

The Characteristics of Cells

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What is a cell?
- What is the cell theory?
- What structures are found in all cells?
- What are the two kinds of cells?



California Science Standards

7.1.a, 7.1.c

What Is a Cell?

All living things are made of tiny structures called cells. A **cell** is the smallest unit that can perform all the functions needed for life. Most cells are so small you need a microscope to see them. More than 50 human cells can fit on the dot in this letter *i*.

Some living things are made of only one cell. Others are made of millions of cells. Cells from two organisms can be very different from one another. Even cells from different parts of the same organism can be very different from one another. However, all cells have some basic things in common.

What Is the Cell Theory?

Scientists first saw cells through a microscope in 1665. Since then, we have learned a lot more about cells. Scientists have learned that all cells have some important things in common. These things make up the cell theory. The cell theory has three parts:

1. All organisms are made of one or more cells.
2. The cell is the basic unit of all living things.
3. All cells come from existing cells. ✓

What Structures Are Found in All Cells?

Cells come in many shapes and sizes and can have different jobs. All cells have three parts in common, however: a cell membrane, genetic material, and organelles.



Organize As you read this section, make lists of things found in prokaryotic cells, things found in eukaryotic cells, and things found in both.



READING CHECK

1. **Identify** What is the basic unit of all living things?

a cell

SECTION 1 The Characteristics of Cells *continued*

CELL MEMBRANE

Every cell has a cell membrane. The **cell membrane** is a layer that covers and protects the cell. Much like the skin covering your body, the cell membrane separates the cell from its surroundings. The cell membrane also controls what goes in and out of the cell. Inside the cell is a fluid called *cytoplasm*.

GENETIC MATERIAL

Almost all cells contain DNA (deoxyribonucleic acid). DNA is the genetic material that holds information needed to make new cells and new organisms. DNA passes from parent cells to new cells. It tells the cell what job to do. In some cells, the DNA is found inside a structure called the **nucleus**. Almost every cell in your body has a nucleus.

ORGANELLES

Cells have parts called **organelles** that do different jobs in the cell. Many organelles are covered with membranes. Different types of cells have different organelles.

CALIFORNIA STANDARDS CHECK

7.1.a Students know cells function similarly in all living organisms.

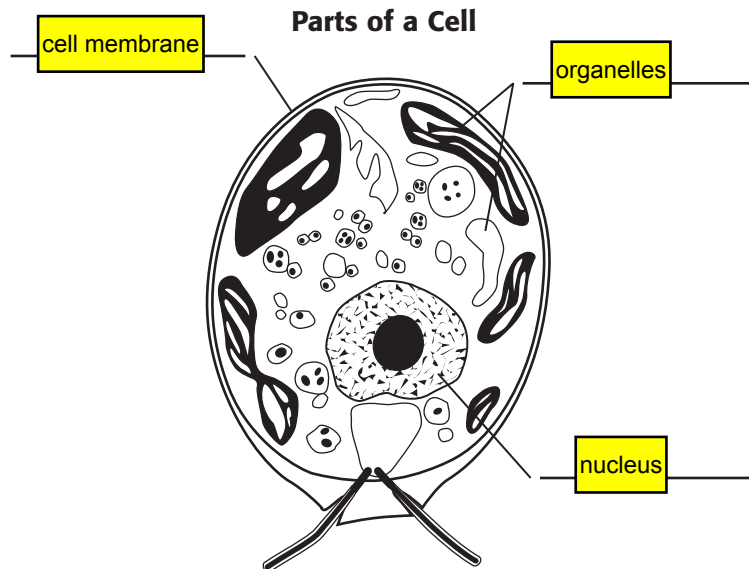
Word Help: function
use or purpose

2. List Name three things that all cells have in common.

1. cell membrane
2. genetic material
3. organelles

TAKE A LOOK

3. Identify Use the information in the text to fill in the blank labels in the figure.



What Are the Two Kinds of Cells?

There are two basic kinds of cells—one kind has a nucleus and the other kind doesn't. A cell without a nucleus is called a *prokaryotic cell*. A cell with a nucleus is called a *eukaryotic cell*.

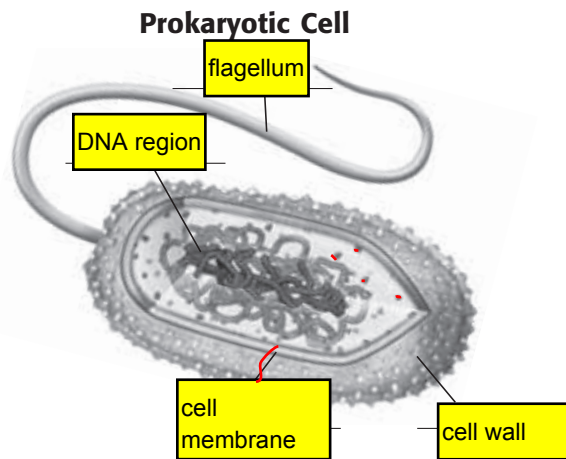
SECTION 1 The Characteristics of Cells *continued*

What Are Prokaryotes?

A prokaryote is a single-celled organism that does not have a nucleus. Even though they have no nuclei, prokaryotes do have DNA. Bacteria and archaea are prokaryotes. Many prokaryotes have flagella (singular, *flagellum*) that help them move.

These are some characteristics of prokaryotes:

- no nucleus
- DNA shaped like a twisted rubber band
- no membrane-covered (or membrane-bound) organelles
- a cell wall outside the cell membrane



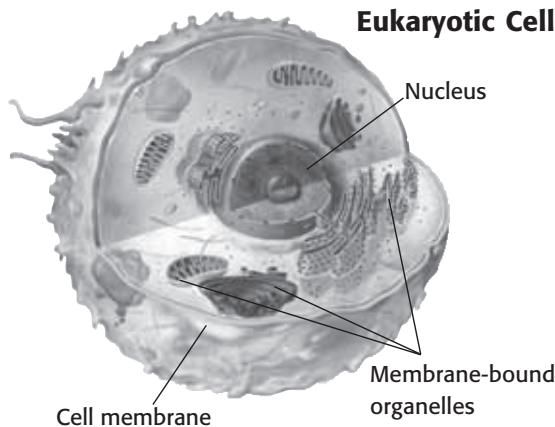
TAKE A LOOK

4. Identify Label the parts of the prokaryote with the following terms: DNA, flagellum, cell membrane, cell wall.

What Are Eukaryotes?

Eukaryotic cells are about 10 times larger than bacteria cells. Eukaryotic cells are still very small, and you need a microscope to see most of them.

Eukaryotes are organisms made of eukaryotic cells. They can have one cell or many cells. Yeast, which makes bread rise, is an example of a eukaryote with one cell. Plants are eukaryotes with many cells.



Math Focus

5. Calculate Most of the smallest prokaryotic cells have diameters of about 1 micron. What do you expect is the diameter of the smallest eukaryotic cell?

10 microns

TAKE A LOOK

6. Identify What does this cell have that a prokaryotic cell does not?

nucleus

Section 1 Review

7.1.a, 7.1.c



SECTION VOCABULARY

cell the smallest functional and structural unit in all living organisms; usually consists of a nucleus, cytoplasm, and a membrane

cell membrane a phospholipid layer that covers a cell's surface and acts as a barrier between the inside of a cell and the cell's environment

eukaryote an organism made up of cells that have a nucleus enclosed by a membrane; eukaryotes include protists, animals, plants, and fungi but not archaea or bacteria

nucleus in a eukaryotic cell, a membrane-bound organelle that contains the cell's DNA and that has a role in processes such as growth, metabolism, and reproduction

organelle one of the small bodies in a cell's cytoplasm that are specialized to perform a specific function

prokaryote a single-celled organism that does not have a nucleus or membrane-bound organelles; examples are archaea and bacteria

Wordwise The prefix *pro-* means "before." The root *karyon* means "nut" or "kernel."

1. Identify What are the three parts of the cell theory?

1. all living things are made of cells
2. the cell is the smallest basic unit of life
3. cells come from pre-existing cells

2. Compare Complete the chart below to compare prokaryotes and eukaryotes.

Prokaryotes	Eukaryotes
have a cell wall.	no cell wall
no nucleus	have a true nucleus
non - membrane bound organelles	membrane-bound organelles
one cell	one or many cells
also DNA	genetic material is DNA

3. Apply Concepts You have just discovered a new organism. It is a single cell and has a cell wall but no nucleus. What kind of organism is it? Explain your answer.

A prokaryote because it does have a cell wall and does NOT have a nucleus. It is not a virus if it has organelles like ribosomes.