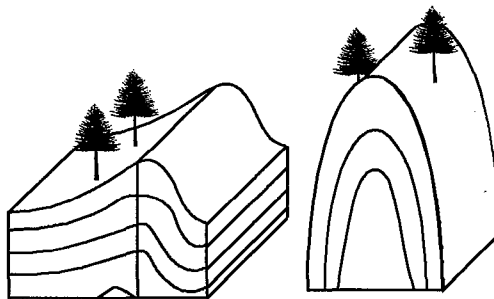


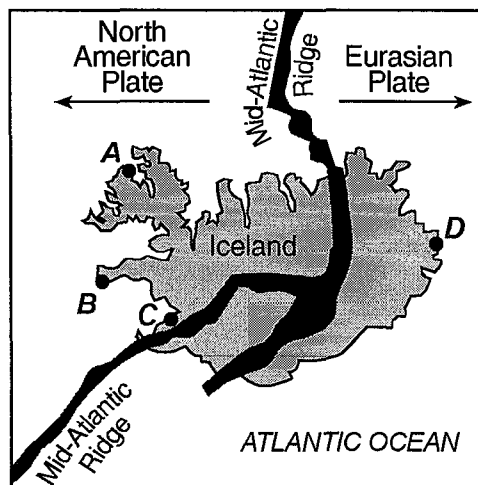
Name: _____

- 1) The cross sections of crust below represent two regions of sedimentary rock layers that have been altered.



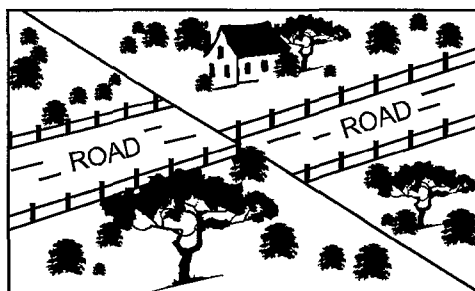
The sedimentary bedrock in *both* regions originally formed as

- A) folded layers
 B) faulted layers
 C) recrystallized layers
 D) horizontal layers
- 2) The map below shows Iceland, a country located on the Mid-Atlantic Ridge. Four locations are represented by the letters *A* through *D*.



The fine-grained texture of *most* of the igneous rock formed on the surface of Iceland is due to

- A) high pressure under the island
 B) numerous faults in the island's bedrock
 C) rapid cooling of the molten rock
 D) high density of the molten rock
- 3) The diagram below 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) movement along a transform fault
 C) down-warping of the crust
 D) folding of surface rock

- 4) A huge undersea earthquake off the Alaskan coastline could produce a
 A) hurricane B) thunderstorm C) cyclone D) tsunami
- 5) The study of how seismic waves change as they travel through Earth has revealed that
 A) *P*-waves travel more slowly than *S*-waves through Earth's crust
 B) Earth's outer core is liquid because *S*-waves are not transmitted through this layer
 C) seismic waves travel more slowly through the mantle because it is very dense
 D) Earth's outer core is solid because *P*-waves are not transmitted through this layer
- 6) The diagram below is a seismogram of the famous San Francisco earthquake of 1906, recorded at a seismic station located 6,400 kilometers from San Francisco.

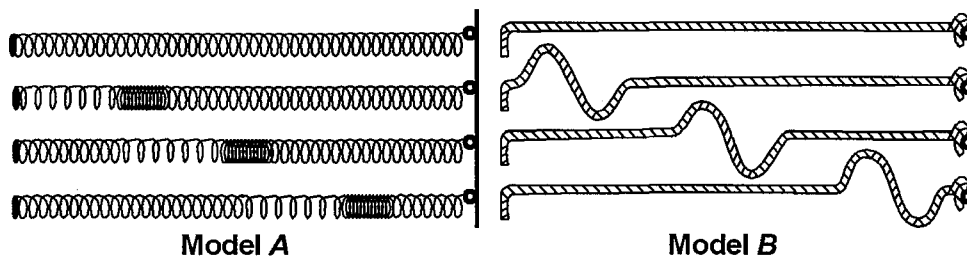


Which time scale *best* represents the arrival-time difference between *P*-waves and *S*-waves at this station?



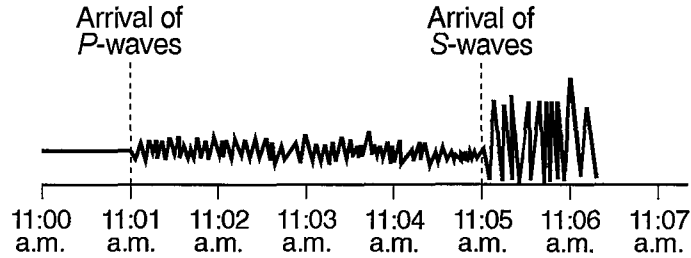
Questions 7 and 8 refer to the following:

The diagram below shows models of two types of earthquake waves.

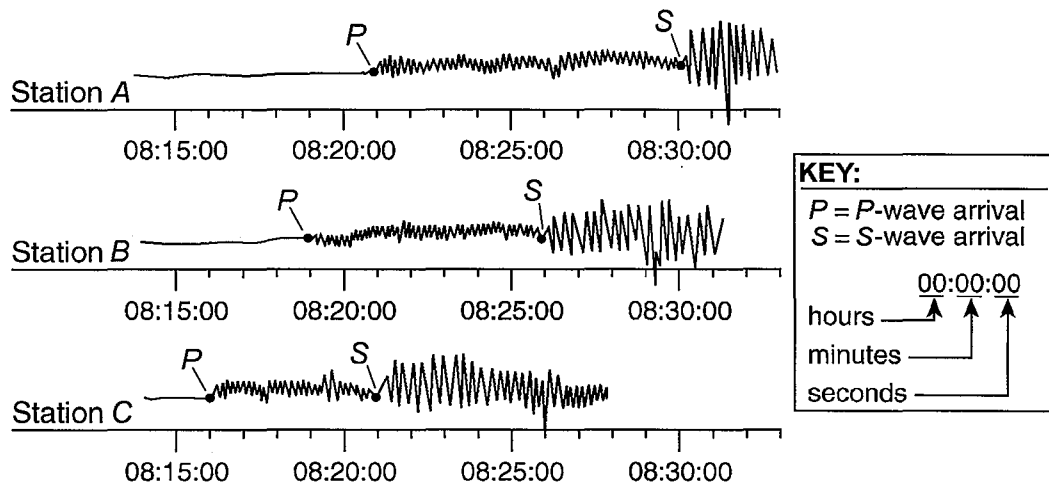


- 7) In the given diagram, model *A* *best* represents the motion of earthquake waves called
 A) *S*-waves (shear waves) that travel faster than *P*-waves (compressional waves) shown in model *B*
 B) *P*-waves (compressional waves) that travel slower than *S*-waves (shear waves) shown in model *B*
 C) *S*-waves (shear waves) that travel slower than *P*-waves (compressional waves) shown in model *B*
 D) *P*-waves (compressional waves) that travel faster than *S*-waves (shear waves) shown in model *B*
- 8) The difference in seismic station arrival times of the two waves represented by the models in the given diagram helps scientists determine the
 A) distance to the epicenter of an earthquake C) time of occurrence of the next earthquake
 B) amount of damage caused by an earthquake D) intensity of an earthquake

Questions 9 and 10 refer to the following:



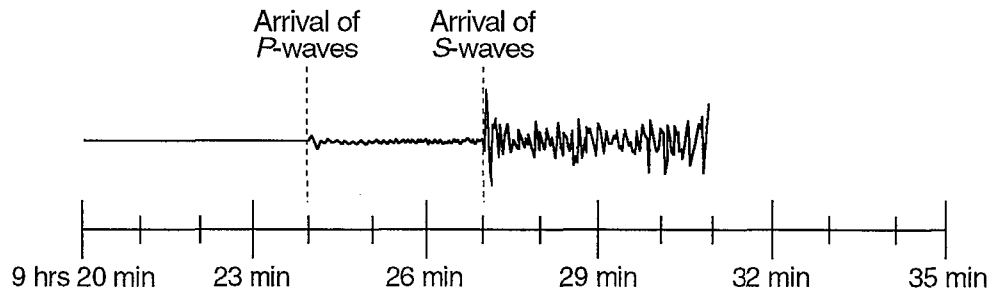
- 9) When did the *first* P-waves arrive at this seismic station?
- A) 9 minutes after an earthquake occurred 3,500 km away
 B) 5 minutes after an earthquake occurred 2,600 km away
 C) 11 minutes after an earthquake occurred 3,500 km away
 D) 3 minutes after an earthquake occurred 2,600 km away
- 10) How many additional seismic stations *must* report seismogram information in order to locate this earthquake?
- A) one B) two C) three D) four
- 11) The diagram below represents three seismograms showing the same earthquake as it was recorded at three different seismic stations, *A*, *B*, and *C*.



Which statement correctly describes the distance between the earthquake epicenter and these seismic stations?

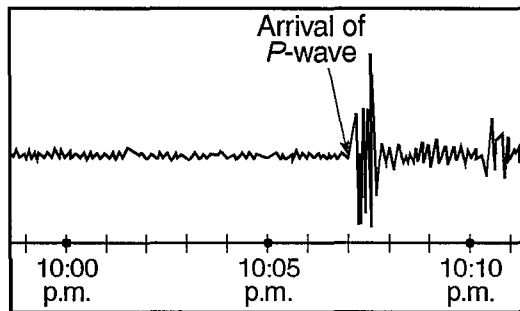
- A) *C* is closest to the epicenter, and *A* is farthest from the epicenter.
 B) *A* is closest to the epicenter, and *C* is farthest from the epicenter.
 C) *A* is closest to the epicenter, and *B* is farthest from the epicenter.
 D) *B* is closest to the epicenter, and *C* is farthest from the epicenter.

- 12) The seismogram below shows the arrival times of an earthquake's *P*-wave and *S*-wave recorded at a seismic station in Portland, Oregon.



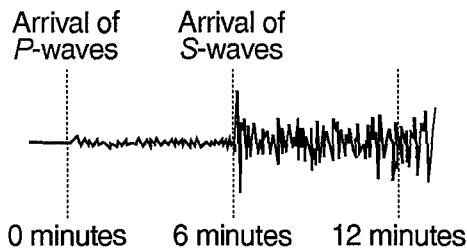
What was the distance from Portland to the earthquake's epicenter?

- A) 3,200 km B) 4,100 km C) 1,800 km D) 2,500 km
- 13) The seismogram below shows the time that an earthquake *P*-wave arrived at a seismic station in Albany, New York.



If the earthquake occurred at exactly 10:00 p.m., approximately how far from the earthquake epicenter was Albany, New York?

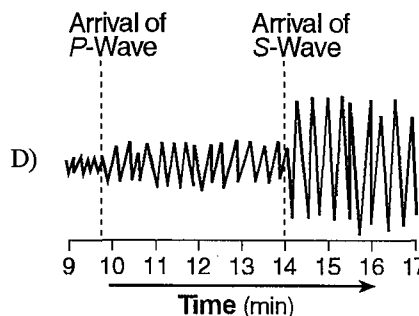
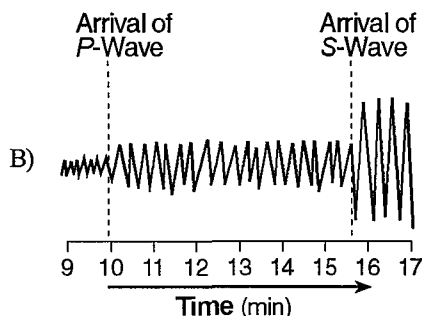
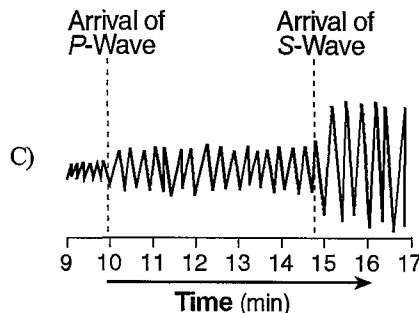
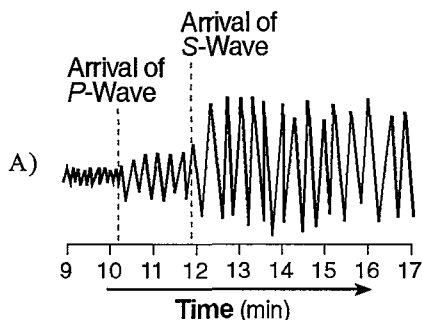
- A) 1,900 km B) 3,200 km C) 5,200 km D) 4,000 km
- 14) The seismogram below shows *P*-wave and *S*-wave arrival times at a seismic station following an earthquake.



The distance from this seismic station to the epicenter of the earthquake is approximately

- A) 4,400 km B) 1,600 km C) 3,200 km D) 5,600 km

15) Which seismogram was recorded approximately 4,000 kilometers from an earthquake epicenter?



16) An earthquake's *P*-wave arrived at a seismograph station at 02 hours 40 minutes 00 seconds. The earthquake's *S*-wave arrived at the same station 2 minutes later. What is the approximate distance from the seismograph station to the epicenter of the earthquake?

- A) 4,000 km B) 3,100 km C) 1,100 km D) 2,400 km

17) What is the average velocity of an earthquake's *S*-wave in its *first* 4 minutes of travel?

- A) 250 km/min B) 500 km/min C) 4 km/min D) 1 km/min

18) How long would it take for the first *S*-wave to arrive at a seismic station 4,000 kilometers away from the epicenter of an earthquake?

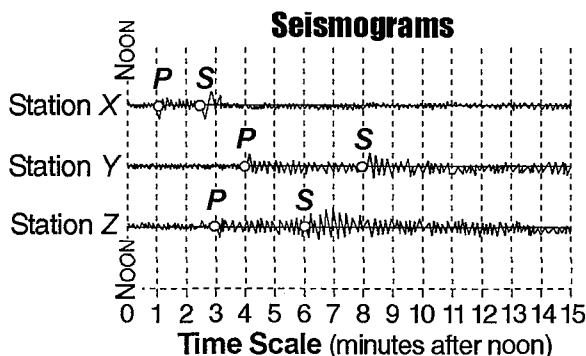
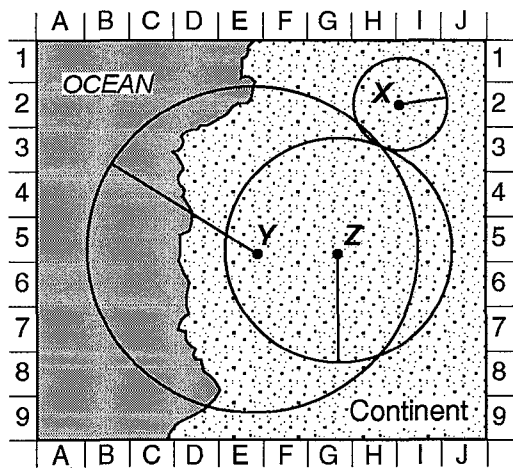
- A) 5 min 40 sec B) 12 min 40 sec C) 7 min 0 sec D) 13 min 20 sec

19) Approximately how long does an earthquake *P*-wave take to travel the first 6,500 kilometers after the earthquake occurs?

- A) 6.5 min B) 8.0 min C) 18.5 min D) 10.0 min

Questions 20 through 23 refer to the following:

The diagram below 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.]



- 20) Approximately how far away from station *Y* is the epicenter?
 A) 5,200 km B) 3,900 km C) 2,600 km D) 1,300 km
- 21) The *S*-waves from this earthquake that travel toward Earth's center will
 A) be totally reflected off the crust-mantle interface
 B) reach the other side of Earth faster than those that travel around Earth in the crust
 C) be deflected by Earth's magnetic field
 D) be absorbed by the liquid outer core
- 22) Seismic station *Z* is 1,700 kilometers from the epicenter. Approximately how long did it take the *P*-wave to travel to station *Z*?
 A) 6 min 30 sec B) 3 min 30 sec C) 2 min 50 sec D) 1 min 50 sec
- 23) On the map, which location is *closest* to the epicenter of the earthquake?
 A) *E*-5 B) *H*-8 C) *H*-3 D) *G*-1

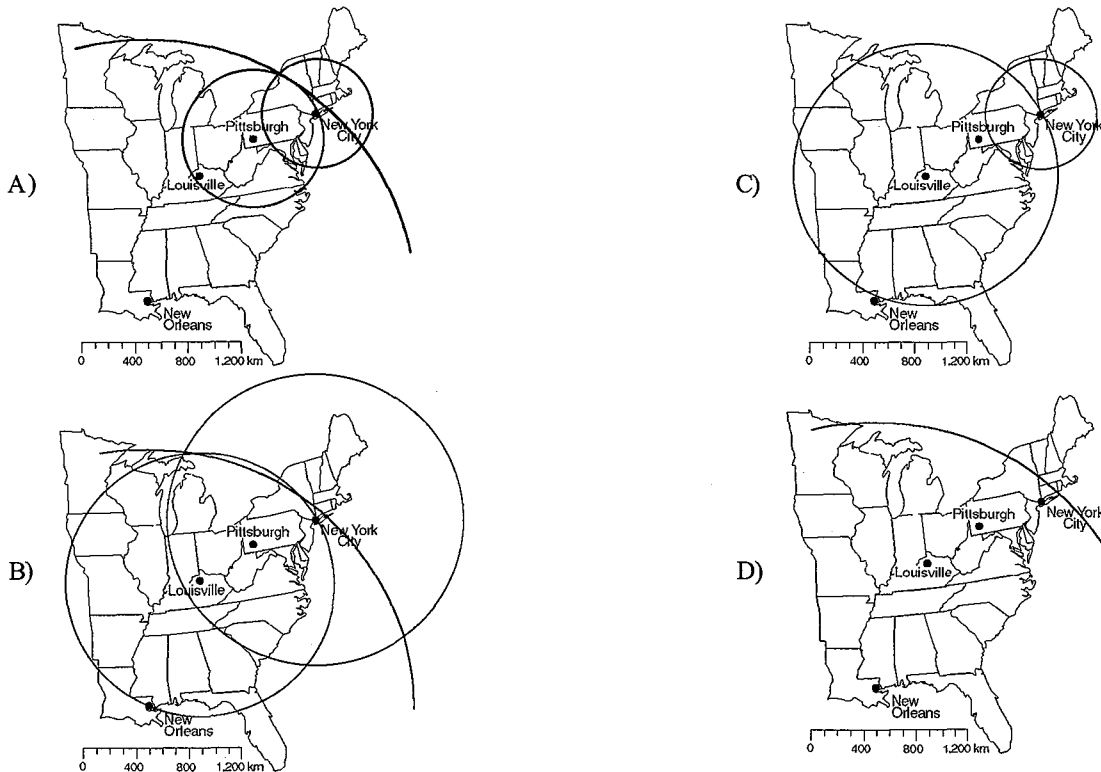
Questions 24 and 25 refer to the following:

Seismic stations are located at the four cities shown on the map below. Letter *X* represents the epicenter of an earthquake determined from seismic waves recorded at all four cities.



- 24) At which city is there a difference of approximately 3 minutes and 20 seconds between the arrival times of the *P*-waves and the *S*-waves?
 A) Louisville B) New York City C) New Orleans D) Pittsburgh

25) Which map correctly shows how the location of the epicenter was determined?



Questions 26 through 28 refer to the following:

The data table below gives information collected at seismic stations *A*, *B*, *C*, and *D* for the same earthquake. [Some of the data has been deliberately omitted.]

Seismic Station	P-Wave Arrival Time	S-Wave Arrival Time	Difference in Arrival Times	Distance to Epicenter
A	08:48:20	No S-waves arrived		
B	08:42:00		00:04:40	
C	08:39:20		00:02:40	
D	08:45:40			6,200 km

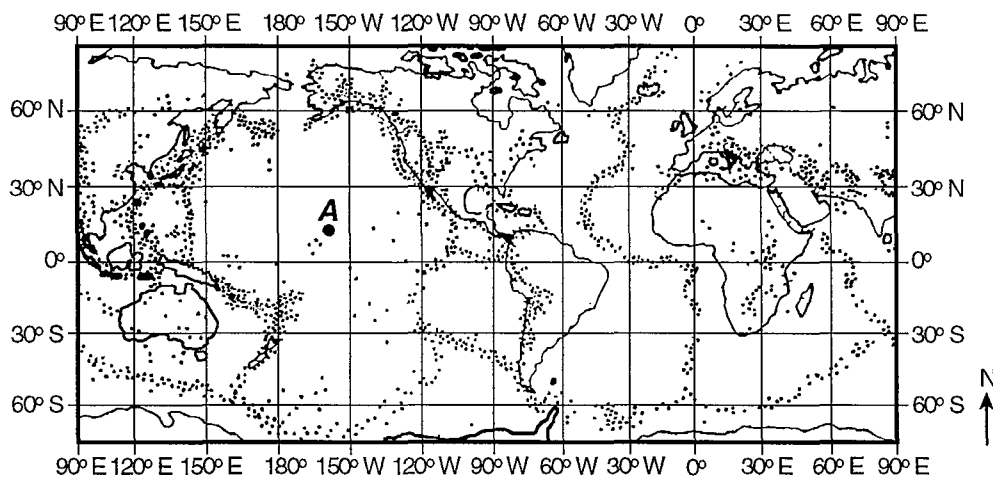
KEY:

08	:	48	:	20
			seconds	
		minutes		
				hours

- 26) What is the *most* probable reason for the absence of *S*-waves at station *A*?
- A) *S*-waves were not generated at the epicenter. C) Station *A* was located on solid bedrock.
 B) *S*-waves cannot travel through liquids. D) Station *A* was located too close to the epicenter.
- 27) What is the approximate distance from station *C* to the earthquake epicenter?
- A) 1,600 km B) 3,200 km C) 2,400 km D) 1,000 km
- 28) How long did it take the *P*-wave to travel from the epicenter of the earthquake to seismic station *D*?
- A) 00:46:20 B) 00:17:20 C) 00:39:20 D) 00:09:40

Questions 29 and 30 refer to the following:

The dots on the map below show the distribution of major earthquake epicenters. The shaded circle labeled *A* represents a location on Earth's surface.



- 29) Which one of the following conclusions can *best* be inferred from the data shown on the given map?
- Most earthquakes occur west of the Prime Meridian and north of the Equator.
 - Most earthquakes occur on continents.
 - Earthquakes generally are evenly distributed over the surface of Earth.
 - Most earthquakes are concentrated in zones along plate boundaries.
- 30) Location *A* in the given diagram is *best* described as an area that is
- within a rift valley at a mid-ocean ridge
 - above a mantle hot spot near the center of a crustal plate
 - at the boundary between two diverging plates
 - within a deep-sea trench between two converging plates
- 31) The density of Earth's crust is
- less than the density of both the outer core and the mantle
 - greater than the density of both the outer core and the mantle
 - greater than the density of the outer core but less than the density of the mantle
 - less than the density of the outer core but greater than the density of the mantle
- 32) Compared to Earth's crust, Earth's core is believed to be
- | | |
|--|--|
| A) less dense, cooler, and composed of more iron | C) more dense, hotter, and composed of more iron |
| B) less dense, hotter, and composed of less iron | D) more dense, cooler, and composed of less iron |
- 33) What is the inferred temperature at the boundary between Earth's stiffer mantle and outer core?
- | | | | |
|------------|------------|------------|------------|
| A) 5,000DC | B) 6,200DC | C) 4,500DC | D) 2,500DC |
|------------|------------|------------|------------|
- 34) Which star's surface temperature is *closest* to the temperature at the boundary between Earth's mantle and core?
- | | | | |
|----------------------|------------------|------------|-----------------|
| A) <i>Betelgeuse</i> | B) <i>Sirius</i> | C) the Sun | D) <i>Rigel</i> |
|----------------------|------------------|------------|-----------------|
- 35) The observed difference in density between continental crust and oceanic crust is most likely due to differences in their
- | | | | |
|--------------------|-------------|--------------|----------------|
| A) rate of cooling | B) porosity | C) thickness | D) composition |
|--------------------|-------------|--------------|----------------|
- 36) Earth's outer core and inner core are *both* inferred to be
- | | |
|----------------------------|--|
| A) liquid | C) composed of a high percentage of iron |
| B) under the same pressure | D) solid |
- 37) In which layer of Earth's interior is the pressure inferred to be 1.0 million atmospheres?
- | | | | |
|---------------|---------------|-----------------|-------------------|
| A) inner core | B) outer core | C) rigid mantle | D) stiffer mantle |
|---------------|---------------|-----------------|-------------------|

- 38) Most inferences about the characteristics of Earth's mantle and core are based on
- A) well drillings from Earth's mantle and core
 - B) chemical changes in exposed and weathered metamorphic rocks
 - C) the behavior of seismic waves in Earth's interior
 - D) comparisons between Moon rocks and Earth rocks
- 39) Andrija Mohorovicic discovered the interface between the crust and the mantle that is now named for him. His discovery of the "Moho" was based on analysis of
- A) erosional surfaces
 - B) seismic waves
 - C) landscape boundaries
 - D) continental coastlines

- 1) D 2) C 3) B 4) D 5) B
- 6) A 7) D 8) A 9) B 10) B
- 11) A 12) C 13) D 14) A 15) B
- 16) C 17) A 18) B 19) D 20) C
- 21) D 22) B 23) C 24) C 25) A
- 26) B 27) A 28) D 29) D 30) B
- 31) A 32) C 33) A 34) C 35) D
- 36) C 37) D 38) C 39) B