Name _____

Daily Science
Big Idea 3
WEEK 1

Day 4

Weekly Question

How was the Grand Canyon formed?

The Colorado River has always been important to the Grand Canyon **ecosystem**. When the river flooded, it helped native fish by carrying away rocks and sand that blocked parts of the river. Floodwaters deposited sand along riverbanks, building sandbars that became plant and animal habitats.

In 1963, water from the Colorado River was dammed up to create the Glen Canyon Dam. This meant that the natural flooding stopped. Scientists later realized that without flooding, the plants and animals living in the Grand Canyon suffered. Now the dam is occasionally opened to release a lot of water. This is done to preserve the ecosystem in the Grand Canyon.

Vocabulary

ecosystem
EE-koh-SIS-tum
a community of plants and animals and the physical environment in which they live

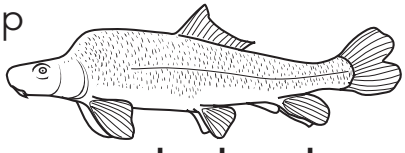
Below are two problems created by the Glen Canyon Dam. Explain how flooding might solve each problem.


saltcedar

1. The saltcedar is a shrub that, if left undisturbed, grows so thick that it stops other plants from growing. Saltcedar also traps salts from the soil and water, making the area around the shrub too salty for freshwater fish and amphibians to live.

_____

_____


razorback sucker

2. The razorback sucker is a fish that lays its eggs in sandbars. It gets most of its food from riverbeds that have been churned up by a lot of flowing water. This fish is currently endangered because it cannot find enough food or places to reproduce.

_____

_____

Name _____

Daily Science
Big Idea 3
WEEK 1

Day 5

Weekly Question

How was the Grand Canyon formed?

A. Use the words in the box to complete the sentences.

erosion	**channels**	**expanded**
uplifted	**ecosystems**	**weathering**

1. Rainwater can carve _____ in the soil.
2. Mountains form when the land is _____.
3. Soil being washed away is an example of _____.
4. Blowing sand can cause _____ of rock.
5. In _____, plants and animals interact with each other.
6. Over millions of years, the Grand Canyon _____.

B. Fill in the bubble next to the correct answer.

1. If you found a very young rock at the bottom of the Grand Canyon, what would be the most likely way that it got there?

   Ⓐ The rock was uplifted from below.
   Ⓒ The rock was from a glacier.
   Ⓑ The rock fell from the cliff above.
   Ⓓ Animals brought the rock there.

2. Over time, erosion and weathering can cause canyons to become _____.

   Ⓐ deeper and narrower
   Ⓒ deeper and wider
   Ⓑ wider and shallower
   Ⓓ shallower and narrower

C. Summarize how Glen Canyon Dam has affected the Grand Canyon ecosystem.

_____

_____

Both slow and rapid processes—from erosion to earthquakes—shape and reshape Earth's surface.

Week 2

Do glaciers really move?

This week, students learn that glaciers are not huge, stationary masses, but slow-moving rivers of ice that grind away rock, carve valleys, and create lakes. Glaciers move slowly, reacting to gravity and intense pressure that cause them to spread out and move. Today, glaciers are melting faster than they are growing due to the fact that Earth is warming. Scientists study glaciers to understand how Earth's climate changed in the past and how it might change again.

Day One

Vocabulary: *glacier*

Materials: page 75; photographs of glaciers

After introducing the vocabulary word, show students photos of glaciers from around the world. List words that describe the glaciers. (icy, white, chunky, like rivers, dark streaks, etc.) Ask students to speculate where the ice comes from. Then have students read the passage to find out. Before students complete the activities, confirm that they understand the meaning of *dense* (tightly packed, thick). Ask, *Which is denser, fluffy snow or ice?*

Day Two

Vocabulary: *meltwater*

Materials: page 76

Tell students that the passage they are about to read will answer the week's question. Then have a volunteer read the first two sentences aloud. Introduce the vocabulary word and direct students to read the remainder of the passage to find out what meltwater has to do with glaciers moving. You may wish to do the activity together to make sure students understand the two causes of glacial movement.

Day Three

Vocabulary: *basin, moraines*

Materials: page 77; map of the U.S.

Tell students that about 15,000 years ago, glaciers covered all of what is now Canada and the northern United States. These glaciers created many of the landforms we know today. Introduce the vocabulary and have students read the passage. Help students find Yosemite Valley and the Great Lakes on the map. Then have them complete the activities.

Day Four

Vocabulary: *retreat*

Materials: page 78; photos of glaciers (optional)

If possible, share photos of retreating glaciers, such as the Boulder Glacier, Easton Glacier, or Grinnell Glacier. Then have students read the passage and complete the first activity. For the oral activity, consider having small groups discuss the question and share their ideas with the class. Then provide the answers: According to scientists, if all of the Antarctic ice melted, sea levels would rise 180 feet (55 meters). If all the ice covering Greenland melted, sea levels would rise 23 feet (7 meters). Scientists are not sure how likely it is that all of Earth's ice will melt. However, even a three-foot rise in sea level would flood many coastal areas around the world.

Day Five

Materials: page 79

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 3
WEEK 2

Day 1

Weekly Question

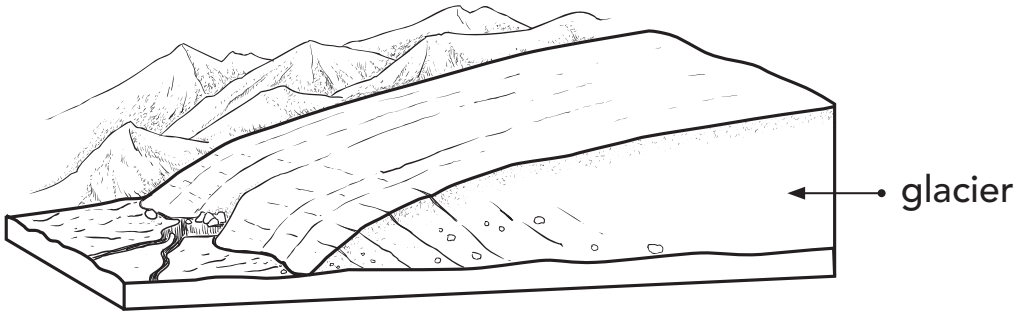
Do glaciers really move?

Have you ever seen pictures of a snow-topped mountain? If so, you may also have been looking at a **glacier**. Glaciers are large sheets of ice that form in places where more snow falls than melts. As layers of snow build upon one another, the weight from a top layer pushes down on the layers beneath it. This pressure turns the snow to ice, like when you squeeze fluffy snow into a hard snowball.

Because glaciers form slowly, we can find them only in places that are cold year-round. Places like Greenland, Antarctica, and the tops of mountain ranges are good places for glaciers to form.

Vocabulary

glacier
GLAY-shur
a large, slow-moving mass of ice



A. Write the two qualities that a place must have in order for a glacier to form there.

1. _____

2. _____

B. Write *true* or *false*.

1. Glaciers are made from many layers of ice. _____

2. Glaciers freeze in winter and melt completely every summer. _____

3. Glaciers are less dense than fresh snow. _____

4. Greenland and Antarctica have cold summers. _____

Name _____

Daily Science
Big Idea 3
WEEK 2

Day 2

Weekly Question

Do glaciers really move?

Glaciers might appear to stay in one place, but they are actually "rivers" of ice that flow downhill. Glaciers move in two main ways. One way a glacier moves is when it becomes so deep and heavy that it can't hold itself together. Gravity causes the ice to spread out, much like the way warm wax flows.

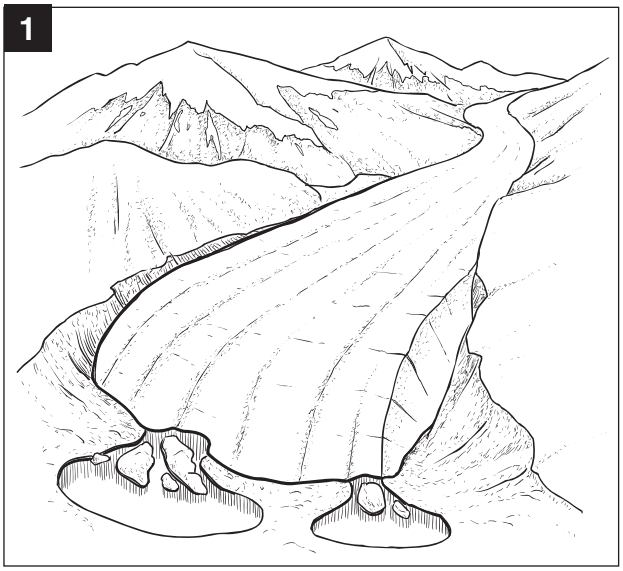
The second way glaciers move is by sliding. This happens because **meltwater** at the bottom of the glacier makes the ground wet and the glacier very slippery. Meltwater can come from melted ice that seeps through the glacier, or it can be created when extreme pressure from the ice above causes the ice at the bottom of the glacier to melt.

Vocabulary

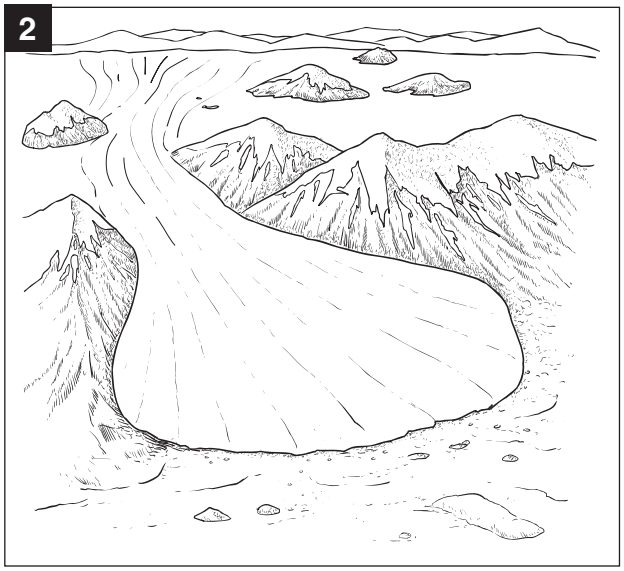
meltwater
MELT-wah-tur
water that melts from a glacier

The pictures below show two ways a glacier can move. Using information from the passage, write a caption that describes each picture.

1



2



_____ _____

_____ _____

Name _____

Daily Science
Big Idea 3
WEEK 2

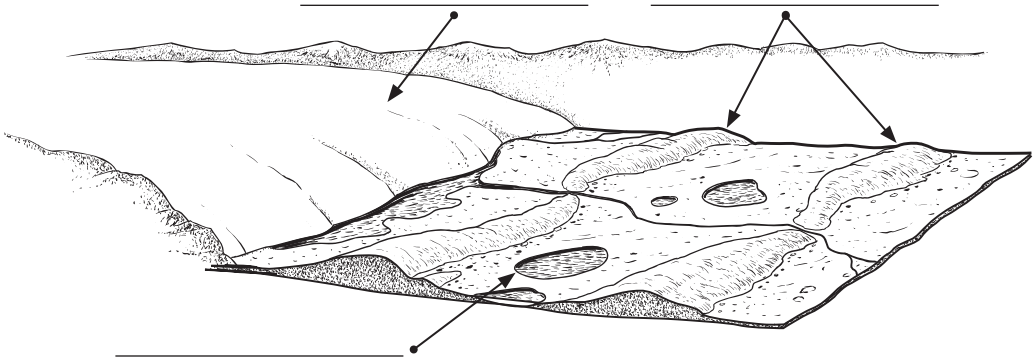
Day 3

Weekly Question

Do glaciers really move?

Glaciers are the largest moving objects on Earth, scraping rocks and soil from their paths like giant bulldozers. We can see the effect of glaciers in many places. For example, California's Yosemite Valley was once filled by a glacier over 3,000 feet deep. This glacier carved a giant U-shaped valley in the rock and left behind ridges of dirt and gravel called **moraines**. In other places, erosion by glaciers resulted in the creation of lakes. The Great Lakes formed from **basins** scooped out by the passage of a glacier. When the ice melted, these basins filled with water.

A. Label each landform with the correct word from the passage.



B. Use the vocabulary words to complete the sentences.

1. Animals looking for water might check small _____ after a rainstorm.
2. Some _____ can become low hills.
3. A _____ contains a mixture of rocks and soil.
4. A bathtub is similar in shape to a _____.

Vocabulary

basin
BA-sin
a large hole or depression in the ground that can contain water

moraines
mor-RAYNZ
ridges of loose rock and soil created by a glacier and left behind when the glacier melts

Name _____

Daily Science
Big Idea 3
WEEK 2

Day 4

Weekly Question

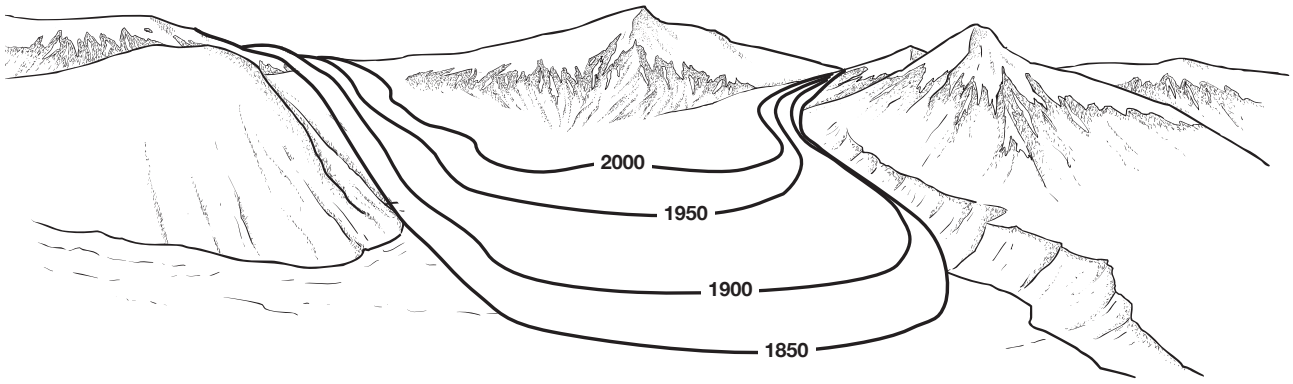
Do glaciers really move?

Today we live in a very warm period, and glaciers are on the move—backward! Most glaciers are melting faster than they are growing. This is called glacial **retreat**. Scientists study glacial retreat to understand how climate change will affect glaciers around the world. One way scientists do this is by comparing photographs of glaciers taken years apart. This tells scientists how much and how fast the ice is melting. In Canada's Glacier National Park, for example, most large glaciers are only a third of the size they were over 150 years ago.

Vocabulary

retreat
ree-TREET
movement backward

Look at the diagram of a glacier. The lines show how far the ice has retreated since 1850. Use the diagram to answer the questions.



1. What span of time is represented by the diagram? _____
2. When was the glacier's rate of retreat the GREATEST? _____
3. When was the glacier's rate of retreat the SMALLEST? _____

Talk

The continent of Antarctica and the island of Greenland are covered with glaciers. What might happen if these glaciers were to completely melt?

Name _____

Daily Science
Big Idea 3
WEEK 2

Day 5

Weekly Question

Do glaciers really move?

A. Use the words in the box to complete the sentences.

meltwater **glaciers** **retreat** **moraines** **basins**

1. A melting glacier leaves behind ridges of rock and gravel called _____.
2. One place to find large, moving _____ is in cold mountain areas.
3. Glaciers scoop out _____ that can later fill up with water.
4. The movement of some glaciers is helped by _____.
5. Climate change can affect the speed of a glacier's _____.

B. Write *true* or *false*.

1. Glaciers do not cause weathering or erosion. _____
2. Gravity plays a role in the movement of glaciers. _____
3. In the past, glaciers were more common. _____
4. Yosemite Valley is an example of a moraine. _____

C. Explain the role of pressure in how a glacier is formed.

_____

_____

Both slow and rapid processes—from erosion to earthquakes—shape and reshape Earth's surface.

Week 3

What makes a volcano erupt?

An erupting volcano is a dramatic example of the powerful forces that shape Earth's surface. Unlike wind, water, and ice, the processes that create volcanoes start deep within the planet. This week, students learn about Earth's layers and that volcanoes are created when hot, soft rock from Earth's mantle rises through cracks in the crust. As this material moves upward, it expands and melts, becoming magma. When volcanoes erupt, magma spills onto Earth's surface in the form of lava.

Day One

Vocabulary: *core, crust, mantle*

Materials: page 81; any fruit with a pit, knife

Cut the fruit you brought in and have volunteers use vocabulary words to compare the skin, flesh, and pit of the fruit to Earth's crust, mantle, and core. When students have completed activity C, have volunteers read aloud their answers and explain their thinking. Then explain that as Earth was forming billions of years ago, its heavier parts sank to the center, while its lighter parts rose to the surface.

Day Two

Vocabulary: *lava, magma*

Materials: page 82

Students may have difficulty understanding that while the rock in the mantle is soft, it is not liquid. Explain that there is no material on Earth's surface quite like the rock in the mantle, but it is similar to putty or toothpaste in that it holds its shape, but is pliable and can be formed. For activity B, consider first completing a Venn diagram or T-chart together. Then have students use the information to write their answers.

Day Three

Vocabulary: *vent*

Materials: page 83; pictures of the Hawaiian Islands

Before students read the passage, show the pictures of Hawaii and ask for theories about how Hawaii was formed. After students have finished reading the passage, explain that the volcanoes in this area of the world span more than 1,600 miles. When students have finished activity A, invite volunteers to share their responses.

Day Four

Vocabulary: *chamber, debris*

Materials: page 84

When introducing the vocabulary, consider asking students to list things they would consider to be *debris.* (e.g., trash, broken wood or glass, etc.) When students have read the passage and completed activity B, invite volunteers to share their responses.

Day Five

Materials: page 85

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 3
WEEK 3

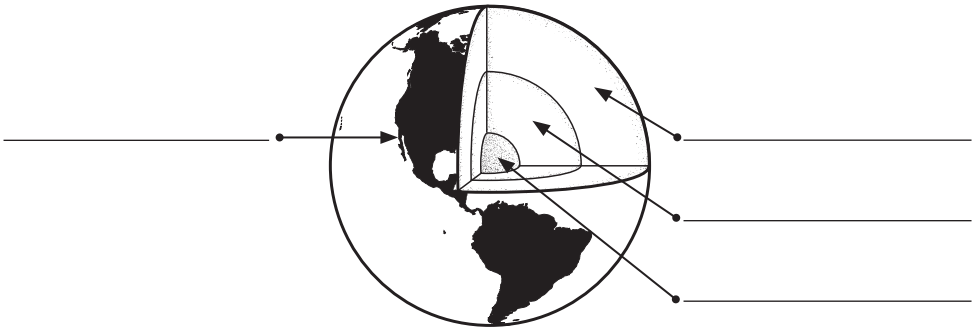
Day 1

Weekly Question

What makes a volcano erupt?

To understand volcanoes, you must first understand Earth's layers. Earth's center is made of two parts, the inner and outer **core**. The core is made of liquid and solid metals. The next layer is the **mantle**. The mantle is solid and made of very hot, soft rock. The final layer is Earth's **crust**, which is the part we see. The crust is hard and brittle. Volcanoes form when hot liquid rock rises from the mantle through cracks in Earth's crust.

A. Use information from the passage to label Earth's *crust, inner core, outer core,* and *mantle.*



B. Use vocabulary words to complete the sentences.

1. Hot rock rises from Earth's _____ through cracks in Earth's _____.

2. Earth's _____ is hard and brittle, while the _____ is soft and hot.

C. Which do you suppose is made from the densest, heaviest materials—the core, mantle, or crust? Explain your answer.

_____

_____

Vocabulary

core
koar
the center of Earth, made up of two parts: a liquid outer core and a solid inner core

crust
krust
the surface layer of Earth

mantle
MAN-tul
the layer of hot rock between Earth's crust and core

Name _____

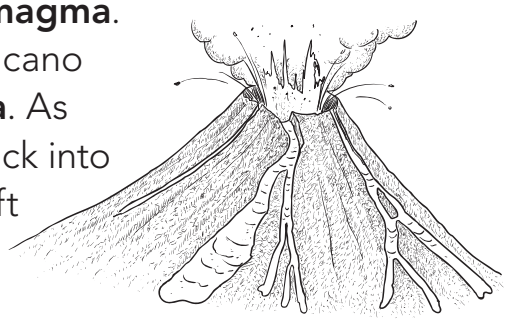
Daily Science
Big Idea 3
WEEK 3

Day 2

Weekly Question

What makes a volcano erupt?

The hot, soft rock in Earth's mantle is always moving. Heavy rock sinks toward Earth's core, while lighter rock moves closer to the surface. As the lighter rock gets closer to the crust, there is less pressure pushing against it. The rock begins to expand and turns from a solid into liquid **magma**. When the magma flows from a volcano onto Earth's surface, we call it **lava**. As lava cools, it turns from a liquid back into a solid. Now it is hard rock, not soft the way it was in Earth's mantle.



Vocabulary

lava
LAH-vuh
magma that flows from a volcano

magma
MAG-muh
hot, liquid rock that comes from Earth's mantle

A. Write *true* or *false*.

1. Magma that flows from a volcano is called lava. _____
2. The heaviest rock in the mantle becomes lava. _____
3. The rock on Earth's surface is harder than the rock in Earth's mantle. _____

B. Compare and contrast rock in the mantle to lava. Name one way they are the same and one way they are different.

1. Same: _____
2. Different: _____

C. According to the passage, what is the difference between magma and lava?

_____

_____

Name _____

Daily Science
Big Idea 3
WEEK 3

Day 3

Weekly Question

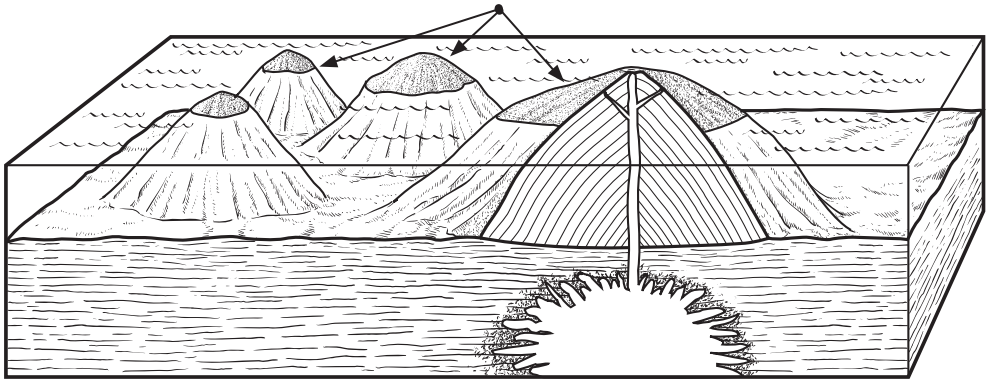
What makes a volcano erupt?

When volcanoes erupt, they can be either violent or quiet and steady. Quiet, steady eruptions are known as lava flows. Lava pours through a **vent** in the crust onto Earth's surface in a slow, constant stream. As it cools, it hardens and becomes rock. The Hawaiian Islands are the result of this kind of eruption. Over a long period of time, lava has been flowing out of the volcanoes directly into the Pacific Ocean. The lava cooled quickly and formed the rock that makes up the islands. In fact, the continuing eruptions mean that the Hawaiian Islands are still growing.

Vocabulary

vent
vent
an opening in a volcano through which lava can flow

Hawaiian Islands



A. Summarize how volcanoes can form islands. Use *vent* in your summary.

_____

_____

B. Write *true* or *false*.

1. A lava flow is a violent eruption. _____

2. Rock made from lava cannot support large buildings. _____

3. Without volcanoes, the Hawaiian Islands would still grow. _____

Name _____

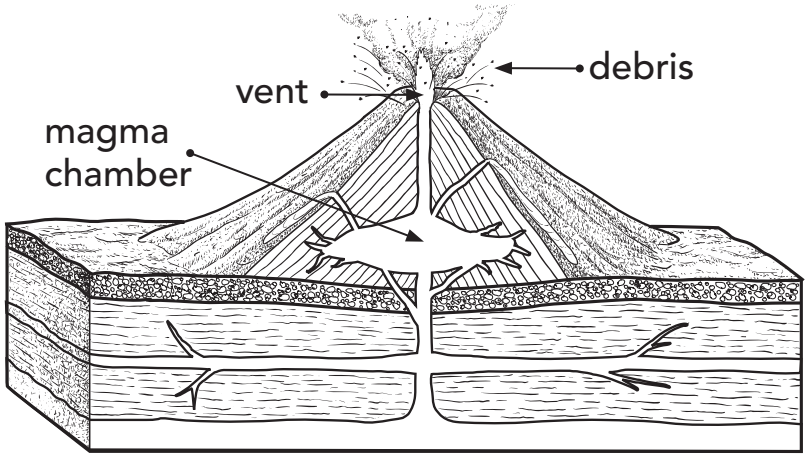
Daily Science
Big Idea 3
WEEK 3

Day 4

Weekly Question

What makes a volcano erupt?

Giant, exploding volcanoes are one of nature's most violent events. Most of these types of volcanoes are shaped like cones. And they were all formed by earlier eruptions of lava. These volcanoes have a deep **chamber** that fills with magma. A long tube runs from the chamber to a vent at the the top of the volcano, which is often made from solid rock. As magma fills the chamber, it releases gases. These gases build up under the layers of rock at the top of the volcano. Eventually, the pressure is so great that the volcano explodes, sending ash, gases, and other volcanic **debris** into the atmosphere.



Vocabulary

chamber
CHAYM-bur
a pocket under the volcano that fills with magma

debris
duh-BREE
small pieces of broken rock, lava, and other materials blown out during an eruption

A. Write the vocabulary word that answers each clue.

1. This is hurled into the air during an eruption. _____
2. This fills with magma. _____

B. One way scientists tell that a volcano is ready to explode is by a bulge that sometimes forms near the top side of the volcano. Why do you think a bulge might form right before an eruption?

_____

Name _____

Daily Science
Big Idea 3
WEEK 3

Day 5

Weekly Question

What makes a volcano erupt?

A. Use the words in the box to complete the sentences.

lava	**core**	**crust**	**vents**
debris	**chamber**	**magma**	**mantle**

1. _____ from the mantle that reaches Earth's surface is called _____.

2. The three layers of Earth are the _____, _____, and _____.

3. Hot rock from the mantle pours through _____ in Earth's crust.

4. When volcanoes explode, they send ash, rock, and other _____ into the air.

5. Under some volcanoes there is a deep _____ that fills with magma.

B. Write *true* or *false*.

1. Rocks in Earth's mantle change from a liquid to a solid as they rise toward the surface. _____

2. Volcanoes can create islands. _____

3. Rocks in the mantle are always moving. _____

4. Lava that cools becomes rock. _____

Both slow and rapid processes—from erosion to earthquakes—shape and reshape Earth's surface.

Week 4

What causes earthquakes?

Some of the most spectacular features on our planet—from the Himalaya Mountains to the Pacific and Atlantic oceans—have been created in association with earthquakes. In this week's activities, students will learn that earthquakes are caused by motions in the Earth's plates. While earthquakes can be destructive, they are also an expression of the dynamic forces within Earth that shape the planet on which we live.

Day One

Vocabulary: *plates*

Materials: page 87

Ask students to recall the layers of Earth they learned about in Week 3—*core*, *mantle*, and *crust*. Tell them that this week they will learn about earthquakes. Whereas volcanic activity involves both the mantle and the crust, earthquakes are generated in the crust. Before reading the passage, call students' attention to the illustration showing Earth's tectonic plates. Point out that the plates are not shaped like squares or triangles but are irregular. Before students complete the activities, take time to discuss the illustration and relate it to the passage.

Day Two

Vocabulary: *boundary, fault*

Materials: page 88

Activate prior knowledge by asking students to share what they know about earthquakes. Discuss the illustration before asking students to complete the activities.

Day Three

Materials: page 89; sheets of scrap paper

Students may have difficulty visualizing what happens when plates collide. After reading the passage, have students draw a line representing a fault across the middle of a sheet of paper. Direct them to put their hands on either side of the paper and push them together. The paper is pushed up in the middle just as Earth's crust is pushed up when plates collide. Also, tell students that when plates pull apart, it doesn't create a giant hole in the ground. Instead, volcanoes located at the boundaries usually send magma to Earth's surface.

Day Four

Vocabulary: *magnitude, seismometer*

Materials: page 90

On the board, write: *In May 2008, a 7.9 magnitude earthquake struck central China.* Ask a volunteer to read the statement. Then point out that scientists use numbers to indicate the strength of earthquakes. After reading the passage, ask students what they could say about the strength of a 7.9 earthquake. (e.g., buildings fall down) Before students complete the activity, read the chart together.

Day Five

Materials: page 91

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 3
WEEK 4

Day 1

Weekly Question

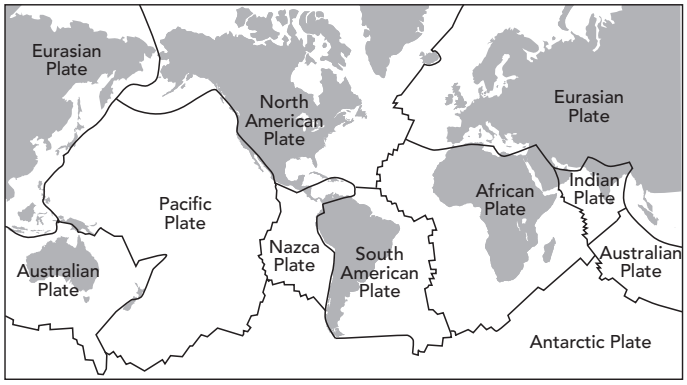
What causes earthquakes?

Until the 1960s, scientists thought that Earth's crust was continuous and unbroken. Now they accept the theory that Earth's crust is broken into many irregularly shaped pieces called **plates**. There are eight large plates and a number of smaller ones. All the land and oceans lie on top of these plates. Beneath the plates is the hot, soft mantle. Because it is soft, the mantle moves, and it carries the plates along with it. So even though we don't feel it, the ground under our feet is moving all the time.

Vocabulary

plates
plaits
rigid sections of Earth's crust

A. Use the map to find where you live. Write the name of the plate you are on.



_____

B. Complete the analogy.

Earth's plates are to *mantle* as _____.

Ⓐ *raft* is to *water*

Ⓑ *car* is to *road*

Ⓒ *hawk* is to *air*

Ⓓ *rocket* is to *outer space*

C. Write *true* or *false*.

1. Earth's crust is broken into plates. _____

2. Only continents lie on Earth's plates. _____

3. The mantle is soft. _____

Name _____

Daily Science
Big Idea 3
WEEK 4

Day 2

Weekly Question

What causes earthquakes?

The movement of plates can be gradual or sudden. When plates move suddenly, an earthquake happens. Part of the ground may lift up several feet, or cracks in the earth may appear. The place where Earth's crust breaks is called a **fault**. A famous plate **boundary** is the San Andreas Fault in California. Here, one plate is moving north while the other moves south.

Vocabulary

boundary
BOWN-dree
border or edge

fault
fawlt
a break in Earth's crust where blocks of rock are moving in different directions

A. Use the diagram to answer the questions.

1. In which direction is this part of the Pacific Plate moving—north, south, east, or west? _____

2. Which cities would be affected by a major earthquake along the San Andreas Fault? _____

B. Use information from the passage to complete the sentences.

1. Earthquakes happen when _____ move suddenly.

2. A crack in the ground that runs for at least several miles is probably a _____.

Name _____

Daily Science
Big Idea 3
WEEK 4

Day 3

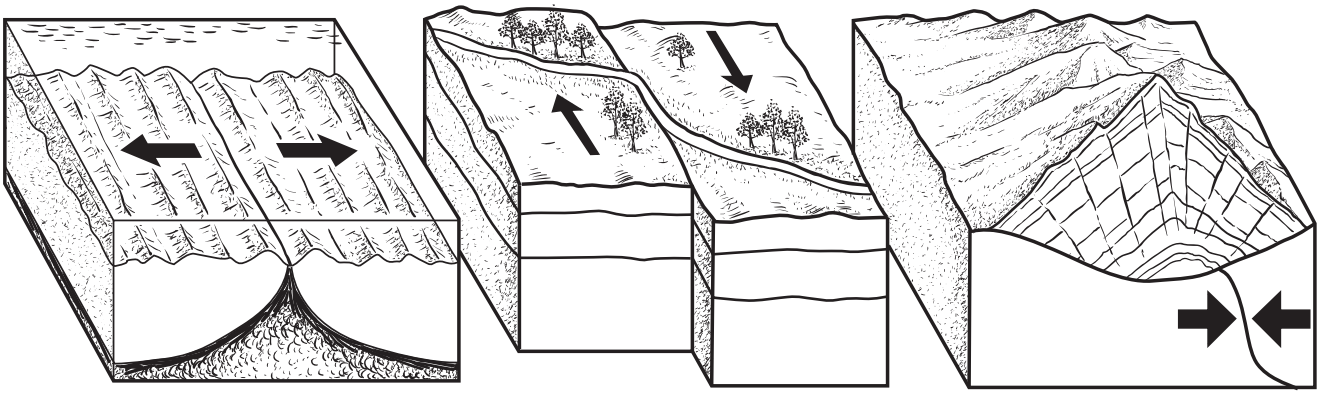
Weekly Question

What causes earthquakes?

Plates move in all different directions. Plates sometimes slide past each other, like they do along the San Andreas Fault in California. Plates also collide, or run into each other. When plates collide, they cause powerful earthquakes and can even build mountains. The Himalaya Mountains in Asia are the result of two plates pushing together.

In other places, plates move apart from each other. This does not cause very strong earthquakes, but ocean basins are often created when two plates pull apart.

A. On the line below each picture, write whether the diagram shows plates *sliding past* each other, *colliding*, or *moving apart*.



1. _____ **2.** _____ **3.** _____

B. Write *true* or *false*.

1. Powerful earthquakes are generated as plates move apart. _____

2. Oceans are always created by plates colliding. _____

3. The San Andreas Fault is an example of mountain-building. _____

4. Plates sliding past each other can generate earthquakes. _____

Name _____

Daily Science
Big Idea 3
WEEK 4

Day 4

Weekly Question

What causes earthquakes?

Scientists study earthquakes with a tool called a **seismometer**, which records movements in the ground. In 1935, a scientist named Charles Richter invented a system of measuring earthquakes. This is called the Richter scale. An earthquake gets a number between 1 and 10 to describe its **magnitude**. A magnitude 1 earthquake is so weak that you can't feel it, while an 8.0 would knock you off your feet! Since scientists began using the Richter scale, the strongest earthquake ever recorded was a 9.5 in Chile in 1960.

Use the information in the chart to complete the sentences.

Richter Scale Magnitude	Average Number of Earthquakes	Earthquake Effects
2.0–2.9	1,300,000 per year	Not felt but are recorded on seismometers
3.0–3.9	130,000 per year	Barely noticeable; hanging objects may swing
4.0–4.9	13,000 per year	Most people notice them; buildings shake
5.0–5.9	1,300 per year	Everyone notices them; windows may break
6.0–6.9	134 per year	Walls may crack; chimneys may fall
7.0–7.9	18 per year	Ground cracks; weak buildings fall down
8.0–8.9	1 per year	Many buildings fall; bridges collapse
9.0–9.9	1 per 20 years	Complete devastation over a wide area
10.0+	Extremely rare	Never recorded

1. Earthquakes of magnitude 9 happen at a rate of about _____ every _____ years.
2. Usually, an earthquake must be at least magnitude _____ to cause any buildings to collapse.
3. Most people notice earthquakes that are magnitude _____ or greater.
4. The number of earthquakes between a magnitude of 3.0 and 6.9 that happen every year is about _____.

Vocabulary

magnitude
MAG-nuh-tood
a measure of the amount of energy released by an earthquake

seismometer
size-MAH-muh-ter
a tool that records movements in Earth's crust

Name _____

Daily Science
Big Idea 3
WEEK 4

Day 5

Weekly Question

What causes earthquakes?

A. Use the words in the box to complete the sentences.

magnitude	**plates**	**fault**
boundaries	**seismometer**	

1. Most earthquakes occur at plate _____.
2. When _____ collide, the land can be pushed up.
3. A _____ is a break in Earth's crust where rocks have moved.
4. A _____ is used to detect and record earthquakes.
5. The Richter scale measures the _____ of earthquakes on a scale of 1 to 10.

B. List the three ways plates can move to cause earthquakes.

1. _____
2. _____
3. _____

C. List three facts you have learned about Earth's plates.

1. _____
2. _____
3. _____

Name _____

Daily Science
Big Idea 3
WEEK 5

Unit Review

Comprehension

The Shaping of Earth

A. Fill in the bubble next to the correct answer.

1. Which of the following is not associated with glaciers?

Ⓐ basins
Ⓑ plate boundaries
Ⓒ erosion
Ⓓ moraines

2. A feature of Earth's surface created by erosion is _____.

Ⓐ a mountain
Ⓑ an earthquake
Ⓒ a canyon
Ⓓ a volcano

3. As a result of weathering, a rock becomes _____.

Ⓐ taller
Ⓑ smaller
Ⓒ longer
Ⓓ larger

4. Which of the following is not the result of plate boundaries pushing against each other?

Ⓐ an ocean
Ⓑ a fault
Ⓒ a mountain
Ⓓ an earthquake

5. Lava from erupting volcanoes comes from Earth's _____.

Ⓐ core
Ⓑ mantle
Ⓒ ocean
Ⓓ crust

B. Write two things you learned about how Earth's surface changes.

1. _____

2. _____

Name _____

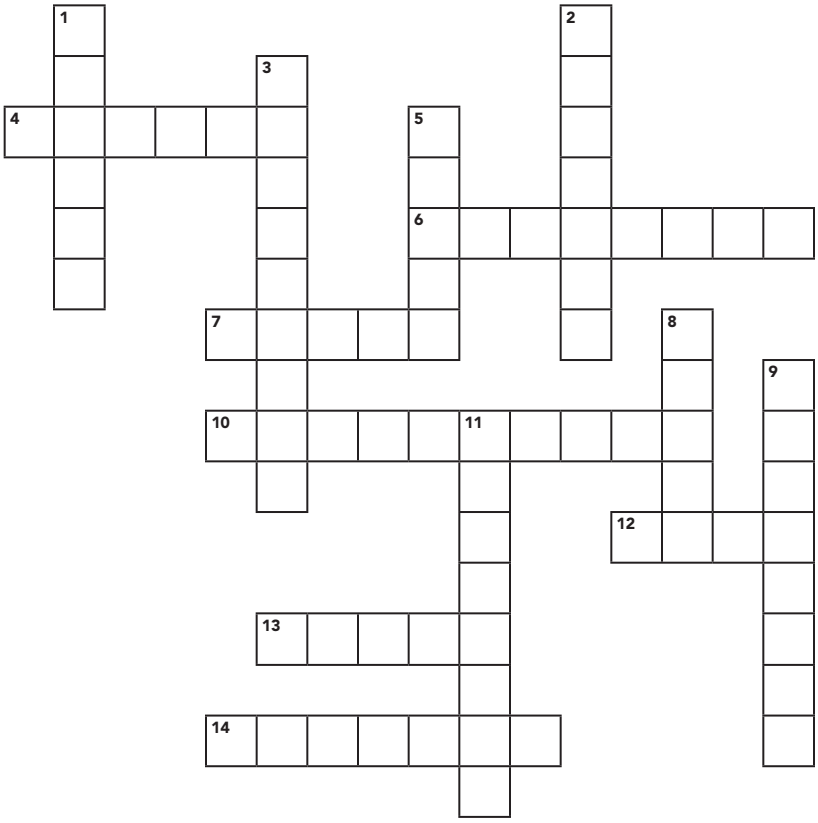
Daily Science
Big Idea 3
WEEK 5

Unit Review

Vocabulary

Puzzle It Out

Select from the list of vocabulary words to complete the puzzle.



basin	lava
boundary	magma
chamber	magnitude
channels	mantle
core	meltwater
crust	moraines
debris	plates
ecosystem	retreat
erosion	seismometer
expanded	uplifted
fault	vent
glacier	weathering

DOWN

1. large, rigid sections of Earth's crust
2. the moving of soil by water
3. this makes a glacier slippery
5. the top layer of Earth
8. hot, liquid rock from the mantle
9. ridges of gravel and rock
11. became larger

ACROSS

4. the layer of Earth between the crust and the core
6. pushed up
7. a break in Earth's crust
10. a process that breaks rocks into smaller pieces
12. this flows from a volcano
13. a hole in the ground that is created by a glacier
14. a slow-moving mass of ice

Name _____

Unit Review

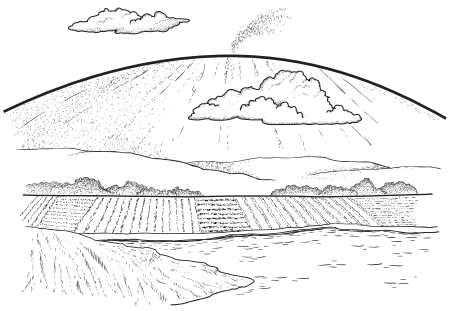
Visual Literacy

Volcano Variety

Daily Science Big Idea 3

WEEK 5

Study the chart to find out about three types of volcanoes.

Composite Volcano	Shield Volcano	Cinder Cone
		
• tall and steep-sided • formed from flows of sticky lava layered with other kinds of rocks • can explode violently	• huge and dome-shaped • formed from many layers of runny lava • erupts quietly and often	• small and cone-shaped • formed from blocks of cooled lava called cinders • lava erupts in sprays

Write the name of the type of volcano being described.

1. has flows of thick, sticky lava _____

2. forms the smallest type of volcano _____

3. erupts with quiet, steady flows of runny lava _____

4. explodes violently _____

5. formed from blocks of lava rock called cinders _____

6. has layers made from different kinds of rocks _____

Name _____

Daily Science
Big Idea 3
WEEK 5

Unit Review

Hands-on Activity

Glacial Grind

In this investigation, you will look at the effect that glacial movement has on landforms. You will use "sandy" ice cubes as a model of a glacier that has pieces of rock in its ice.

What You Need

- ice cube tray
- water
- a few handfuls of clean sand
- aluminum foil
- plastic tub
- paper to cover the desk
- paper towels (for cleanup)

1. Make "sandy" ice cubes by sprinkling sand into an ice cube tray filled with water and freezing it overnight.
2. Smooth out a sheet of aluminum foil on the top of your desk.
3. Rub an ice cube across the sheet of foil.
4. Stack all the ice cubes on one side of a plastic tub and allow them to melt.

What Did You Discover?

1. What happened when you rubbed the ice cube across the foil?

_____

2. What was left in the plastic tub after the ice cubes melted? What would this be called when a real glacier melts?

_____

3. What did the experiment show you about the ways that glaciers change Earth's surface?

_____

_____

The properties of rocks and minerals reflect the process that formed them.

Key Concept
Rocks are composed of different minerals. They are made in distinct ways and have different properties.

National Standard
Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties.

Students may not know that rocks are continuously created, destroyed, or otherwise altered by processes that are not directly observed. This unit focuses on how rocks are formed and how the properties of rocks reflect these processes. In this unit, students will learn the following:

- how rocks are formed;
- the types of rocks;
- the properties of rocks;
- the minerals found in rocks; and
- the rock cycle.

Teacher Background

The appearance and properties of rocks depend on their mineral composition and the process that forms them. In this unit, students will learn what a mineral is and some of the different physical properties used to identify minerals. Students will also learn about the different types of rock and how they form, including rocks from outer space.

All rocks are made up of different minerals: natural, nonorganic solids with a crystalline structure. This means that the atoms in minerals have a regular, repeating structure.

Igneous rock forms from cooling magma, sedimentary rock forms from sediment, and metamorphic rock is igneous or sedimentary rock that has been changed by intense heat and pressure. Rocks from outer space either fall to Earth as meteorites or are collected by astronauts or probes. These lunar rocks share some minerals with rocks on Earth, but they also have their own unique properties.

For specific background information on each week's concepts, refer to the notes on pp. 98, 104, 110, and 116.

Unit Overview

WEEK 1: What's the difference between a rock and a mineral?

Connection to the Big Idea: Rocks are made from different minerals, depending on the processes that form them.

This week, students learn what a mineral is and the common physical properties used to identify minerals.

Content Vocabulary: *cleavage, color, crystalline, fracture, hardness, luster, minerals, streak*

WEEK 2: Where do rocks come from?

Connection to the Big Idea: The different kinds of rock—igneous, sedimentary, and metamorphic—have properties related to how each was formed.

This week, students learn about each type of rock, including some of the physical characteristics and how each type is formed. They then learn about the rock cycle.

Content Vocabulary: *cement, igneous, metamorphic, rock cycle, sediment, sedimentary*

WEEK 3: Are some rocks valuable?

Connection to the Big Idea: Minerals and some other natural resources, such as fossil fuels, are nonrenewable.

This week, students learn how fossil fuels and ores are gathered and used. They then learn that these resources are nonrenewable and must be conserved if they are to last.

Content Vocabulary: *carbon, conserve, extract, fossil fuels, metals, natural resources, ore, renewable*

WEEK 4: Do all rocks come from Earth?

Connection to the Big Idea: Rocks from space share some similarities with rocks on Earth, as well as some differences.

This week, students learn about three common sources for extraterrestrial rocks: asteroids, the Moon, and Mars. They learn how these rocks from space are similar to and different from rocks on Earth.

Content Vocabulary: *asteroids, extraterrestrial, lunar, maria, meteor, meteorite*

WEEK 5: Unit Review

You may choose to do these activities to review properties of rocks and minerals.

p. 122: Comprehension Students answer multiple-choice questions about key concepts from the unit.

p. 123: Vocabulary Students match key vocabulary words from the unit with their definitions.

p. 124: Visual Literacy Students use a chart listing different minerals and their properties to answer clues about the minerals.

p. 125: Hands-on Experiment Students learn more about sedimentary rocks by experimenting with chalk and vinegar. Review the materials and instructions on the student page ahead of time.

The properties of rocks and minerals reflect the process that formed them.

Week 1

What's the difference between a rock and a mineral?

Many students might confuse rocks and minerals as being the same thing. This week, students learn that a mineral is a single, inorganic substance made in nature that forms a solid and has a regular, repeating structure. Rocks are generally a mixture of several minerals. Minerals can be identified by the characteristics of color, streak, hardness, luster, and cleavage or fracture. If mineral samples can be obtained, it is helpful to have them available for students to inspect.

Day One

Vocabulary: *crystalline, minerals*

Materials: page 99; samples of minerals including salt, hand lenses

Activate prior knowledge by asking students to name the different contexts in which they have heard the word *minerals*. (in vitamins, in water, in relation to the ground or rocks, etc.) Introduce the vocabulary and use the illustration on the page to explain how something can be crystalline. Distribute hand lenses and some grains of salt for students to examine. After students have read the passage and finished the activities, reinforce the concept of how minerals form by asking: *If you wanted to make your own salt, would you need ocean water or magma?* (ocean water, because salt forms from evaporation)

Day Two

Vocabulary: *color, luster, streak*

Materials: page 100

Introduce the vocabulary and ask students if they have ever used chalk to draw. Explain that chalk is a mineral, and the lines you make with it are examples of its *streak*, one of the properties that geologists (scientists who study rocks) use to identify minerals. Direct students to read the passage and complete the activities.

Day Three

Vocabulary: *cleavage, fracture*

Materials: page 101; examples or pictures of stone tools (optional)

When introducing the vocabulary, explain that geologists doing fieldwork often carry rock hammers so that they can break open rocks; doing this reveals two more characteristics of minerals—*cleavage* and *fracture*. After students have read the passage and completed the activities, review the answers together. For activity B, you may wish to bring in examples or pictures of a stone ax head or arrowhead.

Day Four

Vocabulary: *hardness*

Materials: page 102; baby powder with talc (optional)

Introduce the vocabulary word and point out the Mohs hardness scale on the page. Explain that hardness or softness of a mineral can be very useful. If you have it, pass around the baby powder and tell students that talc is used in baby powder because it is such a soft mineral that it won't irritate the skin. After students have read the passage, confirm students' understanding that a mineral cannot be scratched by a mineral that is softer than itself. Have them complete the activities.

Day Five

Materials: page 103

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 4
WEEK 1

Day 1

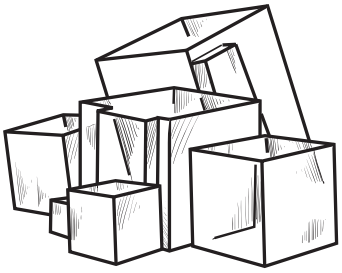
Weekly Question

What's the difference between a rock and a mineral?

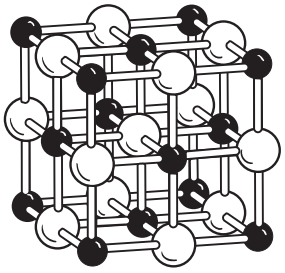
A **mineral** is a nonliving solid that occurs in nature and has a **crystalline** structure. This means that the atoms in the mineral are arranged in a certain order and are regularly spaced apart. Salt is a mineral with a crystalline structure. If you look closely, each grain of salt is shaped more or less like a cube. This is why some people refer to salt as "salt crystals."

Different atoms combine to make different minerals. Many minerals are formed deep in Earth's crust where there is a lot of heat and pressure. As liquid magma from Earth's mantle cools into solid rock, minerals form within the rock. So, all rocks are actually made up of different minerals.

Different amounts of heat and pressure form different minerals. But not all minerals form from cooling magma. Some, like salt, are formed when water evaporates and leaves minerals behind.



magnified salt crystals



atoms in a salt crystal

Vocabulary

crystalline
KRISS-tal-lin
having a repeating, ordered, inside structure

minerals
MIN-er-ulz
naturally-occurring, non-living solids that have a crystalline structure

A. What are the two ways that minerals can form?

1. _____ **2.** _____

B. Write *true* or *false*.

1. Crystals have random structures. _____

2. Minerals occur in nature. _____

3. All rocks contain minerals. _____

Name _____

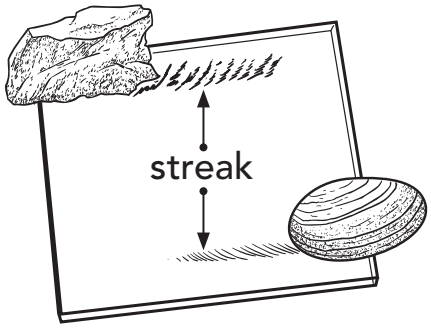
Daily Science
Big Idea 4
WEEK 1

Day 2

Weekly Question

What's the difference between a rock and a mineral?

Minerals are commonly identified by their physical properties. Two properties used to identify minerals are **color** and **streak**. *Streak* describes the mark left behind after rubbing a mineral on a hard, rough, white surface. Surprisingly, the color of a mineral and the color of its streak can be different. For example, the mineral pyrite (PIE-rite), or "fool's gold," has a color very similar to gold. Real gold has a yellowish streak. But pyrite, which contains only iron and sulfur, has a greenish black streak.



Minerals can also be identified by their **luster**, or shininess. A mineral's luster might be glassy, waxy, pearly, metallic, or earthy. Quartz has a glassy luster, while silver is metallic.

Vocabulary

color
KUH-ler
the color or range of colors that a mineral usually appears to be

luster
LUSS-tur
the way in which the surface of a mineral reflects light

streak
streek
the mark left behind after rubbing a mineral on a hard, rough, white surface

A. Use the vocabulary words to complete the sentences.

1. People who like shiny minerals would pay attention to a mineral's _____.
2. If you want to draw a four-square grid on the blacktop, you would want a mineral with a white _____.
3. Diamonds may be clear or have a yellow, blue, or pink _____.

B. Why do you suppose geologists (scientists who study rocks) use more than one property to identify minerals?

_____

_____

Name _____

Daily Science
Big Idea 4
WEEK 1

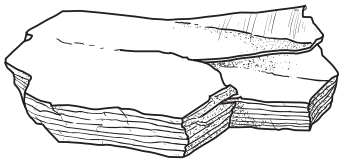
Day 3

Weekly Question

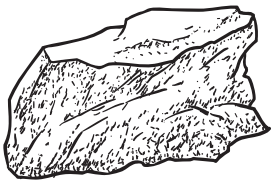
What's the difference between a rock and a mineral?

Some minerals look very similar—until they break! For example, both hematite (HEE-muh-tite) and mica (MIKE-uh) are minerals that can be black or silvery gray. So how can you tell them apart?

Hit mica with a hammer, and it splits into flat sheets. Hit hematite, and it shatters into jagged pieces. The property of breaking along regular, smooth surfaces is called **cleavage**. Mica has nearly perfect cleavage, while hematite doesn't have cleavage. Instead, hematite has a property called **fracture**, which means that it breaks along irregular, jagged surfaces. Geologists use fracture and cleavage to study rocks in places where the only equipment they may have is their eyes and a hammer.



mica



hematite

Vocabulary

cleavage
CLEE-vej
the way some minerals break along flat planes to form regular shapes

fracture
FRAK-chur
the way minerals can break into random pieces with no regular shape

A. Write whether each mineral described shows *cleavage* or *fracture*.

1. When opal breaks, it creates many uneven pieces. _____
2. When calcite breaks, it creates flat, shiny surfaces. _____
3. When jadeite breaks, it forms sharp splinters. _____
4. When augite breaks, it forms nearly perfect prisms. _____

B. Early hunters made axes and arrowheads from rocks. Do you think they chose rocks that had *cleavage* or *fracture*? Why?

_____

_____

Name _____

Daily Science

Big Idea 4

WEEK 1

Day 4

Weekly Question

What's the difference between a rock and a mineral?

A diamond is often described as the hardest mineral on Earth. **Hardness** is a property of minerals that describes how easily a mineral can be scratched. Mineral hardness is ranked from 1 to 10 on the Mohs (moaz) hardness scale, with 10 being the hardest. Diamonds are a 10 on the Mohs scale! Only a diamond can scratch another diamond. Minerals such as talc and mica, on the other hand, are so soft that you can scratch them with your fingernail.

Vocabulary

hardness
HARD-niss
describes how easily a mineral can be scratched

A. Use the chart to complete the sentences below.

Hardness scale	Material	Can be scratched by	Hardness scale	Material	Can be scratched by
1	Talc	fingernail	6	Orthoclase	pocketknife
2	Gypsum	fingernail	7	Quartz	steel file
3	Calcite	penny	8	Topaz	sandpaper
4	Fluorite	iron nail	9	Corundum	knife sharpener
5	Apatite	glass	10	Diamond	diamond

1. If a mineral can be scratched by a penny, its hardness is no greater than _____.

2. A mineral that can't be scratched by a pocketknife but can be scratched by a steel file is _____.

3. A mineral that can be scratched by glass but can't be scratched by fluorite must have a hardness between _____.

B. Drills used for making tunnels or deep holes often have diamonds in their tips. Why do you think this is?

_____

Name _____

Daily Science

Big Idea 4

WEEK 1

Day 5

Weekly Question

What's the difference between a rock and a mineral?

A. Use the words in the box to complete the sentences.

luster	**fracture**	**cleavage**	**crystalline**
streak	**minerals**	**hardness**	**color**

1. Rocks are made of many _____.
2. A mineral showing the property of _____ breaks unevenly.
3. If a mineral shows _____, it breaks along flat planes.
4. Fool's gold has the same _____ as gold, but its _____ is different.
5. The property of _____ determines how easily a mineral can be scratched.
6. Pyrite, silver, and copper have a metallic _____.
7. A _____ structure has atoms that are regularly spaced.

B. Write the name of a mineral property that each tool is used to identify.

cleavage	**color**	**fracture**	**luster**	**streak**

1. rock hammer _____ or _____
2. white tile _____
3. your eyes only _____ or _____

The properties of rocks and minerals reflect the process that formed them.

Week 2

Where do rocks come from?

Rocks on Earth are continuously created, destroyed, and altered by processes of weathering and erosion, as well as processes of rock formation happening beneath Earth's crust. This week, students learn that over time, the cycling and transformation of rocks creates new rocks with different properties.

Rocks can be divided into three main types: igneous, sedimentary, and metamorphic. The appearance and characteristics of each rock type reflect the processes that form them. Rocks within a rock type also differ—for example, pumice and granite are both igneous rocks with different properties. If rock samples are available, it is helpful to have them for students to inspect throughout the week.

Day One

Vocabulary: *igneous*

Materials: page 105; samples of pumice, basalt, and granite (optional)

Explain that this week, students will learn about the three types of rock and how each type is formed. Introduce the vocabulary word and distribute rock samples if you have them. After students read the passage, direct them to complete the activity. When they have finished, invite volunteers to read the sentences aloud.

Day Two

Vocabulary: *cement, sediment, sedimentary*

Materials: page 106; sedimentary rocks such as sandstone, shale, and limestone (optional)

Distribute samples of sedimentary rocks if you have them. Ask students for words that describe the samples. (e.g., layered, striped) Introduce the vocabulary and direct students to read the passage. Then call students' attention to the pictures in the activity. Have students study the pictures and then determine which paragraph of the passage is being illustrated. Then direct students to complete the activity. Review students' responses before conducting the oral activity.

Day Three

Vocabulary: *metamorphic*

Materials: page 107; samples of metamorphic rocks such as marble or slate (optional)

Distribute rock samples if you have them. Tell students they will learn how these rocks are different from igneous and sedimentary rocks. After you introduce the vocabulary word, ask students to visualize the process being described as they read the passage. Then have students complete the activities. Review the answers together.

Day Four

Vocabulary: *rock cycle*

Materials: page 108

Remind students that on Day 3 they learned how heat and pressure can change igneous and sedimentary rocks into metamorphic rocks. Tell them that today they will learn how rocks are always changing from one form into another. After students have read the passage, take time to examine and discuss the rock cycle diagram.

Day Five

Materials: page 109

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 4
WEEK 2

Day 1

Weekly Question

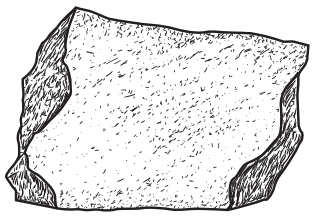
Where do rocks come from?

Scientists divide rocks into three types according to how the rocks are formed. Rock that forms when hot, liquid rock cools and hardens is called **igneous** rock. The properties of an igneous rock are determined by how fast the molten rock cools.

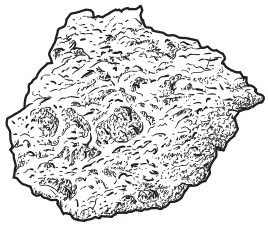
When igneous rock cools slowly under the ground, the minerals in the rock have time to form large, visible crystals. Granite is an example of this kind of igneous rock. In contrast, basalt (buh-SALT) and pumice (PUH-miss) are igneous rocks that form from lava flowing from a volcano. Mineral crystals in these rocks are often too small to see without a strong microscope. These rocks cool above ground and harden quickly. Pumice is very light and airy, while basalt is much denser.

Vocabulary

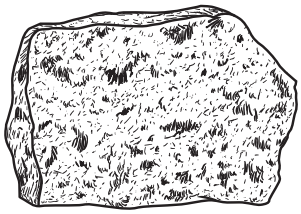
igneous
IG-nee-us
a type of rock that forms when molten rock cools



basalt



pumice



granite

Use information from the passage to complete the sentences.

1. When lava cools, it forms _____ rock.
2. The size of igneous rock _____ depends on how quickly the rock cools.
3. An igneous rock that is so light it can float on water is _____.
4. An igneous rock that forms large crystals is _____.
5. Without a _____, it can be difficult to see the crystals in basalt.

Name _____

Daily Science
Big Idea 4
WEEK 2

Day 2

Weekly Question

Where do rocks come from?

Sedimentary rock is a kind of rock created from **sediment**, which can come from several sources. For instance, the weathering and erosion of larger rocks can create sediment made of smaller rocks and sand. Over time, heat and pressure can cause sediment to **cement** together and form solid rock. Shale is a sedimentary rock formed from mud.

Other kinds of sediment are created in the ocean from the shells of tiny organisms that settle on the seafloor. As layers of sediment pile up, the weight of the sediment squeezes water out of the spaces between the shells. Heat, pressure, and time work to cement the bits of shell into rock. Limestone is a sedimentary rock formed this way.

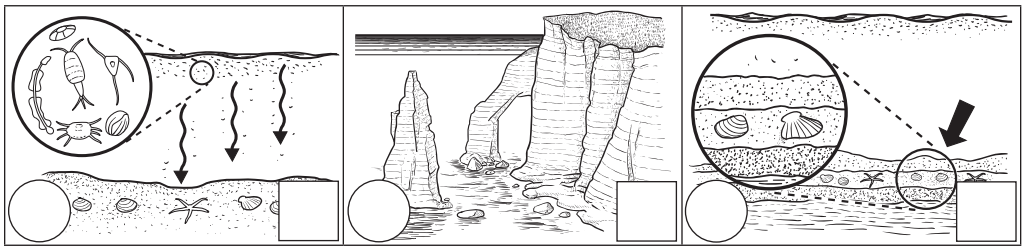
Vocabulary

cement
suh-MENT
to glue together and become solid

sediment
SED-uh-ment
a naturally-occurring deposit of small rocks, sand, or the remains of plants and animals

sedimentary
SED-uh-MEN-tuh-ree
formed from sediment

In the circles, number the pictures to show the order in which sedimentary rock can be formed. In each box, write the letter of the caption that goes with the picture.



a. **Buried sediment, affected by heat and pressure, forms rock.**

b. **Sedimentary rock can be exposed by uplift caused by earthquakes.**

c. **Sediment from microscopic shells builds up on the seafloor.**

Talk

How is it possible that limestone deposits containing a lot of shells can be found many miles from a body of water?

Name _____

Daily Science
Big Idea 4
WEEK 2

Day 3

Weekly Question

Where do rocks come from?

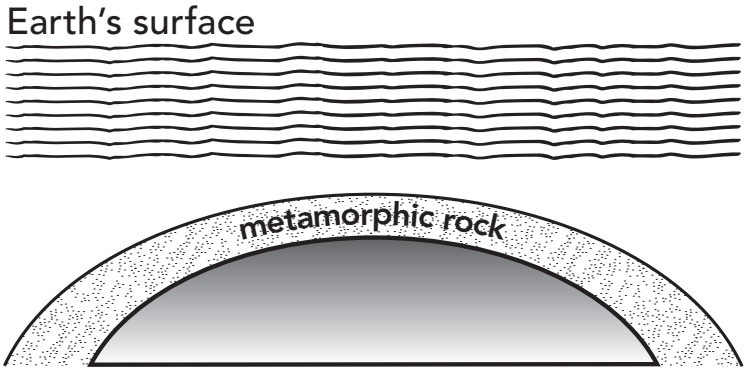
Great heat and pressure, such as the kind that occurs deep within Earth, can cause rocks to change. Rock that changes this way is called **metamorphic** rock. With enough heat, pressure, and time, both igneous and sedimentary rocks can be transformed into metamorphic rocks.

Metamorphic rocks tend to be harder than other kinds of rocks. They are often striped or show a swirled pattern. Where does this pattern come from? When a rock is heated, different-colored parts of the rock can start to melt, like chocolate chips do when cookies are baked. If the rock is then squeezed by pressure, the soft, melted parts can flow. This is what gives the rock stripes or swirls. Marble, which is formed from limestone, is a kind of metamorphic rock. Slate, which is formed from shale, is another kind.

Vocabulary

metamorphic
MET-uh-MOR-fik
a type of rock that has been physically changed by heat or pressure

A. This diagram shows how metamorphic rock forms. Draw arrows and label them to show where the *heat* and *pressure* come from.



B. Use information from the passage to complete the sentences.

1. _____ and _____ can transform one kind of rock into another over a long period of time.
2. Marble is an example of _____ rock.
3. Stripes in metamorphic rock form when parts of the rock _____.

Name _____

Daily Science
Big Idea 4
WEEK 2

Day 4

Weekly Question

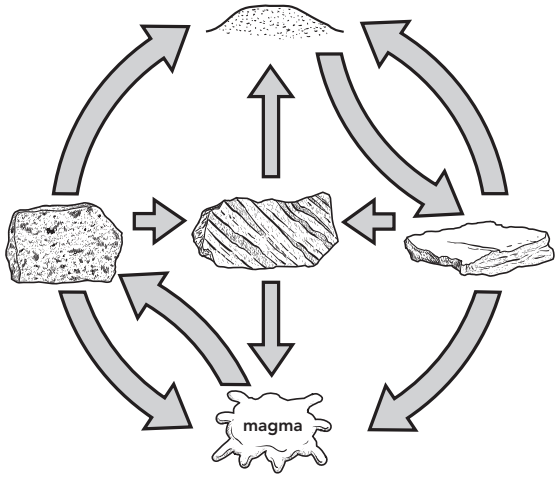
Where do rocks come from?

Rocks are constantly changed by processes on and within Earth. Weathering and erosion break down rocks into sediment. Heat and pressure in Earth's crust change rocks into new kinds. In addition, the movement of Earth's plates allows rocks in the crust to sink back into the mantle and melt. Magma from the mantle can then rise through cracks in the crust and form new rocks. This natural process of creation, destruction, and recycling of rock material between the mantle and Earth's surface is called the **rock cycle**.

Vocabulary

rock cycle
rock SY-kul
natural process of creation, destruction, and recycling of rocks in Earth's crust and upper mantle

Use the diagram of the rock cycle to complete the sentences below.



1. Heat and pressure turn igneous rock or sedimentary rock into _____ rock.
2. Magma cools to become _____.
3. Weathering and erosion turn rock into _____.
4. Cementing results in _____ rock.
5. When rocks melt, they become _____.

Name _____

Daily Science
Big Idea 4
WEEK 2

Day 5

Weekly Question

Where do rocks come from?

A. Use the words in the box to complete the sentences.

igneous	**cement**	**sedimentary**
sediment	**rock cycle**	**metamorphic**

1. When lava or magma cools, it forms _____ rocks.
2. All rocks are created, changed, or destroyed in the _____.
3. _____ rocks are formed when other rocks are weathered or eroded and leave behind _____.
4. Pressure causes sediment to _____ and form a hard rock.
5. A _____ rock forms when another rock is subjected to a lot of heat and pressure.

B. Name one trait of each type of rock and describe how the rock is formed.

1. Igneous: _____
2. Metamorphic: _____
3. Sedimentary: _____

C. Add the missing words to complete three parts of the rock cycle.

1. Igneous rock + _____ and _____ = sedimentary rock
2. Sedimentary rock + _____ and _____ = metamorphic rock
3. Magma + _____ = igneous rock

The properties of rocks and minerals reflect the process that formed them.

Week 3

Are some rocks valuable?

Students may have a general sense of what a natural resource is (air, water, trees), but they may have difficulty identifying natural resources that are dug out of the ground. Natural resources that contain minerals—such as gold and iron—as well as fossil fuels, are nonrenewable. This makes them valuable for both their usefulness and limited availability. Some nonrenewable resources are available but not easily obtainable without further improvements in technology or a substantial impact on the environment, such as with offshore drilling for oil. This week, students will learn about some of these resources, including how they are created, extracted, and used.

Day One

Vocabulary: *natural resources*

Materials: page 111

Activate prior knowledge by asking students to list as many natural resources as they can think of. (e.g., water, trees, oil, sunlight, wind) Introduce the vocabulary word to clarify students' thinking about what a natural resource is. After students have finished reading the passage, guide them through the illustration and have them complete the activity. Review the answers together.

Day Two

Vocabulary: *carbon, fossil fuels*

Materials: page 112; charcoal (optional)

Introduce the vocabulary. If you have it, show students the charcoal and explain that charcoal is mostly carbon and, like other fossil fuels, it can be used as a source of energy. After students finish reading, direct them to complete the activities. Review the answers together. If you wish to extend the lesson, consider explaining to students how fossil fuels are often used in ways other than to produce energy. For example, oil is used to make plastic.

Day Three

Vocabulary: *extract, metals, ore*

Materials: page 113

Point out all the things made of metal in the classroom and ask students to imagine how different life would be without this natural resource. Introduce the vocabulary and point out the illustration on the page. After students have finished reading, direct them to complete activities A and B independently. For the oral activity, pair students or discuss as a group. You may wish to build background by explaining more about the gold rush from the mid-1800s prior to completing the activity.

Day Four

Vocabulary: *conserve, renewable*

Materials: page 114

Introduce the vocabulary. When students have finished reading, confirm students' understanding that fossil fuels and metals are nonrenewable. Then have students complete the activities independently. Review the answers together.

Day Five

Materials: page 115

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 4
WEEK 3

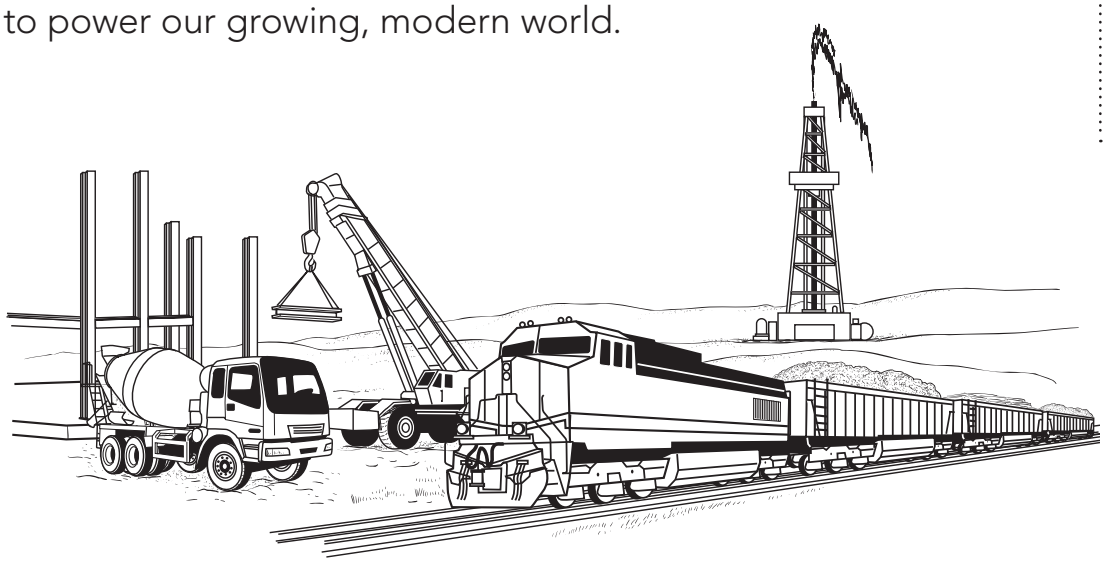
Day 1

Weekly Question

Are some rocks valuable?

If you were to name some **natural resources**, you might include the air, water, plants, and animals that exist all around us. Natural resources also include materials we dig out of the ground. Iron and limestone are natural resources, and so are coal, oil, and natural gas.

These underground resources are found in rocks or in pockets between rock layers. These materials have many uses. We use natural resources to make the steel and cement necessary to build cities and to create the energy that we use to power our growing, modern world.



Vocabulary

natural resources
NACH-er-ul REE-sor-sez
useful materials or sources of energy found on Earth

Fill in the chart with the natural resources listed in the passage.

Natural resources found above ground	Natural resources dug out of the ground

Name _____

Daily Science
Big Idea 4
WEEK 3

Day 2

Weekly Question

Are some rocks valuable?

Coal, oil, and natural gas are a group of natural resources called **fossil fuels**. For many years, they have been the source of the energy we use to heat our homes and run our cars and other machines.

Fossil fuels get their name from the way they were created. Hundreds of millions of years ago, the decaying remains of plants and animals built up at the bottom of swamps and shallow seas. These remains were rich in **carbon**. Eventually, the mud and sediment surrounding the material became sedimentary rock. Heat, time, and pressure caused some of the carbon-rich remains to turn into coal, pools of oil, or pockets of natural gas.

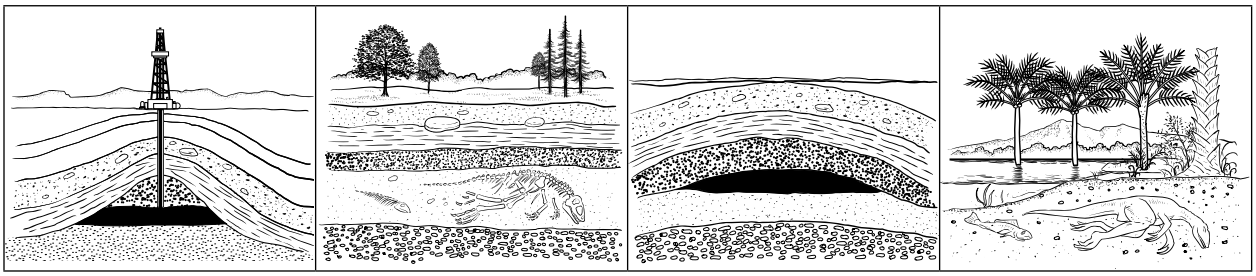
Although the processes that create fossil fuels are still at work, it would take millions of years to replace the oil, coal, and natural gas that we have already used.

Vocabulary

carbon
KAR-bun
an element found in all living things

fossil fuels
FOS-sil fyoolz
fuels formed from the fossilized remains of plants and animals

A. Number the pictures in order to show how fossil fuels are created and removed from the ground.



____ ____ ____ ____

B. Write *true* or *false*.

1. Fossil fuels come from the carbon-rich remains of organisms that lived hundreds of millions of years ago. _____

2. Fossil fuels can be replaced as quickly as they are used. _____

Name _____

Daily Science
Big Idea 4
WEEK 3

Day 3

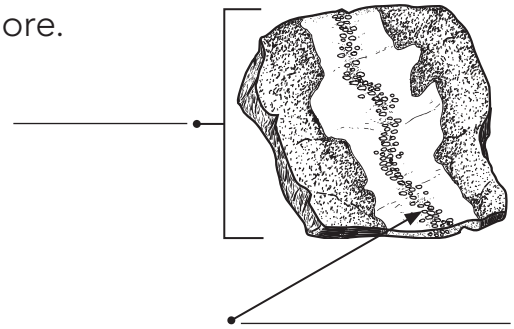
Weekly Question

Are some rocks valuable?

Metals are another natural resource found in the ground. They are used for many things, from gold jewelry to the steel beams in large buildings. Metals are found in rocks. Metal-rich rocks and sediment are called **ores**.

Ores can be removed from the ground by mining the surrounding rock. When the ore lies close to Earth's surface, it can often be dug out of the ground or removed with water. In many cases, however, valuable ores lie deep in the ground. Powerful drills are used to tunnel into the rock, and special machines **extract** the ore.

A. Use the vocabulary words to label the illustration and complete the sentence.



People often use machines to _____ natural resources from the ground.

B. Complete the analogy.

Metal is to *ore* as _____.

- ❒ *rock* is to *natural resource*
- ❒ *mineral* is to *rock*
- ❒ *fossil fuel* is to *energy*
- ❒ *natural resource* is to *tree*

Vocabulary

extract
ek-STRAKT
to remove

metals
MET-ulz
minerals that are usually hard and shiny, conduct electricity and heat, and can be melted and formed into shapes

ore
or
rock or sediment that contains metal

Talk

In the 1800s, people went to California to get rich looking for gold. Do you think these people mined ore close to the surface or deep in the ground? What methods do you think they used? Discuss it with a partner.

Name _____

Daily Science
Big Idea 4
WEEK 3

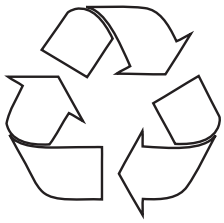
Day 4

Weekly Question

Are some rocks valuable?

Earth's supply of fossil fuels, metals, and other minerals is limited. Materials dug out of the ground are not **renewable** in the way that lumber from a forest is. Forests can be regrown by planting new trees, but scientists cannot make more iron and gold in the laboratory.

Because Earth has limited mineral and fossil fuel resources, scientists are seeking to invent strong, new building materials from substances that are plentiful, such as ground-up rock. They are also trying to find better ways to use plentiful energy sources, such as solar and wind power. In addition, there is now greater interest in, as well as reasons for, finding ways to **conserve** and reuse Earth's valuable materials.



Vocabulary

conserve
kon-SERV
to save or use sparingly

renewable
ree-NEW-ah-bul
able to be replaced by a new supply

A. Write *true* or *false*.

1. Earth has unlimited natural resources. _____
2. Forests are renewable resources. _____
3. Scientists can make gold in the laboratory. _____
4. Solar and wind energy sources won't run out. _____
5. Minerals are renewable. _____

B. Many people involved in conserving resources use the slogan "reduce, reuse, recycle." How would doing each of these things help conserve natural resources? Explain why.

_____

_____

_____

Name _____

Daily Science
Big Idea 4
WEEK 3

Day 5

Weekly Question

Are some rocks valuable?

A. Use the words in the box to complete the sentences.

ore	**metals**	**conserve**	**renewable**
carbon	**extract**	**fossil fuel**	**natural resource**

1. Trees are a _____ that is _____.

2. Coal is a _____ made from organisms that contain the element _____.

3. _____ is rock that contains _____.

4. People _____ resources to keep from running out.

5. Machines _____ ore from deep within the ground.

B. Fill in the chart to describe the role that fossil fuels and metals play in your life.

Fossil fuels I use:	How I use them:
1. _____	**1.** _____
2. _____	**2.** _____

Metals I use:	How I use them:
1. _____	**1.** _____
2. _____	**2.** _____

The properties of rocks and minerals reflect the process that formed them.

Week 4

Do all rocks come from Earth?

Although the vast majority of rock on Earth originated on this planet, some of the rocks and minerals came from space. Most of these samples came from asteroids in our solar system, though we have found rocks from both the Moon and Mars. Scientists looking to learn more about the Moon and Mars have sent astronauts and robots to study the rocks and minerals and sometimes return with samples. These studies and samples have helped scientists learn more about the origin of planets and moons in our solar system. Similarities in lunar and Earth rocks have convinced many scientists that the Moon was once part of Earth. They feel that the Moon was formed after a large impact broke away part of Earth very early in the planet's history. This week, students learn about extraterrestrial rocks and their similarities to and differences from rocks and minerals on Earth.

Day One

Vocabulary: *meteor, meteorite*

Materials: page 117

Ask students if they have ever seen a "shooting star" and invite volunteers to describe what it looked like. Introduce the vocabulary, making sure to explain that a meteor is the glowing trail and not the falling object. Point out the picture on the page and explain that the meteorite was found in Willamette, Oregon, but is now on display in New York. When students have finished reading the passage, have them complete the activities. Review the answers together.

Day Two

Vocabulary: *asteroids*

Materials: page 118

Introduce the vocabulary word and point out the asteroid belt on the page. After students have finished reading, direct them to complete the activities independently. Review the answers together.

Day Three

Vocabulary: *lunar, maria*

Materials: page 119

Have students discuss what they think the surface of the Moon is like and what similarities and differences there might be between Earth rocks and lunar rocks. Then introduce the vocabulary. Point out that *maria* is the Latin word for "seas." The name comes from early scientists who mistook these patches for bodies of water. When students have finished reading, have them complete the activities. Review the answers together.

Day Four

Vocabulary: *extraterrestrial*

Materials: page 120

Introduce the vocabulary word and explain that anything coming from space is considered to be "extraterrestrial." After students have finished reading, explain that scientists are looking for both fossil evidence and evidence of water on Mars, as water is necessary for life as we know it. Have students complete the activities. Review the answers together.

Day Five

Materials: page 121

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 4
WEEK 4

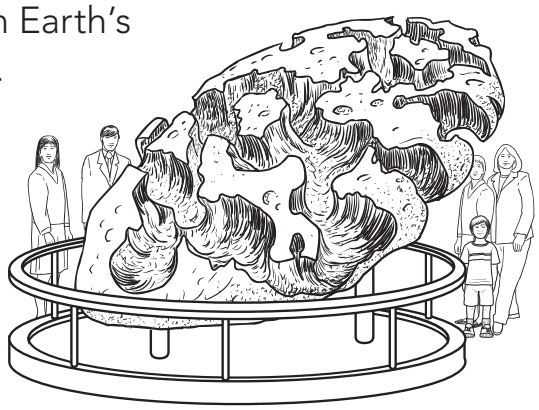
Day 1

Weekly Question

Do all rocks come from Earth?

You might call them "shooting stars," but scientists call the streaks of light you sometimes see flash across the night sky **meteors**. Meteors are bright streaks that are created when rocks or other solid objects from outer space heat up and glow as they fall through Earth's atmosphere. Usually, the objects burn up quickly in the atmosphere and never hit the ground. But if a space rock does land on Earth's surface, it is called a **meteorite**.

Meteorites can look and feel different from other rocks. They can be very heavy, have an unusual shape, and show signs of having melted. If you find a rock like this and it is very different from other rocks in the area, it could be a meteorite.



The Willamette meteorite is the largest meteorite ever discovered in the United States. It weighs over 15 tons.

Vocabulary

meteor
MEE-tee-yor
the glowing trail created by a solid object as it falls through Earth's atmosphere and heats up

meteorite
MEE-tee-yor-ITE
an object from space that hits Earth's surface

A. What four characteristics would help you determine if a rock could be a meteorite?

1. _____ **3.** _____

2. _____ **4.** _____

B. According to the passage, what is the difference between a meteor and a meteorite?

_____

_____

Name _____

Daily Science
Big Idea 4
WEEK 4

Day 2

Weekly Question

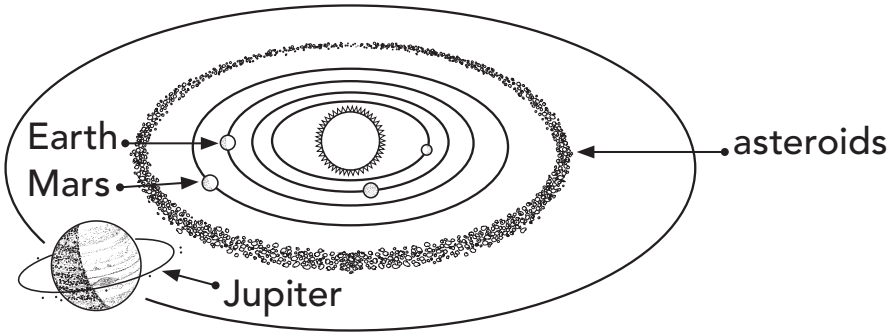
Do all rocks come from Earth?

Most meteorites come from a part of the solar system that is home to many small, rocky bodies called **asteroids**. Asteroids are much smaller than planets, and most of the ones in our solar system exist between Mars and Jupiter. Because asteroids are so small and so far away, scientists have many questions about them, including exactly what they are made of.

Although much about asteroids is unknown, meteorites that come from asteroids give scientists more clues. Iron meteorites, which are almost pure metal, may be the cores of asteroids. Stony meteorites, on the other hand, have minerals that are similar to minerals in Earth's crust and mantle. In the future, we may be able to extract these natural resources from asteroids and use them back on Earth.

Vocabulary

asteroids
AS-ter-oydz
small bodies of solid rock that orbit the sun



A. Why do scientists have difficulty studying asteroids?

_____

B. Write *true* or *false*.

1. Some meteorites contain iron. _____

2. Some asteroids contain part of Earth's crust. _____

3. Asteroids are smaller than planets. _____

Name _____

Daily Science
Big Idea 4
WEEK 4

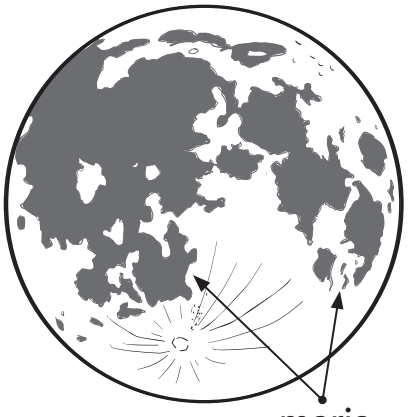
Day 3

Weekly Question

Do all rocks come from Earth?

Meteorites are only one example of the rocks that exist in our solar system. In the late 1960s and early 1970s, astronauts went to the Moon and brought back 842 pounds of **lunar** rocks. There are differences and similarities between lunar and Earth rocks. One difference is that there are fewer minerals in lunar rocks than in Earth rocks. Also, lunar rocks are not changed by weathering or erosion the way that Earth rocks are. This is because the Moon has no atmosphere or flowing water.

Lunar and Earth rocks also have some similarities. For example, lunar dust contains high amounts of calcium, iron, and aluminum, which are all commonly found in rocks on Earth. Also, scientists have determined that lava once flowed across the Moon's surface, forming rock in the same way that it does on Earth. These lava flows created large, dark patches on the Moon, which we call **maria**.



Vocabulary

lunar
LOO-nar
related to or coming from the Moon

maria
MAR-ee-ah
plains of dark basalt rock visible on the Moon's surface

A. What kind of rock makes up the Moon's maria—*sedimentary*, *igneous*, or *metamorphic*? Explain how you know.

_____

_____

B. Name two ways lunar rocks are similar to Earth rocks and two ways they are different.

Similar: **1.** _____ **2.** _____

Different: **1.** _____ **2.** _____

Name _____

Daily Science
Big Idea 4
WEEK 4

Day 4

Weekly Question

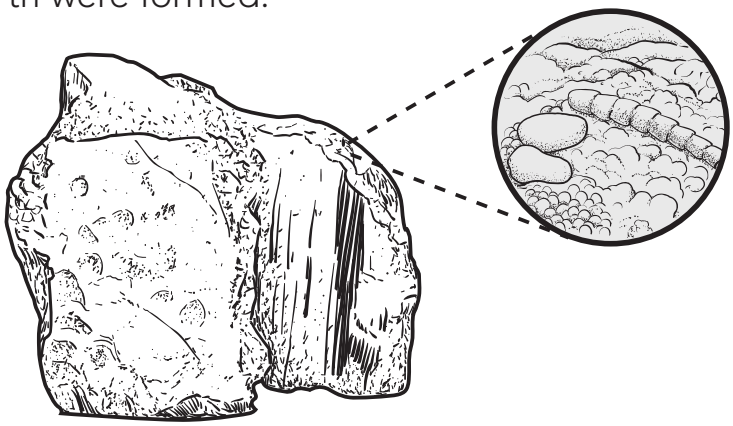
Do all rocks come from Earth?

Of all the rocky places in outer space, Mars is the most like Earth. Mars has volcanoes, canyons, and rocks very similar to those on Earth. Mars gets its red color from rocks containing the iron-rich mineral hematite, which is very common on Earth. But Mars also has unusual minerals that are not found on Earth.

So far, scientists have found 34 meteorites from Mars. These rocks contain some of the special minerals that exist only on Mars, and some even show evidence of what might be bacteria fossils. This has prompted scientists to send robots to Mars to study the planet directly. They are hoping to find more proof of **extraterrestrial** life, as well as to learn more about how Mars and Earth were formed.

Vocabulary

extraterrestrial
EK-struh-tuh-RES-tree-ul
not from Earth



A. Underline the information in the passage that proves Mars has experienced weathering and erosion.

B. What kind of Mars rock might contain fossils: *sedimentary*, *igneous*, or *metamorphic*? Explain how you know.

_____

_____

_____

Name _____

Daily Science
Big Idea 4
WEEK 4

Day 5

Weekly Question

Do all rocks come from Earth?

A. Use the words in the box to complete the paragraph.

asteroid	**lunar**	**extraterrestrial**
meteor	**maria**	**meteorite**

The glowing streak of light from a rock in Earth's atmosphere is a _____, but if the rock strikes Earth's surface, it becomes a _____. If the rock came from the Moon, we would call it a _____ rock, and it could have come from the dark spots on the Moon's surface called _____. If the rock came from Mars, it could contain proof of _____ life. Most likely, though, the rock came from an _____ floating between Mars and Jupiter.

B. Complete the chart to show how each type of rock is similar to and different from Earth rocks.

	Like Earth rocks	Different from Earth rocks
Lunar rocks	**1.** _____ **2.** _____	**1.** _____ **2.** _____
Mars rocks	**1.** _____ **2.** _____	**1.** _____

Name _____

Daily Science
Big Idea 4
WEEK 5

Unit Review

Comprehension

Rocks and Minerals

A. Fill in the bubble next to the correct answer.

1. What type of rock would likely contain a fossil fuel?

Ⓐ metamorphic
Ⓑ igneous
Ⓒ sedimentary
Ⓓ mineral

2. Along with heat and time, what else does a metamorphic rock need in order to form?

Ⓐ water
Ⓑ pressure
Ⓒ sediment
Ⓓ lava

3. Which of these is NOT a property of metal?

Ⓐ found in ore
Ⓑ is a mineral
Ⓒ is renewable
Ⓓ is hard and shiny

4. Which of these is NOT a property used to identify a mineral?

Ⓐ color
Ⓑ streak
Ⓒ cleavage
Ⓓ weight

5. What type of rock makes up the dark spots on the Moon?

Ⓐ igneous
Ⓑ metamorphic
Ⓒ sedimentary
Ⓓ mineral

B. List two properties used to identify minerals and explain what each property describes.

1. _____

2. _____

Name _____

Daily Science
Big Idea 4
WEEK 5

Unit Review

Vocabulary

Rock-Solid Vocabulary

Next to each vocabulary word, write the letter of its definition.

____ **1.** asteroids
____ **2.** cleavage
____ **3.** conserve
____ **4.** crystalline
____ **5.** extract
____ **6.** fracture
____ **7.** hardness
____ **8.** igneous
____ **9.** lunar
____ **10.** luster
____ **11.** metals
____ **12.** metamorphic
____ **13.** meteorite
____ **14.** minerals
____ **15.** natural resources
____ **16.** ore
____ **17.** renewable
____ **18.** rock cycle
____ **19.** sediment
____ **20.** sedimentary

a. to save
b. all rocks are made of these
c. an object from space that strikes Earth
d. the property that describes how easy it is to scratch a mineral
e. things that come from the Moon
f. rock formed from cooled lava
g. able to be replaced by a new supply
h. rock that has changed because of intense heat and pressure
i. useful materials or resources from nature
j. having a repeated, ordered structure
k. to remove
l. gold and iron are examples
m. the way a mineral breaks along flat, even planes
n. small deposits of rock, sand, or plant and animal remains
o. the shininess of a mineral
p. rock or sediment that contains metal
q. the way a mineral breaks into jagged, irregular pieces
r. limestone and sandstone are examples
s. how rock is constantly created, changed, and broken down
t. small bodies of rock between Mars and Jupiter

Name _____

Daily Science
Big Idea 4
WEEK 5

Unit Review

Visual Literacy

Mineral Mysteries

This chart lists several properties of different minerals. Use it to answer the questions below.

Name	Color	Hardness	Streak	Luster	Cleavage or Fracture
graphite	silver or black	1–1.5	black	metallic	perfect cleavage
calcite	white or colorless	3	white	glassy	perfect cleavage
apatite	green	5	white	glassy	fracture
hematite	steel gray	5–6	red	metallic	fracture
quartz	white or colorless	7	white	glassy	poor cleavage

1. Which is the softest mineral that can be colorless? _____

2. Which mineral can be white and has poor cleavage? _____

3. Which is the softest mineral with a metallic luster? _____

4. Three minerals have a white streak. Which mineral can scratch the other minerals? _____

5. Two minerals of similar hardness do not have cleavage. Which has a glassy luster? _____

6. Which mineral's color is different from its streak and also has a metallic luster? _____

Name _____

Daily Science
Big Idea 4
WEEK 5

Unit Review

Hands-on Activity

Chalk It Up to Science

The expression "hard as a rock" suggests that rocks are always hard. But some rocks are harder than others, and some will fall apart more easily than others. In this experiment, you will see what happens to chalk, which is a form of limestone.

What You Need

- two small glass or plastic containers
- 1/2 cup water
- 1/2 cup vinegar
- box of chalk
- rubber gloves

1. Put on the rubber gloves and assemble all the materials on a table.
2. Pour the vinegar into one of the containers and water into the other.
3. Break a piece of chalk into four pieces and drop two pieces into each container. Make sure the chalk is the same size for each container.

What Did You Discover?

1. Compare the chalk in the water to the chalk in the vinegar. Which changed more? What happened?

_____

2. Why do you think it helps to break the chalk into many pieces?

_____

3. Limestone is found in many water supplies and can build up on kitchen and bathroom surfaces. If you were developing a cleaning product, why might you want to include vinegar as an ingredient?

_____

Electrical energy can be converted into heat, light, sound, and motion.

Key Concept
Electrical energy can be converted into other forms of energy.

National Standard
Electricity in circuits can produce light, heat, sound, and magnetic effects.

By fourth grade, students have a basic understanding that electricity is a form of energy that powers lights, appliances, and toys. However, students are probably not aware of the processes that allow electricity to change into other forms of energy. This Big Idea teaches students the following:

- how electricity is converted into heat;
- how electricity is converted into light;
- how electricity is converted into sound; and
- how electricity is converted into mechanical energy.

Teacher Background

There's no doubt that electricity plays a very important role in the lives of modern human beings. Electrical energy provides power to devices old and new—from toasters and hearing aids to LED lights and electric cars. But electricity not only powers these machines, it also provides heat, light, sound, and movement. This unit deals with the idea that electrical energy can be converted into other forms.

Electric current flowing through a circuit is a form of energy. When electrical energy flows in a circuit connected to a resistor, it can change into heat. When an electric current passes through an electric motor, it changes into mechanical energy. The microphone and the speaker of a hearing aid convert sound waves into electricity and back again. And electric current that flows through an LED turns into light.

For specific background information on each week's concepts, refer to the notes on pp. 128, 134, 140, and 146.

Unit Overview

WEEK 1: How do toasters work?

Connection to the Big Idea: Filaments in toasters convert electrical energy into heat. This week, students learn how electric current flows through a circuit. They discover how a resistor is different from a conductor and learn the role it plays in converting electrical energy into heat.

Content Vocabulary: *circuit, conductor, electric current, filaments, radiate, resistor, switch*

WEEK 2: What lights a digital clock?

Connection to the Big Idea: The LEDs (light-emitting diodes) in a digital clock convert electrical energy into light. This week, students learn what an LED is and discover how electric current flows through a digital clock. They then learn that when the current reaches the LED, electrons release energy in the form of light.

Content Vocabulary: *display, electron, LED, photon*

WEEK 3: How do hearing aids help people hear?

Connection to the Big Idea: Hearing aids convert sound waves into an electronic signal and then change the signal back into sound waves. This week, students learn that sound waves travel as waves of energy. They learn about the parts of a hearing aid and discover how each part helps turn the sound energy into electrical energy and then back into sound energy.

Content Vocabulary: *amplifier, electromagnet, hearing aid, microphone, sound waves, speaker*

WEEK 4: How do electric cars work?

Connection to the Big Idea: Electric cars work by using electric motors that convert electrical energy into motion. Motion is a form of mechanical energy. Students learn that an electric motor converts electrical energy into mechanical energy through the use of a permanent magnet and an electromagnet. Students then discover how components of the electric car control the amount of electrical energy a motor receives. Finally, students explore other devices that use electric motors.

Content Vocabulary: *controller, electric motor, electromagnet, magnetic force, mechanical energy*

WEEK 5: Unit Review

These activities review the key concepts of how electrical energy is converted into other forms of energy.

p. 152: Comprehension Students answer multiple-choice items that review key concepts from the unit.

p. 153: Vocabulary Students match key vocabulary words from the unit with their definitions.

p. 154: Visual Literacy Students study different electronic devices and determine the types of energy these devices convert electrical energy into.

p. 155: Hands-on Activity Students create an electric "motor." Review the materials and instructions on the student page ahead of time.

Electrical energy can be converted into heat, light, sound, and motion.

Week 1

How do toasters work?

This week, students learn that a toaster is an example of how electrical energy is converted into heat. A toaster is a simple appliance that sends electric current through a circuit, which is completed or broken by the switch that raises and lowers the toast. Part of the circuit consists of exposed filaments that act as resistors. The resistors limit the amount of electric current flowing through the circuit and convert some of the electrical energy into heat energy. When hot, the filaments radiate heat energy that toasts the bread.

Day One

Vocabulary: *circuit, electric current, switch*

Materials: page 129

Since the purpose of this week is to explain how electric energy can be converted into heat energy, the basics of electricity, electric current, and circuits will not be discussed in depth. You may wish to review these concepts with students as you introduce the vocabulary. You may also wish to complete the activities as a group to make sure students understand what a circuit is and how electric current flows through it.

Day Two

Vocabulary: *conductor, resistor*

Materials: page 130

Before students read the passage, activate prior knowledge by reminding them what conductors are and helping them think of some examples. (Conductors conduct electric current; examples include copper wire, water, steel poles, etc.) After students have finished reading, direct them to complete the activities. Review the answers together.

Day Three

Vocabulary: *filaments, radiate*

Materials: page 131; toaster (optional)

Introduce the vocabulary and, if you have a toaster, allow students to look inside it before you turn it on. Then turn it on and allow students to look from a safe distance at the toaster's filaments as they become hot. After students read the passage, direct them to complete the activities independently. Review the answers together.

Day Four

Materials: page 132

After students finish reading the passage, direct them to complete the activities. Invite volunteers to share their responses to activity B.

Day Five

Materials: page 133

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 5
WEEK 1

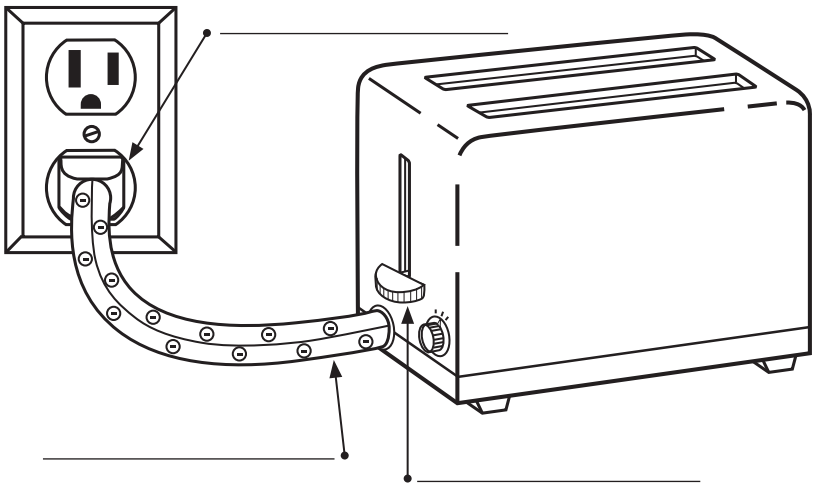
Day 1

Weekly Question

How do toasters work?

You probably think a toaster is a very simple appliance. After all, the only thing it does is make toast. It's true that compared to televisions and computers, toasters are pretty simple. When you push the lever down on a toaster, a **switch** completes a **circuit** that sends **electric current** flowing through the appliance. But would you guess that inventors had a very hard time inventing a toaster? In fact, it took many years to figure out a way to make a toaster that wouldn't melt or burst into flames!

A. Look at the diagram and then follow the instructions.



1. Label these parts of the circuit: the *source* of electric power, the *switch*, and the electric *current*.
2. Draw arrows to show the path of electric current to and from the appliance.

B. Most levers on toasters automatically pop up when the toast is done. Why do you think that happens?

_____

_____

Vocabulary

circuit
SIR-kut
a loop or path along which an electric current flows

electric current
ee-LEK-trik KUR-ent
the flow of electricity

switch
swich
a part of a circuit that starts or stops the flow of electric current

Name _____

Daily Science
Big Idea 5
WEEK 1

Day 2

Weekly Question

How do toasters work?

Inventors in the early 1900s knew that electricity flowed through **conductors**, such as metal. They also knew that some metals were not as good at conducting as others. The inventors found that these metals could be used to limit the flow of electric current in a circuit. Such metals are called **resistors**.

When electric current flows through a circuit, some of that electrical energy turns into another form of energy—heat. When a resistor is added to the circuit, even more electrical energy is converted into heat. This was the result that the inventors of toasters wanted.

Vocabulary

conductor
kun-DUK-tur
something that allows electric current to flow easily

resistor
ree-ZISS-tur
something that limits the flow of electric current through a circuit

A. Write *true* or *false*.

1. A conductor allows electric current to flow through it easily. _____
2. Electrical energy can make heat energy. _____
3. Resistors convert less energy into heat than conductors do. _____
4. All metals conduct electricity equally well. _____

B. What is the main difference between a *conductor* and a *resistor*?

_____

C. How did resistors help the people who invented toasters? Explain your answer.

_____

Name _____

Daily Science
Big Idea 5
WEEK 1

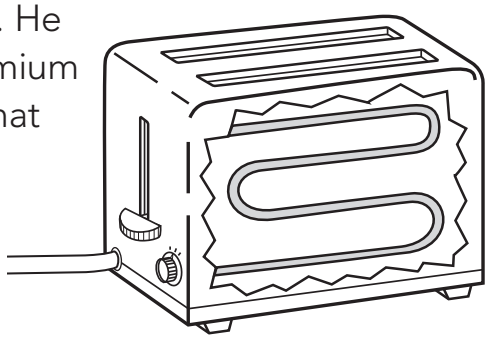
Day 3

Weekly Question

How do toasters work?

If you look inside a toaster as it is toasting bread, you'll notice several strips of glowing wire called **filaments**. These filaments are the resistors in the toaster's circuit. They limit the flow of electric current and convert some of the electrical energy into heat energy. That heat energy **radiates** from the filaments and toasts the bread.

When toasters were first invented, the filaments inside would get hot enough to toast bread, but they didn't last very long before they melted or burned. An inventor named Albert Marsh solved the problem. He used two metals, nickel and chromium (KRO-mee-um), to create a wire that was a good resistor and could withstand very high heat. This metal is used in toasters today.



Vocabulary

filaments
FIL-uh-mentz
wires that heat up or glow when they conduct electricity

radiate
RAY-dee-ate
to send out energy in waves or rays

A. Number the events in the correct order to explain how a toaster works.

____ The filaments radiate heat energy.

____ Electric current completes the circuit in a toaster.

____ Filament resistors convert some electrical energy into heat energy.

____ The bread is toasted.

B. Most toasters allow you to set how light or dark you want your toast. What do you think changes inside the toaster, depending on the setting?

_____

C. List three other things that radiate heat energy.

1. _____ **2.** _____ **3.** _____

Name _____

Daily Science Big Idea 5 WEEK 1

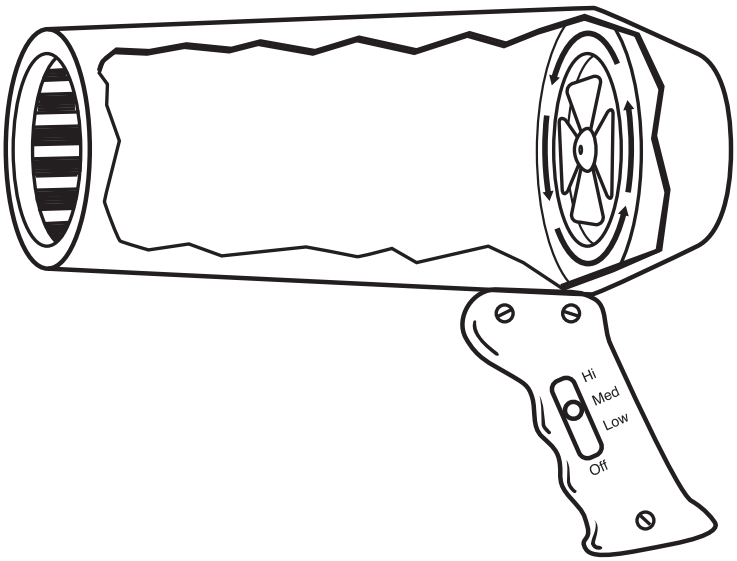
Day 4

Weekly Question

How do toasters work?

Toasters aren't the only appliances that turn electrical energy into heat energy. Electric stoves, electric blankets, irons, and even some cars convert electrical energy into heat energy. All of these inventions use filament resistors that can withstand very high temperatures. But sometimes the materials around the filaments cannot. For example, toast left in the toaster too long can turn black or even catch on fire. That's why you should never leave your toaster unattended while you're making toast.

A. A hair dryer works similarly to a toaster. Look at the diagram of the hair dryer. Where do you think the filaments are? Draw them below.



B. Today, some toasters do more than just toast bread. One toaster can "print" messages from your computer onto your toast. Another toasts pictures of cartoon characters on the bread! If you could invent a new kind of toaster, what would it do? Describe it below.

_____

_____

Name _____

Daily Science
Big Idea 5
WEEK 1

Day 5

Weekly Question

How do toasters work?

A. Use the words in the box to complete the sentences.

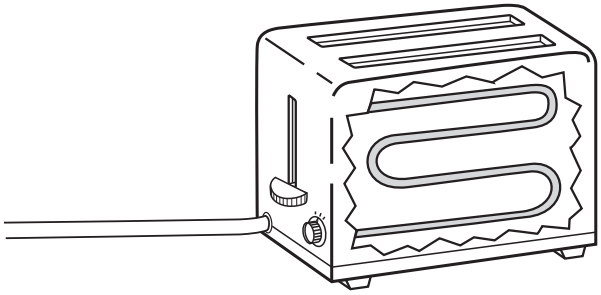
switch	**resistor**	**conductor**	**electric current**
circuit	**radiate**	**filaments**	

1. The lever on a toaster is a _____ that completes the _____ and allows _____ to flow through it.

2. A _____ is good at conducting electricity, while a _____ limits the flow of electric current.

3. The _____ in a toaster become hot and _____ heat energy.

B. Look at the diagram. Label the *switch* and *filaments*. Then draw the path that the electric current travels through the toaster.



C. When people iron, they make sure to move the iron constantly around the cloth. Why is this important?

_____

_____

Electrical energy can be converted into heat, light, sound, and motion.

Week 2

What lights a digital clock?

This week, students learn about LEDs, or light-emitting diodes. The numbers that display the time on a digital clock are LEDs. Each digit is divided into seven segments that are separately connected to the circuit inside the clock. Each segment can turn on and off to form the correct number to tell time. When electrons in an electric current pass through an LED, the electrons get excited and emit photons of light. Compared to incandescent light bulbs, LEDs are much more energy-efficient. They may become the standard devices we use for lighting.

Day One

Vocabulary: *LED*

Materials: page 135; digital clock

Introduce the vocabulary word and show students the digital clock. Point out the LEDs on the display. Tell students that this week they will learn how an LED converts electricity into light. After students finish reading, have them complete the activities. For the oral activity, pair students or discuss the question as a group. You may want to prompt students to think about durability or brightness of LEDs, if necessary.

Day Two

Vocabulary: *display*

Materials: page 136; digital clock

Introduce the vocabulary word. Show students the digital clock. This time, ask them to look closely at the numbers to see how they are divided up into segments. After students have read the passage, have them complete the activities. Go over the answers together.

Day Three

Vocabulary: *electron, photon*

Materials: page 137

Prior to having students read the passage, you may want to review the properties of electric current and how it travels through a circuit. (Electric current is made of electrons; it travels in a loop from the power source through the circuit.) When students have finished reading, direct them to complete the activities. Review the answers together.

Day Four

Materials: page 138; compact fluorescent light, incandescent light bulb

Show students the incandescent light bulb and the compact fluorescent light. Tell students that until recently, people used mostly incandescent light bulbs in their homes. Now, a lot more people are using compact fluorescent lights (CFLs), which last longer and are more energy efficient. But even CFLs are not as efficient as LEDs. After students have read the passage, have them complete the activities. Review the answers together.

Day Five

Materials: page 139

Have students complete the page independently. Then review the answers together.

Name _____

Daily Science
Big Idea 5
WEEK 2

Day 1

Weekly Question

What lights a digital clock?

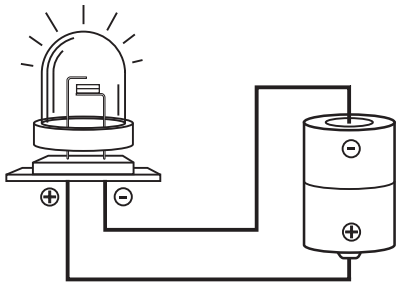
LEDs, or **L**ight-**E**mitting **D**iodes (DY-odz), are all around us. They form the brightly lit numbers in digital clocks. They are the tiny lights that tell us that a computer or TV is turned on. Ambulance and police siren lights often use LEDs.

Like any electrical appliance, an LED has to be connected to a source of electricity in order to work. The simplest way to describe an LED is as a tiny light bulb that fits into an electrical circuit. However, an LED is different from an ordinary light bulb because it uses less electrical energy to create an even brighter glow.

Vocabulary

LED
el-ee-dee
a device specifically made for generating light

A. Look at the diagram of a circuit. Draw an arrow pointing to the LED. Circle the electrical source.



B. Write *true* or *false*.

1. Digital clocks use LEDs. _____
2. In order to work, an LED must be part of an electrical circuit. _____
3. An LED uses the same amount of energy as a light bulb to produce light. _____

Talk

Why do you think the lights on many police cars and ambulances use LEDs? Discuss this question with a partner.

Name _____

Daily Science
Big Idea 5
WEEK 2

Day 2

Weekly Question

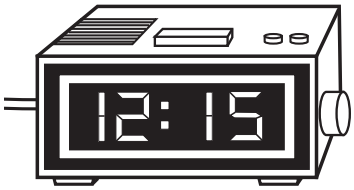
What lights a digital clock?

When a digital clock is attached to a power source, electric current flows through the circuit to reach the LEDs in the clock's numbers. Each digit is divided into seven segments, or parts. Each segment is an LED that is connected separately to the circuit. When one of the segments receives electric current, that LED lights up. As each segment is turned on and off, the **display** on the clock changes. For example, when all seven of the LED segments in a digit are turned on, the display shows the number 8.

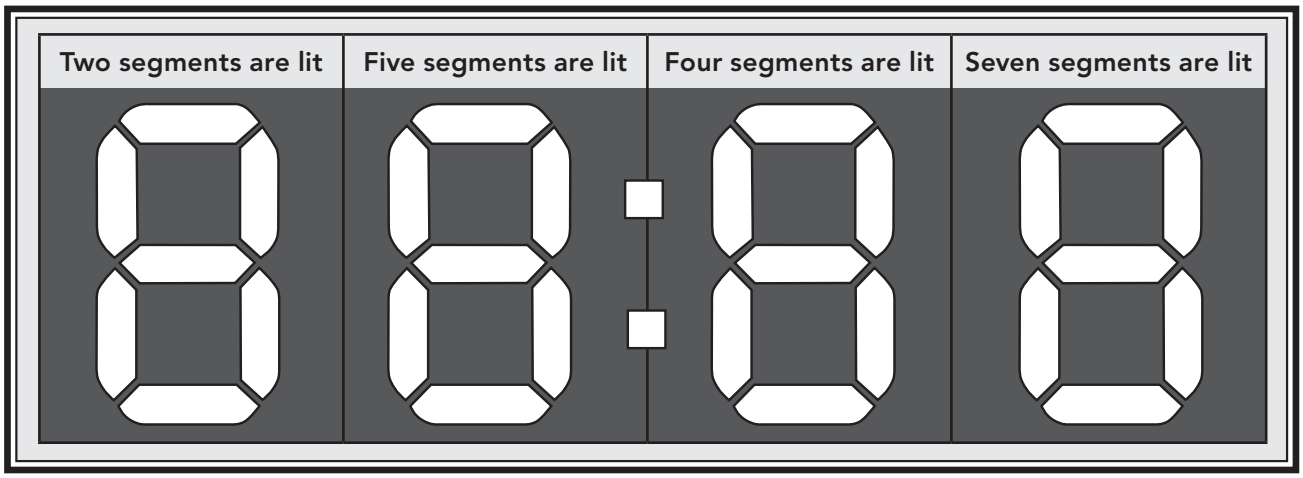
A device in the digital clock "counts" how long each segment receives electric current. That's how the digital clock knows when to change numbers and display the correct time.

Vocabulary

display
dih-SPLAY
information shown visually on a screen



A. Color the segments in each digit to show the time that would be displayed on this clock if:



B. If a clock reads 10:45, how many segments are lit up in all? _____

C. Name something you use that has a display. _____

Name _____

Daily Science
Big Idea 5
WEEK 2

Day 3

Weekly Question

What lights a digital clock?

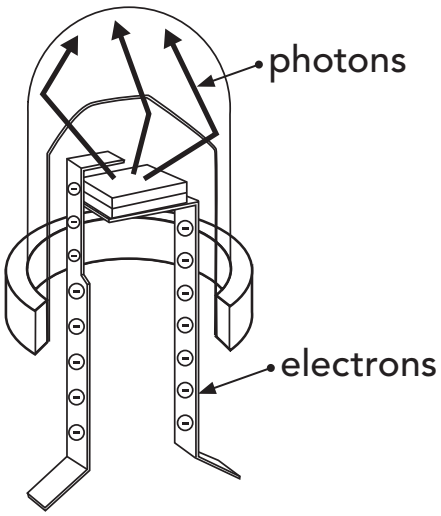
How exactly does an LED produce light? When electric current travels through the circuit and passes through the LED, it causes **electrons** to gain energy and become excited. These excited electrons release their extra energy in the form of light. A unit of light energy is called a **photon**. When you look at the clock to see what time it is, you are actually watching photons being released by the electrons traveling through the LED.

Vocabulary

electron
ee-LEK-trahn
a particle of an atom with a negative charge

photon
FOE-tahn
a tiny unit of light energy

A. Use the vocabulary words to write a caption that explains what is happening in the illustration.



_____

B. Number the events in the correct order to explain how an LED lights up.

____ Electric current passes through the LED.

____ Excited electrons release light energy called photons.

____ The LED is connected to a power source.

____ Electrons gain energy and become excited.

____ We see the LED light up.

Name _____

Daily Science
Big Idea 5
WEEK 2

Day 4

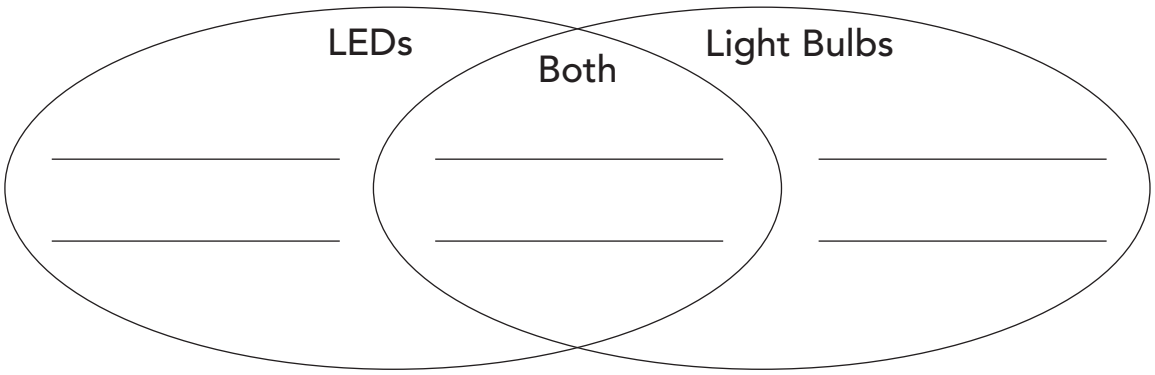
Weekly Question

What lights a digital clock?

Today, LEDs are the most energy-efficient devices used to create light. The filament in an incandescent (IN-can-DESS-ent) light bulb wastes a lot of energy by converting most of the electricity to heat. But an LED changes most of its electrical energy into light. In addition, incandescent bulbs lose a lot of light because they shine it in all directions. This causes some of the light to be absorbed back into the bulb. LEDs shine photons in one direction, so all their light is focused and bright.

LEDs are also longer-lasting than other types of light bulbs. Incandescent light bulbs usually burn out after 900 hours. Compact fluorescent (flor-ESS-ent) lights can last up to 15,000 hours. But researchers believe LEDs can last 35,000 to 50,000 hours (or ten years)! For all of these reasons, LEDs have brightened the future of lighting.

A. Write how LEDs and incandescent bulbs are similar and different.



B. List three reasons why LEDs are better than incandescent light bulbs.

1. _____

2. _____

3. _____

Name _____

Daily Science
Big Idea 5
WEEK 2

Day 5

Weekly Question

What lights a digital clock?

A. Use the words in the box to complete the paragraph.

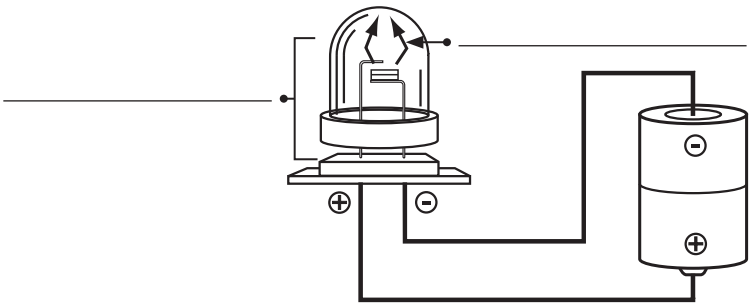
photons	**electrons**
display	**LEDs**

_____ form the brightly lit numbers of a digital clock.

Each digit on the _____ is divided into seven segments.

The segments light up when _____ receive electrical energy and emit _____.

B. Label the *LED* and *photons* in the circuit.



C. Read each sentence. Cross out the word that makes the sentence false and replace it with a word that makes the sentence true.

1. LEDs convert electrical energy into heat energy.

2. Excited electrons release light energy in the form of circuits.

3. An LED is less efficient than an ordinary light bulb.

Electrical energy can be converted into heat, light, sound, and motion.

Week 3

How do hearing aids help people hear?

An estimated 28 million people in the United States suffer from some form of hearing loss, but health researchers think that only 20% of these people use hearing aids. This week, students learn how hearing aids work. Hearing aids consist of a microphone that receives sound waves and circuitry that converts the sound waves into an electric signal. An amplifier strengthens the signal and sends it to the speaker, which then converts the electric signal back into sound waves that are broadcast directly into the ear canal of the wearer.

Day One

Vocabulary: *hearing aid, sound waves*

Materials: page 141

Begin the lesson by introducing the vocabulary and explaining, if necessary, what sound waves are and how they travel. (vibrations that contract and expand the molecules around them, much like the way a spring contracts and expands) After students have read the passage, have them complete the activities. Review the answers together.

Day Two

Vocabulary: *amplifier, microphone, speaker*

Materials: page 142

Introduce the vocabulary, pointing out each part on the diagram. Explain that the amplifier is part of the circuit in a hearing aid and isn't as easily recognizable as the speaker, microphone, or battery can be. Then have students read the passage and complete the activities. Review the answers together.

Day Three

Vocabulary: *electromagnet*

Materials: page 143

Begin by reviewing what an electromagnet is, what a permanent magnet is, and how they work. (*permanent magnet*: a magnet that always has a magnetic field, e.g., a refrigerator magnet; *electromagnet*: metal wrapped in wire that becomes a magnet when electric current flows through the wire) After students have finished reading, direct them to complete the activities. Review the answers together.

Day Four

Materials: page 144

Ask students if anyone has direct experience with a hearing aid, either worn by themselves or by a relative. Invite volunteers to share their knowledge about the hearing aid (what it looks like, what it feels like to wear, etc.). After students read the passage, direct them to complete the activities. Invite students to share what they wrote for activity B.

Day Five

Materials: page 145

Have students complete the page independently. Then review the answers together.

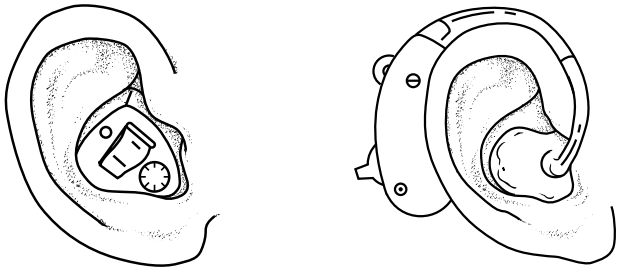
Name _____

Daily Science
Big Idea 5
WEEK 3

Weekly Question

Day 1 How do hearing aids help people hear?

When our ears are healthy and working properly, **sound waves** are collected by the outer ear, vibrate special bones in the middle ear, and travel to the inner ear. These vibrations send a signal that our brain interprets as sound. But sometimes an injury or a disease can damage parts of the ear so that we don't hear sound properly. In fact, there are 28 million people in the U.S. who suffer from hearing loss. These people can often hear better by using a **hearing aid**. Hearing aids use electricity to help our ears better recognize sounds.



Some hearing aids fit inside the ear, while others sit behind it.

Vocabulary

hearing aid
HEER-ing ayd
an electronic device that uses electricity to help the ear hear sounds better

sound waves
sownd wayvz
waves of energy created when an object moves back and forth rapidly

A. Use the vocabulary words to complete the paragraph.

When people have hearing loss, they can use a _____ to help them hear. The earliest hearing aids were shaped like horns. These horns helped focus _____ into people's ears.

B. Write *true* or *false*.

1. Hearing aids contribute to hearing loss. _____

2. Special parts in our ears vibrate when sound reaches them. _____

3. Hearing aids use electricity to help our ears hear sounds. _____