UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

YEAR OF
ZAYED

SCIENCE
2018 - 2019

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McGraw-Hill Education

Integrated Science

United Arab Emirates Edition

Mc Graw Hill Education

Physical Science

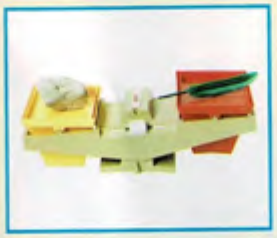
CHAPTER 6

Matter

What are properties of matter?

Vocabulary

matter anything that has mass and takes up space



mass the amount of matter making up an object

length the number of units that fit along one edge of an object

solid a state of matter that has a definite shape and volume

liquid a state of matter that has a definite volume but no definite shape

gas a state of matter that has no definite shape or volume

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.

Matter		
What We Know	What We Want to Know	What We Learned

Lesson 1

Describing Matter

Look and Wonder

In winter, rain can freeze to ice. The warmth of spring melts the ice. How can you tell the difference between rainwater and ice?

Essential Question How do we explain what matter is?

Explore

How can you tell if something is a solid or a liquid?

Make a Prediction

What is a solid? A liquid? Write a definition of each. If you mix cornstarch and water, will you have a solid or a liquid? Make a prediction.

_____

_____

Materials

- 250 grams of cornstarch
- 200 milliliters of water
- bowl
- coin
- paper towels

Test Your Prediction

1. Pour the cornstarch and water into the bowl.
2. Use your fingers to mix the cornstarch and water together.
3. **Observe.** Use your senses to observe the new substance. How does it feel? What does it look like? Record your description.

_____

_____

4. Tap the surface of the substance with your finger. Does it splash out of the bowl?

_____

_____

5. Place a small object such as a coin on the surface. Does it stay on top or sink?

_____

_____

Draw Conclusions

6 **Interpret Data.** Compare your observations to your definitions. How is the new substance like a solid? How is it like a liquid?

7 **Infer.** Is the mixture of cornstarch and water a solid or a liquid? Explain.

8 Do your results support your prediction? Why or why not?

Explore More

What would happen to this substance if you added more water? What if you let it dry out overnight? Make a prediction. Try it! Then report your results.

Open Inquiry

What will happen to the dried cornstarch and water if it is tapped with a rubber mallet?

Read and Respond

What is matter?

Circle the names of the units used to measure mass.

When you mix cornstarch and water, you get a thick gooey substance. You can see and touch it. It takes up space in the container. Like many things, this substance is matter. ***Matter*** is anything that has mass and takes up space.

Most things are made of matter. The air you breathe and the book you are reading are made of matter. Light and heat are not matter, however. They do not take up space.

One way to describe matter is by its properties (PRAH•pur•teez). A ***property*** is a characteristic that you can observe. Color, shape, and size are some properties of matter.

Matter Has Mass

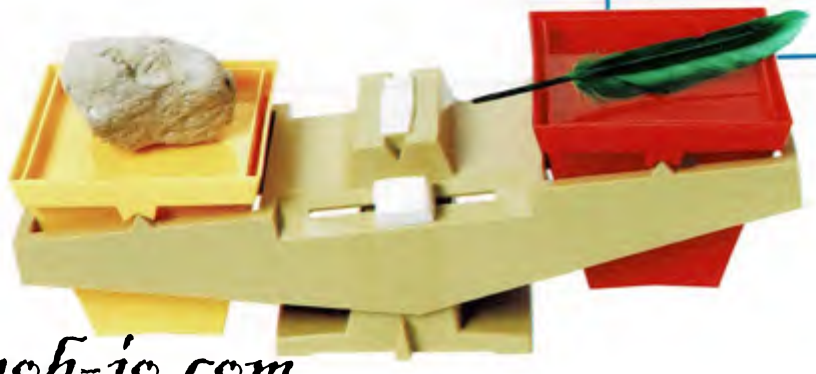
One very important property of matter is mass. ***Mass*** is the amount of matter making up an object. Mass is often measured in units called *grams* or *kilograms*. To measure mass, you use a tool called a *balance* (BA•luns).

Read a Photo

Which has more mass—the rock or the feather? How can you tell?

_____

_____



Matter Has Volume

Another property of matter is volume (VAHL•yum). ***Volume*** is how much space an object takes up. We measure volume by counting the number of cubic units in an object. We can also measure volume with tools like graduated cylinders.

Some Properties Are Unseen

Properties that cannot be seen can still be measured. Take magnetism, for example. This is the ability of matter to attract certain metal objects.

Another unseen property is the ability of matter to dissolve in a liquid. When a substance *dissolves*, it blends in and seems to disappear. Sugar and salt will dissolve in water. Sand will not.

Useful Properties

Properties help people choose the right kinds of matter for different jobs. When strength is needed, iron is a good choice. Wood is better when you need a light material that can easily be shaped.

Buoyancy (BOY•un•see) is a property that helps us build boats. ***Buoyancy*** is the upward force of a liquid or gas on an object. All objects are buoyant. Some objects are so buoyant that they float.

Magnetism is a property of matter. ▶

▲ Salt dissolves in water.

Sand does not dissolve in water. ▼

◀ Some objects can float in water. Other objects sink.

Quick Check

1. How do you know that your desk is matter?

What are the states of matter?

Matter is found in many forms. We call these forms *states*. Solid, liquid, and gas are the three common states of matter on Earth.

Solids

A ***solid*** has a definite shape and takes up a definite amount of space. The particles of matter in a solid are packed together tightly. Often the particles are packed in a regular pattern. This textbook and your desk are solids. What other solids can you name?

This instrument is a solid. Its particles are packed closely together.

Juice is a liquid. Its particles are less tightly packed as those in a solid. They can move past one another.

Liquids

Orange juice is a liquid. Unlike a solid, a ***liquid*** does not have a definite shape. It takes the shape of its container. However, a liquid does take up a definite amount of space.

Consider a glass of juice. The juice has the same volume whether it is in a glass or a graduated cylinder. If the juice spills, it will spread out. Its volume stays the same.

In a liquid, the particles of matter can move more than they do in a solid. The particles can change place and slide past one another. They are farther apart than in a solid.

Water, milk, and oil are all liquids. What other liquids can you name?

Gases

Helium (HEE•lee•um) is an example of a gas. A ***gas*** does not have a definite shape. In that way, it is like a liquid.

Unlike a liquid, a gas does not take up a definite amount of space. It fills the shape and space of its container. The helium in a balloon takes the shape of the balloon. If the balloon bursts, the helium will spread out into the air.

In a gas, the particles of matter move about freely. The particles move farther apart from one another to fill the space around them. If there is less space to fill, the particles are closer together. A gas always spreads out to fill its container.

Quick Check

2. How are solids, liquids, and gases the same? How are they different?

Inside these balloons is a gas. Gas particles move about freely and spread far apart.

3. A cornstarch and water mixture has both liquid and solid properties. How would you classify it?

FACT The particles that make up solids do move

Uses of Matter

Objects Made by People

Objects in Nature

Read a Photo

How are these objects classified? How else could you sort them?

_____

_____

_____

_____

What happens to the matter we use?

You use matter all the time. The food you eat is matter. Your chair is matter. You even breathe matter!

Some matter, like air, can be used again and again. Other forms of matter get thrown away. Too often, matter becomes trash. It goes into landfills or oceans.

Many people choose to ***reuse*** matter. This is when you use something again instead of throwing it away. An egg carton can be used to plant seeds. Are there other uses for things you throw away?

Matter can also be ***recycled***, or made into something else. Cans, paper, plastic, and glass can all be recycled. What else can you recycle?

Quick Check

4. What is the difference between using matter and reusing matter?

_____

_____

_____

_____

My Notes

LESSON 1
Lesson Review

Visual Summary

Complete the lesson summary in your own words.

Properties of Matter _____

_____

_____

_____

_____

States of Matter _____

_____

_____

_____

_____

Uses of Matter _____

_____

_____

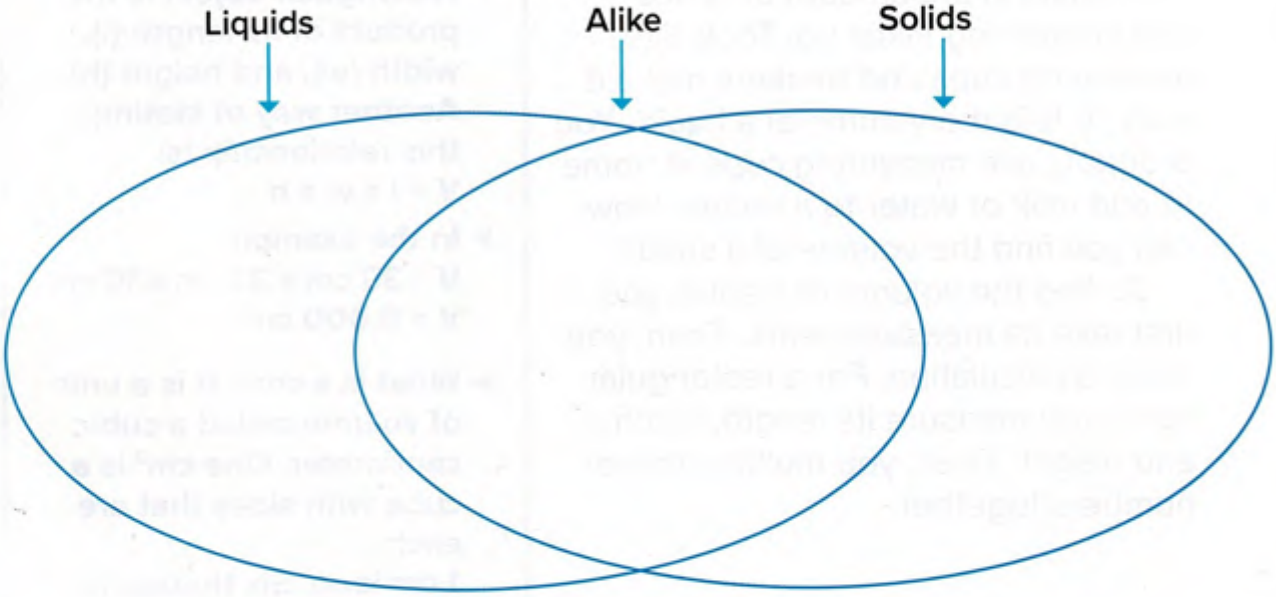
_____

_____

Think, Talk, and Write

1 **Vocabulary.** Solid, liquid, and gas are three _____ of matter.

2 **Compare and Contrast.** Choose two states of matter. How are they alike? How are they different?



3 **Critical Thinking.** Look around your school or classroom. List examples of solids, liquids, and gases.

_____

4 **Test Prep.** Which of the following is matter?

A heat
B sound
C air
D light

Essential Question How do we explain what matter is?

_____

_____

_____

Taking Up Space

Volume is the amount of space that something takes up. Tools like measuring cups and beakers make it easy to find the volume of a liquid. You probably use measuring cups at home to add milk or water to a recipe. How can you find the volume of a solid?

To find the volume of a solid, you first take its measurements. Then, you make a calculation. For a rectangular solid, you measure its length, width, and height. Then, you multiply those numbers together.

Calculating Volume

- **The volume (V) of a rectangular object is the product of its length (l), width (w), and height (h). Another way of stating this relationship is: $V = l \times w \times h$**
- **In the example: $V = 30\ cm \times 20\ cm \times 10\ cm$ $V = 6{,}000\ cm^3$**
- **What is a cm^3? It is a unit of volume called a cubic centimeter. One cm^3 is a cube with sides that are each 1 cm long. Six thousand of them would fit in a box with the measurements above.**

Let's look at an example. A box measures 30 centimeters in length, 20 cm in width, and 10 cm in height. To find its volume, just multiply the numbers.

Solve It

Calculate the volumes of the objects shown.

1. length = 6 cm, width = 4 cm, height = 2 cm

2. length = 31 cm, width = 18 cm, height = 11 cm

3. length = 5 cm, width = 25 cm, height = 38 cm

Lesson 2

Measurement

Look and Wonder

Building a house is no simple task. It takes planning. Every material that is used for the house must be measured. How does a builder make all those measurements?

Essential Question What tools can you use to study matter?

Explore

How can you compare matter?

Make a Prediction

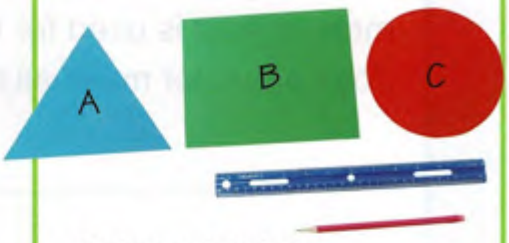
Look at shapes *A*, *B*, and *C*. Predict how you can use the ruler to determine the largest and smallest shapes. Make a prediction.

_____

_____

_____

Materials



- 3 shapes labeled *A*, *B*, and *C*
- ruler
- pencil

Test Your Prediction

1. **Measure.** Use the ruler to draw 2-centimeter squares on shapes *A* and *B*. Draw as many as you can fit. If you reach the edge, make a partial square.

2. **Use Numbers.** Look at shapes *A* and *B*. How will you use the squares you drew to determine which shape is largest? Smallest?

_____

_____

_____

3. **Observe.** Repeat step 1 on shape C. Compare the three shapes again. Record your observations.

_____

_____

Draw Conclusions

4 Which shape is the largest? Smallest?

5 **Communicate.** How did you use the 2-centimeter squares to compare the shapes?

6 Was your prediction correct? Explain.

Explore More

Can you use a different measuring tool to compare shapes *A*, *B*, and *C*? Make a prediction. Then try it.

Open Inquiry

How could you draw several different shapes that are each one unit larger than the previous shape?

Read and Respond

How do we measure matter?

Measuring and counting squares is one way to compare size. When we measure, we use *standard units*. A standard unit is a measurement on which people agree.

Scientists use standard metric units. The **metric system** is based on units of ten. It uses prefixes such as *kilo-*, *centi-*, and *milli-* to define the size of measurements. For example, 1 meter is divided into 100 cm. There are 1,000 meters in 1 km.

Metric Units

	Amount	Estimated Length
1 centimeter	$\frac{1}{100}$ of a meter	the width of your thumbnail
1 decimeter	10 cm $\frac{1}{10}$ of a meter	the length of a crayon
1 meter	10 dm 100 cm	the length of a baseball bat
1 kilometer	1,000 m 100,000 cm	the distance you walk in 10 to 15 minutes

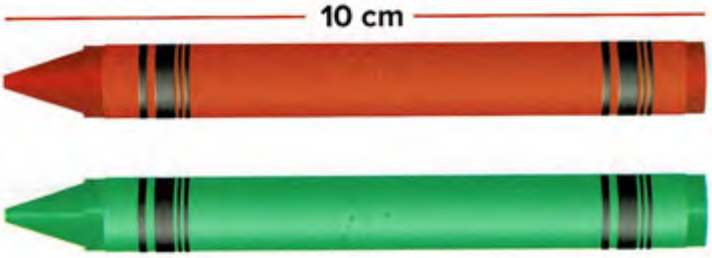
Read a Table

How many centimeters are in a meter? In a kilometer?

_____

_____

_____



You can measure length in centimeters.

Length and Width

An object's **length** is the number of units that fit from one end to the other. *Width* is the number of units that fit across. How wide is this page? How long is it?

Area

Area (AYR•ee•uh) describes the number of unit squares that cover a surface. An easy way to find the area of a rectangular shape is to multiply its length by its width. The area of this page, for example, is 27 cm × 20 cm, or 540 square cm (cm^2).

What if a shape is not rectangular? Divide it into smaller squares. Find the area of each smaller shape. You might need to estimate parts of some shapes. Then add the area of each smaller shape to find the total area.

A baker can measure volume in milliliters or liters.

Kitchen tools like these measure volume.

Volume

Volume describes the number of cubes that fit inside an object. To find the volume of a rectangular solid, multiply its length by its width and height.

If a solid is not rectangular, you can use water. First, measure the amount of water in a container. Then, submerge the entire object below the water. Subtract the original water level from the new water level. The result is the volume of the object.

To find the volume of a liquid, pour it into a measuring cup, spoon, beaker, or graduated cylinder. Then read the markings on the container.

Quick Check

1. How can you measure the area and volume of your room?

What is density?

A plastic ball floats on water. If you fill the ball with sand, it will sink. Why? The volume of the ball is the same, but you increased its mass.

Mass Divided by Volume

The relationship between mass and volume is called density (DEN•suh•tee). **Density** is the mass of the matter in a given space. Scientists define density as the amount of mass in a unit of volume.

To find the density of an object, divide its mass by its volume. If the mass is in grams and the volume in cubic centimeters, then the result will have units in grams per cubic centimeter (g/cm^3). One cubic centimeter of steel is denser than one cubic centimeter of plastic.

The density of cork is 0.24 g/cm^3. The particles are loosely packed.

The density of marble is between 2.4 and 2.7 g/cm^3.

The density of brass is 8.5 g/cm^3. The particles are tightly packed.

Real-World Density

◄ air particles outside balloon

air particles inside balloon ►

Density and Buoyancy

The density of an object also affects its buoyancy. Remember, buoyancy is the upward force of a liquid or gas on another object.

Float or Sink?

Consider cork and water. The density of water is 1 g/cm^3. The density of cork is 0.24 g/cm^3. Does cork float or sink?

An object floats when its density is less than the density of the liquid or gas in which it is placed. The density of cork is less than the density of water. So cork floats on water. Liquids can float on top of water too.

Can you change the density of matter? If you add heat to air, the air particles move more quickly. They spread out more. The heated air is less dense. It rises as cooler, denser air forces it upward.

Read a Diagram

Why does a hot-air balloon float?

_____

_____

_____

_____

Quick Check

2. What is the density of a cube with a mass of 8 g and volume of 1 cm^3?
   A. 0.8 g/cm^3
   B. 2 g/cm^3
   C. 4 g/cm^3
   D. 8 g/cm^3

3. What should a hot-air balloonist do to go higher? Explain.

_____

_____

_____

_____

_____

_____

What is weight?

Weight is another way to measure matter. Weight and mass may seem similar, but they are not the same.

Mass is the amount of matter in an object. **Weight** measures the amount of gravity between an object and a planet, such as Earth. **Gravity** is a force, or pull, between all objects.

How are weight and mass related? The force of gravity depends, in part, on an object's mass. The more mass, the stronger the pull of gravity. The stronger the pull of gravity, the more an object weighs.

Unlike mass, an object's weight is different on other planets and on the Moon. The pull of gravity on the Moon is about $\frac{1}{6}$ as strong as on Earth. So an object's weight on the Moon is only $\frac{1}{6}$ of its weight on Earth.

Do you weigh yourself with a scale? Mass is measured with a balance. Weight is measured with a scale. The metric unit for weight is the *newton* (N).

An object with a mass of 1 kg weighs 9.8 N on Earth. On the Moon, the same object weighs just 1.6 N.

Quick Check

4. What is the difference between a balance and a scale?

_____

_____

_____

My Notes

Visual Summary

Complete the lesson summary in your own words.

Measuring Matter _____

Density _____

Weight _____

Think, Talk, and Write

1 **Vocabulary.** The number of unit squares that cover a surface describes its

_____

2 **Problem and Solution.** Describe how to find the volume of air in your classroom.

Problem	Steps	Solution

3 **Critical Thinking.** Why does 1 kg of foam take up more space than 1 kg of rock?

_____

_____

4 **Test Prep.** This property of matter changes depending on the pull of gravity.

A density **C** mass

B length **D** weight

Essential Question What tools can you use to study matter?

_____

_____

_____

_____

Focus on Skills

Inquiry Skill: Measure

You know that there are many kinds of rocks and minerals. Scientists can describe a particular rock by its properties. Two properties that you can use to describe rock are mass and length. You **measure** to find an object's mass and length.

▶ Learn It

When you **measure**, you find the length, volume, area, mass, or temperature of an object. You can use tools to measure these properties. When you measure, it is a good idea to record your measurements on a table or chart. This helps you stay organized.

▶ Try It

Estimate and **measure** the mass and length of a rock.

Materials **3 rocks, gram masses, balance, metric ruler**

1. Get a rock. Hold it in your hand. Estimate the mass of the rock. Compare the rock to gram masses that you hold in your other hand. Record your estimate, in grams, in the following table.

Rocks	1	2	3
Estimated Mass			
Actual Mass			
Estimated Length			
Actual Length			

Skill Builder

2. Measure the mass of the rock using a balance and gram masses. Place the rock on one side of the balance. One by one, place gram masses on the other side of the balance. When the two sides are even, stop. Add the gram masses to find the actual mass of the rock. Record it.
3. About how long do you estimate the rock is? Use the longest side of the rock. Record your estimate, in millimeters or centimeters, in the table.
4. Measure the length of the rock with a metric ruler. Record the actual length.

Focus on Skills

▶ Apply It

Estimate and **measure** the mass and length of two more rocks. Record this data in your table.

1. Look at your data. Did you closely estimate the mass of each rock? Did you closely estimate the lengths? Which was easier for you to estimate—mass or length? Why?

_____

_____

2. With practice, you can become better at estimating mass and length. Repeat the activity using different rocks. Record your estimates and actual measurements again in a table.

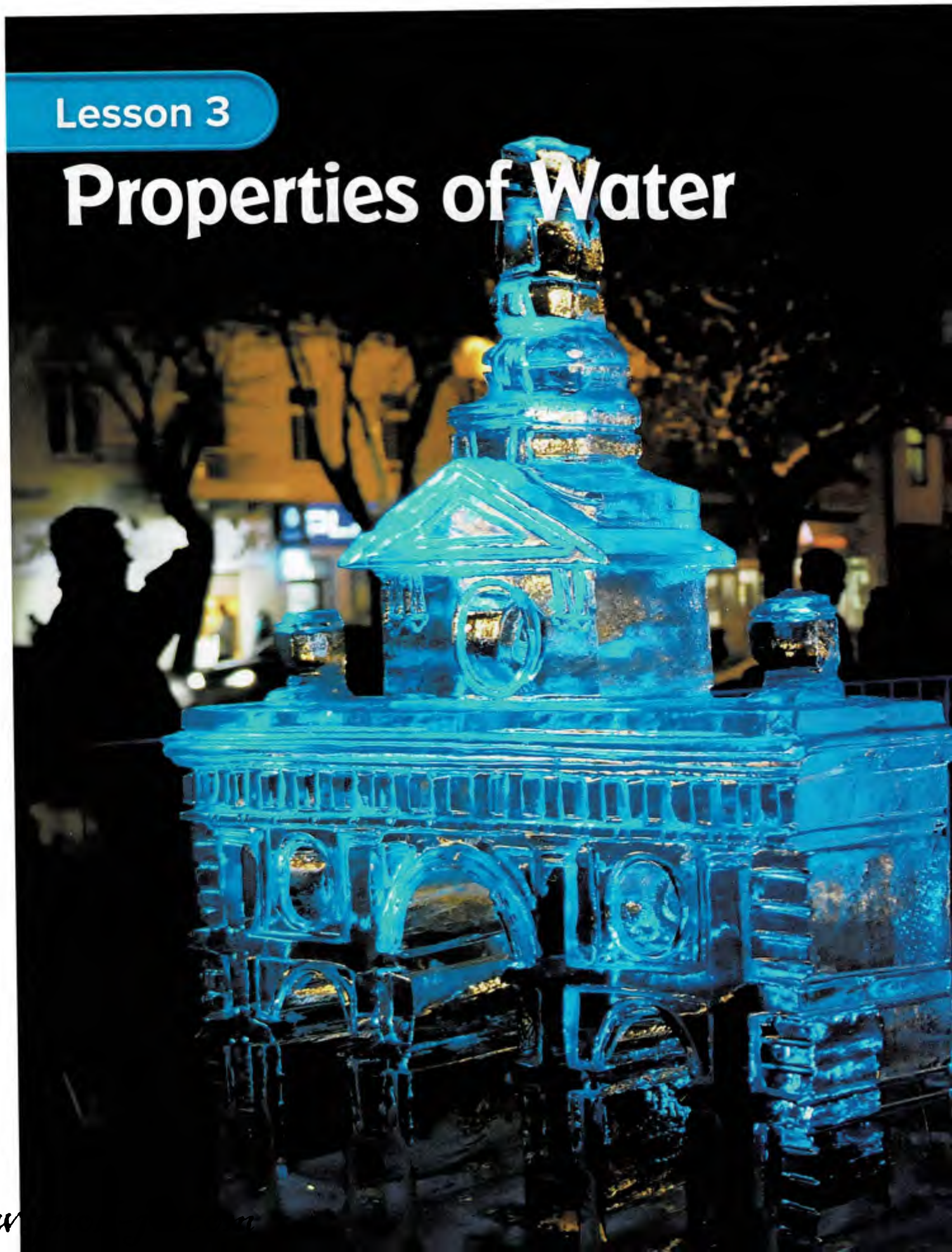
Rocks	1	2	3
Estimated Mass			
Actual Mass			
Estimated Length			
Actual Length			

3. Were your estimates closer to your actual measurements this time?

4. Do you think you can now estimate the mass of a rock before you pick it up? Try it for several rocks. Then use the balance to measure the actual mass. What property or properties do some rocks have that might throw off your estimate?

Lesson 3

Properties of Water



Look and Wonder

This ice sculpture will keep its shape and volume as long as temperatures stay below freezing. If temperatures rise above freezing, however, the sculpture will lose its shape. Why can ice keep its shape?

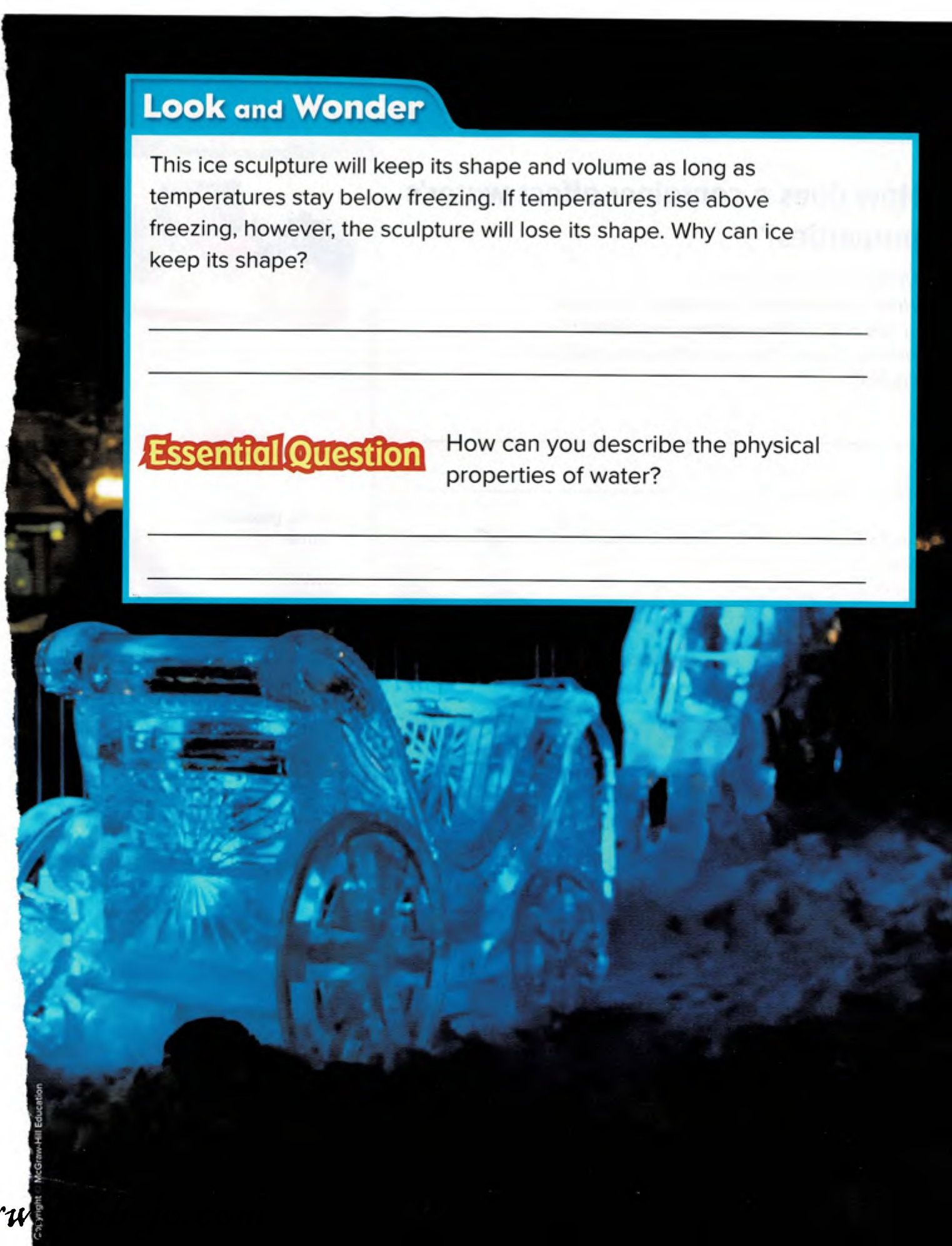
_____

_____

Essential Question How can you describe the physical properties of water?

_____

_____



Explore

How does a container affect water's properties?

Make a Prediction

What happens when you change the shape or size of a container holding water? Will the water's volume, mass, and shape change? Make a prediction.

_____

_____

_____

Materials

- ice cubes
- ruler
- balance with set of masses
- 100 mL graduated cylinder
- bowl
- 150 mL beaker
- aluminum pan
- pitcher of water

Test Your Prediction

1. Record your observations in the table below.

	Volume	Mass	Shape
water in bowl			
water in beaker			
water in pan			
ice cube in bowl			
ice cube in beaker			
ice cube in pan			

2. **Measure.** Calculate the volume of the ice cube by measuring its length, width, and height.

3. Measure the mass of the ice cube.

4. Place the ice cube in the three different containers. Use your table to record changes in volume, mass, and shape when the container is changed.

5. **Measure.** Repeat steps 3 and 4 with 100 milliliters of water.

Draw Conclusions

6. **Interpret Data.** Did any measurement change? Explain.

Explore More

How would you observe changes in the mass, volume, and shape of water vapor as it changes containers? Make a prediction and design an experiment to test it.

Open Inquiry

Will your results change if you use a liquid other than water? Explain.

Read and Respond

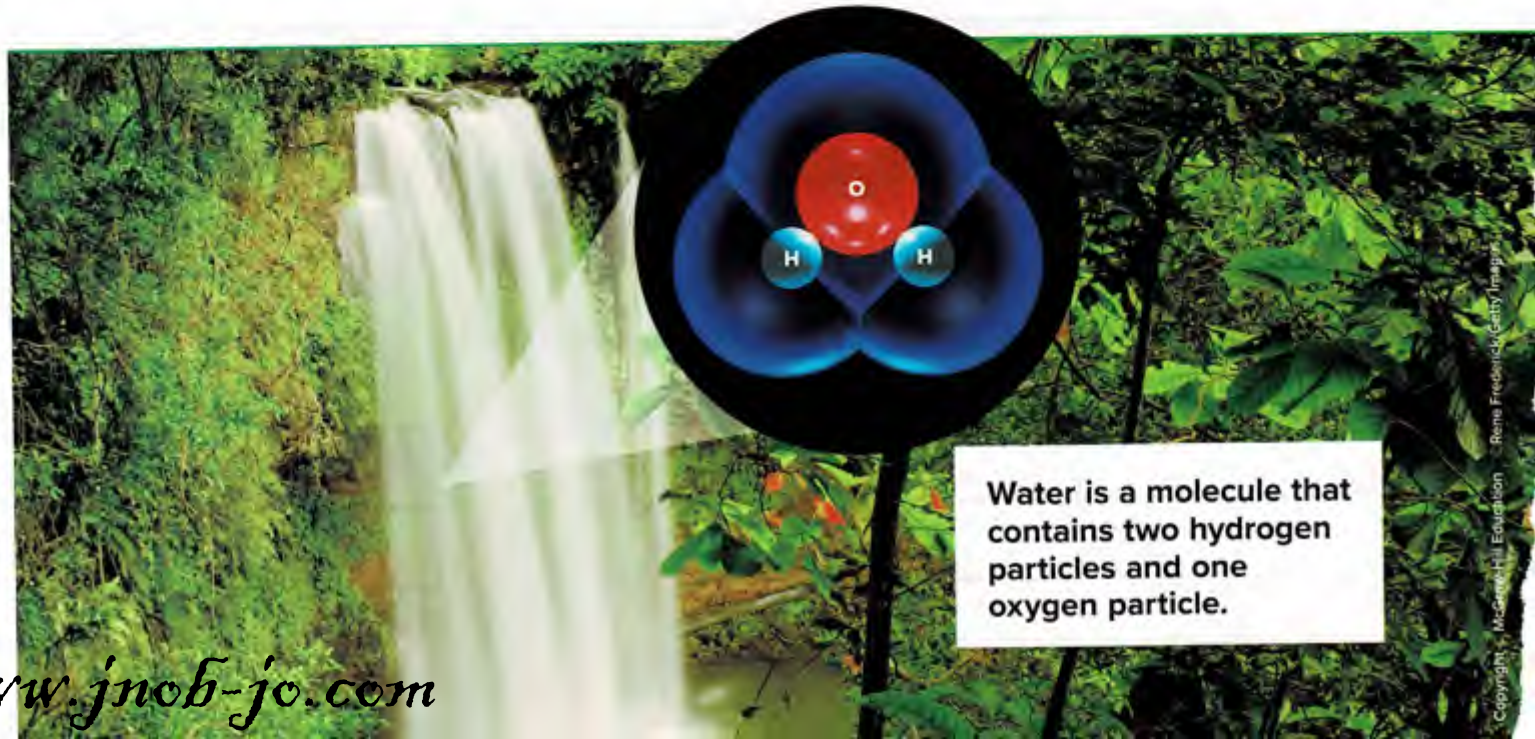
What are some physical properties of water?

Water is an amazing substance! It is used for cooking, cleaning, heating, cooling, and drinking. Water is even used to generate electricity. What makes water so special?

Underline the part of the text that tells what specific particles make up water.

Water has no smell or taste. It is clear and nearly colorless. But water has many unique properties. Water is a molecule. A **molecule** is a particle of matter that is made up of more than one smaller particle joined together. Water is made of two hydrogen particles joined to one oxygen particle. The hydrogen side of the molecule has a positive charge. The oxygen side has a negative charge.

Water can dissolve many substances because its charged sides are attracted to them. This property allows it to carry minerals, nutrients, and chemicals as it moves through soil and our bodies. This property also makes water useful for cleaning.



Water is a molecule that contains two hydrogen particles and one oxygen particle.

Pure water cannot carry electricity. It is an electrical insulator. But, the water that we use every day is not pure. It contains dissolved particles. This makes it an excellent conductor of electricity. It is very dangerous to mix water and electricity.

Sound can also flow through water. Sound flows as the particles of matter collide with each other. The particles in liquid water are closer together than the particles in air and other gases. As a result, sound flows through liquid water faster than it flows through air.

Scientists describe water as cohesive. **Cohesive** means that its molecules are attracted to each other. This creates a "skin" on the surface of water. This skin is called **surface tension**. If an object is spread over the surface, it can rest on this skin even if it would not normally float. Surface tension causes water to form drops. This property also allows water to move through plant roots and through our blood vessels.

Water can dissolve many different substances.

Surface tension allows this insect to walk on water.

Capillary action moves the water up the stem to the flower.

Quick Check

1. Complete this sentence: Because water can _____ substances, it can carry minerals and nutrients throughout our bodies.

How do the properties of water depend on the state of matter?

Water exists on Earth as all three states: solid, liquid, and gas. Water is the only substance to do this.

Ice is solid water. It is a hard, slippery substance. It is clear or white. The particles of ice are close together and have little freedom to move. Ice has a definite shape and volume. If you move ice from one container to another, its shape and volume will not change. The mass stays the same as well.

Liquid water is clear and colorless. Its particles are close together, but they can slide past each other. Liquid water has a definite volume, but not a definite shape. If you pour it from one container into another, it will take the shape of the new container, but its volume will not change. Neither will its mass.

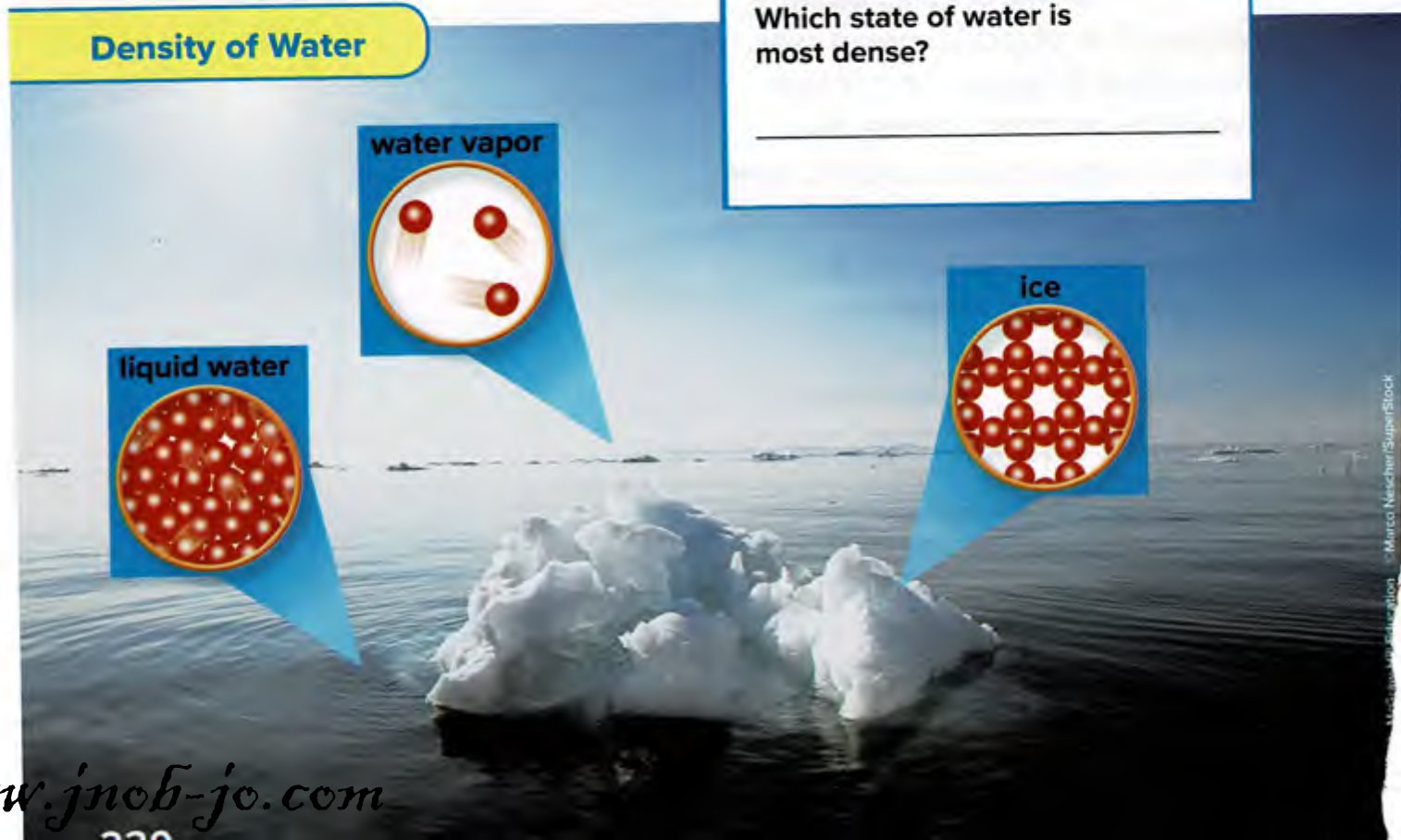
Water vapor is the gaseous form of water. It is also clear and colorless. The particles of water vapor are far apart and move past each other easily. Water vapor has no definite volume or shape. If the container is changed, water vapor expands to fill the new container. Its mass stays the same.

Read a Photo

Which state of water is most dense?

_____

Density of Water



Density of Water

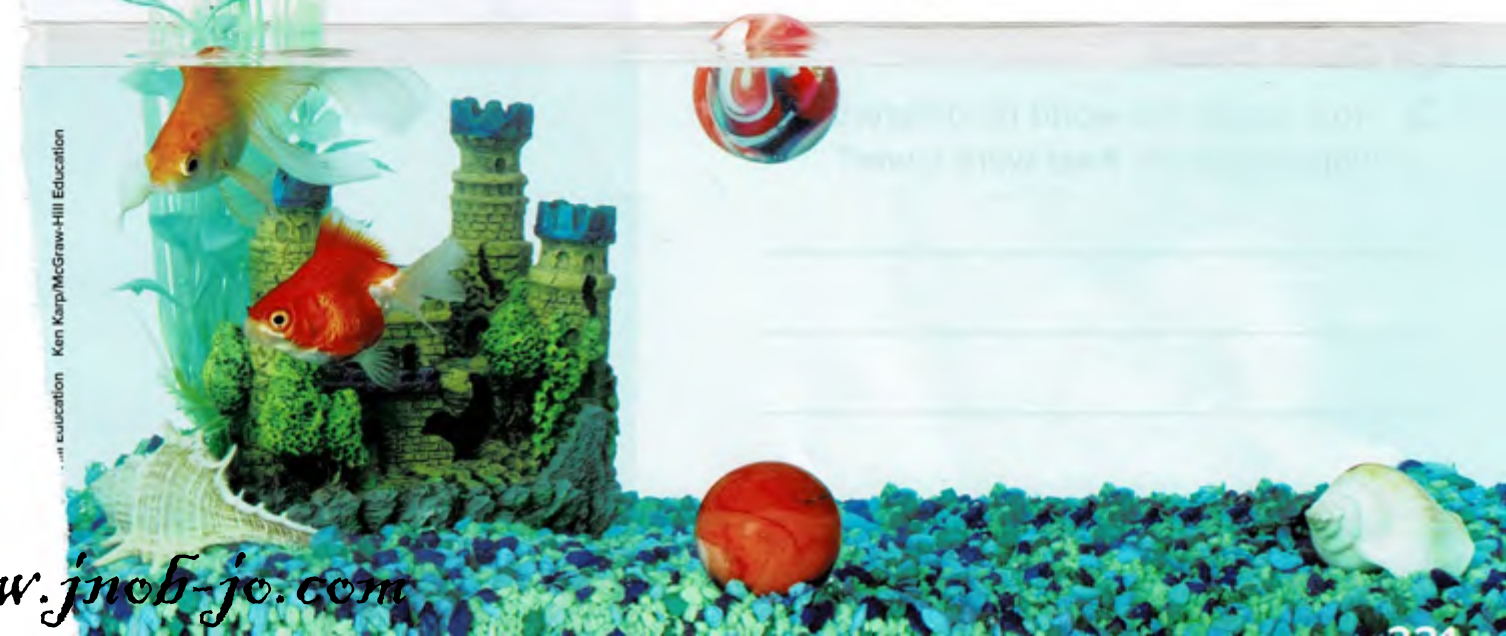
Water is different from other substances because it is less dense as a solid than as a liquid. When water freezes into ice, its particles spread out. The volume increases, but the mass stays the same. As a result, the density decreases. This allows ice to float on water. If it were not for this property of water, lakes would freeze solid from the bottom up.

Quick Check

2. Which properties of water depend on its state?

_____

_____



Objects with a density greater than water will sink. Those with a density less than water will float.

What is the specific heat of water?

Specific heat is the amount of energy needed to raise the temperature of 1 gram of a substance by 1°C. Water has a very high specific heat. It takes a lot of energy to change its temperature. The high specific heat of water is a result of the strong attraction between its molecules.

The high specific heat of water regulates temperatures in bodies of water. Even if the air temperature changes greatly from day to day or from day to night, the water temperature in a lake or ocean will change little. Over time, however, if the air temperature rises or falls, the water temperature will slowly do the same. The organisms living in the water undergo gradual temperature changes.

The high specific heat also regulates temperatures around the globe. Large bodies of water regulate the temperatures nearby. Coastal cities tend to have cooler summers and warmer winters than similar inland cities.

The high specific heat of water protects the organisms living in this lake from rapid swings in temperature.

Quick Check

3. How would the world be different if water's specific heat were lower?

_____

_____

_____

My Notes

Visual Summary

Complete the lesson summary in your own words.

Physical Properties of Water _____

_____

_____

_____

_____

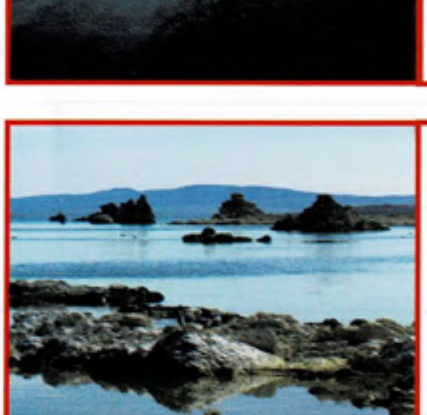
Water's Density _____

_____

_____

_____

_____



Specific Heat of Water _____

_____

_____

_____

_____

Think, Talk, and Write

1 **Vocabulary.** When water is in the form of a gas, it is called

_____

2 **Classify.** Which state of water has both a definite shape and a definite volume?

Definite Shape	Definite Volume
_____	_____

3 **Critical Thinking.** How do the properties of water support life on Earth?

_____

_____

4 **Test Prep.** Which properties of liquid water change when it is poured from a measuring cup into a shallow pan?

A density and shape
B volume and shape
C volume only
D shape only

Essential Question How can you describe the physical properties of water?

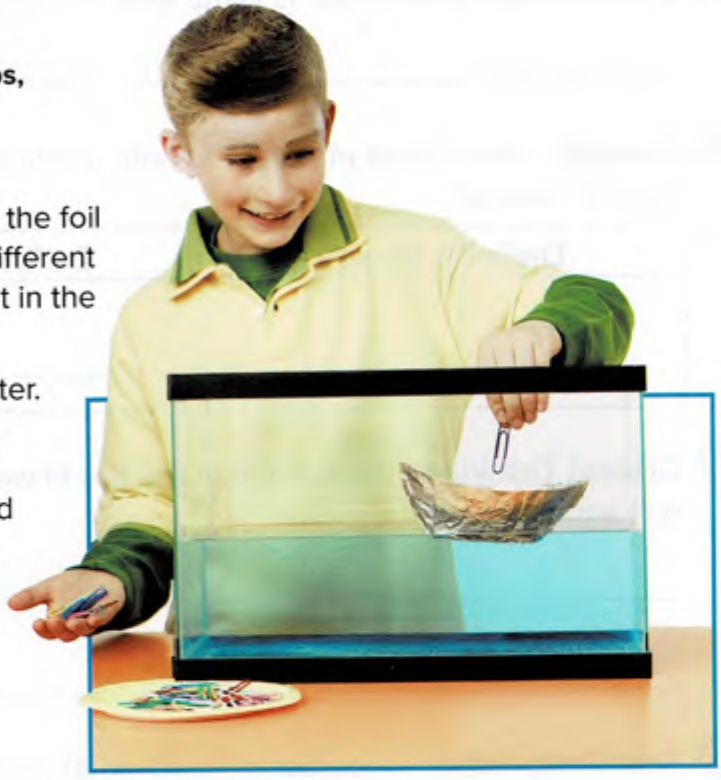
_____

_____

Focus on Skills

Try It

Materials **aluminum foil, paper clips, tank of water**



1. Take a sheet of aluminum foil. Use the foil to make a boat. Experiment with different designs. Draw a picture of the boat in the chart below.
2. Float the boat in a large pan of water. Place the paper clips into the boat and record what happens. How many paper clips can the boat hold before it completely sinks? Try to **infer** why the boat is sinking.

	Picture	Number of clips	How did it work?
Boat 1			
Boat 2			
Boat 3			
Boat 4			

Apply It

1. Record the data and the results from two other students in your chart.
2. Now it is time to analyze your data. Do you notice any pattern between the design of the boat and the number of paper clips?

3. As a class, design a boat that would carry the most paper clips possible. Use a final piece of aluminum foil to make the boat, and record how many paper clips it can hold. Did this boat hold more paper clips than the others?

4. Think about all the models you have seen. Did the ones that held more paper clips have anything in common? What was happening as more paper clips were added to the boat? Use your observations to **infer** what makes an object float. Communicate your opinions by writing down your conclusions.

CHAPTER 6 Review

Visual Summary

Summarize each lesson in your own words.

Lesson 1 _____

Lesson 2 _____

Lesson 3 _____

Vocabulary

Fill each blank with the best term from the list.

density	molecule
gravity	property
matter	water vapor
mass	weight

1. Anything that has mass and takes up space is _____.
2. The measure of gravity's pull between an object and a planet is _____.
3. The gaseous form of water is called _____.
4. Color is an example of a(n) _____ of matter.
5. To calculate an object's _____ you divide its mass by its volume.
6. A _____ is a particle of matter that is made up of more than one smaller particles joined together.
7. The amount of matter making up an object is an object's _____.
8. The pull between objects is called _____.

CHAPTER 6 Review

Skills and Concepts

Answer each of the following in complete sentences.

9. Main Idea and Details. Describe the physical properties of water.

10. Measure. You want to know the area of a sheet of paper. What would you measure? How would you calculate the area?

11. Critical Thinking How can two items of the same shape and size have different densities?

12. Descriptive Writing. Describe the properties of copper.

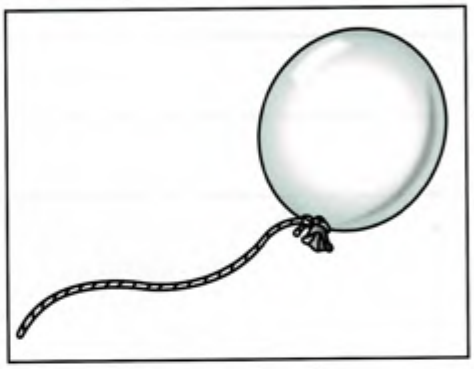
The Big Idea

13. What are the properties of matter?

Test Prep

Circle the best answer for each question.

1. **How can you measure the volume of the gas inside this balloon?**



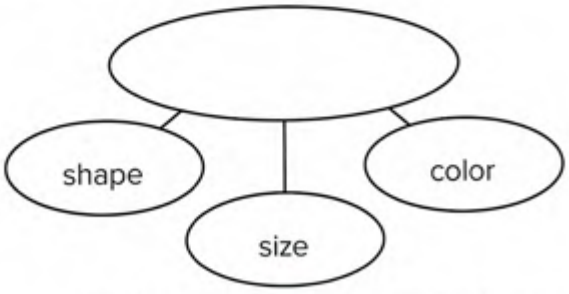
A Submerge the balloon in water. Subtract the original water level from the new water level.

B Measure the length and width of the balloon. Multiply the two numbers.

C Empty the contents of the balloon into a beaker. Record the volume.

D The volume cannot be measured.

2. **Study the diagram below.**



Which of these belongs in the blank oval?

A buoyancy

B properties of matter

C volume

D units of measurement

3. **Which unit would be used to measure the length of your desk?**

A meters

B grams

C centimeters

D g/cm^3

4. **The amount of gravity between an object and a planet is**

A volume.

B length.

C weight.

D mass.

5. **Study the table below.**

Liquid	Solid	Solid
coffee	water vapor	book
milk	helium	desk
juice	shoe	paper

Which word is in the wrong column?

A coffee

B milk

C desk

D shoe

6. Which of the following is a metric unit of measurement?

A meter
B mass
C weight
D color

7. An object's ability to float depends on its

A length.
B density.
C volume.
D weight.

8. The laboratory equipment below would be used to measure

A volume.
B mass.
C weight.
D length.

9. Mass is the measure of the

A amount of matter making up an object.
B weight of an object.
C space an object takes up.
D density of an object.

10. Matter is anything that has

A mass and volume.
B mass and buoyancy.
C volume and buoyancy.
D weight and buoyancy.

11. Choose an item that is an example of matter. List all the properties you can to describe it. Describe how you would measure each property you listed.

_____

_____

_____

12. Complete the chart below.

State of Matter	Property	Example
gas	does not have a definite shape or volume	A.
solid	B.	pencil
C.	has a definite volume, but no definite shape	oil

CHAPTER 7

Matter and Its Changes

How can matter change?

_____

_____

_____

_____

_____

Vocabulary

physical change a change that begins and ends with the same type of matter

chemical change a change in which a new kind of matter is produced

change of state a physical change in which one state of matter changes to another

mixture two or more types of matter that are combined but keep their original properties

water cycle the movement of water between Earth's surface and the air

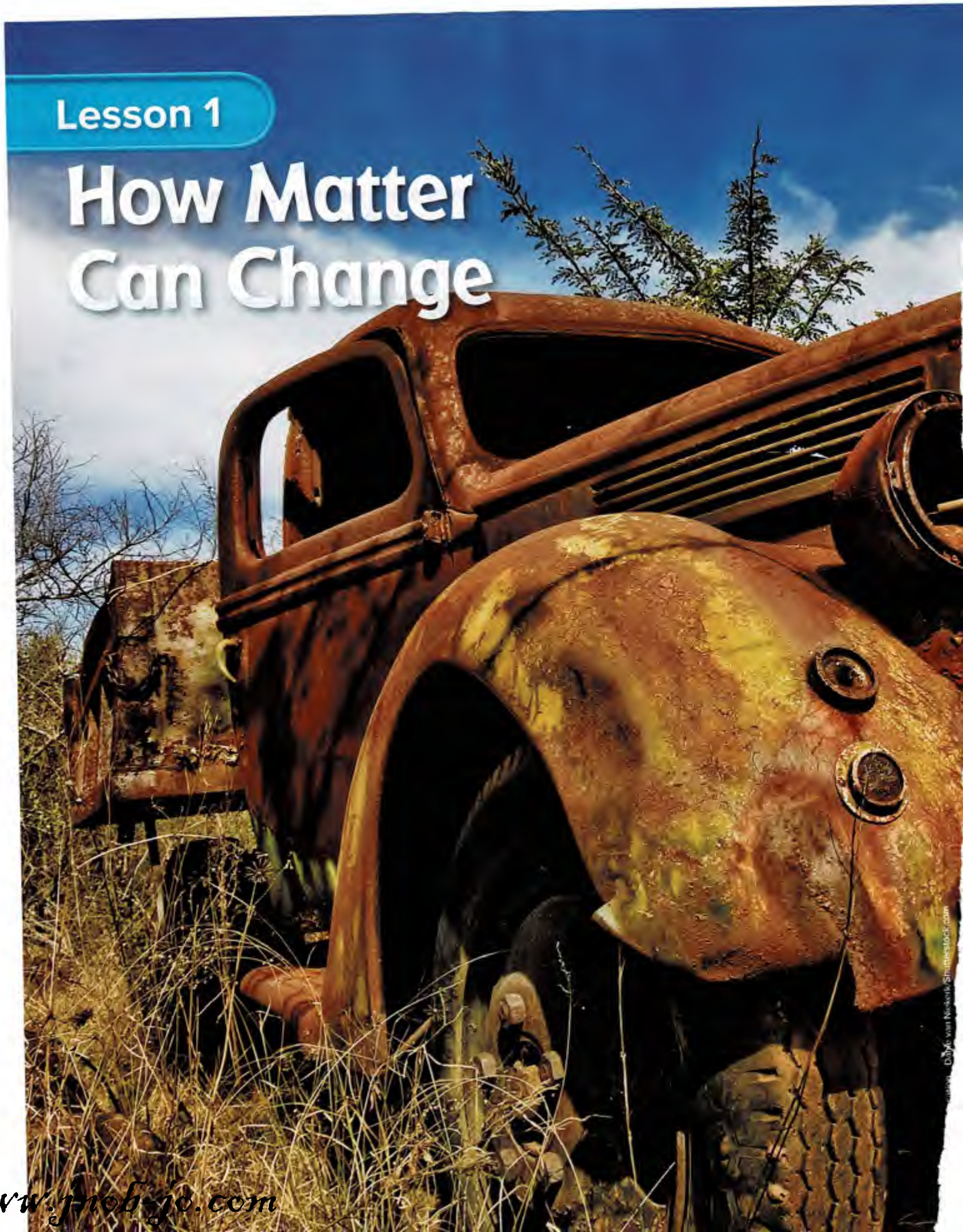
solution a mixture in which one or more types of matter are mixed evenly in another kind of matter

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.

Matter		
What We **K**now	What We **W**ant to Know	What We **L**earned

Lesson 1

How Matter Can Change



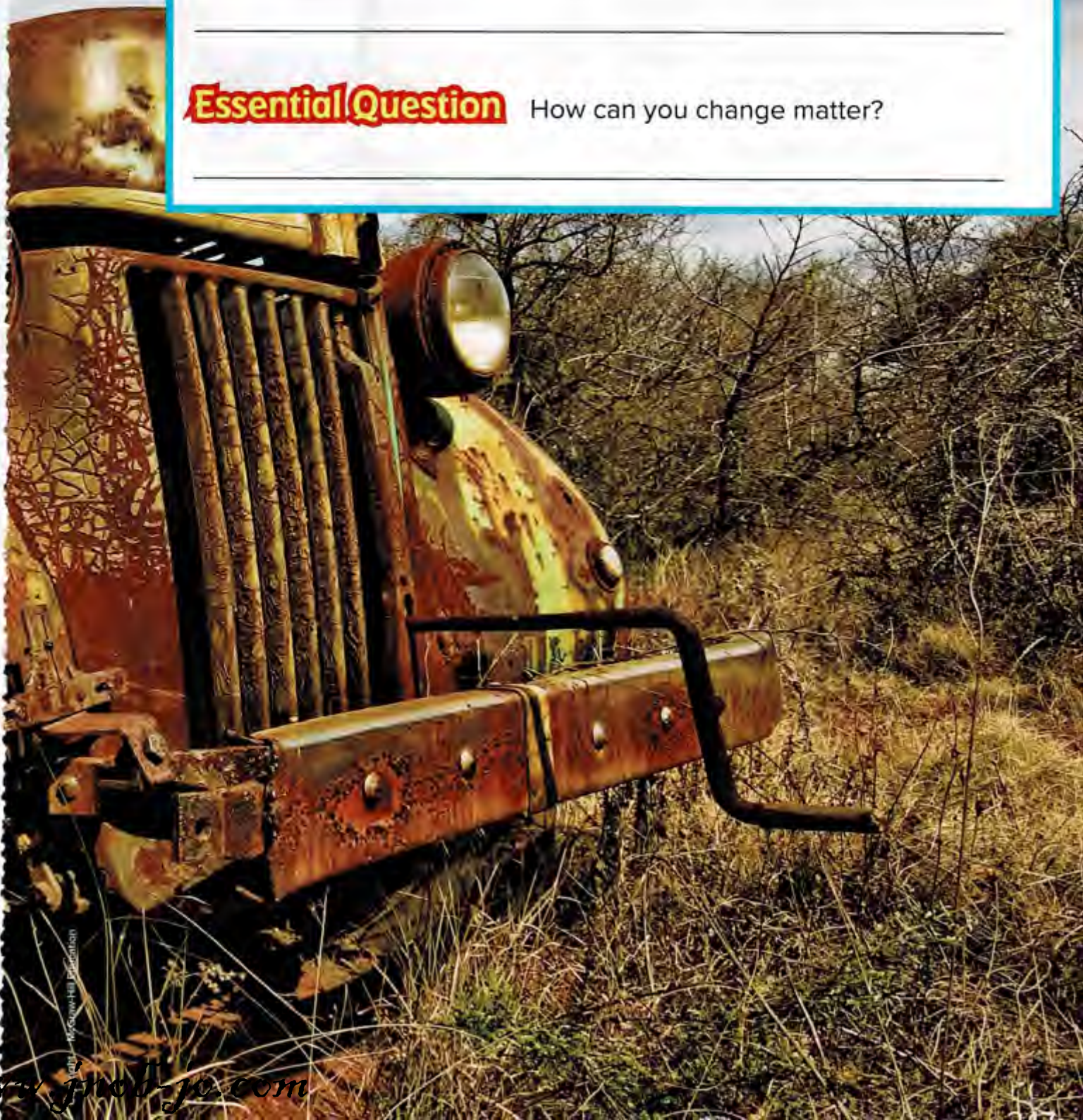
Look and Wonder

This car looks very different from when it was first made. It once had a smooth coat of paint. Now the outside is brittle and brown. What caused the properties of the car to change?

_____

Essential Question How can you change matter?

_____



Explore

What happens when ice melts?

Form a Hypothesis

What happens to the temperature of a cup of ice cubes and water as the ice melts? Write your answer in the form "If a cup of ice and water is steadily warmed, then the temperature of the ice water will..."

_____

_____

Test Your Prediction

1. **Measure.** Half-fill a cup with cool water, and add four ice cubes.

2. Record the mass of the cup of ice water. Do you think the mass will change as the water warms?

_____

_____

3. **Observe.** Swirl the ice and water gently for 15 seconds. Record the temperature of the ice water. Next, place the cup under a lamp.

_____

4. Repeat step 3 every 3 minutes until you have 5 readings after the ice has fully melted.

Temperature Reading 1. _____

Temperature Reading 2. _____

Temperature Reading 3. _____

Temperature Reading 4. _____

Temperature Reading 5. _____

5. Record the mass of the cup of water again.

Materials

- plastic or paper cup
- cool water
- ice cubes
- balance with set of masses
- watch or clock
- thermometer
- lamp

Draw Conclusions

6 Use your data to make a graph of the temperature of water versus time.

7 **Interpret Data.** Describe the temperature and the mass of the ice water as the ice melted.

8 **Communicate.** Did your observations support your prediction? Write a report that describes whether your prediction was correct.

Explore More

How would the temperature of water change with time as it freezes? Write a hypothesis and design an experiment to test it. Conduct your experiment, and report your findings.

Read and Respond

What are physical changes?

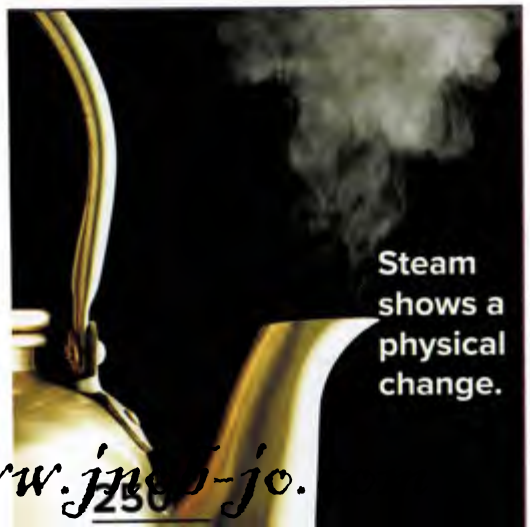
When you flatten a piece of clay or cut it in half, you cause a physical change. A **physical change** begins and ends with the same type of matter. Even though the clay has a different shape, it is still clay. You can cut, crush, tear, bend, or stretch matter. Each action will cause a physical change.

Knitting causes a physical change. The yarn changes shape.

After a physical change, the physical properties of the matter change. However, the matter is still the same substance. For example, an ice cube is solid water. If the ice cube warms, it melts. Now it is liquid water. If you pour that water into a kettle and heat it, you get steam. Steam is water in the form of a gas. Physical changes can be caused by wind, rain, freezing, and heating.

People use physical changes to create useful products. For example, plastic, metal, and glass can be cut and molded into useful shapes. Rock can be sculpted. You will learn about many other ways matter can change throughout this chapter.

Underline the text that describes the physical change from a solid to a gas.



Steam shows a physical change.

Folding paper is a physical change.

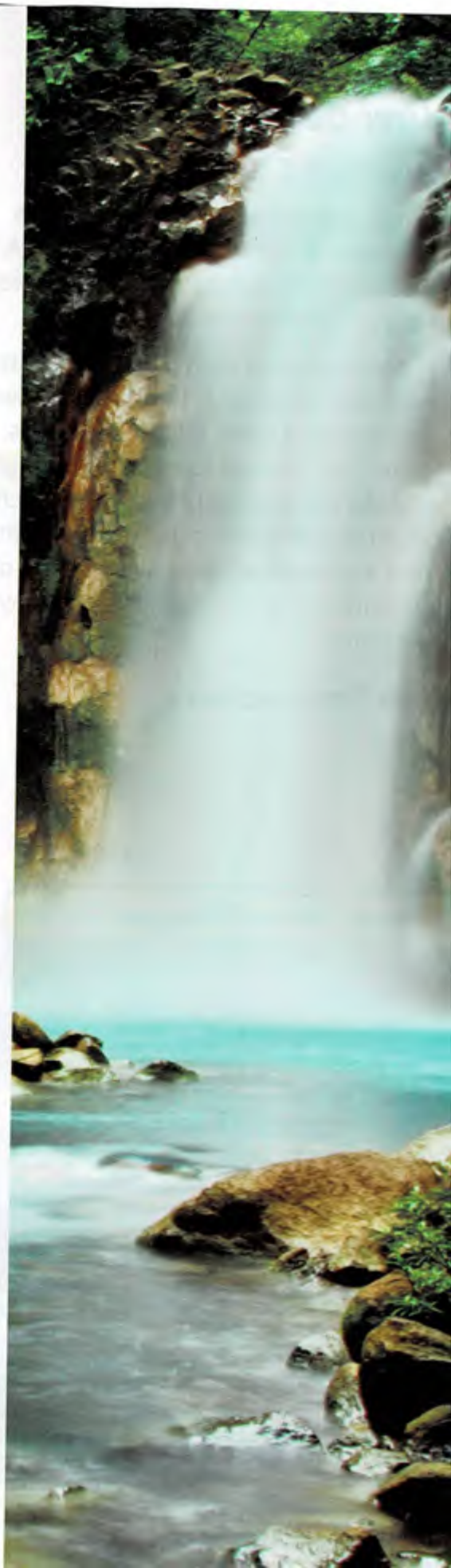
Real-World Changes

How can you tell whether a physical change has taken place? Look for a change in size, shape, or position.

Physical changes happen around you all the time. The sidewalks in your town or city are made of concrete. When the concrete is new, it is one solid piece. In time, chips and cracks form. Small pieces of concrete break off. Wind and rain carry the pieces away. Cracking and breaking are physical changes in the sidewalks.

Water's physical changes allow fish and other organisms to survive in a pond during winter. In winter the surface of lakes and ponds can become solid ice. Beneath the ice the water is still a liquid. How is this possible?

Not all liquids have this property. Unlike most other liquids, water expands when it freezes. That means ice is less dense than liquid water. This is why ice floats in liquid water.



Quick Check

1. What happens when ice turns to liquid water?

How does matter change state?

You know that matter can exist in three states—solid, liquid, and gas. A pair of scissors is a solid. The air you breathe is a gas. Juice and milk are liquids.

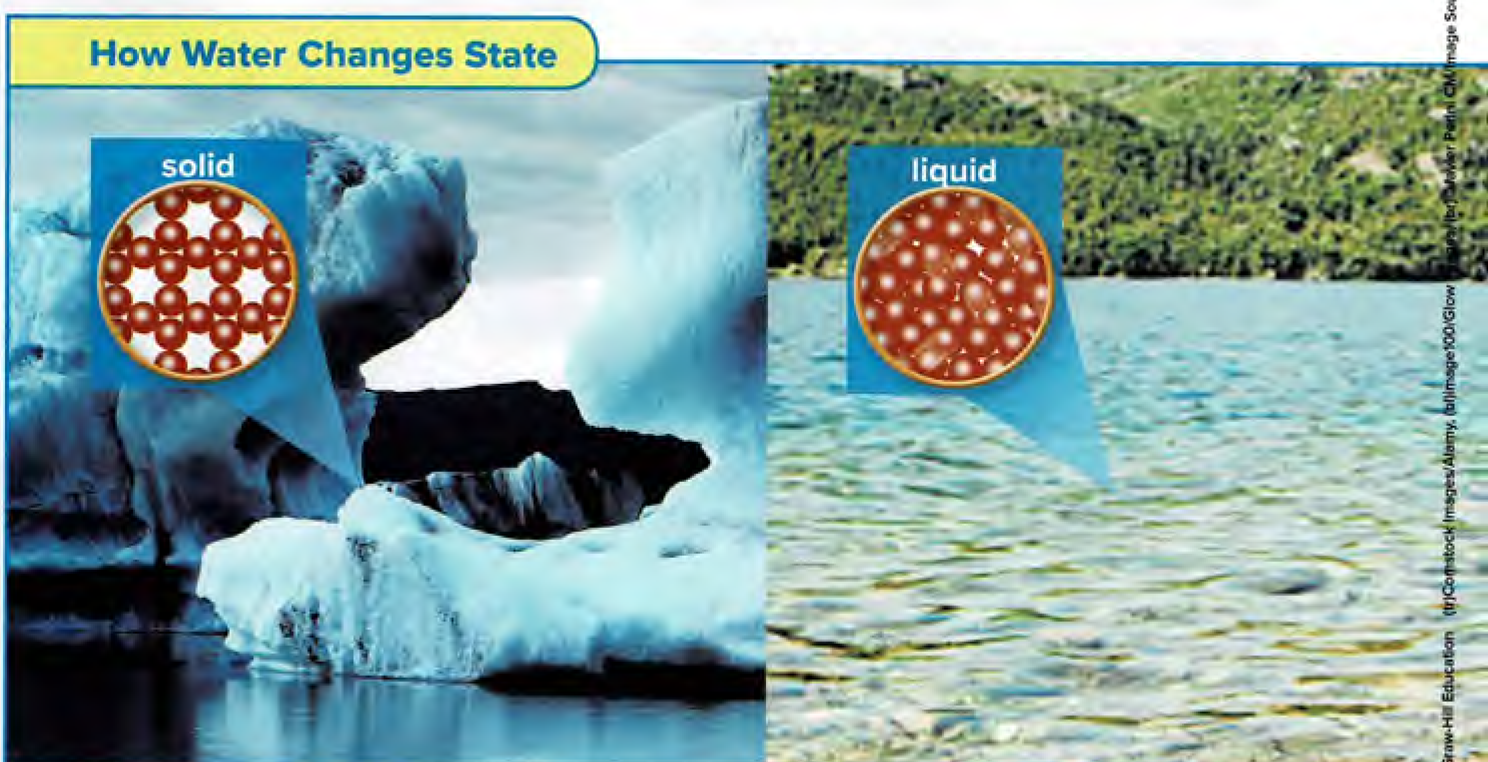
Most types of matter can exist in more than one state. For example, water can exist as a solid, a liquid, or a gas. Matter can change its state. A **change of state** is a physical change in which one state of matter changes to another. After a change of state, the volume of a substance may change. Its mass stays the same.

The Troposphere

If you add energy to a solid by heating it, its particles move faster. If the particles gain enough energy, the solid changes to a liquid. *Melting* is a change of state from a solid to a liquid.

If you add energy to a liquid, it can change to a gas. *Boiling* is a rapid change of state from a liquid to a gas. Boiling is not the only way a liquid can become a gas.

Dew is water that changed state from a gas to a liquid.



Ice melts when energy is added. The particles move faster.

As energy is added to liquid water, the particles move faster. Some turn to gas.

Evaporation is the change of a liquid to a gas without boiling. The Sun's energy causes water in lakes, rivers, and oceans to evaporate.

Cooling

When you take away energy from any substance, its particles move more slowly. The substance cools and its particles move closer together. This is how a gas changes, or *condenses,* to a liquid.

If enough energy is taken away, a liquid *freezes* into a solid. Water particles move closer together until about 4°C. Then they start to move apart. Particles of other kinds of matter continue to move closer together as they freeze.

Quick Check

2. What happens as water changes from a liquid to a gas?

Water vapor is a gas. Its particles move very fast.

Read a Diagram

What happens when energy is added to ice? To liquid water?

Where does water go?

By now you know a lot about water. You know that water can be found in many places. You know it has three different states.

Water is always moving from place to place, in one form or another. The **water cycle** is the movement of water between Earth's surface and the air. Evaporation, condensation, and precipitation help water move through the cycle. The diagram shows you how.

In the water cycle, water changes state among liquid, gas, and solid. The Sun is the energy source for this cycle. The Sun's energy causes water to evaporate from lakes, oceans, and other bodies of water. Water also evaporates from the leaves of plants. This is called *transpiration*. As it rises in the air, the water vapor cools. As it cools, it condenses into water droplets. The water droplets gather with dust particles and form clouds.

Quick Check

3. How does the Sun's energy affect Earth's weather?

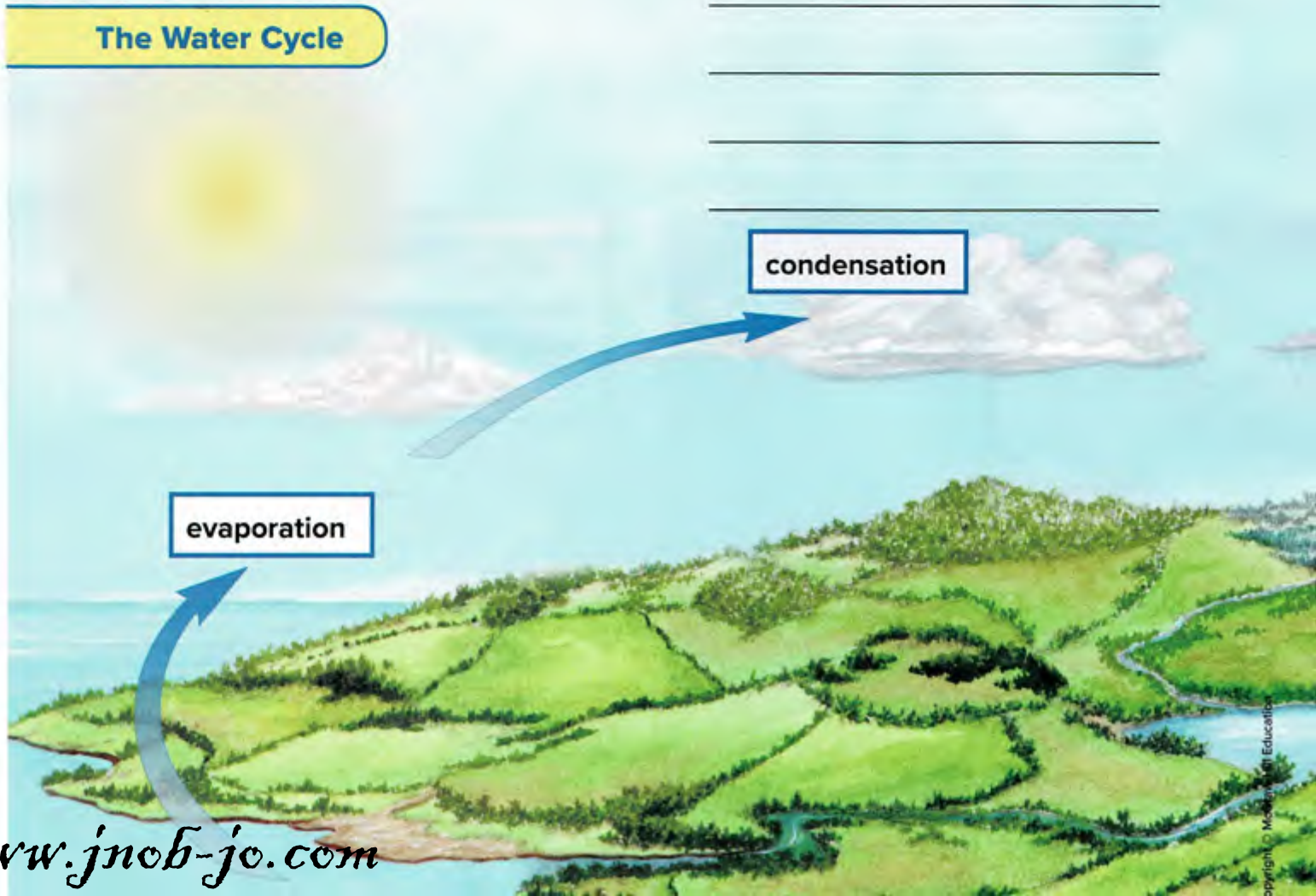
_____

_____

_____

_____

The Water Cycle

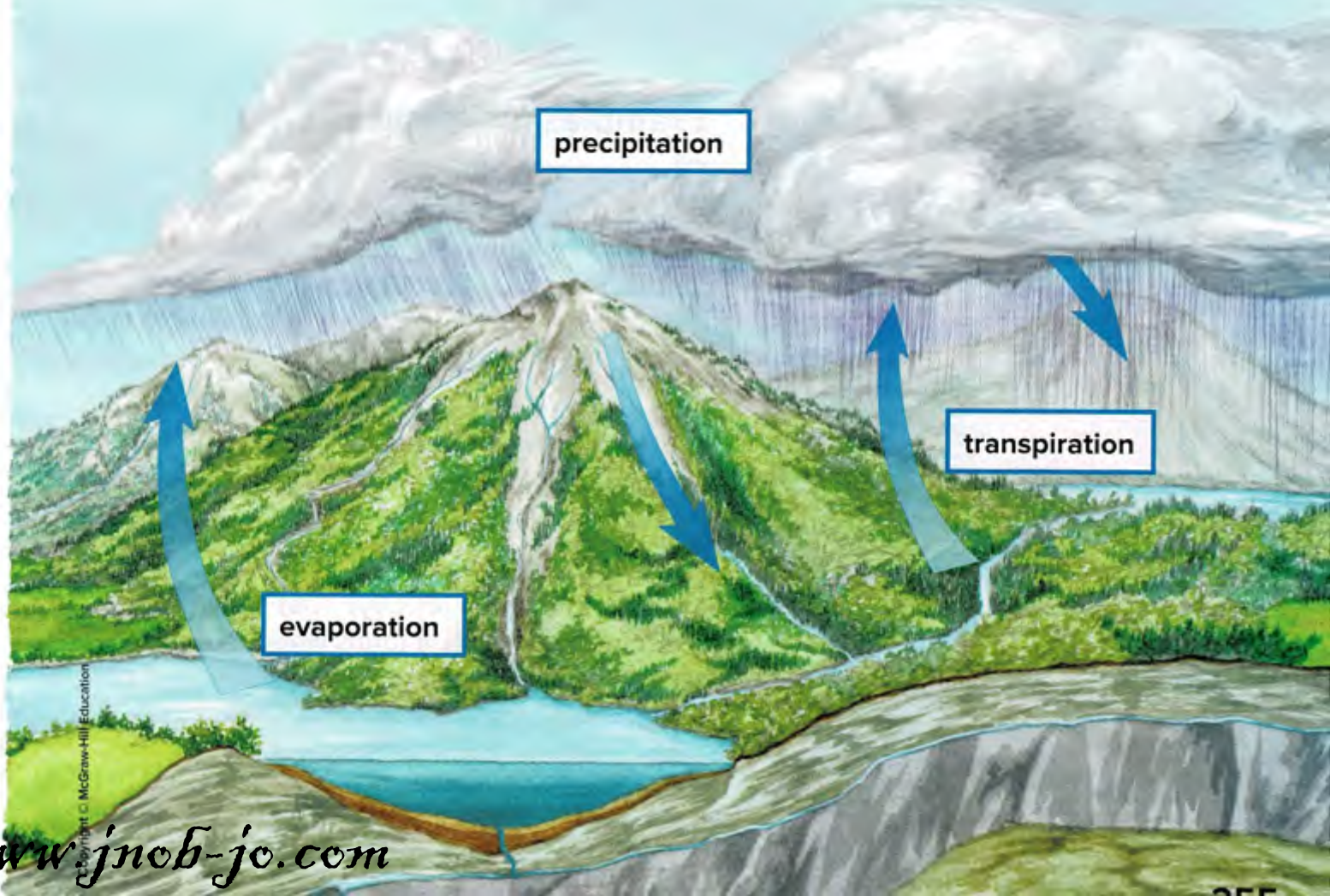


In time, the condensed water may become too heavy and drop out of the clouds as **precipitation** Precipitation can fall as rain, snow, sleet, or hail.

The water cycle continues as precipitation falls back to the surface of Earth. Some of the water that falls as precipitation collects on land and flows downhill. Precipitation that flows across the land's surface and is not absorbed will flow into rivers, lakes, and streams. Most of the water will flow from rivers into the ocean. The cycle begins again. Water is always moving and recycling.

Read a Diagram

Describe one path through the water cycle.



What are chemical changes?

Most bicycle frames contain iron. If you leave a bicycle outside for too long, the frame might rust. **Rust** is a solid, brown substance. It forms when iron gets wet and reacts with oxygen in the air. Rust is neither iron nor oxygen, though it contains both of these elements.

The change from iron to rust is a chemical change. A **chemical change** begins with one kind of matter and ends with another. A chemical change is also known as a chemical reaction.

All chemical reactions either give off energy or use energy. Chemical reactions may give off heat, light, or electricity.

Gas bubbles are evidence of a chemical change. ▼

Quick Check

4. Explain how tarnish forms on silver. How is it removed?

Examples of Chemical Changes

When we cook food, we change the color, taste, and texture of food. Cooking and baking cause chemical changes in food.

Some chemical changes produce gases. When vinegar is mixed with baking soda, carbon dioxide gas is released. You can tell by the bubbles that form.

Have you ever noticed a black substance on silver jewelry? That substance is **tarnish**. It forms when silver reacts with sulfur in the air. If you use polish on the areas of tarnish, you cause another chemical change. The silver gets shiny again!

Signs of a Chemical Change

If you know what to look for, you will find evidence of chemical changes all around you. The most visible sign is a change in color. Rust and tarnish are good examples.

A change in scent is another sign of a chemical change. Have you ever grilled food over a fire? While your food is grilling, it gives off a pleasant smell. If it burns, the odor is less pleasant.

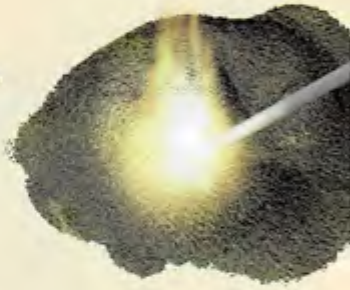
If you see bubbling or hear fizzing, a chemical change may have occurred. These signs indicate the release of a gas. For example, dropping antacid tablets into water will release lots of fizzy bubbles.

Many reactions cause the matter involved to become warm or hot. Others cause the matter to become cold. Some reactions even give off light. Fire is a chemical reaction that gives off light and heat.

Reaction of Iron and Sulfur

1. Iron and sulfur are mixed together. Iron is a gray metal. It is also magnetic. Sulfur is a yellow powder.

2. A metal rod is heated to a high temperature.



3. The heated rod causes a chemical change. Light and heat are released.

4. The result is iron sulfide—a black, nonmagnetic material.

Read a Diagram

How is iron sulfide different from the iron and sulfur that formed it?

Physical Changes

As water vapor cools, it condenses into clouds. When enough drops condense in the cloud, they fall as rain.

outside ▲

The particles of sweat carry away energy as they evaporate, leaving you cooler.

in your body ▲

Moist dough is easy to stretch. It can be pulled apart, braided, or shaped into rolls.

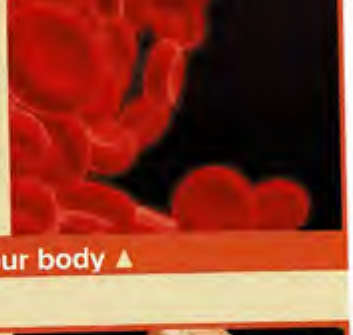
in the kitchen ▲

Chemical Changes

Some rain falls as acid rain. Acid rain reacts with limestone. It eats away at rock, buildings, and statues.

outside ▲

Blood carries oxygen to your cells. In the cell, the oxygen reacts with sugars. This releases energy for your body to use.



in your body ▲

In the presence of heat, the moist dough hardens. Baking changes it into crusty bread.

in the kitchen ▲

What are other real-world changes?

Changes take place around you all the time. What kinds of physical and chemical changes affect you and your environment? The chart shows some examples. Can you think of other cases of physical and chemical changes?

Quick Check

5. Describe the physical and chemical changes that happen when making bread.

My Notes

Visual Summary

Complete the lesson summary in your own words.

Physical Changes _____

_____

_____

_____

_____

Change of State _____

_____

_____

_____

_____

Chemical Changes _____

_____

_____

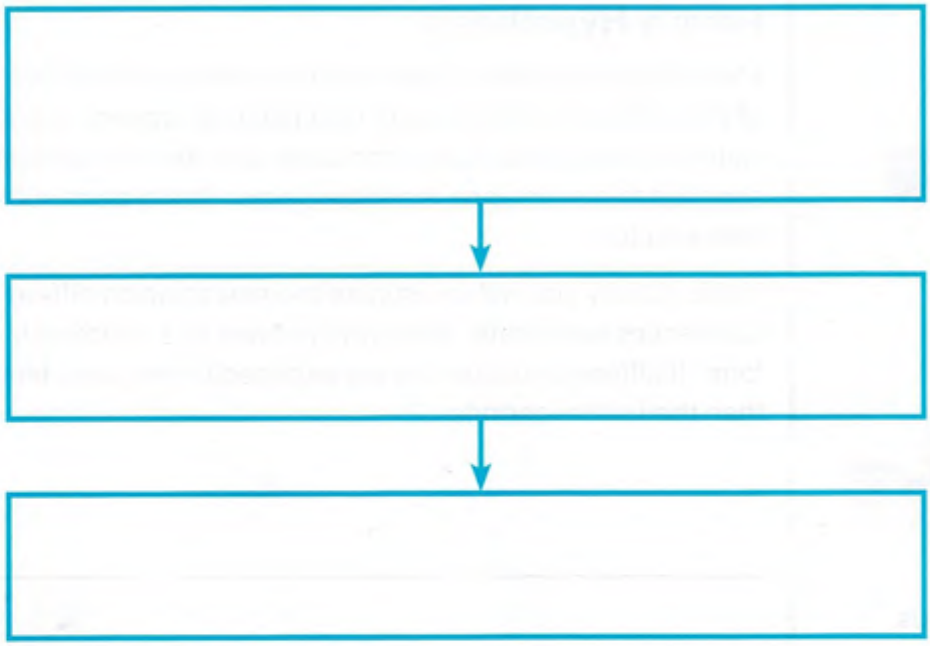
_____

_____

Think, Talk, and Write

1 **Vocabulary.** The change of a liquid to a gas without boiling is called _____.

2 **Sequence.** To build a campfire, wood must be gathered, dried, and cut into small pieces. Which changes are physical? Which are chemical?



3 **Critical Thinking.** What change could you make to a sheet of paper to illustrate a physical change? A chemical change?

_____

_____

4 **Test Prep.** Clouds form when water

A condenses.
B evaporates.
C precipitates.
D transpires.

Essential Question How can you change matter?

_____

_____

_____

_____

Be a Scientist

Materials

goggles

wax paper

assorted liquids

droppers

stopwatch

crayon

Structured Inquiry

What factors affect the rate at which substances evaporate?

Form a Hypothesis

Many factors determine how fast a substance evaporates. One of these factors is the amount of substance present. A drop of water will evaporate faster than a liter of water. The amount of heat supplied to a substance is another factor. The type of substance is also a factor.

In this activity you will investigate the rate at which different substances evaporate. Write your answer as a hypothesis in the form "If different substances are exposed to the same temperature, then they will evaporate...."

_____

_____

_____

Test Your Hypothesis

1. **Observe.** Look at the liquids you will be testing. Which liquids do you think will take the longest time to evaporate?

_____

2. Place a square of wax paper in front of a window. Using the crayon, write the names of the liquids you will be testing (water, salt water, rubbing alcohol, milk, vinegar, ammonia) on different sections of the wax paper.

Step 2

3 **Measure.** ⚠ **Be Careful.** Using the dropper, place one drop of each liquid in the appropriate area on the wax paper.

4 **Use Variables.** Using the stopwatch, record the amount of time it takes each drop to completely evaporate. If a drop takes longer than 5 minutes to evaporate, record >5 minutes.

Evaporation Rates	Liquid	Time Measured

Draw Conclusions

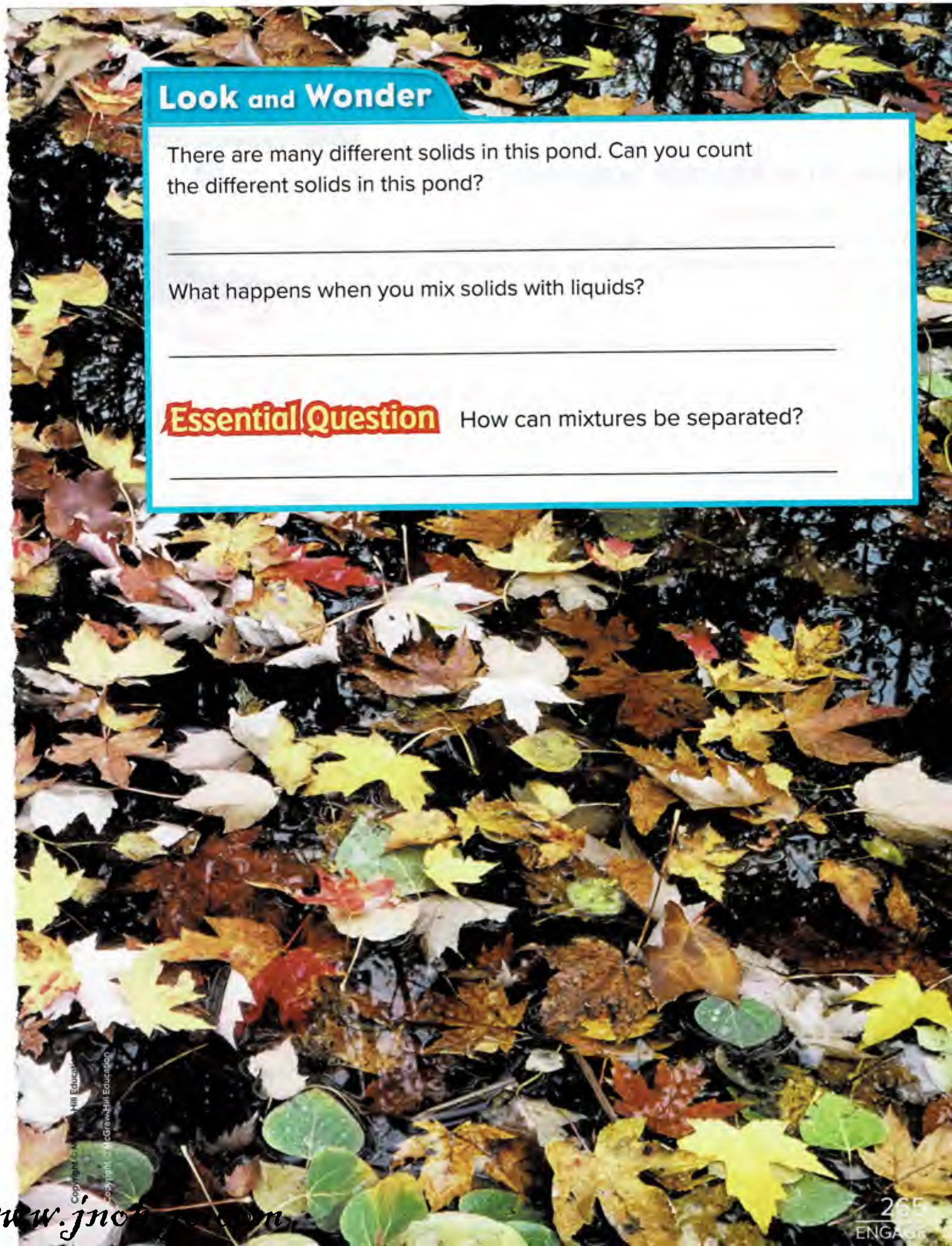
5 **Interpret Data.** Did your data support your hypothesis? Which liquid took the shortest amount of time to evaporate? Which liquids were slow to evaporate?

6 **Infer.** Why did some liquids take less time to evaporate than others?

7 Using the Internet or other resources, find what properties of water, ammonia, and alcohol allow them to evaporate at different rates.

Lesson 2

Mixtures



Look and Wonder

There are many different solids in this pond. Can you count the different solids in this pond?

_____

What happens when you mix solids with liquids?

_____

Essential Question How can mixtures be separated?

_____

Explore

How do solids and water mix?

Form a Hypothesis

What will happen when you mix salt into water? What about oil and water? Sugar and water? A wooden block and water? Make your predictions.

_____

_____

_____

Test Your Prediction

1. Label the cups *salt*, *oil*, *sugar*, and *wooden block*.

2. **Measure.** Pour 100 milliliters of water into each cup. Add one spoonful of salt to the cup marked *salt*. Stir well. Add one spoonful of sugar to the cup marked *sugar*. Stir well. Place several drops of oil in the cup marked *oil*. Stir well.

3. Add a wooden block to the cup marked *wooden block*.

4. Observe Study the contents of the cups carefully. What happened to each material? Record your observations.

_____

_____

Materials

- 4 clear cups
- marker
- measuring cup
- water
- plastic spoon
- salt
- sugar
- oil
- wooden block

Draw Conclusions

5 **Communicate.** Describe the similarities and differences you observed after the four solids were mixed with water. Were your predictions correct?

Explore More

Would you get the same results if the temperature of the water were higher or lower? Write a prediction that you could test.

Read and Respond

Mixtures

Kinds of Mixtures

solids and solids

solids and gases

What is a mixture?

Did you ever make a salad? If you did, then you know how to make a mixture. A **mixture** is a physical combination of two or more kinds of matter. Mixtures are physical changes. They can be separated by physical means.

Everyday Mixtures

A salad is usually a mixture of lettuce, tomatoes, and other foods. The foods that go into a salad might be chopped up. However, they are still the same kinds of food.

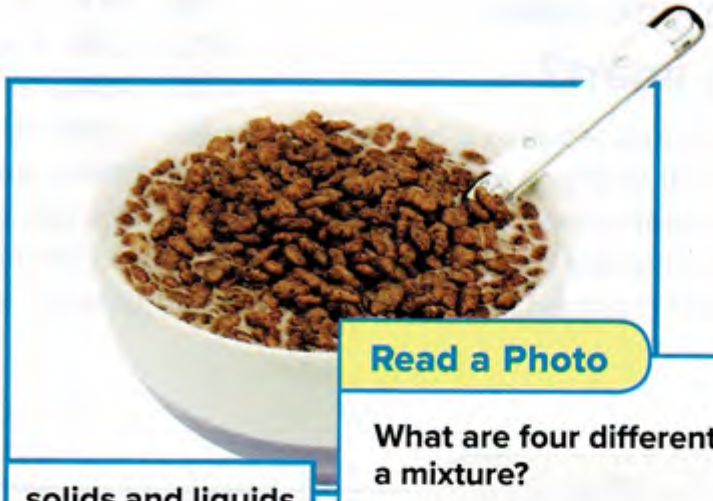
You probably see mixtures every day. Some breakfast cereals are mixtures of solids. If you add milk, you get a mixture of solids and a liquid. Many products, such as food, drinks, and clothing, are made from mixing different kinds of matter.

Lemonade is a solution of water, lemon juice, and sugar.

Solutions Are Mixtures

Some solids mix easily with liquids. If you mix salt into water, the salt will break up. Salt water is a solution. A **solution** is a mixture in which two or more substances are blended completely.

liquids and liquids



solids and liquids

Read a Photo

What are four different ways to make a mixture?

Solution Limits

When there is just a little sugar in water, it is called a dilute sugar solution. This water is not very sweet. Adding more sugar makes the solution more concentrated and also sweeter. Could you dissolve more and more sugar and concentrate the solution without limit? No, after a certain amount, additional sugar will not dissolve. You could stir, but the added sugar would just settle undissolved to the bottom.

Solutions are formed when solvents, such as water, dissolve solutes by pulling apart their particles.

Quick Check

1. How are solutions and mixtures related?

How can you take mixtures apart?

Making mixtures requires a physical change. Physical changes are also needed to separate mixtures. Parts of a mixture with different properties act differently when changed in the same way.

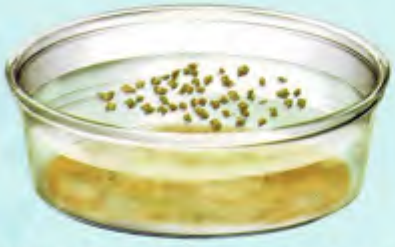
You can use a physical change to push, pull, lift, or otherwise separate one part of a mixture from another. Density, solubility, particle size, magnetism, melting points, and boiling points are all good properties to use when separating mixtures. How can you separate a mixture of water and sand?

Separating Mixtures

Dissolving sugar in water separates it from sand. Filtering and evaporating the water recovers the sugar.

Sand particles cannot pass through the pores in the filter, but water particles can easily.

Iron is attracted to a magnet, but sand is nonmagnetic.



In water, the low-density sawdust floats while the high-density sand sinks.

Read a Diagram

What properties are shown in this diagram that help separate sand and water?

_____

Distilling Water

Separating Liquids

What if you need to separate two liquids? If the two liquids had different boiling points, you could use distillation. **Distillation** is the process of separating liquids by using evaporation and condensation.

You can also separate liquids, or the particles in liquids, using *chromatography*. In this process, a liquid travels up special chromatography paper and carries small substances with it. The substances in the liquid travel at different speeds up the paper. Bands of color appear on the paper as the substances separate.

Quick Check

2. Two liquids boil at about the same temperature. Would it be easy to separate them by distillation? Why or why not?

How are mixtures used?

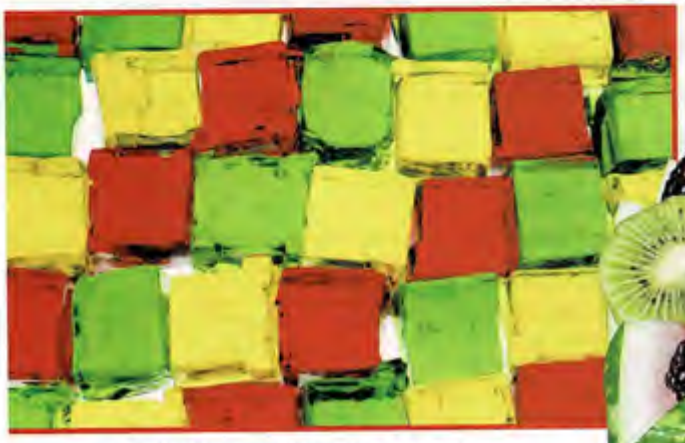
You probably eat mixtures every day. Many drinks are solutions with sugar or other particles dissolved in them. Cheese, low-fat milk, whipped cream, gelatin, and marshmallows are also mixtures.

After you get done eating, you'll probably have to clean up. Most cleaning supplies are mixtures, too. Solutions of ammonia are used to clean windows, countertops, and much more. If you cannot clean it up, you may need to cover the mess with another mixture—paint.

Some of the most important mixtures we use are mixtures of metals. Melted metals are mixed together then cooled to make an ***alloy***. Sometimes when mixed into alloys, the properties of metals seem to blend together. For example, pure copper is soft and flexible and pure zinc is hard and brittle. Brass, an alloy of copper and zinc, is hard but still flexible. It is used to make musical instruments.

Stainless steel is a strong alloy that does not rust.

Iron can be alloyed with carbon, nickel, chromium, and other metals to make steel. Steel is strong and flexible. It is used in nails, cars, silverware, paper clips, spaceships, and much more. By changing the amount of iron and other metals, you can make different kinds of steel. Stainless steel has a lot of chromium and does not easily rust when wet.



Gelatin and fruit salad are both mixtures.

My Notes

Visual Summary

Complete the lesson summary in your own words.

Mixtures _____

_____

_____

_____

_____

Separating Mixtures _____

_____

_____

_____

_____

Separating liquids _____

_____

_____

_____

_____

Think, Talk, and Write

1 **Vocabulary.** To collect the evaporated water from a solution of salt water, you would use _____.

2 **Classify.** Classify the following as mixtures or solutions—vegetable soup, salt water, bronze, smoke, apple juice and water, oil and water, trail mix.

Mixtures	Solutions

3 **Critical Thinking.** Blood is made of water, solids, and gases. Is blood a mixture? How could you separate the solids from blood?

_____

_____

4 **Test Prep.** **How would you separate salt from a saltwater solution?**

A filtration
B magnetism
C evaporation
D settling

Essential Question How can mixtures be separated?

_____

_____

_____

Be a Scientist

Materials

sand

gravel

2 bowls

spoon

iron filings

sieve

tweezers

bar magnet

Structured Inquiry

How can you separate mixtures?

Form a Hypothesis

Are all mixtures made in the same way? Will different methods of separation work equally well on the same mixture? Write your answer in the form "If the method for separating a mixture changes, then..."

Test Your Hypothesis

1. Take a cup of sand and gravel and pour it into a bowl. Add a spoonful of iron filings and mix them into the sand and gravel.
2. **Experiment.** For about 1 minute, use a sieve to separate the mixture into another bowl. Record how well the mixture separated—the dependent variable for this experiment.
3. Remix the ingredients. For about 1 minute, use the tweezers to separate the mixture. Record your results.
4. Repeat step 3 using a magnet.

Draw Conclusions

5 **Use Variables.** What was the independent variable for this experiment? Were there controlled variables?

6 **Interpret Data.** Rank the separation methods from least to most effective. Make sure to give reasons for your ranking.

7 Did your results support your hypothesis? Write a report explaining why or why not.

CHAPTER 7 Review

Visual Summary

Summarize each lesson in your own words.

Lesson 1 _____

_____

_____

_____

Lesson 2 _____

_____

_____

_____

Vocabulary

Fill each blank with the best term from the list.

change of state	**physical change**
chemical change	**precipitation**
evaporation	**solution**
mixture	**water cycle**

1. A(n) _____ begins and ends with the same type of matter.
2. Rusting is a(n) _____
3. If energy is added to a solid, a(n) _____ can occur.
4. A physical combination of two or more kinds of matter is called a(n) _____.
5. A mixture in which two or more substances are blended together completely is called a(n) _____.
6. A liquid changes to a gas during _____.
7. The movement of water between Earth's surface and the air is called the _____.
8. Rain and snow are forms of _____

CHAPTER 7 Review

Skills and Concepts

Answer each of the following in complete sentences.

9. **Sequence.** How does water change from a solid to a liquid? Explain the sequence of events.

10. **Use Variables.** You want to find out if light affects how fast a nail rusts. You plan an experiment to test and compare two nails. Which variable will you change? Which variables will you keep the same?

11. **Sequence.** Describe the path of water from the ocean to a rain drop.

12. **Descriptive Writing.** What happens to a puddle of water on a sunny day? Why?

13. **Expository Writing.** What kinds of changes occur as you blend pancake mix, milk, and an egg and then heat the batter to make pancakes?

14. **Fictional Narrative.** Suppose you are a tiny drop of water in a puddle. Write a story about what happens to you as you travel through the water cycle.

15. How can matter change?

Test Prep

1. Water is found in nature as which states of matter?
   - **A** solid, liquid, and gas
   - **B** solid and liquid only
   - **C** solid and gas only
   - **D** liquid and gas only

2. When thermal energy is added to ice it causes the ice to melt. The ice changes from a
   - **A** gas to a liquid.
   - **B** liquid to a gas.
   - **C** solid to a liquid.
   - **D** liquid to a solid

3. All of the following are correct except
   - **A** after a change of state, the mass of a substance stays the same.
   - **B** after a change of state, a new substance exists.
   - **C** after a change of state, the volume of a substance may change.
   - **D** a change of state is a physical change.

4. Which of these describes what happens to water vapor when it is cooled?
   - **A** It turns into a gas.
   - **B** It stays the same.
   - **C** It turns into a liquid.
   - **D** It turns into another material.

5. Burning a log in a fireplace gives off heat and light. The heat and light are evidence of what type of change?
   - **A** physical
   - **B** chemical
   - **C** melting
   - **D** evaporation

6. The state of matter of a chocolate bar depends on which of the following?
   - **A** the temperature of the air around it
   - **B** the sounds that surround it
   - **C** the color of its packaging
   - **D** the city where it is located

7. Iron and sand could be separated by
   - **A** heating.
   - **B** filtering.
   - **C** magnets.
   - **D** freezing.

8. Which causes a chemical change to a piece of paper?
   - **A** folding
   - **B** cutting
   - **C** coloring
   - **D** burning

9. Which method of separating a solution involves a change in the state of matter?
   - **A** distillation
   - **B** filtering
   - **C** magnetic attraction
   - **D** settling

10. Describe how water moves through the water cycle. Use the words *evaporation, condensation,* and *precipitation* in your answer.

Use your knowledge of the states of matter to complete questions 11 and 12.

Beginning State	Add or Take Away Energy	Ending State	Process Name
solid	A	liquid	E
liquid	B	gas	F
gas	C	liquid	G
liquid	D	solid	H

11. Replace letters A, B, C, and D with *add energy* or *take away energy* where appropriate.

A _____

B _____

C _____

D _____

12. Replace letters E, F, G, and H with the name of the process described.

E _____

F _____

G _____

H _____

13. Describe an experiment you could conduct to test a factor that affects evaporation. Be sure to describe the variable you are changing.

Careers in Science

Pharmacist

Do you look forward to doing science activities? Do you also like working with people? If so, you might enjoy a career in health care. A pharmacy technician works with pharmacists, or people who fill prescriptions. This person may work in a pharmacy in a drugstore, grocery store, hospital, or nursing home.

To qualify for this career, you would train on the job. You might take classes to earn a certificate. Then you could work with a pharmacist. You would help prepare medicines, counsel patients, and work with insurance companies. Best of all, you would help people recover from illnesses.

▲ A pharmacy technician helps people understand more about their medicine.

Pharmaceutical Researcher

Have you ever wondered where your medicine comes from? Some medicines, like aspirin, were first made from plants! Today, most are made in laboratories by pharmaceutical researchers.

If you are curious about how the body works and you want to make a difference, this career might be for you. To become a pharmaceutical researcher, you would study science in college. Then you would study medicine in graduate school.

▲ Pharmaceutical researchers work to develop new medicines.

My Notes