TOPIC 11 "EARTH-MOON-SUN SYSTEM"

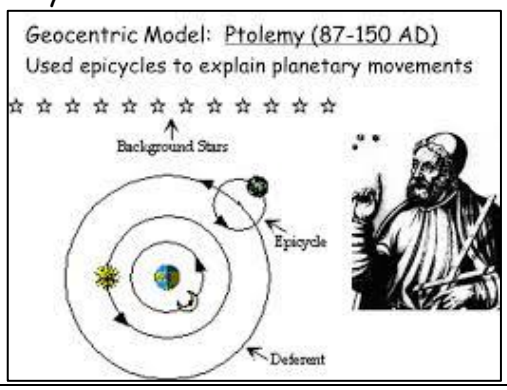
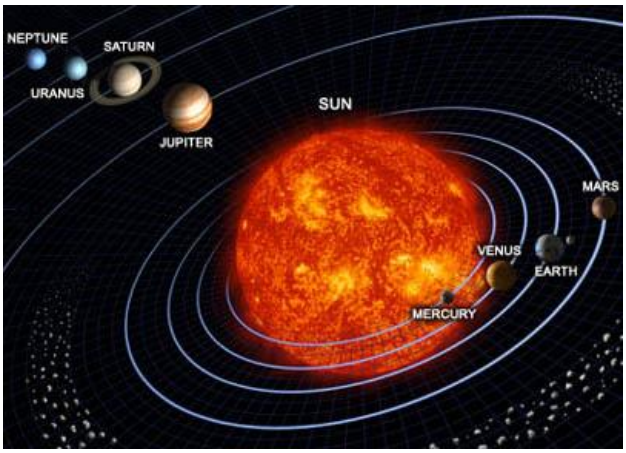
Lesson 1: Movement in Space.....The Night Sky (Pg. 493)

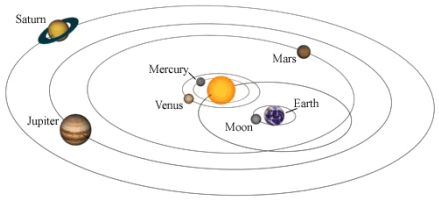
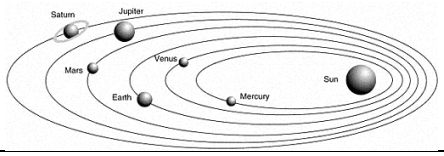
STARS	MOON	PLANETS	METEORS	COMETS
Stars= giant balls of hot gas made of hydrogen & helium ▪ You can see 2000-3000 stars w/ your eyes @ night **Constellation**= pattern or group of stars that people thought represent figure, animal or object. ▪ **88 constellations** ▪ **Polaris also called "North Star"** ▪ Big Dipper (is part of constellation Ursa Major "Great Bear")	Moon ……Is Earth's only "Natural Satellite "(it is *NOT man made*)	Planet = object that orbits the sun & is large enough to have become rounded by its own gravity, & has cleared the area of its orbit or any debris ▪ **8 planets in our solar system** ▪ We see Mercury, Venus, Mars, Jupiter & Saturn w/out a telescope ▪ **Venus is called the "Morning/ Evening Star"**….. It is brightest star in night sky… besides the moon!!	Meteors - streak of light made when a small object (rock) burns up when entering Earth's atmosphere. - Did you see the Perseid Meteor shower Aug 11-13th?	Comets - cold mixture of dust & ice that gives up a long trail of light as it approaches the sun. Example: Halley's Comet will see again 2061.. how old will you be?

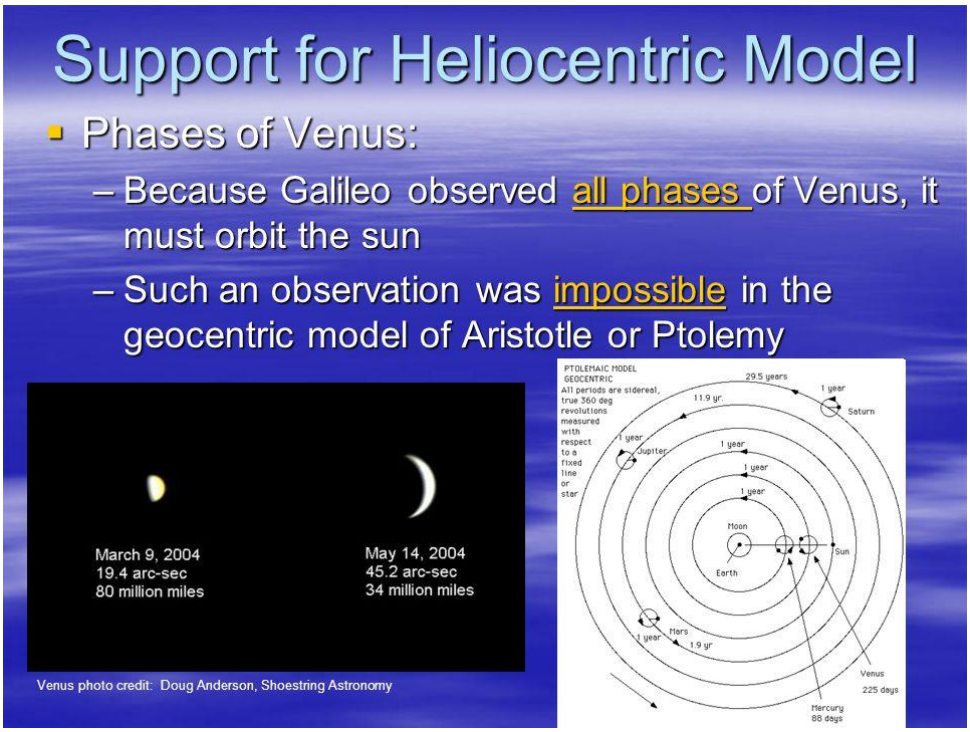
Movement in the Sky..... (pg. 496)

1. STARS & SUN "*appear*" to move from EAST to WEST …this is because Earth is spinning from West to East.
2. Constellations that you can see vary from season to season. (Ex: Orion is in eastern sky during winter & western sky by spring)
   a. Caused by Earth's orbit around the Sun
   b. CIRCUMPOLAR CONSTELLATIONS…. stars you see all year long- they circle around north pole (EX: Big Dipper, Little Dipper, Polaris)
3. Venus & Mercury appear low in sky & can see for short time around sunrise or sunset.

Models of the Solar System..... (pg. 498)

GEOCENTRIC MODEL = Earth is at the center of the revolving planets & stars	**HELIOCENTRIC MODEL** = Earth and other planets revolve around the sun.
1. Early observers thought Earth was at center of universe a. Early Chinese thought Earth was under a dome of stars b. Aristotle (ancient Greek) also thought Earth was center of universe 2. **Ptolemy's Model** a. 140 A.D. Ptolemy (Greek) further developed geocentric model. b. Said that **Earth was at center** of universe, and all the planets & stars orbit our planet. c. Geocentric model accepted for 1500 years!!  	1. This model was first proposed by ancient Greek- Aristarchus.. but was not believed. 2. Copernican Revolution (1543)….Given credit for HELIOCENTRIC MODEL. → **Nicolaus Copernicus**- worked out the arrangement of the known planets…and how they move around the sun. CHANGED SCIENCE FOREVER!!... **THE SUN IS THE CENTER** 

Brahe- **HYBRID MODEL** (late 1500s)	**Johannes Kepler**- Shape of Planets Orbits (1609)… was Brahe's assistant	**Galileo's** Evidence to prove Heliocentric Model (1610)
Tycho Brahe- he thought that the earth is at rest in the middle of the universe. The moon obviously goes around the earth and so does the sun and the stars. All the other planets, however, go around the sun. Little bit of helio…little bit of geo 	a. Kepler said that the orbit of each planet is an **ellipse-** (oval shape) b. Sun is slightly offset in the orbits c. **Planets closer to sun orbit faster than those further out**… you are older on Mercury than on Earth 	Used a telescope to discover 4 moons around Jupiter. Proved that not everything in sky revolves around Earth. Found that Venus goes through series of phases like moon's.. also proved that planets are solid bodies like Earth.



Lesson 2..... Earth's Movement in Space (pg. 504)

How Earth Moves....

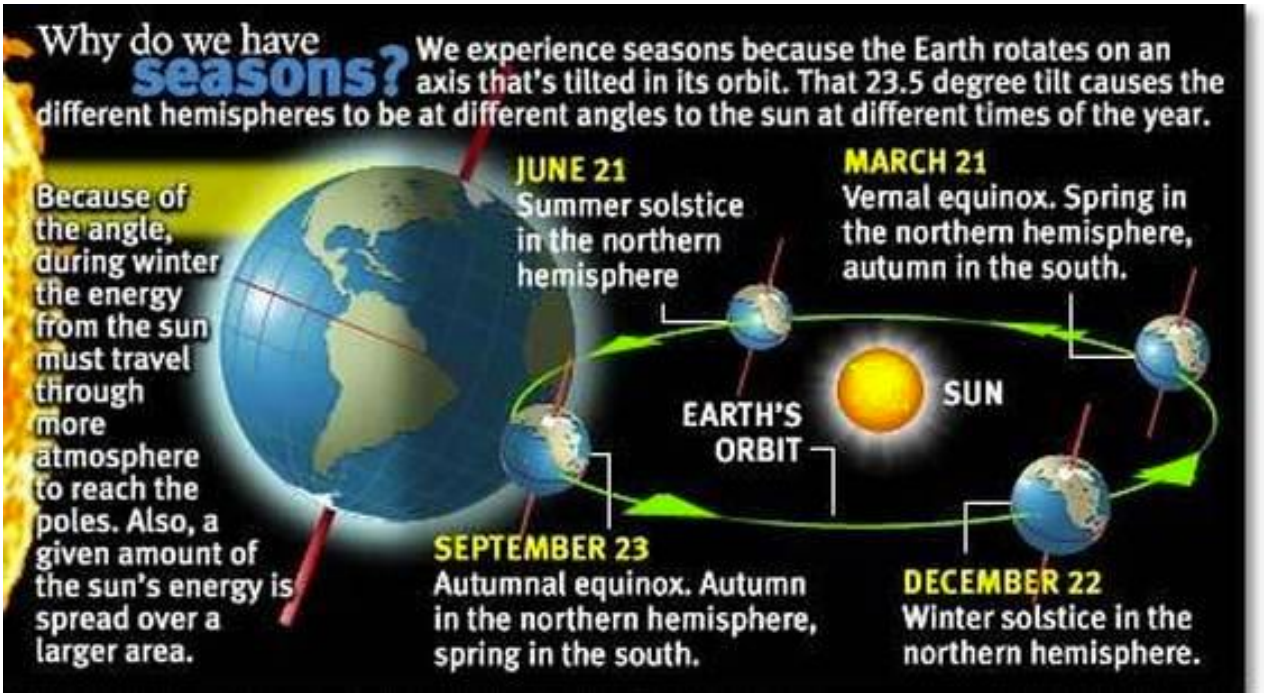
ROTATION	REVOLUTION
→spinning of Earth on its <u>axis</u> (imaginary line running thru Earth) - Causes DAY & NIGHT - Takes 24 hours	→Movement of one object around another - Takes 1 year - Orbit = Earth path… its an ellipse (flattened oval) 

The Seasons... (pg. 507)

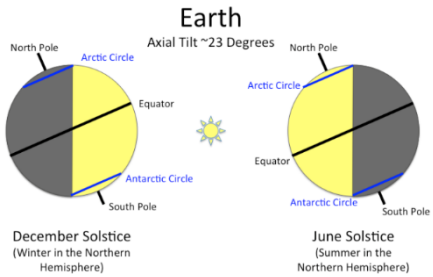
→At equator sunlight hits directly… that's why they have year-round warm weather

→ FYI…Earth is tilted 23.5 degrees….

- **SEASONS are caused by Earth's tilt as it revolves around Sun… it also affects day length**

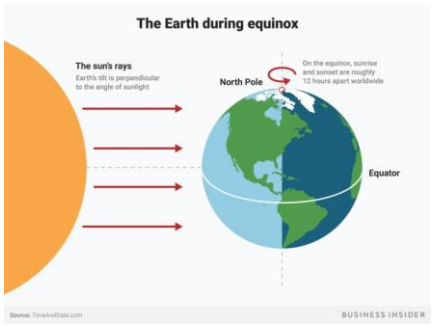


Solstice = sun appears farthest north of equator once a year



- Summer Solstice= about June 21 = longest day & Winter Solstice= about Dec. 21= shortest day

Equinox = noon sun is directly overhead at equator, rises due east and sets due west…. Means "equal night"

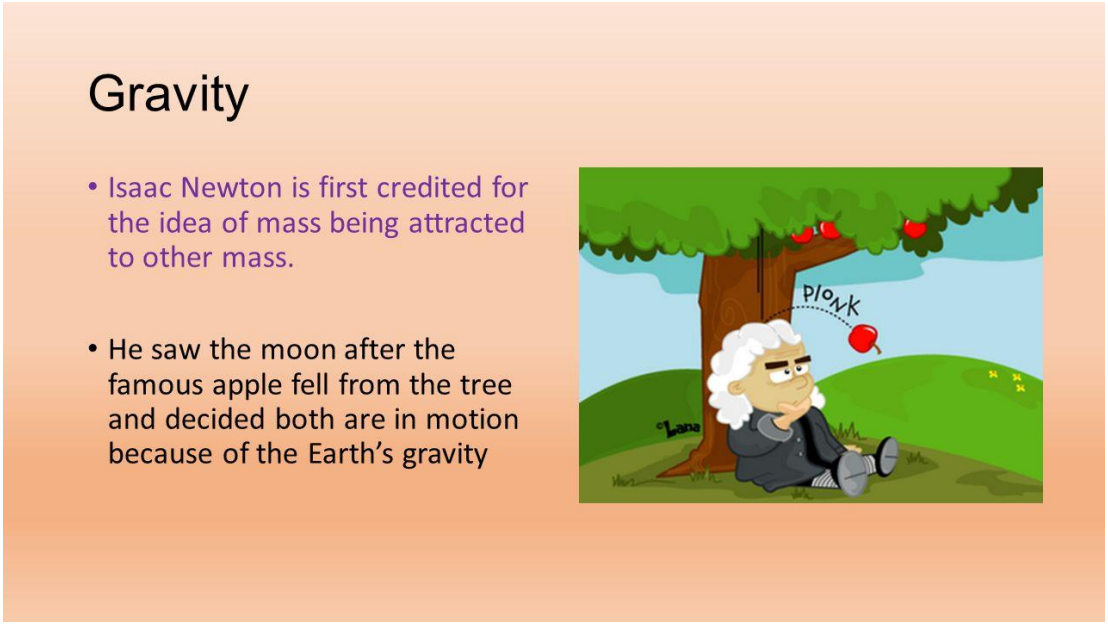


- **Day & night are equal** 12 hrs long everywhere
- Spring equinox = around March 21 & Fall equinox = around Sept. 22

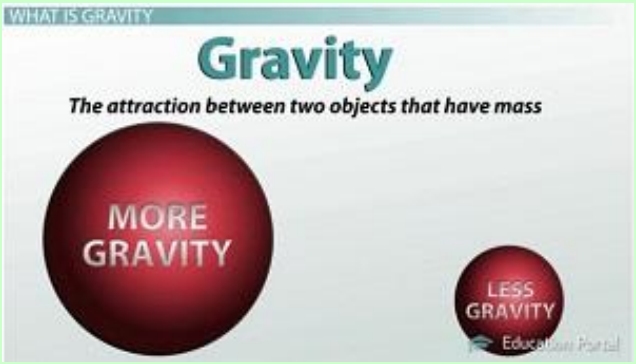
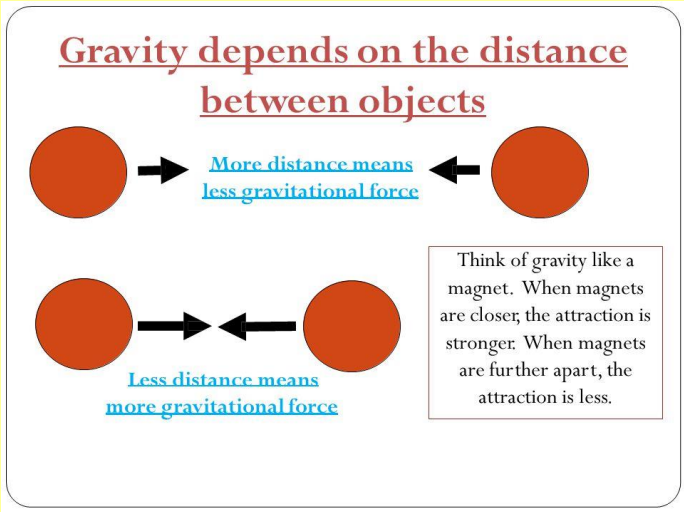
Gravity & Orbits…. (pg. 509)

Gravity = force which attracts all objects toward each other

- **Law of Universal Gravitation** = every object in universe attracts another object.
  - **Isaac Newton** discovered in 1600s that there must be a force= (push or pull) that kept moon orbiting around Earth

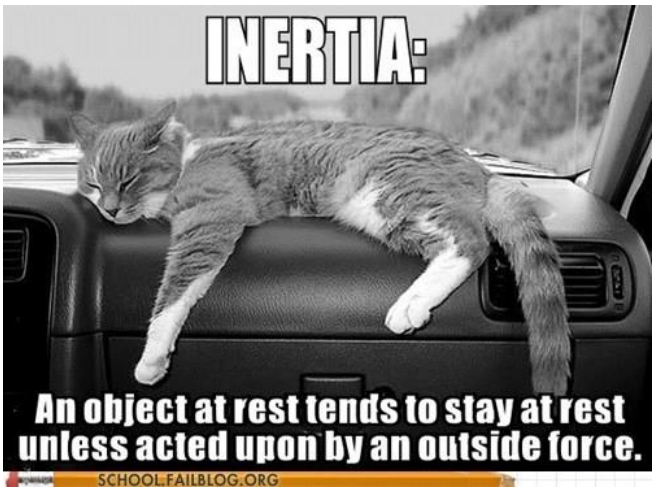


STRENGTH OF GRAVITY depends on 2 things:

MASSES OF THE OBJECTS:	DISTANCE BETWEEN OBJECTS:
→ **Mass** = amount of matter in an object… your mass does NOT change from planet to planet → **Weight** = amount of force of gravity on an object…. Your weight CAN change depending on your location. "My mass doesn't change but my weight can!" 	→ Force of gravity **DECREASES** as distance **INCREASES**. Ex: the farther away from Earth you get… less gravity you feel 

WHY DOESN'T EARTH CRASH INTO THE SUN???

Because we have….

INERTIA	ORBITAL MOTION.. we orbit the Sun
** **when object resists change in motion** (Ex: car stops → you slam into seatbelt) - More mass = greater inertia… harder to start or stop - **Newton's First Law of Motion** = Object at rest will stay at rest and an object in motion will stay in motion with a constant speed and direction unless acted upon by a force.  	**Newton said inertia & gravity combine to keep Earth in orbit around Sun & moon in orbit around the Earth.**

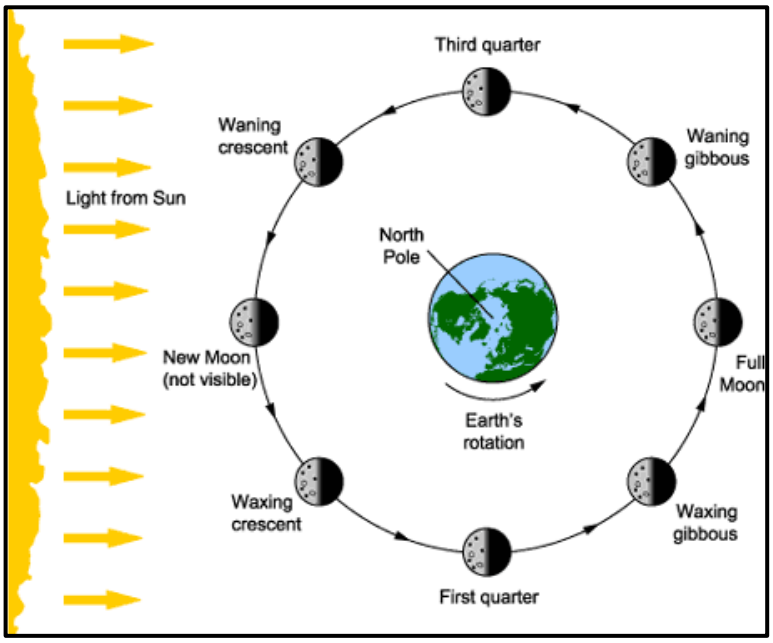
Lesson 3: Phases & Eclipses

The Appearance of the Moon... (pg. 515)

-Moon ROTATES & REVOLVES around the EARTH!!

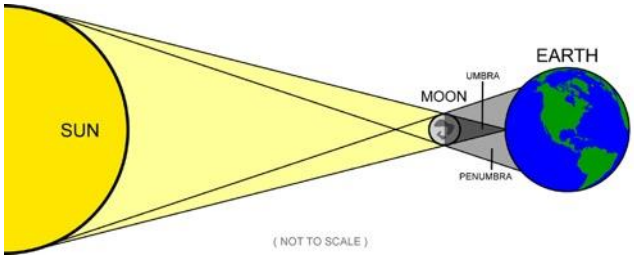
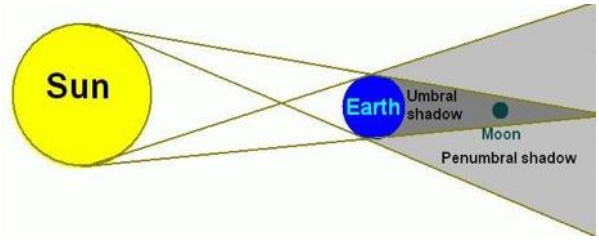
a. You always only see same side of moon

- New Moon = moon is NOT lit
- Waxing Phases = lit side is INCREASING (first ½ of month)
- Waning Phases = lit side is DECREASING (last ½ of month)



WAX ON.....WANE OFF

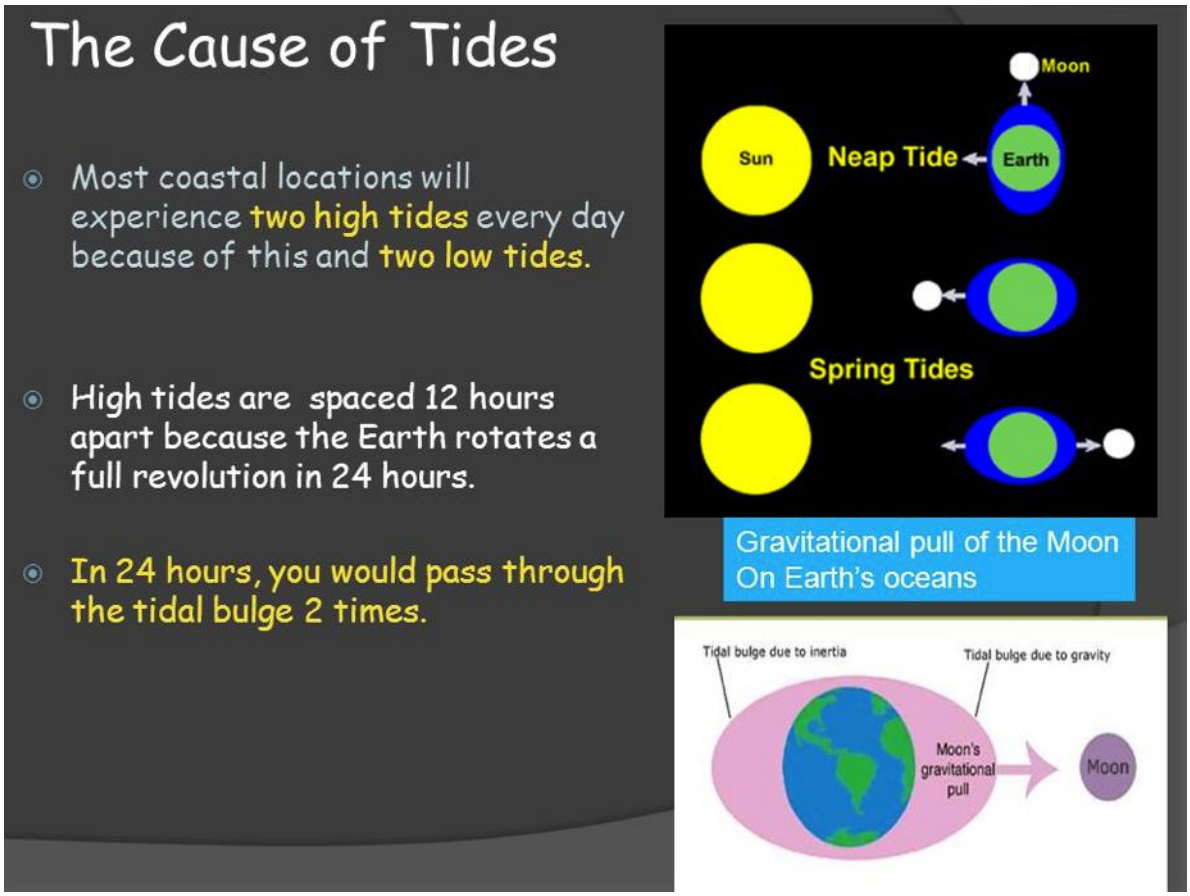
Eclipses.. (pg. 518)

SOLAR ECLIPSE.. "SME"	LUNAR ECLIPSE.... " SEM"
→ Happens in **daytime** & moon's shadow hits Earth & blocks Sun  Next solar eclipse visible in SD: Oct 14, 2023	→ Happens ONLY in full moon when Earth is directly btwn moon & sun.  Next total lunar eclipse visible in SD: July 4-5, 2020

→ **Umbra = darkest part** of the eclipse shadow.....**Penumbra = eclipse shadow that is** dark, but not as dark as the umbra portion

Tides... (pg. 520)

Tide = rise & fall of the ocean water that occur every 12.5 hrs.



SPRING TIDE	NEAP TIDE
-largest difference between high & low tide Sun--- Moon---- Earth (**all in a row- during <u>new</u> moon & full moon**	- least difference between high & low tide…happens during first & third quarter moons) Sun --- Earth | Moon (**at 90 degree right angle**)