Lesson 2 Structures of a Cell

Key Words

cell membrane: outer covering of a cell that controls the passage of substances into and out of the cell

lipids: chains of fatty acids

proteins: chains of amino acids arranged in a specific order

amino acid: chemical compound containing nitrogen, carbon, hydrogen, and oxygen

homeostasis: balance of substances within a cell

nucleus: part of a cell that controls most of the activities of the cell

nucleic acids: chains of nucleotides that direct a cell's activities

nucleotide: chemical made of a simple sugar, a phosphate, and a base

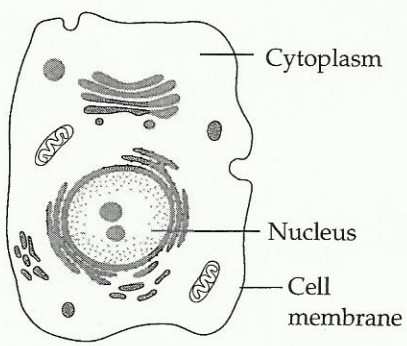
chromosomes: cell stuctures made of DNA and proteins that contain hereditary information

cytoplasm: living substance of a cell located between the nucleus and cell membrane

KEY IDEAS

Most cells possess common structures. The three basic parts of most cells are the cell membrane, the nucleus, and the cytoplasm.

Fig. 2-1



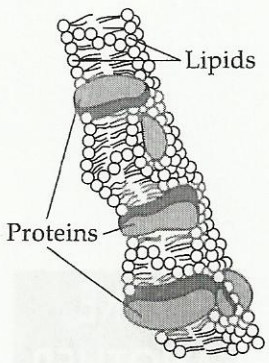
Have you ever heard the expression "a picture is worth a thousand words"? Medical artists make a career out of this saying. They create drawings to illustrate the traits of living things. Textbook publishers, hospitals, medical schools, and research companies use these drawings to help people understand scientific concepts. For example, medical artists sketch the many structures of a cell.

Cells vary in size and shape. Our own bodies contain more than 200 different kinds of cells. However, there are three cell structures common to most cells. They are the cell membrane, the nucleus, and the cytoplasm. Fig. 2-1 shows the locations of these three structures in the cell.

Cell Membrane. The thin outer covering of a cell is called the **cell membrane** (sehl MEHM-brayn). The cell membrane separates the cell from its environment. It is a flexible structure made up of lipids and proteins.

Lipids (LIHP-ihdz) are made of substances called fatty acids. A fatty acid is a chemical compound containing carbon, hydrogen, and oxygen. **Proteins** (PROH-teenz) are chains of amino acids. An **amino acid** (uh-MEE-noh AS-ihd) is a chemical compound containing nitrogen, carbon, hydrogen, and oxygen. A cell membrane contains two layers of lipids. Proteins are scattered throughout the lipids. See Fig. 2-2.

Fig. 2-2



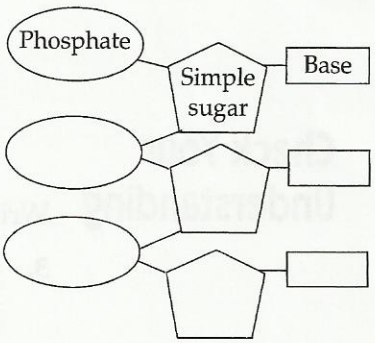
The actions of the cell membrane help the cell maintain **homeostasis** (HOH-mee-oh-STAY-sihs), a balance of substances within the cell. This balance is necessary for the cell to live. The cell membrane maintains homeostasis in three ways. First, it controls the flow of substances into and out of the cell. Substances the cell needs to carry out its life processes can enter the cell membrane. Waste products produced by the cell exit through the cell membrane. Second, it protects the cell from its surroundings. Third, it supports the cell and gives it a shape.

Nucleus. Located near the center of most cells is the nucleus. The **nucleus** (NOO-klee-uhs) is the control center of a cell. It directs most of the activities that occur within the cell. A thin membrane surrounds the nucleus. Pores in this membrane allow certain molecules to enter and leave the nucleus.

Inside the nucleus are nucleic acids and proteins. **Nucleic acids** (noo-KLEE-ihk AS-ihdz) are the materials that help direct the cell's activities. There are two kinds of nucleic acids: RNA and DNA. DNA stands for deoxyribonucleic acid. RNA stands for ribonucleic acid. Both nucleic acids guide and assist in the building of proteins. Proteins are used to build and repair cells.

Nucleic acids are long complex chains. Each link in the chain is called a nucleotide. A **nucleotide** (NOO-klee-oh-tyd) is made up of a simple sugar, a phosphate, and a base. See Fig. 2-3. Bases are made up of nitrogen, carbon, and hydrogen. There are four kinds of bases in a nucleic acid chain. Bases are important because of their role in the genetic code. You will learn more about the genetic code in Lesson 9.

Fig. 2-3



1. What is the job of the nucleus?

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The nucleic acids and the proteins in the nucleus make up structures called **chromosomes** (KROH-muh-sohmz). The DNA of chromosomes contains hereditary information. This information is passed between parents and offspring. It determines the traits of an organism. You will learn more about chromosomes in Lesson 8.

Cytoplasm. All the material inside the cell membrane, except the nucleus, is **cytoplasm** (SYET-oh-plaz-uhm). Many important structures, called

organelles, are in the cytoplasm of a cell. Since organelles vary among different types of cells, they are not considered basic cell parts. You will read more about organelles in Lesson 3.

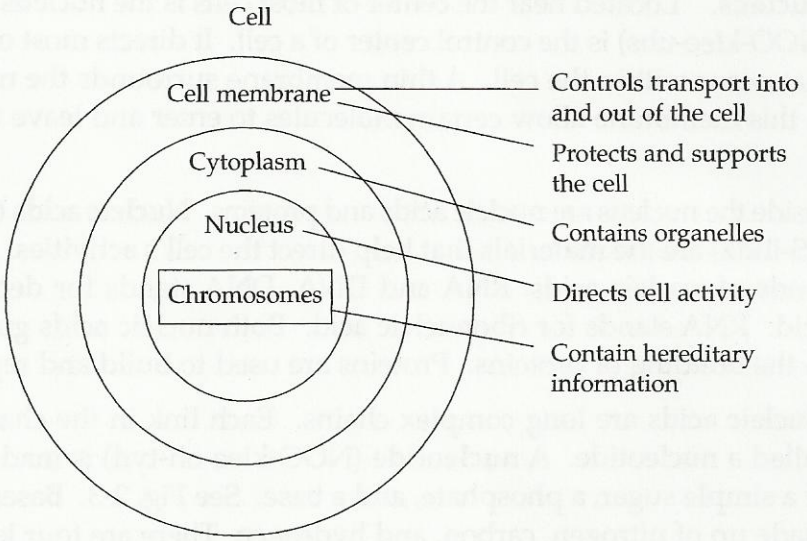
2. What are the three parts that make up most cells?

_____

TAKE ANOTHER LOOK

The cell contains three main parts: the cell membrane, the cytoplasm, and the nucleus. The cell membrane surrounds the cytoplasm. The cytoplasm surrounds the nucleus. The nucleus contains the chromosomes. Fig. 2-4 shows the relationship of these structures and their functions.

Fig. 2-4



Check Your Understanding

Write a sentence explaining the connection between each pair of words.

3. cell membrane, cytoplasm _____

_____

4. lipids, proteins _____

_____

5. nucleus, DNA _____

_____

6. nucleic acids, chromosomes _____

_____

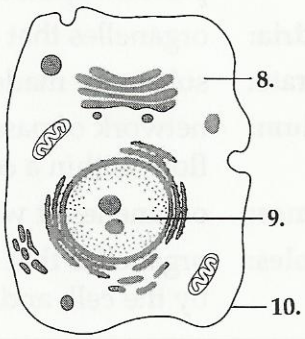
7. nucleic acid, nucleotides _____

_____

Look at Fig. 2-5. Then label the following cell parts on the lines below: *cell membrane, nucleus, cytoplasm.*

8. _____
9. _____
10. _____

Fig. 2-5



11. Why aren't organelles considered to be basic parts of a cell?

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12. What are the three ways the cell membrane helps a cell stay balanced?

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13. What part of a cell would you study if you wanted to observe chromosomes? Why? _____

_____

14. Suppose the cell membrane of a certain cell allowed materials to pass into the cell but prevented materials from flowing out of the cell. Predict the effect this would have on the cell.

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