1. An earthquake occurs at 10:05 a.m. At 10:09 a.m., the first *P*-wave from this earthquake is detected at a seismic station. Approximately how many kilometers (km) from the epicenter is this seismic station located?

   A) 1000 km   **B) 2000 km**
   C) 2600 km   D) 5600 km

2. Base your answer to the following question on the data table below, which gives information collected at seismic stations *W, X, Y,* and *Z* for the same earthquake. Some of the data have been omitted.

Data Table

Seismic Station	P-Wave Arrival Time (h:min:s)	S-Wave Arrival Time (h:min:s)	Difference in Arrival Times (h:min:s)	Distance to Epicenter (km)
W	10:50:00	no S-waves arrived		
X	10:42:00	10:46:40		
Y	10:39:20		00:02:40	
Z	10:45:40			6200

   Which seismic station was farthest from the earthquake epicenter?

   A) *W*   B) *X*   C) *Y*   D) *Z*

3. Base your answer to the next question on the seismogram below. The seismogram was recorded at a seismic station and shows the arrival times of the first *P*-wave and *S*-wave from an earthquake.
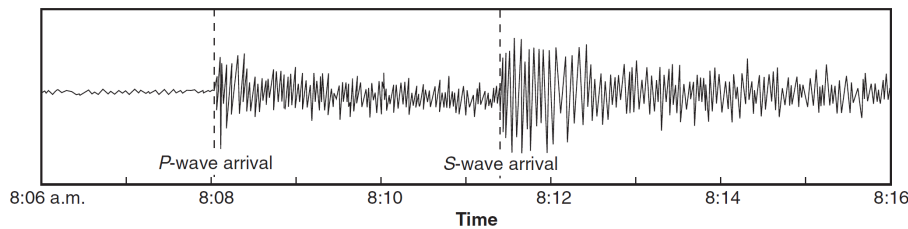

   Which part of this seismogram is used to find the distance to the epicenter of the earthquake?

   A) *P*-wave arrival time, only
   B) *S*-wave arrival time, only
   C) difference in the arrival time of the *P*-wave and *S*-wave
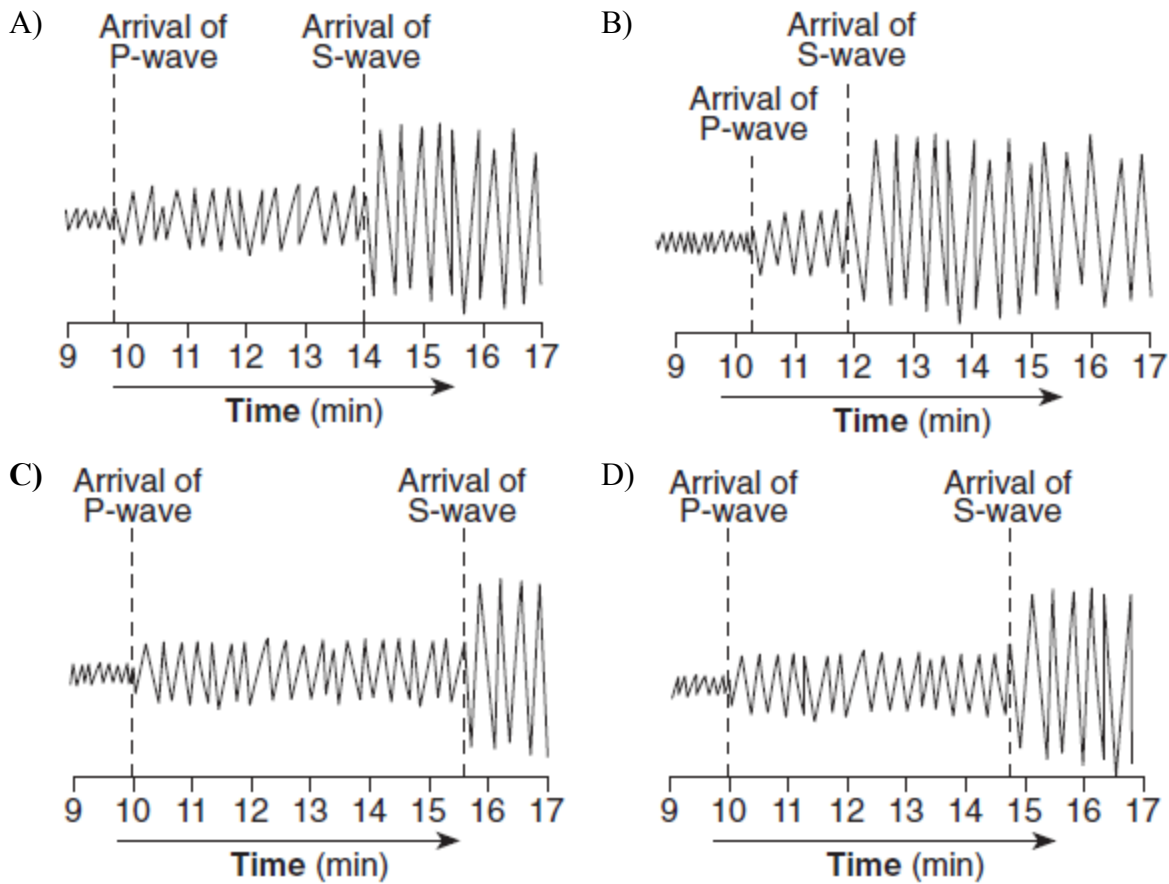   D) difference in the height of the *P*-wave and *S*-wave

4. The diagram below represents three seismograms showing the same earthquake as it was recorded at three different seismic stations, *A, B,* and *C.*
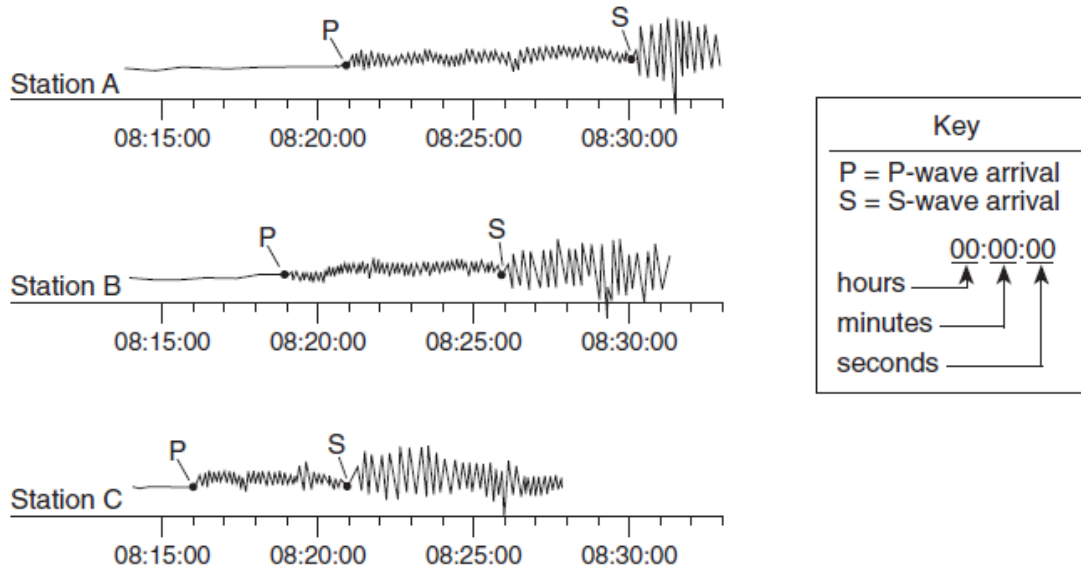

Which statement correctly describes the distance between the earthquake epicenter and these seismic stations?

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

5. Which seismogram was recorded approximately 4,000 kilometers from an earthquake epicenter?

A)

Arrival of
P-wave

Arrival of
S-wave

9 10 11 12 13 14 15 16 17

Time (min)

B)

Arrival of
S-wave

Arrival of
P-wave

9 10 11 12 13 14 15 16 17

Time (min)

C)

Arrival of
P-wave

Arrival of
S-wave

9 10 11 12 13 14 15 16 17

Time (min)

D)

Arrival of
P-wave

Arrival of
S-wave

9 10 11 12 13 14 15 16 17

Time (min)

6. The seismogram below shows *P*-wave and *S*-wave arrival times at a seismic station following an earthquake.

Arrival of
P-waves

Arrival of
S-waves

0 minutes   6 minutes   12 minutes
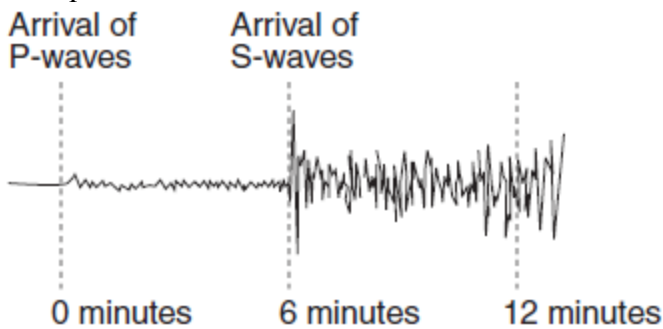
The distance from this seismic station to the epicenter of the earthquake is approximately

A) 1,600 km   B) 3,200 km

C) 4,400 km   D) 5,600 km

Base your answers to questions **7** through **9** on the data table below, which 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 for Reading Time on the Table

```
08 : 48 : 20
         └── seconds
     └────── minutes
 └────────── hours
```
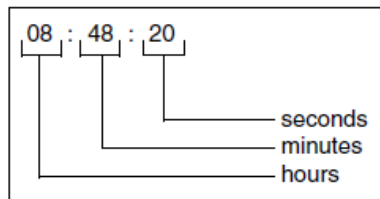
7. How long did it take the *P*-wave to travel from the epicenter of the earthquake to seismic station *D*?

   A) 00:46:20   B) 00:39:20   C) 00:17:20   **D) 00:09:40**

8. What is the approximate distance from station *C* to the earthquake epicenter?

   A) 3,200 km   B) 2,400 km   **C) 1,600 km**   D) 1,000 km

9. What is the most probable reason for the absence of *S*-waves at station *A*?

   A) *S*-waves cannot travel through liquids.
   B) *S*-waves were not generated at the epicenter.
   C) Station *A* was located on solid bedrock.
   D) Station *A* was located too close to the epicenter.

10. Base your answer to the following question on the earthquake seismogram below.
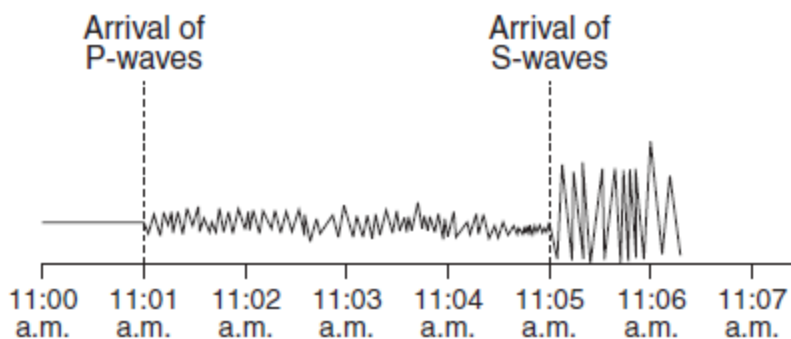
How many additional seismic stations must report seismogram information in order to locate this earthquake?

   A) one   **B) two**   C) three   D) four

Base your answers to questions **11** and **12** 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.
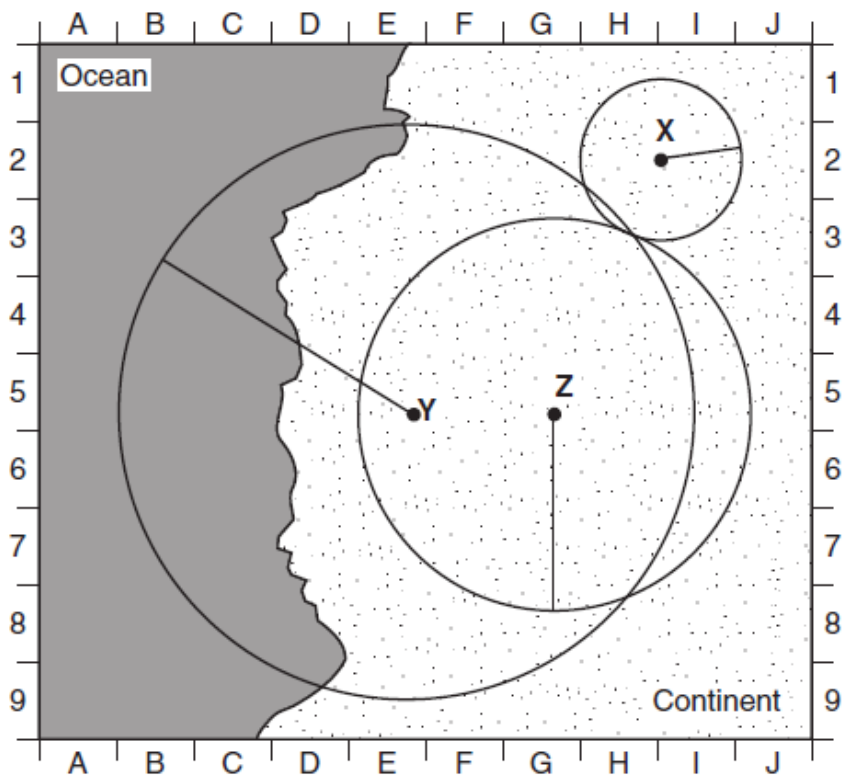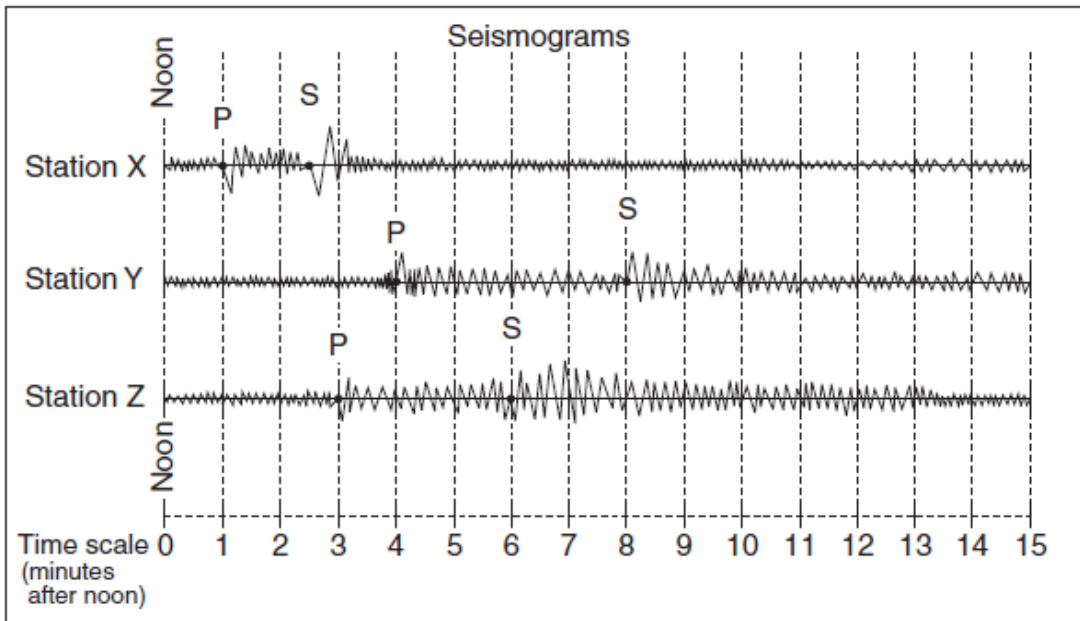
Seismograms

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

A) *E*–5   B) *G*–1   **C) *H*–3**   D) *H*–8

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

   A) 1,300 km   **B) 2,600 km**   C) 3,900 km   D) 5,200 km

13. 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.
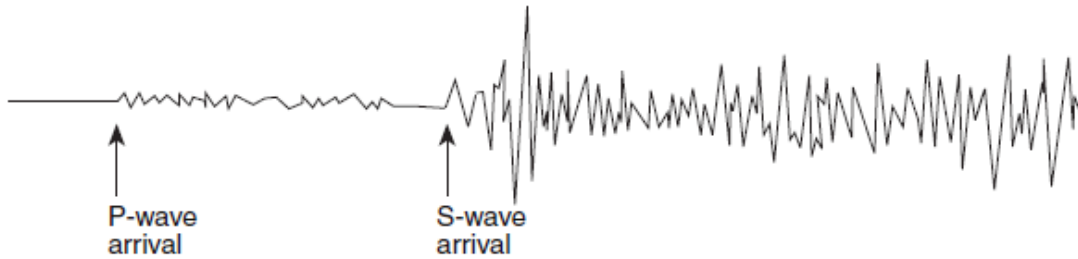

   Which time scale best represents the arrival-time difference between *P*-waves and *S*-waves at this station?

14. 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) 1,100 km   B) 2,400 km
   C) 3,100 km   D) 4,000 km

15. Base your answer to the following question on the diagram below, which represents seismic stations *A*, *B*, and *C*. The distance from each station to an earthquake's epicenter is plotted.
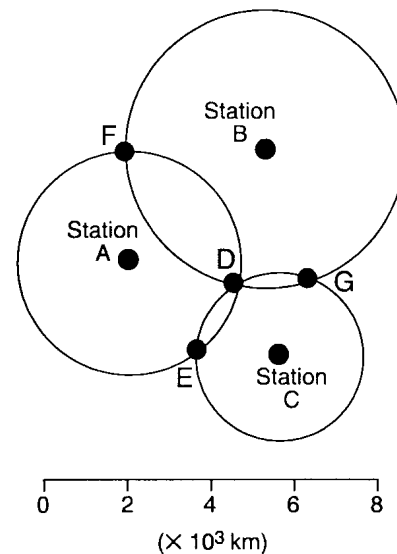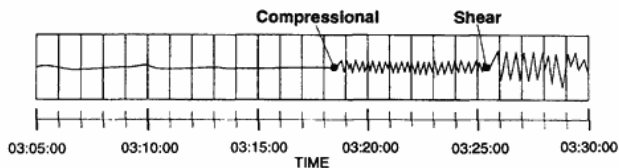

   The epicenter is closest to point

   A) *D*   B) *E*   C) *F*   D) *G*

16. The seismogram below shows the arrival times of an earthquake's *P*-wave and *S*-wave recorded at a seismic station in Portland, Oregon.
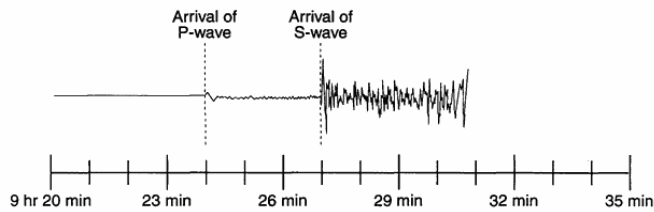
What was the distance from Portland to the earthquake's epicenter?

A) **1800 km**   B) 2500 km

C) 3200 km   D) 4100 km

17. A seismogram recorded at a seismic station is shown below.

Which information can be determined by using this seismogram?

A) the depth of the earthquake's focus

B) the direction to the earthquake's focus

C) the location of the earthquake's epicenter

D) the distance to the earthquake's epicenter

18. 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?

A) **7 min 35 sec**   B) 9 min 20 sec

C) 13 min 10 sec   D) 17 min 00 sec

19. Base your answer to the following question on the diagram of the Earth below showing the observed pattern of waves recorded after an earthquake.
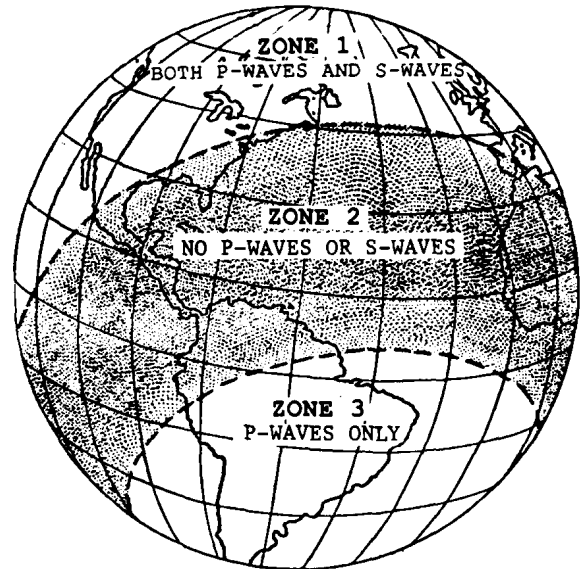
The lack of *S*-waves in zone 3 can best be explained by the presence within the Earth of

A) density changes

B) mantle convection cells

C) a liquid outer core

D) a solid inner core

20. What is the approximate difference in arrival times of the *P*-waves and the *S*-waves at a seismographic station that is 3,000 kilometers from an earthquake epicenter?

A) 2 min 15 sec   B) 3 min 40 sec

**C) 4 min 30 sec**   D) 5 min 40 sec

21. The circles on the map below show the distances from three seismic stations, X, Y, and Z, to the epicenter of an earthquake.
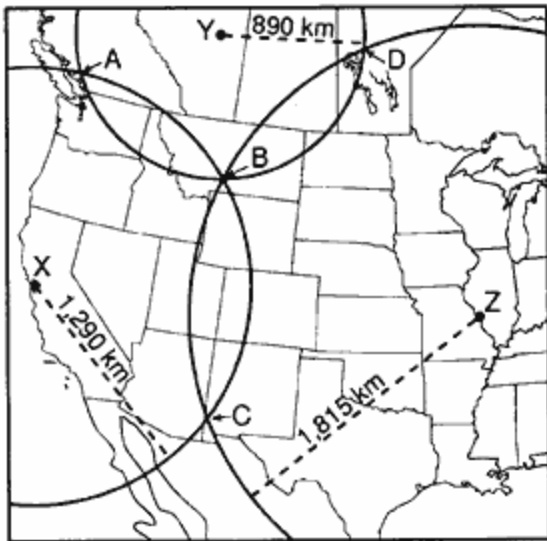
Which location is closest to the earthquake epicenter?

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

22. 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. What is the distance from the seismograph station to the epicenter of the earthquake?

A) 1,200 km   **B) 3,000 km**
C) 6,100 km   D) 7,500 km

23. The difference in arrival times for *P*- and *S*-waves from an earthquake is 5.0 minutes. How far away is the epicenter of the earthquake?

A) 1.3×10^3 km   B) 2.6×10^3 km
C) 3.5×10^3 km   D) 8.1×10^3 km

24. A seismograph station records a difference in arrival time between the *S*- and *P*-wave of 4 minutes. About how far away is the earthquake epicenter?

A) 1,000 km   B) 1,900 km
C) 2,600 km   D) 5,200 km

25. Base your answer to the following question on the diagram below which shows a method used to locate the epicenter of an earthquake.
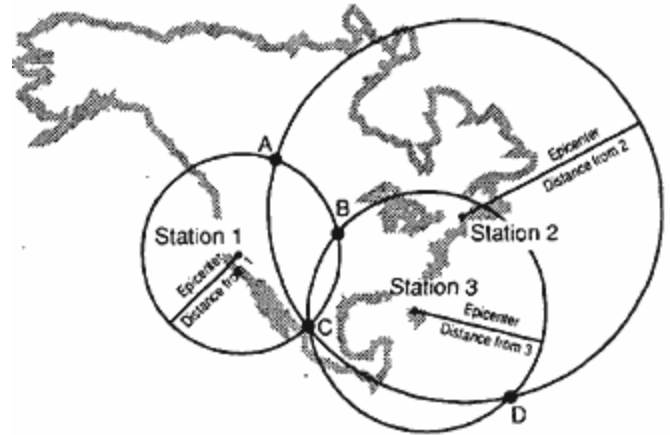
If the distance from the epicenter to station 2 is 3,500 kilometers, what is the approximate difference in the arrival times of the *P*-waves and *S*-waves at station 2?

A) 1 minute 40 seconds
B) 5 minutes 10 seconds
C) 6 minutes 20 seconds
D) 11 minutes 30 seconds

Answer Key
UNIT 4 Practice Set 3

1. __B__
2. __A__
3. __C__
4. __C__
5. __C__
6. __C__
7. __D__
8. __C__
9. __A__
10. __B__
11. __C__
12. __B__
13. __C__
14. __A__
15. __A__
16. __A__
17. __D__
18. __A__
19. __C__
20. __C__
21. __B__
22. __B__
23. __C__
24. __C__
25. __B__