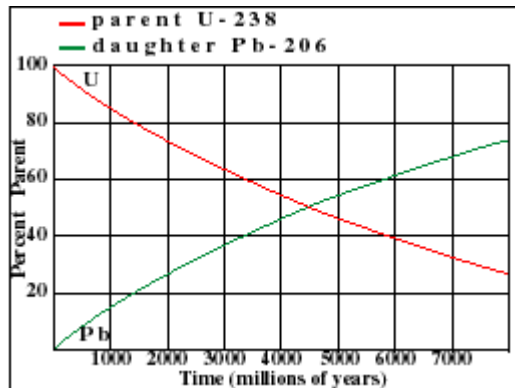


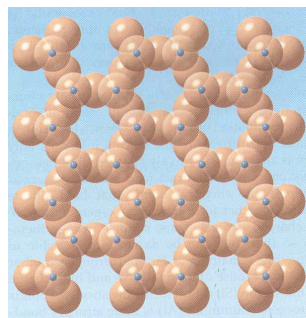
- The Earth is _____ years old.
 - 5,720 years
 - 570 million
 - 2.5 billion
 - 4.5 billion
 - 16 billion
- An isotope has a half-life of 4.5 billion years. How many years must pass before only about 25% of the parent isotopes remain?
 - 2.25 billion
 - 4.5 billion
 - 6.75 billion
 - 9 billion
 - 16 billion

- Use the diagram to the right. What is the half-life of U-238 to Pb-206?
 - 2.25 billion
 - 4.5 billion
 - 6.75 billion
 - 9 billion
 - 16 billion




- Which of the following minerals commonly forms as water evaporates?
 - gypsum
 - galena
 - quartz
 - orthoclase
 - armacolite
- Graphite and diamond are both made of carbon yet both are considered minerals. This is because:
 - graphite is synthetic
 - graphite is formed by organic processes
 - they have different crystalline structures
 - oxygen substitutes for carbon in some diamond crystals
 - none of the above.

- The mineral shown to the right is characterized by a(n) _____ silicate structure:
 - isolated
 - single chain
 - double chain
 - sheet
 - framework

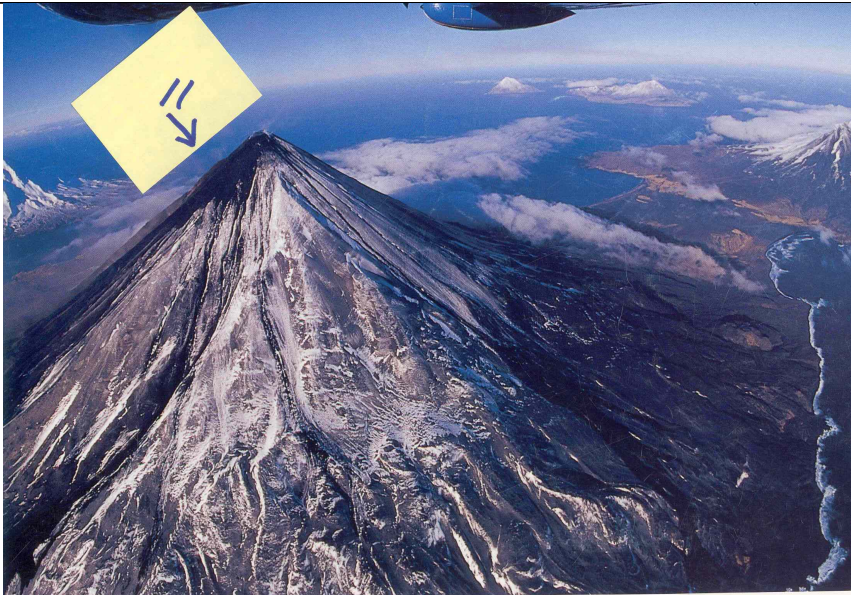


All about volcanoes. Please see the photos below, on the screen, or on the board.

<p>7. Fernandina is probably a:</p> <ul style="list-style-type: none">a. cinder coneb. domec. stratovolcanod. shielde. volcanic neck <p>8. The rock erupted at Fernandina is probably:</p> <ul style="list-style-type: none">a. andesiteb. rhyolitec. basalte. common Steve, there's no way to tell	
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9. The material erupted at Fernandina is probably :
- a. mostly lava
 - b. lava and pyroclasts, roughly equal amounts
 - c. mostly pyroclastic
 - d. just gas, only gas, nothing but gas, nada

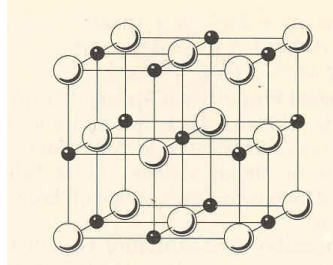
10. The eruptions at Fernandina are probably:
- a. gentle
 - b. violent

<p>11. Cleveland volcano is probably a:</p> <ul style="list-style-type: none">a. cinder coneb. domec. stratovolcanod. shielde. volcanic neck <p>12. The rock erupted at Cleveland is probably :</p> <ul style="list-style-type: none">a. andesiteb. rhyolitec. basaltd. dioritee. common Steve, there's no way to tell	
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------

13. The material erupted at Cleveland is probably :
- a. mostly lava
 - b. lava and pyroclasts, roughly equal amounts
 - c. mostly pyroclastic
 - d. just gas, only gas, nothing but gas, nada

14 Cleavage in this mineral would be (see diagram to the right):

- a. two-directions at right angles
- b. two-directions **not** at right angles
- c. basal (one –direction, perfect)
- d. three-directions at right angles
- e. three-directions **not** at right angles



15. The hardness of the mineral quartz is a result of:

- a. bonding between aluminum atoms
- b. formation at high pressures and temperatures
- c. presence of a single plane of perfect cleavage
- d. bonding between adjacent silica tetrahedral by all oxygen atoms
- e. accumulation of daughter oxygen atoms

16. A coarse-grained plutonic rock made of mostly quartz and potassium feldspar with lesser amounts of ferromagnesian minerals is called:

- a. basalt
- b. granite
- c. gabbro
- d. andesite
- e. rhyolite

17. A silica-poor, iron- and magnesium-rich, fine-grained volcanic rock is

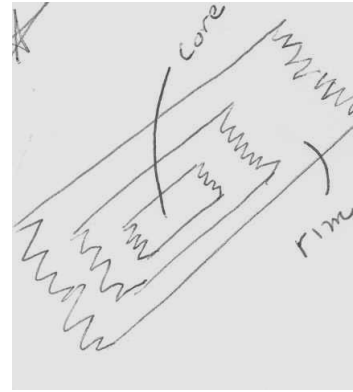
- a. basalt
- b. granite
- c. gabbro
- d. andesite
- e. schist

18. Fine-grained igneous rocks indicate:

- a. the rock is part of a pluton
- b. slow cooling
- c. fast cooling
- d. melting of pre-existing rock
- e. melting of a source with many minerals

19. Assuming the plagioclase crystal shown to the right grew as the magma cooled:

- a. the core would sodium rich and the rim would be calcium rich
- b. the core would calcium rich and the rim would be sodium rich
- c. the core would sodium rich and the rim would be potassium rich
- d. the core would potassium rich and the rim would be sodium rich
- e. damn it Steve, I'm not an experimental petrologist

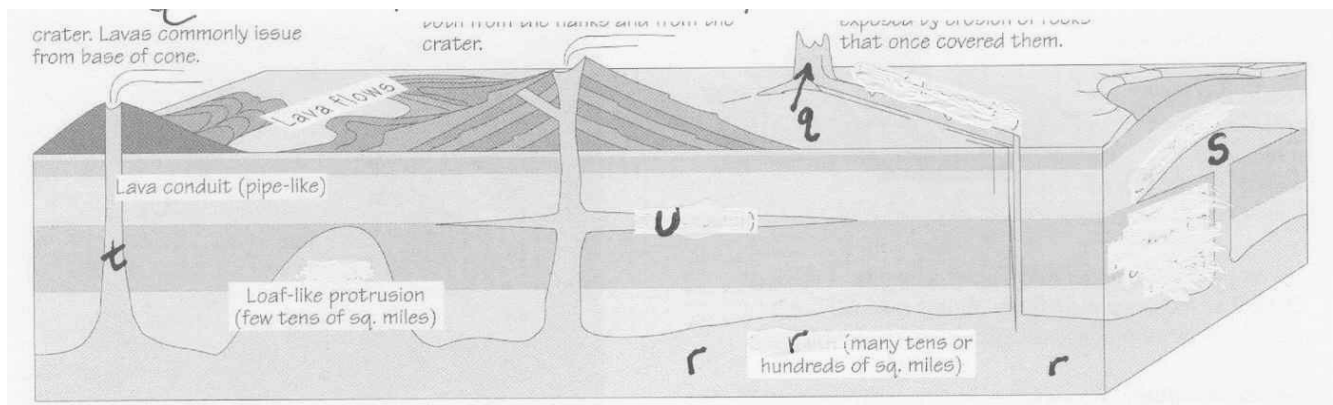


20. According to Bowen's reaction series the first minerals to solidify in a basaltic magma are:

- a. amphibole and plagioclase
- b. sodium-rich plagioclase and pyroxene
- c. calcite and magnetite
- d. olivine and calcium-rich plagioclase
- e. quartz, potassium-feldspar, and muscovite

21. Structure "r" is a(n):

- a. volcanic neck
- b. batholith
- c. laccolith
- d. dike
- e. sill



22. Assuming in the above diagram the layered rocks are sedimentary, which of the following rocks might form in the layer above location "r"?

- a. andesite
- b. gabbro
- c. quartzite
- d. diorite
- e. gneiss

23. Which set of conditions **favor** melting of rock:

- a. all one mineral, no water, high pressure, low temperature
- b. all one mineral, no water, low pressure, low temperature
- c. many minerals, water, high pressure, low temperature
- d. many minerals, water, low pressure, high temperature
- e. damn it Steve, I'm not an experimental petrologist

24. The primary characteristic of all sedimentary rocks is:

- a. precipitation from solution
- b. crystallization from a silicate liquid
- c. accumulation of sediment as layers
- d. rapid cooling at the Earth's surface
- e. recrystallization in a solid state

25. Which of the following rocks is clastic:

- a. anorthosite
- b. basalt
- c. conglomerate
- d. limestone
- e. evaporites

26. With increasing metamorphism, foliation would change from:

- a. gneiss, to schist, to phyllite, to slate
- b. slate, to phyllite, to schist, to gneiss
- c. phyllite, to slate, to gneiss, to schist
- d. schist, to gneiss, to slate, to phyllite

27. Which of these two minerals would indicate a higher grade of metamorphism:

- a. muscovite
- b. garnet

28. An easy way to characterize a valley eroded by glaciers is its:

- a. U-shaped cross-section
- b. V-shaped cross-section
- c. valley cross-section is independent of geologic action
- d. tell-tale signs left by extra-terrestrials

29. JimBob finds a foliated rock with parallel layers of mica and some red garnets. He thinks he found:

- a. argillite
- b. schist
- c. gneiss
- d. slate
- e. not enough information given.

30. Material washed out the front of glaciers by streams is easiest to recognize because it is:

- a. well sorted, sand and gravel, layered
- b. poorly sorted and not layered
- c. fine-grained clastic sediment with no sedimentary structures
- d. well-shaped crystals in glass

31. The primary characteristic of all metamorphic rocks is:

- a. precipitation from solution
- b. crystallization from a silicate liquid
- c. accumulation of sediment as layers
- d. rapid cooling at the Earth's surface
- e. recrystallization in a solid state

32. The best explanation for advances and retreats of glaciers within an Ice Age (periods of 100s to 1000s of years) is:

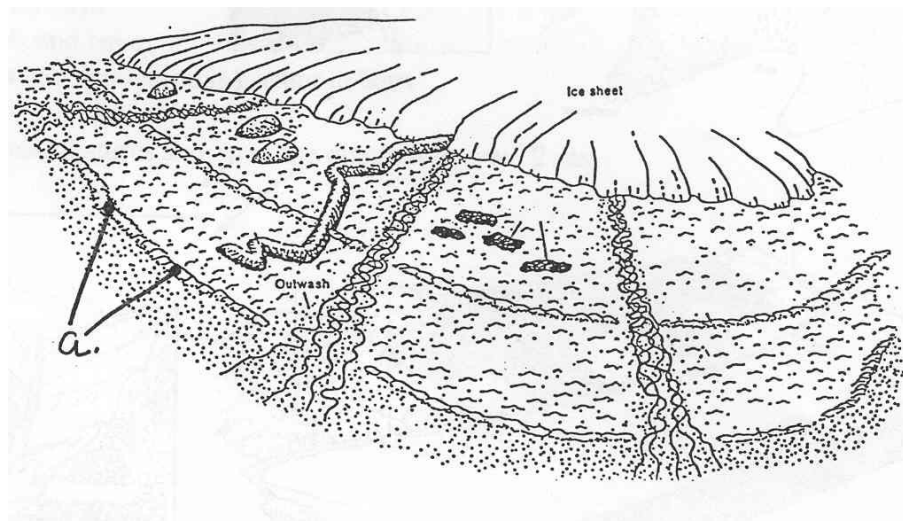
- a. tectonic activity
- b. meteorite impacts
- c. variations in the amount of energy the Sun releases
- d. changes in the Earth's orbit around the sun
- e. volcanic eruptions
- f. none of the above

33. Poorly sorted glacial sediment is called:

- a. outwash
- b. loess
- c. rock flour
- d. till
- e. tephra
- f. erratic

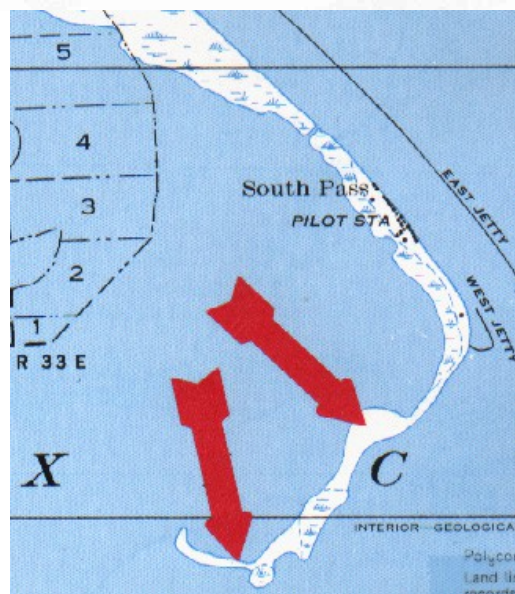
34. On the diagram to the right, feature "a" is a(n):

- a. kame
- b. kettle
- c. moraine
- d. drumlin
- e. esker



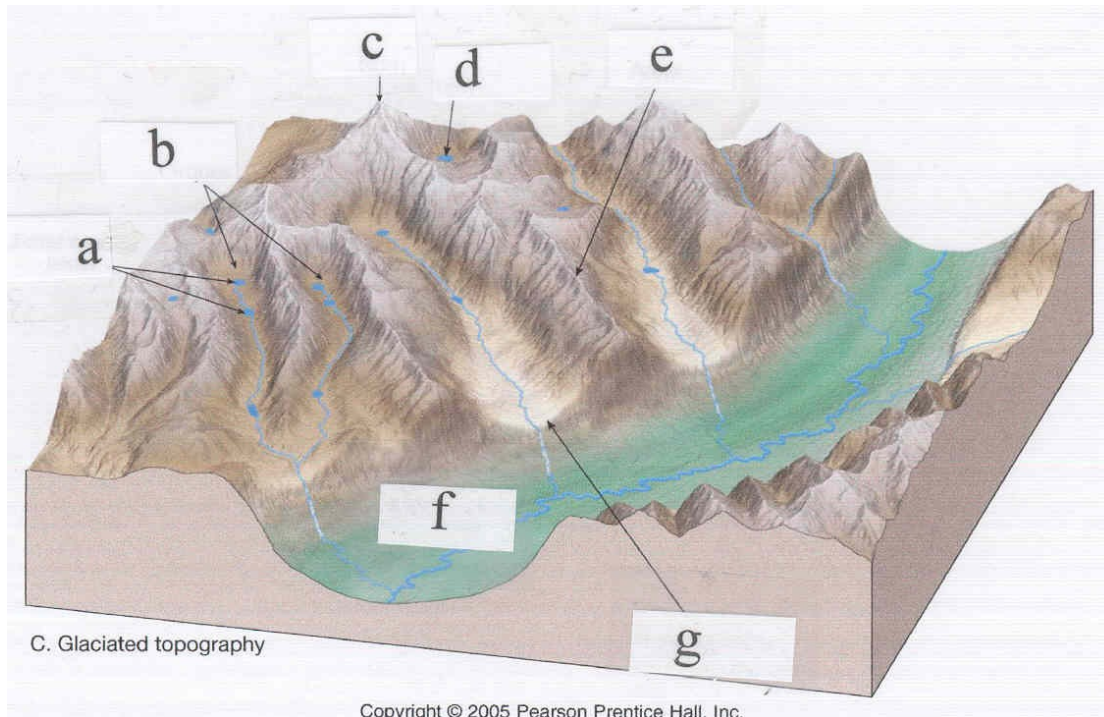
35. On the diagram to the right, the feature is a(n):

- a. tombolo
- b. barrier bar island
- c. baymouth bar
- d. spit
- e. esker



36. Between the two arrows, this feature was moving mostly to the ___ as it formed:
north is at the top

- a. northwest
- b. southeast
- c. southwest
- d. west
- e. east



37. On the diagram above, feature “b” is a(n):

- hanging valley
- boilermaker
- cirque
- tarn
- horn
- arete

38. On the diagram above, feature “e” is a(n):

- hanging valley
- spit
- cirque
- tarn
- horn
- arete

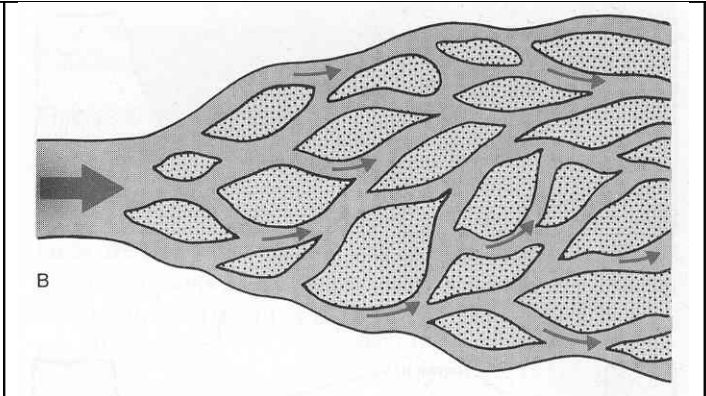
39. On the diagram to the right, the feature at the tip of the arrow is a(n):

- tombolo
- barrier bar island
- baymouth bar
- spit
- esker



40. The feature shown to the right is:

- a. an alluvial fan
- b. a braided stream
- c. a meandering stream
- d. a baymouth bar
- e. a playa



41. Chesapeake Bay, shown to the right, is a(n):

- a. moraine
- b. barrier island
- c. fjord
- d. tombolo
- e. estuary

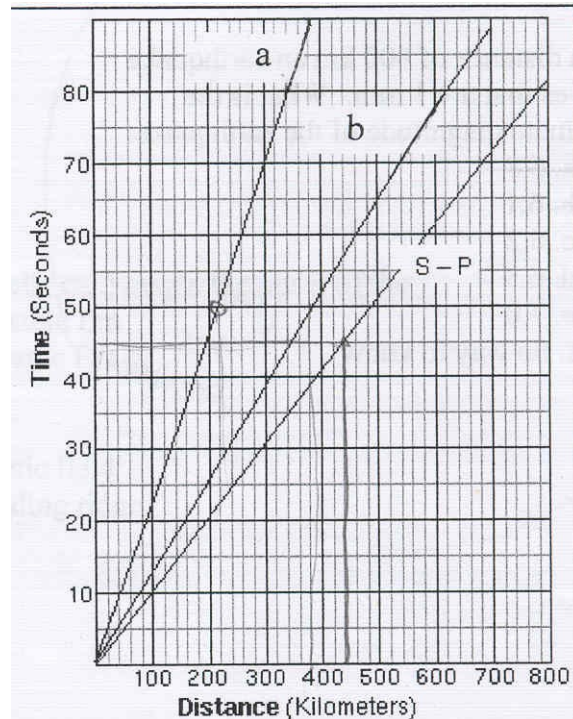


42. Caves systems most commonly develop in:

- a. granite
- b. sandstone
- c. limestone (no photo)
- d. gneiss

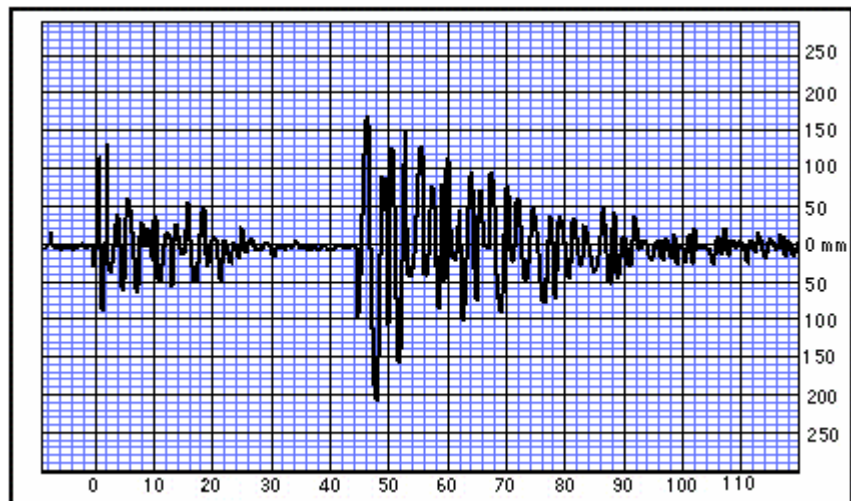
43. The diagram to the right shows the velocity of P- and S-waves through the Earth. Curve “b” is:

- a. for the P-wave
- b. for the S-wave
- c. not enough information



44. Which location (in seconds) marks the arrival of the P-wave:

- a. 0
- b. 30
- c. 45
- d. 210
- e. no P-wave is shown



45. Using the above two graphs, how far away is the earthquake on the seismogram?

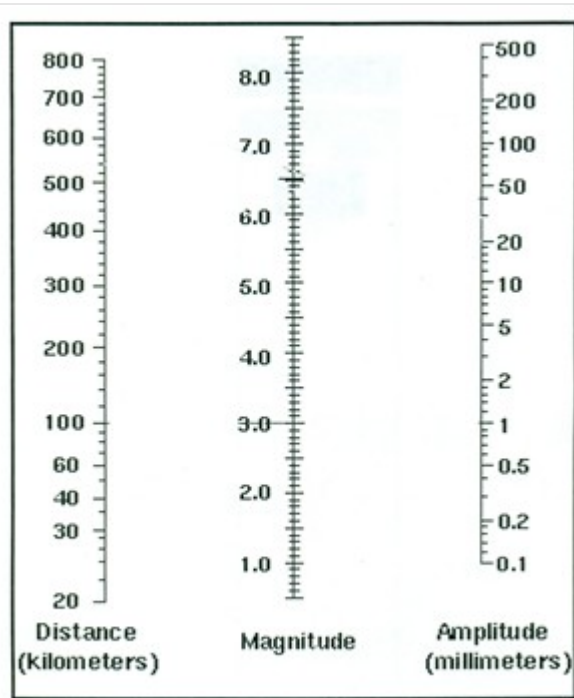
- a. 0 km
- b. 46 km
- c. 450 km
- d. 600 km
- e. not enough information given

46. During the 1868 earthquake in Hawaii observers reported twisted steel rails along some portions of a railroad track. This is an example of:

- a. earthquake magnitude
- b. earthquake intensity
- c. Richter scale
- d. poor construction by non-union labor

47. At a distance of 600 km an earthquake has waves that are 1 mm. What is the approximate magnitude of the earthquake:

- a. 3.0
- b. 5.0
- c. 5.5
- d. 6.5
- e. 7.0
- f. no way to know

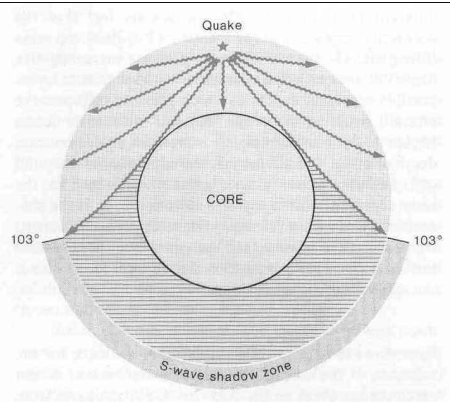


48. Which of the following waves move through the earth's mantle:

- a. P-waves
- b. S-waves
- c. both a and b
- d. none of the above.

49. The diagram to the right shows the paths of P- and S-waves through the Earth. This diagram illustrates how seismologist detected:

- a. the crust/mantle boundary
- b. the weak/soft/hot zone in the asthenosphere
- c. the thickness of tectonic plates
- d. the presence of a liquid outer core
- e. the presence of a solid inner core



50. If a magnitude 2 earthquake generated waves 1 cm high a magnitude 4 earthquake would generated waves _____ cm high.

- a. 1 cm
- b. 10 cm
- c. 100 cm
- d. 1000 cm
- e. not enough information given.

51. Deep earthquakes occur below

- a. Los Angeles
- b. New York
- c. Paris
- d. Bombay
- e. Tokyo

52. The appearance of organisms with hard parts (shells etc.) marks the onset of the:

- a. PreCambrian Era
- b. Mesozoic Era
- c. Paleozoic Era
- d. Cenozoic Era

53. The magnetic stripes on the ocean floor:

- a. record the recent reversal history of Earth's magnetic field
- b. show a symmetric pattern on either side of a spreading ridge
- c. are created as magma crystallizes at ridges
- d. all of the above
- e. a and b only
- f. b and c only

54. Transform faults are common in:

- a. the Black Hills of South Dakota
- b. the Appalachian Mountains of the eastern USA
- c. the rift zone of Africa
- d. San Andres, CA
- e. along the axis of mid-ocean ridges

55. The most common rock in ocean basins is:

- a. andesite
- b. basalt
- c. conglomerate
- d. diorite
- e. evaporite

56. Mount Everest, the highest mountain on earth, is made of marine limestone and is part of the Himalaya mountain chain. The elevation of the limestone to such a great height is primarily the result of:

- a. subduction
- b. rifting
- c. continent-continent convergence
- d. spreading at a mid-ocean ridge
- e. hot spot volcanism
- f. movement on a transform fault

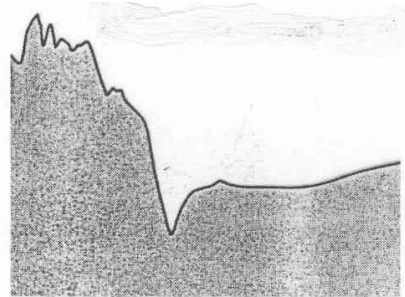
57. Which of the following is a site of an ocean-continent convergent plate margin:

- a. Hawaii
- b. Yellowstone
- c. Himalayas
- d. the Andes
- e. the San Andres fault

58. New oceanic crust is created at:
- transform plate boundaries
 - subduction zones
 - mid-ocean ridges
 - Pizza Hut
 - convergent plate boundaries

59. Offset mid-ocean ridges are examples of _____ plate boundaries:
- divergent
 - convergent
 - transform

60. This profile would most likely be found in the:
- Atlantic Ocean basin
 - between Antarctica and Australia
 - mid-ocean ridges
 - Pacific Ocean basin
 - none of the above.



61. The Cascade volcanoes of the northwest U.S are being produced by:
- volcanism above a subduction zone
 - continental rifting
 - continent-continent convergence
 - motion along a transform boundary

62. J. (for “Jumping”) Tuzo Wilson developed a test for the seafloor spreading hypothesis that involved earthquakes at transform faults that offset mid-ocean ridges. If seafloor spreading was a valid model, geologists should see earthquakes with which of these two possible distributions:

- A
- B

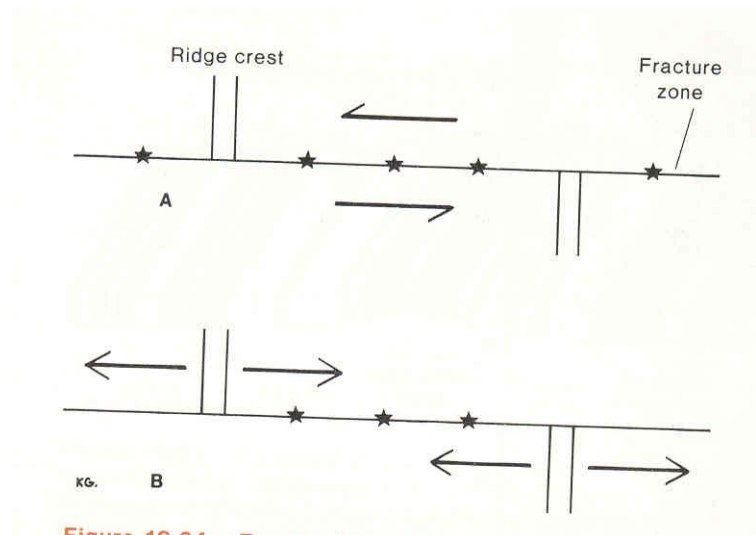
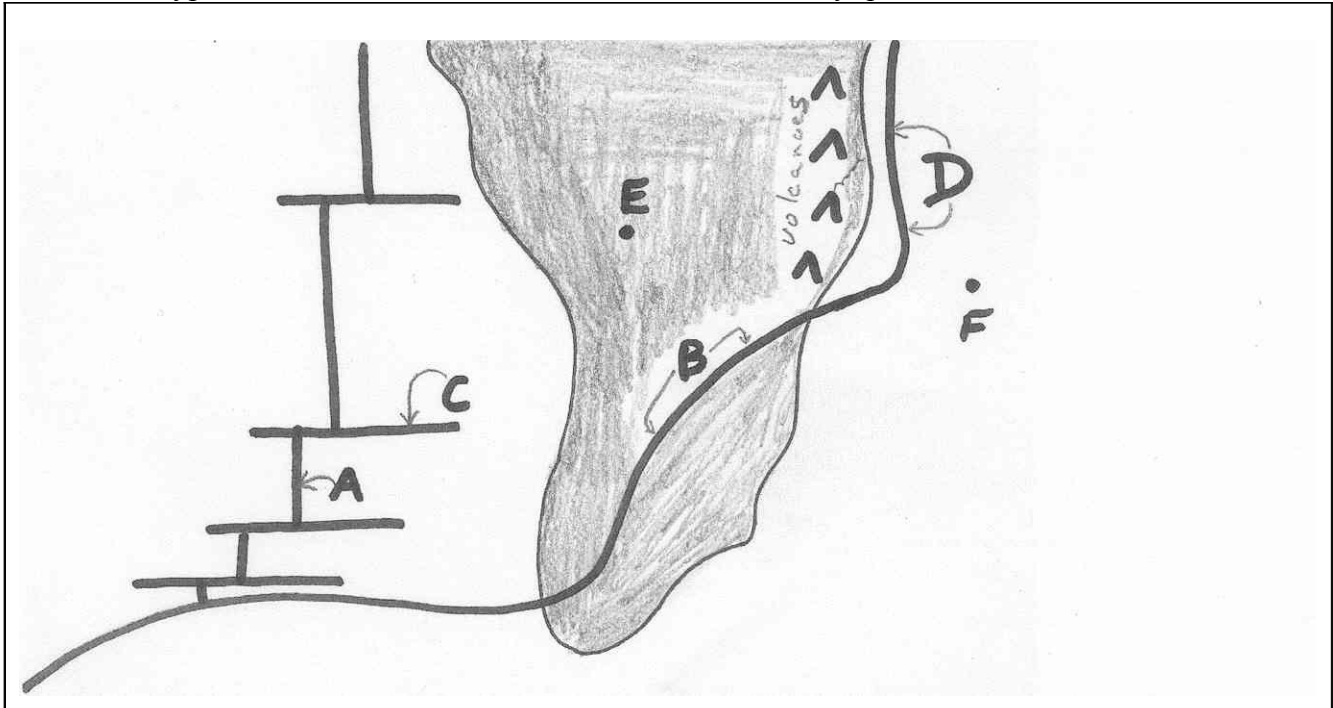


Figure 19.24. The seafloor spreading hypothesis.

63. The “plate” of plate tectonics is made of:
- crust
 - uppermost rigid mantle
 - asthenosphere
 - all of the above
 - a and b only

The next 14 questions test your ability to synthesize a global view of plate tectonics. The map below represents a small piece of the Earth. Use the base map below to answer the following questions. Oceans are indicated by white. A continent is shaded gray. The thick black lines show the location of, but not the type, of tectonic boundaries. Be sure to answer every question below.



64. How many plates are shown on the map?

- a. 1 b. 2 c. 3 d. 4 e. 5

65. At which location would you expect to find the oldest oceanic crust.

- a. O1 b. O2 c. O3

66. At which location would you expect to find the oldest oceanic crust.

- a. closest to a mid ocean ridge
 b. at an intermediate distance from a mid ocean ridge
 c. farthest to a mid ocean ridge
 d. closest to a transform plate boundary

67. What is the most likely composition of the rock erupted at the volcanoes shown on the map just to the west of location D?

- a. andesite
 b. basalt
 c. granite
 d. rhyolite
 e. rhyolite

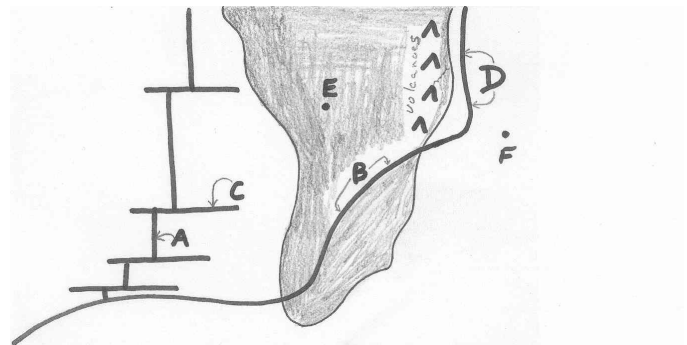
68. Location "A" has only shallow earthquakes and volcanism. What type of plate boundary is it likely to be?

- a. convergent
 b. transform
 c. divergent
 d. not enough information given

69. What is the composition of the rock erupted at the volcanoes at Location “A”?
- andesite
 - basalt
 - gabbro
 - rhyolite
70. Location “B” has shallow earthquakes and no volcanism. What type of plate boundary is it likely to be?
- convergent
 - transform
 - divergent
 - not enough information given
71. The best explanation for why there is no volcanism at Location “B” is:
- mantle rocks are too dry, too cold, and at higher pressure
 - mantle rocks are too wet, too warm, and at higher pressure
 - mantle rocks are too dry, too cold, and at lower pressure
72. What type of plate boundary is it likely to be at location “C”?
- convergent
 - transform
 - divergent
 - not enough information given
73. What type of plate boundary is it likely to be at location “D”?
- convergent
 - transform
 - divergent
 - not enough information given

74. At what location is there a trench?
- A
 - B
 - C
 - D

75. At what location is there an ocean ridge?
- A
 - B
 - C
 - D



76. Relative to the other plates, at point E, what direction is the plate moving? North is to the top.
- north
 - east
 - south
 - west
77. Relative to the other plates, at point F, what direction is the plate moving? North is to the top.
- north to northeast
 - east
 - south
 - west