SECTION 1

What Is an Animal?

Key Concept Animals are made up of many cells. Animals consume other organisms to get the energy they need to grow, survive, and reproduce.

What You Will Learn

- Animals are multicellular organisms.
- Animals have specialized cells, tissues, organs, and organ systems.
- Animals have seven basic characteristics.

Why It Matters

The characteristics of animals allow them to adapt to their environment.

Vocabulary

- coelom
- consumer
- differentiation

READING STRATEGY

Brainstorming The main idea of this section is that all animals share certain characteristics. Brainstorm words and phrases related to the characteristics of animals. Record your work in your **Science Journal.**

What do you think of when you hear the word *animal*? You may think of your dog or cat. You may also think about giraffes or black bears. But would you think of a sponge? Some natural sponges that people use when showering are the remains of an animal. Animals come in many shapes and sizes. Some have four legs and fur, but most do not. Some are too small to be seen without a microscope, and others are bigger than a school bus.

Animal Characteristics

Sponges, worms, penguins, and lions are all animals. But until about 200 years ago, most people thought sponges were plants. And worms don't look like penguins or lions. Some different kinds of organisms are shown in **Figure 1.** The feather star has many flexible arms that it uses to trap food. The coral has a rigid skeleton that is attached to a hard surface. Fish move their bodies to swim from place to place. So, are all of these organisms animals? And what determines whether an organism is an animal, a plant, or something else? There is no simple answer. But all animals share characteristics that set them apart from all other organisms.

Figure 1 *Most of the organisms in this picture are animals.*

Multicellular Makeup

Like all organisms, animals are made up of cells. Unlike plant cells, animal cells do not have cell walls. Animal cells are surrounded by only cell membranes. All animals are made up of many cells and are therefore *multicellular* organisms. In animals, all of the cells work together to perform the life functions of the animal.

Organization in Animals

Animals have different levels of structural organization in their bodies. Each cell in a multicellular organism does not perform every life function of the organism. Instead, a specific kind of cell can specialize to perform a specific function. For example, muscle cells in an animal help the animal move. Groups of the same kinds of cells that work together form *tissues*. For example, muscle cells form muscle tissue.

When different kinds of tissues work together to perform a specific function for the organism, these tissues form an *organ*. The heart, lungs, and kidneys are organs. When a group of organs work together to perform a specific function, the organs form an *organ system*. Each organ system has a unique job that is important to the survival of the whole organism. The failure of any organ system may lead to the death of the organism. The shark shown in **Figure 2** has organ systems that allow the shark to digest food, pump blood, and sense the environment.

Standards Check **What would happen to the shark if its heart failed?** **7.5.b**

7.1.f Students know that as multicellular organisms develop, their cells differentiate.
7.2.a Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.
7.5.a Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
7.5.b Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.
7.5.c Students know how bones and muscles work together to provide a structural framework for movement.

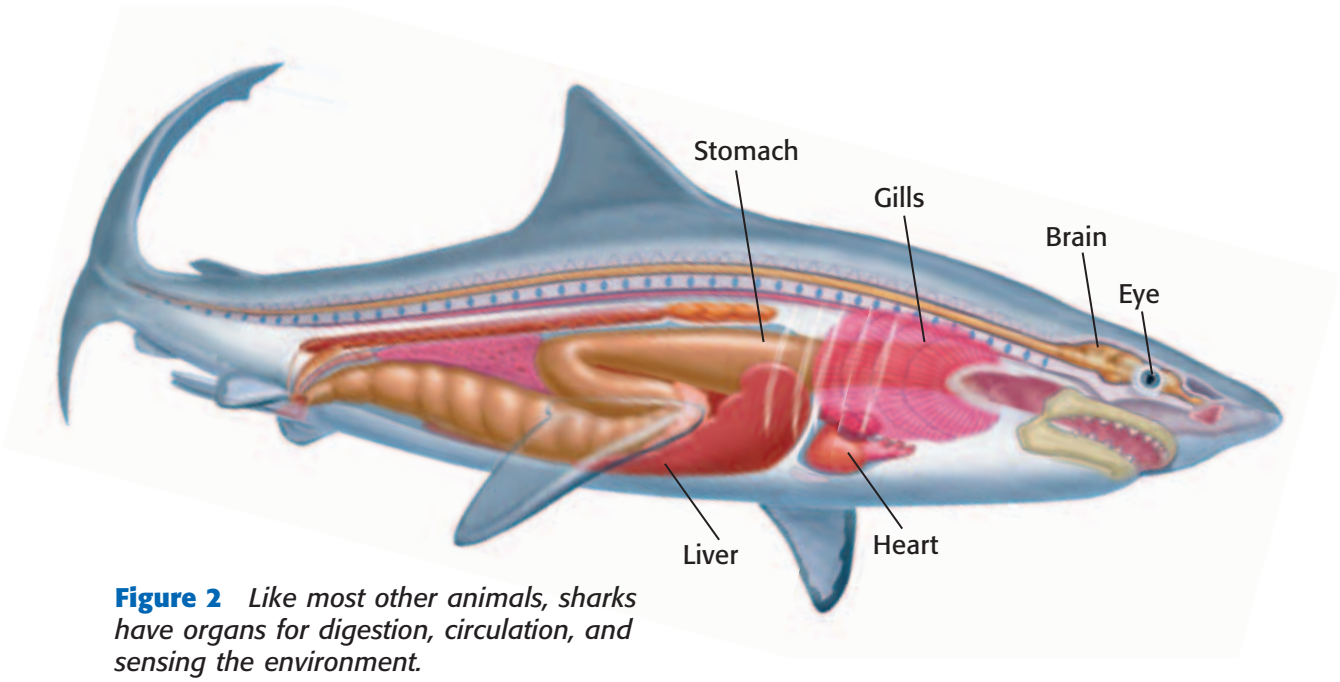
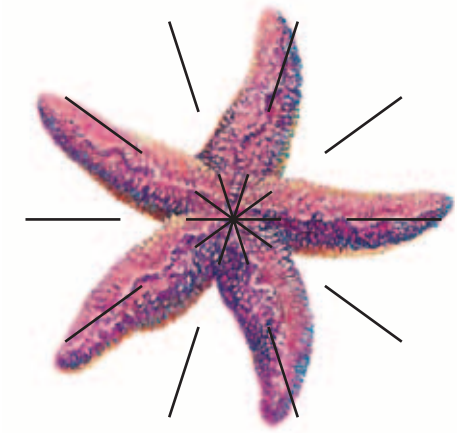


Figure 2 *Like most other animals, sharks have organs for digestion, circulation, and sensing the environment.*

Figure 3 Symmetry in Animal Body Plans

This tortoise has **bilateral symmetry.** The two sides of its body mirror each other. On each side of its body, the tortoise has one eye, one ear, and two legs.



This sea star has **radial symmetry.** Its body is organized around the center, like spokes on a wheel.

This sponge is **asymmetrical.** You cannot draw a straight line to divide its body into two or more equal parts. Its body is not organized around a center.

coelom (SEE luhm) a body cavity that contains the internal organs

consumer (kuhn SOOM uhr) an organism that eats other organisms or organic matter

Body Plans

Animal bodies have two basic types of *symmetry*. Symmetry can be bilateral (bievLAT uhr uhl) or radial (RAY dee uhl). Animals that have no symmetry are asymmetrical (AY suh ME tri kuhl). Most animals have bilateral symmetry. **Figure 3** shows an example of each type of symmetry.

Another basic characteristic of a body plan is whether or not it has a *coelom*. A **coelom** is a body cavity that surrounds and protects many organs, such as the heart. Many animals have coeloms.

Figure 4 *Pandas eat about 13.6 kg of bamboo every day.*

Getting Energy

All organisms need energy to survive. Plants can make their own food to get the energy that they need to live. Unlike plants however, animals cannot make their own food. Animals get energy by consuming other organisms or parts and products of other organisms. Therefore, animals are *consumers*. A **consumer** is an organism that feeds on other organisms to meet its energy needs. One way in which animals differ from plants is that animals are consumers. Although there are a few exceptions, most plants do not feed on other organisms.

Animals eat many kinds of foods. As **Figure 4** shows, pandas eat bamboo. Spiders eat other animals. Mosquitoes drink blood. Butterflies drink nectar from flowers. Also, some animals eat more than one kind of food. For example, the black bear eats both fruits and other animals.

Reproduction

Animals make more animals like themselves through reproduction. Some animals reproduce asexually. In *asexual reproduction,* a parent has offspring that are genetically identical to the parent. For example, hydras can reproduce by budding. In *budding,* part of an organism develops into a new organism. As the new organism develops, it breaks off from the parent. Another kind of asexual reproduction is called *fragmentation.* In fragmentation, parts of an organism break off and then develop into new individuals.

Most animals reproduce sexually. In *sexual reproduction,* offspring are formed when sex cells from two parents combine. The female parent produces sex cells called *eggs.* The male parent produces sex cells called *sperm.* When an egg's nucleus and a sperm's nucleus join in a process called *fertilization,* the first cell of a new organism is formed.

Wordwise **asexual reproduction** The prefix *a-* means "not."

differentiation (DIF uhr EN shee AY shuhn) the process in which the structure and function of the parts of an organism change to enable specialization of those parts

Development

A fertilized egg cell divides into many cells to form an *embryo* (EM bree OH). An embryo is one of the early stages of development of an organism, such as the mouse embryo shown in **Figure 5.**

As a multicellular organism develops, its cells become specialized through *differentiation.* **Differentiation** is the process by which cells that will perform different functions develop different structures. For example, some nerve cells grow very long, to carry electrical signals from your spine to your feet.

Standards Check **What happens during differentiation?** 7.1.f

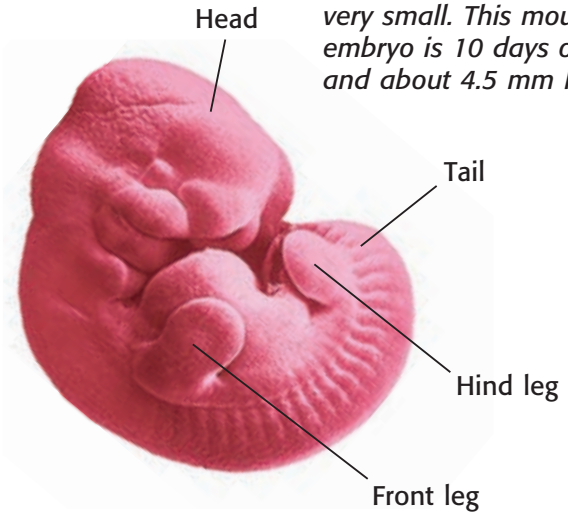


Figure 5 *Embryos are very small. This mouse embryo is 10 days old, and about 4.5 mm long.*

Quick Lab

Differentiating Blood Cells

1. Examine the **slide of the red bone marrow smear.**
2. Notice the different kinds of blood cells in the smear. Sketch a red blood cell and a white blood cell.
3. All blood cells differentiate from the same kind of cell called a blood stem cell. Examine the sketch of a *blood stem cell* made by your teacher.
4. Make a **flip book animation** that shows how one of the blood cells that you sketched developed from the blood stem cell.

7.1.f

20 min

Movement

Nearly all animals move to search for food, shelter, or mates. **Figure 6** shows some of the different ways in which animals move. Some animals can move from place to place only at certain stages of their life. For example, a young sea anemone finds its food as it drifts in ocean currents. When a sea anemone is older, it will swim to the ocean floor and attach itself there. As an adult, a sea anemone cannot move around and must wait for food to come within reach of its tentacles, as **Figure 6** shows.

Most movement in animals is possible because of muscle cells. By contracting and relaxing, groups of muscle cells work together to help an animal move. For example, a parrot flies because the muscles that are attached to its breast bone and bones in its wings contract and relax.

Standards Check **How do muscle cells allow a parrot to fly?** 7.5.a, 7.5.c

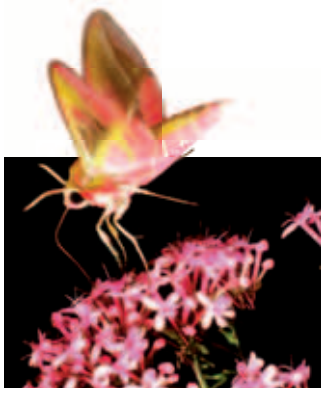
Figure 6 **How Animals Move**

Anemone catching food

Nautilus swimming

Fish swimming

Caterpillar crawling



Moth flying

Parrot flying

Gibbon walking

Maintaining Body Temperature

To function well, all animals need to maintain their bodies within a specific range of temperatures. Birds and mammals maintain their own body temperatures by using some of the energy released by chemical reactions. These kinds of animals are called *endotherms* (EN doh THURMZ).

Animals that rely on their environment to maintain their body temperature are called *ectotherms* (EK toh THURMZ). Some ectotherms have developed different behaviors to control their body temperatures. For example, some lizards sit in the sun to warm themselves in the morning before they hunt. When the weather gets too hot, the lizard may burrow underground to stay cool.

SCHOOL to HOME

Exploring Your Home

With an adult, list all of the animals that you find around your home. Do you have pets? Are there any spiders in spider webs outside? Can you see any animals from your window? When you have finished writing your list, make a poster about the animals you found.

ACTIVITY

SECTION Review

7.1.f, 7.2.a, 7.5.a, 7.5.b, 7.5.c

Summary

- All animals are multicellular organisms. Specialized cells in animals are organized into tissues, organs, and organ systems.
- Most animals have bilateral symmetry or radial symmetry. Some are asymmetrical.
- Animals consume other organisms to get energy.
- Animals reproduce asexually or sexually.
- As an embryo develops, its cells differentiate.
- Animals move in many ways.
- Animals that maintain their own body temperature are endotherms. Animals that rely on their environment to maintain their body temperature are ectotherms.

Using Vocabulary

1. Write an original definition for *embryo* and *consumer*.

Understanding Concepts

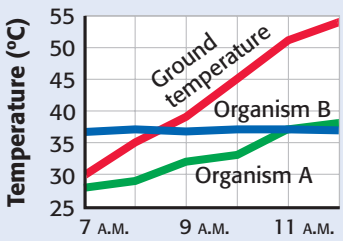
2. **Identifying** What is differentiation?
3. **Describing** Starting at the level of the cell, describe the levels of structural organization in animals.

Critical Thinking

4. **Making Comparisons** What are the two main kinds of reproduction in animals? How do the kinds of reproduction differ?
5. **Identifying Relationships** A fish tank contains water, chemicals, fish, snails, algae, and gravel. Which of these items are alive? Which of these items are animals? Why are some of the living organisms not classified as animals?
6. **Making Inferences** Could a parrot fly if it did not have muscle cells? Explain.

INTERPRETING GRAPHICS The graph shows body temperatures of organism A and organism B and shows the ground temperature. Use the graph below to answer the next two questions.

Body and Ground Temperatures



7. **Evaluating Data** How do the body temperatures of the two organisms change as the ground temperature changes?
8. **Making Inferences** Which organism is probably an ectotherm? Which organism is probably an endotherm? Explain.

Internet Resources

For a variety of links related to this chapter, go to www.scilinks.org

Topic: Animals of California

SciLinks code: HY7C02