

Name: _____ Period: _____ Date: _____

2017-2018 Semester 1 FINAL REVIEW GUIDE
P4: January 10



Vocab to Know:

Ch. 1 Vocab Words:

Inference
Variables
Hypothesis
Theory
Controlled experiment
Controlled variables
Validity
Control condition

Ch. 13 Vocab words:

Convergent plate boundary
Divergent plate boundary
Transform boundary
Convection
Lithosphere
Uplift
Oceanic crust
Continental crust
Subduction zones

Ch. 6 Vocab Words

Law of Superposition
Law of crosscutting relationships
Relative age
Half-life
Absolute age
Parent isotope
Daughter isotope
Natural selection
Fitness
Artificial selection
Selective pressure

*****Know how to convert between meters, millimeters, and kilometers!!!*****

Major Concepts from Chapter 1:

1. Explain the process of scientific inquiry

Scientific inquiry is where students make observations, ask questions about their observations & develop explanations based on their observations & based on evidence. More comprehensive than just an experiment.

2. Explain what a control group is and how is used; know how this is different from the controlled variables in an experiment

Example 1:

Oil Painting



- blue/green color, gold frame
- smells old and musty
- texture shows brush strokes of oil paint
- peaceful scene of the country
- masterful brush strokes

Example 2:

Oil Painting



- picture is 10" by 14"
- with frame 14" by 18"
- weighs 8.5 pounds
- surface area of painting is 140 sq. in.
- cost \$300

3. Which example above for an oil painting shows quantitative data? Example 2 Why? Data, numerical
4. Which example above for an oil painting shows qualitative data? Example 1 Why? Data is based on qualities that can not be measured.

Be able to identify the key elements of a given experimental design

Trial	kg of fuel in rocket A	kg of fuel in rocket B	Altitude reached by rocket A	Altitude reached by Rocket B
1	120	120	10,000	10,000
2	140	120	12,000	10,000
3	160	120	14,000	10,000
4	180	120	15,000	10,000
5	200	120	14,500	10,000
6	220	120	14,000	10,000

5. As a rocket scientist, you are interested in making rockets go higher. In order to do so, you decide that the more fuel the rocket has the higher it will fly. You increase the amount of fuel in rocket A by 20 kg each trial and leave the amount of fuel in rocket B the same.

- What is the manipulated variable in your experiment? mass of fuel
- What is the responding variable in your experiment? Altitude reached
- What was the control group/condition in your experiment? rocket B



6. John wanted to find out which brand of laundry soap was best for removing grass stains. Each brand of soap was mixed with warm water. A brush was then used to scrub a piece of grass-stained cloth for 1 minute. Then the amount of stain left on the cloth was measured.

- What is the responding (responding/dependent) variable?
Amount of stain left on cloth.
- What is the manipulated (manipulated/independent) variable?
Brand of laundry soap.
- What would you use as a control treatment (condition) for this investigation?
Just water (no soap)
- What is a controlled variable for the design above?
Same water temperature used.
Same amount of time washing cloth.
- E. For the investigation above what would make the design more reliable?
Run experiment > 3 times (multiple trials)
- F. For the investigation above what would make the design more valid?
Extra CV: Same amount of laundry soap, cloth cut from same material. Same washing technique used.

7. In your own words, what is a controlled experiment?

- All variables are controlled except 1 (only 1 mv).

8. The scientific method usually follows which order:

- A. Hypothesis, experimental question, experimentation, data analysis, conclusions
- B. Experimental question, experimentation, data analysis, hypothesis, conclusions
- ☒ C. Experimental question, hypothesis, experimentation, data analysis, conclusions
- D. Conclusions, experimentation, experimental question, hypothesis, data analysis

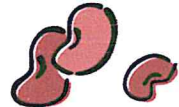
9. "Clear cutting trees from an area will result in drier soils." is an example of:

- A. an inference
- B. a theory
- C. a conclusion
- ☒ D. a hypothesis

10. Based on the following hypothesis: The presence of "Grow More" fertilizer increases growth of rose bushes. Fill in the following:

Control group: Group without Grow More Fertilizer

Experimental group: Group with Grow More Fertilizer.



• Testable question: How does an increasing amount *Miracle Grow*® affect the height of a bean plant?

- Hypothesis: Grow More Fertilizer has no effect on bean plant growth.
Grow More Fertilizer will have an effect on bean growth.

Manipulated variable: Amount of Grow More fertilizer.

- Responding variable: height of plant

☒ Experimental conditions: (described below)

← 5 bean plants grown in liter containers under temperature controlled conditions at 50 degrees Celsius. Plants watered 100 mL of water every 3 days.

← One plant given 1 tablespoon of Miracle Grow, One plant given 2 tablespoons, One plant given 3 tablespoons, One plant given 4 tablespoons, One plant given 5 tablespoon of Miracle Grow.

- Prediction: The more fertilizer used the higher the plant will grow,
because the fertilizer contains essential nutrients

• Actual results: For plant development / growth.

Experimental condition:	Height of plant (in.)
Plant + 1 Tbsp Miracle Grow	5
Plant + 2 Tbsp Miracle Grow	8
Plant + 3 Tbsp Miracle Grow	12
Plant + 4 Tbsp Miracle Grow	17
Plant + 5 Tbsp Miracle Grow	26

- Elements:
- 1 - Conclusive statement
 - 2 - Supporting data
 - 3 - explanatory language connecting data to conclusion

- Write a conclusion to this investigation in the space below:

The hypothesis was supported by the data.
Plants grown with 1 Tbsp of More Grow grew 5 inches,
whereas plants grown with 5 Tbsp of More Grow grew 5 inches tall.
Increasing More Grow by 4 Tbsp resulted in 21 inch increase in growth.

11. Create testable questions from the 3 non-testable questions below:

- How does light affect frogs?
Does Violet light affect egg development in tree frogs?
- How does soap affect fish?
Does bio degradable soap added to water in a fishtank affect the breathing rate of gold fish?
- How does rain affect flowers?
Does the pH of rain water affect the color of a wild rose?

12. Explain the difference between a hypothesis, theory and a scientific law.

- Hypothesis: a tentative explanation that can be tested
- Scientific theory: a well supported broad explanation of some aspect of the natural world that can incorporate, facts, laws, inferences & tested hypotheses.
- Scientific law: a descriptive generalization about how some aspect of the natural world behaves under specific conditions. Often described mathematically.

13. Circle the questions below that would be scientifically testable

- (a) Do mice require calcium for strong bones?
- b. Was the earth was created by an all-powerful being?
- c. Can an active volcano can be prevented from erupting by throwing a young maiden into it during each full moon?
- d. Is communism evil?
- (e) Does watching television cause children to have shorter attention spans?

14. What are two criteria that make a good hypothesis?
- Tentative explanation / statement
 - Testable
 - Falsifiable
 - Relevant to problem

15. Repeat

16. In your own words, what is a controlled experiment?

7 repeat.

17. Be able to evaluate a claim for a particular product or service, scientifically.

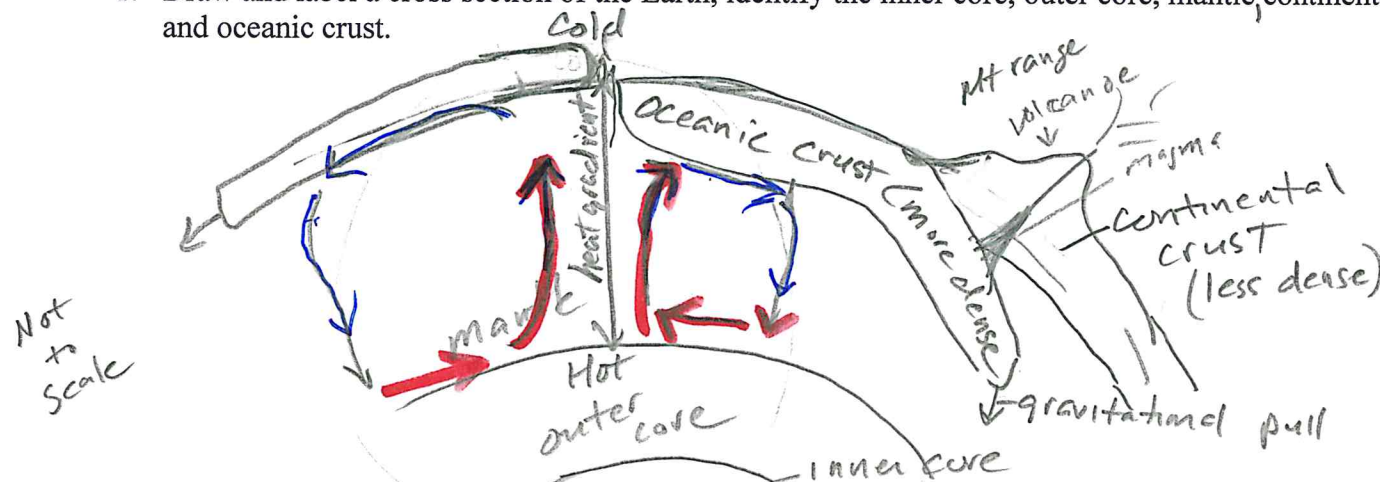
Remember "Valid or deceptive" activity?

- Is claim valid? All CV's controlled. For?
- What evidence is it based on?
- Control group / treatment?
- Are all variables measurable?

Major Concepts from Chapter 13 (Plate tectonics):

- Be able to do unit conversions (i.e. dimensional analysis)
- Be able to distinguish between the different plate boundaries: convergent, divergent, and transform and what is happening at each boundary.
- Be able to predict the plate interactions/landforms given a map showing major tectonic plates and vectors.
- Be able to explain how different geologic formations (i.e. mountains, trenches, etc.) form at each type of plate boundary.
- Be able to explain what a convection cell is and how it causes plate movement

1. Draw and label a cross section of the Earth, identify the inner core, outer core, mantle, continental crust and oceanic crust.



- Add a convection cell to your drawing above and explain how it drives plate movement.

Outer mantle heats liquid in mantle, becomes less dense rises to surface, cools becomes more dense, then sinks creating a convection cell.

2. Explain how rock is recycled in oceanic plates. (i.e. Where is new rock formed? Where does the old rock go?)

Oceanic plates subduct under continental plates because they are more dense. The subducted plates driven by convection & pull of gravity are drawn into mantle where they are melted & absorbed back into mantle. Magma from mantle forms new rock - "igneous".

3. If a plate is moving at 2.3 mm/yr, how far (in kilometers) will the plate travel in 10 million years?




$$\left(\frac{10,000,000 \text{ years}}{1} \right) \left(\frac{2.3 \text{ mm}}{1 \text{ year}} \right) \left(\frac{1 \text{ m}}{1000 \text{ mm}} \right) \left(\frac{1 \text{ km}}{1000 \text{ m}} \right) = \frac{23,000,000 \text{ km}}{1,000,000} = 23 \text{ km}$$

4. Convert between 6 inches per second to meters per hour. 2.54 cm = 1-inch

$$\left(\frac{6 \text{ inches}}{1 \text{ second}} \right) \left(\frac{2.54 \text{ cm}}{1 \text{ inch}} \right) \left(\frac{60 \text{ sec}}{1 \text{ min}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) \left(\frac{1 \text{ m}}{100 \text{ cm}} \right) = \frac{54864 \text{ m}}{100 \text{ hr}} = \frac{548.64 \text{ m}}{1 \text{ hr}}$$

5. Complete the table below describing the 3 main plate boundary types:

	1	2	3
Plate boundary type:	Divergent	Convergent	Transform

	Convergent	Divergent	Transform
Description of what is happening at this plate boundary.	Two plates moving towards each other.	Two plates moving away from each other.	Two plates moving past each other.
Labeled drawing of plate boundary.			
Actual location where you can find this type of boundary:	Cascade Range Andes Range Himalayan Range	Mid-Atlantic ridge Red Sea East African	San Andreas fault Seattle Fault
Geologic structure(s) formed at this plate boundary	- Mountain Range - Trench - Island Arc - Subduction zone	Oceanic ridge Rift valley	fault line

6. Imagine a tectonic plate moving at 50 mm/yr. In 1 million years, how far will this plate move?

$$\left(\frac{1,000,000 \text{ yrs}}{1 \text{ yr}} \right) \left(\frac{50 \text{ mm}}{1 \text{ yr}} \right) = 50,000,000 \text{ mm}$$

or

$$50,000 \text{ m}$$

or

$$50 \text{ km}$$

Major Concepts from Chapter 6 (evolution):

- Explain what the laws of superposition and crosscutting relationships are and be able to provide an example that illustrates these geologic laws.
- Be able to explain and use radioactive decay and half-lives to date objects.
- Explain how competition affects an organism's chance to survive and how this may influence the composition of a population of organisms over successive generations.
- Be able to explain what role genetic variation, selection and time have to do with changes within a population.
- How are natural and artificial selection different? Give an example of each.

1. How are fossils formed? What environments are fossils commonly formed in?

- Remains of an organism are covered by sediments, hard structures such as bones, teeth or shells are mineralized.
- Environments: sedimentary rock - mud, sand, peat bogs, amber (tree sap).

2. What are examples of "living fossils"? - Coelacanth, horse-shoe crabs
 - Cyanobacteria/blue-green algae, - horse tails, Cycads
 - Ginkgo tree, elephant shrews, armadillo, pelicans, crocodiles.

3. What is the difference between relative and absolute dating?

Relative dating is determining age of rock layers/fossils compared to other layers/geologic events.

Absolute dating: methods determining the numeric age of rocks or fossils - tree rings & radiometric dating.

4. Explain what the laws of superposition and crosscutting relationships are and be able to provide an example that illustrates these geologic laws.

Law of Superposition

in an undisturbed sequence of rock layers, the oldest layer is on the bottom & the youngest are towards the surface.

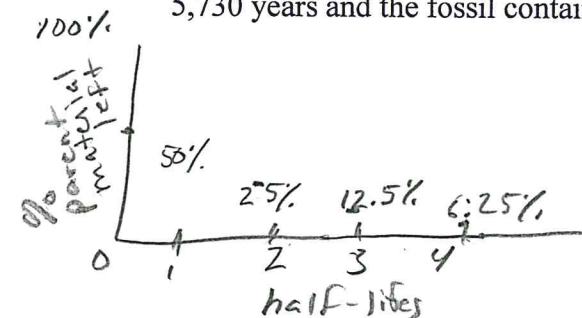
Law of crosscutting relationships
 An igneous rock, fault or other geologic feature must be younger than any rock or layer with it cuts.

5. Describe the process of radiometric dating using the following terms: parent/daughter isotope/element, radioactive decay, half-life.

Naturally occurring elements (& their isotopes) decay into another element (or isotope). The ratio of parent to daughter elements (isotopes) gives an accurate age. The daughter form of the rock or fossil they are part of. When $\frac{1}{2}$ of the parent material has decayed into the daughter product, one half-life has occurred.

6. You have a fossil and want to determine its approximate age. You know the half-life of carbon-14 is 5,730 years and the fossil contains 6.25% carbon-14. About how many years old is the fossil?

$$\approx (4)(5,730) = 22,920 \text{ years old.}$$



7. Circle the organism below that has the greatest fitness:

Rabbit A:

Eats a wide variety of grasses and plants. Lives in a very protected burrow. Had 3 of her offspring survive.

Rabbit B:

Has a limited diet. Lives in a forest also populated with foxes. 10 of her offspring survived out of the last brood.

Rabbit C:

Will eat almost anything. Is the largest rabbit in her neck of the woods. Due to high aggression she is able to drive off predators but hasn't succeeded in finding a mate.

Fitness: an organism's ability to survive & produce offspring.

7. Based on the following hypothesis: The presence of "Grow More" fertilizer increases growth of rose bushes. Fill in the following:

Control group: Roses grown without "Grow More" fertilizer.

Experimental group: Roses grown with "Grow More" fertilizer.

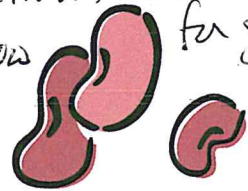
8. Testable question: How does an increasing amount *Miracle Grow*® affect the height of a bean plant?

Hypothesis: Increasing the amount of Miracle Grow will result in increased bean plant growth, because more nutrients will be available for growth.

Manipulated variable: Increased amounts of Miracle Grow

Responding variable: Bean plant height.

Experimental conditions: Presence of Miracle grow.



5 bean plants grown in liter containers under temperature controlled conditions at 50 degrees Celsius. Plants watered 100 mL of water every 3 days.

One plant given 1 tablespoon of Miracle Grow, One plant given 2 tablespoons, One plant given 3 tablespoons, One plant given 4 tablespoons, One plant given 5 tablespoons of Miracle Grow.

Prediction: The plant treated with 5 Tablespoons of Miracle Grow will grow more than the plants treated with 1 Tablespoon.

Actual results:

Experimental condition:	Height of plant (in.)
Plant + 1 Tbsp Miracle Grow	5
Plant + 2 Tbsp Miracle Grow	8
Plant + 3 Tbsp Miracle Grow	12
Plant + 4 Tbsp Miracle Grow	17
Plant + 5 Tbsp Miracle Grow	26

Write a conclusion to this investigation below: (Remember to answer the investigative question, and provide a Claim, Evidence, and Reasoning)

The hypothesis that increasing the amount of Miracle Grow will result in increased bean plant growth was supported. Bean plants treated with 1 Tbsp of Miracle Grow grew to a height of 5 inches. Bean plants treated with 5 Tbsp of Miracle Grow grew to a height of 26 inches. This was a difference of 21 inches, showing 5 times as much growth.

8. Using an illustrative example, explain what the role of genetic variation, selection and time have on the evolution of a population. Example: rock pocket mouse population. Contained two different coat colors (variation). After a change in the environment where the surrounding rock color changed from tan to black, there were selective pressures against the light colored fur & for the dark colored fur by predators (visibility). This dark furred trait over time was passed on & led to increased frequencies of this trait in the pocket mouse population.
9. How are natural and artificial selection different? Give an example of each.
 Natural selection - selective pressures coming from natural/wild environment. Climate / predators / viruses / etc. leading to organisms that fit their environment.
 Artificial selection - humans select for desired traits & breed organisms to amplify that trait.
10. What evidence was provided by the Grants for the evolution of finches in the Galapagos Islands? (HHMI video) They observed measurable changes in beak size over time as a response to food availability due to major droughts. Showed evolution in action.
11. Using the following scenario, explain how the process of natural selection works. Use the terms variation, selection, time, population and frequency of traits in your explanation.

24 On a beach in Florida, the sand is a light tan color. So, most shelled organisms on that reside on the shoreline have a light tan color as to blend in and avoid predators. However, over time, pollution that has washed up onto shore has changed the sand color to a white and black spotted pattern. Because of this, over time, shelled organisms with white shells or black shells have come to be more common than tan shelled organisms"

In a population of shelled organisms (such as clams) there was a genetic variation in shell colors including light tan and white and black spotted shells. At first the population was mostly tan colored. Following an increased level of pollution (oil) the color changed over several generations to black-spotted. -Predators were less likely to prey on the black-spotted clams because they blended in better with their environment (selection) than tan-colored clams. This trait was passed on to successive generations & increased in frequency within this population over time.