MoonWatcher™

a publication of Celestial Products

Guide to accompany the world's most beautiful moon calendars: MoonLight™, MoonShine™, MoonDazzle™, Moons and Blooms™

Phases of the Moon 2017

All times shown in Universal Time (UT hh:mm) – Eclipses are marked with "E" and number for reference under "Eclipses"

New Moon

Month	Day	Time	
Jan	28	00:07	
Feb	26	14:58	E2
Mar	28	02:57	
Apr	26	12:16	
May	25	19:44	
Jun	24	02:31	
Jul	23	09:46	
Aug	21	18:30	E4
Sep	20	05:30	
Oct	19	19:12	
Nov	18	11:42	
Dec	18	06:31	

First Quarter

Month	Day	Time
Jan	05	19:47
Feb	04	04:19
Mar	05	11:32
Apr	03	18:39
May	03	02:47
Jun	01	12:42
Jul	01	00:51
Jul	30	15:23
Aug	29	08:13
Sep	28	02:54
Oct	27	22:22
Nov	26	17:03
Dec	26	09:20

Full Moon

Month	Day	Time	
Jan	12	11:34	
Feb	11	00:33	E1
Mar	12	14:54	
Apr	11	06:08	
May	10	21:43	
Jun	09	13:10	
Jul	09	04:07	
Aug	07	18:11	E3
Sep	06	07:03	
Oct	05	18:40	
Nov	04	05:23	
Dec	03	15:47	

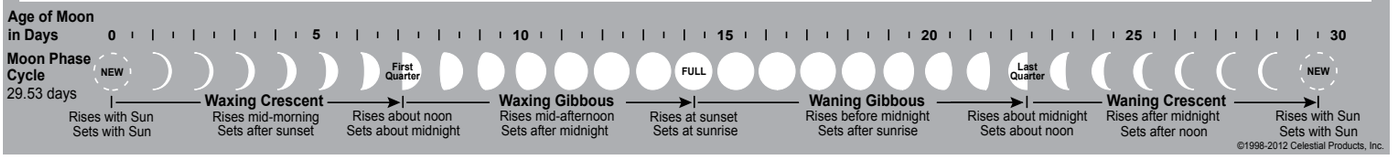
Last Quarter

Month	Day	Time
Jan	19	22:14
Feb	18	19:33
Mar	20	15:58
Apr	19	09:57
May	19	00:33
Jun	17	11:33
Jul	16	19:26
Aug	15	01:15
Sep	13	06:25
Oct	12	12:25
Nov	10	20:37
Dec	10	07:51

Basic data shown here and in other tables credit to Fred Espenak and Sumit Dutta, NASA Goddard Space Flight Center.

Daily Phase Changes and Rise/Set Times

The period of time in which the moon moves through one complete change of phases represents a synodic month - an average of 29.53 days. A lunation generally refers to the period between consecutive new moons - again, an average of 29.53 days. It is common to refer to the age of the moon in units of days. At about 7 days after New, the moon has passed through one fourth of its journey through a complete lunation, hence the name of First Quarter. About halfway through the cycle (14-15 days), the moon is seen in its Full illumination. At about 22 days of age, it is three-quarters through the cycle - the Last Quarter (sometimes called Third Quarter) phase. Finally, the moon comes back to New Moon after 29+ days. In the diagram below, the various phase appearances of the moon are illustrated along the days of age ruler. Names for the moon's illuminated growth/phases between the quarter phases is show immediately below the illustrations. Just remember that the term waxing refers to the moon's increasing illumination and waning to receding illumination. Also shown are mid-latitude rules of thumb for the rise and set times of the moon. More specific times of moonrise and moonset are dependent on many variables: location, date, altitude, localized terrain, and additional sun/earth/moon geometric information. Refer to our mooncalendar.com website for more information on resources for moon watchers.



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Eclipses 2017

Eclipse dates are marked on the Phases of the Moon table. Times shown in that table are close to "mid-eclipse" values. (See Universal Time for discussion on conversion of Universal Time to other zone times.)

E1 – February 10-11 – Penumbral Eclipse of the Moon. Penumbral eclipses are difficult to see because of the only slight shading of the moon. Visible from most of the world except Australia and Indonesia.

E2 – February 26 – Annular/Partial Eclipse of the Sun.* Viewable from southern South America across Atlantic to southern Africa.

E3 – August 7 – Partial Eclipse of the Moon. Visible from Africa, eastern Europe, Asia, Australia.

E4 – August 21 – Total Eclipse of the Sun.* Visible from North America. Here is a mini-map of the path of totality. If you are north or south of that path, then your view of the eclipse is partial. The closer to the path, the greater the percentage of the sun will be blocked by the moon. (0.80 and 0.60 on the map show the maximum portion of blockage - i.e., 80% , 60%.) Greatest duration of totality (2m 40s) is close to Paducah, Kentucky at approximately 1:22 CDT, but states from Oregon to South Carolina will have excellent opportunity to enjoy this eclipse.

Eclipse predictions by Fred Espenak, NASA's Goddard Space Flight Center.

(*Warning: Never look directly at the sun. Use proven methods/devices for solar eclipse viewing.) What you will see depends on your location relative to the path of totality. The moon basically moves from the right of the sun, through it and exits to the left of the sun. If you are north of the path, the center of the moon misses the sun's center passing below it and leaving a portion of the sun exposed above the upper limb of the moon. The opposite is true for viewing from south of the path of totality. If you are lucky to be viewing from inside the path of totality, you will see the moon fully block the sun.

Your location determines how much of the sun will still be seen at your local maximum eclipse.

< North of the path of totality.

< On the path of totality, 100% of the sun is blocked.

< South of the path of totality.

Blue Moons

Should you get excited about seeing a Blue Moon? No, but this popular term has hopefully led to more interest in astronomy. Unlike other astronomical events - an eclipse, occultation, transit of Mercury, etc. - there is nothing to witness in the way of motion or change. Blue Moon definitions (yes, there is more than one!) are just human inventions to put a name on a counting fluctuation that occurs when one puts the grid of our calendar system on the natural moon phase cycle. To help you understand this kind of phenomenon, imagine two systems: the first a spigot that drips once every 29 seconds and the other your hand-held cup that repeatedly moves in and out under the spigot - 30 seconds under and 30 seconds out. Eventually, your cup will be under for 30 seconds and catch two drips 29 seconds apart instead of the usual one drip. So it is with our calendar system of months, season changeover dates, and the moon's phase cycle. Both of the following definitions are the result of looking for an extra count of a full moon inside one of our calendar cycles.

The widely known definition that has permeated western culture since the mid-20th century relates to the occurrence of a second full moon in a calendar month. Since the average lunation takes just over 29.5 days, it is possible to have two full moons within the 30 or 31 day calendar months as long as the first full moon occurs within the first day(s) of the month. One can find one of these Blue Moon months roughly every 2+ years, but this average is hardly a rule that can be used to predict future occurrences. This is due to the varying number of days in each calendar month, leap year, and the variance from the 29.5 day average lunation period. The next Blue Moons under this definition occur January 31, 2018 and March 31, 2018 - both in the same year which can only happen because February has 28 days. The next double Blue Moon like this happens in January and March of 2037.

Now, let's look at a less familiar definition of a seasonal Blue Moon that evolved many decades ago. It refers to the third full moon within a season (astronomical Winter, Spring, Summer, Fall) having four full moons. Normally a season will have only three full moons, but occasionally, the lunation cycle meshes with a season so that it is possible to get in four full moons. Thus, February, May, August, and November are the only months in which one could have one of these "extra" seasonal full moons. The full moon of May 18, 2019 is the next Blue Moon using this definition since there are four full moons in the season period between the March equinox and the June solstice. Remember, this type of Blue Moon is the full moon of the last full month in that season. Since the seasons have beginning and ending dates partially into a calendar month, the Blue Moon will always be the third full moon in the season of four.

The name Blue Moon may otherwise apply to the rare occurrence of seeing a blue colored moon filtered through atmospheric particles that scatter more of the yellow-red wavelengths than the green-blue wavelengths that give it the color.

Equinoxes and Solstices 2017

(See **Universal Time** article for conversion to your time zone)

Month	Day	Time (UT)	Event
Mar	20	10:29	March (Spring/Vernal) Equinox
Jun	21	04:25	June (Summer) Solstice
Sep	22	20:02	September (Fall/Autumnal) Equinox
Dec	21	16:29	December (Winter) Solstice

Perihelion and Aphelion 2017

Month	Day	Time (UT)	Event
Jan	4	10:59	Perihelion (Earth closest to Sun)
Jul	4	00:59	Aphelion (Earth farthest from Sun)

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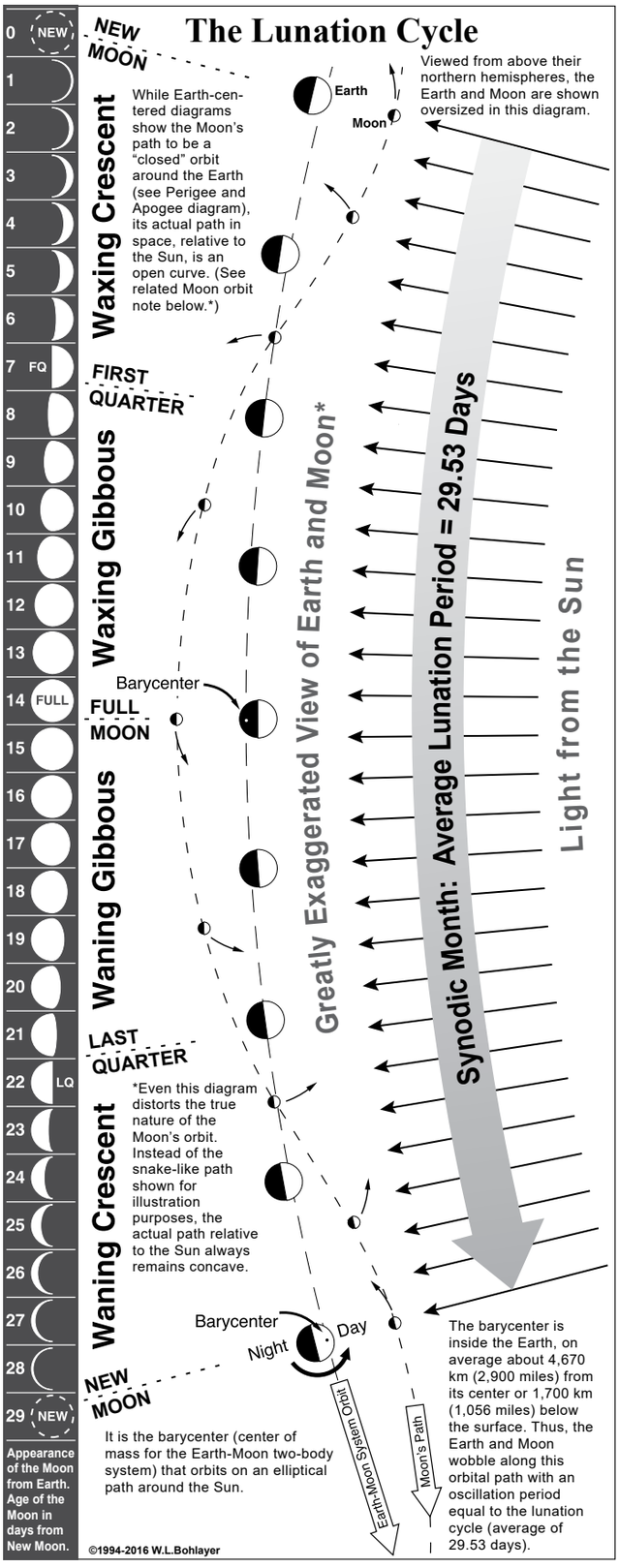
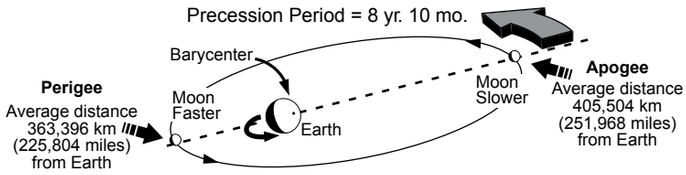


Perigee and Apogee

Like most orbits, the path of the Moon around the Earth is an ellipse with a closest approach, perigee, and farthest point called apogee. (More accurately stated, this path is an ellipse with a focus on the barycenter. See note on the barycenter in diagram at left.) It is possible to visually detect the Moon's larger apparent size at perigee to that at apogee. While perigee and apogee can occur at any phase of the moon, try to capture a full moon at or near perigee and apogee using a medium to long focal length telephoto lens.

The additional increase in lunar gravitational force on the Earth at perigee can lead to higher high tides (and lower low tides) than would normally occur. Couple this increased lunar gravitational component with the Sun's gravitational force at a time when both the Moon and Sun are aligned with the Earth (New or Full Moon) and you have the ingredients for higher than normal tides–tides that are dreaded for their potential shore damage when a storm is present.

As a further complication to the Moon's orbit, the elliptical figure itself turns (precesses) forward relative to the background stars, taking nearly 9 years to complete one circuit.



2017

These dates are also marked directly on most of our moon calendars.
Look for "P" Perigee, "A" Apogee. Data credit to Fred Espenak, NASA GSFC.

Perigee			Apogee		
Date	Time(UT)	km	Date	Time(UT)	km
Jan 10	06:07	363242*	Jan 22	00:14	404913
Feb 06	13:59	368817	Feb 18	21:14	404376
Mar 03	07:24	369065	Mar 18	17:25	404651
Mar 30	12:39	363855	Apr 15	10:05	405478
Apr 27	16:18	359325	May 12	19:51	406212
May 26	01:23	357210*	Jun 08	22:21	406402
Jun 23	10:49	357938*	Jul 06	04:27	405934
Jul 21	17:09	361238	Aug 02	17:55	405026
Aug 18	13:14	366129	Aug 30	11:25	404307
Sep 13	16:04	369856	Sep 27	06:49	404342
Oct 09	05:51	366858	Oct 25	02:25	405151
Nov 06	00:09	361438	Nov 21	18:52	406132
Dec 04	08:42	357496*	Dec 19	01:27	406605

*May 26, 2016 is the shortest distance perigee (357,210 km or 221,960 miles) and nearly coincident with the new moon on May 25. The moon will be too closely aligned with the sun to be visible on the 25th. In similar fashion, the new moon of June 24 is also nearly coincident with perigee of June 23. The closest full moons nearly coincident with a perigee occur on January 12 and December 3. Astronomers have known about these coinciding events for hundreds of years and call them perigee full/new moons, but they got dubbed by an astrologer as "supermoons" and news media jumped on the term. There is more hype than substance attached with the visual aspects to these events. It is more important knowing that every perigee coincident with either a full or new moon has its greatest influence in higher and lower tide height/depth values.

Full Moon Names

The following names for full Moons come to us from American Indian and folklore sources. Take your pick!

January..... Moon After Yule, Old Moon
February ..... Snow Moon, Hunger Moon, Wolf Moon
March..... Sap Moon, Crow Moon, Lenten Moon
April ..... Grass Moon, Egg Moon
May..... Planting Moon, Milk Moon
June..... Rose Moon, Flower Moon, Strawberry Moon
July ..... Thunder Moon, Hay Moon
August ..... Green Corn Moon, Grain Moon
September.. Fruit Moon, Harvest Moon*
October..... Hunter's Moon, Harvest Moon*
November... Hunter's Moon, Frosty Moon, Beaver Moon
December... Moon Before Yule, Long Night Moon

*Usually, the full moon closest to the autumnal equinox is called the Harvest Moon, but for some, the assignment of the Harvest Moon is that which occurs only on or after the autumnal equinox. In either case, this means that there are years when the October full moon may end up being called the Harvest Moon.

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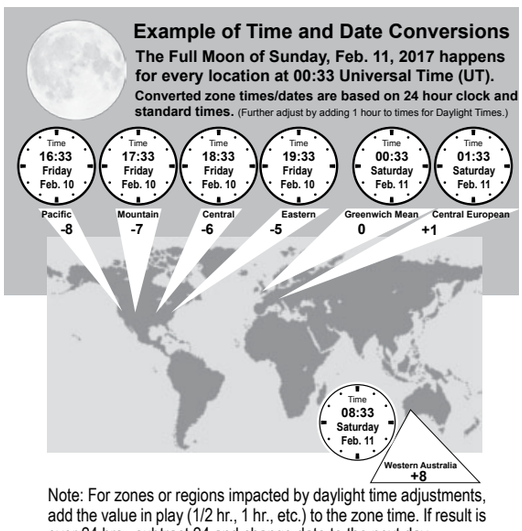
Universal Time

All our publication event times are reported in Universal Time (UT). This is simply understood as the local time on the prime meridian (0 degrees longitude) which passes through Greenwich, England, hence the familiarity you may have with Greenwich Mean Time (GMT). Universal Time uses a 24 hour period with 0 hours representing midnight; 12:00 is noontime; 14:00 is 2 pm; 18:00 is 6 pm, and so forth.



Note: For zones or regions impacted by daylight time adjustments, add the value in play (1/2 hr., 1 hr., etc.) to the zone time. If result is over 24 hrs., subtract 24 and change date to the next day.

To convert Universal Time to your zone time (e.g., Eastern Standard Time), subtract an hour for each time zone west of Greenwich needed. (Add an hour for each zone east of Greenwich). Examples are shown in the Time Conversion Example diagram at left. Note that when the subtraction results in a value less than 0, the date reverts to the **previous** day and the hour value is adjusted by adding 24 hours to the negative value.

For users in the U.S., we have used a star to mark dates of Full and New Moons that may shift depending on your time zone. Thus, you should always check for a "star" and know your time zone affect on whether the event date will shift to the previous day.