

Physical

Earth and Space

Life

**LESSON 57****Identifying the causes and effects of earthquakes*****Lesson Preparation******Program Materials***

- Child's Booklet E *Exploring the Earth's Structure* (pp. 12–13)
- Optional: Information on recent earthquakes at [www.nancylarson.com](http://www.nancylarson.com) under Teacher and Student Links, *Science 3*, Lesson 57
- Science Word List E
- Lesson Review 57

***Collected Materials***

- Yellow highlighter

***The Lesson***

**“What did you learn about tectonic plates in your last science lesson?”** *The names of some of the tectonic plates and how they move; most earthquakes and volcanoes occur along the tectonic plate boundaries.*

**“What is the name of one of the tectonic plates?”** *North American Plate, South American Plate, African Plate, Antarctic Plate, Eurasian Plate, Indo-Australian Plate, Pacific Plate, and several other smaller plates*

- Repeat until several of the plates are named.

**“What are the three ways tectonic plates move?”** *collide, separate, or slide*

**“Use your hands to show plates colliding.”**

- Demonstrate the movement with your hands also.
- Repeat for separating and sliding.

**“What may occur when plates collide or separate?”** *mountains form, earthquakes occur, volcanoes erupt*

**“What happens when plates slide?”** *earthquakes occur*

**“Today you will learn about earthquakes.”**

**“Take out your geology booklet and highlighter.”**

**“Open your booklet to page 12.”**

**“Follow along as I read paragraph 1.”**

- Read the following to your child as he/she follows along.

Earthquakes occur where there are large cracks in the Earth’s crust. These large cracks are called faults. Faults are found where the tectonic plates meet. Faults are also found in the middle of the plates where the solid rock is cracked.

**“Where do earthquakes occur?”** *where there are large cracks in the Earth’s crust*

**“What are the large cracks in the Earth’s crust called?”** *faults*

**“In the second sentence, highlight the words ‘large cracks’ and the word ‘faults.’”**

**“Where are faults found?”** *where plates meet and in the middle of plates where the solid rock is cracked*

- **Teacher Note:** There are many active faults in the New Madrid (něd'rřd) Seismic Zone located in southeastern Missouri, northeastern Arkansas, western Tennessee, western Kentucky, and southern Illinois. Between 1811 and 1812, several major earthquakes occurred in this area. Refer to our website for more information about earthquakes in the New Madrid Seismic Zone.

**“Let’s read about what causes earthquakes.”**

**“Follow along as I read paragraph 2.”**

- Read the following to your child as he/she follows along.

An earthquake occurs when two sections of rock at a fault move suddenly. The two sections of rock can slide past each other and move in opposite directions, or one section of rock can move up or down next to the other section.

**“When does an earthquake occur?”** *when two sections of rock at a fault move suddenly*

**“You can use your hands to demonstrate an earthquake.”**

**“Place the palms of your hands together with your fingers pointing away from you.”**

**“Press your hands together as hard as you can.”**

**“Now try to slide your hands in opposite directions while you continue to press them together.”**

- Demonstrate the movement with your hands.

**“When your hands slide, they move suddenly with a jolt and come to a sudden stop.”**

**“This is similar to what happens when rocks slide past each other and an earthquake occurs.”**

**“Let’s read about what happens when earthquakes occur.”**

**“Follow along as I read paragraph 3.”**

- Read the following to your child as he/she follows along.

The exact place where an earthquake occurs is called the focus. The focus is far below the surface of the ground. The place on the surface of Earth that is directly above the focus is called the epicenter of the earthquake. When an earthquake occurs, seismic waves move outward from the focus in all directions. On the surface of Earth, we feel the shaking caused by the seismic waves. When strong earthquakes occur, there is violent shaking. Near the epicenter, buildings can collapse, and the land can shift or crack.

**“What do geologists call the exact place where an earthquake occurs?”**  
*focus*

**“In the first sentence, highlight the words ‘place where an earthquake occurs’ and ‘focus.’”**

**“Where is the epicenter of the earthquake located?”** *on the surface of Earth directly above the focus*

**“The epicenter is where most of the damage from an earthquake usually occurs.”**

**“In the third sentence, highlight the words ‘place on the surface of Earth that is directly above the focus’ and ‘epicenter.’”**

**“Let’s read about what happens when earthquakes occur below the ocean.”**

**“Follow along as I read paragraph 4.”**

- Read the following to your child as he/she follows along.

When strong earthquakes occur under the ocean, a large mass of water, called a tsunami (tsōō-nă'mē), is often pushed outward in all directions from the epicenter. A tsunami can cause destructive waves and flooding along coastal areas.

**“What happens when a strong earthquake occurs under the ocean?”**  
*There may be a tsunami.*

**“In the first sentence, highlight the word ‘tsunami.’”**

**“What is a tsunami?”** *a large mass of water pushed outward from the epicenter of an earthquake*

**“Let’s read about how geologists measure and describe the strength of an earthquake.”**

**“Follow along as I read paragraph 5 on page 13.”**

- Read the following to your child as he/she follows along.

Each year there are more than a million earthquakes, but only some of these are strong enough for people to feel. Geologists determine the magnitude of an earthquake by measuring the strength of its seismic waves. In 1935, a geologist named Charles Richter (rĭk'tər) created a scale called the Richter Scale for rating the magnitude, or size, of earthquakes. Geologists can measure the intensity of an earthquake by looking at the damage it causes. Although it is possible to measure earthquakes, it is not possible to predict when major earthquakes will occur.

**“Which geologist created a scale for measuring the magnitude, or size, of earthquakes?”** *Charles Richter*

**“Charles Richter’s scale is given on the Earthquake Scales chart shown at the bottom of page 13.”**

**“Also on the chart are the U.S. Geological Survey Description and the Mercalli (mər-kä'lē) Scale of Earthquake Intensity.”**

**“In December 2004, an earthquake that caused a tsunami occurred along the Indo-Australian Plate and the Eurasian Plate.”**

**“This earthquake had a magnitude greater than 9 on the Richter Scale.”**

**“According to the Mercalli Scale of Earthquake Intensity, what type of damage did this earthquake cause?”** *total destruction*

**“How did you find this?”** *9 is larger than 8.0 on the Richter Scale.*

**“What word does the U.S. Geological Survey use to describe an earthquake of this magnitude?”** *great*

**“In 1989 an earthquake occurred near San Francisco, California.”**

**“It was an earthquake of magnitude 7.1 on the Richter Scale.”**

**“What word does the U.S. Geological Survey use to describe an earthquake of 7.1 magnitude?”** *major*

**“How did you find this?”** *7.1 is between 7.0 and 7.9 on the Richter Scale.*

**“What type of damage do earthquakes with a magnitude of 7.1 usually cause?”** *large cracks in the ground, most buildings collapse, bridges fall down*

**“Because of the construction standards in San Francisco, only a few buildings collapsed during the 1989 earthquake.”**

**“What type of damage would an earthquake of magnitude 3.5 cause?”**  
*probably very little damage*

**“How did you find this?”** *3.5 is between 3.0 and 3.9 on the Richter Scale; the Mercalli Scale shows hanging objects may swing; are not felt by most people*

**“What word does the U.S. Geological Survey use to describe an earthquake of 3.5 magnitude?”** *minor*

**“What type of damage would an earthquake of magnitude 5.4 cause?”**  
*furniture moves, walls crack*

**“What word does the U.S. Geological Survey use to describe an earthquake of 5.4 magnitude?”** *moderate*

**“You can check the U.S. Geological Survey website to see where earthquakes have occurred during the past week.”**

- Write the words **earthquake**, **fault**, **focus**, **epicenter**, and **tsunami** on Science Word List E.
- **Optional:** Use our website to show your child where earthquakes have occurred during the past week and examples of the damage earthquakes cause.

**“What is something you learned in today’s science lesson?”**

**“In your next science lesson, you will learn about volcanoes.”**

## *Lesson Review*

- **Note:** Lesson reviews may be completed on the same day the lesson is taught or on the following day.
- Hand Lesson Review 57 to your child.
- Read the directions and questions to your child.
- Discuss the “Use What You Have Learned” question with your child.
- Allow your child to use his/her booklet to answer the questions.
- Correct your child’s paper. Review incorrect answers with your child.

### Earthquakes

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- Earthquakes occur where there are large cracks in the Earth's crust. These **large cracks** are called **faults**. Faults are found where the tectonic plates meet. Faults are also found in the middle of the plates where the solid rock is cracked.
- An earthquake occurs when two sections of rock at a fault move suddenly. The two sections of rock can slide past each other and move in opposite directions, or one section of rock can move up or down next to the other section.
- The exact **place where an earthquake occurs** is called the **focus**. The focus is far below the surface of the ground. The **place on the surface of Earth that is directly above the focus** is called the **epicenter** of the earthquake. When an earthquake occurs, seismic waves move outward from the focus in all directions. On the surface of Earth, we feel the shaking caused by the seismic waves. When strong earthquakes occur, there is violent shaking. Near the epicenter, buildings can collapse, and the land can shift or crack.
- When strong earthquakes occur under the ocean, a large mass of water, called a **tsunami**, is often pushed outward in all directions from the epicenter. A tsunami can cause destructive waves and flooding along coastal areas.

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Science 3

- Each year there are more than a million earthquakes, but only some of these are strong enough for people to feel. Geologists determine the magnitude of an earthquake by measuring the strength of its seismic waves. In 1935, a geologist named Charles Richter created a scale called the Richter Scale for rating the magnitude, or size, of earthquakes. Geologists can measure the intensity of an earthquake by looking at the damage it causes. Although it is possible to measure earthquakes, it is not possible to predict when major earthquakes will occur.

### Earthquake Scales

U.S. Geological Survey Description	Richter Scale of Earthquake Magnitude	Mercalli Scale of Earthquake Intensity
Micro	0-1.9	• No damage • Not felt by people
	2.0-2.9	• No damage • Not felt by most people
Minor	3.0-3.9	• Hanging objects may swing • Not felt by most people
Light	4.0-4.9	• Windows and dishes rattle • Some windows crack
Moderate	5.0-5.9	• Furniture moves • Walls crack • Difficult to stand up
Strong	6.0-6.9	• Some houses collapse • Roads crack
Major	7.0-7.9	• Large cracks in the ground • Most buildings collapse • Bridges fall down
Great	8.0+	• Total destruction

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Name \_\_\_\_\_ Answer Key \_\_\_\_\_  
Date \_\_\_\_\_

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### Earthquakes

- Fill in the boxes titled "Effect."

Cause	Effect
An earthquake of magnitude 4.6 on the Richter Scale	<ul style="list-style-type: none"> <li>• Windows and dishes rattle</li> <li>• Some windows crack</li> </ul>

Cause	Effect
An earthquake of magnitude 7.5 on the Richter Scale	<ul style="list-style-type: none"> <li>• Large cracks in the ground</li> <li>• Most buildings collapse</li> <li>• Bridges fall down</li> </ul>

Circle T for True or F for False.

- A large mass of moving water caused by a strong earthquake under the ocean is called a tsunami. (T) F
- The exact place where an earthquake occurs is called the focus. (T) F
- The equator is the location on the Earth's surface directly above the focus of an earthquake. T (F)
- Earthquakes occur where there are large cracks in the crust, called faults. (T) F

### Use What You Have Learned

- If a person is inside a building when an earthquake begins, what do you think he or she should do?

Accept reasonable answers.

Possible answer: You should get out of the building and move to an open area.

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