

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.



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.

Words to Know

invertebrate	an animal that does not have a backbone
parasite	an organism that lives on or in another organism, called a host, and causes harm to that organism
host	a living thing that supports a parasite
mollusk	an animal with a soft body that is not divided into segments
arthropod	an animal with an outer skeleton, jointed appendages, and a body divided into separate parts, called segments
appendage	a part that extends out from the body, such as a wing, a leg, an arm, or a claw
crustacean	an arthropod with two body segments and five pairs of legs
vertebrate	an animal with a backbone
cold-blooded	having a body temperature that changes with the environment
warm-blooded	having a body temperature that stays fairly constant
amphibian	a cold-blooded vertebrate with wet, slippery skin and two pairs of legs; able to live on both land and in water
reptile	a cold-blooded land vertebrate, usually with four legs and clawed toes
migrate	to move long distances each year to reach warm areas and better feeding grounds
mammal	a warm-blooded vertebrate that has hair on its body; the mother's body makes milk to feed its young

You already know a lot about animals. After all, you are one. However, there are many fascinating things about animals you might not know. For example, humans have 656 muscles. That sounds like a lot, but caterpillars have about 2,000 muscles!

What Are Animals?

All protists, monera, fungi, and plants are made of cells, just as animals are. They also all share the five characteristics of life. Still, there are many differences between members of the animal kingdom and simpler organisms.

Moving

Animals can move around. Animals can fly, swim, run, or walk. Plants move their leaves and bend their stems toward sunlight. However, they cannot choose to get up and move to a different place.

Getting Food

Animals need to get food. They must find plants or other animals to eat. Plants can make their own food, using the chloroplasts in their cells.

Cell Functions

Animals have *specialized* cells. These are cells that do special jobs. Different cells carry out different functions. Plants have cells that do special jobs also. However, the cells of protists, monera, and fungi are not specialized. Each cell does the same thing.

✓ **What are the main differences between animals and other organisms?**

Remember

The five characteristics of life are getting and using food, moving, growing, reproducing, and responding to the environment.

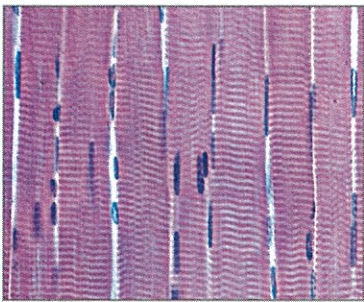
Special Cells, Special Jobs

Most of the organisms you have read about so far are one-celled. A few organisms, like mushrooms, are made of many cells. However, the cells in a mushroom are almost all alike.

Nearly every animal cell has a nucleus, a cell membrane, mitochondria, and other cell parts. Different kinds of animal cells, though, have different shapes and sizes, depending on what jobs they do.

Remember

The nucleus is the part of a cell that controls all other parts. The membrane is the thin covering that holds a cell together. Mitochondria are cell parts that help the cell store and use energy.



Muscle cells must be able to stretch.



Skin cells are flat and broad. They protect the organism.



Nerve cells are long and stringlike. They carry messages around the body.

Think of a one-celled organism as a store run by only one person. That person has to do all the work. Bigger stores hire many workers. Each person has a specialized job. Some people sell, others keep track of the money, and still others are in charge of whole departments. The bigger the store is, the more specialized the jobs are. This is also true of animal cells. The more complicated the animal is, the more specialized cells it has.

✓ **How do the cells in an animal differ from the cells in a simpler organism?**

Lesson Review

1. How do animals and plants differ in how they get their food?
2. Why do animal cells have different shapes and sizes?
3. **CRITICAL THINKING** Why would it be hard for most animals to survive if they could not move around?

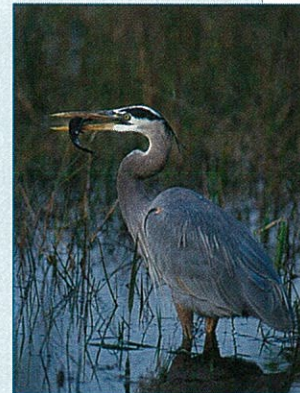
A Closer Look

SPECIALIZED CELLS IN ACTION

A heron stands still alongside a pond. Suddenly it lunges forward and plucks a fish out of the water. Lunch is served!

The heron uses its specialized cells each time it catches a fish. Cells in the bird's eyes sense the light that bounces off the fish. These cells send a message to other cells in the eyes. Nerve cells carry the message to the brain. Other nerve cells in the brain read the message: food! They send a new message to the heron's muscles: strike! The muscle cells pull against the bones in the heron's neck. That forces the heron's head into the water. The muscle cells also open the heron's jaws so it can capture the fish.

CRITICAL THINKING What would happen if a heron's cells did not do their jobs correctly?



A heron fishes for its meal.

6-2 Invertebrates

Words to Know

invertebrate	an animal that does not have a backbone
parasite	an organism that lives on or in another organism, called a host, and causes harm to that organism
host	a living thing that supports a parasite
mollusk	an animal with a soft body that is not divided into segments
arthropod	an animal with an outer skeleton, jointed appendages, and a body divided into separate parts, called segments
appendage	a part that extends out from the body, such as a wing, a leg, an arm, or a claw
crustacean	an arthropod with two body segments and five pairs of legs

Animals come in all shapes, sizes, and colors. These features help them survive in their environments. Any body feature, process, or behavior that allows an organism to survive in its environment is called an *adaptation*. Common animal adaptations are teeth, spines, horns, poisons, odor, speed, and even the ability to stand still for a long time. Color is also important in adaptation. Many animals use color, or *camouflage*, to blend in with their environment so they can hide. Others have bright colors to attract mates.

An **invertebrate** is an animal that does not have a backbone. It is a simple creature compared to an animal with a backbone.



Science Fact

Some sponges are smaller than a penny. Others can be up to 6.6 feet (2 meters) in diameter.

Sponges

A sponge is an animal that lives in water and often grows on rocks. Sponges have existed for more than half a billion years.



Sponges have changed very little in the last half a billion years.

A sponge's body has many holes that let water pass through it. The sponge gets oxygen and food from this water. The water also carries away waste.

Most cleaning sponges found in the kitchen are synthetic, or made by people. They are not natural sponges. Perhaps you have seen a dried natural sponge. It is usually a tan color and has an uneven shape. These sponges are really the remains of once-living sponges.

Sponges are like plants in some ways. They spend most of their lives attached to one object. However, when they are young, they move around, as animals do. Also, they trap their food, as animals do.

✓ Why are sponges called animals?

Worms

Worms are another type of invertebrate. There are many kinds of worms. A tapeworm is a ribbonlike flatworm. Some tapeworms grow to 44 feet (13 meters) long. The tapeworm is a **parasite**. That means it lives on or in another organism and causes harm to that organism. A **host** is a living thing that supports a parasite. The tapeworm absorbs nutrients from the host's digested food.

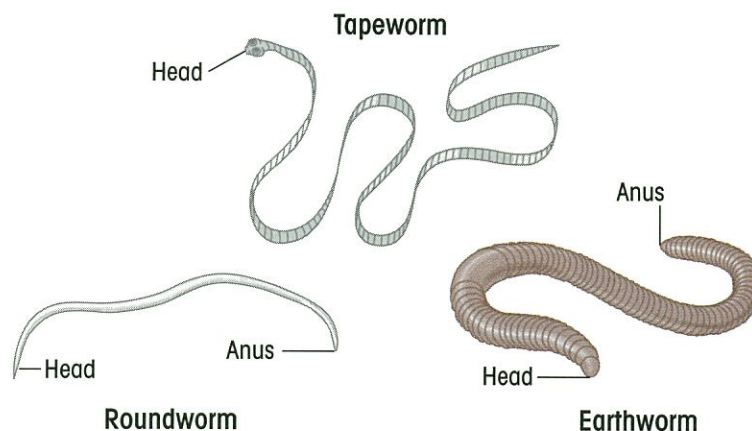


Figure 6-1 *Tapeworm, roundworm, and earthworm*

A roundworm has more parts than a tapeworm. The roundworm can digest its own food. It has a mouth and an *anus*. An anus is an opening through which waste leaves the body.

An earthworm is the kind of worm people dig up for fishing. It has even more parts than the roundworm and a segmented body. Segmented means divided into separate parts. An earthworm has a *crop* for storing food and a *gizzard* for grinding food. It also has five hearts for pumping blood throughout its body.

✓ How is a roundworm different from a tapeworm?

Mollusks

A **mollusk** is an animal with a soft body that is not divided into segments. The word *mollusk* means “soft-body.” Snails, slugs, clams, oysters, squid, and octopuses are all mollusks. Most snails and slugs live in water. A few live on land. Many mollusks have hard shells that protect their bodies. Snails have a tonguelike structure called a *radula*, which is covered with thousands of tiny teeth. Snails that live in water use their radulas to scrape up algae.

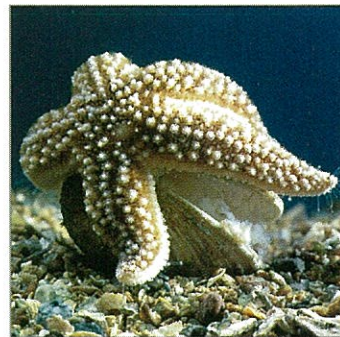
✓ What is the function of a mollusk's shell?

Spiny-Skinned Invertebrates

Sand dollars and sea stars are spiny-skinned invertebrates. They belong to this group of animals that live in salt water. The name “spiny-skinned” comes from the sharp spines on their skin. The spines help to protect the animal from enemies.

Sea stars often eat oysters. A sea star uses its five strong arms to pull the oyster open. Then the sea star actually pushes its own stomach out of its mouth. It puts its stomach into the oyster shell and digests the oyster. Then it swallows its own stomach again.

✓ Where are spiny-skinned invertebrates found?



Sea stars use their arms to pull open the shells of clams and oysters.

Arthropods

An **arthropod** is an animal with an outer skeleton, jointed appendages, and a body divided into segments. An **appendage** is a part that extends out from beyond the body. Wings, legs, arms, and claws are appendages. Some appendages can bend. Spiders, scorpions, cockroaches, ticks, crabs, lobsters, bees, mosquitoes, ants, and grasshoppers are all arthropods.

Arthropods are divided into many groups, or classes. The number of body segments and appendages determines which class an arthropod is in. Three classes of arthropods are insects, crustaceans, and spiders.

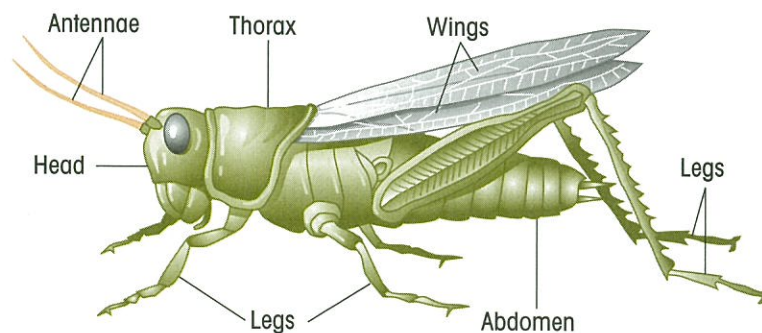
Insects

Insects are the largest group of arthropods. Insects are by far the most common land animals. There are more than 800,000 species of insects. An insect is an arthropod with a body that is divided into three parts: *head*, *thorax*, and *abdomen*. Insects have three pairs of legs and usually two pairs of wings. They also have feelers, called *antennae*.

Many insects, such as bees and butterflies, are useful to humans. Honeybees make honey. Many bees and butterflies spread pollen. Some insects are harmful. Fleas get diseases from rats and pass them to humans. Flies and cockroaches feed on garbage and animal waste and spread harmful organisms.

Science Fact
Grasshoppers can jump over things that are 500 times their own length.

Figure 6-2 An insect has three pairs of legs. Its body is divided into three main sections.



Spiders

Many people think spiders are insects. However, these arthropods have only two body segments and four pairs of legs. Also, they have no antennae. Scorpions, mites, and ticks all belong to the same class as spiders.

Lyme disease is a bacterial disease humans get from the bite of a tiny tick. Most ticks pick up the bacteria from the blood of infected deer or mice. To protect yourself in yards or fields in warm weather, wear light-colored clothes, long sleeves, pants tucked into socks or boots, and insect repellent. Check for ticks daily, and remove them with tweezers only. If a rash or flu develops, see a doctor. The usual treatment is antibiotics. Other diseases transmitted to humans by ticks include Rocky Mountain spotted fever.

Crustaceans

The lobster is an example of a **crustacean**. Crustaceans are arthropods with two body segments and five pairs of legs. The front pair of legs are usually called claws. The other four pairs of legs are called walking legs. Crabs and crayfish are also crustaceans. Crustaceans are used by humans as food.

✓ What are three characteristics of arthropods?

Lesson Review

For statements 1 to 3, decide if each one is true or false. If it is false, rewrite the statement to make it true.

1. Sponges are plants.
2. An earthworm uses its crop to protect its body.
3. Lobsters, crabs, and crayfish are all crustaceans.
4. **CRITICAL THINKING** Most arthropods have hard outer skeletons. However, the parts of the skeleton are connected by soft spaces. How does that help the arthropod?



The female black widow spider releases a poison when she bites.

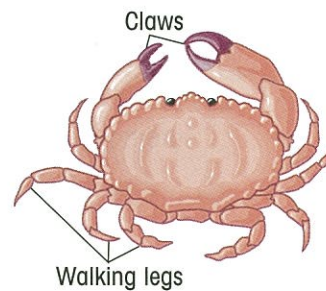


Figure 6-3 A crab

6-3

Vertebrates

Words to Know

vertebrate	an animal with a backbone
cold-blooded	having a body temperature that changes with the environment
warm-blooded	having a body temperature that stays fairly constant
amphibian	a cold-blooded vertebrate with wet, slippery skin and two pairs of legs; able to live on both land and in water
reptile	a cold-blooded land vertebrate, usually with four legs and clawed toes
migrate	to move long distances each year to reach warm areas and better feeding grounds
mammal	a warm-blooded vertebrate that has hair on its body; the mother's body makes milk to feed its young

A **vertebrate** is an animal with a backbone. There are five main groups of vertebrates. Humans, snakes, zebras, birds, fish, rats, dogs, and frogs are all examples of vertebrates.



Science Fact

The whale shark is the largest cold-blooded animal in the world. It can grow to 39 feet (12 meters) long. The blue whale is the largest warm-blooded animal. It can grow to over 100 feet (30 meters) long.

Vertebrates are more complicated organisms than invertebrates. Vertebrates have larger brains, more digestive parts, and more reproductive parts. Most vertebrates also have appendages.

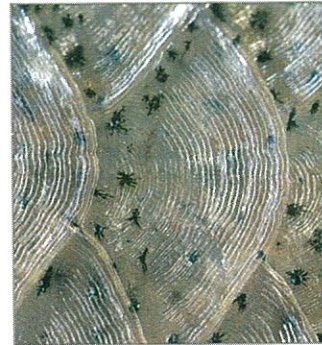
Vertebrates can be **cold-blooded** or **warm-blooded**. The body temperature of cold-blooded animals changes with the environment. The body temperature of warm-blooded animals stays fairly constant. It does not change much. Fish, amphibians, and reptiles are cold-blooded. Birds and mammals are warm-blooded.

Fish

The simplest vertebrates are fish. Salmon, trout, sharks, and minnows are all examples of fish. Fish are cold-blooded vertebrates with fins, scales, and gills. The fins help fish swim.

Fishes' bodies are covered with scales. Look at the picture of a scale on this page. You can see rings on it. The scales on a fish grow with the fish. Each year another ring is added to each scale. You can tell how old a fish is by counting the rings on its scales.

Fish do not have lungs to breathe air. They have gills instead. As water goes through slits in the gills, oxygen is absorbed right into the blood. The blood carries the oxygen to all parts of the fish's body.



Fish scales

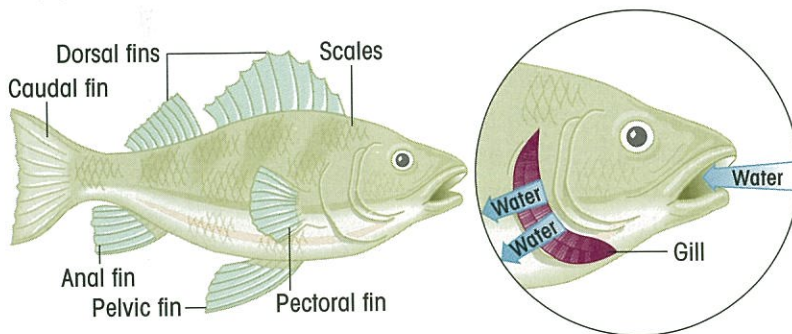


Figure 6-4 *Fish gills absorb oxygen from the water.*

✓ What are the main characteristics of fish?

Amphibians

Frogs, toads, and salamanders are kinds of amphibians. An **amphibian** is a cold-blooded vertebrate with wet, slippery skin and two pairs of legs. Most amphibians have sticky tongues that they use to catch insects.

The word *amphibian* means “able to live on both land and in water.” Frogs, for example, spend most of their lives on land. However, they lay their eggs in water. Amphibian eggs have no shells.



Spotted salamander

Young amphibians have gills, like fish. They use their gills to get oxygen from the water. When they mature they leave the water to live on land. By then, they have developed lungs for breathing air. However, most amphibians live in wet places. They need to keep their skin wet. When a frog is completely underwater, it can absorb oxygen through its skin.

✓ What are three kinds of amphibians?

On the Cutting Edge

RESEARCHING FROG SLIME

Katherine Milton is a scientist from California. She learned something very important about frogs from the Mayoruna Indians of Brazil's Amazon River Basin. Milton watched the Indians collect slime from the bodies of one species of frog, called the phyllomedusa frog. The Indians dried the slime on sticks. Then they burned the skin on their arms and put the dried frog slime into their wounds.

At first, the Indians got very sick and fell asleep. But when they awoke, they were able to hunt for long hours and not get tired. The Mayoruna men "take frog" at least once a month. The Mayoruna women "take frog" when they need to work long hours.

Researchers have found that frog slime is an amazing healer and pain killer. It may lead to discoveries in fighting strokes, Alzheimer's disease, and depression. Katherine Milton is not surprised. She studies the native peoples of the Amazon because she knows they have great knowledge.

CRITICAL THINKING Why do you think medical researchers should study other native peoples of the Amazon?



A phyllomedusa frog

Reptiles

The animal known as the **reptile** is a cold-blooded land vertebrate. Most reptiles have four legs and clawed toes. Some examples of reptiles are lizards, turtles, snakes, alligators, and crocodiles. Reptiles all have lungs for breathing air. Because snakes and some lizards have no legs, they move along on their bellies. Some snakes have as many as 300 pairs of ribs.

Snakes are not slimy, as many people think. They are warm and dry. From time to time, a snake sheds the outer layer of its dry, scaly skin. Some snakes have fangs and a poison called *venom*.

Reptiles can live in very dry places. Their bodies are covered with hard scales, almost like plates. This lets a reptile bake in the hot sun for hours without drying out. The hard coating keeps in moisture.

Reptiles lay eggs. The leathery cover on an egg protects the young reptile inside. It also keeps the egg from drying out when laid on land.



At 12 feet long, crocodiles are among the largest living reptiles.



Safety Alert

Rattlesnakes, copperheads, coral snakes, and cottonmouths bite about 8,000 Americans a year. Their venom can be fatal. When hiking, do not go near any snakes. Walk slowly around them. Wear boots in tall grass and brush. Stay on hiking paths. Do not lift or climb on rocks.



Science Fact

Crocodiles swallow their food whole. A full-grown crocodile carries about 5 pounds (2 kilograms) of rocks in its stomach to grind up the food.

✓ Why are reptiles able to live in dry places?

Birds

A bird is a warm-blooded vertebrate with feathers and wings for flying. Birds also have hollow bones, which make the bones lighter. Because birds are light, it is easier for them to fly. Birds also have two legs.



Science Fact

Some birds are very fast fliers. The peregrine falcon can dive at speeds of more than 180 miles (290 kilometers) per hour.

There are more than 8,600 different kinds of birds. Hummingbirds are the smallest. A hummingbird weighs less than 1 ounce (28 grams). Ostriches are the largest birds. An ostrich can weigh up to 300 pounds (140 kilograms). Like reptiles, birds lay eggs and make nests.

Many birds **migrate**. That means they fly long distances each year to reach warm areas and better feeding grounds. Sometimes they migrate to nest or mate. The blackpoll warbler is a bird about the size of a sparrow. It flies from Canada to New England each year. It flies during the night and rests during the day. It stays in New England for about two weeks eating insects. Then it flies to South America. This is a distance of about 2,500 miles (4,000 kilometers).



Many birds migrate long distances every year, like these snow geese.



What are three characteristics of birds?

Mammals

A **mammal** is a warm-blooded vertebrate that has hair on its body. The mother's body makes milk to feed its young. Most mammals also give birth to live young. Most babies do not hatch from eggs. At birth, most mammals are already formed as young animals. Mammal parents take care of their young. Humans, elephants, mice, dolphins, tigers, bears, and bats are all examples of mammals.

Most mammals have big brains. They have two sets of appendages (all legs or legs and arms), and many have tails. Most mammals live on land. However, some, like whales and seals, live in water. The blue whale is the largest mammal on Earth. The shrew is the smallest mammal.

Some mammals carry a virus in their saliva that causes the disease *rabies*. Rabies is spread mostly by animal bites. Dog bites once caused most rabies in humans. Today, rabies is usually spread to humans by bats, skunks, raccoons, and foxes in the wild. Never go near unknown dogs or any wild animals. If you are bitten, go to a hospital or see a doctor right away. Rabies must be treated within 2 days of infection. It is too late once symptoms appear, about 7 to 10 days after a bite.



Some shrews weigh as little as a hummingbird.

✓ What are three characteristics of mammals?

Lesson Review

1. What characteristic do all vertebrates share?
2. What are the five kinds of vertebrates?
3. What two kinds of vertebrates have bodies that are covered with scales?
4. **CRITICAL THINKING** Why do you think many birds eat a lot of food before they migrate across large bodies of water?



LAB ACTIVITY

Using a Two-Choice Key

BACKGROUND

It can be hard to identify organisms. Scientists make this task easier by using a *two-choice key*. This key is simply a list of statements about the organism. For each characteristic, there are two possible choices. Making the correct choices leads you to the name of the organism.

PURPOSE

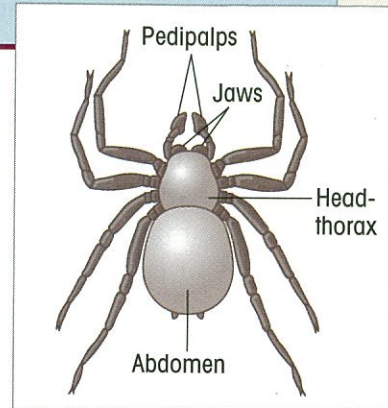
You will identify spiders by using a two-choice key.

MATERIALS

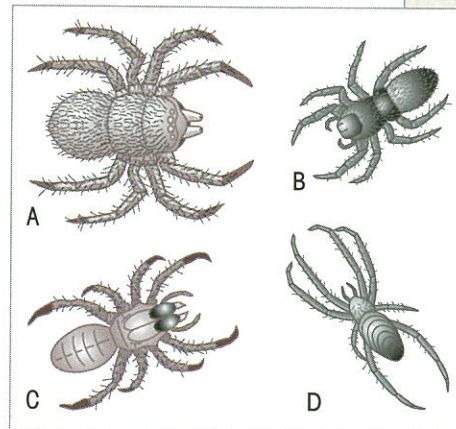
paper, pencil

WHAT TO DO

1. Study the diagram to learn the general structure of spiders.
2. Look at spider A. Read the first two statements in the key. Decide which choice fits. Follow the direction given for that choice.
3. Continue until you come to a type of spider at the end of a choice. That will be spider A. Write the name next to the letter A on a sheet of paper.
4. Repeat Steps 3 and 4 for the other spiders.



Structure of spiders



Two-Choice Key for Identifying Spiders

1. a. The entire body and all legs are covered with hairs. Go to 2
b. Only parts of the body are covered with hairs. Go to 3
2. a. The pedipalps are curved. jumping spider
b. The pedipalps are straight. tarantula
3. a. The jaws are large, and the head-thorax is covered by a plate. trapdoor spider
b. The jaws are small, and the head-thorax is not covered by a plate. argiope

DRAW CONCLUSIONS

- Suppose you found an animal that had antennae. Could you use this key to identify the animal? Explain.

ON-THE-JOB SCIENCE

Pet Store Worker

Rosita Hernandez works in a pet store. She helps customers find the animal they would like to have as a pet. She also helps them find the right food and supplies for that pet. She makes sure each pet is in the correct carrier when it leaves the store.

The animals that are sold in a pet store have different needs. Some must be kept in water. Others need a dry cage with a small bowl of water. Some must stay warm to survive. Others must be kept cool. Each animal eats a certain type of food. A pet store worker must understand the needs of each animal.

Pet store workers usually put similar kinds of animals near each other in the store. That makes it easier for customers to find what they want.

The pet store is divided into six sections: invertebrates, fish, amphibians, reptiles, birds, and mammals. The store receives the following animals:

guppies	parakeets	crayfish	hamsters
lizards	salamanders	snakes	goldfish
gerbils	turtles	frogs	canaries

Using the chart above, answer these questions.

1. Which animals would go in each section?
2. Which animals would need to be kept in water or in a wet environment?
3. Which animals could keep their body temperature constant if the temperature of their surroundings changed?



Rosita takes care of the animals in the pet store.

Critical Thinking

How did you decide where to put the animals for Question 1 below?

Summary

Animals are complex organisms. They are divided into two main groups: vertebrates and invertebrates. Smaller groups share characteristics such as being cold-blooded or warm-blooded.

Lesson 6.1

Animals can move around, must get their own food, and are made of specialized cells.

Lesson 6.2

Invertebrates do not have backbones. Sponges, mollusks, and arthropods are examples of invertebrates.

Lesson 6.3

Vertebrates have backbones, developed brains, and digestive and reproductive parts. Fish, amphibians, reptiles, birds, and mammals are vertebrates.

Vocabulary Review

Complete each sentence with a term from the list.

1. An animal with a backbone is known as a _____.
2. An insect is a type of _____.
3. Some birds _____ long distances to nest or mate.
4. The tapeworm is a _____, which means it lives on or in another living thing.
5. The body temperature of a _____ animal changes with the environment.
6. A body part that extends out from the body, such as a wing or a leg, is an _____.
7. A _____ lays eggs with a leathery cover that keeps them from drying out.
8. A _____ has a soft body that is not divided into segments.

cold-blooded
reptile
arthropod
mollusk
vertebrate
parasite
migrate
appendage

Chapter Quiz

Write your answers on a separate sheet of paper.

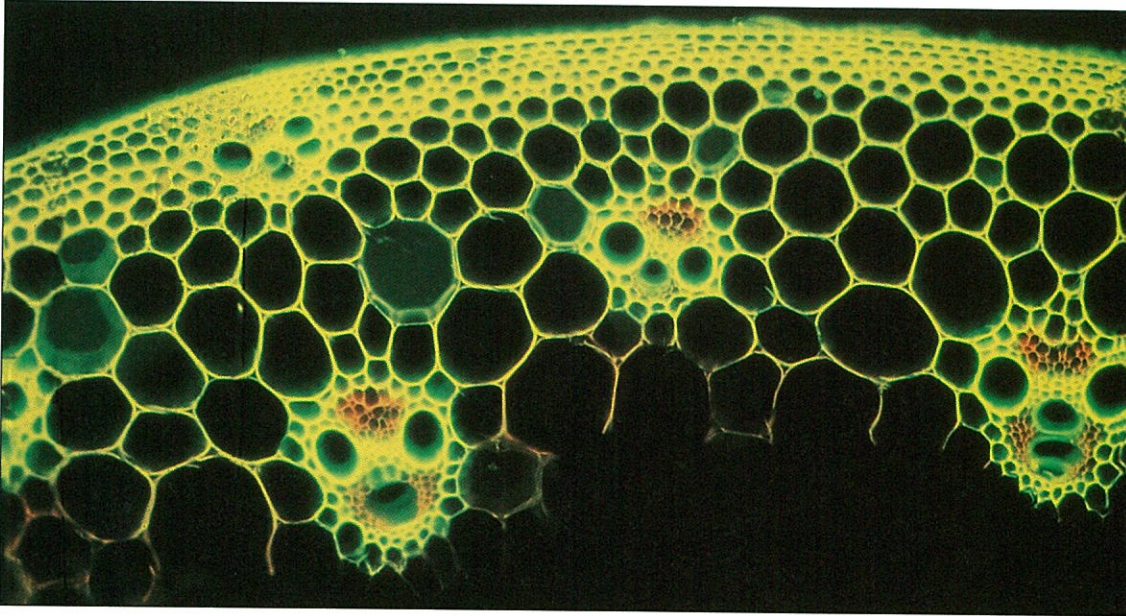
1. How is an animal different from a plant?
2. How are invertebrates different from vertebrates?
3. How are parasites and hosts related?
4. What are three examples of mollusks?
5. What are the three segments of an insect's body?
6. How are spiders different from insects?
7. How are fish different from mature amphibians?
8. What are three examples of reptiles?
9. What kind of bones do birds have that make flying easier?
10. How are mammals different from other vertebrates?

Test Tip

Always try to write answers in complete sentences. This helps improve the quality of your thinking as well as that of your writing.

Research Project

You may have heard of a flock of sheep or a herd of cows. *Flock* and *herd* are the group names for these animals. Other kinds of animals have different group names. Research the group names for the following animals: geese, gorillas, fish, chicks, quail, lions, ants, and wolves. Make a chart that lists each animal and its group name.



Tiny tubes inside a plant's stem carry water, minerals, and food to other parts of the plant. What other plant parts do you know about?

Learning Objectives

- Explain how plants differ from animals.
- Explain the function of seeds, roots, stems, and leaves.
- Describe photosynthesis.
- Identify the parts of a flower and their functions.
- Describe what happens during pollination.
- Describe the process of fertilization.
- Describe the process of seed germination.
- Explain the function of fruits for seed plants.
- LAB ACTIVITY: Compare how different environments affect seed germination.
- SCIENCE IN YOUR LIFE: List common items that are made from trees.