THE SUN-EARTH-MOON SYSTEM

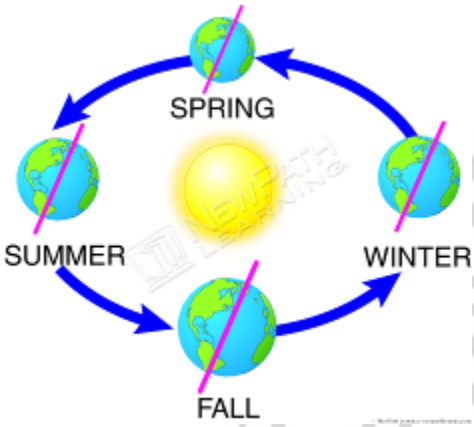
How the Earth Moves

The Earth is simultaneously spinning on its axis (**rotation**) and revolving around the sun. As viewed from space, the Earth rotates counter-clockwise. This is called **prograde rotation**. Planets that spin clockwise are said to have **retrograde rotation** (Venus has retrograde rotation). The **period of rotation**, that is the amount of time it takes for the Earth to rotate once, can be defined based on a number of perspectives. With respect to the sun, a "day" is 24 hours (scientifically referred to as the **mean solar day**). With respect to the stars (referred to as a **stellar day**) a "day" is 23 hours, 56 minutes, and 4.099 seconds. The Earth rotates at slightly more than 1,000 miles per hour.

The **perio** body to revolve ar e Earth toward the lso has forward m it were trying to pass the sun. But the gravitational pull of the sun tries to pull the Earth toward the sun. The combination of these two forces results in the Earth **orbiting** or revolving around the sun. This is the same reason that the moon orbits the Earth. The Earth revolves around the sun at a velocity of 67,000 miles per hour.

Seasons on Earth

The tilt of the Earth on its axis means either the Northern or Southern hemisphere is, to one degree or another, pointed toward or away from the sun as the Earth revolves around the sun.



As the Earth revolves around the sun, the degree to which various points on the globe are pointing toward or away from the sun determines the seasons at those points. One key factor affecting climate is latitude. Because the Earth is a globe, the sun's rays hit the equator more directly than they do the poles. This means the sun's radiation is more concentrated near the equator and the same energy is more spread out nearer the poles.

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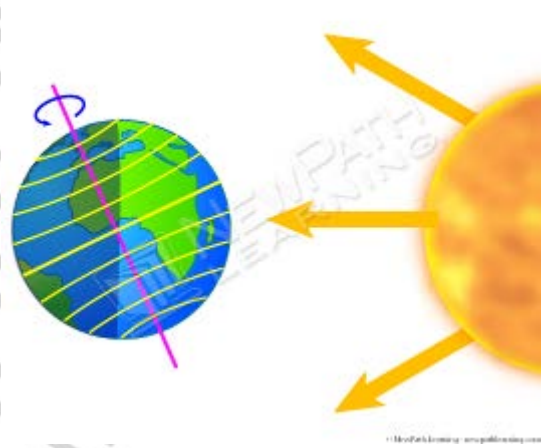
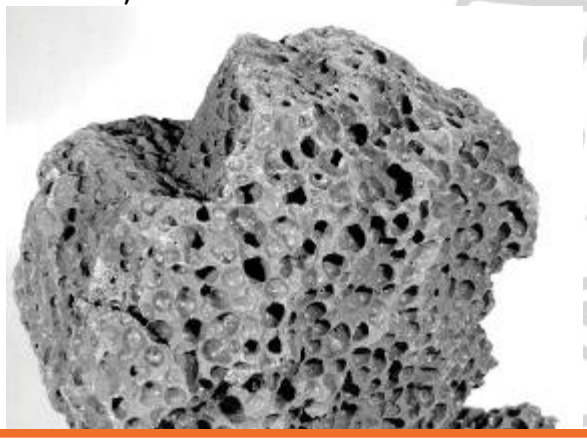


Seasons north and south of the equator are opposite of one another. When it is Winter in the Northern hemisphere, it is Summer in the Southern hemisphere.

The Earth's Moon

The Moon is Earth's only natural satellite. Because it is smaller than the Earth and of a different overall composition (the moon is a solid ball of basaltic rock covered with broken basaltic rocks and dust) its gravitational pull is only about 1/6th that of the Earth's. The rocks on the surface of the moon have not changed since they first formed. The Moon's diameter is 3,474 km.



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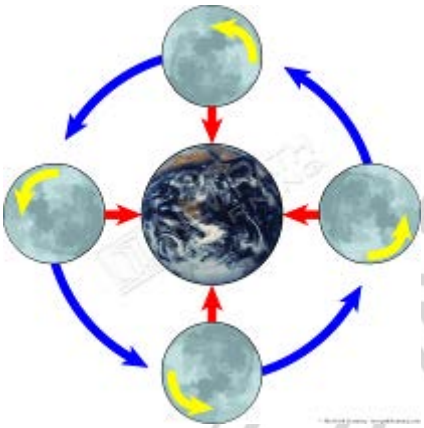
The moon …very 27.3 days. It is … The volume of … the Earth, the Moon i… fact that there are r… covered with pockmarks created by the impact of meteorites. Meteor impacts are the only forces that change the Moon's surface. Because it has no atmosphere, the Moon does not have wind (the American flag planted on the Moon by the astronauts appeared to be flapping in the breeze because it had wires in it to make it look that way!) The Moon is in what scientists call **synchronous rotation**. This means that the same side of the moon faces the Earth at all times. Humans did not see the "dark side of the moon" until the space flights of the 1960's and 1970's.



The current and most widely accepted theory explaining the origins of the moon is that a planet-sized object collided with the forming Earth and threw out a large chunk of Earth's rock material. This theory is based on information gathered from lunar rock samples that are of the same basaltic composition as basalt from the mantle of the Earth.

Age studies of lunar rocks have revealed that the moon, and therefore presumably the Earth as well, is 4.6 billion years old.

The Moo Earth

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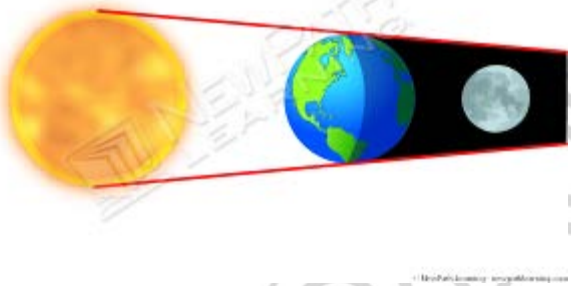
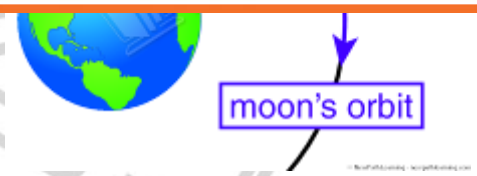
When the portion of the moon that is lit by sunlight is getting larger, the moon is said to be **waxing**. When that portion is getting smaller, it is said to be **waning**.

When one celestial body comes between the sun and a second celestial body, a shadow, called an **eclipse**, is cast on that second body. For example, when the moon comes between the sun and the Earth, a shadow is cast on the Earth. This phenomenon is called a **solar eclipse**. A **lunar eclipse** occurs when the Earth comes between the sun and the moon. A lunar eclipse completely darkens the moon. By comparison, a solar eclipse darkens only a small region on Earth. This is because the moon is a smaller body, and so the shadow it casts on the Earth affects only a small region. The shadow cast by the much larger Earth completely darkens the moon.



One might expect that if the Moon is between the Earth and the sun that there would be a lunar eclipse every day. This does not happen because the moon's orbit around Earth is actually tilted by a little more than 5 degrees. Therefore, the moon is out of the Earth's shadow for most full and new moons.

The gravitational pull of the Moon on the Earth creates bulges in the Earth. The most dramatic of these is the change of the level of the oceans.



The gravitational pull of the moon on the oceans is the most significant force responsible for **high tides**. (The sun's gravitational pull, however, also contributes to tidal swells.) When ocean water is pulled by the moon's gravitational force to create high tides in one area, water leaves other areas at the edges of the oceans. These are **low tides**. When the sun, Earth and moon all line up with each other, the gravitational pull on the oceans is at its maximum, and the **tidal range** (the water level distance between high and low tides) is at its highest. These unusually high tides are known as **spring tides**. A **neap tide** is a high tide that occurs when the sun and the Moon are at 90 degrees to one another. In this configuration, their gravitational pull on the oceans counteracts each other to a degree. The result is a high tide that is lower than a spring tide.

Missions to the Moon

President Dwight D. Eisenhower established the National Aeronautics and Space Administration (NASA) on July 29, 1958, much in response to the fact that the Soviet Union had placed a satellite in orbit around the Earth. On May 25, 1961 President John F. Kennedy challenged the United States to land a man on the moon and return him safely to the Earth by the end of the decade. Under this mandate, NASA aggressively developed the United States' space program. A series of space flight programs, beginning with the Mercury missions, determined first that a human could survive in space. Step by step technology was developed to launch a crew to the moon, land a man on the moon, and then return the crew safely to Earth. In this "race to the moon" John Glenn (pictured here) became the first American to orbit the Earth in space. The first human to step foot on the moon was Neil Armstrong. Edwin "Buzz" Aldrin was the second man to step onto the moon. Yuri Gagarin w et Union.

The Apollo nately landed Am d into the early 1970

Interest in a is presently c n the moon. In September 2005, NASA unveiled a $100 billion plan to put humans on the moon by 2018. Funding for the plan will have to be approved by Congress before the dream becomes reality. The purposes of such an energetic mission include the hope to be able to regularly send crews to the moon for a week at a time. With this, a plan to research and potentially use lunar resources like water and minerals to sustain life on the moon would make a permanent moon base more realistic. Should it be possible to establish a base on the Moon for ongoing research and activity, it is thought that this could be a platform from which further space exploration can happen, such as manned trips to Mars.