Earth Science
Tectonics Exam

Name: _____
Date: _____

1 Most inferences about the characteristics of Earth's mantle and core are based on

(1) well drillings from Earth's mantle and core

(2) comparisons between Moon rocks and Earth rocks

(3) chemical changes in exposed and weathered metamorphic rocks

(4) the behavior of seismic waves in Earth's interior

2 Approximately how long does an earthquake *P*-wave take to travel the first 6500 kilometers after the earthquake occurs?

(1) 6.5 min
(2) 8.0 min
(3) 10.0 min
(4) 18.5 min

3 The study of how seismic waves change as they travel through Earth has revealed that

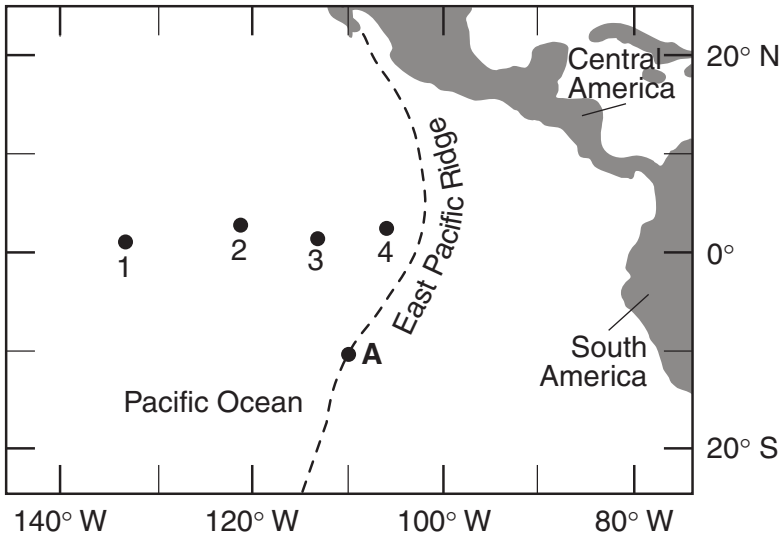
(1) *P*-waves travel more slowly than *S*-waves through Earth's crust
(2) seismic waves travel more slowly through the mantle because it is very dense
(3) Earth's outer core is solid because *P*-waves are not transmitted through this layer
(4) Earth's outer core is liquid because *S*-waves are not transmitted through this layer

4 The observed difference in density between continental crust and oceanic crust is most likely due to differences in their

(1) composition
(2) thickness
(3) porosity
(4) rate of cooling

Base your answers to questions 5 through 7 on the map below. The map shows the locations of deep-sea core drilling sites numbered 1 through 4. The approximate location of the East Pacific Ridge is shown by a dashed line. Point *A* is located on the East Pacific Ridge.

**Map of Drilling Sites**




5 At point *A*, the East Pacific Ridge is the boundary between the

(1) Cocos Plate and the North American Plate
(2) South American Plate and the Nazca Plate
(3) Pacific Plate and the South American Plate
(4) Pacific Plate and the Nazca Plate

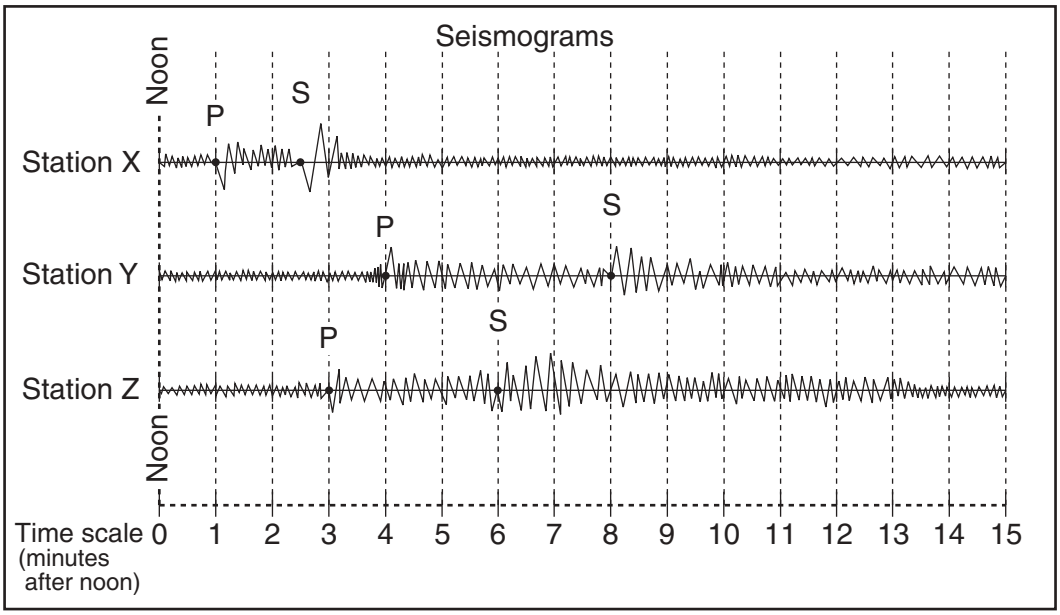
6 At which drilling site would the youngest igneous bedrock most likely be found?

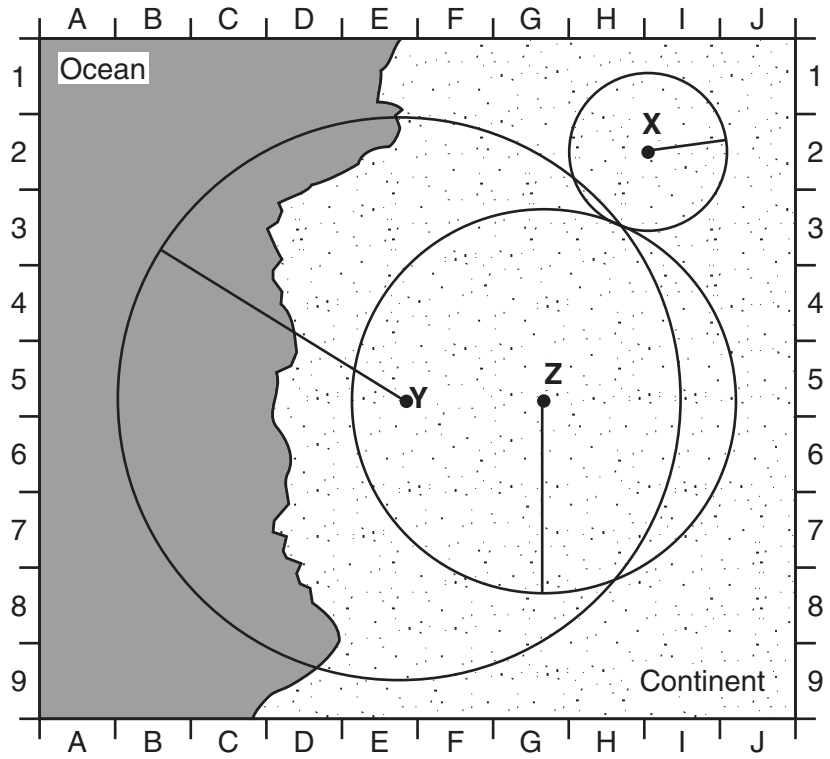
(1) 1
(2) 2
(3) 3
(4) 4

7 Compared to the thickness and density of the oceanic crust of the Pacific floor, the continental crust of South America is

(1) thinner and less dense
(2) thinner and more dense
(3) thicker and less dense
(4) thicker and more dense

Base your answers to questions 8 through 11 on the diagram and map below. The diagram shows three seismograms of the same earthquake recorded at three different seismic stations, *X*, *Y*, and *Z*. The distances from each seismic station to the earthquake epicenter have been drawn on the map. A coordinate system has been placed on the map to describe locations. The map scale has not been included.




8 Approximately how far away from station *Y* is the epicenter?

(1) 1,300 km
(2) 2,600 km
(3) 3,900 km
(4) 5,200 km

9 The *S*-waves from this earthquake that travel toward Earth's center will

(1) be deflected by Earth's magnetic field
(2) be totally reflected off the crust-mantle interface
(3) be absorbed by the liquid outer core
(4) reach the other side of Earth faster than those that travel around Earth in the crust

10 Seismic station *Z* is 1,700 kilometers from the epicenter. Approximately how long did it take the *P*-wave to travel to station *Z*?

(1) 1 min 50 sec
(2) 2 min 50 sec
(3) 3 min 30 sec
(4) 6 min 30 sec

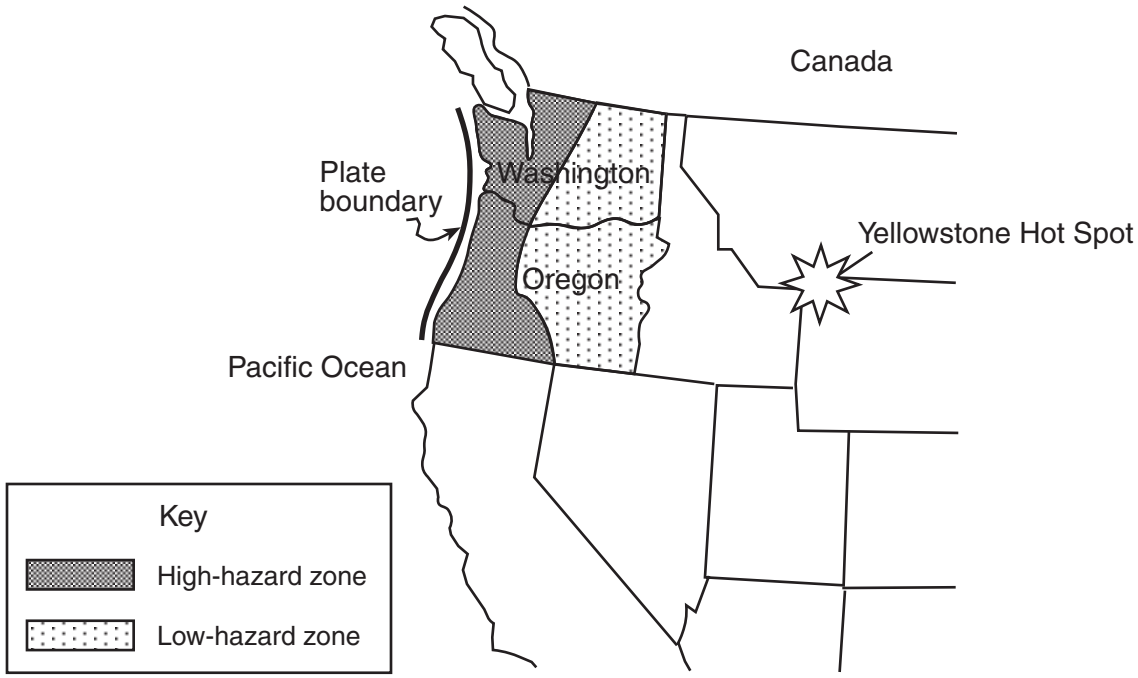
11 On the map, which location is closest to the epicenter of the earthquake?

(1) *E*–5
(2) *G*–1
(3) *H*–3
(4) *H*–8

Base your answers to questions 12 and 13 on the reading passage and map of the western United States below and on your knowledge of Earth science. The states of Washington and Oregon have been labeled on the map. The plate boundary shown on the map is the source area for high-magnitude earthquakes in Washington and Oregon. Two hazardous zones associated with these earthquakes are also shown.

**Washington and Oregon Earthquakes**

Large-magnitude earthquakes have occurred in Washington and Oregon as a result of crustal movement along thrust faults bordering the coasts of these states. Thrust faults occur when one section of Earth's crust slides over another section. Associated with the sudden movement of these thrust faults, coastlines can drop several feet, flooding forests with saltwater. Geologists have discovered evidence from various geologic ages of flooded coastal forests in the bedrock layers of Washington and Oregon. They have also found layers of sandstone thought to have been derived from sand deposits left by tsunamis. Using the rock record, scientists conclude that very large magnitude earthquakes occur every 300 to 500 years with the most recent large quake occurring about 200 years ago.




12 *a* What is a tsunami?

*b* State how tsunamis can affect coastal regions.

13 *a* Identify the tectonic plates on both sides of the plate boundary shown on the map.

*b* Identify the type of tectonic plate boundary shown on the map that is responsible for the thrust faults along the Washington and Oregon coastline.

14 A seismic station in Massena, New York, recorded the arrival of the first *P*-wave at 1:30:00 (1 hour, 30 minutes, 00 seconds) and the first *S*-wave from the same earthquake at 1:34:30.

*a* Determine the distance, in kilometers, from Massena to the epicenter of this earthquake.

*b* State what additional information is needed to determine the location of the epicenter of this earthquake.

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15 Earth's outer core is best inferred to be

(1) liquid, with an average density of approximately 4 g/cm$^3$
(2) liquid, with an average density of approximately 11 g/cm$^3$
(3) solid, with an average density of approximately 4 g/cm$^3$
(4) solid, with an average density of approximately 11 g/cm$^3$

16 The large coal fields found in Pennsylvania provide evidence that the climate of the northeastern United States was much warmer during the Carboniferous Period. This change in climate over time is best explained by the

(1) movements of tectonic plates
(2) effects of seasons
(3) changes in the environment caused by humans
(4) evolution of life

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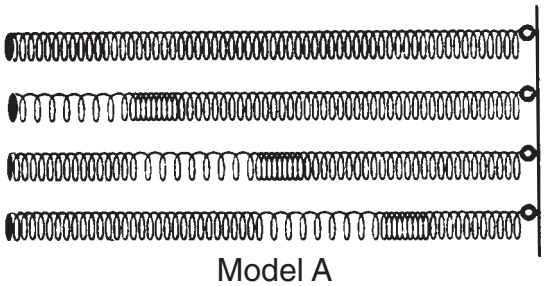
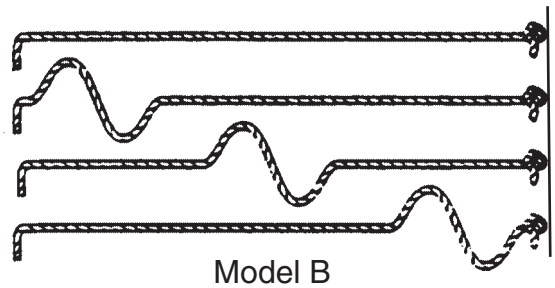
Base your answers to questions 17 and 18 on the diagram below, which shows models of two types of earthquake waves.



Model A



Model B

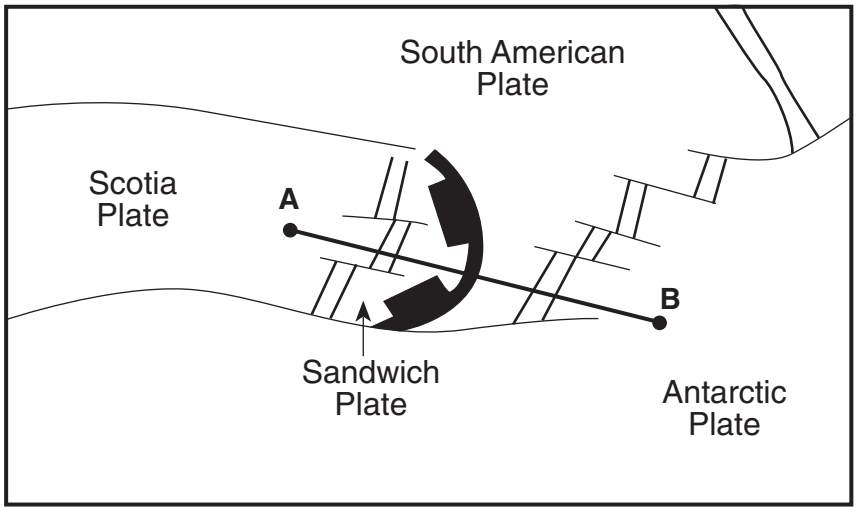
17 Model B best represents the motion of earthquake waves called

(1) *P*-waves (compressional waves) that travel faster than *S*-waves (shear waves) shown in model A
(2) *P*-waves (compressional waves) that travel slower than *S*-waves (shear waves) shown in model A
(3) *S*-waves (shear waves) that travel faster than *P*-waves (compressional waves) shown in model A
(4) *S*-waves (shear waves) that travel slower than *P*-waves (compressional waves) shown in model A

18 The difference in seismic station arrival times of the two waves represented by the models helps scientists determine the

(1) amount of damage caused by an earthquake
(2) intensity of an earthquake
(3) distance to the epicenter of an earthquake
(4) time of occurrence of the next earthquake

20 On the map below, line *AB* is drawn across several of Earth's tectonic plates in the South Atlantic Ocean.




Which cross section best represents the plate boundaries and mantle movement beneath line *AB*?