:	0.2
Mern	ass. 10:36	ν-0 Δ' d1	.2′ m-3.90	1/3 2/ 40	2′ m-1.12	v2 8′ d₋∩	.1′ m-2.47	ν 2.2' d0.1'	m0 36			
сг.р		- 0.7 01		- 5.2 00.	1.14							

h	Sur	า			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.8	N07°58.4	220°36.7	16.1'	S04°36.8	-12.3'	54.3'
1	194°39.9	$07^{\circ}59.3$	$235^{\circ}11.8$	16.2'	$04^{\circ}24.5$	-12.3'	54.3'
2	209°40.1	$08^{\circ}00.2$	249°47.0	16.2'	04°12.2	-12.3'	54.3'
3	224°40.3	• • 01.2	264°22.2	16.2'	04°00.0	-12.3'	54.3'
4 5	239° 40.4 254° 40.6	02.1 03.0	278°57.4 293°32.6	16.2' 16.3'	03°47.6 03°35.3	-12.3' -12.3'	54.2' 54.2'
6	269° 40.8	N08°03.9	308° 07.9	16.3'	503°23.0	-12.3'	54.2'
7	284°40.9	04.9	322°43.2	16.3	03°10.7	-12.3'	54.2'
8	299°41.1	05.8	337° 18.5	16.3'	02°58.3	-12.3'	54.2'
9	314°41.3	• • 06.7	351°53.8	16.3'	02°46.0	-12.4'	54.2'
10	329°41.4	07.6	6°29.1	16.4'	02°33.6	-12.4'	54.2'
11	344°41.6	08.5	21°04.5	16.4'	02°21.3	-12.4'	54.2'
12 13	359°41.8 14°41.9	N08°09.5 10.4	35°39.8 50°15.2	16.4' 16.4'	\$02°08.9 01°56.5	-12.4' -12.4'	54.2' 54.1'
14	29°42.1	11.3	64°50.6	16.4	01°44.2	-12.4'	54.1'
15	44° 42.3	. 12.2	79°26.0	16.4	01°31.8	-12.4'	54.1'
16	59° 42.4	13.2	94°01.5	16.4'	01°19.4	-12.4'	54.1'
17	74°42.6	14.1	108°36.9	16.4'	$01^{\circ}07.0$	-12.4'	54.1'
18	89°42.8	N08° 15.0	123°12.3	16.5'	S00°54.7	-12.4'	54.1'
19	104°42.9	15.9	137° 47.8	16.5'	00°42.3	-12.4'	54.1'
20	119°43.1	16.8	152°23.3 166°58.7	16.5'	00°29.9	-12.4'	54.1'
21 22	134°43.2 149°43.4	· · 17.8 18.7	166°58.7 181°34.2	16.5' 16.5'	00°17.5 \$00°05.2	-12.4' -12.4'	54.1' 54.1'
23	149 43.4 164°43.6	19.6	181 34.2 196°09.7	16.5	N00°07.2	-12.4 12.4'	54.1 54.0'
20					D = 14.8'	±4.T	31.0
	SD = 16.0'	d = 0.9'		SI	$D = 14.8^{\circ}$		
Wed	GHA	Dec	GHA	ν	Dec	d 12.4	HP
0 1	179°43.7 194°43.9	N08°20.5 21.4	210°45.2 225°20.7	16.5' 16.5'	N00°19.6 00°31.9	12.4' 12.4'	54.0' 54.0'
2	209° 44.1	22.3	239°56.2	16.5'	00°31.9	12.4	54.0'
3	224°44.2	• • 23.3	254°31.7	16.5'	00°56.6	12.3'	54.0'
4	239°44.4	24.2	269°07.2	16.5'	$01^{\circ}09.0$	12.3'	54.0'
5	254° 44.6	25.1	283°42.7	16.5'	01°21.3	12.3'	54.0'
6	269° 44.7	N08°26.0	298°18.2	16.5'	N01°33.6 01°45.9	12.3'	54.0'
7 8	284° 44.9 299° 45.0	26.9 27.8	312°53.7 327°29.3	16.5' 16.5'	01°45.9 01°58.3	12.3' 12.3'	54.0' 54.0'
9	314° 45.2	28.8	342°04.8	16.5	01° 30.5	12.3	54.0'
10	329° 45.4	29.7	356°40.3	16.5'	02°22.9	12.3'	54.0'
11	344°45.5	30.6	11° 15.8	16.5'	$02^{\circ}35.1$	12.3'	54.0'
12	359° 45.7	N08°31.5	25°51.3	16.5'	N02°47.4	12.3'	54.0'
13	14° 45.9 29° 46.0	32.4 33.3	40°26.7 55°02.2	16.5' 16.5'	02°59.7 03°11.9	12.2' 12.2'	54.0' 53.9'
14 15	44°46.2	34.3	69°37.7	16.5	03°24.1	12.2'	53.9'
16	59°46.3	35.2	84°13.2	16.5'	03°36.3	12.2'	53.9'
17	74°46.5	36.1	98°48.6	16.4'	03°48.5	12.2'	53.9'
18	89° 46.7	N08°37.0	113°24.1	16.4'	N04°00.7	12.2'	53.9'
19	104°46.8	37.9	127°59.5	16.4'	04°12.9	12.1'	53.9'
20	119° 47.0 134° 47.1	38.8 •• 39.7	142°34.9 157°10.4	16.4' 16.4'	04°25.0 04°37.2	12.1' 12.1'	53.9' 53.9'
21 22	134 47.1 149°47.3	40.7	157 10.4 171°45.8	16.4	04 37.2 04°49.3	12.1'	53.9'
23	164° 47.5	41.6	186°21.2	16.4	05°01.4	12.1'	53.9'
	SD = 16.0'	d = 0.9'		SI	D = 14.7'		
- .							
Thu 0	GHA 179° 47.6	Dec N08° 42.5	GHA 200° 56.5	u 16.4'	Dec N05°13.4	d 12.1'	HP 53.9'
1	179 47.0 194° 47.8	43.4	200 50.5 215°31.9	16.3'	05°25.5	12.1	53.9'
2	209°48.0	44.3	230°07.2	16.3'	05°37.5	12.0'	53.9'
3	224°48.1	• • 45.2	244°42.6	16.3'	$05^{\circ}49.5$	12.0'	53.9'
4	239°48.3	46.1	259° 17.9	16.3'	06°01.5	12.0'	53.9'
5	254° 48.4	47.0	273°53.2	16.3'	06°13.5	11.9'	53.9'
6 7	269° 48.6 284° 48.8	N08°48.0 48.9	288°28.4 303°03.7	16.3' 16.2'	N06°25.4 06°37.3	11.9' 11.9'	53.9' 53.9'
8	284 48.8 299°48.9	48.9 49.8	303 03.7 317°38.9	16.2'	06°49.2	11.9' 11.9'	53.9'
9	314°49.1	50.7	332°14.1	16.2'	07°01.1	11.8'	53.9'
10	329°49.2	51.6	$346^{\circ}49.3$	16.2'	$07^{\circ}12.9$	11.8'	53.9'
11	344°49.4	52.5	1°24.5	16.1'	07°24.7	11.8'	53.9'
12	359°49.5	N08°53.4	15°59.6	16.1'	N07°36.5	11.7'	53.9'
13 14	14° 49.7 29° 49.9	54.3 55.2	30°34.7 45°09.8	16.1' 16.1'	07°48.2 08°00.0	11.7' 11.7'	53.9' 53.9'
15	44° 50.0	56.1	59° 44.9	16.0'	08°11.6	11.7	53.9
16	59° 50.2	57.1	74° 19.9	16.0'	08°23.3	11.6'	53.9'
17	74°50.3	58.0	88°54.9	16.0'	08°34.9	11.6'	53.9'
18	89°50.5	N08°58.9	103°29.9	16.0'	N08°46.5	11.6'	53.9'
19 20	104°50.7 119°50.8	08° 59.8 09° 00.7	118°04.8 132°39.8	15.9' 15.9'	08°58.1 09°09.6	11.5' 11.5'	53.9' 53.9'
21	119 50.8 134°51.0	•• 01.6	132 39.8 147°14.7	15.9'	09 09.6 09°21.1	11.5	53.9'
22	149°51.1	02.5	161°49.5	15.8'	09°32.5	11.4	53.9'
23	164°51.3	03.4	176°24.3	15.8'	09°44.0	11.4'	53.9'
	SD = 15.9'	d = 0.9'		SI	D = 14.7'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	13-3%	
10	01:21	01:13	12:01	09:33	21:54		
11	01:05	00:57	12:01	10:14	22:34		
12	00:49	00:42	12:01	10:54	23:15		

April 13, 14, 15 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
											эпА	
0	201°28.2	174°38.9	N10°03.3	21°59.0	N03°08.8	0°08.2	\$07°16.8	161°29.3	N13°20.2	Alpheratz	357°31.5	29°15.1
1	216°30.7	189°38.5	04.5	37°02.1	09.0	15°11.0	16.7	176°31.4	20.3	Ankaa	353°04.3	-42°08.7
2	231°33.2	204°38.1	05.7	52°05.3	09.2	30°13.8	16.5	191°33.6	20.4	Schedar	349°27.5	56°41.8
3	246°35.6	219°37.6	• • 06.8	67°08.5	• • 09.4	45°16.5	• • 16.4	206°35.7	• • 20.5	Diphda	348° 44.2	-17°49.6
4	261°38.1	234°37.2	08.0	82°11.6	09.5	60°19.3	16.3	221°37.9	20.6			
5	276°40.5	249°36.7	09.2	97°14.8	09.7	75°22.0	16.2	236°40.1	20.7	Achernar	335°18.4	-57°05.3
6	291°43.0	264°36.3	N10° 10.3	112°17.9	N03°09.9	90°24.8	S07°16.1	251°42.2	N13°20.8	Hamal	327°47.6	23°36.0
7	306°45.5	279°35.8	11.5	127°21.1	10.1	105°27.6	16.0	266°44.4	20.9	Polaris	312°35.8	89°23.2
										Acamar	$315^{\circ}09.6$	-40°11.4
8	321°47.9	294°35.4	12.7	142°24.3	10.3	120°30.3	15.8	281°46.5	21.0	Menkar	314°02.8	4°12.1
9	336°50.4	309°34.9	• • 13.8	157°27.4	• • 10.5	135°33.1	• • 15.7	296°48.7	• • 21.1	Mirfak	308°23.7	49°57.9
10	351°52.9	324°34.5	15.0	172°30.6	10.7	150°35.9	15.6	311°50.9	21.2	Aldebaran	290°35.9	16°34.0
11	6°55.3	339°34.0	16.2	187°33.7	10.9	165°38.6	15.5	326°53.0	21.3	Rigel	281°00.8	-8°10.3
12	21°57.8	354°33.6	$N10^{\circ}17.3$	202°36.9	N03°11.0	180°41.4	S07°15.4	341°55.2	N13°21.4			
13	37°00.3	9°33.1	18.5	$217^{\circ}40.1$	11.2	195°44.2	15.2	356°57.4	21.5	Capella	280°17.1	46°01.6
14	52°02.7	24°32.6	19.7	232°43.2	11.4	210°46.9	15.1	11°59.5	21.6	Bellatrix	278°19.4	6°22.4
15	67°05.2	39°32.2	20.8	247°46.4	• • 11.6	225°49.7	• • 15.0	27°01.7	• • 21.7	Elnath	277°57.7	28°37.8
16	82°07.7	54°31.7	22.0	262°49.5	11.8	240°52.5	14.9	42°03.8	21.8	Alnilam	275°34.4	-1°11.2
	97°10.1			202 49.3 277°52.7						Betelgeuse	270°48.5	7°24.5
17		69°31.3	23.1		12.0	255°55.2	14.8	57°06.0	21.9	Canopus	263°51.0	-52°43.1
18	112°12.6	84°30.8	N10°24.3	292°55.8	N03°12.2	270°58.0	S07°14.7	72°08.2	N13°22.0	Sirius	258°23.3	-16°45.7
19	127°15.0	99°30.4	25.5	307°59.0	12.3	286°00.8	14.5	87°10.3	22.1	Adhara	255°03.2	-29°01.1
20	142°17.5	114°29.9	26.6	323°02.1	12.5	301°03.5	14.4	102°12.5	22.2	Procyon	244° 47.3	5°08.7
21	157°20.0	129°29.5	• • 27.8	338°05.3	• • 12.7	$316^{\circ}06.3$	• • 14.3	$117^{\circ}14.6$	• • 22.3	Pollux	244 47.3 243°13.1	27°57.2
22	172°22.4	144°29.0	28.9	353°08.4	12.9	331°09.1	14.2	$132^{\circ}16.8$	22.4	l l		
23	187°24.9	159°28.6	30.1	8°11.6	13.1	346°11.8	14.1	147°19.0	22.5	Avior	234°13.1	-59°36.6
					_					Suhail	222°43.6	-43°33.5
Mer.p	ass. 10:32	$ u$ -0.4 $^{\prime}$ $d1$.2′ m-3.90	ν 3.2′ d0.	2′ m-1.10	ν 2.8′ d-0	.1′ m-2.47	ν 2.2′ d0	.1' m0.36	Miaplacidus	221°37.0	-69°50.7
										Alphard	$217^{\circ}44.2$	-8°47.4
_			_		_		_		_	Regulus	207°30.6	11°49.2
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.6
0	202°27.4	174°28.1	N10°31.3	23°14.7	N03°13.2	$1^{\circ}14.6$	S07°14.0	162°21.1	N13°22.6	Denebola	182°21.2	14°24.3
1	217°29.8	189°27.7	32.4	38°17.8	13.4	$16^{\circ}17.3$	13.8	177°23.3	22.7	Gienah	175°39.7	-17°42.5
2	232°32.3	204°27.2	33.6	53°21.0	13.6	31°20.1	13.7	192°25.4	22.8			-63°15.9
3	247°34.8	219°26.7	• • 34.7	68°24.1	• • 13.8	46°22.9	• • 13.6	207°27.6	• • 22.9	Acrux	172°55.4	
4	262°37.2	234°26.3	35.9	83°27.3	14.0	61°25.6	13.5	222°29.8	23.0		171°47.1	-57°16.9
5	277°39.7	249°25.8	37.0	98°30.4	14.1	76°28.4	13.4	237°31.9	23.1	Alioth	166°09.6	55°48.0
6	292°42.2	264°25.4	N10° 38.2	113°33.5	N03°14.3	91°31.2	507°13.2	252°34.1	N13°23.2	Spica	158° 18.3	-11°19.0
										Alkaid	152°48.9	49°09.9
7	307°44.6	279°24.9	39.4	128°36.7	14.5	106°33.9	13.1	267°36.2	23.3	Hadar	148°30.3	-60°30.9
8	322°47.1	294°24.5	40.5	143°39.8	14.7	121°36.7	13.0	282°38.4	23.4		147°53.1	-36°30.9
9	337°49.5	309°24.0	• • 41.7	158°43.0	• • 14.8	136°39.5	• • 12.9	297°40.6	• • 23.5	Arcturus	145°44.5	19°01.6
10	352°52.0	324°23.5	42.8	173°46.1	15.0	151°42.2	12.8	312°42.7	23.6	Rigil Kent.	139°34.8	-60°57.4
11	7°54.5	339°23.1	44.0	188°49.2	15.2	166°45.0	12.7	327°44.9	23.7	_	137° 19.1	74°01.9
12	22°56.9	354°22.6	N10°45.1	203°52.4	N03°15.4	181°47.8	S07°12.5	342°47.0	N13°23.8	Kochab		
13	37°59.4	9°22.2	46.3	218°55.5	15.5	196°50.5	12.4	357°49.2	23.9	Zuben'ubi	136°51.9	-16°09.9
14	53°01.9	24°21.7	47.4	233°58.6	15.7	211°53.3	12.3	12°51.4	24.0	Alphecca	126°00.5	26°36.8
										Antares	$112^{\circ}11.3$	-26°29.7
15	68°04.3	39°21.2	• • 48.6	249°01.7	• • 15.9	226°56.1	• • 12.2	27°53.5	• • 24.1	Atria	$107^{\circ}02.0$	-69°04.5
16	83°06.8	54°20.8	49.7	264°04.9	16.0	241°58.8	12.1	42°55.7	24.2	Sabik	101°58.6	-15°45.6
17	98°09.3	69°20.3	50.9	279°08.0	16.2	257°01.6	12.0	57°57.8	24.3	Shaula	96°05.5	-37°07.3
18	113°11.7	84°19.9	$N10^{\circ}52.0$	294°11.1	N03°16.4	272°04.3	S 07°11.8	73°00.0	N13°24.4	Rasalhague	95°55.2	12°32.2
19	128°14.2	99°19.4	53.2	309°14.2	16.6	$287^{\circ}07.1$	11.7	88°02.2	24.5	_	90°40.4	51°28.9
20	143°16.6	114°18.9	54.3	324°17.4	16.7	302°09.9	11.6	103°04.3	24.6	Eltanin		
21	158°19.1	129°18.5	• • 55.5	339°20.5	• • 16.9	317°12.6	• • 11.5	118°06.5	• • 24.7	Kaus Aust.	83°27.8	-34°22.0
22	173°21.6	144°18.0	56.6	354°23.6	17.1	332°15.4	11.4	133°08.6	24.8	Vega	80°30.8	38°48.5
23	188°24.0			9°26.7	17.2	347°18.2	11.4	148°10.8		Nunki	75°43.4	-26°15.4
	100 24.0	159°17.6	57.8	9 20.7	17.2	347 10.2	11.2	140 10.0	24.9	Altair	$61^{\circ}56.6$	8°56.7
Mer.n	ass. 10:28	ν -0.5' d1	.2′ m-3.90	$\nu 3.1' \ d0$	2′ m-1.07	$\nu 2.8' \ d-0$.1′ m-2.47	ν 2.2' d0	.1′ m0.35	Peacock	53°00.6	-56°38.1
										Deneb	49°23.5	45°22.9
										Enif	33°35.6	10°00.5
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°29.0	-46°48.9
0	203°26.5	$174^{\circ}17.1$	N10°58.9	24°29.8	N03°17.4	2°20.9	S07°11.1	$163^{\circ}13.0$	$N13^{\circ}25.0$	Fomalhaut	15°11.1	-29°27.9
1	218°29.0	189°16.6	$11^{\circ}00.1$	39°33.0	17.6	17°23.7	11.0	$178^{\circ}15.1$	25.1	Scheat	13°42.1	28°14.4
2	233°31.4	204°16.2	01.2	54°36.1	17.7	32°26.5	10.9	193°17.3	25.2	l l	13° 26.7	26 14.4 15°21.7
3	248°33.9	219°15.7	02.4	69°39.2	17.9	47°29.2	. 10.8	208°19.4	25.3	Markab	13 20.7	1.1 ∠1.1
4	263°36.4	234°15.2	03.5	84°42.3	18.1	62°32.0	10.7	223°21.6	25.4	Apr 13 Fri	SHA	Mer.pass
5	203 30.4 278°38.8	234 15.2 249°14.8		99°45.4		77°34.8		238°23.7			333° 10.7	12:22
			04.7		18.2		10.5		25.5		180° 30.7	22:27
6	293°41.3	264°14.3	N11°05.8	114°48.5	N03°18.4	92°37.5	S07°10.4	253°25.9	N13°25.6	l l		
7	308°43.8	279°13.8	07.0	129°51.6	18.6	107°40.3	10.3	268°28.1	25.7		158°40.0	23:55
8	323°46.2	294°13.4	08.1	144°54.8	18.7	122°43.0	10.2	283°30.2	25.8	Saturn	320°01.0	13:12
9	338°48.7	309°12.9	• • 09.2	159°57.9	• • 18.9	137°45.8	• • 10.1	298°32.4	• • 25.9	Apr 14 Sat	SHA	Mornes
10	353°51.1	324°12.4	10.4	175°01.0	19.0	152°48.6	10.0	313°34.5	26.0			Mer.pass
11	8°53.6	339°12.0	11.5	190°04.1	19.2	$167^{\circ}51.3$	09.8	328°36.7	26.1		332°00.7	12:23
12	23°56.1	354°11.5	N11° 12.7	205°07.2	N03°19.4	182°54.1	S07°09.7	343°38.9	N13°26.2		180°47.3	22:22
13	38°58.5	9°11.0	13.8	220°10.3	19.5	197°56.9	09.6	358°41.0	26.3		158°47.2	23:51
14	54°01.0	24°10.6	15.0	235°13.4	19.7	212°59.6	09.5	13°43.2	26.4	Saturn	319°53.8	13:09
											<u></u>	
15	69°03.5	39°10.1	• • 16.1	250°16.5	• • 19.8	228°02.4	• • 09.4	28°45.3	• • 26.5	Apr 15 Sun	SHA	Mer.pass
16	84°05.9	54°09.6	17.2	265°19.6	20.0	243°05.2	09.3	43°47.5	26.6		330°50.6	12:23
17	99°08.4	69°09.2	18.4	280°22.7	20.2	258°07.9	09.1	58°49.7	26.7		181°03.3	22:17
18	114°10.9	84°08.7	N11° 19.5	295°25.8	N03°20.3	273°10.7	S07°09.0	73°51.8	N13°26.8	Jupiter	158°54.4	23:46
19	129°13.3	99°08.2	20.7	310°28.9	20.5	288°13.5	08.9	88°54.0	26.9		319°46.4	13:05
20	144°15.8	114°07.8	21.8	325°32.0	20.6	303°16.2	8.80	103°56.1	27.0			==
21	159°18.2	129°07.3	22.9	340°35.1	• • 20.8	318°19.0	• • 08.7	118°58.3	• • 27.1	Horizont	al parallax	
22	174°20.7	144°06.8	24.1	355°38.2	20.9	333°21.7	08.6	134°00.4	27.2		Venus:	0.1
23	189°23.2	159°06.3	25.2	10°41.3	21.1	348°24.5	08.4	149°02.6	27.2	Ì	Mars:	0.2
Mer.p	ass. 10:25	ν -0.5 $'$ d1	.1′ m-3.90	ν 3.1′ d0.	2′ m-1.05	ν 2.8′ d-0	.1′ m-2.47	ν 2.2′ d0	.1′ m0.35			

h	Sui	า	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.4	N09°04.3	190°59.1	15.8'	N09°55.3	11.3'	53.9'
1	194°51.6	05.2	205°33.9	15.7'	$10^{\circ}06.7$	11.3'	53.9'
2	209°51.8	06.1	220°08.6	15.7'	10° 18.0	11.3'	53.9'
3	224°51.9	• • 07.0	234°43.3	15.7'	10°29.3	11.2'	53.9'
4 5	239°52.1 254°52.2	07.9 08.8	249°18.0 263°52.6	15.6' 15.6'	10°40.5 10°51.7	11.2' 11.1'	53.9' 53.9'
6	269°52.4	N09°09.7	203 52.0 278°27.2	15.5'	N11°02.8	11.1	53.9'
7	284°52.5	10.7	293°01.8	15.5'	11°13.9	11.1'	53.9'
8	299°52.7	11.6	307°36.3	15.5'	11°25.0	11.0'	53.9'
9	314°52.9	• • 12.5	322°10.7	15.4'	11°36.0	11.0'	53.9'
10	329°53.0	13.4	336°45.2	15.4'	11°46.9	10.9'	53.9'
11	344°53.2	14.3	351°19.6	15.4'	11°57.9	10.9'	53.9'
12 13	359°53.3 14°53.5	N09°15.2 16.1	5°53.9 20°28.2	15.3' 15.3'	N12°08.7 12°19.6	10.8' 10.8'	53.9' 53.9'
14	29°53.6	17.0	20 20.2 35°02.5	15.2'	12 19.0 12°30.4	10.6	53.9'
15	44°53.8	. 17.9	49°36.7	15.2'	12°41.1	10.7'	53.9'
16	59°53.9	18.8	64°10.9	15.1'	12°51.8	10.6'	53.9'
17	74°54.1	19.7	78°45.1	15.1'	13°02.4	10.6'	53.9'
18	89°54.3	N09°20.6	93°19.2	15.1'	N13°13.0	10.5'	53.9'
19	104°54.4	21.5	107°53.2	15.0'	13°23.5	10.5'	53.9'
20 21	119°54.6 134°54.7	22.4	122°27.2 137°01.2	15.0' 14.9'	13°34.0 13°44.4	10.4' 10.4'	53.9' 53.9'
22	134 54.7 149°54.9	24.2	151°35.1	14.9'	13°54.8	10.4	53.9'
23	164°55.0	25.1	166°09.0	14.8'	14°05.1	10.3	53.9
	SD = 15.9'	d = 0.9'			0 = 14.7'		
	<u>JD — 13.9'</u>	u = 0.9		3L	J — 14.7°		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°55.2 194°55.3	N09°26.0 26.9	180°42.8 195°16.6	14.8' 14.7'	N14°15.4 14°25.6	10.2' 10.2'	53.9' 53.9'
2	209°55.5	27.8	209°50.3	14.7'	14° 25.8	10.2	53.9
3	224°55.6	• • 28.7	224°24.0	14.6'	14°45.9	10.0'	53.9'
4	239°55.8	29.6	238°57.7	14.6'	14°55.9	10.0'	53.9'
5	254°55.9	30.5	253°31.2	14.5'	15°05.9	9.9'	53.9'
6	269°56.1 284°56.3	N09°31.4	268°04.8 282°38.3	14.5'	N15°15.8 15°25.6	9.9'	53.9'
7 8	284 56.3 299°56.4	32.3 33.2	282°38.3 297°11.7	14.4' 14.4'	15° 25.6 15° 35.4	9.8' 9.7'	53.9' 53.9'
9	314°56.6	34.1	311°45.1	14.3'	15° 45.2	9.7'	53.9
10	329°56.7	35.0	326°18.4	14.3'	15°54.8	9.6'	53.9'
11	344°56.9	35.9	$340^{\circ}51.7$	14.2'	16°04.4	9.5'	54.0'
12	359°57.0	N09°36.8	355°24.9	14.2'	N16° 14.0	9.5'	54.0'
13 14	14°57.2 29°57.3	37.7 38.6	9°58.1 24°31.2	14.1' 14.1'	16°23.5 16°32.9	9.4' 9.3'	54.0' 54.0'
15	44°57.5	39.5	39°04.3	14.1	16°42.2	9.3'	54.0'
16	59°57.6	40.4	53°37.3	14.0'	16°51.5	9.2'	54.0'
17	74°57.8	41.3	$68^{\circ}10.2$	13.9'	$17^{\circ}00.7$	9.1'	54.0'
18	89°57.9	N09°42.2	82°43.1	13.8'	N17°09.8	9.1'	54.0'
19	104°58.1	43.0	97°16.0	13.8'	17°18.9	9.0'	54.0'
20	119°58.2 134°58.4	43.9 • • 44.8	111°48.8 126°21.5	13.7' 13.7'	17°27.9 17°36.8	8.9' 8.9'	54.0' 54.0'
21 22	149°58.5	45.7	140°54.2	13.6'	17 30.6 17°45.7	8.8'	54.0'
23	164°58.7	46.6	155°26.8	13.6'	17°54.4	8.7'	54.0'
	SD = 15.9'	d = 0.9'		SE	D = 14.7'		
_							
Sun 0	GHA 179°58.8	Dec N09°47.5	GHA 169°59.4	u 13.5'	Dec N18° 03.1	d 8.6'	HP 54.0'
1	179 58.8 194°59.0	48.4	169 59.4 184°31.9	13.5'	18° 11.8	8.6'	54.0'
2	209°59.1	49.3	199°04.4	13.4'	18° 20.3	8.5'	54.0'
3	224°59.3	• • 50.2	213°36.8	13.3'	18°28.8	8.4'	54.1'
4	239°59.4	51.1	228°09.1	13.3'	18° 37.2	8.3'	54.1'
5	254°59.6	52.0	242°41.4	13.2'	18°45.5	8.2'	54.1'
6 7	269°59.7 284°59.9	N09°52.9 53.8	257°13.6 271°45.8	13.2' 13.1'	N18°53.8 19°01.9	8.2' 8.1'	54.1' 54.1'
8	284 59.9 300°00.0	53.8 54.7	271 45.8 286°17.9	13.1'	19 01.9 19°10.0	8.0'	54.1'
9	315°00.2	• • 55.5	300°49.9	13.0'	19° 18.0	7.9'	54.1
10	330°00.3	56.4	$315^{\circ}21.9$	12.9'	19°25.9	7.8'	54.1'
11	345°00.5	57.3	329°53.9	12.9'	19°33.7	7.7'	54.1'
12	0°00.6	N09°58.2	344°25.8	12.8'	N19°41.5	7.7'	54.1'
13 14	15°00.8 30°00.9	09°59.1 10°00.0	358°57.6 13°29.3	12.8' 12.7'	19°49.2 19°56.7	7.6' 7.5'	54.1' 54.2'
15	45°01.1	. 00.9	28°01.0	12.6'	20°04.2	7.5 7.4'	54.2'
16	60°01.2	01.8	42°32.7	12.6'	20°11.6	7.3	54.2'
17	75°01.4	02.7	57°04.3	12.5'	20°18.9	7.2'	54.2'
18	90°01.5	N10°03.6	71°35.8	12.5'	N20°26.2	7.1'	54.2'
19 20	105°01.7 120°01.8	04.4 05.3	86°07.3 100°38.7	12.4' 12.4'	20°33.3 20°40.4	7.1' 7.0'	54.2' 54.2'
21	120 01.8 135°01.9	06.2	100 38.7 115°10.1	12.4	20°47.3	7.0 6.9'	54.2'
22	150°02.1	07.1	129°41.4	12.2'	20°54.2	6.8'	54.2'
23	165°02.2	08.0	144°12.6	12.2'	21°01.0	6.7'	54.2'
	SD = 15.9'	d = 0.9'		SE	D = 14.7'		

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

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

		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	1-1%	
13	00:34	00:27	12:00	11:36	23:57		
14	00:19	00:12	12:00	12:19	-:-		
15	00:05	00:02	12:00	13:04	00:41		

April 16, 17, 18 UT (Mon., Tue., Wed.)

h	Aries	`	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Man -	CHA	CHA	Doo	CHA	Dee	GHA	Doo	CHA	Doo		SHA	Des
Mon	GHA	GHA	Dec	GHA	Dec		Dec	GHA	Dec		эна	Dec
0	204°25.6	174°05.9	N11°26.3	25°44.4	N03°21.3	3°27.3	S07°08.3	164°04.8	N13°27.3	Alpheratz	357°31.5	29° 15.1
1	219°28.1	189°05.4	27.5	40°47.5	21.4	18°30.0	08.2	179°06.9	27.4	Ankaa	353°04.3	-42°08.7
2	234°30.6	204°04.9	28.6	55°50.5	21.6	33°32.8	08.1	194°09.1	27.5	Schedar	349°27.5	56°41.8
3	249°33.0	219°04.5	• • 29.7	70°53.6	• • 21.7	48°35.6	• • 08.0	209°11.2	• • 27.6		348°44.2	-17°49.6
4	264°35.5	234°04.0	30.9	85°56.7	21.9	63°38.3	07.8	224°13.4	27.7	Diphda		
5	279°38.0	249°03.5	32.0	100°59.8	22.0	78°41.1	07.7	239°15.6	27.8	Achernar	335°18.4	-57°05.3
6	294°40.4	264°03.0	N11°33.2	116°02.9	N03°22.2	93°43.9	S07°07.6	254°17.7	N13°27.9	Hamal	327°47.6	23°36.0
7	309°42.9	279°02.6	34.3	131°06.0	22.3	108°46.6	07.5	269°19.9	28.0	Polaris	312°36.1	89°23.2
8	324° 45.4	294°02.1	35.4	146°09.1	22.5	123°49.4	07.4	284°22.0	28.1	Acamar	$315^{\circ}09.6$	-40°11.4
						138°52.1		299°24.2		Menkar	314°02.8	4° 12.2
9	339°47.8	309°01.6	• • 36.5	161°12.1	• • 22.6		• • 07.3		• • 28.2	Mirfak	308°23.7	49°57.9
10	354°50.3	324°01.1	37.7	176° 15.2	22.8	153°54.9	07.1	314°26.3	28.3	Aldebaran	290°35.9	16°33.9
11	9°52.7	339°00.7	38.8	191° 18.3	22.9	168°57.7	07.0	329°28.5	28.4	Rigel	281°00.8	-8°10.3
12	24°55.2	354°00.2	N11°39.9	206°21.4	N03°23.1	184°00.4	S07°06.9	344°30.7	N13°28.5	Capella	280°17.1	46°01.6
13	39°57.7	8°59.7	41.1	221°24.5	23.2	199°03.2	06.8	359°32.8	28.6	Bellatrix	278°19.4	6°22.4
14	55°00.1	23°59.2	42.2	236° 27.5	23.4	$214^{\circ}06.0$	06.7	14°35.0	28.7	Elnath	277°57.7	28°37.8
15	70°02.6	38°58.8	• • 43.3	251°30.6	· · 23.5	229°08.7	• • 06.6	29°37.1	• • 28.8	1		
16	85°05.1	53°58.3	44.5	266°33.7	23.7	244°11.5	06.4	44°39.3	28.9	Alnilam	275°34.4	-1°11.2
17	100°07.5	68°57.8	45.6	281°36.8	23.8	259°14.3	06.3	59°41.4	29.0	Betelgeuse	270°48.5	7°24.5
18	115° 10.0	83°57.3	N11°46.7	296°39.8	N03°24.0	274°17.0	S07°06.2	74°43.6	N13°29.1	Canopus	263°51.1	-52°43.1
19	130°12.5	98°56.8	47.8	311°42.9	24.1	289°19.8	06.1	89°45.8	29.2	Sirius	258°23.3	-16°45.7
20	130 12.5 145° 14.9	96 50.6 113°56.4	47.0	326°46.0	24.1	304°22.5	06.1	104°47.9	29.2	Adhara	$255^{\circ}03.2$	-29°01.1
										Procyon	244°47.3	5°08.7
21	160°17.4	128°55.9	50.1	341°49.0	• • 24.4	319°25.3	•• 05.9	119°50.1	• • 29.4	Pollux	243°13.2	27°57.2
22	175° 19.9	143°55.4	51.2	356°52.1	24.5	334°28.1	05.7	134°52.2	29.5	Avior	234°13.2	-59° 36.6
23	190°22.3	158°54.9	52.4	11°55.2	24.7	349°30.8	05.6	149°54.4	29.6	Suhail	222°43.6	-43°33.5
Mern	ass. 10:21	ν-0 5' d1	.1′ m-3.90	ν3 1' dΩ	2' m-1.03	ν2 8' d-0	.1′ m-2.47	v2 21 40	.1′ m0.35	Miaplacidus	221°37.1	-69°50.7
		- 0.5 41		- 5.1 00						Alphard	217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.6
0	$205^{\circ}24.8$	173°54.5	N11°53.5	26°58.2	N03°24.8	4°33.6	S07°05.5	164°56.5	N13°29.7	Denebola	182°21.2	14°24.3
1	$220^{\circ}27.2$	188°54.0	54.6	42°01.3	25.0	19°36.4	05.4	179°58.7	29.8	Gienah	175°39.7	-17° 42.5
2	235°29.7	203°53.5	55.7	57°04.4	25.1	$34^{\circ}39.1$	05.3	195°00.9	29.9	Acrux		-63°15.9
3	250°32.2	218°53.0	• • 56.9	72°07.4	• • 25.2	49°41.9	• • 05.2	210°03.0	• • 30.0			
4	265°34.6	233°52.5	58.0	87° 10.5	25.4	64°44.6	05.1	225°05.2	30.1		171°47.1	-57°16.9
5	280°37.1	248°52.0	11°59.1	102° 13.6	25.5	79°47.4	04.9	240°07.3	30.2	Alioth	166°09.6	55°48.0
6	295°39.6	263°51.6	N12°00.2	117° 16.6	N03°25.7	94°50.2	S07°04.8	255°09.5	N13°30.3	Spica	158°18.3	-11°19.0
7	310°42.0	278°51.1	01.3	132° 19.7	25.8	109°52.9	04.7	270°11.6	30.4	Alkaid	152°48.9	49°09.9
8	325°44.5	293°50.6	02.5	147°22.7	25.9	124°55.7	04.6	285°13.8	30.5	Hadar	148°30.3	-60°30.9
9	340° 47.0	308°50.1	03.6	162°25.8	26.1	139°58.5	• • 04.5	300°16.0	30.6	Menkent	147°53.1	-36°30.9
										Arcturus	145°44.5	19°01.6
10	355°49.4	323°49.6	04.7	177°28.8	26.2	155°01.2	04.4	315°18.1	30.7	Rigil Kent.	139°34.7	-60°57.4
11	10°51.9	338°49.1	05.8	192°31.9	26.3	170°04.0	04.2	330°20.3	30.8	Kochab	$137^{\circ}19.0$	74°01.9
12	25°54.4	353°48.7	N12°06.9	207°34.9	N03°26.5	185°06.7	S07°04.1	345°22.4	N13°30.9	Zuben'ubi	136°51.9	-16°09.9
13	40°56.8	8°48.2	08.1	222°38.0	26.6	200°09.5	04.0	0°24.6	31.0	Alphecca	126°00.5	26°36.8
14	55° 59.3	23°47.7	09.2	237°41.0	26.7	215°12.3	03.9	15°26.7	31.1	Antares	112°11.3	-26° 29.7
15	71°01.7	38°47.2	• • 10.3	252° 44.1	• • 26.9	230°15.0	• • 03.8	30°28.9	• • 31.2	Atria	107°02.0	-69°04.5
16	86°04.2	53°46.7	11.4	$267^{\circ}47.1$	27.0	245°17.8	03.7	45°31.1	31.3	Sabik	101°58.6	-15°45.6
17	101°06.7	68°46.2	12.5	282°50.2	27.1	260°20.6	03.5	60°33.2	31.4	Shaula	96°05.5	-37°07.3
18	$116^{\circ}09.1$	83°45.8	N12°13.6	297°53.2	N03°27.3	275°23.3	S07°03.4	75°35.4	N13°31.5	Rasalhague	95°55.2	12°32.2
19	$131^{\circ}11.6$	98°45.3	14.8	312°56.3	27.4	290°26.1	03.3	90°37.5	31.6	Eltanin	90°40.3	51°28.9
20	$146^{\circ}14.1$	113°44.8	15.9	327°59.3	27.5	305°28.8	03.2	105°39.7	31.7	Kaus Aust.	83°27.8	-34°22.0
21	161°16.5	128°44.3	• • 17.0	343°02.4	• • 27.7	320°31.6	• • 03.1	120°41.8	• • 31.8			38°48.5
22	176° 19.0	143°43.8	18.1	358°05.4	27.8	335°34.4	03.0	135°44.0	31.9	Vega	80°30.7	
23	191°21.5	158°43.3	19.2	13°08.4	27.9	350°37.1	02.8	150°46.1	32.0	Nunki	75°43.4	-26°15.4
										Altair	61°56.6	8°56.7
Mer.p	ass. 10:17	u-0.5' $d1$.1′ m-3.90	ν 3.1′ d0.	1' m-1.01	ν 2.8′ d -0	.1′ m-2.47	ν 2.2′ d0	$.1^\prime$ m 0.35	Peacock	53°00.5	-56°38.1
										Deneb	49°23.5	45°22.9
\A/1	CHV	CHA	Daa	CD 4	Das	CHA	Daa	CHA	Das	Enif	33°35.6	10°00.5
Wed	GHA	GHA	Dec	GHA	Dec	GHA 5°30 0	Dec \$07°02.7	GHA	Dec	Al Na'ir	27°29.0	-46°48.9
0	206°23.9	173°42.8	N12°20.3	28°11.5 43°14.5	N03°28.1	5°39.9		165°48.3		Fomalhaut	15°11.1	-29°27.9
1	221°26.4	188°42.3	21.4		28.2	20°42.7	02.6	180°50.5	32.2	Scheat	13°42.1	28° 14.4
2	236° 28.8	203°41.8	22.6	58° 17.5	28.3	35°45.4	02.5	195°52.6	32.3	Markab	13°26.7	15°21.7
3	251°31.3	218°41.4	• • 23.7	73°20.6	• • 28.4	50°48.2	• • 02.4	210°54.8	• • 32.4	A 10 11	C114	N4-
4	266°33.8	233°40.9	24.8	88°23.6	28.6	65°50.9	02.3	225°56.9	32.5	Apr 16 Mon	SHA	Mer.pass
5	281°36.2	248°40.4	25.9	103°26.6	28.7	80°53.7	02.2	240°59.1	32.6		329°40.2	12:24
6	296°38.7	263°39.9	N12°27.0	118°29.7	N03°28.8	95°56.5	S07°02.0	256°01.2	N13°32.7	!	181°18.7	22:12
7	311°41.2	278°39.4	28.1	133°32.7	28.9	110°59.2	01.9	271°03.4	32.8		159°01.6	23:42
8	326°43.6	293°38.9	29.2	148°35.7	29.1	126°02.0	01.8	286°05.6	32.9	Saturn	319°39.1	13:02
9	341°46.1	308°38.4	• • 30.3	163°38.8	• • 29.2	141°04.7	• • 01.7	301°07.7	• • 33.0	Apr 17 Tue	SHA	Mer.pass
10	356°48.6	323°37.9	31.4	178°41.8	29.3	156°07.5	01.6	316°09.9	33.1		328°29.7	12:25
11	11°51.0	338°37.4	32.5	193°44.8	29.4	171°10.3	01.5	331°12.0	33.2		181°33.5	22:08
12	$26^{\circ}53.5$	353°36.9	N12°33.6	208°47.8	N03°29.6	186°13.0	S07°01.3	346°14.2	N13°33.3	1	151° 55.5 159° 08.8	23:37
13	$41^{\circ}56.0$	8°36.4	34.8	223°50.8	29.7	201°15.8	01.2	1°16.3	33.4	Saturn	319°31.8	I
14	56° 58.4	23°35.9	35.9	238°53.9	29.8	$216^{\circ}18.5$	01.1	$16^{\circ}18.5$	33.5	Saturn	313 31.0	12:58
15	72°00.9	38°35.4	• • 37.0	253°56.9	• • 29.9	231°21.3	• • 01.0	31°20.6	• • 33.6	Apr 18 Wed	SHA	Mer.pass
16	87°03.3	53°35.0	38.1	$268^{\circ}59.9$	30.0	$246^{\circ}24.1$	00.9	46°22.8	33.7		327°18.9	12:26
17	$102^{\circ}05.8$	68°34.5	39.2	284°02.9	30.2	261°26.8	8.00	61°25.0	33.8		181°47.5	22:03
18	117°08.3	83°34.0	N12°40.3	299°05.9	N03°30.3	276°29.6	S07°00.6		N13°33.8	1	159°16.0	23:33
19	132° 10.7	98°33.5	41.4	314°09.0	30.4	291°32.4	00.5	91°29.3	33.9	Saturn		12:55
20	147° 13.2	113°33.0	42.5	329°12.0	30.5	306°35.1	00.4	106°31.4	34.0	Cataill		12.00
21	162° 15.7	128°32.5	• • 43.6	344° 15.0	30.6	321°37.9	00.3	121°33.6	• • 34.1	Horizont	al parallax	
22	177° 18.1	143°32.0	44.7	359° 18.0	30.8	336°40.6	00.2	136°35.7	34.2		Venus:	0.1
23	192°20.6	158°31.5	45.8	14°21.0	30.9	351°43.4	00.1	151°37.9	34.3		Mars:	0.2
										-		
ivler.p	ass. 10:13	ν -0.5' $d1$.1′ m-3.90	ν 3.0′ $d0$	1′ m-0.98	ν2.8′ d -0	.1′ m-2.47	ν 2.2' d0	.1′ m0.34			

h	Su	0.1309 360	Moon					
h								
Mon 0	GHA 180°02.4	Dec N10°08.9	GHA 158°43.8	u 12.1'	Dec N21° 07.7	<i>d</i> 6.6'	HP 54.3'	
1	195°02.5	09.8	173° 14.9	12.1'	21°14.2	6.5	54.3'	
2	210°02.7	10.6	187°46.0	12.0'	21°20.7	6.4	54.3'	
3	225°02.8	•• 11.5	202°17.0	12.0'	$21^{\circ}27.1$	6.3'	54.3'	
4	240°03.0	12.4	216°47.9	11.9'	21°33.4	6.2'	54.3'	
5	255°03.1 270°03.3	13.3 N10°14.2	231°18.8 245°49.7	11.8' 11.8'	21°39.6 N21°45.7	6.1' 6.0'	54.3' 54.3'	
6 7	270 03.3 285°03.4	N10 14.2 15.1	245 49.7 260°20.4	11.8	N21 45.7 21°51.8	5.9'	54.3'	
8	300°03.6	16.0	274°51.2	11.7'	21°57.7	5.8'	54.4	
9	315°03.7	• • 16.8	289°21.8	11.6'	22°03.5	5.7'	54.4'	
10	330°03.8	17.7	303°52.4	11.6'	22°09.2	5.6'	54.4'	
11	345°04.0	18.6	318°23.0	11.5'	22°14.8	5.5'	54.4'	
12 13	0°04.1 15°04.3	N10°19.5 20.4	332°53.5 347°24.0	11.4' 11.4'	N22°20.3 22°25.7	5.4' 5.3'	54.4' 54.4'	
14	30°04.4	21.3	1°54.3	11.3'	22°31.0	5.2'	54.4	
15	45°04.6	• • 22.1	16°24.7	11.3'	22°36.2	5.1'	54.4'	
16	60°04.7	23.0	30°55.0	11.2'	22°41.3	5.0'	54.5'	
17	75°04.9	23.9 N10°24.8	45°25.2	11.2'	22°46.3 N22°51.1	4.9'	54.5' 54.5'	
18 19	90°05.0 105°05.1	N10 24.8 25.7	59°55.4 74°25.5	11.1' 11.1'	N22°51.1 22°55.9	4.8' 4.7'	54.5' 54.5'	
20	120°05.3	26.5	88°55.6	11.0'	22°00.6	4.6'	54.5	
21	135°05.4	• • 27.4	103°25.6	11.0'	23°05.1	4.4'	54.5'	
22	150°05.6	28.3	$117^{\circ}55.6$	10.9'	23°09.6	4.3'	54.5'	
23	165°05.7	29.2	132°25.5	10.9'	23° 13.9	4.2'	54.6'	
	SD = 15.9'	d = 0.9'		SE	0 = 14.8'			
Tue	GHA	Dec	GHA	ν	Dec	d	НР	
0	180°05.9	N10°30.1	146°55.4	10.8'	N23° 18.1	4.1'	54.6'	
1	195°06.0	30.9	161°25.2	10.8'	23°22.3	4.0'	54.6'	
2	210°06.1	31.8	175°55.0	10.7'	23°26.3	3.9'	54.6'	
3	225°06.3 240°06.4	• • 32.7	190°24.7 204°54.4	10.7'	23°30.2 23°33.9	3.8'	54.6	
4 5	240 06.4 255°06.6	33.6 34.5	204 54.4 219°24.0	10.6' 10.6'	23°37.6	3.7' 3.6'	54.6' 54.6'	
6	270°06.7	N10°35.3	233°53.6	10.5	N23°41.2	3.4	54.7	
7	285°06.9	36.2	248°23.1	10.5'	23°44.6	3.3'	54.7'	
8	300°07.0	37.1	262°52.6	10.4'	23°47.9	3.2'	54.7'	
9	315°07.1	• • 38.0	277°22.0	10.4	23°51.1	3.1'	54.7'	
10 11	330°07.3 345°07.4	38.8 39.7	291°51.4 306°20.8	10.4' 10.3'	23°54.2 23°57.2	3.0' 2.9'	54.7' 54.7'	
12	0°07.6	N10°40.6	320°50.1	10.3	N24°00.0	2.7	54.8	
13	15°07.7	41.5	335°19.4	10.2'	24°02.8	2.6'	54.8'	
14	30°07.8	42.3	349°48.6	10.2'	24°05.4	2.5'	54.8'	
15	45°08.0 60°08.1	• • 43.2	4°17.8 18°46.9	10.1'	24°07.9 24°10.3	2.4' 2.3'	54.8'	
16 17	75°08.3	44.1 45.0	33°16.1	10.1' 10.1'	24°10.5	2.3	54.8' 54.9'	
18	90°08.4	N10°45.8	47°45.1	10.0'	N24° 14.7	2.0'	54.9'	
19	105°08.5	46.7	$62^{\circ}14.2$	10.0'	$24^{\circ}16.7$	1.9'	54.9'	
20	120°08.7	47.6	76°43.2	10.0'	24° 18.6	1.8'	54.9'	
21	135°08.8 150°09.0	• • 48.5	91°12.1 105°41.1	9.9'	24°20.4 24°22.1	1.7'	54.9'	
22 23	165°09.1	49.3 50.2	105 41.1 120°09.9	9.9' 9.9'	24°23.6	1.5' 1.4'	54.9' 55.0'	
23	SD = 15.9'	d = 0.9'			0 = 14.9'		33.0	
		<u>u = 0.9</u>			7 = 14.9			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	180°09.2 195°09.4	N10°51.1 52.0	134°38.8 149°07.6	9.8' 9.8'	N24°25.0 24°26.3	1.3' 1.2'	55.0' 55.0'	
2	210°09.5	52.0 52.8	149 07.6 163°36.4	9.8 9.8'	24 20.3 24°27.5	1.0'	55.0'	
3	225°09.7	• • 53.7	178°05.2	9.7'	24°28.5	0.9'	55.0'	
4	240°09.8	54.6	192°33.9	9.7'	$24^{\circ}29.4$	0.8'	55.1'	
5	255°09.9	55.4	207°02.6	9.7'	24°30.2	0.7'	55.1'	
6 7	270°10.1 285°10.2	N10°56.3 57.2	221°31.3 235°59.9	9.6' 9.6'	N24°30.9 24°31.4	0.5' 0.4'	55.1' 55.1'	
8	285°10.2 300°10.3	57.2 58.1	235°59.9 250°28.6	9.6'	24°31.4 24°31.8	0.4	55.1'	
9	315°10.5	58.9	264°57.2	9.6'	24°32.1	0.3	55.2	
10	$330^{\circ}10.6$	$10^{\circ}59.8$	$279^{\circ}25.7$	9.5'	$24^{\circ}32.3$	0.0'	55.2'	
11	345°10.8	11°00.7	293°54.3	9.5'	24°32.3	-0.1'	55.2'	
12	0°10.9 15°11.0	N11°01.5	308°22.8 322°51.3	9.5' 9.5'	N24°32.2 24°32.0	-0.2'	55.2'	
13 14	15°11.0 30°11.2	02.4 03.3	322°51.3 337°19.8	9.5' 9.5'	24°32.0 24°31.7	-0.3' -0.5'	55.2' 55.3'	
15	45°11.3	•• 04.1	351°48.2	9.4	24°31.7	-0.5'	55.3'	
16	60°11.4	05.0	6°16.7	9.4'	24°30.6	-0.7'	55.3'	
17	75°11.6	05.9	20°45.1	9.4'	24°29.9	-0.9'	55.3'	
18	90°11.7	N11°06.7	35°13.5	9.4'	N24°29.0	-1.0'	55.4'	
19 20	105°11.8 120°12.0	07.6 08.5	49°41.9 64°10.2	9.4' 9.4'	24°28.1 24°26.9	-1.1' -1.2'	55.4' 55.4'	
21	120 12.0 135°12.1	09.3	78°38.6	9.4 9.3'	24 26.9 24°25.7	-1.2 -1.4'	55.4'	
22	150°12.2	10.2	93°06.9	9.3'	24°24.3	-1.5'	55.5'	
23	165°12.4	11.1	107°35.2	9.3'	24°22.8	-1.6'	55.5'	
	SD = 15.9'	d = 0.9'		SE	0 = 15.0'			
			SD = 15.0'					

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-15%	
16	00:10	00:17	12:00	13:52	01:28		
17	00:23	00:30	11:59	14:42	02:17		
18	00:37	00:44	11:59	15:34	03:08		

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	207°23.1	173°31.0	N12° 46.9	29°24.0	N03°31.0	6°46.2	\$07°00.0	166°40.0	N13°34.4			
1	222°25.5	188°30.5	48.0	44°27.0	31.1	21°48.9	06°59.8	181°42.2	34.5	Alpheratz	357°31.5	$29^{\circ}15.1$
2	237°28.0	203°30.0	49.1	59°30.0	31.2	36°51.7	59.7	196°44.4	34.6	Ankaa	353°04.2	-42°08.7
3	252°30.5	218°29.5	50.2	74°33.0	31.3	51°54.4	• • 59.6	211°46.5	• • 34.7	Schedar	349°27.5	56°41.8
4	267°32.9	233°29.0	51.3	89°36.0	31.5	66°57.2	59.5	226°48.7	34.8	Diphda	348°44.2	-17°49.5
5	282°35.4	248°28.5	52.4	104°39.0	31.6	82°00.0	59.4	241°50.8	34.9	Achernar	335°18.4	-57°05.2
6	297°37.8	263°28.0	N12°53.5	119°42.0	N03°31.7	97°02.7	S06°59.3	256°53.0	N13°35.0	Hamal	327°47.6	23°36.0
7	312°40.3	278°27.5	54.6	134°45.0	31.8	112°05.5	59.2	271°55.1	35.1	Polaris	312°36.3	89°23.2
8	327°42.8	293°27.0	55.7	149°48.0	31.9	127°08.2	59.0	286°57.3	35.2	Acamar	315°09.6	-40°11.4
9	342°45.2	308°26.5	• • 56.8	164°51.0	• • 32.0	142°11.0	• • 58.9	301°59.4	• • 35.3	Menkar	314°02.8	4°12.2
10	357°47.7	323°26.0	57.9	179°54.0	32.1	157°13.8	58.8	317°01.6	35.4	Mirfak	308°23.7	49°57.9
11	12°50.2	338°25.5	12°59.0	194°57.0	32.2	$172^{\circ}16.5$	58.7	332°03.8	35.5	Aldebaran	290°35.9	16°33.9
12	27°52.6	353°25.0	N13°00.1	210°00.0	N03°32.3	187°19.3	S06°58.6	347°05.9	N13°35.6	Rigel	281°00.8	-8°10.3
13	42°55.1	8°24.5	01.1	225°03.0	32.5	202°22.0	58.5	2°08.1	35.7	Capella	280° 17.1 278° 19.4	46°01.6 6°22.4
14	57°57.6	23°24.0	02.2	240°06.0	32.6	217°24.8	58.3	$17^{\circ}10.2$	35.8	Bellatrix	276 19.4 277°57.7	28°37.8
15	73°00.0	38°23.5	• • 03.3	255°09.0	• • 32.7	232°27.6	• • 58.2	$32^{\circ}12.4$	• • 35.9	Elnath Alnilam	277 37.7 275°34.4	-1°11.2
16	88°02.5	53°23.0	04.4	270°12.0	32.8	247°30.3	58.1	$47^{\circ}14.5$	36.0	Betelgeuse	270°48.5	7°24.5
17	103°05.0	68°22.5	05.5	285°15.0	32.9	262°33.1	58.0	62°16.7	36.1	Canopus	263°51.1	-52°43.0
18	118°07.4	83°21.9	N13°06.6	300°18.0	N03°33.0	277°35.8	S06°57.9	77°18.8	N13°36.2	Sirius	258°23.3	-16°45.7
19	133°09.9	98°21.4	07.7	315°21.0	33.1	292°38.6	57.8	92°21.0	36.3	Adhara	255°03.2	-29°01.1
20	148°12.3	113°20.9	08.8	330°23.9	33.2	307°41.4	57.7	107°23.1	36.4	Procyon	244° 47.3	5°08.7
21	163°14.8	128°20.4	• • 09.9	345°26.9	• • 33.3	322°44.1	• • 57.5	122°25.3	• • 36.5	Pollux	243°13.2	27°57.2
22	178°17.3	143°19.9	11.0	0°29.9	33.4	337°46.9	57.4	137°27.5	36.6	Avior	234° 13.2	-59°36.6
23	193°19.7	158°19.4	12.1	15°32.9	33.5	352°49.6	57.3	152°29.6	36.7	Suhail	222°43.6	-43°33.5
Mer.n	ass. 10:09	ν -0.5' d1	.1′ m-3.90	ν 3.0' d0	1' m-0.96	ν2.8′ d-0	.1′ m-2.47	$\nu 2.2' \ d0$.1′ m0.34	Miaplacidus	221°37.1	-69°50.7
		ν 0.5 d1								Alphard	217°44.2	-8°47.4
										Regulus	207°30.6	11°49.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°35.6
0	208°22.2	173°18.9	N13°13.1	30°35.9	N03°33.6	7°52.4	S06°57.2	167°31.8	N13°36.8	Denebola	182°21.2	14°24.3
1	223°24.7	188°18.4	14.2	45°38.8	33.7	22°55.2	57.1	182°33.9	36.9	Gienah	175°39.7	-17°42.5
2	238°27.1	203°17.9	15.3	60°41.8	33.8	37°57.9	57.0	197°36.1	37.0	Acrux	172°55.4	-63°15.9
3	253°29.6	218°17.4	• • 16.4	75°44.8	• • 33.9	53°00.7	• • 56.9	212°38.2	•• 37.1	Gacrux	$171^{\circ}47.1$	-57°16.9
4	268°32.1	233°16.9	17.5	90°47.8	34.0	68°03.4	56.7	227°40.4	37.2	Alioth	166°09.6	55°48.0
5	283°34.5	248°16.4	18.6	105°50.7	34.1	83°06.2	56.6	242°42.5	37.3	Spica	158° 18.3	-11°19.0
6	298°37.0	263°15.9	N13° 19.7	120°53.7	N03°34.2	98°08.9	S06°56.5	257°44.7	N13°37.4	Alkaid	152°48.9	49°09.9
7	313°39.4	278°15.3	20.7	135°56.7	34.3	113°11.7	56.4	272°46.8	37.5	Hadar	148°30.3	-60°30.9
8	328°41.9	293°14.8	21.8	150°59.7	34.4	128°14.5	56.3	287°49.0	37.6	Menkent	$147^{\circ}53.1$	-36°31.0
9	343°44.4	308°14.3	• • 22.9	166°02.6	• • 34.5	143°17.2	56.2	302°51.2	• • 37.7	Arcturus	$145^{\circ}44.5$	19°01.6
10	358°46.8	323°13.8	24.0	181°05.6	34.6	158°20.0 173°22.7	56.1	317°53.3	37.8	Rigil Kent.	139°34.7	-60°57.4
11	13°49.3	338°13.3	25.1	196°08.6	34.7	173°22.7 188°25.5	55.9 \$06°55.8	332°55.5	37.9 N13°38.0	Kochab	$137^{\circ}19.0$	74°02.0
12	28°51.8	353°12.8	N13°26.1	211°11.5 226°14.5	N03°34.8			347°57.6		Zuben'ubi	$136^{\circ}51.8$	-16°09.9
13	43°54.2	8°12.3 23°11.8	27.2	220 14.5 241°17.5	34.9	203°28.3 218°31.0	55.7	2°59.8	38.1	Alphecca	$126^{\circ}00.5$	26°36.8
14	58°56.7		28.3		35.0		55.6	18°01.9	38.2	Antares	$112^{\circ}11.3$	-26°29.8
15	73°59.2 89°01.6	38°11.3 53°10.7	· · 29.4 30.5	256°20.4 271°23.4	· · 35.1 35.2	233°33.8 248°36.5	· · 55.5 55.4	33°04.1 48°06.2	· · 38.3 38.4	Atria	$107^{\circ}01.9$	-69°04.5
16 17	104°04.1	68°10.2	31.5	271 23.4 286°26.3	35.2	246 30.5 263°39.3	55.4 55.3	63°08.4	38.5	Sabik	101°58.6	-15°45.6
18	119°06.6	83°09.7	N13° 32.6	301°29.3	N03°35.4	203 39.3 278°42.0	506°55.2	78°10.5	N13°38.6	Shaula	96°05.4	-37°07.3
19	134°09.0	98°09.2	00 =	316°32.3	05.5	293°44.8	55.0	93°12.7	38.7	Rasalhague	95°55.1	12°32.2
20	149°11.5	113°08.7	33. <i>1</i> 34.8	331°35.2	35.5 35.6	308°47.6	54.9	108°14.9	38.8	Eltanin	90°40.3	51°28.9
21	164°13.9	128°08.2	• • 35.8	346°38.2	• • 35.6	323°50.3	• • 54.8	100°14.9 123°17.0	• • 38.9	Kaus Aust.	83°27.8	-34°22.0
22	179°16.4	143°07.6	36.9	1°41.1	35.7	338°53.1	54.7	138°19.2	39.0	Vega	80°30.7	38°48.5
23	194°18.9	158°07.1	38.0	16°44.1	35.8	353°55.8	54.6	153°21.3	39.1	Nunki	75°43.4	-26°15.4
										Altair	61°56.6	8°56.7
Mer.p	bass. 10:05	ν -0.5' $d1$.1' m-3.90	ν 3.0′ d0.	1′ m-0.94	$\nu 2.8' \ d-0.0$.1′ m-2.47	ν 2.2′ d0	.1' m 0.34	Peacock	53°00.5	-56°38.1
										Deneb	49°23.5	45°22.9
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.5	10°00.5
0	209°21.3	173°06.6	N13°39.1	31°47.0	N03°35.9	8°58.6	S06°54.5		N13°39.2	Al Na'ir	27°28.9	-46°48.9 -29°27.9
1	224°23.8	188°06.1	40.1	46°50.0	36.0	24°01.3	54.4	183°25.6	39.3	Fomalhaut Scheat	15° 11.0 13° 42.1	-29°27.9 28°14.4
2	239°26.3	203°05.6	41.2	61°52.9	36.1	39°04.1	54.2	198°27.8	39.4	Markab	13° 42.1 13° 26.7	28 14.4 15°21.7
3	254°28.7	218°05.1	• • 42.3	76°55.9	• • 36.2	54°06.9	• • 54.1	213°29.9	• • 39.5	iviarkab	13 20.7	13 21.1
4	269°31.2	233°04.5	43.4	91°58.8	36.3	69°09.6	54.0	228°32.1	39.6	Apr 19 Thu	SHA	Mer.pass
5	284°33.7	248°04.0	44.4	$107^{\circ}01.8$	36.4	84°12.4	53.9	243°34.2	39.7		$326^{\circ}07.9$	12:26
6	299°36.1	263°03.5	N13°45.5	122°04.7	N03°36.4	99°15.1	S06°53.8	258°36.4	N13°39.7		$182^{\circ}01.0$	21:58
7	314°38.6	278°03.0	46.6	$137^{\circ}07.6$	36.5	$114^{\circ}17.9$	53.7	273°38.5	39.8	Jupiter	$159^{\circ}23.1$	23:29
8	329°41.1	293°02.5	47.6	$152^{\circ}10.6$	36.6	129°20.6	53.6	288°40.7	39.9	Saturn	319°17.0	12:51
9	344°43.5	308°01.9	• • 48.7	$167^{\circ}13.5$	• • 36.7	144°23.4	• • 53.4	303°42.9	• • 40.0	Apr 20 Fri	SHA	Mer.pass
10	359°46.0	323°01.4	49.8	182°16.5	36.8	159°26.2	53.3	318°45.0	40.1		324° 56.7	12:27
11	14°48.4	338°00.9	50.8	197°19.4	36.9	174°28.9	53.2	333°47.2	40.2		182° 13.7	21:53
12	29°50.9	353°00.4	N13°51.9	212°22.3	N03°37.0	189°31.7	S06°53.1	348°49.3	N13°40.3		159° 30.2	23:24
13	44°53.4	7°59.9	53.0	227°25.3	37.0	204°34.4	53.0	3°51.5	40.4	Saturn	319°09.6	12:48
14	59°55.8	22°59.3	54.0	242°28.2	37.1	219°37.2	52.9	18°53.6	40.5			12.70
15	74°58.3	37°58.8	55.1	257°31.1	• • 37.2	234°39.9	• • 52.8	33°55.8	• • 40.6	Apr 21 Sat	SHA	Mer.pass
16	90°00.8	52°58.3	56.2	272°34.1	37.3	249°42.7	52.7	48°57.9	40.7		323°45.3	12:28
17	105°03.2	67°57.8	57.2	287°37.0	37.4	264°45.5	52.5	64°00.1	40.8		182°25.7	21:49
18	120°05.7	82°57.2	N13°58.3	302°39.9	N03°37.4	279°48.2	S06°52.4	79°02.2			159°37.2	23:20
19	135°08.2	97°56.7	13°59.4	317°42.8	37.5	294°51.0	52.3	94°04.4	41.0	Saturn	319°02.1	12:45
20	150°10.6	112°56.2	14°00.4	332°45.8	37.6	309°53.7	52.2	109°06.5	41.1	Horizont	al parallax	
21 22	165°13.1 180°15.6	127°55.7 142°55.1	· · 01.5 02.5	347°48.7 2°51.6	· · · 37.7 37.8	324°56.5 339°59.2	· · 52.1 52.0	124°08.7 139°10.8	· · 41.2 41.3	1.0.12011	Venus:	0.1
23	195°18.0	142 55.1 157°54.6	02.5	2 51.0 17°54.5	37.8	355°02.0	52.0 51.9	159 10.6 154°13.0	41.3		Mars:	0.2
Mer.p	bass. 10:01	ν -0.5' d1	.1′ m-3.90	$\nu 2.9' \ d0.$	1′ m-0.92	$\nu 2.8' \ d-0.0$.1′ m-2.47	ν 2.2′ d0	.1' m 0.33			

h	Sui				Moon		
h 							
Thu 0	GHA 180°12.5	Dec N11°11.9	GHA 122°03.6	u 9.3'	Dec N24°21.2	d -1.8'	HP 55.5'
1	195°12.7	12.8	136°31.9	9.3'	24° 19.5	-1.9'	55.5'
2	210°12.8	13.6	151°00.2	9.3'	24° 17.6	-2.0'	55.5'
3	225°12.9 240°13.1	· · 14.5	165°28.4 179°56.7	9.3'	24°15.6 24°13.4	-2.1'	55.6' 55.6'
4 5	240°13.1 255°13.2	15.4 16.2	179°56.7 194°25.0	9.3' 9.3'	24°13.4 24°11.1	-2.3' -2.4'	55.6'
6	270°13.3	N11°17.1	208°53.2	9.3'	N24°08.7	-2.5'	55.6'
7	285°13.5	18.0	223°21.5	9.2'	24°06.2	-2.7'	55.7'
8 9	300°13.6 315°13.7	18.8 • • 19.7	237°49.7 252°18.0	9.2' 9.2'	24°03.5 24°00.8	-2.8' -2.9'	55.7' 55.7'
10	330°13.9	20.5	266°46.2	9.2	24 00.8 23°57.8	-2.9 -3.0'	55.7'
11	345°14.0	21.4	281°14.4	9.2'	23°54.8	-3.2'	55.8'
12	0°14.1	N11°22.3	295°42.7	9.2'	N23°51.6	-3.3'	55.8'
13 14	15°14.3 30°14.4	23.1 24.0	310°10.9 324°39.1	9.2' 9.2'	23°48.3 23°44.9	-3.4' -3.6'	55.8' 55.9'
15	45°14.5	24.9	339°07.4	9.2	23°41.3	-3.7'	55.9'
16	60°14.6	25.7	353°35.6	9.2'	23°37.6	-3.8'	55.9'
17	75°14.8 90°14.9	26.6 N11°27.4	8°03.9	9.2'	23°33.8 N23°29.8	-4.0'	55.9'
18 19	90°14.9 105°15.0	N11 27.4 28.3	22°32.1 37°00.3	9.2' 9.2'	N23° 29.8 23° 25.8	-4.1' -4.2'	56.0' 56.0'
20	120°15.2	29.1	51°28.6	9.3	23°21.6	-4.3	56.0'
21	135°15.3	• • 30.0	65°56.8	9.3'	23°17.2	-4.5'	56.0'
22 23	150°15.4 165°15.6	30.9	80°25.1 94°53.4	9.3' 9.3'	23°12.8 23°08.2	-4.6'	56.1' 56.1'
23		31.7	94 53.4			-4.7'	50.1
	SD = 15.9'	d = 0.9'		SI	D = 15.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.7	N11°32.6	109°21.6	9.3'	N23°03.5	-4.8'	56.1'
1	195°15.8 210°16.0	33.4 34.3	123°49.9 138°18.2	9.3' 9.3'	22°58.6 22°53.6	-5.0' -5.1'	56.2' 56.2'
2	210 16.0 225°16.1	34.3 · · 35.1	158 18.2 152°46.5	9.3 9.3'	22° 48.5	-5.1 -5.2'	56.2'
4	240°16.2	36.0	167°14.8	9.3'	22°43.3	-5.4'	56.2'
5	255°16.3	36.9	181°43.1	9.3'	22°38.0	-5.5'	56.3'
6 7	270°16.5 285°16.6	N11°37.7 38.6	196°11.5 210°39.8	9.3' 9.4'	N22°32.5 22°26.9	-5.6' -5.7'	56.3' 56.3'
8	300°16.7	39.4	210 39.8 225°08.2	9.4	22°21.1	-5.7 -5.9'	56.4
9	315°16.9	• • 40.3	239°36.5	9.4'	22°15.3	-6.0'	56.4'
10	330°17.0	41.1	254°04.9	9.4'	22°09.3	-6.1'	56.4'
11 12	345°17.1 0°17.2	42.0 N11°42.8	268°33.3 283°01.7	9.4' 9.4'	22°03.2 N21°57.0	-6.2' -6.3'	56.4' 56.5'
13	15°17.4	43.7	297°30.2	9.4	21°50.6	-6.5'	56.5'
14	30°17.5	44.5	311°58.6	9.5'	21°44.2	-6.6'	56.5'
15	45°17.6 60°17.8	• • 45.4 46.2	326°27.1 340°55.5	9.5' 9.5'	21°37.6 21°30.9	-6.7'	56.6' 56.6'
16 17	75°17.9	40.2 47.1	355°24.0	9.5' 9.5'	21 30.9 21°24.0	-6.8' -7.0'	56.6'
18	90°18.0	N11°47.9	9°52.5	9.5'	N21°17.1	-7.1'	56.7'
19	105°18.1	48.8	24°21.1	9.5'	21°10.0	-7.2'	56.7'
20 21	120°18.3 135°18.4	49.6 • • 50.5	38°49.6 53°18.2	9.6' 9.6'	21°02.8 20°55.5	-7.3' -7.4'	56.7' 56.8'
22	150°18.5	51.3	67°46.8	9.6'	20° 48.0	-7.4 -7.6'	56.8
23	165°18.7	52.2	82°15.4	9.6'	20°40.4	-7.7'	56.8'
	SD = 15.9'	d = 0.9'		SI	D = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	180°18.8	N11°53.0	96°44.0	9.6'	N20°32.8	-7.8'	56.8'
1	195°18.9	53.9	111°12.6	9.7'	20°25.0	-7.9'	56.9'
2	210°19.0 225°19.2	54.7 • • 55.6	125°41.3 140°10.0	9.7' 9.7'	20°17.1 20°09.0	-8.0' -8.1'	56.9' 56.9'
4	240°19.3	56.4	154° 38.7	9.7' 9.7'	20°09.0	-8.3'	50.9 57.0'
5	255°19.4	57.3	$169^{\circ}07.4$	9.7'	19°52.6	-8.4'	57.0'
6	270°19.5	N11°58.1	183°36.1	9.8'	N19°44.2	-8.5'	57.0'
7 8	285°19.7 300°19.8	59.0 11°59.8	198°04.9 212°33.7	9.8' 9.8'	19°35.7 19°27.1	-8.6' -8.7'	57.1' 57.1'
9	315°19.9	12°00.7	212 33.7 227°02.5	9.8'	19° 18.4	-8.8'	57.1
10	330°20.0	01.5	241°31.3	9.8'	19°09.6	-8.9'	57.2'
11 12	345°20.2 0°20.3	02.3 N12°03.2	256°00.1 270°29.0	9.9' 9.9'	19°00.6 N18°51.6	-9.1' -9.2'	57.2' 57.2'
13	15°20.4	N12 03.2 04.0	270°29.0 284°57.9	9.9'	18° 42.4	-9.2' -9.3'	57.2 57.3'
14	30°20.5	04.9	299°26.8	9.9'	18°33.1	-9.4	57.3'
15	45°20.6	• • 05.7	313°55.8	10.0'	18°23.7	-9.5'	57.3'
16 17	60°20.8 75°20.9	06.6 07.4	328°24.7 342°53.7	10.0' 10.0'	18°14.2 18°04.6	-9.6' -9.7'	57.4' 57.4'
18	90°21.0	07.4 N12°08.2	342 53.7 357°22.7	10.0'	N17°54.9	-9.7 -9.8'	57.4 57.5'
19	105°21.1	09.1	$11^{\circ}51.7$	10.0'	17°45.1	-9.9'	57.5'
20	120°21.3	09.9	26°20.8	10.1	17°35.2	-10.0'	57.5'
21 22	135°21.4 150°21.5	· · 10.8 11.6	40°49.8 55°18.9	10.1' 10.1'	17°25.1 17°15.0	-10.1' -10.2'	57.6' 57.6'
23	165°21.6	12.5	69°48.0	10.1	17° 04.7	-10.2	57.6'
	SD = 15.9'	d = 0.8'		SI	D = 15.5'		

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

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

		Sun		Moon			
Day	Eqn.o	f Time	Mer.	Mer.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-41%	
19	00:50	00:56	11:59	16:27	04:00		
20	01:03	01:09	11:59	17:19	04:53		
21	01:15	01:21	11:59	18:11	05:45		

April 22, 23, 24 UT (Sun., Mon., Tue.)

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	210°20.5	172°54.1	N14°04.7	32°57.5	N03°37.9	10°04.7	S06°51.8		N13°41.5			
1	225°22.9	187°53.6	05.7	48°00.4	38.0	25°07.5	51.6	184°17.3	41.6	Alpheratz	357°31.4	29°15.1
2	240°25.4	202°53.0	06.8	63°03.3	38.1	40°10.3	51.5	104 17.5 199°19.5	41.7	Ankaa	353°04.2	-42°08.7
3	255° 27.9	202 53.0 217°52.5	07.8	78°06.2	38.1	55°13.0	51.4	214°21.6	• • 41.8	Schedar	349°27.4	56°41.8
4	270°30.3	232°52.0	08.9	93°09.1	38.2	70°15.8	51.3	229°23.8	41.9	Diphda	348°44.2	-17°49.5
5	285°32.8	247°51.4	09.9	108° 12.0	38.3	85°18.5	51.2	244°25.9	42.0	Achernar	335°18.3	-57°05.2
6	300°35.3	262°50.9	N14°11.0	123° 15.0	N03°38.4	100°21.3	S06°51.1	259°28.1	N13° 42.1	Hamal	327°47.6	23°36.0
7	315°37.7	277°50.4	12.1	138° 17.9	38.4	115°24.0	51.0	274°30.2	42.2	Polaris	312°36.6	89°23.2
8	330°40.2	292°49.8	13.1	153° 20.8	38.5	130°26.8	50.9	289°32.4	42.3	Acamar	$315^{\circ}09.6$	-40°11.3
9	345° 42.7	307°49.3	14.2	168° 23.7	• • 38.6	145°29.5	• • 50.7	304°34.5	• • 42.4	Menkar	314°02.8	4°12.2
10	0°45.1	322°48.8	15.2	183° 26.6	38.6	160°32.3	50.6	319°36.7	42.4	Mirfak	308°23.7	49°57.9
11	15°47.6	337°48.3	16.3	198° 29.5	38.7	175°35.0	50.5	334°38.8	42.6	Aldebaran	290°35.9	16°33.9
12	30°50.0	352°47.7	N14° 17.3	213° 32.4	N03°38.8	175° 35.0 190° 37.8	50.5 S06°50.4	349°41.0	N13° 42.7	Rigel	281°00.8	-8°10.3
13	45° 52.5	7°47.2	18.4	213 32.4 228°35.3	38.9	205°40.6	50.3	4°43.1	42.8	Capella	$280^{\circ}17.1$	46°01.6
14	45 52.5 60°55.0	22°46.7	19.4	243°38.2	38.9	205 40.0 220°43.3	50.5 50.2	4 45.1 19°45.3	42.6 42.9	Bellatrix	278°19.4	6°22.4
15	75° 57.4	37°46.1	. 20.5	258°41.1	• • 39.0	235°46.1	50.2	34°47.4	• • 43.0	Elnath	277°57.7	28° 37.8
16	90°59.9	52°45.6	21.5	273° 44.0	39.1	250°48.8	50.0	49°49.6	43.1	Alnilam	275°34.4	-1°11.2
17	90° 59.9 106° 02.4	67°45.1	22.6	273 44.0 288°46.9	39.1	265°51.6	49.8	64°51.8	43.1	Betelgeuse	270°48.5	7°24.6
	100 02.4 121°04.8									Canopus	263°51.1	-52°43.0
18		82°44.5	N14°23.6	303°49.8	N03°39.2	280°54.3	S06°49.7	79°53.9	N13° 43.3	Sirius	258°23.3	-16°45.7
19	136° 07.3 151° 09.8	97°44.0	24.7	318° 52.7 333° 55.6	39.3 39.3	295°57.1 310°59.8	49.6	94°56.1 109°58.2	43.4	Adhara	255°03.3	-29°01.1
20		112°43.5	25.7				49.5		43.5	Procyon	244°47.3	5°08.8
21	166° 12.2	127°42.9	• • 26.8	348° 58.5	39.4	326°02.6	· · 49.4	125°00.4	· · 43.6	Pollux	243°13.2	27°57.2
22	181°14.7	142°42.4	27.8	4°01.4	39.5	341°05.3	49.3	140°02.5	43.7	Avior	$234^{\circ}13.2$	-59°36.6
23	196° 17.2	157°41.8	28.9	19°04.3	39.5	356°08.1	49.2	155°04.7	43.8	Suhail	222°43.6	-43°33.5
Mer.p	ass. 09:57	ν -0.5 $'$ d1	.1′ m-3.90	$\nu 2.9' \ d0.$	1′ m-0.89	ν 2.8′ d-0.	1' m-2.46	ν 2.2′ d0	.1′ m0.33	Miaplacidus	221°37.1	-69°50.7
										Alphard	217°44.3	-8°47.4
		6114	_	6114	_		_	6114	-	Regulus	207°30.6	11°49.2
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.6
0	211°19.6	172°41.3	N14°29.9	34°07.2	N03°39.6	11°10.8	S06°49.1	170°06.8	N13°43.9	Denebola	$182^{\circ}21.2$	14°24.3
1	226°22.1	187°40.8	31.0	49°10.1	39.7	26°13.6	49.0	185°09.0	44.0	Gienah	175°39.7	-17°42.5
2	241°24.5	202°40.2	32.0	64°13.0	39.7	41°16.4	48.8	200°11.1	44.1	Acrux	172°55.4	-63°16.0
3	256°27.0	217°39.7	· · 33.0	79°15.8	• • 39.8	56°19.1	• • 48.7	215°13.3	• • 44.2	Gacrux	171°47.1	-57°16.9
4	271°29.5	232°39.2	34.1	94°18.7	39.8	71°21.9	48.6	230°15.4	44.3	Alioth	166°09.6	55°48.0
5	286°31.9	247°38.6	35.1	109°21.6	39.9	86°24.6	48.5	245°17.6	44.4	Spica	158°18.3	-11°19.0
6	301°34.4	262°38.1	N14°36.2	124°24.5	N03°40.0	101°27.4	S06°48.4	260°19.7	N13°44.5	Alkaid	152°48.9	49°09.9
7	316°36.9	277°37.5	37.2	139°27.4	40.0	116°30.1	48.3	275°21.9	44.6	Hadar	148°30.3	-60°30.9
8	331°39.3	292°37.0	38.2	154°30.3	40.1	131°32.9	48.2	290°24.0	44.7		147°53.1	-36°31.0
9	346°41.8	307°36.5	• • 39.3	169°33.1	• • 40.1	146°35.6	• • 48.1	305°26.2	• • 44.8	Arcturus	145°44.4	19°01.6
10	1°44.3	322°35.9	40.3	184°36.0	40.2	161°38.4	48.0	320°28.3	44.8	Rigil Kent.	139°34.7	-60°57.4
11	16°46.7	337°35.4	41.4	199°38.9	40.3	176°41.1	47.8	335°30.5	44.9	Kochab	137°19.0	74°02.0
12	31°49.2	352°34.8	N14°42.4	214°41.8	N03°40.3	191°43.9	S06°47.7	350°32.6	N13°45.0	Zuben'ubi	136°51.8	-16°09.9
13	46°51.7	7°34.3	43.4	229° 44.7	40.4	206°46.6	47.6	5°34.8	45.1	Alphecca	126°00.5	26° 36.8
14	$61^{\circ}54.1$	22°33.7	44.5	244°47.5	40.4	221°49.4	47.5	20°37.0	45.2	Antares	112°11.3	-26°29.8
15	76°56.6	37°33.2	• • 45.5	259°50.4	• • 40.5	$236^{\circ}52.1$	• • 47.4	35°39.1	• • 45.3	Atria	107°01.9	-69°04.5
16	$91^{\circ}59.0$	52°32.7	46.5	274°53.3	40.5	251°54.9	47.3	50°41.3	45.4	Sabik	101°58.6	-15°45.6
17	$107^{\circ}01.5$	67°32.1	47.6	289°56.1	40.6	266°57.6	47.2	65°43.4	45.5	Shaula	96°05.4	-37°07.3
18	122°04.0	82°31.6	N14°48.6	304°59.0	N03°40.6	282°00.4	S06°47.1	80°45.6	N13°45.6	Rasalhague	95°55.1	12° 32.3
19	137°06.4	97°31.0	49.6	320°01.9	40.7	297°03.1	47.0	95°47.7	45.7	Eltanin	90°40.3	51°28.9
20	152°08.9	112°30.5	50.7	335°04.7	40.7	312°05.9	46.8	110°49.9	45.8	Kaus Aust.	83°27.8	-34°22.0
21	167° 11.4	127°29.9	• • 51.7	350° 07.6	• • 40.8	327°08.6	• • 46.7	125°52.0	• • 45.9	Vega	80°30.7	38° 48.5
22	182° 13.8	142°29.4	52.7	5° 10.5	40.8	342°11.4	46.6	140°54.2	46.0	Nunki	75°43.4	-26° 15.4
23	$197^{\circ}16.3$	157°28.8	53.8	20°13.3	40.9	357°14.2	46.5	155°56.3	46.1	Altair	61°56.5	8°56.7
Mern	ass. 09:53	v-0.5' d1	.0′ m-3.90	1/2 9' d0	1′ m-0.87	v2 8′ d₌0	1' m-2.46	v2 2' d0	.1′ m0.32	Peacock	53°00.4	-56°38.1
- IVICI.P	a33. 03.33	ν 0.5 d1	111 3.30	ν2.5 do.		V2.0 U 0	1 111 2.40		.1 1110.52	Deneb	49°23.4	45°22.9
										Enif	33°35.5	10°00.5
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°48.9
0	212° 18.8	172°28.3	N14°54.8	35° 16.2	N03°40.9	12°16.9	S 06°46.4	170°58.5	N13°46.2	Fomalhaut	15°11.0	-29°27.9
1	227°21.2	187°27.7	55.8	50° 19.0	41.0	27°19.7	46.3	186°00.6	46.3	Scheat	13°42.0	28° 14.4
2	242°23.7	202°27.2	56.9	$65^{\circ}21.9$	41.0	42°22.4	46.2	201°02.8	46.4	Markab	13°26.6	15°21.7
3	257°26.1	217°26.6	• • 57.9	80°24.8	• • 41.1	57°25.2	• • 46.1	216°04.9	• • 46.5			
4	272°28.6	232°26.1	58.9	95°27.6	41.1	72°27.9	46.0	231°07.1	46.6	Apr 22 Sun	SHA	Mer.pass
5	287°31.1	247°25.5	14°59.9	110°30.5	41.2	87°30.7	45.8	246°09.2	46.7		322°33.6	12:29
6	302°33.5	262°25.0	N15°01.0		N03°41.2	102°33.4	S06°45.7		N13°46.8	!	182°37.0	21:44
7	317°36.0	277°24.4	02.0	140°36.2	41.3	117°36.2	45.6	276°13.5	46.9		159°44.3	23:15
8	332°38.5	292°23.9	03.0	155° 39.0	41.3	132°38.9	45.5	291°15.7	47.0	Saturn	318°54.7	12:41
9	347°40.9	307°23.3	• • 04.0	170°41.9	• • 41.4	147°41.7	• • 45.4	306°17.8	• • 47.1	Apr 23 Mon	SHA	Mer.pass
10	2°43.4	322°22.8	05.1	185° 44.7	41.4	162°44.4	45.3	321°20.0	47.2		321°21.7	12:30
11	17°45.9	337°22.2	06.1	200°47.6	41.5	177°47.2	45.2	336°22.1	47.3		182°47.6	21:39
12	32°48.3	352°21.7	N15°07.1	215°50.4	N03°41.5	192°49.9	S06°45.1		N13°47.4	1	159°51.2	23:11
13	47°50.8	7°21.1	08.1	230°53.3	41.6	207°52.7	45.0	6°26.4	47.5		318°47.2	12:38
14	62°53.3	22°20.6	09.1	245°56.1	41.6	222°55.4	44.9	21°28.6	47.6			12.50
15	77°55.7	37°20.0	· · 10.2	260°58.9	• • 41.6	237°58.2	• • 44.7	36°30.7	• • 47.7	Apr 24 Tue	SHA	Mer.pass
16	92°58.2	52°19.5	11.2	276°01.8	41.7	253°00.9	44.6	51°32.9	47.8		$320^{\circ}09.5$	12:31
17	108°00.6	67°18.9	12.2	291°04.6	41.7	268°03.7	44.5	66°35.1	47.9		182°57.4	21:35
18	123°03.1	82°18.4	N15° 13.2	306°07.5	N03°41.8	283°06.4	S06°44.4		N13°48.0	Jupiter	$159^{\circ}58.1$	23:07
19	138°05.6	97°17.8	14.2	321°10.3	41.8	298°09.2	44.3	96°39.4	48.1	Saturn	$318^{\circ}39.7$	12:34
20	153°08.0	112°17.2	15.2	336° 13.1	41.8	313°11.9	44.2	111°41.5	48.2		-1 "	
21	168° 10.5	127°16.7	· · 16.3	351°16.0	• • 41.9	328°14.7	• • 44.1	126°43.7	• 48.3	Horizont	al parallax	0.1
22	183°13.0	142°16.1	17.3	6°18.8	41.9	343°17.4	44.0	141°45.8	48.4		Venus:	0.1
23	198° 15.4	157°15.6	18.3	21°21.6	42.0	358°20.2	43.9	156°48.0	48.5		Mars:	0.2
Mern	ass. 09:49	ν -0.5' d1	.0′ m-3.90	v2 9' d0	0′ m-0.85	ν2 8' d-Ω	1' m-2.46	ν2 2' dΩ	.1′ m0.32			
							. =					

h	Sur			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.8	$N12^{\circ}13.3$	$84^{\circ}17.1$	10.1'	$N16^{\circ}54.4$	-10.4'	57.7'
1	195°21.9	14.1	98°46.3	10.2'	16°43.9	-10.6'	57.7'
2	210°22.0 225°22.1	15.0	113°15.4 127°44.6	10.2' 10.2'	16°33.4 16°22.7	-10.7'	57.7'
3 4	225 22.1 240°22.2	· · 15.8 16.7	127 44.6 142°13.8	10.2'	16° 22.7 16° 12.0	-10.8' -10.9'	57.8' 57.8'
5	255°22.4	17.5	156°43.1	10.2'	16°01.1	-10.9	57.8'
6	270°22.5	N12°18.3	171°12.3	10.3'	N15° 50.2	-11.0'	57.9'
7	285°22.6	19.2	185°41.6	10.3'	$15^{\circ}39.1$	-11.1'	57.9'
8	300°22.7	20.0	200°10.8	10.3'	15°28.0	-11.2'	57.9'
9 10	315°22.8 330°23.0	· · 20.8 21.7	214°40.1 229°09.5	10.3' 10.3'	15°16.7 15°05.4	-11.3' -11.4'	58.0' 58.0'
11	345°23.1	22.5	243°38.8	10.5	15 05.4 14°54.0	-11.4	58.1
12	0°23.2	N12°23.3	258°08.2	10.4'	N14°42.5	-11.6'	58.1'
13	15°23.3	24.2	272°37.5	10.4'	14°30.8	-11.7'	58.1'
14	30°23.4	25.0	287°06.9	10.4'	14° 19.1	-11.8'	58.2'
15 16	45°23.6 60°23.7	· · 25.9 26.7	301°36.3 316°05.7	10.4' 10.4'	14° 07.3 13° 55.4	-11.9' -12.0'	58.2' 58.2'
17	75°23.8	20.7	330°35.2	10.4	13°43.5	-12.1'	58.3'
18	90°23.9	N12°28.4	345°04.6	10.5'	N13°31.4	-12.2'	58.3'
19	105°24.0	29.2	$359^{\circ}34.1$	10.5'	13° 19.2	-12.2'	58.3'
20	120°24.1	30.0	14°03.5	10.5'	13°07.0	-12.3'	58.4'
21	135°24.3 150°24.4	• • 30.9	28°33.0	10.5'	12°54.7 12°42.2	-12.4'	58.4'
22 23	150°24.4 165°24.5	31.7 32.5	43°02.5 57°32.0	10.5' 10.5'	12°42.2 12°29.7	-12.5' -12.6'	58.4' 58.5'
23	SD = 15.9'	d = 0.8'	JI 32.0		D = 15.7'	-12.0	50.5
	$SD = 15.9^{\circ}$	$a = 0.8^{\circ}$		51	J = 15.7		
Mon 0	GHA 180°24.6	Dec N12°33.4	GHA 72°01.6	u 10.5'	Dec N12° 17.2	d -12.7'	HP 58.5'
1	180 24.6 195°24.7	34.2	72 01.6 86°31.1	10.5	12°04.5	-12.7'	58.6'
2	210°24.9	35.0	101°00.6	10.6'	11°51.8	-12.8'	58.6'
3	225°25.0	• • 35.8	115°30.2	10.6'	11°39.0	-12.9'	58.6'
4	240°25.1	36.7	129°59.8	10.6'	11°26.1	-13.0'	58.7'
5	255°25.2	37.5 N12°38.3	144°29.3	10.6'	11°13.1	-13.1'	58.7'
6 7	270°25.3 285°25.4	N12 38.3 39.2	158°58.9 173°28.5	10.6' 10.6'	N11°00.0 10°46.9	-13.1' -13.2'	58.7' 58.8'
8	300°25.5	40.0	187°58.1	10.6'	10°40.9	-13.2	58.8'
9	315°25.7	• • 40.8	202°27.7	10.6'	10°20.4	-13.3'	58.8'
10	330°25.8	41.6	$216^{\circ}57.3$	10.6'	$10^{\circ}07.1$	-13.4'	58.9'
11	345°25.9	42.5	231°26.9	10.6'	09°53.6	-13.5'	58.9'
12 13	0°26.0 15°26.1	N12°43.3 44.1	245°56.5 260°26.1	10.6' 10.6'	N09°40.2 09°26.6	-13.6' -13.6'	59.0' 59.0'
14	30°26.2	45.0	274°55.7	10.6'	09°20.0	-13.0	59.0'
15	45°26.4	• • 45.8	289°25.3	10.6'	08° 59.3	-13.8'	59.1'
16	60°26.5	46.6	303°55.0	10.6'	08°45.5	-13.8'	59.1'
17	75°26.6	47.4	318°24.6	10.6'	08°31.7	-13.9'	59.1'
18 19	90°26.7 105°26.8	N12°48.3 49.1	332°54.2 347°23.8	10.6' 10.6'	N08° 17.8 08° 03.9	-13.9' -14.0'	59.2' 59.2'
20	120°26.9	49.9	1°53.4	10.6'	00° 03.9 07° 49.9	-14.1'	59.2'
21	135°27.0	• • 50.7	16°23.0	10.6'	07°35.8	-14.1'	59.3'
22	150°27.1	51.6	$30^{\circ}52.6$	10.6'	$07^{\circ}21.7$	-14.2'	59.3'
23	165°27.3	52.4	45°22.2	10.6'	07°07.5	-14.2'	59.3'
	SD = 15.9'	d = 0.8'		SI	O = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.4	$N12^{\circ}53.2$	59°51.8	10.6'	$N06^{\circ}53.2$	-14.3'	59.4'
1	195°27.5	54.0	74°21.4	10.6'	06°39.0	-14.3'	59.4
2	210°27.6 225°27.7	54.8 •• 55.7	88°50.9 103°20.5	10.6' 10.6'	06°24.6 06°10.2	-14.4' -14.5'	59.4' 59.5'
3 4	225°27.7 240°27.8	56.5	103° 20.5 117° 50.1	10.5'	06° 10.2 05° 55.8	-14.5'	59.5' 59.5'
5	255°27.9	57.3	132°19.6	10.5'	05°41.3	-14.5'	59.5'
6	270°28.0	N12°58.1	$146^{\circ}49.1$	10.5'	N05°26.7	-14.6'	59.6'
7	285°28.2	59.0	161°18.6	10.5'	05°12.1	-14.6'	59.6'
8 9	300°28.3 315°28.4	12°59.8 13°00.6	175°48.1 190°17.6	10.5' 10.5'	04°57.5 04°42.8	-14.7' -14.7'	59.6' 59.7'
10	315°28.4 330°28.5	01.4	190°17.6 204°47.1	10.5'	04°42.8 04°28.1	-14.7' -14.8'	59.7' 59.7'
11	345°28.6	02.2	219°16.6	10.4	04° 13.3	-14.8'	59.7'
12	0°28.7	N13°03.0	233°46.0	10.4'	N03°58.5	-14.8'	59.8'
13	15°28.8	03.9	248°15.4	10.4	03°43.6	-14.9'	59.8'
14 15	30°28.9 45°29.0	04.7	262°44.8 277°14.2	10.4'	03°28.7 03°13.8	-14.9' -15.0'	59.8' 59.9'
15 16	45°29.0 60°29.1	· · 05.5 06.3	277°14.2 291°43.6	10.4' 10.3'	03°13.8 02°58.9	-15.0° -15.0°	59.9'
17	75°29.3	00.3	306°12.9	10.3	02° 43.9	-15.0'	59.9'
18	90°29.4	N13°08.0	320°42.2	10.3'	N02°28.9	-15.1'	60.0'
19	105°29.5	08.8	335°11.5	10.3'	02°13.8	-15.1'	60.0'
20	120°29.6	09.6	349°40.8	10.2'	01°58.7	-15.1'	60.0'
21 22	135°29.7 150°29.8	· · 10.4 11.2	4°10.0 18°39.2	10.2' 10.2'	01°43.6 01°28.5	-15.1' -15.2'	60.1' 60.1'
23	165°29.9	12.0	33°08.4	10.2'	01°13.3	-15.2'	60.1
	SD = 15.9'	d = 0.8'		SI	O = 16.2'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
- 4,	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-73%	
22	01:27	01:33	11:58	19:02	06:36		
23	01:38	01:44	11:58	19:52	07:27		
24	01:49	01:55	11:58	20:43	08:17		

Wed 0 1 2 3 4 5	GHA		nus	M	ars	Jup	iter	Sat	urn		Stars	
1 2 3 4 5		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
2 3 4 5	213° 17.9	172°15.0	N15° 19.3	36°24.5	N03°42.0	13°22.9	S06°43.8		N13°48.6	Alpheratz	357°31.4	29° 15.0
3 4 5	228° 20.4	187°14.5	20.3	51°27.3	42.0	28°25.6	43.7	186°52.3	48.7	Ankaa	353°04.2	-42°08.7
4 5	243°22.8	202°13.9	21.3	66°30.1	42.1	43°28.4	43.5	201°54.4	48.8	Schedar	349°27.4	56°41.8
5	258°25.3	217°13.3	• • 22.3	81°32.9	• • 42.1	58°31.1	• • 43.4	216°56.6	• • 48.9	Diphda	348°44.2	-17°49.5
	273°27.7 288°30.2	232°12.8 247°12.2	23.4	96°35.8 111°38.6	42.1 42.2	73°33.9 88°36.6	43.3	231°58.7 247°00.9	49.0	Achernar	335°18.3	-57°05.2
6	303°32.7	262°11.7	24.4 N15°25.4	111 36.0 126°41.4	N03°42.2	103°39.4	43.2 \$06°43.1	262°03.0	49.1 N13°49.1	Hamal	327°47.6	23°36.0
7	318°35.1	202 11.7 277°11.1	26.4	141°44.2	42.2	118°42.1	43.0	202 05.0 277°05.2	49.2	Polaris	312°36.9	89°23.2
8	333°37.6	292°10.5	27.4	156°47.1	42.3	133°44.9	42.9	292°07.3	49.3	Acamar	315°09.6	-40°11.3
9	348°40.1	307°10.0	28.4	171°49.9	42.3	148°47.6	• • 42.8	307°09.5	• • 49.4	Menkar	314°02.8	4°12.2
10	3°42.5	322°09.4	29.4	186°52.7	42.3	163°50.4	42.7	322°11.6	49.5	Mirfak	308°23.7 290°35.9	49°57.8
11	18°45.0	337°08.9	30.4	201°55.5	42.4	178°53.1	42.6	337°13.8	49.6	Aldebaran Rigel	290 35.9 281°00.8	16° 33.9 -8° 10.3
12	33°47.5	352°08.3	N15°31.4	216°58.3	N03°42.4	193°55.9	S06°42.5	352°15.9	N13°49.7	Capella	280°17.1	46°01.6
13	48°49.9	7°07.7	32.4	232°01.1	42.4	208°58.6	42.3	7°18.1	49.8	Bellatrix	278°19.4	6°22.4
14	63°52.4	22°07.2	33.4	247°03.9	42.5	224°01.4	42.2	22°20.2	49.9	Elnath	277°57.7	28° 37.8
15	78°54.9	37°06.6	• • 34.4	262°06.8	• • 42.5	239°04.1	• • 42.1	37°22.4	• • 50.0	Alnilam	275°34.4	-1°11.2
16	93°57.3	52°06.0	35.4	277°09.6 292°12.4	42.5	254°06.9	42.0	52°24.5	50.1	Betelgeuse	270°48.5	7°24.6
17 18	108°59.8 124°02.2	67°05.5 82°04.9	36.4 N15°37.4	292 12.4 307°15.2	42.6 N03°42.6	269°09.6 284°12.4	41.9 \$06°41.8	67°26.7 82°28.8	50.2 N13°50.3	Canopus	$263^{\circ}51.1$	-52°43.0
19	139°04.7	97°04.3	38.4	307 15.2 322°18.0	42.6	204 12.4 299°15.1	41.7	97°31.0	50.4	Sirius	258°23.3	-16°45.7
20	159 04.7 154° 07.2	97 04.3 112°03.8	39.4	322 16.0 337°20.8	42.6 42.6	299 15.1 314°17.8	41.7	97 31.0 112°33.1	50.4 50.5	Adhara	255°03.3	-29°01.1
21	169°09.6	112 03.8 127°03.2	• • 40.4	352°23.6	• • 42.7	329°20.6	• • 41.5	112 35.1 127°35.3	50.6	Procyon	244°47.3	5°08.8
22	184° 12.1	142°02.6	41.4	7°26.4	42.7	344°23.3	41.4	142°37.4	50.7	Pollux	243°13.2	27°57.2
23	199°14.6	157°02.1	42.4	22°29.2	42.7	359°26.1	41.3	157°39.6	50.8	Avior	234°13.3	-59°36.6
										Suhail	222°43.6	-43°33.5
Mer.p	pass. 09:45	ν -0.6′ d1	.0′ m-3.90	ν 2.8′ d0.	0′ m-0.82	$\nu 2.7' d-0.$.1′ m-2.46	ν 2.2′ d0	.1′ m0.31	Miaplacidus	221°37.2	-69°50.7
										Alphard	217°44.3	-8°47.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.7 193°36.6	11°49.2 61°35.6
0	214°17.0	172°01.5	N15°43.4	37°32.0	N03°42.7	14°28.8	S06°41.2	172°41.7	N13°50.9	Dubne	193 30.0 182°21.2	14° 24.3
1	229° 19.5	187°00.9	44.4	52°34.8	42.8	29°31.6	41.0	187°43.9	51.0	Gienah	175°39.7	-17° 42.5
2	244°22.0	202°00.4	45.4	67°37.6	42.8	44°34.3	40.9	202°46.0	51.1		173°55.4	-63°16.0
3	259°24.4	216°59.8	• • 46.4	82°40.4	• • 42.8	59°37.1	• • 40.8	217°48.2	• • 51.2		171°47.1	-57°16.9
4	274°26.9	231°59.2	47.4	97°43.2	42.8	74°39.8	40.7	232°50.3	51.3	Alioth	166°09.6	55°48.0
5	289°29.4	246°58.6	48.4	112°46.0	42.8	89°42.6	40.6	247°52.5	51.4	Spica	158°18.3	-11°19.0
6	304°31.8	261°58.1	N15°49.4	127°48.8	N03°42.9	104°45.3	S06°40.5	262°54.6	N13°51.5	Alkaid	152°48.9	49°09.9
7	319°34.3	276°57.5	50.4	142°51.6	42.9	119°48.1	40.4	277°56.8	51.6	Hadar	148°30.3	-60°31.0
8	334°36.7	291°56.9	51.4	157°54.4	42.9	134°50.8	40.3	292°58.9	51.7	Menkent	$147^{\circ}53.1$	-36°31.0
9	349°39.2 4°41.7	306°56.4	• • 52.4	172°57.1	• • 42.9	149°53.5	• • 40.2	308°01.1	• • 51.8	Arcturus	145°44.4	$19^{\circ}01.7$
10 11	4 41.7 19°44.1	321°55.8 336°55.2	53.4 54.4	187°59.9 203°02.7	42.9 43.0	164°56.3 179°59.0	40.1 40.0	323°03.2 338°05.4	51.9 52.0	Rigil Kent.	139°34.7	-60°57.4
12	34° 46.6	351°54.6	N15° 55.4	218°05.5	N03°43.0	179 59.0 195°01.8	506°39.9	353°05.4	N13°52.1	Kochab	137°19.0	74°02.0
13	49°49.1	6°54.1	56.3	233°08.3	43.0	210°04.5	39.7	8°09.7	52.2	Zuben'ubi	136°51.8	-16°09.9
14	64°51.5	21°53.5	57.3	248°11.1	43.0	225°07.3	39.6	23°11.8	52.3	Alphecca	126°00.5	26°36.8
15	79°54.0	36°52.9	58.3	263°13.8	• • 43.0	240°10.0	39.5	38°14.0	52.4	Antares	112°11.3	-26°29.8
16	94° 56.5	51°52.3	15°59.3	278°16.6	43.1	255°12.8	39.4	53°16.1	52.5	Atria Sabik	107°01.8 101°58.5	-69°04.5 -15°45.6
17	109°58.9	66°51.8	16°00.3	293°19.4	43.1	$270^{\circ}15.5$	39.3	68°18.3	52.6	Shaula	96°05.4	-15 45.0 -37°07.3
18	125°01.4	81°51.2	N16°01.3	308°22.2	N03°43.1	285°18.2	S06°39.2	83°20.4	N13°52.7	Rasalhague	95°55.1	12°32.3
19	140°03.8	96°50.6	02.3	323°25.0	43.1	300°21.0	39.1	98°22.6	52.8	Eltanin	90°40.3	51°28.9
20	155°06.3	111°50.0	03.2	338°27.7	43.1	315°23.7	39.0	113°24.7	52.8	Kaus Aust.	83°27.7	-34°22.0
21	170°08.8	126°49.4	• • 04.2	353°30.5	• • 43.1	330°26.5	• • 38.9	128°26.9	• • 52.9	Vega	80°30.7	38°48.5
22	185°11.2	141°48.9	05.2	8°33.3	43.1	345°29.2	38.8	143°29.0	53.0	Nunki	75°43.3	-26°15.4
23	200°13.7	156°48.3	06.2	23°36.0	43.1	0°32.0	38.7	158°31.2	53.1	Altair	$61^{\circ}56.5$	8°56.7
Mer.p	pass. 09:41	ν -0.6' d1	.0′ m-3.90	ν 2.8′ d0.	0′ m-0.80	ν 2.7′ d-0.	.1′ m-2.46	ν 2.2′ d0	.1′ m0.31	Peacock	53°00.4	-56° 38.0
•										Deneb	49°23.4	45°22.9
Fri	GHA	GHA	Dec	GHA	Doc	GHA	Dec	GHA	Doc	Enif	33°35.5	10°00.6
6 0	215° 16.2	БПА 171°47.7	Dec N16°07.2	38°38.8	Dec N03°43.2	БПА 15°34.7	S06° 38.6	173°33.3	Dec N13°53.2	Al Na'ir	27°28.9	-46°48.8
1	230°18.6	186°47.1	08.2	53°41.6	43.2	30°37.4	38.5	188°35.5	53.3	Fomalhaut	15°11.0	-29°27.8
2	245°21.1	201°46.5	09.1	68°44.3	43.2	45°40.2	38.4	203°37.6	53.4	Scheat Markab	13°42.0 13°26.6	28° 14.4 15° 21.7
3	260°23.6	216°46.0	. 10.1	83°47.1	• • 43.2	60°42.9	• • 38.3	218°39.8	• • 53.5	iviarkab		10 21.7
4	275°26.0	231°45.4	11.1	98°49.9	43.2	75°45.7	38.1	233°41.9	53.6	Apr 25 Wed	SHA	Mer.pass
5	290°28.5	246°44.8	12.1	$113^{\circ}52.6$	43.2	90°48.4	38.0	$248^{\circ}44.1$	53.7	Venus	318°57.1	12:31
6	305°31.0	261°44.2	N16° 13.0	128°55.4	N03°43.2	105°51.2	S06°37.9	263°46.2		Mars		21:30
7	320°33.4	276°43.6	14.0	143°58.2	43.2	120°53.9	37.8	278°48.4	53.9	Jupiter	160°05.0	23:02
8	335°35.9	291°43.1	15.0	159°00.9	43.2	135°56.6	37.7	293°50.5	54.0	Saturn	318°32.2	12:31
9	350°38.3	306°42.5	•• 16.0	174°03.7	. 43.2	150°59.4	• • 37.6	308°52.7	54.1	Apr 26 Thu	SHA	Mer.pass
10	5°40.8 20°43.3	321°41.9 336°41.3	16.9	189°06.4	43.2	166°02.1	37.5 37.4	323°54.8 338°57.0	54.2 54.3	Venus	317°44.5	12:32
	20 43.3 35°45.7	350 41.3 351°40.7	17.9 N16° 18.9	204°09.2 219°11.9	43.3 N03°43.3	181°04.9 196°07.6	37.4 \$06°37.3	353° 59.1	54.3 N13°54.4	Mars	$183^{\circ}15.0$	21:26
11	50°48.2	6°40.1	19.9	219 11.9 234°14.7	43.3	211°10.4	37.3	9°01.3	54.5	Jupiter	160°11.8	22:58
11 12	65°50.7	21°39.5	20.8	249°17.5	43.3	226°13.1	37.2	24°03.4	54.6	Saturn	318°24.7	12:27
11 12 13		36°39.0	• • 21.8	264°20.2	• • 43.3	241°15.8	37.0	39°05.6	• • 54.7	Apr 27 Fri	SHA	Mer.pass
11 12 13 14	80°53.1	51°38.4	22.8	279°23.0	43.3	256°18.6	36.9	54°07.7	54.8	Venus		12:33
11 12 13 14 15	80°53.1 95°55.6		23.7	294°25.7	43.3	271°21.3	36.8	69°09.9	54.9		183°22.6	21:21
11 12 13 14		66°37.8					S06°36.7					
11 12 13 14 15 16	95°55.6	81°37.2	$N16^{\circ}24.7$	309°28.4	N03°43.3	286°24.1	500 50.1	84°12.0	N13°55.0	Jupiter	$160^{\circ}18.5$	22:54
11 12 13 14 15 16 17	95°55.6 110°58.1 126°00.5 141°03.0	81°37.2 96°36.6	N16° 24.7 25.7	324°31.2	43.3	301°26.8	36.6	$99^{\circ}14.2$	55.1	Jupiter Saturn	160°18.5 318°17.2	22:54 12:24
11 12 13 14 15 16 17 18 19 20	95°55.6 110°58.1 126°00.5 141°03.0 156°05.4	81°37.2 96°36.6 111°36.0	25.7 26.6	324°31.2 339°33.9	43.3 43.3	301°26.8 316°29.5	36.6 36.4	99°14.2 114°16.3	55.1 55.2	Saturn	318°17.2	
11 12 13 14 15 16 17 18 19 20 21	95° 55.6 110° 58.1 126° 00.5 141° 03.0 156° 05.4 171° 07.9	81°37.2 96°36.6 111°36.0 126°35.4	25.7 26.6 •• 27.6	324°31.2 339°33.9 354°36.7	43.3 43.3 •• 43.3	301°26.8 316°29.5 331°32.3	36.6 36.4 •• 36.3	99°14.2 114°16.3 129°18.5	55.1 55.2 •• 55.3	Saturn	318°17.2	12:24
11 12 13 14 15 16 17 18 19 20 21 22	95° 55.6 110° 58.1 126° 00.5 141° 03.0 156° 05.4 171° 07.9 186° 10.4	81°37.2 96°36.6 111°36.0 126°35.4 141°34.8	25.7 26.6 •• 27.6 28.6	324°31.2 339°33.9 354°36.7 9°39.4	43.3 43.3 •• 43.3 43.3	301°26.8 316°29.5 331°32.3 346°35.0	36.6 36.4 · · 36.3 36.2	99°14.2 114°16.3 129°18.5 144°20.6	55.1 55.2 •• 55.3 55.4	Saturn	318°17.2 tal parallax Venus:	0.1
11 12 13 14 15 16 17 18 19 20 21	95° 55.6 110° 58.1 126° 00.5 141° 03.0 156° 05.4 171° 07.9	81°37.2 96°36.6 111°36.0 126°35.4	25.7 26.6 •• 27.6	324°31.2 339°33.9 354°36.7	43.3 43.3 •• 43.3	301°26.8 316°29.5 331°32.3	36.6 36.4 •• 36.3	99°14.2 114°16.3 129°18.5	55.1 55.2 •• 55.3	Saturn	318°17.2	12:24

h	Sur	1			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.0	N13°12.8	47° 37.6	10.1'	N00°58.1	-15.2'	60.1'
1	195°30.1	13.7	62°06.7	10.1	00°42.9	-15.2'	60.2'
2	210°30.2	14.5	76°35.8	10.1'	00°27.7	-15.2'	60.2'
3	225°30.3	. 15.3	91°04.9	10.0'	N00°12.5	-15.3'	60.2'
4	240°30.4	16.1	105°33.9	10.0'	S00°02.8	15.3'	60.3
5	255° 30.6	16.9	120°02.9	10.0'	00°18.0	15.3'	60.3'
6	270°30.7	N13°17.7	134°31.8	9.9'	S00°33.3	15.3'	60.3'
7	285° 30.8	18.5	149°00.8	9.9'	00°48.6	15.3'	60.3
8	300°30.9	19.3	163°29.7	9.8'	00°43.0	15.3	60.4
9	315°31.0	20.1	177° 58.5	9.8'	01°19.2	15.3	60.4
10	330°31.1	21.0	192°27.3	9.8'	01°34.6	15.3'	60.4
11	345°31.2	21.8	206° 56.1	9.7'	01°49.9	15.3'	60.5
12	0°31.3	N13°22.6	221°24.8	9.7'	S02°05.2	15.3'	60.5
13	15° 31.4	23.4	235°53.5	9.6'	02°20.6	15.3'	60.5
14	30° 31.5	24.2	250°22.1	9.6'	02°25.9	15.3	60.5
15	45° 31.6	25.0	264° 50.7	9.6'	02°51.2	15.3	60.6
16	60°31.7	25.8	279° 19.3	9.5'	02 51.2 03°06.5	15.3'	60.6
17	75° 31.8	26.6	279 19.3 293°47.8	9.5'	03°00.5	15.3'	60.6
18	90°31.9	N13°27.4	308° 16.3	9.4	S03°37.2	15.3	60.6'
			300 10.3 322°44.7				
19	105°32.0 120°32.1	28.2	322°44.7 337°13.1	9.4'	03°52.5 04°07.8	15.3'	60.7'
20	120°32.1 135°32.2	29.0	337°13.1 351°41.4	9.3'	04°07.8 04°23.0	15.3'	60.7'
21		• • 29.8		9.3'		15.3'	60.7'
22	150°32.3	30.6	6°09.6	9.2'	04°38.3 04°53.6	15.3'	60.7'
23	165°32.4	31.5	20°37.9	9.2'	04 53.0	15.2'	60.7'
	SD = 15.9'	d = 0.8'		SI	D = 16.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.5	N13°32.3	35°06.0	9.1'	S05°08.8	15.2'	60.8'
1	195°32.6	33.1	49°34.1	9.1'	05°24.0	15.2'	60.8'
2	210°32.7	33.9	64°02.2	9.0'	05°39.2	15.2'	60.8'
3	225°32.9	• • 34.7	78°30.2	8.9'	05°54.4	15.1'	60.8'
4	240°33.0	35.5	92°58.1	8.9'	$06^{\circ}09.5$	15.1'	60.8'
5	255°33.1	36.3	$107^{\circ}26.0$	8.8'	06°24.6	15.1'	60.9'
6	270°33.2	N13°37.1	121°53.9	8.8'	S06°39.7	15.1'	60.9'
7	285°33.3	37.9	136°21.6	8.7'	06°54.8	15.0'	60.9'
8	300°33.4	38.7	150°49.3	8.7'	07°09.8	15.0'	60.9'
9	315° 33.5	• • 39.5	$165^{\circ}17.0$	8.6'	07°24.8	15.0'	60.9'
10	330°33.6	40.3	179°44.6	8.5'	07°39.8	14.9'	60.9'
11	345°33.7	41.1	194°12.1	8.5'	07°54.7	14.9'	61.0'
12	0°33.8	N13°41.9	208°39.6	8.4'	S08°09.6	14.8'	61.0'
13	15°33.9	42.7	223°07.0	8.3'	08°24.4	14.8'	61.0'
14	30°34.0	43.5	237°34.3	8.3'	08°39.2	14.7'	61.0'
15	45°34.1	• • 44.3	252°01.6	8.2'	08°53.9	14.7'	61.0'
16	60°34.2	45.1	266°28.8	8.1'	09°08.6	14.6'	61.0'
17	75°34.3	45.9	280°56.0	8.1'	09°23.3	14.6'	61.0'
18	90°34.4	N13°46.7	295°23.1	8.0'	S09°37.9	14.5'	61.1'
19	105°34.5	47.5	309°50.1	7.9'	09°52.4	14.5'	61.1'
20	120°34.6	48.3	324°17.0	7.9'	10°06.9	14.4'	61.1'
21	135°34.7	• • 49.1	338°43.9	7.8'	10°21.3	14.4'	61.1'
22	150°34.8	49.9	353°10.7	7.7'	10°35.7	14.3'	61.1'
23	165°34.9	50.7	7°37.4	7.7'	10°50.0	14.2'	61.1'
	SD = 15.9'	d = 0.8'		CI	D = 16.6'		
	JU = 15.9′	u = 0.δ		51	∩ _ T0'0.		
Fri	GHA	Dec	GHA		Dec	d	HP
	180°35.0	Dec N13°51.5	22°04.1	u 7.6'	S11°04.2	a 14.2'	61.1'
0 1	180°35.0 195°35.0	N13 51.5 52.2	36°30.7	7.6° 7.5'	11°18.4	14.2	61.1'
2	210° 35.1	52.2 53.0	50° 57.2	7.5° 7.5'	11° 18.4 11° 32.5	14.1	61.1
3	210 35.1 225° 35.2	53.8	65°23.7	7.5 7.4'	11 32.5 11°46.5	14.0'	61.1
3 4	225° 35.2 240° 35.3	54.6	79°50.1	7.4	11°46.5 12°00.5	14.0 13.9'	61.1
4 5	240°35.3 255°35.4	54.6 55.4	79°50.1 94°16.4	7.3° 7.2'	12°10.5	13.9	61.2'
6	255° 35.4 270° 35.5	55.4 N13°56.2	108° 42.6	7.2'	512°28.2	13.8	61.2'
о 7	270°35.5 285°35.6	N13 50.2 57.0	108° 42.6 123° 08.8	7.2 7.1'	12°41.9	13.7'	61.2'
8	285°35.6 300°35.7	57.0 57.8	123°08.8 137°34.9	7.1	12°41.9 12°55.6	13.6'	61.2'
8 9	300°35.7 315°35.8	57.8 •• 58.6	137° 34.9 152° 00.9	7.0° 6.9°	12°55.6 13°09.2	13.5	61.2'
10	315°35.8 330°35.9	13°59.4	166°26.9	6.9'	13°09.2 13°22.7	13.4	61.2'
10	330 35.9 345°36.0	13 59.4 14°00.2	166 26.9 180°52.7	6.8'	13 22.7 13°36.1	13.4	61.2'
12	0°36.1	N14°01.0	180 52.7 195°18.5	6.7	513°49.4	13.3	61.2
13	15° 36.2	01.8	195 18.5 209°44.3	6.7'	14°02.6	13.1	61.2'
13 14	30° 36.3	01.8 02.5	209°44.3 224°09.9	6.6'	14°02.6 14°15.8	13.1	61.2'
14 15	30°36.3 45°36.4	03.3	224°09.9 238°35.5	6.5	14°15.8 14°28.8	13.0 12.9'	61.2'
15 16	45°36.4 60°36.5	04.1	253° 01.0	6.4	14°28.8 14°41.7	12.9	61.2'
16 17	75° 36.6	04.1 04.9	267°26.4	6.4	14°41.7 14°54.6	12.8'	61.2'
18	75°36.6 90°36.7	04.9 N14°05.7	281°51.8	6.3'	\$15°07.3	12.6'	61.2'
18 19	90°36.7 105°36.8	N14°05.7 06.5	281°51.8 296°17.1	6.3'	515°07.3 15°20.0	12.6'	61.2'
20	105 36.8 120° 36.9	06.5 07.3	290 17.1 310°42.3	6.1	15 20.0 15°32.5	12.5	61.2'
20	120° 36.9 135° 37.0	08.1	310°42.3 325°07.4	6.1	15° 32.5 15° 45.0	12.4	61.2'
22	135° 37.0 150° 37.0	08.8	325°07.4 339°32.5	6.0'	15°45.0 15°57.3	12.3'	61.2'
23	165° 37.0	08.8	353° 57.5	5.9'	15 57.3 16°09.5	12.2	61.2'
23						12.1	01.2
	SD = 15.9'	d = 0.8'		SI	D = 16.7'		

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

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	16:04	18:30	21:29	02:56	02:30	01:58
N 70°	15:59	18:13	20:44	02:56	02:38	02:17
68°	15:55	18:00	20:15	02:56	02:45	02:32
66°	15:52	17:49	19:54	02:56	02:51	02:45
64°	15:49	17:40	19:36	02:56	02:55	02:55
62°	15:47	17:33	19:22	02:56	03:00	03:04
60°	15:45	17:26	19:11	02:56	03:03	03:12
N 58°	15:43	17:20	19:01	02:56	03:07	03:19
56°	15:41	17:15	18:52	02:56	03:10	03:25
54°	15:40	17:11	18:44	02:56	03:12	03:31
52°	15:39	17:07	18:37	02:56	03:15	03:36
50°	15:37	17:03	18:31	02:56	03:17	03:40
45°	15:35	16:55	18:17	02:56	03:22	03:50
N 40°	15:33	16:49	18:06	02:55	03:26	03:59
35°	15:31	16:43	17:57	02:55	03:29	04:06
30°	15:29	16:38	17:49	02:55	03:32	04:12
20°	15:27	16:30	17:35	02:55	03:38	04:23
N 10°	15:24	16:22	17:23	02:55	03:42	04:32
0°	15:22	16:15	17:11	02:55	03:47	04:41
S 10°	15:20	16:09	17:00	02:55	03:51	04:51
20°	15:18	16:01	16:48	02:54	03:56	05:00
30°	15:15	15:53	16:35	02:54	04:02	05:11
35°	15:14	15:49	16:27	02:54	04:05	05:18
40° 45°	15:12	15:44	16:19	02:54 02:54	04:08	05:25 05:34
	15:10	15:38	16:08		04:13	
S 50°	15:08	15:30	15:56	02:53	04:18	05:44
52°	15:07	15:27	15:51	02:53	04:20	05:49
54°	15:06	15:24	15:44	02:53	04:22	05:54
56°	15:05	15:20	15:37	02:53	04:25	06:00
58° S 60°	15:04	15:15	15:30	02:53	04:28	06:07
5 60°	15:02	15:10	15:21	02:52	04:32	06:15

		Sun		Moon			
Day	Eqn.of Time		Eqn.of Time Mer.		Mer.Pass.		
	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	83-97%	
25	02:00	02:05	11:58	21:34	09:08		
26	02:10	02:15	11:58	22:28	10:01		
27	02:20	02:24	11:58	23:25	10:56		

h	Aries	Ve	nus	M	ars	Jup	iter	Satu	rn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	216° 15.3	171°33.7	N16°30.5	39°44.9	N03°43.3	16°40.5	S06°36.0		V13°55.6		эпа	Dec
0		171 33.7 186°33.1			43.3	31°43.2		174 24.9 189°27.1		Alpheratz	357°31.4	29°15.0
1	231°17.8 246°20.2	201°32.5	31.5	54°47.6 69°50.4	43.3	46°46.0	35.9 35.8	204°29.2	55.7	Ankaa	353°04.2	-42°08.7
2			32.4						55.8	Schedar	349°27.4	56°41.8
3	261°22.7	216°31.9	• • 33.4	84°53.1	• • 43.3	61°48.7 76°51.5	• • 35.7	219°31.4	• • 55.9	Diphda	348°44.2	-17°49.5
4	276°25.2	231°31.3	34.4	99°55.8	43.3		35.6	234°33.5	56.0	Achernar	$335^{\circ}18.3$	-57°05.2
5 6	291°27.6 306°30.1	246°30.7 261°30.1	35.3 N16°36.3	114°58.6 130°01.3	43.3 N03°43.3	91°54.2 106°56.9	35.5 \$06°35.4	249°35.7 264°37.8	56.1 N13°56.2	Hamal	327°47.6	23°36.0
7	321°32.6	201 30.1 276°29.5	37.2	145°04.0	43.3	100 50.9 121°59.7	35.3	279°40.0	56.2	Polaris	$312^{\circ}36.9$	89°23.2
8	336°35.0	291°28.9	38.2	160°06.8	43.3	137°02.4	35.2	294°42.1	56.3	Acamar	$315^{\circ}09.6$	-40°11.3
9	351°37.5	306°28.3	• • 39.1	175°09.5	• • 43.2	152°05.2	35.1	309°44.3	56.4	Menkar	314°02.8	4°12.2
10	6°39.9	321°27.7	40.1	190°12.2	43.2	167°07.9	35.0	324°46.4	56.5	Mirfak	308°23.7	49°57.8
11	21°42.4	336°27.1	41.1	205°14.9	43.2	182°10.6	34.9	339°48.6	56.6	Aldebaran	290°35.9	16°33.9
12	36°44.9	351°26.5	N16°42.0	220°17.7	N03°43.2	197°13.4	S06°34.8		N13°56.7	Rigel	281°00.8	-8°10.3
13	51°47.3	6°25.9	43.0	235°20.4	43.2	212°16.1	34.7	9°52.9	56.8	Capella	280°17.1	46°01.6
14	66°49.8	21°25.3	43.9	250°23.1	43.2	227°18.8	34.6	24°55.0	56.9	Bellatrix	278°19.4	6°22.4
15	81°52.3	36°24.7	• • 44.9	265°25.8	• • 43.2	242°21.6	• • 34.4	39°57.2	• • 57.0	Elnath	277°57.8	28°37.8
16	96°54.7	51°24.1	45.8	280°28.5	43.2	257°24.3	34.3	54°59.3	57.1	Alnilam	275°34.5	-1°11.2 7°24.6
17	111°57.2	66°23.5	46.8	295°31.3	43.2	272°27.1	34.2	$70^{\circ}01.5$	57.2	Betelgeuse	270°48.6	
18	126°59.7	81°22.9	N16°47.7	310°34.0	N03°43.2	287°29.8	S06°34.1	85°03.6	V13°57.3	Canopus Sirius	263°51.1 258°23.4	-52°43.0 -16°45.7
19	142°02.1	96°22.3	48.7	325°36.7	43.2	302°32.5	34.0	100°05.8	57.4	Adhara	255°03.3	-10 45.7 -29°01.1
20	157°04.6	$111^{\circ}21.7$	49.6	340°39.4	43.1	317°35.3	33.9	115°07.9	57.5	Procyon	244°47.3	5°08.8
21	172°07.1	$126^{\circ}21.1$	• • 50.6	355°42.1	• • 43.1	332°38.0	• • 33.8	130°10.1	• • 57.6	Pollux	243°13.2	27°57.2
22	187°09.5	141°20.5	51.5	10°44.8	43.1	347°40.8	33.7	145°12.2	57.7	Avior	234°13.3	-59°36.6
23	202°12.0	$156^{\circ}19.9$	52.5	25°47.5	43.1	2°43.5	33.6	160°14.4	57.8	Suhail	222°43.6	-43°33.5
Mern	ass. 09:33	ν-0 6' d1	.0′ m-3.90	ν2 7' d-Ω	.0′ m-0.75	ν2 7' d-Ω	.1′ m-2.45	$\nu 2.1' \ d0.1$	′ m0 20	Miaplacidus	221°37.2	-69°50.7
- wier.p		ν 0.0 d1	111 3.30	ν 2.1 u-0	.5 111 0.13	ν 2.1 u-0.	.111 2.73	ν2.1 UU.1	1110.23	Alphard	217°44.3	-8°47.4
										Regulus	207°30.7	11°49.2
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.6
0	217°14.4	171°19.3	N16°53.4	40°50.3	N03°43.1	17°46.2	S06°33.5		V13°57.9	Denebola	182°21.2	14°24.3
1	232°16.9	186° 18.7	54.4	55°53.0	43.1	32°49.0	33.4	190°18.7	58.0	Gienah	175°39.7	-17°42.5
2	247°19.4	201°18.1	55.3	70°55.7	43.1	47°51.7	33.3	205°20.8	58.1		172°55.4	-63°16.0
3	262°21.8	216° 17.5	• • 56.2	85°58.4	• • 43.1	62°54.4	• • 33.2	220°23.0	• • 58.2	Gacrux	171°47.1	-57°16.9
4	277°24.3	231°16.9	57.2	101°01.1	43.0	77°57.2	33.1	235°25.1	58.3	Alioth	166°09.6	55°48.0
5	292°26.8	246°16.3	58.1	116°03.8	43.0	92°59.9	33.0	250°27.3	58.4	Spica	158°18.3	-11°19.0
6	307°29.2	261°15.7	N16°59.1	131°06.5	N03°43.0	108°02.6	506°32.9		V13°58.5	Alkaid	152°48.9	49°09.9
7	322°31.7	276°15.1	17°00.0	146°09.2	43.0	123°05.4	32.8	280°31.6	58.6	Hadar	148°30.2	-60°31.0
8	337°34.2	291°14.5	01.0	161°11.9	43.0	138°08.1	32.7	295°33.7	58.7	Menkent	$147^{\circ}53.1$	-36°31.0
9	352°36.6	306°13.9	• • 01.9	176°14.6	• • 42.9	153°10.9	• • 32.6	310°35.9	• • 58.8	Arcturus	$145^{\circ}44.4$	19°01.7
10	7°39.1 22°41.5	321°13.3	02.8	191°17.3	42.9	168°13.6	32.5	325°38.0	58.9	Rigil Kent.	139°34.7	-60°57.4
11 12	22 41.5 37°44.0	336° 12.7 351° 12.1	03.8 N17°04.7	206°20.0 221°22.7	42.9 N03°42.9	183°16.3 198°19.1	32.4 \$06°32.3	340°40.2 355°42.3	59.0 N13°59.1	Kochab	$137^{\circ}19.0$	74°02.0
13	52°46.5	6°11.5	05.6	236°25.4	42.9	213°21.8	32.2	10°44.5	59.2	Zuben'ubi	136°51.8	-16°09.9
14	67°48.9	21°10.9	06.6	250°25.4° 251°28.0	42.9	213 21.6 228°24.5	32.2	25°46.6	59.2 59.2	Alphecca	126°00.5	26°36.8
15	82°51.4	36°10.2	•• 07.5	266°30.7	• • 42.8	243°27.3	32.0	40°48.8	59.3	Antares	112°11.2	-26°29.8
16	97°53.9	50°10.2 51°09.6	08.4	200 30.7 281°33.4	42.8	243 27.3 258°30.0	31.9	40 46.6 55°50.9	59.4	Atria	107°01.8	-69°04.5
17	112°56.3	66°09.0	09.4	296°36.1	42.8	273°32.7	31.7	70°53.1	59.5	Sabik	101°58.5	-15°45.6
18	127°58.8	81°08.4	N17°10.3	311°38.8	N03°42.8	288°35.5	S06°31.6		V13°59.6	Shaula	96°05.4	-37°07.3
19	143°01.3	96°07.8	11.2	326°41.5	42.7	303°38.2	31.5	100°57.4	59.7	Rasalhague	95°55.1	12°32.3
20	158°03.7	111°07.2	12.2	341°44.2	42.7	318°40.9	31.4	115°59.5	59.8	Eltanin	90°40.2	51°28.9
21	173°06.2	126°06.6	13.1	356°46.8	• • 42.7	333°43.7	• • 31.3	131°01.7	13°59.9	Kaus Aust.	83°27.7	-34°22.0
22	188°08.7	141°06.0	14.0	11°49.5	42.7	348°46.4	31.2	146°03.8	14°00.0	Vega	80°30.6	38°48.5
23	203°11.1	156°05.4	15.0	26°52.2	42.6	3°49.1	31.1	161°06.0	00.1	Nunki	75°43.3	-26°15.4
										Altair	61°56.5	8°56.7
Mer.p	ass. 09:29	ν -0.6′ d0	.9′ m-3.90	ν 2.7′ d-0	.0′ m-0.73	$\nu 2.7' d-0$.1′ m-2.45	$\nu 2.1' \ d0.1$	m0.28	Peacock	53°00.4	-56°38.0
										Deneb Enif	49°23.4 33°35.5	45°22.9 10°00.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.9	-46°48.8
0	218°13.6	171°04.7	$N17^{\circ}15.9$	41°54.9	N03°42.6	18°51.9	S06°31.0	176°08.1		Fomalhaut	15°11.0	-40° 48.8 -29° 27.8
1	233°16.0	$186^{\circ}04.1$	16.8	56°57.6	42.6	33°54.6	30.9	191°10.3	00.3	Scheat	13°42.0	28° 14.4
2	248°18.5	201°03.5	17.7	72°00.2	42.6	48°57.3	30.8	206°12.4	00.4	Markab	13°26.6	15°21.7
3	263°21.0	$216^{\circ}02.9$	• • 18.7	87°02.9	• • 42.5	64°00.1	• • 30.7	221°14.6	• • 00.5			10 22
4	278°23.4	231°02.3	19.6	102°05.6	42.5	79°02.8	30.6	$236^{\circ}16.7$	00.6	Apr 28 Sat	SHA	Mer.pass
5	293°25.9	246°01.7	20.5	$117^{\circ}08.3$	42.5	94°05.5	30.5	251°18.9	00.7		315°18.4	12:34
6	308°28.4	$261^{\circ}01.1$	N17°21.4	132°10.9	N03°42.4	109°08.3	S06°30.4		14°00.8		183°29.6	21:17
7	323°30.8	276°00.4	22.4	147°13.6	42.4	124°11.0	30.3	281°23.2	00.9		160°25.2	22:49
8	338°33.3	290°59.8	23.3	162°16.3	42.4	139°13.7	30.2	296°25.3	01.0	Saturn	318°09.6	12:21
9	353°35.8	305°59.2	• • 24.2	177°18.9	• • 42.4	154°16.5	• • 30.1	311°27.5	•• 01.1	Apr 29 Sun	SHA	Mer.pass
10	8°38.2	320°58.6	25.1	192°21.6	42.3	169°19.2	30.0	326°29.6	01.2		314°04.9	12:35
11	23°40.7	335°58.0	26.0	207°24.3	42.3	184°21.9	29.9	341°31.8	01.3		183°35.8	21:13
12	38°43.2	350°57.3	N17°27.0	222°26.9	N03°42.3	199°24.7	S06°29.8		V14°01.4		160°31.8	22:45
13	53°45.6	5°56.7	27.9	237°29.6	42.2	214°27.4	29.7	11°36.0	01.5	Saturn	318°02.1	12:17
14	68°48.1	20°56.1	28.8	252°32.2	42.2	229°30.1	29.6	26°38.2	01.6			
15 16	83°50.5	35°55.5	• • 29.7	267°34.9	• • 42.2	244°32.9	• • 29.5	41°40.3	01.7	Apr 30 Mon	SHA	Mer.pass
16	98°53.0	50°54.9	30.6	282°37.6	42.1	259°35.6	29.4	56°42.5	01.8		312°51.2	12:36
17 18	113°55.5 128°57.9	65° 54.2 80° 53.6	31.5 N17°32.5	297°40.2 312°42.9	42.1 N03°42.0	274°38.3 289°41.1	29.3 \$06°29.2	71°44.6 86°46.8	01.9 N14°02.0		183°41.3	21:09
18 19	128 57.9 144°00.4	95° 53.0	33.4	312 42.9 327°45.5	42.0	289 41.1 304°43.8	29.1	80 40.8 101°48.9	02.0		160°38.3	22:40
20	159°02.9	95 55.0 110°52.4	34.3	342°48.2	42.0	319°46.5	29.1	101 46.9 116°51.1	02.0	Saturn	317°54.5	12:14
21	174°05.3	110 52.4 125°51.7	• • 35.2	357°50.8	• • 41.9	334°49.2	28.9	131°53.2	02.1	Horizont	al parallax	
22	189°07.8	140°51.1	36.1	12°53.5	41.9	349°52.0	28.8	146°55.4	02.2		Venus:	0.1
23	204°10.3	155°50.5	37.0	27°56.1	41.9	4°54.7	28.7	161°57.5	02.4		Mars:	0.2
Mer.p	ass. 09:26	ν -0.6′ $d0$.9′ m-3.90	ν2.Γ΄ d-0	.0′ m-0.71	ν 2.1′ d-0.	.1′ m-2.44	$ u 2.1' \ d0.1$	′ m0.27			

h	Sui	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.2	N14°10.4	8°22.4	5.8'	S16°21.6	12.0'	61.2'
1	195°37.3	11.2	22°47.2	5.8'	$16^{\circ}33.6$	11.9'	61.2'
2	210°37.4	12.0	37°12.0	5.7'	16°45.5	11.8'	61.2'
3	225°37.5	• • 12.8	51°36.7	5.6'	16°57.3	11.6'	61.2'
4 5	240°37.6 255°37.7	13.6 14.3	66°01.3 80°25.9	5.6' 5.5'	17°09.0 17°20.5	11.5' 11.4'	61.2' 61.2'
6	255 37.7 270°37.8	N14°15.1	94°50.3	5.4'	\$17°31.9	11.4	61.1'
7	285°37.9	15.9	109°14.8	5.3'	17°43.2	11.2'	61.1'
8	300°38.0	16.7	123°39.1	5.3'	17°54.3	11.0'	61.1'
9	315°38.1	• • 17.5	138°03.4	5.2'	18°05.4	10.9'	61.1'
10	330°38.1	18.3	152°27.6	5.1'	18°16.3	10.8'	61.1'
11	345°38.2	19.0	166°51.7	5.1'	18°27.0	10.6'	61.1'
12	0°38.3 15°38.4	N14°19.8	181°15.8	5.0'	\$18°37.7 18°48.2	10.5' 10.4'	61.1' 61.1'
13 14	30°38.5	20.6 21.4	195°39.8 210°03.8	4.9' 4.9'	18° 48.2 18° 58.5	10.4	61.1
15	45°38.6	22.2	210 03.6 224°27.6	4.8'	10° 08.8	10.1	61.1
16	60°38.7	22.9	238°51.4	4.8'	19°18.9	10.0'	61.0'
17	75°38.8	23.7	253°15.2	4.7'	19°28.8	9.8'	61.0'
18	90°38.9	N14°24.5	267°38.9	4.6'	S 19°38.6	9.7'	61.0'
19	105°38.9	25.3	282°02.5	4.6'	19°48.3	9.5'	61.0'
20	120°39.0	26.0	296°26.1	4.5'	19°57.8	9.4'	61.0'
21	135°39.1 150°39.2	· · 26.8 27.6	310°49.6 325°13.1	4.5'	20°07.2	9.2'	61.0'
22 23	165°39.2	27.6 28.4	325°13.1 339°36.5	4.4' 4.4'	20°16.4 20°25.5	9.1' 8.9'	61.0' 60.9'
23						0.9	00.9
	SD = 15.9'	d = 0.8'		SI	O = 16.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.4	N14°29.2	353°59.8	4.3'	S20°34.4	8.8'	60.9'
1	195°39.5	29.9	8°23.1	4.2'	20°43.2	8.6'	60.9'
2	210°39.6	30.7	22°46.4	4.2'	20°51.8	8.5'	60.9'
3	225°39.6	• • 31.5	37°09.6	4.1'	21°00.2	8.3'	60.9'
4	240°39.7 255°39.8	32.3	51°32.7 65°55.8	4.1'	21°08.6 21°16.7	8.2'	60.8'
5 6	255°39.8 270°39.9	33.0 N14°33.8	80°18.9	4.1' 4.0'	S21°24.7	8.0' 7.8'	60.8' 60.8'
7	270 39.9 285°40.0	34.6	94°41.9	4.0'	21°32.5	7.7'	60.8
8	300°40.1	35.3	109°04.9	3.9'	21°40.2	7.5'	60.8
9	315°40.2	• • 36.1	123°27.8	3.9'	21°47.7	7.3'	60.7'
10	330°40.2	36.9	137°50.7	3.9'	$21^{\circ}55.1$	7.2'	60.7'
11	345°40.3	37.7	152°13.5	3.8'	22°02.2	7.0'	60.7'
12	0°40.4	N14°38.4	166°36.4	3.8'	\$22°09.3	6.9'	60.7'
13	15°40.5 30°40.6	39.2	180°59.2 195°21.9	3.8'	22°16.1 22°22.8	6.7'	60.7'
14 15	30 40.6 45°40.7	40.0 • • 40.7	195 21.9 209°44.6	3.7' 3.7'	22°29.3	6.5' 6.3'	60.6' 60.6'
16	60°40.8	41.5	209° 44.0 224° 07.3	3.7'	22°35.7	6.2	60.6
17	75°40.8	42.3	238°30.0	3.6'	22°41.8	6.0'	60.6'
18	90°40.9	N14°43.0	252°52.7	3.6'	S22°47.9	5.8'	60.5'
19	105°41.0	43.8	267°15.3	3.6'	22°53.7	5.7'	60.5'
20	120°41.1	44.6	281°37.9	3.6'	22°59.4	5.5'	60.5'
21	135°41.2 150°41.2	• • 45.4	296°00.5 310°23.1	3.6'	23°04.9 23°10.2	5.3' 5.2'	60.4'
22 23	165°41.3	46.1 46.9	310°23.1 324°45.6	3.6' 3.5'	23°10.2 23°15.3	5.2 5.0'	60.4' 60.4'
23	SD = 15.9'	d = 0.8'			D = 16.6'	3.0	00.1
	<u>JD = 13.9</u>	<u>u = 0.0</u>			J = 10.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°41.4 195°41.5	N14°47.6 48.4	339°08.2 353°30.7	3.5' 3.5'	\$23°20.3 23°25.1	4.8' 4.6'	60.4' 60.3'
2	210°41.6	49.2	7°53.2	3.5'	23°29.8	4.0 4.5'	60.3
3	225°41.7	49.9	22°15.8	3.5'	23°34.2	4.3'	60.3
4	240°41.7	50.7	36°38.3	3.5'	23°38.5	4.1'	60.2'
5	255°41.8	51.5	51°00.8	3.5'	23°42.6	3.9'	60.2'
6	270°41.9	N14°52.2	65°23.3	3.5'	\$23°46.5	3.8'	60.2'
7	285°42.0	53.0	79°45.9	3.5'	23°50.3	3.6'	60.2'
8 9	300°42.1 315°42.1	53.8 • • 54.5	94°08.4 108°30.9	3.5' 3.6'	23°53.9 23°57.3	3.4' 3.2'	60.1' 60.1'
10	330°42.2	55.3	100 50.9 122°53.5	3.6'	23°00.5	3.1'	60.1
11	345°42.3	56.0	137°16.0	3.6'	24°03.5	2.9'	60.0'
12	0°42.4	N14°56.8	151°38.6	3.6'	\$24°06.4	2.7'	60.0'
13	15°42.5	57.6	166°01.2	3.6'	24°09.1	2.5'	60.0'
14	30°42.5	58.3	180°23.8	3.6'	24°11.6	2.3'	59.9'
15	45°42.6	59.1	194°46.5	3.7'	24°14.0	2.2'	59.9'
16 17	60°42.7 75°42.8	14°59.8 15°00.6	209°09.1 223°31.8	3.7' 3.7'	24°16.2 24°18.2	2.0' 1.8'	59.9' 59.8'
18	75 42.8 90°42.8	N15°01.4	223 31.8 237°54.5	3.7'	524°20.0	1.6'	59.8'
19	105°42.9	02.1	252°17.3	3.8'	24°21.6	1.5'	59.8'
20	120°43.0	02.9	266°40.1	3.8'	24°23.1	1.3'	59.7'
21	135°43.1	• • 03.6	281°02.9	3.8'	24°24.4	1.1'	59.7'
22	150°43.1	04.4	295°25.7	3.9'	24°25.5	1.0'	59.7'
23	165°43.2	05.1	309°48.6	3.9'	24°26.5	0.8'	59.6'
	SD = 15.9'	d = 0.8'		SI	D = 16.5'		

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

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

		Sun			Moon			
Day	Eqn.of Time				Mer.Pass.			
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%		
28	02:29	02:33	11:57	-:-	11:55			
29	02:38	02:42	11:57	00:25	12:56			
30	02:46	02:49	11:57	01:27	13:58			

h	Aries	Ver	านร	Ma	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	219°12.7	GHA 170°49.9	N17°37.9	42°58.8	N03°41.8	19°57.4	506°28.6	176°59.7			ЗПА	Dec
0									N14°02.5	Alpheratz	357°31.4	29°15.0
1	234°15.2	185°49.2	38.8	58°01.4	41.8	35°00.2	28.5	192°01.8	02.6	Ankaa	353°04.2	-42°08.6
2	249°17.7	200°48.6	39.7	73°04.1	41.7	50°02.9	28.4	207°04.0	02.7	Schedar	349°27.4	56°41.8
3	264°20.1	215°48.0	• • 40.6	88°06.7	• • 41.7	65°05.6	• • 28.3	222°06.1	• • 02.8	Diphda	348°44.1	-17°49.5
4	279°22.6	230°47.4	41.5	103°09.4	41.7	80°08.4	28.2	237°08.3 252°10.4	02.9	Achernar	$335^{\circ}18.3$	-57°05.2
5 6	294°25.0 309°27.5	245°46.7 260°46.1	42.5 N17°43.4	118°12.0 133°14.7	41.6 N03°41.6	95°11.1 110°13.8	28.1 \$06°28.0	267°12.6	03.0 N14°03.1	Hamal	327°47.6	23°36.0
7	324°30.0	275° 45.5	44.3	148°17.3	41.5	125°16.5	27.9	282°14.7	03.2	Polaris	312°36.6	89°23.2
8	339°32.4	290° 44.9	45.2	163°19.9	41.5	140°19.3	27.8	202 14.7 297°16.9	03.2	Acamar	$315^{\circ}09.6$	-40°11.3
9	354°34.9	305°44.2	. 46.1	178°22.6	• • 41.5	155°22.0	•• 27.7	312°19.0	• • 03.4	Menkar	314°02.8	4°12.2
10	9°37.4	320°43.6	47.0	193°25.2	41.4	170°24.7	27.6	327°21.2	03.5	Mirfak	308°23.7	49°57.8
11	24°39.8	335°43.0	47.9	208°27.8	41.4	185°27.5	27.5	342°23.3	03.6	Aldebaran	290°35.9	16°33.9
12	39°42.3	350°42.3	N17°48.8	223°30.5	N03°41.3	200°30.2	S06°27.4	357°25.5	N14°03.7	Rigel	281°00.8	-8°10.3
13	54°44.8	5°41.7	49.7	238°33.1	41.3	215°32.9	27.3	12°27.6	03.8	Capella	280°17.1	46°01.6
14	69°47.2	20°41.1	50.6	253°35.7	41.2	230°35.6	27.2	27°29.8	03.9	Bellatrix	278°19.4	6°22.4
15	84°49.7	35°40.4	• • 51.5	268°38.4	• • 41.2	245°38.4	• • 27.1	42°31.9	• • 04.0	Elnath	277°57.8	28°37.8
16	99°52.2	50°39.8	52.4	283°41.0	41.1	260°41.1	27.0	57°34.1	04.1	Alnilam	275°34.5	-1°11.2 7°24.6
17	114°54.6	65°39.2	53.3	298°43.6	41.1	275°43.8	26.9	72°36.2	04.2	Betelgeuse Canopus	270°48.6 263°51.2	-52°43.0
18	129°57.1	80°38.5	N17°54.1	313°46.2	N03°41.0	290°46.6	S06°26.8	87°38.4	N14°04.3	Sirius	258°23.4	-16° 45.7
19	144°59.5	95°37.9	55.0	328°48.9	41.0	305°49.3	26.7	102°40.5	04.4	Adhara	255°03.3	-10 43.7 -29°01.1
20	160°02.0	110°37.3	55.9	343°51.5	40.9	320°52.0	26.6	117°42.7	04.5	Procyon	244°47.3	5°08.8
21	175°04.5	125°36.6	• • 56.8	358°54.1	• • 40.9	335°54.7	• • 26.5	132°44.8	• • 04.6	Pollux	243°13.2	27°57.2
22	190°06.9	140°36.0	57.7	13°56.7	40.8	350°57.5	26.4	147°47.0	04.6	Avior	234°13.3	-59°36.6
23	205°09.4	155°35.4	58.6	28°59.4	40.8	6°00.2	26.3	162°49.1	04.7	Suhail	222°43.7	-43°33.5
Mern	ass. 09:22	ν -0.6' d0.	9' m-3.90	ν 2.6′ d-0.	0′ m-0.69	ν2.7' d-0	1' m-2.44	ν2.1' dΩ	.1′ m0.26	Miaplacidus	221°37.3	-69°50.7
										Alphard	217°44.3	-8°47.4
			_		_		_		_	Regulus	207°30.7	11°49.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.6
0	220°11.9	170°34.7	N17°59.5	44°02.0	N03°40.7	21°02.9	S06°26.2	177°51.2	N14°04.8	Denebola	182°21.2	14°24.3
1	235°14.3	185°34.1	18°00.4	59°04.6	40.7	36°05.6	26.1	192°53.4	04.9	Gienah	175°39.7	-17°42.5
2	250°16.8	200°33.5	01.3	74°07.2	40.6	51°08.4	26.0	207°55.5	05.0	Acrux	$172^{\circ}55.4$	-63°16.0
3	265°19.3	215°32.8	• • 02.2	89°09.8	• • 40.6	66°11.1	• • 25.9	222°57.7	• • 05.1	Gacrux	$171^{\circ}47.1$	-57°16.9
4	280°21.7	230°32.2	03.0	104°12.4	40.5	81°13.8	25.8	237°59.8	05.2	Alioth	$166^{\circ}09.6$	55°48.0
5	295°24.2	245°31.5	03.9	119°15.0	40.5	96°16.5	25.7	253°02.0	05.3	Spica	$158^{\circ}18.3$	-11°19.0
6	310°26.7 325°29.1	260°30.9	N18°04.8	134°17.7	N03°40.4	111°19.3	S06°25.6	268°04.1 283°06.3	N14°05.4	Alkaid	152°48.9	49°10.0
7 8	325 29.1 340°31.6	275°30.3 290°29.6	05.7	149°20.3 164°22.9	40.4 40.3	126°22.0 141°24.7	25.5	283 06.3 298°08.4	05.5	Hadar	148°30.2	-60°31.0
9	355°34.0	305° 29.0	06.6 •• 07.5	104 22.9 179°25.5	. 40.3	141 24.7 156°27.4	25.4 •• 25.3	313°10.6	05.6 •• 05.7	Menkent	147°53.0	-36°31.0
10	10°36.5	320° 28.3	08.3	179 23.5 194°28.1	40.3	171°30.2	25.2	328°12.7	05.8	Arcturus	145°44.4	19°01.7
11	25°39.0	335° 27.7	09.2	209°30.7	40.2	186°32.9	25.2	343°14.9	05.9	Rigil Kent.	139°34.7	-60°57.5
12	40°41.4	350°27.0	N18°10.1	209°30.7 224°33.3	N03°40.1	201°35.6	S06°25.0	358°17.0	N14°06.0	Kochab	137°19.0	74°02.0
13	55°43.9	5°26.4	11.0	239°35.9	40.0	216°38.3	24.9	13°19.2	06.1	Zuben'ubi	136°51.8	-16°09.9
14	70°46.4	20°25.8	11.9	254°38.5	40.0	231°41.1	24.8	28°21.3	06.2	Alphecca	126°00.5	26°36.9
15	85°48.8	35°25.1	. 12.7	269°41.1	• • 39.9	246°43.8	24.7	43°23.5	06.3	Antares	112°11.2	-26°29.8
16	100°51.3	50°24.5	13.6	284°43.7	39.9	261°46.5	24.6	58°25.6	06.4	Atria	107°01.8	-69°04.6
17	115°53.8	65°23.8	14.5	299°46.3	39.8	276°49.2	24.5	73°27.8	06.5	Sabik	101°58.5	-15°45.6
18	130°56.2	80°23.2	N18°15.4	314°48.9	N03°39.7	291°52.0	506°24.4	88°29.9	N14°06.6	Shaula	96°05.3 95°55.1	-37°07.3 12°32.3
19	145°58.7	95°22.5	16.2	329°51.5	39.7	306°54.7	24.3	103°32.1	06.7	Rasalhague	95° 55.1	51°28.9
20	161°01.1	110°21.9	17.1	344°54.1	39.6	321°57.4	24.2	118°34.2	06.8	Eltanin Kaus Aust.	90°40.2 83°27.7	-34°22.0
21	176°03.6	125°21.2	• • 18.0	359°56.7	• • 39.6	337°00.1	• • 24.1	133°36.4	• • 06.9	Vega	80°30.6	38° 48.5
22	191°06.1	140°20.6	18.9	14°59.3	39.5	352°02.9	24.0	148°38.5	07.0	Nunki	75°43.3	-26°15.4
23	206°08.5	$155^{\circ}19.9$	19.7	$30^{\circ}01.9$	39.4	$7^{\circ}05.6$	23.9	163°40.7	07.0	Altair	61°56.5	8°56.8
Mern	ass. 09:18	ν -0.6' d0.	9' m-3 90	v2 6' d-0	1' m-0.66	v2 7' d-0	1' m-2.44	v2 1' d0	.1′ m0.25	Peacock	53°00.3	-56°38.0
- IVICI.P	7433. 09.10	ν-0.0 ασ.		ν2.0 u-0.	1 111-0.00	ν2.1 u-0.	1 111-2.77	ν2.1 d0	.1 1110.25	Deneb	49°23.3	45°22.9
										Enif	33°35.4	10°00.6
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°48.8
0	221°11.0	170°19.3	N18°20.6	45°04.4	N03°39.4	22°08.3	S06°23.8		N14°07.1	Fomalhaut	$15^{\circ}11.0$	-29°27.8
1	236°13.5	185°18.7	21.5	60°07.0	39.3	37°11.0	23.7	193°45.0	07.2	Scheat	13°42.0	28°14.4
2	251°15.9	200°18.0	22.3 · · · 23.2	75°09.6	39.2	52°13.7	23.6	208°47.1	07.3 •• 07.4	Markab	13°26.6	15°21.7
3	266°18.4	215° 17.4		90°12.2	• • 39.2	67°16.5	• • 23.5	223°49.2		May 01 Tuo	CHV	Mor pass
4 5	281°20.9 296°23.3	230° 16.7 245° 16.1	24.1 24.9	105°14.8 120°17.4	39.1 39.1	82°19.2 97°21.9	23.4	238°51.4 253°53.5	07.5 07.6	May 01 Tue	SHA 311°37.1	Mer.pass 12:37
6	296°23.3 311°25.8	245° 16.1 260° 15.4	24.9 N18°25.8	120°17.4 135°20.0	39.1 N03°39.0	97°21.9 112°24.6	23.3 \$06°23.2		07.6 N14°07.7		183°46.1	21:04
7	311 25.6 326°28.3	200 15.4 275°14.7	26.7	150°22.5	38.9	112 24.0 127°27.4	23.1	283°57.8	07.8	1	160°44.7	22:36
8	341°30.7	275 14.7 290°14.1	27.5	165°25.1	38.9	142°30.1	23.1	203 57.0 299°00.0	07.8		317°47.0	12:10
9	356°33.2	305° 13.4	. 28.4	180°27.7	• • 38.8	157°32.8	• • 22.9	314°02.1	• • 08.0			
10	11°35.6	320° 12.8	29.3	195°30.3	38.7	172°35.5	22.8	329°04.3	08.1	May 02 Wed	SHA	Mer.pass
11	26°38.1	335°12.1	30.1	210°32.8	38.6	187°38.2	22.8	344°06.4	08.2		310°22.9	12:38
12	41°40.6	350°11.5	N18°31.0	225°35.4	N03°38.6	202°41.0	S06°22.7	359°08.6	N14°08.3		183°50.1	21:00
13	56°43.0	5° 10.8	31.8	240°38.0	38.5	217°43.7	22.6	14°10.7	08.4		160°51.0	22:32
14	71°45.5	20°10.2	32.7	255°40.6	38.4	232°46.4	22.5	29°12.9	08.5	Saturn	317°39.4	12:07
15	86°48.0	35°09.5	• • 33.6	270°43.1	• • 38.4	247°49.1	• • 22.4	44°15.0	• • 08.6	May 03 Thu	SHA	Mer.pass
16	101°50.4	50°08.9	34.4	285°45.7	38.3	262°51.8	22.3	59°17.2	08.7		309°08.3	12:39
17	$116^{\circ}52.9$	65°08.2	35.3	300°48.3	38.2	277°54.6	22.2	$74^{\circ}19.3$	8.80		183°53.4	20:56
18	131°55.4	80° 07.5	N18°36.1	315°50.8	N03°38.2	292°57.3	506°22.1		N14°08.9		$160^{\circ}57.3$	22:27
19	146°57.8	95°06.9	37.0	330°53.4	38.1	308°00.0	22.0	104°23.6	09.0	Saturn	$317^{\circ}31.8$	12:03
20	162°00.3	110°06.2	37.8	345°56.0	38.0	323°02.7	21.9	119°25.8	09.1	11. 1	ما سد…یا	
21	177°02.8	125°05.6	• • 38.7	0°58.5	• • 37.9	338°05.4	• • 21.8	134°27.9	• • 09.2	Horizont	al parallax	0.1
22	192°05.2	140°04.9	39.5	16°01.1	37.9	353°08.2	21.7	149°30.1	09.2		Venus: Mars:	0.1 0.2
23	207°07.7	155°04.3	40.4	31°03.6	37.8	8°10.9	21.6	164°32.2	09.3		iviars:	0.2
Mer.p	ass. 09:14	ν -0.6′ d0.	9′ m-3.90	ν 2.6′ d-0.	1′ m-0.64	ν 2.7′ d-0.	1′ m-2.43	ν 2.1′ d0	.1′ m0.24			

h	Sur	า			Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°43.3	$N15^{\circ}05.9$	$324^{\circ}11.5$	4.0'	S 24°27.2	0.6'	59.6'		
1	195°43.4	06.7	338°34.5	4.0'	24°27.9	0.4'	59.5'		
2	210° 43.5 225° 43.5	07.4 •• 08.2	352°57.5 7°20.6	4.1' 4.1'	24°28.3 24°28.6	0.3' 0.1'	59.5' 59.5'		
4	240°43.6	08.9	21°43.7	4.2'	24°28.6	-0.1	59.4'		
5	255°43.7	09.7	$36^{\circ}06.9$	4.2'	$24^{\circ}28.6$	-0.2'	59.4'		
6	270°43.8	N15° 10.4	50°30.1	4.3'	\$24°28.3	-0.4'	59.4'		
7 8	285°43.8 300°43.9	11.2 11.9	64°53.4 79°16.7	4.3' 4.4'	24°27.9 24°27.3	-0.6' -0.8'	59.3' 59.3'		
9	315° 44.0	12.7	93°40.1	4.5'	24°26.6	-0.9	59.2		
10	330°44.0	13.4	$108^{\circ}03.6$	4.5'	$24^{\circ}25.7$	-1.1'	59.2'		
11	345°44.1	14.2	122°27.1	4.6'	24°24.6	-1.2'	59.2'		
12 13	0°44.2 15°44.3	N15° 14.9 15.7	136°50.7 151°14.3	4.7' 4.7'	\$24°23.3 24°21.9	-1.4' -1.6'	59.1' 59.1'		
14	30°44.3	16.4	165°38.0	4.8'	24°20.3	-1.7'	59.1		
15	45°44.4	• • 17.2	$180^{\circ}01.8$	4.9'	$24^{\circ}18.6$	-1.9'	59.0'		
16	60°44.5	17.9	194°25.7	4.9'	24°16.7	-2.1'	59.0'		
17 18	75° 44.6 90° 44.6	18.7 N15° 19.4	208°49.6 223°13.6	5.0' 5.1'	24°14.7 5 24°12.4	-2.2' -2.4'	58.9' 58.9'		
19	105°44.7	20.2	223 13.0 237°37 7	5.1 5.2'	24°10.1	-2.4 -2.5'	58.9'		
20	120°44.8	20.9	252°01.9	5.2'	24°07.5	-2.7'	58.8'		
21	135°44.8	• • 21.7	$266^{\circ}26.2$	5.3'	24°04.9	-2.8'	58.8'		
22	150°44.9	22.4	280°50.5	5.4'	24°02.0	-3.0'	58.7'		
23	165°45.0	23.2	295°14.9 5.5' 23°59.0 -3.1' 58						
	SD = 15.9'	d = 0.8'		SD	0 = 16.2'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°45.1	$N15^{\circ}23.9$	309°39.4	5.6'	S23°55.9	-3.3'	58.7'		
1	195°45.1	24.7	324°04.0	5.7'	23°52.6	-3.4'	58.6'		
2	210° 45.2 225° 45.3	25.4 •• 26.1	338°28.6 352°53.4	5.8' 5.8'	23°49.2 23°45.6	-3.6' -3.7'	58.6' 58.5'		
4	240° 45.3	26.9	7°18.3	5.9'	23°41.8	-3.1' -3.9'	58.5		
5	255° 45.4	27.6	21°43.2	6.0'	23°38.0	-4.0'	58.5'		
6	270°45.5	$N15^{\circ}28.4$	36°08.2	6.1'	S23°33.9	-4.2'	58.4'		
7	285°45.5	29.1	50°33.4	6.2'	23°29.8	-4.3'	58.4'		
8 9	300° 45.6 315° 45.7	29.9 · · 30.6	64°58.6 79°23.9	6.3' 6.4'	23°25.4 23°21.0	-4.5' -4.6'	58.3' 58.3'		
10	330° 45.7	31.3	93°49.3	6.5	23°16.4	-4.7'	58.3		
11	345° 45.8	32.1	108° 14.8	6.6'	23°11.7	-4.9'	58.2'		
12	0°45.9	N15°32.8	122°40.4	6.7'	S23°06.8	-5.0'	58.2'		
13 14	15° 45.9 30° 46.0	33.6 34.3	137°06.1 151°31.9	6.8' 6.9'	23°01.8 22°56.7	-5.1' -5.3'	58.1' 58.1'		
15	45°46.1	35.0	165°57.8	7.0'	22°51.4	-5.4'	58.1		
16	60°46.1	35.8	180°23.8	7.1'	22°46.0	-5.5'	58.0'		
17	75°46.2	36.5	$194^{\circ}49.9$	7.2'	$22^{\circ}40.5$	-5.7'	58.0'		
18	90°46.3 105°46.3	N15° 37.2	209° 16.1	7.3'	\$22°34.8	-5.8'	57.9'		
19 20	105°46.3 120°46.4	38.0 38.7	223°42.5 238°08.9	7.4' 7.5'	22°29.0 22°23.1	-5.9' -6.0'	57.9' 57.9'		
21	135° 46.5	• • 39.5	252° 35.4	7.6'	22°17.1	-6.2'	57.8'		
22	150°46.5	40.2	267°02.0	7.7'	22°10.9	-6.3	57.8'		
23	165°46.6	40.9	281°28.7	7.8'	22°04.6	-6.4'	57.7'		
	SD = 15.9'	d = 0.7'		SD	0 = 16.0'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°46.7	N15°41.7	295°55.6	7.9'	S21°58.2	-6.5'	57.7'		
1	195°46.7	42.4	310°22.5	8.0'	21°51.7 21°45.1	-6.6' -6.8'	57.7'		
2	210° 46.8 225° 46.9	43.1 •• 43.9	324°49.6 339°16.7	8.2' 8.3'	21°45.1 21°38.3	-6.8° -6.9°	57.6' 57.6'		
4	240°46.9	44.6	353°44.0	8.4'	21°31.4	-7.0'	57.5		
5	255°47.0	45.3	8°11.3	8.5'	$21^{\circ}24.5$	-7.1'	57.5'		
6	270° 47.0	N15°46.1	22°38.8	8.6'	\$21°17.4	-7.2'	57.5'		
7 8	285° 47.1 300° 47.2	46.8 47.5	37°06.4 51°34.1	8.7' 8.8'	21°10.2 21°02.9	-7.3' -7.4'	57.4' 57.4'		
9	315° 47.2	· · 48.3	66°01.9	8.9'	21 02.9 20°55.5	-7.4 -7.5'	57.4 57.3'		
10	330°47.3	49.0	80°29.8	9.0'	20°47.9	-7.6'	57.3		
11	345° 47.4	49.7	94°57.8	9.1'	20°40.3	-7.7'	57.3'		
12 13	0°47.4 15°47.5	N15°50.4 51.2	109°25.9 123°54.1	9.2' 9.3'	\$20°32.6 20°24.7	-7.8' -7.9'	57.2' 57.2'		
13 14	15°47.5 30°47.5	51.2 51.9	123°54.1 138°22.4	9.3° 9.4'	20° 24.7 20° 16.8	-7.9 -8.0'	57.2 57.1'		
15	45° 47.6	52.6	152°50.9	9.5'	20°08.8	-8.1	57.1		
16	60°47.7	53.4	167° 19.4	9.6'	20°00.7	-8.2'	57.1'		
17	75° 47.7	54.1	181°48.0	9.7'	19°52.4	-8.3'	57.0'		
18 19	90° 47.8 105° 47.8	N15°54.8 55.5	196° 16.8 210° 45.6	9.9' 10.0'	\$19°44.1 19°35.7	-8.4' -8.5'	57.0' 57.0'		
20	105 47.8 120°47.9	55.5 56.3	210 45.6 225°14.6	10.0	19 35.7 19°27.2	-8.6'	57.0 56.9'		
21	135°48.0	• • 57.0	239°43.7	10.2'	19°18.6	-8.7'	56.9'		
22	150°48.0	57.7	254°12.8	10.3'	19°09.9	-8.8'	56.8'		
23	165°48.1	58.4	268°42.1	10.4'	19°01.2	-8.9'	56.8'		
	SD = 15.9'	d = 0.7'	SD = 15.7'						

1 -4	Twi	light	Sunrise	Sunset	Twi	Naut //// //// //// 23:21 22:23 21:55 21:30 21:12 20:58 20:24 20:20 20:01 19:46 19:34 19:14 18:59 18:47 18:36 18:26 18:17 18:12 18:08 17:55 17:55 17:55 17:48 17:48 17:48
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	////	01:42	22:20	////	////
N 70°	////	////	02:24	21:35	////	//// //// //// 23:2: 21:5: 21:3: 21:1: 20:5: 20:4: 20:2: 20:0: 19:4: 19:3: 19:1: 18:5: 18:4: 18:3: 18:1: 18:0: 18:0: 17:5: 17:5: 17:5: 17:5: 17:4: 17:4:
68°	////	00:52	02:52	21:06	23:17	////
66°	////	01:47	03:13	20:44	22:12	////
64°	////	02:19	03:29	20:27	21:38	////
62°	00:46	02:43	03:43	20:13	21:14	23:21
60°	01:36	03:01	03:55	20:01	20:55	22:23
N 58°	02:05	03:16	04:05	19:51	20:40	21:53
56°	02:26	03:29	04:13	19:42	20:27	21:30
54°	02:44	03:39	04:21	19:34	20:16	21:12
52°	02:58	03:49	04:28	19:27	20:06	20:58
	03:10	03:58	04:34	19:21	19:58	20:45
N 70° 68° 66° 64° 62° 50° 54° 52° 50° 40° 35° 30° 20° N 10° 5 10° 20° 35° 40° 45° 55° 55° 55° 56° 58° 56° 58° 58° Lat.	03:35	04:15	04:48	19:07	19:40	20:20
N 40°	03:53	04:29	04:59	18:56	19:25	20:01
35°	04:08	04:41	05:08	18:46	19:14	19:46
30°	04:21	04:51	05:16	18:38	19:04	19:34
20°	04:40	05:07	05:30	18:24	18:47	19:14
	04:55	05:20	05:42	18:12	18:34	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:54	06:16	17:37	18:00	18:26
30°	05:36	06:05	06:30	17:24	17:49	18:17
35°	05:41	06:11	06:37	17:16	17:42	18:12
	05:46	06:18	06:46	17:07	17:36	18:08
45°	05:50	06:25	06:56	16:57	17:28	18:03
20° 30° 35° 40° 45° S 50°	05:56	06:34	07:08	16:45	17:19	17:58
52°	05:58	06:38	07:14	16:39	17:15	17:55
54°	06:00	06:42	07:20	16:33	17:11	17:53
56°	06:03	06:47	07:27	16:26	17:06	17:50
	06:05	06:52	07:35	16:18	17:01	17:48
S 60°	06:08	06:58	07:44	16:09	16:55	17:45
Lat		Moonris	ie		Moonset	t
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
600			02.44			05.10

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

			Sun		Moon				
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age		
	Day	00 ^h	12 ^h	Pass	Upper	Lower	18-20		
L		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-74%		
	01	02:53	02:57	11:57	02:29	15:00			
	02	03:00	03:04	11:57	03:30	15:58			
L	03	03:07	03:10	11:57	04:26	16:53			

h _	Aries	Ve	nus	M	ars	Jup	oiter	Satu	rn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	222°10.1	170°03.6	N18°41.2	46°06.2	N03°37.7	23°13.6	S06°21.5	179°34.4	N14°09.4	Alah ayata	357°31.4	29°15.1
1	237°12.6	185°02.9	42.1	61°08.8	37.6	38°16.3	21.4	194°36.5	09.5	Alpheratz	357 31.4 353°04.2	-42°08.6
2	252°15.1	200°02.3	42.9	76°11.3	37.6	53°19.0	21.3	209°38.6	09.6	Ankaa Schedar	349°27.4	56°41.8
3	267°17.5	$215^{\circ}01.6$	• • 43.8	$91^{\circ}13.9$	• • 37.5	68°21.8	• • 21.2	224°40.8	• • 09.7	Diphda	348°44.1	-17°49.5
4	282°20.0	230°00.9	44.6	$106^{\circ}16.4$	37.4	83°24.5	21.1	239°42.9	09.8	Achernar	335°18.3	-17 49.3 -57°05.2
5	297°22.5	245°00.3	45.5	121°19.0	37.3	98°27.2	21.0	254°45.1	09.9	Hamal	327°47.6	23°36.0
6	312°24.9	259°59.6	N18°46.3	$136^{\circ}21.5$	N03°37.3	113°29.9	506°20.9		N14° 10.0	Polaris	312°36.5	89°23.1
7	327°27.4	274°59.0	47.2	151°24.1	37.2	128°32.6	20.8	284°49.4	10.1	Acamar	315°09.6	-40°11.3
8	342°29.9	289°58.3	48.0	166°26.6	37.1	143°35.3	20.7	299°51.5	10.2	Menkar	314°02.8	4°12.2
9	357°32.3	304°57.6	• • 48.8	181°29.2	• • 37.0	158°38.1	• • 20.6	314°53.7	• • 10.3	Mirfak	308°23.7	49°57.8
10	12°34.8	319°57.0	49.7	196°31.7	36.9	173°40.8	20.5	329°55.8	10.4	Aldebaran	290°35.9	16°33.9
11	27°37.3	334°56.3	50.5	211°34.3	36.9	188°43.5	20.5	344°58.0	10.5	Rigel	281°00.8	-8°10.3
12	42°39.7	349°55.6	N18°51.4	226°36.8	N03°36.8	203°46.2	S06°20.4		N14° 10.6	Capella	280°17.1	46°01.6
13	57°42.2	4°55.0	52.2	241°39.4	36.7	218°48.9	20.3	15°02.3	10.7	Bellatrix	278°19.4	6°22.4
14	72°44.6	19°54.3	53.0	256°41.9	36.6	233°51.6	20.2	30°04.4	10.8	Elnath	277°57.8	28°37.8
15	87°47.1	34°53.6	• • 53.9	271°44.4	· · 36.5	248°54.4	• • 20.1	45°06.6	• 10.9	Alnilam	275°34.5	$-1^{\circ}11.2$
16	102°49.6	49°53.0	54.7	286°47.0	36.4	263°57.1	20.0	60°08.7	11.0	Betelgeuse	270°48.6	7°24.6
17	117°52.0	64° 52.3	55.5	301°49.5	36.4	278°59.8	19.9	75°10.9	11.1	Canopus	263°51.2	-52°43.0
18	132°54.5	79°51.6	N18°56.4	316°52.1	N03°36.3	294°02.5	506° 19.8		N14°11.2	Sirius	258°23.4	-16°45.7
19	147°57.0	94°51.0	57.2	331°54.6	36.2	309°05.2	19.7	105°15.2	11.3	Adhara	255°03.3	-29°01.1
20	162°59.4	109°50.3	58.0	346°57.1	36.1	324°07.9	19.6	120°17.3	11.3	Procyon	244°47.3	5°08.8
21	178°01.9	124°49.6 139°48.9	· · 58.9	1°59.7	36.0	339°10.7	· · 19.5	135°19.5	11.4	Pollux	243°13.2	27°57.2
22	193°04.4		18°59.7	17°02.2	35.9	354°13.4	19.4	150°21.6	11.5	Avior	234°13.3	-59°36.6
23	208°06.8	154°48.3	19°00.5	32°04.7	35.9	9°16.1	19.3	165°23.8	11.6	Suhail	222°43.7	-43°33.5
Mer.p	ass. 09:10	ν -0.7 $'$ d0	.8′ m-3.90	ν 2.6′ d-0	.1′ m-0.62	ν 2.7′ d-0	.1′ m-2.43	$ u 2.1' \ d0.1$	′ m0.23	Miaplacidus	221°37.3	-69°50.7
										Alphard	217°44.3	-8°47.4
C-4	CIIA	CIIA	D	CIIA	D	CIIA	D	CIIA	D	Regulus	207°30.7	11°49.2
Sat	GHA 223°09.3	GHA 169° 47.6	Dec	GHA	Dec	GHA	Dec	GHA 180°25.9	Dec	Dubhe	193°36.6	61°35.6
0 1	223 09.3 238°11.7	169 47.6 184°46.9	N19°01.4 02.2	47°07.3 62°09.8	N03°35.8 35.7	24°18.8 39°21.5	S06° 19.2 19.1	180 25.9 195°28.0	N14°11.7	Denebola	182°21.2	14°24.3
2	250 11.7 253°14.2	199°46.3		77°12.3		54°24.2		210°30.2	11.8	Gienah	175°39.7	-17°42.5
3	253 14.2 268°16.7	199 46.3 214°45.6	03.0 · · 03.9	92°14.8	35.6 •• 35.5	54 24.2 69°26.9	19.0 • • 18.9	210 30.2 225°32.3	11.9 · · 12.0	Acrux	172°55.4	-63°16.0
3 4	283°19.1	214 45.0 229°44.9	04.7	92 14.8 107°17.4	35.4	84°29.7	18.8	225 32.3 240°34.5	12.1	Gacrux	171°47.1	-57°17.0
5	298°21.6	244° 44.2	05.5	107 17.4 122°19.9	35.4	99°32.4	18.8	255°36.6	12.1	Alioth	166°09.6	55°48.0
6	313°24.1	259°43.6	N19°06.3	137°22.4	N03°35.2	99 32.4 114°35.1	506° 18.7		N14° 12.3	Spica	158°18.3	-11°19.0
7	328°26.5	274° 42.9	07.1	157°24.9	35.1	114 33.1 129°37.8	18.6	270 38.8 285°40.9	12.4	Alkaid	152°48.9	49°10.0
8	343°29.0	289°42.2	08.0	167°27.4	35.1	144°40.5	18.5	300°43.1	12.4	Hadar	148°30.2	-60°31.0
9	358°31.5	304°41.5	• • 08.8	182°30.0	• • 35.0	159°43.2	• 18.4	315°45.2	• 12.6	Menkent	147°53.0	-36°31.0
10	13°33.9	319°40.9	09.6	197°32.5	34.9	174°45.9	18.3	330°47.4	12.7	Arcturus	145°44.4	19°01.7
11	28°36.4	334°40.9	10.4	212°35.0	34.8	189°48.6	18.2	345°49.5	12.7	Rigil Kent.	139°34.7	-60°57.5
12	43°38.9	349°39.5	N19°11.2	212 33.0 227°37.5	N03°34.7	204°51.4	S06° 18.1		N14°12.9	Kochab	137°19.0	74°02.0
13	58°41.3	4°38.8	12.1	242°40.0	34.6	219°54.1	18.0	15°53.8	13.0	Zuben'ubi	136°51.8	-16°09.9
14	73°43.8	19°38.1	12.1	257°42.5	34.5	234°56.8	17.9	30°56.0	13.1	Alphecca	126°00.5	26°36.9
15	88°46.2	34°37.5	• • 13.7	272°45.0	• • 34.4	249°59.5	• • 17.8	45°58.1	• 13.2	Antares	112°11.2	-26°29.8
16	103°48.7	49°36.8	14.5	287°47.6	34.3	265°02.2	17.7	61°00.3	13.2	Atria	107°01.7	-69°04.6
17	118°51.2	64°36.1	15.3	302°50.1	34.2	280°04.9	17.6	76°02.4	13.3	Sabik	101°58.5	-15°45.6
18	133°53.6	79°35.4	N19°16.1	317°52.6	N03°34.1	295°07.6	S06°17.5		N14°13.4	Shaula	96°05.3	-37°07.3
19	148°56.1	94°34.7	17.0	332°55.1	34.0	310°10.3	17.4	106°06.7	13.5	Rasalhague	95°55.1	12°32.3
20	163°58.6	109°34.1	17.8	347°57.6	33.9	325°13.1	17.4	121°08.9	13.6	Eltanin	90°40.2	51°28.9
21	179°01.0	124°33.4	• • 18.6	3°00.1	• • 33.8	340°15.8	17.3	136°11.0	· · 13.7	Kaus Aust.	83°27.7	-34°22.0
22	194°03.5	139°32.7	19.4	18°02.6	33.7	355°18.5	17.2	151°13.1	13.8	Vega	80°30.6	38°48.5
23	209°06.0	154°32.0	20.2	33°05.1	33.6	10°21.2	17.1	166°15.3	13.9	Nunki	75°43.3	-26°15.4
										Altair	61°56.4	8°56.8
Mer.p	pass. 09:06	ν -0.7 d0	.8′ m-3.90	$\nu 2.5' d-0$.1′ m-0.60	$\nu 2.7' d-0$.1′ m-2.43	$\nu 2.1' \ d0.1$	′ m0.23	Peacock	53°00.3	-56°38.0
										Deneb Enif	49°23.3 33°35.4	45°22.9 10°00.6
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.8	-46°48.8
0	224°08.4	169°31.3	N19°21.0	48°07.6	N03°33.5	25°23.9	S06° 17.0		N14° 14.0	Fomalhaut	27 20.0 15°10.9	-40 46.6 -29°27.8
1	239°10.9	184°30.7	21.8	63°10.1	33.4	40°26.6	16.9	196°19.6	14.1	Scheat	13°41.9	28°14.4
2	254°13.4	199°30.0	22.6	78°12.6	33.3	55°29.3	16.8	211°21.7	14.2	Markab	13°26.6	15°21.8
3	$269^{\circ}15.8$	214°29.3	• • 23.4	93°15.1	• • 33.2	70°32.0	• • 16.7	226°23.9	• • 14.3			
4	284°18.3	229°28.6	24.2	$108^{\circ}17.6$	33.1	85°34.7	16.6	241°26.0	14.4	May 04 Fri	SHA	Mer.pass
5	299°20.7	244°27.9	25.0	123°20.1	33.0	100°37.4	16.5	256°28.2	14.5	Venus	307°53.4	12:40
6	314°23.2	259°27.2	N19°25.8	138°22.6	N03°32.9	115°40.2	S06°16.4		N14° 14.6	Mars		20:52
7	329°25.7	274°26.5	26.6	153°25.1	32.8	130°42.9	16.3	286°32.5	14.7	Jupiter	161°03.5	22:23
8			27.4	168°27.6	32.7	145°45.6	16.3	301°34.6	14.8	Saturn	317°24.2	12:00
9	344°28.1	289°25.8				4 600 40 0	• • 16.2	0460060	140			Mer.pass
	344°28.1 359°30.6	$304^{\circ}25.2$	• • 28.2	183°30.0	• • 32.6	160°48.3		316°36.8	•• 14.9	May 05 Sat	SHA	
10	344°28.1 359°30.6 14°33.1	304°25.2 319°24.5	· · 28.2 29.0	183°30.0 198°32.5	32.5	175°51.0	16.1	331°38.9	15.0	May 05 Sat	SHA 306°38.3	
10 11	344°28.1 359°30.6 14°33.1 29°35.5	304°25.2 319°24.5 334°23.8	· · 28.2 29.0 29.8	183°30.0 198°32.5 213°35.0	32.5 32.4	175°51.0 190°53.7	16.1 16.0	331°38.9 346°41.1	15.0 15.1	Venus	$306^{\circ}38.3$	12:41
10 11 12	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0	304°25.2 319°24.5 334°23.8 349°23.1	28.2 29.0 29.8 N19°30.6	183°30.0 198°32.5 213°35.0 228°37.5	32.5 32.4 N03°32.3	175°51.0 190°53.7 205°56.4	16.1 16.0 \$06°15.9	331°38.9 346°41.1 1°43.2	15.0 15.1 N14°15.1	Venus Mars	306°38.3 183°58.0	12:41 20:48
10 11 12 13	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4	28.2 29.0 29.8 N19°30.6 31.4	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0	32.5 32.4 N03°32.3 32.2	175°51.0 190°53.7 205°56.4 220°59.1	16.1 16.0 S06°15.9 15.8	331°38.9 346°41.1 1°43.2 16°45.4	15.0 15.1 N14°15.1 15.2	Venus Mars Jupiter	306°38.3 183°58.0 161°09.5	12:41 20:48 22:19
10 11 12 13 14	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9	304° 25.2 319° 24.5 334° 23.8 349° 23.1 4° 22.4 19° 21.7	28.2 29.0 29.8 N19°30.6 31.4 32.2	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5	32.5 32.4 N03°32.3 32.2 32.1	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8	16.1 16.0 \$06°15.9 15.8 15.7	331°38.9 346°41.1 1°43.2 16°45.4 31°47.5	15.0 15.1 N14° 15.1 15.2 15.3	Venus Mars Jupiter Saturn	306°38.3 183°58.0 161°09.5 317°16.6	12:41 20:48 22:19 11:57
10 11 12 13 14 15	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0	28.2 29.0 29.8 N19°30.6 31.4 32.2 · · 33.0	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0	32.5 32.4 N03°32.3 32.2 32.1 · · · 32.0	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6	331°38.9 346°41.1 1°43.2 16°45.4 31°47.5 46°49.7	15.0 15.1 N14° 15.1 15.2 15.3 · · 15.4	Venus Mars Jupiter	306°38.3 183°58.0 161°09.5 317°16.6	12:41 20:48 22:19
10 11 12 13 14 15 16	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4 104°47.8	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3	28.2 29.0 29.8 N19° 30.6 31.4 32.2 33.0 33.8	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0 288°47.4	32.5 32.4 N03°32.3 32.2 32.1 · · 32.0 31.9	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2	16.1 16.0 \$06°15.9 15.8 15.7 •• 15.6 15.5	331°38.9 346°41.1 1°43.2 16°45.4 31°47.5 46°49.7 61°51.8	15.0 15.1 N14° 15.1 15.2 15.3 •• 15.4 15.5	Venus Mars Jupiter Saturn May 06 Sun Venus	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9	12:41 20:48 22:19 11:57 Mer.pass 12:42
10 11 12 13 14 15 16 17	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4 104°47.8 119°50.3	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3 64°19.6	28.2 29.0 29.8 N19° 30.6 31.4 32.2 33.0 33.8 34.6	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0 288°47.4 303°49.9	32.5 32.4 N03°32.3 32.2 32.1 · · 32.0 31.9 31.8	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9	15.0 15.1 N14° 15.1 15.2 15.3 •• 15.4 15.5 15.6	Venus Mars Jupiter Saturn May 06 Sun Venus	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2	12:41 20:48 22:19 11:57 Mer.pass
10 11 12 13 14 15 16 17	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4 104°47.8 119°50.3 134°52.8	304° 25.2 319° 24.5 334° 23.8 349° 23.1 4° 22.4 19° 21.7 34° 21.0 49° 20.3 64° 19.6 79° 18.9	28.2 29.0 29.8 N19°30.6 31.4 32.2 33.0 33.8 34.6 N19°35.4	183° 30.0 198° 32.5 213° 35.0 228° 37.5 243° 40.0 258° 42.5 273° 45.0 288° 47.4 303° 49.9 318° 52.4	32.5 32.4 N03°32.3 32.2 32.1 ··· 32.0 31.9 31.8 N03°31.7	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5 15.4 \$06° 15.3	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1	15.0 15.1 N14° 15.1 15.2 15.3 • 15.4 15.5 15.6 N14° 15.7	Venus Mars Jupiter Saturn May 06 Sun Venus Mars Jupiter	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2 161°15.5	12:41 20:48 22:19 11:57 Mer.pass 12:42
10 11 12 13 14 15 16 17 18 19	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4 104°47.8 119°50.3 134°52.8 149°55.2	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3 64°19.6 79°18.9 94°18.3	28.2 29.0 29.8 N19°30.6 31.4 32.2 33.0 33.8 34.6 N19°35.4 36.2	183°30.0 198°32.5 213°35.0 228°37.5 243°40.2 258°42.5 273°45.0 288°47.4 303°49.9 318°52.4 333°54.9	32.5 32.4 N03°32.3 32.2 32.1 · 32.0 31.9 31.8 N03°31.7 31.6	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6 311°15.4	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5 15.4 \$06° 15.3 15.3	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1 106° 58.2	15.0 15.1 N14° 15.1 15.2 15.3 · 15.4 15.5 15.6 N14° 15.7 15.8	Venus Mars Jupiter Saturn May 06 Sun Venus Mars	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2	12:41 20:48 22:19 11:57 Mer.pass 12:42 20:44
10 11 12 13 14 15 16 17 18 19 20	344°28.1 359°30.6 14°33.1 29°35.5 44°38.0 59°40.5 74°42.9 89°45.4 104°47.8 119°50.3 134°52.8 149°55.2 164°57.7	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3 64°19.6 79°18.9 94°18.3 109°17.6	28.2 29.0 29.8 N19°30.6 31.4 32.2 33.0 33.8 34.6 N19°35.4 36.2 37.0	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0 288°47.4 303°49.9 318°52.4 333°54.9 348°57.3	32.5 32.4 N03° 32.3 32.2 32.1 · · 32.0 31.9 31.8 N03° 31.7 31.6 31.5	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6 311°15.4 326°18.1	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5 15.4 \$06° 15.3 15.3 15.2	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1 106° 58.2 122° 00.4	15.0 15.1 N14° 15.1 15.2 15.3 · 15.4 15.5 15.6 N14° 15.7 15.8 15.9	Venus Mars Jupiter Saturn May 06 Sun Venus Mars Jupiter Saturn	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2 161°15.5 317°09.0	12:41 20:48 22:19 11:57 Mer.pass 12:42 20:44 22:14
10 11 12 13 14 15 16 17 18 19 20 21	344° 28.1 359° 30.6 14° 33.1 29° 35.5 44° 38.0 50° 40.5 74° 42.9 89° 45.4 104° 47.8 119° 50.3 134° 52.8 149° 55.2 164° 57.7 180° 00.2	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3 64°19.6 79°18.9 94°18.3 109°17.6 124°16.9	28.2 29.0 29.8 N19°30.6 31.4 32.2 33.0 33.8 34.6 N19°35.4 36.2 37.0 37.8	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0 288°47.4 303°49.9 318°52.4 333°54.9 348°57.3 3°59.8	32.5 32.4 N03°32.3 32.2 32.1 ··· 32.0 31.9 31.8 N03°31.7 31.6 31.5 ··· 31.3	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6 311°15.4 326°18.1 341°20.8	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5 15.4 \$06° 15.3 15.3 15.2 •• 15.1	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1 106° 58.2 122° 00.4 137° 02.5	15.0 15.1 N14° 15.1 15.2 15.3 · 15.4 15.5 15.6 N14° 15.7 15.8 15.9 · 16.0	Venus Mars Jupiter Saturn May 06 Sun Venus Mars Jupiter Saturn	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2 161°15.5 317°09.0	12:41 20:48 22:19 11:57 Mer.pass 12:42 20:44 22:14 11:53
10 11 12 13 14 15 16 17 18 19 20 21 22	344° 28.1 359° 30.6 14° 33.1 29° 35.5 44° 38.0 59° 40.5 74° 42.9 89° 45.4 104° 47.8 119° 50.3 134° 52.8 149° 55.2 164° 57.7 180° 00.2 195° 02.6	304° 25.2 319° 24.5 334° 23.8 349° 23.1 4° 22.4 19° 21.7 34° 21.0 49° 20.3 64° 19.6 79° 18.9 94° 18.3 109° 17.6 124° 16.9 139° 16.2	. · · 28.2 29.0 29.8 N19° 30.6 31.4 32.2 · · · 33.0 33.8 34.6 N19° 35.4 36.2 37.0 · · 37.8 38.5	183° 30.0 198° 32.5 213° 35.0 228° 37.5 243° 40.0 258° 42.5 273° 45.0 288° 47.4 303° 49.9 318° 52.4 333° 54.9 348° 57.3 3° 59.8 19° 02.3	32.5 32.4 N03°32.3 32.2 32.1 ·· 32.0 31.9 31.8 N03°31.7 31.6 31.5 ·· 31.3	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6 311°15.4 326°18.1 341°20.8 356°23.5	16.1 16.0 \$06° 15.9 15.8 15.7 15.6 15.5 15.4 \$06° 15.3 15.3 15.2 15.1 15.0	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1 106° 58.2 122° 00.4 137° 02.5 152° 04.7	15.0 15.1 N14° 15.1 15.2 15.3 · 15.4 15.5 15.6 N14° 15.7 15.8 15.9 · 16.0 16.1	Venus Mars Jupiter Saturn May 06 Sun Venus Mars Jupiter Saturn	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2 161°15.5 317°09.0	12:41 20:48 22:19 11:57 Mer.pass 12:42 20:44 22:14 11:53
10 11 12 13 14 15 16 17 18 19 20 21	344° 28.1 359° 30.6 14° 33.1 29° 35.5 44° 38.0 50° 40.5 74° 42.9 89° 45.4 104° 47.8 119° 50.3 134° 52.8 149° 55.2 164° 57.7 180° 00.2	304°25.2 319°24.5 334°23.8 349°23.1 4°22.4 19°21.7 34°21.0 49°20.3 64°19.6 79°18.9 94°18.3 109°17.6 124°16.9	28.2 29.0 29.8 N19°30.6 31.4 32.2 33.0 33.8 34.6 N19°35.4 36.2 37.0 37.8	183°30.0 198°32.5 213°35.0 228°37.5 243°40.0 258°42.5 273°45.0 288°47.4 303°49.9 318°52.4 333°54.9 348°57.3 3°59.8	32.5 32.4 N03°32.3 32.2 32.1 ··· 32.0 31.9 31.8 N03°31.7 31.6 31.5 ··· 31.3	175°51.0 190°53.7 205°56.4 220°59.1 236°01.8 251°04.5 266°07.2 281°09.9 296°12.6 311°15.4 326°18.1 341°20.8	16.1 16.0 \$06° 15.9 15.8 15.7 •• 15.6 15.5 15.4 \$06° 15.3 15.3 15.2 •• 15.1	331° 38.9 346° 41.1 1° 43.2 16° 45.4 31° 47.5 46° 49.7 61° 51.8 76° 53.9 91° 56.1 106° 58.2 122° 00.4 137° 02.5	15.0 15.1 N14° 15.1 15.2 15.3 · 15.4 15.5 15.6 N14° 15.7 15.8 15.9 · 16.0	Venus Mars Jupiter Saturn May 06 Sun Venus Mars Jupiter Saturn	306°38.3 183°58.0 161°09.5 317°16.6 SHA 305°22.9 183°59.2 161°15.5 317°09.0	12:41 20:48 22:19 11:57 Mer.pass 12:42 20:44 22:14 11:53

h	Sui						
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.1	N15°59.2	283°11.5	10.5'	S 18°52.3	-8.9'	56.8'
1	195°48.2	$15^{\circ}59.9$	297°41.0	10.6'	18°43.4	-9.0'	56.7'
2	210°48.3	16°00.6	312°10.6	10.7'	18°34.3	-9.1'	56.7'
3	225°48.3	• • 01.3	326°40.2	10.8'	18°25.2	-9.2'	56.7'
4 5	240°48.4 255°48.4	02.0 02.8	341°10.0 355°39.9	10.9' 11.0'	18°16.0 18°06.8	-9.3' -9.3'	56.6' 56.6'
6	270°48.5	N16°03.5	10°09.9	11.1'	S17°57.4	-9.3 -9.4'	56.5
7	285°48.5	04.2	24°40.0	11.2'	17°48.0	-9.5'	56.5
8	300°48.6	04.9	39°10.2	11.3'	17°38.5	-9.6'	56.5'
9	315°48.7	• • 05.6	53°40.5	11.4'	17°28.9	-9.7'	56.4'
10	330°48.7	06.4	68°10.9	11.5'	17°19.3	-9.7'	56.4'
11	345°48.8 0°48.8	07.1	82°41.3	11.6'	17°09.5	-9.8'	56.4'
12 13	15°48.8	N16°07.8 08.5	97°11.9 111°42.6	11.7' 11.8'	\$16°59.7 16°49.9	-9.9' -9.9'	56.3' 56.3'
14	30°48.9	09.2	126°13.4	11.9	16°39.9	-9.9 -10.0'	56.3
15	45°49.0	10.0	140°44.2	12.0'	16°29.9	-10.1'	56.2'
16	60°49.0	10.7	155°15.2	12.1'	$16^{\circ}19.9$	-10.1'	56.2'
17	75°49.1	11.4	169°46.2	12.1'	$16^{\circ}09.7$	-10.2'	56.2'
18	90°49.1	N16°12.1	184°17.4	12.2'	S15°59.5	-10.3'	56.1'
19	105°49.2 120°49.3	12.8	198°48.6 213°19.9	12.3'	15°49.3 15°39.0	-10.3'	56.1
20 21	120°49.3 135°49.3	13.5 •• 14.2	213°19.9 227°51.4	12.4' 12.5'	15°39.0 15°28.6	-10.4' -10.4'	56.1' 56.0'
22	150°49.4	15.0	242°22.9	12.6'	15° 18.1	-10.4	56.0'
23	165°49.4	15.7	256°54.5	12.7'	15°07.6	-10.5	56.0'
	SD = 15.9'	d = 0.7'			D = 15.5'		
		<u>u — 0.1</u>		JL			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°49.5 195°49.5	N16°16.4 17.1	271°26.1 285°57.9	12.8' 12.9'	\$14°57.1 14°46.5	-10.6' -10.7'	55.9' 55.9'
2	210°49.6	17.8	300°29.8	12.9'	14° 35.8	-10.7'	55.9'
3	225°49.6	• • 18.5	315°01.7	13.0'	14°25.1	-10.8'	55.8'
4	240°49.7	19.2	329°33.7	13.1'	$14^{\circ}14.3$	-10.8'	55.8'
5	255°49.7	19.9	344°05.8	13.2'	14°03.5	-10.9'	55.8'
6	270°49.8	N16°20.6	358°38.0	13.3'	\$13°52.6	-10.9'	55.7'
7 8	285°49.8 300°49.9	21.4 22.1	13°10.3 27°42.6	13.3' 13.4'	13°41.7 13°30.7	-11.0' -11.0'	55.7' 55.7'
9	315°49.9	22.8	42°15.1	13.5'	13° 19.7	-11.1'	55.7'
10	330°50.0	23.5	56°47.6	13.6'	13°08.6	-11.1'	55.6'
11	345°50.0	24.2	71°20.2	13.7'	12°57.5	-11.2'	55.6'
12	0°50.1	N16°24.9	85°52.8	13.7'	\$12°46.3	-11.2'	55.6'
13 14	15°50.1 30°50.2	25.6 26.3	100°25.6 114°58.4	13.8' 13.9'	12°35.1 12°23.9	-11.2' -11.3'	55.5' 55.5'
15	45°50.2	27.0	129°31.2	14.0'	12°12.6	-11.3'	55.5'
16	60°50.3	27.7	144°04.2	14.0'	12°01.2	-11.4'	55.4'
17	75°50.3	28.4	$158^{\circ}37.2$	14.1'	$11^{\circ}49.9$	-11.4'	55.4'
18	90°50.4	N16°29.1	173°10.3	14.2'	S11°38.5	-11.4'	55.4'
19	105°50.4	29.8	187°43.5	14.2'	11°27.0	-11.5'	55.4'
20 21	120°50.5 135°50.5	30.5 · · 31.2	202°16.7 216°50.0	14.3' 14.4'	11°15.5 11°04.0	-11.5' -11.6'	55.3' 55.3'
22	150°50.6	31.9	231°23.4	14.4'	10°52.4	-11.6'	55.3'
23	165°50.6	32.6	245°56.8	14.5'	10°40.9	-11.6'	55.3'
	SD = 15.9'	d = 0.7'		SI	D = 15.3'		
C	GHA	Don	GHA		Dee	d	HP
Sun 0	180°50.6	Dec N16°33.3	260°30.3	u 14.6'	Dec \$10°29.2	a -11.7'	пР 55.2'
1	195°50.7	34.0	275°03.9	14.6'	10°17.6	-11.7	55.2'
2	210°50.7	34.7	289°37.5	14.7'	$10^{\circ}05.9$	-11.7'	55.2'
3	225°50.8	• • 35.4	304°11.2	14.7'	09°54.2	-11.8'	55.1'
4	240°50.8	36.1	318°44.9	14.8' 14.9'	09°42.4	-11.8'	55.1'
5 6	255°50.9 270°50.9	36.8 N16°37.5	333°18.7 347°52.6	14.9' 14.9'	09°30.6 S09°18.8	-11.8' -11.8'	55.1' 55.1'
7	270 50.9 285°51.0	38.2	347 52.6 2°26.5	14.9 15.0'	09°07.0	-11.8 -11.9'	55.0'
8	300°51.0	38.9	17°00.5	15.0'	08°55.1	-11.9	55.0'
9	315°51.1	• • 39.6	31°34.5	15.1'	08°43.2	-11.9'	55.0'
10	330°51.1	40.3	46°08.6	15.1'	08°31.3	-11.9'	55.0'
11	345°51.1	41.0 N16°41.7	60°42.8	15.2'	08°19.4	-12.0'	55.0'
12 13	0°51.2 15°51.2	N16°41.7 42.4	75°16.9 89°51.2	15.2' 15.3'	\$08°07.4 07°55.4	-12.0' -12.0'	54.9' 54.9'
13	30°51.3	42.4	89 51.2 104°25.5	15.3'	07 55.4 07°43.4	-12.0'	54.9'
15	45°51.3	• • 43.8	118°59.8	15.4'	07°31.4	-12.0'	54.9'
16	60°51.4	44.5	133°34.2	15.4'	$07^{\circ}19.4$	-12.1'	54.8'
17	75°51.4	45.2	148°08.6	15.5'	07°07.3	-12.1'	54.8'
18	90°51.4 105°51.5	N16°45.9	162°43.1 177°17.6	15.5'	\$06°55.2 06°43.1	-12.1'	54.8'
19 20	105°51.5 120°51.5	46.6 47.3	177°17.6 191°52.2	15.6' 15.6'	06°43.1 06°31.0	-12.1' -12.1'	54.8' 54.8'
21	135°51.6	• • 48.0	206°26.8	15.6'	06°18.8	-12.1	54.7
22	150°51.6	48.6	221°01.4	15.7'	06°06.7	-12.2'	54.7'
23	165°51.6	49.3	235°36.1	15.7'	05°54.5	-12.2'	54.7'
	SD = 15.8'	d = 0.7'		SI	O = 15.1'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age		
Duy	00 ^h	12 ^h	Pass	Upper	Lower	21-23		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-44%		
04	03:13	03:15	11:57	05:18	17:42			
05	03:18	03:20	11:57	06:06	18:28			
06	03:23	03:25	11:57	06:50	19:11			

h	Aries	Ve	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
Mon -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	225°07.6	169°14.8	N19°40.1	49°07.2	N03°31.0	26°28.9	S06°14.8	182°09.0	N14° 16.3			
1	240°10.0	184°14.1	40.9	64°09.7	30.9	41°31.6	14.7	197°11.1	16.4	Alpheratz	357°31.3	29°15.1
2	255°12.5	199°13.4	41.7	79°12.2	30.8	56°34.3	14.6	212°13.3	16.5	Ankaa	353°04.1	-42°08.6
3	270°15.0	214° 12.7	42.5	94°14.6	30.7	71°37.0	• • 14.5	227°15.4	16.6	Schedar	349°27.3	56°41.8
4	285°17.4	229°12.0	43.3	109°17.1	30.6	86°39.7	14.4	242°17.6	16.7	Diphda	348°44.1	-17°49.5
5	300°19.9	244°11.3	44.0	124°19.6	30.5	101°42.4	14.3	257°19.7	16.8	Achernar	335°18.3 327°47.6	-57°05.1 23°36.0
6	315°22.3	$259^{\circ}10.6$	N19°44.8	139°22.0	N03°30.3	$116^{\circ}45.1$	506°14.3	272°21.9	N14°16.9	Hamal Polaris	312°36.5	89°23.1
7	330°24.8	274°09.9	45.6	154°24.5	30.2	131°47.8	14.2	287°24.0	16.9	Acamar	315°09.6	-40°11.3
8	345°27.3	289°09.2	46.4	169°27.0	30.1	146°50.5	14.1	302°26.2	17.0	Menkar	314°02.8	4°12.2
9	0°29.7	304°08.5	• • 47.2	184°29.4	• • 30.0	161°53.2	• • 14.0	317°28.3	• • 17.1	Mirfak	308°23.7	49°57.8
10	15°32.2	319°07.8	47.9	199°31.9	29.9	176°55.9 191°58.6	13.9	332°30.5	17.2	Aldebaran	290°35.9	16°33.9
11 12	30°34.7 45°37.1	334°07.1 349°06.4	48.7 N19°49.5	214°34.3 229°36.8	29.8 N03°29.7	207°01.3	13.8 \$06°13.7	347°32.6 2°34.7	17.3 N14° 17.4	Rigel	$281^{\circ}00.8$	-8°10.3
13	60°39.6	4°05.7	50.3	244°39.3	29.5	207 01.3 222°04.0	13.6	17°36.9	17.5	Capella	$280^{\circ}17.1$	46°01.6
14	75°42.1	19°05.0	51.0	259°41.7	29.4	237°06.7	13.5	32°39.0	17.6	Bellatrix	278°19.4	6°22.4
15	90°44.5	34°04.3	51.8	274°44.2	29.3	252°09.5	• • 13.5	47°41.2	17.7	Elnath	277°57.8	28°37.8
16	105°47.0	49°03.6	52.6	289°46.6	29.2	267°12.2	13.4	62°43.3	17.8	Alnilam	275°34.5	-1°11.2
17	120°49.5	64°02.9	53.3	304°49.1	29.1	282°14.9	13.3	77°45.5	17.9	Betelgeuse	270°48.6	7°24.6
18	135°51.9	79°02.2	N19°54.1	319°51.5	N03°29.0	297°17.6	S06°13.2	92°47.6	N14°18.0	Canopus Sirius	263°51.2 258°23.4	-52°43.0 -16°45.7
19	150°54.4	94°01.5	54.9	334°54.0	28.8	312°20.3	13.1	107°49.8	18.1	Adhara	255°03.3	-10 43.7 -29°01.0
20	165°56.8	109°00.8	55.6	349°56.4	28.7	327°23.0	13.0	122°51.9	18.2	Procyon	244°47.3	5°08.8
21	180°59.3	124°00.1	• • 56.4	4°58.9	• • 28.6	342°25.7	• • 12.9	137°54.1	• • 18.3	Pollux	243°13.2	27°57.2
22	196°01.8	138°59.4	57.2	20°01.3	28.5	357°28.4	12.8	152°56.2	18.4	Avior	234°13.4	-59°36.6
23	211°04.2	153°58.7	57.9	35°03.8	28.4	12°31.1	12.7	167°58.4	18.5	Suhail	222°43.7	-43°33.5
Mer.p	ass. 08:58	ν -0.7 $'$ d0	.8′ m-3.90	$\nu 2.5' \ d-0.$	1' m-0.55	ν 2.7′ d-0.	1' m-2.42	$\nu 2.1' \ d0.$	1' m0.24	Miaplacidus	221°37.4	-69°50.7
										Alphard	217°44.3	-8°47.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.2
0	226°06.7	168°58.0	N19°58.7	50°06.2	N03°28.2	27°33.8	506°12.7	183°00.5	N14°18.5	Dubhe Denebola	193°36.7 182°21.2	61°35.6 14°24.3
1	241°09.2	183°57.3	$19^{\circ}59.5$	65°08.6	28.1	42°36.5	12.6	198°02.7	18.6	Gienah	175°39.7	-17°42.5
2	$256^{\circ}11.6$	198°56.5	$20^{\circ}00.2$	$80^{\circ}11.1$	28.0	57°39.2	12.5	213°04.8	18.7		172°55.4	-63°16.0
3	271°14.1	213°55.8	• • 01.0	95°13.5	• • 27.9	72°41.9	• • 12.4	228°07.0	• • 18.8	Gacrux	171°47.1	-57°17.0
4	286°16.6	228°55.1	01.8	110°16.0	27.7	87°44.6	12.3	243°09.1	18.9	Alioth	166°09.6	55°48.1
5	301°19.0	243°54.4	02.5	125°18.4	27.6	102°47.3	12.2	258°11.3	19.0	Spica	$158^{\circ}18.3$	-11°19.0
6 7	316°21.5 331°23.9	258°53.7 273°53.0	N20°03.3 04.0	140°20.8 155°23.3	N03°27.5 27.4	117°50.0 132°52.7	\$06° 12.1 12.0	273°13.4 288°15.5	N14° 19.1	Alkaid	$152^{\circ}48.9$	49°10.0
8	346°26.4	288°52.3	04.0	155 25.3 170°25.7	27.4	132 52.7 147°55.4	12.0	200 15.5 303°17.7	19.2 19.3	Hadar	148°30.2	-60°31.0
9	1°28.9	303°51.6	• • 05.5	185°28.1	• • 27.1	162°58.1	• • 11.9	318°19.8	19.4	Menkent	147°53.0	-36°31.0
10	16°31.3	318°50.9	06.3	200°30.6	27.0	178°00.8	11.8	333°22.0	19.5	Arcturus	145°44.4	19°01.7
11	31°33.8	333°50.2	07.1	215°33.0	26.9	193°03.5	11.7	348°24.1	19.6	Rigil Kent. Kochab	139°34.7 137°19.0	-60°57.5 74°02.0
12	46°36.3	348°49.4	N20°07.8	230°35.4	N03°26.7	208°06.2	S 06°11.6	3°26.3	N14° 19.7	Zuben'ubi	136°51.8	-16°09.9
13	61°38.7	3°48.7	08.6	245°37.8	26.6	223°08.9	11.5	18°28.4	19.8	Alphecca	126°00.5	26°36.9
14	76°41.2	18°48.0	09.3	260°40.3	26.5	238°11.6	11.4	33°30.6	19.9	Antares	112°11.2	-26°29.8
15	91°43.7	33°47.3	. 10.1	275°42.7	• • 26.4	253°14.3	• • 11.3	48°32.7	• • 20.0	Atria	$107^{\circ}01.7$	-69°04.6
16 17	106°46.1 121°48.6	48°46.6 63°45.9	10.8 11.6	290°45.1 305°47.5	26.2 26.1	268°17.0 283°19.7	11.3 11.2	63°34.9 78°37.0	20.1 20.1	Sabik	101°58.5	-15°45.6
18	136°51.1	78° 45.2	N20°12.3	320°50.0	N03°26.0	298°22.4	S06°11.1	93°39.2	N14° 20.2	Shaula	96°05.3	-37°07.3
19	151°53.5	93°44.4	13.0	335°52.4	25.8	313°25.1	11.0	108°41.3	20.3	Rasalhague	95°55.0	12°32.3
20	166°56.0	108°43.7	13.8	350°54.8	25.7	328°27.8	10.9	123°43.5	20.4	Eltanin Kaus Aust.	90°40.2 83°27.6	51°28.9 -34°22.0
21	181°58.4	123°43.0	• • 14.5	5°57.2	• • 25.6	343°30.5	• • 10.8	138°45.6	• • 20.5	Vega	80°30.6	-34 22.0 38°48.5
22	$197^{\circ}00.9$	138°42.3	15.3	20°59.6	25.4	358°33.1	10.7	153°47.8	20.6	Nunki	75°43.2	-26°15.4
23	212°03.4	153°41.6	16.0	36°02.1	25.3	13°35.8	10.7	168°49.9	20.7	Altair	61°56.4	8°56.8
Mer.p.	ass. 08:54	ν -0.7' d0	.8′ m-3.90	ν 2.4' d-0.	1' m-0.53	$\nu 2.7' \text{ d-0}$	1' m-2.41	$\nu 2.1' d0.$	1' m0.25	Peacock	53°00.2	-56°38.0
										Deneb	49°23.3	45°22.9
10/	CIIA	CIIA	Б	CILA	Б.	CIIA	ъ.	CIIA	Б	Enif	33°35.4	10°00.6
Wed 0	GHA 227°05.8	GHA 168° 40.9	Dec N20°16.8	GHA 51°04.5	Dec N03°25.2	GHA 28°38.5	Dec S 06°10.6	GHA 183°52.1	Dec N14° 20.8	Al Na'ir	27°28.8	-46°48.8
1	242°08.3	183°40.1	17.5	66°06.9	25.0	43°41.2	10.5	198°54.2	20.9	Fomalhaut	15°10.9	-29°27.8
2	257°10.8	198°39.4	18.2	81°09.3	24.9	58°43.9	10.5	213°56.3	21.0	Scheat	13°41.9	28°14.4
3	272°13.2	213°38.7	19.0	96°11.7	• • 24.8	73°46.6	. 10.3	228°58.5	21.1	Markab	13°26.5	15°21.8
4	287°15.7	228°38.0	19.7	111°14.1	24.6	88°49.3	10.2	244°00.6	21.2	May 07 Mon	SHA	Mer.pass
5	$302^{\circ}18.2$	243°37.3	20.5	126°16.5	24.5	$103^{\circ}52.0$	10.1	259°02.8	21.3		304°07.2	12:44
6	$317^{\circ}20.6$	258°36.5	N20°21.2	141°18.9	N03°24.4	118°54.7	S 06° 10.1	274°04.9	N14°21.4		183°59.7	20:40
7	332°23.1	273°35.8	21.9	156°21.3	24.2	133°57.4	10.0	289°07.1	21.5		161°21.3	22:10
8	347°25.5	288°35.1	22.7	171°23.7	24.1	149°00.1	09.9	304°09.2	21.6	Saturn	317°01.4	11:50
9 10	2°28.0 17°30.5	303°34.4 318°33.6	· · 23.4 24.1	186°26.1 201°28.5	· · 24.0 23.8	164°02.8 179°05.5	•• 09.8	319°11.4 334°13.5	• • 21.7	May 08 Tue	SHA	Mer.pass
11	32°32.9	333°32.9	24.1	201°20.5 216°30.9	23.7	179 03.3 194°08.2	09.7 09.6	349°15.7	21.7 21.8		302°51.3	12:45
12	47°35.4	348° 32.2	N20°25.6	231°33.3	N03°23.5	209°10.9	S06°09.5	4°17.8	N14° 21.9		183°59.5	20:36
13	62°37.9	3°31.5	26.3	246°35.7	23.4	224°13.6	09.5	19°20.0	22.0		161°27.1	22:06
14	77°40.3	18°30.8	27.0	$261^{\circ}38.1$	23.3	$239^{\circ}16.3$	09.4	$34^{\circ}22.1$	22.1	Saturn	316°53.8	11:46
15	92°42.8	33°30.0	• • 27.8	276°40.5	• • 23.1	254°19.0	• • 09.3	49°24.3	• • 22.2	May 09 Wed	SHA	Mer.pass
16	107°45.3	48°29.3	28.5	291°42.9	23.0	269°21.7	09.2	64°26.4	22.3		301°35.0	12:46
17	122°47.7	63°28.6	29.2	306°45.3	22.8	284°24.4	09.1	79°28.6	22.4		183°58.6	20:32
18 19	137°50.2 152°52.7	78° 27.8 93° 27.1	N20°29.9 30.7	321°47.7 336°50.1	N03°22.7 22.6	299°27.0 314°29.7	\$06°09.0 08.9	94°30.7 109°32.9	N14°22.5 22.6		161°32.7	22:01
20	167°55.1	93 27.1 108°26.4	31.4	351°52.5	22.4	314 29.7 329°32.4	08.9	109 32.9 124°35.0	22.0	Saturn	316°46.2	11:43
21	182°57.6	123°25.7	32.1	6°54.9	22.3	344°35.1	• • 08.8	139°37.1	• • 22.8	Horizont	al parallax	
22	198°00.0	138°24.9	32.8	21°57.3	22.1	359°37.8	08.7	154°39.3	22.9		Venus:	0.1
23	213°02.5	153°24.2	33.5	36°59.7	22.0	$14^{\circ}40.5$	08.6	169°41.4	23.0		Mars:	0.2
Mer.p	ass. 08:50	ν -0.7′ d0	.7′ m-3.90	ν 2.4′ d-0.	1′ m-0.51	$\nu 2.7' \ d-0.$	1' m-2.41	$\nu 2.1' \ d0.$	1′ m0.26			

h	Sui	า			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.7	N16°50.0	250°10.9	15.8'	\$05°42.3	-12.2'	54.7'
1 2	195°51.7 210°51.8	50.7 51.4	264°45.6 279°20.4	15.8' 15.8'	05°30.1 05°17.9	-12.2' -12.2'	54.7' 54.6'
3	225°51.8	52.1	293°55.3	15.9'	05°05.7	-12.2'	54.6'
4	240°51.8	52.8	308°30.2	15.9'	$04^{\circ}53.5$	-12.2'	54.6'
5	255°51.9	53.5	323°05.1	15.9'	04°41.2	-12.3'	54.6'
6 7	270°51.9 285°52.0	N16°54.2 54.8	337°40.0 352°15.0	16.0' 16.0'	\$04°29.0 04°16.7	-12.3' -12.3'	54.6' 54.5'
8	300°52.0	55.5	6°50.0	16.0'	04°04.4	-12.3'	54.5'
9	315°52.0	• • 56.2	21°25.0	16.1'	03°52.1	-12.3'	54.5'
10 11	330°52.1 345°52.1	56.9 57.6	36°00.1 50°35.2	16.1' 16.1'	03°39.8 03°27.6	-12.3' -12.3'	54.5' 54.5'
12	0°52.2	N16°58.3	65°10.3	16.1	503°15.2	-12.3'	54.5
13	15°52.2	58.9	79°45.4	16.2'	03°02.9	-12.3'	54.4'
14	30°52.2	16°59.6	94°20.6	16.2'	02°50.6	-12.3'	54.4'
15 16	45°52.3 60°52.3	17°00.3 01.0	108°55.8 123°31.0	16.2' 16.2'	02°38.3 02°26.0	-12.3' -12.3'	54.4' 54.4'
17	75°52.3	01.7	138°06.3	16.3'	02°13.7	-12.3'	54.4'
18	90°52.4	$N17^{\circ}02.4$	152°41.5	16.3'	S02°01.3	-12.3'	54.4'
19 20	105°52.4 120°52.4	03.0 03.7	167°16.8 181°52.1	16.3' 16.3'	01°49.0 01°36.7	-12.3' -12.3'	54.3' 54.3'
21	120 52.4 135°52.5	04.4	181 52.1 196°27.4	16.3'	01 36.7 01°24.3	-12.3'	54.3'
22	150°52.5	05.1	211°02.8	16.3'	01°12.0	-12.3'	54.3'
23	165°52.5	05.8	225°38.1	16.4'	00°59.7	-12.3'	54.3'
	SD = 15.8'	d = 0.7'		SI	O = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	180°52.6	$N17^{\circ}06.4$	$240^{\circ}13.5$	16.4'	S00°47.4	-12.3'	54.3'
1	195°52.6	07.1	254°48.8	16.4	00°35.0	-12.3'	54.3'
2	210°52.6 225°52.7	07.8 •• 08.5	269°24.2 283°59.6	16.4' 16.4'	00°22.7 \$00°10.4	-12.3' -12.3'	54.3' 54.2'
4	240°52.7	09.1	298°35.1	16.4	N00°01.9	12.3'	54.2'
5	255°52.7	09.8	$313^{\circ}10.5$	16.4'	$00^{\circ}14.2$	12.3'	54.2'
6	270°52.8 285°52.8	N17°10.5 11.2	327°45.9 342°21.3	16.4' 16.4'	N00°26.5 00°38.8	12.3' 12.3'	54.2' 54.2'
7 8	285 52.8 300°52.8	11.2	342 21.3 356°56.8	16.5	00°51.1	12.3'	54.2'
9	315°52.9	• • 12.5	11°32.2	16.5'	01°03.4	12.3'	54.2'
10	330°52.9	13.2	26°07.7	16.5	01°15.7	12.3'	54.2'
11 12	345°52.9 0°53.0	13.9 N17°14.5	40°43.2 55°18.6	16.5' 16.5'	01°27.9 N01°40.2	12.3' 12.2'	54.1' 54.1'
13	15°53.0	15.2	69°54.1	16.5'	01°52.4	12.2'	54.1'
14	30°53.0	15.9	84°29.6	16.5'	02°04.7	12.2'	54.1'
15 16	45°53.1 60°53.1	· · 16.5 17.2	99°05.0 113°40.5	16.5' 16.5'	02°16.9 02°29.1	12.2' 12.2'	54.1' 54.1'
17	75°53.1	17.2	128° 16.0	16.5	02° 41.3	12.2'	54.1'
18	90°53.2	$N17^{\circ}18.5$	142°51.4	16.5'	N02°53.5	12.2'	54.1'
19	105°53.2 120°53.2	19.2 19.9	157°26.9 172°02.4	16.5' 16.5'	03°05.7 03°17.8	12.2'	54.1' 54.1'
20 21	120 53.2 135°53.2	20.5	172 02.4 186°37.8	16.4	03 17.8 03°30.0	12.1' 12.1'	54.1'
22	150°53.3	21.2	201°13.2	16.4'	03°42.1	12.1'	54.1'
23	165°53.3	21.9	215°48.7	16.4'	03°54.2	12.1'	54.0'
	SD = 15.8'	d = 0.7'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N17°22.5	230°24.1	16.4	N04°06.3	12.1'	54.0'
1 2	195°53.4 210°53.4	23.2 23.9	244°59.5 259°34.9	16.4' 16.4'	04° 18.4 04° 30.5	12.1' 12.0'	54.0' 54.0'
3	225°53.4	24.5	274°10.3	16.4	04° 42.5	12.0'	54.0'
4	240°53.4	25.2	288°45.7	16.4'	04°54.5	12.0'	54.0'
5 6	255°53.5 270°53.5	25.9 N17°26.5	303°21.1 317°56.5	16.4' 16.3'	05°06.5 N05°18.5	12.0' 12.0'	54.0' 54.0'
7	270 53.5 285°53.5	N17 20.5 27.2	317 50.5 332°31.8	16.3'	05°30.5	12.0 11.9'	54.0'
8	300°53.5	27.9	347°07.2	16.3'	05°42.4	11.9'	54.0'
9	315°53.6	• • 28.5	1°42.5	16.3'	05°54.3	11.9'	54.0'
10 11	330°53.6 345°53.6	29.2 29.8	16°17.8 30°53.1	16.3' 16.3'	06°06.2 06°18.1	11.9' 11.8'	54.0' 54.0'
12	0°53.6	N17°30.5	45°28.3	16.2'	N06°29.9	11.8'	54.0'
13	15°53.7	31.2	60°03.6	16.2'	06°41.7	11.8'	54.0'
14 15	30°53.7 45°53.7	31.8 · · 32.5	74°38.8 89°14.0	16.2' 16.2'	06°53.5 07°05.3	11.8' 11.7'	54.0' 54.0'
16	45°53.7	33.1	103°49.2	16.2'	07 05.3 07°17.0	11.7'	54.0'
17	75°53.8	33.8	118°24.3	16.1'	07°28.8	11.7'	53.9'
18	90°53.8	N17°34.4	132°59.4	16.1'	N07°40.4	11.7'	53.9'
19 20	105°53.8 120°53.8	35.1 35.8	147°34.6 162°09.6	16.1' 16.1'	07°52.1 08°03.7	11.6' 11.6'	53.9' 53.9'
21	135°53.9	• • 36.4	$176^{\circ}44.7$	16.0'	08°15.3	11.6'	53.9'
22	150°53.9	37.1	191°19.7	16.0'	08°26.9	11.5'	53.9'
23	165°53.9	37.7	205°54.7	16.0'	08°38.4	11.5'	53.9'
	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°	////	////	00:16	////	////	////
N 70°	////	////	01:44	22:15	////	////
68°	////	////	02:23	21:34	////	////
66°	////	01:01	02:49	21:07	23:02	////
64°	////	01:49	03:09	20:46	22:08	////
62°	////	02:19	03:25	20:30	21:37	////
60°	00:54	02:41	03:39	20:16	21:14	23:07
N 58°	01:38	02:59	03:50	20:04	20:56	22:19
56°	02:05	03:13	04:01	19:54	20:41	21:50
54°	02:26	03:26	04:09	19:45	20:29	21:29
52°	02:43	03:37	04:17	19:37	20:17	21:12
50°	02:57	03:46	04:24	19:30	20:08	20:58
45°	03:24	04:06	04:39	19:14	19:48	20:30
N 40°	03:45	04:22	04:52	19:02	19:32	20:09
35°	04:01	04:35	05:02	18:51	19:19	19:52
30°	04:15	04:46	05:11	18:42	19:08	19:39
20°	04:36	05:04	05:27	18:26	18:50	19:17
N 10°	04:53	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:05	17:47	18:09	18:35
20°	05:29	05:56	06:19	17:34	17:57	18:24
30°	05:40	06:08	06:34	17:19	17:44	18:13
35°	05:45	06:16	06:42	17:10	17:37	18:07
40°	05:51	06:23	06:52	17:01	17:29	18:02
45°	05:57	06:32	07:03	16:49	17:20	17:56
S 50°	06:03	06:42	07:17	16:35	17:10	17:49
52°	06:06	06:47	07:24	16:29	17:05	17:46
54°	06:09	06:52	07:31	16:21	17:00	17:43
56°	06:12	06:57	07:39	16:13	16:55	17:40
58°	06:16	07:04	07:48	16:04	16:49	17:36
S 60°	06:20	07:10	07:58	15:54	16:42	17:33

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	35-18%	
07	03:27	03:29	11:57	07:32	19:52		
08	03:30	03:32	11:56	08:13	20:33		
09	03:33	03:35	11:56	08:53	21:13		

h	Aries	Ve	nus	М	ars	Jup	oiter	Saturr	1		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	228°05.0	168°23.5	N20°34.3	52°02.1	N03°21.8	29°43.2	S06°08.5		.4°23.1			
1	243°07.4	183°22.7	35.0	67°04.4	21.7	44°45.9	08.4	199°45.7	23.1	Alpheratz	357°31.3	$29^{\circ}15.1$
2	258°09.9	198°22.0	35.7	82°06.8	21.7	59°48.6	08.4	214°47.9	23.2	Ankaa	353°04.1	-42°08.6
					. 21.4					Schedar	349°27.3	56°41.7
3	273°12.4	213°21.3	36.4	97°09.2		74°51.3	08.3		• 23.3	Diphda	348°44.1	$-17^{\circ}49.5$
4	288°14.8	228°20.6	37.1	112°11.6	21.3	89°54.0	08.2	244°52.2	23.4	Achernar	335°18.3	-57°05.1
5	303°17.3	243°19.8	37.8	127°14.0	21.1	104°56.7	08.1	259°54.3	23.5	Hamal	327°47.5	23°36.0
6	318°19.8	258° 19.1	N20°38.6	142°16.3	N03°21.0	119°59.3	S06°08.0		.4°23.6	Polaris	312°36.4	89°23.1
7	333°22.2	273°18.4	39.3	157°18.7	20.8	135°02.0	07.9	289°58.6	23.7	Acamar	315°09.6	-40°11.3
8	348°24.7	288°17.6	40.0	172°21.1	20.7	150°04.7	07.9	305°00.8	23.8	Menkar	314°02.8	4°12.2
9	3°27.1	303°16.9	• • 40.7	187°23.5	• • 20.5	165°07.4	• • 07.8	320°02.9 ·	• 23.9	Mirfak	308°23.7	49°57.8
10	18°29.6	$318^{\circ}16.2$	41.4	202°25.9	20.4	$180^{\circ}10.1$	07.7	335°05.1	24.0	Aldebaran	290°35.9	16°33.9
11	33°32.1	333°15.4	42.1	217°28.2	20.2	195°12.8	07.6	350°07.2	24.1		281°00.8	-8°10.3
12	48°34.5	348°14.7	N20°42.8	232°30.6	N03°20.1	210°15.5	S06°07.5	5°09.4 N1	4°24.2	Rigel		
13	63°37.0	3°14.0	43.5	247°33.0	19.9	225°18.2	07.4	20°11.5	24.3	Capella	280°17.1	46°01.6
14	78°39.5	18° 13.2	44.2	262°35.3	19.8	240°20.9	07.4	35°13.7	24.4	Bellatrix	278°19.4	6°22.4
15	93°41.9	$33^{\circ}12.5$	• • 44.9	277°37.7	• • 19.6	255°23.5	• • 07.3	50°15.8 •	• 24.5	Elnath	277°57.8	28°37.8
16	108°44.4	48°11.7	45.6	292°40.1	19.5	270°26.2	07.2	65°17.9	24.5	Alnilam	275°34.5	-1°11.2
17	123°46.9	63°11.0	46.3	307°42.4	19.3	285°28.9	07.1	80°20.1	24.6	Betelgeuse	270°48.6	7°24.6
18	138°49.3	78° 10.3	N20°47.0	322°44.8	N03°19.2	300°31.6	S06°07.0		4°24.7	Canopus	263°51.2	-52°43.0
19	153°51.8	93°09.5	47.7	337°47.2	19.0	315°34.3	06.9	110°24.4	24.8	Sirius	258°23.4	-16°45.7
20	168°54.3	108°08.8	48.4	352°49.5	18.9	330°37.0	06.9	125°26.5	24.8	Adhara	255°03.3	-29°01.0
										Procyon	244°47.4	5°08.8
21	183°56.7	123°08.1	• • 49.1	7°51.9	• • 18.7	345°39.7	•• 06.8		• 25.0	Pollux	243°13.2	27°57.2
22	198°59.2	138°07.3	49.8	22°54.3	18.6	0°42.4	06.7	155°30.8	25.1	Avior	234°13.4	-59°36.6
23	214°01.6	153°06.6	50.5	37°56.6	18.4	15°45.0	06.6	170°33.0	25.2	Suhail	222°43.7	-43°33.5
Mer n	ass. 08:46	ν -0.7' d0	.7′ m-3.90	$\nu 2.4' \ d-0$.1′ m-0.49	$\nu 2.7' d-0$.1′ m-2.41	$\nu 2.1' \ d0.1'$ i	m0.27	Miaplacidus	221°37.4	-69°50.7
сг.р										Alphard	217°44.3	-8°47.4
										Regulus	207°30.7	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec		Dec	Dubhe	193°36.7	61°35.6
0	229°04.1	168°05.8	N20°51.2	52°59.0	N03°18.2	30°47.7	S06°06.5	185°35.1 N1	.4°25.3	Denebola	182°21.2	14°24.4
1	244°06.6	183°05.1	51.9	68°01.3	18.1	45°50.4	06.5	200°37.3	25.4	Gienah	175°39.7	-17°42.5
2	259°09.0	198°04.4	52.6	83°03.7	17.9	60°53.1	06.4	215°39.4	25.5	1		
3	274°11.5	213°03.6	• • 53.3	98°06.0	• • 17.8	75°55.8	• • 06.3		• 25.6	Acrux	172°55.4	-63°16.0
4	289°14.0	228°02.9	54.0	113°08.4	17.6	90°58.5	06.2	245°43.7	25.7	Gacrux	171°47.1	-57°17.0
5	304°16.4	243°02.1	54.7	128°10.7	17.5	106°01.2	06.1	260°45.9	25.8	Alioth	166°09.6	55°48.1
6	319°18.9	258°01.4	N20°55.3	143°13.1	N03°17.3	121°03.8	S06°06.0		4°25.9	Spica	158°18.3	-11°19.0
7	334°21.4	273°00.6	56.0	158°15.4	17.1	136°06.5	06.0	290°50.2	25.9	Alkaid	152°48.9	49°10.0
8	349°23.8	287°59.9	56.7	173° 17.8	17.1	151°09.2	05.9	305°52.3	26.0	Hadar	148°30.2	-60°31.0
9	4°26.3	302°59.1		173 17.8 188°20.1		166°11.9				Menkent	147°53.0	-36°31.0
			• • 57.4		• • 16.8		• • 05.8		• 26.1	Arcturus	145°44.4	$19^{\circ}01.7$
10	19°28.8	317°58.4	58.1	203°22.5	16.7	181°14.6	05.7	335°56.6	26.2	Rigil Kent.	139°34.7	-60°57.5
11	34°31.2	332°57.7	58.8	218°24.8	16.5	196°17.3	05.6	350°58.8	26.3	Kochab	$137^{\circ}19.0$	74°02.1
12	49°33.7	347° 56.9	N20°59.5	233°27.2	N03°16.3	211°20.0	S06°05.6		.4°26.4	Zuben'ubi	136°51.8	-16°09.9
13	64°36.1	2°56.2	21°00.1	248°29.5	16.2	226°22.6	05.5	21°03.0	26.5	Alphecca	126°00.5	26°36.9
14	79°38.6	17°55.4	8.00	263°31.9	16.0	241°25.3	05.4	36°05.2	26.6	Antares	112°11.2	-26°29.8
15	94°41.1	32°54.7	• • 01.5	278°34.2	• • 15.9	256°28.0	• • 05.3	51°07.3 •	· 26.7	Atria	107°01.7	-69°04.6
16	109°43.5	47°53.9	02.2	293°36.5	15.7	271°30.7	05.2	66°09.5	26.8	Sabik	101°58.5	-15°45.6
17	124°46.0	62°53.2	02.9	308°38.9	15.5	286°33.4	05.2	81°11.6	26.9	Shaula	96°05.3	-37°07.3
18	139°48.5	77°52.4	N21°03.5	323°41.2	N03°15.4	301°36.1	S06°05.1	96°13.8 N1	4°27.0		95°55.0	12°32.3
19	154°50.9	92°51.7	04.2	338°43.6	15.2	316°38.7	05.0	111°15.9	27.1	Rasalhague		
20	169°53.4	107°50.9	04.9	353°45.9	15.0	331°41.4	04.9	126°18.1	27.2	Eltanin	90°40.1	51°29.0
21	184°55.9	122°50.2	• • 05.6	8°48.2	14.9	346°44.1	• • 04.8		• 27.2	Kaus Aust.	83°27.6	-34°22.0
22	199°58.3	137°49.4	06.2	23°50.6	14.7	1°46.8	04.8	156°22.4	27.3	Vega	80°30.6	38°48.5
23	215°00.8	152°48.7	06.9	38°52.9	14.5	16°49.5	04.7	171°24.5	27.4	Nunki	75°43.2	-26°15.4
25	213 00.0	-				10 +9.5	04.1	171 24.5	21.4	Altair	61°56.4	8°56.8
Mer.p	ass. 08:42	ν -0.7 $'$ d0	.7′ m-3.90	ν 2.4′ d-0	.2′ m-0.46	$\nu 2.7' \ d-0$.1′ m-2.40	$ u 2.1' \; d0.1'$ ı	m0.28	Peacock	53°00.2	-56°38.0
										Deneb	49°23.3	45°23.0
	c						-	C	Б.	Enif	33°35.4	$10^{\circ}00.6$
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec		Dec	Al Na'ir	27°28.7	-46°48.8
0	230°03.2	167°47.9	N21°07.6	53°55.2	N03°14.4	31°52.1	S06°04.6	186°26.7 N1		Fomalhaut	$15^{\circ}10.9$	-29°27.8
1	245°05.7	182°47.2	08.2	68°57.6	14.2	46°54.8	04.5	201°28.8	27.6	Scheat	13°41.9	28°14.4
2	260°08.2	197°46.4	08.9	83°59.9	14.1	61°57.5	04.4	216°31.0	27.7	Markab	13°26.5	$15^{\circ}21.8$
3	275°10.6	212°45.7	• • 09.6	99°02.2	• • 13.9	77°00.2	• • 04.4		• 27.8	14 15 =:	A	
4	290°13.1	227° 44.9	10.2	114°04.5	13.7	92°02.9	04.3	246°35.3	27.9	May 10 Thu	SHA	Mer.pass
5	305°15.6	242°44.2	10.9	129°06.9	13.5	107°05.5	04.2	261°37.4	28.0		300°18.5	12:47
6	320°18.0	257°43.4	N21°11.6	144°09.2	N03°13.4	122°08.2	S06°04.1		.4°28.1	Mars	183°57.1	20:29
7	335°20.5	272°42.7	12.2	159°11.5	13.2	137°10.9	04.0	291°41.7	28.2		161°38.2	21:57
8	350°23.0	287°41.9	12.9	174°13.8	13.0	152°13.6	04.0	306°43.8	28.3	Saturn	316°38.6	11:39
9	5°25.4	302°41.1	• • 13.6	$189^{\circ}16.1$	• • 12.9	$167^{\circ}16.3$	• • 03.9	321°46.0 •	• 28.4	NA 11 F	CIIA	Ma
10	20°27.9	317°40.4	14.2	204°18.5	12.7	182°18.9	03.8	336°48.1	28.5	May 11 Fri	SHA	Mer.pass
11	35°30.4	332°39.6	14.9	219°20.8	12.5	197°21.6	03.7	351°50.3	28.5	Venus	299°01.7	12:48
12	50°32.8	347°38.9	N21°15.5	234°23.1	N03°12.4	212°24.3	S06°03.7		4°28.6		183°54.9	20:25
13	65°35.3	2°38.1	16.2	249°25.4	12.2	227°27.0	03.6	21°54.6	28.7		161°43.6	21:53
14	80°37.7	17°37.4	16.9	264°27.7	12.0	242°29.7	03.5	36°56.7	28.8	Saturn	316°31.0	11:36
15	95°40.2	32°36.6	17.5	279°30.0	• 11.8	257°32.3	• • 03.4		· 28.9	May 12 Cat	C LIV	Mornass
16	110°42.7	47°35.8	18.2	279 30.0 294°32.4	11.7	272°35.0	03.4	67°01.0	29.0	May 12 Sat	SHA	Mer.pass
											297°44.7	12:49
17	125°45.1	62°35.1	18.8	309°34.7	11.5	287°37.7	03.3	82°03.2	29.1		183°52.0	20:21
18	140°47.6	77°34.3	N21°19.5	324°37.0	N03°11.3	302°40.4	506°03.2		.4°29.2		161°48.9	21:49
19	155°50.1	92°33.6	20.1	339°39.3	11.1	317°43.0	03.1	112°07.5	29.3	Saturn	316°23.4	11:33
20	170°52.5	107°32.8	20.8	354°41.6	11.0	332°45.7	03.0	127°09.6	29.4	⊔ a::-a:-4	al parallax	
21	185°55.0	122°32.0	• • 21.4	9°43.9	• • 10.8	347°48.4	• • 03.0		• 29.5	Horizont	-	0.1
22	200°57.5	137°31.3	22.1	24°46.2	10.6	2°51.1	02.9	157°13.9	29.6		Venus:	0.1
23	215°59.9	152°30.5	22.7	39°48.5	10.4	17°53.8	02.8	172°16.1	29.7		Mars:	0.2
Mern	ass. 08:38	ν-U 8/ 4U	.7′ m-3.90	v2 3/ d₋∩	.2′ m-0.44	1/2 7/ d_0	.1′ m-2.40	ν2.1' d0.1' ι	m() 20			
ivier.p		ν-0.0 d0	., 111-3.90	ν2.5 U-U	111-0.44	ν2.1 U-U	.111-4.40	ν Δ.1 UU.1 I				

h	Sui	า			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.9	N17°38.4	220°29.7	15.9'	N08°49.9	11.5'	53.9'
1	195°53.9	39.0	235°04.6	15.9'	09°01.4	11.4'	53.9'
2	210°54.0	39.7	249°39.6	15.9'	09°12.8	11.4'	53.9'
3	225°54.0 240°54.0	· · 40.3 41.0	264°14.4 278°49.3	15.9' 15.8'	09°24.2 09°35.5	11.4' 11.3'	53.9'
4 5	240 54.0 255°54.0	41.0	278 49.3 293°24.1	15.8'	09 35.5 09°46.9	11.3'	53.9' 53.9'
6	270°54.1	N17°42.3	307°58.9	15.7'	N09°58.2	11.2'	53.9'
7	285°54.1	42.9	322°33.6	15.7'	10°09.4	11.2'	53.9'
8	300°54.1	43.6	337°08.4	15.7'	10°20.6	11.2'	53.9'
9	315°54.1	• • 44.2	351°43.0	15.6'	10°31.8	11.1'	53.9'
10	330°54.1	44.9	6°17.7	15.6'	10°42.9	11.1'	53.9'
11	345°54.2	45.5	20°52.3	15.6'	10°54.0	11.1'	53.9'
12 13	0°54.2 15°54.2	N17°46.2 46.8	35°26.9 50°01.4	15.5' 15.5'	N11°05.1 11°16.1	11.0' 11.0'	53.9' 53.9'
14	30°54.2	40.6 47.5	64°35.9	15.5'	11 10.1 11°27.0	10.9	53.9'
15	45°54.2	. 48.1	79°10.3	15.4	11°38.0	10.9	53.9'
16	60°54.2	48.8	93°44.7	15.4'	11°48.8	10.8'	53.9'
17	75°54.3	49.4	$108^{\circ}19.1$	15.3'	$11^{\circ}59.7$	10.8'	53.9'
18	90°54.3	N17°50.1	122°53.4	15.3'	$N12^{\circ}10.5$	10.7'	53.9'
19	105°54.3	50.7	137°27.7	15.2'	12°21.2	10.7'	53.9'
20	120°54.3	51.3	152°02.0	15.2' 15.2'	12°31.9 12°42.6	10.7'	53.9'
21 22	135°54.3 150°54.3	· · 52.0 52.6	166°36.1 181°10.3	15.2 15.1'	12°42.0	10.6' 10.6'	53.9' 54.0'
23	165°54.4	53.3	195°44.4	15.1	12 55.2 13°03.7	10.5	54.0'
23						10.0	5 1.0
	SD = 15.8'	d = 0.7'		SL	O = 14.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N17°53.9	210°18.5	15.0'	N13°14.2	10.5'	54.0'
1	195°54.4	54.5	224°52.5	15.0'	13°24.7	10.4'	54.0'
2	210°54.4 225°54.4	55.2	239°26.5 254°00.4	14.9'	13°35.1 13°45.4	10.3'	54.0'
3 4	225°54.4 240°54.4	· · 55.8 56.5	268°34.2	14.9' 14.8'	13° 45.4 13° 55.7	10.3' 10.2'	54.0' 54.0'
5	255°54.5	57.1	283°08.1	14.8'	14°06.0	10.2'	54.0'
6	270°54.5	N17°57.7	297°41.8	14.7'	N14° 16.2	10.1'	54.0'
7	285°54.5	58.4	312°15.6	14.7'	14°26.3	10.1'	54.0'
8	300°54.5	59.0	326°49.2	14.6'	14°36.4	10.0'	54.0'
9	315°54.5	17°59.7	341°22.9	14.6'	14°46.4	10.0'	54.0'
10	330°54.5	18°00.3	355°56.4	14.5'	14°56.3	9.9'	54.0'
11 12	345°54.5 0°54.6	00.9 N18°01.6	10°29.9 25°03.4	14.5' 14.4'	15°06.2 N15°16.1	9.8' 9.8'	54.0' 54.0'
13	15°54.6	02.2	25 05.4 39°36.8	14.4	15°25.9	9.6 9.7'	54.0'
14	30°54.6	02.8	54°10.2	14.3'	15°35.6	9.7'	54.0'
15	45°54.6	• • 03.5	68°43.5	14.2'	15°45.3	9.6'	54.0'
16	60°54.6	04.1	83°16.7	14.2'	15°54.9	9.5'	54.0'
17	75°54.6	04.7	97°49.9	14.1'	16°04.4	9.5'	54.0'
18	90°54.6 105°54.6	N18°05.4	112°23.1 126°56.2	14.1'	N16° 13.9 16° 23.3	9.4'	54.0'
19 20	105 54.6 120°54.6	06.0 06.6	120 50.2 141°29.2	14.0' 14.0'	16° 32.6	9.3' 9.3'	54.1' 54.1'
21	135°54.7	07.3	156°02.1	13.9'	16° 41.9	9.3 9.2'	54.1'
22	150°54.7	07.9	170°35.1	13.9'	16°51.1	9.1'	54.1'
23	165°54.7	08.5	185°07.9	13.8'	17°00.3	9.1'	54.1'
	SD = 15.8'	d = 0.6'		SI	O = 14.7'		
Sat	GHA	D	CUA		D-:	.i	LIP
Sat 0	GHA 180°54.7	Dec N18°09.1	GHA 199°40.7	u 13.7'	Dec N17° 09.3	<i>d</i> 9.0'	HP 54.1'
1	195°54.7	09.8	214°13.5	13.7'	17° 18.3	9.0 8.9'	54.1'
2	210°54.7	10.4	228°46.1	13.6'	17°27.3	8.9'	54.1'
3	225°54.7	• • 11.0	243°18.8	13.6'	$17^{\circ}36.1$	8.8'	54.1'
4	240°54.7	11.6	257°51.3	13.5'	17°44.9	8.7'	54.1'
5	255°54.7	12.3	272°23.8	13.4'	17°53.6	8.6'	54.1'
6 7	270°54.7 285°54.7	N18°12.9 13.5	286°56.3 301°28.7	13.4' 13.3'	N18° 02.3 18° 10.8	8.6' 8.5'	54.1' 54.1'
8	300°54.8	14.2	316°01.0	13.3'	18° 19.3	8.4'	54.1 54.2'
9	315°54.8	• • 14.8	330°33.3	13.2'	18° 27.8	8.3'	54.2'
10	330°54.8	15.4	$345^{\circ}05.5$	13.1'	$18^{\circ}36.1$	8.3'	54.2'
11	345°54.8	16.0	359°37.6	13.1'	18°44.4	8.2'	54.2'
12	0°54.8	N18°16.6	14°09.7	13.0'	N18°52.5	8.1'	54.2'
13	15°54.8	17.3	28°41.7	13.0'	19°00.6 19°08.7	8.0'	54.2'
14 15	30°54.8 45°54.8	17.9 •• 18.5	43°13.7 57°45.6	12.9' 12.8'	19°08.7 19°16.6	7.9' 7.9'	54.2' 54.2'
16	60°54.8	19.1	72°17.4	12.8'	19°10.0	7.8'	54.2'
17	75°54.8	19.7	86°49.2	12.7'	19°32.2	7.7'	54.2'
18	90°54.8	N18°20.4	101°20.9	12.7'	N19°39.9	7.6'	54.2'
19	105°54.8	21.0	115°52.6	12.6'	19°47.5	7.5'	54.3'
20	120°54.8	21.6	130°24.2	12.5'	19°55.1	7.4'	54.3'
21	135°54.8	• • 22.2	144°55.7	12.5'	20°02.5	7.4'	54.3'
22 23	150°54.8 165°54.8	22.8 23.5	159°27.2 173°58.6	12.4' 12.3'	20°09.9 20°17.1	7.3' 7.2'	54.3' 54.3'
23						1.4	J+.J
	SD = 15.8'	d = 0.6'		SL	O = 14.8'		

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

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

		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	11-2%
10	03:36	03:37	11:56	09:34	21:55	
11	03:38	03:38	11:56	10:17	22:39	
12	03:39	03:39	11:56	11:02	23:25	

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

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	231°02.4	167°29.8	N21°23.4	54°50.8	N03°10.3	32°56.4	S06°02.7	187°18.2	N14°29.7			
1	246°04.9	182°29.0	24.0	69°53.1	10.1	47°59.1	02.6	202°20.4	29.8	Alpheratz	357°31.3	29°15.1
2	261°07.3	197°28.2	24.7	84°55.4	09.9	63°01.8	02.6	217°22.5	29.9	Ankaa	353°04.1	-42°08.6
3	276°09.8	212°27.5	• • 25.3	99°57.7	• • 09.7	78°04.5	• • 02.5	232°24.7	• • 30.0	Schedar Diphda	349°27.3 348°44.1	56°41.7 -17°49.5
4	$291^{\circ}12.2$	$227^{\circ}26.7$	25.9	$115^{\circ}00.0$	09.6	93°07.1	02.4	247°26.8	30.1	Achernar	335°18.3	-17 49.5 -57°05.1
5	306°14.7	242°25.9	26.6	130°02.3	09.4	108°09.8	02.3	262°29.0	30.2	Hamal	327°47.5	23°36.0
6	321°17.2	257°25.2	N21°27.2	145°04.6	N03°09.2	123°12.5	S06°02.3	277°31.1	N14°30.3	Polaris	312°35.9	89°23.1
7	336°19.6	272°24.4	27.9	160°06.9	09.0	138°15.2	02.2	292°33.2	30.4	Acamar	315°09.6	-40°11.2
8	351°22.1	287°23.6	28.5	175°09.2 190°11.5	08.8	153°17.8	02.1	307°35.4	30.5	Menkar	314°02.8	4°12.2
9 10	6°24.6 21°27.0	302°22.9 317°22.1	· · 29.1 29.8	205°13.8	· · 08.7 08.5	168°20.5 183°23.2	· · 02.0 02.0	322°37.5 337°39.7	· · 30.6 30.7	Mirfak	$308^{\circ}23.6$	49°57.8
11	36°29.5	332°21.3	30.4	200°16.1	08.3	198°25.9	01.9	352°41.8	30.7	Aldebaran	290°35.9	16°33.9
12	51°32.0	347°20.6	N21°31.0	235°18.4	N03°08.1	213°28.5	S06°01.8	7°44.0	N14°30.9	Rigel	281°00.8	-8°10.3
13	66°34.4	2°19.8	31.7	250°20.7	07.9	228°31.2	01.7	22°46.1	30.9	Capella	280°17.1	46°01.5
14	81°36.9	17° 19.0	32.3	265°23.0	07.7	243°33.9	01.7	37°48.3	31.0	Bellatrix Elnath	278°19.4 277°57.8	6°22.4 28°37.8
15	96°39.4	$32^{\circ}18.3$	• • 32.9	280°25.2	• • 07.6	258°36.5	• • 01.6	52°50.4	• • 31.1	Alnilam	275°34.5	-1°11.2
16	111°41.8	47° 17.5	33.6	295°27.5	07.4	273°39.2	01.5	67°52.6	31.2	Betelgeuse	270°48.6	7°24.6
17	126°44.3	62°16.7	34.2	310°29.8	07.2	288°41.9	01.4	82°54.7	31.3	Canopus	263°51.2	-52°43.0
18	141°46.7	77°16.0	N21°34.8	325°32.1	N03°07.0	303°44.6	506°01.3	97°56.9	N14°31.4	Sirius	258°23.4	-16°45.7
19 20	156°49.2 171°51.7	92°15.2 107°14.4	35.4 36.1	340°34.4 355°36.7	06.8 06.6	318°47.2 333°49.9	01.3 01.2	112°59.0 128°01.2	31.5 31.6	Adhara	255°03.4	-29°01.0
20	171 51.7 186°54.1	107 14.4 122°13.7	36.7	10°38.9	06.5	348°52.6	01.2	120 01.2 143°03.3	31.7	Procyon	244°47.4	5°08.8
22	201°56.6	137°12.9	37.3	25°41.2	06.3	3°55.2	01.0	158°05.5	31.8	Pollux	243°13.3	27°57.2
23	216°59.1	152°12.1	37.9	40°43.5	06.1	18°57.9	01.0	173°07.6	31.9	Avior	234°13.4	-59°36.6
			_		-					Suhail	222°43.7	-43°33.5
iVler.p	ass. 08:34	ν -0.8′ $d0$.6′ m-3.90	ν2.3′ d-0	.2′ m-0.42	ν 2.1' d-0.	1′ m-2.39	ν 2.1′ d0	.1′ m0.29	Miaplacidus Alphard	221°37.4 217°44.3	-69°50.7 -8°47.4
										Regulus	217 44.3 207°30.7	11°49.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.7	61°35.7
0	232°01.5	167°11.3	N21°38.6	55°45.8	N03°05.9	34°00.6	506°00.9	188°09.8	N14°32.0	Denebola	182°21.2	14°24.4
1	247°04.0	182°10.6	39.2	70°48.0	05.7	49°03.3	00.8	203°11.9	32.0	Gienah	$175^{\circ}39.7$	-17°42.5
2 3	262°06.5 277°08.9	197°09.8 212°09.0	39.8 • • 40.4	85°50.3 100°52.6	05.5 •• 05.3	64°05.9 79°08.6	00.7 · · 00.7	218°14.1 233°16.2	32.1 · · 32.2		172°55.5	-63°16.1
4	292°11.4	212 09.0 227°08.2	41.0	100 52.0 115°54.9	05.1	94°11.3	00.7	248°18.4	32.3	Gacrux	171°47.1	-57°17.0
5	307°13.8	242°07.5	41.7	130°57.1	05.0	109°13.9	00.5	263°20.5	32.4	Alioth	166°09.6	55°48.1
6	322°16.3	257°06.7	N21°42.3	145°59.4	N03°04.8	124°16.6	S06°00.5	278°22.7	N14°32.5	Spica	158°18.3	-11°19.0
7	$337^{\circ}18.8$	272°05.9	42.9	161°01.7	04.6	$139^{\circ}19.3$	00.4	293°24.8	32.6	Alkaid Hadar	152°48.9 148°30.2	49°10.0 -60°31.0
8	352°21.2	287°05.1	43.5	176°03.9	04.4	154°21.9	00.3	308°26.9	32.7	Menkent	146 50.2 147°53.0	-36°31.0
9	7°23.7	302°04.4	• • 44.1	191°06.2	• • 04.2	169°24.6	•• 00.2	323°29.1	• • 32.8	Arcturus	145°44.4	19°01.7
10	22°26.2	317°03.6	44.7	206°08.5	04.0	184°27.3	00.2	338°31.2	32.9	Rigil Kent.	139°34.7	-60°57.5
11	37°28.6	332°02.8	45.3	221°10.7	03.8	199°30.0	00.1	353°33.4	33.0	Kochab	$137^{\circ}19.0$	74°02.1
12	52°31.1	347°02.0	N21°45.9	236°13.0	N03°03.6	214°32.6	\$06°00.0	8°35.5	N14°33.1	Zuben'ubi	$136^{\circ}51.8$	-16°09.9
13 14	67°33.6 82°36.0	2°01.3 17°00.5	46.5 47.1	251°15.3 266°17.5	03.4 03.2	229°35.3 244°38.0	05°59.9 59.9	23°37.7 38°39.8	33.1 33.2	Alphecca	$126^{\circ}00.4$	26°36.9
15	97°38.5	31°59.7	• • 47.1	281°19.8	03.0	259°40.6	• • 59.8	53°42.0	• • 33.3	Antares	112°11.2	-26°29.8
16	112°41.0	46°58.9	48.4	296°22.0	02.8	274°43.3	59.7	68°44.1	33.4	Atria	107°01.6	-69°04.6
17	127°43.4	61°58.1	49.0	311°24.3	02.6	289°46.0	59.6	83°46.3	33.5	Sabik Shaula	101°58.4 96°05.2	-15°45.6 -37°07.3
18	142°45.9	76°57.4	N21°49.6	326°26.6	N03°02.5	304°48.6	S05°59.6	98°48.4	N14°33.6	Rasalhague	95°55.0	12°32.3
19	157°48.3	91°56.6	50.2	341°28.8	02.3	319°51.3	59.5	113°50.6	33.7	Eltanin	90°40.1	51°29.0
20	172°50.8	106°55.8	50.8	356°31.1	02.1	334°54.0	59.4	128°52.7	33.8	Kaus Aust.	83°27.6	-34°22.0
21	187°53.3	121°55.0	• • 51.4	11°33.3	• • 01.9	349°56.6	• • 59.3	143°54.9	• • 33.9	Vega	80°30.5	38°48.6
22 23	202°55.7 217°58.2	136°54.2 151°53.5	52.0 52.6	26°35.6 41°37.8	01.7 01.5	4°59.3 20°02.0	59.3 59.2	158°57.0 173°59.2	34.0	Nunki	75°43.2	-26°15.4
									34.1	Altair	61°56.4	8°56.8
Mer.p	ass. 08:31	ν -0.8′ d0	.6′ m-3.90	$\nu 2.3' \ d-0$.2′ m-0.40	$\nu 2.7' \ d-0.$	1' m-2.39	$\nu 2.1' \ d0$.1' m 0.30	Peacock	53°00.2	-56°38.0
										Deneb	49°23.2	45°23.0 10°00.6
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°35.4 27°28.7	-46°48.8
0	233°00.7	$166^{\circ}52.7$	N21°53.2	$56^{\circ}40.1$	$N03^{\circ}01.3$	35°04.6	S05°59.1	$189^{\circ}01.3$	N14°34.2	Fomalhaut	15°10.9	-40 46.6 -29°27.8
1	248°03.1	181°51.9	53.8	71°42.3	01.1	50°07.3	59.1	204°03.5	34.2	Scheat	13°41.9	28°14.4
2	263°05.6	196°51.1	54.3	86°44.6	00.9	65°09.9	59.0	219°05.6	34.3	Markab	$13^{\circ}26.5$	15°21.8
3	278°08.1	211°50.3	• • 54.9	101°46.8	•• 00.7	80°12.6	. 58.9	234°07.8	34.4	May 12 C	CUV	Mor ness
4 5	293°10.5 308°13.0	226°49.5 241°48.8	55.5 56.1	116°49.1 131°51.3	00.5 00.3	95°15.3 110°17.9	58.8 58.8	249°09.9 264°12.1	34.5 34.6	May 13 Sun Venus	SHA 296°27.4	Mer.pass 12:51
6	323°15.5	256° 48.0	N21°56.7	131 51.3 146°53.6	N03°00.1	110 17.9 125°20.6	50.0 S05°58.7	279°14.2		Mars	183°48.4	20:18
7	338°17.9	271°47.2	57.3	161°55.8	02°59.9	140°23.3	58.6	294°16.4	34.8	Jupiter	161°54.0	21:44
8	353°20.4	286°46.4	57.9	176°58.0	59.7	155°25.9	58.6	309°18.5	34.9	Saturn	316°15.8	11:29
9	8°22.8	301°45.6	• • 58.5	192°00.3	• • 59.5	170°28.6	• • 58.5	324°20.7	• • 35.0	14.14	CLIA	
10	23°25.3	$316^{\circ}44.8$	59.1	207°02.5	59.3	185°31.3	58.4	339°22.8	35.1	May 14 Mon Venus	SHA 295°09.8	Mer.pass 12:52
11	38°27.8	331°44.0	21°59.6	222°04.8	59.1	200°33.9	58.3	354°25.0	35.2	Mars	183°44.2	20:14
12	53°30.2	346°43.2	N22°00.2	237°07.0	N02°58.9	215°36.6	S05°58.3	9°27.1	N14°35.3	Jupiter	161°59.1	21:40
13	68°32.7	1°42.5	00.8	252°09.2	58.7	230°39.2	58.2 58.1	24°29.2	35.3 35.4	Saturn	316°08.2	11:26
14 15	83°35.2 98°37.6	16°41.7 31°40.9	01.4 •• 02.0	267°11.5 282°13.7	58.5 •• 58.3	245°41.9 260°44.6	58.1 •• 58.1	39°31.4 54°33.5	35.4 •• 35.5	May 1F To		
16	96 37.0 113°40.1	46°40.1	02.5	202 13.7 297°15.9	58.1	200 44.0 275°47.2	58.0	69°35.7	35.6	May 15 Tue Venus	SHA 293°52.0	Mer.pass 12:53
17	128°42.6	61°39.3	03.1	312°18.2	57.9	290°49.9	57.9	84°37.8	35.7		293 52.0 183°39.4	20:10
18	143°45.0	76°38.5	N22°03.7	327°20.4	N02°57.6	305°52.5	S05°57.8	99°40.0	N14°35.8		162°03.9	21:36
19	158°47.5	91°37.7	04.3	342°22.6	57.4	320°55.2	57.8	114°42.1	35.9	Saturn	$316^{\circ}00.7$	11:22
20	173°50.0	106°36.9	04.9	357°24.9	57.2	335°57.9	57.7	129°44.3	36.0	Herita :	al navall	
21	188°52.4	121°36.1	05.4	12°27.1	• • 57.0	351°00.5	•• 57.6	144°46.4	36.1	Horizont	al parallax Venus:	0.1
22 23	203°54.9 218°57.3	136°35.4 151°34.6	06.0 06.6	27°29.3 42°31.5	56.8 56.6	6°03.2 21°05.8	57.6 57.5	159°48.6 174°50.7	36.2 36.3		Mars:	0.1
										L		*
Mer.p	ass. 08:27	ν -0.8′ d0	.6′ m-3.90	ν 2.2′ d-0	.2′ m-0.38	$\nu 2.7' \ d-0.$	1′ m-2.38	ν 2.1′ d0	.1′ m0.30			

h	Sur	า			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N18°24.1	188°29.9	12.3'	N20°24.3	7.1'	54.3'
1 2	195°54.9 210°54.9	24.7 25.3	203°01.2 217°32.5	12.2' 12.2'	20°31.4 20°38.4	7.0' 6.9'	54.3' 54.3'
3	225°54.9	25.9	232°03.6	12.1'	20° 45.3	6.8	54.3
4	240°54.9	26.5	246°34.7	12.0'	20°52.1	6.7'	54.4'
5	255°54.9	27.1	261°05.8	12.0'	20°58.8	6.6'	54.4'
6 7	270°54.9 285°54.9	N18°27.8 28.4	275°36.8 290°07.7	11.9' 11.9'	N21°05.4 21°12.0	6.5' 6.4'	54.4' 54.4'
8	300°54.9	29.0	304°38.5	11.8'	21°18.4	6.3	54.4
9	315°54.9	• • 29.6	$319^{\circ}09.3$	11.7'	21°24.7	6.2'	54.4'
10	330°54.9	30.2	333°40.1	11.7'	21°31.0	6.1'	54.4'
11 12	345°54.9 0°54.9	30.8 N18°31.4	348°10.8 2°41.4	11.6' 11.6'	21°37.1 N21°43.2	6.0' 5.9'	54.4' 54.5'
13	15°54.9	32.0	17°11.9	11.5'	21°49.1	5.8'	54.5'
14	30°54.9	32.6	$31^{\circ}42.4$	11.4'	21°55.0	5.7'	54.5'
15	45°54.9	• • 33.2	46°12.9	11.4'	22°00.7	5.6'	54.5'
16 17	60°54.9 75°54.9	33.8 34.5	60°43.3 75°13.6	11.3' 11.3'	22°06.3 22°11.9	5.5' 5.4'	54.5' 54.5'
18	90°54.9	N18°35.1	89°43.9	11.2'	N22°17.3	5.3	54.5
19	105°54.9	35.7	104°14.1	11.2'	22°22.7	5.2'	54.5'
20	120°54.9	36.3	118°44.3	11.1'	22°27.9	5.1'	54.6'
21	135°54.9 150°54.9	· · 36.9 37.5	133°14.4 147°44.4	11.0'	22°33.0 22°38.0	5.0'	54.6'
22 23	150°54.9 165°54.9	37.5 38.1	147°44.4 162°14.4	11.0' 10.9'	22° 43.0	4.9' 4.8'	54.6' 54.6'
	SD = 15.8'	d = 0.6'			0 = 14.8'	5	
	3D = 15.δ'	$u = 0.0^{\circ}$		5L	ν = 14.8°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.9	N18°38.7	176°44.3	10.9'	N22°47.8	4.7'	54.6'
1 2	195°54.9 210°54.9	39.3 39.9	191°14.2 205°44.1	10.8' 10.8'	22°52.5 22°57.1	4.6' 4.5'	54.6' 54.6'
3	210 54.9 225°54.9	. 40.5	205 44.1 220°13.8	10.8	22 57.1 23°01.5	4.5 4.4'	54.0 54.7'
4	240°54.9	41.1	234°43.6	10.7'	23°05.9	4.3'	54.7'
5	255°54.9	41.7	249°13.2	10.6'	23°10.2	4.1'	54.7'
6	270°54.9 285°54.8	N18°42.3	263°42.8 278°12.4	10.6' 10.5'	N23°14.3 23°18.4	4.0'	54.7'
7 8	285°54.8 300°54.8	42.9 43.5	278°12.4 292°41.9	10.5'	23° 18.4 23° 22.3	3.9' 3.8'	54.7' 54.7'
9	315°54.8	44.1	307°11.4	10.4	23°26.1	3.7'	54.7'
10	330°54.8	44.7	321°40.8	10.4'	23°29.8	3.6'	54.8'
11	345°54.8 0°54.8	45.3 N18°45.9	336°10.2 350°39.5	10.3'	23°33.4 N23°36.8	3.5'	54.8'
12 13	0°54.8 15°54.8	N18 45.9 46.5	5°08.8	10.3' 10.2'	N23° 36.8 23° 40.2	3.4' 3.2'	54.8' 54.8'
14	30°54.8	47.1	19°38.1	10.2'	23°43.4	3.1'	54.8'
15	45°54.8	• • 47.7	34°07.2	10.1'	23°46.5	3.0'	54.8'
16 17	60°54.8 75°54.8	48.3 48.8	48°36.4 63°05.5	10.1' 10.1'	23°49.5 23°52.4	2.9'	54.8'
18	75 54.8 90°54.8	48.8 N18°49.4	77°34.6	10.1	23 52.4 N23°55.2	2.8' 2.6'	54.9' 54.9'
19	105°54.8	50.0	92°03.6	10.0'	23°57.8	2.5'	54.9'
20	120°54.8	50.6	106°32.6		24°00.3	2.4'	54.9'
21	135°54.8 150°54.8	51.2	121°01.5 135°30.4	9.9'	24°02.7 24°05.0	2.3'	54.9'
22 23	150 54.8 165°54.8	51.8 52.4	135 30.4 149°59.3	9.9' 9.8'	24 05.0 24°07.2	2.2' 2.0'	54.9' 55.0'
	SD = 15.8'	d = 0.6'			0 = 14.9'	0	
	3D = 13.δ'	u = 0.0°		- SL	v — 14.9°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.7	N18°53.0	164°28.1	9.8'	N24°09.2	1.9'	55.0'
1 2	195°54.7 210°54.7	53.6 54.2	178°56.9 193°25.6	9.8' 9.7'	24°11.1 24°12.9	1.8' 1.7'	55.0' 55.0'
3	210 54.7 225°54.7	• • 54.7	207°54.4	9.7'	24° 12.9	1.5'	55.0'
4	240°54.7	55.3	222°23.0	9.7'	24°16.2	1.4'	55.0'
5	255°54.7	55.9	236°51.7	9.6'	24°17.6	1.3'	55.1'
6 7	270°54.7 285°54.7	N18°56.5 57.1	251°20.3 265°48.9	9.6' 9.6'	N24°18.9 24°20.1	1.2' 1.0'	55.1' 55.1'
8	300°54.7	57.1 57.7	280°17.5	9.5'	24°21.1	0.9'	55.1
9	315°54.7	• • 58.3	294°46.0	9.5'	24°22.0	0.8'	55.1'
10	330°54.7	58.8	309°14.5	9.5'	24° 22.8	0.7'	55.1'
11 12	345°54.6 0°54.6	18°59.4 N19°00.0	323°43.0 338°11.4	9.5' 9.4'	24°23.5 N24°24.0	0.5' 0.4'	55.2' 55.2'
13	0 54.6 15°54.6	00.6	352°39.9	9.4 9.4'	24° 24.5	0.4	55.2'
14	30°54.6	01.2	7°08.3	9.4'	24°24.8	0.2'	55.2'
15	45°54.6	• • 01.8	21°36.7	9.4'	24°24.9	0.0'	55.2'
16	60°54.6 75°54.6	02.3 02.9	36°05.0 50°33.4	9.3' 9.3'	24°25.0 24°24.9	-0.1' -0.2'	55.3' 55.3'
17 18	75°54.6 90°54.6	02.9 N19°03.5	65°01.7	9.3'	24°24.9 N24°24.6	-0.2'	55.3'
19	105°54.5	04.1	79°30.0	9.3'	24°24.3	-0.5'	55.3'
20	120°54.5	04.7	93°58.3	9.3'	24°23.8	-0.6'	55.3'
21 22	135°54.5 150°54.5	· · 05.2 05.8	108°26.6 122°54.8	9.3' 9.2'	24°23.2 24°22.5	-0.7'	55.3' 55.4'
23	150°54.5 165°54.5	05.8 06.4	122°54.8 137°23.1	9.2' 9.2'	24°22.5 24°21.6	-0.9' -1.0'	55.4' 55.4'
	SD = 15.8'	d = 0.6'			0 = 15.0'		
	JD — 15.6	u = 0.0		ЭL	- 15.0		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer. Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-2%	
13	03:39	03:40	11:56	11:49	-:-		
14	03:39	03:39	11:56	12:39	00:13		
15	03:39	03:39	11:56	13:30	01:04		

h	Aries	Vei	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	233°59.8	166°33.8	N22°07.1	57°33.8	N02°56.4	36°08.5	S05°57.4	189°52.9	N14° 36.3			
1	249°02.3	181°33.0	07.7	72°36.0	56.2	51°11.2	57.4	204°55.0	36.4	Alpheratz	357°31.3	29°15.1
2	264°04.7	196°32.2	08.3	87°38.2	56.0	66°13.8	57.3	219°57.2	36.5	Ankaa	353°04.1	-42°08.6
3	279°07.2	211°31.4	. 08.8	102°40.4	• • 55.8	81°16.5	57.2	234°59.3	36.6	Schedar	349°27.2	56°41.7
4	294°09.7	226°30.6	09.4	117°42.6	55.6	96°19.1	57.1	250°01.5	36.7	Diphda	348°44.1	-17°49.4
5	$309^{\circ}12.1$	241°29.8	10.0	132°44.9	55.4	111°21.8	57.1	265°03.6	36.8	Achernar	335°18.3	-57°05.1
6	$324^{\circ}14.6$	256°29.0	N22°10.5	147°47.1	N02°55.2	126°24.5	S05°57.0	280°05.8	N14°36.9	Hamal Polaris	327°47.5 312°35.3	23°36.0 89°23.1
7	$339^{\circ}17.1$	271°28.2	11.1	162°49.3	54.9	141°27.1	56.9	295°07.9	37.0	Acamar	312 35.3 315°09.6	-40°11.2
8	$354^{\circ}19.5$	286°27.4	11.7	177°51.5	54.7	156°29.8	56.9	310°10.1	37.1	Menkar	314°02.8	4°12.2
9	9°22.0	301°26.6	• • 12.2	192°53.7	• • 54.5	171°32.4	• • 56.8	325°12.2	• • 37.2	Mirfak	308°23.6	49°57.8
10	24°24.4	316°25.8	12.8	207°55.9	54.3	186°35.1	56.7	340°14.4	37.3	Aldebaran	290°35.9	16°33.9
11	39°26.9	331°25.0	13.3	222°58.2	54.1	201°37.7	56.7	355°16.5	37.3	Rigel	281°00.8	-8°10.3
12 13	54°29.4 69°31.8	346°24.2 1°23.4	N22°13.9 14.5	238°00.4 253°02.6	N02°53.9 53.7	216°40.4 231°43.1	\$05°56.6 56.5	10°18.7 25°20.8	N14°37.4 37.5	Capella	$280^{\circ}17.1$	46°01.5
14	84°34.3	16°22.6	15.0	268°04.8	53.7	231 43.1 246°45.7	56.5	40°23.0	37.5	Bellatrix	278°19.4	6°22.4
15	99°36.8	31°21.8	• • 15.6	283°07.0	53.2	261°48.4	• • 56.4	55°25.1	37.7	Elnath	277°57.8	28°37.8
16	114°39.2	46°21.0	16.1	298°09.2	53.0	276°51.0	56.3	70°27.3	37.8	Alnilam	275°34.5	-1°11.2
17	129°41.7	61°20.2	16.7	313°11.4	52.8	291°53.7	56.2	85°29.4	37.9	Betelgeuse	270°48.6	7°24.6
18	144°44.2	76° 19.4	N22°17.2	328°13.6	N02°52.6	306°56.3	S05°56.2	100°31.6	N14°38.0	Canopus Sirius	263°51.3 258°23.4	-52°43.0 -16°45.7
19	159°46.6	$91^{\circ}18.6$	17.8	343°15.8	52.4	321°59.0	56.1	115°33.7	38.1	Adhara	255°03.4	-10 45.7 -29°01.0
20	174°49.1	106° 17.8	18.3	358°18.0	52.2	337°01.6	56.0	130°35.9	38.2	Procyon	244°47.4	5°08.8
21	189°51.6	121°17.0	• • 18.9	13°20.2	• • 52.0	352°04.3	• • 56.0	145°38.0	• • 38.3	Pollux	243°13.3	27°57.2
22	204°54.0	136°16.2	19.4	28°22.4	51.7	7°07.0	55.9	160°40.2	38.3	Avior	234°13.5	-59°36.6
23	219°56.5	151°15.4	20.0	43°24.6	51.5	22°09.6	55.8	175°42.3	38.4	Suhail	222°43.7	-43°33.5
Mer.p	ass. 08:23	ν -0.8′ d0.	.6′ m-3.90	ν 2.2′ d-0.	2′ m-0.36	$\nu 2.7' \ d-0.$	1' m-2.37	$\nu 2.1' \ d0.$	1' m0.31	Miaplacidus	221°37.5	-69°50.7
										Alphard	217°44.3	-8°47.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.3
0	234°58.9	$166^{\circ}14.6$	N22°20.5	58°26.8	N02°51.3	$37^{\circ}12.3$	S 05°55.8	190°44.5	N14°38.5	Dubhe Denebola	193°36.8 182°21.2	61°35.7 14°24.4
1	$250^{\circ}01.4$	181°13.8	21.0	73°29.0	51.1	52°14.9	55.7	205°46.6	38.6	Gienah	175°39.7	-17°42.5
2	265°03.9	$196^{\circ}13.0$	21.6	88°31.2	50.9	$67^{\circ}17.6$	55.6	220°48.8	38.7		172°55.5	-63°16.1
3	280°06.3	211°12.2	• • 22.1	103°33.4	• • 50.6	82°20.2	• • 55.6	235°50.9	• • 38.8		171°47.1	-57°17.0
4	295°08.8	226°11.4	22.7	118°35.6	50.4	97°22.9	55.5	250°53.0	38.9	Alioth	$166^{\circ}09.7$	55°48.1
5 6	310°11.3 325°13.7	241°10.6 256°09.8	23.2 N22°23.7	133°37.8 148°40.0	50.2 N02°50.0	112°25.5 127°28.2	55.4 \$05°55.4	265°55.2 280°57.3	39.0 N14°39.1	Spica	158°18.3	-11°19.0
7	340°16.2	271°09.0	24.3	163°42.2	49.8	142°30.8	55.3	295°59.5	39.2	Alkaid	152°48.9	49°10.0
8	355°18.7	286°08.2	24.8	178°44.4	49.5	157°33.5	55.2	311°01.6	39.2	Hadar	148°30.2	-60°31.0
9	10°21.1	301°07.4	25.4	193°46.6	• • 49.3	172°36.1	55.2	326°03.8	39.3		147°53.0	-36°31.0
10	25°23.6	316°06.6	25.9	208°48.8	49.1	187°38.8	55.1	341°05.9	39.4	Arcturus Rigil Kent.	145°44.4 139°34.6	19°01.7 -60°57.5
11	$40^{\circ}26.1$	331°05.8	26.4	223°50.9	48.9	202°41.4	55.0	356°08.1	39.5	Kochab	137°19.0	74°02.1
12	55°28.5	346°05.0	N22°27.0	238°53.1	N02°48.7	217°44.1	S05°55.0	11°10.2	N14°39.6	Zuben'ubi	136°51.8	-16°09.9
13	70°31.0	1°04.2	27.5	253°55.3	48.4	232°46.7	54.9	26°12.4	39.7	Alphecca	$126^{\circ}00.4$	26°36.9
14	85°33.4 100°35.9	16°03.4 31°02.6	28.0	268°57.5	48.2 •• 48.0	247°49.4 262°52.0	54.8	41°14.5	39.8	Antares	$112^{\circ}11.1$	-26°29.8
15 16	100 35.9 115°38.4	46°01.8	· · 28.5 29.1	283°59.7 299°01.9	47.8	202 52.0 277°54.7	• • 54.8 54.7	56°16.7 71°18.8	· · 39.9 40.0	Atria	107°01.6	-69°04.6
17	130°40.8	61°00.9	29.6	314°04.0	47.5	292°57.3	54.6	86°21.0	40.1	Sabik	101°58.4	-15°45.6
18	145°43.3	76°00.1	N22°30.1	329°06.2	N02°47.3	308°00.0	S05°54.6	101°23.1		Shaula	96°05.2 95°55.0	-37°07.3 12°32.3
19	$160^{\circ}45.8$	90°59.3	30.6	344°08.4	47.1	323°02.6	54.5	116°25.3	40.2	Rasalhague Eltanin	90°40.1	51°29.0
20	175°48.2	$105^{\circ}58.5$	31.2	$359^{\circ}10.6$	46.9	338°05.3	54.4	131°27.4	40.3	Kaus Aust.	83°27.6	-34°22.0
21	190°50.7	120°57.7	• • 31.7	14°12.8	• • 46.6	353°07.9	• • 54.4	146°29.6	• • 40.4	Vega	80°30.5	38°48.6
22	205°53.2	135°56.9	32.2	29°14.9	46.4	8°10.6	54.3	161°31.7	40.5	Nunki	75°43.2	-26°15.4
23	220°55.6	150°56.1	32.7	44°17.1	46.2	23°13.2	54.2	176°33.9	40.6	Altair	61°56.4	8°56.8
Mer.p	ass. 08:19	ν -0.8′ d0.	.5′ m-3.90	$\nu 2.2' \ d-0.$	2′ m-0.34	$\nu 2.7' \ d-0.$	1′ m-2.37	ν 2.1′ d0.	1' m0.31	Peacock	53°00.1	-56°38.0
										Deneb	49°23.2	45°23.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°35.3 27°28.7	10°00.6 -46°48.8
0	235°58.1	165°55.3	N22°33.2	59°19.3	N02°46.0	38°15.9	505°54.2	191°36.0		Fomalhaut	27 20.7 15°10.8	-40 46.6 -29°27.8
1	251°00.6	180°54.5	33.8	$74^{\circ}21.5$	45.7	53°18.5	54.1	206°38.2	40.8	Scheat	13°41.9	28°14.4
2	$266^{\circ}03.0$	195°53.7	34.3	89°23.6	45.5	68°21.2	54.1	221°40.3	40.9	Markab	13°26.5	15°21.8
3	281°05.5	210°52.8	• • 34.8	104°25.8	• • 45.3	83°23.8	• • 54.0	236°42.5	• • 41.0			
4	296°07.9	225°52.0	35.3	119°28.0	45.0	98°26.5	53.9	251°44.6	41.1	May 16 Wed	SHA	Mer.pass
5	311°10.4	240°51.2	35.8	134°30.1	44.8	113°29.1	53.9	266°46.8	41.1		292°34.0 183°34.0	12:54 20:07
6 7	326°12.9 341°15.3	255°50.4 270°49.6	N22°36.3 36.8	149°32.3 164°34.5	N02°44.6 44.4	128°31.8 143°34.4	\$05°53.8 53.7	281 48.9 296°51.1	N14°41.2 41.3		163° 34.0	21:32
8	356°17.8	285°48.8	37.3	179°36.6	44.4	158°37.0	53.7	311°53.2	41.4		315°53.1	11:19
9	11°20.3	300°48.0	37.9	194°38.8	• • 43.9	173°39.7	53.6	326°55.4	41.5			
10	26°22.7	315°47.1	38.4	209°41.0	43.7	188°42.3	53.5	341°57.5	41.6	May 17 Thu	SHA	Mer.pass
11	41°25.2	330°46.3	38.9	224°43.1	43.4	203°45.0	53.5	$356^{\circ}59.7$	41.7		291°15.7 183°27.9	12:56 20:03
12	56°27.7	345°45.5	N22°39.4	239°45.3	N02°43.2	218°47.6	S05°53.4		N14°41.8		162°13.3	21:27
13	71°30.1	0°44.7	39.9	254°47.4	43.0	233°50.3	53.3	27°04.0	41.9		315°45.5	11:15
14 15	86°32.6 101°35.1	15°43.9 30°43.1	40.4 •• 40.9	269°49.6 284°51.8	42.7 • • 42.5	248°52.9 263°55.6	53.3 •• 53.2	42°06.1 57°08.3	42.0 •• 42.0			
15 16	101°35.1 116°37.5	30°43.1 45°42.3	41.4	284 51.8 299°53.9	42.5	263°55.6 278°58.2	53.2	57°08.3 72°10.4	42.0	May 18 Fri	SHA 289°57.2	Mer.pass 12:57
17	131°40.0	45°42.5	41.9	314°56.1	42.0	294°00.8	53.1	87°12.6	42.1		289 57.2 183°21.2	20:00
18	146°42.4	75° 40.6	N22°42.4	329°58.2	N02°41.8	309°03.5	S05°53.0		N14°42.3		162°17.8	21:23
19	161°44.9	90°39.8	42.9	$345^{\circ}00.4$	41.6	$324^{\circ}06.1$	53.0	$117^{\circ}16.9$	42.4		315°37.9	11:12
20	176°47.4	105°39.0	43.4	0°02.5	41.3	339°08.8	52.9	132°19.0	42.5			
21	191°49.8	120°38.2	• • 43.9	15°04.7	• • 41.1	354°11.4	52.8	147°21.2	• • 42.6	Horizont	al parallax Venus:	0.1
22 23	206°52.3 221°54.8	135°37.3 150°36.5	44.4 44.8	30°06.8 45°09.0	40.9 40.6	9°14.1 24°16.7	52.8 52.7	162°23.3 177°25.5	42.7 42.8		Mars:	0.1
										L		-
Mer.p	ass. 08:15	ν -0.8′ d0.	.5′ m-3.90	$\nu 2.2' \ d-0.$	2′ m-0.32	ν 2.6′ d -0.	1′ m-2.36	$\nu 2.1' \ d0.$	ı′ m0.31			

h	Sui	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.5	N19°07.0	151°51.3	9.2'	N24°20.6	-1.1'	55.4'
1	195°54.5	07.5	$166^{\circ}19.5$	9.2'	24°19.5	-1.2'	55.4'
2	210°54.5	08.1	$180^{\circ}47.7$	9.2'	24°18.3	-1.4'	55.4'
3	225°54.4	• • 08.7	$195^{\circ}15.9$	9.2'	24°16.9	-1.5'	55.5'
4	240°54.4	09.3	209°44.1	9.2'	24°15.4	-1.6'	55.5'
5	255°54.4	09.8	224°12.3	9.2'	24°13.8	-1.8'	55.5'
6	270°54.4 285°54.4	N19° 10.4 11.0	238° 40.5 253° 08.7	9.2' 9.2'	N24°12.0 24°10.1	-1.9' -2.0'	55.5' 55.5'
7 8	285 54.4 300°54.4	11.6	267°36.8	9.2' 9.2'	24 10.1 24°08.1	-2.0 -2.2'	55.6'
9	315°54.3	12.1	282°05.0	9.2'	24°05.9	-2.3	55.6'
10	330°54.3	12.7	296°33.1	9.2'	24°03.7	-2.4	55.6'
11	345°54.3	13.3	311°01.3	9.2'	24°01.2	-2.5'	55.6'
12	0°54.3	N19°13.8	325°29.5	9.2'	N23°58.7	-2.7'	55.6'
13	15°54.3	14.4	339°57.6	9.2'	23°56.0	-2.8'	55.7'
14	30°54.3	15.0	354°25.8	9.2'	23°53.2 23°50.3	-2.9'	55.7'
15 16	45° 54.2 60° 54.2	· · 15.5 16.1	8°54.0 23°22.1	9.2' 9.2'	23°50.3 23°47.3	-3.1' -3.2'	55.7' 55.7'
17	75° 54.2	16.7	37°50.3	9.2'	23°44.1	-3.3	55.7'
18	90°54.2	N19° 17.2	52° 18.5	9.2'	N23°40.8	-3.4	55.8'
19	105°54.2	17.8	66°46.7	9.2'	23°37.3	-3.6'	55.8'
20	120°54.2	18.4	81°14.9	9.2'	23°33.8	-3.7'	55.8'
21	135°54.1	• 18.9	95°43.1	9.2'	23°30.1	-3.8'	55.8'
22	150°54.1	19.5	110°11.3	9.2'	23°26.2	-4.0'	55.8'
23	165°54.1	20.1	124°39.5	9.2'	23°22.3	-4.1'	55.9'
	SD = 15.8'	d = 0.6'		SE	0 = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.1	N19°20.6	139°07.7	9.2'	N23°18.2	-4.2'	55.9'
1	195°54.1	21.2	153°36.0	9.3'	23°14.0	-4.3'	55.9'
2	210° 54.0 225° 54.0	21.7	168°04.2 182°32.5	9.3' 9.3'	23°09.7 23°05.2	-4.5'	55.9'
3 4	225°54.0 240°54.0	· · 22.3 22.9	182° 32.5 197° 00.8	9.3'	23°05.2 23°00.6	-4.6' -4.7'	56.0' 56.0'
5	255° 54.0	23.4	211°29.1	9.3'	23°55.9	-4.1'	56.0'
6	270°54.0	N19°24.0	225°57.4	9.3'	N22°51.1	-5.0'	56.0'
7	285°53.9	24.5	240°25.7	9.4'	22°46.1	-5.1'	56.0'
8	300°53.9	25.1	$254^{\circ}54.1$	9.4'	22°41.0	-5.2'	56.1'
9	315°53.9	• • 25.7	269°22.5	9.4'	22°35.8	-5.3'	56.1'
10	330°53.9	26.2	283°50.9	9.4'	22°30.5	-5.5'	56.1'
11	345°53.9	26.8	298°19.3	9.4'	22°25.0	-5.6'	56.1'
12 13	0°53.8 15°53.8	N19°27.3 27.9	312° 47.7 327° 16.1	9.5' 9.5'	N22°19.5 22°13.8	-5.7' -5.8'	56.2' 56.2'
14	30°53.8	28.4	341°44.6	9.5' 9.5'	22 13.6 22°07.9	-5.0 -5.9'	56.2'
15	45°53.8	• • 29.0	356° 13.1	9.5'	22°02.0	-6.1	56.2'
16	60°53.7	29.5	10°41.6	9.5'	21°55.9	-6.2	56.2'
17	75° 53.7	30.1	$25^{\circ}10.2$	9.6'	$21^{\circ}49.7$	-6.3'	56.3'
18	90°53.7	N19° 30.6	39°38.7	9.6'	N21°43.4	-6.4	56.3'
19	105°53.7	31.2	54°07.3	9.6'	21°37.0	-6.5'	56.3'
20	120°53.6 135°53.6	31.8 · · 32.3	68°36.0 83°04.6	9.6' 9.7'	21°30.5 21°23.8	-6.7' -6.8'	56.3' 56.4'
21 22	150°53.6	32.9	97°33.3	9.7 9.7'	21 23.8 21°17.0	-6.8'	56.4'
23	165° 53.6	33.4	112°02.0	9.7'	21°10.1	-0.9 -7.0'	56.4
	SD = 15.8'	d = 0.6'			0 = 15.2'		
Fri 0	GHA 180° 53.5	Dec N19°34.0	GHA 126°30.7	u 9.8'	Dec N21°03.1	d -7.1'	HP 56.4'
1	180 53.5 195°53.5	34.5	120 30.7 140°59.4	9.8 9.8'	20°55.9	-7.1 -7.3'	56.5'
2	210°53.5	35.0	155°28.2	9.8'	20°48.7	-7.4'	56.5'
3	225°53.5	• • 35.6	$169^{\circ}57.0$	9.8'	20°41.3	-7.5'	56.5'
4	240°53.4	36.1	184°25.9	9.9'	20°33.9	-7.6'	56.5'
5	255°53.4	36.7	198°54.7	9.9'	20°26.3	-7.7'	56.5'
6	270°53.4	N19°37.2	213°23.6	9.9'	N20°18.5	-7.8'	56.6'
7 8	285°53.4 300°53.3	37.8 38.3	227°52.6 242°21.5	10.0' 10.0'	20°10.7 20°02.8	-7.9' -8.0'	56.6' 56.6'
9	300°53.3 315°53.3	38.3 · · 38.9	242°21.5 256°50.5	10.0'	20°02.8 19°54.7	-8.0' -8.2'	56.6'
10	330°53.3	39.4	271°19.5	10.0'	19°46.6	-8.3'	56.7
11	345°53.3	39.9	285°48.6	10.1	19°38.3	-8.4	56.7'
12	0°53.2	N19°40.5	300°17.6	10.1'	N19°30.0	-8.5	56.7'
13	15°53.2	41.0	314°46.8	10.1'	19°21.5	-8.6'	56.7'
14	30°53.2	41.6	329° 15.9	10.2'	19°12.9	-8.7'	56.8'
15	45°53.1 60°53.1	• 42.1	343°45.1 358°14.3	10.2'	19°04.2 18°55.4	-8.8'	56.8'
16 17	60°53.1 75°53.1	42.7 43.2	358° 14.3 12° 43.5	10.2' 10.3'	18°55.4 18°46.5	-8.9' -9.0'	56.8' 56.8'
18	90°53.1	43.2 N19°43.7	12 43.5 27°12.8	10.3	N18°37.4	-9.0 -9.1'	56.9'
19	105° 53.0	44.3	41°42.1	10.3	18°28.3	-9.1 -9.2'	56.9
20	120° 53.0	44.8	56°11.4	10.4'	18°19.1	-9.3'	56.9'
21	135°53.0	• • 45.3	70°40.8	10.4'	18°09.8	-9.4'	56.9'
22	150°52.9	45.9	85°10.2	10.4'	18°00.3	-9.5'	57.0'
23	165°52.9	46.4	99°39.6	10.5'	17°50.8	-9.6'	57.0'
	SD = 15.8'	d = 0.5'		SE	0 = 15.4'		

			2029	May 16	to Ma	ay. 18
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	1///	////	01:34	22:24	7///	////
66°	1777	////	02:13	21:43	////	7///
64°	<i> </i>	00:50	02:40	21:15	23:12	7777
62°	1777	01:41	03:01	20:54	22:15	7777
60°	7777	02:12	03:17	20:37	21:44	7777
N 58°	00:45	02:34	03:31	20:23	21:20	23:17
56°	01:32	02:52			21:02	22:25
56° 54°			03:43	20:11		
54° 52°	02:00	03:07	03:54	20:00	20:47	21:55
52° 50°	02:21	03:20	04:03	19:51	20:34	21:34
50 45°	02:38	03:31	04:11	19:43	20:23	21:16
	03:10	03:54	04:29	19:25	19:59	20:44
N 40°	03:34	04:12	04:43	19:10	19:41	20:20
35°	03:52	04:27	04:55	18:58	19:27	20:01
30°	04:07	04:39	05:05	18:48	19:14	19:46
20°	04:31	04:59	05:23	18:30	18:54	19:22
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:05	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:59	06:22	17:31	17:54	18:21
30°	05:45	06:14	06:39	17:13	17:39	18:08
35°	05:51	06:22	06:49	17:03	17:31	18:01
40°	05:58	06:31	07:00	16:52	17:21	17:54
45°	06:06	06:42	07:14	16:39	17:11	17:47
S 50°	06:14	06:54	07:30	16:23	16:59	17:38
52°	06:18	06:59	07:37	16:15	16:53	17:35
54°	06:22	07:05	07:46	16:07	16:47	17:31
56°	06:26	07:12	07:55	15:57	16:40	17:26
58°	06:30	07:20	08:06	15:46	16:33	17:22
S 60°	06:35	07:28	08:18	15:34	16:24	17:17
		Moonris	se .		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°			05:21			02:15
66°		04:06	06:04		01:39	01:30
64°	03:32	04:55	06:33	00:23	00:50	01:01
62°	04:12	05:26	06:55		00:30	00:38
60°	04:12	05:50	07:12	23:55	•• ••	00:30
N 58°	05:00	05.50	07.12	23.35		00.20
ואו "אמ"	1 (12.00)	un:UX	07.27	/ 3°3D		(1(1:())

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

		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	6-18%	
16	03:38	03:37	11:56	14:23	01:57		
17	03:36	03:35	11:56	15:16	02:49		
18	03:34	03:33	11:56	16:07	03:42		

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	236°57.2	165°35.7	N22°45.3	60°11.1	N02°40.4	39°19.3	S05°52.7	192°27.6	N14° 42.8		SHA	
0								207°29.8		Alpheratz	357°31.3	29°15.1
1	251°59.7	180°34.9	45.8	75°13.3	40.2	54°22.0	52.6		42.9	Ankaa	353°04.1	-42°08.6
2	267°02.2	195°34.1	46.3	90°15.4	39.9	69°24.6	52.5	222°31.9	43.0	Schedar	349°27.2	56°41.7
3	282°04.6	210°33.2	• • 46.8	105°17.6	• • 39.7	84°27.3	• • 52.5	237°34.1	• • 43.1	Diphda	348°44.0	$-17^{\circ}49.4$
4	297°07.1	225°32.4	47.3	120°19.7	39.4	99°29.9	52.4	252°36.2	43.2	Achernar	335°18.2	-57°05.1
5	312°09.5	240°31.6	47.8	135°21.9	39.2	114°32.5	52.3	267°38.4	43.3	Hamal	327°47.5	23°36.0
6	327°12.0	255°30.8	N22°48.3	150°24.0	N02°39.0	129°35.2	S05°52.3	282°40.5	N14°43.4	Polaris	312°34.9	89°23.1
7	342°14.5	270°30.0	48.7	165°26.1	38.7	144°37.8	52.2	297°42.7	43.5	Acamar	315°09.6	-40°11.2
8	357°16.9	285°29.1	49.2	180°28.3	38.5	159°40.5	52.2	312°44.8	43.6	Menkar	314°02.8	4°12.2
9	12°19.4	300°28.3	• • 49.7	195°30.4	• • 38.2	174°43.1	• • 52.1	327°47.0	• • 43.7	Mirfak	308°23.6	49°57.8
10	27°21.9	315°27.5	50.2	210°32.6	38.0	189°45.7	52.0	342°49.1	43.7	Aldebaran	290°35.9	16°34.0
11	42°24.3	330°26.7	50.7	225°34.7	37.8	204°48.4	52.0	357°51.3	43.8	Rigel	281°00.8	-8°10.2
12	57°26.8	345°25.8	N22°51.1	240°36.8	N02°37.5	219°51.0	S05°51.9	12°53.4	N14°43.9	Capella	280°17.1	46°01.5
13	72°29.3	0°25.0	51.6	255°39.0	37.3	234°53.7	51.9	27°55.6	44.0	Bellatrix	278°19.4	6°22.4
14	87°31.7	15°24.2	52.1	270°41.1	37.0	249°56.3	51.8	42°57.7	44.1	Elnath	277°57.8	28°37.8
15	102°34.2	30°23.4	• • 52.6	285°43.2	• • 36.8	264°58.9	• • 51.7	57°59.9	• • 44.2	Alnilam	275°34.5	-1°11.2
16	117°36.7	45°22.5	53.0	300°45.4	36.5	280°01.6	51.7	73°02.0	44.3	Betelgeuse	270°48.6	7°24.6
17	132°39.1	60°21.7	53.5	315°47.5	36.3	295°04.2	51.6	88°04.2	44.4	Canopus	263°51.3	-52°43.0
18	147°41.6	75°20.9	N22°54.0	330°49.6	N02°36.1	$310^{\circ}06.9$	S05°51.5	103°06.3	N14°44.5	Sirius	258°23.4	-16°45.6
19	162°44.0	90°20.1	54.5	345°51.8	35.8	325°09.5	51.5	118°08.5	44.5	Adhara	255°03.4	-10° 43.0 -29°01.0
20	177°46.5	$105^{\circ}19.2$	54.9	0°53.9	35.6	340°12.1	51.4	133°10.6	44.6	Procyon	244°47.4	5°08.8
21	192°49.0	120°18.4	• • 55.4	15°56.0	• • 35.3	355°14.8	• • 51.4	148°12.8	• • 44.7	Pollux	243°13.3	27°57.2
22	207°51.4	135°17.6	55.9	$30^{\circ}58.1$	35.1	$10^{\circ}17.4$	51.3	163°14.9	44.8	Avior	234° 13.5	-59°36.6
23	222°53.9	$150^{\circ}16.8$	56.3	46°00.3	34.8	25°20.0	51.2	$178^{\circ}17.1$	44.9		234 13.5 222°43.8	-39°30.0 -43°33.5
N 4	00:11	0.0/ -10	F/ 2.00	-01/-/0	2/ 0.20	-06/-10	1/ 2.26	- 2 1/ -/0	1/ 0 21	Suhail		
ivier.pa	ass. 08:11	ν -0.8° a0	.5′ m-3.90	ν 2.1 a-0	.2′ m-0.30	ν 2.6° a -0.	.1′ m-2.36	ν 2.1 au.	.1′ m0.31	Miaplacidus	221°37.5	-69°50.7
										Alphard	217°44.3	-8°47.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.3
0	237°56.4	165°15.9	N22°56.8	61°02.4	N02°34.6	40°22.7	S05°51.2	193°19.2	N14°45.0	Dubhe	193°36.8	61°35.7
1	252°58.8	180° 15.1	57.2	76°04.5	34.3	55°25.3	51.1	208°21.4	45.1	Denebola	182°21.3	14°24.4
2	268°01.3	195°14.3	57.7	91°06.6	34.1	70°27.9	51.1	223°23.5	45.2	Gienah	175°39.7	-17°42.6
3	283°03.8	210°13.4	58.2	106°08.8	• • 33.8	85°30.6	51.0	238°25.7	• • 45.3		172°55.5	-63°16.1
4	298°06.2	225°12.6	58.6	121°10.9	33.6	100°33.2	50.9	253°27.8	45.3		171°47.2	-57°17.0
5	313°08.7	240°11.8	59.1	136°13.0	33.4	115°35.8	50.9	268°30.0	45.4	Alioth	166°09.7	55°48.1
6	328°11.2	255°11.0	N22°59.5	150°15.0	N02°33.1	130°38.5	S05°50.8	283°32.1	N14° 45.5	Spica	158°18.3	-11°19.0
7	343°13.6	270°10.1	23°00.0	166°17.2	32.9	130 36.5 145°41.1		203 32.1 298°34.3		Alkaid	152°48.9	49°10.0
8	358°16.1	285°09.3	00.5	181°19.4	32.9	160°43.7	50.8 50.7	313°36.4	45.6 45.7	Hadar	148°30.2	-60°31.1
9	13°18.5	205 09.5 300°08.5	• • 00.9	196°21.5	• • 32.4	175°46.4	50.7	328°38.6	45.7 •• 45.8	Menkent	147°53.0	-36°31.0
								343°40.7		Arcturus	145°44.4	19°01.7
10	28°21.0	315°07.6	01.4	211°23.6	32.1	190°49.0	50.6		45.9	Rigil Kent.	139°34.6	-60°57.5
11	43°23.5	330°06.8	01.8	226°25.7	31.9	205°51.6	50.5	358°42.9	46.0	Kochab	$137^{\circ}19.1$	74°02.1
12	58°25.9	345°06.0	N23°02.3	241°27.8	N02°31.6	220°54.3	S05°50.5	13°45.0	N14°46.1	Zuben'ubi	$136^{\circ}51.8$	$-16^{\circ}09.9$
13	73°28.4	0°05.1	02.7	256°29.9	31.4	235°56.9	50.4	28°47.2	46.2	Alphecca	126°00.4	26°36.9
14	88°30.9	15°04.3	03.2	271°32.0	31.1	250°59.5	50.4	43°49.3	46.2	Antares	$112^{\circ}11.1$	-26°29.8
15	103°33.3	30°03.5	• • 03.6	286°34.1	• • 30.9	266°02.2	• • 50.3	58°51.5	• • 46.3	Atria	107°01.6	-69°04.6
16	118°35.8	45°02.6	04.1	301°36.3	30.6	281°04.8	50.2	73°53.6	46.4	Sabik	101°58.4	-15°45.6
17	133°38.3	60°01.8	04.5	316°38.4	30.3	296°07.4	50.2	88°55.8	46.5	Shaula	96°05.2	-37°07.3
18	148°40.7	75°01.0	N23°04.9	331°40.5	N02°30.1	311°10.1	S05°50.1	103°57.9	N14°46.6	Rasalhague	95°55.0	12°32.3
19	163°43.2	90°00.1	05.4	346°42.6	29.8	326°12.7	50.1	119°00.1	46.7	Eltanin	90°40.1	51°29.0
20	178°45.7	104°59.3	05.8	1°44.7	29.6	341°15.3	50.0	134°02.2	46.8	Kaus Aust.	83°27.5	-34°22.0
21	193°48.1	119°58.5	• • 06.3	16°46.8	• • 29.3	356°18.0	• • 50.0	149°04.4	• • 46.9	Vega	80°30.5	38°48.6
22	208°50.6	134° 57.6	06.7	31°48.9	29.1	11°20.6	49.9	164°06.5	46.9	Nunki	75°43.2	-26°15.4
23	223°53.0	149°56.8	07.1	46°51.0	28.8	26°23.2	49.8	179°08.7	47.0	Altair	61°56.3	8°56.8
Mer n	ass. 08:07	v-0.8' d0	.5′ m-3.90	v2 1' d-0	.2′ m-0.28	v2 6' d-0	.1′ m-2.35	v2 2' d0	1′ m0.32	Peacock	53°00.1	-56°38.0
		- 0.0 00	.5 111 5.50		.2 111 0.20					Deneb	49°23.2	45°23.0
										Enif	33°35.3	10°00.6
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.6	-46°48.8
0	238°55.5	164°56.0	N23°07.6	61°53.1	N02°28.6	41°25.8	S05°49.8	194°10.8	N14°47.1	Fomalhaut	15°10.8	-29°27.8
1	253°58.0	179°55.1	0.80	76°55.2	28.3	56°28.5	49.7	209°13.0	47.2	Scheat	13°41.8	28°14.5
2	269°00.4	194°54.3	08.5	91°57.3	28.1	71°31.1	49.7	224°15.2	47.3	Markab	13°26.5	15°21.8
3	284°02.9	209°53.5	• • 08.9	106°59.4	• • 27.8	86°33.7	• • 49.6	239°17.3	• • 47.4			
4	299°05.4	224°52.6	09.3	122°01.5	27.5	101°36.4	49.6	254°19.5	47.5	May 19 Sat	SHA	Mer.pass
5	$314^{\circ}07.8$	239°51.8	09.7	137°03.6	27.3	116°39.0	49.5	269°21.6	47.6		288°38.5	12:58
6	329°10.3	254°51.0	N23°10.2	152°05.7	N02°27.0	131°41.6	S05°49.4	284°23.8	N14°47.7		183°13.9	19:56
7	$344^{\circ}12.8$	$269^{\circ}50.1$	10.6	167°07.8	26.8	146°44.2	49.4	299°25.9	47.7		162°22.1	21:19
8	359°15.2	284°49.3	11.0	182°09.9	26.5	161°46.9	49.3	314°28.1	47.8	Saturn	315°30.4	11:09
9	14°17.7	299°48.4	• • 11.5	$197^{\circ}11.9$	• • 26.3	176°49.5	• • 49.3	329°30.2	• • 47.9	Ma 20. C	CLIA	Ma:: :-
10	29°20.1	314°47.6	11.9	212°14.0	26.0	191°52.1	49.2	344°32.4	48.0	May 20 Sun	SHA	Mer.pass
11	44°22.6	329°46.8	12.3	$227^{\circ}16.1$	25.7	206°54.8	49.2	359°34.5	48.1	Venus	287°19.6	13:00
12	59°25.1	344°45.9	N23°12.7	242°18.2	N02°25.5	221°57.4	S05°49.1	14°36.7	N14°48.2		183°06.0	19:53
13	74°27.5	359°45.1	13.2	257°20.3	25.2	237°00.0	49.0	29°38.8	48.3		162°26.3	21:15
14	89°30.0	14°44.2	13.6	272°22.4	25.0	252°02.6	49.0	44°41.0	48.4	Saturn	315°22.9	11:05
15	104°32.5	29°43.4	• • 14.0	287°24.5	• • 24.7	267°05.3	• • 48.9	59°43.1	• • 48.5	May 21 Mon	SHA	Mer.pass
16	119°34.9	44°42.6	14.4	302°26.6	24.4	282°07.9	48.9	74°45.3	48.5	Venus		13:01
17	134°37.4	59°41.7	14.8	317°28.6	24.2	297°10.5	48.8	89°47.4	48.6		182°57.6	19:50
18	149°39.9	74°40.9	N23°15.2	332°30.7	N02°23.9	312°13.1	S05°48.8	104°49.6	N14°48.7	Jupiter		21:11
19	164°42.3	89°40.0	15.7	347°32.8	23.6	327°15.8	48.7	119°51.7	48.8	Saturn	315°15.3	11:02
20	179°44.8	104°39.2	16.1	2°34.9	23.4	342°18.4	48.7	134°53.9	48.9	Saturn	313 13.3	11:02
21	194°47.3	119°38.4	• • 16.5	17°37.0	• • 23.1	357°21.0	• • 48.6	149°56.0	• • 49.0	Horizont	al parallax	
22	209°49.7	134°37.5	16.9	32°39.1	22.9	12°23.6	48.6	164°58.2	49.0		Venus:	0.1
23	209 49.7 224°52.2	149°36.7	17.3	47°41.1	22.6	27°26.3	48.5	180°00.3	49.1		Mars:	0.2
										L		
Mer.pa	ass. 08:03	ν -0.8′ d0	.4′ m-3.90	$\nu 2.1' \ d$ -0	.3′ m-0.26	$\nu 2.6' \ d-0$.1′ m-2.35	$\nu 2.2' \ d0$.1′ m0.32			

h	Sur	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.9	N19°46.9	114°09.1	10.5'	N17°41.2	-9.7'	57.0'
1	195°52.8	47.5	128°38.5	10.5'	17°31.4	-9.8'	57.0'
2	210°52.8	48.0	143°08.1	10.6'	17°21.6	-9.9'	57.1'
3 4	225°52.8 240°52.7	· · 48.5 49.1	157°37.6 172°07.2	10.6' 10.6'	17° 11.7 17° 01.6	-10.0' -10.1'	57.1' 57.1'
5	255°52.7	49.1	172 07.2 186°36.8	10.6'	16°51.5	-10.1	57.1 57.2'
6	270°52.7	N19°50.1	201°06.5	10.7'	N16°41.3	-10.3	57.2'
7	285°52.7	50.7	215°36.1	10.7'	16°31.0	-10.4'	57.2'
8	300°52.6	51.2	230°05.8	10.7'	16°20.6	-10.5'	57.2'
9	315°52.6	• • 51.7	244°35.6	10.8'	16° 10.1	-10.6'	57.3'
10 11	330°52.6 345°52.5	52.3 52.8	259°05.3 273°35.1	10.8' 10.8'	15° 59.5 15° 48.8	-10.7' -10.8'	57.3' 57.3'
12	0°52.5	N19°53.3	288°05.0	10.9	N15°38.0	-10.9	57.3'
13	15°52.5	53.8	302°34.8	10.9'	15°27.1	-11.0'	57.4'
14	30°52.4	54.4	317°04.7	10.9'	15° 16.2	-11.0'	57.4'
15	45°52.4 60°52.4	• • 54.9	331°34.6 346°04.5	10.9'	15°05.1 14°54.0	-11.1'	57.4'
16 17	75°52.3	55.4 55.9	0°34.5	11.0' 11.0'	14 54.0 14°42.8	-11.2' -11.3'	57.4' 57.5'
18	90°52.3	N19°56.5	15°04.5	11.0'	N14°31.5	-11.4	57.5'
19	105°52.2	57.0	29°34.5	11.0'	14°20.1	-11.5'	57.5'
20	120°52.2	57.5	44°04.6	11.1'	14°08.6	-11.6'	57.6'
21	135°52.2	• • 58.0	58°34.6	11.1'	13°57.0	-11.6'	57.6'
22 23	150°52.1 165°52.1	58.6 59.1	73°04.7 87°34.8	11.1' 11.1'	13°45.4 13°33.7	-11.7' -11.8'	57.6' 57.6'
23			07 34.0			-11.0	37.0
	SD = 15.8'	d = 0.5'		SI	O = 15.6'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°52.1 195°52.0	N19°59.6 20°00.1	102°05.0 116°35.1	11.2' 11.2'	N13°21.9 13°10.0	-11.9' -12.0'	57.7' 57.7'
2	210°52.0	00.6	131°05.3	11.2'	12°58.0	-12.0'	57.7'
3	225°52.0	•• 01.2	145°35.5	11.2'	12°46.0	-12.1'	57.7'
4	240°51.9	01.7	160°05.8	11.3'	12°33.9	-12.2'	57.8'
5	255°51.9	02.2	174°36.0	11.3'	12°21.7	-12.3'	57.8'
6 7	270°51.8 285°51.8	N20°02.7 03.2	189°06.3 203°36.6	11.3' 11.3'	N12°09.5 11°57.1	-12.3' -12.4'	57.8' 57.9'
8	300°51.8	03.2	218°06.9	11.3'	11°44.7	-12.4	57.9'
9	315°51.7	• • 04.3	232°37.2	11.3'	11°32.2	-12.5'	57.9'
10	330°51.7	04.8	247°07.6	11.4'	$11^{\circ}19.7$	-12.6'	57.9'
11	345°51.7	05.3	261°38.0	11.4'	11°07.1	-12.7'	58.0'
12 13	0°51.6 15°51.6	N20°05.8 06.3	276°08.3 290°38.7	11.4' 11.4'	N10°54.4 10°41.6	-12.8' -12.8'	58.0' 58.0'
14	30°51.5	06.8	305°09.2	11.4'	10° 41.0	-12.0 -12.9'	58.0'
15	45°51.5	• • 07.3	319°39.6	11.4'	10° 15.9	-13.0'	58.1'
16	60°51.5	07.8	334°10.0	11.5'	10°03.0	-13.0'	58.1'
17	75°51.4	08.4 N20°08.9	348°40.5	11.5' 11.5'	09°50.0	-13.1'	58.1' 58.2'
18 19	90°51.4 105°51.3	N20°08.9 09.4	3°10.9 17°41.4	11.5'	N09°36.9 09°23.7	-13.1' -13.2'	58.2' 58.2'
20	120°51.3	09.9	32°11.9	11.5'	09° 10.5	-13.3'	58.2
21	135°51.3	• • 10.4	46°42.4	11.5'	08°57.3	-13.3'	58.2'
22	150°51.2	10.9	61°12.9	11.5'	08°44.0	-13.4'	58.3'
23	165°51.2	11.4	75°43.4	11.5'	08°30.6	-13.4'	58.3'
	SD = 15.8'	d = 0.5'		SI	O = 15.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.1	$N20^{\circ}11.9$	90°13.9	11.5'	N08° 17.2	-13.5'	58.3'
1	195°51.1 210°51.1	12.4	104°44.5	11.5' 11.5'	08°03.7	-13.5'	58.4'
2 3	210°51.1 225°51.0	12.9 •• 13.4	119°15.0 133°45.5	11.5'	07°50.1 07°36.5	-13.6' -13.6'	58.4' 58.4'
4	240°51.0	13.4	148°16.1	11.5'	07°22.9	-13.7	58.4
5	255°50.9	14.4	$162^{\circ}46.6$	11.5'	$07^{\circ}09.2$	-13.7'	58.5'
6	270°50.9	N20°14.9	177°17.1	11.5'	N06° 55.4	-13.8'	58.5'
7 8	285°50.8 300°50.8	15.4 15.9	191°47.7 206°18.2	11.5' 11.5'	06°41.7 06°27.8	-13.8' -13.9'	58.5' 58.6'
9	300 50.8 315°50.8	. 16.4	200 18.2 220°48.8	11.5'	06°27.8	-13.9' -13.9'	58.6'
10	330°50.7	16.9	235°19.3	11.5'	06°00.0	-14.0'	58.6'
11	345°50.7	17.4	249°49.8	11.5'	05°46.0	-14.0'	58.6'
12	0°50.6	N20°17.9	264°20.3	11.5'	N05°32.0	-14.1'	58.7'
13 14	15°50.6 30°50.5	18.4 18.9	278°50.9 293°21.4	11.5' 11.5'	05°17.9 05°03.8	-14.1' -14.1'	58.7' 58.7'
15	45°50.5	•• 19.4	307°51.9	11.5'	03°03.8 04°49.7	-14.1	58.7'
16	60°50.4	19.9	322°22.4	11.5'	04°35.5	-14.2'	58.8'
17	75°50.4	20.4	336°52.9	11.5'	04°21.3	-14.3'	58.8'
18	90°50.4	N20°20.9	351°23.4 5°53.8	11.5'	N04°07.0 03°52.7	-14.3'	58.8'
19 20	105°50.3 120°50.3	21.4 21.9	5°53.8 20°24.3	11.5' 11.4'	03°52.7 03°38.4	-14.3' -14.4'	58.9' 58.9'
21	135°50.2	• • 22.4	34°54.7	11.4'	03°24.1	-14.4'	58.9'
22	150°50.2	22.9	49°25.2	11.4'	03°09.7	-14.4'	58.9'
23	165°50.1	23.4	63°55.6	11.4'	02°55.3	-14.4'	59.0'
	SD = 15.8'	d = 0.5'		SI	O = 15.9'		

N 72° □ □ □ □ □ N 70° □ □ □ □ □ 68° //// //// 01:15 22:45 //// //// 66° //// //// 00:03 02:31 21:25 //// //// 66° //// 00:03 02:31 21:25 //// //// 60° //// 01:28 02:53 21:02 22:29 //// 60° //// 02:02 03:11 20:44 21:54 //// N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 2	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70°	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° //// //// 01:15 22:45 //// //// 66° //// //// 02:01 21:55 //// //// 64° //// 00:03 02:31 21:25 //// //// 60° //// 01:28 02:53 21:02 22:29 //// 60° //// 02:02 03:11 20:44 21:54 //// N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40	N 72°						
66° //// //// 02:01 21:55 //// //// 64° //// 00:03 02:31 21:25 //// //// 60° //// 01:28 02:53 21:02 22:29 /// 60° //// 02:02 03:11 20:44 21:54 //// N 88° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 </th <th>N 70°</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	N 70°						
64° //// 00:03 02:31 21:25 //// //// 62° //// 01:28 02:53 21:02 22:29 //// 60° //// 02:02 03:11 20:44 21:54 //// N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:30 04:58 05	68°	////	////	01:15	22:45	////	////
62° //// 01:28 02:53 21:02 22:29 //// 60° //// 02:02 03:11 20:44 21:54 //// N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 <td< th=""><th>66°</th><th>////</th><th>////</th><th>02:01</th><th>21:55</th><th>////</th><th>////</th></td<>	66°	////	////	02:01	21:55	////	////
60° //// 02:02 03:11 20:44 21:54 //// N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16		////	00:03	02:31	21:25	////	////
N 58° 00:02 02:27 03:26 20:29 21:28 //// 56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 19:04 0° 05:05 05:31	62°	////	01:28	02:53	21:02	22:29	////
56° 01:19 02:46 03:38 20:16 21:09 22:38 54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 19:04 0° 05:05 05:31 05:53 18:00 18:22 18:48 5 10° 05:20 05:45	60°	////	02:02	03:11	20:44	21:54	////
54° 01:51 03:02 03:49 20:05 20:53 22:04 52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 19:04 0° 05:05 05:31 05:53 18:00 18:22 18:48 5 10° 05:20 05:45 06:08 17:45 18:08 18:33 20° 05:33 06:00	N 58°	00:02	02:27	03:26	20:29	21:28	////
52° 02:14 03:15 03:59 19:55 20:39 21:41 50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 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 18:07 35° 05:53 06:24	56°	01:19	02:46	03:38	20:16	21:09	22:38
50° 02:32 03:27 04:07 19:47 20:27 21:23 45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 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 17:29 18:00 40° 06:01 06:34	54°	01:51	03:02	03:49	20:05	20:53	22:04
45° 03:06 03:51 04:26 19:28 20:03 20:48 N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 19:04 0° 05:05 05:31 05:53 18:00 18:22 18:48 S 10° 05:05 05:31 06:08 17:45 18:08 18:33 20° 05:33 06:00 06:23 17:30 17:53 18:20 30° 05:46 06:15 06:41 17:12 17:37 18:07 35° 05:53 06:24 06:51 17:02 17:29 18:00 40° 06:01 06:34	52°	02:14	03:15	03:59	19:55	20:39	21:41
N 40° 03:31 04:09 04:40 19:13 19:44 20:23 35° 03:50 04:24 04:53 19:01 19:29 20:04 30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 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 17:37 18:07 35° 05:53 06:24 06:51 17:02 17:29 18:00 40° 06:01 06:34 07:03 16:50 17:19 17:52 45° 06:08 06:44	50°	02:32	03:27	04:07	19:47	20:27	21:23
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30° 04:05 04:37 05:04 18:50 19:16 19:48 20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 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 17:37 18:07 35° 05:53 06:24 06:51 17:02 17:29 18:00 40° 06:01 06:34 07:03 16:50 17:19 17:52 45° 06:08 06:44 07:17 16:36 17:08 17:44 S 50° 06:17 06:57 07:34 16:19 16:55 17:35 52° 06:21 07:03	N 40°	03:31	04:09	04:40	19:13	19:44	20:23
20° 04:30 04:58 05:22 18:31 18:55 19:23 N 10° 04:49 05:16 05:38 18:15 18:38 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 35° 05:53 06:24 06:41 17:12 17:37 18:07 35° 05:53 06:24 06:51 17:02 17:29 18:00 40° 06:01 06:34 07:03 16:50 17:19 17:52 45° 06:08 06:44 07:17 16:36 17:08 17:44 S 50° 06:17 06:57 07:34 16:19 16:55 17:35 52° 06:21 07:03 07:42 16:11 16:49 17:27 56° 06:30 07:17	35°	03:50	04:24	04:53	19:01	19:29	20:04
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	30°	05:46	06:15	06:41	17:12	17:37	18:07
45° 06:08 06:44 07:17 16:36 17:08 17:44 \$ 50° 06:17 06:57 07:34 16:19 16:55 17:35 52° 06:21 07:03 07:42 16:11 16:49 17:31 54° 06:25 07:10 07:50 16:02 16:43 17:27 56° 06:30 07:17 08:00 15:52 16:36 17:23 58° 06:35 07:24 08:11 15:41 16:28 17:18		05:53	06:24	06:51	17:02	17:29	18:00
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52° 06:21 07:03 07:42 16:11 16:49 17:31 54° 06:25 07:10 07:50 16:02 16:43 17:27 56° 06:30 07:17 08:00 15:52 16:36 17:23 58° 06:35 07:24 08:11 15:41 16:28 17:18	45°	06:08	06:44	07:17	16:36	17:08	17:44
54° 06:25 07:10 07:50 16:02 16:43 17:27 56° 06:30 07:17 08:00 15:52 16:36 17:23 58° 06:35 07:24 08:11 15:41 16:28 17:18	S 50°	06:17	06:57	07:34	16:19	16:55	17:35
56° 06:30 07:17 08:00 15:52 16:36 17:23 58° 06:35 07:24 08:11 15:41 16:28 17:18	52°	06:21	07:03	07:42	16:11	16:49	17:31
58° 06:35 07:24 08:11 15:41 16:28 17:18	54°	06:25	07:10	07:50	16:02	16:43	17:27
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S 60° 06:40 07:33 08:25 15:28 16:19 17:12		06:35		08:11	15:41	16:28	17:18
	S 60°	06:40	07:33	08:25	15:28	16:19	17:12

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-48%	
19	03:31	03:30	11:57	16:58	04:33		
20	03:28	03:26	11:57	17:47	05:22		
21	03:25	03:22	11:57	18:36	06:11		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	239°54.6				N02°22.3			195°02.5				
0		164°35.8	N23°17.7	62°43.2		42°28.9	S05°48.4		N14°49.2	Alpheratz	357°31.2	29°15.1
1	254°57.1	179°35.0	18.1	77°45.3	22.1	57°31.5	48.4	210°04.6	49.3	Ankaa	353°04.0	-42°08.5
2	269°59.6	194°34.1	18.5	92°47.4	21.8	72°34.1	48.3	225°06.8	49.4	Schedar	349°27.2	56°41.7
3	285°02.0	209°33.3	• • 18.9	107°49.4	• • 21.5	87°36.7	• • 48.3	240°08.9	• • 49.5	Diphda	348°44.0	-17°49.4
4	300°04.5	224°32.5	19.3	122°51.5	21.3	102°39.4	48.2	255°11.1	49.6	Achernar	335°18.2	-57°05.1
5	315°07.0	239°31.6	19.7	137°53.6	21.0	117°42.0	48.2	270°13.2	49.7	Hamal	327°47.5	23°36.0
6	330°09.4	254°30.8	N23°20.1	152°55.6	N02°20.7	132°44.6	505°48.1	285°15.4	N14°49.8		312°34.5	89°23.0
7	345°11.9	269°29.9	20.5	167°57.7	20.5	147°47.2	48.1	300°17.5	49.9	Polaris		
8	0°14.4	284°29.1	20.9	182°59.8	20.2	162°49.9	48.0	315°19.7	49.9	Acamar	315°09.6	-40°11.2
9	15°16.8	299°28.2	21.3	198°01.9	• • 19.9	177°52.5	• • 48.0	330°21.8	• • 50.0	Menkar	314°02.8	4°12.2
	30°19.3									Mirfak	308°23.6	49°57.8
10		314°27.4	21.7	213°03.9	19.7	192°55.1	47.9	345°24.0	50.1	Aldebaran	290°35.9	16°34.0
11	45°21.7	329°26.5	22.1	228°06.0	19.4	207°57.7	47.8	0°26.2	50.2	Rigel	281°00.8	-8°10.2
12	60°24.2	344°25.7	N23°22.5	243°08.1	N02°19.1	223°00.3	S05°47.8	15°28.3	$N14^{\circ}50.3$	Capella	280°17.1	46°01.5
13	75°26.7	359°24.8	22.9	$258^{\circ}10.1$	18.9	238°03.0	47.7	30°30.5	50.4	Bellatrix	278°19.4	6°22.4
14	90°29.1	14°24.0	23.3	273°12.2	18.6	253°05.6	47.7	45°32.6	50.5			
15	105°31.6	29°23.2	• • 23.7	288°14.2	• • 18.3	268°08.2	• • 47.6	60°34.8	• • 50.6	Elnath	277°57.8	28°37.8
16	120°34.1	44°22.3	24.1	303°16.3	18.1	283°10.8	47.6	75°36.9	50.7	Alnilam	275°34.5	-1°11.2
17	135°36.5	59°21.5	24.5	318°18.4	17.8	298°13.4	47.5	90°39.1	50.7	Betelgeuse	270°48.6	7°24.6
										Canopus	263°51.3	-52°42.9
18	150°39.0	74°20.6	N23°24.9	333°20.4	N02°17.5	313°16.1	S05°47.5	105°41.2	N14°50.8	Sirius	258°23.4	-16°45.6
19	165°41.5	89° 19.8	25.3	348°22.5	17.2	328°18.7	47.4	120°43.4	50.9	Adhara	255°03.4	-29°01.0
20	180°43.9	104° 18.9	25.6	3°24.5	17.0	343°21.3	47.4	135°45.5	51.0	Procyon	244°47.4	5°08.8
21	195°46.4	$119^{\circ}18.1$	• • 26.0	18°26.6	• • 16.7	358°23.9	• • 47.3	150°47.7	• • 51.1		244 47.4 243°13.3	27°57.2
22	210°48.9	134°17.2	26.4	33°28.7	16.4	13°26.5	47.3	165°49.8	51.2	Pollux		
23	225°51.3	149°16.4	26.8	48°30.7	16.2	28°29.1	47.2	180°52.0	51.3	Avior	234°13.5	-59°36.6
										Suhail	222°43.8	-43° 33.5
Mer.p	ass. 07:59	ν -0.8 $'$ d0	.4′ m-3.90	$\nu 2.1' \ d-0$.3′ m-0.24	ν 2.6′ d-0	.1′ m-2.34	ν 2.2 $^{\prime}$ d0	.1' m0.32	Miaplacidus	221°37.6	-69°50.7
										Alphard	217°44.4	-8°47.4
										Regulus	207°30.7	11°49.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.8	61°35.7
0	240°53.8	164°15.5	N23°27.2	63°32.8	N02°15.9	43°31.8	S05°47.2	195°54.1	N14°51.4	Denebola	182°21.3	14°24.4
1	255°56.2	179°14.7	27.6	78°34.8	15.6	58°34.4	47.1	210°56.3	51.4		162 21.3 175°39.8	-17°42.5
2	270°58.7	194°13.8	27.9	93°36.9	15.3	73°37.0	47.1	225°58.4	51.5	Gienah		
3	286°01.2	209° 13.0	28.3	108°38.9	. 15.1	88°39.6	• • 47.0	241°00.6	51.6	Acrux	172°55.5	-63°16.1
4	301°03.6	224°12.1	28.7	123°41.0	14.8	103°42.2	47.0	256°02.7	51.7	Gacrux	171°47.2	-57° 17.0
										Alioth	$166^{\circ}09.7$	55°48.1
5	316°06.1	239°11.3	29.1	138°43.0	14.5	118°44.8	46.9	271°04.9	51.8	Spica	158°18.3	-11°19.0
6	331°08.6	254°10.4	N23°29.4	153°45.1	N02°14.2	133°47.5	S05°46.9	286°07.0	N14°51.9	Alkaid	152°49.0	49°10.1
7	$346^{\circ}11.0$	269°09.6	29.8	$168^{\circ}47.1$	14.0	$148^{\circ}50.1$	46.8	$301^{\circ}09.2$	52.0	Hadar	148°30.2	-60°31.1
8	1°13.5	284°08.7	30.2	183°49.2	13.7	163°52.7	46.8	316°11.3	52.1	Menkent	147°53.0	-36°31.0
9	$16^{\circ}16.0$	299°07.9	• • 30.6	198°51.2	• • 13.4	178°55.3	• • 46.7	331°13.5	• • 52.1	1		
10	31°18.4	314°07.0	30.9	213°53.3	13.1	193°57.9	46.7	346°15.7	52.2	Arcturus	145°44.4	19°01.7
11	46°20.9	329°06.2	31.3	228°55.3	12.9	209°00.5	46.6	1°17.8	52.3	Rigil Kent.	139°34.7	-60°57.6
	61°23.4	344°05.3	N23°31.7	243°57.4	N02°12.6	224°03.1	\$05°46.5	16°20.0	N14°52.4	Kochab	$137^{\circ}19.1$	74°02.1
12										Zuben'ubi	136°51.8	-16°09.9
13	76°25.8	359°04.4	32.0	258°59.4	12.3	239°05.8	46.5	31°22.1	52.5	Alphecca	126°00.4	26°36.9
14	91°28.3	14°03.6	32.4	274°01.4	12.0	254°08.4	46.4	46°24.3	52.6	Antares	112°11.1	-26°29.8
15	106°30.7	29°02.7	• • 32.8	289°03.5	•• 11.7	$269^{\circ}11.0$	• • 46.4	61°26.4	• • 52.7	Atria	107°01.5	-69°04.6
16	121°33.2	44°01.9	33.1	304°05.5	11.5	284°13.6	46.3	76°28.6	52.7	Sabik	101°58.4	-15° 45.6
17	136°35.7	59°01.0	33.5	319°07.6	11.2	299°16.2	46.3	91°30.7	52.8	1		
18	151°38.1	74°00.2	N23°33.8	334°09.6	N02°10.9	314°18.8	S05°46.2	106°32.9	N14°52.9	Shaula	96°05.2	-37°07.3
19	166°40.6	88° 59.3	34.2	349°11.6	10.6	329°21.4	46.2	121°35.0	F0.0	Rasalhague	95°55.0	12°32.3
						344°24.0			53.0	Eltanin	90°40.1	51°29.0
20	181°43.1	103°58.5	34.6	4°13.7	10.4		46.1	136°37.2	53.1	Kaus Aust.	83°27.5	-34°22.0
21	196°45.5	118°57.6	• • 34.9	19°15.7	• • 10.1	359°26.7	• • 46.1	151°39.3	• • 53.2	Vega	80°30.5	38°48.6
22	211°48.0	133°56.8	35.3	34°17.7	09.8	14°29.3	46.0	166°41.5	53.3	Nunki	75°43.1	-26° 15.4
23	226°50.5	148°55.9	35.6	49°19.8	09.5	29°31.9	46.0	181°43.6	53.4	Altair	61°56.3	8°56.8
N 4	07.55	0.0/.10	.4′ m-3.90	0.1/ / 0	.3′ m-0.22	2.6/ 1.0	1/ 0.22	2 2/ 10	.1′ m0.32	Peacock	53°00.1	-56°38.0
ivier.p	ass. 07:55	ν -0.8 au	.4 m-3.90	ν 2.1 a-0	.3 m-0.22	ν 2.0 a-0	.1′ m-2.33	ν2.2 αυ	.1 mu.32	l l		
										Deneb	49°23.1	45°23.0
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.3	10°00.6
0	241°52.9	163°55.0	N23°36.0	64°21.8	N02°09.2	44°34.5	S05° 46.0	196°45.8	N14°53.4	Al Na'ir	27°28.6	-46°48.8
										Fomalhaut	15°10.8	-29°27.7
1	256°55.4	178°54.2	36.3	79°23.8	08.9	59°37.1	45.9	211°47.9	53.5	Scheat	13°41.8	28° 14.5
2	271°57.8	193°53.3	36.7	94°25.9	08.7	74°39.7	45.9	226°50.1	53.6	Markab	13°26.4	15°21.8
3	287°00.3	208°52.5	• • 37.0	109°27.9	• • 08.4	89°42.3	• • 45.8	241°52.3	• • 53.7			
4	302°02.8	223°51.6	37.4	124°29.9	08.1	104°44.9	45.8	256°54.4	53.8	May 22 Tue	SHA	Mer.pass
5	$317^{\circ}05.2$	238°50.8	37.7	139°31.9	07.8	119°47.5	45.7	271°56.6	53.9		284°41.2	13:02
6	332°07.7	253°49.9	N23°38.1	154°34.0	N02°07.5	134°50.1	S05°45.7	286°58.7	N14°54.0	Mars	182°48.6	19:46
7	347°10.2	268°49.0	38.4	169°36.0	07.2	149°52.8	45.6	302°00.9	54.1	Jupiter	162°34.2	21:06
8	2°12.6	283°48.2	38.7	184°38.0	07.0	164°55.4	45.6	317°03.0	54.1	Saturn	315°07.8	10:58
9	17°15.1	298°47.3	39.1	199°40.0	• • 06.7	179°58.0	• • 45.5	332°05.2	• • 54.2	3444.11		
										May 23 Wed	SHA	Mer.pass
10	32°17.6	313°46.5	39.4	214°42.1	06.4	195°00.6	45.5	347°07.3	54.3		283°21.7	13:04
11	47°20.0	328° 45.6	39.8	229°44.1	06.1	210°03.2	45.4	2°09.5	54.4	Mars	182°39.0	19:43
12	62°22.5	343°44.8	N23°40.1	244°46.1	N02°05.8	225°05.8	S05°45.4	17°11.6	N14°54.5	Jupiter	162°38.0	21:02
13	77°25.0	358°43.9	40.4	259°48.1	05.5	240°08.4	45.3	$32^{\circ}13.8$	54.6			
14	92°27.4	13°43.0	40.8	274°50.1	05.3	255°11.0	45.3	$47^{\circ}15.9$	54.7	Saturn	315°00.3	10:55
15	107°29.9	28°42.2	• • 41.1	289°52.2	• • 05.0	270°13.6	• • 45.2	62°18.1	• • 54.7	May 24 Thu	SHA	Mer.pass
16	122°32.3	43°41.3	41.4	304°54.2	04.7	285°16.2	45.2	77°20.2	54.8		282°02.1	13:05
								92°22.4				
17	137°34.8	58°40.5	41.8	319°56.2	04.4	300°18.8	45.1		54.9	l l	182°28.9	19:40
18	152°37.3	73°39.6	N23°42.1	334°58.2	N02°04.1	315°21.4	S05°45.1	107°24.6	N14°55.0		162°41.6	20:58
19	167°39.7	88°38.7	42.4	350°00.2	03.8	330°24.0	45.0	122°26.7	55.1	Saturn	314°52.9	10:51
20	182°42.2	103°37.9	42.8	5°02.2	03.5	345°26.6	45.0	137°28.9	55.2			
21	197°44.7	118°37.0	• • 43.1	20°04.3	• • 03.2	0°29.2	• • 44.9	152°31.0	• • 55.3	Horizont	al parallax	
22	212°47.1	133°36.2	43.4	35°06.3	02.9	15°31.9	44.9	167°33.2	55.4		Venus:	0.1
23	227°49.6	148°35.3	43.8	50°08.3	02.7	30°34.5	44.8	182°35.3	55.4		Mars:	0.2
										•		
Mer.p	ass. 07:51	ν -0.9 $'$ d0	.4′ m-3.90	ν 2.0′ d-0	.3′ m-0.20	ν 2.6′ d-0	.0′ m-2.33	ν 2.2′ d0	.1' m0.32			

h	Sui			Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.1	N20°23.9	78°26.0	11.4'	N02°40.8	-14.5'	59.0'
1	195° 50.0	24.4	92°56.4	11.4'	02°26.3	-14.5'	59.0'
2	210° 50.0	24.9	107°26.7	11.3'	02°11.8	-14.5'	59.0'
3 4	225°49.9 240°49.9	· · 25.4 25.8	121°57.1 136°27.4	11.3' 11.3'	01°57.3 01°42.8	-14.5' -14.6'	59.1' 59.1'
5	255° 49.8	26.3	150° 57.7	11.3'	01°42.8	-14.6'	59.1'
6	270° 49.8	N20°26.8	165°28.0	11.3'	N01°13.6	-14.6'	59.2'
7	285°49.7	27.3	179°58.2	11.2'	00°59.0	-14.6'	59.2'
8	300°49.7	27.8	194°28.5	11.2'	00°44.4	-14.6'	59.2'
9	315°49.6	• • 28.3	208°58.7	11.2'	00°29.7	-14.7'	59.2'
10 11	330° 49.6 345° 49.5	28.8 29.2	223°28.8 237°59.0	11.1' 11.1'	00°15.0 N00°00.4	-14.7' -14.7'	59.3' 59.3'
12	0°49.5	N20°29.7	252°29.1	11.1'	S00°14.3	14.7	59.3'
13	15°49.4	30.2	266° 59.2	11.1'	00°29.0	14.7'	59.3'
14	30°49.4	30.7	$281^{\circ}29.2$	11.0'	00°43.7	14.7'	59.4'
15	45°49.3	• • 31.2	295°59.3	11.0'	00°58.5	14.7'	59.4
16 17	60° 49.3 75° 49.2	31.7 32.1	310°29.2 324°59.2	11.0' 10.9'	01°13.2 01°27.9	14.7' 14.7'	59.4' 59.4'
18	90°49.2	N20°32.6	339°29.1	10.9	S01°42.7	14.7	59.5
19	105°49.1	33.1	353°59.0	10.8'	01°57.4	14.7'	59.5'
20	120°49.1	33.6	8°28.8	10.8'	$02^{\circ}12.2$	14.8'	59.5'
21	135°49.0	• • 34.1	22°58.6	10.8'	02°26.9	14.8'	59.5'
22	150°49.0	34.5	37°28.4	10.7'	02°41.7	14.7'	59.6'
23	165°48.9	35.0	51°58.1	10.7'	02°56.4	14.7'	59.6'
	SD = 15.8'	d = 0.5'		SI	O = 16.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.9	N20°35.5	66°27.8	10.6'	\$03°11.2	14.7'	59.6'
1 2	195° 48.8 210° 48.8	36.0 36.4	80°57.4 95°27.0	10.6' 10.5'	03°25.9 03°40.6	14.7' 14.7'	59.6' 59.7'
3	210 48.8 225°48.7	36.9	95 27.0 109°56.6	10.5	03 40.6 03°55.4	14.7'	59.7' 59.7'
4	240°48.7	37.4	124°26.1	10.4	04°10.1	14.7'	59.7'
5	255°48.6	37.9	138°55.5	10.4'	04°24.8	14.7'	59.7'
6	270°48.6	N20°38.3	153°24.9	10.4'	S04°39.5	14.7'	59.7'
7	285°48.5	38.8	167°54.3	10.3'	04°54.2	14.7'	59.8'
8 9	300° 48.5 315° 48.4	39.3 •• 39.8	182°23.6 196°52.8	10.2' 10.2'	05°08.8 05°23.5	14.6' 14.6'	59.8' 59.8'
10	330°48.4	40.2	211°22.0	10.2	05°23.3	14.6	59.8'
11	345°48.3	40.7	225°51.1	10.1'	05°52.7	14.6'	59.9'
12	0°48.2	N20°41.2	240°20.2	10.0'	S 06°07.3	14.6'	59.9'
13	15°48.2	41.6	254°49.3	10.0'	06°21.9	14.5'	59.9'
14 15	30°48.1 45°48.1	42.1 •• 42.6	269°18.2 283°47.1	9.9' 9.9'	06°36.4 06°50.9	14.5' 14.5'	59.9' 59.9'
16	60°48.0	43.0	203 47.1 298°16.0	9.9 9.8'	00 50.9 07°05.4	14.5	60.0'
17	75° 48.0	43.5	312°44.8	9.7'	07°19.8	14.4'	60.0'
18	90°47.9	N20°44.0	$327^{\circ}13.5$	9.7'	S07°34.3	14.4'	60.0'
19	105°47.9	44.4	341°42.2	9.6'	07°48.7	14.4'	60.0'
20	120° 47.8 135° 47.7	44.9	356°10.8 10°39.3	9.5'	08°03.0 08°17.3	14.3	60.0' 60.1'
21 22	150°47.7	• • 45.4 45.8	10 39.3 25°07.8	9.5' 9.4'	08 17.3 08°31.6	14.3' 14.2'	60.1
23	165° 47.6	46.3	39°36.2	9.3'	08°45.8	14.2'	60.1
	SD = 15.8'	d = 0.5'		SI	D = 16.3'		
T I.	GHA	D	GHA		D-:		HP
Thu 0	GHA 180°47.6	Dec N20°46.8	GHA 54°04.6	u 9.3'	Dec \$09°00.0	d 14.2'	60.1'
1	195° 47.5	47.2	68°32.9	9.3 9.2'	09°14.2	14.1	60.1
2	210°47.5	47.7	83°01.1	9.1'	09°28.3	14.1'	60.2'
3	225° 47.4	• • 48.1	97°29.2	9.1'	09°42.4	14.0'	60.2'
4	240°47.3	48.6	111°57.3	9.0'	09°56.4 10°10.4	14.0' 13.9'	60.2'
5 6	255° 47.3 270° 47.2	49.1 N20°49.5	126°25.3 140°53.2	8.9' 8.9'	10°10.4 \$10°24.3	13.9' 13.9'	60.2' 60.2'
7	270 47.2 285°47.2	50.0	140 55.2 155°21.1	8.8'	10°38.1	13.8'	60.2
8	300°47.1	50.4	169°48.9	8.7'	10°51.9	13.7'	60.2'
9	315°47.1	•• 50.9	184° 16.6	8.6'	11°05.7	13.7'	60.3'
10	330°47.0	51.3	198°44.2	8.6'	11°19.4	13.6'	60.3'
11 12	345°46.9 0°46.9	51.8 N20°52.3	213°11.8 227°39.3	8.5' 8.4'	11°33.0 \$11°46.6	13.6' 13.5'	60.3' 60.3'
13	0 46.9 15°46.8	N20 52.3 52.7	242° 06.7	8.3'	12°00.1	13.5	60.3
14	30°46.8	53.2	256°34.0	8.3'	12°13.5	13.4	60.3
15	45°46.7	• • 53.6	271°01.3	8.2'	12°26.9	13.3'	60.3'
16	60°46.6	54.1	285°28.4	8.1'	12°40.2	13.2'	60.4'
17	75°46.6	54.5	299°55.5	8.0'	12°53.4	13.2'	60.4'
18 19	90° 46.5 105° 46.5	N20°55.0 55.4	314°22.6 328°49.5	7.9' 7.9'	\$13°06.5 13°19.6	13.1' 13.0'	60.4' 60.4'
20	105 46.5 120°46.4	55.4 55.9	343°16.4	7.9 7.8'	13°19.0	12.9'	60.4
21	135°46.3	56.3	357°43.2	7.7'	13°45.5	12.8'	60.4
22	150° 46.3	56.8	12°09.9	7.6'	13°58.4	12.8'	60.4'
23	165°46.2	57.2	26°36.5	7.5'	14°11.2	12.7'	60.4'
	SD = 15.8'	d = 0.5'		SI	O = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.Pass.		Age	
5	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-80%	
22	03:20	03:18	11:57	19:25	07:00		
23	03:16	03:13	11:57	20:16	07:50		
24	03:10	03:08	11:57	21:09	08:42		

Fig. Color Col	h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1	Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
2 277-515 179-133 444 44 46 41 52 41 52 41 52 44 47 47 48 42 42 43 44 42 43 43 43													
2 227 70 193 1											Alpheratz		
2											Ankaa	353°04.0	-42°08.5
1											Schedar	349°27.2	56°41.7
19 1819-44											Diphda	348°44.0	-17°49.4
1											Achernar	335°18.2	-57°05.0
8 311-08												327°47.5	
1													
1				46.3				44.5		56.1			
19	8	3°11.8	283°27.5	46.6	185°26.3	$02^{\circ}00.0$	165°57.9	44.4	317°54.7	56.2			
10 31-167 312-28	9	18°14.2	298°26.7	• • 46.9	200°28.3	$01^{\circ}59.7$	181°00.5	• • 44.4	332°56.9	• • 56.3	!		
14 19 19 19 19 19 19 19	10	33°16.7	313°25.8	47.3	215°30.3	59.5	196°03.1	44.3	347°59.0	56.4			
1													
14 93°60 13°223 482 200°305 588 221°109 442 33°05 506 13°225 606 13°22													
14 01°26 13°12-3 44.8 20°16-3 58.0 20°13-5 44.2 40°16 56.7 56.7 1.5 1.											Capella		
15 128											Bellatrix	278°19.4	6°22.4
16 123°31.5 139°0.6 49 306°4.3 305°4.3 357.7 286°187 44 39°14.1 570 570 180°18.2 329°4.8 357.4 30°12.1 344.0 39°14.1 570 570 380°18.3 380°18.1 380°18.											Elnath	277°57.8	28°37.8
17 18 18 18 18 18 18 18											Alnilam	275°34.5	$-1^{\circ}11.2$
18 18 18 18 18 18 18 18													
18 18 18 18 18 18 18 18											_		
Mathematic Mat	18	153°36.4	73°18.9	N23°49.7	335°46.3	N01°57.1	316°23.9	S05°44.0	108°16.2	N14°57.1			
22 22 23 43 40 7 1941 45 51 2 50 56 3 3 56 3 34 60 4 3 18 25 00 5 7 4 4 4 5 18 25 00 5 7 4 4 4 5 18 2 2 18 2 18 4 5 18 2 2 18 3 18 4 5 18 2 2 18 3 18 4 5 18 2 2 18 3 18 4 5 18 2 2 18 3 18 3 18 3 18 2 18 2 2 18 3 18 2 2 18 3 18 3	19	168°38.9	88° 18.0	50.0	350°48.3	56.8	331°26.5	43.9	123°18.4	57.2			
198 498 31 198 493 31 329 436 509 35 543 550 16 343 348 186 299 57.5 57.5 57.5 329	20	183°41.3	103°17.1	50.3	5°50.3	56.5	346°29.1	43.9	138°20.6	57.2			
22 213"463						56.2							
28 28 48 7 148 48 512 50 50 35 55 316 318 39 43.8 387 27 0 57.5 34 35 35 35 36 38 38 38 37 27 37 38 38 38 38 38 38 3													
Mer pass 07:47											Avior	234°13.5	-59°36.6
Mer. Mer.	23	228-48.7							183-27.0	57.5	Suhail	222°43.8	
Sat GHA CHA CHA CHA CHA CHA CHA CHA	Mer n	ass 07·47	ν -0.9' d0	3′ m-3 90	$\nu 2.0' d-0$	3′ m-0.18	$\nu 2.6' d-0$	0′ m-2 32	$\nu 2.2' d0$	1′ m0.32			
Sat GHA CHA CHA Dec GHA Dec GHA Dec Perman Perman 0 1 243 53.2 169 13.7 N23 51.5 658.3 N01 55.3 659 3.0 N15 53.5 659 3.	тист.р	455. 07.17	ν 0.5 do	.5 111 5.50	ν 2.0 α 0	.5 111 0.10	ν 2.0 α σ	.0 111 2.32	ν 2.2 do				
Sat GHA GHA CHA Dec GHA													
0 243°51.2 163°137 N23°51.5 6°58.3 N01°553 46°39.5 S05°437 199°39.2 N14°57.6 Clean 172°63.2 13 28°73.5 173°12.8 518 8 100.2 50.6 16°42.1 43.7 213°13.5 57.8 6.6 16°42.1 43.7 213°13.5 57.8 6.6 16°42.1 43.7 213°13.5 57.8 6.6 16°42.1 43.7 213°13.5 57.8 57.8 6.7 16°44.1 43.7 43.6 226°33.5 57.8 57.8 57.8 57.8 57.8 57.8 57.8 57	Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_		
1 288°557 188°128 518 81°002 550 61°421 447 213°313 577 3 288°566 039°111 524 111°042 544 744 436 228°335 578 4 304°01.1 223°102 527 102°062 514 106°499 43.5 228°335 57.9 5 319°035 238°03 530 141°082 53.8 121°925 54.5 238°348 57.9 6 347°06.0 253°085 522°522 156°102 N07535 136°515 505°435 528°421 141°851 7 349°084 268°076 53.8 161°102 N07535 136°515 505°435 528°421 141°851 8 4°109 283°067 53.8 161°11 52.9 167°002 43.4 303°443 58.2 9 19 13.4 298°067 53.8 161°11 52.9 167°002 43.4 303°443 58.2 19 19 13.4 298°067 53.8 161°14 52.9 167°002 43.4 303°443 58.2 19 19 13.4 298°067 53.8 161°14 52.9 167°002 43.4 303°443 58.2 11 49 49 18.3 388°061 54.4 21°101 52.3 188°024 43.3 334°60 58.4 11 49 18.3 388°061 54.7 231°01 52.0 21°208 54.3 338°60 58.4 11 49 18.3 388°061 54.7 231°01 52.0 21°208 54.3 338°50 58.7 12 64°208 343°033 122°49 246°221 N01°51.7 227°10.6 50°43.2 18°55.0 14°86.6 13 9°022 388°024 55.2 266°240 51.1 257°15.8 44.1 48°59.3 58.9 16 124°30.6 42°508 50.1 306°30.0 50.5 287°21.0 44.0 79°03.6 59.0 16 124°30.6 67°57 55.0 56.9 30°33.9 N01°49 317°62.6 59.0 18 164°30.6 67°57 55.0 56.9 56.3 33°33.9 N01°49 317°62.6 59.0 18 164°30.6 67°57 57°50 55.5 56°45.8 44.3 44.1 48°59.0 18 164°30.6 67°57 50°50 5													
2 2373°56.1 193°11.9 52.1 96°02.2 54.7 76°44.7 947.3 43.6 228°33.5 57.8 Across 172°32.5 4.7 110°42.2 54.4 91°47.3 43.6 228°33.5 57.8 Across 172°32.3 4.3 172°32.3													
38 88°86.6 208°11.1 23°10.1 23°10.2 25°71.1 25°62.6 25°1.1 10°64.9 91°43.5 243°35.6 0.578.6 36°40.1 23°10.2 25°71.2 25°71.7 0.506.2 51.1 20°62.5 31.1 25°25.6 31.5 23°37.8 57.9 38°0.3 31°0.5 25°38.3 11													
304**01.1 23**10.2 5.23**10.3 5.30 140**08.2 5.41 100**39.9 45.5 288**31.8 57.9 45.6 5315**10.1 66**09.7 55**4a.1 66**0											Acrux	172°55.5	$-63^{\circ}16.1$
5 319°05 238°09.5 530 141°08.2 53.8 121°92.5 43.5 273°30.9 58.0 Allette 160 U. 170 U											Gacrux	171°47.2	-57°17.0
Solit Soli											Alioth	166°09.7	55°48.1
334**06.0 253**06.5 N23**53.2 156**10.2 N01**53.5 136**51.5 508**43.5 288**42.1 N14**58.1 Alkiadi 182**49.0 49**10.1 88 4**10.9 238**06.7 53.8 186**14.1 52.9 167**00.2 43.4 318**46.4 58.3 303**43.3 58.2 Menkent 147**53.0 36**31.1 34**158.3 313**05.0 54.4 216**181 52.3 197**05.4 43.3 348**50.7 58.4 Alkiadi 182**30.2 35**21.1 34**158.3 328**06.1 54.4 216**181 52.3 197**05.4 43.3 348**50.7 58.4 Alkiadi 183**23.6 36**31.1 34**158.3 328**06.1 54.4 226**12.1 52.0 212**08.0 43.2 3**52.9 58.5 Kochab 137**19.1 74**02.1 21.0 64**20.8 33**30.3 N23**54.9 246**22.1 N01**51.7 227**10.6 505**43.2 185*50 N14**58.6 337**19.1 74**02.1 21.0 40**22.2 28**00.6 55.5 26**24.0 51.1 257**15.8 43.1 48**59.3 58.8 41.6 10**92.2 28**00.6 55.5 276**26.0 51.1 257**15.8 43.1 48**59.3 58.8 41.6 10**92.2 28**00.6 55.5 22**03.3 50.8 22**27.184 43.1 45**93.3 58.2 43.1 10**01.5 59.9 43.1	5	319°03.5	238°09.3	53.0	141°08.2	53.8	121°52.5	43.5		58.0			
349'064 288'067 53.8 171'122 53.2 151'167,7 43.4 303'44.3 58.2 9 19'134 288'067 53.8 180'141 52.9 167'002 43.4 318''46.6 58.3 9 19'134 313''60.0 54.1 201'161 52.6 182''028 43.3 333''48.6 58.4 10 34''15.8 313''60.0 54.1 201''161 52.6 182''028 43.3 333''48.6 58.4 11 49''15.3 338''06.0 54.4 201''161 52.6 182''028 43.3 333''48.6 58.4 11 49''15.3 338''06.0 54.7 231''201 52.0 212''08.0 43.2 33''52.9 58.5 12 64''20.8 343''03.3 N23''54.9 64''021 N1''191.7 22''13.2 43.2 33''57.2 58.7 13 79''22.2 388''02.4 55.2 261''24.0 51.4 242''13.2 43.2 33''57.2 58.7 14 94''55.7 13''01.5 55.5 276''26.0 51.4 22''13.2 43.2 33''57.2 58.7 15 109''28.2 28''00.6 55.8 291''28.0 50.5 287''11.0 43.0 40''0.5 59.0 15 109''28.2 28''00.6 55.8 291''28.0 50.5 287''12.1 43.0 40''0.5 59.0 17 139''33.1 57''56.9 56.3 321''31.9 50.2 302''23.6 43.0 40''0.8 59.0 18 146''35.6 72''58.0 N23''56.6 331''31.9 50.2 302''23.6 43.0 40''0.8 59.0 19 199''34.0 17''55.4 57.4 21''30.8 49.0 2''34.0 42.8 154''14.4 59.4 Mer.pass. 07:43 17''57.5 56.9 351''35.9 49.6 332''31.4 42.9 139''12.3 59.3 Mer.pass. 07:43 17''57.5 58.0 51''43.8 48.4 32''39.2 42.7 14''16.1 59.6 22 214''46.1 132''54.6 57.7 36''41.8 48.7 17''56.6 42.8 169''16.6 59.5 Mer.pass. 07:43 17''57.8 58.6 81''47.7 47.8 62''44.3 42.7 214''20.0 59.6 22 24''46.4 132''54.6 57.7 36''41.8 48.7 17''65.6 42.8 169''16.6 59.5 Mer.pass. 07:43 17''57.9 58.6 81''47.7 47.8 62''44.3 42.7 214''20.0 59.6 2 24''45.3 192''57.1 58.8 81''47.7 47.8 62''44.3 42.7 214''20.0 59.6 3 30''57.7 20''50.2 59.0 111''51.6 44.1 92''45.1 42.9 92.9 42.7 14''49.9 3 290''57.7	6	334°06.0	253°08.5	N23°53.2	156°10.2	N01°53.5	$136^{\circ}55.1$	S05°43.5	288°42.1	N14°58.1			
8 4°10.9 283°06.7 53.8 186°14.1 52.9 167°00.2 43.4 318°64.6 58.4 Monkent 147°53. 03°1.1 10°13.4 298°05.9 54.4 216°18.1 52.3 197°05.4 43.3 333°48.6 58.4 Arcturus 145°44.4 19°0.17 11°49°1.3 338°04.1 54.7 231°20.1 52.0 212°8.0 43.2 38°50.7 58.4 Monkent 147°3.2 10°10.1 14°18.3 338°04.1 54.7 231°20.1 52.0 212°8.0 43.2 38°50.7 58.5 12.0 46°20.8 43°30.3 N23°64.9 246°22.1 N01°51.7 227°10.6 505°43.2 18°55.0 N14°58.6 Kochab 137°19.1 74°02.1 20°10.1 10°10.7 20°10.1 10°10.7 20°10.1 10°10.7 20°10.1 10°10.7 20°10.1 10°10.7 20°10.1 10°10.1 10°10.7 20°10.1 10°	7	349°08.4	268°07.6	53.5	171°12.2	53.2	151°57.7	43.4	303°44.3	58.2			
9 19°134 298°059 5 541 201°161													
11													
11 49°818.3 338°04.1 54.7 231°20.1 52.0 122°08.0 43.2 3°52.9 58.5 Normal Color 120°0.0											Arcturus		
12 66°20.8 343°03.3 N23°54.9 246°22.1 N01°51.7 227°01.6 S05°43.2 18°55.0 N14°58.6 16°09.9 Alphacea 1.0°09.9 Alphacea 1.0											Rigil Kent.	139°34.7	-60°57.6
13 79°23 38°8024 55.2 26°940 51.4 242°132 43.2 33°572 58.7 Alpheca 26°370 20											Kochab	$137^{\circ}19.1$	74°02.1
13 79°23.2 388°02.4 55.2 26°26.0 51.1 242°13.2 43.2 33°57.2 58.7 Alpheca 126°00.4 26°37.0 114°96°25.7 13°07.3 58.6 15.5 276°26.0 51.1 24°13.2 43.2 33°57.2 58.7 Alpheca 126°00.4 26°37.0 116°16.124°30.6 42°59.8 56.1 306°30.0 50.5 287°21.0 43.0 79°03.6 590.0 17 139°33.1 57°58.9 56.3 32°31.9 50.2 302°32.6 43.0 94°05.8 590.0 114°51.0 57°58.9 56.3 32°31.9 50.2 302°32.6 43.0 94°05.8 590.0 114°51.0 57°15. 6.69°04.6 18 154°34.0 190°80.0 N14°99.1 196°38.0 N32°95.6 336°39.0 N14°99.1 196°38.0 N32°95.6 35°35.9 49.6 332°38.8 49.0 347°31.4 42.9 139°12.3 59.3 Elatin 90°40.5 12°22.2 144°4.5 102°65.3 57.1 6°37.8 49.0 347°31.4 42.9 139°12.3 59.3 Elatin 90°40.5 12°22.2 144°4.5 102°65.4 4.5 57.4 22°38.8 49.0 2°34.0 4.2 8 154°14.4 4.9 9.4 4.2 9.2 144°10.1 59.2 12°10.1 190°42.9 117°55.4 4.5 57.4 22°38.8 48.4 32°39.2 42.7 184°18.7 59.6 Nunki 75°43.1 -26°15.4 4.2 12°22.2 144°4.5 132°64.6 57.7 36°41.8 48.7 12°36.6 42.8 169°6.6 59.5 4.2 140°5.2 14				N23°54.9		N01°51.7		\$05°43.2		N14°58.6	Zuben'ubi	136°51.8	-16°09.9
14 94°25.7 13°01.5 55.5 291°28.0 55.8 291°28.0 55.	13	79°23.2	358°02.4	55.2	261°24.0	51.4	242°13.2	43.2	33°57.2	58.7			
16 124°30.6 42°98.8 56.1 306°30.0 50.5 287°21.0 43.0 79°03.6 59.0 1310°30.1 50.6 17 139°33.1 57°58.9 56.3 321°31.9 50.2 302°23.6 43.0 94°05.8 59.0 138164°34.5 75°58.9 56.3 321°31.9 50.2 302°23.6 43.0 94°05.8 59.0 138164°34.5 75°58.9 150.3 321°31.9 50.2 302°23.6 43.0 94°05.8 59.0 138164°34.5 10.5 11.0 159.2 11.0 169°38.0 18°57.2 56.0 351°35.9 49.6 332°8.8 42.0 124°10.1 59.2 11.0 159.2 11.0 159.2 11.0 159.2 11.0 159.2 11.0 159.3 11.0 159.	14	94°25.7	$13^{\circ}01.5$	55.5	276°26.0	51.1	$257^{\circ}15.8$	43.1	48°59.3	58.8			
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13 80°22.4 357°41.5 01.6 262°11.2 44.1 243°15.4 42.2 34°48.9 00.8 14 95°24.8 12°40.6 01.8 277°13.2 43.7 258°18.0 42.1 49°51.1 00.8 15 110°27.3 27°39.7 · 02.1 292°15.1 · 43.4 273°20.6 · 42.1 64°53.2 · 00.9 16 125°29.8 42°38.8 02.3 307°17.1 43.1 288°23.2 42.1 79°55.4 01.0 17 140°32.2 57°38.0 02.6 322°19.0 42.8 303°25.7 42.0 94°57.5 01.1 18 155°34.7 72°37.1 N24°02.8 337°21.0 N01°42.5 318°28.3 S05°42.0 109°59.7 N15°01.2 19 170°37.2 87°36.2 03.1 352°22.9 42.2 333°30.9 41.9 125°01.8 01.3 20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 21 200°42.1 117°34.5 · 03.5 22°26.8 · 41.6 3°36.1 · 41.9 155°06.2 · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6													
14 95 24.8 12 40.6 01.8 277 13.2 43.7 258 18.0 42.1 49 51.1 00.8 15 110 27.3 27 39.7 · · 02.1 292 15.1 · · · 43.4 273 20.6 · · · 42.1 64 53.2 · · · 00.9 16 125 29.8 42 38.8 02.3 307 17.1 43.1 288 23.2 42.1 79 55.4 01.0 17 140 32.2 57 38.0 02.6 322 19.0 42.8 303 25.7 42.0 94 57.5 01.1 18 155 34.7 72 37.1 N24 02.8 337 21.0 N01 42.5 318 28.3 S05 42.0 109 59.7 N15 01.2 19 170 37.2 87 36.2 03.1 352 22.9 42.2 333 30.9 41.9 125 01.8 01.3 20 185 39.6 102 35.3 03.3 7 24.9 41.9 348 33.5 41.9 140 04.0 01.3 21 200 42.1 117 34.5 · · 03.5 22 26.8 · · 41.6 3 36.1 · · 41.9 155 06.2 · · 01.4 22 215 44.5 132 33.6 03.8 37 28.8 41.2 18 38.7 41.8 170 08.3 01.5 23 230 47.0 147 32.7 04.0 52 30.7 40.9 33 41.3 41.8 185 10.5 01.6 May 27 Sun SHA Mer.pass Venus 278 02.5 13:09 10.0 Mars 181 55.4 19:30 10.0 Mars 181 55.4 19:30 10.0 Mars 181 55.4 19:30 10.0 Mars 181 02 51.4 20:46 Saturn 314 30.6 10:41	13	80°22.4	357°41.5	01.6	262°11.2	44.1	243°15.4	42.2	34°48.9	8.00			
15 110°27.3 27°39.7 · · · 02.1 292°15.1 · · · 43.4 273°20.6 · · · 42.1 64°53.2 · · · 00.9 125°29.8 42°38.8 02.3 307°17.1 43.1 288°23.2 42.1 79°55.4 01.0 17 140°32.2 57°38.0 02.6 322°19.0 42.8 303°25.7 42.0 94°57.5 01.1 18 155°34.7 72°37.1 N24°02.8 337°21.0 N01°42.5 318°28.3 S05°42.0 109°59.7 N15°01.2 19 170°37.2 87°36.2 03.1 352°22.9 42.2 333°30.9 41.9 125°01.8 01.3 20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 21 200°42.1 117°34.5 · · · 03.5 22°26.8 · · 41.6 3°36.1 · · 41.9 155°06.2 · · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 May 27 Sun SHA Mer.pass Venus 278°02.5 13:09 Ner.pass Venus 278°02.5 13:09 Ner.	14	95°24.8	12°40.6	01.8	277°13.2	43.7	258°18.0	42.1	49°51.1	8.00	Saturn	J14 38.U	10:45
16 125°29.8 42°38.8 02.3 307°17.1 43.1 288°23.2 42.1 79°55.4 01.0 Venus 278°02.5 13:09 17 140°32.2 57°38.0 02.6 322°19.0 42.8 303°25.7 42.0 94°57.5 01.1 Mars 181°55.4 19:30 18 155°34.7 72°37.1 N24°02.8 337°21.0 N01°42.5 318°28.3 505°42.0 109°59.7 N15°01.2 Jupiter 162°51.4 20:46 19 170°37.2 87°36.2 03.1 352°22.9 42.2 333°30.9 41.9 125°01.8 01.3 3turn 314°30.6 10:41 20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 34 314°30.6 10:41 21 200°42.1 117°34.5 · 03.5 22°26.8 · 41.6 3°36.1 · 41.9 155°06.2 · 01.4 40.9 40.9 40.9 18°38.7 41.8 170°08.3 01.5 170°08.3 10.5 40.9 40.9 33°41.3 41.8 <											May 27 Sun	SHA	Mer nass
17													
18													
19 170°37.2 87°36.2 03.1 352°22.9 42.2 333°30.9 41.9 125°01.8 01.3 20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 21 200°42.1 117°34.5 · · 03.5 22°26.8 · · 41.6 3°36.1 · · 41.9 155°06.2 · · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Saturn 314°30.6 10:41													
20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 21 200°42.1 117°34.5 · 03.5 22°26.8 · 41.6 3°36.1 · 41.9 155°06.2 · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Mars: 0.2												162°51.4	20:46
20 185°39.6 102°35.3 03.3 7°24.9 41.9 348°33.5 41.9 140°04.0 01.3 21 200°42.1 117°34.5 · · 03.5 22°26.8 · · 41.6 3°36.1 · · 41.9 155°06.2 · · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Horizontal parallax Venus: 0.1 Mars: 0.2											Saturn	314°30.6	10:41
21 200°42.1 117°34.5 · · · 03.5 22°26.8 · · · 41.6 3°36.1 · · · 41.9 155°06.2 · · · 01.4 22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Mars: 0.2	20	185°39.6	102°35.3	03.3	7°24.9	41.9	348°33.5	41.9	140°04.0	01.3			
22 215°44.5 132°33.6 03.8 37°28.8 41.2 18°38.7 41.8 170°08.3 01.5 Venus: 0.1 23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Mars: 0.2											Horizont	al parallax	
23 230°47.0 147°32.7 04.0 52°30.7 40.9 33°41.3 41.8 185°10.5 01.6 Mars: 0.2												Venus:	0.1
25 250 11.0 211 52.1 51.0 52 50.1 10.5 55 12.5 12.0 12.0												Mars:	
Mer.pass. 07:39 ν -0.9′ d0.3′ m-3.90 ν 2.0′ d-0.3′ m-0.15 ν 2.6′ d-0.0′ m-2.31 ν 2.2′ d0.1′ m0.32													
	Mer.p	ass. 07:39	ν -0.9 $'$ d0	.3′ m-3.90	ν 2.0′ d-0	.3′ m-0.15	$\nu 2.6' \ d-0$.0′ m-2.31	ν 2.2′ d0	.1′ m0.32			

h	Sun				Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.1	N20°57.7	41°03.0	7.5'	S14°23.8	12.6'	60.5'
1	195°46.1	58.1	55°29.5	7.4'	14°36.4	12.5'	60.5'
2	210°46.0	58.6	69°55.8	7.3'	14°48.9	12.4'	60.5'
3	225°46.0	• • 59.0	84°22.1	7.2'	$15^{\circ}01.3$	12.3'	60.5'
4	240°45.9	59.4	98°48.3	7.1'	15°13.7	12.2'	60.5'
5	255°45.8	20°59.9	113°14.5	7.0'	15°25.9	12.1'	60.5
6	270°45.8 285°45.7	N21°00.3 00.8	127°40.5 142°06.5	7.0' 6.9'	\$15°38.0 15°50.1	12.0' 11.9'	60.5'
7 8	285 45.7 300°45.6	00.8	142 00.5 156°32.4	6.8	15°50.1	11.8'	60.5' 60.5'
9	315°45.6	01.7	170°58.1	6.7'	16°13.8	11.7	60.5
10	330°45.5	02.1	185°23.9	6.6'	16°25.6	11.6'	60.5'
11	345°45.5	02.5	199°49.5	6.5'	$16^{\circ}37.2$	11.5'	60.5'
12	0°45.4	N21°03.0	$214^{\circ}15.0$	6.5'	S16°48.7	11.4'	60.5'
13	15°45.3	03.4	228°40.5	6.4'	17°00.1	11.3'	60.5'
14	30°45.3 45°45.2	03.9	243°05.9 257°31.2	6.3'	17°11.4 17°22.6	11.2'	60.5'
15 16	45°45.2 60°45.1	· · 04.3 04.7	257° 31.2 271° 56.4	6.2' 6.1'	17°22.6 17°33.7	11.1' 11.0'	60.5' 60.6'
17	75°45.1	05.2	286°21.5	6.1	17°44.7	10.9'	60.6
18	90°45.0	N21°05.6	300°46.6	6.0'	\$17°55.5	10.7	60.6'
19	105°44.9	06.0	315°11.6	5.9'	18°06.3	10.6'	60.6'
20	120°44.9	06.5	329°36.5	5.8'	$18^{\circ}16.9$	10.5'	60.6'
21	135°44.8	• • 06.9	344°01.3	5.7'	18°27.4	10.4'	60.6'
22	150°44.7	07.3	358°26.0	5.7'	18°37.8	10.2	60.6'
23	165°44.7	07.8	12°50.7	5.6'	18°48.0	10.1'	60.6'
	SD = 15.8'	d = 0.4'		SI	D = 16.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	180°44.6	N21°08.2	27°15.3	5.5'	\$18°58.1	10.0'	60.6
1	195°44.5	08.6	41°39.8	5.4'	$19^{\circ}08.1$	9.9'	60.6'
2	210°44.5	09.1	56°04.2	5.3'	19°18.0	9.7'	60.6'
3	225°44.4	• • 09.5	70°28.5	5.3'	19°27.7	9.6'	60.6'
4	240°44.3	09.9	84°52.8	5.2'	19°37.3	9.5'	60.6'
5	255°44.3 270°44.2	10.4 N21°10.8	99°17.0 113°41.1	5.1' 5.1'	19°46.7 \$19°56.1	9.3' 9.2'	60.6' 60.6'
6 7	270 44.2 285°44.1	11.2	113 41.1 128°05.2	5.0'	20°05.2	9.2	60.5
8	300°44.1	11.2	142°29.2	4.9'	20°14.3	8.9'	60.5
9	315°44.0	12.1	156°53.1	4.8'	20°23.2	8.8'	60.5'
10	330°43.9	12.5	171°16.9	4.8'	20°31.9	8.6'	60.5'
11	345°43.8	12.9	185°40.7	4.7'	20°40.6	8.5'	60.5'
12	0°43.8	N21°13.3	200°04.4	4.6'	S20°49.0	8.3'	60.5'
13	15°43.7	13.8	214°28.1	4.6'	20°57.3	8.2'	60.5
14	30°43.6 45°43.6	14.2 •• 14.6	228°51.6 243°15.2	4.5' 4.5'	21°05.5 21°13.5	8.0' 7.9'	60.5' 60.5'
15 16	60°43.5	15.0	243 15.2 257°38.6	4.5 4.4'	21 13.5 21°21.4	7.9 7.7'	60.5
17	75°43.4	15.5	272°02.0	4.3'	21°29.1	7.6'	60.5
18	90°43.4	N21°15.9	286°25.3	4.3'	S21°36.7	7.4	60.5'
19	105°43.3	16.3	300°48.6	4.2'	$21^{\circ}44.1$	7.3'	60.5'
20	120°43.2	16.7	$315^{\circ}11.8$	4.2'	21°51.4	7.1'	60.5'
21	135°43.1	• • 17.1	329°35.0	4.1'	21°58.5	6.9'	60.4'
22	150°43.1 165°43.0	17.6	343°58.1 358°21.2	4.1'	22°05.4 22°12.2	6.8'	60.4' 60.4'
23		18.0	358 21.2	4.0'		6.6'	00.4
	SD = 15.8'	d = 0.4'		- 51	D = 16.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.9	N21°18.4	12°44.2	4.0'	\$22°18.8	6.5'	60.4
1	195°42.9 210°42.8	18.8	27°07.2 41°30.1	3.9' 3.9'	22°25.3 22°31.6	6.3'	60.4'
2	210°42.8 225°42.7	19.2 •• 19.6	41°30.1 55°53.0	3.9'	22°31.6 22°37.7	6.1' 6.0'	60.4' 60.4'
3 4	240°42.6	20.0	70°15.8	3.8'	22°43.7	5.8'	60.4
5	255°42.6	20.5	84°38.6	3.8'	22°49.5	5.6'	60.4
6	270°42.5	N21°20.9	99°01.4	3.7'	\$22°55.1	5.5'	60.3'
7	285°42.4	21.3	$113^{\circ}24.1$	3.7'	23°00.6	5.3'	60.3'
8	300°42.3	21.7	127°46.8	3.7'	23°05.9	5.1'	60.3'
9	315°42.3	• • 22.1	142°09.4	3.6'	23°11.0	5.0'	60.3'
10 11	330°42.2 345°42.1	22.5 22.9	156°32.1 170°54.7	3.6' 3.6'	23°16.0 23°20.7	4.8' 4.6'	60.3' 60.3'
11	0°42.1	22.9 N21°23.3	170°54.7 185°17.2	3.6'	23°20.7 \$23°25.4	4.6	60.2
13	15°42.0	23.7	199°39.8	3.5'	23°29.8	4.3'	60.2'
14	30°41.9	24.2	214°02.3	3.5'	23°34.1	4.1'	60.2'
15	45°41.8	• • 24.6	228°24.8	3.5'	23°38.2	3.9'	60.2'
16	60°41.8	25.0	242°47.3	3.5'	23°42.1	3.8'	60.2'
17	75°41.7	25.4	257°09.8	3.5'	23°45.9	3.6'	60.2'
18	90°41.6	N21°25.8	271°32.3	3.5'	\$23°49.5	3.4'	60.1'
19 20	105°41.5 120°41.5	26.2 26.6	285°54.7 300°17.2	3.4' 3.4'	23°52.9 23°56.1	3.2' 3.1'	60.1' 60.1'
21	120 41.5 135°41.4	20.0	300 17.2 314°39.6	3.4'	23°59.1	3.1 2.9'	60.1
22	150°41.3	27.4	329°02.1	3.4	24°02.0	2.7'	60.1
23	165°41.2	27.8	343°24.5	3.4'	24°04.7	2.5'	60.0'
	SD = 15.8'	d = 0.4'		SI	D = 16.5'		
			-				

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

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

		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%	
25	03:05	03:02	11:57	22:07	09:38		
26	02:58	02:55	11:57	23:07	10:36		
27	02:52	02:48	11:57	-:-	11:38		

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Mon -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
	245°49.5	162°31.8	N24°04.3	67°32.7	N01°40.6	48°43.8	S05°41.8	200°12.6	N15°01.7		эпа	Dec
0	245 49.5 260°51.9	102 31.6 177°31.0	04.5	82°34.6		40 43.0 63°46.4				Alpheratz	357°31.2	29°15.1
1 2	275°54.4	177 31.0 192°30.1	04.5	97°36.6	40.3 40.0	78°49.0	41.7	215°14.8 230°16.9	01.8	Ankaa	353°04.0	-42°08.5
	275 54.4 290°56.9						41.7		01.9	Schedar	$349^{\circ}27.1$	56°41.7
3		207°29.2 222°28.3	• • 05.0	112°38.5	• • 39.7	93°51.6	• • 41.6	245°19.1	• • 01.9	Diphda	348°44.0	-17°49.4
4 5	305°59.3		05.2	127°40.5	39.4	108°54.2	41.6	260°21.2	02.0	Achernar	$335^{\circ}18.2$	-57°05.0
	321°01.8	237°27.4	05.4 N24°05.6	142°42.4	39.0	123°56.8 138°59.3	41.6 \$05°41.5	275°23.4	02.1	Hamal	327°47.4	23°36.0
6 7	336°04.3 351°06.7	252°26.6 267°25.7	05.9	157°44.4 172°46.3	N01°38.7 38.4	156 59.5 154°01.9	41.5	290°25.6 305°27.7	N15°02.2 02.3	Polaris	$312^{\circ}32.7$	89°23.0
8	6°09.2	282°24.8	06.1	187°48.2	38.1	169°04.5	41.5	320°29.9	02.4	Acamar	$315^{\circ}09.6$	-40°11.2
9	21°11.7	202 24.0 297°23.9	06.3	202°50.2	37.8	184°07.1	• • 41.4	335°32.0	02.4	Menkar	314°02.7	4°12.2
10	36°14.1	312°23.1	06.6	217°52.1	37.5	199°09.7	41.4	350°34.2	02.5	Mirfak	308°23.6	49°57.8
11	51°16.6	327°22.2	06.8	232°54.0	37.1	214°12.3	41.3	5°36.3	02.6	Aldebaran	290°35.9	16°34.0
12	66°19.0	342°21.3	N24°07.0	247°56.0	N01°36.8	229°14.8	S05°41.3	20°38.5	N15°02.7	Rigel	281°00.8	-8°10.2
13	81°21.5	357°20.4	07.2	262°57.9	36.5	244°17.4	41.3	35°40.7	02.8	Capella	280°17.1	46°01.5
14	96°24.0	12° 19.5	07.4	277°59.9	36.2	259°20.0	41.2	50°42.8	02.9	Bellatrix	278°19.4	6°22.4
15	111°26.4	$27^{\circ}18.7$	• • 07.7	293°01.8	• • 35.9	274°22.6	• • 41.2	65°45.0	• • 03.0	Elnath	277°57.8	28°37.8
16	126°28.9	42°17.8	07.9	308°03.7	35.6	289°25.2	41.2	80°47.1	03.0	Alnilam	275°34.5	-1°11.2
17	141°31.4	$57^{\circ}16.9$	08.1	323°05.7	35.2	304°27.7	41.1	95°49.3	03.1	Betelgeuse	270°48.6	7°24.6
18	156°33.8	$72^{\circ}16.0$	N24°08.3	338°07.6	N01°34.9	319°30.3	S05°41.1	110°51.4	N15°03.2	Canopus	263°51.3 258°23.4	-52°42.9 -16°45.6
19	171°36.3	$87^{\circ}15.2$	08.5	353°09.5	34.6	334°32.9	41.0	125°53.6	03.3	Sirius Adhara	256 23.4 255°03.4	-10 45.0 -29°01.0
20	186°38.8	102°14.3	08.7	$8^{\circ}11.4$	34.3	349°35.5	41.0	140°55.8	03.4	Procyon	244°47.4	5°08.8
21	201°41.2	$117^{\circ}13.4$	• • 09.0	23°13.4	• • 34.0	4°38.1	• • 41.0	155°57.9	• • 03.5	Pollux	244 47.4 243°13.3	27°57.2
22	216°43.7	$132^{\circ}12.5$	09.2	38°15.3	33.6	19°40.6	40.9	$171^{\circ}00.1$	03.5	Avior	234°13.6	-59°36.6
23	231°46.2	$147^{\circ}11.6$	09.4	53°17.2	33.3	34°43.2	40.9	186°02.2	03.6	Suhail	234 13.0 222°43.8	-39 30.0 -43°33.5
Mern	ass. 07:35	ν-0 9' d0	.2′ m-3.90	ν1 9' d-0	3′ m-0.13	ν2 6' d-0	.0′ m-2.30	$\nu 2.2' \ d0.$	1′ m0 32	Miaplacidus	221°37.7	-43 33.3 -69°50.7
- wier.pa		ν 0.5 u0	111-3.30	ν 1.5 U-U		ν2.0 u-0.	.0 111-2.30	ν Δ.Δ u0.	1110.52	Alphard	217°44.4	-8°47.4
										Regulus	207°30.8	11°49.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.7
0	246°48.6	162° 10.8	N24°09.6	68°19.2	N01°33.0	49°45.8	\$05°40.9	201°04.4	N15°03.7	Denebola	182°21.3	14°24.4
1	261°51.1	177°09.9	09.8	83°21.1	32.7	64°48.4	40.8	216°06.5	03.8	Gienah	175°39.8	-17°42.5
2	276°53.5	192°09.0	10.0	98°23.0	32.4	79°51.0	40.8	231°08.7	03.9		172°55.5	-63°16.1
3	291°56.0	207°08.1	· · 10.2	113°24.9	• • 32.0	94°53.5	• • 40.8	246°10.9	• • 04.0	Gacrux	171°47.2	-57°17.0
4	306°58.5	222°07.2	10.4	128°26.9	31.7	109°56.1	40.7	261°13.0	04.0	Alioth	166°09.7	55°48.1
5	322°00.9	237°06.4	10.6	143°28.8	31.4	124°58.7	40.7	276°15.2	04.1	Spica	158°18.3	-11°19.0
6	337°03.4	252°05.5	N24°10.8	158°30.7	N01°31.1	140°01.3	S05°40.7	291°17.3	N15°04.2	Alkaid	152°49.0	49°10.1
7	352°05.9	267°04.6	11.0	173°32.6	30.7	155°03.8	40.6	306°19.5	04.3	Hadar	148°30.2	-60°31.1
8	7°08.3	282°03.7	11.2	188°34.5	30.4	170°06.4	40.6	321°21.6	04.4	Menkent	147°53.0	-36°31.0
9	22°10.8	297°02.8	• • 11.4	203°36.5	30.1	185°09.0	• • 40.6	336°23.8	• • 04.5	Arcturus	145°44.4	19°01.7
10	37°13.3	312°01.9	11.6	218°38.4	29.8	200°11.6	40.5	351°26.0	04.6	Rigil Kent.	139°34.6	-60°57.6
11	52°15.7 67°18.2	327°01.1	11.8	233°40.3	29.4	215°14.1	40.5	6°28.1 21°30.3	04.6	Kochab	$137^{\circ}19.1$	74°02.2
12	82°20.7	342°00.2 356°59.3	N24°12.0	248°42.2 263°44.1	N01°29.1	230°16.7 245°19.3	S05°40.5	21 30.3 36°32.4	N15°04.7	Zuben'ubi	136°51.8	-16°09.9
13 14	82 20.7 97°23.1	350 59.3 11°58.4	12.2 12.4	263 44.1 278°46.1	28.8 28.5	245 19.3 260°21.9	40.4 40.4	50 32.4 51°34.6	04.8 04.9	Alphecca	126°00.4	26°37.0
15	112°25.6	26° 57.5	12.5	278 40.1 293°48.0	. 28.1	275°24.4	• • 40.4	66°36.7	05.0	Antares	$112^{\circ}11.1$	-26°29.8
16	112 25.0 127°28.0	20°57.5 41°56.7	12.5	308°49.9	27.8	275 24.4 290°27.0	40.4	81°38.9	05.1	Atria	107°01.5	-69°04.7
17	142°30.5	56°55.8	12.7	323°51.8	27.5	305°29.6	40.3	96°41.1	05.1	Sabik	101°58.4	-15°45.6
18	157°33.0	71°54.9	N24°13.1	338°53.7	N01°27.2	320°32.2	\$05°40.3	111°43.2	N15°05.2	Shaula	96°05.2	-37°07.3
19	172°35.4	86°54.0	13.3	353°55.6	26.8	335°34.7	40.2	126°45.4	05.3	Rasalhague	95°54.9	12°32.4
20	187°37.9	101°53.1	13.5	8°57.5	26.5	350°37.3	40.2	141°47.5	05.4	Eltanin	90°40.0	51°29.1
21	202°40.4	116°52.2	· · 13.7	23°59.4	26.2	5°39.9	40.2	156°49.7	• • 05.5	Kaus Aust.	83°27.5	-34°22.0
22	217°42.8	131°51.4	13.8	39°01.3	25.8	20°42.4	40.1	171°51.8	05.6	Vega	80°30.4	38°48.6
23	232°45.3	146°50.5	14.0	54°03.3	25.5	35°45.0	40.1	186°54.0	05.6	Nunki	75°43.1 61°56.3	-26°15.4
		-					0/ 0.20			Altair		8°56.8 -56°38.0
ivier.pa	ass. 07:32	ν -0.9° a0	.2′ m-3.90	ν 1.9° a -0.	3′ m-0.11	ν 2.6 a-0.	.0′ m-2.30	ν 2.2′ d0.	1' mu.33	Peacock Deneb	53°00.0 49°23.1	45°23.0
										Enif	33°35.2	10°00.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.6	-46°48.7
0	247°47.8	161°49.6	N24°14.2	69°05.2	N01°25.2	50°47.6	S05°40.1	201°56.2	N15°05.7	Fomalhaut	15°10.7	-40°40.7
1	262°50.2	176°48.7	14.4	84°07.1	24.9	65°50.2	40.0	216°58.3	05.8	Scheat	13°41.8	28°14.5
2	277°52.7	191°47.8	14.6	99°09.0	24.5	80°52.7	40.0	232°00.5	05.9	Markab	13°26.4	15°21.8
3	292°55.2	206°47.0	• • 14.7	114°10.9	• • 24.2	95°55.3	• • 40.0	247°02.6	• • 06.0			
4	307°57.6	221°46.1	14.9	129°12.8	23.9	110°57.9	39.9	262°04.8	06.1	May 28 Mon	SHA	Mer.pass
5	323°00.1	236°45.2	15.1	144°14.7	23.5	126°00.4	39.9	277°07.0	06.1		276°42.4	13:11
6	338°02.5	251°44.3	N24°15.2	159°16.6	N01°23.2	141°03.0	S05°39.9	292°09.1			181°43.2	19:27
7	353°05.0	266°43.4	15.4	174°18.5	22.9	156°05.6	39.8	307°11.3	06.3		162°54.4	20:42
8	8°07.5	281°42.5	15.6	189°20.4	22.5	171°08.1	39.8	322°13.4	06.4	Saturn	314°23.1	10:38
9	23°09.9	296°41.6	• • 15.8	204°22.3	• • 22.2	186°10.7	• • 39.8	337°15.6	• • 06.5	May 29 Tue	SHA	Mer.pass
10	38°12.4	311°40.8	15.9	219°24.2	21.9	201°13.3	39.7	352°17.7	06.6		275°22.1	13:12
11	53°14.9	326°39.9	16.1	234°26.1	21.6	216°15.9	39.7	7°19.9	06.6		181°30.5	19:24
12	68°17.3 83°19.8	341°39.0	N24°16.2	249°28.0	N01°21.2	231°18.4 246°21.0	S05°39.7	22°22.1 37°24.2	N15°06.7		$162^{\circ}57.2$	20:37
13 14	83°19.8 98°22.3	356°38.1 11°37.2	16.4 16.6	264°29.9 279°31.8	20.9 20.6	246°21.0 261°23.6	39.6 39.6	37°24.2 52°26.4	06.8 06.9	Saturn		10:34
14 15	98 22.3 113°24.7	26°36.3	16.6	279 31.8 294°33.7	20.2	201 23.0 276°26.1	39.6	52 26.4 67°28.5	07.0	May: 20 14/	CIIA	Marrier
16	113 24.7 128°27.2	20 30.3 41°35.5	16.7	294 33.7 309°35.6	19.9	276 26.1 291°28.7	39.5	82°30.7	07.0	May 30 Wed	SHA	Mer.pass
17	143°29.7	56°34.6	17.0	309 35.0 324°37.5	19.9	306°31.3	39.5 39.5	97°32.9	07.1		274°01.8	13:13
18	143 29.7 158°32.1	71°33.7	N24°17.2	339°39.3	N01°19.2	300 31.3 321°33.8	505°39.5		N15°07.2	l .	181°17.4 162°59.8	19:21 20:33
19	173°34.6	86°32.8	17.4	354°41.2	18.9	336°36.4	39.5	112 33.0 127°37.2	07.3		314°08.4	10:31
20	188°37.0	101°31.9	17.5	9°43.1	18.5	351°39.0	39.4	142°39.3	07.4	Saturn	314 UØ.4	10:31
21	203°39.5	116°31.0	•• 17.7	24°45.0	. 18.2	6°41.5	39.4	157°41.5	07.5	Horizont	al parallax	
22	218°42.0	131°30.1	17.8	39°46.9	17.9	21°44.1	39.4	172°43.6	07.6		Venus:	0.1
23	233°44.4	146°29.3	18.0	54°48.8	17.5	36°46.6	39.3	187°45.8	07.6		Mars:	0.2
										_		
ivier.pa	ass. 07:28	ν -0.9′ d0	.2′ m-3.90	ν 1.9° d -0.	3′ m-0.09	ν 2.0° d -0.	.0′ m-2.29	ν 2.2′ d0.	⊥ mU.33			

h	Sui	า			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.1	$N21^{\circ}28.2$	357°46.9	3.4'	\$24°07.3	2.4'	60.0'
1	195°41.1	28.6	12°09.4	3.5'	24°09.6	2.2'	60.0'
2	210°41.0 225°40.9	29.0 •• 29.4	26°31.8 40°54.3	3.5' 3.5'	24°11.8 24°13.8	2.0' 1.8'	60.0' 59.9'
4	240°40.8	29.8	55°16.8	3.5'	24°15.6	1.7'	59.9'
5	255°40.8	30.2	69°39.3	3.5'	24°17.3	1.5'	59.9'
6	270°40.7	N21°30.6	84°01.8	3.5'	S24°18.8	1.3'	59.9'
7	285°40.6 300°40.5	31.0	98°24.3 112°46.8	3.5'	24°20.1 24°21.2	1.1'	59.8'
8 9	300 40.5 315°40.4	31.4 •• 31.8	112 46.8 127°09.4	3.6' 3.6'	24 21.2 24°22.1	0.9' 0.8'	59.8' 59.8'
10	330°40.4	32.2	141°32.0	3.6'	24°22.1	0.6	59.8'
11	345°40.3	32.6	$155^{\circ}54.6$	3.6'	24°23.5	0.4'	59.7'
12	0°40.2	N21°33.0	170°17.2	3.7'	\$24°23.9	0.3'	59.7'
13 14	15°40.1 30°40.1	33.4 33.7	184°39.9 199°02.6	3.7' 3.8'	24°24.2 24°24.3	0.1' -0.1'	59.7' 59.7'
15	45°40.0	34.1	213°25.4	3.8'	24°24.3	-0.1 -0.3'	59.1°
16	60°39.9	34.5	227°48.2	3.8'	24°23.9	-0.4'	59.6'
17	75°39.8	34.9	242°11.0	3.9'	24°23.5	-0.6'	59.6'
18	90°39.7	N21°35.3	256°33.9	3.9'	\$24°22.8 24°22.1	-0.8'	59.6'
19 20	105°39.7 120°39.6	35.7 36.1	270°56.8 285°19.8	4.0' 4.0'	24°22.1 24°21.1	-1.0' -1.1'	59.5' 59.5'
21	135°39.5	36.5	299°42.8	4.1'	24°20.0	-1.3	59.5'
22	150°39.4	36.9	314°05.9	4.1'	24°18.7	-1.5'	59.4'
23	165°39.3	37.3	328°29.0	4.2'	24°17.2	-1.6'	59.4'
	SD = 15.8'	d = 0.4'		SI	O = 16.4'		
Tue	GHA	Dec	GHA	••	Dec	d	НР
Tue 0	GHA 180°39.2	Dec N21°37.6	342°52.2	ν 4.2'	S24°15.6	a -1.8'	нР 59.4'
1	195°39.2	38.0	$357^{\circ}15.5$	4.3'	24°13.8	-2.0'	59.3'
2	210°39.1	38.4	11°38.8	4.4'	24°11.9	-2.1'	59.3'
3	225°39.0	• • 38.8	26°02.1 40°25.6	4.4'	24°09.8 24°07.5	-2.3'	59.3'
4 5	240°38.9 255°38.8	39.2 39.6	40°25.6 54°49.1	4.5' 4.6'	24°07.5 24°05.0	-2.4' -2.6'	59.3' 59.2'
6	270°38.8	N21°39.9	69°12.6	4.6'	S24°02.4	-2.8'	59.2'
7	285°38.7	40.3	83°36.3	4.7'	23°59.6	-2.9'	59.2'
8	300°38.6	40.7	98°00.0	4.8'	23°56.7	-3.1'	59.1'
9 10	315°38.5 330°38.4	· · 41.1 41.5	112°23.8 126°47.6	4.9' 4.9'	23°53.6 23°50.4	-3.2' -3.4'	59.1' 59.1'
11	345°38.3	41.8	141°11.6	5.0'	23°47.0	-3.4 -3.6'	59.1°
12	0°38.3	N21°42.2	155°35.6	5.1'	523°43.4	-3.7'	59.0'
13	15°38.2	42.6	169°59.7	5.2'	23°39.7	-3.9'	59.0'
14	30°38.1 45°38.0	43.0 • • 43.3	184°23.9 198°48.2	5.3' 5.4'	23°35.9 23°31.8	-4.0' -4.2'	58.9' 58.9'
15 16	60°37.9	43.7	213°12.5	5.4' 5.4'	23°27.7	-4.2 -4.3'	58.9'
17	75°37.8	44.1	227°36.9	5.5'	23°23.4	-4.5'	58.8'
18	90°37.7	N21°44.5	242°01.5	5.6'	S23°18.9	-4.6'	58.8'
19	105°37.7 120°37.6	44.8	256°26.1	5.7'	23°14.3	-4.8'	58.8'
20 21	120 37.6 135°37.5	45.2 •• 45.6	270°50.8 285°15.6	5.8' 5.9'	23°09.5 23°04.6	-4.9 -5.0'	58.7' 58.7'
22	150°37.4	46.0	299°40.5	6.0'	22°59.6	-5.2'	58.7'
23	165°37.3	46.3	314°05.5	6.1'	22°54.4	-5.3'	58.6'
	SD = 15.8'	d = 0.4'		SI	O = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.2	N21°46.7	$328^{\circ}30.5$	6.2'	S22°49.1	-5.5'	58.6'
1	195°37.2 210°37.1	47.1	342°55.7	6.3'	22°43.7	-5.6'	58.6'
2 3	210°37.1 225°37.0	47.4 •• 47.8	357°21.0 11°46.4	6.4' 6.5'	22°38.1 22°32.3	-5.7' -5.9'	58.5' 58.5'
4	240°36.9	48.2	26°11.8	6.6'	22°26.5	-6.0'	58.4
5	255°36.8	48.5	40°37.4	6.7'	22°20.5	-6.1'	58.4'
6	270°36.7	N21°48.9	55°03.1	6.8'	\$22°14.3	-6.3'	58.4'
7 8	285°36.6 300°36.5	49.3 49.6	69°28.9 83°54.7	6.9' 7.0'	22°08.1 22°01.7	-6.4' -6.5'	58.3' 58.3'
9	315°36.5	· · 50.0	98°20.7	7.0 7.1'	22 01.7 21°55.2	-0.5 -6.6'	58.3'
10	330°36.4	50.4	112°46.8	7.2'	21°48.5	-6.8'	58.2'
11	345°36.3	50.7	127°13.0	7.3'	21°41.8	-6.9'	58.2'
12 13	0°36.2 15°36.1	N21°51.1 51.5	141°39.3 156°05.7	7.4' 7.5'	\$21°34.9 21°27.9	-7.0' -7.1'	58.2' 58.1'
13 14	30°36.0	51.5 51.8	170°32.2	7.5 7.6'	21°20.8	-7.1 -7.2'	58.1'
15	45°35.9	• • 52.2	184°58.8	7.7'	21°13.5	-7.4'	58.1'
16	60°35.8	52.5	199°25.5	7.8'	21°06.2	-7.5	58.0'
17	75°35.7	52.9	213°52.4	7.9'	20°58.7	-7.6'	58.0'
18 19	90°35.7 105°35.6	N21°53.3 53.6	228°19.3 242°46.3	8.0' 8.2'	\$20°51.1 20°43.4	-7.7' -7.8'	57.9' 57.9'
20	100°35.5	54.0	257°13.5	8.3'	20°35.6	-7.9'	57.9'
21	135°35.4	• • 54.3	271°40.7	8.4'	20°27.7	-8.0'	57.8'
22	150°35.3	54.7	286°08.1	8.5'	20°19.7	-8.1'	57.8'
23	165°35.2	55.0	300°35.6	8.6'	20°11.5	-8.2'	57.8'
	SD = 15.8'	d = 0.4'		SI	O = 16.0'		

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

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

		Sun			Moon	Moon		
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age		
	00 ^h	12 ^h	Pass	Upper	Lower	15-17		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-93%		
28	02:45	02:41	11:57	00:09	12:41			
29	02:37	02:33	11:57	01:11	13:42			
30	02.20	02.25	11.58	02.11	14.30			

The CHA	h	Aries	Ve	nus	М	ars	Jup	oiter	Saturn			Stars	
1	Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA D	ec		SHA	Dec
2													
2 29 51.8 101 266 114									217°50 1		Alpheratz		
3 2931-51 3 2061-52											Ankaa		
8 989-968 2017-94 1917 1919 1919 1919 1919 1919 1919 19											Schedar		
1 327°592 297°39 3 188 1870°01 155 127°020 9 302 77°588 831											Diphda		
9 39°017 29°121 N24°130 10°102 N01°152 142°190 29°191 29°190 N15°082											Achernar	$335^{\circ}18.1$	
1 98°01012 286°1213 3103 109°105 1.45 137°072 391 308°091. 083											Hamal		
10 10 10 10 10 10 10 10											Polaris	312°31.9	89°23.0
10 24*1081 395*204 1940 20*076 114 20*0715 116 20*076 116 2											Acamar	$315^{\circ}09.5$	-40°11.1
10 93°115 31°195 195 20°1095 138 20°148 30 0 93°066 086 Mine 20°221 11 69°165 31°17 7 82°169 20°114 135 21°174 30.0 6 117 868 6 Mine 20°221 11 69°165 31°17 7 82°169 20°113 100°151 1 32°250 50°530 0 31°10 18°07 Care 20°114 6°224 11°160 20°114 10°109 20°115 1 20°22 20°114 100°129 20°114 10°109 20°114 10°129 20°114 10°114 10°129 20°114 10°114 10°129 20°114 10°114 10°129 20°114 10°114 10°129 20°114 10°											Menkar	314°02.7	4°12.2
11 58 1-6 30 30 1-8 107 23 114 115 217 174											Mirfak	308°23.5	49°57.8
12 90°16.5 341°17.7 924°18.8 29°13.3 90°13.1 92°30.1 90°30.0 29°13.0 91°00.0 29°13.0 91°00.0 90°10.1 920°10.1 12.8 94°12.5 90°30.0 39°10.0 98.8 1980°10.0 90°10.1 12.8 920°10.2 93.8 95°13.0 98.8 1980°10.0 90°10.1 12.8 92°17.0											Aldebaran	290°35.9	16°34.0
14 99714 1710 201 2017 20											Rigel	281°00.8	-8°10.2
1													
15 11 12 12 12 13 13 13 12 13 13 14 12 12 15 15 15 15 15 15 15 15 15 15 15 15 15													
19													
Betelgene													
18 1973 13 1971 124 N24" 2016 340" 24.5 101" 111 322" 53 505" 38 138" 200 09.3 340" 24.5 201" 139 177" 237 38" 138" 230" 234 201" 230" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235 201" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 234" 235" 235" 234" 235" 235" 235" 235" 235" 235" 235" 235													
16	17	144°28.8		20.5				38.8			_		
Achieva 10 10 10 10 10 10 10 1	18	159°31.3	71° 12.4	N24°20.6	340°24.5	$N01^{\circ}11.1$	322°35.3	S05°38.8	113°26.8 N15°	°09.2			
Procedure Proc	19	174°33.7	$86^{\circ}11.5$	20.7	355°26.4	10.8	337°37.9	38.8	128°29.0	09.3			
20	20	189°36.2	101°10.7	20.8	10°28.3	10.4		38.7	143°31.2	09.4			
22 219°4-11 31°6-96 211 40°32.0 69.7 22°4.56 38.7 173°35.5 69.5	21	204°38.6	$116^{\circ}09.8$	• • 21.0	25°30.1	• • 10.1	7°43.0	• • 38.7	158°33.3 · ·	09.5			
Mer.													
Mer. pass. 07.24													
Charles							_						
Fig. CHA	Mer.p	ass. 07:24	$ u$ -0.9 $^{\prime}$ d0	.1′ m-3.90	$\nu 1.9' \ d-0$.3′ m-0.07	ν 2.6′ d-0	.0′ m-2.28	u2.2′ d 0.1′ m	0.33			
Fig. 6HA 6HA 6HA 6HA 6HA 6HA 6HA 6HA 6HA 6HA													
2 49°460	Eri	CHV	CHV	Doc	CHV	Doc	CHV	Doc	CHV D	00	_		
1 264°485 176°662 21.4 88°376 08.7 67°832 38.6 218°420 09.8 6											Dubhe		
2 2979*51.0 1910*05.3 21.5 100*39.5 08.4 82*95.8 38.6 233*4.1 00.9 4.00 4.00 4.00 4.00 4.00 4.00 4.00											Denebola	182°21.3	14°24.4
3 294"53.4 206"04.4 0.21.7 115"41.3 0.08.0 97"88.4 38.5 248"46.3 0.10.0 GACHE 171"47.2 5.57"17.0 4 300"65.9 0.21"03.0 21.8 130"43.2 0.77 115"09 83.5 0.28"36.4 10.0 GACHE 171"47.2 5.57"17.0 4 300"65.9 0.21"03.0 145"45.1 0.73 128"03.5 83.5 278"50.6 10.1 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0											Gienah	175°39.8	-17°42.6
4 309"559 221"03.6 218 130"43.2 07.7 113"00.9 38.5 203"48.1 10.0 1.5 348"58.4 236"02.7 21.9 145"451. 07.3 126"93.5 38.5 238"59.6 10.1 5.5 345"58.4 236"02.7 21.9 145"451. 07.3 126"93.5 38.5 238"59.6 10.1 5.5 345"58.4 236"02.7 21.9 145"451. 07.5 48.8 10.6 156"08.7 38.5 238"59.8 10.5 10.2 4.5 345"1.0 10.3 8.0 10.0 3.8 10"0.0 8 22.1 19"50.7 0.6.3 173"11.1 38.4 323"57.1 10.4 345"61.0 308"54.9 10.3 10.5 10.5 345"59.1 10.5 10.5 10.5 345"59.1 10.5 10.5 10.5 10.5 10.5 10.5 10.5 10											Acrux	172°55.6	-63°16.1
5 346*08.4 286*02.7 21.9 145*451 0.7.3 128*03.5 38.5 28*78.06 10.1 Allein 1890.0 39*3.05 34.6 340*08.2 21.0 106*469 Molifor.0 143*06.0 505*38.5 28*78.0 1815*10.2 Allein 1890.0 32.1 175*48.8 06.6 158*08.6 38.4 338*59.2 10.4 4 4.2 32.5 32.5 32.5 32.8 32.8 1815*10.2 Allein 1890.0 32.1 175*48.8 06.6 158*08.6 38.4 338*59.2 10.4 4 4.2 32.5 32.5 32.5 32.8 32.8 32.8 32.8 32.8 32.8 32.8 32.8											Gacrux	171°47.2	-57°17.0
5 344*58.4 2510.8 124° 221 19 145*451 07.3 128°03.5 38.5 278*50.6 10.1 Spica 188°18.3 11*19.0 40 40 40 40 40 40 40 40 40 40 40 40 40											Alioth	166°09.7	55°48.1
Section Sec													
350 350 350 360													
8 10°06.8 281°00.0 22.2 190°60.7 06.3 173°11.1 38.4 338°92.7 10.4 9 10°60.2 296°99.1 22.3 200°52.5 0.69 1881°3.7 38.4 338°92.7 10.4 10 40°10.7 310°68.2 22.4 220°64.4 0.66 203°16.2 38.4 338°92.7 10.6 11 55°13.1 325°57.3 22.5 235°56.3 0.62 218°18.8 38.3 9°03.8 10.6 12 70°15.6 340°56.5 N24°22.6 250°58.1 N01°04.9 233°21.4 505°38.3 24°05.7 N15°10.7 14 100°20.5 10°94.7 22.8 281°10.8 04.2 263°26.5 38.3 39°07.0 10.8 15 115°30.3 25°53.8 22.3 281°10.8 04.2 263°26.5 38.3 39°07.0 10.8 16 130°55.5 40°82.9 23.0 311°05.5 0.35 293°31.6 38.2 84°14.4 11.0 17 145°27.9 55°52.0 23.1 326°07.4 03.2 308°41.1 38.2 99°15.1 11.1 18 160°30.4 70°81.1 N24°32.2 341°90.2 N01°02.8 332°36.7 505°82.2 114°18.7 N15°11.2 19 175°29.8 85°20.0 23.3 356°11.1 0.25 338°39.2 381.1 129°30.8 11.3 28181.3 29°15.2 11.4 12 12 05°37.8 115°45.6 23.6 41°16.7 0.14 23°46.9 38.1 159°55.2 11.4 12 12 05°37.8 115°45.6 23.6 41°16.7 0.14 23°46.9 38.1 174°27.3 11.5 15 15°50.7 15°54.9 23.6 41°16.7 0.14 23°46.9 38.1 174°27.3 11.5 15 15°50.7 15°54.9 23.6 41°16.7 0.14 23°46.9 38.1 174°27.3 11.5 11.6 41.						06.6							
9 25'08 2 295'99 1 22.3 205'95 5 108'13 7 338.4 338'91 2 104 105 115'91 310'91 325'973 225 220'5948 05.6 218'18 8 33.3 9'03 6 105 Kochab 137'91 2 74'02 2 205'981 05'981	8		281°00.0			06.3		38.4					
10	9	25°08.2	295°59.1	· · 22.3	205°52.5	• • 05.9	188°13.7	• • 38.4	338°59.2 · ·	10.4			
11 55°13.1 325°57.3 225.5 235°56.3 05.2 218°18.8 38.3 9°03.6 10.0 Kochab 137°19.2 74°02.2 12°07.5 340°56.5 N24°22.6 250°58.1 N01°04.9 233°21.4 S05°38.3 24°07.7 N15°10.7 Zuben'ubi 186°51.8 16°09.9 13.8 187°19.2 74°02.2 14.1 100°20.5 10°54.7 228.2 281°01.8 0.42 263°26.5 38.3 28°07.9 10.8 Alpheca 115°13.0 25°53.8 1.3 28°53.8 213.0 290°03.7 .03.9 278°29.0 .38.2 69°12.2 .10.9 Alpheca Antares 116°10.9 Alpheca 115°11.1 25°52.0 15°52.0 23.1 306°07.4 03.2 306°34.1 38.2 84°14.4 11.0 Antares 112°11.1 2°51.2 36°18.1 10°51.2 11.1 2°51.2 38°1.0 11.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 10°51.2 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°1.1 11.1 2°51.2 38°2.1 11.1 2°51.2 38°2.1 11.1 20°5.7 38°2.1 11.1 2°51.2 38	10	40°10.7	310°58.2	22.4	220°54.4	05.6	203°16.2	38.4	354°01.4	10.5	l l		
12	11	55°13.1	325°57.3	22.5	235°56.3	05.2	218°18.8	38.3	9°03.6	10.6			
	12	70°15.6	340°56.5	N24°22.6	250°58.1	N01°04.9	233°21.4	S05°38.3	24°05.7 N15°	010.7			
14 100°203 10°543 228 281°018 04.2 263°26.5 38.3 54°10.0 10.9 51 15°23.0 25°58.8 23.0 296°03.7 03.9 268°29.0 03.2 60°12.2 10.9 16 130°25.5 40°52.9 23.0 311°05.5 03.5 293°31.6 38.2 84°14.4 11.0 17 145°27.9 55°52.0 23.1 326°07.4 03.2 306°34.1 38.2 99°16.5 11.1 18 160°30.4 70°51.1 N24°33.2 341°09.2 N01°02.8 323°36.7 S05°38.2 114°18.7 N15°11.2 20 190°35.3 100°49.3 23.4 11°13.0 02.1 355°41.8 38.1 144°21.0 11.4 12 12 12 12 12 12 12	13	85°18.1	355°55.6		266°00.0	04.6	248°23.9	38.3	39°07.9	10.8			
15 115°230 25°53.8 · 23.0 296°03.7 · 0.3.9 278°9.0 · 0.38.2 66°12.2 · 10.9	14	100°20.5	10°54.7	22.8	281°01.8	04.2	263°26.5	38.3	54°10.0	10.9			
16 130°25.5 40°52.9 23.0 311°05.5 233°31.6 38.2 384°14.4 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 11.0 340°15.1 11.1 340°15.1 11.0 340°15.1 11.1 340°15.1 11.1 340°15.1							278°29.0						
146°27.9 55°9.0 23.1 326°07.4 03.2 308°34.1 38.2 99°16.5 11.1 Shaula 96°05.1 32°37.3 18 160°30.4 70°51.1 714°23.2 341°90.2 N01°02.8 323°36.7 506°38.2 114°18.7 N15°1.2 Fasalhague 95°54.9 12°32.4 19 175°32.9 85°60.2 23.3 356°11.1 02.5 338°39.2 38.1 120°20.8 11.3 12 12 12 12 13 13 14 14 13 15 15 13 18 160°30.3 100°49.3 23.4 11°13.0 02.1 353°41.8 38.1 144°23.0 11.4 22 220°40.3 130°47.6 23.5 41°16.7 01.4 23°46.9 38.1 174°27.3 11.5 Mer.pats 07.20 \$\times 0.90' \times 0.1 0.1 0.2 0.2 0.2 Mer.pats 07.20 \$\times 0.1 \times 0.1 0.2 0.2 0.2 0.0 Mer.pats 07.20 \$\times 0.1 0.2 0.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Sat GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA 0.0 0									84°14.4				
18													
19 175°32.9 85°50.2 233 356°11.1 02.5 338°39.2 38.1 120°20.8 11.3 144°23.0 11.4 120°20.8 11.3 100°49.3 23.4 11°13.0 02.1 353°41.8 38.1 144°23.0 11.4 142°30.1 11.4 142°30.1 11.4 142°30.1 11.4 142°30.1 11.4 142°30.1 11.4 150°25.2 1.11.4 15													
20								00.1			_		
22 205°378 115°48.5 23.5 26°14.8 01.8 8°44.3 38.1 159°25.2 11.4 Vega 220°40.3 130°47.6 23.6 41°16.7 01.4 23°46.9 38.1 174°27.3 11.5 Nunki 75°43.1 26°15.4 26°15.5 26°15.4 26°15.5 26°15.4 26°15.5 26°15.5 26°15.5 26°15.4 26°15.5 26°15.5 26°15.5 26°15.5 26°15.5 26°15.5 26°15.5 26													
22 220°403 130°476 23.6 41°16.7 01.4 23°46.9 38.1 174°27.3 11.5 Nunki 75°43.1 -26°15.4 Mer.pass. 07:20 ν-0.9′ d0.1′ m-3.89 ν1.9′ d-0.3′ m-0.06 ν2.6′ d-0.0′ m-2.28 ν2.2′ d0.1′ m0.33 Peace 52°59.9 -56°38.0 Deba							9°11.3						
23 235°42.7 145°46.7 23.7 56°18.5 01.1 38°49.4 38.0 189°29.5 11.6 Normal (1.5 most)											_		
Mer.parks O7:20 V-0.9' d0.1' m-3.89 V1.9' d-0.3' m-0.06 V2.6' d-0.0' m-2.28 V2.2' d0.1' m0.33 Peacock S2.9' 9.9 56° 38.0 Denb 49° 23.1 45° 23.0 Denb 49° 23.1 45											Nunki		
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13 86°17.2 355°34.2 24.8 266°44.3 56.1 249°25.1 37.7 39°59.7 12.7 14 101°19.7 10°33.3 24.9 281°46.2 55.8 264°27.7 37.7 55°01.9 12.8 116°22.1 25°32.5 · 25.0 296°48.0 · 55.4 279°30.2 · 37.7 70°04.1 · 12.9 12.8 131°24.6 40°31.6 25.1 311°49.9 55.1 294°32.8 37.6 85°06.2 13.0 17 146°27.1 55°30.7 25.1 326°51.7 54.7 309°35.3 37.6 100°08.4 13.1 18 161°29.5 70°29.8 N24°25.2 341°53.5 N00°54.4 324°37.9 S05°37.6 115°10.5 N15°13.1 19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 201°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 11 206°36.9 115°27.1 · 25.4 26°59.0 · 53.3 9°45.5 · 37.5 160°17.0 · 13.4 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6	12	71°14.7	340°35.1	N24°24.8	251°42.5	N00°56.5	234°22.6	S05°37.7	24°57.6 N15°	°12.7			
14 101°19.7 10°33.3 24.9 281°46.2 55.8 264°27.7 37.7 55°01.9 12.8 15 116°22.1 25°32.5 · · · 25.0 296°48.0 · · · 55.4 279°30.2 · · · 37.7 70°04.1 · · · 12.9 16 131°24.6 40°31.6 25.1 311°49.9 55.1 294°32.8 37.6 85°06.2 13.0 17 146°27.1 55°30.7 25.1 326°51.7 54.7 309°35.3 37.6 100°08.4 13.1 18 161°29.5 70°29.8 N24°25.2 341°53.5 N00°54.4 324°37.9 S05°37.6 115°10.5 N15°13.1 19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 20 191°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 21 206°36.9 115°27.1 · · · 25.4 26°59.0 · · 53.3 9°45.5 · · · 37.5 160°17.0 · · · 13.4 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6 Saturn 313°53.7 10:24 Jun 02 Sat SHA Mer.pass Venus 270°00.6 13:18 Mars 180°35.2 19:12 Jupiter 163°06.8 20:21 Saturn 313°46.5 10:20 Horizontal parallax Venus 0.1 Mars: 0.2	13	86°17.2	355°34.2	24.8	266°44.3	56.1	249°25.1	37.7	39°59.7	12.7			
15 116°22.1 25°32.5 · · · 25.0 296°48.0 · · · 55.4 279°30.2 · · 37.7 70°04.1 · · 12.9 Jun 02 Sat SHA Mer.pass 16 131°24.6 40°31.6 25.1 311°49.9 55.1 294°32.8 37.6 85°06.2 13.0 Venus 270°00.6 13:18 17 146°27.1 55°30.7 25.1 326°51.7 54.7 309°35.3 37.6 100°08.4 13.1 Mars 180°35.2 19:12 18 161°29.5 70°29.8 N24°25.2 341°53.5 N00°54.4 324°37.9 S05°37.6 115°10.5 N15°13.1 Jupiter 163°06.8 20:21 19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 Saturn 313°46.5 10:20 20 191°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 13.2 Saturn 313°46.5 10:20 21 206°36.9 115°27.1 · · 25.4 26°59.0 · · 53.3 9°45.5		101°19.7	10°33.3	24.9	281°46.2	55.8		37.7	55°01.9	12.8	Saturn	313 53./	10:24
16 131°24.6 40°31.6 25.1 311°49.9 55.1 294°32.8 37.6 85°06.2 13.0 Venus 270°00.6 13:18 17 146°27.1 55°30.7 25.1 326°51.7 54.7 309°35.3 37.6 100°08.4 13.1 Mars 180°35.2 19:12 18 161°29.5 70°29.8 N24°25.2 341°53.5 N00°54.4 324°37.9 S05°37.6 115°10.5 N15°13.1 Jupiter 163°06.8 20:21 19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 Saturn 313°46.5 10:20 20 191°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 33 21 206°36.9 115°27.1 · 25.4 26°59.0 · 53.3 9°45.5 · 37.5 160°17.0 · 13.4 Horizontal parallax 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 Nems: 0.2			25°32.5	• • 25.0	296°48.0	• • 55.4		• • 37.7			Jun 02 Sat	SHA	Mer.pass
17													
18 161°29.5 70°29.8 N24°25.2 341°53.5 N00°54.4 324°37.9 S05°37.6 115°10.5 N15°13.1 Jupiter 163°06.8 20:21 19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 13.2 13.3 130°12.7 13.2 13.3 145°14.9 13.3 13.3 145°14.9 13.3 13.3 145°14.9 13.3 145°14.9 13.3 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.4 145°14.9 13.5 145°14.9 13.5 145°14.9 13.4 145°14.9 13.6 145°14.9 13.5 145°14.9 13.5 145°14.9 13.5													
19 176°32.0 85°28.9 25.3 356°55.4 54.0 339°40.4 37.6 130°12.7 13.2 20 191°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 21 206°36.9 115°27.1 • 25.4 26°59.0 • 53.3 9°45.5 • 37.5 160°17.0 • 13.4 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6													
20 191°34.5 100°28.0 25.3 11°57.2 53.6 354°43.0 37.6 145°14.9 13.3 21 206°36.9 115°27.1 · · 25.4 26°59.0 · · 53.3 9°45.5 · · 37.5 160°17.0 · · 13.4 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6 Mars: 0.2													
21 206°36.9 115°27.1 ··· 25.4 26°59.0 ··· 53.3 9°45.5 ··· 37.5 160°17.0 ··· 13.4 Horizontal parallax 22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6 Horizontal parallax Venus: 0.1 Mars: 0.2											Saturn	JIJ 40.5	10:20
22 221°39.4 130°26.2 25.4 42°00.9 52.9 24°48.0 37.5 175°19.2 13.5 Venus: 0.1 23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6 Mars: 0.2											Horizont	al parallax	
23 236°41.9 145°25.3 25.5 57°02.7 52.6 39°50.6 37.5 190°21.4 13.6 Mars: 0.2												-	0.1
25 250 12.5 115 25.5 25.5 37 62.1 32.6 35 36.0 31.5 126 21.1 12.0													
Mer.pass. 07:16 ν -0.9′ d 0.1′ m-3.89 ν 1.8′ d -0.4′ m-0.04 ν 2.6′ d -0.0′ m-2.27 ν 2.2′ d 0.1′ m0.33													
	Mer.p	ass. 07:16	ν -0.9 $'$ d0	.1' m-3.89	ν 1.8′ d-0	.4′ m-0.04	ν 2.6′ d-0	.0′ m-2.27	$ u 2.2' \ d0.1' \ {\rm m}$	0.33			

h	Sui	n					
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.1	N21°55.4	$315^{\circ}03.2$	8.7'	S 20°03.3	-8.3'	57.7'
1	195°35.0 210°34.9	55.7 56.1	329°30.9 343°58.7	8.8'	19°55.0 19°46.5	-8.4'	57.7'
2	210 34.9 225°34.8	56.5	343 58.7 358°26.6	8.9' 9.0'	19 46.5 19°38.0	-8.5' -8.6'	57.6' 57.6'
4	240°34.8	56.8	12°54.6	9.1'	19°29.4	-8.7'	57.6'
5	255°34.7	57.2	27°22.7	9.2'	19°20.6	-8.8'	57.5'
6	270°34.6 285°34.5	N21°57.5 57.9	41°50.9 56°19.3	9.3' 9.4'	\$19°11.8 19°02.9	-8.9' -9.0'	57.5' 57.5'
7 8	205 34.5 300°34.4	57.9 58.2	70°47.7	9.4	19 02.9 18°53.9	-9.0 -9.1'	57.5 57.4'
9	315°34.3	• • 58.6	85°16.3	9.7'	18°44.8	-9.2'	57.4'
10	330°34.2	58.9	99°45.0	9.8'	18°35.6	-9.3'	57.4'
11 12	345°34.1 0°34.0	59.2 N21°59.6	114°13.7 128°42.6	9.9' 10.0'	18° 26.3 \$18° 16.9	-9.4' -9.4'	57.3' 57.3'
13	15°33.9	21°59.9	143°11.6	10.1	18° 07.5	-9.5'	57.2'
14	30°33.8	22°00.3	$157^{\circ}40.7$	10.2'	$17^{\circ}58.0$	-9.6'	57.2'
15	45°33.7 60°33.6	• • 00.6	172°09.9 186°39.2	10.3'	17°48.3 17°38.6	-9.7'	57.2'
16 17	75°33.6	01.0 01.3	201°08.6	10.4' 10.5'	17 38.6 17°28.9	-9.8' -9.9'	57.1' 57.1'
18	90°33.5	N22°01.7	215°38.1	10.6'	\$17°19.0	-9.9'	57.1'
19	105°33.4	02.0	230°07.7	10.7'	17°09.1	-10.0'	57.0'
20 21	120°33.3 135°33.2	02.3 · · 02.7	244°37.4 259°07.2	10.8'	16°59.1 16°49.0	-10.1'	57.0' 57.0'
22	150°33.1	03.0	273°37.2	10.9' 11.0'	16° 49.0	-10.1' -10.2'	56.9'
23	165°33.0	03.4	288°07.2	11.1'	16° 28.6	-10.3	56.9'
	SD = 15.8'	d = 0.4'		SI	O = 15.7'		
Fri 0	GHA 180°32.9	Dec N22°03.7	GHA 302°37.3	u 11.2'	Dec \$16° 18.3	d -10.4'	HP 56.8'
1	195°32.8	04.0	317°07.5	11.3'	16°08.0	-10.4'	56.8'
2	210°32.7	04.4	331°37.8	11.4'	15°57.6	-10.5'	56.8'
3	225°32.6	• • 04.7	346°08.3	11.5'	15° 47.1	-10.6'	56.7'
4 5	240°32.5 255°32.4	05.0 05.4	0°38.8 15°09.4	11.6' 11.7'	15°36.5 15°25.9	-10.6' -10.7'	56.7' 56.7'
6	270°32.3	N22°05.7	29°40.1	11.8'	\$15°15.2	-10.7	56.6'
7	285°32.2	06.0	44°10.9	11.9'	15°04.5	-10.8'	56.6'
8	300°32.1	06.4	58°41.8	12.0'	14°53.7	-10.9'	56.6'
9 10	315°32.0 330°31.9	· · 06.7 07.0	73°12.8 87°43.9	12.1' 12.2'	14°42.8 14°31.9	-10.9' -11.0'	56.5' 56.5'
11	345°31.8	07.4	102°15.0	12.3'	14°21.0	-11.0'	56.5'
12	0°31.7	N22°07.7	116°46.3	12.4'	S 14°09.9	-11.1'	56.4'
13	15°31.6 30°31.5	08.0	131°17.7 145°49.1	12.4'	13°58.9 13°47.7	-11.1'	56.4
14 15	30°31.5 45°31.4	08.4 •• 08.7	145°49.1 160°20.6	12.5' 12.6'	13° 47.7 13° 36.5	-11.2' -11.2'	56.4' 56.3'
16	60°31.4	09.0	174°52.3	12.7'	13°25.3	-11.3'	56.3'
17	75°31.3	09.4	189°24.0	12.8'	13° 14.0	-11.3'	56.3'
18 19	90°31.2 105°31.1	N22°09.7 10.0	203°55.8 218°27.7	12.9' 13.0'	\$13°02.7 12°51.4	-11.4' -11.4'	56.2' 56.2'
20	105 31.1 120°31.0	10.0	232°59.6		12°39.9		56.2'
21	135°30.9	. 10.7	247°31.7	13.1'	12°28.5	-11.5'	56.1'
22	150°30.8	11.0	262°03.8	13.2'	12° 17.0	-11.5'	56.1'
23	165°30.7	11.3	276°36.0	13.3'	12°05.4	-11.6'	56.1'
	SD = 15.8'	d = 0.3'		SI	O = 15.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.6	N22°11.6	291°08.3	13.4'	\$11°53.9	-11.6'	56.0'
1 2	195°30.5 210°30.4	11.9 12.3	305°40.7 320°13.1	13.4' 13.5'	11°42.2 11°30.6	-11.7' -11.7'	56.0' 56.0'
3	225°30.3	12.6	334°45.6	13.6'	11°18.9	-11.7	55.9'
4	240°30.2	12.9	349°18.2	13.7'	11°07.2	-11.8'	55.9'
5 6	255°30.1 270°30.0	13.2 N22°13.5	3°50.9 18°23.7	13.8' 13.8'	10°55.4 \$10°43.6	-11.8' -11.8'	55.9' 55.8'
6 7	270°30.0 285°29.9	N22°13.5 13.9	18°23.7 32°56.5	13.8'	10° 31.8	-11.8° -11.9'	55.8°
8	300°29.8	14.2	47°29.4	14.0'	10° 19.9	-11.9'	55.8'
9	315°29.7	• • 14.5	62°02.4	14.0'	10°08.0	-11.9'	55.7'
10 11	330°29.6 345°29.5	14.8 15.1	76°35.4 91°08.5	14.1' 14.2'	09°56.1 09°44.1	-12.0' -12.0'	55.7' 55.7'
11	345 29.5 0°29.4	15.1 N22°15.4	91°08.5 105°41.7	14.2'	509° 32.1	-12.0' -12.0'	55.7'
13	15°29.3	15.8	$120^{\circ}14.9$	14.3'	$09^{\circ}20.1$	-12.0'	55.6'
14	30°29.2	16.1	134°48.2	14.4	09°08.1	-12.1'	55.6'
15 16	45°29.1 60°29.0	· · 16.4 16.7	149°21.6 163°55.0	14.4' 14.5'	08°56.0 08°43.9	-12.1' -12.1'	55.6' 55.5'
16	75°28.9	16.7 17.0	163°55.0 178°28.5	14.5° 14.6°	08° 43.9 08° 31.8	-12.1' -12.1'	55.5'
18	90°28.8	N22°17.3	193°02.1	14.6'	S08°19.6	-12.2'	55.5'
19	105°28.6	17.6	207°35.7	14.7	08°07.5	-12.2'	55.5'
20 21	120°28.5 135°28.4	17.9 •• 18.2	222°09.4 236°43.1	14.7' 14.8'	07°55.3 07°43.1	-12.2' -12.2'	55.4' 55.4'
21	135°28.4 150°28.3	18.5	236°43.1 251°16.9	14.8'	07°43.1 07°30.9	-12.2' -12.2'	55.4' 55.4'
23	165°28.2	18.9	265°50.7	14.9'	07° 18.6	-12.3'	55.3'
	SD = 15.8'	d = 0.3'		SI	D = 15.3'		

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

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

		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	87-70%
31	02:20	02:16	11:58	03:06	15:32	
01	02:12	02:07	11:58	03:57	16:21	
02	02:02	01:57	11:58	04:44	17:06	

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
			N24° 25.6				S05°37.5				эпа	Dec
0	251°44.3	160°24.5		72°04.5	N00°52.2	54°53.1		205°23.5	N15°13.6	Alpheratz	357°31.1	29°15.1
1	266°46.8	175°23.6	25.6	87°06.4	51.9	69°55.7	37.5	220°25.7	13.7	Ankaa	353°03.9	-42°08.5
2	281°49.2	190°22.7	25.7	102°08.2	51.5	84°58.2	37.4	235°27.8	13.8	Schedar	349°27.0	56°41.7
3	296°51.7	205°21.8	• • 25.7	117°10.0	51.1	100°00.8	• • 37.4	250°30.0	• • 13.9	Diphda	348°43.9	-17°49.4
4	311°54.2	220°20.9	25.8	132°11.8	50.8	115°03.3	37.4	265° 32.2	14.0	Achernar	335°18.1	-57°05.0
5	326°56.6	235°20.0	25.8	147°13.7	50.4	130°05.8	37.4	280°34.3	14.0	Hamal	327°47.4	23°36.0
6	341°59.1	250°19.1	N24°25.9	162°15.5	N00°50.1	145°08.4	S05°37.3	295°36.5	N15°14.1	Polaris	312°31.2	89°23.0
7	357°01.6	265°18.2	25.9	177°17.3	49.7	160° 10.9	37.3	310°38.7	14.2	Acamar	315°09.5	-40°11.1
8	12°04.0	280°17.3	26.0	192°19.1	49.3	175° 13.5	37.3	325°40.8	14.3	Menkar	314°02.7	4°12.2
9	27°06.5	295°16.4	• • 26.0	207°21.0	• • 49.0	190°16.0	• • 37.3	340°43.0	• • 14.4	Mirfak	308°23.5	49°57.7
10	42°09.0	310° 15.6	26.1	222°22.8	48.6	205° 18.6	37.3	355° 45.1	14.4	Aldebaran	290°35.9	16°34.0
11	57°11.4	325°14.7	26.1	237°24.6	48.3	220°21.1	37.2	10°47.3	14.5	Rigel	281°00.8	-8°10.2
12	72°13.9	340°13.8	N24°26.2	252°26.4	N00°47.9	235°23.6	S05°37.2	25° 49.5	N15°14.6	Capella	280°17.1	46°01.5
13	87°16.4	355°12.9	26.2	267°28.3	47.5	250°26.2	37.2	40°51.6	14.7	Bellatrix	278°19.4	6°22.4
14	102°18.8	10°12.0	26.3	282°30.1	47.2	265°28.7	37.2	55°53.8	14.8	Elnath	277°57.7	28°37.8
15	117°21.3	25°11.1	• • 26.3	297°31.9	• • 46.8	280°31.3	• • 37.2	70° 56.0	• • 14.8	Alnilam	275°34.5	-1°11.1
16	132°23.7	40°10.2	26.3	312°33.7	46.5	295°33.8	37.1	85° 58.1	14.9	Betelgeuse	270°48.6	7°24.6
17	147°26.2	55°09.3	26.4	327°35.5	46.1	310°36.3	37.1	101°00.3	15.0	Canopus	263°51.3	-52°42.9
18	162°28.7	70°08.4	N24°26.4	342°37.4	N00°45.7	325°38.9	S05°37.1	116°02.4	N15°15.1	Sirius	258°23.4	-16°45.6
19	177°31.1	85°07.6	26.5	357°39.2	45.4	340°41.4	37.1	131°04.6	15.2	Adhara	255°03.4	-29°01.0
20	192°33.6	100°06.7	26.5	12°41.0	45.0	355°44.0	37.1	146°06.8	15.2	Procyon	244°47.4	5°08.8
21	207°36.1	115°05.8	• • 26.5	27°42.8	• • 44.6	10°46.5	• • 37.1	161°08.9	• • 15.3	Pollux	243°13.3	27°57.2
22	222°38.5	130°04.9	26.6	42°44.6	44.3	25°49.0	37.0	176° 11.1	15.4	Avior	234°13.6	-59°36.6
23	237°41.0	145°04.0	26.6	57°46.4	43.9	40°51.6	37.0	191°13.3	15.5	Suhail	222°43.8	-43°33.5
Mer.n	ass. 07:12	ν -0.9' d0	.1′ m-3.89	ν1.8′ d-0	.4' m-0.02	$\nu 2.5' \ d-0.$	0′ m-2.26	ν 2.2' d0.	1′ m0.33	Miaplacidus	221°37.7	-69°50.7
		- 3.3 40			0.02					Alphard	217°44.4	-8°47.4
			_		_		_		_	Regulus	207°30.8	11°49.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.7
0	252°43.5	160°03.1	N24°26.6	72°48.3	N00°43.6	55°54.1	S05°37.0	206° 15.4	N15°15.6	Denebola	182°21.3	14°24.4
1	267°45.9	175°02.2	26.6	87°50.1	43.2	70°56.6	37.0	221°17.6	15.6	Gienah	175°39.8	-17°42.5
2	282°48.4	190°01.3	26.7	102°51.9	42.8	85°59.2	37.0	236° 19.7	15.7	Acrux	172°55.6	-63°16.1
3	297°50.8	205°00.4	• • 26.7	117°53.7	• • 42.5	101°01.7	• • 36.9	251°21.9	• • 15.8	Gacrux	171°47.2	-57°17.0
4	312°53.3	219°59.5	26.7	132°55.5	42.1	116°04.3	36.9	266°24.1	15.9	Alioth	166°09.8	55°48.1
5	327°55.8	234°58.7	26.7	147°57.3	41.7	131°06.8	36.9	281°26.2	16.0	Spica	158°18.3	-11°19.0
6	342°58.2	249°57.8	N24°26.8	162°59.1	N00°41.4	146°09.3	S05°36.9	296°28.4	N15°16.1	Alkaid	152°49.0	49°10.1
7	358°00.7	264°56.9	26.8	178°00.9	41.0	161°11.9	36.9	311°30.6	16.1	Hadar	148°30.2	-60°31.1
8	13°03.2	279°56.0	26.8	193°02.7	40.6	176°14.4	36.9	326° 32.7	16.2	Menkent	147°53.0	-36°31.1
9	28°05.6	294°55.1	• • 26.8	208°04.5	• • 40.3	191°16.9	• • 36.8	341°34.9	• • 16.3	Arcturus	145°44.4	19°01.8
10	43°08.1	309°54.2	26.8	223°06.3	39.9	206° 19.5	36.8	356°37.1	16.4	Rigil Kent.	139°34.7	-60°57.6
11	58°10.6	324°53.3	26.9	238°08.1	39.5	221°22.0	36.8	11°39.2	16.5	Kochab	$137^{\circ}19.2$	74°02.2
12	73°13.0	339°52.4	N24°26.9	253°10.0	N00°39.2	236°24.5	S05°36.8	26°41.4	N15°16.5	Zuben'ubi	$136^{\circ}51.8$	-16°09.9
13	88°15.5	354°51.5	26.9	268°11.8	38.8	251°27.1	36.8	41°43.5	16.6	Alphecca	126°00.4	26°37.0
14	103°18.0	9°50.7	26.9	283°13.6	38.4	266° 29.6	36.8	56°45.7	16.7	Antares	$112^{\circ}11.1$	-26°29.8
15	118°20.4	24°49.8	• • 26.9	298°15.4	• • 38.1	281°32.1	• • 36.7	71°47.9	• • 16.8	Atria	$107^{\circ}01.4$	-69°04.7
16	133°22.9	39°48.9	26.9	313°17.2	37.7	296°34.7	36.7	86°50.0	16.9	Sabik	101°58.4	-15°45.6
17	148°25.3 163°27.8	54°48.0	26.9 N24° 26.9	328°19.0	37.3	311°37.2	36.7	101°52.2 116°54.4	16.9	Shaula	$96^{\circ}05.1$	-37°07.4
18		69°47.1 84°46.2		343°20.8 358°22.6	N00°37.0	326°39.7	S05°36.7	110 54.4 131°56.5	N15°17.0	Rasalhague	95°54.9	12°32.4
19	178°30.3		26.9		36.6	341°42.3	36.7		17.1	Eltanin	90°40.0	51°29.1
20	193°32.7	99°45.3	26.9	13°24.4	36.2	356° 44.8	36.7	146°58.7	17.2	Kaus Aust.	83°27.4	-34°22.0
21	208°35.2 223°37.7	114°44.4 129°43.5	• • 26.9	28°26.2	• • 35.8	11°47.3	• • 36.6	162°00.9	• • 17.3	Vega	80°30.4	38°48.7
22			26.9	43°28.0	35.5	26°49.9	36.6	177°03.0	17.3	Nunki	75°43.1	-26°15.4
23	238°40.1	144°42.7	26.9	58°29.8	35.1	41°52.4	36.6	192°05.2	17.4	Altair	$61^{\circ}56.2$	8°56.9
Mer.p	ass. 07:08	ν -0.9 $'$ d0	.0′ m-3.89	ν 1.8′ d-0	.4′ m-0.00	$\nu 2.5' d-0.$	0′ m-2.26	ν 2.2′ d0.	1' m 0.33	Peacock	52°59.9	-56°38.0
										Deneb	49°23.0	45°23.0
-	CIIA	CIIA	ъ.	CIIA	Б	CIIA	Б	CIIA	Б	Enif	33°35.2	10°00.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.5	-46°48.7
0	253°42.6	159°41.8	N24° 26.9	73°31.5	N00°34.7	56°54.9	S05°36.6		N15°17.5	Fomalhaut	$15^{\circ}10.7$	-29°27.7
1	268°45.1	174°40.9	26.9	88°33.3	34.4	71°57.5	36.6	222°09.5	17.6	Scheat	13°41.7	28°14.5
2	283°47.5	189°40.0	26.9	103°35.1	34.0	87°00.0	36.6	237°11.7	17.6	Markab	13°26.3	15°21.8
3	298°50.0	204°39.1	• • 26.9	118°36.9	• • 33.6	102°02.5	• • 36.5	252°13.8	• • 17.7	I 02 C	CLIA	N4
4	313°52.5	219°38.2	26.9	133°38.7 148°40.5	33.2	117°05.0 132°07.6	36.5	267°16.0 282°18.2	17.8	Jun 03 Sun	SHA 268°40.1	Mer.pass 13:19
5	328°54.9	234°37.3	26.9		32.9		36.5		17.9		180°20.2	19:09
6	343°57.4	249°36.4	N24°26.9	163°42.3	N00°32.5	147°10.1	S05°36.5	297°20.3	N15°18.0			
7	358°59.8	264°35.5	26.9	178°44.1	32.1	162°12.6	36.5 36.5	312°22.5	18.0	Jupiter Saturn	163°08.8 313°39.2	20:17 10:17
8	14°02.3 29°04.8	279°34.7 294°33.8	26.9 •• 26.9	193°45.9 208°47.7	31.8	177° 15.2 192° 17.7	36.5 · · 36.5	327° 24.7 342° 26.8	18.1	Saturn	JIJ J9.2	10.17
9 10	29 04.8 44°07.2	294 33.8 309°32.9	26.9	208 47.7 223°49.5	· · 31.4 31.0	192 17.7 207°20.2	36.4	342 26.8 357°29.0	· · 18.2 18.3	Jun 04 Mon	SHA	Mer.pass
11	44 07.2 59°09.7	309 32.9 324°32.0	26.9 26.9	223 49.5 238°51.2	30.6	207 20.2 222° 22.7	36.4 36.4	357 29.0 12°31.2	18.3		$267^{\circ}19.7$	13:21
12	74°12.2	339°31.1	N24° 26.8	250°51.2 253°53.0	N00°30.3	237° 25.3	505°36.4	27°33.3	N15°18.4		180°04.8	19:06
13	89°14.6	354°30.2	26.8	268°54.8	29.9	257° 25.3° 252° 27.8	36.4	42°35.5	18.5		163°10.7	20:13
14	104°17.1	9°29.3	26.8	283°56.6	29.5	267°30.3	36.4	57°37.7	18.6	Saturn	313°32.0	10:13
15	119°19.6	24°28.4	. 26.8	298°58.4	29.1	282°32.8	36.4	72°39.8	. 18.7	Jun 05 Tue	SHA	Mer.pass
16	134°22.0	39°27.6	26.8	314°00.2	28.8	297°35.4	36.4	87°42.0	18.8		265°59.2	13:22
17	149°24.5	54°26.7	26.7	329°02.0	28.4	312°37.9	36.3	102°44.2	18.8	I	179°49.0	19:04
18	164°26.9	69°25.8	N24°26.7	344°03.7	N00°28.0	327° 40.4	S05°36.3	117°46.3	N15°18.9		163°12.3	20:09
19	179°29.4	84°24.9	26.7	359°05.5	27.6	342° 42.9	36.3	132°48.5	19.0		313°24.8	10:10
20	194°31.9	99°24.0	26.7	14°07.3	27.3	357° 45.5	36.3	147°50.7	19.1	Jatuill	515 24.0	10.10
21	209°34.3	114°23.1	• • 26.6	29°09.1	26.9	12°48.0	• • 36.3	162°52.8	• • 19.2	Horizont	al parallax	
22	224°36.8	129°22.2	26.6	44°10.9	26.5	27° 50.5	36.3	177°55.0	19.2		Venus:	0.1
23	239°39.3	144°21.3	26.6	59°12.6	26.1	42°53.0	36.3	192°57.1	19.3		Mars:	0.2
			0.0′ m-3.89		.4′ m0.01	$\nu 2.5' \ d-0.$		$\nu 2.2' d0.$				
ivier.p	ass. 07:04	ν -0.9 a -0	u III-3.09	ν 1.0 u -0	.+ IIIU.UI	ν∠.ο α-0.	0 111-2.23	ν2.2 UU.	1110.33			

h	Sur	า	Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°28.1	N22°19.2	280°24.6	15.0'	507°06.4	-12.3'	55.3'	
1 2	195°28.0 210°27.9	19.5 19.8	294°58.6 309°32.6	15.0' 15.1'	06°54.1 06°41.8	-12.3' -12.3'	55.3' 55.3'	
3	225°27.8	. 20.1	324°06.7	15.1'	06°29.5	-12.3	55.2'	
4	240°27.7	20.4	338°40.8	15.2'	06° 17.2	-12.3'	55.2'	
5 6	255°27.6 270°27.5	20.7 N22°21.0	353°14.9 7°49.1	15.2' 15.3'	06°04.9 \$05°52.5	-12.3' -12.4'	55.2' 55.2'	
7	285°27.4	21.3	22°23.4	15.3'	05°40.2	-12.4'	55.1'	
8	300°27.3	21.6	36°57.7	15.3'	05°27.8	-12.4'	55.1'	
9 10	315°27.2 330°27.1	· · 21.9	51°32.1 66°06.4	15.4' 15.4'	05°15.4 05°03.0	-12.4' -12.4'	55.1' 55.1'	
11	345°27.0	22.5	80°40.9	15.5'	04°50.6	-12.4'	55.0'	
12	0°26.9	N22°22.8	95°15.4	15.5'	S04°38.2	-12.4'	55.0'	
13 14	15°26.8 30°26.7	23.1 23.4	109°49.9 124°24.4	15.6' 15.6'	04°25.8 04°13.4	-12.4' -12.4'	55.0' 55.0'	
15	45°26.6	. 23.4	138°59.0	15.6'	04°13.4	-12.4'	55.0'	
16	60°26.5	24.0	153°33.7	15.7'	03°48.5	-12.4'	54.9'	
17 18	75°26.4 90°26.3	24.3 N22°24.6	168°08.3 182°43.0	15.7' 15.7'	03°36.1 \$03°23.6	-12.4' -12.4'	54.9' 54.9'	
19	90 20.3 105°26.1	24.8	102 43.0 197°17.8	15.7	03°11.2	-12.4' -12.4'	54.9'	
20	120°26.0	25.1	211°52.5	15.8'	02°58.7	-12.5'	54.8'	
21	135°25.9 150°25.8	• • 25.4	226°27.3	15.8'	02°46.3	-12.5'	54.8' 54.8'	
22 23	150°25.8 165°25.7	25.7 26.0	241°02.2 255°37.0	15.9' 15.9'	02°33.8 02°21.4	-12.5' -12.5'	54.8'	
	SD = 15.8'	d = 0.3'		SI	D = 15.1'			
				- 51				
Mon	GHA 180°25.6	Dec N22°26.3	GHA 270°11.9	u 15.9'	Dec \$02°08.9	d -12.5'	HP 54.8'	
0 1	180 25.6 195°25.5	N22 26.3 26.6	270 11.9 284°46.8	15.9'	01°56.5	-12.5 -12.4'	54.8 54.7'	
2	210°25.4	26.9	299°21.8	16.0'	01°44.0	-12.4'	54.7'	
3	225°25.3	• • 27.2	313°56.8	16.0'	01°31.6	-12.4'	54.7'	
4 5	240°25.2 255°25.1	27.5 27.7	328°31.8 343°06.8	16.0' 16.0'	01°19.1 01°06.7	-12.4' -12.4'	54.7' 54.7'	
6	270°25.0	N22°28.0	357°41.8	16.1'	S00°54.3	-12.4'	54.6'	
7	285°24.9	28.3	12°16.9	16.1'	00°41.8	-12.4'	54.6'	
8 9	300°24.8 315°24.6	28.6 •• 28.9	26°52.0 41°27.1	16.1' 16.1'	00°29.4 00°17.0	-12.4' -12.4'	54.6' 54.6'	
10	330°24.5	29.2	56°02.2	16.1'	S00°04.6	-12.4'	54.6'	
11	345°24.4	29.4	70°37.3	16.2'	N00°07.8	12.4'	54.6'	
12 13	0°24.3 15°24.2	N22°29.7 30.0	85°12.5 99°47.7	16.2' 16.2'	N00°20.2 00°32.6	12.4' 12.4'	54.5' 54.5'	
14	30°24.1	30.3	114°22.8	16.2'	00°45.0	12.4'	54.5'	
15	45°24.0	• • 30.6	128°58.0	16.2'	00°57.4	12.4'	54.5'	
16 17	60°23.9 75°23.8	30.8 31.1	143°33.3 158°08.5	16.2' 16.2'	01°09.7 01°22.1	12.3' 12.3'	54.5' 54.5'	
18	90°23.7	N22°31.4	172°43.7	16.2'	N01°34.4	12.3'	54.4'	
19	105°23.6	31.7	187°18.9	16.2'	01°46.7	12.3'	54.4'	
20 21	120°23.4 135°23.3	32.0 · · 32.2	201°54.2 216°29.4	16.3' 16.3'	01°59.1 02°11.4	12.3' 12.3'	54.4' 54.4'	
22	150°23.2	32.5	231°04.7	16.3'	02°23.6	12.3'	54.4'	
23	165°23.1	32.8	245°40.0	16.3'	02°35.9	12.3'	54.4'	
	SD = 15.8'	d = 0.3'		SI	O = 14.9'			
Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°23.0	N22°33.1	260°15.2	16.3'	N02°48.2	12.2'	54.4'	
1 2	195°22.9 210°22.8	33.3 33.6	274°50.5 289°25.8	16.3' 16.3'	03°00.4 03°12.6	12.2' 12.2'	54.3' 54.3'	
3	225°22.7	• • 33.9	304°01.0	16.3'	03°24.8	12.2'	54.3'	
4	240°22.6	34.1	318°36.3	16.3'	03°37.0	12.2'	54.3'	
5 6	255°22.4 270°22.3	34.4 N22°34.7	333°11.6 347°46.9	16.3' 16.3'	03°49.2 N04°01.3	12.1' 12.1'	54.3' 54.3'	
7	285°22.2	34.9	2°22.1	16.3'	04° 13.4	12.1'	54.3'	
8	300°22.1	35.2	16°57.4	16.3'	04°25.6	12.1'	54.3'	
9 10	315°22.0 330°21.9	· · 35.5 35.8	31°32.6 46°07.9	16.3' 16.2'	04°37.6 04°49.7	12.1' 12.0'	54.3' 54.2'	
11	345°21.8	36.0	60°43.1	16.2	05°01.7	12.0'	54.2'	
12	0°21.7	N22°36.3	75°18.4	16.2'	N05°13.8	12.0'	54.2'	
13 14	15°21.5 30°21.4	36.5 36.8	89°53.6 104°28.8	16.2' 16.2'	05°25.8 05°37.7	12.0' 11.9'	54.2' 54.2'	
15	45°21.3	37.1	119°04.0	16.2	05°49.7	11.9'	54.2'	
16	60°21.2	37.3	133°39.2	16.2	06°01.6	11.9'	54.2'	
17 18	75°21.1 90°21.0	37.6 N22°37.9	148°14.4 162°49.6	16.2' 16.2'	06° 13.5 N06° 25.4	11.9' 11.8'	54.2' 54.2'	
19	105°20.9	38.1	$177^{\circ}24.7$	16.2	06°37.2	11.8	54.2'	
20	120°20.8	38.4	191°59.8	16.1'	06°49.0	11.8'	54.2'	
21 22	135°20.6 150°20.5	· · 38.6 38.9	206°35.0 221°10.1	16.1' 16.1'	07°00.8 07°12.6	11.8' 11.7'	54.2' 54.1'	
23	165°20.4	39.2	235°45.2	16.1	07 12.0 07°24.3	11.7	54.1	
	SD = 15.8'	d = 0.3'		SI	D = 14.8'			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-41%	
03	01:53	01:48	11:58	05:28	17:49		
04	01:42	01:37	11:58	06:09	18:30		
05	01:32	01:27	11:59	06:50	19:11		

h	Aries	Ve	nus	M	ars	Jup	iter	Sati	urn		Stars	
\/\ad	CHA	CHA	Doo	CHA	Doo	CHA	Dee	CHA	Das		СПУ	Dos
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	254°41.7	159° 20.5	N24° 26.6	74°14.4	N00°25.7	57°55.6	S05°36.3	207°59.3	N15° 19.4	Alpheratz	357°31.1	29°15.1
1	269°44.2	174°19.6	26.5	89°16.2	25.4	72°58.1	36.2	223°01.5	19.5	Ankaa	353°03.9	-42°08.5
2	284°46.7	189° 18.7	26.5	104°18.0	25.0	88°00.6	36.2	238°03.6	19.6	Schedar	349°27.0	56°41.7
3	299°49.1	204° 17.8	• • 26.5	119°19.8	• • 24.6	103°03.1	• • 36.2	253°05.8	• • 19.6	Diphda	348°43.9	-17°49.4
4	314°51.6	219°16.9	26.4	134°21.5	24.2	118°05.7	36.2	268°08.0	19.7	Achernar	335°18.1	-57°05.0
5	329°54.1	234°16.0	26.4	149°23.3	23.9	133°08.2	36.2	283°10.1	19.8	Hamal	327°47.4	23°36.0
6	344°56.5	249°15.1	N24° 26.3	164°25.1	N00°23.5	148°10.7	S05°36.2	298°12.3	N15° 19.9	Polaris	312°30.4	89°23.0
7	359°59.0	264°14.2	26.3	179°26.8	23.1	163°13.2	36.2	313°14.5	19.9	Acamar	315°09.5	-40°11.1
8	15°01.4	279°13.4	26.3	194°28.6	22.7	178°15.8	36.2	328°16.6	20.0	Menkar	$314^{\circ}02.7$	4°12.2
9	30°03.9	294°12.5	• • 26.2	209°30.4	• • 22.3	193°18.3	36.1	343°18.8	. 20.1	Mirfak	308°23.5	49°57.7
10	45°06.4	309°11.6	26.2	224°32.2	22.0	208°20.8	36.1	358°21.0	20.2	Aldebaran	290°35.9	16°34.0
11	60°08.8 75°11.3	324°10.7 339°09.8	26.1 N24°26.1	239°33.9 254°35.7	21.6 N00°21.2	223°23.3 238°25.8	36.1 \$05°36.1	13°23.1 28°25.3	20.3 N15°20.3	Rigel	281°00.8	-8°10.2
12 13	90°13.8	354°08.9	26.0	269°37.5	20.8	253°28.4	36.1	43°27.5	20.4	Capella	$280^{\circ}17.1$	46°01.5
14	105°16.2	9°08.0	26.0	284°39.2	20.6	268°30.9	36.1	58°29.6	20.4	Bellatrix	$278^{\circ}19.4$	6°22.4
15	120°18.7	24°07.1	25.9	299°41.0	20.1	283°33.4	36.1	73°31.8	20.6	Elnath	277°57.7	28°37.8
16	135°21.2	39°06.3	25.9	314°42.8	19.7	298°35.9	36.1	88°34.0	20.7	Alnilam	275°34.5	-1°11.1
17	150°23.6	54°05.4	25.8	329°44.5	19.7	313°38.4	36.1	103°36.1	20.7	Betelgeuse	270°48.6	7°24.6
18	165°26.1	69°04.5	N24° 25.8	344°46.3	N00°18.9	328°40.9	S05°36.0	118°38.3	N15°20.8	Canopus	263°51.3	-52°42.9
19	180°28.6	84°03.6	25.7	359°48.1	18.5	343°43.5	36.0	133°40.5	20.9	Sirius	258°23.4	-16°45.6
20	195°31.0	99°02.7	25.7	14°49.8	18.1	358°46.0	36.0	148°42.6	21.0	Adhara	255°03.4	-29°01.0
21	210°33.5	114°01.8	25.6	29°51.6	17.8	13°48.5	36.0	163°44.8	21.0	Procyon	244°47.4	5°08.8
22	225°35.9	129°00.9	25.6	44°53.4	17.4	28°51.0	36.0	178°47.0	21.1	Pollux	243°13.3	27°57.2
23	240°38.4	144°00.1	25.5	59°55.1	17.0	43°53.5	36.0	193°49.1	21.2	Avior	234°13.6	-59°36.6
			_							Suhail	222°43.9	-43°33.4
Mer.p	ass. 07:00	ν -0.9′ d-0	.0′ m-3.89	ν 1.8′ d -0	0.4′ m0.03	ν 2.5′ d -0.	.0′ m-2.24	ν 2.2′ d0.	ı m0.33	Miaplacidus	221°37.8	-69°50.7
										Alphard	217°44.4	-8°47.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8 193°36.9	11°49.3
0	255°40.9	158°59.2	N24°25.4	74°56.9	N00°16.6	58°56.1	S05°36.0	208°51.3	N15°21.3	Dubhe Denebola	193 30.9 182°21.3	61°35.7 14°24.4
1	270°43.3	173°58.3	25.4	89°58.6	16.2	73°58.6	36.0	223°53.5	21.4		162 21.3 175°39.8	-17°42.5
2	285°45.8	188°57.4	25.3	105°00.4	15.8	89°01.1	36.0	238°55.6	21.4	Gienah	175 39.6 172°55.6	-17 42.5 -63°16.1
3	300°48.3	203°56.5	• • 25.3	120°02.2	• • 15.5	104°03.6	• • 36.0	253°57.8	• • 21.5	Gacrux	172 55.0 171°47.3	-03 10.1 -57°17.0
4	315°50.7	218°55.6	25.2	135°03.9	15.1	119°06.1	35.9	269°00.0	21.6	Alioth	171 47.3 166°09.8	55°48.2
5	330°53.2	233°54.7	25.1	150°05.7	14.7	134°08.6	35.9	284°02.1	21.7	Spica	158° 18.3	-11°19.0
6	345°55.7	248°53.9	N24°25.1	165°07.4	N00°14.3	149°11.1	S05°35.9	299°04.3	N15°21.8	Alkaid	150° 10.5° 152° 49.0	49°10.1
7	$0^{\circ}58.1$	263°53.0	25.0	180°09.2	13.9	$164^{\circ}13.7$	35.9	$314^{\circ}06.5$	21.8	Hadar	148°30.3	-60°31.1
8	$16^{\circ}00.6$	278°52.1	24.9	195°10.9	13.5	179°16.2	35.9	329°08.6	21.9	Menkent	140°53.0	-36°31.1
9	31°03.0	293°51.2	• • 24.8	$210^{\circ}12.7$	• • 13.1	194°18.7	• • 35.9	344°10.8	• • 22.0	Arcturus	145°44.4	19°01.8
10	46°05.5	308°50.3	24.8	225°14.4	12.8	209°21.2	35.9	359°13.0	22.1	Rigil Kent.	139°34.7	-60°57.6
11	61°08.0	323°49.4	24.7	240°16.2	12.4	224°23.7	35.9	14° 15.1	22.1	Kochab	137°19.2	74°02.2
12	76°10.4	338° 48.6	N24°24.6	255°18.0	N00°12.0	239°26.2	S05°35.9	29°17.3	N15°22.2	Zuben'ubi	136°51.8	-16°09.9
13	91°12.9	353°47.7	24.5	270°19.7	11.6	254°28.7	35.9	44°19.5	22.3	Alphecca	126°00.4	26°37.0
14	106°15.4	8°46.8	24.5	285°21.5	11.2	269°31.3	35.9	59°21.6	22.4	Antares	112°11.1	-26°29.8
15	121°17.8	23°45.9	• • 24.4	300°23.2	• • 10.8	284°33.8	• • 35.9	74°23.8	• • 22.5	Atria	107°01.4	-69°04.7
16	136°20.3	38°45.0	24.3	315°25.0	10.4	299°36.3	35.8	89°26.0	22.5	Sabik	101°58.3	-15°45.6
17	151°22.8	53°44.1	24.2	330°26.7	10.0	314°38.8 329°41.3	35.8	104°28.2 119°30.3	22.6	Shaula	$96^{\circ}05.1$	-37°07.4
18	166°25.2 181°27.7	68° 43.2 83° 42.4	N24°24.1	345°28.5 0°30.2	N00°09.7	329 41.3 344°43.8	S05°35.8	119 30.3 134°32.5	N15°22.7	Rasalhague	95°54.9	12°32.4
19			24.1		09.3		35.8		22.8	Eltanin	90°40.0	51°29.1
20 21	196°30.2 211°32.6	98°41.5 113°40.6	24.0 •• 23.9	15°31.9 30°33.7	08.9 •• 08.5	359°46.3 14°48.8	35.8 •• 35.8	149°34.7 164°36.8	22.8 •• 22.9	Kaus Aust.	83°27.4	-34°22.0
22	211 32.0 226°35.1	113 40.0 128° 39.7	23.9	45°35.4	08.1	29°51.3	35.8	179°39.0	23.0	Vega	80°30.4	38°48.7
23	241°37.5	143°38.8	23.7	60°37.2	07.7	44°53.9	35.8	194°41.2	23.0	Nunki	75°43.0	-26°15.4
								_		Altair	61°56.2	8°56.9
Mer.p	ass. 06:56	ν -0.9' d-0	.1′ m-3.89	$\nu 1.8' \ d$ -0	.4′ m0.04	$\nu 2.5' \ d$ -0.	.0′ m-2.23	ν 2.2′ d0.3	1' m 0.33	Peacock	52°59.9	-56°38.0
										Deneb	49°23.0	45°23.1
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.2	10°00.7
0	256°40.0	158°37.9	N24°23.6	75°38.9	N00°07.3	59°56.4	S05°35.8		N15°23.2	Al Na'ir	27°28.5	-46°48.7
1	271°42.5	173°37.1	23.5	90°40.7	06.9	74°58.9	35.8	224°45.5	23.2	Fomalhaut	15°10.7	-29°27.7
2	286°44.9	188°36.2	23.4	105°42.4	06.5	90°01.4	35.8	239°47.7	23.3	Scheat	13°41.7 13°26.3	28°14.5 15°21.8
3	301°47.4	203°35.3	23.3	120°44.2	• • 06.1	105°03.9	• • 35.8	254°49.8	• • 23.4	Markab	13 20.3	15 21.0
4	316°49.9	218°34.4	23.2	135°45.9	05.8	120°06.4	35.8	269°52.0	23.5	Jun 06 Wed	SHA	Mer.pass
5	331°52.3	233°33.5	23.1	150°47.6	05.4	135°08.9	35.8	284°54.2	23.5	Venus	264°38.7	13:23
6	346°54.8	248°32.7	N24°23.0	165°49.4	N00°05.0	150°11.4	\$05°35.7	299°56.3	N15°23.6	Mars	179°32.7	19:01
7	1°57.3	263°31.8	22.9	180°51.1	04.6	165°13.9	35.7	314°58.5	23.7	Jupiter	163°13.8	20:05
8	$16^{\circ}59.7$	278°30.9	22.8	195°52.9	04.2	180°16.4	35.7	330°00.7	23.8	Saturn	313°17.6	10:07
9	$32^{\circ}02.2$	293°30.0	• • 22.7	210°54.6	• • 03.8	195°18.9	• • 35.7	345°02.8	• • 23.9	I 07 Thu	CHA	May mass
10	47°04.7	308°29.1	22.6	225°56.3	03.4	210°21.5	35.7	0°05.0	23.9	Jun 07 Thu Venus	SHA 263°18.3	Mer.pass 13:25
11	62°07.1	323°28.2	22.5	240°58.1	03.0	225°24.0	35.7	15°07.2	24.0		179°16.0	18:58
12	77°09.6	338°27.4	N24°22.4	255°59.8	N00°02.6	240°26.5	S05°35.7	30°09.4	N15°24.1		163°15.2	20:01
13	92°12.0	353°26.5	22.3	271°01.5	02.2	255°29.0	35.7	45°11.5	24.2	Saturn	313°10.4	10:03
14	107°14.5	8°25.6	22.2	286°03.3	01.8	270°31.5	35.7	60°13.7	24.2			
15	122°17.0	23°24.7	• • 22.1	301°05.0	01.4	285°34.0	• • 35.7	75°15.9	• • 24.3	Jun 08 Fri	SHA	Mer.pass
16	137°19.4	38°23.8	22.0	316°06.7	01.0	300°36.5	35.7	90°18.0	24.4		261°57.9	13:26
17	152°21.9	53°23.0	21.9	331°08.5	00.6	315°39.0	35.7	105°20.2	24.5		178°58.9	18:55
18 19	167°24.4	68°22.1 83°21.2	N24°21.8	346°10.2	N00°00.2 S00°00.1	330°41.5 345°44.0	\$05°35.7 35.7		N15°24.6		163°16.4	19:57
	182°26.8 197°29.3	98° 20.3	21.7 21.5	1°11.9 16°13.7	00.5	345 44.0 0°46.5	35.7 35.7	135°24.5 150°26.7	24.6 24.7	Saturn	313°03.3	10:00
20 21	197°29.3 212°31.8	98° 20.3 113° 19.4	21.5	31°15.4	00.9	0°46.5 15°49.0	35.7 •• 35.7	165°28.9	24.7 •• 24.8	Horizont	al parallax	
22	212 31.8 227°34.2	113 19.4 128° 18.6	21.4	46°17.1	01.3	30°51.5	35.7	180°31.0	24.8		Venus:	0.1
23	242°36.7	143° 17.7	21.2	61°18.8	01.7	45°54.0	35.7	195°33.2	24.9		Mars:	0.1
Mer.p	ass. 06:52	ν -0.9′ d-0	.1′ m-3.89	$\nu 1.7' d$ -0	0.4′ m0.06	$\nu 2.5' \ d-0.$	0′ m-2.23	$\nu 2.2' \ d0.1$	I′ m0.33			

h	Sur		Moon					
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°20.3	N22°39.4	250°20.2	16.0'	N07°36.0	11.7'	54.1'	
1	195°20.2	39.7	$264^{\circ}55.3$	16.0'	07°47.7	11.6'	54.1'	
2	210°20.1	39.9	279°30.3	16.0'	07°59.3	11.6'	54.1'	
3	225°20.0	• • 40.2	294°05.3	16.0'	08°10.9	11.6'	54.1'	
4	240° 19.8 255° 19.7	40.4	308°40.3 323°15.2	16.0' 15.9'	08°22.5 08°34.0	11.5'	54.1'	
5 6	255° 19.7 270° 19.6	40.7 N22°40.9	323° 15.2 337° 50.1	15.9'	N08°45.6	11.5' 11.5'	54.1' 54.1'	
7	285° 19.5	41.2	352°25.0	15.9'	08°57.0	11.4	54.1	
8	300° 19.4	41.4	6°59.9	15.8'	00° 37.0	11.4'	54.1'	
9	315° 19.3	• • 41.7	21°34.8	15.8'	09°19.9	11.4'	54.1'	
10	330°19.2	41.9	$36^{\circ}09.6$	15.8'	09°31.2	11.3'	54.1'	
11	345°19.0	42.2	50°44.4	15.8'	09°42.6	11.3'	54.1'	
12	0°18.9	N22°42.4	65° 19.2	15.7'	N09°53.9	11.3'	54.1'	
13	15° 18.8	42.7	79°53.9	15.7'	10°05.1	11.2'	54.1'	
14 15	30° 18.7 45° 18.6	42.9 •• 43.2	94°28.6 109°03.2	15.7' 15.6'	10°16.3 10°27.5	11.2' 11.1'	54.1' 54.1'	
16	45 18.5 60° 18.5	43.4	109 03.2 123°37.9	15.6'	10°27.5	11.1	54.1'	
17	75° 18.3	43.7	138° 12.5	15.6'	10° 49.7	11.1'	54.1'	
18	90° 18.2	N22°43.9	152°47.0	15.5'	N11°00.8	11.0'	54.1'	
19	105° 18.1	44.2	167°21.6	15.5'	11°11.8	11.0'	54.1'	
20	120° 18.0	44.4	$181^{\circ}56.1$	15.5'	11°22.7	10.9'	54.1'	
21	135° 17.9	• • 44.6	196°30.5	15.4'	11°33.7	10.9'	54.1'	
22	150° 17.8	44.9	211°04.9	15.4'	11°44.5	10.8'	54.1'	
23	165°17.6	45.1	225°39.3	15.3'	11°55.4	10.8'	54.1'	
	SD = 15.8'	d = 0.3'		SE	O = 14.8'			
Thu	GHA	Dec	GHA	ν	Dec	d	НР	
0	180° 17.5	N22°45.4	240°13.7	15.3'	N12°06.2	10.7'	54.1'	
1	195° 17.4	45.6	254° 47.9	15.3'	12°16.9	10.7'	54.1'	
2	210° 17.3	45.8	269°22.2	15.2'	12°27.6	10.6'	54.1'	
3	225° 17.2	• • 46.1	283°56.4	15.2'	12°38.3	10.6'	54.1'	
4	240°17.0 255°16.9	46.3	298°30.6	15.1'	12°48.9 12°59.4	10.5'	54.1'	
5 6	255° 16.9 270° 16.8	46.6 N22°46.8	313°04.7 327°38.8	15.1' 15.0'	N13°09.9	10.5' 10.4'	54.1' 54.1'	
7	285° 16.7	47.0	342° 12.8	15.0'	13°20.4	10.4	54.1	
8	300° 16.6	47.3	356°46.8	14.9'	13°30.8	10.3'	54.1'	
9	315° 16.5	• • 47.5	11°20.8	14.9'	13°41.1	10.3'	54.1'	
10	330°16.3	47.7	$25^{\circ}54.7$	14.9'	13°51.4	10.2'	54.1'	
11	345°16.2	48.0	40°28.5	14.8'	14°01.6	10.2'	54.1'	
12	0°16.1	N22°48.2	55°02.3	14.8'	N14°11.8	10.1'	54.1'	
13 14	15° 16.0 30° 15.9	48.4 48.7	69°36.1 84°09.8	14.7' 14.7'	14°21.9 14°32.0	10.1' 10.0'	54.1' 54.1'	
15	45° 15.7	• • 48.9	98°43.4	14.6'	14° 42.0	10.0'	54.1	
16	60° 15.6	49.1	113° 17.0	14.6'	14°52.0	9.9'	54.1'	
17	75° 15.5	49.4	$127^{\circ}50.6$	14.5'	$15^{\circ}01.9$	9.8'	54.1'	
18	90° 15.4	N22°49.6	142°24.1	14.4'	N15°11.8	9.8'	54.1'	
19	105° 15.3	49.8	156° 57.5		15°21.5	9.7'	54.1'	
20	120° 15.1	50.0	171°30.9	14.3'	15°31.3	9.7'	54.1'	
21	135°15.0 150°14.9	· · 50.3 50.5	186°04.3 200°37.6	14.3' 14.2'	15°40.9 15°50.5	9.6' 9.5'	54.1' 54.1'	
22 23	165° 14.8	50.5 50.7	200 37.6 215°10.8	14.2'	15 50.5 16°00.1	9.5 9.5'	54.1'	
23	SD = 15.8'	d = 0.2'	213 10.0		0 = 14.7'	9.5	J4.1	
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	180° 14.7 195° 14.5	N22°50.9 51.2	229°44.0 244°17.1	14.1' 14.1'	N16°09.6 16°19.0	9.4' 9.4'	54.1' 54.2'	
2	195 14.5 210° 14.4	51.2 51.4	244 17.1 258°50.1	14.1 14.0'	16 19.0 16°28.3	9.4 9.3'	54.2'	
3	225° 14.3	51.6	273°23.1	13.9'	16° 37.6	9.2	54.2'	
4	240° 14.2	51.8	287° 56.1	13.9'	16°46.8	9.2	54.2'	
5	$255^{\circ}14.1$	52.0	$302^{\circ}29.0$	13.8'	16°56.0	9.1'	54.2'	
6	270° 13.9	N22°52.3	317°01.8	13.8'	N17°05.1	9.0'	54.2'	
7	285° 13.8	52.5	331°34.6	13.7'	17°14.1	8.9'	54.2'	
8	300°13.7	52.7	346°07.3 0°39.9	13.7'	17°23.0 17°31.9	8.9'	54.2'	
9 10	315°13.6 330°13.5	· · 52.9 53.1	0°39.9 15°12.5	13.6' 13.5'	17°31.9 17°40.7	8.8' 8.7'	54.2' 54.2'	
11	345° 13.3	53.3	29°45.1	13.5'	17 40.7 17°49.4	8.7'	54.2'	
12	0° 13.2	N22°53.6	44° 17.5	13.4'	N17°58.1	8.6'	54.2'	
13	15° 13.1	53.8	58°49.9	13.3'	18°06.7	8.5'	54.3'	
14	30° 13.0	54.0	73°22.3	13.3'	18°15.2	8.4'	54.3'	
15	45° 12.8	• • 54.2	87°54.6	13.2'	18°23.6	8.4'	54.3'	
16	60° 12.7	54.4	102°26.8	13.2'	18°32.0	8.3'	54.3'	
17	75°12.6 90°12.5	54.6 N22°54.8	116°59.0	13.1'	18°40.3	8.2'	54.3'	
18 19	90°12.5 105°12.4	N22°54.8 55.0	131°31.1 146°03.1	13.0' 13.0'	N18°48.5 18°56.6	8.1' 8.0'	54.3' 54.3'	
20	105 12.4 120° 12.2	55.3	140 03.1 160°35.1	12.9'	10 50.0 19°04.7	8.0'	54.3'	
21	135° 12.1	• • 55.5	175°07.0	12.8'	19°12.6	7.9'	54.3'	
22	150° 12.0	55.7	189°38.8	12.8'	19°20.5	7.8'	54.3'	
23	$165^{\circ}11.9$	55.9	$204^{\circ}10.6$	12.7'	19°28.3	7.7'	54.4'	
	SD = 15.8'	d = 0.2'		SE	D = 14.8'			
			JU — 14.0					

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	32-16%	
06	01:21	01:16	11:59	07:31	19:52		
07	01:10	01:04	11:59	08:13	20:35		
08	00:59	00:53	11:59	08:57	21:20		

Section Sect	h	Aries	`	nus	M	ars	Jup	iter	Sat	urn		Stars	
20 20 20 20 20 20 20 20	Sat	GHA	CHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 777-81 0 777-81 0 777-81 0 778-90 100-240 100-240 200 100-24													
2 207*4.1 189115.0 2.0 20 107*4.0 229 91*01.5 35.0 207*3.7 207*3.7 207*3.7 2.2											Alpheratz	357°31.1	$29^{\circ}15.1$
3 307'46.5 2031'14.2 "											Ankaa	353°03.9	-42°08.5
11 12 10 12 13 20 10 12 13 20 10 12 12 12 15 15 15 12 13 14 15 15 15 15 15 15 15											Schedar	349°27.0	56°41.7
Section Control Cont											Diphda	348°43.9	$-17^{\circ}49.4$
8 917539 296115 1824°203 100°309 S00°015 151°115 150°35 50 S00°484 N55°55 5 Program 127°24 20°116 1 187 150°5 1 18											Achernar	$335^{\circ}18.1$	-57°05.0
7 2°56.4 20°10.0 20.2 181°32.0 049 100°14.0 35.0 131°50.0 25.6 1.5 0.0 1.0 100°14.0 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5											Hamal	327°47.4	
9 33°03 29°099 20°199 20°199 20°191 100 21°191 105 109 21°191 105 109 21°191 105 109 21°191 105 109 21°191 100 21°191 100 21°191 100 21°191 100 21°191 100 21°191 100 21°191 100 21°191 100 20°19											Polaris	312°29.3	89°23.0
9 35°G.13 295°G.9 1.99 121°S.1 0.95° 199°19.0 35.6 385°S.9 7.50°S.1 285°S.0 10 487°G.9 30°G.05 10 82 295°G.0 6.6 212°S.2 35°G.0 10 10 10 10 10 10 10 10 10 10 10 10 10											Acamar	315°09.5	
10 670.3 32707.1 129 1270.2 104 1270.2 129 120 120 120 120 120 120 120 120 120 120											Menkar	314°02.7	4°12.2
101 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1											Mirfak	308°23.5	49°57.7
11 63*10.2 38*70.4 10.94 24*73.2 50*0.0 20.0											Aldebaran	290°35.9	
19 19 20 20 20 20 20 20 20 2													
1.5 1.37 1.6 2.7 2.											_		
18													
Alloy													
Belegams 187-150 187											l l		
19 183 23 23 24 25 25 25 25 25 25 25													
1887-500 1887-500											_		
183 183				N24°18.7		S00°09.3							
1875-109 1975-20													
22 226735.4 12757.5 18.1 4054.4 10.9 3151.5 3.0 180.21.1 26.6 April 2275.6 18.1 4054.4 10.9 3151.5 3.0 180.21.2 26.8 More 23.4 13.6 973.6 973.6 More 23.4 13.6 4.7 13.6 14.7 13.7 13.7 13.7 13.6 14.	20	198°28.4	97° 59.2	18.4		10.1	1°46.5	35.6	151°18.8	26.5			
22 28-31.2 147-56.5 18.0 67-00.1 11.3 46-56.4 35.5 187-23.1 28-7-30.8 Mer. pass. 06-48													
Mar. Mar.						10.9							
Mapple M	23	243°35.8	142°56.6	18.0	62°00.1	11.3	46°54.0	35.6	196°25.3	26.8			
Sum GHA GHA Dec GHA	Mers	ass 06·4Ω	ν-0 0' A C) 1' m-3 20	1/1 7 [/] d0	4' m0 00	υ2 5' d Ω	0' m-2 22	1/2 2/ 40	1' m0 33			
Sun GiA GiA CiC	ivier.p	ass. UU.40	ν-0.9 α-0	,.1 III-3.09	ν1.1 UU	.+ 1110.00	ν2.5 u -0.	.0 111-2.22	ν2.2 dU	.1110.33			
Son GHA													
288°343 172°546 177 972°185 177 175°187 176	Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
273*408 1 172*548 1177 92*035 12.1 76*59.0 35.6 226*29.6 26.99 2 288*48.1 1775*10*177.0 12.5 92*01.5 35.6 226*39.6 2.279 3 303*48.7 227*53.1 174 122*07.0 1.129 107*04.0 35.6 26*34.0 2.71.1 4 318*48.1 217*52.2 172 137*08.1 13.1 122*05.5 35.6 226*34.0 2.71.1 5 348*53.1 247*59.5 N24*16.9 167*12.1 500*14.1 152*11.5 50*35.6 301*30.5 N15*27.3 Aloh 166*09.8 55*36.0 301*30.5 N15*27.3 Aloh 166*09.8 55*50.0 20*30.0 166*09.8 55*50.0 166*09.0 166*09.8 55*50.0 166*09.0	0	258°38.3	157°55.7	N24°17.8	$77^{\circ}01.8$	S00°11.7	61°56.5	S05°35.6	211°27.5	$N15^{\circ}26.9$			
2 288°43.2 187°54.0 1775 107°65.2 12.5 9°201.5 35.6 241°31.8 27.0 330°45.7 202°33.1 \cdot 177.5 107°65.2 12.9 107°64.0 35.6 241°31.8 27.0 340°45.7 202°33.1 \cdot 177.5 107°65.2 12.9 107°64.0 35.6 271°36.2 27.2 341°45.0 127°52.6 177.3 15.6 177.3 15.6 177.3 15.6 177.3 15.6 177.3 15.6 177.3 15.6 177.3 15.6 177.3 15.6 167°12.1 500°14.1 152°11.5 505°3.6 301°40.5 N15°27.3 4 14.3 12.3 17.0 15.2 11.5 10.3 11.5 10.5 11.5 505°3.6 301°40.5 N15°27.3 4 14.3 12.3 11.6 10.5 10.4 12.1 15.0 167°12.1 500°14.1 152°11.5 505°3.6 301°40.5 N15°27.3 4 14.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12						12.1	76°59.0		226°29.6				
3 303°49.7 22°531 1.7'4 122°070 · 12.9 107°040 · 35.6 256°340 · 27.1 d	2	288°43.2	187°54.0	17.5	107°05.2	12.5	92°01.5	35.6	241°31.8	27.0			
4 318°48.1 21"92.2 17.2 137"08.7 13.3 122"06.5 33.6 21"136.2 27.2 Alieh 166'0.98 55'48.2 5 338'30.6 232"35'5. 262"38.3 17.0 152"10.4 13.7 137"09.0 35.6 263"38.3 27.2 5 5 5 5 5 262"49.6 167"12.1 500"14.1 152"11.5 5 505"35.6 301"40.5 N15"27.3 Alieh 166'0.08 52"42.5 14.9 182"15.5 14.9													
5 338° 90.6 232° 91.3 17.0 152° 10.4 13.7 137° 99.0 35.6 268° 38.3 27.2 6 348° 33.1 247° 90.5 124° 16.9 167° 121.3 508° 38.6 301° 40.5 155° 27.3 7 3° 55.5 202° 94.6 16.7 182° 13.8 14.5 167° 14.0 35.6 301° 40.5 155° 27.3 8 18° 88.0 277° 48.7 16.6 212° 11.7 14.9 182° 16.5 35.6 316° 44.7 27.6 9 34° 90.5 292° 47.8 16.4 212° 11.7 2.15.3 197° 18.9 35.6 346° 47.0 2.27.6 10 49° 92.9 307° 47.0 16.2 222° 18.8 181° 12.1 35.6 31° 53.5 346° 47.0 2.27.6 11 64° 96.4 322° 46.1 16.1 242° 20.6 16.2 222° 23.9 35.6 16° 51.4 27.7 12 79° 70 337° 45.2 222° 42.9 257° 22.3 500° 16.6 242° 20.6 508° 35.6 16° 51.4 27.7 13 49° 10.3 352° 44.3 15.7 277° 24.0 17.0 257° 28.9 35.6 40° 55.7 27.8 14 109° 12.8 74.35 15.6 237° 25.7 17.4 277° 31.4 35.6 61° 57.9 27.9 15 124° 15.3 22° 42.6 15.4 302° 27.4 17.8 287° 33.9 35.6 61° 57.9 27.9 15 160° 22.5 574.00 15.1 332° 30.8 18.6 317° 38.9 35.6 107° 04.4 26.1 15 160° 22.5 574.00 15.1 332° 30.8 18.6 317° 38.9 35.6 12° 10.9 27.6 16 160° 22.5 674.00 N24° 14.3 22° 37.6 20.2 22° 51.3 35.6 12° 10.9 27.6 18 160° 22.5 674.00 N24° 14.3 22° 37.6 20.6 22° 51.3 35.6 12° 10.9 27.6 22 229° 37.4 157° 34.7 14.7 22° 34° 35.5 15.7 12° 37.6 20.6 22° 51.3 35.6 12° 10.9 27.4 22 244° 35.6 14.2 47° 35.8 16.7 22° 3.5 35.6 12° 10.9 22° 4.0 22 248° 35.7 148° 35.8 148°	4				137°08.7	13.3							
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18 170°21.8 67°19.1 N24°10.4 348°13.1 S00°28.8 333°41.1 S05°35.7 122°58.7 N15°30.0 Jupiter 163°18.9 19:45 19 185°24.2 82°18.2 10.2 3°14.8 29.3 348°43.5 35.7 138°00.9 30.1 Saturn 312°42.2 09:49 20 200°26.7 97°17.4 10.0 18°16.4 29.7 3°46.0 35.7 153°03.1 30.2 30.2 12°16.5 09.8 33°18.1 30.1 18°48.5 35.7 168°05.2 30.3 30.3 168°05.2 30.3 30.3 Venus: 0.1 22 230°31.6 127°15.6 09.6 48°19.8 30.5 33°51.0 35.7 183°07.4 30.3 30.3 Venus: 0.1 23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4 Mars: 0.1													
19 185°24.2 82°18.2 10.2 3°14.8 29.3 348°43.5 35.7 138°00.9 30.1 20 200°26.7 97°17.4 10.0 18°16.4 29.7 3°46.0 35.7 153°03.1 30.2 21 215°29.2 112°16.5 · · · 09.8 33°18.1 · · 30.1 18°48.5 · · 35.7 168°05.2 · · 30.3 22 230°31.6 127°15.6 09.6 48°19.8 30.5 33°51.0 35.7 183°07.4 30.3 23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4													
20 200°26.7 97°17.4 10.0 18°16.4 29.7 3°46.0 35.7 153°03.1 30.2 21 215°29.2 112°16.5 ··· 09.8 33°18.1 ··· 30.1 18°48.5 ··· 35.7 168°05.2 ··· 30.3 22 230°31.6 127°15.6 09.6 48°19.8 30.5 33°51.0 35.7 183°07.4 30.3 23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4 Horizontal parallax Venus: 0.1 Mars: 0.1													
21 215°29.2 112°16.5 · · · 09.8 33°18.1 · · 30.1 18°48.5 · · 35.7 168°05.2 · · 30.3 Horizontal parallax 22 230°31.6 127°15.6 09.6 48°19.8 30.5 33°51.0 35.7 183°07.4 30.3 Venus: 0.1 23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4 Mars: 0.1											Saturn	312°42.2	09:49
22 230°31.6 127°15.6 09.6 48°19.8 30.5 33°51.0 35.7 183°07.4 30.3 Venus: 0.1 23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4 Mars: 0.1											Horizont	al narallav	
23 245°34.1 142°14.8 09.4 63°21.5 30.9 48°53.5 35.7 198°09.6 30.4 Mars: 0.1											1101120111	-	0.1
25 215 51.1 112 11.5 55.1 65.15 55.1 15 55.5 55.1													
Mer.pass. 06:40 ν -0.9′ d -0.2′ m-3.89 ν 1.7′ d 0.4′ m0.11 ν 2.5′ d 0.0′ m-2.21 ν 2.2′ d 0.1′ m0.33	23	∠45 ⁻ 34.1	142-14.8	09.4	03-21.5	30.9	48 ⁻ 53.5	35.7	198-09.6	30.4		ividi 5.	
	Mer.p	ass. 06:40	ν -0.9 $'$ d-0).2′ m-3.89	ν 1.7 $^{\prime}$ d0	.4′ m0.11	ν 2.5′ d0.	0′ m-2.21	ν 2.2′ d0	.1′ m0.33			

h	Sur	า			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°11.7	N22°56.1	218°42.3	12.6'	N19°36.1	7.6'	54.4'
1	195°11.6	56.3	233°13.9	12.6'	19°43.7	7.6'	54.4'
2	210°11.5	56.5	247°45.5	12.5'	19°51.3	7.5'	54.4'
3	225°11.4	• • 56.7	262°17.0 276°48.5	12.5'	19°58.7	7.4'	54.4'
4 5	240°11.2 255°11.1	56.9 57.1	276°48.5 291°19.9	12.4' 12.3'	20°06.1 20°13.4	7.3' 7.2'	54.4' 54.4'
6	270°11.0	N22°57.3	305°51.2	12.3'	N20° 20.6	7.1'	54.4
7	285°10.9	57.5	320°22.5	12.2'	20°27.7	7.0'	54.4'
8	300°10.8	57.7	334°53.7	12.1'	20°34.8	6.9'	54.5'
9	315°10.6	• • 57.9	349°24.8	12.1'	20°41.7	6.9'	54.5
10 11	330°10.5 345°10.4	58.1 58.3	3°55.9 18°26.9	12.0' 11.9'	20°48.6 20°55.3	6.8' 6.7'	54.5' 54.5'
12	0°10.3	00.3 N22°58.5	32°57.8	11.9'	20 55.3 N21°02.0	6.6	54.5
13	15°10.1	58.7	47°28.7	11.8'	21°08.6	6.5	54.5'
14	30°10.0	58.9	61°59.5	11.7'	$21^{\circ}15.1$	6.4'	54.5'
15	45°09.9	• • 59.1	76°30.2	11.7'	21°21.5	6.3'	54.6'
16 17	60°09.8 75°09.6	59.3 59.5	91°00.9 105°31.5	11.6' 11.6'	21°27.7 21°33.9	6.2' 6.1'	54.6' 54.6'
18	90°09.5	N22°59.7	105 31.5 120°02.1	11.5'	N21°40.0	6.0'	54.6'
19	105°09.4	22°59.9	134°32.6	11.4	21°46.0	5.9'	54.6'
20	120°09.3	$23^{\circ}00.1$	149°03.0	11.4'	21°51.9	5.8'	54.6'
21	135°09.1	• • 00.3	163°33.3	11.3'	21°57.7	5.7'	54.6'
22	150°09.0	00.5	178°03.6	11.2'	22°03.4	5.6'	54.7'
23	165°08.9	00.7	192°33.9	11.2'	22°09.0	5.5'	54.7'
	SD = 15.7'	d = 0.2'		SE	0 = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°08.8 195°08.6	N23°00.8 01.0	207°04.0 221°34.2	11.1' 11.0'	N22°14.5 22°19.9	5.4' 5.3'	54.7' 54.7'
2	210°08.5	01.0	221 34.2 236°04.2	11.0'	22 19.9 22°25.2	5.3' 5.2'	54.7'
3	225°08.4	01.4	250°34.2	10.9'	22°30.4	5.1'	54.7'
4	240°08.2	01.6	$265^{\circ}04.1$	10.9'	22°35.4	5.0'	54.7'
5	255°08.1	01.8	279°34.0	10.8'	22°40.4	4.9'	54.8'
6	270°08.0 285°07.9	N23°02.0	294°03.8 308°33.5	10.7'	N22°45.3 22°50.0	4.8'	54.8'
7 8	285°07.9 300°07.7	02.2 02.3	308°33.5 323°03.2	10.7' 10.6'	22°50.0 22°54.7	4.6' 4.5'	54.8' 54.8'
9	315°07.6	02.5	337°32.8	10.6'	22°59.2	4.4	54.8
10	330°07.5	02.7	352°02.4	10.5'	23°03.6	4.3'	54.8'
11	345°07.4	02.9	6°31.9	10.5'	23°08.0	4.2'	54.9'
12	0°07.2	N23°03.1	21°01.4	10.4	N23°12.2	4.1'	54.9'
13 14	15°07.1 30°07.0	03.2 03.4	35°30.8 50°00.1	10.3' 10.3'	23°16.3 23°20.2	4.0' 3.9'	54.9' 54.9'
15	45°06.9	03.4	64°29.4	10.3	23°24.1	3.8'	54.9'
16	60°06.7	03.8	78°58.7	10.2'	23°27.8	3.6'	54.9'
17	75°06.6	04.0	93°27.8	10.1'	23°31.5	3.5'	55.0'
18	90°06.5	N23°04.1	107°57.0 122°26.0	10.1'	N23°35.0 23°38.4	3.4'	55.0'
19 20	105°06.3 120°06.2	04.3 04.5	122°26.0 136°55.1	10.0' 10.0'	23° 38.4 23° 41.7	3.3' 3.2'	55.0' 55.0'
21	135°06.1	04.7	150° 55.1° 151° 24.0	9.9'	23°44.9	3.0'	55.0'
22	150°06.0	04.8	165°53.0	9.9'	23°47.9	2.9'	55.1'
23	165°05.8	05.0	$180^{\circ}21.8$	9.8'	23°50.8	2.8'	55.1'
	SD = 15.7'	d = 0.2'		SE	0 = 14.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°05.7	N23°05.2	194°50.7	9.8'	N23°53.7	2.7'	55.1'
1	195°05.6	05.4	209°19.4	9.7'	23°56.3	2.6'	55.1'
2	210°05.4	05.5	223°48.2	9.7'	23°58.9	2.4'	55.1'
3 4	225°05.3 240°05.2	· · 05.7 05.9	238°16.9 252°45.5	9.6' 9.6'	24°01.4 24°03.7	2.3' 2.2'	55.1' 55.2'
4 5	240°05.2 255°05.1	05.9 06.0	252°45.5 267°14.1	9.6'	24°03.7 24°05.9	2.2	55.2'
6	270°04.9	N23°06.2	281°42.7	9.5'	N24°08.0	2.0'	55.2'
7	285°04.8	06.4	296°11.2	9.5'	24°09.9	1.8'	55.2'
8	300°04.7	06.5	310°39.7	9.4'	24°11.8	1.7'	55.2'
9	315°04.5 330°04.4	· · 06.7	325°08.1 339°36.5	9.4' 9.4'	24°13.5 24°15.1	1.6' 1.5'	55.3' 55.3'
10 11	330°04.4 345°04.3	06.9 07.0	339°36.5 354°04.8	9.4	24° 15.1 24° 16.5	1.5'	55.3'
12	0°04.2	N23°07.2	8°33.2	9.3'	N24°17.8	1.2'	55.3'
13	15°04.0	07.4	23°01.4 9.2' 24°19.1 1.1'				55.3'
14	30°03.9	07.5	37°29.7	9.2'	24°20.1	1.0'	55.4'
15 16	45°03.8 60°03.6	· · 07.7 07.9	51°57.9 66°26.1	9.2' 9.2'	24°21.1 24°21.9	0.8' 0.7'	55.4' 55.4'
16 17	75°03.5	07.9 08.0	80°54.2	9.2 9.1'	24°21.9 24°22.6	0.7	55.4' 55.4'
18	90°03.4	N23°08.2	95°22.4	9.1'	N24°23.2	0.4	55.4'
19	105°03.3	08.3	109°50.4	9.1'	24°23.6	0.3'	55.4'
20	120°03.1	08.5	124°18.5	9.0'	24°23.9	0.2'	55.5'
21 22	135°03.0 150°02.9	· · 08.7 08.8	138°46.5 153°14.6	9.0' 9.0'	24°24.1 24°24.1	0.0' -0.1'	55.5' 55.5'
23	165°02.7	09.0	167°42.5	9.0'	24°24.1	-0.1	55.5'
	SD = 15.7'	d = 0.2'			0 = 15.0'		

	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:27	23:39	////	////
64°	////	////	01:39	22:21	////	////
62°	////	////	02:14	21:46	////	////
60°	////	01:02	02:39	21:21	22:59	////
N 58°	////	01:46	02:59	21:01	22:14	////
56°	////	02:14	03:15	20:45	21:46	////
54°	00:57	02:35	03:29	20:31	21:25	23:04
52°	01:37	02:52	03:41	20:19	21:07	22:23
50°	02:03	03:07	03:51	20:08	20:52	21:57
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	20:43
35°	03:40	04:16	04:46	19:14	19:43	20:20
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:04	19:33
N 10°	04:49	05:16	05:39	18:20	18:43	19:11
0°	05:07	05:33	05:56	18:03	18:26	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:26	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:14	06:48	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:35	16:24	16:58	17:35
S 50°	06:35	07:17	07:55	16:04	16:42	17:24
52°	06:40	07:24	08:04	15:54	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
56°	06:52	07:41	08:28	15:31	16:18	17:07
58°	06:58	07:51	08:42	15:17	16:08	17:00
S 60°	07:06	08:02	08:59	15:00	15:57	16:53
		Moonris	ie		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N. 700				i		

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

		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	10-1%	
09	00:47	00:41	11:59	09:44	22:08		
10	00:35	00:29	12:00	10:33	22:58		
11	00:23	00:17	12:00	11:25	23:51		

June 12, 13, 14 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 0	260°36.6	157° 13.9	N24°09.1	78°23.2	500°31.3	63°56.0	S05°35.7	213°11.8	N15°30.5			
1	275°39.0	172° 13.9	08.9	93°24.8	31.7	78°58.4	35.7	213 11.6 228°13.9	30.6	Alpheratz	$357^{\circ}31.1$	29°15.1
2	275 39.0 290°41.5	172 13.0 187°12.2	08.9	93°24.6 108°26.5	32.2	94°00.9	35.7	243°16.1	30.6	Ankaa	353°03.9	-42°08.4
3	305°44.0	202°11.3	• • 08.5	123°28.2	• • 32.6	109°03.4	35.7	258°18.3	• • 30.7	Schedar	349°26.9	56°41.7
4	320°46.4	217° 10.4	08.3	138°29.9	33.0	124°05.9	35.7	273°20.5	30.8	Diphda	348°43.9	-17°49.3
5	335°48.9	232°09.6	08.1	153°31.6	33.4	139°08.4	35.7	288°22.6	30.9	Achernar	335°18.0	-57°04.9
6	350°51.4	247°08.7	N24° 07.9	168°33.2	S00°33.8	154°10.8	S05°35.7	303°24.8	N15°30.9	Hamal	327°47.3	23°36.0
7	5°53.8	262°07.8	07.6	183°34.9	34.2	169°13.3	35.7	318°27.0	31.0	Polaris	312°28.0	89°23.0
8	20°56.3	277° 07.0	07.4	198°36.6	34.6	184°15.8	35.7	333°29.2	31.1	Acamar	315°09.5	-40°11.1
9	35°58.7	292°06.1	07.2	213°38.2	• • 35.1	199°18.3	35.7	348°31.3	• • 31.2	Menkar	314°02.7	4°12.3
10	51°01.2	307°05.2	07.0	228°39.9	35.5	214°20.8	35.8	3°33.5	31.2	Mirfak	308°23.5	49°57.7
11	66°03.7	322°04.4	06.8	243°41.6	35.9	229°23.2	35.8	18°35.7	31.3	Aldebaran	290°35.8	16°34.0
12	81°06.1	337°03.5	N24°06.5	258°43.3	S00°36.3	244°25.7	S05°35.8	33°37.9	N15°31.4	Rigel	281°00.8	-8°10.2
13	96°08.6	352°02.6	06.3	273°44.9	36.7	259°28.2	35.8	48°40.0	31.5	Capella	280°17.1	46°01.5
14	$111^{\circ}11.1$	7°01.8	06.1	288°46.6	37.1	274°30.7	35.8	63°42.2	31.5	Bellatrix	278°19.4	6°22.4
15	126°13.5	22°00.9	• • 05.9	303°48.3	• • 37.6	289°33.1	• • 35.8	78°44.4	• • 31.6	Elnath Alnilam	277°57.7 275°34.4	28°37.8 -1°11.1
16	141°16.0	$37^{\circ}00.1$	05.6	318°49.9	38.0	304°35.6	35.8	93°46.6	31.7	Betelgeuse	270°48.6	7°24.6
17	156°18.5	51°59.2	05.4	333°51.6	38.4	319°38.1	35.8	108°48.7	31.8	Canopus	263°51.3	-52°42.8
18	171°20.9	66°58.3	N24°05.2	348°53.3	S00°38.8	334°40.6	S05°35.8	123°50.9	$N15^{\circ}31.8$	Sirius	258°23.4	-16°45.6
19	186°23.4	81°57.5	04.9	3°54.9	39.2	349°43.1	35.8	138°53.1	31.9	Adhara	255°03.4	-29°00.9
20	201°25.9	96° 56.6	04.7	18°56.6	39.7	4°45.5	35.8	153°55.3	32.0	Procyon	244°47.4	5°08.8
21	216°28.3	111°55.7	• • 04.5	33°58.3	• • 40.1	19°48.0	• • 35.8	168°57.4	• • 32.0	Pollux	243°13.3	27°57.2
22	231°30.8	126° 54.9	04.2	48°59.9	40.5	34°50.5	35.8	183°59.6	32.1	Avior	234°13.7	-59°36.6
23	246°33.2	141°54.0	04.0	64°01.6	40.9	49°53.0	35.8	199°01.8	32.2	Suhail	222°43.9	-43°33.4
Mer n	ass. 06:36	ν -0.9' d-0	0.2′ m-3.89	$\nu 1.7' d0$.4′ m0.12	$\nu^2 5' d0$	0′ m-2.20	$\nu^2 2' d0$.1′ m0.33	Miaplacidus	221°37.8	-69°50.7
- Wici.p		- 0.5 d 0								Alphard	217°44.4	-8°47.4
										Regulus	207°30.8	11°49.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.0	61°35.7
0	261°35.7	156° 53.2	N24°03.8	79°03.3	500°41.3	64°55.4	S05°35.8	214°04.0	N15°32.3	Denebola	182°21.3	14°24.4
1	276°38.2	171°52.3	03.5	94°04.9	41.8	79°57.9	35.9	229°06.1	32.3	Gienah	175°39.8	-17°42.5
2	291°40.6	186°51.4	03.3	109°06.6	42.2	95°00.4	35.9	244°08.3	32.4	Acrux	172°55.6	-63°16.1
3	306°43.1	201°50.6	• • 03.0	124°08.3	• • 42.6	110°02.9	• • 35.9	259°10.5	• • 32.5	Gacrux	171°47.3	-57°17.1
4	321°45.6	216°49.7	02.8	139°09.9	43.0	125°05.3	35.9	274°12.7	32.6	Alioth	166°09.8	55°48.2
5	336°48.0	231°48.9	02.5	154°11.6	43.4	140°07.8	35.9	289°14.8	32.6	Spica	158°18.3	-11°19.0
6	351°50.5	246°48.0	N24°02.3	169°13.2	S00°43.9	155°10.3	S05°35.9	304°17.0	N15°32.7	Alkaid	152°49.0	49°10.1
7	6°53.0	261°47.1	02.1	184°14.9	44.3	170°12.7	35.9	319°19.2	32.8	Hadar	148°30.3	-60°31.1
8	21°55.4	276°46.3	01.8	199°16.6	44.7	185°15.2	35.9	334°21.4	32.9	Menkent	147°53.0	-36°31.1
9	36°57.9	291°45.4	• • 01.6	214°18.2	• • 45.1	200°17.7	• • 35.9	349°23.5	• • 32.9	Arcturus	$145^{\circ}44.4$	19°01.8
10	52°00.4	306° 44.6	01.3	229°19.9	45.5	215°20.2	35.9	4°25.7	33.0	Rigil Kent.	139°34.7	-60°57.6
11	67°02.8	321°43.7	01.1	244°21.5	46.0 \$00°46.4	230°22.6	35.9	19°27.9	33.1 N15°33.2	Kochab	137°19.3	74°02.2
12	82°05.3	336° 42.9	N24°00.8	259°23.2		245°25.1	S05°36.0	34°30.1		Zuben'ubi	136°51.8	-16°09.9
13 14	97°07.7 112°10.2	351°42.0 6°41.1	00.5 00.3	274°24.8 289°26.5	46.8 47.2	260°27.6 275°30.0	36.0 36.0	49°32.2 64°34.4	33.2 33.3	Alphecca	126°00.4	26°37.0
	112 10.2 127°12.7	21°40.3	24°00.0	304°28.1	• • 47.7	275 30.0 290°32.5	36.0	79°36.6	33.4	Antares	$112^{\circ}11.1$	-26°29.8
15 16	142° 15.1	36°39.4	24 00.0 23°59.8	319°29.8	48.1	305°35.0	36.0	94°38.8	33.5	Atria	107°01.4	-69°04.7
17	142 13.1 157°17.6	50° 39.4 51° 38.6	23 59.6 59.5	334°31.5	48.5	320°37.5	36.0	109°40.9	33.5	Sabik	101°58.3	-15°45.6
18	172°20.1	66°37.7	N23° 59.3	349°33.1	500°48.9	335°39.9	S05°36.0	109°40.9	N15°33.6	Shaula	96°05.1	-37°07.4
19	187°22.5	81°36.9	59.0	4°34.8	49.4	350°42.4	36.0	139°45.3	33.7	Rasalhague	95°54.9	12°32.4
20	202°25.0	96°36.0	58.7	19°36.4	49.8	5°44.9	36.0	154°47.5	33.7	Eltanin	90°40.0	51°29.1
21	217°27.5	111°35.1	• • 58.5	34°38.1	• • 50.2	20°47.3	• • 36.0	169°49.7	• • 33.8	Kaus Aust.	83°27.4	-34°22.0
22	232°29.9	126°34.3	58.2	49°39.7	50.6	35°49.8	36.0	184°51.8	33.9	Vega	80°30.4	38°48.7
23	247°32.4	141°33.4	57.9	64°41.4	51.1	50°52.3	36.1	199°54.0	34.0	Nunki	75°43.0	-26°15.4
										Altair	61°56.2	8°56.9
Mer.p	ass. 06:33	ν -0.9′ d -0).2′ m-3.89	$\nu 1.7' d0$.4′ m0.14	$\nu 2.5' \ d0.$	0′ m-2.19	ν 2.2′ d0	.1' m 0.32	Peacock	52°59.8	-56°38.0
										Deneb	49°23.0	45°23.1
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.1	10°00.7
0	262°34.9	156° 32.6	N23°57.7	79°43.0	S00°51.5	65°54.7	S05°36.1		N15°34.0	Al Na'ir Fomalhaut	27°28.4 15°10.6	-46°48.7 -29°27.7
1	277°37.3	171°31.7	57.4	94°44.7	51.9	80°57.2	36.1	229°58.4	34.1	Scheat	15 10.6 13°41.6	-29 27.7 28°14.5
2	292°39.8	186°30.9	57.1	109°46.3	52.3	95°59.7	36.1	245°00.5	34.2	Markab	13°26.3	26 14.5 15°21.9
3	307°42.2	201°30.0	• • 56.9	124°47.9	• • 52.8	111°02.1	• • 36.1	260°02.7	• • 34.3	IVIAIKAD	10.20.3	13 21.9
4	322°44.7	$216^{\circ}29.2$	56.6	139°49.6	53.2	126°04.6	36.1	275°04.9	34.3	Jun 12 Tue	SHA	Mer.pass
5	$337^{\circ}47.2$	231°28.3	56.3	$154^{\circ}51.2$	53.6	$141^{\circ}07.1$	36.1	290°07.1	34.4	I	256°37.3	13:32
6	352°49.6	246°27.5	N23°56.0	169°52.9	S 00°54.0	156°09.5	S05°36.1	305°09.3	N15°34.5		177°46.6	18:44
7	$7^{\circ}52.1$	261°26.6	55.8	184°54.5	54.5	171°12.0	36.1	320°11.4	34.6		163°19.4	19:41
8	22°54.6	276°25.8	55.5	199°56.2	54.9	$186^{\circ}14.5$	36.2	$335^{\circ}13.6$	34.6	Saturn	312°35.2	09:46
9	37°57.0	291°24.9	• • 55.2	214°57.8	• • 55.3	$201^{\circ}16.9$	• • 36.2	350°15.8	• • 34.7	Jun 13 Wed	SHA	Mer pass
10	52°59.5	$306^{\circ}24.1$	54.9	229°59.5	55.7	$216^{\circ}19.4$	36.2	5°18.0	34.8	I	255°17.5	Mer.pass 13:33
11	68°02.0	321°23.2	54.6	245°01.1	56.2	231°21.9	36.2	20°20.1	34.8		177°27.6	18:42
12	83°04.4	336°22.4	N23°54.4	260°02.7	S00°56.6	246°24.3	S05°36.2	35°22.3	N15°34.9		163°19.7	19:37
13	98°06.9	351°21.5	54.1	275°04.4	57.0	261°26.8	36.2	50°24.5	35.0	Saturn	312°28.2	09:42
14	113°09.3	6°20.7	53.8	290°06.0	57.5	276°29.3	36.2	65°26.7	35.1			03.72
15	128°11.8	21°19.8	• • 53.5	305°07.7	• • 57.9	291°31.7	• • 36.2	80°28.9	• • 35.1	Jun 14 Thu	SHA	Mer.pass
16	143°14.3	36° 19.0	53.2	320°09.3	58.3	306°34.2	36.3	95°31.0	35.2		253°57.7	13:35
17	158°16.7	51°18.1	52.9	335°10.9	58.7	321°36.6	36.3	110°33.2	35.3	I	177°08.2	18:39
18	173°19.2	66° 17.3	N23°52.6	350°12.6	S00°59.2	336°39.1	S05°36.3	125°35.4	N15°35.4		163°19.9	19:33
19	188°21.7	81°16.4	52.3	5°14.2	00°59.6	351°41.6	36.3	140°37.6	35.4	Saturn	312°21.3	09:39
20	203°24.1	96°15.6	52.1	20°15.8	01°00.0	6°44.0	36.3	155°39.7	35.5	Harizant	al parallax	
21	218°26.6	111°14.7	• • 51.8	35°17.5	• • 00.5	21°46.5	36.3	170°41.9	• • 35.6	TIOTIZONI	Venus:	0.1
22	233°29.1	126°13.9	51.5	50°19.1	00.9	36°49.0	36.3	185°44.1	35.6		venus: Mars:	0.1
23	248°31.5	141°13.0	51.2	65°20.7	01.3	51°51.4	36.3	200°46.3	35.7		IVIAI 3.	0.1
Mer.p	ass. 06:29	ν -0.9' d-0).3′ m-3.89	ν 1.6′ d0.	.4′ m0.15	$\nu 2.5' \ d0.$	0′ m-2.19	ν 2.2′ d0	.1′ m0.32			

Tue CHA Dec J HBD 0 180°02.6 N23°09.1 182°10.5 8.9° N24°23.9 -0.3′ 55.5° 55.6° 2 210°02.3 09.4 210°62.8 8.9° 24°23.5 -0.6° 55.6° 55.6° 55.6° 55.6° 55.6° 55.6° 55.6° 55.6° 55.6° 55.6° 525°02.0° 99.9 254°30.0 8.8° 24°21.0 0.9° 55.6° 66 270°01.8 N23°10.1 55.7° 728°50.7° 8.8° N24°19.8 -1.1° 55.7° 728°50.7° 1.0° 30°01.3 10.7° 280°57.8 8.8° 24°17.4 -1.4° 55.7° 10 330°01.3 10.7° 326°49.1 8.8° 24°17.4 -1.4° 55.7° 10 330°01.3 10.7° 326°49.1 8.8° 24°17.6 -1.1° 55.7° 10 330°01.3 10.7° 30°56.46 8.8° 24°14.5 -1.7° 55.7° 11 36°00.8 11.1 10°2.2 8.8° 24°14.5 -1.7° 55.7° 55.8° 12.2 10°0.0 11.1 10°2.	h	Sui	n			Moon		
198°02.5	Tue	GHA	Dec	GHA	ν	Dec	d	HP
2	0		$N23^{\circ}09.1$		8.9'		-0.3'	55.5'
3								
5								
Color								
Section Sect								
19	7	285°01.7	10.2		8.8'	24°18.7	-1.3'	55.7'
10 330°01.3 10.7 326°49.1 8.8 24°14.5 1.17 55.7 11 345°01.2 10.8 341°16.8 8.8 24°12.9 1.8 55.8 12 0°01.0 N23°10.9 355°44.6 8.8 N24°11.1 1.19 55.8 13 15°00.9 11.1 10°12.4 8.8 24°09.1 2.1 55.8 14 30°00.8 11.2 24°01.1 8.7 24°07.1 2.2 55.8 15 45°00.6 11.4 39°07.9 8.7 24°04.9 2.3 55.9 16 66°00.5 11.5 53°5.6 8.7 24°04.0 2.3 55.9 16 66°00.5 11.5 53°5.6 8.7 24°04.0 2.3 55.9 17 75°00.4 11.7 68°03.4 8.7 N23°57.5 2.7 55.9 18 90°00.3 N23°11.8 82°31.1 8.7 N23°57.5 2.7 55.9 19 105°00.1 12.0 96°58.8 8.7 23°54.8 2.8 55.9 20 120°00.0 12.1 111°26.6 8.7 23°54.9 3.2 56.0 21 134°59.9 12.2 1266.4 8.7 23°45.9 3.2 56.0 22 149°59.7 12.4 140°22.0 8.7 23°45.9 3.2 56.0 23 164°59.6 12.5 154°49.8 8.7 23°45.9 3.2 56.0 24 199°59.2 12.9 198°13.0 8.8 N23°33.3 3.5 56.1 25 254°58.8 13.3 212°40.8 8.7 23°34.0 3.3 56.1 3 244°59.1 13.1 212°40.8 8.8 N23°33.3 3.9 56.1 4 239°58.1 14.0 313°55.4 8.8 N23°33.3 3.9 56.1 3 34°58.9 13.2 22°60.6 8.8 23°21.4 4.0 56.1 4 239°56.1 14.0 313°55.4 8.9 22°48.6 5.1 56.2 10 329°58.1 14.0 313°55.4 8.9 22°48.6 5.1 56.2 11 344°50.7 14.4 35°19.1 8.8 23°01.0 4.4 56.2 2 359°57.9 N23°13.3 34°55.4 8.9 22°48.5 5.2 56.3 11 344°50.7 14.4 35°19.1 8.9 22°48.5 5.2 56.3 12 359°57.9 N23°13.3 34°55.4 8.9 22°48.6 5.1 56.3 13 14°57.7 14.4 35°19.1 8.9 22°48.6 5.1 56.5 14 29°57.6 14.5 11°47.0 8.9 22°48.5 5.2 56.3 15 44°57.5 14.7 45°1.1 47°1.0 8.9 22°48.5 5.2 56.3 15 44°57.5 14.7 14.4 35°19.1 9.0 22°20.5 5.6 16 59°57.3 14.8 15°60.4 9.0 0.2 0.2 0.5 56.6 26 26 26 25 25 25 25 25								
11								
12								
13								
15		15°00.9	11.1	10°12.4	8.8'	24°09.1		
16 60°00.5 11.5 59°35.6 8.7' 24°02.6 -2.5' 55.9' 17 75°00.4 11.7 68°03.4 8.7' 24°02.6 -2.5' 55.9' 18 90°00.3 N23°11.8 82°31.1 8.7' N23°57.5 -2.7' 55.9' 19 105°00.1 12.0 96°58.8 8.7' 23°54.8 -2.8' 55.9' 20 120°00.0 12.1 111.62.6 8.7' 23°52.0 -3.0' 56.0' 21 134°59.9 · 12.2 125°54.3 8.7' 23°52.0 -3.0' 56.0' 22 149°59.7 12.4 140°22.0 8.7' 23°45.9 -3.2' 56.0' 23 164°59.6 12.5 154°49.8 8.7' 23°45.9 -3.2' 56.0' 24 199°59.5 N23°12.7 166°17.5 8.8' N23°39.3 -3.5' 56.0' 25 290°59.2 12.9 198°13.0 8.8' 23°32.1 -3.8' 56.1' 2 200°59.2 12.9 198°13.0 8.8' 23°32.1 -3.8' 56.1' 2 200°59.2 12.9 198°13.0 8.8' 23°32.1 -3.8' 56.1' 3 224°59.1 · 13.1 212°40.8 8.8' 23°32.1 -3.8' 56.1' 4 239°58.9 13.2 227°08.6 8.8' 23°32.0 4 -4.0' 56.1' 5 254°58.8 13.3 241°36.3 8.8' 23°30.4 -4.0' 56.1' 5 254°58.8 13.3 241°36.3 8.8' 23°20.4 -4.2' 56.1' 6 269°58.7 N23°13.5 256°04.1 8.8' N23°16.2 -4.3' 56.2' 7 284°58.9 13.8 284°59.8 8.8' 23°10.0 -4.4' 56.2' 8 299°58.4 13.8 284°59.8 8.8' 23°10.5 -4.6' 56.2' 9 314°58.3 13.9 299°27.6 8.8' 23°30.4 -4.2' 56.2' 10 329°58.1 14.0 313°55.4 8.9' 22°58.3 -4.8' 56.2' 11 344°58.0 14.1 328°23.3 8.9' 22°58.3 -4.8' 56.2' 11 344°58.0 14.1 328°23.3 8.9' 22°58.3 -4.8' 56.2' 11 344°58.0 14.1 328°23.3 8.9' 22°58.3 -4.8' 56.2' 12 359°57.9 N23°14.3 342°51.2 8.9' N22°48.6 -5.1' 56.3' 15 44°57.5 · 14.7 26°14.9 9.0' 22°33.0 -5.4' 56.4' 16 59°57.3 14.8 40°42.9 9.0' 22°33.0 -5.4' 56.4' 17 74°57.2 14.9 55°10.9 9.0' 22°33.0 -5.4' 56.4' 18 89°57.1 N23°15.0 66°38.9 9.0' N22°16.3 -5.8' 56.4' 19 104°57.0 15.2 84°06.9 9.0' 22°20.5 -5.6' 56.4' 19 104°56.3 N23°15.8 156°27.4 9.2' N21°39.5 -6.6' 56.5' 22 149°56.6 15.5 127°31.1 9.1' 21°58.4 -6.2' 56.5' 22 149°56.6 15.5 127°31.1 9.1' 21°58.4 -6.2' 56.5' 24 290°55.5 16.6 15.5 127°31.1 9.1' 21°58.4 -6.2' 56.5' 25 254°55.6 16.4 228°48.9 9.3' 21°19.5 -6.6' 56.5' 25 254°55.6 16.4 228°48.9 9.3' 21°19.5 -6.6' 56.5' 26 269°55.5 N23°16.5 243°16.9 9.4' N20°43.6 -7.5' 56.6' 26 269°55.5 N23°16.5 243°16.9 9.4' N20°43.6 -7.5' 56.6' 26 269°55.5 N23°16.5 243°16.9 9.4' N20°43.6 -7.5' 56.6' 26 269°55.5 N23°16.5 24								
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This This	21	134°59.9	• • 12.2	125°54.3	8.7'	23°49.0	-3.1'	56.0'
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179°59.5 N23°12.7 160°17.5 8.8' N23°39.3 -3.5' 56.0' 194°59.3 12.8 183°45.3 8.8' 23°35.7 -3.6' 56.1' 2 209°59.2 12.9 198°13.0 8.8' 23°22.1 -3.8' 56.1' 3 224°59.1 · 13.1 212°40.8 8.8' 23°28.3 -3.9' 56.1' 4 239°58.9 13.2 227°08.6 8.8' 23°24.4 -4.0' 56.1' 5 254°58.8 13.3 241°36.3 8.8' 23°24.4 -4.0' 56.1' 6 269°58.7 N23°13.5 256°04.1 8.8' N23°16.2 -4.3' 56.2' 7 284°58.5 13.6 270°31.9 8.8' 23°12.0 -4.4' 56.2' 8 299°58.4 13.8 284°59.8 8.8' 23°07.5 -4.6' 56.2' 9 314°58.3 · 13.9 299°27.6 8.8' 23°03.0 -4.7' 56.2' 10 329°58.1 14.0 313°55.4 8.9' 22°58.3 -4.8' 56.2' 11 344°58.0 14.1 328°23.3 8.9' 22°53.5 -4.9' 56.3' 12 359°57.9 N23°14.3 342°51.2 8.9' N22°48.6 -5.1' 56.3' 13 14°57.7 14.4 357°19.1 8.9' 22°43.5 -5.2' 56.3' 14 29°57.6 14.5 11°47.0 8.9' 22°33.0 -5.4' 56.4' 16 59°57.3 14.8 40°42.9 9.0' 22°27.5 5.6' 56.4' 17 74°57.2 14.9 55°10.9 9.0' 22°27.5 5.6' 56.4' 19 104°57.0 15.2 84°06.9 9.0' 22°27.5 5.6' 56.4' 19 104°57.0 15.2 84°06.9 9.0' 22°21.0 5.7' 56.4' 20 119°56.8 15.3 98°35.0 9.1' 22°14.5 -6.1' 56.5' 21 134°56.7 · 15.4 113°03.0 9.1' 21°52.2 -6.3' 56.5' 22 149°56.6 15.5 127°31.1 9.1' 21°52.2 -6.3' 56.5' 22 149°56.6 15.5 127°31.1 9.1' 21°52.2 -6.3' 56.5' 22 149°55.6 16.4 228°48.6 9.3' 21°12.5 -7.0' 56.6' 4 239°55.5 N23°15.6 324°20.3 9.3' 21°12.5 -7.0' 56.6' 5 254°55.5 N23°15.5 16.3 214°20.3 9.3' 21°12.5 -7.0' 56.6' 6 269°55.5 N23°15.5 16.6 257°45.3 9.4' 20°43.6 -7.5' 56.7' 9 314°55.1 · 16.9 286°42.1 9.5' 20°30.1 -7.6' 56.6' 10 329°54.4 17.0 301°10.6 9.5' 20°20.7 -7.9' 56.8' 11 344°54.8 17.1 315°39.0 9.5' 20°20.7 -7.9' 56.8' 12 359°54.7 N2		SD = 15.7'	d = 0.2'		SE	0 = 15.1'		
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10 329°54.9 17.0 301°10.6 9.5' 20°28.4 -7.7' 56.8' 11 344°54.8 17.1 315°39.0 9.5' 20°20.7 -7.9' 56.8' 12 359°54.7 N23°17.2 330°07.6 9.6' N20°12.8 -8.0' 56.8' 13 14°54.5 17.3 344°36.1 9.6' 20°04.9 -8.1' 56.8' 14 29°54.4 17.4 359°04.7 9.6' 19°56.8 -8.2' 56.8' 15 44°54.3 · 17.5 13°33.4 9.7' 19°48.6 -8.3' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' N19°25.9 -8.9' 57.	8	299°55.2		$272^{\circ}13.7$	9.4'		-7.5'	56.7'
11 344°54.8 17.1 315°39.0 9.5' 20°20.7 -7.9' 56.8' 12 359°54.7 N23°17.2 330°07.6 9.6' N20°12.8 -8.0' 56.8' 13 14°54.5 17.3 344°36.1 9.6' 20°04.9 -8.1' 56.8' 14 29°54.4 17.4 359°04.7 9.6' 19°56.8 -8.2' 56.8' 15 44°54.3 · 17.5 13°33.4 9.7' 19°40.2 -8.4' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0'								
12 359°54.7 N23°17.2 330°07.6 9.6' N20°12.8 -8.0' 56.8' 13 14°54.5 17.3 344°36.1 9.6' 20°04.9 -8.1' 56.8' 14 29°54.4 17.4 359°04.7 9.6' 19°56.8 -8.2' 56.8' 15 44°54.3 ·· 17.5 13°33.4 9.7' 19°40.2 -8.4' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.								
13 14°54.5 17.3 344°36.1 9.6' 20°04.9 -8.1' 56.8' 14 29°54.4 17.4 359°04.7 9.6' 19°56.8 -8.2' 56.8' 15 44°54.3 · 17.5 13°33.4 9.7' 19°48.6 -8.3' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
14 29°54.4 17.4 359°04.7 9.6' 19°56.8 -8.2' 56.8' 15 44°54.3 · 17.5 13°33.4 9.7' 19°48.6 -8.3' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'<								
15 44°54.3 · · 17.5 13°33.4 9.7' 19°48.6 -8.3' 56.9' 16 59°54.1 17.6 28°02.0 9.7' 19°40.2 -8.4' 56.9' 17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
17 74°54.0 17.8 42°30.7 9.7' 19°31.8 -8.5' 56.9' 18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'							-8.3'	56.9'
18 89°53.9 N23°17.9 56°59.5 9.8' N19°23.3 -8.6' 56.9' 19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
19 104°53.7 18.0 71°28.2 9.8' 19°14.6 -8.8' 56.9' 20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
20 119°53.6 18.1 85°57.1 9.9' 19°05.9 -8.9' 57.0' 21 134°53.5 · 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
21 134°53.5 ·· 18.2 100°25.9 9.9' 18°57.0 -9.0' 57.0' 22 149°53.3 18.3 114°54.8 9.9' 18°48.1 -9.1' 57.0' 23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
23 164°53.2 18.4 129°23.7 10.0' 18°39.0 -9.2' 57.0'								
SD = 15.7' d = 0.1' $SD = 15.4'$	23	164°53.2		129°23.7			-9.2'	57.0'
		SD = 15.7'	d = 0.1'		SE	0 = 15.4'		

			2029	June 12	z to Ju	n. 14
Lat.	Twi	light	Sunrise	Sunset		light
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:35	22:26	////	////
62°	////	////	02:11	21:50	////	////
60°	////	00:56	02:37	21:24	23:06	////
N 58°	////	01:43	02:57	21:04	22:18	////
56°	////	02:12	03:14	20:47	21:49	////
54°	00:51	02:34	03:28	20:33	21:27	23:11
52°	01:34	02:51	03:40	20:21	21:09	22:27
50°	02:01	03:06	03:50	20:10	20:54	21:59
45°	02:46	03:35	04:13	19:48	20:25	21:15
N 40°	03:16	03:58	04:31	19:30	20:03	20:44
35°	03:39	04:16	04:46	19:15	19:45	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:05	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:53
S 10°	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:37	07:18	07:57	16:04	16:42	17:23
52°	06:42	07:26	08:06	15:54	16:35	17:18
54°	06:48	07:34	08:17	15:43	16:26	17:13
56°	06:54	07:43	08:30	15:30	16:17	17:06
58°	07:00	07:53	08:44	15:16	16:07	17:00
S 60°	07:08	08:04	09:02	14:58	15:56	16:52
		Moonris	e		Moonset	
Lat.	Tue Wed		Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°			02:43			00:42
66°		01:39	03:41	23:55	23:44	23:37
64°	01:24	02:39	04:15	22:55	23:10	23:16
62°	02:04	03:13	04:39	22:21	22:45	22:59
02	02:04	05:13	04:39	22:21	22:43	22:39

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

ı			Sun			Moon		
	Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	,	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%	
	12	00:10	00:04	12:00	12:18	-:-		
ı	13	00:02	80:00	12:00	13:11	00:44		
ı	14	00:15	00:21	12:00	14:04	01:38		

June 15, 16, 17 UT (Fri., Sat., Sun.)

h	Aries	Aries Venus		Mars		Jup	Jupiter Sa ⁻		Saturn		Stars	
Fri _	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
							S05°36.4				SHA	Dec
0	263°34.0	156° 12.2	N23°50.9	80°22.4	S01°01.8	66°53.9		215°48.5	N15°35.8	Alpheratz	357°31.0	29°15.1
1	278°36.5	171°11.3	50.6	95°24.0	02.2	81°56.3	36.4	230°50.6	35.9	Ankaa	353°03.8	-42°08.4
2	293°38.9	$186^{\circ}10.5$	50.3	110°25.6	02.6	96°58.8	36.4	245°52.8	35.9	Schedar	349°26.9	56°41.7
3	308°41.4	201°09.6	• • 50.0	125°27.3	• • 03.0	112°01.3	• • 36.4	260°55.0	• • 36.0	Diphda	348°43.8	-17°49.3
4	323°43.8	216°08.8	49.7	140°28.9	03.5	127°03.7	36.4	275°57.2	36.1			
5	338°46.3	231°07.9	49.4	155°30.5	03.9	142°06.2	36.4	290°59.4	36.2	Achernar	335°18.0	-57°04.9
6	353°48.8	246°07.1	N23°49.1	170°32.2	S01°04.3	157°08.6	S05°36.4	306°01.5	N15°36.2	Hamal	327°47.3	23°36.0
7	8°51.2	261°06.2	48.8	185°33.8	04.8	172°11.1	36.5	321°03.7	36.3	Polaris	312°26.9	89°22.9
8	23°53.7	276°05.4	48.5	200°35.4	05.2	187°13.6	36.5	336°05.9	36.4	Acamar	$315^{\circ}09.5$	-40°11.1
		270 03.4 291°04.6		200 33.4 215°37.1	. 05.2	202°16.0				Menkar	314°02.7	4°12.3
9	38°56.2		• • 48.1				36.5	351°08.1	• • 36.4	Mirfak	308°23.4	49°57.7
10	53°58.6	306°03.7	47.8	230°38.7	06.1	217°18.5	36.5	6°10.3	36.5	Aldebaran	290°35.8	16°34.0
11	69°01.1	321°02.9	47.5	245°40.3	06.5	232°20.9	36.5	21°12.4	36.6	Rigel	281°00.8	-8°10.2
12	84°03.6	336°02.0	N23°47.2	260°41.9	S01°06.9	247°23.4	S05°36.5	36°14.6	N15°36.7	Capella	280°17.0	46°01.5
13	99°06.0	351°01.2	46.9	275°43.6	07.4	262°25.8	36.5	51°16.8	36.7	Bellatrix	278° 19.4	6°22.4
14	114°08.5	6°00.3	46.6	290°45.2	07.8	277°28.3	36.6	66°19.0	36.8			
15	129°11.0	20°59.5	• • 46.3	305°46.8	• • 08.2	292°30.8	• • 36.6	81°21.2	• • 36.9	Elnath	277°57.7	28°37.8
16	144°13.4	35°58.6	46.0	320°48.4	08.7	307°33.2	36.6	96°23.3	37.0	Alnilam	275°34.4	-1°11.1
17	159°15.9	50° 57.8	45.6	335°50.1	09.1	322°35.7	36.6	111°25.5	37.0	Betelgeuse	270°48.5	7°24.6
18	174°18.3	65°57.0	N23°45.3	350°51.7	S01°09.5	337°38.1	S05°36.6	126°27.7	N15°37.1	Canopus	263°51.3	-52°42.8
						352°40.6				Sirius	258°23.4	-16°45.6
19	189°20.8	80°56.1	45.0	5°53.3	10.0		36.6	141°29.9	37.2	Adhara	255°03.4	-29°00.9
20	204°23.3	95°55.3	44.7	20°54.9	10.4	7°43.0	36.7	156°32.1	37.2	Procyon	244°47.4	5°08.8
21	219°25.7	110°54.4	• • 44.4	35°56.5	• 10.9	22°45.5	• • 36.7	171°34.2	• • 37.3	Pollux	243°13.3	27°57.2
22	234°28.2	125°53.6	44.0	50°58.2	11.3	37°47.9	36.7	186°36.4	37.4	Avior	234° 13.7	-59°36.6
23	249°30.7	140°52.8	43.7	65°59.8	11.7	52°50.4	36.7	201°38.6	37.5	Suhail	234 13.7 222°43.9	-39 30.0 -43°33.4
N 4	00 05	- 0.0/ 1.0	2/ - 2.00	-1.0/ 10	4/ 0 17	-0.5/ 10	0/ 0.10	-0.0/ /0	1/ 0.22			
Mer.p	ass. 06:25	ν -0.8′ d-0).3′ m-3.89	ν 1.6′ d 0.	.4′ m0.17	$\nu^{2.5'} d0.$	0′ m-2.18	$\nu^{2.2'} d0$.1′ m0.32	Miaplacidus	221°37.9	-69°50.7
										Alphard	217°44.4	-8°47.4
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
		155°51.9	N23°43.4	81°01.4	S01°12.2	67°52.8	S05°36.7		N15°37.5	Dubhe	193°37.0	61°35.7
0	264°33.1							216°40.8 231°43.0		Denebola	182°21.3	14°24.4
1	279°35.6	170°51.1	43.1	96°03.0	12.6	82°55.3	36.7		37.6	Gienah	175°39.8	-17°42.5
2	294°38.1	185° 50.2	42.7	111°04.6	13.0	97°57.8	36.8	246°45.1	37.7	Acrux	172°55.7	-63°16.1
3	309°40.5	200°49.4	• • 42.4	126°06.3	• • 13.5	113°00.2	• • 36.8	261°47.3	• • 37.7	Gacrux	171°47.3	-57°17.1
4	324°43.0	215°48.6	42.1	141°07.9	13.9	128°02.7	36.8	276°49.5	37.8	Alioth	166°09.8	55°48.2
5	339°45.5	230°47.7	41.7	156°09.5	14.3	143°05.1	36.8	291°51.7	37.9	I	158° 18.3	-11°19.0
6	354°47.9	245°46.9	N23°41.4	$171^{\circ}11.1$	S01°14.8	158°07.6	S05°36.8	306°53.9	N15°38.0	Spica		
7	9°50.4	260°46.0	41.1	186°12.7	15.2	173°10.0	36.8	321°56.0	38.0	Alkaid	152°49.0	49°10.1
8	24°52.8	275°45.2	40.7	201°14.3	15.7	188°12.5	36.9	336°58.2	38.1	Hadar	148°30.3	-60°31.2
9	39°55.3	273°43.2 290°44.4	• • 40.4	216°15.9	. 16.1	203°14.9	• • 36.9	352°00.4	• • 38.2	Menkent	147°53.0	-36°31.1
										Arcturus	145°44.5	19°01.8
10	54°57.8	305°43.5	40.1	231°17.6	16.5	218°17.4	36.9	7°02.6	38.2	Rigil Kent.	139°34.7	-60°57.6
11	70°00.2	320°42.7	39.7	246°19.2	17.0	233°19.8	36.9	22°04.8	38.3	Kochab	$137^{\circ}19.3$	74°02.2
12	85°02.7	335°41.9	N23°39.4	261°20.8	S01°17.4	248°22.3	S05°36.9	37°07.0	N15°38.4	Zuben'ubi	136°51.8	-16°09.9
13	100°05.2	350°41.0	39.0	276°22.4	17.8	263°24.7	36.9	52°09.1	38.5	Alphecca	126°00.4	26°37.0
14	115°07.6	5°40.2	38.7	291°24.0	18.3	278°27.2	37.0	67°11.3	38.5		112° 11.0	-26°29.8
15	130°10.1	20°39.4	• • 38.4	306°25.6	• • 18.7	293°29.6	• • 37.0	82°13.5	• • 38.6	Antares		
16	145°12.6	35°38.5	38.0	321°27.2	19.2	308°32.1	37.0	97°15.7	38.7	Atria	107°01.4	-69°04.7
17	160°15.0	50°37.7	37.7	336°28.8	19.6	323°34.5	37.0	112°17.9	38.7	Sabik	101°58.3	-15°45.6
18	175°17.5	65°36.9	N23°37.3	351°30.4	S01°20.0	338°37.0	S05°37.0	127°20.0	N15°38.8	Shaula	96°05.1	-37°07.4
19							07.4			Rasalhague	95°54.9	12°32.4
	190°19.9	80°36.0	37.0	6°32.0	20.5	353°39.4	37.1	142°22.2	38.9	Eltanin	90°40.0	51°29.2
20	205°22.4	95°35.2	36.6	21°33.6	20.9	8°41.9	37.1	157°24.4	39.0	Kaus Aust.	83°27.4	-34°22.0
21	220°24.9	110°34.4	• • 36.3	36°35.3	• • 21.4	23°44.3	• • 37.1	172°26.6	• • 39.0	Vega	80°30.4	38°48.7
22	235°27.3	125°33.5	35.9	51°36.9	21.8	38°46.8	37.1	187°28.8	39.1	Nunki	75°43.0	-26°15.4
23	250°29.8	140°32.7	35.6	66°38.5	22.2	53°49.2	37.1	202°31.0	39.2	Altair	61°56.2	8°56.9
N 4	06.01	0.0/ -1.0	0.3′ m-3.89	- 1 6/ -10	4/ 0 10	- 2 5/ -10	0/ 0.17	- 2 2/ -10	1/ 0.22	Peacock	52°59.8	-56°38.0
ivier.p	oass. 06:21	ν -0.8 a-0	0.3 m-3.89	ν 1.0 au.	.4′ m0.18	ν 2.5° a 0.	0′ m-2.17	ν2.2 αυ	.1′ m0.32	Deneb	49°22.9	45°23.1
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.1	10°00.7
0	265°32.3	155°31.9	N23°35.2	81°40.1		68°51.7	S05°37.2		N15°39.2	Al Na'ir	27°28.4	-46°48.7
1	280°34.7	170°31.0	34.9	96°41.7	23.1	83°54.1	37.2	232°35.3	39.3	Fomalhaut	15°10.6	-29°27.7
										Scheat	13°41.6	28°14.5
2	295°37.2	185°30.2	34.5	111°43.3	23.6	98°56.5	37.2	247°37.5	39.4	Markab	13°26.2	15°21.9
3	310°39.7	200°29.4	• • 34.1	126°44.9	• • 24.0	113°59.0	• • 37.2	262°39.7	• • 39.5		C114	N4:
4	325°42.1	215°28.5	33.8	141°46.5	24.5	129°01.4	37.2	277°41.9	39.5	Jun 15 Fri	SHA	Mer.pass
5	340°44.6	230°27.7	33.4	156°48.1	24.9	144°03.9	37.2	292°44.1	39.6		252°38.2	13:36
6	355°47.1	245°26.9	N23°33.1	171°49.7	S01°25.3	159°06.3	S05°37.3	307°46.2	N15°39.7		176°48.4	18:36
7	10°49.5	260°26.0	32.7	186°51.3	25.8	174°08.8	37.3	322°48.4	39.7	Jupiter	163°19.9	19:29
8	25°52.0	275°25.2	32.3	201°52.9	26.2	189°11.2	37.3	337°50.6	39.8	Saturn	$312^{\circ}14.5$	09:35
9	40°54.4	290°24.4	• • 32.0	216°54.5	26.7	204°13.7	• • 37.3	352°52.8	• • 39.9			
10	55°56.9	305°23.6	31.6	231°56.1	27.1	219°16.1	37.4	7°55.0	40.0	Jun 16 Sat	SHA	Mer.pass
11	70°59.4	320°22.7	31.2	246°57.7	27.6	234°18.5	37.4	22°57.2	40.0		251°18.8	13:37
12	86°01.8	335°21.9	N23°30.9	261°59.3	S01°28.0	249°21.0	S05°37.4	37°59.3	N15°40.1	Mars	176°28.3	18:34
13	101°04.3	350°21.1		201 59.5 277°00.9		264°23.4	37.4	53°01.5		Jupiter	$163^{\circ}19.7$	19:25
			30.5		28.4				40.2	Saturn	$312^{\circ}07.7$	09:32
14	116°06.8	5°20.3	30.1	292°02.5	28.9	279°25.9	37.4	68°03.7	40.2			
15	131°09.2	20°19.4	• • 29.8	307°04.1	• • 29.3	294°28.3	• • 37.5	83°05.9	• • 40.3	Jun 17 Sun	SHA	Mer.pass
16	146°11.7	35° 18.6	29.4	322°05.7	29.8	309°30.8	37.5	98°08.1	40.4	Venus		13:39
17	161°14.2	50° 17.8	29.0	337°07.3	30.2	324°33.2	37.5	113°10.3	40.4	Mars	176°07.8	18:31
18	176°16.6	65°17.0	N23°28.6	352°08.8	S01°30.7	339°35.6	S05°37.5	128°12.4	N15°40.5		163°19.4	19:21
19	191°19.1	$80^{\circ}16.1$	28.3	7°10.4	31.1	354°38.1	37.5	$143^{\circ}14.6$	40.6	Saturn		09:28
20	206°21.6	95° 15.3	27.9	22°12.0	31.6	9°40.5	37.6	158°16.8	40.7	5444.11	30.3	
21	221°24.0	110° 14.5	27.5	37°13.6	• • 32.0	24°43.0	• • 37.6	173°19.0	• • 40.7	Horizont	al parallax	
22	236°26.5	125° 13.7	27.1	52°15.2	32.4	39°45.4	37.6	188°21.2	40.8		Venus:	0.1
23	251°28.9	140° 12.8	26.7	67°16.8	32.4	54°47.8	37.6	203°23.4	40.9		Mars:	0.1
25	231 20.9											
Mer.p	ass. 06:17	ν -0.8' d-0).4′ m-3.89	$\nu 1.6' \ d0$.4′ m0.20	$\nu 2.4' \ d0.$	0′ m-2.16	$\nu 2.2' \ d0$.1′ m0.32			

h	Sui	า	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.1	N23°18.5	143°52.7	10.0'	N18°29.8	-9.3'	57.0'
1	194°52.9	18.6	$158^{\circ}21.7$	10.0'	$18^{\circ}20.5$	-9.4'	57.1'
2	209°52.8	18.7	172°50.7	10.1'	18° 11.1	-9.5'	57.1'
3	224°52.7	• • 18.8	187°19.8	10.1'	18°01.6	-9.6'	57.1'
4	239°52.5	18.9	201°48.9	10.2'	17°52.1	-9.7'	57.1'
5 6	254°52.4 269°52.3	19.0 N23°19.1	216°18.1 230°47.3	10.2' 10.2'	17°42.4 N17°32.6	-9.8' -9.9'	57.2' 57.2'
7	284°52.1	19.2	245°16.5	10.2	17°22.7	-9.9 -10.0'	57.2'
8	299°52.0	19.3	259°45.8	10.3'	17°12.7	-10.1	57.2'
9	314°51.9	• • 19.4	274°15.1	10.3'	17°02.6	-10.2'	57.2'
10	329°51.7	19.5	288°44.4	10.4'	$16^{\circ}52.4$	-10.3'	57.3'
11	344°51.6	19.6	303°13.8	10.4'	16°42.2	-10.4'	57.3'
12	359°51.5	N23°19.7	317°43.2	10.5'	N16°31.8 16°21.3	-10.5'	57.3'
13 14	14°51.3 29°51.2	19.8 19.9	332°12.7 346°42.2	10.5' 10.5'	16°21.3 16°10.8	-10.6' -10.6'	57.3' 57.3'
15	29 51.2 44°51.1	20.0	1°11.7	10.5	16°10.8	-10.0	57.3 57.4'
16	59°50.9	20.1	15°41.3	10.6'	15°49.4	-10.7	57.4'
17	74°50.8	20.2	30°10.9	10.7'	15°38.6	-10.9'	57.4'
18	89°50.6	N23°20.3	44°40.6	10.7'	N15°27.6	-11.0'	57.4'
19	104°50.5	20.4	59°10.3	10.7'	$15^{\circ}16.6$	-11.1'	57.4'
20	119°50.4	20.4	73°40.0	10.8'	15°05.5	-11.2'	57.5'
21	134°50.2	• • 20.5	88°09.7	10.8'	14°54.4	-11.3'	57.5'
22	149°50.1	20.6 20.7	102°39.5 117°09.4	10.8'	14°43.1	-11.3'	57.5'
23	164°50.0		117 09.4	10.9'	14°31.8	-11.4'	57.5'
	SD = 15.7'	d = 0.1'		SI	D = 15.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°49.8	N23°20.8	131°39.2	10.9'	N14°20.3	-11.5'	57.5'
1 2	194°49.7 209°49.6	20.9 21.0	146°09.1 160°39.1	10.9' 11.0'	14°08.8 13°57.2	-11.6' -11.7'	57.6' 57.6'
3	209 49.0 224°49.4	. 21.0	175°09.0	11.0'	13°45.6	-11.7'	57.6'
4	239°49.3	21.1	189°39.1	11.0'	13°33.8	-11.8'	57.6'
5	254°49.2	21.2	204°09.1	11.1'	13°22.0	-11.9'	57.6'
6	269°49.0	N23°21.3	218°39.2	11.1'	$N13^{\circ}10.1$	-12.0'	57.7'
7	284°48.9	21.4	233°09.3	11.1'	12°58.1	-12.0'	57.7'
8	299°48.8	21.5	247°39.4	11.2'	12°46.1	-12.1'	57.7'
9	314°48.6	• • 21.6	262°09.6	11.2'	12°34.0 12°21.8	-12.2'	57.7'
10 11	329°48.5 344°48.3	21.6 21.7	276°39.8 291°10.0	11.2' 11.3'	12°21.8 12°09.5	-12.3' -12.3'	57.7' 57.8'
12	359°48.2	N23°21.8	305°40.3	11.3'	N11°57.2	-12.4'	57.8
13	14°48.1	21.9	320°10.5	11.3'	11°44.8	-12.5'	57.8'
14	29°47.9	22.0	334°40.9	11.3'	11°32.3	-12.5'	57.8'
15	44°47.8	• • 22.0	$349^{\circ}11.2$	11.4'	$11^{\circ}19.8$	-12.6'	57.8'
16	59°47.7	22.1	3°41.6	11.4'	11°07.2	-12.7'	57.9'
17	74°47.5	22.2	18°12.0	11.4'	10°54.5	-12.7'	57.9'
18 19	89°47.4 104°47.3	N23°22.3 22.3	32°42.4 47°12.9	11.5' 11.5'	N10°41.8 10°29.0	-12.8' -12.9'	57.9' 57.9'
20	104 47.3 119°47.1	22.3	61°43.3	11.5'	10° 29.0° 16.1	-12.9'	57.9'
21	134°47.0	• • 22.5	76°13.8	11.5'	10°10.1	-12.9	58.0'
22	149°46.9	22.6	90°44.3	11.5'	09°50.3	-13.0'	58.0'
23	164°46.7	22.6	105°14.9	11.6'	09°37.2	-13.1'	58.0'
	SD = 15.7'	d = 0.1'		SI	D = 15.7′		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.6	N23°22.7	119°45.5	ν 11.6'	N09°24.2	-13.1'	58.0'
1	194°46.4	22.8	134°16.0	11.6'	09°11.0	-13.2'	58.0'
2	209°46.3	22.8	148°46.7	11.6'	08°57.8	-13.2'	58.1'
3	224°46.2	• • 22.9	163°17.3	11.6'	08°44.6	-13.3'	58.1'
4	239°46.0	23.0	177°47.9	11.7'	08°31.3	-13.4'	58.1'
5	254°45.9 269°45.8	23.0 N23°23.1	192°18.6	11.7' 11.7'	08°17.9	-13.4'	58.1' 58.1'
6 7	269°45.8 284°45.6	N23°23.1 23.2	206°49.3 221°20.0	11.7' 11.7'	N08°04.5 07°51.1	-13.5' -13.5'	58.1′ 58.2′
8	284 45.0 299°45.5	23.2	221 20.0 235°50.7	11.7'	07 51.1 07°37.6	-13.5'	58.2'
9	314°45.4	• • 23.3	250°21.4	11.7'	07°24.0	-13.6'	58.2'
10	329°45.2	23.4	264°52.1	11.8'	07°10.4	-13.6'	58.2'
11	344°45.1	23.4	279°22.9	11.8'	06°56.8	-13.7'	58.2'
12	359°44.9	N23°23.5	293°53.7	11.8'	N06°43.1	-13.7'	58.2'
13	14°44.8	23.5	308°24.4 11.8' 06°29.			-13.8'	58.3'
14	29°44.7 44°44.5	23.6	322°55.2 337°26.0	11.8' 11.8'	06°15.6 06°01.8	-13.8'	58.3'
15 16	44°44.5 59°44.4	· · 23.7 23.7	351°56.8 11.8' 05°48.0			-13.8' -13.9'	58.3' 58.3'
16 17	59°44.4 74°44.3	23.7	6°27.6 11.8' 05°34.1			-13.9' -13.9'	58.3'
18	89°44.1	N23°23.8	20°58.5 11.8' N05°20.2 -			-13.9'	58.4
19	104°44.0	23.9	9 35°29.3 11.8' 05°06.2 -14			-14.0'	58.4'
20	119°43.9	24.0				-14.0'	58.4'
21	134°43.7	• • 24.0	64°30.9	11.8'	04°38.2	-14.0'	58.4'
22	149°43.6	24.1	79°01.8	11.8'	04°24.2	-14.1'	58.4'
23	164°43.5	24.1	93°32.6	11.8'	04°10.1	-14.1'	58.4'
	SD = 15.7'	d = 0.1'		SI	D = 15.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Лег. Mer.Pass.		Age	
2,	00 ^h	12 ^h	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-24%	
15	00:28	00:34	12:01	14:55	02:30		
16	00:41	00:47	12:01	15:45	03:20		
17	00:54	01:00	12:01	16:33	04:09		

June 18, 19, 20 UT (Mon., Tue., Wed.)

h	Aries	`	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	266°31.4	155°12.0	N23°26.4	82°18.4	S01°33.3	69°50.3	S05°37.6	218°25.5	N15°40.9			
1	281°33.9	170°11.2	26.0	97°20.0	33.8	84°52.7	37.7	233°27.7	41.0	Alpheratz	357°31.0	29°15.1
2	296°36.3	185°10.4	25.6	112°21.6	34.2	99°55.2	37.7	248°29.9	41.1	Ankaa	353°03.8	-42°08.4
3	311°38.8	200°09.5	25.2	127°23.2	• • 34.7	114°57.6	• • 37.7	263°32.1	• • 41.2	Schedar	349°26.9	56°41.7
4	326°41.3	215°08.7	24.8	142°24.8	35.1	130°00.0	37.7	278°34.3	41.2	Diphda	348°43.8	-17°49.3
5	341°43.7	230°07.9	24.4	157°26.3	35.6	145°02.5	37.8	293°36.5	41.3	Achernar	335°18.0	-57°04.9
6	356°46.2	245°07.1	N23°24.0	172°27.9	S01°36.0	160°04.9	S05°37.8	308°38.6	N15°41.4	Hamal	327°47.3	23°36.0
7	11°48.7	260°06.3	23.6	187°29.5	36.5	175°07.4	37.8	323°40.8	41.4	Polaris	312°25.9	89°22.9
8	26°51.1	275°05.4	23.3	202°31.1	36.9	190°09.8	37.8	338°43.0	41.5	Acamar	315°09.4	-40°11.0
9	41°53.6	290°04.6	• • 22.9	217°32.7	• • 37.4	205°12.2	• • 37.9	353°45.2	• • 41.6	Menkar	314°02.6	4°12.3
10	56°56.0	305°03.8	22.5	232°34.3	37.8	$220^{\circ}14.7$	37.9	8°47.4	41.6	Mirfak	308°23.4	49°57.7
11	71°58.5	320°03.0	22.1	247°35.8	38.3	$235^{\circ}17.1$	37.9	23°49.6	41.7	Aldebaran	290°35.8	16°34.0
12	87°01.0	335°02.2	N23°21.7	262°37.4	S01°38.7	250°19.5	S05°37.9	38°51.8	N15°41.8	Rigel Capella	281°00.8 280°17.0	-8°10.2 46°01.5
13	102°03.4	350°01.3	21.3	277°39.0	39.2	265°22.0	37.9	53°53.9	41.9	Bellatrix	278° 19.4	6°22.4
14	$117^{\circ}05.9$	5°00.5	20.9	292°40.6	39.6	280°24.4	38.0	$68^{\circ}56.1$	41.9	Elnath	277° 57.7	28°37.8
15	132°08.4	19°59.7	• • 20.5	307°42.2	• • 40.0	295°26.9	• • 38.0	83°58.3	• • 42.0	Alnilam	275°34.4	-1°11.1
16	147°10.8	34°58.9	20.1	322°43.8	40.5	310°29.3	38.0	99°00.5	42.1	Betelgeuse	270°48.5	7°24.6
17	162°13.3	49°58.1	19.7	337°45.3	40.9	325°31.7	38.0	114°02.7	42.1	Canopus	263°51.3	-52°42.8
18	177°15.8	64°57.3	N23° 19.3	352°46.9	S01°41.4	340°34.2	S05°38.1	129°04.9	N15°42.2	Sirius	258°23.4	-16°45.6
19	192°18.2	79°56.4	18.9	7°48.5	41.8	355°36.6	38.1	144°07.1	42.3	Adhara	255°03.4	-29°00.9
20	207°20.7	94°55.6	18.5	22°50.1	42.3	10°39.0	38.1	159°09.2	42.3	Procyon	244°47.4	5°08.8
21	222°23.2	109°54.8	18.1	37°51.7	• • 42.7	25°41.5	38.1	174°11.4	• • 42.4	Pollux	243°13.3	27°57.2
22	237°25.6	124°54.0	17.6	52°53.2	43.2	40°43.9	38.2	189°13.6	42.5	Avior	234°13.7	-59°36.5
23	252°28.1	139°53.2	17.2	67°54.8	43.6	55°46.3	38.2	204°15.8	42.5	Suhail	222°43.9	-43°33.4
Mer.p	ass. 06:13	ν -0.8' d-0).4′ m-3.89	ν 1.6′ d0	.4′ m0.21	ν 2.4′ d0.	0′ m-2.16	ν 2.2′ d0	.1′ m0.32	Miaplacidus	221°37.9	-69°50.7
										Alphard	217°44.4	-8°47.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
Tue 0	GHA 267°30.5	GHA 154°52.4	Dec N23°16.8	82°56.4	S01°44.1	GHA 70°48.8	S05°38.2	219°18.0	Dec N15°42.6	Dubhe	193°37.0	61°35.7
1	282°33.0	154 52.4 169°51.6	N23° 16.8 16.4	97°58.0	44.1	70°48.8 85°51.2	38.2	219°18.0 234°20.2	N15 42.6 42.7	Denebola	182°21.3	14°24.4
2	202 35.0 297°35.5	184°50.7	16.0	112°59.5	45.0	100°53.6	38.3	249°22.4	42.8	Gienah	175°39.8	-17°42.5
3	312°37.9	199°49.9	15.6	112 39.3 128°01.1	• • 45.5	115°56.1	38.3	264°24.5	• • 42.8	Acrux	172°55.7	-63°16.1
4	327°40.4	214°49.1	15.2	143°02.7	45.9	130°58.5	38.3	279°26.7	42.9		171°47.3	-57°17.1
5	342°42.9	229°48.3	14.8	158°04.3	46.4	146°00.9	38.3	294°28.9	43.0	Alioth	166°09.9	55°48.2
6	357°45.3	244°47.5	N23° 14.3	173°05.8	S01°46.8	161°03.3	S05°38.4	309°31.1	N15°43.0	Spica	158° 18.4	-11°19.0
7	12°47.8	259°46.7	13.9	188°07.4	47.3	176°05.8	38.4	324°33.3	43.1	Alkaid	152°49.1	49°10.1
8	27°50.3	274°45.9	13.5	203°09.0	47.7	191°08.2	38.4	339°35.5	43.2	Hadar	148°30.3	-60°31.2
9	42°52.7	289°45.1	· · 13.1	218° 10.5	• • 48.2	206°10.6	• • 38.4	354°37.7	• • 43.2	Menkent		-36°31.1
10	57°55.2	304°44.2	12.7	233°12.1	48.6	221°13.1	38.5	9°39.9	43.3	Arcturus	145°44.5	19°01.8
11	72°57.7	319°43.4	12.2	248°13.7	49.1	236°15.5	38.5	24°42.0	43.4	Rigil Kent. Kochab	139°34.7 137°19.4	-60°57.6 74°02.2
12	88°00.1	334°42.6	N23°11.8	263°15.3	S01°49.5	251°17.9	S05°38.5	39°44.2	N15°43.5	Zuben'ubi	136°51.8	-16°09.9
13	103°02.6	349°41.8	11.4	278°16.8	50.0	266°20.4	38.6	54°46.4	43.5	Alphecca	130° 51.6 126° 00.4	-10 09.9 26°37.0
14	118°05.0	4°41.0	11.0	293°18.4	50.4	281°22.8	38.6	69°48.6	43.6		120 00.4 112°11.0	-26°29.8
15	133°07.5	19°40.2	• • 10.5	308°20.0	• • 50.9	296°25.2	• • 38.6	84°50.8	• • 43.7	Antares Atria	112 11.0 107°01.4	-20 29.8 -69°04.8
16	148°10.0	34°39.4	10.1	323°21.5	51.3	311°27.6	38.6	99°53.0	43.7	Sabik	101°58.3	-15°45.6
17	$163^{\circ}12.4$	49°38.6	09.7	338°23.1	51.8	$326^{\circ}30.1$	38.7	114°55.2	43.8	Shaula	96°05.1	-37°07.4
18	178°14.9	64°37.8	N23°09.2		S01°52.2	341°32.5	S05°38.7	129°57.4	N15°43.9	Rasalhague	95°54.9	12°32.4
19	193°17.4	79°37.0	8.80	8°26.2	52.7	356°34.9	38.7	144°59.5	43.9	Eltanin	90°40.0	51°29.2
20	208°19.8	94°36.2	08.4	23°27.8	53.2	11°37.4	38.7	160°01.7	44.0	Kaus Aust.	83°27.4	-34°22.0
21	223°22.3	109°35.4	• • 07.9	38°29.4	• • 53.6	26°39.8	• • 38.8	175°03.9	• • 44.1	Vega	80°30.4	38°48.7
22	238°24.8	124°34.6	07.5	53°30.9	54.1	41°42.2	38.8	190°06.1	44.1	Nunki	75°43.0	-26°15.4
23	253°27.2	139°33.8	07.1	68°32.5	54.5	56°44.6	38.8	205°08.3	44.2	Altair	61°56.2	8°56.9
Mer.p	ass. 06:09	ν-0.8′ d-0).4′ m-3.89	$\nu 1.6' d0$.5′ m0.23	$\nu 2.4' d0.$	0′ m-2.15	$\nu 2.2' \ d0$.1′ m0.32	Peacock	52°59.7	-56°38.0
										Deneb	49°22.9	45°23.1
			_		_		_		_	Enif	$33^{\circ}35.1$	10°00.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.3	-46°48.7
0	268°29.7	154°33.0	N23°06.6		S01°55.0	71°47.1	\$05°38.8		N15°44.3	Fomalhaut	15° 10.6	-29°27.7
1 2	283°32.1 298°34.6	169°32.1 184°31.3	06.2 05.8	98°35.6 113°37.2	55.4 55.9	86°49.5 101°51.9	38.9 38.9	235°12.7 250°14.9	44.3	Scheat	13°41.6	28°14.5
3	298°34.6 313°37.1	184°31.3 199°30.5	·· 05.8	113°37.2 128°38.7	55.9 •• 56.3	101°51.9 116°54.3	38.9	250°14.9 265°17.0	44.4 •• 44.5	Markab	13°26.2	15°21.9
4	313 37.1 328°39.5	214°29.7	04.9	120 30.7 143°40.3	56.8	131°56.8	39.0	280°19.2	44.6	Jun 18 Mon	SHA	Mer.pass
5	343°42.0	229°28.9	04.4	158°41.9	57.3	146°59.2	39.0	295°21.4	44.6		248° 40.6	13:40
6	358°44.5	244°28.1	N23°04.0	173°43.4		162°01.6	S05°39.0	310°23.6	N15°44.7		175°47.0	18:29
7	13°46.9	259°27.3	03.5	188°45.0	58.2	177°04.0	39.0	325°25.8	44.8		163°18.9	19:18
8	28°49.4	274°26.5	03.1	203°46.5	58.6	192°06.5	39.1	340°28.0	44.8	Saturn	311°54.1	09:25
9	43°51.9	289°25.7	• • 02.6	218°48.1	• • 59.1	207°08.9	• • 39.1	355°30.2	• • 44.9			
10	58°54.3	304°24.9	02.2	233°49.6	$01^{\circ}59.5$	222°11.3	39.1	10°32.4	45.0	Jun 19 Tue	SHA	Mer.pass
11	73°56.8	$319^{\circ}24.1$	01.7	248°51.2	$02^{\circ}00.0$	$237^{\circ}13.7$	39.2	25°34.6	45.0		247°21.8	13:41
12	88°59.3	334°23.3	N23°01.3	263°52.8	S02°00.5	$252^{\circ}16.1$	S05°39.2	40°36.7	N15°45.1		175°25.8 163°18.2	18:26 19:14
13	104°01.7	349°22.5	8.00	278°54.3	00.9	267°18.6	39.2	55°38.9	45.2	Saturn		09:14
14	119°04.2	4°21.7	23°00.4	293°55.9	01.4	282°21.0	39.2	70°41.1	45.2	Jatuin	J11 41.4	09.21
15	134°06.6	19°20.9	22°59.9	308°57.4	• • 01.8	297°23.4	• • 39.3	85°43.3	• • 45.3	Jun 20 Wed	SHA	Mer.pass
16	149°09.1	34°20.1	59.5	323°59.0	02.3	312°25.8	39.3	100°45.5	45.4		$246^{\circ}03.3$	13:43
17	164°11.6	49°19.3	59.0	339°00.5	02.8	327°28.3	39.3	115°47.7	45.4		$175^{\circ}04.4$	18:24
18	179°14.0	64°18.5	N22° 58.5	354°02.1	S02°03.2	342°30.7	S05°39.4		N15°45.5		163°17.4	19:10
19	194°16.5	79°17.8	58.1	9°03.6	03.7	357°33.1	39.4	145°52.1	45.6	Saturn	311°40.8	09:18
20	209°19.0	94°17.0	57.6	24°05.2	04.1	12°35.5	39.4	160°54.3	45.6	Horizont	al parallax	
21	224°21.4	109°16.2	· · 57.2	39°06.7	•• 04.6	27°37.9	39.5	175°56.4	· · 45.7	1101120111	Venus:	0.1
22	239°23.9 254°26.4	124°15.4	56.7	54°08.3	05.1	42°40.4	39.5 30.5	190°58.6	45.8 45.8		Mars:	0.1
23	204 20.4	139°14.6	56.2	69°09.8	05.5	57°42.8	39.5	206°00.8	45.8			
Mer.p	ass. 06:05	ν -0.8' d-0).4′ m-3.89	$ u$ 1.6 $^{\prime}$ d0	.5′ m0.24	ν 2.4′ d0.	0′ m-2.14	ν 2.2′ d0	.1′ m0.32			

h	Sur	า			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.3	N23°24.2	108°03.4	11.8'	N03°56.0	-14.1'	58.5'
1	194°43.2	24.2	122°34.3	11.8'	03°41.9	-14.2'	58.5'
2	209°43.0	24.3	137°05.1	11.8'	03°27.7	-14.2'	58.5'
3 4	224°42.9 239°42.8	· · 24.3	151°35.9 166°06.8	11.8' 11.8'	03°13.5 02°59.3	-14.2' -14.2'	58.5' 58.5'
5	254°42.6	24.4	180°37.6	11.8	02 59.5 02°45.1	-14.2 -14.3'	58.6'
6	269°42.5	N23°24.5	195°08.4	11.8'	N02°30.8	-14.3'	58.6'
7	284°42.4	24.5	209°39.2	11.8'	$02^{\circ}16.5$	-14.3'	58.6'
8	299°42.2	24.6	224°10.0	11.8'	02°02.2	-14.3'	58.6'
9	314°42.1	• • 24.6	238°40.8	11.8'	01°47.9	-14.3'	58.6' 58.6'
10 11	329°42.0 344°41.8	24.7 24.7	253°11.6 267°42.4	11.8' 11.8'	01°33.6 01°19.2	-14.4' -14.4'	58.6° 58.7'
12	359°41.7	N23°24.8	282°13.1	11.7'	N01°04.9	-14.4	58.7
13	14°41.5	24.8	296°43.9	11.7'	00°50.5	-14.4'	58.7'
14	29°41.4	24.8	311°14.6	11.7'	00°36.1	-14.4'	58.7'
15	44°41.3	• • 24.9	325°45.4	11.7'	00°21.7	-14.4'	58.7'
16 17	59°41.1 74°41.0	24.9 25.0	340°16.1 354°46.7	11.7' 11.7'	N00°07.3 S00°07.1	-14.4' 14.4'	58.8' 58.8'
18	89°40.9	N23°25.0	9°17.4	11.7'	500°07.1	14.4	58.8'
19	104°40.7	25.0	23°48.1	11.6'	00°36.0	14.4'	58.8'
20	119°40.6	25.1	38°18.7	11.6'	$00^{\circ}50.5$	14.4'	58.8'
21	134°40.5	• • 25.1	52°49.3	11.6'	01°04.9	14.4'	58.8'
22 23	149°40.3 164°40.2	25.2 25.2	67°19.9 81°50.4	11.6' 11.5'	01°19.3 01°33.8	14.4' 14.4'	58.9' 58.9'
23			01 30.4			14.4	50.9
	SD = 15.7'	d=0.1'		SI	O = 15.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°40.0 194°39.9	N23°25.2 25.3	96°21.0 110°51.5	11.5' 11.5'	\$01°48.2 02°02.7	14.4' 14.4'	58.9' 58.9'
2	209°39.8	25.3 25.3	110 51.5 125°22.0	11.5'	02 02.7 02°17.1	14.4	58.9'
3	224°39.6	25.3	139°52.4	11.4'	02°31.6	14.4	58.9'
4	239°39.5	25.4	154°22.9	11.4'	02°46.0	14.4'	58.9'
5	254°39.4	25.4	168°53.3	11.4'	03°00.4	14.4'	59.0'
6	269°39.2	N23°25.4	183°23.6	11.3'	503°14.8	14.4	59.0'
7 8	284°39.1 299°39.0	25.5 25.5	197°54.0 212°24.3	11.3' 11.3'	03°29.3 03°43.7	14.4' 14.4'	59.0' 59.0'
9	314°38.8	25.5	212 24.3 226°54.5	11.2'	03°58.0	14.4	59.0'
10	329°38.7	25.6	241°24.8	11.2'	04°12.4	14.4'	59.0'
11	344°38.5	25.6	255°55.0	11.2'	04°26.8	14.3'	59.1'
12	359°38.4	N23°25.6	270°25.1	11.1'	S04°41.1	14.3'	59.1'
13 14	14°38.3 29°38.1	25.6 25.7	284°55.2 299°25.3	11.1' 11.0'	04°55.4 05°09.7	14.3' 14.3'	59.1' 59.1'
15	44°38.0	25.7	299 25.3 313°55.3	11.0'	05°09.7	14.3	59.1'
16	59°37.9	25.7	328°25.3	11.0'	05°38.3	14.2'	59.1'
17	74°37.7	25.7	$342^{\circ}55.3$	10.9'	05°52.5	14.2'	59.1'
18	89°37.6	N23°25.8	357°25.2	10.9'	506°06.8	14.2'	59.2'
19 20	104°37.5 119°37.3	25.8	11°55.1 26°24.9	10.8' 10.8'	06°21.0 06°35.1	14.2' 14.1'	59.2' 59.2'
21	134°37.2	25.8 • • 25.8	40°54.6	10.8	06°49.3	14.1	59.2'
22	149°37.0	25.8	55°24.4	10.7'	07°03.4	14.1'	59.2'
23	164°36.9	25.9	69°54.0	10.6'	$07^{\circ}17.4$	14.0'	59.2'
	SD = 15.7'	d = 0.0'		SI	O = 16.1'		
Wed	GHA	Dec	GHA		Dec	d	НР
vved 0	GHA 179°36.8	Dес N23°25.9	GHA 84°23.7	u 10.6'	S 07°31.5	a 14.0'	нР 59.2'
1	194°36.6	25.9	98°53.2	10.5	07°45.5	14.0'	59.3'
2	209°36.5	25.9	$113^{\circ}22.7$	10.5'	07°59.5	13.9'	59.3'
3	224°36.4	• • 25.9	127°52.2	10.4	08°13.4	13.9'	59.3'
4	239°36.2 254°36.1	26.0 26.0	142°21.6 156°51.0	10.4' 10.3'	08°27.3 08°41.2	13.9' 13.8'	59.3' 59.3'
5 6	269°36.0	26.0 N23°26.0	156°51.0 171°20.3	10.3'	08°41.2 \$08°55.0	13.8'	59.3'
7	284°35.8	26.0	185°49.5	10.2'	09°08.8	13.7	59.3'
8	299°35.7	26.0	200°18.7	10.1'	09°22.5	13.7'	59.4'
9	314°35.6	• • 26.0	214°47.8	10.1'	09°36.2	13.6'	59.4
10 11	329°35.4 344°35.3	26.0 26.0	229°16.9 243°45.9	10.0' 9.9'	09°49.8 10°03.4	13.6' 13.5'	59.4' 59.4'
11	344 35.3 359°35.1	26.0 N23°26.1	243°45.9 258°14.8	9.9'	\$10° 03.4 \$10° 16.9	13.5'	59.4
13	14°35.0	26.1	272°43.7	9.8'	10°30.4	13.4	59.4
14	29°34.9	26.1	287°12.5	9.8'	10°43.9	13.4'	59.4'
15	44°34.7	• • 26.1	301°41.3	9.7'	10°57.2	13.3'	59.4
16 17	59°34.6 74°34.5	26.1 26.1	316°10.0 330°38.6	9.6' 9.6'	11° 10.6 11° 23.8	13.3' 13.2'	59.4' 59.5'
17	74°34.5 89°34.3	26.1 N23°26.1	330°38.6 345°07.2	9.6'	511° 37.0	13.2	59.5'
19	104°34.2	26.1	359°35.7	9.3 9.4'	11°50.2	13.1	59.5'
20	119°34.1	26.1	14°04.1	9.4'	12°03.3	13.0'	59.5'
21	134°33.9	• • 26.1	28°32.4	9.3'	12°16.3	13.0'	59.5'
22 23	149°33.8 164°33.7	26.1	43°00.7 57°28.9	9.2' 9.1'	12°29.2 12°42.1	12.9'	59.5'
23		26.1	or 28.9			12.8'	59.5'
	SD = 15.7'	d = 0.0'	-	SI	O = 16.2'		

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	34-57%	
18	01:07	01:13	12:01	17:22	04:57		
19	01:20	01:26	12:01	18:11	05:46		
20	01:33	01:39	12:02	19:02	06:36		

June 21, 22, 23 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	269°28.8	154° 13.8	N22°55.8	84°11.4	S02°06.0	72°45.2	S05°39.6	221°03.0	N15°45.9			
1	284°31.3	169°13.0	55.3	99°12.9	06.4	87°47.6	39.6	236°05.2	46.0	Alpheratz	357°31.0	29°15.1
2	299°33.8	184°12.2	54.8	114°14.5	06.9	102°50.0	39.6	251°07.4	46.1	Ankaa	353°03.8	-42°08.4
3	314°36.2	199°11.4	• • 54.4	129°16.0	• • 07.4	117°52.5	• • 39.6	266°09.6	• • 46.1	Schedar	349°26.8	56°41.7
4	329°38.7	214° 10.6	53.9	144°17.6	07.8	132°54.9	39.7	281°11.8	46.2	Diphda	348°43.8	-17°49.3
5	344°41.1	229°09.8	53.4	159°19.1	08.3	147°57.3	39.7	296°14.0	46.3	Achernar	335°17.9	-57°04.9
6	359°43.6	244°09.0	N22°53.0	174°20.7	S02°08.7	162°59.7	S05°39.7	311°16.2	N15°46.3	Hamal	327°47.3 312°24.7	23°36.0
7	14°46.1	259°08.2	52.5	189°22.2	09.2	178°02.1	39.8	326°18.3	46.4	Polaris		89°22.9
8	29°48.5	274°07.4	52.0	204°23.8	09.7	193°04.5	39.8	341°20.5	46.5	Acamar	315°09.4 314°02.6	-40°11.0 4°12.3
9	44°51.0	289°06.6	• • 51.5	219°25.3	• • 10.1	208°07.0	• • 39.8	356°22.7	• • 46.5	Menkar	308°23.4	4 12.3 49°57.7
10	59°53.5	304°05.9	51.1	234°26.9	10.6	223°09.4	39.9	11°24.9	46.6	Mirfak		49 57.7 16°34.0
11	74°55.9	319°05.1	50.6	249°28.4	11.0	238°11.8	39.9	$26^{\circ}27.1$	46.7	Aldebaran	290°35.8 281°00.8	-8°10.2
12	89°58.4	334°04.3	N22°50.1	264°29.9	S02°11.5	253°14.2	S05°39.9	41°29.3	N15°46.7	Rigel		-8 10.2 46°01.5
13	105°00.9	349°03.5	49.6	279°31.5	12.0	$268^{\circ}16.6$	40.0	56°31.5	46.8	Capella	280°17.0 278°19.4	6°22.5
14	120°03.3	4°02.7	49.1	294°33.0	12.4	283°19.0	40.0	71°33.7	46.9	Bellatrix Elnath	276 19.4 277°57.7	28°37.8
15	135°05.8	$19^{\circ}01.9$	• • 48.6	309°34.6	• • 12.9	298°21.4	• • 40.0	86°35.9	• • 46.9	Alnilam	277 37.7 275°34.4	-1°11.1
16	150°08.2	34°01.1	48.2	324°36.1	13.4	313°23.9	40.1	101°38.1	47.0	Betelgeuse	270°48.5	7°24.6
17	165°10.7	49°00.3	47.7	339°37.7	13.8	328°26.3	40.1	116°40.3	47.1	Canopus	263°51.3	-52°42.8
18	180°13.2	63°59.6	N22°47.2	354°39.2	502°14.3	343°28.7	S05°40.1	131°42.4	N15°47.1	Sirius	258°23.4	-32 42.6 -16°45.6
19	195°15.6	78° 58.8	46.7	9°40.7	14.7	358°31.1	40.2	146°44.6	47.2	Adhara	255°03.4	-10 45.0 -29°00.9
20	210°18.1	93°58.0	46.2	24°42.3	15.2	13°33.5	40.2	161°46.8	47.3	Procyon	244°47.4	5°08.8
21	225°20.6	108°57.2	• • 45.7	39°43.8	• • 15.7	28°35.9	• • 40.2	176°49.0	• • 47.3	Pollux	244 47.4 243°13.3	27°57.2
22	240°23.0	123°56.4	45.2	54°45.3	16.1	43°38.3	40.3	191°51.2	47.4	Avior	243 13.3 234°13.7	-59°36.5
23	255°25.5	$138^{\circ}55.6$	44.7	69°46.9	16.6	58°40.8	40.3	206°53.4	47.5	Suhail	234 13.7 222°43.9	-59 30.5 -43°33.4
Mars	pass. 06:01	ν <u>-</u> 0 8/ 4 0	0.5' m-3.89	v1 5' d0	.5′ m0.25	1/2 A/ 40	0′ m-2.14	1/2 2/ 40	.1′ m0.32	Miaplacidus	222 43.9 221°37.9	-43 33.4 -69°50.6
ivier.p	vass. UU.UI	ν-0.6 <i>u</i> -0	111-3.09	ν1.5 dU	.5 1110.25	ν2.4 d0.	0 111-2.14	ν ∠.∠ d0	.1 1110.32	Alphard	221 37.9 217°44.4	-8°47.4
										Regulus	207°30.8	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.1	61°35.7
0	270°28.0	153°54.8	N22°44.3	84°48.4	502°17.1	73°43.2	\$05°40.3	221°55.6	N15°47.5	Denebola	182°21.3	14°24.4
1	285°30.4	$168^{\circ}54.1$	43.8	99°50.0	17.5	88°45.6	40.4	236°57.8	47.6	Gienah	175°39.8	-17°42.5
2	300°32.9	183°53.3	43.3	114°51.5	18.0	103°48.0	40.4	252°00.0	47.7	1	173°55.7	-63°16.1
3	315°35.4	198°52.5	• • 42.8	129°53.0	• • 18.5	118°50.4	• • 40.4	267°02.2	• • 47.7	I	171°47.3	-57°17.1
4	330°37.8	213°51.7	42.3	144°54.6	18.9	133°52.8	40.5	282°04.4	47.8	Alioth	166°09.9	55°48.2
5	345°40.3	228°50.9	41.8	159°56.1	19.4	148°55.2	40.5	297°06.6	47.9	Spica	158° 18.4	-11°19.0
6	0°42.7	243°50.2	N22°41.3	174°57.6	502°19.9	163°57.6	\$05°40.5	312°08.8	N15°47.9	Alkaid	152°49.1	49°10.1
7	15°45.2	258°49.4	40.8	$189^{\circ}59.2$	20.3	$179^{\circ}00.0$	40.6	$327^{\circ}10.9$	48.0	Hadar	148°30.3	-60°31.2
8	30°47.7	273°48.6	40.3	205°00.7	20.8	194°02.5	40.6	$342^{\circ}13.1$	48.1	I	147°53.1	-36°31.1
9	45°50.1	288°47.8	• • 39.8	220°02.2	• • 21.3	209°04.9	• • 40.6	357°15.3	• • 48.1	Arcturus	145°44.5	19°01.8
10	60°52.6	303°47.0	39.3	235°03.8	21.7	224°07.3	40.7	$12^{\circ}17.5$	48.2	Rigil Kent.	139°34.7	-60°57.6
11	75°55.1	318°46.3	38.8	250°05.3	22.2	239°09.7	40.7	27°19.7	48.3	Kochab	137°19.4	74°02.3
12	90°57.5	333°45.5	N22°38.3	265°06.8	502°22.7	$254^{\circ}12.1$	\$05°40.7	42°21.9	N15°48.3	Zuben'ubi	136°51.8	-16°09.9
13	106°00.0	348°44.7	37.7	280°08.3	23.1	269°14.5	40.8	57°24.1	48.4	Alphecca	126°00.4	26°37.0
14	121°02.5	3°43.9	37.2	295°09.9	23.6	284°16.9	40.8	72°26.3	48.5	Antares	112°11.0	-26°29.8
15	136°04.9	18°43.2	• • 36.7	310°11.4	• • 24.1	299°19.3	• • 40.8	87°28.5	• • 48.5	Atria	107°01.4	-69°04.8
16	151°07.4	33°42.4	36.2	325°12.9	24.5	314°21.7	40.9	102°30.7	48.6	Sabik	101°58.3	-15°45.6
17	166°09.9	48°41.6	35.7	340°14.5	25.0	329°24.1	40.9	117°32.9	48.7	Shaula	96°05.1	-37°07.4
18	181°12.3	63°40.8	N22°35.2	355°16.0	S02°25.5	344°26.5	S05°40.9	132°35.1	N15°48.7	Rasalhague	95°54.9	12°32.4
19	196°14.8	78°40.1	34.7	10°17.5	25.9	359°28.9	41.0	147°37.3	48.8	Eltanin	90°40.0	51°29.2
20	211°17.2	93°39.3	34.2	25°19.0	26.4	14°31.4	41.0	162°39.5	48.9	Kaus Aust.	83°27.4	-34°22.0
21	226°19.7	108°38.5	• • 33.7	40°20.6	• • 26.9	29°33.8	• • 41.0	177°41.6	• • 48.9	Vega	80°30.3	38°48.7
22	241°22.2	123°37.7	33.1	55°22.1	27.3	44°36.2	41.1	192°43.8	49.0	Nunki	75°43.0	-26°15.4
23	256°24.6	138°37.0	32.6	70°23.6	27.8	59°38.6	41.1	207°46.0	49.1	Altair	61°56.1	8°56.9
Mer n	pass. 05:57	v-0.8' d-0	0.5′ m-3.89	v1.5'.d0	.5′ m0.27	$v^2 4' d0$	0′ m-2.13	v2 2' d0	.1′ m0.32	Peacock	52°59.7	-56°38.0
		ν σ.σ α σ		ν 1.5 · G ·						Deneb	49°22.9	45°23.1
										Enif	33°35.1	10°00.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.3	-46°48.7
0	271°27.1	153°36.2	N22°32.1	85°25.1		74°41.0	S05°41.2		N15°49.1	Fomalhaut	15°10.5	-29°27.7
1	286°29.6	168°35.4	31.6	100°26.7	28.7	89°43.4	41.2	237°50.4	49.2	Scheat	13°41.6	28°14.5
2	301°32.0	183°34.6	31.1	115°28.2	29.2	104°45.8	41.2	252°52.6	49.3	Markab	13°26.2	15°21.9
3	316°34.5	198°33.9	• • 30.5	130°29.7	• • 29.7	119°48.2	• • 41.3	267°54.8	• • 49.3	1 21 -	C	
4	331°37.0	213°33.1	30.0	145°31.2	30.2	134°50.6	41.3	282°57.0	49.4	Jun 21 Thu	SHA	Mer.pass
5	346°39.4	228° 32.3	29.5	160°32.7	30.6	149°53.0	41.3	297°59.2	49.5	1	244°45.0	13:44
6	1°41.9	243°31.6	N22°29.0	175°34.3	S02°31.1	164°55.4	S05°41.4	313°01.4	N15°49.5	1	174°42.6	18:21
7	16°44.4	258°30.8	28.4	190°35.8	31.6	179°57.8	41.4	328°03.6	49.6		163°16.4	19:06
8	31°46.8	273°30.0	27.9	205°37.3	32.0	195°00.2	41.4	343°05.8	49.7	Saturn	311°34.2	09:14
9	46°49.3	288° 29.3	• • 27.4	220°38.8	• • 32.5	210°02.6	• • 41.5	358°08.0	• • 49.7	Jun 22 Fri	SHA	Mer.pass
10	61°51.7	303°28.5	26.8	235°40.3	33.0	225°05.0	41.5	13°10.2	49.8		243°26.9	13:45
11	76°54.2	318° 27.7	26.3	250°41.9	33.4	240°07.4	41.6	28°12.4	49.9	1	174°20.5	18:19
12	91°56.7	333°26.9	N22°25.8	265°43.4	S02°33.9	255°09.8	S05°41.6	43°14.6	N15°49.9	1	163°15.2	19:02
13	106°59.1	348°26.2	25.2	280°44.9	34.4	270°12.2	41.6	58°16.8	50.0	Saturn	311°27.6	09:11
14	122°01.6	3°25.4	24.7	295°46.4	34.9	285°14.6	41.7	73°19.0	50.1			
15	137°04.1	18°24.7	• • 24.2	310°47.9	• • 35.3	300°17.0	• • 41.7	88°21.2	• • 50.1	Jun 23 Sat	SHA	Mer.pass
16	152°06.5	33°23.9	23.6	325°49.4	35.8	315°19.4	41.7	103°23.3	50.2	1	242°09.1	13:46
17	167°09.0	48°23.1	23.1	340°51.0	36.3	330°21.8	41.8	118°25.5	50.3	1	173°58.0	18:16
18	182°11.5	63°22.4	N22°22.6	355°52.5	S02°36.7	345°24.2	S05°41.8		N15°50.3		163°13.9	18:58
19	197°13.9	78°21.6	22.0	10°54.0	37.2	0°26.6	41.9	148°29.9	50.4	Saturn	311°21.1	09:07
20	212°16.4	93°20.8	21.5	25°55.5	37.7	15°29.0	41.9	163°32.1	50.5	Horizont	al parallax	
21	227°18.8	108°20.1	• • 20.9	40°57.0	• • 38.2	30°31.4	• • 41.9	178°34.3	• • 50.5	TIOTIZOTI	Venus:	0.1
22	242°21.3	123°19.3	20.4	55°58.5	38.6	45°33.8	42.0	193°36.5	50.6		Mars:	0.1
23	257°23.8	138° 18.5	19.8	71°00.0	39.1	60°36.2	42.0	208°38.7	50.7		ividi 5.	0.1
Mer.p	ass. 05:53	ν -0.8′ d-0	0.5′ m-3.89	ν 1.5′ d0	.5′ m0.28	ν 2.4′ d0.	0′ m-2.12	ν 2.2′ d0	.1′ m0.32			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.5	N23°26.1	71°57.1	9.1'	\$12°54.9	12.7'	59.5'
1 2	194°33.4 209°33.2	26.1 26.1	86°25.1 100°53.1	9.0' 8.9'	13°07.7 13°20.4	12.7' 12.6'	59.5' 59.5'
3	224°33.1	26.1	115°21.1	8.9'	13°33.0	12.5'	59.6'
4	239°33.0	26.1	129°48.9	8.8'	13°45.5	12.5'	59.6'
5 6	254°32.8 269°32.7	26.1 N23°26.1	144°16.7 158°44.4	8.7' 8.6'	13°57.9 \$14°10.3	12.4' 12.3'	59.6' 59.6'
7	284°32.6	26.1	173° 12.0	8.6'	14° 22.6	12.2'	59.6'
8	299°32.4	26.1	$187^{\circ}39.6$	8.5'	$14^{\circ}34.8$	12.1'	59.6'
9 10	314°32.3 329°32.2	· · 26.1	202°07.1 216°34.5	8.4' 8.3'	14°47.0 14°59.0	12.0' 12.0'	59.6' 59.6'
11	344°32.0	26.1	210 34.5 231°01.8	8.3'	14 59.0 15°11.0	11.9'	59.6'
12	359°31.9	N23°26.1	245°29.1	8.2'	S 15°22.8	11.8'	59.6'
13 14	14°31.8 29°31.6	26.1 26.1	259°56.2 274°23.3	8.1' 8.0'	15°34.6 15°46.3	11.7' 11.6'	59.6'
14 15	29 31.0 44°31.5	. 26.1	274 23.3 288°50.4	8.0 7.9'	15 46.3 15°57.9	11.5	59.6' 59.7'
16	59°31.3	26.1	$303^{\circ}17.3$	7.9'	$16^{\circ}09.4$	11.4'	59.7'
17 18	74°31.2 89°31.1	26.0 N23°26.0	317°44.2 332°10.9	7.8'	16° 20.8 \$16° 32.2	11.3'	59.7'
19	104°30.9	N23 26.0 26.0	332 10.9 346°37.6	7.7' 7.6'	16°43.4	11.2' 11.1'	59.7' 59.7'
20	119°30.8	26.0	1°04.3	7.5'	16°54.5	11.0'	59.7'
21	134°30.7	• • 26.0	15°30.8	7.5'	17°05.5	10.9'	59.7'
22 23	149°30.5 164°30.4	26.0 26.0	29°57.3 44°23.7	7.4' 7.3'	17°16.4 17°27.2	10.8' 10.7'	59.7' 59.7'
23	SD = 15.7'	d = 0.0'	TT 25.1		D = 16.2'	10.7	33.1
	3D = 15.1'	<i>u</i> = 0.0°		31	J — 10.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.3 194°30.1	N23°25.9 25.9	58° 50.0 73° 16.2	7.2' 7.2'	\$17°37.9 17°48.5	10.6' 10.5'	59.7' 59.7'
1 2	209°30.0	25.9 25.9	73 10.2 87°42.4	7.2 7.1'	17 48.5 17°59.0	10.5	59.7' 59.7'
3	224°29.9	• • 25.9	102°08.5	7.0'	18°09.4	10.3'	59.7'
4	239°29.7	25.9	116°34.5	6.9'	18° 19.6	10.1'	59.7'
5 6	254°29.6 269°29.5	25.9 N23°25.8	131°00.4 145°26.2	6.8' 6.8'	18° 29.8 \$18° 39.8	10.0' 9.9'	59.7' 59.7'
7	284°29.3	25.8	159°52.0	6.7'	18°49.7	9.8'	59.7'
8	299°29.2	25.8	174° 17.7	6.6'	18°59.5	9.7'	59.7'
9 10	314°29.1 329°28.9	· · 25.8 25.8	188°43.3 203°08.8	6.5' 6.5'	19°09.2 19°18.8	9.6' 9.4'	59.7' 59.7'
11	344°28.8	25.7	217°34.3	6.4	19° 18.2	9.3'	59.7'
12	359°28.6	N23°25.7	231°59.7	6.3'	S19°37.5	9.2'	59.7'
13 14	14°28.5 29°28.4	25.7 25.7	246°25.0 260°50.2	6.2' 6.2'	19°46.7 19°55.8	9.1' 8.9'	59.7' 59.7'
15	44°28.2	25.6	275° 15.4	6.1'	20°04.7	8.8'	59.7'
16	59°28.1	25.6	289°40.4	6.0'	20° 13.5	8.7'	59.7'
17 18	74°28.0 89°27.8	25.6 N23°25.5	304°05.5 318°30.4	5.9' 5.9'	20°22.1 \$20°30.7	8.5' 8.4'	59.7' 59.7'
19	104°27.7	25.5	332°55.3	5.8'	20°39.1	8.3	59.7'
20	119°27.6	25.5	347°20.1		20°47.3	8.1'	59.7'
21 22	134°27.4 149°27.3	· · 25.5 25.4	1°44.8 16°09.5	5.7' 5.6'	20°55.5 21°03.4	8.0' 7.8'	59.7' 59.7'
23	164°27.2	25.4	30°34.1	5.5'	21°11.3	7.7'	59.7'
	SD = 15.7'	d = -0.0'	-	SI	D = 16.3'		
Sat 0	GHA 179°27.0	Dec N23°25.4	GHA 44°58.6	ν 5.5'	Dec \$21° 19.0	d 7.6'	HP 59.7'
1	194°26.9	25.3	59°23.0	5.4'	21°26.6	7.4'	59.7'
2	209°26.8 224°26.6	25.3 •• 25.3	73°47.4 88°11.8	5.3'	21°34.0	7.3'	59.7'
3 4	224 26.6 239°26.5	25.3	88°11.8 102°36.1	5.3' 5.2'	21°41.3 21°48.4	7.1' 7.0'	59.7' 59.7'
5	254°26.4	25.2	$117^{\circ}00.3$	5.2'	21°55.4	6.8'	59.7'
6	269°26.2 284°26.1	N23°25.1	131°24.4 145°48.5	5.1' 5.0'	\$22°02.2 22°08.9	6.7'	59.7'
7 8	284 26.1 299°26.0	25.1 25.1	145 48.5 160°12.6	5.0'	22 08.9 22°15.4	6.5' 6.4'	59.7' 59.7'
9	314°25.8	• • 25.0	$174^{\circ}36.6$	4.9'	22°21.8	6.2'	59.7'
10	329°25.7 344°25.6	25.0	189°00.5	4.9'	22°28.0	6.1'	59.7'
11 12	344 25.6 359°25.4	25.0 N23°24.9	203°24.4 217°48.2	4.8' 4.8'	22°34.1 S 22°40.0	5.9' 5.8'	59.7' 59.7'
13	14°25.3	24.9	$232^{\circ}12.0$	4.7'	22°45.8	5.6'	59.7'
14	29°25.2	24.8	246°35.7	4.7'	22°51.4	5.5'	59.7'
15 16	44°25.0 59°24.9	· · 24.8 24.7	260°59.4 275°23.0	4.6' 4.6'	22°56.9 23°02.2	5.3' 5.1'	59.7' 59.6'
17	74°24.8	24.7	289°46.6	4.6'	23°07.3	5.0'	59.6'
18	89°24.6	N23°24.6	304° 10.2	4.5'	\$23°12.3	4.8'	59.6'
19 20	104°24.5 119°24.4	24.6 24.6	318°33.7 332°57.2	4.5' 4.4'	23° 17.1 23° 21.8	4.7' 4.5'	59.6' 59.6'
21	134°24.2	• • 24.5	$347^{\circ}20.6$	4.4'	23°26.2	4.3'	59.6'
22	149°24.1	24.5	1°44.0	4.4'	23°30.6	4.2'	59.6'
23	164°24.0	24.4	16°07.4	4.3'	23°34.7	4.0'	59.6'
	SD = 15.7'	d = -0.0'		SI	D = 16.3'		

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

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

		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	68-87%		
21	01:46	01:52	12:02	19:56	07:28			
22	01:59	02:05	12:02	20:53	08:24			
23	02:12	02:18	12:02	21:53	09:22			

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

CHA	h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	turn		Stars	
Color	Sun	GHA	СНА	Dec	GHA.	Dec	GHA	Dec	GHA.	Dec		SHA	Dec
1 907 987 1061710 1877 107131 401 097410 415 107604 410 127675 500 097410 415 107604 415													
2 907*31.2 1887*163 18.2 110*04.6 49.5 105*48.4 22 207.75 8.00													
3 17°316 396°155 - 177 11°61 · 440 . 10°656 · 420 . 10°656 · 420 . 20°757 · 50.0													
332°361 215°147 171 140°576 15 135°482 422 288°497 510	3	317°33.6	198°15.5	• • 17.7	131°06.1	• • 41.0	120°45.8	• • 42.2	268°47.5	• • 50.9			
19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4	$332^{\circ}36.1$	213°14.7	17.1	146°07.6	41.5		42.2	283°49.7	51.0			
8 2746 277117 140 205118 141 241 241 241 241 241 241 241 241 241											1		
19-14-10 2011-10 144 2011-15 144 2011-15 143 2011-15 201													
9 677-68 288*110 14.3 221*15. 14.3 211*10. 14.5 221*15. 14.6 24.5											Acamar		-40°11.0
10											Menkar	$314^{\circ}02.6$	4°12.3
11 077583 318/00.4 132 95/181 448 94/1950 425 99/01 51.4 All Control of the con											1		
19 127953 3 107754 3 1775											l l		
11 197807 97 007 07 12 12 20 20 20 18 10 10 11 10 11 12 20 46 7 30 14 6 42 7 10 10 10 11 15 18 18 18 18 19 10 18 18 18 19 10 18 18 18 19 10 18 18 18 19 10 18 18 18 18 19 10 18 18 18 18 18 19 10 18 18 18 18 18 18 18 18 18 18 18 18 18	12	92°55.8	333°08.7	N22° 12.7	266°19.6	S02°45.3		S05°42.5	44°07.3	N15°51.5			
Bissel													
15 183 167 160 184 160 184 185													
18 18 18 10 10 10 10 10											Alnilam	275°34.4	
183*106													
188"131 189"131 59"00.4 087 11"30.2 48.6 11"241 42.8 149"22.7 52.0													
2011 2011													
228 220 128 220 128 220 107 05 05 05 05 05 05 05 05 05 05 05 05 05	20			08.2		49.1				52.0	1		
Astronomy Astr													
Mon											1		
Mon GHA GHA Dec GHA	23	258°22.9	138°00.4	06.4	71°36.2	50.5	61°33.7	43.0	209°31.4	52.2	Suhail		
CHA	Mer.p	ass. 05:49	ν -0.8′ d-0).5′ m-3.89	$\nu 1.5' \ d0.$	5′ m0.29	ν 2.4′ d0.	0′ m-2.12	ν 2.2 $^{\prime}$ d0	.1' m0.32			
Color													
273°25.4 122°95.7 122°05.9 86°37.7 502°51.0 76°36.1 505°43.0 224°31.6 115°52.3 Density 122°21.1 40°24.4 2 303°30.3 123°56.2 127°57.4 0.41 116°40.7 51.9 106°40.9 43.1 236°38.0 52.4 3 318°32.8 127°57.4 0.41 131°42.2 52.4 121°43.3 43.2 236°40.2 52.5 3 343°37.7 227°55.7 0.36 146°43.7 52.9 133°45.7 43.2 234°42.4 52.5 3 343°37.7 227°55.7 0.36 146°43.7 52.9 133°45.7 43.2 234°42.4 52.5 3 346°37.7 227°55.7 0.36 146°43.7 52.9 334°45.7 43.2 234°42.4 52.5 3 46°37.7 227°55.7 0.32 116°40.5 522°53.8 166°50.5 505°43.3 314°40.8 15°27.7 4 333°35.2 227°52.7 0.02 116°40.5 522°53.8 166°50.5 505°43.3 314°40.8 15°27.7 5 346°37.7 227°55.7 0.03 0.04°40.6 54.8 106°50.5 505°43.3 314°40.8 15°27.7 6 346°4.6 227°57.7 0.03 0.04°40.6 54.8 106°50.5 505°43.3 314°40.8 15°27.7 7 48°4.6 227°52.7 0.07 221°51.1 0.55.3 21°57.6 0.34 34.9 44°51.2 24°41.1 7 48°52.5 317°51.5 21°99.5 251°54.1 55.2 22°00.1 406°55.6 505°55.5 505°55.6 505°7.5 505°40.4 53.2 11 91°51.5 31°59.5 325°50.7 227°00.5 257°04.8 35.0 257°04.4 53.2 11 106°50.3 327°50.7 27°40.8 25.0	Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
2 303°203 167°589 05.3 101°392 51.5 91°385 431 239°358 52.3 2 303°303 157°582 047 041 131°427 05.24 121°433 432°880 62.2 05.24 3 318°328 177°574 041 131°427 05.24 131°467 43.2 280°402 05.25 3 48°370 03.6 046°437 046°437													
3 338°323 1976°74 04.7 116°407 51.9 106°409 43.1 254°380 52.4 3 338°352 212°867 03.6 146°437 52.9 136°457 43.2 284°424 52.5 5 348°377 227°859 03.0 161°452 53.4 151°481 43.2 299°44.6 52.5 6 348°377 227°859 03.0 161°452 53.4 151°481 43.2 299°44.6 52.5 6 348°377 227°859 03.0 161°452 53.4 151°481 43.2 299°44.6 52.7 8 18°456 227°851 030°4916 44.8 161°50.5 53.3 116°450 53.3 9 48°47.6 228°82.9 00.7 221°511 55.3 211°57.6 44.4 38°53.4 52.9 11 63°80.0 300°82.2 22°001 236°52.6 58.8 227°00.0 43.4 43°53.4 52.9 11 78°52.5 332°60.7 721°58.5 251°54.1 56.2 242°02.4 43.5 29°57.8 53.0 12 93°55.0 332°90.7 721°58.5 251°54.1 56.2 242°02.4 43.5 29°57.8 53.0 13 108°57.4 347°50.0 83.3 231°57.1 57.2 272°07.2 43.6 60°02.2 53.1 Abertula 136°30.3 60°57.7 15 139°02.3 17°48.5 57.2 332°00.1 58.2 300°12.0 43.6 60°02.2 53.1 Abertula 136°30.3 60°57.7 16 156°04.8 32°47.7 56.6 332°01.6 58.6 332°14.3 43.7 90°66.6 53.2 Abertula 136°30.3 60°57.7 17 160°07.3 47°47.0 56.0 332°01.6 58.6 332°14.3 43.7 105°0.8 53.3 Abertula 53.4 43.8	1			05.3		51.5		43.1		52.3	l l		
3 318°328 197°574 04.1 131°422 °524 121°433 °432 260°402 °525 5 4 33°327 221°567 03.6 16°457 239 136°57 43.2 260°402 °525 5 346°377 227°559 03.0 161°452 53.4 151°481 7 38°42.6 257°544 01.8 191°481 7 38°42.6 257°544 01.8 191°481 7 38°42.6 257°547 01.3 206°496 7 38°42.6 257°547 01.3 206°496 7 38°42.6 257°54.7 01.3 206°496 7 38°42.6 257°54.7 01.3 206°496 7 38°42.6 257°54.7 01.3 206°496 7 38°42.6 257°54.7 01.3 206°496 7 38°42.6 257°54.7 01.3 206°496 7 38°42.7 01.5 21°95.8 221°541 7 38°42.0 21°57.1 1 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 337°51.5 21°95.8 221°541 7 38°52.0 340°52													
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8 34°44.2 272°35.9 47.0 207°25.4 06.3 197°52.5 44.4 345°44.0 54.3 9 49°46.7 287°35.2 · · · 46.4 222°26.8 · · · 06.8 212°54.9 · · · 44.5 0°46.2 · · 54.4 10 64°49.2 302°34.5 45.8 237°28.3 07.3 227°57.3 44.5 15°48.4 54.5 15°48.4 54.5 12°454.1 332°33.0 N21°44.6 267°31.3 \$03°08.3 258°02.0 \$050°44.6 45°52.8 N15°54.6 13°109°56.6 347°32.3 44.0 282°32.8 08.7 273°04.4 44.6 60°55.0 54.7 14 124°59.0 2°31.6 43.3 297°34.3 09.2 288°06.8 44.7 75°57.2 54.7 15 140°01.5 17°30.8 · · · 42.7 312°35.7 · · · 09.7 303°09.2 · · · 44.7 90°59.4 · · 54.8 16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 185°08.9 62°28.6 N21°40.9 357°40.2 \$03°11.2 348°16.3 \$050°44.9 136°06.0 N15°55.0 54.0 19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21°20.5 33°20.5 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3													
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10 64°49.2 302°34.5 45.8 237°28.3 07.3 227°57.3 44.5 15°48.4 54.5 11 79°51.6 317°33.8 45.2 252°29.8 07.8 242°59.6 44.6 30°50.6 54.5 12 94°54.1 332°33.0 N21°44.6 267°31.3 S03°08.3 258°02.0 S05°44.6 45°52.8 N15°54.6 13 109°56.6 347°32.3 44.0 282°32.8 08.7 273°04.4 44.6 60°55.0 54.7 14 124°59.0 2°31.6 43.3 297°34.3 09.2 288°06.8 44.7 75°57.2 54.7 15 140°01.5 17°30.8 · 42.7 312°35.7 · 09.7 303°09.2 · 44.7 90°59.4 · 54.8 16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 10 10°26.5 Nars 10.1 10.1 10.1 10.1 10.1 10.1 10.1 10.											Saturn	311 14./	09:04
11 79°51.6 317°33.8 45.2 252°29.8 07.8 242°59.6 44.6 30°50.6 54.5 12 94°54.1 332°33.0 N21°44.6 267°31.3 S03°08.3 258°02.0 S05°44.6 45°52.8 N15°54.6 13 109°56.6 347°32.3 44.0 282°32.8 08.7 273°04.4 44.6 60°55.0 54.7 14 124°59.0 2°31.6 43.3 297°34.3 09.2 288°06.8 44.7 75°57.2 54.7 15 140°01.5 17°30.8 · 42.7 312°35.7 · 09.7 303°09.2 · 44.7 90°59.4 · 54.8 16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Venus 239°34.3 13:49 Mars 173°12.3 18:12 Jupiter 163°10.7 18:51 Saturn 311°08.3 09:00 Jupiter 163°10.7 18:51 Saturn 311°08.3 09:00 Jupiter 163°10.7 18:51 Saturn 311°08.3 09:00 Jupiter 163°08.9 18:47 Saturn 311°01.9 08:57 Horizontal parallax Venus: 0.1 Mars: 0.1											Jun 25 Mon	SHA	Mer.pass
12 94°54.1 332°33.0 N21°44.6 267°31.3 S03°08.3 258°02.0 S05°44.6 45°52.8 N15°54.6 13 109°56.6 347°32.3 44.0 282°32.8 08.7 273°04.4 44.6 60°55.0 54.7 14 124°59.0 2°31.6 43.3 297°34.3 09.2 288°06.8 44.7 75°57.2 54.7 15 140°01.5 17°30.8 · 42.7 312°35.7 · 09.7 303°09.2 · 44.7 90°59.4 · 54.8 16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 N15°54.6 44.6 60°55.0 54.7 54.7 18:51 Saturn 311°08.3 09:00 1.1													
13 109°56.6 347°32.3 44.0 282°32.8 08.7 273°04.4 44.6 60°55.0 54.7 14 124°59.0 2°31.6 43.3 297°34.3 09.2 288°06.8 44.7 75°57.2 54.7 15 140°01.5 17°30.8 · 42.7 312°35.7 · 09.7 303°09.2 · 44.7 90°59.4 · 54.8 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 20°215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 2 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 2 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 2 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 3 Mars: 0.1 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1													
14 124 59.0 2 31.0 43.3 297 34.3 09.2 288 06.8 44.7 75 57.2 54.7 15 140 01.5 17 30.8 · 42.7 312 35.7 · · · 09.7 303 09.2 · · · 44.7 90 59.4 · · 54.8 16 155 04.0 32 30.1 42.1 327 37.2 10.2 318 11.6 44.8 106 01.6 54.8 17 170 06.4 47 29.4 41.5 342 38.7 10.7 333 13.9 44.8 121 03.8 54.9 18 185 08.9 62 28.6 N21 04.9 357 04.2 S03 11.2 348 16.3 S05 04.9 136 06.0 N15 05.0 19 200 11.3 77 027.9 40.3 12 041.6 11.6 3 18.7 44.9 151 08.2 55.0 20 215 13.8 92 027.2 39.6 27 043.1 12.1 18 021.1 45.0 166 10.4 55.1 21 230 16.3 107 026.5 · · · 39.0 42 04.6 · · 12.6 33 023.5 · · · 45.0 181 02.7 · · · 55.2 22 245 01.7 120 25.7 38.4 57 046.1 13.1 48 025.8 45.1 196 01.9 55.2 Venus: 0.1 23 260 021.2 137 025.0 37.8 72 047.5 13.6 63 028.2 45.1 211 07.1 55.3	13	109°56.6	347°32.3	44.0	282°32.8	08.7	273°04.4	44.6	60°55.0	54.7			
16 155°04.0 32°30.1 42.1 327°37.2 10.2 318°11.6 44.8 106°01.6 54.8 Venus 238°17.3 13:50 17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 Mars 172°49.0 18:09 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 Jupiter 163°08.9 18:47 19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 Saturn 311°01.9 08:57 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 55.0 Saturn 311°01.9 08:57 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 Horizontal parallax 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 Venus: 0.1 23													
17 170°06.4 47°29.4 41.5 342°38.7 10.7 333°13.9 44.8 121°03.8 54.9 18 185°08.9 62°28.6 N21°40.9 357°40.2 S03°11.2 348°16.3 S05°44.9 136°06.0 N15°55.0 19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Mars 172°49.0 18:09 Jupiter 163°08.9 18:47 Saturn 311°01.9 08:57 Horizontal parallax Venus: 0.1 Mars: 0.1													
18													
19 200°11.3 77°27.9 40.3 12°41.6 11.6 3°18.7 44.9 151°08.2 55.0 20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 · 39.0 42°44.6 · 12.6 33°23.5 · 45.0 181°12.7 · 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Saturn 311°01.9 08:57 Horizontal parallax Venus: 0.1 Mars: 0.1													
20 215°13.8 92°27.2 39.6 27°43.1 12.1 18°21.1 45.0 166°10.4 55.1 21 230°16.3 107°26.5 ··· 39.0 42°44.6 ··· 12.6 33°23.5 ··· 45.0 181°12.7 ··· 55.2 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Horizontal parallax Venus: 0.1 Mars: 0.1													
21 230°16.3 107°26.5 ·· 39.0 42°44.6 ·· 12.6 33°23.5 ·· 45.0 181°12.7 ·· 55.2 Horizontal parallax 22 245°18.7 122°25.7 38.4 57°46.1 13.1 48°25.8 45.1 196°14.9 55.2 Venus: 0.1 23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Mars: 0.1													30.31
23 260°21.2 137°25.0 37.8 72°47.5 13.6 63°28.2 45.1 211°17.1 55.3 Mars: 0.1											Horizont		
25 260 212 107 25.0 51.0 72 11.5 15.0 05 26.2 10.1 211 17.1 50.0													
Mer.pass. 05:41 ν -0.7 $'$ d-0.6 $'$ m-3.89 ν 1.5 $'$ d0.5 $'$ m0.32 ν 2.4 $'$ d0.0 $'$ m-2.10 ν 2.2 $'$ d0.1 $'$ m0.31	23	200~21.2	13/~25.0	37.8			03~28.2	45.1				ividI5.	0.1
	Mer.p	ass. 05:41	ν -0.7′ d-0).6′ m-3.89	ν 1.5′ d0.	5′ m0.32	ν 2.4′ d0.	0′ m-2.10	ν 2.2′ d0	.1′ m0.31			

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.8	N23°24.4	30°30.7	4.3'	\$23°38.7	3.8'	59.6'
1 2	194°23.7 209°23.6	24.3 24.3	44°54.0 59°17.3	4.3' 4.3'	23°42.6 23°46.3	3.7' 3.5'	59.6' 59.6'
3	224°23.4	24.2	73°40.6	4.2'	23°49.8	3.3'	59.5'
4	239°23.3	24.2	88°03.8	4.2'	$23^{\circ}53.1$	3.2'	59.5'
5	254°23.2	24.1	102°27.1 116°50.3	4.2'	23°56.3 523°59.3	3.0'	59.5'
6 7	269°23.0 284°22.9	N23°24.0 24.0	116 50.3 131°13.5	4.2' 4.2'	523°59.3 24°02.1	2.8' 2.7'	59.5' 59.5'
8	299°22.8	23.9	145°36.6	4.2'	24°04.8	2.5'	59.5'
9	314°22.6	• • 23.9	159°59.8	4.2'	24°07.3	2.3'	59.5'
10 11	329°22.5 344°22.4	23.8 23.8	174°23.0 188°46.1	4.1' 4.1'	24°09.6 24°11.8	2.2' 2.0'	59.5' 59.4'
12	359°22.2	N23° 23.7	203°09.2	4.1	\$24°13.8	1.8'	59.4
13	14°22.1	23.6	$217^{\circ}32.4$	4.1'	$24^{\circ}15.6$	1.7'	59.4'
14 15	29°22.0 44°21.8	23.6 •• 23.5	231°55.5 246°18.7	4.1' 4.1'	24°17.3 24°18.8	1.5' 1.3'	59.4' 59.4'
16	59°21.7	23.5	240 16.7 260°41.8	4.1'	24 10.0 24°20.1	1.1'	59.4'
17	74°21.6	23.4	275°04.9	4.2'	24°21.2	1.0'	59.4'
18	89°21.4	N23°23.3	289°28.1	4.2'	\$24°22.2	0.8'	59.3'
19 20	104°21.3 119°21.2	23.3 23.2	303°51.3 318°14.4	4.2' 4.2'	24°23.0 24°23.7	0.6' 0.5'	59.3' 59.3'
21	134°21.0	23.1	332°37.6	4.2'	24°24.1	0.3	59.3'
22	149°20.9	23.1	347°00.8	4.2'	24° 24.4	0.1'	59.3'
23	164°20.8	23.0	1°24.0	4.2'	24°24.6	-0.0'	59.3'
	SD = 15.7'	d = -0.1'		SI	O = 16.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°20.6	N23°22.9	15°47.3	4.3'	S24°24.5	-0.2'	59.2'
1	194°20.5	22.9	30°10.6	4.3'	24°24.3	-0.4'	59.2'
2	209°20.4 224°20.3	22.8 · · 22.7	44°33.8 58°57.2	4.3' 4.3'	24°24.0 24°23.4	-0.5' -0.7'	59.2' 59.2'
4	239°20.1	22.7	73°20.5	4.4'	24°22.7	-0.9	59.2'
5	254°20.0	22.6	87°43.9	4.4'	24°21.8	-1.0'	59.2'
6 7	269°19.9 284°19.7	N23°22.5 22.5	102°07.3 116°30.8	4.4' 4.5'	\$24°20.8 24°19.6	-1.2' -1.4'	59.1' 59.1'
8	299°19.6	22.3	130°54.2	4.5	24°18.2	-1.4 -1.5'	59.1
9	314°19.5	• • 22.3	145°17.8	4.6'	$24^{\circ}16.7$	-1.7'	59.1'
10	329°19.3 344°19.2	22.2 22.2	159°41.3 174°04.9	4.6' 4.7'	24°15.0 24°13.1	-1.9' -2.0'	59.1'
11 12	344 19.2 359°19.1	N23°22.1	174 04.9 188°28.6	4.7'	24 13.1 S24°11.1	-2.0'	59.0' 59.0'
13	14°18.9	22.0	202°52.3	4.8'	24°08.9	-2.3	59.0'
14	29°18.8	21.9	217°16.1	4.8'	24°06.6	-2.5'	59.0'
15 16	44°18.7 59°18.5	· · 21.9 21.8	231°39.9 246°03.7	4.9' 4.9'	24°04.1 24°01.4	-2.7' -2.8'	59.0' 58.9'
17	74°18.4	21.7	260°27.7	5.0'	23°58.6	-3.0'	58.9'
18	89°18.3	N23°21.6	274°51.6	5.0'	\$23°55.6	-3.1'	58.9'
19 20	104°18.2 119°18.0	21.5 21.5	289°15.7 303°39.8	5.1' 5.2'	23°52.5 23°49.2	-3.3' -3.5'	58.9' 58.8'
21	134°17.9	21.3	318°03.9	5.2'	23°45.7	-3.6'	58.8'
22	149°17.8	21.3	$332^{\circ}28.1$	5.3'	$23^{\circ}42.1$	-3.8'	58.8'
23	164°17.6	21.2	346°52.4	5.4'	23°38.3	-3.9'	58.8'
	SD = 15.7'	d = -0.1'		SI	0 = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.5	N23°21.1	1°16.8	5.4'	\$23°34.4	-4.1'	58.8'
1 2	194°17.4 209°17.2	21.0 21.0	15°41.2 30°05.7	5.5' 5.6'	23°30.3 23°26.1	-4.2' -4.4'	58.7' 58.7'
3	224°17.1	20.9	44°30.3	5.6'	23°21.8	-4.5'	58.7
4	239°17.0	20.8	58°54.9	5.7'	23°17.3	-4.7'	58.7'
5 6	254°16.9 269°16.7	20.7 N23° 20.6	73°19.6 87°44.4	5.8' 5.9'	23°12.6 \$23°07.8	-4.8' -5.0'	58.6' 58.6'
7	284°16.6	20.5	102°09.3	6.0'	23°02.8	-5.1'	58.6
8	299°16.5	20.4	116°34.3	6.0'	22°57.7	-5.2'	58.6'
9 10	314°16.3 329°16.2	· · 20.3 20.2	130°59.3 145°24.4	6.1' 6.2'	22°52.5 22°47.1	-5.4' -5.5'	58.5' 58.5'
11	344°16.1	20.2	145 24.4 159°49.6	6.3	22°41.6	-5.7'	58.5
12	359°15.9	N23°20.1	174°14.9	6.4'	S22°36.0	-5.8'	58.4'
13 14	14°15.8 29°15.7	20.0 19.9	188°40.3 203°05.7	6.5' 6.5'	22°30.2 22°24.2	-5.9' -6.1'	58.4' 58.4'
14 15	29°15.7 44°15.6	19.9	203°05.7 217°31.3	6.6'	22° 24.2 22° 18.2	-6.1'	58.4' 58.4'
16	59°15.4	19.7	231°56.9	6.7'	$22^{\circ}12.0$	-6.3'	58.3'
17	74°15.3	19.6	246°22.6	6.8'	22°05.7	-6.5'	58.3'
18 19	89°15.2 104°15.0	N23° 19.5 19.4	260°48.4 275°14.3	6.9' 7.0'	\$21°59.2 21°52.6	-6.6' -6.7'	58.3' 58.3'
20	119°14.9	19.4	289°40.3	7.1	21°45.9	-6.8'	58.2'
21	134°14.8	• • 19.2	304°06.4	7.2'	21°39.1	-7.0'	58.2'
22 23	149°14.7 164°14.5	19.1 19.0	318°32.6 332°58.9	7.3' 7.4'	21°32.1 21°25.0	-7.1' -7.2'	58.2' 58.1'
23	SD = 15.7'	d = -0.1'	- 552 50.9		O = 16.0'	1.4	50.1
	<u> </u>	<u>u – -0.1</u>		اد	_ 10.0		

			2029	June 2	T LU JU	n. 26 l
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Tw i	ilight Naut.
N 72°						
N 70° 68°						
66°						
64°			01:33	22:31	////	
62°	////	////	01:33	21:54	////	////
60°	1111	00:52	02:11	21:34	23:12	////
N 58°						
1N 58 56°		01:42 02:12	02:58 03:15	21:07 20:51	22:23	//// ////
54°	00:48	02:12	03:15	20:31	21:53 21:31	23:16
52°	01:34	02:52	03:41	20:30	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	04:00	04:33	19:33	20:06	20:47
35°	03:41	04:00	04:33	19:33	19:48	20:47
30°	04:00	04:18	05:01	19:15	19:48	20:24
20°	04:29	04:58	05:23	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:37	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	05:54	06:35	17:49	17:55	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:06
35°	06:09	06:40	07:09	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:22	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:48	15:17	16:09	17:02
S 60°	07:11	80:80	09:06	15:00	15:57	16:54
Lat.		Moonris	e		Moonse	t
	Sun	Mon	Tue	Sun	Mon	Tue
N 72° N 70°					_	
68°			23:56			
66°		23:19	22:58			00:36
64°	21:29	22:10	22:24		00:19	01:45
62°	20:46	21:35	21:59	00:14	01:02	02:20
60°	20:17	21:09	21:40	00:40	01:31	02:46
N 58°	19:55	20:48	21:23	01:00	01:53	03:06
56°	19:37	20:40	21:09	01:00	01:33	03:00
54°	19:21	20:17	20:57	01:31	02:27	03:37
52°	19:08	20:04	20:47	01:44	02:40	03:49
50°	18:56	19:53	20:37	01:55	02:52	04:00
45°	18:32	19:30	20:17	02:18	03:16	04:22
N 40°	18:13	19:11	20:00	02:36	03:35	04:41
35°	17:57	18:56	19:47	02:52	03:51	04:56
30°	17:43	18:42	19:34	03:06	04:05	05:09
20°	17:19	18:19	19:14	03:29	04:29	05:31
N 10°	16:59	17:59	18:56	03:49	04:50	05:51
0°	16:40	17:40	18:39	04:07	05:09	06:09
S 10°	16:20	17:22	18:22	04:26	05:28	06:27
20°	16:00	17:02	18:04	04:46	05:48	06:46
30°	15:37	16:39	17:43	05:09	06:12	07:08
35°	15:23	16:25	17:31	05:23	06:26	07:21
40°	15:07	16:09	17:16	05:38	06:41	07:35
45°	14.48	15.50	17:00	05.57	07:00	07.53

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
Duy	00 ^h	12 ^h	Pass	Upper	Lower	12-14		
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	94-100%		
24	02:25	02:31	12:03	22:54	10:23			
25	02:37	02:44	12:03	23:55	11:25			
26	02:50	02:56	12:03	-:-	12:24			

17:00

16:39

16:29

16:18

16:05

15:50

05:57

06:20

06:32

06:44

06:59

07:16

07:00

07:24

07:35

07:48

08:03

08:20

07:53

08:14

08:25

08:36

08:49

09:04

15:50

15:27

15:16

15:03

14:48

14:31

45°

52° 54°

56°

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

14:48

14:24

14:13

14:00

13:45

13:28

June 27, 28, 29 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
o 0	275°23.7	152°24.3	N21° 37.2	87°49.0	503°14.1	78°30.6	S05°45.2	226°19.3	N15°55.3			
1	290°26.1	167°23.6	36.5	102°50.5	14.6	93°33.0	45.2	241°21.5	55.4	Alpheratz	357°30.9	29°15.2
2	305°28.6	182°22.8	35.9	102 50.5 117°52.0	15.0	108°35.3	45.2	256°23.7	55.5	Ankaa	353°03.7	-42°08.4
3	320°31.1	197°22.1	• • 35.3	132°53.4	• • 15.5	123°37.7	. 45.3	271°25.9	55.5	Schedar	349°26.7	56°41.8
4	335°33.5	212°21.4	34.7	147°54.9	16.0	138°40.1	45.3	286°28.1	55.6	Diphda	348°43.7	-17°49.3
5	350°36.0	227°20.7	34.0	162°56.4	16.5	153°42.5	45.4	301°30.3	55.7	Achernar	335°17.9	-57°04.9
6	5°38.5	242° 19.9	N21°33.4	177°57.9	S03°17.0	168°44.9	S05°45.4	316°32.5	N15°55.7	Hamal	327°47.2	23°36.0
7	20°40.9	257° 19.2	32.8	192°59.3	17.5	183°47.2	45.5	331°34.7	55.8	Polaris	312°21.7	89°22.9
8	35°43.4	272° 18.5	32.1	208°00.8	18.0	198°49.6	45.5	346°36.9	55.9	Acamar	315°09.4	-40°11.0
9	50°45.8	$287^{\circ}17.8$	• • 31.5	223°02.3	• • 18.4	213°52.0	• • 45.6	1°39.1	• • 55.9	Menkar	314°02.6	4°12.3
10	65°48.3	$302^{\circ}17.1$	30.9	238°03.7	18.9	228°54.4	45.6	16°41.3	56.0	Mirfak	308°23.3	49°57.7 16°34.0
11	80°50.8	$317^{\circ}16.3$	30.2	253°05.2	19.4	243°56.7	45.7	31°43.5	56.0	Aldebaran	290°35.8 281°00.7	-8°10.1
12	95°53.2	332° 15.6	N21°29.6	268°06.7	S03°19.9	258°59.1	S05°45.7	46°45.7	N15°56.1	Rigel Capella	281 00.7 280°17.0	-8 10.1 46°01.4
13	110°55.7	$347^{\circ}14.9$	29.0	283°08.2	20.4	274°01.5	45.8	61°47.9	56.2	Bellatrix	278°19.3	6°22.5
14	125°58.2	2°14.2	28.3	298°09.6	20.9	289°03.9	45.8	76°50.1	56.2	Elnath	277°57.7	28°37.8
15	141°00.6	17° 13.5	• • 27.7	313°11.1	• • 21.4	304°06.2	• • 45.9	91°52.3	• • 56.3	Alnilam	275°34.4	-1°11.1
16	156°03.1	32° 12.8	27.1	328°12.6	21.8	319°08.6	45.9	106°54.5	56.4	Betelgeuse	270°48.5	7°24.6
17	171°05.6	47° 12.0	26.4	343°14.0	22.3	334°11.0	46.0	121°56.7	56.4	Canopus	263°51.3	-52°42.8
18	186°08.0	62°11.3	N21°25.8	358°15.5	S03°22.8	349°13.4	S05°46.0	136°58.9	N15°56.5	Sirius	258°23.4	-16°45.5
19	201°10.5	77°10.6	25.1	13°17.0	23.3	4°15.7	46.1	152°01.1	56.5	Adhara	255°03.4	-29°00.9
20	216°12.9	92°09.9	24.5	28°18.4	23.8	19°18.1	46.1	167°03.3	56.6	Procyon	244°47.4	5°08.8
21	231°15.4	107°09.2	• • 23.8	43°19.9	• • 24.3	34°20.5	• • 46.2	182°05.5	56.7	Pollux	243°13.3	27°57.2
22 23	246°17.9 261°20.3	122°08.5 137°07.8	23.2 22.5	58°21.3 73°22.8	24.8 25.3	49°22.9 64°25.2	46.2 46.3	197°07.7 212°09.9	56.7 56.8	Avior	$234^{\circ}13.7$	-59°36.5
										Suhail	222°43.9	-43°33.4
Mer.p	ass. 05:37	ν -0.7 $'$ d-0).6′ m-3.89	u 1.5' d0	.5' m0.33	ν 2.4′ d0.	0′ m-2.10	ν 2.2 $^{\prime}$ d0	.1' m 0.31	Miaplacidus	221°38.0	-69°50.6
										Alphard	217°44.4	-8°47.4
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	276°22.8	152°07.0	N21°21.9	88°24.3	S03°25.8	79°27.6	S05°46.3	227°12.1	N15°56.9	Dubhe	193°37.1	61°35.7
1	291°25.3	167°06.3	21.3	103°25.7	26.2	94°30.0	46.4	242°14.3	56.9	Denebola	182°21.4	14°24.4
2	306°27.7	182°05.6	20.6	118°27.2	26.7	109°32.3	46.4	257°16.6	57.0	Gienah	175°39.8	-17°42.5
3	321°30.2	197°04.9	20.0	133°28.7	• • 27.2	124°34.7	46.5	272°18.8	• • 57.0	Acrux	172°55.8	-63°16.1
4	336°32.7	212°04.2	19.3	148°30.1	27.7	139°37.1	46.5	287°21.0	57.1	!	171°47.4	-57°17.1
5	351°35.1	227°03.5	18.6	163°31.6	28.2	154°39.5	46.6	302°23.2	57.2	Alioth	166°09.9 158°18.4	55°48.2 -11°19.0
6	6°37.6	242°02.8	N21° 18.0	178°33.0	S03°28.7	169°41.8	S05°46.6	317°25.4	N15°57.2	Spica Alkaid	150 10.4 152°49.1	49°10.2
7	21°40.1	$257^{\circ}02.1$	17.3	193°34.5	29.2	184°44.2	46.7	332°27.6	57.3	Hadar	152 49.1 148°30.3	-60°31.2
8	36°42.5	272°01.4	16.7	208°36.0	29.7	199°46.6	46.7	347°29.8	57.3	Menkent	_	-36°31.1
9	51°45.0	287°00.7	• • 16.0	223°37.4	• • 30.2	214°48.9	• • 46.8	2°32.0	• • 57.4	Arcturus	147 33.1 145°44.5	19°01.8
10	66°47.4	301°59.9	15.4	238°38.9	30.6	229°51.3	46.8	17°34.2	57.5	Rigil Kent.	139°34.7	-60°57.7
11	81°49.9	$316^{\circ}59.2$	14.7	253°40.3	31.1	244°53.7	46.9	32°36.4	57.5	Kochab	137°19.5	74°02.3
12	96°52.4	331°58.5	N21°14.0	268°41.8	S03°31.6	259°56.0	S05°46.9	47°38.6	N15°57.6	Zuben'ubi	136°51.8	-16°09.9
13	111°54.8	346° 57.8	13.4	283°43.3	32.1	274°58.4	47.0	62°40.8	57.7	Alphecca	126°00.4	26°37.1
14	126°57.3	1°57.1	12.7	298°44.7	32.6	290°00.8	47.0	77°43.0	57.7	Antares	112°11.0	-26°29.8
15	141°59.8	16° 56.4	• • 12.1	313°46.2	• • 33.1	305°03.1	• • 47.1	92°45.2	• • 57.8	Atria	107°01.4	-69°04.8
16	157°02.2	31°55.7	11.4	328°47.6	33.6	320°05.5	47.1	107°47.4	57.8	Sabik	101°58.3	-15°45.6
17	172°04.7	46°55.0	10.7	343°49.1	34.1	335°07.9	47.2	122°49.6	57.9	Shaula	96°05.0	-37°07.4
18	187°07.2	61°54.3	N21°10.1	358°50.5	\$03°34.6	350°10.2	S05°47.2	137°51.8	N15°58.0	Rasalhague	95°54.9	12°32.5
19	202°09.6 217°12.1	76°53.6	09.4	13°52.0	35.1	5°12.6	47.3	152°54.1	58.0	Eltanin	90°40.0	51°29.2
20 21	217 12.1 232°14.6	91°52.9 106°52.2	08.7 •• 08.1	28°53.4 43°54.9	35.6 •• 36.0	20°15.0 35°17.3	47.3 •• 47.4	167°56.3 182°58.5	58.1 •• 58.1	Kaus Aust.	83°27.3	-34°22.0
22	247°17.0	100 52.2 121°51.5	07.4	58°56.3	36.5	50°19.7	47.4	198°00.7	58.2	Vega	80°30.3	38°48.8
23	262°19.5	136° 50.8	06.7	73°57.8	37.0	65°22.1	47.5	213°02.9	58.3	Nunki	75°42.9	-26°15.4
										Altair	61°56.1	8°56.9
Mer.p	ass. 05:34	ν -0.7′ d-0).6′ m-3.89	$\nu 1.5' \ d0$.5' m0.34	ν 2.4′ d0.	0′ m-2.09	$\nu 2.2' \ d0$	$.1^\prime$ m 0.31	Peacock	52°59.7	-56°38.0
										Deneb	49°22.9	45°23.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.0	10°00.8
0	277°21.9	151° 50.1	N21°06.0	88°59.2		80°24.4	S05°47.5		N15°58.3	Al Na'ir Fomalhaut	27°28.2 15°10.5	-46°48.7 -29°27.6
1	292°24.4	166°49.4	05.4	104°00.7	38.0	95°26.8	47.6	243°07.3	58.4	Scheat	13°41.5	-29°27.0 28°14.6
2	$307^{\circ}26.9$	181°48.7	04.7	$119^{\circ}02.1$	38.5	110°29.2	47.7	258°09.5	58.5	Markab	13°26.1	15°21.9
3	322°29.3	196°48.0	• • 04.0	$134^{\circ}03.6$	• • 39.0	125°31.5	• • 47.7	$273^{\circ}11.7$	• • 58.5			
4	337°31.8	211°47.3	03.3	$149^{\circ}05.0$	39.5	140°33.9	47.8	$288^{\circ}13.9$	58.6	Jun 27 Wed	SHA	Mer.pass
5	352°34.3	226° 46.6	02.7	164°06.5	40.0	155°36.3	47.8	303°16.1	58.6		237°00.6	13:51
6	7°36.7	241°45.9	N21°02.0	179°07.9	S 03°40.5	170°38.6	S05°47.9	318°18.3	N15°58.7	1	172°25.4	18:07
7	22°39.2	256°45.2	01.3	194°09.4	41.0	185°41.0	47.9	333°20.5	58.8		163°06.9	18:43
8	37°41.7	271°44.5	00.6	209°10.8	41.5	200°43.4	48.0	348°22.7	58.8	Saturn	310°55.6	08:53
9	52°44.1	286° 43.8	21°00.0	224°12.3	• • 42.0	215°45.7	• • 48.0	3°25.0	• • 58.9	Jun 28 Thu	SHA	Mer.pass
10	67°46.6	301°43.1	20°59.3	239°13.7	42.5	230°48.1	48.1	18°27.2	58.9	1	235°44.2	13:52
11	82°49.1	316° 42.4	58.6	254°15.2	42.9	245°50.4	48.1	33°29.4	59.0	I	172°01.5	18:05
12	97°51.5	331°41.7	N20°57.9	269°16.6	\$03°43.4	260°52.8	\$05°48.2		N15°59.1		163°04.8	18:39
13 14	112°54.0 127°56.4	346°41.1 1°40.4	57.2 56.5	284°18.1 299°19.5	43.9 44.4	275°55.2 290°57.5	48.2 48.3	63°33.8 78°36.0	59.1 59.2	Saturn	310°49.3	08:50
14 15	127 56.4 142°58.9	1 40.4 16°39.7	55.8	299 19.5 314°21.0	• • 44.9	290 57.5 305°59.9	48.3	93°38.2	59.2	I 00 E :	CIIA	N4::::-
16	142 56.9 158°01.4	31°39.0	55.2	314 21.0 329°22.4	45.4	305 59.9 321°02.2	48.4	93 36.2 108°40.4	59.3	Jun 29 Fri	SHA	Mer.pass
17	173°03.8	46°38.3	55.2 54.5	344°23.9	45.4 45.9	336°04.6	48.5	100 40.4 123°42.6	59.5 59.4	1	234°28.2 171°37.3	13:53
18	188°06.3	61°37.6	N20° 53.8	359°25.3	\$03°46.4	351°07.0	S05°48.5		N15°59.4		171°37.3 163°02.5	18:02 18:35
19	203°08.8	76°36.9	53.1	14°26.7	46.9	6°09.3	48.6	153°47.0	59.5		310°43.1	08:46
20	218°11.2	91°36.2	52.4	29°28.2	47.4	21°11.7	48.6	168°49.2	59.6	Jaturn	J1U 4J.1	00.40
21	233°13.7	106°35.5	• • 51.7	44°29.6	• • 47.9	36°14.0	• • 48.7	183°51.5	• • 59.6	Horizont	al parallax	
22	248°16.2	121°34.8	51.0	59°31.1	48.4	51°16.4	48.7	198°53.7	59.7		Venus:	0.1
23	263°18.6	136°34.2	50.3	74°32.5	48.9	66°18.8	48.8	213°55.9	59.7		Mars:	0.1
N/a===	ass. 05:30).7′ m-3.89		.5′ m0.36		1′ m-2.08		.1′ m0.31			
ivier.p	ass. UU.SU	ν-0.1 α-0	7.1 111-3.09	ν1.5 α0	.5 1110.30	ν2.4 UU.	111-2.00	ν2.2 d0	.1 1110.31			

-	011-010 =	T0.1370 Sec			— +09.02						
h	Su	n			Moon						
Wed	GHA	Dec N23°18.9	GHA	ν	Dec	d 7.2'	HP				
0 1	179° 14.4 194° 14.3	N23 18.9 18.8	347°25.2 1°51.7	7.5' 7.6'	\$21°17.8 21°10.5	-7.3' -7.4'	58.1' 58.1'				
2	209° 14.1	18.7	16°18.3	7.7'	21°03.0	-7.6'	58.1				
3	224°14.0	• • 18.6	30°44.9	7.8'	20°55.5	-7.7'	58.0'				
4	239° 13.9	18.5	45°11.7	7.9'	20°47.8	-7.8'	58.0'				
5	254° 13.8	18.4	59°38.6	8.0'	20°40.0	-7.9'	58.0'				
6 7	269°13.6 284°13.5	N23°18.3 18.2	74°05.5 88°32.6	8.1' 8.2'	\$20°32.1 20°24.0	-8.0' -8.1'	57.9' 57.9'				
8	299° 13.4	18.1	102°59.7	8.3	20° 24.0	-8.2'	57.9'				
9	314° 13.2	• • 18.0	117°27.0	8.4'	20°07.7	-8.3'	57.9'				
10	329° 13.1	17.8	131°54.3	8.5'	19°59.3	-8.5'	57.8'				
11	344° 13.0 359° 12.9	17.7	146°21.8	8.6'	19°50.9 \$19°42.3	-8.6'	57.8' 57.8'				
12 13	359°12.9 14°12.7	N23°17.6 17.5	160°49.3 175°17.0	8.7' 8.8'	19° 33.6	-8.7' -8.8'	57.8° 57.7'				
14	29°12.6	17.4	189°44.8	8.9'	19°24.9	-8.9'	57.7'				
15	44°12.5	• • 17.3	204°12.6	9.0'	19°16.0	-9.0'	57.7'				
16	59°12.3	17.2	218°40.6	9.1'	19°07.1	-9.1'	57.6'				
17 18	74° 12.2 89° 12.1	17.1 N23°17.0	233°08.6 247°36.8	9.2' 9.3'	18°58.0 \$18°48.8	-9.2' -9.2'	57.6' 57.6'				
19	104° 12.1	16.8	247 30.8 262°05.0	9.3 9.4'	18°39.6	-9.2 -9.3'	57.6'				
20	119° 11.8	16.7	276°33.4	9.5'	18° 30.3	-9.4'	57.5'				
21	134°11.7	• • 16.6	291°01.9	9.6'	18°20.8	-9.5'	57.5'				
22	149°11.6	16.5	305°30.4	9.7'	18°11.3	-9.6'	57.5'				
23	164°11.5	16.4	319°59.1	9.8'	18°01.7	-9.7'	57.4'				
	SD = 15.7'	d = -0.1'		SI	O = 15.9'						
Thu	GHA	Dec	GHA	ν	Dec	d	HP				
0	179°11.3	N23°16.3	334°27.8	9.9'	S 17°52.0	-9.8'	57.4'				
1	194°11.2	16.1	348°56.7	10.0'	17°42.2	-9.9'	57.4'				
2	209°11.1	16.0	3°25.7	10.1'	17°32.3	-9.9'	57.3'				
3 4	224° 10.9 239° 10.8	· · 15.9 15.8	17°54.7 32°23.9	10.2' 10.3'	17°22.4 17°12.4	-10.0' -10.1'	57.3' 57.3'				
5	254°10.7	15.7	46°53.1	10.3	17° 12.4	-10.1 -10.2'	57.3'				
6	269° 10.6	N23°15.5	61°22.5	10.5'	S16°52.1	-10.3'	57.2'				
7	284° 10.4	15.4	75°51.9	10.5'	16°41.8	-10.3'	57.2'				
8	299° 10.3	15.3	90°21.5 104°51.1	10.6'	16°31.5	-10.4'	57.1				
9 10	314° 10.2 329° 10.1	· · 15.2 15.0	104°51.1 119°20.9	10.7' 10.8'	16°21.1 16°10.6	-10.5' -10.6'	57.1' 57.1'				
11	344°09.9	14.9	133°50.7	10.0	16°00.0	-10.6'	57.1'				
12	359°09.8	N23°14.8	148°20.6	11.0'	S15°49.4	-10.7'	57.0'				
13	14°09.7	14.7	162°50.7	11.1'	15°38.7	-10.8'	57.0'				
14	29°09.6	14.5	177°20.8 191°51.0	11.2'	15°28.0 15°17.1	-10.8'	57.0'				
15 16	44°09.4 59°09.3	· · 14.4 14.3	191°51.0 206°21.3	11.3' 11.4'	15°17.1 15°06.3	-10.9' -10.9'	56.9' 56.9'				
17	74°09.2	14.1	220°51.7	11.5'	14°55.3	-11.0'	56.9'				
18	89°09.1	N23°14.0	235°22.2	11.6'	S 14°44.3	-11.1'	56.8'				
19	104°08.9	13.9	249°52.8		14°33.2		56.8'				
20 21	119°08.8 134°08.7	13.7 · · 13.6	264°23.5 278°54.2	11.8' 11.9'	14°22.1 14°10.9	-11.2' -11.2'	56.8' 56.7'				
22	149° 08.6	13.5	276 34.2 293°25.1	11.9'	14 10.9 13°59.7	-11.2	56.7'				
23	164°08.4	13.3	307°56.0	12.0'	13°48.4	-11.4'	56.7'				
	SD = 15.7'	d = -0.1'		SI	D = 15.7'						
		_			_						
Fri	GHA 179°08.3	Dec N23°13.2	GHA 322°27.1	u 12.1'	Dec \$13° 37.0	d -11.4'	HP 56.7'				
0 1	179°08.3 194°08.2	N23 13.2 13.1	322°27.1 336°58.2	12.1	13°25.6	-11.4 -11.5'	56.6'				
2	209°08.1	12.9	351°29.4	12.3'	13° 14.2	-11.5'	56.6'				
3	224°07.9	• • 12.8	6°00.7	12.4'	13°02.7	-11.6'	56.6'				
4	239° 07.8 254° 07.7	12.7	20°32.1	12.5'	12°51.1 12°39.5	-11.6'	56.5'				
5 6	254°07.7 269°07.6	12.5 N23°12.4	35°03.5 49°35.1	12.5' 12.6'	12°39.5 \$12°27.9	-11.6' -11.7'	56.5' 56.5'				
7	284° 07.4	12.2	64°06.7	12.7'	12°16.2	-11.7'	56.4				
8	299°07.3	12.1	78°38.4	12.8'	12°04.4	-11.8'	56.4'				
9	314°07.2	• • 12.0	93°10.2	12.9'	11°52.7	-11.8'	56.4'				
10	329°07.1 344°06.9	11.8	107°42.0 122°14.0	12.9'	11°40.8 11°29.0	-11.9'	56.3'				
11 12	344°06.9 359°06.8	11.7 N23°11.5	122°14.0 136°46.0	13.0' 13.1'	\$11°29.0 \$11°17.1	-11.9' -11.9'	56.3' 56.3'				
13	14° 06.7	11.4	151°18.1	13.1	11°05.1	-12.0'	56.3'				
14	29°06.6	11.2	165°50.3	13.2'	10°53.2	-12.0'	56.2'				
15	44°06.4	• • 11.1	180°22.5	13.3'	10°41.2	-12.0'	56.2'				
16 17	59°06.3 74°06.2	10.9 10.8	194°54.8 209°27.2	13.4' 13.5'	10°29.1 10°17.0	-12.1' -12.1'	56.2' 56.1'				
18	89°06.1	N23°10.7	209 27.2 223°59.7	13.5'	510°04.9	-12.1'	56.1				
19	104° 05.9	10.5	238°32.2	13.6'	09°52.8	-12.2'	56.1				
20	119°05.8	10.4	253°04.9	13.7'	09°40.6	-12.2'	56.0'				
21	134°05.7	• • 10.2	267°37.5	13.7'	09°28.4	-12.2'	56.0'				
22 23	149°05.6 164°05.5	10.1 09.9	282°10.3 296°43.1	13.8' 13.9'	09°16.2 09°03.9	-12.3' -12.3'	56.0' 56.0'				
23			230 43.1			-12.3	50.0				
	SD = 15.7'	d = -0.1'		SI	O = 15.5'						

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
5	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-91%	
27	03:02	03:09	12:03	00:52	13:20		
28	03:15	03:21	12:03	01:46	14:11		
29	03:27	03:33	12:04	02:35	14:58		

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	turn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	278°21.1	151°33.5	N20°49.6	89°33.9	S03°49.4	81°21.1	S05°48.8	228°58.1	N15°59.8			
1	293°23.5	166°32.8	48.9	104°35.4	49.9	96°23.5	48.9	244°00.3	59.9	Alpheratz	357°30.9	29°15.2
2	308°26.0	181°32.1	48.2	119°36.8	50.4	111°25.8	48.9	259°02.5	15°59.9	Ankaa	353°03.7	-42°08.4
3	323°28.5	196°31.4	• • 47.5	134°38.3	• • 50.9	126°28.2	• • 49.0	274°04.7	16°00.0	Schedar	349°26.7	56°41.8
4	338°30.9	211°30.7	46.8	149°39.7	51.4	141°30.6	49.1	289°06.9	00.0	Diphda	348°43.7	-17°49.3
5	353°33.4	226°30.0	46.1	164°41.1	51.9	156°32.9	49.1	304°09.1	00.1	Achernar	335°17.8	-57°04.9
6	8°35.9	241°29.4	N20°45.4	179°42.6	S03°52.4	171°35.3	S05°49.2	319°11.3	N16°00.2	Hamal	327°47.2	23°36.0
7	23°38.3	256°28.7	44.7	194°44.0	52.9	186°37.6	49.2	334°13.5	00.2	Polaris	312°20.5	89°22.9
8	38°40.8	271°28.0	44.0	209°45.4	53.3	201°40.0	49.3	349°15.8	00.3	Acamar	315°09.4	-40°11.0
9	53°43.3	286°27.3	• • 43.3	224°46.9	• • 53.8	216°42.3	• • 49.3	4°18.0	• • 00.3	Menkar	314°02.6	4°12.3
10	68°45.7	301°26.6	42.6	239°48.3	54.3	231°44.7	49.4	19°20.2	00.4	Mirfak	308°23.3	49°57.7
11	83°48.2	316°26.0	41.9	254°49.8	54.8	246°47.1	49.4	34°22.4	00.5	Aldebaran	290°35.7	16°34.0
12	98°50.7	331°25.3	N20°41.2	269°51.2	S03°55.3	261°49.4	S05°49.5	49°24.6	N16°00.5	Rigel	281°00.7	-8°10.1
13	113°53.1	346°24.6	40.5	284°52.6	55.8	276°51.8	49.6	64°26.8	00.6	Capella	280°17.0	46°01.4
14	128°55.6	1°23.9	39.8	299°54.1	56.3	291°54.1	49.6	79°29.0	00.6	Bellatrix	278°19.3	6°22.5
15	143°58.0	16°23.2	• • 39.0	314°55.5	• • 56.8	306°56.5	• • 49.7	94°31.2	• • 00.7	Elnath	277°57.6	28°37.8
16	159°00.5	31°22.6	38.3	329°56.9	57.3	321°58.8	49.7	109°33.4	8.00	Alnilam	275°34.4	-1°11.1
17	174°03.0	46°21.9	37.6	344°58.3	57.8	337°01.2	49.8	124°35.7	8.00	Betelgeuse	270°48.5	7°24.6
18	189°05.4	61°21.2	N20°36.9	359°59.8	S03°58.3	352°03.5	S05°49.8	139°37.9	N16°00.9	Canopus	263°51.3	-52°42.8 -16°45.5
19	204°07.9	76°20.5	36.2	15°01.2	58.8	7°05.9	49.9	154°40.1	00.9	Sirius	258°23.4	-10 45.5 -29°00.9
20	219°10.4	91°19.8	35.5	30°02.6	59.3	22°08.2	50.0	169°42.3	01.0	Adhara	255°03.4	
21	234°12.8	$106^{\circ}19.2$	• • 34.8	45°04.1	$03^{\circ}59.8$	$37^{\circ}10.6$	• • 50.0	184°44.5	•• 01.1	Procyon	244°47.4	5°08.8
22	$249^{\circ}15.3$	121°18.5	34.0	$60^{\circ}05.5$	$04^{\circ}00.3$	52°13.0	50.1	199°46.7	01.1	Pollux	243°13.3	27°57.2
23	264°17.8	136° 17.8	33.3	75°06.9	8.00	$67^{\circ}15.3$	50.1	214°48.9	01.2	Avior	234°13.7 222°43.9	-59°36.5 -43°33.4
N/a= -	DE: 05:26	1,07/10	0.7′ m-3.89	,,1 1/ 10	.5′ m0.37	1/2 1/ 10	1′ m-2.07	1/2 2/ 40	.1′ m0.31	Suhail Miaplacidus	222°43.9 221°38.0	-43° 33.4 -69° 50.6
ivier.p	ass. 05:26	ν -0.1 a-0	v./ IN-3.89	ν1.4 aU	.5.UNI C.	ν2.4 a0.	1 111-2.07	ν2.2 d0	.1 1110.31	Miaplacidus	221°38.0 217°44.4	-69°50.6 -8°47.4
											217 44.4 207°30.8	-6 47.4 11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207 30.8 193°37.1	61°35.6
0	279°20.2	151° 17.2	N20°32.6	90°08.4	S04°01.3	82°17.7	S05°50.2	229°51.1	$N16^{\circ}01.2$	Dubne	193°37.1 182°21.4	14°24.4
1	294°22.7	$166^{\circ}16.5$	31.9	$105^{\circ}09.8$	01.8	97°20.0	50.2	244°53.3	01.3	Gienah	182 21.4 175°39.8	-17°42.5
2	$309^{\circ}25.2$	181°15.8	31.2	$120^{\circ}11.2$	02.3	112°22.4	50.3	259°55.6	01.4	Acrux	175° 39.8 172° 55.8	-17 42.5 -63°16.1
3	324°27.6	196° 15.1	• • 30.4	135°12.6	• • 02.8	127°24.7	• • 50.4	274°57.8	• • 01.4	Gacrux		-03 10.1 -57°17.1
4	339°30.1	211° 14.5	29.7	$150^{\circ}14.1$	03.3	142°27.1	50.4	290°00.0	01.5	Alioth	166°09.9	55°48.2
5	354°32.5	226°13.8	29.0	$165^{\circ}15.5$	03.8	157°29.4	50.5	305°02.2	01.5	Spica	158° 18.4	-11°19.0
6	9°35.0	241°13.1	N20°28.3	180°16.9	S04°04.3	172°31.8	S05°50.5	320°04.4	N16°01.6	Alkaid	150° 10.4° 152° 49.1	49°10.2
7	24°37.5	$256^{\circ}12.5$	27.5	195°18.3	04.8	187°34.1	50.6	335°06.6	01.7	Hadar	148°30.4	-60°31.2
8	39°39.9	271°11.8	26.8	210°19.8	05.3	202°36.5	50.7	350°08.8	01.7	Menkent	147°53.1	-36°31.1
9	54°42.4	$286^{\circ}11.1$	• • 26.1	225°21.2	• • 05.8	217°38.8	• • 50.7	5°11.0	• • 01.8	Arcturus	145°44.5	19°01.8
10	69°44.9	301°10.4	25.3	240°22.6	06.3	232°41.2	50.8	20°13.3	01.8	Rigil Kent.	139°34.8	-60°57.7
11	84°47.3	316°09.8	24.6	255°24.0	06.8	247°43.5	50.8	35°15.5	01.9	Kochab	137°19.5	74°02.3
12	99°49.8	331°09.1	N20°23.9	270°25.5	S04°07.3	262°45.9	\$05°50.9	50°17.7	N16°01.9	Zuben'ubi	136°51.8	-16°09.9
13	114°52.3	346°08.4	23.2	285°26.9	07.8	277°48.2	50.9	$65^{\circ}19.9$	02.0	Alphecca	126°00.4	26°37.1
14	129°54.7	1°07.8	22.4	300°28.3	08.3	292°50.6	51.0	80°22.1	02.1	Antares	112° 11.0	-26°29.8
15	144°57.2	$16^{\circ}07.1$	• • 21.7	$315^{\circ}29.7$	• • 08.8	307°52.9	• • 51.1	95°24.3	•• 02.1	Atria	107°01.4	-69°04.8
16	159°59.6	31°06.5	21.0	330°31.2	09.3	322°55.3	51.1	$110^{\circ}26.5$	02.2	Sabik	101°58.3	-15°45.6
17	175°02.1	46°05.8	20.2	345°32.6	09.8	337°57.6	51.2	125°28.7	02.2	Shaula	96°05.0	-37°07.4
18	190°04.6	$61^{\circ}05.1$	N20°19.5	0°34.0	S04°10.3	352°59.9	S05°51.2	140°31.0	N16°02.3	Rasalhague	95°54.9	12°32.5
19	205°07.0	76°04.5	18.7	15°35.4	10.8	8°02.3	51.3	155°33.2	02.4	Eltanin	90°40.0	51°29.2
20	220°09.5	91°03.8	18.0	30°36.8	11.3	23°04.6	51.4	170°35.4	02.4	Kaus Aust.	83°27.3	-34°22.0
21	235°12.0	106°03.1	• • 17.3	45°38.3	• • 11.8	38°07.0	• • 51.4	185°37.6	• • 02.5	Vega	80°30.3	38°48.8
22	250°14.4	121°02.5	16.5	60°39.7	12.3	53°09.3	51.5	200°39.8	02.5	Nunki	75°42.9	-26°15.4
23	265°16.9	136°01.8	15.8	75°41.1	12.8	68°11.7	51.5	215°42.0	02.6	Altair	61°56.1	8°57.0
Mern	ass. 05:22	₁₁-0 7′ d-0	0.7′ m-3.89	ν1 Λ' dΩ	.5′ m0.38	1/2 A' d0	1′ m-2.07	1/2 2' d0	.1′ m0.31	Peacock	52°59.6	-56°38.0
- IVICI.P	033. 03.22	ν-0.1 α-0	7.7 111-3.09	ν1.4 ασ	.5 1110.50	ν2. 4 ασ.	1 111-2.07	νz.z ασ	.1 1110.51	Deneb	49°22.8	45°23.2
										Enif	33°35.0	10°00.8
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.2	-46°48.7
0	280° 19.4	151°01.2	N20°15.0	90°42.5	S04°13.3	83°14.0	S05°51.6	230°44.2		Fomalhaut	15°10.4	-29°27.6
1	295°21.8	166°00.5	14.3	105°43.9	13.8	98°16.4	51.7	245°46.5	02.7	Scheat	13°41.5	28°14.6
2	310°24.3	180°59.8	13.5	120°45.3	14.3	113°18.7	51.7	260°48.7	02.8	Markab	13°26.1	15°21.9
3	325°26.8	195°59.2	• • 12.8	135°46.8	• • 14.8	128°21.1	• • 51.8	275°50.9	• • 02.8			
4	340°29.2	210°58.5	12.0	150°48.2	15.3	143°23.4	51.8	290°53.1	02.9	Jun 30 Sat	SHA	Mer.pass
5	355°31.7	225°57.9	11.3	165°49.6	15.8	158°25.8	51.9	305°55.3	02.9		233°12.4	13:54
6	10°34.1	240°57.2	N20°10.6	180°51.0	S04°16.4	173°28.1	S05°52.0	320°57.5	N16°03.0		171°12.9	18:00
7	25°36.6	255° 56.5	09.8	195°52.4	16.9	188°30.4	52.0	335°59.7	03.1		163°00.0	18:32
8	40°39.1	270°55.9	09.1	210°53.8	17.4	203°32.8	52.1	351°02.0	03.1	Saturn	310°37.0	08:43
9	55°41.5	285°55.2	• • 08.3	225°55.2	• • 17.9	218°35.1	• • 52.2	6°04.2	• • 03.2	Jul 01 Sun	SHA	Mer.pass
10	70°44.0	300°54.6	07.5	240°56.7	18.4	233°37.5	52.2	21°06.4	03.2		231°56.9	13:55
11	85°46.5	315°53.9	06.8	255°58.1	18.9	248°39.8	52.3	36°08.6	03.3	1	170°48.1	17:58
12	100°48.9	330°53.3	N20°06.0	270°59.5	S04°19.4	263°42.2	S05°52.3	51°10.8	N16°03.4		162°57.4	18:28
13	115°51.4	345°52.6	05.3	286°00.9	19.9	278°44.5	52.4	66°13.0	03.4	Saturn	310°30.9	08:39
14	130°53.9	0°52.0	04.5	301°02.3	20.4	293°46.8	52.5	81°15.2	03.5			
15	145°56.3	15°51.3	• • 03.8	316°03.7	• • 20.9	308°49.2	• • 52.5	96°17.5	• • 03.5	Jul 02 Mon	SHA	Mer.pass
16	160°58.8	30°50.7	03.0	331°05.1	21.4	323°51.5	52.6	111°19.7	03.6	1	230°41.8	13:57
17	176°01.3	45°50.0	02.2	346°06.5	21.9	338°53.9	52.6	126°21.9	03.6	1	170°23.1	17:55
18	191°03.7	60°49.4	N20°01.5	1°07.9	S04°22.4	353°56.2	S05°52.7		N16°03.7		162°54.7	18:24
19	206°06.2	75° 48.7	00.7	16°09.4	22.9	8°58.5	52.8	156°26.3	03.8	Saturn	310°24.9	08:36
20	221°08.6	90°48.1	20°00.0	31°10.8	23.4	24°00.9	52.8	171°28.5	03.8	⊔ a::	al parallar	
21	236°11.1	105° 47.4	19°59.2	46°12.2	• • 23.9	39°03.2	• • 52.9	186°30.8	• • 03.9	Horizont	al parallax Venus:	0.1
22	251°13.6	120°46.8	58.4	61°13.6	24.4	54°05.6	53.0	201°33.0	03.9		venus: Mars:	0.1
23	266°16.0	135°46.1	57.7	76°15.0	24.9	69°07.9	53.0	216°35.2	04.0		ividIS.	0.1
Mer.n	ass. 05:18	ν -0.7' d-0).7′ m-3.89	$\nu 1.4' d0$.5′ m0.39	$\nu 2.3' d0$	1′ m-2.06	$\nu 2.2' d0$.1′ m0.30			
		_				. • .			-			

h	Su	n	Moon					
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°05.3	N23°09.7	311°16.0	13.9'	S08°51.6	-12.3'	55.9'	
1	194°05.2	09.6	325°48.9	14.0'	$08^{\circ}39.3$	-12.3'	55.9'	
2	209°05.1	09.4	340°21.9	14.1'	08°27.0	-12.4'	55.9'	
3	224°05.0	•• 09.3	354°55.0	14.1'	08°14.7	-12.4'	55.8'	
4 5	239°04.8 254°04.7	09.1 09.0	9°28.1 24°01.3	14.2' 14.3'	08°02.3 07°49.9	-12.4' -12.4'	55.8' 55.8'	
6	254 04.7 269°04.6	N23°08.8	24 01.3 38°34.6	14.3	507°37.5	-12.4'	55.8'	
7	284°04.5	08.7	53°07.9	14.4'	07°25.0	-12.5'	55.7'	
8	299°04.4	08.5	67°41.3	14.4'	07°12.6	-12.5'	55.7'	
9	314°04.2	• • 08.3	82°14.7	14.5'	$07^{\circ}00.1$	-12.5'	55.7'	
10	329°04.1	08.2	96°48.2	14.5'	06°47.6	-12.5'	55.7'	
11	344°04.0	08.0 N23°07.9	111°21.8	14.6'	06°35.1	-12.5'	55.6'	
12 13	359°03.9 14°03.7	N23°07.9 07.7	125°55.4 140°29.0	14.7' 14.7'	\$06°22.6 06°10.1	-12.5' -12.5'	55.6' 55.6'	
14	29°03.6	07.7	140 29.0 155°02.7	14.8'	05°57.5	-12.6'	55.5'	
15	44°03.5	07.4	169°36.5	14.8'	05°45.0	-12.6'	55.5'	
16	59°03.4	07.2	184°10.3	14.9'	05°32.4	-12.6'	55.5'	
17	74°03.3	07.1	198°44.2	14.9'	$05^{\circ}19.8$	-12.6'	55.5'	
18	89°03.1	N23°06.9	213°18.1	15.0'	S05°07.2	-12.6'	55.4'	
19	104°03.0 119°02.9	06.7	227°52.0 242°26.0	15.0'	04°54.6 04°42.0	-12.6'	55.4'	
20 21	119°02.9 134°02.8	06.6 •• 06.4	242°26.0 257°00.1	15.0' 15.1'	04°42.0 04°29.4	-12.6' -12.6'	55.4' 55.4'	
22	134 02.8 149°02.7	06.2	257 00.1 271°34.2	15.1	04 29.4 04°16.8	-12.6'	55.3'	
23	164°02.5	06.1	286°08.3	15.2'	04°04.2	-12.6'	55.3'	
	SD = 15.7'	d = -0.2'		ÇI	D = 15.3'			
	<u> </u>	u — -0.2		JL	13.3			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°02.4	N23°05.9	300°42.5	15.2'	S03°51.5	-12.6'	55.3'	
1	194°02.3	05.7	315°16.7	15.3'	03°38.9	-12.6'	55.3'	
2	209°02.2 224°02.1	05.5 •• 05.4	329°50.9 344°25.2	15.3' 15.3'	03°26.3 03°13.6	-12.6' -12.6'	55.2' 55.2'	
3 4	239°01.9	05.2	358°59.6	15.3 15.4'	03°01.0	-12.6'	55.2'	
5	254°01.8	05.0	13°33.9	15.4'	02°48.4	-12.6'	55.2'	
6	269°01.7	N23°04.9	28°08.3	15.4'	S02°35.7	-12.6'	55.2'	
7	284°01.6	04.7	42°42.8	15.5'	$02^{\circ}23.1$	-12.6'	55.1'	
8	299°01.5	04.5	57°17.2	15.5'	02°10.5	-12.6'	55.1'	
9	314°01.3 329°01.2	• • 04.3	71°51.7 86°26.3	15.5'	01°57.8 01°45.2	-12.6'	55.1'	
10 11	329°01.2 344°01.1	04.2 04.0	86°26.3 101°00.8	15.6' 15.6'	01°45.2 01°32.6	-12.6' -12.6'	55.1' 55.0'	
12	359°01.0	N23°03.8	101 00.0 115°35.4	15.6'	501°20.0	-12.6'	55.0'	
13	14°00.9	03.6	130°10.1	15.7'	01°07.4	-12.6'	55.0'	
14	29°00.7	03.4	144°44.7	15.7'	00°54.8	-12.6'	55.0'	
15	44°00.6	• • 03.3	159°19.4	15.7'	00°42.2	-12.6'	55.0'	
16	59°00.5 74°00.4	03.1	173°54.1	15.7'	00°29.6	-12.6'	54.9'	
17 18	74°00.4 89°00.3	02.9 N23°02.7	188°28.8 203°03.6	15.7' 15.8'	00°17.0 \$00°04.4	-12.6' -12.6'	54.9' 54.9'	
19	104°00.2	02.5	203 03.0 217°38.3	15.8'	N00°08.2	12.6'	54.9'	
20	119°00.0	02.4	232°13.1	15.8'	00°20.7	12.5'	54.9'	
21	133°59.9	• • 02.2	246°47.9	15.8'	00°33.3	12.5'	54.8'	
22	148°59.8	02.0	261°22.8	15.9'	00°45.8	12.5'	54.8'	
23	163°59.7	01.8	275°57.6	15.9'	00°58.3	12.5'	54.8'	
	SD = 15.7'	d = -0.2'		SI	O = 15.1'			
Mon	GHA	Dec	GHA	ν	Dec	d	НР	
0	178°59.6	N23°01.6	290°32.5	15.9'	N01°10.8	12.5'	54.8'	
1	193°59.4	01.4	305°07.4	15.9'	01°23.3	12.5'	54.8'	
2	208°59.3	01.2	319°42.3	15.9'	01°35.8	12.5'	54.7'	
3	223°59.2 238°59.1	•• 01.1	334°17.2 348°52.1	15.9' 15.9'	01°48.3	12.4'	54.7'	
4 5	238°59.1 253°59.0	00.9 00.7	348°52.1 3°27.1	15.9' 15.9'	02°00.7 02°13.1	12.4' 12.4'	54.7' 54.7'	
6	268°58.9	N23°00.5	18°02.0	16.0'	N02°25.6	12.4	54.7	
7	283°58.7	00.3	32°37.0	16.0'	02°37.9	12.4	54.7'	
8	298°58.6	$23^{\circ}00.1$	47°11.9	16.0'	$02^{\circ}50.3$	12.4'	54.6'	
9	313°58.5	22°59.9	61°46.9	16.0'	03°02.7	12.3'	54.6'	
10	328°58.4	59.7	76°21.9	16.0'	03°15.0	12.3'	54.6'	
11 12	343°58.3 358°58.2	59.5 N22°59.3	90°56.9 105°31.9	16.0' 16.0'	03°27.3 N03°39.6	12.3' 12.3'	54.6' 54.6'	
13	13°58.0	59.1	105 31.9 120°06.9	16.0'	03°51.9	12.3'	54.6'	
14	28°57.9	58.9	134°41.9	16.0'	04°04.2	12.2'	54.5'	
15	43°57.8	• • 58.7	$149^{\circ}16.9$	16.0'	$04^{\circ}16.4$	12.2'	54.5'	
16	58°57.7	58.6	163°51.9	16.0'	04°28.6	12.2'	54.5'	
17	73°57.6	58.4	178°26.9	16.0'	04°40.8	12.2'	54.5'	
18 19	88°57.5 103°57.4	N22°58.2 58.0	193°01.9 207°36.9	16.0' 16.0'	N04°53.0 05°05.1	12.1' 12.1'	54.5' 54.5'	
20	103 57.4 118°57.2	56.0 57.8	207 30.9 222°11.9	16.0'	05 05.1 05°17.2	12.1	54.5'	
21	133°57.1	• • 57.6	236°46.9	16.0'	05°29.3	12.1'	54.4'	
22	148°57.0	57.4	251°21.8	16.0'	05°41.4	12.0'	54.4'	
23	163°56.9	57.2	265°56.8	16.0'	05°53.4	12.0'	54.4'	
	SD = 15.7'	d = -0.2'		SI	0 = 14.9'			

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

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

h	Aries	•	nus	,	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	281°18.5	150° 45.5	N19°56.9	91°16.4	S04°25.4	84°10.2	S05°53.1	231°37.4	N16°04.1			
	296°21.0	165° 44.8		106°17.8	25.9	99°12.6		246°39.6		Alpheratz	357°30.9	29°15.2
1			56.1				53.1		04.1	Ankaa	353°03.7	-42°08.4
2	311°23.4	180°44.2	55.4	121°19.2	26.4	114°14.9	53.2	261°41.8	04.2	Schedar	349°26.7	56°41.8
3	326°25.9	195°43.5	• • 54.6	136°20.6	• • 26.9	129°17.3	• • 53.3	276°44.1	• • 04.2	Diphda	348°43.7	-17°49.3
4	341°28.4	210°42.9	53.8	151°22.0	27.5	144°19.6	53.3	291°46.3	04.3	Achernar	335°17.8	-57°04.9
5	356°30.8	225°42.3	53.1	166°23.4	28.0	159°21.9	53.4	306°48.5	04.3	Hamal	327°47.2	23°36.0
6	11°33.3	240°41.6	N19°52.3	181°24.8	S04°28.5	174°24.3	S05°53.5	321°50.7	N16°04.4	Polaris	312°19.2	89°22.9
7	26°35.7	255°41.0	51.5	196°26.2	29.0	189°26.6	53.5	336°52.9	04.5			-40°11.0
8	41°38.2	270°40.3	50.7	211°27.6	29.5	204°29.0	53.6	351°55.1	04.5	Acamar	315°09.3	
9	56°40.7	285°39.7	• • 50.0	226°29.0	• • 30.0	219°31.3	• • 53.7	6°57.4	• • 04.6	Menkar	314°02.5	4°12.3
10	71°43.1	300°39.0	49.2	241°30.4	30.5	234°33.6	53.7	21°59.6	04.6	Mirfak	308°23.3	49°57.7
11	86°45.6	315°38.4	48.4	256°31.8	31.0	249°36.0	53.8	37°01.8	04.7	Aldebaran	290°35.7	16°34.0
12	101°48.1	330°37.8	N19°47.6	271°33.2	S04°31.5	264°38.3	S05°53.8	52°04.0	N16°04.7	Rigel	281°00.7	-8°10.1
13	116°50.5	345°37.1	46.9	286°34.6	32.0	279°40.6	53.9	67°06.2	04.8	Capella	$280^{\circ}17.0$	46°01.4
	131°53.0	0°36.5		301°36.0	32.5	294°43.0	54.0	82°08.4		Bellatrix	278°19.3	6°22.5
14			46.1						04.9 •• 04.9	Elnath	277°57.6	28°37.8
15	146°55.5	15°35.8	• • 45.3	316°37.4	• • 33.0	309°45.3	• • 54.0	97°10.7		Alnilam	275°34.4	-1°11.1
16	161°57.9	30°35.2	44.5	331°38.8	33.5	324°47.6	54.1	112°12.9	05.0	Betelgeuse	270°48.5	7°24.6
17	177°00.4	45°34.6	43.7	346°40.2	34.0	339°50.0	54.2	127°15.1	05.0	Canopus	263°51.3	-52°42.7
18	192°02.9	60°33.9	N19°43.0	1°41.6	S04°34.6	354°52.3	S05°54.2	142°17.3	$N16^{\circ}05.1$	Sirius	258°23.4	-16°45.5
19	207°05.3	75°33.3	42.2	16°43.0	35.1	9°54.6	54.3	$157^{\circ}19.5$	05.1	Adhara	255°03.4	-10 45.5 -29°00.9
20	222°07.8	90°32.7	41.4	31°44.4	35.6	24°57.0	54.4	172°21.8	05.2			
21	237°10.2	105°32.0	• • 40.6	46°45.8	• • 36.1	39°59.3	• • 54.4	187°24.0	• • 05.3	Procyon	244°47.4	5°08.8
22	252°12.7	120°31.4	39.8	61°47.2	36.6	55°01.6	54.5	202°26.2	05.3	Pollux	243°13.3	27°57.2
23	267°15.2	135°30.8	39.0	76°48.6	37.1	70°04.0	54.6	217°28.4	05.4	Avior	234°13.8	-59°36.5
										Suhail	222°43.9	-43°33.4
Mer.p	ass. 05:14	ν -0.6′ d-0).8′ m-3.89	$ u$ 1.4 $^{\prime}$ d0	.5′ m0.40	$\nu 2.3' \ d0.$	1′ m-2.05	ν 2.2′ d0	.1' m 0.30	Miaplacidus	221°38.1	-69°50.6
										Alphard	217°44.4	-8°47.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	282°17.6	150° 30.1	N19°38.2	91°50.0	504°37.6	85°06.3	S05°54.6	232°30.6	N16°05.4	Dubhe	193°37.1	61°35.6
1	202 17.0 297°20.1	165° 29.5	37.5	106°51.4	38.1	100°08.6		247°32.9		Denebola	182°21.4	14°24.4
							54.7		05.5	Gienah	175°39.9	-17°42.5
2	312°22.6	180°28.9	36.7	121°52.8	38.6	115°11.0	54.8	262°35.1	05.5	Acrux	172°55.8	-63°16.1
3	327°25.0	195°28.2	• • 35.9	136°54.2	• • 39.1	130°13.3	• • 54.8	277°37.3	• • 05.6	Gacrux	171°47.4	-57°17.1
4	342°27.5	210°27.6	35.1	151°55.6	39.6	145°15.6	54.9	292°39.5	05.7	Alioth	$166^{\circ}10.0$	55°48.2
5	357°30.0	225°27.0	34.3	166°57.0	40.1	160°18.0	55.0	307°41.7	05.7	Spica	158°18.4	-11°19.0
6	12°32.4	240°26.3	N19°33.5	181°58.4	S04°40.7	175°20.3	S05°55.0	322°43.9	N16°05.8	Alkaid	152°49.1	49°10.2
7	27°34.9	255° 25.7	32.7	196°59.8	41.2	190°22.6	55.1	337°46.2	05.8	Hadar	148°30.4	-60°31.2
8	42°37.3	270°25.1	31.9	212°01.2	41.7	205°25.0	55.1	352°48.4	05.9	Menkent	147°53.1	-36°31.1
9	57°39.8	285°24.5	• • 31.1	227°02.5	• • 42.2	220°27.3	• • 55.2	7°50.6	• • 05.9	Arcturus	145°44.5	19°01.8
10	72°42.3	300°23.8	30.3	242°03.9	42.7	235°29.6	55.3	22°52.8	06.0	Rigil Kent.	139°34.8	-60°57.7
11	87°44.7	315°23.2	29.5	257°05.3	43.2	250°32.0	55.3	37°55.0	06.1	Kochab	137°19.6	74°02.3
12	102°47.2	330°22.6	N19°28.7	272°06.7	S04°43.7	265°34.3	S05°55.4	52°57.3	N16°06.1	Zuben'ubi	136°51.8	-16°09.9
13	$117^{\circ}49.7$	345°21.9	27.9	$287^{\circ}08.1$	44.2	280°36.6	55.5	67°59.5	06.2	Alphecca	126°00.5	26°37.1
14	132°52.1	0°21.3	27.1	302°09.5	44.7	295°38.9	55.5	83°01.7	06.2			-26°29.8
15	147°54.6	15°20.7	• • 26.3	317°10.9	• • 45.3	310°41.3	• • 55.6	98°03.9	• • 06.3	Antares	112°11.0	
16	162°57.1	30°20.1	25.5	332°12.3	45.8	325°43.6	55.7	113°06.2	06.3	Atria	107°01.4	-69°04.8
17	177°59.5	45° 19.5	24.7	347°13.7	46.3	340°45.9	55.8	128°08.4	06.4	Sabik	101°58.3	-15°45.6
18	193°02.0	60° 18.8	N19°23.9	2°15.0	S04°46.8	355°48.3	S05°55.8	143°10.6	N16°06.4	Shaula	96°05.0	-37°07.4
19	208°04.5	75° 18.2	23.1	17°16.4	47.3	10°50.6	55.9	158°12.8	06.5	Rasalhague	95°54.9	12°32.5
20	223°06.9	90°17.6	22.3	32°17.8	47.8	25°52.9	56.0	173°15.0	06.6	Eltanin	90°40.0	51°29.3
21	238°09.4	105° 17.0	21.5	47°19.2	• • 48.3	40°55.2	• • 56.0	188°17.3	• • 06.6	Kaus Aust.	83°27.3	-34°22.0
22	253°11.8	120°16.3	20.7	62°20.6	48.8	55°57.6	56.1	203°19.5	06.7	Vega	80°30.3	38°48.8
										Nunki	75°42.9	-26°15.4
23	268°14.3	135° 15.7	19.9	77°22.0	49.3	70°59.9	56.2	218°21.7	06.7	Altair	$61^{\circ}56.1$	8°57.0
Mer.p	ass. 05:10	ν -0.6′ d-0).8′ m-3.89	ν 1.4′ d0	.5′ m0.42	$\nu 2.3' \ d0.$	1′ m-2.05	ν 2.2′ d0	.1' m0.30	Peacock	52°59.6	-56°38.1
<u> </u>										Deneb	49°22.8	45°23.2
			_		_		_		_	Enif	33°35.0	10°00.8
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.2	-46°48.7
0	283°16.8	150° 15.1	N19°19.0	92°23.4	S04°49.9	86°02.2	S05°56.2	233°23.9	N16°06.8	Fomalhaut	15°10.4	-29°27.6
1	298°19.2	165° 14.5	18.2	107°24.7	50.4	101°04.5	56.3	248°26.1	06.8	Scheat	13°41.5	28°14.6
2	313°21.7	180° 13.9	17.4	122°26.1	50.9	116°06.9	56.4	263°28.4	06.9	Markab	13°26.1	15°21.9
3	328°24.2	195° 13.2	• • 16.6	137°27.5	• • 51.4	131°09.2	• • 56.4	278°30.6	• • 07.0			
4	343°26.6	210° 12.6	15.8	152°28.9	51.9	146°11.5	56.5	293°32.8	07.0	Jul 03 Tue	SHA	Mer.pass
5	358°29.1	225°12.0	15.0	167°30.3	52.4	161°13.8	56.6	308°35.0	07.1	Venus	229°27.0	13:58
6	13°31.6	240°11.4	N19°14.2	182°31.7	S04°52.9	$176^{\circ}16.2$	\$05°56.6	323°37.3	N16°07.1	1	169°57.9	17:53
7	28°34.0	$255^{\circ}10.8$	13.3	197°33.0	53.4	191°18.5	56.7	338°39.5	07.2	Jupiter	162°51.7	18:20
8	43°36.5	$270^{\circ}10.2$	12.5	212°34.4	54.0	206°20.8	56.8	353°41.7	07.2	Saturn	310°18.9	08:32
9	58°39.0	285°09.6	• • 11.7	227°35.8	• • 54.5	221°23.1	• • 56.8	8°43.9	• • 07.3	Jul 04 Wed	SHA	Marrie
10	73°41.4	300°08.9	10.9	242°37.2	55.0	236°25.5	56.9	23°46.1	07.3			Mer.pass
11	88°43.9	$315^{\circ}08.3$	10.1	257°38.6	55.5	251°27.8	57.0	38°48.4	07.4	Venus		13:59
12	103°46.3	330°07.7	N19°09.2	272°39.9	S04°56.0	266°30.1	S05°57.0	53°50.6	N16°07.5		169°32.4	17:51
13	118°48.8	$345^{\circ}07.1$	08.4	287°41.3	56.5	281°32.4	57.1	68°52.8	07.5	Jupiter		18:17
14	133°51.3	0°06.5	07.6	302°42.7	57.0	296°34.8	57.2	83°55.0	07.6	Saturn	310°13.0	08:29
15	148°53.7	15°05.9	• • 06.8	317°44.1	• • 57.5	311°37.1	• • 57.3	98°57.3	• • 07.6	Jul 05 Thu	SHA	Mer.pass
16	163°56.2	30°05.3	06.0	332°45.5	58.1	326°39.4	57.3	113°59.5	07.7	Venus		14:00
17	178°58.7	45°04.7	05.1	347°46.8	58.6	341°41.7	57.4	129°01.7	07.7		169°06.6	17:49
18	194°01.1	60°04.0	N19°04.3	2°48.2	S04°59.1	356°44.0	S05°57.5	144°03.9	N16°07.8		169°06.6	18:13
19	209°03.6	75°03.4	03.5	17°49.6	04°59.6	11°46.4	57.5	159°06.1	07.8	Saturn	310°07.1	08:25
20	224°06.1	90°02.8	02.6	32°51.0	05°00.1	26°48.7	57.6	174°08.4	07.9	Saturn	210 01.1	00:25
21	239°08.5	105°02.2	01.8	47°52.3	• • 00.6	41°51.0	• • 57.7	189°10.6	• • 08.0	Horizont	al parallax	
22	254°11.0	120°01.6	01.0	62°53.7	01.1	56°53.3	57.7	204°12.8	08.0		Venus:	0.1
23	269°13.4	135°01.0	00.2	77°55.1	01.7	71°55.7	57.8	219°15.0	08.1		Mars:	0.1
										L		
Mer.p	ass. 05:06	ν -0.6′ d -0).8′ m-3.89	ν 1.4′ d0	.5′ m0.43	$\nu 2.3' \ d0.$	1′ m-2.04	ν 2.2′ d0	.1′ m0.30			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 56.8	N22°56.9	280°31.8	16.0'	N06°05.4	12.0'	54.4'
1 2	193° 56.7 208° 56.5	56.7 56.5	295°06.8 309°41.7	16.0' 15.9'	06°17.4 06°29.3	11.9' 11.9'	54.4' 54.4'
3	223°56.4	56.3	324°16.7	15.9'	06°41.2	11.9'	54.4'
4	238°56.3	56.1	$338^{\circ}51.6$	15.9'	$06^{\circ}53.1$	11.9'	54.4'
5	253°56.2	55.9	353°26.5	15.9'	07°05.0	11.8'	54.4'
6 7	268° 56.1 283° 56.0	N22°55.7 55.5	8°01.5 22°36.4	15.9' 15.9'	N07°16.8 07°28.6	11.8' 11.8'	54.3' 54.3'
8	298° 55.9	55.3	37°11.2	15.9'	07° 40.3	11.7	54.3'
9	313°55.8	• • 55.1	$51^{\circ}46.1$	15.9'	$07^{\circ}52.1$	11.7'	54.3'
10	328°55.6	54.9	66°21.0	15.8'	08°03.7	11.7'	54.3'
11 12	343°55.5 358°55.4	54.7 N22°54.5	80°55.8 95°30.6	15.8' 15.8'	08°15.4 N08°27.0	11.6' 11.6'	54.3' 54.3'
13	13°55.3	54.3	110°05.4	15.8'	08°38.6	11.5'	54.3'
14	28°55.2	54.0	$124^{\circ}40.2$	15.8'	$08^{\circ}50.1$	11.5'	54.3'
15	43°55.1 58°55.0	• • 53.8	139°15.0 153°49.7	15.7'	09°01.7 09°13.1	11.5'	54.3'
16 17	73° 54.8	53.6 53.4	153 49.7 168°24.4	15.7' 15.7'	09 13.1 09°24.6	11.4' 11.4'	54.3' 54.3'
18	88° 54.7	N22°53.2	182°59.1	15.7'	N09°35.9	11.4'	54.2'
19	103°54.6	53.0	197°33.8	15.6'	09°47.3	11.3'	54.2'
20	118° 54.5 133° 54.4	52.8	212°08.4 226°43.1	15.6'	09°58.6 10°09.9	11.3'	54.2'
21 22	133 54.4 148°54.3	· · 52.5 52.3	241°17.7	15.6' 15.6'	10 09.9 10°21.1	11.2' 11.2'	54.2' 54.2'
23	163°54.2	52.1	255°52.2	15.5'	10°32.3	11.1'	54.2'
	SD = 15.7'	d = -0.2'		SI	O = 14.8'		
Wed 0	GHA 178°54.1	Dec N22°51.9	GHA 270°26.7	u 15.5'	Dec N10°43.4	d 11.1'	HP 54.2'
1	178 54.1 193°54.0	51.7	285°01.3	15.5'	10° 54.5	11.1	54.2'
2	208°53.8	51.4	299°35.7	15.4'	11°05.6	11.0'	54.2'
3	223°53.7	• • 51.2	314°10.2	15.4'	11°16.6	11.0'	54.2'
4 5	238° 53.6 253° 53.5	51.0 50.8	328°44.6 343°19.0	15.4' 15.3'	11°27.6 11°38.5	10.9' 10.9'	54.2' 54.2'
6	268° 53.4	N22°50.5	357°53.3	15.3'	N11°49.4	10.8	54.2'
7	283°53.3	50.3	$12^{\circ}27.6$	15.3'	12°00.2	10.8'	54.2'
8	298°53.2	50.1	27°01.9	15.2'	12°11.0	10.7'	54.2'
9 10	313°53.1 328°53.0	• • 49.9 49.6	41°36.1 56°10.3	15.2' 15.2'	12°21.7 12°32.4	10.7' 10.6'	54.2' 54.2'
11	343°52.8	49.0	70°44.5	15.1'	12°43.0	10.6'	54.2'
12	358° 52.7	N22°49.2	85°18.6	15.1'	N12°53.6	10.5'	54.2'
13	13°52.6	49.0	99°52.7	15.0'	13°04.1	10.5'	54.2'
14 15	28° 52.5 43° 52.4	48.7 •• 48.5	114°26.8 129°00.8	15.0' 15.0'	13°14.6 13°25.1	10.4' 10.4'	54.2' 54.2'
16	58° 52.3	48.3	143°34.7	14.9'	13°35.4	10.3	54.2'
17	73°52.2	48.0	158°08.6	14.9'	13°45.7	10.3'	54.2'
18	88°52.1 103°52.0	N22°47.8 47.6	172°42.5 187°16.4	14.8' 14.8'	N13°56.0 14°06.2	10.2' 10.2'	54.2'
19 20	103 52.0 118°51.9	47.0 47.3	201°50.1		14 06.2 14°16.4		54.2' 54.2'
21	133°51.7	• • 47.1	216°23.9	14.7'	14°26.5	10.0'	54.2'
22	148°51.6	46.9	230°57.6	14.7'	14°36.5	10.0'	54.2'
23	163°51.5	46.6	245°31.2	14.6'	14°46.5	9.9'	54.2'
	SD = 15.7'	d = -0.2'		SI	O = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.4	N22°46.4	260°04.8	14.6'	N14°56.4	9.9'	54.2'
1 2	193°51.3 208°51.2	46.2 45.9	274°38.4 289°11.9	14.5' 14.5'	15°06.3 15°16.1	9.8' 9.7'	54.2' 54.2'
3	208 51.2 223°51.1	45.9 •• 45.7	289 11.9 303°45.4	14.5 14.4'	15 16.1 15°25.8	9.7 9.7'	54.2'
4	238°51.0	45.5	318°18.8	14.4'	15°35.5	9.6'	54.2'
5	253°50.9	45.2	332°52.1	14.3'	15°45.1	9.6'	54.2'
6 7	268° 50.8 283° 50.7	N22°45.0 44.7	347°25.4 1°58.7	14.3' 14.2'	N15°54.7 16°04.2	9.5' 9.4'	54.2' 54.2'
8	298°50.6	44.7	16°31.9	14.2'	16°13.6	9.4'	54.2'
9	313°50.5	• • 44.3	31°05.1	14.1'	16°23.0	9.3'	54.2'
10 11	328° 50.3 343° 50.2	44.0 43.8	45°38.2 60°11.2	14.0' 14.0'	16°32.3 16°41.5	9.2' 9.2'	54.2' 54.2'
11	343°50.2 358°50.1	43.8 N22°43.5	74°44.2	13.9'	N16° 50.7	9.2	54.2'
13	13°50.0	43.3	$89^{\circ}17.1$	13.9'	$16^{\circ}59.8$	9.0'	54.2'
14	28°49.9	43.0	103°50.0	13.8'	17°08.8	9.0'	54.2'
15 16	43° 49.8 58° 49.7	· · 42.8 42.5	118°22.8 132°55.6	13.8' 13.7'	17° 17.8 17° 26.7	8.9' 8.8'	54.2' 54.3'
16 17	58° 49.7 73° 49.6	42.5 42.3	132°55.6 147°28.3	13.6'	17° 26.7 17° 35.5	8.8° 8.7'	54.3'
18	88° 49.5	N22°42.0	162°00.9	13.6'	N17°44.3	8.7'	54.3'
19	103°49.4	41.8	176°33.5	13.5'	17°52.9	8.6'	54.3'
20 21	118° 49.3 133° 49.2	41.5 •• 41.3	191°06.1 205°38.5	13.5' 13.4'	18°01.5 18°10.1	8.5' 8.5'	54.3' 54.3'
22	133 49.2 148°49.1	41.0	200° 10.9	13.4	18° 18.5	8.4	54.3
23	163°49.0	40.8	234°43.3	13.3'	18°26.9	8.3'	54.3'
	SD = 15.7'	d = -0.2'		SI	0 = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	57-38%	
03	04:13	04:18	12:04	05:27	17:48		
04	04:24	04:29	12:04	06:09	18:30		
05	04:34	04:39	12:05	06:52	19:14		

Fri 0 1 2 3 4 5 5 6 7 8 9 10 11 12 13	GHA 284°15.9 299°18.4 314°20.8 329°23.3	GHA 150°00.4 164°59.8	Dec N18°59.3	GHA 92°56.5	Dec \$05°02.2	GHA	Dec	GHA 234°17.3	Dec		SHA	Dec
0 1 2 3 4 5 6 7 8 9 10 11	284°15.9 299°18.4 314°20.8 329°23.3	150°00.4	$N18^{\circ}59.3$							1		
2 3 4 5 6 7 8 9 10 11 12	314°20.8 329°23.3	164°59.8			305 02.2	86°58.0	S05°57.9	234 17.3	$N16^{\circ}08.1$		257020.0	00015.0
2 3 4 5 6 7 8 9 10 11 12	314°20.8 329°23.3		58.5	107°57.8	02.7	102°00.3	58.0	249°19.5	08.2	Alpheratz	357°30.9	29°15.2
3 4 5 6 7 8 9 10 11 12	329°23.3	179°59.2	57.7	122°59.2	03.2	117°02.6	58.0	264°21.7	08.2	Ankaa	353°03.6	-42°08.4
4 5 6 7 8 9 10 11 12		194°58.6	56.8	138°00.6	• • 03.7	132°04.9	• • 58.1	279°23.9	08.3	Schedar	349°26.6	56°41.8
5 6 7 8 9 10 11	344°25.8	209°58.0	56.0	153°01.9	04.2	147°07.3	58.2	294°26.2	08.3	Diphda	348°43.7	-17°49.3
6 7 8 9 10 11	359°28.2	224° 57.4	55.2	168°03.3	04.7	162°09.6	58.2	309°28.4	08.4	Achernar	335°17.8	-57°04.9
7 8 9 10 11 12	14°30.7	239° 56.8	N18°54.3	183°04.7	S05°05.3	177°11.9	S05°58.3	324°30.6	N16°08.4	Hamal	327°47.2	23°36.0
8 9 10 11 12	29°33.2	254° 56.2	53.5	198°06.1		192°14.2		339°32.8		Polaris	$312^{\circ}17.7$	89°22.9
9 10 11 12					05.8		58.4		08.5	Acamar	315°09.3	-40°11.0
10 11 12	44°35.6	269°55.6	52.6	213°07.4	06.3	207°16.5	58.5	354°35.1	08.6	Menkar	314°02.5	4°12.3
11 12	59°38.1	284°55.0	• • 51.8	228°08.8	• • 06.8	222°18.8	• • 58.5	9°37.3	• • 08.6	Mirfak	308°23.2	49°57.7
12	74°40.6	299°54.4	51.0	243°10.2	07.3	237°21.2	58.6	24°39.5	08.7	Aldebaran	290°35.7	16°34.0
	89°43.0	314°53.8	50.1	258°11.5	07.8	252°23.5	58.7	39°41.7	08.7	Rigel	281°00.7	-8°10.1
13	104°45.5	329°53.2	N18°49.3	273°12.9	S05°08.4	267°25.8	S05°58.7	54°44.0	$N16^{\circ}08.8$	Capella	280°16.9	46°01.4
	119°47.9	344°52.6	48.4	288°14.3	08.9	282°28.1	58.8	69°46.2	8.80	Bellatrix	278° 19.3	6°22.5
14	134°50.4	359°52.0	47.6	303°15.6	09.4	297°30.4	58.9	84°48.4	08.9			
15	149°52.9	14°51.4	· · 46.7	318°17.0	• • 09.9	312°32.7	• • 59.0	99°50.6	• • 08.9	Elnath	277°57.6	28°37.8
16	164°55.3	29°50.8	45.9	333°18.4	10.4	327°35.1	59.0	114°52.9	09.0	Alnilam	275°34.4	-1°11.1
17	179°57.8	44°50.2	45.1	348°19.7	10.9	342°37.4	59.1	129°55.1	09.1	Betelgeuse	270°48.5	7°24.6
18	195°00.3	59°49.6	N18°44.2	3°21.1	S05°11.5	357°39.7	S05°59.2	144°57.3	N16°09.1	Canopus	263°51.3	-52°42.7
										Sirius	258°23.4	-16°45.5
19	210°02.7	74°49.0	43.4	18°22.5	12.0	12°42.0	59.2	159°59.5	09.2	Adhara	255°03.4	-29°00.8
20	225°05.2	89°48.4	42.5	33°23.8	12.5	27°44.3	59.3	175°01.8	09.2	Procyon	244°47.4	5°08.8
21	240°07.7	104°47.8	• • 41.7	48°25.2	• • 13.0	42°46.6	• • 59.4	190°04.0	• • 09.3	Pollux	243°13.3	27°57.2
22	$255^{\circ}10.1$	119°47.2	40.8	63°26.6	13.5	57°48.9	59.5	205°06.2	09.3	I	245 13.3 234°13.8	-59°36.5
23	$270^{\circ}12.6$	134°46.6	40.0	78°27.9	14.0	72°51.3	59.5	220°08.5	09.4	Avior		
					_					Suhail	222°43.9	-43°33.4
Mer.p	ass. 05:02	ν -0.6′ d-0).8′ m-3.89	ν 1.4′ d 0.	.5′ m0.44	ν 2.3′ d0.	1' m-2.04	ν 2.2′ d0	.1' m0.30	Miaplacidus	221°38.1	-69°50.6
		-		-		-	-			Alphard	217°44.4	-8°47.4
C	GHA	CHA	Dos	GHA	Dag	GHA	Das	GHA	Dee	Regulus	207°30.8	11°49.3
Sat		GHA	Dec		Dec		Dec		Dec	Dubhe	193°37.2	61°35.6
0	285°15.1	149°46.0	N18°39.1	93°29.3	S05°14.6	87°53.6	S05°59.6	235°10.7	N16°09.4	Denebola	182°21.4	14°24.4
1	300°17.5	164°45.5	38.2	108°30.7	15.1	102°55.9	59.7	250°12.9	09.5	Gienah	175°39.9	-17°42.5
2	315°20.0	179°44.9	37.4	123°32.0	15.6	$117^{\circ}58.2$	59.8	265°15.1	09.5	Acrux		-63°16.1
3	330°22.4	194°44.3	• • 36.5	138°33.4	• • 16.1	133°00.5	• • 59.8	280°17.4	• • 09.6	Gacrux	172 33.0 171°47.4	-57°17.1
4	345°24.9	209°43.7	35.7	153°34.7	16.6	148°02.8	05°59.9	295°19.6	09.6			
5	0°27.4	224°43.1	34.8	168°36.1	17.2	163°05.1	06°00.0	310°21.8	09.7	Alioth	166°10.0	55°48.2
6	15°29.8	239° 42.5	N18°34.0	183°37.5	S05°17.7	178°07.5	S06°00.0	325°24.0	N16°09.8	Spica	158° 18.4	-11°19.0
										Alkaid	$152^{\circ}49.2$	49°10.2
7	30°32.3	254°41.9	33.1	198°38.8	18.2	193°09.8	00.1	340°26.3	09.8	Hadar	148°30.4	-60°31.2
8	45°34.8	269°41.3	32.2	213°40.2	18.7	208°12.1	00.2	355°28.5	09.9	Menkent	$147^{\circ}53.1$	-36°31.1
9	60°37.2	284°40.7	• • 31.4	228°41.5	• • 19.2	223°14.4	• • 00.3	10°30.7	• • 09.9	Arcturus	145°44.5	19°01.8
10	75°39.7	299°40.2	30.5	243°42.9	19.7	238°16.7	00.3	25°33.0	10.0	Rigil Kent.	139°34.8	-60°57.7
11	90°42.2	314°39.6	29.7	258°44.3	20.3	253°19.0	00.4	40°35.2	10.0	Kochab	137°19.7	74°02.3
12	105°44.6	329°39.0	N18°28.8	273°45.6	S05°20.8	268°21.3	S06°00.5	55°37.4	N16°10.1			-16°09.9
13	120°47.1	344°38.4	27.9	288°47.0	21.3	283°23.6	00.6	70°39.6	10.1	Zuben'ubi	136°51.8	
14	135°49.6	359° 37.8	27.1	303°48.3	21.8	298°25.9	00.6	85°41.9	10.2	Alphecca	126°00.5	26°37.1
15	150°52.0	14°37.2	26.2	318°49.7	• • 22.3	313°28.3	00.7	100°44.1	. 10.2	Antares	112°11.0	-26°29.8
										Atria	$107^{\circ}01.4$	-69°04.8
16	165°54.5	29°36.7	25.3	333°51.0	22.9	328°30.6	8.00	115°46.3	10.3	Sabik	101°58.3	-15°45.6
17	180°56.9	44°36.1	24.5	348°52.4	23.4	343°32.9	00.9	130°48.6	10.3	Shaula	96°05.0	-37°07.4
18	195°59.4	59° 35.5	N18°23.6	3°53.8	S05°23.9	358°35.2	S06°00.9	145°50.8	N16°10.4	Rasalhague	95°54.9	12°32.5
19	211°01.9	74°34.9	22.7	18°55.1	24.4	13°37.5	01.0	160°53.0	10.5	Eltanin	90°40.0	51°29.3
20	226°04.3	89°34.3	21.9	33°56.5	24.9	28°39.8	01.1	175°55.2	10.5	Kaus Aust.	83°27.3	-34°22.0
21	241°06.8	104°33.7	· · 21.0	48°57.8	• • 25.5	43°42.1	• • 01.2	190°57.5	• • 10.6	Vega	80°30.3	38°48.8
22	256°09.3	119°33.2	20.1	63°59.2	26.0	58°44.4	01.2	205°59.7	10.6	_		
23	271°11.7	134°32.6	19.3	79°00.5	26.5	73°46.7	01.3	221°01.9	10.7	Nunki	75°42.9	-26°15.4
										Altair	61°56.1	8°57.0
Mer.p	ass. 04:58	ν -0.6′ d-0	0.9′ m-3.89	ν 1.4′ d0.	.5′ m0.45	ν 2.3′ d0.	1′ m-2.03	ν 2.2′ d0	.1' m 0.29	Peacock	52°59.6	-56°38.1
						-				Deneb	49°22.8	45°23.2
_	C114	G114	_		_	6114	_		_	Enif	33°35.0	10°00.8
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.2	-46°48.7
0	286°14.2	149°32.0	N18°18.4	94°01.9	S05°27.0	88°49.0	S06°01.4	236°04.2		Fomalhaut	$15^{\circ}10.4$	-29°27.6
1	301°16.7	164°31.4	17.5	109°03.2	27.5	103°51.3	01.5	251°06.4	10.8	Scheat	13°41.4	28°14.6
2	316°19.1	179°30.9	16.6	124°04.6	28.1	118°53.6	01.5	266°08.6	10.8	Markab	13°26.1	15°21.9
3	331°21.6	194°30.3	• • 15.8	139°05.9	• • 28.6	133°56.0	•• 01.6	281°10.8	• • 10.9			
4	346°24.0	209°29.7	14.9	154°07.3	29.1	148°58.3	01.7	$296^{\circ}13.1$	10.9	Jul 06 Fri	SHA	Mer.pass
5	1°26.5	224°29.1	14.0	169°08.6	29.6	164°00.6	01.8	311°15.3	11.0	Venus	225°44.5	14:01
6	16°29.0	239° 28.6	N18°13.1	184°10.0	S05°30.1	179°02.9	S06°01.8	326°17.5	N16°11.0	Mars	168°40.5	17:47
7	31°31.4	254°28.0	12.2	199°11.3	30.7	194°05.2	01.9	341°19.8	11.1	Jupiter	162°42.1	18:09
8	46°33.9	269° 27.4	11.4	214°12.7	31.2	209°07.5	02.0	356°22.0	11.1	Saturn	310°01.4	08:22
										Jatuill	J10 U1.4	
9	61°36.4	284°26.8	• • 10.5	229°14.0	• • 31.7	224°09.8	• • 02.1	11°24.2	• • 11.2	Jul 07 Sat	SHA	Mer.pass
10	76°38.8	299°26.3	09.6	244°15.4	32.2	239°12.1	02.2	26°26.5	11.3	Venus		14:01
11	91°41.3	314°25.7	08.7	259°16.7	32.7	254°14.4	02.2	41°28.7	11.3		168° 14.2	17:44
12	106°43.8	329°25.1	N18°07.8	274°18.1	S05°33.3	269°16.7	506°02.3	56°30.9	N16°11.4	Jupiter	162°38.5	18:06
13	121°46.2	344°24.5	06.9	289°19.4	33.8	284°19.0	02.4	71°33.1	11.4			
14	136°48.7	359°24.0	06.1	304°20.8	34.3	299°21.3	02.5	86°35.4	11.5	Saturn	309°55.6	08:18
15	151°51.2	14°23.4	05.2	319°22.1	• • 34.8	314°23.6	02.5	101°37.6	. 11.5	Jul 08 Sun	SHA	Mer.pass
16	166°53.6	29° 22.8	04.3	334°23.5	35.4	329°25.9	02.5	116°39.8	11.6			-
										Venus		14:02
17	181°56.1	44°22.3	03.4	349°24.8	35.9	344°28.2	02.7	131°42.1	11.6		167°47.7	17:42
18	196°58.5	59°21.7	N18°02.5	4°26.1	S05°36.4	359°30.5	S06°02.8	146°44.3	N16°11.7		162°34.8	18:02
19	212°01.0	74°21.1	01.6	19°27.5	36.9	14°32.8	02.8	161°46.5	11.7	Saturn	309°50.0	08:14
20	227°03.5	89°20.6	18°00.7	34°28.8	37.4	29°35.1	02.9	176°48.8	11.8			
21	242°05.9	104°20.0	17°59.8	49°30.2	• • 38.0	44°37.4	• • 03.0	191°51.0	• • 11.8	Horizon	al parallax	
	257°08.4	119° 19.4	59.0	64°31.5	38.5	59°39.7	03.1	206°53.2	11.9		Venus:	0.1
22	272°10.9	134° 18.9	58.1	79°32.9	39.0	74°42.0	03.2	221°55.5	11.9		Mars:	0.1
22 23										1		
22 23	ass. 04:54	ν -0.6' d-0	. 0/ 0.00	ν 1.4′ d0.		$\nu 2.3' \ d0.$.1′ m0.29			

h	Su	n		1	Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.9	N22°40.5	249°15.6	13.2'	N18°35.2	8.2'	54.3'
1	193°48.8	40.3	263°47.8	13.2'	18°43.4	8.2'	54.3'
2	208°48.7	40.0	278°20.0	13.1'	18°51.6	8.1'	54.3'
3	223°48.5	• • 39.8	292°52.1	13.0'	18°59.7	8.0'	54.3'
4 5	238°48.4 253°48.3	39.5 39.3	307°24.1 321°56.1	13.0' 12.9'	19°07.7 19°15.6	7.9' 7.8'	54.4' 54.4'
6	253 48.3 268°48.2	39.3 N22°39.0	321 50.1 336°28.0	12.9'	N19°23.4	7.8	54.4
7	283°48.1	38.8	350° 59.9	12.8'	19°31.2	7.7'	54.4'
8	298°48.0	38.5	5°31.7	12.7'	19°38.8	7.6'	54.4'
9	313°47.9	• • 38.2	20°03.4	12.7'	19°46.4	7.5'	54.4'
10	328°47.8	38.0	34°35.1	12.6'	19°53.9	7.4'	54.4'
11	343°47.7	37.7	49°06.7	12.5'	20°01.3	7.3'	54.4'
12	358°47.6 13°47.5	N22°37.5	63°38.2 78°09.7	12.5'	N20°08.7 20°15.9	7.2'	54.4'
13 14	13°47.5 28°47.4	37.2 36.9	78°09.7 92°41.1	12.4' 12.3'	20°15.9 20°23.1	7.2' 7.1'	54.5' 54.5'
15	43°47.3	36.7	107°12.5	12.3'	20° 30.1	7.0'	54.5'
16	58°47.2	36.4	121°43.7	12.2'	20°37.1	6.9'	54.5'
17	73°47.1	36.1	136°15.0	12.2'	20°44.0	6.8'	54.5'
18	88°47.0	N22°35.9	150°46.1	12.1'	N20°50.8	6.7'	54.5'
19	103°46.9	35.6	165°17.2	12.0'	20°57.5	6.6'	54.5'
20	118°46.8	35.4	179°48.2	12.0'	21°04.1	6.5'	54.6'
21 22	133°46.7 148°46.6	· · 35.1 34.8	194°19.2 208°50.1	11.9' 11.8'	21°10.7 21°17.1	6.4' 6.3'	54.6' 54.6'
23	148 46.6 163°46.5	34.8 34.6	208 50.1 223°20.9	11.8'	21 17.1 21°23.4	6.2	54.6'
23						J. <u>L</u>	3 1.0
	SD = 15.7'	d = -0.3'		SD	0 = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.4	$N22^{\circ}34.3$	237°51.7	11.7'	N21°29.7	6.1'	54.6'
1	193°46.3	34.0	252°22.4	11.6'	21°35.8	6.1'	54.6'
2	208°46.2	33.7	266°53.0	11.6'	21°41.9	6.0'	54.6'
3 4	223°46.1 238°46.0	· · 33.5	281°23.6 295°54.1	11.5' 11.4'	21°47.8 21°53.7	5.9' 5.8'	54.7' 54.7'
5	253°45.9	32.9	310°24.5	11.4'	21°59.4	5.7'	54.7
6	268°45.8	N22°32.7	324°54.9	11.3'	N22°05.1	5.6'	54.7'
7	283°45.7	32.4	339°25.2	11.2'	22°10.6	5.5'	54.7'
8	298°45.6	32.1	353°55.4	11.2'	22°16.1	5.4'	54.7'
9	313°45.5	• • 31.8	8°25.6	11.1'	22°21.4	5.2'	54.8'
10	328°45.4	31.6	22°55.7	11.1'	22°26.7	5.1'	54.8'
11 12	343°45.3 358°45.2	31.3 N22°31.0	37°25.8 51°55.8	11.0' 10.9'	22°31.8 N22°36.9	5.0' 4.9'	54.8' 54.8'
13	13°45.1	30.7	66°25.7	10.9	22°41.8	4.8'	54.8
14	28°45.0	30.4	80°55.5	10.8'	22°46.6	4.7'	54.8'
15	43°44.9	• • 30.2	95°25.3	10.7'	22°51.4	4.6'	54.9'
16	58°44.8	29.9	109°55.1	10.7'	22°56.0	4.5'	54.9'
17	73°44.7	29.6	124°24.8	10.6	23°00.5	4.4'	54.9'
18 19	88°44.6 103°44.5	N22°29.3 29.0	138°54.4 153°23.9	10.6' 10.5'	N23°04.9 23°09.2	4.3' 4.2'	54.9' 54.9'
20	118°44.4	28.8	167°53.4	10.4	23°13.3	4.1'	55.0'
21	133°44.3	28.5	182°22.9	10.4	23°17.4	4.0'	55.0'
22	148°44.2	28.2	196°52.2	10.3'	23°21.3	3.8'	55.0'
23	163°44.1	27.9	211°21.6	10.3'	23°25.2	3.7'	55.0'
	SD = 15.7'	d = -0.3'		SD	9 = 14.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.0	N22°27.6	225°50.8	10.2'	N23°28.9	3.6'	55.0'
1	193°43.9	27.3	240°20.0	10.1'	23°32.5	3.5'	55.1'
2	208°43.8	27.1	254°49.2 269°18.3	10.1'	23°36.0	3.4'	55.1'
3 4	223°43.7 238°43.6	· · 26.8 26.5	269°18.3 283°47.3	10.0' 10.0'	23°39.4 23°42.7	3.3' 3.1'	55.1' 55.1'
5	250 45.0 253°43.5	26.2	203 47.3 298°16.3	9.9'	23°45.8	3.0'	55.1'
6	268°43.4	N22°25.9	312°45.2	9.9'	N23°48.8	2.9'	55.2
7	283°43.3	25.6	327°14.1	9.8'	23°51.7	2.8'	55.2'
8	298°43.2	25.3	341°42.9	9.8'	23°54.5	2.7'	55.2'
9	313°43.1	• • 25.0	356°11.6	9.7'	23°57.2	2.5'	55.2'
10 11	328°43.0 343°42.9	24.7 24.5	10°40.4 25°09.0	9.7' 9.6'	23°59.7 24°02.2	2.4' 2.3'	55.2' 55.3'
11	343°42.9 358°42.8	24.5 N22°24.2	25°09.0 39°37.6	9.6'	N24°04.5	2.3'	55.3'
13	13°42.8	23.9	54°06.2	9.5'	24°06.7	2.1'	55.3
14	28°42.7	23.6	68°34.7	9.5'	24°08.7	1.9'	55.3'
15	43°42.6	• • 23.3	83°03.2	9.4'	$24^{\circ}10.7$	1.8'	55.3'
16	58°42.5	23.0	97°31.6	9.4'	24°12.5	1.7'	55.4'
17	73°42.4	22.7	112°00.0	9.3'	24°14.2	1.6'	55.4'
18 19	88°42.3 103°42.2	N22°22.4 22.1	126°28.3 140°56.6	9.3' 9.2'	N24°15.7 24°17.2	1.4' 1.3'	55.4' 55.4'
20	103°42.2 118°42.1	22.1	140°56.6 155°24.8	9.2' 9.2'	24°17.2 24°18.5	1.3	55.4° 55.5'
21	133°42.0	21.5	169°53.0	9.2'	24°19.7	1.1'	55.5
22	148°41.9	21.2	184°21.2	9.1'	24°20.7	0.9'	55.5'
23	163°41.8	20.9	198°49.3	9.1'	24°21.7	0.8'	55.5'
	SD = 15.7'	d = -0.3'		SD	0 = 15.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	29-14%	
06	04:45	04:50	12:05	07:37	20:01		
07	04:54	04:59	12:05	08:25	20:50		
08	05:04	05:09	12:05	09:16	21:42		

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
				94°34.2	S05°39.5		S06°03.2				SHA	Dec
0	287°13.3 302°15.8	149° 18.3 164° 17.7	N17°57.2	94 34.2 109°35.5		89°44.3		236°57.7 251°59.9	N16°12.0	Alpheratz	357°30.8	29°15.2
1			56.3		40.1	104°46.6	03.3		12.0	Ankaa	353°03.6	-42°08.4
2	317°18.3	179°17.2	55.4	124°36.9	40.6	119°48.9	03.4	267°02.2	12.1	Schedar	349°26.6	56°41.8
3	332°20.7	194° 16.6	• • 54.5	139°38.2	• • 41.1	134°51.2	• • 03.5	282°04.4	• • 12.1	Diphda	348°43.7	$-17^{\circ}49.2$
4	347°23.2	209°16.1	53.6	154°39.6	41.6	149°53.5	03.5	297°06.6	12.2	Achernar	335°17.7	-57°04.8
5	2°25.7	224° 15.5	52.7	169°40.9	42.2	164°55.8	03.6	312°08.9	12.3	Hamal	327°47.1	23°36.0
6	17°28.1	239°14.9	N17°51.8	184°42.2	S05°42.7	179°58.1	S06°03.7	327°11.1	N16°12.3	Polaris	312°16.0	89°22.9
7	32°30.6	254° 14.4	50.9	199°43.6	43.2	195°00.4	03.8	342°13.3	12.4	Acamar	315°09.3	-40°11.0
8	47°33.0	269°13.8	50.0	214°44.9	43.7	210°02.7	03.9	357°15.6	12.4	Menkar	314°02.5	4°12.3
9	62°35.5	284°13.3	• • 49.1	229°46.3	• • 44.3	225°05.0	• • 03.9	12°17.8	• • 12.5	Mirfak	308°23.2	49°57.7
10	77°38.0	299°12.7	48.2	244°47.6	44.8	240°07.3	04.0	27°20.0	12.5	Aldebaran	290°35.7	16°34.0
11	92°40.4	314° 12.1	47.3	259°48.9	45.3	255°09.6	04.1	42°22.3	12.6	Rigel	281°00.7	-8°10.1
12	107°42.9	329°11.6	N17°46.4	274°50.3	S05°45.8	270°11.9	S06°04.2	57°24.5	$N16^{\circ}12.6$	Capella	280°16.9	46°01.4
13	122°45.4	344°11.0	45.5	289°51.6	46.3	285°14.2	04.3	72°26.7	12.7	Bellatrix	278°19.3	6°22.5
14	137°47.8	359° 10.5	44.6	304°52.9	46.9	300°16.5	04.3	87°29.0	12.7			
15	152°50.3	14°09.9	· · 43.7	319°54.3	• • 47.4	315°18.8	• • 04.4	102°31.2	· · 12.8	Elnath	277°57.6	28°37.8
16	167°52.8	29°09.4	42.8	334°55.6	47.9	330°21.1	04.5	117°33.4	12.8	Alnilam	275°34.3	-1°11.1
17	182°55.2	44°08.8	41.9	349°56.9	48.4	345°23.4	04.6	132°35.7	12.9	Betelgeuse	270°48.5	7°24.6
18	197°57.7	59°08.3	N17°41.0	4°58.3	S05°49.0	0°25.7	S06°04.7	147°37.9	N16°12.9	Canopus	263°51.3	-52°42.7
19	213°00.2	74° 07.7	40.0	19°59.6	49.5	15°28.0	04.7	162°40.1	13.0	Sirius	258°23.4	-16°45.5
20	228°02.6	89°07.1	39.1	35°00.9	50.0	30°30.3	04.8	177°42.4	13.0	Adhara	255°03.4	-29°00.8
21	243°05.1	104°06.6	38.2	50°02.3	50.5	45°32.6	• • 04.9	192°44.6	• • 13.1	Procyon	244°47.4	5°08.8
22	258°07.5	104 06.0 119°06.0	37.3	65°03.6	51.1	60°34.9	05.0	207°46.8	13.1	Pollux	243°13.3	27°57.2
23	258 07.5 273°10.0	119 06.0 134° 05.5		80°04.9		75°37.2		207 46.8 222°49.1		Avior	$234^{\circ}13.8$	-59°36.5
23	213 10.0		36.4		51.6		05.1	222 49.1	13.2	Suhail	222°43.9	-43°33.3
Mer.p	ass. 04:50	ν -0.6' d-0	0.9′ m-3.90	ν 1.3′ d0.	5′ m0.47	$\nu 2.3' \ d0.$	1′ m-2.02	ν 2.2′ d0	.1' m0.29	Miaplacidus	221°38.1	-69°50.6
										Alphard	217°44.4	-8°47.4
_			_		_		_		_	Regulus	207°30.8	11°49.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.6
0	288°12.5	149°04.9	N17°35.5	95°06.3	S05°52.1	90°39.5	S06°05.1	237°51.3	N16°13.2	Denebola	182°21.4	14°24.4
1	303°14.9	164°04.4	34.6	110°07.6	52.7	105°41.8	05.2	$252^{\circ}53.5$	13.3	Gienah	175°39.9	-17°42.5
2	$318^{\circ}17.4$	179°03.8	33.7	125°08.9	53.2	120°44.1	05.3	267°55.8	13.3	Acrux	172°55.9	-63°16.1
3	$333^{\circ}19.9$	194°03.3	• • 32.7	140°10.3	• • 53.7	135°46.4	• • 05.4	282°58.0	• • 13.4	Gacrux		-57°17.1
4	348°22.3	209°02.7	31.8	$155^{\circ}11.6$	54.2	150°48.7	05.5	298°00.2	13.4	Alioth	166°10.0	55°48.2
5	3°24.8	224°02.2	30.9	170°12.9	54.8	165°51.0	05.5	313°02.5	13.5	Spica	158° 18.4	-11°19.0
6	18°27.3	239°01.6	N17°30.0	185°14.3	S05°55.3	180°53.2	S06°05.6	328°04.7	N16°13.5	Alkaid	150° 10.4° 152° 49.2	49°10.2
7	33°29.7	$254^{\circ}01.1$	29.1	200°15.6	55.8	195°55.5	05.7	343°06.9	13.6	Hadar	132 49.2 148°30.4	-60°31.2
8	48°32.2	269°00.6	28.2	$215^{\circ}16.9$	56.3	210°57.8	05.8	358°09.2	13.6	I		
9	63°34.7	284°00.0	• • 27.2	230°18.2	• • 56.9	226°00.1	• • 05.9	13°11.4	• • 13.7	Menkent	147°53.1	-36°31.1
10	78°37.1	298° 59.5	26.3	245°19.6	57.4	241°02.4	05.9	28°13.7	13.8	Arcturus	145°44.5	19°01.8
11	93°39.6	313°58.9	25.4	260°20.9	57.9	256°04.7	06.0	43°15.9	13.8	Rigil Kent.	139°34.8	-60°57.7
12	108°42.0	328° 58.4	N17°24.5	275°22.2	S05°58.4	271°07.0	S06°06.1	58°18.1	N16°13.9	Kochab	137°19.7	74°02.3
13	123°44.5	343°57.8	23.6	290°23.5	59.0	286°09.3	06.2	73°20.4	13.9	Zuben'ubi	136°51.8	-16°09.9
14	138°47.0	358° 57.3	22.6	305°24.9	05°59.5	301°11.6	06.3	88°22.6	14.0	Alphecca	126°00.5	26°37.1
15	153°49.4	13° 56.8	21.7	320°26.2	06°00.0	316°13.9	. 06.4	103°24.8	. 14.0	Antares	112°11.0	-26°29.8
16	168°51.9	28° 56.2	20.8	335°27.5	00.0	331°16.2	06.4	118°27.1	14.1	Atria	$107^{\circ}01.4$	-69°04.8
17	183°54.4	43°55.7	19.9	350°28.8	01.1	346°18.5	06.5	133°29.3		Sabik	101°58.3	-15°45.6
							S06°06.6		14.1 N16°14.2	Shaula	96°05.0	-37°07.4
18	198°56.8	58°55.1	N17°18.9	5°30.2	S06°01.6	1°20.8		148°31.6	440	Rasalhague	95°54.9	12°32.5
19	213°59.3	73°54.6	18.0	20°31.5	02.1	16°23.0	06.7	163°33.8	14.2	Eltanin	90°40.0	51°29.3
20	229°01.8	88°54.1	17.1	35°32.8	02.7	31°25.3	06.8	178°36.0	14.3	Kaus Aust.	83°27.3	-34°22.0
21	244°04.2	103°53.5	• • 16.1	50°34.1	• • 03.2	46°27.6	• • 06.8	193°38.3	• • 14.3	Vega	80°30.3	38°48.8
22	259°06.7	118°53.0	15.2	65°35.5	03.7	61°29.9	06.9	208°40.5	14.4	Nunki	75°42.9	-26°15.4
23	274°09.2	133°52.4	14.3	80°36.8	04.2	76°32.2	07.0	223°42.7	14.4	Altair	61°56.1	8°57.0
Mern	ass. 04:46	ν -0.5' d-0	0.9′ m-3.90	$\nu 1.3' d0.$	5′ m0.48	$\nu 2.3' d0$	1' m-2.01	$\nu^{2.2'} d\Omega$.1′ m0.29	Peacock	52°59.6	-56°38.1
р										Deneb	49°22.8	45°23.2
										Enif	33°34.9	10°00.8
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.1	-46°48.7
0	$289^{\circ}11.6$	$148^{\circ}51.9$	$N17^{\circ}13.3$	95°38.1	S06°04.8	91°34.5	\$06°07.1		N16°14.5	Fomalhaut	15°10.4	-29°27.6
1	$304^{\circ}14.1$	163°51.4	12.4	110°39.4	05.3	106°36.8	07.2	253°47.2	14.5	Scheat	13°41.4	28°14.6
2	$319^{\circ}16.5$	$178^{\circ}50.8$	11.5	125°40.7	05.8	121°39.1	07.3	268°49.5	14.6	Markab	13°26.1	15°22.0
3	$334^{\circ}19.0$	193°50.3	• • 10.5	140°42.1	• • 06.4	136°41.4	• • 07.3	283°51.7	• • 14.6			
4	$349^{\circ}21.5$	208°49.8	09.6	155°43.4	06.9	151°43.6	07.4	298°53.9	14.7	Jul 09 Mon	SHA	Mer.pass
5	4°23.9	223°49.2	08.7	170°44.7	07.4	166°45.9	07.5	$313^{\circ}56.2$	14.7	Venus	222°05.0	14:03
6	19°26.4	238°48.7	N17°07.7	185°46.0	S06°07.9	181°48.2	S06°07.6	328°58.4	$N16^{\circ}14.8$	Mars	$167^{\circ}20.9$	17:40
7	34°28.9	253°48.2	06.8	200°47.3	08.5	196°50.5	07.7	344°00.6	14.8	Jupiter	$162^{\circ}31.0$	17:58
8	49°31.3	268°47.6	05.9	215°48.7	09.0	211°52.8	07.8	359°02.9	14.9	Saturn	309°44.4	08:11
9	64°33.8	283°47.1	• • 04.9	230°50.0	• • 09.5	226°55.1	07.8	14°05.1	• • 14.9			
10	79°36.3	298° 46.6	04.0	245°51.3	10.1	241°57.4	07.9	29°07.4	15.0	Jul 10 Tue	SHA	Mer.pass
11	94°38.7	313°46.0	03.0	260°52.6	10.6	256°59.7	08.0	44°09.6	15.0	Venus		14:04
12	109°41.2	328° 45.5	N17°02.1	275°53.9	S06°11.1	272°01.9	S06°08.1	59°11.8	N16°15.1		166°53.8	17:38
13	124°43.6	343°45.0	01.2	290°55.2	11.6	287°04.2	08.2	74°14.1	15.1		162°27.0	17:55
14	139°46.1	358° 44.4	17°00.2	305°56.6	12.2	302°06.5	08.3	89°16.3	15.2	Saturn	309°38.8	08:07
15	154°48.6	13°43.9	16°59.3	320°57.9	• • 12.7	317°08.8	• • 08.3	104°18.6	. 15.2	Jul 11 Wed	SHA	Mer pace
16	169°51.0	28° 43.4	58.3	335°59.2	13.2	332°11.1	08.4	119°20.8	15.3		219°40.3	Mer.pass
17	109 51.0 184°53.5	43° 42.9	57.4	351°00.5	13.2	347°13.4	08.4	134°23.0	15.3			14:05
18	199°56.0	43 42.9 58°42.3	N16°56.4	6°01.8	506°14.3	2°15.6	S06°08.6	134 23.0 149°25.3	N16°15.4		166°26.5	17:36
19	199 56.0 214°58.4	58 42.3 73°41.8		21°03.1	14.8	2 15.0 17°17.9	08.7	149 25.3 164°27.5			162°22.9	17:51
	214 58.4 230°00.9	73 41.8 88°41.3	55.5 54.6					104 27.5 179°29.8	15.4	Saturn	309°33.4	08:04
20			54.6	36°04.4	15.3	32°20.2	08.8 •• 08.9		15.5	Horizont	al parallax	
21	245°03.4	103°40.8	· · 53.6	51°05.7	· · 15.9	47°22.5		194°32.0	· · 15.5		Venus:	0.1
22	260°05.8	118° 40.2	52.7	66°07.1	16.4	62°24.8	08.9	209°34.2	15.6		Mars:	0.1
23	275°08.3	133°39.7	51.7	81°08.4	16.9	77°27.1	09.0	224°36.5	15.6		141013.	V.1
N 4	ass. 04:42	ν -0.5' d-0	0.9′ m-3.90	$\nu 1.3' \ d0.$	5′ m0 49	$\nu^2 3' d0$	1′ m-2.00	$\nu 2.2' \ d0$.1′ m0.29			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.7	N22°20.6	213°17.4	9.0'	N24°22.5	0.7'	55.6'
1	193°41.6	20.3	227°45.4	9.0'	24°23.1	0.5'	55.6'
2 3	208°41.5 223°41.4	20.0 •• 19.7	242°13.4 256°41.4	9.0' 8.9'	24°23.7 24°24.1	0.4' 0.3'	55.6' 55.6'
4	238°41.3	19.4	271°09.3	8.9'	24°24.1	0.3	55.6'
5	253°41.3	19.1	285°37.2	8.9'	24°24.5	0.0'	55.7'
6	268°41.2	$N22^{\circ}18.8$	$300^{\circ}05.1$	8.8'	N24°24.6	-0.1'	55.7'
7	283°41.1	18.5	314°32.9	8.8'	24°24.4	-0.2'	55.7'
8 9	298°41.0 313°40.9	18.2 •• 17.8	329°00.7 343°28.5	8.8' 8.7'	24°24.2 24°23.8	-0.4' -0.5'	55.7' 55.8'
10	313 40.9 328°40.8	17.5	343 26.3 357°56.3	8.7'	24°23.3	-0.5 -0.6'	55.8'
11	343°40.7	17.2	12°24.0	8.7'	24°22.7	-0.8'	55.8'
12	358°40.6	N22°16.9	26°51.7	8.7'	N24°21.9	-0.9'	55.8'
13	13°40.5	16.6	41°19.3	8.6'	24°21.0	-1.0'	55.9'
14 15	28°40.4 43°40.3	16.3 •• 16.0	55°47.0 70°14.6	8.6' 8.6'	24°20.0 24°18.8	-1.2' -1.3'	55.9' 55.9'
16	58°40.2	15.7	84°42.2	8.6'	24°17.5	-1.3 -1.4'	55.9'
17	73°40.2	15.4	99°09.8	8.6'	24°16.1	-1.6'	56.0'
18	88°40.1	N22° 15.1	113°37.3	8.5'	N24° 14.5	-1.7'	56.0'
19	103°40.0	14.7	128°04.9	8.5'	24°12.8 24°11.0	-1.8'	56.0'
20 21	118°39.9 133°39.8	14.4 •• 14.1	142°32.4 156°59.9	8.5' 8.5'	24°11.0 24°09.0	-2.0' -2.1'	56.0' 56.1'
22	133 39.6 148°39.7	13.8	150 59.9 171°27.4	8.5'	24°06.9	-2.1 -2.2'	56.1
23	163°39.6	13.5	185°54.9	8.5'	24°04.7	-2.4'	56.1
	SD = 15.7'	d = -0.3'		SI	D = 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°39.5 193°39.4	N22°13.2 12.8	200°22.3 214°49.8	8.5' 8.4'	N24°02.3 23°59.8	-2.5' -2.6'	56.1' 56.2'
2	208°39.4	12.6	214 49.6 229°17.3	8.4'	23°57.1	-2.8'	56.2'
3	223°39.3	• • 12.2	243°44.7	8.4'	23°54.4	-2.9'	56.2'
4	238°39.2	11.9	$258^{\circ}12.1$	8.4'	23°51.4	-3.1'	56.2'
5	253°39.1	11.6	272°39.5	8.4'	23°48.4	-3.2'	56.3'
6 7	268°39.0 283°38.9	N22°11.2 10.9	287°07.0 301°34.4	8.4' 8.4'	N23°45.2 23°41.9	-3.3' -3.5'	56.3' 56.3'
8	203 30.9 298°38.8	10.9	316°01.8	8.4'	23°38.4	-3.6'	56.3'
9	313°38.7	• • 10.3	330°29.2	8.4'	23°34.8	-3.7'	56.4'
10	328°38.7	10.0	344°56.6	8.4'	23°31.1	-3.9'	56.4'
11	343°38.6	09.6	359°24.0	8.4'	23°27.3	-4.0'	56.4
12 13	358°38.5 13°38.4	N22°09.3 09.0	13°51.4 28°18.8	8.4' 8.4'	N23°23.3 23°19.1	-4.1' -4.3'	56.4' 56.5'
14	28°38.3	08.7	42°46.3	8.4'	23°14.9	-4.4'	56.5
15	43°38.2	• • 08.3	57°13.7	8.4'	23°10.5	-4.5'	56.5'
16	58°38.1	0.80	71°41.1	8.4'	23°06.0	-4.7'	56.5'
17 18	73°38.0 88°38.0	07.7 N22°07.3	86°08.6 100°36.0	8.4' 8.5'	23°01.3 N22°56.5	-4.8' -4.9'	56.6' 56.6'
19	103°37.9	07.0	100 30.0 115°03.5	o.5 8.5'	22°51.6	-4.9 -5.1'	56.6'
20	118°37.8	06.7	129°30.9		22°46.5	-5.2'	56.6'
21	133°37.7	• • 06.3	143°58.4	8.5'	22°41.3	-5.3'	56.7'
22	148°37.6	06.0	158°25.9	8.5'	22°36.0	-5.5'	56.7'
23	163°37.5	05.7	172°53.4	8.5'	22°30.6	-5.6'	56.7'
	SD = 15.7'	d = -0.3'		SI	D = 15.3'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.5	N22°05.4	187°20.9	8.5'	N22°25.0	-5.7'	56.7'
1	193°37.4	05.0	201°48.4	8.5'	22°19.3	-5.8'	56.8'
2	208°37.3 223°37.2	04.7 •• 04.3	216°16.0 230°43.6	8.6' 8.6'	22°13.4 22°07.5	-6.0' -6.1'	56.8' 56.8'
3 4	238°37.1	04.0	230 43.6 245°11.1	8.6'	22°01.4	-6.1 -6.2'	56.9'
5	253°37.0	03.7	259°38.7	8.6'	21°55.2	-6.4	56.9'
6	268°36.9	N22°03.3	274°06.4	8.6'	N21°48.8	-6.5'	56.9'
7	283°36.9	03.0	288°34.0	8.7'	21°42.3 21°35.7	-6.6'	56.9'
8 9	298°36.8 313°36.7	02.7 · · · 02.3	303°01.7 317°29.4	8.7' 8.7'	21°35.7 21°29.0	-6.7' -6.9'	57.0' 57.0'
10	328°36.6	02.0	331°57.1	8.7'	21°22.1	-7.0'	57.0'
11	343°36.5	01.6	346°24.8	8.8'	$21^{\circ}15.1$	-7.1'	57.0'
12	358°36.5	N22°01.3	0°52.6	8.8'	N21°08.0	-7.2'	57.0'
13 14	13°36.4 28°36.3	01.0 00.6	15°20.4 29°48.2	8.8' 8.8'	21°00.8 20°53.4	-7.4' -7.5'	57.1' 57.1'
15	43°36.2	22°00.3	44°16.0	o.o 8.9'	20° 45.9	-7.6'	57.1'
16	58°36.1	21°59.9	58°43.9	8.9'	20°38.3	-7.7'	57.1'
17	73°36.0	59.6	73°11.8	8.9'	20°30.6	-7.8'	57.2'
18	88°36.0 103°35.9	N21°59.2	87°39.7 102°07.7	9.0' 9.0'	N20°22.8 20°14.8	-8.0'	57.2'
19 20	103°35.9 118°35.8	58.9 58.6	102°07.7 116°35.7	9.0'	20° 14.8 20° 06.7	-8.1' -8.2'	57.2' 57.2'
21	133°35.7	58.2	131°03.7	9.0'	19°58.5	-8.3	57.3'
22	148°35.6	57.9	145°31.7	9.1'	19°50.2	-8.4'	57.3'
23	163°35.6	57.5	159°59.8	9.1'	19°41.8	-8.6'	57.3'
	SD = 15.7'	d = -0.3'		SI	D = 15.5'		

			2029	July 0	9 to Ju	ıl. 11 l
Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:14	22:53	////	////
64°	////	////	02:02	22:07	////	////
62° 60°	////	////	02:32	21:37	////	////
	////	01:30	02:55	21:15	22:38	////
N 58°	1///	02:05	03:13	20:57	22:04	////
56° 54°	//// 01:22	02:30 02:50	03:28 03:41	20:42 20:29	21:39 21:20	//// 22:46
54°	01:22	02:50	03:41	20:29	21:20	22:40
50°	02:19	03:20	04:03	20:08	20:51	21:51
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:28	04:08	04:40	19:30	20:02	20:43
35°	03:49	04:25	04:54	19:16	19:45	20:21
30°	04:07	04:40	05:07	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:36
$N 10^{\circ}$	04:56	05:22	05:45	18:26	18:48	19:15
0°	05:14	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:39	07:07	17:04	17:32	18:03
40° 45°	06:17	06:50	07:20	16:51	17:21	17:54
	06:26	07:03	07:36	16:35	17:08	17:45
S 50° 52°	06:37	07:18	07:55	16:16	16:53	17:34
52° 54°	06:42 06:47	07:25 07:32	08:04 08:15	16:07 15:57	16:47 16:39	17:30 17:24
56°	06:52	07:32	08:26	15:45	16:31	17:19
58°	06:58	07:50	08:39	15:32	16:22	17:13
S 60°	07:05	08:00	08:55	15:16	16:11	17:06
Lat		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						23:28
68°						22:27
66°	22:48		01:08	22:27	22:00	21:52
64°		00:18	01:49	20:56	21:18	21:27
62°		00:55	02:17	20:19	20:50	21:07
60°	00:22	01:21	02:38	19:52	20:28	20:50

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

		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	8-0%	
09	05:13	05:18	12:05	10:09	22:35		
10	05:22	05:26	12:05	11:02	23:30		
11	05:30	05:34	12:06	11:56	-:-		

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	290°10.8	148° 39.2	N16°50.8	96°09.7	S06°17.5	92°29.3	S06°09.1	239°38.7	N16°15.7			
1	305°13.2	163°38.7	49.8	111°11.0	18.0	107°31.6	09.2	254°41.0	15.7	Alpheratz	357°30.8	29°15.2
2	320°15.7	178°38.1		126°12.3	18.5	122°33.9	09.2	269°43.2		Ankaa	353°03.6	-42°08.4
		176 36.1 193°37.6	48.9						15.8	Schedar	349°26.6	56°41.8
3	335°18.1		• • 47.9	141°13.6	• • 19.1	137°36.2	• • 09.4	284°45.4	• • 15.8	Diphda	348°43.6	-17°49.2
4	350°20.6	208°37.1	46.9	156°14.9	19.6	152°38.5	09.5	299°47.7	15.9	Achernar	335°17.7	-57°04.8
5	5°23.1	223°36.6	46.0	171°16.2	20.1	167°40.8	09.5	314°49.9	15.9	Hamal	327°47.1	23°36.1
6	20°25.5	238°36.1	N16°45.0	186°17.5	S06°20.7	182°43.0	S06°09.6	329°52.2	N16°16.0	Polaris	312°14.5	89°22.9
7	35°28.0	253°35.5	44.1	201°18.8	21.2	197°45.3	09.7	344°54.4	16.0	Acamar	315°09.3	-40°10.9
8	50°30.5	268°35.0	43.1	216°20.2	21.7	212°47.6	09.8	359°56.6	16.1			
9	65°32.9	283°34.5	• • 42.2	231°21.5	• • 22.2	227°49.9	• • 09.9	14°58.9	• • 16.1	Menkar	314°02.5	4°12.3
10	80°35.4	298°34.0	41.2	246°22.8	22.8	242°52.2	10.0	30°01.1	16.2	Mirfak	308°23.2	49°57.7
11	95°37.9	313°33.5	40.3	261°24.1	23.3	257°54.4	10.1	45°03.4	16.2	Aldebaran	290°35.7	16°34.0
12	110°40.3	328° 33.0	N16°39.3	276°25.4	S06°23.8	272°56.7	S06°10.1	60°05.6	N16°16.3	Rigel	281°00.7	-8°10.1
	125°42.8	343°32.4	38.3	291°26.7		287°59.0	10.2	75°07.9		Capella	$280^{\circ}16.9$	46°01.4
13					24.4				16.3	Bellatrix	278°19.3	6°22.5
14	140°45.3	358°31.9	37.4	306°28.0	24.9	303°01.3	10.3	90°10.1	16.4	Elnath	277°57.6	28°37.8
15	155°47.7	13°31.4	• • 36.4	321°29.3	• • 25.4	318°03.6	• • 10.4	105°12.3	• • 16.4	Alnilam	275°34.3	$-1^{\circ}11.1$
16	170°50.2	28° 30.9	35.4	336°30.6	26.0	333°05.8	10.5	120°14.6	16.5	Betelgeuse	270°48.4	7°24.6
17	185°52.6	43°30.4	34.5	351°31.9	26.5	348°08.1	10.6	135°16.8	16.5	Canopus	263°51.3	-52°42.7
18	200°55.1	58° 29.9	N16°33.5	6°33.2	S06°27.0	3°10.4	S06°10.7	$150^{\circ}19.1$	N16°16.6	Sirius	258°23.4	-16°45.5
19	215°57.6	73°29.4	32.6	21°34.5	27.6	18°12.7	10.7	165°21.3	16.6			
20	231°00.0	88°28.9	31.6	36°35.8	28.1	33°15.0	10.8	180°23.6	16.7	Adhara	255°03.4	-29°00.8
21	246°02.5	103°28.3	30.6	51°37.1	28.6	48°17.2	• • 10.9	195°25.8	• • 16.7	Procyon	244° 47.4	5°08.8
22	261°05.0	118° 27.8	29.7	66°38.4	29.2	63°19.5	11.0	210°28.0	16.7	Pollux	243°13.3	27°57.2
	201 03.0 276°07.4	133°27.3		81°39.7	29.2	78°21.8		225°30.3		Avior	234°13.8	-59°36.4
23	210 07.4	-	28.7	01 39.7	29.1	10 21.8	11.1	225 30.3	16.8	Suhail	222°43.9	-43°33.3
Mer.n	ass. 04:39	ν -0.5' d-1	0′ m-3.90	ν 1.3 $^{\prime}$ d0	.5′ m0.50	$\nu 2.3' d0$	1' m-2.00	ν 2.2' d0	.0′ m0.28	Miaplacidus	221°38.1	-69°50.6
		- 0.0 4 2								Alphard	217°44.4	-8°47.4
										Regulus	207°30.8	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.6
0	291°09.9	$148^{\circ}26.8$	$N16^{\circ}27.7$	96°41.0	S06°30.2	93°24.1	S06°11.2	240°32.5	N16°16.8	Denebola	182°21.4	14°24.4
1	306°12.4	$163^{\circ}26.3$	26.8	111°42.3	30.8	108°26.3	11.3	255°34.8	16.9	1		
2	321°14.8	178°25.8	25.8	126°43.6	31.3	123°28.6	11.4	270°37.0	16.9	Gienah	175°39.9	-17°42.5
3	336°17.3	193°25.3	• • 24.8	141°44.9	• • 31.8	138°30.9	• • 11.4	285°39.3	• • 17.0	Acrux	172°55.9	-63°16.1
4	351°19.8	208° 24.8	23.8	156°46.2	32.4	153°33.2	11.5	300°41.5	17.0		171°47.5	-57°17.1
5	6°22.2	223°24.3	22.9	171°47.5	32.9	168°35.4	11.6	315°43.8	17.1	Alioth	$166^{\circ}10.0$	55°48.2
										Spica	$158^{\circ}18.4$	-11°19.0
6	21°24.7	238°23.8	N16°21.9	186°48.8	S06°33.4	183°37.7	S06°11.7	330°46.0	N16°17.1	Alkaid	152°49.2	49°10.2
7	36°27.1	253°23.3	20.9	201°50.1	34.0	198°40.0	11.8	345°48.2	17.2	Hadar	148°30.4	-60°31.2
8	51°29.6	268°22.8	20.0	216°51.4	34.5	213°42.3	11.9	0°50.5	17.2	Menkent	147°53.1	-36°31.1
9	66°32.1	283°22.3	• • 19.0	231°52.7	• • 35.0	228°44.5	• • 12.0	15°52.7	• • 17.3	Arcturus	145°44.5	19°01.8
10	81°34.5	298°21.8	18.0	246°54.0	35.6	243°46.8	12.1	30°55.0	17.3	Rigil Kent.	139°34.8	-60°57.7
11	96°37.0	313°21.3	17.0	261°55.3	36.1	258°49.1	12.2	45°57.2	17.4	1 -		
12	111°39.5	328° 20.7	N16°16.0	276°56.6	S06°36.6	273°51.4	S06°12.2	60°59.5	N16°17.4	Kochab	137°19.8	74°02.3
13	126°41.9	343°20.2	15.1	291°57.9	37.2	288°53.6	12.3	76°01.7	17.5	Zuben'ubi	136°51.8	-16°09.9
14	141°44.4	358° 19.7	14.1	306°59.2	37.7	303°55.9	12.4	91°04.0	17.5	Alphecca	126°00.5	26°37.1
15	156°46.9	13° 19.2		322°00.5	• • 38.2	318°58.2	. 12.5	106°06.2	• • 17.6	Antares	$112^{\circ}11.0$	-26°29.8
			· · 13.1							Atria	$107^{\circ}01.4$	-69°04.8
16	171°49.3	28° 18.7	12.1	337°01.8	38.8	334°00.5	12.6	121°08.4	17.6	Sabik	101°58.3	-15°45.6
17	186°51.8	43°18.2	11.2	352°03.1	39.3	349°02.7	12.7	136°10.7	17.7	Shaula	96°05.0	-37°07.4
18	201°54.3	58° 17.7	$N16^{\circ}10.2$	7°04.4	S06°39.8	4°05.0	S06°12.8		N16°17.7	Rasalhague	95°54.9	12°32.5
19	216°56.7	73° 17.2	09.2	22°05.7	40.4	19°07.3	12.9	166°15.2	17.8	Eltanin	90°40.0	51°29.3
20	231°59.2	88°16.7	08.2	37°06.9	40.9	34°09.5	13.0	181°17.4	17.8	Kaus Aust.	83°27.3	-34°22.1
21	247°01.6	103°16.3	• • 07.2	52°08.2	• • 41.4	49°11.8	• • 13.0	196°19.7	• • 17.9	Vega	80°30.3	38°48.9
22	262°04.1	$118^{\circ}15.8$	06.2	67°09.5	42.0	64°14.1	13.1	211°21.9	17.9			
23	277°06.6	133° 15.3	05.3	82°10.8	42.5	79°16.4	13.2	226°24.2	18.0	Nunki	75°42.9	-26°15.4
										Altair	61°56.1	8°57.0
Mer.p	ass. 04:35	ν -0.5 $'$ d-1	0′ m-3.90	$\nu 1.3' \ d0$	$.5' \; m0.51$	$\nu 2.3' \ d0.$	1' m-1.99	ν 2.2 $^{\prime}$ d0	.0′ m0.28	Peacock	52°59.5	-56°38.1
										Deneb	49°22.8	45°23.2
٠.	CIIA	CIIA	ъ	CIIA		CIIA		CIIA	ь.	Enif	33°34.9	10°00.8
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}28.1$	-46°48.7
0	292°09.0	148° 14.8	N16°04.3	97°12.1		94°18.6	S06°13.3		N16°18.0	Fomalhaut	$15^{\circ}10.4$	-29°27.6
1	307°11.5	163°14.3	03.3	112°13.4	43.6	109°20.9	13.4	256°28.7	18.1	Scheat	13°41.4	28°14.6
2	322°14.0	178° 13.8	02.3	127°14.7	44.1	124°23.2	13.5	271°30.9	18.1	Markab	13°26.0	15°22.0
3	$337^{\circ}16.4$	193°13.3	• • 01.3	142°16.0	• • 44.6	139°25.4	• • 13.6	286°33.2	•• 18.1			
4	$352^{\circ}18.9$	$208^{\circ}12.8$	$16^{\circ}00.3$	157°17.3	45.2	154°27.7	13.7	301°35.4	18.2	Jul 12 Thu	SHA	Mer.pass
5	7°21.4	223°12.3	15°59.3	172°18.6	45.7	169°30.0	13.8	316°37.7	18.2	Venus	218°28.4	14:06
6	22°23.8	238°11.8	N15°58.3	187°19.8	S06°46.2	184°32.2	S06°13.9	331°39.9		Mars	165°58.9	17:34
7	37°26.3	253°11.3	57.4	202°21.1	46.8	199°34.5	13.9	346°42.1	18.3		162°18.6	17:47
8	52°28.7	268° 10.8	56.4	217°22.4	47.3	214°36.8	14.0	1°44.4	18.4	Saturn	309°28.0	08:00
9	67°31.2	283°10.3	55.4	232°23.7	• • 47.8	214 30.8 229°39.1	•• 14.1	16°46.6	. 18.4	Jutuill		
										Jul 13 Fri	SHA	Mer.pass
10	82°33.7	298°09.8	54.4	247°25.0	48.4	244°41.3	14.2	31°48.9	18.5		217°16.9	14:07
11	97°36.1	313°09.3	53.4	262°26.3	48.9	259°43.6	14.3	46°51.1	18.5	I	165°31.1	17:32
12	112°38.6	328°08.9	N15°52.4	277°27.6	S06°49.5	274°45.9	S06°14.4	61°53.4	$N16^{\circ}18.6$		162°14.2	17:44
13	127°41.1	343°08.4	51.4	292°28.9	50.0	289°48.1	14.5	76°55.6	18.6	Saturn		07:57
14	142°43.5	358°07.9	50.4	307°30.1	50.5	304°50.4	14.6	91°57.9	18.7	Jatum	309 44.0	
15	157°46.0	13°07.4	• • 49.4	322°31.4	• • 51.1	319°52.7	• • 14.7	$107^{\circ}00.1$	• • 18.7	Jul 14 Sat	SHA	Mer.pass
16	172°48.5	28°06.9	48.4	337°32.7	51.6	334°54.9	14.8	122°02.4	18.8		216°05.7	14:07
17	187°50.9	43°06.4	47.4	352°34.0	52.1	349°57.2	14.9	137°04.6	18.8	I	165°03.1	17:30
18	202°53.4	58°05.9	N15°46.4	7°35.3	S06°52.7	4°59.5	506°14.9	152°06.9	N16°18.9			
	202 55.4 217°55.9	73°05.5		22°36.6		4 59.5 20°01.7	15.0	167°09.1			162°09.6	17:40
19			45.4		53.2				18.9	Saturn	309°17.4	07:53
20	232°58.3	88°05.0	44.4	37°37.8	53.7	35°04.0	15.1	182°11.4	19.0	∐au!ast	al parallas	
21	248°00.8	103°04.5	• • 43.4	52°39.1	• • 54.3	50°06.3	• • 15.2	197°13.6	• • 19.0	norizoni	al parallax	0.1
22	263°03.2	118°04.0	42.4	67°40.4	54.8	65°08.5	15.3	212°15.9	19.0		Venus:	0.1
23	278°05.7	133°03.5	41.4	82°41.7	55.4	80°10.8	15.4	227°18.1	19.1		Mars:	0.1
N/1	200 04.21	1, O E/ -1 1	0/ == 2.00	.,1 2/ -/0	E/ m0 F2	10 2/ -10	1/ m 1 00	1/2 2/ -/2	0/ 20 20			
ivier.p	ass. 04:31	ν -0.5′ d -1	0′ m-3.90	$\nu_{1.3'} d0$.5′ m0.52	ν 2.3′ $d0$.	1′ m-1.99	ν 2.2' $d0$.0′ m0.28			

h	Sun				Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°35.5 193°35.4	N21°57.2 56.8	174°27.9 188°56.1	9.1' 9.2'	N19°33.2 19°24.5	-8.7' -8.8'	57.3' 57.4'
2	208°35.3	56.5	203°24.2	9.2'	19°24.5 19°15.8	-0.0 -8.9'	57.4'
3	223°35.2	•• 56.1	217°52.4	9.2'	19°06.9	-9.0'	57.4'
4 5	238°35.2 253°35.1	55.8 55.4	232°20.7 246°49.0	9.3' 9.3'	18°57.9 18°48.7	-9.1' -9.2'	57.4' 57.5'
6	268°35.0	N21°55.1	261° 17.3	9.4'	N18°39.5	-9.3'	57.5'
7	283°34.9	54.7	275° 45.6	9.4'	18°30.2	-9.4'	57.5'
8 9	298°34.9 313°34.8	54.3 •• 54.0	290°14.0 304°42.4	9.4' 9.5'	18°20.7 18°11.2	-9.6' -9.7'	57.5' 57.6'
10	328°34.7	53.6	319° 10.9	9.5'	18°01.5	-9.8'	57.6'
11	343°34.6	53.3	333°39.4	9.5'	17°51.7	-9.9'	57.6'
12 13	358°34.5 13°34.5	N21°52.9 52.6	348°07.9 2°36.5	9.6' 9.6'	N17°41.9 17°31.9	-10.0' -10.1'	57.6' 57.6'
14	28°34.4	52.2	17°05.1	9.6'	17°21.8	-10.2	57.7'
15	43°34.3	• • 51.9	31°33.7	9.7'	17°11.6	-10.3'	57.7'
16 17	58°34.2 73°34.2	51.5 51.1	46°02.4 60°31.1	9.7' 9.8'	17°01.3 16°50.9	-10.4' -10.5'	57.7' 57.7'
18	88°34.1	N21°50.8	74°59.9	9.8'	N16°40.5	-10.6'	57.8'
19	103°34.0	50.4	89°28.7	9.8'	16°29.9	-10.7'	57.8'
20 21	118°33.9 133°33.9	50.1 •• 49.7	103°57.5 118°26.4	9.9' 9.9'	16°19.2 16°08.4	-10.8' -10.9'	57.8' 57.8'
22	148°33.8	49.3	132°55.3	9.9'	15°57.5	-11.0'	57.8'
23	163°33.7	49.0	147°24.2	10.0'	15°46.6	-11.1'	57.9'
	SD = 15.7'	d = -0.3'		SI	O = 15.6'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.6	N21°48.6	161°53.2	10.0'	N15°35.5	-11.2'	57.9'
1 2	193°33.6 208°33.5	48.2 47.9	176°22.2 190°51.3	10.1' 10.1'	15°24.4 15°13.1	-11.2' -11.3'	57.9' 57.9'
3	223°33.4	• • 47.5	205°20.4	10.1	15°01.8	-11.4	57.9'
4	238°33.3	47.1	219°49.5	10.2'	14°50.4	-11.5'	58.0'
5 6	253°33.3 268°33.2	46.8 N21°46.4	234° 18.7 248° 47.9	10.2' 10.2'	14°38.9 N14°27.3	-11.6' -11.7'	58.0' 58.0'
7	283°33.1	46.0	263° 17.1	10.2	14°15.6	-11.7	58.0'
8	298°33.0	45.7	277°46.4	10.3'	14°03.8	-11.8'	58.0'
9 10	313°33.0 328°32.9	· · 45.3 44.9	292°15.7 306°45.0	10.3' 10.4'	13°52.0 13°40.1	-11.9' -12.0'	58.1' 58.1'
11	343°32.8	44.5	321°14.4	10.4	13°28.0	-12.1'	58.1
12	358°32.8	N21°44.2	335°43.8	10.5'	N13°16.0	-12.2'	58.1'
13 14	13°32.7 28°32.6	43.8 43.4	350°13.3 4°42.8	10.5' 10.5'	13°03.8 12°51.6	-12.2' -12.3'	58.1' 58.2'
15	43°32.5	• • 43.1	19°12.3	10.6'	12°39.2	-12.4	58.2'
16	58°32.5	42.7	33°41.9	10.6'	12°26.8	-12.5'	58.2'
17 18	73°32.4 88°32.3	42.3 N21°41.9	48°11.4 62°41.1	10.6' 10.7'	12°14.4 N12°01.8	-12.5' -12.6'	58.2' 58.2'
19	103°32.3	41.6	77° 10.7	10.7'	11°49.2	-12.7'	58.3'
20	118°32.2 133°32.1	41.2 •• 40.8	91°40.4 106°10.1	10.7' 10.7'	11°36.5 11°23.8	-12.7' -12.8'	58.3' 58.3'
21 22	133 32.1 148°32.0	40.4	100 10.1 120°39.9	10.7	11 23.8 11°11.0	-12.8 -12.9'	58.3'
23	163°32.0	40.0	135°09.6	10.8'	10°58.1	-12.9'	58.3'
	SD = 15.7'	d = -0.4'		SI	O = 15.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.9	N21°39.7	149°39.4	10.8'	N10°45.2	-13.0'	58.3'
1 2	193°31.8 208°31.8	39.3 38.9	164°09.3 178°39.1	10.9' 10.9'	10°32.2 10°19.1	-13.1' -13.1'	58.4' 58.4'
3	200 31.0 223°31.7	· · 38.5	176 39.1 193°09.0	10.9	10 19.1 10°05.9	-13.1 -13.2'	58.4'
4	238°31.6	38.1	207°39.0	10.9'	09°52.8	-13.3'	58.4'
5 6	253°31.6 268°31.5	37.8 N21°37.4	222°08.9 236°38.9	11.0' 11.0'	09°39.5 N09°26.2	-13.3' -13.4'	58.4' 58.4'
7	283°31.4	37.0	251°08.9	11.0'	09°12.8	-13.4'	58.5
8	298°31.4	36.6	265°38.9	11.1'	08°59.4	-13.5'	58.5
9 10	313°31.3 328°31.2	· · 36.2 35.8	280°09.0 294°39.0	11.1' 11.1'	08°45.9 08°32.4	-13.5' -13.6'	58.5' 58.5'
11	343°31.1	35.4	309°09.1	11.1'	08°18.8	-13.6'	58.5'
12	358°31.1	N21°35.1	323°39.3	11.1'	N08°05.2	-13.7'	58.5'
13 14	13°31.0 28°30.9	34.7 34.3	338°09.4 352°39.6	11.2' 11.2'	07°51.5 07°37.8	-13.7' -13.8'	58.6' 58.6'
15	43°30.9	• • 33.9	7°09.7	11.2'	$07^{\circ}24.1$	-13.8'	58.6'
16	58°30.8	33.5	21°39.9	11.2'	07°10.2	-13.9'	58.6'
17 18	73°30.8 88°30.7	33.1 N21°32.7	36° 10.2 50° 40.4	11.2' 11.3'	06°56.4 N06°42.5	-13.9' -13.9'	58.6' 58.6'
19	103°30.6	32.3	65°10.7	11.3'	06°28.5	-14.0'	58.6'
20	118°30.6	31.9	79°40.9	11.3'	06°14.6	-14.0'	58.7'
21 22	133°30.5 148°30.4	· · 31.5 31.1	94°11.2 108°41.5	11.3' 11.3'	06°00.6 05°46.5	-14.1' -14.1'	58.7' 58.7'
23	163°30.4	30.7	123° 11.9	11.3'	05°32.4	-14.1'	58.7'
	SD = 15.7'	d = -0.4'		SI	D = 15.9'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-7%	
12	05:38	05:42	12:06	12:49	00:23		
13	05:45	05:49	12:06	13:40	01:15		
14	05:52	05:56	12:06	14:30	02:06		

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
	CIIA	CHA	D	CIIA	D	CIIA	D	CIIA	D			D
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	293°08.2	148°03.0	N15°40.4	97°43.0	S06°55.9	95°13.1	S06°15.5	242°20.4	N16°19.1	Alpheratz	357°30.8	29°15.2
1	308°10.6	163°02.6	39.4	112°44.2	56.4	110°15.3	15.6	257°22.6	19.2	Ankaa	353°03.5	-42°08.4
2	323°13.1	178°02.1	38.4	127°45.5	57.0	125°17.6	15.7	272°24.9	19.2	Schedar	349°26.5	56°41.8
3	338°15.6	193°01.6	• • 37.4	142°46.8	• • 57.5	140°19.8	• • 15.8	287°27.1	• • 19.3	Diphda	348°43.6	-17°49.2
4	353°18.0	208°01.1	36.4	157°48.1	58.0	155°22.1	15.9	302°29.4	19.3	Achernar	335°17.7	-57°04.8
5	8°20.5	223°00.6	35.4	172°49.4	58.6	170°24.4	16.0	317°31.6	19.4	Hamal	327°47.1	23°36.1
6	23°23.0	238°00.2	N15°34.4	187°50.6	S06°59.1	185°26.6	S06°16.1	332°33.9	N16°19.4	Polaris	312°13.1	89°22.9
7	38°25.4	252°59.7	33.4	202°51.9	06°59.6	200°28.9	16.1	347°36.1	19.5	Acamar	315°09.2	-40°10.9
8	53°27.9	267°59.2	32.4	217°53.2	07°00.2	215°31.2	16.2	2°38.4	19.5	Menkar	314°02.4	4°12.3
9	68°30.4	282°58.7	• • 31.3	232°54.5	• • 00.7	230°33.4	• • 16.3	17°40.6	• • 19.6	Mirfak	308°23.1	49°57.7
10	83°32.8	297°58.2	30.3	247°55.8	01.3	245°35.7	16.4	32°42.9	19.6	Aldebaran	290°35.7	16°34.0
11	98°35.3	312°57.8	29.3	262°57.0	01.8	260°37.9	16.5	47°45.1	19.6	Rigel	281°00.6	-8°10.1
12	113°37.7	327°57.3	N15°28.3	277°58.3	S07°02.3	275°40.2	S06°16.6	62°47.4	N16°19.7	Capella	280°16.9	46°01.4
13	128°40.2	342°56.8	27.3	292°59.6	02.9	290°42.5	16.7	77°49.6	19.7	Bellatrix	278°19.2	6°22.5
14	143°42.7	357°56.3	26.3	308°00.9	03.4	305°44.7	16.8	92°51.9	19.8	Elnath	277°57.6	28°37.8
15	158°45.1	12°55.9	• • 25.3	323°02.1	• • 03.9	320°47.0	• • 16.9	107°54.1	• • 19.8	Alnilam	275°34.3	-1°11.1
16	173°47.6	27°55.4	24.3	338°03.4	04.5	335°49.3	17.0	122°56.4	19.9	Betelgeuse	270°48.4	7°24.6
17	188°50.1	42°54.9	23.3	353°04.7	05.0	350°51.5	17.1	137°58.6	19.9	Canopus	263°51.3	-52°42.7
18	203°52.5	57°54.5	N15°22.2	8°06.0	S07°05.6	5°53.8	S06°17.2	153°00.9	N16°20.0	Sirius	258°23.4	-16°45.5
19	218°55.0	72°54.0	21.2	23°07.2	06.1	20°56.0	17.3	168°03.1	20.0	Adhara	255°03.4	-29°00.8
20	233°57.5	87°53.5	20.2	38°08.5	06.6	35°58.3	17.4	183°05.4	20.1	Procyon	244°47.4	5°08.8
21	248°59.9	102°53.0	· · 19.2	53°09.8	• • 07.2	51°00.6	• • 17.5	198°07.6	• • 20.1	Pollux	243°13.3	27°57.2
22	264°02.4	117°52.6	18.2	68°11.0	07.7	66°02.8	17.6	213°09.9	20.2	Avior	234°13.8	-59°36.4
23	279°04.8	132°52.1	17.2	83°12.3	08.3	81°05.1	17.6	228°12.1	20.2	Suhail	222°44.0	-43°33.3
Mern	ass. 04:27	ν -0.5' d-1	0′ m-3.90	$\nu 1.3' d0$.5′ m0.53	$\nu 2.3' d0$	1′ m-1.98	ν2 2' dΩ	.0′ m0.28	Miaplacidus	221°38.1	-69°50.6
		₽ 0.5 U-1	3.30	- 1.5 UU		- Z.5 UO.	1.30	- 2.2 00		Alphard	217°44.4	-8°47.3
										Regulus	207°30.8	11°49.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.6
0	294°07.3	147° 51.6	N15°16.1	98°13.6	S07°08.8	96°07.3	S06°17.7	243°14.4	N16°20.2	Denebola	182°21.4	14°24.4
1	309°09.8	162°51.2	15.1	113°14.9	09.3	111°09.6	17.8	$258^{\circ}16.7$	20.3	Gienah	175°39.9	-17°42.5
2	324°12.2	177°50.7	14.1	128°16.1	09.9	126°11.9	17.9	273°18.9	20.3	Acrux	173°55.9	-63°16.1
3	$339^{\circ}14.7$	192°50.2	•• 13.1	143°17.4	• • 10.4	$141^{\circ}14.1$	• • 18.0	288°21.2	• • 20.4	Gacrux		-57°17.1
4	354°17.2	207°49.8	12.1	158°18.7	10.9	$156^{\circ}16.4$	18.1	303°23.4	20.4	Alioth	166°10.0	55°48.2
5	9°19.6	222°49.3	11.0	173°19.9	11.5	171°18.6	18.2	318°25.7	20.5	Spica	158° 18.4	-11°19.0
6	24°22.1	237°48.8	N15°10.0	188°21.2	S07°12.0	186°20.9	S06°18.3	333°27.9	N16°20.5	Alkaid	150° 10.4° 152° 49.2	49°10.2
7	39°24.6	252°48.4	09.0	203°22.5	12.6	201°23.1	18.4	348°30.2	20.6	Hadar	132 49.2 148°30.5	-60°31.2
8	54°27.0	267°47.9	08.0	218°23.7	13.1	216°25.4	18.5	3°32.4	20.6	Menkent	146 50.5 147°53.1	-36°31.1
9	69°29.5	282°47.4	• • 06.9	233°25.0	• • 13.6	231°27.7	• • 18.6	18°34.7	• • 20.7	Arcturus	147 55.1 145°44.5	19°01.8
10	84°32.0	297°47.0	05.9	248°26.3	14.2	246°29.9	18.7	33°36.9	20.7	Rigil Kent.	139°34.9	-60°57.7
11	99°34.4	312°46.5	04.9	263°27.5	14.7	261°32.2	18.8	48°39.2	20.7	Kochab	139 34.9 137°19.8	74°02.3
12	114°36.9	327°46.1	N15°03.9	278°28.8	\$07°15.3	276°34.4	S06°18.9	63°41.4	N16°20.8		136°51.8	
13	129°39.3	342°45.6	02.8	293°30.1	15.8	291°36.7	19.0	78°43.7	20.8	Zuben'ubi	136 51.8 126°00.5	-16°09.9
14	144°41.8	$357^{\circ}45.1$	01.8	308°31.3	16.3	306°38.9	19.1	93°46.0	20.9	Alphecca		26°37.1
15	159°44.3	12°44.7	15°00.8	323°32.6	• • 16.9	321°41.2	• • 19.2	108°48.2	• • 20.9	Antares	112°11.0	-26°29.8
16	174°46.7	27° 44.2	14°59.7	338°33.9	17.4	336°43.4	19.3	123°50.5	21.0	Atria	107°01.4	-69°04.9
17	189°49.2	42°43.8	58.7	353°35.1	18.0	351°45.7	19.4	138°52.7	21.0	Sabik	101°58.3	-15°45.6
18	204°51.7	57°43.3	N14°57.7	8°36.4	S07°18.5	6°48.0	S06°19.5	153°55.0	N16°21.1	Shaula	96°05.0	-37°07.4
19	219°54.1	72°42.8	56.6	23°37.7	19.0	21°50.2	19.6	168°57.2	21.1	Rasalhague	95°54.9	12°32.5
20	234°56.6	87°42.4	55.6	38°38.9	19.6	36°52.5	19.6	183°59.5	21.2	Eltanin	90°40.0	51°29.3
21	249°59.1	102°41.9	• • 54.6	53°40.2	20.1	51°54.7	19.7	199°01.7	21.2	Kaus Aust.	83°27.3	-34°22.1
22	265°01.5	117°41.5	53.5	68°41.4	20.7	66°57.0	19.8	214°04.0	21.2	Vega	80°30.3	38°48.9
23	280°04.0	132°41.0	52.5	83°42.7	21.2	81°59.2	19.9	229°06.2	21.3	Nunki	75°42.9	-26°15.4
										Altair	61°56.0	8°57.0
Mer.p	ass. 04:23	u-0.5' d-1	0′ m-3.90	$\nu 1.3' \ d0$.5′ m0.54	$\nu 2.3' \ d0.$	1' m-1.97	ν 2.3′ d0	.0′ m0.27	Peacock	52°59.5	-56°38.1
										Deneb	49°22.8	45°23.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.9	10°00.8
0	295°06.4	147° 40.6	N14°51.5	98°44.0	507°21.7	97°01.5	S06°20.0	244°08.5	N16°21.3	Al Na'ir	27°28.1	-46°48.7
1	310°08.9	162°40.1	50.4	113°45.2	22.3	112°03.7	20.1	259°10.8	21.4	Fomalhaut	15°10.3	-29°27.6
2	325°11.4	177°39.6	49.4	128°46.5	22.8	127°06.0	20.2	274°13.0	21.4	Scheat	13°41.4	28°14.6
3	340°13.8	192°39.2	• • 48.4	143°47.7	23.4	142°08.2	. 20.2	289°15.3	. 21.5	Markab	13°26.0	15°22.0
4	355°16.3	207° 38.7	47.3	158°49.0	23.9	157°10.5	20.4	304°17.5	21.5	Jul 15 Sun	SHA	Mer.pass
5	10°18.8	222°38.3	46.3	173°50.3	24.4	172°12.7	20.5	319°19.8	21.6		214°54.9	14:08
6	25°21.2	237° 37.8	N14°45.3	188°51.5	S07°25.0	187°15.0	S06°20.6	334°22.0	N16°21.6		164°34.8	17:28
7	40°23.7	252°37.4	44.2	203°52.8	25.5	202°17.2	20.7	349°24.3	21.6		162°04.9	17:36
8	55°26.2	267°36.9	43.2	218°54.0	26.1	217°19.5	20.8	4°26.6	21.7	Saturn	309°12.2	07:49
9	70°28.6	282°36.5	• • 42.1	233°55.3	26.6	232°21.7	20.9	19°28.8	21.7			
10	85°31.1	297°36.0	41.1	248°56.6	27.1	247°24.0	21.0	34°31.1	21.8	Jul 16 Mon	SHA	Mer.pass
11	100°33.6	312°35.6	40.0	263°57.8	27.7	262°26.2	21.1	49°33.3	21.8	l l	213°44.3	14:09
12	115°36.0	327°35.1	N14°39.0	278°59.1	S07°28.2	277°28.5	S06°21.2	64°35.6	N16°21.9		164°06.3	17:26
13	130°38.5	342° 34.7	38.0	294°00.3	28.8	292°30.7	21.3	79°37.8	21.9		162°00.0	17:33
14	145°40.9	357° 34.2	36.9	309°01.6	29.3	307°33.0	21.4	94°40.1	22.0	Saturn	309°07.1	07:46
15	160°43.4	12°33.8	• • 35.9	324°02.8	• • 29.8	322°35.2	• • 21.5	109°42.4	• • 22.0	Jul 17 Tue	SHA	Mer.pass
16	175°45.9	27° 33.3	34.8	339°04.1	30.4	337°37.5	21.6	124°44.6	22.0		212°34.1	14:10
17	190°48.3	42°32.9	33.8	354°05.3	30.9	352°39.7	21.7	139°46.9	22.1	I	163°37.5	17:24
18	205°50.8	57° 32.5	N14°32.7	9°06.6	S07°31.5	7°42.0	S06°21.8		N16°22.1	I	161°55.0	17:29
19	220°53.3	72°32.0	31.7	24°07.9	32.0	22°44.2	21.9	169°51.4	22.2		309°02.1	07:42
20	235°55.7	87°31.6	30.6	39°09.1	32.6	37°46.5	22.0	184°53.6	22.2	Jatuill	JJJ JZ.1	01.74
21	250°58.2	102°31.1	• • 29.6	54°10.4	• • 33.1	52°48.7	• • 22.1	199°55.9	22.3	Horizont	al parallax	
22	266°00.7	117° 30.7	28.5	69°11.6	33.6	67°51.0	22.2	214°58.2	22.3		Venus:	0.1
23	281°03.1	132°30.2	27.5	84°12.9	34.2	82°53.2	22.3	230°00.4	22.4		Mars:	0.1
ivier.pa	ass. 04:19	ν -0.5' a -1	0′ m-3.90	ν 1.5 $a0$.5′ m0.55	ν 2.5° a 0.	1′ m-1.97	ν2.5' d0	.0′ m0.27			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.3	N21°30.4	137°42.2	11.3'	N05°18.3	-14.2'	58.7'
1 2	193°30.2 208°30.2	30.0 29.6	152°12.5 166°42.9	11.4' 11.4'	05°04.1 04°50.0	-14.2' -14.2'	58.7' 58.7'
3	223°30.1	29.2	181°13.2	11.4'	04°35.7	-14.2'	58.7
4	238°30.0	28.8	$195^{\circ}43.6$	11.4'	04°21.5	-14.3'	58.8'
5	253°30.0 268°29.9	28.4	210°14.0	11.4'	04°07.2	-14.3'	58.8'
6 7	268°29.9 283°29.9	N21°28.0 27.6	224°44.4 239°14.8	11.4' 11.4'	N03°52.9 03°38.6	-14.3' -14.3'	58.8' 58.8'
8	298°29.8	27.2	253°45.2	11.4'	03°24.2	-14.4'	58.8'
9	313°29.7	• • 26.8	268°15.6	11.4'	03°09.9	-14.4'	58.8'
10 11	328°29.7 343°29.6	26.4 26.0	282°46.0 297°16.5	11.4' 11.4'	02°55.5 02°41.1	-14.4' -14.4'	58.8' 58.8'
12	358°29.5	N21°25.6	311°46.9	11.4	N02°26.6	-14.4	58.9
13	13°29.5	25.2	326°17.3	11.4'	02°12.2	-14.5'	58.9'
14	28°29.4	24.8	340°47.7	11.4'	01°57.7	-14.5'	58.9'
15 16	43°29.4 58°29.3	· · 24.4 23.9	355°18.1 9°48.6	11.4' 11.4'	01°43.3 01°28.8	-14.5' -14.5'	58.9' 58.9'
17	73°29.2	23.5	24°19.0	11.4'	01°14.3	-14.5'	58.9'
18	88°29.2	N21°23.1	38°49.4	11.4'	N00°59.8	-14.5'	58.9'
19 20	103°29.1 118°29.1	22.7 22.3	53°19.8 67°50.2	11.4' 11.4'	00°45.2 00°30.7	-14.5' -14.5'	58.9' 58.9'
20	118 29.1 133°29.0	21.9	82°20.6	11.4 11.4'	00°30.7	-14.5'	58.9'
22	148°28.9	21.5	96°51.0	11.4'	N00°01.6	-14.5'	59.0'
23	163°28.9	21.1	111°21.4	11.4'	S00°12.9	14.5'	59.0'
	SD = 15.7'	d = -0.4'		SI	O = 16.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	178°28.8	N21°20.7	125°51.8	11.4'	S00°27.5	14.5'	59.0'
1	193°28.8	20.3	140°22.1	11.4'	00°42.0	14.5	59.0'
2 3	208°28.7 223°28.6	19.9 •• 19.4	154°52.5 169°22.8	11.3' 11.3'	00°56.6 01°11.1	14.5' 14.5'	59.0' 59.0'
3 4	238°28.6	19.4	109 22.6 183°53.2	11.3	01 11.1 01°25.7	14.5	59.0'
5	253°28.5	18.6	198°23.5	11.3'	01°40.2	14.5'	59.0'
6	268°28.5	N21°18.2	212°53.8	11.3'	S01°54.7	14.5'	59.0'
7 8	283°28.4 298°28.4	17.8 17.4	227°24.1 241°54.3	11.3' 11.3'	02°09.2 02°23.8	14.5' 14.5'	59.0' 59.0'
9	313°28.3	17.0	256°24.6	11.2'	02°23.3	14.5	59.0'
10	328°28.2	16.5	270°54.8	11.2'	02°52.8	14.5'	59.1'
11	343°28.2 358°28.1	16.1	285°25.0 299°55.2	11.2'	03°07.3 \$03°21.7	14.5'	59.1'
12 13	358°28.1 13°28.1	N21°15.7 15.3	299°55.2 314°25.4	11.2' 11.1'	03°36.2	14.5' 14.4'	59.1' 59.1'
14	28°28.0	14.9	328°55.6	11.1'	03°50.6	14.4'	59.1'
15	43°28.0	• • 14.5	343°25.7	11.1'	04°05.0	14.4'	59.1'
16 17	58°27.9 73°27.9	14.0 13.6	357°55.8 12°25.8	11.1' 11.0'	04°19.4 04°33.8	14.4' 14.4'	59.1' 59.1'
18	88°27.8	N21°13.2	26°55.9	11.0'	S04°48.2	14.3'	59.1
19	103°27.7	12.8	41°25.9	11.0'	05°02.5	14.3'	59.1'
20	118°27.7	12.3	55°55.9 70°25.9		05°16.8		59.1'
21 22	133°27.6 148°27.6	· · 11.9 11.5	70 25.9 84°55.8	10.9' 10.9'	05°31.1 05°45.4	14.3' 14.2'	59.1' 59.1'
23	163°27.5	11.1	99°25.7	10.9'	05°59.6	14.2'	59.1'
	SD = 15.7'	d = -0.4'		SI	D = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	178°27.5	N21°10.6	113°55.5	10.8'	S06°13.8	14.2'	59.1'
1	193°27.4	10.2	128°25.4	10.8'	06°28.0	14.1'	59.1'
2 3	208°27.4 223°27.3	09.8 •• 09.4	142°55.2 157°24.9	10.8' 10.7'	06°42.1 06°56.2	14.1' 14.1'	59.2' 59.2'
3 4	223 27.3 238°27.3	08.9	157 24.9 171°54.7	10.7'	06 56.2 07°10.3	14.1 14.0'	59.2'
5	253°27.2	08.5	186°24.3	10.6'	07°24.3	14.0'	59.2'
6	268°27.2 283°27.1	N21°08.1 07.7	200°54.0 215°23.6	10.6' 10.6'	\$07°38.3 07°52.2	13.9' 13.9'	59.2' 59.2'
7 8	283°27.1 298°27.1	07.7 07.2	215°23.6 229°53.2	10.6'	07°52.2 08°06.1	13.9'	59.2' 59.2'
9	313°27.0	06.8	244°22.7	10.5'	08°20.0	13.8'	59.2'
10	328°27.0	06.4	258°52.2	10.4	08°33.8	13.8'	59.2'
11 12	343°26.9 358°26.9	05.9 N21°05.5	273°21.6 287°51.0	10.4' 10.4'	08°47.6 \$09°01.3	13.7' 13.7'	59.2' 59.2'
13	13°26.8	05.1	302°20.4	10.4	09°15.0	13.6'	59.2'
14	28°26.8	04.6	$316^{\circ}49.7$	10.3'	09°28.6	13.6'	59.2'
15	43°26.7	04.2	331°18.9	10.2'	09°42.2	13.5'	59.2'
16 17	58°26.7 73°26.6	03.8 03.3	345°48.2 0°17.3	10.2' 10.1'	09°55.7 10°09.2	13.5' 13.4'	59.2' 59.2'
18	88°26.6	N21°02.9	14°46.4	10.1	S10°22.6	13.4'	59.2'
19	103°26.5	02.5	29°15.5	10.0'	10°36.0	13.3'	59.2'
20 21	118°26.5 133°26.4	02.0 •• 01.6	43°44.5 58°13.5	10.0' 9.9'	10°49.3 11°02.5	13.2' 13.2'	59.2' 59.2'
22	133 20.4 148°26.4	01.1	72°42.4	9.9' 9.9'	11°15.7	13.1'	59.2'
23	163°26.3	00.7	87°11.3	9.8'	11°28.8	13.1'	59.2'
	SD = 15.7'	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°	////	////	01:41	22:28	////	////
64°	////	////	02:19	21:51	////	////
62°	////	00:59	02:46	21:25	23:08	////
60°	////	01:49	03:06	21:05	22:20	////
N 58°	////	02:19	03:23	20:48	21:51	////
56°	00:54	02:41	03:37	20:34	21:29	23:13
54°	01:40	02:59	03:49	20:22	21:12	22:30
52°	02:08	03:14	03:59	20:12	20:57	22:03
50°	02:29	03:27	04:09	20:03	20:44	21:42
45°	03:06	03:53	04:29	19:43	20:19	21:05
N 40°	03:33	04:13	04:45	19:27	19:59	20:38
35°	03:54	04:29	04:58	19:14	19:43	20:18
30°	04:11	04:43	05:10	19:02	19:29	20:01
20°	04:37	05:06	05:30	18:42	19:07	19:35
N 10°	04:57	05:24	05:47	18:25	18:48	19:15
0°	05:15	05:40	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:17	18:43
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:19	17:44	18:14
35°	06:06	06:37	07:05	17:08	17:35	18:06
40°	06:14	06:48	07:18	16:55	17:25	17:58
45°	06:23	07:00	07:32	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:22	16:59	17:40
52°	06:38	07:20	07:59	16:13	16:53	17:35
54°	06:42	07:27	08:09	16:04	16:46	17:30
56°	06:47	07:35	08:20	15:53	16:38	17:25
58°	06:53	07:43	08:32	15:41	16:29	17:20
S 60°	06:59	07:53	08:46	15:26	16:19	17:14

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

		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	13-32%	
15	05:59	06:02	12:06	15:19	02:55		
16	06:05	06:07	12:06	16:09	03:44		
17	06.10	06.13	12:06	16.59	04:33		

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

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	296°05.6	147° 29.8	N14°26.4	99°14.1	S07°34.7	97°55.5	S06°22.4	245°02.7	N16°22.4			
1	311°08.1	162°29.3	25.4	114°15.4	35.3	112°57.7	22.5	260°04.9	22.4	Alpheratz	357°30.8	29°15.2
2	326°10.5	177°28.9	24.3	129°16.6	35.8	128°00.0	22.6	275°07.2	22.5	Ankaa	353°03.5	-42°08.4
3	341°13.0	192°28.5	23.3	144°17.9	36.3	143°02.2	22.7	290°09.5	22.5	Schedar	349°26.5	56°41.8
4	356°15.4	207°28.0	22.2	159°19.1	36.9	158°04.5	22.8	305°11.7	22.6	Diphda	348°43.6	-17°49.2
5	$11^{\circ}17.9$	222°27.6	21.2	174°20.4	37.4	173°06.7	22.9	$320^{\circ}14.0$	22.6	Achernar Hamal	335°17.6 327°47.1	-57°04.8 23°36.1
6	26°20.4	$237^{\circ}27.1$	N14°20.1	189°21.6	S 07°38.0	188°09.0	S 06°23.0	335°16.2	N16°22.7	Polaris	312°11.5	89°22.9
7	41°22.8	252°26.7	19.1	204°22.9	38.5	203°11.2	23.1	350°18.5	22.7	Acamar	315°09.2	-40°10.9
8	56°25.3	267°26.3	18.0	219°24.1	39.1	218°13.4	23.2	5°20.8	22.7	Menkar	314°02.4	4°12.4
9	71°27.8	282°25.8	• • 17.0	234°25.4	• • 39.6	233°15.7	• • 23.3	20°23.0	• • 22.8	Mirfak	308°23.1	49°57.7
10 11	86°30.2 101°32.7	297°25.4 312°25.0	15.9 14.8	249°26.6 264°27.9	40.1 40.7	248°17.9 263°20.2	23.4 23.5	35°25.3 50°27.5	22.8 22.9	Aldebaran	290°35.6	16°34.0
12	101 32.7 116°35.2	312 25.0 327°24.5	N14°13.8	279°29.1	507°41.2	203 20.2 278°22.4	506°23.6	65°29.8	N16°22.9	Rigel	281°00.6	-8°10.1
13	131°37.6	342°24.1	12.7	294°30.4	41.8	293°24.7	23.7	80°32.1	23.0	Capella	280°16.8	46°01.4
14	146°40.1	357°23.7	11.7	309°31.6	42.3	308°26.9	23.8	95°34.3	23.0	Bellatrix	278°19.2	6°22.5
15	161°42.5	12°23.2	• • 10.6	324°32.8	• • 42.9	323°29.2	• • 23.9	110°36.6	• • 23.1	Elnath	277°57.5	28°37.8
16	176°45.0	27°22.8	09.5	339°34.1	43.4	338°31.4	24.0	125°38.8	23.1	Alnilam	275°34.3 270°48.4	-1°11.0 7°24.7
17	191°47.5	42°22.4	08.5	354°35.3	43.9	353°33.6	24.1	140°41.1	23.1	Betelgeuse Canopus	263°51.3	-52°42.7
18	206°49.9	57°21.9	N14°07.4	9°36.6	S07°44.5	8°35.9	S06°24.2	155°43.4	N16°23.2	Sirius	258°23.3	-16°45.5
19	221°52.4	72°21.5	06.4	24°37.8	45.0	23°38.1	24.3	170°45.6	23.2	Adhara	255°03.3	-29°00.8
20 21	236°54.9 251°57.3	87°21.1 102°20.6	05.3 •• 04.2	39°39.1 54°40.3	45.6 •• 46.1	38°40.4 53°42.6	24.4 •• 24.5	185°47.9 200°50.2	23.3	Procyon	244°47.3	5°08.8
22	266°59.8	102 20.0 117°20.2	03.2	69°41.6	46.7	68°44.9	24.5	200 50.2 215°52.4	23.4	Pollux	243°13.2	27°57.1
23	282°02.3	132° 19.8	02.1	84°42.8	47.2	83°47.1	24.7	230°54.7	23.4	Avior	234°13.8	-59°36.4
										Suhail	222°44.0	-43°33.3
Mer.p	ass. 04:15	ν -0.4′ d-1	1′ m-3.90	$\nu 1.3' \ d0.$	5′ m0.56	ν 2.2' d0.	1′ m-1.96	$\nu^{2.3'} d0$.0′ m0.27	Miaplacidus Alphard	221°38.2 217°44.4	-69°50.5 -8°47.3
										Regulus	217 44.4 207°30.8	-6 47.3 11°49.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.6
0	297°04.7	147° 19.3	N14°01.0	99°44.0	S07°47.7	98°49.3	S06°24.8	245°56.9	N16°23.4	Denebola	182°21.4	14°24.4
1	312°07.2	162°18.9	14°00.0	114°45.3	48.3	113°51.6	24.9	260°59.2	23.5	Gienah	175°39.9	-17°42.5
2	327°09.7 342°12.1	177° 18.5 192° 18.1	13°58.9 •• 57.8	129°46.5 144°47.8	48.8 •• 49.4	128°53.8 143°56.1	25.0 •• 25.1	276°01.5 291°03.7	23.5 · · 23.6	Acrux	172°56.0	-63°16.1
3 4	342 12.1 357°14.6	207° 17.6	56.8	159°49.0	49.4	143 50.1 158°58.3	25.2	306°06.0	23.6	Gacrux		-57°17.0
5	12°17.0	222°17.2	55.7	174°50.2	50.5	174°00.5	25.2	321°08.3	23.7	Alioth	166°10.1	55°48.2
6	27°19.5	237°16.8	N13°54.6	189°51.5	S07°51.0	189°02.8	S06°25.4	336°10.5	N16°23.7	Spica	158°18.4	-11°19.0
7	42°22.0	$252^{\circ}16.3$	53.6	204°52.7	51.5	204°05.0	25.5	351°12.8	23.7	Alkaid Hadar	152°49.2 148°30.5	49°10.2 -60°31.2
8	57°24.4	$267^{\circ}15.9$	52.5	219°54.0	52.1	219°07.3	25.6	$6^{\circ}15.0$	23.8	Menkent		-36°31.1
9	72°26.9	$282^{\circ}15.5$	• • 51.4	234°55.2	• • 52.6	234°09.5	• • 25.7	21°17.3	• • 23.8	Arcturus	145°44.5	19°01.8
10	87°29.4	297° 15.1	50.4	249°56.4	53.2	249°11.7	25.8	36°19.6	23.9	Rigil Kent.	139°34.9	-60°57.7
11	102°31.8	312°14.7	49.3	264°57.7	53.7 507°54.2	264°14.0	25.9	51°21.8	23.9	Kochab	$137^{\circ}19.9$	74°02.3
12 13	117°34.3 132°36.8	327°14.2 342°13.8	N13°48.2 47.1	279°58.9 295°00.2	\$07°54.3 54.8	279°16.2 294°18.5	\$06°26.0 26.1	66°24.1 81°26.4	N16°23.9 24.0	Zuben'ubi	$136^{\circ}51.8$	-16°09.9
14	147°39.2	357° 13.4	46.1	310°01.4	55.4	309°20.7	26.1	96°28.6	24.0	Alphecca	126°00.5	26°37.1
15	162°41.7	12°13.0	• • 45.0	325°02.6	• • 55.9	324°22.9	26.3	111°30.9	• • 24.1	Antares	112°11.1	-26°29.8
16	177°44.2	27° 12.5	43.9	340°03.9	56.4	339°25.2	26.4	126°33.2	24.1	Atria Sabik	107°01.4 101°58.3	-69°04.9 -15°45.6
17	$192^{\circ}46.6$	42°12.1	42.8	355°05.1	57.0	354°27.4	26.5	141°35.4	24.2	Shaula	96°05.0	-15 45.0 -37°07.4
18	207°49.1	57° 11.7	N13°41.8		S07°57.5	9°29.7	S 06°26.6		N16°24.2	Rasalhague	95°54.9	12°32.5
19	222°51.5	72°11.3	40.7	25°07.6	58.1	24°31.9	26.7	171°39.9	24.2	Eltanin	90°40.0	51°29.3
20	237°54.0	87° 10.9	39.6	40°08.8	58.6	39°34.1	26.8	186°42.2	24.3	Kaus Aust.	83°27.3	-34°22.1
21 22	252°56.5 267°58.9	102° 10.4 117° 10.0	· · 38.5 37.5	55°10.0 70°11.3	· · 59.2 07°59.7	54°36.4 69°38.6	· · 26.9 27.0	201°44.5 216°46.7	· · 24.3 24.4	Vega	80°30.3	38°48.9
23	283°01.4	132°09.6	36.4	85°12.5	08°00.3	84°40.8	27.0	231°49.0	24.4	Nunki	75°42.9	-26°15.4
										Altair	61°56.0	8°57.0
Mer.p	ass. 04:11	ν -0.4′ d-1	1′ m-3.91	$\nu 1.2' d0.$	5′ m0.57	ν 2.2′ d0.	1′ m-1.96	$\nu 2.3' d0$.0′ m0.27	Peacock	52°59.5	-56°38.1
										Deneb Enif	49°22.8 33°34.9	45°23.3 10°00.8
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.1	-46°48.7
0	298°03.9	147°09.2	N13°35.3	100°13.7	S08°00.8	99°43.1	S06°27.2		$N16^{\circ}24.5$	Fomalhaut	15°10.3	-29°27.6
1	313°06.3	162°08.8	34.2	115°15.0	01.3	114°45.3	27.3	261°53.5	24.5	Scheat	13°41.3	28°14.7
2	328°08.8	177°08.4	33.1	130°16.2	01.9	129°47.5	27.4	276°55.8	24.5	Markab	13°26.0	15°22.0
3 4	343°11.3 358°13.7	192°07.9 207°07.5	· · 32.0 31.0	145°17.4 160°18.7	· · 02.4 03.0	144°49.8 159°52.0	· · 27.5 27.6	291°58.1 307°00.3	· · 24.6 24.6	Jul 18 Wed	SHA	Mer.pass
5	13°16.2	222°07.1	29.9	175°19.9	03.5	174°54.2	27.7	322°02.6	24.7	<u> </u>	211°24.2	14:10
6	28°18.6	237°06.7	N13°28.8	190°21.1	S08°04.1	189°56.5	S06°27.8	337°04.9			163°08.5	17:22
7	43°21.1	252°06.3	27.7	205°22.4	04.6	204°58.7	28.0	352°07.1	24.7	Jupiter	$161^{\circ}49.9$	17:26
8	58°23.6	267°05.9	26.6	$220^{\circ}23.6$	05.2	$220^{\circ}01.0$	28.1	7°09.4	24.8	Saturn	308°57.1	07:39
9	73°26.0	282°05.5	• • 25.5	235°24.8	• • 05.7	235°03.2	• • 28.2	22°11.7	• • 24.8	Jul 19 Thu	SHA	Mer.pass
10	88°28.5	297°05.1	24.5	250°26.0	06.3	250°05.4	28.3	37°13.9	24.9	I	210°14.6	14:11
11	103°31.0	312°04.6	23.4 N12°22.2	265°27.3	06.8 \$08°07.3	265°07.7	28.4	52°16.2	24.9 N16°25.0		162°39.3	17:20
12 13	118°33.4 133°35.9	327°04.2 342°03.8	N13°22.3 21.2	280°28.5 295°29.7	07.9	280°09.9 295°12.1	\$06°28.5 28.6	67°18.5 82°20.7	N16°25.0 25.0		161°44.6	17:22
14	148°38.4	357°03.4	20.1	310°31.0	07.9	310°14.4	28.7	97°23.0	25.0	Saturn	308°52.2	07:35
15	163°40.8	12°03.0	· · 19.0	325°32.2	• • 09.0	325°16.6	28.8	112°25.3	• • 25.1	Jul 20 Fri	SHA	Mer.pass
16	178°43.3	27°02.6	17.9	340°33.4	09.5	340°18.8	28.9	127°27.5	25.1		209°05.3	14:12
17	193°45.8	42°02.2	16.8	355°34.6	10.1	355°21.0	29.0	142°29.8	25.2	I	162°09.9	17:18
18	208°48.2	57°01.8	N13°15.8	10°35.9	S08°10.6	10°23.3	S06°29.1		N16°25.2		161°39.2	17:19
19	223°50.7	72°01.4	14.7	25°37.1	11.2	25°25.5	29.2	172°34.3	25.2	Saturn	308°47.4	07:31
20 21	238°53.1 253°55.6	87°01.0 102°00.6	13.6 •• 12.5	40°38.3 55°39.5	11.7 · · 12.3	40°27.7 55°30.0	29.3 •• 29.4	187°36.6 202°38.9	25.3 •• 25.3	Horizont	al parallax	
22	268°58.1	102 00.0 117°00.2	11.4	70°40.8	12.8	70°32.2	29.4	202 38.9 217°41.1	25.4		Venus:	0.1
23	284°00.5	131°59.8	10.3	85°42.0	13.3	85°34.4	29.6	232°43.4	25.4		Mars:	0.1
	ass. 04:07		1′ m-3.91	$\nu 1.2' \ d0.$			1′ m-1.95		.0′ m0.26			
ivier.p	uss. U4.U1	ν-0.4 U-1	111-3.91	ν1.∠ UU.	5 1110.36	ν Δ.Δ UU.	1 11-1.90	ν2.5 u0	.0 1110.20			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178°26.3	N21°00.3	$101^{\circ}40.1$	9.8'	S 11°41.9	13.0'	59.2'
1	193°26.2	20°59.8	116°08.8	9.7'	11°54.9	12.9'	59.2'
2	208° 26.2 223° 26.1	59.4 •• 58.9	130°37.5 145°06.2	9.6' 9.6'	12°07.8 12°20.7	12.9' 12.8'	59.2' 59.2'
4	238°26.1	58.5	159°34.8	9.5'	12°33.5	12.7'	59.2'
5	253°26.0	58.0	174°03.3	9.5'	12°46.2	12.6'	59.2'
6	268° 26.0	N20°57.6	188°31.8	9.4'	S12°58.8	12.6'	59.2'
7	283°26.0 298°25.9	57.2	203°00.2 217°28.6	9.4'	13°11.4 13°23.9	12.5'	59.2' 59.2'
8 9	298°25.9 313°25.9	56.7 • • 56.3	217°28.6 231°56.9	9.3' 9.2'	13°23.9 13°36.3	12.4' 12.3'	59.2' 59.2'
10	328° 25.8	55.8	246°25.1	9.2'	13°48.7	12.3'	59.2'
11	343°25.8	55.4	$260^{\circ}53.3$	9.1'	14°00.9	12.2'	59.2'
12	358°25.7	N20°54.9	275°21.4	9.1'	\$14°13.1	12.1'	59.2'
13 14	13°25.7 28°25.6	54.5 54.0	289°49.5 304°17.5	9.0' 8.9'	14°25.2 14°37.2	12.0' 11.9'	59.2' 59.2'
15	43°25.6	• • 53.6	318°45.4	8.9'	14° 49.2	11.8'	59.2'
16	58°25.6	53.1	333°13.3	8.8'	15°01.0	11.8'	59.2'
17	73° 25.5	52.7	347°41.1	8.7'	15°12.8	11.7'	59.2'
18	88°25.5 103°25.4	N20°52.2	2°08.8 16°36.5	8.7'	\$15°24.4 15°36.0	11.6' 11.5'	59.2'
19 20	103°25.4 118°25.4	51.8 51.3	31°04.1	8.6' 8.6'	15° 36.0 15° 47.5	11.5	59.2' 59.2'
21	133°25.3	• • 50.9	45°31.7	8.5'	15°58.9	11.3'	59.2'
22	148°25.3	50.4	59°59.1	8.4'	$16^{\circ}10.2$	11.2'	59.2'
23	163°25.3	50.0	74°26.6	8.4'	16°21.4	11.1'	59.2'
	SD = 15.7'	d = -0.4'		SI	D = 16.2'		
TL	GHA	Daa	GHA		Dec	ال	HP
Thu 0	GHA 178°25.2	Dec N20°49.5	GHA 88°53.9	ν 8.3'	Dec \$16°32.5	<i>d</i> 11.0'	НР 59.2'
1	193°25.2	49.1	103°21.2	8.2'	16°43.5	10.9'	59.2'
2	208°25.1	48.6	117°48.4	8.2'	16°54.4	10.8'	59.2'
3	223°25.1	• • 48.1	132°15.6	8.1'	17°05.2	10.7'	59.2'
4 5	238° 25.1 253° 25.0	47.7 47.2	146°42.7 161°09.7	8.0' 8.0'	17°15.9 17°26.5	10.6' 10.5'	59.2' 59.2'
6	268° 25.0	N20°46.8	175°36.7	7.9'	S17°37.0	10.5	59.2'
7	283°24.9	46.3	190°03.6	7.8'	17°47.4	10.3'	59.2'
8	298°24.9	45.9	204°30.4	7.8'	17°57.7	10.2'	59.2'
9	313°24.9 328°24.8	• • 45.4 44.9	218°57.2 233°23.9	7.7' 7.6'	18°07.9 18°17.9	10.1' 9.9'	59.2' 59.2'
10 11	328 24.8 343°24.8	44.9 44.5	233 23.9 247°50.5	7.6'	18 17.9 18°27.9	9.9 9.8'	59.2'
12	358°24.7	N20°44.0	262°17.1	7.5'	S18°37.7	9.7'	59.2'
13	13°24.7	43.5	276°43.6	7.4'	18°47.5	9.6'	59.2'
14	28°24.7	43.1	291°10.0	7.4'	18°57.1	9.5'	59.2'
15 16	43°24.6 58°24.6	· · 42.6 42.2	305°36.4 320°02.7	7.3' 7.2'	19°06.5 19°15.9	9.4' 9.3'	59.2' 59.2'
17	73°24.5	41.7	334°28.9	7.2'	19°25.2	9.1	59.2'
18	88°24.5	N20°41.2	348°55.1	7.1'	S19°34.3	9.0'	59.2'
19	103°24.5	40.8	3°21.2	7.0'	19°43.3	8.9'	59.2'
20 21	118°24.4 133°24.4	40.3 •• 39.8	17°47.2 32°13.2	7.0° 6.9'	19°52.2 20°01.0	8.8' 8.6'	59.2' 59.2'
22	148° 24.4	39.4	46°39.1	6.9	20°09.6	8.5	59.2'
23	163°24.3	38.9	61°05.0	6.8'	20°18.1	8.4'	59.1'
	SD = 15.7'	d = -0.5'		SI	D = 16.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.3	N20°38.4	75°30.8	6.7'	S20°26.5	8.3'	59.1'
1	193°24.3 208°24.2	37.9	89°56.5	6.7'	20°34.7	8.1'	59.1'
2	208°24.2 223°24.2	37.5 · · 37.0	104°22.2 118°47.8	6.6' 6.6'	20°42.8 20°50.8	8.0' 7.9'	59.1' 59.1'
4	238°24.2	36.5	133°13.4	6.5	20°58.7	7.7'	59.1
5	253°24.1	36.1	$147^{\circ}38.9$	6.4'	21°06.4	7.6'	59.1'
6	268°24.1	N20°35.6	162°04.3	6.4'	\$21°14.0	7.5'	59.1'
7 8	283°24.1 298°24.0	35.1 34.6	176°29.7 190°55.0	6.3' 6.3'	21°21.5 21°28.8	7.3' 7.2'	59.1' 59.1'
9	313°24.0	• • 34.2	205°20.3	6.2	21°35.9	7.0'	59.1
10	328°24.0	33.7	219°45.5	6.2'	21°43.0	6.9'	59.1'
11	343°23.9	33.2	234°10.7	6.1'	21°49.9	6.8'	59.1'
12 13	358°23.9 13°23.9	N20°32.7 32.3	248°35.8 263°00.9	6.1' 6.0'	\$21°56.6 22°03.2	6.6' 6.5'	59.1' 59.1'
13	28° 23.8	32.3 31.8	263 00.9 277°25.9	6.0'	22 03.2 22°09.7	6.3'	59.1 59.0'
15	43°23.8	• • 31.3	291°50.8	5.9'	$22^{\circ}16.0$	6.2'	59.0'
16	58° 23.8	30.8	306°15.7	5.9'	22°22.2	6.0'	59.0'
17	73°23.7	30.4	320°40.6	5.8'	22°28.3	5.9'	59.0'
18 19	88°23.7 103°23.7	N20°29.9 29.4	335°05.4 349°30.2	5.8' 5.7'	\$22°34.1 22°39.9	5.7' 5.6'	59.0' 59.0'
20	118°23.6	28.9	3°54.9	5.7'	22°45.5	5.4	59.0'
21	133°23.6	• • 28.4	$18^{\circ}19.6$	5.6'	22°50.9	5.3'	59.0'
22	148°23.6	27.9	32°44.3	5.6'	22°56.2	5.1'	59.0'
23	163°23.5	27.5	47°08.9	5.6'	23°01.4	5.0'	59.0'
	SD = 15.7'	d = -0.5'			D = 16.1'		

			2023	July 1	.O LU JI	JI. 20 (
Lat.	Twi	light	Sunrise	unrise Sunset		light
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	7///	////	00:49	23:14	////	////
66°	////	////	01:54	22:15	////	////
64°	////	////	02:28	21:42	////	////
62°	////	01:17	02:53	21:18	22:51	////
60°	////	01:59	03:12	20:59	22:11	////
$N 58^{\circ}$	////	02:26	03:28	20:43	21:44	////
56°	01:10	02:47	03:41	20:30	21:24	22:58
54°	01:49	03:04	03:53	20:19	21:07	22:21
52°	02:15	03:19	04:03	20:09	20:53	21:56
50°	02:34	03:31	04:12	19:59	20:41	21:37
45°	03:10	03:56	04:32	19:41	20:16	21:01
$N 40^{\circ}$	03:36	04:16	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:13	04:45	05:11	19:01	19:28	20:00
20°	04:38	05:07	05:31	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:39	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:03	17:10	17:37	18:08
40°	06:13	06:46	07:16	16:57	17:27	18:00
45°	06:21	06:57	07:30	16:43	17:16	17:52
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:17	07:56	16:17	16:56	17:38
54°	06:39	07:24	08:05	16:08	16:49	17:34
56°	06:44	07:31	08:16	15:58	16:42	17:29
58°	06:50	07:40	08:27	15:46	16:34	17:24
S 60°	06:55	07:49	08:41	15:32	16:24	17:18
		Moonris	ie		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	15:30			19:50		
N 70°	14:54	18:06		20:28	19:11	
68°	14:28	16:47		20:55	20:30	
66°	14:09	16:10	18:22	21:16	21:09	20:57
64°	13:53	15:44	17:34	21:32	21:36	21:45
62°	13:41	15:24	17:04	21:46	21:57	22:16

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-66%	
18	06:15	06:17	12:06	17:51	05:25		
19	06:19	06:21	12:06	18:46	06:18		
20	06:23	06:24	12:06	19:44	07:15		

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	299°03.0	146°59.4	N13°09.2	100°43.2	S08°13.9	100°36.7	S06°29.7	247°45.7	N16°25.4			
1	314°05.5	161°59.0	08.1	115°44.4	14.4	115°38.9	29.8	262°47.9	25.5	Alpheratz	357°30.7	29°15.2
2	329°07.9	176°58.5	07.0	130°45.7	15.0	130°41.1	29.9	277°50.2	25.5	Ankaa	353°03.5	-42°08.4
3	344°10.4	191°58.1	• • 05.9	145°46.9	• • 15.5	145°43.4	• • 30.0	292°52.5	• • 25.6	Schedar	349°26.5	56°41.8
4	359°12.9	206° 57.7	04.8	160°48.1	16.1	160°45.6	30.2	307°54.8	25.6	Diphda	348°43.6	-17°49.2
5	14°15.3	221°57.3	03.7	175°49.3	16.6	175°47.8	30.3	322°57.0	25.7	Achernar	335°17.6	-57°04.8
6	29°17.8	236°56.9	N13°02.6	190°50.5	S08°17.2	190°50.0	S06°30.4	337°59.3	N16°25.7	Hamal	327°47.0	23°36.1 89°22.9
7	44°20.3	251°56.5	01.5	205°51.8	17.7	205°52.3	30.5	353°01.6	25.7	Polaris	312°09.7	-40°10.9
8	59°22.7	$266^{\circ}56.1$	13°00.4	220°53.0	18.3	220°54.5	30.6	8°03.8	25.8	Acamar Menkar	315°09.2 314°02.4	4° 12.4
9	74°25.2	281°55.7	12°59.3	235°54.2	• • 18.8	235°56.7	• • 30.7	23°06.1	• • 25.8	Mirfak	308°23.1	49°57.7
10	89°27.6	296° 55.3	58.2	250°55.4	19.4	250°59.0	30.8	38°08.4	25.9	Aldebaran	290°35.6	16°34.0
11	104°30.1	311°54.9	57.1	265°56.6	19.9	266°01.2	30.9	53°10.6	25.9	Rigel	290 33.0 281°00.6	-8°10.1
12	119°32.6	326°54.5	N12°56.0	280°57.9	508°20.4	281°03.4	S06°31.0	68°12.9	N16°25.9	Capella	280°16.8	-6°10.1
13	134°35.0	$341^{\circ}54.1$	54.9	$295^{\circ}59.1$	21.0	296°05.6	31.1	83°15.2	26.0	Bellatrix	278°19.2	6°22.5
14	$149^{\circ}37.5$	356°53.8	53.8	311°00.3	21.5	311°07.9	31.2	98°17.5	26.0	Elnath	277°57.5	28°37.8
15	164°40.0	11°53.4	• • 52.7	326°01.5	• • 22.1	326°10.1	• • 31.3	113°19.7	· · 26.1	Alnilam	275°34.3	-1°11.0
16	179°42.4	26°53.0	51.6	341°02.7	22.6	341°12.3	31.4	128°22.0	26.1	Betelgeuse	270°48.4	7°24.7
17	194°44.9	41°52.6	50.5	356°04.0	23.2	356°14.5	31.5	143°24.3	26.1	Canopus	263°51.3	-52°42.6
18	209°47.4	56°52.2	N12°49.4	11°05.2	S08°23.7	11°16.8	S06°31.6	158°26.5	N16°26.2	Sirius	258°23.3	-16°45.5
19	224°49.8	71°51.8	48.3	26°06.4	24.3	26°19.0	31.7	173°28.8	26.2	Adhara	255°03.3	-29°00.8
20	239°52.3	86°51.4	47.2	41°07.6	24.8	41°21.2	31.9	188°31.1	26.3	Procyon	244°47.3	5°08.8
21	254°54.8	101°51.0	• • 46.1	56°08.8	• • 25.4	56°23.5	• • 32.0	203°33.4	• • 26.3	Pollux	243°13.2	27°57.1
22	269°57.2	116° 50.6	45.0	71°10.0	25.9	71°25.7	32.1	218°35.6	26.3	Avior	234°13.8	-59°36.4
23	284°59.7	131°50.2	43.9	86°11.3	26.5	86°27.9	32.2	233°37.9	26.4	Suhail	222°44.0	-43°33.3
Mer.p	ass. 04:03	ν -0.4' d-1	1′ m-3.91	$\nu 1.2' d0$.5′ m0.59	$\nu 2.2' d0.$	1' m-1.94	$\nu 2.3' d0$.0′ m0.26	Miaplacidus	221°38.2	-69°50.5
										Alphard	217°44.4	-8°47.3
_			_		_		_		_	Regulus	207°30.8	11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.6
0	300°02.1	146°49.8	N12°42.8	101°12.5	S08°27.0	101°30.1	S06°32.3	248°40.2	N16°26.4	Denebola	182°21.4	14°24.4
1	315°04.6	161°49.4	41.7	116°13.7	27.6	116°32.4	32.4	263°42.4	26.5	Gienah	_	-17°42.5
2	330°07.1	176°49.0	40.6	131°14.9	28.1	131°34.6	32.5	278°44.7	26.5	Acrux	172°56.0	-63°16.1
3	345°09.5	191°48.6	• • 39.5	146°16.1	• • 28.7	146°36.8	• • 32.6	293°47.0	• • 26.5	I	171°47.5	-57°17.0
4	0°12.0	206°48.3	38.3	161°17.3	29.2	161°39.0	32.7	308°49.3	26.6	Alioth	$166^{\circ}10.1$	55°48.2
5	15°14.5	221°47.9	37.2	176°18.5	29.7	176°41.2	32.8	323°51.5	26.6	Spica	158°18.4	$-11^{\circ}19.0$
6	30°16.9	236° 47.5	N12°36.1	191°19.7	S08°30.3	191°43.5	S06°32.9	338°53.8	N16°26.7	Alkaid	152°49.3	49°10.2
7	45°19.4	251°47.1	35.0	206°21.0	30.8	206°45.7	33.0	353°56.1	26.7	Hadar	148°30.5	-60°31.2
8	60°21.9	266°46.7	33.9	221°22.2	31.4	221°47.9	33.1	8°58.3	26.7	Menkent	147°53.2	-36°31.1
9	75°24.3	281°46.3	• • 32.8	236°23.4	• • 31.9	236°50.1	• • 33.3	24°00.6	• • 26.8	Arcturus	145°44.6	19°01.9
10	90°26.8	296°45.9	31.7	251°24.6	32.5	251°52.4	33.4	39°02.9	26.8	Rigil Kent.	139°34.9	-60°57.7
11	105°29.3	311°45.5 326°45.2	30.6	266°25.8	33.0 \$08°33.6	266°54.6	33.5	54°05.2	26.9	Kochab	$137^{\circ}19.9$	74°02.3
12	120°31.7		N12°29.5	281°27.0		281°56.8	S06°33.6	69°07.4	N16°26.9	Zuben'ubi	$136^{\circ}51.8$	$-16^{\circ}09.9$
13	135°34.2 150°36.6	341°44.8 356°44.4	28.3	296°28.2 311°29.4	34.1	296°59.0 312°01.3	33.7	84°09.7 99°12.0	26.9	Alphecca	$126^{\circ}00.5$	26°37.1
14 15	165°39.1	11°44.0	27.2	311 29.4 326°30.6	34.7 · · 35.2	312 01.3 327°03.5	33.8 · · 33.9	99 12.0 114°14.3	27.0 •• 27.0	Antares	$112^{\circ}11.1$	-26°29.8
	180°41.6	26° 43.6	· · 26.1 25.0	341°31.8	35.8	342°05.7	34.0	114 14.5 129°16.5	27.0	Atria	$107^{\circ}01.5$	-69°04.9
16 17	195°44.0	41°43.2	23.9	356°33.1	36.3	357°07.9	34.1	144°18.8	27.1	Sabik	101°58.3	-15°45.6
18	210°46.5	56° 42.8	N12°22.8	11°34.3		12°10.1	S06°34.2		N16°27.1	Shaula	96°05.0	-37°07.4
19	210°40.3° 225°49.0	71°42.5	21.6	26°35.5	37.4	27°12.4	34.3	174°23.4	27.2	Rasalhague	95°54.9	12°32.5
20	240°51.4	86°42.1	20.5	41°36.7	38.0	42°14.6	34.5	189°25.6	27.2	Eltanin	90°40.0	51°29.4
21	255°53.9	101°41.7	. 19.4	56°37.9	• • 38.5	57°16.8	• • 34.6	204°27.9	27.3	Kaus Aust.	83°27.3	-34°22.1
22	270°56.4	116°41.3	18.3	71°39.1	39.1	72°19.0	34.7	219°30.2	27.3	Vega	80°30.3	38°48.9
23	285°58.8	131°40.9	17.2	86°40.3	39.6	87°21.2	34.8	234°32.5	27.3	Nunki	75°42.9	-26°15.4
										Altair	61°56.0	8°57.0
Mer.p	ass. 03:59	ν -0.4' d-1	1.1' m- 3.91	u 1.2' d0	.5′ m0.60	ν 2.2′ d0.	1' m-1.94	ν 2.3′ d0	.0′ m0.26	Peacock	52°59.5	-56°38.1
										Deneb	49°22.8	45°23.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.9	10°00.8
0	301°01.3	146°40.6	N12°16.0	101°41.5		102°23.5	S06°34.9		N16°27.4	Al Na'ir	27°28.1 15°10.3	-46°48.7 -29°27.6
1	316°03.8	161°40.2	14.9	116°42.7	40.7	117°25.7	35.0	264°37.0	27.4	Fomalhaut Scheat	15° 10.3 13° 41.3	-29°27.6 28°14.7
2	331°06.2	176°39.8	13.8	131°43.9	41.3	132°27.9	35.1	279°39.3	27.4	Markab	13 41.3 13°26.0	28 14.7 15°22.0
3	346°08.7	191°39.4	• • 12.7	146°45.1	• • 41.8	147°30.1	• • 35.2	294°41.6	• • 27.5	ividikaD	10.0	
4	1°11.1	206°39.0	11.6	161°46.3	42.3	162°32.3	35.3	309°43.8	27.5	Jul 21 Sat	SHA	Mer.pass
5	$16^{\circ}13.6$	221°38.7	10.4	176°47.5	42.9	177°34.6	35.4	324°46.1	27.6		$207^{\circ}56.3$	14:12
6	31°16.1	236°38.3	N12°09.3	191°48.7	S08°43.4	192°36.8	S06°35.5	339°48.4	N16°27.6	Mars	$161^{\circ}40.2$	17:16
7	$46^{\circ}18.5$	251°37.9	08.2	206°49.9	44.0	207°39.0	35.7	354°50.7	27.6	Jupiter	$161^{\circ}33.7$	17:15
8	61°21.0	266°37.5	07.1	221°51.1	44.5	222°41.2	35.8	9°52.9	27.7	Saturn	308°42.7	07:28
9	76°23.5	281°37.2	• • 05.9	$236^{\circ}52.3$	• • 45.1	237°43.4	• • 35.9	24°55.2	• • 27.7	Int 22 Co.	CHA	Me:
10	91°25.9	296°36.8	04.8	251°53.5	45.6	252°45.6	36.0	39°57.5	27.8	Jul 22 Sun	SHA	Mer.pass
11	$106^{\circ}28.4$	311°36.4	03.7	266°54.7	46.2	267°47.9	36.1	54°59.8	27.8	Venus	206°47.7 161°10.3	14:13 17:14
12	121°30.9	326°36.0	N12°02.6	281°55.9	S08°46.7	282°50.1	S06°36.2	70°02.0	N16°27.8		161°10.3 161°28.0	17:14 17:11
13	$136^{\circ}33.3$	341°35.7	01.4	296°57.1	47.3	297°52.3	36.3	85°04.3	27.9	Saturn	308°38.0	07:24
14	151°35.8	$356^{\circ}35.3$	12°00.3	311°58.3	47.8	$312^{\circ}54.5$	36.4	100°06.6	27.9	Saturn	JUU JO.U	01:24
15	166°38.2	11°34.9	11°59.2	326°59.5	• • 48.4	327°56.7	• • 36.5	115°08.9	• • 27.9	Jul 23 Mon	SHA	Mer.pass
16	181°40.7	26°34.6	58.1	342°00.7	48.9	342°58.9	36.7	$130^{\circ}11.2$	28.0		205°39.3	14:14
17	196°43.2	41°34.2	56.9	357°01.9	49.5	358°01.2	36.8	145°13.4	28.0	I	160°40.2	17:12
18	211°45.6	56° 33.8	N11°55.8	12°03.1		13°03.4	S06°36.9		N16°28.1		161°22.2	17:08
19	226°48.1	71°33.4	54.7	27°04.3	50.6	28°05.6	37.0	175°18.0	28.1	Saturn		07:21
20	241°50.6	86°33.1	53.5	42°05.5	51.1	43°07.8	37.1	190°20.3	28.1			
21	256°53.0	101°32.7	• • 52.4	57°06.7	• • 51.7	58°10.0	• • 37.2	205°22.5	• • 28.2	Horizont	al parallax	2.1
22	271°55.5	116°32.3	51.3	72°07.9	52.2	73°12.2	37.3	220°24.8	28.2		Venus:	0.1
23	286°58.0	131°32.0	50.1	87°09.1	52.8	88°14.4	37.4	235°27.1	28.3		Mars:	0.1
Mern	ass. 03:55	ν -0 4' d-1	.1′ m-3.91	ν1 2' d0	.5′ m0.61	ν2 2' dΩ	1′ m-1.93	ν2 3' d0	.0′ m0.26			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.5	N20°27.0	61°33.4	5.5'	\$23°06.4	4.8'	59.0'
1	193°23.5	26.5	75°58.0	5.5'	23°11.2	4.7'	59.0'
2 3	208°23.5 223°23.4	26.0 •• 25.5	90°22.5 104°46.9	5.5' 5.4'	23°15.9 23°20.4	4.5' 4.4'	58.9' 58.9'
4	238°23.4	25.0	119°11.4	5.4'	23°24.8	4.2'	58.9'
5	253°23.4	24.6	$133^{\circ}35.8$	5.4'	23°29.0	4.1'	58.9'
6	268°23.3 283°23.3	N20°24.1	148°00.1	5.3'	523°33.1	3.9'	58.9'
7 8	283°23.3 298°23.3	23.6 23.1	162°24.5 176°48.8	5.3' 5.3'	23°37.0 23°40.8	3.8' 3.6'	58.9' 58.9'
9	313°23.3	22.6	191°13.1	5.3'	23°44.4	3.4'	58.9'
10	328°23.2	22.1	205°37.3	5.2'	23°47.8	3.3'	58.9'
11	343°23.2 358°23.2	21.6 N20°21.1	220°01.6 234°25.8	5.2' 5.2'	23°51.1 523°54.2	3.1' 3.0'	58.9'
12 13	13°23.2	20.6	234 25.8 248°50.0	5.2'	23°57.2	3.0 2.8'	58.8' 58.8'
14	28°23.1	20.1	263°14.2	5.2'	24°00.0	2.7'	58.8'
15	43°23.1	• • 19.7	277°38.4	5.2'	24°02.7	2.5'	58.8'
16 17	58°23.1 73°23.1	19.2 18.7	292°02.5 306°26.7	5.1' 5.1'	24°05.2 24°07.5	2.3' 2.2'	58.8' 58.8'
18	88°23.0	N20° 18.2	320°50.8	5.1'	\$24°07.3	2.0'	58.8'
19	103°23.0	17.7	335°15.0	5.1'	24°11.7	1.9'	58.8'
20	118°23.0	17.2	349°39.1	5.1'	24°13.5	1.7'	58.8'
21 22	133°23.0 148°22.9	· · 16.7 16.2	4°03.2 18°27.3	5.1' 5.1'	24°15.2 24°16.8	1.5' 1.4'	58.7' 58.7'
23	163°22.9	16.2 15.7	18 27.3 32°51.4	5.1'	24 16.8 24°18.1	1.4	58.7'
	SD = 15.7'	d = -0.5'		SI	D = 16.1'		
	<u> </u>	u — -0.5		ال			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.9 193°22.9	N20° 15.2 14.7	47°15.5 61°39.7	5.1'	\$24° 19.4 24° 20.4	1.0' 0.9'	58.7' 58.7'
1 2	193 22.9 208°22.8	14.7 14.2	76°03.8	5.1' 5.1'	24 20.4 24°21.3	0.9	58.7'
3	223°22.8	. 13.7	90°27.9	5.1'	24°22.0	0.6'	58.7'
4	238°22.8	13.2	104°52.1	5.1'	24°22.6	0.4'	58.7'
5 6	253°22.8 268°22.8	12.7 N20° 12.2	119°16.2 133°40.4	5.2' 5.2'	24°23.0 \$24°23.2	0.2'	58.6' 58.6'
7	283°22.7	11.7	148°04.5	5.2'	24°23.3	-0.1	58.6
8	298°22.7	11.2	162°28.7	5.2'	24°23.3	-0.2'	58.6'
9	313°22.7	• • 10.7	176°52.9	5.2'	24°23.0	-0.4'	58.6'
10 11	328°22.7 343°22.6	10.2 09.7	191°17.2 205°41.4	5.2' 5.3'	24°22.6 24°22.1	-0.6' -0.7'	58.6' 58.6'
12	358°22.6	N20° 09.2	220°05.7	5.3	\$24°21.4	-0.7	58.5
13	13°22.6	08.7	234°30.0	5.3'	24°20.5	-1.0'	58.5'
14	28°22.6 43°22.6	08.2	248°54.3	5.4'	24° 19.5 24° 18.3	-1.2'	58.5'
15 16	43°22.6 58°22.6	· · 07.7 07.2	263°18.7 277°43.0	5.4' 5.4'	24° 18.3 24° 16.9	-1.3' -1.5'	58.5' 58.5'
17	73°22.5	06.6	292°07.5	5.4'	24° 15.4	-1.7'	58.5
18	88°22.5	N20°06.1	306°31.9	5.5'	S24°13.8	-1.8'	58.4'
19 20	103°22.5 118°22.5	05.6 05.1	320°56.4 335°20.9	5.5' 5.6'	24°12.0 24°10.0	-2.0'	58.4' 58.4'
21	133°22.5	• • 04.6	349°45.5	5.6'	24° 07.9	-2.3'	58.4
22	148°22.4	04.1	4°10.1	5.6'	24°05.6	-2.4'	58.4'
23	163°22.4	03.6	18°34.7	5.7'	24°03.1	-2.6'	58.4'
	SD = 15.7'	d = -0.5'		SI	O = 16.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.4	N20°03.1	32°59.4	5.7'	\$24°00.5	-2.7'	58.3'
1	193°22.4	02.6	47°24.1	5.8'	23°57.8	-2.9'	58.3'
2	208°22.4 223°22.4	02.1 •• 01.5	61°48.9 76°13.7	5.8' 5.9'	23°54.9 23°51.9	-3.0' -3.2'	58.3' 58.3'
4	238°22.3	01.0	90°38.6	5.9'	23°48.7	-3.3'	58.3
5	253°22.3	00.5	$105^{\circ}03.5$	6.0'	23°45.3	-3.5'	58.3'
6 7	268°22.3 283°22.3	N20°00.0 19°59.5	119°28.5 133°53.6	6.0' 6.1'	\$23°41.8 23°38.2	-3.6' -3.8'	58.2' 58.2'
8	203 22.3 298°22.3	19 59.5 59.0	133 53.0 148°18.6	6.2	23°34.4	-3.0 -3.9'	58.2'
9	313°22.3	• • 58.4	162°43.8	6.2'	23°30.5	-4.1'	58.2'
10	328°22.2	57.9	177°09.0	6.3'	23°26.4	-4.2'	58.2'
11 12	343°22.2 358°22.2	57.4 N19°56.9	191°34.3 205°59.6	6.3' 6.4'	23°22.2 \$23°17.8	-4.4' -4.5'	58.2' 58.1'
13	13°22.2	56.4	205 59.0 220°25.0	6.5	23°13.3	-4.5 -4.7'	58.1
14	28°22.2	55.9	234°50.5	6.5'	23°08.6	-4.8'	58.1'
15	43°22.2	• • 55.3	249°16.0	6.6'	23°03.9	-4.9'	58.1'
16 17	58°22.2 73°22.2	54.8 54.3	263°41.6 278°07.2	6.7' 6.7'	22°58.9 22°53.9	-5.1' -5.2'	58.1' 58.0'
18	88°22.1	N19°53.8	292°33.0	6.8	\$22°48.6	-5.3'	58.0'
19	103°22.1	53.2	306°58.8	6.9'	22°43.3	-5.5'	58.0'
20 21	118°22.1 133°22.1	52.7 •• 52.2	321°24.6 335°50.6	6.9' 7.0'	22°37.8 22°32.2	-5.6' -5.7'	58.0' 58.0'
22	133°22.1 148°22.1	51.7	335°50.6 350°16.6	7.0	22° 32.2 22° 26.5	-5.7' -5.9'	58.0° 57.9'
23	163°22.1	51.2	4°42.7	7.2'	22°20.6	-6.0'	57.9'
	SD = 15.7'	d = -0.5'	-	SI	O = 15.9'		

			202	9 July 2	21 to J	ul. 23 l
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Tw i	ilight Naut.
N 72°						
N 70°						
68°	7///	7///	01:16	22:50	7///	7///
66°	////	////	02:07	22:03	////	////
64°	////	////	02:37	21:33	////	////
62°	////	01:32	03:00	21:11	22:36	////
60°	////	02:09	03:18	20:53	22:02	////
N 58°	////	02:34	03:34	20:38	21:37	////
56°	01:24	02:54	03:46	20:25	21:18	22:45
54° 52°	01:58 02:21	03:10 03:24	03:58 04:07	20:14 20:05	21:02 20:48	22:13 21:50
50°	02:21	03:24	04:07	19:56	20:46	21:31
45°	03:15	04:00	04:35	19:38	20:13	20:57
N 40°	03:39	04:18	04:50	19:23	19:54	20:33
35°	03:59	04:34	05:02	19:10	19:39	20:33
30°	04:15	04:47	05:13	18:59	19:26	19:58
20°	04:40	05:08	05:32	18:41	19:05	19:33
N 10°	04:59	05:25	05:48	18:25	18:47	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:55	06:18	17:55	18:18	18:43
20°	05:43	06:10	06:33	17:40	18:03	18:30
30°	05:57	06:26	06:51	17:22	17:47	18:17
35° 40°	06:04	06:34 06:44	07:02 07:14	17:12 17:00	17:39	18:10
45°	06:11 06:19	06:55	07:14	16:46	17:29 17:18	18:02 17:54
S 50°	06:28	07:08	07:44	16:29	17:05	17:45
52°	06:32	07:08	07:44	16:29	17:05	17:45
54°	06:36	07:20	08:01	16:12	16:53	17:37
56°	06:41	07:27	08:11	16:02	16:46	17:33
58°	06:46	07:35	08:22	15:51	16:38	17:28
S 60°	06:51	07:44	08:36	15:38	16:29	17:22
Lat.	. .	Moonris			Moonse	
N 72°	Sat	Sun	Mon	Sat	Sun	Mon
		_				
N 70° 68°						
66°			21:15			
64°	19:12	20:10	20:32	22:12	23:18	
62°	18:31	19:30	20:03	22:53	23:58	
60°	18:03	19:03	19:41	23:21		00:25
N 58 $^{\circ}$	17:41	18:41	19:22	23:43		00:47
56°	17:23	18:24	19:07		00:01	01:04
54°	17:08	18:09	18:54		00:16	01:19
52°	16:55	17:56	18:42		00:29	01:32
50° 45°	16:44	17:44	18:32	00.12	00:41	01:43
	16:20	17:20	18:11	00:12	01:05	02:07
N 40° 35°	16:01	17:01	17:53	00:30	01:24	02:26
35°	15:45 15:31	16:45 16:31	17:38 17:26	00:45 00:58	01:40 01:54	02:41 02:55
20°	15:08	16:08	17:20	01:20	01:54	02:55
N 10°	14:48	15:48	16:45	01:40	02:38	03:38
0°	14:29	15:29	16:27	01:58	02:57	03:57
S 10°	14:10	15:10	16:09	02:16	03:16	04:15
20°	13:50	14:49	15:50	02:35	03:37	04:35
30°	13:27	14:26	15:28	02:58	04:00	04:58
35°	13.13	14.12	15.15	03.11	04.14	05:11

30	11.55	12.54	13.44	07.77	05.52	00.44
58°	11:22	12:16	13:28	05:00	06:10	07:01
S 60°	11:02	11:55	13:09	05:20	06:32	07:20
		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-92%
21	06:26	06:27	12:06	20:43	08:13	
22	06:28	06:29	12:06	21:43	09:13	
23	06:30	06:31	12:07	22:40	10:12	

15:15

15:00

14:42

14:20

14:10

13:58

13:44

35°

40°

45°

S 50° 52° 54°

56°

13:13

12:58

12:39

12:16

12:05

11:53

11:39

14:12

13:56

13:37

13:13

13:02

12:49

12:34

04:14

04:30

04:49

05:13

05:25

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05:52

03:11

03:26

03:44

04:07

04:17

04:30

04:44

05:11

05:27

05:45

06:07

06:18

06:30

06:44

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	302°00.4	146°31.6	N11°49.0	102°10.3	S08°53.3	103°16.7	S06°37.5	250°29.4	N16°28.3			
1	317°02.9	161°31.2	47.9	102 10.3 117°11.5	53.9	118° 18.9	37.7	265°31.7	28.3	Alpheratz	357°30.7	29°15.3
2	332°05.4	176° 30.9	46.7	117 11.3 132°12.7	54.4	133°21.1	37.8	280°33.9	28.4	Ankaa	353°03.5	-42°08.4
3	347°07.8			132 12.7 147°13.9	55.0	148°23.3		295°36.2		Schedar	349°26.4	56°41.8
	2°10.3	191°30.5	• • 45.6				• • 37.9		• • 28.4	Diphda	348°43.5	-17°49.2
4		206°30.1	44.5	162°15.1	55.5	163°25.5	38.0	310°38.5	28.4	Achernar	335°17.6	-57°04.8
5	17°12.7	221°29.8	43.3	177°16.3	56.1	178°27.7	38.1	325°40.8	28.5	Hamal	327°47.0	23°36.1
6	32°15.2	236°29.4 251°29.0	N11°42.2	192°17.5 207°18.7	S08°56.6	193°29.9 208°32.2	S06°38.2	340°43.1	N16°28.5	Polaris	$312^{\circ}07.9$	89°22.9
7	47°17.7		41.1		57.2	208 32.2 223°34.4	38.3	355°45.3	28.6	Acamar	$315^{\circ}09.2$	-40°10.9
8	62°20.1	266°28.7	39.9	222°19.9	57.7		38.4	10°47.6	28.6	Menkar	$314^{\circ}02.4$	4°12.4
9	77°22.6	281°28.3	• • 38.8	237°21.1	• • 58.3	238°36.6	• • 38.5	25°49.9	• • 28.6	Mirfak	308°23.0	49°57.7
10	92°25.1	296°27.9	37.7	252°22.3	58.8	253°38.8	38.7	40°52.2	28.7	Aldebaran	290°35.6	16°34.0
11	107°27.5	311°27.6	36.5	267°23.4	59.4 \$08°59.9	268°41.0	38.8	55°54.5	28.7	Rigel	281°00.6	-8°10.1
12	122°30.0	326°27.2	N11°35.4	282°24.6		283°43.2	S06°38.9	70°56.7	N16°28.7	Capella	$280^{\circ}16.8$	46°01.4
13	137°32.5 152°34.9	341°26.9	34.2	297°25.8	09°00.5	298°45.4	39.0	85°59.0	28.8	Bellatrix	278°19.2	6°22.5
14	167°37.4	356°26.5 11°26.1	33.1 •• 32.0	312°27.0 327°28.2	01.0 •• 01.6	313°47.6 328°49.8	39.1 · · 39.2	101°01.3 116°03.6	28.8 •• 28.9	Elnath	277°57.5	28°37.8
15	107 37.4 182°39.9	26°25.8		342°29.4	02.1			131°05.9		Alnilam	275°34.3	-1°11.0
16	102 39.9 197°42.3	20 25.6 41°25.4	30.8 29.7	342 29.4 357°30.6	02.1	343°52.1 358°54.3	39.3 39.4	131 05.9 146°08.1	28.9 28.9	Betelgeuse	270°48.4	7°24.7
17	212°44.8						506°39.6			Canopus	263°51.2	-52°42.6
18	212 44.6 227°47.2	56°25.1 71°24.7	N11°28.5	12°31.8 27°33.0	S09°03.2	13°56.5 28°58.7		161°10.4 176°12.7	N16°29.0	Sirius	258°23.3	-16°45.4
19 20	242°49.7	86°24.3	27.4 26.3	42°34.2	03.8 04.3	44°00.9	39.7 39.8	170 12.7 191°15.0	29.0 29.0	Adhara	255°03.3	-29°00.8
										Procyon	244°47.3	5°08.8
21 22	257°52.2 272°54.6	101°24.0 116°23.6	•• 25.1	57°35.3 72°36.5	· · 04.9	59°03.1 74°05.3	· · 39.9 40.0	206°17.3 221°19.5	· · 29.1 29.1	Pollux	243°13.2	27°57.1
22	272°54.6 287°57.1	116°23.6 131°23.3	24.0 22.8	72°36.5 87°37.7	05.4	74°05.3 89°07.5	40.0 40.1	221°19.5 236°21.8	29.1	Avior	$234^{\circ}13.8$	-59°36.4
23	201 51.1				06.0	-				Suhail	222°44.0	-43°33.3
Mer.p	ass. 03:51	ν -0.4' d-1	1' m-3.91	ν 1.2′ d0	.5′ m0.62	ν 2.2′ d0.	1' m-1.93	ν 2.3′ d0	.0′ m0.25	Miaplacidus	221°38.2	-69°50.5
										Alphard	$217^{\circ}44.4$	-8°47.3
۱۸/۵۰۱	СПУ	CHA	Dec	CUA	Doc	CUA	Doc	CHA	Doc	Regulus	207°30.8	11°49.3
Wed 0	GHA 302°59.6	GHA 146°22.9	Dec N11°21.7	GHA 102°38.9	Dec \$09°06.5	GHA 104°09.7	Dec \$06°40.2	GHA 251°24.1	Dec N16°29.2	Dubhe	193°37.3	61°35.6
0 1	302°59.6 318°02.0	146°22.9 161°22.6	20.5	102°38.9 117°40.1	07.1	104°09.7 119°11.9	40.4	266°26.4	N16 29.2 29.2	Denebola	182°21.4	14°24.4
2	318 02.0 333°04.5	161 22.6 176°22.2	20.5 19.4	117 40.1 132°41.3	07.1	119 11.9 134°14.1	40.4 40.5	200 20.4 281°28.7	29.2	Gienah	175°39.9	-17°42.5
3	348°07.0	170 22.2 191°21.8		132 41.3 147°42.5	. 08.2	134 14.1 149°16.4		296°31.0			172°56.0	-63°16.1
	348 07.0 3°09.4		• • 18.2	147 42.5 162°43.7		149 16.4 164°18.6	• • 40.6	311°33.2		Gacrux	171°47.6	-57°17.0
4	3 09.4 18°11.9	206°21.5	17.1	102 43.7 177°44.8	08.7		40.7	311 33.2 326°35.5	29.3	Alioth	$166^{\circ}10.1$	55°48.2
5		221°21.1	15.9		09.3	179°20.8	40.8		29.4	Spica	158°18.4	-11°19.0
6	33°14.4	236°20.8	N11°14.8	192°46.0 207°47.2	S09°09.8	194°23.0	S06°40.9	341°37.8 356°40.1	N16°29.4	Alkaid	152°49.3	49°10.2
7 8	48°16.8	251°20.4	13.7	207 47.2 222°48.4	10.4	209°25.2 224°27.4	41.0	11°42.4	29.5	Hadar	148°30.5	-60°31.2
9	63°19.3 78°21.7	266°20.1 281°19.7	12.5 •• 11.4	222 46.4 237°49.6	10.9 •• 11.5	239°29.6	41.2 · · 41.3	26°44.7	29.5 •• 29.5	Menkent	147°53.2	-36°31.1
10	93°24.2	201 19.7 296°19.4	10.2	252°50.8	12.0	254°31.8	41.4	41°46.9	29.6	Arcturus	145°44.6	19°01.9
11	93 24.2 108°26.7	311°19.0	09.1	267°51.9	12.6	269°34.0	41.4	56°49.2	29.6	Rigil Kent.	139°34.9	-60°57.7
12	108° 20.7 123° 29.1	311 19.0 326°18.7	N11°07.9	282°53.1	509°13.1	284°36.2	\$06°41.6	71°51.5	N16°29.6	Kochab	137°20.0	74°02.3
13	138°31.6	341°18.3	06.8	202 55.1 297°54.3	13.7	299°38.4	41.7	86°53.8	29.7	Zuben'ubi	136°51.8	-16°09.9
14	153°34.1	356° 18.0	05.6	312°55.5	14.2	314°40.6	41.7	101°56.1	29.7	Alphecca	126°00.5	26°37.1
15	168° 36.5	11° 17.6	• • 04.5	312 55.5 327°56.7	• • 14.8	329°42.8	42.0	116° 58.4	• • 29.7	Antares	$112^{\circ}11.1$	-26°29.8
16	183°39.0	26°17.3	03.3	342°57.9	15.3	344°45.0	42.0	132°00.6	29.7	Atria	107°01.5	-69°04.9
17	198°41.5	41°16.9	02.1	357°59.0	15.5	359°47.2	42.1	147°02.9	29.8	Sabik	101°58.3	-15°45.6
18	213°43.9	56° 16.6	N11°01.0	13°00.2		14°49.4	506°42.3	162°05.2	N16°29.9	Shaula	96°05.0	-37°07.4
19	213°45.9° 228°46.4	71°16.2	10°59.8	28°01.4	17.0	29°51.7	42.4	177°07.5	29.9	Rasalhague	95°54.9	12°32.5
20	243°48.9	86° 15.9	58.7	43°02.6	17.5	44°53.9	42.5	192°09.8	29.9	Eltanin	90°40.0	51°29.4
21	258°51.3	101° 15.5	• • 57.5	58°03.8	• 18.1	59°56.1	• • 42.6	207°12.1	30.0	Kaus Aust.	83°27.3	-34°22.1
22	273°53.8	116° 15.2	56.4	73°04.9	18.6	74°58.3	42.8	222°14.4	30.0	Vega	80°30.3	38°48.9
23	288°56.2	131° 14.8	55.2	88°06.1	19.2	90°00.5	42.9	237°16.6	30.0	Nunki	75°42.9	-26°15.4
				_						Altair	61°56.0	8°57.0
Mer.p	ass. 03:47	ν -0.4' d-1	1' m-3.91	$\nu 1.2' \ d0$.5' m0.63	ν 2.2′ d0.	1′ m-1.92	ν 2.3′ d0	.0′ m0.25	Peacock	52°59.5	-56°38.1
										Deneb	49°22.7	45°23.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.9	10°00.9
0	303°58.7	146°14.5	N10°54.1	103°07.3	S09°19.7	105°02.7	S06°43.0	252°18.9	N16°30.1	Al Na'ir	27°28.0	-46°48.7
1	319°01.2	161°14.2	52.9	118°08.5	20.3	120°04.9	43.1	267°21.2	30.1	Fomalhaut	15°10.3	-29°27.6
2	334°03.6	176° 13.8	51.8	133°09.6	20.8	135°07.1	43.2	282°23.5	30.1	Scheat	13°41.3	28°14.7
3	349°06.1	191° 13.5	• • 50.6	148°10.8	• • 21.4	150°09.3	. 43.2	297°25.8	30.2	Markab	13°26.0	15°22.0
4	4°08.6	206° 13.1	49.4	163°12.0	21.9	165°11.5	43.4	312°28.1	30.2	Jul 24 Tue	SHA	Mer.pass
5	19°11.0	221°12.8	48.3	178°13.2	22.5	180°13.7	43.6	327°30.4	30.2	1	204°31.2	14:14
6	34°13.5	236°12.4	N10°47.1	193°14.4		195°15.9	S06°43.7	342°32.6	N16°30.3	I	160°09.9	17:10
7	49°16.0	251°12.1	46.0	208°15.5	23.6	210°18.1	43.8	357°34.9	30.3	I	161°16.2	17:04
8	64°18.4	266°11.8	44.8	223°16.7	24.1	225°20.3	43.9	12°37.2	30.4	Saturn	308°29.0	07:17
9	79°20.9	281°11.4	• • 43.6	238°17.9	• • 24.7	240°22.5	• • 44.0	27°39.5	30.4			
10	94°23.3	296°11.1	42.5	253°19.1	25.2	255°24.7	44.1	42°41.8	30.4	Jul 25 Wed	SHA	Mer.pass
11	109°25.8	311°10.7	41.3	268°20.2	25.8	270°26.9	44.3	57°44.1	30.5		203°23.3	14:15
12	124°28.3	326° 10.4	N10°40.2	283°21.4	S09°26.3	285°29.1	S06°44.4	72°46.4	N16°30.5		159°39.3	17:08
13	139°30.7	341°10.0	39.0	298°22.6	26.9	300°31.3	44.5	87°48.6	30.5	1	161°10.2	17:01
14	154°33.2	356°09.7	37.8	313°23.8	27.4	315°33.5	44.6	102°50.9	30.6	Saturn	308°24.5	07:13
15	169°35.7	11°09.4	36.7	328°24.9	• • 28.0	330°35.7	• • 44.7	117°53.2	30.6	Jul 26 Thu	SHA	Mer.pass
16	184°38.1	26°09.0	35.5	343°26.1	28.5	345°37.9	44.8	132°55.5	30.6		202°15.8	14:15
17	199°40.6	41°08.7	34.3	358°27.3	29.1	0°40.1	45.0	147°57.8	30.7	I	159°08.6	17:06
18	214°43.1	56°08.4	N10°33.2	13°28.4	S09°29.6	15°42.3	S06°45.1		N16°30.7		161°04.0	16:57
19	229°45.5	71°08.0	32.0	28°29.6	30.2	30°44.5	45.2	178°02.4	30.7		308°20.2	07:10
20	244°48.0	86°07.7	30.9	43°30.8	30.7	45°46.7	45.3	193°04.7	30.8			
21	259°50.5	101°07.4	• • 29.7	58°32.0	• • 31.3	60°48.9	• • 45.4	208°07.0	• • 30.8	Horizont	al parallax	
22	274°52.9	$116^{\circ}07.0$	28.5	73°33.1	31.8	75°51.1	45.5	223°09.2	30.9		Venus:	0.1
23	289°55.4	131°06.7	27.4	88°34.3	32.4	90°53.3	45.7	238°11.5	30.9		Mars:	0.1
1/102 -	ass. 03:43	1/_O 3/ ⊿ 1	2′ m-3.92	,,1 2/ d0	.6′ m0.63	1/2 2/ 40	1′ m-1.92	7/2 2/ 40	.0′ m0.25			
		ν 0.5 u-1	111-3.34	ν 1.Δ UU	.5 1110.03	ν Δ.Δ UU.	111-1.34		.0 1110.23			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.1	N19°50.6	19°08.8	7.2'	S22°14.6	-6.1'	57.9'
1	193°22.1	50.1	33°35.1	7.3'	22°08.4	-6.3'	57.9'
2	208°22.1	49.6	48°01.4	7.4'	22°02.2	-6.4'	57.9'
3	223°22.0	• • 49.0	62°27.8	7.5'	21°55.8	-6.5'	57.8'
4	238°22.0 253°22.0	48.5	76°54.3 91°20.8	7.6'	21°49.2 21°42.6	-6.6'	57.8'
5 6	268°22.0	48.0 N19°47.5	91 20.8 105°47.5	7.6' 7.7'	S21°35.8	-6.8' -6.9'	57.8' 57.8'
7	283°22.0	46.9	100° 14.2	7.8'	21°28.9	-0.9 -7.0'	57.8'
8	298°22.0	46.4	134°41.0	7.9'	21°21.9	-7.1'	57.7'
9	313°22.0	• • 45.9	149°07.9	8.0'	21°14.8	-7.3'	57.7'
10	328°22.0	45.3	163°34.8	8.1'	21°07.5	-7.4'	57.7'
11	343°22.0	44.8	178°01.9	8.1'	21°00.1	-7.5'	57.7'
12 13	358°22.0 13°22.0	N19°44.3 43.7	192°29.0 206°56.2	8.2' 8.3'	\$20°52.7 20°45.1	-7.6' -7.7'	57.6' 57.6'
14	28°21.9	43.7	200 50.2 221°23.6	6.3 8.4'	20° 45.1 20° 37.3	-7.8'	57.6'
15	43°21.9	• • 42.7	235°50.9	8.5'	20°29.5	-7.9'	57.6'
16	58°21.9	42.1	250°18.4	8.6'	20°21.6	-8.0'	57.6'
17	73°21.9	41.6	264°46.0	8.7'	$20^{\circ}13.5$	-8.2'	57.5'
18	88°21.9	N19°41.1	279°13.6	8.7'	S20°05.4	-8.3'	57.5'
19	103°21.9	40.5	293°41.4	8.8'	19°57.1	-8.4'	57.5'
20	118°21.9 133°21.9	40.0	308°09.2 322°37.1	8.9'	19°48.7 19°40.2	-8.5'	57.5'
21 22	133 21.9 148°21.9	· · 39.5 38.9	322 37.1 337°05.1	9.0' 9.1'	19 40.2 19°31.7	-8.6' -8.7'	57.4' 57.4'
23	163°21.9	38.4	351°33.2	9.1 9.2'	19° 23.0	-0.1 -8.8'	57.4'
-	SD = 15.7'	d = -0.5'			D = 15.8'		
	3D = 13.1°	u — -0.5		31			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°21.9 193°21.9	N19°37.8 37.3	6°01.4 20°29.6	9.3' 9.4'	\$19°14.2 19°05.3	-8.9' -9.0'	57.4' 57.3'
2	208°21.9	36.8	34°58.0	9.4	18°56.4	-9.1'	57.3'
3	223°21.9	• • 36.2	49°26.4	9.5'	18°47.3	-9.2'	57.3'
4	238°21.9	35.7	63°55.0	9.6'	18°38.1	-9.3'	57.3'
5	253°21.9	35.1	78°23.6	9.7'	18°28.9	-9.4'	57.3'
6 7	268°21.9 283°21.9	N19°34.6 34.1	92°52.3 107°21.1	9.8' 9.9'	\$18°19.5 18°10.1	-9.4' -9.5'	57.2' 57.2'
8	203 21.9 298°21.9	33.5	107 21.1 121°50.0	10.0'	18°00.5	-9.5 -9.6'	57.2'
9	313°21.9	33.0	136°19.0	10.1	17°50.9	-9.7'	57.2
10	328°21.9	32.4	150°48.0	10.2'	17°41.2	-9.8'	57.1'
11	343°21.9	31.9	165°17.2	10.2'	17°31.4	-9.9'	57.1'
12	358°21.8 13°21.8	N19°31.3	179°46.4 194°15.8	10.3'	\$17°21.5	-10.0'	57.1'
13 14	28°21.8	30.8 30.2	194 15.8 208°45.2	10.4' 10.5'	17°11.6 17°01.5	-10.0' -10.1'	57.1' 57.0'
15	43°21.8	29.7	223°14.7	10.6'	16°51.4	-10.2	57.0'
16	58°21.8	29.1	237°44.3	10.7'	16°41.2	-10.3'	57.0'
17	73°21.8	28.6	252°13.9	10.8'	16°30.9	-10.4'	57.0'
18	88°21.8	N19°28.0	266°43.7 281°13.6	10.9'	\$16°20.6	-10.4'	56.9'
19 20	103°21.8 118°21.8	27.5 26.9	281°13.6 295°43.5	10.9' 11.0'	16°10.2 15°59.7	-10.5' -10.6'	56.9' 56.9'
21	133°21.8	. 26.4	310°13.5	11.1'	15°49.1	-10.6'	56.9
22	148°21.8	25.8	324°43.6	11.2'	15°38.5	-10.7	56.8'
23	163°21.8	25.3	339°13.8	11.3'	15°27.7	-10.8'	56.8'
	SD = 15.7'	d = -0.5'		SI	D = 15.6'		
Thu	GHA	Dec	GHA		Dec	d	НР
i nu O	GHA 178°21.8	Dес N19°24.7	353°44.1	u 11.4'	S15°17.0	a -10.8'	56.8'
1	193°21.9	24.2	8°14.5	11.4'	15°06.1	-10.9'	56.8
2	208°21.9	23.6	22°44.9	11.5'	$14^{\circ}55.2$	-11.0'	56.7'
3	223°21.9	• • 23.1	37°15.4	11.6'	14°44.2	-11.0'	56.7'
4	238°21.9	22.5	51°46.0	11.7'	14°33.2	-11.1'	56.7'
5 6	253°21.9 268°21.9	22.0 N19°21.4	66°16.7 80°47.5	11.8' 11.9'	14°22.1 \$14°10.9	-11.2' -11.2'	56.7' 56.6'
7	283°21.9	20.9	95°18.3	11.9'	13°59.7	-11.2	56.6
8	298°21.9	20.3	109°49.3	12.0'	13°48.5	-11.3'	56.6'
9	313°21.9	• • 19.7	124°20.3	12.1'	13°37.1	-11.4'	56.6'
10	328°21.9	19.2	138°51.4	12.2'	13°25.7	-11.4'	56.5'
11 12	343°21.9 358°21.9	18.6 N19° 18.1	153°22.6 167°53.8	12.2' 12.3'	13°14.3 \$13°02.8	-11.5' -11.5'	56.5' 56.5'
13	13°21.9	17.5	182°25.1	12.4'	12°51.3	-11.5 -11.6'	56.5'
14	28°21.9	16.9	196°56.5	12.5'	12°39.7	-11.6'	56.4
15	43°21.9	• • 16.4	211°28.0	12.6'	12°28.0	-11.7'	56.4'
16	58°21.9	15.8	225°59.6	12.6'	12°16.3	-11.7'	56.4'
17	73°21.9	15.3 N19°14.7	240°31.2 255°02.9	12.7'	12°04.6 \$11°52.8	-11.8'	56.4'
18 19	88°21.9 103°21.9	N19°14.7 14.1	269°34.7	12.8' 12.8'	511°52.8 11°41.0	-11.8' -11.9'	56.3' 56.3'
20	118°21.9	13.6	284°06.5	12.9'	11°29.1	-11.9'	56.3
21	133°21.9	• • 13.0	298°38.4	13.0'	11°17.2	-12.0'	56.3'
22	148°21.9	12.4	313°10.4	13.1'	11°05.3	-12.0'	56.2'
23	163°22.0	11.9	327°42.5	13.1'	10°53.3	-12.0'	56.2'
	SD = 15.7'	d = -0.6'		SI	O = 15.5'		

			_0_5	July 2-		0 0
Lat	Twi	light	Sunrise	Cumant	Tw	ilight
Lat.	Naut.	Civil	Summe	Sunset	Civil	Naut.
N 72°						
N 70°						
68°	7///	////	01:37	22:31	7///	7///
66°	////	////	02:19	21:51	////	////
64°	////	00:47	02:47	21:24	23:16	////
62°	////	01:46	03:08	21:03	22:23	////
60°	////	02:18	03:25	20:46	21:52	////
N 58°	00:43	02:42	03:39	20:32	21:29	23:21
56°	01:37	03:00	03:52	20:20	21:11	22:33
54°	02:07	03:16	04:02	20:10	20:56	22:04
52°	02:28	03:29	04:12	20:00	20:43	21:43
50°	02:46	03:40	04:20	19:52	20:32	21:26
45°	03:19	04:03	04:38	19:35	20:09	20:53
N 40°	03:43	04:21	04:52	19:20	19:51	20:29
35°	04:02	04:36	05:04	19:08	19:37	20:11
30°	04:17	04:49	05:15	18:58	19:24	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:49	18:24	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:24	06:50	17:24	17:49	18:18
35°	06:02	06:33	07:00	17:14	17:41	18:12
40°	06:09	06:42	07:11	17:02	17:32	18:05
45°	06:17	06:52	07:24	16:49	17:21	17:57
S 50°	06:25	07:05	07:41	16:33	17:09	17:49
52°	06:29	07:10	07:48	16:25	17:03	17:45
54°	06:33	07:16	07:57	16:17	16:57	17:41
56°	06:37	07:23	08:06	16:07	16:50	17:37
58°	06:42	07:31	08:17	15:57	16:43	17:32
S 60°	06:47	07:39	08:30	15:44	16:34	17:27
Lat.		Moonris	e		Moonse	t
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°		22:21	21:38			02:51
N 70°	22:43	21:45	21:20		00:42	03:26
68°	21:41	21:19	21:05		01:43	03:51
66°	21:05	20:59	20:53	00:14	02:18	04:09

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

h _	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	304°57.8	$146^{\circ}06.3$	N10°26.2	103°35.5	S09°32.9	$105^{\circ}55.5$	S06°45.8	253°13.8	$N16^{\circ}30.9$	Alpheratz	357°30.7	29°15.3
1	320°00.3	161°06.0	25.0	118°36.6	33.5	120°57.7	45.9	268°16.1	31.0	Ankaa	353°03.4	-42°08.3
2	335°02.8	176°05.7	23.9	133°37.8	34.0	135°59.9	46.0	283°18.4	31.0	Schedar	349°26.4	56°41.9
3	350°05.2	191°05.3	• • 22.7	148°39.0	• • 34.6	151°02.1	• • 46.1	298°20.7	· · 31.0	Diphda	348°43.5	-17°49.2
4	5°07.7	206°05.0	21.5	163°40.1	35.2	166°04.3	46.3	313°23.0	31.1	Achernar	335°17.5	-57°04.8
5	20°10.2	221°04.7	20.3	178°41.3	35.7	181°06.5	46.4	328°25.3	31.1	Hamal	327°47.0	23°36.1
6	35°12.6	236°04.3	N10°19.2	193°42.5	S09°36.3	196°08.7	S06°46.5	343°27.6	N16°31.1	Polaris	312°06.5	89°22.9
7	50°15.1	251°04.0	18.0	208°43.6	36.8	211°10.9	46.6	358°29.8	31.2	Acamar	315°09.1	-40°10.9
8	65°17.6 80°20.0	266°03.7 281°03.4	16.8	223°44.8 238°46.0	37.4	226°13.1 241°15.3	46.7	13°32.1 28°34.4	31.2	Menkar	$314^{\circ}02.3$	4°12.4
9 10	95°22.5	201 03.4 296°03.0	• • 15.7	253°47.1	· · 37.9 38.5	241 15.5 256°17.5	· · 46.8 47.0	43°36.7	• • 31.2	Mirfak	308°23.0	49°57.7
11	95 22.5 110°25.0	311°02.7	14.5 13.3	268°48.3	39.0	271°19.7	47.0 47.1	43 30.7 58°39.0	31.3 31.3	Aldebaran	290°35.6	$16^{\circ}34.0$
12	125°27.4	326°02.4	N10°12.1	283°49.5	509°39.6	286°21.9	506°47.2	73°41.3	N16°31.3	Rigel	281°00.6	-8°10.0
13	140°29.9	341°02.0	11.0	298°50.6	40.1	301°24.0	47.3	88°43.6	31.4	Capella	280°16.7	46°01.4
14	155°32.3	356°01.7	09.8	313°51.8	40.7	316°26.2	47.4	103°45.9	31.4	Bellatrix	278°19.2	6°22.5
15	170°34.8	11°01.4	• • 08.6	328°53.0	41.2	331°28.4	• • 47.6	118°48.2	• • 31.4	Elnath	277°57.5	28°37.8
16	185°37.3	26°01.1	07.5	343°54.1	41.8	346°30.6	47.7	133°50.5	31.5	Alnilam	275°34.2	-1°11.0
17	200°39.7	41°00.7	06.3	358°55.3	42.3	1°32.8	47.8	148°52.8	31.5	Betelgeuse	270°48.4	7°24.7
18	215°42.2	56°00.4	N10°05.1	13°56.4	S09°42.9	16°35.0	S06°47.9	163°55.0	N16°31.5	Canopus	263°51.2	-52°42.6
19	230°44.7	$71^{\circ}00.1$	03.9	28°57.6	43.4	31°37.2	48.0	178°57.3	31.6	Sirius	258°23.3	-16°45.4
20	245°47.1	85°59.7	02.8	43°58.8	44.0	46°39.4	48.1	193°59.6	31.6	Adhara	255°03.3 244°47.3	-29°00.8 5°08.8
21	260°49.6	$100^{\circ}59.4$	•• 01.6	58°59.9	• • 44.5	61°41.6	• • 48.3	209°01.9	• • 31.6	Procyon Pollux	244 47.3 243°13.2	5 08.8 27°57.1
22	275°52.1	$115^{\circ}59.1$	10°00.4	$74^{\circ}01.1$	45.1	76°43.8	48.4	224°04.2	31.7	Avior	243 13.2 234°13.8	-59°36.4
23	290°54.5	$130^{\circ}58.8$	09°59.2	89°02.3	45.6	91°46.0	48.5	239°06.5	31.7	Suhail	234 13.8 222°44.0	-59 30.4 -43°33.3
Mer n	pass. 03:40	v_0 3′ d 1	2′ m-3.92	1/1 2 [/] d0	.6′ m0.64	1/2 2/ 40	.1′ m-1.91	1/2 3/ 40	.0′ m0.24	Miaplacidus	222 44.0 221°38.2	-43 33.3 -69°50.5
ivier.p	Jass. US.4U	ν-0.5 α-1	111-3.92	ν1.2 UU	.0 1110.04	ν2.2 u 0.	.1 111-1.91	ν2.3 dU	.0 1110.24	Alphard	221 38.2 217°44.4	-8°47.3
										Regulus	207°30.8	11°49.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.6
0	305°57.0	145°58.5	N09°58.0	104°03.4	S09°46.2	106°48.2	S06°48.6	254°08.8	N16°31.7	Denebola	182°21.4	14°24.4
1	320°59.4	160°58.1	56.9	119°04.6	46.7	121°50.4	48.7	269°11.1	31.8	Gienah	175°39.9	-17°42.5
2	336°01.9	175°57.8	55.7	134°05.7	47.3	136°52.6	48.9	284°13.4	31.8	Acrux	172°56.0	-63°16.1
3	351°04.4	190°57.5	• • 54.5	149°06.9	• • 47.8	151°54.8	• • 49.0	299°15.7	• • 31.9	Gacrux	171°47.6	-57°17.0
4	6°06.8	205° 57.2	53.3	164°08.1	48.4	166°57.0	49.1	314°18.0	31.9	Alioth	166°10.1	55°48.2
5	21°09.3	220°56.8	52.2	179°09.2	48.9	181°59.1	49.2	329°20.3	31.9	Spica	158° 18.5	-11°19.0
6	36°11.8	235° 56.5	N09°51.0	194°10.4	S09°49.5	197°01.3	S06°49.3	344°22.6	N16°32.0	Alkaid	152°49.3	49°10.2
7	51°14.2	250° 56.2	49.8	209°11.5	50.0	212°03.5	49.5	359°24.9	32.0	Hadar	148°30.6	-60°31.2
8	66°16.7	265°55.9	48.6	224°12.7	50.6	227°05.7	49.6	14°27.1	32.0	Menkent	147°53.2	-36°31.1
9	81°19.2 96°21.6	280°55.6	• • 47.4	239°13.8	• • 51.2	242°07.9	• • 49.7	29°29.4	· · 32.1	Arcturus	145°44.6	$19^{\circ}01.9$
10 11	96 21.6 111°24.1	295°55.2 310°54.9	46.2	254°15.0 269°16.2	51.7 52.3	257°10.1 272°12.3	49.8 49.9	44°31.7 59°34.0	32.1 32.1	Rigil Kent.	139°35.0	-60°57.7
12	111 24.1 126°26.6	310 54.9 325°54.6	45.1 N09°43.9	284°17.3	52.3 \$09°52.8	272 12.3 287°14.5	506°50.1	74°36.3	N16°32.2	Kochab	137°20.0	74°02.3
13	141°29.0	340°54.3	42.7	204 17.3 299°18.5	53.4	302°16.7	50.2	89°38.6	32.2	Zuben'ubi	136°51.8	-16°09.9
14	156°31.5	355°54.0	41.5	314°19.6	53.4	317°18.9	50.2	104°40.9	32.2	Alphecca	126°00.5	26°37.1
15	171°33.9	10°53.6	• • 40.3	329°20.8	• • 54.5	332°21.1	• • 50.4	119°43.2	32.3	Antares	112°11.1	-26°29.8
16	186°36.4	25°53.3	39.1	344°21.9	55.0	347°23.2	50.5	134°45.5	32.3	Atria	107°01.5	-69°04.9
17	201°38.9	40°53.0	38.0	359°23.1	55.6	2°25.4	50.7	149°47.8	32.3	Sabik	101°58.3	-15°45.6
18	216°41.3	55° 52.7	N09°36.8	14°24.2	S09°56.1	17°27.6	S06°50.8		N16°32.4	Shaula	96°05.0 95°54.9	-37°07.4 12°32.5
19	231°43.8	70°52.4	35.6	29°25.4	56.7	32°29.8	50.9	179°52.4	32.4	Rasalhague Eltanin	95° 54.9	51°29.4
20	246°46.3	85°52.1	34.4	44°26.5	57.2	47°32.0	51.0	194°54.7	32.4	Kaus Aust.	83° 27.3	-34°22.1
21	261°48.7	100°51.7	• • 33.2	59°27.7	• • 57.8	62°34.2	• • 51.1	209°57.0	• • 32.5	Vega	80°30.3	38°48.9
22	276°51.2	115°51.4	32.0	74°28.9	58.3	77°36.4	51.3	224°59.3	32.5	Nunki	75°42.9	-26°15.4
23	291°53.7	130°51.1	30.8	89°30.0	58.9	92°38.6	51.4	240°01.6	32.5	Altair	61°56.0	8°57.0
Morn	pass. 03:36	11 0 3' d 1	2′ m-3.92	11 2' d0	.6′ m0.65	1/2 2 ¹ d0	.1′ m-1.91	1/2 3/ 40	.0′ m0.24	Peacock	52°59.5	-56°38.1
ivici.p	Jass. 05.50	ν-0.5 u-1	111-3.92	ν1.2 d0	.0 1110.03	νz.z ασ.	.1 111-1.91	ν2.5 d0	.0 1110.24	Deneb	49°22.7	45°23.3
										Enif	33°34.8	10°00.9
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.0	-46°48.7
0	306°56.1	145°50.8	N09°29.7	104°31.2	S09°59.4	107°40.8	S06°51.5	255°03.9	N16°32.6	Fomalhaut	15°10.2	-29°27.6
1	321°58.6	160°50.5	28.5	119°32.3	10°00.0	122°42.9	51.6	270°06.2	32.6	Scheat	13°41.3	$28^{\circ}14.7$
2	337°01.0	175°50.2	27.3	134°33.5	00.5	137°45.1	51.7	285°08.5	32.6	Markab	13°25.9	15°22.0
3	352°03.5	190°49.9	• • 26.1	149°34.6	01.1	152°47.3	51.9	300°10.8	• • 32.7	Jul 27 Fri	SHA	Mornas
4	7°06.0 22°08.4	205° 49.6 220° 49.2	24.9 23.7	164°35.8 179°36.9	01.6 02.2	167°49.5 182°51.7	52.0 52.1	315°13.0 330°15.3	32.7 32.7	Venus	201°08.5	Mer.pass 14:16
5 6	37°10.9	220° 49.2 235° 48.9	23.7 N09°22.5	179°36.9 194°38.1	02.2 \$10°02.7	182°51.7 197°53.9	52.1 \$06°52.2	330°15.3 345°17.6	32.7 N16°32.7	Mars	158° 37.6	17:04
7	52°13.4	250°48.6	21.3	209°39.2	03.3	212°56.1	52.4	0°19.9	32.8	Jupiter	160°57.6	16:54
8	67°15.8	265°48.3	20.1	209 39.2 224°40.4	03.9	212 50.1 227°58.3	52.4 52.5	15°22.2	32.8	Saturn	308°16.0	07:06
9	82°18.3	280°48.0	. 19.0	239°41.5	• • 04.4	243°00.4	• • 52.6	30°24.5	32.8			
10	97°20.8	295°47.7	17.8	254°42.7	05.0	258°02.6	52.7	45°26.8	32.9	Jul 28 Sat	SHA	Mer.pass
11	112°23.2	310°47.4	16.6	269°43.8	05.5	273°04.8	52.8	60°29.1	32.9	Venus	200°01.5	14:16
12	127°25.7	325°47.1	N09°15.4	284°44.9	S10°06.1	288°07.0	S06°53.0	75°31.4	N16°32.9		158°06.4	17:02
13	142°28.2	340°46.8	14.2	299°46.1	06.6	303°09.2	53.1	90°33.7	33.0	Jupiter	160°51.2	16:50
14	157°30.6	355°46.5	13.0	$314^{\circ}47.2$	07.2	318°11.4	53.2	105°36.0	33.0	Saturn	308°11.8	07:02
15	172°33.1	$10^{\circ}46.1$	• • 11.8	329°48.4	• • 07.7	333°13.5	• • 53.3	120°38.3	• • 33.0	Jul 29 Sun	SHA	Mer.pass
16	187°35.5	25°45.8	10.6	344°49.5	08.3	$348^{\circ}15.7$	53.5	$135^{\circ}40.6$	33.1		198°54.7	14:17
17	202°38.0	40°45.5	09.4	$359^{\circ}50.7$	8.80	3°17.9	53.6	150°42.9	33.1		157°35.0	17:01
18	217°40.5	55° 45.2	N09°08.2	14°51.8	S10°09.4	18° 20.1	S06°53.7	165°45.2	$N16^{\circ}33.1$	Jupiter	160°44.6	16:47
19	232°42.9	70°44.9	07.0	29°53.0	09.9	33°22.3	53.8	180°47.5	33.2	Saturn	308°07.7	06:59
20	247°45.4	85°44.6	05.8	44°54.1	10.5	48°24.5	53.9	195°49.8	33.2	11.	al =====	
21	262°47.9	100°44.3	• • 04.6	59°55.3	• • 11.0	63°26.7	• • 54.1	210°52.1	• • 33.2	Horizont	al parallax	0.1
22	277°50.3	115° 44.0	03.4	74°56.4	11.6	78°28.8	54.2	225°54.4	33.3		Venus: Mars:	0.1 0.1
23	292°52.8	130°43.7	02.2	89°57.5	12.1	93°31.0	54.3	240°56.7	33.3		iviars:	0.1
	ass. 03:32	11 0 31 d 1	2′ m-3.92	11 21 d0	.6′ m0.66	112 21 d0	.1′ m-1.90	112 31 d0	.0′ m0.24			

h	Su			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.0	N19° 11.3	342°14.6	13.2'	\$10°41.2	-12.1'	56.2'
1 2	193°22.0 208°22.0	10.7 10.2	356°46.8 11°19.0	13.3' 13.3'	10°29.2 10°17.1	-12.1' -12.1'	56.2' 56.1'
3	223°22.0	09.6	25°51.4	13.4'	10°17.1	-12.1	56.1'
4	238°22.0	09.0	40°23.8	13.5'	09°52.7	-12.2'	56.1'
5	253°22.0	08.5	54°56.2	13.5'	09°40.5	-12.2'	56.1'
6 7	268°22.0 283°22.0	N19°07.9 07.3	69°28.8 84°01.3	13.6' 13.6'	\$09°28.3 09°16.0	-12.3' -12.3'	56.0' 56.0'
8	298°22.0	06.8	98°34.0	13.7'	09°10.0	-12.3'	56.0'
9	313°22.0	• • 06.2	113°06.7	13.8'	08°51.4	-12.4'	56.0'
10	328°22.1 343°22.1	05.6 05.1	127°39.5 142°12.3	13.8' 13.9'	08°39.1 08°26.7	-12.4'	55.9' 55.9'
11 12	358°22.1	N19° 04.5	142 12.3 156°45.2	14.0'	508°14.3	-12.4' -12.4'	55.9'
13	13°22.1	03.9	171°18.1	14.0'	08°01.9	-12.5'	55.9'
14	28°22.1	03.3	185°51.2	14.1'	07°49.4	-12.5'	55.8'
15 16	43°22.1 58°22.1	· · 02.8 02.2	200°24.2 214°57.3	14.1' 14.2'	07°36.9 07°24.4	-12.5' -12.5'	55.8' 55.8'
17	73°22.1	01.6	229°30.5	14.2'	07°11.9	-12.5'	55.8'
18	88°22.1	$N19^{\circ}01.0$	244°03.7	14.3'	S 06°59.4	-12.6'	55.7'
19 20	103°22.2 118°22.2	19°00.5 18°59.9	258°37.0 273°10.4	14.3' 14.4'	06°46.8 06°34.3	-12.6' -12.6'	55.7' 55.7'
20	118 22.2 133°22.2	18 59.9	273 10.4 287°43.7	14.4 14.4'	06°34.3	-12.6'	55.7'
22	148°22.2	58.7	302°17.2	14.5'	06°09.1	-12.6'	55.7'
23	163°22.2	58.1	316°50.7	14.5'	05°56.5	-12.6'	55.6'
	SD = 15.7'	d = -0.6'		SI	O = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	178°22.2	N18°57.6	331°24.2	14.6'	S 05°43.8	-12.6'	55.6'
1	193°22.2 208°22.3	57.0 56.4	345°57.8 0°31.4	14.6' 14.7'	05°31.2 05°18.5	-12.7' -12.7'	55.6' 55.6'
2	208°22.3 223°22.3	50.4 •• 55.8	15°05.1	14.7' 14.7'	05°18.5 05°05.9	-12.7' -12.7'	55.5'
4	238°22.3	55.2	29°38.8	14.8'	04°53.2	-12.7'	55.5'
5	253°22.3	54.7	44°12.6	14.8'	04°40.5	-12.7'	55.5'
6 7	268°22.3 283°22.3	N18°54.1 53.5	58°46.4 73°20.2	14.8' 14.9'	\$04°27.8 04°15.1	-12.7' -12.7'	55.5' 55.4'
8	298°22.3	52.9	87°54.1	14.9'	04°13.1	-12.7'	55.4'
9	313°22.4	• • 52.3	$102^{\circ}28.0$	15.0'	03°49.7	-12.7'	55.4'
10 11	328°22.4 343°22.4	51.7 51.2	117°02.0 131°36.0	15.0' 15.0'	03°37.0 03°24.3	-12.7' -12.7'	55.4' 55.4'
12	358°22.4	N18° 50.6	131 30.0 146°10.0	15.1'	503°11.6	-12.7	55.3'
13	13°22.4	50.0	160°44.1	15.1'	02°58.8	-12.7'	55.3'
14	28°22.4	49.4	175°18.2	15.1'	02°46.1	-12.7'	55.3' 55.3'
15 16	43°22.5 58°22.5	•• 48.8 48.2	189°52.4 204°26.6	15.2' 15.2'	02°33.4 02°20.7	-12.7' -12.7'	55.3' 55.2'
17	73°22.5	47.6	219°00.8	15.2'	02°08.0	-12.7'	55.2'
18	88°22.5	N18°47.1	233°35.0	15.3'	S01°55.2	-12.7'	55.2'
19 20	103°22.5 118°22.6	46.5 45.9	248°09.3 262°43.6	15.3' 15.3'	01°42.5 01°29.8	-12.7'	55.2' 55.2'
21	133°22.6	• • 45.3	202 43.0 277°17.9	15.4'	01°17.1	-12.7'	55.1'
22	148°22.6	44.7	291°52.3	15.4'	$01^{\circ}04.4$	-12.7'	55.1'
23	163°22.6	44.1	306°26.7	15.4'	00°51.7	-12.7'	55.1'
	SD = 15.7'	d = -0.6'		SI	O = 15.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.6	N18° 43.5	321°01.1	15.4'	500°39.0	-12.7'	55.1'
1 2	193°22.7 208°22.7	42.9 42.3	335°35.6 350°10.0	15.5' 15.5'	00°26.4 00°13.7	-12.7' -12.7'	55.1' 55.0'
3	223°22.7	• • 41.7	4°44.5	15.5'	S00°01.0	-12.7'	55.0'
4	238°22.7	41.1	19°19.0	15.5'	N00°11.6	12.6'	55.0'
5 6	253°22.7 268°22.8	40.5 N18°39.9	33°53.6 48°28.1	15.6' 15.6'	00°24.3 N00°36.9	12.6' 12.6'	55.0' 55.0'
7	283°22.8	39.3	63°02.7	15.6'	00°49.5	12.6'	54.9'
8	298°22.8	38.8	77°37.3	15.6'	01°02.1	12.6'	54.9'
9 10	313°22.8 328°22.8	· · 38.2 37.6	92°11.9 106°46.5	15.6' 15.6'	01°14.7 01°27.3	12.6' 12.6'	54.9' 54.9'
10	328 22.8 343°22.9	37.6 37.0	106 46.5 121°21.2	15.6	01 27.3 01°39.8	12.5'	54.9' 54.9'
12	358°22.9	N18°36.4	135°55.8	15.7'	N01°52.4	12.5'	54.9'
13	13°22.9	35.8	150°30.5	15.7'	02°04.9	12.5'	54.8'
14 15	28°22.9 43°23.0	35.2 •• 34.6	165°05.2 179°39.9	15.7' 15.7'	02°17.4 02°29.9	12.5' 12.5'	54.8' 54.8'
16	58°23.0	34.0	194°14.6	15.7'	02°42.4	12.5'	54.8'
17	73°23.0	33.4	208°49.3	15.7'	02°54.8	12.4'	54.8'
18 19	88°23.0 103°23.1	N18° 32.8 32.2	223°24.0 237°58.7	15.7' 15.7'	N03°07.2 03°19.7	12.4' 12.4'	54.7' 54.7'
20	118°23.1	31.6	252°33.5	15.7' 15.7'	03°32.0	12.4'	54.7'
21	133°23.1	• • 31.0	267°08.2	15.8'	03°44.4	12.3'	54.7'
22 23	148°23.1 163°23.2	30.4 29.7	281°43.0 296°17.7	15.8' 15.8'	03°56.8 04°09.1	12.3' 12.3'	54.7' 54.7'
23	SD = 15.7'	$\frac{29.7}{d = -0.6'}$	290 11.1		D = 15.0'	12.3	54.7
	שט = 15. <i>l'</i>	$a = -0.0^{\circ}$		51	J = 15.0°		

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

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

		Sun		Moon			
Day	Eqn.of Time 00 ^h 12 ^h		Mer.	Mer.	Pass.	Age	
Duy			Pass	Upper	Upper Lower		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-88%	
27	06:32	06:32	12:07	01:13	13:36		
28	06:31	06:30	12:07	01:58	14:19		
29	06:29	06:28	12:06	02:40	15:01		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	307°55.3	GПА 145°43.4	N09°01.0	104°58.7	S10°12.7	108°33.2	S06° 54.4	255°59.0	N16° 33.3			
1	307 55.3 322°57.7	160°43.1	08°59.8	119° 59.8	13.2	100 35.2 123°35.4	54.6	271°01.3	33.4	Alpheratz	357°30.7	29°15.3
2	338°00.2	175°42.8	58.6	135°01.0	13.8	138° 37.6	54.7	286°03.6	33.4	Ankaa	353°03.4	-42°08.3
3	353°02.7	190°42.5	57.4	150°02.1	. 14.3	153° 39.7	• • 54.8	301°05.9	• • 33.4	Schedar	349°26.4	56°41.9
4	8°05.1	205°42.2	56.2	165°03.3	14.9	168°41.9	54.9	316°08.2	33.5	Diphda	348°43.5	-17°49.2
5	23°07.6	220°41.9	55.0	180°04.4	15.5	183°44.1	55.1	331°10.5	33.5	Achernar	335°17.5	-57°04.8
6	38°10.0	235°41.6	N08°53.9	195°05.5	S10°16.0	198°46.3	S06°55.2	346°12.8	N16°33.5	Hamal	327°46.9	23°36.1
7	53°12.5	250°41.3	52.7	210°06.7	16.6	213°48.5	55.3	1°15.1	33.6	Polaris	312°05.0	89°22.9
8	68°15.0	265°41.0	51.5	225°07.8	17.1	228°50.7	55.4	16°17.4	33.6	Acamar	315°09.1	-40°10.9
9	83°17.4	280°40.7	• • 50.2	240°09.0	• • 17.7	243°52.8	• • 55.5	31°19.7	• • 33.6	Menkar	314°02.3	4°12.4
10	98°19.9	295°40.4	49.0	255° 10.1	18.2	258°55.0	55.7	46°22.0	33.6	Mirfak	308°23.0	49°57.7
11	113°22.4	310°40.1	47.8	270°11.2	18.8	273°57.2	55.8	61°24.3	33.7	Aldebaran	290°35.6	16°34.0
12	128°24.8	325°39.8	N08°46.6	285° 12.4	S10°19.3	288°59.4	S06°55.9	76°26.6	N16°33.7	Rigel	281°00.5	-8°10.0
13	143°27.3	340°39.5	45.4	300°13.5	19.9	304°01.6	56.0	91°28.9	33.7	Capella Bellatrix	280° 16.7 278° 19.2	46°01.4 6°22.5
14	158°29.8	355°39.2	44.2	315° 14.6	20.4	319°03.7	56.2	$106^{\circ}31.2$	33.8	Elnath	277° 57.5	28°37.8
15	173°32.2	10°38.9	• • 43.0	330° 15.8	• • 21.0	334°05.9	• • 56.3	121°33.5	• • 33.8	Alnilam	277 37.3 275°34.2	-1°11.0
16	188°34.7	25°38.6	41.8	345°16.9	21.5	349°08.1	56.4	136°35.8	33.8	Betelgeuse	270°48.4	7°24.7
17	203°37.1	40°38.3	40.6	0°18.1	22.1	4°10.3	56.5	151°38.1	33.9	Canopus	263°51.2	-52°42.6
18	218°39.6	55°38.0	N08°39.4	15° 19.2	S10°22.6	19° 12.5	S06°56.7	166°40.4	N16°33.9	Sirius	258°23.3	-16°45.4
19	233°42.1	70°37.7	38.2	30°20.3	23.2	34°14.6	56.8	181°42.7	33.9	Adhara	255°03.3	-29°00.7
20	248°44.5	85°37.4	37.0	45°21.5	23.7	49°16.8	56.9	196°45.0	34.0	Procyon	244° 47.3	5°08.8
21	263°47.0	100°37.1	• • 35.8	60°22.6	• • 24.3	64°19.0	• • 57.0	211°47.3	• • 34.0	Pollux	243°13.2	27°57.1
22	278°49.5	115°36.8	34.6	75°23.7	24.8	79°21.2	57.2	226°49.6	34.0	Avior	234°13.8	-59°36.3
23	293°51.9	130°36.5	33.4	90°24.9	25.4	94°23.3	57.3	241°51.9	34.1	Suhail	222°44.0	-43°33.3
Mern	ass. 03:28	ν -0.3' d-1	l.2′ m-3.92	ν 1 1' d0	.6′ m0.67	ν2 2' dΩ	1′ m-1.90	ν2 3' d0	.0′ m0.23	Miaplacidus	221°38.2	-69°50.5
.vici.p		- 0.5 u-1		ν 1.1 UU		- 2.2 00.	1.30	-2.5 00	.5 1110.25	Alphard	217°44.4	-8°47.3
										Regulus	207°30.8	11°49.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.6
0	308°54.4	145°36.2	N08°32.2	105°26.0	S10°26.0	109°25.5	S06°57.4	256°54.3	N16°34.1	Denebola	182°21.4	14°24.4
1	323°56.9	160°35.9	31.0	120°27.1	26.5	124°27.7	57.5	271°56.6	34.1	Gienah	175°39.9	-17°42.5
2	338°59.3	175°35.6	29.8	135°28.3	27.1	139°29.9	57.7	286°58.9	34.1		172°56.1	-63°16.1
3	354°01.8	190°35.3	• • 28.6	150°29.4	• • 27.6	154°32.1	• • 57.8	302°01.2	• • 34.2		171°47.6	-57°17.0
4	9°04.3	205°35.0	27.4	165°30.5	28.2	169°34.2	57.9	317°03.5	34.2	Alioth	$166^{\circ}10.1$	55°48.2
5	24°06.7	220°34.8	26.2	180°31.7	28.7	184°36.4	58.0	332°05.8	34.2	Spica	$158^{\circ}18.5$	-11°19.0
6	39°09.2	235°34.5	N08°25.0	195°32.8	\$10°29.3	199°38.6	S06°58.2	347°08.1	N16°34.3	Alkaid	152°49.3	49°10.2
7	54°11.6	250°34.2	23.7	210°33.9	29.8	214°40.8	58.3	2°10.4	34.3	Hadar	148°30.6	-60°31.2
8	69°14.1	265°33.9	22.5	225°35.1	30.4	229°42.9	58.4	17°12.7	34.3	Menkent	$147^{\circ}53.2$	-36°31.1
9	84°16.6	280°33.6	• • 21.3	240°36.2	• • 30.9	244°45.1	• • 58.5	32°15.0	• • 34.4	Arcturus	145°44.6	19°01.9
10	99°19.0	295°33.3	20.1	255°37.3	31.5	259° 47.3	58.7	47°17.3	34.4	Rigil Kent.	139°35.0	-60°57.7
11	114°21.5	310°33.0	18.9	270°38.4	32.0	274°49.5	58.8	62°19.6	34.4	Kochab	$137^{\circ}20.1$	74°02.3
12	129°24.0	325°32.7	N08°17.7	285°39.6	\$10°32.6	289°51.6	S06°58.9	77°21.9	N16° 34.5	Zuben'ubi	$136^{\circ}51.9$	-16°09.9
13	144°26.4 159°28.9	340°32.4 355°32.1	16.5	300°40.7 315°41.8	33.1	304°53.8 319°56.0	59.0	92°24.2	34.5	Alphecca	$126^{\circ}00.5$	26°37.1
14	159 26.9 174°31.4	10°31.8	15.3		33.7		59.2	107°26.5	34.5	Antares	$112^{\circ}11.1$	-26°29.8
15 16	174 31.4 189°33.8	25°31.6	· · 14.1 12.8	330°43.0 345°44.1	· · 34.2 34.8	334°58.2 350°00.3	· · 59.3 59.4	122°28.8 137°31.1	· · 34.5 34.6	Atria	$107^{\circ}01.5$	-69°04.9
17	204°36.3	40°31.3	11.6	0°45.2	34.o 35.4	5°02.5	59. 4 59.5	157 31.1 152°33.4	34.6	Sabik	101°58.3	-15°45.6
18	204 30.3 219°38.7	55°31.0	N08°10.4	15°46.3	\$10°35.9	20°04.7	59.5 S06°59.7		N16°34.6	Shaula	96°05.0	-37°07.4
19	219 36.7 234°41.2	70°30.7		30° 47.5		35°06.9	59.8	182°38.0	0.4 7	Rasalhague	95°54.9	12°32.6
20	249°43.7	85°30.4	09.2 08.0	45° 48.6	36.5 37.0	50°09.0	06° 59.9	197°40.3	34.7 34.7	Eltanin	90°40.0	51°29.4
21	264° 46.1	100°30.1	06.8	60°49.7	• • 37.6	65°11.2	00° 59.9 07° 00.0	212°42.7	• • 34.7	Kaus Aust.	83°27.3	-34°22.1
22	279°48.6	115°29.8	05.6	75° 50.8	38.1	80°13.4	00.0	212 42.7 227°45.0	34.8	Vega	80°30.3	38°48.9
23	294°51.1	130°29.6	04.4	90°52.0	38.7	95° 15.6	00.2	242°47.3	34.8	Nunki	75°42.9	-26°15.4
	294 31.1									Altair	61°56.0	8°57.0
Mer.p	ass. 03:24	ν -0.3' d-1	l.2′ m-3.92	u 1.1' d0	.6′ m0.67	$\nu 2.2' \ d0.$	1' m-1.89	ν 2.3 $^{\prime}$ d0	.0′ m0.23	Peacock	52°59.5	-56°38.1
										Deneb	49°22.7	45°23.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.8	10°00.9
0 0	309°53.5	145°29.3	N08°03.1	105°53.1		110° 17.7	S07°00.4		N16°34.8	Al Na'ir	27°28.0	-46°48.7
1	324°56.0	160°29.0	01.9	100°54.2	39.8	125° 19.9	00.6	272°51.9	34.8	Fomalhaut	15°10.2	-29°27.6
2	339°58.5	175°28.7	08°00.7	135°55.3	40.3	140°22.1	00.7	287°54.2	34.9	Scheat	13°41.3 13°25.9	28°14.7
3	355°00.9	190°28.4	07°59.5	150° 56.5	• • 40.9	155°24.2	. 00.8	302°56.5	34.9	Markab	13 25.9	15°22.0
4	10°03.4	205°28.1	58.3	165°57.6	41.4	170° 26.4	00.9	317°58.8	34.9	Jul 30 Mon	SHA	Mer.pass
5	25°05.9	220°27.8	57.1	180°58.7	42.0	185°28.6	01.1	333°01.1	35.0	Venus	197°48.1	14:17
6	40°08.3	235°27.6	N07°55.8	195°59.8	S10°42.5	200°30.8	S07°01.2		N16°35.0	Mars	$157^{\circ}03.4$	16:59
7	55°10.8	250°27.3	54.6	211°01.0	43.1	215°32.9	01.3	3°05.7	35.0	Jupiter	160°37.9	16:43
8	70°13.2	265°27.0	53.4	226°02.1	43.6	230°35.1	01.4	18°08.0	35.1	Saturn	308°03.8	06:55
9	85°15.7	280°26.7	• • 52.2	241°03.2	• • 44.2	245°37.3	•• 01.6	33°10.3	• • 35.1	Lat 21 T	CIIA	Ma:: :-
10	100°18.2	295°26.4	51.0	256°04.3	44.8	260°39.4	01.7	48°12.7	35.1	Jul 31 Tue	SHA 106° 41 9	Mer.pass
11	115°20.6	310°26.2	49.8	271°05.4	45.3	275°41.6	01.8	63°15.0	35.1		196°41.8	14:18
12	130°23.1	325°25.9	N07°48.5	286°06.6	S 10°45.9	290°43.8	S07°02.0		N16°35.2		156°31.6 160°31.1	16:57
13	$145^{\circ}25.6$	340°25.6	47.3	301°07.7	46.4	$305^{\circ}46.0$	02.1	93°19.6	35.2	Jupiter	307°59.9	16:40 06:51
14	$160^{\circ}28.0$	355°25.3	46.1	$316^{\circ}08.8$	47.0	$320^{\circ}48.1$	02.2	108°21.9	35.2	Saturn	301 39.9	00:51
15	175°30.5	10°25.0	• • 44.9	$331^{\circ}09.9$	• • 47.5	$335^{\circ}50.3$	• • 02.3	123°24.2	• • 35.3	Aug 01 Wed	SHA	Mer.pass
16	190°33.0	25°24.8	43.7	$346^{\circ}11.0$	48.1	$350^{\circ}52.5$	02.5	$138^{\circ}26.5$	35.3		195°35.7	14:18
17	205°35.4	40°24.5	42.4	1°12.2	48.6	5°54.6	02.6	153°28.8	35.3	Mars	155°59.6	16:55
18	220°37.9	55°24.2	N07°41.2	16° 13.3	S10°49.2	20°56.8	S07°02.7		N16°35.3	Jupiter	$160^{\circ}24.2$	16:36
19	235°40.4	70°23.9	40.0	31° 14.4	49.7	35°59.0	02.8	183°33.4	35.4	Saturn	$307^{\circ}56.0$	06:48
20	250°42.8	85°23.6	38.8	46° 15.5	50.3	51°01.1	03.0	198°35.7	35.4		-1 - "	
21	265°45.3	100°23.4	• • 37.5	61°16.6	• • 50.8	66°03.3	• • 03.1	213°38.1	• • 35.4	Horizont	al parallax	0.1
22	280°47.7	115°23.1	36.3	76° 17.8	51.4	81°05.5	03.2	228°40.4	35.5		Venus:	0.1
23	295°50.2	130°22.8	35.1	91°18.9	51.9	96°07.7	03.4	243°42.7	35.5		Mars:	0.1
Mer n	ass. 03:20	ν -0.3' d-1	L.2′ m-3.93	$\nu 1.1' d0$.6′ m0.68	$\nu^{2.2'} d0$	1′ m-1.89	$\nu^{2.3'} d0$.0′ m0.23			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.2	N18° 29.1	310°52.5	15.8'	N04°21.4	12.3'	54.6'
1	193°23.2	28.5	$325^{\circ}27.3$	15.8'	04°33.6	12.2'	54.6'
2	208°23.2	27.9	340°02.0	15.8'	04°45.9	12.2'	54.6'
3 4	223°23.3 238°23.3	· · 27.3 26.7	354°36.8 9°11.6	15.8' 15.8'	04°58.1 05°10.3	12.2' 12.2'	54.6' 54.6'
5	250 25.3 253°23.3	26.1	23°46.3	15.8'	05 10.3 05°22.5	12.1	54.6'
6	268°23.4	N18° 25.5	38°21.1	15.8'	N05°34.6	12.1'	54.6'
7	283°23.4	24.9	52°55.9	15.8'	05°46.7	12.1'	54.5'
8	298°23.4	24.3	67°30.6	15.8'	05°58.8	12.0'	54.5'
9	313°23.4 328°23.5	· · 23.7 23.1	82°05.4 96°40.1	15.8'	06°10.8 06°22.8	12.0' 12.0'	54.5' 54.5'
10 11	343°23.5	22.5	90 40.1 111°14.9	15.7' 15.7'	06°34.8	12.0'	54.5'
12	358°23.5	N18° 21.8	125°49.6	15.7'	N06°46.8	11.9'	54.5'
13	13°23.6	21.2	$140^{\circ}24.4$	15.7'	06°58.7	11.9'	54.5'
14	28°23.6	20.6	154°59.1	15.7'	07°10.6	11.9'	54.5'
15 16	43°23.6 58°23.6	· · 20.0 19.4	169°33.8 184°08.5	15.7' 15.7'	07°22.4 07°34.2	11.8' 11.8'	54.4' 54.4'
17	73°23.7	18.8	198°43.2	15.7'	07°46.0	11.7	54.4'
18	88°23.7	N18° 18.2	213°17.9	15.7'	N07°57.8	11.7'	54.4'
19	103°23.7	17.6	227°52.5	15.7'	08°09.5	11.7'	54.4'
20	118°23.8	16.9	242°27.2	15.6'	08°21.1	11.6'	54.4'
21 22	133°23.8 148°23.8	· · 16.3 15.7	257°01.8 271°36.4	15.6' 15.6'	08°32.8 08°44.4	11.6' 11.6'	54.4' 54.4'
23	163°23.9	15.1	286°11.0	15.6'	08°55.9	11.5	54.4
	SD = 15.7'	d = -0.6'			0 = 14.9'		
	<u> </u>	<u>u = -0.0</u>		J.	7 — 14.9		
Tue	GHA	Dec	GHA	ν 15.6'	Dec	d	HP
0 1	178°23.9 193°23.9	N18° 14.5 13.9	300°45.6 315°20.2	15.6' 15.6'	N09°07.4 09°18.9	11.5' 11.4'	54.3' 54.3'
2	208°24.0	13.9	315 20.2 329°54.7	15.5'	09°10.9	11.4	54.3'
3	223°24.0	• • 12.6	344°29.3	15.5'	09°41.7	11.3'	54.3'
4	238°24.0	12.0	359°03.8	15.5'	09°53.1	11.3'	54.3'
5	253°24.1 268°24.1	11.4 N18° 10.8	13°38.3 28°12.7	15.5'	10°04.4 N10°15.6	11.3' 11.2'	54.3'
6 7	268°24.1 283°24.1	N18-10.8 10.1	28°12.7 42°47.2	15.4' 15.4'	10°26.9	11.2'	54.3' 54.3'
8	298°24.2	09.5	57°21.6	15.4'	10° 20.9	11.1'	54.3'
9	313°24.2	• • 08.9	71°56.0	15.4'	10°49.2	11.1'	54.3'
10	328°24.2	08.3	86°30.4	15.3'	11°00.3	11.0'	54.3'
11	343°24.3 358°24.3	07.6 N18° 07.0	101°04.7 115°39.0	15.3'	11°11.3 N11°22.3	11.0' 10.9'	54.3' 54.2'
12 13	358°24.3 13°24.3	N18-07.0 06.4	115° 39.0 130° 13.3	15.3' 15.3'	11°33.2	10.9'	54.2'
14	28°24.4	05.8	144°47.6	15.2'	11°44.1	10.8	54.2'
15	43°24.4	•• 05.1	159°21.8	15.2'	$11^{\circ}54.9$	10.8'	54.2'
16	58°24.5	04.5	173°56.0	15.2'	12°05.7	10.7'	54.2'
17 18	73°24.5 88°24.5	03.9 N18° 03.3	188°30.2 203°04.3	15.1' 15.1'	12°16.5 N12°27.2	10.7' 10.6'	54.2' 54.2'
19	103°24.6	02.6	217°38.4	15.1'	12°37.8	10.6'	54.2'
20	118°24.6	02.0	232°12.5	15.0'	12°48.4	10.5'	54.2'
21	133°24.6	•• 01.4	246°46.5	15.0'	12°58.9	10.5'	54.2'
22	148°24.7	8.00	261°20.5	15.0'	13°09.4	10.4' 10.4'	54.2'
23	163°24.7	00.1	275°54.5	14.9'	13°19.8	10.4	54.2'
	SD = 15.7'	d = -0.6'		SI	0 = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.8	N17°59.5	290°28.4	14.9'	N13°30.2	10.3'	54.2'
1	193°24.8	58.9	305°02.3	14.9'	13°40.5	10.3'	54.2' 54.2'
2 3	208°24.8 223°24.9	58.2 •• 57.6	319°36.2 334°10.0	14.8' 14.8'	13°50.8 14°01.0	10.2' 10.1'	54.2' 54.2'
4	238°24.9	57.0	348°43.8	14.7'	14°11.1	10.1	54.2'
5	253°25.0	56.3	3°17.5	14.7'	14°21.2	10.0'	54.2'
6	268°25.0	N17°55.7	17°51.3	14.7'	N14°31.3	10.0'	54.2'
7 8	283°25.0 298°25.1	55.1 54.4	32°24.9 46°58.5	14.6' 14.6'	14°41.2 14°51.1	9.9' 9.8'	54.2' 54.2'
9	298 25.1 313°25.1	• • 53.8	40 58.5 61°32.1	14.6 14.5'	14 51.1 15°01.0	9.8 9.8'	54.2'
10	328°25.2	53.2	$76^{\circ}05.6$	14.5'	$15^{\circ}10.8$	9.7'	54.2'
11	343°25.2	52.5	90°39.1	14.4'	15°20.5	9.7'	54.2'
12	358°25.2 13°25.3	N17°51.9	105°12.6 119°46.0	14.4'	N15°30.1 15°39.7	9.6'	54.2'
13 14	13°25.3 28°25.3	51.3 50.6	119°46.0 134°19.4	14.4' 14.3'	15°39.7 15°49.3	9.5' 9.5'	54.2' 54.2'
15	43°25.4	• • 50.0	148°52.7	14.3'	15°58.8	9.4	54.2'
16	58°25.4	49.4	163°25.9	14.2'	16°08.2	9.3'	54.2'
17	73°25.5	48.7	177°59.1	14.2'	16°17.5	9.3'	54.2'
18 19	88°25.5 103°25.5	N17° 48.1 47.4	192°32.3 207°05.4	14.1' 14.1'	N16°26.8 16°36.0	9.2' 9.1'	54.2' 54.2'
20	103 25.5 118°25.6	47.4 46.8	207 05.4 221°38.5	14.1 14.0'	16°45.1	9.1 9.1'	54.2'
21	133°25.6	• • 46.2	236°11.5	14.0'	16°54.2	9.0'	54.2'
22	148°25.7	45.5	250°44.5	13.9'	17°03.2	8.9'	54.2'
23	163°25.7	44.9	265°17.4	13.9'	17°12.1	8.9'	54.2'
	SD = 15.8'	d = -0.6'		SE	0 = 14.8'		

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

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

	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	81-64%
30	06:27	06:26	12:06	03:22	15:43	
31	06:24	06:23	12:06	04:04	16:25	
01	06:21	06:19	12:06	04:46	17:08	

August 02, 03, 04 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
0	310°52.7	145°22.5	N07°33.9	106°20.0	\$10°52.5	111°09.8	S07°03.5	258°45.0	N16°35.5			
1	325°55.1	160°22.3	32.7	121°21.1	53.0	126° 12.0	03.6	273°47.3	35.5	Alpheratz	357°30.6	29° 15.3
								288°49.6		Ankaa	353°03.4	-42°08.3
2	340°57.6	175°22.0	31.4	136°22.2	53.6	141°14.2	03.7		35.6	Schedar	$349^{\circ}26.3$	56°41.9
3	356°00.1	190°21.7	30.2	151°23.3	• • 54.2	156°16.3	• • 03.9	303°51.9	• • 35.6	Diphda	348°43.5	-17°49.2
4	11°02.5	205°21.4	29.0	166°24.4	54.7	171°18.5	04.0	318°54.2	35.6	Achernar	335°17.5	-57°04.8
5	26°05.0	220°21.1	27.8	181°25.6	55.3	186°20.7	04.1	333°56.5	35.7	Hamal	327°46.9	23°36.1
6	41°07.5	235°20.9	N07°26.5	196°26.7	S10°55.8	201°22.8	S07°04.3	348°58.9	N16°35.7	Polaris	312°03.2	89°22.9
7	56°09.9	250°20.6	25.3	211°27.8	56.4	216°25.0	04.4	4°01.2	35.7	Acamar	315°09.1	-40° 10.9
8	71°12.4	265°20.3	24.1	226° 28.9	56.9	231°27.2	04.5	19°03.5	35.7		314°02.3	4° 12.4
9	86°14.8	280°20.1	• • 22.9	241°30.0	• • 57.5	246°29.3	• • 04.6	34°05.8	• • 35.8	Menkar		
10	101°17.3	295°19.8	21.6	256°31.1	58.0	261°31.5	04.8	49°08.1	35.8	Mirfak	308°23.0	49°57.7
11	116°19.8	310°19.5	20.4	271°32.2	58.6	276°33.7	04.9	64°10.4	35.8	Aldebaran	290°35.5	16°34.0
12	131°22.2	325°19.2	N07°19.2	286°33.4	S10°59.1	291°35.8	S07°05.0	79°12.7	N16°35.9	Rigel	281°00.5	-8° 10.0
13	146°24.7	340°19.0	18.0	301°34.5	10°59.7	306°38.0	05.2	94°15.0	35.9	Capella	280°16.7	46°01.4
14	161°27.2	355°18.7	16.7	316°35.6	10° 39.7 11° 00.2	321°40.1	05.2	109°17.4	35.9	Bellatrix	$278^{\circ}19.1$	6°22.5
15	176° 29.6	10°18.4		331° 36.7	. 00.2	336° 42.3	• • 05.4	109 17.4 124°19.7		Elnath	277°57.4	28° 37.8
			15.5						• • 35.9	Alnilam	275°34.2	$-1^{\circ}11.0$
16	191°32.1	25°18.1	14.3	346°37.8	01.3	351°44.5	05.6	139°22.0	36.0	Betelgeuse	270°48.3	7°24.7
17	206°34.6	40°17.9	13.0	1°38.9	01.9	6°46.6	05.7	154°24.3	36.0	Canopus	263°51.2	-52°42.6
18	221°37.0	55°17.6	N07°11.8	16°40.0	S11°02.4	21°48.8	S07°05.8	169°26.6	N16°36.0	Sirius	258°23.3	-16°45.4
19	236°39.5	70°17.3	10.6	31°41.1	03.0	36°51.0	05.9	184°28.9	36.1	Adhara	255°03.3	-29°00.7
20	251°42.0	85°17.1	09.4	46°42.2	03.6	51°53.1	06.1	199°31.2	36.1		244°47.3	5°08.8
21	266°44.4	100°16.8	• • 08.1	61°43.3	• • 04.1	66°55.3	• • 06.2	214°33.6	• • 36.1	Procyon		
22	281°46.9	$115^{\circ}16.5$	06.9	76°44.4	04.7	81°57.5	06.3	229°35.9	36.1	Pollux	243°13.2	27°57.1
23	296°49.3	130°16.3	05.7	91°45.6	05.2	96°59.6	06.5	244°38.2	36.2	Avior	234°13.8	-59°36.3
										Suhail	222°44.0	-43°33.2
Mer.p	ass. 03:16	ν -0.3′ d -1	2′ m-3.93	u 1.1' d0	.6′ m0.69	ν 2.2′ d0.	1^\prime m-1.88	ν 2.3′ d0	.0′ m0.22	Miaplacidus	221°38.2	-69°50.5
										Alphard	217°44.4	-8°47.3
E!	CHA	CHA	Dee	CHA	Dee	CHA	Doo	CHA	Dos	Regulus	207°30.8	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.6
0	311°51.8	145°16.0	N07°04.4	106°46.7	S11°05.8	112°01.8	S07°06.6	259°40.5	N16°36.2	Denebola	182°21.4	14°24.4
1	326°54.3	160°15.7	03.2	121° 47.8	06.3	127°03.9	06.7	274°42.8	36.2	Gienah	175°39.9	-17°42.5
2	341°56.7	175°15.5	02.0	136°48.9	06.9	142°06.1	06.9	289°45.1	36.3	Acrux	172°56.1	-63°16.1
3	356°59.2	190°15.2	07°00.7	151°50.0	• • 07.4	157°08.3	• • 07.0	304°47.4	• • 36.3		171°47.6	-57° 17.0
4	12°01.7	205°14.9	06°59.5	$166^{\circ}51.1$	08.0	$172^{\circ}10.4$	07.1	319°49.8	36.3	Alioth	166°10.2	55°48.2
5	27°04.1	220°14.7	58.3	181°52.2	08.5	$187^{\circ}12.6$	07.2	334°52.1	36.3	Spica	158° 18.5	-11°19.0
6	42°06.6	235°14.4	N06°57.0	196°53.3	S11°09.1	202°14.8	S07°07.4	349°54.4	N16°36.4		150° 10.5	49° 10.2
7	57°09.1	250°14.1	55.8	211°54.4	09.6	$217^{\circ}16.9$	07.5	4°56.7	36.4	Alkaid		
8	72°11.5	265°13.9	54.6	226° 55.5	10.2	232° 19.1	07.6	19°59.0	36.4	Hadar	148°30.6	-60°31.2
9	87°14.0	280°13.6	• • 53.3	241°56.6	• • 10.7	247°21.2	• • 07.8	35°01.3	36.4	1	147°53.2	-36°31.1
10	102°16.5	295°13.3	52.1	256° 57.7	11.3	262°23.4	07.9	50°03.6	36.5	Arcturus	145°44.6	19°01.9
11	102 10.3 117°18.9		50.9	271°58.8	11.8	202 25.4 277°25.6	08.0	65°06.0	36.5	Rigil Kent.	139°35.0	-60°57.7
		310°13.1 325°12.8		271 56.6 286°59.9						Kochab	137°20.2	74°02.3
12	132°21.4		N06°49.6		S11°12.4	292°27.7	S07°08.2	80°08.3	N16°36.5	Zuben'ubi	136°51.9	$-16^{\circ}09.9$
13	147°23.8	340°12.5	48.4	302°01.0	13.0	307°29.9	08.3	95°10.6	36.6	Alphecca	126°00.6	26°37.1
14	162°26.3	355°12.3	47.2	317°02.1	13.5	322°32.0	08.4	110°12.9	36.6	Antares	112°11.1	-26° 29.8
15	177°28.8	10°12.0	• • 45.9	332°03.2	• • 14.1	337° 34.2	• • 08.6	125°15.2	• • 36.6	Atria	107°01.5	-69°04.9
16	192°31.2	25°11.7	44.7	347°04.3	14.6	352°36.4	08.7	$140^{\circ}17.5$	36.6	Sabik	101°58.3	-15° 45.5
17	207°33.7	$40^{\circ}11.5$	43.5	2°05.4	15.2	7°38.5	8.80	155°19.9	36.7	Shaula	96°05.0	-37°07.4
18	222°36.2	55°11.2	N06°42.2	17°06.5	S11°15.7	22°40.7	S07°08.9	170°22.2	N16°36.7	Rasalhague	95°54.9	12°32.6
19	237°38.6	70°11.0	41.0	32°07.6	16.3	37°42.8	09.1	185°24.5	36.7	_		
20	252°41.1	85°10.7	39.8	47°08.7	16.8	52°45.0	09.2	200°26.8	36.7	Eltanin	90°40.1	51°29.4
21	267°43.6	100°10.4	38.5	62°09.8	17.4	67°47.2	09.3	215°29.1	36.8	Kaus Aust.	83°27.3	-34°22.1
22	282°46.0	115°10.2	37.3	77° 10.9	17.9	82°49.3	09.5	230°31.5	36.8	Vega	80°30.3	38°49.0
23	202 40.0 297°48.5	130°09.9		92° 12.0		97°51.5		245°33.8		Nunki	75°42.9	-26° 15.4
23	291 40.5	130 09.9	36.0	92 12.0	18.5	97 51.5	09.6	245 33.0	36.8	Altair	$61^{\circ}56.0$	$8^{\circ}57.1$
Mer.p	ass. 03:12	ν -0.3' d-1	.2′ m-3.93	$\nu 1.1' d0$.6′ m0.70	$\nu 2.2' \ d0.$	1′ m-1.88	$\nu 2.3' \ d0$.0′ m0.22	Peacock	52°59.5	-56°38.1
										Deneb	49°22.7	45°23.4
										Enif	33°34.8	10°00.9
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.0	-46°48.7
0	$312^{\circ}51.0$	$145^{\circ}09.7$	N06°34.8		S11°19.0	$112^{\circ}53.6$	S07°09.7		N16°36.9	Fomalhaut	15°10.2	-29°27.6
1	327°53.4	160°09.4	33.6	122° 14.2	19.6	127° 55.8	09.9	275°38.4	36.9	Scheat	13°41.3	28° 14.7
2	342°55.9	175°09.1	32.3	$137^{\circ}15.3$	20.1	142°58.0	10.0	290°40.7	36.9	Markab	13°25.9	15°22.0
3	357°58.3	190°08.9	• • 31.1	152° 16.4	• • 20.7	158°00.1	• • 10.1	305°43.0	• • 36.9	IVIAINAD	13 23.9	
4	13°00.8	205°08.6	29.9	167° 17.5	21.2	173°02.3	10.3	320°45.4	37.0	Aug 02 Thu	SHA	Mer.pass
5	28°03.3	220°08.4	28.6	182°18.6	21.8	188°04.4	10.4	335°47.7	37.0	_	194°29.9	14:19
6	43°05.7	235°08.1	N06°27.4	197° 19.7		203°06.6	S07°10.5	350°50.0	N16°37.0		155°27.3	16:53
7	58°08.2	250°07.8	26.1	212°20.8	22.9	218° 08.7	10.7	5°52.3	37.0		160°17.1	16:33
8	73°10.7	265°07.6	24.9	212 20.8 227°21.9	23.5	233°10.9	10.7	20°54.6	37.0	Saturn	307°52.3	06:44
				242° 23.0						Jatuill	501 32.3	
9	88°13.1	280°07.3	· · 23.7		• • 24.0	248°13.1	• • 10.9	35°57.0	37.1	Aug 03 Fri	SHA	Mer.pass
10	103°15.6	295°07.1	22.4	257°24.1	24.6	263°15.2	11.1	50°59.3	37.1		193°24.2	14:19
11	118°18.1	310°06.8	21.2	272°25.2	25.1	278° 17.4	11.2	66°01.6	37.1		154°54.9	16:52
12	133°20.5	325°06.6	N06°19.9	287°26.3	S11°25.7	293° 19.5	S07°11.3		N16°37.2		160°10.0	16:30
13	148°23.0	340°06.3	18.7	302°27.4	26.2	$308^{\circ}21.7$	11.5	96°06.2	37.2	Saturn	307°48.7	06:40
14	163°25.4	355°06.0	17.4	317°28.5	26.8	323°23.8	11.6	$111^{\circ}08.6$	37.2	Saturn	JU1 48.1	00:40
15	178°27.9	10°05.8	• • 16.2	332°29.6	• • 27.3	338°26.0	• • 11.7	126°10.9	• • 37.3	Aug 04 Sat	SHA	Mer.pass
16	193°30.4	25°05.5	15.0	347°30.6	27.9	353°28.1	11.9	141°13.2	37.3		192°18.7	14:20
17	208°32.8	40°05.3	13.7	2°31.7	28.4	8°30.3	12.0	156°15.5	37.3		192 10.7 154°22.2	16:50
18	200° 32.0 223° 35.3	55°05.0	N06°12.5	17°32.8	\$11°29.0	23°32.4	507° 12.1		N16°37.3			
	223 35.3 238°37.8	70°04.8		32°33.9				171 17.8 186°20.2			160°02.7	16:26
19			11.2		29.5	38°34.6	12.3		37.4	Saturn	307°45.1	06:37
20	253°40.2	85°04.5	10.0	47°35.0	30.1	53°36.8	12.4	201°22.5	37.4	Horizont	al parallax	
21	268°42.7	100°04.3	• • 08.7	62°36.1	• • 30.6	68°38.9	• • 12.5	216°24.8	• • 37.4	TIOTIZOTI	-	0.1
22	283°45.2	115°04.0	07.5	77°37.2	31.2	83°41.1	12.7	231°27.1	37.4		Venus:	0.1
23	298°47.6	130°03.8	06.3	92°38.3	31.7	98°43.2	12.8	246°29.5	37.5		Mars:	0.1
Morn	ass. 03:08	v_∩ 3/ ⊿ 1	2′ m-3.93	ν1 1/ dΩ	.6′ m0.70	1/2 2/ d0	1′ m-1.87	1/2 3/ 40	.0′ m0.22			
ivier.p	,a33. U3.U0	ν-0.5 u-1	111-3.93	ν 1.1 00	.5 1110.70	ν Δ.Δ UO.	± 111-1.0 <i>1</i>	ν2.5 dU	.0 1110.22			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.8	N17°44.2	279°50.3	13.8'	N17°21.0	8.8'	54.2'
1 2	193°25.8 208°25.8	43.6 42.9	294°23.1 308°55.9	13.8' 13.7'	17°29.7 17°38.5	8.7' 8.6'	54.2' 54.2'
3	200 25.0 223°25.9	• • 42.3	323°28.6	13.7	17°47.1	8.6'	54.2'
4	238°25.9	41.7	$338^{\circ}01.3$	13.6'	17°55.7	8.5'	54.2'
5	253°26.0	41.0	352°33.9	13.6'	18°04.2	8.4'	54.2'
6 7	268°26.0 283°26.1	N17°40.4 39.7	7°06.5 21°39.0	13.5' 13.4'	N18°12.6 18°20.9	8.3' 8.3'	54.2' 54.2'
8	298°26.1	39.1	36°11.4	13.4	18°29.2	8.2'	54.2'
9	313°26.2	• • 38.4	50°43.8	13.3'	18°37.4	8.1'	54.2'
10 11	328°26.2 343°26.3	37.8 37.1	65°16.2 79°48.4	13.3' 13.2'	18°45.5 18°53.5	8.0' 8.0'	54.3' 54.3'
12	358°26.3	N17°36.5	94°20.7	13.2'	N19°01.5	7.9	54.3
13	13°26.4	35.8	$108^{\circ}52.8$	13.1'	19°09.3	7.8'	54.3'
14	28°26.4	35.2	123°25.0	13.1'	19°17.1	7.7'	54.3'
15 16	43°26.5 58°26.5	· · 34.5 33.9	137°57.0 152°29.0	13.0' 12.9'	19°24.8 19°32.5	7.6' 7.5'	54.3' 54.3'
17	73°26.6	33.2	167°00.9	12.9'	19°40.0	7.5'	54.3'
18	88°26.6	N17°32.6	181°32.8	12.8'	N19°47.5	7.4'	54.3'
19 20	103°26.7 118°26.7	31.9 31.3	196°04.7 210°36.4	12.8' 12.7'	19°54.9 20°02.1	7.3' 7.2'	54.3' 54.3'
21	133°26.8	• • 30.6	210 30.4 225°08.1	12.6'	20°02.1	7.1'	54.3
22	148°26.8	30.0	239°39.8	12.6'	20°16.5	7.0'	54.4'
23	163°26.9	29.3	254°11.4	12.5'	20°23.5	6.9'	54.4'
	SD = 15.8'	d = -0.6'		SD	9 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.9	N17°28.7	$268^{\circ}42.9$	12.5'	N20°30.5	6.9'	54.4'
1	193°27.0 208°27.0	28.0 27.4	283°14.4 297°45.8	12.4' 12.4'	20°37.3 20°44.1	6.8' 6.7'	54.4' 54.4'
2	208 27.0 223°27.1	. 26.7	297 45.8 312°17.1	12.4	20° 44.1	6.6'	54.4'
4	238°27.1	26.1	326°48.4	12.2'	20°57.4	6.5'	54.4'
5	253°27.2	25.4	341°19.7	12.2'	21°03.9	6.4'	54.4'
6 7	268°27.2 283°27.3	N17°24.7 24.1	355°50.8 10°21.9	12.1' 12.0'	N21°10.3 21°16.6	6.3' 6.2'	54.5' 54.5'
8	298°27.3	23.4	24°53.0	12.0'	21°22.8	6.1'	54.5'
9	313°27.4	• • 22.8	39°24.0	11.9'	21°28.9	6.0'	54.5'
10 11	328°27.4 343°27.5	22.1 21.5	53°54.9 68°25.8	11.9' 11.8'	21°34.9 21°40.9	5.9' 5.8'	54.5' 54.5'
12	358°27.5	N17°20.8	82°56.6	11.7'	N21°46.7	5.7'	54.5'
13	13°27.6	20.1	97°27.3	11.7'	21°52.4	5.6'	54.5'
14	28°27.6 43°27.7	19.5 •• 18.8	111°58.0 126°28.6	11.6' 11.6'	21°58.1 22°03.6	5.5' 5.4'	54.6' 54.6'
15 16	43 27.7 58°27.8	18.1	120 28.0 140°59.2	11.5	22 03.6 22°09.1	5.4 5.3'	54.6'
17	73°27.8	17.5	$155^{\circ}29.7$	11.4'	22°14.4	5.2'	54.6'
18	88°27.9 103°27.9	N17° 16.8	170°00.1 184°30.5	11.4' 11.3'	N22°19.7 22°24.8	5.1' 5.0'	54.6'
19 20	118°28.0	16.2 15.5	184 30.5 199°00.8		22°29.8		54.6' 54.7'
21	133°28.0	• • 14.8	213°31.1	11.2'	22°34.8	4.8'	54.7'
22	148°28.1	14.2	228°01.3	11.1'	22°39.6	4.7'	54.7'
23	$\frac{163^{\circ}28.2}{SD = 15.8'}$	13.5	242°31.5	11.1'	22°44.3	4.6'	54.7'
	$\frac{SD = 15.8'}{SD}$	d = -0.7'		- SL	0 = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°28.2 193°28.3	N17° 12.8 12.2	257°01.5 271°31.6	11.0' 11.0'	N22°48.9 22°53.5	4.5' 4.4'	54.7' 54.7'
2	208°28.3	11.5	286°01.5	10.9'	22°57.9	4.4	54. <i>1</i> ′
3	223°28.4	• • 10.8	300°31.4	10.9'	23°02.2	4.2'	54.8'
4 5	238°28.4 253°28.5	10.2 09.5	315°01.3 329°31.1	10.8' 10.7'	23°06.4 23°10.4	4.1' 4.0'	54.8' 54.8'
6	268°28.6	N17°08.8	344°00.8	10.7	N23°14.4	3.9'	54.8
7	283°28.6	08.2	358° 30.5	10.6'	23°18.3	3.8'	54.9'
8 9	298°28.7 313°28.7	07.5 •• 06.8	13°00.1 27°29.7	10.6' 10.5'	23°22.0 23°25.7	3.6' 3.5'	54.9'
10	313 28.7 328°28.8	06.2	27 29.7 41°59.2	10.5	23°29.2	3.5 3.4'	54.9' 54.9'
11	343°28.9	05.5	$56^{\circ}28.7$	10.4'	23°32.6	3.3'	54.9'
12	358°28.9	N17°04.8	70°58.1	10.3'	N23°35.9	3.2'	55.0'
13 14	13°29.0 28°29.0	04.1 03.5	85°27.4 99°56.7	10.3' 10.2'	23°39.1 23°42.2	3.1' 3.0'	55.0' 55.0'
15	43°29.1	02.8	$114^{\circ}25.9$	10.2'	23°45.2	2.8'	55.0'
16	58°29.2	02.1	128° 55.1	10.1'	23°48.0	2.7'	55.0'
17 18	73°29.2 88°29.3	01.4 N17°00.8	143°24.3 157°53.3	10.1' 10.0'	23°50.7 N23°53.3	2.6' 2.5'	55.1' 55.1'
19	103°29.3	17°00.1	172°22.4	10.0'	23°55.8	2.4'	55.1'
20	118°29.4	16°59.4	186°51.3	9.9'	23°58.2	2.3'	55.1'
21 22	133°29.5 148°29.5	· · 58.7 58.1	201°20.3 215°49.2	9.9' 9.8'	24°00.5 24°02.6	2.1' 2.0'	55.2' 55.2'
23	163°29.6	57.4	215 49.2 230° 18.0	9.8'	24°04.6	2.0 1.9'	55.2'
	SD = 15.8'	d = -0.7'			0 = 14.9'		
					-		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	55-36%	
02	06:17	06:15	12:06	05:31	17:54		
03	06:12	06:10	12:06	06:17	18:41		
04	06:07	06:04	12:06	07:06	19:32		

August 05, 06, 07 UT (Sun., Mon., Tue.)

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
				107°39.4	S11°32.3		507°12.9	261°31.8			эпа	Dec
0	313°50.1	145°03.5	N06°05.0			113°45.4			N16°37.5	Alpheratz	357°30.6	29°15.3
1	328°52.6	160°03.2	03.8	122°40.5	32.8	128°47.5	13.1	276°34.1	37.5	Ankaa	353°03.4	-42°08.3
2	343°55.0	175°03.0 190°02.7	02.5	137°41.6	33.4	143°49.7	13.2	291°36.4	37.5	Schedar	349°26.3	56°41.9
3 4	358° 57.5	190 02.7 205°02.5	•• 01.3	152°42.6	• • 34.0	158°51.8	• • 13.3	306°38.7 321°41.1	• • 37.6	Diphda	348°43.5	-17°49.2
5	13°59.9 29°02.4	205 02.5 220°02.2	06°00.0 05°58.8	167°43.7 182°44.8	34.5 35.1	173°54.0 188°56.1	13.5 13.6	336°43.4	37.6 37.6	Achernar	$335^{\circ}17.4$	-57°04.8
6	44°04.9	235°02.0	N05°57.5	197°45.9	\$11°35.6	203°58.3	507°13.7	351° 45.7	N16°37.6	Hamal	327°46.9	23°36.1
7	59°07.3	250°01.7	56.3	212°47.0	36.2	219°00.4	13.9	6°48.0	37.7	Polaris	$312^{\circ}01.4$	89°22.9
8	74°09.8	265°01.5	55.1	227°48.1	36.7	234°02.6	14.0	21°50.4	37.7	Acamar	$315^{\circ}09.1$	-40°10.9
9	89°12.3	280°01.2	• • 53.8	242°49.2	37.3	249°04.7	• • 14.1	36°52.7	• • 37.7	Menkar	314°02.3	4°12.4
10	104° 14.7	295°01.0	52.6	257°50.2	37.8	264°06.9	14.3	51°55.0	37.7	Mirfak	308°22.9	49°57.7
11	119° 17.2	310°00.7	51.3	272°51.3	38.4	279°09.0	14.4	66° 57.3	37.8	Aldebaran	290°35.5	16°34.0
12	134° 19.7	325°00.5	N05°50.1	287°52.4	S11°38.9	294°11.2	S07°14.5	81°59.7	N16°37.8	Rigel	281°00.5	-8°10.0
13	149°22.1	340°00.2	48.8	302°53.5	39.5	309°13.3	14.7	97°02.0	37.8	Capella	280°16.7	46°01.4
14	164° 24.6	355°00.0	47.6	317°54.6	40.0	324°15.5	14.8	112°04.3	37.8	Bellatrix	278°19.1	6°22.5
15	179°27.1	9°59.7	• • 46.3	332°55.7	• • 40.6	339°17.6	• • 14.9	127°06.6	• • 37.9	Elnath	277°57.4	28°37.8
16	194° 29.5	24°59.5	45.1	347°56.8	41.1	354°19.8	15.1	142°09.0	37.9	Alnilam	275°34.2	-1°11.0
17	209°32.0	39°59.3	43.8	2°57.8	41.7	9°22.0	15.2	$157^{\circ}11.3$	37.9	Betelgeuse	270°48.3	7°24.7
18	224°34.4	54°59.0	N05°42.6	17°58.9	S11°42.2	24°24.1	S07°15.3	172° 13.6	N16°37.9	Canopus	263°51.2	-52°42.6 -16°45.4
19	239°36.9	69°58.8	41.3	33°00.0	42.8	39°26.2	15.5	$187^{\circ}15.9$	38.0	Sirius Adhara	258°23.3	-16 45.4 -29°00.7
20	254° 39.4	84°58.5	40.1	48°01.1	43.3	54°28.4	15.6	202°18.3	38.0		255°03.3 244°47.3	5°08.8
21	269°41.8	99°58.3	• • 38.8	63°02.2	• • 43.9	69°30.5	• • 15.8	$217^{\circ}20.6$	• • 38.0	Procyon Pollux	244 47.3 243°13.2	27°57.1
22	284°44.3	114°58.0	37.6	78°03.2	44.4	84°32.7	15.9	232°22.9	38.0	Avior	234° 13.8	-59°36.3
23	299°46.8	129°57.8	36.3	93°04.3	45.0	99°34.8	16.0	247°25.2	38.1	Suhail	222°44.0	-43°33.2
Mern	ass. 03:04	ν-0 3' d 1	2′ m-3.94	v1 1' d0	.6′ m0.71	1/2 2/ d0	1′ m-1.87	1/2 3/ 40	.0′ m0.21	Miaplacidus	221°38.2	-43 33.2 -69°50.5
- IVIEL.P	455. 05.04	ν-0.5 u-1	2 111-3.94	ν1.1 do	.0 1110.71	νz.z uo.	1 111-1.07	ν2.5 d0	.0 1110.21	Alphard	217°44.4	-8°47.3
										Regulus	207°30.8	11°49.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.5
0	314°49.2	144°57.5	N05°35.1	108°05.4	S11°45.5	114°37.0	S07°16.2	262°27.6	N16°38.1	Denebola	182°21.4	14°24.4
1	329°51.7	159°57.3	33.8	123°06.5	46.1	129°39.1	16.3	277°29.9	38.1	Gienah	175°39.9	-17°42.5
2	344°54.2	174°57.0	32.6	138°07.6	46.7	144°41.3	16.4	292°32.2	38.1		172°56.1	-63°16.1
3	359° 56.6	189°56.8	• • 31.3	153°08.6	• • 47.2	159°43.4	• • 16.6	307° 34.5	• • 38.2	Gacrux		-57°17.0
4	14°59.1	204°56.5	30.1	168°09.7	47.8	174°45.6	16.7	322°36.9	38.2	Alioth	166°10.2	55°48.1
5	30°01.6	219°56.3	28.8	183°10.8	48.3	189°47.7	16.8	337° 39.2	38.2	Spica	158° 18.5	-11°19.0
6	45°04.0	234°56.1	N05°27.6	198°11.9	S11°48.9	204°49.9	S07°17.0	352°41.5	N16°38.2	Alkaid	152°49.3	49°10.2
7	60°06.5	249°55.8	26.3	213°13.0	49.4	219°52.0	17.1	7°43.8	38.3	Hadar	148°30.6	-60°31.2
8	75°08.9	264°55.6	25.1	228°14.0	50.0	234°54.2	17.2	22°46.2	38.3	Menkent	147°53.2	-36°31.1
9	90°11.4	279°55.3	• • 23.8	243°15.1	• • 50.5	249°56.3	•• 17.4	37°48.5	• • 38.3	Arcturus	145°44.6	19°01.9
10	105° 13.9	294°55.1	22.5	258°16.2	51.1	264°58.5	17.5	52°50.8	38.3	Rigil Kent.	139°35.0	-60°57.7
11	120°16.3	309°54.8	21.3	273°17.3	51.6	280°00.6	17.6	67°53.2	38.4	Kochab	137°20.2	74°02.3
12	135° 18.8	324°54.6	N05°20.0	288°18.3	S11°52.2	295°02.8	S07°17.8	82°55.5	N16°38.4	Zuben'ubi	136°51.9	-16°09.9
13	150°21.3	339°54.4	18.8	303°19.4	52.7	310°04.9	17.9	97°57.8	38.4	Alphecca	126°00.6	26°37.2
14	165°23.7	354°54.1	17.5	318°20.5	53.3	325°07.1	18.1	113°00.1	38.4	Antares	$112^{\circ}11.1$	-26°29.8
15	180°26.2	9°53.9	• • 16.3	333°21.6	• • 53.8	340°09.2	• • 18.2	128°02.5	• • 38.5	Atria	$107^{\circ}01.6$	-69°04.9
16	195°28.7	24°53.6	15.0	348°22.6	54.4	355°11.3	18.3	143°04.8	38.5	Sabik	101°58.3	-15°45.5
17	210°31.1	39°53.4	13.8	3°23.7	54.9	10°13.5	18.5	158° 07.1	38.5	Shaula	96°05.0	-37°07.4
18	225°33.6	54°53.2	N05°12.5	18°24.8	\$11°55.5	25°15.6	S07°18.6	173°09.5	N16°38.5	Rasalhague	95°54.9	12°32.6
19	240°36.0	69°52.9	11.3	33°25.9	56.0	40°17.8	18.7	188°11.8	38.6	Eltanin	90°40.1	51°29.4
20	255° 38.5	84°52.7	10.0	48°26.9 63°28.0	56.6	55°19.9	18.9	203°14.1 218°16.4	38.6 •• 38.6	Kaus Aust.	83°27.3	-34°22.1
21 22	270°41.0 285°43.4	99°52.4 114°52.2	· · 08.7 07.5	78°29.1	· · 57.1 57.7	70°22.1 85°24.2	· · 19.0 19.2	233° 18.8	38.6	Vega	80°30.3	38°49.0
23	300°45.9	114 52.2 129°52.0	06.2	93°30.2	58.2	100°26.4	19.2	248°21.1	38.7	Nunki	75°42.9	-26°15.4
	300 45.9									Altair	61°56.0	8°57.1
Mer.p	ass. 03:00	ν -0.2' d-1	3′ m-3.94	$\nu 1.1' d0$.6′ m0.72	$\nu 2.1' \ d0.$	1' m-1.86	$\nu 2.3' \ d0$.0' m 0.21	Peacock	52°59.4	-56°38.1
										Deneb	49°22.7	45°23.4
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.8	10°00.9
0	315°48.4	144°51.7	N05°05.0	108°31.2	S11°58.8	115°28.5	507°19.4	263°23.4	N16°38.7	Al Na'ir	27°28.0	-46°48.7
1	330°50.8	159°51.5	03.7	100° 31.2 123° 32.3	59.3	130°30.6	19.4	278° 25.8	38.7	Fomalhaut	15°10.2	-29°27.6
2	345° 53.3	174°51.2	02.5	138°33.4	11°59.9	145°32.8	19.7	293°28.1	38.7	Scheat	13°41.2	28°14.7
3	0°55.8	189°51.0	05°01.2	153°34.4	12°00.4	160°34.9	. 19.8	308°30.4	38.7	Markab	13°25.9	15°22.1
4	15°58.2	204°50.8	04°59.9	168°35.5	01.0	175°37.1	20.0	323°32.8	38.8	Aug 05 Sun	SHA	Mer.pass
5	31°00.7	219°50.5	58.7	183°36.6	01.6	190°39.2	20.1	338°35.1	38.8		191°13.4	14:20
6	46°03.2	234°50.3	N04°57.4	198°37.7		205°41.4	S07°20.2		N16°38.8		153°49.3	16:48
7	61°05.6	249°50.1	56.2	213°38.7	02.7	220°43.5	20.4	8°39.7	38.8		159°55.3	16:23
8	76°08.1	264°49.8	54.9	228°39.8	03.2	235°45.6	20.5	23°42.1	38.9	Saturn		06:33
9	91°10.5	279°49.6	• • 53.7	243°40.9	• • 03.8	250°47.8	• • 20.7	38°44.4	• • 38.9	A 0C 11	C114	N4-
10	$106^{\circ}13.0$	294°49.4	52.4	258°41.9	04.3	265°49.9	20.8	53°46.7	38.9	Aug 06 Mon	SHA	Mer.pass
11	121° 15.5	309°49.1	51.1	273°43.0	04.9	280°52.1	20.9	$68^{\circ}49.1$	38.9		190°08.3	14:20
12	$136^{\circ}17.9$	324°48.9	N04°49.9	288°44.1	S12°05.4	295°54.2	S07°21.1	83°51.4	N16°39.0		153°16.2	16:46 16:19
13	151°20.4	339°48.6	48.6	303°45.1	06.0	310°56.4	21.2	98°53.7	39.0	Saturn	159°47.8 307°38.3	06:29
14	$166^{\circ}22.9$	354°48.4	47.4	318°46.2	06.5	325°58.5	21.3	$113^{\circ}56.1$	39.0	Saturn	JU1 JO.J	00:29
15	181°25.3	9°48.2	• • 46.1	333°47.3	• • 07.1	341°00.6	• • 21.5	128° 58.4	• • 39.0	Aug 07 Tue	SHA	Mer.pass
16	$196^{\circ}27.8$	24°47.9	44.8	348°48.3	07.6	356°02.8	21.6	$144^{\circ}00.7$	39.0		189°03.4	14:21
17	211°30.3	39°47.7	43.6	3°49.4	08.2	11°04.9	21.8	159°03.1	39.1		152°42.9	16:45
18	226°32.7	54°47.5	N04°42.3	18°50.5	S12°08.7	26°07.1	S07°21.9	174°05.4		Jupiter	$159^{\circ}40.1$	16:16
19	241°35.2	69°47.2	41.1	33°51.5	09.3	41°09.2	22.0	189°07.7	39.1	Saturn	307°35.1	06:25
20	256° 37.7	84°47.0	39.8	48°52.6	09.8	56°11.3	22.2	204° 10.1	39.1	U! ·	al navall-	
21	271°40.1	99°46.8	• • 38.5	63°53.7	• • 10.4	71°13.5	• • 22.3	219°12.4	• • 39.2	Horizont	al parallax	0.1
22	286° 42.6	114°46.5	37.3	78°54.7	10.9	86°15.6	22.5	234° 14.7	39.2		Venus: Mars:	0.1
23	301°45.0	129°46.3	36.0	93°55.8	11.5	101°17.8	22.6	249° 17.1	39.2		iviars:	0.1
Mer.p	ass. 02:56	ν -0.2' d-1	3′ m-3.94	ν 1.1′ d0	.6′ m0.73	$\nu 2.1' \ d0.$	1′ m-1.86	ν 2.3′ d0	.0′ m0.21			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.7	N16°56.7	244°46.8	9.7'	$N24^{\circ}06.5$	1.8'	55.2'
1	193°29.7	56.0	259°15.5	9.7'	24°08.3	1.7'	55.3'
2 3	208°29.8 223°29.8	55.4 •• 54.7	273°44.2 288°12.8	9.6' 9.6'	24°09.9 24°11.5	1.5' 1.4'	55.3' 55.3'
4	238°29.9	54.0	302°41.4	9.6'	24°12.9	1.3'	55.3'
5	253°30.0	53.3	$317^{\circ}10.0$	9.5'	$24^{\circ}14.2$	1.2'	55.4'
6	268°30.0	N16°52.6	331°38.5	9.5'	N24°15.3 24°16.3	1.0'	55.4'
7 8	283°30.1 298°30.2	52.0 51.3	346°07.0 0°35.4	9.4' 9.4'	24° 16.3 24° 17.3	0.9' 0.8'	55.4' 55.4'
9	313°30.2	50.6	15°03.8	9.3'	24° 18.0	0.7'	55.5'
10	328°30.3	49.9	29°32.1	9.3'	24° 18.7	0.5'	55.5'
11 12	343°30.4 358°30.4	49.2 N16°48.6	44°00.4 58°28.7	9.3' 9.2'	24°19.2 N24°19.6	0.4' 0.3'	55.5' 55.5'
13	13°30.5	47.9	72°56.9	9.2' 9.2'	24° 19.0	0.3	55.6'
14	28°30.6	47.2	87°25.1	9.2'	24°20.1	0.0'	55.6'
15	43°30.6	• • 46.5	101°53.2	9.1'	24°20.1	-0.1'	55.6'
16 17	58°30.7 73°30.8	45.8 45.1	116°21.3 130°49.4	9.1' 9.0'	24°20.0 24°19.7	-0.2' -0.4'	55.6' 55.7'
18	88°30.8	N16° 44.4	145° 17.5	9.0'	N24° 19.4	-0.5	55.7'
19	103°30.9	43.8	159°45.5	9.0'	$24^{\circ}18.9$	-0.6'	55.7'
20	118°31.0	43.1	174°13.5	9.0'	24° 18.2	-0.8'	55.7'
21 22	133°31.0 148°31.1	· · 42.4 41.7	188°41.4 203°09.3	8.9' 8.9'	24°17.5 24°16.6	-0.9' -1.0'	55.8' 55.8'
23	163°31.2	41.0	203 09.3 217°37.2	8.9'	24° 15.6	-1.2	55.8'
	SD = 15.8'	d = -0.7'			D = 15.1'		
		0.1					
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°31.2 193°31.3	N16° 40.3 39.6	232°05.1 246°32.9	8.8' 8.8'	N24°14.4 24°13.1	-1.3' -1.4'	55.9' 55.9'
2	208°31.4	38.9	261°00.7	8.8	24°11.7	-1.5'	55.9'
3	223°31.5	• • 38.3	275°28.5	8.8'	$24^{\circ}10.2$	-1.7'	55.9'
4	238°31.5	37.6	289°56.3	8.7'	24°08.5	-1.8'	56.0'
5 6	253°31.6 268°31.7	36.9 N16°36.2	304°24.0 318°51.7	8.7' 8.7'	24°06.7 N24°04.7	-1.9' -2.1'	56.0' 56.0'
7	283°31.7	35.5	333°19.4	8.7'	24°02.7	-2.2'	56.1
8	298°31.8	34.8	$347^{\circ}47.1$	8.7'	24°00.5	-2.3'	56.1'
9	313°31.9	• • 34.1	2°14.8	8.6'	23°58.1	-2.5'	56.1'
10 11	328°31.9 343°32.0	33.4 32.7	16°42.4 31°10.0	8.6' 8.6'	23°55.6 23°53.0	-2.6' -2.7'	56.2' 56.2'
12	358°32.1	N16°32.0	45°37.7	8.6'	N23°50.3	-2.9'	56.2'
13	13°32.2	31.3	60°05.2	8.6'	23°47.4	-3.0'	56.2'
14	28°32.2 43°32.3	30.6 •• 29.9	74°32.8 89°00.4	8.6' 8.6'	23°44.4 23°41.3	-3.1' -3.3'	56.3' 56.3'
15 16	45 32.3 58°32.4	29.9	103°27.9	8.5'	23°38.0	-3.3 -3.4'	56.3'
17	73°32.5	28.5	117°55.5	8.5'	23°34.6	-3.5'	56.4'
18	88°32.5	N16°27.8	132°23.0	8.5'	N23°31.0	-3.7'	56.4'
19 20	103°32.6 118°32.7	27.1 26.4	146°50.6 161°18.1	8.5' 8.5'	23°27.3 23°23.5	-3.8' -3.9'	56.4' 56.5'
21	133°32.8	. 25.8	175°45.6	8.5	23° 19.6	-3.9 -4.1'	56.5
22	148°32.8	25.1	$190^{\circ}13.1$	8.5'	$23^{\circ}15.5$	-4.2'	56.5'
23	163°32.9	24.4	204°40.6	8.5'	23°11.3	-4.3'	56.5'
	SD = 15.8'	d = -0.7'		SI	D = 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.0	N16°23.7	219°08.1	8.5'	N23°06.9	-4.5'	56.6'
1	193°33.1	23.0	233°35.6	8.5'	23°02.4	-4.6'	56.6'
2	208°33.1 223°33.2	22.3 · · 21.6	248°03.1 262°30.6	8.5' 8.5'	22°57.8 22°53.1	-4.7' -4.9'	56.6' 56.7'
3 4	223°33.2 238°33.3	20.8	262°30.6 276°58.1	8.5'	22° 48.2	-4.9 -5.0'	56.7'
5	253°33.4	20.1	291°25.5	8.5'	22°43.2	-5.1'	56.7'
6	268°33.4	N16° 19.4	305°53.0	8.5'	N22°38.0	-5.3'	56.8'
7 8	283°33.5 298°33.6	18.7 18.0	320°20.5 334°48.0	8.5' 8.5'	22°32.8 22°27.4	-5.4' -5.5'	56.8' 56.8'
9	313°33.7	17.3	349°15.5	8.5'	22°21.8	-5.5' -5.7'	56.9'
10	328°33.7	16.6	3°43.1	8.5'	22°16.1	-5.8'	56.9'
11	343°33.8 358°33.9	15.9 N16° 15.2	18°10.6 32°38.1	8.5'	22°10.3 N22°04.4	-5.9'	56.9'
12 13	358 33.9 13°34.0	14.5	32°38.1 47°05.6	8.5' 8.5'	N22°04.4 21°58.3	-6.1' -6.2'	57.0' 57.0'
14	28°34.1	13.8	61°33.2	8.6'	$21^{\circ}52.1$	-6.3	57.0'
15	43°34.1	· · 13.1	76°00.7	8.6'	21°45.8	-6.5'	57.0'
16 17	58°34.2 73°34.3	12.4 11.7	90°28.3 104°55.9	8.6' 8.6'	21°39.3 21°32.8	-6.6' -6.7'	57.1' 57.1'
18	73 34.3 88°34.4	N16° 11.0	104 55.9 119°23.5	8.6'	N21°26.1	-6.8'	57.1'
19	103°34.5	10.3	$133^{\circ}51.1$	8.6'	$21^{\circ}19.2$	-7.0'	57.2'
20	118°34.5	09.6	148°18.7	8.6'	21°12.2	-7.1'	57.2'
21 22	133°34.6 148°34.7	· · 08.9 08.1	162°46.3 177°13.9	8.6' 8.7'	21°05.1 20°57.9	-7.2' -7.3'	57.2' 57.3'
23	163°34.8	07.4	177 13.9 191°41.6	8.7'	20°50.6	-7.5'	57.3'
	SD = 15.8'	d = -0.7'		SI	D = 15.4'		
					20		

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

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

			Sun		Moon			
	Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
İ	,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-11%	
	05	06:01	05:58	12:06	07:58	20:24		
İ	06	05:55	05:52	12:06	08:51	21:18		
ı	07	05:48	05:44	12:06	09:45	22:11		

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

Ved 0 1 2 3 4 5 6 7 8 9 110 111 12 13 14 15 16 117 18 119 220 21	GHA 316° 47.5 331° 50.0 346° 52.4 1° 54.9 16° 57.4 31° 59.8 47° 02.3 62° 04.8 77° 07.2 92° 09.7 107° 12.2 122° 14.6 137° 17.1 152° 19.5 167° 22.0 182° 24.5	GHA 144° 46.1 159° 45.8 174° 45.6 189° 45.4 204° 45.2 219° 44.9 234° 44.7 249° 44.5 260° 44.9 294° 43.8 309° 43.5	Dec N04° 34.8 33.5 32.2 31.0 29.7 28.4 N04° 27.2 25.9 24.6	GHA 108° 56.8 123° 57.9 138° 59.0 154° 00.0 169° 01.1 184° 02.1 199° 03.2 214° 04.3	Dec \$12°12.0 12.6 13.1 ·· 13.7 14.2 14.8	GHA 116° 19.9 131° 22.0 146° 24.2 161° 26.3 176° 28.5	Dec \$07° 22.7 22.9 23.0 ⋅⋅ 23.1	GHA 264°19.4 279°21.7 294°24.1 309°26.4	Dec N16°39.2 39.3 39.3 ⋅⋅⋅39.3	Alpheratz Ankaa Schedar	SHA 357°30.6 353°03.3 349°26.3	Dec 29°15.3 -42°08.3 56°41.9
1 2 3 3 4 5 5 6 6 7 7 8 8 9 9 110 111 112 113 114 115 116 117 118 119 220 221	331°50.0 346°52.4 1°54.9 16°57.4 31°59.8 47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	159° 45.8 174° 45.6 189° 45.4 204° 45.2 219° 44.9 234° 44.7 249° 44.5 264° 44.2 279° 44.0 294° 43.8	33.5 32.2 ·· 31.0 29.7 28.4 N04°27.2 25.9 24.6	123°57.9 138°59.0 154°00.0 169°01.1 184°02.1 199°03.2 214°04.3	12.6 13.1 · · 13.7 14.2 14.8	131°22.0 146°24.2 161°26.3	22.9 23.0	279°21.7 294°24.1 309°26.4	39.3 39.3	Ankaa	353°03.3	-42°08.3
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	346°52.4 1°54.9 16°57.4 31°59.8 47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	174° 45.6 189° 45.4 204° 45.2 219° 44.9 234° 44.7 249° 44.5 264° 44.2 279° 44.0 294° 43.8	32.2 · · 31.0 29.7 28.4 N04°27.2 25.9 24.6	138°59.0 154°00.0 169°01.1 184°02.1 199°03.2 214°04.3	13.1 · · 13.7 14.2 14.8	146°24.2 161°26.3	22.9 23.0	294°24.1 309°26.4	39.3	Ankaa	353°03.3	-42°08.3
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	1°54.9 16°57.4 31°59.8 47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	189° 45.4 204° 45.2 219° 44.9 234° 44.7 249° 44.5 264° 44.2 279° 44.0 294° 43.8	31.0 29.7 28.4 N04°27.2 25.9 24.6	154°00.0 169°01.1 184°02.1 199°03.2 214°04.3	· · 13.7 14.2 14.8	$161^{\circ}26.3$		$309^{\circ}26.4$				
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	1°54.9 16°57.4 31°59.8 47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	189° 45.4 204° 45.2 219° 44.9 234° 44.7 249° 44.5 264° 44.2 279° 44.0 294° 43.8	31.0 29.7 28.4 N04°27.2 25.9 24.6	154°00.0 169°01.1 184°02.1 199°03.2 214°04.3	· · 13.7 14.2 14.8	$161^{\circ}26.3$		$309^{\circ}26.4$		Schedar	349°26.3	56°41.9
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	16° 57.4 31° 59.8 47° 02.3 62° 04.8 77° 07.2 92° 09.7 107° 12.2 122° 14.6 137° 17.1 152° 19.5 167° 22.0	204° 45.2 219° 44.9 234° 44.7 249° 44.5 264° 44.2 279° 44.0 294° 43.8	29.7 28.4 N04°27.2 25.9 24.6	169° 01.1 184° 02.1 199° 03.2 214° 04.3	14.2 14.8				.39.3			
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	31°59.8 47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	219°44.9 234°44.7 249°44.5 264°44.2 279°44.0 294°43.8	28.4 N04°27.2 25.9 24.6	184°02.1 199°03.2 214°04.3	14.8	110 20.0	23.3	324°28.7	39.3	Diphda	348°43.4	-17°49.2
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	47°02.3 62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	234°44.7 249°44.5 264°44.2 279°44.0 294°43.8	N04°27.2 25.9 24.6	199°03.2 214°04.3		191°30.6	23.4	339°31.1	39.3	Achernar	335°17.4	-57°04.8
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	62°04.8 77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	249°44.5 264°44.2 279°44.0 294°43.8	25.9 24.6	214°04.3	> 1 / 16 3	206°32.7	S07°23.6	354°33.4	N16°39.4	Hamal	327°46.9	23°36.1
8 9 10 11 12 13 14 15 16 17 18 19 20 21	77°07.2 92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	264°44.2 279°44.0 294°43.8	24.6		\$12°15.3			9°35.7		Polaris	311°59.7	89°22.9
9 10 11 12 13 14 15 16 17 18 19 20 21	92°09.7 107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	279°44.0 294°43.8			15.9	221°34.9	23.7		39.4	Acamar	315°09.0	-40°10.9
10 11 12 13 14 15 16 17 18 19 20 21	107°12.2 122°14.6 137°17.1 152°19.5 167°22.0	294°43.8		229°05.3	16.4	236° 37.0	23.8	24°38.1	39.4	Menkar	314°02.3	4°12.4
11 12 13 14 15 16 17 18 19 20 21	122°14.6 137°17.1 152°19.5 167°22.0		• • 23.4	244°06.4	• • 17.0	251°39.1	• • 24.0	39°40.4	• • 39.4	Mirfak		49°57.7
12 13 14 15 16 17 18 19 20 21	137° 17.1 152° 19.5 167° 22.0	309°43.5	22.1	259°07.4	17.5	266°41.3	24.1	54°42.8	39.5	Aldebaran	290°35.5	16°34.0
13 14 15 16 17 18 19 20 21	152°19.5 167°22.0		20.9	274°08.5	18.1	281°43.4	24.3	69°45.1	39.5	1	290° 33.3 281° 00.5	-8°10.0
14 15 16 17 18 19 20	167°22.0	324°43.3	N04°19.6	289°09.6	S12°18.6	296°45.6	S07°24.4	84°47.4	N16°39.5	Rigel		
14 15 16 17 18 19 20	167°22.0	339°43.1	18.3	304°10.6	19.2	311°47.7	24.5	99°49.8	39.5	Capella	280°16.6	46°01.4
15 16 17 18 19 20 21		354°42.9	17.1	319°11.7	19.7	326°49.8	24.7	114°52.1	39.5	Bellatrix	278°19.1	6°22.5
16 17 18 19 20 21		9°42.6	• • 15.8	334° 12.7	20.3	341°52.0	• • 24.8	129°54.4	• • 39.6	Elnath	277°57.4	28°37.8
17 18 19 20 21	197°26.9	24°42.4	14.5	349°13.8	20.8	356° 54.1	25.0	144°56.8	39.6	Alnilam	275°34.2	$-1^{\circ}11.0$
18 19 20 21	212°29.4	39°42.2	13.3	4°14.9	21.4	11°56.2	25.1	159°59.1		Betelgeuse	270°48.3	7°24.7
19 20 21									39.6	Canopus	263°51.2	-52°42.6
20 21	227°31.9	54°41.9	N04°12.0	19° 15.9	S12°21.9	26°58.4	S07°25.2	175°01.4	N16°39.6	Sirius	258°23.2	-16°45.4
21	242°34.3	69°41.7	10.7	34° 17.0	22.5	42°00.5	25.4	190°03.8	39.7	Adhara	255°03.3	-29°00.7
	257°36.8	84°41.5	09.5	49°18.0	23.0	57°02.6	25.5	205°06.1	39.7	Procyon	244° 47.3	5°08.9
22	272°39.3	99°41.3	• • 08.2	64°19.1	• • 23.6	72°04.8	• • 25.7	220°08.5	• • 39.7	Pollux		27°57.1
22	287°41.7	114°41.0	06.9	79°20.1	24.1	87°06.9	25.8	235°10.8	39.7			
23	302°44.2	129°40.8	05.7	94°21.2	24.7	102°09.0	25.9	250°13.1	39.7	Avior	234°13.7	-59°36.3
										Suhail	222°43.9	-43°33.2
∕ler.pa	ass. 02:52	ν -0.2' d-1	3′ m-3.94	$\nu 1.1' \ d0.$.6′ m0.73	$\nu 2.1' \ d0.$	1' m-1.85	ν 2.3 $^{\prime}$ d0	.0′ m0.20	Miaplacidus	221°38.2	-69°50.4
										Alphard	217°44.4	-8°47.3
	6114		-				-	a	-	Regulus	207°30.8	11°49.3
Γhu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.5
0	317°46.7	144°40.6	N04°04.4	109°22.2	S12°25.2	$117^{\circ}11.2$	S07°26.1	265°15.5	N16°39.8	Denebola	182°21.4	14°24.4
1	332°49.1	159°40.4	03.1	124°23.3	25.8	132° 13.3	26.2	280°17.8	39.8	Gienah	175°39.9	-17°42.5
2	347°51.6	174°40.1	01.9	139°24.3	26.3	147° 15.5	26.4	295°20.1	39.8		172°56.1	-63°16.1
3	2°54.0	189°39.9	04°00.6	154° 25.4	• • 26.9	$162^{\circ}17.6$	• • 26.5	310°22.5	• • 39.8			
4	17°56.5	204°39.7	03°59.3	169° 26.4	27.4	$177^{\circ}19.7$	26.6	325°24.8	39.9	!	171°47.6	-57°17.0
5	32°59.0	219°39.5	58.1	184°27.5	28.0	192°21.9	26.8	340°27.2	39.9	Alioth	166°10.2	55°48.1
6	48°01.4	234°39.2	N03°56.8	199°28.6	\$12°28.5	207°24.0	S07°26.9	355°29.5	N16°39.9	Spica	158° 18.5	-11°19.0
						222°26.1				Alkaid	152°49.4	49°10.2
7	63°03.9	249°39.0	55.5	214°29.6	29.1		27.1	10°31.8	39.9	Hadar	148°30.7	-60°31.2
8	78°06.4	264°38.8	54.3	229°30.7	29.6	237°28.3	27.2	25°34.2	39.9	Menkent	147°53.2	-36°31.1
9	93°08.8	279°38.6	• • 53.0	244°31.7	• • 30.2	252°30.4	• • 27.3	40°36.5	• • 40.0	Arcturus	145°44.6	19°01.9
10	108°11.3	294°38.3	51.7	259° 32.8	30.7	267°32.5	27.5	55°38.9	40.0	Rigil Kent.	139°35.1	-60°57.7
11	123°13.8	309°38.1	50.5	274°33.8	31.3	282°34.7	27.6	70°41.2	40.0	Kochab	137°20.3	74°02.3
12	138°16.2	324°37.9	N03°49.2	289°34.9	S12°31.8	297°36.8	S07°27.8	85°43.5	N16°40.0	Zuben'ubi		-16°09.9
13	153°18.7	339°37.7	47.9	304°35.9	32.4	312°38.9	27.9	100°45.9	40.0			
14	168°21.1	354°37.4	46.7	319°37.0	32.9	327°41.1	28.0	115°48.2	40.1	Alphecca	126°00.6	26°37.2
15	183°23.6	9°37.2	• • 45.4	334°38.0	• • 33.5	342°43.2	28.2	130°50.6	• • 40.1	Antares		-26°29.8
16	198°26.1	24°37.0	44.1	349°39.0	34.0	357°45.3	28.3	145°52.9	40.1	Atria	$107^{\circ}01.6$	-69°04.9
17	213°28.5	39°36.8	42.8	4°40.1	34.6	12°47.4	28.5	160°55.2	40.1	Sabik		-15°45.5
										Shaula	$96^{\circ}05.1$	-37°07.4
18	228°31.0	54°36.6	N03°41.6	19°41.1	\$12°35.1	27°49.6	S07°28.6	175°57.6	N16°40.1	Rasalhague	95°54.9	12°32.6
19	243°33.5	69°36.3	40.3	34° 42.2	35.7	42°51.7	28.8	190°59.9	40.2	Eltanin	90°40.1	51°29.4
20	258°35.9	84°36.1	39.0	49°43.2	36.2	57°53.8	28.9	206°02.3	40.2	Kaus Aust.	83°27.3	-34°22.1
21	273°38.4	99°35.9	• • 37.8	64°44.3	• • 36.8	72°56.0	• • 29.0	221°04.6	• • 40.2	Vega	80°30.4	38°49.0
22	288°40.9	114°35.7	36.5	79°45.3	37.3	87°58.1	29.2	236°06.9	40.2	Nunki	75°42.9	-26°15.4
23	303°43.3	129°35.5	35.2	94°46.4	37.9	103°00.2	29.3	251°09.3	40.2	Altair	61°56.0	8°57.1
	00.40	0.0/ 1.1	2/ 2.05	1.1/ 10	<i>cl</i> 0.74	0.1/ 10	1/ 1.05	2 2/ 10	0/ 0.00	1		
/ler.pa	ass. 02:48	ν -0.2′ d-1	3′ m-3.95	ν 1.1′ d 0.	.6′ m0.74	ν 2.1′ d0.	1' m-1.85	ν 2.3′ d0	.0′ m0.20	Peacock	52°59.4	-56°38.2
										Deneb	49°22.7	45°23.4
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.8	10°00.9
	318°45.8	144°35.2	N03°33.9	109° 47.4	\$12°38.4	118°02.4	S07° 29.5		N16° 40.3	Al Na'ir	27°27.9	-46°48.7
0						118 02.4 133°04.5				Fomalhaut	15° 10.2	-29°27.6
1	333°48.3	159°35.0	32.7	124°48.5	39.0		29.6	281°14.0	40.3	Scheat	13°41.2	28°14.8
2	348°50.7	174°34.8	31.4	139°49.5	39.5	148°06.6	29.7	296°16.3	40.3	Markab	13°25.9	$15^{\circ}22.1$
3	3°53.2	189°34.6	• • 30.1	154°50.6	• • 40.1	163°08.8	• • 29.9	311°18.7	• • 40.3			
4	18°55.6	204°34.4	28.9	169°51.6	40.6	178° 10.9	30.0	326°21.0	40.4	Aug 08 Wed	SHA	Mer.pass
5	33°58.1	219°34.1	27.6	184°52.6	41.2	193°13.0	30.2	341°23.3	40.4	Venus		14:21
6	49°00.6	234°33.9	N03°26.3	199°53.7	S 12°41.7	208° 15.1	507°30.3	356°25.7	N16°40.4	Mars	152°09.3	16:43
7	64°03.0	249°33.7	25.0	214°54.7	42.3	223°17.3	30.5	11°28.0	40.4	Jupiter	159°32.4	16:12
8	79°05.5	264°33.5	23.8	229°55.8	42.8	238° 19.4	30.6	26°30.4	40.4	Saturn	307°31.9	06:22
9	94°08.0	279°33.3	22.5	244° 56.8	• • 43.4	253°21.5	• • 30.7	41°32.7	• • 40.5			
10	109°10.4	294°33.0	21.2	259°57.8	43.9	268°23.7	30.9	56°35.1	40.5	Aug 09 Thu	SHA	Mer.pass
11	109 10.4 124°12.9	309°32.8	20.0	274° 58.9	44.5	283°25.8	31.0	71°37.4	40.5	Venus	$186^{\circ}53.9$	14:22
										Mars	151°35.6	16:41
12	139°15.4	324°32.6	N03°18.7	289°59.9	\$12°45.0	298°27.9	S07°31.2	86°39.8	N16° 40.5	Jupiter		16:09
13	154°17.8	339°32.4	17.4	305°01.0	45.6	313°30.0	31.3	101°42.1	40.5	Saturn	307°28.8	06:18
14	169°20.3	354°32.2	16.1	320°02.0	46.1	328° 32.2	31.5	116°44.4	40.6			
15	184°22.8	9°32.0	• • 14.9	335°03.1	• • 46.7	343°34.3	• • 31.6	131°46.8	• • 40.6	Aug 10 Fri	SHA	Mer.pass
16	199°25.2	24°31.7	13.6	350°04.1	47.2	358°36.4	31.7	$146^{\circ}49.1$	40.6		185°49.4	14:22
17	214°27.7	39°31.5	12.3	5°05.1	47.8	13°38.5	31.9	161°51.5	40.6		151°01.6	16:40
18	229°30.1	54°31.3	N03°11.0	20°06.2	S12°48.3	28° 40.7	S07°32.0	176°53.8	N16°40.6		159° 16.6	16:06
19	244°32.6	69°31.1	09.8	35°07.2	48.9	43° 42.8	32.2	191°56.2	40.7	Saturn	307°25.8	06:14
20	259°35.1	84°30.9	09.5	50°08.2	49.4	58° 44.9	32.3	206°58.5	40.7	Saturn		U0:14
										Horizont	tal parallax	
21	274°37.5	99°30.7	• • 07.2	65°09.3	• • 50.0	73°47.1	• • 32.5	222°00.9	• • 40.7	1.01120111	-	0.1
22	289°40.0	114°30.4	05.9	80°10.3	50.5	88°49.2	32.6	237°03.2	40.7		Venus:	0.1
23	304°42.5	129°30.2	04.7	95°11.4	51.1	103°51.3	32.7	252°05.5	40.7		Mars:	0.1
	ass. 02:44	1/_∩ 2/ d 1	3′ m-3.95	$\nu 1.0' \ d0.$	E/ m0 7F	,,2 1/ JA	1′ m-1.84	1/2 3/ 40	.0′ m0.19			

h	Sun				Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.9	$N16^{\circ}06.7$	206°09.3	8.7'	N20°43.1	-7.6'	57.3'
1 2	193°34.9 208°35.0	06.0 05.3	220°37.0 235°04.7	8.7' 8.7'	20°35.5 20°27.8	-7.7' -7.8'	57.4' 57.4'
3	206 35.0 223°35.1	04.6	249°32.4	8.7'	20° 27.8	-7.8 -8.0'	57.4'
4	238°35.2	03.9	264°00.2	8.8'	20°12.0	-8.1'	57.5'
5	253°35.3	03.2	278°27.9	8.8'	20°03.9	-8.2'	57.5'
6 7	268° 35.4 283° 35.4	N16°02.4 01.7	292°55.7 307°23.5	8.8' 8.8'	N19°55.7 19°47.3	-8.3' -8.5'	57.5' 57.6'
8	298° 35.5	01.7	301° 23.3 321° 51.4	8.9'	19° 47.3	-8.6'	57.6'
9	313°35.6	$16^{\circ}00.3$	$336^{\circ}19.2$	8.9'	19°30.3	-8.7'	57.6'
10	328°35.7 343°35.8	15°59.6	350°47.1 5°15.0	8.9'	19°21.6 19°12.8	-8.8'	57.6'
11 12	343 35.8 358°35.9	58.9 N15°58.2	5 15.0 19°42.9	8.9' 8.9'	19 12.8 N19°03.9	-8.9' -9.0'	57.7' 57.7'
13	13°35.9	57.4	34°10.8	9.0'	18°54.8	-9.2'	57.7'
14	28°36.0	56.7	48°38.8	9.0'	18°45.6	-9.3	57.8'
15 16	43°36.1 58°36.2	· · 56.0 55.3	63°06.8 77°34.8	9.0' 9.0'	18° 36.4 18° 27.0	-9.4' -9.5'	57.8' 57.8'
17	73°36.3	54.6	92°02.9	9.1'	18° 17.5	-9.6'	57.9'
18	88°36.4	$N15^{\circ}53.9$	106°31.0	9.1'	N18°07.9	-9.7'	57.9'
19 20	103°36.4 118°36.5	53.1	120°59.0 135°27.2	9.1' 9.2'	17°58.1 17°48.3	-9.8' -10.0'	57.9'
21	133°36.6	52.4 •• 51.7	135 27.2 149°55.3	9.2' 9.2'	17 48.3 17°38.3	-10.0	57.9' 58.0'
22	148°36.7	51.0	164°23.5	9.2'	17°28.3	-10.2	58.0'
23	163°36.8	50.3	178°51.7	9.2'	17° 18.1	-10.3'	58.0'
	SD = 15.8'	d = -0.7'		SI	O = 15.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	178°36.9	N15°49.5	193°19.9	9.3'	N17°07.8	-10.4'	58.1'
1	193°37.0	48.8	207°48.2	9.3'	16°57.4	-10.5'	58.1'
2	208°37.1 223°37.1	48.1 •• 47.4	222°16.5 236°44.8	9.3' 9.3'	16° 46.9 16° 36.4	-10.6' -10.7'	58.1' 58.2'
3 4	238° 37.2	46.6	250 44.6 251°13.1	9.3 9.4'	16° 25.7	-10.7	58.2'
5	253° 37.3	45.9	265°41.5	9.4'	16° 14.9	-10.9'	58.2'
6	268°37.4	N15°45.2	280°09.9	9.4'	N16°04.0	-11.0'	58.2'
7 8	283°37.5 298°37.6	44.5 43.7	294°38.3 309°06.8	9.5' 9.5'	15°53.0 15°41.9	-11.1' -11.2'	58.3' 58.3'
9	313° 37.7	• • 43.0	323°35.3	9.5'	15°30.7	-11.3'	58.3
10	328° 37.8	42.3	338°03.8	9.5'	$15^{\circ}19.4$	-11.4'	58.4'
11	343°37.9 358°37.9	41.6 N15°40.8	352°32.3 7°00.9	9.6'	15°08.0 N14°56.5	-11.5'	58.4'
12 13	358° 37.9 13° 38.0	N15 40.8 40.1	7°00.9 21°29.5	9.6' 9.6'	14° 44.9	-11.6' -11.7'	58.4' 58.4'
14	28°38.1	39.4	35°58.1	9.7'	14°33.2	-11.8'	58.5'
15	43°38.2	• • 38.7	50°26.8	9.7'	14°21.5	-11.9'	58.5'
16 17	58° 38.3 73° 38.4	37.9 37.2	64°55.4 79°24.1	9.7' 9.7'	14°09.6 13°57.7	-11.9' -12.0'	58.5' 58.5'
18	88° 38.5	N15°36.5	93°52.9	9.8'	N13°45.6	-12.1'	58.6'
19	103°38.6	35.7	108°21.6	9.8'	13°33.5	-12.2'	58.6'
20 21	118° 38.7 133° 38.8	35.0 •• 34.3	122°50.4 137°19.3	9.8' 9.8'	13°21.3 13°09.0	-12.3' -12.4'	58.6' 58.6'
22	148° 38.9	33.6	151° 48.1	9.6 9.9'	13 09.0 12°56.6	-12.4	58.7'
23	163°39.0	32.8	166°17.0	9.9'	12°44.2	-12.5'	58.7'
	SD = 15.8'	d = -0.7'		SI	O = 15.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.1	$N15^{\circ}32.1$	180°45.9	9.9'	N12°31.6	-12.6'	58.7'
1 2	193°39.1 208°39.2	31.4 30.6	195°14.8 209°43.7	9.9' 10.0'	12°19.0 12°06.3	-12.7' -12.8'	58.7' 58.8'
3	208 39.2 223°39.3	29.9	209 43.7 224°12.7	10.0'	12 06.3 11°53.6	-12.8'	58.8'
4	238°39.4	29.2	238°41.7	10.0'	11°40.7	-12.9'	58.8'
5	253°39.5	28.4	253°10.7	10.0'	11°27.8	-13.0'	58.8'
6 7	268°39.6 283°39.7	N15°27.7 27.0	267°39.8 282°08.8	10.1' 10.1'	N11°14.8 11°01.7	-13.1' -13.1'	58.9' 58.9'
8	298°39.8	26.2	296°37.9	10.1'	10°48.6	-13.2'	58.9'
9	313°39.9	• • 25.5	311°07.1	10.1'	10°35.4	-13.3'	58.9'
10 11	328° 40.0 343° 40.1	24.7 24.0	325°36.2 340°05.4	10.2' 10.2'	10°22.1 10°08.8	-13.3' -13.4'	59.0' 59.0'
12	358°40.2	N15°23.3	354° 34.6	10.2	N09°55.3	-13.4	59.0'
13	13°40.3	22.5	9°03.8	10.2'	09°41.9	-13.5'	59.0'
14 15	28° 40.4 43° 40.5	21.8 •• 21.1	23°33.0 38°02.2	10.2' 10.3'	09°28.3 09°14.7	-13.6' -13.7'	59.0' 59.1'
15 16	43°40.5 58°40.6	20.3	52°31.5	10.3'	09°14.7 09°01.1	-13.7' -13.7'	59.1' 59.1'
17	73°40.7	19.6	67°00.8	10.3'	08°47.4	-13.8'	59.1
18	88°40.8	N15°18.8	81°30.1	10.3'	N08°33.6	-13.8'	59.1'
19 20	103°40.9 118°41.0	18.1 17.4	95°59.4 110°28.8	10.3' 10.4'	08° 19.8 08° 05.9	-13.9' -13.9'	59.1' 59.2'
21	133°41.1	. 16.6	110 28.8 124°58.1	10.4'	06 05.9 07°51.9	-13.9 -14.0'	59.2'
22	148°41.2	15.9	$139^{\circ}27.5$	10.4'	07°37.9	-14.0'	59.2'
23	163°41.3	15.1	153°56.9	10.4'	07°23.9	-14.1'	59.2'
	SD = 15.8'	d = -0.7'		SI	O = 16.0'		

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

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

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

3 479.3 1097.94 201.0 2	h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
1 34 - 47 4 199 - 90 8 0 20 1 129 134 5 22 138 - 150 3 20 20 - 102 4 0.8 8	Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 34 - 47 4 199 - 90 8 0 20 1 129 134 5 22 138 - 150 3 20 20 - 102 4 0.8 8	0	319°44.9	144°30.0	N03°03.4	110°12.4	S12°51.6	118°53.4	507°32.9	267°07.9	N16°40.8	A1.1		00015.0
2 989*489 174*286 03*03 Mol*1415 527 148*577 33.2 289*12.0 40.8 Albaha 32*0.2 Albaha 34*24.2 Alb	1	334°47.4	159°29.8	02.1	125°13.4	52.2	133°55.6		282° 10.2	40.8			29°15.3
3 4°92.3 190°94.0 0°96.6 155°15.5 130 170°96.8 33.3 12°16.0 -0.08 1 10°16.1 10°16.8 10°96.6 130°16.2 10°96.7		349°49.9									l l		-42°08.4
19-518 201-22 55.3 179-165 53.5 179-165 33.5 179-165 33.5 327-173 50.8 16-500 50.5 14-500 50.5													56°41.9
5 43-75.2 2019:26 0 57.0 186-716 512-74 2019:26 307-33.7 33.6 347-19.6 40.8 141-75.7 2019:36 512-74 2019:36 512-74 2019:36 512-74 2019:37 2019													-17°49.2
6											Achernar	335°17.4	-57°04.8
7 65°02 2 200°25 5 54.5 220°20 7 560 220°03 3 330 12°24 3 699 6 600 3 600 600 600 3 600 600 600 600 6											Hamal	327°46.8	23°36.1
8 80°046 0 296°23 552 298°20 7 500 299°10.4 34.0 27°20 7 409 9 401 10 100°06 294°27 5 1.0 295°21 7 57.1 280°14.7 34.3 57°11.4 40.9 10 100°06 294°27 5 1.0 296°27 5 1.0 280°14.7 34.3 57°11.4 40.9 10 100°06 294°27 5 1.0 296°27 5 1.0 280°27 5 1.0 280°14.7 34.3 57°11.4 40.9 10 100°06 294°27 5 1.0 296°27 5 1.											Polaris	311°58.2	89°22.9
0 96"071 270"281 51.0 285"217 55.5 284"12.6 34.2 42"29.0 49.9 49.9 49.0 49.9 49.0 49.9 49.1 49											Acamar	315°09.0	-40°10.9
10 10 10 10 10 10 10 10											Menkar	$314^{\circ}02.2$	4°12.4
1											Mirfak	308°22.8	49°57.7
12													16°34.0
Capella 1967 1973 1974 1975 1974 1975 1974 1975 1974 1975 1974 1975 1974 1975 1974 1975 1974 1975 1974 1975													-8°10.0
Bellard Section Sect	12	140° 14.5	324°27.5	N02°48.1	290°24.8	S12°58.2	299°18.9	S07°34.6		N16°41.0			46°01.4
	13	155° 17.0	339°27.2	46.8	305°25.8	58.7	314°21.0	34.8	102°38.4	41.0			6°22.5
All All	14	$170^{\circ}19.4$	354°27.0	45.5	320°26.9	59.3	329°23.2	34.9	117°40.8	41.0			28°37.8
Betelgems	15	185°21.9	9°26.8	• • 44.3	335°27.9	12°59.8	344°25.3	• • 35.0	132°43.1	• • 41.0	l .		
17 215°26.8 39°26.4 44.7 5°29.9 0.09 14°29.5 35.3 162°47.8 4.11 5.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1	16	200°24.4	24°26.6	43.0	350°28.9	13°00.4	359°27.4	35.2	147°45.5	41.1	l l		-1°11.0
18							14°29.5						7°24.7
19 246*311 247*318 356 127*25 311													-52°42.5
20											Sirius		-16°45.4
21 275°367 9 301 114°253 353 805°51 037 89°40.1 300 237°596 412											Adhara	255°03.2	-29°00.7
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Mer.pass. 02:41											,		27°57.1
Substitute 1967 1967 1968 1968 1968 1969 1											1		-59°36.3
Mer purs Mer purs	23	305°41.6	129°25.1	34.0	95°36.1	04.2	104°42.3	36.2	253°01.9	41.2			-43°33.2
Sun GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA GRegulus Org. 70,98 Org.	Mern	ass 02·41	ν-0 2' d.1	3' m-3 05	v1 0' d0	5′ m0.75	v2 1' d0	1′ m-1 Ω/	1/2 3/ 40	0' m0 10	l l		-69°50.4
Sun CHA CHA CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec Dubbe Option Opt	iviei.p	0455. 02.41	ν-0.2 u-1	111-3.93	ν1.0 α0	.5 1110.75	ν2.1 do.	1 111-1.04	ν2.3 d0	.0 1110.19			-8°47.3
Sin G-HA													-6 47.3 11°49.3
0 330°441 144°249 N02°328 110°371 313°048 119°444 507°363 268°043 N16°412 Denebola 175°39 2 1 335°450 174°245 30.2 140°392 05.8 149°486 36.8 313°10.0 41.2 2 350°490 174°245 30.2 140°392 05.8 149°486 36.8 313°11.3 41.3 4 20°539 20°4241 2.2 20°539 26.4 185°402 00.6 146′4968 36.8 313°11.3 41.3 5 35°564 219°239 26.4 185°23 07.5 194°550 37.1 343°16.0 41.3 54.6 166°10.2 6 50°588 242°237 N02°251 200°433 313°08.0 29°571 507°372 358°18.4 N16°41.3 54.6 166°10.2 8 8 81°038 26°4233 22.8 20°424 00.1 240°10.4 37.5 28°231 41.4 1487 36.7 14.1 14.1 14.1 14.1 14.1 14.1 14.1 14	Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_		
1 393°46.5 199°24.7 31.5 125°38.2 05.3 144°46.5 36.5 283°06.6 41.2 Genetic 17.2°39.3 1.2 305°40.0 174°24.5 30.2 140°39.2 06.8 149°46.8 36.6 298°09.0 41.2 Genetic 17.2°39.3 1.2 3.3 5°51.5 189°24.3 28.9 155°40.2 06.4 164°50.8 36.8 313°11.3 41.3 Genetic 17.2°39.3 1.2 41.3 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2											l .		61°35.5
2 350°40.0 174°24.5 30.2 140°30.2 05.8 149°48.6 36.6 296°00.4 41.2 Acris 172°50.1 4.3 3°50.5 189°24.3 3°28.9 1.6 190°41.3 06.9 179°52.9 36.9 36.9 326°13.7 41.3 Airi 172°50.1 41.3 5°56.6 190°41.3 1.6 1													14°24.4
3 5°51.5 189°24.3 2.8.9 155°40.2 · 0.6.4 164°50.8 · 36.8 313°11.3 · 41.3 Garr.x 171°47.7 · 170°41.3 1.60 · 17													-17°42.5
4 20°539 20°241 276 170°413 069 179°529 369 328°137 413 Alsich 413 55°10 53°15 35°64 219°239 9°64 185°423 775 145°50 371 343°160 413 55°10 371 343°160 414 54°10 371 343°10 371 343°10 371 343°160 414 54°10 371 343°10 371													-63°16.1
15 15 15 15 15 16 16 16											Gacrux	171°47.7	-57°17.0
50 50 58 8.2 24 23.7 7.0 27.5 1.0 20.43 3.13 20.8 2.0 20.8 27.5 2.3 2.3 3.1 3.1 3.3 3.1 3.3 3.1 3.8 3.0 3.2 2.3 3.1 3.1 3.3											Alioth	$166^{\circ}10.2$	55°48.1
8 8 81°33 2 64°33 3 22.5 23.8 215°44.3 08.6 224°59.2 37.4 13°20.7 41.3 8 81°30.7 41.3 9 86°60.2 27°63.3 20°45.4 0.91 240°01.4 37.5 28°231 41.4 14.4 147°53.2 9 96°60.2 27°63.3 20°25.4 0.91 240°60.6 37.8 58°27.8 4.41.4 14.7 53.2 9 10 111°60.7 29°49.2 20°0.2 20°27.4 10.2 27°60.6 37.8 58°27.8 58°27.8 14.4 14.4 147°53.2 11.1 126°11.2 30°22.6 18.7 27°548.4 10.8 285°07.7 37.9 73°50.1 41.4 14.1 126°11.2 141°13.6 32°22.4 1002°17.4 20°49.4 11.3 30°08. 50°78.8 18°25.2 510°41.4 14.3 156°16.1 339°22.2 16.1 305°51.5 11.9 315°12.0 38.2 103°24.8 41.4 14.7 126°1.1 14.1 126°1.1 2 141°13.6 34°22.0 11.8 32°51.5 11.9 315°12.0 38.2 103°24.8 41.4 14.4 14.1 126°1.1 14.1 126°1.1 2 141°1.3 14.1 141°1.1 14.1 14.1 14.1 14.1 14.1 1											Spica	158°18.5	$-11^{\circ}19.0$
8 8103 264°233 224°235 238 215'44.3 08.6 224'59.2 37.4 13'20.7 41.3 Hada 14.8'30.7 29 96'06.2 279'23.0 21.2 245'46.4 0.91 240'01.4 31.5 28'23.1 41.4 Menkent 14.75'5.2 29 96'06.2 279'23.0 21.2 245'46.4 0.91 240'01.4 31.5 24.7 21.2 245'46.4 0.91 240'01.5 31.6 41.4 14.5 24.7 21.1 120'11.2 309'22.6 18.7 25'48.4 10.8 265'07.7 37.9 73'30.1 41.4 Kochab 137'20.3 12 141'31.6 324'22.4 N02'17.4 290'494.5 13'11.3 300'0.8 50'73.3 1. 86'32.5 N16'41.4 Kochab 137'20.3 13 156'16.1 339'22.2 16.1 305'50.5 11.9 315'12.0 38.2 103'34.8 41.4 Kochab 137'20.3 13 156'16.1 339'22.2 16.1 305'50.5 11.9 315'12.0 38.2 103'34.8 41.4 Kochab 137'20.3 13 156'16.1 339'22.2 16.1 305'50.5 11.9 315'12.0 38.2 103'34.8 41.6 Altares 11.2 11.1 1.5 15'0.2 38.2 103'34.8 41.6 Kochab 137'20.3 14.1 14.5 136'61.9 41.5 136'6											Alkaid	152°49.4	49°10.2
8 81°03.8 264°233 22.5 290°45.4 09.1 240°01.4 37.5 28°23.1 41.4 Menkent 147°53.2 99°96°62 279°23.0 21.2 245°46.4 0.97 25°03.5 37.6 43°25.4 0.41.4 14.6 11.0 111°08.7 294°22.8 20.0 260°47.4 10.2 270°05.6 37.8 56°27.8 41.4 14.6 11.1 126°11.2 390°22.6 18.7 275°48.4 10.8 285°07.7 37.9 73°30.1 41.4 14.6 Kochab 137°20.3 12 141°13.6 324°22.4 N02°17.4 290°49.4 \$13°11.3 300°09.8 50°7.81 88°32.5 N16°41.4 14.6 Kochab 137°20.3 13 156°16.1 339°22.2 16.1 305°50.5 11.9 315°12.0 38.2 103°34.8 41.4 14.6 Kochab 137°20.3 2.0 14.8 320°51.5 11.4 330°14.1 38.4 118°37.2 41.5 15.1 16°0.6 14.1 171°18.6 354°22.0 14.8 320°51.5 12.4 330°14.1 38.4 118°37.2 41.5 16.2 10.2 12.3 350°53.5 13.5 0°18.3 38.7 148°41.9 41.5 16.1 201°23.5 24°21.6 12.3 350°53.5 13.5 0°18.3 38.7 148°41.9 41.5 54b. 101°58.3 17.2 12.0 12.0 12.0 1.2 12.0 12.0 1.2 12.0 12.0													-60°31.2
9 9°060.8 7 29°0238 200 260°47.4 10.2 270°05.6 37.8 58°27.8 41.4 1.4 11 126°11.2 309°22.6 18.7 275°48.4 10.8 285°07.7 37.9 73°30.1 41.4 1.4 126°11.2 309°22.6 18.7 275°48.4 10.8 285°07.7 37.9 73°30.1 41.4 1.4 1.4 126°11.2 309°22.6 18.7 20°249.4 10.8 285°07.7 37.9 73°30.1 41.4 1.4 1.4 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5													-36°31.1
10 111'08'1.2 309'22.6 18.7 275'48.4 10.8 285'07.7 37.9 73'9.0 1 41.4 Kochab 137'03.0 121'11'08'1.4 200'217.4 290'49.4 513'11.3 300'09.8 50''38.1 88'32.5 NI\$6'41.4 313''20.3 317'01.0 131'5'12.0 31.5'12.0 31	9	96°06.2	279°23.0	• • 21.2	245°46.4	•• 09.7	255°03.5	• • 37.6		• • 41.4	l l		19°01.9
11 126°11.2 309°22.6 309°22.6 18.7 25°48.4 10.8 285°07.7 37.9 73°30.1 41.4 Kochab 137°20.3 12 141°13.6 334°22.4 N02°17.4 290°49.4 513°11.3 30°09.8 50°31. 18°32.5 N16°41.4 11°13°16°16.1 339°22.2 16.1 305°50.5 11.9 315°12.0 38.2 103°34.8 41.4 Alpheca 126°00.6 14 17°18.6 354°22.0 14.8 320°51.5 12.4 330°14.1 38.4 118°37.2 41.5 16 20°23.5 24°21.6 12.3 350°55.5 13.5 0°18.3 38.7 186°41.9 41.5 51°12.0 330°14.1 10.0 5°54.6 14.1 15°20.4 38.8 163°44.2 41.5 Sabik 101°58.3 17 216°26.0 39°21.4 11.0 5°54.6 11.1 15°20.4 38.8 163°44.2 41.5 Sabik 101°58.3 19 246°30.9 69°21.0 0.84 33°55.6 513°4.6 30°22.5 50°39.0 178°46.6 N16°41.5 Sabik 101°58.3 19 246°30.9 69°21.0 0.84 33°55.6 513°4.6 30°22.5 50°39.0 178°46.6 N16°41.5 Sabik 101°58.3 19 246°30.9 69°21.0 0.84 33°56.6 151.1 45°24.7 39.1 193°48.9 41.5 Sabik 101°58.3 19 246°30.9 69°21.0 0.84 33°56.6 153°4.6 0.162 75°29.9 39.4 222°83.6 41.6 Sabik 222°291°38.8 193°00.6 0.59 65°58.6 1.62 75°29.9 39.4 223°83.6 41.6 N16°45.2 N16°41.4 N16°45.0 N16°4.2 N16	10	111°08.7	294°22.8	20.0	260°47.4	10.2	270°05.6	37.8	58° 27.8	41.4			-60°57.7
12 141°136 34°222 161 305°505 11.9 300°098 50°381 88°32.5 MP6·14. 13 156°161 339°22.2 161 305°505 11.9 315°12.0 33.2 103°34.6 41.5 14 171°186 354°22.0 14.8 305°51.5 11.2 130°151.0	11	126°11.2	309°22.6	18.7	275°48.4	10.8	285°07.7		73°30.1	41.4			74°02.3
13 156°16.1 339°22.2 16.1 306°50.5 11.9 315°12.0 38.2 103°34.8 41.4 Alphace 126°00.6 141.7 1186 354°22.0 14.8 320°51.5 12.4 330°14.1 38.4 118°37.2 41.5 Alphace 126°00.6 15 186°21.0 9°21.8 1.16 335°52.5 13.0 345°16.2 335°18.5 133°39.5 141.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°34.2 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1618°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1818°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1818°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1818°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.4 38.8 1818°41.9 41.5 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.2 291°33.3 88°20.6 0.05 40.6 80°59.7 16.8 90°31.0 39.5 238°56.0 41.6 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.2 291°38.3 114°20.4 04.6 80°59.7 16.8 90°31.0 39.5 238°56.0 41.6 Alphace 126°00.6 Altares 112°11.1 1.1 15°20.2 291°38.3 114°20.4 04.6 80°59.7 16.8 90°30.1 39.7 253°58.4 41.6 Alphace 126°00.6 Al	12	141°13.6	324°22.4	N02°17.4	290°49.4	S13°11.3	300°09.8	S07°38.1	88°32.5	N16°41.4	l l		-16°09.9
14 171°18.6 354°22.0 148 320°51.5 12.4 330°14.1 33.4 118°37.2 41.5	13	$156^{\circ}16.1$	339°22.2	16.1	305°50.5	11.9	315°12.0		103°34.8	41.4	l .		
15			354°22.0			12.4							26°37.2
16 201°235 24°216 12.3 350°535 13.5 0°18.3 38.7 148°41.9 41.5 5abik 10°18.3 18°24.2 41.5 5abik 10°18.3 18°34.2 41.5 41.5 66°08.2 41.5 66°08.2 41.5 60°08.2 41.5 60°08.3 41.5 60°08.2 41.5 60°08.2 41.5 60°08.2 41.5 60°08.2 41.5 60°08.2 41.5 60°08.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2 41.5 60°09.2											l .		-26°29.8
17 216°260 39°21.4 11.0 5°54.6 14.1 15°20.4 38.8 163°44.2 41.5 58Jaula 96°05.1 18 231°28.4 54°21.2 N02°09.7 20°55.6 513°14.6 30°22.5 507°39.0 178°46.6 N16°41.5 18aslhague 96°05.1 192°46°30.9 66°21.0 08.4 35°56.6 15.1 45°24.7 39.1 193°48.9 41.5 18aslhague 96°05.1 192°45°38.9 99°20.6 0.5.9 65°8.6 16.2 75°28.9 39.2 208°51.3 41.6 18aslhague 95°04.9 121 276°38.9 99°20.6 0.5.9 65°8.6 16.2 75°28.9 39.2 208°51.3 41.6 18aslhague 95°04.9 121 276°38.9 39.2 208°51.3 41.6 18aslhague 95°04.9 121 276°38.9 39.2 60°0.7 16.8 90°31.0 39.5 238°56.0 41.6 Nunki 75°42.9 18aslhague 95°04.9 18aslhague													-69°04.9
18 231°28.4 54°21.2 NO2°09.7 20°55.6 S13°14.6 30°22.5 S07°39.0 178°46.6 N16°41.5 Rasalhague 95°54.9 19 246°30.9 69°1.0 08.4 35°56.6 15.1 45°24.7 39.1 193°48.9 41.5 Eltanin 90°40.1 22°20.2 026°33.3 84°20.8 07.2 50°57.6 15.7 60°26.8 39.2 208°51.3 41.6 Vega 80°30.4 22 201°38.3 114°20.4 04.6 80°9.9 7 16.8 90°31.0 39.5 238°55.0 41.6 Vega 80°30.4											l l		-15°45.5
19 246°30.9 69°21.0 08.4 35°56.6 15.1 45°24.7 39.1 193°48.9 41.5 Eltanin 90°40.1 20 261°33.3 84°20.8 07.2 50°57.6 15.7 60°26.8 39.2 208°51.3 41.6 Kaus Aust. 83°27.3 - 22°21°38.3 114°20.4 04.6 80°59.7 16.8 90°31.0 39.5 238°56.0 41.6 Vega 80°30.4 Vega 80°30.4 192°32.3 306°0.7 129°0.2 03.3 96°0.7 17.3 105°33.1 39.7 235°58.4 41.6 Nunki 75°42.9 1.0 Nunki 75°42.9 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42.9 1.0 Nunki 75°42											Shaula		-37°07.4
20 261°33.3 84°20.8 97°2 50°57.6 15.7 60°26.8 39.2 208°51.3 41.6 21 276°35.8 99°20.6 · 0.5.9 65°58.6 · 16.2 75°28.9 · 39.4 223°55.6 · 41.6 22 291°38.3 114°20.4 04.6 80°59.7 16.8 90°31.0 39.5 233°56.0 41.6 Nunki 75°42.9 233°36.0 41.6 Nunki 75°42.9 233°36.0 129°20.2 03.3 96°00.7 17.3 105°33.1 39.7 253°58.4 41.6 Nunki 75°42.9 24.6 Nunki 75°42.9 Nunki 75°42.9 Nunki 75°42.9 Nunki 75°42.9 Nunki 75°42.9 Nunki 75°42.9 Nunki 75°42.9 Nu											Rasalhague	95°54.9	12°32.6
21 276°35.8 99°20.6 · · · · · · · · · · · · · · · · · · ·											Eltanin	90°40.1	51°29.4
22 291° 38.3 114° 20.4 0.46 80° 59.7 16.8 90° 31.0 39.5 238° 56.0 41.6											Kaus Aust.	83°27.3	-34°22.1
22 291°38.3 114°20.4 04.6 80°59.7 16.8 90°31.0 39.5 238°56.0 41.6 Munki 75°42.9 Altair 61°56.0 Mer.pass. 02:37											Vega	80°30.4	38°49.0
Mer.pass. 02:37 \(\begin{array}{c c c c c c c c c c c c c c c c c c c	22	291°38.3	114°20.4	04.6	80°59.7	16.8	90°31.0	39.5	238° 56.0	41.6	_		-26°15.4
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18 232°27.6 54°16.3 N01°39.0 21°20.0 S13°27.7 31°13.3 S07°42.5 179°43.1 N16°41.9 19 247°30.0 69°16.1 37.7 36°21.0 28.2 46°15.4 42.6 194°45.5 42.0 20 262°32.5 84°15.9 36.4 51°22.0 28.8 61°17.5 42.8 209°47.8 42.0 21 277°34.9 99°15.7 · 35.1 66°23.0 · 29.3 76°19.7 · 42.9 224°50.2 · 42.0 22 292°37.4 114°15.5 33.8 81°24.0 29.9 91°21.8 43.1 239°52.6 42.0 23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:	17										Mars	$149^{\circ}18.5$	16:35
19 247°30.0 69°16.1 37.7 36°21.0 28.2 46°15.4 42.6 194°45.5 42.0 20 262°32.5 84°15.9 36.4 51°22.0 28.8 61°17.5 42.8 209°47.8 42.0 21 277°34.9 99°15.7 · 35.1 66°23.0 · 29.3 76°19.7 · 42.9 224°50.2 · 42.0 22 292°37.4 114°15.5 33.8 81°24.0 29.9 91°21.8 43.1 239°52.6 42.0 23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:	18		54°16.3	N01°39.0		S13°27.7		S07°42.5	179°43.1	N16°41.9			15:55
20 262°32.5 84°15.9 36.4 51°22.0 28.8 61°17.5 42.8 209°47.8 42.0 21 277°34.9 99°15.7 · 35.1 66°23.0 · 29.3 76°19.7 · 42.9 224°50.2 · 42.0 22 292°37.4 114°15.5 33.8 81°24.0 29.9 91°21.8 43.1 239°52.6 42.0 23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:		247°30.0	69°16.1		36°21.0				194°45.5				06:03
21 277°34.9 99°15.7 · · 35.1 66°23.0 · · 29.3 76°19.7 · · 42.9 224°50.2 · · 42.0 Horizontal parallax 22 292°37.4 114°15.5 33.8 81°24.0 29.9 91°21.8 43.1 239°52.6 42.0 Venus: 23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:													55.05
22 292°37.4 114°15.5 33.8 81°24.0 29.9 91°21.8 43.1 239°52.6 42.0 Venus: 23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:											Horizont	al parallax	
23 307°39.9 129°15.3 32.5 96°25.0 30.4 106°23.9 43.2 254°54.9 42.0 Mars:												-	0.1
25 501 55.5 125 15.5 52.5 50 25.0 50.1 100 25.5 15.2 251 51.5 12.0													0.1
Mar nace 02:22	23	307 39.9	129 15.5	32.5			100 23.9	43.2	234 54.9	42.0			V.2
Mer.pass. 02:33 ν -0.2' d -1.3' m-3.96 ν 1.0' d 0.5' m0.77 ν 2.1' d 0.1' m-1.83 ν 2.4' d 0.0' m0.18	Mer n	ass. 02:33	ν -0.2' d-1	3′ m-3.96	$\nu 1.0' d0$.5′ m0.77	$\nu 2.1' d0$	1′ m-1.83	$\nu 2.4' d\Omega$.0′ m0.18			

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.4	N15° 14.4	$168^{\circ}26.3$	10.4'	N07°09.8	-14.1'	59.2'
1	193°41.5	13.7	182°55.7	10.4	06°55.7	-14.2'	59.3'
2	208°41.6 223°41.7	12.9 •• 12.2	197°25.1 211°54.6	10.4' 10.5'	06°41.5 06°27.3	-14.2' -14.3'	59.3' 59.3'
4	238°41.8	11.4	226°24.0	10.5'	06°13.0	-14.3'	59.3'
5	253°41.9	10.7	240°53.5	10.5'	05°58.7	-14.3'	59.3'
6 7	268° 42.0 283° 42.1	N15°09.9 09.2	255°23.0 269°52.5	10.5' 10.5'	N05°44.4 05°30.0	-14.4' -14.4'	59.3' 59.4'
8	298°42.2	08.4	284°22.0	10.5'	05°15.5	-14.4 -14.5'	59.4'
9	313°42.3	• • 07.7	298°51.5	10.5'	05°01.1	-14.5'	59.4'
10	328°42.4 343°42.5	07.0	313°21.0 327°50.5	10.5'	04°46.6 04°32.1	-14.5'	59.4
11 12	358°42.6	06.2 N15°05.5	342°20.1	10.5' 10.5'	N04°17.5	-14.6' -14.6'	59.4' 59.4'
13	13°42.7	04.7	356°49.6	10.5'	04°02.9	-14.6'	59.5'
14	28°42.8	04.0	11°19.2	10.5'	03°48.3	-14.6'	59.5'
15 16	43°42.9 58°43.0	· · 03.2 02.5	25°48.7 40°18.3	10.6' 10.6'	03°33.6 03°19.0	-14.7' -14.7'	59.5' 59.5'
17	73°43.1	01.7	54°47.8	10.6'	03°04.3	-14.7'	59.5'
18	88°43.2	N15°01.0	69°17.4	10.6'	N02°49.6	-14.7'	59.5'
19 20	103°43.3 118°43.4	15°00.2 14°59.5	83°46.9 98°16.5	10.6' 10.6'	02°34.8 02°20.1	-14.8' -14.8'	59.5' 59.5'
21	133°43.5	· · 58.7	96 10.5 112°46.1	10.6'	02°20.1	-14.8'	59.5'
22	148°43.6	58.0	127°15.6	10.6'	01°50.5	-14.8'	59.6'
23	163°43.7	57.2	141°45.2	10.6'	01°35.7	-14.8'	59.6'
	SD = 15.8'	d = -0.7'		SI	O = 16.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	178°43.8	N14°56.5	156°14.7	10.6'	N01°20.9	-14.8'	59.6'
1	193°43.9	55.7	170°44.3	10.5'	01°06.1	-14.8'	59.6'
2	208°44.0 223°44.1	55.0 •• 54.2	185°13.8 199°43.4	10.5' 10.5'	00°51.2 00°36.4	-14.8' -14.9'	59.6' 59.6'
4	238°44.2	53.5	214°12.9	10.5'	00°30.4	-14.9'	59.6'
5	253°44.3	52.7	228°42.4	10.5'	N00°06.6	-14.9'	59.6'
6	268°44.5	N14°51.9	243°11.9 257°41.5	10.5'	500°08.2 00°23.1	14.9'	59.6'
7 8	283°44.6 298°44.7	51.2 50.4	257°41.5 272°11.0	10.5' 10.5'	00°23.1 00°38.0	14.9' 14.9'	59.7' 59.7'
9	313°44.8	• • 49.7	286°40.4	10.5'	00°52.8	14.9'	59.7'
10	328°44.9	48.9	301°09.9	10.5'	01°07.7	14.9'	59.7'
11 12	343°45.0 358°45.1	48.2 N14°47.4	315°39.4 330°08.9	10.5' 10.4'	01°22.6 \$01°37.4	14.9' 14.9'	59.7' 59.7'
13	13°45.2	46.6	344°38.3	10.4	01°52.3	14.8'	59.7'
14	28°45.3	45.9	359°07.7	10.4'	02°07.1	14.8'	59.7'
15 16	43°45.4 58°45.5	· · 45.1 44.4	13°37.1 28°06.5	10.4' 10.4'	02°21.9 02°36.8	14.8' 14.8'	59.7' 59.7'
17	73°45.6	43.6	42°35.9	10.4	02°51.6	14.8	59.7'
18	88°45.8	N14°42.9	57°05.3	10.3'	503°06.4	14.8'	59.7'
19 20	103°45.9 118°46.0	42.1 41.3	71°34.6 86°03.9	10.3' 10.3'	03°21.1 03°35.9	14.8' 14.7'	59.7' 59.7'
21	118 46.0 133°46.1	· · 40.6	100°33.2	10.3	03°50.6	14.7'	59.7' 59.7'
22	148°46.2	39.8	$115^{\circ}02.5$	10.3'	04°05.4	14.7'	59.7'
23	163°46.3	39.1	129°31.8	10.2'	04°20.1	14.7'	59.8'
	SD = 15.8'	d = -0.8'		SI	O = 16.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.4	N14°38.3	144°01.0	10.2'	504°34.7	14.6'	59.8'
1 2	193°46.5 208°46.6	37.5 36.8	158°30.2 172°59.4	10.2' 10.2'	04°49.4 05°04.0	14.6' 14.6'	59.8' 59.8'
3	223°46.7	• • 36.0	187°28.6	10.1'	05°18.6	14.6'	59.8'
4	238°46.9	35.2	201°57.7	10.1'	05°33.2	14.5'	59.8'
5 6	253°47.0 268°47.1	34.5 N14°33.7	216°26.8 230°55.9	10.1' 10.1'	05°47.7 \$06°02.2	14.5' 14.5'	59.8' 59.8'
7	283°47.2	32.9	245°24.9	10.0'	$06^{\circ}16.7$	14.4'	59.8'
8	298°47.3	32.2	259°54.0	10.0'	06°31.1	14.4'	59.8'
9 10	313°47.4 328°47.5	· · 31.4 30.7	274°22.9 288°51.9	10.0' 9.9'	06°45.5 06°59.8	14.4' 14.3'	59.8' 59.8'
11	343°47.6	29.9	303°20.8	9.9'	07°14.1	14.3'	59.8'
12	358°47.8	N14°29.1	317°49.7	9.9'	S07°28.4	14.2'	59.8'
13 14	13°47.9 28°48.0	28.4 27.6	332°18.6 346°47.4	9.8' 9.8'	07°42.6 07°56.8	14.2' 14.1'	59.8' 59.8'
15	43°48.1	26.8	1°16.2	9.8'	07° 30.8 08° 10.9	14.1	59.8'
16	58°48.2	26.0	15°45.0	9.7'	08°25.0	14.0'	59.8'
17 18	73°48.3 88°48.5	25.3 N14°24.5	30°13.7 44°42.4	9.7' 9.6'	08°39.1 \$08°53.0	14.0' 13.9'	59.8' 59.8'
18 19	88°48.5 103°48.6	23.7	44 42.4 59°11.0	9.6' 9.6'	09°07.0	13.9'	59.8'
20	118°48.7	23.0	73°39.6	9.6'	09°20.8	13.8'	59.8'
21 22	133°48.8 148°48.9	· · 22.2 21.4	88°08.2 102°36.7	9.5' 9.5'	09°34.7 09°48.4	13.8' 13.7'	59.8' 59.7'
23	148°48.9 163°49.0	21.4	102°36.7 117°05.2	9.5° 9.4'	10°02.1	13.6'	59.7' 59.7'
	SD = 15.8'	d = -0.8'			D = 16.3'		

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

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

August 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	322°42.3	144°15.1	N01°31.3	111°26.0	\$13°31.0	121°26.0	S07°43.4	269°57.3	N16° 42.0			
1	337°44.8	159°14.9	30.0	126°27.0	31.5	136°28.1	43.5	284°59.6	42.1	Alpheratz		29°15.3
2	352°47.3	174°14.7	28.7	141°28.0	32.1	151°30.2	43.7	300°02.0	42.1	Ankaa	353°03.3	-42°08.4
3	7°49.7	189°14.5	27.4	156° 29.1	32.6	166°32.3	• • 43.8	315°04.3	• • 42.1	Schedar	349°26.2	56°41.9
4	22°52.2	204°14.3	26.1	171°30.1	33.1	181°34.4	43.9	330°06.7	42.1	Diphda	348°43.4	-17°49.2
5	37°54.7	$219^{\circ}14.1$	24.8	186°31.1	33.7	196°36.6	44.1	345°09.1	42.1	Achernar	335°17.3	-57°04.8 23°36.1
6	52°57.1	234°13.9	N01°23.6	201°32.1	S13°34.2	211°38.7	S07°44.2	0°11.4	N16°42.1	Hamal	327°46.8 311°56.5	89°22.9
7	67°59.6	249°13.7	22.3	216°33.1	34.8	226°40.8	44.4	15°13.8	42.2	Acamar	311 30.3 315°09.0	-40°10.9
8	83°02.1	264°13.5	21.0	231°34.1	35.3	241°42.9	44.5	$30^{\circ}16.1$	42.2	Menkar	314°02.2	4°12.4
9	98°04.5	279°13.3	• • 19.7	246°35.1	• • 35.9	256° 45.0	• • 44.7	45°18.5	• • 42.2	Mirfak	308° 22.8	49°57.7
10	113°07.0	294°13.1	18.4	261°36.1	36.4	271°47.1	44.8	60°20.9	42.2	Aldebaran	290°35.4	16°34.0
11	128°09.4	309°12.9	17.1	276°37.1	37.0	286°49.2	45.0	75°23.2	42.2	Rigel	281°00.4	-8°10.0
12	143°11.9	324°12.7	N01°15.9	291°38.1	\$13°37.5	301°51.3	S07°45.1	90°25.6	N16° 42.2	Capella	$280^{\circ}16.6$	46°01.4
13 14	158°14.4 173°16.8	339°12.5 354°12.3	14.6 13.3	306°39.1 321°40.1	38.0 38.6	316°53.4 331°55.6	45.3 45.4	105°27.9 120°30.3	42.2 42.3	Bellatrix	$278^{\circ}19.1$	6°22.5
15	188°19.3	9°12.1	. 12.0	336°41.1	39.1	346° 57.7	• • 45.6	120°30.3	42.3	Elnath	277°57.3	28°37.8
16	203°21.8	24°11.9	10.7	351°42.1	39.7	1°59.8	45.7	150°35.0	42.3	Alnilam	275°34.1	-1°11.0
17	218°24.2	39°11.7	09.4	6°43.1	40.2	17°01.9	45.9	165°37.4	42.3	Betelgeuse	270°48.3	7°24.7
18	233°26.7	54°11.5	N01°08.1	21°44.1	S13°40.8	32°04.0	S07°46.0	180°39.8	N16°42.3	Canopus	263°51.1	-52°42.5
19	248°29.2	69°11.3	06.9	36°45.1	41.3	47°06.1	46.2	195°42.1	42.3	Sirius	258°23.2	-16°45.4
20	263°31.6	84°11.1	05.6	51°46.1	41.8	62°08.2	46.3	210°44.5	42.4	Adhara	255°03.2	-29°00.7
21	278°34.1	99°10.9	• • 04.3	66°47.1	• • 42.4	77° 10.3	• • 46.5	225°46.8	• • 42.4	Procyon Pollux	244° 47.2 243° 13.1	5°08.9 27°57.1
22	293°36.5	$114^{\circ}10.7$	03.0	81°48.1	42.9	92°12.4	46.6	240°49.2	42.4	Avior	234° 13.7	-59°36.3
23	308°39.0	129°10.5	01.7	96°49.1	43.5	107° 14.5	46.8	255°51.6	42.4	Suhail	222°43.9	-43°33.2
Mern	ass. 02:29	v-0.2' d-1	3′ m-3.96	v1 0' d0	.5′ m0.77	v2 1' d0	1' m-1.83	1/2 4' d0	.0′ m0.18	Miaplacidus	221°38.2	-69°50.4
- IVICI.P	433. 02.23	ν 0.2 d 1		ν1.0 do	.5 1110.77	ν Z.1 ασ.		ν Z.Ψ ασ		Alphard	217°44.4	-8°47.3
										Regulus	207°30.8	11°49.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.5
0	323°41.5	144°10.3	N01°00.4	111°50.1	S13°44.0	122°16.6	S07°46.9	270°53.9	N16°42.4	Denebola	$182^{\circ}21.5$	14°24.4
1	338°43.9	159°10.1	00°59.1	126°51.1	44.6	137°18.8	47.1	285°56.3	42.4	Gienah	175°40.0	-17°42.5
2	353°46.4	174°09.9	57.9	141°52.1	45.1	152°20.9	47.2	300°58.7	42.4	Acrux	$172^{\circ}56.2$	-63°16.1
3 4	8°48.9 23°51.3	189°09.7 204°09.5	· · 56.6 55.3	156°53.1 171°54.1	· · 45.6 46.2	167°23.0 182°25.1	•• 47.4 47.5	316°01.0 331°03.4	•• 42.5 42.5		$171^{\circ}47.7$	-57°17.0
5	25 51.5 38°53.8	204 09.5 219°09.3	55.5 54.0	171 54.1 186°55.1	46.2 46.7	102 25.1 197°27.2	47.5 47.7	346°05.7	42.5 42.5	Alioth	$166^{\circ}10.2$	55°48.1
6	53°56.3	219 09.3 234°09.1	N00°52.7	201° 56.1	\$13°47.3	212°29.3	507°47.8		N16° 42.5	Spica	158° 18.5	-11°19.0
7	68°58.7	249°08.9	51.4	216° 57.1	47.8	227°31.4	48.0	16°10.5	42.5	Alkaid	152°49.4	49°10.2
8	84°01.2	264°08.7	50.1	231°58.1	48.4	242°33.5	48.1	31°12.8	42.5	Hadar	148°30.7	-60°31.2
9	99°03.7	279°08.5	• • 48.9	246°59.1	48.9	257°35.6	48.3	46°15.2	• • 42.6	1	147°53.3	-36°31.1
10	114°06.1	294°08.4	47.6	262°00.1	49.4	272°37.7	48.4	61°17.6	42.6	Arcturus	145°44.6 139°35.1	19°01.9 -60°57.7
11	129°08.6	309°08.2	46.3	277°01.1	50.0	287°39.8	48.6	76°19.9	42.6	Rigil Kent. Kochab	139 35.1 137°20.4	74°02.3
12	$144^{\circ}11.0$	324°08.0	N00°45.0	292°02.1	S13°50.5	302°41.9	S07°48.7	91°22.3	N16°42.6	Zuben'ubi	136°51.9	-16°09.9
13	159°13.5	339°07.8	43.7	$307^{\circ}03.1$	51.1	317°44.0	48.9	106°24.7	42.6	Alphecca	126° 00.6	26°37.2
14	174°16.0	354°07.6	42.4	322°04.1	51.6	332°46.1	49.0	121°27.0	42.6		112° 11.1	-26°29.8
15	189°18.4	9°07.4	• • 41.1	337°05.1	• • 52.2	347°48.3	• • 49.2	136°29.4	• • 42.6	Atria	107°01.7	-69°04.9
16	204°20.9	24°07.2	39.9	352°06.1	52.7	2°50.4	49.3	151°31.8	42.7	Sabik	101°58.3	-15°45.5
17	219°23.4	39°07.0	38.6	7°07.1	53.2	17°52.5	49.5	166°34.1	42.7	Shaula	$96^{\circ}05.1$	-37°07.4
18	234°25.8	54°06.8	N00°37.3		S13°53.8	32°54.6	S07°49.6	181°36.5	N16° 42.7	Rasalhague	95°54.9	12°32.6
19 20	249°28.3 264°30.8	69°06.6 84°06.4	36.0 34.7	37°09.1 52°10.1	54.3 54.9	47°56.7 62°58.8	49.8 49.9	196°38.9 211°41.2	42.7 42.7	Eltanin	90°40.1	51°29.4
21	279°33.2	99°06.2	•• 33.4	67°11.1	• • 55.4	78° 00.9	• 50.1	226°43.6	• • 42.7	Kaus Aust.	83°27.3	-34°22.1
22	294°35.7	114°06.0	32.1	82°12.1	56.0	93°03.0	50.2	241°46.0	42.7	Vega	80°30.4	38°49.0
23	309°38.2	129°05.8	30.8	97° 13.1	56.5	108°05.1	50.4	256°48.3	42.8	Nunki	75°42.9	-26°15.4
	00.05						1′ m-1.82			Altair	61°56.0 52°59.4	8°57.1 -56°38.2
Mer.p	ass. 02:25	ν -0.2' d-1	3′ m-3.96	ν 1.0' d0	.5′ m0.78	$\nu^{2.1'} d0.$	1′ m-1.82	$\nu^{2.4'} d0$.0′ m0.17	Peacock Deneb	52 59.4 49°22.7	-50 38.2 45°23.4
										Enif	33°34.8	10°00.9
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	324°40.6	144°05.6	N00°29.6	$112^{\circ}14.1$	S13°57.0	123°07.2	\$07°50.5	271°50.7	N16°42.8	Fomalhaut	15° 10.2	-29°27.6
1	339°43.1	159°05.4	28.3	127° 15.1	57.6	138°09.3	50.7	286°53.1	42.8	Scheat	13°41.2	28°14.8
2	354°45.5	174°05.3	27.0	142°16.0	58.1	153°11.4	50.8	301°55.4	42.8	Markab	$13^{\circ}25.9$	15°22.1
3	9°48.0	189°05.1	• • 25.7	157° 17.0	• • 58.7	168° 13.5	• • 51.0	316°57.8	• • 42.8	A 14 T	CLIA	N4
4	24°50.5	204°04.9	24.4	172°18.0	59.2	183°15.6	51.1	332°00.2	42.8	Aug 14 Tue	SHA 181°32.7	Mer.pass
5 6	39°52.9 54°55.4	219°04.7 234°04.5	23.1 N00°21.8	187° 19.0 202° 20.0	13°59.7 \$14°00.3	198° 17.7 213° 19.8	51.3 \$07°51.4	347°02.5 2°04.9	42.8 N16° 42.9		181° 32.7 148° 43.7	14:23 16:33
7	69°57.9	249°04.3	20.5	202 20.0 217°21.0	00.8	213 19.8 228°21.9	51.6	17°07.3	42.9	!	158°43.7	15:52
8	85°00.3	264°04.3	19.3	232°22.0	01.4	243°24.0	51.7	32°09.6	42.9	Saturn		05:59
9	100°02.8	279°03.9	. 18.0	247°23.0	• • 01.9	258° 26.1	• • 51.9	47°12.0	• • 42.9			
10	115°05.3	294°03.7	16.7	262°24.0	02.4	273°28.2	52.0	62°14.4	42.9	Aug 15 Wed	SHA	Mer.pass
11	130°07.7	309°03.5	15.4	277°25.0	03.0	288°30.3	52.2	77°16.7	42.9		180°28.8	14:24
12	145°10.2	324°03.3	N00°14.1	292°25.9	S14°03.5	303°32.4	S07°52.3	92°19.1	N16°42.9		148°08.7	16:32
13	$160^{\circ}12.6$	339°03.1	12.8	$307^{\circ}26.9$	04.1	$318^{\circ}34.5$	52.5	$107^{\circ}21.5$	42.9		158° 35.2 307° 12.5	15:49 05:55
14	175°15.1	354°02.9	11.5	322°27.9	04.6	333°36.6	52.6	122°23.8	43.0	Saturn	JU1 12.5	05.55
15	190°17.6	9°02.8	•• 10.2	337°28.9	•• 05.2	348°38.7	• • 52.8	137°26.2	• • 43.0	Aug 16 Thu	SHA	Mer.pass
16	205°20.0	24°02.6	09.0	352°29.9	05.7	3°40.8	52.9	152°28.6	43.0		$179^{\circ}25.0$	14:24
17	220°22.5	39°02.4	07.7	7°30.9	06.2	18° 42.9	53.1	167°31.0	43.0		147°33.4	16:30
18	235°25.0	54°02.2	N00°06.4	22°31.9		33°45.0	S07°53.2		N16°43.0		158° 26.6	15:45
19	250°27.4	69°02.0	05.1	37°32.8	07.3	48°47.1	53.4	197°35.7	43.0	Saturn	307°10.1	05:52
20	265°29.9	84°01.8	03.8	52°33.8	07.9	63°49.2	53.5	212°38.1	43.0	Horizont	al parallax	
21 22	280°32.4 295°34.8	99°01.6 114°01.4	· · 02.5 N00°01.2	67°34.8 82°35.8	· · 08.4 08.9	78°51.3 93°53.4	· · 53.7 53.8	227°40.4 242°42.8	· · 43.1 43.1		Venus:	0.1
23	295 34.6 310°37.3	114 01.4 129°01.2	S00°00.1	97°36.8	00.9	95 55.4 108°55.5	53.0 54.0	242 42.6 257°45.2	43.1		Mars:	0.1
Mer.p	ass. 02:21	ν -0.2′ d-1	3′ m-3.97	ν 1.0′ d0	.5′ m0.79	$\nu 2.1' d0.$	2′ m-1.82	ν 2.4′ d0	.0′ m0.17			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.1	N14°19.9	131°33.6	9.4'	S 10°15.8	13.6'	59.7'
1	193°49.3	19.1	146°02.0	9.4'	10°29.4	13.5'	59.7'
2 3	208° 49.4 223° 49.5	18.3 • • 17.6	160°30.4 174°58.7	9.3' 9.3'	10°42.9 10°56.3	13.5' 13.4'	59.7' 59.7'
4	238° 49.6	16.8	189°27.0	9.2'	11°09.7	13.3'	59.7'
5	253°49.7	16.0	203°55.2	9.2'	11°23.0	13.2'	59.7'
6	268° 49.9	N14°15.3	218°23.4	9.1'	S11°36.3	13.2'	59.7'
7 8	283°50.0 298°50.1	14.5 13.7	232°51.5 247°19.6	9.1' 9.0'	11°49.4 12°02.6	13.1' 13.0'	59.7' 59.7'
9	313°50.2	. 12.9	261°47.6	9.0'	12°15.6	13.0'	59.7'
10	328°50.3	12.2	$276^{\circ}15.6$	8.9'	12°28.5	12.9'	59.7'
11	343°50.5 358°50.6	11.4 N14°10.6	290°43.6 305°11.5	8.9'	12°41.4 \$12°54.2	12.8'	59.7' 59.7'
12 13	13° 50.7	09.8	305 11.5 319°39.3	8.8' 8.8'	13°06.9	12.7' 12.6'	59.7' 59.7'
14	28° 50.8	09.0	334°07.1	8.8	13°19.6	12.6'	59.7'
15	43°50.9	• • 08.3	348°34.9	8.7'	13°32.1	12.5'	59.7'
16 17	58° 51.1 73° 51.2	07.5 06.7	3°02.6 17°30.2	8.7' 8.6'	13°44.6 13°57.0	12.4' 12.3'	59.6' 59.6'
18	88° 51.3	N14°05.9	31°57.8	8.5'	\$14°09.3	12.3	59.6'
19	103°51.4	05.2	46°25.4	8.5'	14°21.5	12.1'	59.6'
20	118°51.5	04.4	60°52.9	8.4'	14°33.6	12.0'	59.6'
21 22	133°51.7 148°51.8	· · 03.6 02.8	75°20.3 89°47.7	8.4' 8.3'	14°45.7 14°57.6	11.9' 11.8'	59.6' 59.6'
23	163°51.9	02.0	104°15.1	8.3'	15°09.4	11.8	59.6'
	SD = 15.8'	d = -0.8'			D = 16.3'		-
				JI			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178° 52.0 193° 52.1	N14°01.3 14°00.5	118°42.3 133°09.6	8.2' 8.2'	\$15°21.2 15°32.9	11.7' 11.6'	59.6' 59.6'
2	193 52.1 208°52.3	14 00.5 13°59.7	133 09.6 147°36.8	8.1'	15 32.9 15°44.4	11.5	59.6'
3	223°52.4	• • 58.9	162°03.9	8.1'	15°55.9	11.4'	59.5'
4	238°52.5	58.1	176°31.0	8.0'	16°07.2	11.3'	59.5'
5 6	253° 52.6 268° 52.8	57.3 N13°56.6	190°58.0 205°25.0	8.0' 7.9'	16°18.5 \$16°29.6	11.2' 11.0'	59.5' 59.5'
7	283° 52.9	55.8	203°23.0° 219°51.9	7.9'	16°40.7	10.9'	59.5'
8	298°53.0	55.0	234°18.8	7.8'	16°51.6	10.8'	59.5'
9	313°53.1	• • 54.2	248°45.6	7.8'	17°02.4	10.7'	59.5'
10 11	328° 53.3 343° 53.4	53.4 52.6	263°12.3 277°39.0	7.7' 7.7'	17°13.2 17°23.8	10.6' 10.5'	59.5' 59.5'
12	358° 53.5	N13°51.9	292°05.7	7.6'	S17°34.3	10.4	59.4'
13	13°53.6	51.1	306°32.3	7.5'	17°44.7	10.3'	59.4'
14	28° 53.8 43° 53.9	50.3 •• 49.5	320°58.8 335°25.3	7.5' 7.4'	17°55.0 18°05.1	10.2' 10.0'	59.4' 59.4'
15 16	43 53.9 58° 54.0	48.7	335 25.3 349°51.8	7.4 7.4'	18 05.1 18°15.2	9.9'	59.4 59.4'
17	73°54.1	47.9	4°18.1	7.3'	18°25.1	9.8'	59.4'
18	88°54.3	N13°47.1	18°44.5	7.3'	518°34.9	9.7'	59.4'
19 20	103°54.4 118°54.5	46.4 45.6	33°10.8 47°37.0	7.2'	18°44.6 18°54.2	9.6' 9.5'	59.4' 59.3'
21	133°54.7	• • 44.8	62°03.2	7.1	10° 03.6	9.3	59.3'
22	148°54.8	44.0	$76^{\circ}29.3$	7.1'	19°13.0	9.2'	59.3'
23	163°54.9	43.2	90°55.4	7.0'	19°22.2	9.1'	59.3'
	SD = 15.8'	d = -0.8'		SI	D = 16.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.0	N13°42.4	105°21.4	7.0'	\$19°31.2	9.0'	59.3'
1	193°55.2	41.6	119°47.4	6.9'	19°40.2	8.8'	59.3'
2 3	208° 55.3 223° 55.4	40.8 • • 40.0	134°13.3 148°39.2	6.9' 6.8'	19°49.0 19°57.7	8.7' 8.6'	59.3' 59.2'
3 4	223°55.4 238°55.6	39.2	148° 39.2 163° 05.0	6.8	19°57.7 20°06.3	8.6° 8.4°	59.2' 59.2'
5	253°55.7	38.5	177°30.8	6.7'	20°14.7	8.3'	59.2'
6	268° 55.8	N13°37.7	191°56.5	6.7'	\$20°23.0	8.2'	59.2'
7 8	283°55.9 298°56.1	36.9 36.1	206°22.2 220°47.9	6.6' 6.6'	20°31.2 20°39.2	8.0' 7.9'	59.2' 59.2'
9	313°56.2	• • 35.3	235°13.5	6.6'	20° 47.1	7.8'	59.2'
10	328° 56.3	34.5	249°39.0	6.5'	$20^{\circ}54.9$	7.6'	59.1'
11	343° 56.5 358° 56.6	33.7 N13°32.9	264°04.5 278°30.0	6.5'	21°02.5 S 21°10.0	7.5'	59.1'
12 13	358°56.6 13°56.7	N13 32.9 32.1	278° 30.0 292° 55.4	6.4' 6.4'	21°17.4	7.4' 7.2'	59.1' 59.1'
14	28°56.9	31.3	307°20.8	6.3'	21°24.6	7.1'	59.1'
15	43°57.0	• • 30.5	321°46.1	6.3'	21°31.7	6.9'	59.1'
16 17	58° 57.1 73° 57.3	29.7 28.9	336°11.4 350°36.7	6.3' 6.2'	21°38.6 21°45.4	6.8' 6.7'	59.1' 59.0'
18	73 57.3 88°57.4	28.9 N13°28.1	5°01.9	6.2	\$21°52.1	6.5	59.0'
19	103°57.5	27.3	19°27.1	6.2'	21°58.6	6.4'	59.0'
20	118° 57.7	26.5	33°52.3	6.1'	22°04.9	6.2'	59.0'
21 22	133° 57.8 148° 57.9	· · 25.7 24.9	48°17.4 62°42.5	6.1' 6.1'	22°11.2 22°17.2	6.1' 5.9'	59.0' 59.0'
23	163°58.1	24.1	77°07.5	6.0'	22°23.2	5.8'	58.9'
	SD = 15.8'	d = -0.8'	-	SI	D = 16.2'		

Lat	Twi	light	Sunrise	Sunset	Twi	light
Lat. N 72° N 70° 68° 660° 60° N 58° 56° 54° 52° 80° N 10° 0° S 10° 20° 30° 35° 40° 45° S 50° 52°	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	02:26	21:37	////	////
N 70°	////	////	02:58	21:07	23:25	////
68°	////	01:46	03:21	20:45	22:17	////
	////	02:22	03:38	20:28	21:42	////
	////	02:48	03:53	20:14	21:18	23:29
	01:34	03:08	04:05	20:02	20:59	22:29
60°	02:07	03:23	04:15	19:52	20:43	21:58
$N 58^{\circ}$	02:31	03:37	04:24	19:44	20:30	21:35
56°	02:49	03:48	04:31	19:36	20:19	21:17
54°	03:04	03:58	04:38	19:29	20:10	21:02
52°	03:17	04:06	04:44	19:23	20:01	20:50
50°	03:28	04:14	04:50	19:18	19:54	20:39
45°	03:51	04:30	05:02	19:06	19:38	20:17
$N 40^{\circ}$	04:08	04:43	05:12	18:56	19:25	20:00
35°	04:21	04:53	05:20	18:48	19:15	19:47
	04:32	05:02	05:28	18:41	19:06	19:36
20°	04:50	05:17	05:40	18:29	18:51	19:18
N 10°	05:04	05:29	05:51	18:18	18:39	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:24	05:49	06:11	17:58	18:20	18:44
20°	05:33	05:59	06:22	17:48	18:10	18:36
30°	05:41	06:09	06:33	17:36	18:00	18:29
35°	05:44	06:14	06:40	17:29	17:55	18:25
40°	05:48	06:20	06:48	17:21	17:49	18:21
45°	05:52	06:26	06:57	17:13	17:43	18:18
S 50°	05:56	06:34	07:08	17:02	17:36	18:14
52°	05:58	06:37	07:13	16:57	17:32	18:12
54°	05:59	06:41	07:18	16:52	17:29	18:10
56°	06:01	06:45	07:24	16:45	17:25	18:09
58°	06:03	06:49	07:31	16:39	17:21	18:07
S 60°	06:05	06:54	07:39	16:31	17:16	18:05
		Moonris	e		Moonset	+

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

1			Sun		Moon				
	Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
-	,	00 ^h	12 ^h	Pass	Upper	Lower	4-6		
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-41%		
	14	04:43	04:38	12:05	15:47	03:21			
ı	15	04:32	04:26	12:04	16:42	04:14			
	16	04:20	04:14	12:04	17:39	05:10			

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

h	Aries		nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	325°39.8	144°01.0	S00°01.3	112°37.8	S14°10.0	123°57.6	S07°54.1	272°47.6	N16°43.1			
1	340°42.2	159°00.9	02.6	127°38.8	10.6	138°59.7	54.3	287°49.9	43.1	Alpheratz	357°30.5	29°15.4
2	355°44.7	174°00.7	03.9	142°39.7	11.1	154°01.8	54.4	302°52.3	43.1	Ankaa	353°03.3	-42°08.4
3	10°47.1	189°00.5	05.2	157°40.7	. 11.6	169°03.9	• • 54.6	317°54.7	• • 43.1	Schedar	349°26.2	56°41.9
4	25°49.6	204°00.3	06.5	172°41.7	12.2	184°06.0	54.7	332°57.0	43.1	Diphda	348°43.4	-17°49.2
5	40°52.1	219°00.1	07.8	187°42.7	12.7	199°08.1	54.9	347°59.4	43.2	Achernar	335°17.3	-57°04.8
6	55°54.5	233°59.9	S00°09.1	202°43.7	\$14°13.2	214° 10.2	S07°55.0	3°01.8	N16°43.2	Hamal	327°46.8	23°36.2
7	70°57.0	248°59.7	10.4	217°44.6	13.8	229° 12.3	55.2	18°04.2	43.2	Polaris	311°54.7	89°22.9
8	85°59.5	263°59.5	11.7	232°45.6	14.3	244° 14.4	55.4	33°06.5	43.2	Acamar	315°09.0	-40°10.9
9	101°01.9	278° 59.3	12.9	247°46.6	• • 14.9	259° 16.5	• • 55.5	48°08.9	• • 43.2	Menkar	314°02.2	4°12.4
10	116°04.4	293°59.2	14.2	262°47.6	15.4	274°18.6	55.7	63°11.3	43.2	Mirfak	308°22.8	49°57.7
11	131°06.9	308° 59.0	15.5	277°48.6	15.9	289° 20.7	55.8	78°13.6	43.2	Aldebaran	290°35.4	16°34.0
12	146°09.3	323°58.8	S00°16.8	292°49.5	\$14°16.5	304°22.8	S07°56.0	93°16.0	N16°43.3	Rigel	281°00.4	-8°10.0
13	161°11.8	338°58.6	18.1	307°50.5	17.0	319°24.9	56.1	108°18.4	43.3	Capella	280°16.6	46°01.4
14	176°14.3	353°58.4	19.4	322°51.5	17.6	334°27.0	56.3	123°20.8	43.3	Bellatrix	278°19.0	6°22.5
15	191°16.7	8°58.2	20.7	337°52.5	• • 18.1	349°29.1	56.4	138°23.1	• • 43.3	Elnath	277°57.3	28°37.8
16	206°19.2	23°58.0	22.0	352°53.5	18.6	4°31.2	56.6	153°25.5	43.3	Alnilam	275°34.1	-1°11.0
17	221°21.6	38° 57.8	23.2	7°54.4	19.2	19°33.3	56.7	168°27.9	43.3	Betelgeuse	270°48.2	7°24.7
18	236°24.1	53°57.6	S00°24.5	22°55.4	\$14°19.7	34°35.4	S07°56.9	183°30.3	N16°43.3	Canopus	263°51.1	-52°42.5
19	251°26.6	68° 57.5	25.8	37°56.4	20.3	49°37.5	57.0	198°32.6	43.3	Sirius	258°23.2	-16°45.4
20	266°29.0	83°57.3	27.1	52°57.4	20.8	64°39.6	57.2	213°35.0	43.4	Adhara	255°03.2	-29°00.7
21	281°31.5	98° 57.1	28.4	67°58.3	• • 21.3	79°41.7	• • 57.3	228°37.4	• • 43.4	Procyon	244°47.2	5°08.9
22	296°34.0	113°56.9	29.7	82°59.3	21.9	94°43.8	57.5	243°39.8	43.4	Pollux	243°13.1	27°57.1
23	311°36.4	113° 56.3° 128° 56.7	31.0	98°00.3	22.4	109°45.9	57.6	258°42.1	43.4	Avior	234°13.7	-59°36.3
					_					Suhail	222°43.9	-43°33.2
Mer.p	ass. 02:17	ν -0.2' d1	.3′ m-3.97	ν 1.0′ d0	.5′ m0.79	$\nu 2.1' \ d0.$	2′ m-1.81	ν 2.4′ d0	.0′ m0.17	Miaplacidus	221°38.2	-69°50.4
										Alphard	217°44.4	-8°47.3
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	326°38.9	143°56.5	S00°32.3	113°01.3	S14°22.9	124°48.0	S07°57.8	273°44.5	N16°43.4	Dubhe	193°37.3	61°35.5
1	341°41.4	158° 56.3	33.6	128°02.2	23.5	139°50.1	57.9	288°46.9	43.4	Denebola	182°21.5	14°24.4
2	356°43.8	173°56.1	34.8	143°03.2	24.0	154°52.2	58.1	303°49.3	43.4	Gienah	175°40.0	-17°42.5
3	11°46.3	188° 56.0	36.1	158°04.2	• • 24.6	169°54.3	58.3	318°51.6	• • 43.4	Acrux	172°56.2	-63°16.0
4	26°48.8	203°55.8	37.4	173°05.2	25.1	184°56.4	58.4	333°54.0	43.4	Gacrux	171°47.7	-57°17.0
5	41°51.2	218°55.6	38.7	188°06.1	25.6	199°58.5	58.6	348°56.4	43.5	Alioth	166°10.3	55°48.1
6	56°53.7	233°55.4	S00°40.0	203°07.1	S14°26.2	215°00.6	S07°58.7	3°58.8	N16°43.5	Spica	158°18.5	-11°19.0
7	71°56.1	248°55.2	41.3	218°08.1	26.7	230°02.7	58.9	19°01.1	43.5	Alkaid	152°49.4	49°10.2
8	86°58.6	263°55.0	42.6	233°09.1	27.2	245°04.8	59.0	34°03.5	43.5	Hadar	148°30.7	-60°31.2
9	102°01.1	278° 54.8	• • 43.9	248° 10.0	• • 27.8	260°06.9	59.2	49°05.9	• • 43.5	Menkent	147°53.3	-36°31.0
10	117°03.5	293°54.7	45.2	263°11.0	28.3	275°09.0	59.3	64°08.3	43.5	Arcturus	145°44.7	19°01.9
11	132°06.0	308° 54.5	46.4	278° 12.0	28.9	290°11.0	59.5	79°10.7	43.5	Rigil Kent.	139°35.1	-60°57.7
12	147°08.5	323°54.3	S00°47.7	293°12.9	S14°29.4	305°13.1	S07°59.6	94°13.0	N16°43.5	Kochab	137°20.4	74°02.3
13	162°10.9	338°54.1	49.0	308° 13.9	29.9	320° 15.2	59.8	109°15.4	43.6	Zuben'ubi	136°51.9	-16°09.9
14	177°13.4	353°53.9	50.3	323°14.9	30.5	335°17.3	07°59.9	124°17.8	43.6	Alphecca	126°00.6	26°37.2
15	192°15.9	8°53.7	51.6	338° 15.9	• • 31.0	350° 19.4	08°00.1	139°20.2	• • 43.6	Antares	112°11.1	-26°29.8
16	207°18.3	23°53.5	52.9	353°16.8	31.5	5°21.5	00.2	154°22.5	43.6	Atria	107°01.7	-69°04.9
17	222°20.8	38°53.4	54.2	8°17.8	32.1	20°23.6	00.4	169°24.9	43.6	Sabik	101°58.4	-15°45.5
18	237°23.3	53°53.2	S00°55.5	23°18.8	S14°32.6	35°25.7	508°00.6	184°27.3	N16°43.6	Shaula	96°05.1	-37°07.4
19	252°25.7	68°53.0	56.8	38° 19.7	33.2	50° 27.8	00.7	199°29.7	43.6	Rasalhague	95°54.9	12°32.6
20	267°28.2	83°52.8	58.0	53°20.7	33.7	65°29.9	00.9	214°32.1	43.6	Eltanin	90°40.1	51°29.5
21	282°30.6	98°52.6	00°59.3	68°21.7	• • 34.2	80°32.0	• • 01.0	229°34.4	• • 43.6	Kaus Aust.	83°27.3	-34°22.1
22	297°33.1	113°52.4	01°00.6	83°22.6	34.8	95°34.1	01.2	244°36.8	43.7	Vega	80°30.4	38°49.0
23	312°35.6	128°52.3	01.9	98°23.6	35.3	110°36.2	01.3	259°39.2	43.7	Nunki	75°42.9	-26°15.4
										Altair	61°56.0	8°57.1
Mer.p	oass. 02:13	ν -0.2' d1	.3′ m-3.97	ν 1.0' d0	.5′ m0.80	ν 2.1′ d0.	2′ m-1.81	$\nu^{2.4'} d0$.0′ m0.16	Peacock Deneb	52°59.4 49°22.7	-56°38.2 45°23.4
											33°34.8	45°23.4 10°00.9
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33 34.8 27°27.9	-46°48.8
0	327°38.0	143°52.1	501°03.2	113°24.6	S14°35.8	125°38.3	S08°01.5	274°41.6	N16°43.7	Fomalhaut	27 27.9 15°10.1	-40 48.8 -29°27.6
1	342°40.5	158° 51.9	04.5	128°25.5	36.4	140°40.4	01.6	289°44.0	43.7	Scheat	13°41.2	-29 27.6 28°14.8
2	357°43.0	173°51.7	05.8	143°26.5	36.9	155°42.4	01.8	304°46.3	43.7	Markab	13°25.8	26 14.6 15°22.1
3	12°45.4	188°51.5	07.1	158° 27.5	37.4	170°44.5	01.9	319°48.7	• • 43.7	iviarkab	13 23.6	13 22.1
4	27°47.9	203°51.3	08.3	173°28.4	38.0	185°46.6	02.1	334°51.1	43.7	Aug 17 Fri	SHA	Mer.pass
5	42°50.4	218°51.1	09.6	188°29.4	38.5	200°48.7	02.3	349°53.5	43.7	Venus	$178^{\circ}21.3$	14:24
6	57°52.8	233°51.0	501°10.9	203°30.4	S14°39.0	215°50.8	S08°02.4	4°55.9	N16°43.7	Mars	146°58.0	16:28
7	72°55.3	248°50.8	12.2	218°31.3	39.6	230°52.9	02.6	19°58.2	43.8	Jupiter	158°17.9	15:42
8	87°57.7	263°50.6	13.5	233°32.3	40.1	245°55.0	02.7	35°00.6	43.8	Saturn	307°07.8	05:48
9	103°00.2	278°50.4	• • 14.8	248°33.2	• • 40.7	$260^{\circ}57.1$	•• 02.9	50°03.0	• • 43.8	A 10 C :	CIIA	Me:::-
10	118°02.7	293°50.2	16.1	263°34.2	41.2	275°59.2	03.0	65°05.4	43.8	Aug 18 Sat	SHA 177°17 6	Mer.pass
11	133°05.1	308°50.0	17.4	278°35.2	41.7	291°01.3	03.2	80°07.8	43.8		177°17.6	14:24
12	148°07.6	323°49.9	S01°18.7	293°36.1	S14°42.3	306°03.4	S08°03.3	95°10.2	N16°43.8	Mars	146°22.4	16:27
13	163°10.1	338°49.7	19.9	308°37.1	42.8	321°05.4	03.5	110°12.5	43.8	Jupiter	158°09.1	15:39
14	178°12.5	353°49.5	21.2	323°38.1	43.3	$336^{\circ}07.5$	03.6	125°14.9	43.8	Saturn	307°05.6	05:44
15	193°15.0	8°49.3	• • 22.5	338°39.0	• • 43.9	351°09.6	• • 03.8	140°17.3	• • 43.8	Aug 19 Sun	SHA	Mer.pass
16	208°17.5	23°49.1	23.8	353°40.0	44.4	$6^{\circ}11.7$	04.0	155°19.7	43.8		176°14.0	14:25
17	223°19.9	38°48.9	25.1	8°40.9	44.9	21° 13.8	04.1	170°22.1	43.9		145°46.5	16:25
18	238°22.4	53° 48.8	501°26.4	23°41.9	S14°45.5	36° 15.9	S08°04.3	185°24.4	N16°43.9		158°00.2	15:35
19	253°24.9	68°48.6	27.7	38°42.9	46.0	51°18.0	04.4	200°26.8	43.9	Saturn	307°03.5	05:40
20	268°27.3	83°48.4	29.0	53°43.8	46.5	66° 20.1	04.6	215°29.2	43.9			
21	283°29.8	98°48.2	• • 30.3	68°44.8	• • 47.1	81°22.2	• • 04.7	230°31.6	• • 43.9	Horizont	tal parallax	
22	298°32.2	113°48.0	31.5	83°45.7	47.6	96°24.2	04.9	245°34.0	43.9		Venus:	0.1
23	313°34.7	128°47.9	32.8	98°46.7	48.1	111°26.3	05.0	260°36.4	43.9		Mars:	0.1
Mern	ass. 02:09	ν -0.2' d1	.3′ m-3.98	$\nu 1.0' d0$.5′ m0.80	ν 2.1' d0	2′ m-1.81	$\nu^{2.4'} d0$.0′ m0.16			

	6.10.0	+0.1300 sec	Моор					
h	Su	n 			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°58.2 193°58.3	N13°23.3 22.5	91°32.6 105°57.5	6.0' 6.0'	\$22°28.9 22°34.6	5.6'	58.9'	
1 2	193 58.3 208°58.5	22.5 21.7	105 57.5 120°22.5	5.9'	22°40.1	5.5' 5.3'	58.9' 58.9'	
3	223°58.6	20.9	134°47.4	5.9'	22°45.4	5.2'	58.9'	
4	238°58.7	20.1	149°12.3	5.9'	22°50.6	5.0'	58.9'	
5	253°58.9	19.3	163°37.2	5.9'	22°55.6	4.9'	58.8'	
6	268°59.0	N13° 18.5	178°02.1	5.8'	\$23°00.5	4.7'	58.8'	
7 8	283°59.1 298°59.3	17.7 16.9	192°26.9 206°51.7	5.8' 5.8'	23°05.3 23°09.9	4.6' 4.4'	58.8' 58.8'	
9	313°59.4	. 16.1	221°16.5	5.8'	23°14.3	4.3'	58.8	
10	328°59.5	15.3	235°41.3	5.8'	23°18.6	4.1'	58.7'	
11	343°59.7	14.5	250°06.0	5.7'	23°22.7	4.0'	58.7'	
12	358°59.8 13°59.9	N13°13.7	264°30.8 278°55.5	5.7'	\$23°26.7	3.8'	58.7'	
13 14	13 59.9 29°00.1	12.9 12.1	278 55.5 293°20.2	5.7' 5.7'	23°30.5 23°34.2	3.7' 3.5'	58.7' 58.7'	
15	44°00.2	. 11.3	307°44.9	5.7'	23°37.7	3.4'	58.7	
16	59°00.4	10.5	$322^{\circ}09.6$	5.7'	23°41.0	3.2'	58.6'	
17	74°00.5	09.7	336°34.2	5.7'	23°44.3	3.1'	58.6'	
18 19	89°00.6 104°00.8	N13°08.9 08.1	350°58.9 5°23.6	5.7' 5.7'	\$23°47.3 23°50.2	2.9' 2.7'	58.6' 58.6'	
20	104 00.8 119°00.9	07.3	5 23.0 19°48.2	5.6'	23°52.9	2.6'	58.6'	
21	134°01.1	06.5	34°12.9	5.6'	23°55.5	2.4'	58.6	
22	149°01.2	05.7	48°37.5	5.6'	23°58.0	2.3'	58.5'	
23	164°01.3	04.9	63°02.2	5.6'	24°00.2	2.1'	58.5'	
	SD = 15.8'	d = -0.8'		SI	O = 16.1'			
Sat	GHA	Dec	GHA	ν	Dec	d	НР	
0	179°01.5	N13°04.1	$77^{\circ}26.8$	5.7'	\$24°02.4	2.0'	58.5	
1	194°01.6	03.3	91°51.5	5.7'	24°04.3	1.8'	58.5	
2	209°01.7	02.5	106°16.1	5.7'	24°06.1	1.7'	58.5'	
3 4	224°01.9 239°02.0	· · 01.6 00.8	120°40.8 135°05.4	5.7' 5.7'	24°07.8 24°09.3	1.5' 1.3'	58.4' 58.4'	
5	254°02.2	13°00.0	149°30.1	5.7'	24° 10.6	1.2'	58.4	
6	269°02.3	N12°59.2	163°54.8	5.7'	S24°11.8	1.0'	58.4'	
7	284°02.5	58.4	178°19.5	5.7'	24°12.8	0.9'	58.4'	
8 9	299°02.6 314°02.7	57.6 •• 56.8	192°44.2 207°08.9	5.7' 5.7'	24°13.7 24°14.4	0.7' 0.6'	58.3' 58.3'	
10	329°02.9	56.0	201 06.9 221°33.7	5. <i>1</i> 5.8'	24 14.4 24°15.0	0.6	58.3'	
11	344°03.0	55.2	235°58.4	5.8'	24° 15.4	0.3	58.3	
12	359°03.2	N12°54.4	250°23.2	5.8'	S24°15.6	0.1'	58.3'	
13	14°03.3	53.5	264°48.0	5.8'	24° 15.7	-0.1'	58.3'	
14 15	29°03.4 44°03.6	52.7 •• 51.9	279°12.8 293°37.7	5.8' 5.9'	24° 15.7 24° 15.5	-0.2' -0.4'	58.2' 58.2'	
16	59°03.7	51.1	308°02.5	5.9'	24° 15.1	-0.5	58.2	
17	74°03.9	50.3	$322^{\circ}27.4$	5.9'	$24^{\circ}14.6$	-0.7'	58.2'	
18	89°04.0	N12°49.5	336°52.4	6.0'	\$24°13.9	-0.8'	58.2'	
19 20	104°04.2 119°04.3	48.7 47.8	351°17.3 5°42.3	6.0' 6.0'	24°13.1 24°12.1	-1.0' -1.1'	58.1' 58.1'	
21	134°04.4	• • 47.0	5 42.3 20°07.4	6.1	24 12.1 24°11.0	-1.1 -1.3'	58.1	
22	149°04.6	46.2	34°32.4	6.1'	24°09.7	-1.4	58.1	
23	164°04.7	45.4	48°57.5	6.1'	24°08.3	-1.6'	58.1'	
	SD = 15.8'	d = -0.8'		SI	O = 16.0'			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°04.9	N12°44.6	63°22.6	6.2'	\$24°06.7	-1.7'	58.0'	
1	194°05.0	43.8	77°47.8	6.2'	24°05.0	-1.9'	58.0'	
2	209°05.2 224°05.3	43.0 •• 42.1	92°13.0 106°38.3	6.3'	24°03.1 24°01.1	-2.0'	58.0' 58.0'	
3 4	224°05.3 239°05.5	· · 42.1 41.3	106°38.3 121°03.6	6.3' 6.3'	24°01.1 23°58.9	-2.2' -2.3'	58.0°	
5	254°05.6	40.5	135°28.9	6.4	23°56.6	-2.5'	57.9	
6	269°05.8	N12°39.7	149°54.3	6.4'	\$23°54.1	-2.6'	57.9'	
7	284°05.9	38.9	164°19.7	6.5'	23°51.5	-2.8'	57.9'	
8	299°06.0 314°06.2	38.0 •• 37.2	178°45.2 193°10.7	6.5' 6.6'	23°48.7 23°45.8	-2.9' -3.1'	57.9' 57.9'	
10	329°06.3	36.4	207°36.3	6.6'	23°42.8	-3.1	57.8'	
11	344°06.5	35.6	222°02.0	6.7'	23°39.6	-3.3'	57.8'	
12	359°06.6	N12°34.8	236°27.6	6.7'	\$23°36.2	-3.5'	57.8'	
13 14	14°06.8 29°06.9	33.9 33.1	250°53.4 265°19.2	6.8' 6.9'	23°32.7 23°29.1	-3.6' -3.8'	57.8' 57.8'	
15	44°07.1	32.3	205 19.2 279°45.0	6.9	23°25.4	-3.0 -3.9'	57.6 57.7'	
16	59°07.2	31.5	294°11.0	7.0'	23°21.5	-4.0'	57.7'	
17	74°07.4	30.7	308°36.9	7.0'	23°17.4	-4.2'	57.7'	
18 19	89°07.5 104°07.7	N12°29.8 29.0	323°03.0 337°29.1	7.1' 7.2'	\$23°13.3 23°08.9	-4.3' -4.4'	57.7' 57.7'	
20	104 07.7 119°07.8	29.0	351°55.2	7.2'	23 08.9 23°04.5	-4.4 -4.6'	57.7 57.6'	
21	134°08.0	• • 27.4	6°21.4	7.3'	22°59.9	-4.7'	57.6	
22	149°08.1	26.6	20°47.7	7.4'	22°55.2	-4.9'	57.6'	
23	164°08.3	25.7	35°14.1	7.4'	22°50.3	-5.0'	57.6'	
	SD = 15.8'	d = -0.8'		SI	O = 15.8'			

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

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

		Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	53-74%	
17	04:07	04:01	12:04	18:38	06:08		
18	03:54	03:47	12:04	19:36	07:07		
19	03:40	03:33	12:04	20:34	08:05		

August 20, 21, 22 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	328°37.2	143°47.7	S01°34.1	113°47.7	S14°48.7	126°28.4	S08°05.2	275°38.8	N16°43.9			
1	343°39.6	143 47.7 158°47.5	35.4	113 47.7 128°48.6	49.2	120 20.4 141°30.5	05.4	275 36.6 290°41.1	43.9	Alpheratz	357°30.5	29° 15.4
2	358° 42.1	173° 47.3	36.7	143°49.6	49.2 49.7	141 30.5 156°32.6	05.4	305°43.5	43.9	Ankaa	353°03.3	-42°08.4
3	13°44.6	173 47.3 188°47.1	• • 38.0	158°50.5	50.3	171°34.7	05.7	320°45.9	• • 44.0	Schedar	349°26.1	56°42.0
4	28°47.0	203°46.9	39.3	173°51.5	50.8	171 34.7 186°36.8	05.8	335°48.3	44.0	Diphda	348°43.4	-17°49.2
5	43°49.5	203 40.9 218°46.8	40.6	173 51.5 188°52.4	51.3	201°38.9	06.0	350°50.7	44.0	Achernar	335°17.3	-57°04.8
6	58° 52.0	233°46.6	S01°41.9	203°53.4	\$14°51.9	216°40.9	S08°06.1	5°53.1	N16°44.0	Hamal	327°46.8	23°36.2
7	73°54.4	248°46.4	43.1	218°54.3	52.4	231°43.0	06.3	20°55.4	44.0	Polaris	311°52.9	89°22.9
8	88°56.9	263°46.2	44.4	233°55.3	52.9	246°45.1	06.4	35°57.8	44.0	Acamar	315°08.9	-40° 10.9
9	103°59.4	278°46.0	• • 45.7	248°56.3	• • 53.5	261°47.2	06.6	51°00.2	• • 44.0	Menkar	314°02.2	4°12.4
10	119°01.8	293°45.9	47.0	263°57.2	54.0	276°49.3	06.8	66°02.6	44.0	Mirfak	308°22.7	49°57.8
11	134°04.3	308°45.7	48.3	278°58.2	54.5	291°51.4	06.9	81°05.0	44.0	Aldebaran	290°35.4	16°34.1
12	149°06.7	323°45.5	S01°49.6	293°59.1	\$14°55.1	306°53.5	S08°07.1	96°07.4	N16°44.0	Rigel	281°00.4	-8°10.0
13	164°09.2	338°45.3	50.9	309°00.1	55.6	321°55.6	07.2	111°09.8	44.1	Capella	280°16.5	46°01.4
14	179° 11.7	353°45.1	52.2	324°01.0	56.1	336°57.6	07.4	126°12.1	44.1	Bellatrix	278°19.0	6°22.6
15	194° 14.1	8°44.9	• • 53.4	339°02.0	56.7	351°59.7	• • 07.5	141°14.5	• • 44.1	Elnath	277°57.3	28° 37.8
16	209° 16.6	23°44.8	54.7	354°02.9	57.2	7°01.8	07.7	156°16.9	44.1	Alnilam	275°34.1	-1°11.0
17	224° 19.1	38°44.6	56.0	9°03.9	57.7	22°03.9	07.9	171°19.3	44.1	Betelgeuse	270°48.2	7°24.7
18	239°21.5	53°44.4	S01°57.3	24°04.8	S14°58.3	37°06.0	S08°08.0	186°21.7	N16°44.1	Canopus	263°51.1	-52°42.5
19	254°24.0	68°44.2	58.6	39°05.8	58.8	52°08.1	08.2	201°24.1	44.1	Sirius	258°23.2	-16°45.4
20	269° 26.5	83°44.0	01°59.9	54°06.7	59.3	67°10.2	08.3	216°26.5	44.1	Adhara	255°03.2	-29°00.7
21	284°28.9	98°43.9	02°01.2	69°07.7	14°59.9	82°12.2	• • 08.5	231°28.9	• • 44.1	Procyon	244°47.2	5°08.9
22	299°31.4	113°43.7	02.5	84°08.6	15°00.4	97°14.3	08.6	246°31.2	44.1	Pollux	243°13.1	27°57.1
23	314°33.9	128°43.5	03.7	99°09.6	00.9	112°16.4	08.8	261°33.6	44.1	Avior	234°13.7	-59°36.2
										Suhail	222°43.9	-43°33.2
Mer.p	ass. 02:05	ν -0.2′ $d1$.	.3′ m-3.98	ν 1.0′ d0	.5′ m0.81	$\nu 2.1' d0.$	2′ m-1.80	$\nu^{2.4'} d0$.0′ m0.15	Miaplacidus	221°38.2	-69°50.4
										Alphard	217°44.4	-8°47.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	329°36.3	143°43.3	S02°05.0	114°10.5	S15°01.5	127°18.5	S08°09.0	276°36.0	N16°44.2	Dubhe	193°37.3	61°35.5
1	344°38.8	158°43.1	06.3	129°11.5	02.0	142°20.6	09.1	291°38.4	44.2	Denebola	182°21.5	14°24.4
2	359°41.2	173°43.0	07.6	144°12.4	02.5	157°22.7	09.3	306°40.8	44.2	Gienah	175°40.0	-17°42.4
3	14°43.7	188°42.8	• • 08.9	159°13.4	03.1	172°24.7	• • 09.4	321°43.2	• • 44.2		172°56.2	-63°16.0
4	29°46.2	203°42.6	10.2	174°14.3	03.6	187°26.8	09.6	336°45.6	44.2	1	171°47.7	-57°17.0
5	44°48.6	218°42.4	11.5	189°15.3	04.1	202°28.9	09.7	351°48.0	44.2	Alioth	166°10.3 158°18.5	55°48.1 -11°19.0
6	59°51.1	233°42.2	S02°12.8	204°16.2	S15°04.6	217°31.0	508°09.9	6°50.4	N16°44.2	Spica	158 18.5 152°49.4	-11 19.0 49°10.1
7	74°53.6	248°42.1	14.0	219°17.2	05.2	232°33.1	10.1	21°52.7	44.2	Alkaid Hadar	152 49.4 148°30.7	-60°31.2
8	89°56.0	263°41.9	15.3	234°18.1	05.7	247°35.2	10.2	$36^{\circ}55.1$	44.2		146 50.7 147°53.3	-36°31.0
9	104°58.5	278°41.7	• • 16.6	249°19.1	• • 06.2	262°37.2	• • 10.4	51°57.5	• • 44.2	Arcturus	147 55.5 145°44.7	19°01.9
10	120°01.0	293°41.5	17.9	264°20.0	06.8	277°39.3	10.5	66°59.9	44.2	Rigil Kent.	139°35.2	-60°57.7
11	135°03.4	308°41.3	19.2	279°21.0	07.3	292°41.4	10.7	82°02.3	44.3	Kochab	139° 33.2 137° 20.5	74°02.3
12	150°05.9	323°41.2	S02°20.5	294°21.9	S15°07.8	307°43.5	S08°10.8	97°04.7	N16°44.3	Zuben'ubi	136°51.9	-16°09.9
13	165°08.3	338°41.0	21.8	309°22.8	08.4	322°45.6	11.0	$112^{\circ}07.1$	44.3	Alphecca	126°00.6	26°37.2
14	$180^{\circ}10.8$	353°40.8	23.1	324°23.8	08.9	337°47.7	11.2	127°09.5	44.3	Antares	112° 11.1	-26°29.8
15	195° 13.3	8°40.6	• • 24.3	339°24.7	• • 09.4	352°49.7	• • 11.3	142°11.9	• • 44.3	Atria	107°01.7	-20°29.8 -69°04.9
16	210° 15.7	23°40.4	25.6	354°25.7	10.0	7°51.8	11.5	157°14.3	44.3	Sabik	101°58.4	-15°45.5
17	225° 18.2	38°40.3	26.9	9°26.6	10.5	22°53.9	11.6	$172^{\circ}16.7$	44.3	Shaula	96°05.1	-37°07.4
18	240°20.7	53°40.1	S02°28.2	24°27.6	S15°11.0	37°56.0	508°11.8	$187^{\circ}19.0$	N16°44.3	Rasalhague	95°54.9	12°32.6
19	255°23.1	68°39.9	29.5	39°28.5	11.5	52°58.1	11.9	202°21.4	44.3	Eltanin	90°40.2	51°29.5
20	270°25.6	83°39.7	30.8	54°29.4	12.1	68°00.1	12.1	217°23.8	44.3	Kaus Aust.	83°27.3	-34°22.1
21	285°28.1	98°39.5	• • 32.1	69°30.4	•• 12.6	83°02.2	• • 12.3	232°26.2	• • 44.3	Vega	80°30.4	38°49.0
22	300°30.5	113°39.4	33.3	84°31.3	13.1	98°04.3	12.4	247°28.6	44.3	Nunki	75°42.9	-26° 15.4
23	315°33.0	128°39.2	34.6	99°32.3	13.7	113°06.4	12.6	262°31.0	44.4	Altair	61°56.0	8°57.1
Mern	ass. 02:01	u_0 2′ d1	.3′ m-3.99	ν0 0' d0	.5′ m0.81	v2 1' d0	2′ m-1.80	1/2 A' d0	.0′ m0.15	Peacock	52°59.4	-56°38.2
- IVICI.P	a33. U2.U1	ν-0.2 α1.	.5 111-5.99	νο.σ do	.5 1110.01	ν2.1 do.	2 111-1.00	ν2. τ ασ	.0 1110.13	Deneb	49°22.7	45° 23.5
										Enif	33°34.8	10°00.9
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	330° 35.5	143°39.0	502°35.9		S15°14.2	128°08.5	S08°12.7	277°33.4	N16°44.4	Fomalhaut	15°10.1	-29°27.6
1	345°37.9	158°38.8	37.2	129°34.2	14.7	143°10.5	12.9	292°35.8	44.4	Scheat	13°41.2	28° 14.8
2	0°40.4	173°38.7	38.5	144°35.1	15.2	158°12.6	13.0	307°38.2	44.4	Markab	13°25.8	15°22.1
3	15°42.8	188°38.5	• • 39.8	159°36.0	• • 15.8	173°14.7	• • 13.2	322°40.6	• • 44.4			
4	30°45.3	203°38.3	41.1	174°37.0	16.3	188°16.8	13.4	337°43.0	44.4	Aug 20 Mon	SHA	Mer.pass
5	45°47.8	218°38.1	42.3	189°37.9	16.8	203°18.9	13.5	352°45.4	44.4		175°10.5	14:25
6	60°50.2	233°37.9	S02°43.6	204°38.8	S15°17.4	218°20.9	S08°13.7	7°47.8	N16°44.4	1	145°10.5	16:24
7	75° 52.7	248°37.8	44.9	219°39.8	17.9	233°23.0	13.8	22°50.2	44.4		157°51.2	15:32
8	90°55.2	263°37.6	46.2	234°40.7	18.4	248°25.1	14.0	37°52.6	44.4	Saturn	307°01.6	05:37
9	105°57.6	278°37.4	• • 47.5	249°41.7	• • 19.0	263°27.2	• • 14.2	52°54.9	• • 44.4	Aug 21 Tue	SHA	Mer.pass
10	121°00.1	293°37.2	48.8	264°42.6	19.5	278°29.3	14.3	67°57.3	44.4	-	174°07.0	14:25
11	136°02.6	308°37.0	50.1	279°43.5	20.0	293°31.3	14.5	82°59.7	44.4		144°34.2	16:22
12	151°05.0	323°36.9	S02°51.3	294°44.5	S15°20.5	308°33.4	S08°14.6	98°02.1	N16°44.5	1	157°42.2	15:29
13	166°07.5	338°36.7	52.6	309°45.4	21.1	323°35.5	14.8	113°04.5	44.5	Saturn	306°59.7	05:33
14	181°10.0	353°36.5	53.9	324°46.3	21.6	338°37.6	14.9	128°06.9	44.5			
15	196° 12.4	8°36.3	• • 55.2	339°47.3	• • 22.1	353°39.7	•• 15.1	143°09.3	• • 44.5	Aug 22 Wed	SHA	Mer.pass
16	211° 14.9	23°36.1	56.5	354°48.2	22.6	8°41.7	15.3	158°11.7	44.5		173°03.6	14:26
17	226° 17.3	38°36.0	57.8	9°49.2	23.2	23°43.8	15.4	173°14.1	44.5	Mars	143°57.8	16:21
18	241°19.8	53°35.8	S02°59.1		S15°23.7	38°45.9	S08°15.6	188°16.5	N16°44.5		157°33.0	15:25
19	256°22.3	68°35.6	03°00.3	39°51.0	24.2	53°48.0	15.7	203°18.9	44.5	Saturn	306°57.9	05:29
20	271°24.7	83°35.4	01.6	54°52.0	24.8	68°50.0	15.9	218°21.3	44.5		-1 "	
21	286°27.2	98°35.3	• • 02.9	69°52.9	• • 25.3	83°52.1	• • 16.1	233°23.7	• • 44.5	Horizont	al parallax	0.1
22	301°29.7	113°35.1	04.2	84°53.8	25.8	98°54.2	16.2	248°26.1	44.5		Venus:	0.1
23	316°32.1	128°34.9	05.5	99°54.8	26.3	113°56.3	16.4	263°28.5	44.5		Mars:	0.1
Mern	ass. 01:57	ν -0.2' d1.	.3′ m-3 99	ν0 9' d0	.5′ m0.82	ν2 1' dΩ	2′ m-1.80	ν2 4' dΩ	.0′ m0.14			
				- 3.5 40								

h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.4	N12°24.9	49°40.5	7.5'	\$22°45.4	-5.1'	57.6
1	194°08.6	24.1	64°07.0	7.6'	22°40.2	-5.2'	57.5
2	209°08.7	23.3	78° 33.5	7.6'	22°35.0	-5.4	57.5
3	224°08.9	22.4	93°00.2	7.7'	22°29.6	-5.5'	57.5
4	239°09.0	21.6	107° 26.8	7.8'	22°24.1	-5.6'	57.5
5	254°09.2	20.8	121°53.6	7.8'	22°18.5	-5.8'	57.5
6	269°09.3	N12°20.0	136° 20.4	7.9'	S22°12.7	-5.9'	57.4
7	284°09.5	19.1	150°47.3	8.0'	22°06.9	-6.0'	57.4
8	299°09.6	18.3	165°14.3	8.0'	22°00.9	-6.1'	57.4
9	314°09.8	• • 17.5	179°41.4	8.1'	21°54.7	-6.2'	57.4
10	329°09.9	16.6	194°08.5	8.2'	21°48.5	-6.4'	57.4
11	344°10.1	15.8	208°35.7	8.3'	21°42.1	-6.5'	57.3
12	359°10.2	N12°15.0	223°03.0	8.3'	S21°35.6	-6.6'	57.3
13	14°10.4	14.2	237°30.3	8.4'	21°29.0	-6.7'	57.3
14	29°10.5	13.3	251°57.7	8.5'	$21^{\circ}22.3$	-6.8'	57.3
15	44°10.7	•• 12.5	266°25.2	8.6'	$21^{\circ}15.5$	-7.0'	57.3
16	59°10.8	11.7	280°52.8	8.7'	$21^{\circ}08.5$	-7.1'	57.2
17	74°11.0	10.8	295°20.5	8.7'	21°01.4	-7.2'	57.2
18	89°11.1	N12°10.0	309°48.2	8.8'	S20°54.2	-7.3'	57.2
19	104°11.3	09.2	324°16.0	8.9'	20°47.0	-7.4'	57.2
20	119°11.5	08.4	338°43.9	9.0'	20°39.5	-7.5'	57.1
21	134°11.6	• • 07.5	353°11.9	9.0'	20°32.0	-7.6'	57.1
22	149°11.8	06.7	7°39.9	9.1'	20°24.4	-7.7'	57.1
23	164°11.9	05.9	22°08.0	9.2'	20°16.7	-7.8'	57.1
	SD = 15.8'	d = -0.8'		SI	O = 15.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.1	N12°05.0	36°36.2	9.3'	S20°08.8	-7.9'	57.1
1	194°12.2	04.2	51°04.5	9.4'	20°00.9	-8.0'	57.0
2	209°12.4	03.4	65°32.9	9.4'	19°52.9	-8.1'	57.0
3	224°12.5	• • 02.5	80°01.3	9.5'	19°44.7	-8.2'	57.0
4	239°12.7	01.7	94°29.9	9.6'	19°36.5	-8.3'	57.0
5	254°12.9	00.9	$108^{\circ}58.5$	9.7'	19°28.1	-8.4'	57.0
6	269°13.0	N12°00.0	123°27.2	9.8'	S19°19.7	-8.5'	56.9
7	284°13.2	11°59.2	137°55.9	9.9'	$19^{\circ}11.1$	-8.6'	56.9
8	299°13.3	58.4	152° 24.8	9.9'	19°02.5	-8.7'	56.9
9	314°13.5	• • 57.5	$166^{\circ}53.7$	10.0'	18°53.8	-8.8'	56.9
10	329°13.6	56.7	181°22.7	10.1'	18°44.9	-8.9'	56.9
11	344°13.8	55.9	195°51.8	10.2'	18°36.0	-9.0'	56.8
12	359°13.9	N11°55.0	$210^{\circ}21.0$	10.3'	S18°27.0	-9.1'	56.8
13	14°14.1	54.2	224°50.2	10.3'	18°17.9	-9.2'	56.8
14	29°14.3	53.3	239° 19.6	10.4'	18°08.7	-9.3'	56.8
15	44°14.4	• • 52.5	253°49.0	10.5'	17°59.4	-9.4'	56.8
16	59°14.6	51.7	268° 18.5	10.6'	17°50.1	-9.5'	56.7
17	74°14.7	50.8	282°48.1	10.7'	17°40.6	-9.5'	56.7
18	89°14.9	N11°50.0	297° 17.7	10.7'	\$17°31.1	-9.6'	56.7
19	104°15.1	49.2	311°47.5		17°21.5	-9.7'	56.7
20	119°15.2	48.3	326° 17.3	10.9'	17°11.8	-9.8'	56.7
21	134°15.4 149°15.5	• • 47.5	340°47.2	11.0'	17°02.0	-9.9'	56.6
22		46.6	355° 17.1	11.1'	16°52.1	-9.9'	56.6
23	$\frac{164^{\circ}15.7}{SD = 15.8'}$	$\frac{45.8}{d = -0.8'}$	9°47.2	11.1'	0 = 15.6'	-10.0'	56.6
	$5D = 15.8^{\circ}$	$a = -0.8^{\circ}$		- SI	$J = 15.0^{\circ}$		
Ved	GHA	Dec	GHA	ν	Dec	d	HF
0	179°15.9	N11°45.0	24°17.3	11.2'	S 16°32.2	-10.1'	56.6
1	194°16.0	44.1	38° 47.5	11.3'	16°22.1	-10.2'	56.5
2	209°16.2	43.3	53° 17.8	11.4'	16°11.9	-10.2'	56.5
3	224°16.3	• • 42.4	67°48.2	11.4'	16°01.7	-10.3'	56.5
4	239°16.5	41.6	82°18.6	11.5'	15°51.4	-10.4'	56.5
5	254°16.7	40.8	96°49.1	11.6'	15°41.0	-10.5'	56.5
6	269°16.8	N11°39.9	111°19.7	11.7'	\$15°30.5	-10.5'	56.4
7	284°17.0	39.1	125°50.4	11.7'	15°20.0	-10.6'	56.4
8	299°17.1	38.2	140°21.1	11.8'	15°09.4	-10.7'	56.4
9	314°17.3	• • 37.4	154°51.9	11.9'	14°58.8	-10.7'	56.4
10	329°17.5 344°17.6	36.5	169°22.8	12.0'	14°48.1	-10.8'	56.4
11 12	344°17.6 359°17.8	35.7 N11°34.9	183°53.8 198°24.8	12.0' 12.1'	14°37.3 \$14°26.4	-10.8' -10.9'	56.3 56.3
13	359°17.8 14°17.9	34.9	198° 24.8 212° 55.9	12.1	14°15.5	-10.9° -11.0'	56.3
13 14	29°18.1	34.0 33.2	212°55.9 227°27.1	12.2	14°15.5 14°04.6	-11.0' -11.0'	56.3
14 15	29°18.1 44°18.3	· · 32.3	241°58.4	12.3'	14°04.6 13°53.5	-11.0 -11.1'	56.3
16	59°18.4	31.5	241 58.4 256°29.7	12.3 12.4'	13 53.5 13°42.5	-11.1 -11.1'	56.2
16 17	59°18.4 74°18.6	31.5 30.6	256°29.7 271°01.1	12.4	13°42.5 13°31.3	-11.1' -11.2'	56.2
18	74 18.6 89°18.8	N11°29.8	271 01.1 285°32.6	12.5'	S13°20.1	-11.2'	56.2
18 19	89°18.8 104°18.9	N11 29.8 28.9	285° 32.6 300° 04.1	12.6'	13°08.9	-11.2 -11.3'	56.2
20	104 18.9 119°19.1	28.9	300 04.1 314°35.7	12.7	13 08.9 12°57.6	-11.3 -11.4'	56.2
21	134°19.3	27.3	314 35.7 329°07.4	12.7'	12°46.2	-11.4 -11.4'	56.1
22	134 19.3 149°19.4	26.4	343°39.1	12.7	12°34.8	-11.4 -11.5'	56.1
23	164°19.6	25.6	358° 10.9	12.9'	12°23.4	-11.5'	56.1
	SD = 15.8'	d = -0.8'			D = 15.4'		55.3
	5D = 15.8'	a = -0.8'		SI	J = 15.4'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	83-95%	
20	03:26	03:19	12:03	21:28	09:01		
21	03:12	03:04	12:03	22:20	09:54		
22	02:57	02:49	12:03	23:08	10:44		

August 23, 24, 25 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	331°34.6	143°34.7	S03°06.8	114°55.7	S15°26.9	128°58.3	S08° 16.5	278°30.9	N16° 44.5			
1	346°37.1	158° 34.5	08.1	129°56.6	27.4	144°00.4	16.7	293°33.3	44.5	Alpheratz	357°30.5	29°15.4
2	1°39.5	173°34.4	09.3	144°57.5	27.9	159°02.5	16.9	308°35.7	44.5	Ankaa	353°03.2	-42°08.4
3	16°42.0	188°34.2	. 10.6	159°58.5	. 28.4	174°04.6	17.0	323°38.1	• • 44.6	Schedar	349°26.1	56°42.0
4	31°44.4	203°34.0	11.9	174°59.4	29.0	189°06.7	17.2	338°40.5	44.6	Diphda	348°43.3	-17°49.2
5	46°46.9	218°33.8	13.2	190°00.3	29.5	204°08.7	17.3	353°42.9	44.6	Achernar	335°17.2	-57°04.8
6	61°49.4	233°33.7	S03°14.5	205°01.3	S15°30.0	219° 10.8	508°17.5	8°45.3	N16° 44.6	Hamal	327°46.8	23°36.2
7	76°51.8	248°33.5	15.8	220°02.2	30.5	234°12.9	17.6	23°47.7	44.6	Polaris	311°51.4	89°22.9
8	91°54.3	263°33.3	17.0	235°03.1	31.1	249°15.0	17.8	38°50.1	44.6	Acamar	315°08.9	-40°10.8
9	106°56.8	278°33.1	• • 18.3	250°04.1	• • 31.6	264°17.0	• • 18.0	53°52.5	• • 44.6	Menkar	314°02.1	4°12.4
10	121°59.2	293°32.9	19.6	265°05.0	32.1	279°19.1	18.1	68°54.9	44.6	Mirfak	308°22.7	49°57.8
11	137°01.7	308°32.8	20.9	280°05.9	32.7	294°21.2	18.3	83°57.3	44.6	Aldebaran	290°35.4	16°34.1
12	152°04.2	323°32.6	503°22.2	295°06.8	S15°33.2	309°23.3	508°18.4	98°59.7	N16° 44.6	Rigel	281°00.4	-8°10.0
13	167°06.6	338°32.4	23.5	310°07.8	33.7	324°25.3	18.6	114°02.1	44.6	Capella	280°16.5	46°01.4
14	182°09.1	353°32.2	24.7	325°08.7	34.2	339°27.4	18.8	129°04.5	44.6	Bellatrix	278°19.0	6°22.6
15	197°11.6	8°32.1	• • 26.0	340°09.6	• • 34.8	354°29.5	· · 18.9	144°06.9	• • 44.6	Elnath	277°57.3	28°37.8
16	212°14.0	23°31.9	27.3	355°10.6	35.3	9°31.6	19.1	159°09.3	44.6	Alnilam	275°34.1	-1°11.0
17	227°16.5	$38^{\circ}31.7$	28.6	10°11.5	35.8	24°33.6	19.2	174°11.7	44.6	Betelgeuse	270°48.2	7°24.7
18	242°18.9	53°31.5	S03°29.9	25°12.4	S15°36.3	39°35.7	508°19.4	189°14.1	N16°44.7	Canopus	263°51.0 258°23.2	-52°42.5 -16°45.4
19	257°21.4	68°31.3	31.2	40°13.3	36.9	54° 37.8	19.6	204°16.5	44.7	Sirius		-10 45.4 -29°00.7
20	272°23.9	83°31.2	32.4	55° 14.3	37.4	69°39.9	19.7	219°18.9	44.7	Adhara	255°03.2 244°47.2	-29 00.7 5°08.9
21	287°26.3	98°31.0	• • 33.7	70° 15.2	• • 37.9	84°41.9	• • 19.9	234°21.3	• • 44.7	Procyon Pollux	244 47.2 243°13.1	27°57.1
22	302°28.8	113°30.8	35.0	85°16.1	38.4	99°44.0	20.0	249°23.7	44.7	Avior	245 13.1 234°13.7	-59°36.2
23	317°31.3	128°30.6	36.3	100°17.0	39.0	$114^{\circ}46.1$	20.2	264°26.1	44.7		234 13.7 222°43.9	-39 30.2 -43°33.2
Mar -	pass. 01:53	1/_D 2/ 41	.3′ m-3.99	1/0 0/ 40	.5′ m0.83	1/2 1/ d0	2′ m-1.79	1/2 A/ A0	.0′ m0.14	Suhail Miaplacidus	222°43.9 221°38.2	-43° 33.2 -69° 50.4
ivier.p	ass. 01:55	ν-0.2 α1	.5 111-5.99	νο.9 αυ	.5 1110.65	ν 2.1 a_0 .	2 m-1.79	ν2.4 d0	.0 M0.14	Alphard	221 36.2 217°44.4	-8°47.3
										Regulus	217 44.4 207°30.8	-6 47.3 11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.5
0	332°33.7	143°30.5	S03°37.6	115° 18.0	S15°39.5	129°48.1	508°20.4	279°28.5	N16°44.7	Denebola	193°37.5	14°24.4
1	347°36.2	158°30.3	38.9	130°18.9	40.0	144°50.2	20.5	294°30.9	44.7	Gienah	175° 40.0	-17°42.4
2	2°38.7	173°30.1	40.1	145°19.8	40.5	159°52.3	20.7	309°33.3	44.7	Acrux	173° 40.0	-63°16.0
3	17°41.1	$188^{\circ}29.9$	• • 41.4	160°20.7	• • 41.0	174°54.4	• • 20.8	324°35.7	• • 44.7		172 30.2 171°47.7	-57°17.0
4	32°43.6	203°29.8	42.7	175°21.6	41.6	189°56.4	21.0	339°38.1	44.7	Alioth	166° 10.3	55°48.1
5	47°46.1	$218^{\circ}29.6$	44.0	190°22.6	42.1	204°58.5	21.2	354°40.5	44.7	Spica	158° 18.5	-11°19.0
6	62°48.5	233°29.4	S03°45.3	205°23.5	S15°42.6	220°00.6	508°21.3	9°42.9	N16° 44.7	Alkaid	152° 49.4	49°10.1
7	77°51.0	$248^{\circ}29.2$	46.5	220°24.4	43.1	235°02.7	21.5	24°45.3	44.7	Hadar	148°30.8	-60°31.2
8	92°53.4	263°29.0	47.8	235°25.3	43.7	250°04.7	21.7	39°47.7	44.7	Menkent	147°53.3	-36°31.0
9	107°55.9	278°28.9	• • 49.1	250°26.2	• • 44.2	265°06.8	• • 21.8	54°50.1	• • 44.7	Arcturus	145°44.7	19°01.9
10	122°58.4	293°28.7	50.4	265°27.2	44.7	280°08.9	22.0	69°52.5	44.7	Rigil Kent.	139°35.2	-60°57.7
11	138°00.8	308° 28.5	51.7	280°28.1	45.2	295° 10.9	22.1	84°54.9	44.7	Kochab	137°20.6	74°02.3
12	153°03.3	323°28.3	S03°53.0	295°29.0	S15°45.8	310°13.0	S08°22.3	99°57.3	N16°44.8	Zuben'ubi	136°51.9	-16°09.9
13	168°05.8	338° 28.2	54.2	310°29.9	46.3	325°15.1	22.5	114°59.7	44.8	Alphecca	126°00.6	26°37.2
14	183°08.2	353°28.0	55.5	325°30.8	46.8	340° 17.2	22.6	130°02.1	44.8	Antares	112°11.2	-26°29.8
15	198°10.7	8° 27.8	• • 56.8	340°31.8	• • 47.3	355° 19.2	• • 22.8	145°04.5	• • 44.8	Atria	107°01.8	-69°04.9
16	213°13.2	23°27.6	58.1	355°32.7	47.8	10°21.3	22.9	160°06.9	44.8	Sabik	101°58.4	-15°45.5
17	228°15.6	38°27.4	03°59.4	10°33.6	48.4	25°23.4	23.1	175°09.3	44.8	Shaula	$96^{\circ}05.1$	-37°07.4
18	243°18.1	53°27.3	S04°00.6	25°34.5	S15°48.9	40°25.4	S08°23.3		N16°44.8	Rasalhague	95°54.9	12°32.6
19	258°20.5	68°27.1	01.9	40°35.4	49.4	55°27.5	23.4	205°14.1	44.8	Eltanin	90°40.2	51°29.5
20	273°23.0	83°26.9	03.2	55°36.4	49.9	70°29.6	23.6	220°16.5	44.8	Kaus Aust.	83°27.3	-34°22.1
21	288°25.5	98°26.7	• • 04.5	70°37.3	• • 50.5	85°31.6	• • 23.7	235°18.9	• • 44.8	Vega	80°30.4	38°49.0
22	303°27.9	113°26.6	05.8	85°38.2	51.0	100°33.7	23.9	250°21.4	44.8	Nunki	75°42.9	-26°15.4
23	318°30.4	128°26.4	07.0	100°39.1	51.5	115°35.8	24.1	265°23.8	44.8	Altair	61°56.0	8°57.1
Mer.p	ass. 01:49	ν -0.2' d1	.3′ m-4.00	ν 0.9 $^{\prime}$ d0	.5′ m0.83	$\nu 2.1' \ d0.$	2′ m-1.79	$\nu 2.4' \ d0$.0′ m0.13	Peacock	52°59.4	-56°38.2
										Deneb	49°22.7	45°23.5
. .	C	a	-		-		-		-	Enif	33°34.8	10°00.9
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	333°32.9	143°26.2	504°08.3	115°40.0	\$15°52.0	130°37.9	508°24.2	280°26.2	N16°44.8	Fomalhaut	$15^{\circ}10.1$	-29°27.6
1	348°35.3	158°26.0	09.6	130°40.9	52.5	145°39.9	24.4	295°28.6	44.8	Scheat	13°41.2	28°14.8
2	3°37.8	173°25.9	10.9	145°41.8	53.1	160°42.0	24.6	310°31.0	44.8	Markab	13°25.8	15°22.1
3	18°40.3	188°25.7	12.2	160°42.8	· · 53.6	175°44.1	• • 24.7	325°33.4	• • 44.8	Aug 23 Thu	SHA	Mor noos
4	33°42.7	203°25.5	13.4	175°43.7	54.1 54.6	190°46.1	24.9	340°35.8	44.8		3HA 172°00.1	Mer.pass 14:26
5	48°45.2	218°25.3	14.7	190°44.6	54.6 \$15°55.1	205°48.2	25.0 \$08° 25.2	355°38.2	44.8 N16°44.8		172 00.1 143°21.1	16:19
6 7	63°47.7 78°50.1	233°25.1 248°25.0	S04°16.0	205° 45.5	\$15°55.1	220°50.3 235°52.3	S08°25.2	10°40.6 25°43.0	N16°44.8		143 21.1 157°23.8	15:22
8	78°50.1 93°52.6	248° 25.0 263° 24.8	17.3 18.5	220°46.4 235°47.3	55.7 56.2	235°52.3 250°54.4	25.4 25.5	25°43.0 40°45.4	44.8 44.8	Saturn	306° 56.3	05:25
9	93°52.6 108°55.0	263°24.8 278°24.6	18.5	235°47.3 250°48.2	56.2 •• 56.7	250° 54.4 265° 56.5	25.5	40°45.4 55°47.8	44.8 •• 44.9	Jaturn	500 50.5	
10	106 55.0 123°57.5	276 24.0 293°24.4	21.1	265°49.1	57.2	280° 58.5	25.8	70°50.2	44.9	Aug 24 Fri	SHA	Mer.pass
10	123°57.5 139°00.0	293°24.4 308°24.3	21.1	265°49.1 280°50.1	57.2 57.7	280°58.5 296°00.6	25.8 26.0	70°50.2 85°52.6	44.9 44.9	Venus	$170^{\circ}56.7$	14:26
12	154°02.4	306 24.3 323°24.1	504°23.7	295° 51.0	\$15°58.3	311°02.7	508°26.2	100°55.1			$142^{\circ}44.2$	16:18
13	169°04.9	338°23.9	24.9	310°51.9	58.8	326°04.7	26.3	100 55.1 115°57.5	44.9		$157^{\circ}14.4$	15:19
14	184°07.4	353°23.7	24.9	325° 52.8	50.0 59.3	341°06.8	26.5	130°59.9	44.9 44.9	Saturn	306°54.7	05:21
15	199°09.8	8°23.5	27.5	340°53.7	59.5 15°59.8	356°08.9	. 26.7	146°02.3	• • 44.9	A 25 C	ÇU A	Ma:
16	214°12.3	0 23.5 23°23.4	28.8	355° 54.6	15 59.6 16°00.3	11°10.9	26.8	140 02.3 161°04.7	44.9	Aug 25 Sat	SHA	Mer.pass
17	214 12.3 229°14.8	23°23.4 38°23.2	30.1	10°55.5	00.9	26° 13.0	27.0	176°07.1	44.9 44.9		169°53.3	14:26
18	229°14.8 244°17.2	53° 23.2	30.1 S04°31.3	25° 56.4	00.9 \$16°01.4	26° 13.0 41° 15.1	508°27.1	176°07.1 191°09.5	44.9 N16°44.9		142°07.1	16:16
19	259°19.7	68°22.8	32.6	40° 57.3	01.9	56° 17.1	27.3	206°11.9	44.9		157°05.0	15:15
20	259 19.7 274°22.1	83°22.7	33.9	55° 58.2	01.9	71°19.2	27.5 27.5	200 11.9 221°14.3	44.9 44.9	Saturn	306°53.3	05:17
21	274 22.1 289°24.6	98°22.5	· · 35.2	55 58.2 70°59.1	02.4	71 19.2 86°21.3	27.6	221 14.3 236°16.7	• • 44.9	Horizon	al parallax	
22	304°27.1	113°22.3	36.4	86°00.1	03.5	101°23.3	27.8	251°19.1	44.9		Venus:	0.1
23	319°29.5	113 22.3 128°22.1	37.7	101°01.0	04.0	101°25.3	28.0	266°21.6	44.9		Mars:	0.1
						_						
Mer.p	ass. 01:46	ν -0.2' d1	.3′ m-4.00	$ u$ 0.9 $^{\prime}$ d0	.5′ m0.84	$\nu 2.1' \ d0.$	2′ m-1.79	ν 2.4′ d0	.0′ m0.13			

h	Su	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°19.7	N11°24.7	12°42.8	12.9'	\$12°11.9	-11.6'	56.1'	
1 2	194°19.9 209°20.1	23.9 23.0	27°14.7 41°46.7	13.0' 13.1'	12°00.3 11°48.7	-11.6' -11.6'	56.0' 56.0'	
3	209 20.1 224°20.2	• • 22.2	56° 18.8	13.1	11°37.1	-11.7'	56.0'	
4	239°20.4	21.3	$70^{\circ}50.9$	13.2'	11°25.4	-11.7'	56.0'	
5	254°20.6	20.5	85°23.1	13.3'	11°13.7	-11.8'	56.0'	
6 7	269°20.7 284°20.9	N11°19.6 18.8	99°55.4 114°27.7	13.3' 13.4'	\$11°01.9 10°50.1	-11.8' -11.9'	55.9' 55.9'	
8	299°21.1	17.9	129°00.1	13.4'	10°38.2	-11.9'	55.9'	
9	314°21.2	• • 17.1	143°32.5	13.5'	10°26.3	-11.9'	55.9'	
10 11	329°21.4 344°21.6	16.2 15.4	158°05.0 172°37.6	13.6' 13.6'	10°14.4 10°02.4	-12.0' -12.0'	55.9' 55.8'	
12	359°21.7	N11° 14.5	172 37.0 187° 10.2	13.7'	509°50.4	-12.0'	55.8'	
13	14°21.9	13.7	201°42.9	13.7'	09°38.4	-12.1'	55.8'	
14	29°22.1	12.8	216° 15.6	13.8'	09°26.3	-12.1'	55.8'	
15 16	44°22.2 59°22.4	· · 12.0 11.1	230°48.4 245°21.2	13.8' 13.9'	09°14.2 09°02.1	-12.1' -12.2'	55.8' 55.7'	
17	74°22.6	10.3	259°54.1	13.9'	08°49.9	-12.2'	55.7'	
18	89°22.7	N11°09.4	274°27.1	14.0'	S08°37.7	-12.2'	55.7'	
19 20	104°22.9 119°23.1	08.6 07.7	289°00.1 303°33.1	14.1' 14.1'	08°25.5 08°13.3	-12.3' -12.3'	55.7' 55.7'	
21	134°23.2	• • 06.8	318°06.2	14.1	08°01.0	-12.3'	55.6'	
22	149°23.4	06.0	332°39.4	14.2'	07°48.7	-12.3'	55.6'	
23	164°23.6	05.1	347°12.6	14.3'	07°36.3	-12.4'	55.6'	
	SD = 15.8'	d = -0.8'		SI	O = 15.3'			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°23.7	N11°04.3	1°45.9	14.3'	S 07°24.0	-12.4'	55.6'	
1 2	194°23.9 209°24.1	03.4 02.6	16° 19.2 30° 52.5	14.3' 14.4'	07°11.6 06°59.2	-12.4' -12.4'	55.6' 55.5'	
3	209 24.1 224°24.3	01.7	45° 25.9	14.4	06°46.8	-12.4' -12.4'	55.5'	
4	239°24.4	00.9	59°59.3	14.5'	06°34.4	-12.5'	55.5'	
5	254°24.6	11°00.0	74°32.8	14.5'	06°21.9	-12.5'	55.5'	
6 7	269°24.8 284°24.9	N10°59.1 58.3	89°06.4 103°39.9	14.6' 14.6'	\$06°09.5 05°57.0	-12.5' -12.5'	55.5' 55.4'	
8	299°25.1	57.4	118° 13.5	14.7'	05°44.5	-12.5'	55.4	
9	314°25.3	• • 56.6	132°47.2	14.7'	05°31.9	-12.5'	55.4'	
10 11	329°25.4 344°25.6	55.7 54.9	147°20.9 161°54.6	14.7' 14.8'	05°19.4 05°06.9	-12.5' -12.6'	55.4' 55.4'	
12	359°25.8	N10° 54.0	176°28.4	14.8'	504°54.3	-12.6'	55.3'	
13	14°26.0	53.1	191°02.2	14.8'	04°41.7	-12.6'	55.3'	
14 15	29°26.1 44°26.3	52.3 •• 51.4	205°36.0 220°09.9	14.9' 14.9'	04°29.2 04°16.6	-12.6' -12.6'	55.3' 55.3'	
16	59°26.5	50.6	234°43.9	14.9 15.0'	04 10.0 04°04.0	-12.6'	55.3'	
17	74°26.6	49.7	$249^{\circ}17.8$	15.0'	$03^{\circ}51.4$	-12.6'	55.3'	
18	89°26.8 104°27.0	N10°48.8	263°51.8 278°25.8	15.0'	\$03°38.8 03°26.1	-12.6'	55.2'	
19 20	104 27.0 119°27.2	48.0 47.1	278 25.8 292°59.9	15.1' 15.1'	03°26.1	-12.6' -12.6'	55.2' 55.2'	
21	134°27.3	• • 46.3	307°34.0	15.1'	03°00.9	-12.6'	55.2'	
22	149°27.5	45.4	322°08.1	15.1'	02°48.3	-12.6'	55.2'	
23	164°27.7	44.5	336°42.2	15.2'	02°35.6	-12.6'	55.1'	
	SD = 15.8'	d = -0.9'		SI	O = 15.2'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	179°27.9 194°28.0	N10°43.7 42.8	351°16.4 5°50.6	15.2' 15.2'	\$02°23.0 02°10.4	-12.6' -12.6'	55.1' 55.1'	
2	209°28.2	42.0	20°24.8	15.3'	01°57.7	-12.6'	55.1	
3	224°28.4	• • 41.1	34°59.1	15.3'	$01^{\circ}45.1$	-12.6'	55.1'	
4 5	239°28.5 254°28.7	40.2 39.4	49°33.4 64°07.7	15.3' 15.3'	01°32.5 01°19.8	-12.6' -12.6'	55.1' 55.0'	
6	269°28.9	N10°38.5	78° 42.0	15.4'	501°07.2	-12.6'	55.0'	
7	284°29.1	37.6	93°16.3	15.4'	00°54.6	-12.6'	55.0'	
8 9	299°29.2 314°29.4	36.8 •• 35.9	107°50.7 122°25.1	15.4' 15.4'	00°42.0 00°29.4	-12.6' -12.6'	55.0' 55.0'	
10	314 29.4 329°29.6	35.0	136° 59.5	15.4' 15.4'	00°29.4 00°16.8	-12.6'	54.9'	
11	344°29.8	34.2	$151^{\circ}34.0$	15.5'	S 00°04.2	-12.6'	54.9'	
12	359°29.9 14°30.1	N10°33.3	166°08.4	15.5'	N00°08.4 00°21.0	12.6'	54.9'	
13 14	14°30.1 29°30.3	32.4 31.6	180° 42.9 195° 17.4	15.5' 15.5'	00°21.0 00°33.6	12.6' 12.6'	54.9' 54.9'	
15	44°30.5	• • 30.7	$209^{\circ}51.9$	15.5'	00°46.1	12.5'	54.9'	
16	59°30.6	29.8	224° 26.4	15.5'	00°58.7	12.5'	54.8'	
17 18	74°30.8 89°31.0	29.0 N10°28.1	239°00.9 253°35.5	15.5' 15.6'	01°11.2 N01°23.7	12.5' 12.5'	54.8' 54.8'	
19	104°31.2	27.2	$268^{\circ}10.0$	15.6'	01°36.2	12.5'	54.8	
20	119°31.4	26.4	282°44.6	15.6'	01°48.7	12.5'	54.8'	
21 22	134°31.5 149°31.7	· · 25.5 24.6	297°19.2 311°53.8	15.6' 15.6'	02°01.2 02°13.6	12.5' 12.4'	54.8' 54.8'	
23	164°31.9	23.8	326°28.4	15.6'	02°13.0	12.4'	54.6 54.7'	
	SD = 15.8'	d = -0.9'		SI	O = 15.0'			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-99%	
23	02:41	02:33	12:03	23:53	11:30		
24	02:25	02:17	12:02	-:-	12:15		
25	02:09	02:00	12:02	00:36	12:57		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	334°32.0	143°22.0	S04°39.0	116°01.9	S16°04.5	131°27.5	S08°28.1	281°24.0	N16°44.9			
1	349°34.5	158°21.8	40.3	131°02.8	05.0	146°29.5	28.3	296°26.4	44.9	Alpheratz	357°30.5	29° 15.4
2	4°36.9	173°21.6	41.5	146°03.7	05.5	161°31.6	28.4	311°28.8	44.9	Ankaa	353°03.2	-42°08.4
3	19°39.4	188°21.4	• • 42.8	161°04.6	06.1	176°33.7	• • 28.6	326°31.2	• • 44.9	Schedar	349°26.1	56° 42.0
4	34°41.9	203°21.2	44.1	176°05.5	06.6	191°35.7	28.8	341°33.6	44.9	Diphda	348°43.3	-17°49.2
5	49°44.3	$218^{\circ}21.1$	45.4	191°06.4	07.1	206°37.8	28.9	356°36.0	44.9	Achernar	335°17.2	-57°04.8
6	64°46.8	233°20.9	S04°46.7	206°07.3	S16°07.6	221°39.9	S08°29.1	11°38.4	N16°44.9	Hamal	327°46.7 311°49.9	23°36.2 89°22.9
7	79°49.3	248°20.7	47.9	221°08.2	08.1	236°41.9	29.3	26°40.8	44.9	Polaris Acamar	311 49.9 315°08.9	-40° 10.8
8	94°51.7	263°20.5	49.2	$236^{\circ}09.1$	08.6	251°44.0	29.4	41°43.3	44.9	Menkar	314°02.1	4° 12.4
9	109°54.2	278°20.4	• • 50.5	251°10.0	• • 09.2	266°46.1	• • 29.6	56°45.7	• • 44.9	Mirfak	308°22.7	49°57.8
10	124°56.6	293°20.2	51.8	266°10.9	09.7	281°48.1	29.7	71°48.1	44.9	Aldebaran	290°35.3	16°34.1
11	139°59.1	308°20.0	53.0	281°11.8	10.2	296°50.2	29.9	86°50.5	44.9	Rigel	281°00.4	-8° 10.0
12	155°01.6	323°19.8	S04°54.3	296°12.7	S16°10.7	311°52.2	S08°30.1	101°52.9	N16°44.9	Capella	280°16.5	46°01.4
13	170°04.0	338°19.6	55.6	311°13.6	11.2	326°54.3	30.2	116°55.3	45.0	Bellatrix	278°19.0	6°22.6
14	185°06.5	353°19.5	56.9	326°14.5	11.7	341°56.4	30.4	131°57.7	45.0	Elnath	277°57.2	28° 37.8
15	200°09.0	8°19.3	• • 58.1	341°15.4	• • 12.3	356°58.4	• • 30.6	147°00.1	• • 45.0	Alnilam	275°34.0	-1°11.0
16	215° 11.4	23°19.1 38°18.9	04°59.4	356°16.3 11°17.2	12.8	12°00.5 27°02.6	30.7	162°02.6	45.0	Betelgeuse	270°48.2	7°24.7
17	230° 13.9 245° 16.4	58 18.9 53°18.8	05°00.7		13.3 \$16°13.8	42°04.6	30.9 \$08°31.0	177°05.0 192°07.4	45.0 N16°45.0	Canopus	263°51.0	-52° 42.5
18 19	245 10.4 260° 18.8	68°18.6	\$05°02.0 03.2	26°18.1 41°19.0	14.3	57°06.7	31.2	207°09.8	45.0	Sirius	258°23.1	-16°45.4
20	275° 21.3	83°18.4	03.2	56°19.9	14.3	72°08.8	31.4	207 09.8 222°12.2	45.0	Adhara	255°03.2	-29°00.7
21	290°23.7	98°18.2	• • 05.8	71°20.8	. 15.4	87°10.8	31.5	237°14.6	• • 45.0	Procyon	244°47.2	5°08.9
22	305°26.2	113°18.0	07.0	86°21.7	15.9	102°12.9	31.7	252°17.0	45.0	Pollux	243°13.1	27°57.1
23	320°28.7	128°17.9	08.3	101°22.6	16.4	117°14.9	31.9	267°19.5	45.0	Avior	234°13.7	-59°36.2
										Suhail	222°43.9	-43°33.1
Mer.p	ass. 01:42	ν -0.2′ $d1$.3′ m-4.01	u 0.9' d0	.5′ m0.84	$\nu 2.1' \ d0.$	2′ m-1.78	ν 2.4′ d0	.0′ m0.13	Miaplacidus	221°38.2	-69°50.3
										Alphard	217°44.4	-8°47.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	335°31.1	143°17.7	S05°09.6	116°23.5	S16° 16.9	132°17.0	508°32.0	282°21.9	N16°45.0	Dubhe	193°37.3	61°35.4
1	350° 33.6	158°17.5	10.9	131°24.4	17.4	$147^{\circ}19.1$	32.2	297°24.3	45.0	Denebola Gienah	182°21.5 175°40.0	14°24.4 -17°42.4
2	5°36.1	173°17.3	12.1	146°25.3	17.9	$162^{\circ}21.1$	32.4	312°26.7	45.0		175 40.0 172°56.2	-17 42.4 -63°16.0
3	20°38.5	$188^{\circ}17.2$	• • 13.4	161°26.2	• • 18.5	177°23.2	• • 32.5	$327^{\circ}29.1$	• • 45.0		172 30.2 171°47.7	-03 10.0 -57°16.9
4	$35^{\circ}41.0$	203°17.0	14.7	$176^{\circ}27.1$	19.0	192°25.3	32.7	342°31.5	45.0	Alioth	166°10.3	55°48.1
5	50°43.5	$218^{\circ}16.8$	16.0	191°28.0	19.5	207°27.3	32.8	357°33.9	45.0	Spica	158° 18.5	-11° 19.0
6	65°45.9	233°16.6	\$05°17.2	206°28.9	S16°20.0	222°29.4	S08°33.0	12°36.4	N16°45.0	Alkaid	152°49.5	49° 10.1
7	80°48.4	$248^{\circ}16.4$	18.5	221°29.8	20.5	237°31.4	33.2	27°38.8	45.0	Hadar	148°30.8	-60°31.1
8	95°50.9	263°16.3	19.8	236°30.7	21.0	252°33.5	33.3	42°41.2	45.0		147°53.3	-36°31.0
9	110°53.3	278°16.1	• • 21.0	251°31.6	• • 21.5	267°35.6	• • 33.5	57°43.6	• • 45.0	Arcturus	145°44.7	19°01.9
10	125°55.8	293°15.9	22.3	266°32.5	22.1	282°37.6	33.7	72°46.0	45.0	Rigil Kent.	139°35.2	-60°57.7
11	140°58.2	308°15.7	23.6	281°33.4	22.6	297°39.7	33.8	87°48.4	45.0	Kochab	137°20.6	74°02.3
12	156°00.7	323°15.6	S05°24.9	296°34.3	\$16°23.1	312°41.7	S08°34.0	102°50.9	N16°45.0	Zuben'ubi	$136^{\circ}51.9$	-16°09.9
13	171°03.2	338°15.4	26.1	311°35.2	23.6	327°43.8	34.2	117°53.3	45.0	Alphecca	$126^{\circ}00.7$	26° 37.2
14	186°05.6 201°08.1	353°15.2	27.4	326°36.1	24.1	342°45.9 357°47.9	34.3	132°55.7	45.0	Antares	$112^{\circ}11.2$	-26° 29.8
15	201°08.1 216°10.6	8°15.0 23°14.8	• • 28.7	341°36.9 356°37.8	• • 24.6	12°50.0	• • 34.5	147°58.1 163°00.5	· · 45.0	Atria	107°01.8	-69°04.9
16 17	210 10.0 231° 13.0	23 14.6 38°14.7	29.9 31.2	11°38.7	25.1 25.7	27°52.0	34.6 34.8	178°02.9	45.0 45.0	Sabik	101°58.4	-15°45.5
18	246° 15.5	53°14.5	S05°32.5	26°39.6	\$16°26.2	42°54.1	S08°35.0	193°05.4	N16°45.0	Shaula	96°05.1	-37°07.4
19	261° 18.0	68°14.3	33.8	41°40.5	26.7	57°56.2	35.1	208°07.8	45.0	Rasalhague	95°55.0	12°32.6
20	276° 20.4	83°14.1	35.0	56°41.4	27.2	72°58.2	35.3	223°10.2	45.0	Eltanin	90°40.2	51°29.5
21	291°22.9	98°13.9	36.3	71°42.3	• • 27.7	88°00.3	• • 35.5	238°12.6	• • 45.0	Kaus Aust.	83°27.3	-34°22.1
22	306° 25.4	113°13.8	37.6	86°43.2	28.2	103°02.3	35.6	253°15.0	45.0	Vega	80°30.4	38°49.0
23	321°27.8	128°13.6	38.8	101°44.1	28.7	118°04.4	35.8	268°17.5	45.0	Nunki	75°42.9	-26°15.4
					F/ 0.0F					Altair	61°56.0	8° 57.1 -56° 38.2
Mer.p	ass. 01:38	ν -0.2' d1.	.3′ m-4.01	$\nu_{0.9'} = 0$.5′ m0.85	ν 2.1′ d0.	2′ m-1.78	$\nu^{2.4'} d0$.0′ m0.12	Peacock Deneb	52°59.5 49°22.8	-50 38.2 45°23.5
										Enif	33°34.8	10°01.0
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	$336^{\circ}30.3$	143°13.4	S05°40.1		S 16°29.2	$133^{\circ}06.5$	S08°36.0	283°19.9	N16°45.0	Fomalhaut	15°10.1	-40° 40.6
1	351°32.7	158°13.2	41.4	131°45.9	29.8	148°08.5	36.1	298°22.3	45.0	Scheat	13°41.2	28° 14.8
2	6°35.2	173°13.1	42.6	146°46.7	30.3	163°10.6	36.3	313°24.7	45.0	Markab	13°25.8	15°22.1
3	21°37.7	188°12.9	• • 43.9	161°47.6	• • 30.8	178°12.6	• • 36.5	328°27.1	• • 45.0			
4	36° 40.1	203°12.7	45.2	176°48.5	31.3	193°14.7	36.6	343°29.6	45.0	Aug 26 Sun	SHA	Mer.pass
5	51°42.6	218°12.5	46.4	191°49.4	31.8	208°16.7	36.8	358°32.0	45.0		168°49.9	14:27
6	66° 45.1	233°12.3	S05°47.7		\$16°32.3	223°18.8	S08°36.9	13°34.4	N16°45.0		141°29.9	16:15 15:12
7	81°47.5	248°12.2	49.0	221°51.2 236°52.1	32.8	238°20.9 253°22.9	37.1	28°36.8 43°39.2	45.0 45.0	Jupiter	156°55.5 306°52.0	15:12 05:14
8 9	96°50.0 111°52.5	263°12.0 278°11.8	50.3 •• 51.5	251°53.0	33.3 •• 33.9	253°22.9 268°25.0	37.3 · · 37.4	43°39.2 58°41.7	45.0 • • 45.0	Jatuin	JUU J2.U	05.14
10	111 52.5 126° 54.9	278 11.8 293°11.6	52.8	251 53.0 266°53.8	34.4	283°27.0	37.4	73°44.1	45.0 45.0	Aug 27 Mon	SHA	Mer.pass
11	120 54.9 141°57.4	308°11.4	52.6 54.1	200 55.8 281°54.7	34.4	203 27.0 298°29.1	37.8	73 44.1 88°46.5	45.0 45.0		167°46.6	14:27
12	156° 59.8	323°11.3	\$05°55.3		\$16°35.4	313°31.1	S08°37.9	103°48.9	N16°45.0		140°52.4	16:13
13	172°02.3	338°11.1	56.6	311°56.5	35.9	328°33.2	38.1	118°51.3	45.0		156°45.9	15:09
14	187°04.8	353°10.9	57.9	326°57.4	36.4	343°35.3	38.3	133°53.8	45.0	Saturn	306°50.7	05:10
15	202°07.2	8°10.7	05°59.1	341°58.3	• • 36.9	358°37.3	• • 38.4	148°56.2	• • 45.0	Aug 28 Tue	SHA	Mer.pass
16	217°09.7	23°10.5	06°00.4	356°59.1	37.4	13°39.4	38.6	163°58.6	45.0		166°43.1	14:27
17	232° 12.2	38°10.4	01.7	12°00.0	37.9	28°41.4	38.8	179°01.0	45.1		140°14.7	16:12
18	247° 14.6	53°10.2	S06°02.9	27°00.9	S16°38.5	43°43.5	S08°38.9	194°03.5	N16°45.1		156°36.2	15:06
19	$262^{\circ}17.1$	68°10.0	04.2	42°01.8	39.0	58°45.5	39.1	209°05.9	45.1	Saturn		05:06
20	277° 19.6	83°09.8	05.5	57°02.7	39.5	73°47.6	39.3	224°08.3	45.1			
21	292° 22.0	98°09.6	• • 06.7	72°03.6	• • 40.0	88°49.6	• • 39.4	239°10.7	• • 45.1	Horizont	al parallax	
22	307°24.5	113°09.5	0.80	87°04.4	40.5	103°51.7	39.6	254°13.2	45.1		Venus:	0.1
23	322°27.0	128°09.3	09.3	102°05.3	41.0	118°53.8	39.8	269°15.6	45.1		Mars:	0.1
Mer.n	ass. 01:34	ν -0.2' d1	.3′ m-4.02	ν 0.9' d0	.5′ m0.85	$\nu 2.1' d0$	2′ m-1.78	$\nu^{2.4'} d0$.0′ m0.12			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.1	N10°22.9	341°03.0	15.6'	N02°38.5	12.4'	54.7'
1 2	194°32.2 209°32.4	22.0 21.2	355°37.6 10°12.3	15.6' 15.6'	02°50.9 03°03.3	12.4' 12.4'	54.7' 54.7'
3	209 32.4 224°32.6	20.3	24°46.9	15.6'	03°15.7	12.4	54.7'
4	239°32.8	19.4	$39^{\circ}21.5$	15.6'	03°28.0	12.3'	54.7'
5	254°32.9	18.6	53°56.2	15.6'	03°40.3	12.3'	54.6'
6 7	269°33.1 284°33.3	N10° 17.7 16.8	68°30.8 83°05.5	15.7' 15.7'	N03°52.6 04°04.9	12.3' 12.3'	54.6' 54.6'
8	299°33.5	15.9	97°40.1	15.7'	04° 04.9	12.2'	54.6'
9	314°33.7	•• 15.1	$112^{\circ}14.8$	15.7'	04°29.4	12.2'	54.6'
10	329°33.8 344°34.0	14.2	126°49.4 141°24.1	15.7'	04°41.6 04°53.8	12.2' 12.2'	54.6'
11 12	359°34.2	13.3 N10°12.5	141 24.1 155°58 7	15.7' 15.7'	N05°05.9	12.1	54.6' 54.5'
13	14°34.4	11.6	170°33.4	15.6'	05°18.1	12.1'	54.5'
14	29°34.6	10.7	185°08.0	15.6'	05°30.2	12.1'	54.5'
15 16	44°34.7 59°34.9	· · 09.8 09.0	199°42.7 214°17.3	15.6' 15.6'	05°42.2 05°54.3	12.0' 12.0'	54.5' 54.5'
17	74°35.1	08.1	214 17.3 228°52.0	15.6'	06°06.3	12.0'	54.5'
18	89°35.3	N10°07.2	243°26.6	15.6'	N06°18.3	11.9'	54.5'
19	104°35.5	06.3	258°01.2	15.6'	06°30.2	11.9'	54.5'
20 21	119°35.6 134°35.8	05.5 •• 04.6	272°35.8 287°10.4	15.6' 15.6'	06°42.1 06°54.0	11.9' 11.9'	54.4' 54.4'
22	149°36.0	03.7	301°45.0	15.6'	07°05.9	11.8'	54.4'
23	164°36.2	02.8	$316^{\circ}19.6$	15.6'	$07^{\circ}17.7$	11.8'	54.4'
	SD = 15.8'	d = -0.9'		SI	O = 14.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	179°36.4	N10°02.0	330°54.2	15.6'	N07°29.5	11.7'	54.4'
1	194°36.5	01.1	345°28.8	15.6'	07°41.2	11.7'	54.4'
2	209°36.7 224°36.9	10°00.2 09°59.3	0°03.3 14°37.9	15.5' 15.5'	07°52.9 08°04.6	11.7' 11.6'	54.4' 54.4'
3 4	239°37.1	09 59.5 58.5	29°12.4	15.5'	08°16.2	11.6'	54.4'
5	254°37.3	57.6	43°46.9	15.5'	08°27.8	11.6'	54.3'
6	269°37.5	N09° 56.7	58°21.4	15.5'	N08°39.4	11.5'	54.3'
7 8	284°37.6 299°37.8	55.8 54.9	72°55.9 87°30.4	15.5' 15.5'	08°50.9 09°02.4	11.5' 11.4'	54.3' 54.3'
9	314°38.0	• • 54.1	102°04.9	15.4	09°13.8	11.4'	54.3'
10	329°38.2	53.2	116°39.3	15.4'	09°25.2	11.4'	54.3'
11 12	344°38.4 359°38.6	52.3 N09°51.4	131°13.7 145°48.1	15.4' 15.4'	09°36.6 N09°47.9	11.3' 11.3'	54.3' 54.3'
13	14°38.7	50.6	145 46.1 160°22.5	15.4	09°59.2	11.3	54.3'
14	29°38.9	49.7	174°56.9	15.3'	10°10.4	11.2'	54.3'
15	44°39.1	• • 48.8	189°31.2	15.3'	10°21.6	11.1'	54.2'
16 17	59°39.3 74°39.5	47.9 47.0	204°05.5 218°39.8	15.3' 15.3'	10°32.7 10°43.8	11.1' 11.0'	54.2' 54.2'
18	89°39.7	N09°46.1	233°14.1	15.2'	N10°54.8	11.0'	54.2'
19	104°39.8	45.3	247°48.3	15.2'	11°05.8	10.9'	54.2'
20 21	119°40.0 134°40.2	44.4 •• 43.5	262°22.5 276°56.7	15.2' 15.2'	11°16.8 11°27.6	10.9' 10.8'	54.2' 54.2'
22	149°40.4	42.6	291°30.9	15.1'	11°38.5	10.8	54.2'
23	164°40.6	41.7	$306^{\circ}05.0$	15.1'	11°49.3	10.7'	54.2'
	SD = 15.8'	d = -0.9'		SI	O = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	179°40.8	N09°40.9	320°39.2	15.1'	$N12^{\circ}00.0$	10.7'	54.2'
1	194°40.9	40.0	335°13.2	15.1'	12°10.7 12°21.4	10.6	54.2'
2 3	209°41.1 224°41.3	39.1 •• 38.2	349°47.3 4°21.3	15.0' 15.0'	12°21.4 12°32.0	10.6' 10.5'	54.2' 54.2'
4	239°41.5	37.3	18°55.3	15.0'	12°42.5	10.5	54.1'
5	254°41.7	36.4	33°29.3	14.9'	12°53.0	10.4	54.1'
6 7	269°41.9 284°42.1	N09° 35.6 34.7	48°03.2 62°37.1	14.9' 14.9'	N13°03.4 13°13.8	10.4' 10.3'	54.1' 54.1'
8	204 42.1 299°42.2	33.8	77°11.0	14.8'	13°24.1	10.3	54.1'
9	314°42.4	• • 32.9	91°44.8	14.8'	13°34.3	10.2'	54.1'
10	329°42.6 344°42.8	32.0	106°18.7 120°52.4	14.8'	13°44.5 13°54.7	10.1'	54.1'
11 12	344°42.8 359°43.0	31.1 N09°30.2	120°52.4 135°26.2	14.7' 14.7'	13°54.7 N14°04.8	10.1' 10.0'	54.1' 54.1'
13	14°43.2	29.4	149°59.9	14.7'	$14^{\circ}14.8$	10.0'	54.1'
14	29°43.4	28.5	164°33.5	14.6'	14°24.7	9.9'	54.1'
15 16	44°43.6 59°43.7	· · 27.6 26.7	179°07.2 193°40.8	14.6' 14.6'	14°34.7 14°44.5	9.8' 9.8'	54.1' 54.1'
17	59 43.7 74°43.9	25.8	193 40.8 208°14.3	14.6 14.5'	14 44.5 14°54.3	9.8 9.7'	54.1'
18	89°44.1	N09°24.9	222°47.8	14.5'	N15°04.0	9.7'	54.1'
19 20	104°44.3 119°44.5	24.0	237°21.3 251°54.7	14.4' 14.4'	15°13.6 15°23.2	9.6' 9.5'	54.1' 54.1'
20	119°44.5 134°44.7	23.2 •• 22.3	251°54.7 266°28.1	14.4	15°23.2 15°32.8	9.5° 9.5'	54.1'
22	149°44.9	21.4	281°01.5	14.3'	15°42.2	9.4'	54.1'
23	164°45.1	20.5	295°34.8	14.3'	15°51.6	9.3'	54.1'
	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°	////	01:52	03:37	20:22	22:03	////
N 70°	////	02:31	03:55	20:05	21:27	////
68°	////	02:58	04:08	19:52	21:01	23:22
66°	01:37	03:17	04:19	19:41	20:42	22:19
64°	02:12	03:33	04:29	19:32	20:27	21:47
62°	02:36	03:46	04:37	19:24	20:14	21:23
60°	02:55	03:57	04:44	19:18	20:04	21:05
N 58°	03:10	04:06	04:50	19:12	19:55	20:50
56°	03:23	04:14	04:55	19:07	19:47	20:38
54°	03:34	04:22	05:00	19:02	19:40	20:27
52°	03:43	04:28	05:04	18:58	19:34	20:18
50°	03:51	04:34	05:08	18:54	19:28	20:10
45°	04:08	04:45	05:16	18:46	19:16	19:53
N 40°	04:21	04:55	05:23	18:39	19:07	19:41
35°	04:32	05:03	05:29	18:33	18:59	19:30
30°	04:41	05:10	05:34	18:28	18:53	19:22
20°	04:54	05:21	05:43	18:19	18:42	19:08
N 10°	05:05	05:30	05:51	18:12	18:33	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:19	05:44	06:05	17:58	18:19	18:44
20°	05:25	05:50	06:13	17:51	18:13	18:39
30°	05:29	05:57	06:21	17:42	18:07	18:35
35°	05:31	06:00	06:26	17:38	18:03	18:33
40°	05:32	06:03	06:31	17:33	18:00	18:31
45°	05:33	06:07	06:37	17:27	17:56	18:30
S 50°	05:34	06:12	06:44	17:19	17:52	18:30
52°	05:34	06:13	06:48	17:16	17:50	18:29
54°	05:35	06:15	06:51	17:12	17:48	18:29
56°	05:35	06:18	06:55	17:08	17:46	18:29
58°	05:35	06:20	07:00	17:04	17:44	18:30
S 60°	05:34	06:22	07:05	16:59	17:42	18:30
	ı			ı		

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-86%	
26	01:52	01:43	12:02	01:18	13:39		
27	01:35	01:26	12:01	02:00	14:21		
28	01:17	01:08	12:01	02:42	15:04		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	337° 29.4	143°09.1	S06° 10.5		S 16°41.5	133°55.8	508°39.9	284°18.0	N16°45.1	A 11 :	357°30.5	29°15.4
1	352°31.9	158°08.9	11.8	$132^{\circ}07.1$	42.0	148°57.9	40.1	299°20.4	45.1	Alpheratz		-42°08.4
2	7°34.3	173°08.7	13.0	147°08.0	42.5	163°59.9	40.3	314°22.8	45.1	Ankaa Schedar	353°03.2 349°26.1	
3	22°36.8	188°08.6	• • 14.3	162°08.8	• • 43.0	179°02.0	• • 40.4	329°25.3	• • 45.1		349 20.1 348°43.3	56° 42.0 -17° 49.2
4	37°39.3	203°08.4	15.6	177°09.7	43.5	194°04.0	40.6	344°27.7	45.1	Diphda		
5	52°41.7	$218^{\circ}08.2$	16.8	192°10.6	44.1	$209^{\circ}06.1$	40.8	359°30.1	45.1	Achernar	335°17.2 327°46.7	-57°04.8 23°36.2
6	67°44.2	233°08.0	S06°18.1	207°11.5	S16°44.6	224°08.1	S08°40.9	14°32.5	N16°45.1	Hamal	321 40.1 311°48.2	
7	82°46.7	248°07.8	19.4	222°12.4	45.1	239°10.2	41.1	29°35.0	45.1	Polaris	311 48.2 315°08.9	89°22.9 -40°10.9
8	97°49.1	263°07.7	20.6	237°13.2	45.6	254°12.3	41.2	44°37.4	45.1	Acamar Menkar	314°02.1	4° 12.4
9	112°51.6	278°07.5	• • 21.9	$252^{\circ}14.1$	• • 46.1	269°14.3	• • 41.4	59°39.8	• • 45.1	Mirfak	308°22.7	4 12.4 49°57.8
10	127°54.1	293°07.3	23.2	$267^{\circ}15.0$	46.6	284°16.4	41.6	74°42.2	45.1	1	290°35.3	49 57.8 16°34.1
11	142°56.5	308°07.1	24.4	282°15.9	47.1	299°18.4	41.7	89°44.7	45.1	Aldebaran	290 33.3 281°00.3	-8° 10.0
12	157°59.0	323°06.9	S06°25.7	297°16.7	S16°47.6	314°20.5	S08°41.9	104°47.1	N16°45.1	Rigel		-6 10.0 46°01.4
13	173°01.4	338°06.8	26.9	312°17.6	48.1	329°22.5	42.1	119°49.5	45.1	Capella	280°16.4	6°22.6
14	188°03.9	353°06.6	28.2	$327^{\circ}18.5$	48.6	344°24.6	42.2	134°52.0	45.1	Bellatrix	278°18.9	
15	203°06.4	8°06.4	• • 29.5	$342^{\circ}19.4$	• • 49.1	359°26.6	• • 42.4	149°54.4	• • 45.1	Elnath	277°57.2	28°37.8
16	218°08.8	23°06.2	30.7	357°20.2	49.6	14°28.7	42.6	164°56.8	45.1	Alnilam	275°34.0	-1°11.0
17	$233^{\circ}11.3$	38°06.0	32.0	$12^{\circ}21.1$	50.1	29°30.7	42.7	179°59.2	45.1	Betelgeuse	270°48.2	7°24.7
18	248°13.8	53°05.9	506°33.3	27°22.0	S16°50.7	44°32.8	508°42.9	195°01.7	N16°45.1	Canopus	263°51.0	-52°42.5
19	263°16.2	68°05.7	34.5	42°22.9	51.2	59°34.8	43.1	210°04.1	45.1	Sirius	258°23.1	-16°45.4
20	278°18.7	83°05.5	35.8	57°23.7	51.7	74°36.9	43.2	225°06.5	45.1	Adhara	255°03.1	-29°00.6
21	293°21.2	98°05.3	• • 37.0	72°24.6	• • 52.2	89°38.9	• • 43.4	240°08.9	• • 45.1	Procyon	244°47.2	5°08.9
22	308°23.6	113°05.1	38.3	87°25.5	52.7	104°41.0	43.6	255°11.4	45.1	Pollux	243°13.0	27°57.1
23	323°26.1	128°04.9	39.6	102°26.4	53.2	119°43.0	43.7	270°13.8	45.1	Avior	234°13.6	-59°36.2
					_			-		Suhail	222°43.9	-43°33.1
Mer.p	ass. 01:30	ν -0.2′ $d1$.3′ m-4.02	ν 0.9′ d0	.5′ m0.86	$\nu^{2.1'} d^{0}$.	.2′ m-1.77	$\nu^{2.4'} d0$.0′ m0.11	Miaplacidus	221°38.1	-69°50.3
										Alphard	217°44.4	-8°47.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	338° 28.6	143°04.8	S06°40.8		S16°53.7	134°45.1	S08°43.9	285°16.2	N16°45.1	Dubhe	193°37.3	61°35.4
1	353°31.0	158°04.6	42.1	132°28.1	54.2	149°47.1	44.1	300°18.7	45.1	Denebola	182°21.5	14°24.4
2	8°33.5	173°04.4	43.3	147°29.0	54.7	164°49.2	44.2	315°21.1	45.0	Gienah	175°40.0	-17°42.4
3	23°35.9	188°04.2	• • 44.6	162°29.8	55.2	179°51.2	• • 44.4	330°23.5	• • 45.0	Acrux	172°56.2	-63°16.0
4	38°38.4	203°04.0	45.9	177°30.7	55.7	194°53.3	44.6	345°25.9	45.0		171°47.8	-57°16.9
5	53°40.9	218°03.9	47.1	192°31.6	56.2	209°55.4	44.7	0°28.4	45.0	Alioth	166°10.3	55°48.1 -11°18.9
6	68°43.3	233°03.7	506°48.4	207°32.5	S16°56.7	224°57.4	S08°44.9	15°30.8	N16°45.0	Spica	158°18.5	
7	83°45.8	248°03.5	49.6	222°33.3	57.2	239°59.5	45.1	30°33.2	45.0	Alkaid	152°49.5	49° 10.1
8	98°48.3	263°03.3	50.9	237°34.2	57.7	255°01.5	45.2	45°35.7	45.0	Hadar	148°30.8 147°53.3	-60°31.1 -36°31.0
9	113°50.7	278°03.1	• • 52.1	252°35.1	• • 58.2	270°03.6	• • 45.4	60°38.1	• • 45.0	Menkent		
10	128°53.2	293°02.9	53.4	267°35.9	58.7	285°05.6	45.6	75°40.5	45.0	Arcturus Rigil Kent.	145°44.7 139°35.2	19°01.9 -60°57.7
11	143°55.7	308°02.8	54.7	282°36.8	59.2	300°07.7	45.7	90°43.0	45.0	Kochab	139° 33.2 137° 20.7	74° 02.3
12	158°58.1	323°02.6	S06°55.9	297°37.7	S16°59.8	315°09.7	S08°45.9	105°45.4	N16°45.0	Zuben'ubi	136°52.0	-16°09.8
13	174°00.6	338°02.4	57.2	312°38.5	17°00.3	330°11.8	46.1	120°47.8	45.0	Alphecca	126°00.7	26°37.2
14	189°03.1	353°02.2	58.4	327°39.4	8.00	345°13.8	46.2	135°50.2	45.0	Antares	112° 11.2	-26°29.8
15	204°05.5	8°02.0	06°59.7	342°40.3	• • 01.3	$0^{\circ}15.9$	• • 46.4	150°52.7	• • 45.0	Atria	107°01.8	-69°04.9
16	$219^{\circ}08.0$	23°01.8	$07^{\circ}01.0$	357°41.1	01.8	$15^{\circ}17.9$	46.6	165°55.1	45.0	Sabik	101°58.4	-15° 45.5
17	234°10.4	$38^{\circ}01.7$	02.2	12°42.0	02.3	30°20.0	46.7	180°57.5	45.0	Shaula	96°05.1	-37°07.4
18	249°12.9	53°01.5	S07°03.5	27°42.9	S17°02.8	45°22.0	S08°46.9	196°00.0	N16°45.0	Rasalhague	95°55.0	12°32.6
19	264°15.4	$68^{\circ}01.3$	04.7	42°43.7	03.3	60°24.0	47.1	211°02.4	45.0	Eltanin	90°40.2	51°29.5
20	279°17.8	83°01.1	06.0	57°44.6	03.8	75°26.1	47.2	226°04.8	45.0	Kaus Aust.	83°27.4	-34°22.1
21	294°20.3	98°00.9	•• 07.2	72°45.5	• • 04.3	90°28.1	• • 47.4	241°07.3	• • 45.0	Vega	80°30.4	38°49.0
22	309°22.8	113°00.7	08.5	87°46.3	04.8	105°30.2	47.6	256°09.7	45.0	Nunki	75°42.9	-26° 15.4
23	324°25.2	128°00.6	09.7	102°47.2	05.3	120°32.2	47.7	$271^{\circ}12.1$	45.0	Altair	61°56.0	8°57.1
Morn	ass. 01:26	1, 0.2' d1	.3′ m-4.02	υ0 0′ d0	.5′ m0.86	1/2 1/ d0	.2′ m-1.77	1/2 A' d C	.0′ m0.11	Peacock	52°59.5	-56°38.2
- IVIEL.P	455. 01.20	ν-0.2 d1	.5 111-4.02	νο.9 do	.5 1110.00	ν2.1 do.	.2 111-1.77	ν2.4 u-0	.0 1110.11	Deneb	49°22.8	45° 23.5
										Enif	33°34.8	10°01.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	339° 27.7	143°00.4	S07°11.0	117°48.0	S17°05.8	135°34.3	508°47.9	286°14.6	N16°45.0	Fomalhaut	15°10.1	-29°27.6
1	354°30.2	158°00.2	12.3	132°48.9	06.3	150°36.3	48.1	301°17.0	45.0	Scheat	13°41.1	28° 14.8
2	9°32.6	173°00.0	13.5	147°49.8	8.60	165°38.4	48.3	316°19.4	45.0	Markab	13°25.8	15°22.1
3	24°35.1	187°59.8	• • 14.8	162°50.6	• • 07.3	180°40.4	• • 48.4	331°21.9	• • 45.0			
4	39°37.5	202°59.6	16.0	177°51.5	07.8	195°42.5	48.6	346°24.3	45.0	Aug 29 Wed	SHA	Mer.pass
5	54°40.0	217°59.5	17.3	192°52.4	08.3	210°44.5	48.8	1°26.7	45.0	Venus	165°39.7	14:28
6	69°42.5	232°59.3	S07°18.5	207°53.2	S 17°08.8	225°46.6	S08°48.9	16°29.2	N16°45.0	Mars	139°36.8	16:11
7	84°44.9	247°59.1	19.8	222°54.1	09.3	240°48.6	49.1	31°31.6	45.0	Jupiter	156°26.4	15:02
8	99°47.4	262°58.9	21.0	237°54.9	09.8	255°50.7	49.3	46°34.0	45.0	Saturn	306°48.6	05:02
9	114°49.9	277°58.7	• • 22.3	252°55.8	• • 10.3	270°52.7	• • 49.4	61°36.5	• • 45.0	Aug 30 Thu	SHA	Mer.pass
10	129°52.3	292°58.5	23.5	267°56.7	10.8	285°54.8	49.6	76°38.9	45.0		164°36.2	14:28
11	144°54.8	307°58.4	24.8	282°57.5	11.3	300°56.8	49.8	91°41.3	45.0		138°58.7	16:09
12	159°57.3	322°58.2	S07°26.0	297°58.4	\$17°11.8	315°58.9	S08°49.9	106°43.8	N16°45.0	Jupiter	156° 16.5	14:59
13	174°59.7	337°58.0	27.3	312°59.2	12.3	331°00.9	50.1	121°46.2	45.0	Saturn	306°47.7	04:58
14	190°02.2	352°57.8	28.5	328°00.1	12.8	346°03.0	50.3	136°48.6	45.0			
15	205°04.7	7°57.6	• • 29.8	343°01.0	• • 13.3	1°05.0	• • 50.4	151°51.1	• • 45.0	Aug 31 Fri	SHA	Mer.pass
16	220°07.1	22°57.4	31.0	358°01.8	13.8	16°07.0	50.6	166°53.5	45.0	l .	163°32.7	14:28
17	235°09.6	37°57.2	32.3	13°02.7	14.3	31°09.1	50.8	181°55.9	45.0		138°20.4	16:08
18	250°12.0	52°57.1	S07°33.5	28°03.5	S17°14.8	46°11.1	S08°50.9	196°58.4	N16°45.0		156°06.6	14:56
19	265°14.5	67°56.9	34.8	43°04.4	15.3	61°13.2	51.1	212°00.8	45.0	Saturn	306°46.9	04:54
20	280°17.0	82°56.7	36.0	58°05.2	15.8	76°15.2	51.3	227°03.3	45.0	11. 7	al me	
21	295° 19.4	97°56.5	• • 37.3	73°06.1	• • 16.3	91°17.3	• • 51.4	242°05.7	• • 45.0	Horizont	al parallax	0.1
22	310°21.9	112°56.3	38.5	88°07.0	16.8	106°19.3	51.6	257°08.1	45.0		Venus:	0.1
23	325°24.4	127°56.1	39.8	103°07.8	17.3	121°21.4	51.8	272°10.6	45.0		Mars:	0.1
Mer n	ass. 01:22	ν -0.2' d1	.3′ m-4.03	$\nu 0.9' d0$.5′ m0.87	$\nu 2.0' d0.$.2′ m-1.77	$\nu 2.4' \ d-0$.0′ m0.10			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°45.2	N09°19.6	310°08.1	14.2'	N16°00.9	9.3'	54.1'
1 2	194° 45.4 209° 45.6	18.7 17.8	324°41.3 339°14.5	14.2' 14.1'	16° 10.2 16° 19.4	9.2' 9.1'	54.1' 54.1'
3	209 45.0 224° 45.8	16.9	353° 47.7	14.1	16° 19.4 16° 28.5	9.1'	54.1
4	239°46.0	16.0	8°20.8	14.1'	16°37.6	9.0'	54.1'
5	254°46.2	15.2	22°53.8	14.0'	16°46.6	8.9'	54.1'
6 7	269° 46.4 284° 46.6	N09°14.3 13.4	37°26.9 51°59.8	14.0' 13.9'	N16°55.5 17°04.3	8.8' 8.8'	54.1' 54.1'
8	299° 46.8	12.5	66°32.8	13.9'	17°13.1	8.7'	54.1'
9	314°47.0	• • 11.6	81°05.6	13.8'	$17^{\circ}21.8$	8.6'	54.1'
10	329° 47.1 344° 47.3	10.7	95°38.5 110°11.3	13.8' 13.7'	17°30.4 17°39.0	8.6' 8.5'	54.1' 54.1'
11 12	359° 47.5	09.8 N09°08.9	110 11.3 124°44.0	13.7'	N17°47.4	8.4	54.1
13	14°47.7	08.0	139°16.7	13.7'	17°55.8	8.3'	54.1'
14	29°47.9	07.1	153°49.4	13.6'	18°04.2	8.3'	54.1'
15 16	44° 48.1 59° 48.3	· · 06.2 05.3	168°22.0 182°54.5	13.6' 13.5'	18° 12.4 18° 20.6	8.2' 8.1'	54.1' 54.1'
17	74° 48.5	04.5	197°27.0	13.5'	18°28.7	8.0'	54.1'
18	89°48.7	N09°03.6	211°59.5	13.4'	N18°36.7	7.9'	54.1'
19 20	104° 48.9 119° 49.0	02.7 01.8	226°31.9 241°04.3	13.4' 13.3'	18° 44.6 18° 52.5	7.9' 7.8'	54.1' 54.1'
20	119 49.0 134°49.2	00.9	241 04.3 255°36.6	13.3'	18 52.5 19°00.3	7.8 7.7'	54.1'
22	149°49.4	09°00.0	270°08.9	13.2'	19°08.0	7.6'	54.1'
23	164°49.6	08°59.1	284°41.1	13.2'	19° 15.6	7.5'	54.1'
	SD = 15.8'	d = -0.9'		SD	0 = 14.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	179° 49.8	N08°58.2	299°13.2	13.1'	N19°23.1	7.5'	54.1'
1	194°50.0	57.3	313°45.3	13.1'	19°30.6	7.4'	54.1'
2	209° 50.2 224° 50.4	56.4 •• 55.5	328°17.4 342°49.4	13.0' 13.0'	19°38.0 19°45.2	7.3' 7.2'	54.1' 54.1'
4	239° 50.6	54.6	357°21.4	12.9'	19° 43.2 19° 52.4	7.1	54.1
5	254° 50.8	53.7	11°53.3	12.9'	19°59.5	7.0'	54.1'
6	269°51.0	N08°52.8	26°25.1	12.8'	N20°06.6	6.9'	54.2'
7 8	284°51.2 299°51.4	51.9 51.0	40°56.9 55°28.7	12.8' 12.7'	20°13.5 20°20.4	6.9' 6.8'	54.2' 54.2'
9	314°51.6	50.1	70°00.4	12.6'	20°27.1	6.7	54.2'
10	329°51.7	49.2	84°32.1	12.6'	20°33.8	6.6'	54.2'
11 12	344°51.9 359°52.1	48.3 N08°47.4	99°03.7 113°35.2	12.5' 12.5'	20°40.4 N20°46.9	6.5' 6.4'	54.2' 54.2'
13	14° 52.3	46.5	113 35.2 128°06.7	12.5	20°53.3	6.3	54.2'
14	29°52.5	45.6	142°38.1	12.4'	20°59.6	6.2'	54.2'
15	44°52.7	• • 44.7	157°09.5	12.3'	21°05.8	6.1'	54.2'
16 17	59°52.9 74°53.1	43.8 42.9	171°40.9 186°12.1	12.3' 12.2'	21°11.9 21°18.0	6.0' 5.9'	54.2' 54.2'
18	89°53.3	N08°42.0	200°43.4	12.2'	N21°23.9	5.8'	54.3'
19	104°53.5	41.1	215°14.5	12.1'	21°29.8	5.8'	54.3'
20 21	119°53.7 134°53.9	40.2 · · 39.3	229°45.7 244°16.7	12.1' 12.0'	21°35.5 21°41.2	5.7' 5.6'	54.3' 54.3'
22	149° 54.1	38.4	258°47.8	12.0'	21°46.7	5.5'	54.3'
23	164°54.3	37.5	273°18.7	11.9'	21°52.2	5.4'	54.3'
	SD = 15.8'	d = -0.9'		SD	0 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.5	N08°36.6	287°49.6	11.9'	N21°57.5	5.3'	54.3'
1	194°54.7	35.7	302°20.5 316°51.3	11.8'	22°02.8 22°08.0	5.2'	54.3'
2 3	209° 54.9 224° 55.1	34.8 · · 33.9	316°51.3 331°22.1	11.8' 11.7'	22°08.0 22°13.0	5.1' 5.0'	54.4' 54.4'
4	239°55.2	33.0	345°52.8	11.7'	22°18.0	4.9'	54.4
5	254°55.4	32.1	0°23.4	11.6'	22°22.9	4.8'	54.4'
6 7	269° 55.6 284° 55.8	N08°31.2 30.3	14°54.0 29°24.6	11.6' 11.5'	N22°27.6 22°32.3	4.7' 4.6'	54.4' 54.4'
8	299°56.0	29.4	43°55.1	11.5'	22°36.9	4.5	54.4
9	314°56.2	• • 28.5	58°25.6	11.4'	22°41.3	4.3'	54.4'
10 11	329° 56.4 344° 56.6	27.6 26.7	72°56.0 87°26.3	11.3' 11.3'	22°45.7 22°49.9	4.2' 4.1'	54.5' 54.5'
11	344°56.6 359°56.8	26.7 N08°25.8	87°26.3 101°56.6	11.3'	N22°54.0	4.1'	54.5'
13	14°57.0	24.9	$116^{\circ}26.9$	11.2'	22°58.1	3.9'	54.5'
14	29°57.2	24.0	130°57.0	11.1'	23°02.0	3.8'	54.5'
15 16	44° 57.4 59° 57.6	· · 23.1 22.2	145°27.2 159°57.3	11.1' 11.1'	23°05.8 23°09.5	3.7' 3.6'	54.5' 54.6'
17	74°57.8	21.3	174°27.4	11.0'	23°13.1	3.5'	54.6'
18	89°58.0	N08°20.4	188°57.4	11.0'	N23° 16.6	3.4'	54.6'
19 20	104° 58.2 119° 58.4	19.5 18.6	203°27.3 217°57.2	10.9' 10.9'	23°20.0 23°23.3	3.3' 3.2'	54.6' 54.6'
21	134° 58.6	10.0	232°27.1	10.9	23°26.5	3.1'	54.6'
22	149°58.8	16.8	246°56.9	10.8'	23°29.5	2.9'	54.7'
23	164°59.0	15.9	261°26.7	10.7'	23°32.5	2.8'	54.7'
	SD = 15.8'	d = -0.9'		SD	0 = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-61%	
29	00:59	00:50	12:01	03:26	15:48		
30	00:41	00:31	12:01	04:11	16:34		
31	00:22	00:13	12:00	04:58	17:23		

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

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	340°26.8	142°55.9	S07°41.0	118°08.7	\$17°17.8	136°23.4	S08°51.9	287°13.0	N16°45.0			
1	355°29.3	157°55.8	42.3	133°09.5	18.3	151°25.5	52.1	302°15.4	45.0	Alpheratz	357°30.5	29°15.4
2	10°31.8	172°55.6	43.5	148°10.4	18.8	166°27.5	52.3	317°17.9	45.0	Ankaa	353°03.2	-42°08.4
3	25°34.2	187°55.4	• • 44.8	163°11.2	• • 19.3	181°29.5	• • 52.5	332°20.3	• • 45.0	Schedar	349°26.1	56°42.0
4	40°36.7	202°55.2	46.0	178°12.1	19.8	196°31.6	52.6	347°22.8	45.0	Diphda	348°43.3	-17°49.2
5	55°39.2	217°55.0	47.3	193°12.9	20.3	211°33.6	52.8	2°25.2	45.0	Achernar	335°17.2	-57°04.8
6	70°41.6	232°54.8	S07°48.5	208°13.8	S17°20.8	226°35.7	S08°53.0	17°27.6	N16°45.0	Hamal	327°46.7	23°36.2
7	85°44.1	247°54.6	49.8	223°14.6	21.3	241°37.7	53.1	32°30.1	44.9	Polaris	311°46.5	89°22.9
8	100°46.5	262°54.4	51.0	238° 15.5	21.8	256° 39.8	53.3	47°32.5	44.9	Acamar	315°08.8	-40°10.9
9	115°49.0	277°54.3	• • 52.3	253°16.3	• • 22.3	271°41.8	• • 53.5	62°35.0	• • 44.9	Menkar	314°02.1	4°12.5
10	130°51.5	292°54.1	53.5	268°17.2	22.8	286°43.9	53.6	77°37.4	44.9	Mirfak	308°22.6	49°57.8
11	145°53.9	307°53.9	54.8	283°18.0	23.3	301°45.9	53.8	92°39.8	44.9	Aldebaran	290°35.3	16°34.1
12	160°56.4	322°53.7	S07°56.0	298° 18.9	S17°23.8	316°47.9	S08°54.0	107°42.3	N16°44.9	Rigel	281°00.3	-8°10.0 46°01.4
13	175°58.9	337°53.5	57.3	313° 19.7	24.3	331°50.0	54.1	122°44.7	44.9	Capella	280°16.4 278°18.9	6°22.6
14	191°01.3	352°53.3	58.5	328°20.6	24.8	346°52.0	54.3	137°47.1	44.9	Bellatrix	276 16.9 277°57.2	28°37.8
15	206°03.8	$7^{\circ}53.1$	07°59.8	343°21.4	• • 25.3	$1^{\circ}54.1$	• • 54.5	152°49.6	• • 44.9	Elnath Alnilam	275°34.0	-1°11.0
16	221°06.3	22°52.9	$08^{\circ}01.0$	358°22.3	25.8	$16^{\circ}56.1$	54.6	167°52.0	44.9		270°48.1	7°24.7
17	236°08.7	$37^{\circ}52.8$	02.2	13°23.1	26.3	31°58.2	54.8	182°54.5	44.9	Betelgeuse Canopus	263°51.0	-52°42.5
18	251°11.2	52°52.6	S08°03.5	28°24.0	S 17°26.8	47°00.2	S08°55.0	197°56.9	N16°44.9	Sirius	258°23.1	-32 42.3 -16°45.4
19	266°13.7	67°52.4	04.7	43°24.8	27.3	62°02.2	55.2	212°59.4	44.9	Adhara	255°03.1	-10° 45.4 -29° 00.6
20	$281^{\circ}16.1$	82°52.2	06.0	58° 25.7	27.8	77°04.3	55.3	228°01.8	44.9	Procyon	244°47.1	5°08.9
21	$296^{\circ}18.6$	97°52.0	• • 07.2	73°26.5	• • 28.3	92°06.3	•• 55.5	243°04.2	• • 44.9	Pollux	244 47.1 243°13.0	27°57.1
22	$311^{\circ}21.0$	112°51.8	08.5	88°27.4	28.7	$107^{\circ}08.4$	55.7	258°06.7	44.9	Avior	243 13.0 234°13.6	-59°36.2
23	$326^{\circ}23.5$	$127^{\circ}51.6$	09.7	103°28.2	29.2	$122^{\circ}10.4$	55.8	273°09.1	44.9	Suhail	234°13.6 222°43.9	-59°36.2 -43°33.1
Ma: :-	ass. 01:18	,, n 2/ J1	.2′ m-4.03	1/0 0/ JO	.5′ m0.87	1/2 0/ 40	2′ m-1.76	112 A/ J C	.0′ m0.10	Miaplacidus	222 43.9 221°38.1	-43 33.1 -69°50.3
ivier.p	ass. 01:10	ν-0.2 α1	.2 111-4.03	νο.9 αυ	.5 1110.67	ν2.0 d0.	2 m-1.70	ν2.4 <i>α</i> -0	.0 1110.10	Alphard	221 30.1 217°44.4	-8°47.3
										Regulus	207°30.8	-6 47.3 11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.4
0	341°26.0	142°51.4	S08°11.0	$118^{\circ}29.1$	S17°29.7	$137^{\circ}12.4$	S08°56.0	288°11.6	N16°44.9	Dubne	193 37.3 182°21.5	14°24.4
1	356°28.4	157°51.3	12.2	133°29.9	30.2	152°14.5	56.2	$303^{\circ}14.0$	44.9	Gienah	175°40.0	-17°42.4
2	11°30.9	$172^{\circ}51.1$	13.4	148°30.8	30.7	$167^{\circ}16.5$	56.3	318°16.4	44.9		173° 40.0	-63°16.0
3	26°33.4	187°50.9	• • 14.7	163°31.6	• • 31.2	182° 18.6	• • 56.5	333°18.9	• • 44.9		172 30.3 171°47.8	-57°16.9
4	41°35.8	202°50.7	15.9	178°32.4	31.7	197°20.6	56.7	348°21.3	44.9	Alioth	166°10.3	55°48.1
5	56°38.3	$217^{\circ}50.5$	17.2	193°33.3	32.2	212°22.7	56.9	3°23.8	44.9	Spica	158° 18.6	-11°18.9
6	71°40.8	232°50.3	508°18.4	208°34.1	S 17°32.7	227°24.7	508°57.0	18°26.2	N16°44.9	Alkaid	150° 10.0	49°10.1
7	86°43.2	$247^{\circ}50.1$	19.6	223°35.0	33.2	242°26.7	57.2	33°28.7	44.9	Hadar	148°30.8	-60°31.1
8	101°45.7	262°49.9	20.9	238°35.8	33.7	257°28.8	57.4	48°31.1	44.9		147°53.3	-36°31.0
9	116°48.1	277°49.7	• • 22.1	253°36.7	• • 34.2	272°30.8	• • 57.5	63°33.5	• • 44.9	Arcturus	145°44.7	19°01.8
10	131°50.6	292°49.5	23.4	268°37.5	34.7	287°32.9	57.7	78°36.0	44.9	Rigil Kent.	139°35.3	-60°57.6
11	146°53.1	307°49.4	24.6	283°38.3	35.2	302°34.9	57.9	93°38.4	44.8	Kochab	137°20.7	74°02.3
12	161°55.5	322°49.2	S08°25.9	298°39.2	S17°35.7	317°36.9	S08°58.0	108°40.9	N16°44.8	Zuben'ubi	136°52.0	-16°09.8
13	176°58.0	337° 49.0	27.1	313°40.0	36.2	332°39.0	58.2	123°43.3	44.8	Alphecca	126°00.7	26°37.2
14	192°00.5	352°48.8	28.3	328°40.9	36.7	347°41.0	58.4	138°45.8	44.8	Antares	112°11.2	-26°29.8
15	207°02.9	7°48.6	• • 29.6	343°41.7	• • 37.2	2°43.1	• • 58.5	153°48.2	• • 44.8	Atria	107°01.9	-69°04.9
16	222°05.4	22°48.4	30.8	358° 42.5	37.6	17°45.1	58.7	168°50.7	44.8	Sabik	101°58.4	-15°45.5
17	237°07.9	37°48.2	32.0	13°43.4	38.1	32°47.1	58.9	183°53.1	44.8	Shaula	96°05.2	-37°07.4
18	252°10.3	52°48.0	S08°33.3		S17°38.6	47°49.2	S08°59.1	198°55.5	N16°44.8	Rasalhague	95°55.0	12°32.6
19	267°12.8	67° 47.8	34.5	43°45.1	39.1	62°51.2	59.2	213°58.0	44.8	Eltanin	90°40.3	51°29.5
20	282°15.3	82°47.6	35.8	58°45.9	39.6	77°53.2	59.4	229°00.4	44.8	Kaus Aust.	83°27.4	$-34^{\circ}22.1$
21	297°17.7	97°47.4	• • 37.0	73°46.7	• • 40.1	92°55.3	• • 59.6	244°02.9	• • 44.8	Vega	80°30.5	38°49.1
22	312°20.2	112°47.3	38.2	88° 47.6	40.6	107°57.3	59.7	259°05.3	44.8	Nunki	75°42.9	$-26^{\circ}15.4$
23	327°22.6	127°47.1	39.5	103°48.4	41.1	122°59.4	59.9	274°07.8	44.8	Altair	$61^{\circ}56.1$	8°57.1
Mer.p	ass. 01:14	ν -0.2' d1	.2′ m-4.04	ν 0.8′ d0	.5′ m0.88	$\nu 2.0' d0.$	2′ m-1.76	$\nu 2.4' \ d-0$.0′ m0.09	Peacock	52°59.5	-56°38.2
										Deneb	49°22.8	45°23.5
			_		_		_		_	Enif	33°34.8	$10^{\circ}01.0$
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	342°25.1	142°46.9	S08°40.7	118°49.3		138°01.4	S09°00.1	289°10.2	N16°44.8	Fomalhaut	$15^{\circ}10.1$	-29°27.6
1	357°27.6	157°46.7	41.9	133°50.1	42.1	153°03.4	00.2	304°12.7	44.8	Scheat	13°41.1	28°14.9
2	12°30.0	172°46.5	43.2	148°50.9	42.6	168°05.5	00.4	319°15.1	44.8	Markab	13°25.8	15°22.1
3	27°32.5	187°46.3	· · 44.4	163°51.8	43.1	183°07.5	00.6	334°17.6	• • 44.8	Sep 01 Sat	SHA	Mer.pass
4	42°35.0	202°46.1	45.7 46.0	178°52.6	43.5	198°09.6	8.00	349°20.0 4°22.5	44.8		3HA 162°29.1	14:28
5	57°37.4	217°45.9	46.9	193°53.4	44.0 \$17°44.5	213°11.6	00.9		44.8 N16°44.9		102 29.1 137°41.8	14:28
6	72°39.9	232°45.7	508°48.1	208°54.3	\$17°44.5	228°13.6	S09°01.1	19°24.9	N16°44.8		157 41.6 155°56.6	14:52
7 Ω	87°42.4	247°45.5	49.4 50.6	223°55.1	45.0 45.5	243° 15.7 258° 17.7	01.3	34°27.4 49°29.8	44.8	Saturn	306°46.2	04:50
8 9	102°44.8 117°47.3	262° 45.3 277° 45.1	50.6 •• 51.8	238° 55.9 253° 56.8	45.5 •• 46.0	258° 17.7 273° 19.7	01.4 · · 01.6	49°29.8 64°32.2	44.7 •• 44.7	Jatuill	JUU 40.2	04.50
10	117 47.3 132°49.8	277 45.1 292°44.9	53.1	268° 57.6	46.5	273 19.7 288°21.8	01.8	79°34.7	44.7	Sep 02 Sun	SHA	Mer.pass
11	132 49.8 147°52.2	292 44.9 307°44.7	53.1 54.3	283°58.4	40.5 47.0	288 21.8 303°23.8	01.8	79 34.7 94°37.1	44.7 44.7		$161^{\circ}25.5$	14:29
12	147 52.2 162°54.7	307 44.7 322°44.6	508°55.5	203 50.4 298°59.3	\$17°47.5	318° 25.9	509°02.1	109°39.6	N16°44.7	Mars	$137^{\circ}03.1$	16:05
13	162 54.7 177°57.1	322 44.0 337°44.4	508 55.5	298 59.3 314°00.1	48.0	318 25.9 333°27.9	02.3	109 39.0 124°42.0	N10 44.7 44.7	Jupiter	155°46.5	14:49
14	177 57.1 192°59.6	352°44.2	58.0	329°00.9	48.4	348° 29.9	02.5	139°44.5	44.7 44.7	Saturn	306°45.6	04:46
15	208°02.1	7°44.0	08°59.2	344°01.8	• 48.9	3°32.0	02.6	159 44.5 154°46.9	• • 44.7	Son 02 M4-	СПУ	Me:
16	200 02.1 223°04.5	22°43.8	06 59.2 09°00.5	359°02.6	49.4	3 32.0 18°34.0	02.8	169°49.4	44.7	Sep 03 Mon	SHA 160° 21 °	Mer.pass
	223 04.5 238°07.0	22 43.6 37°43.6	09 00.5	14°03.4	49.4	33°36.0	03.0	109 49.4 184°51.8	44.7 44.7		160°21.8	14:29
17 18	253°09.5	52°43.4	509°02.9		49.9 \$17°50.4	48° 38.1	509°03.1	184 51.8 199°54.3	44.7 N16°44.7		136°24.1	16:04
18 19	253 09.5 268°11.9	52 43.4 67°43.2	04.1	29 04.3 44°05.1	50.4	48 38.1 63°40.1	03.3	199 54.3 214°56.7	44.7		155°36.3	14:46
20	200 11.9 283°14.4	82°43.0	05.4	59°05.9	51.4	78° 42.1	03.5	214 50.7 229°59.2	44.7 44.7	Saturn	306°45.1	04:43
21	283 14.4 298°16.9	82 43.0 97°42.8	06.6	74° 06.8	51.4	78 42.1 93°44.2	03.7	229 59.2 245°01.6	44.7 •• 44.7	Horizont	al parallax	
22	313°19.3	97 42.6 112°42.6	07.8	89°07.6	52.4	93°44.2 108°46.2	03.8	260°04.1	44.7		Venus:	0.1
23	328°21.8	127°42.4	09.1	104°08.4	52.4	123°48.2	04.0	275°06.5	44.7		Mars:	0.1
										L		
Mer.p	ass. 01:10	ν -0.2' $d1$.2′ m-4.04	u0.8′ d0	.5′ m0.88	ν 2.0′ d0.	2′ m-1.76	ν 2.4′ d-0	.0′ m0.09			

h	Su			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.2	N08° 14.9	275°56.4	10.7'	N23°35.3	2.7'	54.7'
1 2	194°59.4 209°59.6	14.0 13.1	290°26.0 304°55.7	10.6' 10.6'	23°38.0 23°40.6	2.6' 2.5'	54.7' 54.7'
3	209 59.0 224°59.8	. 12.2	319°25.3	10.5	23°43.1	2.4	54.8'
4	240°00.0	11.3	333°54.8	10.5'	23°45.5	2.3'	54.8'
5	255°00.2	10.4	348°24.3	10.5'	23°47.7	2.1'	54.8'
6 7	270°00.4 285°00.6	N08° 09.5 08.6	2°53.7 17°23.2	10.4' 10.4'	N23°49.9 23°51.9	2.0' 1.9'	54.8' 54.8'
8	300°00.8	07.7	31°52.5	10.4	23°53.8	1.8'	54.9'
9	315°01.0	• • 06.8	46°21.8	10.3'	23°55.6	1.7'	54.9'
10	330°01.2 345°01.4	05.9 05.0	60°51.1 75°20.4	10.2' 10.2'	23°57.3 23°58.9	1.6' 1.4'	54.9'
11 12	0°01.6	N08°04.1	75 20.4 89°49.6	10.2'	23 58.9 N24°00.3	1.4	54.9' 55.0'
13	15°01.8	03.1	104°18.7	10.1'	24°01.7	1.2'	55.0'
14	30°02.0	02.2	118°47.9	10.1'	24°02.9	1.1'	55.0'
15 16	45°02.2 60°02.4	· · 01.3 08°00.4	133°16.9 147°46.0	10.0' 10.0'	24°04.0 24°04.9	1.0' 0.8'	55.0' 55.0'
17	75°02.6	07°59.5	162°15.0	10.0'	24°05.8	0.7	55.1'
18	90°02.8	N07°58.6	176°44.0	9.9'	N24°06.5	0.6'	55.1'
19	105°03.0	57.7	191°12.9	9.9'	24°07.1	0.5'	55.1'
20 21	120°03.2 135°03.4	56.8 •• 55.9	205°41.8 220°10.7	9.9' 9.8'	24°07.6 24°08.0	0.4' 0.2'	55.1' 55.2'
22	150°03.6	54.9	234°39.5	9.8'	24°08.2	0.1	55.2'
23	165°03.8	54.0	249°08.3	9.8'	24°08.3	-0.0'	55.2'
	SD = 15.8′	d = -0.9'		SE	0 = 14.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
o O	180°04.0	N07°53.1	263°37.1	ν 9.7'	N24°08.3	-0.1'	55.2'
1	195°04.2	52.2	278°05.8	9.7'	24°08.2	-0.3	55.3'
2	210°04.4	51.3	292°34.5	9.7'	24°07.9	-0.4'	55.3'
3 4	225°04.6 240°04.8	• • 50.4 49.5	307°03.2 321°31.9	9.6' 9.6'	24°07.6 24°07.1	-0.5' -0.6'	55.3' 55.3'
5	255°05.0	48.6	336°00.5	9.6'	24°06.4	-0.7	55.4'
6	270°05.2	N07°47.6	350°29.1	9.6'	N24°05.7	-0.9'	55.4'
7 8	285°05.4 300°05.6	46.7 45.8	4°57.6 19°26.2	9.5' 9.5'	24°04.8 24°03.8	-1.0' -1.1'	55.4' 55.5'
9	315°05.8	· · 44.9	33°54.7	9.5' 9.5'	24 03.6 24°02.7	-1.1 -1.3'	55.5'
10	330°06.0	44.0	48°23.2	9.5'	24°01.4	-1.4'	55.5'
11	345°06.2	43.1	62°51.6	9.4'	24°00.1	-1.5'	55.5'
12 13	0°06.4 15°06.6	N07° 42.2 41.2	77°20.1 91°48.5	9.4' 9.4'	N23°58.6 23°56.9	-1.6' -1.8'	55.6' 55.6'
14	30°06.8	40.3	106°16.9	9.4'	23°55.2	-1.9'	55.6'
15	45°07.0	• • 39.4	120°45.3	9.4'	23°53.3	-2.0'	55.7'
16	60°07.2 75°07.4	38.5 37.6	135°13.6 149°41.9	9.3' 9.3'	23°51.3 23°49.1	-2.1'	55.7'
17 18	90°07.6	N07°36.7	149 41.9 164°10.3	9.3	N23°46.9	-2.3' -2.4'	55.7' 55.7'
19	105°07.8	35.8	178°38.5	9.3'	23°44.5	-2.5'	55.8'
20	120°08.0	34.8	193°06.8	9.3'	23°41.9		55.8'
21 22	135°08.2 150°08.4	· · 33.9 33.0	207°35.1 222°03.3	9.2' 9.2'	23°39.3 23°36.5	-2.8' -2.9'	55.8' 55.9'
23	165°08.6	32.1	236°31.6	9.2'	23°33.6	-3.0'	55.9'
	SD = 15.8'	d = -0.9'		SE	0 = 15.1'		
Mon 0	GHA 180°08.8	Dec N07°31.2	GHA 250°59.8	u 9.2'	Dec N23°30.6	d -3.2'	HP 55.9'
1	195°09.0	30.3	265°28.0	9.2'	23°27.4	-3.3'	56.0'
2	210°09.2	29.3	279°56.2	9.2'	23°24.1	-3.4'	56.0'
3 4	225°09.4 240°09.7	· · 28.4 27.5	294°24.3 308°52.5	9.2' 9.2'	23°20.7 23°17.1	-3.5' -3.7'	56.0' 56.1'
5	255°09.9	26.6	306 32.3 323°20.7	9.2 9.1'	23°13.5	-3.8'	56.1
6	270°10.1	N07°25.7	337°48.8	9.1'	N23°09.7	-3.9'	56.1'
7 8	285°10.3 300°10.5	24.7 23.8	352°16.9 6°45.1	9.1' 9.1'	23°05.7 23°01.7	-4.1' -4.2'	56.2' 56.2'
8 9	300°10.5 315°10.7	23.8	6°45.1 21°13.2	9.1' 9.1'	23°01.7 22°57.5	-4.2 -4.3'	56.2'
10	330°10.9	22.0	$35^{\circ}41.3$	9.1'	$22^{\circ}53.1$	-4.4'	56.3'
11	345°11.1	21.1	50°09.4	9.1'	22°48.7	-4.6'	56.3'
12 13	0°11.3 15°11.5	N07°20.1 19.2	64°37.5 79°05.6	9.1' 9.1'	N22°44.1 22°39.4	-4.7' -4.8'	56.3' 56.4'
14	30°11.7	18.3	93°33.7	9.1'	22°34.6	-5.0'	56.4
15	45°11.9	• • 17.4	108°01.8	9.1'	22°29.6	-5.1'	56.4'
16 17	60°12.1 75°12.3	16.5 15.5	122°29.9 136°58.0	9.1' 9.1'	22°24.5 22°19.3	-5.2' -5.3'	56.5' 56.5'
18	75°12.3 90°12.5	15.5 N07° 14.6	130°58.0 151°26.1	9.1'	N22°14.0	-5.5'	56.5
19	105°12.7	13.7	$165^{\circ}54.2$	9.1'	22°08.5	-5.6'	56.6'
20	120°12.9	12.8	180°22.3	9.1'	22°02.9	-5.7'	56.6'
21 22	135°13.1 150°13.3	· · 11.9 10.9	194°50.3 209°18.4	9.1' 9.1'	21°57.2 21°51.3	-5.9' -6.0'	56.6' 56.7'
23	165°13.6	10.0	223°46.5	9.1'	21°45.4	-6.1	56.7'
	SD = 15.8'	d = -0.9'		SE	0 = 15.3'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
_ 43	00 ^h	12 ^h	Pass	Upper Lower		22-24	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	52-33%	
01	00:03	00:06	12:00	05:48	18:14		
02	00:16	00:26	12:00	06:39	19:06		
03	00:35	00:45	11:59	07:32	19:58		

September 04, 05, 06 UT (Tue., Wed., Thu.)

h	Aries	Vei	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	343°24.3	142° 42.2	S09°10.3	119°09.2	\$17°53.3	138°50.3	S09°04.2	290°09.0	N16°44.7			
1	358°26.7	157° 42.0	11.5	134° 10.1	53.8	153°52.3	04.3	305°11.4	44.7	Alpheratz	357°30.5	29°15.4
2	13°29.2	172°41.8	12.8	149°10.9	54.3	168°54.4	04.5	320°13.9	44.6	Ankaa	353°03.2	-42°08.4
3	28°31.6	187°41.6	• • 14.0	164°11.7	• • 54.8	183°56.4	04.7	335°16.3	• • 44.6	Schedar	349°26.0	56°42.0
4	43°34.1	202°41.4	15.2	179°12.5	55.3	198°58.4	04.9	350°18.8	44.6	Diphda	348°43.3	-17°49.2
5	58°36.6	217°41.2	16.4	194°13.4	55.8	214°00.5	05.0	5°21.3	44.6	Achernar	335°17.1 327°46.7	-57°04.8 23°36.2
6	73°39.0	232°41.0	S09°17.7	209°14.2	S17°56.2	229°02.5	S09°05.2	20°23.7	N16°44.6	Hamal Polaris	321 40.1 311°44.8	23 30.2 89°22.9
7	88°41.5	247°40.8	18.9	224°15.0	56.7	244°04.5	05.4	35°26.2	44.6	Acamar	315°08.8	-40°10.9
8	103°44.0	262°40.7	20.1	239°15.9	57.2	259°06.6	05.5	50°28.6	44.6	Menkar	314°02.1	4°12.5
9	118°46.4	277° 40.5	• • 21.3	254° 16.7	• • 57.7	274°08.6	• • 05.7	65°31.1	• • 44.6	Mirfak	308° 22.6	49°57.8
10	133°48.9	292°40.3	22.6	269°17.5	58.2	289° 10.6	05.9	80°33.5	44.6	Aldebaran	290°35.3	16°34.1
11	148°51.4	307°40.1	23.8	284° 18.3	58.7	304° 12.7	06.1	95°36.0	44.6	Rigel	281°00.3	-8°10.0
12	163°53.8	322°39.9	S09°25.0	299°19.1	\$17°59.2	319° 14.7 334° 16.7	S09°06.2	110°38.4 125°40.9	N16°44.6	Capella	280°16.4	46°01.4
13 14	178°56.3 193°58.7	337°39.7 352°39.5	26.3 27.5	314°20.0 329°20.8	17°59.6 18°00.1	334 10.7 349°18.8	06.4 06.6	125 40.9 140°43.3	44.6 44.6	Bellatrix	278°18.9	6°22.6
15	209°01.2	7°39.3	28.7	344° 21.6	. 00.1	4° 20.8	. 06.7	155°45.8	• • 44.6	Elnath	277°57.2	28°37.8
16	224°03.7	22° 39.1	29.9	359°22.4	01.1	19° 22.8	06.9	170°48.2	44.6	Alnilam	275°34.0	-1°11.0
17	239°06.1	37°38.9	31.2	14°23.3	01.6	34°24.9	07.1	185°50.7	44.6	Betelgeuse	270°48.1	7°24.7
18	254°08.6	52°38.7	S09°32.4	29°24.1	S18°02.1	49°26.9	S09°07.3	200°53.1	N16°44.5	Canopus	263°50.9	-52°42.5
19	269°11.1	67°38.5	33.6	44°24.9	02.6	64°28.9	07.4	215°55.6	44.5	Sirius	258°23.1	-16°45.3
20	284°13.5	82°38.3	34.8	59°25.7	03.0	79°31.0	07.6	230°58.1	44.5	Adhara	255°03.1 244°47.1	-29°00.6 5°08.9
21	$299^{\circ}16.0$	97°38.1	• • 36.0	74°26.5	• • 03.5	94°33.0	• • 07.8	246°00.5	• • 44.5	Procyon Pollux	244 47.1 243°13.0	27°57.1
22	$314^{\circ}18.5$	112°37.9	37.3	89°27.4	04.0	109°35.0	07.9	261°03.0	44.5	Avior	234° 13.6	-59°36.2
23	329°20.9	127°37.7	38.5	104°28.2	04.5	124°37.1	08.1	276°05.4	44.5	Suhail	234 13.0 222°43.9	-39 30.2 -43°33.1
Mer n	ass. 01:06	ν -0.2' d1.	.2′ m-4.05	$\nu 0.8' d0$.5′ m0.89	$\nu 2.0' d0$	2′ m-1.75	ν2.5′ d-0	.0′ m0.08	Miaplacidus	221°38.1	-69°50.3
- wier.p		- U.Z UI.	7.03	- J.O UU		- 2.0 UU.		-2.5 u-0		Alphard	217°44.4	-8°47.3
			_		_		_		_	Regulus	207°30.8	11°49.3
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.4
0	344°23.4	142°37.5	S09°39.7	119°29.0	\$18°05.0	139°39.1	S09°08.3	291°07.9	N16°44.5	Denebola	$182^{\circ}21.5$	14°24.4
1	359°25.9	157°37.3	40.9	134°29.8 149°30.6	05.5	154°41.1	08.5	306°10.3 321°12.8	44.5	Gienah	175°40.0	-17°42.4
2	14°28.3 29°30.8	172°37.1 187°36.9	42.2 •• 43.4	149 30.6 164°31.5	05.9 •• 06.4	169°43.1 184°45.2	08.6 •• 08.8	321 12.8 336°15.2	44.5 •• 44.5	Acrux	172°56.3	-63°16.0
4	44°33.2	202° 36.7	44.6	179° 32.3	06.9	104 45.2 199°47.2	09.0	351°17.7	44.5	Gacrux	171°47.8	-57°16.9
5	59°35.7	202 30.7 217° 36.5	45.8	194°33.1	07.4	214°49.2	09.0	6°20.2	44.5	Alioth	166°10.3	55°48.0
6	74°38.2	232°36.3	\$09°47.0	209° 33.9	S18°07.9	229°51.3	S09°09.3	21°22.6	N16°44.5	Spica	158° 18.6	-11°18.9
7	89°40.6	247°36.1	48.3	224°34.7	08.4	244°53.3	09.5	36°25.1	44.5	Alkaid	152°49.5	49°10.1
8	104°43.1	262°35.9	49.5	239°35.6	08.8	259°55.3	09.7	51°27.5	44.4	Hadar	148°30.9	-60°31.1
9	119°45.6	277°35.7	• • 50.7	254°36.4	09.3	274°57.4	09.8	66°30.0	• • 44.4	Menkent	147°53.3	-36°31.0
10	134°48.0	292°35.5	51.9	269°37.2	09.8	289°59.4	10.0	81°32.4	44.4	Arcturus	145°44.7 139°35.3	19°01.8 -60°57.6
11	149°50.5	307°35.3	53.1	284°38.0	10.3	305°01.4	10.2	96°34.9	44.4	Rigil Kent. Kochab	139° 35.3 137° 20.8	74°02.3
12	164°53.0	322°35.1	S09°54.4	299°38.8	S18°10.8	320°03.5	S09° 10.4	111°37.4	N16°44.4	Zuben'ubi	136°52.0	-16°09.8
13	179°55.4	337°34.9	55.6	314°39.6	11.2	335°05.5	10.5	126°39.8	44.4	Alphecca	126°00.7	26°37.2
14	194°57.9	352°34.7	56.8	329°40.4	11.7	350°07.5	10.7	141°42.3	44.4	Antares	112° 11.2	-26°29.8
15	210°00.4	7°34.5	• 58.0	344°41.3	• • 12.2	5°09.5	• • 10.9	156°44.7	• • 44.4	Atria	107°01.9	-69°04.9
16	225°02.8	22°34.3	09°59.2	359°42.1	12.7	20°11.6	11.0	171°47.2	44.4	Sabik	101°58.4	-15°45.5
17	240°05.3	37°34.1	10°00.4	14° 42.9	13.2	35°13.6	11.2	186°49.7	44.4	Shaula	96°05.2	-37°07.4
18	255°07.7	52°33.9	\$10°01.7	29°43.7	\$18°13.6	50°15.6	S09°11.4	201°52.1	N16°44.4	Rasalhague	95°55.0	12°32.6
19 20	270°10.2 285°12.7	67°33.7 82°33.5	02.9 04.1	44°44.5 59°45.3	14.1	65° 17.7 80° 19.7	11.6	216°54.6 231°57.0	44.4 44.4	Eltanin	90°40.3	51°29.5
21	300°15.1	97°33.3	05.3	74°46.1	14.6 •• 15.1	95° 21.7	11.7 · · 11.9	246°59.5	• • 44.4	Kaus Aust.	83°27.4	-34°22.1
22	315°17.6	112°33.1	06.5	89°46.9	15.6	110°23.8	12.1	262°01.9	44.3	Vega	80°30.5	38°49.1
23	330°20.1	127°32.9	07.7	104°47.8	16.0	125°25.8	12.3	277°04.4	44.3	Nunki	75°42.9	-26°15.4
										Altair	61°56.1	8°57.1
Mer.p	ass. 01:02	ν -0.2' d1.	.2′ m-4.06	$\nu 0.8' d0$.5′ m0.89	$\nu 2.0' d0.$	2′ m-1.75	$\nu 2.5' d-0$.0′ m0.08	Peacock Deneb	52°59.5 49°22.8	-56°38.2 45°23.5
										Enif	33°34.8	45 23.5 10°01.0
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 27.9	-46°48.8
0	345°22.5	$142^{\circ}32.7$	S10°08.9	$119^{\circ}48.6$	S18°16.5	140°27.8	S09°12.4	292°06.9	N16°44.3	Fomalhaut	15° 10.1	-40° 48.8 -29° 27.6
1	0°25.0	157°32.5	10.2	134°49.4	17.0	155°29.8	12.6	307°09.3	44.3	Scheat	13°41.1	28°14.9
2	15°27.5	172°32.3	11.4	149°50.2	17.5	170°31.9	12.8	322°11.8	44.3	Markab	13°25.8	15°22.2
3	30°29.9	187°32.1	• • 12.6	164°51.0	• • 18.0	185°33.9	• • 12.9	337°14.3	• • 44.3			
4	45°32.4	202°31.8	13.8	179°51.8	18.4	200°35.9	13.1	352°16.7	44.3	Sep 04 Tue	SHA 150° 19 0	Mer.pass
5	60°34.8	217°31.6	15.0 \$10°16.2	194°52.6	18.9	215°38.0	13.3	7°19.2	44.3 N16°44.3		159° 18.0 135° 45.0	14:29 16:03
6 7	75°37.3 90°39.8	232°31.4	\$10°16.2		\$18°19.4	230°40.0	S09°13.5	22°21.6 37°24.1	N16°44.3		155° 26.0	14:43
8	90°39.8 105°42.2	247°31.2 262°31.0	17.4 18.6	224°54.2 239°55.0	19.9 20.4	245° 42.0 260° 44.0	13.6 13.8	52°26.6	44.3 44.3	Saturn	306°44.7	04:39
9	105 42.2 120°44.7	202 31.0 277° 30.8	19.9	254° 55.8	. 20.4	275°46.1	• • 14.0	67°29.0	• • 44.3			
10	135°47.2	292°30.6	21.1	269° 56.7	21.3	290°48.1	14.2	82°31.5	44.2	Sep 05 Wed	SHA	Mer.pass
11	150°49.6	307°30.4	22.3	284°57.5	21.8	305°50.1	14.3	97°33.9	44.2		158°14.1	14:30
12	165°52.1	322°30.2	S10°23.5	299°58.3	S18°22.3	320°52.1	S09°14.5	112°36.4	N16°44.2		135°05.6	16:01
13	$180^{\circ}54.6$	$337^{\circ}30.0$	24.7	$314^{\circ}59.1$	22.7	$335^{\circ}54.2$	14.7	127°38.9	44.2	Jupiter Saturn	155° 15.7 306° 44.5	14:39 04:35
14	195°57.0	352°29.8	25.9	329°59.9	23.2	350°56.2	14.9	142°41.3	44.2	Jatuin	JUU 44.3	04.33
15	210°59.5	7°29.6	• • 27.1	345°00.7	• • 23.7	5°58.2	• • 15.0	157°43.8	• • 44.2	Sep 06 Thu	SHA	Mer.pass
16	226°02.0	22°29.4	28.3	0°01.5	24.2	21°00.3	15.2	172°46.3	44.2		157° 10.1	14:30
17	241°04.4	37°29.2	29.5	15°02.3	24.6	36°02.3	15.4	187°48.7	44.2		134°26.0	16:00
18	256°06.9	52°29.0	\$10°30.7		\$18°25.1	51°04.3	S09° 15.5		N16°44.2		155°05.3	14:36
19 20	271°09.3 286°11.8	67° 28.8 82° 28.6	31.9 33.1	45°03.9 60°04.7	25.6 26.1	66°06.3 81°08.4	15.7 15.9	217°53.6 232°56.1	44.2 44.2	Saturn	306°44.3	04:31
20	280 11.8 301°14.3	97°28.4	34.4	75°05.5	26.5	96° 10.4	15.9	232 50.1 247°58.6	• • 44.2	Horizont	al parallax	
22	316°16.7	112°28.1	35.6	90°06.3	27.0	111°12.4	16.2	263°01.0	44.2		Venus:	0.1
23	331°19.2	127°27.9	36.8	105°07.1	27.5	126° 14.4	16.4	278°03.5	44.1		Mars:	0.1
ivier.p	ass. 00:58	ν-U.2' α1.	.2′ m-4.06	νυ.δ΄ αθ	.5′ m0.90	ν 2.0° a 0.	2′ m-1.75	ν 2.5 a-0	.0′ m0.07			

h	Su	n			Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP		
0	180°13.8	$N07^{\circ}09.1$	$238^{\circ}14.6$	9.1'	$N21^{\circ}39.3$	-6.2'	56.7'		
1	195°14.0	08.2	252°42.7 267°10.8	9.1'	21°33.0	-6.4'	56.8'		
2 3	210° 14.2 225° 14.4	07.2 •• 06.3	267°10.8 281°38.9	9.1' 9.1'	21°26.7 21°20.2	-6.5' -6.6'	56.8' 56.8'		
4	240°14.6	05.4	296°07.0	9.1'	21°13.6	-6.7'	56.9'		
5	255°14.8	04.5	$310^{\circ}35.2$	9.1'	$21^{\circ}06.9$	-6.9'	56.9'		
6	270°15.0	N07°03.6	325°03.3	9.1'	N21°00.0	-7.0'	57.0'		
7 8	285° 15.2 300° 15.4	02.6 01.7	339°31.4 353°59.6	9.1' 9.1'	20°53.0 20°45.9	-7.1' -7.2'	57.0' 57.0'		
9	315° 15.6	07°00.8	8°27.7	9.2'	20°38.7	-7.3	57.1		
10	330°15.8	$06^{\circ}59.9$	22°55.9	9.2'	20°31.4	-7.5'	57.1'		
11	345°16.0 0°16.2	58.9 N06°58.0	37°24.0 51°52.2	9.2' 9.2'	20°23.9 N20°16.3	-7.6' -7.7'	57.1' 57.2'		
12 13	15° 16.2	57.1	66°20.4	9.2' 9.2'	20° 08.6	-7.7° -7.8°	57.2'		
14	30° 16.7	56.2	80°48.6	9.2'	20°00.8	-8.0'	57.2'		
15	45° 16.9	•• 55.2	95°16.8	9.2'	19°52.8	-8.1'	57.3'		
16 17	60° 17.1 75° 17.3	54.3 53.4	109°45.0 124°13.2	9.2' 9.2'	19°44.7 19°36.5	-8.2' -8.3'	57.3' 57.4'		
18	90°17.5	N06°52.5	138°41.4	9.2'	N19°28.2	-8.4'	57.4		
19	105° 17.7	51.5	153°09.7	9.3'	19° 19.8	-8.5'	57.4'		
20	120° 17.9	50.6	167°38.0	9.3'	19°11.3	-8.7'	57.5'		
21	135° 18.1 150° 18.3	· · 49.7 48.7	182°06.2 196°34.5	9.3'	19°02.6 18°53.8	-8.8'	57.5'		
22 23	165° 18.5	48.7 47.8	190 34.5 211°02.8	9.3' 9.3'	18° 44.9	-8.9' -9.0'	57.5' 57.6'		
	SD = 15.9'	d = -0.9'			D = 15.5'				
		<u>u — -0.9</u>		اد					
Wed	GHA	Dec	GHA						
0	180° 18.7	N06°46.9	225°31.1	9.3'	N18°35.9	-9.1'	57.6'		
1 2	195° 18.9 210° 19.2	46.0 45.0	239°59.5 254°27.8	9.3' 9.4'	18° 26.8 18° 17.5	-9.2' -9.4'	57.7' 57.7'		
3	225° 19.4	• • 44.1	268°56.1	9.4	18°08.2	-9.4 -9.5'	57.7'		
4	240°19.6	43.2	283°24.5	9.4'	$17^{\circ}58.7$	-9.6'	57.8'		
5	255°19.8	42.3	297°52.9	9.4'	17°49.1	-9.7'	57.8'		
6 7	270°20.0 285°20.2	N06°41.3 40.4	312°21.3 326°49.7	9.4' 9.4'	N17°39.5 17°29.7	-9.8' -9.9'	57.8' 57.9'		
8	300° 20.4	39.5	341°18.1	9.4	17° 19.7	-10.0'	57.9'		
9	315°20.6	• • 38.5	355°46.6	9.5'	$17^{\circ}09.7$	-10.1'	57.9'		
10	330°20.8 345°21.0	37.6	10°15.1 24°43.5	9.5'	16°59.6 16°49.4	-10.2'	58.0'		
11 12	0°21.2	36.7 N06°35.8	24°43.5 39°12.0	9.5' 9.5'	N16°39.0	-10.3' -10.4'	58.0' 58.1'		
13	15°21.5	34.8	53°40.5	9.5'	16°28.6	-10.6'	58.1		
14	30°21.7	33.9	68°09.0	9.5'	$16^{\circ}18.0$	-10.7'	58.1'		
15 16	45°21.9 60°22.1	· · 33.0 32.0	82°37.6 97°06.1	9.6' 9.6'	16°07.4 15°56.6	-10.8' -10.9'	58.2' 58.2'		
17	75°22.3	32.0	97 00.1 111°34.7	9.6'	15° 45.8	-10.9 -11.0'	58.2'		
18	90°22.5	N06°30.2	126°03.3	9.6'	N15°34.8	-11.1'	58.3'		
19	105°22.7	29.2	140°31.9	9.6'	15°23.7	-11.2'	58.3'		
20 21	120°22.9 135°23.1	28.3 •• 27.4	155°00.5 169°29.1	9.6' 9.6'	15°12.6 15°01.3	-11.3' -11.4'	58.4' 58.4'		
22	150°23.3	26.4	109 29.1 183°57.8	9.0 9.7'	15 01.3 14°50.0	-11.4	58.4'		
23	165°23.6	25.5	198°26.4	9.7'	14°38.5	-11.6'	58.5'		
	SD = 15.9'	d = -0.9'		SI	D = 15.7'				
Thu	GHA 180° 23.8	Dec N06°24.6	GHA 212°55.1	u 9.7'	Dec N14° 26.9	d -11.6'	HP 58.5'		
0 1	180°23.8 195°24.0	23.7	212°55.1 227°23.8	9.7' 9.7'	14° 15.3	-11.6 -11.7'	58.5'		
2	210°24.2	22.7	241°52.5	9.7'	14°03.6	-11.8'	58.6'		
3	225° 24.4	• • 21.8	256°21.2	9.7'	13°51.7	-11.9'	58.6'		
4 5	240°24.6 255°24.8	20.9 19.9	270°50.0 285°18.7	9.7' 9.8'	13°39.8 13°27.8	-12.0' -12.1'	58.6' 58.7'		
6	270°25.0	N06°19.0	299°47.5	9.8'	N13°15.7	-12.1	58.7'		
7	285°25.2	18.1	$314^{\circ}16.3$	9.8'	13°03.5	-12.3'	58.7'		
8	300°25.5	17.1	328°45.0	9.8'	12°51.2	-12.4'	58.8'		
9 10	315°25.7 330°25.9	· · 16.2 15.3	343°13.8 357°42.7	9.8' 9.8'	12°38.8 12°26.4	-12.5' -12.5'	58.8' 58.8'		
11	345°26.1	14.3	12°11.5	9.8'	12° 13.8	-12.6'	58.9'		
12	0°26.3	N06°13.4	26°40.3	9.9'	N12°01.2	-12.7'	58.9'		
13	15°26.5	12.5	41°09.2 55°38.0	9.9' 9.9'	11°48.5 11°35.7	-12.8'	59.0'		
14 15	30° 26.7 45° 26.9	11.5 •• 10.6	55°38.0 70°06.9	9.9'	11°35.7 11°22.9	-12.9' -12.9'	59.0' 59.0'		
16	60°27.1	09.7	84°35.8	9.9'	11°09.9	-13.0'	59.1'		
17	75°27.4	08.7	99°04.7	9.9'	10°56.9	-13.1'	59.1'		
18 19	90°27.6 105°27.8	N06°07.8 06.8	113°33.6 128°02.5	9.9' 9.9'	N10°43.8 10°30.6	-13.2' -13.2'	59.1' 59.1'		
19 20	105°27.8 120°28.0	06.8 05.9	128°02.5 142°31.4	9.9' 9.9'	10° 30.6 10° 17.4	-13.2° -13.3'	59.1° 59.2'		
21	135°28.2	• • 05.0	157°00.4	9.9'	10°04.1	-13.4	59.2'		
22	150°28.4	04.0	171°29.3	9.9'	09°50.7	-13.5'	59.2'		
23	165°28.6	03.1	185°58.3	10.0'	09°37.2	-13.5'	59.3'		
	SD = 15.9'	d = -0.9'		SI	O = 16.0'				

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-8%	
04	00:55	01:05	11:59	08:25	20:51		
05	01:15	01:25	11:59	09:18	21:44		
06	01:35	01:45	11:58	10:09	22:35		

September 07, 08, 09 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
0	346°21.7	142°27.7	\$10°38.0	120°07.9	S18°28.0	141°16.5	S09°16.6	293°06.0	N16°44.1		
1	1°24.1	157° 27.5	39.2	135°08.7	28.4	156° 18.5	16.8	308°08.4	44.1	Alpheratz	357°30.5
2	16°26.6	172°27.3	40.4	150°09.5	28.9	171°20.5	16.9	323°10.9	44.1	Ankaa Schedar	353°03.2
3	31°29.1	$187^{\circ}27.1$	• • 41.6	165°10.3	• • 29.4	186°22.5	• • 17.1	338°13.4	• • 44.1	Diphda	349°26.0 348°43.3
4	46°31.5	$202^{\circ}26.9$	42.8	180°11.1	29.9	201°24.6	17.3	353°15.8	44.1	Achernar	335°17.1
5	61°34.0	217° 26.7	44.0	195°11.9	30.3	216°26.6	17.5	8°18.3	44.1	Hamal	327°46.7
6	76°36.5	232°26.5	\$10°45.2	210°12.7	S18°30.8	231°28.6	S09°17.6	23°20.8	N16°44.1	Polaris	311°43.4
7	91°38.9	247°26.3	46.4	225° 13.5	31.3	246°30.6	17.8	38°23.2	44.1	Acamar	315°08.8
8 9	106°41.4 121°43.8	262°26.1 277°25.9	47.6 •• 48.8	240°14.3 255°15.1	31.8 · · 32.2	261°32.7 276°34.7	18.0 •• 18.1	53°25.7 68°28.2	44.1 •• 44.0	Menkar	$314^{\circ}02.0$
10	136°46.3	292°25.7	50.0	270° 15.9	32.7	291°36.7	18.3	83°30.6	44.0	Mirfak	308°22.6
11	151°48.8	307°25.4	51.2	285° 16.7	33.2	306°38.7	18.5	98°33.1	44.0	Aldebaran	290°35.2
12	166°51.2	322°25.2	S10°52.4	300°17.5	S18°33.7	321°40.8	S09° 18.7	113°35.6	N16°44.0	Rigel	281°00.3
13	181°53.7	337°25.0	53.6	315°18.3	34.1	336°42.8	18.8	128°38.0	44.0	Capella	280°16.3
14	196°56.2	$352^{\circ}24.8$	54.8	330°19.1	34.6	351°44.8	19.0	143°40.5	44.0	Bellatrix Elnath	278°18.9 277°57.1
15	211°58.6	7°24.6	• • 56.0	345°19.9	• • 35.1	6°46.8	• • 19.2	158°43.0	• • 44.0	Alnilam	277 37.1 275°34.0
16	227°01.1	22°24.4	57.2	0°20.7	35.5	21°48.9	19.4	173°45.4	44.0	Betelgeuse	270°48.1
17	242°03.6	37°24.2	58.4	15°21.5	36.0	36°50.9	19.5	188°47.9	44.0	Canopus	263°50.9
18	257°06.0	52°24.0	\$10°59.6	30°22.3	S18°36.5	51°52.9	S09°19.7	203°50.4	N16°44.0	Sirius	258°23.1
19 20	272°08.5 287°10.9	67°23.8 82°23.5	11°00.8 02.0	45°23.1 60°23.9	37.0 37.4	66°54.9 81°57.0	19.9 20.1	218°52.8 233°55.3	43.9 43.9	Adhara	$255^{\circ}03.1$
20	302°13.4	97°23.3	03.2	75° 24.7	37.9	96°59.0	. 20.1	233 55.3 248°57.8	. 43.9	Procyon	$244^{\circ}47.1$
22	317°15.9	112°23.1	04.4	90°25.5	38.4	112°01.0	20.4	264°00.2	43.9	Pollux	
23	332°18.3	127°22.9	05.6	105°26.3	38.8	127°03.0	20.6	279°02.7	43.9	Avior	234°13.6
		0.0/ /1		ν 0.8' d0.		-	_	0.5/ 1.0		Suhail	222°43.8
ivier.	pass. 00:54	ν -0.2 a1	.2′ m-4.07	$\nu_{0.8}$ au.	.5' mu.90	ν 2.0° a 0.	.2′ m-1.75	ν 2.5° a -0	0.0′ m0.07	Miaplacidus Alphard	221°38.1 217°44.3
										Regulus	207°30.8
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3
0	347°20.8	142°22.7	S11°06.8	120°27.1	S18°39.3	142°05.0	S09°20.8	294°05.2	N16°43.9	Denebola	$182^{\circ}21.5$
1 2	2°23.3 17°25.7	157°22.5 172°22.3	08.0 09.2	135°27.9 150°28.6	39.8 40.3	157°07.1 172°09.1	20.9 21.1	309°07.7 324°10.1	43.9 43.9	Gienah	175°40.0
3	32°28.2	172 22.3 187°22.1	. 10.4	165° 29.4	40.7	187° 11.1	21.3	339°12.6	• • 43.9		172°56.3
4	47°30.7	202°21.9	11.6	180°30.2	41.2	202°13.1	21.5	354°15.1	43.9	Gacrux	
5	62°33.1	217°21.6	12.8	195°31.0	41.7	217°15.2	21.6	9°17.5	43.8	Alioth Spica	166° 10.3 158° 18.6
6	77°35.6	232°21.4	S 11°14.0	210°31.8	S18°42.1	232° 17.2	509°21.8	24°20.0	N16°43.8	Alkaid	150° 10.0
7	92°38.1	247°21.2	15.2	225°32.6	42.6	247° 19.2	22.0	39°22.5	43.8	Hadar	148°30.9
8	107°40.5	262°21.0	16.4	240°33.4	43.1	262°21.2	22.2	54°24.9	43.8	Menkent	147°53.4
9 10	122°43.0 137°45.4	277°20.8 292°20.6	· · 17.5 18.7	255°34.2 270°35.0	· · 43.5 44.0	277°23.2 292°25.3	· · 22.3 22.5	69°27.4 84°29.9	· · 43.8 43.8	Arcturus	$145^{\circ}44.7$
11	152°47.9	307°20.4	19.9	285° 35.8	44.5	307° 27.3	22.7	99°32.4	43.8	Rigil Kent.	139°35.3
12	167°50.4	322°20.1	S11°21.1	300°36.5	S18°44.9	322°29.3	S09°22.9	114°34.8	N16°43.8	Kochab	137°20.8
13	182°52.8	$337^{\circ}19.9$	22.3	315°37.3	45.4	337°31.3	23.0	129°37.3	43.8	Zuben'ubi Alphecca	136°52.0 126°00.7
14	197°55.3	$352^{\circ}19.7$	23.5	330°38.1	45.9	$352^{\circ}33.4$	23.2	144°39.8	43.7	Antares	112° 11.2
15	212°57.8	7° 19.5	• • 24.7	345°38.9	• • 46.3	7°35.4	• • 23.4	159°42.2	• • 43.7	Atria	107°02.0
16	228°00.2	22°19.3	25.9	0°39.7	46.8	22°37.4	23.5	174°44.7	43.7	Sabik	$101^{\circ}58.4$
17 18	243°02.7 258°05.2	37° 19.1 52° 18.9	27.1 \$11°28.3	15°40.5 30°41.3	47.3 \$18°47.7	37°39.4 52°41.4	23.7 \$09°23.9	189°47.2 204°49.7	43.7 N16°43.7	Shaula	96°05.2
19	273°07.6	67° 18.6	29.5	45°42.1	48.2	67°43.5	24.1	219°52.1	43.7	Rasalhague	95°55.0
20	288°10.1	82° 18.4	30.6	60°42.8	48.7	82°45.5	24.2	234°54.6	43.7	Eltanin	90°40.3
21	303°12.5	97° 18.2	• • 31.8	75°43.6	• • 49.1	97°47.5	• • 24.4	249°57.1	• • 43.7	Kaus Aust. Vega	83°27.4 80°30.5
22	318°15.0	$112^{\circ}18.0$	33.0	90°44.4	49.6	112°49.5	24.6	264°59.6	43.7	Nunki	75°42.9
23	333°17.5	127° 17.8	34.2	105°45.2	50.1	127°51.5	24.8	280°02.0	43.7	Altair	61°56.1
Mer.	pass. 00:50	ν -0.2' d1	.2′ m-4.07	ν 0.8′ d0.	5′ m0.90	ν 2.0′ d0.	.2′ m-1.74	ν 2.5′ d-0	0.0′ m0.06	Peacock	52°59.5
										Deneb	49°22.8
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.8
0	348°19.9	142°17.6	S11°35.4	120°46.0	S18°50.5	142°53.6	S09°24.9	295°04.5	N16°43.6	Al Na'ir	27°27.9
1	3°22.4	157° 17.3	36.6	135°46.8	51.0	157°55.6	25.1	310°07.0	43.6	Fomalhaut Scheat	15°10.1 13°41.1
2	18°24.9	$172^{\circ}17.1$	37.8	150°47.6	51.5	172°57.6	25.3	325°09.5	43.6	Markab	13°25.8
3	33°27.3	$187^{\circ}16.9$	• • 39.0	165°48.3	•• 51.9	187°59.6	•• 25.5	340°11.9	• • 43.6		
4	48°29.8	202°16.7	40.1	180°49.1	52.4	203°01.6	25.6	355°14.4	43.6	Sep 07 Fri	
5	63°32.3	217°16.5	41.3	195°49.9	52.9	218°03.7	25.8	10°16.9	43.6		156°06.1 133°46.3
6 7	78°34.7 93°37.2	232°16.3 247°16.0	\$11°42.5 43.7	210°50.7 225°51.5	\$18°53.3 53.8	233°05.7 248°07.7	\$09°26.0 26.2	40°21.8	N16°43.6 43.6		153 40.5 154°54.8
8	108°39.7	262° 15.8	44.9	240°52.2	54.3	263°09.7	26.3	55°24.3	43.6	Saturn	
9	123°42.1	277° 15.6	• • 46.1	255° 53.0	• • 54.7	278° 11.7	26.5	70°26.8	• • 43.5		
10	138°44.6	292°15.4	47.2	270°53.8	55.2	293°13.7	26.7	85°29.3	43.5	Sep 08 Sat	SHA 155°01.0
11	153°47.0	307° 15.2	48.4	285°54.6	55.6	308° 15.8	26.9	100°31.7	43.5		155°01.9 133°06.3
12	168°49.5	322°14.9	S11°49.6	300°55.4	\$18°56.1	323°17.8	S09°27.0		N16°43.5		154°44.2
13	183°52.0 198°54.4	337°14.7 352°14.5	50.8 52.0	315°56.2 330°56.9	56.6 57.0	338° 19.8 353° 21.8	27.2 27.4	130°36.7 145°39.2	43.5 43.5		306°44.4
14 15	198 54.4 213°56.9	352 14.5 7°14.3	53.2	345° 57.7	57.0 •• 57.5	8° 23.8	. 27.4	145 39.2 160°41.6	43.5 •• 43.5	Sep 09 Sun	SHA
16	213 50.9 228°59.4	7 14.3 22°14.1	54.3	0°58.5	58.0	23° 25.9	27.8	175°44.1	43.5		3HA 153°57.6
17	244°01.8	37° 13.8	55.5	15°59.3	58.4	38° 27.9	27.9	190°46.6	43.4		132°26.0
18	259°04.3	52° 13.6	S11°56.7	31°00.0	S18°58.9	53° 29.9	S09°28.1		$N16^{\circ}43.4$		154°33.6
19	274°06.8	67°13.4	57.9	46°00.8	59.4	68°31.9	28.3	220°51.5	43.4	Saturn	306°44.6
20	289°09.2	82°13.2	11°59.1	61°01.6	18°59.8	83°33.9	28.5	235°54.0	43.4	Horizont	al parallax
21 22	304°11.7 319°14.1	97°13.0 112°12.7	12°00.2 01.4	76°02.4 91°03.2	19°00.3 00.7	98°35.9 113°38.0	· · 28.6 28.8	250°56.5 265°59.0	· · 43.4 43.4	1101120111	Venus:
23	334°16.6	127°12.5	02.6	106°03.9	01.2	128° 40.0	29.0	281°01.5	43.4		Mars:
	pass. 00:47		.2′ m-4.08		5′ m0.91		2′ m-1.74		0.0' m0.06	<u> </u>	·
14161.		ν 0.2 UI	00	ν σ.σ ασ.		ν 2.0 u0.	- 11-1./4	ν2.3 u-0	1110.00		

Dec 29°15.4 -42°08.4 56°42.1 -17°49.2 -57°04.9 23°36.2 89°22.9 -40°10.9 4°12.5 49°57.8 16°34.1 -8°10.0 $46^{\circ}01.4$ $6^{\circ}22.6$ 28°37.8 $-1^{\circ}11.0$ 7°24.7 -52°42.5 -16°45.3 -29°00.6 5°08.9 27°57.1 -59°36.2 -43°33.1 -69°50.3 -8°47.3 11°49.3 61°35.4 14°24.4 -17°42.4

-63° 16.0 -57° 16.9 55° 48.0 -11° 18.9 49° 10.1 -60° 31.1 -36° 31.0 19° 01.8 -60° 57.6 74° 02.2 -16° 09.8 26° 37.2 -26° 29.8 -69° 04.9 -15° 45.5 -37° 07.4 12° 32.6 51° 29.5 51° 29.5 -34° 22.1 38° 49.1

-26° 15.4 8° 57.1 -56° 38.3 45° 23.5

 $10^{\circ}01.0$ -46°48.8 -29°27.6 $28^{\circ}14.9$ 15°22.2 Mer.pass 14:30 15:59 14:33 04:27 Mer.pass 14:31 15:57 14:30 04:23 Mer.pass 14:31 15:56 14:26 04:19

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Fri	h	Su	n	Moon				
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1 195°39.4 16.1 190°02.0 9.5' 02°33.0 15.1' 60.4' 2 210°39.6 15.2 204°30.5 9.5' 02°48.0 15.1' 60.4' 3 225°39.8 · 14.2 218°59.0 9.4' 03°03.1 15.0' 60.5' 4 240°40.0 13.3 233°27.4 9.4' 03°18.1 15.0' 60.5' 5 255°40.2 12.3 247°55.8 9.4' 03°33.1 15.0' 60.5' 6 270°40.4 N05°11.4 262°24.2 9.3' 503°48.1 15.0' 60.5' 7 285°40.7 10.4 276°52.5 9.3' 04°03.1 15.0' 60.5' 8 300°40.9 09.5 291°20.9 9.3' 04°18.1 14.9' 60.5' 9 315°41.1 · 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1	195°39.4		190°02.0	9.5'	02°33.0	15.1'	60.4'
4 240°40.0 13.3 233°27.4 9.4' 03°18.1 15.0' 60.5' 5 255°40.2 12.3 247°55.8 9.4' 03°33.1 15.0' 60.5' 6 270°40.4 N05°11.4 262°24.2 9.3' S03°48.1 15.0' 60.5' 7 285°40.7 10.4 276°52.5 9.3' 04°03.1 15.0' 60.5' 8 300°40.9 09.5 291°20.9 9.3' 04°18.1 14.9' 60.5' 9 315°41.1 · · · 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' S05°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°47.								
5 255°40.2 12.3 247°55.8 9.4' 03°33.1 15.0' 60.5' 6 270°40.4 N05°11.4 262°24.2 9.3' S03°48.1 15.0' 60.5' 7 285°40.7 10.4 276°52.5 9.3' 04°03.1 15.0' 60.5' 8 300°40.9 09.5 291°20.9 9.3' 04°18.1 14.9' 60.5' 9 315°41.1 · 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' S05°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°47.4 14.8' 60.6' 15 45°42.4 · 02.9 32°38.1 9.0' 06°02.2 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
7 285°40.7 10.4 276°52.5 9.3' 04°03.1 15.0' 60.5' 8 300°40.9 09.5 291°20.9 9.3' 04°18.1 14.9' 60.5' 9 315°41.1 · · · 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' 505°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°47.4 14.8' 60.6' 15 45°42.4 · · 02.9 32°38.1 9.0' 06°02.2 14.7' 60.6' 16 60°42.6 01.9 47°06.1 9.0' 06°16.9 14.7' 60.6' 17 75°42.8 01.0 61°34.1 9.0' 06°31.6 <td></td> <td>255°40.2</td> <td>12.3</td> <td>$247^{\circ}55.8$</td> <td>9.4'</td> <td>03°33.1</td> <td>15.0'</td> <td>60.5'</td>		255°40.2	12.3	$247^{\circ}55.8$	9.4'	03°33.1	15.0'	60.5'
8 300°40.9 09.5 291°20.9 9.3' 04°18.1 14.9' 60.5' 9 315°41.1 · · · 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' S05°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°34.4 14.8' 60.5' 15 45°42.4 · · 02.9 32°38.1 9.0' 06°02.2 14.7' 60.6' 16 60°42.6 01.9 47°06.1 9.0' 06°31.6 14.7' 60.6' 17 75°42.8 01.0 61°34.1 9.0' 06°31.6 14.7' 60.6' 18 90°43.0 N05°00.0 76°02.1 8.9' 506°46.								
9 315°41.1 ··· 08.5 305°49.1 9.2' 04°33.0 14.9' 60.5' 10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' 505°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°47.4 14.8' 60.6' 15 45°42.4 ··· 02.9 32°38.1 9.0' 06°02.2 14.7' 60.6' 16 60°42.6 01.9 47°06.1 9.0' 06°16.9 14.7' 60.6' 17 75°42.8 01.0 61°34.1 9.0' 06°31.6 14.7' 60.6' 18 90°43.0 N05°00.0 76°02.1 8.9' 506°46.3 14.6' 60.6' 19 105°43.3 04°59.1 90°30.0 8.9' 07°01.0 14.6' 60.6' 20 120°43.5 58.1 104°57.9 8.8' 07°15.5 14.6' 60.6' 21 135°43.7 ··· 57.2 119°25.7 8.8' 07°30.1 14.5' 60.6' 22 150°43.9 56.2 133°53.5 8.8' 07°44.6 14.5' 60.6' 23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
10 330°41.3 07.6 320°17.4 9.2' 04°48.0 14.9' 60.5' 11 345°41.5 06.7 334°45.6 9.2' 05°02.9 14.9' 60.5' 12 0°41.7 N05°05.7 349°13.8 9.1' S05°17.7 14.8' 60.5' 13 15°42.0 04.8 3°41.9 9.1' 05°32.6 14.8' 60.5' 14 30°42.2 03.8 18°10.0 9.1' 05°47.4 14.8' 60.6' 15 45°42.4 · 02.9 32°38.1 9.0' 06°02.2 14.7' 60.6' 16 60°42.6 01.9 47°06.1 9.0' 06°16.9 14.7' 60.6' 17 75°42.8 01.0 61°34.1 9.0' 06°31.6 14.7' 60.6' 18 90°43.0 N05°00.0 76°02.1 8.9' S06°46.3 14.6' 60.6' 19 105°43.3 04°59.1 90°30.0 8.9' 07°01.0 14.6' 60.6'<								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14	30°42.2	03.8	$18^{\circ}10.0$	9.1'	05°47.4	14.8'	60.6'
17 75°42.8 01.0 61°34.1 9.0' 06°31.6 14.7' 60.6' 18 90°43.0 N05°00.0 76°02.1 8.9' S06°46.3 14.6' 60.6' 19 105°43.3 04°59.1 90°30.0 8.9' 07°01.0 14.6' 60.6' 20 120°43.5 58.1 104°57.9 8.8' 07°15.5 14.6' 60.6' 21 135°43.7 · · 57.2 119°25.7 8.8' 07°30.1 14.5' 60.6' 22 150°43.9 56.2 133°53.5 8.8' 07°44.6 14.5' 60.6' 23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
18 90°43.0 N05°00.0 76°02.1 8.9' S06°46.3 14.6' 60.6' 19 105°43.3 04°59.1 90°30.0 8.9' 07°01.0 14.6' 60.6' 20 120°43.5 58.1 104°57.9 8.8' 07°15.5 14.6' 60.6' 21 135°43.7 · · 57.2 119°25.7 8.8' 07°30.1 14.5' 60.6' 22 150°43.9 56.2 133°53.5 8.8' 07°44.6 14.5' 60.6' 23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
20 120° 43.5 58.1 104° 57.9 8.8' 07° 15.5 14.6' 60.6' 21 135° 43.7 · · 57.2 119° 25.7 8.8' 07° 30.1 14.5' 60.6' 22 150° 43.9 56.2 133° 53.5 8.8' 07° 44.6 14.5' 60.6' 23 165° 44.1 55.3 148° 21.3 8.7' 07° 59.1 14.4' 60.6'		90°43.0						
21 135°43.7 ··· 57.2 119°25.7 8.8' 07°30.1 14.5' 60.6' 22 150°43.9 56.2 133°53.5 8.8' 07°44.6 14.5' 60.6' 23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
22 150°43.9 56.2 133°53.5 8.8' 07°44.6 14.5' 60.6' 23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
23 165°44.1 55.3 148°21.3 8.7' 07°59.1 14.4' 60.6'								
SD = 15.9' d = -0.9' $SD = 16.5'$								
		SD = 15.9'	d = -0.9'		SI	O = 16.5'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	28-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%	
07	01:55	02:06	11:58	11:01	23:27		
08	02:16	02:26	11:58	11:52	-:-		
09	02:37	02:47	11:57	12:45	00:18		

September 10, 11, 12 UT (Mon., Tue., Wed.)

h	Aries	Vei	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	349°19.1	142°12.3	\$12°03.8	121°04.7	\$19°01.7	143°42.0	S09°29.2	296°03.9	N16°43.4			
1	4°21.5	157° 12.1	04.9	136°05.5	02.1	158° 44.0	29.3	311°06.4	43.3	Alpheratz	357°30.5	29°15.4
2	19°24.0	172°11.9	06.1	151°06.3	02.6	173°46.0	29.5	326°08.9	43.3	Ankaa	353°03.1	-42°08.4
3	34°26.5	187°11.6	07.3	166°07.0	• • 03.0	188° 48.0	29.7	341°11.4	• • 43.3	Schedar	349°26.0	56°42.1
4	49°28.9	202°11.4	08.5	181°07.8	03.5	203°50.1	29.9	356°13.9	43.3	Diphda	348°43.3	-17°49.2
5	64°31.4	217°11.2	09.7	196°08.6	04.0	218°52.1	30.0	11°16.3	43.3	Achernar	335°17.1	-57°04.9
6	79°33.9	232°11.0	S12°10.8	211°09.4	S19°04.4	233°54.1	509°30.2	26°18.8	N16°43.3	Hamal	327°46.6	23°36.2
7	94°36.3	$247^{\circ}10.7$	12.0	$226^{\circ}10.1$	04.9	248°56.1	30.4	41°21.3	43.3		311°42.0 315°08.8	89°22.9 -40°10.9
8	109°38.8	$262^{\circ}10.5$	13.2	241°10.9	05.3	263°58.1	30.6	56°23.8	43.3	Acamar Menkar	314°02.0	4°12.5
9	124°41.3	$277^{\circ}10.3$	• • 14.3	256°11.7	• • 05.8	279°00.1	• • 30.7	71°26.3	• • 43.2	Mirfak	308°22.5	49°57.8
10	139°43.7	$292^{\circ}10.1$	15.5	271°12.4	06.3	294°02.2	30.9	86°28.7	43.2	Aldebaran	290°35.2	16°34.1
11	154°46.2	307°09.8	16.7	286° 13.2	06.7	309°04.2	31.1	101°31.2	43.2	Rigel	281°00.3	-8°10.0
12	169°48.6	322°09.6	S12°17.9	301°14.0	S19°07.2	324°06.2	S09°31.3	116°33.7	N16°43.2	Capella	280°16.3	46°01.4
13	184°51.1	337°09.4	19.0	316°14.8	07.6	339°08.2	31.4	131°36.2	43.2	Bellatrix	278°18.9	6°22.6
14	199°53.6	352°09.2	20.2	331°15.5	08.1	354°10.2	31.6	146°38.7	43.2	Elnath	277°57.1	28°37.8
15	214°56.0	7°08.9	• • 21.4	346°16.3	• • 08.5	9°12.2	• • 31.8	161°41.1	• • 43.2	Alnilam	275°33.9	-1°11.0
16	229°58.5	22°08.7	22.6	1°17.1	09.0	24°14.2	32.0	176°43.6 191°46.1	43.2	Betelgeuse	$270^{\circ}48.1$	7°24.7
17	245°01.0 260°03.4	37°08.5	23.7	16°17.8	09.5	39° 16.3	32.1	206°48.6	43.1	Canopus	263°50.9	-52°42.5
18 19	275°05.9	52°08.3 67°08.0	\$12°24.9 26.1	31°18.6 46°19.4	\$19°09.9 10.4	54°18.3 69°20.3	\$09°32.3 32.5	200 46.0 221°51.1	N16°43.1 43.1	Sirius	258°23.0	-16°45.3
20	290°08.4	82°07.8	27.2	61°20.1	10.4	84° 22.3	32.5	236°53.6	43.1	Adhara	$255^{\circ}03.1$	-29°00.6
21	305°10.8	97°07.6	28.4	76° 20.9	. 11.3	99° 24.3	32.8	251°56.0	• • 43.1	Procyon	244°47.1	5°08.9
22	320°13.3	112°07.4	29.6	91°21.7	11.7	99°24.3 114°26.3	33.0	266°58.5	43.1	Pollux	243°13.0	27°57.1
23	335°15.8	112 07.4 127°07.1	30.7	106° 22.4	12.2	114 20.3 129° 28.3	33.2	282°01.0	43.1	Avior	234°13.6	-59°36.2
			_							Suhail	222°43.8	-43°33.1
Mer.p	ass. 00:43	ν -0.2′ d1.	.2′ m-4.08	ν 0.8′ d0	.5′ m0.91	$\nu 2.0' d0.$	2′ m-1.74	$\nu^{2.5'} d-0$.0′ m0.05	Miaplacidus	221°38.1	-69°50.3
										Alphard	217°44.3	-8°47.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.8	11°49.3
0	350°18.2	142°06.9	S12°31.9	121°23.2	S19°12.7	144°30.4	S09°33.4	297°03.5	N16°43.1	Dubhe	193°37.3 182°21.5	61°35.4
1	5°20.7	157°06.7	33.1	136°24.0	13.1	159°32.4	33.6	312°06.0	43.0	Denebola	182°21.5 175°40.0	14°24.4 -17°42.4
2	20°23.1	172°06.5	34.2	151°24.7	13.6	174°34.4	33.7	327°08.4	43.0	Gienah	175 40.0 172°56.3	-17 42.4 -63°15.9
3	35°25.6	$187^{\circ}06.2$	• • 35.4	166°25.5	• • 14.0	189°36.4	• • 33.9	342°10.9	• • 43.0		172 50.5 171°47.8	-03 15.9 -57°16.9
4	50°28.1	202°06.0	36.6	181°26.3	14.5	204°38.4	34.1	$357^{\circ}13.4$	43.0	Alioth	166°10.4	55°48.0
5	65°30.5	$217^{\circ}05.8$	37.7	196°27.0	14.9	219°40.4	34.3	12°15.9	43.0	Spica	158° 18.6	-11°18.9
6	80°33.0	232°05.6	S 12°38.9	211°27.8	S19°15.4	234°42.4	509°34.4	27°18.4	N16°43.0	Alkaid	152°49.5	49°10.1
7	95°35.5	$247^{\circ}05.3$	40.1	226°28.6	15.8	249° 44.5	34.6	42°20.9	43.0	Hadar	148°30.9	-60°31.1
8	110°37.9	262°05.1	41.2	241°29.3	16.3	264° 46.5	34.8	57°23.4	42.9		147°53.4	-36°31.0
9	125°40.4	277°04.9	• • 42.4	256°30.1	• • 16.7	279°48.5	• • 35.0	72°25.8	• • 42.9	Arcturus	145°44.7	19°01.8
10	140°42.9	292°04.6	43.5	271°30.9	17.2	294°50.5	35.1	87°28.3	42.9	Rigil Kent.	139°35.3	-60°57.6
11	155°45.3	307°04.4	44.7	286°31.6	17.7	309°52.5	35.3	102°30.8	42.9	Kochab	137°20.9	74°02.2
12	170°47.8	322°04.2	S12°45.9	301°32.4	S19°18.1	324°54.5	S09°35.5	117°33.3	N16°42.9	Zuben'ubi	136°52.0	-16°09.8
13	185°50.2	337°03.9	47.0	316°33.2	18.6	339°56.5	35.7	132°35.8	42.9	Alphecca	126°00.7	26°37.2
14	200°52.7	352°03.7	48.2	331°33.9	19.0	354°58.5	35.8	147°38.3	42.9	Antares	$112^{\circ}11.2$	-26°29.8
15	215°55.2	7°03.5	• • 49.4	346°34.7	19.5	10°00.6	36.0	162°40.8	• • 42.9	Atria	$107^{\circ}02.0$	-69°04.9
16	230°57.6	22°03.3 37°03.0	50.5	1°35.4	19.9	25°02.6	36.2	177°43.2 192°45.7	42.8	Sabik	$101^{\circ}58.5$	-15°45.5
17 18	246°00.1 261°02.6	52°02.8	51.7 \$12°52.8	16°36.2	20.4 \$19°20.8	40°04.6 55°06.6	36.4 \$09°36.6	207°48.2	42.8 N16°42.8	Shaula	96°05.2	-37°07.4
19	201 02.0 276°05.0	67°02.6	54.0	46° 37.7	21.3	70°08.6	36.7	207 46.2 222°50.7	42.8	Rasalhague	95°55.0	12°32.6
20	291°07.5	82°02.3	55.1	61°38.5	21.7	85° 10.6	36.9	237°53.2	42.8	Eltanin	90°40.3	51°29.5
21	306°10.0	97°02.1	56.3	76°39.2	22.2	100° 12.6	37.1	252°55.7	• • 42.8	Kaus Aust.	83°27.4	-34°22.1
22	321°12.4	112°01.9	57.5	91°40.0	22.6	115° 14.6	37.3	267°58.2	42.8	Vega	80°30.5	38°49.1
23	336°14.9	127°01.6	58.6	106°40.8	23.1	130° 16.6	37.4	283°00.6	42.7	Nunki	75°43.0	-26°15.4
										Altair	61°56.1	8°57.1
Mer.p	ass. 00:39	ν -0.2′ $d1$.	.2′ m-4.09	ν 0.8′ d0	.5′ m0.92	$\nu 2.0' \ d0.$	2′ m-1.74	$\nu 2.5' \ d-0$.0′ m0.05	Peacock	52°59.5	-56°38.3
										Deneb	49°22.8	45°23.6
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°34.8 27°27.9	10°01.0 -46°48.8
0	351°17.4	142°01.4	S12°59.8	121°41.5	S19°23.5	145°18.7	S09°37.6	298°03.1	N16°42.7	Fomalhaut	15°10.1	-40 46.6 -29°27.6
1	$6^{\circ}19.8$	$157^{\circ}01.2$	13°00.9	$136^{\circ}42.3$	24.0	$160^{\circ}20.7$	37.8	$313^{\circ}05.6$	42.7	Scheat	13°41.1	28°14.9
2	21°22.3	$172^{\circ}00.9$	02.1	$151^{\circ}43.0$	24.4	$175^{\circ}22.7$	38.0	$328^{\circ}08.1$	42.7	Markab	13°25.8	15°22.2
3	36°24.7	187°00.7	•• 03.2	166°43.8	• • 24.9	190°24.7	• • 38.1	343°10.6	• • 42.7			
4	51°27.2	202°00.5	04.4	181°44.5	25.3	205°26.7	38.3	358°13.1	42.7	Sep 10 Mon	SHA	Mer.pass
5	66°29.7	217°00.2	05.5	196°45.3	25.8	220°28.7	38.5	13°15.6	42.7		152°53.2	14:31
6	81°32.1	232°00.0	S13°06.7		S19°26.2	235°30.7	S09°38.7	28°18.1	N16°42.6		131°45.6	15:55
7	96°34.6	246°59.8	07.9	226°46.8	26.7	250°32.7	38.9	43°20.6	42.6		154°22.9	14:23
8	111°37.1	261°59.5	09.0	241°47.6	27.1	265°34.7	39.0	58°23.0	42.6	Saturn	306°44.9	04:15
9	126°39.5	276°59.3	• • 10.2	256°48.3	• • 27.6	280°36.8	· · 39.2	73°25.5	• • 42.6	Sep 11 Tue	SHA	Mer.pass
10	141°42.0	291°59.1	11.3	271°49.1	28.0	295°38.8	39.4	88°28.0	42.6		151°48.7	14:32
11	156°44.5	306°58.8	12.5	286°49.8	28.5	310°40.8	39.6	103°30.5	42.6		131°05.0	15:54
12	171°46.9	321°58.6	\$13°13.6	301°50.6		325°42.8	S09°39.7	118°33.0	N16°42.6	1	$154^{\circ}12.1$	14:20
13 14	186°49.4 201°51.8	336°58.4 351°58.1	14.8 15.9	316°51.3 331°52.1	29.4 29.8	340°44.8 355°46.8	39.9 40.1	133°35.5 148°38.0	42.5 42.5		$306^{\circ}45.3$	04:11
14 15	201°51.8 216°54.3	351 58.1 6°57.9	15.9	331 52.1 346° 52.8	· · 30.3	355 46.8 10°48.8	40.1 •• 40.3	148° 38.0 163° 40.5	42.5			N4-
15 16	216°54.3 231°56.8	6°57.9 21°57.7	18.2	1°53.6	30.3	10°48.8 25°50.8	40.4	163°40.5 178°43.0	•• 42.5 42.5	Sep 12 Wed		Mer.pass
17	231 50.6 246°59.2	36° 57.4	19.4	1 55.0 16°54.4	31.2	40°52.8	40.4	176 45.0 193°45.5	42.5 42.5		150°44.1 130°24.2	14:32
18	262°01.7	50° 57.4	\$13°20.5		\$1.2 \$19°31.6	55° 54.8	509°40.8	208°47.9	N16°42.5		130°24.2 154°01.3	15:52 14:17
19	202 01.7 277°04.2	66° 57.0	21.7	46°55.9	32.1	70°56.8	41.0	223°50.4	42.4		306°45.8	04:07
20	292°06.6	81°56.7	22.8	61°56.6	32.5	85°58.9	41.2	238°52.9	42.4	Jatuin	JUU 43.0	04.07
21	307°09.1	96° 56.5	23.9	76°57.4	• • 33.0	101°00.9	41.3	253°55.4	• • 42.4	Horizont	al parallax	
22	322°11.6	111°56.2	25.1	91°58.1	33.4	116°02.9	41.5	268°57.9	42.4		Venus:	0.1
23	$337^{\circ}14.0$	$126^{\circ}56.0$	26.2	106°58.9	33.8	131°04.9	41.7	284°00.4	42.4		Mars:	0.1
			.2′ m-4.10				2′ m-1.73					<u> </u>
ivier.p	ass. 00:35	ν-U.2 a1.	.∠ 111-4.10	νυ.ο΄ αυ	.5′ m0.92	ν2.0 a0.	∠ III-1./3	ν2.5 a-0	.0′ m0.04			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.3	N04°54.4	162°49.0	8.7'	S08°13.5	14.4'	60.6'
1	195°44.6 210°44.8	53.4 52.5	177°16.7 191°44.3	8.6'	08°27.8 08°42.2	14.3' 14.3'	60.6
2	210 44.8 225°45.0	5∠.5 · · 51.5	206°11.9	8.6' 8.5'	08 42.2 08°56.4	14.3	60.6' 60.6'
4	240°45.2	50.6	220°39.4	8.5'	09°10.6	14.1	60.6
5	255°45.4	49.6	235°06.9	8.4'	09°24.8	14.1'	60.6'
6	270°45.7	N04°48.7	249°34.4	8.4'	S09°38.9	14.0'	60.6'
7	285°45.9 300°46.1	47.7	264°01.8	8.4'	09°52.9	14.0'	60.6
8 9	300°46.1 315°46.3	46.8 • • 45.8	278°29.1 292°56.4	8.3' 8.3'	10°06.8 10°20.7	13.9' 13.8'	60.6' 60.6'
10	330°46.5	44.9	307°23.7	8.2	10° 20.7	13.8'	60.6
11	345°46.7	43.9	321°50.9	8.2'	10°48.3	13.7'	60.6'
12	0°47.0	N04°43.0	336°18.1	8.1'	S11°02.0	13.6'	60.6'
13 14	15°47.2 30°47.4	42.0 41.1	350°45.2 5°12.3	8.1' 8.0'	11°15.7 11°29.2	13.6' 13.5'	60.6' 60.6'
14 15	30 47.4 45°47.6	. 40.1	5 12.3 19°39.3	8.0'	11 29.2 11°42.7	13.5	60.6
16	60°47.8	39.2	34°06.2	7.9'	11°56.1	13.3'	60.6'
17	75°48.1	38.2	48°33.2	7.9'	12°09.4	13.2'	60.6'
18	90°48.3	N04°37.3	63°00.0	7.8'	512°22.7	13.2'	60.6'
19 20	105°48.5 120°48.7	36.3 35.4	77°26.8 91°53.6	7.8' 7.7'	12°35.9 12°48.9	13.1' 13.0'	60.6' 60.5'
21	135°48.9	34.4	91 55.0 106°20.3	7.7'	12 46.9 13°01.9	12.9'	60.5
22	150°49.1	33.5	120°47.0	7.6'	13°14.8	12.8'	60.5
23	165°49.4	32.5	$135^{\circ}13.6$	7.6'	13°27.7	12.7'	60.5'
	SD = 15.9'	d = -0.9'		S	D = 16.5'		
Tue 0	GHA 180°49.6	Dec N04°31.6	GHA 149°40.1	u 7.5'	Dec \$13° 40.4	d 12.6'	HP 60.5'
1	195°49.8	30.6	164°06.7	7.5'	13°53.1	12.6'	60.5
2	210°50.0	29.7	178°33.1	7.4	14°05.6	12.5'	60.5
3	225°50.2	• • 28.7	192°59.5	7.3'	14°18.1	12.4'	60.5'
4	240°50.5	27.8	207°25.9	7.3'	14°30.4	12.3'	60.5
5 6	255°50.7 270°50.9	26.8 N04°25.9	221°52.1 236°18.4	7.2' 7.2'	14°42.7 \$14°54.9	12.2' 12.1'	60.5' 60.5'
7	285°51.1	24.9	250°44.6	7.1'	15°06.9	12.0'	60.4
8	300°51.3	24.0	265°10.7	7.1'	15°18.9	11.9'	60.4
9	315°51.6	• • 23.0	279°36.8	7.0'	15°30.7	11.8'	60.4
10 11	330°51.8 345°52.0	22.1 21.1	294°02.8 308°28.8	7.0' 6.9'	15° 42.5 15° 54.1	11.6' 11.5'	60.4' 60.4'
12	0°52.2	N04° 20.2	322°54.8	6.9	\$16°05.7	11.4	60.4
13	15°52.4	19.2	337°20.6	6.8	16° 17.1	11.3'	60.4
14	30°52.7	18.2	$351^{\circ}46.5$	6.8'	$16^{\circ}28.4$	11.2'	60.4'
15	45°52.9 60°53.1	• • 17.3	6°12.2 20°38.0	6.7'	16°39.6 16°50.7	11.1'	60.3'
16 17	75°53.1	16.3 15.4	20°38.0 35°03.6	6.7' 6.6'	16°50.7 17°01.7	11.0' 10.9'	60.3' 60.3'
18	90°53.5	N04° 14.4	49°29.3	6.6'	S17°12.6	10.7	60.3
19	105°53.8	13.5	63°54.8	6.5'	$17^{\circ}23.3$	10.6'	60.3'
20	120°54.0	12.5	78°20.3		17°33.9		60.3
21 22	135°54.2 150°54.4	· · 11.6 10.6	92°45.8 107°11.2	6.4' 6.4'	17°44.4 17°54.8	10.4' 10.3'	60.2' 60.2'
23	165°54.6	09.7	121°36.6	6.3	18° 05.0	10.1	60.2
	SD = 15.9'	d = -1.0'		S	D = 16.5'		
Wed 0	GHA 180°54.9	Dec N04°08.7	GHA 136°01.9	ν 6.3'	Dec \$18° 15.2	d 10.0'	HP 60.2'
1	195°55.1	07.8	150° 27.2	6.2	18° 25.2	9.9'	60.2
2	210°55.3	06.8	164°52.5	6.2'	18°35.0	9.7'	60.2'
3	225°55.5	•• 05.9	179°17.6	6.1'	18°44.8	9.6'	60.1'
4 5	240°55.7 255°56.0	04.9 03.9	193°42.8 208°07.9	6.1' 6.0'	18°54.4 19°03.9	9.5' 9.4'	60.1' 60.1'
6	270°56.2	N04°03.0	200 07.9 222°32.9	6.0'	\$19° 13.2	9.4	60.1
7	285°56.4	02.0	236°57.9	6.0'	19°22.5	9.1'	60.1
8	300°56.6	01.1	251°22.9	5.9'	$19^{\circ}31.5$	8.9'	60.0'
9	315°56.8	04°00.1	265°47.8	5.9'	19°40.5	8.8'	60.0'
10 11	330°57.1 345°57.3	03°59.2 58.2	280°12.7 294°37.5	5.8' 5.8'	19°49.3 19°58.0	8.7' 8.5'	60.0' 60.0'
12	0°57.5	N03° 57.3	309°02.3	5.8'	S20°06.5	8.4	60.0'
13	15°57.7	56.3	323°27.1	5.7'	20°14.9	8.3'	59.9'
14	30°57.9	55.3	337°51.8	5.7'	20°23.1	8.1'	59.9'
15 16	45°58.2 60°58.4	· · 54.4 53.4	352°16.5 6°41.1	5.6' 5.6'	20°31.3 20°39.2	8.0' 7.8'	59.9' 59.9'
10 17	75°58.6	53.4 52.5	0 41.1 21°05.7	5.6'	20° 47.0	7.8 7.7'	59.9' 59.9'
18	90°58.8	N03°51.5	35°30.3	5.5'	S20°54.7	7.5'	59.8'
19	105°59.1	50.6	49°54.9	5.5'	21°02.3	7.4'	59.8'
20	120°59.3 135°59.5	49.6	64°19.4 78°43.8	5.5' 5.4'	21°09.6 21°16.9	7.2' 7.1'	59.8' 59.8'
21 22	135°59.5 150°59.7	· · 48.7 47.7	78°43.8 93°08.3	5.4° 5.4°	21°16.9 21°24.0	7.1° 6.9'	59.8° 59.7'
23	165°59.9	46.7	107°32.7	5.4	21°30.9	6.8	59.7
	SD = 15.9'	d = -1.0'		SI	D = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-18%	
10	02:57	03:08	11:57	13:38	01:11		
11	03:18	03:29	11:57	14:34	02:06		
12	03:39	03:50	11:56	15:32	03:03		

September 13, 14, 15 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	352°16.5	141°55.8	S13°27.4	121°59.6	S19°34.3	146°06.9	S09°41.9	299°02.9	N16°42.4			
1	7°19.0	156° 55.5	28.5	137°00.4	34.7	161°08.9	42.0	314°05.4	42.4	Alpheratz		29°15.5
2	22°21.4	171°55.3	29.7	152°01.1	35.2	176° 10.9	42.2	329°07.9	42.3	Ankaa	353°03.1	-42°08.4
3	37°23.9	186°55.1	30.8	167°01.9	• • 35.6	191°12.9	• • 42.4	344°10.4	42.3	Schedar	349°26.0	56°42.1
4	52°26.3	201°54.8	32.0	182°02.6	36.1	206°14.9	42.6	359°12.9	42.3	Diphda	348°43.2	-17°49.2
5	67°28.8	216° 54.6	33.1	197°03.4	36.5	221°16.9	42.8	14° 15.4	42.3	Achernar	335°17.1	-57°04.9
6	82°31.3	231°54.3	S13°34.2	212°04.1	S 19°37.0	236°18.9	S09°42.9	29°17.9	N16°42.3	Hamal	327°46.6 311°40.3	23°36.2
7	97°33.7	246°54.1	35.4	227°04.8	37.4	251°20.9	43.1	44°20.3	42.3	Polaris Acamar	311 40.3 315°08.7	89°23.0 -40°10.9
8	$112^{\circ}36.2$	261°53.9	36.5	242°05.6	37.8	266°23.0	43.3	59°22.8	42.3	Menkar	314°02.0	4°12.5
9	127°38.7	276°53.6	• • 37.7	257°06.3	• • 38.3	281°25.0	• • 43.5	74°25.3	• • 42.2	Mirfak	308°22.5	49°57.8
10	142°41.1	291°53.4	38.8	272°07.1	38.7	296°27.0	43.6	89°27.8	42.2	Aldebaran	290°35.2	16°34.1
11	157°43.6	306°53.1	39.9	287°07.8	39.2	311°29.0	43.8	104°30.3	42.2	Rigel	281°00.2	-8°10.0
12	172°46.1	321°52.9	\$13°41.1	302°08.6	S19°39.6	326°31.0	S09°44.0	119°32.8	N16°42.2	Capella	280°16.3	46°01.4
13 14	187°48.5 202°51.0	336° 52.7 351° 52.4	42.2 43.4	317°09.3 332°10.1	40.1 40.5	341°33.0 356°35.0	44.2	134°35.3 149°37.8	42.2 42.2	Bellatrix	$278^{\circ}18.8$	6°22.6
15	202 51.0 217°53.5	6°52.2	• • 44.5	347° 10.8	. 41.0	11°37.0	44.4 • • 44.5	164°40.3	• • 42.1	Elnath	277°57.1	28°37.8
16	232°55.9	21°51.9	45.6	2°11.6	41.4	26°39.0	44.7	179°42.8	42.1	Alnilam	275°33.9	-1°11.0
17	247°58.4	36°51.7	46.8	17° 12.3	41.8	41°41.0	44.9	194°45.3	42.1	Betelgeuse	270°48.0	7°24.7
18	263°00.8	51°51.5	S13°47.9	32°13.0	S19°42.3	56°43.0	S09°45.1	209°47.8	N16°42.1	Canopus	263°50.8	-52°42.5
19	278°03.3	66°51.2	49.0	47° 13.8	42.7	71°45.0	45.2	224°50.3	42.1	Sirius	258°23.0	-16°45.3
20	293°05.8	81°51.0	50.2	62°14.5	43.2	86°47.0	45.4	239°52.8	42.1	Adhara	255°03.0	-29°00.6
21	308°08.2	96°50.7	• • 51.3	77° 15.3	• • 43.6	101°49.0	• • 45.6	254°55.3	• • 42.0	Procyon	244°47.1 243°12.9	5°08.9 27°57.1
22	323°10.7	111°50.5	52.5	92°16.0	44.0	$116^{\circ}51.0$	45.8	269°57.8	42.0	Pollux Avior	243 12.9 234°13.5	-59°36.1
23	$338^{\circ}13.2$	126° 50.2	53.6	$107^{\circ}16.8$	44.5	131°53.1	46.0	285°00.3	42.0	Suhail	234 13.3 222°43.8	-43°33.1
Mer	pass. 00:31	v-0.2′ d1	.1′ m-4.10	ν0 7' d0	.4′ m0.92	v2 0' d0	.2′ m-1.73	v2 5′ d₌0	0.0' m0.04	Miaplacidus	221°38.0	-69°50.3
- IVICI.	pass. 00.51	ν-0.2 d1	.1 111-4.10		.+ 1110.92	ν2.0 do.	.2 111-1.75	ν2.5 u-0	7.0 1110.04	Alphard	217°44.3	-8°47.3
										Regulus	207°30.8	11°49.3
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.3
0	353°15.6	141°50.0	S13°54.7	122° 17.5	S19°44.9	146°55.1	S09°46.1	300°02.8	N16°42.0	Denebola	182°21.5	14°24.4
1	8°18.1	156°49.8	55.9	137°18.2	45.4	161°57.1	46.3	315°05.3	42.0	Gienah	175°40.0	-17°42.4
2	23°20.6	171°49.5	57.0	152°19.0	45.8	176°59.1	46.5	330°07.8	42.0	Acrux	$172^{\circ}56.3$	-63°15.9
3	38°23.0	186°49.3 201°49.0	58.1	167° 19.7	• • 46.2	192°01.1	• • 46.7	345°10.3	• • 41.9	Gacrux	171°47.8	-57°16.9
4 5	53°25.5 68°28.0	201 49.0 216°48.8	13°59.2 14°00.4	182°20.5 197°21.2	46.7 47.1	207°03.1 222°05.1	46.8 47.0	0°12.8 15°15.3	41.9 41.9	Alioth	$166^{\circ}10.4$	55°48.0
6	83°30.4	231°48.5	\$14°00.4	212°21.9	\$19°47.6	237°07.1	509°47.2	30°17.8	N16°41.9	Spica	158°18.6	-11°18.9
7	98°32.9	246°48.3	02.6	212 21.9 227°22.7	48.0	252°09.1	47.4	45°20.3	41.9	Alkaid	152°49.6	49°10.1
8	113°35.3	261°48.0	03.8	242°23.4	48.4	267°11.1	47.6	60°22.7	41.9	Hadar	148°30.9	-60°31.1
9	128°37.8	276° 47.8	04.9	257°24.2	• • 48.9	282°13.1	• • 47.7	75°25.2	• • 41.9	Menkent	147°53.4	-36°31.0
10	143°40.3	291°47.6	06.0	272°24.9	49.3	297° 15.1	47.9	90°27.7	41.8	Arcturus	145°44.7	19°01.8
11	158°42.7	306° 47.3	07.2	287° 25.6	49.8	312° 17.1	48.1	105°30.2	41.8	Rigil Kent. Kochab	139°35.4 137°20.9	-60°57.6 74°02.2
12	173°45.2	321°47.1	S14°08.3	302°26.4	S19°50.2	$327^{\circ}19.1$	S09°48.3	120°32.7	N16°41.8	Zuben'ubi	136°52.0	-16°09.8
13	188°47.7	336°46.8	09.4	$317^{\circ}27.1$	50.6	$342^{\circ}21.1$	48.5	135°35.2	41.8	Alphecca	136° 52.0 126° 00.7	26°37.1
14	203°50.1	351°46.6	10.5	332°27.8	51.1	$357^{\circ}23.1$	48.6	150°37.7	41.8	Antares	112° 11.3	-26°29.8
15	218°52.6	6°46.3	• • 11.7	347°28.6	•• 51.5	$12^{\circ}25.1$	• • 48.8	165°40.2	• • 41.8	Atria	107°02.0	-69°04.9
16	233°55.1	21°46.1	12.8	2°29.3	51.9	27°27.1	49.0	180°42.7	41.7	Sabik	101°58.5	-15°45.5
17	248°57.5	36° 45.8	13.9	17°30.0	52.4	42°29.1	49.2	195°45.2	41.7	Shaula	96°05.2	-37°07.4
18	264°00.0	51°45.6	\$14°15.0	32°30.8	S19°52.8	57°31.1	S09°49.3	210°47.7	N16°41.7	Rasalhague	95°55.0	12°32.6
19	279°02.4	66° 45.3	16.2	47°31.5	53.2	72°33.1	49.5	225°50.2	41.7	Eltanin	90°40.4	51°29.5
20 21	294°04.9 309°07.4	81°45.1 96°44.8	17.3 •• 18.4	62°32.3 77°33.0	53.7 •• 54.1	87°35.2 102°37.2	49.7 • • 49.9	240°52.7 255°55.2	41.7 •• 41.6	Kaus Aust.	83°27.4	-34°22.1
22	324°09.8	111°44.6	19.5	92°33.7	54.6	102 37.2 117°39.2	50.1	270°57.7	41.6	Vega	80°30.5	38°49.1
23	339°12.3	126°44.3	20.6	107°34.5	55.0	132°41.2	50.2	286°00.2	41.6	Nunki	75°43.0	-26°15.4
										Altair	61°56.1	8°57.1
Mer.	pass. 00:27	ν -0.2' d1	.1′ m-4.11	u0.7′ d0	.4′ m0.93	$\nu 2.0' \ d0.$.2′ m-1.73	ν 2.5′ d-0	0.0' m 0.03	Peacock	52°59.5	-56°38.3
										Deneb	49°22.8 33°34.8	45°23.6 10°01.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33 34.6 27°27.9	-46°48.8
0	354°14.8	141°44.1	S14°21.8	122°35.2	S19°55.4	147°43.2	S09°50.4	301°02.7	N16°41.6	Fomalhaut	15°10.1	-40°40.6
1	9°17.2	156° 43.8	22.9	137°35.9	55.9	162°45.2	50.6	$316^{\circ}05.2$	41.6	Scheat	13°41.1	28°14.9
2	24°19.7	171°43.6	24.0	152°36.7	56.3	177°47.2	50.8	331°07.7	41.6	Markab	13°25.8	15°22.2
3	39°22.2	186°43.3	• • 25.1	167°37.4	• • 56.7	192°49.2	• • 51.0	346°10.3	• • 41.5			
4	54°24.6	201°43.1	26.2	182°38.1	57.2	207°51.2	51.1	1°12.8	41.5	Sep 13 Thu		Mer.pass
5	69°27.1	216° 42.8	27.4	197°38.8	57.6	222°53.2	51.3	16°15.3	41.5		149°39.3	14:33
6	84°29.6	231°42.6	\$14°28.5		\$19°58.0	237°55.2	S09°51.5	31°17.8	N16°41.5		129°43.1	15:51
7	99°32.0	246°42.3	29.6	227°40.3	58.5	252°57.2	51.7	46°20.3	41.5	Saturn	153°50.4 306°46.4	14:14
8 9	114°34.5 129°36.9	261°42.1 276°41.8	30.7 · · 31.8	242°41.0 257°41.8	58.9 •• 59.3	267°59.2 283°01.2	51.8 •• 52.0	61°22.8 76°25.3	41.5 •• 41.4	Saturn	500 40.4	04:03
10	144°39.4	291°41.6	33.0	272°42.5	19°59.8	298°03.2	52.2	91°27.8	41.4	Sep 14 Fri		Mer.pass
11	159°41.9	306°41.3	34.1	287°43.2	20°00.2	313°05.2	52.4	106°30.3	41.4		148°34.4	14:33
12	174°44.3	321°41.1	\$14°35.2	302°44.0	S20°00.2	328°07.2	S09°52.6	100° 30.3	N16°41.4		129°01.9	15:50
13	189°46.8	336°40.8	36.3	317°44.7	01.1	343°09.2	52.7	136°35.3	41.4		153°39.4	14:10
14	204°49.3	351°40.6	37.4	332°45.4	01.5	358°11.2	52.9	151°37.8	41.4	Saturn	306°47.1	03:59
15	219°51.7	6°40.3	• • 38.5	347°46.1	•• 01.9	13°13.2	• • 53.1	166°40.3	• • 41.3	Sep 15 Sat	SHA	Mer.pass
16	234°54.2	$21^{\circ}40.1$	39.6	2°46.9	02.3	$28^{\circ}15.2$	53.3	181°42.8	41.3		147°29.3	14:33
17	249°56.7	36°39.8	40.7	17°47.6	02.8	43° 17.2	53.5	196°45.3	41.3		128°20.4	15:49
18	264°59.1	51°39.6	S 14°41.9	32°48.3		58° 19.2	S09°53.6	211°47.8	N16°41.3		153°28.4	14:07
19	280°01.6	66°39.3	43.0	47°49.0	03.6	73°21.2	53.8	226°50.3	41.3	Saturn	306°48.0	03:55
20	295°04.1	81°39.1	44.1	62°49.8	04.1	88°23.2	54.0	241°52.8	41.2	Horizon	tal parallax	
21	310°06.5	96°38.8	· · 45.2	77°50.5	04.5	103°25.2	• • 54.2	256°55.3	• • 41.2	Horizon	Venus:	0.1
22 23	325°09.0 340°11.4	111°38.6 126°38.3	46.3 47.4	92°51.2 107°51.9	04.9 05.4	118°27.2 133°29.2	54.4 54.5	271°57.8 287°00.3	41.2 41.2		Mars:	0.1
												V. <u>-</u>
Mer.	pass. 00:23	u-0.2' $d1$.1′ m-4.12	$ u$ 0.7 $^{\prime}$ d0	.4′ m0.93	$\nu 2.0' \ d0.$.2′ m-1.73	ν 2.5′ d -0	0.0′ m0.03			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°00.2	N03°45.8	121°57.1	5.4'	\$21°37.7	6.6'	59.7'
1 2	196°00.4 211°00.6	44.8 43.9	136°21.5 150°45.8	5.3' 5.3'	21°44.3 21°50.8	6.5' 6.3'	59.7' 59.6'
3	226°00.8	• • 42.9	165° 10.1	5.3'	21°57.2	6.2	59.6'
4	241°01.0	42.0	179°34.4	5.3'	22°03.4	6.0'	59.6'
5	256°01.3 271°01.5	41.0	193° 58.7 208° 23.0	5.3'	22°09.4 \$22°15.3	5.9'	59.6'
6 7	271 01.5 286°01.7	N03°40.0 39.1	208 23.0 222°47.2	5.2' 5.2'	22°21.0	5.7' 5.6'	59.5' 59.5'
8	301°01.9	38.1	237° 11.4	5.2'	22°26.6	5.4'	59.5'
9	316°02.2	• • 37.2	251°35.6	5.2'	22°32.0	5.3'	59.5'
10 11	331°02.4 346°02.6	36.2 35.3	265°59.8 280°24.0	5.2' 5.2'	22°37.2 22°42.3	5.1' 4.9'	59.4' 59.4'
12	1°02.8	N03°34.3	294°48.1	5.1'	S22°47.3	4.8'	59.4
13	16°03.0	33.3	309°12.3	5.1'	22°52.1	4.6'	59.4'
14 15	31°03.3 46°03.5	32.4 •• 31.4	323°36.4 338°00.5	5.1' 5.1'	22°56.7 23°01.2	4.5' 4.3'	59.3' 59.3'
16	61°03.7	30.5	352°24.7	5.1'	23°05.5	4.2'	59.3'
17	76°03.9	29.5	6°48.8	5.1'	23°09.6	4.0'	59.3'
18 19	91°04.2 106°04.4	N03°28.5 27.6	21°12.9 35°37.0	5.1' 5.1'	\$23°13.6 23°17.5	3.8' 3.7'	59.2' 59.2'
20	121°04.6	26.6	50°01.2	5.1'	23°21.2	3.5'	59.2'
21	136°04.8	• • 25.7	64°25.3	5.1'	23°24.7	3.4'	59.2'
22 23	151°05.0 166°05.3	24.7 23.8	78° 49.4 93° 13.5	5.1' 5.1'	23°28.0 23°31.2	3.2' 3.0'	59.1' 59.1'
23			93 13.3			3.0	39.1
	SD = 15.9'	d = -1.0'		51	D = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°05.5 196°05.7	N03°22.8 21.8	107°37.7 122°01.8	5.1' 5.2'	\$23°34.3 23°37.2	2.9' 2.7'	59.1'
1 2	196°05.7 211°05.9	21.8	122°01.8 136°26.0	5.2'	23°37.2 23°39.9	2.6'	59.0' 59.0'
3	226°06.2	• • 19.9	150°50.1	5.2'	23°42.5	2.4'	59.0'
4	241°06.4	19.0	165° 14.3	5.2'	23°44.9	2.2'	59.0'
5 6	256°06.6 271°06.8	18.0 N03° 17.0	179° 38.5 194° 02.7	5.2' 5.2'	23°47.1 \$23°49.2	2.1' 1.9'	58.9' 58.9'
7	286°07.0	16.1	208° 26.9	5.2'	23°51.1	1.8'	58.9'
8	301°07.3	15.1	222°51.2	5.3'	23°52.9	1.6'	58.9'
9 10	316°07.5 331°07.7	· · 14.2 13.2	237°15.4 251°39.7	5.3' 5.3'	23°54.5 23°55.9	1.4' 1.3'	58.8' 58.8'
11	346°07.9	12.2	266°04.0	5.3'	23°57.2	1.1'	58.8'
12	1°08.2	N03°11.3	280°28.3	5.4'	\$23°58.4	1.0'	58.7'
13 14	16°08.4 31°08.6	10.3 09.4	294° 52.7 309° 17.1	5.4' 5.4'	23°59.3 24°00.2	0.8' 0.7'	58.7' 58.7'
15	46°08.8	•• 08.4	323°41.5	5.5'	24°00.8	0.5'	58.7'
16	61°09.0	07.4	338°06.0	5.5'	24°01.3	0.3'	58.6'
17 18	76°09.3 91°09.5	06.5 N03°05.5	352°30.5 6°55.0	5.5' 5.6'	24°01.7 \$24°01.9	0.2' 0.0'	58.6' 58.6'
19	106°09.7	04.6	21° 19.5	5.6'	24°01.9	-0.1	58.5'
20	121°09.9	03.6	35°44.1		24°01.8	-0.3'	58.5'
21 22	136°10.2 151°10.4	· · 02.6 01.7	50°08.8 64°33.4	5.7' 5.7'	24°01.5 24°01.1	-0.4' -0.6'	58.5' 58.5'
23	166°10.6	00.7	78° 58.1	5.8'	24°00.5	-0.7'	58.4'
	SD = 15.9'	d = -1.0'		SI	O = 16.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	181°10.8	N02°59.7	93°22.9	5.8'	\$23°59.7	-0.9'	58.4'
1 2	196°11.0 211°11.3	58.8 57.8	107° 47.7 122° 12.5	5.8' 5.9'	23°58.9 23°57.8	-1.0' -1.2'	58.4' 58.3'
3	226°11.5	• • 56.9	136° 37.4	5.9'	23°56.6	-1.3'	58.3
4	241°11.7	55.9	$151^{\circ}02.4$	6.0'	23°55.3	-1.5'	58.3'
5 6	256°11.9 271°12.2	54.9 N02° 54.0	165°27.4 179°52.4	6.0' 6.1'	23°53.8 \$23°52.1	-1.6' -1.8'	58.3' 58.2'
7	271 12.2 286°12.4	53.0	179 52.4 194° 17.5	6.2	23°50.3	-1.0 -1.9'	58.2'
8	301°12.6	52.0	208°42.7	6.2'	23°48.4	-2.1'	58.2'
9 10	316°12.8 331°13.1	· · 51.1 50.1	223°07.9 237°33.2	6.3' 6.3'	23°46.3 23°44.1	-2.2' -2.4'	58.1' 58.1'
11	346°13.3	49.2	251°58.5	6.4	23°41.7	-2.4 -2.5'	58.1
12	1°13.5	N02°48.2	266° 23.9	6.4'	S 23°39.2	-2.7'	58.1'
13 14	16°13.7 31°13.9	47.2 46.3	280° 49.3 295° 14.8	6.5' 6.6'	23°36.5 23°33.7	-2.8' -3.0'	58.0' 58.0'
14 15	46°14.2	46.3 •• 45.3	295° 14.8 309° 40.4	6.6	23° 33.7 23° 30.7	-3.0° -3.1°	58.0'
16	61°14.4	44.3	324°06.0	6.7'	23°27.6	-3.2'	57.9'
17 18	76°14.6 91°14.8	43.4 N02°42.4	338° 31.7 352° 57.5	6.8' 6.8'	23°24.4 \$23°21.0	-3.4' -3.5'	57.9'
18 19	91°14.8 106°15.1	N02°42.4 41.5	352°57.5 7°23.3	6.8'	23° 17.5	-3.5' -3.7'	57.9' 57.9'
20	121°15.3	40.5	$21^{\circ}49.2$	7.0'	23°13.8	-3.8'	57.8'
21	136°15.5 151°15.7	• • 39.5	36° 15.2 50° 41.2	7.0'	23° 10.0	-3.9'	57.8'
22 23	151°15.7 166°16.0	38.6 37.6	50°41.2 65°07.3	7.1' 7.2'	23°06.1 23°02.1	-4.1' -4.2'	57.8' 57.7'
	SD = 15.9'	d = -1.0'			D = 15.9'		•

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:01	03:51	05:04	18:44	19:56	21:42
N 70°	02:35	04:05	05:09	18:39	19:43	21:11
68°	02:58	04:16	05:14	18:35	19:33	20:49
66°	03:16	04:24	05:18	18:31	19:24	20:32
64°	03:30	04:32	05:21	18:28	19:17	20:18
62°	03:41	04:38	05:24	18:26	19:11	20:07
60°	03:51	04:43	05:26	18:23	19:06	19:58
N 58°	03:59	04:48	05:28	18:21	19:01	19:50
56°	04:06	04:52	05:30	18:20	18:57	19:43
54°	04:13	04:56	05:32	18:18	18:54	19:37
52°	04:18	04:59	05:33	18:17	18:51	19:31
50°	04:23	05:02	05:35	18:15	18:48	19:27
45°	04:33	05:08	05:38	18:12	18:42	19:17
N 40°	04:41	05:13	05:40	18:10	18:37	19:09
35°	04:47	05:17	05:42	18:08	18:33	19:03
30°	04:52	05:20	05:44	18:06	18:30	18:58
20°	04:59	05:25	05:47	18:03	18:25	18:51
N 10° 0°	05:04	05:29	05:50	18:01	18:22	18:46
	05:07	05:32	05:52	17:59	18:19	18:43
S 10°	05:09	05:33	05:54	17:57	18:18	18:42
20°	05:09	05:35	05:57	17:54	18:16	18:42
30°	05:08	05:35	05:59	17:52	18:16	18:44
35° 40°	05:06 05:04	05:35 05:35	06:01 06:02	17:51 17:49	18:16 18:16	18:45 18:48
40 45°	05:04	05:35	06:02	17:49	18:16	18:51
	ł					
S 50°	04:56	05:34	06:06	17:46	18:18	18:56
52° 54°	04:54 04:52	05:33 05:33	06:07 06:08	17:45 17:44	18:19 18:19	18:58 19:00
56°	04:52	05:33	06:08	17:44	18:19	19:00
58°	04:49	05:32	06:09	17:43	18:20	19:03
S 60°	04:40	05:31	06:10	17:42	18:22	19:07
	· · · · · -	00.00			10.22	-5

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

			Sun			Moon	
1 6	Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
-	,	00 ^h	12 ^h	Pass	Upper	Lower	5-7
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-49%
	13	04:01	04:11	11:56	16:32	04:02	
	14	04:22	04:33	11:55	17:31	05:01	
	15	04:43	04:54	11:55	18:29 06:01		

September 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	355°13.9	141°38.0	S14°48.5	122°52.7	S20°05.8	148°31.2	S09°54.7	302°02.8	N16°41.2			
1	10°16.4	156° 37.8	49.6	137°53.4	06.2	163°33.2	54.9	317°05.3	41.2	Alpheratz	357°30.4	29°15.5
2	25°18.8	171°37.5	50.7	152°54.1	06.6	178°35.2	55.1	332°07.8	41.1	Ankaa	353°03.1	-42°08.4
3	40°21.3	186°37.3	• • 51.8	167°54.8	•• 07.1	193°37.2	• • 55.2	347°10.4	• • 41.1	Schedar	349°26.0	56°42.1
4	55°23.8	201°37.0	52.9	182°55.6	07.5	208°39.2	55.4	2°12.9	41.1	Diphda	348°43.2	-17°49.2
5	70°26.2	216°36.8	54.1	197°56.3	07.9	223°41.2	55.6	17°15.4	41.1	Achernar	335°17.1	-57°04.9
6	85°28.7	231°36.5	S14°55.2	212°57.0	S20°08.4	238°43.2	S09°55.8	32°17.9	$N16^{\circ}41.1$	Hamal	327°46.6	23°36.2
7	100°31.2	246°36.3	56.3	227°57.7	8.80	253°45.2	56.0	47°20.4	41.0	Polaris	311°38.7	89°23.0
8	115°33.6	261°36.0	57.4	242°58.5	09.2	268°47.2	56.1	62°22.9	41.0	Acamar	315°08.7	-40°10.9
9	130°36.1	276°35.7	• • 58.5	257°59.2	• • 09.6	283°49.2	• • 56.3	77°25.4	• • 41.0	Menkar	314°02.0	4°12.5
10	145°38.6	291°35.5	14°59.6	272°59.9	10.1	298°51.2	56.5	92°27.9	41.0	Mirfak	308°22.5	49°57.8 16°34.1
11	160°41.0	306°35.2	15°00.7	288°00.6	10.5	313°53.2	56.7	107°30.4	41.0	Aldebaran	290°35.2	1
12	175°43.5	321°35.0	S15°01.8	303°01.3	S20°10.9	328° 55.2	S09°56.9	122°32.9	N16°41.0	Rigel	281°00.2	-8°10.0
13	190°45.9	336°34.7	02.9	$318^{\circ}02.1$	11.3	343°57.2	57.0	137°35.4	40.9	Capella	280°16.2	46°01.4 6°22.6
14	205°48.4	351°34.5	04.0	333°02.8	11.8	358°59.2	57.2	152°37.9	40.9	Bellatrix	278°18.8	
15	220°50.9	6°34.2	•• 05.1	348°03.5	• • 12.2	14°01.2	• • 57.4	167°40.4	• • 40.9	Elnath	277°57.1 275°33.9	28°37.8 -1°11.0
16	235°53.3	21°33.9	06.2	3°04.2	12.6	29°03.2	57.6	182°43.0	40.9	Alnilam	270°48.0	1
17	250°55.8	36°33.7	07.3	18°04.9	13.0	44°05.2	57.8	197°45.5	40.9	Betelgeuse	263°50.8	7°24.7 -52°42.5
18	265°58.3	51°33.4	S15°08.4	33°05.7	S20°13.5	59°07.2	S09°57.9	212°48.0	N16°40.8	Canopus	258°23.0	-32 42.5 -16°45.3
19	281°00.7	66°33.2	09.5	48°06.4	13.9	74°09.2	58.1	227°50.5	40.8	Sirius	255°03.0	-10 45.5 -29°00.6
20	296°03.2	81°32.9	10.6	63°07.1	14.3	89°11.2	58.3	242°53.0	40.8	Adhara	244°47.0	5°08.9
21	311°05.7	96°32.6	• • 11.7	78° 07.8	• • 14.7	104° 13.2	• • 58.5	257°55.5	• • 40.8	Procyon		27°57.1
22	326°08.1	111°32.4	12.8	93°08.5	15.2	119° 15.2	58.7	272°58.0	40.8	Pollux	243°12.9 234°13.5	
23	341°10.6	$126^{\circ}32.1$	13.9	108°09.2	15.6	134°17.2	58.8	288°00.5	40.7	Avior		-59°36.1
N/a===	ass. 00:19		.1′ m-4.12	,,n 7/ ,10	.4′ m0.94	1/2 0/ 40	2′ m-1.72	1/2 E/ J C	0.0' m0.02	Suhail Miaplacidus	222°43.8 221°38.0	-43°33.1 -69°50.3
ivier.p	ass. 00:19	ν-0.5 α1	.1 M-4.12	νο.τ αυ	.4 1110.94	ν2.0 d0.	Z III-1.72	ν2.5 <i>a</i> -0	7.0 MO.02	Alphard	221 36.0 217°44.3	-8°47.3
										Regulus	217 44.3 207°30.7	11°49.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.3
0	$356^{\circ}13.1$	141°31.9	S15°15.0	123°10.0	S20°16.0	149°19.2	S09°59.0	303°03.0	N16°40.7	Denebola	182°21.5	14°24.4
1	$11^{\circ}15.5$	$156^{\circ}31.6$	16.1	$138^{\circ}10.7$	16.4	$164^{\circ}21.2$	59.2	$318^{\circ}05.5$	40.7	Gienah	175°40.0	-17°42.4
2	26°18.0	171°31.3	17.1	153°11.4	16.9	179°23.2	59.4	333°08.0	40.7		173° 40.0	-63°15.9
3	41°20.4	$186^{\circ}31.1$	• • 18.2	$168^{\circ}12.1$	• • 17.3	194°25.2	• • 59.6	$348^{\circ}10.6$	• • 40.7		172 30.3 171°47.8	-57°16.9
4	56°22.9	201°30.8	19.3	183°12.8	17.7	209°27.2	59.7	3°13.1	40.6	Alioth	166°10.4	55°48.0
5	71°25.4	$216^{\circ}30.6$	20.4	198°13.5	18.1	224°29.2	09°59.9	18°15.6	40.6	Spica	158° 18.6	-11°18.9
6	86°27.8	231°30.3	S15°21.5	213° 14.2	S20°18.6	239°31.2	S10°00.1	33°18.1	N16°40.6	Alkaid	152°49.6	49°10.1
7	101°30.3	246°30.0	22.6	$228^{\circ}15.0$	19.0	254°33.2	00.3	48°20.6	40.6	Hadar	148°30.9	-60°31.1
8	116°32.8	261°29.8	23.7	243° 15.7	19.4	269°35.2	00.5	63°23.1	40.6		140°53.4	-36°31.0
9	131°35.2	$276^{\circ}29.5$	• • 24.8	258° 16.4	• • 19.8	284°37.2	• • 00.6	78°25.6	• • 40.6	Arcturus	147 33.4 145°44.7	19°01.8
10	146°37.7	291°29.2	25.9	273°17.1	20.2	299°39.2	8.00	93°28.1	40.5	Rigil Kent.	139°35.4	-60°57.6
11	161°40.2	$306^{\circ}29.0$	27.0	288° 17.8	20.7	314°41.2	01.0	108°30.7	40.5	Kochab	137°21.0	74°02.2
12	176°42.6	321°28.7	S15°28.1	303°18.5	S20°21.1	329°43.2	S10°01.2	123°33.2	N16°40.5	Zuben'ubi	136°52.0	-16°09.8
13	191°45.1	336°28.4	29.1	318° 19.2	21.5	344°45.2	01.4	138°35.7	40.5	Alphecca	126°00.8	26°37.1
14	206°47.5	351°28.2	30.2	333° 19.9	21.9	359°47.2	01.5	153°38.2	40.5	Antares	112°11.3	-26°29.8
15	221°50.0	6°27.9	• • 31.3	348°20.7	• • 22.3	14°49.1	•• 01.7	168°40.7	• • 40.4	Atria	107°02.1	-69°04.9
16	236°52.5	$21^{\circ}27.7$	32.4	3°21.4	22.8	29°51.1	01.9	183°43.2	40.4	Sabik	101°58.5	-15°45.5
17	251°54.9	36° 27.4	33.5	18°22.1	23.2	44°53.1	02.1	198°45.7	40.4	Shaula	96°05.2	-37°07.4
18	266°57.4	51°27.1	S15°34.6	33°22.8	S20°23.6	59°55.1	S10°02.3	213°48.2	N16°40.4	Rasalhague	95°55.0	12°32.6
19	281°59.9	66° 26.9	35.7	48°23.5	24.0	74°57.1	02.4	228°50.8	40.4	Eltanin	90°40.4	51°29.5
20	297°02.3	81°26.6	36.7	63°24.2	24.4	89°59.1	02.6	243°53.3	40.3	Kaus Aust.	83°27.4	-34°22.1
21	312°04.8	96°26.3	• • 37.8	78°24.9	• • 24.9	105°01.1	• • 02.8	258°55.8	• • 40.3	Vega	80°30.5	38°49.1
22	327°07.3	111°26.1	38.9	93°25.6	25.3	120°03.1	03.0	273°58.3	40.3	Nunki	75°43.0	-26°15.4
23	342°09.7	126°25.8	40.0	108°26.3	25.7	135°05.1	03.2	289°00.8	40.3	Altair	$61^{\circ}56.1$	8°57.1
Mer.p	ass. 00:15	ν -0.3' d1	.1′ m-4.13	$\nu 0.7' d0$.4′ m0.94	$\nu 2.0' d0.$	2′ m-1.72	$\nu 2.5' \ d-0$	0.0′ m0.02	Peacock	52°59.5	-56°38.3
										Deneb	49°22.8	45°23.6
										Enif	33°34.8	10°01.0
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.8
0	357°12.2	141°25.5	\$15°41.1	123°27.0		150°07.1	S10°03.3	304°03.3	N16°40.3	Fomalhaut	$15^{\circ}10.1$	-29°27.6
1	12°14.7	156°25.3	42.2	138°27.7	26.5	165°09.1	03.5	319°05.8	40.2	Scheat	13°41.1	28°14.9
2	27°17.1	171°25.0	43.2	153°28.5	26.9	180°11.1	03.7	334°08.4	40.2	Markab	13°25.8	15°22.2
3	42°19.6	186°24.7	• • 44.3	168°29.2	• • 27.4	195°13.1	• • 03.9	349°10.9	• • 40.2	6 16 5	C	
4	57°22.0	201°24.5	45.4	183°29.9	27.8	210°15.1	04.1	4°13.4	40.2	Sep 16 Sun	SHA	Mer.pass
5	72°24.5	216°24.2	46.5	198°30.6	28.2	225°17.1	04.2	19°15.9	40.2		146°24.1	14:34
6	87°27.0	231°23.9	\$15°47.6	213°31.3	\$20°28.6	240°19.1	S10°04.4	34°18.4	N16°40.1		127°38.8	15:48
7	102°29.4	246°23.7	48.6	228°32.0	29.0	255°21.1	04.6	49°20.9	40.1		153°17.3	14:04
8	117°31.9	261°23.4	49.7	243°32.7	29.4	270°23.1	04.8	64°23.5	40.1	Saturn	306°48.9	03:51
9	132°34.4	276°23.1	50.8	258°33.4	• • 29.9	285°25.1	• • 05.0	79°26.0	• • 40.1	Sep 17 Mon	SHA	Mer.pass
10	147°36.8	291°22.8	51.9	273°34.1	30.3	300°27.1	05.1	94°28.5	40.1		145°18.8	14:34
11	162°39.3	306°22.6	52.9	288°34.8	30.7	315°29.1	05.3	109°31.0	40.0		126°56.9	15:47
12	177°41.8	321°22.3	S15°54.0	303°35.5	\$20°31.1	330°31.0	\$10°05.5	124°33.5	N16°40.0		153°06.1	14:01
13	192°44.2	336°22.0	55.1	318°36.2	31.5	345°33.0	05.7	139°36.0	40.0	Saturn	306°50.0	03:47
14	207°46.7	351°21.8	56.2	333°36.9	31.9	0°35.0	05.9	154°38.6	40.0			
15	222°49.2	6°21.5	57.2	348° 37.6	• • 32.3	15°37.0	06.0	169°41.1	39.9	Sep 18 Tue	SHA	Mer.pass
16	237°51.6	21°21.2	58.3	3°38.3	32.8	30°39.0	06.2	184°43.6	39.9		144°13.3	14:35
17	252°54.1	36°21.0	15°59.4	18°39.0	33.2	45°41.0	06.4	199°46.1	39.9		126°14.9	15:45
18	267°56.5	51°20.7	\$16°00.4	33°39.7	\$20°33.6	60°43.0	\$10°06.6	214°48.6	N16°39.9		152°54.9	13:58
19	282°59.0	66°20.4	01.5	48° 40.4	34.0	75°45.0	06.8	229°51.1	39.9	Saturn	306°51.1	03:43
20	298°01.5	81°20.1	02.6	63°41.1	34.4 •• 34.8	90°47.0	06.9	244°53.7	39.8	Horizont	al parallax	
21	313°03.9	96°19.9	03.7	78°41.8		105°49.0	07.1	259°56.2 274°58.7	· · 39.8	1.01120111	Venus:	0.2
22	328°06.4	111°19.6	04.7	93°42.5	35.2	120°51.0	07.3		39.8		Mars:	0.2
23	343°08.9	126° 19.3	05.8	108°43.2	35.6	135°53.0	07.5	290°01.2	39.8	L	141013.	0.1
Mer.p	ass. 00:11	$ u$ -0.3 $^{\prime}$ d1	.1′ m-4.14	$ u$ 0.7 $^{\prime}$ d 0	.4′ m0.94	ν 2.0′ d0.	2′ m-1.72	ν 2.5 $^{\prime}$ d-0	0.0′ m0.01			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°16.2	N02°36.6	79°33.5	7.2'	S22°57.9	-4.3'	57.7'
1	196°16.4	35.7	93°59.7	7.3'	22°53.5	-4.5'	57.7'
2	211°16.6	34.7	108°26.0	7.4'	22°49.1	-4.6'	57.7'
3	226°16.9	• • 33.7	122°52.4	7.5'	22°44.5	-4.7'	57.6'
4	241°17.1	32.8	137°18.9	7.5'	22°39.7	-4.9'	57.6'
5	256°17.3	31.8	151°45.4	7.6'	22°34.9	-5.0'	57.6'
6	271°17.5	N02°30.9	166°12.1	7.7'	522°29.9	-5.1'	57.6'
7	286°17.7	29.9	180°38.8	7.8'	22°24.8	-5.2'	57.5'
8	301°18.0	28.9	195°05.5	7.9'	22°19.6	-5.4'	57.5'
9 10	316°18.2 331°18.4	· · 28.0 27.0	209°32.4 223°59.3	7.9' 8.0'	22°14.2 22°08.7	-5.5' -5.6'	57.5'
11	331 18.4 346°18.6	27.0 26.0	223 59.3 238°26.3	8.1'	22°03.1	-5.0 -5.7'	57.4' 57.4'
12	1°18.9	N02°25.1	252°53.4	8.2'	S21°57.4	-5.7 -5.8'	57.4
13	16°19.1	24.1	267°20.6	8.2'	21°51.5	-6.0'	57.4
14	31°19.3	23.1	281°47.8	8.3'	21°45.6	-6.1	57.3'
15	46°19.5	22.2	296°15.2	8.4'	21°39.5	-6.2	57.3'
16	61°19.8	21.2	310°42.6	8.5'	21°33.3	-6.3'	57.3'
17	76°20.0	20.2	$325^{\circ}10.1$	8.6'	21°27.0	-6.4'	57.3'
18	91°20.2	N02° 19.3	339°37.6	8.7'	S21°20.5	-6.5'	57.2'
19	106°20.4	18.3	354°05.3	8.7'	21°14.0	-6.7'	57.2'
20	121°20.7	17.3	8°33.0	8.8'	21°07.3	-6.8'	57.2'
21	136°20.9	• • 16.4	23°00.9	8.9'	21°00.5	-6.9'	57.1'
22	151°21.1	15.4	37°28.8	9.0'	20°53.7	-7.0'	57.1'
23	166°21.3	14.4	51°56.7	9.1'	20°46.7	-7.1'	57.1'
	SD = 15.9'	d = -1.0'		SI	O = 15.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°21.5 196°21.8	N02° 13.5 12.5	66°24.8 80°53.0	9.2' 9.2'	\$20°39.6 20°32.3	-7.2' -7.3'	57.1' 57.0'
1 2	211°22.0	12.5 11.5	95°21.2	9.2	20° 32.3 20° 25.0	-7.3° -7.4'	57.0° 57.0°
3	226°22.2	. 10.6	109°49.5	9.4'	20° 23.0	-7.5'	57.0'
4	241°22.4	09.6	124°17.9	9.5'	20°10.1	-7.6'	57.0'
5	256°22.7	08.7	138°46.4	9.6'	20°02.5	-7.7'	56.9'
6	271°22.9	N02°07.7	153°15.0	9.7'	S19°54.7	-7.8'	56.9'
7	286°23.1	06.7	167°43.6	9.7'	19°46.9	-7.9'	56.9'
8	301°23.3	05.8	182°12.4	9.8'	19°39.0	-8.0'	56.9'
9	316°23.6	• • 04.8	196°41.2	9.9'	19°31.0	-8.1'	56.8'
10	331°23.8	03.8	211°10.1	10.0'	19°22.9	-8.2'	56.8'
11 12	346°24.0 1°24.2	02.9 N02°01.9	225°39.1 240°08.2	10.1' 10.2'	19°14.6 \$19°06.3	-8.3' -8.4'	56.8' 56.8'
13	16°24.5	00.9	254° 37.3	10.2'	18°57.9	-0.4 -8.5'	56.7'
14	31°24.7	02°00.0	269°06.6	10.2	18°49.4	-8.6'	56.7'
15	46°24.9	01°59.0	283°35.9	10.4'	18°40.9	-8.7'	56.7'
16	61°25.1	58.0	298°05.3	10.5'	18°32.2	-8.8'	56.7'
17	76°25.3	57.1	$312^{\circ}34.8$	10.6'	18°23.4	-8.8'	56.6'
18	91°25.6	N01°56.1	327°04.4	10.7'	S18°14.6	-8.9'	56.6'
19	106°25.8	55.1	341°34.0	10.7'	18°05.6	-9.0'	56.6'
20	121°26.0	54.2	356°03.8	10.8'	17°56.6	-9.1'	56.6'
21	136°26.2 151°26.5	• • 53.2	10°33.6 25°03.5	10.9'	17°47.5	-9.2'	56.5'
22 23	151 26.5 166°26.7	52.2 51.2	25 03.5 39°33.5	11.0' 11.1'	17°38.3 17°29.1	-9.3' -9.3'	56.5' 56.5'
23	SD = 15.9'	d = -1.0'	39 33.3		O = 15.6'	-9.5	30.3
T						.J	LIP
Tue 0	GHA 181°26.9	Dec N01°50.3	GHA 54°03.5	u 11.1'	Dec \$17°19.7	d -9.4'	HP 56.5'
1	181°26.9 196°27.1	N01 50.3 49.3	68°33.7	11.1	17°10.3	-9.4 -9.5'	56.4
2	211°27.4	48.3	83°03.9	11.3'	17°10.3	-9.5' -9.6'	56.4
3	226°27.6	• • 47.4	97°34.2	11.4'	16°51.2	-9.7'	56.4
4	241°27.8	46.4	112°04.6	11.5'	16°41.5	-9.7'	56.4'
5	256°28.0	45.4	126°35.0	11.5'	16°31.8	-9.8'	56.3'
6	271°28.3	N01°44.5	141°05.6	11.6'	S 16°22.0	-9.9'	56.3'
7	286°28.5	43.5	$155^{\circ}36.2$	11.7'	$16^{\circ}12.1$	-9.9'	56.3'
8	301°28.7	42.5	170°06.9	11.8'	16°02.2	-10.0'	56.3'
9	316°28.9	• • 41.6	184°37.7	11.8'	15°52.2	-10.1'	56.3'
10	331°29.2	40.6	199°08.5	11.9'	15°42.1	-10.2'	56.2'
11 12	346°29.4 1°29.6	39.6 N01°38.7	213°39.4 228°10.4	12.0' 12.1'	15°31.9 \$15°21.7	-10.2' -10.3'	56.2' 56.2'
13	1 29.6 16°29.8	37.7	242°41.5	12.1'	15°11.4	-10.3 -10.4'	56.2'
14	31°30.0	36.7	242 41.5 257°12.6	12.1	15°01.1	-10.4'	56.1
15	46°30.3	• • 35.8	271°43.8	12.3'	14°50.7	-10.5'	56.1
16	61°30.5	34.8	$286^{\circ}15.1$	12.4'	14°40.2	-10.5'	56.1'
17	76°30.7	33.8	$300^{\circ}46.5$	12.4'	14°29.6	-10.6'	56.1'
18	91°30.9	N01°32.9	315°17.9	12.5'	\$14°19.0	-10.7'	56.0'
19	106°31.2	31.9	329°49.4	12.6'	14°08.4	-10.7'	56.0'
20	121°31.4 136°31.6	30.9	344°21.0 358°52.6	12.6' 12.7'	13°57.7 13°46.9	-10.8'	56.0'
21 22	136°31.6 151°31.8	· · 30.0 29.0	358°52.6 13°24.3	12.7	13°46.9 13°36.1	-10.8' -10.9'	56.0' 56.0'
23	166°32.1	28.0	27°56.1	12.8'	13°25.2	-10.9'	55.9'
	SD = 15.9'	d = -1.0'	50.1		D = 15.4'		
	JD = 15.9′	$a = -1.0^{\circ}$		51	J = 15.4'		

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

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

Day		Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.			
,	00 ^h	00 ^h 12 ^h		Upper	Lower	8-10		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-80%		
16	05:05	05:15	11:55	19:25	06:57			
17	05:26	05:37	11:54	20:16	07:51			
18	05:48	05:58	11:54	21:05	08:41			

September 19, 20, 21 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	358°11.3	141° 19.0	\$16°06.9	123°43.9	\$20°36.1	150°55.0	S10°07.7	305°03.7	N16°39.8			
1	13°13.8	156° 18.8	07.9	138°44.6	36.5	165°57.0	07.8	320°06.3	39.7	Alpheratz	357°30.4	29°15.5
2	28°16.3	171° 18.5	09.0	153°45.3	36.9	180°59.0	08.0	335°08.8	39.7	Ankaa	353°03.1	-42°08.4
3	43°18.7	186° 18.2	. 10.1	168°46.0	37.3	196°01.0	08.2	350° 11.3	39.7	Schedar	349°26.0	56°42.1
4	58°21.2	201°18.0	11.1	183°46.7	37.7	211°02.9	08.4	5°13.8	39.7	Diphda	348°43.2	-17°49.2
5	73°23.6	$216^{\circ}17.7$	12.2	198°47.4	38.1	226°04.9	08.6	20°16.3	39.7	Achernar	335°17.0 327°46.6	-57°04.9 23°36.2
6	88°26.1	231° 17.4	S16°13.3	213°48.1	S20°38.5	241°06.9	S10°08.7	35° 18.9	N16°39.6	Hamal Polaris	327 40.0 311°37.4	23 30.2 89°23.0
7	103°28.6	$246^{\circ}17.1$	14.3	228°48.8	38.9	256°08.9	08.9	50°21.4	39.6	Acamar	311 37.4 315°08.7	-40°10.9
8	118°31.0	261°16.9	15.4	243°49.5	39.3	271°10.9	09.1	65°23.9	39.6	Menkar	314°02.0	4°12.5
9	133°33.5	276° 16.6	• • 16.4	258°50.2	• • 39.7	286° 12.9	• • 09.3	80°26.4	• • 39.6	Mirfak	308°22.4	49°57.8
10	148°36.0	291°16.3	17.5	273°50.9	40.2	301°14.9	09.5	95°28.9	39.5	Aldebaran	290°35.2	16°34.1
11	163°38.4	306°16.0	18.6	288°51.6	40.6	316°16.9	09.7	110°31.5	39.5	Rigel	281°00.2	-8°10.0
12	178°40.9 193°43.4	321° 15.8 336° 15.5	\$16°19.6	303°52.3 318°53.0	\$20°41.0	331°18.9 346°20.9	\$10°09.8	125°34.0 140°36.5	N16°39.5	Capella	280°16.2	46°01.4
13 14	208°45.8	351° 15.5	20.7 21.7	333°53.7	41.4 41.8	1°22.9	10.0 10.2	140 30.5 155°39.0	39.5 39.5	Bellatrix	278°18.8	6°22.6
15	223°48.3	6°14.9	22.8	348°54.4	42.2	16°24.9	. 10.4	170°41.5	39.4	Elnath	277°57.0	28°37.8
16	238°50.8	21°14.6	23.9	3°55.1	42.6	31°26.8	10.6	185°44.1	39.4	Alnilam	275°33.9	-1°11.0
17	253°53.2	36° 14.4	24.9	18°55.8	43.0	46°28.8	10.7	200°46.6	39.4	Betelgeuse	270°48.0	7°24.7
18	268°55.7	51°14.1	S16°26.0	33°56.5	S20°43.4	61°30.8	S10° 10.9	215°49.1	N16°39.4	Canopus	263°50.8	-52°42.5
19	283°58.1	66° 13.8	27.0	48°57.2	43.8	76°32.8	11.1	230°51.6	39.4	Sirius Adhara	258°23.0	-16°45.3 -29°00.6
20	299°00.6	81°13.5	28.1	63°57.8	44.2	91°34.8	11.3	245° 54.2	39.3	Procyon	255°03.0 244°47.0	5°08.9
21	$314^{\circ}03.1$	96°13.3	• • 29.1	78°58.5	• • 44.6	106°36.8	• • 11.5	260° 56.7	• • 39.3	Pollux	244 47.0 243°12.9	27°57.1
22	329°05.5	111° 13.0	30.2	93°59.2	45.0	121°38.8	11.6	275°59.2	39.3	Avior	234°13.5	-59°36.1
23	344°08.0	126° 12.7	31.3	108°59.9	45.4	136°40.8	11.8	291°01.7	39.3	Suhail	222°43.8	-43°33.1
Mer.p	ass. 00:07	ν -0.3' d1	.1′ m-4.14	$\nu 0.7' d0$.4′ m0.95	$\nu 2.0' d0.$	2′ m-1.72	$\nu 2.5' \ d-0$.0′ m0.01	Miaplacidus	221°38.0	-69°50.2
										Alphard	217°44.3	-8°47.3
	6114	6114	_	6114	-	6114	_	6114	_	Regulus	207°30.7	11°49.3
Thu	GHA 250°10 5	GHA 141° 12.4	Dec \$16°22.2	GHA 124°00.6	Dec \$20°45.9	GHA	Dec \$10°12.0	GHA	Dec N16° 20. 2	Dubhe	193°37.3	61°35.3
0 1	359°10.5 14°12.9	141° 12.4 156° 12.1	\$16°32.3 33.4	124°00.6 139°01.3	\$20°45.9 46.3	151°42.8 166°44.8	\$10°12.0 12.2	306° 04.2 321° 06.8	N16°39.2 39.2	Denebola	182°21.5	14°24.4
2	29°15.4	171° 11.9	34.4	154°02.0	46.7	181°46.8	12.4	336°09.3	39.2	Gienah	175°40.0	-17°42.4
3	44°17.9	186°11.6	• • 35.5	169°02.7	• • 47.1	196°48.7	• 12.5	351°11.8	39.2		172°56.3	-63°15.9
4	59°20.3	201°11.3	36.5	184°03.4	47.5	211°50.7	12.7	6°14.3	39.2	Gacrux	171°47.8	-57°16.8
5	74°22.8	216° 11.0	37.6	199°04.1	47.9	226°52.7	12.9	21°16.9	39.1	Alioth	166°10.4	55°48.0
6	89°25.2	231°10.7	S16°38.6	214°04.8	S20°48.3	241°54.7	S10°13.1	36° 19.4	N16°39.1	Spica	158°18.6	-11°18.9
7	104°27.7	$246^{\circ}10.5$	39.7	229°05.4	48.7	256° 56.7	13.3	51°21.9	39.1	Alkaid Hadar	152°49.6 148°30.9	49°10.0 -60°31.1
8	119°30.2	261°10.2	40.7	244°06.1	49.1	271°58.7	13.4	66°24.4	39.1	Menkent	146 50.9 147°53.4	-36°31.0
9	134°32.6	276°09.9	• • 41.8	259°06.8	• • 49.5	287°00.7	• • 13.6	81°27.0	• • 39.0	Arcturus	147° 33.4	19°01.8
10	149°35.1	291°09.6	42.8	274°07.5	49.9	302°02.7	13.8	96°29.5	39.0	Rigil Kent.	139°35.4	-60°57.6
11	164°37.6	306°09.3	43.9	289°08.2	50.3	317°04.7	14.0	111°32.0	39.0	Kochab	137°21.0	74°02.2
12	179°40.0	321°09.1	S16°44.9	304°08.9	\$20°50.7	332°06.7	S10°14.2	126°34.5	N16°39.0	Zuben'ubi	136°52.0	-16°09.8
13	194°42.5	336°08.8	45.9	319°09.6	51.1	347°08.6	14.4	141°37.1	39.0	Alphecca	126°00.8	26°37.1
14	209°45.0 224°47.4	351°08.5	47.0	334°10.3	51.5	2°10.6	14.5	156° 39.6	38.9 •• 38.9	Antares	112°11.3	-26°29.8
15 16	224 47.4 239°49.9	6°08.2 21°07.9	· · 48.0 49.1	349°10.9 4°11.6	· · 51.9 52.3	17°12.6 32°14.6	· · 14.7 14.9	171° 42.1 186° 44.6		Atria	$107^{\circ}02.1$	-69°04.9
17	254°52.4	36° 07.6	50.1	19°12.3	52.7	47° 16.6	15.1	201°47.2	38.9 38.9	Sabik	101°58.5	-15°45.5
18	269°54.8	51°07.4	\$16°51.2	34°13.0	\$20°53.1	62° 18.6	S10°15.3	216°49.7	N16°38.8	Shaula	96°05.2	-37°07.4
19	284°57.3	66°07.1	52.2	49°13.7	53.5	77° 20.6	15.4	231°52.2	38.8	Rasalhague	95°55.1	12°32.6
20	299°59.7	81°06.8	53.2	64°14.4	53.9	92°22.6	15.6	246° 54.8	38.8	Eltanin	90°40.4	51°29.5 -34°22.1
21	315°02.2	96°06.5	• • 54.3	79°15.1	• • 54.3	107°24.6	• • 15.8	261°57.3	• • 38.8	Kaus Aust.	83°27.4 80°30.6	-34 22.1 38°49.1
22	330°04.7	111°06.2	55.3	94°15.7	54.7	122°26.5	16.0	276°59.8	38.7	Vega Nunki	75°43.0	-26°15.4
23	345°07.1	126°05.9	56.4	109°16.4	55.1	137°28.5	16.2	292°02.3	38.7	Altair	61°56.1	8°57.2
Mern	pass. 23:59	v-0 3' d1	.1′ m-4.15	ν0 7' d0	.4′ m0.95	v2 0' d0	2′ m-1.72	v2 5' d-0	.0′ m0.00	Peacock	52°59.5	-56°38.3
- Wici.p	23.33	ν 0.5 d1	.1 111 4.13	- VO.1 UO		ν 2.0 do.				Deneb	49°22.8	45°23.6
										Enif	33°34.8	10°01.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.9
0	0°09.6	141°05.6	\$16°57.4	124°17.1	\$20°55.5	152°30.5 167°32.5	\$10°16.3	307°04.9	N16°38.7	Fomalhaut	15°10.1	-29°27.7
1 2	15°12.1 30°14.5	156°05.4 171°05.1	58.4 16°59.5	139°17.8 154°18.5	55.9 56.3	167 32.5 182°34.5	16.5 16.7	322°07.4 337°09.9	38.7 38.7	Scheat	13°41.1	28°14.9
3	30 14.5 45°17.0	171 05.1 186°04.8	16 59.5 17°00.5	154 18.5 169°19.1	56.7	182 34.5 197°36.5	16.7	352°12.5	38.7 •• 38.6	Markab	13°25.8	15°22.2
4	60°19.5	201°04.5	01.5	184°19.8	57.1	212°38.5	17.1	7° 15.0	38.6	Sep 19 Wed	SHA	Mer.pass
5	75°21.9	216°04.2	02.6	199°20.5	57.5	227°40.5	17.3	22° 17.5	38.6		143°07.7	14:35
6	90°24.4	231°03.9	S17°03.6		S20°57.9	242° 42.5	S10°17.4	37°20.0	N16°38.6		125°32.6	15:44
7	105°26.8	246°03.6	04.7	229°21.9	58.3	257°44.4	17.6	52°22.6	38.5	Jupiter	152°43.6	13:54
8	120°29.3	261°03.4	05.7	244°22.6	58.7	272°46.4	17.8	$67^{\circ}25.1$	38.5	Saturn	306°52.4	03:39
9	135°31.8	276°03.1	• • 06.7	259°23.2	• • 59.1	287°48.4	• • 18.0	82°27.6	• • 38.5	Sep 20 Thu	SHA	Mer.pass
10	150°34.2	291°02.8	07.7	274°23.9	59.5	302°50.4	18.2	97°30.2	38.5		142°02.0	14:35
11	165°36.7	306°02.5	08.8	289°24.6	20°59.9	317°52.4	18.3	112°32.7	38.4		124°50.1	15:43
12	180°39.2	321°02.2	\$17°09.8	304°25.3	\$21°00.3	332°54.4	\$10°18.5	127°35.2	N16°38.4		152°32.3	13:51
13	195°41.6 210°44.1	336°01.9 351°01.6	10.8	319°26.0	00.7 01.1	347°56.4 2°58.4	18.7 18.9	142°37.7 157°40.3	38.4 38.4	Saturn		03:35
14 15	210°44.1 225°46.6	6°01.3	11.9 • • 12.9	334°26.6 349°27.3	01.1	2°58.4 18°00.3	18.9	157°40.3 172°42.8	38.4 •• 38.4	C 21 F.1	CHA	
16	240°49.0	21°01.0	13.9	4°28.0	01.9	33°02.3	19.1	172 42.6 187°45.3	38.3	Sep 21 Fri	SHA 140°56.0	Mer.pass 14:36
17	255°51.5	36°00.8	15.9	19°28.7	02.2	48°04.3	19.3	202°47.9	38.3		140 56.0 124°07.5	15:42
18	270°54.0	51°00.5	\$17°16.0		S21°02.6	63°06.3	S10°19.6	217°50.4	N16°38.3		152°20.9	13:42
19	285°56.4	66°00.2	17.0	49°30.0	03.0	78°08.3	19.8	232°52.9	38.3	Saturn		03:31
20	300°58.9	80°59.9	18.0	64°30.7	03.4	93°10.3	20.0	247°55.5	38.2			33.31
21	$316^{\circ}01.3$	95°59.6	• • 19.1	79°31.4	• • 03.8	$108^{\circ}12.3$	• • 20.2	262°58.0	• • 38.2	Horizont	al parallax	
22	331°03.8	110°59.3	20.1	94°32.0	04.2	123° 14.2	20.3	278°00.5	38.2		Venus:	0.2
23	346°06.3	125°59.0	21.1	109°32.7	04.6	138°16.2	20.5	293°03.1	38.2		Mars:	0.1
Mer.p	ass. 23:55	ν -0.3′ d1	.0′ m-4.16	ν 0.7′ d0	.4′ m0.95	$\nu 2.0' \ d0.$	2′ m-1.71	$\nu 2.5' \ d-0$.0′ m-0.00			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°32.3	N01°27.0	42°28.0	12.9'	\$13°14.2	-11.0'	55.9'
1 2	196°32.5 211°32.7	26.1 25.1	56°59.9 71°31.9	13.0' 13.0'	13°03.2 12°52.2	-11.0' -11.1'	55.9' 55.9'
3	226°33.0	24.1	86°03.9	13.1'	12°41.1	-11.1'	55.9'
4	241°33.2	23.2	100°36.0	13.2'	12°30.0	-11.2'	55.8'
5	256°33.4 271°33.6	22.2 N01°21.2	115°08.2 129°40.4	13.2' 13.3'	12°18.8 \$12°07.5	-11.2' -11.3'	55.8' 55.8'
6 7	271 33.0 286°33.8	20.3	129 40.4 144°12.7	13.4	11°56.3	-11.3'	55.8'
8	301°34.1	19.3	158°45.1	13.4'	11°44.9	-11.4'	55.7'
9	316°34.3	• • 18.3	173°17.5	13.5'	11°33.6	-11.4'	55.7'
10 11	331°34.5 346°34.7	17.4 16.4	187°50.0 202°22.6	13.5' 13.6'	11°22.1 11°10.7	-11.5' -11.5'	55.7' 55.7'
12	1°35.0	N01°15.4	216°55.2	13.7'	\$10°59.2	-11.5	55.7'
13	16°35.2	14.4	231°27.8	13.7'	10°47.6	-11.6'	55.6'
14 15	31°35.4 46°35.6	13.5 •• 12.5	246°00.5 260°33.3	13.8' 13.8'	10°36.0 10°24.4	-11.6' -11.7'	55.6' 55.6'
16	61°35.9	11.5	200 33.3 275°06.1	13.9'	10°24.4 10°12.8	-11.7' -11.7'	55.6'
17	76°36.1	10.6	289°39.0	13.9'	$10^{\circ}01.1$	-11.7'	55.6'
18	91°36.3	N01°09.6 08.6	304°12.0	14.0'	509°49.3	-11.8'	55.5'
19 20	106°36.5 121°36.7	08.6 07.7	318°45.0 333°18.0	14.0' 14.1'	09°37.6 09°25.8	-11.8' -11.8'	55.5' 55.5'
21	136°37.0	06.7	347°51.1	14.1'	09°13.9	-11.9'	55.5'
22	151°37.2	05.7	2°24.2	14.2'	09°02.1	-11.9'	55.5'
23	166°37.4	04.7	16°57.4	14.2'	08°50.2	-11.9'	55.5'
	SD = 15.9'	d = -1.0'		SI	O = 15.3'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°37.6	N01°03.8	31°30.7	14.3'	S08°38.2	-12.0'	55.4'
1 2	196°37.9 211°38.1	02.8 01.8	46°04.0 60°37.3	14.3' 14.4'	08°26.3 08°14.3	-12.0' -12.0'	55.4' 55.4'
3	211 38.1 226°38.3	01.8 01°00.9	75°10.7	14.4 14.4'	08 14.3 08°02.3	-12.0'	55.4'
4	241°38.5	00°59.9	89°44.2	14.5'	07°50.3	-12.1'	55.4'
5	256°38.8	58.9	104°17.7	14.5'	07°38.2	-12.1'	55.3'
6 7	271°39.0 286°39.2	N00°58.0 57.0	118°51.2 133°24.8	14.6' 14.6'	\$07°26.1 07°14.0	-12.1' -12.1'	55.3' 55.3'
8	301°39.4	56.0	147°58.4	14.7'	07°01.9	-12.2	55.3'
9	316°39.6	• • 55.0	162°32.0	14.7'	06°49.7	-12.2'	55.3'
10 11	331°39.9 346°40.1	54.1 53.1	177°05.7 191°39.5	14.7' 14.8'	06°37.5 06°25.3	-12.2' -12.2'	55.2' 55.2'
12	1°40.3	N00°52.1	206°13.2	14.8'	S06°13.1	-12.2'	55.2'
13	16°40.5	51.2	$220^{\circ}47.1$	14.9'	$06^{\circ}00.9$	-12.3'	55.2'
14	31°40.8 46°41.0	50.2 •• 49.2	235°20.9 249°54.8	14.9'	05°48.6 05°36.4	-12.3' -12.3'	55.2' 55.2'
15 16	46 41.0 61°41.2	48.2	249 54.8 264°28.7	14.9' 15.0'	05 36.4 05°24.1	-12.3'	55.2' 55.1'
17	76°41.4	47.3	279°02.7	15.0'	05°11.8	-12.3'	55.1'
18	91°41.6 106°41.9	N00°46.3	293°36.7	15.0'	\$04°59.5 04°47.2	-12.3'	55.1'
19 20	106°41.9 121°42.1	45.3 44.4	308°10.7 322°44.8	15.1' 15.1'	04°47.2 04°34.8	-12.3' -12.3'	55.1' 55.1'
21	136°42.3	• • 43.4	337°18.9	15.1'	04°22.5	-12.4	55.1'
22	151°42.5	42.4	351°53.0	15.2'	04°10.1	-12.4'	55.0'
23	166°42.8	41.5	6°27.2	15.2'	03°57.7	-12.4'	55.0'
	SD = 15.9'	d = -1.0'		SL	D = 15.1'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°43.0 196°43.2	N00° 40.5 39.5	21°01.4 35°35.6	15.2' 15.2'	\$03°45.4 03°33.0	-12.4' -12.4'	55.0' 55.0'
2	211°43.4	39.5 38.5	50°09.8	15.2 15.3'	03°20.6	-12.4 -12.4'	55.0'
3	226°43.6	• • 37.6	64°44.1	15.3'	03°08.2	-12.4'	55.0'
4 5	241°43.9 256°44.1	36.6 35.6	79°18.4 93°52.7	15.3' 15.3'	02°55.8 02°43.4	-12.4' -12.4'	54.9' 54.9'
6	256°44.1 271°44.3	35.6 N00°34.7	93°52.7 108°27.1	15.4'	02°43.4 \$02°31.0	-12.4'	54.9'
7	286°44.5	33.7	123°01.4	15.4'	02°18.6	-12.4'	54.9'
8	301°44.8	32.7	137°35.8	15.4'	02°06.1	-12.4'	54.9'
9 10	316°45.0 331°45.2	· · 31.7 30.8	152°10.2 166°44.7	15.4' 15.5'	01°53.7 01°41.3	-12.4' -12.4'	54.9' 54.8'
11	346°45.4	29.8	181°19.1	15.5'	01°28.9	-12.4'	54.8'
12	1°45.6	N00°28.8	195°53.6	15.5'	S01°16.5	-12.4'	54.8'
13 14	16°45.9 31°46.1	27.9 26.9	210°28.1 225°02.6	15.5' 15.5'	01°04.0 00°51.6	-12.4' -12.4'	54.8' 54.8'
15	46°46.3	25.9	239°37.1	15.5'	00°31.0	-12.4' -12.4'	54.8'
16	61°46.5	24.9	254°11.7	15.6'	00°26.8	-12.4'	54.8'
17	76°46.8	24.0	268°46.3	15.6'	00°14.4 \$00°02.0	-12.4'	54.7'
18 19	91°47.0 106°47.2	N00°23.0 22.0	283°20.8 297°55.4	15.6' 15.6'	N00°10.4	-12.4' 12.4'	54.7' 54.7'
20	121°47.4	21.0	$312^{\circ}30.0$	15.6'	00°22.8	12.4'	54.7'
21	136°47.6	. 20.1	327°04.7	15.6'	00°35.1	12.4'	54.7'
22 23	151°47.9 166°48.1	19.1 18.1	341°39.3 356°13.9	15.6' 15.6'	00°47.5 00°59.9	12.4' 12.3'	54.7' 54.7'
	SD = 15.9'	d = -1.0'			0 = 15.0'	9	
				J.	10.0		

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

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

		Sun		Moon				
Day	Eqn.of	Time	ime Mer. Mer.Pass.			Age		
Duy	00 ^h	12 ^h	Pass	Upper	Lower	11-13		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-97%		
19	06:09	06:20	11:54	21:50	09:28			
20	06:31	06:41	11:53	22:33	10:12			
21	06:52	07:03	11:53	23:16 10:55				

September 22, 23, 24 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	1°08.7	140°58.7	\$17°22.1	124°33.4	S21°05.0	153°18.2	S10°20.7	308°05.6	N16°38.1			
1	16°11.2	155°58.4	23.2	139°34.1	05.4	168°20.2	20.9	323°08.1	38.1	Alpheratz	357°30.4	29°15.5
2	31°13.7	170°58.1	24.2	154°34.7	05.8	183°22.2	21.1	338° 10.7	38.1	Ankaa	353°03.1	-42°08.4
3	46°16.1	185°57.8	25.2	169°35.4	06.2	198°24.2	21.3	353° 13.2	38.1	Schedar	349°26.0	56°42.1
4	61°18.6	200°57.5	26.2	184°36.1	06.6	213°26.2	21.4	8° 15.7	38.0	Diphda	348°43.2	-17°49.2
5	76°21.1	215°57.3	27.2	199°36.8	07.0	228°28.1	21.6	23° 18.3	38.0	Achernar	335°17.0	-57°04.9
6	91°23.5	230°57.0	S17°28.3	214°37.4	S21°07.3	243°30.1	S10°21.8	38° 20.8	N16°38.0	Hamal	327°46.6	23°36.3
7	106°26.0	245°56.7	29.3	229°38.1	07.7	258°32.1	22.0	53°23.3	38.0	Polaris	311°36.2	89°23.0
8	121°28.5	260°56.4	30.3	244°38.8	08.1	273°34.1	22.2	68° 25.9	37.9	Acamar	315°08.7	-40°10.9
9	136°30.9	275°56.1	• • 31.3	259°39.5	• • 08.5	288°36.1	• • 22.3	83°28.4	• • 37.9	Menkar	314°02.0	4°12.5
10	151°33.4	290°55.8	32.3	274°40.1	08.9	303°38.1	22.5	98°30.9	37.9	Mirfak	308°22.4	49°57.8
11	166°35.8	305°55.5	33.3	289°40.8	09.3	318°40.1	22.7	113°33.5	37.9	Aldebaran	290°35.1	16°34.1
12	181°38.3	320°55.2	S17°34.4	304°41.5	S21°09.7	333°42.0	S10°22.9	128°36.0	N16°37.8	Rigel	281°00.2	-8°10.0
13	196°40.8	335°54.9	35.4	319°42.1	10.1	348°44.0	23.1	143°38.5	37.8	Capella	280°16.2	46°01.4
14	211°43.2	350°54.6	36.4	334°42.8	10.5	3°46.0	23.3	$158^{\circ}41.1$	37.8	Bellatrix	278°18.8	6°22.6
15	226°45.7	5°54.3	• • 37.4	349°43.5	• • 10.9	18°48.0	• • 23.4	173°43.6	· · 37.8	Elnath	277°57.0	28°37.8 -1°11.0
16	241°48.2	20°54.0	38.4	4°44.2	11.2	33°50.0	23.6	188°46.1	37.8	Alnilam Betelgeuse	275°33.9 270°48.0	7°24.7
17	256°50.6	35°53.7	39.4	19°44.8	11.6	48°52.0	23.8	203°48.7	37.7	Canopus	263°50.7	-52°42.4
18	271°53.1	50°53.4	S17°40.4	34°45.5	S21°12.0	63°54.0	S 10°24.0	218°51.2	N16°37.7	Sirius	258°23.0	-32 42.4 -16°45.3
19	286°55.6	65°53.1	41.4	49°46.2	12.4	78°55.9	24.2	233°53.7	37.7	Adhara	255°03.0	-10° 43.3 -29° 00.6
20	301°58.0	80°52.8	42.5	64°46.8	12.8	93°57.9	24.3	248°56.3	37.7	Procyon	244°47.0	5°08.9
21	317°00.5	95°52.5	• • 43.5	79°47.5	• • 13.2	108°59.9	• • 24.5	263°58.8	• • 37.6	Pollux	243°12.9	27°57.1
22	332°02.9	110°52.2	44.5	94°48.2	13.6	124°01.9	24.7	279°01.3	37.6	Avior	234°13.4	-59°36.1
23	347°05.4	125°51.9	45.5	109°48.8	14.0	139°03.9	24.9	294°03.9	37.6	Suhail	222°43.8	-43°33.1
Mern	ass. 23:51	v-0 3' d1	.0′ m-4.17	ν0.7' d0	.4′ m0.96	v2 0' d0	2′ m-1.71	v2 5' d-0	.0′ m-0.01	Miaplacidus	221°37.9	-69°50.2
ivier.p	,uss. 2J.JI	ν-0.5 UI	.0 111-4.17	νυ.ι u0	1110.90	ν Δ.Ο		ν Δ.J U-U	.0 111-0.01	Alphard	221 37.9 217°44.3	-8°47.2
										Regulus	217 44.3 207°30.7	11°49.3
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.3
0	2°07.9	140°51.6	S 17°46.5	124°49.5	S21°14.3	154°05.9	S10°25.1	309°06.4	N16°37.6	Denebola	182°21.5	14°24.4
1	17°10.3	155°51.3	47.5	139°50.2	14.7	169°07.8	25.3	324°09.0	37.5	Gienah	175°40.0	-17°42.4
2	32°12.8	170°51.0	48.5	154°50.8	15.1	184°09.8	25.4	$339^{\circ}11.5$	37.5	Acrux	172°56.3	-63°15.9
3	47°15.3	185°50.7	• • 49.5	169°51.5	• • 15.5	199°11.8	• • 25.6	$354^{\circ}14.0$	• • 37.5	Gacrux	171°47.8	-57° 16.8
4	62°17.7	200°50.4	50.5	184°52.2	15.9	214°13.8	25.8	9°16.6	37.5	Alioth	166°10.4	55°48.0
5	77°20.2	$215^{\circ}50.1$	51.5	199°52.8	16.3	229°15.8	26.0	$24^{\circ}19.1$	37.4	Spica	158°18.6	-11° 18.9
6	92°22.7	230°49.8	S17°52.5	214°53.5	S21°16.6	244°17.8	\$10°26.2	39°21.6	N16°37.4	Alkaid	152°49.6	49° 10.0
7	107°25.1	245°49.5	53.5	229°54.2	17.0	259°19.7	26.3	54°24.2	37.4	Hadar	148°31.0	-60°31.1
8	122°27.6	260°49.2	54.5	244°54.8	17.4	274°21.7	26.5	69°26.7	37.4	Menkent	147°53.4	-36°31.0
9	137°30.1	275°48.9	• • 55.5	259°55.5	• • 17.8	289°23.7	• • 26.7	84°29.3	• • 37.3	Arcturus	145°44.8	19°01.8
10	152°32.5	290°48.6	56.5	274°56.1	18.2	304°25.7	26.9	99°31.8	37.3	Rigil Kent.	139°35.4	-60°57.6
11	167°35.0	305°48.3	57.5	289°56.8	18.6	319°27.7	27.1	114° 34.3	37.3	Kochab	137°21.1	74°02.2
12	182°37.4	320°48.0	S17°58.5	304°57.5	S21°18.9	334°29.7	S10°27.3	129°36.9	N16°37.3	Zuben'ubi	136°52.0	-16°09.8
13	197°39.9	335°47.7	17°59.5	319°58.1	19.3	349°31.6	27.4	144°39.4	37.2	Alphecca	126°00.8	26°37.1
14	212°42.4	350°47.4	18°00.5	334°58.8	19.7	4°33.6	27.6	159°41.9	37.2	Antares	112°11.3	-26°29.8
15	227°44.8	5°47.1	• • 01.5	349°59.5	20.1	19°35.6	• • 27.8	174° 44.5	• • 37.2	Atria	$107^{\circ}02.1$	-69°04.9
16	242°47.3	20°46.8	02.5	5°00.1	20.5	34°37.6	28.0	189°47.0	37.1	Sabik	$101^{\circ}58.5$	$-15^{\circ}45.5$
17	257°49.8	35°46.5	03.5	20°00.8	20.9	49°39.6	28.2	204°49.6	37.1	Shaula	96°05.3	-37°07.4
18	272°52.2	50°46.2	S18°04.5		\$21°21.2	64°41.6	S10°28.3	219°52.1	N16°37.1	Rasalhague	95°55.1	$12^{\circ}32.6$
19	287°54.7	65°45.9	05.5	50°02.1	21.6	79°43.5	28.5	234°54.6	37.1	Eltanin	90°40.4	51°29.5
20	302°57.2	80°45.6	06.5	65°02.8	22.0	94°45.5	28.7	249°57.2	37.0	Kaus Aust.	83°27.5	-34°22.1
21	317°59.6	95°45.3	• • 07.5	80°03.4	• • 22.4	109°47.5	• • 28.9	264°59.7	• • 37.0	Vega	80°30.6	$38^{\circ}49.1$
22	333°02.1	110°45.0	08.5	95°04.1	22.8	124°49.5	29.1	280°02.3	37.0	Nunki	75°43.0	$-26^{\circ}15.4$
23	348°04.5	125°44.7	09.5	110°04.7	23.1	139°51.5	29.3	295°04.8	37.0	Altair	$61^{\circ}56.1$	8°57.2
Mer.p	ass. 23:48	ν -0.3 $'$ d1	.0′ m-4.17	$ u$ 0.7 $^{\prime}$ d0	.4′ m0.96	ν 2.0′ d0.	2′ m-1.71	$\nu 2.5' \ d-0$.0′ m-0.01	Peacock	52°59.6	-56°38.3
										Deneb	49°22.9	45°23.6
	CIIA	CIIA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Enif	33°34.8	10°01.0
Mon	GHA 3°07.0	GHA 140°44.4	Dec \$18°10.5	GHA 125°05 4	Dec \$21°23.5	GHA 154°53.4	Dec \$10°29.4	GHA	Dec N16°36.9	Al Na'ir	27°27.9	-46°48.9
0 1	18°09.5	140°44.4 155°44.1	11.4	125°05.4 140°06.1	23.9	154 53.4 169 55.4	29.6	310°07.3 325°09.9	36.9	Fomalhaut	15°10.1	-29°27.7
2	33°11.9	155 44.1 170°43.8	11.4 12.4	140 06.1 155°06.7	23.9	169 55.4 184°57.4	29.8	325 09.9 340°12.4	36.9 36.9	Scheat	13°41.1	28°14.9
3	33 11.9 48°14.4	170 43.8 185°43.5	12.4	155 06.7 170°07.4	24.7	184 57.4 199°59.4	30.0	340 12.4 355°15.0	36.9	Markab	13°25.8	15°22.2
4	48 14.4 63°16.9	200°43.2	14.4	170 07.4 185°08.0	25.0	215°01.4	30.2	355 15.0 10°17.5	36.8	Sep 22 Sat	SHA	Mer.pass
5	78°19.3	200 43.2 215°42.9	15.4	200°08.7	25.0 25.4	230°03.3	30.4	25°20.1	36.8		139°50.0	14:36
6	93°21.8	230°42.6	\$18°16.4		\$21°25.8	245°05.3	\$10°30.5	40°22.6	N16°36.8		123°24.7	15:41
7	93 21.6 108°24.3	245°42.3	17.4	215 09.3 230°10.0	26.2	245 05.3 260°07.3	30.7	55°25.1	36.8		152°09.5	13:45
8	106 24.3 123°26.7	245 42.3 260°42.0	18.4	245°10.7	26.5	275°09.3	30.7	70°27.7	36.7	Saturn	306°56.9	03:27
9	138°29.2	275°41.6	• 19.3	260°11.3	26.9	275 09.3 290°11.3	31.1	85°30.2	36.7			
10	153°31.7	290°41.3	20.3	275°12.0	27.3	305°13.3	31.3	100°32.8	36.7	Sep 23 Sun	SHA	Mer.pass
11	168°34.1	305°41.0	20.3	275 12.0 290°12.6	27.3 27.7	320° 15.2	31.3	100 32.8 115°35.3	36.7		138°43.8	14:37
12	183°36.6	320°40.7	\$18°22.3	305°13.3	\$21°28.0	335°17.2	S10°31.6	130°37.9	N16°36.6		122°41.6	15:40
13	198°39.0	335°40.4	23.3	320°13.9	28.4	350°19.2	31.8	145°40.4	36.6		151°58.0	13:42
14	213°41.5	350°40.4	24.3	335°14.6	28.8	5°21.2	32.0	160°42.9	36.6	Saturn	306°58.5	03:23
15	213°41.3	5°39.8	• • 25.2	350°15.2	29.2	20°23.2	• • 32.2	175° 45.5	• • 36.6	Sep 24 Mon	SHA	Mer pass
16	243°46.4	20°39.5	26.2	5°15.9	29.5	35°25.1	32.4	175° 43.3 190° 48.0	36.5		3HA 137°37.4	Mer.pass 14:37
17	258°48.9	35°39.2	27.2	20°16.5	29.9	50°27.1	32.5	205°50.6	36.5		137 37.4 121°58.4	15:39
18	273°51.4	50°38.9	\$18°28.2		S21°30.3	65°29.1	S10°32.7	220°53.1	N16°36.5	l .	151°46.4	13:39
19	288°53.8	65°38.6	29.2	50°17.9	30.7	80°31.1	32.9	235°55.7	36.4	Saturn	307°00.3	03:19
20	303°56.3	80°38.3	30.1	65°18.5	31.0	95°33.1	33.1	250°58.2	36.4	Jaturn	301 00.3	03.19
21	318°58.8	95°37.9	31.1	80°19.2	· · 31.4	110°35.0	• • 33.3	266° 00.7	36.4	Horizont	al parallax	
22	334°01.2	110°37.6	32.1	95°19.8	31.8	125°37.0	33.5	281°03.3	36.4		Venus:	0.2
23	349°03.7	125°37.3	33.1	110°20.5	32.2	140°39.0	33.6	296° 05.8	36.3		Mars:	0.1
ivier.p	ass. 23:44	ν-U.3' d1	.0′ m-4.18	νυ.τ αυ	.4′ m0.96	ν2.0° α0.	2′ m-1.71	ν2.5 α-0	.0′ m-0.02			

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°48.3	N00° 17.2	10°48.6	15.7'	$N01^{\circ}12.2$	12.3'	54.6'
1	196°48.5	16.2	25°23.2	15.7'	01°24.5	12.3'	54.6'
2	211°48.7 226°49.0	15.2 •• 14.2	39°57.9 54°32.6	15.7' 15.7'	01°36.9 01°49.2	12.3' 12.3'	54.6' 54.6'
4	241°49.2	13.3	69°07.3	15.7'	02°01.5	12.3'	54.6'
5	256°49.4	12.3	83°41.9	15.7'	$02^{\circ}13.8$	12.3'	54.6'
6	271°49.6	N00°11.3	98°16.6	15.7'	N02°26.0	12.3'	54.6'
7 8	286°49.9 301°50.1	10.4 09.4	112°51.3 127°26.0	15.7' 15.7'	02°38.3 02°50.5	12.2' 12.2'	54.5' 54.5'
9	316°50.3	08.4	142°00.7	15.7'	03°02.7	12.2'	54.5'
10	331°50.5	07.4	$156^{\circ}35.4$	15.7'	03°14.9	12.2'	54.5'
11	346°50.7 1°51.0	06.5 N00°05.5	171°10.1 185°44 9	15.7'	03°27.1 N03°39.3	12.2'	54.5'
12 13	16°51.0	04.5	185°44.9 200°19.6	15.7' 15.7'	03°51.4	12.1' 12.1'	54.5' 54.5'
14	31°51.4	03.5	214°54.3	15.7'	04°03.5	12.1'	54.5'
15	46°51.6	• • 02.6	229°29.0	15.7'	04°15.6	12.1'	54.4'
16	61°51.8 76°52.1	01.6 N00°00.6	244°03.7 258°38.4	15.7' 15.7'	04°27.7 04°39.8	12.1' 12.0'	54.4'
17 18	91°52.3	S00°00.3	258 38.4 273°13.1	15.7'	04 39.8 N04°51.8	12.0'	54.4' 54.4'
19	106°52.5	01.3	287°47.8	15.7'	05°03.8	12.0'	54.4'
20	121°52.7	02.3	302°22.5	15.7'	05°15.8	12.0'	54.4'
21	136°52.9 151°53.2	· · 03.3 04.2	316°57.1 331°31.8	15.7'	05°27.7 05°39.7	11.9'	54.4'
22 23	166°53.4	04.2 05.2	331°31.8 346°06.5	15.7' 15.7'	05° 39.7 05° 51.6	11.9' 11.9'	54.4' 54.4'
	SD = 15.9'	d = -1.0'	0 30.3		03 31.0 0 = 14.9'		
	JD = 15.9′	u = -1.0)L	J — 14.9°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°53.6	S00°06.2	0°41.1	15.6'	N06°03.4	11.8'	54.3'
1 2	196°53.8 211°54.0	07.1 08.1	15°15.8 29°50.4	15.6' 15.6'	06°15.3 06°27.1	11.8' 11.8'	54.3' 54.3'
3	211 54.0 226°54.3	09.1	44°25.0	15.6'	06°27.1	11.8	54.3'
4	241°54.5	10.1	58°59.7	15.6'	06°50.6	11.7'	54.3'
5	256°54.7	11.0	73°34.3	15.6'	07°02.3	11.7'	54.3'
6 7	271°54.9 286°55.1	S00° 12.0 13.0	88°08.9 102°43.4	15.6' 15.6'	N07°14.0 07°25.7	11.7' 11.6'	54.3' 54.3'
8	301°55.4	14.0	102 43.4 117°18.0	15.6'	07°37.3	11.6'	54.3'
9	316°55.6	• • 14.9	131°52.6	15.5'	07°48.9	11.5'	54.2'
10	331°55.8	15.9	146°27.1	15.5'	08°00.4	11.5'	54.2'
11 12	346°56.0 1°56.2	16.9 S 00° 17.8	161°01.6 175°36.1	15.5' 15.5'	08°12.0 N08°23.4	11.5' 11.4'	54.2' 54.2'
13	16°56.5	18.8	190°10.6	15.5'	08°34.9	11.4	54.2'
14	31°56.7	19.8	$204^{\circ}45.1$	15.4'	08°46.3	11.4'	54.2'
15	46°56.9 61°57.1	• • 20.8	219°19.5 233°53.9	15.4'	08°57.6 09°09.0	11.3'	54.2'
16 17	76°57.3	21.7 22.7	233 53.9 248°28.4	15.4' 15.4'	09 09.0 09°20.2	11.3' 11.2'	54.2' 54.2'
18	91°57.6	500°23.7	263°02.7	15.4'	N09°31.5	11.2'	54.2'
19	106°57.8	24.7	277°37.1	15.3'	09°42.7	11.2'	54.2'
20 21	121°58.0 136°58.2	25.6 •• 26.6	292°11.5 306°45.8	15.3' 15.3'	09°53.8 10°04.9	11.1' 11.1'	54.1' 54.1'
22	150 56.2 151°58.4	27.6	300 45.6 321°20.1	15.3'	10° 04.9	11.1	54.1'
23	166°58.7	28.6	335°54.4	15.3'	10°27.0	11.0'	54.1'
	SD = 15.9'	d = 1.0'		SE	O = 14.8'		
Mon	GHA 181°58.9	Dec \$00°29.5	GHA 350°28.6	u 15.2'	Dec N10°38.0	<i>d</i> 10.9'	HP 54.1'
0 1	181°58.9 196°59.1	30.5	5°02.9	15.2' 15.2'	10°49.0	10.9'	54.1'
2	211°59.3	31.5	19°37.1	15.2'	10°59.8	10.8'	54.1'
3	226°59.5	• • 32.4	34°11.2	15.2'	11°10.7	10.8'	54.1'
4 5	241°59.7 257°00.0	33.4 34.4	48°45.4 63°19.5	15.1' 15.1'	11°21.5 11°32.2	10.7' 10.7'	54.1' 54.1'
6	272°00.2	S00°35.4	77°53.6	15.1'	N11°42.9	10.6	54.1'
7	287°00.4	36.3	92°27.7	15.0'	11°53.5	10.6'	54.1'
8	302°00.6	37.3	107°01.7	15.0'	12°04.1	10.5'	54.1'
9 10	317°00.8 332°01.1	· · 38.3 39.3	121°35.7 136°09.7	15.0' 15.0'	12°14.7 12°25.2	10.5' 10.4'	54.1' 54.0'
11	347°01.3	40.2	150°43.7	14.9'	12°35.6	10.4	54.0'
12	2°01.5	S00°41.2	165°17.6	14.9'	N12°46.0	10.3'	54.0'
13	17°01.7 32°01.9	42.2	179°51.5	14.9'	12°56.3	10.3'	54.0'
14 15	32°01.9 47°02.1	43.1 •• 44.1	194°25.3 208°59.2	14.8' 14.8'	13°06.6 13°16.8	10.2' 10.2'	54.0' 54.0'
16	62°02.4	45.1	223°32.9	14.8'	13°27.0	10.1	54.0'
17	77°02.6	46.1	238°06.7	14.7'	13°37.1	10.0'	54.0'
18 19	92°02.8 107°03.0	S00°47.0 48.0	252°40.4 267°14.1	14.7' 14.7'	N13°47.1 13°57.1	10.0' 9.9'	54.0' 54.0'
20	107°03.0 122°03.2	48.0 49.0	267°14.1 281°47.8	14.7 14.6'	13°57.1 14°07.0	9.9'	54.0' 54.0'
21	137°03.5	• • 50.0	296°21.4	14.6'	14°16.9	9.8'	54.0'
22	152°03.7	50.9	310°55.0	14.5'	14°26.7	9.7'	54.0'
23	167°03.9	51.9	325°28.5	14.5'	14°36.4	9.7'	54.0'
	SD = 15.9'	d = 1.0'	SD = 14.8′				

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

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

	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	99-98%
22	07:13	07:24	11:53	23:57	11:36	
23	07:34	07:45	11:52	-:-	12:18	
24	07:55	08:06	11:52	00:39	13:01	

September 25, 26, 27 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	4°06.1	140°37.0	\$18°34.0	125°21.1	S21°32.5	155°41.0	S10°33.8	311°08.4	N16°36.3			
1	19°08.6	155°36.7	35.0	140°21.8	32.9	170°43.0	34.0	326° 10.9	36.3	Alpheratz	357°30.4	29°15.5
2	34°11.1			155°22.4	33.3	170 43.0 185°44.9		341°13.5		Ankaa	353°03.1	-42°08.5
		170°36.4	36.0			200°46.9	34.2	356° 16.0	36.3	Schedar	349°25.9	56°42.2
3	49°13.5	185°36.1	• • 36.9	170°23.1	• • 33.7		• • 34.4		• • 36.2	Diphda	348°43.2	-17°49.2
4	64°16.0	200°35.8	37.9	185°23.7	34.0	215°48.9	34.6	11°18.6	36.2	Achernar	335°17.0	-57°04.9
5	79°18.5	215°35.5	38.9	200°24.4	34.4	230°50.9	34.7	26°21.1	36.2	Hamal	327°46.6	23°36.3
6	94°20.9	230°35.1	\$18°39.9	215°25.0	S21°34.8	245°52.8	S10°34.9	41°23.7	N16°36.2	Polaris	311°34.8	89°23.0
7	109°23.4	245°34.8	40.8	230°25.7	35.1	260°54.8	35.1	56°26.2	36.1	Acamar	315°08.7	-40°10.9
8	124°25.9	260°34.5	41.8	245°26.3	35.5	275°56.8	35.3	71°28.7	36.1	Menkar	314°01.9	4°12.5
9	139°28.3	275°34.2	• • 42.8	260°27.0	• • 35.9	290°58.8	• • 35.5	86°31.3	36.1	Mirfak	308°22.4	49°57.8
10	154°30.8	290°33.9	43.7	275°27.6	36.2	306°00.8	35.7	101°33.8	36.0	Aldebaran	290°35.1	16°34.1
11	169°33.3	305°33.6	44.7	290°28.2	36.6	321°02.7	35.8	116°36.4	36.0	Rigel	281°00.1	-8°10.0
12	184°35.7	320°33.3	\$18°45.7	305°28.9	S21°37.0	336°04.7	S10°36.0	131°38.9	N16°36.0	Capella	280°16.2	46°01.4
13	199°38.2	335°32.9	46.6	320°29.5	37.4	351°06.7	36.2	146°41.5	36.0	Bellatrix	278°18.7	6°22.6
14	214°40.6	350°32.6	47.6	335°30.2	37.7	6°08.7	36.4	161°44.0	35.9	Elnath	277°57.0	28°37.8
15	229°43.1	5°32.3	• • 48.6	350°30.8	• • 38.1	21°10.7	• • 36.6	176° 46.6	• • 35.9	Alnilam	275°33.8	-1°11.0
16	244°45.6	20°32.0	49.5	5°31.5	38.5	36°12.6	36.7	191°49.1	35.9	Betelgeuse	270°48.0	7°24.7
17	259°48.0	35°31.7	50.5	20°32.1	38.8	51°14.6	36.9	206°51.7	35.9	Canopus	263°50.7	-52°42.4
18	274°50.5	50°31.4	\$18°51.4	35°32.8	S21°39.2	66° 16.6	\$10°37.1	221°54.2	N16°35.8	Sirius	258°22.9	-16°45.3
19	289°53.0	65°31.1	52.4	50°33.4	39.6	81°18.6	37.3	236°56.8	35.8	Adhara	255°02.9	-29°00.6
20	304°55.4	80°30.7	53.4	65°34.1	39.9	96°20.5	37.5	251°59.3	35.8	Procyon	244°47.0	5°08.9
21	319°57.9	95°30.4	• • 54.3	80°34.7	• • 40.3	111°22.5	• • 37.7	267°01.9	• • 35.7	Pollux	243°12.9	27°57.1
22	335°00.4	110°30.1	55.3	95°35.3	40.7	126°24.5	37.8	282°04.4	35.7	Avior	234°13.4	-59°36.1
23	350°02.8	125°29.8	56.2	110°36.0	41.0	141°26.5	38.0	297°07.0	35.7	Suhail	222°43.7	-43°33.0
Mer.p	ass. 23:40	ν -0.3′ d1	.0′ m-4.19	ν 0.7′ d0.	4′ m0.97	ν 2.0′ d0.	2′ m-1.71	$\nu 2.5' \ d-0$.0′ m-0.02	Miaplacidus	221°37.9	-69°50.2
							-			Alphard	217°44.3	-8°47.2
			_		_		_		_	Regulus	207°30.7	11°49.2
Wed	GHA FOR 2	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.3	61°35.3
0	5°05.3	140°29.5	\$18°57.2	125°36.6	\$21°41.4	156°28.5	\$10°38.2	312°09.5	N16°35.7	Denebola	182°21.4	14°24.4
1	20°07.8	155°29.2	58.2	140°37.3	41.8	171°30.4	38.4	327°12.1	35.6	Gienah	175°40.0	-17°42.4
2	35°10.2	170°28.8	18°59.1	155°37.9	42.1	186°32.4	38.6	342°14.6	35.6	Acrux	172°56.3	-63°15.9
3	50°12.7	185°28.5	19°00.1	170°38.6	• • 42.5	201°34.4	• • 38.8	357°17.2	• • 35.6	Gacrux	171°47.8	-57°16.8
4	65°15.1	200°28.2	01.0	185°39.2	42.8	216°36.4	38.9	12° 19.7	35.5	Alioth	166°10.4	55°47.9
5	80°17.6	215°27.9	02.0	200°39.8	43.2	231°38.3	39.1	27°22.3	35.5	Spica	158°18.6	-11°18.9
6	95°20.1	230°27.6	S19°02.9	215°40.5	S21°43.6	246°40.3	S10°39.3	42°24.8	N16°35.5	Alkaid	152°49.6	49°10.0
7	110°22.5	245°27.2	03.9	230°41.1	43.9	261°42.3	39.5	57° 27.4	35.5	Hadar	148°31.0	-60°31.0
8	125°25.0	260°26.9	04.8	245°41.8	44.3	276°44.3	39.7	72°29.9	35.4	Menkent	147°53.4	-36°31.0
9	140°27.5	275°26.6	• • 05.8	260°42.4	• • 44.7	291°46.2	• • 39.9	87°32.5	• • 35.4	Arcturus	145°44.8	19°01.8
10	155°29.9	290°26.3	06.7	275°43.0	45.0	306°48.2	40.0	102°35.0	35.4	Rigil Kent.	139°35.4	-60°57.6
11	170°32.4	305°26.0	07.7	290°43.7	45.4	321°50.2	40.2	117°37.6	35.4	Kochab	$137^{\circ}21.1$	74°02.2
12	185°34.9	320°25.6	S19°08.6	305°44.3	S21°45.8	336°52.2	S10°40.4	132°40.1	N16°35.3	Zuben'ubi	136°52.0	-16°09.8
13	200°37.3	335°25.3	09.6	320°45.0	46.1	351°54.2	40.6	147°42.7	35.3	Alphecca	126°00.8	26°37.1
14	215°39.8	350°25.0	10.5	335°45.6	46.5	6°56.1	40.8	162°45.2	35.3	Antares	$112^{\circ}11.3$	-26°29.8
15	230°42.2	5°24.7	• • 11.5	350°46.2	• • 46.8	21°58.1	• • 41.0	177° 47.8	• • 35.2	Atria	$107^{\circ}02.2$	-69°04.9
16	245°44.7	20°24.4	12.4	5°46.9	47.2	37°00.1	41.1	192°50.3	35.2	Sabik	101°58.5	-15°45.5
17	260°47.2	35°24.0	13.4	20°47.5	47.6	52°02.1	41.3	207°52.9	35.2	Shaula	96°05.3	-37°07.4
18	275°49.6	50°23.7	S19°14.3		S21°47.9	67°04.0	\$10°41.5	222°55.4	N16°35.2	Rasalhague	95°55.1	12°32.6
19	290°52.1	65°23.4	15.2	50°48.8	48.3	82°06.0	41.7	237°58.0	35.1	Eltanin	90°40.5	51°29.5
20	305°54.6	80°23.1	16.2	65°49.4	48.6	97°08.0	41.9	253°00.5	35.1	Kaus Aust.	83°27.5	-34°22.1
21	320°57.0	95°22.8	. 17.1	80°50.0	• • 49.0	112°10.0	• • 42.1	268°03.1	• • 35.1	Vega	80°30.6	38°49.1
22	335°59.5	110°22.4	18.1	95°50.7	49.4	127°11.9	42.2	283°05.6	35.0	Nunki	75°43.0	-26°15.4
23	351°02.0	125°22.1	19.0	110°51.3	49.7	142°13.9	42.4	298°08.2	35.0	Altair	$61^{\circ}56.1$	8°57.2
Mer.p	ass. 23:36	ν -0.3' d1	.0′ m-4.20	ν 0.6′ d0.	.4′ m0.97	ν 2.0′ d0.	2′ m-1.71	$\nu 2.5' \ d-0$.0′ m-0.03	Peacock	52°59.6	-56°38.3
										Deneb	49°22.9	45°23.6
T1.	CIIA	CILA	D	CIIA	D	CIIA	D	CIIA	D	Enif	33°34.8	10°01.0
Thu	6°04.4	GHA	Dec \$10°20.0	GHA	Dec \$21°50.1	GHA 157° 15 0	Dec \$10°42.6	GHA 212 ⁰ 10.7	Dec	Al Na'ir	27°27.9	-46°48.9
0	6°04.4	140°21.8 155°21.5	\$19°20.0	125°52.0		157°15.9	\$10°42.6	313° 10.7	N16°35.0	Fomalhaut	15°10.1	-29°27.7
1	21°06.9		20.9	140°52.6	50.4	172°17.9	42.8	328° 13.3	35.0	Scheat	13°41.1	28°14.9
2	36°09.4	170°21.1	21.8	155°53.2	50.8	187°19.8 202°21.8	43.0 •• 43.2	343°15.9	34.9 •• 34.9	Markab	13°25.8	15°22.2
3	51°11.8 66°14.3	185°20.8	• • 22.8	170°53.9 185°54.5	· · 51.1	202°21.8 217°23.8		358° 18.4 13° 21.0		Sep 25 Tue	SHA	Mer pass
4		200°20.5	23.7	185°54.5 200°55.1	51.5		43.3		34.9		36°30.9	Mer.pass 14:38
5	81°16.7	215°20.2	24.6		51.9	232°25.8	43.5	28° 23.5	34.8		130 30.9 121°15.0	15:38
6	96°19.2	230°19.8	S19°25.6		\$21°52.2	247°27.7	\$10°43.7	43°26.1	N16°34.8		121 15.0 151°34.8	
7	111°21.7	245°19.5	26.5	230°56.4	52.6	262°29.7	43.9	58°28.6	34.8	Saturn		13:35 03:15
8 9	126°24.1 141°26.6	260°19.2	27.4	245°57.0 260°57.7	52.9 •• 53.3	277°31.7 292°33.7	44.1 •• 44.3	73°31.2 88°33.7	34.8 •• 34.7	Jatuill	301 02.2	05.15
	141°26.6 156°29.1	275° 18.9 290° 18.5	28.4	275°58.3	53.6	292°33.7 307°35.6		88° 33.7 103° 36.3		Sep 26 Wed	SHA	Mer.pass
10 11	150 29.1 171°31.5	290 18.5 305°18.2	29.3 30.2	275 58.3 290°58.9	53.0 54.0	307 35.6 322°37.6	44.4 44.6	103 36.3 118°38.8	34.7 34.7	Venus	$135^{\circ}24.2$	14:38
12	171 31.5 186°34.0	305 18.2 320°17.9	519°31.2		54.0 \$21°54.3	322 37.6 337°39.6	510°44.8	118 38.8 133°41.4	34.7 N16°34.6		120°31.3	15:37
13	201°36.5	320 17.9 335°17.6	32.1	305 59.5 321°00.2	521 54.3 54.7	352°41.6	45.0	133 41.4 148°44.0	N10 34.0 34.6	Jupiter	151°23.2	13:32
13 14	201 36.5 216°38.9	350°17.0	33.0	321 00.2 336°00.8	54.7 55.1	7°43.5	45.0 45.2	148 44.0 163°46.5	34.6 34.6	Saturn	$307^{\circ}04.2$	03:11
14 15	210 38.9 231°41.4	5° 16.9	34.0	350 00.8 351°01.4	. 55.1	7 43.5 22°45.5	45.2 •• 45.4	103 40.5 178°49.1	34.6 •• 34.6	Coc 27 TI	CIIA	Ma:: ::
15 16	231 41.4 246°43.9	5 16.9 20°16.6	34.0	6°02.1	55.8	22 45.5 37°47.5	45.5	178 49.1 193°51.6	34.5	Sep 27 Thu	SHA	Mer.pass
16 17	240 43.9 261°46.3	20 16.6 35°16.2	34.9 35.8	0 02.1 21°02.7	55.8 56.1	52°49.4	45.5 45.7	193 51.6 208°54.2	34.5 34.5		134°17.4	14:39
18	201 40.3 276°48.8	50° 15.9	519°36.7		50.1 \$21°56.5	52 49.4 67°51.4	45.7 \$10°45.9	208 54.2 223°56.7	34.5 N16°34.5		119°47.5	15:36
19	270 46.6 291°51.2	65° 15.6	37.7	50 05.5 51°04.0	56.8	82°53.4	46.1	223 50.7 238°59.3	34.4		151°11.5 307°06.3	13:29
20	306°53.7	80° 15.3	38.6	66°04.6	57.2	97°55.4	46.3	254°01.9	34.4	Saturn	JU1 U0.3	03:07
21	321°56.2	95° 14.9	• • 39.5	81°05.2	• • 57.5	112°57.3	• • 46.5	269°04.4	34.4	Horizont	al parallax	
22	336°58.6	110° 14.6	40.4	96°05.8	57.9	112 57.3 127°59.3	46.6	284°07.0	34.3		Venus:	0.2
23	352°01.1	125°14.3	41.4	111°06.5	58.2	143°01.3	46.8	299°09.5	34.3		Mars:	0.1
Mer.p	ass. 23:32	ν -0.3′ d0	.9′ m-4.20	ν 0.6′ d0.	.4′ m0.97	ν 2.0′ d0.	2′ m-1.70	ν 2.6′ d-0	.0′ m-0.03			

h	Sui	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°04.1	S00°52.9	340°02.0	14.5'	N14°46.1	9.6'	54.0'
1 2	197°04.3 212°04.5	53.9 54.8	354°35.5 9°08.9	14.4' 14.4'	14°55.8 15°05.3	9.6' 9.5'	54.0' 54.0'
3	227° 04.8	• • 55.8	23°42.3	14.4'	15°14.8	9.4	54.0'
4	242°05.0	56.8	38° 15.7	14.3'	15°24.2	9.4'	54.0'
5 6	257°05.2 272°05.4	57.7 \$00°58.7	52°49.0 67°22.3	14.3' 14.2'	15°33.6 N15°42.9	9.3' 9.2'	54.0' 54.0'
7	287° 05.6	00°59.7	81°55.5	14.2	15°52.1	9.2'	54.0'
8	302°05.8	$01^{\circ}00.7$	96°28.7	14.2'	$16^{\circ}01.3$	9.1'	54.0'
9	317°06.1 332°06.3	• • 01.6	111°01.9 125°35.0	14.1'	16°10.4 16°19.4	9.0'	54.0'
10 11	332 06.3 347°06.5	02.6 03.6	125 35.0 140°08.1	14.1' 14.0'	16 19.4 16°28.4	9.0' 8.9'	54.0' 54.0'
12	2°06.7	S01°04.6	154°41.2	14.0'	N16°37.3	8.8'	53.9'
13	17°06.9	05.5	169°14.2	14.0'	16°46.1	8.7'	53.9'
14 15	32°07.1 47°07.4	06.5 •• 07.5	183°47.1 198°20.0	13.9' 13.9'	16°54.8 17°03.5	8.7' 8.6'	53.9' 53.9'
16	62°07.6	08.5	212°52.9	13.8'	17°12.1	8.5'	53.9'
17	77°07.8	09.4	227°25.7	13.8'	17°20.6	8.5'	53.9'
18 19	92°08.0 107°08.2	S01°10.4 11.4	241°58.5 256°31.3	13.7' 13.7'	N17°29.1	8.4' 8.3'	53.9' 53.9'
20	122°08.4	12.3	271°04.0	13.7'	17°45.8	8.2'	53.9'
21	137°08.6	• • 13.3	285°36.6	13.6'	17°54.0	8.2'	53.9'
22 23	152°08.9 167°09.1	14.3 15.3	300°09.2 314°41.8	13.6' 13.5'	18°02.2 18°10.2	8.1' 8.0'	53.9' 53.9'
25	SD = 15.9'	d = 1.0'			0 = 14.7'	0.0	33.3
	$5D = 15.9^{\circ}$	$a = 1.0^{\circ}$		3L	$0 = 14.7^{\circ}$		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°09.3 197°09.5	S01°16.2 17.2	329°14.3 343°46.8	13.5' 13.4'	N18°18.2 18°26.2	7.9' 7.8'	53.9' 53.9'
2	212°09.7	18.2	358° 19.2	13.4	18°34.0	7.8'	53.9
3	227°09.9	• • 19.2	12°51.6	13.3'	18°41.8	7.7'	53.9'
4 5	242°10.1 257°10.4	20.1 21.1	27°24.0 41°56.3	13.3' 13.3'	18°49.4 18°57.0	7.6' 7.5'	54.0' 54.0'
6	272°10.4	S01°22.1	56° 28.5	13.2	N19°04.5	7.4	54.0'
7	287° 10.8	23.0	71°00.7	13.2'	19°12.0	7.3'	54.0'
8 9	302°11.0 317°11.2	24.0 •• 25.0	85°32.9 100°05.0	13.1' 13.1'	19°19.3 19°26.6	7.3' 7.2'	54.0' 54.0'
10	332°11.4	26.0	114° 37.1	13.1	19°23.8	7.1'	54.0'
11	347° 11.7	26.9	129°09.1	13.0'	19°40.9	7.0'	54.0'
12 13	2°11.9 17°12.1	S01°27.9 28.9	143°41.1 158°13.0	12.9' 12.9'	N19°47.9 19°54.8	6.9' 6.8'	54.0' 54.0'
14	32°12.3	29.9	172°44.9	12.8'	20°01.6	6.8	54.0'
15	47° 12.5	• • 30.8	187° 16.8	12.8'	20°08.4	6.7'	54.0'
16 17	62° 12.7 77° 12.9	31.8 32.8	201°48.6 216°20.3	12.8' 12.7'	20°15.1 20°21.6	6.6' 6.5'	54.0' 54.0'
18	92°13.1	S01°33.8	230°52.0	12.7	N20°28.1	6.4	54.0'
19	107° 13.4	34.7	245° 23.7	12.6'	20°34.5	6.3'	54.0'
20 21	122°13.6 137°13.8	35.7 •• 36.7	259°55.3 274°26.9	12.6' 12.5'	20°40.8 20°47.0	6.2' 6.1'	54.0' 54.0'
22	157 15.6 152° 14.0	37.6	274 20.9 288°58.4	12.5'	20°53.1	6.0'	54.0'
23	167° 14.2	38.6	303°29.9	12.4'	$20^{\circ}59.2$	5.9'	54.0'
	SD = 15.9'	d = 1.0'		SD	0 = 14.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	182°14.4	S01°39.6	318°01.3	12.4'	$N21^{\circ}05.1$	5.8'	54.0'
1 2	197°14.6 212°14.9	40.6 41.5	332°32.7 347°04.0	12.3' 12.3'	21°10.9 21°16.7	5.7' 5.7'	54.0' 54.0'
3	212 14.9 227°15.1	41.5 · · 42.5	1°35.3	12.3'	21 10.7 21°22.3	5.6'	54.0 54.1'
4	242°15.3	43.5	16°06.6	12.2'	21°27.9	5.5'	54.1'
5	257°15.5	44.5 S01°45.4	30°37.8	12.2'	21°33.4	5.4'	54.1
6 7	272° 15.7 287° 15.9	46.4	45°09.0 59°40.1	12.1' 12.1'	N21°38.7 21°44.0	5.3' 5.2'	54.1' 54.1'
8	$302^{\circ}16.1$	47.4	$74^{\circ}11.1$	12.0'	21°49.2	5.1'	54.1'
9	317°16.3	• • 48.3	88° 42.2	12.0'	21°54.2	5.0'	54.1'
10 11	332°16.6 347°16.8	49.3 50.3	103°13.2 117°44.1	11.9' 11.9'	21°59.2 22°04.1	4.9' 4.8'	54.1' 54.1'
12	2°17.0	S01°51.3	132°15.0	11.9'	N22°08.8	4.7'	54.1'
13	17° 17.2	52.2	146°45.8	11.8'	22°13.5	4.6'	54.1'
14 15	32°17.4 47°17.6	53.2 •• 54.2	161° 16.7 175° 47.4	11.8' 11.7'	22°18.1 22°22.6	4.5' 4.4'	54.1' 54.2'
16	62°17.8	55.2	$190^{\circ}18.1$	11.7'	22°26.9	4.3'	54.2'
17	77° 18.0	56.1	204°48.8	11.6'	22°31.2	4.2'	54.2'
18 19	92° 18.2 107° 18.5	S01°57.1 58.1	219° 19.5 233° 50.1	11.6' 11.6'	N22°35.4 22°39.4	4.1' 4.0'	54.2' 54.2'
20	122° 18.7	01°59.0	248°20.6	11.5'	22°43.4	3.8'	54.2'
21	137° 18.9	02°00.0	262°51.1 277°21.6	11.5'	22°47.2	3.7'	54.2'
22 23	152° 19.1 167° 19.3	01.0 02.0	277°21.6 291°52.1	11.4' 11.4'	22°51.0 22°54.6	3.6' 3.5'	54.2' 54.2'
_0	SD = 15.9'	d = 1.0'			0 = 14.7'		

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

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

		Sun		Moon			
Day		f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-84%	
25	08:16	08:27	11:52	01:22	13:44		
26	08:37	08:47	11:51	02:07	14:30		
27	08:58	09:08	11:51	02:53	15:17		

September 28, 29, 30 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	7°03.6	140°13.9	S19°42.3	126°07.1	S21°58.6	158°03.3	S10°47.0	314° 12.1	N16°34.3			
1	22°06.0	155°13.6	43.2	141°07.7	58.9	173°05.2	47.2	329° 14.6	34.3	Alpheratz	357°30.4	29° 15.5
2	37°08.5	170°13.3	44.1	156°08.3	59.3	188°07.2	47.4	344° 17.2	34.2	Ankaa	353°03.1	-42°08.5
3	52°11.0	185°12.9	• • 45.0	171°09.0	21°59.6	203°09.2	• • 47.6	359° 19.8	34.2	Schedar	349°25.9	56°42.2
4	67°13.4	200°12.6	46.0	171 09.0 186°09.6	21° 39.0 22° 00.0	203 09.2 218°11.2	47.7	14°22.3	34.2	Diphda	348°43.2	-17°49.2
5	82°15.9	215°12.3	46.9	201°10.2	00.3	233°13.1	47.7	29° 24.9	34.1	Achernar	$335^{\circ}17.0$	-57°04.9
6	97°18.3	230°12.0	519°47.8	201 10.2 216°10.8	522°00.7	248°15.1	\$10°48.1	44° 27.4	N16°34.1	Hamal	327°46.5	23°36.3
7	112°20.8	245°11.6	48.7	231°11.5	01.0	263°17.1	48.3	59° 30.0	34.1	Polaris	311°33.4	89°23.0
								74°32.6		Acamar	$315^{\circ}08.6$	-40°10.9
8	127°23.3	260°11.3	49.6	246°12.1	01.4	278°19.0 293°21.0	48.5		34.0	Menkar	$314^{\circ}01.9$	4° 12.5
9	142°25.7	275°11.0	• • 50.5	261°12.7	• • 01.7		• • 48.7	89°35.1	• • 34.0	Mirfak	308°22.4	49°57.9
10	157°28.2	290°10.6	51.5	276°13.3	02.1	308°23.0	48.8	104°37.7	34.0	Aldebaran	290°35.1	16°34.1
11	172°30.7	305°10.3	52.4	291°14.0	02.4	323°25.0	49.0	119°40.2	34.0	Rigel	281°00.1	-8°10.0
12	187°33.1	320°10.0	S19°53.3	306°14.6	S22°02.8	338°26.9	S10°49.2	134° 42.8	N16°33.9	Capella	280°16.1	46°01.4
13	202°35.6	335°09.6	54.2	321°15.2	03.1	353°28.9	49.4	149°45.3	33.9	Bellatrix	278°18.7	6°22.6
14	217°38.1	350°09.3	55.1	336°15.8	03.5	8°30.9	49.6	164°47.9	33.9	Elnath	277°57.0	28° 37.8
15	232°40.5	5°09.0	• • 56.0	351°16.4	• • 03.8	23°32.9	• • 49.8	179°50.5	• • 33.8	Alnilam	275°33.8	-1°11.0
16	247°43.0	20°08.6	56.9	6°17.1	04.2	38°34.8	49.9	194°53.0	33.8	Betelgeuse	270°47.9	7°24.7
17	262°45.5	35°08.3	57.8	21°17.7	04.5	53°36.8	50.1	209°55.6	33.8	Canopus	263°50.7	-52°42.5
18	277°47.9	50°08.0	S19°58.7	36°18.3	S22°04.9	68°38.8	\$10°50.3	224°58.2	N16°33.8	Sirius	258°22.9	-16°45.3
19	292°50.4	65°07.6	19°59.7	51°18.9	05.2	83°40.7	50.5	240°00.7	33.7	Adhara	255°02.9	-29°00.6
20	307°52.8	80°07.3	20°00.6	66°19.6	05.5	98°42.7	50.7	255°03.3	33.7	Procyon	244°47.0	5°08.9
21	322°55.3	95°07.0	•• 01.5	81°20.2	• • 05.9	113°44.7	• • 50.9	270°05.8	• • 33.7	Pollux	243°12.8	27°57.0
22	337°57.8	$110^{\circ}06.6$	02.4	96°20.8	06.2	128°46.7	51.0	285°08.4	33.6	Avior	234°13.4	-59°36.1
23	353°00.2	125°06.3	03.3	111°21.4	06.6	143°48.6	51.2	300°11.0	33.6	Suhail	234 13.4 222°43.7	-43°33.0
Mar	pass. 23:28	1/-U 3/ 40	.9′ m-4.21	νη 6' 40	.4′ m0.98	1/2 O/ 40	2′ m-1.70	1/26/ 40	.0′ m-0.04	Miaplacidus	222 43.7 221°37.8	-43 33.0 -69°50.2
ivier.p	Dass. 25:20	ν-0.5 αυ	.9 m-4.∠1	ν 0.0 a 0	.4 1110.96	ν2.0 d0.	2 m-1.70	ν2.0 a-0	.0 m-0.04		221 37.6 217°44.2	-8°47.3
										Alphard		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.2
0	8°02.7	140°06.0	S20°04.2	126°22.0	S22°06.9	158°50.6	\$10°51.4	315° 13.5	N16°33.6	Dubhe	193°37.2	61°35.3
1	23°05.2	155°05.6	05.1	141°22.6	07.3	173°52.6	51.6	330°16.1	33.5	Denebola	182°21.4	14°24.3
2	38°07.6	170°05.3	06.0	156°23.3	07.6	188°54.5	51.8	345°18.6	33.5	Gienah	175°40.0	-17°42.4
3	53°10.1	185°04.9	06.9	171°23.9	• • 08.0	203°56.5	52.0	0°21.2	• • 33.5		172°56.3	-63°15.9
4	68°12.6	200°04.6	07.8	186°24.5	08.3	218°58.5	52.1	15°23.8	33.4	!	171°47.8	-57°16.8
5	83°15.0	215°04.3	08.7	201°25.1	08.6	234°00.4	52.3	30°26.3	33.4	Alioth	166°10.4	55°47.9
6	98°17.5	230°03.9	S20°09.6	216°25.7	\$22°09.0	249°02.4	S10°52.5	45° 28.9	N16°33.4	Spica	158°18.6	-11°18.9
7	113°20.0	245°03.6	10.5	231°26.4	09.3	264°04.4	52.7	60°31.5	33.4	Alkaid	152°49.6	49°10.0
	113 20.0 128°22.4	260°03.3		246°27.0		279°06.4		75° 34.0		Hadar	148°31.0	-60°31.0
8			11.4		09.7		52.9		33.3	Menkent	147°53.4	-36°31.0
9	143°24.9	275°02.9	• • 12.3	261°27.6	• • 10.0	294°08.3	53.1	90°36.6	• • 33.3	Arcturus	145°44.8	19°01.8
10	158°27.3	290°02.6	13.2	276°28.2	10.3	309°10.3	53.2	105°39.1	33.3	Rigil Kent.	139°35.4	-60°57.6
11	173°29.8	305°02.2	14.1	291°28.8	10.7	324°12.3	53.4	120°41.7	33.2	Kochab	137°21.2	74°02.2
12	188°32.3	320°01.9	\$20°15.0	306°29.4	\$22°11.0	339°14.2	S10°53.6	135°44.3	N16°33.2	Zuben'ubi	136°52.0	-16°09.8
13	203°34.7	335°01.6	15.9	321°30.0	11.4	354°16.2	53.8	150°46.8	33.2	Alphecca	126°00.8	26°37.1
14	218°37.2	350°01.2	16.8	336°30.7	11.7	9°18.2	54.0	165°49.4	33.1	Antares	112°11.3	-26° 29.8
15	233°39.7	5°00.9	• • 17.6	351°31.3	• • 12.0	24°20.2	• • 54.2	180°52.0	• • 33.1	Atria	107°02.2	-69°04.9
16	248°42.1	20°00.5	18.5	6°31.9	12.4	39°22.1	54.4	195°54.5	33.1	Sabik	101°58.5	-15°45.5
17	263°44.6	35°00.2	19.4	21°32.5	12.7	54°24.1	54.5	210°57.1	33.0	Shaula	96°05.3	-37°07.4
18	278°47.1	49°59.9	S20°20.3	36°33.1	S22°13.1	69°26.1	S10°54.7	225°59.7	N16°33.0	Rasalhague	95°55.1	12°32.6
19	293°49.5	64°59.5	21.2	51°33.7	13.4	84°28.0	54.9	241°02.2	33.0	Eltanin	90°40.5	51°29.5
20	308°52.0	79°59.2	22.1	66°34.3	13.7	99°30.0	55.1	256°04.8	33.0	Kaus Aust.	83°27.5	-34°22.1
21	323°54.4	94°58.8	• • 23.0	81°35.0	• • 14.1	114°32.0	• • 55.3	271°07.4	• • 32.9	Vega	80°30.6	38°49.1
22	338°56.9	109°58.5	23.9	96°35.6	14.4	129°33.9	55.5	286°09.9	32.9	Nunki	75°43.0	-26°15.4
23	353°59.4	124°58.2	24.7	111°36.2	14.7	144°35.9	55.6	301°12.5	32.9	Altair	61°56.1	-20 15.4 8°57.2
	00.04	0.0/	0/ 4.00		2/ 0.00	0.0/			0/ 0.05	I		
ivler.p	pass. 23:24	ν -0.3′ d0	.9′ m-4.22	ν 0.6′ d 0	.3′ m0.98	ν 2.0° d 0.	2′ m-1.70	ν 2.6′ d -0	.0′ m-0.05	Peacock	52°59.6	-56°38.3
										Deneb	49°22.9 33°34.8	45°23.6 10°01.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.8 27°27.9	-46°48.9
0	9°01.8	139°57.8	\$20°25.6		S22°15.1	159°37.9	S10°55.8	316° 15.1	N16°32.8	Al Na'ir Fomalhaut	27°27.9 15°10.1	-46°48.9 -29°27.7
1	24°04.3	154°57.5	26.5	141°37.4	15.4	174°39.8	56.0	331°17.6	32.8	I	15 10.1 13°41.1	-29 27.7 28°15.0
2	39°06.8	169°57.1	27.4	156°38.0	15.8	189°41.8	56.2	346°20.2	32.8	Scheat		
3	54°09.2	184°56.8	28.3	171°38.6	16.1	204°43.8	56.4	1°22.8	32.7	Markab	13°25.8	15°22.2
4	69°11.7	199°56.4	29.2	186°39.2	16.4	219°45.8	56.6	16°25.3	32.7	Sep 28 Fri	SHA	Mer.pass
5	84°14.2	214°56.1	30.0	201°39.8	16.8	234°47.7	56.7	31°27.9	32.7		133°10.4	14:39
6	99°16.6	229°55.8	S20°30.9		S22°17.1	249°49.7	S10°56.9	46°30.5	N16°32.6		119°03.5	15:35
7	114°19.1	244°55.4	31.8	231°41.1	17.4	264°51.7	57.1	61°33.0	32.6	!	150°59.7	13:26
8	129°21.6	259°55.1	32.7	246°41.7	17.8	279°53.6	57.3	76°35.6	32.6	Saturn	307°08.5	03:03
9	144°24.0	274°54.7	33.6	261°42.3	18.1	294°55.6	• • 57.5	91°38.2	• • 32.5			
10	159°26.5	289°54.4	34.4	276°42.9	18.4	309°57.6	57.5 57.7	106° 40.7	32.5	Sep 29 Sat	SHA	Mer.pass
11	174°28.9	304°54.0	35.3	270 42.9 291°43.5	18.8	324°59.5	57.7 57.8	100°40.7 121°43.3	32.5	Venus	132°03.2	14:40
12	174 28.9 189°31.4	319°53.7	520°36.2		\$22°19.1	340°01.5	\$10°58.0	121 45.5 136°45.9	N16°32.5	Mars	118°19.3	15:34
13	204°33.9	319 53.7 334°53.4	37.1	306 44.1 321°44.7	19.4	340 01.5 355°03.5	58.2	150 45.9 151°48.4	32.4	Jupiter	150°47.9	13:23
	204 33.9 219°36.3	334 53.4 349°53.0	37.1 37.9	321 44.7 336°45.3	19.4 19.8	355 03.5 10°05.4		151 48.4 166°51.0	32.4 32.4	Saturn	$307^{\circ}10.8$	02:59
14 15							58.4			6 20 5	C	
15 16	234°38.8	4°52.7	38.8	351°45.9	• • 20.1	25°07.4	. 58.6	181°53.6	• • 32.4	Sep 30 Sun	SHA	Mer.pass
16	249°41.3	19°52.3	39.7	6°46.5	20.4	40°09.4	58.8	196°56.1	32.3		130°56.0	14:40
17	264°43.7	34°52.0	40.6	21°47.1	20.7	55°11.3	58.9	211°58.7	32.3		117°34.9	15:33
18	279°46.2	49°51.6	\$20°41.4	36°47.7	\$22°21.1	70°13.3	\$10°59.1	227°01.3	N16°32.3		150°36.0	13:20
19	294°48.7	64°51.3	42.3	51°48.3	21.4	85°15.3	59.3	242°03.8	32.2	Saturn	307°13.2	02:54
20	309°51.1	79°50.9	43.2	66°48.9	21.7	100°17.2	59.5	257°06.4	32.2	U! ·	ol novol!	
21	324°53.6	94°50.6	• • 44.0	81°49.5	• • 22.1	115°19.2	• • 59.7	272°09.0	• • 32.2	norizont	al parallax	0.0
22	339°56.1	109°50.2	44.9	96°50.1	22.4	130°21.2	10°59.9	287°11.5	32.1		Venus:	0.2
23	354°58.5	124°49.9	45.8	111°50.7	22.7	145°23.1	11°00.1	302°14.1	32.1		Mars:	0.1
Mern	pass. 23:20	ν -0.3' d0	.9′ m-4.23	$\nu^{0.6'}$ d0	.3′ m0.98	$\nu 2.0' d0$	2′ m-1.70	ν2 6' d-0	.0′ m-0.05			
		- 3.3 40	29									

h	Sui	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°19.5	S02°02.9	306°22.4	11.4'	N22°58.1	3.4'	54.3'
1	197°19.7	03.9	320°52.8	11.3'	23°01.6	3.3'	54.3'
2	212°19.9	04.9	$335^{\circ}23.1$	11.3'	23°04.9	3.2'	54.3'
3	227°20.1	• • 05.9	349°53.4	11.2'	23°08.1	3.1'	54.3'
4	242°20.4	06.8	4°23.6	11.2'	23°11.2	3.0'	54.3'
5	257°20.6	07.8	18°53.8	11.2'	23°14.2	2.9'	54.3'
6	272°20.8	S02°08.8	33°24.0	11.1'	N23°17.1	2.8'	54.3'
7	287°21.0	09.7	47°54.1	11.1'	23° 19.9 23° 22.5	2.7'	54.3'
8 9	302°21.2 317°21.4	10.7 •• 11.7	62°24.2 76°54.3	11.1' 11.0'	23°25.1	2.6' 2.4'	54.4' 54.4'
10	332°21.6	12.7	70 54.3 91°24.3	11.0'	23°27.5	2.4	54.4'
11	347°21.8	13.6	105°54.3	11.0'	23°29.9	2.2'	54.4'
12	2°22.0	S02°14.6	120°24.2	10.9'	N23°32.1	2.1'	54.4'
13	17°22.2	15.6	134°54.2	10.9'	23°34.2	2.0'	54.4'
14	32°22.4	16.5	149°24.0	10.9'	23°36.2	1.9'	54.4'
15	47°22.7	• • 17.5	163°53.9	10.8'	23°38.1	1.8'	54.5'
16	62°22.9	18.5	178°23.7	10.8'	23°39.9	1.7'	54.5'
17	77°23.1	19.5	192°53.5	10.8'	23°41.5	1.5'	54.5
18	92°23.3 107°23.5	\$02°20.4 21.4	207°23.3 221°53.0	10.7' 10.7'	N23°43.1 23°44.5	1.4'	54.5'
19 20	107 23.5 122°23.7	21.4	221 53.0 236°22.7	10.7	23 44.5 23°45.8	1.3' 1.2'	54.5' 54.5'
21	137°23.9	. 23.3	250°52.3	10.6'	23° 47.0	1.1'	54.6'
22	152°24.1	24.3	265°22.0	10.6'	23°48.1	1.0'	54.6'
23	167°24.3	25.3	279°51.6	10.6'	23°49.1	0.9'	54.6'
	SD = 16.0'	d = 1.0'			0 = 14.8'		
		<u>u — 1.0</u>	-	JL	. — 17.0		
Sat	GHA	Dec	GHA	ν 10.6'	Dec N23° 50.0	d 0.7'	HP
0 1	182°24.5 197°24.7	\$02°26.3 27.2	294°21.2 308°50.7	10.6' 10.5'	N23°50.0 23°50.7	0.7' 0.6'	54.6' 54.6'
2	212°24.9	28.2	323°20.3	10.5	23°51.3	0.5	54.7
3	227°25.2	• • 29.2	337°49.8	10.5	23°51.8	0.4	54.7'
4	242°25.4	30.1	352°19.2	10.5'	23°52.2	0.3'	54.7'
5	257°25.6	31.1	6°48.7	10.4'	23°52.5	0.2'	54.7'
6	272°25.8	S02°32.1	21°18.1	10.4'	N23°52.7	0.0'	54.7'
7	287°26.0	33.1	35°47.5	10.4'	23°52.7	-0.1'	54.8'
8	302°26.2	34.0	50°16.9	10.4	23°52.6	-0.2'	54.8'
9	317°26.4	• • 35.0	64°46.2	10.3'	23°52.4	-0.3'	54.8'
10 11	332°26.6 347°26.8	36.0 36.9	79°15.6 93°44.9	10.3' 10.3'	23°52.1 23°51.7	-0.4' -0.6'	54.8' 54.8'
12	2°27.0	502°37.9	108°14.2	10.3	N23°51.1	-0.7	54.9'
13	17°27.2	38.9	122°43.5	10.3'	23°50.5	-0.8'	54.9'
14	32°27.4	39.9	$137^{\circ}12.7$	10.2'	23°49.7	-0.9'	54.9'
15	47°27.6	• • 40.8	151°42.0	10.2'	23°48.8	-1.0'	54.9'
16	62°27.8	41.8	166°11.2	10.2'	23°47.7	-1.1'	55.0'
17	77°28.1	42.8	180°40.4	10.2'	23°46.6	-1.3'	55.0'
18 19	92°28.3 107°28.5	\$02°43.7 44.7	195°09.6 209°38.7	10.2' 10.2'	N23°45.3 23°43.9	-1.4' -1.5'	55.0' 55.0'
20	107 28.3 122°28.7	45.7	209 38.7 224°07.9	10.2	23°42.4	-1.6'	55.0'
21	137°28.9	• • 46.7	238°37.0	10.1	23°40.8	-1.7'	55.1
22	152°29.1	47.6	253°06.2	10.1	23°39.0	-1.9'	55.1'
23	167°29.3	48.6	267°35.3	10.1'	23°37.2	-2.0'	55.1'
	SD = 16.0'	d = 1.0'		SE	0 = 14.9'		
_							
Sun	GHA 182°29.5	Dec S 02°49.6	GHA 282°04.4	u 10.1'	Dec N23° 35.2	d -2.1'	HP 55.1'
0 1	182°29.5 197°29.7	502-49.6	282°04.4 296°33.5	10.1'	N23° 35.2 23° 33.1	-2.1' -2.2'	55.1° 55.2'
2	212°29.9	51.5	290 33.5 311°02.5	10.1	23°30.8	-2.2 -2.4'	55.2'
3	227°30.1	• • 52.5	325°31.6	10.1	23°28.5	-2.5'	55.2'
4	242°30.3	53.5	$340^{\circ}00.7$	10.0'	23°26.0	-2.6'	55.2'
5	257°30.5	54.4	354°29.7	10.0'	23°23.4	-2.7'	55.3'
6	272°30.7	S02°55.4	8°58.8	10.0'	N23°20.7	-2.8'	55.3'
7	287°30.9	56.4	23°27.8	10.0'	23°17.9	-3.0'	55.3'
8	302°31.1 317°31.3	57.3 •• 58.3	37°56.8 52°25.8	10.0' 10.0'	23°14.9 23°11.8	-3.1' -3.2'	55.4' 55.4'
9 10	317°31.3 332°31.5	02°59.3	52°25.8 66°54.8	10.0'	23°11.8 23°08.6	-3.2' -3.3'	55.4' 55.4'
11	347°31.7	02 39.3 03°00.2	81°23.8	10.0'	23°05.3	-3.4'	55.4'
12	2°31.9	S03°01.2	95°52.8	10.0'	N23°01.9	-3.6'	55.5'
13	17°32.1	02.2	$110^{\circ}21.8$	10.0'	22°58.3	-3.7'	55.5'
14	32°32.3	03.2	124°50.8	10.0'	22°54.6	-3.8'	55.5'
15	47°32.6	•• 04.1	139°19.8	10.0'	22°50.8	-3.9'	55.5'
16	62°32.8	05.1	153°48.8	10.0'	22°46.9	-4.0'	55.6'
17	77°33.0 92°33.2	06.1 \$03°07.0	168°17.8 182°46.7	10.0' 10.0'	22°42.8 N22°38.7	-4.2' -4.3'	55.6'
18 19	92°33.2 107°33.4	08.0	182°46.7 197°15.7	10.0'	N22°38.7 22°34.4	-4.3' -4.4'	55.6' 55.7'
20	107 33.4 122°33.6	09.0	211°44.7	10.0'	22°30.0	-4.5'	55.7'
21	137°33.8	• • 09.9	226°13.7	10.0'	22°25.5	-4.6'	55.7'
22	152°34.0	10.9	240°42.7	10.0'	22°20.8	-4.8'	55.8'
23	167°34.2	11.9	$255^{\circ}11.6$	10.0'	$22^{\circ}16.1$	-4.9'	55.8'
	SD = 16.0'	d = 1.0'	-	SD	0 = 15.0'		
		-					

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

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

		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	77-59%	
28	09:18	09:28	11:51	03:42	16:07		
29	09:38	09:48	11:50	04:32	16:57		
30	09:58	10:08	11:50	05:23	17:48		

October 01, 02, 03 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	10°01.0	139°49.5	\$20°46.6	126°51.4	S22°23.1	160°25.1	S11°00.2	317° 16.7	N16°32.1			
1	25°03.4	154°49.2	47.5	141°52.0	23.4	175°27.1	00.4	332° 19.3	32.0	Alpheratz	357°30.4	29°15.5
2	40°05.9	169°48.8	48.4	156°52.6	23.7	190°29.0	00.6	347°21.8	32.0	Ankaa	353°03.1	-42°08.5
3	55°08.4	184°48.5	• • 49.2	171°53.2	24.0	205°31.0	00.8	2°24.4	• • 32.0	Schedar	349°25.9	56°42.2
4	$70^{\circ}10.8$	199°48.1	50.1	186°53.8	24.4	220°33.0	01.0	17°27.0	31.9	Diphda	348°43.2	-17°49.2
5	85°13.3	214°47.8	50.9	201°54.4	24.7	235°34.9	01.2	$32^{\circ}29.5$	31.9	Achernar Hamal	335°17.0 327°46.5	-57°04.9 23°36.3
6	$100^{\circ}15.8$	229°47.5	S20°51.8	216°55.0	\$22°25.0	250°36.9	S11°01.3	47°32.1	N16°31.9	Polaris	311°32.1	89° 23.0
7	115°18.2	244°47.1	52.7	231°55.6	25.3	265°38.9	01.5	62°34.7	31.8	Acamar	315°08.6	-40° 10.9
8	130°20.7	259°46.8	53.5	246°56.2	25.7	280°40.8	01.7	77° 37.2	31.8	Menkar	314°01.9	4°12.5
9	145°23.2	274°46.4	• • 54.4	261°56.8	• • 26.0	295°42.8	•• 01.9	92°39.8	• • 31.8	Mirfak	308°22.3	49°57.9
10 11	160°25.6 175°28.1	289°46.1 304°45.7	55.2 56.1	276°57.4 291°58.0	26.3 26.7	310°44.8 325°46.7	02.1 02.3	107° 42.4 122° 45.0	31.8	Aldebaran	290°35.1	16°34.1
12	175 28.1 190°30.6	319°45.4	50.1 \$20°57.0	306°58.6	\$22°27.0	340°48.7	511°02.4	122 45.0 137°47.5	31.7 N16°31.7	Rigel	$281^{\circ}00.1$	-8°10.0
13	205°33.0	334°45.0	57.8	321°59.2	27.3	355°50.7	02.6	152°50.1	31.7	Capella	280°16.1	46°01.4
14	220°35.5	349°44.7	58.7	336°59.8	27.6	10°52.6	02.8	167°52.7	31.6	Bellatrix	278°18.7	6°22.6
15	235°37.9	4°44.3	20°59.5	352°00.4	• • 27.9	25°54.6	• • 03.0	182°55.3	• • 31.6	Elnath	277°56.9	28°37.8
16	250°40.4	19°43.9	21°00.4	7°01.0	28.3	40°56.6	03.2	197°57.8	31.6	Alnilam	275°33.8 270°47.9	-1°11.0 7°24.7
17	265°42.9	34°43.6	01.2	22°01.6	28.6	55°58.5	03.4	213°00.4	31.5	Betelgeuse Canopus	263°50.7	-52°42.5
18	280°45.3	49°43.2	521°02.1		\$22°28.9	71°00.5	S 11°03.6	228°03.0	N16°31.5	Sirius	258°22.9	-32 42.3 -16°45.3
19	295°47.8	64°42.9	02.9	52°02.8	29.2	86°02.5	03.7	243°05.5	31.5	Adhara	255°02.9	-29°00.6
20	310°50.3	79°42.5	03.8	67°03.3	29.6	101°04.4	03.9	258°08.1	31.4	Procyon	244°46.9	5°08.9
21	325°52.7	94°42.2	• • 04.6	82°03.9	• • 29.9	116°06.4	• • 04.1	273°10.7	• • 31.4	Pollux	243°12.8	27°57.0
22 23	340°55.2 355°57.7	109°41.8 124°41.5	05.5 06.3	97°04.5 112°05.1	30.2 30.5	131°08.4 146°10.3	04.3	288° 13.3 303° 15.8	31.4	Avior	$234^{\circ}13.3$	-59°36.1
23	355 51.1	124 41.5	00.5	112 05.1	30.5		04.5	303 13.6	31.3	Suhail	222°43.7	-43°33.0
Mer.p	ass. 23:16	ν -0.3' d0.	.9′ m-4.24	ν 0.6′ d0.	.3′ m0.99	$\nu 2.0' d0.$	2′ m-1.70	ν 2.6′ d-0	.0′ m-0.06	Miaplacidus	221°37.8	-69°50.2
										Alphard	217°44.2	-8°47.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.7 193°37.2	11°49.2 61°35.2
0	$11^{\circ}00.1$	$139^{\circ}41.1$	521°07.2	$127^{\circ}05.7$	522°30.9	$161^{\circ}12.3$	S 11°04.7	318° 18.4	$N16^{\circ}31.3$	Denebola	182°21.4	14°24.3
1	26°02.6	154°40.8	08.0	142°06.3	31.2	176°14.3	04.8	333°21.0	31.3	Gienah	175°40.0	-17°42.4
2	41°05.0	169°40.4	08.9	157°06.9	31.5	191°16.2	05.0	348°23.6	31.2	Acrux	$172^{\circ}56.3$	-63°15.9
3 4	56°07.5 71°10.0	184°40.1 199°39.7	· · 09.7 10.5	172°07.5 187°08.1	· · 31.8 32.1	206°18.2 221°20.2	· · 05.2 05.4	3°26.1 18°28.7	· · 31.2 31.2	Gacrux	171°47.8	-57°16.8
5	86°12.4	214°39.4	11.4	202°08.7	32.5	236°22.1	05.4	33°31.3	31.1	Alioth	166°10.4	55° 47.9
6	101°14.9	229°39.0	S21°12.2	217°09.3	S22°32.8	251°24.1	S11°05.8	48° 33.9	N16°31.1	Spica	158°18.6	-11°18.9
7	116°17.4	244°38.6	13.1	232°09.9	33.1	266°26.1	05.9	63°36.4	31.1	Alkaid Hadar	152°49.6 148°31.0	49°10.0 -60°31.0
8	131°19.8	259°38.3	13.9	247°10.5	33.4	281°28.0	06.1	78°39.0	31.0	Menkent	146 51.0 147°53.4	-36° 30.9
9	$146^{\circ}22.3$	274°37.9	•• 14.7	$262^{\circ}11.1$	• • 33.7	296°30.0	• • 06.3	93°41.6	• • 31.0	Arcturus	145°44.8	19°01.8
10	161°24.8	289°37.6	15.6	277°11.7	34.0	311°32.0	06.5	108° 44.2	31.0	Rigil Kent.	139°35.4	-60°57.5
11	176°27.2 191°29.7	304°37.2	16.4	292°12.3 307°12.9	34.4 \$22°34.7	326°33.9	06.7	123° 46.7 138° 49.3	30.9 N16°30.9	Kochab	$137^{\circ}21.2$	74°02.1
12 13	206°32.2	319°36.9 334°36.5	\$21°17.3 18.1	307 12.9 322°13.4	35.0	341°35.9 356°37.8	\$11°06.9 07.1	150 49.5 153°51.9	30.9	Zuben'ubi	136°52.1	-16°09.8
14	200 32.2 221°34.6	349°36.2	18.9	337°14.0	35.3	11°39.8	07.1	168°54.5	30.8	Alphecca	126°00.8	26°37.1
15	236°37.1	4°35.8	• • 19.8	352°14.6	35.6	26°41.8	07.4	183°57.0	30.8	Antares	112°11.3	-26°29.8
16	251°39.5	19°35.4	20.6	7°15.2	35.9	41°43.7	07.6	198°59.6	30.8	Atria Sabik	107°02.2 101°58.5	-69°04.9 -15°45.5
17	266°42.0	34°35.1	21.4	22°15.8	36.3	56°45.7	07.8	214°02.2	30.7	Shaula	96°05.3	-37°07.4
18	281°44.5	49°34.7	S21°22.3		S22°36.6	71°47.7	S11°08.0	229°04.8	N16°30.7	Rasalhague	95°55.1	12°32.6
19	296°46.9	64°34.4	23.1	52°17.0	36.9	86°49.6	08.2	244°07.3	30.7	Eltanin	90°40.5	51°29.5
20 21	311°49.4 326°51.9	79°34.0 94°33.7	23.9 • • 24.7	67°17.6 82°18.2	37.2 •• 37.5	101°51.6 116°53.6	08.3 •• 08.5	259° 09.9 274° 12.5	30.6 · · 30.6	Kaus Aust.	83°27.5	-34°22.1
22	341°54.3	109°33.3	25.6	97°18.8	37.8	131°55.5	08.7	289° 15.1	30.6	Vega	80°30.6	38°49.1
23	356°56.8	124°32.9	26.4	112°19.3	38.1	146°57.5	08.9	304° 17.7	30.5	Nunki	75°43.0	-26°15.4
			.8′ m-4.25		3′ m0.99					Altair Peacock	61°56.2 52°59.6	8°57.2 -56°38.3
ivier.p	ass. 23:12	ν -0.4° a 0.	.8 m-4.25	ν 0.6 a0.	.3 mu.99	ν 2.0 a0.	2′ m-1.70	ν2.0 a-0	.0′ m-0.06	Deneb	49°22.9	45° 23.6
										Enif	33°34.8	10°01.0
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°27.9	-46°48.9
0	11°59.3	139°32.6	S21°27.2	127°19.9	S22°38.5	161°59.5	S11°09.1	319°20.2	N16°30.5	Fomalhaut	$15^{\circ}10.1$	-29°27.7
1	27°01.7	154°32.2	28.0	142°20.5	38.8 30.1	177°01.4	09.3	334°22.8	30.5 30.4	Scheat	13°41.1	28° 15.0
2	42°04.2 57°06.7	169°31.9 184°31.5	28.9 •• 29.7	157°21.1 172°21.7	39.1 •• 39.4	192°03.4 207°05.3	09.4 •• 09.6	349°25.4 4°28.0	30.4 · · 30.4	Markab	13°25.8	15°22.2
4	72°09.1	199°31.1	30.5	187°22.3	39.4	207 03.3 222°07.3	09.8	19°30.5	30.4	Oct 01 Mon	SHA	Mer.pass
5	87°11.6	214°30.8	31.3	202°22.9	40.0	237°09.3	10.0	34°33.1	30.3	Venus	129°48.6	14:41
6	102°14.0	229°30.4	S21°32.2		S22°40.3	252°11.2	S11°10.2	49°35.7	N16°30.3		$116^{\circ}50.4$	15:32
7	$117^{\circ}16.5$	244°30.1	33.0	232°24.0	40.6	267°13.2	10.4	64°38.3	30.3		150°24.1	13:17
8	132°19.0	259°29.7	33.8	247°24.6	40.9	282°15.2	10.6	79°40.9	30.2	Saturn	307°15.7	02:50
9	147°21.4	274°29.3	• • 34.6	262°25.2	• • 41.3	297°17.1	• • 10.7	94°43.4	• • 30.2	Oct 02 Tue	SHA	Mer.pass
10 11	162°23.9 177°26.4	289°29.0 304°28.6	35.4 36.3	277°25.8 292°26.4	41.6 41.9	312°19.1 327°21.0	10.9 11.1	109° 46.0 124° 48.6	30.2 30.1	Venus	$128^{\circ}41.0$	14:42
12	192°28.8	319°28.3	521°37.1	307°27.0	\$22°42.2	342°23.0	\$11°11.3	139°51.2	N16°30.1		116°05.6	15:31
13	207°31.3	334°27.9	37.9	322°27.5	42.5	357°25.0	11.5	154°53.8	30.1		150°12.2	13:13
14	222°33.8	349°27.5	38.7	337°28.1	42.8	12°26.9	11.7	169°56.3	30.0	Saturn	307°18.3	02:46
15	237°36.2	4°27.2	• • 39.5	352°28.7	• • 43.1	27°28.9	• • 11.8	184°58.9	• • 30.0	Oct 03 Wed	SHA	Mer.pass
16	252°38.7	19°26.8	40.3	7°29.3	43.4	42°30.9	12.0	200°01.5	30.0		127°33.3	14:42
17	267°41.1	34°26.5	41.1	22°29.9	43.7	57°32.8	12.2	215°04.1	29.9		115°20.7	15:30
18 19	282°43.6 297°46.1	49°26.1 64°25.7	\$21°42.0 42.8	37°30.5 52°31.0	\$22°44.0 44.3	72°34.8 87°36.7	\$11°12.4 12.6	230°06.7 245°09.2	N16°29.9 29.8		150°00.2	13:10
20	312°48.5	79°25.4	42.6	67°31.6	44.5 44.6	102°38.7	12.8	245 09.2 260°11.8	29.8	Saturn	307°21.0	02:42
21	327°51.0	94°25.0	• • 44.4	82°32.2	• • 45.0	102 30.7 117°40.7	. 12.9	275° 14.4	29.8	Horizont	al parallax	
22	342°53.5	$109^{\circ}24.6$	45.2	97°32.8	45.3	$132^{\circ}42.6$	13.1	$290^{\circ}17.0$	29.7		Venus:	0.2
23	357°55.9	124°24.3	46.0	112°33.4	45.6	147°44.6	13.3	305° 19.6	29.7		Mars:	0.1
Mer.p	ass. 23:08	ν -0.4' d0.	.8′ m-4.25	$\nu 0.6' \ d0.$	3′ m0.99	$\nu 2.0' d0.$	2′ m-1.70	$\nu 2.6' \ d-0$.0′ m-0.07			

h	Sui	า			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°34.4	S03°12.8	269°40.6	10.0'	N22°11.2	-5.0'	55.8'
1 2	197°34.6 212°34.8	13.8 14.8	284°09.6 298°38.6	10.0' 10.0'	22°06.2 22°01.0	-5.1' -5.2'	55.9' 55.9'
3	227°35.0	. 15.8	313°07.6	10.0'	21°55.8	-5.4'	55.9'
4	242°35.2	16.7	$327^{\circ}36.5$	10.0'	$21^{\circ}50.4$	-5.5'	55.9'
5	257°35.4	17.7	342°05.5	10.0'	21°44.9	-5.6'	56.0'
6 7	272°35.6 287°35.8	S03°18.7 19.6	356°34.5 11°03.5	10.0' 10.0'	N21°39.3 21°33.6	-5.7' -5.8'	56.0' 56.0'
8	302°36.0	20.6	25°32.5	10.0'	21°27.8	-6.0'	56.1
9	317°36.2	• • 21.6	40°01.6	10.0'	21°21.8	-6.1'	56.1'
10 11	332°36.4 347°36.6	22.5 23.5	54°30.6 68°59.6	10.0' 10.0'	21°15.8 21°09.6	-6.2' -6.3'	56.1' 56.2'
12	2°36.8	23.5 S03°24.5	83°28.6	10.0'	N21°03.3	-0.3 -6.4'	56.2
13	17°37.0	25.4	97°57.7	10.0'	20°56.8	-6.5	56.2'
14	32°37.2	26.4	112°26.7	10.0'	20°50.3	-6.7'	56.3'
15 16	47°37.4 62°37.6	· · 27.4 28.4	126°55.7 141°24.8	10.1' 10.1'	20°43.6 20°36.9	-6.8' -6.9'	56.3' 56.3'
17	77°37.8	29.3	155°53.9	10.1'	20°30.0	-7.0'	56.4
18	92°38.0	S03°30.3	170°22.9	10.1'	N20°23.0	-7.1'	56.4'
19 20	107°38.2 122°38.4	31.3 32.2	184°52.0 199°21.1	10.1' 10.1'	20°15.9 20°08.6	-7.2' -7.3'	56.5' 56.5'
21	137°38.6	33.2	213°50.2	10.1	20°01.3	-7.5'	56.5
22	152°38.8	34.2	228°19.3	10.1'	$19^{\circ}53.8$	-7.6'	56.6'
23	167°39.0	35.1	242°48.4	10.1'	19°46.3	-7.7'	56.6'
	SD = 16.0'	d = 1.0'		SI	O = 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°39.2	S03°36.1	257°17.6	10.1'	N19°38.6	-7.8'	56.6'
1	197°39.4	37.1	271°46.7	10.1'	19°30.8	-7.9'	56.7'
2 3	212°39.6 227°39.8	38.0 •• 39.0	286°15.8 300°45.0	10.2' 10.2'	19°22.9 19°14.8	-8.0' -8.1'	56.7' 56.7'
4	242°40.0	40.0	315°14.2	10.2'	19°06.7	-8.2	56.8'
5	257°40.2	40.9	329°43.3	10.2'	18°58.5	-8.4'	56.8'
6 7	272°40.4 287°40.6	S03°41.9 42.9	344°12.5 358°41.7	10.2' 10.2'	N18°50.1 18°41.7	-8.5' -8.6'	56.9' 56.9'
8	302°40.8	43.8	13°10.9	10.2'	18°33.1	-8.7'	56.9
9	317°41.0	• • 44.8	$27^{\circ}40.1$	10.2'	$18^{\circ}24.4$	-8.8'	57.0'
10 11	332°41.2 347°41.4	45.8 46.7	42°09.4 56°38.6	10.2' 10.2'	18° 15.6 18° 06.7	-8.9' -9.0'	57.0' 57.0'
12	2°41.6	\$03°47.7	71°07.8	10.2	N17°57.7	-9.1	57.1
13	17°41.8	48.7	85°37.1	10.3'	17°48.6	-9.2'	57.1'
14 15	32°42.0 47°42.1	49.6 •• 50.6	100°06.4 114°35.7	10.3' 10.3'	17°39.4 17°30.1	-9.3' -9.4'	57.2' 57.2'
16	62°42.3	51.6	114 35.7 129°04.9	10.3'	17° 20.6	-9.4 -9.5'	57.2'
17	77°42.5	52.5	$143^{\circ}34.2$	10.3'	$17^{\circ}11.1$	-9.6'	57.3'
18	92°42.7 107°42.9	S03°53.5	158°03.6 172°32.9	10.3' 10.3'	N17°01.5 16°51.7	-9.7'	57.3'
19 20	107 42.9 122°43.1	54.5 55.4	172 32.9 187°02.2		16° 41.9	-9.8' -9.9'	57.4' 57.4'
21	137°43.3	• • 56.4	201°31.6	10.4'	16°31.9	-10.0'	57.4'
22	152°43.5	57.4	216°00.9	10.4	16°21.9	-10.1'	57.5
23	167°43.7	58.3	230°30.3	10.4'	16°11.8	-10.2'	57.5'
	SD = 16.0'	d = 1.0'		51	O = 15.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°43.9 197°44.1	\$03°59.3 04°00.3	244°59.6 259°29.0	10.4' 10.4'	N16°01.5 15°51.2	-10.3' -10.4'	57.5' 57.6'
2	212°44.3	04 00.3	259 29.0 273°58.4	10.4	15° 51.2	-10.4 -10.5'	57.6'
3	227°44.5	• • 02.2	288°27.8	10.4'	$15^{\circ}30.2$	-10.6'	57.7'
4	242°44.7 257°44.9	03.2	302°57.2	10.4	15°19.6 15°08.8	-10.7'	57.7'
5 6	257°44.9 272°45.1	04.1 S 04°05.1	317°26.6 331°56.0	10.4' 10.4'	15°08.8 N14°58.0	-10.8' -10.9'	57.7' 57.8'
7	287°45.3	06.1	$346^{\circ}25.5$	10.4'	$14^{\circ}47.1$	-11.0'	57.8'
8	302°45.5	07.0	0°54.9	10.4'	14°36.1	-11.1'	57.9'
9 10	317°45.7 332°45.9	· · 08.0 09.0	15°24.4 29°53.8	10.5' 10.5'	14°25.0 14°13.8	-11.2' -11.3'	57.9' 57.9'
11	347°46.1	09.9	44°23.3	10.5'	14°02.5	-11.4'	58.0'
12	2°46.2	S04°10.9	58°52.7	10.5'	N13°51.1	-11.5'	58.0'
13 14	17°46.4 32°46.6	11.9 12.8	73°22.2 87°51.7	10.5' 10.5'	13°39.6 13°28.0	-11.6' -11.7'	58.1' 58.1'
15	47°46.8	• • 13.8	102°21.2	10.5'	13° 16.4	-11.7	58.1
16	62°47.0	14.8	116°50.7	10.5	13°04.6	-11.8'	58.2'
17 18	77°47.2 92°47.4	15.7 \$04°16.7	131°20.1 145°49.6	10.5' 10.5'	12°52.8 N12°40.9	-11.9' -12.0'	58.2' 58.3'
19	92 47.4 107°47.6	17.6	145 49.6 160°19.1	10.5'	12°28.9	-12.0 -12.1'	58.3'
20	122°47.8	18.6	174°48.6	10.5'	$12^{\circ}16.8$	-12.2'	58.3'
21 22	137°48.0 152°48.2	· · 19.6 20.5	189°18.1 203°47.7	10.5' 10.5'	12°04.7 11°52.4	-12.2' -12.3'	58.4' 58.4'
23	167°48.4	20.5	203 47.7 218°17.2	10.5'	11° 40.1	-12.3 -12.4'	58.5'
	SD = 16.0'	d = 1.0'	-	SI	D = 15.7'		

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

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

		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	49-29%	
01	10:18	10:27	11:50	06:14	18:40		
02	10:37	10:46	11:49	07:05	19:31		
03	10:56	11:05	11:49	07:56	20:21		

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

h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	12°58.4	139°23.9	S21°46.8	127°33.9	S22°45.9	162°46.6	S11°13.5	320°22.1	N16°29.7			
1	28°00.9	154°23.5	47.6	142°34.5	46.2	177°48.5	13.7	335°24.7	29.6	Alpheratz	357°30.4	29°15.5
2	43°03.3	169°23.2	48.4	157°35.1	46.5	192°50.5	13.9	350° 27.3	29.6	Ankaa	353°03.1	-42°08.5
3	58°05.8	184°22.8	• • 49.2	172°35.7	• • 46.8	207°52.4	• • 14.1	5°29.9	• • 29.6	Schedar	349°25.9	56°42.2
4	73°08.3	199°22.5	50.0	187°36.3	47.1	222°54.4	14.2	20°32.5	29.5	Diphda	348°43.2	-17°49.2
5	88°10.7	214°22.1	50.8	202°36.8	47.4	237°56.4	14.4	35°35.1	29.5	Achernar	335°17.0	-57°05.0
6	103°13.2	229°21.7	S21°51.6	217°37.4	S22°47.7	252°58.3	S11°14.6	50°37.6	N16°29.5	Hamal	327°46.5	23°36.3
7	$118^{\circ}15.6$	$244^{\circ}21.4$	52.4	232°38.0	48.0	268°00.3	14.8	65°40.2	29.4	Polaris	311°31.0	89°23.0
8	133°18.1	$259^{\circ}21.0$	53.2	247°38.6	48.3	283°02.2	15.0	80°42.8	29.4	Acamar Menkar	315°08.6 314°01.9	-40°10.9 4°12.5
9	148°20.6	274°20.6	• • 54.0	262°39.1	• • 48.6	298°04.2	• • 15.2	95°45.4	• • 29.4	Mirfak	308° 22.3	49°57.9
10	163°23.0	289°20.3	54.8	277°39.7	48.9	313°06.2	15.3	110°48.0	29.3	Aldebaran	290°35.0	16°34.1
11	178°25.5	$304^{\circ}19.9$	55.6	292°40.3	49.2	328°08.1	15.5	125°50.6	29.3	Rigel	281°00.1	-8°10.0
12	193°28.0	$319^{\circ}19.5$	S21°56.4	307°40.9	S22°49.5	343°10.1	S11°15.7	140°53.1	N16°29.3	Capella	280°16.1	46°01.4
13	208°30.4	$334^{\circ}19.2$	57.2	322°41.4	49.8	$358^{\circ}12.1$	15.9	155°55.7	29.2	Bellatrix	278° 18.7	6°22.6
14	223°32.9	349°18.8	58.0	337°42.0	50.1	13°14.0	16.1	170°58.3	29.2	Elnath	277°56.9	28°37.8
15	238°35.4	4°18.4	• • 58.8	352°42.6	• • 50.4	28°16.0	•• 16.3	186°00.9	• • 29.2	Alnilam	275°33.8	-1°11.0
16	253°37.8	19° 18.1	21°59.6	7°43.2	50.7	43°17.9	16.5	201°03.5	29.1	Betelgeuse	270°47.9	7°24.7
17	268°40.3	34° 17.7	22°00.4	22°43.7	51.0	58°19.9	16.6	216°06.1	29.1	Canopus	263°50.6	-52°42.5
18	283°42.8	49° 17.3	\$22°01.2	37°44.3	S22°51.3	73°21.9	S11°16.8	231°08.6	N16°29.0	Sirius	258°22.9	-16°45.3
19	298°45.2	64° 17.0	01.9	52°44.9	51.6	88°23.8	17.0	246°11.2	29.0	Adhara	255°02.9	-29°00.6
20	313°47.7	79° 16.6	02.7	67°45.5	51.9	103°25.8	17.2	261°13.8	29.0	Procyon	244°46.9	5°08.8
21	328°50.1	94°16.2	• • 03.5	82°46.0	• • 52.2	118°27.7	•• 17.4	276°16.4	• • 28.9	Pollux	243°12.8	27°57.0
22	343°52.6	109°15.9	04.3	97°46.6	52.5	133°29.7	17.6	291°19.0	28.9	Avior	234°13.3	-59°36.1
23	358°55.1	124° 15.5	05.1	112°47.2	52.8	148°31.7	17.7	306°21.6	28.9	Suhail	222°43.7	-43°33.0
Mer.p	pass. 23:04	ν -0.4' $d0$.8′ m-4.26	ν 0.6' d0.	.3′ m0.99	$\nu 2.0' \ d0.$	2′ m-1.70	$\nu 2.6' \ d-0$.0′ m-0.07	Miaplacidus	221°37.8	-69°50.2
										Alphard	217°44.2	-8°47.3
F.J	CUA	CHA	D	CIIA	D	CIIA	D	CIIA	D	Regulus	$207^{\circ}30.7$	11°49.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.2	61°35.2
0	13°57.5	139°15.1	\$22°05.9	127°47.8 142°48.3	\$22°53.1	163°33.6	\$11°17.9	321°24.2	N16°28.8	Denebola	$182^{\circ}21.4$	14°24.3
1	29°00.0 44°02.5	154°14.8	06.7	142°48.3 157°48.9	53.4 52.7	178°35.6	18.1	336°26.7	28.8	Gienah	$175^{\circ}40.0$	-17°42.4
2		169°14.4	07.5		53.7	193°37.5	18.3	351°29.3 6°31.9	28.8	Acrux	172°56.3	-63°15.8
3	59°04.9 74°07.4	184°14.0	• • 08.2	172°49.5	• • 54.0	208°39.5 223°41.5	• • 18.5		• • 28.7	Gacrux	171°47.8	-57°16.8
4 5	74 07.4 89°09.9	199°13.6	09.0	187°50.1	54.3	223 41.5 238°43.4	18.7	21°34.5	28.7	Alioth	166°10.4	55°47.9
6	104°12.3	214°13.3 229°12.9	09.8 \$22°10.6	202°50.6 217°51.2	54.6 \$22°54.9	253°45.4	18.9	36°37.1 51°39.7	28.7 N16°28.6	Spica	158° 18.6	-11°18.9
7	104 12.3 119°14.8	244°12.5		217 51.2 232°51.8	55.2	268°47.3	\$11°19.0 19.2	66° 42.3		Alkaid	152°49.6	49°10.0
8	119 14.6 134°17.2	259° 12.2	11.4 12.1	232 51.6 247°52.3	55.2 55.5	283°49.3	19.2	81°44.9	28.6	Hadar	148°31.0	-60°31.0
9	134 17.2 149°19.7	259 12.2 274°11.8	• 12.1	247 52.3 262°52.9	55.7	203 49.3 298°51.3	19.4	96°47.4	28.6 •• 28.5	Menkent	147°53.4	-36°30.9
10	149 19.7 164°22.2	289°11.4	13.7	202 52.9 277°53.5	56.0	313°53.2	19.8	111°50.0	28.5	Arcturus	145°44.8	19°01.8
11	104 22.2 179°24.6	304°11.1	14.5	277 55.5 292°54.0	56.3	328°55.2	20.0	111 50.0 126°52.6	28.4	Rigil Kent.	139°35.5	-60°57.5
12	194°27.1	319° 10.7	\$22°15.2	307°54.6	50.5 S22°56.6	343°57.1	S11°20.1	141°55.2	N16°28.4	Kochab	137°21.2	74°02.1
13	209°29.6	334°10.3	16.0	322°55.2	56.9	358°59.1	20.3	156° 57.8	28.4	Zuben'ubi	136°52.1	-16°09.8
14	224°32.0	349°09.9	16.8	337°55.7	57.2	14°01.0	20.5	172°00.4	28.3	Alphecca	126°00.8	26°37.1
15	239°34.5	4°09.6	. 17.6	352°56.3	• • 57.5	29°03.0	20.7	187°03.0	. 28.3	Antares	112°11.3	-26°29.8
16	254°37.0	19°09.2	18.3	7°56.9	57.8	44°05.0	20.9	202°05.6	28.3	Atria	107°02.3	-69°04.9
17	269°39.4	34°08.8	19.1	22°57.4	58.1	59°06.9	21.1	217°08.1	28.2	Sabik	101°58.6	-15°45.5
18	284°41.9	49°08.5	S22°19.9	37°58.0	S22°58.4	74°08.9	S11°21.2	232° 10.7	N16°28.2	Shaula	96°05.3	-37°07.4
19	299°44.4	64°08.1	20.6	52°58.6	58.7	89°10.8	21.4	247° 13.3	28.2	Rasalhague	95°55.1	12°32.6
20	314°46.8	79°07.7	21.4	67°59.1	59.0	104°12.8	21.6	262° 15.9	28.1	Eltanin	90°40.5	51°29.5
21	329°49.3	94°07.3	22.2	82°59.7	• • 59.2	119°14.8	• • 21.8	277° 18.5	28.1	Kaus Aust.	83°27.5	-34°22.1
22	344°51.7	109°07.0	22.9	98°00.3	59.5	134°16.7	22.0	292°21.1	28.1	Vega	80°30.7	38°49.1
23	359°54.2	124°06.6	23.7	113°00.8	59.8	149°18.7	22.2	307°23.7	28.0	Nunki	75°43.1	-26°15.4
										Altair	61°56.2	8°57.2
Mer.p	pass. 23:00	ν -0.4′ d0	.8′ m-4.27	ν 0.6′ d0.	.3′ m1.00	$\nu 2.0' \ d0.$	2′ m-1.69	ν 2.6′ d-0	.0′ m-0.08	Peacock	52°59.7	-56°38.3 45°23.6
										Deneb	49°22.9	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°34.8 27°27.9	10°01.0 -46°48.9
0	14°56.7	139°06.2	S22°24.5		\$23°00.1	164°20.6	S11°22.4	322° 26.3	N16°28.0	Fomalhaut	27°27.9 15°10.1	-46 48.9 -29°27.7
1	29°59.1	154°05.8	25.2	143°02.0	00.4	179°22.6	22.5	337°28.9	27.9	Scheat	13°41.1	-29°27.7 28°15.0
2	45°01.6	169°05.5	26.0	158°02.5	00.7	194°24.6	22.7	352°31.4	27.9	Markab	13° 25.8	15°22.2
3	60°04.1	184°05.1	26.8	173°03.1	• • 01.0	$209^{\circ}26.5$	• • 22.9	7°34.0	• • 27.9			19 44.4
4	75°06.5	199°04.7	27.5	$188^{\circ}03.7$	01.3	224°28.5	23.1	22°36.6	27.8	Oct 04 Thu	SHA	Mer.pass
5	90°09.0	214°04.4	28.3	203°04.2	01.6	239°30.4	23.3	37°39.2	27.8		126°25.5	14:43
6	105°11.5	229°04.0	S22°29.0	218°04.8	S23°01.8	254°32.4	S11°23.5	52°41.8	N16°27.8		114°35.5	15:29
7	120°13.9	244°03.6	29.8	233°05.4	02.1	269°34.3	23.6	67°44.4	27.7		149°48.2	13:07
8	135°16.4	259°03.2	30.5	248°05.9	02.4	284°36.3	23.8	82°47.0	27.7	Saturn	307°23.8	02:38
9	150°18.8	274°02.9	• • 31.3	263°06.5	• • 02.7	299°38.3	• • 24.0	97°49.6	• • 27.7	Oct 05 Fri	SHA	Mer.pass
10	165°21.3	289°02.5	32.1	278°07.0	03.0	314°40.2	24.2	112°52.2	27.6		125° 17.6	14:43
11	180°23.8	304°02.1	32.8	293°07.6	03.3	329°42.2	24.4	127°54.8	27.6		113° 50.2	15:28
12	195°26.2	319°01.7	S22°33.6	308°08.2	S23°03.6	344°44.1	S11°24.6	142°57.3	N16°27.5		149°36.1	13:04
13	210°28.7	334°01.4	34.3	323°08.7	03.8	359°46.1	24.8	157°59.9	27.5	Saturn	307°26.6	02:34
14	225°31.2	349°01.0	35.1	338°09.3	04.1	14°48.0	24.9	173°02.5	27.5			02.57
15	240°33.6	4°00.6	• • 35.8	353°09.8	• • 04.4	29°50.0	• • 25.1	188°05.1	• • 27.4	Oct 06 Sat	SHA	Mer.pass
16	255°36.1	19°00.2	36.6	8°10.4	04.7	44°52.0	25.3	203°07.7	27.4		124°09.5	14:44
17	270°38.6	33°59.9	37.3	23°11.0	05.0	59°53.9	25.5	218° 10.3	27.4		113°04.7	15:27
18	285°41.0	48°59.5	S22°38.1		\$23°05.3	74°55.9	S11°25.7	233°12.9	N16°27.3		149°24.0	13:01
19	300°43.5	63°59.1	38.8	53°12.1	05.5	89°57.8	25.9	248° 15.5	27.3	Saturn	307°29.6	02:30
20	315°46.0	78°58.7	39.6	68°12.6	05.8	104°59.8	26.0	263°18.1	27.3	Horizont	al parallax	
21	330°48.4	93°58.3	• • 40.3	83°13.2	06.1	120°01.7	• • 26.2	278°20.7	• • 27.2	TOTIZOTI	Venus:	0.2
22	345°50.9	108°58.0	41.1	98°13.8	06.4	135°03.7	26.4	293°23.3	27.2		Mars:	0.2
23	0°53.3	123°57.6	41.8	113°14.3	06.7	150°05.7	26.6	308°25.9	27.1		141013.	V.1
Mer.p	pass. 22:56	ν -0.4 $'$ d0	.8′ m-4.28	ν 0.6′ d0.	.3′ m1.00	ν 2.0′ d0.	2′ m-1.69	ν 2.6′ d-0	.0′ m-0.08			

h	Sui	า			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°48.6	S04°22.5	232°46.7	10.5'	N11°27.7	-12.5'	58.5'
1	197°48.7	23.4	247°16.2	10.5	11°15.2	-12.6'	58.5'
2	212°48.9 227°49.1	24.4 •• 25.4	261°45.7 276°15.2	10.5' 10.5'	11°02.6 10°50.0	-12.6' -12.7'	58.6' 58.6'
3 4	242°49.1	26.3	270 15.2 290°44.7	10.5	10° 50.0 10° 37.3	-12.7 -12.8'	58.7'
5	242 49.5 257°49.5	27.3	305°14.2	10.5	10° 37.5	-12.0 -12.9'	58.7'
6	272°49.7	S04°28.2	319°43.7	10.5	N10°11.6	-12.9'	58.7
7	287°49.9	29.2	334°13.2	10.5'	09°58.7	-13.0'	58.8'
8	302°50.1	30.2	348°42.7	10.5'	09°45.7	-13.1'	58.8'
9	317°50.3	• • 31.1	3°12.2	10.5'	09°32.6	-13.2'	58.9'
10	332°50.5	32.1	17°41.7	10.5'	09° 19.4	-13.2'	58.9'
11	347°50.6	33.1	32°11.2	10.5'	09°06.2	-13.3'	58.9'
12 13	2°50.8 17°51.0	\$04°34.0 35.0	46°40.7 61°10.2	10.5' 10.5'	N08°52.9 08°39.6	-13.4' -13.4'	59.0' 59.0'
14	32°51.2	36.0	75°39.6	10.5	08°26.1	-13.4	59.0 59.1'
15	47°51.4	36.9	90°09.1	10.5	08°12.6	-13.6'	59.1'
16	62°51.6	37.9	104°38.5	10.4	07°59.1	-13.6'	59.1'
17	77°51.8	38.8	119°08.0	10.4'	07°45.5	-13.7'	59.2'
18	92°52.0	S04°39.8	133°37.4	10.4'	N07°31.8	-13.7'	59.2'
19	107°52.2	40.8	148°06.8	10.4'	$07^{\circ}18.1$	-13.8'	59.3'
20	122°52.3	41.7	162°36.2	10.4'	07°04.3	-13.8'	59.3'
21	137°52.5	• • 42.7	177°05.6	10.4'	06°50.4	-13.9'	59.3'
22	152°52.7	43.7	191°35.0	10.4	06°36.5	-14.0'	59.4
23	167°52.9	44.6	206°04.4	10.4'	06°22.6	-14.0'	59.4'
	SD = 16.0'	d = 1.0'		SI	D = 16.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°53.1 197°53.3	\$04°45.6 46.5	220°33.7 235°03.1	10.3' 10.3'	N06°08.6 05°54.5	-14.1' -14.1'	59.4' 59.5'
2	197 53.3 212°53.5	40.5 47.5	235 03.1 249°32.4	10.3	05°40.4	-14.1 -14.2'	59.5'
3	212 53.5 227°53.7	• • 48.5	249 32.4 264°01.7	10.3	05°26.2	-14.2'	59.5'
4	242°53.9	49.4	278°31.0	10.3	05°12.0	-14.3'	59.6'
5	257°54.0	50.4	293°00.3	10.3'	04°57.7	-14.3'	59.6'
6	272°54.2	S04°51.3	307°29.6	10.2'	N04°43.4	-14.4'	59.7'
7	287°54.4	52.3	321°58.8	10.2'	$04^{\circ}29.1$	-14.4'	59.7'
8	302°54.6	53.3	336°28.0	10.2'	04°14.7	-14.4'	59.7'
9	317°54.8	• • 54.2	350°57.2	10.2'	04°00.3	-14.5'	59.8'
10	332°55.0	55.2	5°26.4	10.2'	03°45.8	-14.5'	59.8'
11	347°55.2	56.2	19°55.5	10.1'	03°31.3	-14.6'	59.8'
12 13	2°55.3 17°55.5	\$04°57.1 58.1	34°24.7 48°53.8	10.1' 10.1'	N03°16.7 03°02.1	-14.6' -14.6'	59.9' 59.9'
14	32°55.7	04°59.0	63°22.9	10.1	03 02.1 02°47.5	-14.0 -14.7'	59.9'
15	47°55.9	05°00.0	77°51.9	10.1	02° 32.9	-14.7'	60.0'
16	62°56.1	01.0	92°20.9	10.0'	02°18.2	-14.7'	60.0'
17	77°56.3	01.9	$106^{\circ}49.9$	10.0'	$02^{\circ}03.5$	-14.7'	60.0'
18	92°56.5	S05°02.9	121°18.9	9.9'	N01°48.7	-14.8'	60.1'
19	107°56.6		135°47.9	9.9'	01°33.9	-14.8'	60.1'
20	122°56.8	04.8	150°16.8	9.9'	01°19.1	-14.8'	60.1'
21	137°57.0	• • 05.8	164°45.7	9.9'	01°04.3	-14.8'	60.2'
22	152°57.2 167°57.4	06.7	179°14.5 193°43.3	9.8' 9.8'	00°49.5 00°34.6	-14.9'	60.2'
23		07.7	193 43.3			-14.9'	60.2'
	SD = 16.0'	d = 1.0'		SI	D = 16.2'		
C.+	CUA		GHA		D		Пυ
Sat 0	GHA 182°57.6	Dec \$05°08.6	GHA 208°12.1	ν 9.8'	Dec N00° 19.8	d -14.9'	HP 60.3'
1	182 57.0 197°57.7	09.6	208 12.1 222°40.9	9.8 9.7'	N00 19.8 N00°04.9	-14.9' -14.9'	60.3
2	212°57.9	10.5	237°09.6	9.7	500° 10.1	14.9	60.3
3	227°58.1	. 11.5	251°38.3	9.6'	00° 25.0	14.9'	60.3
4	242°58.3	12.5	266°06.9	9.6'	00°39.9	14.9'	60.4'
5	257°58.5	13.4	280°35.5	9.6'	00°54.9	15.0'	60.4'
6	272°58.7	S05°14.4	295°04.1	9.5'	S01°09.8	15.0'	60.4'
7	287°58.8	15.3	309°32.6	9.5'	01°24.8	15.0'	60.5'
8	302°59.0	16.3	324°01.1	9.4'	01°39.8	15.0'	60.5'
9	317°59.2	• • 17.3	338°29.5	9.4'	01°54.7	15.0'	60.5'
10	332°59.4 347°59.6	18.2 19.2	352°57.9 7°26.3	9.4' 9.3'	02°09.7 02°24.7	15.0'	60.5'
11 12	347°59.6 2°59.7	19.2 \$05°20.1	7°26.3 21°54.6	9.3'	02°24.7 S02°39.7	15.0' 15.0'	60.6' 60.6'
13	17°59.9	21.1	36°22.9	9.3 9.2'	02°54.6	15.0'	60.6
14	33°00.1	22.0	50° 51.1	9.2'	02° 09.6	15.0'	60.6
15	48°00.3	23.0	65°19.3	9.1	03°24.6	15.0'	60.7'
16	63°00.5	24.0	79°47.5	9.1'	03°39.5	14.9'	60.7'
17	78°00.6	24.9	$94^{\circ}15.6$	9.0'	03°54.5	14.9'	60.7'
18	93°00.8	S05°25.9	108°43.6	9.0'	S04°09.4	14.9'	60.7'
19	108°01.0	26.8	123°11.6	8.9'	04°24.3	14.9'	60.8'
20	123°01.2	27.8	137°39.5	8.9'	04°39.2	14.9'	60.8'
21	138°01.4	• • 28.7	152°07.4	8.8'	04°54.1	14.9'	60.8'
22	153°01.5 168°01.7	29.7	166°35.3 181°03.1	8.8' 9.7'	05°09.0 05°23.8	14.8'	60.8'
23		30.7	181 03.1	8.7'		14.8'	60.8'
	SD = 16.0'	d = 1.0'		SI	D = 16.4'		

	Twilight		_		Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	04:10	05:30	06:38	16:57	18:04	19:23	
N 70°	04:20	05:32	06:32	17:02	18:03	19:14	
68°	04:27	05:32	06:28	17:07	18:02	19:07	
66°	04:33	05:33	06:24	17:11	18:02	19:01	
64°	04:38	05:33	06:21	17:14	18:02	18:57	
62°	04:42	05:34	06:18	17:17	18:01	18:53	
60°	04:46	05:34	06:16	17:20	18:01	18:49	
N 58°	04:49	05:34	06:13	17:22	18:01	18:47	
56°	04:51	05:34	06:11	17:24	18:01	18:44	
54°	04:53	05:34	06:10	17:26	18:01	18:42	
52°	04:55	05:34	06:08	17:28	18:01	18:40	
50°	04:57	05:34	06:06	17:29	18:02	18:39	
45°	05:00	05:34	06:03	17:33	18:02	18:36	
N 40°	05:02	05:33	06:00	17:36	18:03	18:34	
35°	05:03	05:33	05:58	17:38	18:03	18:33	
30°	05:04	05:32	05:56	17:40	18:04	18:32	
20°	05:04	05:30	05:52	17:44	18:06	18:32	
N 10°	05:03	05:27	05:48	17:48	18:09	18:34	
0°	05:00	05:24	05:45	17:52	18:12	18:36	
S 10°	04:56	05:20	05:42	17:55	18:16	18:41	
20°	04:50	05:16	05:38	17:59	18:21	18:47	
30°	04:41	05:09	05:33	18:04	18:28	18:56	
35°	04:35	05:05	05:31	18:07	18:32	19:02	
40° 45°	04:28	05:00	05:28	18:10	18:37	19:09	
	04:19	04:55	05:24	18:13	18:43	19:19	
S 50°	04:08	04:47	05:20	18:18	18:51	19:30	
52°	04:02	04:44	05:18	18:20	18:54	19:36	
54° 56°	03:56	04:40	05:16	18:22	18:58	19:42	
56°	03:49 03:41	04:35 04:31	05:14 05:11	18:24 18:27	19:03 19:08	19:50 19:58	
S 60°	03:41	04:31	05:11	18:30	19:08	20:08	
3 00	05.51	04.23	05.00	10.50	19.13	20.00	

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

		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	19-5%	
04	11:14	11:23	11:49	08:47	21:12		
05	11:32	11:41	11:48	09:37	22:03		
06	11:50	11:59	11:48	10:29	22:56		

October 07, 08, 09 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	15°55.8	138°57.2	\$22°42.5	128°14.9	\$23°06.9	165°07.6	\$11°26.8	323°28.5	N16°27.1			
1	30°58.3	153°56.8	43.3	143°15.4	07.2	180°09.6	27.0	338°31.0	27.1	Alpheratz	357°30.4	29° 15.5
2	46°00.7	168°56.5	44.0	158°16.0	07.5	195°11.5	27.2	353°33.6	27.0	Ankaa	353°03.1	-42°08.5
3	61°03.2	183°56.1	• • 44.8	173°16.5	07.8	210°13.5	• • 27.3	8°36.2	• • 27.0	Schedar	349°25.9	56°42.2
4	76°05.7	198°55.7	45.5	188°17.1	08.1	225°15.4	27.5	23°38.8	27.0	Diphda	348°43.2	-17°49.2
5	91°08.1	213°55.3	46.2	203°17.7	08.3	240°17.4	27.7	38°41.4	26.9	Achernar	335°17.0	-57°05.0
6	106°10.6	228°55.0	S22°47.0	218°18.2	S23°08.6	255°19.4	S11°27.9	53°44.0	N16°26.9	Hamal	327°46.5	23°36.3
7	121°13.1	243°54.6	47.7	233°18.8	08.9	270°21.3	28.1	68° 46.6	26.8	Polaris	311°29.9	89°23.1
8	136°15.5	258°54.2	48.4	248°19.3	09.2	285°23.3	28.3	83°49.2	26.8	Acamar	315°08.6	-40°10.9
9	151°18.0	273°53.8	• • 49.2	263°19.9	• • 09.4	300°25.2	• • 28.4	$98^{\circ}51.8$	• • 26.8	Menkar	314°01.9 308°22.3	4°12.5
10	166°20.4	288°53.4	49.9	278°20.4	09.7	315°27.2	28.6	113°54.4	26.7	Mirfak Aldebaran	290°35.0	49°57.9 16°34.1
11	181°22.9	303°53.1	50.7	293°21.0	10.0	330°29.1	28.8	128°57.0	26.7	Rigel	290 33.0 281°00.1	-8° 10.0
12	196°25.4	318°52.7	\$22°51.4	308°21.5	S23°10.3	345°31.1	S11°29.0	143°59.6	$N16^{\circ}26.7$	Capella	280°16.0	46°01.4
13	211°27.8	333°52.3	52.1	323°22.1	10.6	0°33.0	29.2	159°02.2	26.6	Bellatrix	278°18.7	6°22.6
14	226°30.3	348°51.9	52.8	338°22.7	10.8	15°35.0	29.4	174°04.8	26.6	Elnath	277°56.9	28°37.8
15	241°32.8	3°51.5	• • 53.6	353°23.2	• • 11.1	30°37.0	• • 29.5	189°07.4	• • 26.5	Alnilam	275°33.7	-1°11.0
16	256°35.2	18°51.2	54.3	8°23.8	11.4	45°38.9	29.7	204°10.0	26.5	Betelgeuse	270°47.9	7°24.7
17	271°37.7	33°50.8	55.0	23°24.3	11.7	60°40.9	29.9	219°12.6	26.5	Canopus	263°50.6	-52° 42.5
18	286°40.2	48°50.4	\$22°55.8	38°24.9	\$23°11.9	75°42.8	S11°30.1	234° 15.2	N16°26.4	Sirius	258°22.8	-16°45.3
19	301°42.6 316°45.1	63°50.0 78°49.6	56.5	53°25.4 68°26.0	12.2	90°44.8	30.3	249° 17.8 264° 20.3	26.4	Adhara	255°02.8	-29°00.6
20 21	310 45.1 331°47.6	78 49.6 93°49.3	57.2 •• 57.9	83°26.5	12.5 •• 12.7	105°46.7 120°48.7	30.5 · · 30.7	204 20.3 279°22.9	26.4 •• 26.3	Procyon	244°46.9	5°08.8
22	346°50.0	95 49.5 108°48.9	58.7	98°27.1	13.0	120 46.7 135°50.6	30.8	279 22.9 294°25.5	· · 26.3 26.3	Pollux	243°12.8	27°57.0
23	1°52.5	100° 48.9 123° 48.5	59.4	113°27.6	13.3	150°52.6	31.0	309°28.1	26.2	Avior	234°13.3	-59°36.1
										Suhail	222°43.7	-43°33.0
Mer.p	ass. 22:53	ν -0.4' d0	.7′ m-4.29	$ u 0.6' \ d0$.3' m 1.00	$\nu 2.0' \ d0.$	2′ m-1.69	$\nu 2.6' \ d-0$.0′ m-0.09	Miaplacidus	221°37.7	-69°50.2
		-		-				-		Alphard	217°44.2	-8°47.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.7	11°49.2
0	16°54.9	138°48.1	\$23°00.1	128°28.2	\$23°13.6	165°54.6	S11°31.2	324°30.7	N16°26.2	Dubhe	193°37.2	61°35.2
1	31°57.4	153°47.7	00.8	143°28.7	13.8	180°56.5	31.4	339°33.3	26.2	Denebola	182°21.4	14°24.3
2	46°59.9	168°47.4	01.5	158°29.3	14.1	195°58.5	31.6	354°35.9	26.1	Gienah	175°40.0	-17°42.4
3	62°02.3	183°47.0	02.3	173°29.8	• • 14.4	211°00.4	• • 31.8	9°38.5	26.1	Acrux	172°56.3	-63°15.8
4	77°04.8	198°46.6	03.0	188°30.4	14.6	226°02.4	31.9	24°41.1	26.1	Gacrux	171°47.8	-57°16.8
5	92°07.3	213°46.2	03.7	203°30.9	14.9	241°04.3	32.1	39°43.7	26.0	Alioth	166°10.4	55°47.9
6	107°09.7	228°45.8	S23°04.4	218°31.5	\$23°15.2	256°06.3	S11°32.3	54°46.3	N16°26.0	Spica	158°18.6	-11°18.9
7	122°12.2	243°45.5	05.1	233°32.0	15.5	271°08.2	32.5	69°48.9	25.9	Alkaid	152°49.6	49° 10.0
8	137°14.7	258°45.1	05.8	248°32.6	15.7	286°10.2	32.7	84°51.5	25.9	Hadar	148°31.0	-60°31.0
9	152°17.1	273°44.7	• • 06.5	263°33.1	• • 16.0	301°12.1	• • 32.9	99°54.1	• • 25.9	Menkent	147°53.4	-36°30.9
10	167°19.6	288°44.3	07.3	278°33.7	16.3	316°14.1	33.1	114°56.7	25.8	Arcturus	145°44.8	19°01.8
11	182°22.0	303°43.9	08.0	293°34.2	16.5	331°16.1	33.2	129°59.3	25.8	Rigil Kent.	139°35.5 137°21.3	-60°57.5 74°02.1
12	197°24.5	318°43.5	S23°08.7	308°34.8	523°16.8	346°18.0	S11°33.4	145°01.9	N16°25.8	Kochab Zuben'ubi	137 21.3 136°52.1	-16°09.8
13	212°27.0	333°43.2	09.4	323°35.3	17.1	1°20.0	33.6	160°04.5	25.7	Alphecca	130° 52.1 126° 00.8	26°37.1
14	227°29.4	348°42.8	10.1	338°35.8	17.3	16°21.9	33.8	$175^{\circ}07.1$	25.7	Antares	112° 11.4	-26°29.8
15	242°31.9	3°42.4	• • 10.8	353°36.4	• • 17.6	31°23.9	• • 34.0	190°09.7	• • 25.6	Atria	107°02.3	-69°04.9
16	257°34.4	18°42.0	11.5	8°36.9	17.9	46°25.8	34.2	$205^{\circ}12.3$	25.6	Sabik	101°58.6	-15° 45.5
17	272°36.8	33°41.6	12.2	23°37.5	18.1	61°27.8	34.3	$220^{\circ}14.9$	25.6	Shaula	96°05.3	-37°07.4
18	287°39.3	48°41.2	S23°12.9	38°38.0	S23°18.4	76°29.7	S 11°34.5	235° 17.5	N16°25.5	Rasalhague	95°55.1	12°32.6
19	302°41.8	63°40.9	13.6	53°38.6	18.7	91°31.7	34.7	250°20.1	25.5	Eltanin	90°40.6	51°29.5
20	317°44.2	78°40.5	14.3	68°39.1	18.9	106°33.6	34.9	265°22.7	25.4	Kaus Aust.	83°27.5	-34°22.1
21	332°46.7	93°40.1	• • 15.0	83°39.7	• • 19.2	121°35.6	• • 35.1	280°25.3	• • 25.4	Vega	80°30.7	38°49.1
22	347°49.2	108°39.7	15.7	98°40.2	19.4	136°37.6	35.3	295°27.9	25.4	Nunki	75°43.1	-26° 15.4
23	2°51.6	123°39.3	16.4	113°40.7	19.7	151°39.5	35.5	310°30.5	25.3	Altair	61°56.2	8°57.2
Mer.p	ass. 22:49	ν -0.4' d0	.7′ m-4.30	$\nu 0.6' d0$.3′ m1.01	$\nu 2.0' d0.$	2′ m-1.69	$\nu 2.6' \ d-0$.0′ m-0.09	Peacock	52°59.7	-56°38.3
										Deneb	49°22.9	45°23.6
_			_		_		_		_	Enif	33°34.8	10°01.0
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.0	-46°48.9
0	17°54.1	138°38.9	\$23°17.1		\$23°20.0	166°41.5	\$11°35.6	325°33.1 340°35.7	N16°25.3	Fomalhaut	15°10.1	-29°27.7
1 2	32°56.5 47°59.0	153°38.6 168°38.2	17.8 18.5	143°41.8 158°42.4	20.2 20.5	181°43.4 196°45.4	35.8 36.0	340°35.7 355°38.3	25.3 25.2	Scheat	13°41.1	28°15.0
3	47 59.0 63°01.5	183°37.8	18.5	158 42.4 173°42.9	. 20.5	211°47.3	36.2	355 38.3 10°40.9	25.2	Markab	13°25.8	15°22.2
4	78°03.9	198°37.4	19.2	173 42.9 188°43.5	21.0	211 47.3 226°49.3	36.4	25°43.5	25.1	Oct 07 Sun	SHA	Mer.pass
5	93°06.4	213°37.0	20.6	203°44.0	21.3	241°51.2	36.6	40°46.1	25.1	1	123°01.4	14:45
6	108°08.9	228°36.6	\$23°21.3	218°44.5	\$23°21.5	256°53.2	S11°36.7	55°48.7	N16°25.1		112° 19.1	15:26
7	123°11.3	243°36.3	22.0	233°45.1	21.8	271°55.1	36.9	70°51.3	25.0		149°11.8	12:58
8	138°13.8	258°35.9	22.7	248°45.6	22.1	286°57.1	37.1	85°53.9	25.0	Saturn	307°32.6	02:26
9	153°16.3	273°35.5	• • 23.4	263°46.2	22.3	301°59.0	• • 37.3	100° 56.5	24.9			
10	$168^{\circ}18.7$	288°35.1	24.1	278°46.7	22.6	317°01.0	37.5	115°59.1	24.9	Oct 08 Mon	SHA	Mer.pass
11	183°21.2	303°34.7	24.7	293°47.2	22.8	332°02.9	37.7	$131^{\circ}01.7$	24.9		121°53.2	14:45
12	198°23.7	318°34.3	S23°25.4	308°47.8	S23°23.1	347°04.9	S11°37.8	146°04.3	N16°24.8		111°33.2 148°59.6	15:26
13	$213^{\circ}26.1$	333°33.9	26.1	323°48.3	23.4	$2^{\circ}06.8$	38.0	161°06.9	24.8	Saturn	307°35.8	12:55 02:22
14	228°28.6	348°33.6	26.8	338°48.9	23.6	17°08.8	38.2	176°09.5	24.8	Saturn	JU1 JJ.6	02.22
15	243°31.0	3°33.2	• • 27.5	353°49.4	• • 23.9	32°10.8	• • 38.4	191°12.1	• • 24.7	Oct 09 Tue	SHA	Mer.pass
16	258°33.5	18°32.8	28.2	8°49.9	24.1	47°12.7	38.6	206° 14.7	24.7		$120^{\circ}44.9$	14:46
17	273°36.0	33°32.4	28.9	23°50.5	24.4	62°14.7	38.8	221°17.3	24.6		110°47.2	15:25
18	288°38.4	48°32.0	S23°29.5		\$23°24.6	77°16.6	S11°39.0	236° 19.9	N16°24.6		148°47.4	12:52
19	303°40.9	63°31.6	30.2	53°51.6	24.9	92°18.6	39.1	251°22.5	24.6	Saturn	307°39.0	02:17
20	318°43.4	78°31.2	30.9	68°52.1	25.2	107°20.5	39.3	266°25.1	24.5	Horizont	al narallar	
21	333°45.8	93°30.9	· · 31.6	83°52.6	• • 25.4	122°22.5	• • 39.5	281°27.7	• • 24.5	norizont	al parallax Venus:	0.2
22	348°48.3	108°30.5	32.3	98°53.2	25.7	137°24.4	39.7	296°30.3	24.4		venus: Mars:	0.2 0.1
23	3°50.8	123°30.1	32.9	113°53.7	25.9	152°26.4	39.9	311°32.9	24.4		141013.	0.1
Mer.p	ass. 22:45	ν -0.4′ d0	.7′ m-4.31	u0.5′ d0	.3′ m1.01	ν 2.0′ d0.	2′ m-1.69	ν 2.6′ d-0	.0′ m-0.10			

	-	10.1501 500		1-01		210 30	
h	Sur	1			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°01.9	S05°31.6	$195^{\circ}30.8$	8.7'	S 05°38.7	14.8'	60.9'
1	198°02.1	32.6	209°58.5	8.6'	05°53.5	14.8'	60.9'
2	213°02.3	33.5	224°26.1	8.6'	06°08.2	14.7'	60.9'
3	228°02.4	• • 34.5	238°53.7	8.5'	06°23.0	14.7'	60.9'
4	243°02.6 258°02.8	35.4 36.4	253°21.2 267°48.7	8.5' 8.4'	06°37.7 06°52.4	14.7'	60.9' 61.0'
5 6	258 02.8 273°03.0	505°37.4	282°16.1	8.4	507°07.0	14.6' 14.6'	61.0
7	288°03.2	38.3	296°43.5	8.3	07°21.6	14.6'	61.0'
8	303°03.3	39.3	311°10.8	8.2'	07°36.2	14.5	61.0'
9	318°03.5	40.2	325°38.0	8.2'	07°50.7	14.5'	61.0'
10	333°03.7	41.2	340°05.2	8.1'	08°05.2	14.4'	61.0'
11	348°03.9	42.1	354°32.3	8.1'	$08^{\circ}19.6$	14.4'	61.0'
12	3°04.0	S05°43.1	8°59.4	8.0'	S08°34.0	14.4'	61.1'
13	18°04.2	44.0	23°26.4	7.9'	08°48.4	14.3'	61.1'
14	33°04.4	45.0	37°53.3	7.9'	09°02.7	14.2'	61.1'
15	48°04.6	• • 46.0	52°20.2	7.8'	09°16.9	14.2'	61.1'
16	63°04.8 78°04.9	46.9	66°47.0 81°13.7	7.8'	09°31.1 09°45.3	14.1' 14.1'	61.1' 61.1'
17 18	78 04.9 93°05.1	47.9 \$05°48.8	95°40.4	7.7' 7.6'	509°59.4	14.1	61.1
19	108°05.3	49.8	110°07.1	7.6'	10°13.4	14.0'	61.1
20	123°05.5	50.7	124°33.6	7.5'	10°27.4	13.9'	61.1
21	138°05.6	51.7	139°00.1	7.4'	10°41.3	13.8'	61.2'
22	153°05.8	52.6	153°26.5	7.4'	10°55.1	13.8'	61.2'
23	168°06.0	53.6	167°52.9	7.3'	11°08.9	13.7'	61.2'
	SD = 16.0'	d = 1.0'		SI	D = 16.6'		
	<u> </u>						
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°06.2	S05°54.5	182°19.2	7.2'	S11°22.5	13.6'	61.2'
1	198°06.3	55.5	196°45.4	7.2'	11°36.2	13.6'	61.2'
2	213°06.5	56.4	211°11.6	7.1'	11°49.7	13.5'	61.2'
3 4	228°06.7 243°06.9	• • 57.4 58.4	225°37.7 240°03.8	7.0' 7.0'	12°03.2 12°16.6	13.4' 13.3'	61.2' 61.2'
5	258°07.0	05°59.3	254° 29.7	6.9	12° 29.9	13.2'	61.2
6	273°07.2	S06°00.3	268°55.6	6.8'	S12°43.2	13.2'	61.2'
7	288°07.4	01.2	283°21.5	6.8'	12°56.3	13.1'	61.2'
8	303°07.6	02.2	297°47.2	6.7'	13°09.4	13.0'	61.2'
9	318°07.7	• • 03.1	312°12.9	6.6'	13°22.4	12.9'	61.2'
10	333°07.9	04.1	326°38.6	6.6'	13°35.3	12.8'	61.2'
11	348°08.1	05.0	341°04.1	6.5'	13°48.1	12.7'	61.2'
12	3°08.2	S06°06.0	355°29.7	6.4'	\$14°00.8	12.6'	61.2'
13	18°08.4 33°08.6	06.9	9°55.1 24°20.5	6.4' 6.3'	14°13.4 14°25.9	12.5' 12.4'	61.2' 61.2'
14 15	48°08.8	07.9 •• 08.8	24 20.5 38°45.8	6.2'	14 25.9 14°38.4	12.4	61.2
16	63°08.9	09.8	53°11.0	6.2	14°50.7	12.2'	61.2
17	78°09.1	10.7	67°36.2	6.1	15°02.9	12.1'	61.2'
18	93°09.3	\$06°11.7	82°01.3	6.0'	S15°15.0	12.0'	61.2'
19	108°09.4	12.6	96°26.3		15°27.0	11.9'	61.2'
20	123°09.6	13.6	110°51.3	5.9'	15°39.0	11.8'	61.2'
21	138°09.8	• • 14.5	125°16.2	5.8'	15°50.8	11.7'	61.2'
22	153°10.0	15.5	139°41.0	5.8'	16°02.4	11.6'	61.2'
23	168°10.1	16.4	154°05.8	5.7'	16°14.0	11.5'	61.2'
	SD = 16.0'	d = 1.0'		SI	D = 16.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	183°10.3	S06°17.4	168°30.5	5.6'	\$16°25.5	11.3'	61.2
1	198°10.5	18.3	182°55.1	5.6'	16°36.8	11.2'	61.2'
2	213°10.6	19.3	$197^{\circ}19.7$	5.5'	16°48.0	11.1'	61.2'
3	228°10.8	• • 20.2	211°44.2	5.5'	16°59.2	11.0'	61.1'
4	243°11.0	21.2	226°08.7	5.4'	$17^{\circ}10.1$	10.9'	61.1'
5	258°11.1	22.1	240°33.1	5.3'	17°21.0	10.7'	61.1'
6	273°11.3	S06°23.1	254°57.4	5.3'	\$17°31.7	10.6'	61.1'
7	288°11.5	24.0	269°21.7	5.2'	17°42.3	10.5	61.1'
8 9	303°11.7 318°11.8	25.0 •• 25.9	283°45.9 298°10.1	5.2' 5.1'	17°52.8 18°03.2	10.4' 10.2'	61.1' 61.1'
10	333°12.0	26.9	312°34.2	5.0'	18°13.4	10.2	61.1
11	333 12.0 348°12.2	26.9 27.8	312 34.2 326°58.2	5.0'	18 13.4 18°23.5	10.1	61.1
12	3°12.3	S06°28.8	341°22.2	4.9'	\$18°33.5	9.8'	61.0
13	18°12.5	29.7	355°46.1	4.9'	18°43.3	9.7'	61.0'
14	33°12.7	30.7	$10^{\circ}10.0$	4.8'	18°53.0	9.5'	61.0'
15	48°12.8	• • 31.6	24°33.8	4.8'	19°02.5	9.4'	61.0'
16	63°13.0	32.6	38°57.6	4.7'	19°11.9	9.3'	61.0'
17	78°13.2	33.5	53°21.3	4.7'	19°21.2	9.1'	61.0'
18 19	93°13.3 108°13.5	S06°34.5 35.4	67°45.0 82°08.6	4.6' 4.6'	\$19°30.3 19°39.3	9.0' 8.8'	61.0' 60.9'
20	108°13.5 123°13.7	35.4 36.3	96°32.2	4.6 4.5'	19°39.3 19°48.1	8.8	60.9
21	138°13.8	37.3	90° 52.2 110° 55.7	4.5'	19°56.8	8.5'	60.9
22	153°14.0	38.2	125°19.2	4.4'	20°05.4	8.4'	60.9
23	168°14.2	39.2	139°42.6	4.4'	20°13.7	8.2'	60.9'
	SD = 16.0'	d = 0.9'		SI	D = 16.7'		

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

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

		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%
07	12:08	12:16	11:48	11:23	23:50	
80	12:25	12:33	11:47	12:19	-:-	
09	12:41	12:49	11:47	13:18	00:48	

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

Victor Collision Collisi	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
19	Wod.	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1 1970 1970 1970 1970 1970 1970 1970 197													
2 49°861 188728											Alpheratz		
3 6*7006 133*255 · 3.56 1775*58 · 299 217*342 · 4.06 11*414 · 34.2											l .		
1													
10 10 10 10 10 10 10 10	4	79°03.1		36.3			227°36.1	40.8	26°46.0				
19 19 19 19 19 19 19 19	5	94°05.5	213°27.8	37.0	203°56.9	27.4	242°38.1	41.0	41°48.6	24.2			
15 15 15 15 15 15 15 15	6	109°08.0	228°27.4	\$23°37.7	218°57.4	\$23°27.7	257°40.0	S11°41.2	56°51.2	N16°24.1	l .		
19 19 19 19 19 19 19 19	7	$124^{\circ}10.5$	243°27.0	38.3	233°58.0	27.9	272°42.0	41.4	71°53.8	24.1			
1	8		$258^{\circ}26.6$	39.0	248°58.5	28.2	287°43.9	41.5	86° 56.4	24.0			
11 10 10 10 20 20 20 20	9			• • 39.7	263°59.0	• • 28.5		• • 41.7		• • 24.0			
13													
14 2007.73 34879.43 349.00 309.00 32.50 347.24 347.42 347													
16 229°277. 346°443 4.0 a. 33°10.7 c. 77. 77.56 d. 42.6 l. 177°12.0 2.18 l. 16. 226°27.0 3°23.0 4.16 586°22.2 30.0 a. 277.56 c. 42.3 l. 10°14.6 c. 32.18 l. 10°14.6 c.													
16 289*226 18*233 443 9*228 30.2 47*596 43.0 20*7172 2.328 Betigenes 28*31.6 40*31.7 130*31.8 12*31.6 4.2 130*31.7 130*31.8 12													
16 299°326 180°227											Elnath	$277^{\circ}56.9$	28°37.8
18											Alnilam	275°33.7	
289 2976 6 367227 52746 39°038 528°30.7 78°035 511°43.4 237°22.4 N16°23.7 Cappell 20 30°40.0 63°223 463 54°04.4 30.9 09°06.4 31.4 120°03 43.9 26°203 23.5 25°08.8 Part 20 21 334°45.0 05°21.2 46.9 09°06.4 31.4 120°03 43.9 26°203 23.5 25°08.8 Part 20 21 334°45.0 05°21.2 46.9 09°06.3 13.1 120°10.4 43.9 120°20.5 23.5 Aver 20 21 340°45.2 10°20.2 46.9 09°06.3 13.1 120°10.4 43.9 120°20.5 23.5 Aver 20 21 21°20.2 46.9 09°06.3 13.1 120°10.4 43.9 120°20.5 23.5 Aver 20 21°20.5 Aver 20 2											_		
19													
29 319°425 67219 469 69°69 912 121 088°07.4 43.7 26°727.7 22.6 Adapta 221 34°65.0 85°21.6 47.6 81°65.4 31.4 129°03 43.9 222°33.0 235 Avio 23°12.2 23°34 43°47.4 100°52 31.7 138°11.3 441 20°73.0 235°12.5 Avio 23°13.2 29°36.1 Avio 23°13.2 29°36.1 Avio 23°13.2 23°5.4 Avio 23°13.2 29°36.1 Avio 23°13.2 23°5.4 Avio 23°13.2 29°36.1 Avio 23°13.2 29°36.											l .		
22 384°450 9 122°08 48.9 972.16 · 476 84°05.4 · 31.4 123°03.3 · 23.5 8 4°409 122°08 48.9 114°06.5 · 31.9 138°11.3 · 44.1 297°29.2 23.5 Mer. pass. 2241											II.		
23		334°45.0							282°30.3		1		
Mer.pass. 224 12*20 8 489 114*06 5 310 139*11.2 443 312*30.5 227*36 43*33.0 43*36 43*33.0 43*36 43		349°47.4	108°21.2	48.3			138°11.3	44.1	297°32.9				1
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17 276°33.4 33°04.4 15.5 24°28.5 41.9 64°35.1 52.0 224°25.1 21.8 Mars 108°28.1 15:22 18 291°35.9 48°04.0 \$24°16.2 39°29.0 \$23°42.1 79°37.0 \$\$11°52.2 239°27.7 \$\$N16°21.7 \$\$Jupiter \$\$148°10.5 12:42 19 306°38.3 63°03.6 16.8 54°29.5 42.4 94°39.0 52.4 254°30.3 21.7 \$\$Saturn 307°49.2 02:05 20 321°40.8 78°03.3 17.4 69°30.0 42.6 109°40.9 52.6 269°32.9 21.6 21.6 43.3 43.1 139°44.8 53.0 299°38.2 21.6 21.6 43.3 43.1 139°44.8 53.0 299°38.2 21.6 21.6 Venus: 0.2 23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Mars: 0.1													
18 291°35.9 48°04.0 \$24°16.2 39°29.0 \$23°42.1 79°37.0 \$11°52.2 239°27.7 N16°21.7 19 306°38.3 63°03.6 16.8 54°29.5 42.4 94°39.0 52.4 254°30.3 21.7 20 321°40.8 78°03.3 17.4 69°30.0 42.6 109°40.9 52.6 269°32.9 21.6 21 336°43.2 93°02.9 · 18.0 84°30.5 · 42.8 124°42.9 · 52.8 284°35.6 · 21.6 22 351°45.7 108°02.5 18.6 99°31.1 43.1 139°44.8 53.0 299°38.2 21.6 23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Jupiter 148°10.5 12:42													
20 321°40.8 78°03.3 17.4 69°30.0 42.6 109°40.9 52.6 269°32.9 21.6 21 336°43.2 93°02.9 · · 18.0 84°30.5 · · 42.8 124°42.9 · · 52.8 284°35.6 · · 21.6 22 351°45.7 108°02.5 18.6 99°31.1 43.1 139°44.8 53.0 299°38.2 21.6 23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Horizontal parallax Venus: 0.2 Mars: 0.1											Jupiter	$148^{\circ}10.5$	12:42
21 336°43.2 93°02.9 · · 18.0 84°30.5 · · 42.8 124°42.9 · · 52.8 284°35.6 · · 21.6 Horizontal parallax 22 351°45.7 108°02.5 18.6 99°31.1 43.1 139°44.8 53.0 299°38.2 21.6 Venus: 0.2 23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Mars: 0.1											Saturn	307°49.2	02:05
22 351°45.7 108°02.5 18.6 99°31.1 43.1 139°44.8 53.0 299°38.2 21.6 Venus: 0.2 23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Mars: 0.1											Horizont	al narallar	
23 6°48.2 123°02.1 19.2 114°31.6 43.3 154°46.8 53.1 314°40.8 21.5 Mars: 0.1											HORIZONI	•	0.2
25 0 10.2 12.5 02.1 15.2 111 51.0 15.5 15 1 10.0 55.1 51 10.0 21.5													
Mer.pass. 22:33 ν -0.4' d 0.6' m-4.34 ν 0.5' d 0.2' m1.02 ν 1.9' d 0.2' m-1.69 ν 2.6' d -0.0' m-0.11													7.2
	Mer.p	ass. 22:33	ν -0.4′ d0	.6′ m-4.34	ν 0.5′ d0.	.2′ m1.02	ν 1.9′ d0.	2′ m-1.69	ν 2.6′ d-0	.0′ m-0.11			

		+0.1303 sec	Moon							
h	Sui	1			Moon					
Wed	GHA	Dec	GHA	ν	Dec	d	HP			
0	183°14.3	S06°40.1	154°06.0 168°29.3	4.3'	\$20°22.0	8.1'	60.8'			
1 2	198° 14.5 213° 14.7	41.1 42.0	168° 29.3 182° 52.7	4.3' 4.3'	20°30.1 20°38.0	7.9' 7.8'	60.8' 60.8'			
3	228° 14.8	• • 43.0	197° 15.9	4.2'	20° 45.8	7.6'	60.8			
4	243°15.0	43.9	211°39.2	4.2'	20°53.4	7.5'	60.8'			
5	258° 15.2	44.9	226°02.4	4.2'	21°00.9	7.3'	60.7'			
6	273°15.3	S06°45.8	240°25.5	4.1'	\$21°08.2	7.2'	60.7'			
7 8	288° 15.5 303° 15.7	46.8 47.7	254°48.6 269°11.7	4.1' 4.1'	21°15.4 21°22.4	7.0' 6.8'	60.7' 60.7'			
9	318° 15.8	• • 48.6	283°34.8	4.0'	21°29.2	6.7	60.7			
10	333°16.0	49.6	297°57.8	4.0'	21°35.9	6.5'	60.6'			
11	348°16.1	50.5	$312^{\circ}20.8$	4.0'	21°42.4	6.4'	60.6'			
12	3°16.3	S06°51.5	326°43.8	4.0'	\$21°48.8	6.2'	60.6'			
13 14	18° 16.5 33° 16.6	52.4 53.4	341°06.8 355°29.7	3.9' 3.9'	21°55.0 22°01.0	6.0' 5.9'	60.6' 60.5'			
15	48° 16.8	• • 54.3	9°52.7	3.9'	22°06.9	5.7'	60.5			
16	63°17.0	55.3	24° 15.6	3.9'	22° 12.6	5.5'	60.5			
17	78° 17.1	56.2	38°38.4	3.9'	22° 18.2	5.4'	60.5'			
18	93°17.3	S06°57.1	53°01.3	3.9'	\$22°23.6	5.2'	60.4			
19	108° 17.4 123° 17.6	58.1 06°59.0	67°24.2 81°47.0	3.8' 3.8'	22°28.8 22°33.8	5.0' 4.9'	60.4'			
20 21	123 17.0 138° 17.8	06 59.0 07°00.0	96°09.9	3.8'	22°38.7	4.9 4.7'	60.4' 60.3'			
22	153° 17.9	00.9	110°32.7	3.8'	22°43.4	4.5'	60.3			
23	168° 18.1	01.9	124°55.5	3.8'	22°47.9	4.4'	60.3'			
	SD = 16.0'	d = 0.9'		SI	D = 16.6'					
	<u> </u>									
Thu	GHA	Dec	GHA	ν	Dec	d	HP			
0 1	183° 18.2 198° 18.4	\$07°02.8 03.7	139°18.4 153°41.2	3.8' 3.8'	\$22°52.3 22°56.5	4.2' 4.0'	60.3' 60.2'			
2	213° 18.6	04.7	168°04.0	3.8'	22° 00.6	3.9'	60.2			
3	228° 18.7	05.6	182°26.8	3.8'	23°04.4	3.7'	60.2			
4	243°18.9	06.6	$196^{\circ}49.7$	3.8'	23°08.1	3.5'	60.1'			
5	258° 19.1	07.5	211°12.5	3.8'	23°11.7	3.4'	60.1'			
6	273°19.2 288°19.4	S07°08.5 09.4	225°35.4 239°58.2	3.9' 3.9'	\$23°15.0 23°18.2	3.2' 3.0'	60.1' 60.1'			
7 8	288° 19.4 303° 19.5	10.3	239°58.2 254°21.1	3.9'	23° 18.2 23° 21.2	3.0 2.9'	60.0'			
9	318° 19.7	. 11.3	268°44.0	3.9'	23°24.1	2.7	60.0			
10	333° 19.8	12.2	283°06.9	3.9'	23°26.8	2.5'	60.0'			
11	348° 20.0	13.2	297°29.8	3.9'	23°29.3	2.3'	59.9'			
12	3°20.2 18°20.3	S07°14.1	311°52.7 326°15.7	4.0'	\$23°31.6	2.2'	59.9'			
13 14	33° 20.5	15.0 16.0	326° 15.7 340° 38.7	4.0' 4.0'	23°33.8 23°35.8	2.0' 1.8'	59.9' 59.8'			
15	48° 20.6	. 16.9	355°01.7	4.0'	23° 37.7	1.7'	59.8'			
16	63°20.8	17.9	9°24.7	4.1'	23°39.3	1.5'	59.8'			
17	78°21.0	18.8	23°47.8	4.1'	23°40.8	1.3'	59.7'			
18 19	93°21.1 108°21.3	\$07° 19.7 20.7	38°10.9 52°34.0	4.1' 4.2'	\$23°42.2 23°43.3	1.2' 1.0'	59.7' 59.7'			
20	108 21.3 123°21.4	20.7	52 34.0 66°57.2	4.2'	23 43.3 23°44.3	0.8'	59. <i>1</i> 59.6'			
21	138°21.6	22.6	81°20.4	4.3'	23° 45.2	0.7	59.6'			
22	153°21.7	23.5	95°43.7	4.3'	23°45.8	0.5'	59.6'			
23	168°21.9	24.4	110°07.0	4.3'	23°46.3	0.3'	59.5'			
	SD = 16.0'	d = 0.9'		SI	0 = 16.4'					
Fri	GHA	Dec	GHA	ν	Dec	d	HP			
0	183°22.0	S07°25.4	124°30.3	ν 4.4'	\$23°46.7	0.2	59.5'			
1	198°22.2	26.3	138°53.7	4.4'	23°46.9	0.0'	59.5'			
2	213°22.4	27.2	153° 17.1	4.5'	23°46.9	-0.2'	59.4'			
3	228° 22.5 243° 22.7	•• 28.2	167°40.6	4.5'	23°46.7 23°46.4	-0.3'	59.4'			
4 5	243°22.7 258°22.8	29.1 30.1	182°04.1 196°27.7	4.6' 4.6'	23°46.4 23°45.9	-0.5' -0.6'	59.4' 59.3'			
6	273°23.0	S07°31.0	210°51.3	4.7'	\$23°45.3	-0.8'	59.3'			
7	288°23.1	31.9	$225^{\circ}15.0$	4.7'	23°44.5	-1.0'	59.3'			
8	303°23.3	32.9	239°38.8	4.8'	23°43.5	-1.1'	59.2'			
9	318°23.4	• • 33.8	254°02.6	4.9'	23° 42.4	-1.3'	59.2'			
10 11	333°23.6 348°23.7	34.7 35.7	268°26.4 282°50.4	4.9' 5.0'	23°41.1 23°39.7	-1.4' -1.6'	59.1' 59.1'			
12	348 23.7 3°23.9	507°36.6	282 50.4 297°14.4	5.1'	23 39.7 \$23°38.1	-1.8'	59.1'			
13	18°24.1	37.6	$311^{\circ}38.4$	5.1'	23°36.3	-1.9'	59.0'			
14	33°24.2	38.5	326°02.5	5.2'	23°34.4	-2.1'	59.0'			
15	48°24.4	• • 39.4	340°26.7	5.3'	23° 32.3	-2.2'	59.0'			
16 17	63°24.5 78°24.7	40.4 41.3	354°51.0 9°15.3	5.3' 5.4'	23°30.1 23°27.8	-2.4' -2.5'	58.9' 58.9'			
18	78° 24.7 93° 24.8	41.3 \$07°42.2	9°15.3 23°39.7	5.4	23°27.8 \$23°25.2	-2.5' -2.7'	58.9'			
19	108° 25.0	43.2	38°04.2	5.6'	23°22.6	-2.8'	58.8'			
20	123°25.1	44.1	52°28.8	5.6'	23° 19.8	-3.0'	58.8'			
21	138°25.3	• • 45.0	66°53.4	5.7'	23°16.8	-3.1'	58.8'			
22 23	153°25.4 168°25.6	46.0 46.9	81°18.1 95°42.9	5.8' 5.9'	23°13.7 23°10.4	-3.3' -3.4'	58.7' 58.7'			
23			95 42.9			-3.4	50.1			
	SD = 16.0'	d = 0.9'		51	O = 16.2'					

Lat. Naut. Civil Sunrise Sunset Civ N 72° 04:38 05:57 07:06 16:25 17:3 N 70° 04:44 05:55 06:57 16:34 17:3 68° 04:49 05:53 06:50 16:42 17:3 66° 04:53 05:52 06:44 16:48 17:4 64° 04:56 05:51 06:38 16:53 17:4 62° 04:58 05:49 06:34 16:58 17:4 60° 05:00 05:48 06:30 17:02 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4 56° 05:04 05:45 06:21 17:12 17:4	18:52 36 18:47 38 18:42 40 18:39 41 18:36 43 18:34 44 18:32
N 70° 04:44 05:55 06:57 16:34 17:3 68° 04:49 05:53 06:50 16:42 17:3 66° 04:53 05:52 06:44 16:48 17:4 64° 04:56 05:51 06:38 16:53 17:4 62° 04:58 05:49 06:34 16:58 17:4 60° 05:00 05:48 06:27 17:06 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	36 18:47 38 18:42 40 18:39 41 18:36 43 18:34 44 18:32
68° 04:49 05:53 06:50 16:42 17:3 66° 04:53 05:52 06:44 16:48 17:4 64° 04:56 05:51 06:38 16:53 17:4 62° 04:58 05:49 06:34 16:58 17:4 60° 05:00 05:04 06:27 17:06 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	38 18:42 40 18:39 41 18:36 43 18:34 44 18:32
66° 04:53 05:52 06:44 16:48 17:4 64° 04:56 05:51 06:38 16:53 17:4 62° 04:58 05:49 06:34 16:58 17:4 60° 05:00 05:48 06:30 17:02 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	10 18:39 11 18:36 13 18:34 14 18:32
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	11 18:36 13 18:34 14 18:32
62° 04:58 05:49 06:34 16:58 17:4 60° 05:00 05:48 06:30 17:02 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	13 18:34 14 18:32
60° 05:00 05:48 06:30 17:02 17:4 N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	14 18:32
N 58° 05:02 05:47 06:27 17:06 17:4 56° 05:03 05:46 06:23 17:09 17:4	
56° 05:03 05:46 06:23 17:09 17:4	15 18:30
540 05.04 05.45 06.21 17.12 17.4	16 18:29
34 05.04 05.45 00.21 17.12 17.4	17 18:28
52° 05:05 05:44 06:18 17:14 17:4	18:27
50° 05:06 05:43 06:16 17:17 17:4	19 18:26
45° 05:07 05:41 06:11 17:22 17:5	18:25
N 40° 05:08 05:39 06:06 17:26 17:5	3 18:25
35° 05:08 05:37 06:03 17:30 17:5	55 18:25
30° 05:08 05:35 05:59 17:33 17:5	7 18:25
20° 05:06 05:31 05:54 17:39 18:0	2 18:27
N 10° 05:03 05:27 05:48 17:45 18:0	06 18:30
0° 04:58 05:23 05:43 17:50 18:1	18:35
S 10° 04:52 05:17 05:38 17:55 18:1	18:41
20° 04:44 05:10 05:33 18:01 18:2	23 18:49
30° 04:34 05:02 05:26 18:08 18:3	
35° 04:26 04:57 05:23 18:11 18:3	37 19:08
40° 04:18 04:51 05:18 18:16 18:4	13 19:16
45° 04:07 04:43 05:13 18:21 18:5	51 19:27
S 50° 03:53 04:34 05:07 18:27 19:0	
52° 03:47 04:29 05:04 18:30 19:0)5 19:48
54° 03:39 04:25 05:01 18:33 19:1	19:56
56° 03:31 04:19 04:58 18:37 19:1	16 20:05
58° 03:21 04:13 04:54 18:41 19:2	
S 60° 03:09 04:06 04:50 18:45 19:3	30 20:27

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

		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	7-24%		
10	12:57	13:05	11:47	14:19	01:48			
11	13:13	13:21	11:47	15:21	02:50			
12	13:28	13:36	11:46	16:21	03:51			

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

Section Sect	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
27 17:06 1881017 Set 198 12953 Set 45 109487 Set 1981 Set 2981	Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
1													00045.6
2													
3 6°850 183°05 · 216 1778 50 · 44.2 2178 10 · 55.9 16°12 · 213 3													
29 1975 1987 19													
5 1170 2275 2275 2375 2475 2476 2570 2475 2475 2476 2570 2475 24													
12 12 12 13 13 13 13 13													
7 127 079 342 500 240 243 527 451 275 024 543 300 43 548 75 010 7 211 6 Market 31 100 41 12 100 41 12 100 41 12 100 41 12 100 41 12 100 41 12 11 12 11 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 17 12 12 12 12 12 12 12 12 12 12 12 12 12											Hamal		
18											Polaris	311°27.4	
9 1571218 277522 2 252 244136 7 455 3050063 552 101095 211.											Acamar	315°08.6	-40°10.9
10 172715-3 28757-8 28-8 29-8 290-372 4-98 300-982 5-92 100-199 2-11 46-20-20											Menkar	314°01.8	4°12.5
11 1877 17 17 17 17 17 1											Mirfak	308°22.2	49°57.9
13 210° 210 317° 50 32° 50 30° 33 32° 40 30° 31 31° 40° 21 30° 50											Aldebaran	290°35.0	$16^{\circ}34.1$
Cape Cape											Rigel	281°00.0	-8°10.0
14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1												280°16.0	46°01.4
14													
19													
18 200730. 277-38. 378-39. 30. 37-40. 37-40. 37-40. 37-40. 38-40													
1.5													
19											_		
Adhus 250 22 30 30 30 30 30 30 3	18	292°35.0	47°54.7	S24°30.6	39°41.3	S23°47.5	80°23.8	S11°56.6	240°30.5	N16°20.7			
32 32 39 4 69 30 53 35 33 3	19	307°37.5	62°54.3	31.2	54°41.8	47.8	95°25.7	56.8	255°33.1	20.7			
23 35°44.2 10°53.3 1.32.8 844.29 18.2 12°24.6 57.4 30°90.5 20.6 Polius 24°31.2 2°25.7 20°50.5 Male 22°31.2 2°25.7 20°50.5 Male 22°31.2 2°35.8 114°4.5 9 6.6 116°51.6 51.3 114°4.5 9 6.6 116°51.6 116°51.6 51.3 114°4.5 9 6.6 116°51.	20	322°39.9	77°53.9	31.8		48.0	$110^{\circ}27.7$	57.0	270°35.7	20.6			
23 23 7473 122° 927 335 114° 149 848 365° 335 576 315° 435 205 366 366 205 366 366 205 366	21	337°42.4	92°53.5	• • 32.3		• • 48.2	125°29.6	• • 57.2	285°38.3	• • 20.6			
Mer.pass. 22:29	22	352°44.9	107°53.1	32.9		48.4	140°31.6	57.4	300°40.9				
Series CHA													
Sum CHA CHA CHA CHA Dec CHA De						_							
Sun GHA GHA Dec GHA Dec GHA Dec GHA Dec Dubbh 379-30.8 11-40.2	Mer.p	ass. 22:29	ν -0.4′ d0.	.o′ m-4.35	ν 0.5′ d0.	.2′ m1.02	$\nu_{1.9'} d0.$	∠′ m-1.69	ν 2.6′ d-0	.u′ m-0.12			
Sun GHA Dec GHA De													
22 - 1 - 2 - 2 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3	Sun	GHA	GHΔ	Dec	GH∆	Dec	GH∆	Dec	GH∆	Dec	_		
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2 52°547, 10°7515, 353, 159°454, 493, 200°394, 581, 0°514, 204, 468°693, 20°395, 36°518, 20°394, 581, 0°514, 204, 482°596, 10°7908, 364, 189°464, 497, 23°396, 23°3452, 587, 387, 387, 387, 387, 387, 387, 387, 3													
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8 143°070 242°496 38.2 244°8.6 50.6 200°81.0 59.2 91°07.1 20.1 Hadia H8°31.0 -60°31.0 91.0 173°14.0 20.1 Hadia H8°31.0 -60°31.0 91.0 173°14.0 20.1 Hadia H8°31.0 -60°31.0 91.0 173°14.0 20.1 Hadia H8°31.0 -60°31.0 Hadia H8°31.0 -60°31.0 Hadia H8°31.0 -60°31.0 Hadia H8°31.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0											Spica	158°18.6	-11°18.9
8 143°90,5 257°49,2 38.7 249°48,5 50.6 290°51,0 59.2 91°07,1 20.1 Minelent 147°33,4 30°33,0 10 173°14,4 287°48,4 39.9 279°49,5 51.0 320°54,9 59.6 121°12,4 20.1 Netherlan 147°33,4 30°30,1 1188°16,9 300°48,0 40.5 294°50,0 51.2 335°59,9 11°98,8 136°15,0 20.0 Netherlan 147°33,4 31°10,1 128°15,0 1188°16,9 300°48,0 40.5 294°50,0 51.2 335°59,9 11°98,8 136°15,0 20.0 Netherlan 147°33,4 30°30,1 128°21,3 32°47,3 41.6 300°50,5 523°51,4 350°58,8 512°00,0 151°07,6 N16°20,0 Netherlan 147°31,5 40°30,1 128°47,3 41.6 324°51,0 51.7 6°00,8 00.1 166°20,2 19.9 N16°19,4 128°21,1 16°08,4 137°21,3 74°02,1 140°4,4 14											Alkaid	152°49.6	49°09.9
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14 233°24.3 347°46.9 42.2 389°51.5 1.9 21°02.7 0.0.3 181°22.8 19.9 15 248°26.7 2°46.5 42.7 384°52.0 · 52.1 36°04.7 · 0.0.5 196°25.4 · 1.9.8 16 263°29.2 17°46.1 43.3 9°52.5 52.3 51°06.6 0.0.7 211°28.1 19.8 17 278°31.7 32°45.7 43.9 24°53.0 52.5 66°08.5 0.0.9 22°9.07 19.8 18 293°34.1 4°45.3 524°44.4 39°53.5 523°52.7 81°10.5 \$12°01.1 241°33.3 N16°19.7 19 308°36.6 62°4.9 45.0 545°4.0 52.9 96°12.4 0.1.2 25°53.5 19.6 20 323°39.1 77°44.5 45.6 69°54.5 53.1 111°14.4 01.4 271°38.5 19.6 21 338°41.5 92°44.1 · 46.1 84°55.0 · 53.3 126°16.3 01.6 286°4.1 2 · 19.6 22 353°34.0 107°43.7 46.7 99°55.5 53.6 141°18.3 01.8 301°43.8 19.6 22 353°44.0 107°43.7 46.7 99°55.5 53.6 141°18.3 01.8 301°43.8 19.6 23 8°46.5 122°43.4 47.3 114°56.0 53.8 156°20.2 02.0 316°46.4 19.5 23 8°46.5 122°43.4 47.3 114°56.0 53.8 156°20.2 02.0 316°46.4 19.5 24 878°51.4 152°42.6 48.4 144°57.0 54.2 186°24.1 02.3 346°51.6 19.4 25 35°3.8 16°2.2 48.4 186°46.7 147°5.1 17°2.2 110°2.5 1°64.3 19.4 36 88°56.3 122°41.8 · 49.5 174°58.1 · 54.6 216°28.0 · 0.0.7 16°56.9 · 19.3 4 83°58.8 197°41.4 50.0 188°58.6 54.8 231°30.0 02.9 31°56.9 · 19.3 4 83°58.8 197°41.4 50.0 188°58.6 54.8 231°30.0 02.9 31°56.9 · 19.3 5 99°01.2 212°41.0 50.6 204°59.1 550. 246°31.9 03.1 47°02.1 19.3 5 144°03.7 227°40.6 524°51.2 235°00.1 55.4 201°26.1 0.5 11°20.2 19.3 6 114°03.7 227°40.6 524°51.2 35°00.1 55.4 21°37.7 03.6 92°10.0 19.1 9 159°11.1 272°39.5 · 52.8 265°01.1 55.8 306°39.7 · 0.8 10°12.6 · 19.1 10 174°13.6 287°39.1 53.4 280°10.6 56.0 321°41.6 0.4 0 122°15.2 19.0 11 189°16.0 302°38.7 53.9 295°02.1 56.0 332°43.1 50.7 0.4 50.5 11°22.1 19.3 12 204°18.5 317°38.3 \$24°54.5 310°02.6 523°55.5 315°45.5 \$12°04.4 152°05.5 116°19.0 11 249°25.9 2°37.1 · 56.1 355°04.1 · 57.1 36°51.3 · 04.9 197°28.3 18.8 15 246°25.9 2°37.1 · 56.1 355°04.1 · 57.1 36°51.3 · 04.9 197°28.3 18.8 16 246°25.9 2°37.1 · 56.6 136°06.6 58.1 112°01.0 6.2 27°38.8 18.7 18 249°25.9 2°37.1 · 56.6 136°06.6 58.7 112°01.0 6.2 27°35.8 18.7 18 249°25.9 2°37.1 · 56.1 355°04.1 · 57.1 36°55.2 06	13	218°21.8	332°47.3	41.6	324°51.0	51.7	6°00.8	00.1	166°20.2	19.9			
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15													
16 264°28.3 17°36.7 56.6 10°04.6 57.3 51°53.3 05.1 212°31.0 18.8 Venus 113°54.1 14:50 17 279°30.8 32°36.4 57.2 25°05.1 57.5 66°55.2 05.3 227°33.6 18.7 Mars 106°07.6 15:20 18 294°33.3 47°36.0 \$24°57.7 40°05.6 \$23°57.7 81°57.2 \$12°05.5 242°36.2 N16°18.7 Jupiter 147°33.2 12:33 19 309°35.7 62°35.6 58.3 55°06.1 57.9 96°59.1 05.6 257°38.8 18.7 Saturn 308°00.1 01:52 20 324°38.2 77°35.2 58.8 70°06.6 58.1 112°01.1 05.8 272°41.5 18.6 6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 127°03.0 · 06.0 287°44.1 · 18.6 18.6 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 Mars: 0.1 23	14			55.5	340°03.6	56.9	21°49.4	04.7		18.9	Jatuin	501 30.4	01.31
16 264°28.3 17°36.7 56.6 10°04.6 57.3 51°53.3 05.1 212°31.0 18.8 Venus 113°54.1 14:50 17 279°30.8 32°36.4 57.2 25°05.1 57.5 66°55.2 05.3 227°33.6 18.7 Mars 106°07.6 15:20 18 294°33.3 47°36.0 S24°57.7 40°05.6 S23°57.7 81°57.2 S12°05.5 242°36.2 N16°18.7 Jupiter 147°33.2 12:33 19 309°35.7 62°35.6 58.3 55°06.1 57.9 96°59.1 05.6 257°38.8 18.7 20 324°38.2 77°35.2 58.8 70°06.6 58.1 112°01.1 05.8 272°41.5 18.6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 127°03.0 · 06.0 287°44.1 · 18.6 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9	15			•• 56.1		•• 57.1	36°51.3	• • 04.9		• • 18.8	Oct 15 Mon	SHA	Mer.pass
17 279°30.8 32°36.4 57.2 25°05.1 57.5 66°55.2 05.3 227°33.6 18.7 Mars 106°07.6 15:20 18 294°33.3 47°36.0 \$24°57.7 40°05.6 \$23°57.7 81°57.2 \$12°05.5 242°36.2 N16°18.7 Jupiter 147°33.2 12:33 19 309°35.7 62°35.6 58.3 55°06.1 57.9 96°59.1 05.6 257°38.8 18.7 20 324°38.2 77°35.2 58.8 70°06.6 58.1 112°01.1 05.8 272°41.5 18.6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 127°03.0 · 06.0 287°44.1 · 18.6 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5		264°28.3	17°36.7	56.6	10°04.6	57.3	51°53.3	05.1	212°31.0				
18 294°33.3 47°36.0 \$24°57.7 40°05.6 \$23°57.7 81°57.2 \$12°05.5 242°36.2 \$N16°18.7 \$Jupiter 147°33.2 \$12:33 19 309°35.7 62°35.6 58.3 55°06.1 57.9 96°59.1 05.6 257°38.8 18.7 20 324°38.2 77°35.2 58.8 70°06.6 58.1 \$12°01.1 05.8 272°41.5 18.6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 \$127°03.0 · 06.0 287°44.1 · 18.6 22 354°43.1 \$107°34.4 24°59.9 \$100°07.6 58.5 \$142°05.0 06.2 302°46.7 18.5 23 9°45.6 \$122°34.0 25°00.4 \$115°08.0 58.7 \$157°06.9 06.4 317°49.3 18.5													
19 309°35.7 62°35.6 58.3 55°06.1 57.9 96°59.1 05.6 257°38.8 18.7 20 324°38.2 77°35.2 58.8 70°06.6 58.1 112°01.1 05.8 272°41.5 18.6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 127°03.0 · 06.0 287°44.1 · 18.6 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5 Mars: 0.1		294°33.3											
20 324°38.2 77°35.2 58.8 70°06.6 58.1 112°01.1 05.8 272°41.5 18.6 21 339°40.7 92°34.8 · 59.3 85°07.1 · 58.3 127°03.0 · 06.0 287°44.1 · 18.6 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5 Mars: 0.1													
21 339°40.7 92°34.8 · · 59.3 85°07.1 · · 58.3 127°03.0 · · 06.0 287°44.1 · · 18.6 Horizontal parallax 22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 Venus: 0.2 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5 Mars: 0.1													01.02
22 354°43.1 107°34.4 24°59.9 100°07.6 58.5 142°05.0 06.2 302°46.7 18.5 Venus: 0.2 23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5 Mars: 0.1											Horizont	al parallax	
23 9°45.6 122°34.0 25°00.4 115°08.0 58.7 157°06.9 06.4 317°49.3 18.5 Mars: 0.1												-	0.2
25 5 15.0 122 51.0 25 50.1 125 50.0 50.1 25 60.5 50.1													
Mer.pass. 22:21 ν -0.4′ d 0.6′ m-4.37 ν 0.5′ d 0.2′ m1.02 ν 1.9′ d 0.2′ m-1.69 ν 2.6′ d -0.0′ m-0.13													
	Mer.p	ass. 22:21	ν -0.4′ d0.	.6′ m-4.37	ν 0.5′ d0.	.2′ m1.02	$\nu 1.9' \ d0.$	2′ m-1.69	ν 2.6′ d-0	.0′ m-0.13			

h	Sui	า			Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP		
0	183°25.7	507°47.8	110°07.7	5.9'	S23°07.0	-3.5'	58.6'		
1	198°25.9	48.8	124°32.7	6.0'	23°03.5	-3.7'	58.6'		
2	213°26.0	49.7	138°57.7	6.1'	22°59.8	-3.8'	58.6'		
3	228°26.2	• • 50.6	153°22.8	6.2'	22°56.0	-4.0'	58.5'		
4	243°26.3 258°26.5	51.6 52.5	167°48.0 182°13.3	6.3' 6.4'	22°52.0 22°47.9	-4.1' -4.2'	58.5'		
5 6	258 20.5 273°26.6	52.5 \$07°53.4	182 13.3 196°38.7	6.5	522°43.6	-4.2 -4.4'	58.5' 58.4'		
7	288°26.8	54.4	211°04.1	6.5	22°39.2	-4.5'	58.4'		
8	303°26.9	55.3	225°29.7	6.6'	22°34.7	-4.7'	58.3'		
9	318°27.1	• • 56.2	239°55.3	6.7'	22°30.1	-4.8'	58.3'		
10	333°27.2	57.2	254°21.0	6.8'	22°25.3	-4.9'	58.3'		
11	348°27.4	58.1	268°46.8	6.9'	22°20.4	-5.1'	58.2'		
12	3°27.5 18°27.7	\$07°59.0 08°00.0	283°12.7	7.0' 7.1'	\$22°15.3 22°10.1	-5.2' -5.3'	58.2' 58.2'		
13 14	33°27.8	00.0	297°38.7 312°04.8	7.1 7.2'	22°10.1 22°04.8	-5.3° -5.4'	58.2 58.1'		
15	48°28.0	01.8	326°31.0	7.3	21°59.4	-5.6'	58.1		
16	63°28.1	02.8	340°57.3	7.4'	21°53.8	-5.7'	58.1'		
17	78°28.3	03.7	355°23.6	7.5'	21°48.1	-5.8'	58.0'		
18	93°28.4	508°04.6	9°50.1	7.6'	S21°42.3	-5.9'	58.0'		
19	108°28.5	05.5	24°16.6	7.6'	21°36.4	-6.1'	57.9'		
20	123°28.7	06.5	38°43.3	7.7'	21°30.3	-6.2'	57.9'		
21 22	138°28.8 153°29.0	· · 07.4 08.3	53°10.0 67°36.8	7.8' 7.9'	21°24.2 21°17.9	-6.3' -6.4'	57.9' 57.8'		
23	168°29.1	09.3	82°03.8	8.0'	21°11.5	-6.5'	57.8'		
						0.0			
	SD = 16.0'	d = 0.9'		51	O = 16.0'				
Sun	GHA	Dec	GHA	ν	Dec	d	HP		
0	183°29.3	S08°10.2	96°30.8	8.1' 8.2'	\$21°05.0	-6.6'	57.8'		
1 2	198°29.4 213°29.6	11.1 12.1	110°57.9 125°25.2	8.2	20°58.3 20°51.6	-6.7' -6.9'	57.7' 57.7'		
3	228°29.7	• • 13.0	139°52.5	8.4	20° 44.7	-7.0'	57.7'		
4	243°29.9	13.9	154°19.9	8.5'	20°37.7	-7.1	57.6'		
5	258°30.0	14.8	168°47.4	8.6'	20°30.7	-7.2'	57.6'		
6	273°30.1	S08°15.8	183°15.0	8.7'	\$20°23.5	-7.3	57.6'		
7	288°30.3 303°30.4	16.7	197°42.7 212°10.5	8.8' 8.9'	20°16.2 20°08.8	-7.4'	57.5'		
8 9	303°30.4 318°30.6	17.6 •• 18.6	212°10.5 226°38.4	8.9 9.0'	20°08.8 20°01.3	-7.5' -7.6'	57.5' 57.5'		
10	333°30.7	19.5	241°06.5	9.1'	19°53.7	-7.7'	57.4'		
11	348°30.9	20.4	255°34.6	9.2'	19°46.0	-7.8'	57.4		
12	3°31.0	508°21.3	270°02.7	9.3'	S19°38.2	-7.9'	57.3'		
13	18°31.1	22.3	284°31.0	9.4'	19°30.3	-8.0'	57.3'		
14	33°31.3 48°31.4	23.2	298°59.4 313°27.9	9.5'	19°22.3 19°14.2	-8.1'	57.3'		
15 16	48°31.4 63°31.6	25.0	313°27.9 327°56.5	9.6' 9.7'	19°14.2 19°06.0	-8.2' -8.3'	57.2' 57.2'		
17	78°31.7	26.0	342°25.2	9.8'	18° 57.7	-8.4	57.2		
18	93°31.9	508°26.9	356°54.0	9.9'	S18°49.4	-8.5'	57.1'		
19	108°32.0	27.8	11°22.8	10.0'	18°40.9	-8.6'	57.1'		
20	123°32.1	28.7	25°51.8	10.1'	18° 32.3	-8.6'	57.1'		
21	138°32.3 153°32.4	• • 29.7	40°20.8	10.2'	18°23.7	-8.7'	57.0'		
22 23	153°32.4 168°32.6	30.6 31.5	54°50.0 69°19.3	10.2' 10.3'	18° 15.0 18° 06.2	-8.8' -8.9'	57.0' 57.0'		
23	SD = 16.0'	d = 0.9'	09 19.5		D = 15.8'	-0.9	57.0		
				31					
Mon	GHA	Dec	GHA	ν	Dec	d	HP		
0 1	183°32.7 198°32.8	\$08°32.4 33.4	83°48.6 98°18.0	10.4' 10.5'	\$17°57.3 17°48.3	-9.0' -9.1'	56.9' 56.9'		
2	198°32.8 213°33.0	33.4 34.3	98° 18.0 112° 47.6	10.5'	17°48.3 17°39.2	-9.1' -9.1'	56.9'		
3	228°33.1	35.2	112 47.0 127°17.2	10.7	17°39.2	-9.1'	56.8		
4	243°33.3	36.1	141°46.9	10.8'	17°20.8	-9.3'	56.8'		
5	258°33.4	37.1	156°16.7	10.9'	17° 11.5	-9.4'	56.8'		
6	273°33.5	S08°38.0	170°46.6	11.0'	\$17°02.2	-9.5'	56.7'		
7 8	288°33.7 303°33.8	38.9 39.8	185°16.6 199°46.7	11.1' 11.2'	16°52.7 16°43.2	-9.5' -9.6'	56.7' 56.7'		
9	303°33.8 318°33.9	39.8 • • 40.7	199°46.7 214°16.8	11.2	16°43.2 16°33.6	-9.6° -9.7'	56.7' 56.7'		
10	333°34.1	41.7	214 10.8 228°47.1	11.3'	16° 23.9	-9.7'	56.6'		
11	348°34.2	42.6	243°17.4	11.4'	16°14.2	-9.8'	56.6'		
12	3°34.4	S08°43.5	257°47.9	11.5'	S16°04.3	-9.9'	56.6'		
13	18°34.5	44.4	272°18.4	11.6'	15°54.5	-10.0'	56.5'		
14 15	33°34.6 48°34.8	45.4 •• 46.3	286°49.0 301°19.7	11.7' 11.8'	15° 44.5 15° 34.5	-10.0' -10.1'	56.5' 56.5'		
16	48 34.8 63°34.9	47.2	301 19.7 315°50.4	11.8	15 34.5 15°24.4	-10.1 -10.1'	56.4'		
17	78°35.0	48.1	330°21.3	11.9'	15° 14.3	-10.1	56.4		
18	93°35.2	S08°49.0	344°52.2	12.0'	S 15°04.1	-10.3'	56.4'		
19	108°35.3	50.0	359°23.3	12.1'	14°53.8	-10.3'	56.3'		
20	123°35.4	50.9	13°54.4	12.2'	14° 43.4	-10.4'	56.3'		
21 22	138°35.6 153°35.7	· · 51.8 52.7	28°25.6 42°56.8	12.3' 12.3'	14°33.1 14°22.6	-10.4' -10.5'	56.3' 56.3'		
23	168°35.8	53.6	57°28.2	12.4	14° 12.1	-10.6'	56.2		
	SD = 16.0'	d = 0.9'			D = 15.5'		- -		

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

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

		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	34-56%		
13	13:43	13:50	11:46	17:19	04:51			
14	13:57	14:04	11:46	18:13	05:47			
15	14:11	14:17	11:46	19:03	06:38			

October 16, 17, 18 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	24°48.1	137°33.6	S25°01.0	130°08.5	\$23°58.9	172°08.8	S12°06.6	332°51.9	N16° 18.4			
1	39°50.5	152° 33.3	01.5	145°09.0	59.1	187°10.8	06.7	347° 54.6	18.4	Alpheratz	357°30.4	29°15.6
2	54°53.0	167°32.9	02.0	160°09.5	59.3	202°12.7	06.9	2°57.2	18.4	Ankaa	353°03.1	-42°08.5
3	69°55.5	182°32.5	02.6	175°10.0	• • 59.5	217°14.7	07.1	17°59.8	. 18.3	Schedar	349°25.9	56°42.3
4	84°57.9	197°32.1	03.1	190°10.5	59.7	232°16.6	07.3	33°02.4	18.3	Diphda	348°43.2	-17°49.2
5	100°00.4	212°31.7	03.6	205°11.0	23°59.9	247°18.6	07.5	48°05.1	18.2	Achernar	335°16.9	-57°05.0
6	115°02.8	227°31.3	S25°04.1	220°11.5	S24°00.1	262°20.5	S12°07.7	63°07.7	N16°18.2	Hamal	327°46.5	23°36.3
7	130°05.3	242°30.9	04.7	235°12.0	00.3	277°22.5	07.8	78° 10.3	18.1	Polaris	311°26.6	89°23.1
8	145°07.8	257° 30.5	05.2	250°12.5	00.5	292°24.4	08.0	93°12.9	18.1	Acamar	315°08.6	-40°11.0
9	160°10.2	272°30.2	• • 05.7	265°13.0	• • 00.6	307°26.3	• • 08.2	$108^{\circ}15.6$	• • 18.1	Menkar	314°01.8	4°12.5
10	175°12.7	$287^{\circ}29.8$	06.3	$280^{\circ}13.5$	8.00	322°28.3	08.4	123°18.2	18.0	Mirfak	308°22.2 290°35.0	49°57.9 16°34.1
11	190°15.2	302°29.4	06.8	295°14.0	01.0	337°30.2	08.6	138° 20.8	18.0	Aldebaran	290 35.0 281°00.0	-8°10.0
12	205°17.6	317°29.0	S25°07.3	310°14.5	S24°01.2	352°32.2	S12°08.8	153°23.4	N16°17.9	Rigel Capella	281 00.0 280°15.9	-8 10.0 46°01.4
13	220°20.1	332°28.6	07.8	325°15.0	01.4	7°34.1	08.9	$168^{\circ}26.1$	17.9	Bellatrix	278° 18.6	6°22.6
14	235°22.6	$347^{\circ}28.2$	08.3	$340^{\circ}15.5$	01.6	22°36.1	09.1	183°28.7	17.8	Elnath	277°56.8	28°37.8
15	250°25.0	2°27.8	• • 08.9	$355^{\circ}16.0$	• • 01.8	37°38.0	• • 09.3	198°31.3	• • 17.8	Alnilam	277 30.8 275°33.7	-1°11.0
16	265°27.5	$17^{\circ}27.5$	09.4	$10^{\circ}16.5$	02.0	52°40.0	09.5	213°33.9	17.8	Betelgeuse	270°47.8	7°24.7
17	280°29.9	32°27.1	09.9	25°17.0	02.2	67°41.9	09.7	228°36.6	17.7	Canopus	263°50.5	-52°42.5
18	295°32.4	47°26.7	\$25°10.4	40°17.5	S24°02.4	82°43.8	S 12°09.9	243°39.2	N16°17.7	Sirius	258°22.8	-16°45.4
19	310°34.9	62°26.3	10.9	55°17.9	02.6	97°45.8	10.0	258°41.8	17.6	Adhara	255°02.8	-29°00.6
20	325°37.3	77°25.9	11.5	70°18.4	02.8	112°47.7	10.2	273°44.4	17.6	Procyon	244°46.8	5°08.8
21	340°39.8	92°25.5	• • 12.0	85°18.9	• • 03.0	127°49.7	• • 10.4	288°47.1	• • 17.5	Pollux	243°12.7	27°57.0
22	355°42.3	107°25.1	12.5	100°19.4	03.2	142°51.6	10.6	303°49.7	17.5	Avior	234°13.2	-59°36.1
23	10°44.7	122°24.7	13.0	115°19.9	03.3	157°53.6	10.8	318°52.3	17.4	Suhail	222°43.6	-43°33.0
Mer.n	pass. 22:17	ν -0.4' d0	.5′ m-4.38	ν 0.5' d0	.2′ m1.03	ν 1.9 $^{\prime}$ d0	2′ m-1.68	$\nu 2.6' d-0$.0′ m-0.13	Miaplacidus	221°37.6	-69°50.2
										Alphard	217°44.1	-8°47.3
			_		_		_		_	Regulus	207°30.6	11°49.2
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.1	61°35.2
0	25°47.2	137°24.4	S25°13.5	130°20.4	S24°03.5	172°55.5	S12°11.0	333° 54.9	N16°17.4	Denebola	182°21.4	14°24.3
1	40°49.7	152°24.0	14.0	145°20.9	03.7	187°57.4	11.1	348° 57.6	17.4	Gienah	175°39.9	-17°42.4
2	55°52.1	167°23.6	14.5	160°21.4	03.9	202°59.4	11.3	4°00.2	17.3	Acrux	172°56.2	-63°15.8
3	70°54.6	182°23.2	• • 15.0	175°21.9	• • 04.1	218°01.3	• • 11.5	19°02.8	17.3	Gacrux	171°47.7	$-57^{\circ}16.7$
4	85°57.1	197°22.8	15.5	190°22.4	04.3	233°03.3	11.7	34°05.4	17.2	Alioth	166°10.4	55°47.8
5	100°59.5	212°22.4	16.1	205°22.9	04.5	248°05.2	11.9	49°08.1	17.2	Spica	$158^{\circ}18.6$	$-11^{\circ}18.9$
6	116°02.0	227° 22.1	S25°16.6	220°23.3	\$24°04.7	263°07.2	S12°12.1	64° 10.7	N16°17.1	Alkaid	152°49.6	49°09.9
7	131°04.4	242°21.7	17.1	235°23.8	04.9	278°09.1	12.2	79°13.3	17.1	Hadar	148°31.0	-60°31.0
8	146°06.9	257°21.3	17.6	250°24.3	05.0	293°11.0	12.4	94°16.0	17.1	Menkent	147°53.4	-36°30.9
9	161°09.4	272°20.9	• • 18.1	265°24.8	• • 05.2	308°13.0	• • 12.6	109° 18.6	• • 17.0	Arcturus	145°44.8	$19^{\circ}01.7$
10	176°11.8	287°20.5	18.6	280°25.3	05.4	323°14.9	12.8	124°21.2	17.0	Rigil Kent.	139°35.5	-60°57.5
11	191°14.3	302°20.1	19.1	295°25.8	05.6	338°16.9	13.0	139°23.8	16.9	Kochab	137°21.4	74°02.1
12	206°16.8	317° 19.7 332° 19.4	\$25°19.6	310°26.3	\$24°05.8	353°18.8	\$12°13.2	154°26.5	N16°16.9	Zuben'ubi	$136^{\circ}52.1$	$-16^{\circ}09.8$
13	221°19.2 236°21.7	332 19.4 347°19.0	20.1	325°26.8 340°27.3	06.0	8°20.8 23°22.7	13.3	169° 29.1 184° 31.7	16.8	Alphecca	$126^{\circ}00.9$	$26^{\circ}37.1$
14	250 21.7 251°24.2	2°18.6	20.6	355°27.7	06.2	38°24.6	13.5		16.8	Antares	$112^{\circ}11.4$	-26°29.8
15	251 24.2 266°26.6	2 18.6 17°18.2	• • 21.1	10°28.2	· · 06.3 06.5	58°26.6	13.7	199°34.4 214°37.0	· · 16.7	Atria	107°02.4	-69°04.9
16 17	281°29.1	32°17.8	21.6 22.1	25°28.7	06.7	68°28.5	13.9 14.1	214 37.0 229°39.6	16.7 16.7	Sabik	101°58.6	-15°45.5
18	296°31.6	47° 17.4	\$25°22.5	40°29.2		83°30.5	\$12°14.3	244°42.2	N16°16.6	Shaula	96°05.4	-37°07.4
19	311°34.0	62°17.1	23.0	55°29.7	07.1	98°32.4		259°44.9	16.6	Rasalhague	95°55.2	12°32.6
20	326°36.5	77° 16.7	23.5	70°30.2	07.1	113°34.4	14.4 14.6	274° 47.5	16.5	Eltanin	90°40.6	51°29.5
21	341°38.9	92°16.3	• • 24.0	85°30.7	07.4	128°36.3	• • 14.8	289°50.1	. 16.5	Kaus Aust.	83°27.6	-34°22.1
22	356°41.4	107° 15.9	24.5	100°31.1	07.4	143°38.2	15.0	304°52.7	16.4	Vega	80°30.7	38°49.1
23	11°43.9	122° 15.5	25.0	115°31.6	07.8	158°40.2	15.2	319°55.4	16.4	Nunki	75°43.1	-26°15.4
										Altair	61°56.2	8°57.2
Mer.p	bass. 22:13	ν -0.4' d0	.5′ m-4.39	ν 0.5′ d0	.2′ m1.03	$\nu 1.9' \ d0.$	2′ m-1.68	ν 2.6′ d-0	.0′ m-0.14	Peacock	52°59.7	-56°38.3
										Deneb	49°23.0	45°23.7
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.9	10°01.0
0	26°46.3	137° 15.2	\$25°25.5		\$24°08.0	173°42.1	S12°15.4	334°58.0	N16°16.3	Al Na'ir	27°28.0	-46°48.9
1	41°48.8	157° 13.2 152° 14.8	26.0	145°32.6	08.2	188°44.1	15.5	350°00.6	16.3	Fomalhaut	15°10.1	-29°27.7
2	56°51.3	167° 14.4	26.5	160°33.1	08.3	203°46.0	15.7	5°03.3	16.3	Scheat	13°41.1	28°15.0
3	71°53.7	182°14.0	26.9	175°33.6	08.5	218°48.0	•• 15.9	20°05.9	16.2	Markab	13°25.8	15°22.2
4	86°56.2	197°13.6	27.4	190°34.1	08.7	233°49.9	16.1	35°08.5	16.2	Oct 16 Tue	SHA	Mer.pass
5	101°58.7	212° 13.2	27.9	205°34.5	08.9	248°51.8	16.3	50°11.2	16.1	l .	112°45.6	14:50
6	117°01.1	227° 12.9	S25°28.4	220°35.0	S24°09.0	263°53.8	S12°16.5	65° 13.8	N16°16.1		105°20.5	15:19
7	132°03.6	242° 12.5	28.9	235°35.5	09.2	278°55.7	16.6	80° 16.4	16.0		147°20.8	12:30
8	147°06.0	257° 12.1	29.3	250°36.0	09.4	293°57.7	16.8	95° 19.0	16.0	Saturn	308°03.9	01:48
9	162°08.5	272° 11.7	• • 29.8	265°36.5	09.6	308°59.6	17.0	110°21.7	. 16.0			
10	177°11.0	287° 11.3	30.3	280°37.0	09.7	324°01.6	17.2	125°24.3	15.9	Oct 17 Wed	SHA	Mer.pass
11	192°13.4	302°11.0	30.8	295°37.4	09.9	339°03.5	17.4	140° 26.9	15.9		111°37.2	14:51
12	207°15.9	317° 10.6	S25°31.3	310°37.9	S24°10.1	354°05.4	S12°17.6	155° 29.6	N16°15.8		104°33.2	15:18
13	222°18.4	332° 10.2	31.7	325°38.4	10.3	9°07.4	17.7	170°32.2	15.8		147°08.3	12:27
14	237°20.8	347°09.8	32.2	340°38.9	10.4	24°09.3	17.9	185°34.8	15.7	Saturn	308°07.7	01:44
15	252°23.3	2°09.4	• • 32.7	355°39.4	· · 10.6	39°11.3	· · 18.1	200° 37.5	• • 15.7	Oct 18 Thu	SHA	Mer.pass
16	267°25.8	17°09.1	33.1	10°39.8	10.8	54°13.2	18.3	215°40.1	15.6		110°28.8	14:51
17	282°28.2	32°08.7	33.6	25°40.3	11.0	69°15.1	18.5	230° 42.7	15.6		103°45.8	15:17
18	297°30.7	47°08.3	\$25°34.1	40°40.8	\$24°11.1	84°17.1	S12°18.7	245° 45.4	N16°15.6		146°55.8	12:24
19	312°33.2	62°07.9	34.5	55°41.3	11.3	99°19.0	18.8	260°48.0	15.5	Saturn	308°11.7	01:40
20	327°35.6	77°07.5	35.0	70°41.8	11.5	114°21.0	19.0	275°50.6	15.5			
21	342°38.1	92°07.2	• • 35.5	85°42.3	• • 11.7	129°22.9	• • 19.2	290°53.2	• • 15.4	Horizont	al parallax	
22	357°40.5	107°06.8	35.9	$100^{\circ}42.7$	11.8	144°24.8	19.4	305°55.9	15.4		Venus:	0.2
23	12°43.0	122°06.4	36.4	115°43.2	12.0	159°26.8	19.6	320°58.5	15.3		Mars:	0.1
Mers	pass. 22:09	1/=0 A/ d0	.5′ m-4.40	νη Ε/ ΑΠ	.2′ m1.03	ν1 0/ dΩ	2′ m-1.68	u2 6/ d 0	.0′ m-0.14			
- viei.p		ν υ. ¬ uυ	.5 111-7.40	ν U.J UU		ν1.5 UU.		ν 2.0 u-0	.0 111-0.14			

h	Sui	า			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°36.0	508°54.6	71°59.6	12.5'	S 14°01.5	-10.6'	56.2'
1	198°36.1	55.5	86°31.1	12.6'	13°50.9	-10.7'	56.2'
2	213°36.2	56.4	101°02.7	12.7'	13°40.2	-10.7'	56.1'
3	228°36.4	• • 57.3	115°34.3	12.7'	13°29.5	-10.8'	56.1'
4	243°36.5	58.2	130°06.1	12.8'	13°18.7	-10.8'	56.1'
5	258° 36.6 273° 36.8	08°59.2 S09°00.1	144°37.9 159°09.8	12.9'	13°07.9 \$12°57.0	-10.9'	56.1'
6 7	273 36.8 288°36.9	01.0	159 09.8 173°41.7	13.0' 13.0'	12°46.1	-10.9' -11.0'	56.0' 56.0'
8	303°37.0	01.0	173 41.7 188°13.8	13.1'	12°35.1	-11.0'	56.0'
9	318° 37.2	. 02.8	202°45.8	13.2'	12°24.1	-11.1'	55.9'
10	333°37.3	03.7	217° 18.0	13.2'	12°13.0	-11.1'	55.9'
11	348°37.4	04.7	231°50.3	13.3'	12°01.9	-11.2'	55.9'
12	3°37.6	S09°05.6	246°22.6	13.4'	S11°50.8	-11.2'	55.9'
13	18°37.7	06.5	260°54.9	13.4'	11°39.6	-11.2'	55.8'
14	33°37.8	07.4	275°27.4	13.5'	11°28.3	-11.3'	55.8'
15	48°38.0	• • 08.3	289°59.9	13.6'	11°17.0	-11.3'	55.8'
16	63°38.1	09.2	304°32.5	13.6'	11°05.7	-11.4'	55.8'
17 18	78°38.2 93°38.4	10.1 S09°11.1	319°05.1 333°37.8	13.7' 13.8'	10°54.4 \$10°43.0	-11.4' -11.4'	55.7' 55.7'
19	108° 38.5	12.0	348°10.6	13.8'	10°31.5	-11.4	55.7'
20	123°38.6	12.9	2°43.4	13.9'	10° 20.0	-11.5'	55.7'
21	138°38.7	• • 13.8	17°16.3	13.9'	10°08.5	-11.5'	55.6'
22	153°38.9	14.7	31°49.2	14.0'	09°57.0	-11.6'	55.6'
23	168°39.0	15.6	46°22.2	14.1'	09°45.4	-11.6'	55.6'
	SD = 16.0'	d = 0.9'		SI	0 = 15.3'		
		<u>u = 0.5</u>			3 – 13.3		
Wed	GHA	Dec COO° 16 6	GHA	ν 141'	Dec	d 11.6'	HP
0 1	183°39.1 198°39.3	\$09°16.6 17.5	60°55.3 75°28.4	14.1' 14.2'	\$09°33.8 09°22.2	-11.6' -11.7'	55.6' 55.5'
2	198 39.3 213°39.4	17.5 18.4	75 28.4 90°01.6	14.2'	09°22.2	-11.7'	55.5'
3	228°39.5	. 19.3	104°34.8	14.3'	08°58.8	-11.7'	55.5'
4	243°39.6	20.2	119°08.1	14.3'	08°47.1	-11.8'	55.5'
5	258°39.8	21.1	133°41.4	14.4'	08°35.3	-11.8'	55.4'
6	273°39.9	S09°22.0	148°14.8	14.4'	S08°23.5	-11.8'	55.4'
7	288°40.0	22.9	162°48.3	14.5'	08°11.7	-11.8'	55.4'
8	303°40.1	23.9	177°21.8	14.5'	07°59.9	-11.9'	55.4'
9	318°40.3	• • 24.8	191°55.3	14.6'	07°48.0	-11.9'	55.3'
10	333°40.4	25.7	206°28.9	14.6'	07°36.1	-11.9'	55.3'
11 12	348° 40.5 3° 40.6	26.6 \$09°27.5	221°02.5 235°36.2	14.7' 14.7'	07°24.2 507°12.3	-11.9' -12.0'	55.3' 55.3'
13	18° 40.8	28.4	250° 10.0	14.7	07°00.3	-12.0'	55.3'
14	33°40.9	29.3	264°43.7	14.8'	06°48.4	-12.0'	55.2'
15	48°41.0	30.2	279°17.6	14.9'	06°36.4	-12.0'	55.2'
16	63°41.1	31.1	293°51.4	14.9'	$06^{\circ}24.4$	-12.0'	55.2'
17	78°41.3	32.0	308°25.3	14.9'	$06^{\circ}12.3$	-12.0'	55.2'
18	93°41.4	S09°33.0	322°59.3	15.0'	506°00.3	-12.1'	55.2'
19	108°41.5	33.9	337°33.3	15.0'	05°48.2	-12.1'	55.1'
20	123°41.6 138°41.8	34.8	352°07.3	15.1'	05°36.2	-12.1'	55.1'
21 22	138°41.8 153°41.9	· · 35.7 36.6	6°41.3 21°15.4	15.1' 15.1'	05°24.1 05°12.0	-12.1' -12.1'	55.1' 55.1'
23	168° 42.0	37.5	35°49.6	15.1	05 12.0 04°59.9	-12.1'	55.0'
23	SD = 16.0'	d = 0.9'	33 49.0		D = 15.2'	-12.1	33.0
		<u>u = 0.9</u>			7 = 13.2		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183° 42.1 198° 42.2	S09°38.4	50°23.8	15.2'	\$04°47.7 04°35.6	-12.1' -12.2'	55.0' 55.0'
1 2	198° 42.2 213° 42.4	39.3 40.2	64°58.0 79°32.2	15.2' 15.3'	04°35.6 04°23.4	-12.2' -12.2'	55.0' 55.0'
3	213 42.4 228° 42.5	41.1	94°06.5	15.3'	04°23.4	-12.2'	55.0'
4	243° 42.6	42.0	108° 40.8	15.3'	03°59.1	-12.2'	55.0'
5	258° 42.7	42.9	123° 15.1	15.4'	03°46.9	-12.2'	54.9'
6	273°42.9	S09°43.8	137°49.5	15.4'	S03°34.7	-12.2'	54.9'
7	288°43.0	44.8	152°23.9	15.4'	03°22.5	-12.2'	54.9'
8	303°43.1	45.7	166°58.3	15.4'	03°10.3	-12.2'	54.9'
9	318°43.2	• • 46.6	181°32.8	15.5'	02°58.1	-12.2'	54.9'
10 11	333° 43.3 348° 43.5	47.5 48.4	196°07.2 210°41.7	15.5' 15.5'	02°45.9 02°33.7	-12.2' -12.2'	54.8' 54.8'
11	348°43.5 3°43.6	48.4 \$09°49.3	210°41.7 225°16.3	15.5'	02°33.7 \$02°21.5	-12.2' -12.2'	54.8'
13	18° 43.7	50.2	225 10.3 239°50.8	15.6'	02°09.3	-12.2'	54.8'
14	33°43.8	51.1	254° 25.4	15.6'	02 09.3 01°57.1	-12.2'	54.8'
15	48° 43.9	• • 52.0	269°00.0	15.6'	01°44.8	-12.2'	54.8'
16	63°44.0	52.9	283°34.6	15.6'	01°32.6	-12.2'	54.7'
17	78°44.2	53.8	298°09.2	15.7'	01°20.4	-12.2'	54.7'
18	93°44.3	S09°54.7	312°43.9	15.7'	S01°08.2	-12.2'	54.7'
19	108°44.4	55.6	327° 18.5	15.7'	00°56.0	-12.2'	54.7'
20	123° 44.5	56.5	341°53.2	15.7'	00°43.7	-12.2'	54.7'
21	138° 44.6 153° 44.7	· · 57.4 58.3	356°27.9 11°02.7	15.7'	00°31.5 00°19.3	-12.2' -12.2'	54.7' 54.6'
22 23	153°44.7 168°44.9	58.3 59.2	25° 37.4	15.7' 15.7'	00°19.3 00°07.1	-12.2' -12.2'	54.6'
23	SD = 16.0'	d = 0.9'			D = 15.0'	-14.4	J+.U
	JD — 10.0	u — 0.9		31	J — 15.0		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-83%	
16	14:24	14:30	11:45	19:49	07:26		
17	14:37	14:43	11:45	20:32	08:11		
18	14:49	14:54	11:45	21:15	08:54		

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

h _	Aries		nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	27°45.5	137°06.0	S25°36.9	130°43.7	S24°12.2	174°28.7	S 12°19.8	336°01.1	N16°15.3			
1	42°47.9	152°05.6	37.3	145°44.2	12.3	189°30.7	19.9	351°03.8	15.2	Alpheratz	357°30.4	29° 15.6
2	57°50.4	167°05.3	37.8	160°44.7	12.5	204°32.6	20.1	6°06.4	15.2	Ankaa	353°03.1	-42°08.5
3	72°52.9	182°04.9	38.3	175°45.1	. 12.7	219°34.6	20.3	21°09.0	• • 15.1	Schedar	349°25.9	56°42.3
4	87°55.3	197°04.5	38.7	190°45.6	12.8	234°36.5	20.5	36°11.7	15.1	Diphda	348°43.2	-17°49.2
5	102°57.8	212°04.1	39.2	205°46.1	13.0	249°38.4	20.7	51°14.3	15.1	Achernar	$335^{\circ}16.9$	-57°05.0
6	102 57.8 118°00.3	212 04.1 227°03.8	\$25°39.6	205 46.1 220°46.6	524°13.2	249 36.4 264°40.4	\$12°20.8	66°16.9	N16°15.0	Hamal	327°46.5	23°36.3
7	118 00.3 133°02.7	242°03.4	40.1	235°47.0	13.4	279°42.3	21.0	81°19.6	15.0	Polaris	311°25.8	89°23.1
8	148°05.2	257°03.0		250°47.5	13.4	279 42.3 294°44.3		96°22.2		Acamar	$315^{\circ}08.5$	-40°11.0
9			40.5			309°46.2	21.2	90 22.2 111°24.8	14.9	Menkar	314°01.8	4°12.5
	163°07.6	272°02.6	• • 41.0	265°48.0	· · 13.7		• • 21.4		• • 14.9	Mirfak	308°22.2	49°57.9
10	178°10.1	287°02.3	41.4	280°48.5	13.9	324°48.1	21.6	126°27.5	14.8	Aldebaran	290°35.0	16°34.1
11	193°12.6	302°01.9	41.9	295°49.0	14.0	339°50.1	21.8	141°30.1	14.8	Rigel	281°00.0	-8°10.0
12	208°15.0	317°01.5	S25°42.3	310°49.4	S24°14.2	354°52.0	S12°21.9	156°32.7	N16°14.7	Capella	280°15.9	46°01.4
13	223°17.5	332°01.1	42.8	325°49.9	14.3	9°54.0	22.1	171°35.4	14.7	Bellatrix .	278°18.6	6°22.6
14	238°20.0	347°00.7	43.2	340°50.4	14.5	24°55.9	22.3	186°38.0	14.7	Elnath	277°56.8	28° 37.8
15	253°22.4	2°00.4	• • 43.7	355°50.9	• • 14.7	39°57.8	• • 22.5	201°40.6	• • 14.6	Alnilam	275°33.7	-1°11.0
16	268°24.9	17°00.0	44.1	10°51.3	14.8	54°59.8	22.7	216°43.3	14.6	Betelgeuse	270°47.8	7°24.7
17	283°27.4	31°59.6	44.6	25°51.8	15.0	70°01.7	22.9	231°45.9	14.5	Canopus	263°50.5	-52°42.5
18	298°29.8	46°59.2	\$25°45.0	40°52.3	S24°15.2	85°03.7	S12°23.0	246°48.5	N16°14.5	Sirius	258°22.8	-16°45.4
19	313°32.3	61°58.9	45.5	55°52.8	15.3	100°05.6	23.2	261°51.2	14.4	Adhara	255°02.8	-29°00.6
20	328°34.8	76°58.5	45.9	70°53.2	15.5	115°07.5	23.4	276°53.8	14.4	Procyon	244°46.8	5°08.8
21	343°37.2	91°58.1	• • 46.3	85°53.7	• • 15.7	130°09.5	• • 23.6	291°56.4	• • 14.3	Pollux	243°12.7	27°57.0
22	358°39.7	106°57.8	46.8	100°54.2	15.8	145°11.4	23.8	306°59.1	14.3	Avior	234° 13.1	-59°36.1
23	13°42.1	121°57.4	47.2	115°54.7	16.0	160°13.4	24.0	322°01.7	14.2	Suhail	234 13.1 222°43.5	-39 30.1 -43°33.0
Mar	ass. 22:05	1/_O A/ dO	.5′ m-4.41	νΩ Ε/ ΔΩ	.2′ m1.03	1/1 0/ do	2′ m-1.68	1/26/ 40	.0′ m-0.14	Miaplacidus	222 43.5 221°37.5	-43 33.0 -69°50.2
ivier.p	bass. 22:05	ν-0.4 αυ	.5 m-4.41	νο.5 αυ	.2 111.03	$\nu_{1.9} \ a_{0.}$	2 111-1.00	ν2.0 α-0	.0 m-0.14	Alphard	221 37.3 217°44.1	-8°47.3
											217 44.1 207°30.6	-6 47.3 11°49.2
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus		
0	28°44.6	136°57.0	S25°47.7	130°55.1	524°16.1	175°15.3	S 12°24.1	337°04.3	N16°14.2	Dubhe	193°37.1	61°35.1
1	43°47.1	151°56.6	48.1	145°55.6	16.3	190°17.3	24.3	352°07.0	14.2	Denebola	182°21.4	14°24.3
2	58°49.5	166°56.3	48.5	160°56.1	16.5	205°19.2	24.5	7°09.6	14.1	Gienah	175°39.9	-17°42.4
3	73°52.0	181°55.9	• • 49.0	175°56.6	16.6	220°21.1	24.7	22°12.2	14.1		172°56.2	-63°15.8
4	88°54.5	196°55.5	49.4	190°57.0	16.8	235°23.1	24.9	37°14.9	14.0	1	171°47.7	-57° 16.7
5	103°56.9	211°55.1	49.8	205°57.5	16.9	250°25.0	25.0	52°17.5	14.0	Alioth	166°10.4	55° 47.8
6	118°59.4	226°54.8	\$25°50.3	220°58.0	\$24°17.1	265°27.0	\$12°25.2	67°20.1	N16°13.9	Spica	158°18.6	-11°18.9
7	134°01.9	241°54.4	50.7	235°58.4	17.3	280°28.9	25.4	82°22.8	13.9	Alkaid	152°49.6	49°09.9
	134 01.9 149°04.3	241 54.4 256°54.0		250°58.9	17.3	295°30.8		97°25.4		Hadar	148°31.0	-60°30.9
8			51.1				25.6		13.8	Menkent	147°53.4	-36°30.9
9	164°06.8	271°53.7	• • 51.6	265°59.4	• • 17.6	310°32.8	• • 25.8	112°28.1	• • 13.8	Arcturus	145°44.8	19°01.7
10	179°09.2	286°53.3	52.0	280°59.9	17.7	325°34.7	26.0	127°30.7	13.7	Rigil Kent.	139°35.5	-60°57.5
11	194°11.7	301°52.9	52.4	296°00.3	17.9	340°36.7	26.1	142°33.3	13.7	Kochab	137°21.4	74°02.0
12	209°14.2	316°52.5	S25°52.8	311°00.8	S24°18.0	355°38.6	S12°26.3	157°36.0	N16°13.7	Zuben'ubi	$136^{\circ}52.1$	-16°09.8
13	224°16.6	331°52.2	53.3	326°01.3	18.2	10°40.5	26.5	172°38.6	13.6	Alphecca	126°00.9	26°37.1
14	239°19.1	346°51.8	53.7	341°01.7	18.3	25°42.5	26.7	187°41.2	13.6	Antares	112°11.4	-26° 29.8
15	254°21.6	1°51.4	• • 54.1	356°02.2	• • 18.5	40°44.4	• • 26.9	202°43.9	• • 13.5	Atria	107°02.4	-69°04.9
16	269°24.0	$16^{\circ}51.1$	54.5	11°02.7	18.7	55°46.3	27.1	217°46.5	13.5	Sabik	101°58.6	-15°45.5
17	284°26.5	31°50.7	54.9	26°03.2	18.8	70°48.3	27.2	232°49.1	13.4	Shaula	96°05.4	-37°07.4
18	299°29.0	46°50.3	\$25°55.4	41°03.6	S24°19.0	85°50.2	S12°27.4	247°51.8	N16°13.4	Rasalhague	95°55.2	12°32.6
19	314°31.4	$61^{\circ}50.0$	55.8	56°04.1	19.1	100°52.2	27.6	262°54.4	13.3	Eltanin	90°40.7	51°29.5
20	329°33.9	76°49.6	56.2	71°04.6	19.3	115°54.1	27.8	277°57.1	13.3	Kaus Aust.	83°27.6	-34°22.1
21	344°36.4	91°49.2	• • 56.6	86°05.0	• • 19.4	130°56.0	• • 28.0	292°59.7	• • 13.2	Vega	80°30.8	38°49.1
22	359°38.8	106°48.9	57.0	101°05.5	19.6	145°58.0	28.1	308°02.3	13.2	Nunki	75°43.1	-26° 15.4
23	14°41.3	121°48.5	57.4	116°06.0	19.7	160°59.9	28.3	323°05.0	13.2	Altair	61°56.2	-20 15.4 8°57.2
	22.01	0.4/ 10	4/ 4.40	0.5/ /0	0/ 1.02	1.0/.10	0/ 1.60	2.6/ 1.0	0/ 0.15	1		-56°38.3
ivier.p	ass. 22:01	ν -0.4′ d0	.4′ m-4.42	ν 0.5' $d0$.2′ m1.03	$\nu_{1.9} d0.$	2′ m-1.68	ν 2.0° d -0	.0′ m-0.15	Peacock Deneb	52°59.8 49°23.0	-56° 38.3 45° 23.7
											49°23.0 33°34.9	45°23.7 10°01.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°34.9 27°28.0	-46°48.9
0	29°43.7	136°48.1	S25°57.9		S24°19.9	176°01.9	S12°28.5	338°07.6	N16°13.1	Fomalhaut	27°28.0 15°10.1	-46°48.9 -29°27.7
1	44°46.2	151°47.7	58.3	146°06.9	20.0	191°03.8	28.7	353°10.2	13.1		15 10.1 13°41.2	-29 27.7 28°15.0
2	59°48.7	166°47.4	58.7	161°07.4	20.2	206°05.7	28.9	8°12.9	13.0	Scheat		
3	74°51.1	181°47.0	59.1	176°07.8	20.3	221°07.7	29.1	23°15.5	• • 13.0	Markab	13°25.8	15°22.2
4	89°53.6	196°46.6	59.5	191°08.3	20.5	236°09.6	29.2	38°18.1	12.9	Oct 19 Fri	SHA	Mer.pass
5	104°56.1	211°46.3	25°59.9	206°08.8	20.6	251°11.6	29.4	53°20.8	12.9		109°20.6	14:52
6	119°58.5	226°45.9	\$26°00.3		S24°20.8	266°13.5	S12°29.6	68°23.4	N16°12.8		102°58.2	15:17
7	135°01.0	241°45.5	00.7	236°09.7	20.9	281°15.4	29.8	83°26.1	12.8	1	146°43.3	12:20
8	150°03.5	256°45.2	01.1	251°10.2	21.1	296°17.4	30.0	98°28.7	12.7	Saturn	308°15.7	01:36
9	165°05.9	271°44.8	•• 01.5	266°10.6	21.2	311°19.3	30.0	113°31.3	•• 12.7			
10	180°08.4	271 44.8 286°44.5	01.9	281°11.1	21.3	326°21.3	30.3	113 31.3 128°34.0	12.7	Oct 20 Sat	SHA	Mer.pass
11	195° 10.8	301°44.1	02.3	296°11.6	21.5	341°23.2	30.5	143°36.6	12.7		108°12.4	14:53
12	210°13.3	316°43.7	526°02.7	311°12.0	\$24°21.6	356°25.1	\$12°30.7	158°39.3	N16°12.6		$102^{\circ}10.5$	15:16
13	210 13.3 225°15.8	310 43.7 331°43.4	03.1	311 12.0 326°12.5	21.8	11°27.1	30.9	158 39.3 173°41.9		Jupiter	$146^{\circ}30.7$	12:17
	240°18.2	331 43.4 346°43.0	03.1	320 12.5 341°13.0	21.8	26°29.0		173 41.9 188°44.5	12.5 12.5	Saturn	$308^{\circ}19.7$	01:31
14							31.1			0 : 25 5	C	
15 16	255°20.7	1°42.6	03.9	356°13.4	• • 22.1	41°31.0	31.2	203°47.2	• • 12.4	Oct 21 Sun	SHA	Mer.pass
16	270°23.2	16°42.3	04.3	11°13.9	22.2	56°32.9	31.4	218°49.8	12.4		107°04.4	14:53
17	285°25.6	31°41.9	04.7	26°14.4	22.4	71°34.8	31.6	233°52.4	12.3		101°22.7	15:15
18	300°28.1	46°41.5	\$26°05.1	41°14.8	S24°22.5	86°36.8	S12°31.8	248°55.1	N16°12.3		146°18.1	12:14
19	315°30.6	61°41.2	05.5	56°15.3	22.6	101°38.7	32.0	263°57.7	12.2	Saturn	308°23.9	01:27
20	330°33.0	76°40.8	05.9	71°15.8	22.8	116°40.6	32.1	279°00.4	12.2	∐asilaa	al parallar	
21	345°35.5	91°40.5	• • 06.3	86°16.2	• • 22.9	131°42.6	• • 32.3	294°03.0	• • 12.1	HORIZON	al parallax	0.3
22	0°38.0	106°40.1	06.7	101°16.7	23.1	146°44.5	32.5	309°05.6	12.1		Venus:	0.2
23	15°40.4	121°39.7	07.1	116°17.2	23.2	161°46.5	32.7	324°08.3	12.1		Mars:	0.1
Mern	ass. 21:57	ν -0.4' d0	.4′ m-4.43	$\nu 0.5' d0$.2′ m1.04	ν 1 9' d0	2′ m-1.68	ν2 6' d-0	.0′ m-0.15			

h	Sui	า	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.0	S10°00.1	40°12.1	15.8'	N00°05.1	12.2'	54.6'
1 2	198°45.1 213°45.2	01.0 01.9	54°46.9 69°21.7	15.8' 15.8'	00°17.3 00°29.4	12.2' 12.2'	54.6' 54.6'
3	228°45.3	02.8	83°56.5	15.8'	00°41.6	12.2'	54.6'
4	243°45.4	03.7	98°31.2	15.8'	00°53.8	12.2'	54.5'
5 6	258°45.6 273°45.7	04.6 \$10°05.5	113°06.0 127°40.9	15.8' 15.8'	01°05.9 N01°18.1	12.1' 12.1'	54.5' 54.5'
7	273 45.7 288°45.8	06.4	127 40.9 142°15.7	15.8'	01°30.2	12.1'	54.5'
8	303°45.9	07.3	156°50.5	15.8'	01°42.3	12.1'	54.5'
9	318°46.0	•• 08.2	171°25.3	15.8'	01°54.4	12.1'	54.5'
10 11	333°46.1 348°46.2	09.1 10.0	186°00.2 200°35.0	15.8' 15.8'	02°06.5 02°18.6	12.1' 12.1'	54.5' 54.5'
12	3°46.3	S10°10.9	215°09.9	15.8'	N02°30.7	12.1'	54.4'
13	18°46.5	11.8	229°44.7	15.8'	02°42.8	12.0'	54.4'
14 15	33°46.6 48°46.7	12.7 •• 13.6	244°19.6 258°54.4	15.9' 15.9'	02°54.8 03°06.8	12.0' 12.0'	54.4' 54.4'
16	63°46.8	14.5	273°29.3	15.8'	03°18.8	12.0'	54.4'
17	78°46.9	15.4	288°04.1	15.8'	03°30.8	12.0'	54.4'
18	93°47.0	\$10°16.3	302°39.0 317°13.8	15.8'	N03°42.8	12.0'	54.4'
19 20	108°47.1 123°47.2	17.2 18.1	317°13.8 331°48.6	15.8' 15.8'	03°54.7 04°06.7	11.9' 11.9'	54.4' 54.3'
21	138°47.3	19.0	346°23.5	15.8'	04°18.6	11.9'	54.3'
22	153°47.5	19.9	0°58.3	15.8'	04°30.5	11.9'	54.3'
23	168°47.6	20.8	15°33.1	15.8'	04°42.3	11.8'	54.3'
	SD = 16.1'	d = 0.9'		SE	0 = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.7	S10°21.7	30°08.0	15.8'	N04°54.2	11.8'	54.3'
1	198°47.8	22.6	44°42.8	15.8'	05°06.0	11.8'	54.3'
2	213°47.9 228°48.0	23.5 •• 24.4	59°17.6 73°52.4	15.8' 15.8'	05°17.8 05°29.6	11.8' 11.7'	54.3' 54.3'
4	243°48.1	25.3	88°27.2	15.8'	05°41.3	11.7'	54.2'
5	258°48.2	26.2	103°02.0	15.8'	$05^{\circ}53.0$	11.7'	54.2'
6	273°48.3 288°48.4	\$10°27.1	117°36.7 132°11.5	15.8'	N06°04.7 06°16.4	11.7'	54.2'
7 8	288°48.4 303°48.5	28.0 28.8	132°11.5 146°46.2	15.7' 15.7'	06° 16.4 06° 28.0	11.6' 11.6'	54.2' 54.2'
9	318°48.6	• • 29.7	161°21.0	15.7'	06°39.7	11.6'	54.2'
10	333°48.8	30.6	175°55.7	15.7'	06°51.2	11.6'	54.2'
11 12	348°48.9 3°49.0	31.5 \$10°32.4	190°30.4 205°05.1	15.7' 15.7'	07°02.8 N07°14.3	11.5' 11.5'	54.2' 54.2'
13	18°49.1	33.3	219°39.8	15.7'	07°25.8	11.5'	54.2'
14	33°49.2	34.2	234°14.4	15.6'	07°37.3	11.4'	54.2'
15 16	48°49.3 63°49.4	· · 35.1 36.0	248°49.1 263°23.7	15.6' 15.6'	07°48.7 08°00.1	11.4' 11.4'	54.1' 54.1'
17	78°49.5	36.9	203 23.7 277°58.3	15.6'	08°11.4	11.4	54.1
18	93°49.6	S10°37.8	292°32.9	15.6'	N08° 22.7	11.3'	54.1'
19	108°49.7 123°49.8	38.7	307°07.4 321°42.0	15.5' 15.5'	08°34.0 08°45.3	11.2'	54.1' 54.1'
20 21	123 49.8 138°49.9	39.6 • • 40.4	321 42.0 336°16.5	15.5'	08°56.5	11.2'	54.1'
22	153°50.0	41.3	350°51.0	15.5'	09°07.6	11.1'	54.1'
23	168°50.1	42.2	5°25.5	15.5'	09°18.8	11.1'	54.1'
	SD = 16.1'	d = 0.9'		SE	0 = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.2	S10°43.1	19°59.9	15.4'	N09°29.9	11.1'	54.1'
1 2	198°50.3 213°50.4	44.0 44.9	34°34.4 49°08.8	15.4' 15.4'	09°40.9 09°51.9	11.0' 11.0'	54.1' 54.1'
3	213 50.4 228°50.5	• • 45.8	63°43.2	15.4'	10°02.9	10.9'	54.0'
4	243°50.6	46.7	78°17.5	15.3'	10°13.8	10.9'	54.0'
5	258°50.7 273°50.8	47.6 \$10°48.4	92°51.8 107°26.1	15.3' 15.3'	10°24.7 N10°35.6	10.8' 10.8'	54.0' 54.0'
6 7	273 50.8 288°50.9	49.3	107 20.1 122°00.4	15.3 15.2'	10°46.4	10.8	54.0'
8	303°51.0	50.2	136°34.7	15.2'	10°57.1	10.7'	54.0'
9	318°51.1 333°51.2	· · 51.1 52.0	151°08.9 165°43.1	15.2' 15.2'	11°07.8 11°18.5	10.7'	54.0'
10 11	333 51.2 348°51.3	52.0 52.9	165 43.1 180°17.2	15.2 15.1'	11 18.5 11°29.1	10.6' 10.6'	54.0' 54.0'
12	3°51.4	\$10°53.8	194°51.4	15.1'	N11°39.7	10.5'	54.0'
13	18°51.5	54.6	209°25.5	15.1'	11°50.2	10.5	54.0'
14 15	33°51.6 48°51.7	55.5 •• 56.4	223°59.5 238°33.6	15.0' 15.0'	12°00.6 12°11.1	10.4' 10.4'	54.0' 54.0'
16	63°51.8	57.3	250° 07.6	15.0'	12°11.1	10.4	54.0'
17	78°51.9	58.2	267°41.5	14.9'	12°31.7	10.3'	54.0'
18	93°52.0	\$10°59.1	282°15.5	14.9'	N12°42.0	10.2'	54.0'
19 20	108°52.1 123°52.2	11°00.0 00.8	296°49.4 311°23.2	14.9' 14.8'	12°52.2 13°02.4	10.2' 10.1'	54.0' 54.0'
21	138°52.3	01.7	$325^{\circ}57.1$	14.8'	13° 12.5	10.0'	53.9'
22	153°52.4	02.6	340°30.9	14.8'	13°22.5	10.0'	53.9'
23	168°52.5	03.5	355°04.6	14.7'	13°32.5	9.9'	53.9'
	SD = 16.1'	d = 0.9'		SE	0 = 14.7'		

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

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

		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	90-98%	
19	15:00	15:05	11:45	21:56	09:35		
20	15:11	15:16	11:45	22:38	10:17		
21	15:21	15:26	11:45	23:20	10:59		

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

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	30°42.9	136°39.4	S26°07.5	131°17.6	S24°23.4	176°48.4	S12°32.9	339°10.9	N16°12.0			
1	45°45.3	151°39.0	07.8	$146^{\circ}18.1$	23.5	191°50.3	33.1	354°13.6	12.0	Alpheratz	357°30.4 353°03.1	29°15.6 -42°08.6
2	60°47.8	166°38.7	08.2	$161^{\circ}18.5$	23.6	206°52.3	33.2	9°16.2	11.9	Ankaa Schedar	353°03.1 349°25.9	-42°08.6 56°42.3
3	75°50.3	181°38.3	• • 08.6	$176^{\circ}19.0$	• • 23.8	221°54.2	• • 33.4	24°18.8	• • 11.9	Diphda	349°23.9	-17° 49.2
4	90°52.7	196°37.9	09.0	$191^{\circ}19.5$	23.9	236°56.2	33.6	39°21.5	11.8	Achernar	335°16.9	-57°05.1
5	105°55.2	211°37.6	09.4	206°19.9	24.1	251°58.1	33.8	54°24.1	11.8	Hamal	327°46.5	23°36.3
6	120°57.7	226°37.2	S 26°09.8	221°20.4	S24°24.2	267°00.0	\$12°34.0	69°26.8	N16°11.7	Polaris	311°25.0	89°23.1
7	136°00.1	241°36.9	10.1	236°20.9	24.3	282°02.0	34.1	84°29.4	11.7	Acamar	315°08.5	-40°11.0
8	151°02.6	256°36.5	10.5	251°21.3	24.5	297°03.9	34.3	99°32.0	11.6	Menkar	314°01.8	4°12.5
9 10	166°05.1 181°07.5	271°36.1 286°35.8	· · 10.9 11.3	266°21.8 281°22.2	· · 24.6 24.7	312°05.8 327°07.8	· · 34.5 34.7	114°34.7 129°37.3	• • 11.6	Mirfak	$308^{\circ}22.2$	49°57.9
11	196°10.0	301°35.4	11.7	296°22.7	24.7	342°09.7	34.7	144° 40.0	11.5 11.5	Aldebaran	290°34.9	16°34.1
12	211°12.5	316°35.1	\$26°12.0	311°23.2	\$24°25.0	357°11.7	\$12°35.1	159°42.6	N16°11.4	Rigel	281°00.0	-8°10.0
13	226°14.9	331°34.7	12.4	326°23.6	25.1	12°13.6	35.2	174°45.2	11.4	Capella	280°15.9	46°01.4
14	241°17.4	346°34.4	12.8	341°24.1	25.3	27°15.5	35.4	189°47.9	11.4	Bellatrix	278°18.6	6°22.6
15	$256^{\circ}19.8$	1°34.0	• • 13.2	356°24.5	• • 25.4	42°17.5	• • 35.6	204°50.5	• • 11.3	Elnath	277°56.8	28°37.8
16	$271^{\circ}22.3$	16°33.6	13.5	$11^{\circ}25.0$	25.5	57°19.4	35.8	219°53.2	11.3	Alnilam Betelgeuse	275°33.6 270°47.8	-1°11.0 7°24.7
17	286°24.8	31°33.3	13.9	26°25.5	25.7	72°21.3	36.0	234°55.8	11.2	Canopus	263°50.4	-52°42.5
18	301°27.2	46°32.9	S26°14.3	41°25.9	S24°25.8	87°23.3	S 12°36.1	249°58.5	N16°11.2	Sirius	258°22.7	-16°45.4
19	316°29.7	61°32.6	14.6	56°26.4	25.9	102°25.2	36.3	265°01.1	11.1	Adhara	255°02.7	-29°00.6
20	331°32.2	76°32.2	15.0	71°26.8	26.1	117°27.2	36.5	280°03.7	11.1	Procyon	244°46.8	5°08.8
21	346°34.6	91°31.9	• • 15.4	86°27.3	• • 26.2	132°29.1	• • 36.7	295°06.4	• • 11.0	Pollux	243°12.6	27°57.0
22	1°37.1	106°31.5	15.7	101°27.8	26.3	147°31.0	36.9	310°09.0	11.0	Avior	234°13.1	-59°36.1
23	16°39.6	121°31.2	16.1	116°28.2	26.5	162°33.0	37.1	325°11.7	10.9	Suhail	222°43.5	-43°33.0
Mer.p	ass. 21:54	ν -0.4' d0.	.4′ m-4.44	ν 0.5′ d0	$.1^\prime$ m 1.04	$\nu 1.9' \ d0.$	2′ m-1.68	ν 2.6′ d-0	.0′ m-0.16	Miaplacidus	221°37.5	-69°50.2
								-		Alphard	217°44.1	-8°47.3
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.6	11°49.2
0	31°42.0	136°30.8	S26°16.5	131°28.7	S24°26.6	177°34.9	S 12°37.2	340°14.3	N16°10.9	Dubhe Denebola	193°37.1 182°21.4	61°35.1 14°24.3
1	46°44.5	151°30.4	16.8	$146^{\circ}29.1$	26.7	192°36.8	37.4	$355^{\circ}16.9$	10.8	Gienah	175°39.9	-17° 42.4
2	61°46.9	$166^{\circ}30.1$	17.2	161°29.6	26.9	207°38.8	37.6	$10^{\circ}19.6$	10.8	Acrux	173°56.2	-63°15.8
3	76°49.4	181°29.7	• • 17.5	176°30.0	• • 27.0	222°40.7	• • 37.8	25°22.2	• • 10.7	Gacrux	171°47.7	-57° 16.7
4	91°51.9	196°29.4	17.9	191°30.5	27.1	237°42.7	38.0	40°24.9	10.7	Alioth	166°10.4	55°47.8
5	106°54.3	211°29.0	18.3	206°31.0	27.2	252°44.6	38.1	55°27.5	10.7	Spica	158°18.6	-11° 18.9
6	121°56.8	226°28.7	S26°18.6	221°31.4	\$24°27.4	267°46.5	\$12°38.3	70°30.2	N16°10.6	Alkaid	152°49.6	49°09.9
7	136°59.3	241°28.3	19.0	236°31.9	27.5	282°48.5	38.5	85°32.8	10.6	Hadar	148°31.0	-60°30.9
8 9	152°01.7	256°28.0	19.3	251°32.3	27.6	297°50.4	38.7	100°35.4	10.5	Menkent	$147^{\circ}53.4$	-36°30.9
9 10	167°04.2 182°06.7	271°27.6 286°27.3	· · 19.7 20.0	266°32.8 281°33.2	· · 27.8 27.9	312°52.3 327°54.3	· · 38.9 39.0	115°38.1 130°40.7	· · 10.5 10.4	Arcturus	145°44.8	19°01.7
11	197°09.1	301°26.9	20.0	201 33.2 296°33.7	28.0	342°56.2	39.0	130 40.7 145°43.4	10.4	Rigil Kent.	139°35.5	-60°57.5
12	212°11.6	316°26.6	\$26°20.7	311°34.2	\$24°28.1	357°58.2	S12°39.4	160°46.0	N16°10.3	Kochab	137°21.4	74°02.0
13	227°14.1	331°26.2	21.1	326°34.6	28.3	13°00.1	39.6	175°48.7	10.3	Zuben'ubi	136°52.1	-16°09.8
14	242°16.5	346°25.9	21.4	341°35.1	28.4	28°02.0	39.8	190°51.3	10.2	Alphecca	126°00.9	26°37.1
15	257°19.0	1°25.5	• • 21.8	356°35.5	• • 28.5	43°04.0	• • 40.0	205°53.9	• • 10.2	Antares	112°11.4	-26°29.7 -69°04.8
16	$272^{\circ}21.4$	$16^{\circ}25.2$	22.1	11°36.0	28.6	58°05.9	40.1	220°56.6	10.1	Atria Sabik	107°02.5 101°58.6	-09 04.8 -15°45.5
17	287°23.9	31°24.8	22.5	26°36.4	28.8	73°07.8	40.3	235°59.2	10.1	Shaula	96°05.4	-13° 43.3
18	302°26.4	46°24.5	S26°22.8	41°36.9	S24°28.9	88°09.8	S 12°40.5	251°01.9	N16°10.0	Rasalhague	95°55.2	12°32.6
19	317°28.8	61°24.2	23.1	56°37.3	29.0	103°11.7	40.7	266°04.5	10.0	Eltanin	90°40.7	51°29.5
20	332°31.3	76°23.8	23.5	71°37.8	29.1	118°13.7	40.9	281°07.2	10.0	Kaus Aust.	83°27.6	-34°22.1
21	347°33.8	91°23.5	• • 23.8	86°38.2	• • 29.2	133°15.6	• • 41.0	296°09.8	• • 09.9	Vega	80°30.8	38°49.1
22	2°36.2	106°23.1	24.2	101°38.7	29.4	148°17.5	41.2	311°12.5	09.9	Nunki	75°43.2	-26°15.4
23	17°38.7	121°22.8	24.5	116°39.2	29.5	163°19.5	41.4	326° 15.1	09.8	Altair	61°56.2	8°57.2
Mer.p	ass. 21:50	ν -0.4' d0.	.4′ m-4.46	ν 0.5 $^{\prime}$ d0	$.1^\prime$ m 1.04	$\nu 1.9' \ d0.$	2′ m-1.68	ν 2.6′ d-0	.0′ m-0.16	Peacock	52°59.8	-56°38.3
										Deneb	49°23.0	45°23.7
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°34.9 27°28.0	10°01.0 -46°49.0
0	32°41.2	136°22.4	S26°24.8		S24°29.6	178°21.4	S12°41.6	341°17.7	N16°09.8	Al Na'ir Fomalhaut	27 28.0 15°10.1	-46 49.0 -29°27.7
1	47°43.6	151°22.1	25.2	$146^{\circ}40.1$	29.7	193°23.3	41.8	$356^{\circ}20.4$	09.7	Scheat	13°41.2	28° 15.0
2	62°46.1	166°21.7	25.5	161°40.5	29.8	208°25.3	41.9	11°23.0	09.7	Markab	13°25.8	15°22.2
3	77°48.6	181°21.4	• • 25.9	176°41.0	• • 30.0	223°27.2	• • 42.1	26°25.7	• • 09.6			
4	92°51.0	196°21.1	26.2	191°41.4	30.1	238°29.2	42.3	41°28.3	09.6	Oct 22 Mon	SHA 105°56 5	Mer.pass
5	107°53.5	211°20.7	26.5	206°41.9	30.2	253°31.1	42.5	56°31.0	09.5		105°56.5 100°34.7	14:54
6	122°55.9	226°20.4	\$26°26.9	221°42.3	\$24°30.3	268°33.0	\$12°42.7	71°33.6	N16°09.5	Mars Jupiter		15:14 12:11
7 8	137°58.4 153°00.9	241°20.0 256°19.7	27.2 27.5	236°42.8 251°43.2	30.4 30.5	283°35.0 298°36.9	42.9 43.0	86° 36.3 101° 38.9	09.4 09.4	Saturn	308°28.0	01:23
9	168°03.3	250 19.7 271°19.3	27.8	251 43.2 266°43.7	30.5	298 30.9 313°38.8	· · 43.0	101 38.9 116°41.5	09.4			01.23
10	183°05.8	286°19.0	28.2	281°44.1	30.8	328°40.8	43.4	131° 44.2	09.3	Oct 23 Tue	SHA	Mer.pass
11	198°08.3	301°18.7	28.5	296°44.6	30.9	343°42.7	43.4	146°46.8	09.2	Venus	104°48.8	14:54
12	213° 10.7	316°18.3	S26°28.8	311°45.0	S24°31.0	358°44.6	S12°43.8	161°49.5	N16°09.2	Mars	99°46.7	15:14
13	228°13.2	331°18.0	29.1	326°45.5	31.1	13°46.6	43.9	176°52.1	09.1		145°52.9	12:08
14	$243^{\circ}15.7$	$346^{\circ}17.6$	29.5	341°45.9	31.2	28°48.5	44.1	191°54.8	09.1	Saturn	308°32.3	01:19
15	$258^{\circ}18.1$	1°17.3	• • 29.8	$356^{\circ}46.4$	• • 31.4	43°50.5	• • 44.3	$206^{\circ}57.4$	•• 09.1	Oct 24 Wed	SHA	Mer.pass
16	273°20.6	16°17.0	30.1	11°46.8	31.5	58°52.4	44.5	222°00.1	09.0	Venus		14:55
17	288°23.0	31°16.6	30.4	26°47.3	31.6	73°54.3	44.7	237°02.7	09.0	Mars	98°58.4	15:13
18	303°25.5	46°16.3	S26°30.7		S24°31.7	88°56.3	S12°44.8	252°05.4	N16°08.9		145°40.2	12:05
19	318°28.0	61°16.0	31.1	56°48.2	31.8	103°58.2	45.0	267°08.0	08.9	Saturn	308°36.6	01:15
20 21	333°30.4 348°32.9	76°15.6 91°15.3	31.4 · · 31.7	71°48.6 86°49.1	31.9 · · 32.0	119°00.1 134°02.1	45.2 •• 45.4	282° 10.6 297° 13.3	08.8 •• 08.8	Horizont	al parallax	
21	348 32.9 3°35.4	91 15.3 106°14.9	32.0	86 49.1 101°49.5	32.0	134 02.1 149°04.0	45.4 45.6	297 13.3 312°15.9	08.7		Venus:	0.2
23	18°37.8	121°14.6	32.3	116°50.0	32.1	164°05.9	45.7	327° 18.6	08.7		Mars:	0.1
ivier.p	ass. 21:46	ν -0.5' $a0$.3′ m-4.47	νυ.5' d0	.1′ m1.04	$\nu_{1.9}$ a0.	2′ m-1.68	ν2.0 a-0	.0′ m-0.17			

h	Sur	1		_	Moon		
						,	un
Mon 0	GHA 183°52.6	Dec \$11°04.4	GHA 9°38.3	u 14.7'	Dec N13° 42.4	d 9.9'	HP 53.9'
1	198°52.7	05.3	24°12.0	14.6'	13°52.3	9.8'	53.9
2	213°52.8	06.1	38°45.7	14.6'	14°02.1	9.8'	53.9'
3	228°52.9	• • 07.0	53°19.3	14.6'	$14^{\circ}11.9$	9.7'	53.9'
4	243°53.0	07.9	67°52.9	14.5'	14°21.6	9.6'	53.9'
5	258°53.1	08.8	82°26.4	14.5'	14°31.3	9.6'	53.9'
6	273°53.2	S11°09.7	96°59.9	14.5'	N14°40.8	9.5'	53.9'
7	288°53.2 303°53.3	10.5	111°33.3 126°06.8	14.4'	14°50.4 14°59.8	9.5' 9.4'	53.9' 53.9'
8 9	303 53.3 318°53.4	11.4 •• 12.3	120 00.8 140°40.1	14.4' 14.3'	14 59.8 15°09.2	9.4 9.3'	53.9'
10	333°53.5	13.2	155°13.5	14.3'	15° 18.6	9.3'	53.9
11	348°53.6	14.1	169°46.8	14.3'	15°27.8	9.2'	53.9'
12	3°53.7	S11°14.9	184°20.0	14.2'	N15°37.0	9.1'	53.9'
13	18°53.8	15.8	198°53.2	14.2'	15°46.2	9.1'	53.9'
14	33°53.9	16.7	213°26.4	14.1'	15°55.2	9.0'	53.9'
15	48°54.0	• • 17.6	227°59.5	14.1'	16°04.2	8.9'	53.9'
16	63°54.1	18.4	242°32.6	14.0'	16°13.2	8.9'	53.9'
17 18	78°54.2 93°54.3	19.3 \$11°20.2	257°05.7 271°38.7	14.0' 14.0'	16°22.1 N16°30.9	8.8' 8.7'	53.9' 53.9'
18	93 54.3 108°54.3	21.1	271 38.7 286°11.6	13.9'	16°39.6	8.7'	53.9'
20	106 54.5 123°54.4	22.0	300°44.6	13.9'	16°48.2	8.6'	53.9
21	138°54.5	22.8	315°17.4	13.8'	16° 56.8	8.5	53.9'
22	153°54.6	23.7	329°50.3	13.8'	17°05.4	8.4'	53.9'
23	168°54.7	24.6	344°23.0	13.7'	17° 13.8	8.4'	53.9'
	SD = 16.1'	d = 0.9'		SD	0 = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°54.8 198°54.9	\$11°25.5 26.3	358°55.8 13°28.5	13.7' 13.7'	N17°22.2 17°30.5	8.3' 8.2'	53.9' 53.9'
2	213°55.0	27.2	28°01.1	13.6'	17°38.7	8.1	53.9
3	228°55.1	28.1	42°33.7	13.6'	17°46.8	8.1'	53.9'
4	243°55.1	29.0	57°06.3	13.5'	17° 54.9	8.0'	53.9'
5	258°55.2	29.8	71°38.8	13.5'	18°02.9	7.9'	53.9'
6	273°55.3	S11°30.7	86°11.3	13.4'	N18° 10.8	7.8'	53.9'
7	288°55.4	31.6	100°43.7	13.4'	18° 18.7	7.8'	53.9'
8	303°55.5	32.5	115°16.1	13.3'	18°26.4	7.7'	53.9'
9	318°55.6	• • 33.3	129°48.4	13.3'	18°34.1	7.6'	53.9'
10 11	333°55.7 348°55.7	34.2 35.1	144°20.7 158°53.0	13.2' 13.2'	18° 41.7 18° 49.2	7.5' 7.4'	53.9' 53.9'
12	3°55.8	S11°35.9	173°25.2	13.2'	N18° 56.7	7.4	53.9
13	18°55.9	36.8	187°57.3	13.1'	19°04.0	7.3'	53.9'
14	33°56.0	37.7	202°29.4	13.1'	19° 11.3	7.2'	53.9'
15	48°56.1	• • 38.6	$217^{\circ}01.5$	13.0'	19° 18.5	7.1'	53.9'
16	63°56.2	39.4	231°33.5	13.0'	19°25.6	7.0'	53.9'
17	78°56.3	40.3	246°05.5	12.9'	19°32.6	6.9'	53.9'
18	93°56.3 108°56.4	\$11°41.2	260°37.4 275°09.3	12.9'	N19°39.5 19°46.4	6.8'	53.9'
19 20	108 56.4 123°56.5	42.0 42.9	275 09.3 289°41.1	12.8' 12.8'	19 46.4 19°53.2	6.8' 6.7'	53.9' 53.9'
21	138°56.6	• • 43.8	304°12.9	12.7'	19°55.2	6.6'	53.9'
22	153°56.7	44.6	318°44.7	12.7'	20°06.4	6.5	53.9
23	168°56.7	45.5	333°16.4	12.7'	20°12.9	6.4'	53.9'
	SD = 16.1'	d = 0.9'		SD	0 = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	183°56.8	S11°46.4	347°48.0	12.6'	N20° 19.3	6.3'	53.9
1	198°56.9	47.3	2°19.7	12.6'	20°25.6	6.2	53.9
2	213°57.0	48.1	$16^{\circ}51.2$	12.5'	20°31.9	6.1'	53.9'
3	228°57.1	• • 49.0	31°22.8	12.5'	20°38.0	6.0'	53.9'
4	243°57.1	49.9	45°54.2	12.4'	20°44.1	6.0'	53.9'
5	258°57.2	50.7 \$11°51.6	60°25.7	12.4'	20°50.0	5.9'	53.9'
6 7	273°57.3 288°57.4	511°51.6 52.5	74°57.1 89°28.4	12.3' 12.3'	N20°55.9 21°01.6	5.8' 5.7'	53.9' 54.0'
8	288 57.4 303°57.5	52.5 53.3	89 28.4 103°59.7	12.3'	21 01.6 21°07.3	5. <i>1</i> 5.6'	54.0'
9	318°57.5	• • 54.2	118°31.0	12.2'	21°12.9	5.5'	54.0
10	333°57.6	55.0	133°02.2	12.2'	21° 18.4	5.4	54.0'
11	348°57.7	55.9	147°33.4	12.1'	21°23.8	5.3'	54.0'
12	3°57.8	S11°56.8	162°04.5	12.1'	N21°29.1	5.2'	54.0'
13	18°57.9	57.6	176°35.6	12.0'	21°34.2	5.1'	54.0'
14	33°57.9	58.5	191°06.6	12.0'	21°39.3	5.0'	54.0'
15	48°58.0	11°59.4	205°37.7	12.0'	21°44.3	4.9'	54.0'
16 17	63°58.1 78°58.2	12°00.2 01.1	220°08.6 234°39.5	11.9' 11.9'	21°49.2 21°54.0	4.8' 4.7'	54.0' 54.0'
18	78°58.2 93°58.2	01.1 S12°02.0	234°39.5 249°10.4	11.9	N21°58.7	4.6'	54.0'
19	108°58.3	02.8	263°41.3	11.8'	22°03.3	4.5	54.0'
20	123°58.4	03.7	278°12.1	11.8'	22°07.8	4.4'	54.0'
21	138°58.5	• • 04.5	292°42.9	11.7'	22° 12.2	4.3'	54.0'
22	153°58.5	05.4	307°13.6	11.7'	$22^{\circ}16.5$	4.2'	54.0'
23	168°58.6	06.3	321°44.3	11.7'	22°20.7	4.1'	54.0'
	SD = 16.1'	d = 0.9'	-	SD	0 = 14.7'		

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

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

ı			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
		00 ^h	12 ^h	Pass	Upper	Lower	15-17	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-98%	
	22	15:30	15:35	11:44	-:-	11:42		
	23	15:39	15:43	11:44	00:04	12:27		
	24	15:47	15:51	11:44	00:50	13:14		

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

h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	33°40.3	136° 14.3	\$26°32.6	131°50.4	S24°32.4	179°07.9	S12°45.9	342°21.2	N16°08.6			
1	48°42.8	151° 13.9	32.9	146°50.9	32.5	194°09.8	46.1	357°23.9	08.6	Alpheratz	357°30.4	29°15.6
2	63°45.2	166°13.6	33.3	161°51.3	32.6	209°11.8	46.3	12°26.5	08.5	Ankaa	353°03.1	-42°08.6
3	78°47.7	181°13.3	• • 33.6	176°51.8	32.7	224°13.7	46.5	27° 29.2	08.5	Schedar	349°25.9	56°42.3
4	93°50.2	$196^{\circ}12.9$	33.9	191°52.2	32.8	239°15.6	46.7	42°31.8	08.4	Diphda	348°43.2	-17°49.2
5	108°52.6	211°12.6	34.2	206°52.7	32.9	254°17.6	46.8	57°34.5	08.4	Achernar	335°16.9	-57°05.1
6	123°55.1	$226^{\circ}12.3$	S26°34.5	221°53.1	S24°33.0	269°19.5	S 12°47.0	72°37.1	$N16^{\circ}08.3$	Hamal	327°46.5	23°36.3
7	138°57.5	241°11.9	34.8	236°53.5	33.1	284°21.4	47.2	87°39.8	08.3	Polaris	311°24.1	89°23.2
8	154°00.0	$256^{\circ}11.6$	35.1	251°54.0	33.2	299°23.4	47.4	102°42.4	08.2	Acamar Menkar	315°08.5 314°01.8	-40°11.0 4°12.5
9	169°02.5	$271^{\circ}11.3$	• • 35.4	266°54.4	• • 33.3	314°25.3	• • 47.6	$117^{\circ}45.1$	• • 08.2	Mirfak	308° 22.2	49°57.9
10	184°04.9	$286^{\circ}10.9$	35.7	281°54.9	33.4	329°27.2	47.7	132°47.7	08.2	Aldebaran	290°34.9	16°34.1
11	199°07.4	$301^{\circ}10.6$	36.0	296°55.3	33.5	344°29.2	47.9	147°50.4	08.1	Rigel	280°59.9	-8°10.0
12	214°09.9	$316^{\circ}10.3$	S26°36.3	311°55.8	S24°33.6	359°31.1	S 12°48.1	162°53.0	$N16^{\circ}08.1$	Capella	280° 15.9	46°01.4
13	229°12.3	331°10.0	36.6	326°56.2	33.7	14°33.0	48.3	177°55.6	0.80	Bellatrix	278° 18.5	6°22.6
14	244°14.8	346°09.6	36.9	341°56.7	33.9	29°35.0	48.5	192°58.3	0.80	Elnath	277°56.8	28°37.8
15	259°17.3	1°09.3	• • 37.2	356°57.1	• • 34.0	44°36.9	• • 48.6	208°00.9	• • 07.9	Alnilam	275°33.6	-1°11.0
16	274°19.7	16°09.0	37.5	11°57.6	34.1	59°38.9	48.8	223°03.6	07.9	Betelgeuse	270°47.7	7°24.7
17	289°22.2	31°08.6	37.8	26°58.0	34.2	74°40.8	49.0	238°06.2	07.8	Canopus	263°50.4	-52°42.5
18	304°24.7	46°08.3	S26°38.1	41°58.4	S24°34.3	89°42.7	S12°49.2	253°08.9	N16°07.8	Sirius	258°22.7	-16°45.4
19	319°27.1	61°08.0	38.4	56°58.9	34.4	104°44.7	49.4	268°11.5	07.7	Adhara	255°02.7	-29°00.6
20	334°29.6	76°07.7	38.7	71°59.3	34.5	119°46.6	49.5	283°14.2	07.7	Procyon	244°46.8	5°08.8
21	349°32.0	91°07.3	• • 39.0	86°59.8	• • 34.6	134°48.5	• • 49.7	298°16.8	•• 07.6	Pollux	243°12.6	27°57.0
22	4°34.5	106°07.0	39.2	102°00.2	34.7	149°50.5	49.9	313°19.5	07.6	Avior	234°13.1	-59°36.1
23	19°37.0	121°06.7	39.5	117°00.7	34.8	164°52.4	50.1	328°22.1	07.5	Suhail	222°43.5	-43°33.0
Mer.p	ass. 21:42	ν -0.3' d0	.3′ m-4.48	ν 0.4' d0	.1′ m1.05	$\nu 1.9' \ d0.$	2′ m-1.68	$\nu 2.6' \ d-0$.0′ m-0.17	Miaplacidus	221°37.4	-69°50.2
										Alphard	217°44.1	-8°47.3
	CIIA	CILA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Regulus	207°30.5	11°49.2
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.0	61°35.1
0	34°39.4	136°06.4	\$26°39.8	132°01.1	\$24°34.9	179°54.3	\$12°50.3	343°24.8 358°27.4	N16°07.5	Denebola	$182^{\circ}21.3$	14°24.3
1	49°41.9	151°06.0	40.1	147°01.6	35.0 25.1	194°56.3	50.4		07.4	Gienah	$175^{\circ}39.9$	-17°42.4
2	64°44.4 79°46.8	166°05.7	40.4	162°02.0	35.1	209°58.2	50.6	13°30.1	07.4	Acrux	172°56.2	-63°15.8
3	79°46.8 94°49.3	181°05.4	• • 40.7	177°02.4 192°02.9	• • 35.2	225°00.1	50.8	28°32.7	•• 07.3	Gacrux	171°47.7	-57°16.7
4	94 49.3 109°51.8	196°05.1 211°04.7	41.0	192 02.9 207°03.3	35.3	240°02.1 255°04.0	51.0	43°35.4 58°38.0	07.3	Alioth	$166^{\circ}10.3$	55°47.8
5 6	109 51.8 124°54.2	211 04.7 226°04.4	41.2 \$26°41.5	207 03.3 222°03.8	35.4 \$24°35.5	255 04.0 270°05.9	51.2 \$12°51.3	73°40.7	07.2 N16°07.2	Spica	158° 18.6	-11°18.9
7	139°56.7	241°04.4	41.8	237°04.2	35.5	270 05.9 285°07.9	51.5	88°43.3	07.2	Alkaid	152°49.6	49°09.9
8	159 50.7 154°59.2	256°03.8	42.1	252°04.7	35.5 35.6	300°09.8	51.5 51.7	00 45.5 103°46.0	07.1	Hadar	148°31.0	-60°30.9
9	170°01.6	271°03.5	• • 42.1	267°05.1	35.7	315°11.8	• • 51.9	103 40.0 118°48.6	07.1	Menkent	147°53.4	-36°30.9
10	185°04.1	271 03.5 286°03.1	42.4	282°05.5	35.8	330°13.7	52.1	133°51.3	07.0	Arcturus	145°44.8	19°01.7
11	200°06.5	301°02.8	42.0	202 05.5 297°06.0	35.0 35.9	345°15.6	52.1 52.2	133 51.3 148°53.9	07.0	Rigil Kent.	139°35.5	-60°57.4
12	215°09.0	316°02.5	\$26°43.2	312°06.4	\$24°36.0	0°17.6	\$12°52.4	163°56.6	N16°06.9	Kochab	137°21.4	74°02.0
13	230°11.5	331°02.2	43.5	327°06.9	36.1	15°19.5	52.6	178° 59.2	06.9	Zuben'ubi	136°52.1	-16°09.8
14	245°13.9	346°01.9	43.7	342°07.3	36.2	30°21.4	52.8	194°01.9	06.8	Alphecca	126°00.9	26°37.0
15	260°16.4	1°01.5	• • 44.0	357°07.7	36.3	45°23.4	• • 53.0	209°04.5	. 06.8	Antares	112°11.4	-26°29.7
16	275°18.9	16°01.2	44.3	12°08.2	36.4	60°25.3	53.1	224° 07.2	06.7	Atria	107°02.5	-69°04.8
17	290°21.3	31°00.9	44.5	27°08.6	36.5	75°27.2	53.3	239°09.8	06.7	Sabik	101°58.6	-15°45.5
18	305°23.8	46°00.6	S26°44.8	42°09.1		90°29.2	S12°53.5	254° 12.5	N16°06.6	Shaula	96°05.4	-37°07.4
19	320°26.3	61°00.3	45.1	57°09.5	36.7	105°31.1	53.7	269° 15.1	06.6	Rasalhague	95°55.2	12°32.6
20	335°28.7	76°00.0	45.3	72°09.9	36.8	120°33.0	53.9	284° 17.8	06.5	Eltanin	90°40.7	51°29.5
21	350°31.2	90°59.7	• • 45.6	87°10.4	36.9	135°35.0	• • 54.0	299° 20.4	06.5	Kaus Aust.	83°27.6	-34°22.1
22	5°33.6	105°59.3	45.9	102°10.8	36.9	150°36.9	54.2	314°23.1	06.4	Vega	80°30.8	38°49.1
23	20°36.1	120°59.0	46.1	117°11.3	37.0	165°38.8	54.4	329°25.7	06.4	Nunki	75°43.2	-26°15.4
										Altair	61°56.3	8°57.2
Mer.p	ass. 21:38	ν -0.3′ d0	.3′ m-4.49	ν 0.4′ d0	$.1^\prime$ m 1.05	$\nu 1.9' \ d0.$	2′ m-1.68	ν 2.6′ d-0	.0′ m-0.18	Peacock	52°59.8	-56°38.3
										Deneb	49°23.1 33°34.9	45°23.7
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33 34.9 27°28.0	10°01.0 -46°49.0
0	35°38.6	135°58.7	\$26°46.4		S24°37.1	180°40.8	S12°54.6	344°28.4	N16°06.3	Fomalhaut	27 28.0 15°10.1	-46 49.0 -29°27.7
1	50°41.0	150°58.4	46.7	$147^{\circ}12.1$	37.2	195°42.7	54.8	359°31.0	06.3	Scheat	13°41.2	28°15.0
2	65°43.5	165°58.1	46.9	$162^{\circ}12.6$	37.3	210°44.6	54.9	14°33.7	06.2	Markab	13° 25.8	15°22.2
3	80°46.0	180°57.8	• • 47.2	$177^{\circ}13.0$	• • 37.4	225°46.6	•• 55.1	29°36.3	• • 06.2			19 44.4
4	95°48.4	195°57.5	47.4	$192^{\circ}13.5$	37.5	240°48.5	55.3	44°39.0	06.1	Oct 25 Thu	SHA	Mer.pass
5	110°50.9	210°57.2	47.7	$207^{\circ}13.9$	37.6	255°50.4	55.5	59°41.6	06.1		102°34.0	14:55
6	125°53.4	225°56.8	\$26°47.9		S24°37.6	270°52.4	S12°55.7	74°44.3	N16°06.0	Mars	98°10.1	15:12
7	140°55.8	240° 56.5	48.2	237°14.8	37.7	285°54.3	55.8	89°46.9	06.0		145°27.6	12:02
8	155°58.3	255° 56.2	48.5	252°15.2	37.8	300°56.3	56.0	104°49.6	05.9	Saturn	308°40.9	01:10
9	171°00.8	270°55.9	• • 48.7	267°15.6	• • 37.9	315°58.2	• • 56.2	119°52.2	• • 05.9	Oct 26 Fri	SHA	Mer.pass
10	186°03.2	285°55.6	49.0	282°16.1	38.0	331°00.1	56.4	134°54.9	05.8		101°26.9	14:56
11	201°05.7	300°55.3	49.2	297°16.5	38.1	346°02.1	56.6	149°57.5	05.8	Mars	97°21.7	15:11
12	216°08.1	315°55.0	\$26°49.5	312°17.0	S24°38.2	1°04.0	S12°56.7	165°00.2	N16°05.7		145°14.9	11:59
13	231°10.6	330°54.7	49.7	327°17.4	38.2	16°05.9	56.9	180°02.8	05.7	Saturn	308°45.3	01:06
14	246°13.1	345°54.4	50.0	342°17.8	38.3	31°07.9	57.1	195°05.5	05.6			01.00
15	261°15.5	0°54.1	• • 50.2	357°18.3	• • 38.4	46°09.8	•• 57.3	210°08.1	• • 05.6	Oct 27 Sat	SHA	Mer.pass
16	276°18.0	15°53.8	50.4	12°18.7	38.5	61°11.7	57.5	225° 10.8	05.6		$100^{\circ}20.1$	14:56
17	291°20.5	30°53.5	50.7	27°19.1	38.6	76°13.7	57.6	240°13.5	05.5	Mars	$96^{\circ}33.1$	15:11
18	306°22.9	45°53.2	\$26°50.9		\$24°38.7	91°15.6	S12°57.8	255° 16.1	N16°05.5		145°02.2	11:56
19	321°25.4	60°52.9	51.2	57°20.0	38.7	106°17.5	58.0	270°18.8	05.4	Saturn	308°49.8	01:02
20	336°27.9	75°52.6	51.4	72°20.4	38.8	121°19.5	58.2	285°21.4	05.4	Horizont	al parallax	
21	351°30.3	90°52.3	• • 51.7	87°20.9	• • 38.9	136°21.4	• • 58.4	300°24.1	•• 05.3	TIOTIZOTI	Venus:	0.2
22	6°32.8	105°52.0	51.9	102°21.3	39.0	151°23.3	58.5	315°26.7	05.3		Mars:	0.2
23	21°35.3	120°51.7	52.1	117°21.7	39.0	166°25.3	58.7	330°29.4	05.2		141013.	V.1
Mer.p	ass. 21:34	ν -0.3′ d0	.3′ m-4.50	u0.4′ d0	.1′ m1.05	ν 1.9 $^{\prime}$ d0.	2′ m-1.68	ν 2.7′ d-0	.0′ m-0.18			

h	Sui	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.7	S 12°07.1	$336^{\circ}14.9$	11.6'	N22°24.8	4.0'	54.1'
1	198°58.8	0.80	350°45.5	11.6'	22°28.8 22°32.7	3.9'	54.1'
2	213°58.8 228°58.9	08.8 •• 09.7	5°16.1 19°46.7	11.5' 11.5'	22° 32.7 22° 36.5	3.8' 3.7'	54.1' 54.1'
4	243°59.0	10.6	34°17.2	11.5'	22°40.1	3.6'	54.1'
5	258°59.0	11.4	48°47.6	11.4'	22°43.7	3.5'	54.1'
6 7	273°59.1 288°59.2	\$12°12.3 13.1	63°18.1 77°48.5	11.4' 11.4'	N22°47.2 22°50.5	3.4' 3.2'	54.1' 54.1'
8	303°59.3	14.0	92°18.8	11.4	22°53.8	3.1'	54.1
9	318°59.3	• • 14.9	106°49.2	11.3'	22°56.9	3.0'	54.1'
10	333°59.4 348°59.5	15.7	121°19.5 135°49.7	11.3' 11.2'	22°59.9 23°02.9	2.9'	54.1'
11 12	3°59.5	16.6 \$12°17.4	150°20.0	11.2'	N23°05.7	2.8' 2.7'	54.1' 54.2'
13	18°59.6	18.3	164°50.2	11.2'	23°08.4	2.6'	54.2'
14	33°59.7	19.1	179°20.4	11.1'	23°11.0	2.5'	54.2'
15 16	48°59.8 63°59.8	· · 20.0 20.9	193°50.5 208°20.6	11.1' 11.1'	23°13.5 23°15.9	2.4' 2.3'	54.2' 54.2'
17	78°59.9	21.7	222°50.7	11.1'	23°18.1	2.2'	54.2'
18	94°00.0	S12°22.6	237°20.8	11.0'	N23°20.3	2.1'	54.2'
19 20	109°00.0 124°00.1	23.4 24.3	251°50.8 266°20.8	11.0' 11.0'	23°22.4 23°24.3	1.9' 1.8'	54.2' 54.2'
21	139°00.2	25.1	280°50.8	11.0'	23°26.1	1.7	54.2 54.3'
22	154°00.2	26.0	295°20.7	10.9'	23°27.8	1.6'	54.3'
23	169°00.3	26.8	309°50.7	10.9'	23°29.4	1.5'	54.3'
	SD = 16.1'	d = 0.9'		SE	0 = 14.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	184°00.4	\$12°27.7	324°20.6	10.9'	N23°30.9	1.4'	54.3'
1	199°00.4	28.5	338°50.5	10.9'	23°32.3	1.3'	54.3'
2	214°00.5 229°00.6	29.4 •• 30.2	353°20.3 7°50.2	10.8' 10.8'	23°33.6 23°34.7	1.2' 1.0'	54.3' 54.3'
4	244°00.6	31.1	22°20.0	10.8	23°35.8	0.9'	54.3'
5	259°00.7	31.9	36°49.8	10.8'	23°36.7	0.8'	54.4'
6	274°00.7 289°00.8	\$12°32.8	51°19.5 65°49.3	10.8'	N23°37.5 23°38.2	0.7'	54.4'
7 8	289°00.8 304°00.9	33.6 34.5	65°49.3 80°19.0	10.7' 10.7'	23°38.2 23°38.8	0.6' 0.5'	54.4' 54.4'
9	319°00.9	• • 35.3	94°48.7	10.7'	23°39.3	0.4'	54.4'
10	334°01.0	36.2	109°18.4	10.7'	23°39.6	0.2'	54.4'
11 12	349°01.1 4°01.1	37.0 \$12°37.9	123°48.1 138°17.8	10.7' 10.7'	23°39.9 N23°40.0	0.1'	54.4' 54.5'
13	19°01.2	38.7	150° 17.0	10.6'	23°40.0	-0.1	54.5
14	34°01.3	39.6	167° 17.1	10.6'	23°39.9	-0.2'	54.5'
15 16	49°01.3 64°01.4	· · 40.4 41.3	181°46.7 196°16.3	10.6' 10.6'	23°39.7 23°39.3	-0.3' -0.5'	54.5' 54.5'
17	79°01.4	42.1	210°45.9	10.6'	23°38.9	-0.6	54.5'
18	94°01.5	S12°43.0	225°15.5	10.6'	N23°38.3	-0.7'	54.5'
19 20	109°01.6 124°01.6	43.8 44.7	239°45.1 254°14.6	10.6' 10.6'	23°37.6 23°36.8	-0.8' -0.9'	54.6' 54.6'
21	124 01.6 139°01.7	44.7 •• 45.5	254 14.0 268°44.2	10.5	23°35.9	-0.9 -1.0'	54.6'
22	154°01.7	46.4	283°13.8	10.5'	23°34.8	-1.2'	54.6'
23	169°01.8	47.2	297°43.3	10.5'	23°33.7	-1.3'	54.6'
	SD = 16.1'	d = 0.9'		SE	0 = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.8	\$12°48.1	312°12.8	10.5'	N23°32.4	-1.4'	54.6'
1 2	199°01.9 214°02.0	48.9 49.7	326°42.4 341°11.9	10.5' 10.5'	23°31.0 23°29.5	-1.5' -1.6'	54.7' 54.7'
3	229°02.0	50.6	355°41.4	10.5'	23°27.9	-1.7'	54.7'
4	244°02.1	51.4	10°10.9	10.5'	23°26.2	-1.9'	54.7'
5 6	259°02.1 274°02.2	52.3 \$12°53.1	24°40.4 39°09.9	10.5' 10.5'	23°24.3 N23°22.4	-2.0' -2.1'	54.7' 54.7'
7	289°02.2	54.0	53°39.4	10.5'	23°20.3	-2.1 -2.2'	54.7 54.8'
8	304°02.3	54.8	68°08.9	10.5'	23°18.1	-2.3'	54.8'
9 10	319°02.4 334°02.4	· · 55.6 56.5	82°38.4 97°07.9	10.5' 10.5'	23°15.8 23°13.3	-2.4' -2.5'	54.8' 54.8'
11	349°02.5	50.5 57.3	97 07.9 111°37.4	10.5	23°10.8	-2.5' -2.7'	54.8'
12	4°02.5	S12°58.2	126°06.9	10.5'	N23°08.1	-2.8'	54.9'
13	19°02.6	59.0	140°36.4	10.5'	23°05.3	-2.9'	54.9'
14 15	34°02.6 49°02.7	12°59.8 13°00.7	155°05.9 169°35.4	10.5' 10.5'	23°02.4 22°59.4	-3.0' -3.1'	54.9' 54.9'
16	64°02.7	01.5	184°04.9	10.5	22°56.3	-3.2'	54.9'
17	79°02.8	02.4	198°34.4	10.5'	22°53.0	-3.4'	55.0'
18 19	94°02.8 109°02.9	\$13°03.2 04.0	213°03.9 227°33.4	10.5' 10.5'	N22°49.7 22°46.2	-3.5' -3.6'	55.0' 55.0'
20	109 02.9 124°02.9	04.0	242°03.0	10.5'	22°42.6	-3.0 -3.7'	55.0'
21	139°03.0	• • 05.7	256°32.5	10.5'	22°38.9	-3.8'	55.0'
22 23	154°03.0 169°03.1	06.6 07.4	271°02.0 285°31.6	10.5' 10.6'	22°35.1 22°31.1	-3.9' -4.1'	55.1' 55.1'
23	SD = 16.1'	d = 0.8'	203 31.0		0 = 14.9'	-4.1	JJ.1
	<u> </u>	<u>u — 0.0</u>	-	JL	, — 14.9		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:43	07:03	08:23	15:04	16:23	17:43
N 70°	05:41	06:54	08:03	15:24	16:33	17:45
68°	05:40	06:46	07:47	15:39	16:41	17:46
66°	05:38	06:39	07:35	15:52	16:48	17:48
64°	05:37	06:33	07:24	16:03	16:54	17:49
62°	05:36	06:28	07:15	16:12	16:59	17:51
60°	05:35	06:23	07:07	16:19	17:03	17:52
N 58°	05:33	06:19	07:01	16:26	17:07	17:53
56°	05:32	06:16	06:55	16:32	17:11	17:55
54°	05:31	06:13	06:49	16:38	17:14	17:56
52°	05:30	06:09	06:44	16:43	17:18	17:57
50°	05:29	06:07	06:40	16:47	17:20	17:58
45°	05:26	06:00	06:30	16:57	17:27	18:01
N 40°	05:23	05:55	06:23	17:05	17:33	18:04
35°	05:20	05:50	06:16	17:12	17:38	18:07
30° 20°	05:17	05:45	06:10	17:18	17:42	18:10
N 10°	05:10 05:03	05:36 05:28	05:59 05:49	17:29 17:38	17:51 18:00	18:17 18:25
0°	05.05	05:28	05:49	17:47	18:08	18:33
S 10°	04:35	05:19	05:32	17:56	18:18	18:43
20°	04:45	04:59	05:32	18:06	18:29	18:56
30°	04:16	04:46	05:22	18:18	18:43	19:12
35°	04:06	04:37	05:04	18:24	18:51	19:23
40°	03:53	04:28	04:56	18:32	19:01	19:35
45°	03:38	04:16	04:48	18:41	19:13	19:51
S 50°	03:18	04:02	04:37	18:52	19:27	20:12
52°	03:08	03:55	04:32	18:57	19:34	20:22
54°	02:56	03:47	04:27	19:02	19:42	20:33
56°	02:43	03:39	04:21	19:09	19:51	20:47
58°	02:27	03:29	04:14	19:16	20:01	21:03
S 60°	02:08	03:17	04:06	19:24	20:13	21:24

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

		Sun			Moon	oon		
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	94-82%		
25	15:55	15:58	11:44	01:38	14:03			
26	16:01	16:05	11:44	02:28	14:53			
27	16:07	16:10	11:44	03:18	15:43			

October 28, 29, 30 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	36°37.7	135°51.4	\$26°52.4	132°22.2	\$24°39.1	181°27.2	S12°58.9	345°32.0	N16°05.2			
1	51°40.2	150°51.1	52.6	132 22.2 147°22.6	39.2	196°29.1	59.1	0°34.7	05.1	Alpheratz	357°30.4	29°15.6
2	66°42.6	165°50.8	52.0 52.8	147 22.0 162°23.0	39.2	211°31.1	59.1 59.3	15°37.3	05.1	Ankaa	353°03.1	-42°08.6
3	81°45.1					211 31.1 226°33.0		30°40.0		Schedar	349°25.9	56°42.3
		180°50.5	53.1	177°23.5	39.4		• • 59.4		• • 05.0	Diphda	348°43.2	-17°49.2
4	96°47.6	195°50.2	53.3	192°23.9 207°24.3	39.4	241°34.9	59.6	45°42.6	05.0	Achernar	$335^{\circ}16.9$	-57°05.1
5 6	111°50.0 126°52.5	210°49.9 225°49.6	53.5 \$26°53.8		39.5 \$24°39.6	256°36.9	12°59.8	60° 45.3 75° 47.9	04.9	Hamal	327°46.4	23°36.3
7	120 52.5 141°55.0	240°49.3		222°24.8 237°25.2	39.7	271°38.8 286°40.7	\$13°00.0	90°50.6	N16°04.9	Polaris	311°23.3	89°23.2
8	141 55.0 156°57.4	240 49.3 255°49.0	54.0 54.2	252°25.6	39.7 39.7	301°42.7	00.2 00.3	90°50.0 105°53.2	04.8	Acamar	$315^{\circ}08.5$	-40°11.0
9	171°59.9	255 49.0 270°48.7	• • 54.5	267°26.1	39.8	316°44.6	• • 00.5	105 55.2 120°55.9	04.8 •• 04.7	Menkar	$314^{\circ}01.8$	4°12.5
10	171 59.9 187°02.4	270 48.7 285°48.4	54.7	282°26.5	39.9	331°46.5	00.5	135° 58.6	04.7	Mirfak	308°22.1	49°58.0
11	202°04.8	300°48.1	54.7 54.9	202 20.5 297°26.9	39.9 40.0	346°48.5	00.7	155 56.0 151°01.2	04.7	Aldebaran	290°34.9	16°34.1
12	202 04.8 217°07.3	315°47.8	\$26°55.1		\$24°40.0	1°50.4	\$13°01.1	166°03.9	N16°04.6	Rigel	280°59.9	-8°10.0
13	232°09.8	330°47.5	55.4	327°27.8	40.1	16°52.3	01.2	181°06.5	04.5	Capella	$280^{\circ}15.8$	46°01.4
14	232 09.8 247°12.2	345°47.2	55.6	342°28.2	40.1	31°54.3	01.2	196°09.2	04.5	Bellatrix	$278^{\circ}18.5$	6°22.5
15	262°14.7	0°46.9	• • 55.8	357°28.7	40.3	46°56.2	01.6	211°11.8	• • 04.4	Elnath	277°56.7	28°37.8
16	277°17.1	15°46.6	56.0	12°29.1	40.3	61°58.1	01.8	226° 14.5	04.4	Alnilam	275°33.6	-1°11.0
17	292°19.6	30°46.4	56.2	27°29.5	40.4	77°00.1	02.0	241°17.1	04.3	Betelgeuse	270°47.7	7°24.7
18	307°22.1	45°46.1	\$26°56.5	42°30.0	\$24°40.5	92°02.0	S13°02.1	256° 19.8	N16°04.3	Canopus	263°50.4	-52°42.5
19	322°24.5	60°45.8	56.7	57°30.4	40.5	107°03.9	02.3	271°22.4	04.2	Sirius	258°22.7	-16°45.4
20	337°27.0	75°45.5	56.9	72°30.8	40.6	122°05.9	02.5	286°25.1	04.2	Adhara	255°02.7	-29°00.7
21	352°29.5	90°45.2	• • 57.1	87°31.3	• • 40.7	137°07.8	02.7	301°27.7	04.1	Procyon	244°46.7	5°08.8
22	7°31.9	105°44.9	57.3	102°31.7	40.7	152°09.7	02.8	316°30.4	04.1	Pollux	243°12.6	27°57.0
23	22°34.4	120°44.6	57.5	117°32.1	40.8	167°11.7	03.0	331°33.1	04.0	Avior	234°13.0	-59°36.1
										Suhail	222°43.5	-43°33.0
Mer.p	ass. 21:30	ν -0.3′ d0	.2′ m-4.51	$\nu 0.4' d0$.1′ m1.05	ν 1.9′ d0.	2′ m-1.68	$\nu 2.7' d-0$.0′ m-0.19	Miaplacidus	221°37.4	-69°50.2
										Alphard	217°44.0	-8°47.3
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.5	11°49.2
0	37°36.9	135°44.3	S26°57.7	132°32.5	S24°40.9	182°13.6	S13°03.2	346°35.7	N16°04.0	Dubhe	193°37.0	61°35.1
1	52°39.3	150°44.0	58.0	147°33.0	40.9	197°15.5	03.4	1°38.4	03.9	Denebola	182°21.3	14°24.3
2	67°41.8	165°43.8	58.2	162°33.4	41.0	212°17.5	03.6	16°41.0	03.9	Gienah	175°39.9	-17°42.4
3	82°44.2	180°43.5	• • 58.4	177°33.8	• • 41.1	227°19.4	• • 03.7	31°43.7	• • 03.8		172°56.1 171°47.7	-63°15.7 -57°16.7
4	97°46.7	195°43.2	58.6	192°34.3	41.1	242°21.3	03.9	46°46.3	03.8	Gacrux	171 47.7 166°10.3	-57 10.7 55°47.7
5	112°49.2	210°42.9	58.8	207°34.7	41.2	257°23.3	04.1	61°49.0	03.7	Alioth Spica	158°18.5	-11° 18.9
6	127°51.6	225°42.6	S26°59.0	222°35.1	S24°41.3	272°25.2	S13°04.3	$76^{\circ}51.6$	$N16^{\circ}03.7$	Alkaid	150°16.5	49°09.8
7	142°54.1	240°42.3	59.2	237°35.6	41.3	$287^{\circ}27.1$	04.5	91°54.3	03.7	Hadar	148°31.0	-60°30.9
8	157°56.6	255°42.1	59.4	252°36.0	41.4	302°29.1	04.6	106°57.0	03.6	Menkent	146 51.0 147°53.4	-36° 30.9
9	172°59.0	270°41.8	• • 59.6	267°36.4	• • 41.5	317°31.0	• • 04.8	121°59.6	• • 03.6	Arcturus	147° 33.4	19°01.7
10	188°01.5	285°41.5	26°59.8	282°36.8	41.5	332°32.9	05.0	137°02.3	03.5	Rigil Kent.	139°35.5	-60°57.4
11	203°04.0	300°41.2	27°00.0	297°37.3	41.6	347°34.9	05.2	152°04.9	03.5	Kochab	137°21.4	74°02.0
12	218°06.4	315°40.9	S27°00.2	312°37.7	S24°41.7	2°36.8	S13°05.4	167°07.6	$N16^{\circ}03.4$	Zuben'ubi	136°52.1	-16°09.8
13	233°08.9	330°40.7	00.4	327°38.1	41.7	17°38.7	05.5	$182^{\circ}10.2$	03.4	Alphecca	126°00.9	26°37.0
14	248°11.4	345°40.4	00.6	342°38.6	41.8	32°40.7	05.7	$197^{\circ}12.9$	03.3	Antares	112° 11.4	-26°29.7
15	263°13.8	0°40.1	• • 00.8	357°39.0	• • 41.8	47°42.6	• • 05.9	$212^{\circ}15.5$	• • 03.3	Atria	107°02.5	-69°04.8
16	278°16.3	15°39.8	01.0	12°39.4	41.9	62°44.5	06.1	227°18.2	03.2	Sabik	101°58.6	-15°45.5
17	293°18.7	30°39.6	01.2	27°39.8	42.0	77°46.5	06.2	242°20.9	03.2	Shaula	96°05.4	-37°07.4
18	308°21.2	45°39.3	S27°01.4	42°40.3	S24°42.0	92°48.4	S13°06.4	257° 23.5	$N16^{\circ}03.1$	Rasalhague	95°55.2	12°32.6
19	323°23.7	60°39.0	01.6	57°40.7	42.1	107°50.3	06.6	272°26.2	03.1	Eltanin	90°40.7	51°29.5
20	338°26.1	75°38.7	01.8	72°41.1	42.1	122°52.3	06.8	287° 28.8	03.0	Kaus Aust.	83°27.6	-34°22.1
21	353°28.6	90°38.5	• • 01.9	87°41.5	• • 42.2	137°54.2	• • 07.0	302°31.5	• • 03.0	Vega	80°30.8	38°49.1
22	8°31.1	105°38.2	02.1	102°42.0	42.3	152°56.1	07.1	317° 34.1	02.9	Nunki	75°43.2	-26°15.4
23	23°33.5	120°37.9	02.3	117°42.4	42.3	167°58.1	07.3	332°36.8	02.9	Altair	61°56.3	8°57.2
Mer n	ass. 21:26	ν -0.3' d0	.2′ m-4.52	$\nu 0.4' d0$.1′ m1.05	$\nu 1.9' d0$	2′ m-1.68	$\nu^2 7' d-0$.0′ m-0.19	Peacock	52°59.9	-56°38.3
		- 0.0 40								Deneb	49°23.1	45°23.7
	_	_	_		_	_	_	_	_	Enif	33°34.9	10°01.0
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}28.1$	-46°49.0
0	38°36.0	135°37.7	\$27°02.5	132°42.8	\$24°42.4	183°00.0	S13°07.5	347°39.4	N16°02.8	Fomalhaut	$15^{\circ}10.1$	-29°27.7
1	53°38.5	150°37.4	02.7	147°43.2	42.4	198°01.9	07.7	2°42.1	02.8	Scheat	$13^{\circ}41.2$	28° 15.0
2	68°40.9	165°37.1	02.9	162°43.7	42.5	213°03.9	07.9	17°44.8	02.7	Markab	13°25.8	15°22.3
3	83°43.4	180°36.8	03.1	177°44.1	• • 42.5	228°05.8	0.80	32°47.4	• • 02.7	Oct 20 C	SHA	Monasta
4	98°45.9	195°36.6	03.2	192°44.5	42.6	243°07.7	08.2	47°50.1	02.6	Oct 28 Sun Venus		Mer.pass
5	113°48.3	210°36.3	03.4	207°44.9	42.7	258°09.7	08.4	62°52.7	02.6	Venus Mars	99°13.6 95°44.5	14:57 15:10
6	128°50.8	225°36.0	\$27°03.6		\$24°42.7	273°11.6	\$13°08.6	77°55.4	N16°02.5	Jupiter		
7 8	143°53.2 158°55.7	240°35.8 255°35.5	03.8 04.0	237°45.8 252°46.2	42.8 42.8	288°13.5 303°15.5	08.7 08.9	92°58.0 108°00.7	02.5 02.4	Saturn	308°54.3	11:53 00:58
9	158°55.7 173°58.2	255° 35.5 270° 35.2	04.0	252°46.2 267°46.6	42.8 •• 42.9	303°15.5 318°17.4	09.1	108°00.7 123°03.4	• • 02.4	Jaturn	JUU J4.J	00.50
10	173 56.2 189°00.6	270 35.2 285°35.0	04.1	282°47.1	42.9	333°19.3	09.1	123 03.4 138°06.0	02.4	Oct 29 Mon	SHA	Mer.pass
11	204°03.1	300°34.7	04.5 04.5	297°47.5	43.0	348°21.3	09.5	150 00.0 153°08.7	02.3	Venus	98°07.5	14:57
12	219°05.6	315°34.4	\$27°04.7	312°47.9	\$24°43.0	3°23.2	\$13°09.6	168° 11.3	N16°02.2	Mars	94°55.7	15:09
13	234°08.0	330°34.2	04.8	327°48.3	43.1	18°25.1	09.8	183°14.0	02.2	Jupiter		11:50
14	249°10.5	345°33.9	05.0	342°48.8	43.1	33°27.1	10.0	198° 16.6	02.1	Saturn	308°58.9	00:53
15	264°13.0	0°33.7	05.2	357°49.2	• • 43.2	48°29.0	. 10.2	213° 19.3	02.1	Oct 30 Tue	SHA	Mer.pass
16	279°15.4	15°33.4	05.3	12°49.6	43.2	63°30.9	10.3	228°22.0	02.0	Venus	97°01.7	14:58
17	294°17.9	30°33.1	05.5	27°50.0	43.3	78°32.9	10.5	243°24.6	02.0	Mars	94°06.8	15:09
18	309°20.3	45°32.9	S27°05.7		\$24°43.3	93°34.8	S13°10.7	258° 27.3	N16°01.9		144°24.0	11:46
19	324°22.8	60°32.6	05.9	57°50.9	43.4	108°36.7	10.9	273°29.9	01.9	Saturn	309°03.4	00:49
20	339°25.3	75°32.4	06.0	$72^{\circ}51.3$	43.4	123°38.7	11.1	288°32.6	01.8			
21	354°27.7	90°32.1	• • 06.2	$87^{\circ}51.7$	• • 43.5	138°40.6	• • 11.2	303°35.2	•• 01.8	Horizont	al parallax	
22	9°30.2	105°31.9	06.3	102°52.1	43.5	153°42.5	11.4	318° 37.9	01.7		Venus:	0.2
23	24°32.7	120°31.6	06.5	117°52.6	43.6	168°44.5	11.6	333°40.6	01.7		Mars:	0.1
Mern	ass. 21:22	ν -0.3' d0	.2′ m-4.54	ν0 4' d0	.1′ m1.06	ν1 9' dΩ	2′ m-1.68	ν2 7' d-Ω	.0′ m-0.20			
					.=.00							

h	Sui	า			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.1	S13°08.2	300°01.1	10.6'	N22°27.1	-4.2'	55.1'
1 2	199°03.2 214°03.2	09.1 09.9	314°30.7 329°00.3	10.6' 10.6'	22°22.9 22°18.6	-4.3' -4.4'	55.1' 55.2'
3	229°03.3	. 10.7	343°29.8	10.6'	22°14.2	-4.4 -4.5	55.2'
4	244°03.3	11.6	357°59.4	10.6'	22°09.7	-4.6'	55.2'
5	259°03.4	12.4	12°29.0	10.6'	22°05.1	-4.7'	55.2'
6 7	274°03.4 289°03.5	\$13°13.2 14.1	26°58.6 41°28.2	10.6' 10.6'	N22°00.4 21°55.5	-4.8' -5.0'	55.3' 55.3'
8	304°03.5	14.1	55°57.9	10.6'	21°50.6	-5.0 -5.1'	55.3'
9	319°03.6	•• 15.7	70°27.5	10.7'	21°45.5	-5.2'	55.3'
10	334°03.6	16.6	84°57.2	10.7'	21°40.3	-5.3'	55.4'
11 12	349°03.7 4°03.7	17.4 \$13°18.2	99°26.8 113°56.5	10.7' 10.7'	21°35.0 N21°29.6	-5.4' -5.5'	55.4' 55.4'
13	19°03.8	19.1	128°26.2	10.7'	21°24.1	-5.6'	55.4'
14	34°03.8	19.9	142°55.9	10.7'	21° 18.5	-5.7'	55.5'
15 16	49°03.9 64°03.9	· · 20.7 21.6	157°25.6 171°55.4	10.7' 10.7'	21°12.7 21°06.9	-5.9' -6.0'	55.5' 55.5'
17	79°04.0	22.4	171 55.4 186°25.1	10.7	21°00.9	-6.1'	55.5'
18	94°04.0	S13°23.2	200°54.9	10.8'	N20°54.8	-6.2'	55.6'
19	109°04.0	24.1	215°24.7	10.8'	20°48.6	-6.3	55.6'
20 21	124°04.1 139°04.1	24.9 •• 25.7	229°54.4 244°24.3	10.8' 10.8'	20°42.4 20°36.0	-6.4' -6.5'	55.6' 55.6'
22	154°04.2	26.5	258°54.1	10.8'	20° 29.4	-6.6'	55.7'
23	169°04.2	27.4	273°23.9	10.9'	20°22.8	-6.7'	55.7'
	SD = 16.1'	d = 0.8'		SI	D = 15.0'		
Man	GHA	Doc	GHA		Dec	d	НР
Mon 0	GHA 184°04.3	Dec \$13°28.2	287°53.8	u 10.9'	Dec N20°16.1	а -6.8'	нР 55.7'
1	199°04.3	29.0	$302^{\circ}23.7$	10.9'	20°09.3	-6.9'	55.7'
2	214°04.3	29.9	316°53.5	10.9'	20°02.3	-7.0'	55.8'
3 4	229°04.4 244°04.4	· · 30.7 31.5	331°23.5 345°53.4	10.9' 10.9'	19°55.3 19°48.2	-7.1' -7.3'	55.8' 55.8'
5	259°04.5	32.3	0°23.3	11.0'	19°40.2	-7.4'	55.9'
6	274°04.5	S13°33.2	14°53.3	11.0'	N19°33.5	-7.5'	55.9'
7	289°04.5	34.0	29°23.3	11.0'	19°26.1	-7.6'	55.9'
8 9	304°04.6 319°04.6	34.8 •• 35.6	43°53.2 58°23.3	11.0' 11.0'	19° 18.5 19° 10.8	-7.7' -7.8'	56.0' 56.0'
10	334°04.7	36.5	72°53.3	11.0'	19°03.1	-7.9'	56.0'
11	349°04.7	37.3	87°23.3	11.1'	18°55.2	-8.0'	56.0'
12	4°04.7 19°04.8	\$13°38.1 38.9	101°53.4 116°23.5	11.1' 11.1'	N18° 47.2 18° 39.1	-8.1' -8.2'	56.1' 56.1'
13 14	19 04.8 34°04.8	38.9 39.7	110 23.5 130°53.6	11.1'	18°31.0	-8.2 -8.3	56.1'
15	49°04.8	• • 40.6	145°23.7	11.1'	18°22.7	-8.4	56.2'
16	64°04.9	41.4	159°53.8	11.1'	18° 14.3	-8.5	56.2'
17 18	79°04.9 94°05.0	42.2 \$13°43.0	174°24.0 188°54.1	11.2' 11.2'	18°05.8 N17°57.2	-8.6' -8.7'	56.2' 56.3'
19	109°05.0	43.9	203°24.3	11.2'	17°48.5	-8.8'	56.3
20	124°05.0	44.7	$217^{\circ}54.5$		$17^{\circ}39.8$	-8.9'	56.3'
21	139°05.1 154°05.1	• • 45.5	232°24.7	11.2'	17°30.9	-9.0'	56.4' 56.4'
22 23	169°05.1	46.3 47.1	246°55.0 261°25.2	11.2' 11.3'	17°21.9 17°12.9	-9.1' -9.2'	56.4'
	SD = 16.1'	d = 0.8'			O = 15.2'	J.2	
Tue 0	GHA 184°05.2	Dec S 13°48.0	GHA 275°55.5	u 11.3'	Dec N17°03.7	d -9.3'	HP 56.5'
1	184 05.2 199°05.2	48.8	275 55.5 290°25.7	11.3'	16°54.4	-9.3 -9.4'	56.5'
2	214°05.2	49.6	304°56.0	11.3'	$16^{\circ}45.1$	-9.4'	56.5'
3	229°05.3	• • 50.4	319°26.3	11.3'	16°35.6	-9.5'	56.6'
4 5	244°05.3 259°05.3	51.2 52.0	333°56.7 348°27.0	11.3' 11.4'	16° 26.1 16° 16.5	-9.6' -9.7'	56.6' 56.6'
6	274°05.4	S13°52.9	2°57.4	11.4'	$N16^{\circ}06.7$	-9.8'	56.7'
7	289°05.4	53.7	17°27.7	11.4'	15°56.9	-9.9'	56.7'
8 9	304°05.4 319°05.5	54.5 •• 55.3	31°58.1 46°28.5	11.4' 11.4'	15° 47.0 15° 37.0	-10.0' -10.1'	56.7' 56.8'
10	319 05.5 334°05.5	56.1	40 28.5 60°58.9	11.4 11.4'	15° 37.0	-10.1 -10.2'	56.8'
11	349°05.5	56.9	75°29.4	11.4'	$15^{\circ}16.7$	-10.3'	56.8'
12	4°05.5	\$13°57.8	89°59.8	11.4'	N15°06.5	-10.4'	56.9'
13 14	19°05.6 34°05.6	58.6 13°59.4	104°30.2 119°00.7	11.5' 11.5'	14°56.1 14°45.7	-10.4' -10.5'	56.9' 56.9'
15	49°05.6	14°00.2	133°31.2	11.5'	14° 35.2	-10.6'	57.0'
16	64°05.7	01.0	148°01.7	11.5'	14°24.5	-10.7'	57.0'
17	79°05.7 94°05.7	01.8 \$14°02.6	162°32.2 177°02.7	11.5'	14° 13.8 N14° 03.1	-10.8'	57.0'
18 19	94°05.7 109°05.7	03.4	177°02.7 191°33.2	11.5' 11.5'	13°52.2	-10.9' -10.9'	57.1' 57.1'
20	124°05.8	04.3	206°03.7	11.5'	13°41.3	-11.0'	57.1'
21	139°05.8	•• 05.1	220°34.2	11.5'	13°30.2	-11.1'	57.2'
22 23	154°05.8 169°05.9	05.9 06.7	235°04.8 249°35.3	11.5' 11.6'	13°19.1 13°07.9	-11.2' -11.3'	57.2' 57.3'
23	SD = 16.1'	$\frac{00.7}{d = 0.8'}$			D = 15.4'	-11.3	31.3
	JD — 10.1	u — 0.0		اد	J — 13.4		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h		Pass	Upper Lower		21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	74-55%	
28	16:13	16:15	11:44	04:08	16:33		
29	16:17	16:19	11:44	04:58	17:23		
30	16:21	16:22	11:44	05:48	18:12		

October 31, 01, 02 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	39°35.1	135°31.3	\$27°06.7	132°53.0	S24°43.6	183°46.4	\$13°11.8	348°43.2	N16°01.6			
1	54°37.6	150°31.1	06.8	147°53.4	43.7	198°48.3	11.9	3°45.9	01.6	Alpheratz	357°30.4	29°15.6
2	69°40.1	165°30.8	07.0	162°53.8	43.7	213°50.3	12.1	18° 48.5	01.5	Ankaa	353°03.1	-42°08.6
3	84°42.5	180°30.6	07.1	177°54.3	• • 43.8	228°52.2	12.3	33°51.2	01.5	Schedar	349°25.9	56°42.3
4	99°45.0	195°30.3	07.3	192°54.7	43.8	243°54.1	12.5	48°53.9	01.4	Diphda	348°43.2	-17°49.2
5	114°47.5	210°30.1	07.5	207°55.1	43.8	258°56.1	12.7	63°56.5	01.4	Achernar	335°16.9	-57°05.1
6	129°49.9	225°29.8	S27°07.6	222°55.5	S24°43.9	273°58.0	S13°12.8	78°59.2	$N16^{\circ}01.3$	Hamal Polaris	327°46.4 311°22.7	23°36.3 89°23.2
7	144°52.4	240°29.6	07.8	237°55.9	43.9	288°59.9	13.0	94°01.8	01.3	Acamar	315°08.5	-40°11.0
8	159°54.8	255° 29.3	07.9	252°56.4	44.0	304°01.9	13.2	109°04.5	01.2	Menkar	314°01.8	4°12.5
9	174°57.3	270°29.1	• • 08.1	267°56.8	• • 44.0	319°03.8	• • 13.4	124°07.1	• • 01.2	Mirfak	308°22.1	49°58.0
10	189°59.8	285°28.8	08.2	282°57.2	44.1	334°05.7	13.5	139°09.8	01.1	Aldebaran	290°34.9	16°34.1
11	205°02.2	300°28.6	08.4	297°57.6	44.1	349°07.7	13.7	154° 12.5	01.1	Rigel	280°59.9	-8°10.0
12	220°04.7	315°28.3	\$27°08.5	312°58.0	\$24°44.1	4°09.6	\$13°13.9	169° 15.1	N16°01.0	Capella	$280^{\circ}15.8$	46°01.4
13 14	235°07.2 250°09.6	330°28.1 345°27.9	08.7 08.8	327°58.5 342°58.9	44.2 44.2	19°11.5 34°13.5	14.1 14.3	184° 17.8 199° 20.4	01.0 00.9	Bellatrix	$278^{\circ}18.5$	6°22.5
15	265°12.1	0°27.6	• • 09.0	357°59.3	44.3	49°15.4	. 14.3	214°23.1	00.9	Elnath	277°56.7	28°37.8
16	280°14.6	15°27.4	09.1	12°59.7	44.3	64°17.3	14.6	229° 25.8	00.8	Alnilam	275°33.6	-1°11.0
17	295°17.0	30°27.1	09.3	28°00.1	44.3	79°19.2	14.8	244° 28.4	00.8	Betelgeuse	270°47.7	7°24.7
18	310°19.5	45°26.9	S27°09.4	43°00.6	S24°44.4	94°21.2	S13°15.0	259°31.1	N16°00.7	Canopus	263°50.4	-52°42.5
19	325°22.0	60°26.6	09.5	58°01.0	44.4	109°23.1	15.1	274°33.7	00.7	Sirius	258°22.7	-16°45.4
20	340°24.4	75°26.4	09.7	73°01.4	44.4	124°25.0	15.3	289°36.4	00.6	Adhara	255°02.7	-29°00.7
21	355°26.9	90°26.2	• • 09.8	88°01.8	• • 44.5	139°27.0	• • 15.5	$304^{\circ}39.1$	• • 00.6	Procyon Pollux	244°46.7 243°12.6	5°08.8 27°57.0
22	10°29.3	$105^{\circ}25.9$	10.0	103°02.2	44.5	154°28.9	15.7	319°41.7	00.5	Avior	234°13.0	-59°36.1
23	25°31.8	120°25.7	10.1	118°02.7	44.6	169°30.8	15.9	334°44.4	00.5	Suhail	222°43.4	-43°33.0
Mern	ass. 21:18	ν-0 3 ⁷ d0	.2′ m-4.55	ν0 4' d0	.0′ m1.06	ν1 9' dΩ	2′ m-1.68	v27' d-0	.0' m-0.20	Miaplacidus	221°37.3	-43°50.2
- Wici.p	7433. 21.10	ν 0.5 do.	.2 111 4.33	νο. - αο.		ν1.5 do.	2 111 1.00	ν <u>2.1 α σ</u>	.0 111 0.20	Alphard	217°44.0	-8°47.3
										Regulus	207°30.5	11°49.2
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°37.0	61°35.1
0	40°34.3	135°25.4	\$27°10.2	133°03.1	S24°44.6	184°32.8	S13°16.0	349°47.0	N16°00.4	Denebola	182°21.3	14°24.3
1	55°36.7	150°25.2	10.4	148°03.5	44.6	199°34.7	16.2	4°49.7	00.4	Gienah	175°39.9	-17°42.4
2	70°39.2	165°25.0	10.5	163°03.9	44.7	214°36.6	16.4	19°52.4	00.3	Acrux	$172^{\circ}56.1$	-63°15.7
3 4	85°41.7 100°44.1	180°24.7 195°24.5	10.6	178°04.3 193°04.7	• • 44.7 44.7	229°38.6 244°40.5	•• 16.6	34°55.0	00.3	Gacrux	171°47.6	-57°16.7
5	100 44.1 115°46.6	210° 24.3	10.8 10.9	193 04.7 208°05.2	44.7 44.8	259°42.4	16.7 16.9	49° 57.7 65° 00.3	00.2 00.2	Alioth	$166^{\circ}10.3$	55°47.7
6	130°49.1	210° 24.3° 225° 24.0	\$27°11.0	208 05.2 223°05.6	\$24°44.8	274°44.4	\$13°17.1	80°03.0	N16°00.1	Spica	158°18.5	-11°18.9
7	145°51.5	240°23.8	11.2	238°06.0	44.8	289°46.3	17.3	95°05.7	00.1	Alkaid	152°49.6	49°09.8
8	160°54.0	255° 23.6	11.3	253°06.4	44.9	304°48.2	17.5	110°08.3	00.0	Hadar	148°31.0	-60°30.9
9	175°56.4	270°23.3	• • 11.4	268°06.8	• • 44.9	319°50.2	• • 17.6	125° 11.0	16°00.0	Menkent	147°53.4	-36°30.9
10	190°58.9	285°23.1	11.5	283°07.2	44.9	334°52.1	17.8	140° 13.6	15°59.9	Arcturus	145°44.8	19°01.7
11	206°01.4	300°22.9	11.7	298°07.7	45.0	349°54.0	18.0	155° 16.3	59.9	Rigil Kent. Kochab	139°35.5 137°21.4	-60°57.4 74°02.0
12	221°03.8	315°22.7	S27°11.8	313°08.1	\$24°45.0	4°56.0	S 13°18.2	170° 19.0	N15°59.8	Zuben'ubi	137 21.4 136°52.1	-16°09.8
13	236°06.3	330°22.4	11.9	328°08.5	45.0	19°57.9	18.3	185°21.6	59.8	Alphecca	130° 52.1 126° 00.9	26°37.0
14	251°08.8	345°22.2	12.0	343°08.9	45.0	34°59.8	18.5	200°24.3	59.7	Antares	112° 11.4	-26°29.7
15	$266^{\circ}11.2$	0°22.0	• • 12.2	358°09.3	• • 45.1	50°01.8	•• 18.7	$215^{\circ}26.9$	• • 59.7	Atria	107°02.5	-69°04.8
16	281°13.7	15°21.7	12.3	13°09.7	45.1	65°03.7	18.9	230° 29.6	59.6	Sabik	101°58.6	-15°45.5
17	296°16.2	30°21.5	12.4	28°10.2	45.1	80°05.6	19.1	245° 32.3	59.6	Shaula	96°05.4	-37°07.4
18	311°18.6	45°21.3	S27°12.5	43°10.6	S24°45.2	95°07.6	S13°19.2	260°34.9	N15°59.5	Rasalhague	95°55.2	12°32.6
19	326°21.1	60°21.1	12.6	58°11.0	45.2	110°09.5	19.4	275°37.6	59.5	Eltanin	90°40.7	51°29.4
20 21	341°23.6 356°26.0	75°20.9 90°20.6	12.8 • • 12.9	73°11.4 88°11.8	45.2 •• 45.2	125°11.4 140°13.3	19.6 · · 19.8	290° 40.2 305° 42.9	59.4 •• 59.4	Kaus Aust.	83°27.7	-34°22.1
22	11°28.5	105° 20.4	13.0	103°12.2	45.3	155° 15.3	19.0	320° 45.6	59.3	Vega	80°30.8	38°49.1
23	26°30.9	120° 20.2	13.1	118°12.6	45.3	170° 17.2	20.1	335°48.2	59.3	Nunki	75°43.2	-26°15.4
										Altair	61°56.3	8°57.2
Mer.p	ass. 21:14	ν -0.2′ d0.	$.1^\prime$ m-4.56	ν 0.4′ d0.	.0' m1.06	$\nu 1.9' \ d0.$	2′ m-1.68	$\nu 2.7' d-0$.0′ m-0.21	Peacock	52°59.9	-56°38.3
										Deneb	49°23.1	45°23.7
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°34.9 27°28.1	10°01.0 -46°49.0
0	41°33.4	135°20.0	\$27°13.2	133°13.1	\$24°45.3	185°19.1	S13°20.3	350°50.9	N15°59.2	Fomalhaut	27 28.1 15°10.2	-46 49.0 -29°27.8
1	56°35.9	$150^{\circ}19.8$	13.3	$148^{\circ}13.5$	45.3	$200^{\circ}21.1$	20.5	$5^{\circ}53.5$	59.2	Scheat	13°41.2	28°15.0
2	71°38.3	165° 19.5	13.4	163°13.9	45.4	215°23.0	20.6	20°56.2	59.1	Markab	13°25.8	15°22.3
3	86°40.8	180°19.3	• • 13.5	178°14.3	• • 45.4	230°24.9	• • 20.8	35°58.9	• • 59.1			
4	101°43.3	195° 19.1	13.6	193°14.7	45.4	245°26.9	21.0	51°01.5	59.0	Oct 31 Wed	SHA	Mer.pass
5	116°45.7	210°18.9	13.8	208°15.1	45.4	260°28.8	21.2	66°04.2	59.0	Venus	95°56.2	14:58
6	131°48.2	225°18.7	S27°13.9		\$24°45.5	275°30.7	\$13°21.4	81°06.8	N15°58.9	Mars Jupiter	93°17.9 144°11.3	15:08 11:43
7	146°50.7	240°18.5	14.0	238°16.0	45.5	290°32.7	21.5	96°09.5	58.9	Saturn	309°08.1	00:45
8 9	161°53.1 176°55.6	255° 18.3 270° 18.0	14.1 •• 14.2	253°16.4 268°16.8	45.5 • • 45.5	305°34.6 320°36.5	21.7 · · 21.9	111° 12.2 126° 14.8	58.8 •• 58.8	Jatuin		00.45
9 10	170 55.0 191°58.1	270 18.0 285°17.8	14.3	208 10.8 283°17.2	45.5 45.5	320 30.5 335°38.5	22.1	120 14.8 141°17.5	58.7	Nov 01 Thu	SHA	Mer.pass
11	207°00.5	300° 17.6	14.3	298°17.6	45.5 45.6	350°40.4	22.1	156° 20.2	58.7	Venus	94°51.2	14:59
12	222°03.0	315° 17.4	\$27°14.5	313°18.0	S24°45.6	5°42.3	S13°22.4	171°22.8	N15°58.6	Mars	92°28.8	15:07
13	237°05.4	330°17.2	14.6	328°18.4	45.6	20°44.3	22.6	186° 25.5	58.6		143°58.5	11:40
14	252°07.9	345°17.0	14.7	343°18.8	45.6	35°46.2	22.8	201°28.1	58.5	Saturn	309°12.8	00:41
15	267°10.4	0°16.8	• • 14.8	358°19.3	• • 45.6	50°48.1	• • 22.9	216°30.8	• • 58.5	Nov 02 Fri	SHA	Mer.pass
16	$282^{\circ}12.8$	$15^{\circ}16.6$	14.9	$13^{\circ}19.7$	45.6	65°50.0	23.1	$231^{\circ}33.5$	58.4	Venus	93°46.6	14:59
17	$297^{\circ}15.3$	30°16.4	15.0	$28^{\circ}20.1$	45.7	80°52.0	23.3	$246^{\circ}36.1$	58.4	Mars	91°39.6	15:07
18	312°17.8	45° 16.2	\$27°15.0		S24°45.7	95°53.9	S13°23.5	261°38.8	N15°58.3	Jupiter	$143^{\circ}45.7$	11:37
19	327°20.2	60°16.0	15.1	58°20.9	45.7	110°55.8	23.7	276°41.5	58.3	Saturn	309°17.5	00:37
20	342°22.7	75°15.8	15.2	73°21.3	45.7	125°57.8	23.8	291°44.1	58.2	Horizont	al parallax	
21	357°25.2	90°15.6	· · 15.3	88°21.7	· · 45.7	140°59.7	• • 24.0	306°46.8	· · 58.2	1101120111	Venus:	0.2
22 23	12°27.6 27°30.1	105° 15.4 120° 15.2	15.4 15.5	103°22.1 118°22.6	45.7 45.8	156°01.6 171°03.6	24.2 24.4	321°49.4 336°52.1	58.1 58.1		Mars:	0.2
										L	=:=:	-
Mer.p	ass. 21:10	ν -0.2′ d0.	.1′ m-4.57	ν 0.4′ d0.	.0′ m1.06	ν 1.9′ d0.	2′ m-1.68	$\nu 2.7' \ d-0$.0′ m-0.21			

h	Sur			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.9	S14°07.5	264°05.9	11.6'	N12°56.6	-11.4'	57.3'
1	$199^{\circ}05.9$	08.3	278°36.4	11.6'	12°45.3	-11.4'	57.3'
2	214°05.9	09.1	293°07.0	11.6'	12°33.9	-11.5'	57.4'
3	229°06.0	• • 09.9	307°37.6	11.6'	12°22.3	-11.6'	57.4'
4	244°06.0	10.7	322°08.2	11.6'	12°10.8	-11.7'	57.4'
5	259°06.0 274°06.0	11.5 \$14°12.3	336°38.7 351°09.3	11.6' 11.6'	11°59.1 N11°47.4	-11.7' -11.8'	57.5' 57.5'
6 7	289°06.0	13.2	5°39.9	11.6'	11°35.5	-11.6 -11.9'	57.6'
8	304°06.1	14.0	20° 10.5	11.6'	11°23.6	-12.0'	57.6'
9	319°06.1	• • 14.8	34°41.1	11.6'	11°11.7	-12.0'	57.6'
10	334°06.1	15.6	49°11.7	11.6'	10°59.7	-12.1'	57.7'
11	$349^{\circ}06.1$	16.4	63°42.3	11.6'	10°47.5	-12.2'	57.7'
12	4°06.2	S 14°17.2	78° 12.9	11.6'	N10°35.4	-12.2'	57.7'
13	19°06.2	18.0	92°43.5	11.6'	10°23.1	-12.3'	57.8'
14	34°06.2	18.8	107°14.1 121°44.6	11.6'	10°10.8	-12.4'	57.8'
15 16	49°06.2 64°06.2	· · 19.6 20.4	121 44.6 136°15.2	11.6' 11.6'	09°58.4 09°46.0	-12.5' -12.5'	57.9' 57.9'
17	79°06.3	21.2	150° 15.2	11.6'	09°40.0	-12.6'	57.9'
18	94°06.3	\$14°22.0	165° 16.4	11.6'	N09°20.9	-12.6'	58.0'
19	109°06.3	22.8	179°47.0	11.6'	09°08.2	-12.7'	58.0'
20	124°06.3	23.6	194° 17.5	11.6'	08°55.5	-12.8'	58.1'
21	139°06.3	• • 24.4	208°48.1	11.5'	08°42.7	-12.8'	58.1'
22	154°06.4	25.2	223°18.6	11.5'	08°29.9	-12.9'	58.1'
23	169°06.4	26.0	237°49.2	11.5'	08°17.0	-13.0'	58.2'
	SD = 16.1'	d = 0.8'		SI	D = 15.6'		
Th	GHA	Dec	CHA		Dee		HP
Thu 0	GHA 184°06.4	Dec \$14°26.8	GHA 252° 19.7	u 11.5'	Dec N08°04.1	<i>d</i> −13.0'	НР 58.2'
1	199°06.4	27.6	266° 50.2	11.5'	07°51.0	-13.1'	58.3
2	214°06.4	28.4	281°20.7	11.5'	07°38.0	-13.1'	58.3'
3	229°06.4	29.2	295°51.2	11.5'	07°24.8	-13.2'	58.3'
4	244°06.5	30.0	$310^{\circ}21.7$	11.5'	$07^{\circ}11.6$	-13.2'	58.4'
5	259°06.5	30.8	$324^{\circ}52.2$	11.5'	06°58.4	-13.3'	58.4'
6	274°06.5	S14°31.6	339°22.7	11.4'	N06°45.1	-13.4'	58.4'
7	289°06.5	32.4	353°53.1	11.4'	06°31.8	-13.4'	58.5'
8	304°06.5	33.2	8°23.5	11.4'	06°18.4	-13.5'	58.5'
9	319°06.5 334°06.5	• • 34.0	22°53.9 37°24.3	11.4' 11.4'	06°04.9 05°51.4	-13.5' -13.6'	58.6' 58.6'
10 11	334 06.5 349°06.6	34.8 35.6	51°54.7	11.4 11.4'	05 51.4 05°37.8	-13.6'	58.6'
12	4°06.6	\$14°36.4	66°25.0	11.4	N05°24.2	-13.6'	58.7'
13	19°06.6	37.2	80°55.4	11.3'	05°10.6	-13.7'	58.7'
14	34°06.6	38.0	95°25.7	11.3'	04°56.9	-13.7'	58.8'
15	49°06.6	• • 38.8	109°56.0	11.3'	04°43.2	-13.8'	58.8'
16	64°06.6	39.6	124°26.2	11.2'	04°29.4	-13.8'	58.8'
17	79°06.6	40.4	138°56.5	11.2'	04°15.6	-13.9'	58.9'
18	94°06.6	\$14°41.1	153°26.7	11.2'	N04°01.7	-13.9'	58.9'
19 20	109°06.6 124°06.7	41.9 42.7	167° 56.9 182° 27.1	11.2' 11.1'	03°47.8 03°33.8	-13.9' -14.0'	59.0' 59.0'
21	139°06.7	• 43.5	196° 57.2	11.1	03°19.9	-14.0'	59.0'
22	154°06.7	44.3	211°27.3	11.1'	03°05.8	-14.1'	59.1'
23	169°06.7	45.1	225°57.4	11.0'	02°51.8	-14.1'	59.1'
	SD = 16.1'	d = 0.8'		SI	D = 15.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 06.7	\$14°45.9	240°27.4	ν 11.0'	N02°37.7	-14.1'	59.1'
1	199°06.7	46.7	254° 57.4	11.0'	02°23.6	-14.1	59.2'
2	214°06.7	47.5	269°27.4	10.9'	02°09.4	-14.2'	59.2'
3	229°06.7	• • 48.3	283°57.4	10.9'	01°55.2	-14.2'	59.3'
4	244°06.7	49.1	298°27.3	10.9'	01°41.0	-14.2'	59.3'
5	259°06.7	49.8	312°57.1	10.8'	01°26.8	-14.3'	59.3'
6	274°06.7	\$14°50.6	327°27.0	10.8'	N01°12.5	-14.3'	59.4'
7	289°06.7 304°06.7	51.4 52.2	341°56.8 356°26.5	10.8' 10.7'	00°58.2 00°43.9	-14.3' -14.3'	59.4' 59.4'
8 9	304°06.7 319°06.8	52.2 · · 53.0	350° 26.5 10° 56.3	10.7'	00°43.9 00°29.5	-14.3' -14.4'	59.4 59.5'
10	334°06.8	53.8	25°25.9	10.7	00°29.3	-14.4'	59.5'
11	349°06.8	54.6	39°55.6	10.6'	N00°00.8	-14.4'	59.6'
12	4°06.8	S 14°55.3	54°25.2	10.6'	S00°13.6	14.4'	59.6'
13	19°06.8	56.1	68°54.7	10.5'	00°28.0	14.4'	59.6'
14	34°06.8	56.9	83°24.2	10.5'	00°42.5	14.4'	59.7'
15	49°06.8	• • 57.7	97°53.7	10.4'	00°56.9	14.5'	59.7'
16	64°06.8	58.5	112°23.1	10.4'	01°11.4	14.5'	59.7'
17 18	79°06.8 94°06.8	14°59.3 \$15°00.1	126°52.5 141°21.8	10.3' 10.3'	01°25.8 S01°40.3	14.5' 14.5'	59.8' 59.8'
18 19	94°06.8 109°06.8	00.8	141°21.8 155°51.0	10.3	01°54.8	14.5'	59.8'
20	109 00.8 124°06.8	00.8	170°20.3	10.2'	01 54.8 02°09.3	14.5	59.6 59.9'
21	139°06.8	02.4	184°49.4	10.2	02°03.8	14.5	59.9'
22	154°06.8	03.2	199° 18.5	10.1'	02°38.3	14.5'	59.9'
23	169°06.8	04.0	213°47.6	10.0'	02°52.8	14.5'	60.0'
	SD = 16.1'	d = 0.8'		SI	O = 16.1'		

Naut. Civil Stinise Civil Naut. N 72° 06:07 07:30 08:58 14:27 15:55 17:18 N 70° 06:03 07:17 08:32 14:54 16:08 17:23 68° 05:59 07:06 08:12 15:14 16:19 17:26 66° 05:56 06:58 07:56 15:30 16:28 17:30 62° 05:53 06:50 07:43 15:43 16:36 17:33 60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:33 06:08 06:39 16:48	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 06:03 07:17 08:32 14:54 16:08 17:23 68° 05:59 07:06 08:12 15:14 16:19 17:26 66° 05:56 06:58 07:56 15:30 16:28 17:30 64° 05:56 06:58 07:56 15:30 16:28 17:30 60° 05:53 06:50 07:43 15:43 16:36 17:33 60° 05:48 06:38 07:23 15:54 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:29 06:01	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° 05:59 07:06 08:12 15:14 16:19 17:26 66° 05:56 06:58 07:56 15:30 16:28 17:30 64° 05:53 06:50 07:43 15:43 16:36 17:33 62° 05:50 06:43 07:32 15:54 16:43 17:38 60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:01 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:57 35° 05:29 05:55	N 72°	06:07	07:30	08:58	14:27	15:55	17:18
66° 05:56 06:58 07:56 15:30 16:28 17:30 64° 05:53 06:50 07:43 15:43 16:36 17:33 62° 05:50 06:43 07:32 15:54 16:43 17:36 60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49	N 70°	06:03	07:17	08:32	14:54	16:08	17:23
64° 05:53 06:50 07:43 15:43 16:36 17:33 62° 05:50 06:43 07:32 15:54 16:43 17:36 60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 20° 05:13 05:39			07:06		15:14	16:19	
62° 05:50 06:43 07:32 15:54 16:43 17:36 60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 20° 05:21 05:49 06:14 17:13 17:37 18:06 N 10° 05:04 05:29 05:51 17:36 17:58 18:14 N 10° 04:42 05:08		05:56	06:58	07:56	15:30	16:28	
60° 05:48 06:38 07:23 16:03 16:49 17:38 N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:01 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29	-				I		
N 58° 05:46 06:32 07:15 16:12 16:54 17:40 56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:42 05:08							
56° 05:44 06:28 07:07 16:19 16:59 17:43 54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:42 05:08 05:30 17:47 18:08 18:33 5 10° 04:42 05:08	60°	05:48	06:38	07:23	16:03	16:49	17:38
54° 05:42 06:23 07:01 16:25 17:03 17:45 52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 5 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55		05:46	06:32	07:15	16:12	16:54	17:40
52° 05:40 06:20 06:55 16:31 17:07 17:47 50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 \$10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40		05:44	06:28	07:07	16:19	16:59	17:43
50° 05:38 06:16 06:50 16:36 17:10 17:49 45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 S 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31		05:42	06:23	07:01	16:25	17:03	17:45
45° 05:33 06:08 06:39 16:48 17:18 17:53 N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 S 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20	-	05:40	06:20	06:55	16:31	17:07	17:47
N 40° 05:29 06:01 06:29 16:57 17:25 17:57 35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 S 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:24 05:08 05:30 17:58 18:19 18:45 20° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58						17:10	
35° 05:25 05:55 06:21 17:06 17:32 18:02 30° 05:21 05:49 06:14 17:13 17:37 18:06 20° 05:13 05:39 06:02 17:25 17:48 18:14 N 10° 05:04 05:29 05:51 17:36 17:58 18:23 0° 04:54 05:19 05:40 17:47 18:08 18:33 \$10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$50° 03:04 03:50	45°	05:33	06:08	06:39	16:48	17:18	17:53
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:29	06:01	06:29	16:57		17:57
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		05:25	05:55	06:21	17:06		18:02
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 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 S 50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 56° 02:23 03:33 04:07 19:22 20:06 20:50 58° 02:04 03:11			05:49		17:13		
0° 04:54 05:19 05:40 17:47 18:08 18:33 S 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 S 50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11		05:13	05:39	06:02	17:25	17:48	18:14
S 10° 04:42 05:08 05:30 17:58 18:19 18:45 20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26		05:04	05:29		17:36	17:58	
20° 04:28 04:55 05:18 18:09 18:32 18:59 30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26	0°	04:54	05:19	05:40	17:47	18:08	18:33
30° 04:10 04:40 05:05 18:22 18:48 19:18 35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26		04:42	05:08	05:30	17:58	18:19	18:45
35° 03:58 04:31 04:58 18:30 18:57 19:30 40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$ 50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26		04:28	04:55	05:18	18:09	18:32	18:59
40° 03:44 04:20 04:49 18:39 19:08 19:44 45° 03:27 04:06 04:39 18:49 19:22 20:02 \$50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26		04:10	04:40		18:22	18:48	
45° 03:27 04:06 04:39 18:49 19:22 20:02 \$ 50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26		03:58	04:31	04:58	18:30	18:57	19:30
S 50° 03:04 03:50 04:26 19:02 19:39 20:25 52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26	-	03:44	04:20	04:49	18:39	19:08	19:44
52° 02:52 03:42 04:20 19:08 19:47 20:37 54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26	45°	03:27	04:06	04:39	18:49	19:22	20:02
54° 02:39 03:33 04:14 19:15 19:56 20:50 56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26					19:02	19:39	
56° 02:23 03:23 04:07 19:22 20:06 21:06 58° 02:04 03:11 03:59 19:30 20:18 21:26							
58° 02:04 03:11 03:59 19:30 20:18 21:26	-		03:33	04:14	19:15	19:56	20:50
					1		
S 60° 01:39							
	S 60°	01:39	02:57	03:49	19:40	20:32	21:53

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer. Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-24%	
31	16:24	16:25	11:44	06:37	19:01		
01	16:26	16:26	11:44	07:25	19:50		
02	16:27	16:27	11:44	08:15	20:40		

November 03, 04, 05 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	42°32.5	135° 15.0	\$27°15.6	133°23.0	S24°45.8	186° 05.5	\$13°24.5	351°54.8	N15°58.0		JIIA	
1	57°35.0	150°14.8	15.7	148° 23.4	45.8	201° 07.4		6°57.4	58.0	Alpheratz	357°30.4	29°15.6
	72°37.5	165°14.6		146 23.4 163°23.8	45.6 45.8	201 07.4 216°09.4	24.7	22°00.1		Ankaa	$353^{\circ}03.1$	-42°08.6
2			15.8			210 09.4 231°11.3	24.9		57.9	Schedar	349°25.9	56°42.3
3	87°39.9	180°14.4	• • 15.8	178°24.2	45.8		• • 25.1	37°02.8	• • 57.9	Diphda	348°43.2	-17°49.3
4	102°42.4	195°14.2	15.9	193°24.6	45.8	246°13.2	25.2	52°05.4	57.8	Achernar	335°16.9	-57°05.1
5	117°44.9	210°14.0	16.0	208°25.0	45.8	261°15.2	25.4	67°08.1	57.8	Hamal	327°46.4	23°36.3
6	132°47.3	225°13.8	\$27°16.1	223°25.4	\$24°45.8	276° 17.1	S13°25.6	82°10.7	N15°57.7	Polaris	311°22.3	89°23.2
7	147°49.8	240°13.6	16.2	238°25.8	45.9	291°19.0	25.8	97°13.4	57.7	Acamar	315°08.5	-40°11.0
8	162°52.3	255° 13.4	16.2	253°26.2	45.9	306°20.9	25.9	112°16.1	57.6	Menkar	$314^{\circ}01.8$	4°12.5
9	177°54.7	270°13.2	. 16.3	268°26.7	• • 45.9	321°22.9	• • 26.1	127°18.7	• • 57.6	Mirfak	308°22.1	49°58.0
10	192°57.2	285°13.0	16.4	283°27.1	45.9	336°24.8	26.3	142°21.4	57.5	Aldebaran	290°34.9	16°34.1
11	207°59.7	300°12.8	16.5	298°27.5	45.9	351°26.7	26.5	157°24.1	57.5	Rigel	280°59.9	-8°10.0
12	223°02.1	315°12.6	\$27°16.6	313°27.9	\$24°45.9	6°28.7	S13°26.7	172°26.7	N15°57.4	Capella	$280^{\circ}15.8$	46°01.4
13	238°04.6	330°12.5	16.6	328°28.3	45.9	21°30.6	26.8	187°29.4	57.4	Bellatrix .	278°18.5	6°22.5
14	253°07.0	345°12.3	16.7	343°28.7	45.9	36°32.5	27.0	202°32.0	57.3	Elnath	277°56.7	28°37.8
15	268°09.5	0°12.1	16.8	358°29.1	• • 45.9	51°34.5	• • 27.2	217°34.7	• • 57.3	Alnilam	275°33.6	-1°11.0
16	283°12.0	15°11.9	16.8	13°29.5	45.9	66°36.4	27.4	232°37.4	57.2	Betelgeuse	270°47.7	7°24.7
17	298°14.4	30°11.7	16.9	28°29.9	45.9	81°38.3	27.5	247°40.0	57.2	Canopus	263°50.3	-52°42.5
18	313°16.9	45°11.5	\$27°17.0	43°30.3	S24°45.9	96°40.3	\$13°27.7	262°42.7	N15°57.1	Sirius	258°22.6	-16°45.4
19	328°19.4	60°11.4	17.1	58°30.7	45.9	111°42.2	27.9	277°45.4	57.1	Adhara	255°02.6	-29°00.7
20	343°21.8	75°11.2	17.1	73°31.2	45.9	126°44.1	28.1	292°48.0	57.0	Procyon	244°46.7	5°08.8
21	358°24.3	90°11.0	• • 17.2	88°31.6	• • 46.0	141°46.1	• • 28.2	307°50.7	• • 57.0	Pollux	243°12.5	27°57.0
22	13°26.8	105°10.8	17.2	103°32.0	46.0	156° 48.0	28.4	322°53.3	56.9	Avior	234°12.9	-59°36.1
23	28°29.2	120°10.6	17.3	118°32.4	46.0	171°49.9	28.6	337°56.0	56.9	Suhail	222°43.4	-43°33.0
Mer.p	ass. 21:06	ν -0.2' d0	.1′ m-4.58	ν 0.4 $^{\prime}$ d0	.0′ m1.06	ν 1.9′ d0.	2′ m-1.68	ν 2.7′ d-0	1' m-0.22	Miaplacidus	221°37.3	-69°50.2
										Alphard	217°44.0	-8°47.3
	CIIA	CILA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Regulus	207°30.5	11°49.2
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.1
0	43°31.7	135°10.5	S27°17.4	133°32.8	S24°46.0	186°51.8	S13°28.8	352°58.7	N15°56.8	Denebola	$182^{\circ}21.3$	14°24.2
1	58°34.1	150°10.3	17.4	148°33.2	46.0	201°53.8	28.9	8°01.3	56.8	Gienah	175°39.8	-17°42.4
2	73°36.6	165°10.1	17.5	163°33.6	46.0	216°55.7	29.1	23°04.0	56.7	Acrux	$172^{\circ}56.1$	-63°15.7
3	88°39.1	180°09.9	• • 17.6	178°34.0	• • 46.0	231°57.6	• • 29.3	38°06.7	• • 56.7	Gacrux	$171^{\circ}47.6$	-57°16.7
4	103°41.5	195°09.8	17.6	193°34.4	46.0	246°59.6	29.5	53°09.3	56.6	Alioth	166° 10.3	55°47.7
5	118°44.0	210°09.6	17.7	208°34.8	46.0	262°01.5	29.6	68°12.0	56.6	Spica	$158^{\circ}18.5$	-11°18.9
6	133°46.5	225°09.4	\$27°17.7	223°35.2	S24°46.0	277°03.4	S13°29.8	83°14.7	N15°56.5	Alkaid	152°49.6	49°09.8
7	148°48.9	240°09.2	17.8	238°35.6	46.0	292°05.4	30.0	98°17.3	56.5	Hadar	148°30.9	-60°30.9
8	163°51.4	255°09.1	17.8	253°36.0	46.0	307°07.3	30.2	113°20.0	56.4	Menkent	$147^{\circ}53.4$	-36°30.9
9	178°53.9	270°08.9	• • 17.9	268°36.4	• • 46.0	322°09.2	• • 30.3	128°22.7	• • 56.4	Arcturus	145°44.8	19°01.7
10	193°56.3	285°08.7	17.9	283°36.9	46.0	337°11.2	30.5	143°25.3	56.3	Rigil Kent.	139°35.5	-60°57.4
11	208°58.8	300°08.6	18.0	298°37.3	46.0	352°13.1	30.7	158°28.0	56.3	Kochab	$137^{\circ}21.4$	74°01.9
12	224°01.3	315°08.4	\$27°18.1	313°37.7	\$24°46.0	7°15.0	\$13°30.9	173°30.6	N15°56.2	Zuben'ubi	$136^{\circ}52.1$	-16°09.8
13	239°03.7	330°08.2	18.1	328°38.1	46.0	22°17.0	31.0	188°33.3	56.2	Alphecca	$126^{\circ}00.9$	26°37.0
14	254°06.2	345°08.1	18.1	343°38.5	46.0	37° 18.9	31.2	203°36.0	56.1	Antares	$112^{\circ}11.4$	-26°29.7
15	269°08.6	0°07.9	. 18.2	358°38.9	• • 45.9	52°20.8	• • 31.4	218°38.6	• • 56.1	Atria	$107^{\circ}02.5$	-69°04.8
16	284°11.1	15°07.7	18.2	13°39.3	45.9	67°22.7	31.6	233°41.3	56.0	Sabik	101°58.6	-15°45.5
17	299°13.6	30°07.6	18.3	28°39.7	45.9	82°24.7	31.7	248°44.0	56.0	Shaula	96°05.4	-37°07.4
18	314°16.0	45°07.4	\$27°18.3	43°40.1	\$24°45.9	97°26.6	S13°31.9	263°46.6	N15°55.9	Rasalhague	95°55.2	12°32.6
19	329°18.5	60°07.3	18.4	58°40.5	45.9	112°28.5	32.1	278°49.3	55.9	Eltanin	90°40.8	51°29.4
20	344°21.0 359°23.4	75°07.1	18.4 •• 18.5	73°40.9 88°41.3	45.9	127° 30.5 142° 32.4	32.3	293°52.0 308°54.6	55.8	Kaus Aust.	83°27.7	-34°22.1
21	14°25.9	90°06.9		00 41.3 103°41.7	· · 45.9	142 32.4 157°34.3	• • 32.4		• • 55.8	Vega	80°30.8	38°49.0
22		105°06.8	18.5		45.9		32.6	323°57.3	55.7	Nunki	75°43.2	-26°15.4
23	29°28.4	120°06.6	18.5	118°42.1	45.9	172°36.3	32.8	339°00.0	55.7	Altair	$61^{\circ}56.3$	8°57.1
Mer.p	ass. 21:02	ν -0.2' d0	.1' m-4.60	ν 0.4′ d0	.0′ m1.07	$\nu 1.9' \ d0.$	2′ m-1.68	$\nu 2.7' \ d-0$	1' m-0.22	Peacock	52°59.9	-56°38.3
										Deneb	49°23.1	45°23.7
	CIIA	CILA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Enif	33°34.9	10°01.0
Mon	GHA 44°20 ∘	GHA	Dec	GHA	Dec \$24°45.9	GHA	Dec	GHA 354°02.6	Dec	Al Na'ir	27°28.1	-46°49.0
0	44°30.8	135°06.5	\$27°18.6	133°42.5 148°42.9		187°38.2	\$13°33.0		N15°55.6	Fomalhaut	15° 10.2	-29°27.8
1	59°33.3	150°06.3	18.6		45.9 45.0	202°40.1	33.1	9°05.3	55.6	Scheat	13°41.2	28°15.0
2	74°35.8	165°06.2	18.7	163°43.3	45.9	217° 42.1 232° 44.0	33.3	24°07.9	55.5	Markab	13°25.8	15°22.3
3	89°38.2 104°40.7	180°06.0	· · 18.7	178°43.7 193°44.1	· · 45.9	232°44.0 247°45.9	· · 33.5	39°10.6 54°13.3	· · 55.5	Nov 03 Sat	SHA	Mer.pass
4		195°05.9	18.7	193°44.1 208°44.5	45.9		33.7		55.4	Venus	92°42.4	14:59
5	119°43.1	210°05.7	18.8	208° 44.5 223° 44.9	45.8 \$24°45.8	262°47.8 277°49.8	33.8	69°15.9 84°18.6	55.4	Mars	92 42.4 90°50.4	15:06
6 7	134°45.6	225°05.6	\$27°18.8				\$13°34.0		N15°55.3	Jupiter	90° 50.4 143° 33.0	11:34
7 8	149°48.1 164°50.5	240°05.4 255°05.3	18.8 18.9	238° 45.4 253° 45.8	45.8 45.8	292°51.7 307°53.6	34.2	99°21.3 114°23.9	55.3 55.2	Saturn	309° 22.2	00:32
9	164 50.5 179°53.0	255°05.3 270°05.1	18.9	253°45.8 268°46.2	45.8 •• 45.8	307°53.6 322°55.6	34.4 •• 34.5	114°23.9 129°26.6	55.2	Jaturn	JU3 44.4	00.32
10	179 55.0 194°55.5	270 05.1 285°05.0	18.9	200 40.2 283°46.6	45.8	322 55.0 337°57.5	34.7	129 20.0 144°29.3	55.1	Nov 04 Sun	SHA	Mer.pass
11	194 55.5 209°57.9	300°04.8	18.9	298°47.0	45.8	352° 59.4	34.7	144 29.3 159°31.9	55.1	Venus	$91^{\circ}38.8$	14:59
12	209 57.9 225°00.4	300 04.8 315°04.7	527°19.0	313°47.4	\$24°45.8	8°01.4	\$13°35.1	159 31.9 174°34.6	N15°55.0	Mars	$90^{\circ}01.1$	15:05
13	240°02.9	330°04.7	19.0	328°47.8	45.7	23°03.3	35.2	174 34.0 189°37.3	55.0		143°20.2	11:31
14	255°05.3	345°04.4	19.0	343°48.2	45.7	38° 05.2	35.4	204°39.9	54.9	Saturn	309°27.0	00:28
15	270°07.8	0°04.3	• • 19.0	358°48.6	. 45.7	53° 07.2	35.6	204 39.9 219°42.6	• • 54.9	Nov OF Mar-	C LI V	Mor noon
16	285°10.2	15°04.1	19.0	13°49.0	45.7	68°09.1	35.8	219 42.0 234°45.3	54.8	Nov 05 Mon Venus	SHA 90°35.6	Mer.pass 15:00
17	300°12.7	30°04.0	19.1	28°49.4	45.7	83° 11.0	35.0	249°47.9	54.8	Venus	90°35.6 89°11.7	15:00
18	315°15.2	45°03.8	\$27°19.1	43°49.8	\$24°45.7	98°12.9	\$13°36.1	264°50.6	N15°54.7		89 11.7 143°07.4	11:28
19	330°17.6	60°03.7	19.1	58° 50.2	45.6	113° 14.9	36.3	279°53.3	54.7	Saturn	309°31.8	00:24
20	345°20.1	75°03.6	19.1	73°50.6	45.6	128° 16.8	36.5	294°55.9	54.6	Saturn	JU9 JI.0	00:24
21	0°22.6	90°03.4	19.2	88°51.0	• • 45.6	143° 18.7	• • 36.6	309°58.6	54.6	Horizont	al parallax	
22	15°25.0	105°03.3	19.2	103°51.4	45.6	158° 20.7	36.8	325°01.2	54.5		Venus:	0.2
23	30°27.5	120°03.2	19.2	118°51.8	45.6	173°22.6	37.0	340°03.9	54.5		Mars:	0.1
										-		
ivier.p	ass. 20:58	ν -0.2' d0	.0′ m-4.61	ν 0.4' d -0	.0′ m1.07	ν 1.9° d 0.	2′ m-1.68	ν2.Γ d-0	1′ m-0.23			

h	Sun				Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.8	S15°04.7	228°16.6	9.9'	503°07.4	14.5'	60.0'
1	199°06.8	05.5	$242^{\circ}45.5$	9.9'	03°21.9	14.5'	60.0'
2	214°06.8	06.3	257°14.4	9.8'	03°36.4	14.5'	60.1'
3	229°06.8 244°06.8	•• 07.1	271°43.3	9.8'	03°50.9	14.5	60.1
4 5	244°06.8 259°06.8	07.9 08.6	286°12.0 300°40.8	9.7' 9.7'	04°05.4 04°19.9	14.5' 14.5'	60.1' 60.2'
6	274°06.8	S15°09.4	315°09.4	9.6'	504°34.4	14.5	60.2
7	289°06.8	10.2	329°38.0	9.5'	04°48.8	14.5	60.2'
8	304°06.8	11.0	344°06.5	9.5'	05°03.3	14.4'	60.3'
9	319°06.8	• • 11.7	358°35.0	9.4'	05°17.8	14.4'	60.3'
10	334°06.8	12.5	13°03.4	9.3'	05°32.2	14.4'	60.3'
11	349°06.8	13.3	27°31.7	9.3'	05°46.6	14.4	60.4
12 13	4°06.8 19°06.8	\$15°14.1 14.8	42°00.0 56°28.2	9.2' 9.1'	\$06°01.0 06°15.4	14.4' 14.4'	60.4' 60.4'
14	34°06.8	15.6	70°56.4	9.1'	06°29.7	14.4	60.5
15	49°06.7	. 16.4	85°24.4	9.0'	06°44.1	14.3'	60.5
16	64°06.7	17.2	99°52.4	8.9'	06°58.4	14.3'	60.5'
17	79°06.7	17.9	$114^{\circ}20.4$	8.9'	$07^{\circ}12.7$	14.3'	60.5'
18	94°06.7	S15°18.7	128°48.2	8.8'	507°26.9	14.2'	60.6'
19	109°06.7	19.5	143°16.0	8.7'	07°41.1	14.2'	60.6
20 21	124°06.7 139°06.7	20.3	157°43.7 172°11.3	8.6' 8.6'	07°55.3 08°09.5	14.2' 14.1'	60.6' 60.7'
22	154°06.7	21.8	186°38.9	8.5'	08°23.6	14.1	60.7
23	169°06.7	22.6	201°06.4	8.4	08°37.7	14.0'	60.7
	SD = 16.1'	d = 0.8'		SI	D = 16.4'		
	<u> </u>	<u>u — 0.0</u>		اد			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.7	S15°23.3	215°33.8	8.3'	S08°51.7	14.0'	60.7'
1 2	199°06.7 214°06.7	24.1 24.9	230°01.2 244°28.4	8.3' 8.2'	09°05.7 09°19.6	14.0' 13.9'	60.8' 60.8'
3	214 00.7 229°06.7	25.6	258°55.6	8.1	09°19.0	13.9	60.8
4	244°06.6	26.4	273°22.7	8.0'	09°47.4	13.8'	60.8
5	259°06.6	27.2	287°49.7	7.9'	10°01.2	13.8'	60.9'
6	274°06.6	S 15°27.9	$302^{\circ}16.7$	7.9'	S10°15.0	13.7'	60.9'
7	289°06.6	28.7	316°43.5	7.8'	10°28.7	13.6'	60.9'
8 9	304°06.6 319°06.6	29.5 · · 30.2	331°10.3 345°37.0	7.7' 7.6'	10°42.3 10°55.9	13.6' 13.5'	60.9' 60.9'
10	334°06.6	31.0	0°03.7	7.6 7.5'	10 55.9 11°09.4	13.5	61.0'
11	349°06.6	31.8	14°30.2	7.5'	11°22.9	13.4	61.0'
12	4°06.5	S 15°32.5	28°56.7	7.4'	S11°36.3	13.3'	61.0'
13	19°06.5	33.3	43°23.0	7.3'	11°49.6	13.3'	61.0'
14	34°06.5	34.1	57°49.3	7.2'	12°02.9	13.2'	61.0'
15 16	49°06.5 64°06.5	· · 34.8 35.6	72°15.5 86°41.7	7.1' 7.0'	12°16.1 12°29.2	13.1' 13.1'	61.1' 61.1'
17	79°06.5	36.4	101°07.7	7.0'	12°42.3	13.1	61.1
18	94°06.5	\$15°37.1	115°33.7	6.9'	\$12°55.3	12.9'	61.1'
19	109°06.4	37.9	129°59.5	6.8'	13°08.2	12.8'	61.1'
20	124°06.4	38.6	$144^{\circ}25.3$	6.7'	13°21.0	12.7'	61.1'
21	139°06.4	• • 39.4	158°51.0	6.6'	13°33.8	12.7'	61.2'
22 23	154°06.4 169°06.4	40.2 40.9	173°16.6 187°42.2	6.5' 6.4'	13°46.4 13°59.0	12.6' 12.5'	61.2' 61.2'
23	SD = 16.1'	d = 0.8'	107 42.2		D = 16.6'	12.5	01.2
	SD = 10.1	$a = 0.8^{\circ}$		- 51	$D = 10.0^{\circ}$		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.4	S 15°41.7	202°07.6	6.4'	S14°11.5	12.4'	61.2'
1	199°06.3	42.4	216°33.0	6.3'	14°23.9	12.3'	61.2'
2	214°06.3 229°06.3	43.2 •• 44.0	230°58.2 245°23.4	6.2' 6.1'	14°36.2 14°48.4	12.2' 12.1'	61.2' 61.2'
3 4	229 06.3 244°06.3	44.7	245 23.4 259°48.5	6.0'	14 48.4 15°00.5	12.1	61.3
5	259°06.3	45.5	274°13.5	5.9'	15°12.5	11.9'	61.3'
6	274°06.3	S 15°46.2	288°38.5	5.8'	S15°24.5	11.8'	61.3'
7	289°06.2	47.0	303°03.3	5.8'	15°36.3	11.7'	61.3'
8	304°06.2	47.7	317°28.1	5.7'	15°48.0	11.6'	61.3'
9	319°06.2 334°06.2	· · 48.5 49.3	331°52.7 346°17.3	5.6' 5.5'	15°59.6 16°11.1	11.5' 11.4'	61.3' 61.3'
10 11	349°06.1	49.3 50.0	0°41.8	5.4'	16°11.1	11.4	61.3
12	4°06.1	\$15°50.8	15°06.2	5.3'	S16°33.8	11.2'	61.3'
13	19°06.1	51.5	29°30.6	5.3'	16°45.0	11.1'	61.3'
14	34°06.1	52.3	43°54.8	5.2'	16°56.0	10.9'	61.3'
15	49°06.1	• • 53.0	58°19.0	5.1'	17°07.0	10.8'	61.3'
16 17	64°06.0 79°06.0	53.8 54.5	72°43.1 87°07.1	5.0' 4.9'	17°17.8 17°28.5	10.7' 10.6'	61.3' 61.4'
17	79°06.0 94°06.0	54.5 \$15°55.3	101°31.0	4.9'	517°39.1	10.6	61.4
19	109°06.0	56.0	115°54.9	4.8'	17°49.5	10.3'	61.4
20	124°05.9	56.8	$130^{\circ}18.7$	4.7'	17°59.9	10.2'	61.4'
21	139°05.9	•• 57.5	144°42.4	4.6'	18°10.1	10.1'	61.4'
22	154°05.9	58.3	159°06.0	4.5'	18°20.1	9.9'	61.4
23	169°05.9	59.0	173°29.5	4.5'	18°30.1	9.8'	61.4'
	SD = 16.1'	d = 0.8'		SI	D = 16.7'		

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

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

		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	15-2%	
03	16:27	16:27	11:44	09:06	21:32		
04	16:27	16:26	11:44	10:00	22:28		
05	16:25	16:25	11:44	10:57	23:27		

November 06, 07, 08 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	45°30.0	135°03.0	\$27°19.2	133°52.2	S24°45.6	188°24.5	S13°37.2	355°06.6	N15°54.4			
1	60°32.4	150°02.9	19.2	148°52.6	45.5	203°26.5	37.3	10°09.2	54.4	Alpheratz	357°30.4	29°15.6
2	75°34.9	165°02.8	19.2	163°53.0	45.5	218°28.4	37.5	25°11.9	54.3	Ankaa	353°03.1	-42°08.6
3	90°37.4	180°02.7	· · 19.2	178°53.4	• • 45.5	233°30.3	• • 37.7	40°14.6	• • 54.3	Schedar	349°25.9	56°42.4
4	105°39.8	195°02.5	19.3	193°53.8	45.5	248°32.3	37.9	55° 17.2	54.2	Diphda	348°43.2	-17°49.3
5	120°42.3	210°02.4	19.3	208°54.2	45.4	263°34.2	38.0	70°19.9	54.2	Achernar	335°17.0	-57°05.1
6	135°44.7	225°02.3	S27°19.3	223°54.6	S24°45.4	278°36.1	S 13°38.2	85°22.6	N15°54.1	Hamal	327°46.4	23°36.3
7	150°47.2	240°02.2	19.3	238°55.0	45.4	293°38.0	38.4	$100^{\circ}25.2$	54.1	Polaris	311°21.7	89°23.2
8	165°49.7	255°02.0	19.3	253°55.4	45.4	308°40.0	38.6	$115^{\circ}27.9$	54.0	Acamar	315°08.5	-40°11.1
9	180°52.1	270°01.9	• • 19.3	268°55.8	• • 45.4	323°41.9	• • 38.7	130°30.6	• • 54.0	Menkar	314°01.8 308°22.1	4°12.5
10	195°54.6	285°01.8	19.3	283°56.2	45.3	338°43.8	38.9	145°33.2	53.9	Mirfak	290°34.9	49°58.0 16°34.1
11	210°57.1	300°01.7	19.3	298°56.6	45.3	353°45.8	39.1	160°35.9	53.9	Aldebaran	290°54.9 280°59.9	-8°10.0
12	225°59.5	315°01.6	S27°19.3	313°57.0	S24°45.3	8°47.7	S13°39.3	175°38.6	N15°53.8	Rigel Capella	280° 59.9 280° 15.8	-8 10.0 46°01.4
13	241°02.0	330°01.4	19.3	328°57.4	45.3	23°49.6	39.4	190°41.2	53.8	Bellatrix	278° 18.5	6°22.5
14	256°04.5	345°01.3	19.3	343°57.8	45.2	38°51.6	39.6	205°43.9	53.7	Elnath	276 16.5 277°56.7	28°37.8
15	271°06.9	0°01.2	• • 19.3	358°58.2	• • 45.2	53°53.5	• • 39.8	220°46.6	• • 53.7	Alnilam	277 50.7 275°33.6	-1°11.0
16	286°09.4	15°01.1	19.3	13°58.6	45.2	68°55.4	40.0	235°49.2	53.6	Betelgeuse	270°47.7	7°24.7
17	301°11.9	30°01.0	19.3	28°59.0	45.2	83°57.4	40.1	250°51.9	53.6	Canopus	263°50.3	-52°42.5
18	316°14.3	45°00.9	S27°19.3	43°59.4	S24°45.1	98°59.3	S 13°40.3	265°54.6	N15°53.5	Sirius	258°22.6	-32 42.3 -16°45.4
19	331°16.8	60°00.8	19.3	58°59.8	45.1	114°01.2	40.5	280°57.2	53.5	Adhara	255°02.6	-10 45.4 -29°00.7
20	$346^{\circ}19.2$	75°00.7	19.3	74°00.2	45.1	129°03.1	40.7	295°59.9	53.4	Procyon	244°46.7	5°08.8
21	1°21.7	90°00.5	• • 19.3	89°00.6	• • 45.0	$144^{\circ}05.1$	• • 40.8	311°02.6	• • 53.4	Procyon	244 46.7 243°12.5	5 08.8 27°57.0
22	16°24.2	105°00.4	19.3	104°01.0	45.0	159°07.0	41.0	326°05.2	53.3	Avior	245 12.5 234°12.9	-59°36.1
23	$31^{\circ}26.6$	120°00.3	19.3	$119^{\circ}01.4$	45.0	174°08.9	41.2	341°07.9	53.3	Suhail	234 12.9 222°43.4	-59 30.1 -43°33.0
Mers	ass. 20:55	u-0 1′ d0	.0′ m-4.62	ν0 Λ' Α O	.0′ m1.07	v1 0/ d0	2′ m-1.68	1/2 7' d O	.1' m-0.24	Miaplacidus	222 43.4 221°37.2	-43 33.0 -69°50.2
ivier.p	ass. 20.00	ν-0.1 α0.	.0 111-4.02	νυ.4 u-0	.0 1111.01	ν1.9 d0.		ν2.1 u-0	.1 111-0.24	Alphard	221 37.2 217°44.0	-8°47.3
										Regulus	207°30.5	11°49.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.1
0	$46^{\circ}29.1$	$135^{\circ}00.2$	\$27°19.3	$134^{\circ}01.8$	S 24°44.9	$189^{\circ}10.9$	S13°41.4	$356^{\circ}10.6$	N15°53.2	Denebola	193 30.9 182°21.3	14°24.2
1	61°31.6	150°00.1	19.3	149°02.2	44.9	204°12.8	41.5	11°13.2	53.2	Gienah	175°39.8	-17°42.4
2	76°34.0	165°00.0	19.2	164°02.6	44.9	219°14.7	41.7	$26^{\circ}15.9$	53.1	1	173°56.0	-63°15.7
3	91°36.5	179°59.9	• • 19.2	179°03.0	• • 44.9	234°16.7	• • 41.9	41°18.6	• • 53.1		171°47.6	-57°16.7
4	106°39.0	194°59.8	19.2	194°03.4	44.8	249°18.6	42.0	56°21.2	53.0	Alioth	166°10.3	55°47.7
5	121°41.4	209°59.7	19.2	209°03.8	44.8	264°20.5	42.2	71°23.9	53.0	Spica	158° 18.5	-11°18.9
6	136°43.9	224°59.6	S27°19.2	224°04.2	S24°44.8	279°22.5	S 13°42.4	86° 26.6	N15°52.9	Alkaid	150° 10.5° 152° 49.6	49°09.8
7	151°46.3	239°59.5	19.2	239°04.6	44.7	294°24.4	42.6	101°29.2	52.8	Hadar	148°30.9	-60°30.9
8	166°48.8	254°59.4	19.2	254°05.0	44.7	309°26.3	42.7	$116^{\circ}31.9$	52.8	Menkent	147°53.4	-36°30.9
9	181°51.3	269°59.3	• • 19.1	269°05.4	• • 44.7	324°28.2	• • 42.9	131°34.6	• • 52.7	Arcturus	145°44.8	19°01.7
10	196°53.7	284°59.2	19.1	284°05.8	44.6	339°30.2	43.1	146°37.2	52.7	Rigil Kent.	139°35.5	-60°57.4
11	211°56.2	299°59.1	19.1	299°06.2	44.6	354°32.1	43.3	161°39.9	52.6	Kochab	137°21.5	74°01.9
12	226°58.7	314°59.0	\$27°19.1	314°06.6	S24°44.5	9°34.0	S 13°43.4	176°42.6	N15°52.6	Zuben'ubi	136°52.0	-16°09.8
13	242°01.1	329°59.0	19.1	329°07.0	44.5	24°36.0	43.6	191°45.2	52.5	Alphecca	126°00.9	26°37.0
14	257°03.6	344°58.9	19.0	344°07.4	44.5	39°37.9	43.8	206°47.9	52.5	Antares	112° 11.4	-26°29.7
15	$272^{\circ}06.1$	359°58.8	• • 19.0	359°07.8	• • 44.4	54°39.8	• • 44.0	221°50.6	• • 52.4	Atria	107°02.5	-69°04.8
16	287°08.5	14°58.7	19.0	14°08.2	44.4	69°41.8	44.1	236°53.2	52.4	Sabik	101°58.6	-15°45.5
17	302°11.0	29°58.6	19.0	29°08.6	44.4	84°43.7	44.3	251°55.9	52.3	Shaula	96°05.5	-37°07.4
18	317° 13.5	44°58.5	S27°18.9	44°09.0	S24°44.3	99°45.6	S13°44.5	266°58.6	N15°52.3	Rasalhague	95°55.2	12°32.6
19	332°15.9	59° 58.4	18.9	59°09.4	44.3	114°47.6	44.7	282°01.2	52.2	Eltanin	90°40.8	51°29.4
20	347°18.4	74°58.4	18.9	74°09.7	44.2	129°49.5	44.8	297°03.9	52.2	Kaus Aust.	83°27.7	-34°22.1
21	2°20.8	89°58.3	• • 18.9	89°10.1	• • 44.2	144°51.4	• • 45.0	312°06.6	• • 52.1	Vega	80°30.9	38°49.0
22	17°23.3	104°58.2	18.8	104°10.5	44.2	159°53.3	45.2	327°09.2	52.1	Nunki	75°43.2	-26°15.4
23	32°25.8	119°58.1	18.8	119°10.9	44.1	174°55.3	45.3	342°11.9	52.0	Altair	61°56.3	8°57.1
Mer n	ass. 20:51	ν -0.1' d-0	0.0' m-4.63	v0.4'.d-0	.0′ m1.07	v1 9' d0	2′ m-1.68	$v^{2} 7' d^{-0}$.1′ m-0.24	Peacock	52°59.9	-56°38.3
- Wici.p		- 0.1 0 0				ν 1.5 · α σ.				Deneb	49°23.1	45°23.7
										Enif	33°34.9	10°01.0
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}28.1$	-46°49.0
0	47°28.2	134°58.0	\$27°18.8	134°11.3	\$24°44.1	189°57.2	S13°45.5	357°14.6	N15°52.0	Fomalhaut	$15^{\circ}10.2$	-29°27.8
1	62°30.7	149°58.0	18.7	149°11.7	44.0	204°59.1	45.7	12°17.2	51.9	Scheat	13°41.2	28°15.0
2	77°33.2	164°57.9	18.7	164°12.1	44.0	220°01.1	45.9	27°19.9	51.9	Markab	13°25.9	15°22.3
3	92°35.6	179°57.8	• • 18.7	179°12.5	• • 44.0	235°03.0	• • 46.0	42°22.6	• • 51.8	No. Of T	CIIA	Ma::::
4	107°38.1	194°57.7	18.6	194°12.9	43.9	250°04.9	46.2	57°25.2	51.8	Nov 06 Tue	SHA	Mer.pass
5	122°40.6	209°57.7	18.6	209°13.3	43.9	265°06.9	46.4	72°27.9	51.7	Venus	89°33.1 88°22.2	15:00 15:04
6	137°43.0	224°57.6	\$27°18.6	224°13.7	\$24°43.8	280°08.8	\$13°46.6	87°30.6	N15°51.7	Mars		15:04
7	152°45.5	239°57.5	18.5	239°14.1	43.8	295°10.7	46.7	102°33.2	51.6	Jupiter	142°54.6 309°36.6	11:25
8	167°48.0	254° 57.5	18.5	254°14.5	43.7	310°12.7	46.9	117°35.9	51.6	Saturn	JU9 J0.0	00:20
9	182°50.4	269°57.4	18.4	269°14.9	43.7	325°14.6	47.1	132°38.6	• • 51.5	Nov 07 Wed	SHA	Mer.pass
10	197°52.9 212°55.3	284°57.3	18.4	284°15.3	43.6	340°16.5	47.3	147°41.2 162°43.9	51.5	Venus	88°31.1	15:00
11 12	212 55.3 227°57.8	299°57.3 314°57.2	18.3 \$27°18.3	299°15.7 314°16.1	43.6 \$24°43.5	355°18.4 10°20.4	47.4 \$13°47.6	162 43.9 177°46.6	51.4 N15°51.4	Mars	87°32.7	15:03
13	243°00.3	314 57.2 329° 57.1	18.3		43.5	25°22.3		177°46.6 192°49.3	N15°51.4 51.3	Jupiter	$142^{\circ}41.8$	11:22
	243°00.3 258°02.7		18.3 18.2	329°16.5	43.5 43.4	25°22.3 40°24.2	47.8 47.0	192°49.3 207°51.9		Saturn	$309^{\circ}41.5$	00:15
14 15		344°57.1		344°16.9			47.9		51.3	N - 00 T	C114	
15 16	273°05.2 288°07.7	359°57.0	· · 18.2	359°17.3	· · 43.4	55°26.2 70°28.1	· · 48.1	222°54.6 237°57.3	· · 51.2	Nov 08 Thu	SHA	Mer.pass
16 17	288°07.7 303°10.1	14°56.9 29°56.9	18.1	14°17.7 29°18.1	43.3 43.3	70°28.1 85°30.0	48.3 48.5	252°59.9	51.2 51.1	Venus	87°29.8	15:00
17 18	303°10.1 318°12.6	29°56.9 44°56.8	18.1 \$27°18.0	29°18.1 44°18.4	43.3 \$24°43.2	85°30.0 100°32.0	48.5 \$13°48.6	252°59.9 268°02.6	51.1 N15°51.1	Mars	86°43.1	15:03
19	333°15.1	59° 56.8	18.0	59°18.8	43.2	100 32.0 115°33.9	48.8	283°05.3	51.0	Jupiter		11:19
20	333 15.1 348°17.5	59 56.8 74°56.7	18.0 17.9	59 18.8 74°19.2	43.2	115 33.9 130°35.8	48.8 49.0	283 05.3 298°07.9	51.0	Saturn	309°46.3	00:11
21	3°20.0	89° 56.7	17.9	89°19.6	· · 43.1	130 35.6 145°37.8	• • 49.0	313° 10.6	• • 50.9	Horizont	al parallax	
22	18°22.5	104° 56.6	17.9	104°20.0	43.0	145° 37.8	49.2	328° 13.3	50.9		Venus:	0.3
23	33°24.9	119°56.6	17.8	119°20.4	43.0	175°41.6	49.5	343°15.9	50.8		Mars:	0.1
						_						
Mer.p	ass. 20:47	ν -0.1' d-0	0.0′ m-4.64	ν 0.4′ d-0	.0′ m1.07	$\nu 1.9' \ d0.$	2′ m-1.69	ν 2.7′ d-0	.1' m-0.25			

h	Sui	Moon					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.8	S15°59.8	187°53.0	4.4'	S18°39.9	9.7'	61.4'
1	199°05.8	$16^{\circ}00.5$	202°16.4	4.3'	18°49.6	9.5'	61.4'
2	214°05.8	01.3	216°39.7	4.2'	18°59.1	9.4'	61.4'
3	229°05.8	• • 02.0	231°02.9	4.2'	19°08.5	9.3'	61.4'
4	244°05.7	02.8	245°26.1	4.1'	19° 17.8	9.1'	61.4'
5 6	259°05.7 274°05.7	03.5 \$16°04.3	259°49.2 274°12.2	4.0' 4.0'	19°26.9 \$19°35.9	9.0' 8.8'	61.4' 61.3'
7	289°05.6	05.0	288°35.2	3.9'	19° 44.7	8.7	61.3
8	304°05.6	05.7	302°58.1	3.8'	19°53.4	8.5'	61.3'
9	319°05.6	• • 06.5	317°20.9	3.8'	20°01.9	8.4'	61.3'
10	334°05.6	07.2	331°43.7	3.7'	20°10.3	8.2'	61.3'
11	349°05.5	08.0	346°06.4	3.6'	20° 18.5	8.1'	61.3'
12	4°05.5 19°05.5	\$16°08.7	0°29.1 14°51.7	3.6'	\$20°26.6 20°34.5	7.9'	61.3'
13 14	19°05.5 34°05.4	09.5 10.2	14°51.7 29°14.2	3.5' 3.5'	20° 34.5 20° 42.3	7.8' 7.6'	61.3' 61.3'
15	49°05.4	10.2	43°36.7	3.4'	20°42.3	7.5'	61.3
16	64°05.4	11.7	57°59.1	3.4'	20°57.4	7.3	61.3'
17	79°05.3	12.4	$72^{\circ}21.5$	3.3'	21°04.7	7.1'	61.3'
18	94°05.3	S 16°13.2	86°43.8	3.3'	S21°11.8	7.0'	61.3'
19	109°05.3	13.9	101°06.1	3.2'	21° 18.8	6.8'	61.2'
20	124°05.2	14.6	115°28.3	3.2'	21°25.6	6.7'	61.2'
21 22	139°05.2 154°05.2	· · 15.4 16.1	129°50.5 144°12.6	3.1' 3.1'	21°32.3 21°38.8	6.5' 6.3'	61.2' 61.2'
22	154°05.2 169°05.1	16.1 16.9	144° 12.6 158° 34.7	3.1'	21°38.8 21°45.1	6.3'	61.2'
23						J. Z	01.2
	SD = 16.1'	d = 0.7'		SI	D = 16.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.1	\$16° 17.6	172°56.8	3.0'	\$21°51.3	6.0'	61.2'
1	199°05.1 214°05.0	18.3	187°18.8 201°40.8	3.0'	21°57.3 22°03.1	5.8'	61.2'
2	214°05.0 229°05.0	19.1 •• 19.8	201°40.8 216°02.7	3.0' 2.9'	22°03.1 22°08.7	5.7' 5.5'	61.1' 61.1'
3 4	244°05.0	20.5	210 02.7 230°24.6	2.9' 2.9'	22°14.2	5.3'	61.1
5	259°04.9	21.3	244°46.5	2.9'	22° 19.5	5.1'	61.1'
6	274°04.9	S16°22.0	259°08.4	2.8'	S22°24.7	5.0'	61.1'
7	289°04.8	22.7	273°30.3	2.8'	22°29.6	4.8'	61.1'
8	304°04.8	23.5	287°52.1	2.8'	22°34.4	4.6'	61.0'
9	319°04.8	• • 24.2	302°13.9	2.8'	22°39.0	4.4'	61.0'
10 11	334°04.7 349°04.7	24.9 25.7	316°35.7 330°57.4	2.8' 2.8'	22°43.5 22°47.8	4.3' 4.1'	61.0' 61.0'
12	4°04.7	\$16°26.4	345°19.2	2.7'	\$22°51.9	3.9'	61.0
13	19°04.6	27.1	359° 40.9	2.7'	22°55.8	3.7'	60.9
14	34°04.6	27.9	14°02.7	2.7'	22°59.5	3.6'	60.9'
15	49°04.5	• • 28.6	28°24.4	2.7'	23°03.1	3.4'	60.9'
16	64°04.5	29.3	42°46.1	2.7'	23°06.5	3.2'	60.9'
17	79°04.5	30.1 \$16°30.8	57°07.9	2.7'	23°09.7	3.0'	60.8
18 19	94°04.4 109°04.4	31.5	71°29.6 85°51.3	2.7' 2.7'	\$23°12.7 23°15.6	2.9' 2.7'	60.8' 60.8'
20	124°04.3	32.2	100° 13.1	2.8'	23° 18.3	2.5'	60.8
21	139°04.3	33.0	114°34.8	2.8'	23°20.8	2.3'	60.8
22	154°04.2	33.7	128°56.6	2.8'	23°23.1	2.1'	60.7'
23	169°04.2	34.4	143°18.4	2.8'	23°25.2	2.0'	60.7'
	SD = 16.1'	d = 0.7'		SI	D = 16.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.2	S 16°35.1	157°40.2	2.8'	S23°27.2	1.8'	60.7'
1	199°04.1	35.9	172°02.0	2.8'	23°29.0	1.6'	60.6'
2	214°04.1	36.6	186° 23.8	2.9'	23°30.6	1.4'	60.6'
3 4	229°04.0 244°04.0	· · 37.3 38.0	200°45.7 215°07.6	2.9' 2.9'	23°32.0 23°33.3	1.3' 1.1'	60.6' 60.6'
4 5	259°03.9	38.8	215 07.6 229°29.5	2.9' 2.9'	23°34.4	0.9'	60.5
6	274° 03.9	\$16°39.5	243°51.4	3.0'	\$23°35.3	0.7	60.5
7	289° 03.8	40.2	258° 13.4	3.0'	23°36.0	0.6'	60.5'
8	304°03.8	40.9	272°35.4	3.0'	23°36.6	0.4'	60.4'
9	319°03.7	• • 41.7	286° 57.5	3.1'	23°37.0	0.2'	60.4
10	334°03.7	42.4	301°19.5	3.1'	23°37.2	0.0'	60.4'
11 12	349°03.6 4°03.6	43.1 \$16°43.8	315°41.7 330°03.9	3.2' 3.2'	23°37.2 \$23°37.0	-0.1' -0.3'	60.4' 60.3'
13	19°03.6	44.5	344°26.1	3.2'	23°36.7	-0.5'	60.3
14	34°03.5	45.2	358° 48.4	3.3'	23°36.2	-0.7	60.3
15	49°03.5	• • 46.0	$13^{\circ}10.7$	3.4'	23°35.6	-0.8'	60.2'
16	64°03.4	46.7	27°33.1	3.4'	23°34.7	-1.0'	60.2'
17	79°03.4	47.4	41°55.5	3.5'	23°33.7	-1.2'	60.2'
18 19	94°03.3 109°03.3	S16°48.1 48.8	56° 18.0 70° 40.5	3.6' 3.6'	\$23°32.6 23°31.2	-1.3' -1.5'	60.1' 60.1'
20	109°03.3 124°03.2	48.8 49.6	70°40.5 85°03.1	3.6	23° 31.2 23° 29.7	-1.5 -1.7'	60.1
21	139° 03.2	50.3	99° 25.8	3.7'	23° 28.0	-1.8'	60.0'
22	154° 03.1	51.0	113°48.6	3.8'	23°26.2	-2.0'	60.0'
23	169°03.1	51.7	128°11.4	3.9'	23°24.2	-2.2'	60.0'
	SD = 16.1'	d = 0.7'		SI	D = 16.5'		

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

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

		Sun		Moon			
Day	Eqn.of	f 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%	
06	16:23	16:22	11:44	11:58	-:-		
07	16:20	16:19	11:44	13:01	00:29		
80	16:17	16:14	11:44	14:05	01:33		

November 09, 10, 11 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
			\$27° 17.7		S24°42.9		S13°49.7		N15°50.8		JIIA	Dec
0	48°27.4	134°56.5		134°20.8		190°43.5		358° 18.6		Alpheratz	357°30.4	29° 15.6
1	63°29.8	149°56.5	17.7	149°21.2	42.9	205°45.5	49.8	13°21.3	50.7	Ankaa	353°03.1	-42°08.6
2	78°32.3	164°56.4	17.6	164°21.6	42.8	220°47.4	50.0	28°23.9	50.7	Schedar	349°25.9	56° 42.4
3	93°34.8	179°56.4	• • 17.5	179°22.0	• • 42.8	235°49.3	• • 50.2	43°26.6	• • 50.6	Diphda	348°43.2	-17°49.3
4	108°37.2	194°56.3	17.5	194°22.4	42.7	250°51.3	50.4	58°29.3	50.6	Achernar	335°17.0	-57°05.1
5	123°39.7	209°56.3	17.4	209°22.8	42.7	265°53.2	50.5	73°31.9	50.5			
6	138°42.2	224°56.2	S27°17.4	224°23.2	S24°42.6	280°55.1	S13°50.7	88°34.6	N15°50.5	Hamal	327°46.4	23°36.3
7	153°44.6	239°56.2	17.3	239°23.6	42.6	295°57.1	50.9	103°37.3	50.4	Polaris	311°21.0	89°23.2
8	168°47.1	254°56.2	17.2	254°24.0	42.5	310°59.0	51.0	118°39.9	50.4	Acamar	315°08.5	-40°11.1
9	183°49.6	269°56.1	17.2	269°24.4	• • 42.4	326°00.9	51.2	133°42.6	50.3	Menkar	314°01.8	4° 12.5
10	198°52.0	284°56.1	17.1	284°24.7	42.4	341°02.9	51.4	148°45.3	50.3	Mirfak	308°22.1	49°58.0
11	213°54.5	299°56.1	17.1	299°25.1	42.4	356°04.8	51.4	163°47.9	50.3	Aldebaran	290°34.8	16°34.1
										Rigel	280°59.9	-8° 10.0
12	228°57.0	314°56.0	\$27° 17.0	314°25.5	S24°42.3	11°06.7	S13°51.7	178°50.6	N15°50.2	Capella	280°15.7	46°01.5
13	243°59.4	329°56.0	16.9	329°25.9	42.2	26°08.6	51.9	193°53.3	50.1	Bellatrix	278°18.4	6°22.5
14	259°01.9	344°56.0	16.8	344°26.3	42.2	41°10.6	52.1	208°55.9	50.1	Elnath	277°56.6	28° 37.8
15	274°04.3	359°55.9	• • 16.8	359°26.7	• • 42.1	56°12.5	• • 52.3	223°58.6	• • 50.0	Alnilam	275°33.5	-1°11.0
16	289°06.8	14°55.9	16.7	$14^{\circ}27.1$	42.0	71°14.4	52.4	239°01.3	50.0	Betelgeuse	270°47.6	7°24.7
17	304°09.3	29°55.9	16.6	29°27.5	42.0	86°16.4	52.6	254°04.0	49.9	_		-52°42.6
18	319°11.7	44°55.8	S27°16.6	44°27.9	S24°41.9	101°18.3	S13°52.8	269°06.6	N15°49.9	Canopus	263°50.3	
19	334°14.2	59° 55.8	16.5	59°28.3	41.8	116°20.2	52.9	284°09.3	49.8	Sirius	258°22.6	-16°45.4
20	349°16.7	74°55.8	16.4	74°28.7	41.8	131°22.2	53.1	299°12.0	49.8	Adhara	255°02.6	-29°00.7
21	4°19.1	89°55.8	. 16.3	89°29.1	• • 41.7	146°24.1	• • 53.3	314° 14.6	• • 49.7	Procyon	244°46.7	5°08.8
22	19°21.6	104°55.8	16.3	104°29.5	41.7	161°26.0	53.5	329°17.3	49.7	Pollux	243°12.5	27°57.0
23	34°24.1			104 29.5 119°29.8	41.7	176° 28.0	53.5 53.6	344°20.0		Avior	$234^{\circ}12.9$	-59°36.1
23	34 24.1	119°55.7	16.2	119 29.8	41.0	-			49.6	Suhail	222°43.3	-43°33.0
Mer.p	pass. 20:43	ν -0.0′ d-0).1′ m-4.66	ν 0.4′ d-0	.1' m1.07	ν 1.9′ d0.	2′ m-1.69	ν 2.7′ d-0	.1′ m-0.26	Miaplacidus	221°37.2	-69° 50.2
										Alphard	217°44.0	-8°47.3
_			_		_		_		_	Regulus	207°30.4	11°49.1
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.9	61°35.0
0	49°26.5	134°55.7	S27°16.1	134°30.2	S24°41.5	191°29.9	S13°53.8	359°22.6	N15°49.6	Denebola	182°21.3	14°24.2
1	64°29.0	149°55.7	16.0	149°30.6	41.5	206°31.8	54.0	14°25.3	49.5	Gienah	175°39.8	-17° 42.4
2	79°31.5	164°55.7	15.9	164°31.0	41.4	221°33.7	54.1	29°28.0	49.5		172°56.0	-63° 15.7
3	94°33.9	179°55.7	• • 15.9	179°31.4	• • 41.3	236°35.7	• • 54.3	44°30.6	• • 49.4	Gacrux	171°47.5	-57° 16.7
4	109°36.4	194°55.7	15.8	194°31.8	41.3	251°37.6	54.5	59°33.3	49.4	Alioth	166°10.3	55° 47.7
5	124°38.8	209°55.6	15.7	209°32.2	41.2	266°39.5	54.7	74°36.0	49.3	Spica	158° 18.5	-11°18.9
6	139°41.3	224°55.6	S27° 15.6	224°32.6	S24°41.1	281°41.5	S13°54.8	89°38.6	N15°49.3		150° 10.5° 152° 49.6	49°09.8
7	154°43.8	239°55.6	15.5	239°33.0	41.1	296°43.4	55.0	104°41.3	49.2	Alkaid		
8	169°46.2	254°55.6	15.4	254°33.4	41.0	311°45.3	55.2	119°44.0	49.2	Hadar	148°30.9	-60°30.9
9	184°48.7	269°55.6	• • 15.4	269°33.8	• • 40.9	326°47.3	55.3	134°46.6	• • 49.1	Menkent	147°53.3	-36°30.9
10	199°51.2	284°55.6	15.3	284°34.2	40.9	341°49.2	55.5	149°49.3	49.1	Arcturus	145°44.8	19°01.7
11	214°53.6	299°55.6	15.2	299°34.5	40.8	356°51.1	55.7	164°52.0	49.0	Rigil Kent.	139°35.4	-60°57.4
12	229°56.1	314°55.6	\$27° 15.1	314°34.9	\$24°40.7	11°53.1	S13°55.9	179°54.7	N15°49.0	Kochab	137°21.5	74°01.9
13	244°58.6	329°55.6	15.0	329°35.3		26°55.0	56.0	194°57.3	48.9	Zuben'ubi	136°52.0	-16°09.8
					40.7		56.2	210°00.0		Alphecca	126°00.9	26°37.0
14	260°01.0	344°55.6	14.9	344°35.7	40.6	41°56.9			48.9	Antares	$112^{\circ}11.4$	-26°29.7
15	275°03.5	359°55.6	• • 14.8	359°36.1	• • 40.5	56°58.8	56.4	225°02.7	• • 48.8	Atria	$107^{\circ}02.5$	-69°04.8
16	290°06.0	14°55.6	14.7	14°36.5	40.4	72°00.8	56.5	240°05.3	48.8	Sabik	101°58.6	-15°45.5
17	305°08.4	29°55.6	14.6	29°36.9	40.4	87°02.7	56.7	255°08.0	48.7	Shaula	96°05.4	-37°07.4
18	320°10.9	44°55.6	S27°14.5	44°37.3	S24°40.3	102°04.6	S13°56.9	270°10.7	N15°48.7	Rasalhague	95°55.2	12°32.6
19	335°13.3	59°55.6	14.4	59°37.7	40.2	117°06.6	57.1	285°13.3	48.6	Eltanin	90°40.8	51°29.4
20	350°15.8	74°55.6	14.3	74°38.1	40.2	132°08.5	57.2	300°16.0	48.6	Kaus Aust.	83°27.7	-34°22.1
21	5°18.3	89°55.6	• • 14.3	89°38.5	• • 40.1	147°10.4	• • 57.4	315° 18.7	• • 48.5	Vega	80°30.9	38°49.0
22	20°20.7	104°55.6	14.2	104°38.8	40.0	162°12.4	57.6	330°21.3	48.5	Nunki	75°43.2	-26° 15.4
23	35°23.2	119°55.6	14.1	119°39.2	39.9	177°14.3	57.7	345°24.0	48.4	Altair	61°56.3	8°57.1
Morn	pass. 20:39	" U U, 4 U	0.1' m-4.67	υ0 Δ' d 0	.1′ m1.08	11 0' d0	2′ m-1.69	127' d 0	.1′ m-0.28	Peacock	52°59.9	-56°38.3
ivier.p	Jass. 20.39	ν -0.0 u -0	7.1 111-4.07	νο.4 α-ο	.1 1111.00	ν1.9 do.	2 111-1.09	ν2.1 u-0	.1 111-0.20	Deneb	49°23.2	45°23.7
										Enif	33°34.9	10°01.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.1	-46°49.0
0	50°25.7	134°55.7	\$27° 14.0	134°39.6	524°39.9	192°16.2	S13°57.9	0°26.7	N15°48.4	Fomalhaut	15°10.2	-40 49.0 -29°27.8
1	65°28.1	149°55.7	13.9	149°40.0	39.8	207°18.2	58.1	15°29.3	48.3			
2	80°30.6	164°55.7	13.8	164°40.4	39.7	222°20.1	58.3	30°32.0	48.2	Scheat	13°41.2	28°15.0
3	95°33.1	179°55.7	. 13.6	179°40.8	• • 39.6	237°22.0	• • 58.4	45°34.7	• • 48.2	Markab	13°25.9	15°22.3
4	110°35.5	194°55.7	13.5	194°41.2	39.5	252°23.9	58.6	60°37.4	48.1	Nov 09 Fri	SHA	Mer.pass
5	110 33.5 125°38.0	209° 55.8	13.4	209°41.6	39.5	267°25.9	58.8	75°40.0	48.1	Venus	86°29.1	15:00
6	140°40.4	209 55.8 224° 55.8	527°13.3	209 41.0 224°42.0	524°39.4	282°27.8	50.0 \$13°58.9	90°42.7	N15°48.0	Mars	85°53.4	15:02
										Jupiter		11:16
7	155°42.9	239°55.8	13.2	239°42.3	39.3	297°29.7	59.1	105°45.4	48.0 47.0	Saturn	309°51.2	00:07
8	170°45.4	254°55.8	13.1	254°42.7	39.2	312°31.7	59.3	120°48.0	47.9	Saturn	JU9 31.2	00:07
9	185°47.8	269°55.8	• • 13.0	269°43.1	• • 39.2	327°33.6	• • 59.5	135°50.7	• • 47.9	Nov 10 Sat	SHA	Mer.pass
10	200°50.3	284°55.9	12.9	284°43.5	39.1	342°35.5	59.6	150°53.4	47.8	Venus	85°29.2	15:00
11	215°52.8	299°55.9	12.8	299°43.9	39.0	357°37.5	13°59.8	165°56.0	47.8	Mars	85°03.7	15:02
12	230°55.2	314°55.9	\$27° 12.7	314°44.3	S24°38.9	12°39.4	S14°00.0	180°58.7	N15°47.7		142°03.4	11:13
13	245°57.7	329°56.0	12.6	329°44.7	38.8	27°41.3	00.1	196°01.4	47.7	Saturn	309°56.1	00:02
14	261°00.2	344°56.0	12.5	344°45.1	38.8	42°43.3	00.3	211°04.0	47.6			
15	276°02.6	359°56.0	• • 12.3	359°45.5	• • 38.7	57°45.2	• • 00.5	226°06.7	• • 47.6	Nov 11 Sun	SHA	Mer.pass
16	291°05.1	14°56.1	12.2	14°45.9	38.6	72°47.1	00.7	241°09.4	47.5	Venus	84°30.0	15:00
17	306°07.6	29°56.1	12.1	29°46.2	38.5	87°49.1	8.00	256°12.0	47.5	Mars	84°14.0	15:01
18	321°10.0	44°56.1	S27°12.0	44°46.6	S24°38.4	102°51.0	S 14°01.0	271°14.7	N15°47.4	Jupiter	$141^{\circ}50.6$	11:09
19	$336^{\circ}12.5$	59°56.2	11.9	59°47.0	38.3	$117^{\circ}52.9$	01.2	286° 17.4	47.4	Saturn		23:54
20	351°14.9	74°56.2	11.8	74°47.4	38.3	132°54.8	01.3	301°20.1	47.3			
21	6°17.4	89°56.3	• • 11.6	89°47.8	• • 38.2	147°56.8	• • 01.5	316°22.7	• • 47.3	Horizont	al parallax	
22	21°19.9	104°56.3	11.5	104°48.2	38.1	162°58.7	01.7	331°25.4	47.2		Venus:	0.3
23	36°22.3	119°56.4	11.4	119°48.6	38.0	178°00.6	01.8	346°28.1	47.2		Mars:	0.1
NA	20:25		1/ m 4.60	··· 4/ -1 0	1/ -1 00	1,1 0/ -10	2′ m-1.69	1,0 7/ -1.0	.1′ m-0.29			
ivier.p	pass. 20:35	ν 0.0° a -0	.1′ m-4.68	$\nu_{0.4}$ a-0	.1′ m1.08	ν1.9' α0.	∠ 111-1.09	ν2.Γ α -0	.1 m-U.29			

h	Sui	า	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°03.0	S16°52.4	142°34.3	4.0'	\$23°22.0	-2.3'	59.9'	
1	199°02.9	53.1	156°57.2	4.0'	23°19.7	-2.5'	59.9'	
2	214°02.9	53.8	171°20.2	4.1'	23°17.2	-2.7'	59.9'	
3	229°02.8	• • 54.5	185°43.3	4.2'	23°14.5	-2.8'	59.8'	
4	244°02.8	55.3	200°06.5	4.3'	23°11.7	-3.0'	59.8'	
5	259°02.7	56.0	214°29.8	4.3'	23°08.7	-3.1'	59.7'	
6	274°02.7 289°02.6	\$16°56.7 57.4	228°53.1 243°16.5	4.4'	\$23°05.6 23°02.3	-3.3' -3.4'	59.7'	
7 8	304°02.6	57.4 58.1	243 10.5 257°40.0	4.5' 4.6'	23 02.3 22°58.9	-3.4 -3.6'	59.7' 59.6'	
9	319°02.5	58.8	272°03.6	4.7'	22°55.3	-3.8'	59.6'	
10	334°02.5	16°59.5	286°27.3	4.8'	22°51.5	-3.9'	59.6'	
11	349°02.4	17°00.2	300°51.1	4.9'	22°47.6	-4.1'	59.5'	
12	4°02.3	S17°00.9	315°14.9	4.9'	S22°43.6	-4.2'	59.5'	
13	19°02.3	01.6	329°38.9	5.0'	22°39.4	-4.3'	59.4'	
14	34°02.2	02.4	344°02.9	5.1'	22°35.0	-4.5'	59.4'	
15	49°02.2 64°02.1	03.1	358°27.0 12°51.3	5.2'	22°30.5 22°25.9	-4.6' -4.8'	59.4'	
16 17	79°02.1	03.8 04.5	12 51.3 27°15.6	5.3' 5.4'	22°21.1	-4.8 -4.9'	59.3' 59.3'	
18	94°02.0	\$17°05.2	41°40.0	5.5'	\$22°16.2	-5.1	59.3'	
19	109°01.9	05.9	56°04.5	5.6'	22°11.1	-5.2'	59.2'	
20	124°01.9	06.6	70°29.1	5.7'	22°05.9	-5.3'	59.2'	
21	139°01.8	• • 07.3	84°53.8	5.8'	22°00.6	-5.5'	59.1'	
22	154°01.8	08.0	99°18.7	5.9'	$21^{\circ}55.1$	-5.6'	59.1'	
23	169°01.7	08.7	113°43.6	6.0'	21°49.5	-5.7'	59.1'	
	SD = 16.1'	d = 0.7'		SI	O = 16.3'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°01.6	\$17°09.4	128°08.6	6.1'	S21°43.7	-5.9'	59.0'	
1	199°01.6	10.1	142°33.7	6.2'	21°37.8	-6.0'	59.0'	
2	214°01.5	10.8	$156^{\circ}59.0$	6.3'	21°31.8	-6.1'	58.9'	
3	229°01.5	•• 11.5	171°24.3	6.4'	21°25.7	-6.3'	58.9'	
4	244°01.4	12.2	185°49.7	6.5'	21°19.4	-6.4'	58.9'	
5	259°01.3	12.9	200°15.3	6.7'	21°13.0	-6.5'	58.8'	
6	274°01.3 289°01.2	S17°13.6	214°40.9 229°06.7	6.8'	\$21°06.5 20°59.9	-6.6'	58.8'	
7 8	289°01.2 304°01.1	14.3 15.0	243°32.5	6.9' 7.0'	20°59.9 20°53.1	-6.8' -6.9'	58.7' 58.7'	
9	319°01.1	15.7	257°58.5	7.0	20°46.2	-0.9 -7.0'	58.7'	
10	334°01.0	16.4	272°24.6	7.2'	20°39.3	-7.1	58.6'	
11	349°00.9	17.1	286°50.8	7.3'	20°32.1	-7.2	58.6'	
12	4°00.9	S 17°17.8	301°17.1	7.4'	S20°24.9	-7.3'	58.5'	
13	19°00.8	18.5	315°43.5	7.5'	20°17.6	-7.5'	58.5'	
14	34°00.7	19.2	330°10.0	7.6'	20°10.1	-7.6'	58.5'	
15	49°00.7	• • 19.9	344°36.7	7.7'	20°02.5	-7.7'	58.4'	
16 17	64°00.6 79°00.5	20.5 21.2	359°03.4 13°30.2	7.8' 8.0'	19°54.9 19°47.1	-7.8' -7.9'	58.4' 58.3'	
18	94°00.5	\$17°21.9	27°57.2	8.1'	519°39.2	-8.0'	58.3'	
19	109°00.4	22.6	42°24.3	8.2'	19°31.2	-8.1	58.3'	
20	124°00.3	23.3	56°51.5	8.3'	19°23.1	-8.2	58.2'	
21	139°00.3	• • 24.0	71°18.7	8.4'	19°14.9	-8.3'	58.2'	
22	154°00.2	24.7	85°46.1	8.5'	19°06.6	-8.4'	58.1'	
23	169°00.1	25.4	100°13.7	8.6'	18°58.2	-8.5'	58.1'	
	SD = 16.1'	d = 0.7'		SI	O = 16.1'			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°00.1	\$17°26.1	114°41.3	8.7'	\$18°49.7	-8.6'	58.0'	
1	199°00.0	26.8	129°09.0	8.8'	18°41.2	-8.7'	58.0'	
2	213°59.9	27.5	143°36.8	8.9'	$18^{\circ}32.5$	-8.8'	58.0'	
3	228°59.9	• • 28.1	158°04.8	9.1'	18°23.7	-8.9'	57.9'	
4	243°59.8	28.8	172°32.8	9.2'	18°14.8	-9.0'	57.9'	
5 6	258°59.7 273°59.6	29.5 \$17°30.2	187°01.0 201°29.3	9.3' 9.4'	18°05.9 \$17°56.9	-9.0' -9.1'	57.8' 57.8'	
6 7	273°59.6 288°59.6	30.9	201°29.3 215°57.7	9.4° 9.5'	517°56.9 17°47.7	-9.1' -9.2'	57.8°	
8	303°59.5	31.6	230°26.1	9.5 9.6'	17 47.7 17°38.5	-9.2 -9.3'	57.6 57.7'	
9	318°59.4	32.3	244°54.7	9.7'	17°29.2	-9.4'	57.7'	
10	333°59.4	32.9	259°23.4	9.8'	17°19.8	-9.5'	57.6'	
11	348°59.3	33.6	273°52.2	9.9'	17°10.4	-9.5'	57.6'	
12	3°59.2	S17°34.3	288°21.1	10.0'	S17°00.8	-9.6'	57.6'	
13	18°59.1	35.0	302°50.2	10.1'	16°51.2	-9.7'	57.5'	
14	33°59.1	35.7 •• 36.4	317°19.3	10.2'	16°41.5	-9.8'	57.5'	
15 16	48°59.0 63°58.9	· · 36.4 37.0	331°48.5 346°17.8	10.3' 10.4'	16°31.8 16°21.9	-9.8' -9.9'	57.5' 57.4'	
16 17	78°58.9	37.0 37.7	346°17.8 0°47.3	10.4	16°21.9 16°12.0	-9.9' -10.0'	57.4° 57.4°	
18	93°58.8	\$17°38.4	15°16.8	10.6'	\$16°02.0	-10.0	57.3'	
19	108°58.7	39.1	29°46.4	10.7'	15°52.0	-10.1	57.3'	
20	123°58.6	39.8	44°16.1	10.8'	15°41.9	-10.2'	57.3'	
21	138°58.5	• • 40.4	58°46.0	10.9'	15°31.7	-10.3'	57.2'	
22	153°58.4	41.1	73°15.9	11.0'	15°21.4	-10.3'	57.2'	
23	168°58.4	41.8	87°45.9	11.1'	15°11.1	-10.4'	57.1'	
	SD = 16.1'	d = 0.7'		SI	O = 15.8'			

N 72° N 70° 68°	Naut. 06:42	Civil 08:12	Sunrise	Sunset		
N 70°		00.12			Civil	Naut.
		08:12	10:05	13:22	15:15	16:44
68°	06:34	07:53	09:20	14:07	15:34	16:53
	06:27	07:38	08:51	14:36	15:49	17:00
66°	06:21	07:25	08:29	14:58	16:02	17:06
64°	06:16	07:15	08:12	15:15	16:12	17:11
62°	06:11	07:06	07:58	15:29	16:21	17:15
60°	06:07	06:58	07:46	15:41	16:29	17:20
N 58°	06:04	06:51	07:36	15:52	16:36	17:23
56°	06:00	06:45	07:27	16:01	16:42	17:27
54°	05:57	06:40	07:19	16:09	16:48	17:30
52°	05:54	06:35	07:11	16:16	16:53	17:33
50°	05:51	06:30	07:05	16:22	16:57	17:36
45°	05:44	06:20	06:51	16:36	17:08	17:43
N 40°	05:38	06:11	06:40	16:48	17:17	17:49
35°	05:33	06:03	06:30	16:58	17:24	17:55
30°	05:27	05:56	06:21	17:06	17:32	18:00
20°	05:17	05:43	06:06	17:22	17:45	18:11
N 10°	05:06	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:23	04:51	05:14	18:14	18:37	19:05
30°	04:02	04:33	04:59	18:30	18:56	19:26
35°	03:49	04:22	04:49	18:39	19:07	19:40
40°	03:32	04:09	04:39	18:50	19:20	19:57
45°	03:11	03:53	04:27	19:02	19:36	20:18
S 50°	02:44	03:33	04:11	19:17	19:56	20:46
52°	02:30	03:24	04:04	19:25	20:05	21:00
54°	02:13	03:13	03:56	19:33	20:16	21:17
56°	01:52	03:00	03:48	19:42	20:29	21:39
58°	01:25	02:46	03:38	19:52	20:44	22:08
S 60°	00:40	02:28	03:26	20:04	21:02	22:57
Lat.		Moonris	e e		Moonset	

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

		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	11-29%
09	16:12	16:09	11:44	15:06	02:36	
10	16:07	16:04	11:44	16:04	03:36	
11	16:00	15:57	11:44	16:57	04:31	

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

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	51°24.8	134° 56.4	\$27°11.3	134°49.0	\$24°37.9	193°02.6	S14°02.0	1°30.7	N15°47.1			
1	66°27.3	149° 56.5	11.2	149°49.3	37.8	208° 04.5	02.2	16°33.4	47.1	Alpheratz	357°30.4	29°15.6
2	81°29.7	164° 56.5	11.0	164°49.7	37.7	223°06.4	02.4	31°36.1	47.0	Ankaa	353°03.2	-42°08.6
3	96°32.2	179°56.6	• • 10.9	179°50.1	• • 37.6	238°08.4	• • 02.5	46°38.7	• • 47.0	Schedar Diphda	349°25.9 348°43.2	56°42.4 -17°49.3
4	111°34.7	194°56.6	10.8	194°50.5	37.6	253° 10.3	02.7	61°41.4	46.9	Achernar	335° 17.0	-17 49.3 -57°05.2
5	126°37.1	209°56.7	10.7	209°50.9	37.5	268° 12.2	02.9	76°44.1	46.9	Hamal	327°46.4	23°36.3
6	141°39.6	224°56.7	\$27°10.5	224°51.3	\$24°37.4	283°14.2	S14°03.0	91°46.7	N15°46.8	Polaris	311°20.8	89°23.3
7 8	156°42.1 171°44.5	239° 56.8 254° 56.8	10.4	239°51.7 254°52.1	37.3 37.2	298° 16.1 313° 18.0	03.2 03.4	106°49.4 121°52.1	46.8	Acamar	$315^{\circ}08.5$	-40°11.1
9	171 44.5 186°47.0	269° 56.9	10.3 · · 10.1	269°52.5	37.2	328° 20.0	03.5	121 52.1 136°54.7	46.7 •• 46.7	Menkar	$314^{\circ}01.8$	4°12.5
10	201°49.4	284°57.0	10.1	284°52.8	37.0	343°21.9	03.7	150°57.4	46.6	Mirfak	308°22.1	49°58.0
11	216°51.9	299° 57.0	09.9	299°53.2	36.9	358° 23.8	03.9	167°00.1	46.6	Aldebaran	290°34.8	16°34.1
12	231°54.4	314°57.1	S27°09.7	314°53.6	S24°36.8	13°25.7	S 14°04.1	182°02.8	N15°46.5	Rigel	280°59.8	-8°10.0
13	246°56.8	329° 57.2	09.6	329°54.0	36.7	28°27.7	04.2	197°05.4	46.5	Capella Bellatrix	280° 15.7 278° 18.4	46°01.5 6°22.5
14	261°59.3	344° 57.2	09.5	344°54.4	36.6	43°29.6	04.4	212°08.1	46.4	Elnath	277° 56.6	28°37.8
15	277°01.8	359° 57.3	• • 09.3	359°54.8	• • 36.6	58°31.5	• • 04.6	227°10.8	• • 46.4	Alnilam	275°33.5	-1°11.0
16	292°04.2	14°57.4	09.2	14°55.2	36.5	73°33.5	04.7	242°13.4	46.3	Betelgeuse	270°47.6	7°24.7
17	307°06.7 322°09.2	29°57.4	09.1 \$27°08.9	29°55.6	36.4	88°35.4	04.9	257°16.1 272°18.8	46.3	Canopus	263°50.3	-52°42.6
18 19	322 09.2 337°11.6	44° 57.5 59° 57.6	08.8	44°55.9 59°56.3	\$24°36.3 36.2	103°37.3 118°39.3	\$14°05.1 05.2	272 18.8 287°21.4	N15° 46.2 46.2	Sirius	$258^{\circ}22.6$	-16°45.4
20	352°14.1	74°57.7	08.7	74°56.7	36.1	133°41.2	05.4	302°24.1	46.1	Adhara	255°02.6	-29°00.7
21	7°16.5	89°57.7	• • 08.5	89°57.1	36.0	148°43.1	• • 05.6	317°26.8	• • 46.1	Procyon	244°46.6	5°08.8
22	22°19.0	104° 57.8	08.4	104°57.5	35.9	163°45.1	05.8	332°29.4	46.0	Pollux	243°12.4	27°57.0
23	$37^{\circ}21.5$	$119^{\circ}57.9$	08.2	119°57.9	35.8	178°47.0	05.9	347°32.1	46.0	Avior Suhail	234°12.8 222°43.3	-59°36.1 -43°33.1
Mern	ass. 20:31	ν0 0' d-0	.1' m-4.69	ν0 4' d-0	.1′ m1.08	ν1 9' d0	2′ m-1.69	v2 7' d-0	.1' m-0.30	Miaplacidus	222 43.3 221°37.1	-43 33.1 -69°50.2
- IVICI.P	a33. 20.31	νο.ο u-ο.	.1 111-4.09	νο. - α-ο	.1 1111.00	ν1.9 ασ.		ν2.1 u-0	.1 111-0.50	Alphard	217°43.9	-8°47.3
_			_		_		_		_	Regulus	207°30.4	11°49.1
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.8	61°35.0
0 1	52°23.9 67°26.4	134°58.0 149°58.1	\$27°08.1 07.9	134°58.3 149°58.6	\$24°35.7 35.6	193°48.9 208°50.9	\$14°06.1 06.3	2°34.8 17°37.5	N15° 45.9 45.9	Denebola	$182^{\circ}21.2$	14°24.2
2	82°28.9	164° 58.2	07.9	164° 59.0	35.5	200 50.9 223°52.8	06.4	32°40.1	45.9 45.8	Gienah	175°39.8	-17°42.4
3	97°31.3	179°58.2	• • 07.7	179°59.4	35.4	238°54.7	06.6	47°42.8	• • 45.8	Acrux	172°56.0	-63°15.7
4	112°33.8	194°58.3	07.5	194°59.8	35.3	253°56.7	06.8	62°45.5	45.7	Gacrux	171°47.5	-57°16.7
5	127°36.3	209°58.4	07.4	210°00.2	35.2	268° 58.6	06.9	77°48.1	45.7	Alioth Spica	166° 10.2 158° 18.5	55°47.7 -11°19.0
6	142°38.7	224°58.5	S27°07.2	225°00.6	S24°35.1	284°00.5	S14°07.1	92°50.8	N15°45.6	Alkaid	150° 10.5° 152° 49.6	49°09.8
7	$157^{\circ}41.2$	239°58.6	07.1	$240^{\circ}01.0$	35.0	299°02.4	07.3	107°53.5	45.6	Hadar	148°30.9	-60°30.9
8	172°43.7	254° 58.7	06.9	255°01.4	34.9	314°04.4	07.5	122°56.1	45.5	Menkent	147°53.3	-36°30.9
9	187°46.1	269°58.8	• • 06.8	270°01.7	• • 34.8	329°06.3	•• 07.6	137°58.8	• • 45.5	Arcturus	145°44.7	19°01.6
10	202°48.6	284°58.9	06.6	285°02.1	34.7	344°08.2	07.8	153°01.5	45.4	Rigil Kent.	139°35.4	-60°57.4
11 12	217°51.0 232°53.5	299°59.0 314°59.1	06.5 \$27°06.3	300°02.5 315°02.9	34.6 \$24°34.5	359° 10.2 14° 12.1	08.0 \$14°08.1	168°04.1 183°06.8	45.4 N15°45.3	Kochab	137°21.5	74°01.9
13	247°56.0	329°59.2	06.1	330°03.3	34.4	29° 14.0	08.3	198°09.5	45.3	Zuben'ubi	136°52.0	-16°09.8
14	262°58.4	344°59.3	06.0	345°03.7	34.3	44°16.0	08.5	213°12.2	45.2	Alphecca	126°00.9	26°37.0
15	278°00.9	359° 59.4	• • 05.8	0°04.1	• • 34.2	59° 17.9	• • 08.6	228°14.8	• • 45.2	Antares Atria	112°11.4 107°02.5	-26°29.7 -69°04.8
16	293°03.4	$14^{\circ}59.5$	05.7	15°04.4	34.1	74°19.8	8.80	243°17.5	45.1	Sabik	107 02.5 101°58.6	-09 04.8 -15°45.5
17	308°05.8	29°59.6	05.5	30°04.8	34.0	89°21.8	09.0	258°20.2	45.1	Shaula	96°05.5	-37°07.4
18	323°08.3	44°59.7	S27°05.4	45°05.2	S24°33.9	104°23.7	\$14°09.1	273°22.8	N15°45.0	Rasalhague	95°55.2	12°32.5
19	338°10.8	59°59.9	05.2	60°05.6	33.7	119°25.6	09.3	288°25.5	45.0	Eltanin	90°40.8	51°29.4
20 21	353°13.2 8°15.7	75°00.0 90°00.1	05.0 •• 04.9	75°06.0 90°06.4	33.6 •• 33.5	134°27.6 149°29.5	09.5 •• 09.6	303°28.2 318°30.8	44.9 •• 44.9	Kaus Aust.	83°27.7	-34°22.1
22	23°18.2	105°00.2	04.9	105°06.8	33.4	164° 31.4	09.8	333°33.5	44.8	Vega	80°30.9	38°49.0
23	38°20.6	120°00.3	04.6	120°07.1	33.3	179°33.4	10.0	348°36.2	44.8	Nunki	75°43.2	-26°15.4
					_					Altair Peacock	61°56.3 53°00.0	8°57.1 -56°38.3
ivier.p	ass. 20:27	ν 0.1 a-0.	.1′ m-4.71	$\nu_{0.4}$ a-0	.1′ m1.08	ν 1.9 a 0.	2′ m-1.69	ν2.Γ a-0	.1′ m-0.31	Deneb	49°23.2	45°23.7
										Enif	33°35.0	10°01.0
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.1	-46°49.0
0	53°23.1	135°00.4	\$27°04.4	135°07.5	\$24°33.2	194°35.3	\$14° 10.2	3°38.8	N15°44.7	Fomalhaut	$15^{\circ}10.2$	-29°27.8
1 2	68°25.5 83°28.0	150°00.6 165°00.7	04.2 04.1	150°07.9 165°08.3	33.1 33.0	209°37.2 224°39.2	10.3 10.5	18°41.5 33°44.2	44.7 44.6	Scheat	13°41.2	28°15.0
3	98°30.5	180°00.8	03.9	180°08.7	32.9	224 39.2 239°41.1	10.5	33 44.2 48°46.9	· · 44.6	Markab	13°25.9	15°22.3
4	113°32.9	195°00.9	03.7	195°09.1	32.8	254°43.0	10.8	63°49.5	44.5	Nov 12 Mon	SHA	Mer.pass
5	128°35.4	210°01.1	03.6	210°09.5	32.7	269°44.9	11.0	78°52.2	44.5	Venus	83°31.6	15:00
6	143°37.9	225°01.2	S27°03.4	225°09.8	S24°32.5	284°46.9	S 14°11.2	93°54.9	N15°44.4	Mars	83°24.2	15:00
7	158°40.3	240°01.3	03.2	240°10.2	32.4	299°48.8	11.3	108°57.5	44.4	Jupiter	141°37.8	11:06
8	173°42.8	255°01.5	03.0	255°10.6	32.3	314°50.7	11.5	124°00.2	44.3	Saturn	310°05.9	23:50
9	188°45.3	270°01.6	•• 02.9	270°11.0	• • 32.2	329°52.7	• • 11.7	139°02.9	• • 44.3	Nov 13 Tue	SHA	Mer.pass
10 11	203°47.7 218°50.2	285°01.7 300°01.9	02.7 02.5	285°11.4 300°11.8	32.1 32.0	344°54.6 359°56.5	11.8 12.0	154°05.5 169°08.2	44.2	Venus	82°34.0	15:00
12	233°52.6	315°02.0	527°02.3	315° 12.2	524°31.9	14° 58.5	\$14° 12.2	184°10.9	44.2 N15°44.1	Mars	82°34.3	15:00
13	248°55.1	330°02.0	02.2	330°12.5	31.7	30°00.4	12.3	199°13.5	44.1	Jupiter	141°25.0	11:03
14	263°57.6	345°02.3	02.0	345°12.9	31.6	45°02.3	12.5	214°16.2	44.0	Saturn	310° 10.8	23:45
15	279°00.0	$0^{\circ}02.4$	• • 01.8	$0^{\circ}13.3$	• • 31.5	60°04.3	•• 12.7	229°18.9	• • 44.0	Nov 14 Wed	SHA	Mer.pass
16	294°02.5	15°02.6	01.6	15° 13.7	31.4	75°06.2	12.9	244°21.5	43.9	Venus	81°37.4	15:00
17	309°05.0	30°02.7	01.5	30°14.1	31.3	90°08.1	13.0	259°24.2	43.9	Mars	81°44.5	14:59
18	324°07.4	45°02.9	\$27°01.3	45°14.5	\$24°31.2	105°10.1	\$14° 13.2	274°26.9	N15°43.8	Jupiter	141°12.2	11:00
19	339°09.9 354°12.4	60°03.0	01.1	60°14.9	31.0	120° 12.0 135° 13.9	13.4	289°29.6 304°32.2	43.8 43.7	Saturn	310°15.8	23:41
20 21	354 12.4 9°14.8	75°03.2 90°03.3	00.9 •• 00.7	75° 15.2 90° 15.6	30.9 · · 30.8	135° 13.9 150° 15.9	13.5 •• 13.7	304°32.2 319°34.9	43.7 •• 43.7	Horizont	al parallax	
22	24°17.3	105°03.5	00.7	105° 16.0	30.7	165° 17.8	13.7	334°37.6	43.6		Venus:	0.3
23	39°19.8	120°03.7	00.4	120° 16.4	30.6	180° 19.7	14.0	349°40.2	43.6		Mars:	0.1
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20 123°52.1 27.2 11°20.9 15.5' 01°47.4 -12.2' 55.0' 21 138°52.0 · · · 27.8 25°55.4 15.5' 01°35.2 -12.2' 55.0' 22 153°51.9 28.5 40°29.9 15.5' 01°23.0 -12.2' 55.0' 23 168°51.8 29.1 55°04.4 15.6' 01°10.8 -12.2' 54.9'									
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22 153°51.9 28.5 40°29.9 15.5' 01°23.0 -12.2' 55.0' 23 168°51.8 29.1 55°04.4 15.6' 01°10.8 -12.2' 54.9'									
23 168°51.8 29.1 55°04.4 15.6' 01°10.8 -12.2' 54.9'									
SD = 16.2' d = 0.6' $SD = 15.1'$									
		SD = 16.2'	d = 0.6'		SI	O = 15.1'			

N 72° 06:53 08:26 10:36 12:51 15:01 1 N 70° 06:44 08:05 09:38 13:49 15:23 1 68° 06:36 07:48 09:05 14:23 15:40 1 66° 06:29 07:34 08:41 14:47 15:53 1 64° 06:23 07:23 08:22 15:06 16:05 1 62° 06:18 07:13 08:06 15:21 16:14 1 60° 06:13 07:05 07:53 15:34 16:23 1 N 58° 06:09 06:58 07:42 15:45 16:30 1 56° 06:05 06:51 07:23 15:55 16:37 1 54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	laut. 6:34
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	6:34
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	6:44
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	6:52
62° 06:18 07:13 08:06 15:21 16:14 1 60° 06:13 07:05 07:53 15:34 16:23 1 N 58° 06:09 06:58 07:42 15:45 16:30 1 56° 06:05 06:51 07:33 15:55 16:37 1 54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	6:58
60° 06:13 07:05 07:53 15:34 16:23 1 N 58° 06:09 06:58 07:42 15:45 16:30 1 56° 06:05 06:51 07:33 15:55 16:37 1 54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	7:04
N 58° 06:09 06:58 07:42 15:45 16:30 1 56° 06:05 06:51 07:33 15:55 16:37 1 54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	7:10
56° 06:05 06:51 07:33 15:55 16:37 1 54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	7:14
54° 06:02 06:45 07:24 16:04 16:43 1 52° 05:58 06:39 07:17 16:11 16:49 1	7:19
52° 05:58 06:39 07:17 16:11 16:49 1	7:22
	7:26
50° 05:55 06:35 07:10 16:18 16:54 1	7:30
	7:33
45° 05:48 06:24 06:55 16:33 17:05 1	7:40
	7:47
35° 05:35 06:06 06:33 16:56 17:22 1	7:53
	7:59
	8:10
	8:22
0° 04:54 05:19 05:41 17:48 18:10 1	8:35
	8:49
	9:07
	9:29
	9:44
	0:01
	0:23
	0:53
	1:08
	1:27
	1:51
	2:24
S 60° //// 02:18 03:19 20:12 21:13	////

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

١			Sun		Moon			
ı	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	2	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
l		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-60%	
	12	15:53	15:49	11:44	17:45	05:21		
l	13	15:45	15:41	11:44	18:30	06:08		
l	14	15:36	15:32	11.44	19.13	06.52		

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

h	Aries	Ve	nus		ars	Jup	oiter	Saturn		Stars		
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	54°22.2	135°03.8	\$27°00.2	135°16.8	S24°30.4	195°21.7	S14°14.2	4° 42.9	N15°43.5		ЗПА	
	69°24.7	150°04.0	27°00.2	150°17.2		210°23.6		19°45.6		Alpheratz	357°30.4	29°15.6
1		165°04.1		165°17.5	30.3		14.4		43.5	Ankaa	353°03.2	-42°08.6
2	84°27.1		26°59.8		30.2	225°25.5	14.5	34° 48.2 49° 50.9	43.4	Schedar	349°26.0	56°42.4
3	99°29.6	180°04.3	• • 59.6	180°17.9	• • 30.1	240°27.5	• • 14.7		• • 43.4	Diphda	348°43.2	-17°49.3
4	114°32.1	195°04.5	59.4	195°18.3	30.0	255°29.4	14.9	64°53.6	43.3	Achernar	335°17.0	-57°05.2
5	129°34.5	210°04.6	59.3	210°18.7	29.8	270°31.3	15.0	79°56.2	43.3	Hamal	327°46.4	23°36.3
6	144°37.0	225°04.8	S26°59.1	225°19.1	S24°29.7	285°33.3	\$14°15.2	94°58.9	N15°43.2	Polaris	311°20.7	89°23.3
7	159°39.5	240°05.0	58.9	240°19.5	29.6	300°35.2	15.4	110°01.6	43.2	Acamar	315°08.5	-40°11.1
8	174°41.9	255°05.2	58.7	255°19.9	29.5	315°37.1	15.5	125°04.3	43.1	Menkar	314°01.7	4°12.5
9	189°44.4	270°05.3	• • 58.5	270°20.2	• • 29.3	330°39.0	• • 15.7	140°06.9	• • 43.1	Mirfak	308°22.0	49°58.0
10	204°46.9	285°05.5	58.3	285°20.6	29.2	345°41.0	15.9	155°09.6	43.0	Aldebaran	290°34.8	16°34.1
11	219°49.3	300°05.7	58.1	300°21.0	29.1	0°42.9	16.0	170° 12.3	43.0	Rigel	280°59.8	-8°10.1
12	234°51.8	315°05.9	S26°57.9	315°21.4	S24°29.0	15°44.8	S14°16.2	185° 14.9	N15°42.9	Capella	280°15.7	46°01.5
13	249°54.3	330°06.0	57.7	330°21.8	28.8	30°46.8	16.4	200° 17.6	42.9	Bellatrix	278°18.4	6°22.5
14	264°56.7	345°06.2	57.5	345°22.2	28.7	45°48.7	16.5	215° 20.3	42.8	Elnath	277°56.6	28°37.8
15	279°59.2	0°06.4	• • 57.3	0°22.5	• • 28.6	60°50.6	•• 16.7	230° 22.9	• • 42.8	Alnilam	275°33.5	-1°11.0
16	295°01.6	15°06.6	57.1	15°22.9	28.5	75°52.6	16.9	245°25.6	42.7	Betelgeuse	270°47.6	7°24.7
17	310°04.1	30°06.8	56.9	30°23.3	28.3	90°54.5	17.0	260°28.3	42.7	Canopus	263°50.2	-52°42.6
18	325°06.6	45°07.0	\$26°56.7	45°23.7	S24°28.2	105°56.4	S14°17.2	275°30.9	N15°42.6	Sirius	258°22.6	-16°45.4
19	340°09.0	60°07.2	56.5	60°24.1	28.1	120°58.4	17.4	290°33.6	42.6	Adhara	255°02.5	-29°00.7
20	355°11.5	75°07.4	56.3	75°24.5	27.9	136°00.3	17.5	305°36.3	42.5	Procyon	244°46.6	5°08.8
21	10°14.0	90°07.6	• • 56.1	90°24.8	• • 27.8	151°02.2	•• 17.7	320° 38.9	• • 42.5	Pollux	244° 40.0 243° 12.4	27°57.0
22	$25^{\circ}16.4$	105°07.8	55.9	105°25.2	27.7	166°04.2	17.9	335°41.6	42.4	Avior	245 12.4 234°12.8	-59°36.1
23	40°18.9	120°08.0	55.7	120°25.6	27.5	181°06.1	18.1	350°44.3	42.4	Suhail	234 12.6 222°43.3	-39 30.1 -43°33.1
Mar	pass. 20:19	υΩ 2/ ΔΩ	.2′ m-4.73	υΩ Δ/ Δ Ω	.1′ m1.08	1/1 O/ dO	2′ m-1.69	1/27/40	.0' m-0.31	Miaplacidus	222 43.3 221°37.1	-43 33.1 -69°50.2
ivier.p	Dass. 20:19	νο.2 α-υ	.2 M-4.73	νο.4 α-0	.1 111.00	$\nu_{1.9} \ a_{0.}$	2 m-1.09	ν2.1 α-0	.0 111-0.31	Alphard	221 37.1 217°43.9	-8° 47.3
											217 43.9 207°30.4	-6 47.3 11°49.1
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus		1
0	55°21.4	135°08.2	S26°55.5	135°26.0	524°27.4	196°08.0	S 14°18.2	5°47.0	N15°42.3	Dubhe	193°36.8	61°35.0
1	70°23.8	150°08.4	55.3	150°26.4	27.3	211°10.0	18.4	20°49.6	42.3	Denebola	182°21.2	14°24.2
2	85°26.3	165°08.6	55.1	165°26.8	27.2	226°11.9	18.6	35°52.3	42.2	Gienah	175°39.8	-17°42.4
3	100°28.7	180°08.8	• • 54.9	180°27.1	27.0	241°13.8	• • 18.7	50°55.0	42.2		172°55.9	-63°15.7
4	115°31.2	195°09.0	54.7	195°27.5	26.9	256°15.8	18.9	65° 57.6	42.1		171°47.5	-57°16.7
5	130°33.7	210°09.2	54.5	210°27.9	26.8	271°17.7	19.1	81°00.3	42.1	Alioth	166°10.2	55°47.6
6	145°36.1	225°09.4	\$26°54.3	225°28.3	S24°26.6	286°19.6	S14°19.2	96°03.0	N15°42.0	Spica	158°18.5	-11°19.0
7	160°38.6	240°09.6	54.0	240°28.7	26.5	301°21.6	19.4	111°05.6	42.0	Alkaid	152°49.5	49°09.7
8	175°41.1	255°09.8	53.8	255°29.1	26.3	316°23.5	19.6	126°08.3	41.9	Hadar	148°30.9	-60°30.8
9	190°43.5	270°10.0	• • 53.6	270°29.4	. 26.2	331°25.4	19.7	141°11.0	41.9	1	147°53.3	-36°30.9
10	205°46.0	285°10.3	53.4	285°29.8	26.1	346°27.4	19.7	156° 13.6	41.8	Arcturus	145°44.7	19°01.6
11	200°48.5	300°10.5	53.4	300°30.2	25.9	1°29.3	20.1	171° 16.3	41.8	Rigil Kent.	139°35.4	-60°57.4
12	235°50.9	315°10.7	\$26°53.0	315°30.6	S24°25.8	16°31.2	\$14°20.2	171 10.3 186° 19.0	N15°41.7	Kochab	137°21.5	74°01.9
13	250°53.4	330°10.7		330°31.0	25.7	31°33.2	20.4	201°21.6		Zuben'ubi	136°52.0	-16°09.8
	265°55.9	345°11.1	52.8	345°31.4		46°35.1		201 21.0 216°24.3	41.7	Alphecca	126°00.9	26°37.0
14			52.6		25.5		20.6		41.6	Antares	$112^{\circ}11.4$	-26°29.7
15	280°58.3	0°11.4	• • 52.3	0°31.7	• • 25.4	61°37.0 76°39.0	• • 20.7	231°27.0	• • 41.6	Atria	107°02.6	-69°04.8
16	296°00.8	15°11.6	52.1	15°32.1	25.2		20.9	246°29.7	41.5	Sabik	101°58.6	-15°45.5
17	311°03.2	30°11.8	51.9	30°32.5	25.1	91°40.9	21.1	261°32.3	41.5	Shaula	96°05.5	-37°07.4
18	326°05.7	45°12.1	\$26°51.7	45°32.9	S24°25.0	106°42.8	\$14°21.2	276°35.0	N15°41.4	Rasalhague	95°55.3	12°32.5
19	341°08.2	60°12.3	51.5	60°33.3	24.8	121°44.8	21.4	291°37.7	41.4	Eltanin	90°40.8	51°29.4
20	356°10.6	75°12.5	51.2	75°33.7	24.7	136°46.7	21.6	306° 40.3	41.3	Kaus Aust.	83°27.7	-34°22.1
21	11°13.1	90°12.8	• • 51.0	90°34.0	• • 24.5	151°48.6	· · 21.7	321°43.0	• • 41.3	Vega	80°30.9	38°49.0
22	26°15.6	105°13.0	50.8	105°34.4	24.4	166°50.6	21.9	336° 45.7	41.2	Nunki	75°43.2	-26°15.4
23	41°18.0	120°13.3	50.6	120°34.8	24.3	181°52.5	22.1	351°48.3	41.2	Altair	61°56.3	8°57.1
Mer.n	pass. 20:15	ν 0.2′ d-0	.2′ m-4.74	$\nu 0.4' \ d-0$.1′ m1.09	$\nu 1.9' \ d0$	2′ m-1.69	$\nu 2.7' \ d-0$.0′ m-0.29	Peacock	53°00.0	-56°38.3
										Deneb	49°23.2	45°23.7
_			_		_		_		_	Enif	33°35.0	10°01.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.2	-46°49.0
0	56°20.5	135°13.5	\$26°50.3	135°35.2	\$24°24.1	196°54.4	S14°22.2	6°51.0	N15°41.1	Fomalhaut	$15^{\circ}10.2$	-29°27.8
1	71°23.0	150°13.7	50.1	150°35.6	24.0	211°56.4	22.4	21°53.7	41.1	Scheat	13°41.2	28°15.0
2	86°25.4	165°14.0	49.9	165°36.0	23.8	226°58.3	22.6	36° 56.3	41.0	Markab	13°25.9	15°22.3
3	101°27.9	180°14.2	• • 49.7	180°36.3	• • 23.7	242°00.2	• • 22.7	51°59.0	• • 41.0	New 15 T	CIIA	Ma:::::
4	116°30.3	195°14.5	49.4	195°36.7	23.5	257°02.2	22.9	67°01.7	40.9	Nov 15 Thu	SHA	Mer.pass
5	131°32.8	210°14.7	49.2	210°37.1	23.4	272°04.1	23.0	82°04.3	40.9	Venus	80°41.6	15:00
6	146°35.3	225°15.0	S26°49.0	225°37.5	S24°23.2	287°06.0	S14°23.2	97°07.0	N15°40.8	Mars	80°54.6	14:58
7	161°37.7	240°15.3	48.8	240°37.9	23.1	302°08.0	23.4	112°09.7	40.8	Jupiter		10:57
8	176°40.2	255°15.5	48.5	255°38.3	23.0	317°09.9	23.5	127°12.3	40.7	Saturn	310°20.7	23:37
9	191°42.7	270°15.8	• • 48.3	270°38.6	• • 22.8	332°11.8	· · 23.7	142°15.0	• • 40.7	Nov 16 Fri	SHA	Mer.pass
10	206°45.1	285°16.0	48.1	285°39.0	22.7	347°13.8	23.9	157° 17.7	40.6	Venus	79°46.8	14:59
11	221°47.6	300°16.3	47.8	300°39.4	22.5	2°15.7	24.0	172°20.4	40.6	Mars	80°04.6	14:58
12	236°50.1	315°16.6	\$26°47.6	315°39.8	S24°22.4	17°17.6	S14°24.2	187°23.0	N15°40.5	Jupiter		10:54
13	251°52.5	330°16.8	47.4	330°40.2	22.2	32°19.6	24.4	202°25.7	40.5	Saturn	310°25.6	23:33
14	266°55.0	345°17.1	47.1	345°40.6	22.1	47°21.5	24.5	217° 28.4	40.4			
15	281°57.5	0°17.4	• • 46.9	0°40.9	• • 21.9	62°23.4	• • 24.7	232°31.0	• • 40.4	Nov 17 Sat	SHA	Mer.pass
16	296°59.9	15°17.6	46.7	15°41.3	21.8	77°25.4	24.9	247°33.7	40.3	Venus	78°53.0	14:59
17	312°02.4	30°17.9	46.4	30°41.7	21.6	92°27.3	25.0	262°36.4	40.3	Mars	79°14.7	14:57
18	327°04.8	45°18.2	S26°46.2	45°42.1	S24°21.5	107°29.2	S14°25.2	277°39.0	N15°40.2	Jupiter	140°33.9	10:51
19	342°07.3	60°18.5	45.9	60°42.5	21.3	122°31.2	25.4	292°41.7	40.2	Saturn	$310^{\circ}30.5$	23:28
20	357°09.8	75°18.7	45.7	75°42.9	21.2	137°33.1	25.5	307°44.4	40.1		-1 "	
21	12°12.2	90°19.0	• • 45.5	90°43.2	• • 21.0	152°35.0	• • 25.7	322°47.0	• • 40.1	Horizont	al parallax	0.0
22	27°14.7	105°19.3	45.2	105°43.6	20.9	167°37.0	25.9	337°49.7	40.0		Venus:	0.3
23	42°17.2	120°19.6	45.0	120°44.0	20.7	182°38.9	26.0	352°52.4	40.0		Mars:	0.1
Mern	pass. 20:11	ν0 2/ d-0	.2′ m-4.75	ν0 4' d.0	.1′ m1.09	v1 0/ d0	2′ m-1.69	1/2 7' d-0	.0′ m-0.28			
.vici.p		- J.Z u-0		<i>ν</i> σ.∓ u-0		ν 1.5 UO.	1.03	- Z.1 U-0	0.20			

h	Sui	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.7	\$18°29.7	69°39.0	15.6'	S00°58.6	-12.2'	54.9'
1 2	198°51.6 213°51.5	30.4 31.0	84°13.5 98°48.1	15.6' 15.6'	00°46.4 00°34.2	-12.2' -12.2'	54.9' 54.9'
3	213 51.5 228°51.4	31.7	113°22.8	15.6'	00°34.2	-12.2'	54.8'
4	243°51.3	32.3	$127^{\circ}57.4$	15.7'	S 00°09.9	-12.2'	54.8'
5	258°51.2	32.9	142°32.1	15.7'	N00°02.3	12.1'	54.8'
6 7	273°51.1 288°51.0	\$18°33.6 34.2	157°06.8 171°41.5	15.7' 15.7'	N00°14.4 00°26.6	12.1' 12.1'	54.8' 54.8'
8	303°50.9	34.8	186°16.2	15.7'	00°20.0	12.1'	54.7'
9	318°50.8	• • 35.5	200°50.9	15.8'	00°50.8	12.1'	54.7'
10	333°50.7 348°50.5	36.1	215°25.7 230°00.4	15.8'	01°02.9 01°15.0	12.1'	54.7'
11 12	348 50.5 3°50.4	36.7 \$18°37.3	244°35.2	15.8' 15.8'	N01°27.1	12.1' 12.1'	54.7' 54.7'
13	18°50.3	38.0	259°10.0	15.8'	01°39.2	12.1'	54.6'
14	33°50.2	38.6	273°44.8	15.8'	01°51.2	12.0'	54.6'
15 16	48°50.1 63°50.0	· · 39.2 39.9	288°19.6 302°54.4	15.8' 15.8'	02°03.3 02°15.3	12.0' 12.0'	54.6' 54.6'
17	78°49.9	40.5	317°29.3	15.8'	02° 13.3	12.0'	54.6'
18	93°49.8	S18°41.1	332°04.1	15.8'	N02°39.3	12.0'	54.6'
19	108°49.7	41.7	346°39.0	15.8'	02°51.3	12.0'	54.5'
20 21	123°49.6 138°49.4	42.4 •• 43.0	1°13.8 15°48.7	15.9' 15.9'	03°03.3 03°15.2	11.9' 11.9'	54.5' 54.5'
22	153°49.3	43.6	30°23.5	15.9'	03°27.1	11.9'	54.5'
23	168°49.2	44.2	44°58.4	15.9'	03°39.0	11.9'	54.5'
	SD = 16.2'	d = 0.6'		SI	D = 15.0'		
- .					Б.	,	
Fri 0	GHA 183°49.1	Dec \$18°44.9	GHA 59°33.2	u 15.9'	Dec N03°50.9	<i>d</i> 11.9'	HP 54.5'
1	198°49.0	45.5	74°08.1	15.9'	04°02.8	11.8'	54.4'
2	213°48.9	46.1	88°42.9	15.9'	04° 14.6	11.8'	54.4'
3 4	228°48.8 243°48.7	• • 46.7 47.4	103°17.8 117°52.7	15.9' 15.9'	04°26.4 04°38.2	11.8' 11.8'	54.4' 54.4'
5	258°48.5	48.0	132°27.5	15.9'	04°50.0	11.7	54.4'
6	273°48.4	S 18°48.6	147°02.4	15.8'	N05°01.8	11.7'	54.4'
7	288°48.3	49.2	161°37.2	15.8'	05°13.5	11.7'	54.4'
8 9	303°48.2 318°48.1	49.8 •• 50.4	176°12.0 190°46.9	15.8' 15.8'	05°25.2 05°36.9	11.7' 11.6'	54.3' 54.3'
10	333°48.0	51.1	205°21.7	15.8'	05°48.5	11.6'	54.3'
11	348°47.8	51.7	219°56.5	15.8'	06°00.1	11.6'	54.3'
12 13	3°47.7 18°47.6	\$18°52.3 52.9	234°31.3 249°06.1	15.8' 15.8'	N06°11.7 06°23.3	11.6' 11.5'	54.3' 54.3'
14	33°47.5	52.9	263°40.9	15.8'	06°23.3	11.5	54.3'
15	48°47.4	• • 54.1	$278^{\circ}15.7$	15.8'	$06^{\circ}46.3$	11.5'	54.2'
16	63°47.3	54.8	292°50.5	15.8'	06°57.8 07°09.2	11.4'	54.2'
17 18	78°47.1 93°47.0	55.4 \$18°56.0	307°25.2 322°00.0	15.7' 15.7'	07 09.2 N07°20.6	11.4' 11.4'	54.2' 54.2'
19	108°46.9	56.6	336°34.7	15.7'	07°32.0	11.3'	54.2'
20	123°46.8	57.2	351°09.4		07°43.4	11.3'	54.2'
21 22	138°46.7 153°46.5	• • 57.8 58.4	5°44.1 20°18.8	15.7' 15.7'	07°54.7 08°06.0	11.3' 11.2'	54.2' 54.2'
23	168°46.4	59.0	34°53.4	15.6'	08° 17.2	11.2'	54.2'
	SD = 16.2'	d = 0.6'		SI	D = 14.9'		
Sat 0	GHA 183°46.3	Dec \$18°59.6	GHA 49°28.1	u 15.6'	Dec N08° 28.4	d 11.2'	HP 54.1'
1	198°46.2	19°00.3	64°02.7	15.6'	08°39.6	11.1'	54.1'
2	213°46.1	00.9	78°37.3	15.6'	08°50.7	11.1'	54.1'
3 4	228°45.9 243°45.8	· · 01.5 02.1	93°11.9 107°46.4	15.6' 15.5'	09°01.8 09°12.9	11.1' 11.0'	54.1' 54.1'
4 5	243 45.8 258°45.7	02.1	107 46.4 122°21.0	15.5'	09 12.9 09°23.9	11.0'	54.1'
6	273°45.6	S19°03.3	136°55.5	15.5'	N09°34.9	10.9'	54.1'
7	288°45.4 303°45.3	03.9	151°30.0	15.5'	09°45.8 09°56.7	10.9'	54.1'
8 9	303°45.3 318°45.2	04.5 · · 05.1	166°04.4 180°38.9	15.4' 15.4'	09°56.7 10°07.6	10.9' 10.8'	54.1' 54.1'
10	333°45.1	05.7	195°13.3	15.4	10° 18.4	10.8	54.1'
11	348°44.9	06.3	209°47.7	15.4	10°29.2	10.7	54.1'
12 13	3°44.8 18°44.7	\$19°06.9 07.5	224°22.0 238°56.4	15.3' 15.3'	N10°39.9 10°50.6	10.7' 10.6'	54.0' 54.0'
14	33°44.6	07.5	253°30.7	15.3'	10° 50.6 11° 01.2	10.6'	54.0'
15	48°44.4	• • 08.7	$268^{\circ}05.0$	15.2'	$11^{\circ}11.8$	10.6'	54.0'
16	63°44.3 78°44.2	09.3	282°39.2	15.2'	11°22.4	10.5'	54.0'
17 18	78°44.2 93°44.1	09.9 \$19°10.5	297°13.4 311°47.6	15.2' 15.2'	11°32.9 N11°43.3	10.5' 10.4'	54.0' 54.0'
19	108°43.9	11.1	$326^{\circ}21.8$	15.1'	11°53.7	10.4'	54.0'
20	123°43.8	11.7	340°55.9	15.1'	12°04.1	10.3'	54.0'
21 22	138°43.7 153°43.5	· · 12.3 12.9	355°30.0 10°04.0	15.1' 15.0'	12°14.4 12°24.7	10.3' 10.2'	54.0' 54.0'
23	168°43.4	13.5	24°38.0	15.0'	12°34.9	10.2	54.0'
	SD = 16.2'	d = 0.6'			D = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	69-85%	
15	15:27	15:22	11:45	19:55	07:34		
16	15:16	15:11	11:45	20:36	08:16		
17	15:05	14:59	11:45	21:19	08:57		

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

h	Aries	Vei	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	57°19.6	135° 19.9	S26°44.7	135°44.4	S24°20.5	197° 40.8	S14°26.2	7°55.0	N15°39.9			
1	72°22.1	150° 20.2	44.5	150°44.8	20.4	212° 42.8	26.4	22°57.7	39.9	Alpheratz	357°30.5	29°15.6
2	87°24.6	165°20.5	44.2	165°45.2	20.2	227° 44.7	26.5	38°00.4	39.8	Ankaa	353°03.2	-42°08.6
3	102°27.0	180°20.8	• • 44.0	180°45.5	20.1	242°46.6	• • 26.7	53°03.0	• • 39.8	Schedar	349°26.0	56°42.4
4	$117^{\circ}29.5$	195°21.1	43.7	195°45.9	19.9	257°48.6	26.9	68°05.7	39.7	Diphda	348°43.2	-17°49.3
5	132°32.0	$210^{\circ}21.4$	43.5	210°46.3	19.8	272°50.5	27.0	83°08.4	39.7	Achernar	335°17.0	-57°05.2 23°36.3
6	147°34.4	225°21.7	S26°43.3	225°46.7	S24°19.6	287°52.4	S14°27.2	98°11.0	N15°39.7	Hamal Polaris	327°46.4 311°20.5	23 30.3 89°23.3
7	162°36.9	240°22.0	43.0	240°47.1	19.5	302°54.4	27.4	113°13.7	39.6	Acamar	311 20.5 315°08.5	-40°11.1
8	177°39.3	255°22.3	42.8	255°47.4	19.3	317°56.3	27.5	128°16.4	39.6	Menkar	314°01.7	4°12.5
9	192°41.8	270°22.6	• • 42.5	270°47.8	• • 19.1	332°58.2	• • 27.7	143°19.0	• • 39.5	Mirfak	308° 22.0	49°58.0
10	207°44.3	285°22.9	42.3	285°48.2	19.0	348°00.2	27.9	158°21.7	39.5	Aldebaran	290°34.8	16°34.1
11	222°46.7	300°23.2	42.0	300°48.6	18.8	3°02.1	28.0	173°24.4	39.4	Rigel	280°59.8	-8°10.1
12	237°49.2	315°23.5	\$26°41.7	315°49.0	\$24°18.7	18°04.0	\$14°28.2	188°27.1	N15°39.4	Capella	280°15.7	46°01.5
13 14	252°51.7 267°54.1	330°23.8 345°24.1	41.5 41.2	330°49.4 345°49.7	18.5 18.3	33°06.0 48°07.9	28.3 28.5	203°29.7 218°32.4	39.3 39.3	Bellatrix	278°18.4	6°22.5
15	282°56.6	0°24.4	• • 41.0	0°50.1	. 18.2	63°09.8	28.7	233°35.1	• • 39.2	Elnath	277°56.6	28°37.8
16	297°59.1	15°24.8	40.7	15°50.5	18.0	78° 11.8	28.8	248°37.7	39.2	Alnilam	275°33.5	-1°11.0
17	313°01.5	30°25.1	40.5	30°50.9	17.9	93° 13.7	29.0	263°40.4	39.1	Betelgeuse	270°47.6	7°24.6
18	328°04.0	45°25.4	S26°40.2	45°51.3	S24°17.7	108° 15.6	S14°29.2	278°43.1	N15°39.1	Canopus	263°50.2	-52°42.6
19	343°06.4	60°25.7	40.0	60°51.7	17.5	123° 17.6	29.3	293°45.7	39.0	Sirius	258° 22.5	-16°45.5
20	358°08.9	75°26.1	39.7	75°52.0	17.4	138° 19.5	29.5	308°48.4	39.0	Adhara	255°02.5	-29°00.7
21	13°11.4	90°26.4	• • 39.4	90°52.4	• • 17.2	153°21.4	• • 29.7	323°51.1	• • 38.9	Procyon Pollux	244°46.6 243°12.4	5°08.8 27°57.0
22	28°13.8	$105^{\circ}26.7$	39.2	105°52.8	17.0	168°23.4	29.8	338°53.7	38.9	Avior	234° 12.8	-59°36.1
23	43°16.3	$120^{\circ}27.0$	38.9	120°53.2	16.9	183°25.3	30.0	353°56.4	38.8	Suhail	234 12.6 222°43.3	-39 30.1 -43°33.1
Mern	ass. 20:07	ν0 3' d-0	.2′ m-4.77	ν0 4' d-0	.2′ m1.09	ν1 9' d0	2′ m-1.69	ν2 7′ d-0	.0′ m-0.27	Miaplacidus	221°37.0	-43 33.1 -69°50.2
- wier.p		- J.J u-0.	7.11	ν σ.¬ u-0		ν 1.5 UU.	1.09	u-0	0.21	Alphard	217°43.9	-8°47.3
										Regulus	207°30.4	11°49.1
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.8	61°35.0
0	58°18.8	135°27.4	\$26°38.7	135°53.6	S24°16.7	198°27.2	S14°30.2	8°59.1	N15°38.8	Denebola	182°21.2	14°24.2
1	73°21.2	150°27.7	38.4	150°54.0	16.5	213°29.2	30.3	24°01.7	38.7	Gienah	175°39.7	-17°42.4
2	88°23.7	165°28.1	38.1	165°54.3	16.4	228°31.1	30.5	39°04.4	38.7	Acrux	172°55.9	-63°15.7
3 4	103°26.2 118°28.6	180°28.4 195°28.7	· · 37.9 37.6	180°54.7 195°55.1	· · 16.2 16.0	243°33.1 258°35.0	· · 30.7 30.8	54°07.1 69°09.7	· · 38.6 38.6	Gacrux	171°47.5	-57°16.6
5	133°31.1	210° 29.1	37.0	210°55.5	15.9	273° 36.9	31.0	84°12.4	38.5	Alioth	$166^{\circ}10.2$	55°47.6
6	148°33.6	210 29.1 225°29.4	526°37.1	210 55.5 225°55.9	524° 15.7	288° 38.9	\$1.0 \$14°31.1	99°15.1	30.5 N15°38.5	Spica	158° 18.4	-11°19.0
7	163°36.0	240°29.8	36.8	240°56.2	15.5	303°40.8	31.3	114°17.7	38.4	Alkaid	152°49.5	49°09.7
8	178°38.5	255°30.1	36.5	255°56.6	15.4	318° 42.7	31.5	129°20.4	38.4	Hadar	148°30.8	-60°30.8
9	193°40.9	270°30.5	36.3	270°57.0	15.2	333° 44.7	31.6	144°23.1	38.3	Menkent	147°53.3	-36°30.9
10	208°43.4	285°30.8	36.0	285°57.4	15.0	348°46.6	31.8	159°25.7	38.3	Arcturus	145°44.7	19°01.6
11	223°45.9	300°31.2	35.7	300°57.8	14.9	3°48.5	32.0	174°28.4	38.2	Rigil Kent.	139°35.4 137°21.4	-60°57.4 74°01.9
12	238°48.3	315°31.5	S26°35.5	315°58.2	\$24°14.7	18° 50.5	S 14°32.1	189°31.1	N15°38.2	Kochab Zuben'ubi	137 21.4 136°52.0	-16°09.8
13	253°50.8	330°31.9	35.2	330°58.5	14.5	33°52.4	32.3	204°33.7	38.1	Alphecca	130° 52.0 126° 00.9	26°36.9
14	268°53.3	$345^{\circ}32.3$	34.9	345°58.9	14.3	48°54.3	32.5	219°36.4	38.1	Antares	112° 11.4	-26°29.7
15	283°55.7	0°32.6	• • 34.6	0°59.3	•• 14.2	63°56.3	• • 32.6	234°39.1	• • 38.0	Atria	107°02.6	-69°04.7
16	298°58.2	15°33.0	34.4	15°59.7	14.0	78°58.2	32.8	249°41.7	38.0	Sabik	101°58.6	-15°45.5
17	314°00.7	30°33.4	34.1	31°00.1	13.8	94°00.1	32.9	264°44.4	37.9	Shaula	96°05.5	-37°07.4
18	329°03.1	45°33.7	S26°33.8	46°00.5	S24°13.6	109°02.1	S14°33.1	279°47.1	N15°37.9	Rasalhague	95°55.3	12°32.5
19	344°05.6	60°34.1	33.5	61°00.8	13.5	124°04.0	33.3	294°49.7	37.8	Eltanin	90°40.8	51°29.4
20	359°08.1 14°10.5	75°34.5 90°34.9	33.3 · · 33.0	76°01.2 91°01.6	13.3 •• 13.1	139°05.9 154°07.9	33.4	309°52.4 324°55.1	37.8 · · 37.7	Kaus Aust.	83°27.7	-34°22.1
21 22	29°13.0	105°35.2	32.7	106°02.0	12.9	169°09.8	· · 33.6 33.8	339°57.7	37.7	Vega	80°30.9	38°49.0
23	44°15.4	100° 35.2	32.4	121°02.4	12.8	184° 11.7	33.9	355°00.4	37.6	Nunki	75°43.2	-26°15.4
										Altair	61°56.3	8°57.1
Mer.p	ass. 20:03	ν 0.3′ d-0.	.3′ m-4.78	ν 0.4′ d -0	.2′ m1.09	$\nu 1.9' \ d0.$	2′ m-1.70	ν 2.7′ d-0	.0′ m-0.26	Peacock	53°00.0	-56°38.3
										Deneb	49°23.2	45°23.7
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°35.0 27°28.2	10°01.0 -46°49.0
0	59°17.9	135°36.0	S26°32.2	136°02.7	S24°12.6	199° 13.7	S14°34.1	10°03.1	N15°37.6	Fomalhaut	27 28.2 15°10.2	-46 49.0 -29°27.8
1	74°20.4	$150^{\circ}36.4$	31.9	$151^{\circ}03.1$	12.4	$214^{\circ}15.6$	34.3	25°05.7	37.5	Scheat	13°41.2	28°15.0
2	89°22.8	165°36.8	31.6	166°03.5	12.2	229° 17.6	34.4	40°08.4	37.5	Markab	13°25.9	15°22.3
3	104°25.3	180°37.2	• • 31.3	181°03.9	• 12.1	244°19.5	• • 34.6	55°11.1	• • 37.4			
4	119°27.8	195°37.6	31.0	196°04.3	11.9	259°21.4	34.8	70°13.7	37.4	Nov 18 Sun	SHA	Mer.pass
5	134°30.2	210°38.0	30.7	211°04.7	11.7	274°23.4	34.9	85°16.4	37.3	Venus	78°00.3	14:58
6	149°32.7	225°38.3	\$26°30.5	226°05.0	S24°11.5	289°25.3	\$14°35.1	100°19.1	N15° 37.3	Mars	78°24.8 140°21.2	14:57
7	164°35.2	240°38.7	30.2	241°05.4	11.3	304°27.2	35.2	115°21.7	37.3	Jupiter Saturn	310°35.4	10:48 23:24
8 9	179°37.6 194°40.1	255°39.1 270°39.5	29.9 • • 29.6	256°05.8 271°06.2	11.2 •• 11.0	319°29.2 334°31.1	35.4 •• 35.6	130°24.4 145°27.1	37.2 · · 37.2	Jaturn	510 33.4	25.24
10	209°42.5	270 39.5 285°40.0	29.0	271 06.2 286°06.6	10.8	349°33.0	35.7	145°27.1	37.2	Nov 19 Mon	SHA	Mer.pass
11	209 42.5 224°45.0	300°40.4	29.3	301°06.9	10.6	4° 35.0	35.7	175°32.4	37.1	Venus	77°08.6	14:58
12	239°47.5	315°40.8	S26°28.7	316°07.3	S24°10.4	19°36.9	S14°36.1	190°35.1	N15°37.0	Mars	77°34.8	14:56
13	254°49.9	330°41.2	28.5	331°07.7	10.3	34°38.8	36.2	205°37.7	37.0	Jupiter		10:45
14	269°52.4	345°41.6	28.2	346°08.1	10.1	49°40.8	36.4	220°40.4	36.9	Saturn	310°40.3	23:20
15	284°54.9	0°42.0	• • 27.9	1°08.5	• • 09.9	64° 42.7	• • 36.5	235°43.1	• • 36.9	Nov 20 Tue	SHA	Mer.pass
16	299°57.3	$15^{\circ}42.4$	27.6	$16^{\circ}08.9$	09.7	79°44.6	36.7	250°45.7	36.8	Venus	76° 18.1	14:57
17	$314^{\circ}59.8$	30°42.8	27.3	$31^{\circ}09.2$	09.5	94° 46.6	36.9	265°48.4	36.8	Mars	76°44.8	14:55
18	330°02.3	45°43.3	S26°27.0	46°09.6	S24°09.3	109°48.5	S14°37.0	280°51.1	N15°36.7	Jupiter	$139^{\circ}55.8$	10:42
19	345°04.7	60°43.7	26.7	61°10.0	09.1	124°50.5	37.2	295°53.7	36.7	Saturn	310°45.2	23:16
20	0°07.2	75°44.1	26.4	76°10.4	09.0	139°52.4	37.4	310°56.4	36.6	Horizont	al parallax	
21	15°09.7	90°44.5	26.1	91°10.8	08.8	154° 54.3	· · 37.5	325°59.1	· · 36.6	1101120111	Venus:	0.3
22 23	30°12.1 45°14.6	105°45.0 120°45.4	25.8 25.5	106°11.2 121°11.5	08.6 08.4	169°56.3 184°58.2	37.7 37.9	341°01.7 356°04.4	36.5 36.5		Mars:	0.3
										L	=:=:	-
Mer.p	Mer.pass. 20:00 ν 0.4′ d -0.3′ m-4.79 ν 0.		ν 0.4′ d-0	.2′ m1.09	ν 1.9′ d0.	2′ m-1.70	ν 2.7′ d -0	.0′ m-0.25				

h	Sui	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°43.3	S 19°14.1	39°12.0	14.9'	N12°45.0	10.1'	54.0'
1 2	198°43.1 213°43.0	14.7 15.3	53°46.0 68°19.9	14.9' 14.9'	12°55.2 13°05.2	10.1' 10.0'	54.0' 54.0'
3	213 43.0 228°42.9	15.9	82°53.8	14.8'	13° 15.2	9.9'	54.0'
4	243°42.8	16.5	97°27.6	14.8'	13°25.2	9.9'	54.0'
5	258°42.6	17.1	112°01.4	14.8'	13°35.0	9.8'	53.9'
6	273°42.5 288°42.4	\$19°17.7 18.2	126°35.2 141°08.9	14.7' 14.7'	N13°44.9 13°54.7	9.8' 9.7'	53.9' 53.9'
7 8	303°42.2	18.2 18.8	141 08.9 155°42.6	14.7 14.6'	13 54.7 14°04.4	9.7 9.7'	53.9'
9	318°42.1	• • 19.4	170°16.2	14.6'	14° 14.1	9.6'	53.9'
10	333°42.0	20.0	184°49.8	14.6'	14°23.7	9.5'	53.9'
11	348°41.8 3°41.7	20.6 \$19°21.2	199°23.4 213°56.9	14.5'	14°33.2 N14°42.7	9.5'	53.9'
12 13	3 41.7 18°41.6	21.8	213 50.9 228°30.4	14.5' 14.4'	14° 52.1	9.4' 9.4'	53.9' 53.9'
14	33°41.4	22.4	243°03.9	14.4'	15°01.5	9.3'	53.9'
15	48°41.3	• • 22.9	257°37.3	14.4'	15° 10.8	9.2'	53.9'
16	63°41.2	23.5	272°10.6	14.3'	15°20.0	9.2'	53.9'
17 18	78°41.0 93°40.9	24.1 \$19°24.7	286°43.9 301°17.2	14.3' 14.2'	15°29.2 N15°38.3	9.1' 9.1'	53.9' 53.9'
19	108°40.7	25.3	315°50.4	14.2'	15° 47.4	9.0'	53.9'
20	123°40.6	25.9	$330^{\circ}23.6$	14.1'	15°56.4	8.9'	53.9'
21	138°40.5	• • 26.5	344°56.8	14.1'	16°05.3	8.9'	53.9'
22 23	153°40.3 168°40.2	27.0 27.6	359°29.9 14°02.9	14.0' 14.0'	16° 14.2 16° 23.0	8.8' 8.7'	53.9' 53.9'
23			14 02.9			0.1	33.9
	SD = 16.2'	d = 0.6'		SE	O = 14.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°40.1	\$19°28.2	28°35.9 43°08.9	14.0'	N16°31.7 16°40.3	8.7'	53.9'
1 2	198°39.9 213°39.8	28.8 29.4	43°08.9 57°41.8	13.9' 13.9'	16°40.3 16°48.9	8.6' 8.5'	53.9' 53.9'
3	228°39.6	29.9	72°14.6	13.8'	16° 57.4	8.4	53.9'
4	243°39.5	30.5	86°47.5	13.8'	17°05.9	8.4'	53.9'
5	258°39.4	31.1	101°20.2	13.7'	17°14.2	8.3'	53.9'
6 7	273°39.2 288°39.1	\$19°31.7 32.2	115°53.0 130°25.6	13.7' 13.6'	N17°22.5 17°30.7	8.2' 8.1'	53.9' 53.9'
8	303°38.9	32.2	130°25.0° 144°58.3	13.6'	17°38.9	8.1	53.9
9	318°38.8	• • 33.4	159°30.9	13.5'	17°47.0	8.0'	53.9'
10	333°38.7	34.0	174°03.4	13.5'	17°55.0	7.9'	53.9'
11 12	348°38.5 3°38.4	34.5 \$19°35.1	188°35.9 203°08.3	13.4' 13.4'	18°02.9 N18°10.7	7.8' 7.8'	53.9' 53.9'
13	18°38.2	35.7	203 06.3 217°40.7	13.4	18° 18.5	7.0 7.7'	53.9'
14	33°38.1	36.3	232°13.1	13.3'	18°26.2	7.6'	53.9'
15	48°37.9	• • 36.8	246°45.4	13.2'	18° 33.8	7.5'	53.9'
16 17	63°37.8 78°37.7	37.4 38.0	261°17.6 275°49.8	13.2' 13.1'	18° 41.4 18° 48.8	7.5' 7.4'	53.9' 53.9'
18	93°37.5	\$19°38.5	290°21.9	13.1'	N18° 56.2	7.3	53.9'
19	108°37.4	39.1	304°54.0	13.1'	19°03.5	7.2'	53.9'
20	123°37.2	39.7	319°26.1	-0.0	19° 10.7	7.1'	53.9'
21 22	138°37.1 153°36.9	· · 40.2 40.8	333°58.1 348°30.1	13.0' 12.9'	19° 17.8 19° 24.9	7.0' 7.0'	53.9' 53.9'
23	168°36.8	41.4	3°02.0	12.9'	19°31.8	6.9'	53.9'
	SD = 16.2'	d = 0.6'		SE	D = 14.7'		
Tue 0	GHA 183°36.6	Dec \$19°41.9	GHA 17°33.8	u 12.8'	Dec N19° 38.7	<i>d</i> 6.8'	HP 53.9'
1	183 36.6 198°36.5	42.5	32°05.6	12.8'	19° 45.5	6.7	53.9' 53.9'
2	213°36.3	43.1	46°37.4	12.7'	19°52.2	6.6'	54.0'
3	228°36.2	• • 43.6	61°09.1	12.7'	19°58.8	6.5'	54.0'
4 5	243°36.0 258°35.9	44.2 44.8	75°40.8 90°12.4	12.6' 12.6'	20°05.3 20°11.8	6.4' 6.4'	54.0' 54.0'
6	258° 35.9 273° 35.7	44.8 \$19°45.3	90°12.4 104°43.9	12.5'	20°11.8 N20°18.1	6.3	54.0'
7	288°35.6	45.9	$119^{\circ}15.5$	12.5'	20°24.4	6.2'	54.0'
8	303°35.4	46.5	133°46.9	12.4'	20°30.6	6.1'	54.0'
9 10	318°35.3 333°35.1	· · 47.0 47.6	148°18.3 162°49.7	12.4' 12.3'	20°36.7 20°42.6	6.0' 5.9'	54.0' 54.0'
10 11	333°35.1 348°35.0	47.6 48.1	162°49.7 177°21.1	12.3'	20° 42.6 20° 48.5	5.9° 5.8'	54.0° 54.0°
12	3°34.8	\$19°48.7	191°52.3	12.2'	N20°54.3	5.7'	54.0'
13	18°34.7	49.2	206°23.6	12.2'	21°00.1	5.6'	54.0'
14	33°34.5	49.8	220°54.8	12.1'	21°05.7	5.5'	54.0'
15 16	48°34.4 63°34.2	· · 50.4 50.9	235°25.9 249°57.0	12.1' 12.1'	21°11.2 21°16.6	5.4' 5.3'	54.0' 54.0'
17	78°34.1	51.5	249 57.0 264°28.0	12.1	21°10.0	5.3' 5.2'	54.0'
18	93°33.9	S 19°52.0	278°59.1	12.0'	N21°27.2	5.1'	54.0'
19	108°33.8	52.6	293°30.0	11.9'	21°32.3	5.0'	54.0'
20 21	123°33.6 138°33.5	53.1 •• 53.7	308°00.9 322°31.8	11.9' 11.8'	21°37.4 21°42.3	4.9' 4.8'	54.0' 54.0'
22	158° 33.5 153° 33.3	54.2	322 31.8 337°02.6	11.8'	21°47.2	4.8 4.7'	54.0 54.1'
23	168°33.2	54.8	351°33.4	11.7'	21°51.9	4.6'	54.1'
	SD = 16.2'	d = 0.6'		SE	D = 14.7'		

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

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

		Sun					
Day	Eqn.of Time		Mer.	Mer.	Age		
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-99%	
18	14:53	14:47	11:45	22:02	09:40		
19	14:40	14:33	11:45	22:47	10:25		
20	14:27	14:19	11:46	23:35	11:11		

November 21, 22, 23 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	60° 17.0	135°45.8	\$26°25.2	136°11.9	S24°08.2	200°00.1	\$14°38.0	11°07.1	N15°36.4			
1	75° 19.5	150°46.3	24.9	151°12.3	08.0	215°02.1	38.2	26°09.7	36.4	Alpheratz	357°30.5	29°15.6
2	90°22.0	165°46.7	24.6	166° 12.7	07.8	230°04.0	38.3	41°12.4	36.3	Ankaa	353°03.2	-42°08.7
3	105°24.4	180°47.1	• • 24.3	181°13.1	• • 07.6	245°05.9	• • 38.5	56°15.1	• • 36.3	Schedar	349°26.0	56°42.4
4	$120^{\circ}26.9$	195°47.6	24.0	196°13.4	07.5	260°07.9	38.7	$71^{\circ}17.7$	36.2	Diphda Achernar	348°43.2 335°17.0	-17°49.3 -57°05.2
5	$135^{\circ}29.4$	210°48.0	23.7	211°13.8	07.3	275°09.8	38.8	86°20.4	36.2	Hamal	327°46.4	23°36.4
6	150°31.8	225°48.5	526°23.4	226° 14.2	S24°07.1	290°11.7	S14°39.0	101°23.1	N15°36.1	Polaris	311°20.3	89°23.3
7	165°34.3	240°48.9	23.1	241°14.6	06.9	305°13.7	39.2	116°25.7	36.1	Acamar	315°08.5	-40°11.1
8	180°36.8	255°49.4	22.8	256° 15.0	06.7	320°15.6	39.3	131°28.4	36.0	Menkar	314°01.7	4°12.4
9	195°39.2	270°49.8	• • 22.5	271°15.4	• • 06.5	335°17.6	• • 39.5	146°31.1	• • 36.0	Mirfak	308°22.0	49°58.0
10	210°41.7 225°44.2	285°50.3 300°50.7	22.2 21.9	286° 15.7 301° 16.1	06.3 06.1	350°19.5 5°21.4	39.6 39.8	161°33.7 176°36.4	35.9 35.9	Aldebaran	290°34.8	16°34.1
11 12	240°46.6	315°51.2	\$26°21.6	316° 16.5	524°05.9	20°23.4	514°40.0	170 30.4 191°39.1	35.9 N15°35.8	Rigel	$280^{\circ}59.8$	-8°10.1
13	255°49.1	330°51.7	21.3	331° 16.9	05.7	35°25.3	40.1	206°41.7	35.8	Capella	280° 15.6	46°01.5
14	270°51.5	345°52.1	21.0	346°17.3	05.5	50°27.2	40.3	221°44.4	35.8	Bellatrix	278°18.4	6°22.5
15	285°54.0	0°52.6	• • 20.7	1°17.7	• • 05.3	65°29.2	• • 40.5	236°47.1	• • 35.7	Elnath	277°56.6	28°37.8
16	$300^{\circ}56.5$	15°53.1	20.4	16°18.0	05.1	80°31.1	40.6	251°49.7	35.7	Alnilam	275°33.5	-1°11.0 7°24.6
17	$315^{\circ}58.9$	$30^{\circ}53.5$	20.1	31°18.4	04.9	95°33.0	40.8	266°52.4	35.6	Betelgeuse Canopus	270°47.6 263°50.2	-52°42.6
18	331°01.4	45°54.0	S26°19.8	46° 18.8	S24°04.7	110°35.0	S14°40.9	281°55.0	N15°35.6	Sirius	258° 22.5	-32 42.0 -16°45.5
19	346°03.9	60°54.5	19.5	61°19.2	04.6	125°36.9	41.1	296°57.7	35.5	Adhara	255°02.5	-29°00.7
20	1°06.3	75°54.9	19.1	76°19.6	04.4	140°38.8	41.3	312°00.4	35.5	Procyon	244°46.6	5°08.7
21	16°08.8	90°55.4	• • 18.8	91°20.0	• • 04.2	155°40.8	• • 41.4	327°03.0	• • 35.4	Pollux	243°12.4	27°57.0
22	31°11.3 46°13.7	105°55.9	18.5	106°20.3	04.0	170°42.7 185°44.7	41.6	342°05.7	35.4	Avior	$234^{\circ}12.7$	-59°36.2
23	40 13.7	120°56.4	18.2	121°20.7	03.8		41.7	357°08.4	35.3	Suhail	222°43.2	-43°33.1
Mer.p	ass. 19:56	ν 0.4′ d-0.	.3′ m-4.80	ν 0.4′ d-0	.2′ m1.09	$\nu 1.9' \ d0.$	2′ m-1.70	$\nu 2.7' \ d-0$.0′ m-0.24	Miaplacidus	221°36.9	-69°50.2
										Alphard	217°43.9	-8°47.3
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.3 193°36.7	11°49.1 61°35.0
0	$61^{\circ}16.2$	135°56.9	S26°17.9	$136^{\circ}21.1$	S24°03.6	200°46.6	S14°41.9	12°11.0	N15°35.3	Denebola	182°21.2	14°24.2
1	76° 18.7	150°57.4	17.6	151°21.5	03.4	215°48.5	42.1	27°13.7	35.2	Gienah	175°39.7	-17°42.4
2	91°21.1	165°57.9	17.3	166°21.9	03.2	230°50.5	42.2	42°16.4	35.2		172°55.9	-63°15.7
3	106°23.6 121°26.0	180°58.3	•• 17.0	181°22.2 196°22.6	• • 03.0	245°52.4 260°54.3	• • 42.4	57°19.0 72°21.7	• • 35.1	Gacrux	$171^{\circ}47.4$	-57°16.6
4 5	121 20.0 136° 28.5	195°58.8 210°59.3	16.6 16.3	211°23.0	02.8 02.6	200 54.3 275°56.3	42.6 42.7	72 21.7 87°24.4	35.1 35.0	Alioth	166° 10.2	55°47.6
6	151°31.0	225°59.8	S26°16.0	226°23.4	S24°02.4	290°58.2	\$14°42.9	102°27.0	N15°35.0	Spica	158° 18.4	-11°19.0
7	166°33.4	241°00.3	15.7	241°23.8	02.2	306°00.2	43.0	117°29.7	34.9	Alkaid	152°49.5	49°09.7
8	181°35.9	256°00.8	15.4	256° 24.2	01.9	321°02.1	43.2	132°32.4	34.9	Hadar Menkent	148°30.8 147°53.3	-60°30.8 -36°30.9
9	$196^{\circ}38.4$	271°01.3	• • 15.0	271°24.5	• • 01.7	336°04.0	• • 43.4	147°35.0	• • 34.8	Arcturus	147 55.5 145°44.7	19°01.6
10	211°40.8	$286^{\circ}01.9$	14.7	286°24.9	01.5	351°06.0	43.5	162°37.7	34.8	Rigil Kent.	139°35.4	-60°57.3
11	226°43.3	301°02.4	14.4	301°25.3	01.3	6°07.9	43.7	177°40.4	34.7	Kochab	137°21.4	74°01.8
12	241°45.8	316°02.9	S26°14.1	316°25.7	S24°01.1	21°09.8	\$14°43.8	192°43.0	N15°34.7	Zuben'ubi	136°52.0	-16°09.8
13	256°48.2	331°03.4	13.8	331°26.1	00.9	36°11.8	44.0	207°45.7	34.7	Alphecca	$126^{\circ}00.9$	26°36.9
14	271°50.7 286°53.1	346°03.9 1°04.4	13.4 •• 13.1	346°26.5 1°26.8	00.7 •• 00.5	51°13.7 66°15.6	44.2 •• 44.3	222°48.3 237°51.0	34.6 •• 34.6	Antares	$112^{\circ}11.4$	-26°29.7
15 16	301°55.6	16°05.0	12.8	16°27.2	00.3	81°17.6	44.5	252°53.7	34.5	Atria	107°02.6	-69°04.7
17	316°58.1	31°05.5	12.5	31°27.6	24°00.1	96°19.5	44.7	267°56.3	34.5	Sabik	101°58.6	-15°45.5
18	332°00.5	46°06.0	S26°12.1	46°28.0	S23°59.9	111°21.5	S14°44.8	282°59.0	N15°34.4	Shaula Rasalhague	96°05.5 95°55.3	-37°07.4 12°32.5
19	$347^{\circ}03.0$	$61^{\circ}06.5$	11.8	61°28.4	59.7	126°23.4	45.0	298°01.7	34.4	Eltanin	90°40.9	51°29.4
20	$2^{\circ}05.5$	$76^{\circ}07.1$	11.5	76°28.8	59.5	141°25.3	45.1	313°04.3	34.3	Kaus Aust.	83°27.7	-34°22.1
21	17°07.9	91°07.6	• • 11.2	91°29.1	• • 59.3	156°27.3	• • 45.3	328°07.0	• • 34.3	Vega	80°30.9	38°49.0
22	32°10.4	106°08.1	10.8	106°29.5	59.1	171°29.2	45.5	343°09.7	34.2	Nunki	75°43.2	-26°15.4
23	47°12.9	121°08.7	10.5	121°29.9	58.8	186°31.1	45.6	358°12.3	34.2	Altair	$61^{\circ}56.4$	8°57.1
Mer.p	ass. 19:52	ν 0.5′ d-0.	.3′ m-4.81	ν 0.4′ d-0	.2′ m1.10	$\nu 1.9' \ d0.$	2′ m-1.70	$\nu 2.7' \ d-0$.0′ m-0.23	Peacock	53°00.0	-56°38.3
										Deneb	49°23.2	45°23.7
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°35.0	10°01.0
0	62° 15.3	136°09.2	S26°10.2	136°30.3	S23°58.6	201°33.1	S14°45.8	13°15.0	N15°34.1	Al Na'ir Fomalhaut	27°28.2 15°10.2	-46°49.0 -29°27.8
1	$77^{\circ}17.8$	$151^{\circ}09.8$	09.8	$151^{\circ}30.7$	58.4	216°35.0	45.9	$28^{\circ}17.7$	34.1	Scheat	13°41.3	28°15.0
2	92°20.3	166°10.3	09.5	166° 31.0	58.2	231°37.0	46.1	43°20.3	34.0	Markab	13° 25.9	15°22.3
3	107°22.7	181°10.8	09.2	181°31.4	• • 58.0	246°38.9	• • 46.3	58°23.0	• • 34.0			
4	122°25.2	196°11.4	08.9	196°31.8	57.8	261°40.8	46.4	73°25.6	33.9	Nov 21 Wed	SHA 75°20.0	Mer.pass
5	137°27.6	211°11.9	08.5	211°32.2	57.6	276°42.8	46.6	88°28.3	33.9	Venus	75°28.8	14:56
6	152° 30.1	226°12.5	\$26°08.2	226°32.6	\$23°57.4	291°44.7	\$14°46.7	103°31.0	N15°33.8	Mars	75°54.9	14:55
7 8	167°32.6 182°35.0	241°13.1 256°13.6	07.9 07.5	241°33.0 256°33.3	57.2 56.9	306°46.6 321°48.6	46.9 47.1	118°33.6 133°36.3	33.8 33.7	Jupiter Saturn	139°43.1 310°50.0	10:39 23:11
9	182 35.0 197°37.5	250 13.0 271°14.2	07.5	250 33.3 271°33.7	56.7	321 48.6 336°50.5	• • 47.1	133 30.3 148°39.0	33.7			
10	212° 40.0	286°14.7	06.8	286°34.1	56.5	351°52.5	47.4	163°41.6	33.7	Nov 22 Thu	SHA	Mer.pass
11	227°42.4	301°15.3	06.5	301°34.5	56.3	6°54.4	47.6	178°44.3	33.6	Venus	74°40.7	14:56
12	242°44.9	316°15.9	S26°06.2	316° 34.9	S23°56.1	21°56.3	S 14°47.7	193°47.0	N15°33.6	Mars	75°04.9 139°30.4	14:54 10:36
13	257° 47.4	331°16.4	05.8	331°35.3	55.9	36°58.3	47.9	208°49.6	33.5	Saturn	310°54.9	23:07
14	272°49.8	346°17.0	05.5	346°35.6	55.6	52°00.2	48.0	223°52.3	33.5			
15 16	287°52.3 302°54.8	1°17.6 16°18.2	· · 05.2 04.8	1°36.0 16°36.4	· · 55.4 55.2	67°02.1 82°04.1	· · 48.2 48.4	238°54.9 253°57.6	· · 33.4 33.4	Nov 23 Fri	SHA	Mer.pass
16 17	302 54.8 317°57.2	31°18.8	04.8 04.5	31° 36.8	55.∠ 55.0	97°06.0	48.4 48.5	253 57.0 269°00.3	33.4	Venus Mars	73°53.9 74°15.0	14:55 14:54
18	332°59.7	46°19.3	S26°04.1	46°37.2	S23°54.8	112°08.0	\$14°48.7	284°02.9	N15°33.3		139° 17.8	10:32
19	348°02.1	61°19.9	03.8	61°37.6	54.6	127°09.9	48.8	299°05.6	33.2	Saturn	310°59.7	23:03
20	3°04.6	76°20.5	03.4	76° 37.9	54.3	142°11.8	49.0	314°08.3	33.2			
21	18°07.1	91°21.1	• • 03.1	91°38.3	• • 54.1	157°13.8	• • 49.2	329°10.9	• • 33.1	Horizont	al parallax	0.3
22	33°09.5	106°21.7	02.8	106°38.7	53.9	172°15.7	49.3	344°13.6	33.1		Venus: Mars:	0.3 0.1
23	48° 12.0	121°22.3	02.4	121°39.1	53.7	187°17.6	49.5	359°16.3	33.0		141013.	
Mer.p	Mer.pass. 19:48 $\nu 0.5' \ d$ -0.3' m-4.82		.3′ m-4.82	ν 0.4′ d-0	.2′ m1.10	ν 1.9′ d0.	2′ m-1.70	ν 2.7′ d-0	.0′ m-0.22			

h	Sui	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.0	S 19°55.3	6°04.2	11.7'	N21°56.6	4.5'	54.1'
1 2	198°32.8 213°32.7	55.9 56.4	20°34.9 35°05.5	11.7' 11.6'	22°01.1 22°05.5	4.4' 4.3'	54.1' 54.1'
3	213 32.7 228°32.5	57.0	49°36.1	11.6'	22°09.9	4.2	54.1'
4	243°32.4	57.5	64°06.7	11.5'	22°14.1	4.1'	54.1'
5	258° 32.2	58.1	78°37.2	11.5'	22°18.3	4.0'	54.1'
6 7	273°32.1 288°31.9	\$19°58.6 59.2	93°07.7 107°38.2	11.5' 11.4'	N22°22.3 22°26.2	3.9' 3.8'	54.1' 54.1'
8	200 31.9 303°31.8	59.2 19°59.7	107 36.2 122°08.6	11.4'	22°20.2	3.0 3.7'	54.1'
9	318°31.6	20°00.3	136°39.0	11.3'	22°33.8	3.6'	54.1'
10	333°31.4	8.00	151°09.3	11.3'	22°37.4	3.5'	54.1'
11 12	348°31.3 3°31.1	01.4 \$20°01.9	165°39.6 180°09.9	11.3' 11.2'	22°40.9 N22°44.3	3.4' 3.3'	54.2' 54.2'
13	18°31.0	02.4	194° 40.1	11.2'	22°47.6	3.2'	54.2'
14	33°30.8	03.0	209°10.3	11.2'	22°50.8	3.1'	54.2'
15	48°30.6	• • 03.5	223°40.5	11.1'	22°53.8	3.0'	54.2'
16 17	63°30.5 78°30.3	04.1 04.6	238° 10.6 252° 40.7	11.1' 11.1'	22°56.8 22°59.7	2.9' 2.8'	54.2' 54.2'
18	93°30.2	\$20°05.1	267°10.8	11.1	N23°02.4	2.6'	54.2'
19	108° 30.0	05.7	281°40.8	11.0'	23°05.1	2.5'	54.2'
20	123°29.8	06.2	296°10.8	11.0'	23°07.6	2.4'	54.2'
21	138°29.7	06.8	310°40.7	10.9'	23°10.0	2.3'	54.2'
22 23	153°29.5 168°29.3	07.3 07.8	325°10.7 339°40.6	10.9' 10.9'	23°12.4 23°14.6	2.2' 2.1'	54.3' 54.3'
	SD = 16.2'	d = 0.6'			0 = 14.7'		5
	JD — 10.2	u = 0.0°	-)L	- 14.7		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.2	\$20°08.4	354°10.5	10.8'	N23°16.6	2.0'	54.3'
1 2	198°29.0 213°28.8	08.9 09.4	8°40.3 23°10.1	10.8' 10.8'	23°18.6 23°20.5	1.9' 1.8'	54.3' 54.3'
3	228°28.7	• • 10.0	37°39.9	10.8	23°22.2	1.6'	54.3'
4	243°28.5	10.5	52°09.7	10.7'	23°23.9	1.5'	54.3'
5	258°28.4	11.0	66°39.4	10.7'	23°25.4	1.4'	54.3'
6 7	273°28.2 288°28.0	\$20°11.6 12.1	81°09.2 95°38.9	10.7' 10.7'	N23°26.8 23°28.1	1.3' 1.2'	54.3' 54.3'
8	303°27.9	12.1	110°08.5	10.7'	23°29.3	1.1'	54.4'
9	318°27.7	• • 13.2	124°38.2	10.6'	23°30.4	1.0'	54.4'
10	333°27.5	13.7	139°07.8	10.6'	23°31.4	0.8'	54.4'
11 12	348°27.4 3°27.2	14.2 \$20°14.7	153°37.4 168°07.0	10.6' 10.6'	23°32.2 N23°32.9	0.7' 0.6'	54.4' 54.4'
13	18° 27.0	15.3	182°36.6	10.6'	23°33.6	0.5	54.4
14	33°26.9	15.8	$197^{\circ}06.2$	10.5'	23°34.1	0.4'	54.4'
15	48°26.7	• • 16.3	211°35.7	10.5'	23°34.4	0.3'	54.4'
16 17	63°26.5 78°26.3	16.9 17.4	226°05.2 240°34.8	10.5' 10.5'	23°34.7 23°34.9	0.2' 0.0'	54.5' 54.5'
18	93°26.2	S20°17.9	255°04.3	10.5'	N23°34.9	-0.1	54.5'
19	108°26.0	18.4	269°33.7	10.5'	23°34.8	-0.2'	54.5'
20	123°25.8 138°25.7	18.9	284°03.2 298°32.7	10.5' 10.5'	23°34.6 23°34.3	0.0	54.5'
21 22	158 25.7 153°25.5	· · 19.5 20.0	298 32.7 313°02.1	10.5	23 34.3 23°33.9	-0.4' -0.5'	54.5' 54.5'
23	168°25.3	20.5	327°31.6	10.4'	23°33.3	-0.7	54.5'
	SD = 16.2'	d = 0.5'		SE	0 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°25.2 198°25.0	\$20°21.0 21.6	342°01.0 356°30.4	10.4' 10.4'	N23°32.7 23°31.9	-0.8' -0.9'	54.6' 54.6'
2	213°24.8	22.1	10°59.8	10.4	23°31.0	-1.0'	54.6'
3	228°24.6	• • 22.6	25°29.3	10.4'	23°30.0	-1.1'	54.6'
4 5	243°24.5 258°24.3	23.1 23.6	39°58.7 54°28.1	10.4' 10.4'	23°28.9 23°27.6	-1.2' -1.4'	54.6' 54.6'
6	258° 24.3 273° 24.1	23.6 \$20°24.1	68° 57.5	10.4	N23°26.2	-1.4	54.6
7	288°23.9	24.7	83°26.9	10.4'	23°24.8	-1.6'	54.6'
8	303°23.8	25.2	97°56.2	10.4'	23°23.2	-1.7'	54.7'
9 10	318°23.6 333°23.4	· · 25.7 26.2	112°25.6 126°55.0	10.4' 10.4'	23°21.5 23°19.6	-1.8' -1.9'	54.7' 54.7'
10 11	333°23.4 348°23.2	26.2 26.7	126°55.0 141°24.4	10.4'	23°19.6 23°17.7	-1.9° -2.1'	54.7' 54.7'
12	3°23.1	S20°27.2	155°53.8	10.4'	N23°15.6	-2.2'	54.7'
13	18° 22.9	27.7	170°23.2	10.4	23°13.4	-2.3'	54.7'
14 15	33°22.7 48°22.5	28.2 •• 28.8	184°52.6 199°22.0	10.4' 10.4'	23°11.1 23°08.7	-2.4' -2.5'	54.8' 54.8'
16	48 22.5 63°22.4	29.3	199 22.0 213°51.4	10.4	23 08.7 23°06.2	-2.5 -2.6'	54.8'
17	78°22.2	29.8	228°20.8	10.4	23°03.5	-2.8'	54.8'
18	93°22.0	\$20°30.3	242°50.2	10.4	N23°00.8	-2.9'	54.8'
19 20	108°21.8 123°21.6	30.8 31.3	257°19.7 271°49.1	10.4' 10.4'	22°57.9 22°54.9	-3.0' -3.1'	54.8' 54.8'
21	123 21.0 138°21.5	31.8	271 49.1 286° 18.5	10.4	22°51.8	-3.1 -3.2'	54.8 54.9'
22							
	153°21.3	32.3	300°48.0	10.5'	22°48.6	-3.3'	54.9'
23	$ \begin{array}{r} 153^{\circ}21.3 \\ 168^{\circ}21.1 \end{array} $ $ SD = 16.2' $	32.3 32.8	300°48.0 315°17.4	10.5' 10.5'	22°48.6 22°45.2	-3.3' -3.5'	54.9'

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

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

		Sun		Moon				
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.			
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%		
21	14:12	14:04	11:46	-:-	11:59			
22	13:57	13:49	11:46	00:24	12:49			
23	13:41 13:32		11:46	01:14 13:40				

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

h	Aries	Vei	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	63°14.5	136°22.9	\$26°02.1	136°39.5	S23°53.4	202°19.6	S14°49.6	14°18.9	N15°33.0			
1	78°16.9	151°23.5	01.7	151°39.9	53.2	217°21.5	49.8	29°21.6	32.9	Alpheratz	357°30.5	29°15.6
2	93°19.4	166°24.1	01.4	166°40.2	53.0	232°23.5	50.0	44°24.2	32.9	Ankaa	353°03.2	-42°08.7
3	108°21.9	181°24.7	•• 01.0	181°40.6	• • 52.8	247° 25.4	• • 50.1	59°26.9	• • 32.9	Schedar	349°26.0	56°42.4
4	$123^{\circ}24.3$	196°25.3	00.7	$196^{\circ}41.0$	52.6	262°27.3	50.3	74°29.6	32.8	Diphda	348°43.2	-17°49.3
5	$138^{\circ}26.8$	211°25.9	00.3	211°41.4	52.3	277°29.3	50.4	89°32.2	32.8	Achernar Hamal	335°17.0 327°46.4	-57°05.2 23°36.4
6	153°29.3	226°26.5	S26°00.0	226°41.8	S23°52.1	292°31.2	S14°50.6	104°34.9	N15°32.7	Polaris	311°20.2	89°23.3
7	168°31.7	241°27.1	25°59.6	241°42.2	51.9	307°33.2	50.8	119°37.6	32.7	Acamar	315°08.5	-40°11.1
8	183°34.2	256°27.7	59.3	256°42.5	51.7	322°35.1	50.9	134°40.2	32.6	Menkar	314°01.7	4°12.4
9	198°36.6	271°28.4	• • 58.9	271°42.9	• • 51.4	337°37.0	51.1	149°42.9	• • 32.6	Mirfak	308°22.0	49°58.1
10	213°39.1 228°41.6	286°29.0	58.6	286°43.3 301°43.7	51.2	352°39.0 7°40.9	51.2	164°45.5 179°48.2	32.5 32.5	Aldebaran	290°34.8	16°34.1
11 12	243°44.0	301°29.6 316°30.2	58.2 \$25°57.9	316°44.1	51.0 \$23°50.8	7 40.9 22°42.8	51.4 \$14°51.6	179 46.2 194°50.9	N15°32.4	Rigel	$280^{\circ}59.8$	-8°10.1
13	258°46.5	331° 30.2	57.5	331°44.5	50.5	37°44.8	51.7	209°53.5	32.4	Capella	280° 15.6	46°01.5
14	273°49.0	346°31.5	57.2	346°44.9	50.3	52°46.7	51.9	224°56.2	32.3	Bellatrix	278°18.4	6°22.5
15	288°51.4	1°32.1	• • 56.8	1°45.2	• • 50.1	67°48.7	• • 52.0	239°58.9	• • 32.3	Elnath	277°56.6	28°37.8
16	303°53.9	$16^{\circ}32.8$	56.5	16°45.6	49.8	82°50.6	52.2	255°01.5	32.2	Alnilam	275°33.5	-1°11.1 7°24.6
17	$318^{\circ}56.4$	31°33.4	56.1	31°46.0	49.6	97°52.5	52.3	270°04.2	32.2	Betelgeuse Canopus	270°47.6 263°50.2	-52°42.6
18	333°58.8	46°34.0	\$25°55.8	46°46.4	S23°49.4	112°54.5	S14°52.5	285°06.8	N15°32.1	Sirius	258° 22.5	-16°45.5
19	349°01.3	61°34.7	55.4	61°46.8	49.2	127°56.4	52.7	300°09.5	32.1	Adhara	255°02.5	-29°00.8
20	4°03.8	76°35.3	55.0	76°47.2	48.9	142°58.4	52.8	315°12.2	32.1	Procyon	244°46.5	5°08.7
21	19°06.2	91°36.0	• • 54.7	91°47.5	• • 48.7	158°00.3	• • 53.0	330°14.8	• • 32.0	Pollux	243°12.3	27°57.0
22	34°08.7	106°36.6	54.3 54.0	106°47.9	48.5	173°02.2	53.1	345°17.5	32.0	Avior	$234^{\circ}12.7$	-59°36.2
23	49°11.1	121°37.3	54.0	121°48.3	48.2	188°04.2	53.3	0°20.2	31.9	Suhail	$222^{\circ}43.2$	-43°33.1
Mer.p	ass. 19:44	ν 0.6′ d-0.	.3′ m-4.83	ν 0.4′ d -0	.2′ m1.10	ν 1.9′ d0.	2′ m-1.70	ν 2.7′ d-0	.0′ m-0.22	Miaplacidus	221°36.9	-69°50.2
										Alphard	217°43.8	-8°47.4
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.3 193°36.7	11°49.1 61°35.0
0	64°13.6	136°37.9	\$25°53.6	136°48.7	S23°48.0	203°06.1	S14°53.5	15°22.8	N15°31.9	Denebola	182°21.1	14°24.2
1	79°16.1	151°38.6	53.2	151°49.1	47.8	218°08.0	53.6	30°25.5	31.8	Gienah	175°39.7	-17°42.4
2	94°18.5	166°39.2	52.9	166°49.5	47.5	233°10.0	53.8	45°28.1	31.8	Acrux	$172^{\circ}55.8$	-63°15.7
3 4	109°21.0 124°23.5	181°39.9 196°40.6	· · 52.5 52.2	181°49.8 196°50.2	· · 47.3 47.1	248° 11.9 263° 13.9	· · 53.9 54.1	60°30.8 75°33.5	· · 31.7 31.7	Gacrux	171°47.4	-57°16.6
5	139°25.9	211° 41.2	51.8	211°50.6	46.8	278° 15.8	54.3	90°36.1	31.6	Alioth	166° 10.1	55°47.6
6	154°28.4	226°41.9	S25°51.4	226°51.0	S23°46.6	293° 17.7	\$14°54.4	105°38.8	N15°31.6	Spica	158° 18.4	-11°19.0
7	169°30.9	241°42.6	51.1	241°51.4	46.4	308° 19.7	54.6	120°41.4	31.5	Alkaid	152°49.5 148°30.8	49°09.7 -60°30.8
8	184°33.3	256°43.3	50.7	256°51.8	46.1	323°21.6	54.7	$135^{\circ}44.1$	31.5	Hadar Menkent	146 50.6 147°53.3	-36°30.9
9	199°35.8	271°43.9	• • 50.3	271°52.2	• • 45.9	338° 23.6	• • 54.9	150°46.8	• • 31.4	Arcturus	145°44.7	19°01.6
10	214°38.3	286° 44.6	50.0	286°52.5	45.6	353°25.5	55.1	165°49.4	31.4	Rigil Kent.	139°35.3	-60°57.3
11	229°40.7	301°45.3	49.6	301°52.9	45.4	8°27.4	55.2	180°52.1	31.4	Kochab	$137^{\circ}21.4$	74°01.8
12	244°43.2	316°46.0	\$25°49.2	316°53.3	\$23°45.2	23°29.4 38°31.3	\$14°55.4	195°54.8	N15°31.3	Zuben'ubi	$136^{\circ}52.0$	-16°09.8
13 14	259°45.6 274°48.1	331°46.7 346°47.4	48.9 48.5	331°53.7 346°54.1	44.9 44.7	53° 33.3	55.5 55.7	210°57.4 226°00.1	31.3 31.2	Alphecca	126°00.9	26°36.9
15	289°50.6	1°48.1	• 48.1	1°54.5	• • 44.4	68° 35.2	• • 55.8	241°02.7	31.2	Antares	112°11.4	-26°29.7
16	304°53.0	16°48.7	47.8	16°54.8	44.2	83°37.1	56.0	256°05.4	31.1	Atria	107°02.5 101°58.6	-69°04.7
17	319°55.5	31°49.4	47.4	31°55.2	44.0	98°39.1	56.2	271°08.1	31.1	Sabik Shaula	96°05.5	-15°45.5 -37°07.4
18	334°58.0	46°50.1	\$25°47.0	46°55.6	S23°43.7	113°41.0	S14°56.3	286°10.7	N15°31.0	Rasalhague	95°55.3	12°32.5
19	350°00.4	61°50.9	46.7	61°56.0	43.5	128°43.0	56.5	301°13.4	31.0	Eltanin	90°40.9	51°29.3
20	5°02.9	76°51.6	46.3	76°56.4	43.2	143°44.9	56.6	316°16.0	30.9	Kaus Aust.	83°27.7	-34°22.1
21	20°05.4	91°52.3	• • 45.9	91°56.8	• • 43.0	158° 46.8	56.8	331°18.7	• • 30.9	Vega	80°30.9	38°49.0
22 23	35°07.8 50°10.3	106°53.0 121°53.7	45.5 45.2	106°57.2 121°57.5	42.8 42.5	173°48.8 188°50.7	57.0 57.1	346°21.4 1°24.0	30.8 30.8	Nunki	75°43.2	-26°15.4
										Altair	61°56.4	8°57.1
Mer.p	ass. 19:40	ν 0.7′ d-0.	.4′ m-4.84	ν 0.4′ d-0	.2' m1.10	$\nu 1.9' \ d0.$	2′ m-1.70	$\nu 2.7' \ d-0$.0′ m-0.21	Peacock	53°00.0	-56°38.3
										Deneb Enif	49°23.2 33°35.0	45°23.6 10°01.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27° 28.2	-46°49.0
0	$65^{\circ}12.7$	$136^{\circ}54.4$	S25°44.8	$136^{\circ}57.9$	S 23°42.3	203°52.7	S 14°57.3	$16^{\circ}26.7$	N15°30.8	Fomalhaut	15° 10.2	-40 49.0 -29°27.8
1	80°15.2	151°55.1	44.4	151°58.3	42.0	218° 54.6	57.4	31°29.3	30.7	Scheat	13°41.3	28°15.1
2	95°17.7	166°55.8	44.0	166°58.7	41.8	233°56.5	57.6	46°32.0	30.7	Markab	13°25.9	15°22.3
3	110°20.1 125°22.6	181°56.6	• • 43.7	181°59.1 196°59.5	• • 41.5	248° 58.5 264° 00.4	•• 57.7	61°34.7 76°37.3	• • 30.6	Nov 24 Sat	SHA	Ma:: ::
4		196°57.3	43.3		41.3		57.9		30.6	Venus	73°08.4	Mer.pass 14:54
5 6	140°25.1 155°27.5	211°58.0 226°58.8	42.9 \$25°42.5	211°59.8 227°00.2	41.0 \$23°40.8	279°02.4 294°04.3	58.1 \$14°58.2	91°40.0 106°42.6	30.5 N15° 30.5	Mars	73°25.0	14:54
7	170°30.0	241°59.5	42.2	242°00.6	40.5	309°06.2	58.4	100 42.0 121°45.3	30.4	Jupiter	139°05.1	10:29
8	185°32.5	257° 00.2	41.8	257°01.0	40.3	324°08.2	58.5	136°48.0	30.4	Saturn	311°04.4	22:59
9	200°34.9	272°01.0	• • 41.4	272°01.4	• • 40.1	339°10.1	• • 58.7	151°50.6	30.3	Nov. 2E Co.	CHA	Me: :
10	215°37.4	287°01.7	41.0	287°01.8	39.8	354° 12.1	58.8	166°53.3	30.3	Nov 25 Sun Venus	SHA 72°24.3	Mer.pass 14:53
11	230°39.9	302°02.5	40.6	302°02.2	39.6	9°14.0	59.0	181°55.9	30.2	Mars	72° 35.1	14:52
12	245°42.3	317°03.2	\$25°40.3	317°02.5	\$23°39.3	24°15.9	\$14°59.2	196°58.6	N15° 30.2		138°52.5	10:26
13 14	260°44.8 275°47.2	332°03.9 347°04.7	39.9 39.5	332°02.9 347°03.3	39.1 38.8	39° 17.9 54° 19.8	59.3 59.5	212°01.3 227°03.9	30.2 30.1	Saturn	311°09.2	22:54
15	275 47.2 290°49.7	2°05.5	39.5	2°03.7	· · 38.6	69°21.8	59.6	242°06.6	30.1	Nov 26 Mon	SHA	Mer.pass
16	305°52.2	17°06.2	38.7	17°04.1	38.3	84°23.7	14°59.8	257°09.2	30.0	Venus	эна 71°41.7	14:52
17	320°54.6	32°07.0	38.4	32°04.5	38.1	99° 25.6	15°00.0	272°11.9	30.0	Mars	71°45.2	14:52
18	$335^{\circ}57.1$	47°07.7	S25°38.0	47°04.9	S 23°37.8	114°27.6	S 15°00.1	287°14.6	N15°29.9		138°39.9	10:23
19	350°59.6	62°08.5	37.6	62°05.2	37.5	129° 29.5	00.3	302°17.2	29.9	Saturn	311°13.9	22:50
20	6°02.0	77°09.3	37.2	77°05.6	37.3	144°31.5	00.4	317°19.9	29.8	Horizont	al parallax	$\overline{}$
21 22	21°04.5 36°07.0	92°10.0 107°10.8	· · 36.8 36.4	92°06.0 107°06.4	· · 37.0 36.8	159°33.4 174°35.3	· · 00.6 00.7	332°22.5 347°25.2	· · 29.8 29.7	TIOTIZOTIL	Venus:	0.3
23	50°07.0	107 10.8 122°11.6	36.0	107 00.4 122°06.8	36.5	174 35.3 189°37.3	00.7	2°27.9	29.7		Mars:	0.1
ivier.p	Mer.pass. 19:36 ν 0.7' d -0.4' m-4.85		.4° m-4.85	ν 0.4' d -0	.2′ m1.10	$\nu_{1.9}$ d0.	2′ m-1.70	ν2.Γ d-0	.0′ m-0.20			

h	Sui	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.9	S20°33.3	329°46.9	10.5'	N22°41.8	-3.6'	54.9'
1 2	198°20.7 213°20.6	33.8 34.3	344°16.4 358°45.9	10.5' 10.5'	22°38.2 22°34.5	-3.7' -3.8'	54.9' 54.9'
3	213 20.0 228°20.4	• • 34.8	13°15.4	10.5	22°30.7	-3.6' -3.9'	55.0'
4	243°20.2	35.3	27°44.9	10.5'	$22^{\circ}26.8$	-4.0'	55.0'
5	258°20.0	35.8	42°14.4	10.5'	22°22.8	-4.1'	55.0'
6 7	273°19.8 288°19.7	\$20°36.3 36.8	56°44.0 71°13.5	10.6' 10.6'	N22°18.7 22°14.4	-4.3' -4.4'	55.0' 55.0'
8	303°19.5	37.3	85°43.1	10.6'	22° 10.0	-4.5	55.0'
9	318°19.3	• • 37.8	100°12.7	10.6'	22°05.6	-4.6'	55.1'
10 11	333°19.1 348°18.9	38.3 38.8	114°42.3 129°11.9	10.6' 10.6'	22°01.0 21°56.3	-4.7' -4.8'	55.1' 55.1'
12	3°18.7	520°39.3	143°41.6	10.0	N21°51.5	-4.0 -4.9'	55.1'
13	18° 18.6	39.8	158°11.3	10.7'	21°46.5	-5.0'	55.1'
14	33°18.4	40.3	172°40.9	10.7'	21°41.5	-5.1'	55.2'
15 16	48°18.2 63°18.0	· · 40.8 41.3	187°10.6 201°40.4	10.7' 10.7'	21°36.4 21°31.1	-5.3' -5.4'	55.2' 55.2'
17	78°17.8	41.8	216°10.1	10.8'	21°25.7	-5.5'	55.2'
18	93°17.6	S20°42.3	230°39.9	10.8'	N21°20.3	-5.6'	55.2'
19 20	108°17.4 123°17.3	42.8 43.3	245°09.6 259°39.5	10.8' 10.8'	21°14.7 21°09.0	-5.7' -5.8'	55.2' 55.3'
20	123 17.3 138°17.1	43.3 • • 43.8	259 39.5 274°09.3	10.8	21 09.0 21°03.2	-5.8 -5.9'	55.3'
22	153°16.9	44.3	288°39.1	10.9'	20°57.3	-6.0'	55.3'
23	168°16.7	44.7	303°09.0	10.9'	20°51.3	-6.1'	55.3'
	SD = 16.2'	d = 0.5'		SI	D = 15.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	183°16.5	\$20°45.2	317°38.9	10.9'	N20°45.1	-6.2'	55.3'
1	198°16.3	45.7	332°08.8	10.9'	20°38.9	-6.3'	55.4'
2	213°16.1 228°15.9	46.2 •• 46.7	346°38.8 1°08.8	11.0' 11.0'	20°32.6 20°26.2	-6.4' -6.5'	55.4' 55.4'
4	243°15.8	47.2	15°38.8	11.0'	20° 20.2	-6.6'	55.4'
5	258°15.6	47.7	30°08.8	11.0'	$20^{\circ}13.0$	-6.7'	55.4'
6	273°15.4 288°15.2	\$20°48.1 48.6	44°38.8 59°08.9	11.1' 11.1'	N20°06.2 19°59.4	-6.9' -7.0'	55.5' 55.5'
7 8	288 15.2 303°15.0	48.0 49.1	73°39.0	11.1	19 59.4 19°52.4	-7.0 -7.1'	55.5'
9	318°14.8	• • 49.6	88°09.1	11.2'	19°45.3	-7.2	55.5'
10	333°14.6	50.1	102°39.3	11.2'	19°38.2	-7.3'	55.5'
11 12	348°14.4 3°14.2	50.6 \$20°51.0	117°09.4 131°39.6	11.2' 11.2'	19°30.9 N19°23.6	-7.4' -7.5'	55.6' 55.6'
13	18°14.0	51.5	146°09.9	11.3'	19° 16.1	-7.6'	55.6'
14	33°13.8	52.0	$160^{\circ}40.1$	11.3'	$19^{\circ}08.5$	-7.7'	55.6'
15 16	48°13.7 63°13.5	· · 52.5 53.0	175°10.4 189°40.7	11.3' 11.3'	19°00.9 18°53.1	-7.8' -7.9'	55.7' 55.7'
17	78°13.3	53.4	204°11.1	11.3 11.4'	18° 45.3	-7.9 -8.0'	55.7'
18	93°13.1	\$20°53.9	218°41.4	11.4'	N18° 37.3	-8.0'	55.7'
19	108°12.9 123°12.7	54.4	233°11.8	11.4'	18°29.3	-8.1'	55.7'
20 21	123°12.7 138°12.5	54.9 •• 55.3	247°42.2 262°12.7	11.4' 11.5'	18°21.1 18°12.9	-8.2' -8.3'	55.8' 55.8'
22	153°12.3	55.8	276°43.2	11.5'	18° 04.5	-8.4	55.8'
23	168°12.1	56.3	291°13.7	11.5'	17°56.1	-8.5'	55.8'
	SD = 16.2'	d = 0.5'		SI	D = 15.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°11.9	\$20°56.8	305°44.2	11.6'	N17°47.6	-8.6'	55.9'
1 2	198°11.7 213°11.5	57.2 57.7	320°14.7 334°45.3	11.6' 11.6'	17°39.0 17°30.3	-8.7' -8.8'	55.9' 55.9'
3	213 11.5 228°11.3	• • 58.2	349°15.9	11.6'	17° 21.5	-0.0 -8.9'	55.9'
4	243°11.1	58.6	3°46.6	11.7'	$17^{\circ}12.6$	-9.0'	56.0'
5 6	258°10.9 273°10.7	59.1 \$20°59.6	18°17.2 32°47.9	11.7' 11.7'	17°03.6 N16°54.5	-9.1' -9.2'	56.0' 56.0'
7	273 10.7 288°10.5	21°00.0	32 47.9 47°18.6	11.7' 11.7'	16° 45.4	-9.2' -9.2'	56.0'
8	303°10.3	00.5	61°49.4	11.8'	16°36.1	-9.3'	56.1'
9	318°10.1	• • 01.0	76°20.1	11.8'	16°26.8	-9.4'	56.1'
10 11	333°09.9 348°09.7	01.4 01.9	90°50.9 105°21.7	11.8' 11.8'	16° 17.4 16° 07.9	-9.5' -9.6'	56.1' 56.1'
12	3°09.5	S21°02.4	119°52.6	11.9'	N15°58.3	-9.7'	56.2
13	18°09.3	02.8	134°23.5	11.9'	15°48.6	-9.8'	56.2
14 15	33°09.1 48°08.9	03.3 · · 03.8	148°54.3 163°25.3	11.9' 11.9'	15°38.8 15°29.0	-9.8' -9.9'	56.2' 56.2'
16	63°08.7	04.2	103 25.3 177°56.2	12.0'	15° 19.1	-10.0'	56.3'
17	78°08.5	04.7	192°27.2	12.0'	15°09.0	-10.1'	56.3'
18	93°08.3 108°08.1	\$21°05.1 05.6	206°58.1 221°29.2	12.0' 12.0'	N14°58.9 14°48.8	-10.2' -10.3'	56.3'
19 20	108°08.1 123°07.9	05.6	221 29.2 236°00.2	12.1'	14° 48.8 14° 38.5	-10.3'	56.3' 56.4'
21	138°07.7	• • 06.5	250°31.2	12.1'	14°28.2	-10.4'	56.4'
22	153°07.5 168°07.3	07.0	265°02.3 279°33.4	12.1' 12.1'	14°17.8 14°07.3	-10.5'	56.4'
23		$\frac{07.4}{d = 0.5'}$	219-33.4			-10.6'	56.4'
	SD = 16.2'		SI	D = 15.2'			

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

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

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

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	66°11.9	137°12.4	\$25°35.7	137°07.2	S23°36.3	204°39.2	\$15°01.1	17°30.5	N15°29.7			
1	81°14.4	152°13.2	35.3	157°07.2	36.0	219°41.2	01.2	32°33.2	29.6	Alpheratz	357°30.5	$29^{\circ}15.6$
2	96° 16.8	152 13.2 167°13.9	35.3 34.9	152 07.6 167°07.9	35.8	219 41.2 234°43.1	01.2	32 33.2 47°35.8	29.6	Ankaa	$353^{\circ}03.2$	-42°08.7
3	111° 19.3	182°14.7	34.5	182°08.3	35.5	249°45.1	01.5	62°38.5	• • 29.5	Schedar	349°26.0	56°42.4
4	111 19.3 126° 21.7	197°15.5	34.1	197°08.7	35.3	264° 47.0	01.5	77°41.2	29.5	Diphda	348°43.2	$-17^{\circ}49.3$
5	141° 24.2	212°16.3		212°09.1		279°48.9		92°43.8		Achernar	$335^{\circ}17.0$	-57°05.2
	141 24.2 156° 26.7	212 10.3 227°17.1	33.7 \$25°33.3	212 09.1 227°09.5	35.0		01.8	92 43.6 107°46.5	29.4	Hamal	327°46.4	23°36.4
6	171° 29.1	242°17.1		242°09.9	\$23°34.7	294°50.9	\$15°02.0	107 40.5 122°49.1	N15°29.4	Polaris	311°20.4	89°23.4
7			32.9		34.5	309°52.8	02.1		29.3	Acamar	$315^{\circ}08.5$	-40°11.1
8	186°31.6	257°18.7	32.5	257°10.3	34.2	324°54.8	02.3	137°51.8	29.3	Menkar	$314^{\circ}01.7$	4°12.4
9	201°34.1	272°19.5	· · 32.1	272°10.6	• • 34.0	339°56.7	• • 02.5	152°54.4	• • 29.2	Mirfak	308°22.0	49°58.1
10	216°36.5	287°20.3	31.7	287°11.0	33.7	354°58.6	02.6	167°57.1	29.2	Aldebaran	290°34.8	$16^{\circ}34.1$
11	231°39.0	302°21.1	31.4	302°11.4	33.4	10°00.6	02.8	182°59.8	29.2	Rigel	280°59.8	-8°10.1
12	246°41.5	317°21.9	S25°31.0	317°11.8	S23°33.2	25°02.5	S15°02.9	198°02.4	N15°29.1	Capella	280°15.6	46°01.5
13	261°43.9	332°22.7	30.6	332°12.2	32.9	40°04.5	03.1	213°05.1	29.1	Bellatrix	278°18.4	6°22.5
14	276°46.4	347°23.6	30.2	347°12.6	32.7	55°06.4	03.2	228°07.7	29.0	Elnath	277°56.5	28°37.8
15	291°48.8	2°24.4	• • 29.8	2°13.0	• • 32.4	70°08.4	• • 03.4	243°10.4	• • 29.0	Alnilam	275°33.4	$-1^{\circ}11.1$
16	306°51.3	17°25.2	29.4	17°13.4	32.1	85°10.3	03.6	258°13.1	28.9	Betelgeuse	270°47.5	7°24.6
17	321°53.8	32°26.0	29.0	32°13.7	31.9	100°12.2	03.7	273°15.7	28.9	Canopus	263°50.1	-52°42.6
18	336° 56.2	47°26.8	S25°28.6	47° 14.1	S23°31.6	115°14.2	S15°03.9	288°18.4	N15°28.8	Sirius	258° 22.5	-16°45.5
19	351°58.7	62°27.7	28.2	62°14.5	31.3	130°16.1	04.0	303°21.0	28.8	Adhara	255°02.5	-29°00.8
20	7°01.2	77°28.5	27.8	77° 14.9	31.1	145°18.1	04.2	318°23.7	28.7	Procyon	244°46.5	5°08.7
21	22°03.6	92°29.3	• • 27.4	92°15.3	30.8	160°20.0	• • 04.3	333°26.3	• • 28.7	Pollux	243°12.3	27°57.0
22	37°06.1	107°30.2	27.0	107° 15.7	30.6	175°21.9	04.5	348°29.0	28.7	Avior	234°12.7	-59°36.2
23	52°08.6	122°31.0	26.6	122°16.1	30.3	190°23.9	04.7	3°31.7	28.6	Suhail	222°43.2	-43°33.1
Mern	pass. 19:32	ν0 8' d-0	.4′ m-4.86	ν0 4' d-0	.3′ m1.10	v1 9' d0	2′ m-1.71	v27' d-0	.0′ m-0.20	Miaplacidus	221°36.8	-69°50.2
.vici.p		- 5.5 u-0.		<i>□</i> 3.∓ u-0	.5	ν 1.5 dO.	1./1	- Z.1 U-0	0.20	Alphard	217°43.8	-8°47.4
										Regulus	207°30.3	11°49.1
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°35.0
0	$67^{\circ}11.0$	137°31.9	S25°26.2	$137^{\circ}16.5$	S23°30.0	205°25.8	S 15°04.8	18°34.3	N15°28.6	Denebola	182°21.1	14°24.2
1	82° 13.5	152°32.7	25.8	$152^{\circ}16.8$	29.8	220°27.8	05.0	33°37.0	28.5	Gienah	175°39.7	-17°42.4
2	97°16.0	167°33.6	25.4	$167^{\circ}17.2$	29.5	$235^{\circ}29.7$	05.1	48°39.6	28.5	Acrux	173° 55.8	-17 42.4 -63°15.7
3	112° 18.4	182°34.4	• • 25.0	182° 17.6	• • 29.2	250°31.7	• • 05.3	63°42.3	• • 28.4	Gacrux	171°47.4	-57°16.6
4	127°20.9	197°35.3	24.6	$197^{\circ}18.0$	29.0	265°33.6	05.4	78°44.9	28.4	Alioth	166° 10.1	55°47.6
5	142°23.3	212°36.1	24.2	212°18.4	28.7	280°35.5	05.6	93°47.6	28.3	Spica	158° 18.4	-11°19.0
6	157°25.8	227°37.0	\$25°23.8	227°18.8	S23°28.4	295°37.5	S15°05.7	108°50.3	N15°28.3	Alkaid	150° 10.4° 152° 49.5	49°09.7
7	172°28.3	242°37.9	23.4	$242^{\circ}19.2$	28.1	310°39.4	05.9	123°52.9	28.2	Hadar	132 49.3 148°30.7	-60°30.8
8	187°30.7	257°38.7	23.0	$257^{\circ}19.6$	27.9	325°41.4	06.1	138°55.6	28.2	Menkent	146 50.7 147°53.2	-36°30.9
9	202°33.2	272°39.6	• • 22.6	$272^{\circ}19.9$	• • 27.6	340°43.3	• • 06.2	153°58.2	• • 28.2	l .	147 55.2 145°44.7	19°01.6
10	217°35.7	287°40.5	22.2	287°20.3	27.3	355°45.3	06.4	169°00.9	28.1	Arcturus		
11	232°38.1	302°41.3	21.8	302°20.7	27.1	10°47.2	06.5	184°03.5	28.1	Rigil Kent.	139°35.3	-60°57.3
12	247° 40.6	317°42.2	S25°21.3	317°21.1	S23°26.8	25°49.1	S15°06.7	199°06.2	N15°28.0	Kochab	137°21.4	74°01.8
13	262°43.1	332°43.1	20.9	332°21.5	26.5	40°51.1	06.8	214°08.9	28.0	Zuben'ubi	136°52.0	-16°09.8
14	277°45.5	347°44.0	20.5	347°21.9	26.3	55°53.0	07.0	229°11.5	27.9	Alphecca	126°00.8	26°36.9
15	292°48.0	2°44.9	20.1	2°22.3	26.0	70°55.0	07.1	244°14.2	27.9	Antares	112°11.4	-26°29.7
16	307°50.5	17°45.8	19.7	17° 22.7	25.7	85°56.9	07.3	259°16.8	27.8	Atria	107°02.5	-69°04.7
17	322°52.9	32°46.6	19.3	32°23.0	25.4	100°58.8	07.5	274°19.5	27.8	Sabik	101°58.6	-15°45.5
18	337°55.4	47°47.5	S25°18.9	47° 23.4	S23°25.2	116°00.8	\$15°07.6	289°22.1	N15°27.8	Shaula	96°05.5	-37°07.4
19	352°57.8	62°48.4	18.5	62°23.8	24.9	131°02.7	07.8	304°24.8	27.7	Rasalhague	95°55.3	12°32.5
20	8°00.3	77°49.3	18.1	77°24.2	24.6	146°04.7	07.9	319°27.5	27.7	Eltanin	90°40.9	51°29.3
21	23°02.8	92°50.2	•• 17.7	92°24.6	24.3	161°06.6	•• 08.1	334°30.1	27.6	Kaus Aust.	83°27.7	-34°22.1
22	38°05.2	107°51.1	17.3	107°25.0	24.1	176°08.6	08.2	349°32.8	27.6	Vega	80°30.9	38°49.0
23	53° 07.7	122°52.1	16.8	122°25.4	23.8	191°10.5	08.4	4°35.4	27.5	Nunki	75°43.2	-26°15.4
23	33 01.1									Altair	61°56.4	8°57.1
Mer.p	ass. 19:28	ν 0.8′ d-0.	.4′ m-4.87	ν 0.4′ d-0	.3′ m1.10	$\nu 1.9' \ d0.$.2′ m-1.71	ν 2.7′ d-0	.0′ m-0.19	Peacock	53°00.1	-56°38.3
										Deneb	49°23.3	45°23.6
Thu	GHA	GHA	Doc	GHA	Dec	GHA	Doc	GHA	Doc	Enif	33°35.0	10°01.0
0 0	68° 10.2	дна 137°53.0	Dec \$25°16.4	лана 137° 25.8	Dec \$23°23.5	206°12.5	Dec \$15°08.5	19°38.1	Dec N15°27.5	Al Na'ir	27°28.2	-46°49.0
1	83° 12.6	157 53.0 152°53.9	16.0	157° 25.6 152° 26.1	23.2	200 12.5 221°14.4	08.7	34°40.7	27.4	Fomalhaut	15°10.3	-29°27.8
2	98° 15.1	167°54.8	15.6	167° 26.5	22.9	236°16.3	08.7	49°43.4	27.4	Scheat	13°41.3	28°15.0
3	98 15.1 113°17.6	167 54.8 182°55.7	15.0	182° 26.9	22.7	250 10.3 251°18.3	09.0	49 43.4 64°46.0	27.4	Markab	13°25.9	15°22.3
4	113 17.0 128° 20.0	197°56.6	14.8	102 20.9 197°27.3	22.4	266°20.2	09.0	79°48.7	27.3	Nov 27 Tue	SHA	Mer.pass
5	128 20.0 143°22.5	212°57.6	14.6	212° 27.7	22.4	200 20.2 281°22.2	09.2	94°51.4	27.3	Venus	71°00.5	14:50
6	143 22.5 158° 24.9	212 57.0 227°58.5	\$25°13.9	212 27.7 227°28.1	\$23°21.8	296°24.1	\$15°09.5	109°54.0	N15°27.2	Mars	71°00.3	14:51
7	173° 27.4	242°59.4	13.5	242°28.5	21.6	311°26.1	09.6	109°54.0 124°56.7	27.2	Jupiter		10:20
8	173 27.4 188° 29.9	242 59.4 258°00.4	13.5	242 28.5 257°28.9	21.0	311 20.1 326°28.0	09.8	124 50.7 139°59.3	27.2	Saturn	311°18.6	22:46
9	203°32.3	258 00.4 273°01.3	13.1	257 28.9 272°29.3	21.0	320 28.0 341°29.9	09.8	159 59.3 155°02.0	27.1	Jatuill	J11 10.U	22.70
10	203 32.3 218° 34.8	288°02.2	12.7	272 29.3 287°29.6	20.7	356°31.9	10.1	170°04.6	27.1	Nov 28 Wed	SHA	Mer.pass
11	216 34.6 233° 37.3	303°03.2	12.3	302°30.0	20.7	11°33.8	10.1	170 04.0 185°07.3	27.0	Venus	70°20.8	14:49
12	233 37.3 248°39.7	318°04.1	525°11.4	302 30.0 317°30.4	\$23°20.1	26°35.8	\$15°10.4	200°09.9	N15°27.0	Mars	$70^{\circ}05.4$	14:51
13	248 39.7 263°42.2	318 04.1 333°05.1	11.0	317 30.4 332°30.8	19.9	20 35.8 41°37.7	10.4	200 09.9 215°12.6	N15 27.0 26.9	Jupiter	138°14.8	10:17
13	203 42.2 278°44.7	348°06.0	10.6	332 30.8 347°31.2	19.9	41 37.7 56°39.7		215 12.0 230°15.3	26.9	Saturn	$311^{\circ}23.3$	22:42
							10.7			N 22 T	CIII	
15 16	293°47.1	3°07.0	10.2	2°31.6	19.3	71°41.6	10.9	245°17.9	• • 26.8	Nov 29 Thu	SHA	Mer.pass
16	308°49.6	18°07.9	09.8	17°32.0	19.0	86°43.6	11.0	260°20.6	26.8	Venus	69°42.8	14:48
17	323°52.1	33°08.9	09.3	32°32.4	18.7	101°45.5	11.2	275°23.2	26.7	Mars	69°15.6	14:50
18	338°54.5	48°09.9	\$25°08.9	47°32.8	\$23°18.4	116°47.4	\$15°11.3	290°25.9	N15°26.7	Jupiter	138°02.3	10:14
19	353°57.0	63°10.8	08.5	62°33.2	18.2	131°49.4	11.5	305°28.5	26.6	Saturn	311°27.9	22:37
20	8°59.4	78°11.8	08.1	77°33.5	17.9	146°51.3	11.6	320°31.2	26.6 •• 26.6	Horizont	al parallax	
21	24°01.9 39°04.4	93°12.8	· · 07.7 07.2	92°33.9 107°34.3	· · 17.6 17.3	161°53.3 176°55.2	11.8	335°33.8 350°36.5		1.31123110	Venus:	0.3
22 23	54°06.8	108°13.7		107 34.3 122°34.7	17.3 17.0		11.9		26.5 26.5		Mars:	0.1
23	υθ.δ ————————————————————————————————————	123°14.7	06.8			191°57.2	12.1	5°39.1	26.5	L		V
Mer.p	ass. 19:24	ν 0.9′ d-0.	.4′ m-4.88	ν 0.4′ d-0	.3′ m1.11	ν 1.9′ d0.	.2′ m-1.71	ν 2.7′ d-0	.0′ m-0.19			

h	Sui	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°07.1	S21°07.9	294°04.5	12.1'	N13°56.7	-10.6'	56.5'
1 2	198°06.9 213°06.7	08.3 08.8	308°35.6 323°06.8	12.2' 12.2'	13°46.1 13°35.4	-10.7' -10.8'	56.5' 56.5'
3	228° 06.5	09.3	337°38.0	12.2'	13°24.6	-10.9	56.6'
4	243°06.3	09.7	352°09.2	12.2'	13°13.7	-10.9'	56.6'
5	258°06.1 273°05.9	10.2 S 21°10.6	6°40.4 21°11.6	12.2' 12.2'	13°02.8 N12°51.7	-11.0' -11.1'	56.6' 56.6'
6 7	273 05.9 288°05.7	521 10.6 11.1	21 11.6 35°42.8	12.2	12°40.7	-11.1 -11.2'	56.7
8	303°05.5	11.5	50°14.1	12.3'	12°29.5	-11.2'	56.7'
9	318°05.3	• • 12.0	64°45.4	12.3'	12°18.3	-11.3'	56.7'
10 11	333°05.1 348°04.8	12.4 12.9	79°16.7 93°48.0	12.3' 12.3'	12°07.0 11°55.6	-11.4' -11.4'	56.7' 56.8'
12	3°04.6	S21°13.3	108° 19.3	12.3'	N11°44.2	-11.5	56.8
13	18°04.4	13.8	$122^{\circ}50.6$	12.3'	$11^{\circ}32.7$	-11.6'	56.8'
14 15	33°04.2 48°04.0	14.2 •• 14.6	137°22.0 151°53.3	12.4' 12.4'	11°21.1 11°09.5	-11.6' -11.7'	56.9' 56.9'
16	63°03.8	15.1	166° 24.7	12.4'	11 09.5 10°57.8	-11. <i>1</i> -11.8'	56.9'
17	78°03.6	15.5	$180^{\circ}56.1$	12.4'	10°46.0	-11.8'	56.9'
18	93°03.4	S21°16.0	195°27.5	12.4'	N10°34.2	-11.9'	57.0'
19 20	108° 03.2 123° 03.0	16.4 16.9	209°58.9 224°30.3	12.4' 12.4'	10°22.3 10°10.4	-11.9' -12.0'	57.0' 57.0'
21	138° 02.8	17.3	239°01.7	12.4'	09°58.4	-12.1'	57.1
22	153°02.5	17.7	$253^{\circ}33.1$	12.4'	09°46.3	-12.1'	57.1'
23	168°02.3	18.2	268°04.6	12.4'	09°34.2	-12.2'	57.1'
	SD = 16.2'	d = 0.5'		SI	O = 15.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	183°02.1	S21°18.6	$282^{\circ}36.0$	12.4'	N09°22.0	-12.2'	57.2'
1	198°01.9 213°01.7	19.1 19.5	297°07.4 311°38.9	12.4'	09°09.7 08°57.4	-12.3'	57.2'
2 3	213°01.7 228°01.5	19.5	311° 38.9 326° 10.3	12.4' 12.4'	08°57.4 08°45.1	-12.4' -12.4'	57.2' 57.2'
4	243°01.3	20.4	340°41.8	12.4'	08°32.7	-12.5'	57.3'
5	258°01.1	20.8	355° 13.2	12.5'	08°20.2	-12.5'	57.3'
6 7	273°00.9 288°00.6	\$21°21.2 21.7	9°44.7 24°16.1	12.4' 12.4'	N08°07.7 07°55.1	-12.6' -12.6'	57.3' 57.4'
8	303°00.4	22.1	38°47.6	12.4'	07°42.5	-12.7'	57.4'
9	318°00.2	• • 22.5	53°19.0	12.4'	$07^{\circ}29.8$	-12.7'	57.4'
10 11	333°00.0 347°59.8	23.0 23.4	67°50.4 82°21.9	12.4' 12.4'	07°17.1 07°04.3	-12.8' -12.8'	57.5' 57.5'
12	2°59.6	521°23.8	96°53.3	12.4	N06°51.5	-12.0	57.5
13	17°59.4	24.3	111°24.8	12.4'	06°38.6	-12.9'	57.6'
14	32°59.1	24.7	125°56.2	12.4'	06°25.7	-13.0'	57.6'
15 16	47°58.9 62°58.7	· · 25.1 25.6	140°27.6 154°59.0	12.4' 12.4'	06°12.8 05°59.8	-13.0' -13.0'	57.6' 57.7'
17	77° 58.5	26.0	169°30.4	12.4'	05°46.7	-13.1'	57.7'
18	92°58.3	S21°26.4	184°01.8	12.4'	N05°33.6	-13.1'	57.7'
19 20	107° 58.1 122° 57.8	26.8 27.3	198°33.2 213°04.5	12.4' 12.4'	05°20.5 05°07.3	-13.2'	57.7' 57.8'
21	137° 57.6	•• 27.7	213 ° 04.3 227° 35.9	12.3'	04°54.1	-13.2'	57.8'
22	152° 57.4	28.1	242°07.2	12.3'	04°40.9	-13.3'	57.8'
23	167°57.2	28.5	256°38.6	12.3'	04°27.6	-13.3'	57.9'
	SD = 16.2'	d = 0.4'		SI	D = 15.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°57.0	S21°29.0	271°09.9	12.3'	N04°14.3	-13.4'	57.9'
1 2	197° 56.7 212° 56.5	29.4 29.8	285°41.2 300°12.4	12.3' 12.3'	04°00.9 03°47.5	-13.4' -13.4'	57.9' 58.0'
3	212 50.3 227°56.3	30.2	314°43.7	12.2'	03°34.1	-13.5'	58.0'
4	242°56.1	30.6	329°14.9	12.2'	03°20.6	-13.5'	58.0'
5 6	257° 55.9 272° 55.6	31.1 \$21°31.5	343°46.1 358°17.3	12.2' 12.2'	03°07.1 N02°53.6	-13.5' -13.6'	58.1' 58.1'
7	287°55.4	31.9	12°48.5	12.1'	02°40.0	-13.6'	58.1
8	302°55.2	32.3	27° 19.6	12.1'	02°26.5	-13.6'	58.2'
9	317°55.0 332°54.8	•• 32.7	41°50.8 56°21.8	12.1' 12.1'	02°12.9 01°59.2	-13.6'	58.2'
10 11	332°54.8 347°54.5	33.1 33.6	56°21.8 70°52.9	12.1	01°59.2 01°45.6	-13.7' -13.7'	58.2' 58.3'
12	2°54.3	S21°34.0	85°24.0	12.0'	N01°31.9	-13.7'	58.3'
13	17°54.1	34.4	99°55.0 114°25.9	12.0'	01°18.2	-13.7'	58.3'
14 15	32°53.9 47°53.6	34.8 •• 35.2	114°25.9 128°56.9	11.9' 11.9'	01°04.4 00°50.7	-13.8' -13.8'	58.4' 58.4'
16	62°53.4	35.6	$143^{\circ}27.8$	11.9'	00°36.9	-13.8'	58.4'
17	77°53.2	36.0	157° 58.7	11.8'	00°23.1	-13.8'	58.5'
18 19	92°53.0 107°52.7	\$21°36.4 36.8	172°29.5 187°00.3	11.8' 11.8'	N00°09.3 S00°04.5	-13.8' 13.8'	58.5' 58.5'
20	107 52.7 122°52.5	37.3	201°31.1	11.7	00°18.3	13.9	58.6'
21	137°52.3	• • 37.7	216°01.8	11.7'	00°32.2	13.9'	58.6'
22 23	152°52.1 167°51.8	38.1 38.5	230°32.5 245°03.2	11.7' 11.6'	00°46.1 00°59.9	13.9' 13.9'	58.6' 58.7'
23	SD = 16.2'	$\frac{38.5}{d=0.4'}$	245 03.2		$00^{\circ}59.9$ 0 = 15.8'	13.9	50.1
	JU = 10.2′	$u = 0.4^{\circ}$		51	ν = 13.8°		

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

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

		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	71-50%	
27	12:28	12:19	11:48	04:32	16:56		
28	12:09	11:58	11:48	05:20	17:43		
29	11:48	11:37	11:48	06:07	18:31		

November 30, 01, 02 UT (Fri., Sat., Sun.)

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	69°09.3	138°15.7	S25°06.4	137°35.1	\$23°16.7	206°59.1	S15°12.2	20°41.8	N15°26.4			
1	84°11.8	153°16.7	06.0	152°35.5	16.4	222°01.0	12.4	35°44.5	26.4	Alpheratz	357°30.5	29° 15.6
2	99°14.2	168°17.7	05.5	167°35.9	16.1	237°03.0	12.6	50°47.1	26.3	Ankaa	353°03.2	-42°08.7
3	114°16.7	183°18.7	05.1	182°36.3	• • 15.9	252°04.9	. 12.7	65°49.8	26.3	Schedar	349°26.0	56° 42.4
4	$129^{\circ}19.2$	$198^{\circ}19.7$	04.7	197°36.7	15.6	267°06.9	12.9	80°52.4	26.3	Diphda	348°43.2	-17°49.3
5	144°21.6	213°20.7	04.3	212°37.0	15.3	282°08.8	13.0	95°55.1	26.2	Achernar Hamal	335°17.1 327°46.4	-57°05.2 23°36.4
6	159°24.1	228°21.7	\$25°03.8	227°37.4	S23°15.0	297°10.8	S 15°13.2	110°57.7	N15°26.2	Polaris	311°20.7	89° 23.4
7	174°26.6	243°22.7	03.4	242°37.8	14.7	312°12.7	13.3	126°00.4	26.1	Acamar	315°08.5	-40° 11.2
8	189°29.0	258°23.7	03.0	257°38.2	14.4	327°14.7	13.5	141°03.0	26.1	Menkar	314°01.7	4° 12.4
9	204°31.5	273°24.7	• • 02.5	272°38.6	• • 14.1	342°16.6	• • 13.6	156°05.7	• • 26.0	Mirfak	308°22.0	49°58.1
10 11	219°33.9 234°36.4	288°25.7 303°26.7	02.1 01.7	287°39.0 302°39.4	13.8 13.5	357°18.6 12°20.5	13.8 13.9	171°08.3 186°11.0	26.0 25.9	Aldebaran	290°34.8	16°34.1
12	249°38.9	318°27.7	\$25°01.3	317°39.8	523°13.2	27°22.4	S15°14.1	201°13.6	N15°25.9	Rigel	280°59.8	-8°10.1
13	264°41.3	333°28.7	00.8	332°40.2	12.9	42°24.4	14.2	216° 16.3	25.9	Capella	280°15.6	46°01.5
14	279°43.8	348°29.8	00.4	347°40.6	12.6	57°26.3	14.4	231° 18.9	25.8	Bellatrix	278°18.3	6°22.5
15	294°46.3	3°30.8	25°00.0	2°41.0	• • 12.3	72°28.3	• • 14.6	246°21.6	• • 25.8	Elnath	277°56.5	28°37.8
16	309°48.7	18°31.8	24°59.5	17°41.3	12.1	87°30.2	14.7	261°24.3	25.7	Alnilam	275°33.4 270°47.5	-1°11.1 7°24.6
17	324°51.2	33°32.8	59.1	32°41.7	11.8	102°32.2	14.9	276°26.9	25.7	Betelgeuse Canopus	263°50.1	-52°42.7
18	339°53.7	48°33.9	\$24°58.7	47°42.1	S23°11.5	117°34.1	S 15°15.0	291°29.6	N15°25.6	Sirius	258°22.5	-16° 45.5
19	354°56.1	63°34.9	58.2	62°42.5	11.2	132°36.1	15.2	306° 32.2	25.6	Adhara	255°02.4	-29°00.8
20	9°58.6	78°36.0	57.8	77°42.9	10.9	147°38.0	15.3	321°34.9	25.6	Procyon	244°46.5	5°08.7
21	25°01.0	93°37.0	• • 57.4	92°43.3	• • 10.6	162°39.9	• • 15.5	336°37.5	• • 25.5	Pollux	243°12.3	27°56.9
22	40°03.5 55°06.0	108°38.0	56.9	107°43.7	10.3	177°41.9	15.6 15.8	351°40.2	25.5 25.4	Avior	$234^{\circ}12.6$	-59°36.2
23		123°39.1	56.5	122°44.1	10.0	192°43.8	15.8	6°42.8	25.4	Suhail	$222^{\circ}43.1$	-43°33.1
Mer.p	ass. 19:20	$\nu 1.0' d-0.$.4′ m-4.88	ν 0.4′ d-0	.3' m1.11	ν 1.9′ d0.	2′ m-1.71	ν 2.7′ d-0	.0′ m-0.18	Miaplacidus	221°36.8	-69°50.2
										Alphard	217°43.8	-8°47.4
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°30.3 193°36.6	11°49.1 61°35.0
0	70°08.4	$138^{\circ}40.1$	\$24°56.1	137°44.5	S23°09.7	207°45.8	S 15°15.9	21°45.5	N15°25.4	Denebola	182°21.1	14°24.1
1	85°10.9	153°41.2	55.6	152°44.9	09.4	222°47.7	16.1	36°48.1	25.3	Gienah	175°39.7	-17°42.4
2	100°13.4	168°42.3	55.2	167°45.3	09.1	237°49.7	16.2	51°50.8	25.3	Acrux	$172^{\circ}55.7$	-63° 15.7
3 4	115°15.8 130°18.3	183°43.3 198°44.4	• • 54.8 54.3	182°45.6 197°46.0	· · 08.8 08.5	252°51.6 267°53.6	· · 16.4 16.5	66°53.4 81°56.1	· · 25.3 25.2	Gacrux	171°47.3	-57° 16.6
5	145°20.8	213°45.5	53.9	212°46.4	08.2	282°55.5	16.7	96°58.7	25.2	Alioth	166°10.1	55°47.6
6	160°23.2	228°46.5	S24°53.5	227°46.8	S23°07.9	297°57.5	S15°16.8	112°01.4	N15°25.1	Spica	158°18.4	-11°19.0
7	175°25.7	243°47.6	53.0	242°47.2	07.6	312°59.4	17.0	127°04.0	25.1	Alkaid Hadar	152°49.5 148°30.7	49°09.7 -60°30.8
8	190°28.2	258°48.7	52.6	257°47.6	07.3	328°01.4	17.2	142°06.7	25.0	Menkent	146 50.7 147°53.2	-36° 30.9
9	205°30.6	273°49.8	• • 52.1	272°48.0	• • 07.0	343°03.3	• • 17.3	157°09.3	• • 25.0	Arcturus	145°44.7	19°01.6
10	220°33.1	288°50.8	51.7	287°48.4	06.7	358°05.2	17.5	172° 12.0	24.9	Rigil Kent.	139°35.3	-60°57.3
11	235°35.5	303°51.9	51.3	302°48.8	06.4	13°07.2	17.6	187°14.6	24.9	Kochab	$137^{\circ}21.4$	74°01.8
12 13	250°38.0 265°40.5	318°53.0 333°54.1	\$24°50.8 50.4	317°49.2 332°49.6	\$23°06.1 05.7	28°09.1 43°11.1	\$15°17.8 17.9	202° 17.3 217° 19.9	N15°24.9 24.8	Zuben'ubi	136°52.0	-16°09.8
14	280°42.9	348°55.2	49.9	347°50.0	05.4	58°13.0	18.1	232°22.6	24.8	Alphecca	126°00.8	26°36.9
15	295°45.4	3°56.3	• • 49.5	2°50.4	. 05.1	73°15.0	. 18.2	247°25.2	24.7	Antares	112°11.4	-26°29.7
16	310°47.9	18°57.4	49.1	17°50.7	04.8	88°16.9	18.4	262°27.9	24.7	Atria Sabik	107°02.5 101°58.6	-69°04.7 -15°45.5
17	325°50.3	33°58.5	48.6	32°51.1	04.5	103°18.9	18.5	277°30.6	24.6	Shaula	96°05.5	-13° 43.3 -37° 07.4
18	340°52.8	48°59.6	S24°48.2	47°51.5	S23°04.2	118°20.8	S15°18.7	292°33.2	N15°24.6	Rasalhague	95°55.3	12°32.5
19	355°55.3	64°00.7	47.7	62°51.9	03.9	133°22.8	18.8	307°35.9	24.6	Eltanin	90°40.9	51°29.3
20	10°57.7	79°01.9	47.3	77°52.3	03.6 •• 03.3	148°24.7	19.0	322°38.5	24.5	Kaus Aust.	83°27.7	-34°22.1
21 22	26°00.2 41°02.7	94°03.0 109°04.1	• • 46.8 46.4	92°52.7 107°53.1	03.0	163°26.7 178°28.6	· · 19.1 19.3	337°41.2 352°43.8	· · 24.5 24.4	Vega	80°30.9	38°49.0
23	56°05.1	124°05.2	46.0	122°53.5	02.7	193°30.6	19.4	7°46.5	24.4	Nunki	75°43.3	-26° 15.4
										Altair	61°56.4	8°57.1
Mer.p	ass. 19:16	$\nu_{1.1'} d$ -0.	.4′ m-4.89	ν 0.4′ d-0	.3′ m1.11	ν 1.9' d 0.	2′ m-1.71	ν 2.7 d-0	.0′ m-0.18	Peacock Deneb	53°00.1 49°23.3	-56°38.3 45°23.6
										Enif	33°35.0	10°01.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.2	-46°49.0
0	71°07.6	139°06.4	S24°45.5	137°53.9	S23°02.4	208°32.5	S15°19.6	22°49.1	N15°24.4	Fomalhaut	$15^{\circ}10.3$	-29°27.8
1	86°10.0	154°07.5	45.1	152°54.3	02.1	223°34.4	19.7	37°51.8	24.3	Scheat	13°41.3	28° 15.0
2	101°12.5 116°15.0	169°08.6 184°09.8	44.6	167°54.7 182°55.1	01.7 · · 01.4	238°36.4 253°38.3	19.9 · · 20.0	52°54.4 67°57.1	24.3 •• 24.2	Markab	13°25.9	15°22.2
4	110 15.0 131°17.4	184 09.8 199°10.9	· · 44.2 43.7	182 55.1 197°55.5	01.4	253 38.3 268°40.3	20.2	82°59.7	24.2	Nov 30 Fri	SHA	Mer.pass
5	146°19.9	214°12.0	43.7	212°55.9	00.8	283°42.2	20.2	98°02.4	24.2	Venus	69°06.4	14:46
6	161°22.4	229°13.2	\$24° 42.8	227°56.2	S23°00.5	298°44.2	S15°20.5	113°05.0	N15°24.1	Mars	68°25.8	14:49
7	176°24.8	244°14.3	42.4	242°56.6	23°00.2	313°46.1	20.6	128°07.7	24.1	Jupiter	$137^{\circ}49.8$	10:11
8	191°27.3	259°15.5	41.9	257°57.0	$22^{\circ}59.9$	$328^{\circ}48.1$	20.8	143°10.3	24.0	Saturn	311°32.5	22:33
9	206°29.8	274°16.6	• • 41.5	272°57.4	• • 59.6	343°50.0	20.9	158° 13.0	• • 24.0	Dec 01 Sat	SHA	Mer.pass
10	221°32.2	289°17.8	41.0	287°57.8	59.2	358°52.0	21.1	173°15.6	23.9	Venus	68°31.7	14:44
11 12	236°34.7 251°37.1	304°19.0 319°20.1	40.6 \$24°40.1	302°58.2 317°58.6	58.9 \$22°58.6	13°53.9 28°55.9	21.3 \$15°21.4	188° 18.3 203° 20.9	23.9 N15°23.8	Mars	67°36.0	14:49
13	251 37.1 266°39.6	319 20.1 334°21.3	39.7	317 58.0 332°59.0	58.3	28 55.9 43°57.8	21.6	203 20.9 218°23.6	23.8		137°37.3	10:08
14	281°42.1	349°22.5	39.2	347°59.4	58.0	58°59.8	21.7	233°26.2	23.8	Saturn	311°37.0	22:29
15	296°44.5	4°23.6	• • 38.8	2°59.8	• • 57.7	74°01.7	21.9	248°28.8	23.7	Dec 02 Sun	SHA	Mer.pass
16	311°47.0	$19^{\circ}24.8$	38.3	$18^{\circ}00.2$	57.3	89°03.7	22.0	263°31.5	23.7	Venus	67°58.8	14:42
17	326°49.5	34°26.0	37.9	33°00.6	57.0	104°05.6	22.2	278°34.1	23.6	Mars	$66^{\circ}46.3$	14:48
18	341°51.9	49°27.2	S24°37.4	48°01.0	S22°56.7	119°07.6	S15°22.3	293°36.8	N15°23.6		137°24.9	10:05
19	356°54.4	64°28.4	37.0	63°01.4	56.4	134°09.5	22.5	308°39.4	23.5	Saturn	311°41.5	22:25
20 21	11°56.9 26°59.3	79°29.6 94°30.8	36.5 · · 36.1	78°01.8 93°02.2	56.1 •• 55.8	149°11.5 164°13.4	22.6 · · 22.8	323°42.1 338°44.7	23.5 •• 23.5	Horizont	al parallax	
22	42°01.8	109°32.0	35.6	108°02.6	55.4	179°15.4	22.9	353°47.4	23.4		Venus:	0.4
23	57°04.3	124°33.2	35.2	123°03.0	55.1	194°17.3	23.1	8°50.0	23.4		Mars:	0.1
Mern	ass. 19:12	ν1 1′ d-0	4′ m-4.90	νη 4' d.η	.3′ m1.11	v1 0/ d0	2′ m-1.71	1/2 7/ d=0	.0′ m-0.17			
ivici.p		ν 1.1 u-0.		νσ. - α-0		ν1.5 UU.	_ 111 ⁻ 1./1	ν Δ.1 U-U	11-0.11			

h	Sui	า			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°51.6	S21°38.9	259°33.8	11.6'	S01°13.8	13.9'	58.7'
1 2	197°51.4 212°51.2	39.3 39.7	274°04.4 288°34.9	11.5' 11.5'	01°27.7 01°41.6	13.9' 13.9'	58.7' 58.8'
3	212 51.2 227°50.9	40.1	200 34.9 303°05.4	11.4	01 41.0 01°55.6	13.9'	58.8'
4	242°50.7	40.5	317°35.8	11.4'	02°09.5	13.9'	58.8'
5	257°50.5	40.9	332°06.2	11.3'	02°23.4	13.9'	58.9'
6 7	272°50.3 287°50.0	\$21°41.3 41.7	346°36.6 1°06.9	11.3' 11.2'	\$02°37.3 02°51.3	13.9' 13.9'	58.9' 58.9'
8	302°49.8	42.1	15°37.1	11.2'	02° 31.3	13.9'	59.0'
9	317°49.6	• • 42.5	30°07.3	11.1'	03°19.1	13.9'	59.0'
10	332°49.3	42.9	44°37.5	11.1'	03°33.1	13.9'	59.0'
11 12	347°49.1 2°48.9	43.3 \$21°43.7	59°07.6 73°37.6	11.0' 11.0'	03°47.0 504°00.9	13.9' 13.9'	59.1' 59.1'
13	17°48.7	44.1	88°07.6	10.9'	04°14.8	13.9'	59.1
14	32°48.4	44.5	$102^{\circ}37.5$	10.9'	04°28.8	13.9'	59.1'
15 16	47°48.2 62°48.0	• • 44.9 45.3	117°07.4 131°37.2	10.8' 10.7'	04°42.7 04°56.6	13.9' 13.9'	59.2' 59.2'
17	77°47.7	45.3 45.7	131 37.2 146°06.9	10.7	04 30.0 05°10.4	13.9	59.2'
18	92°47.5	S21°46.1	160°36.6	10.6'	S05°24.3	13.9'	59.3'
19	107°47.3	46.4	175°06.2	10.6'	05°38.2	13.8'	59.3'
20 21	122°47.0 137°46.8	46.8 •• 47.2	189°35.8 204°05.3	10.5' 10.4'	05°52.0 06°05.8	13.8' 13.8'	59.3' 59.4'
22	152°46.6	47.6	218°34.7	10.4	06°19.6	13.8'	59.4
23	167°46.3	48.0	233°04.1	10.3'	06°33.4	13.8'	59.4'
	SD = 16.2'	d = 0.4'		SE	0 = 16.0'		
_							
Sat 0	GHA 182°46.1	Dec S 21°48.4	GHA 247°33.4	u 10.2'	Dec 506° 47.2	d 13.7'	HP 59.5'
1	197°45.9	48.8	262°02.6	10.2'	07°00.9	13.7'	59.5'
2	212°45.6	49.2	276°31.8	10.1'	07°14.6	13.7'	59.5'
3 4	227°45.4 242°45.2	· · 49.6 49.9	291°00.9 305°29.9	10.0' 10.0'	07°28.3 07°42.0	13.7' 13.6'	59.6' 59.6'
5	242 45.2 257°44.9	50.3	319°58.9	9.9'	07 42.0 07°55.6	13.6'	59.6'
6	272°44.7	S21°50.7	334°27.8	9.8'	S08°09.2	13.6'	59.6'
7	287°44.5	51.1	348°56.6	9.7'	08°22.8	13.5'	59.7'
8 9	302°44.2 317°44.0	51.5 •• 51.9	3°25.3 17°54.0	9.7' 9.6'	08°36.4 08°49.9	13.5' 13.5'	59.7' 59.7'
10	332°43.8	52.2	32°22.5	9.5'	09°03.3	13.4	59.8'
11	347°43.5	52.6	46°51.0	9.4'	$09^{\circ}16.8$	13.4'	59.8'
12	2°43.3 17°43.1	\$21°53.0 53.4	61°19.5 75°47.8	9.3' 9.3'	\$09°30.1 09°43.5	13.3' 13.3'	59.8' 59.8'
13 14	32°42.8	53.4 53.8	75 47.8 90°16.1	9.3 9.2'	09 43.5 09°56.8	13.3	59.8 59.9'
15	47°42.6	• • 54.1	104°44.3	9.1'	10°10.1	13.2'	59.9'
16	62°42.3	54.5	119°12.4	9.0'	10°23.3	13.2'	59.9'
17 18	77°42.1 92°41.9	54.9 \$21°55.3	133°40.4 148°08.3	8.9' 8.9'	10°36.5 \$10°49.6	13.1' 13.1'	60.0' 60.0'
19	107°41.6	55.6	162°36.2	8.8'	11°02.6	13.0'	60.0
20	122°41.4	56.0	177°03.9	8.7'	11°15.6		60.0'
21 22	137°41.2 152°40.9	· · 56.4 56.7	191°31.6 205°59.2	8.6' 8.5'	11°28.6 11°41.5	12.9' 12.8'	60.1' 60.1'
23	167°40.7	57.1	200° 26.7	8.4	11°54.4	12.8'	60.1
	SD = 16.2'	d = 0.4'		SE	0 = 16.2'		
•							
Sun 0	GHA 182°40.4	Dec \$21°57.5	GHA 234°54.1	ν 8.3'	Dec \$12°07.1	d 12.7'	HP 60.1'
1	197°40.2	57.9	249°21.5	8.2	12°19.9	12.7'	60.2
2	212°40.0	58.2	263°48.7	8.2'	12°32.5	12.6'	60.2'
3 4	227°39.7 242°39.5	· · 58.6 59.0	278°15.9 292°42.9	8.1' 8.0'	12°45.1 12°57.6	12.5' 12.5'	60.2' 60.2'
5	257°39.2	59.3	307°09.9	7.9'	13°10.1	12.4	60.3
6	272°39.0	S21°59.7	321°36.8	7.8'	S13°22.5	12.3'	60.3'
7	287°38.7 302°38.5	22°00.1 00.4	336°03.6 350°30.3	7.7' 7.6'	13°34.8 13°47.0	12.2' 12.2'	60.3' 60.3'
8 9	302 38.5 317°38.3	. 00.4	4°56.9	7.6 7.5'	13 47.0 13°59.2	12.2	60.4
10	332°38.0	01.2	19°23.4	7.4'	$14^{\circ}11.3$	12.0'	60.4'
11	347°37.8	01.5	33°49.8	7.3'	14°23.3	11.9'	60.4
12 13	2°37.5 17°37.3	\$22°01.9 02.2	48°16.2 62°42.4	7.2' 7.1'	\$14°35.2 14°47.0	11.8' 11.8'	60.4' 60.4'
14	32°37.0	02.6	77°08.5	7.0'	14°58.8	11.7'	60.5
15	47°36.8	•• 03.0	91°34.6	7.0'	15°10.5	11.6'	60.5'
16 17	62°36.6 77°36.3	03.3 03.7	106°00.5 120°26.4	6.9' 6.8'	15°22.0 15°33.5	11.5' 11.4'	60.5' 60.5'
18	92°36.1	03.7 \$22°04.0	120°26.4 134°52.2	6.7'	15°33.5 \$15°44.9	11.4	60.5
19	107°35.8	04.4	149°17.8	6.6'	15°56.2	11.2'	60.6'
20	122°35.6	04.7	163°43.4	6.5'	16°07.4	11.1'	60.6'
21 22	137°35.3 152°35.1	· · 05.1 05.5	178°08.9 192°34.3	6.4' 6.3'	16°18.5 16°29.5	11.0' 10.9'	60.6' 60.6'
23	167°34.8	05.8	206°59.6	6.2'	16°40.4	10.9	60.6
	SD = 16.2'	d = 0.4'		SE	0 = 16.4'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	39-18%	
30	11:26	11:16	11:49	06:55	19:20		
01	11:04	10:53	11:49	07:46	20:12		
02	10:42	10:30	11:49	08:39	21:08		

December 03, 04, 05 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	72°06.7	139°34.4	S24°34.7	138°03.3	S22°54.8	209°19.2	S15°23.2	23°52.7	N15°23.3			
1	87°09.2	154°35.6	34.3	153°03.7	54.5	224°21.2	23.4	38°55.3	23.3	Alpheratz	357°30.5	29°15.6
2	102° 11.6	169°36.8	33.8	168°04.1	54.2	239°23.1	23.5	53°58.0	23.3	Ankaa	353°03.2	-42°08.7
3	117° 14.1	184°38.0	33.3	183°04.5	53.8	254°25.1	23.7	69°00.6	23.2	Schedar	349°26.0	56°42.4
4	132° 16.6	199°39.2	32.9	198°04.9	53.5	269°27.0	23.8	84°03.3	23.2	Diphda	348°43.3	-17°49.3
5	147° 19.0	214°40.4	32.4	213°05.3	53.2	284°29.0	24.0	99°05.9	23.1	Achernar	335°17.1	-57°05.2
6	162°21.5	229°41.7	S24°32.0	228°05.7	S22°52.9	299°30.9	S15°24.1	114°08.6	N15°23.1	Hamal	327°46.4	23°36.4
7	177°24.0	244°42.9	31.5	243°06.1	52.5	314°32.9	24.3	129°11.2	23.0	Polaris	311°20.8	89°23.4
8	192°26.4	259°44.1	31.1	258°06.5	52.2	329°34.8	24.4	144°13.9	23.0	Acamar	315°08.5	-40°11.2
9	207°28.9	274°45.4	• • 30.6	273°06.9	• • 51.9	344°36.8	• • 24.6	159°16.5	• • 23.0	Menkar	314°01.7	4°12.4
10	222°31.4	289°46.6	30.1	288°07.3	51.6	359°38.7	24.7	174°19.2	22.9	Mirfak	308°22.0	49°58.1
11	237°33.8	304°47.8	29.7	303°07.7	51.2	14°40.7	24.9	189°21.8	22.9	Aldebaran	290°34.7	16°34.1
12	252°36.3	319°49.1	S24°29.2	318°08.1	S22°50.9	29°42.6	S15°25.0	204°24.5	N15°22.8	Rigel	280°59.8	-8°10.1
13	267°38.8	334°50.3	28.8	333°08.5	50.6	44°44.6	25.2	$219^{\circ}27.1$	22.8	Capella	280°15.6	46°01.5
14	282°41.2	349°51.6	28.3	348°08.9	50.3	59°46.5	25.3	234°29.8	22.8	Bellatrix Elnath	278° 18.3 277° 56.5	6°22.5 28°37.8
15	297°43.7	4°52.8	• • 27.8	3°09.3	• • 49.9	74°48.5	• • 25.5	249°32.4	• • 22.7	Alnilam	277 30.5 275°33.4	-1°11.1
16	$312^{\circ}46.1$	$19^{\circ}54.1$	27.4	18°09.7	49.6	89°50.4	25.6	264°35.0	22.7	Betelgeuse	270°47.5	7°24.6
17	327°48.6	34°55.4	26.9	33°10.1	49.3	104°52.4	25.8	279°37.7	22.6	Canopus	263°50.1	-52°42.7
18	342°51.1	49°56.6	S24°26.5	48°10.5	522°49.0	119°54.3	S15°25.9	294°40.3	N15°22.6	Sirius	258° 22.5	-32 42.7 -16°45.5
19	357°53.5	64°57.9	26.0	63°10.9	48.6	134°56.3	26.1	309°43.0	22.5	Adhara	255°02.4	-10 45.5 -29°00.8
20	$12^{\circ}56.0$	79°59.2	25.5	78°11.3	48.3	149°58.2	26.2	324°45.6	22.5	Procyon	244° 46.5	5°08.7
21	27°58.5	95°00.4	• • 25.1	93°11.7	• • 48.0	$165^{\circ}00.2$	• • 26.4	339°48.3	• • 22.5	Pollux	244 40.5 243°12.3	5 08.7 27°56.9
22	43°00.9	$110^{\circ}01.7$	24.6	$108^{\circ}12.1$	47.6	180°02.1	26.5	354°50.9	22.4	Avior	245 12.5 234° 12.6	-59°36.2
23	58°03.4	125°03.0	24.2	123°12.5	47.3	$195^{\circ}04.1$	26.7	9°53.6	22.4	Suhail	234 12.6 222°43.1	-59 30.2 -43°33.1
Mern	ass. 19:08	ν1 2 ¹ d-0	.5′ m-4.90	ν 0.4 $^{\prime}$ d.0	.3′ m1.11	v1 0' d0	2′ m-1.72	v26' d-0	.0′ m-0.17	Miaplacidus	222 43.1 221°36.7	-43 33.1 -69°50.2
ivier.p	uss. 19.00	ν1.2 U-0.	.5 111-4.90	νυ. 4 u-0		ν1.5 UU.	4 111-1.14	ν Δ.Ο · u -0	.0 111-0.17	Alphard	221 30.7 217°43.8	-8°47.4
										Regulus	207°30.2	11°49.1
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.6	61°34.9
0	73°05.9	140°04.3	S24°23.7	138°12.9	\$22°47.0	210°06.0	S 15°26.8	24°56.2	N15°22.3	Denebola	182°21.1	14°24.1
1	88°08.3	155°05.6	23.2	153°13.2	46.6	225°08.0	27.0	39°58.9	22.3	Gienah	175°39.6	-17°42.4
2	$103^{\circ}10.8$	170°06.9	22.8	168°13.6	46.3	240°09.9	27.1	55°01.5	22.3	Acrux	172°55.7	-63°15.7
3	$118^{\circ}13.3$	185°08.2	• • 22.3	183°14.0	• • 46.0	255°11.9	• • 27.3	70°04.2	• • 22.2	Gacrux	171°47.3	-57°16.6
4	133° 15.7	200°09.5	21.8	198°14.4	45.6	270°13.8	27.4	85°06.8	22.2	Alioth	166° 10.1	55°47.6
5	148° 18.2	$215^{\circ}10.8$	21.4	213°14.8	45.3	285°15.8	27.6	100°09.4	22.1	Spica	158° 18.4	-11°19.0
6	163°20.6	230°12.1	S24°20.9	228°15.2	S22°45.0	300°17.7	S15°27.7	115°12.1	N15°22.1	Alkaid	152°49.4	49°09.6
7	178°23.1	245°13.4	20.4	243°15.6	44.6	315°19.7	27.9	130°14.7	22.1	Hadar	148°30.7	-60°30.8
8	193°25.6	260°14.7	20.0	258°16.0	44.3	330°21.6	28.0	145°17.4	22.0	Menkent	147°53.2	-36°30.9
9	208°28.0	275°16.0	• • 19.5	273°16.4	• • 44.0	345°23.6	• • 28.2	160°20.0	• • 22.0	Arcturus	145°44.7	19°01.6
10	223°30.5	290°17.3	19.0	288°16.8	43.6	0°25.5	28.3	175°22.7	21.9	Rigil Kent.	139°35.3	-60°57.3
11	238°33.0	305°18.6	18.6	303°17.2	43.3	15°27.5	28.5	190°25.3	21.9	Kochab	137°21.4	74°01.8
12	253°35.4	320°20.0	S24°18.1	318°17.6	S22°43.0	30°29.4	S15°28.6	205°28.0	N15°21.8	Zuben'ubi	136°51.9	-16°09.8
13	268°37.9	335°21.3	17.6	333°18.0	42.6	45°31.4	28.8	220°30.6	21.8	Alphecca	126°00.8	26°36.9
14	283°40.4	350°22.6	17.2	348°18.4	42.3	60°33.3	28.9	235°33.3	21.8	Antares	112°11.4	-26°29.7
15	298°42.8	5°24.0	• • 16.7	3°18.8	• • 41.9	75°35.3	• • 29.1	250°35.9	• • 21.7	Atria	107°02.5	-69°04.7
16	313°45.3	20°25.3	16.2	18°19.2	41.6	90°37.2	29.2	265°38.5	21.7	Sabik	101°58.6	-15°45.5
17	328°47.7	35°26.6	15.8	33°19.6	41.3	105°39.2	29.4	280°41.2	21.6	Shaula	96°05.5	-37°07.3
18	343°50.2	50°28.0	\$24° 15.3	48°20.0	\$22°40.9	120°41.1	S15°29.5	295°43.8	N15°21.6	Rasalhague	95°55.3	12°32.5
19	358°52.7	65°29.3	14.8	63°20.4	40.6	135°43.1	29.7	310°46.5	21.6	Eltanin	90°40.9	51°29.3
20	13°55.1	80°30.7	14.4	78°20.8	40.3	150°45.0	29.8	325°49.1 340°51.8	21.5	Kaus Aust.	83°27.7	-34°22.1
21	28°57.6	95°32.0	13.9	93°21.2	• • 39.9	165°47.0	• • 29.9		• • 21.5	Vega	80°30.9	38°48.9
22	44°00.1	110°33.4	13.4	108°21.6	39.6	180°48.9	30.1	355°54.4	21.4	Nunki	75°43.3	-26°15.4
23	59°02.5	125°34.8	12.9	123°22.0	39.2	195°50.9	30.2	10°57.0	21.4	Altair	61°56.4	8°57.1
Mer.p	ass. 19:04	ν 1.3′ d-0.	.5′ m-4.91	ν 0.4′ d-0	.3′ m1.11	ν 2.0′ d0.	1' m-1.72	ν 2.6′ d-0	.0′ m-0.17	Peacock	53°00.1	-56°38.3
										Deneb	49°23.3	45°23.6
\A/I	CHA	CLIA	Da-	CIIA	Dr-	CIIA	De-	CIIA	Da-	Enif	33°35.0	10°01.0
Wed 0	GHA 74°05.0	GHA 140°36 1	Dec \$24° 12.5	GHA 138°22.4	Dec \$22°38.9	GHA 210°52.8	Dec \$15°30.4	GHA 25°59.7	Dec N15°21.4	Al Na'ir	27°28.3	-46°49.0
1	74 05.0 89°07.5	140°36.1 155°37.5	12.0	158° 22.4 153° 22.8	38.5	210 52.8 225°54.8	30.5	25 59.7 41°02.3	21.3	Fomalhaut	15°10.3	-29°27.8
2	89 07.5 104°09.9	155 37.5 170°38.9	12.0	153 22.8 168°23.2	38.5 38.2	240°56.8	30.5	41 02.3 56°05.0	21.3	Scheat	13°41.3	28°15.0
3	104 09.9 119°12.4	170 36.9 185°40.3	11.1	106 23.2 183°23.6	37.9	240 50.6 255°58.7	• • 30.8	71°07.6	. 21.3	Markab	13°25.9	15°22.2
4	134° 14.9	200°41.6	10.6	198°24.0	37.5	271°00.7	31.0	86°10.3	21.2	Dec 03 Mon	SHA	Mer.pass
5	134 14.9 149° 17.3	200 41.0 215°43.0	10.0	213°24.4	37.3	286°02.6	31.0	101°12.9	21.2	Venus	67°27.7	14:41
6	164° 19.8	230°44.4	\$24°09.6	213 24.4 228°24.8	\$22°36.8	301°04.6	\$15°31.3	101 12.9 116°15.6	N15°21.1	Mars	65°56.6	14:47
7	179° 22.2	245°45.8	09.0	243°25.2	36.5	316°06.5	31.4	131° 18.2	21.1		137°12.5	10:01
8	179 22.2 194°24.7	260°47.2	09.2	243°25.2 258°25.6	36.1	331°08.5	31.4	146°20.8	21.1	Saturn	311°46.0	22:21
9	209°27.2	275°48.6	•• 08.2	273°26.0	35.8	346°10.4	31.7	161°23.5	. 21.0			
10	224°29.6	290°50.0	07.8	288°26.4	35.4	1°12.4	31.9	176°26.1	21.0	Dec 04 Tue	SHA	Mer.pass
11	239°32.1	305°51.4	07.3	303°26.8	35.1	16°14.3	32.0	191°28.8	20.9	Venus	66°58.4	14:38
12	254°34.6	320°52.8	S24°06.8	318°27.2	S22°34.8	31°16.3	S15°32.2	206°31.4	N15°20.9	Mars	65°07.0	14:47
13	269°37.0	335°54.2	06.3	333°27.6	34.4	46°18.2	32.3	221°34.1	20.8	Jupiter	137°00.2	09:58
14	284°39.5	350°55.6	05.9	348°28.0	34.1	61°20.2	32.5	236°36.7	20.8	Saturn	311°50.4	22:16
15	299°42.0	5°57.1	• • 05.4	3°28.4	• • 33.7	76°22.1	32.6	251°39.3	20.8	Dec 05 Wed	SHA	Mer.pass
16	314°44.4	20°58.5	04.9	18°28.8	33.4	91°24.1	32.8	266°42.0	20.7	Venus	66°31.1	14:36
17	329°46.9	35°59.9	04.4	33°29.2	33.0	106°26.0	32.9	281°44.6	20.7	Mars	64° 17.4	14:46
18	344°49.4	51°01.3	S24°03.9	48°29.6	S22°32.7	121°28.0	S15°33.1	296°47.3	N15°20.6	Jupiter		09:55
19	359°51.8	66°02.8	03.5	63°30.0	32.3	136°29.9	33.2	311°49.9	20.6	Saturn	311°54.7	22:12
20	14°54.3	81°04.2	03.0	78°30.4	32.0	151°31.9	33.4	326°52.5	20.6			
21	29°56.7	96°05.7	• • 02.5	93°30.8	• • 31.6	166°33.8	• • 33.5	341°55.2	• • 20.5	Horizont	al parallax	
22	44°59.2	111°07.1	02.0	108°31.2	31.3	181°35.8	33.6	356°57.8	20.5		Venus:	0.4
23	$60^{\circ}01.7$	$126^{\circ}08.6$	01.6	123°31.6	30.9	196°37.8	33.8	12°00.5	20.4		Mars:	0.1
Mara	255 10:01	1/1 // / 0	.5′ m-4.91	υΩ Λ/ ຝ Ω	.3′ m1.12	1/2 0/ 40	1′ m-1.72		.0′ m-0.16			
ivier.p	ass. 19:01	ν1.4 U-U.	.5 111-4.91	νυ. 4 α-0	1111.12	ν2.0 UU.	111-1.12	ν 2.0 u-0	.0 111-0.10			

	6	T0.1330 Sec						
h	Sur	1			Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°34.6 197°34.3	\$22°06.2	221°24.8 235°49.9	6.1'	\$16°51.2 17°01.9	10.7'	60.7'	
1 2	212°34.1	06.5 06.9	250°14.9	6.0' 5.9'	17 01.9 17°12.5	10.6' 10.5'	60.7' 60.7'	
3	227°33.9	• • 07.2	264°39.8	5.8'	17°23.0	10.4	60.7	
4	242°33.6	07.6	279°04.6	5.7'	17°33.3	10.3'	60.7'	
5	257°33.4	07.9	293°29.3	5.6'	17°43.6	10.1'	60.7'	
6	272°33.1	S22°08.3	307°54.0	5.5'	\$17°53.7	10.0'	60.7'	
7 8	287°32.9 302°32.6	08.6 09.0	322°18.5 336°43.0	5.5' 5.4'	18°03.8 18°13.7	9.9' 9.8'	60.8' 60.8'	
9	317°32.4	09.3	351°07.3	5.3'	18°23.4	9.7'	60.8	
10	332°32.1	09.7	5°31.6	5.2'	18°33.1	9.5'	60.8	
11	347°31.9	10.0	19°55.8	5.1'	18°42.6	9.4'	60.8'	
12	2°31.6	S22°10.3	34°19.9	5.0'	\$18°52.0	9.3'	60.8'	
13 14	17°31.4 32°31.1	10.7 11.0	48°43.9 63°07.8	4.9' 4.8'	19°01.3 19°10.5	9.2' 9.0'	60.8' 60.8'	
15	47°30.9	. 11.4	77°31.6	4.7	19°10.5	9.0 8.9'	60.9	
16	62°30.6	11.7	91°55.4	4.7'	19°28.4	8.8'	60.9'	
17	77°30.4	12.0	$106^{\circ}19.0$	4.6'	19°37.1	8.6'	60.9'	
18	92°30.1	\$22°12.4	120°42.6	4.5'	\$19°45.8	8.5'	60.9'	
19 20	107°29.9 122°29.6	12.7 13.1	135°06.1 149°29.5	4.4' 4.3'	19°54.2 20°02.6	8.3' 8.2'	60.9' 60.9'	
21	137°29.4	. 13.1	149 29.5 163°52.8	4.3 4.2'	20°10.8	8.1'	60.9	
22	152°29.1	13.7	178°16.1	4.2'	20°18.8	7.9'	60.9'	
23	167°28.9	14.1	192°39.2	4.1'	20°26.8	7.8'	60.9'	
	SD = 16.2'	d = 0.4'		SI	D = 16.5'			
Tue	GHA 182°28.6	Dec 522°14.4	GHA 207°02.3	ν 4.0'	Dec \$20°34.5	d 7.6'	HP 60.9'	
0 1	182 28.0 197°28.3	14.7	207 02.3 221°25.4	4.0 3.9'	20°42.2	7.6 7.5'	60.9	
2	212°28.1	15.1	235°48.3	3.9'	20°49.6	7.3'	60.9	
3	227°27.8	• • 15.4	250°11.2	3.8'	20°57.0	7.2'	60.9'	
4	242°27.6	15.7	264°34.0	3.7'	21°04.1	7.0'	60.9'	
5	257°27.3 272°27.1	16.1 \$22°16.4	278°56.7 293°19.4	3.7' 3.6'	21°11.2 S21°18.0	6.9' 6.7'	60.9'	
6 7	272 27.1 287°26.8	16.7	293 19.4 307°42.0	3.5'	21°24.7	6.6'	61.0' 61.0'	
8	302°26.6	17.1	322°04.5	3.5'	21°31.3	6.4	61.0'	
9	317°26.3	• • 17.4	336°27.0	3.4'	21°37.7	6.2'	61.0'	
10	332°26.1	17.7	350°49.4	3.3'	21°43.9	6.1'	61.0'	
11	347°25.8 2°25.5	18.0 S 22°18.4	5°11.7 19°34.0	3.3' 3.2'	21°50.0 \$21°55.9	5.9'	61.0'	
12 13	17°25.3	18.7	19°34.0 33°56.2	3.2'	22°01.7	5.8' 5.6'	61.0' 61.0'	
14	32°25.0	19.0	48° 18.4	3.1'	22°07.3	5.4	61.0'	
15	47°24.8	• • 19.3	62°40.6	3.1'	22°12.7	5.3'	61.0'	
16	62°24.5	19.7	77°02.6	3.0'	22°17.9	5.1'	60.9'	
17 18	77°24.3 92°24.0	20.0 S 22°20.3	91°24.7 105°46.7	3.0' 2.9'	22°23.0 522°27.9	4.9' 4.8'	60.9' 60.9'	
19	107°23.7	20.6	120°08.6		22°32.7	4.6'	60.9	
20	122°23.5	21.0	134°30.5	2.9'	22°37.3	4.4'	60.9'	
21	137°23.2	• • 21.3	148°52.4	2.8'	22°41.7	4.2'	60.9'	
22	152°23.0	21.6	163°14.2	2.8'	22°45.9 22°50.0	4.1'	60.9'	
23	167°22.7	21.9	177°36.0	2.8'		3.9'	60.9'	
	SD = 16.2'	d = 0.3'		SI	D = 16.6'			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°22.5	S22°22.2	191°57.8	2.7'	S22°53.9	3.7'	60.9'	
1	197°22.2	22.5	206°19.5	2.7'	22°57.6	3.5'	60.9'	
2 3	212°21.9 227°21.7	22.9 •• 23.2	220°41.2 235°02.9	2.7' 2.7'	23°01.2 23°04.5	3.4' 3.2'	60.9' 60.9'	
4	242°21.4	23.5	249°24.5	2.6'	23°07.7	3.0'	60.9	
5	257°21.2	23.8	263°46.2	2.6'	23°10.8	2.8'	60.9'	
6	272°20.9	S 22°24.1	278°07.8	2.6'	S23°13.6	2.7'	60.9'	
7	287°20.6	24.4	292°29.4	2.6'	23°16.3	2.5'	60.8'	
8 9	302°20.4 317°20.1	24.7 •• 25.0	306°51.0 321°12.6	2.6' 2.6'	23°18.8 23°21.1	2.3' 2.1'	60.8' 60.8'	
10	332°19.9	25.4	335°34.2	2.6'	23°23.2	2.0'	60.8	
11	347°19.6	25.7	349°55.7	2.6'	23°25.2	1.8'	60.8'	
12	2°19.3	S22°26.0	4°17.3	2.6'	\$23°26.9	1.6'	60.8'	
13	17°19.1 32°18.8	26.3	18°38.9 33°00.5	2.6'	23°28.5 23°30.0	1.4'	60.8'	
14 15	32°18.8 47°18.5	26.6 •• 26.9	33°00.5 47°22.0	2.6' 2.6'	23°30.0 23°31.2	1.2' 1.1'	60.8' 60.7'	
16	62°18.3	27.2	61°43.6	2.6'	23°32.3	0.9'	60.7	
17	77°18.0	27.5	76°05.2	2.6'	23°33.1	0.7'	60.7	
18	92°17.8	S22°27.8	90°26.8	2.6'	\$23°33.9	0.5'	60.7'	
19	107°17.5	28.1	104°48.5	2.6'	23°34.4	0.4'	60.7'	
20 21	122°17.2 137°17.0	28.4 •• 28.7	119°10.1 133°31.8	2.7' 2.7'	23°34.7 23°34.9	0.2' -0.0'	60.7' 60.6'	
22	152°16.7	29.0	133 31.8 147°53.5	2.7' 2.7'	23 34.9 23°34.9	-0.0 -0.2'	60.6	
23	167°16.4	29.3	162°15.2	2.7'	23°34.7	-0.4	60.6'	
	SD = 16.2'	d = 0.3'		SI	D = 16.6'			

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	ss Upper Lov		27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	10-1%	
03	10:18	10:06	11:50	09:37	22:07		
04	09:54	09:42	11:50	10:38	23:10		
05	09:30	09:17	11:51	11:42	-:-		

December 06, 07, 08 UT (Thu., Fri., Sat.)

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. 00.000 1 100.113 0000 305.32 3.000 30.200 31.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.0	0	75°04.1	141°10.0	524°01.1	138°32.0	522°30.6	211°39.7	S15°33.9	27°03.1	N15°20.4		0570005	00045.6
1 1097/901 1711/29 249011 1873/88 29.8 2411/45.6 34.4 5771.0 20.3 Accounty of the control		90°06.6					226°41.7						
1 101115 1867144 22566 18732 225 286785 244 72110 203 Soleton 38778 39774 39784 187140 203 187140 207 147 39783 39784 39		105°09.1			168°32.8	29.8	241°43.6		57°08.4				
1. 1. 1. 1. 1. 1. 1. 1.		120°11.5											
1. 150°165 15													
1													
19 19 19 19 19 19 19 19													
10 2012 2013 2012 2013 2012 2013 20													
10 2057-208 2017-247 563 2083-36 270 1.590.2 536 177-205 200 2004-240 2005-													
14 240"31.2 300"5.2 55.8 300"5.6 22"63 3.10"5.0 56 17"0.1 35.6 19"2.2 20.0 10"0.0													
12 255"317 321"277 321"53 18"368 32"243 32"01 S15"357 70"3748 N15"190													
13 207°36.2 338°27.2 54.8 338°371.2 599 47°05.1 35.9 227°14. 1999 Cappell 277.5 237°14. 1999 Cappell 277.5 238°14. 1999 Cappe													
14 887886 891 891 97 5-44 896 976 02 20 20 20 20 20 20 20 20 20 20 20 20													
19											Bellatrix		
19 131 436 21 237 52 31 40 36 32 15 24 4 1938 2 25 10 10 36 3 27 48 198 8 198 8 198 198 198 198 198 198 19													
17 330"640 36"35.2 \$2.9 \$37"389 \$22"241 \$10"129 \$36. \$22"80 \$19.7 \$10"51.9 \$10.0 \$1													
18											Betelgeuse		
19 0°91.0 66°333 51.9 66°393 7.238 137°168 36.7 81°293 197.6 Ambus 26°302 20°00.0 18°34 81°393 81°1											Canopus		
19 15°534 81°393 51.5 98°413 1.50 98°413 2.24 152°188 36.9 93°75.9 19.0 PARTHER 25.0 2.24 2.24 152°18 1.24 1.24 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.25											Sirius	258°22.4	
24 30°85.9 69°41.3 · · · · · · · · · · · · · · · · · ·											Adhara	255°02.4	-29°00.8
24 6 6 6 6 6 1 1 1 1 1 2 1 2 1 2 1 2 1 2 1											Procyon	244°46.5	5°08.7
Mer_pass 18-70 Mer_pass Mer_pass											Pollux	243°12.3	27°56.9
											Avior	$234^{\circ}12.6$	-59°36.2
Mer pass 18-57 Mer pass 18-57 Mer pass 18-57 Mer pass 18-57 Mer pass 18-57 Mer pass M	23	9.00.8							13-03.8	19.5	Suhail		
Fig. CHA C	Mer.p	bass. 18:57	ν 1.5′ d-0	.5′ m-4.91	ν 0.4′ d-0	.4′ m1.12	ν 2.0′ d0.	1' m-1.72	ν 2.6′ d-0	.0′ m-0.16			
Fig. GHA GHA Obc CHA Obc O	- 1											217°43.7	
Fig. CHA C				_		_		_		_	Regulus	207°30.2	11°49.0
0 70 033 1414-59 523 490 153-221 21 22 222.0 212 22 26.5 15 37.5 28 06.5 115 115 0 Denhelo 382 211 14 24.1 19 10 010 02 1714-50 40.6 166 42.5 21.2 2272.6 5 37.6 45.7 191 134 Gischa 173-39 6. 174-25.2 2 10 010 02 1714-50 40.6 6 166 42.5 21.2 2272.6 5 37.6 45.7 191 134 6.1 2 1174-50 40.6 6 166 42.5 21.2 2272.5 30.5 37.6 38 11.6 134 6.1 2 1174-50 40.6 6 166 42.5 21.2 2272.5 273.5 4.3 2.1 2 1174-50 5 151-15.6 2 1673.7 47.6 1913-3 20.5 273.4 4.3 31. 881-17.0 1.3 2.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1											_	193°36.5	61°34.9
1 91.057, 91.05475											Denebola		
2 106°08.2 117°49.0 48.6 166°42.5 21.2 22°30.5 37.8 18°11.8 19.4 19.4 19.1 19.4 19.1 19.3 19.1 19.4 19.5 19.1 19.3 19.2 19.1 19.3 19.2 19.2 19.2 19.2 19.3 19.3 19.2 19.2 19.2 19.3 19.3 19.2 19.2 19.2 19.3 19.3 19.2 19.2 19.2 19.2 19.3 19.2 19.2 19.2 19.2 19.2 19.2 19.2 19.2											I		
121 107 1 108 50.6													
180 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 131 136 13													
5 15 15 15 15 15 15 15 15 15													
160-181 231-55.3 523-666 228-441 522-198 302-393 318-39.2 318	5	151°15.6		47.1			287°36.4	38.2					
Table Tabl	6		231°55.3	S23°46.6		S22°19.8	302°38.3	S15°38.3		$N15^{\circ}19.2$			
8 196°23.0 261°86.4 45.6 258°44.9 19.0 332°42.2 33.6 148°27.6 19.1 9 211°25 277°40.0 45.6 278°45.3 18.7 347°42. 33.8 163°30.2 19.1 12 24°37.9 290°10.6 44.7 288°45.7 18.3 27°40.2 38.9 178°32.9 19.1 12 24°32.9 322°04.7 523°3.7 318°46.5 522°17.6 32°50.1 516°39.2 208°38.1 159°10.0 13 271°35.3 337°63.3 43.2 333°46.3 11.2 47°50. 39.5 233°43.4 18.9 19.0 14 286°37.8 352°07.9 42.7 348°47.3 16.8 62°54.0 39.5 233°43.4 18.9 19.0 15 301°40.2 70°95. 42.2 348°47.3 16.8 62°54.0 39.5 233°43.4 18.9 19.0 16 316°42.7 22°11.1 41.7 18°48.2 16.1 92°57.9 39.8 268°48.7 18.8 36.6 11.7 10°0.8 39.0 283°51.3 18.8 36.6 11.7 10°0.8 39.0 283°51.3 18.8 36.6 11.7 10°0.8 39.0 283°51.3 18.8 36.6 11.7 10°0.8 39.0 283°51.5 18.7 311°6.2 37°0.7 34°2.2 38.8 38.8 108°60.6 13.9 18.7 18	7	181°20.5	246°56.8	46.1	243°44.5	19.4		38.5		19.2			
11 12 12 13 14 15 15 15 15 15 15 15	8	196°23.0	261°58.4	45.6	258°44.9	19.0	332°42.2	38.6	148°27.6	19.1			
10 226°279 4 30°03.1 44.7 288°45.7 18.3 2°46.2 38.9 178°32.9 19.1 19.1 241°04.0 30°03.1 44.2 288°45.7 18.3 2°46.2 38.9 193°35.2 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0	9	211°25.5	277°00.0	• • 45.2	273°45.3	• • 18.7	347°44.2	• • 38.8	163°30.2	• • 19.1			
11 247°304 930°031 44.2 303°46.1 179 17'481 991 193°35.1 910 20°575.2 32°204.7 \$23°43.7 \$318°46.5 \$22°17.6 32°50.1 \$15°90.2 \$20°38.1 \$10.5°19.0 31 271°35.3 \$37°06.3 43.2 333°46.9 17.2 47'52.0 39.4 \$233°40.8 19.0 4 286°35.3 \$37°06.3 43.2 333°46.9 17.2 47'52.0 39.4 \$223°40.8 19.0 4 286°35.3 \$37°07.9 42.7 388°47.3 16.8 62°54.0 39.5 238°43.4 18.9 4 286°40.7 \$22°11.1 41.7 18°48.2 16.1 92°57.9 39.8 268°40.7 18.8 5 301°40.2 7°09.5 4.2 2 3°47.7 16.5 77'55.9 39.7 \$253°46.0 18.9 4 318°45.2 37°12.7 41.2 33°48.6 15.7 107'59.8 39.9 \$288°41.3 18.8 5 346°47.6 52°14.3 \$23°40.8 48°49.0 \$22°15.4 132°01.8 \$15°40.1 \$208°40.8 15°18.8 5 346°4.6 52°14.3 \$23°40.8 48°49.0 \$22°15.4 132°01.8 \$15°40.1 \$208°40.8 15°18.8 5 346°4.6 52°14.5 39.8 48.8 48°49.9 \$22°15.4 138°0.5 4 40.2 \$313°56.6 18.7 5 36°1.6 67'15.9 40.3 63°49.4 \$15.0 138°0.8 40.2 313°56.6 18.7 5 46°5.6 82°17.5 39.8 78°49.8 14.6 138°0.5 4 40.2 313°56.6 18.7 5 46°5.6 82°17.5 39.8 78°49.8 14.6 138°0.5 4 40.2 313°56.6 18.7 5 46°5.7 312°20.8 33.8 108°50.6 13.9 138°30.6 40.7 359°0.5 18.7 5 46°5.7 312°20.8 33.8 108°50.6 13.9 138°30.6 40.7 359°0.4 5 16.6 5 46°5.7 312°20.8 33.8 108°50.6 13.9 138°30.6 40.7 359°0.5 18.6 5 46°4.7 42°24.0 \$23°37.8 138°51.4 \$22°13.1 213°13.5 \$15°41.0 \$20°00.8 N15°18.5 \$20°00.9 \$20°3.3 \$32°30.9 \$38°40.0 \$23°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.9 \$38°40.0 \$20°30.0 \$38°40.	10	226°27.9	292°01.6	44.7	288°45.7	18.3	2°46.2	38.9	178°32.9	19.1			
12 256 32.9 32°04.7 38°40.5 \$22°17.6 32°50.1 \$15°39.2 208°38.1 \$15°19.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$130°51.0 \$10°50.8 \$130°51.0 \$15°51.0 \$10°50.8 \$130°51.0 \$15°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°50.8 \$130°51.0 \$10°51.0 \$60°51.0 \$10°51.0 \$60°51.0 \$10°51.0 \$60°51.0 \$10°50.0 \$130°51.0 \$130°51.0 \$10°51	11	241°30.4	307°03.1	44.2	303°46.1	17.9	$17^{\circ}48.1$	39.1	193°35.5	19.0			
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9 212°24.6 277°38.9 · · 33.4 273°55.1 · · · 09.7 348°31.2 · · · 42.3 164°33.5 · · · 18.2 10 227°27.1 292°40.6 32.9 288°55.5 09.4 3°33.1 42.4 179°36.1 18.2 11 242°29.5 307°42.2 32.4 303°55.9 09.0 18°35.1 42.6 194°38.8 18.1 12 257°32.0 322°43.9 \$23°31.9 318°56.3 \$22°08.6 33°37.0 \$15°42.7 209°41.4 \$N15°18.1 13 272°34.5 337°45.6 31.4 333°56.7 08.2 48°39.0 42.8 224°44.0 18.0 14 287°36.9 352°47.3 30.9 348°57.1 07.9 63°40.9 43.0 239°46.7 18.0 15 302°39.4 7°49.0 · · 30.4 3°57.5 · · 07.5 78°42.9 · · 43.1 254°49.3 · · 18.0 16 317°41.9 22°50.7 29.9 18°57.9 07.1 93°44.9 43.3 269°51.9 17.9 17 332°44.3 37°52.4 29.5 33°58.3 06.7 108°46.8 43.4 284°54.6 17.9 18 347°46.8 52°54.1 \$23°29.0 48°58.7 \$22°06.3 123°48.8 \$15°43.6 299°57.2 \$N15°17.9 19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · · 27.5 94°00.0 · · 05.2 168°54.6 · · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23													
10 227°27.1 292°40.6 32.9 288°55.5 09.4 3°33.1 42.4 179°36.1 18.2 11 242°29.5 307°42.2 32.4 303°55.9 09.0 18°35.1 42.6 194°38.8 18.1 12 257°32.0 322°43.9 \$23°31.9 318°56.3 \$22°08.6 33°37.0 \$515°42.7 \$209°41.4 \$15°18.1 13 272°34.5 337°45.6 31.4 333°56.7 08.2 48°39.0 42.8 224°44.0 18.0 18.0 18.0 18.0 18.0 18.0 18.0 18											Jatuill	J11 J3.U	22.00
11 242°29.5 307°42.2 32.4 303°55.9 09.0 18°35.1 42.6 194°38.8 18.1 12 257°32.0 322°43.9 \$23°31.9 318°56.3 \$22°08.6 33°37.0 \$15°42.7 209°41.4 \$N15°18.1 13 272°34.5 337°45.6 31.4 333°56.7 08.2 48°39.0 42.8 224°44.0 18.0 14 287°36.9 352°47.3 30.9 348°57.1 07.9 63°40.9 43.0 239°46.7 18.0 15 302°39.4 7°49.0 · 30.4 3°57.5 · 07.5 78°42.9 · 43.1 254°49.3 · 18.0 16 317°41.9 22°50.7 29.9 18°57.9 07.1 93°44.9 43.3 269°51.9 17.9 17 332°44.3 37°52.4 29.5 33°58.3 06.7 108°46.8 43.4 284°54.6 17.9 18 347°46.8 52°54.1 \$23°29.0 48°58.7 \$22°06.3 123°48.8 \$15°43.6 299°57.2 N15°17.9 19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · 27.5 94°00.0 · 05.2 168°54.6 · 44.0 345°05.1 · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Mars: 65°42.7 14:31 Mars 62°38.4 14:45 Jupiter 136°23.3 09:49 Jupiter 136°23.3 09:49 48°49.4 14.4 14.5 Jupiter 136°23.3 09:49 44.4 14.5 44.5 44.5 Jupiter 136°23.3 09:49 42.8 224°44.0 18.0 44.0 45.0											Dec 07 Fri		Mer.pass
12 257°32.0 322°43.9 \$23°31.9 318°56.3 \$22°08.6 33°37.0 \$15°42.7 209°41.4 \$N15°18.1 \$13 272°34.5 337°45.6 31.4 333°56.7 08.2 48°39.0 42.8 224°44.0 18.0 18.0 18.0 18.0 18.0 18.0 18.0 18											Venus	65°42.7	14:31
13 272°34.5 337°45.6 31.4 333°56.7 08.2 48°39.0 42.8 224°44.0 18.0 18.0 18.0 18.0 18.0 18.0 18.0 18											Mars	62°38.4	14:45
14 287°36.9 352°47.3 30.9 348°57.1 07.9 63°40.9 43.0 239°46.7 18.0 15 302°39.4 7°49.0 · · 30.4 3°57.5 · · 07.5 78°42.9 · · · 43.1 254°49.3 · · 18.0 16 317°41.9 22°50.7 29.9 18°57.9 07.1 93°44.9 43.3 269°51.9 17.9 17 332°44.3 37°52.4 29.5 33°58.3 06.7 108°46.8 43.4 284°54.6 17.9 18 347°46.8 52°54.1 \$23°29.0 48°58.7 \$22°06.3 123°48.8 \$15°43.6 299°57.2 N15°17.9 19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · 27.5 94°00.0 · · 05.2 168°54.6 · · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7											Jupiter	$136^{\circ}23.3$	09:49
15 302°39.4 7°49.0 · · 30.4 3°57.5 · · · 07.5 78°42.9 · · 43.1 254°49.3 · · 18.0 16 317°41.9 22°50.7 29.9 18°57.9 07.1 93°44.9 43.3 269°51.9 17.9 17.9 18.0 18.0 18.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19											Saturn	$312^{\circ}03.2$	22:04
16 317°41.9 22°50.7 29.9 18°57.9 07.1 93°44.9 43.3 269°51.9 17.9 17.9 17.9 17.9 17.9 17.9 17.9 1											D. 00.0	CIIA	NA-
17 332°44.3 37°52.4 29.5 33°58.3 06.7 108°46.8 43.4 284°54.6 17.9 18 347°46.8 52°54.1 \$23°29.0 48°58.7 \$22°06.3 123°48.8 \$15°43.6 299°57.2 \$N15°17.9 19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · 27.5 94°00.0 · · 05.2 168°54.6 · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Mars 61°49.0 14:44 Jupiter 136°11.1 09:46 Saturn 312°07.3 21:59 Horizontal parallax Venus: 0.4 Mars 61°49.0 14:44 Volume: 136°11.1 09:46 Saturn 312°07.3 21:59													
18 347°46.8 52°54.1 \$23°29.0 48°58.7 \$22°06.3 123°48.8 \$15°43.6 299°57.2 N15°17.9 19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · · 27.5 94°00.0 · · · 05.2 168°54.6 · · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 315°10.													
19 2°49.2 67°55.8 28.5 63°59.1 05.9 138°50.7 43.7 314°59.8 17.8 20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · 27.5 94°00.0 · · 05.2 168°54.6 · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Saturn 312°07.3 21:59 Horizontal parallax Venus: 0.4 Mars: 0.1													
20 17°51.7 82°57.5 28.0 78°59.6 05.6 153°52.7 43.9 330°02.5 17.8 21 32°54.2 97°59.2 · · 27.5 94°00.0 · · 05.2 168°54.6 · · 44.0 345°05.1 · · 17.7 22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Horizontal parallax Venus: 0.4 Mars: 0.1													
21 32°54.2 97°59.2 · · 27.5 94°00.0 · · 05.2 168°54.6 · · 44.0 345°05.1 · · 17.7 Horizontal parallax Venus: 0.4 23 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 Venus: 0.4 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Mars: 0.1 0.1											Saturn	312°07.3	21:59
22 47°56.6 113°00.9 27.0 109°00.4 04.8 183°56.6 44.1 0°07.7 17.7 Venus: 0.4 23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Mars: 0.1											Horizont	al narallav	
23 62°59.1 128°02.6 26.5 124°00.8 04.4 198°58.6 44.3 15°10.4 17.7 Mars: 0.1											1101120111	-	0.4
25 02 33.1 120 02.0 20.3 121 00.0 01.1 130 30.0 11.3 15 10.1 17.1													
Mer.pass. 18:49 $\nu 1.6' \ d$ -0.5' m-4.91 $\nu 0.4' \ d$ -0.4' m1.12 $\nu 2.0' \ d$ 0.1' m-1.73 $\nu 2.6' \ d$ -0.0' m-0.15	23	0∠ 59.1	128 02.0	∠0.5			190 08.0	44.3	15 10.4	17.7		141013.	0.1
	Mer.p	ass. 18:49	ν 1.6′ d-0	.5′ m-4.91	ν 0.4′ d-0	.4′ m1.12	ν 2.0′ d0.	1′ m-1.73	ν 2.6′ d-0	.0′ m-0.15			

h	Sui	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°16.2	S22°29.6	176°36.9	2.8'	S23°34.4	-0.5'	60.6'	
1 2	197°15.9 212°15.6	29.9 30.2	190°58.7 205°20.5	2.8' 2.8'	23°33.8 23°33.1	-0.7' -0.9'	60.6' 60.5'	
3	212 15.0 227°15.4	30.2	205 20.5 219°42.4	2.0	23°32.2	-0.9 -1.1'	60.5	
4	242°15.1	30.8	234°04.3	2.9'	23°31.2	-1.2'	60.5	
5	257°14.9	31.1	248°26.2	3.0'	23°29.9	-1.4'	60.5'	
6 7	272°14.6 287°14.3	\$22°31.4 31.7	262°48.2 277°10.2	3.0' 3.1'	\$23°28.5 23°26.9	-1.6' -1.8'	60.5' 60.4'	
8	302°14.1	32.0	291°32.3	3.1'	23°25.2	-1.0 -1.9'	60.4	
9	317°13.8	• • 32.3	305°54.4	3.2'	23°23.3	-2.1'	60.4'	
10	332°13.5	32.6	320°16.6	3.2'	23°21.2	-2.3'	60.4'	
11 12	347°13.3 2°13.0	32.8 \$22°33.1	334°38.8 349°01.1	3.3' 3.3'	23°18.9 523°16.5	-2.4' -2.6'	60.3' 60.3'	
13	17°12.7	33.4	3°23.4	3.4'	23°13.8	-2.8'	60.3	
14	32°12.5	33.7	17°45.8	3.5'	$23^{\circ}11.1$	-2.9'	60.3'	
15	47°12.2	• • 34.0	32°08.3	3.5'	23°08.1	-3.1'	60.2'	
16 17	62°11.9 77°11.7	34.3 34.6	46°30.8 60°53.4	3.6' 3.7'	23°05.0 23°01.8	-3.3' -3.4'	60.2' 60.2'	
18	92°11.4	\$22°34.9	75°16.1	3.7'	\$22°58.3	-3.6'	60.2'	
19	107°11.1	35.1	89°38.8	3.8'	22°54.7	-3.8'	60.1'	
20	122°10.8	35.4	104°01.7	3.9'	22°51.0	-3.9'	60.1	
21 22	137°10.6 152°10.3	· · 35.7 36.0	118°24.6 132°47.5	4.0' 4.1'	22°47.1 22°43.0	-4.1' -4.2'	60.1' 60.0'	
23	167°10.0	36.3	147°10.6	4.1'	22°38.8	-4.4'	60.0	
	SD = 16.2'	d = 0.3'		S	D = 16.5'			
Fri	GHA 182°09.8	Dec	GHA	ν	Dec	d	HP	
0 1	182°09.8 197°09.5	\$22°36.5 36.8	161°33.7 175°56.9	4.2' 4.3'	\$22°34.4 22°29.9	-4.5' -4.7'	60.0' 60.0'	
2	212°09.2	37.1	190°20.2	4.4'	22°25.2	-4.8'	59.9'	
3	227°09.0	• • 37.4	204°43.6	4.5'	22°20.3	-5.0'	59.9'	
4	242°08.7 257°08.4	37.7	219°07.1 233°30.7	4.6'	22°15.3 22°10.2	-5.1'	59.9'	
5 6	257°08.4 272°08.1	37.9 \$22°38.2	233° 30.7 247° 54.3	4.7' 4.7'	522°04.9	-5.3' -5.4'	59.8' 59.8'	
7	287°07.9	38.5	262°18.1	4.8'	21°59.4	-5.6'	59.8'	
8	302°07.6	38.8	276°41.9	4.9'	21°53.9	-5.7'	59.7'	
9	317°07.3 332°07.1	• • 39.0	291°05.9	5.0'	21°48.1 21°42.3	-5.9'	59.7'	
10 11	332 07.1 347°06.8	39.3 39.6	305°29.9 319°54.0	5.1' 5.2'	21 42.3 21°36.3	-6.0' -6.1'	59.7' 59.6'	
12	2°06.5	S22°39.9	334°18.2	5.3'	S21°30.1	-6.3'	59.6'	
13	17°06.2	40.1	348°42.6	5.4'	21°23.8	-6.4'	59.6'	
14 15	32°06.0 47°05.7	40.4 •• 40.7	3°07.0 17°31.5	5.5' 5.6'	21°17.4 21°10.9	-6.6' -6.7'	59.5' 59.5'	
16	62°05.4	40.7	31°56.2	5.7'	21°04.2	-6.8	59.5'	
17	77°05.2	41.2	$46^{\circ}20.9$	5.8'	$20^{\circ}57.3$	-6.9'	59.4'	
18	92°04.9 107°04.6	\$22°41.5	60°45.8 75°10.7	5.9'	\$20°50.4 20°43.3	-7.1'	59.4'	
19 20	107 04.6 122°04.3	41.7 42.0	75 10.7 89°35.7	6.1' 6.2'	20°36.1	-7.2' -7.3'	59.4' 59.3'	
21	137°04.1	• • 42.3	104°00.9	6.3	20°28.8	-7.5'	59.3'	
22	152°03.8	42.5	118°26.2	6.4'	20°21.3	-7.6'	59.3'	
23	167°03.5	42.8	132°51.5	6.5'	20°13.8	-7.7'	59.2'	
	SD = 16.2'	d = 0.3'		S	D = 16.4'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°03.2	S22°43.1	147°17.0	6.6'	\$20°06.1	-7.8'	59.2'	
1 2	197°03.0 212°02.7	43.3 43.6	161°42.6 176°08.3	6.7' 6.8'	19°58.3 19°50.3	-7.9' -8.0'	59.2' 59.1'	
3	212 02.7 227°02.4	. 43.8	170 08.3 190°34.1	6.9'	19°50.3	-8.2'	59.1'	
4	242°02.1	44.1	$205^{\circ}00.1$	7.0'	19°34.2	-8.3'	59.0'	
5	257°01.9 272°01.6	44.3	219°26.1	7.1'	19°25.9	-8.4'	59.0'	
6 7	272°01.6 287°01.3	\$22°44.6 44.9	233°52.2 248°18.5	7.3' 7.4'	\$19°17.5 19°09.0	-8.5' -8.6'	59.0' 58.9'	
8	302°01.0	45.1	262°44.8	7.5'	19°00.4	-8.7'	58.9'	
9	317°00.8	• • 45.4	277°11.3	7.6'	18°51.7	-8.8'	58.9'	
10 11	332°00.5 347°00.2	45.6 45.9	291°37.9 306°04.6	7.7' 7.8'	18°43.0 18°34.1	-8.9' -9.0'	58.8' 58.8'	
11	1°59.9	45.9 \$22°46.1	306°04.6 320°31.4	7.8	\$18°34.1 \$18°25.1	-9.0° -9.1°	58.8	
13	16°59.6	46.4	334°58.3	8.0'	$18^{\circ}16.0$	-9.2'	58.7'	
14	31°59.4	46.6	349°25.4	8.1'	18°06.8	-9.3'	58.7'	
15 16	46°59.1 61°58.8	· · 46.9 47.1	3°52.5 18°19.8	8.3' 8.4'	17°57.5 17°48.1	-9.4' -9.5'	58.6' 58.6'	
17	76°58.5	47.1 47.4	32°47.2	8.5'	17°48.1 17°38.6	-9.5 -9.6'	58.5'	
18	91°58.3	S22°47.6	47°14.6	8.6'	S17°29.1	-9.6'	58.5'	
19	106°58.0	47.9	61°42.2	8.7'	17°19.4	-9.7'	58.5'	
20 21	121°57.7 136°57.4	48.1 •• 48.4	76°09.9 90°37.7	8.8' 8.9'	17°09.7 16°59.9	-9.8' -9.9'	58.4' 58.4'	
22	150°57.4	48.6	105°05.7	9.0'	16°50.0	-10.0'	58.4	
23	166°56.9	48.9	119°33.7	9.1'	16°40.0	-10.1'	58.3'	
	SD = 16.2'	d = 0.3'		S	D = 16.1'	_		

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

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

		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%	
06	09:05	08:52	11:51	12:46	00:14		
07	08:39	08:26	11:52	13:47	01:17		
08	08:13	08:00	11:52	14:44	02:16		

December 09, 10, 11 UT (Sun., Mon., Tue.)

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	78°01.6	143°04.3	\$23°26.0	139°01.2	\$22°04.0	214°00.5	S15°44.4	30°13.0	N15°17.6		JIIA	
1	93°04.0	158°06.1		154°01.6	03.7	214 00.5 229°02.5		45°15.6	17.6	Alpheratz	357°30.5	29°15.6
2	93 04.0 108°06.5		25.5 25.0	169°02.0	03.7	244°04.4	44.6	60°18.3		Ankaa	353°03.3	-42°08.7
		173°07.8				259°06.4	44.7	75°20.9	17.6	Schedar	$349^{\circ}26.1$	56°42.5
3	123°09.0	188°09.5	• • 24.5	184°02.4	• • 02.9		• • 44.9		• • 17.5	Diphda	348°43.3	-17°49.3
4	138° 11.4	203°11.3	24.0	199°02.8	02.5	274°08.4	45.0	90°23.5	17.5	Achernar	$335^{\circ}17.1$	-57°05.3
5	153° 13.9	218°13.0	23.5	214°03.2	02.1	289°10.3	45.1	105°26.2	17.5	Hamal	327°46.4	23°36.4
6	168° 16.3	233°14.8	523°23.0	229°03.7	\$22°01.7	304°12.3	S15°45.3	120°28.8	N15°17.4	Polaris	311°21.3	89°23.4
7	183° 18.8	248°16.5	22.5	244°04.1	01.3	319°14.2	45.4	135°31.4	17.4	Acamar	315°08.5	-40°11.2
8	198°21.3	263°18.3	22.0	259°04.5	01.0	334°16.2	45.6	150°34.1	17.3	Menkar	$314^{\circ}01.7$	4°12.4
9	213°23.7	278°20.0	• • 21.5	274°04.9	• • 00.6	349°18.2	• • 45.7	165°36.7	• • 17.3	Mirfak	308°22.0	49°58.1
10	228° 26.2	293°21.8	21.0	289°05.3	22°00.2	4°20.1	45.9	180°39.3	17.3	Aldebaran	290°34.7	16°34.1
11	243°28.7	308°23.6	20.5	304°05.7	21°59.8	19°22.1	46.0	195°42.0	17.2	Rigel	280°59.7	-8°10.1
12	258°31.1	323°25.3	\$23°20.0	319°06.1	S21°59.4	34°24.0	S15°46.1	210°44.6	N15°17.2	Capella	$280^{\circ}15.5$	46°01.5
13	273°33.6	338°27.1	19.5	334°06.5	59.0	49°26.0	46.3	225°47.2	17.2	Bellatrix	278°18.3	6°22.5
14	288°36.1	353°28.9	19.0	349°06.9	58.6	64°28.0	46.4	240°49.9	17.1	Elnath	277°56.5	28°37.8
15	303°38.5	8°30.7	• • 18.5	4°07.3	• • 58.2	79°29.9	• • 46.6	255°52.5	• • 17.1	Alnilam	275°33.4	-1°11.1
16	318°41.0	23°32.5	18.0	19°07.8	57.8	94°31.9	46.7	270°55.1	17.0	Betelgeuse	270°47.5	7°24.6
17	333°43.5	38°34.3	17.5	34°08.2	57.4	109°33.8	46.9	285°57.8	17.0	Canopus	263°50.1	-52°42.7
18	348°45.9	53°36.1	\$23°17.0	49°08.6	S21°57.1	124°35.8	S15°47.0	301°00.4	N15°17.0	Sirius	258° 22.4	-16°45.5
19	3°48.4	68°37.9	16.5	64°09.0	56.7	139°37.8	47.1	316°03.0	16.9	Adhara	255°02.4	-29°00.8
20	18° 50.8	83°39.7	16.0	79°09.4	56.3	154°39.7	47.3	331°05.7	16.9	Procyon	244°46.4	5°08.7
21	33°53.3	98°41.5	• • 15.6	94°09.8	• • 55.9	169°41.7	• • 47.4	346°08.3	• • 16.9	Pollux	243°12.2	27°56.9
22	48°55.8	113°43.3	15.1	109°10.2	55.5	184°43.6	47.6	1°10.9	16.8	Avior	234°12.5	-59°36.2
23	63°58.2	128°45.1	14.6	124°10.6	55.1	199°45.6	47.7	16°13.5	16.8	Suhail	222°43.1	-43°33.2
Mer.p	ass. 18:45	$\nu 1.7' \ d-0.$.5′ m-4.91	ν 0.4′ d-0	.4′ m1.12	$\nu 2.0' \ d0.$	1′ m-1.73	$\nu 2.6' \ d-0$.0′ m-0.14	Miaplacidus	221°36.6	-69°50.3
<u> </u>										Alphard	217°43.7	-8°47.4
	CIIA	CIIA	Б	CIIA	Б	CIIA	Б	CIIA	Б	Regulus	207°30.2	11°49.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.5	61°34.9
0	79°00.7	143°46.9	\$23°14.1	139°11.1	S21°54.7	214°47.6	S15°47.9	31°16.2	N15°16.8	Denebola	$182^{\circ}21.0$	14°24.1
1	94°03.2	158°48.8	13.6	154°11.5	54.3	229°49.5	48.0	46°18.8	16.7	Gienah	175°39.6	-17°42.5
2	109°05.6	173°50.6	13.1	169°11.9	53.9	244°51.5	48.1	61°21.4	16.7	Acrux	172°55.6	-63°15.7
3	124°08.1	188°52.4	• • 12.6	184°12.3	• • 53.5	259°53.4	• • 48.3	76°24.1	• • 16.6	Gacrux	171°47.2	-57°16.6
4	139° 10.6	203°54.3	12.1	199°12.7	53.1	274°55.4	48.4	91°26.7	16.6	Alioth	$166^{\circ}10.0$	55°47.5
5	154° 13.0	218°56.1	11.6	214°13.1	52.7	289°57.4	48.6	106°29.3	16.6	Spica	158° 18.3	-11°19.0
6	169° 15.5	233°57.9	\$23°11.1	229°13.5	S21°52.3	304°59.3	S15°48.7	121°32.0	N15°16.5	Alkaid	152°49.4	49°09.6
7	184° 18.0	248°59.8	10.6	244°13.9	51.9	320°01.3	48.9	136°34.6	16.5	Hadar	148°30.6	-60°30.8
8	199° 20.4	264°01.6	10.1	259°14.4	51.5	335°03.2	49.0	151°37.2	16.5	Menkent	$147^{\circ}53.1$	-36°30.9
9	214°22.9	279°03.5	• • 09.6	274°14.8	• • 51.1	350°05.2	• • 49.1	166°39.8	. 16.4	Arcturus	145°44.6	19°01.5
10	229°25.3	294°05.4	09.0	289°15.2	50.7	5°07.2	49.3	181°42.5	16.4	Rigil Kent.	139°35.2	-60°57.3
11	244°27.8	309°07.2	08.5	304°15.6	50.3	20°09.1	49.4	196°45.1	16.4	Kochab	$137^{\circ}21.3$	74°01.7
12	259°30.3	324°09.1	\$23°08.0	319°16.0	S21°49.9	35°11.1	S15°49.6	211°47.7	N15°16.3	Zuben'ubi	$136^{\circ}51.9$	-16°09.8
13	274°32.7	339°11.0	07.5	334°16.4	49.5	50°13.0	49.7	226°50.4	16.3	Alphecca	126°00.8	26°36.8
14	289°35.2	354°12.8	07.0	349°16.8	49.1	65°15.0	49.9	241°53.0	16.3	Antares	$112^{\circ}11.3$	-26°29.7
15	304° 37.7	9°14.7	• • 06.5	4°17.3	• • 48.7	80°17.0	• • 50.0	256°55.6	. 16.2	Atria	$107^{\circ}02.5$	-69°04.6
16	319°40.1	24°16.6	06.0	19°17.7	48.3	95°18.9	50.1	271°58.3	16.2	Sabik	101°58.6	-15°45.5
17	334°42.6	39°18.5	05.5	34°18.1	47.9	110°20.9	50.3	287°00.9	16.1	Shaula	96°05.4	-37°07.3
18	349°45.1	54°20.4	\$23°05.0	49°18.5	S21°47.5	125°22.9	\$15°50.4	302°03.5	N15°16.1	Rasalhague	95°55.2	12°32.5
19	4°47.5	69°22.3	04.5	64°18.9	47.1	140°24.8	50.6	317°06.1	16.1	Eltanin	90°40.9	51°29.3
20	19°50.0	84°24.2	04.0	79°19.3	46.7	155°26.8	50.7	332°08.8	16.0	Kaus Aust.	83°27.7	-34°22.0
21	34°52.4	99°26.1	• • 03.5	94°19.7 109°20.2	• • 46.3	170°28.7	• • 50.8	347°11.4	• • 16.0	Vega	80°30.9	38°48.9
22	49°54.9	114°28.0	03.0	109 20.2 124°20.6	45.9	185°30.7	51.0	2°14.0	16.0	Nunki	75°43.2	-26°15.4
23	64°57.4	129°29.9	02.5	124 20.6	45.5	200°32.7	51.1	17°16.7	15.9	Altair	$61^{\circ}56.4$	8°57.1
Mer.p	ass. 18:41	ν 1.8′ d-0.	.5′ m-4.90	ν 0.4′ d-0	.4′ m1.12	ν 2.0′ d0.	1′ m-1.73	ν 2.6′ d-0	.0′ m-0.14	Peacock	53°00.1	-56°38.3
										Deneb	49°23.3	45°23.6
T	CIIA	CILA	D	CIIA	D	CIIA	D	CIIA	D	Enif	33°35.0	10°01.0
Tue	GHA 79°59.8	GHA	Dec	GHA 120° 21 0	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.3	-46°49.0
0		144°31.9	\$23°02.0	139°21.0	\$21°45.1	215°34.6	\$15°51.3	32°19.3	N15°15.9	Fomalhaut	15°10.3	-29°27.8
1	95°02.3	159°33.8	01.5	154°21.4	44.7	230°36.6	51.4 51.6	47°21.9	15.9	Scheat	13°41.3	28°15.0
2	110°04.8	174°35.7	01.0	169°21.8	44.3	245°38.6	51.6	62°24.5	15.8	Markab	13°25.9	15°22.2
3	125°07.2 140°09.7	189°37.6	· · 00.5	184°22.2 199°22.7	· · 43.9	260°40.5	· · 51.7	77°27.2 92°29.8	· · 15.8	Dec 09 Sun	SHA	Mer.pass
4		204°39.6	23°00.0		43.5	275°42.5	51.8 52.0		15.8	Venus	5HA 65°02.8	14:26
5	155° 12.2	219°41.5	22°59.5	214°23.1	43.1	290°44.4	52.0 \$15°52.1	107°32.4	15.7 N15°15.7	Mars	60°59.6	14:26
6	170°14.6	234°43.5	S22°59.0	229°23.5	\$21°42.7	305°46.4	\$15°52.1	122°35.0	N15°15.7	Jupiter	135°59.0	09:43
7 8	185° 17.1 200° 19.6	249°45.4 264°47.4	58.5 58.0	244°23.9 259°24.3	42.3 41.9	320°48.4 335°50.3	52.3 52.4	137°37.7 152°40.3	15.7 15.6	Saturn	312° 11.4	21:55
9	200° 19.6 215° 22.0	264°47.4 279°49.3	58.0 •• 57.5	259°24.3 274°24.7	41.9 •• 41.5	350°52.3		152°40.3 167°42.9	15.6	Saturn	J12 11.4	21.00
	215 22.0 230° 24.5	279 49.3 294°51.3		274 24.7 289°25.2	41.5	5°54.3	• • 52.5 52.7	167 42.9 182°45.5	15.5	Dec 10 Mon	SHA	Mer.pass
10 11	230° 24.5 245° 26.9	294°51.3 309°53.2	57.0 56.5	289°25.2 304°25.6	41.1 40.7	5°54.3 20°56.2	52.7 52.8	182°45.5 197°48.2	15.5 15.5	Venus	64°46.2	14:23
12	245 26.9 260° 29.4	309 53.2 324°55.2	50.5 \$22°56.0	304 25.6 319°26.0	40.7 \$21°40.2	20 56.2 35°58.2	52.8 \$15°53.0	212°50.8	N15°15.5	Mars	$60^{\circ}10.4$	14:43
13	200 29.4 275°31.9	324 55.2 339°57.2	522 50.0 55.5	319 26.0 334°26.4	39.8	55 58.2 51°00.1	53.1	212 50.8 227°53.4	N15 15.5 15.4	Jupiter	135°46.9	09:40
13 14	275 31.9 290°34.3	354°59.2	55.0	334 26.4 349°26.8	39.8 39.4	66°02.1	53.1	242°56.1	15.4 15.4	Saturn	$312^{\circ}15.5$	21:51
	290 34.3 305°36.8	354 59.2 10°01.2	54.5	349 20.8 4°27.2	39.4	81°04.1	53.4	242 56.1 257°58.7	15.4	D 11 T	CIIA	Ma:: :-
15 16	305 36.8 320°39.3	25°03.1	54.5 54.0	4 27.2 19°27.7	38.6	96°06.0	53.5	257 58.7 273°01.3	15.4	Dec 11 Tue	SHA 64°32.0	Mer.pass
16 17	320 39.3 335°41.7	40°05.1	54.0 53.5	19 27.7 34°28.1	38.0	96 06.0 111°08.0	53.5 53.7	273 01.3 288°03.9	15.3	Venus	64°32.0	14:20
18	350°44.2	40 05.1 55°07.1	53.5 \$22°52.9	49°28.5	38.2 \$21°37.8	111 08.0 126°10.0	53.7 \$15°53.8	288 03.9 303°06.6	N15°15.3	Mars	59°21.1	14:42
19	5° 46.7	70°09.1	52.4	64°28.9	37.4	141°11.9	53.9	318°09.2	15.2		135°34.8	09:36
20	20°49.1	85°11.1	51.9	79°29.3	37.4	156°13.9	54.1	333°11.8	15.2	Saturn	312°19.4	21:47
21	35°51.6	100°13.1	•• 51.4	94°29.7	• • 36.5	171°15.9	• • 54.2	348°14.4	. 15.2	Horizont	al parallax	
22	50°54.1	115°15.2	50.9	109°30.2	36.1	171 13.9 186°17.8	54.4	3°17.1	15.2		Venus:	0.4
23	65° 56.5	130°17.2	50.4	124°30.6	35.7	201°19.8	54.5	18°19.7	15.1		Mars:	0.1
Mer.p	ass. 18:37	ν 1.9′ d-0.	.5′ m-4.90	ν 0.4′ d-0	.4′ m1.12	ν 2.0′ d0.	1′ m-1.73	ν 2.6′ d-0	.0′ m-0.13			

h	Sui		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°56.6	S22°49.1	134°01.8	9.2'	S16°29.9	-10.1'	58.3'
1 2	196°56.3 211°56.0	49.3 49.6	148°30.1 162°58.4	9.4' 9.5'	16° 19.8 16° 09.5	-10.2' -10.3'	58.2' 58.2'
3	226°55.7	49.8	102 36.4 177°26.9	9.6'	15°59.2	-10.3 -10.4'	58.2
4	241°55.5	50.1	191°55.5	9.7'	$15^{\circ}48.9$	-10.4'	58.1'
5	256°55.2	50.3	206°24.1	9.8'	15°38.4	-10.5'	58.1'
6 7	271°54.9 286°54.6	\$22°50.5 50.8	220°52.9 235°21.8	9.9' 10.0'	\$15°27.9 15°17.3	-10.6' -10.7'	58.0' 58.0'
8	301°54.3	51.0	249°50.8	10.1	15°06.7	-10.7'	58.0'
9	316°54.1	• • 51.3	264°19.9	10.2'	$14^{\circ}56.0$	-10.8'	57.9'
10	331°53.8 346°53.5	51.5	278°49.1 293°18.4	10.3' 10.4'	14°45.2 14°34.3	-10.8'	57.9'
11 12	1°53.2	51.7 S 22°52.0	293 18.4 307°47.8	10.4	14 34.3 S14°23.4	-10.9' -11.0'	57.8' 57.8'
13	16°52.9	52.2	322°17.3	10.6'	14° 12.5	-11.0'	57.8'
14	31°52.7	52.4	336°47.0	10.7'	14°01.4	-11.1'	57.7'
15 16	46°52.4 61°52.1	· · 52.7 52.9	351°16.7 5°46.5	10.8' 10.9'	13°50.3 13°39.2	-11.1' -11.2'	57.7' 57.6'
17	76°51.8	53.1	20°16.4	11.0'	13° 28.0	-11.2'	57.6'
18	91°51.5	S22°53.4	34°46.4	11.1'	S 13°16.8	-11.3'	57.6'
19	106°51.2	53.6	49°16.5	11.2'	13°05.5	-11.4'	57.5
20 21	121°51.0 136°50.7	53.8 • • 54.0	63°46.7 78°17.0	11.3' 11.4'	12°54.1 12°42.7	-11.4' -11.4'	57.5' 57.4'
22	151°50.4	54.3	92°47.4	11.5'	12°31.3	-11.5'	57.4'
23	166°50.1	54.5	$107^{\circ}17.9$	11.6'	$12^{\circ}19.8$	-11.5'	57.4'
	SD = 16.2'	d = 0.2'		SI	O = 15.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	181°49.8	\$22°54.7	121°48.4	u 11.7'	\$12°08.2	-11.6'	57.3'
1	196°49.5	54.9	$136^{\circ}19.1$	11.8'	11°56.6	-11.6'	57.3'
2	211°49.3 226°49.0	55.2	150°49.9 165°20.7	11.8' 11.9'	11°45.0 11°33.3	-11.7'	57.2'
3 4	226°49.0 241°48.7	• • 55.4 55.6	165°20.7 179°51.7	11.9	11° 33.3 11° 21.6	-11.7' -11.8'	57.2' 57.2'
5	256°48.4	55.8	194°22.7	12.1'	11°09.9	-11.8'	57.1
6	271°48.1	S22°56.0	208°53.8	12.2'	\$10°58.1	-11.8'	57.1'
7 8	286°47.8 301°47.6	56.3 56.5	223°25.0 237°56.3	12.3' 12.4'	10°46.3 10°34.4	-11.9' -11.9'	57.1' 57.0'
9	316°47.3	56.7	252°27.6	12.4	10° 34.4 10° 22.5	-11.9'	57.0°
10	331°47.0	56.9	266°59.1	12.5'	10° 10.6	-12.0'	56.9'
11	346°46.7	57.1	281°30.6	12.6'	09°58.6	-12.0'	56.9'
12 13	1°46.4 16°46.1	\$22°57.3 57.6	296°02.2 310°33.9	12.7' 12.8'	\$09°46.6 09°34.6	-12.0' -12.0'	56.9' 56.8'
14	31°45.8	57.8	325°05.7	12.8'	09°22.6	-12.1'	56.8
15	46°45.6	• • 58.0	339°37.5	12.9'	09°10.5	-12.1'	56.8'
16 17	61°45.3 76°45.0	58.2 58.4	354°09.5 8°41.5	13.0' 13.1'	08° 58.4 08° 46.3	-12.1' -12.2'	56.7' 56.7'
18	91°44.7	\$22°58.6	23°13.5	13.1'	508°34.1	-12.2'	56.6'
19	106°44.4	58.8	37°45.7	13.2'	$08^{\circ}21.9$	-12.2'	56.6'
20	121°44.1	59.0	52°17.9		08°09.7		56.6'
21 22	136°43.8 151°43.6	· · 59.2 59.5	66°50.2 81°22.6	13.4' 13.4'	07°57.5 07°45.3	-12.2' -12.3'	56.5' 56.5'
23	166°43.3	59.7	95°55.0	13.5'	07°33.0	-12.3'	56.5'
	SD = 16.2'	d = 0.2'	-	SI	O = 15.6'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°43.0	\$22°59.9	110°27.5	ν 13.6'	S07° 20.7	-12.3'	56.4'
1	196°42.7	23°00.1	$125^{\circ}00.1$	13.6'	$07^{\circ}08.5$	-12.3'	56.4'
2 3	211°42.4 226°42.1	00.3	139°32.7 154°05.4	13.7'	06° 56.2 06° 43.8	-12.3'	56.4'
3 4	226°42.1 241°41.8	· · 00.5 00.7	154°05.4 168°38.1	13.8' 13.8'	06°43.8 06°31.5	-12.3' -12.3'	56.3' 56.3'
5	256°41.5	00.9	183°11.0	13.9'	$06^{\circ}19.1$	-12.4'	56.3'
6	271°41.3	\$23°01.1	197°43.8	13.9'	S06°06.8	-12.4'	56.2'
7 8	286°41.0 301°40.7	01.3 01.5	212°16.8 226°49.8	14.0' 14.1'	05°54.4 05°42.0	-12.4' -12.4'	56.2' 56.2'
9	316°40.4	01.7	241°22.8	14.1'	05°29.6	-12.4'	56.1
10	331°40.1	01.9	255°56.0	14.2'	05°17.2	-12.4'	56.1'
11 12	346°39.8 1°39.5	02.1 \$23°02.3	270°29.1 285°02.4	14.2' 14.3'	05°04.8 S 04°52.4	-12.4' -12.4'	56.1' 56.0'
13	1 39.5 16°39.2	02.5	205 02.4 299°35.7	14.3'	04°40.0	-12.4' -12.4'	56.0'
14	31°38.9	02.7	$314^{\circ}09.0$	14.4'	04°27.6	-12.4'	56.0'
15	46°38.6	• • 02.9	328°42.4	14.4'	04° 15.1	-12.4'	55.9'
16 17	61°38.4 76°38.1	03.0 03.2	343°15.8 357°49.3	14.5' 14.5'	04°02.7 03°50.3	-12.4' -12.4'	55.9' 55.9'
18	91°37.8	\$23°03.4	12°22.8	14.6'	503°37.8	-12.4'	55.8'
19	106°37.5	03.6	26°56.4	14.6'	03°25.4	-12.4'	55.8'
20 21	121°37.2 136°36.9	03.8 •• 04.0	41°30.0 56°03.7	14.7' 14.7'	03°13.0 03°00.5	-12.4' -12.4'	55.8' 55.7'
22	136°36.9 151°36.6	04.0	70°37.4	14.7 14.8'	03°00.5 02°48.1	-12.4' -12.4'	55.7° 55.7'
23	166°36.3	04.4	85°11.2	14.8'	02°35.6	-12.4'	55.7'
	SD = 16.2'	d = 0.2'		SI	D = 15.4'		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-33%
09	07:46	07:33	11:52	15:36	03:11	
10	07:19	07:06	11:53	16:24	04:01	
11	06:52	06:38	11:53	17:09	04:47	

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

Color	h	Aries	Vei	nus	М	ars	Jup	iter	Sat	urn		Stars	
0 00°360	Wed -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
2 111709 17732 404 15731 407 17732 404 15731 4 345 247 277 7 50 4 67746 150 150 56000 307 347 277 1 50 17732 40													
2 111 O.9 175 2.2 48 5 167 3.0 34 5 267 3.7 54.0 527 5.1 50 5 27 5 15.0 10 10 10 10 10 10 10 10 10 10 10 10 10											Alpheratz		I
2											!		
14 11 10 18 2007 18 19 19 19 18 18 19 19													
Second Property													
Fig. 1,14 1.00													
8											!		
8 201°187 200°376 4 50 200°376 4 320 380°475 5 56 183°433 148													
9 206*21.2 200*37.6 · · · · · · · · · · · · · · · · · · ·													
201 221/236 206/596 44.8 206/556 31.1 0f.41.4 56.0 183*45.5 14.7 11 246/56.1 300*41.7 44.3 386*56.3 307 247.4 4 56.2 186/512 14.7 14.7 14.1 12. 261*23.3 30*43.5 217.3 3 14.5 14.7 14.8 14.2 14.2 14.2 14.3 14.2 14.2 14.3 14.2 14.2 14.2 14.2 14.2 14.2 14.2 14.2											!		
11 260°261 30°417 44 43 30°436 50°7 21°434 50°2 39°512 14.7	10			44.8									
22 e1 26 30 54 38 32 43 38 34 56 20 30 34 38 34 56 20 30 34 38 34 56 20 30 34 38 34 36 36 36 36 36 36 36									198°51.2				
Bellam 1973											_		
14 2011315 305740 4.28 40735 200 817512 5567 207017 1.16 68 68 68 48.3 566 24798 0 14.6 15 306755 305720 1.10 1.10 1.10 1.10 1.10 1.10 1.10 1.					334°36.5								
Amilian Amil									243°59.0		!		
18	15	306°35.9	10°50.0	• • 42.3	4°37.3	• • 29.0	81°51.2	• • 56.7	$259^{\circ}01.7$	• • 14.5	!		
19	16	321°38.4	$25^{\circ}52.1$	41.8	19°37.7	28.6	96°53.2	56.9	274°04.3	14.5			
Simple S	17	336°40.9	40°54.2	41.3	34°38.1	28.2	111°55.2	57.0	289°06.9	14.5			
23 26 26 27 27 28 28 28 28 28 28	18	351°43.3	55°56.3	S22°40.8	49°38.6	S21°27.8	126°57.1	S15°57.2	304°09.5	N15°14.4			
24 25 25 26 26 27 28 26 28 28 28 28 28 28	19		70°58.4	40.3	64°39.0	27.4	141°59.1	57.3	$319^{\circ}12.2$	14.4	!		
23 65/53, 110/048 38.8 109/402 20.1 18/7050 57, 18/20 14.3 Aug 124.3 Subal 124/407 234/125 29/505/08 19/20.6 14.3 Subal 124/407 234/125 24.3 Subal 124/407 234/407 234/125 24.3 Subal 124/407 234/407	20	21°48.3	86°00.5	39.8	79°39.4	26.9	$157^{\circ}01.1$	57.4	334° 14.8	14.4			
23 66 57 131 106 138 38.8 109 40.7 25.1 187 100 57.7 19 122 25 14.3 14.5 14.	21	36°50.7	101°02.6	• • 39.3	94°39.8	• • 26.5	172°03.0	• • 57.6	349° 17.4	• • 14.3	-		
Mer. pass. 181-90 Sas. 124-91 Sas. 124-91 Sas. 124-91 Sas. 124-91 Sas. 122-91 Sas. 1	22	51°53.2	116°04.8	38.8	109°40.2	26.1	187°05.0	57.7	4°20.0	14.3			
Misplacides Misplacides	23	66°55.7	131°06.9	38.3	124°40.7	25.7	202°07.0	57.9	19°22.6	14.3	1		
Thu GHA GHA GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA GRgulus 277-30 2. 11°400 0 81°581 46°700 5277.7 130°41.1 \$21°25.2 2. 2700.0 510 581 449°25.3 115°58.0 34°25.3 115°14.2 Decebola 182°21.0 14°24.1 51°25.2 112°05.0 191°15.4 0.36.2 184°42.4 0.40.4 262°14.8 0.58.3 64°30.5 14.2 Acras 17°26.5 191°15.4 0.36.2 184°42.4 0.40.4 262°14.8 0.58.3 64°30.5 14.2 Acras 17°26.5 157°10.4 221°19.7 35.2 214°35.2 231°2.2 229°43.6 521°22.7 30°20.7 15°58.8 124°41.0 N15°14.0 141°4.0 121°19.7 35.2 214°43.2 231°30°20.7 15°58.8 124°41.0 N15°14.0 141°4.0 121°19.7 35.2 214°43.2 231°30°20.7 15°58.8 124°41.0 N15°14.0 141°4.0 15°4.0 141°4	Mar	255 10.22	1/2 O/ 4 O	5' m / 90	10 A1 A O	1/ m1 12	1/2 0/ 40	1/ m 1 7/	126' d 0	0' m 0 12	!		
Thu GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec Dubble 1973 04 114 940 11	ivier.p	ass. 10:33	ν 2.0 a -0.	.5 111-4.09	$\nu_{0.4} = a_{-0}$	7.4 m1.15	ν 2.0 a 0.	1 m-1.74	ν2.0 α-0	.0 111-0.13			
Thu 6HA													
0 81759. 1 40 090 324". 19"41. 31". 19"4.1 34". 24". 29". 21". 24". 29". 21". 21". 21". 21". 21". 21". 21". 21	Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
1 97'000 1 101'11.3 36.7 104'41.5 24.8 223'10.9 58.3 49'27.9 14.2 2 112'000 1 107'11.3 36.7 104'41.5 24.8 223'10.9 58.3 49'27.9 14.2 3 127'005 1 107'11.3 36.2 104'42.4 24.0 1 20'14.8 58.5 94'73.31 1.14.1 4 127'005 1 200'17.5 38.2 104'42.4 24.0 1 20'14.8 58.5 94'38.8 1.1 5 127'01.8 58.2 14.7 14.1 5 127'02.5 101'15.4 38.2 104'42.4 24.0 1 20'14.8 58.5 94'38.8 1.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.7 14.1 5 127'01.8 58.2 14.1 5 127'01.8 58.2 14.1 5 127'01.8 58.2 14.1 5 127'01.8 58.2 14.1 5 127'01.8 58.2 1 5 127'01.8 58.2 1 5 127'01.8 58.2 1 5 127'01.8 58.2 1 5 127'01.8 58.2 1 5 127'01.8 58.8 1 5 124'01.0 N15'14.0 N15'14.0 N15'14.0 5 158'18.3 1-11'19.0 5 158'18.3	0	81°58.1	146°09.0	S22°37.7	139°41.1	S21°25.2	217°08.9	S15°58.0	34°25.3	N15°14.2			
2 112°03.0 176°13.3 367, 160°41.9 244, 247°12.9 583, 64°30.5 1442 3 127°05.5 191°15.4 · 362 184°42.4 · 224 0 202°18.8 · 584, 79°33.1 · 1.14 4 142°08.0 201°17.5 35.2 191°42.8 23.5 27°16.8 · 585, 94°38.8 14.1 5 157°10.4 221°19.7 35.2 214°43.2 221 29°218.8 · 587, 109°38.4 · 1.1 6 172°12.9 26°21.8 · 522°34.1 224°43.6 · 521°22.7 30°20.7 15°8.8 124°41.0 N15°14.0 6 172°12.9 26°21.8 · 522°34.2 224°43.6 · 521°22.7 30°20.7 588.8 124°41.0 N15°14.0 6 172°12.9 26°21.8 · 522°34.2 224°43.0 · 221°3.7 588.8 124°41.0 N15°14.0 6 172°12.9 26°21.8 · 522°34.2 224°44.0 · 21.4 35°20.6 · 59.2 169°48.9 · 13.9 10 232°22.8 269°35.3 2.2 226°44.9 · 21.4 35°20.6 · 59.2 169°48.9 · 13.9 11 246°25.2 311°32.7 32.2 306°45.7 2.0 6 22°30.6 · 59.5 199°84.1 13.9 12 262°27.7 36°38.8 · 522°31.6 319°46.2 52°10.1 37°32.5 \ 15°59.7 214°45.7 N15°31.8 \ 142°40.1 31.9 \ 142°40.2 \ 142°40.2 \ 142°40.2 \ 142°40.1 33°40.6 \ 142°40.1 33°40.6 \ 142°40.1 33°40.6 \ 142°40.1 33°40.6 \ 142°40.1 34°40.2 \ 142°40.1 34°40.1 \ 142°40.1 34°40.2 \ 142°40.1 34°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34°40.1 \ 142°40.1 34	1	97°00.6	$161^{\circ}11.1$	37.2	154°41.5	24.8	232°10.9	58.1	49°27.9	14.2			
127'058 291'154	2	112°03.0	176°13.3	36.7	169°41.9	24.4	247°12.9	58.3	64°30.5	14.2			
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Mer.pass. 18:25 $\nu 2.2' \ d$ -0.5' m-4.87 $\nu 0.4' \ d$ -0.4' m1.13 $\nu 2.0' \ d$ 0.1' m-1.74 $\nu 2.6' \ d$ -0.0' m-0.12													
	Mer.p	ass. 18:25	$\nu^{2.2'} d-0.$.5′ m-4.87	ν 0.4′ d-0	0.4′ m1.13	$\nu 2.0' d0.$	1′ m-1.74	$\nu^{2.6'} d-0$.0′ m-0.12			

h	Sur	ำ			Moon		
Wed	CUA	D	GHA		Dec	-1	HP
vvea 0	GHA 181°36.0	Dec 523°04.6	GПА 99°45.0	u 14.8'	502°23.2	d -12.4'	55.6'
	196°35.7	04.7	99 45.0 114°18.8	14.0 14.9'	02°10.8	-12.4'	55.6'
1	211° 35.7	04.7	114 18.8 128°52.7	14.9'	02 10.8 01°58.4	-12.4 -12.4'	55.6'
2	211 35.5 226°35.2	05.1	128 52.7 143°26.6		01 58.4 01°46.0		
3	220 35.2 241°34.9		143 20.6 158°00.6	15.0'	01 46.0 01°33.5	-12.4'	55.5' 55.5'
4	241 34.9 256°34.6	05.3	158 00.6 172°34.6	15.0'	01 33.5 01°21.1	-12.4'	
5	250 34.0 271°34.3	05.5 \$23°05.7	172 34.6 187°08.6	15.0' 15.1'	501°08.7	-12.4' -12.4'	55.5' 55.5'
6 7	271 34.3 286°34.0	05.8	201°42.7	15.1'	00°56.4	-12.4 -12.4'	55.4'
8	301°33.7	06.0	201 42.7 216° 16.7	15.1	00°50.4	-12.4' -12.4'	55.4'
9	316° 33.4	06.2	210 10.7 230°50.9	15.1	00°44.0	-12.4'	55.4'
10	331° 33.1	06.4	245° 25.0	15.2'	00° 19.3	-12.4	55.3'
11	346°32.8	06.6	259° 59.2	15.2'	S00°06.9	-12.3'	55.3
12	1° 32.5	\$23°06.7	274° 33.4	15.2'	N00°05.4	12.3	55.3
13	16°32.2	06.9	289° 07.7	15.2	00°17.8	12.3'	55.3'
14	31° 31.9	07.1	303°41.9	15.3'	00°30.1	12.3'	55.2'
15	46°31.7	07.3	318° 16.2	15.3'	00°42.4	12.3'	55.2'
16	61°31.4	07.4	332°50.5	15.3'	00°54.6	12.3'	55.2'
17	76°31.1	07.6	347°24.9	15.4'	01°06.9	12.2'	55.2'
18	91°30.8	\$23°07.8	1°59.2	15.4'	N01°19.2	12.2'	55.1'
19	106° 30.5	08.0	16° 33.6	15.4'	01°31.4	12.2'	55.1'
20	121°30.2	08.1	31°08.0	15.4'	01°43.6	12.2'	55.1'
21	136° 29.9	08.3	45° 42.5	15.4'	01°55.8	12.2'	55.1'
22	151° 29.6	08.5	60°16.9	15.5'	02°08.0	12.2'	55.0'
23	166° 29.3	08.6	74°51.4	15.5'	02°20.1	12.1'	55.0'
	SD = 16.2'	d = 0.2'		SI	D = 15.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181° 29.0	S23°08.8	89°25.8	15.5'	N02°32.3	12.1'	55.0'
1	196° 28.7	09.0	104°00.3	15.5'	02°44.4	12.1'	55.0'
2	211°28.4	09.1	118°34.8	15.5'	02°56.5	12.1'	54.9'
3	226° 28.1	09.3	133°09.4	15.5'	03°08.6	12.1'	54.9'
4	241°27.8	09.5	147°43.9	15.5'	03°20.6	12.0'	54.9'
5	256° 27.5	09.6	162°18.4	15.6'	03°32.7	12.0'	54.9'
6	271°27.2	\$23°09.8	176°53.0	15.6'	N03°44.7	12.0'	54.9'
7	286°26.9	10.0	191°27.5	15.6'	03°56.7	12.0'	54.8'
8	301°26.6	10.1	206°02.1	15.6'	04°08.6	11.9'	54.8'
9	316°26.4	• • 10.3	220°36.7	15.6'	04°20.6	11.9'	54.8'
10	331°26.1	10.4	235°11.3	15.6'	04°32.5	11.9'	54.8'
11	346°25.8	10.6	249°45.9	15.6'	04°44.3	11.9'	54.7'
12	1°25.5	\$23°10.7	264°20.4	15.6'	N04°56.2	11.8'	54.7'
13	16°25.2	10.9	278°55.0	15.6'	$05^{\circ}08.0$	11.8'	54.7'
14	31°24.9	11.1	293°29.6	15.6'	$05^{\circ}19.8$	11.8'	54.7'
15	46°24.6	• • 11.2	308°04.2	15.6'	05°31.6	11.7'	54.7'
16	61°24.3	11.4	322°38.8	15.6'	05°43.3	11.7'	54.6'
17	76°24.0	11.5	337°13.4	15.6'	05°55.0	11.7'	54.6'
18	91°23.7	S23°11.7	351°48.0	15.6'	N06°06.7	11.6'	54.6'
19	106°23.4	11.8	6°22.6	15.6'	06°18.4	11.6'	54.6'
20	121°23.1	12.0	20°57.2	15.6'	06°30.0	11.6'	54.6'
21	136°22.8	•• 12.1	35°31.8	15.6'	06°41.6	11.5'	54.6'
22	151°22.5	12.3	50°06.4	15.6'	06°53.1	11.5'	54.5'
23	166°22.2	12.4	64°41.0	15.6'	07°04.6	11.5'	54.5'
	SD = 16.2'	d = 0.2'		SI	D = 15.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°21.9	\$23°12.6	79° 15.5	15.6'	N07°16.1	11.4'	54.5'
1	196°21.6	12.7	93°50.1	15.6'	07°27.6	11.4'	54.5'
2	211°21.3	12.9	108° 24.7	15.5'	07°39.0	11.4'	54.5'
3	226°21.0	•• 13.0	122°59.2	15.5'	07°50.3	11.3'	54.5'
4	241°20.7	13.2 13.3	137°33.7	15.5' 15.5'	08°01.7 08°13.0	11.3'	54.4' 54.4'
5	256°20.4	13.3 \$23°13.5	152°08.3		08°13.0 N08°24.2	11.3' 11.2'	
6 7	271°20.1 286°19.8	13.6	166° 42.8 181° 17.3	15.5' 15.5'	08°35.5	11.2'	54.4' 54.4'
7 8	286° 19.8 301° 19.5	13.6	181°17.3 195°51.7	15.5'	08° 35.5 08° 46.7	11.1'	54.4'
9	301°19.5 316°19.2	13.7	195°51.7 210°26.2	15.5'	08° 46.7 08° 57.8	11.1'	54.4'
10	310 19.2 331° 18.9	14.0	210 20.2 225°00.7	15.4	00° 08.9	11.1	54.4
11	346° 18.6	14.0	239°35.1	15.4	09 08.9 09°20.0	11.1	54.3'
12	1° 18.3	\$23°14.3	254° 09.5	15.4'	N09°31.0	11.0'	54.3
13	16° 18.0	14.4	268° 43.9	15.4'	09°42.0	10.9'	54.3
14	31° 17.7	14.4	283° 18.3	15.4'	09°52.9	10.9	54.3'
15	46° 17.4	. 14.7	297°52.7	15.3'	10°03.8	10.9'	54.3'
16	61° 17.1	14.8	312°27.0	15.3'	10° 03.6	10.8	54.3'
17	76° 16.8	15.0	327°01.3	15.3'	10°14.0	10.8	54.3'
18	91° 16.5	\$23°15.1	341°35.6	15.3'	N10°36.2	10.7	54.2'
19	106° 16.2	15.2	356°09.9	15.3'	10°46.9	10.7	54.2'
20	121° 15.9	15.4	10°44.2	15.2'	10°57.6	10.6'	54.2'
21	136° 15.6	. 15.5	25° 18.4	15.2'	11°08.2	10.6'	54.2'
22	151° 15.3	15.6	39°52.6	15.2'	11°18.8	10.5	54.2'
23	166° 15.0	15.8	54°26.8	15.2'	11°29.3	10.5'	54.2'
	SD = 16.2'	d = 0.1'		CI	D = 14.9'		
	JD — 10.2	u — U.1		اد	J — 14.9		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-62%
12	06:24	06:10	11:54	17:52	05:31	
13	05:56	05:42	11:54	18:34	06:13	
14	05:28	05:13	11:55	19:16	06:55	

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

Same CHA	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
8 57-564 147-562 522-13.3 1407-15 521-041 516-041 517	Sat	GHA	GHΔ	Dec	GHA	Dec	GHA	Dec	GHΔ	Dec		SHA	Dec
1												JIIA	
11 10 10 1 10 10 10 10 10 10 10 10 10 10											Alpheratz	357°30.5	29°15.6
20											Ankaa	353°03.3	-42°08.7
4 4 6 6 3 20 6 6 1 2 20 7 27 3 6 2 27 27 3 5 6 3 6 4 4 12 5 4 4 4 4 12 5 4 4 4 4 4 12 5 4 4 4 4 4 12 5 4 4 4 4 4 4 4 4 4											Schedar	$349^{\circ}26.1$	56°42.5
Section 1.00											Diphda	348°43.3	-17°49.3
Feb Feb											Achernar	$335^{\circ}17.2$	-57°05.3
18											Hamal	327°46.4	23°36.4
8 201°16.1 206°17.1 206°18.2 201°17.5 0.0 2 200°16.2 0.0 338°19.2 66.7 16.9°10.1 124 4 1.0 201°24.5 201°17.1 201°19.1 10.2 201°19.2 10.0 201°											Polaris	311°22.6	89°23.4
19											Acamar	315°08.5	-40°11.2
10 242*210 298*19											Menkar	$314^{\circ}01.7$	4°12.4
11 260°215 313°223 0.77 305°02 207°95 24°051 0.61 201°507 12.3 3.666 3.667 3.676 3											Mirfak	308°22.0	49°58.1
11 2079-26. 343-27.0 3670-26. 3670-27. 3670											Aldebaran	290°34.7	16°34.1
19													
Bellam 19											_		
18											·		
All													
18 347													
19													
Section Sect											_		
Adhaba 28*10.4 2019 20									307°18.0		· ·		
23 25 26 26 26 26 27 27 27 28 27 27 28 27 27													
Polity Property Polity Property Polity Property Polity Property Proper													
23 96 53 133 513 513 513 514 541 545 549 545 549 545 549 545 549 545 549 545 549 545 549 545 545 549 545 5											-		
Mar. pass 18 18 18 18 18 18 18													
Morp pass 18:21	23	69°53.1	133°51.3	01.5	125°11.4	54.1	204°28.8	07.7	22°31.1	12.0			
Sum GHA GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA	Mern	ass. 18·21	ν2 3' d-0	.5′ m-4 86	ν0 4' d-0	.4' m1 13	$\nu 2.0' d0$	1' m-1 74	ν2 6′ d-0	.0′ m-0 11			
Sum GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec Dubble 1937-94.	- IVICI.P	a33. 10.21	ν2.5 u σ.	.5 111 4.00	νο.+ α ο	.+ 1111.15	ν2.0 do.	1 111 1.74	ν2.0 d 0	.0 111 0.11			
Sim GHA GHA CHA Doc GHA Doc GHA Doc GHA Doc GHA Doc Doc Dubb 193*36.4 61:34.9 0 84*55.5 148*337 22*201.0 14*24.1 1 99*58.0 148*337 22*201.0 14*24.1 1 99*58.0 138*36.2 0:05 15\$*12.3 53.2 24*32.7 0.80 0 52*35.3 11.9 1 199*58.0 138*36.2 0:05 15\$*12.3 53.2 24*32.7 0.80 0 52*35.3 11.9 1 199*58.0 138*36.2 0:05 15\$*12.3 53.2 24*32.7 0.80 0 52*35.3 11.9 1 145*06.4 199*03.6 21*99.0 186*12.2 0.81 18.7 0.81 67*38.9 11.9 1 145*06.4 199*03.6 21*99.0 186*12.2 0.81 18.7 0.81 67*38.9 11.9 1 150*07.1 0.92*13.3 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.92*13.5 0.93 18.8 0.93*13.5 0.93 18.8 0.93*13.5 0.93 18.8 0.93*13.5 0.93 18.8 0.93*13.5 0.93*14											· ·		
0 98-25.0 183°50.2 00.5 135°50.2 00.5 135°30.3 01.0 199 37.33.7 N15°11.9 119 199 1199 1199 1199 1199 1199 1											_		
1 99°80, 183°50, 2 005 155°12, 3 53, 2 244°36, 7 08.1 52°36, 3 11.9 (Giena) 175°38, 5 17°42, 5 17°42, 7 18°11, 3 18°10, 2 18°11, 3 18°11, 3 18°12, 5 18°13,	0		148°53.7	S22°01.0		S20°53.7		S16°07.9		N15°11.9			
115°00.5 194°01.1 21°99.5 185°13.2 249°34.7 0.81. 67°38.9 11.9 3 130°02.9 194°01.1 21°99.5 185°13.2 249°34.7 0.83. 32°41.5 11.8 4 145°05.4 90°03.6 59.0 200°13.6 51.8 279°38.7 0.83. 32°41.5 11.8 5 160°07.9 224°06.0 58.5 215°14.0 51.1 244°4.6 0.85.7 112°46.7 11.8 6 175°10.3 239°10.5 521°88.0 230°14.5 520°8.9 30°42.6 50°8.7 112°46.7 11.8 6 175°10.3 249°11.0 57.5 249°15.3 50.0 33°44.6 0.88.1 112°40.7 11.7 6 175°10.3 249°11.0 57.5 249°15.3 50.0 33°44.6 0.88.1 112°40.7 11.7 6 175°10.3 249°10.1 57.5 249°15.3 50.0 33°44.6 0.88.1 112°40.7 11.7 6 175°10.2 249°16.1 57.5 249°15.3 50.0 349°16.0 60.8 112°40.7 11.7 6 175°10.3 249°10.1 57.5 249°15.3 50.0 32°40.5 50.0 112°57.2 11.7 6 175°10.2 299°15.5 55.0 290°15.2 40.1 299°15.2 11.6 6 175°10.3 249°10.1 249°15.3 249°15.3 249°15.3 249°15.3 249°15.3 249°15.3 6 122°20.5 249°15.5 250°25.5 230°16.2 441.0 24°45.5 249°15.3 6 228°24.6 344°26.0 54.4 335°17.9 47.7 36°56.4 0.97 248°16.0 11.5 6 230°30.7 249°30.5 248°30													
3 130°029 194°011 21°95 186°132 · 523 264°367 · 083 82°415 · 118 6 Garrux 171°471 - 57°166 5 160°099 5°5°475 5 160°099 240°600 5 855 215°840 5 14 294°406 0 85 112°467 118 6 Spica 1878°133 219°190 5 158°183 215°140 5 14 294°406 0 85 112°467 118 6 Spica 1878°133 21°190 6 175°103 229°105 5 21°860 20165 5 2009 300°426 5 16°087 12°7404 118′118 118 1878°131 31°190 6 180°105 110	2	$115^{\circ}00.5$	178°58.6	22°00.0	170°12.7	52.8	249°34.7	08.1	67°38.9	11.9			
4 145°05-4 209°03-6 50.0 200°13-6 51.8 297°38-7 08-4 97°44.1 11.8 51.6 6 106°09-9 55°47-5 100°09-9 200°09-20-6 108-5 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 51.8 112°46-7 11.8 112	3	130°02.9	194°01.1	21°59.5	185°13.2	• • 52.3	264°36.7	• • 08.3		• • 11.8			
6 176°07.9 224°06.0 85.5 215°14.0 51.4 294°40.6 08.5 112°46.7 11.8 Spica 158°18.3 11°19.0 7 190°12.8 254°11.0 57.5 245°14.9 50.5 324°44.6 08.8 142°52.0 11.7 Menker 147°53.1 36°30.0 8 205°15.2 269°13.5 56.9 200°15.3 50.0 339°46.6 08.9 172°57.2 11.7 Menker 147°53.1 36°30.0 9 220°17.7 284°16.0 56.4 275°15.8 4.66 383°48.5 0.91 172°57.2 11.7 Menker 147°53.1 36°30.0 10 235°30.2 299°18.5 55.9 200°16.2 4.91 9°50.5 0.92 218°55.9 11.6 Rigil Kert. 139°35.1 60°57.3 11 250°22.6 314°21.0 55.4 305°16.6 46.7 24°52.5 69.3 205°02.4 11.6 Rigil Kert. 139°35.1 60°57.3 12 280°27.5 329°23.5 521°54.9 330°17.1 520°46.2 39°54.5 510°09.5 218°05.0 11.5 16.6	4	145°05.4	209°03.6	59.0	200°13.6	51.8	279°38.7	08.4	97°44.1	11.8			
6 175°10.3 239°08.5 S21°8.0 230°14.5 520°50 309°42.6 16°08.7 127°49.4 N15°11.8 Alkald 152°49.3 49°09.6 67 100°235°20.2 296°13.5 50.9 260°15.3 50.0 339°46.6 0.8.9 157°54.6 11.7 Hadrid 148°30.5 -60°30.8 Mentent 147°53.1 .36°30.9 20°17.7 284°16.0 56.4 25°15.8 .49.5 354°48.5 .09.1 172°57.2 11.7 Arctum. 145°44.6 19°0.15 11.2 50°22.6 314°21.0 55.4 30°16.6 48.7 24°52.5 0.93 200°02.4 11.6 Kochal 137°21.2 61.2 12 265°25.1 329°23.5 S21°49.9 320°17.1 520°48.2 39°54.5 16°09.5 218°50.0 N15°11.6 Kochal 137°21.2 74°0.1 7 246°1.1 250°2.6 314°21.0 55.4 30°16.6 48.7 24°52.5 0.93 200°02.4 11.6 Kochal 137°21.2 74°0.1 7 246°1.1 250°2.6 314°2.5 11.5 126°2.6 314°2.5 11.5 126°2.6 314°2.5 11.5 126°2.6 314°2.5 11.5 126°2.6 314°2.5 11.5 126°2.6 314°2.5 11.5 126°2.5 11.5 126°2.5 11.5 126°3.5 126°3.5	5	$160^{\circ}07.9$	224°06.0	58.5	215°14.0	51.4	294°40.6	08.5	112°46.7	11.8			
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4 240°59.0 21.5 105°45.4 13.0' 19°21.9 7.0' 54.0' 5 255°58.7 21.6 120°17.3 12.9' 19°28.9 6.9' 54.0' 6 270°58.4 \$23°21.7 134°49.2 12.9' N19°35.8 6.8' 54.0' 7 285°58.1 21.8 149°21.1 12.8' 19°42.6 6.7' 54.0' 8 300°57.8 21.8 163°52.9 12.8' 19°49.4 6.6' 54.0' 9 315°57.5 · 21.9 178°24.6 12.7' 19°56.0 6.6' 54.0' 10 330°57.2 22.0 192°56.3 12.7' 20°02.6 6.5' 54.0' 11 345°56.9 22.1 207°28.0 12.6' N20°15.4 6.3' 54.1' 12 0°56.6 \$23°22.2 221°59.6 12.6' N20°15.4 6.3' 54.1' 13 15°56.3 22.2 236°31.2 12.5' 20°21.7 6.2' 54.1' 14 30°56.0 22.3 251°02.7 12.5' 20°27									
5 255°58.7 21.6 120°17.3 12.9' 19°28.9 6.9' 54.0' 6 270°58.4 \$23°21.7 134°49.2 12.9' N19°35.8 6.8' 54.0' 7 285°58.1 21.8 149°21.1 12.8' 19°42.6 6.7' 54.0' 8 300°57.8 21.8 163°52.9 12.8' 19°49.4 6.6' 54.0' 9 315°57.5 · 21.9 178°24.6 12.7' 19°56.0 6.6' 54.0' 10 330°57.2 22.0 192°56.3 12.7' 20°02.6 6.5' 54.0' 11 345°56.9 22.1 207°28.0 12.6' N20°15.4 6.3' 54.1' 12 0°56.6 523°22.2 221°59.6 12.6' N20°15.4 6.3' 54.1' 13 15°56.3 22.2 236°31.2 12.5' 20°21.7 6.2' 54.1' 14 30°56.0 22.3 251°02.7 12.5' 20°27.9 6.1' 5									
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8 300°57.8 21.8 163°52.9 12.8' 19°49.4 6.6' 54.0' 9 315°57.5 · · · 21.9 178°24.6 12.7' 19°56.0 6.6' 54.0' 10 330°57.2 22.0 192°56.3 12.7' 20°02.6 6.5' 54.0' 11 345°56.9 22.1 207°28.0 12.6' 20°09.1 6.4' 54.1' 12 0°56.6 \$23°22.2 221°59.6 12.6' N20°15.4 6.3' 54.1' 13 15°56.3 22.2 236°31.2 12.5' 20°21.7 6.2' 54.1' 14 30°56.0 22.3 251°02.7 12.5' 20°27.9 6.1' 54.1' 15 45°55.6 · · 22.4 265°34.1 12.4' 20°34.1 6.0' 54.1' 16 60°55.3 22.5 280°05.5 12.4' 20°40.1 5.9' 54.1' 17 75°55.0 22.6 294°36.9 12.3' N20°51.9 5.8' 54.1' 18 90°54.7 S23°22.6 309°08.2 12.3' <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
10 330°57.2 22.0 192°56.3 12.7' 20°02.6 6.5' 54.0' 11 345°56.9 22.1 207°28.0 12.6' 20°09.1 6.4' 54.1' 12 0°56.6 \$23°22.2 221°59.6 12.6' N20°15.4 6.3' 54.1' 13 15°56.3 22.2 236°31.2 12.5' 20°21.7 6.2' 54.1' 14 30°56.0 22.3 251°02.7 12.5' 20°27.9 6.1' 54.1' 15 45°55.6 · 22.4 265°34.1 12.4' 20°34.1 6.0' 54.1' 16 60°55.3 22.5 280°05.5 12.4' 20°40.1 5.9' 54.1' 17 75°55.0 22.6 294°36.9 12.3' 20°40.0 5.8' 54.1' 18 90°54.7 \$23°22.6 309°08.2 12.3' N20°51.9 5.8' 54.1' 19 105°54.4 22.7 323°39.4 12.2' 20°57.6 5.7' 54.1' 20 120°54.1 22.8 338°10.6 12.2' 21°0				163°52.9					
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18 90°54.7 \$23°22.6 309°08.2 12.3' N20°51.9 5.8' 54.1' 19 105°54.4 22.7 323°39.4 12.2' 20°57.6 5.7' 54.1' 20 120°54.1 22.8 338°10.6 12.2' 21°03.3 5.6' 54.1' 21 135°53.8 · · · 22.8 352°41.8 12.1' 21°08.9 5.5' 54.1' 22 150°53.5 22.9 7°12.9 12.1' 21°14.3 5.4' 54.1' 23 165°53.2 23.0 21°43.9 12.0' 21°19.7 5.3' 54.1'						$20^{\circ}40.1$			
19 105°54.4 22.7 323°39.4 12.2' 20°57.6 5.7' 54.1' 20 120°54.1 22.8 338°10.6 12.2' 21°03.3 5.6' 54.1' 21 135°53.8 · · · 22.8 352°41.8 12.1' 21°08.9 5.5' 54.1' 22 150°53.5 22.9 7°12.9 12.1' 21°14.3 5.4' 54.1' 23 165°53.2 23.0 21°43.9 12.0' 21°19.7 5.3' 54.1'									
20 120°54.1 22.8 338°10.6 12.2' 21°03.3 5.6' 54.1' 21 135°53.8 22.8 352°41.8 12.1' 21°08.9 5.5' 54.1' 22 150°53.5 22.9 7°12.9 12.1' 21°14.3 5.4' 54.1' 23 165°53.2 23.0 21°43.9 12.0' 21°19.7 5.3' 54.1'									
21 135°53.8 · · 22.8 352°41.8 12.1' 21°08.9 5.5' 54.1' 22 150°53.5 22.9 7°12.9 12.1' 21°14.3 5.4' 54.1' 23 165°53.2 23.0 21°43.9 12.0' 21°19.7 5.3' 54.1'									
22 150°53.5 22.9 7°12.9 12.1' 21°14.3 5.4' 54.1' 23 165°53.2 23.0 21°43.9 12.0' 21°19.7 5.3' 54.1'									
	22		22.9	7°12.9	12.1'	21° 14.3	5.4'	54.1'	
SD = 16.2' d = 0.1' $SD = 14.7'$	23			21°43.9	12.0'	21° 19.7	5.3'	54.1'	
		SD = 16.2'	d = 0.1'		SI	0 = 14.7'			

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

Lat			Moonris	e		Moonset	į.
Lat	•	Sat	Sun	Mon	Sat	Sun	Mon
N 7	2°	10:34	09:46		04:20	06:40	
N 7	0°	10:59	10:36	09:31	03:57	05:52	08:31
	8°	11:18	11:07	10:52	03:40	05:21	07:11
	6°	11:33	11:31	11:30	03:26	04:58	06:34
1	4°	11:46	11:50	11:57	03:14	04:40	06:07
	2°	11:57	12:05	12:17	03:04	04:26	05:47
1	0°	12:06	12:18	12:35	02:56	04:14	05:31
N 5		12:14	12:29	12:49	02:49	04:03	05:17
1	6°	12:21	12:39	13:01	02:42	03:54	05:05
	4°	12:27	12:47	13:12	02:37	03:46	04:54
1	2°	12:33	12:55	13:22	02:31	03:39	04:45
1	0°	12:38	13:02	13:30	02:27	03:32	04:37
4	5°	12:50	13:17	13:48	02:17	03:18	04:20
N 4		12:59	13:29	14:03	02:08	03:07	04:05
3	5°	13:07	13:40	14:16	02:01	02:57	03:53
	0°	13:15	13:49	14:27	01:55	02:49	03:43
	0°	13:27	14:05	14:46	01:44	02:34	03:25
N 1		13:38	14:19	15:03	01:35	02:21	03:09
	0°	13:48	14:33	15:19	01:26	02:09	02:55
S 1		13:59	14:46	15:34	01:17	01:58	02:40
1	0°	14:10	15:00	15:51	01:08	01:45	02:25
1	0°	14:23	15:17	16:11	00:57	01:31	02:07
	5°	14:30	15:26	16:22	00:51	01:22	01:56
	0°	14:39	15:37	16:35	00:44	01:13	01:45
	5°	14:49	15:50	16:51	00:36	01:02	01:31
S 5		15:01	16:06	17:10	00:27	00:48	01:14
	2°	15:06	16:14	17:19	00:22	00:42	01:06
	4°	15:13	16:22	17:29	00:17	00:35	00:57
	6°	15:20	16:31	17:41	00:12	00:28	00:48
	8°	15:28	16:42	17:54	00:06	00:19	00:36
S 6	0°	15:37	16:54	18:10		00:10	00:24

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	71-86%		
15	04:59	04:45	11:55	19:59	07:37			
16	04:30	04:15	11:56	20:43	08:21			
17	04:01	03:46	11:56	21:30	09:07			

December 18, 19, 20 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	86°53.8	150°56.7	\$21°36.5	140°32.8	S20°31.4	221°05.6	S16°14.3	39°38.9	N15°10.5			
1	101°56.3	165°59.4	36.0	155°33.2	31.0	236°07.6	14.4	54°41.5	10.5	Alpheratz	357°30.5	29°15.6
2	116°58.7	181°02.1	35.5	170°33.7	30.5	251°09.6	14.5	69°44.1	10.5	Ankaa	353°03.3	-42°08.7
3	132°01.2	196°04.8	• • 35.0	185°34.1	• • 30.0	266°11.5	• • 14.7	84° 46.7	. 10.4	Schedar	349°26.1	56°42.5
4	147°03.7	211°07.5	34.5	200°34.6	29.6	281°13.5	14.8	99°49.3	10.4	Diphda	348°43.3	-17°49.4
5	162°06.1	226°10.2	34.0	215°35.0	29.1	296°15.5	14.9	114°51.9	10.4	Achernar	335°17.2	-57°05.3
6	177°08.6	241°12.9	S21°33.5	230°35.5	S20°28.6	311°17.5	S16°15.1	129° 54.5	N15°10.4	Hamal	327°46.4	23°36.4
7	192°11.1	$256^{\circ}15.6$	33.0	245°35.9	28.1	326°19.5	15.2	144°57.1	10.3	Polaris Acamar	311°23.1 315°08.5	89°23.5
8	207°13.5	271°18.3	32.5	260°36.3	27.7	341°21.4	15.3	159°59.7	10.3	Menkar	315 08.5 314°01.7	-40°11.2 4°12.4
9	222°16.0	286°21.0	• • 31.9	275°36.8	• • 27.2	356°23.4	• • 15.5	175°02.3	• • 10.3	Mirfak	308° 22.0	4 12.4 49°58.1
10	$237^{\circ}18.5$	301°23.7	31.4	290°37.2	26.7	11°25.4	15.6	190°04.9	10.2	Aldebaran	290°34.7	16°34.1
11	252°20.9	316°26.4	30.9	305°37.7	26.2	26°27.4	15.7	205°07.5	10.2	Rigel	280° 59.7	-8°10.2
12	267°23.4	331°29.2	S21°30.4	320°38.1	S20°25.8	41°29.4	S16°15.9	220° 10.1	$N15^{\circ}10.2$	Capella	280° 15.5	46°01.5
13	282°25.8	346°31.9	29.9	335°38.5	25.3	56°31.3	16.0	235° 12.8	10.2	Bellatrix	278°18.3	6°22.5
14	297°28.3	1°34.6	29.4	350°39.0	24.8	71°33.3	16.1	250° 15.4	10.1	Elnath	277°56.5	28°37.8
15	312°30.8	16°37.4	• • 28.9	5°39.4	• • 24.3	86°35.3	• • 16.3	265°18.0	• • 10.1	Alnilam	275°33.4	-1°11.1
16	327°33.2	31°40.1	28.4	20°39.9	23.8	101°37.3	16.4	280° 20.6	10.1	Betelgeuse	270°47.5	7°24.6
17	342°35.7	46°42.9	27.9	35°40.3	23.4	116°39.3	16.5	295°23.2	10.0	Canopus	263°50.1	-52°42.8
18	357°38.2	61°45.6	S21°27.4	50°40.8	S20°22.9	131°41.2	S16°16.7	310°25.8	N15°10.0	Sirius	258° 22.4	-16°45.6
19	12°40.6	76°48.4	26.9	65°41.2	22.4	146°43.2	16.8	325°28.4	10.0	Adhara	255°02.4	-29°00.9
20	27°43.1	91°51.2	26.3	80°41.6	21.9	161°45.2	16.9	340°31.0	10.0	Procyon	244°46.4	5°08.7
21	42°45.6	106°53.9	• • 25.8	95°42.1	• • 21.4	176°47.2	· · 17.0	355° 33.6 10° 36.2	• • 09.9	Pollux	243°12.2	27°56.9
22	57°48.0	121°56.7	25.3	110°42.5	21.0	191°49.2	17.2		09.9	Avior	234°12.4	-59°36.3
23	72°50.5	136°59.5	24.8	125°43.0	20.5	206°51.1	17.3	25°38.8	09.9	Suhail	222°43.0	-43°33.2
Mer.p	ass. 18:09	ν 2.7′ d-0	.5′ m-4.79	ν 0.4′ d-0	.5' m1.13	ν 2.0′ d0.	1' m-1.75	ν 2.6′ d-0	.0′ m-0.10	Miaplacidus	221°36.5	-69°50.3
										Alphard	217°43.7	-8°47.4
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.1	11°49.0
0 0	87°53.0	152°02.3	S21°24.3	140°43.4	\$20°20.0	221°53.1	S16°17.4	40°41.4	N15°09.9	Dubhe	193°36.3	61°34.9
1	102°55.4	167°05.1	23.8	155°43.9	19.5	236°55.1	17.6	55°44.0	09.8	Denebola	182°21.0	14°24.1
2	117°57.9	182°07.9	23.3	170°44.3	19.0	251°57.1	17.7	70° 46.6	09.8	Gienah	175°39.5	-17°42.5
3	133°00.3	197°10.7	22.8	185°44.8	. 18.6	266°59.1	• • 17.8	85° 49.2	09.8	Acrux	172°55.5	-63°15.7
4	148°02.8	212°13.5	22.3	200°45.2	18.1	282°01.0	18.0	100°51.8	09.7	Gacrux	171°47.1	-57°16.7
5	163°05.3	227°16.3	21.8	215°45.6	17.6	297°03.0	18.1	115°54.4	09.7	Alioth	166°09.9	55°47.5
6	178°07.7	242°19.1	S21°21.3	230°46.1	S20°17.1	312°05.0	S16°18.2	130° 57.0	N15°09.7	Spica	158° 18.2	-11°19.0
7	193°10.2	257°21.9	20.8	245°46.5	16.6	327°07.0	18.4	145° 59.6	09.7	Alkaid	152°49.3	49°09.6
8	208°12.7	272°24.7	20.3	260°47.0	16.1	342°09.0	18.5	161°02.2	09.6	Hadar	148°30.5	-60°30.8 -36°30.9
9	223°15.1	287°27.6	• • 19.7	275°47.4	• • 15.7	357°10.9	• • 18.6	176°04.8	• • 09.6	Menkent Arcturus	147°53.1 145°44.6	-30 30.9 19°01.5
10	238°17.6	302°30.4	19.2	290°47.9	15.2	12°12.9	18.7	191°07.4	09.6	Rigil Kent.	139°35.1	-60°57.3
11	253°20.1	317°33.2	18.7	305°48.3	14.7	27°14.9	18.9	$206^{\circ}10.0$	09.6	Kochab	137°21.2	74°01.7
12	268°22.5	332°36.1	S21°18.2	320°48.8	S20°14.2	42°16.9	S16°19.0	221° 12.6	$N15^{\circ}09.5$	Zuben'ubi	136°51.8	-16°09.9
13	283°25.0	347°38.9	17.7	335°49.2	13.7	57°18.9	19.1	$236^{\circ}15.2$	09.5	Alphecca	126° 00.8	26°36.8
14	298°27.5	2°41.8	17.2	350°49.7	13.2	72°20.9	19.3	251° 17.8	09.5	Antares	112° 11.3	-26°29.7
15	313°29.9	17°44.6	• • 16.7	5°50.1	• • 12.7	87°22.8	•• 19.4	266° 20.4	• • 09.5	Atria	107°02.4	-69°04.6
16	328°32.4	32°47.5	16.2	20°50.6	12.3	102°24.8	19.5	281°23.0	09.4	Sabik	101°58.6	-15°45.5
17	343°34.8	47°50.3	15.7	35°51.0	11.8	117°26.8	19.7	296° 25.6	09.4	Shaula	96°05.4	-37°07.3
18	358°37.3	62°53.2	S21°15.2	50°51.4	S20°11.3	132°28.8	S16°19.8	311°28.2	N15°09.4	Rasalhague	95°55.2	12°32.4
19	13°39.8	77°56.1	14.7	65°51.9	10.8	147°30.8	19.9	326° 30.8	09.3	Eltanin	90°40.9	51°29.2
20	28°42.2	92°59.0	14.2	80°52.3	10.3	162°32.8	20.1	341°33.4	09.3	Kaus Aust.	83°27.7	-34°22.0
21	43°44.7	108°01.8	• • 13.7	95°52.8	• • 09.8	177°34.7	• • 20.2	356° 36.0	• • 09.3	Vega	80°31.0	38°48.9
22	58°47.2	123°04.7	13.1	110°53.2	09.3	192°36.7	20.3	11°38.6	09.3	Nunki	75°43.2	-26°15.4
23	73°49.6	138°07.6	12.6	125°53.7	8.80	207°38.7	20.4	26°41.2	09.2	Altair	$61^{\circ}56.4$	8°57.1
Mer.p	ass. 18:05	ν 2.8′ d-0	.5′ m-4.77	ν 0.4′ d-0	.5′ m1.14	ν 2.0′ d0.	1' m-1.75	ν 2.6′ d-0	.0′ m-0.09	Peacock	53°00.1	-56°38.3
										Deneb	49°23.4	45°23.6
ть	CHA	CHA	Doo	CHA	Doo	CHA	Doo	CHA	Doo	Enif	33°35.1	10°01.0
Thu 0	GHA 88°52.1	GHA 153°10.5	Dec \$21°12.1	GHA 140°54.1	Dec \$20°08.3	GHA 222°40.7	Dec \$16°20.6	GHA 41° 43.8	Dec N15°09.2	Al Na'ir	27°28.3	-46°49.0
1	103°54.6	168°13.4	11.6	155° 54.6	07.8	237°42.7	20.7	56° 46.4	09.2	Fomalhaut	15°10.3	-29°27.8
2	118° 57.0	183°16.3	11.1	170°55.0	07.4	252°44.7	20.7	71°49.0	09.2	Scheat	13°41.4	28°15.0
3	133°59.5	198°19.2	•• 10.6	185°55.5	06.9	267°46.6	21.0	86°51.6	•• 09.1	Markab	13°26.0	15°22.2
4	149°01.9	213°22.2	10.1	200°55.9	06.4	282°48.6	21.1	101°54.2	09.1	Dec 18 Tue	SHA	Mer.pass
5	164°04.4	228°25.1	09.6	215°56.4	05.9	297°50.6	21.2	116° 56.8	09.1	Venus	64°02.9	13:54
6	179°06.9	243°28.0	S21°09.1	230°56.8	S20°05.4	312°52.6	S16°21.4	131°59.4	N15°09.1	Mars	53°39.0	14:37
7	194°09.3	258°30.9	08.6	245°57.3	04.9	327°54.6	21.5	147°02.0	09.0	!	134°11.8	09:14
8	209°11.8	273°33.9	08.1	260°57.7	04.4	342°56.6	21.6	162°04.6	09.0	Saturn	$312^{\circ}45.1$	21:18
9	$224^{\circ}14.3$	288°36.8	• • 07.6	275°58.2	• • 03.9	357°58.5	• • 21.7	177°07.2	• • 09.0	De- 10 M	CIIA	N4::::-
10	$239^{\circ}16.7$	303°39.8	07.1	290°58.6	03.4	13°00.5	21.9	192°09.7	09.0	Dec 19 Wed Venus	SHA 64° 09.3	Mer.pass 13:49
11	$254^{\circ}19.2$	$318^{\circ}42.7$	06.6	$305^{\circ}59.1$	02.9	28°02.5	22.0	$207^{\circ}12.3$	08.9	Venus	52°50.5	13:49 14:37
12	269°21.7	333°45.7	S21°06.1	320°59.5	520°02.4	43°04.5	S16°22.1	222° 14.9	N15°08.9	Jupiter	52 50.5 134°00.2	09:11
13	284°24.1	348°48.6	05.6	336°00.0	01.9	58°06.5	22.3	237° 17.5	08.9	Saturn	312°48.4	21:14
14	299°26.6	3°51.6	05.1	351°00.4	01.4	73°08.5	22.4	252°20.1	08.9			41.17
15	314°29.1	18°54.6	• • 04.5	6°00.9	• • 00.9	88°10.5	• • 22.5	267° 22.7	• • 08.8	Dec 20 Thu	SHA	Mer.pass
16	329°31.5	33°57.5	04.0	21°01.3	20°00.4	103°12.4	22.6	282°25.3	08.8	Venus	64°18.4	13:45
17	344°34.0	49°00.5	03.5	36°01.8	19°59.9	118°14.4	22.8	297°27.9	08.8	Mars	52°02.0	14:36
18	359°36.4	64°03.5	\$21°03.0	51°02.2	\$19°59.4	133°16.4	\$16°22.9	312°30.5	N15°08.7	Jupiter		09:08
19	14°38.9	79°06.5	02.5	66°02.7	59.0	148°18.4	23.0	327°33.1	08.7	Saturn	312°51.7	21:09
20	29°41.4 44°43.8	94°09.5 109°12.5	02.0 •• 01.5	81°03.1 96°03.6	58.5 •• 58.0	163°20.4 178°22.4	23.2	342°35.7 357°38.3	08.7 •• 08.7	Horizont	al parallax	
21 22	44 43.8 59°46.3	109 12.5 124°15.5	01.0	90 03.0 111°04.0	57.5	178 22.4 193°24.3	· · 23.3 23.4	357 38.3 12°40.9	08.7		Venus:	0.5
23	74°48.8	139°18.5	00.5	111 04.0 126°04.5	57.5 57.0	208°26.3	23.4	27° 43.5	08.6		Mars:	0.1
Mer.p	ass. 18:02	$\nu 2.9' \ d-0$.5′ m-4.74	ν 0.4′ d-0	.5′ m1.14	ν 2.0′ d0.	1′ m-1.76	ν 2.6′ d-0	.0′ m-0.09			

h	Sui	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	180°52.9	\$23°23.1	36°14.9	12.0'	N21°25.0	5.2'	54.1'
1	195°52.6	23.1	50°45.9	11.9'	21°30.2	5.1'	54.1'
2	210°52.3	23.2	$65^{\circ}16.8$	11.9'	21°35.3	5.0'	54.1'
3	225°52.0	• • 23.3	79°47.7	11.8'	21°40.3	4.9'	54.2'
4	240°51.7	23.3	94°18.5	11.8'	21°45.2	4.8'	54.2'
5 6	255° 51.4 270° 51.1	23.4 \$23°23.5	108°49.3 123°20.0	11.7' 11.7'	21°49.9 N21°54.6	4.7' 4.6'	54.2' 54.2'
7	270 51.1 285°50.7	23.5	123 20.0 137°50.6	11.6'	21°59.2	4.0 4.5'	54.2'
8	300° 50.4	23.6	152°21.3	11.6'	22°03.7	4.4	54.2'
9	315°50.1	23.7	166°51.8	11.5'	22°08.1	4.3'	54.2'
10	330°49.8	23.7	181°22.4	11.5'	22°12.4	4.2'	54.2'
11	345°49.5	23.8	195°52.9	11.4'	22°16.6	4.1'	54.2'
12	0°49.2	S 23°23.8	210°23.3	11.4'	N22°20.7	4.0'	54.2'
13	15° 48.9	23.9	224°53.7	11.4'	22°24.7	3.9'	54.2'
14 15	30° 48.6 45° 48.3	24.0 •• 24.0	239°24.1 253°54.4	11.3' 11.3'	22°28.6 22°32.3	3.8' 3.7'	54.2' 54.3'
16	60°48.0	24.0	268°24.7	11.2'	22°36.0	3.6'	54.3'
17	75°47.7	24.1	282°54.9	11.2'	22°39.6	3.5'	54.3'
18	90°47.4	523°24.2	297°25.1	11.1'	N22°43.0	3.4'	54.3'
19	105°47.1	24.3	$311^{\circ}55.2$	11.1'	22°46.4	3.2'	54.3'
20	120°46.8	24.3	326°25.3	11.1'	22°49.6	3.1'	54.3'
21	135°46.5	• • 24.4	340°55.4	11.0'	22°52.8	3.0'	54.3'
22	150°46.1	24.4	355°25.4	11.0'	22°55.8	2.9'	54.3'
23	165°45.8	24.5	9°55.4	10.9'	22°58.7	2.8'	54.3'
	SD = 16.2'	d = 0.1'		SE	0 = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.5	\$23°24.5	24°25.3	10.9'	N23°01.5	2.7'	54.4'
1	195° 45.2 210° 44.9	24.6	38°55.2 53°25.1	10.9' 10.8'	23°04.2 23°06.8	2.6' 2.5'	54.4'
2 3	210°44.9 225°44.6	24.6 •• 24.7	53°25.1 67°55.0	10.8'	23°06.8 23°09.3	2.5'	54.4' 54.4'
3 4	240°44.3	24.7	82°24.8	10.8	23 09.3 23°11.7	2.4	54.4' 54.4'
5	255° 44.0	24.8	96° 54.5	10.7	23°14.0	2.1'	54.4'
6	270°43.7	S23°24.8	111°24.3	10.7'	N23°16.1	2.0'	54.4'
7	285°43.4	24.9	125°53.9	10.7'	23°18.1	1.9'	54.4'
8	300°43.1	24.9	140°23.6	10.6'	$23^{\circ}20.1$	1.8'	54.4'
9	315°42.8	• • 24.9	154°53.2	10.6'	23°21.9	1.7'	54.5'
10	330°42.4	25.0	169°22.9	10.6'	23°23.6	1.6'	54.5'
11 12	345°42.1 0°41.8	25.0 \$23°25.1	183°52.4 198°22.0	10.5' 10.5'	23°25.2 N23°26.6	1.5' 1.4'	54.5' 54.5'
13	15°41.5	25.1	212°51.5	10.5	23°28.0	1.4	54.5'
14	30°41.2	25.1	227°21.0	10.5'	23°29.2	1.1'	54.5'
15	45°40.9	• • 25.2	241°50.4	10.4'	23°30.3	1.0'	54.5'
16	60°40.6	25.2	$256^{\circ}19.9$	10.4'	23°31.4	0.9'	54.5'
17	75°40.3	25.3	270°49.3	10.4'	23°32.3	0.8'	54.6'
18	90°40.0	\$23°25.3	285°18.6 299°48.0	10.4'	N23°33.0 23°33.7	0.7'	54.6'
19 20	105°39.7 120°39.4	25.3 25.4	299 48.0 314°17.3	10.3' 10.3'	23°34.2	0.5'	54.6' 54.6'
21	135°39.1	. 25.4	328° 46.7	10.3	23°34.2	0.4' 0.3'	54.6'
22	150°38.8	25.4	343°15.9	10.3'	23°35.0	0.2	54.6'
23	165°38.4	25.5	357° 45.2	10.3'	23°35.2	0.1'	54.6'
	SD = 16.2'	d = 0.1'		SE	0 = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
i nu O	180°38.1	S23°25.5	12°14.5	ν 10.2'	N23°35.3	<i>a</i> -0.0'	пР 54.7'
1	195° 37.8	25.5	26°43.7	10.2'	23°35.2	-0.0	54.7'
2	210° 37.5	25.6	41°12.9	10.2'	23°35.1	-0.3	54.7'
3	225°37.2	• • 25.6	$55^{\circ}42.1$	10.2'	23°34.8	-0.4'	54.7'
4	240°36.9	25.6	70°11.3	10.2'	23°34.4	-0.5	54.7'
5	255°36.6	25.6	84°40.5	10.2'	23°33.9	-0.6'	54.7'
6 7	270°36.3 285°36.0	\$23°25.7 25.7	99°09.6 113°38.8	10.1' 10.1'	N23°33.2 23°32.5	-0.8' -0.9'	54.7' 54.8'
8	285°36.0 300°35.7	25.7 25.7	113° 38.8 128° 07.9	10.1'	23°32.5 23°31.6	-0.9' -1.0'	54.8'
9	315° 35.4	• • 25.8	142° 37.0	10.1	23°30.6	-1.1'	54.8
10	330°35.0	25.8	157°06.1	10.1'	23°29.5	-1.2	54.8'
11	345°34.7	25.8	171°35.2	10.1'	23°28.3	-1.3'	54.8'
12	0°34.4	S23°25.8	186°04.3	10.1'	N23°27.0	-1.5'	54.8'
13	15°34.1	25.8	200°33.4	10.1'	23°25.5	-1.6'	54.9'
14 15	30°33.8 45°33.5	25.9 •• 25.9	215°02.5 229°31.6	10.1' 10.1'	23°23.9 23°22.2	-1.7' -1.8'	54.9' 54.9'
16	60°33.2	25.9	244°00.6	10.1	23°20.4	-1.0 -1.9'	54.9'
17	75° 32.9	25.9	258°29.7	10.1	23°18.4	-2.1'	54.9'
18	90°32.6	S23°25.9	272°58.7	10.1'	N23°16.4	-2.2'	54.9'
19	105°32.3	26.0	287°27.8	10.1'	23°14.2	-2.3'	54.9'
20	120°32.0	26.0	301°56.9	10.1'	23°11.9	-2.4'	55.0'
21	135°31.6	• • 26.0	316°25.9	10.1'	23°09.5 23°07.0	-2.5'	55.0'
22 23	150°31.3 165°31.0	26.0 26.0	330°55.0 345°24.0	10.1' 10.1'	23°07.0 23°04.3	-2.7' -2.8'	55.0' 55.0'
23	SD = 16.2'	d = 0.0'	J+J Z4.U		0 = 14.9'	-2.0	33.0
	JD — 10.2	u — 0.0)L	_ 14.9		

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

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

		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	92-99%		
18	03:32	03:17	11:57	22:19	09:54			
19	03:02	02:47	11:57	23:09	10:44			
20	02:33	02:18	11:58	-:-	11:35			

December 21, 22, 23 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	89°51.2	154°21.5	S21°00.0	141°04.9	\$19°56.5	223°28.3	S16°23.7	42°46.1	N15°08.6			
1	104°53.7	169°24.5	20°59.5	156°05.4	56.0	238°30.3	23.8	57° 48.7	08.6	Alpheratz	357°30.6	$29^{\circ}15.6$
	119°56.2									Ankaa	353°03.3	-42°08.7
2		184°27.5	59.0	171°05.8	55.5	253°32.3	23.9	72°51.3	08.5	Schedar	349°26.1	56° 42.5
3	134°58.6	199°30.5	• • 58.5	186°06.3	• • 55.0	268°34.3	• • 24.1	87°53.9	• • 08.5	Diphda	348°43.3	-17°49.4
4	150°01.1	214°33.6	58.0	201°06.7	54.5	283°36.3	24.2	102°56.5	08.5	Achernar	335°17.2	-57°05.3
5	165°03.6	229°36.6	57.5	216°07.2	54.0	298°38.3	24.3	$117^{\circ}59.1$	08.5	Hamal	327°46.4	23°36.4
6	$180^{\circ}06.0$	244°39.6	S20°57.0	231°07.7	S19°53.5	313°40.2	S16°24.4	133°01.7	$N15^{\circ}08.4$	Polaris	311°23.7	89°23.5
7	195°08.5	259°42.7	56.5	246°08.1	52.9	328°42.2	24.6	148°04.2	08.4			
8	210°10.9	274°45.7	56.0	261°08.6	52.4	343°44.2	24.7	163°06.8	08.4	Acamar	315°08.5	-40°11.2
9	225°13.4	289°48.8	• • 55.5	276°09.0	• • 51.9	358°46.2	• • 24.8	178°09.4	• • 08.4	Menkar	314°01.7	4°12.4
10	240°15.9	304°51.8	55.0	291°09.5	51.4	13°48.2	25.0	193°12.0	08.3	Mirfak	308°22.0	49°58.1
11	255°18.3	319°54.9	54.5	306°09.9	50.9	28°50.2	25.1	208° 14.6	08.3	Aldebaran	290°34.7	16°34.1
12	270°20.8	334°58.0	\$20°54.0	321°10.4	S19°50.4	43°52.2	\$16°25.2	223°17.2	N15°08.3	Rigel	280°59.7	-8° 10.2
										Capella	280°15.5	$46^{\circ}01.5$
13	285°23.3	350°01.0	53.5	336°10.8	49.9	58°54.1	25.3	238° 19.8	08.3	Bellatrix	278°18.3	6°22.5
14	300°25.7	5°04.1	53.0	351°11.3	49.4	73°56.1	25.5	253°22.4	08.2	Elnath	277°56.4	28° 37.8
15	315°28.2	20°07.2	• • 52.5	6°11.7	• • 48.9	88°58.1	• • 25.6	268° 25.0	• • 08.2	Alnilam	275°33.4	$-1^{\circ}11.1$
16	330°30.7	35°10.3	51.9	21°12.2	48.4	104°00.1	25.7	283°27.6	08.2	Betelgeuse	270°47.4	$7^{\circ}24.6$
17	345°33.1	50°13.3	51.4	36°12.7	47.9	119°02.1	25.9	298°30.2	08.2	Canopus	263°50.0	-52°42.8
18	0°35.6	65°16.4	S20°50.9	51°13.1	S19°47.4	134°04.1	S16°26.0	313°32.8	$N15^{\circ}08.2$	Sirius	258°22.4	-16° 45.6
19	15°38.1	80°19.5	50.4	66°13.6	46.9	$149^{\circ}06.1$	26.1	328° 35.4	08.1		255°02.3	-10° 43.0 -29° 00.9
20	30°40.5	95°22.6	49.9	81°14.0	46.4	164°08.1	26.2	343°37.9	08.1	Adhara		
21	45°43.0	110°25.7	• • 49.4	96°14.5	• • 45.9	179°10.0	• • 26.4	358° 40.5	• • 08.1	Procyon	244°46.4	5°08.7
22	60°45.4	125°28.9	48.9	111°14.9	45.4	194°12.0	26.5	13°43.1	08.1	Pollux	243°12.1	27°56.9
23	75°47.9	140°32.0	48.4	126°15.4	44.9	209°14.0	26.6	28° 45.7	08.0	Avior	234°12.4	-59° 36.3
										Suhail	222°43.0	-43° 33.2
Mer.p	pass. 17:58	ν 3.0′ d-0.	.5′ m-4.70	ν 0.5′ d -0	.5′ m1.14	$\nu 2.0' \ d0.$	1' m-1.76	ν 2.6′ d-0	.0′ m-0.08	Miaplacidus	221°36.5	-69°50.3
										Alphard	217°43.6	-8°47.5
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.1	11°49.0
0	90°50.4	155°35.1	S20°47.9	141°15.8	S19°44.4	224°16.0	\$16°26.7	43° 48.3	N15°08.0	Dubhe	193°36.3	61°34.9
1	105°52.8	170°38.2	47.4	156°16.3	43.8	239°18.0	26.9	58° 50.9	08.0	Denebola	182°20.9	14°24.1
2						254°20.0		73°53.5		Gienah	175°39.5	-17°42.5
3	120°55.3	185°41.4	46.9 •• 46.4	171°16.8	43.3	269°22.0	27.0		08.0	Acrux	172°55.4	-63° 15.7
	135°57.8	200°44.5		186°17.2	• • 42.8	269 22.0 284°24.0	• • 27.1	88°56.1 103°58.7	• • 07.9	Gacrux	171°47.0	-57° 16.7
4	151°00.2	215°47.6	45.9	201°17.7	42.3		27.3		07.9	Alioth	$166^{\circ}09.9$	55° 47.5
5	166°02.7	230°50.8	45.4	216°18.1	41.8	299°26.0	27.4	119°01.3 134°03.9	07.9	Spica	158°18.2	-11° 19.0
6	181°05.2	245°53.9	\$20°44.9	231°18.6	S19°41.3	314°27.9	S16°27.5		N15°07.9	Alkaid	152°49.3	49°09.5
7	196°07.6	260°57.1	44.4	246°19.0	40.8	329°29.9	27.6	149°06.4	07.8	Hadar	148°30.4	-60°30.8
8	211°10.1	276°00.2	43.9	261°19.5	40.3	344°31.9	27.8	164°09.0	07.8	Menkent	147°53.0	-36° 30.9
9	226°12.6	291°03.4	• • 43.4	276°20.0	• • 39.8	359°33.9	• • 27.9	179° 11.6	• • 07.8	Arcturus	145°44.5	19°01.5
10	241°15.0	306°06.6	42.9	291°20.4	39.3	14°35.9	28.0	194° 14.2	07.8	Rigil Kent.	139°35.0	-60°57.3
11	256°17.5	321°09.7	42.4	306°20.9	38.7	29°37.9	28.1	209°16.8	07.7	Kochab	$137^{\circ}21.2$	74°01.7
12	271°19.9	336°12.9	S20°41.9	321°21.3	\$19°38.2	44°39.9	S16°28.3	224°19.4	N15°07.7	Zuben'ubi	136°51.8	-16°09.9
13	286°22.4	351°16.1	41.4	336°21.8	37.7	59°41.9	28.4	239°22.0	07.7	Alphecca	126°00.7	26° 36.8
14	301°24.9	6°19.3	40.9	351°22.2	37.2	74°43.9	28.5	254°24.6	07.7	Antares	112°11.3	-26° 29.7
15	316°27.3	21°22.5	• • 40.4	6°22.7	• • 36.7	89°45.9	• • 28.6	269°27.2	• • 07.7	Atria	107°02.4	-69°04.6
16	331°29.8	36°25.6	39.9	21°23.2	36.2	104°47.8	28.8	284°29.7	07.6	Sabik	101°58.6	-15°45.5
17	346°32.3	51°28.8	39.4	36°23.6	35.7	119°49.8	28.9	299°32.3	07.6	Shaula	96°05.4	-37°07.3
18	1°34.7	66°32.0	S20°38.9	51°24.1	\$19°35.1	134°51.8	S16°29.0	314°34.9	N15°07.6	Rasalhague	95°55.2	12°32.4
19	16°37.2	81°35.3	38.4	66°24.5	34.6	149°53.8	29.1	329° 37.5	07.6	Eltanin	90°40.9	51°29.2
20	31°39.7	96°38.5	37.9	81°25.0	34.1	164°55.8	29.3	344°40.1	07.5	Kaus Aust.	83°27.7	-34°22.0
21	46°42.1	111°41.7	• • 37.4	96°25.5	• • 33.6	179°57.8	• • 29.4	359° 42.7	• • 07.5	Vega	80°31.0	38°48.9
22	61°44.6	126°44.9	36.9	111°25.9	33.1	194°59.8	29.5	14°45.3	07.5	_		-26°15.4
23	76°47.1	141°48.1	36.4	126°26.4	32.6	210°01.8	29.7	29°47.9	07.5	Nunki Altair	75°43.2 61°56.4	-20 15.4 8°57.1
- A	17.54	21/ /0	F/ 4.66	0.5/ 1.0		2.0/_10	1/ 1.76	26/10	0/ 0.00	Peacock	53°00.2	-56°38.3
ivier.p	pass. 17:54	ν 3.1 a -0.	.5′ m-4.66	ν 0.5° a -0	0.5' m1.14	ν 2.0° a 0.	.1′ m-1.76	ν 2.0° a -0	.0′ m-0.08	Deneb	49°23.4	-50 36.3 45°23.6
										Enif	33°35.1	10°01.0
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.3	-46°49.0
0	91°49.5	156°51.4	\$20°35.9	141°26.8	S19°32.0	225°03.8	S16°29.8	44°50.4	N15°07.4	Fomalhaut	27 20.3 15°10.3	-40 49.0 -29°27.8
1	106°52.0	171°54.6	35.4	156°27.3	31.5	240°05.8	29.9	59°53.0	07.4	I	15°10.3 13°41.4	
2	121°54.4	186°57.8	34.9	171°27.8	31.0	255°07.8	30.0	74°55.6	07.4	Scheat		28° 15.0
3	136°56.9	202°01.1	• • 34.4	186°28.2	30.5	270°09.8	30.2	89°58.2	• • 07.4	Markab	13°26.0	15°22.2
4	151°59.4	217°04.3	33.9	201°28.7	30.0	285°11.7	30.3	105°00.8	07.4	Dec 21 Fri	SHA	Mer.pass
5	167°01.8	232°07.6	33.4	216°29.1	29.5	300°13.7	30.4	120°03.4	07.3	Venus	64°30.2	13:40
6	182°04.3	247°10.8	\$20°32.9	231°29.6	S19°28.9	315°15.7	S16°30.5	135°06.0	N15°07.3	Mars	51°13.7	14:35
7	197°06.8	262°14.1	32.5	246°30.1	28.4	330°17.7	30.7	150°08.5	07.3	Jupiter		09:05
8	212°09.2	202 14.1 277°17.4	32.5	240 30.1 261°30.5	27.9	345°19.7	30.7	165° 11.1	07.3	Saturn	312°54.9	21:05
9	212 09.2 227°11.7	292°20.6	31.5	201 30.5 276°31.0	•• 27.4	0°21.7	• • 30.9	180° 13.7	• • 07.2	Jatain	51.5	
10	242°14.2	307°23.9	31.0	270 31.0 291°31.5	26.9	15°23.7	31.0	195° 16.3	07.2	Dec 22 Sat	SHA	Mer.pass
11	242 14.2 257°16.6	307 23.9 322°27.2	30.5	306°31.9	26.9	30°25.7	31.0	210° 18.9	07.2	Venus	64°44.7	13:35
12	272°19.1	322 21.2 337°30.5	520° 30.0	300 31.9 321°32.4	519°25.8	45°27.7	\$1.2 \$16°31.3	210 16.9 225°21.5	N15°07.2	Mars	50°25.5	14:34
13	272 19.1 287°21.5	352°33.7	29.5	321 32.4 336°32.8	25.3	45 27.7 60°29.7	31.4	240°24.1	N15 07.2 07.2	Jupiter	133°25.6	09:02
14	302°24.0	7°37.0	29.5	351°33.3	25.3 24.8	75°31.7	31.4	255° 26.6	07.2	Saturn	312°57.9	21:01
15	302 24.0 317°26.5	22°40.3	. 28.5	6°33.8	• • 24.2	90°33.7	31.7	270° 29.2	•• 07.1	De- 22.0	CIIA	Ma:: :-
	317 20.5 332°28.9	22 40.3 37°43.6	28.0	0 33.8 21°34.2	23.7	90 33.7 105°35.7		270 29.2 285°31.8		Dec 23 Sun	SHA 65°01.0	Mer.pass
16 17	332 28.9 347°31.4						31.8	285 31.8 300°34.4	07.1	Venus	65°01.8	13:30
17	2°33.9	52°46.9 67°50.3	27.5 \$20° 27.0	36°34.7 51°35.2	23.2 \$19°22.7	120°37.6	31.9 \$16°32.0	300°34.4 315°37.0	07.1	Mars	49°37.3	14:34
18	2°33.9 17°36.3	82°53.6	\$20°27.0 26.5	66°35.6	22.1	135°39.6 150°41.6	\$16°32.0	315°37.0 330°39.6	N15°07.0	Jupiter		08:59
19							32.2		07.0	Saturn	313°00.9	20:57
20	32°38.8	97°56.9	26.0	81°36.1	21.6	165°43.6	32.3	345°42.2 0°44.7	07.0	Horizont	al parallax	
21 22	47°41.3 62°43.7	113°00.2 128°03.5	· · 25.5 25.0	96°36.6 111°37.0	· · 21.1 20.6	180°45.6 195°47.6	· · 32.4 32.5	15° 47.3	· · 07.0 07.0		Venus:	0.5
23	77°46.2	120 03.5 143°06.9	24.5	111 37.0 126°37.5	20.0	210°49.6	32.5	30°49.9	07.0		Mars:	0.1
23	11 40.2											
Mer.p	pass. 17:50	ν 3.2′ d-0	.5′ m-4.62	ν 0.5′ d -0	0.5′ m1.14	$\nu 2.0' \ d0.$.1′ m-1.77	ν 2.6′ d-0	.0′ m-0.07			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.7	\$23°26.0	$359^{\circ}53.1$	10.1'	$N23^{\circ}01.5$	-2.9'	55.0'
1	195°30.4	26.0	14°22.2	10.1'	22°58.6	-3.0'	55.0'
2	210°30.1 225°29.8	26.0 •• 26.1	28°51.2 43°20.3	10.1' 10.1'	22°55.6 22°52.5	-3.1' -3.2'	55.1' 55.1'
4	240°29.5	26.1	43°20.3	10.1	22°49.3	-3.4'	55.1'
5	255°29.2	26.1	72°18.5	10.1'	22°45.9	-3.5'	55.1'
6	270°28.9	S23°26.1	86°47.6	10.1'	N22°42.4	-3.6'	55.1'
7	285°28.6	26.1	101°16.7	10.1'	22°38.8	-3.7'	55.1'
8	300°28.2 315°27.9	26.1 •• 26.1	115° 45.8	10.1' 10.1'	22°35.1 22°31.3	-3.8'	55.2'
9 10	315°27.9 330°27.6	26.1	130°14.9 144°44.1	10.1	22°27.3	-3.9' -4.1'	55.2' 55.2'
11	345°27.3	26.1	159° 13.2	10.1	22°23.3	-4.2'	55.2'
12	0°27.0	S23°26.1	173°42.4	10.2'	N22°19.1	-4.3'	55.2'
13	15°26.7	26.1	188° 11.5	10.2'	22°14.8	-4.4'	55.2'
14	30°26.4	26.1	202°40.7 217°09.9	10.2'	22°10.4 22°05.8	-4.5'	55.3'
15 16	45°26.1 60°25.8	· · 26.1 26.1	217 09.9 231°39.2	10.2' 10.2'	22 05.8 22°01.2	-4.6' -4.8'	55.3' 55.3'
17	75°25.5	26.1	246°08.4	10.3'	21°56.4	-4.9'	55.3'
18	90°25.1	\$23°26.1	260°37.6	10.3'	N21°51.6	-5.0'	55.3'
19	105°24.8	26.1	275°06.9	10.3'	21°46.6	-5.1'	55.4'
20	120°24.5	26.1	289°36.2 304°05.5	10.3'	21°41.5	-5.2'	55.4'
21 22	135°24.2 150°23.9	· · 26.1	304°05.5 318°34.8	10.3' 10.3'	21°36.3 21°30.9	-5.3' -5.4'	55.4' 55.4'
23	165°23.6	26.1	333°04.2	10.4	21°25.5	-5.5'	55.4'
	SD = 16.3'	d = 0.0'			O = 15.0'		
	<u>JD = 10.5</u>	<u>u = 0.0</u>		JI	J = 13.0		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°23.3 195°23.0	\$23°26.1 26.1	347°33.6 2°03.0	10.4' 10.4'	N21°20.0 21°14.3	-5.7' -5.8'	55.4' 55.5'
2	210°22.7	26.0	16°32.4	10.4	21°08.5	-5.6' -5.9'	55.5'
3	225°22.4	26.0	31°01.8	10.5'	21°02.7	-6.0'	55.5'
4	240°22.0	26.0	45°31.3	10.5'	20°56.7	-6.1'	55.5'
5	255°21.7	26.0	60°00.8	10.5'	20°50.6	-6.2'	55.5'
6	270°21.4 285°21.1	\$23°26.0 26.0	74°30.3 88°59.8	10.5' 10.6'	N20°44.4 20°38.0	-6.3' -6.4'	55.6' 55.6'
7 8	285 21.1 300°20.8	26.0	88 59.8 103°29.4	10.6'	20°31.6	-6.5'	55.6'
9	315°20.5	26.0	117°58.9	10.6'	20°25.1	-6.6'	55.6'
10	330°20.2	25.9	$132^{\circ}28.6$	10.6'	20°18.4	-6.7'	55.6'
11	345°19.9	25.9	146°58.2	10.7'	20°11.7	-6.9'	55.6'
12 13	0°19.6 15°19.3	\$23°25.9 25.9	161°27.9 175°57.6	10.7' 10.7'	N20°04.8 19°57.9	-7.0' -7.1'	55.7' 55.7'
14	30°18.9	25.9 25.9	175° 37.0	10.7	19°50.8	-7.1 -7.2'	55.7'
15	45°18.6	• • 25.9	204°57.0	10.8'	19°43.7	-7.3'	55.7'
16	60°18.3	25.8	219°26.8	10.8'	19°36.4	-7.4'	55.7'
17 18	75°18.0 90°17.7	25.8 \$23°25.8	233°56.6 248°26.5	10.8' 10.9'	19°29.0 N19°21.6	-7.5' -7.6'	55.8' 55.8'
19	105°17.4	25.8	240 20.5 262°56.3	10.9'	19°14.0	-7.0 -7.7'	55.8'
20	120°17.1	25.7	277°26.2	10.9'	19°06.3	-7.8'	55.8'
21	135°16.8	• • 25.7	$291^{\circ}56.2$	11.0'	18°58.5	-7.9'	55.8'
22	150°16.5	25.7	306°26.1	11.0'	18°50.7	-8.0'	55.9'
23	165°16.2	25.7	320°56.1	11.0'	18°42.7	-8.1'	55.9'
	SD = 16.3'	d = -0.0'		SI	D = 15.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.9	\$23°25.6	335°26.1	11.1'	N18°34.6	-8.2'	55.9'
1	195°15.5	25.6	349°56.2	11.1'	18°26.5	-8.3'	55.9'
2	210°15.2 225°14.9	25.6 • • 25.6	4°26.3 18°56.4	11.1' 11.1'	18°18.2 18°09.8	-8.4' -8.5'	55.9' 56.0'
4	240°14.6	25.5	33°26.5	11.2'	18°01.4	-8.6'	56.0'
5	255°14.3	25.5	47°56.7	11.2'	17°52.8	-8.6'	56.0'
6	270°14.0	S23°25.5	62°26.9	11.2'	N17°44.2	-8.7'	56.0'
7	285°13.7 300°13.4	25.4	76°57.2 91°27.4	11.3' 11.3'	17°35.4 17°26.6	-8.8' ° 0'	56.0'
8 9	300°13.4 315°13.1	25.4 •• 25.4	91°27.4 105°57.8	11.3'	17°26.6 17°17.7	-8.9' -9.0'	56.0' 56.1'
10	330°12.8	25.3	120°28.1	11.4'	17°08.7	-9.1'	56.1
11	345°12.4	25.3	134°58.5	11.4'	16°59.6	-9.2'	56.1'
12	0°12.1	\$23°25.3	149°28.9	11.4'	N16°50.4	-9.3'	56.1'
13 14	15°11.8 30°11.5	25.2 25.2	163°59.3 178°29.8	11.5' 11.5'	16°41.1 16°31.7	-9.4' -9.5'	56.1' 56.2'
15	45°11.2	25.2	178 29.8 193°00.3	11.5'	16°31.7 16°22.3	-9.5' -9.5'	56.2'
16	60°10.9	25.1	207°30.8	11.6'	16°12.7	-9.6'	56.2'
17	75°10.6	25.1	222°01.4	11.6'	$16^{\circ}03.1$	-9.7'	56.2'
18	90°10.3	\$23°25.0	236°31.9	11.6'	N15°53.4	-9.8'	56.2'
19 20	105°10.0 120°09.7	25.0 24.9	251°02.6 265°33.2	11.7' 11.7'	15°43.6 15°33.7	-9.9' -10.0'	56.3' 56.3'
20	120 09.7 135°09.3	24.9	205 33.2 280°03.9	11.7'	15 33.7 15°23.8	-10.0'	56.3'
22	150°09.0	24.8	294°34.6	11.7'	15°13.7	-10.1	56.3
23	165°08.7	24.8	309°05.4	11.8'	15°03.6	-10.2'	56.3'
	SD = 16.3'	d = -0.0'		SI	O = 15.2'		

N 72° C	Naut. 08:26 08:06 07:50 07:37	Civil 10:58 09:55 09:20	Sunrise	Sunset	Civil 12:59	Naut. 15:31
N 70°	08:06 07:50 07:37	09:55 09:20		_		15:31
)7:50)7:37	09:20				
68° C	7:37				14:02	15:51
		00 - 4			14:38	16:07
		08:54	10:35	13:22	15:03	16:20
	7:26	08:34	09:53	14:05	15:23	16:31
62° 0	7:16	08:18	09:24	14:33	15:39	16:41
60° C	7:08	08:05	09:03	14:55	15:53	16:50
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56° (06:54	07:43	08:30	15:27	16:15	17:04
54° (06:47	07:34	08:18	15:40	16:24	17:10
52° 0	06:42	07:25	08:06	15:51	16:32	17:16
50° C	06:36	07:18	07:56	16:01	16:39	17:21
45° C	06:25	07:02	07:36	16:22	16:56	17:33
N 40°	06:14	06:48	07:19	16:39	17:09	17:43
35° C	06:05	06:36	07:05	16:53	17:21	17:53
)5:56	06:26	06:52	17:05	17:32	18:01
)5:39	06:07	06:31	17:26	17:50	18:18
)5:23	05:50	06:12	17:45	18:08	18:34
0° 0)5:06	05:32	05:55	18:02	18:25	18:51
S 10°)4:47	05:14	05:37	18:20	18:43	19:10
)4:25	04:54	05:18	18:39	19:04	19:33
	3:55	04:29	04:56	19:01	19:29	20:02
	3:37	04:13	04:43	19:14	19:44	20:21
	3:13	03:55	04:28	19:29	20:02	20:44
45° (2:43	03:33	04:10	19:47	20:25	21:15
S 50°	1:57	03:03	03:47	20:10	20:55	22:00
	1:29	02:48	03:37	20:21	21:10	22:28
	0:42	02:30	03:24	20:33	21:28	23:15
	////	02:07	03:10	20:47	21:50	////
	////	01:37	02:53	21:04	22:20	////
S 60°	////	00:46	02:33	21:25	23:11	////

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

		Sun		Moon			
Day	Eqn.of Time Mer. Mer.Pass.		Pass.	Age			
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm	100-96%	
21	02:03	01:48	11:58	00:00	12:26		
22	01:33	01:18	11:59	00:52	13:17		
23	01:03	00:49	11:59	01:42	14:06		

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

h	Aries	Ve	nus	M	ars	Jup	iter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
		158°10.2	520°24.0	141°37.9	S19°19.5						эпа	Dec
0	92°48.7					225°51.6	S16°32.8	45°52.5	N15°06.9	Alpheratz	357°30.6	29°15.6
1	107°51.1	173°13.5	23.5	156°38.4	19.0	240°53.6	32.9	60°55.1	06.9	Ankaa	353°03.3	-42°08.7
2	122°53.6	188°16.9	23.0	171°38.9	18.5	255°55.6	33.0	75°57.7	06.9	Schedar	349°26.2	56°42.5
3	137°56.0	203°20.2	• • 22.5	186°39.3	• • 17.9	270°57.6	• • 33.2	91°00.2	• • 06.8	Diphda	348°43.3	-17°49.4
4	152°58.5	218°23.6	22.0	201°39.8	17.4	285°59.6	33.3	106°02.8	06.8	Achernar	335°17.2	-57°05.3
5	168°01.0	233°27.0	21.6	216°40.3	16.9	301°01.6	33.4	121°05.4	06.8	Hamal	327°46.5	23°36.4
6	183°03.4	248°30.3	S20°21.1	231°40.7	S19°16.4	316°03.6	S16°33.5	136°08.0	N15°06.8	Polaris	311°24.6	89°23.5
7	198°05.9	263°33.7	20.6	246°41.2	15.8	331°05.6	33.7	151°10.6	06.8	Acamar	315°08.5	-40°11.3
8	213°08.4	278°37.0	20.1	261°41.7	15.3	346°07.6	33.8	166°13.1	06.7	Menkar	314°01.7	4°12.4
9	228° 10.8	293°40.4	• • 19.6	276°42.1	• • 14.8	1°09.6	• • 33.9	181°15.7	• • 06.7	Mirfak	308° 22.0	49°58.1
10	243°13.3	308°43.8	19.1	291°42.6	14.2	$16^{\circ}11.6$	34.0	196°18.3	06.7	Aldebaran	290°34.7	16°34.1
11	258° 15.8	323°47.2	18.6	306°43.1	13.7	31°13.6	34.1	211°20.9	06.7	Rigel	280°59.7	-8°10.2
12	273° 18.2	338°50.6	S20°18.1	321°43.5	S19°13.2	46°15.5	S16°34.3	226°23.5	N15°06.7	Capella	280° 15.5	46°01.6
13	288°20.7	353°54.0	17.6	336°44.0	12.6	61°17.5	34.4	241°26.1	06.6	Bellatrix	278° 18.3	6°22.5
14	303°23.2	8°57.4	17.1	351°44.5	12.1	76°19.5	34.5	256°28.6	06.6	Elnath	277°56.4	28°37.8
15	318°25.6	24°00.8	• • 16.6	6°44.9	• • 11.6	91°21.5	• • 34.6	271°31.2	• • 06.6	Alnilam	275°33.3	-1°11.1
16	333°28.1	39°04.2	16.1	21°45.4	11.1	106°23.5	34.8	286°33.8	06.6	Betelgeuse	270°47.4	7°24.6
17	348°30.5	54°07.6	15.6	36°45.9	10.5	121°25.5	34.9	301°36.4	06.5	Canopus	263°50.0	-52°42.8
18	3°33.0	$69^{\circ}11.0$	S20°15.1	51°46.3	S19°10.0	136°27.5	S16°35.0	316°39.0	$N15^{\circ}06.5$	Sirius	258°22.4	-16°45.6
19	18°35.5	84°14.4	14.7	66°46.8	09.5	151°29.5	35.1	331°41.5	06.5	Adhara	255°02.3	-10 43.0 -29°00.9
20	33°37.9	99°17.8	14.2	81°47.3	08.9	166°31.5	35.3	346°44.1	06.5		244°46.4	5°08.7
21	48°40.4	114°21.3	· · 13.7	96°47.7	• • 08.4	181°33.5	• • 35.4	1°46.7	• • 06.5	Procyon Pollux	244 46.4 243°12.1	5 08.7 27°56.9
22	63°42.9	129°24.7	13.2	111°48.2	07.9	196°35.5	35.5	16°49.3	06.4		243 12.1 234°12.4	-59°36.3
23	78°45.3	144°28.1	12.7	126°48.7	07.3	211°37.5	35.6	31°51.9	06.4	Avior	234° 12.4 222° 42.9	-59°36.3 -43°33.2
N 4 e ··	200 17.46		.5′ m-4.57	10 E/ -1 O	.5′ m1.14	1/2 0/ -10	1′ m-1.77	106/ 10	0/ m 0.07	Suhail		
ivier.p	ass. 17:46	ν 3.3 a -0	.ɔ ɪn-4.5 <i>[</i>	ν 0.5 a -0	.5 m1.14	ν 2.0° a 0.	T III-T.//	ν2.0 a-0	.0′ m-0.07	Miaplacidus	221°36.4 217°43.6	-69°50.3 -8°47.5
										Alphard		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°30.1	11°49.0
0	93°47.8	159°31.6	S20°12.2	141°49.1	S19°06.8	226°39.5	S16°35.8	46°54.4	N15°06.4	Dubhe	193°36.2	61°34.9
1	108°50.3	174°35.0	11.7	156°49.6	06.3	241°41.5	35.9	61°57.0	06.4	Denebola	182°20.9	14°24.1
2	123°52.7	189°38.5	11.2	171°50.1	05.7	256°43.5	36.0	76°59.6	06.4	Gienah	175°39.4	-17°42.5
3	138°55.2	204°41.9	. 10.7	186°50.6	. 05.2	271°45.5	36.1	92°02.2	. 06.3		172°55.4	-63°15.7
4	153°57.7	219°45.4	10.2	201°51.0	04.6	286°47.5	36.2	107°04.7	06.3	Gacrux		-57°16.7
5	169° 00.1	234°48.8	09.8	216°51.5	04.1	301°49.5	36.4	122°07.3	06.3	Alioth	166°09.8	55°47.5
6	184°02.6	249°52.3	S20°09.3	231°52.0	S19°03.6	316°51.5	\$16°36.5	137°09.9	N15°06.3	Spica	158° 18.2	-11°19.1
7	199°05.0	264°55.8	08.8	246°52.4	03.0	331°53.5	36.6	152°12.5	06.3	Alkaid	152°49.2	49°09.5
8	214° 07.5	279°59.2	08.3	261°52.9	02.5	346°55.5	36.7	167°15.1	06.2	Hadar	148°30.4	-60°30.8
9	214 07.5 229°10.0	279 59.2 295°02.7	07.8	201 52.9 276°53.4	• • 02.0	1°57.5	• • 36.9	182°17.6	06.2	Menkent	147°53.0	-36°30.9
	244° 12.4	310°06.2		270 53.4 291°53.8		16°59.5		197°20.2		Arcturus	145°44.5	19°01.5
10			07.3	306°54.3	01.4	32°01.5	37.0	212°22.8	06.2	Rigil Kent.	139°35.0	-60°57.3
11	259° 14.9	325°09.7	06.8		00.9 \$19°00.3	47°03.5	37.1 \$16°37.2	212 22.6 227°25.4	06.2	Kochab	$137^{\circ}21.1$	74°01.6
12	274°17.4	340°13.2	\$20°06.3	321°54.8					N15°06.2	Zuben'ubi	136°51.8	-16°09.9
13	289°19.8	355°16.7	05.8	336°55.3	18°59.8	62°05.5	37.3	242°28.0	06.1	Alphecca	$126^{\circ}00.7$	26°36.8
14	304°22.3	10°20.1	05.4	351°55.7	59.3	77°07.5	37.5	257°30.5	06.1	Antares	$112^{\circ}11.3$	-26°29.7
15	319°24.8	25°23.6	• • 04.9	6°56.2	• • 58.7	92°09.5	• • 37.6	272°33.1	• • 06.1	Atria	$107^{\circ}02.3$	-69°04.6
16	334°27.2	40°27.2	04.4	21°56.7	58.2	107°11.5	37.7	287°35.7	06.1	Sabik	101°58.5	-15°45.5
17	349°29.7	55°30.7	03.9	36°57.1	57.6	122°13.5	37.8	302°38.3	06.1	Shaula	96°05.4	-37°07.3
18	4°32.1	70°34.2	S20°03.4	51°57.6	\$18°57.1	137°15.5	S16°38.0	317°40.8	N15°06.0	Rasalhague	95°55.2	12°32.4
19	19°34.6	85°37.7	02.9	66°58.1	56.6	152°17.5	38.1	332°43.4	06.0	Eltanin	90°40.9	51°29.2
20	34°37.1	100°41.2	02.4	81°58.6	56.0	167°19.5	38.2	347°46.0	06.0	Kaus Aust.	83°27.7	-34°22.0
21	49°39.5	115°44.7	• • 01.9	96°59.0	• • 55.5	182°21.5	• • 38.3	2°48.6	• • 06.0	Vega	80°30.9	38°48.8
22	64°42.0	130°48.3	01.5	111°59.5	54.9	197°23.5	38.4	17°51.1	06.0	Nunki	75°43.2	-26°15.4
23	79°44.5	145°51.8	01.0	127°00.0	54.4	212°25.5	38.6	32°53.7	05.9	Altair	61°56.4	8°57.1
Mer n	ass. 17:42	$\nu^{3} 4' d-0$.5′ m-4.52	$\nu 0.5' d-0$.5′ m1.14	$v^2 0' d0$	1′ m-1.77	v2 6' d-0	.0′ m-0.06	Peacock	53°00.2	-56°38.2
		23.1 4 0	1.52				4.11			Deneb	49°23.4	45°23.6
										Enif	33°35.1	10°01.0
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.3	-46°49.0
0	94°46.9	160°55.3	\$20°00.5	142°00.5	S18°53.9	227°27.5	S 16°38.7	47°56.3	N15°05.9	Fomalhaut	15°10.4	-29°27.8
1	109°49.4	175°58.9	20°00.0	157°00.9	53.3	242°29.5	38.8	62°58.9	05.9	Scheat	13°41.4	28°15.0
2	124°51.9	191°02.4	$19^{\circ}59.5$	172°01.4	52.8	257°31.5	38.9	78°01.4	05.9	Markab	13°26.0	15°22.2
3	139°54.3	206°06.0	• • 59.0	187°01.9	• • 52.2	272°33.5	• • 39.1	93°04.0	• • 05.9			
4	154°56.8	221°09.5	58.5	202°02.3	51.7	287°35.5	39.2	108°06.6	05.8	Dec 24 Mon	SHA	Mer.pass
5	169°59.3	236°13.1	58.1	217°02.8	51.1	302°37.5	39.3	123°09.2	05.8	Venus	65°21.5	13:24
6	185°01.7	251°16.7	S19°57.6	232°03.3	S18°50.6	317°39.5	S16°39.4	138°11.7	N15°05.8	Mars	48°49.3	14:33
7	200°04.2	266°20.2	57.1	247°03.8	50.0	332°41.5	39.5	153°14.3	05.8	Jupiter		08:55
8	215°06.6	281°23.8	56.6	262°04.2	49.5	347°43.5	39.7	168°16.9	05.8	Saturn	313°03.8	20:53
9	230°09.1	296°27.4	• • 56.1	277°04.7	• • 48.9	2°45.5	• • 39.8	183°19.5	• • 05.7	Dec 25 Tue	SHA	Mer.pass
10	$245^{\circ}11.6$	311°30.9	55.6	292°05.2	48.4	17°47.5	39.9	198°22.0	05.7	Venus	5па 65°43.8	13:19
11	$260^{\circ}14.0$	326°34.5	55.2	307°05.7	47.9	32°49.5	40.0	213°24.6	05.7	Mars	48°01.4	14:32
12	$275^{\circ}16.5$	341°38.1	S19°54.7	322°06.1	S 18°47.3	47°51.5	S16°40.1	228°27.2	N15°05.7		48 01.4 132°51.7	08:52
13	290° 19.0	356°41.7	54.2	337°06.6	46.8	62°53.5	40.3	243°29.8	05.7	Saturn	313°06.6	20:49
14	$305^{\circ}21.4$	11°45.3	53.7	352°07.1	46.2	77°55.5	40.4	258°32.3	05.7	Jatuill	J1J UU.U	20.49
15	$320^{\circ}23.9$	26°48.9	• • 53.2	7°07.6	• • 45.7	92°57.5	• • 40.5	273°34.9	• • 05.6	Dec 26 Wed	SHA	Mer.pass
16	$335^{\circ}26.4$	41°52.5	52.7	22°08.0	45.1	107°59.5	40.6	288°37.5	05.6	Venus	66°08.4	13:13
17	$350^{\circ}28.8$	$56^{\circ}56.1$	52.3	37°08.5	44.6	123°01.5	40.8	303°40.0	05.6	Mars	47° 13.5	14:32
18	5°31.3	71°59.7	S19°51.8	52°09.0	S18°44.0	138°03.5	S16°40.9	318°42.6	N15°05.6		132°40.5	08:49
19	20°33.8	87°03.3	51.3	67°09.5	43.5	153°05.5	41.0	333°45.2	05.6	Saturn		20:45
20	35°36.2	102°06.9	50.8	82°10.0	42.9	168°07.5	41.1	348°47.8	05.5			
21	50°38.7	$117^{\circ}10.6$	• • 50.3	97°10.4	• • 42.4	183°09.5	• • 41.2	3°50.3	• • 05.5	Horizont	al parallax	
22	65°41.1	132°14.2	49.9	$112^{\circ}10.9$	41.8	198°11.5	41.4	18°52.9	05.5		Venus:	0.5
23	80°43.6	147°17.8	49.4	127°11.4	41.3	213°13.5	41.5	33°55.5	05.5		Mars:	0.1
N 4 e ··	200 17:20	2 E/ -1.0	E/ m 4 46	10 E/ -1 O	.5′ m1.15	1/2 0/ -10	1/ m 1 70	106/ 10	0/ m 0.06			
ivier.p	ass. 17:38	ν 3.5 a -0	.5′ m-4.46	ν 0.5 a-0	.o m1.15	ν 2.0° a 0.	1′ m-1.78	ν 2.0° a -0	.0′ m-0.06			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.4	\$23°24.7	$323^{\circ}36.1$	11.8'	$N14^{\circ}53.4$	-10.3'	56.4'
1	195°08.1	24.7	338°06.9	11.8'	14°43.1	-10.4'	56.4
2	210°07.8 225°07.5	24.7 •• 24.6	352°37.8 7°08.7	11.9' 11.9'	14°32.7 14°22.3	-10.4' -10.5'	56.4' 56.4'
4	240°07.2	24.6	21°39.5	11.9'	14°22.3	-10.5	56.5
5	255°06.9	24.5	36°10.5	12.0'	14°01.2	-10.7'	56.5
6	270°06.6	\$23°24.4	50°41.4	12.0'	$N13^{\circ}50.5$	-10.7'	56.5'
7	285°06.2	24.4	65°12.4	12.0'	13°39.8	-10.8'	56.5'
8 9	300°05.9 315°05.6	24.3	79°43.4 94°14.4	12.0' 12.1'	13°29.0 13°18.1	-10.9' -11.0'	56.5' 56.6'
10	315 05.0 330°05.3	· · 24.3 24.2	94 14.4 108°45.5	12.1'	13 18.1 13°07.2	-11.0'	56.6'
11	345°05.0	24.2	123°16.6	12.1'	12°56.1	-11.1'	56.6'
12	0°04.7	\$23°24.1	137°47.7	12.1'	N12°45.0	-11.2'	56.6'
13	15°04.4	24.1	152°18.8	12.2'	12°33.9	-11.2'	56.6'
14 15	30°04.1 45°03.8	24.0 •• 23.9	166°50.0 181°21.2	12.2' 12.2'	12°22.6 12°11.3	-11.3' -11.4'	56.7' 56.7'
16	60°03.5	23.9	195°52.4	12.2'	12°11.3	-11.4'	56.7
17	75°03.2	23.8	210°23.6	12.3'	11°48.5	-11.5'	56.7'
18	90°02.8	S 23°23.8	224°54.9	12.3'	N11°37.1	-11.6'	56.7'
19	105°02.5	23.7	239°26.2	12.3'	11°25.5	-11.6'	56.8'
20 21	120°02.2 135°01.9	23.6	253°57.5 268°28.8	12.3' 12.3'	11°13.9 11°02.2	-11.7' -11.7'	56.8' 56.8'
22	150°01.6	23.5	200 20.0 283°00.2	12.3	10°50.5	-11.7 -11.8'	56.8
23	165°01.3	23.4	297°31.5	12.4'	10°38.6	-11.9'	56.8'
	SD = 16.3'	d = -0.0'		SI	D = 15.4'		
_	CUA				Б.	,	LID
Tue 0	GHA 180°01.0	Dec \$23°23.4	GHA 312°02.9	u 12.4'	Dec N10°26.8	d -11.9'	HP 56.9'
1	195°00.7	23.3	326°34.3	12.4'	10°14.9	-12.0'	56.9
2	210°00.4	23.2	341°05.7	12.4'	10°02.9	-12.0'	56.9'
3	225°00.1	• • 23.2	355°37.2	12.5'	09°50.9	-12.1'	56.9'
4 5	239°59.8 254°59.4	23.1 23.0	10°08.6 24°40.1	12.5' 12.5'	09°38.8 09°26.6	-12.1' -12.2'	57.0' 57.0'
6	269°59.1	523°23.0	39°11.6	12.5'	N09°14.4	-12.2'	57.0'
7	284°58.8	22.9	53°43.1	12.5'	09°02.2	-12.3'	57.0'
8	299°58.5	22.8	$68^{\circ}14.6$	12.5'	08°49.9	-12.3'	57.0'
9	314°58.2	• • 22.7	82°46.1	12.5'	08°37.5	-12.4'	57.1'
10 11	329°57.9 344°57.6	22.7 22.6	97°17.7 111°49.2	12.6' 12.6'	08°25.2 08°12.7	-12.4' -12.5'	57.1' 57.1'
12	359°57.3	\$23° 22.5	126°20.8	12.6'	N08°00.2	-12.5'	57.1
13	14°57.0	22.4	140°52.4	12.6'	07°47.7	-12.6'	57.2'
14	29°56.7	22.4	155°24.0	12.6'	07°35.1	-12.6'	57.2'
15	44°56.4 59°56.0	· · 22.3	169°55.6 184°27.2	12.6' 12.6'	07°22.5 07°09.8	-12.7'	57.2' 57.2'
16 17	74°55.7	22.2	198°58.8	12.6'	07 09.8 06°57.1	-12.7' -12.8'	57.2'
18	89°55.4	\$23°22.0	213°30.4	12.6'	N06°44.3	-12.8'	57.3
19	104°55.1	22.0	228°02.0	12.6'	06°31.5	-12.8'	57.3'
20	119°54.8	21.9	242°33.7	12.6'	06°18.7	-12.9'	57.3'
21 22	134°54.5 149°54.2	· · 21.8 21.7	257°05.3 271°36.9	12.6' 12.6'	06°05.8 05°52.9	-12.9' -13.0'	57.3' 57.3'
23	164°53.9	21.6	286°08.6	12.6'	05°39.9	-13.0'	57.4'
	SD = 16.3'	d = -0.1'		SI	D = 15.5'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.6	\$23°21.5	300°40.2	12.6'	N05°26.9	-13.0'	57.4'
1	194°53.3	21.5	$315^{\circ}11.9$	12.6'	05°13.9	-13.1'	57.4'
2	209°53.0	21.4	329°43.5	12.6'	05°00.8	-13.1'	57.4'
3	224°52.7 239°52.3	· · 21.3 21.2	344°15.2 358°46.8	12.6' 12.6'	04°47.7 04°34.6	-13.1' -13.2'	57.5' 57.5'
4 5	239 52.3 254°52.0	21.2	358 40.8 13°18.4	12.6'	04 34.6 04°21.4	-13.2'	57.5'
6	269°51.7	\$23°21.0	27°50.1	12.6'	N04°08.2	-13.2'	57.5'
7	284°51.4	20.9	42°21.7	12.6'	03°55.0	-13.2'	57.5'
8	299°51.1	20.8	56°53.3	12.6'	03°41.8	-13.3'	57.6'
9 10	314°50.8 329°50.5	· · 20.7 20.6	71°24.9 85°56.5	12.6' 12.6'	03°28.5 03°15.2	-13.3' -13.3'	57.6' 57.6'
11	344°50.2	20.5	100°28.1	12.6'	03°01.9	-13.3'	57.6
12	359°49.9	\$23°20.5	114°59.7	12.6'	N02°48.5	-13.4'	57.7'
13	14°49.6	20.4	129°31.3	12.6'	02°35.2	-13.4'	57.7'
14 15	29°49.3 44°49.0	20.3	144°02.9 158°34.4	12.6' 12.5'	02°21.8 02°08.4	-13.4' -13.4'	57.7' 57.7'
15 16	59°48.7	20.2	158 34.4 173°06.0	12.5'	02 08.4 01°54.9	-13.4 -13.5'	57.7 57.8'
17	74°48.3	20.0	187°37.5	12.5'	01°41.5	-13.5'	57.8
18	89°48.0	\$23°19.9	202°09.0	12.5'	N01°28.0	-13.5'	57.8'
19	104°47.7	19.8	216°40.5	12.5'	01°14.5	-13.5'	57.8'
20 21	119°47.4 134°47.1	19.7 •• 19.6	231°12.0 245°43.5	12.5' 12.4'	01°01.0 00°47.5	-13.5' -13.5'	57.8' 57.9'
22	134 47.1 149°46.8	19.5	260°14.9	12.4'	00°34.0	-13.5'	57.9'
23	164°46.5	19.3	274°46.3	12.4'	00°20.4	-13.6'	57.9'
	SD = 16.3'	d = -0.1'		SI	O = 15.7'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	00 ^h 12 ^h		Upper Lower		19-2	
	mm:ss mm:ss hh:mm		hh:mm	hh:mm	hh:mm	91-75	
24	00:34	00:19	12:00	02:30	14:54		
25	00:04	00:11	12:00	03:18	15:42		
26	00:26	00:40	12:01	04:05	16:29		

December 27, 28, 29 UT (Thu., Fri., Sat.)

h	Aries	Ve	nus	М	ars	Jup	iter	Sat	urn		Stars	
Thu -	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	95°46.1	162°21.4	\$19°48.9	142°11.9	S18°40.7	228° 15.5	S16°41.6	48°58.0	N15°05.5			
1	110°48.5	102 21.4 177°25.1		157°12.3	40.7	243° 17.5		64°00.6	05.5	Alpheratz	$357^{\circ}30.6$	29°15.6
2	110 46.5 125°51.0	177 25.1 192°28.7	48.4	157 12.3 172°12.8	39.6	243 17.5 258° 19.5	41.7	79°03.2		Ankaa	353°03.4	-42°08.7
			47.9				41.8		05.4	Schedar	$349^{\circ}26.2$	56°42.5
3	140°53.5	207°32.4 222°36.0	• • 47.5	187°13.3 202°13.8	• • 39.1	273°21.5 288°23.5	• • 42.0	94°05.8	• • 05.4	Diphda	348°43.3	-17°49.4
4	155°55.9		47.0		38.5		42.1	109°08.3	05.4	Achernar	$335^{\circ}17.2$	-57°05.3
5	170°58.4	237°39.6	46.5	217°14.3	37.9	303°25.5	42.2	124°10.9	05.4	Hamal	327°46.5	23°36.4
6	186°00.9	252°43.3	\$19°46.0	232°14.7	S18°37.4	318°27.5	\$16°42.3	139°13.5	N15°05.4	Polaris	311°25.6	89°23.5
7	201°03.3	267°47.0	45.5	247°15.2	36.8	333°29.5	42.4	154°16.0	05.3	Acamar	315°08.6	-40°11.3
8	216°05.8	282°50.6	45.1	262°15.7	36.3	348°31.5	42.6	169°18.6	05.3	Menkar	$314^{\circ}01.7$	4°12.4
9	231°08.2	297°54.3	• • 44.6	277°16.2	• • 35.7	3°33.5	• • 42.7	184°21.2	• • 05.3	Mirfak	308°22.0	49°58.1
10	246°10.7	312°58.0	44.1	292°16.6	35.2	18°35.6	42.8	199°23.8	05.3	Aldebaran	290°34.7	16°34.1
11	261°13.2	328°01.6	43.6	307°17.1	34.6	33°37.6	42.9	214°26.3	05.3	Rigel	280°59.7	-8°10.2
12	276°15.6	343°05.3	S19°43.1	322°17.6	\$18°34.1	48°39.6	S16°43.0	229°28.9	N15°05.3	Capella	280°15.5	46°01.6
13	291°18.1	358°09.0	42.7	337°18.1	33.5	63°41.6	43.2	244°31.5	05.2	Bellatrix	278°18.3	6°22.4
14	306°20.6	13°12.7	42.2	352°18.6	33.0	78°43.6	43.3	259°34.0	05.2	Elnath	277°56.4	28°37.8
15	321°23.0	28°16.4	• • 41.7	7°19.0	• • 32.4	93°45.6	• • 43.4	274°36.6	• • 05.2	Alnilam	275°33.3	-1°11.1
16	336°25.5	43°20.0	41.2	22°19.5	31.8	108°47.6	43.5	289°39.2	05.2	Betelgeuse	270°47.4	7°24.6
17	351°28.0	58°23.7	40.8	37°20.0	31.3	123°49.6	43.6	304°41.7	05.2	Canopus	263°50.0	-52°42.8
18	6°30.4	73°27.4	S19°40.3	52°20.5	S18°30.7	138°51.6	S16°43.8	319°44.3	N15°05.2	Sirius	258°22.4	-16°45.6
19	21°32.9	88°31.1	39.8	67°21.0	30.2	153°53.6	43.9	334°46.9	05.1	Adhara	255°02.3	-29°00.9
20	36°35.4	103°34.8	39.3	82°21.4	29.6	168°55.6	44.0	349°49.4	05.1	Procyon	244°46.3	5°08.7
21	51°37.8	118°38.6	• • 38.9	$97^{\circ}21.9$	• • 29.0	183°57.6	• • 44.1	4°52.0	•• 05.1	Pollux	243°12.1	27°56.9
22	66°40.3	133°42.3	38.4	112°22.4	28.5	198°59.6	44.2	19°54.6	05.1	Avior	234° 12.4	-59°36.3
23	81°42.7	148°46.0	37.9	127°22.9	27.9	214°01.6	44.3	34°57.1	05.1	Suhail	222°42.9	-43°33.2
Morn	ass. 17:34	1/3 6/ 4 0	.5′ m-4.40	υ0 5′ d 0	.6′ m1.15	1/2 0/ d0	1′ m-1.78	1/2 6/ d 0	.0' m-0.05	Miaplacidus	221°36.4	-43 33.2 -69°50.3
ivier.p	vass. 11.54	ν 3.0 a-0	.5 111-4.40	νυ.5 α-U	.0 1111.13	ν2.0 a0.	111-1./0	ν2.0 <i>α</i> -0	.0 111-0.05	Alphard	221 30.4 217°43.6	-8°47.5
										Regulus	207°30.0	11°49.0
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.2	61°34.9
0	96°45.2	163°49.7	S19°37.4	142°23.4	S18°27.4	229°03.6	S 16°44.5	49°59.7	N15°05.0	Dubne	193 30.2 182°20.9	14°24.0
1	111°47.7	178°53.4	37.0	157°23.9	26.8	244°05.6	44.6	65°02.3	05.0	Gienah	182 20.9 175°39.4	-17°42.5
2	126°50.1	193°57.1	36.5	172°24.3	26.2	259°07.6	44.7	80°04.8	05.0			
3	141°52.6	209°00.9	• • 36.0	187°24.8	• • 25.7	274°09.6	• • 44.8	95°07.4	• • 05.0		172°55.3	-63°15.7
4	156°55.1	224°04.6	35.5	202°25.3	25.1	289°11.7	44.9	110°10.0	05.0	Gacrux		-57°16.7
5	171°57.5	239°08.3	35.1	217°25.8	24.6	304°13.7	45.1	125°12.5	05.0	Alioth	166°09.8	55°47.5
6	187°00.0	254°12.1	S19°34.6	232°26.3	S18°24.0	319° 15.7	S16°45.2	140°15.1	N15°04.9	Spica	158° 18.2	-11°19.1
7	202°02.5	269°15.8	34.1	247°26.7	23.4	334° 17.7	45.3	155° 17.7	04.9	Alkaid	152°49.2	49°09.5
8	217°04.9	284°19.6	33.6	262°27.2	22.9	349° 19.7	45.4	170°20.2	04.9	Hadar	148°30.4	-60°30.8
9	232°07.4	299°23.3	• • 33.2	277°27.7	22.3	4°21.7	• • 45.5	185°22.8	04.9	1	147°53.0	-36°30.9
10	247°09.8	314°27.1	32.7	292°28.2	21.8	19°23.7	45.7	200°25.4	04.9	Arcturus	145°44.5	19°01.4
11	262°12.3	329°30.8	32.7	307°28.7	21.0	34° 25.7	45.8	215°27.9	04.9	Rigil Kent.	139°35.0	-60°57.3
12	202 12.3 277°14.8	344°34.6	\$19°31.8	322°29.2	\$18°20.6	49° 27.7	\$16°45.9	230°30.5	N15°04.8	Kochab	$137^{\circ}21.1$	74°01.6
13	292°17.2	359°38.4	31.3	337°29.7	20.1	64° 29.7		245°33.1	04.8	Zuben'ubi	136°51.8	-16°09.9
	307°19.7			352°30.1		79°31.7	46.0	245 33.1 260°35.6		Alphecca	$126^{\circ}00.7$	26°36.8
14		14°42.1	30.8		19.5		46.1		04.8	Antares	$112^{\circ}11.2$	-26°29.7
15	322°22.2	29°45.9	• • 30.3	7°30.6	• • 18.9	94°33.7	• • 46.2	275°38.2	• • 04.8	Atria	$107^{\circ}02.3$	-69°04.6
16	337°24.6	44°49.7	29.9	22°31.1	18.4	109°35.7	46.4	290°40.8	04.8	Sabik	101°58.5	-15°45.6
17	352°27.1	59°53.5	29.4	37°31.6	17.8	124°37.8	46.5	305°43.3	04.8	Shaula	96°05.4	-37°07.3
18	7°29.6	74°57.2	\$19°28.9	52°32.1	\$18°17.2	139°39.8	\$16°46.6	320°45.9	N15°04.7	Rasalhague	95°55.2	12°32.4
19	22°32.0	90°01.0	28.5	67°32.6	16.7	154°41.8	46.7	335°48.5	04.7	Eltanin	90°40.9	51°29.2
20	37°34.5	105°04.8	28.0	82°33.0	16.1	169°43.8	46.8	350°51.0	04.7	Kaus Aust.	83°27.7	-34°22.0
21	52°37.0	120°08.6	• • 27.5	97°33.5	• • 15.5	184°45.8	• • 46.9	5°53.6	• • 04.7	Vega	80°30.9	38°48.8
22	67°39.4	135°12.4	27.1	112°34.0	15.0	199°47.8	47.1	20°56.2	04.7	Nunki	75°43.2	-26°15.4
23	82°41.9	150°16.2	26.6	127°34.5	14.4	214°49.8	47.2	35°58.7	04.7	Altair	61°56.4	8°57.1
Mer.p	ass. 17:30	$\nu 3.7' d-0$.5′ m-4.33	$\nu 0.5' d-0$.6′ m1.15	$\nu 2.0' d0.$	1′ m-1.78	$\nu 2.6' d-0$.0′ m-0.05	Peacock	53°00.2	-56°38.2
										Deneb	49°23.4	45°23.5
	_	_	_		_	_	_	_	_	Enif	$33^{\circ}35.1$	10°01.0
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.4	-46°49.0
0	97°44.3	165°20.0	S19°26.1	142°35.0	\$18°13.8	229°51.8	S16°47.3	51°01.3	N15°04.7	Fomalhaut	$15^{\circ}10.4$	-29°27.8
1	112°46.8	180°23.8	25.6	157°35.5	13.3	244°53.8	47.4	66°03.8	04.6	Scheat	13°41.4	28°15.0
2	127°49.3	195°27.6	25.2	172°36.0	12.7	259°55.8	47.5	81°06.4	04.6	Markab	$13^{\circ}26.0$	15°22.2
3	142°51.7	210°31.4	• • 24.7	187°36.4	• • 12.1	274°57.8	• • 47.7	96°09.0	• • 04.6	D 27 =:	6	
4	157°54.2	225°35.2	24.2	202°36.9	11.6	289°59.9	47.8	111°11.5	04.6	Dec 27 Thu	SHA	Mer.pass
5	172°56.7	240°39.0	23.8	217°37.4	11.0	305°01.9	47.9	126°14.1	04.6	Venus	66°35.4	13:07
6	187°59.1	255°42.9	S19°23.3	232°37.9	\$18°10.4	320°03.9	S16°48.0	141°16.7	N15°04.6	Mars	46°25.8	14:31
7	203°01.6	270°46.7	22.8	247°38.4	09.8	335°05.9	48.1	156°19.2	04.5	Jupiter		08:46
8	218°04.1	285°50.5	22.4	262°38.9	09.3	350°07.9	48.2	171°21.8	04.5	Saturn	313°12.0	20:41
9	233°06.5	300°54.3	• • 21.9	277°39.4	• • 08.7	5°09.9	• • 48.4	186°24.3	• • 04.5	Dec 28 Fri	SHA	Mer.pass
10	248°09.0	315°58.2	21.4	292°39.9	08.1	20°11.9	48.5	201°26.9	04.5	Venus	67°04.5	13:01
11	263°11.5	331°02.0	21.0	307°40.3	07.6	35° 13.9	48.6	216°29.5	04.5	Mars	45°38.2	14:30
12	278°13.9	346°05.8	S19°20.5	322°40.8	\$18°07.0	50° 15.9	S16°48.7	231°32.0	N15°04.5		132° 18.4	08:43
13	293°16.4	1°09.7	20.1	337°41.3	06.4	65°18.0	48.8	246°34.6	04.5	Saturn	313° 14.5	20:36
14	308°18.8	16°13.5	19.6	352°41.8	05.8	80°20.0	48.9	261°37.1	04.4	Catain	1.5	
15	323°21.3	31°17.4	• • 19.1	7°42.3	• • 05.3	95°22.0	• • 49.1	276°39.7	• • 04.4	Dec 29 Sat	SHA	Mer.pass
16	338°23.8	46°21.2	18.7	22°42.8	04.7	110°24.0	49.2	291°42.3	04.4	Venus	67°35.6	12:55
17	353°26.2	61°25.1	18.2	37°43.3	04.1	125°26.0	49.3	306°44.8	04.4	Mars	44°50.6	14:29
18	8°28.7	76°28.9	S19°17.7	52°43.8	S18°03.6	140°28.0	S16°49.4	321°47.4	N15°04.4	Jupiter	$132^{\circ}07.5$	08:39
19	23°31.2	91°32.8	17.3	67°44.3	03.0	155° 30.0	49.5	336°49.9	04.4	Saturn	$313^{\circ}16.9$	20:32
20	38°33.6	106°36.7	16.8	82°44.7	02.4	170°32.0	49.6	351°52.5	04.3		-1 "	
21	53°36.1	121°40.5	• • 16.3	97°45.2	• • 01.8	185°34.1	• • 49.8	6°55.1	• • 04.3	Horizont	al parallax	0.5
22	68°38.6	136°44.4	15.9	112°45.7	01.3	200°36.1	49.9	21°57.6	04.3		Venus:	0.5
23	83°41.0	151°48.3	15.4	127°46.2	00.7	215°38.1	50.0	37°00.2	04.3		Mars:	0.1
Mern	pass. 17:26	v3 8/ d-∪	.5′ m-4.25	ν0.5/ d.0	.6′ m1.15	v2 0' d0	1′ m-1.79	v2 6′ d₋0	.0′ m-0.04			
.vici.p	11.20	₽ 3.0 U-0	7.43	- J.J u-0	.5 1111.13	- 2.0 UU.		u-0	0.07			

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.2	\$23°19.2	289°17.7	12.4'	N00°06.9	-13.6'	57.9'
1 2	194°45.9 209°45.6	19.1 19.0	303°49.1 318°20.5	12.4' 12.3'	\$00°06.7 00°20.3	13.6' 13.6'	58.0' 58.0'
3	224°45.3	• • 18.9	332°51.8	12.3'	00°20.3	13.6'	58.0'
4	239°45.0	18.8	$347^{\circ}23.1$	12.3'	00°47.5	13.6'	58.0'
5	254°44.7	18.7	1°54.4	12.3'	01°01.1	13.6'	58.0'
6 7	269°44.4 284°44.0	\$23° 18.6 18.5	16°25.6 30°56.8	12.2' 12.2'	501°14.7 01°28.3	13.6' 13.6'	58.1' 58.1'
8	299°43.7	18.4	45°28.0	12.2'	01°41.9	13.6'	58.1
9	314°43.4	• • 18.3	59°59.2	12.1'	01°55.5	13.6'	58.1'
10 11	329°43.1 344°42.8	18.1 18.0	74°30.3 89°01.4	12.1' 12.1'	02°09.1 02°22.7	13.6' 13.6'	58.2' 58.2'
12	359°42.5	523°17.9	103°32.5	12.1	502°36.3	13.6'	58.2
13	14°42.2	17.8	118°03.5	12.0'	02°49.9	13.6'	58.2'
14	29°41.9	17.7	132°34.5	12.0'	03°03.6	13.6'	58.3'
15 16	44°41.6 59°41.3	· · 17.6 17.4	147°05.5 161°36.4	11.9' 11.9'	03°17.2 03°30.7	13.6' 13.6'	58.3' 58.3'
17	74°41.0	17.3	176°07.3	11.8'	03°44.3	13.6'	58.3'
18	89°40.7	S23°17.2	190°38.1	11.8'	S03°57.9	13.6'	58.3'
19	104°40.4 119°40.1	17.1 17.0	205°08.9 219°39.7	11.8' 11.7'	04°11.5 04°25.0	13.6' 13.5'	58.4' 58.4'
20 21	119°40.1 134°39.8	17.0	219° 39.7 234° 10.4	11.7' 11.7'	04°25.0 04°38.6	13.5'	58.4' 58.4'
22	149°39.5	16.7	248°41.0	11.6'	04°52.1	13.5'	58.4'
23	164°39.1	16.6	263°11.7	11.6'	05°05.6	13.5'	58.5'
	SD = 16.3'	d = -0.1'		SI	O = 15.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	179°38.8	S23°16.5	277°42.2	11.5'	S05°19.1	13.5'	58.5'
1	194°38.5	16.3	292°12.8	11.5'	05°32.6	13.5'	58.5'
2	209°38.2 224°37.9	16.2 •• 16.1	306°43.3 321°13.7	11.4' 11.4'	05°46.1 05°59.5	13.4' 13.4'	58.5' 58.5'
4	239°37.6	16.0	335°44.1	11.3'	06°12.9	13.4	58.6'
5	254°37.3	15.8	$350^{\circ}14.4$	11.3'	$06^{\circ}26.3$	13.4'	58.6'
6	269°37.0 284°36.7	\$23°15.7	4°44.7 19°14.9	11.2'	\$06°39.7 06°53.1	13.4'	58.6'
7 8	284 36.7 299°36.4	15.6 15.4	19° 14.9 33° 45.1	11.2' 11.1'	06°53.1 07°06.4	13.3' 13.3'	58.6' 58.7'
9	314°36.1	• • 15.3	48° 15.2	11.1'	07°19.7	13.3'	58.7'
10	329°35.8	15.2	62°45.2	11.0'	07°32.9	13.2'	58.7'
11 12	344°35.5 359°35.2	15.0 \$23°14.9	77°15.2 91°45.2	10.9' 10.9'	07°46.2 \$07°59.4	13.2' 13.2'	58.7' 58.7'
13	14°34.9	14.8	106° 15.0	10.8	08°12.6	13.1	58.8'
14	29°34.6	14.6	$120^{\circ}44.9$	10.8'	08°25.7	13.1'	58.8'
15	44°34.3 59°34.0	• • 14.5	135° 14.6 149° 44.3	10.7'	08°38.8 08°51.9	13.1' 13.0'	58.8'
16 17	59 34.0 74°33.7	14.4 14.2	149 44.3 164°13.9	10.6' 10.6'	08 51.9 09°04.9	13.0'	58.8' 58.9'
18	89°33.3	S23°14.1	178°43.5	10.5'	S09°17.9	13.0'	58.9'
19	104°33.0	13.9	193° 13.0	10.4'	09°30.9	12.9'	58.9'
20 21	119°32.7 134°32.4	13.8 · · 13.7	207°42.4 222°11.8	10.4' 10.3'	09°43.8 09°56.7	12.9' 12.8'	58.9' 58.9'
22	149°32.1	13.5	236°41.1	10.3	10°09.5	12.8'	59.0'
23	164°31.8	13.4	$251^{\circ}10.3$	10.2'	$10^{\circ}22.3$	12.7'	59.0'
	SD = 16.3'	d = -0.1'		SI	O = 15.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	179°31.5	\$23°13.2	265°39.5	10.1'	S10°35.0	12.7'	59.0'
1	194°31.2	13.1	280°08.6	10.0'	10°47.7	12.6'	59.0'
2	209°30.9 224°30.6	12.9 •• 12.8	294°37.6 309°06.6	9.9' 9.9'	11°00.3 11°12.9	12.6' 12.5'	59.0' 59.1'
4	239°30.3	12.6	323°35.4	9.8'	11°25.4	12.5'	59.1'
5	254°30.0	12.5	338°04.2	9.7'	11°37.9	12.4'	59.1'
6 7	269°29.7 284°29.4	\$23°12.3 12.2	352°33.0 7°01.6	9.6' 9.6'	\$11°50.3 12°02.7	12.4' 12.3'	59.1' 59.2'
8	204 29.4 299°29.1	12.2	21°30.2	9.6 9.5'	12° 15.0	12.3	59.2'
9	314°28.8	• • 11.9	35°58.7	9.4'	12°27.2	12.2'	59.2'
10	329°28.5	11.7	50°27.1	9.3'	12°39.4	12.1'	59.2'
11 12	344°28.2 359°27.9	11.6 \$23°11.4	64° 55.4 79° 23.7	9.3' 9.2'	12°51.5 \$13°03.5	12.0' 12.0'	59.2' 59.3'
13	14°27.6	11.3	93°51.9	9.1'	13°15.5	11.9'	59.3'
14	29°27.3	11.1	108°20.0	9.0'	13°27.4	11.8'	59.3'
15 16	44°27.0 59°26.7	· · 11.0 10.8	122°48.0 137°15.9	8.9' 8.9'	13°39.3 13°51.0	11.8' 11.7'	59.3' 59.3'
16 17	59°26.7 74°26.4	10.8 10.6	137°15.9 151°43.8	8.9'	13°51.0 14°02.7	11.7° 11.6'	59.3'
18	89°26.1	S23°10.5	166°11.6	8.7'	S14°14.4	11.5'	59.4'
19	104°25.8	10.3	180°39.3	8.6'	14°25.9	11.5'	59.4'
20 21	119°25.5 134°25.2	10.2 •• 10.0	195°06.9 209°34.4	8.5' 8.4'	14°37.4 14°48.8	11.4' 11.3'	59.4' 59.4'
22	134 25.2 149°24.9	09.8	209° 34.4 224° 01.8	8.4	15°00.1	11.2	59.4
23	164°24.6	09.7	238°29.2	8.3'	15°11.3	11.1'	59.5'
	SD = 16.3'	d = -0.1'		SI	O = 16.1'		

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

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

		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	66-43%	
27	00:55	01:10	12:01	04:52	17:16		
28	01:25	01:39	12:02	05:40	18:05		
29	01:54	02:08	12:02	06:31	18:57		

December 30, 31, 01 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	98°43.5	166°52.1	\$19°15.0	142°46.7	\$18°00.1	230°40.1	S16°50.1	52°02.7	N15°04.3		JIIA	
	96° 45.5 113° 45.9	181°56.0		157°47.2	17°59.5	245°42.1	50.2	67°05.3		Alpheratz	357°30.6	29°15.6
1 2	113 45.9 128°48.4	196°59.9	14.5	172°47.7		245 42.1 260°44.1		82°07.9	04.3	Ankaa	353°03.4	-42°08.7
			14.0	172 47.7 187°48.2	59.0		50.3		04.3	Schedar	349°26.2	56°42.5
3	143°50.9	212°03.8 227°07.7	• • 13.6		• • 58.4	275°46.1	• • 50.5	97°10.4	• • 04.2	Diphda	348°43.3	-17°49.4
4	158° 53.3		13.1	202°48.7	57.8	290°48.1	50.6	112°13.0	04.2	Achernar	$335^{\circ}17.3$	-57°05.3
5	173°55.8	242°11.5	12.7	217°49.2	57.2	305°50.2	50.7	127°15.5	04.2	Hamal	327°46.5	23°36.4
6	188° 58.3	257°15.4	\$19°12.2	232°49.7	S17°56.6	320°52.2	S16°50.8	142°18.1	N15°04.2	Polaris	311°26.5	89°23.5
7	204°00.7	272°19.3	11.7	247°50.1	56.1	335°54.2	50.9	157°20.7	04.2	Acamar	315°08.6	-40°11.3
8	219°03.2	287°23.2	11.3	262°50.6	55.5	350°56.2	51.0	172°23.2	04.2	Menkar	$314^{\circ}01.7$	4°12.4
9	234°05.7	302°27.1	• • 10.8	277°51.1	• • 54.9	5°58.2	• • 51.1	187°25.8	• • 04.2	Mirfak	308°22.0	49°58.1
10	249°08.1	317°31.0	10.4	292°51.6	54.3	21°00.2	51.3	202°28.3	04.1	Aldebaran	290°34.7	16°34.1
11	264°10.6	332°34.9	09.9	307°52.1	53.7	36°02.2	51.4	217°30.9	04.1	Rigel	280°59.7	-8°10.2
12	279°13.1	347°38.8	\$19°09.5	322°52.6	S17°53.2	51°04.3	S16°51.5	232°33.4	N15°04.1	Capella	$280^{\circ}15.5$	46°01.6
13	294°15.5	2°42.7	09.0	337°53.1	52.6	66°06.3	51.6	247°36.0	04.1	Bellatrix	278°18.3	6°22.4
14	309°18.0	17°46.7	08.5	352°53.6	52.0	81°08.3	51.7	262°38.6	04.1	Elnath	277°56.4	28°37.8
15	324°20.4	32°50.6	• • 08.1	7°54.1	• • 51.4	96°10.3	• • 51.8	277°41.1	•• 04.1	Alnilam	275°33.3	-1°11.1
16	339°22.9	47°54.5	07.6	22°54.6	50.8	111°12.3	52.0	292°43.7	04.1	Betelgeuse	270°47.4	7°24.6
17	354°25.4	62°58.4	07.2	37°55.1	50.3	126°14.3	52.1	307°46.2	04.0	Canopus	263°50.0	-52°42.8
18	9°27.8	78°02.3	S19°06.7	52°55.6	S17°49.7	141°16.3	S16°52.2	322°48.8	N15°04.0	Sirius	258° 22.4	-16°45.6
19	24°30.3	93°06.3	06.3	67°56.1	49.1	156°18.4	52.3	337°51.3	04.0	Adhara	255°02.3	-29°00.9
20	39°32.8	108°10.2	05.8	82°56.5	48.5	171°20.4	52.4	352°53.9	04.0	Procyon	244°46.3	5°08.6
21	54°35.2	123°14.1	05.4	97°57.0	• • 47.9	186°22.4	• • 52.5	7°56.4	• • 04.0	Pollux	243°12.1	27°56.9
22	69°37.7	138°18.1	04.9	112°57.5	47.3	201°24.4	52.6	22°59.0	04.0	Avior	234°12.4	-59°36.4
23	84°40.2	153°22.0	04.4	127°58.0	46.8	216°26.4	52.8	38°01.6	04.0	Suhail	222°42.9	-43°33.3
Mer.p	ass. 17:22	$\nu 3.9' d-0$.5′ m-4.17	ν 0.5 $^{\prime}$ d-0	.6′ m1.15	$\nu 2.0' \ d0$	1′ m-1.79	$\nu 2.6' d-0$.0′ m-0.04	Miaplacidus	221°36.4	-69°50.4
										Alphard	217°43.6	-8°47.5
			_		_		_		_	Regulus	207°30.0	11°49.0
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°36.2	61°34.9
0	99°42.6	168°25.9	S19°04.0	142°58.5	S17°46.2	231°28.4	S16°52.9	53°04.1	N15°04.0	Denebola	182°20.9	14°24.0
1	114°45.1	183°29.9	03.5	157°59.0	45.6	246°30.5	53.0	68°06.7	03.9	Gienah	175°39.4	-17°42.5
2	129°47.6	198°33.8	03.1	172°59.5	45.0	261°32.5	53.1	83°09.2	03.9	Acrux	172°55.3	-63°15.7
3	144°50.0	213°37.8	• • 02.6	188°00.0	• • 44.4	276°34.5	• • 53.2	98°11.8	• • 03.9	Gacrux	171°46.9	-57°16.7
4	159°52.5	228°41.7	02.2	203°00.5	43.8	291°36.5	53.3	113°14.3	03.9	Alioth	166°09.8	55°47.4
5	174°54.9	243°45.7	01.7	218°01.0	43.3	306°38.5	53.4	128°16.9	03.9	Spica	158° 18.1	-11°19.1
6	189°57.4	258°49.6	S19°01.3	233°01.5	S17°42.7	321°40.5	S16°53.6	143°19.4	N15°03.9	Alkaid	152°49.2	49°09.5
7	204°59.9	273°53.6	8.00	248°02.0	42.1	336°42.6	53.7	158°22.0	03.9	Hadar	148°30.3	-60°30.8
8	220°02.3	288°57.5	19°00.4	263°02.5	41.5	351°44.6	53.8	173°24.5	03.8	Menkent	147°53.0	-36°30.9
9	235°04.8	304°01.5	18°59.9	278°03.0	• • 40.9	6°46.6	• • 53.9	188°27.1	• • 03.8	Arcturus	145°44.5	19°01.4
10	250°07.3	319°05.5	59.5	293°03.5	40.3	21°48.6	54.0	203°29.6	03.8	Rigil Kent.	139°34.9	-60°57.3
11	265°09.7	334°09.4	59.0	308°04.0	39.7	36°50.6	54.1	218°32.2	03.8	Kochab	$137^{\circ}21.0$	74°01.6
12	280°12.2	349°13.4	\$18°58.6	323°04.5	S17°39.2	51°52.6	S16°54.2	233°34.8	N15°03.8	Zuben'ubi	136°51.8	-16°09.9
13	295°14.7	4°17.4	58.1	338°05.0	38.6	66°54.7	54.4	248°37.3	03.8	Alphecca	126°00.7	26°36.7
14	310°17.1	19°21.3	57.7	353°05.5	38.0	81°56.7	54.5	263°39.9	03.8	Antares	112°11.2	-26°29.7
15	325°19.6	34°25.3	• • 57.2	8°06.0	• • 37.4	96°58.7	• • 54.6	278°42.4	• • 03.8	Atria	107°02.3	-69°04.6
16	340°22.1	49°29.3	56.8	23°06.5	36.8	112°00.7	54.7	293°45.0	03.7	Sabik	101°58.5	-15°45.6
17	355°24.5	64°33.3	56.3	38°07.0	36.2	127°02.7	54.8	308°47.5	03.7	Shaula	96°05.3	-37°07.3
18	10°27.0	79°37.3	\$18°55.9	53°07.5	S17°35.6	142°04.8	S16°54.9	323°50.1	N15°03.7	Rasalhague	95°55.2	12°32.4
19	25°29.4	94°41.2	55.4	68°08.0	35.0	157°06.8	55.0	338°52.6	03.7	Eltanin	90°40.9	51°29.2
20	40°31.9	109°45.2	55.0	83°08.5	34.4	172°08.8	55.2	353°55.2	03.7	Kaus Aust.	83°27.6	-34°22.0
21	55°34.4	124°49.2	• • 54.6	98°09.0	• • 33.8	187°10.8	• • 55.3	8°57.7	• • 03.7	Vega	80°30.9	38°48.8
22	70°36.8	139°53.2	54.1	113°09.5	33.3	202°12.8	55.4	24°00.3	03.7	Nunki	75°43.2	-26°15.4
23	85°39.3	154°57.2	53.7	128°10.0	32.7	217°14.9	55.5	39°02.8	03.7	Altair	$61^{\circ}56.4$	8°57.0
Mer.p	ass. 17:18	$\nu 3.9' \ d-0.0$.5′ m-4.22	ν 0.5′ d-0	.6′ m1.15	$\nu 2.0' d0.$	1' m-1.79	ν 2.6′ d-0	.0′ m-0.03	Peacock	53°00.2	-56°38.2
				-						Deneb	49°23.4	45°23.5
_			_		_		_		_	Enif	$33^{\circ}35.1$	10°01.0
Tue	GHA 100° 41 0	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°28.4	-46°49.0
0	100°41.8	170°01.2	\$18°53.2	143°10.5	\$17°32.1	232°16.9	\$16°55.6	54°05.4	N15°03.6	Fomalhaut	15°10.4	-29°27.8
1	115°44.2	185°05.2	52.8	158°11.0	31.5	247°18.9	55.7	69°07.9	03.6	Scheat	13°41.4	28°15.0
2	130°46.7	200°09.2	52.3	173°11.5	30.9	262°20.9	55.8	84°10.5	03.6	Markab	13°26.0	15°22.2
3	145°49.2	215°13.2	51.9	188°12.0	30.3	277°22.9	· · 55.9	99°13.0	• • 03.6	Dec 30 Sun	SHA	Mor noss
4	160°51.6	230°17.2	51.4 51.0	203°12.5 218°13.0	29.7	292°25.0	56.1	114°15.6	03.6	Venus	68°08.6	Mer.pass 12:49
5	175°54.1	245°21.2	51.0 \$1.0° 50.6		29.1	307°27.0	56.2	129°18.1	03.6	Mars	44°03.2	14:28
6	190°56.6	260°25.2	\$18° 50.6	233°13.5	\$17°28.5	322°29.0	\$16°56.3	144°20.7	N15°03.6	Jupiter	131°56.6	08:36
7	205°59.0	275°29.2	50.1	248°14.0	27.9	337°31.0	56.4	159°23.2	03.6	Saturn	313° 19.3	20:28
8 9	221°01.5 236°03.9	290°33.2 305°37.3	49.7 •• 49.2	263°14.5 278°15.0	27.3 · · 26.7	352°33.0 7°35.1	56.5	174°25.8 189°28.3	03.6 •• 03.5	Saturn	313 19.3	20.20
	236°03.9 251°06.4					7°35.1 22°37.1	· · 56.6	189°28.3 204°30.9		Dec 31 Mon	SHA	Mer.pass
10 11	266°08.9	320°41.3 335°45.3	48.8 48.4	293°15.5 308°16.0	26.1 25.5	37°39.1	56.7	204°30.9 219°33.4	03.5 03.5	Venus	68°43.3	12:43
12	200 08.9 281°11.3	350°49.3	48.4 \$18°47.9	308 16.0 323°16.5	25.5 \$17°24.9	52°41.1	56.8 \$16°57.0	219 33.4 234°36.0	N15°03.5	Mars	43° 15.9	14:28
13	281 11.3 296°13.8	5°53.3	518 47.9 47.5	323 10.5 338°17.0	24.4	52 41.1 67°43.1	57.0	234 36.0 249°38.5	03.5	Jupiter	131°45.8	08:33
13 14	290 13.8 311°16.3	5 53.3 20°57.4	47.5 47.0	358 17.0 353°17.5	23.8	82°45.2	57.1 57.2	249 38.5 264°41.1	03.5	Saturn	$313^{\circ}21.5$	20:24
	311 16.3 326°18.7	20 57.4 36°01.4	47.0 •• 46.6	353 17.5 8°18.0	. 23.8	82 45.2 97°47.2	57.2	279°43.6	03.5	I 01 T	CIIA	Ma:: :-
15 16	341°21.2	50 01.4 51°05.4	46.2	8 18.0 23°18.5	22.6	97 47.2 112°49.2	57.4	279 43.0 294°46.2	03.5	Jan 01 Tue	SHA	Mer.pass
	341 21.2 356°23.7	66°09.4	46.2 45.7	23 18.5 38°19.0	22.0	112 49.2 127°51.2	57.4 57.5	294 46.2 309°48.7	03.5	Venus	69°19.4	12:37
17 18	11°26.1	81°13.5	45.7 \$18°45.3	53° 19.0	\$17°21.4	142°53.3	57.5 \$16°57.6	309 48.7 324°51.3	N15°03.4	Mars	42°28.7	14:27
19	26°28.6	96°17.5	44.8	68°20.0	20.8	142 55.3 157°55.3	57.7	324 51.3 339°53.8	03.4		131°35.1	08:30
20	41°31.1	90 17.5 111°21.5	44.4	83°20.5	20.8	172°57.3	57.7 57.9	354°56.3	03.4	Saturn	313°23.6	20:20
21	56°33.5	111 21.5 126°25.6	• • 44.0	98°21.0	. 19.6	172 57.3 187°59.3	• • 58.0	9°58.9	•• 03.4	Horizont	al parallax	
22	71°36.0	141°29.6	43.5	113°21.5	19.0	203°01.3	58.1	25°01.4	03.4		Venus:	0.5
23	86°38.4	156°33.7	43.1	128°22.0	18.4	218°03.4	58.2	40°04.0	03.4		Mars:	0.1
Mer.p	ass. 17:14	ν 4.0′ d-0.	.4′ m-4.30	ν 0.5′ d-0	.6′ m1.15	ν 2.0′ d0.	1′ m-1.80	ν 2.6′ d-0	.0′ m-0.03			

h	Su	n		-011		-00 360	
h					Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°24.3 194°24.0	\$23°09.5 09.3	252°56.4 267°23.6	8.2' 8.1'	\$15°22.5 15°33.5	11.1' 11.0'	59.5' 59.5'
2	209°23.7	09.2	281°50.7	8.0'	15° 44.5	10.9'	59.5'
3	224°23.4	• • 09.0	296°17.7	7.9'	15°55.4	10.8'	59.5'
4	239°23.1	08.9	$310^{\circ}44.7$	7.8'	$16^{\circ}06.2$	10.7'	59.6'
5	254°22.8	08.7	325°11.5	7.7'	16°16.9	10.6'	59.6'
6 7	269°22.5 284°22.2	\$23°08.5 08.3	339°38.2 354°04.9	7.7' 7.6'	\$16°27.5 16°38.0	10.5' 10.4'	59.6' 59.6'
8	299°21.8	08.2	8°31.5	7.5'	16°48.5	10.4	59.6'
9	314°21.5	08.0	22°58.0	7.4	16°58.8	10.2	59.6'
10	329°21.2	07.8	37°24.3	7.3'	$17^{\circ}09.0$	10.1'	59.7'
11	344°20.9	07.7	51°50.7	7.2'	17° 19.1	10.0'	59.7'
12	359°20.6	\$23°07.5	66°16.9	7.1'	\$17°29.2	9.9'	59.7'
13 14	14°20.3 29°20.0	07.3 07.1	80°43.0 95°09.1	7.0' 7.0'	17° 39.1 17° 48.9	9.8' 9.7'	59.7' 59.7'
15	44°19.7	• • 07.0	109°35.0	6.9	17° 58.6	9.6'	59.7'
16	59°19.4	06.8	124°00.9	6.8'	18°08.2	9.5'	59.7'
17	74°19.1	06.6	$138^{\circ}26.7$	6.7'	$18^{\circ}17.7$	9.4'	59.8'
18	89°18.8	\$23°06.4	152°52.4	6.6'	\$18°27.1	9.3'	59.8'
19	104°18.5	06.2	167°18.0	6.5'	18°36.3	9.2'	59.8'
20 21	119°18.2 134°17.9	06.1 •• 05.9	181°43.5 196°08.9	6.4' 6.4'	18° 45.5 18° 54.5	9.0' 8.9'	59.8' 59.8'
22	149°17.6	05.7	210°34.3	6.3	19°03.4	8.8'	59.8'
23	164°17.3	05.5	224°59.5	6.2	19°12.2	8.7'	59.8'
	SD = 16.3'	d = -0.2'		SI	D = 16.2'		
	<u> </u>	u = -0.2	-	- 31	J = 10.2		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.0 194°16.8	\$23°05.3	239°24.7 253°49.8	6.1'	\$19°20.9 19°29.5	8.6'	59.9'
1 2	194°16.8 209°16.5	05.2 05.0	253°49.8 268°14.8	6.0' 5.9'	19° 29.5 19° 37.9	8.4' 8.3'	59.9' 59.9'
3	224°16.2	• • 04.8	282°39.8	5.8'	19°46.2	8.2	59.9'
4	239°15.9	04.6	297°04.6	5.8'	19°54.4	8.1'	59.9'
5	254°15.6	04.4	311°29.4	5.7'	$20^{\circ}02.4$	7.9'	59.9'
6	269°15.3	S23°04.2	325°54.0	5.6'	520°10.4	7.8'	59.9'
7	284°15.0	04.0	340°18.7 354°43.2	5.5'	20°18.1	7.7'	59.9'
8 9	299°14.7 314°14.4	03.8 · · 03.7	354 43.2 9°07.6	5.4' 5.4'	20° 25.8 20° 33.3	7.5' 7.4'	60.0' 60.0'
10	329°14.1	03.5	23°32.0	5.3'	20° 40.7	7.3	60.0
11	344°13.8	03.3	37°56.3	5.2'	20°48.0	7.1	60.0'
12	359°13.5	S23°03.1	52°20.5	5.1'	S20°55.1	7.0'	60.0'
13	14°13.2	02.9	66°44.6	5.1'	21°02.1	6.8'	60.0'
14	29°12.9	02.7	81°08.7	5.0'	21°08.9	6.7'	60.0'
15 16	44°12.6 59°12.3	· · 02.5 02.3	95°32.7 109°56.6	4.9' 4.8'	21°15.6 21°22.1	6.5' 6.4'	60.0' 60.0'
17	74°12.0	02.1	109° 30.0	4.8'	21°28.5	6.3	60.0'
18	89°11.7	S23°01.9	138°44.2	4.7'	S21°34.8	6.1'	60.0'
19	104°11.4	01.7	153°07.9	4.6'	21°40.9	6.0'	60.0'
20	119°11.1	01.5	167°31.6	4.6'	21°46.9	5.8'	60.1'
21	134°10.8 149°10.5	• • 01.3	181°55.1 196°18.7	4.5'	21°52.7 21°58.3	5.7'	60.1'
22 23	149 10.5 164°10.2	01.1 00.9	210°42.1	4.5' 4.4'	21 58.3 22°03.8	5.5' 5.4'	60.1' 60.1'
25	SD = 16.3'	d = -0.2'			D = 16.3'	J. 1	
	3D = 10.3	a = -0.2		31	J = 10.5		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.9	\$23°00.7	225°05.5	4.3'	\$22°09.2	5.2'	60.1'
1 2	194°09.6 209°09.3	00.5 00.3	239°28.8 253°52.1	4.3' 4.2'	22° 14.4 22° 19.5	5.0' 4.9'	60.1' 60.1'
3	209°09.3 224°09.0	00.3 23°00.1	253°52.1 268°15.3	4.2' 4.2'	22° 19.5 22° 24.3	4.9° 4.7°	60.1
4	239°08.7	22°59.9	282°38.5	4.1'	22°29.1	4.6'	60.1
5	254°08.4	59.7	297°01.6	4.1'	22°33.7	4.4'	60.1'
6	269°08.1	S22°59.5	311°24.7	4.0'	S22°38.1	4.3'	60.1'
7	284°07.8	59.3	325°47.7	4.0'	22°42.3	4.1'	60.1
8 9	299°07.5 314°07.2	59.1 •• 58.8	340°10.7 354°33.6	3.9' 3.9'	22°46.4 22°50.4	3.9' 3.8'	60.1' 60.1'
10	314 07.2 329°06.9	58.6	354 33.6 8°56.5	3.8'	22°54.2	3.6'	60.1
11	344°06.7	58.4	23°19.3	3.8'	22°57.8	3.4'	60.1
12	359°06.4	S22°58.2	37°42.1	3.8'	S 23°01.2	3.3'	60.1'
13	14°06.1	58.0	52°04.8	3.7'	23°04.5	3.1'	60.1'
14	29°05.8	57.8	66°27.6	3.7'	23°07.6	3.0'	60.1'
15 16	44°05.5 59°05.2	· · 57.6 57.4	80°50.2 95°12.9	3.7' 3.6'	23° 10.6 23° 13.4	2.8' 2.6'	60.1' 60.1'
16 17	74°04.9	57.4 57.1	95°12.9 109°35.5	3.6'	23° 13.4 23° 16.0	2.5	60.1
18	89°04.6	\$22°56.9	109°53.3° 123°58.1	3.6'	\$23°18.4	2.3'	60.1
19	104°04.3	56.7	$138^{\circ}20.7$	3.6'	23°20.7	2.1'	60.1'
20	119°04.0	56.5	152°43.3	3.5'	23°22.8	1.9'	60.1'
21	134°03.7	• • 56.3	167°05.8	3.5'	23°24.8	1.8'	60.1'
22 23	149°03.4 164°03.1	56.1 55.8	181°28.3 195°50.8	3.5' 3.5'	23°26.6 23°28.2	1.6' 1.4'	60.1' 60.1'
23		_	190 00.8			1.4	00.1
	SD = 16.3'	d = -0.2'		SI	D = 16.4'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
y	00 ^h	12 ^h	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	32-13%
30	02:23	02:37	12:03	07:25	19:53	
31	02:52	03:06	12:03	08:22	20:52	
01	03:20	03:35	12:04	09:23	21:54	