This assessment is for you and I both to get an idea of how much you've learned during this course. This assessment is composed of actual final exam questions I have given in the past. I expect you will be able to answer very few of these with the letter "a" (meaning you know the answer) at the beginning of the course, but by the end of the course, I expect that you will be able to answer "a" to all these questions.

You will receive extra credit points only if you complete this assessment both at the beginning of the course, and the end.

Instructions: DO NOT select the correct answer from the given options for each question! For all questions, the choices are as follows:

a. I know the correct answer
b. I don't know the answer, but I know how to find it easily.
c. I don't know the answer, and, although I could probably find it on the internet, I have no idea right now.
d. I don't even understand the question.

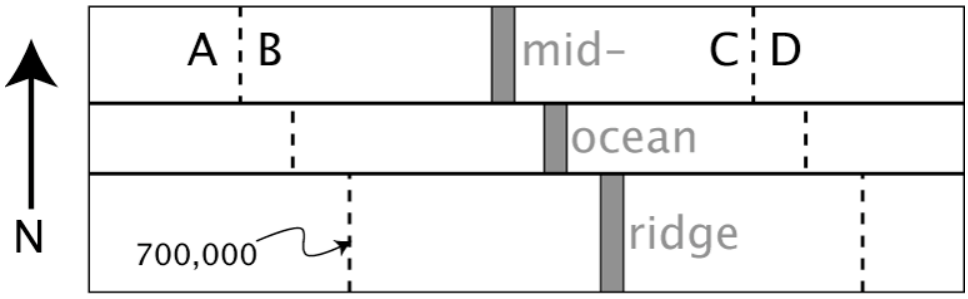
1. Large mountains are typically NOT formed by
   a. Reverse Faulting
   b. Folding
   c. Igneous Activity
   d. Normal Faulting

2. True or false: Many of the rocks in the north Cascades began as volcanic island arcs in the ocean, and were then accreted to the edge of North America.
   a. True
   b. False

3. The volcanoes found in Washington state are
   a. active
   b. made of andesitic material
   c. composite volcanoes
   d. composed of both pyroclastic material and lava
   e. All of the above are true.

4. Plate tectonics says that the earth's outermost region is composed of a small number of rigid plates. What region of the earth is the region that behaves rigidly, and essentially IS the plate?
   a. basalt
   b. mantle
   c. lithosphere
   d. crust
   e. asthenosphere

5. In the diagram below, the dotted line represents rocks dated radiometrically at 700,000 years old. Assume that the most recent magnetic reversal was 700,000 years ago. The arrow at the left points north. Which of the following statements could be true?



a. The rocks at A are 750,000 years old, and moving west.
b. The rocks at A are 650,000 years old, and moving west.
c. The rocks at A are 750,000 years old, and moving east.
d. The rocks at A are 650,000 years old, and moving east.
e. None of the above is true.

6. Which type of coal is the most "mature", that is, has come the furthest from its original state?

a. lignite
b. bituminous
c. sub-bituminous
d. anthracite

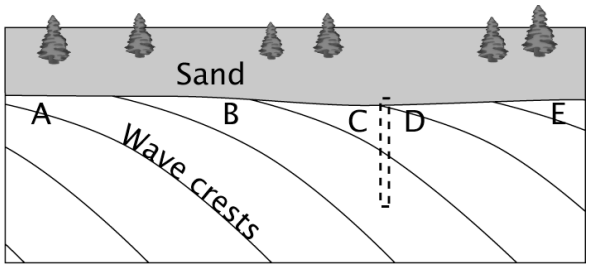
7. Large earthquakes occur

a. most often at divergent plate boundaries
b. randomly.
c. most often at convergent plate boundaries
d. equally often everywhere, as illustrated by the New Madrid quake in the Northeast US
e. most often in the interiors of plates

8. Both plutonic (intrusive) igneous rocks and metamorphic rocks can be formed at high temperatures and pressures. What, then is the difference between them?

a. Plutonic igneous rocks are composed of different minerals.
b. Igneous rocks came from a melt, while metamorphic rocks remain unmelted.
c. Metamorphic rocks are finer-grained (smaller crystals).
d. Plutonic rocks crystallized much deeper than metamorphic rocks.
e. Metamorphic rocks are all foliated.

9. In the image below, each wave crest is a line showing the top of a single wave. If a wall is built where the dotted line is shown, then erosion will increase (relative to the case before the wall) at which point?

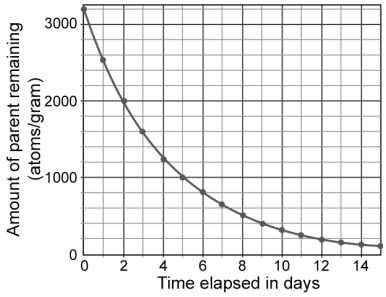


a. A
b. B
c. C
d. D
e. E

10. True or false: The sea floor has no mineral deposits of any value, being only basalt and gabbro.

a. True
b. False

11. Examine the graph below, which shows the amount of a given isotope in a mineral over time. What is the half-life of this isotope?

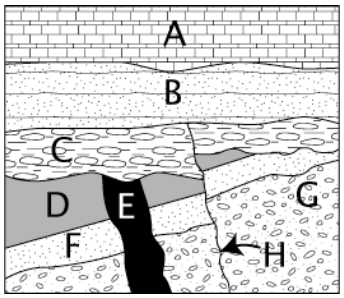


a. 1 day
b. 3 days
c. 5 days
d. 7.5 days
e. You cannot tell from the graph because it does not show the amount of the daughter element.

12. Science currently can tell you reliably

a. that there is a good chance of an earthquake happening in the next week, by examining changes in animal behavior.
b. when an earthquake is months away, by examining changes in groundwater.
c. nothing about earthquakes; there is no way to predict anything about earthquake occurrence.
d. that there is a good chance of an earthquake happening in the next decade, by examining the pattern of earthquakes in the past.

13. True or false: rock E is older (i.e., formed prior to) fault H.



a. True
b. False

14. Geologists recently found some extremely old sedimentary and volcanic rocks in Canada, which are about 3.6 billion years old. About what percentage of the whole history of the earth have those rocks existed?

a. 10%
b. 30%
c. 80%
d. 100%
e. 125%

15. The silicon-oxygen tetrahedron is

a. the building block of most minerals in the crust.
b. made up of a pyramid of 4 silicons with an oxygen at the center.
c. positively charged.
d. held together by weak bonds.

16. The lava which tends to be the most fluid and least explosive is

a. rhyolitic
b. andesitic
c. basaltic
d. it depends on whether it is erupted at the surface or cools underground
e. they are all the same.

17. Exposures of plutonic igneous rocks at the earth's surface indicate that

a. there have been glaciers in the area
b. exfoliation has ceased there
c. there will be sedimentary rocks nearby
d. volcanos will soon erupt in that region
e. extensive erosion has occurreed

18. If you live in the "10,000 year floodplain", for the Nooksack River, then you can expect...

a. your flood risk to decrease if buildings and roads are built in the Nooksack watershed.
b. the Nooksack to rise above its banks about once in every 10,000 years.
c. the Nooksack will definitely flood your house at least once in the next 10,000 years.
d. your flood risk to be greater than that of those who live closer to the river than you.
e. the Nooksack to flood your house about once in every 10,000 years.

19. How can seismologists tell the distance an earthquake is from their seismometer?
    a. Because the S wave travels faster than the P wave, the difference between the times of arrival tells them how far the waves have traveled.
    b. The strength (amplitude) of the waves tells them how far the waves have traveled, because they get weaker the farther they go.
    c. Because the P wave travels faster than the S wave, the difference between the times of arrival tells them how far the waves have traveled.
    d. None of the above is true.

20. True or false: Taller buildings will always shake more in an earthquake, and thus have more damage, than shorter buildings.
    a. True
    b. False

21. Large mountains tend to have very thick crusts under them, to buoy them up so high. What happens when they erode?
    a. As the mountains get high enough, erosion slows down because most of the precipitation falls as snow, not rain, so the mountains are preserved indefinitely.
    b. As the mountains erode, isostasy keeps the crust where it is, until finally the mountains are gone, but their "root" is preserved.
    c. As the mountains erode, isostasy pulls them even further down, quickly removing any topographic evidence, but preserving a crustal "root" even deeped than it was before the erosion began.
    d. As the mountains erode, isostasy pushes them up from the bottom, until the crust gets to a normal thickness.

22. What geologic hazards do we need to worry about the least here in Bellingham?
    a. mudflows
    b. lava flows
    c. floods
    d. tsunami
    e. earthquakes

23. Where is the most common place for pillow basalts to occur?
    a. High atop mountains
    b. Continental margins
    c. Ocean crust
    d. Stable continental craton
    e. Places like the Columbia River Plateau

24. Major rivers have deltas that form at their mouths. So, why is there no delta at the mouth of the Columbia River?
    a. The river has high energy and so it doesn't form a delta.
    b. The river doesn't need a delta.
    c. The river is too big to have a delta.
    d. The ocean environment near the mouth of the Columbia has high energy and removes all the sediment from the mouth area.
    e. The river has low energy and sediment sits too long, so a delta cannot develop.

25. You observe a stack of rocks with a layer of coal at the bottom, then cross-bedded sandstone, then sandstone with symmetrical ripples, then siltstone with fossils, and finally mudstone with fossils on the top. What can you conclude from this stack of rocks?

a. During deposition, either the land was rising or sea level was sinking.
b. These rocks are somebody's idea of a joke.
c. During deposition, a new river was eroding the area.
d. This indicates that a series of large landslides occurred to put these different rocks on top of one another.
e. During deposition, either the land was sinking or sea level was rising.

26. Continental ice sheets...

a. form U-shaped valleys.
b. form cirques.
c. cause the crust to be isostatically depressed.
d. All of the above are true.

27. The largest earthquakes we get in the Pacific Northwest are caused by

a. changes within the subducting Juan de Fuca plate.
b. movement along shallow faults within the North American plate.
c. sliding of the subducting Juan de Fuca plate past the leading edge of North America.
d. All of the above cause earthquakes of about equal magnitude.

28. Given what you know about plate tectonics and the major plates of the earth, are we moving closer to, or further from Japan over time?

a. Neither
b. Further
c. Closer

29. Which of the following would increase the likelihood of mass wasting events near a house you bought on a hillside?

a. Replacing some pine trees with a flower garden
b. Bringing in some beavers to make a small dam on a creek so you can have a fishing pond down the hill a little ways below your house.
c. Digging a trench along the base of the hillside
d. (a), (b), and (c) are all true.
e. None of the above.

30. Why is beach sand generally very rich in quartz?

a. Quartz is produced from river water in rivers flowing down to the sea.
b. Quartz is essentially impervious to chemical weathering.
c. Quartz is produced at beaches directly from ocean water.
d. This is a false question; beach sand is not rich in quartz.
e. Quartz is abundant in the bedrock near beaches.

31. Assuming no faulting, in between two synclines, there must be a (an)

a. basin
b. dome
c. monocline
d. anticline

32. In a MONTH, a fast-moving plate might travel...
    a. 8 meters
    b. 0.8 centimeters
    c. 0.8 millimeters
    d. 0.8 meters
    e. 8 centimeters

33. All the energy that is released in an earthquake comes from
    a. heat in the rocks near the fault
    b. electrical energy in the rocks near the fault
    c. elastic strain stored in the rocks near the fault
    d. All of the above are true.
    e. None of the above are true.

34. How can a single original basaltic magma eventually produce rocks of different compositions?
    a. Country rock is melted and assimilated (mixed in), changing the composition.
    b. The composition of rock depends on how deep below the earth's surface the magma is when it crystallizes.
    c. Early-formed crystals settle out, leaving magma of a new composition.
    d. Both (a) and (c) are correct.
    e. It can't; a basaltic original magma always forms rocks of a single composition:basalt/gabbro.

35. If you were to separate a piece of typical crust into minerals, which pile would be the largest?
    a. feldspar
    b. quartz
    c. calcite
    d. biotite
    e. olivine

36. The North Cascades, like the Himalayas in Asia, is dominated by what kind of structures?
    a. Folds and normal faults
    b. Horst and graben structures
    c. Folds and thrust faults
    d. Transform faults
    e. None of the above