

## Study Questions: Earthquakes

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**The quiz about earthquakes will involve questions like the ones that follow.**

**Note:** Whenever you see reference to *Tarbuck*, in the following questions, that means the eText of the textbook by Tarbuck and others, **Earth**

1. How are earthquakes that occur in Earth's upper crust related (if at all) to active faults?
2. How deep are the deepest earthquakes? (This is the Keith Sverdrup Memorial Question, even though Keith Sverdrup is not dead yet.)
3. What tectonic feature or environment (type of plate boundary) are intermediate- and deep-focus earthquakes associated with?
4. What is the name we give to the spot on Earth's surface that is directly above the place where an earthquake originated?
5. What name(s) do we give to the point below Earth's surface where an earthquake originates?
6. How is a seismic body wave different than a seismic surface wave?
7. Thinking about an earthquake P-wave, is it a *body* wave or a *surface* wave?
8. Thinking about an earthquake S-wave, is it a *body* wave or a *surface* wave?
9. Thinking about an earthquake Love- or Rayleigh-wave, is it a *body* wave or a *surface* wave?
10. Which has the greatest speed, and so reaches a distant seismograph first from an earthquake: a P-, S-, or surface wave?
11. Which type of wave is associated with most, if not all, of the damage we experience from major earthquakes: P-, S-, or surface waves?
12. What is the difference between a seismograph, seismometer, and seismogram?
13. The time difference between the first arrival of a P wave and the first arrival of an S wave at a given seismic station tells us something important about the location of the earthquake epicenter. What does it tell us?
14. If you were to buy or build a house in an area where major earthquakes occur, would you be safer in a house whose foundation rests on hard bedrock (like a dense igneous or metamorphic rock) or soft material (like sediment or artificial fill material)?
15. Can a well-recorded earthquake (i.e., one that is recorded clearly by many seismographs across a broad area) provide a seismologist with information that would allow her to determine the type of fault that produced the earthquake (e.g., a normal fault, reverse fault, or a strike-slip fault)?
16. As a compressional wave passes through, does an individual particle affected by that wave move back-and-forth parallel to the direction the wave is moving, or side-to-side perpendicular to the direction the wave is moving, or in a rolling motion like a cork moving as water waves move past it?
17. Which of the three primary states of matter that interest us in geology (solid, liquid, gas) can a compressional wave from an earthquake pass through?
18. As a shear wave passes through, does an individual particle affected by that wave move back-and-forth parallel to the direction the wave is moving, or side-to-side perpendicular to the direction the wave is moving, or in a rolling motion like a cork moving as water waves move past it?
19. Which of the three primary states of matter that interest us in geology (solid, liquid, gas) can a shear wave from an earthquake pass through?
20. Name one active fault in the United States that has produced a major damaging earthquake in the last 150 years.
21. Name another active fault in the United States that has produced a major earthquake in the last 150 years, different from your previous answer.
22. Very large earthquakes sometimes cause significant numbers of deaths and serious injuries. The shaking itself does not harm humans, so what is one of the major causes of death in earthquakes?
23. Name another major cause of death in earthquakes.
24. What sort of very damaging water wave can be generated when a major earthquake occurs on a fault along which there is significant vertical motion of the seafloor?
25. What is liquifaction?
26. Imagine an instance when analysis of records from a network of seismograph stations indicates that an earthquake had a magnitude of 5. A seismologist, talking on an NPR program, mentions that a magnitude 5 earthquake releases about 32 times the energy as a magnitude 4 earthquake in this area. About how much more energy would a magnitude 6 earthquake release than a magnitude 4 earthquake if it occurred in the same area?
27. Most modern seismograph stations are integrated into a network of many seismograph stations so that information about earthquakes can be quickly analyzed. What is the *minimum* number of seismograph stations we need to get a reasonable location estimate for the epicenter of an earthquake?
28. Is there a significant chance of an earthquake occurring in the next 500 years that would cause major damage in Los Angeles? ...Chicago? ...New York? ...Lagos, Nigeria? ...Seattle? ...Dallas? ...Memphis, Tennessee? ...Salt Lake City? ...Waco?
29. Thinking globally, are earthquake epicenters distributed almost evenly everywhere across Earth's surface, or do they tend to occur frequently in some areas and almost not at all in others?
30. How do we know that Earth has a *liquid* outer core?
31. How do we know that Earth's mantle is in the *solid* state of matter?
32. Do seismic waves travel *faster* or *slower* through more dense material (compared with wave velocity through less dense material)?

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