Name _____

Dynamic Crust Regents Review

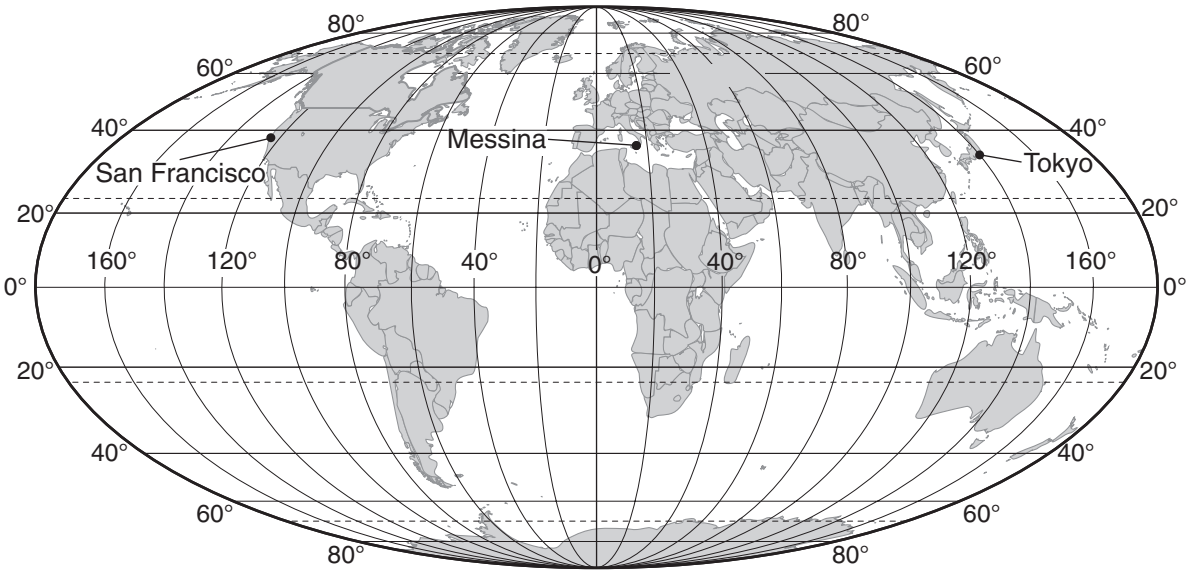
Base your answers to questions 1 through 3 on the table below, which lists the location of some earthquakes, their Richter magnitude, and their year of occurrence.

Data Table

Location	Richter Magnitude	Year
San Francisco, United States	7.8	1906
Messina, Italy	7.5	1908
Tokyo, Japan	8.3	1923
San Francisco, United States	7.1	1989

1. What data do scientists use to determine the magnitude of earthquakes without visiting the actual sites?

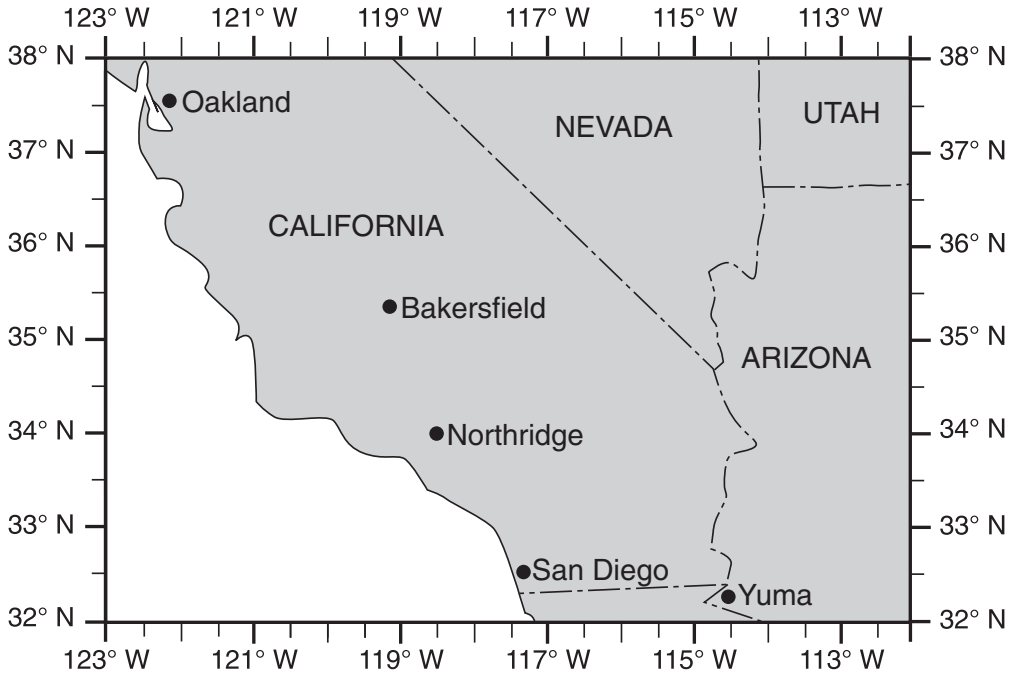
2. The locations of earthquakes listed in the table are shown on the map below.



Explain how the locations of these earthquakes are related to tectonic plates.

3. Identify the process in Earth's asthenosphere that is inferred to be the cause of tectonic plate motion.

Base your answers to questions 4 through 7 on the map below, which shows a portion of southwestern United States. On January 17, 1994, an earthquake occurred with an epicenter at Northridge, California.



4. State the latitude and longitude of Northridge, California. Include the correct units and compass directions in your answer.

5. Explain why earthquakes are common in this region of California.

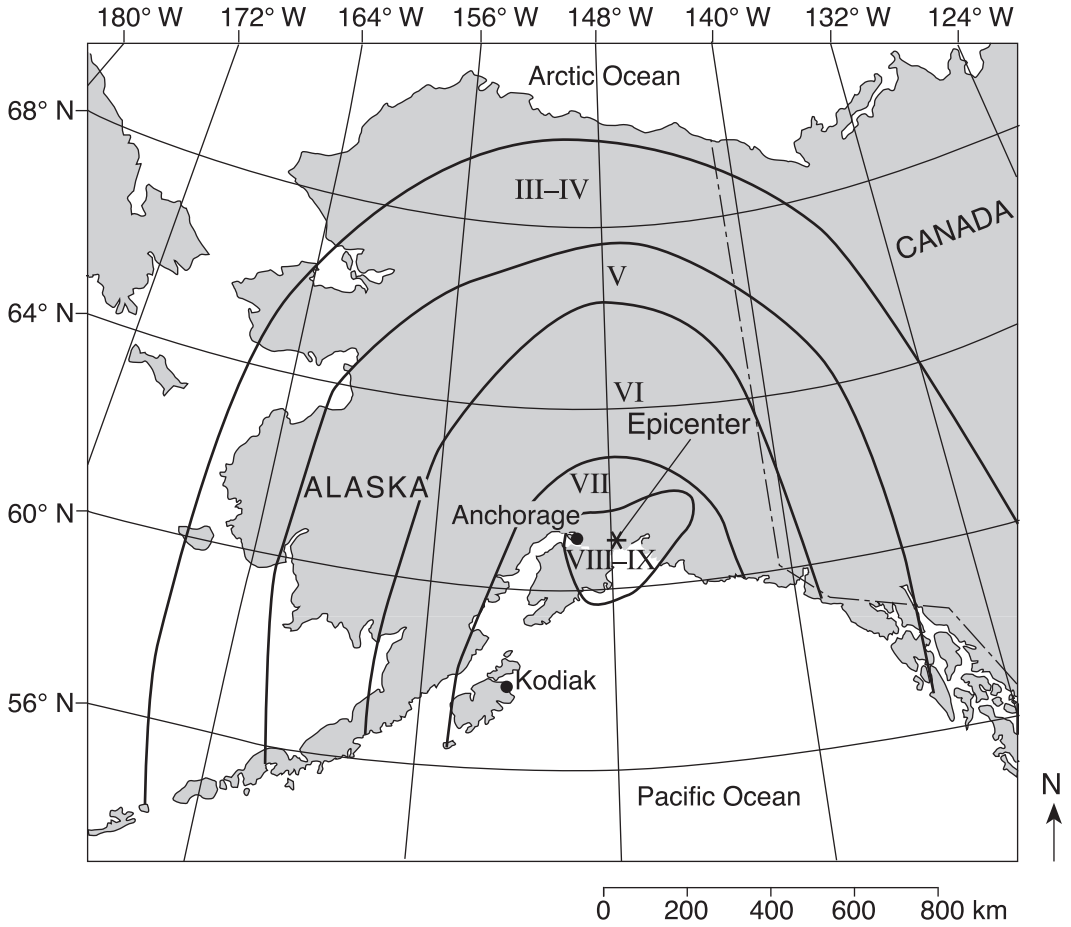
6. Of the cities shown on the map, explain why Oakland was the last city to receive P-waves from this earthquake.

7. List *two* actions that a homeowner could take to prepare the home or family for the next earthquake.

   1.

   2.

Base your answers to questions 8 through 12 on the map and the modified Mercalli intensity scale below. The map shows modified Mercalli intensity scale damage zones resulting from a large earthquake that occurred in 1964. The earthquake's epicenter was near Anchorage, Alaska. The cities Kodiak and Anchorage are shown on the map. The Mercalli scale describes earthquake damage at Earth's surface.



Modified Mercalli Intensity Scale

I	Instrumental: detected only by instruments	VII	Very strong: noticed by people in autos Damage to poor construction
II	Very feeble: noticed only by people at rest	VIII	Destructive: chimneys fall, much damage in substantial buildings, heavy furniture overturned
III	Slight: felt by people at rest Like passing of a truck	IX	Ruinous: great damage to substantial structures Ground cracked, pipes broken
IV	Moderate: generally perceptible by people in motion Loose objects disturbed	X	Disastrous: many buildings destroyed
V	Rather strong: dishes broken, bells rung, pendulum clocks stopped People awakened	XI	Very disastrous: few structures left standing
VI	Strong: felt by all, some people frightened Damage slight, some plaster cracked	XII	Catastrophic: total destruction

8. Describe *one* type of damage that occurred in Anchorage but *not* in Kodiak.

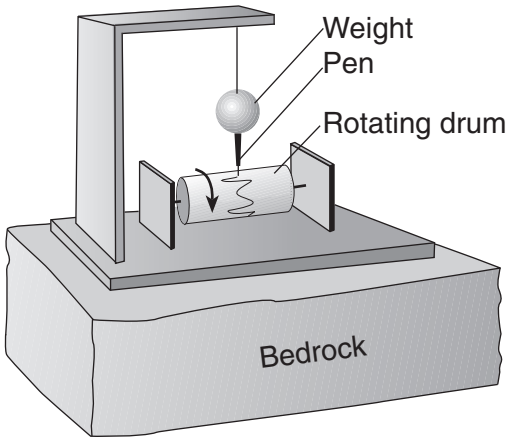
9. Write the names of the *two* converging tectonic plates that caused this earthquake.

10. Explain why S-waves from this earthquake were *not* directly received on the opposite side of Earth.

11. This earthquake produced a large ocean-floor displacement. Identify *one* dangerous geologic event affecting Pacific Ocean shorelines as a result of this ocean-floor displacement.

12. Determine the latitude and longitude of this epicenter. Include the units and compass directions in your answer.

Base your answers to questions 13 through 15 on the diagram below, which shows a seismograph that recorded seismic waves from an earthquake located 4000 kilometers from this seismic station.

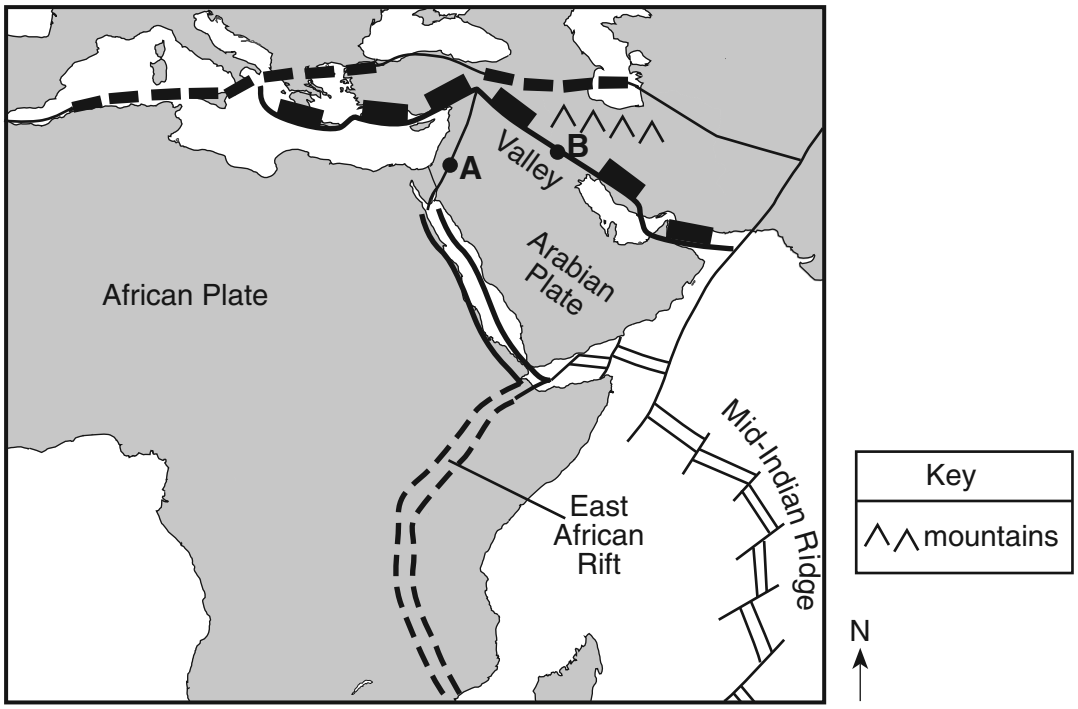


13. State *one* possible cause of the earthquake that resulted in the movement of the bedrock detected by this seismograph.

14. Which type of seismic wave was recorded first on the rotating drum?

15. How long does the first S-wave take to travel from the earthquake epicenter to this seismograph?

Base your answers to 16 through 18 on the map below, which is an enlargement of a portion of the *Tectonic Plates* map form the *Earth Science Reference Tables.* Points A and B are locations on different boundaries of the Arabian Plate.

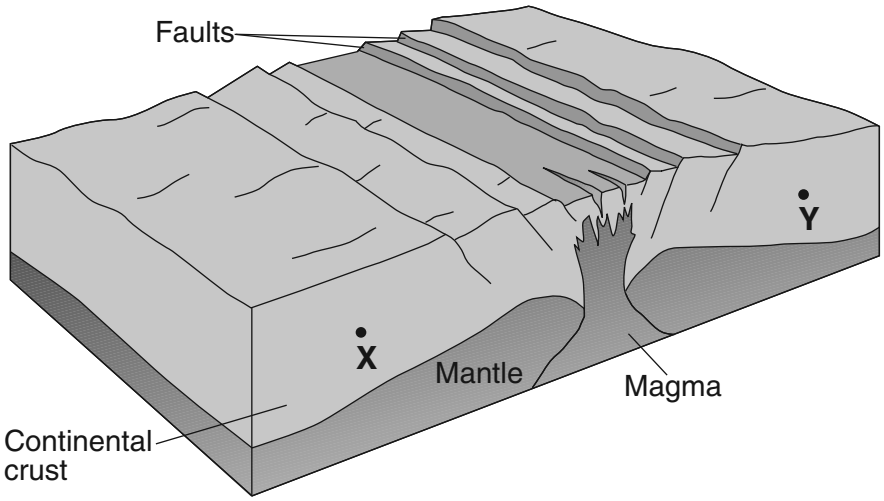


16. Identify the type of tectonic plate boundary located at point A.

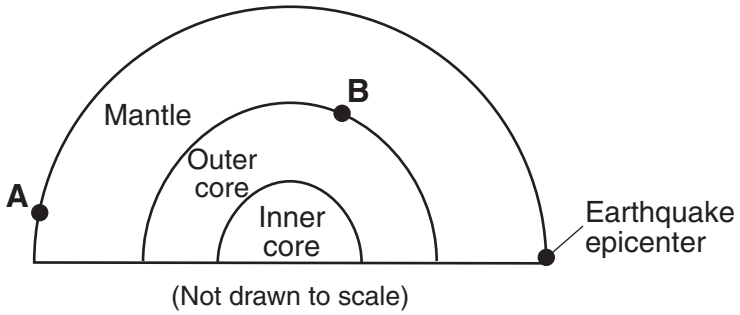
17. On the map shown, a valley is located south of point B and a mountain range north of point B. State the tectonic process that is creating these two land features.

18. The block diagram below represents Earth's surface and interior along the East African Rift. Draw *two* arrows, one through point X and one through point Y, to indicate the relative motion of each of these sections of the continental crust.

East African Rift



Base your answers to questions 19 and 20 on the cross section below, which shows a portion of Earth's interior layers and the location of an earthquake epicenter. Letter A represents a seismic station on Earth's surface. Letter B represents a location in Earth's interior.

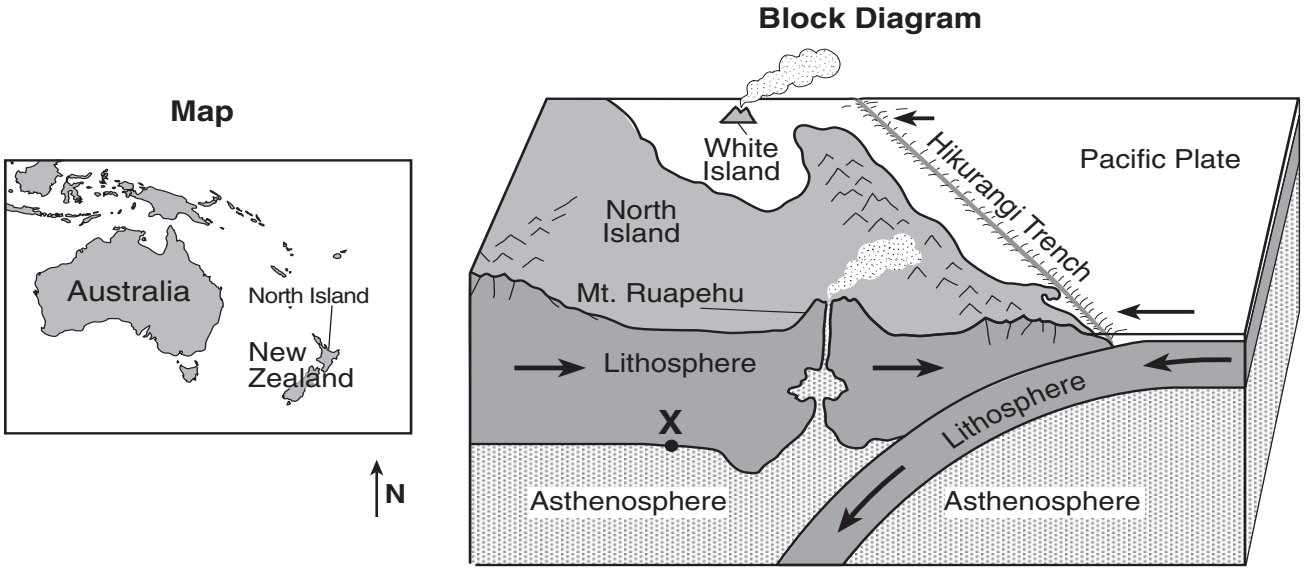


(Not drawn to scale)

19. Explain why seismic station A receives P-waves but *not* S-waves from this earthquake.

20. What is the approximate depth at location B?

Base your answers to questions 21 through 24 on the map and block diagram below. The map shows the location of North Island in New Zealand. The block diagram shows a portion of North Island. The Hikurangi Trench is shown forming at the edge of the Pacific Plate. Point X is at the boundary between the lithosphere and the asthenosphere.



(Not drawn to scale)

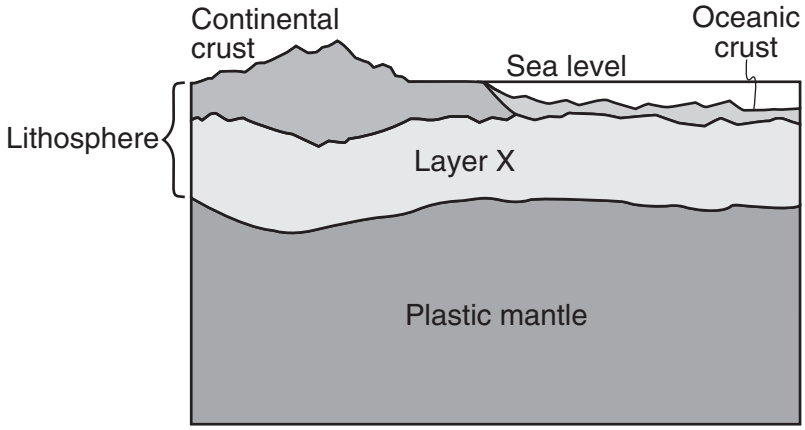
21. State the approximate temperature at point X.

22. On what tectonic plate are both North Island and White Island located?

23. Describe the type of tectonic plate motion that formed the Hikurangi Trench.

24. Describe *one* action that people on North island should take if a tsunami warning is issued.

Base your answers to questions 25 through 27 on the cross section below and your knowledge of Earth Science. The cross section shows a portion of Earth's interior. Layer X is part of Earth's interior.



(Not drawn to scale)

25. Identify the texture and relative density of the granitic bedrock of the continental crust and the basaltic bedrock of the oceanic crust.

26. The minerals biotite and amphibole may be found in igneous bedrock of both the oceanic crust and continental crust. Identify *two* other minerals commonly found in the basaltic oceanic crust.

27. Identify the part of the Earth's lithosphere represented by layer X.

Base your answers to questions 28 through 30 on the passage below and on your knowledge of Earth Science.

A New Oregon Volcano?

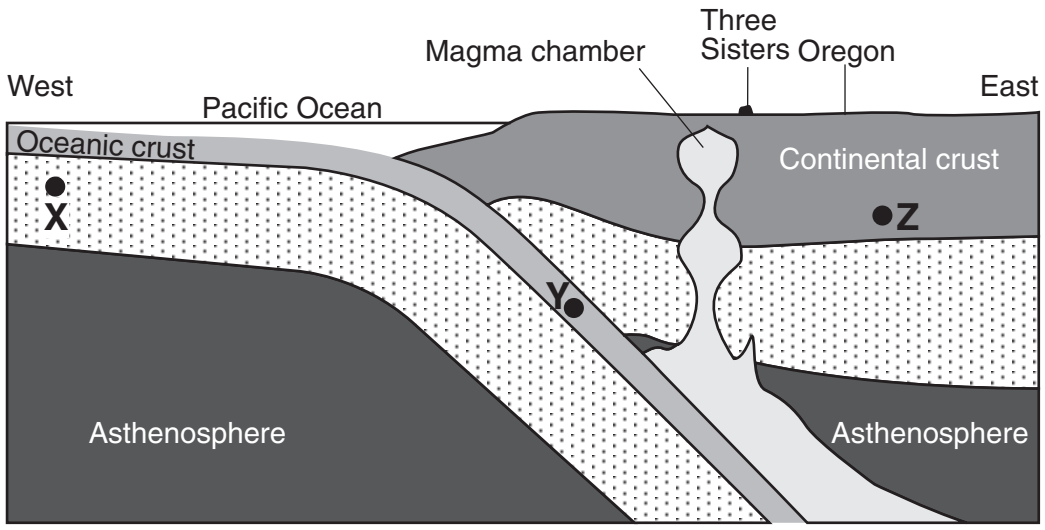
The Three Sisters are 10,000-foot volcanic mountain peaks in Oregon. Volcanic eruptions began building the Three Sisters from andesitic lava and cinders 700,000 years ago. The last major eruption occurred 2000 years ago.

West of the Three Sisters peaks, geologists have recently discovered that Earth's surface is bulging upward in a bull's-eye pattern 10 miles wide. There is a 4-inch rise at its center, which geologists believe could be the beginning of another volcano. The uplift was found by comparing satellite images. This uplift in Oregon may allow the tracking of a volcanic eruption from its beginning, long before the smoke and explosions begin.

This uplift is most likely caused by an upflow of molten rock from more than four miles below the surface. Rock melts within Earth's interior and then moves upward in cracks in Earth's crust, where it forms large underground pools called magma chambers. Magma upwelling often produces signs that help scientists predict eruptions and protect humans. When the pressure of rising magma becomes forceful enough to crack bedrock, swarms of small earthquakes occur. Rising magma releases carbon dioxide and other gases that can be detected at the surface.

28. Identify *one* of the minerals found in the andesite rock of the Three Sisters volcanoes.

29. The cross section below represents Earth's interior beneath the Three Sisters. Place a triangle, ▲ ,on the cross section to indicate the location where the new volcano will most likely form.



(Not drawn to scale)

30. On the same cross section, place arrows through each point X, Y, and Z, to indicate the relative motion of *each* of these sections of the lithosphere.

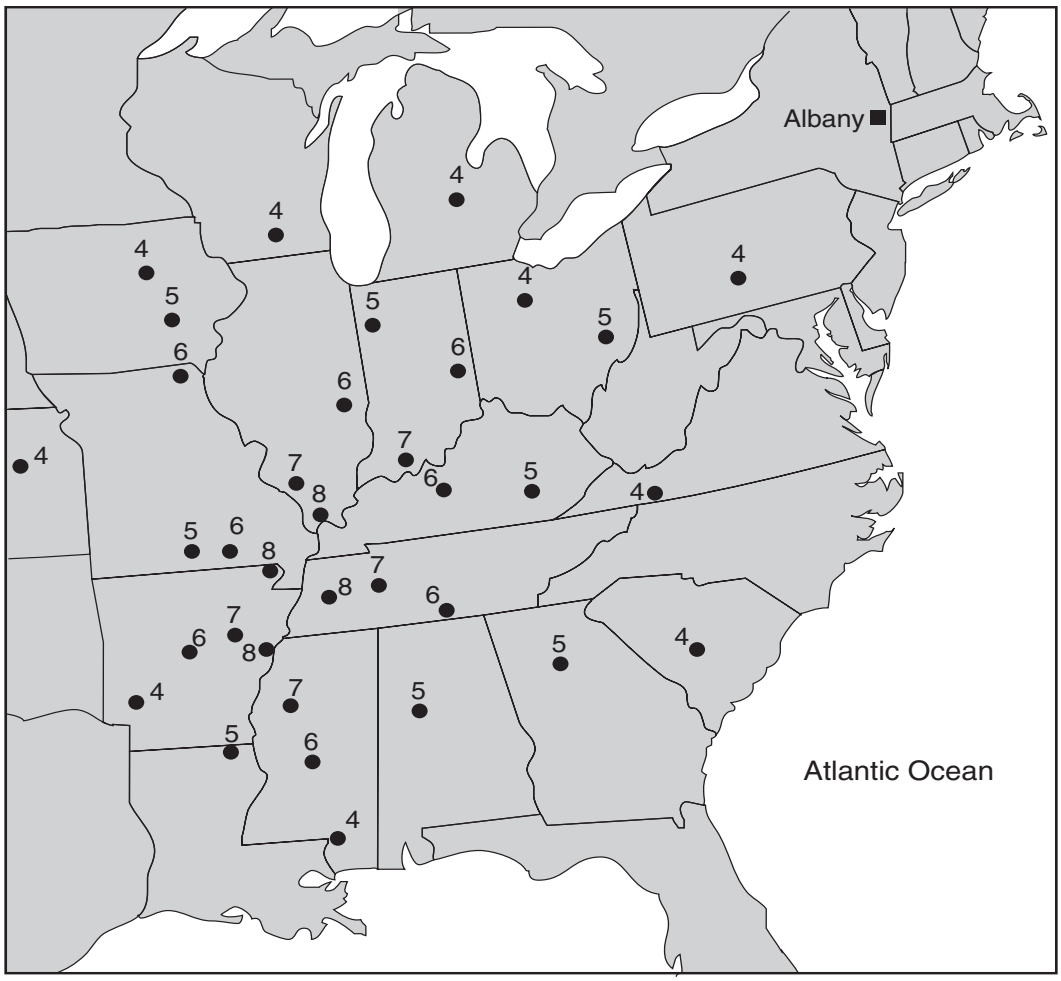
Base your answers to questions 31 through 34 on the passage and map below. The passage describes the New Madrid fault system. The numbers on the map show the predicted relative damage at various locations if a large earthquake occurs along the New Madrid fault system. The higher the number, the greater the relative damage.

The New Madrid Fault System

The greatest earthquake risk area east of the Rocky Mountains is along the New Madrid fault system. The New Madrid fault system consists of a series of faults along a weak zone in the continental crust in the midwestern United States. Earthquakes occur in the Midwest less often than in California, but when they do happen, the damage is spread over a wider area due to the underlying bedrock.

In 1811 and 1812, the New Madrid fault system experienced three major earthquakes. Large land areas sank, new lakes formed, the course of the Mississippi River changed, and 150,000 acres of forests were destroyed.

31. On the map below, draw the 4, 6, and 8 isolines indicating relative damage.



32. Using the predicted damage numbers, place an **X** on the map to indicate where the New Madrid fault system most likely exists.

33. The distance between the New Madrid fault system and Albany, New York, is 1800 kilometers. What is the time difference between the arrival of the first P-wave and the arrival of the first S-wave at Albany when the 1812 earthquake occurred?

34. State *one* reason why earthquakes occur more frequently on the western coast of the United States than in the New Madrid region.