Chapter Quiz

Write your answers on a separate sheet of paper.

1. What did Robert Hooke discover?
2. What is the Periodic Table of Elements?
3. How are molecules formed?
4. Why is the nucleus called the cell's "command post"?
5. What three things do vacuoles store?
6. What are three reasons why cells need energy?
7. What two things must pass into a cell in order for it to get energy by cellular respiration?
8. Why are plant cells able to make their own food but animal cells are not?
9. What does the structure of a DNA molecule look like?
10. How does DNA determine a person's eye color?

Test Tip
Make flash cards of important terms to help you study for a test. Write a term on one side of the card. Write the meaning of the term on the other side.

Research Project

A cell has other parts in addition to those shown in the drawings on page 55. Use library references to find out about two other cell parts, such as ribosomes, endoplasmic reticulum, nucleolus, and lysosomes. Draw and label the cell parts and write what they do.

Chapter 5 The Kingdoms of Life

Scientists divide organisms into groups to make them easier to study. This photo shows organisms from three different groups, called kingdoms. What do you think those kingdoms are?

Learning Objectives

- Name the kingdoms of life.
- Explain the relationship between a kingdom, phylum, and species.
- Compare protists, monera, and fungi.
- Compare plants and fungi.
- Name one member of each kingdom.
- LAB ACTIVITY: Observe protists that live in pond water.
- SCIENCE IN YOUR LIFE: Identify antibacterial products in your home.

Words to Know

biologist	a scientist who studies the behavior and characteristics of living things
classification	the grouping of organisms by their type
kingdom	one of the five main groups in biological classification
phylum	the largest of the groupings of organisms below kingdom (plural, *phyla*)
species	organisms that can reproduce together and have offspring that can also reproduce
protist	a tiny one-celled organism that is neither plant nor animal but may have characteristics of both
alga	a plantlike protist (plural, *algae*)
protozoan	an animal-like protist (plural, *protozoa*)
moneran	a tiny organism that has DNA but no true nucleus (plural, *monera*)
bacterium	a tiny one-celled moneran seen only through a microscope (plural, *bacteria*)
fungus	an organism that gets its food by breaking down dead matter and absorbing useful elements from it (plural, *fungi*)

5-1 Classifying Organisms

Words to Know

biologist	a scientist who studies the behavior and characteristics of living things
classification	the grouping of organisms by their type
kingdom	one of the five main groups in biological classification
phylum	the largest of the groupings of organisms below kingdom (plural, *phyla*)
species	organisms that can reproduce together and have offspring that can also reproduce

More than 1 million kinds of animals are known today. At least 324,000 kinds of plants are known. A scientist who studies the behavior and characteristics of living things is called a **biologist.** In this chapter, you will learn more about how biologists group organisms.

The Kingdoms of Life

Grouping organisms by their type is called **classification.** Biologists study many characteristics of organisms to decide how they should be grouped. In all, there are five main groups in biological classification. Each one of these is called a **kingdom.**

You already know a lot about two of the kingdoms—the Plant Kingdom and the Animal Kingdom. The biggest difference between these is the way the organisms get food. Animals must eat other organisms for food. Plants use chlorophyll and sunlight to make their own food.

The chart on the next page lists the five kingdoms. It describes some characteristics of the organisms in each kingdom. It also gives examples of organisms from each kingdom.

Science Fact

Some scientists think there should be a sixth kingdom made up of some kinds of organisms now classified as bacteria.

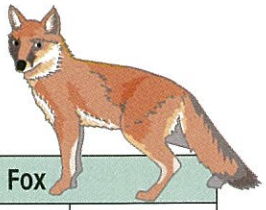
The Five Kingdoms of Life		
Kingdom	**Description**	**Examples**
1. Protist	Usually is one-celled Has a nucleus	Protozoa Algae
2. Moneran	One-celled Has no true nucleus	Bacteria Blue-green bacteria
3. Fungus	Single-celled and many-celled Has cell walls Has no chlorophyll	Molds Yeasts Mushrooms
4. Plant	Many-celled Has cell walls Uses sunlight and chlorophyll to make food	Seed plants Evergreens Ferns
5. Animal	Many-celled Has no chlorophyll Cannot make its own food Eats other organisms	Insects Fish Reptiles Birds Mammals

✓ What are the main classification groups of organisms called, and how many are there?

From Kingdoms to Species

In each of the five kingdoms, there are smaller groupings of organisms. The largest of these is called a **phylum.** The Animal Kingdom has about 20 phyla. All animals that have backbones are part of the phylum called Chordata. Within each phylum, there are many smaller groupings, including class, order, family, and genus. A **species** is all organisms that can reproduce together and have offspring that can also reproduce. Species are the smallest groupings. Humans belong to the class *Mammalia* (Mammals) and the species *Homo sapiens*.

✓ What are the main classifications of organisms below kingdom?



Red Fox	
Kingdom	Animal
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Canidae
Genus	Vulpes
Species	Fulva

Figure 5-1 *This chart shows the classification of a red fox.*

Lesson Review

1. List three features of organisms in the plant kingdom.
2. What is the smallest grouping within the biological classification system?
3. **CRITICAL THINKING** Why are turtles and butterflies two different species?

Great Moments in Science

ARISTOTLE'S CLASSIFICATION SYSTEM

Aristotle, a philosopher and scientist who lived in ancient Greece, formed one of the first classification systems. Aristotle divided living things into plants and animals. He further divided animals into three groups based on where they lived: in the air, in the water, or on land.

Aristotle (384–322 B.C.)

Aristotle's system was a good start. It was not perfect, however. For example, penguins live in the water, like fish. However, penguins have wings and feathers, not fins and scales. Today, penguins are classified as birds, even though they cannot fly.

Whales and dolphins live in the water and look like fish. Yet they breathe air, like land animals. Whales and dolphins are really mammals. They are more like humans and tigers than fish. Biologists no longer group organisms by where they live. Today's classification systems are based on characteristics such as an organism's body structure, development, and DNA.

Penguins have wings and feathers, like other birds, but they cannot fly.

CRITICAL THINKING Bats and elephants have hair. Bats and pigeons can fly. How would Aristotle have grouped these three animals? How do biologists group them today?

5-2 Earth's Simplest Organisms

Words to Know

protist	a tiny one-celled organism that is neither plant nor animal but may have characteristics of both
alga	a plantlike protist (plural, *algae*)
protozoan	an animal-like protist (plural, *protozoa*)
moneran	a tiny organism that has DNA but no true nucleus (plural, *monera*)
bacterium	a tiny one-celled moneran seen only through a microscope (plural, *bacteria*)
fungus	an organism that gets its food by breaking down dead matter and absorbing useful elements from it (plural, *fungi*)

This protist is called a paramecium.

Protists

People used to believe there were only two kingdoms—plants and animals. Then the microscope was invented. It showed new kinds of organisms. Today we call these organisms protists. A **protist** is a tiny one-celled organism that is neither plant nor animal but may have characteristics of both. This is why protists were given their own kingdom. Some protists are more like plants. One plantlike protist is called an **alga.** You may have seen algae growing on lakes or floating in the sea. They are usually green, red, or brown. What you are really seeing is a giant colony of algae. A single alga is usually too small to be seen without a microscope.

One animal-like protist is a **protozoan.** Protozoa often have tiny shells. When they die, these shells pile up on the ocean floor. The chalk in your classroom is made up of these shells.

✓ **What is the main difference between algae and protozoa?**

Monera

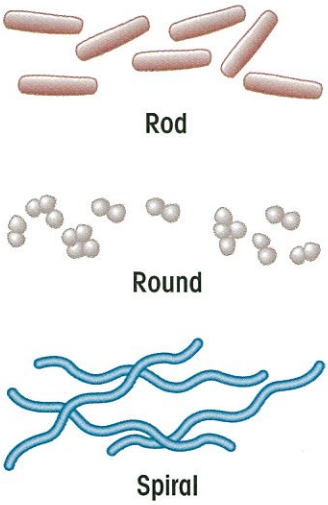


Figure 5-2 *Bacteria shapes*

A **moneran**, like a protist, a plant, and an animal, has DNA in its cells. However, it does not have a true nucleus to hold the DNA. The DNA floats around in the cytoplasm. For this reason, scientists decided to give monera their own kingdom—the Moneran Kingdom.

The Moneran Kingdom is made up of different kinds of bacteria. A **bacterium** is a tiny one-celled organism seen only through a microscope. Like the protists, bacteria are found everywhere. They live in the ocean, the sky, and even in your skin. Many bacteria actually live inside your body.

Some bacteria are very useful. We use them to make many kinds of foods, such as cheese and yogurt. Other types of bacteria are very dangerous. They can cause sickness and even death.

Blue-green bacteria are another kind of monera. Blue-green bacteria contain chlorophyll. They are able to make their own food by photosynthesis.

✓ **How are monera different from all other organisms?**

Safety Alert

Some bacteria are very dangerous. *Clostridium botulinum* bacteria produce a deadly poison, which causes an illness called botulism. Improperly canned foods can contain this poison. Do not buy food in cans that are bulging, crushed, or open.

Fungi

If you leave bread out for a long time, something soft and fuzzy might grow on it. This fuzzy substance is called *mold*. Mold is a **fungus**. A fungus is an organism that gets its food by breaking down dead matter and absorbing useful elements from it.

People used to group fungi with plants. After all, they have a lot in common with plants. They grow in one place. They do not move around looking for food, as most animals do. However, fungi are missing one important plant characteristic—chloroplasts. That means they cannot make their own food using photosynthesis. Fungi cannot be monera either, because they do have true nuclei in their cells. Finally, fungi are too big to be protists. So scientists created a kingdom just for them.

Fungi include molds, yeasts, and mushrooms. Fungi get their food from dead organisms or dead matter on an organism. For example, athlete's foot is a fungus that eats the dead skin on people's feet.

✓ **How are fungi different from plants?**

Lesson Review

1. Name one animal-like protist.
2. What are bacteria, and how are some of them useful?
3. How are fungi similar to plants?
4. **CRITICAL THINKING** A biologist discovers a one-celled organism without a nucleus. What kingdom must the organism belong to?

On the Cutting Edge

FIGHTING DANGEROUS PROTOZOA

Most protozoa are harmless to humans. However, some cause serious diseases. The worst of these diseases is *malaria*. More than 500 million people have malaria. Over 2.5 million people die of the disease each year. The protozoa that cause malaria are spread by mosquitoes. When a mosquito bites an infected person, the mosquito picks up the protozoa from the person's blood. It then passes the protozoa to the next person it bites.

Some mosquitoes spread malaria.

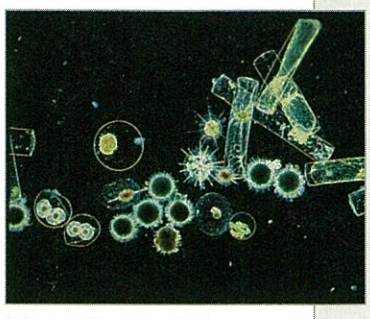
For years, scientists have tried to find a medicine to prevent malaria. Now they are studying the DNA of the malaria protozoa. Learning about the DNA may help scientists make more powerful medicines. The DNA could also be injected into a person. This may help the person's body fight off the protozoa if bitten by a mosquito.

CRITICAL THINKING Another way to fight malaria is to use poisons that kill mosquitoes. How would this help prevent malaria from spreading?

LAB ACTIVITY
Observing Protists

BACKGROUND

Have you ever looked closely at the water in a pond? It may look clear, but it is actually full of organisms. Many of the organisms in pond water are protists. Most are too small to be seen with your eyes alone. You must use a microscope to observe them.



Many tiny protists can be found in a drop of pond water.

PURPOSE

You will observe and describe some of the protists that live in pond water.

MATERIALS

paper, pencil, medicine dropper, pond water, microscope slide, coverslip, microscope

WHAT TO DO

1. Make a chart with spaces big enough for you to draw in them. Copy the column heads in the chart shown.
2. Place a drop of pond water on a microscope slide. Place the coverslip on top of the drop of water.
3. Place the slide on the microscope stage.
4. Look for protists on the slide. Use the photo on this page and on page 67 as a guide.
5. In your chart, draw each protist that you find. Also describe its color and decide whether it moves. List any other features you observe.

Drawing of Protist	Animal-like Features	Plantlike Features

Safety Alert

Be careful when handling the slide. It may cut you if it breaks.

DRAW CONCLUSIONS

- What plantlike features did some of the protists have?
- What animal-like features did some of the protists have?
- What can you now say about protists?

SCIENCE IN YOUR LIFE
Fighting Bacteria at Home

Toshio had a serious ear infection. His doctor told him the infection was caused by bacteria. The doctor gave Toshio medicine called an antibiotic to get rid of the infection. Antibiotics are drugs that kill bacteria in your body.

You can protect yourself from harmful bacteria. Some products that you use to clean your body or your home contain chemicals called *antibacterial agents*. These chemicals help prevent infections caused by bacteria. For example, many soaps and deodorants contain antibacterial agents. Some household cleaners do, too. They fight bacteria in the kitchen and the bathroom.

Many types of products contain antibacterial agents.

Check out the products in your home. How many contain antibacterial agents, and what do they do? Follow these steps:

1. Read the labels on all cleaning products that are kept in your kitchen or bathroom. Look for products that say they kill bacteria. Some products will have the word "antibacterial" on the label. Others may say "kills germs" or "germ fighting." All of these terms mean the same thing.
2. Divide your list into two groups:
   a. Products that kill bacteria in or on your body
   b. Products that kill bacteria on surfaces around the house

Critical Thinking

How might you find out how effective certain household products are at killing bacteria?

Chapter 5 Review

Summary

Scientists classify organisms to learn about them and to understand their relationships to other organisms.

Lesson 5.1

The five kingdoms are animal, plant, protist, moneran, and fungus. Each of the kingdoms is broken down into many more groups. The smallest groups of classification are called species.

Lesson 5.2

Protists can be plantlike or animal-like. Algae are plantlike protists. Protozoa are animal-like protists. Monera do not have true nuclei. Bacteria and blue-green bacteria are monera. Fungi cannot move around like animals but do not have chloroplasts. Molds, yeasts, and mushrooms are all fungi.

Vocabulary Review

fungus
alga
species
classification
biologist
protozoan
kingdom
bacterium

Complete each sentence with a term from the list.

1. The grouping of organisms by their type is called _____.
2. A _____ is a protist that cannot make its own food.
3. Bacteria belong to the Moneran _____.
4. A _____ is a scientist who studies the behavior and characteristics of living things.
5. A one-celled plantlike protist is known as an _____.
6. A _____ is a one-celled organism without a nucleus.
7. A mushroom is an example of a many-celled _____.
8. A _____ includes all organisms that can reproduce together and and have offspring that can also reproduce.

Chapter Quiz

Write your answers on a separate sheet of paper.

1. What are the names of the five kingdoms?
2. Which kingdoms contain many-celled organisms?
3. Which classification grouping includes Chordata, or all animals that have backbones?
4. What is the smallest classification grouping?
5. Which kingdom do algae belong to?
6. Which kingdom contains organisms that do not have nuclei?
7. What is the name of one kind of monera?
8. How are fungi different from plants?
9. How do fungi get food?
10. What are the names of three kinds of fungi?

Test Tip
Number all of your answers. Make sure each answer has the same number as its question.

Research Project

Simple organisms help make the following foods: bread, buttermilk, cottage cheese, miso, pickles, ricotta cheese, sauerkraut, sour cream, soy sauce, tempeh, and tofu. Research how these foods are made. Some are made with the help of bacteria, and some are made with the help of fungi. Write about one of each type. Describe how the fungi or bacteria help make the food.

Chapter 6 The Animal Kingdom

The ability to move is important in the animal kingdom. These dolphins jump through the air and swim quickly through the ocean. Other animals crawl, run, or fly. How does moving around help animals to survive?

Learning Objectives

- Identify characteristics common to all animals.
- Compare animals with simpler organisms.
- Compare and contrast invertebrates with vertebrates.
- Identify groups of invertebrates.
- List characteristics of fish, amphibians, reptiles, birds, and mammals.
- LAB ACTIVITY: Identify animals by using a two-choice key.
- ON-THE-JOB SCIENCE: Relate knowledge of animal characteristics to pet store work.