EARTH, MOON & SUN

Scientists believe that the moon was created when the planet Theia struck the earth nearly 4.5 billion years ago.

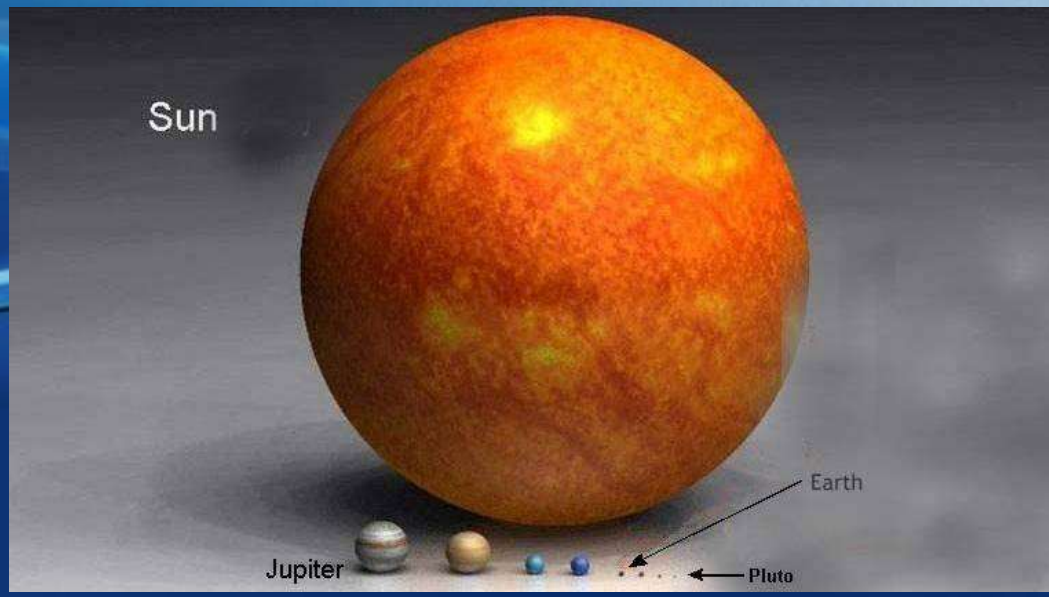
Gravity -

A force that causes objects to move towards each other.

Two things make gravity stronger:

1. The more mass, the more gravity.
2. The closer the objects are, the more gravity.

So, why do we go around the sun, and the sun doesn't go around us?



The sun is 110 times larger than the earth.

If the sun is so big, why does the moon go around the earth and not the sun?

The moon is 238,000 miles from the earth, but over 93,000,000 miles from the sun.

MOON PHASES

Why can we see the moon from the earth?

We see the sunlight reflecting off of the moon's surface.

How long does it take for the moon to revolve around the earth?

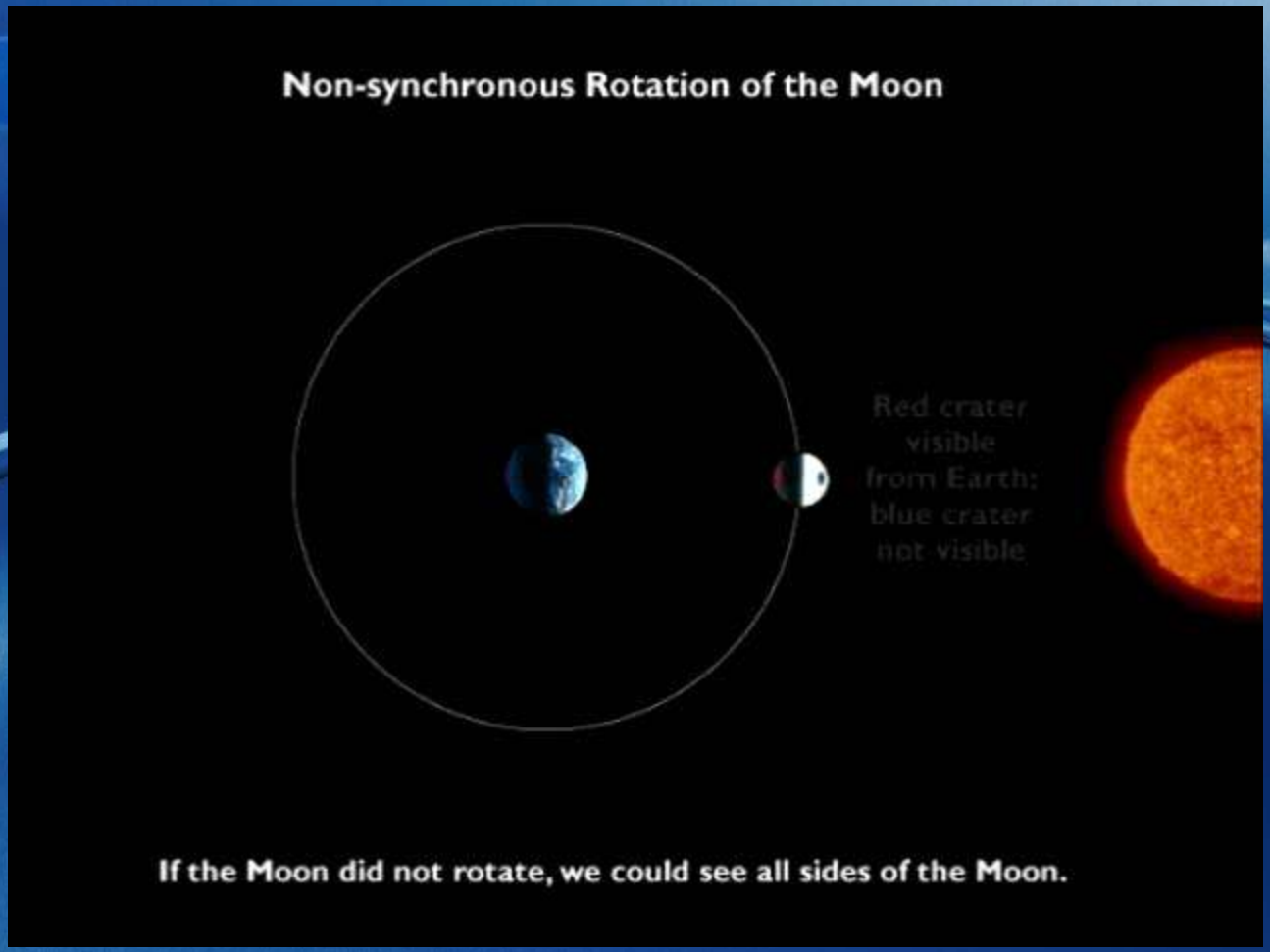
About 1 month. (27.32 days)

So, how often is there a full moon?

About every month

Why do we always see the same side of the moon?

The moon spins or rotates, about the same speed it orbits the earth. So you always see the same side.


Non-synchronous Rotation of the Moon
Red crater visible from Earth; blue crater not visible
If the Moon did not rotate, we could see all sides of the Moon.

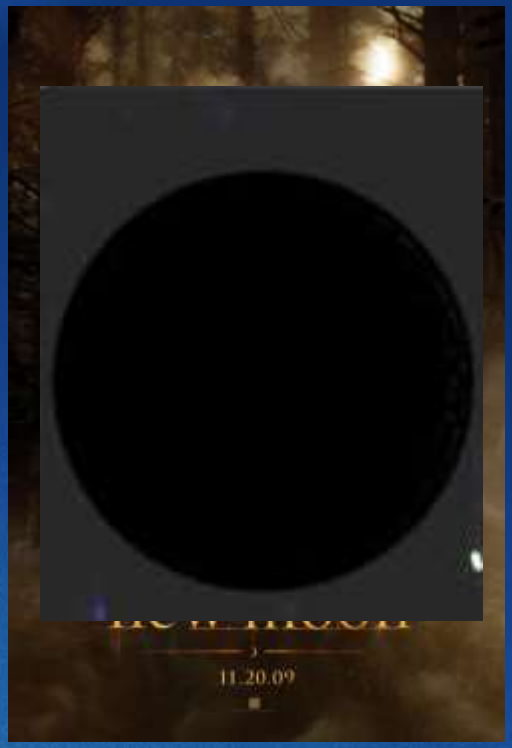
The sun shines on half of the moon at any given time. Areas that the sun doesn't hit look dark, and is hard to see from earth. It takes about a month for the moon to go around the earth. In that time, it goes through phases and it looks different, because of the light shining on it.

Full -

When the moon is completely lighted.

New -

When the moon is completely dark.



Oops!

Waxing -

When the lighted moon is growing towards a full moon.

Waning -

When the lighted moon is shrinking towards a new moon.

Crescent -

When less than half of the moon is visible.

Quarter -

When exactly half of the moon is visible.

Gibbous -

When more than half of the moon is visible.

1. New Moon

The lit half of the moon is facing away from the earth. So, what would the moon look like?

The dashed line shows the part of the moon you can see from earth.

2. Waxing Crescent

Sunlight

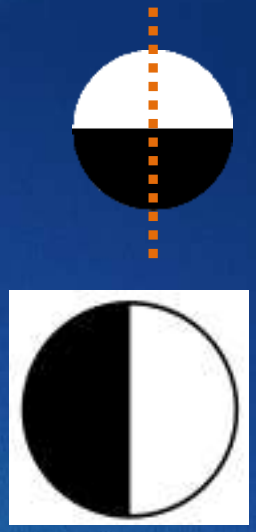
So, what would the moon look like?

The dashed line shows the part of the moon you can see from earth.

3. 1st Quarter Moon

Sunlight

So, what would the moon look like?

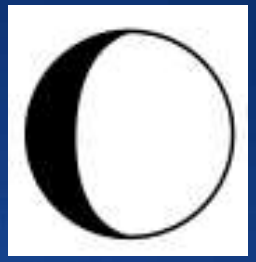


The dashed line shows the part of the moon you can see from earth.

4. Waxing Gibbous

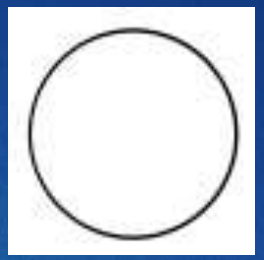
Sunlight

So, what would the moon look like?



5. Full Moon

The lit half of the moon is facing towards the earth. So, what would the moon look like?



6. Waning Gibbous

Sunlight

So, what would the moon look like?

7. 3rd Quarter Moon

Sunlight

So, what would the moon look like?

8. Waning Crescent

So, what would the moon look like?

Sunlight

Back to a New Moon

Sunlight

earth

The dashed line shows the part of the moon you can see from earth.

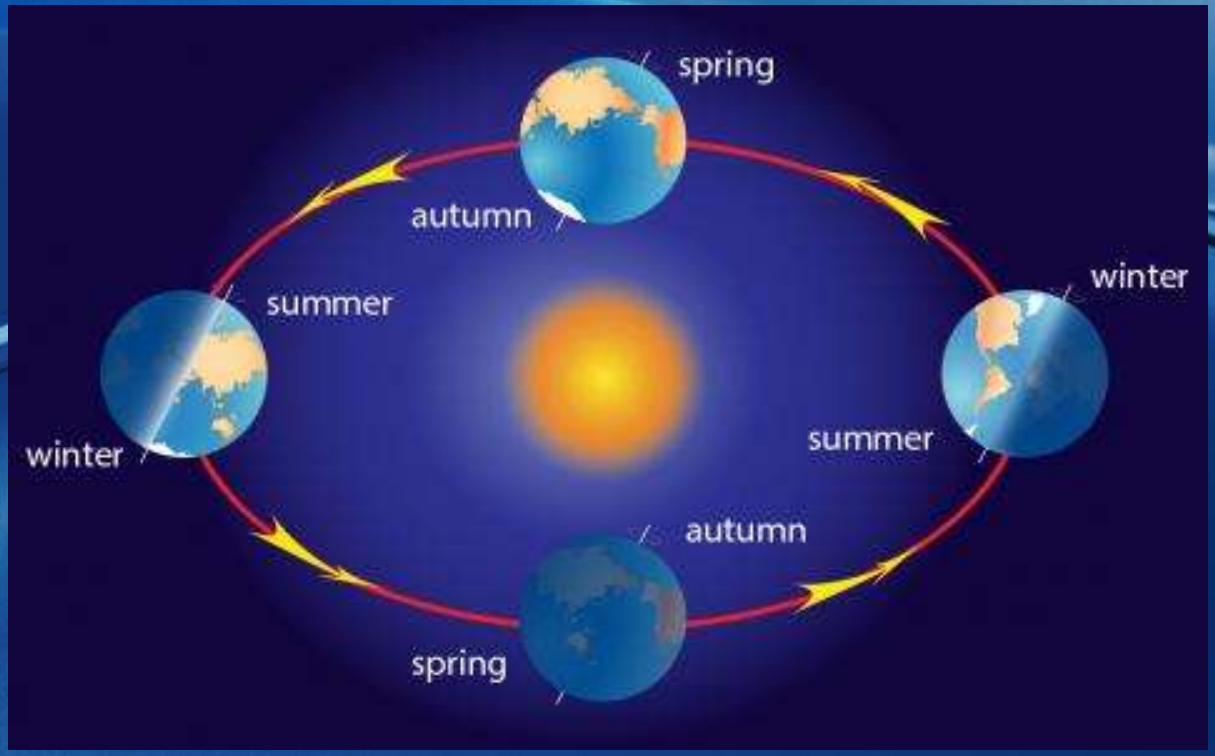
So, the moon moves through two phases a week. In one month, you go through all the phases.

THE BRIGHT LIGHT GROWS ON THE RIGHT.

SEASONS

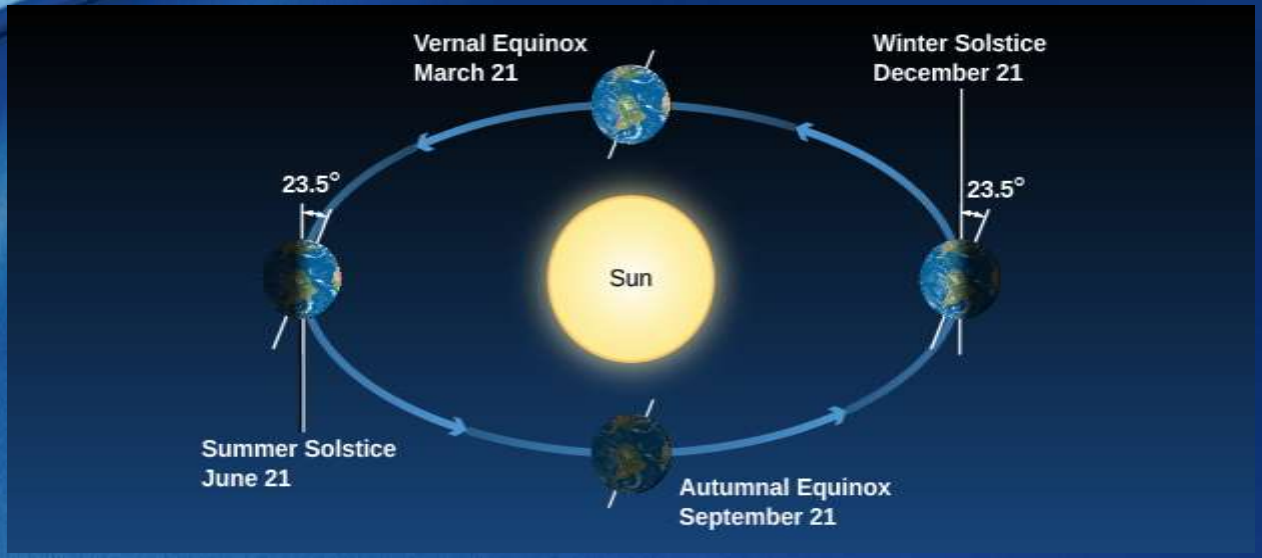
Why there are seasons -

The Earth is tilted at 23.5 degrees. When sunlight hits the northern hemisphere the most, we have summer. When it hits it the least, we get winter.


spring
autumn
summer
winter
winter
summer
autumn
spring

Summer Solstice -

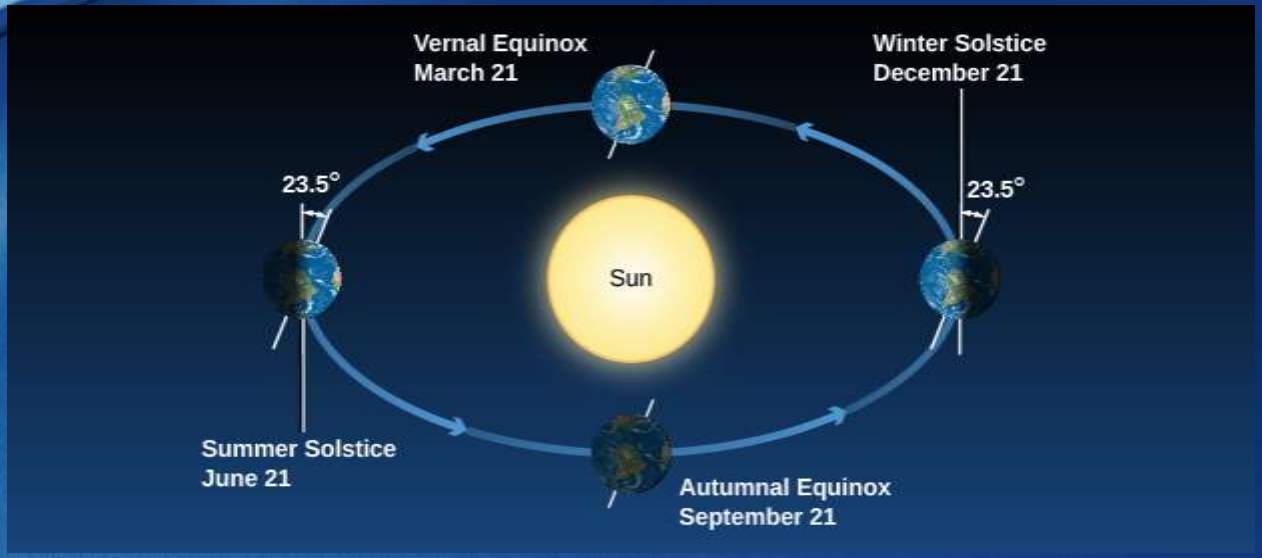
The first day of summer when you have the most sunlight of any day.



While we're having summer, the southern hemisphere is having winter.

Winter Solstice -

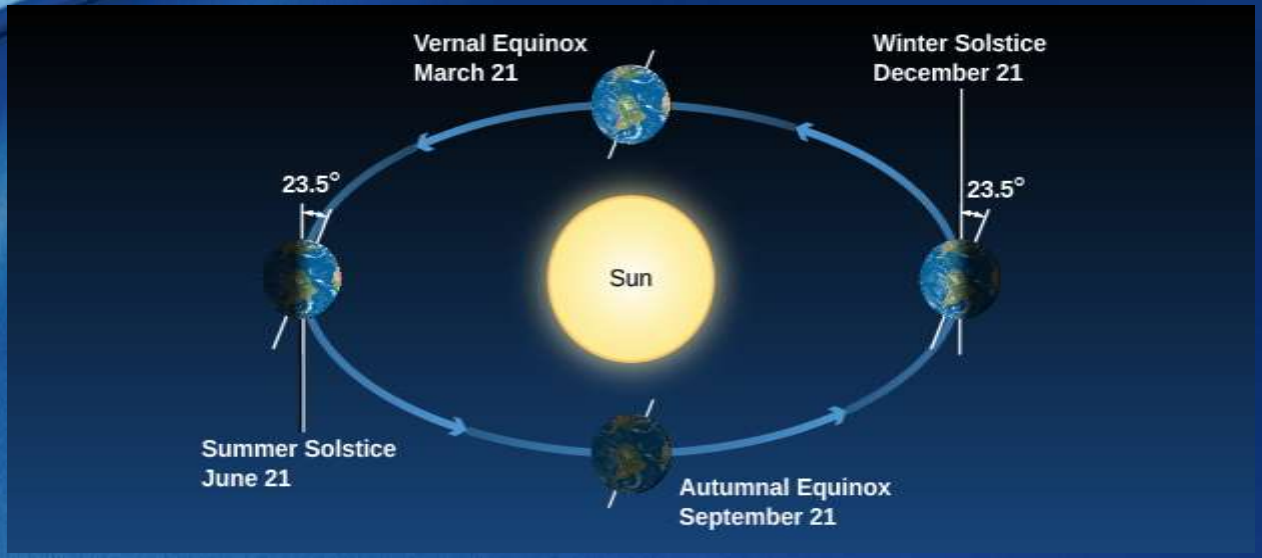
The first day of winter when you have the least sunlight of any day.



While we're having winter, the southern hemisphere is having summer.

Vernal Equinox -

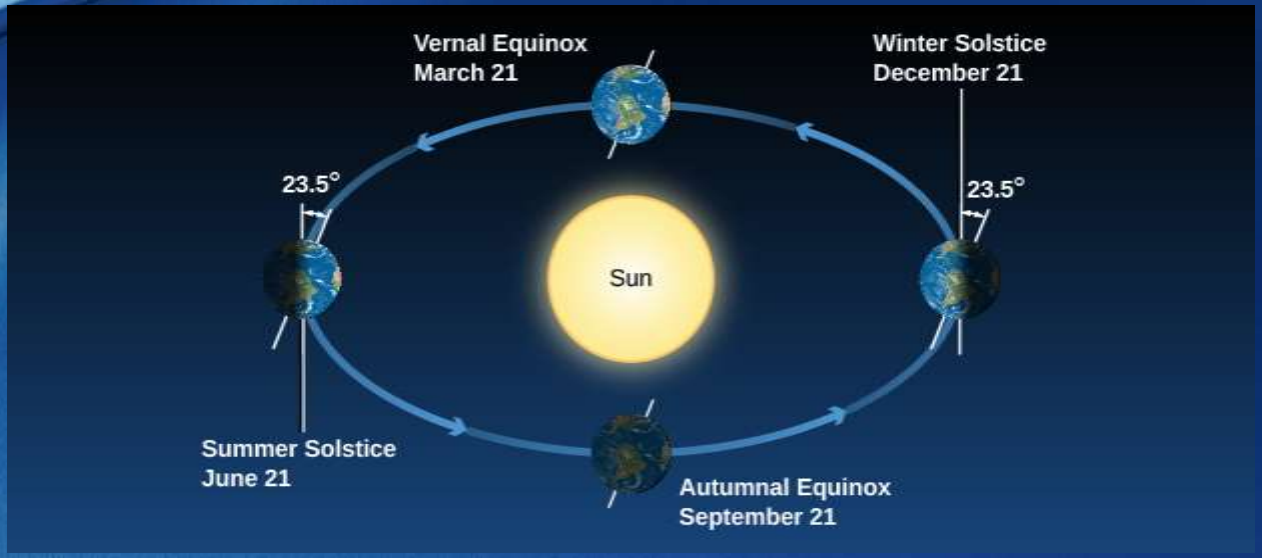
The first day of spring when you have 12 hours of day and night.



While we're having spring, the southern hemisphere is having fall.

Autumnal Equinox -

The first day of fall when you have 12 hours of day and night.

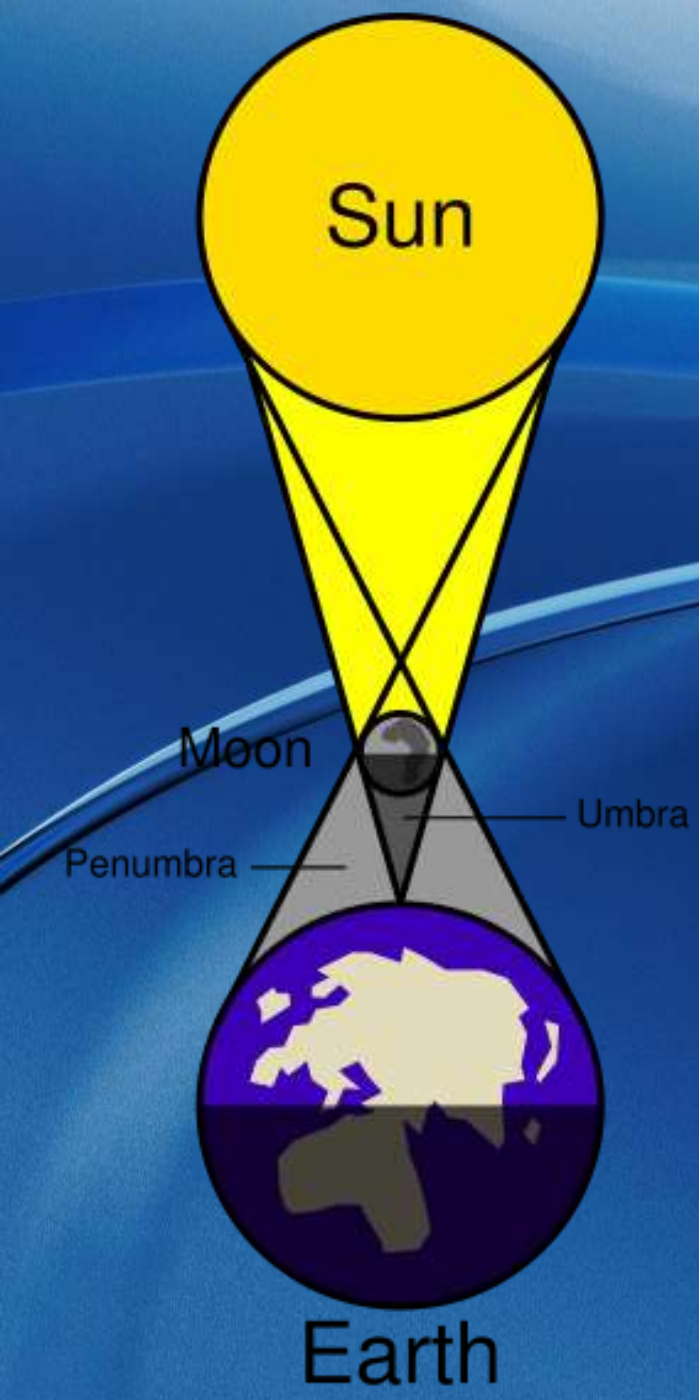


While we're having fall, the southern hemisphere is having spring.

ECLIPSES

Solar eclipse -

When the earth moves into the shadow of the moon. This causes some or all of the sun to appear dark from the earth.



When the moon does a solar eclipse happen, with? (Hint, look at the picture.)

A new moon does a solar eclipse happen, with the moon still block the sun.

If you are in the part of the world where the Umbra is, you see a full eclipse. If you are in the Penumbra, you see a partial eclipse.

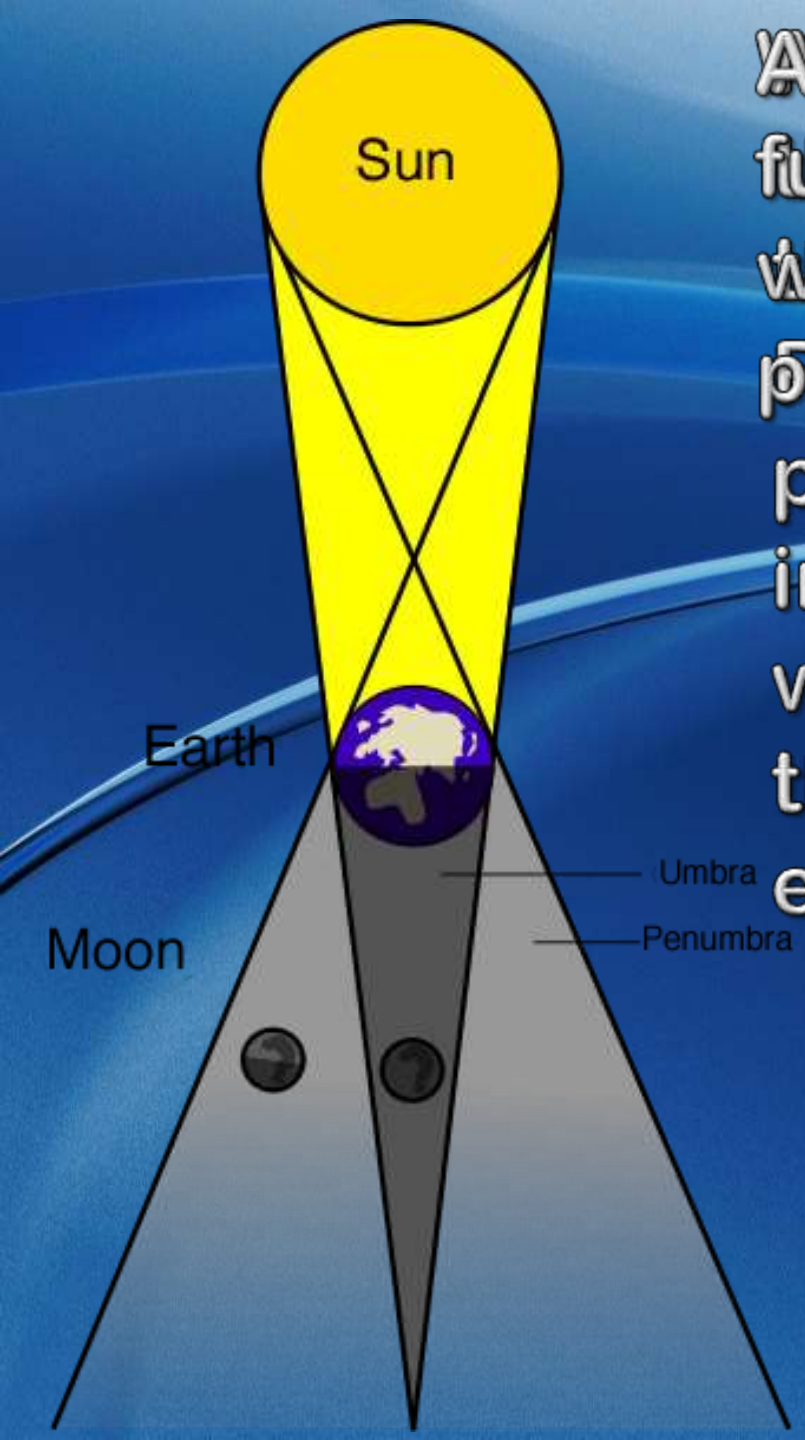
Full eclipse

Partial eclipse

Map of the 2017 total eclipse path in the United States

Lunar eclipse -

When the moon moves into the shadow of the earth. This causes some or all of the moon to appear dark from the earth.



A full moon phase does a full lunar eclipse happen with? (Hint; look at the picture!)

If you are in the Umbra, you see a partial eclipse. If you are in the part of the world where all of the moon is in the Umbra, you see a full eclipse.

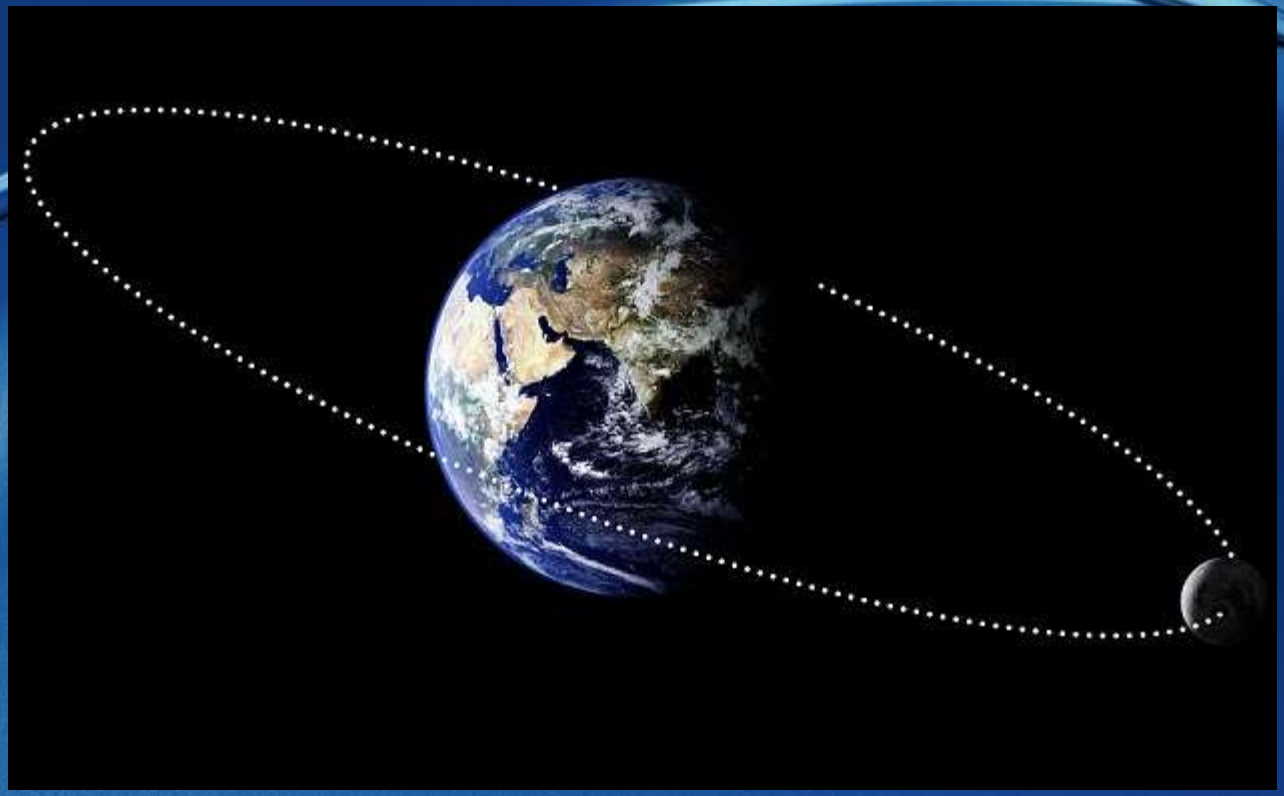
Full eclipse

Partial eclipse

The earth's atmosphere causes the shadow to make it look reddish in color.

Because the moon doesn't orbit in a straight path, it orbits on an angle.

Because the moon doesn't orbit in a straight path, it orbits on an angle every month?



TIDES

Centrifugal force -

A force that causes objects to move outward when they spin.


FAILJUNKIES.COM

Tides -

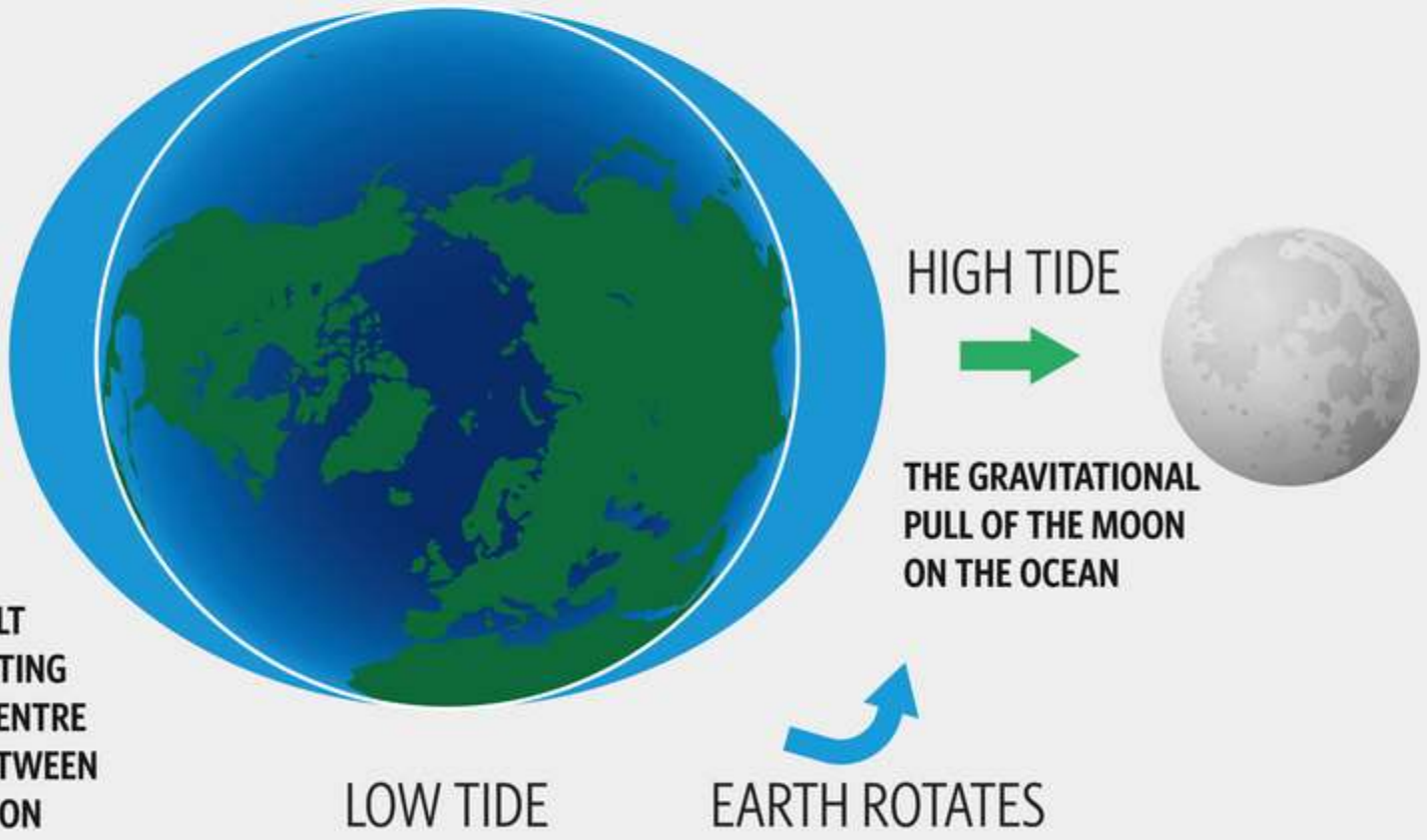
Large bulges of water caused by the gravity of the moon and sun on the earth.

High tide

Low tide

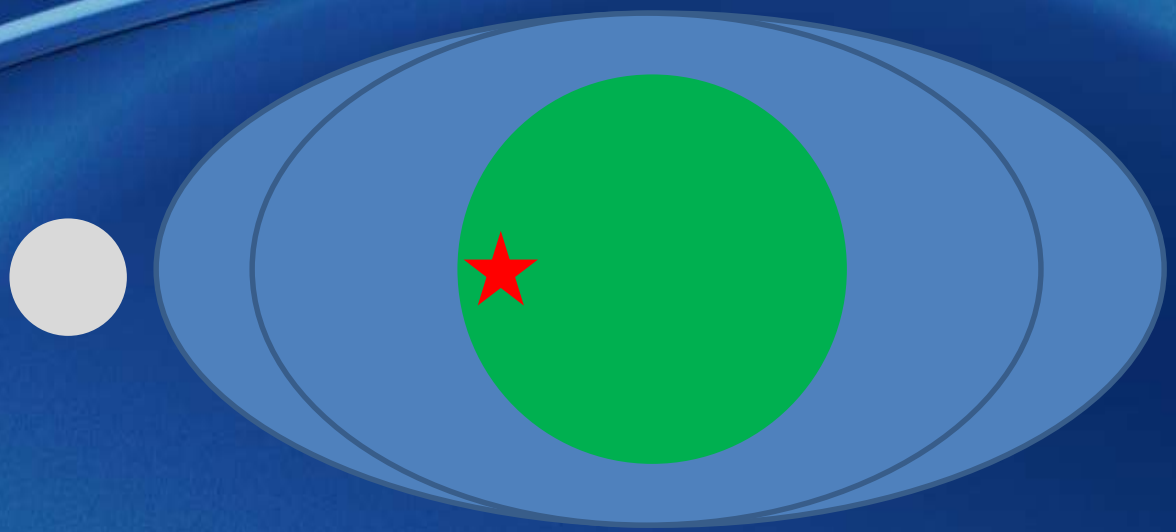
This is why there are tides.

FORCES THAT INFLUENCE THE TIDES



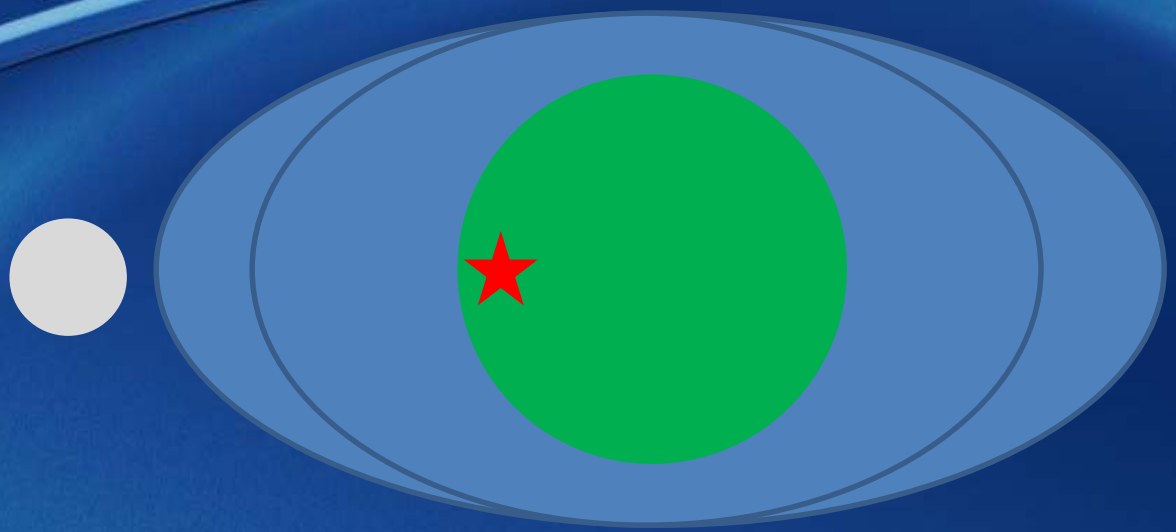
Now, the sun also affects the tides. Because it's so far away, it doesn't have as much pull as the moon. However, it does change things a bit.

When the sun is in line with the moon, it increases the pull of the water. This makes the tides even higher. This is called spring tides.



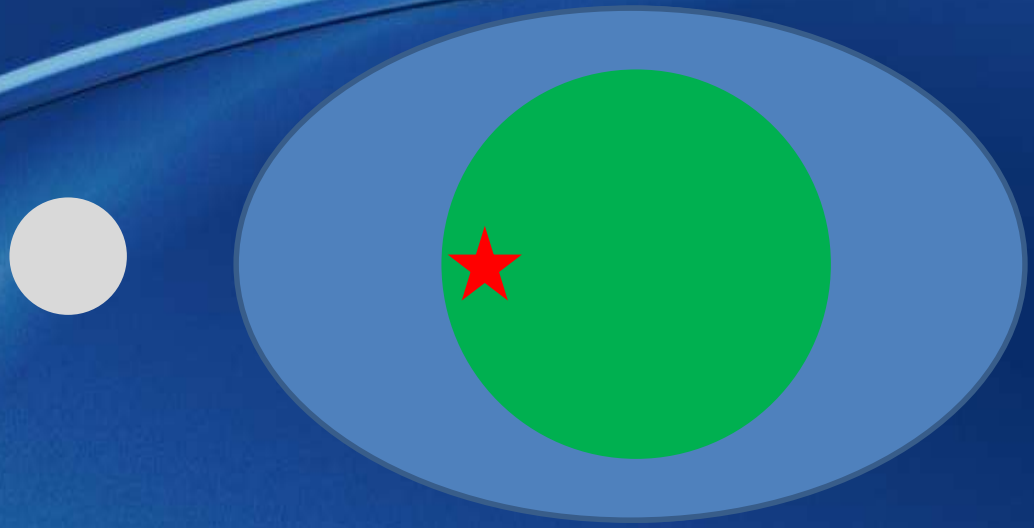
What moon phase is this?

Spring tides happen if the sun and moon are in the same direction, or opposite, as long as they are aligned.



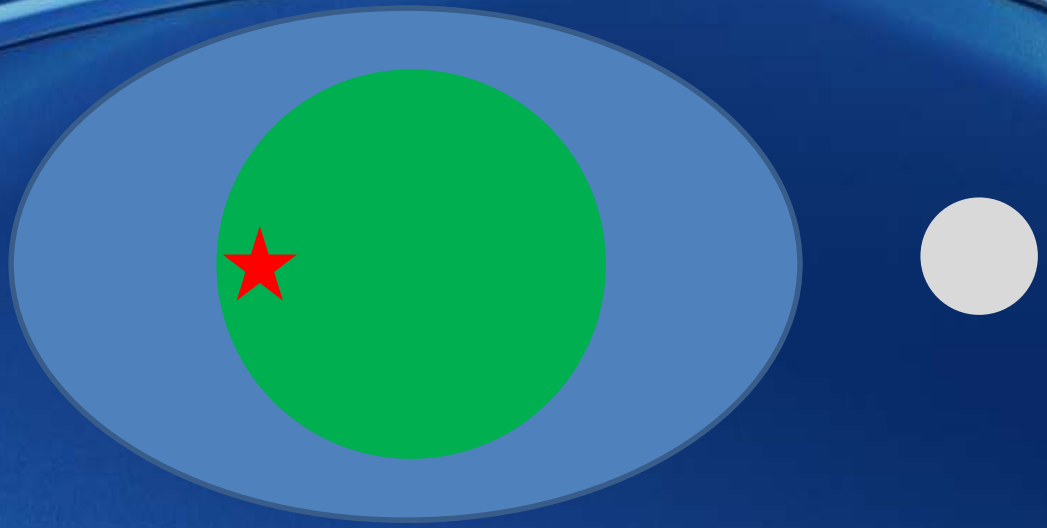
What moon phase is this?

When the sun is pulling in the other direction, it lessens the impact of the moon, making the tides smaller. This is called neap tides.



What moon phase is this?

It doesn't matter which side the sun or moon are on, as long as they are each pulling in opposite directions.



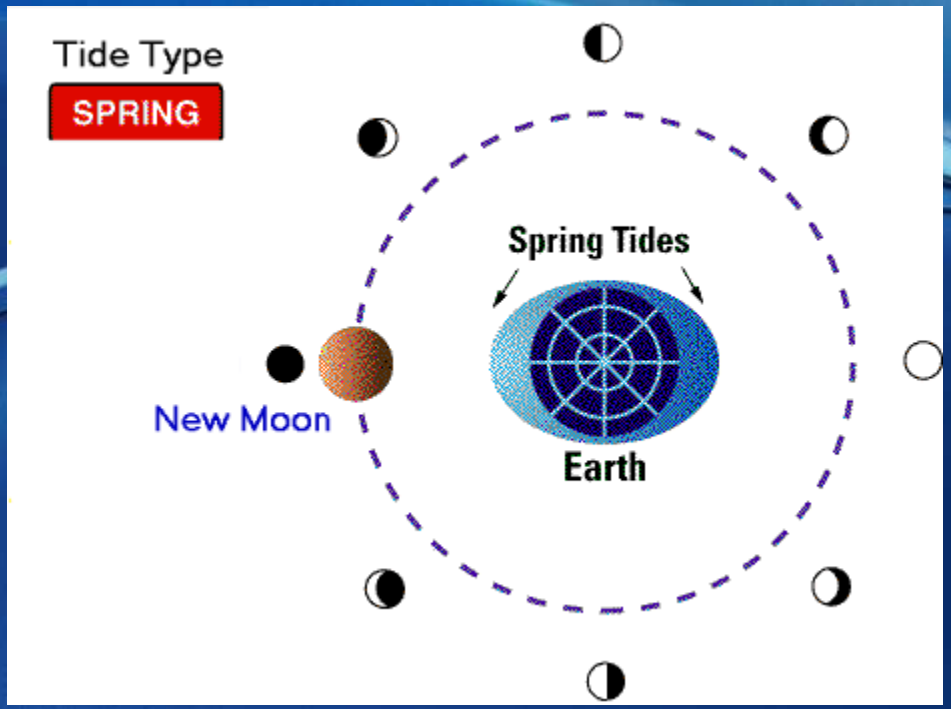
What moon phase is this?

Spring tides -

Tides that are larger than normal because of the sun's gravity combining with the moon's gravity. Full and new moons.

Neap tides -

Tides that are less than normal because of the sun's gravity competes with the moon's gravity and cancels some of it out. Quarter moons.


Tide Type
SPRING
Spring Tides
New Moon
Earth