Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_

**Chapter 1.3: Measuring and Predicting Earthquakes**

**Lesson 1.3: True or False**

Write true if the statement is true or false if the statement is false.

\_\_\_\_\_ 1. One way of determining the intensity of an earthquake is by the damage it causes.

\_\_\_\_\_ 2. The Richter magnitude scale is the earthquake intensity scale used by most scientists today.

\_\_\_\_\_ 3. The Mercalli intensity scale uses seismograph data to measure earthquake intensity.

\_\_\_\_\_ 4. The Richter magnitude and moment magnitude scales are logarithmic.

\_\_\_\_\_ 5. On average, one earthquake per year occurs with a Richter magnitude between 8.0 and 8.9.

\_\_\_\_\_ 6. Scientists are a long way from being able to predict earthquakes.

\_\_\_\_\_ 7. Small earthquakes, called foreshocks, always occur a few days before a major earthquake.

\_\_\_\_\_ 8. As stress builds up in rocks before an earthquake, the ground may start to tilt.

\_\_\_\_\_ 9. Seismographs record only the surface waves generated by an earthquake.

\_\_\_\_\_ 10. A seismometer must be very close to the epicenter of an earthquake to detect seismic waves.

**Lesson 1.3: Critical Reading**

Read this passage based on the text and answer the questions that follow.

**Earthquake Prediction**

Scientists are a long way from being able to predict earthquakes. A good prediction must be accurate in terms of where an earthquake will occur, when it will occur, and what magnitude it will be. This information is need to decide whether and when people should be evacuated from an area. An unnecessary evacuation due to an inaccurate prediction would be expensive. It also might cause people to disregard future evacuation orders.

Where an earthquake will occur is the easiest factor to predict. Scientists know that earthquakes take place at plate boundaries and tend to occur where they have occurred before. Earthquake-prone communities should always be prepared for an earthquake. For example, they can implement building codes to make structures earthquake safe.

When an earthquake will occur is much more difficult to predict. The stress on rocks along a fault builds up at a

constant rate, so earthquakes should occur at regular intervals. However, this is not always the case. For example, near Parkfield, California, an earthquake of magnitude 6.0 or higher occurs about once every 22 years on average. Based on the dates of previous earthquakes, seismologists predicted that the next earthquake would strike the area in 1993, but it didn’t occur until 2004.

Sometimes certain signs precede large earthquakes. Small earthquakes called foreshocks may occur as stress builds up before a major earthquake. Rocks around a fault may dilate and develop fractures as stress builds up in them. Water levels in wells may fluctuate as water moves into or out of rock fractures. The ground may start to tilt with building stress. Although these changes often precede large earthquakes, they don’t always occur. There have been many reports of animals behaving erratically before earthquakes. Whether animals can actually sense imminent earthquakes is not clear. It they can, scientists do not know what it is they are sensing.

**Questions about the Passage**

1. If scientists could predict earthquakes, why would accurate predictions be important?

2. What is the easiest factor to predict about earthquakes? Why?

3. Identify signs that sometimes precede large earthquakes. Why are these signs not very useful for predicting

 earthquakes?

**Lesson 1.3: Multiple Choice**

Circle the letter of the correct choice.

1. Seismograms contain information that can be used to determine how

1. strong an earthquake was.
2. long an earthquake lasted.
3. far away an earthquake was.
4. all of the above

2. A seismogram shows the arrival times of P-waves and S-waves from an earthquake. The greater the

 difference in arrival times is, the greater is the

1. distance of the epicenter from the seismometer.
2. magnitude of the earthquake.
3. length of time the earthquake lasted.
4. destruction caused by the earthquake.

3. If a seismometer records P-waves and surface waves but not S-waves, you can infer that the earthquake

 occurred

1. on the other side of Earth.
2. at more than one epicenter.
3. very close to the seismograph.
4. very far below Earth’s surface.

4. The situation in question 3 occurs because S-waves cannot travel

1. as far as P-waves.
2. deep underground.
3. as quickly as surface waves.
4. through Earth’s liquid outer core.

5. On the moment magnitude scale, the earthquake with the greatest intensity

1. releases the most total energy.
2. is felt by the largest number of people.
3. has a wave with the highest magnitude.
4. causes the greatest destruction to buildings.

6. How often do Richter magnitude 9 or higher earthquakes occur?

1. at least once a month
2. about five times a year
3. about once a year
4. several times a century

7. Which of the following earthquake features is easiest to predict?

1. when an earthquake will occur
2. where an earthquake will occur
3. how long an earthquake will last
4. what magnitude an earthquake will be

**Lesson 1.3: Matching**

Match each definition with the correct term.

|  |  |
| --- | --- |
| **Definitions**\_\_\_\_\_ 1. scale of earthquake intensity based on what people feel and what  damage is done\_\_\_\_\_ 2. strength of an earthquake\_\_\_\_\_ 3. device that records ground motions detected by a seismometer\_\_\_\_\_ 4. scale of earthquake intensity based on the magnitude of the largest  jolt of energy released by an earthquake\_\_\_\_\_ 5. device that senses ground motions caused by seismic waves\_\_\_\_\_ 6. scale of earthquake intensity based on the total energy released by  an earthquake\_\_\_\_\_ 7. record of the ground motions created by a seismograph | **Terms**a. seismographb. earthquake intensityc. Mercalli intensity scaled. seismograme. Richter magnitude scalef. moment magnitude scaleg. seismometer |

**Lesson 1.3: Fill in the Blank**

Fill in the blank with the appropriate term.

1. Scientists currently favor the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ scale for measuring earthquake intensity.

2. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an earthquake’s largest seismic wave is used to determine the Richter

 magnitude of the earthquake.

3. The distance from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an earthquake to a seismometer can be calculated from the

 difference in arrival times of P- and S-waves.

4. The epicenter of an earthquake can be found based on the distance from the epicenter to

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ different seismometers.

5. On the Richter scale, the intensity of a magnitude 5 earthquake is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ times greater than

 the intensity of a magnitude 3 earthquake.

6. An increase in two integers on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ scale equals a 900-fold increase in energy

 released by an earthquake.

7. The last seismic waves to arrive at a seismometer are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ waves.

**Lesson 1.3: Critical Writing**

Thoroughly respond to the prompt below. Use appropriate academic vocabulary and clear and complete sentences.

***Prompt:*** Explain how to find the epicenter of an earthquake using data from different seismometers.