KEY _Midterm Review for College Prep Integrated Science__ *Fall Semester 2019-20*

Please do not give students a copy, they must complete their review guide then check answers. Taking pictures of this review guide is prohibited.

* The mid-term will NOT cover JUST the material in this Review. Be sure to study from the handouts, notes, and tests.

Lab Safety

1. Correct the following lab safety rules:
   a. While doing an experiment, ~~only~~ *always* wear goggles if chemicals are being used *and any glassware.*

   b. Horseplay is *not* allowed.

   c. It is okay to make up your own lab procedures without receiving approval from the teacher.

      No

   d. Any unused chemicals can be put back in the original containers.

      Never put any unused chemicals put back into the original containers, follow the teachers directions for correct disposal.

   e. If a chemical is spilled, ~~leave it there to evaporate.~~

      Tell the teacher so it can be cleaned up properly.

2. A scientist conducts an experiment, but the results are unexpected and don't support the hypothesis. What should s/he do?

   Revise hypothesis and run the experiment again

3. Identify the steps in the scientific method that are involved in the following situations:
   a. Predicting the outcome of the experiment: *hypothesis*
   b. Information obtained through the senses: *collect data*
   c. Creating steps that will be followed during the experiment: *procedure*
   d. Summarize observations and discuss how they relate to the hypothesis: *analyze data / conclusion*
   e. Explaining why the experiment is being done: *purpose*

4. Identify at least one unit that can be used for the following types of measurements:

a. mass: *g*	c. time: *sec*	e.length: *m*
b. volume: *L or cm^3*	d. temperature: *K or C*	f.density: *g/cm^3 or kg/L*

5. Determine which type of graph should be used in each of the following situations:

Height of one child over several years: *line graph*

Average yearly precipitation in 2009 for 10 different cities*: bar graph*

6. Write a hypothesis for the following:

a. How does the amount of leaves on a tree affect how many birds will build nests in it?

If the tree has more leaves, then more birds will build nests, because leaves provide cover for nesting birds which protect them from predators.
IV – amount of leaves DV – amount of birds building nests

b. Do heavier mass objects accelerate faster than light objects?

If an object has more mass, it will accelerate slower, because according to Newton's 2^{nd} law, more force is needed to accelerate heavier objects.
IV – mass of object DV – acceleration

c. Does eating breakfast increase performance in school?

If a student eats breakfast in the morning, then they will get higher grades, because they will have energy to stay awake in school and concentrate.
IV – amount of breakfast eaten DV – performance in school

7.Jennifer and Josh worked together to make a solar cooker. They decided to test whether coloring the water would warm up the water faster. During their experiment,

they made sure to use the same cooker, beaker and amount of water. Also, since it was cloudy outside, they used a heat lamp that was always kept at the same distance.

	Volume of Water	Initial Water Temp	Final Water Temp	Total Heating Time
Red Water	99.8 mL	22.1 ^{o}C	35.3 ^{o}C	10 min
Blue Water	100.2 mL	24.2 ^{o}C	65.8 ^{o}C	10 min
Plain Water	100.1 mL	25.9 ^{o}C	45.1 ^{o}C	10 min

a. What were Jennifer and Josh's independent and dependent variables?

   IV: color of water

   DV: water temperature

b. What is the control Group? *Plain water*

c. What is the experimental Group? *Colored water*

d. List the control variables. *Same cooker, same beaker, same heating time*

e. List all the variables that Jennifer and Josh did not control.

   Amount of water (all different amounts in data table), initial water temperature all different.

f. Write a hypothesis in the proper format that describes what they are trying to figure out.

   If the water is colored red, then it will heat up the water more, because the color red absorbs more light energy.

g. Based on the data, write a claim, then use data to support your claim.

   Claim: Blue water heats up the water the quickest in a solar cooker.

   In order to provide data, you need to subtract the initial water temp from the final water temperature to get the difference.

   Data: The red water only heated up the water only 13.2 C, compared to the blue water which heated the water up 41.6 C, and the clear water only heated the water up 19.2 C.

h. How reliable was their experiment? What are some things they did well? What are some things they need to improve?

   The experiment is not reliable. They failed to control all variables such as amount of water and initial water temperature and they only conducted one trial (3 trials is best)

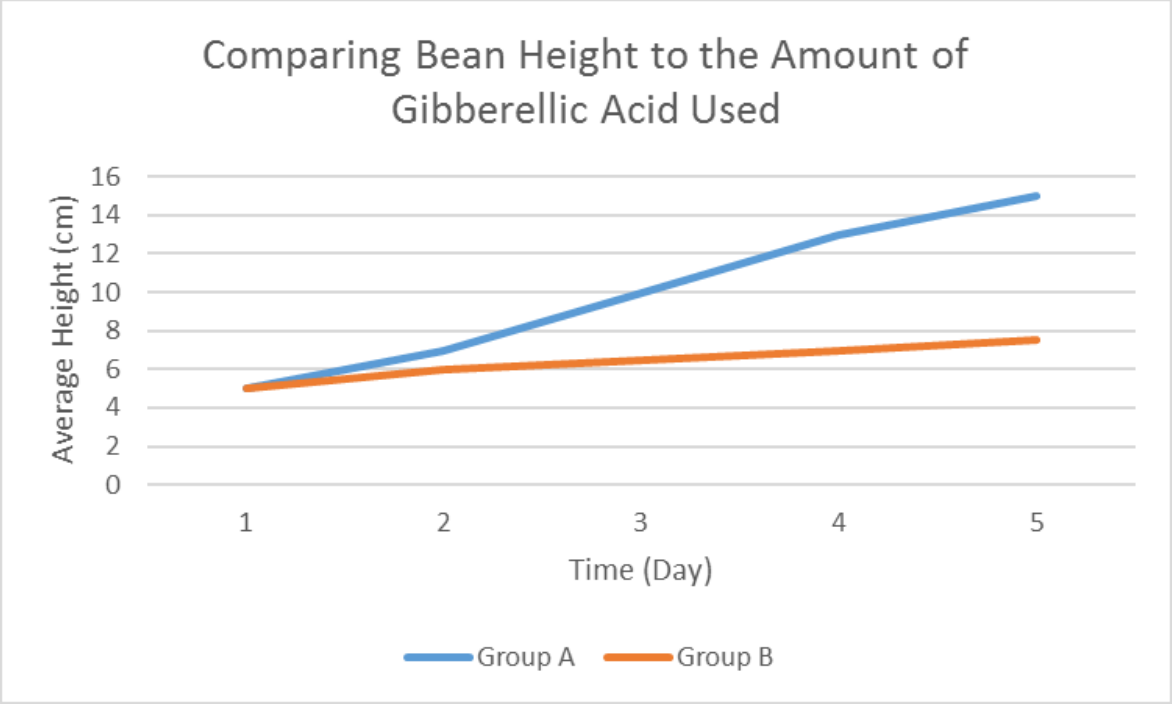
Directions: Using the information below to complete the graph

8. A number of bean seeds planted at the same time produced plants that were later divided into two groups, *A* and *B*. Each plant in group *A* was treated with the same concentration of gibberellic acid (a plant hormone). The plants in group *B* were not treated with gibberellic acid. All other growth conditions were kept constant. The height of each plant was measured on 5 consecutive days, and the average height of each group was recorded in the data table below.

Data Table

	Average Plant Height (cm)				
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Group A	5	7	10	13	15
Group B	5	6	6.5	7	7.5

Directions (1-3): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.



What would be an appropriate claim for the graph above?

When bean plants are given gibberellic acid they grow taller.

9. <u>Create a data table for the following to test the following experiment.</u>

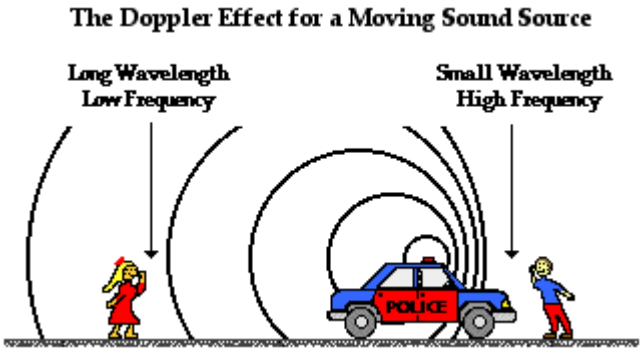
John Audubon wanted to attract more northern cardinals to his feeder, so he put out 5 different types of food in five feeders, then weighed the amount of food left at the end of one week. He weighed each food type at the beginning of the experiment to ensure they all started with the same weight in grams. The following type of food were tested: millet, peanuts, raisins, black sunflower seeds, and thistle seed.

Comparing the type of food that Cardinal's eat

Type of food	*Initial weight (g)*	*Final Weight (g)*	*Change in weight (g)*
Millet			
Peanuts			
Raisins			
Black Sunflower Seed			
Thistle Seed			

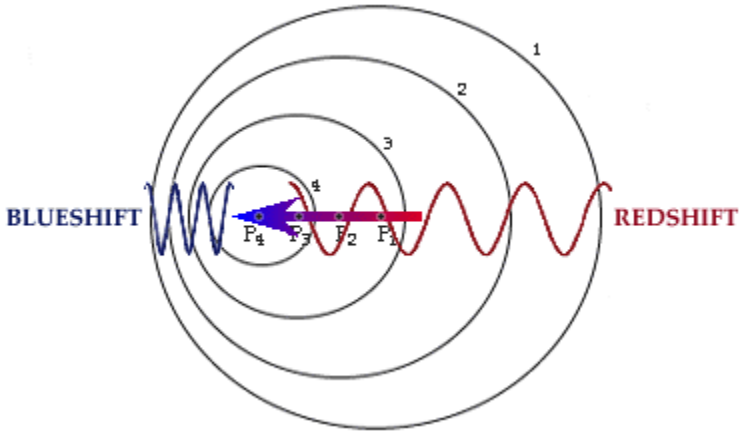
10.

DOPPLER EFFECT



a. What happens to the sound when the siren APPROACHES the listener?
The frequency of the sound increases, the wavelength decreases, and the pitch becomes higher.

b. What happens to the sound when the siren moves AWAY FROM (recedes from) the listener?
The frequency of the sound decreases, the wavelength increases, and the pitch becomes softer/decreases.



11. How does this apply to light?
When a star is moving towards you, the frequency increases, the wavelength decreases, so the color shifts towards the blue end the spectrum, "blue-shift"

12. When an automobile moves towards a listener, the sound of its horn seems relatively
a. Low pitched (low frequency) ***b. High Pitched (high frequency)***
c. Normal (no change in frequency)

13. When the automobile moves away from the listener, its horn seems
a. Low pitched(low frequency) b. High Pitched (high frequency)
c. Normal (no change in frequency)

14. ***True*** / False: If the object stays still, but the observer moves, the Doppler effect is still observed.

15. True / ***False***: A moving wave source does not affect the frequency of the wave encountered by the observer.

16. ***True*** / False: A higher frequency results when a wave source moves towards an observer.

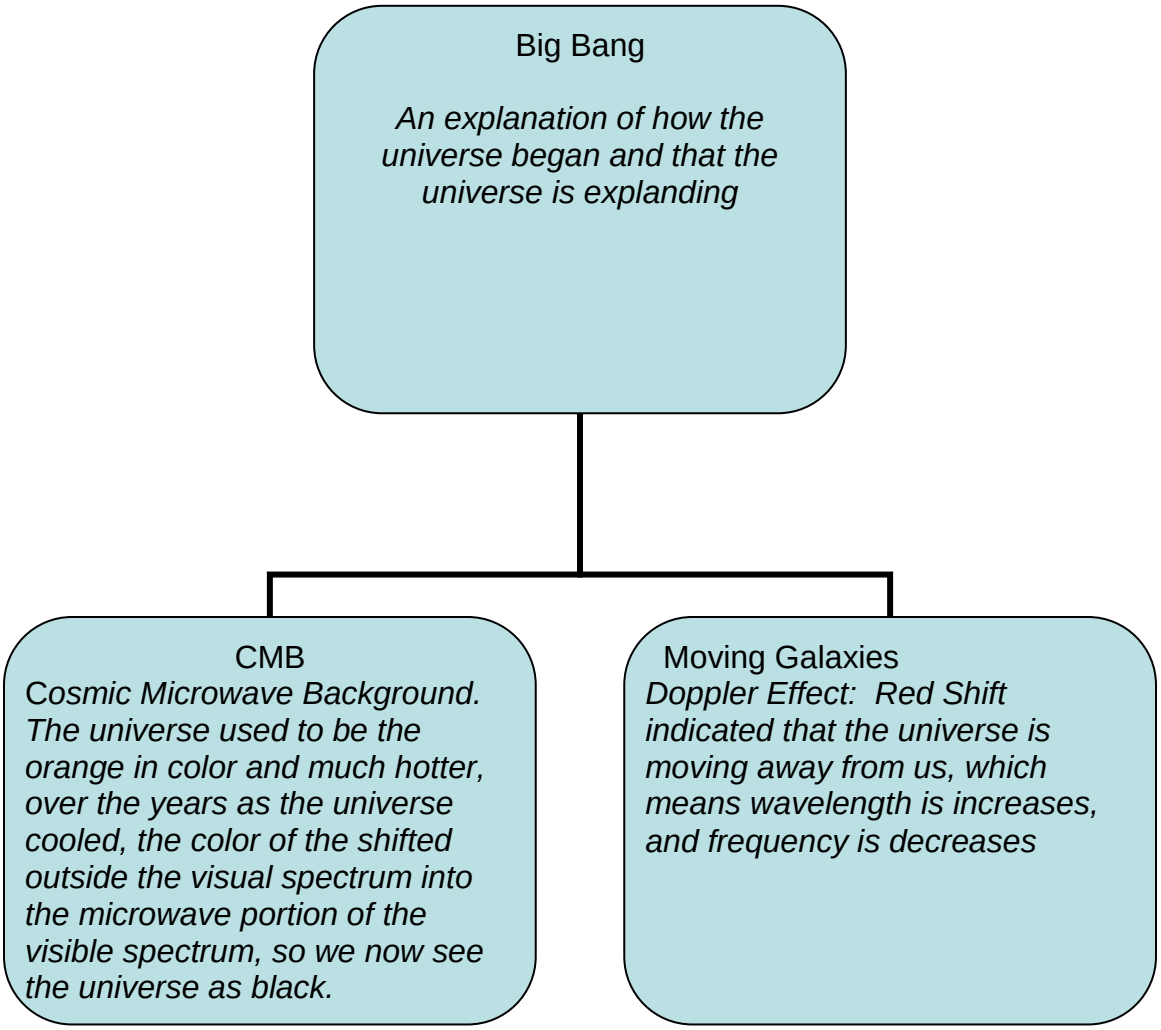
17. List the colors of the visible light spectrum in order of lowest to highest frequency.
Red, orange, yellow, green, blue, indigo, violet

18. When galaxies move away from us they appear to have a "red shift" in color. **Explain** why this happens.
They are "red shift" because they are increasing in wavelength, and the frequency is decreasing, so the color is shifted towards the red end of the spectrum.

19. What color do galaxies appear if they are moving towards us?
Blue Shift (frequency increases, wavelength decreases)

Review star spectrum element analysis worksheets.

20. Complete the boxes below by explaining what the Big Bang is and describe the two pieces of evidence.



21. **Life Cycle of a Star – Use the word bank to complete the sentences below.**

(Make sure you review the life cycle of stars' diagram)

Word Bank

gas	sun	ten	gravity
white	billions	red giant	neutron
supernova	helium	planetary nebula	black hole
nebula	mass	black	
hydrogen	energy	dust	
nuclear fusion	main sequence	protostar	

Step One

Stars change during their lifetime, which can be _____*billions*_____ of years long. They start out as diffuse clouds of _*dust*__ and __*gas*___ drifting through space. One of these clouds is called a ___*nebula*_____.

Step Two

The force of _*gravity*_____pulls the nebula together causing a _____*protostar*_____ to form. Heat and pressure begin to build until ___*nuclear fusion*_____ begins to take place. Inside the core, _*hydrogen*_____ atoms smash together and are fused into heavier ___*helium*___ atoms. This process generates an enormous amount of ___*energy*_____ and the star ignites becoming a ___*main sequence*_____ star.

Step Three

Our _*sun*_ is a main sequence star about halfway through its __*ten*__billion year long life as a main sequence star. Eventually our sun will use up all of its hydrogen and it will start to expand to many times its current size to become a __*red giant*___.

Step Four

What happens after this point depends on the _*mass*___ of the star. A star the size of our sun will enter the ___*planetary nebula*____ phase, which means it loses its outer layers. The star's mass is lost until it collapses into a ___*white*____ dwarf, which will lose energy and become a _____*black*___ dwarf.

Step Five

Stars bigger than our sun will collapse so quickly they explode into a _____*supernova*____. The core that is leftover after a supernova may form a ____*neutron*____ star. If the leftover core was above a certain mass, it will continue to collapse in on itself and form a __*black hole*____. Its gravity is so powerful that nothing within its range can escape, not even ____*light*_!

22. Describe how the force of fusion and the force of gravity influence the size of stars.

There are two forces within a star the force of fusion pushing out and the force of gravity pushing in. When the force of fusion is greater than the force of gravity the star enlarges, when the force of gravity if larger that the force of fusion the star shrinks. If the forces are equal the star size does not change.

Refer to force diagrams.

23. Describe why large mass stars have heavier elements

Large mass stars have heavier elements because they have more mass, stars with more mass have more gravity pushing in, so the rate of fusion increases and is faster, resulting in heavier elements like iron.

KEPLERS LAWS

24. 1st Law: The planets move about the sun in _____ (circular / ***elliptical)*** orbits, with the sun at one focus of the ellipse.

25. 2nd Law: The straight line joining the sun and a given planet sweeps *_in equal areas in equal amounts of time*_____.

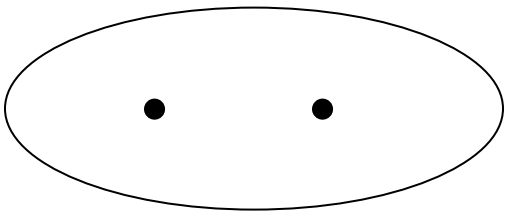
Can be remembered as _____*law of equal areas*_____

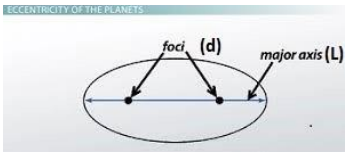
26. 3rd Law: The square of the period of revolution of a planet ABOUT THE SUN is proportional to the cube of its mean distance from the sun.

This means that
Planets closer to the sun have shorter revolution time, because they are closer to the sun and have more gravitational pull compared to planets that are further away.

27. Defining the variables: e= d / L
e = *__eccentricity, how flat the shape of the orbit is*_____
d = *__distance between the two foci points*_____
L= *__length of the entire major axis*_____

28. Calculate the following eccentricity: e = d ÷ L





29. **Some key things to remember/know about Kepler's Laws**

1st Law:

a. Circles have centers. Ellipses are like flattened circles, that don't have a center, but rather have two ___*foci points*__.

b. ***Eccentricity*** may be interpreted as a measure of how much an orbit's shape deviates from a circle. For a circle, e =_***0***___
For an ellipse, 0 < e < 1 (the lower the e value, the more _*circular it is*_____)

2nd Law:

a. Planets move __*faster*___ when they are on the side of their elliptical orbit that is closest to the sun. This is called ____*perihelon*_____, compared to __*aphelion*__ when the planet is farthest from the sun.

3rd Law:

a. According to Kepler's Laws, which planet takes longer to orbit the sun, Saturn or Neptune? Explain. *Neptune, because according to Kepler's 3rd law, planets that are further from the sun, have less gravitational force and larger orbits, so move slower.*

30. What is the formula for Newton's second law of motion? Rearrange it to find acceleration or mass? $F = m \times a$

$m = F \div a$

$a = F \div m$

31. When solving for Newton's law, Force is measure in ____ *Newtons (N),* _, acceleration is measured in __ m/s^2___, and mass is measured in ___ *kg* ___.

32. How is Newton's 2nd law related to Kepler's 2nd law as a planet moves closer to the sun?

As planet's move closer to the sun they have more gravitational force from the sun, so as Newton's 2ns law states the more force, the more acceleration, so planets move quicker closer to the sun.

33. A force of 52 N acts upon a 4 kg block sitting on the ground. Calculate the acceleration of the object.

$a = F \div m$ $52 \div 4 = 13\ m/s^2$

34. A 5 kg block is pulled across a table by a force of 61 N. Calculate the acceleration of the object.

$61 \div 5 = 12.2\ m/s$

35. An object of mass 10 kg is accelerated upward at 2 m/s^2. What force is required?

$F = m \times a$ $10 \times 2 = 20$

36. What is the mass of an object if a force of 17 N causes it to accelerate at 1.5 m/s/s?

$$m = F \div a \qquad 17 \div 1.5 = 11.3\ kg$$

Plate Tectonics

37. What is the theory of continental drift?

The theory of continental drift is that continents at one time were all joined together into a super continent called Pangea, over time the continents drifted apart to their current locations.

38. Discuss pieces of evidence that support the theory of continental drift.

a. Fossils **-** *Fossils of the same plants and animals could be found in areas of continents that had once been connected. For example, the tropical ferns fossils can be found in cold areas like Antarctica suggesting that the continent was once warm.*

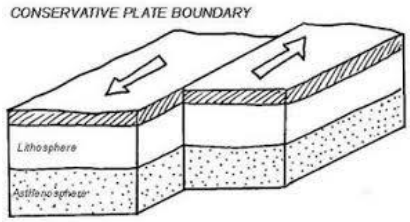
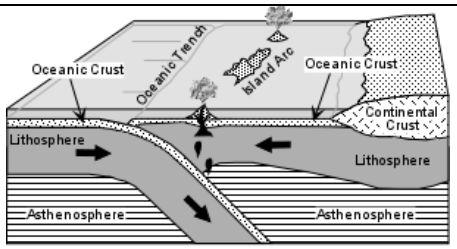
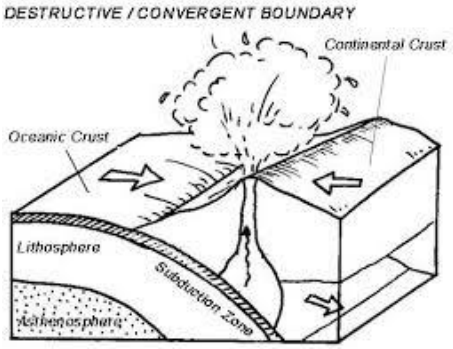
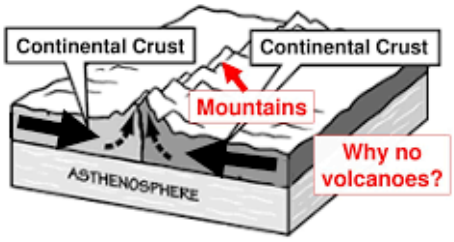
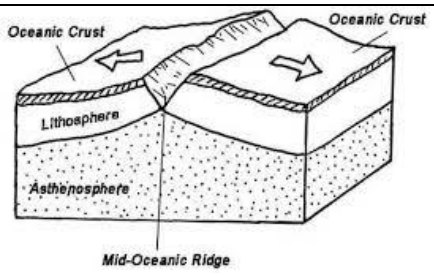
b. Land Formation - *Same types of rocks (mountain ranges) and rock layers in the coastal regions of widely separated areas matched closely*

c. Continent Shapes - *Continentals looked like they fit together like a puzzle*

d. Magnetic Reversal - *Scientists discovered an alternating magnetic pattern on the ocean floor on each side of a mid-ocean ridge, these patterns are in chronological order.*

e. Plate Tectonics - *earth's surface is broken into numbers of shifting plates that move based on the direction of convection currents. Plates can collide to create mountains or diverge to create mid-ocean ridges and new ocean floor or one plate can subduct under another, each changing the shape and location of continents.*

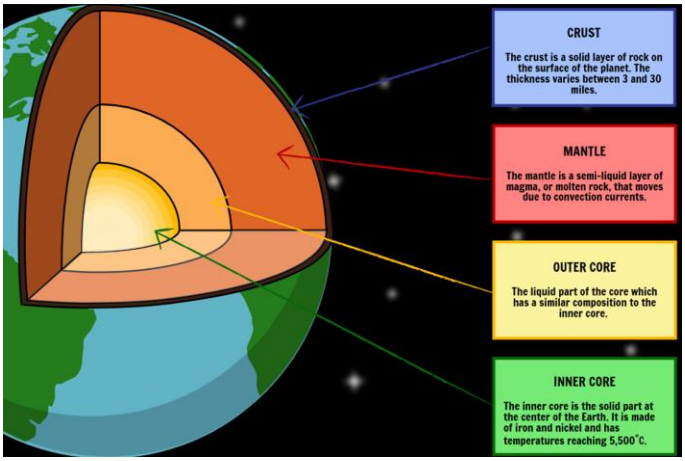
39. Complete the table

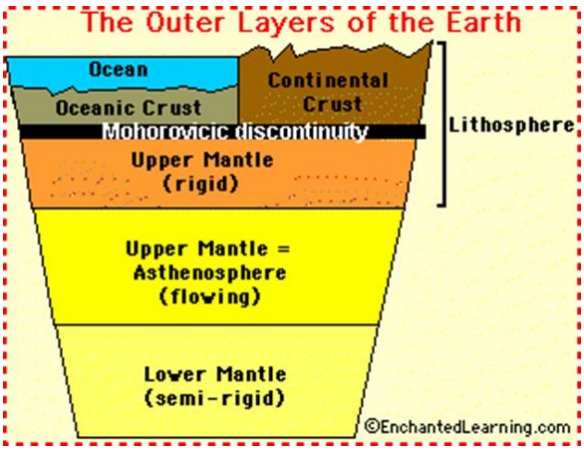
Plate Boundary Type	***Image to help you remember***	***Direction of plate movement***	***Features Formed***
Transform		*Slip past each other*	*Earthquakes*
Convergent Ocean-Ocean		*Push together, once plate sinks under other*	*Earthquakes, volcanoes, trench*
Convergent Ocean-Continental		*Push together, ocean plate sinks under continental*	*Earthquakes, volcanoes, trench*
Convergent Continental-Continental		*Push together and creates folds*	*Earthquakes, mountains*
Divergent		Move away from each other	Volcanoes, valleys, mid-ocean ridge

40. What are convection current, what drives convection currents, and how the movement of plates related to the movement of convection currents.

Since hotter material deep in the asthenosphere is less dense it will rise slowly, as it reaches the base of the lithosphere it begins to cool, become more dense, and will sink due to gravity, this creates convection currents. Radioactive decay is the source of energy for earth's tectonic system which drives the convection currents. When convection currents rise, plates gets pushes away from each other, when convection currents sink, subduction occurs.

41. Draw the layer of the Earth. Describe the composition of each layer (i.e solid, liquid, etc.)





42. What are the three different types of Earthquake waves we discussed in class?
Primary (p-waves), Secondary(s-waves), Surface

S and P waves are body waves go into the layers of earth, surface waves do not

43. What is the difference between S and P waves? (what they can go through and how they move).
P (primary) waves travel through any kind of material, whether it is a solid, liquid or gas. On the other hand, S (secondary) waves only move through solids and are stopped by liquids and gases. S waves move slower than P waves. P waves compress material as they go through (push and pull) while S waves move up and down or side to side.

44. What is the shadow zone?
The area on Earth on the opposite side of the focus of the earthquake, where no direct seismic waves from a particular earthquake can be detected, because waves are refracted as they go through the earth's layers.

45. What is the epicenter?
Earth's surface directly above a hypocenter or focus, the point where an earthquake originates.