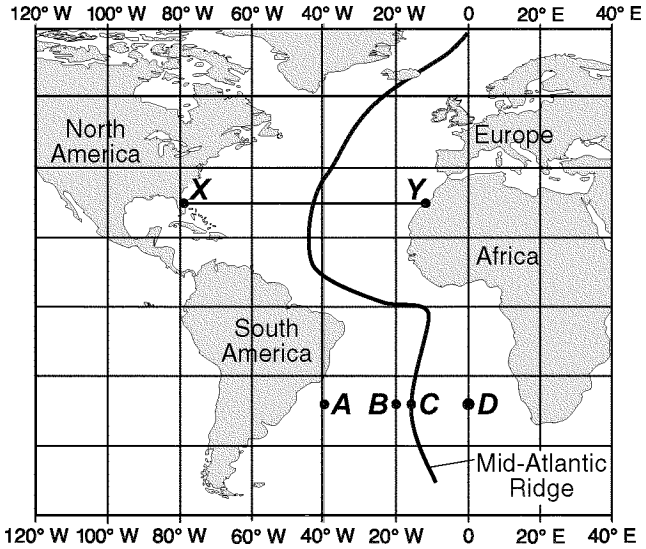
Name: _____

Questions 1 through 3 refer to the following:

The map below shows the Mid-Atlantic Ridge. Points *A* through *D* are locations on the ocean floor. Line *XY* connects locations in North America and Africa.



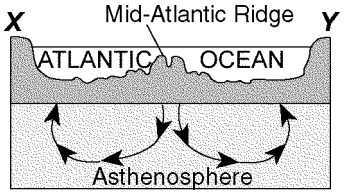
1) Samples of ocean-floor bedrock were collected at points *A*, *B*, *C*, and *D* on the given map. Which sequence shows the correct order of the age of the bedrock from *oldest* to *youngest*?

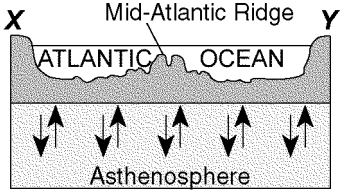
A) $D \longrightarrow C \longrightarrow B \longrightarrow A$
B) $A \longrightarrow D \longrightarrow B \longrightarrow C$
C) $A \longrightarrow B \longrightarrow D \longrightarrow C$
D) $C \longrightarrow B \longrightarrow D \longrightarrow A$

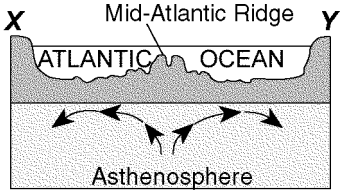
2) The boundary between which two tectonic plates is most similar geologically to the plate boundary at the Mid-Atlantic Ridge?

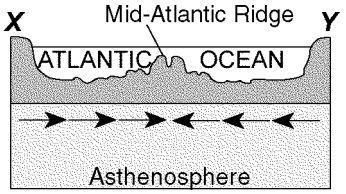
A) Pacific and Nazca
B) Cocos and Caribbean
C) Nazca and South American
D) Eurasian and Indian-Australian

3) In which cross section do the arrows *best* show the convection occurring within the asthenosphere beneath line *XY* on the map shown?

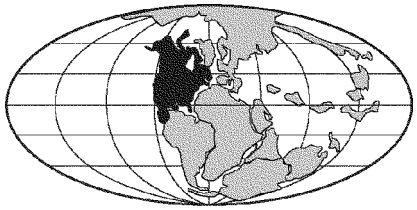
A)


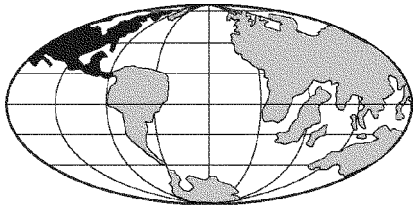
B)


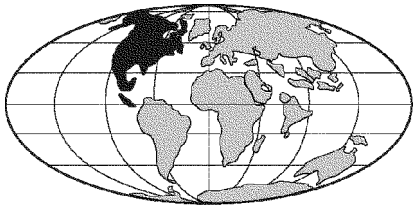
C)


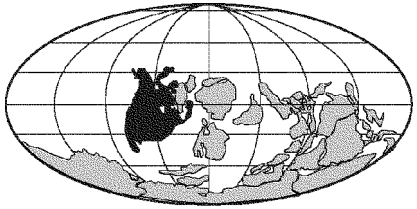
D)


4) Which map *best* indicates the probable locations of continents 100 million years from now if tectonic plate movement continues at its present rate and direction?

A) 

B) 

C) 

D) 

5) Why does the oceanic crust sink beneath the continental crust at a subduction boundary?

A) The oceanic crust is pulled downward by Earth's magnetic field.
B) The continental crust is pulled upward by the Moon's gravity.
C) The continental crust has a more mafic composition.
D) The oceanic crust has a greater density.

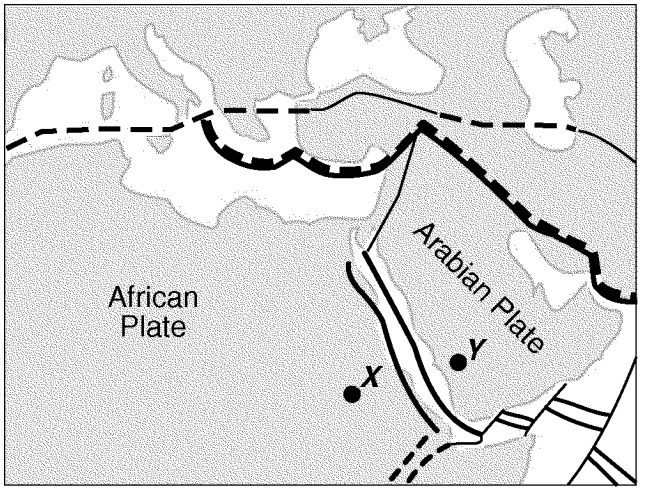
6) Which temperature is inferred to exist in Earth's plastic mantle?

A) 3,000°C B) 6,000°C C) 2,000°C D) 5,000°C

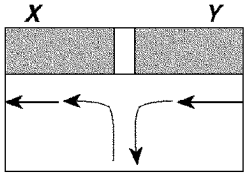
7) In which Earth layer are *most* convection currents that cause seafloor spreading thought to be located?

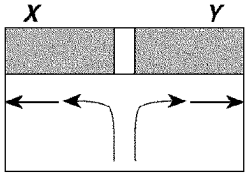
A) inner core
B) asthenosphere
C) outer core
D) crust

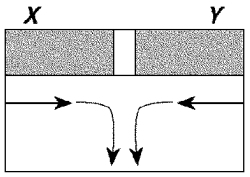
8) The map below shows a portion of Earth's surface. Points *X* and *Y* are locations on the lithosphere.

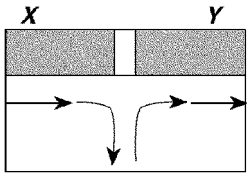


Which of the following cross sections shows the inferred movement of material in the asthenosphere beneath points *X* and *Y*?

A) 

C) 

B) 

D) 

9) The Mariana Trench was most likely created by the

A) movement of the Pacific Plate over the Hawaii Hot Spot
B) divergence of the Eurasian and Philippine Plates
C) convergence of the Pacific and Philippine Plates
D) sliding of the Pacific Plate past the North American Plate

10) Scientists have inferred the structure of Earth's interior mainly by analyzing

A) Earth's seismic data
B) the Moon's composition
C) the Moon's interior
D) Earth's surface features

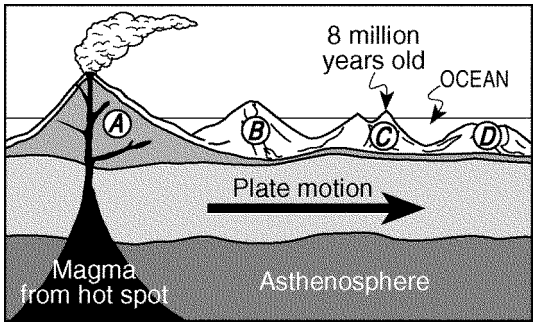
11) Beneath which surface location is Earth's crust the *thinnest*?

A) San Andreas Fault
B) the center of South America
C) East Pacific Ridge
D) Old Forge, New York

12) Which conditions normally can be found in Earth's asthenosphere, producing a partial melting of ultramafic rock?

A) temperature = 3,500°C;
pressure = 0.5 million atmospheres
B) temperature = 2,000°C;
pressure = 0.1 million atmospheres
C) temperature = 6,000°C;
pressure = 4 million atmospheres
D) temperature = 1,000°C;
pressure = 10 million atmospheres

13) The cross section below shows the direction of movement of an oceanic plate over a mantle hot spot, resulting in the formation of a chain of volcanoes labeled *A*, *B*, *C*, and *D*. The geologic age of volcano *C* is shown.



What are the most likely geologic ages of volcanoes *B* and *D*?

A) *B* is 5 million years old and *D* is 12 million years old.
B) *B* is 9 million years old and *D* is 9 million years old.
C) *B* is 2 million years old and *D* is 6 million years old.
D) *B* is 10 million years old and *D* is 4 million years old.

14) At which of the following plate boundaries is one lithospheric plate sliding under another?

A) Nazca Plate and Pacific Plate
B) Indian-Australian Plate and Antarctic Plate
C) Nazca Plate and Antarctic Plate
D) Pacific Plate and Indian-Australian Plate

15) The data table below shows the origin depths of all large-magnitude earthquakes over a 20-year period.

DATA TABLE

Depth Below Surface (km)	Number of Earthquakes
0–33	27,788
34–100	17,585
101–300	7,329
301–700	3,167

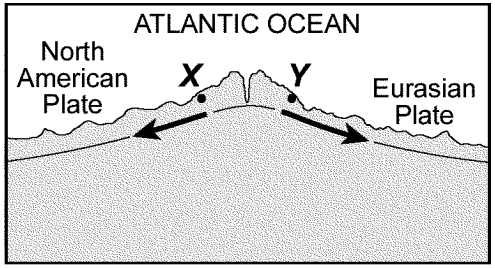
According to these data, most of these earthquakes occurred within Earth's

A) outer core
B) asthenosphere
C) lithosphere
D) stiffer mantle

16) Which two tectonic plates are separated by a mid-ocean ridge?

A) Indian-Australian and Eurasian
B) Indian-Australian and Pacific
C) North American and South American
D) North American and Eurasian

17) The cross section below shows an underwater mountain range in the Atlantic Ocean. The oceanic bedrock is composed mainly of basalt. Points *X* and *Y* are locations in the bedrock that have been diverging at the same rate. The movement of the North American Plate and Eurasian Plate is shown by the two arrows.



(not drawn to scale)

Which statements *best* describe the age and magnetic orientation of the basalts found at locations *X* and *Y* on the cross section shown?

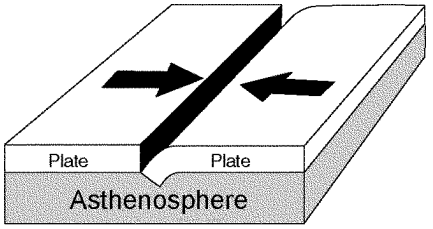
A) The basalt at location *X* is younger than the basalt at location *Y*. Both locations have the same magnetic orientation.
B) The basalts at locations *X* and *Y* are the same age. Both locations have the same magnetic orientation.
C) The basalt at location *X* is older than the basalt at location *Y*. Location *X* has reversed magnetic orientation and location *Y* has normal magnetic orientation.
D) The basalts at locations *X* and *Y* are the same age. Location *X* has normal magnetic orientation and location *Y* has reversed magnetic orientation.

18) Compared to the continental crust, the oceanic crust is

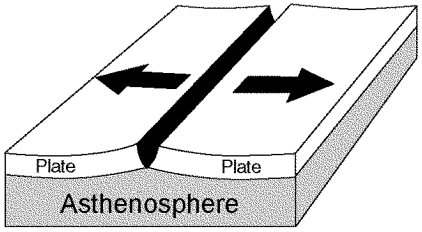
A) more dense and thinner
B) less dense and thinner
C) more dense and thicker
D) less dense and thicker

19) Which block diagram *best* represents the relative direction of plate motion at the San Andreas Fault?

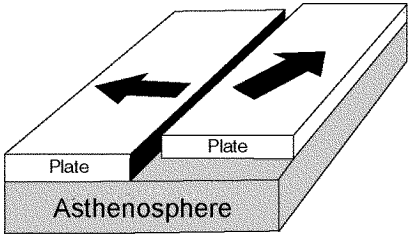
A)



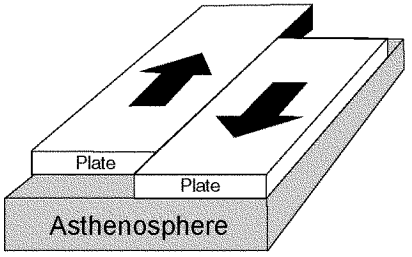
B)



C)



D)



20) Convection currents in the plastic mantle are believed to cause divergence of lithospheric plates at the

A) Peru-Chile Trench
B) Canary Islands Hot Spot
C) Mariana Trench
D) Iceland Hot Spot

21) Compared to the continental crust, the oceanic crust is

A) less dense and less felsic
B) less dense and less mafic
C) more dense and more mafic
D) more dense and more felsic

22) Which observation about the Mid-Atlantic Ridge region provides the *best* evidence that the seafloor has been spreading for millions of years?

A) The bedrock of the ridge and nearby seafloor is igneous rock.
B) Seafloor bedrock is younger near the ridge and older farther away.
C) Several faults cut across the ridge and nearby seafloor.
D) The ridge is the location of irregular volcanic eruptions.

23) Active volcanoes are *most* abundant along the

A) edges of tectonic plates
B) eastern coastline of continents
C) 23.5° N and 23.5° S parallels of latitude
D) equatorial ocean floor

24) Based on the theory of plate tectonics, it is inferred that over the past 250 million years North America has moved toward the

A) southeast
B) northwest
C) northeast
D) southwest

25) What happens to the density and temperature of rock within Earth's interior as depth increases?

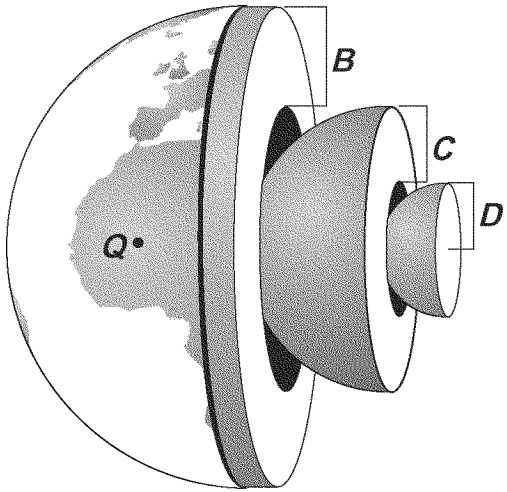
A) density decreases and temperature decreases
B) density increases and temperature decreases
C) density increases and temperature increases
D) density decreases and temperature increases

26) What does granite bedrock found high on a mountaintop indicate?

A) A large amount of erosion has occurred.
B) Sea level has risen.
C) The crust has been sinking.
D) Global temperatures have cooled.

Questions 27 and 28 refer to the following:

In the diagram of Earth shown below, letters *B*, *C*, and *D* represent layers of Earth. Letter *Q* represents a location on Earth's surface.



27) Which letter in the given diagram *best* represents Earth's mantle?

A) *B*
B) *Q*
C) *C*
D) *D*

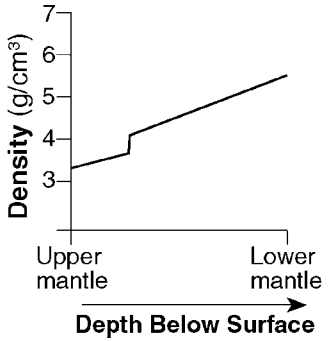
28) What is the probable density of the granitic bedrock at *Q* in the given diagram?

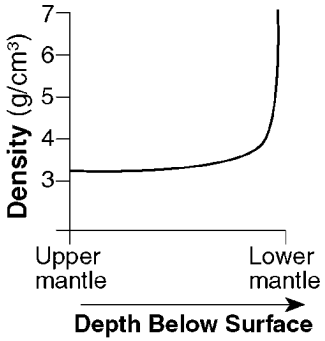
A) 3.0 g/cm^3
B) 1.0 g/cm^3
C) 2.7 g/cm^3
D) 5.5 g/cm^3

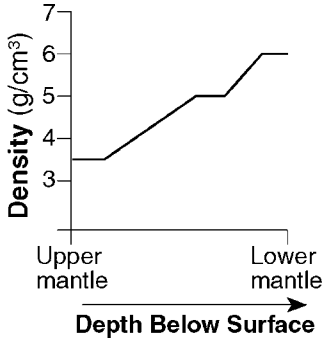
29) Earth's inner core is inferred to be solid based on the analysis of

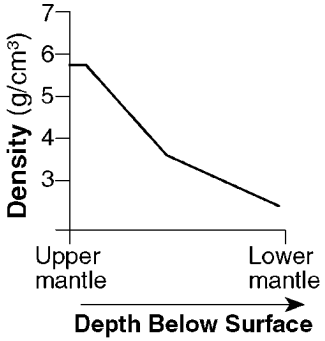
A) magnetic pole reversals
B) seismic waves
C) radioactive decay rates
D) crustal rocks

30) Which graph *best* shows the inferred density of Earth's interior as depth increases from the upper mantle to the lower mantle?

A)


C)


B)


D)


31) What part of Earth's interior is inferred to have convection currents that cause tectonic plates to move?

A) asthenosphere
B) rigid mantle
C) inner core
D) outer core

32) The edges of *most* lithospheric plates are characterized by

A) reversed magnetic orientation
B) unusually rapid radioactive decay
C) low *P*-wave and high *S*-wave velocity
D) frequent volcanic activity

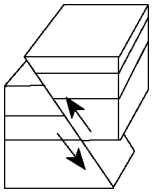
33) Alternating parallel bands of normal and reversed magnetic polarity are found in the basaltic bedrock on either side of the

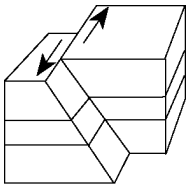
A) Mid-Atlantic Ridge
B) Yellowstone Hot Spot
C) Peru-Chile Trench
D) San Andreas Fault

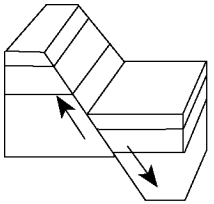
34) When two tectonic plates collide, oceanic crust usually subducts beneath continental crust because oceanic crust is primarily composed of igneous rock that has

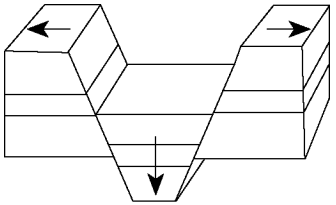
A) high density and is felsic
B) low density and is mafic
C) low density and is felsic
D) high density and is mafic

35) Which of the following block diagrams *best* shows a transform fault?

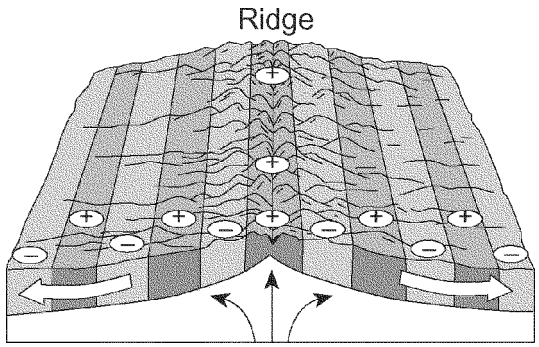
A)


B)


C)


D)


36) The block diagram below represents the present ocean floor. The white arrows show the movement of the ocean floor and the black arrows show the movement of the asthenosphere.



Which characteristic of the ocean-floor bedrock is *best* described by the ⊕ and ⊖ symbols in the diagram?

A) ⊕ = normal magnetic polarity; ⊖ = reversed magnetic polarity

B) ⊕ = reversed magnetic polarity; ⊖ = normal magnetic polarity

C) ⊕ = younger age; ⊖ = older age

D) ⊕ = older age; ⊖ = younger age

37) Which coastal area is most likely to experience a severe earthquake?

A) east coast of Australia
B) west coast of Africa
C) east coast of North America
D) west coast of South America

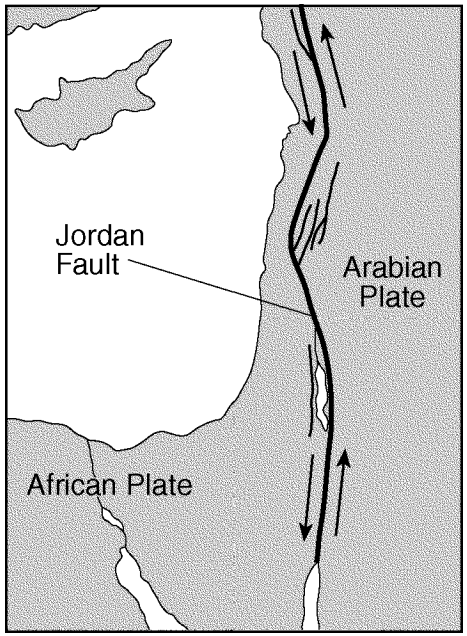
38) The movement of tectonic plates is inferred by many scientists to be driven by

A) solidification in the lithosphere
B) density differences in the troposphere
C) convection currents in the asthenosphere
D) tidal motions in the hydrosphere

39) 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

40) The map below shows the northern section of the boundary between the Arabian Plate and the African Plate. Arrows show the relative direction of plate motion.



Which type of plate boundary is located at the Jordan Fault?

A) transform
B) divergent
C) subduction
D) convergent

41) Which of the following combinations of temperature and pressure is inferred to occur within Earth's stiffer mantle?

A) 5,500°C and 2.0 million atmospheres
B) 5,500°C and 0.4 million atmospheres
C) 3,500°C and 0.4 million atmospheres
D) 3,500°C and 2.0 million atmospheres

42) Compared to Earth's continental crust, Earth's oceanic crust is

A) thinner and less dense
B) thinner and more dense
C) thicker and less dense
D) thicker and more dense

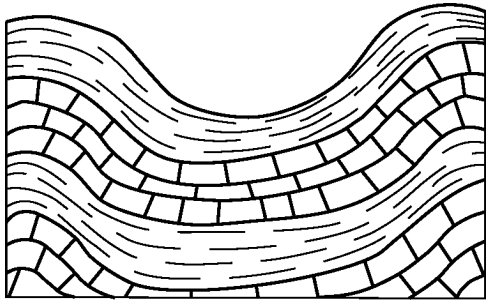
43) Antarctica's location and climate changed over the last 200 million years because Antarctica moved

A) southward, resulting in a colder climate
B) northward, resulting in a colder climate
C) northward, resulting in a warmer climate
D) southward, resulting in a warmer climate

44) Which statement correctly describes the density of Earth's mantle compared to the density of Earth's core and crust?

A) The mantle is more dense than both the core and the crust.
B) The mantle is less dense than both the core and the crust.
C) The mantle is more dense than the core, but less dense than the crust.
D) The mantle is less dense than the core, but more dense than the crust.

45) The cross section below shows a portion of Earth's crust.



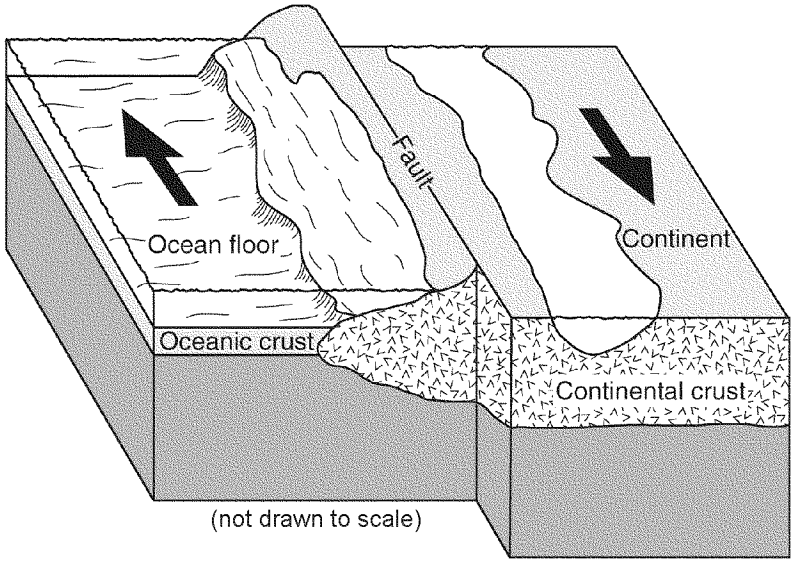
Which observation provides the *most* direct evidence that crustal plate collision has occurred near this region?

A) alternating layers of shale and limestone bedrock
B) folding of the sedimentary layers
C) different thicknesses of the sedimentary layers
D) absence of an igneous intrusive rock

46) What is Earth's inferred interior pressure, in millions of atmospheres, at a depth of 3,500 kilometers?

A) 6,500 B) 5,500 C) 2.8 D) 1.9

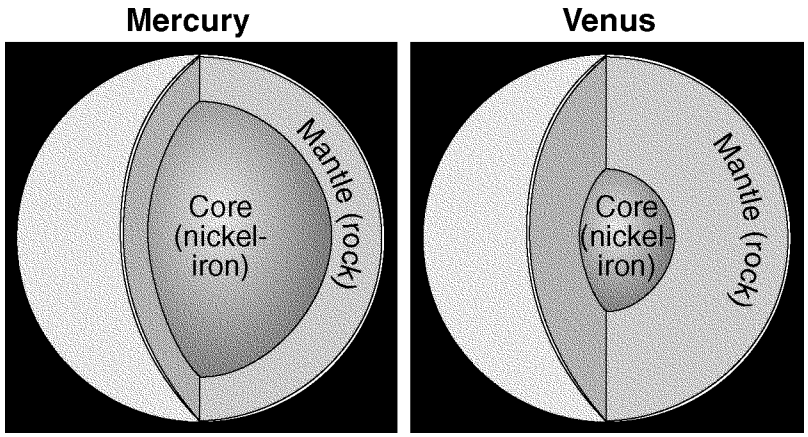
47) Arrows in the block diagram below show the relative movement along a tectonic plate boundary.



Between which two tectonic plates does this type of plate boundary exist?

A) North American Plate and Eurasian Plate
B) Pacific Plate and North American Plate
C) Nazca Plate and South American Plate
D) Eurasian Plate and Indian-Australian Plate

48) The diagram below shows cutaway views of the inferred interior layers of the planets Mercury and Venus.



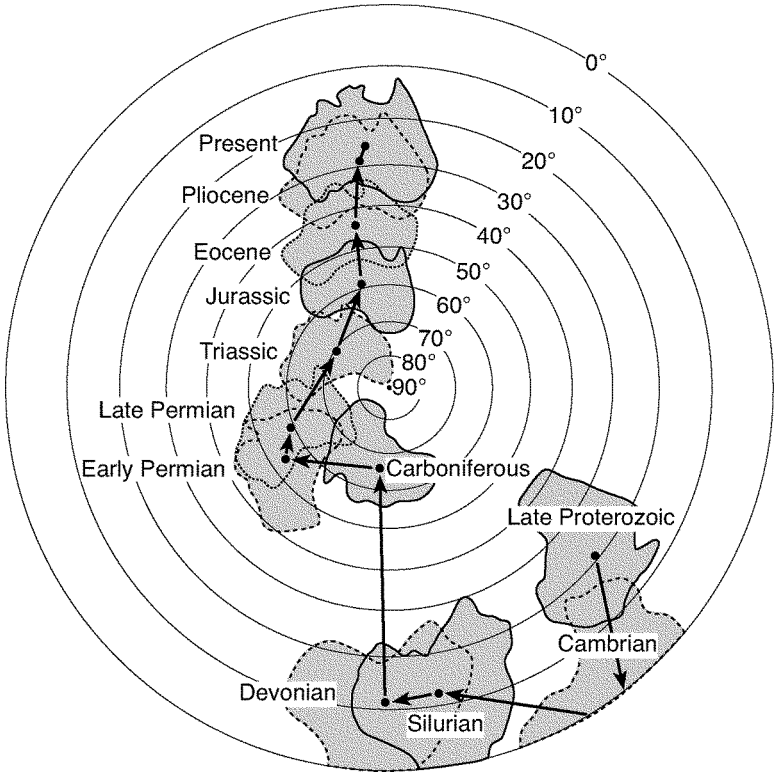
(not drawn to scale)

What is the reason for the development of the interior layers of these two planets?

A) Heat from the Sun melted the surface rocks to form the mantles above the cores.
B) Impact events added the mantle rock above the cores.
C) Gravity separated the cores and mantles due to their density differences.
D) Rapid heat loss caused the cores to solidify before the mantles.

Questions 49 and 50 refer to the following:

The map below shows Earth's Southern Hemisphere and the inferred tectonic movement of the continent of Australia over geologic time. The arrows between the dots show the relative movement of the center of the continent of Australia. The parallels of latitude from 0° to 90° south are labeled.



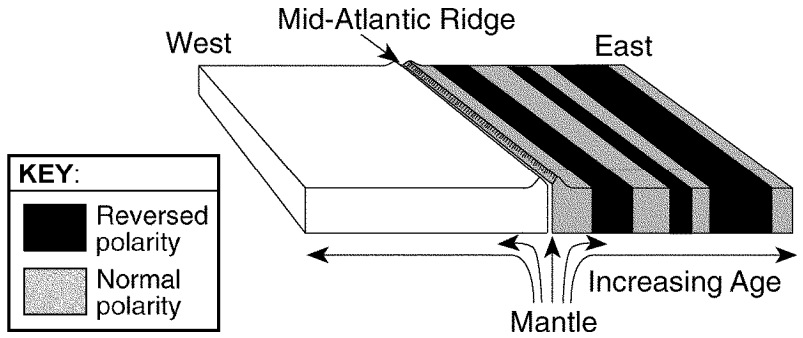
49) The geographic position of Australia on Earth's surface has been changing mainly because

A) Earth's rotation has spun Australia into different locations
B) heat energy has been creating convection currents in Earth's interior
C) the tilt of Earth's axis has changed several times
D) the gravitational force of the Moon has been pulling on Earth's landmasses

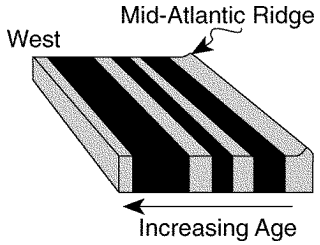
50) Based on the map shown, during which geologic time interval did Australia most likely have a warm, tropical climate because of its location?

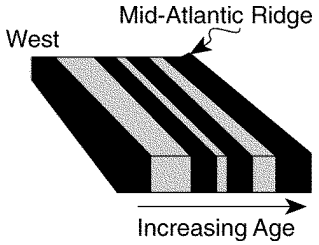
A) Carboniferous
B) Eocene
C) Cambrian
D) Late Permian

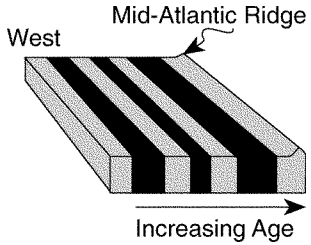
51) The diagram below represents the pattern of normal and reversed magnetic polarity and the relative age of the igneous bedrock composing the ocean floor on the east side of the Mid-Atlantic Ridge. The magnetic polarity of the bedrock on the west side of the ridge has been deliberately left blank.

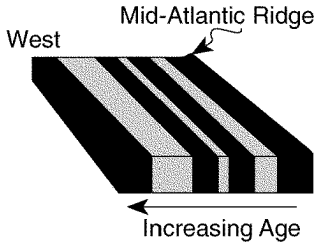


Which diagram below *best* shows the magnetic pattern and relative age of the igneous bedrock on the west side of the ridge?

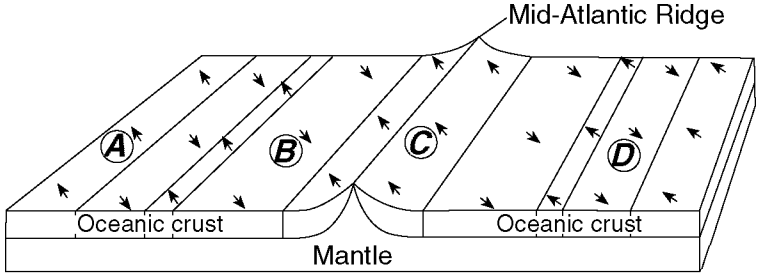
A)


C)


B)


D)


52) The diagram below shows the magnetic polarity preserved by minerals within the bedrock of the oceanic crust near the Mid-Atlantic Ridge. Letters *A*, *B*, *C*, and *D* represent locations in the ocean-floor bedrock.



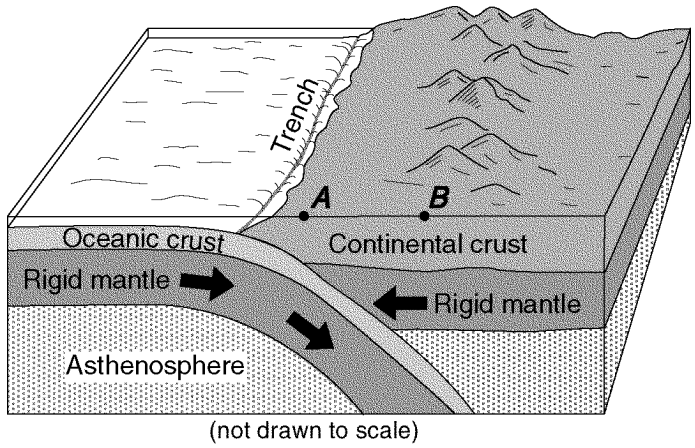
KEY:

Magnetic Polarity of the Bedrock	
Normal	Reversed

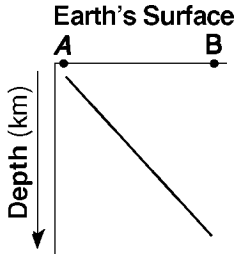
The most recently formed bedrock is found at location

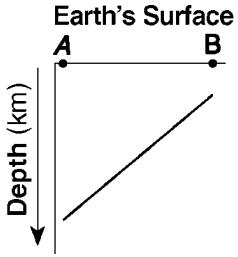
A) *A* B) *B* C) *C* D) *D*

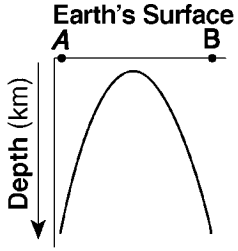
53) The block diagram below shows a tectonic plate boundary. Points *A* and *B* represent locations on Earth's surface.

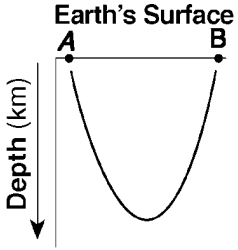


Which graph *best* shows the depths of most major earthquakes whose epicenters lie between *A* and *B*?

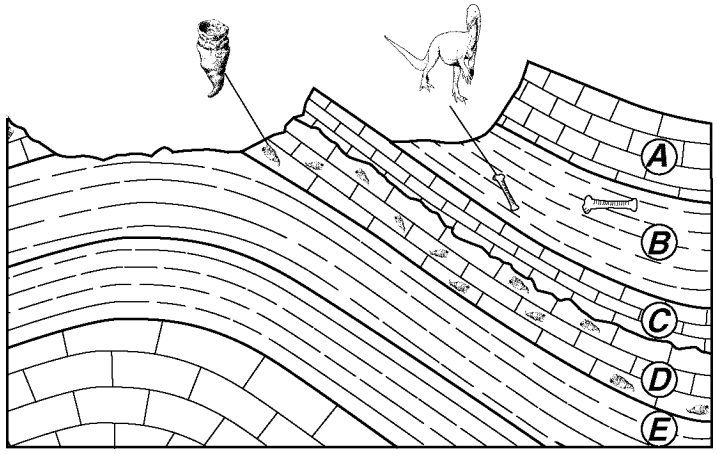
A)


C)


B)


D)


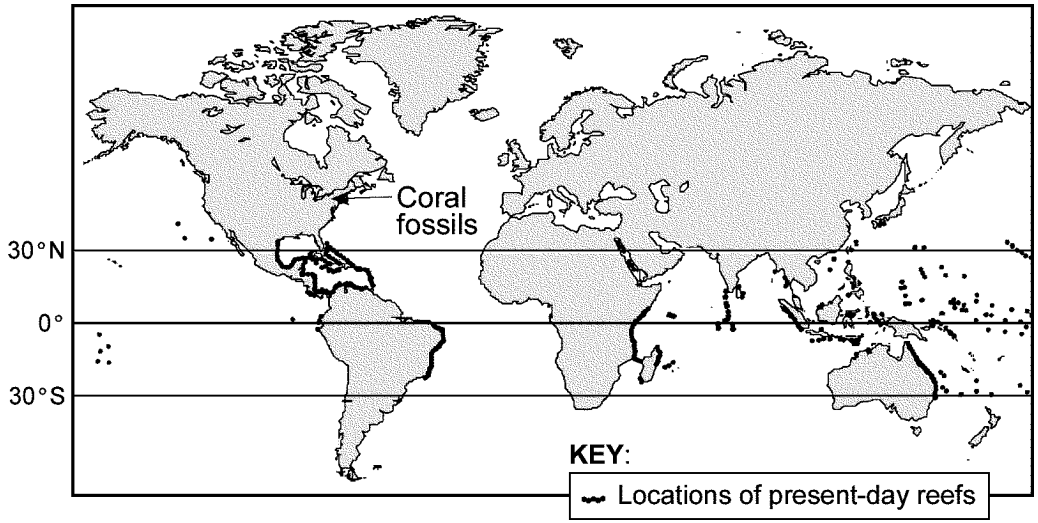
54) The geologic cross section below shows a region of Earth's crust. Rock layers *A* through *E* have been labeled. Two index fossils are shown and their locations within the rock layers are indicated.



Evidence of tectonic activity in the given cross section is provided by the

A) faulting and movement of the rock layers
B) collision of crustal plate boundaries in the rock layers
C) folding and tilting of the rock layers
D) igneous intrusion into the rock layers

55) On the map below, the thick blackened areas represent locations where living corals currently exist. The arrow points to a location where coral fossils have been found in Devonian-age bedrock in New York State.



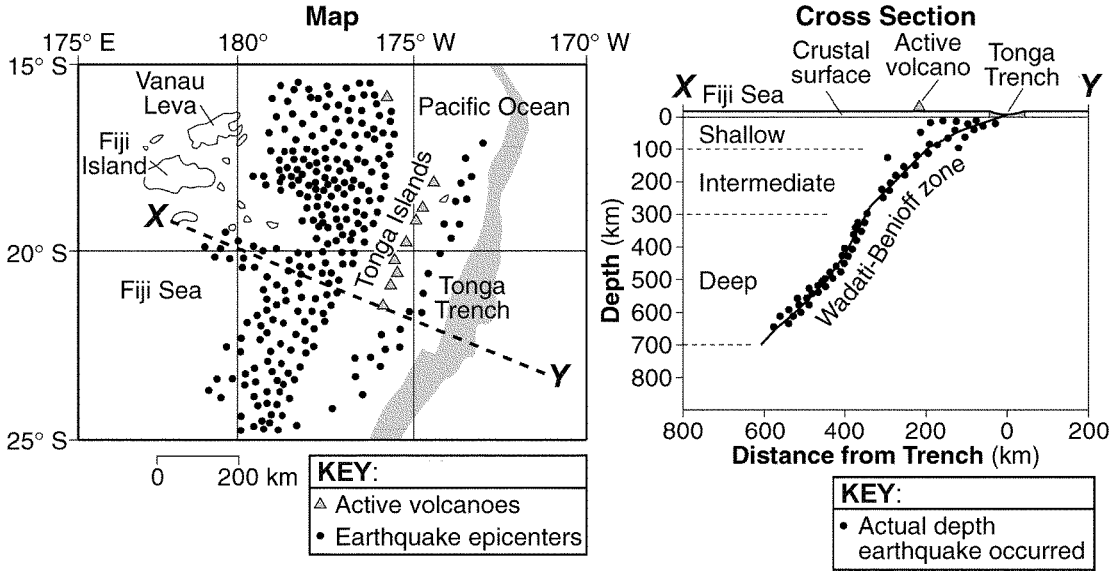
Devonian-age coral fossils found in some New York State bedrock are *not* located in the same general region that present-day corals are living because during the Devonian Period

A) corals lived everywhere on Earth
B) corals migrated to New York State
C) New York State had a colder climate
D) New York State was closer to the equator

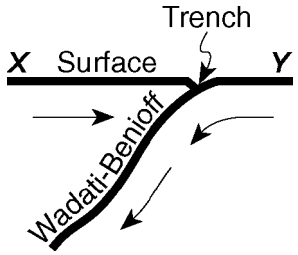
Questions 56 through 58 refer to the following:

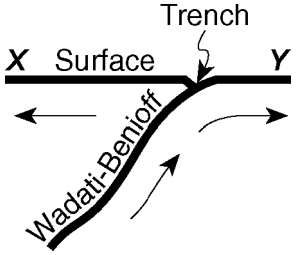
The map represents a portion of Earth's surface in the Pacific Ocean. The positions of islands, earthquake epicenters, active volcanoes, and the Tonga Trench are shown. Lines of latitude and longitude have been included.

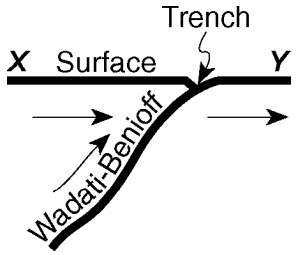
The cross section shows earthquakes that occurred beneath line *XY* on the map. The scale along the left side of the cross section indicates depth beneath Earth's surface, as are the range of depths for shallow, intermediate, and deep earthquakes. The scale along the bottom of the cross section indicates distance from the trench.

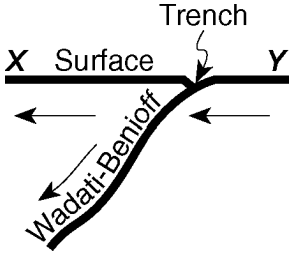


56) Which cross section below has arrows that *best* represent the relative motion of the crustal plates along the Wadati-Benioff zone beneath the Tonga Trench shown in the map?

A)


B)


C)


D)


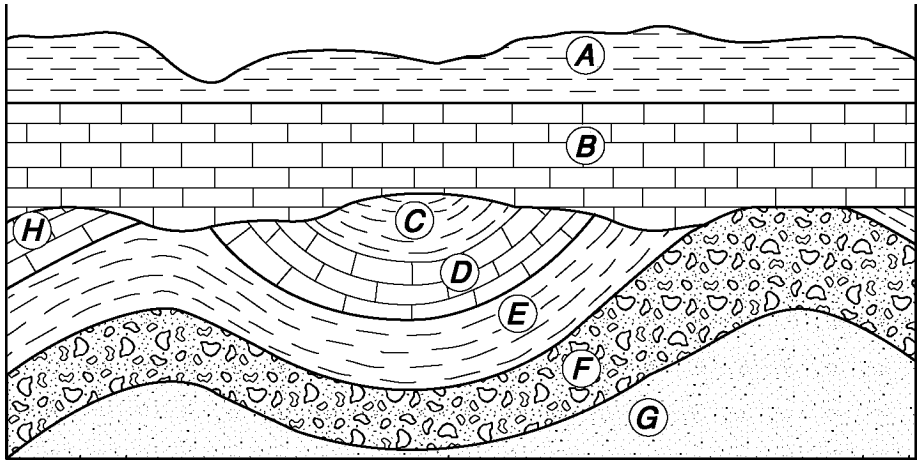
57) The Tonga Trench is located at the tectonic boundary between the Pacific Plate and the

A) Philippine Plate
B) Nazca Plate
C) Indian-Australian Plate
D) Antarctic Plate

58) The *greatest* number of earthquakes shown in the cross section occurred

A) between sea level and a depth of 100 km
B) at a depth between 100 and 300 km
C) at a depth between 300 and 600 km
D) at sea level

59) Overturning has not occurred on the geologic cross section below. Letters *A* through *H* represent rock layers.

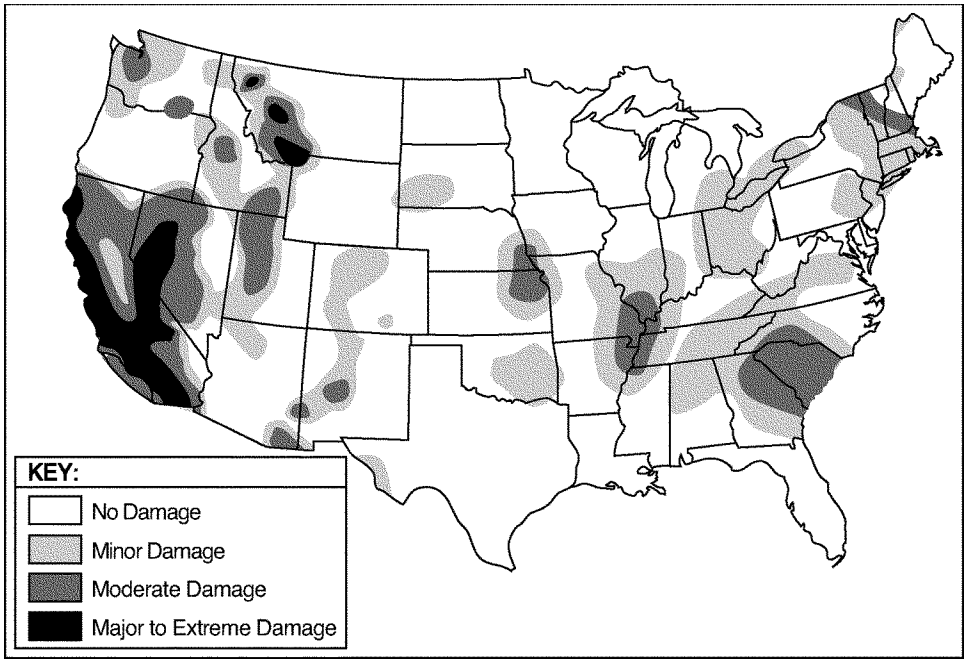


The folding of rock layers *G* through *C* on the cross section shown was most likely caused by

A) the extrusion of igneous rock
B) erosion of overlying sediments
C) contact metamorphism
D) the collision of lithospheric plates

Questions 60 and 61 refer to the following:

The map below shows the risk of damage from seismic activity in the United States.



60) In the United States, most of the major damage expected from a future earthquake is predicted to occur near a

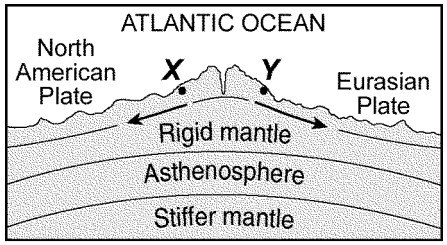
A) mid-ocean ridge and a divergent plate boundary
B) convergent plate boundary, only
C) divergent plate boundary, only
D) transform plate boundary and a hot spot

61) According to the map, which New York State location has the *greatest* risk of earthquake damage?

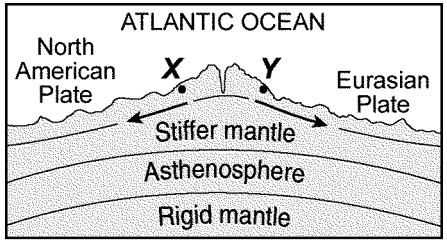
A) Binghamton
B) Plattsburgh
C) Elmira
D) Buffalo

62) Which cross section *best* represents the relative locations of Earth's asthenosphere, rigid mantle, and stiffer mantle? [*The cross sections are not drawn to scale.*]

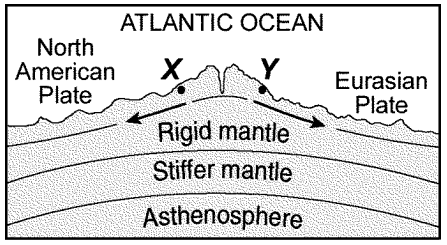
A)



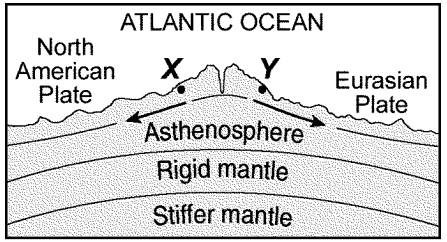
B)



C)

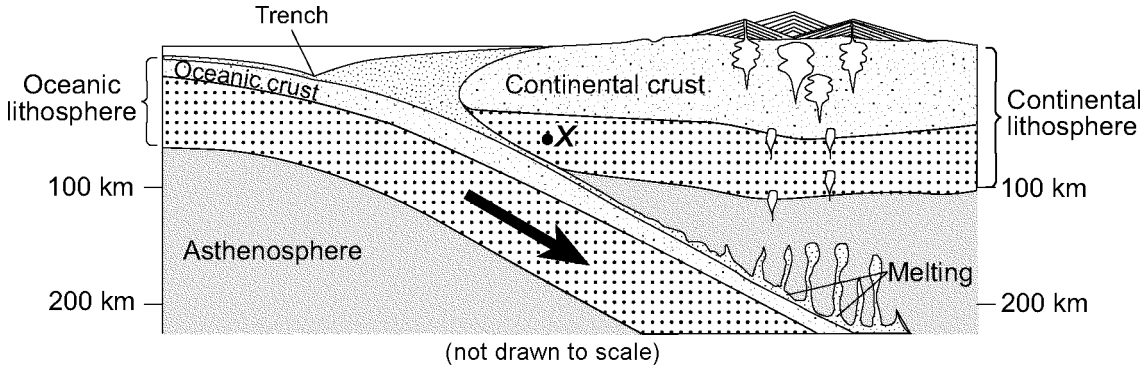


D)



Questions 63 through 65 refer to the following:

The cross section below shows the boundary between two lithospheric plates. Point *X* is a location in the continental lithosphere. The depth below Earth's surface is labeled in kilometers.



63) The temperature of the asthenosphere at the depth where melting first occurs is

A) 5,000°C B) 4,200°C C) 1,300°C D) 100°C

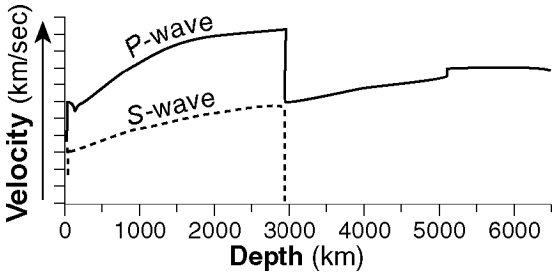
64) Between which two lithospheric plates could the given boundary be located?

A) South American Plate and African Plate
B) African Plate and Arabian Plate
C) Scotia Plate and Antarctic Plate
D) Nazca Plate and South American Plate

65) Point *X* on the given cross section is located in which Earth layer?

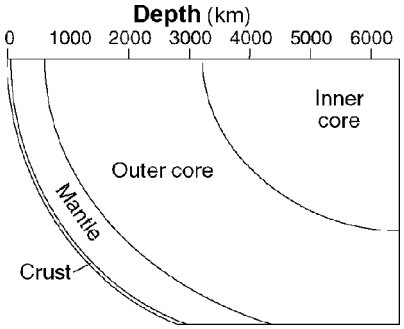
A) outer core
B) rigid mantle
C) asthenosphere
D) stiffer mantle

66) The graph below shows the different velocities of *P*-waves and *S*-waves through Earth's interior.

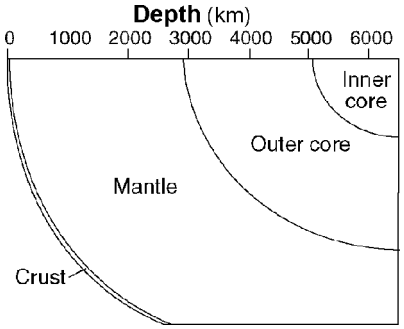


Which cross section *best* shows the inferred thickness of Earth's interior layers that cause these different velocities?

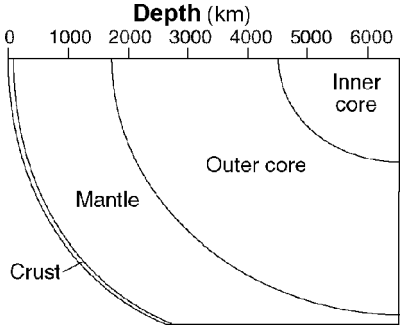
A)



C)



B)



D)