

Lesson 3

Earthquakes and Volcanoes



1. What causes an earthquake?
2. What kind of instrument is used to measure earthquakes?
3. Which waves cause the most damage in an earthquake?
4. Where is the focus of an earthquake?
5. Where is the epicenter?
6. Where in the world are most active volcanoes located?
7. Why are some volcanoes flat and others more cone-shaped?

Mount St. Helens in Washington state erupted in 1980 and dramatically changed the landscape of the area. To learn more about this incredible eruption and see before and after photos of the area, go to the US Forest Service site at www.mshslc.org. It has links to videos that show the eruption and how the area changed after the eruption.



Make a Volcano

Get an empty water bottle ($\frac{1}{2}$ liter). Place the bottle in the center of a flat board. Crumble up newspaper and place it around the bottle to make the cinder cone. Wrap the pile of papers with aluminum foil to hold it together. Don't put foil over the opening of the bottle. Mix Plaster of Paris according to its directions. Spread the plaster over the foil, shaping the cone. Don't let the mouth of the bottle get clogged with plaster. After the plaster has dried, you can paint the volcano. Try looking up some images of real volcanoes so you know what one looks like.

To make your volcano erupt, pour about $\frac{1}{4}$ cup of baking soda into the bottle at the center of the volcano. Take 1 cup of vinegar and add 1 or 2 drops of red food coloring to it. Pour the vinegar into the bottle and watch the lava flow!

Earth-Shaking and Ground-Breaking!

The amount of energy released in earthquakes and volcanic eruptions is tremendous. That is why the destruction they cause can be so disastrous. Read pp. 439 – 458 and answer the questions below to learn more about their affects on the world.

1. List two different scales that are used to describe the strength of an earthquake.
2. How much more energy does a magnitude 5 earthquake have than a magnitude 2 earthquake on the Richter Scale?
3. Using the Richter Scale, what is the magnitude of earthquake that would cause damage to a properly constructed building?
4. Using the Modified Mercalli Intensity scale in Appendix B of your book, determine the type of earthquake based on the descriptions below:
 - a. Windows, dishes, glassware broken, books fall off shelves. Slight damage.
 - b. Considerable damage in well-built structures. Buildings shifted off foundations.
5. What is a tsunami?
6. List the three types of shock waves that are produced by an earthquake.
7. Why is it difficult to predict earthquakes?
8. What is a caldera?
9. What else is emitted from volcano besides lava?
10. Where and when was the largest known volcanic explosion within historic times?
11. Where is the largest known volcano?
12. Approximately how many active volcanoes are on land?



To learn more about earthquakes that have occurred in Texas, go to the US Geological Society web page at <https://catalog.texnet.beg.utexas.edu/> .

LESSON 3, PAGE 1:

1. Earthquakes are caused by tectonic plates that rub against each other causing vibrations.
2. A seismograph
3. Long waves
4. Underground, at the center of energy
5. On the earth's surface, directly above the focus.
6. $\frac{3}{4}$ of the earth's active volcanoes are located along the "Ring of Fire" in the Pacific
7. Flat volcanoes are formed by runny lava that oozes out. Cone-shaped volcanoes are caused by cinders and debris piling up after the volcano erupts.

Make a Volcano

In class, we talked about different ways to make a volcano model erupt. Baking soda and vinegar is the easiest, but it also might be fun to try soda and Mentos. You could try using a red soda such as Big Red to get the lava affect. Definitely an outside activity!

PAGE 2:

1. The Richter scale and the Modified Mercalli Index.
2. Every time the Richter scale goes up one number, the energy is multiplied by 31.6. Since the Richter number went up three numbers (from 2 to 5), the earthquake's energy would increase to $31.6 \times 31.6 \times 31.6 = 3125$ times.
3. 6.0 – 6.9 (The scale is listed on page 440.)
4. a. V b. IX
5. A tsunami is an enormous wave caused by an earthquake or volcanic eruption.
6. P waves, S waves, L waves
7. Earthquakes are difficult to predict because seismologists don't fully understand what causes them and the factors that they do understand are very complex.
8. A caldera is a large crater formed by the explosion or collapse of a volcano. Sometimes they will fill up with water to form a lake.
9. Volcanoes emit hot gases, superheated water vapor, ash, cinders, and large chunks of rock.
10. The explosion that formed the Yellowstone Caldera was probably a category 8 eruption. In 1815, Mt. Tambora in Indonesia exploded and was a category 7.
11. Mauna Loa has the base with the greatest area. Mauna Kea is the tallest volcano. Both are part of the Hawaiian Islands.
12. More than 1511 active volcanoes are on land.

Current eruptions:

https://www.upi.com/Top_News/World-News/2022/12/06/hawaii-indonesia-italy-japan-volcano-eruptions-increase-worldwide/6661670376373/