

## The Moon

The Moon is the only natural satellite of the Earth, and the 5<sup>th</sup> largest satellite in the Solar System. It is the brightest object in the sky, after the Sun.

Its prominence in the sky and its regular cycle of phases have, since ancient times, made the Moon an important cultural influence on language, calendars, art, and mythology.

The Moon's gravity produces tides and the minute lengthening of the day (the Moon's gravity is slowing Earth's rotation, making the day get longer over time).

Even though the Moon is much smaller than the Sun, the fact that it is also much closer to Earth makes the Moon and the Sun appear to be roughly the same size in the sky.

The moon is the only celestial body on which humans have landed.

### Formation of the Moon

The prevailing theory is that the Earth-Moon system formed as a result of a giant impact. A Mars sized body hit the nearly formed Earth, blasting material into orbit around it. This material slowly collected together (by gravity) to form the Moon.

### Structure of the Moon

The structure of the Moon is illustrated in the diagram to the right.

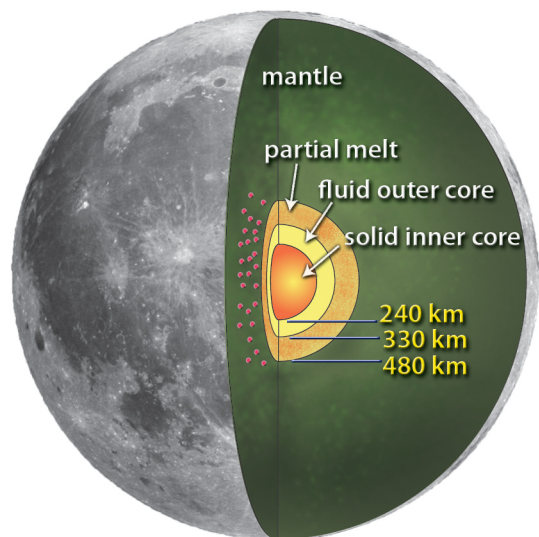
The Moon has a solid inner core, primarily made of iron, with a radius of about 240 kilometers, and a fluid outer core, primarily of liquid iron, with a radius of about 300 kilometers.

Around the core is a partially molten layer with a radius of about 500 kilometers.

The outer crust of the moon is very iron-rich, and is on average 50 kilometers thick. The 1200 kilometers between the crust and the core is called the mantle. The mantle is partially molten rock that is rich in magnesium and iron.

The surface of the Moon is covered with craters from meteor impacts, the largest of which has a diameter of 2240 kilometers. This is the largest known crater in the Solar System.

The Moon has an atmosphere, but it is so thin as to be nearly a vacuum.



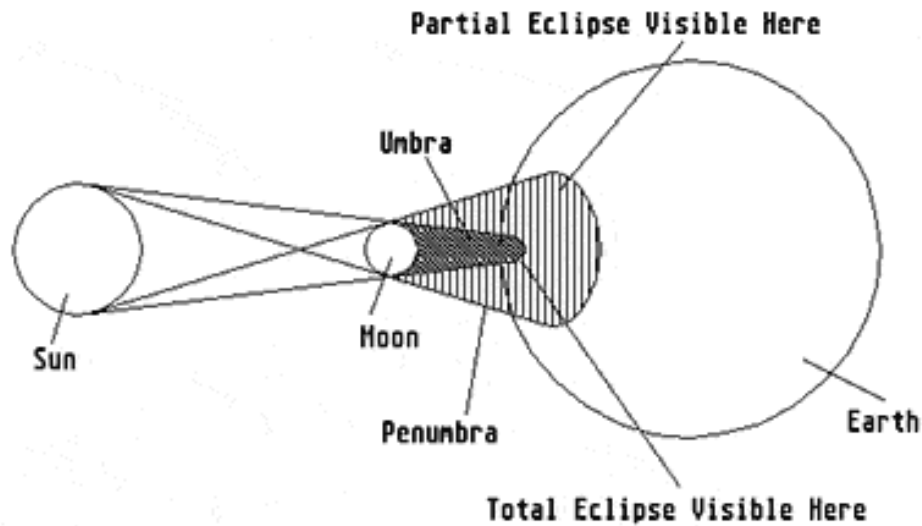
## Relationship to Earth

The Moon makes a complete orbit around the Earth once every 27.3 days. However, because Earth is moving in its orbit around the Sun at the same time, it takes 29.5 days for the Moon to show the same phase to Earth.

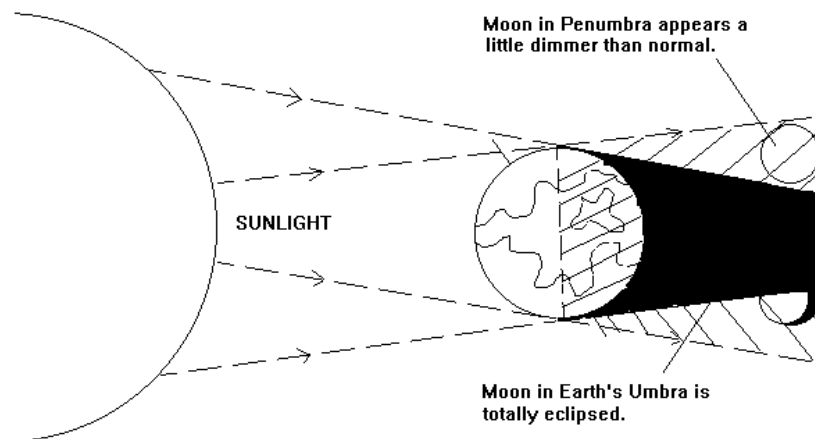
The Moon is quite large relative to the Earth: nearly a quarter the diameter of the planet and 1/81 its mass.

The Moon is in synchronous rotation with Earth, which means it rotates about its axis in the same time it takes to orbit Earth. This results in it nearly always keeping the same face turned towards the Earth.

Solar eclipses occur when the Moon passes between the Earth and the Sun, as shown below.



Lunar eclipses occur when the Earth passes between the Sun and the Moon near the time of a full moon, as shown below.



## Phases of the Moon

A lunar phase is the appearance of the lit portion of the Moon as seen from Earth. The lunar phases change in a repeating pattern over a 29.5 day period.

One half of the lunar surface is always lit by the Sun. Lunar phases are the result of looking at the lit half from different angles. They are **not** caused by the shadow of the Earth falling on the Moon's surface.

The Moon exhibits different phases as the relative position of the Sun, Earth, and Moon changes. A full moon, for example, occurs when the Sun and Moon are on opposite sides of the Earth. A new moon occurs when they are on the same side.

The diagram below illustrates the phases of the Moon.

