

Dynamic Planet

RAHS C Division Invitational 2017-18

School /Team: _____

C- _____

Names: _____

DO NOT OPEN OR START TEST UNTIL TOLD TO DO SO

Instructions:

- Answer all questions on this answer sheet.
- Sheets may be double sided, check both sides!
- If you separate the sheets of the test be sure to label each sheet with school/team and ID in case they get mixed up during scoring.
- Tie breakers:

<i>For Scoring only</i>	
Part 1: multiple choice short answer	_____ / 40
Part 2: fill in blanks and free response	_____ / 20
Total	_____ / 60
1st Tiebreaker: Highest Score on Part 2 .1 per question	_____
2nd Tiebreaker: Highest score on pre-selected test questions part 1 .01 per question	_____

Multiple choice questions: Circle the letter selection for your answer.

Free response: write your answers in the space provided or answer spaces.

1. Which of the following is not a characteristic feature of at least one type of plate boundary?
 - a. Earthquake activity
 - b. Volcanic activity
 - c. High heat flow
 - d. Lack of geologic activity

2. Minerals in igneous rocks can show the direction of Earth's
 - a. Polarity field at the time the rocks formed
 - b. Magnetic field at the time the rocks formed
 - c. Heat flow field at the time the rocks formed
 - d. Transform field at the time the rocks formed

3. The rift valley along a mid-ocean ridge marks
 - a. A boundary between two plates
 - b. A region where subduction is occurring
 - c. A region where a deep sea trench is forming
 - d. A boundary between oceanic and continental crust.

4. Both collision boundaries and subduction boundaries are types of
 - a. Transform boundaries
 - b. Spreading boundaries
 - c. Divergent boundaries
 - d. Convergent boundaries

5. A chain of volcanoes commonly forms when
 - a. A continental plate subducts
 - b. An oceanic plate subducts
 - c. Two continents collide
 - d. Two plates slide past one another

6. Pyroclastic materials include which of the following?
 - a. Pahoehoe
 - b. Aa
 - c. Ash
 - d. All of the above

7. A volcano that has a broad base and gently sloping sides is called a
 - a. Shield volcano
 - b. Cinder cone
 - c. Caldera
 - d. Composite volcano

8. Active volcanoes near convergent boundaries would be expected to erupt
 - a. Explosively with abundant Pyroclastic material

- b. Explosively with little Pyroclastic material
 - c. Quietly with little pyroclastic material
9. Which type of lava forms underwater?
- a. Pahoehoe
 - b. Pillow lava
 - c. Aa
 - d. None of the above
10. Volcanoes can form over divergent boundaries
- a. True
 - b. False
11. Hawaii is an example of land forming over
- a. A divergent boundary
 - b. A hot spot
 - c. A convergent boundary
 - d. A rift valley
12. The deepest earthquakes tend to occur at
- a. Collision boundaries
 - b. Divergent boundaries
 - c. Transform boundaries
 - d. Subduction boundaries
13. The location of an earthquake can be determined by two seismograph stations
- a. True
 - b. False
14. A geologic formation caused by plate movement that allows hydrocarbons to build up in one location is called a
- a. structural trap
 - b. plate thrust
 - c. unconformity trap
 - d. seal zone
15. Iceland is formed as a result of a
- a. hot spot
 - b. Collision boundaries
 - c. Divergent boundaries
 - d. Subduction boundaries

16. the instrument used to record the magnitude of an earthquake is called a
- seismograph
 - seismometer
 - seismogram
 - Richter scale
17. A magnitude 8 earthquake is twice as strong as a magnitude 4 earthquake
- True
 - False
18. Which of the following statements about aftershocks is true?
- Aftershocks are usually just as strong as the main earthquake
 - The frequency of aftershocks increases over time
 - Aftershocks cannot cause building damage
 - There may be as many as 100 aftershocks in a day after an earthquake
19. Liquefaction is likely to occur due to an earth quake
- Underwater
 - In loose sediments
 - In solid bedrock
 - Under buildings
20. A boundary between continental crust and oceanic crust is called
- A northern margin
 - A continental margin
 - An oceanic margin
 - A divergent plate
21. When continental crust and oceanic crust collide, mountains form
- On the continent
 - Under the ocean
 - Over a hot spot
 - Under the lithosphere
22. Stress on rock layers that involves forces pushing in opposite directions is called
- Compression
 - Tension
 - Shear stress
 - Torsion

23. Synclines

- a. Are up folds in rock
- b. Are down folds in rock
- c. Occur no a limb
- d. Occur along divergent boundaries

24. Anticlines

- a. Are up folds in rock
- b. Are down folds in rock
- c. Occur no a limb
- d. Occur along divergent boundaries

25. A reverse fault occurs when the hanging wall moves

- a. Down with respect to the footwall
- b. Horizontally across the footwall
- c. Up with respect to the footwall

26. Fault Block Mountains are associated with

- a. Normal faults
- b. Reverse faults
- c. Thrust faults
- d. Strike-slip faults

27. Depending on how it is formed a _____ can be classified a plutonic or tectonic

- a. Dome Mountain
- b. Volcano
- c. Fault
- d. Shield Mountain

28. A normal fault occurs as a result of

- a. Tension
- b. Stress
- c. Compression
- d. Reverse uplifting

29. The eruption of this volcano in 1991 caused a global temperature drop of almost 1 degree Fahrenheit

- a. Mt. Pinatubo
- b. Mt. St. Helens
- c. Krakatau
- d. Katmai

Identify the two plate interaction or geologic structure that is the cause of each of these formations to form



Pacific plate subducting under north American plate



Collisions between the north American plate and Pacific plate

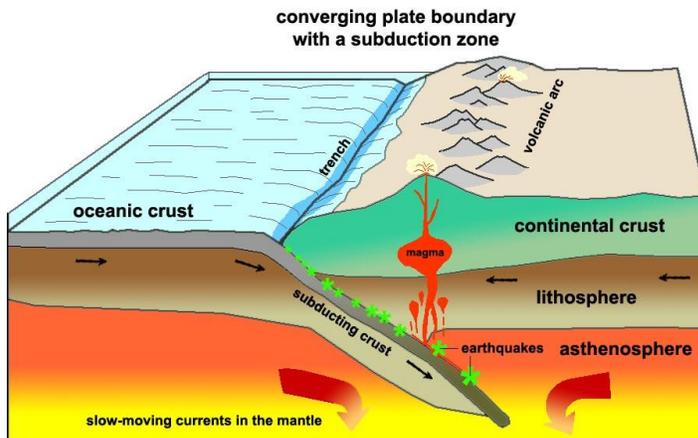


Hot spot in the mantel creating a dormant super volcano



Collisions between the north American plate and north African plate before Pangea rifted apart

34. Draw a cross sectional diagram of a subduction boundary. And then,
 35. Label the Deep Ocean trench, Continental crust, Ocean crust, Lithosphere and Mantle interactions.



36. If an earthquake of Richter magnitude 5 were to strike in the Atlantic Ocean 300 miles west of Long Island, NY, the chief danger to most of Long Island would be Liquefaction.

37. The property of a magma that determines whether or not it has high viscosity:

- density
- silica content
- color
- iron content
- water content

38. Most stratovolcanoes tend to erupt:

- rhyolite
- basalt
- andesite
- gabbro
- obsidian

39. The Puget Sound area is located in an extremely geological active region. List the 3 types of major natural hazards that could be caused by a plate shift in the region.

- a. _____ **Mud Slide**
- b. _____ **Volcanic Eruption**
- c. _____ **Earth Quake**

40. The San Andreas is what kind of fault boundary?

- a) Normal dip-slip
b) Thrust dip-slip
c) Left-lateral strike-slip
d) **Right-lateral strike-slip**

Continents move??? Prove it!

Instructions: In your answer key, write the word(s) that best fill each blank.

For most people, rocks are just rocks. For geologists and other interested observers, rocks are the key to the past. Alfred Wegener was a geologist who opened a door to understanding the past AND possible futures using clues found in the rocks.

Wegener noticed something that many other people had noticed: the shorelines of (1) _____ and Africa seem to match very closely (the continental shelves of these two continents were later discovered to be even more closely aligned). This observation and the questions he pondered related to this observation set the course for the rest of his academic career.

Wegener, a trained geologist, began by compiling data from the mountain ranges in North America and Europe. He noticed that the (2) _____ & (3) _____ of rocks were IDENTICAL on opposite sides of the Atlantic Ocean. An astounding coincidence!

He collected additional data, this time looking for (4) _____ that were found in only several locations in the world. Mesosaurus remains were found only in South America and Africa. Glossopteris remains were found only in few parts of Africa, South America, Antarctica and Australia. The Glossopteris find was particularly puzzling: how could a tropical plant possibly grow on a continent of ice?

Wegener collected a third set of data: glacial grooves. Like any good geologist, Wegener recognized that glaciers have come and gone over time, carving through rock

and carrying debris. Glaciers are called “rivers of _____(5)_____” for good reason. The debris carried by glaciers scratches the bedrock of the land over which the glacier travels. Continental ice sheets (like the ones that cover Greenland and Antarctica) push outward radially (from the center outward), leaving behind grooves that point outward from the center.

The glacial grooves recorded by scientists of the time did not make sense. Bedrock in India has grooves running east and west, South America has grooves running southeast and northwest, Africa from north to south. How did a glacier form in India and then only push in one direction? Wegener suspected that if the continents in question were _____(6)_____ and joined, these data would make sense.

These data compelled Wegener to write the theory of continental drift. Other scientists of the day were very skeptical. What force of nature could possibly move entire _____(7)_____? After proposing the theory of continental drift, Alfred Wegener had a very tricky time trying to find another teaching job.

Wegener eventually found another teaching and researcher position. He died while attempting to deliver food to researchers trapped by snow in Greenland. His theory of continental drift went dormant.

After WWII, navy researchers began mapping the ocean floor using sonar. The world was surprised to learn that the ocean floor had mountains and valleys. Of particular interest was the discovery of the _____(8)_____, a submerged mountain range running through the center of the Atlantic Ocean.

In the 1960s, scientists were surprised again when measuring the age of the rocks of the ocean. They discovered that the very youngest rocks were found at the _____(9)_____ (*center* or *edge*) of the ocean, while the rocks in other parts of the ocean were about the same age as the fossils of dinosaurs.

Even more compelling evidence surfaced later in the 1960s. Over the course of Earth’s history, the north and south magnetic poles have changed places, in a poorly understood process called *magnetic reversal*; what was magnetic south becomes magnetic north, and vice versa. It turns out that the lava contains grains of magnetic minerals. These grains act as tiny compasses. As the lava cools, the grains are locked into place, preserving a

record of magnetic north. As scientists mapped the zones of magnetic reversals, they noticed matching bands of “normal” and “reverse” polarity on either side of the mid-ocean ridge. These data suggested that the oceans were growing in a process dubbed _____(10)_____.

And if ocean floors could grow, then continents could move. The theory of continental drift resurfaced with powerful new evidence, but still lacked a convincing explanation for how it was responsible for changing Earth’s surface.

Today, scientists think that _____(11)_____ within the mantle drive the motion of tectonic plates. As material is heated within the Earth, the hot material rises, pushing the old crust apart and creating new crust. When the old ocean crust reaches the edges of the continental crust, it _____(12)_____, or sinks beneath the continental crust. Scientists have inferred the location of tectonic plates by mapping the location of thousands of _____(13)_____ and volcanoes, phenomena which are explained by the motion of tectonic plates as they slip, slide and collide with other plates.

Of course, dozens of important questions remain unanswered about plate tectonics and continental drift, but the door is open. Explore your world!

Station 3: Continents move??? Prove it!

- (1) _____ **South America** _____
- (2) _____ **Age** _____
- (3) _____ **Type** _____
- (4) _____ **Fossils** _____
- (5) _____ **Ice** _____
- (6) _____ **Rotated** _____
- (7) _____ **Continents** _____
- (8) _____ **mid-ocean ridge** _____
- (9) _____ **Youngest** _____

-
- | | |
|------|----------------------------|
| (10) | <u>Seafloor spreading</u> |
| (11) | <u>Convection currents</u> |
| (12) | <u>Subducts</u> |
| (13) | <u>Earthquakes</u> |
-

Tools of the trade

Please explain each device or concept and at least one reason for its use in geology.

14. Hypsometer - _____ a device for calibrating thermometers at the boiling point of water at a known height above sea level. Used for estimating height above sea level by finding the temperature at which water boils.

15. Brunton compass- _____ a special compass that is used to calculate the strike, dip trend and plunge of an outcropping of a geologic formation. It is used to calculate structural and stratigraphic layering maps of geologic formations

16. Isostatic Adjustments - _____ refers to the transient (10^2 – 10^4 years) or long term ($> 10^5$ years) nonelastic response of the earth's lithosphere to loading and unloading due to erosion, deposition, water loading, desiccation, ice accumulation, and deglaciation. Used to understand and maybe predict effects of climate change

17. Geiger counter - _____ an instrument used for measuring ionizing radiation used widely in applications. _____ Used to detect specific radioactive minerals in rocks for identification and dating purposes.

18. Seismograph - _____ or seismometer, is an instrument used to detect and record earthquakes. _____ They measure the amplitude and time and therefore using 3 or more can triangulate the epicenter of an earthquake.

19. Magnetic anomaly detector- _____ is an instrument used to detect minute variations in the Earth's magnetic field. _____ Used to detect anomalies in the earth magnetic field also used to detect mineral and other ore deposits _____

20. Seismic Acquisition (2D, 3D, 4D) - _____ seismic data are used to map subsurface formations. Used to map rock formations, track rock movement over time to better predict geologic activities to prevent and predict natural disasters. _____