REGENTS REVIEW PACKETS

Name _____ Partner _____

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Packet Number: _____ Score _____

Material Covered: Dynamic Crust

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1. Which is the best evidence of crustal movement?
   (1) molten rock in the Earth's outer core
   (2) tilted sedimentary rock layers
   (3) residual sediments on top of bedrock
   (4) marine fossils found below sea level

2. A sandstone layer is tilted at a steep angle. What probably caused this tilting?
   (1) The sediments that formed this sandstone layer were originally deposited at a steep angle.
   (2) This sandstone layer has changed position due to crustal movement
   (3) This sandstone layer has recrystallized due to contact metamorphism.
   (4) Nearly all sandstone layers are formed from wind deposited sands.

3. Rock strata containing fossils of shark's teeth are found at an elevation of 5,000 meters. Which process most likely caused the shark's teeth to be located at this elevation?
   (1) crustal subsidence
   (2) ocean floor spreading
   (3) crustal uplift
   (4) continental glaciation

4. Fossils of marine life can be found at locations higher than 200 meters above sea level in New York State. Which statement best explains this fact?
   (1) Much of New York State was once below sea level and has since been uplifted.
   (2) Much of New York State was once above sea level and has since subsided.
   (3) Sea level was once more than 200 meters lower than it is today.
   (4) Sea level was once more than 200 meters higher than it is today.

5. Evidence of crustal subsidence (sinking) is provided by
   (1) zones of igneous activity at mid-ocean ridges
   (2) heat-flow measurements on coastal plains
   (3) marine fossils on mountaintops
   (4) shallow-water fossils beneath the deep ocean

6. Which observed feature would provide the best evidence of crustal stability?
   (1) horizontal sedimentary layers
   (2) changed benchmark elevations
   (3) folded, faulted, and tilted rock strata
   (4) marine fossils at elevations high above sea level

7. Where are earthquakes most likely to take place?
   (1) along the core-mantle interface
   (2) where the composition of the Earth tends to be uniform
   (3) near the Earth's Equator
   (4) near a fault zone

8. Which best describes a major characteristic of both volcanoes and earthquakes?
   (1) They are centered at the poles.
   (2) They are located in the same geographic areas.
   (3) They are related to the formation of glaciers.
   (4) They are restricted to the Southern Hemisphere.

9. Where does most present-day faulting of rock occur?
   (1) in regions of glacial activity
   (2) in the interior areas of continents
   (3) at locations with many lakes
   (4) at interfaces between moving parts of the crust

10. According to the *Earth Science Reference Tables*, which of the following locations is the site of a convergent plate boundary?
   (1) the mid-Atlantic ridge
   (2) the Aleutian trench
   (3) the Atlantic-Indian ridge
   (4) the Pacific/North American plate boundary

11. What do mid-ocean ridges and hot spots beneath ocean plates have in common?
   (1) Rising magma moves due to density differences
   (2) They are located along crustal plate boundaries
   (3) Local earthquakes originate at great depths
   (4) Neither is associated with plate motions

12. Contact zones between tectonic plates may produce trenches. According to the *Earth Science Reference Tables*, one of these trenches is located at the boundary between which plates?
   (1) Australian and Pacific
   (2) South American and African
   (3) Australian and Antarctic
   (4) North American and Eurasian

13. Which features are commonly formed at the plate boundaries where continental crust converges with oceanic crust?
   (1) large volcanic mountain ranges parallel to the coast at the center of the continents
   (2) a deep ocean trench and a continental volcanic mountain range near the coast
   (3) an underwater volcanic mountain range and rift valley on the ocean ridge near the coast
   (4) long chains of mid-ocean volcanic islands perpendicular to the coast

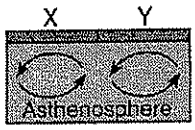
14. Igneous materials found along oceanic ridges contain magnetic iron particles that show reversal of magnetic orientation. This is evidence that
   (1) volcanic activity has occurred constantly throughout history
   (2) the Earth's magnetic poles have exchanged their positions
   (3) igneous materials are always formed beneath oceans
   (4) the Earth's crust does not move

15. Which is the best evidence supporting the concept of ocean floor spreading?
(1) Earthquakes occur at greater depths beneath continents than beneath oceans.
(2) Sandstones and limestones can be found both in North America and Europe.
(3) Volcanoes appear at random within the oceanic crust.
(4) Igneous rocks along the mid-oceanic ridges are younger than those farther from the ridges.

16. Which evidence supports the theory of ocean floor spreading?
(1) The rocks of the ocean floor and the continents have similar origins.
(2) In the ocean floor, rocks near the mid-ocean ridge are cooler than rocks near the continents.
(3) The pattern of magnetic orientation of rocks is similar on both sides of the mid-ocean ridge.
(4) The density of oceanic crust is greater than the density of continental crust.

17. According to the *Earth Science Reference Tables*, the border between the South American plate and the African plate is best described as
(1) converging and located at an oceanic ridge
(2) converging and located at an oceanic trench
(3) diverging and located at an oceanic ridge
(4) diverging and located at an oceanic trench

18. Which cross-sectional diagram of Earth's asthenosphere best shows the convection currents that would cause crustal plate *X* to drift away from crustal plate *Y*?

(1)


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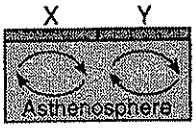

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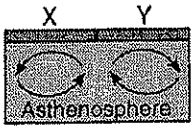

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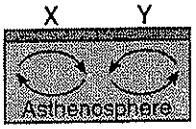


19. Which information indicates that new seafloor rock is forming along a mid-ocean ridge and then moving horizontally away from the ridge?
(1) Most volcanoes are located under ocean water.
(2) Seafloor rock is older than continental rock.
(3) Fossils of marine organisms can be found at high elevations on continents
(4) The age of seafloor rock increases as the distance from the mid-ocean ridge increases.

20. Which statement best supports the theory that all the continents were once a single landmass?
(1) Rocks of the ocean ridges are older than those of the adjacent sea floor.
(2) Rock and fossil correlation can be made where the continents appear to fit together.
(3) Marine fossils can be found at high elevations above sea level on all continents.
(4) Great thicknesses of shallow-water sediments are found at interior locations on some continents.

21. According to the *Earth Science Reference Tables*, for the last 200 million years, continents on opposite sides of the Atlantic Ocean have generally
(1) been drifting closer together
(2) been drifting farther apart
(3) remained the same distance apart

22. According to the *Earth Science Reference Tables*, during which geologic time period were the continents of North America, South America and Africa closest together?
(1) Tertiary
(2) Cretaceous
(3) Triassic
(4) Carboniferous

23. Igneous rocks of the same age have been found on different continents. Magnetic minerals in these rocks indicate different locations of the north magnetic pole. The best explanation for this observation is that
(1) the Earth had two different north magnetic poles when the rocks formed
(2) magnetic minerals do not indicate the direction of the north magnetic pole
(3) the continents have moved since the time the rocks were formed
(4) an error was made in determining the age of the rocks

24. A seismic station is 2,000 kilometers from an earthquake epicenter. According to the *Earth Science Reference Tables*, how long does it take an *S*-wave to travel from the epicenter to the station?
(1) 7 minutes 20 seconds
(2) 5 minutes 10 seconds
(3) 3 minutes 20 seconds
(4) 4 minutes 10 seconds

25. An abrupt change in the speed of seismic waves is an indication that the
(1) seismic waves are colliding
(2) shear wave has overtaken the compressional wave
(3) waves are going into a material with different properties
(4) waves are passing through material of the same density

26. Useful information regarding the composition of the interior of the Earth can be derived from earthquakes because earthquake waves
(1) release materials from within the Earth
(2) travel through the Earth at a constant velocity
(3) travel at different rates through different materials
(4) change radioactive decay rates of rocks

27. What is the average velocity of an earthquake's S-wave in its first 4 minutes of travel?
(1) 1 km/min
(2) 250 km/min
(3) 500 km/min
(4) 4 km/min

28. In 8 minutes, an earthquake *P*-wave travels a total distance of
(1) 2,100 km
(2) 4,700 km
(3) 6,600 km
(4) 11,300 km

29. Which statement best describes the relationship between the travel rates and travel times of earthquake *P*-waves and *S*-waves from the focus of an earthquake to a seismograph station?
(1) *P*-waves travel at a slower rate and take less time.
(2) *P*-waves travel at a faster rate and take less time.
(3) *S*-waves travel at a slower rate and take less time.
(4) *S*-waves travel at a faster rate and take less time.

30. Earthquake S-waves do *not* travel through the Earth's
(1) crust
(2) moho
(3) mantle
(4) core

31. When the seafloor moves as a result of an underwater earthquake and a large tsunami develops, what will most likely occur?
(1) Deep-ocean sediments will be transported over great distances.
(2) No destruction will occur near the origin of the earthquake.
(3) The direction of the tsunami will be determined by the magnitude of the earthquake.
(4) Severe destruction will occur in coastal areas.

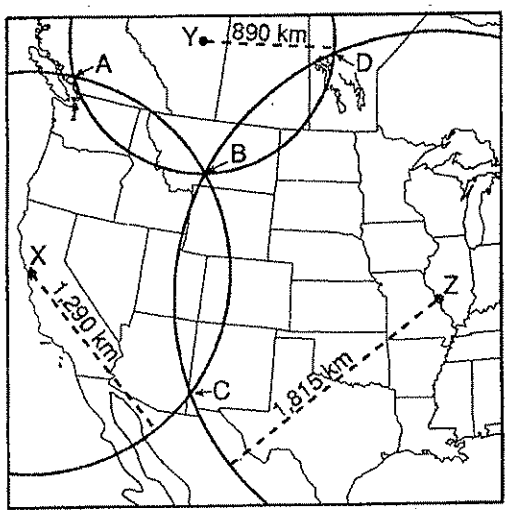
32. A seismic station received the *P*-waves generated by an earthquake but did not receive the *S*-waves. Which statement best explains the absence of the *S*-waves?
(1) The earthquake was too weak to produce *S*-waves.
(2) The earthquake's epicenter and focus were at the same location.
(3) The *S*-waves were absorbed by a fluid layer as they traveled toward the seismic station.
(4) The *S*-waves were reflected away from the seismic station when they reached the Moho interface.

33. A seismograph indicates the difference between the arrival of S-waves and P-waves to be 4 minutes. Based on the *Earth Science Reference Tables*, the distance of the seismograph station from the earthquake's epicenter is about
(1) 1,000 km
(2) 1,500 km
(3) 2,000 km
(4) 2,500 km

34. The difference in arrival times for *P*- and *S*-waves from an earthquake is 5.0 minutes. According to the *Earth Science Reference Tables*, how far away is the epicenter of the earthquake?
(1) 1.3×10^3 km
(2) 2.6×10^3 km
(3) 3.5×10^3 km
(4) 8.1×10^3 km

35. Following an earthquake, a seismograph station recorded the arrival of a *P*-wave at 3:09:30 a.m. and an *S*-wave at 3:14:00 a.m. According to the *Earth Science Reference Tables*, what is the distance from the seismograph station to the epicenter of the earthquake?
(1) 1,200 km
(2) 3,000 km
(3) 6,100 km
(4) 7,500 km

36. The circles on the map below show the distances from three seismic stations, *X*, *Y*, and *Z*, to the epicenter of an earthquake.



Which location is closest to the earthquake epicenter?
(1) *A*
(2) *B*
(3) *C*
(4) *D*

37. Which seismic information is needed to find the distance from an observer to an earthquake epicenter?
(1) origin time of the earthquake
(2) depth of the earthquake focus
(3) *P*-wave and *S*-wave refractions
(4) *P*-wave and *S*-wave arrival times

38. Base your answer to the following question on the *Earth Science Reference Tables*.

At a seismograph recording station, the difference between the arrival times of an earthquake's compression wave (*P*-wave) and its shear wave (*S*-wave) is 8 minutes 20 seconds. How far from the station is the epicenter?
(1) 2,400 km
(2) 4,500 km
(3) 5,000 km
(4) 6,800 km

39. The epicenter of an earthquake is 6,000 kilometers from an observation point. What is the difference in travel time for the *P*-waves and *S*-waves?
(1) 7 min 35 sec
(2) 9 min 20 sec
(3) 13 min 10 sec
(4) 17 min 00 sec

40. How far from an earthquake epicenter is a city where the difference between the *P*-wave and *S*-wave arrival times is 6 minutes and 20 seconds?
(1) 1.7×10^3 km (3) 3.5×10^3 km
(2) 9.9×10^3 km (4) 4.7×10^3 km

41. At which epicenter distance is the difference in arrival times between *P*-waves and *S*-waves greatest?
(1) 1,000 km (3) 5,000 km
(2) 3,000 km (4) 7,000 km

42. A *P*-wave reaches a seismograph station 2,600 kilometers from an earthquake epicenter at 12:10 p.m. According to the *Earth Science Reference Tables*, at what time did the earthquake occur?
(1) 12:01 p.m. (3) 12:15 p.m.
(2) 12:05 p.m. (4) 12:19 p.m.

43. A seismograph station 3×10^3 kilometers from an epicenter received *P*-waves at 3:33:00 in the afternoon. What was the origin time of the earthquake? [Refer to the *Earth Science Reference Tables*.]
(1) 3:03:00 p.m. (3) 3:28:40 p.m.
(2) 3:27:20 p.m. (4) 3:38:40 p.m.

44. An earthquake occurred at 5:00:00 a.m. According to the *Earth Science Reference Tables*, at what time would the *P*-wave reach a seismic station 3,000 kilometers from the epicenter?
(1) 5:01:40 a.m. (3) 5:05:40 a.m.
(2) 5:04:30 a.m. (4) 5:10:15 a.m.

45. A seismographic station determines that its distance from the epicenter of an earthquake is 4,000 kilometers. According to the *Earth Science Reference Tables*, if the *P*-wave arrived at the station at 10:15 a.m., the time of the earthquake's origin was
(1) 10:02 a.m. (3) 10:10 a.m.
(2) 10:08 a.m. (4) 10:22 a.m.

46. Seismic studies of the Moon have helped scientists to make inferences about
(1) water erosion on the Moon
(2) weathering on the Moon's surface
(3) radioactivity of the Moon's surface rocks
(4) the Moon's interior

47. The inference that the inner core of the Earth is solid is based on analysis of
(1) seismic data (3) radioactive data
(2) crustal rock (4) meteorite composition

48. According to the *Earth Science Reference Tables*, as depth within the Earth's interior increases, the
(1) density, temperature, and pressure decrease
(2) density, temperature, and pressure increase
(3) density and temperature decrease, but pressure increases
(4) density decreases, but temperature and pressure increase

49. Where is the thickest part of the Earth's crust?
(1) at mid-ocean ridges
(2) at transform faults
(3) under continental mountain ranges
(4) under volcanic islands

50. The thinnest section of the Earth's crust is found beneath
(1) oceans (3) mountain regions
(2) coastal plains (4) desert regions

51. The interface between the crust and mantle of the Earth is generally much deeper under continental surfaces than under ocean surfaces. This information indicates that
(1) the interface varies in an unpredictable manner
(2) oceanic crust is thicker than continental crust
(3) continental crust is thicker than oceanic crust
(4) both oceanic and continental crusts are approximately the same thickness

52. Which statement best describes Earth's crust and mantle?
(1) The crust is thicker and less dense than the mantle.
(2) The crust is thicker and more dense than the mantle.
(3) The crust is thinner and less dense than the mantle.
(4) The crust is thinner and more dense than the mantle.

53. Where is the thickest part of the Earth's crust?
(1) at the edge of continental shelves
(2) at mid-ocean ridges
(3) under continental mountain ranges
(4) under volcanic islands

54. Compared to the continental crust of central North America, the oceanic crust of the Mid-Atlantic Ridge is
(1) younger (3) less dense
(2) thicker (4) more felsic

55. According to the *Earth Science Reference Tables*, the *rate* of temperature increase below the Earth's surface is greatest between depths of
(1) 250 and 500 km (3) 2500 and 3500 km
(2) 1500 and 2500 km (4) 3500 and 4000 km

56. According to the *Earth Science Reference Tables*, in which region of the Earth's interior would material with a density of 10 grams per cubic centimeter most likely be found?
(1) inner core (3) crust
(2) outer core (4) mantle

57. According to the *Earth Science Reference Tables*, in which zone of the Earth's interior is the melting point of the rock inferred to be lower than the actual temperature of the rock?

(1) outer core (3) crust
(2) inner core (4) mantle

58. Which statement about the Earth's mantle is best supported by data given in the *Earth Science Reference Tables*?

(1) The density of the mantle is greatest 300 km below the Earth's surface.
(2) The highest temperatures within the Earth occur in the mantle.
(3) The greatest pressures within the Earth exist in the mantle.
(4) The temperature of the mantle 300 km below the Earth's surface is very near its melting point.

59. The source of energy for the high temperatures found deep within the Earth is

(1) tidal friction
(2) incoming solar radiation
(3) decay of radioactive materials
(4) meteorite bombardment of the Earth

60. Which statement best explains why the direction of some seismic waves changes sharply as the waves travel through the Earth?

(1) The Earth is spherical.
(2) Seismic waves tend to travel in curved paths.
(3) The temperature of the Earth's interior decreases with depth.
(4) Different parts of the Earth's interior have different densities.

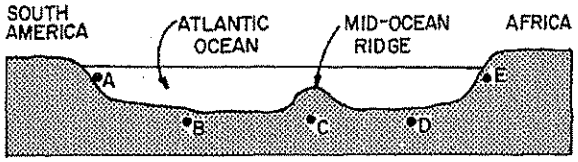
61. The composition of the Earth's core is thought to be the same as the composition of

(1) certain meteorites (3) most granites
(2) most basalts (4) volcanic ash

62. The primary cause of convection currents in the Earth's mantle is believed to be the

(1) differences in densities of earth materials
(2) subsidence of the crust
(3) occurrence of earthquakes
(4) rotation of the Earth

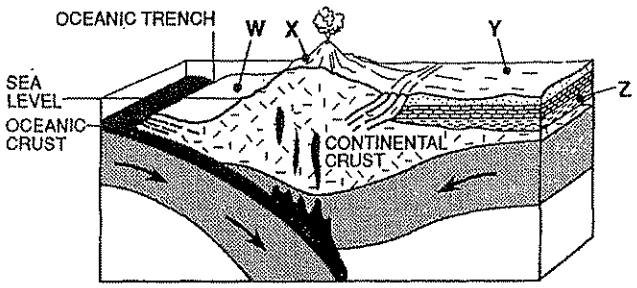
63. The diagram below represents a cross section of the Atlantic Ocean from the eastern coast of South America to the western coast of Africa along the Equator.



At what point would evidence of a rising convection current in the mantle most likely be found?

(1) *A* (3) *C*
(2) *B* (4) *E*

64. The diagram below represents a cross section of the Earth's crust at a location where an oceanic plate is converging (colliding) with a continental plate. The arrows indicate the direction of plate motion. Letters *W*, *X*, *Y*, and *Z* represent locations on the Earth.



For an observer on the Earth's surface, the best evidence of this crustal plate collision would probably be provided by

(1) seafloor fossils at location *W*
(2) earthquakes and volcanic eruptions near location *X*
(3) flooding near location *Y*
(4) horizontal sedimentary layers at location *Z*

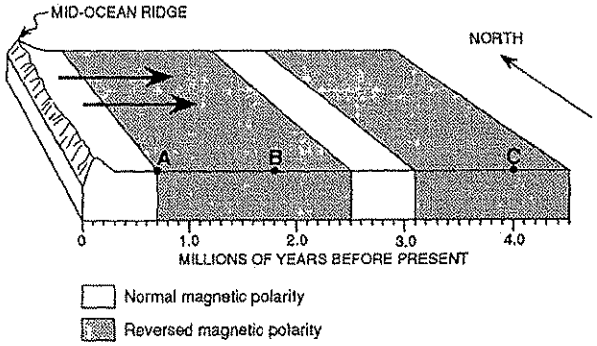
65. Crustal disturbances such as earthquakes and volcanic eruptions are best described as

(1) events that are cyclic and predictable
(2) events that are usually related and cannot be predicted with accuracy
(3) unrelated events that follow no pattern
(4) phenomena seldom found in the same regions

Base your answers to questions **66** through **68** on the *Earth Science Reference Tables* and the information and diagram below.

At intervals in the past, the Earth's magnetic field has reversed. The present North magnetic pole was once the South magnetic pole, and the present South magnetic pole was once the North magnetic pole. A record of these changes is preserved in the igneous rocks that formed at mid-ocean ridges and moved away from the ridges.

The diagram below represents the pattern of normal and reversed magnetic polarity in the igneous rocks composing the ocean crust on the east side of a mid-ocean ridge.

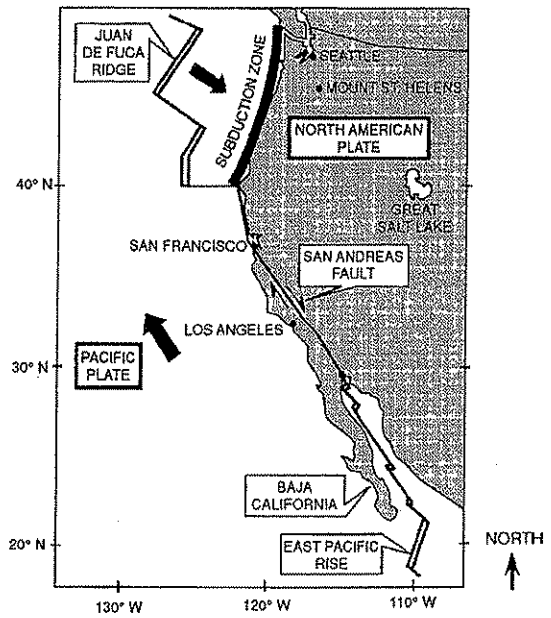


66. Approximately how many million years were required to form the material shown between *A* and *B* in the diagram?
(1) 2.5 (3) 1.1
(2) 1.8 (4) 0.7

67. During which geological epoch were the rocks at letter *C* formed?
(1) Eocene (3) Paleocene
(2) Oligocene (4) Pliocene

68. The igneous material along this mid-ocean ridge was found to be younger than the igneous material farther from the ridge. This fact supports the theory of
(1) crustal subsidence (3) superposition
(2) seafloor spreading (4) dynamic equilibrium

Base your answers to questions **69** through **73** on the map below. The map shows crustal plate boundaries located along the Pacific coastline of the United States. The arrows show the general directions in which some of the plates appear to be moving slowly.



69. Which feature is located at 20° North latitude and 109° West longitude?
(1) San Andreas fault (3) Baja California
(2) East Pacific rise (4) Juan de Fuca Ridge

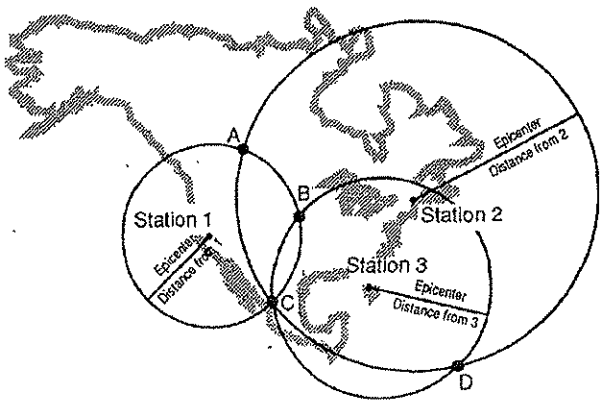
70. Geologic studies of the San Andreas fault indicate that
(1) many earthquakes occur along the San Andreas fault
(2) the North American plate and the Pacific plate are locked in dynamic equilibrium
(3) the subduction zone is the boundary at which the crustal plates are drifting apart
(4) the age of the bedrock increases as distance from the fault increases

71. Which features are most often found at crustal plate boundaries like those shown on the map?
(1) meandering rivers and warm-water lakes
(2) plains and plateaus
(3) geysers and glaciers
(4) faulted bedrock and volcanoes

72. What would a study of the East Pacific rise (a mid-ocean ridge) indicate about the age of the basaltic bedrock in this area?
(1) The bedrock is youngest at the ridge.
(2) The bedrock is oldest at the ridge.
(3) The bedrock at the ridge is the same age as the bedrock next to the continent.
(4) The bedrock at the ridge is the same age as the bedrock at the San Andreas fault.

73. The best way to find the direction of crustal movement along the San Andreas fault is to
    (1) study the Earth's present magnetic field
    (2) observe erosion along the continental coastline
    (3) measure gravitational strength on opposite sides of the fault
    (4) match displaced rock types from opposite sides of the fault

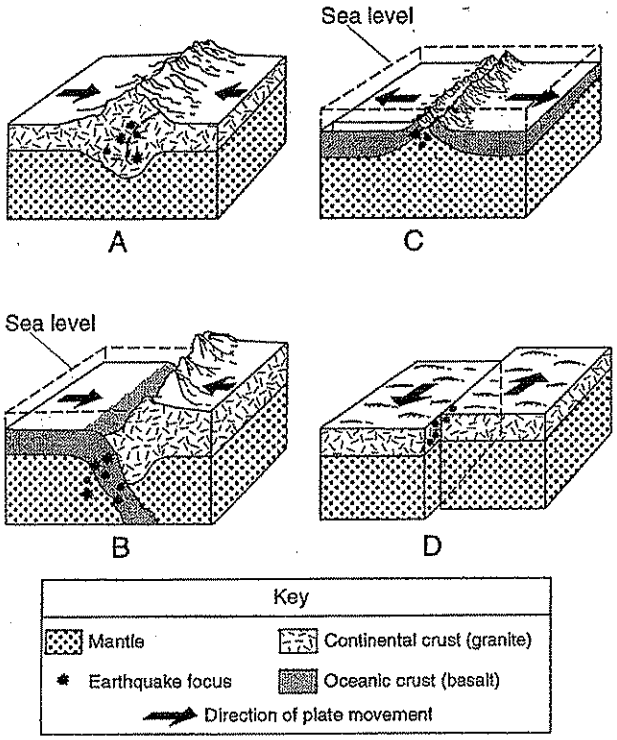
Base your answers to questions **74** and **75** on the *Earth Science Reference Tables* and the diagram below. The diagram shows a method used to locate the epicenter of an earthquake.



74. Which location represents the epicenter of the earthquake?
    (1) *A* (3) *C*
    (2) *B* (4) *D*

75. If the distance from the epicenter to station 2 is 3,500 kilometers, what is the approximate difference in the arrival times of the *P*-waves and *S*-waves at station 2?
    (1) 1 minute 40 seconds (3) 6 minutes 20 seconds
    (2) 5 minutes 10 seconds (4) 11 minutes 30 seconds

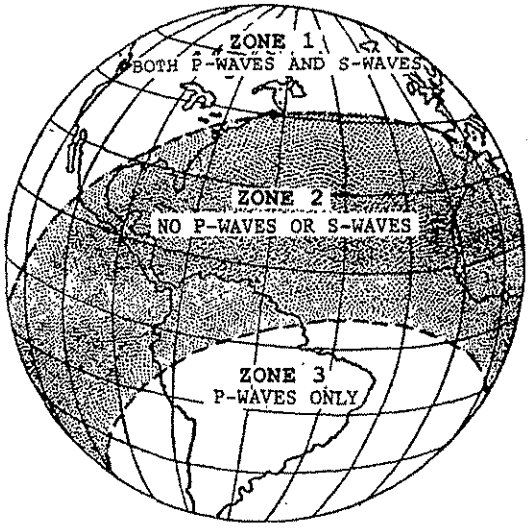
Base your answers to questions **76** and **77** on the diagrams below of geologic cross sections of the upper mantle and crust at four different Earth locations, *A*, *B*, *C*, and *D*. Movement of the crustal sections (plates) is indicated by arrows, and the locations of frequent earthquakes are indicated by ∗. Diagrams are not drawn to scale.



76. Which location best represents the boundary between the African plate and the South American plate?
    (1) *A* (3) *C*
    (2) *B* (4) *D*

77. Which diagram represents plate movement associated with transform faults such as those causing California earthquakes?
    (1) *A* (3) *C*
    (2) *B* (4) *D*

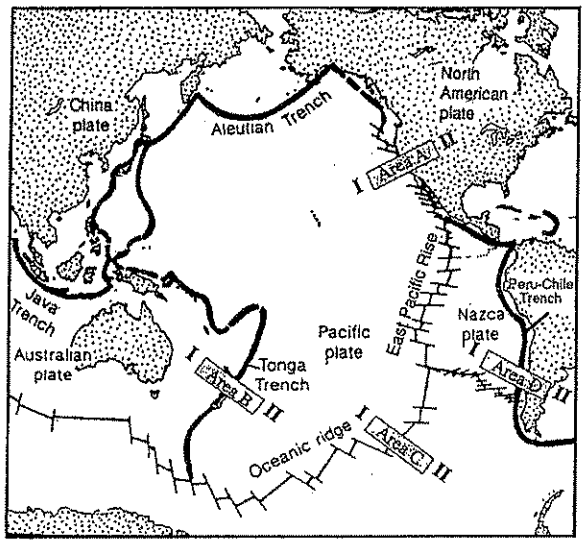
Base your answers to questions **78** and **79** on the diagram of the Earth below showing the observed pattern of waves recorded after an earthquake.



78. The lack of *S*-waves in zone 3 can best be explained by the presence within the Earth of
    (1) density changes
    (2) mantle convection cells
    (3) a liquid outer core
    (4) a solid inner core

79. The location of the epicenter of the earthquake that produced the observed wave pattern most likely is in the
    (1) crust in zone 1
    (2) mantle in zone 2
    (3) crust in zone 3
    (4) core of the Earth

Base your answers to questions **80** through **82** on the *Earth Science Reference Tables* and the map below. The map shows mid-ocean ridges and trenches in the Pacific Ocean. Specific areas *A*, *B*, *C*, and *D* are indicated by shaded rectangles.

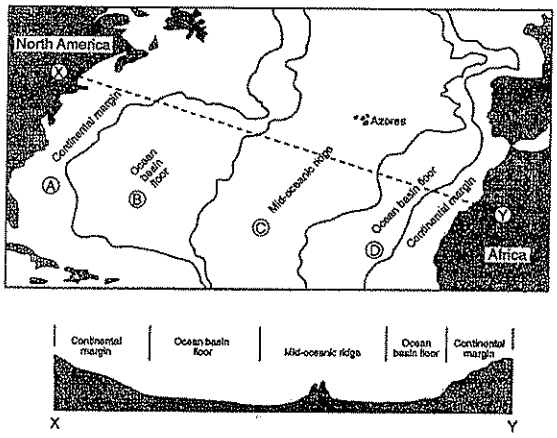


80. Movement of the crustal plates shown in the diagram is most likely caused by
    (1) the revolution of the Earth
    (2) the erosion of the Earth's crust
    (3) shifting of the Earth's magnetic poles
    (4) convection currents in the Earth's mantle

81. The crust at the mid-ocean ridges is composed mainly of
    (1) shale
    (2) limestone
    (3) granite
    (4) basalt

82. Mid-ocean ridges such as the East Pacific Rise and the Oceanic Ridge are best described as
    (1) mountains containing folded sedimentary rocks
    (2) mountains containing fossils of present-day marine life
    (3) sections of the ocean floor that contain the youngest oceanic crust
    (4) sections of the ocean floor that are the remains of a submerged continent

Base your answers to questions **83** through **85** on the map and profile shown below. The map shows the major areas of the North Atlantic Ocean. Letters *A*, *B*, *C*, and *D* represent locations in the ocean floor. The profile represents the ocean bottom from point *X* in North America along the dashed line to point *Y* in Africa. Note that the profile is vertically exaggerated.

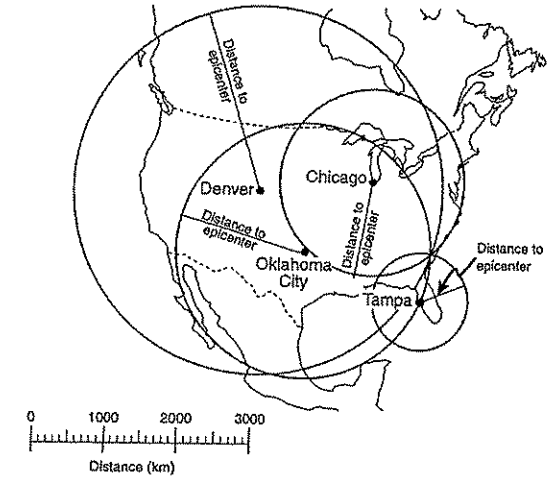


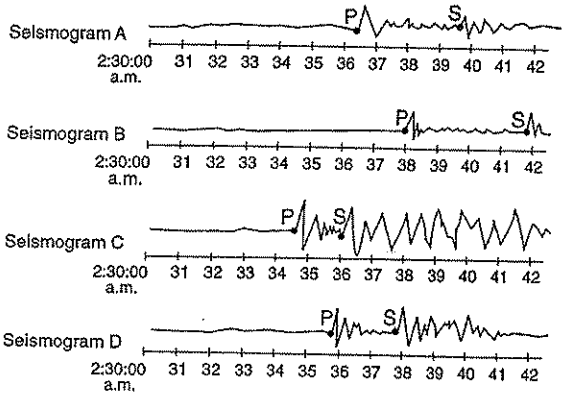
83. Classification of the ocean bottom into the areas shown is based on the
    (1) distance from continental landmasses
    (2) topography of the ocean floor
    (3) age of ocean-bottom rocks
    (4) type of ocean-bottom sediments

84. At which location would land-derived sediments most likely be accumulating on the ocean bottom?
    (1) *A* (3) *C*
    (2) *B* (4) *D*

85. Which statement about the age of ocean-floor rocks is correct?
    (1) All ocean-floor rocks are generally the same age.
    (2) Rocks at location *C* are generally older than rocks at locations *A* and *B*.
    (3) Rocks at location *C* are generally younger than rocks at locations *A* and *B*.
    (4) Igneous rocks at location *D* are generally younger than rocks at location *C*.

Base your answers to questions **86** through **88** on the *Earth Science Reference Tables* and the map and seismograms below. 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.



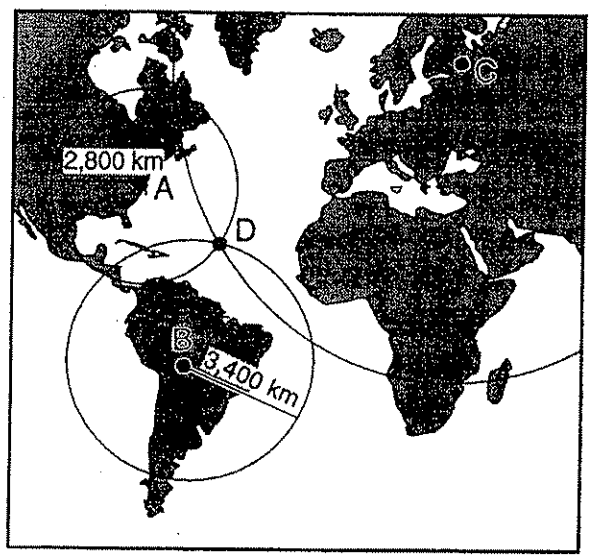


86. Which seismogram was recorded at Tampa?
(1) seismogram *A* (2) seismogram *B* (3) seismogram *C* (4) seismogram *D*

87. What was the origin time of this earthquake?
(1) 2:33:00 a.m. (2) 2:34:40 a.m. (3) 2:35:40 a.m. (4) 2:37:00 a.m.

88. 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 this same seismic station?
(1) 1 minute 20 seconds (2) 2 minutes 40 seconds (3) 3 minutes 30 seconds (4) 4 minutes 50 seconds

Base your answers to questions **89** through **93** on the *Earth Science Reference Tables* and the map below. 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.



89. At which location is the arrival-time difference between the *P*-wave and the *S*-wave greatest?
    (1) *A* (3) *C*
    (2) *B* (4) *D*

90. Approximately how long did the *S*-wave take to travel from the epicenter to location *A*?
    (1) 11 min 15 sec (3) 5 min 20 sec
    (2) 9 min 35 sec (4) 4 min 20 sec

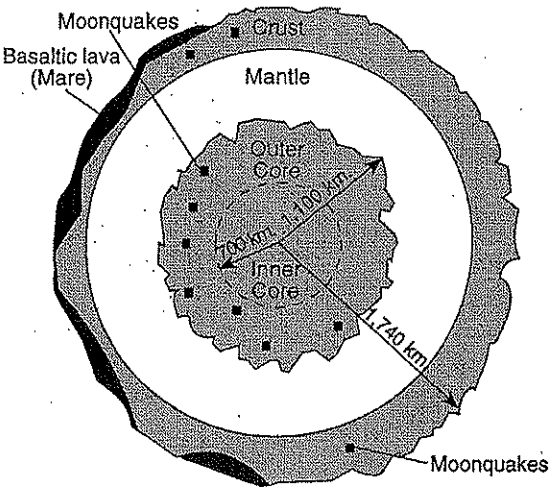
91. Which statement best describes the igneous crustal bedrock below locations *A, B, C,* and *D*?
    (1) The bedrock below *D* is mostly basalt; below *A, B,* and *C,* the bedrock is mostly granite.
    (2) The bedrock below *D* is mostly granite; below *A, B,* and *C,* the bedrock is mostly basalt.
    (3) The bedrock below *A, B, C,* and *D* is mostly basalt.
    (4) The bedrock below *A, B, C,* and *D* is mostly granite.

92. If seismograph station *B* receives the first *P*-wave at 09:35:20, at what time did the earthquake occur?
    (1) 09:05:00 (3) 09:29:05
    (2) 09:06:15 (4) 09:33:25

93. How does the age of the ocean-floor bedrock change as the distance east or west of location *D* increases?
    (1) The age decreases, because *D* is in an oceanic trench.
    (2) The age decreases, because *D* is on a mid-oceanic ridge.
    (3) The age increases, because *D* is in an oceanic trench.
    (4) The age increases, because *D* is on a mid-oceanic ridge.

Base your answers to questions **94** through **98** on the *Earth Science Reference Tables* and on the information and the cross section below. The cross section represents a possible model of the Moon's interior.

Seismographs left on the Moon by astronauts have provided enough data to develop a model of the Moon's interior. Scientists believe that the Moon has a layered interior and that its crustal thickness varies greatly from one side of the Moon to the other.



94. From a single seismograph recording of the *P*- and *S*-waves from a moonquake, scientists can determine the
    (1) distance to the Earth
    (2) location of the quake focus
    (3) distance to the quake epicenter
    (4) circumference of the Moon

95. According to the cross section, which characteristic of seismic waves has enabled scientists to determine that the Moon has a layered interior?
    (1) *P*-waves do not pass through liquid rock.
    (2) *P*-waves travel slower than *S*-waves.
    (3) Both *P*- and *S*-waves cannot be reflected.
    (4) Both *P*- and *S*-waves bend as they pass through different materials.

96. According to the cross section, which kind of surface bedrock is found in large amounts on the Moon?
    (1) fossil limestone (3) sedimentary conglomerate
    (2) volcanic rock (4) nonclastic evaporite

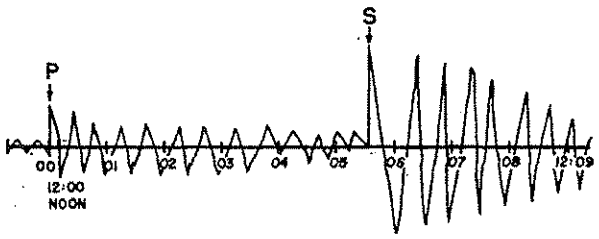
97. If the pressure, temperature, and density patterns of the Moon's interior are similar to those of the Earth's interior, which statement best describes the Moon's characteristics?
    (1) Pressure, temperature, and density all increase with depth.
    (2) Pressure increases with depth, but temperature and density remain the same.
    (3) Pressure and temperature increase with depth, but density remains the same.
    (4) Pressure, temperature, and density remain the same at all depths.

98. Which inference is best supported by the Moon's apparent absence of continental drift?
    (1) The Moon's crust is very thin.
    (2) The Moon has a low-density core.
    (3) The Moon's mountain ranges are rapidly weathering.
    (4) The Moon lacks convection currents in its mantle.

99. Base your answer to the following question on the *Earth Science Reference Tables*.

    A seismograph station records a travel time difference of 5.5 minutes between the P-waves and S-waves of an earthquake. How far is the seismic station from the epicenter of this earthquake?
    (1) 1.5×10^3 km
    (2) 2.0×10^3 km
    (3) 3.0×10^3 km
    (4) 4.0×10^3 km

100. The seismogram below shows the arrival times of *P*- and *S*-waves from a single earthquake. According to the *Earth Science Reference Tables*, how far from the earthquake epicenter was the station that recorded this seismogram?



    (1) 1.5×10^3 km
    (2) 2.5×10^3 km
    (3) 3.0×10^3 km
    (4) 4.0×10^3 km