

Levels of Organization

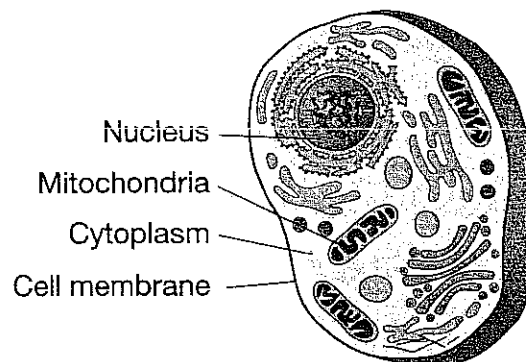


Getting the Idea

All living things are made up of tiny units called cells. A **cell** is the smallest unit capable of performing all the basic functions of life. Some organisms are made up of only one cell. However, larger organisms can be made up of trillions of cells. The cells in a complex organism must be organized in order to work together to keep that organism alive.

All animals, plants, fungi, and bacteria are made up of cells. Different types of cells—whether plant or animal—contain the same basic structures. A few structures are unique to either the plant cell or the animal cell. Each of these tiny cell structures, called **organelles**, performs a specific function. Use this picture of an animal cell to locate each structure.

Animal Cell



The **cell membrane** is a thin structure that surrounds the cell. It controls which materials can enter and leave a cell. Inside the membrane is the **cytoplasm**, the thick fluid that makes up most of the cell. The **nucleus** is a large structure inside the cell that controls many functions in the cell. The nucleus also contains the cell's genetic material. Some simple cells, such as bacteria, do not

Key Words

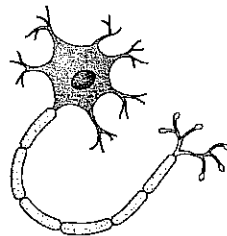
cell
organelle
cell membrane
cytoplasm
nucleus
mitochondria
tissue
organ
organ system

Did You Know?

Your body is up to 60 percent water. Without water, the cells of your body could not function. A person cannot survive more than a few days without water!

have a nucleus. In these cells, the genetic material is found in the cytoplasm. All cells need energy, which they get from molecules of glucose, a kind of sugar. Glucose is broken down to release energy inside structures called **mitochondria**.

Cells in multicellular organisms, such as humans, are specialized for certain functions. Each cell has a specific job. However, these cells cannot work alone. Each type of cell depends on other kinds of cells to function. For example, nerve cells carry information from one part of the body to another. They send messages to muscle cells to tell them to move. Muscle cells work together to move the body. However, they can only move the body if they get enough oxygen to release energy. They depend on red blood cells to deliver the oxygen. The pictures below show these three types of cells.



Nerve cell



Muscle cell



Red blood cell

Levels of Organization within an Organism

Because multicellular organisms can be made up of trillions of cells, they must be organized in order to allow the body to function properly. Let's take a closer look at each level of organization.

As you have seen, the first level of organization in multicellular organisms is the cell. Cells are specialized for different jobs. The second level of organization is the tissue. A **tissue** is a group of similar cells working together to perform a specific function. For example, a group of muscle cells forms muscle tissue. The muscle tissue contracts and expands. This produces the external movement of body parts such as your hands. It also moves blood, food, and other materials through the body.

The third level of organization in multicellular organisms is the organ. An **organ** is a group of different tissues that work together to perform a specific function. An example of an organ is the stomach. The stomach is made up of several different tissues, including epithelial, muscle, and connective tissue. These tissues work together in the stomach to help digest food. Another organ is the eye. Muscle, nervous, and connective tissues work together to produce vision.

The fourth level of organization in multicellular organisms is the organ system. An **organ system** is a group of organs that work together to perform a complex function. For example, the human digestive system includes the mouth, esophagus, stomach, small intestine, large intestine, liver, pancreas, and gall bladder. These organs work together to convert food into the simpler molecules needed by every cell in the body. You will learn more about human organ systems in following lessons.

Levels of Organization



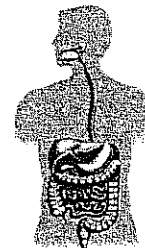
Cell
Muscle cell



Tissue
Smooth muscle tissue



Organ
Stomach



Organ System
Digestive system

All these organs and organ systems help maintain the body's internal balance. For example, the digestive system provides the energy the body needs to keep warm. The nervous system tells the rest of the body whether it is in balance. If the body is out of balance, the nervous system sends signals to other organs. Those signals tell the rest of the body how to restore its internal balance.

The final level of organization is the whole organism. A multicellular organism is made up of organ systems, which are made up of organs. These organs are made up of tissues, which are made up of specialized cells. The foundation that every level builds upon is the cell, the most basic unit of life.

DISCUSSION QUESTION

Do you think all living things, like plants and animals, have similar levels of organization within their bodies?

LESSON REVIEW

- Which of the following lists the correct order of organization in a living thing?
 - tissue, organ, cell, organ system
 - organ system, cell, organ, tissue
 - cell, tissue, organ, organ system
 - organ, cell, tissue, organ system
- Organs are made up of
 - tissues.
 - organelles.
 - mitochondria.
 - organ systems.
- What is a tissue?
 - a single cell
 - a group of organs that work together
 - a group of one type of cell that has one job
 - a group of different types of cells with various functions
- What cell structure controls which materials enter or leave an animal cell?
 - nucleus
 - cytoplasm
 - mitochondria
 - cell membrane