

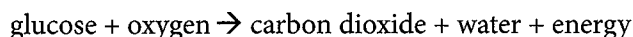
1.1.2 The Function of Various Cell Structures and Organelles

By the mid-1800s, scientists had observed enough organisms to conclude the following: all living things are composed of cells; cells come from other cells; and cells are the building blocks of life. This generalization became known as the **cell theory**.

All living things are made of at least one cell. One-celled living things are called unicellular. Living things made of more than one cell are called multicellular. Cells must constantly balance certain life processes in order to survive. These processes include:

- intake and storage of nutrients
- growth
- response to stimuli
- exchange of gases
- waste removal
- reproduction

To survive, cells need nutrients and oxygen. **Cellular respiration** describes the process in which the cell uses one of these nutrients, a sugar called glucose, together with oxygen, to produce the energy needed to carry out various life processes. The word equation for cellular respiration is:



Notice that carbon dioxide is a product of respiration. Carbon dioxide is a waste material that must be removed for the cell to remain healthy.

All cells have a variety of structures that carry out specific tasks. For example, both plant and animal cells are surrounded by cell membranes. Plant cells also have a cell wall for support. Inside the cell membrane is the cytoplasm, a jelly-like fluid that contains the **organelles**. Organelles are internal cell structures in which special cell functions are carried out.

Cell Structures and Organelles Observable with a Microscope

Plant and animal cells have many of the same structures and organelles that perform the same functions. You can use a compound light microscope to view the cell parts described in Table 1.3.

TABLE 1.3 Structures and Organelles Found in Both Plant and Animal Cells

Structure/Organelle	Function
Cell membrane	A thin outer covering that regulates materials coming into the cell and waste materials going out.
Cytoplasm	The region of the cell between the nucleus and cell membrane. The jelly-like substance made of water and life-supporting compounds is called the cytosol and contains the organelles.
Nucleus	The structure that directs all cellular activities, such as movement, growth, and other life functions.
Vacuole	An organelle that carries out a variety of functions in plant and animal cells. In plant cells, vacuoles tend to be larger, act as storage areas, and assist in regulating water. In animal cells, vacuoles are usually called vesicles. Vesicles are smaller and provide temporary storage of various materials.

Plant cells have structures and organelles that animal cells do not (Table 1.4 on page 8).



For more examples of the powerful instruments and different techniques used to view cell structures and organelles, check out bcscience.com.

TABLE 1.4 Structures and Organelles Found Only in Plant Cells

Structure/Organelle	Function
Cell wall	The structure that surrounds the cell membrane. It protects the plant cell and helps maintain the plant's shape.
Chloroplast	The organelle that carries out photosynthesis, converting the Sun's energy into nutrients for the cell. The word equation for photosynthesis is: <div style="text-align: center;"> sunlight ↓ carbon dioxide + water → glucose + oxygen </div>

Cell Structures and Organelles Not Observable with a Microscope

There are many structures and organelles you cannot observe with a compound light microscope. Table 1.5 describes some of these that can be observed only using more powerful microscopes such as the electron microscope.

TABLE 1.5 Structures and Organelles Not Seen with a Compound Light Microscope

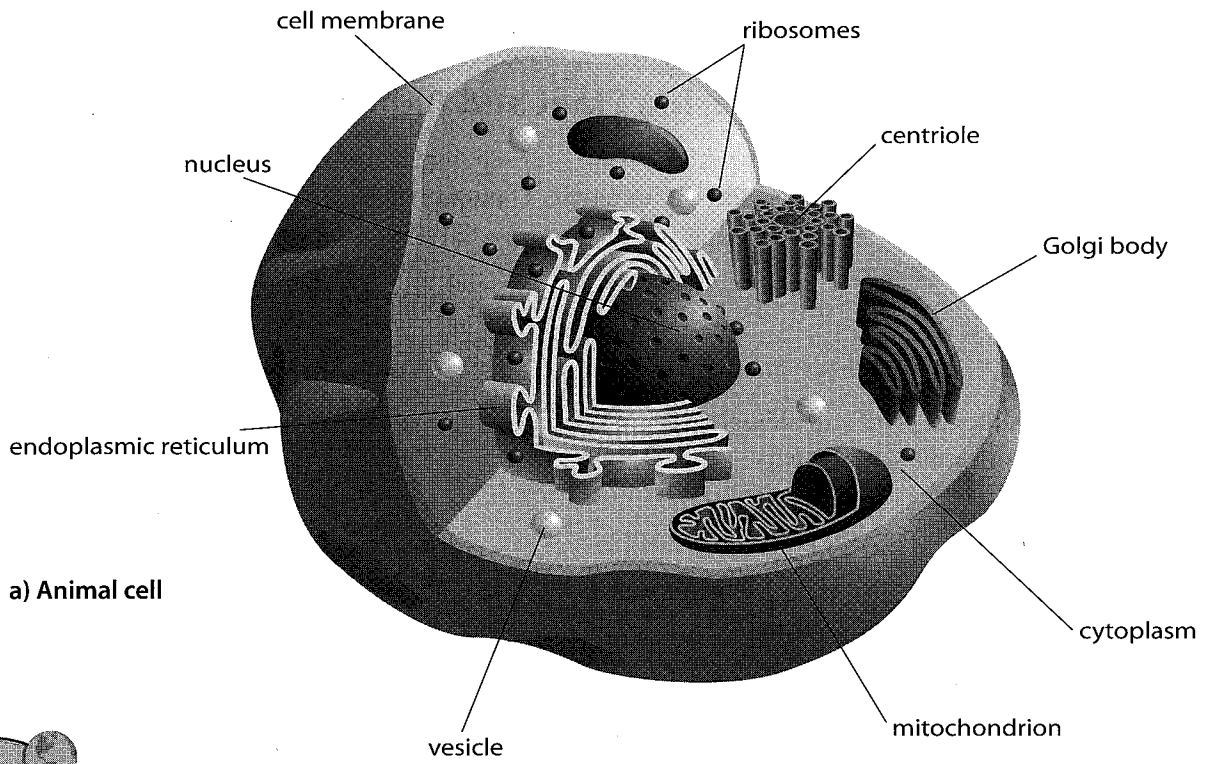
Structure/Organelle	Function
Centrioles	Protein fibres that aid cell division in animal cells by helping to move chromosomes.
Mitochondrion	An organelle that converts the chemical energy in sugar into energy the cell can use. Mitochondria are found in both plant and animal cells.
Ribosome	The organelle where proteins are assembled. Ribosomes are found in both plant and animal cells.
Endoplasmic reticulum	A network of membranes within the cytoplasm that transports materials through the cell. Some ribosomes attach to it.

Study Prep



For other pictures of plant and animal cells, check out bcscience.com.

You can compare the functions of a healthy cell and its structures and organelles to the operations of a city. This kind of comparison is called a metaphor. Develop a table that lists each of the organelles discussed on pages 7 and 8 in the first column. In the second column, use a metaphor to describe each organelle's function. For example, using the city metaphor, you could describe the vacuole as the water storage reservoir.





 For information about the Golgi body, check out bcscience.com

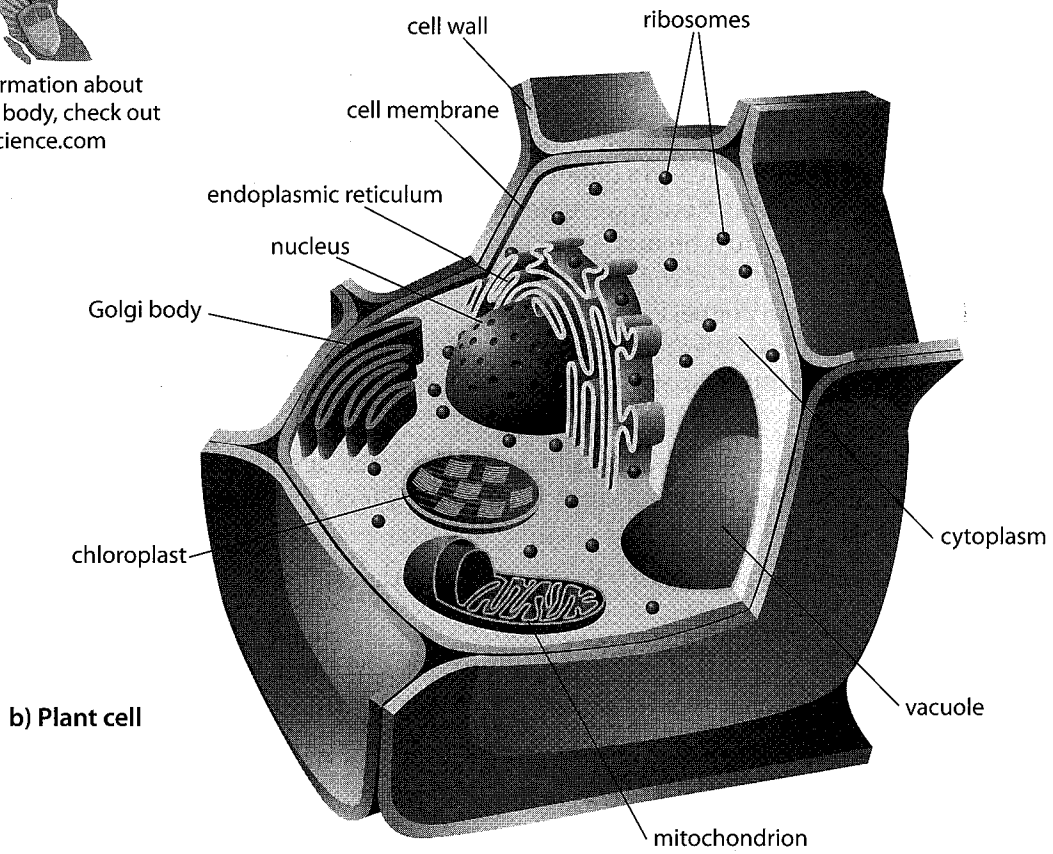


FIGURE 1.5 Animal and plant cells