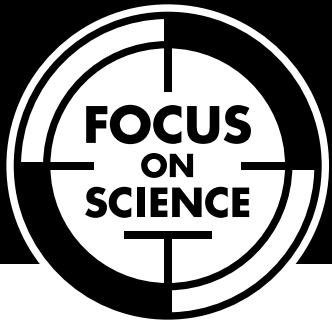


Basic Level



Physical Science

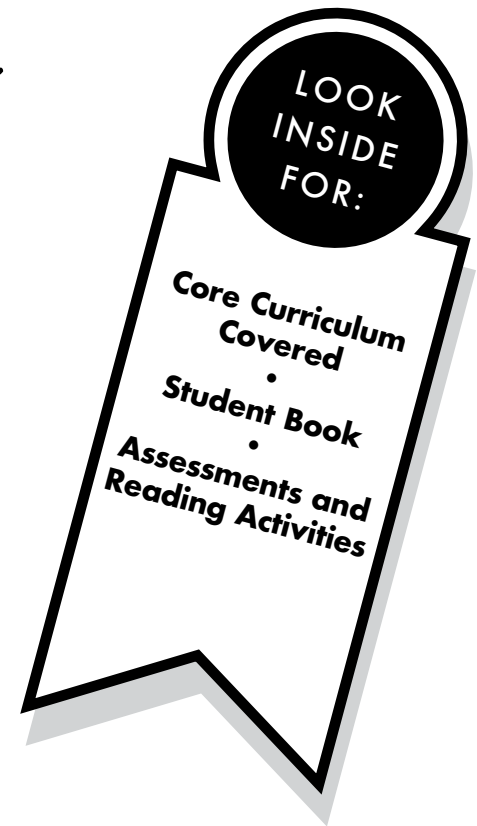
Matter and Energy

# All About Matter

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# All About Matter

What are some of the properties of matter?

## CORE CURRICULUM STATEMENTS

**Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.**

Matter takes up space and has mass. Two objects cannot occupy the same place at the same time.

Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.

Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light.

Measurements can be made with standard metric units and nonstandard units.

The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.

Basic Level



Physical Science

Matter and Energy

# Student Book

*All About Matter*

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# All About Matter

What are some of the properties of matter?

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**Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.**

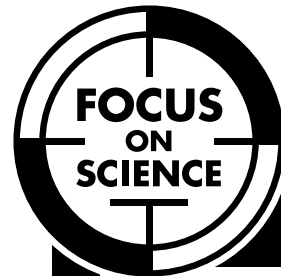
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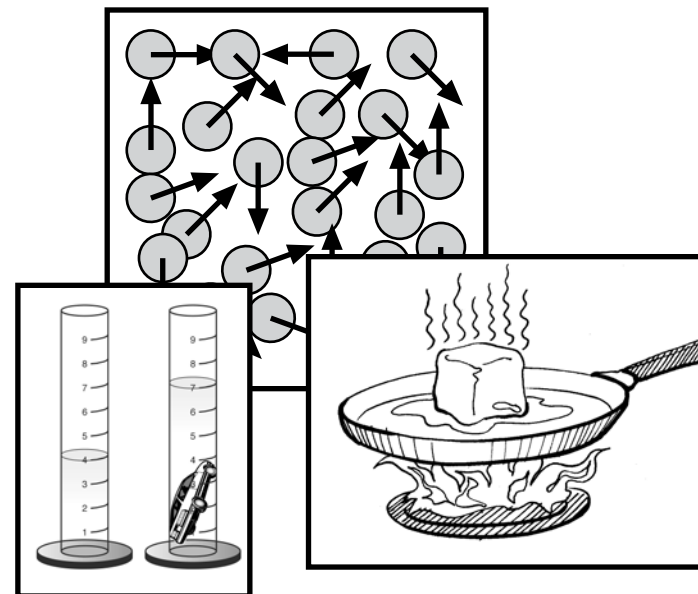


Physical Science

Matter and Energy

# All About Matter

by Laura Portalupi





Physical Science

Matter and Energy

# All About Matter

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**FOCUS**curriculum

Curriculum materials for **your** content standards

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*– Predict –*

*What do you think you will  
learn from reading this book?*

## What Is Matter?

Picture a balloon on a string. The balloon and the string are made of matter. The air inside the balloon is matter, too.

Matter is anything that takes up space and has **mass**. Everything is made of matter.

**mass:** the amount of material in an object

## States of Matter

Matter can be found in three states. It can be a solid, liquid, or gas.

**Solid**—Matter that is solid has a certain shape. It does not change shape unless something forces it to change. A brick is an example of a solid.

**Liquid**—A liquid does not have a certain shape. It flows to take the shape of its container. Juice is a liquid.

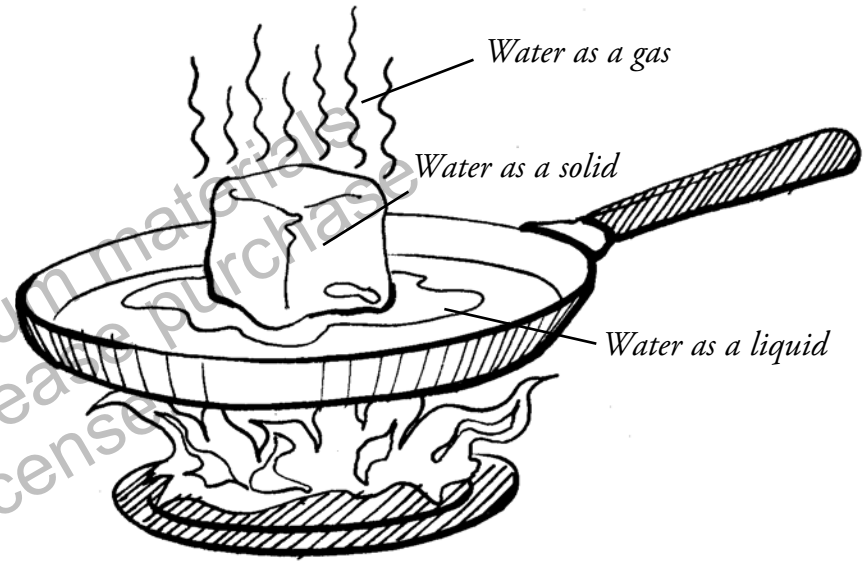
**Gas**—A gas does not have a certain shape, either. It fills whatever space it is in. Air is a gas.

– Describe –  
How are liquids different from gases?

---

Matter can change from one state to another. Water is matter. When it is very cold, water is solid. It is ice. If you heat the ice, the water turns to a liquid.

If you heat the liquid water more, it turns to a gas. This is called water vapor. You sometimes see fog on a bathroom mirror. This is water vapor. Some of the warm liquid water from the shower turned to gas.



*When solid water is heated, it begins to melt. It turns into a liquid. If heated enough, the liquid water turns into gas or vapor.*

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– Hypothesize –  
*How could you turn water vapor back into liquid water?*



## Physical Properties

You have learned that matter can change state. Its **physical property** can change from solid to liquid to gas. A physical property is something that you can **detect** with your five senses.

For example, an ice cube is solid and small. It is shaped like a box. It is slippery. You could describe an ice cube in all of these ways. These are physical properties of an ice cube.

**physical property:** a quality that you can detect with your five senses

**detect:** to notice or discover something

## Shape

There are other physical properties of matter we can describe. Shape can tell us about an object. For example, a ball is round so that it can roll. A glass is shaped so that it can hold a drink.

Sometimes a solid can change shape without becoming a liquid or gas. If you mold clay into a ball, it is round. If you press down on the clay, it is flat. If you roll it into a rope, it is long and thin. It is still solid clay, but its shape has changed.

– Recall –

*What are the five senses we use to determine the physical properties of something?*

---

## Size

Size is another way to describe matter.

*Huge, big, small, and tiny* are all words that describe size. Think about a birthday cake. You could use size to describe which piece of cake you want. Would you ask for a big piece or a little piece?

## Color

We use color to describe matter. Picture two football teams. An easy way to tell them apart is by the colors of their uniforms.

All states of matter can be described by color. A banana is yellow. An apple is red or yellow. Water is colorless or clear.

---

## Texture

Texture is the way something feels.

*Rough, smooth, soft, and bumpy* are words that describe texture.

## Mass

Objects with a lot of mass are heavy.

Objects with very little mass are light.

You can measure the mass of an object by weighing it on a scale.

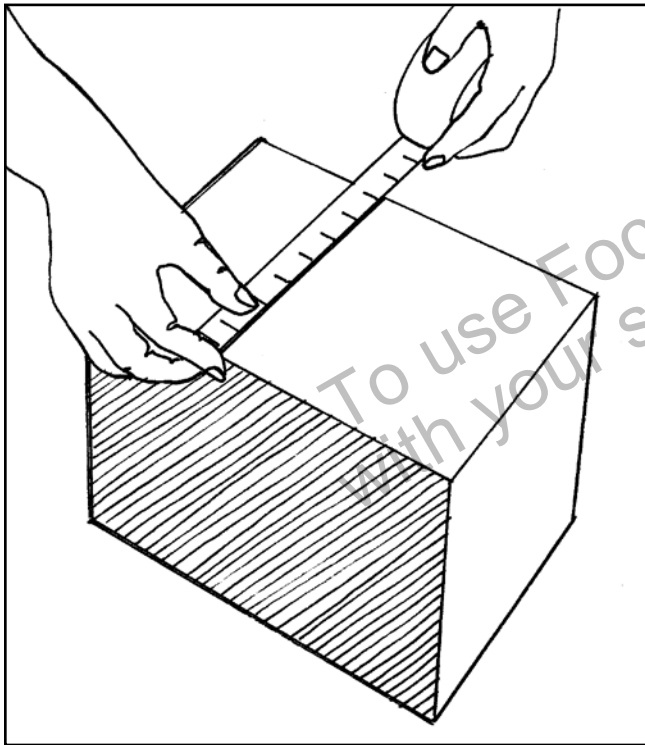
You can measure the mass of a liquid, too. Weigh an empty glass. Then fill it with water. Weigh the glass again. Subtract the mass of the empty glass. The result is the mass of the water.

– Extend –

*Can you think of any other physical properties used to describe matter?*

## Volume

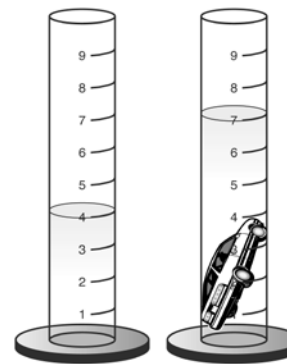
Volume is the amount of space that matter takes up. You can use a ruler to find the volume of a solid. Find the length, width, and height of the object. Then multiply these numbers. The answer is the volume of the object.



**volume:** the amount of space that matter takes up

Liquid is measured in the U.S. customary system using fluid ounces (oz) and gallons (gal). When we use the metric system we measure liquids in milliliters (mL) and liters (l).

You can use a graduated cylinder to find the volume of a liquid. A graduated cylinder can also tell you the volume of a solid. Fill one halfway with water. Write down the height of the water. Add a toy car. Write down the new height of the water. Subtract the first height from the second height. The result is the volume of the toy car.



*The volume of the toy car is  
 $7 \text{ mL} - 4 \text{ mL} = 3 \text{ mL}$ .*

*– Apply –*

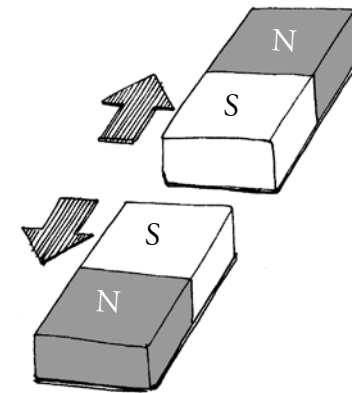
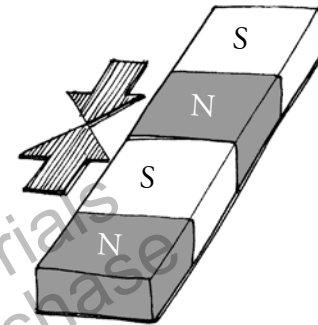
*Which has a greater volume, a toy car or a real car?*

---

## Magnetism

Some materials are magnetic. They have a pulling force on some metals. We make magnets out of these materials.

Magnets have north and south poles. Poles that are the same **repel**, or push each other away. Poles that are opposite come together.



*The south poles are marked with an “S”. The north poles are marked with a “N”. What would happen if you placed the north poles near each other?*

**magnetism:** the ability to attract metals such as iron  
**repel:** drive or push away

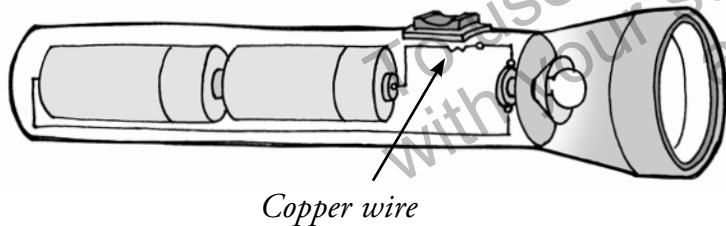
– Experiment –

*Test whether different objects around your home are attracted to a magnet. Record your findings in a chart.*

# Conductivity

**Conductivity** is the ability to transfer electricity, heat, or sound. Some materials have high conductivity. Others have low conductivity.

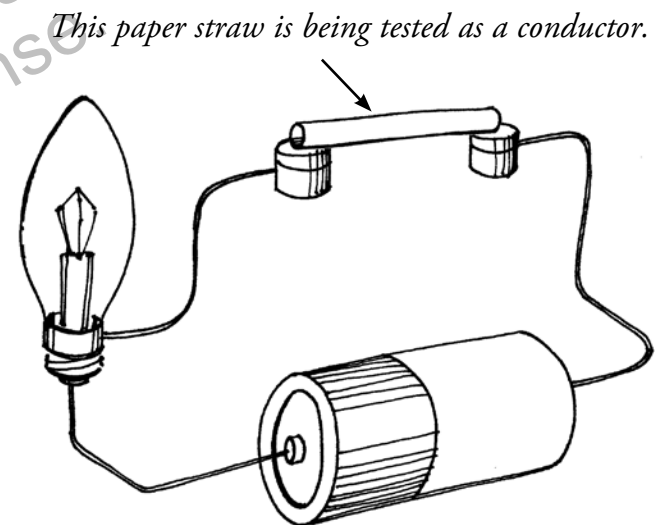
Electricity can be conducted through some metals. Copper is a good **conductor** of electricity. Most wires are made from copper.



**conductivity:** the ability to transfer electricity, heat or sound  
**conductor:** a material that transfers heat or electricity

## Testing for Conductivity

How can you test a material's conductivity? Connect a wire from the battery to the material, say a paper straw. Connect the other wire from the straw to the light bulb. Connect the third wire from the light bulb to the other end of the battery. If the bulb lights up, the straw is a conductor.



– Hypothesize –

*Is a paper straw a good conductor of electricity?*

---

Heat can also be conducted or transferred. Think about soup in a cooking pot. The pot conducts heat. Heat moves from the stove through the pot to the soup inside it.

You don't want to get burned when you stir the soup. You might use a wooden spoon. Why? Wood is not a good conductor of heat.

---

## Insulation

A substance that keeps heat from conducting is an **insulator**.

Feathers are insulators. They keep birds warm in winter. If you wear a feather-filled coat during winter, it will keep you warm.

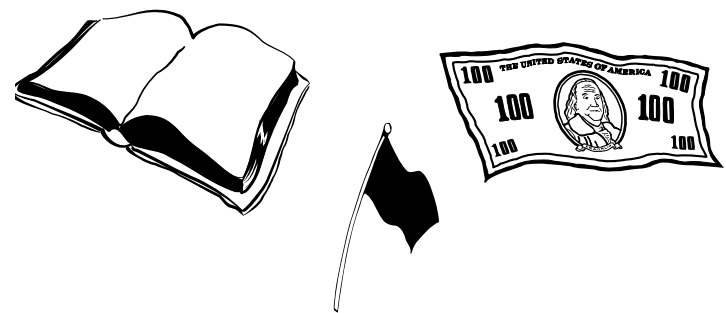
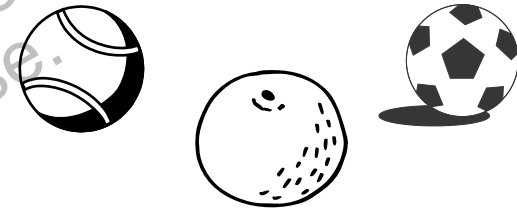
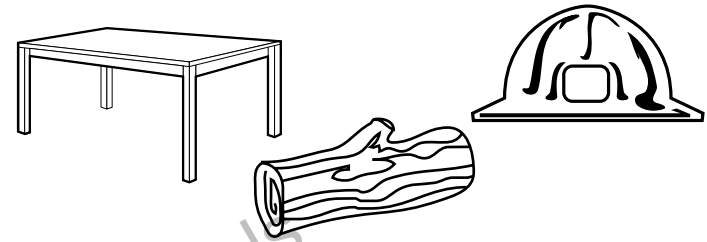
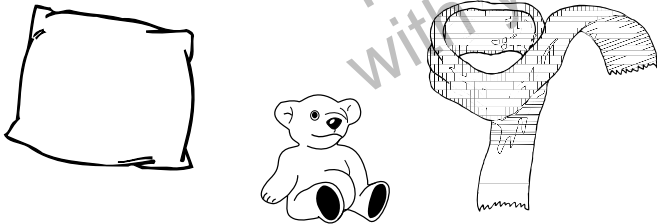
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**insulator:** a material that keeps heat or electricity from transferring

## Categorizing Properties

Physical properties let us categorize matter. To categorize is to group items together. For example, you could put a green shirt, a green leaf, and a green frog in the same group. The objects are different but they are all the same color.

Think of some other ways to categorize matter. What physical property do the items in the following groups share?



---

## Glossary

**conductivity**—the ability to transfer electricity, heat, or sound

**conductor**—a material that transfers heat or electricity

**detect**—to notice or discover something

**insulator**—a material that keeps heat or electricity from transferring

**magnetism**—the ability to attract metals such as iron

**mass**—the amount of material in an object

**physical property**—a quality that you can detect with your five senses

**repel**—drive or push away

**volume**—the amount of space that matter takes up

---

## To Find Out More . . .

Want to learn more about matter?

### Try these books

*States of Matter* by Robert Snedden. Reed Educational and Professional Publishing, 2001.

*Solids, Liquids, and Gases* by Carol Ballard. Heinemann, 2004.

### Access these Web sites

Chem4Kids  
<http://www.chem4kids.com>

BrainPOP  
<http://www.brainpop.com/science/matter/>

### Write for more information

Odyssey Magazine: Adventures in Science  
Cobblestone Publishing Company  
30 Grove Street, Suite C  
Peterborough, NH 03458



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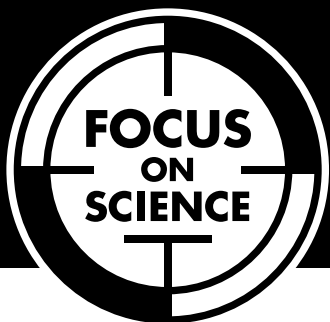
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Physical Science

Matter and Energy

# Assessments

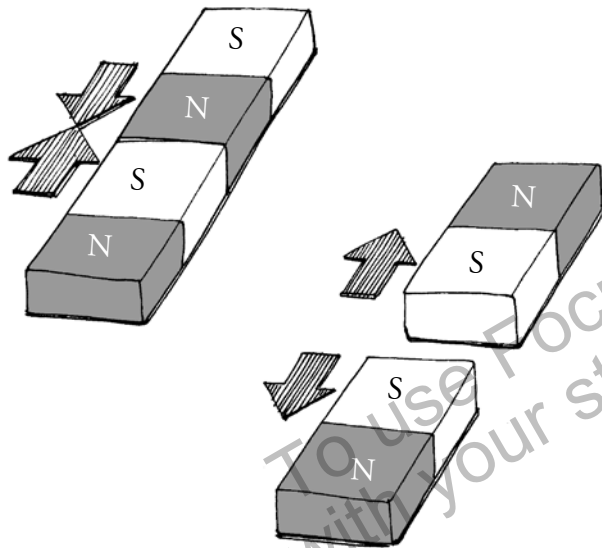
*All About Matter*

Print pages 20–22 of this PDF for the assessments.

# Check Understanding

Shade the circle next to the correct answer.

1. Which physical property is best shown in the picture?



- (A) mass
- (B) texture
- (C) conductivity
- (D) magnetism

2. Which statement best describes what happens when heat is applied to solid matter?

- (A) The solid changes shape.
- (B) The solid changes volume.
- (C) The solid changes color.
- (D) The solid changes size.

3. A student takes a rubber band and stretches it. Which property of the rubber band will stay the same when it is stretched?

- (A) shape
- (B) length
- (C) mass
- (D) width

# Check Understanding

4. To categorize is to group items together because they share a physical property. The items below may be grouped together because they are all round.



Identify the physical property that was used to categorize these items.

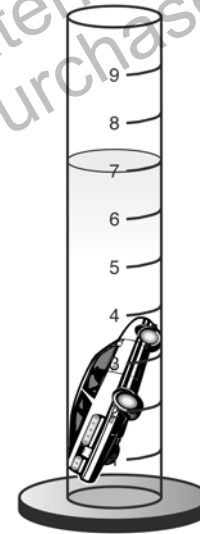
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Identify a different physical property that you could use to group these items together.

---

Note that question 5 has only three choices.

5. The diagram below shows a toy car placed in a graduated cylinder filled with water.



What will happen to the height of the water if you take the toy car out?

- (A) It will increase.
- (B) It will decrease.
- (C) It will remain the same.

# Assessment Scoring Guidelines

1. Answer D is correct.
2. Answer A is correct.
3. Answer C is correct.
4. Students should identify another physical property, such as texture, that could be used to group these items together
5. Answer B is correct.

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English Language  
Arts Activities  
*All About Matter*

Print pages 24–28 of this PDF for the reading activities.

# Homographs

## TRY THE SKILL

Homographs are words that are spelled the same but have different meanings. You can figure out the meaning of a homograph by looking for context clues. For example, look at the following uses of the homograph *close*.

*If you close your eyes and count sheep, you'll fall asleep.*

*The pitcher's fastball whizzed close to the batter's elbow.*

In the first sentence, *close* means "to shut." In the second sentence, *close* means "near."

---

**Read the sentence and find the word in dark type. Then read the two meanings of that word. Shade the circle next to the meaning that is used in the sentence.**

1. Everything in the universe is made of **matter**.  
 (A) anything that has mass and takes up space  
 (B) something to be talked about
2. The **property** next door is going up for sale.  
 (A) land or real estate that is owned  
 (B) a quality by which something is known

3. You must **state** your reason for missing a week of school.  
 (A) condition  
 (B) say
4. Copper wires are covered in rubber because rubber is a poor **conductor**.  
 (A) material that transfers heat or electricity  
 (B) leader of an orchestra
5. The **volume** of a swimming pool is greater than that of a bathtub.  
 (A) loudness of a sound  
 (B) amount of space that is inside something
6. A **mass** meeting was held in the gym.  
 (A) having to do with a large number of people  
 (B) amount of matter in an object

# Suffixes

## TRY THE SKILL

Suffixes are groups of letters that are added to the end of a base word. They change the meaning of the word. Here are three common suffixes.

*-less* meaning “without”: *shapeless, colorless, harmless*  
For example, *shapeless* means “without shape.”

*-or* meaning “one who does”: *creator, director, insulator*  
For example, *creator* means “one who creates.”

*-ly* meaning “in a way that is”: *permanently, tightly, slowly*  
For example, *slowly* means “in a way that is slow.”

Understanding these suffixes can help you figure out the meanings of new words. Remember: Pay attention to the suffixes.

**Read each meaning. Then shade the circle next to the word that matches it.**

- in a way that is quick  
 A expediently       B benefactor  
 C timeless       D deniably
- someone who gives a gift  
 A expediently       B benefactor  
 C timeless       D deniably
- without end  
 A expediently       B benefactor  
 C timeless       D deniably

**Think of more words that use the suffixes *-less*, *-or*, and *-ly*. Write them on the lines. Use a dictionary for help.**

---

---

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# Understanding Main Ideas

## TRY THE SKILL

The main idea is the most important idea in a paragraph. Supporting details help you better understand the main idea.

Liquid is measured in the U.S. customary system using fluid ounces (fl oz) and gallons (gal). When we use the metric system we measure liquids in milliliters (mL) and liters (l). You can use a graduated cylinder to find the volume of a liquid. A graduated cylinder can also tell you the volume of a solid. Fill the graduated cylinder halfway with water. Write down the height of the water. Add a toy car. Write down the new height of the water. Subtract the first height from the second height. The result is the volume of the toy car.

### What is the main idea of this paragraph?

You can use a graduated cylinder to find the volume of a liquid or a solid.

### What are some details that support the main idea?

Liquid is measured in the U.S. customary system using fluid ounces (fl oz) and gallons (gal). When we use the metric system we measure liquids in milliliters (mL) and liters (l).

After you read the paragraph below, answer the questions that follow.

Water exists in all three states. When water is a liquid, you can drink it. If you fill a cup with liquid water, it takes the shape of the cup. When water is a solid, we call it ice. Ice cubes do not change shape if you put them in a cup. When water is a gas, it is called water vapor. If you take a hot shower, water vapor might fill the bathroom.

1. What is the main idea of this paragraph?
  - A When water is a solid, we call it ice.
  - B When water is a liquid, you can drink it.
  - C Water exists in all three states.
  - D Water can be found everywhere on Earth.
2. Which is NOT a supporting detail?
  - A When water is a gas, it is called water vapor.
  - B When water is a solid, we call it ice.
  - C When water is a liquid, you can drink it.
  - D Water vapor rises into the air.

# Steps in a Process

## TRY THE SKILL

Understanding the steps in a process can help you understand and remember what you read. You can summarize the steps in a process using words such as *first*, *then*, *next*, and *finally*.

**Read this passage from *All About Matter* and try to identify the steps in the process.**

Weigh an empty glass. Then fill it with water. Weigh the glass again. Subtract the mass of the empty glass. The result is the mass of the water.

<b>Step 1</b>	First, weigh an empty glass.
<b>Step 2</b>	Then, fill it with water.
<b>Step 3</b>	Next, weigh the glass again.
<b>Step 4</b>	Finally, subtract the mass of the empty glass.

**Read this passage from *All About Matter* and try to identify the steps in the process. Use the graphic organizer to help you.**

Let's test the conductivity of an object. Look at the diagram below. First, we connect a wire from the battery to the object. Then, we connect another wire from the object to the light bulb. We connect a third wire from the light bulb to the other end of the battery. If the bulb lights up, the object is a conductor.

<b>Step 1</b>	
<b>Step 2</b>	
<b>Step 3</b>	
<b>Step 4</b>	

# Answer Key

## Homographs

1. A
2. A
3. B
4. A
5. B
6. A

## Suffixes

1. A
2. B
3. C

## Understanding Main Ideas

1. C
2. D

## Steps in a Process

**Step 1:** First, connect a wire from the battery to the object.

**Step 2:** Then, connect another wire from the object to the light bulb.

**Step 3:** Next, connect a third wire from the light bulb to the other end of the battery.

**Step 4:** Finally, check to see if the bulb lights up.