

CONCEPT 1

Scientists classify cells into two types based on the presence or absence of a nucleus.

Activity

Asking Questions About Cells

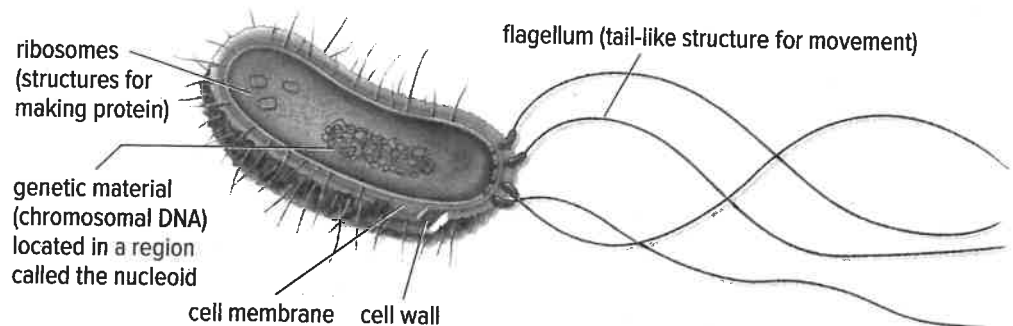
As a scientist, you observe the two cells shown in **Figure 1.10**. Record at least three observations you can make. What questions can you ask based on your observations? What hypothesis would you state based on your observations and questions? How would you test your hypothesis?



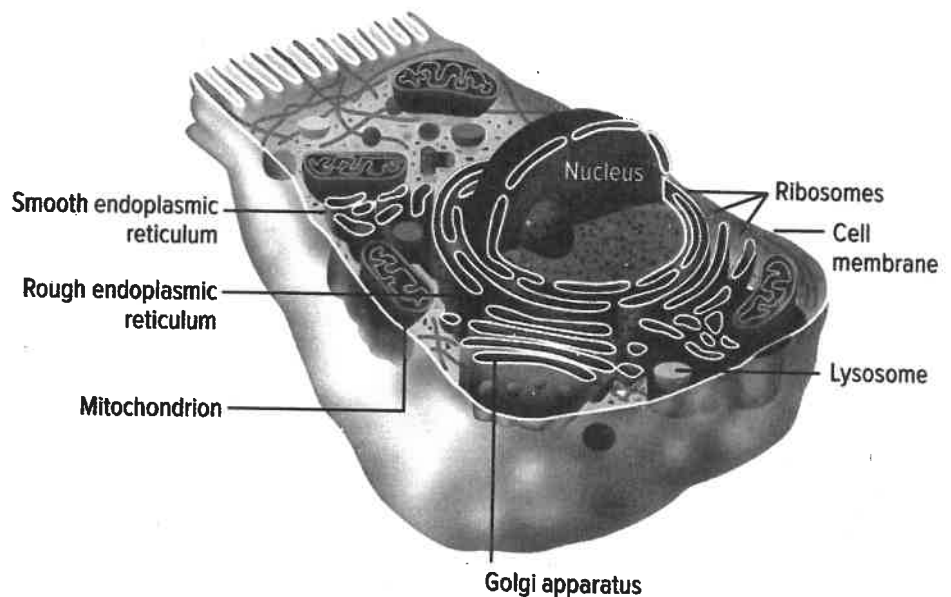
Figure 1.10 The two main types of cells

As scientists have studied millions of cells, they have developed criteria that let them classify all cells into two main types. These two types—prokaryotic cells and eukaryotic cells—are compared in **Figure 1.10**.

Prokaryotic Cell



Eukaryotic Cell



Prokaryotic Cells

A **prokaryotic cell** does not have a separate nucleus. In fact, the word prokaryotic comes from the words *pro-*, which means before, and *karyon*, which means nucleus. In addition to lacking a nucleus, prokaryotic cells are simpler than the other type of cells. They have fewer internal structures.

prokaryotic cell a type of cell without a nucleus and whose internal parts are not surrounded by membranes

Eukaryotic Cells

A **eukaryotic cell** has a nucleus, which contains the cell's genetic material. The nucleus is surrounded by a membrane. The *eu-* part of the word means proper, so a eukaryotic cell is one that has a proper or actual nucleus. Eukaryotic cells also contain other internal structures called organelles, which carry out cell processes. Eukaryotic cells are about 10 times as large as prokaryotic cells, and they are more complex. Table 1.2 compares these two types of cells.

eukaryotic cell a type of cell whose nucleus and other internal parts are surrounded by membranes

Table 1.2 Comparison of Prokaryotic and Eukaryotic Cells

Characteristic	Prokaryotic Cell	Eukaryotic Cell
Genetic material contained in nucleus surrounded by a membrane	no	yes
Organelles surrounded by membranes	no	yes
Size and complexity	smaller and less complex	about 10 times as large and more complex
Can carry out all processes needed to stay alive	yes	yes
Example	bacterium	liver cell of an animal

Activity

Cell Models

Build a model of an organism that either is or contains prokaryotic or eukaryotic cells. Use materials you bring from home, those provided by your teacher, or computer software to make your model. How can you connect the components of your model to the processes of life?

Before you leave this page . . .

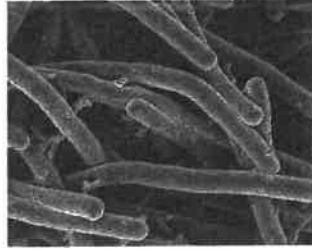
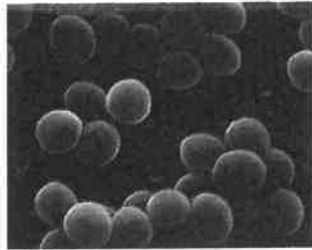
1. Use a Venn diagram to compare and contrast prokaryotic and eukaryotic cells.
2. Write three statements that are true of both prokaryotic and eukaryotic cells.

Bacteria are prokaryotic cells.

Activity

Describing Bacteria

Observe the different types of bacteria cells shown below. How would you describe each cell? How are they similar? How are they different?



Could you live in boiling water or super-salty lakes? You could if you belonged to the archaea. These prokaryotic organisms live in extreme environments. You may be more familiar with the other group of prokaryotic organisms: bacteria.

Bacteria

A typical bacterial cell looks like the prokaryotic cell in **Figure 1.10** (on page 24). It has a cell wall and a cell membrane that surround its jelly-like cytoplasm. Genetic material and protein-making structures called ribosomes float within the cytoplasm. Some bacteria have whip-like flagella for movement.

Archaea

Like bacteria, archaea lack a nucleus and have a cell wall. But there are some important differences between them. Molecules found in archaea are more like the molecules found in eukaryotic cells than those of bacterial cells. Archaea also have molecules in their cytoplasm that are not found in any other type of organism.



Before you leave this page . . .

1. Make a T-chart to compare and contrast bacteria and archaea.
2. What new questions do you have about bacteria and archaea?