

SCIENCE

Student Book

▶ **5th Grade** | Unit 9

SCIENCE 509

CYCLES IN NATURE

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CYCLES IN NATURE

God has created and designed our world with great love, care, and wisdom. He has placed a great amount of order within His creation. We can also observe that there are many ordered *cycles* within God's creation. These signs of God's order and creation's cycles are all around us in nature. For example, in previous LIFEPACs, you learned about the water cycle, carbon cycle, and chemical cycle in nature. You also learned about life cycles of plants and animals. Yet, there are many more cycles than these in God's creation. The four seasons of the year—spring, summer, fall, and winter—are one example. The seasons change, yet they return again in a cycle from year to year.

In fact, the substance of all things that we can sense and observe — called *matter*—goes through change. Matter can also go through cycles. In this LIFEPAC®, you will study more about matter and the properties of matter. You will learn about the structure of matter and how matter changes. You will also learn about other cycles in nature—like the seasons of the year. Finally, you will learn more about God's order in all things that He has created.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAAC. Each section will list according to the numbers below what objectives will be met in that section. When you have finished this LIFEPAAC, you should be able to:

1. Identify the properties of matter.
2. Tell about the changes in matter.
3. Describe the structure of matter.
4. Explain the relationship between matter and the cycles of nature.
5. Describe some natural cycles.
6. Explain Bible accounts of God's order in creation.



1. MATTER

God created everything that exists, both seen and unseen. All that is seen includes the physical universe. Things that are unseen include spiritual beings, like the angels. Our focus in this LIFEPAC will be on things seen — the physical universe that God created. Every *thing* in the physical universe consists of *matter*. Matter is the substance of which all things in the physical universe are made. From the smallest living cell to the greatest galaxy in the universe, all things are made of matter.

You are surrounded by matter. You stand on it. You breathe it. In fact, your physical body is made of matter. All objects consist of matter. They may differ a great deal in size, shape, and appearance, but they all consist of matter.

Matter has *properties*. Some properties of matter are *common* to all matter. Other properties are *special* or specific to each kind of matter. This means similar types of matter have certain special characteristics that are common to all other matter of the same kind. For instance, all matter composed of the metal iron has similar characteristics, or *special properties*. These special properties help us to **distinguish** one kind of matter from another. You will learn more about common properties and special properties of matter in this section of the LIFEPAC.

Matter can *change*. Matter changes in many ways, including form, shape, and state. The changes in matter are very orderly because of the properties of matter. You will learn more about changes in matter in this section of the LIFEPAC.

All matter has *structure*. Matter consists of tiny particles that give matter its basic structure. You will learn more about the particles of matter and the motion of these particles in this section of the LIFEPAC.

By studying the *properties*, *changes*, and *structure* of matter, you should better understand the importance of matter in the cycles of nature. You should also be able to better appreciate the loving care and order that God has put into His creation.

Objectives

Review these objectives. When you have completed this section, you should be able to:

1. Identify the properties of matter.
2. Tell about the changes in matter.
3. Describe the structure of matter.
4. Explain the relationship between matter and the cycles of nature.

Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

atom (at' əm). The small particle that makes up molecules. Each atom is unique for a chemical element.

brittleness (brit' l nəs). The physical property of being broken easily or of being broken with a snap.

characteristics (kar' ik' tə ris' tiks). Special features of something that help set one thing apart from another.

combustibility (kəm bus' tə bil' ət ē). The ability of a material to burn. It is a chemical property of matter.

conduct (kən dukt'). To channel through; heat or electricity can be channeled through conductors.

conservation (kon' sər vā' shən). The state of not being used up.

density (den' sə tē). The condition of being closely packed together. It is the amount of matter in a given volume of material.

displace (dis plās'). To take the place of something else.

distinguish (dis ting' gwish). To perceive as being separate or different.

exist (eg zist'). To be; to have being.

hydrogen (hī' drə jən). A colorless element commonly found in gas form. It burns easily, and its mass is less than all other elements.

inertia (in er' shu). To remain still if still, or continue moving if moving unless acted upon by an outside force.

molecule (mol' ə kyül). The smallest part of matter that can still exist without a chemical change. It is made up of atoms of elements.

normally (nôr' mə lē). In a regular way; commonly.

symbol (sim' bəl). Something that stands for, or represents, something else.

volume (vol' yəm). The amount of space taken up by matter.

Note: All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

Pronunciation Key: hat, āge, cāre, fār; let, ēqual, tērm; it, īce; hot, ōpen, ôrder; oil; out; cup, pūt, rüle; child; long; thin; /TH/ for then; /zh/ for measure; /u/ or /ə/ represents /a/ in about, /e/ in taken, /i/ in pencil, /o/ in lemon, and /u/ in circus.

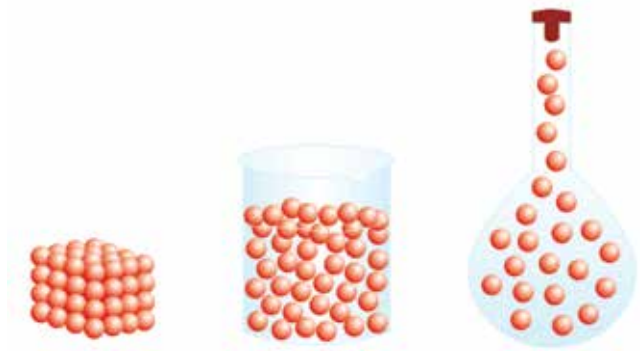
Properties of Matter

All matter has *properties*. These properties are the **characteristics** of matter. They are the various ways in which we describe matter. Some of these properties are *common* to all matter. Other properties are *special* or specific to each kind of matter. Let's explore these common and special properties of matter.

Common properties. All matter in the universe has some common properties. Three of these common properties are **volume**, *mass*, and **inertia**. We can describe any matter as having volume, mass, and inertia. Let's first consider the property of volume.

Volume is the space taken up by matter. In fact, some scientists define matter as anything that occupies space. Objects of small volume do not take up much space. Objects with larger volumes take up more space. Does a tiny ant take up space? Yes. Its volume is small, though. An elephant has much more volume than an ant and takes up more space.

Volume is measured in units like pints, liters, gallons, cubic feet, or cubic meters. For example, when your parents or friends fill their car with 10 gallons of gasoline, they are putting a certain volume of gasoline into the car's gas tank. The volume of the gasoline is 10 gallons. It would occupy 10 gallons of space in the gas tank. Can two objects occupy the same space at the same time? Try this exercise to find out. Place your pencil on a desk. Now try to put your hand in exactly the same place. Can you do it? No. The pencil is taking up space so that your hand cannot occupy the exact same space. Two objects cannot occupy the same space at the same time. However, two objects can occupy the same space at different times. If you remove your pencil from the desk, you can rest your hand in the exact same place that the pencil previously occupied. In this case, we say that you **displace** the pencil with your hand. The volume of your hand now occupies part of the space formerly occupied by the volume of the pencil. In the experiment that follows, you will learn more about volume and how one object might displace another object.



| Solids, liquids and gasses behave differently when put in containers.



| Your hand and your pencil cannot occupy the exact same space together

509.A VOLUME



View 509
VOLUME
EXPERIMENT:
Grade 5 Science
experiments video

You will use two marbles of different size to demonstrate how the volume of an object can be measured by displacing the same volume of another substance (in this case, water).

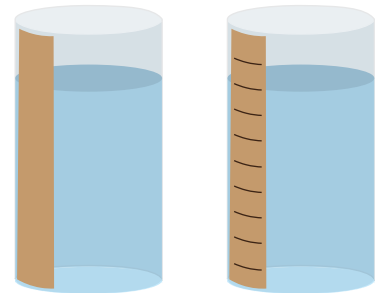
These supplies are needed:

a tall, thin glass jar **or** a graduated cylinder
water
small marble
large marble

masking tape
pen, pencil, or marker
ruler with centimeter markings

Follow these directions carefully. Put a check mark in the box when each step is completed. (**NOTE:** If using a graduated cylinder, there is no need to make markings on tape with a ruler. Simply use some of the markings already imprinted on the cylinder for your measurements and record them on a sheet of paper for each step. Proceed with step 3 below.)

1. Place a piece of masking tape on the jar from top to bottom.
2. Using a ruler to measure, make marks one centimeter apart on the strip of tape, from bottom to top.
3. Pour water into the jar until it reaches your fifth mark.
4. Carefully drop the small marble into the water. Put a small mark on the tape where the new water level is located. Label it "X."
5. Remove the small marble. Make sure the water level is the same as step 3. Add more water if necessary.
6. Drop the large marble into the water. Put another mark on the tape where the water level is located. Label it "Z."





Answer these questions.

1.1 Why did the water level change when you dropped the marbles in the water?

1.2 Which marble caused the most change in water level? _____

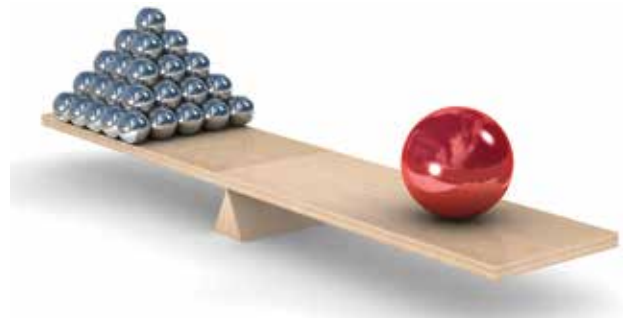
Complete this activity.

1.3 Compare the volume of the two marbles. _____

Mass is a second common property of all matter. The quantity of matter in an object is called its *mass*. Mass is measured in units such as grams and pounds (mass). The mass of an object will be the same no matter where it is measured.

Mass should not be confused with an object's *weight*. The weight of an object of a given mass is directly related to the earth's gravitational pull on the object. Therefore, an object's weight can change depending upon the pull of gravity on the object. Since the force of gravity decreases as one moves away from earth, the weight of the object would also decrease as one moves away from earth.

For example, a person with a mass of 75 pounds (mass) would weigh 75 pounds (force) on Earth; however, that person would weigh very little in outer space. That same 75 pound person would weigh about 12 pounds (force) on the moon because the force of gravity on the moon is less than that on Earth. However, the person would still have the same mass—75 pounds (mass)—whether on the earth, in outer space, or on the moon.



| A balance measures the mass of an object.

The mass of an object is usually measured on a balance by comparing it with another object of known mass. The mass tells us the amount of matter present in the object.

The third common property of matter is called *inertia*. All matter has inertia. This means that it resists any change in its condition of rest or of motion. Inertia means that an object remains still if still or continues moving if moving, unless acted upon by an outside force. For example, if you place a book on your desk, the book will remain still on your desk unless some force acts upon it to remove it. The inertia of the book at rest makes it remain at rest. Inertia keeps it from moving.



| Inertia can keep a body in motion.

On the other hand, inertia will keep a moving object moving until another force acting upon it causes it to slow down or stop. For example, if you kick a soccerball into the air, inertia keeps the ball moving until it hits something (like someone's foot) or the force of gravity pulls the ball to the ground.



Complete this list.

1.4

What are three common properties of all matter?

- _____
- _____
- _____

Write the correct letter and answer on each line.

1.5

The substance of all things that we can sense and touch is called _____.

- matter
- volume
- color

1.6

The space taken up by matter is called _____.

- mass
- volume
- a box

1.7

All matter has _____.

- cells
- seeds
- properties

1.8

The quantity of matter in an object is called its _____.

- volume
- mass
- measure

- 1.9** _____ means that matter resists any change in its condition of rest or of motion.
- a. Inertia b. Toughness c. Stillness
- 1.10** The _____ of an object measures the pull of gravity on its mass.
- a. stability b. weight c. inertia

Special properties. There are many kinds or varieties of matter in the universe. One kind of matter differs from another kind. For example, a rock differs from cheese. Both a rock and cheese differ from water. Therefore, there are some properties of matter that are specific to the different kinds of matter. These are called *special properties* of matter.

There are two main categories of special properties of matter: (1) *physical properties* and (2) *chemical properties*. Let's explore each of these special properties of matter.

Physical properties help us to recognize different kinds of matter by the five senses. Our sight, smell, touch, taste, and hearing allow us to distinguish between a great variety of matter. For example, by sight, we can recognize gold by its *color*. It would look different from silver because silver has a different color than gold. Therefore, *color* would be a physical property of matter. Another physical property using one of the five senses would be *odor*. We could tell the difference between gasoline and water by the odor of each.

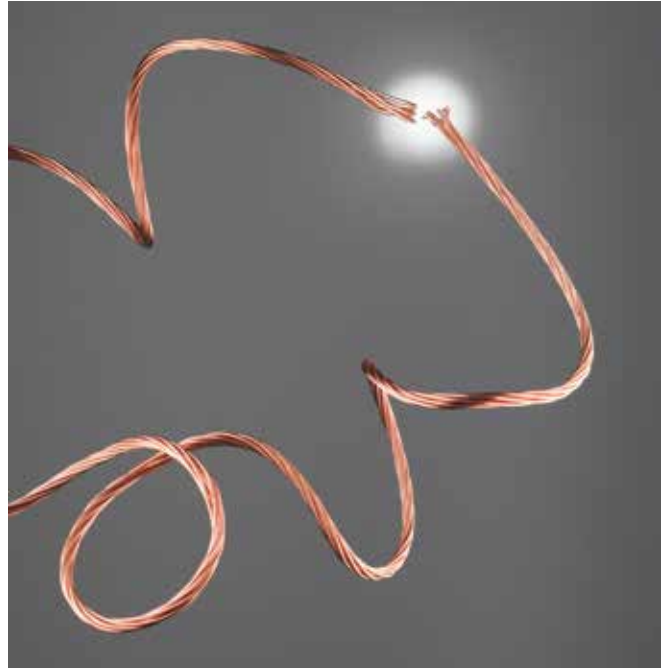
There are other physical properties that can be used to distinguish matter of different kinds. An important one of these other physical properties is **density**. Density is the amount of mass in a given volume of matter. It is measured in units like pounds (mass) per cubic foot or kilograms per cubic meter. Density is a physical property that varies among different kinds of matter. For example, the density of steel metal would be much greater than the density of cork. There would be more mass in a cubic inch of steel than in a cubic inch of cork because the density of steel is greater than that of cork.

Brittleness is another physical property of matter. Suppose you threw a ball through a closed window. What would happen? The glass in the window would break into many pieces, but the ball would not break. By easily breaking into many pieces, the glass shows that it has the physical property of *brittleness*. Like other physical properties, brittleness differs from one kind of matter to another.



| The glass breaks because of its brittleness.

Two other physical properties of matter will be mentioned before we go on to the chemical properties of matter. One of these is *solubility*. This is the ability of one kind of matter to dissolve in another. For example, some materials will more readily dissolve in water than others. We would say that the materials that dissolve more readily would have greater solubility than the others. Another important physical property of matter is its ability to **conduct** heat or electricity. This physical property is called *conductivity*. Copper wire is an example of matter that has a higher conductivity than many other materials. Both heat and electricity are easily conducted through copper.



| Copper conducts both heat and electricity.



| A drop of ink showing its solubility in water.

SELF TEST 1

Match these items (each answer, 3 points).

- | | | |
|------|-------------------|-------------------------------|
| 1.01 | _____ color | a. common property of matter |
| 1.02 | _____ volume | b. special property of matter |
| 1.03 | _____ odor | c. not a property of matter |
| 1.04 | _____ mass | |
| 1.05 | _____ density | |
| 1.06 | _____ inertia | |
| 1.07 | _____ brittleness | |
| 1.08 | _____ measurement | |
| 1.09 | _____ solubility | |
| 1.10 | _____ liquid | |

Answer true or false (each answer, 2 points).

- 1.011 _____ Matter is the substance that we can sense and observe.
- 1.012 _____ Matter does not go through change or cycles.
- 1.013 _____ All matter in the universe has some common properties.
- 1.014 _____ Ten gallons of water is a measurement of its mass.
- 1.015 _____ An object's weight is always the same as its mass.
- 1.016 _____ Inertia causes an object at rest to remain at rest.
- 1.017 _____ Density is the amount of mass in a given volume of material.
- 1.018 _____ Changing from liquid to gas is a chemical change.
- 1.019 _____ Gas molecules of material move slower than those of a liquid of the material.

Write the correct answer on each line (each answer, 3 points).

- 1.020** An example of a physical change in a material is _____ .
 a. breaking it b. rusting c. a nuclear reaction
- 1.021** An object in motion will keep moving because of its _____ .
 a. size b. speed c. inertia
- 1.022** The ability to conduct heat is a _____ property of matter.
 a. chemical b. physical c. common
- 1.023** The chemical symbol for water is _____ .
 a. H_2O b. CO_2 c. CH_2
- 1.024** A chemical _____ is made up of all the same atoms.
 a. element b. compound c. shape
- 1.025** Matter can _____ when it changes from one state to another and back again.
 a. disappear b. be created c. cycle

List the three common states of matter (each answer, 3 points).

- 1.026** _____
- 1.027** _____
- 1.028** _____

Complete these statements (each answer, 3 points).

- 1.029** Matter that has its own size and shape is in the _____ state.
- 1.030** Changing matter from one state to another is a _____ change.
- 1.031** A _____ change always produces new materials.
- 1.032** When matter changes from one state to another, the total mass is _____ .
- 1.033** _____ form the most basic substances of nature called the chemical elements.

Answer these questions (each answer, 5 points).

1.034 What is the *law of conservation of mass and energy*? _____

1.035 How can heat change matter from a solid to a liquid to a gas? _____

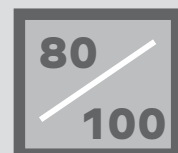


Teacher check:

Score _____

Initials _____

Date _____





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