



UNITED ARAB EMIRATES  
MINISTRY OF EDUCATION

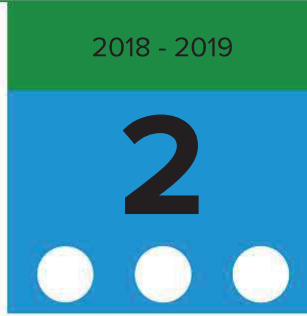


YEAR OF TOLERANCE

2018 - 2019

McGraw-Hill Education  
**Integrated Science**

United Arab Emirates Edition



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McGraw-Hill Education

# Integrated Science

United Arab Emirates Edition

GRADE 2 • VOLUME 3

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"Extensive knowledge and modern science must be acquired. The educational process we see today is in an ongoing and escalating challenge which requires hard work. We succeeded in entering the third millennium, while we are more confident in ourselves."

**H.H. Sheikh Khalifa Bin Zayed Al Nahyan**  
President of the United Arab Emirates



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## Program Authors

### **Dr. Jay K. Hackett**

Professor Emeritus of Earth Sciences  
University of Northern Colorado  
Greeley, CO

### **Dr. Richard H. Moyer**

Professor of Science Education and  
Natural Sciences  
University of Michigan–Dearborn  
Dearborn, MI

### **Dr. JoAnne Vasquez**

Elementary Science Education Consultant  
NSTA Past President  
Member, National Science Board  
and NASA Education Board

### **Mulugheta Teferi, M.A.**

Principal, Gateway Middle School  
Center of Math, Science, and Technology  
St. Louis Public Schools  
St. Louis, MO

### **Kathryn LeRoy, M.S.**

Chief Officer  
Curriculum Services  
Duval County Schools, FL

### **Dr. Dorothy J. T. Terman**

Science Curriculum Development Consultant  
Former K–12 Science and Mathematics Coordinator  
Irvine Unified School District, CA  
Irvine, CA

### **Dr. Gerald F. Wheeler**

Executive Director  
National Science Teachers Association

### **Bank Street College of Education**

New York, NY

### **MaryJo Fante Milburn, M.Ed.**

Instructional Technology Specialist  
Jefferson County Public Schools  
Louisville, KY

## Contributing Authors

### **Dr. Sally Ride**

Sally Ride Science  
San Diego, CA

### **Lucille Villegas Barrera, M.Ed.**

Elementary Science Supervisor  
Houston Independent School District  
Houston, TX

### **American Museum of Natural History**

New York, NY

## Contributing Writer

### **Ellen C. Grace, M.S.**

Consultant  
Albuquerque, NM

[alManahj.com/ae](http://alManahj.com/ae)

## Content Consultants

### **Paul R. Haberstroh, Ph.D.**

Mohave Community College  
Lake Havasu City, AZ

### **Timothy Long**

School of Earth and Atmospheric  
Sciences  
Georgia Institute of Technology  
Atlanta, GA

### **Rick MacPherson, Ph.D.**

Program Director  
The Coral Reef Alliance  
San Francisco, CA

### **Hector Córdova Mireles, Ph.D.**

Physics Department  
California State  
Polytechnic University  
Pomona, CA

### **Charlotte A. Otto, Ph.D.**

Department of Natural Sciences  
University of Michigan-Dearborn  
Dearborn, MI

### **Paul Zitzewitz, Ph.D.**

Department of Natural Sciences  
University of Michigan-Dearborn  
Dearborn, MI

## Editorial Advisory Board

### **Deborah T. Boros, M.A.**

President, Society of Elementary  
Presidential Awardees  
Second-Grade Teacher  
Mississippi Elementary  
Coon Rapids, MN

### **Lorraine Conrad**

K–12 Coordinator of Science  
Richland County School District #2  
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### **Kitty Farnell**

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Fourth-Grade Teacher  
Rudy Bologna Elementary School  
Chandler, AZ

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Presidential Awardees  
Past Preschool/Elementary NSTA  
Director  
Carefree, AZ and Chester, CT

### **Jean Kugler**

Gaywood Elementary School  
Prince Georges County Public  
Schools  
Lanham, MD

### **Bill Metz, Ph.D.**

Science Education Consultant  
Fort Washington, PA

### **Karen Stratton**

Science Coordinator K–12  
Lexington District One  
Lexington, SC

### **Emma Walton, Ph.D.**

Science Education Consultant  
NSTA Past President  
Anchorage, AK

### **Debbie Wickerham**

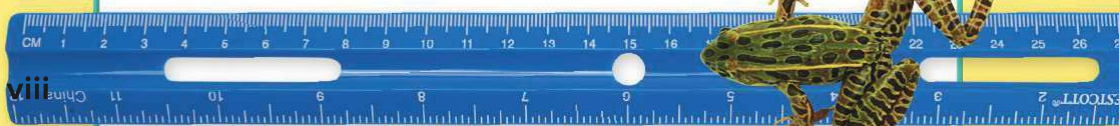
Teacher  
Findlay City Schools  
Findlay, OH

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# Physical Science



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## How Things Move



How do things move?

Answers will vary. Accept all reasonable responses.

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### Vocabulary



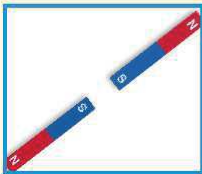
**motion** a change in the position of an object



**friction** a force that slows down moving things



**lever** a simple machine made of a bar that turns around a point



**repel** to push away or apart

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Before reading this chapter, write down what you already know in the first column. In the second column, write down what you want to learn. After you have completed this chapter, write down what you learned in the third column.

<b>Motion</b>		
<b>What We Know</b>	<b>What We Want to Know</b>	<b>What We Learned</b>
Someone or some thing cause objects to move.	Can objects move by themselves?	Objects move if a force acts upon them.
Simple machines help us lift things.	What are some simple machines?	Ramps, levers, wheels, and axles are examples of simple machines.
Magnets pull some things to them.	What attracts magnets? Where is a magnet's strength?	Magnets attract objects made of iron. Every magnet has a north pole and south pole where the magnet's push or pull is the strongest.



# Position and Motion



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## Look and Wonder

### Before You Read

Look at the man and horse in this picture. How would you describe where they are? What words could you use to describe their position and motion?

Student answers will vary, but should include something about the

location and the position and motion of the athletes in the image.

### Essential Question

How can you tell that something has moved?

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## What words help us find things?

### What to Do

- 1 Work with a partner. Pick an object in the classroom. Do not tell your partner what the object is.
- 2 **Communicate.** Describe where your object is. Give clues to your partner. Ask your partner to find the object. Switch with your partner and try again.
- 3 Switch with your partner and try again.
- 4 **Draw Conclusions.** Which words in your description were most helpful to your partner?

Answers will vary but might include descriptive words such as above,

below, next to, and near.

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**Explore** [More](#)

- 5 **Communicate.** Draw a picture and write directions to find an object in your picture. Then switch with a partner.

Answers will vary.

**Open Inquiry**

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Investigate why it is important to be able to explain the position of something.

My question is:

Sample question: How can I tell my friends how to get to my home if they do

not know where it is?

## What are position and motion?

### ✓ Quick Check

**Position** is the place where something is. You can tell the position of an object by comparing it to the positions of other objects.

You can use words such as above or below to describe where things are. You can also use the words in, on, under, next to, near, left, or right.

1. Fill in the blank.

People can describe the position of an object by comparing it to the position of another object.



Where are the rabbit and the cat? What sentences can you make about their positions?



When something moves, its position changes. **Motion** is a change in the position of an object. Some ways objects move are up, down, around, sideways, or zigzag. You can describe an object's motion by telling how its position changed.



▲ up and down



◀ around

✓ **Quick Check**

2. Choose a motion listed on this page and draw how an object moves in that way.

Children's drawings should show an object moving up, down, straight, back-and-forth, sideways, zigzag, or rolling.



## What is speed?



Some things, such as snails, move slowly. Others, such as cheetahs, move quickly. **Speed** is how far something moves in a certain amount of time.

### Quick Lab

Measure three meters in the classroom. Walk and then hop the distance. Record the time it took for each.



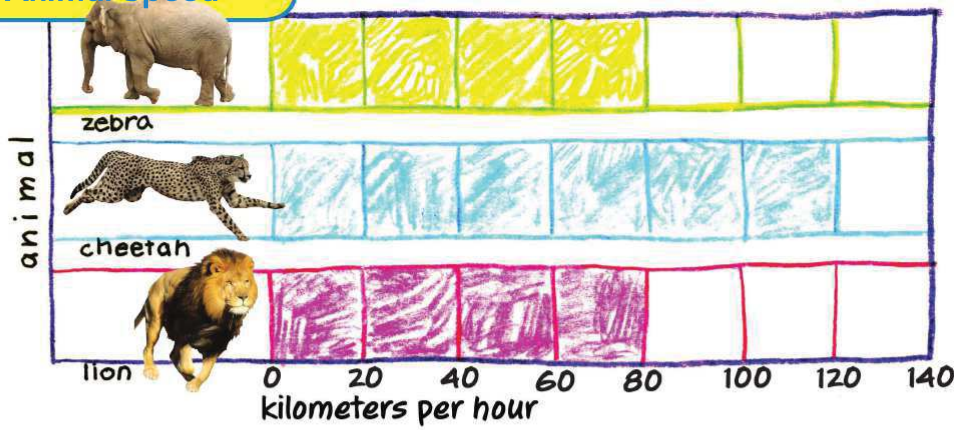
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A cheetah's speed can be measured with a stopwatch and a tape measure. The fastest objects move farthest in a certain amount of time.



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## Animal Speed



### Read a Graph

Which animal is the fastest?

cheetah

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### ✓ Quick Check

3. What are some objects that move at high speeds?

Possible answers: plane, rocket, cheetah, race car

## Visual Summary

Write about what you learned.



### Position

Possible answer: Position is the place

where something is



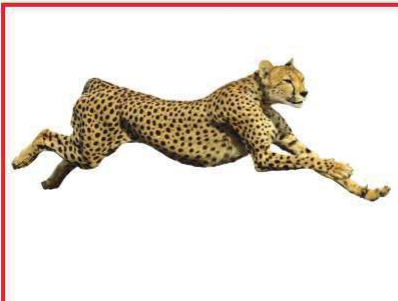
### Motion

Possible answer: Motion is a change in

position, such as moving up, down, or

around. Motion is described by telling

how position changes.



### Speed

Possible answer: Speed is how quickly

something moves in a given time.



## Think, Talk, and Write

- 1 **Sequence.** Describe the order of the objects you would pass as you move from your desk to your teacher's desk.

Answers will vary, depending on the student's location.

↓

↓

- 2 What words can you use to describe motion?

Possible answers: straight, zigzag, in a circle

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### Essential Question

How can you tell that something has moved?

Possible answer: You can look at its position now and its position in the past.

---

If the object has moved, its position will be different.

---

### Inquiry Skill: Investigate

When you **investigate**, you make a plan and test it out.

#### ► Learn It

Fares and Omar will run in a race. They want to find their speeds. They make a plan.

First, they measure 20 meters. They make a start and a finish line. Next, they measure the time it took them to run the distance.

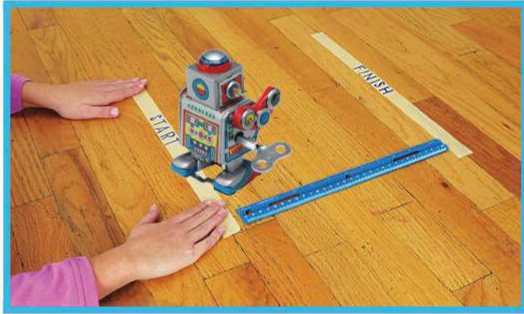
Look at the chart. Who is faster?

Our Race	
Fares	30 Seconds
Omar	28 Seconds

## ► Try It

Which toy moves fastest? Make a plan to find out. Then test your plan.

1. Use tape to make a start line. Measure how far away your finish line will be. Mark it with tape.



2. Use a stopwatch to find out how long it took each toy to go the distance. Record the times.

Answers will vary.

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3. Which toy was fastest?

Children should name the toy that took the least

---

amount of time.

---

### You need



masking tape



ruler



windup toys



stopwatch

# Forces



## Look and Wonder

### Before You Read

How can you make something move? How can you make it move farther?

Possible answer. I can make something move by pushing or pulling

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it. I can make an object move farther by pushing it harder.

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### Essential Question

What do forces do?

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## How do you make things go farther and faster?

### What to Do

1 Line up the car at a starting line.  
Push the car gently over the line.

2 **Measure.** How far did it go?

Student answers will vary depending on how how hard they pushed the car and how far it went.

### You need



toy car



masking tape



ruler



Step 2

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- 3** Do the activity again, but this time push the car harder. Observe what happens. How far did it go this time?

Student answers will vary depending on how hard they pushed the car and how far it went.

**Explore More**

- 4 Predict.** What might happen if you pulled the car toward you with your hands? Would it go as far?

Predictions may vary, but should describe how pulling a car might be different from pushing a car.

**Open Inquiry**

Investigate how other objects react to different amounts of force.

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My question is:

Sample question: What happens when I push a wooden block? What happens when I push it harder?

## What makes things move?

Objects cannot start to move on their own. You have to use a push or a pull to put something in motion.

When you play football, you kick the ball to move it across the field. Your kick is a push. If you do not kick the ball, it will stay in the same place.

Underline two ways you can put an object in motion.



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A stronger kick will make an object move farther.





A push or pull is called a **force**. If you push something, it will move away from you. If you pull it, it will move closer to you.



What is making the cart move?

A kick is a kind of push. Opening a drawer is a kind of pull. You can move different objects with different amounts of force.

 **Quick Check**

1. Why do we need forces?

Possible answer: to make things move

▼ These boys are pulling the rope. Why does it not move?

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395  
EXPLAIN

## What are some forces?

When you let go of a ball, it falls.

**Gravity** is a force that pulls down on everything on Earth. When you jump up in the air, gravity pulls you back down to the ground. The amount of force that pulls something down toward Earth is called its weight.

### ✓ Quick Check

Answer true or false.

2. When you drop something, gravity pulls it down to the ground.

True

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- ▲ Why is the ball falling?  
What do you think will happen to the cat?

**FACT** All planets have gravity.

When you skate, you drag a rubber stopper on the ground to stop. The dragging causes friction. Friction is a force that slows down moving things. Friction happens when two things rub together.

There is usually more friction on rough surfaces than on smooth ones. It is usually harder to push or pull something on a rough surface than on a smooth surface.

The ball falls to the grass and rolls. Friction makes the ball slow down and stop. ▼

## Quick Lab

Slide a wooden block on different slanted surfaces. Compare how friction affects the speed of the block.



Dragging the rubber stopper on the ground causes friction. This slows the skater down.

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## How does gravity affect objects?

Think about holding a beach ball in one hand. You are holding a bowling ball in the other. Gravity pulls both objects down. The bowling ball feels heavier because it has more matter. Matter makes up everything around you.

Mass is the amount of matter in an object. An object with a large mass feels heavy. An object with a small mass feels light. A balance is used to measure mass.



▲ A bowling ball has more matter than a beach ball. It is heavier.

▼ The larger shoe has more mass than the smaller shoe.



**FACT** A balance does not measure weight, but measures the mass.

You know that gravity pulls on objects through air. When you kick a ball, gravity pulls the ball back down to Earth. The force of gravity also pulls on objects through solids and liquids. Look at the fish in the fish bowl. Gravity pulls on the fish through the glass, gravel, and water. The fish swim against the force of gravity to get to the top of the bowl.

 **Quick Check**

3. How do you know gravity can affect objects in water?

Possible answer: I know that gravity affects objects in water because those objects are still pulled toward Earth. The gravel in the fishbowl, for example, is pulled to the bottom of the bowl. The fish has to swim against gravity to reach the surface of the water.



▼ Gravity can affect objects through air, liquids, and solids.

## How can forces change motion?

You know that forces can change how things move. Forces can make things start moving, speed up, slow down, and stop. Forces can make things change direction too. In many different sports, the players use forces to change the direction of the ball.

The pitcher uses a force to throw the ball toward the batter. ▼

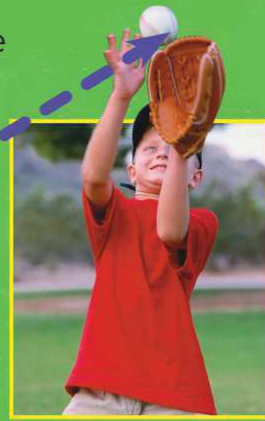


### How a Ball Changes Direction



◀ The batter hits the ball with a push. It changes direction and flies toward the outfield.

The player in the outfield catches the ball and uses a force to stop its motion. He can also use a force to throw the ball to another player. ▶



### Read a Diagram

What kind of forces do the players use?

pushes, pulls, and friction

### ✓ Quick Check

4. Think about a sport that uses a ball. How does the ball change direction?

Possible answers: In soccer, the ball is thrown or kicked using a

push in one direction. The other team intercepts the ball. They

stop it by using friction, and run with it in the opposite direction.



## Visual Summary

Write about what you learned.



### Forces

Possible answer: A force is what makes

things move. Forces can be gravity or

friction, or actions like kicking or pulling.



### Gravity

Possible answer: Gravity a force that pulls down on

everything on Earth/ is what holds objects to Earth.

Gravity pulls objects through solids, liquids, and gases.



### Friction

Possible answer: Friction is a force that

slows two things down when they rub

together.

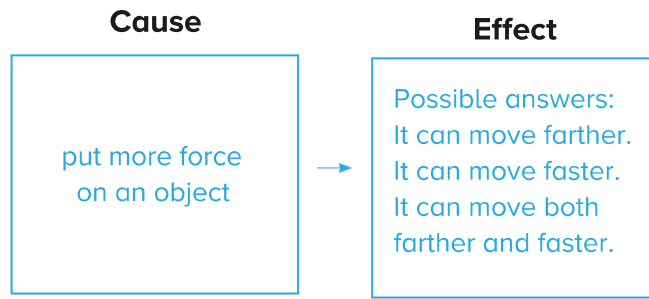
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## Think, Talk, and Write

**1 Vocabulary.** What is gravity?

a force that pulls down on everything on Earth

**2 Cause and Effect.** What happens when you put more force on an object?



**3** Why is it hard to push objects on some surfaces?

Possible answers: Friction causes objects to rub together and slow

down. It is harder to move objects on rough surfaces, because there

is more friction.

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**Essential Question** What do forces do?

Possible answer: Friction can stop or change the direction of objects

that are moving. Pushes or pulls can also cause an object that is still to

move. Gravity pulls us down so we stay close to Earth.

### Inquiry Skill: **Infer**

When you **infer** you use what you know to figure something out.

#### ► **Learn It**

Gravity is a force. You can not see or touch it. It pulls objects down toward Earth. Gravity pulls on object through solids, liquids, and gases.

You can use what you know about gravity to describe what happens to objects. Look at the picture below. The ball floats and the marble sinks. Gravity is pulling both objects to Earth.

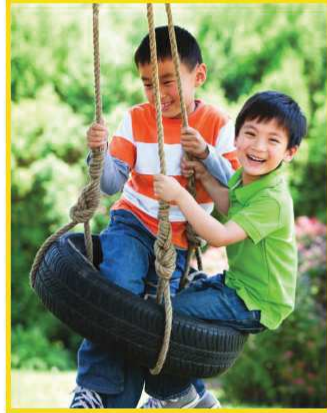


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## ► Try It

Look at the pictures below.



1. What can you **infer** about how gravity is acting on the object in the pictures? Share what you infer with a classmate.
2. Draw other pictures to show how gravity can act through solids, liquids, and gases.
3. **Write About It.** Tell what would happen if gravity could not pull through solids and liquids.

Possible answers: if gravity could not pull through a solid, many objects

would simply float in the air if a solid were between the object and

Earth. Similarly, objects would not be pulled through water. This means

that boats would not work, as they would not be held to the water.



# Uses of Simple Machines

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## Look and Wonder

### Before You Read

Have you ever used a shovel? How does it make digging easier?

Possible answer: The shovel holds more than my hands, so it

would take more time and strength to dig without it.

### Essential Question

How can you use simple machines?

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## Which side will go up?

### What to Do

- 1 Tape a marker to the middle of your desk.
- 2 Tape 10 coins to the edge of one end of a ruler. Tape 5 coins to the edge of the other end.

#### Step 2



#### You need



marker



tape



ruler



15 coins

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- 3 Predict.** What will happen if you put the middle of the ruler on the marker? Which side will lift up? Try it. Was your prediction correct?

Answers will vary, but students should say that one side of the ruler will

go up and the other side will go down.

**Explore More**

- 4** Try to move the ruler so that 5 coins can lift 10 coins. Where did you need to move the ruler?

Possible answers: When the marker is far away from five coins, five

coins can lift ten coins. Less force can lift the heavier side if the marker

is closer to it.

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**Open Inquiry**

Investigate other ways to use levers.

My question is:

Same questions: What kind of lever would lift a heavy object, such as a large

stone or person? What other kinds of tools are levers?

## What are levers and ramps?

A **simple machine** is a tool that changes the size or the direction of a force. A simple machine can make work easier.

A **lever** is a bar that moves against an unmoving point. The unmoving point that a lever moves against is called a **fulcrum**. Shovels and seesaws are levers. When you push down on one side of the lever, the other side moves up.

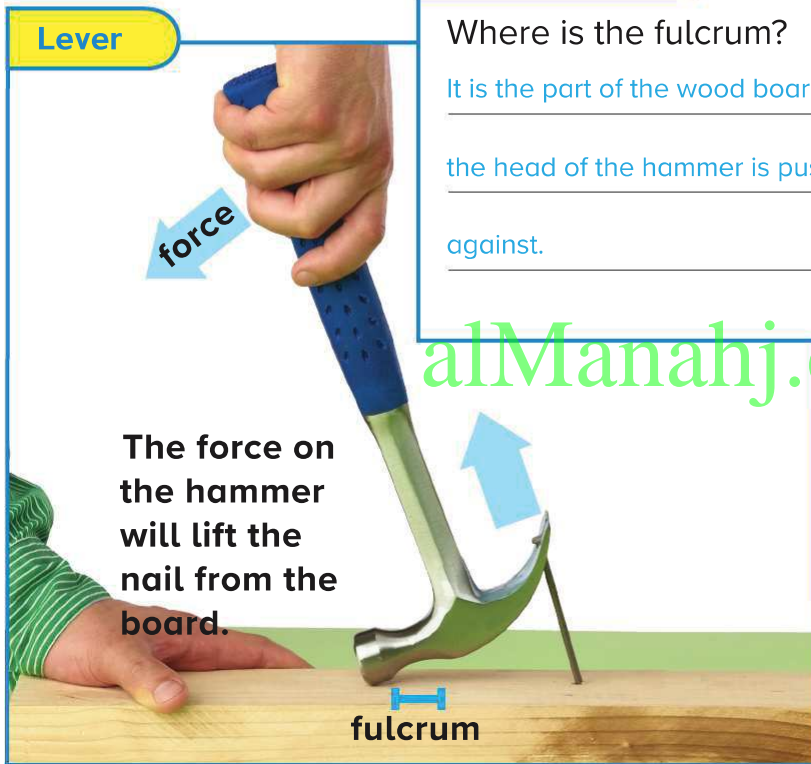
### Read a Photo

Where is the fulcrum?

It is the part of the wood board that

the head of the hammer is pushing

against.



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- ▲ You use less force to push a heavy box up a ramp than to lift the box.

Another kind of simple machine is a ramp. A **ramp** is a surface that is straight and slanted. Ramps can be used to move an object from one place to another. Pushing something up a ramp is easier than lifting it. Less force is needed to move something on a long, low ramp than on a short, steep ramp.

 **Quick Check**

**Answer true or false.**

1. Less force is needed to push a heavy box on a short, steep ramp.

false

## What are other simple machines?

A bicycle uses a simple machine called a wheel and axle. A **wheel and axle** is made of a wheel and a bar, or axle. The bar is connected to the center of the wheel. When the wheel turns, the bar turns too.

A doorknob and a steering wheel each use a wheel and axle. Each axle on a car or bus has two wheels attached.

### ▼ Where is the axle on this monster truck?

## Quick Lab

**Investigate** how to make a pulley. Use the pulley to lift a pail filled with blocks.

### ✓ Quick Check

2. How do a lever and a ramp make work easier?

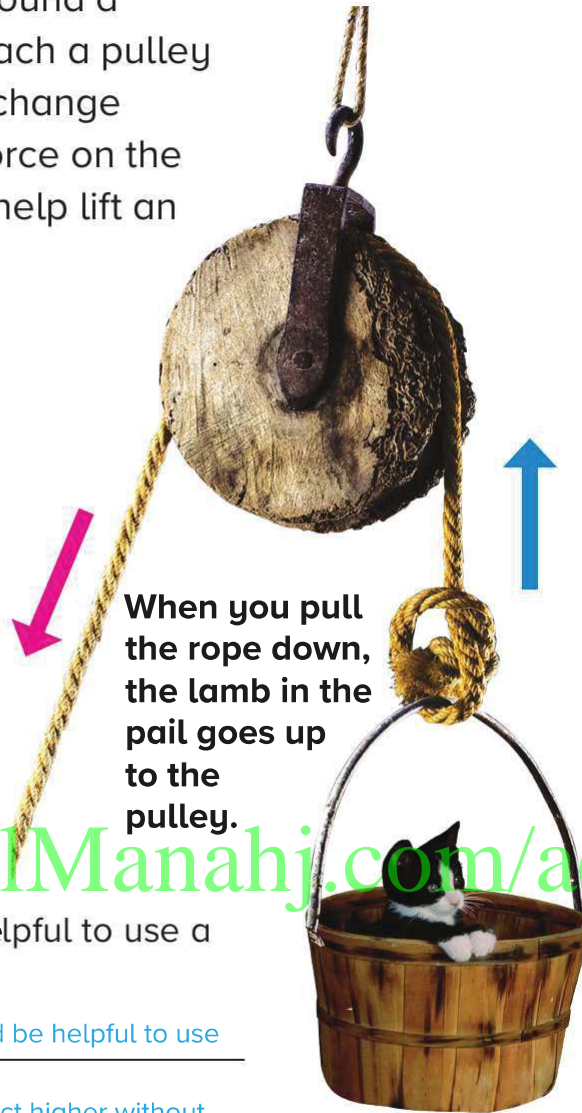
Possible answer: They let

people use less force to do

work.



A **pulley** is also a simple machine. A pulley is made with a rope that moves around a wheel. When you attach a pulley to an object, you can change the direction of the force on the object. A pulley can help lift an object up high.



**Quick Check**

3. When might it be helpful to use a pulley?

Possible answer: It would be helpful to use a pulley to move an object higher without needing to use a ladder.

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## Visual Summary

Write about what you learned.



### Lever and Fulcrum

Possible answer: A lever is a simple machine that is a bar moving against an unmoving point called a fulcrum. Examples include shovels and seesaws.



### Ramp

Possible answer: A ramp is a straight surface that is slanted. It can be used to push things up instead of lifting them.



### Wheels, Axles, and Pulleys

Possible answer: A wheel and axle is a wheel that is connected to a bar. A pulley is made with a rope that moves around a wheel.

## Think, Talk, and Write

**1 Vocabulary.** What is a simple machine?

a tool that changes the size or the direction of a force

---



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**2 Summarize.** How do simple machines make our lives easier?

Possible answer: Simple machines can help move things and lift things

---

to make work easier.

---

**3** What are some kinds of simple machines?

Possible answers: ramps, levers, wheels/axles, pulleys

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**Essential Question** How can you use simple machines?

Possible answers: I use pulleys to close my curtains. I use a ramp to help lift

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heavy items up. I use a lever when I play on a seesaw.

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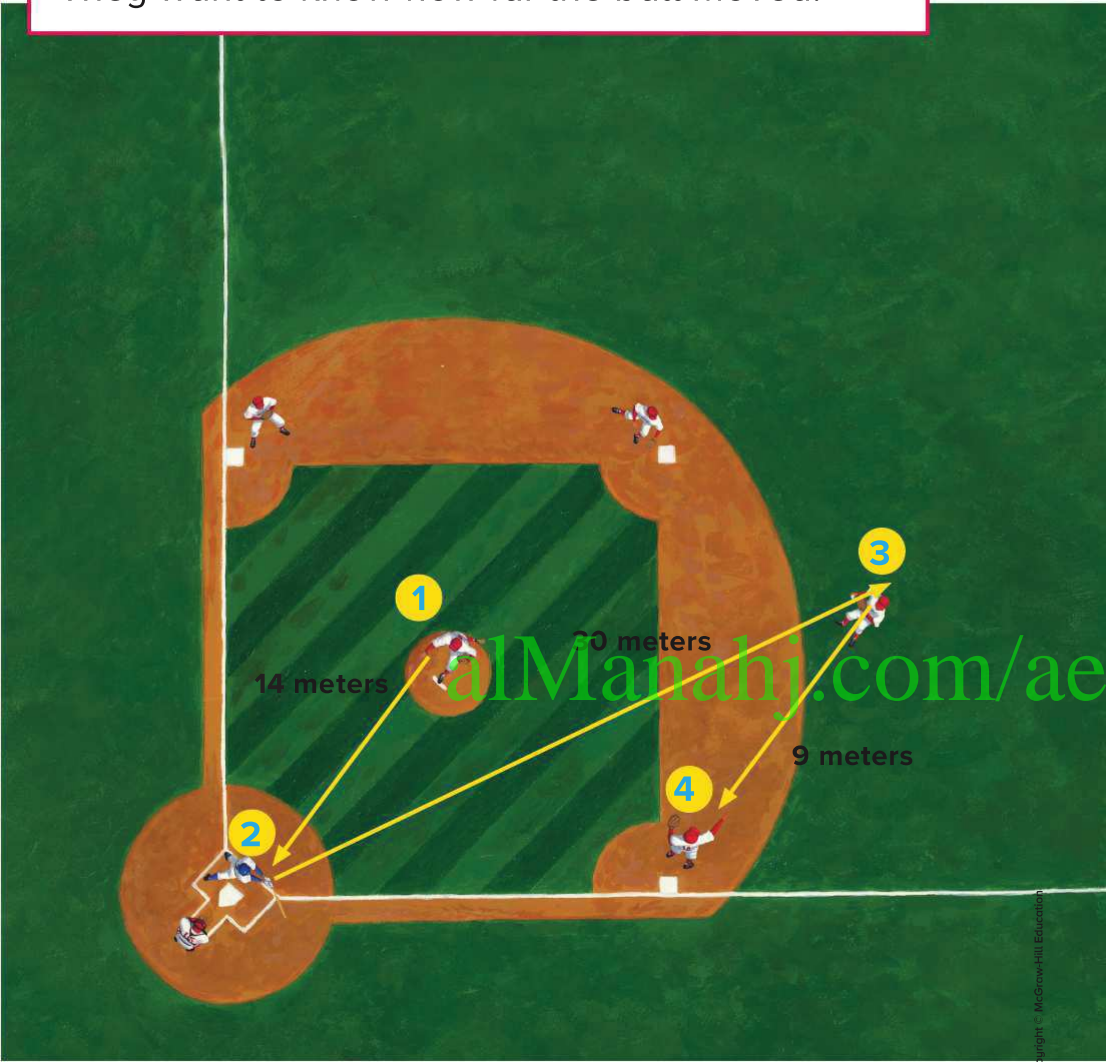


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# How Far Did It Move?

These students are playing a game.  
They want to know how far the ball moved.



## Add Measurements

Add the distances the ball moved. How far did it go? How many times did the ball change direction? Make up your own math problem about the game.

### Remember

Add the 1s first.  
Then add the 10s.  
Then add the 100s.

Students should answer that the ball traveled 53 meters and changed

directions 3 times. Children's math problem may vary.



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# Discover Magnets



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## Look and Wonder

### Before You Read

Why does the magnet pull some of these objects and not others?

Possible answers: Some objects are not attracted to the magnet; they are  
made out of different materials, such as rubber or plastic.

### Essential Question

What are magnets?

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## What can a magnet pick up?

### What to Do

- 1 Predict.** Put the objects in a bag.  
Which objects will stick to a magnet?
- 2** Tie a string to a pencil. Tie a magnet to the end of the string.
- 3** Use the magnet to pull objects out of the bag.



### You need



small objects



paper bag



string



pencil



magnet

- 4 Record Data.** Draw the types of small objects you will use in the activity. Then record whether or not the object stuck to the magnet. Use the chart below to classify your findings.

Object 1	Object 2	Object 3	Object 4	Object 5
Possible answer: Sketch of a coin, whether or not it stuck to the magnet.				

**Explore More**

- 5 Classify.** Predict how the things that stick to the magnet are alike.

Answers will vary depending on the small objects students used.

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**Open Inquiry**

Investigate how magnets are used.

My question is:

Same question: What machines or devices use magnets to sort objects?



## What do magnets do?

A magnet can **attract**, or pull, some objects. Magnets attract objects through solids, liquids, and gases. A very strong magnet can pull objects from far away. The farther a magnet is from the object, the weaker the magnet's pull will be.

Many magnets contain iron. Magnets attract objects made with iron, including steel. They can also attract objects containing nickel.

### ✓ Quick Check

Answer true or false.

1. The farther a magnet is away from an object, the stronger the magnet's attraction.

false



The magnet pulls the paper clip without touching it.



Magnets are holding these objects in place.



## What are poles?

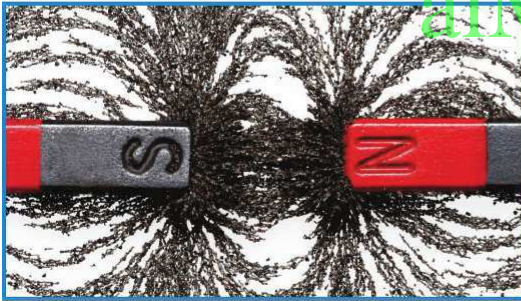
The two ends of a magnet are its **poles**. Every magnet has a north pole and a south pole. Put the north pole of one magnet next to the south pole of another. They will **attract** each other.

### Quick Lab

Cover the labels on two bar magnets. **Investigate** to find which poles are alike and which are different.



Now put the two south poles together. They will **repel**, or push apart. The same thing will happen with the two north poles. The push or pull of a magnet is strongest at its poles.



◀ This magnet attracts tiny pieces of iron.

**FACT** Some magnets are much stronger than others.

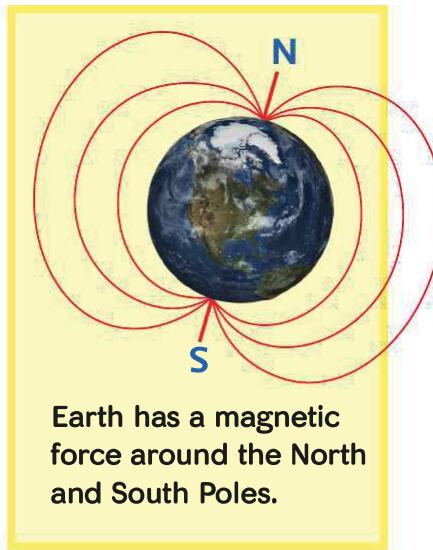
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EXPLAIN

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Earth acts like a big magnet. Like every magnet, it has north and south poles.

A compass is a magnet that is free to spin. The north pole in the magnet points toward Earth's North Pole.



The needle inside a compass is a magnet that points to Earth's North Pole.



**Quick Check**

3. Do two magnetic poles that are alike attract or repel each other?

attract

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4. Where is the pull of a magnet strongest?

at the poles

## Visual Summary

Write about what you learned.



### Magnets Attract

Possible answer: A magnet can attract,  
or pull, objects made with iron or nickel.

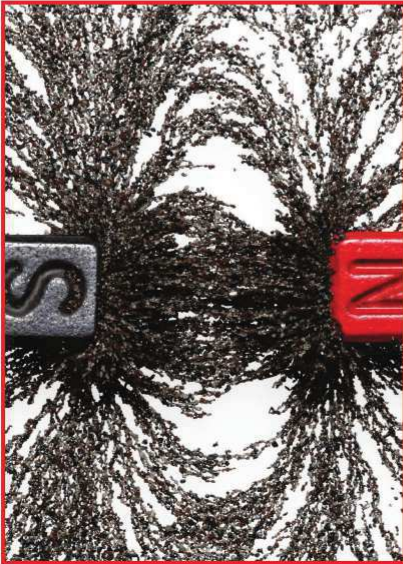
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### Poles

Possible answer: Every magnet has a  
north pole and a south pole. Opposite  
poles on two magnets attract each other  
but if you put the same poles together,  
they will repel, or push apart.

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## Think, Talk, and Write

- 1 **Compare and Contrast.** What is the meaning of the word *repel*?

Possible answer: When two things repel, they push each other apart.

---

- 2 **Problem and Solution.** Two magnets repel each other. How can you make them stick together?

Possible answer: Turn one magnet so that opposite poles are near each

other.

---

- 3 What will a magnet attract?

Possible answer: Magnets attract objects made with iron or nickel, such

as paper clips.

---

### **Essential Question** What are magnets?

Possible answer: A magnet is a piece of metal that attracts or pulls objects

made with iron or nickel.

---

## How can you compare the strength of different magnets?

Find out how many paper clips each of the magnets can attract.

### What to Do

- 1 Hang a paper clip from a magnet. Keep adding more clips in a line until no more will stick.
- 2 **Record Data.** Write how many paper clips can hang from the magnet.

Answers will vary.

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### You need



paper clips



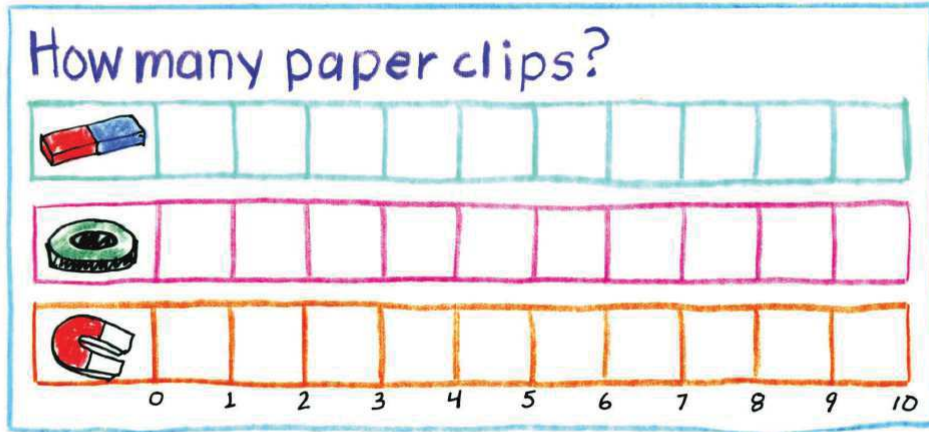
magnets



- 3 Repeat the steps using different magnets.

Answers will vary.

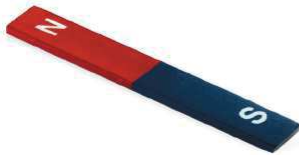
- 4 **Communicate.** Make a bar graph to show the strengths of your magnets.



**Investigate More**

**Investigate.** How many paper clips can you pick up with two magnets? Find a way to attach two magnets and try it out.

Answers will vary.



# CHAPTER 13 Review

## Vocabulary

Use each word once for items 1–6.

1. When two objects rub together, they can be slowed down by friction.
2. A simple machine that makes it easier to push an object to a higher level is a ramp.



3. We can tell where an object is by its position.
4. Objects fall to the floor because of a force called gravity.
5. How far an object moves in a period of time is called speed.
6. A simple machine that moves against a fulcrum is called a lever.



friction

gravity

lever

position

ramp

speed

Answer the questions below.

7. **Summarize.** Describe the position of the blue paper.



The blue paper is under the orange pencil.

The blue paper is on top of the red paper.

The blue paper is next to the books.

The position of the blue paper can be described by the position of the objects near it.

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# CHAPTER 13 Review

8. **Investigate.** What can help you move a heavy object?

Possible answers: levers, pulleys, ramps, wheel and axle

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9. Describe some of the simple machines in this picture and how they work.

Possible answers: A shovel is a lever that is used to dig; you push down

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on the handle and the other end moves up. A wagon has wheels and

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axles; It is pulled or pushed to move things easily.

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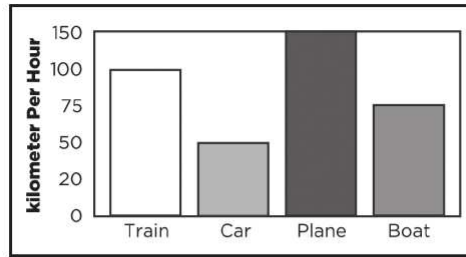
10. How do things move?

Accept all reasonable responses.

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1. This graph shows how fast a train, a car, a plane, and a boat can move.



Which moves the fastest?

- A a train
  - B a car
  - C a plane
  - D a boat
2. Look at the picture.



What force is the boy using to close the door?

- A gravity
  - B friction
  - C pulling
  - D pushing
3. Which item will not be attracted by a magnet?
- A a paper clip
  - B scissors
  - C a rubber band
  - D a safety pin

## Crash Tester

If you like to learn about cars and safety, you could become a crash tester. Crash testers learn how to make cars safer by setting up crashes!

These workers explore what happens to dummies, or big dolls, in a car crash. Then the crash testers decide how to make the cars safer. Crash testers study air bags and seat belts to make help protect people better.



crash tester



Why are crash testers important?

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Answers will vary. Accept all reasonable responses.



Why is it recommended to use a seat belt and a children's chair while driving?

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## Changes in Matter



How can matter change?

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### Vocabulary



physical  
change



chemical  
change



mixture



solution

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Before reading this chapter, write down what you already know in the first column. In the second column, write down what you want to learn. After you have completed this chapter, write down what you learned in the third column.

<b>Changes in Matter</b>		
<b>What We Know</b>	<b>What We Want to Learn</b>	<b>What We Learned</b>
Some objects or things can change.		

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Lesson 1

# Changes in Matter

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**Before You Read**

What matter is being changed here?

Possible answer: modeling clay

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**Essential Question**

What changes matter?

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## How can clay be changed?

### What to Do

- 1 Measure.** Find two pieces of clay that are the same mass. Use a balance to show they are equal.
- 2** Squeeze and shape one piece of clay into a ball. Describe its properties.

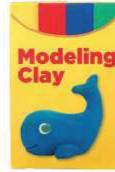
*Students' descriptions will vary.*



- 3 Predict.** Do you think the mass of the clay changed after it was made into a ball? Place it back on the balance to find out.

*Students' predictions will vary.*

### You need




**modeling clay**



**balance**



**plastic knife**

**4**  **Be Careful!** Cut the clay ball into two halves with a plastic knife. Make the two pieces into two figures.

**5** **Draw Conclusions.** How did you change the clay?

Answers will vary.

---

**Explore More**

**6** **Investigate.** What other ways can you change clay? Will the mass change?

The mass of the clay will stay the same regardless of the shape.

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**Open Inquiry**

Investigate other materials people use and change.

My question is:

Sample question: How could you check whether those changes affect the

mass of the material?

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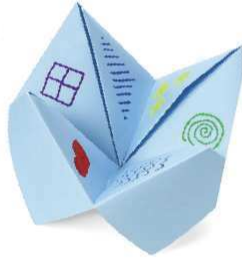
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## What are physical changes?

Matter can change in different ways. You can change the size or shape of matter. This is called a **physical change**.

When you cut, bend, fold, or tear matter, you cause a physical change. You can change the shape or size of paper by cutting or folding it. It is still paper.



◀ **Folding and writing on paper are physical changes.**

▼ **When you only change the shape of matter, its mass stays the same.**



### ✓ Quick Check

Fill in the blank.

1. Changing the size and shape of matter is a physical change.

Sometimes, the temperature of matter changes. On a cold day, water can change to ice. This is a physical change.

Wetting and drying can be physical changes too. Wet mud looks and feels different from dry mud.



**Quick Check**

2. What is a physical change you could make to juice?

▲ The water on this branch has changed to ice.

Possible answers: Juice can be poured into different shaped containers and the temperature of juice can be changed; Juice can be frozen into juice pops.



The color of dry mud is different from the color of wet mud. Mud feels squishy when it is wet and hard when it is dry.

# What are chemical changes?

Sometimes the properties of matter can change. This is called a **chemical change**. When matter goes through a chemical change, it is not easy to change it back. It becomes a new kind of matter with different properties.

When you burn paper, you cannot change it back. Seeing light and feeling heat are clues that a chemical change may be happening. All matter does not change in the same way.

## Quick Lab

Observe a slice of apple. **Infer** what causes the apple to go through a chemical change.







## Read a Chart

How did the metal nail change?

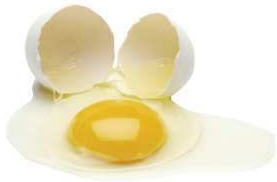
Water and air caused rust to

form on the surface of the nail.

## Chemical Changes

Before	After	Cause
		Heat causes the matchstick to burn. The properties of the matchstick have changed.
		Water and air can cause metal to rust. Rusting is a chemical change that happens slowly.
		Water and air do not change the properties of plastic.

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Heat causes the egg to go through a chemical change you can see and smell.

**✓ Quick Check**

3. How can you tell if a chemical change has happened?

Possible answer: A chemical change occurs when the \_\_\_\_\_

properties of the matter have changed; the change \_\_\_\_\_

cannot be easily reversed. \_\_\_\_\_

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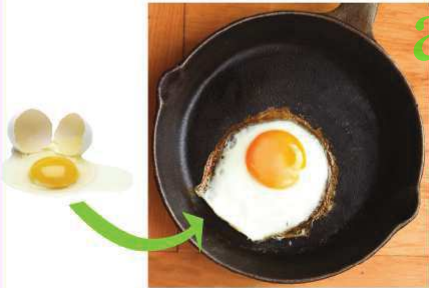
## Visual Summary

Write about what you learned.



### Physical Changes

Possible answer: When you change the size or shape of matter, it is a physical change. For example, cutting paper or freezing water are both physical changes.



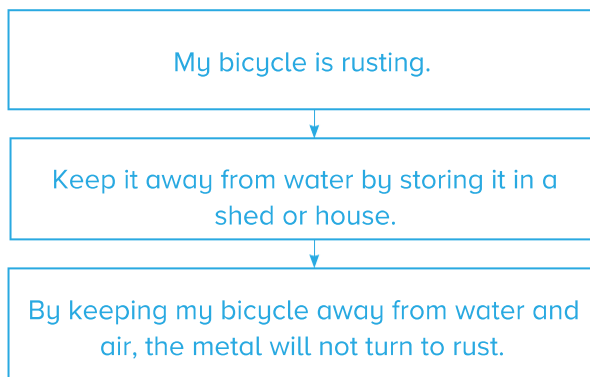
### Chemical Changes

Possible answer: A chemical change is when the properties of matter change. For example, when you burn paper or a nail rusts. When a chemical change occurs, you cannot change it back.



## Think, Talk, and Write

- 1 **Problem and Solution.** Describe how you could keep a bicycle from rusting.



- 2 What are three examples of physical changes?

Possible answers: tearing, folding, cutting

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### **Essential Question** What changes matter?

Bending, folding, and cutting are physical changes that change the size and

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shape of matter. Rusting and burning are chemical changes that change the

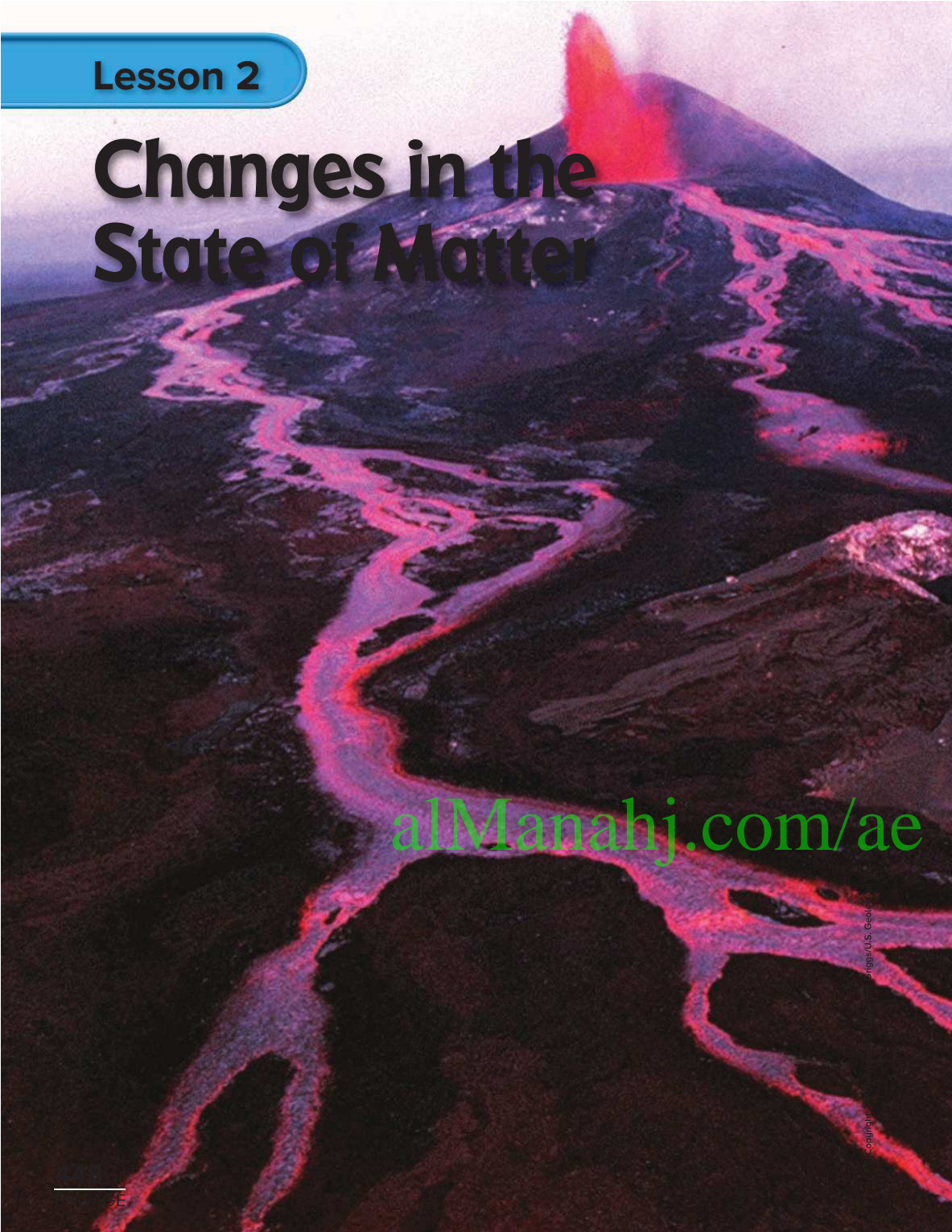
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properties of matter.

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Lesson 2

# Changes in the State of Matter



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## Look and Wonder

### Before You Read

Volcanoes are so hot that rocks can melt and flow like a liquid. How else can heat change things?

Possible answers: water when it is boiled; food when it is cooked

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### Essential Question

How does temperature affect matter?

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## How can heat change matter?

### What to Do

- 1 Predict.** What do you think will happen to butter and chocolate in sunlight?

Possible prediction: I think that butter and chocolate

will melt.

- 2 Observe.** Place the butter and chocolate on two plates. Draw how they look.

- 3 Predict.** How will the Sun's heat change each thing? Find a sunny spot. Leave the plates in the sunlight.

Possible answers: they will get soft; they will melt; they

will become gooey.

#### You need



paper plates



butter



chocolate



- 4 **Communicate.** What happens to each thing after one hour? Draw how they look. Compare your pictures.

Answers will vary, but students should describe what happened to the butter and chocolate.

**Explore More**

- 5 Now try another item. How will it change?

Answers will vary depending on the items that students test.

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**Open Inquiry**

Investigate other items that can be changed by heat.

My question is:

Sample question: Do all things melt in the heat?



## How can heating change matter?

Have you ever left a bar of chocolate in your pocket in summer? When you reached in to get it, it was probably melting.

Melting is a change from a solid to a liquid. Some solids, such as gold and glass, will only melt when they are very hot. Other solids, such as ice and butter, melt at much lower temperatures.



### Quick Check

Fill in each blank.

1. Heat can change a solid into a liquid or a liquid into a gas.



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When gold melts, you can pour it into molds. As the gold cools, it will harden.



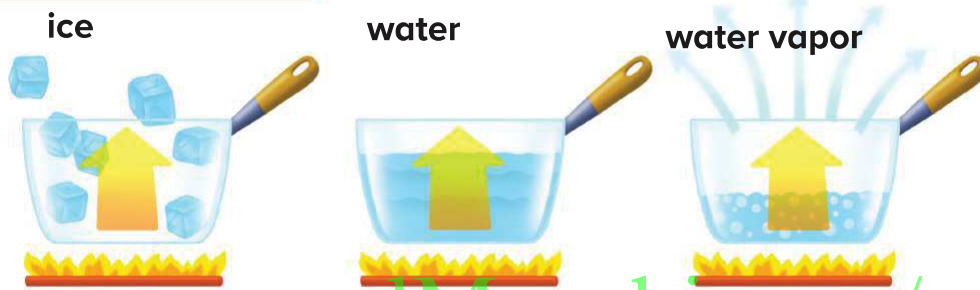
Water can change to a gas when it is heated. **Evaporate** means to change from liquid to gas and go into the air.

If enough heat is added to water, it will boil. When water boils, you can see bubbles. The bubbles show that the water is changing to a gas called water vapor. We can not see water vapor.

- ▼ **Solid ice cubes melt when left at room temperature.**



### Adding Heat to Ice



Adding heat to ice makes ice turn to a liquid and then to a gas.

### Read a Diagram

How does ice change when it is heated?

It changes from a solid to a liquid and then  
to a gas.

## How can cooling change matter?

Matter can also change by cooling, or taking away heat. Gases **condense** when they are cooled. Condense means to change from a gas to a liquid.

Water vapor in the air condenses when it touches cool objects. This is why you see small drops of water on the outside of a cold glass.

### ✓ Quick Check

Answer true or false.

2. Water vapor condenses when it cools.

true

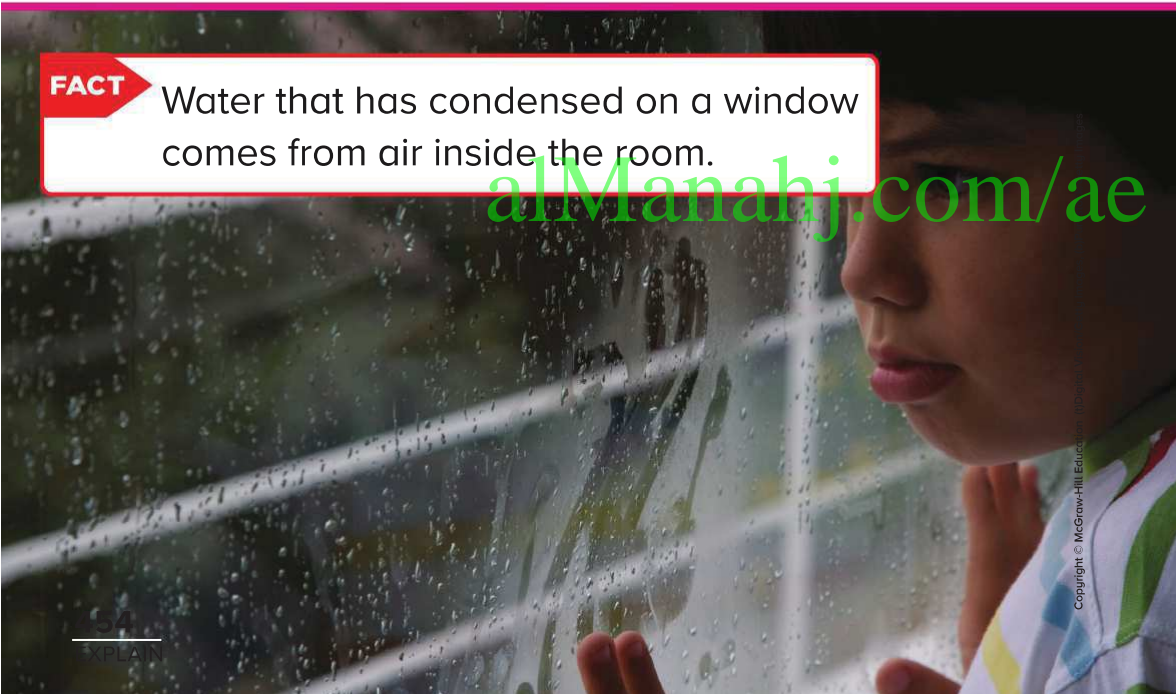


▲ Water vapor condenses on the outside of a bottle.

### FACT

Water that has condensed on a window comes from air inside the room.

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When liquids cool, they can freeze, or become solid. Wax and some other liquids will freeze at room temperature. Other liquids, such as water, need to be much colder to freeze.

**Quick Lab**  
**Classify** pictures of water from magazines as solid, liquid, or gas.

**Quick Check**

3. How does water change when it is cooled?

Possible answer: Water can freeze if it is cooled enough.

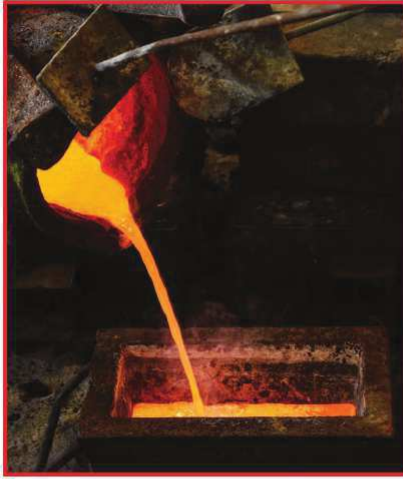
**After a candle burns, the wax will cool and become solid. ▶**



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## Visual Summary

Write about what you learned.



### Changing Matter with Heat

Possible answer: Heat can cause a solid

to melt and become liquid. It can also

make a liquid evaporate into gas.



### Changing Matter by Cooling

Possible answer: Gases condense and

become a liquid when they are cooled.

When liquids cool, they can freeze and

become solid.

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## Think, Talk, and Write

**1 Vocabulary.** What does *condense* mean?

Condense means to change from a gas to a liquid.

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---

**2 Predict.** What will happen to a puddle of water on a sunny day?

Possible answer: The heat from the Sun will make the water evaporate into the air. The puddle will get smaller and eventually disappear.

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**3** What happens when water vapor condenses?

Possible answer: Water vapor (from gas) turns into water (liquid)

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**Essential Question** How does temperature affect matter?

Possible answer: Heat can melt a solid or cause a liquid to evaporate. Cold can cause a liquid to freeze and a gas to condense.

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# Colorful Creations

There are all kinds of colors inside your crayon box.  
How were those crayons made?



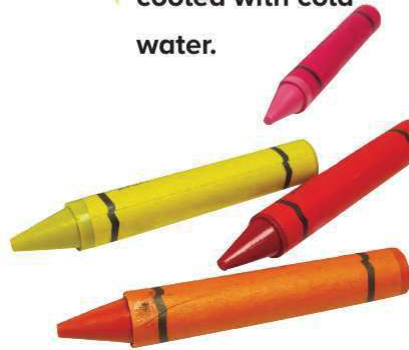
Most crayons are made of wax. This man adds special dye to a tub of wax to give the wax color.



The colored wax is melted into a liquid. Then a worker pours this hot wax into a mold.



Inside the mold there are hundreds of holes shaped like crayons. The wax fills each hole. Then the mold is cooled with cold water.

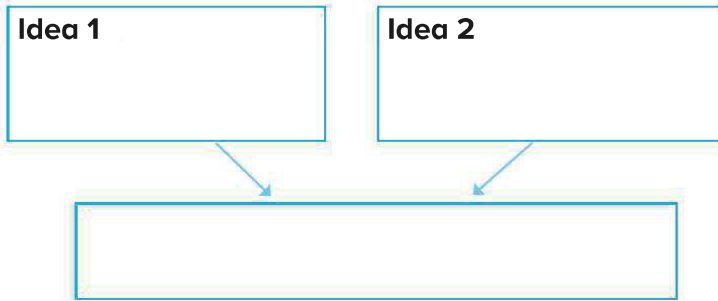




This woman checks the crayons by hand to make sure they are good.



**Summarize.** List the most important ideas in the chart below. Then summarize the article. Remember, when you summarize, you retell the most important ideas in the selection.



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# Mixtures

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## Look and Wonder

### Before You Read

What does a mixture of sand and water feel like? How is it different from dry sand?

Possible answers: Wet sand is sticky and can hold together. Dry sand is

free-flowing and does not hold a shape.

### Essential Question

How can you make mixtures?

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## What mixes with water?

### What to Do

- 1 **Measure.** Add 57 grams of salt to one plastic cup of water. What happens?

Possible answer: Some of the salt disappears in the water right away.

- 2 **Measure.** Add 57 grams of sand to another plastic cup of water. Does the sand change?

The sand does not change.

### You need



measuring cup



2 plastic cups



2 spoons



salt



- 3 Compare.** Stir both mixtures with a spoon. Let them sit. What happens? How are the mixtures different from each other?

Possible answer: The salt has dissolved while the sand is at the

---

bottom of the cup.

---

**Explore More**

- 4 Investigate.** Tell how you could take the sand and the water apart. Can the salt be taken out of the water?

Possible answer: The water would evaporate and the sand and salt

---

would be left.

---

**Open Inquiry**

Investigate other types of mixtures.

My question is:

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Same question: How do solids react when mixed with water?

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## What are mixtures?

When you put salt into water, you make a mixture. A **mixture** is two or more things put together. Mixtures can be any combination of solids, liquids, and gases.

When you glue different things to paper, you make a mixture. When you put pieces of clay together, you also make a mixture.

**Papier mâché is a mixture of flour, water, and newspaper.**



**You can cover items with papier mâché to make things.**

### ✓ Quick Check

**Answer true or false.**

1. A mixture can be made of two or more solids, or both solids and liquids.

true



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Sometimes when you mix things together, it is easy to pick them apart again. You can see the different parts of the mixture. The things in the mixture do not change.



The pencil holder is a mixture made of papier mâché, a can, and buttons. What other mixtures do you see?

**✓ Quick Check**

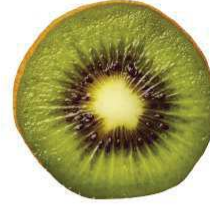
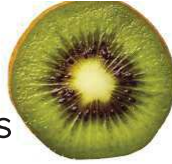
2. What kinds of matter can be used to make a mixture?

Possible answer: Mixtures can be made from solids, liquids, or gases.

---

## Which mixtures stay mixed?

Sometimes when you mix things, it is not easy to change them back. When you make a shake or a smoothie, you mix different foods together. It is hard to take apart after it has been blended.



### Making a Smoothie

#### Read a Photo

Which mixture is harder to take apart?

The blender on the right because the mixture  
cannot be easily taken apart.



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A **solution** is a mixture that is hard to take apart. Sugar and water make a solution. Sugar will **dissolve**, or stay evenly mixed in the water.

Sand and water can be mixed, but they do not make a solution. The sand does not stay mixed and sinks to the bottom of the glass.

The drink mix dissolves in the water. ▶



▲ The soapy water is a solution. The dishes are a mixture.

**Quick Check**

3. How is a solution a special kind of mixture?

Possible answer: A solution is a kind of mixture with

parts that cannot be easily separated.

## How can you take mixtures apart?

Have you ever picked the pretzels out of a snack mix? You were taking apart a mixture. Some mixtures are harder to take apart.

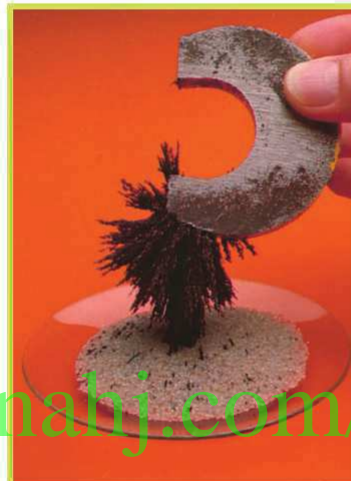
Filters are screens that trap solids but let liquids flow through. Magnets can also help take some mixtures apart. They can be used to separate iron from a mixture.

### Quick Lab

**Investigate** how evaporation helps take a mixture apart.



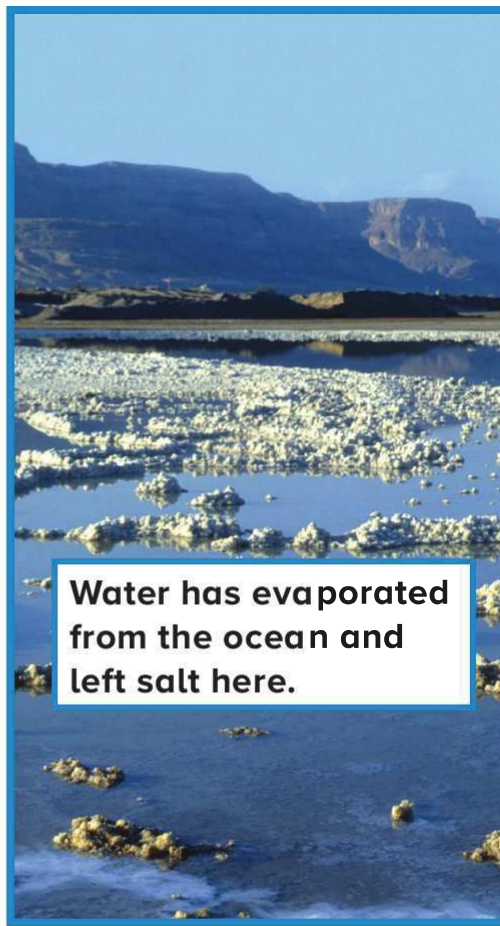
**A filter can help take apart a mixture of sand and water.**



**A magnet can help take apart a mixture of sand and iron filings.**

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Some mixtures can be even harder to take apart. Evaporation can be used to take a solution of salt water apart. If you leave salt water out to dry, the water evaporates. The salt is left behind.



 **Quick Check**

4. How do filters help separate mixtures?

Possible answers: Filters keep solids from passing through, but allow

liquids to pass through easily.

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## Visual Summary

Write about what you learned.



### Mixtures

Possible answer: A mixture is two or more  
things put together. A mixture can be easy or  
hard to take apart after you put it together.



### Solutions

Possible answer: Solutions are mixtures that  
are hard to take apart. For example, sugar  
dissolves into water and you cannot take  
the sugar back out.



### Taking Apart Mixtures

Possible answer: Some mixtures are easy to  
take apart, such as pretzels from a snack mix.  
Some mixtures can be taken apart by using a  
filter or magnet. And sometimes evaporation  
is used to take water out of a mixture.

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## Think, Talk, and Write

- 1 Main Idea and Details.** Describe how different things mix with water.

Possible answer: Some solids and liquids, such as sugar and

---

dishwashing liquid, dissolve in water to become a solution. Some

---

solids and liquids, such as sand and oil, do not dissolve when mixed

---

with water.

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- 2** How can you take apart a solution of salt and water?

A saltwater solution can be taken apart by letting the water evaporate,

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so only the salt remains.

---

### **Essential Question** How can you make mixtures?

Possible answers: You can make a mixture by mixing together two or more

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kinds of matter. You can make a mixture with any combination of solids,

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liquids, or gases.

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## Writing a Recipe

A recipe is a set of directions for making something. The steps are explained in order. A recipe can tell you how to make a mixture by adding things together.



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### Write About It

You can write a recipe! Explain how you would use some of the fruit here to make a fruit salad. Tell why it is a mixture.



### Remember

When you write to explain, you tell how to do something. You write the steps in order.

### Planning and Organizing

Write the steps for your recipe below.

Answers may vary. Possible response: Chop a banana into thin slices.

Answers may vary. Possible response: Chop strawberries into thin slices.

Answers may vary. Possible response: Combine bananas and strawberries.

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# CHAPTER 14 Review

## Vocabulary

Use each term once for items 1–6.

1. When wood burns, there is a \_\_\_\_\_  
*chemical change*.
2. Water in the air can \_\_\_\_\_  
*condense*  
or change into a liquid.
3. Sugar and water form a mixture that will stay mixed. It is called a \_\_\_\_\_  
*solution*.
4. Fruit salad is a kind of \_\_\_\_\_  
*mixture*.
5. Tearing paper is a \_\_\_\_\_  
*physical change*.
6. After the snowman melts, the liquid water will turn into a gas, or \_\_\_\_\_  
*evaporate*.

**chemical  
change**

**condense**

**evaporate**

**mixture**

**physical  
change**

**solution**



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## Science Skills and Ideas

Answer the questions below.

7. **Communicate.** Which photo shows a physical change? Which shows a chemical change? What are some other examples of each kind of change?



Possible answers: The picture of the folded paper on the right

shows a physical change. The picture of the rusted bicycle on the

left shows a chemical change. Other examples of physical changes

are bending clay or wire or melting ice. Other examples of chemical

changes are cooking an egg or burning wood.

8. **Predict.** What will happen if ice is heated at a high temperature for a long time?

What I Predict	What Happens
The ice will melt, turn to water, and then evaporate and become a gas.	The ice melts, turns to water, and then evaporates and becomes a gas.

9. Describe how a solution of sugar and water is different from a mixture of sand and water.

Sugar mixes thoroughly with water and dissolves. This solution cannot be separated easily. Sand does not mix thoroughly with water; it can be easily separated.

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10. How can matter change?

Accept all reasonable answers.

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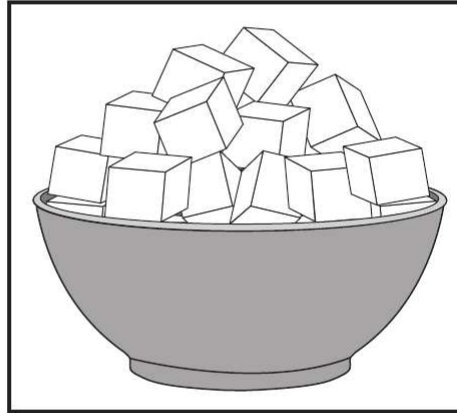
1. Which of these can change matter into different matter?

- A folding
- B tearing
- C bending
- D burning

2. Look at the picture.

What is the first thing that will happen if this is left at room temperature?

- A The water will evaporate.
- B The ice will melt.
- C The water vapor will condense.
- D The water will freeze.



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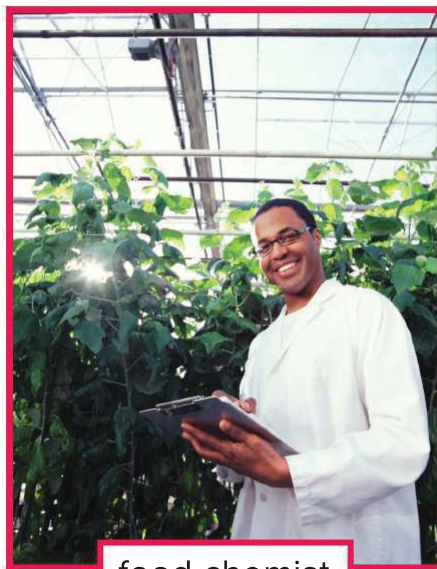
3. Which item is a solution?

- A a fruit salad
- B a chicken taco
- C a peanut butter and jelly sandwich
- D a milk shake

## Food Chemist


Would you like to make your own cereal or flavor of juice? You could become a food chemist. Food chemists explore ways to make new and more delicious foods.

Food chemists learn how to make yogurt smooth. They find out how to keep cereal crunchy. They might find a way to freeze vegetables so they taste fresher. Food chemists have to understand the science of how food products are made.



food chemist

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 Choose a food you would like to change. Describe how you would make it better.

*Students' responses will vary. Accept all reasonable responses.*

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## Using Energy



How do we use energy?

Answers will vary. Accept all reasonable responses.

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### Vocabulary



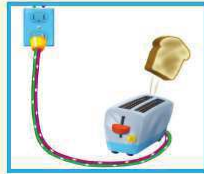
**fuel** something that gives off heat when it burns



**circuit** a path that electricity flows in



**vibrate** to move back and forth quickly



**current electricity** a kind of energy that moves in a path



Before reading this chapter, write down what you already know in the first column. In the second column, write down what you want to learn. After you have completed this chapter, write down what you learned in the third column.

Using Energy		
What We <b>K</b> now	What We <b>W</b> ant to <b>K</b> now	What We <b>L</b> earned
The Sun heats Earth.	What are some other sources of heat?	Heat comes from fuel. Gas, oil, wood, and coal can be burned as fuel.
Some sounds can be loud.	How is sound made?	Sound energy is made when objects vibrate.
Electricity turns on lights.	Where does electricity come from?	Current electricity can come from batteries or from outlets. Power plants change energy into electricity that travels through power lines.

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# Heat

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**Before You Read**

This is a desert on a sunny day. How can you tell it is hot?

Possible answers: The sun is beaming on the land; land looks dry

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**Essential Question**

What can heat do to matter?

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## Where will ice cubes melt more quickly?

### What to Do

- 1 Fill two plastic cups with equal amounts of ice. Place one plastic cup in a sunny place. Place the other cup in a shady place.



- 2 **Predict.** Which cup of ice will melt first?

Possible answer: The cup of ice in the Sun

will melt.

### You need



ice cubes



2 plastic cups



watch or clock

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- 3 Record how long it takes for the ice in each cup to melt. Why did one cup of ice melt more quickly?

Possible answer: The cup in the Sun melted first because it received  
 more heat.

**Explore** More

- 4 **Predict.** Repeat the activity. Use equal amounts of water of the same temperature in two cups. How will each cup of water feel after one hour?

Possible answer: The water in the shade will feel cooler than the water  
 in the sun.

**Open Inquiry**

Create another test to explore the rate at which things melt.

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My question is:

Sample question: Will ice melt faster in water?



## What is heat?

Energy makes matter move or change. There are many kinds of energy. **Heat** is a kind of energy that can change the state of matter.

Heat can turn a solid into a liquid.

Heat can turn a liquid into a gas.

We use heat every day. Most heat on Earth comes from the Sun. The Sun warms the air, the land, and the water on Earth.



Underline two ways that heat can change states of matter.

On a hot day, the Sun warms the water and the land first. Then the air becomes warm.

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Heat comes from other things too. **Fuel** is something that gives off heat when it burns. Gas, oil, wood, and coal can be burned as fuel.

Heat can also come from motion. Rub your hands together quickly to make them warm. Now touch your hands to your face. Heat moved from your hands to your face.



▲ People use fuel to keep warm.



People use fuel to cook food.

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 **Quick Check**

1. How is heat used in your school and home?

Possible answers: to cook food, to make the room warmer, to boil water

---

# What is temperature?

Remember that temperature is a measure of how hot or cold something is. We measure the temperature of air, water, and our bodies. To measure temperature, we use a tool called a thermometer. Some thermometers have a liquid inside. The liquid goes up or down with the temperature.

## Temperature



### Read a Photo

Is it hotter during the day or night? How can you tell?

It is hotter during the day because the temperature is higher. The thermometer reads 50°C for the day and 20°C for the night.

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# Quick Lab

Use a thermometer to **compare** the temperature of soil, water, and air.



## Quick Check

2. What are some objects with a temperature that you can measure?

Possible answer: your body, outdoor and indoor

air; water

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## Visual Summary

Write about what you learned.



### Heat Energy

Possible answer: Heat is a type of energy that can change the state of matter. Heat from the Sun warms Earth.



### Sources of Heat

Possible answer: Much heat comes from the Sun. Fuel, such as gas, oil, and wood, also gives off heat when it is burned.



### Temperature

Possible answer: Temperature is a measure of how hot or cold something is. Temperature is measured with a thermometer.

## Think, Talk, and Write

**1 Vocabulary.** What is fuel?

Fuel is something that gives off heat when it burns.

---

**2 Main Idea and Details.** Where does most of our heat come from?

Most of Earth's heat comes from the Sun.

---

**3** How do we measure temperature?

Thermometers are used to measure temperature.

---

**Essential Question** What can heat do to matter?

Possible answers: Heat can change the state of matter. Heat can change a

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solid into a liquid. Heat can change a liquid into a gas. Heat can change the

---

temperature of matter.

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Lesson 2

# Sound





**Before You Read**

Keep the noise down! How are sounds made? How can some sounds be different from others?

Possible answers: Some sounds are made when people speak to each other. Sounds are high and low.

**Essential Question**

How do you we hear sounds?

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# Explore

## How is sound made?

### What to Do

- 1 Tie the string to the paper clip. Make a hole in bottom of the c
- 2 Pull the string t The clip keeps pulling through
- 3 Wear goggles. string with a pa partner snaps t

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494  
EXPLORE

**4 Observe.** What happens? How did you make sound?

The string moved back and forth and a sound was heard. We made  
 sound by making the string vibrate.

Explore [More](#)

**5 Predict.** How will the sound be different if you change the length of the string? Try it.

Possible answer: A shorter string will make a higher sound, and a longer  
 string will make a lower sound.

Open Inquiry

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Investigate sounds other materials can make.

My question is:

Sample question: What type of sound do rubber bands create?

## What makes sound?

Ring! A loud alarm clock wakes you up each morning. How do you hear it? **Sound** is a kind of energy that we can hear.



- ▲ When the bells on the alarm clock are hit, they move back and forth quickly.

### How We Hear Sound



- ▶ The sound of fireworks vibrate and make the air around them vibrate, too.



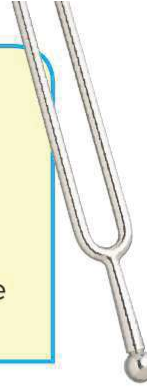
Sound energy is made when objects vibrate. An object can **vibrate** when it moves back and forth quickly. When something vibrates, air around the object vibrates also.

The eardrum is the part of our body we use to hear sounds. Messages sent from your ear to your brain tell you what sound you heard.

- ▼ These vibrations move to your eardrum so you can hear the sound of the fireworks.

## Quick Lab

Use a tool called a tuning fork. **Observe** what happens when you strike it and place it in water.

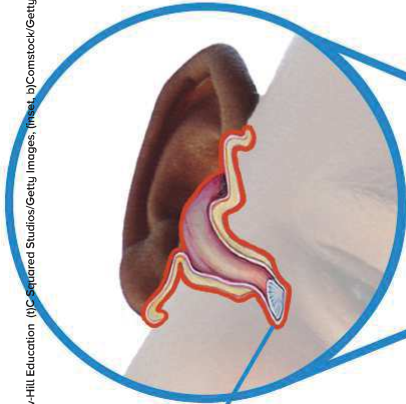


### Read a Diagram

How did the sound travel from the fireworks to the boy's ear?

The sound vibrations move from \_\_\_\_\_  
the fireworks through the air to the \_\_\_\_\_  
boy's eardrum, so he can hear it.

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eardrum



## How are sounds different?

Not all sounds are the same. You hear loud and soft sounds every day. You can make your voice loud or soft. A whisper has less energy than a shout. Try making loud and soft sounds.



- ▲ Small vibrations make soft sounds. The meow of a cat sounds soft.

- ▼ Big vibrations make loud sounds. The roar of a lion sounds loud.



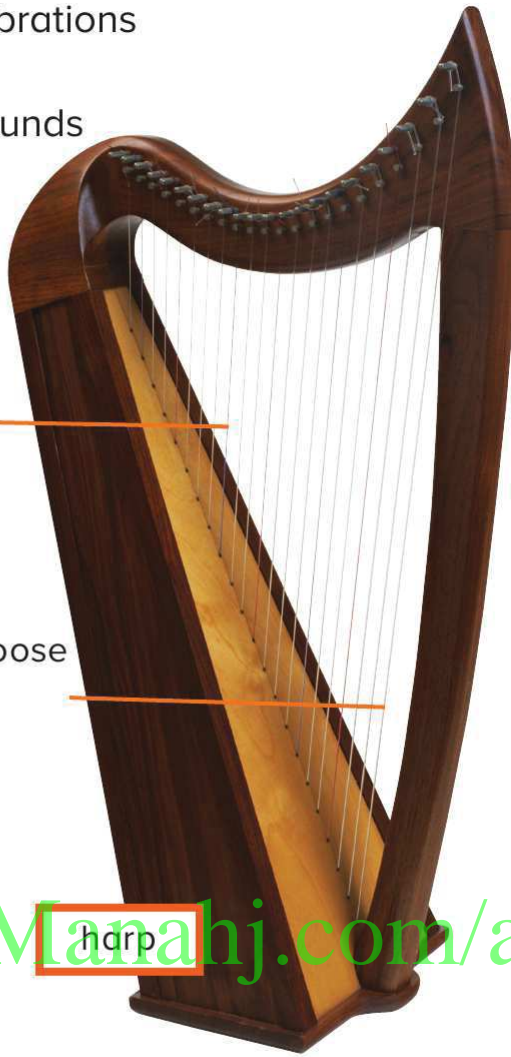
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**Pitch** is a quality by which your ear distinguishes fast vibrations from slower vibrations. Fast vibrations make sounds with a high pitch. Slow vibrations make sounds with a low pitch.

▶ If you snap a short or tight string, it makes a high pitch.

▶ If you snap a long or loose string, it makes a low pitch.



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harp

**Quick Check**

1. How is a high pitch made?

Possible answers: when something vibrates

quickly; when a small object or string vibrates

## What do sounds move through?

Place your ear against your desk. Now gently tap the desk with your pencil. You hear vibrations through the desk. Sound moves through solids, such as wood or plastic.

Sound moves through liquids also. Have you ever heard sound under water? When a sound is made, the water vibrates and you hear the sound.

- ▼ Dolphins and other animals make sounds under water to communicate with each other.



Most sounds you hear move through air. Air is made of gases. The closer you are to a sound, the louder it sounds. The farther you are from a sound, the softer it sounds.



▲ How can you tell when a fire engine is close by or far away?

 **Quick Check**

2. What can sounds move through?

solids

liquids

gases

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## Visual Summary

Write about what you learned.



### Sources of Sound

Possible answer: Sound is energy that we can hear. Sound happens when objects vibrate and move the air.



### Loudness and Pitch

Possible answer: How loud a sound is depends on the size of the vibrations. Big vibrations make loud sounds. Pitch is a quality by which your ear distinguishes fast vibrations from slower vibrations. Fast vibrations create a higher pitch.



### Sound and Matter

Possible answer: Sound can move through solids, liquids, and gas. Most sound moves through air, or gases.

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## Think, Talk, and Write

**1 Vocabulary.** What does vibrate mean?

When something vibrates, it moves back and forth quickly.

---

**2 Problem and Solution.** How would you get a guitar string to make a sound with a high pitch?

Possible answers: pluck a short string; hold a string down against the

---

handle to make the part that vibrates shorter.

---

**3** Why do your hands make a sound when you clap them together?

When your hands hit together, they make the air around them vibrate.

---

The vibrating air moves to your ears, so a sound is heard.

---

**Essential Question** How do we hear sounds?

Possible answers: When an object vibrates, the vibrations move through the

---

air to our eardrum. Our eardrum vibrates and sends messages about the

---

sound to our brain.

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## Sound Off!

Think about the sounds you hear every day. Some sounds are loud and others are soft. Some sounds are high and others are low.



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## Write About It

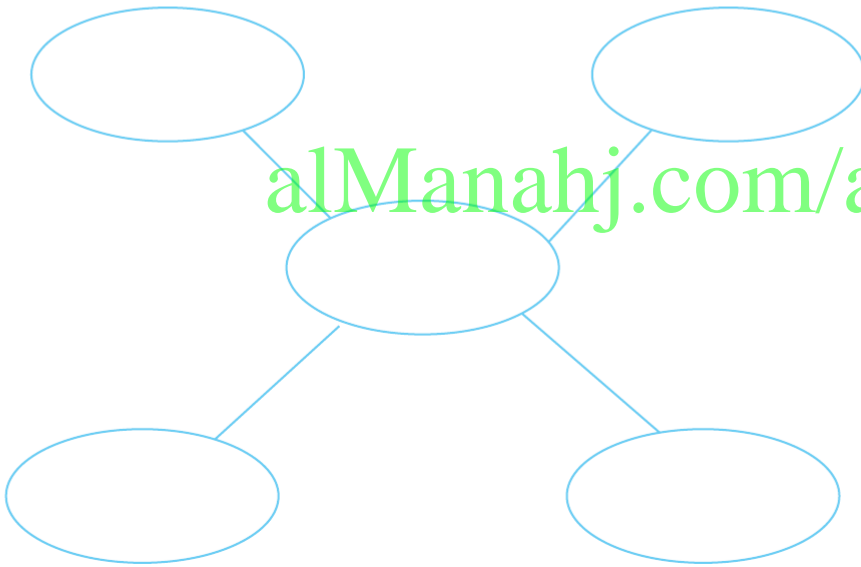
Describe the pitch and volume of a sound you hear every day. How do we use sounds? Why are sounds important?

### Remember

When you describe something, you give details.

## Getting Ideas

Choose a sound you hear every day. Write it in the center oval. In the outer ovals, write words that describe the sound.



## Lesson 3

# Light

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## Look and Wonder

### Before You Read

Where is this light coming from?

Possible answers: The light is coming from the sun. The tall

trees block some of the light.

### Essential Question

How does light help us to see?

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## What does light pass through?

### What to Do

- 1 Predict.** Which materials will light pass through? Which will block the light?

Possible answer: I predict that light will pass through

clear objects and that dark objects will block the light.

- 2** Work with a partner. Hold up the cardboard. Hold plastic wrap eight centimeters in front of the board. Your partner shines the flashlight on the object.

- 3 Observe.** Did the plastic wrap block the light, or did the light pass through it?

The light passed through it.

- 4 Compare.** Which objects block the light and which let light pass through?

Possible answer: Cardboard and other dark objects

block the light. Plastic wrap and other light objects let

light pass through.

### You need



flashlight



cardboard



plastic wrap



various items

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**Explore** More

**5 Predict.** What might happen with other classroom items? Try it.

Possible answer: I predict that the light will pass through a hand lens,

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but not a calculator.

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**Open Inquiry**

Investigate other sources of light.

My question is:

Sample question: Does light have color?

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## What is light?

You need light to see things.

**Light** is a kind of energy. You see things because light will **reflect**, or bounce off things around you. Light that reflects off objects enters your eyes. Then you can see the objects.

Some sources of light are the Sun, light bulbs, and flashlights. Most light on Earth comes from the Sun.

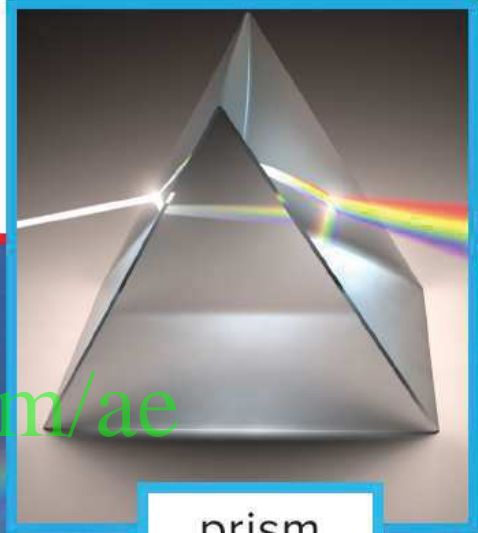


Draw a circle around three sources of light.

**Smooth, shiny objects, such as the gem's on this bear's vest reflect a lot of light.**

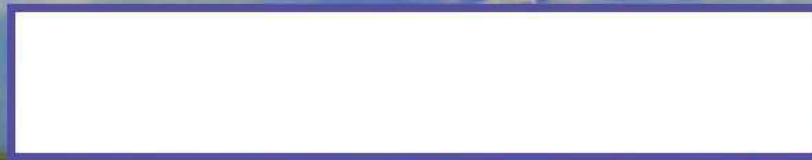


# Quick Lab



prism

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bends?



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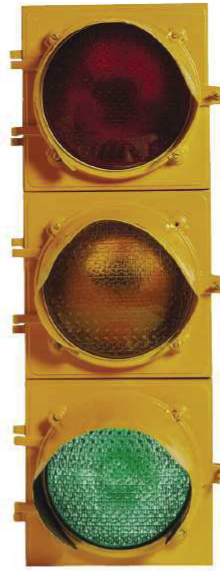
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Have you ever seen colored lights? A filter is a tool that lets only certain colors of light pass through it.

Some filters let only one color pass through. A red filter blocks all colors except red. You see only red light with a red filter.



Colored glass makes a white light look red, green, or yellow.

 **Quick Check**

1. What happens when white light bends?

It separates and allows people to see \_\_\_\_\_

all the different colors. \_\_\_\_\_

2. What color is most light we see?

Most light we see is white light. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



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## Visual Summary

Write about what you learned.



### Light Movement and Sources

Possible answer: Light is energy that bounces  
off objects and enters your eyes. Sources  
include Sun, light bulbs, and flashlights.



### Shadows

Possible answer: A shadow is a dark area that  
happens when light hits something solid that  
blocks the light.



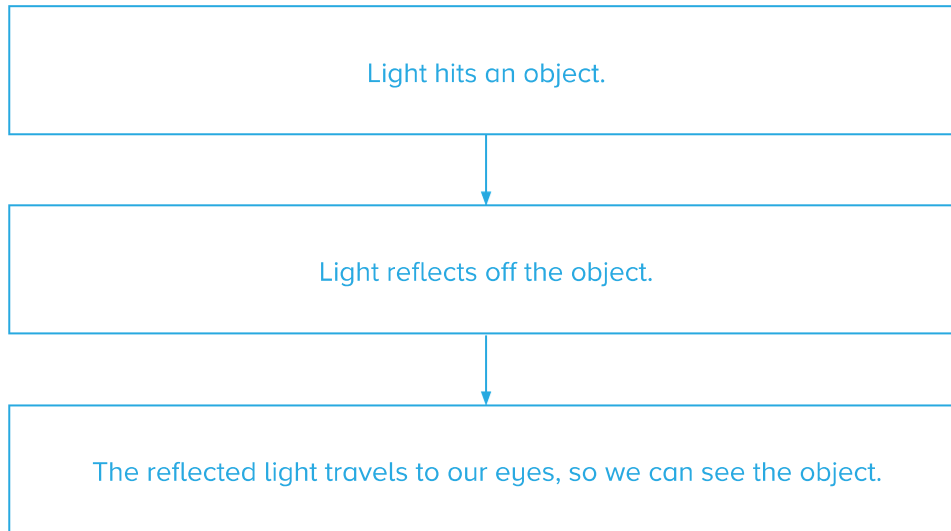
### Color

Possible answer: Light is a mix of all colors. When  
light bends, it separates the colors. Filters allow  
certain colors to pass through but not others.

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## Think, Talk, and Write

**1 Sequence.** What happens when we see objects?



**2** What kind of objects make shadows?

Objects that do not let light pass through them make shadows.

**Essential Question** How does light help us to see?

Possible answers: When light reflects off an object, it enters our eyes and we

see the object. We can also see things that make their own light, such as a

flashlight or the Sun.

- ☰
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## Look and Wonder

### Before You Read

How do you think these lights get energy?

Possible answer: The lights get energy from electricity.

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### Essential Question

How do we get electricity?

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## What makes the bulb light up?

### What to Do

- 1 Predict.** Look at the battery, bulb, and wires. How could you put them together to light the bulb? Record your ideas with a partner.

Possible answer: I could touch the wires to the

battery and to the bulb at the same time or

connect the wires and touch the bulb with them.


- 2 Be Careful.** Try your ideas. Which of your ideas made the bulb light? Which ideas did not work?

Answers will vary.

**You need**



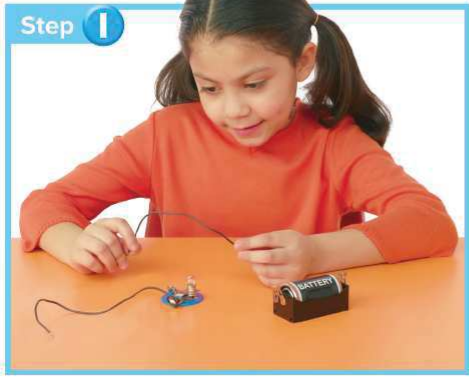
**wire**



**battery**



**light bulb**



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**3 Record Data.** Write down your results with your partner. How many ways did you make the bulb light up?

Possible answer: I found two ways to make the bulb light up.

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---

**Explore More**

**4 Predict.** How could you make a second bulb light up? What else would you need?

Possible answer: I would need another wire and another battery.

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**Open Inquiry**

Investigate other forms of electricity.

My question is:

Sample question: How does a battery work?

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## What is current electricity?

Do batteries make some of your toys work? Batteries make a kind of electricity. **Current electricity** is a kind of energy that moves in a path. The electricity moves along a path called a **circuit**. The circuit needs to be completely connected for the electricity to move.

### Read a Diagram

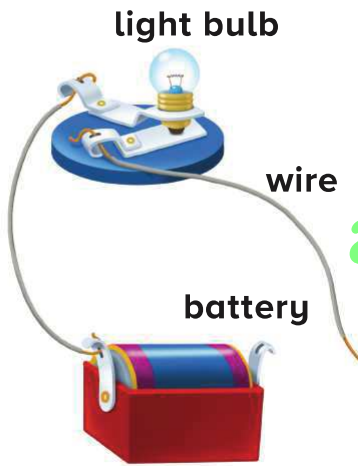
Which picture shows a complete circuit?

the picture on the right;

because all wires are

connected and the bulb is lit

### Circuit



► The light goes on only when all the wires are connected in a complete circuit.



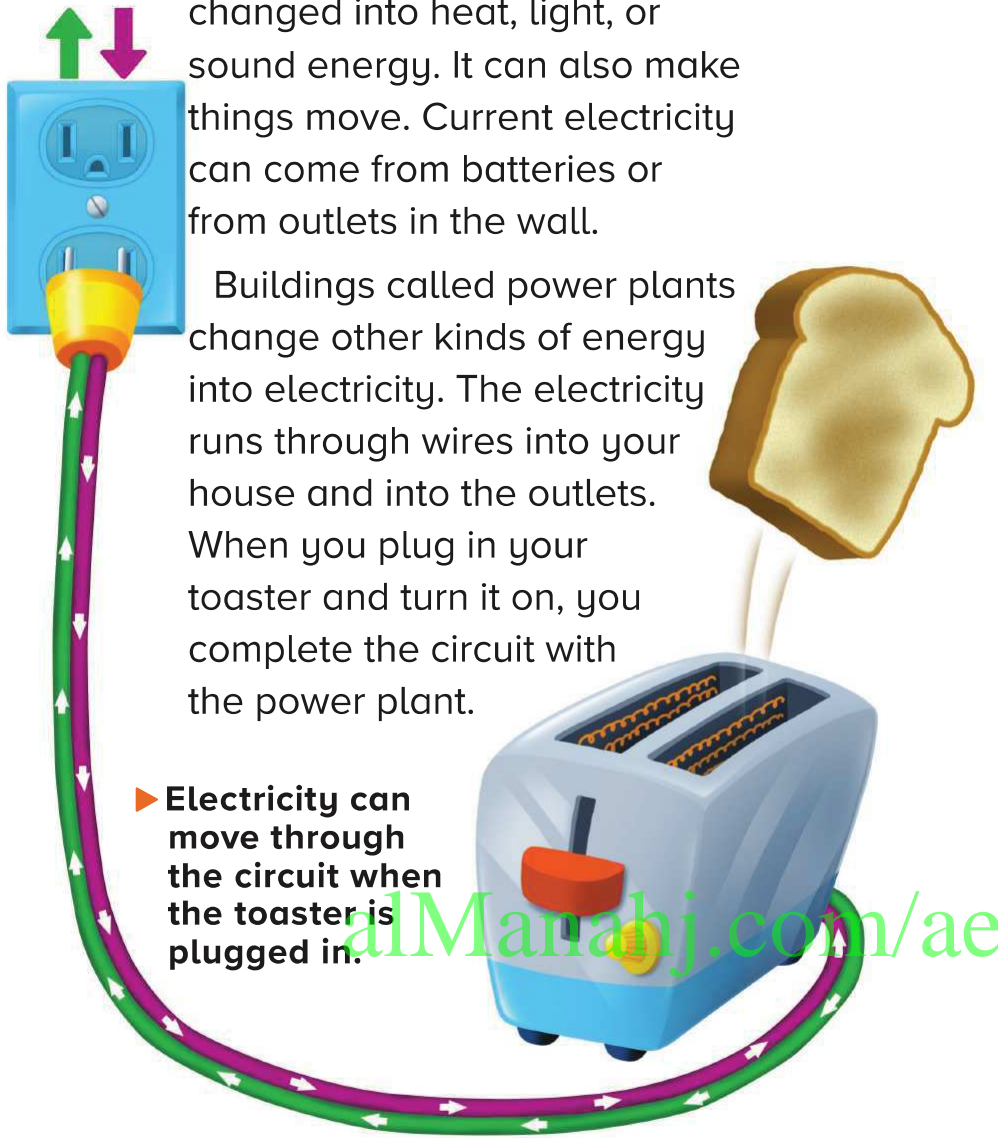
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Current electricity can be changed into heat, light, or sound energy. It can also make things move. Current electricity can come from batteries or from outlets in the wall.

Buildings called power plants change other kinds of energy into electricity. The electricity runs through wires into your house and into the outlets. When you plug in your toaster and turn it on, you complete the circuit with the power plant.

- ▶ Electricity can move through the circuit when the toaster is plugged in.



 **Quick Check**

1. How do you use current electricity every day?

Accept all reasonable answers.

## What is static electricity?

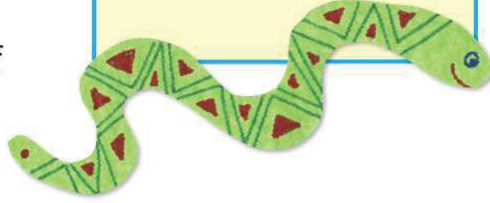
You take your clothes out of the dryer. They are stuck together! This happens because of static electricity.

**Static electricity** is a kind of energy made by tiny pieces of matter. You can not see these pieces of matter, but they are everywhere.

Like magnets, some of these pieces of matter attract or repel each other.

### Quick Lab

Make a tissue paper worm. Rub a ruler to charge it. **Observe** how the ruler moves the worm.



Lightning is static electricity. Charges made in a storm jump between the clouds and the ground.

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When the tiny pieces of matter attract or repel each other, they have a static charge.

A static charge can build up on one object and jump to another. Sometimes you can see or hear a static charge move from one object to another.



**This girl's hair is attracted to the charged balloon, so it sticks up.**

 **Quick Check**

What are some examples of static electricity?

lightning; clothes sticking together in a dryer; a charged balloon

sticking to a wall; getting a shock when you touch a doorknob

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## Visual Summary

Write about what you learned.



### Current Electricity

Possible answer: Current electricity is energy that moves in a path called a circuit. Current electricity can be used for heat, light, or sound, as well as making things move.



### Static Electricity

Possible answer: Static electricity is made up of tiny pieces of matter that attract or repel each other. These pieces of matter can create a static charge which can jump from one object to another.

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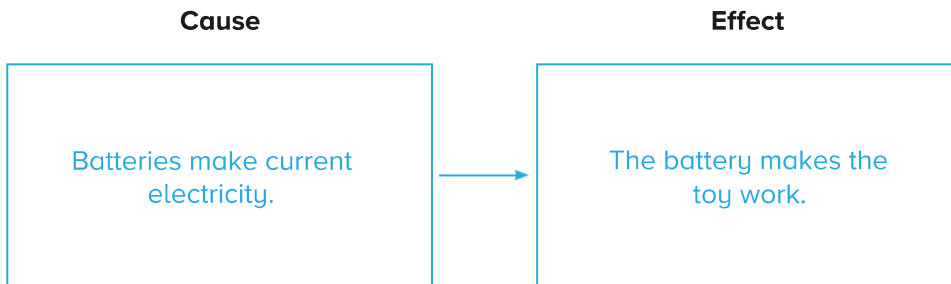
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## Think, Talk, and Write

**1 Vocabulary.** What is current electricity?

A kind of energy that moves in a path

**2 Cause and Effect.** How does a battery make your toy work?



**3** What kind of energy causes your socks to stick together?

Static electricity makes socks stick together.

**Essential Question** How do we get electricity?

Possible answers: We can get electricity from batteries. We can also get

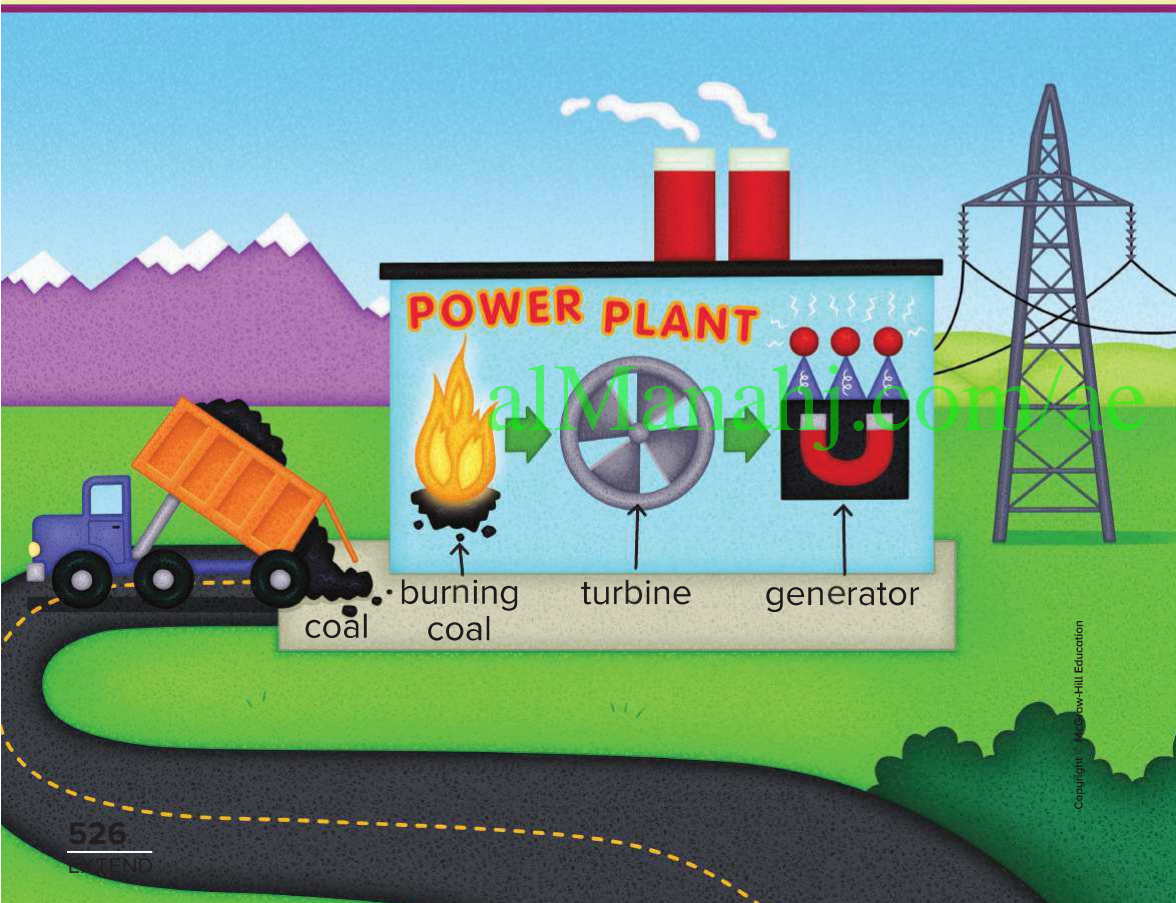
electricity from a power plant. The electricity travels through wires into the

outlets in our homes.

# It's Electric

You can flip a switch to turn on a light, a computer, or a dishwasher. They all use electricity.

The electricity starts at a power plant. At the plant, energy turns a large wheel called a turbine. The energy might come from burning coal or oil, flowing water, wind, or nuclear reactions.



The turbine turns a magnet inside a machine called a generator. The generator makes electricity.

When you flip a switch in your home, you complete the circuit with the power plant. Then electricity flows through power lines and stations to the plug in your home and into your lamp.

Electricity leaves the power plant and travels through many power lines.



Electricity comes to my home.

I pull the cord.  
The light goes on.

**Cause and Effect.** What makes the light go on in your home?

Possible answers: The electricity starts at the power plant. Then it goes through power lines.

Then it comes to my home. I pull the cord or flip the light switch. The light goes on.

# CHAPTER 15 Review

## Vocabulary

Use each word once for items 1–5.

circuit

current electricity

reflect

static electricity

vibrate

1. Sound is made when objects

vibrate .

2. Energy that moves through wires is called current electricity .

3. Energy that jumps from object to object is called

static electricity .

4. We can see objects because of the light they

reflect .

5. This picture shows a complete

circuit .



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## Science Skills and Ideas

Answer the questions below.

6. What happens to a sound when it moves away from you?

It gets softer.

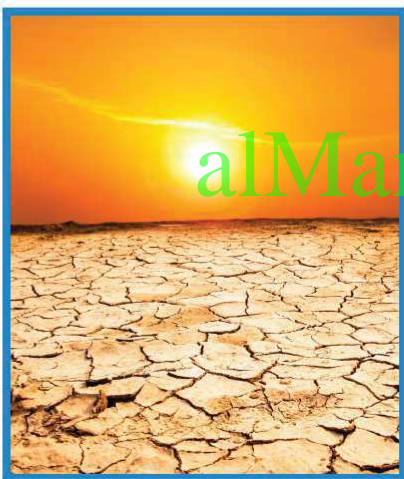
7. **Measure.** How many degrees Celsius is the temperature on this thermometer?

21° C

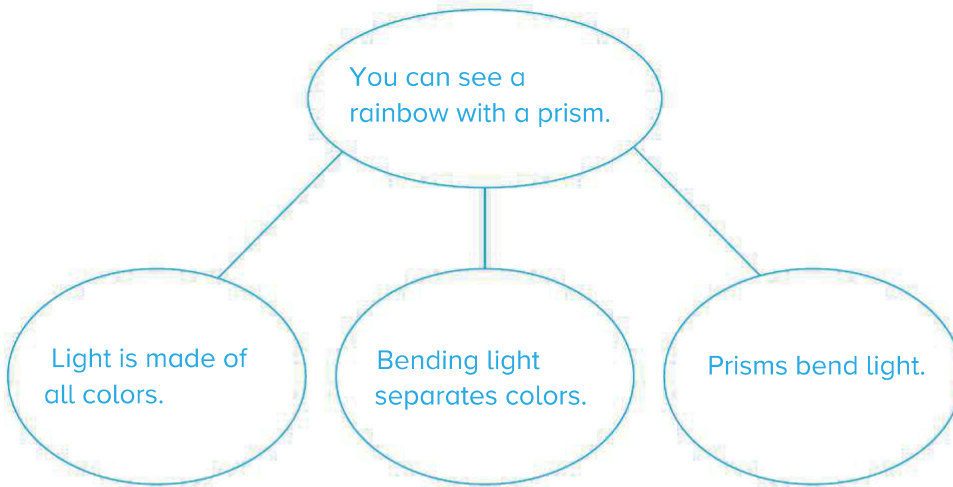
8. What can heat do?

Heat can turn solids into liquids, turn liquids into

gases, melt things, and warm things.



9. **Main Idea and Details.** Why can you see a rainbow with a prism?



A prism bends white light to separate it into different colors.

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10. How do we use energy?

Accept all reasonable answers.

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1. At the train station, the sound of the train gets louder and louder.

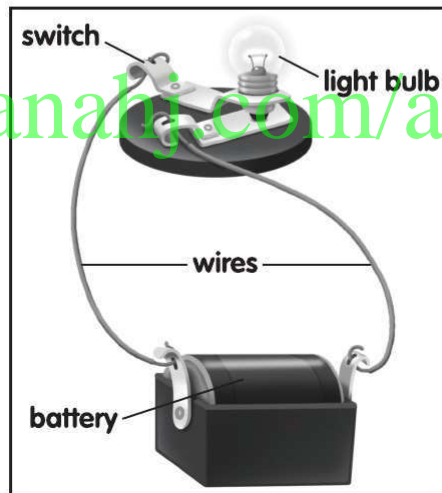
What do you know?

- A The train is moving toward you.
  - B The train is moving away from you.
  - C The train is slowing down.
  - D The train is speeding up.
2. What happens when white light bends?
    - A It speeds up.
    - B It separates into different colors.
    - C It makes a shadow.
    - D It prevents us from seeing.

3. Look at the picture.

Which part of this circuit makes electricity?

- A the light bulb
- B the switch
- C the wires
- D the battery





C

**classify** to group things by how they are alike.

You can classify animals by how many legs they have.



**تصنيف** تجميع الأشياء حسب أوجه الشبه بينها. يمكنك تصنيف الحيوانات حسب عدد الأرجل التي لدى كل منها.



**communicate** to write, draw, or tell your ideas .

You can communicate the ways you can change a piece of clay.

**Changing Clay**

1. I roll the clay.
2. I pinched the clay.
3. I squeezed the clay.
4. I poked the clay.

**تواصل** هي كتابة أفكارك أو رسمها أو التعبير عنها أو مشاركتها مع الآخرين. يمكنك مشاركة الطرق التي تمكّنك من تغيير قطعة صلصال.

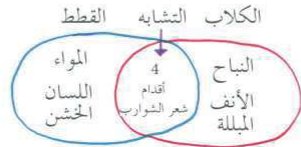
**تغيير قطعة صلصال**

1. صنعت لفافة من قطعة الصلصال.
2. أمسكت قطعة الصلصال بإصبعي.
3. ضغطت على قطعة الصلصال.
4. ضغطت بإصبعي على قطعة الصلصال.

**compare** to observe how things are alike or different

You can compare how a cat and a dog are alike and different.

**مقارنة** ملاحظة مدى التشابه أو الاختلاف بين الأشياء. يمكنك مقارنة مدى التشابه والاختلاف بين القطط والكلاب.





**continent** a large piece of land on Earth.  
There are seven continents on Earth.



**قارة** قطعة يابسة كبيرة من الأرض.  
يوجد في الأرض سبع قارات.



## D

**decompose** when plant and animal parts rot or break down.  
This log will decompose over time.



**تحلل** عملية طبيعية تحدث للكائنات الحية تؤدي إلى انفصال عناصرها وتحللها بعد موت الحي بفعل البكتيريا. سوف يتحلل جذع الشجرة هذا مع مرور الوقت.



**desert** a dry place.  
Cactus plants can live in the desert.

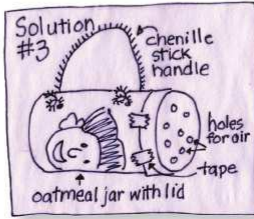


**صحراء** مكان جاف وحرار، يتميز بندرة سقوط الأمطار.  
بإمكان نباتات الصبار أن تعيش في الصحراء.

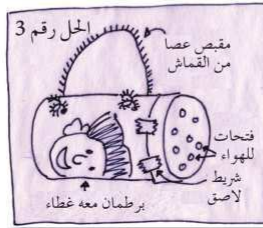


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**design** to draw, plan, build, and test an idea.  
This drawing was made during the design process for a hamster carrier.



**تصميم** رسم فكرة والتخطيط لها وتنفيذها واختبارها. تم عمل هذه الرسمة أثناء عملية تصميم حقيبة لحمل حيوان الهامستر.



**deposition** the dropping off of weathered rock.  
There is much deposition in rocky areas.



**ترسيب** تراكم فتات صخري على شكل طبقات بفعل الرياح و الماء.  
يكثُر الترسيب في المناطق الصخرية.



**dissolve** to mix evenly with a liquid and form a solution.  
Sugar will dissolve when it is mixed with water.



**ذوبان** امتزاج المادة كلياً بالوسائل لعمل محلول.  
سوف يذوب السكر عند خلطه مع الماء.



**draw conclusions** to use what you observe to explain what happens  
You can draw conclusions about why the stick will make a shadow.

**استنتاج خلاصات** استخدام النتائج لتفسير ما يحدث.  
يمكنك استنتاج السبب الذي سوف يجعل العصا تصنع ظلاً.



## E

**erosion** when rock and soil are moved by wind or water to a new place.  
**Erosion slowly changes the shape of land.**



**تعرية** تحريك التربة والصخور بفعل الرياح أو المياه إلى مكان جديد.  
**تغير التعرية شكل الأرض ببطء.**



**extinct** when a living thing dies out and no more of its kind live on Earth.  
**Dinosaurs are extinct.**



**انقراض** عندما يموت كائن حي ولا يعيش أي فرد من نوعه على الأرض.  
**الديناصور حيوان منقرض.**



## F

**flower** a part of a plant that makes seeds.  
**Flowers come in many shapes and colors.**



**زهرة** جزء من النبات ينتج البذور.  
**تتميز الزهور بأشكالها وألوانها المختلفة.**



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**force** a push or pull on an object.  
When you kick a ball, you are using a kind of force.



**قوة** عملية دفع أو شد تمارس على جسم ما.  
عندما تركل الكرة فإنك تستخدم أحد أنواع القوة.



**fossil** what is left of a living thing from the past.  
This fish fossil was found in the desert.



**أحفورة** آثار أو بقايا مخلوقات حية عاشت في الماضي البعيد.  
عُثِر على أحفورة السمكة هذه في الصحراء.



**friction** a force that slows down moving things.  
A skate makes friction when the stopper rubs against the ground.



**احتكاك** قوة تعمل على إبطاء الأشياء المتحركة.  
يحدث الاحتكاك حينما يحتك المكبح المطاطي لحذاء التزلج بالأرض.



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**fruit** the plant part that holds the seeds.  
The peach fruit has a seed inside.

**ثمرة** جزء من النبات يحمل البذور.  
تحتوي ثمرة الخوخ على بذرة بداخلها.



**fulcrum** the point that a lever moves against.  
This piece of wood can act as a fulcrum.

**نقطة ارتكاز** هي النقطة التي تتحرك منها الرافعة.  
يمكن أن تكون هذه القطعة الخشبية نقطة ارتكاز.



fulcrum



نقطة ارتكاز

G

**gravity** a kind of force that pulls down on everything on Earth.  
Gravity is the force that pulls a ball to the ground.

**الجاذبية الأرضية** هي نوع من القوة التي تجذب كل شيء على الأرض إلى أسفل.  
**الجاذبية** هي القوة التي تجذب الكرة نحو الأرض.



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## H

**human-made things** are things made by people.  
Glue and beach balls are examples of human-made things.

**أشياء مصنّعة** أشياء من صنع الإنسان.  
من أمثلة الأشياء المصنّعة الغراء  
وكرات الشاطئ.



## I

**infer** to use what you know to figure something out.  
From these tracks, you can infer what animal was here.

**استنتاج** استخدام المعرفة السابقة للوصول إلى  
معرفة جديدة.  
من هذه الآثار يمكنك استنتاج أي الحيوانات كان هنا.



**investigate** to make a plan and try it out.  
You can investigate how long it takes the car to stop rolling.

**تحقق** وضع خطة وتجربتها.  
يمكنك التحقق من طول المسافة.





## L

**leaves** the plant parts that use sunlight and air to make food.  
**Leaves come in different shapes and sizes.**



**أوراق** أجزاء النبات التي تستخدم ضوء الشمس والهواء لصنع الغذاء.  
للأوراق أشكال وأحجام مختلفة.

**lever** a simple machine made of a bar that turns around a point.  
**A lever can help you move or lift objects.**

**رافعة** آلة بسيطة مصنوعة من قضيب يدور حول نقطة محددة.  
بإمكان الرافعة أن تساعدك على رفع الأجسام.



**life cycle** how a living thing grows, lives, and dies.  
**The life cycle of a bean plant starts with a seed.**

**دورة الحياة** مراحل نمو الكائن الحي ومعيشته وموته.  
تبدأ دورة حياة نبات الفول بالبذرة.

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**living** a thing that grows, changes, and needs food, air, and water to survive.  
This man is a living thing.



**كائن حي** الكائن الذي ينمو ويتغير ويحتاج إلى الغذاء والهواء والماء ليحيا.  
الإنسان كائن حي.



M

**make a model** to make something to show how something looks.  
You can make a model of a mountain in the ocean.



**عمل نموذج** صنع شيء لتوضيح ما يبدو عليه شيء محدد.  
يمكنك صنع نموذج لجبل في المحيط.



**measure** to find out how far something moves, or how long, how much, or how warm something is.  
You can measure temperature with a thermometer.



**قياس** إجراء تقوم به لإيجاد مدى بعد شيء ما أو طوله أو كميته أو درجة حرارته.  
يمكنك قياس درجة الحرارة باستخدام ميزان الحرارة.



**minerals (nutrients)** bits of rock and soil that help plants and animals grow.  
Plants use minerals in the ground to grow.



**model** a sample of a product or idea used for testing.  
You can make a model to show how an idea should look.



**motion** a change in the position of an object.  
This horse is in motion.



**mountain** land that is very high.  
A mountain is the highest type of land.



**معادن (العناصر الغذائية)** أجزاء من مكونات الصخور والتربة تساعد النباتات والحيوانات على النمو. تستخدم النباتات المعادن الموجودة في الأرض لتنمو.



**نموذج** عينة لمنتج أو فكرة تُستخدم من أجل الاختبار. يمكنك تصميم نموذج لتوضيح كيف تبدو الفكرة.



**حركة** تغيّر في موضع أحد الأجسام (تغير مكان الجسم). هذا الحصان في حالة حركة.



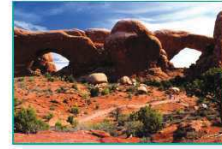
**جبل** أرض مرتفعة للغاية. الجبل هو المكان الأكثر ارتفاعاً على اليابسة.



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**natural resource** a material fr  
that people use in daily life.  
**Rocks are a natural resource.**



**nonliving things** a thing that do  
and change, or need food, air, or  
**Rocks and books are exampl**  
**nonliving things.**

**nutrients** things in the soil tha  
grow and stay healthy.  
**There are lots of nutrients in**



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O

**observe** to see, hear, taste, touch, or smell  
You can observe how the flower looks, smells, and feels.



**ملاحظة** استخدام الحواس الخمسة للمعرفة (الرؤية- السمع-التذوق-اللمس-الشم).  
يمكنك ملاحظة شكل الزهور ورائحتها وملمسها.



**oxygen** a gas found in the air we breathe.  
Living things need oxygen.



**أكسجين** غاز موجود في الهواء الذي نتنفسه.  
تحتاج الكائنات الحية إلى الأكسجين.



P

**plains** flat land that spreads out a long way.  
Plains are wide and flat.

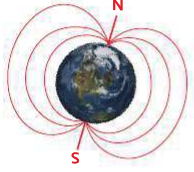


**سهول** أرض منبسطة تمتد لمدى واسع.  
السهول واسعة ومنبسطة.



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**poles** the two ends of a magnet, or either end of Earth's axis.  
Earth has two poles, a north pole and a south pole.



**pollen** sticky powder inside the flower that helps make seeds.  
Pollen sticks to bees when they land on flowers.



**pollution** anything that makes air, land, or water dirty.  
Garbage is one kind of pollution.



**قطبان** طرفا المغناطيس أو طرفي محور الأرض.  
الأرض لها قطبان؛ القطب الشمالي والقطب الجنوبي.



**حبوب اللقاح** حبيبات دقيقة داخل الزهرة يساعد في إنتاج البذور.  
تلتصق حبوب اللقاح بالنحل عندما يقف على الزهور.



**تلوث** أي شيء يجعل الهواء أو الأرض أو الماء غير نظيف.  
النفايات أحد أشكال التلوث.



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**recycle** To make new items out of old items.  
You can recycle paper.



**إعادة التدوير** تصنع أشياء جديدة باستخدام أشياء قديمة.  
ويمكنك إعادة تدوير الورق.



**reduce** to cut back on how much you use something.  
We should reduce the amount of water we use.



**ترشيد** تقليل الكمية التي تستخدمها من شيء ما.  
ينبغي علينا ترشيد كمية المياه التي نستخدمها.



**repel** to push away or apart.  
The two south poles of a magnet repel each other.

**تنافر** الدفع بعيدًا.  
يتنافر القطبان الجنوبيان لمغناطيس مع بعضهما البعض.

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**reuse** to use something again.  
We can reuse items to cut down on waste.



**إعادة الاستخدام** استخدام الشيء مرة أخرى.  
يمكننا إعادة استخدام العناصر لتقليل المخلفات.



**river** a body of fresh water that moves.  
A river may flow into a lake.



**نهر** مياه عذبة تسير في مجرى واسع.  
قد يتدفق النهر إلى إحدى البحيرات.



**rock** a hard, nonliving part of Earth.  
A rock like this can be used as a tool.



**صخرة** جزء صلب وجامد.  
تم استخدام هذه الصخرة كفأس قديمًا.



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**root** a plant part that keeps the plant in the ground.  
Roots hold a plant in the ground.



**جذر** جزء من النبات يعمل على تثبيته في الأرض.  
الجذور تثبت النباتات في التربة.



## S

**seed** a part of a plant that can grow into a new plant.

A seed inside a peach can grow into a peach tree.

**بذرة** جزء من النبات ينمو ويصبح نباتًا جديدًا.  
يمكن أن تنمو البذرة الموجودة داخل ثمرة الخوخ لتصبح شجرة خوخ.

**seedling** a young plant.

A young bean plant is a seedling.

**بادرة** نبتة صغيرة في بداية ظهورها.  
برعم الفول هو البادرة.

**simple machine** a tool that can change the size or direction of a force.

This simple machine is called a ramp.

**آلة بسيطة** أداة يمكن أن تُغيّر من حجم القوة أو اتجاهها.

تعرف هذه الآلة البسيطة باسم أداة التحميل.



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**soil** a mix of tiny rocks and bits of dead plants and animals.  
Most plants need soil to grow.



**تربة** مزيج من الصخور الصغيرة وبقايا النباتات والحيوانات الميتة.  
تحتاج معظم النباتات إلى التربة لكي تنمو.



**solution** a kind of mixture with parts that do not easily come apart.



**محلول** نوع من المخاليط يصعب فصل مكوناته.



**speed** is how far something moves in a certain amount of time.  
Cheetahs can run at very high speed.



**سرعة** هي مقدار حركة الجسم في فترة زمنية معينة.  
تجري الفهود بسرعة كبيرة جدًا.



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**stem** the part of a plant that holds up the plant.  
The stem holds up the flower.

**ساق** جزء من النبات يحمله ويدعمه.  
يدعم الساق الزهرة.



**T**

**technology** all the tools and ideas we use.  
Technology helps make our lives easier.

**تكنولوجيا** جميع الأدوات والأفكار التي نستخدمها.  
تساعد التكنولوجيا في تسهيل حياتنا.



**tool** an object or body part that helps do work.  
Our hands and teeth are tools.

**عضو** جزء من الجسم يساعد على أداء العمل.  
أيدينا وأسناننا عبارة عن أعضاء تساعدنا في أداء الأعمال.



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