

Parts of a Cell Seen with an Electron Microscope

LEARNING TIP

Stop and think. When you come across words in bold print, think about each word and ask yourself, "Is this word familiar? Where have I seen it before?"

The cytoplasm, the working area of a cell, contains tiny structures called **organelles**. Many of these organelles can be seen only with a transmission electron microscope. The organelles described below are found in both plant and animal cells, although **Figure 1** shows those of an animal cell.

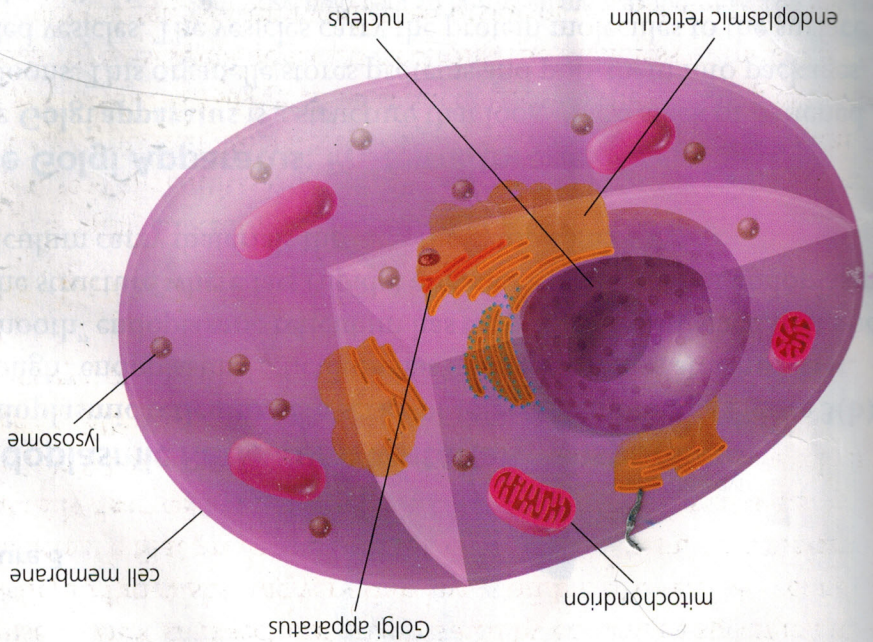


Figure 1

These organelles are found in both animal (shown here) and plant cells.

Mitochondria: Energy Production

Mitochondria (singular is *mitochondrion*), are circular or rod-shaped organelles. They are often referred to as the power plants of cells (**Figure 2**). They provide cells with energy. In a process called **cellular respiration**, mitochondria release energy by combining sugar molecules with oxygen molecules to form carbon dioxide and water. This energy is used in almost every other function of the cell.

Ribosomes: Protein Manufacturing

Ribosomes (**Figure 3(a)**) are very small organelles. In fact, they are so small that they appear as small fuzzy dots even when viewed with a transmission electron microscope. Ribosomes use information from the nucleus and molecules from the cytoplasm to produce proteins. Proteins are needed for cell growth, repair, and reproduction.

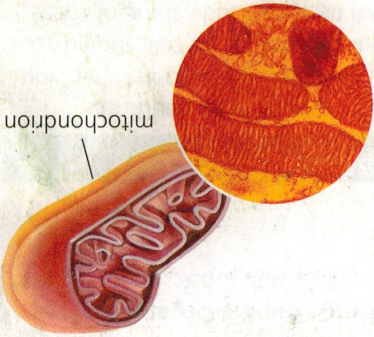


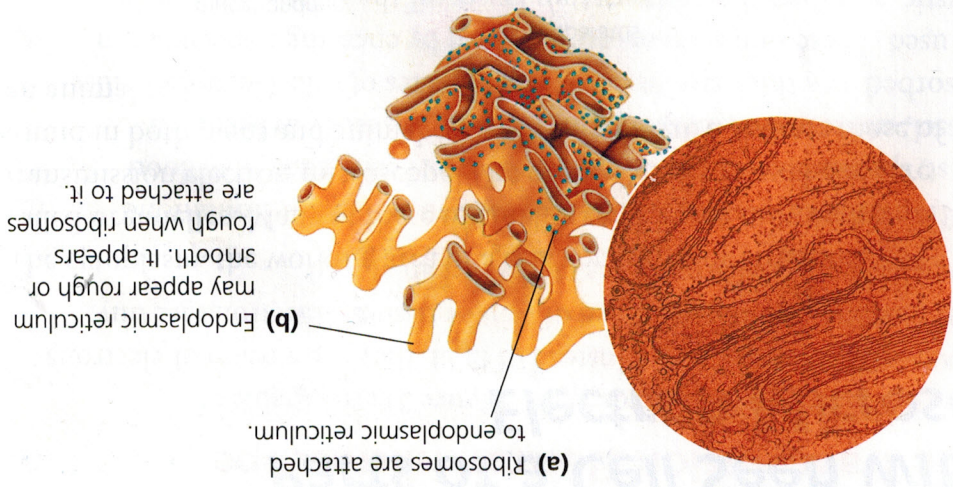
Figure 2

Mitochondria, often referred to as the power plants of cells, are generally the largest of the cytoplasmic organelles.

Active readers interact with the text. Ask yourself questions about your reading.

LEARNING TIP

Figure 3



Endoplasmic Reticulum: Material Transport ★

Endoplasmic reticulum is a series of folded membranes (Figure 3(b)). "Rough" endoplasmic reticulum has many ribosomes attached to it. "Smooth" endoplasmic reticulum has no ribosomes attached to it and is the structure where fats (lipids) are made. Both types of endoplasmic reticulum carry materials through the cytoplasm.

The Golgi Apparatus: Protein Storage ★

The Golgi apparatus is a structure that looks like a stack of flattened balloons. This organelle stores proteins and puts them into packages, called vesicles. The vesicles carry the protein molecules to the surface of the cell, where they are released to the outside (Figure 4). The proteins in the vesicles vary, depending on their function.

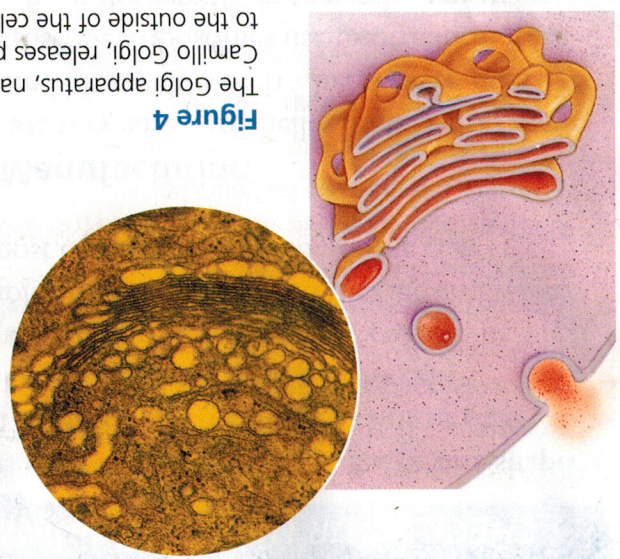


Figure 4

The Golgi apparatus, named after its discoverer, Camillo Golgi, releases packages of protein molecules to the outside of the cell.

1.6 CHECK YOUR UNDERSTANDING

1. What are organelles?
2. Make a concept map that shows cell structures and their functions. Include structures that are visible with a light microscope and with an electron microscope.
3. Predict what would happen to a cell if its mitochondria stopped working.
4. Cells lining the stomach release enzymes that aid digestion. Digestive enzymes are protein molecules. Explain why many Golgi apparatuses are found in stomach cells.

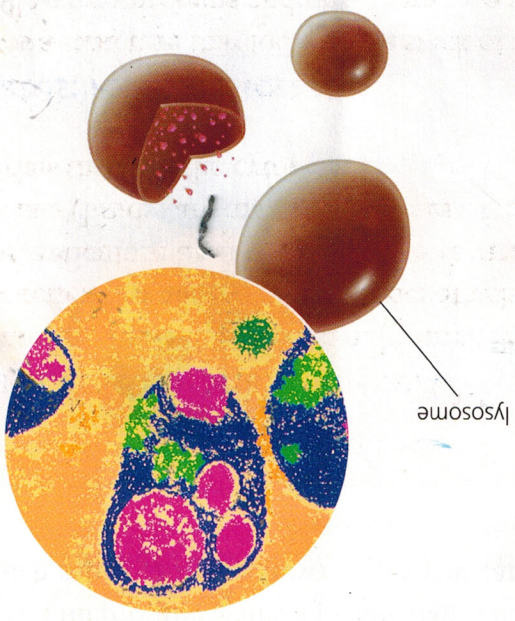
PERFORMANCE TASK

You have learned about the organelles inside a cell. When you build a specialized cell, should your cell design include some of these organelles? Explain.

LEARNING TIP

A concept map is a collection of words or pictures, or both, connected with lines or arrows. For further information on making concept maps, see **Using Graphic Organizers** in the Skills Handbook.

Figure 5 Damaged and worn-out cells are destroyed by their own lysosomes.



Lysosomes: Recycling Lysosomes are formed by the Golgi apparatus to patrol and clean the cytoplasm (Figure 5). They contain special proteins that are used to break down large molecules into many smaller molecules that can then be used by the cell. The smaller molecules can also be reused as building blocks for other large molecules. In humans and other animals, lysosomes play an important role in destroying harmful substances and invading bacteria that enter the cell.