

Unit 3: Dynamic Earth Practice Questions

Name: _____

Date: _____

- What is the approximate temperature at the mantle-outer core boundary?
A. 1,500°C B. 4,500°C
C. 5,000°C D. 7,000°C
- In which layer of Earth's interior is the pressure inferred to be 1.0 million atmospheres?
A. outer core B. inner core
C. rigid mantle D. stiffer mantle
- Earth's internal heat is the primary source of energy that
A. warms the lower troposphere
B. melts glacial ice at lower altitudes
C. moves the lithospheric plates
D. pollutes deep groundwater with radioactivity
- Which layer of Earth is composed of both the crust and the rigid mantle?
- In which Earth layer does the pressure reach 3.5 million atmospheres?
A. crust B. stiffer mantle
C. outer core D. inner core
- Seafloor spreading is occurring at the boundary between the
A. African plate and Antarctic plate
B. Nazca plate and South American plate
C. China plate and Philippine plate
D. Australian plate and Eurasian plate
- The two most abundant elements by mass in Earth's crust are oxygen and
A. potassium B. hydrogen
C. nitrogen D. silicon
- A seismic station recorded the arrival of a *P*-wave at 10:00:00 am. The *S*-wave arrival was recorded at 10:04:20 am. What is the approximate distance between the earthquake epicenter and the seismic station?
A. 1.1×10^3 km B. 2.2×10^3 km
C. 2.9×10^3 km D. 7.2×10^3 km
- Most inferences about the characteristics of Earth's mantle and core are based on
A. the behavior of seismic waves in Earth's interior
B. well drillings from Earth's mantle and core
C. chemical changes in exposed and weathered metamorphic rocks
D. comparisons between Moon rocks and Earth rocks
- Which features are commonly formed at the plate boundaries where continental crust converges with oceanic crust?
A. large volcanic mountain ranges parallel to the coast at the center of the continents
B. a deep ocean trench and a continental volcanic mountain range near the coast
C. an underwater volcanic mountain range and rift valley on the ocean ridge near the coast
D. long chains of mid-ocean volcanic islands perpendicular to the coast

11. The actual temperature at the boundary between the stiffer mantle and the outer core is estimated to be approximately

- A. 1.5° C
- B. 250° C
- C. 3000° C
- D. 5000° C

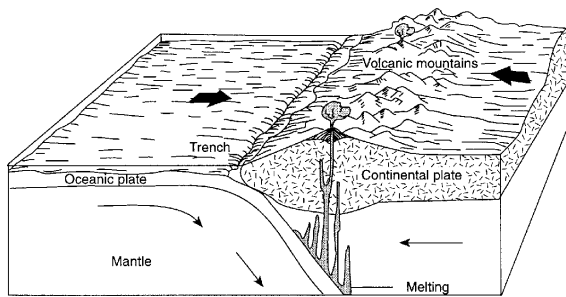
12. Which feature is commonly formed at a plate boundary where oceanic crust converges with continental crust?

- A. a mid-ocean ridge
- B. an ocean trench
- C. a transform fault
- D. new oceanic crust

13. When a continental crustal plate collides with an oceanic crustal plate, the continental crust is forced to move over the oceanic crust. What is the primary reason that the continental crust stays on top of the oceanic crust?

- A. Continental crust is less dense.
- B. Continental crust deforms less easily.
- C. Continental crust melts at higher temperatures.
- D. Continental crust contains more mafic minerals.

14. The diagram below shows the collision of an oceanic plate and a continental plate.



Collisions between oceanic plates and continental plates are thought to result primarily from

- A. hot liquid magma in the inner core
- B. convection currents in the mantle
- C. volcanic eruptions along coastlines
- D. meteor impacts in the ocean basins

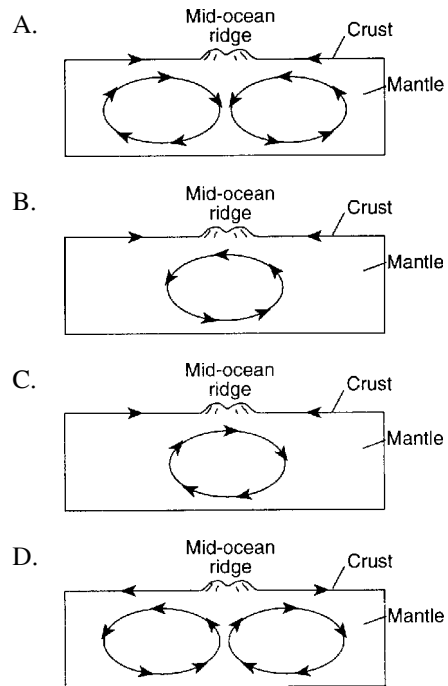
15. In which area of Earth's interior is the pressure most likely to be 2.5 million atmospheres?

- A. asthenosphere
- B. stiffer mantle
- C. inner core
- D. outer core

16. According to tectonic plate maps, New York State is presently located

- A. at a convergent plate boundary
- B. above a mantle hot spot
- C. above a mid-ocean ridge
- D. near the center of a large plate

17. Which cross-section diagram of a portion of the crust and mantle best shows the pattern of mantle convection currents that are believed to cause the formation of a mid-ocean ridge?

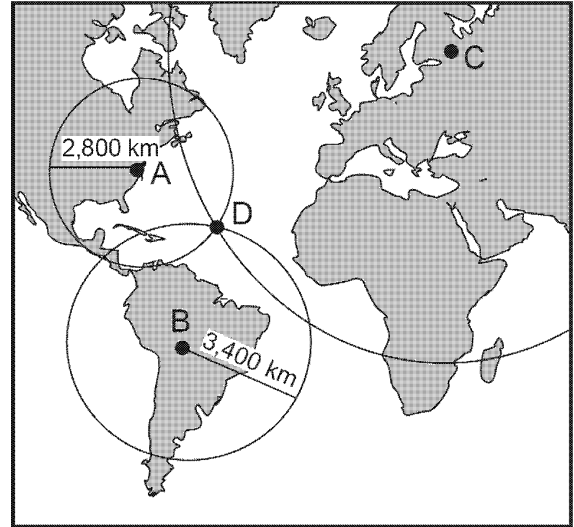


18. A huge undersea earthquake off the Alaskan coastline could produce a

- A. tsunami
- B. cyclone
- C. hurricane
- D. thunderstorm

19. Compared to oceanic crust, continental crust is generally
- older and thinner
 - older and thicker
 - younger and thinner
 - younger and thicker
20. Through which materials can *P*-waves travel?
- solid rock, only
 - magma and water, only
 - magma, water, and natural gas, only
 - solid rock, magma, water, and natural gas
21. On which tectonic plate is Puerto Rico located?
- North American Plate
 - South American Plate
 - Caribbean Plate
 - Cocos Plate
22. A seismograph records the arrival of a *P*-wave at 11:13 am. If the earthquake occurred 4,000 kilometers from the recording station, when did the earthquake occur?
- 11:06 am
 - 11:11 am
 - 11:13 am
 - 11:20 am
23. Which statement best describes Earth's crust and mantle?
- The crust is thicker and less dense than the mantle
 - The crust is thicker and more dense than the mantle
 - The crust is thinner and less dense than the mantle
 - The crust is thinner and more dense than the mantle

24. Base your answer(s) to the following question(s) on the *Earth Science Reference Tables*, the map below, and your knowledge of Earth science. The map shows seismograph recording stations at locations *A*, *B*, and *C*. Location *D* is an earthquake epicenter. The distances from locations *A* and *B* to this epicenter are given in kilometers.



Which statement best describes the igneous crustal bedrock below locations *A*, *B*, *C*, and *D*?

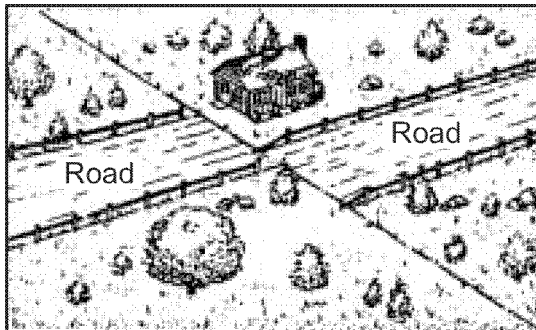
- The bedrock below *D* is mostly basalt; below *A*, *B*, and *C*, the bedrock is mostly granite.
 - The bedrock below *D* is mostly granite; below *A*, *B*, and *C*, the bedrock is mostly basalt.
 - The bedrock below *A*, *B*, *C*, and *D* is mostly basalt.
 - The bedrock below *A*, *B*, *C*, and *D* is mostly granite.
25. How does the age of the ocean-floor bedrock change as the distance east or west of location *D* increases?
- The age decreases, because *D* is in an oceanic trench.
 - The age decreases, because *D* is on a midoceanic ridge.
 - The age increases, because *D* is in an oceanic trench.
 - The age increases, because *D* is on a midoceanic ridge.

26. Which geologic events occur most often at this mid-oceanic ridge plate boundary?
- A. magnetic pole reversals and cooling of ocean water
 - B. meteorite impacts and tilting of shorelines
 - C. hydrospheric pollution and adiabatic heating
 - D. earthquakes and volcanic eruptions

27. Tectonic plate boundaries may be classified as divergent, convergent, or transform. For *each* location listed in the data table below, place an **X** in the proper column to indicate the type of plate boundary at that location.

Plate Boundaries Data Table			
Location	Type of Plate Boundary		
	Divergent	Convergent	Transform
East Pacific Ridge			
Aleutian Trench			
West side of the South American Plate			
San Andreas Fault			

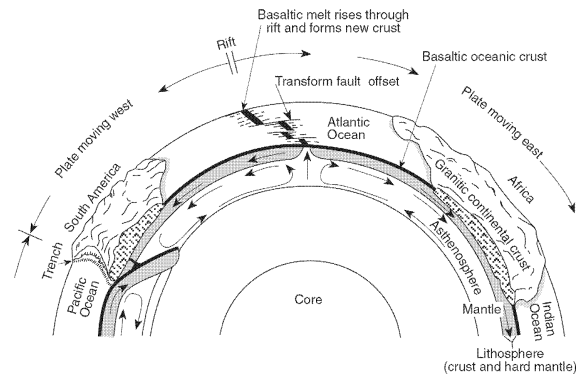
28. The accompanying diagram shows land features that have been disrupted by an earthquake.



Which type of crustal movement most likely caused the displacement of features in this area?

- A. vertical lifting of surface rock
- B. folding of surface rock
- C. down-warping of the crust
- D. movement along a transform fault

29. Base your answer(s) to the following question(s) on the diagram below. The diagram shows a model of the relationship between Earth's surface and its interior.

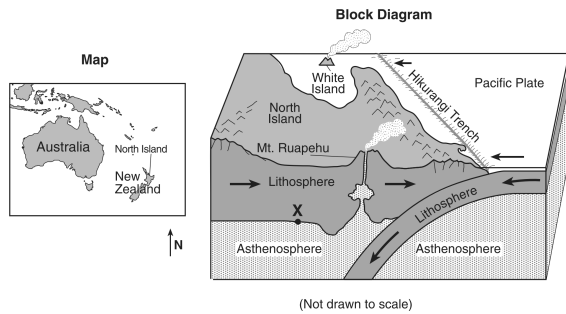


(Not drawn to scale)

The motion of the convection currents in the mantle beneath the Atlantic Ocean appears to be mainly making this ocean basin

- A. deeper
 - B. shallower
 - C. wider
 - D. narrower
30. According to the diagram, the deep trench along the west coast of South America is caused by movement of the oceanic crust that is
- A. sinking beneath the continental crust
 - B. uplifting over the continental crust
 - C. sinking at the Mid-Atlantic ridge
 - D. colliding with the Atlantic oceanic crust
31. Mid-ocean ridges (rifts) normally form where tectonic plates are
- A. converging
 - B. diverging
 - C. stationary
 - D. sliding past each other

32. Base your answer(s) to the following question(s) on the map and block diagram below. The map shows the location of North Island in New Zealand. The block diagram shows a portion of North Island. The Hikurangi Trench is shown forming at the edge of the Pacific Plate. Point X is at the boundary between the lithosphere and the asthenosphere.

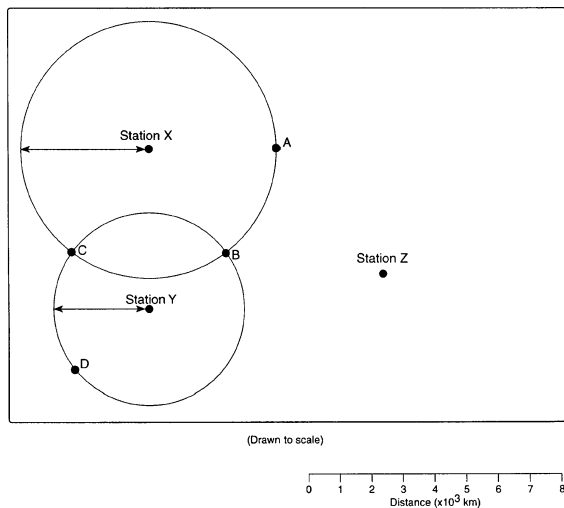


State the approximate temperature at point X.

33. On what tectonic plate are both North Island and White Island located?
34. Describe the type of tectonic plate motion that formed the Hikurangi Trench.
35. Compared to the continental crust, the oceanic crust is
- A. thicker B. more dense
C. more granitic D. more felsic
36. Name one region of the United States that is likely to experience a major damaging earthquake. Explain why an earthquake is likely to occur in that region.
37. Earth's outer core and inner core are both inferred to be
- A. liquid
B. solid
C. composed of a high percentage of iron
D. under the same pressure
38. Why is Earth's outer core inferred to be a liquid?
- A. *P*-waves can pass through the outer core.
B. *P*-waves cannot pass through the outer core.
C. *S*-waves can pass through the outer core.
D. *S*-waves cannot pass through the outer core.
39. The density of Earth's crust is
- A. less than the density of the outer core but greater than the density of the mantle
B. greater than the density of the outer core but less than the density of the mantle
C. less than the density of both the outer core and the mantle
D. greater than the density of both the outer core and the mantle
40. A seismic station received the *P*-waves generated by an earthquake but did not receive the *S*-waves. Which statement best explains the absence of the *S*-waves?
- A. The earthquake was too weak to produce *S*-waves.
B. The earthquake's epicenter and focus were at the same location.
C. The *S*-waves were absorbed by a fluid layer as they traveled toward the seismic station.
D. The *S*-waves were reflected away from the seismic station when they reached the Moho interface.
41. Which coastal area is most likely to experience a severe earthquake?
- A. east coast of North America
B. east coast of Australia
C. west coast of Africa
D. west coast of South America

42. An earthquake's magnitude can be determined by
- analyzing the seismic waves recorded by a seismograph
 - calculating the depth of the earthquake faulting
 - calculating the time the earthquake occurred
 - comparing the speed of P-waves and S-waves

43. Base your answer(s) to the following question(s) on the *Earth Science Reference Tables*, the map below, and on your knowledge of Earth science. The map shows seismic stations X, Y, and Z that have recorded seismic waves from the same earthquake. The distances from seismic stations X and Y to the earthquake epicenter have been drawn on the map. Locations A, B, C, and D represent possible earthquake epicenters. The distance from seismic station Z to the earthquake epicenter has been deliberately omitted.

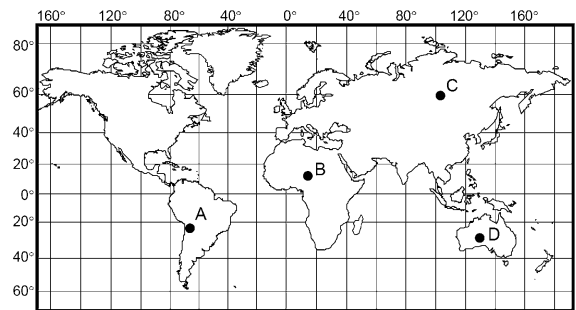


How far is station X from the earthquake epicenter?

- 5,200 km
 - 2,400 km
 - 3,000 km
 - 4,000 km
44. If the earthquake's focus was 2 kilometers below Earth's surface, the earthquake occurred in the
- lithosphere
 - asthenosphere
 - stiffer mantle
 - outer core

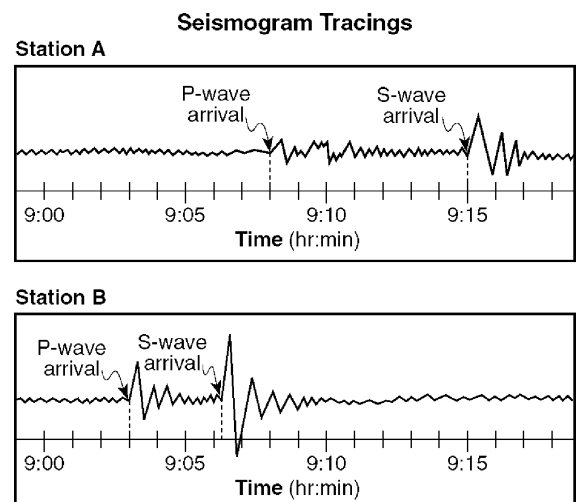
45. What is the direct cause of most earthquakes?
- gravitational pull on bedrock by the Moon
 - deposition of sediment in lakes and oceans
 - movement of bedrock along a fault line
 - heat exchange between the crust and the atmosphere

46. Letters A through D shown on the accompanying map are locations on Earth's surface.



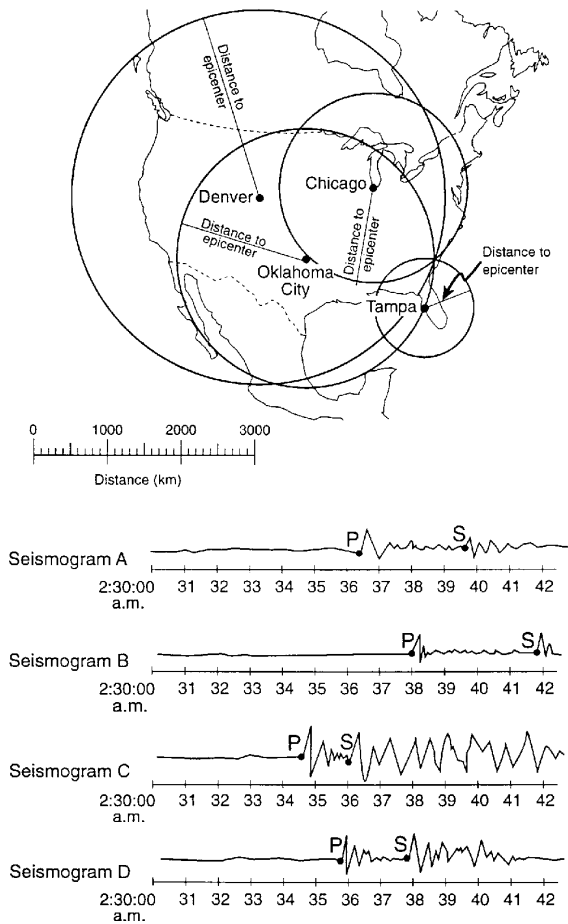
Which location is closest to a major zone of frequent earthquakes and volcanic activities?

- A
 - B
 - C
 - D
47. Base your answer(s) to the following question(s) on the diagram below, which shows two seismogram tracings, at stations A and B, for the same earthquake. The arrival times of the P-waves and S-waves are indicated on each tracing.



Explain how the seismic tracings recorded at station A and station B indicate that station A is farther from the earthquake epicenter than station B.

48. Base your answer(s) to the following question(s) on the *Earth Science Reference Tables*, the map and seismograms below, and your knowledge of Earth science. The map shows seismic stations in Chicago, Denver, Oklahoma City, and Tampa that recorded data from an earthquake. Seismograms A, B, C, and D show, in Greenwich time, the arrival times of the earthquake waves at the four stations.



Which seismograph was recorded at Tampa?

- A. seismogram A B. seismogram B
 C. seismogram C D. seismogram D
49. What was the origin time of this earthquake?
- A. 2:33:00 am B. 2:34:40 am
 C. 2:35:40 am D. 2:37:00 am

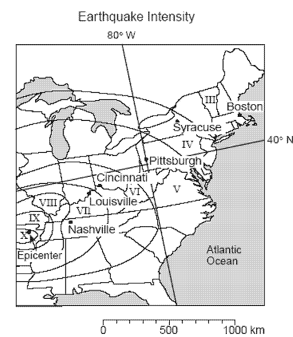
50. The *P*-wave generated by this earthquake took 2 minutes and 40 seconds to reach one of the seismic stations. Approximately how long did the *S*-wave take to reach the same seismic station?

- A. 1 minute 20 seconds
 B. 2 minutes 40 seconds
 C. 3 minutes 30 seconds
 D. 4 minutes 50 seconds

51. What is the *minimum* number of seismic stations needed to locate most earthquake epicenters?

- A. 1 B. 2 C. 3 D. 4

52. Base your answer(s) to the following question(s) on the *Earth Science Reference Tables*, the map and table of the Modified Mercalli Scale below, and your knowledge of Earth science. The map shows the intensities of the earthquake that occurred slightly southwest of New Madrid, Missouri, on December 16, 1811. The numbered areas on the map were determined from the Modified Mercalli Scale according to the observed effects of the earthquake.



Modified Mercalli Scale	
Intensity	Observed Effects
I	Felt by only a few people under very special circumstances
II	Felt by only a few people at rest, especially on the upper floors of buildings
III	Felt noticeably indoors, especially on upper floors of buildings
IV	Felt indoors by many people, outdoors by a few; some awaken
V	Felt by nearly everyone; many awaken; dishes and windows break; plaster cracks
VI	Felt by everyone; many frightened and run outdoors; heavy furniture moves
VII	Everyone runs outdoors; slight to moderate damage in ordinary structures
VIII	Considerable damage in ordinary structures; chimneys and monuments fall
IX	Considerable damage in all structures; ground cracks; underground pipes break
X	Most structures destroyed; rails bend; landslides occur; water splashes over banks
XI	Few structures left standing; bridges destroyed; broad fissures in the ground; underground pipes break
XII	Damage total; waves seen on ground surfaces; objects thrown in air

What is the approximate location of the earthquake's epicenter?

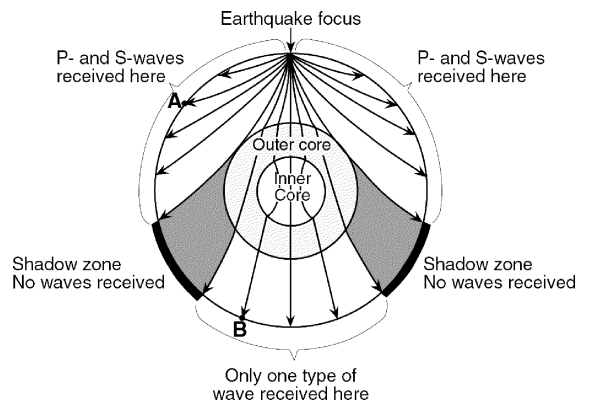
- A. 36° N, 90° W B. 90° N, 36° W
 C. 36° N, 90° E D. 90° N, 36° E

53. What was the approximate travel time for the earthquake's *P*-wave from the epicenter to Syracuse, New York?
- A. 1 min B. 5 min
C. 3 min D. 10 min
54. Which statement best describes the earthquake waves recorded at Louisville?
- A. *S*-waves arrived ahead of *P*-waves.
B. *P*-waves arrived ahead of *S*-waves.
C. *S*-waves arrived but *P*-waves did not arrive.
D. Neither *S*-waves nor *P*-waves arrived.
55. For which city was the difference in arrival times between *P*-waves and *S*-waves greatest?
- A. Nashville B. Pittsburgh
C. Syracuse D. Boston
56. From the top of the stiffer mantle to the center of Earth, the rock material is inferred to be
- A. solid all the way to the center of the inner core
B. solid, then liquid to the center of the inner core
C. solid, then liquid, then solid again to the center of the inner core
D. solid, then liquid, then gaseous to the center of the inner core

57. Base your answer(s) to the following question(s) on the *Earth Science Reference Tables* and on your knowledge of Earth science.

The pressure at the interface between the mantle and the outer core of Earth is inferred to be approximately

- A. 1.0 million atmospheres
B. 1.4 million atmospheres
C. 3.0 million atmospheres
D. 3.4 million atmospheres
58. Base your answer(s) to the following question(s) on the cross-sectional view of Earth below, which shows seismic waves traveling from the focus of an earthquake. Points *A* and *B* are locations on Earth's surface.



Which statement best explains why only one type of seismic wave was recorded at location *B*?

- A. *S*-waves cannot travel through the liquid outer core.
B. *S*-waves cannot travel through the liquid inner core.
C. *P*-waves cannot travel through the solid outer core.
D. *P*-waves cannot travel through the solid inner core.