

Properties of Matter

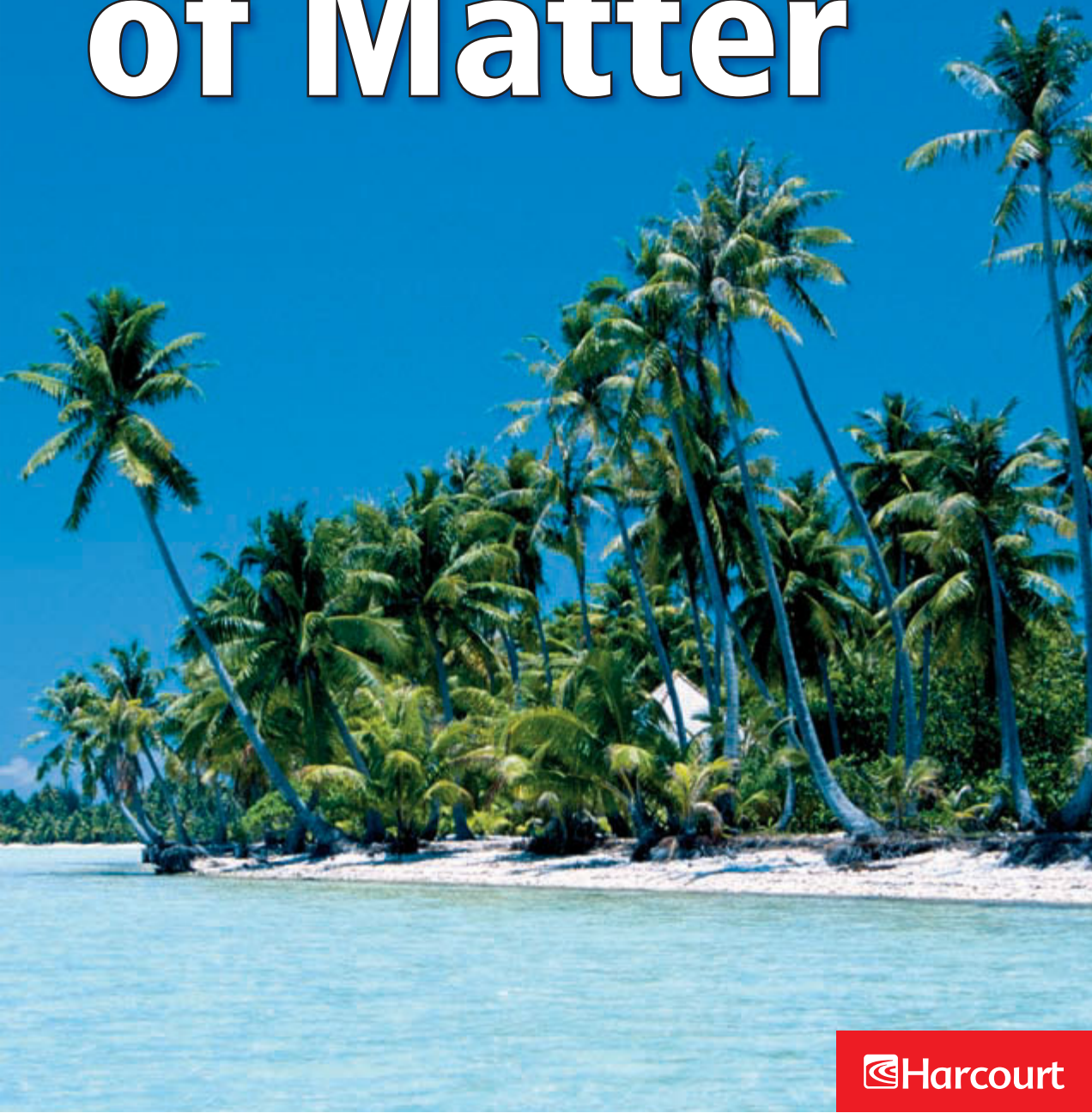


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What Is Matter?

VOCABULARY

matter
physical property
mass
volume
density



Matter is anything that takes up space. Everything you see and feel is matter. Trees, air, water, and sand are all matter.



A **physical property** is anything you can observe about matter using your senses. The smell and taste of popcorn are two of its physical properties.



▶ **Mass** is the amount of matter an object has. A balance is often used to measure mass.



▶ **Volume** is how much space an object takes up. A measuring cup measures volume.



▶ **Density** is the mass of matter compared to its volume. Different objects have different densities. Objects float in water if they have less density than water.



READING FOCUS SKILL MAIN IDEA AND DETAILS

The **main idea** is what the text is mostly about. **Details** tell more about the **main idea**.

Look for **details** about matter.

Matter

Everything you see and feel is matter. **Matter** is anything that takes up space. Ice, air, clouds, and trees are matter. Even people are matter.



- ▶ Look around you. What matter do you see? Desks, books, pencils, and your classroom are matter. Your teacher and classmates are matter. How do you know? They take up space.
- ▶ Now, look outside. Is it raining? Is it snowing? Is it sunny? Rain, snow, and sun are matter, too.
- ▶ Air is matter you can't see. Air takes up space. You can see air move leaves on trees. You can feel air on your skin.

▶  **What is matter?**



▶ Everything in this picture takes up space, even the air you cannot see.

Physical Properties

- ▶ A **physical property** is anything you can observe about matter using one or more of your senses. Your senses are sight, hearing, touch, smell, and taste.
- ▶ Sight tells you the size and color of something. Hearing tells you what something sounds like. Touch tells you what something feels like. Smell tells you how something smells. Taste tells you if something is sweet, salty, sour, or bitter.

▶ Which senses help you observe the physical properties of each thing below?



▶ popcorn



▶ pineapple



cat

Color, size, shape, and texture are a few physical properties that tell about matter. But there are many others. Some matter, such as rubber, can bounce and stretch. Some matter, such as salt, can mix in water. Some matter, such as steel, does not bend easily.



Name three physical properties and the senses you use to observe them.



▼ window



◀ cymbals

Measuring Matter

- ▶ Matter has properties that you can measure. **Mass** is the amount of matter an object has. You can use a balance to measure mass. You measure mass in grams (g) or kilograms (kg).
- ▶ **Volume** is the amount of space matter takes up. You can use a measuring cup to measure the volume of liquids in milliliters (mL).




▶ Measuring mass



▶ Measuring volume

▶ **Density** is the mass of matter compared to its volume. A box of feathers and the same box of rocks have the same volume. But the box of rocks has more mass. So the rocks also have greater density than the feathers.

▶ Density is also why some objects float or sink. An object with greater density than water sinks. An object with less density floats.

▶  **What are mass, volume, and density?**



▶ **Balls with less density than water float.**

Review

▶  **Focus Skill**

▶ Complete the **main idea** statement.

▶ 1. Matter has many _____ that you can observe and measure.

▶ Complete the **detail** statements.

▶ 2. The amount of _____ an object takes up is its volume.

▶ 3. An object's mass is measured with a _____.

▶ 4. If an object has less density than water, the object will _____.



What Are States of Matter?

VOCABULARY

- solid
- liquid
- gas
- evaporation
- condensation



- A **solid** is matter with a volume and a shape that stay the same. A bus is a solid.



- A **liquid** is matter that has a volume that stays the same, but a shape that can change. Liquid soap takes the shape of its container.



▶ A **gas** is matter that has no definite shape or volume. A gas takes up all the space in a container. Gas fills a balloon.



▶ **Evaporation** is the change of a liquid to a gas. Evaporation takes place when a liquid is heated. You can't see water after it evaporates. It is in the air.



▶ **Condensation** is the change of a gas to a liquid. Condensation takes place when gas cools. Drops of water form when water condenses.



READING FOCUS SKILL

COMPARE AND CONTRAST

When you **compare and contrast**, you tell how things are alike and different.

- Look for ways to **compare and contrast** solids, liquids, and gases.

States of Matter

Matter has different forms called states. Three states of matter are solid, liquid, and gas.



How are solids, liquids, and gases alike?

- The mountains, water, and air are each a different state of matter.



Solids

▶ A **solid** is matter with a volume and a shape that stay the same. A solid stays solid unless something, such as heat, changes it.

▶ Ice is a solid. If you heat ice, it melts and changes to a liquid.

▶  **Tell how all solids are alike.**

▶ Solids have volume and shape that stay the same. Name the solids you see.



Liquids

▶ A **liquid** is matter with a volume that stays the same, but a shape that can change. A liquid takes the shape of whatever holds it. Think of a tall, thin glass of water. If you pour the water into a short, wide jar, its shape changes. But its volume stays the same.

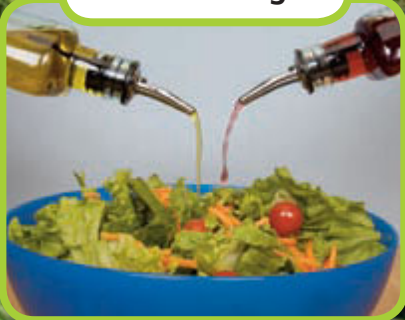
▶  Tell how liquids and solids are different.

▶ Liquids change shape.

▶ Liquid soap



▶ Oil and vinegar



▶ Waterfall

Gases

▶ A **gas** is matter that has no definite shape or volume. A gas takes up all the space in a container. Look at the balloon. A gas fills the space inside the balloon.

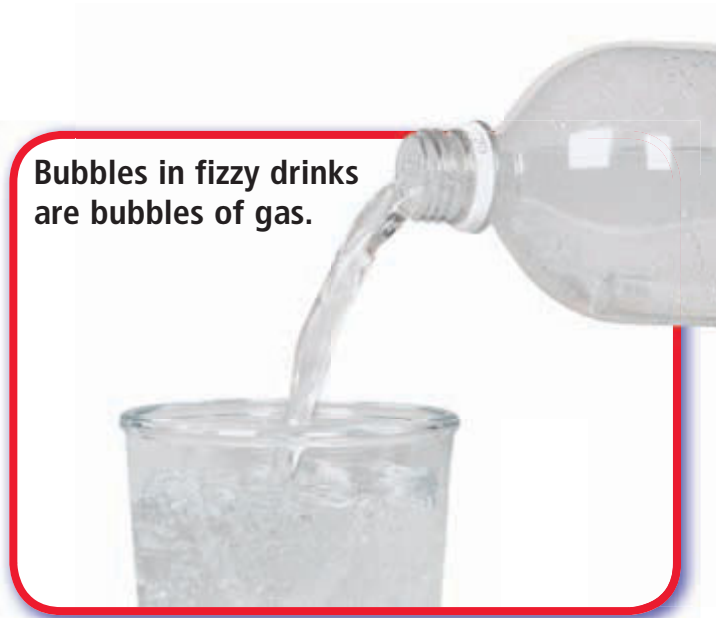
▶ You breathe air. Air is a gas. Some stoves use natural gas. You cannot see the gas, but when it burns, you see a blue flame.

▶  **How are gases alike and different?**



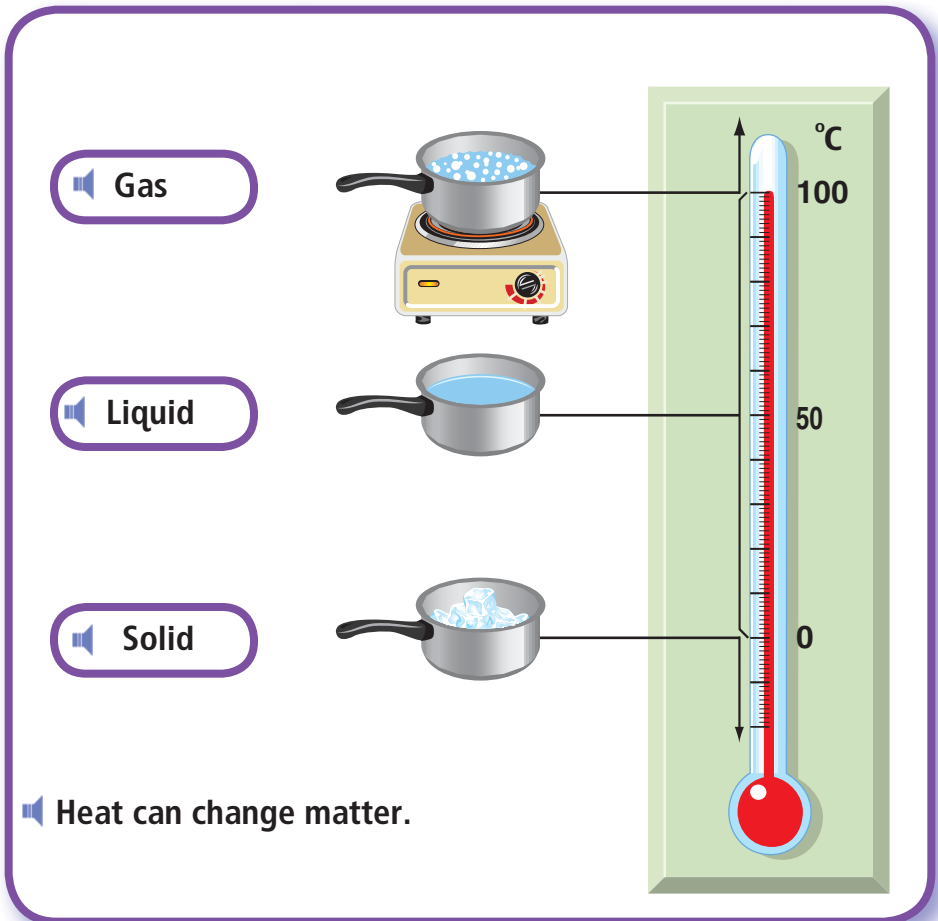
▶ Helium gas fills the balloon.

▶ Bubbles in fizzy drinks are bubbles of gas.




Changes of State

- Heat can cause matter to change from one state to another. Heat causes ice to melt. The frozen water changes from a solid to a liquid.
- If you place a cup of water in a warm place, it will be empty in a few days. Heat changes the water from a liquid to a gas. The liquid water is now in the air as a gas. This change from a liquid to a gas is called **evaporation**.



▶ When a gas cools, it changes back to a liquid. This change from a gas to a liquid is called **condensation**.

▶ Water is in the air as a gas. When the gas cools and changes back to a liquid, it may rain or snow.

▶  **Tell the difference between evaporation and condensation.**

Review

 Focus Skill

Complete the **compare and contrast** statements.

- ▶ 1. Solids, liquids, and gases are all _____ .
- ▶ 2. All _____ have volume and a shape that stays the same.
- ▶ 3. Both liquids and gases take the shape of their containers, but only _____ take up all the space of their containers.
- ▶ 4. Water changes from liquid to gas during _____ and from gas to liquid during _____.



How Does Matter Change?

VOCABULARY



mixture



solution



A **mixture** is a substance that has two or more different kinds of matter. You can separate the parts of a mixture. A bowl of cereal and fruit is a mixture.



▶ A **solution** is a mixture in which the different kinds of matter mix evenly.



READING FOCUS SKILL MAIN IDEA AND DETAILS

The **main idea** is what the text is mostly about. **Details** tell more about the **main idea**.

▶ Look for **details** about how matter can change.

Physical Changes

▶ Matter can be changed and still be the same kind of matter. A change that does not form a new kind of matter is a *physical change*.

▶ Cutting is one kind of physical change. Cutting changes the size of things. It can make a piece of paper smaller. But the pieces are still paper. They are the same kind of matter.




Tell what a physical change is.



▶ Changing sheep's wool into yarn is a physical change.

Mixtures

- ▶ A **mixture** is a substance that has two or more kinds of matter. Making a mixture is a physical change. You put different kinds of matter together. But you do not form new kinds of matter.
- ▶ You can separate the parts of a mixture. This is a physical change, too.
- ▶  Tell why a bowl of cereal and fruit is a mixture.



▶◀ A mixture of beads

▶▼ A mixture of cereal and fruit



Solutions

🔊 A **solution** is a mixture in which different kinds of matter mix evenly and completely.

🔊 Salt and water mix evenly and completely. You can no longer see the salt. A mixture of salt and water is a solution.



Tell why a solution is a kind of mixture.

🔊 A drink mix and water make a solution. ▶



Chemical Changes

Some changes form different kinds of matter. These are called *chemical changes*. Cooking causes chemical changes. Burning does too. Burning changes wood into ashes and smoke. The ashes and smoke cannot change back into wood.



What is a chemical change?



▲ Rusting is a chemical change.

▲ Rotting is a chemical change.

Review



Complete the **main idea** statement.

1. Physical and chemical changes are kinds of changes to _____.

Complete the **detail** statements.

2. Making a mixture of cereal and fruit is a kind of _____ change.

3. Burning wood and cooking are kinds of _____ changes.

4. A _____ of salt and water is a mixture.

GLOSSARY

- ▶ **condensation** (kahn•duhn•SAY•shuhn) The process by which water vapor changes into liquid water (17)
- ▶ **density** (DEN•suh•tee) The mass of matter compared with its volume (9)
- ▶ **evaporation** (ee•vap•uh•RAY•shuhn) The process by which liquid water changes into a water vapor (16)
- ▶ **gas** (GAS) Matter that has no definite shape or volume (15)
- ▶ **liquid** (LIK•wid) Matter that has a volume that stays the same but a shape that can change (14)
- ▶ **mass** (MAS) The amount of matter in an object (8)
- ▶ **matter** (MAT•er) Anything that takes up space (4)
- ▶ **mixture** (MIKS•chuhr) A substance that has two or more different kinds of matter (21)
- ▶ **physical property** (FIZ•ih•kuhl PRAHP•er•tee) Anything you can observe about an object by using one or more of your senses (6)
- ▶ **solid** (SAHL•id) Matter with a volume and a shape that both stay the same (13)
- ▶ **solution** (suh•LOO•shuhn) A mixture in which the different kinds of matter mix evenly (22)
- ▶ **volume** (VAHL•yoom) The amount of space that matter takes up (8)

🔊 Think About the Reading

- 🔊 **1.** What is matter? What are some of its physical properties? Can you measure matter? How?
- 🔊 **2.** What are the states of matter? Tell how matter can change states. How else can matter change?

🔊 Hands-On Activity

Use a jar, water, oil, corn syrup, and an assortment of small objects to explore density, floating, and sinking.

- 🔊 **1.** Pour equal amounts of water, oil, and corn syrup in a jar. Write or draw your observations.
- 🔊 **2.** Drop several objects made of different materials in the jar half filled with water. Write or draw your observations.

🔊 School-Home Connection

Tell a family member what you read about the kinds of physical and chemical changes that can happen to matter. Together, make a table that shows the chemical and physical changes that happen to food when meals are made.

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