MoonWatcher™

A publication of Celestial Products

Guide to accompany the World's Most Beautiful Moon Calendars™

MoonLight™, MoonShine™, MoonDazzle™, Moons and Blooms™, MoonDance™

Phases of the Moon 2020

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	24	21:42	
Feb	23	15:32	
Mar	24	09:28	
Apr	23	02:26	
May	22	17:39	
Jun	21	06:41	E3
Jul	20	17:33	
Aug	19	02:41	
Sep	17	11:00	
Oct	16	19:31	
Nov	15	05:07	
Dec	14	16:17	E6

First Quarter

Month	Day	Time
Jan	3	04:45
Feb	2	01:42
Mar	2	19:57
Apr	1	10:21
Apr	30	20:38
May	30	03:30
Jun	28	08:16
Jul	27	12:32
Aug	25	17:58
Sep	24	01:55
Oct	23	13:23
Nov	22	04:45
Dec	21	23:41

Full Moon

Month	Day	Time	
Jan	10	19:21	E1
Feb	9	07:33	
Mar	9	17:48	
Apr	8	02:35	
May	7	10:45	
Jun	5	19:12	E2
Jul	5	04:44	E4
Aug	3	15:59	
Sep	2	05:22	
Oct	1	21:05	
Oct	31	14:49	
Nov	30	09:30	E5
Dec	30	03:28	

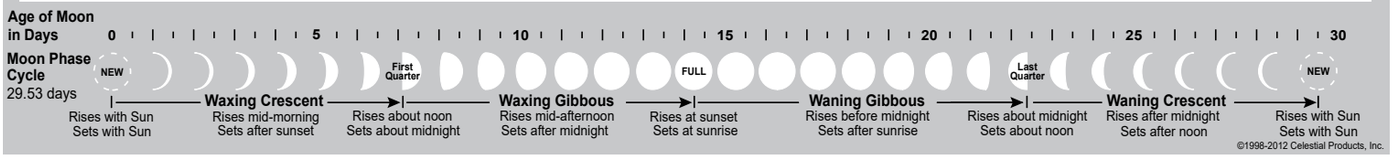
Last Quarter

Month	Day	Time
Jan	17	12:58
Feb	15	22:17
Mar	16	09:34
Apr	14	22:56
May	14	14:03
Jun	13	06:24
Jul	12	23:29
Aug	11	16:45
Sep	10	09:26
Oct	10	00:39
Nov	8	13:46
Dec	8	00:37

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 shown 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. Hence, any more specific moonrise/moonset almanac information must be generated based on those variables. Refer to our mooncalendar.com website for more information on resources for moon watchers.



Eclipses 2020

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 – January 10 – Penumbral Eclipse of the Moon. Visible from Europe, Africa, Asia, Australia.

E2 – June 5 – Penumbral Eclipse of the Moon. Visible from Europe, Africa, Asia, Australia.

E3 – June 20-21 – Annular Eclipse of the Sun. Visible from Africa, southeastern Europe, Asia.

E4 – July 5 – Penumbral Eclipse of the Moon. Visible from Americas, southwest Europe, Africa.

E5 – November 29-30 – Penumbral Eclipse of the Moon. Visible from Asia, Australia, Pacific, Americas.

E6 – December 14 – Total Eclipse of the Sun visible from the southern South America, southern Pacific, Antartica.

Eclipse predictions by Fred Espenak, NASA. See Eclipsewise.com for details and map illustrations.

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 29.5 day 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 Moon under this definition occurs October 31, 2020.

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) hav ing 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 August 22, 2021 is the next Blue Moon using this definition since there are four full moons in the season period between the June solstice and September equinox. 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 that has four full moons.

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 leaving the green-blue wavelengths that can give it that color.

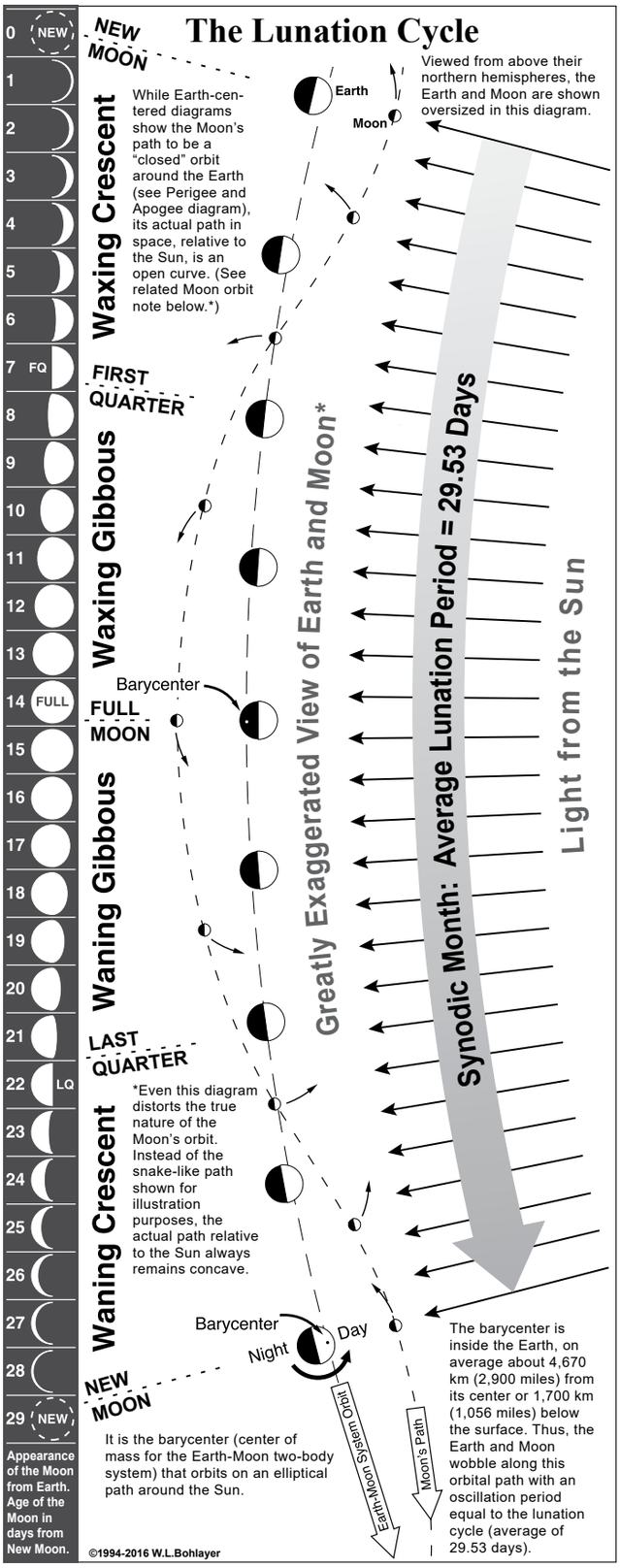
Equinoxes and Solstices 2020

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

Month	Day	Time (UT)	Event
Mar	20	03:50	March (Spring/Vernal) Equinox
Jun	20	21:43	June (Summer) Solstice
Sep	22	13:31	September (Fall/Autumnal) Equinox
Dec	21	10:02	December (Winter) Solstice

Perihelion and Aphelion 2020

Month	Day	Time (UT)	Event
Jan	5	07:48	Perihelion (Earth closest to Sun)
Jul	4	11:35	Aphelion (Earth farthest from Sun)

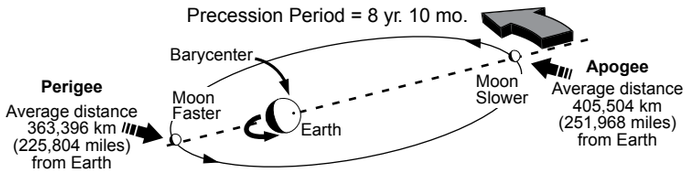


Perigee and Apogee

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.



2020

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 02	01:30	404580
Jan 13	20:20	365964	Jan 29	21:28	405390
Feb 10	20:31	360464*	Feb 26	11:35	406277
Mar 10	06:33	357123*	Mar 24	15:23	406690
Apr 07	18:08	356909*	Apr 20	19:01	406463
May 06	03:03	359656*	May 18	07:45	405584
Jun 03	03:36	364366	Jun 15	00:56	404597
Jun 30	02:09	368958	Jul 12	19:27	404201
Jul 25	04:54	368367	Aug 09	13:51	404658
Aug 21	10:59	363513	Sep 06	06:31	405606
Sep 18	13:44	359081	Oct 03	17:22	406321
Oct 16	23:46	356913	Oct 30	18:46	406393
Nov 14	11:48	357839	Nov 27	02:29	405891
Dec 12	20:42	361777	Dec 24	16:32	405010

*February10, March 10, April 7, and May 6 perigees are sufficiently close to full moon dates giving rise to calling these supermoons, as known in popular culture. These full moons appear larger and brighter than a normal full moon at less than average perigee distances. April 7 is the shortest distance perigee (356,909 km or 221,767 miles) of 2020 and nearly coincident with the full moon of April 7-8. Hence, this one will be the biggest and brightest of the full moons in 2020. New moons coincident with perigee are by the supermoon definition also "super." In September, October and November, the new moon dates are nearly coincident with perigee. There is more hype than substance attached with the 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. Coastal flooding can be more extensive with storms on those dates.

Full Moon Names

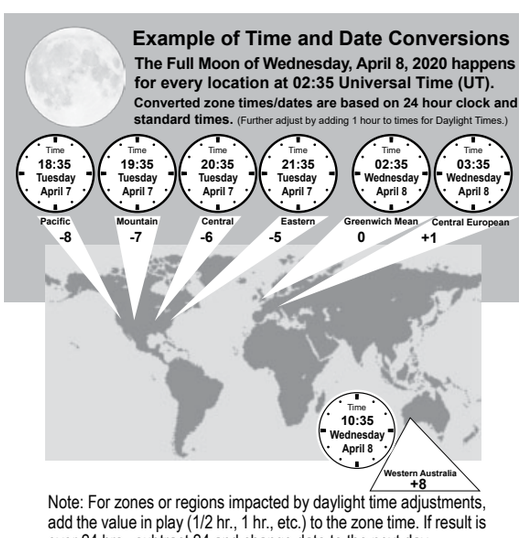
The following names for full Moons come to us from American Indian and folklore sources. Take your pick!

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, Pink 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.

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 on many of our moon calendars 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.

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