SECTION 1

Characteristics of Living Things

Key Concept Living things have six characteristics in common.

What You Will Learn

- Living things are composed of one or more cells.
- Living things sense and respond to changes in their environment.
- Living things produce offspring through sexual reproduction or asexual reproduction.
- The cells of living things contain DNA.
- Living things use energy.
- Living things grow and develop.

Why It Matters

Learning about the characteristics that all living things share helps you understand life science.

Vocabulary

- cell
- homeostasis
- sexual reproduction
- asexual reproduction
- metabolism

READING STRATEGY

Summarizing Read this section silently. In pairs, take turns summarizing the material. Stop to discuss ideas and words that seem confusing.

7.1.a Students know cells function similarly in all living organisms.
7.2.a Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.

While outside one day, you notice something strange in the grass. It is slimy and bright yellow and is about the size of a dime. You have no idea what it is. Is it alive? How can you tell? An amazing variety of *organisms,* or living things, exist on Earth. All living things are alike in several ways. What does a dog have in common with a bacterium? And what do *you* have in common with a slimy, yellow blob known as a *slime mold?* Read on to find out about the six characteristics that all organisms share.

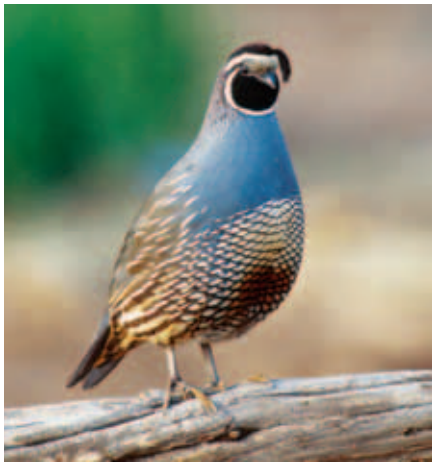
Living Things Have Cells

All living things, such as those in **Figure 1,** are composed of one or more cells. A **cell** is the structural and functional unit of life. It is the smallest unit that can carry out the activities of life. All cells are surrounded by a *cell membrane,* which separates the contents of the cell from the cell's environment. Most cells are too small to be seen with the naked eye.

In an organism made up of only one cell, different parts of the cell perform different functions. For example, a one-celled protist needs to eat. So, some parts of the cell take in food. Other parts of the cell break down the food. Still other parts of the cell excrete wastes.

Some living things are made up of trillions of cells. In an organism with many cells, different kinds of cells perform specialized functions. For example, your nerve cells transport signals, and your muscle cells are specialized for movement.

Standards Check **What are all living things made of?** 7.1.a



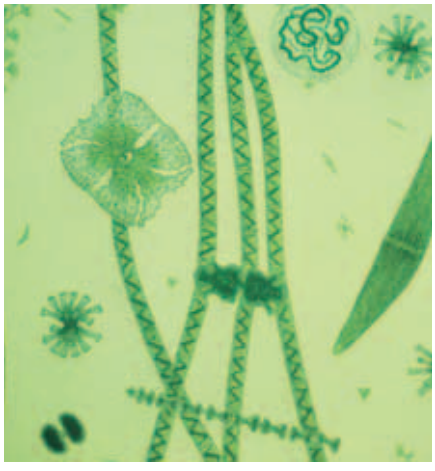


Figure 1 *Some organisms, such as the California quail on the left, are made up of trillions of cells. The protists on the right are made up of one cell or a few cells. They are so small that they can be seen only with a microscope.*

Figure 2 *The touch of an insect triggers the Venus' flytrap to close its leaves quickly.*

Living Things Sense and Respond to Change

All living things are able to sense change in their environment and to respond to that change. When your pupils are exposed to light, they respond by becoming smaller. A change that affects the activity of an organism is called a *stimulus* (plural, *stimuli*).

Stimuli can be chemicals, gravity, light, sounds, hunger, or anything that causes organisms to respond in some way. A gentle touch causes a response in the plant shown in **Figure 2.**

cell (SEL) the smallest functional and structural unit of all living organisms

homeostasis (HOH mee OH STAY sis) the maintenance of a constant internal state in a changing environment

Homeostasis

Even though an organism's outside environment may change, conditions inside its body must stay the same. Many chemical reactions keep an organism alive. These reactions can take place only when conditions are exactly right. An organism must maintain stable internal conditions to survive. The maintenance of a stable internal environment is called **homeostasis.**

Responding to External Changes

Your body maintains a temperature of about 37°C. When you get hot, your body responds by sweating. When you get cold, your muscles twitch in an attempt to warm you up. This twitching is called *shivering*. Whether you are sweating or shivering, your body is trying to return itself to normal.

Other organisms also need to have stable internal conditions. But many cannot respond the way you do. Some living things control their body temperature by moving from one environment to another. If they get warm, they move to the shade. If they get cool, they move into the sunlight. For example, turtles often can be seen sunning themselves on rocks. When they get too warm, the turtles slide into the water.

Quick Lab

The Role of Cells

7.1.a

1. Gather **20 to 30 small marshmallows.**
2. Use **toothpicks** to connect your marshmallows into any shape that you like.
3. Compare your marshmallow arrangements with your classmates'. What do they have in common?
4. If your arrangement represents an organism, describe how the marshmallows represent cells.

10 min

Figure 3 *Like most animals, bears produce offspring by sexual reproduction.*

Figure 4 *The hydra can reproduce asexually by forming buds that break off and grow into new individuals.* ***How will the new buds compare to the original organism?***

Living Things Reproduce

Living things make offspring like themselves by either sexual reproduction or asexual reproduction. In **sexual reproduction,** two parents produce offspring that share characteristics of both parents. Most plants and animals, such as the bears in **Figure 3,** reproduce sexually. In **asexual reproduction,** a single parent produces offspring that are identical to the parent. Most single-celled organisms and many multicellular organisms reproduce asexually. **Figure 4** shows a hydra, a multicellular animal that reproduces asexually.

Standards Check **Describe asexual reproduction.** 7.2.a

Living Things Have DNA

The cells of all living things contain the molecule **d**eoxyribo**n**ucleic **a**cid (dee AHK see RIE boh noo KLEE ik AS id), or DNA. DNA carries instructions for the organism's traits. When organisms reproduce, they pass copies of their DNA to their offspring. Passing DNA ensures that the traits of parents are passed to the offspring. This passing of traits is called *heredity.*

Living Things Use Energy

Living things use energy to carry out the chemical activities of life. Some of these activities are changing energy into food, breaking down food, moving materials into and out of cells, growing, and building cells. An organism's **metabolism** is the sum of all of the activities that the organism performs.

sexual reproduction (SEK shoo uhl REE pruh DUHK shuhn) reproduction in which the sex cells from two parents unite to produce offspring that share traits from both parents

asexual reproduction (ay SEK shoo uhl REE pruh DUHK shuhn) reproduction that does not involve the union of sex cells and in which one parent produces offspring that are genetically identical to the parent

metabolism (muh TAB uh LIZ uhm) the sum of all chemical processes that occur in an organism

Living Things Grow and Develop

All living things grow during parts of their lives. In a single-celled organism, the cell gets larger and divides, which makes other organisms. In a multicellular organism, the number of cells increases, and the organism gets bigger. As living things grow, they also may develop and change. Like the organisms in **Figure 5,** you will pass through different stages in your life as you develop into an adult.

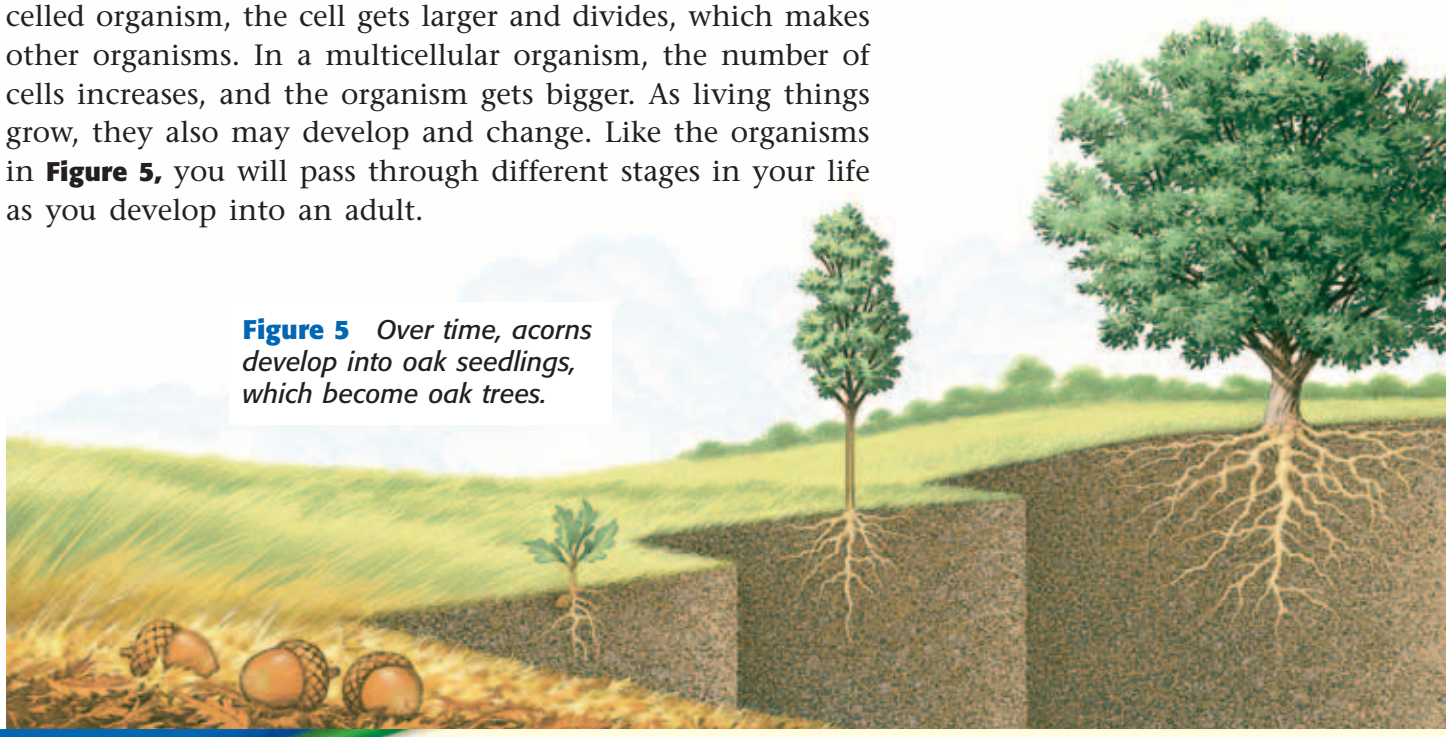


Figure 5 *Over time, acorns develop into oak seedlings, which become oak trees.*

SECTION Review

7.1.a, 7.2.a

Summary

- Organisms are made up of one or more cells.
- Organisms detect and respond to stimuli.
- Organisms reproduce through sexual or asexual reproduction.
- Organisms have DNA.
- Organisms use energy to carry out their activities.
- Organisms grow and develop.

Using Vocabulary

Complete each of the following sentences by choosing the correct term from the word bank.

cells stimulus
homeostasis metabolism

1. Sunlight can be a ___.
2. Living things are made of ___.

Understanding Concepts

3. **Describing** Describe the six characteristics of living things.
4. **Comparing** Explain the two types of reproduction.

Critical Thinking

5. **Applying Concepts** How are traits of parents passed to offspring? What traits might be passed to offspring if both parents are California quails?
6. **Identifying Relationships** How is the fur coat of a bear related to homeostasis?

Math Skills

7. **Using Equations** Bacteria double every generation. If one bacterium is in the first generation, how many bacteria will be in the sixth generation?

Challenge

8. **Making Inferences** Sexual reproduction produces offspring that share characteristics from two parents. What is an advantage of sexual reproduction?

Internet Resources

For a variety of links related to this chapter, go to www.scilinks.org
Topic: Characteristics of Living Things
SciLinks code: HY70258