

What life activities are these basketball players carrying on?



Chapter 1

WHAT ARE LIVING THINGS MADE OF?

Take a moment to think about where you live. Is it in the middle of a big city, in a quiet suburb, or on a farm? Wherever your home is, you will find many living and nonliving things. Everything on planet Earth can be placed into one of these two groups. All living things carry on certain activities that separate them from nonliving things.

A. Living and Nonliving Things

After doing this lesson you will be able:

- A1 • to list five activities that make living things different from nonliving things
- A2 • to tell the difference between organic and inorganic substances
- A3 • to find out what protoplasm is and describe it

All living things can carry on certain activities. These activities, called **life activities**, include (1) movement, (2) nutrition, (3) respiration, (4) sensitivity and (5) reproduction. Nonliving things cannot carry on these life activities.

1. Movement. *All living things are able to carry on some kind of movement.* Animals can move from place to place. Plants bend their stems and turn their leaves to receive the sunlight. A nonliving thing cannot move by itself.

2. Nutrition. *All living things use food for growth and for release of energy.* A nonliving thing does not use food. If it becomes larger, it is not because it has used food. A snowball becomes larger if it is made larger.

3. Respiration. *Most living things need oxygen.* Oxygen is used to burn food and release energy. The activity by which living things take in and use oxygen to let out energy is called respiration.

4. Sensitivity. *All living things are aware of and react to changes in their environment.* Light, sound, heat and chemicals are just some of the things that can change in the environment. Things that are not living do not react to changes.

5. Reproduction. *All living things reproduce.* Animals produce (make) other animals like themselves. Plants produce other plants like themselves. If living things could not reproduce, life would disappear from the earth. Nonliving things do not produce more of their own kind.

Thus, only living things carry on life activities. Things that are not living do not carry on any life activities.

Scientists class all matter as **organic** or **inorganic**. All living things are made up of

organic substances. Organic substances have carbon. Substances that do not have carbon are inorganic. For example, coal and oil are organic, while metals are inorganic.

All living things are made up of a substance called **protoplasm**. What is protoplasm? *Protoplasm is the basic living material.* It is always made of carbon, oxygen, hydrogen, nitrogen and very often sulfur and phosphorus.

Protoplasm also has a very large amount of water in it. Protoplasm is usually colorless. It feels and looks like jelly. Only living things can make new protoplasm or repair damaged protoplasm.

Since you are a living thing, you must be made of protoplasm. Yet, you don't look or feel like jelly. You have a definite shape. Most plants and animals aren't colorless and jellylike. They, too, have a shape. Where, then, is the protoplasm?

Check Up A

A1. Name five life activities.

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

A2. What is the difference between organic and inorganic substances? _____

A3. What is protoplasm? What does it look and feel like? _____

B. Cells

After doing this lesson you will be able:

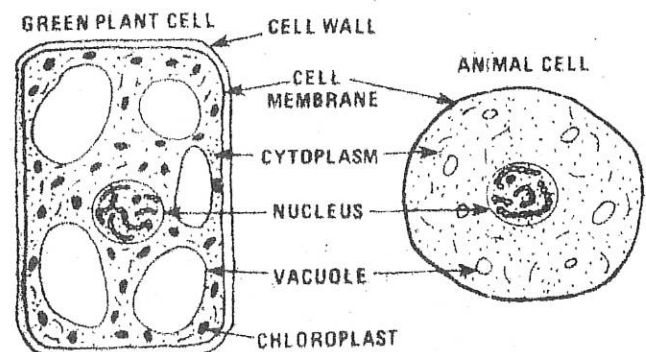
- B1 • to tell what the building blocks of all living things are called
- B2 • to name the person who invented one of the first microscopes
- B3 • to name the person who first saw part of a cell
- B4 • to tell the functions of the

(1) nucleus	(4) vacuole
(2) cytoplasm	(5) cell wall
(3) cell membrane	(6) chloroplast
- B5 • to list four parts found in both plant and animal cells
- B6 • to list two things found only in plant cells

The protoplasm of all living things is found in cells. Cells are *the building blocks of all living things*. Some living things are made of only one cell. Others are made up of millions of cells. Most cells are so small that they can be seen only with the aid of a microscope. Others can be seen by the unaided eye. It is the cell that carries on all the life activities of a living thing. What does a cell look like?

A Dutch lens maker, Anton van Leeuwenhoek (1632-1723), invented one of the first microscopes. The microscope made it possible to see very small things. Later Robert Hooke (1635-1703), an English scientist, improved the microscope. He thought he saw the first cell. Actually, he saw only

How does the structure of a green plant cell differ from that of an animal cell?



one part of the cell—the cell wall. (You will learn more about the cell wall later in this chapter.)

Scientists using powerful microscopes are able to observe what makes up cells. They have discovered that most cells are made up of two kinds of protoplasm: (1) the nucleus and (2) cytoplasm.

1. The **nucleus** usually is found in the center of the cell. It is thick and has a round shape. The nucleus controls most of the activities of the cell. It also plays a big part in the reproduction of the cell.

2. **Cytoplasm** is the protoplasm that is outside of the nucleus. The cytoplasm carries out all the life activities of the cell *except* cell reproduction.

All living things are made up of cells and all cells are made up of protoplasm. Also, almost all cells have a nucleus and cytoplasm. If you were to look at a plant cell and an animal cell under a microscope, you would see how they are alike and how they are different. Look at the pictures of plant and animal cells on page 6.

Every cell, plant and animal, has a **cell membrane**. This layer is the outermost living layer of all cells. The cell membrane is made up of living protoplasm. It is very thin and gives a cell its shape. It allows oxygen, carbon dioxide, water, food materials and other substances to enter and wastes to leave the cell. It also keeps out harmful materials.

Both plant and animal cells have **vacuoles**. Vacuoles are fluid-filled spaces in a cell. They serve many purposes in the cell. Some vacuoles hold food. In some simple forms of living things, the food is broken down in special vacuoles so it can be used by the cell. Some vacuoles hold the waste materials and water that are made by the cell.

Both plant and animal cells have a nucleus, cytoplasm, cell membrane and vacuoles. How do they differ? Plant cells have

parts which animal cells do not have. One part is the **cell wall** which is outside the cell membrane of a plant cell. The cell wall is not made up of living protoplasm but of **cellulose**. Cellulose is a nonliving part of the plant cell. **The cell wall increases in size as a plant gets older.** The wall gives the plant extra support and strength.

Other parts found in green plant cells, but not in animal cells, are **chloroplasts**. Chloroplasts are very small and contain green coloring matter called **chlorophyll**. Chlorophyll is needed by the green plant so it can make its own food. Animals cannot make their own food. Most animal food comes from green plants.

Check Up B

B1. What are the building blocks of all living things? _____

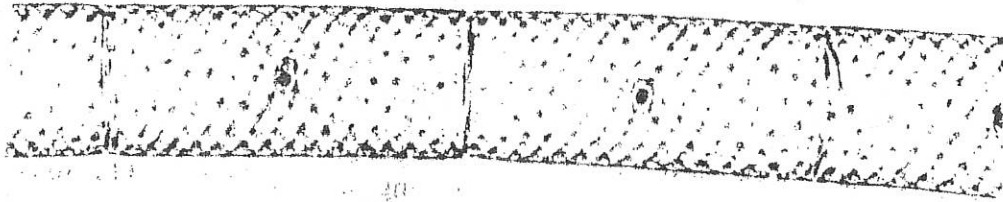
B2, 3. Who invented one of the first microscopes? Who improved it and first saw a part of a cell?

B4. Write a function of each of the following cell parts:

(1) Nucleus _____

(2) Cytoplasm _____

(3) Cell membrane _____



The *spirogyra* is usually found in long strands of many *spirogyra* cells living together end to end. Can you identify the nucleus and the spiral chloroplasts?

(4) Vacuole _____

(5) Cell wall _____

(6) Chloroplast _____

B5. List four parts found in both plant and animal cells.

(1) _____

(2) _____

(3) _____

(4) _____

B6. What two parts are found only in plant cells?

(1) _____

(2) _____