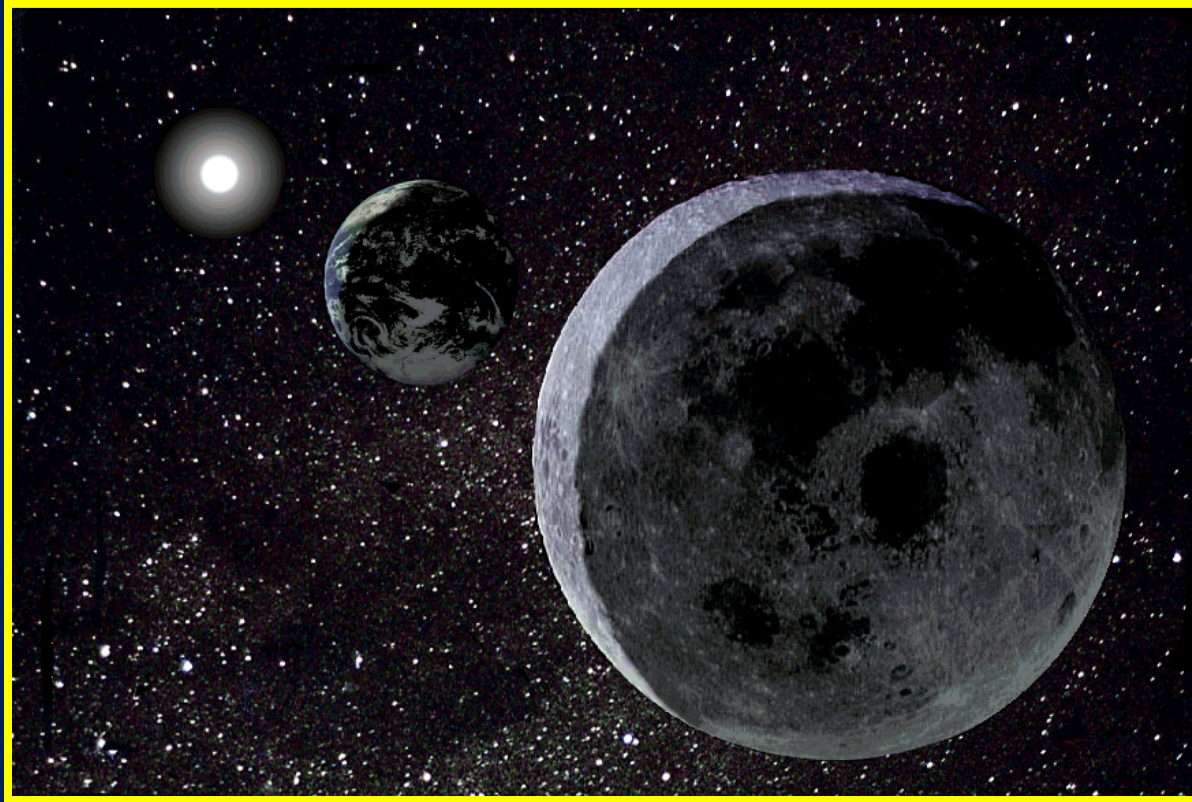


Eclipses and Tides



Essential Standard 1.1: Explain Earth's role as a body in space.

Objective 1.1.2: Explain how the Earth's rotation and revolution around the Sun affect its shape and is related to seasons and tides.

I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I describe basic characteristics of the Moon.
- I can describe the position of the Moon in relation to the Sun and Earth for each of the Moon's phases.
- I can describe the position of the Moon, Earth, and Sun during solar and lunar eclipses.
- I can explain how the difference in the gravitational pull of the Moon creates high tides and low tides.
- I can distinguish between spring and neap tides.

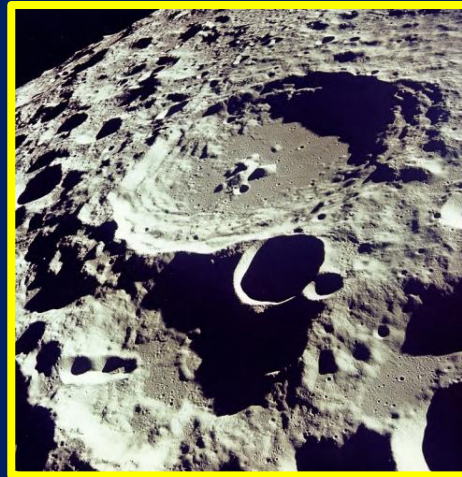
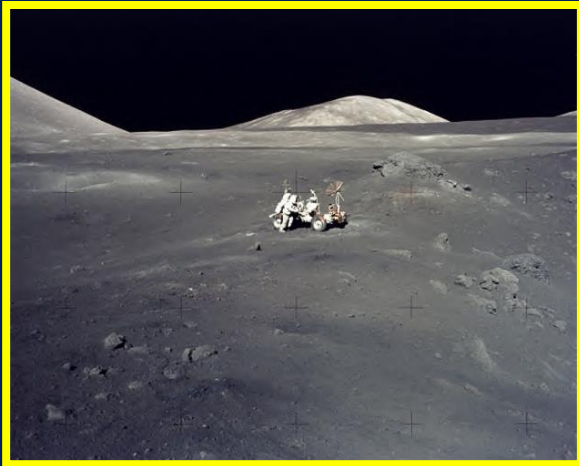
The Moon

The Moon, officially called Lunar, has no light of its own, it simply reflects sunlight.



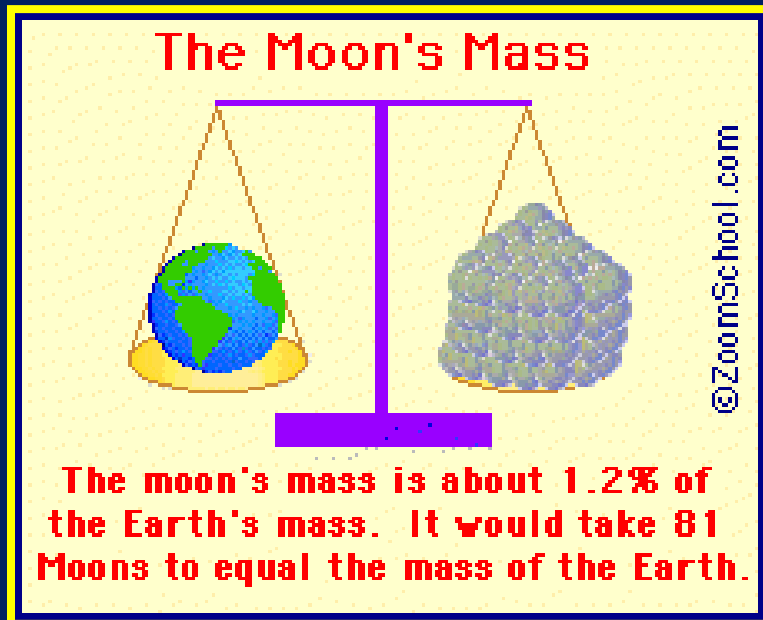
Moonscape

The Moon is dark, cold, and dry, with hills and plains, and has a surface studded with craters, and covered with rocks, and dust.



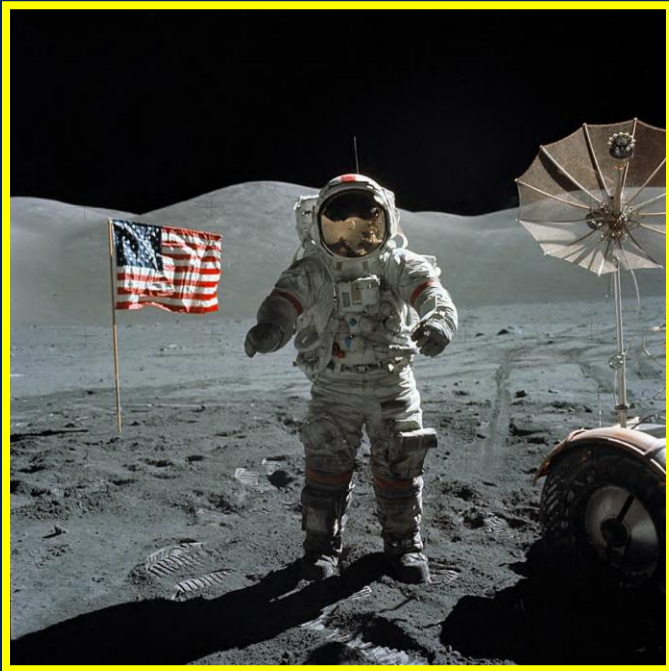
Moon's Mass

The moon is a lot smaller than the Earth. So small, in fact, that the Moon does not have enough gravity to maintain an atmosphere.



Moon's Atmosphere

Since there is no atmosphere, light is not scattered, as it is on Earth, so it is dark all the time.

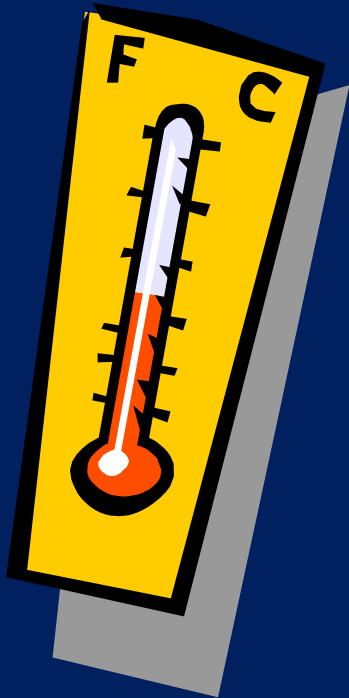


Since sounds needs to travel through a medium, such as air, there is no sound on the Moon.

Think about that for a minute – it is completely dark with no sound at all

Moon's Temperature

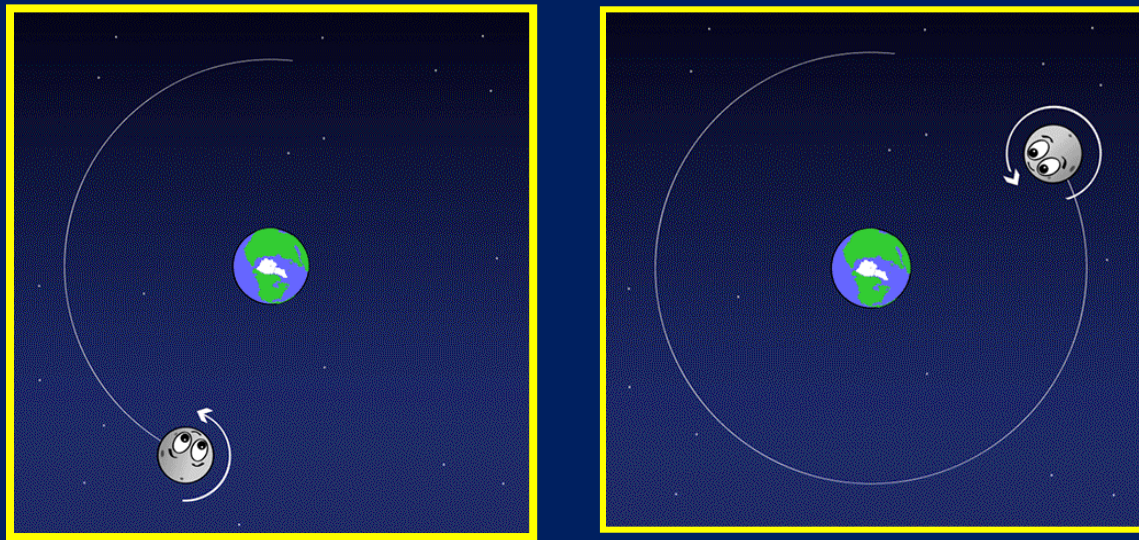
With no atmosphere, any heat generated by the Moon escapes into space. So, the temperature on the moon varies a lot.



Temperature ranges from
265 degrees Fahrenheit to -
170 degrees Fahrenheit

Dark Side of the Moon

The time it takes for the moon to rotate on its own axis equals the time it takes to orbit the Earth.



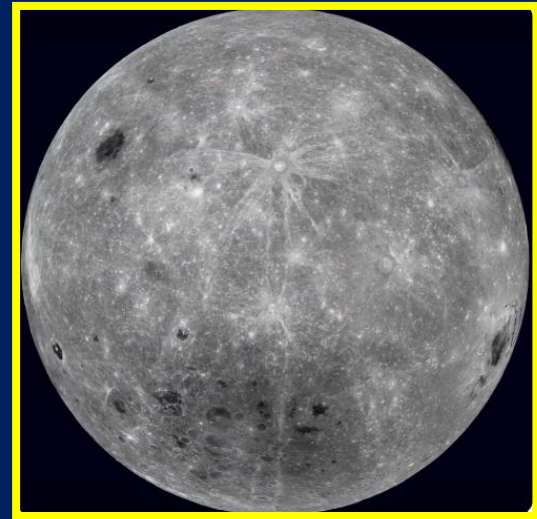
As a result, the same side of the moon always faces the Earth.

Dark Side of the Moon

The side that does not face Earth gets just as much light as the other side, so it should just be called the Far Side of the Moon.



Near Side



Far Side

Moon's Orbit

The Moon is 238,900 miles from Earth and takes 27 days and 8 hours to revolve around the Earth.



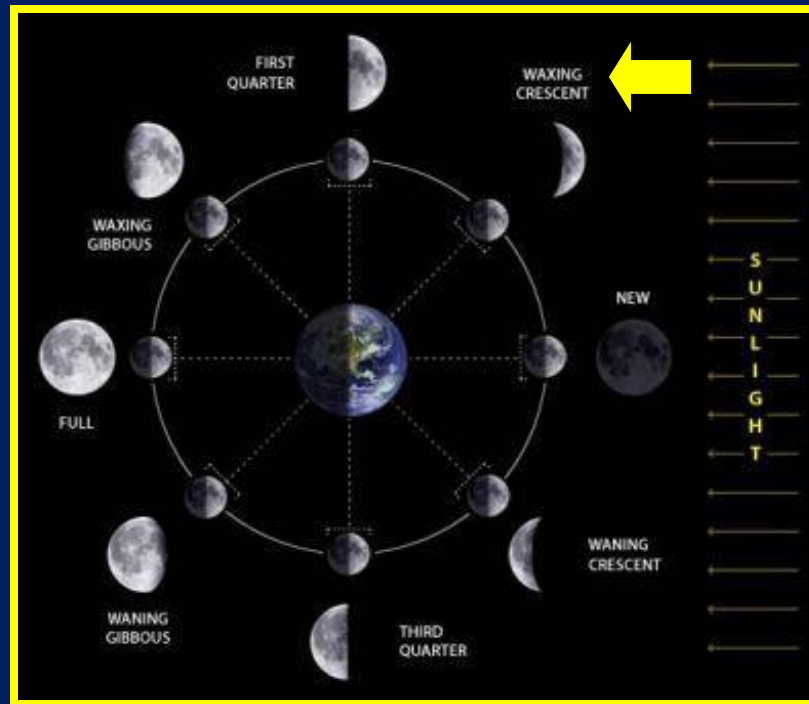
New Moon

The new moon occurs when the moon is between Earth and the Sun. We see this moon during the daytime.



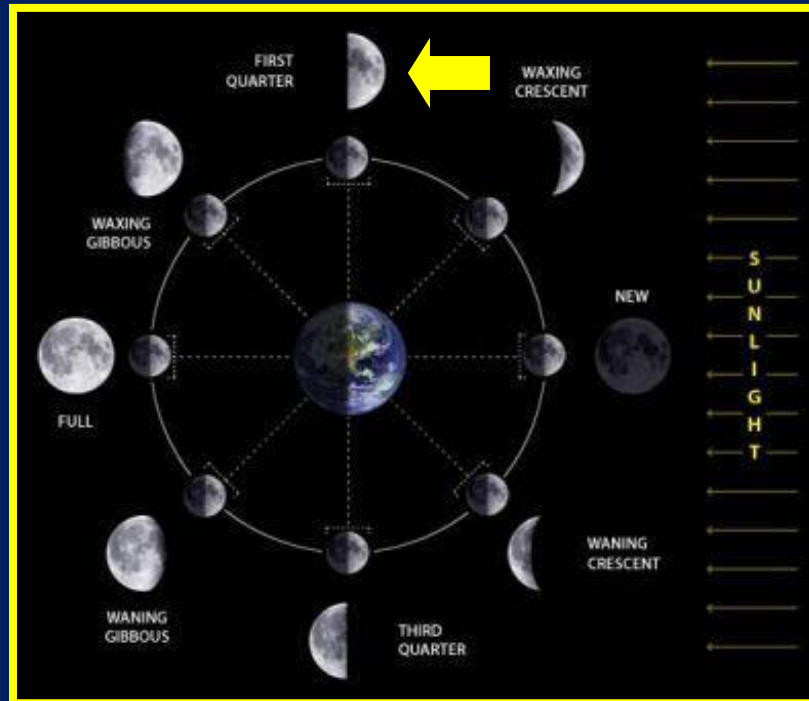
Waxing Crescent Moon

As the moon moves away from the Sun, we can see more of the moon and call it a waxing crescent moon.



First Quarter Moon

One week after the new moon, the moon is called a first quarter moon and only half of the moon is lit up.



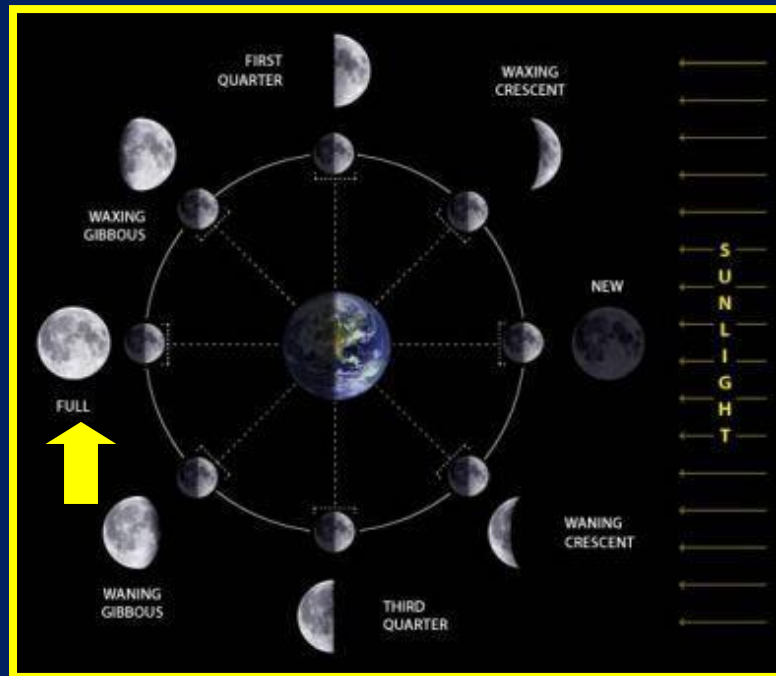
Waxing Gibbous Moon

When more than half of the moon is lit up, it is called a waxing gibbous moon.



Full Moon

When the moon is on the other side of the Earth from the Sun, we can see the entire side of the moon that faces the Earth. We call this a full moon.



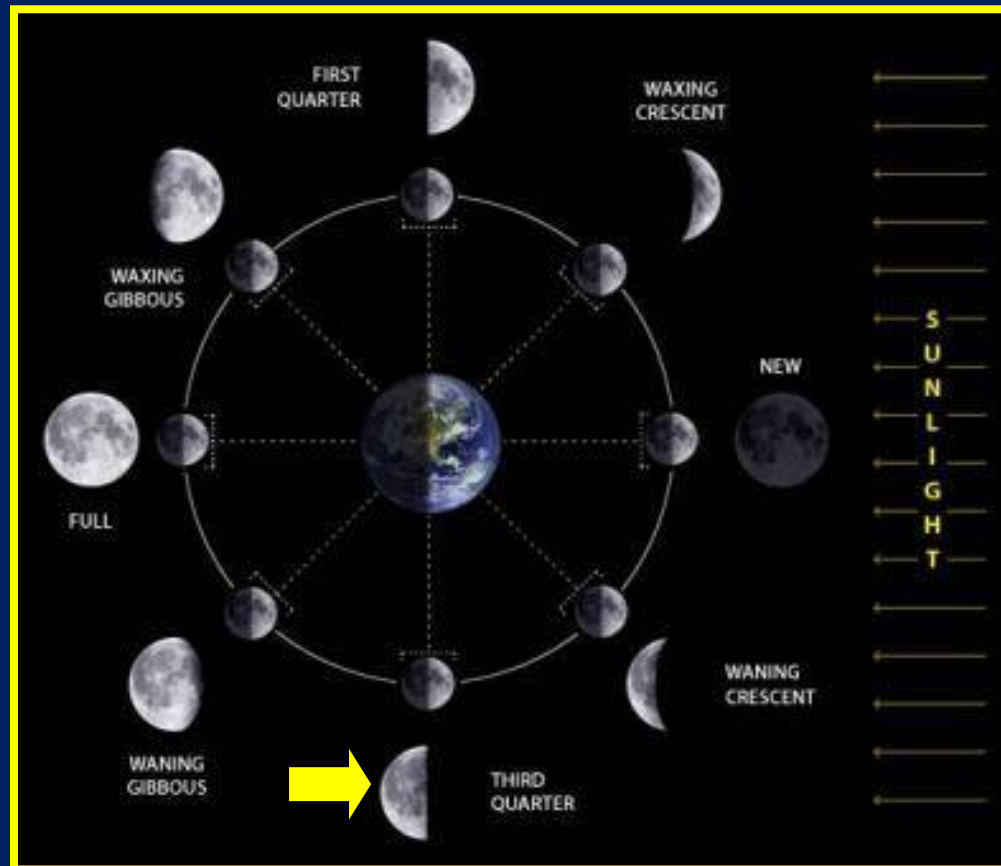
Waning Gibbous Moon

When the part of the moon that is lit up becomes smaller but we can still see more than half the moon, we call it a waning gibbous moon.



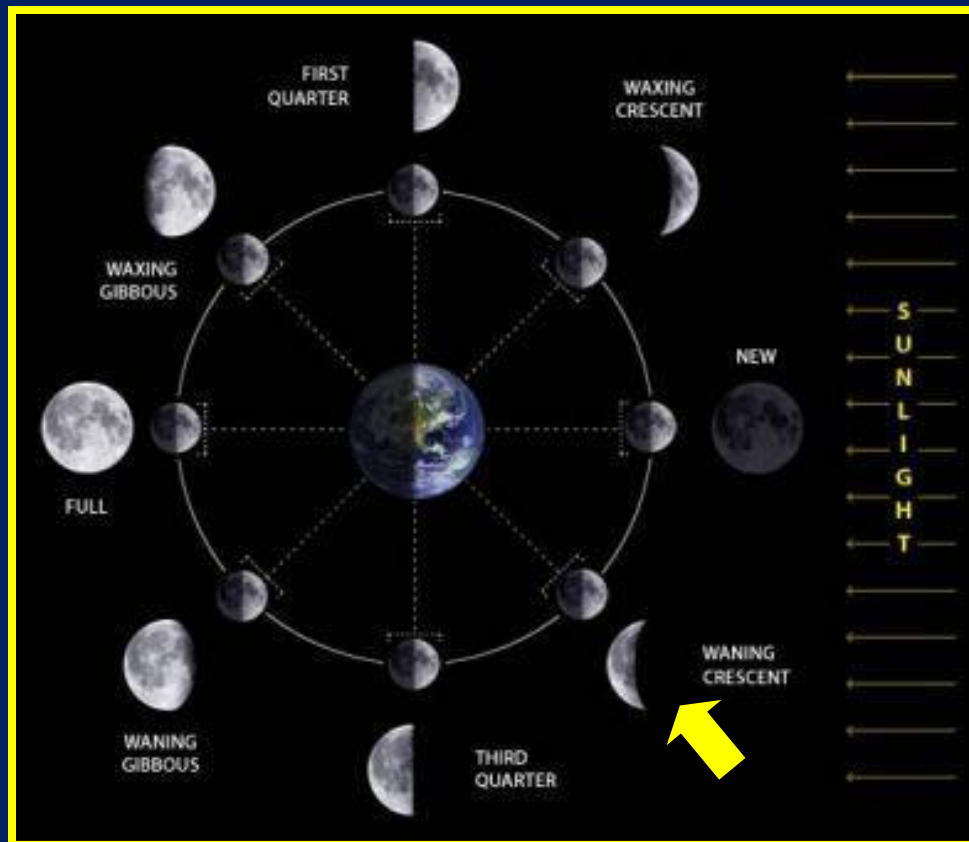
Third Quarter Moon

When only half of the moon is lit up again, we call it the third quarter moon.



Waning Crescent Moon

When the moon appears crescent shaped again, we call it a waning crescent.

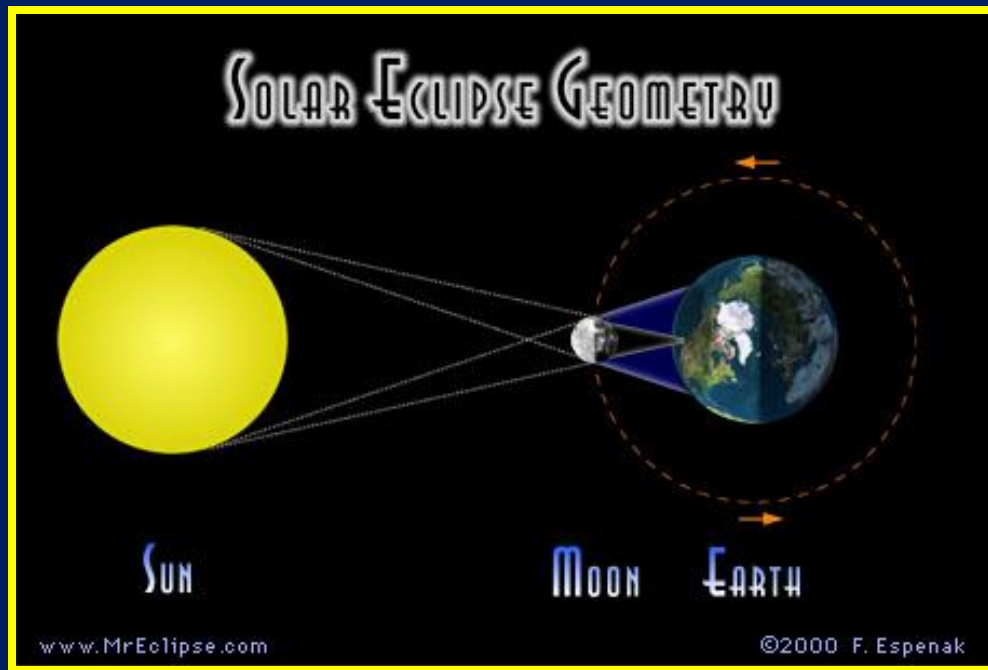


In the Shadow of the Moon



Solar Eclipse

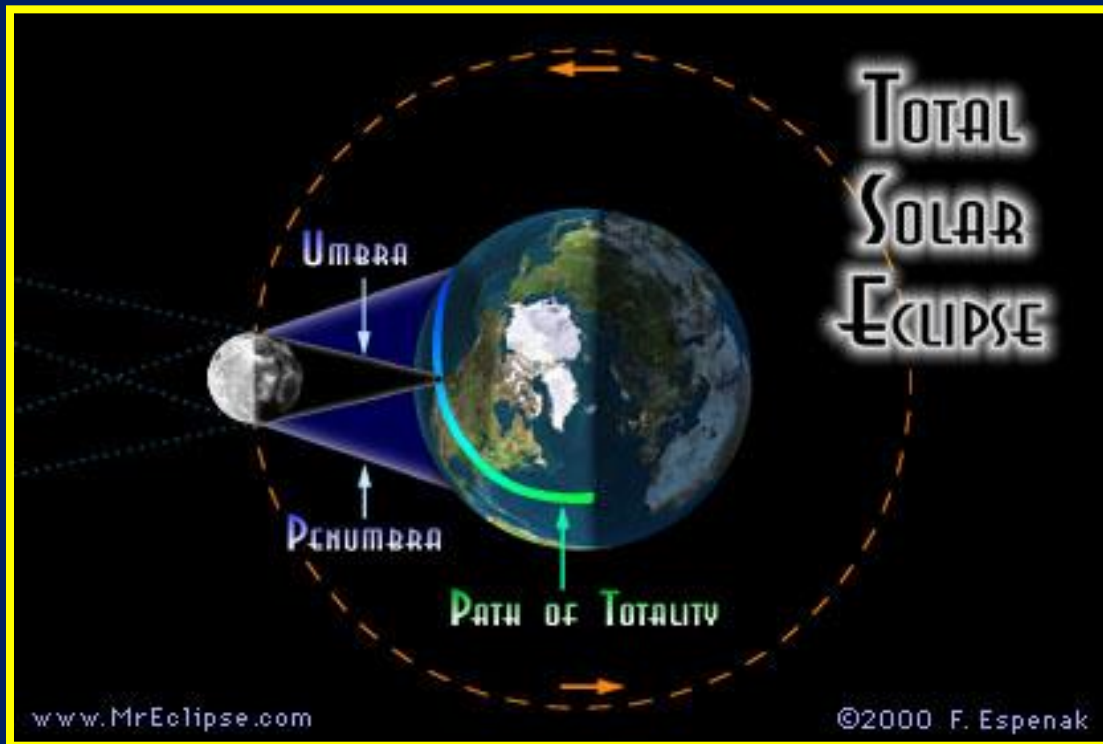
During a Solar Eclipse, the moon is between the Earth and the Sun, creating a shadow on the Earth.



Only occurs during a new moon.

Moon Shadows

Umbra is the darker shadow and Penumbra is the fainter shadow



It will only go completely dark in the Umbra section.

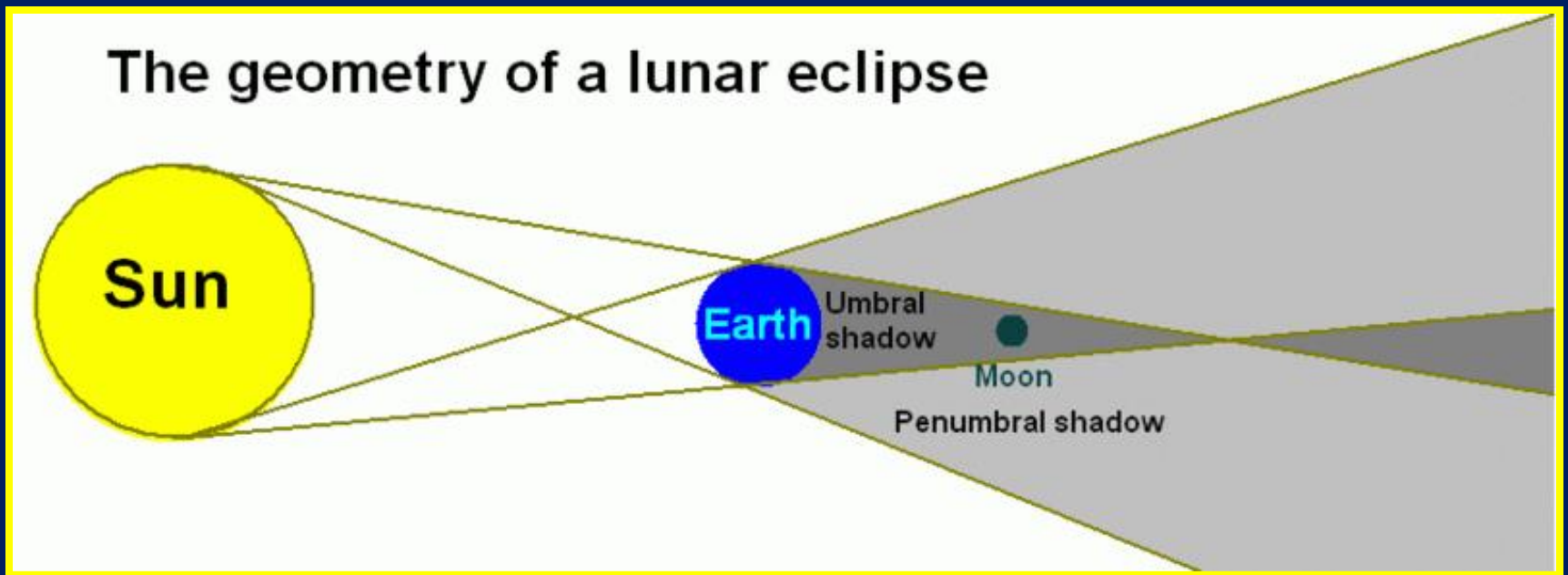
Sun's Corona



During a total eclipse of the Sun, you can see the Sun's corona.

Lunar Eclipse

During a Lunar Eclipse, the Moon passes into the Earth's shadow.



Only occurs during a full moon

Total Lunar Eclipse

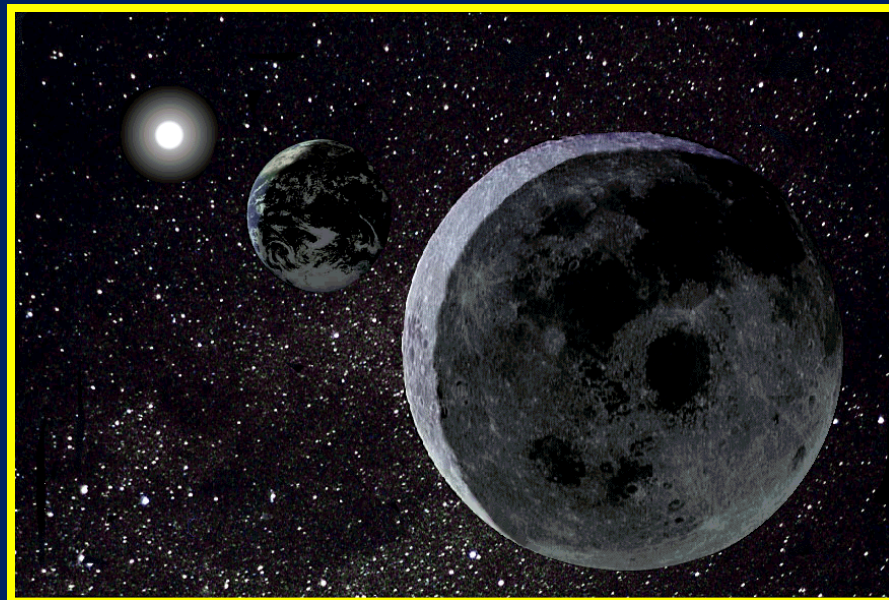
A total lunar eclipse occurs when the entire Moon passes through the umbral shadow of Earth.



Only indirect light reaches Earth and is filtered by our atmosphere, so that only red light gets through.

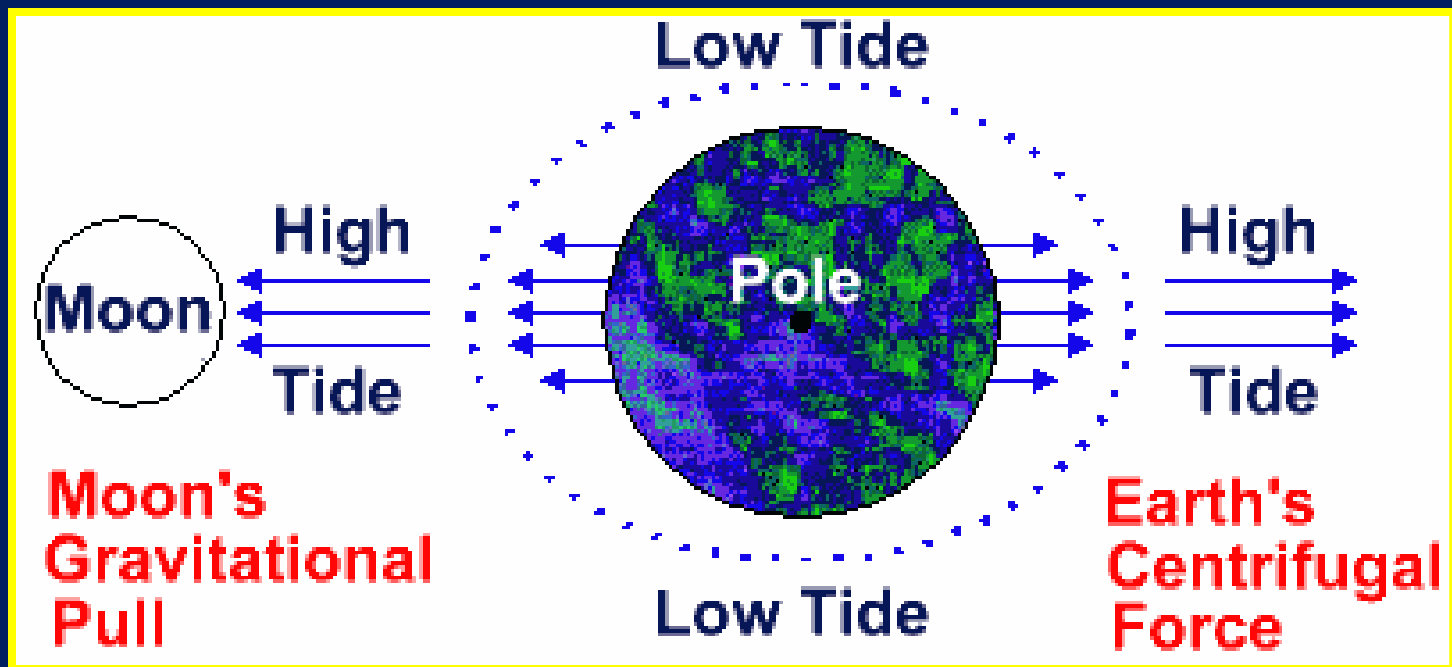
Tides

Tides are mostly caused by the Moon because, even though it's much smaller than the Sun, it is a whole lot closer to Earth.



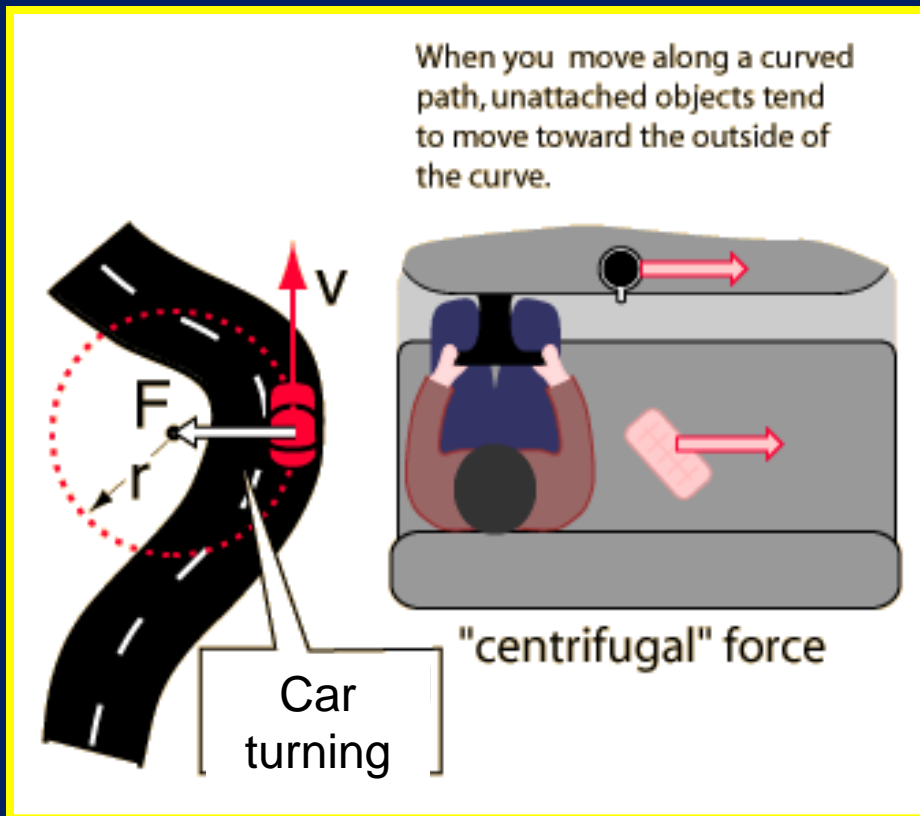
High Tide

The Moon's gravitational pull on one side of Earth, causes the water to form a bulge on that side of Earth. The bulge is known as high tide.



Centrifugal Force

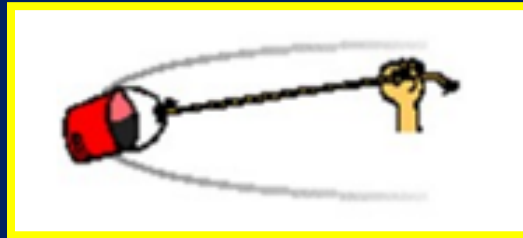
On the other side of the Earth from the Moon, the water wants to go straight, based on its own inertia, even though the Earth is rotating.



This force that causes unattached objects to slide towards the outside of curve is called centrifugal force.

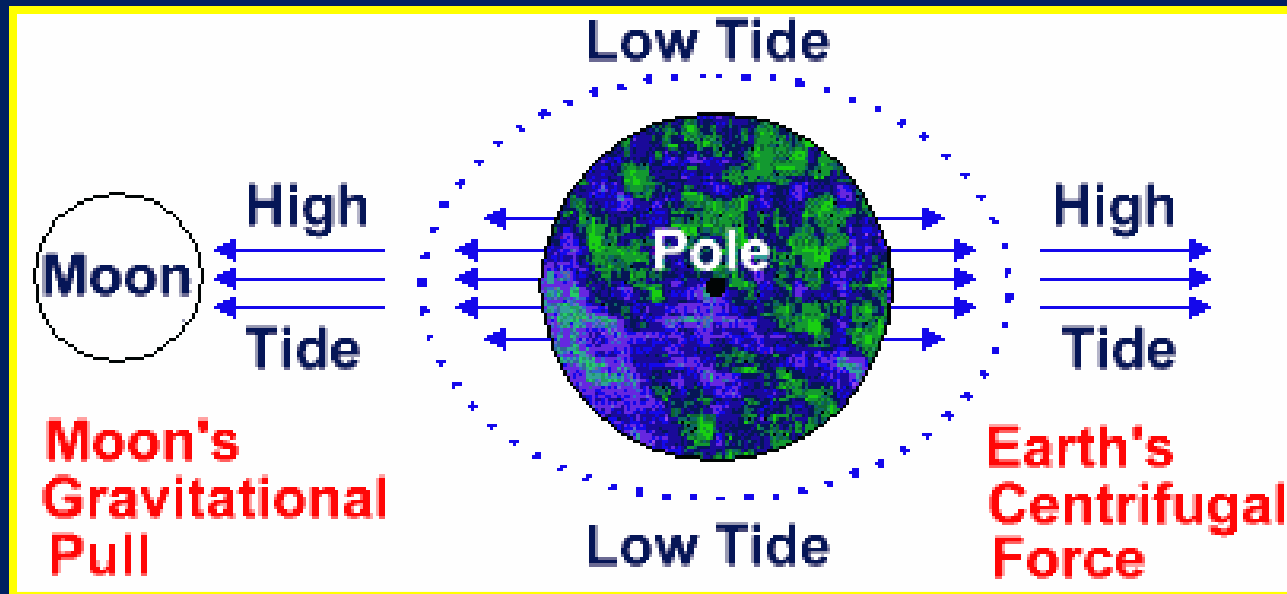
Centrifugal Force

Centrifugal force is what keeps the water in the bucket as it is swung around or the people pushed against the wall in a Gravitron ride.



Second High Tide

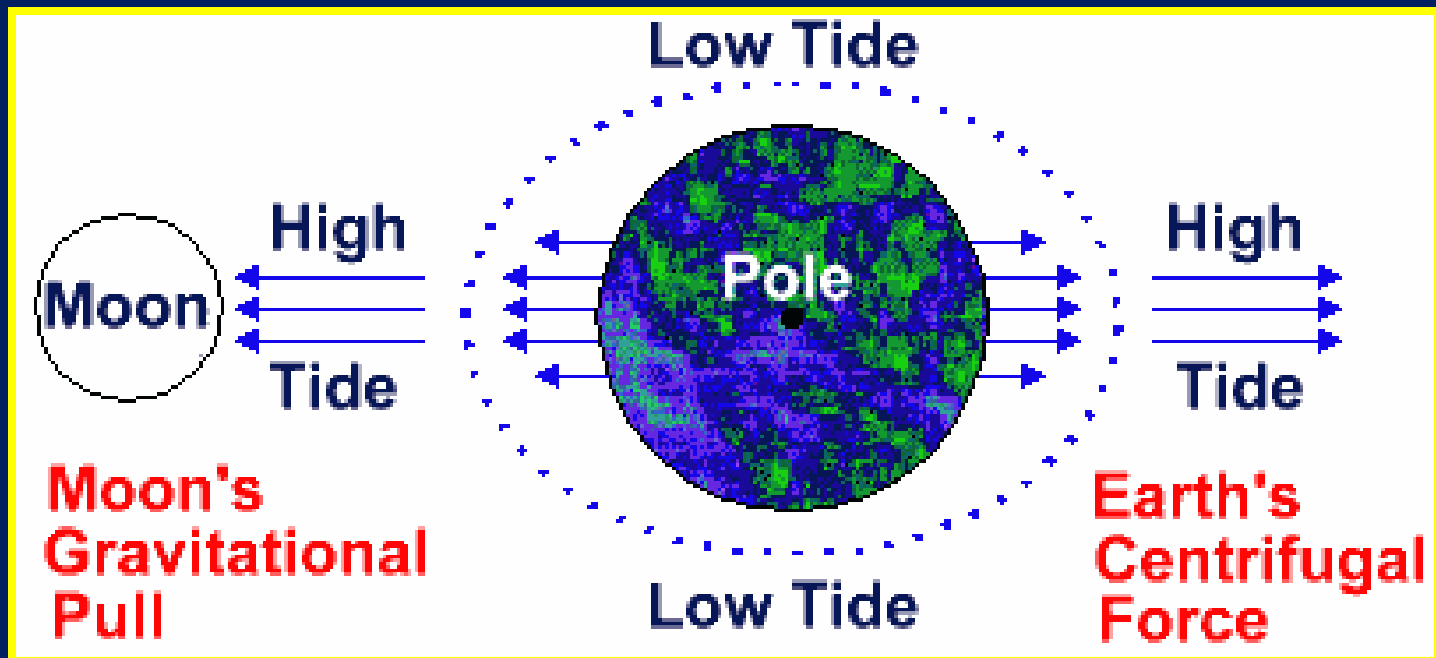
As the Earth spins, its centrifugal causes another bulge of water on the opposite side of the Earth, from the Moon.



This is why most places on Earth experience two high tides and two low tides each day, 12 hours apart.

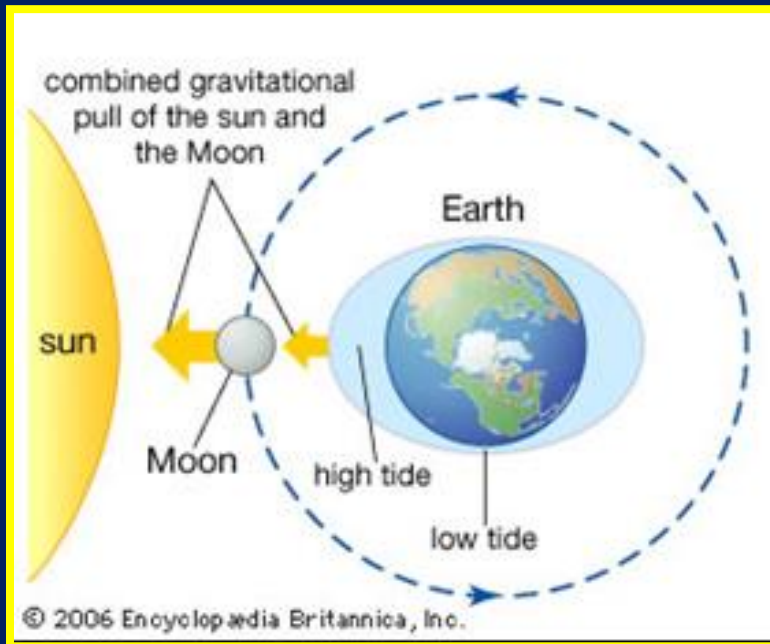
Low Tide

Low tides occur on the parts of Earth that are not facing the Moon nor facing away from the Moon.



Spring Tides

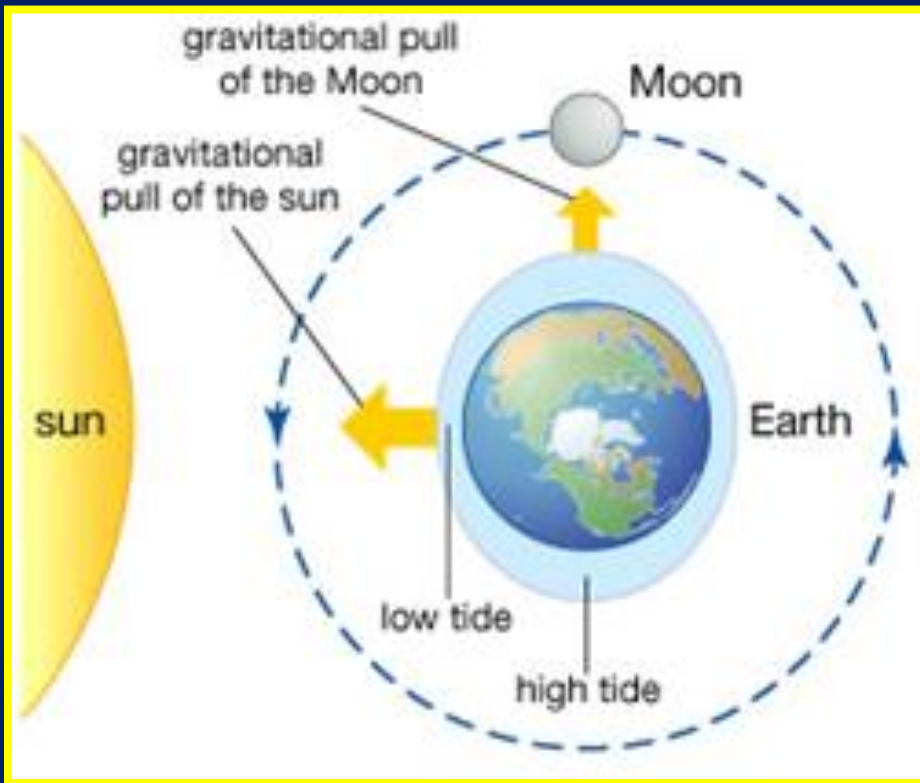
Spring tides occur when the moon and the Sun are on the same plane, during full and new moons.



The combined gravitational pull of both cause really large high tides and very small low tides.

Neap Tides

Neap tides occur when the Sun and Moon are perpendicular to each other.



During neap tides, there isn't as much difference between high and low tides.

Selected Moons of the Solar System, with Earth for Scale

