

Cell : Structure And Functions

8



IN THIS CHAPTER

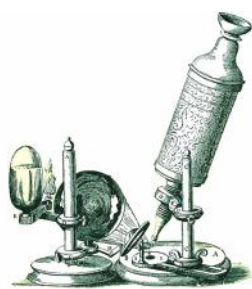
- Discovery of the cell
- The cell
- Unicellular and multicellular organisms
- Shape and size of cell
- Cell structure and functions
- Parts of cells
- Tissue

INTRODUCTION

As you know that different organs perform the various functions. Basic structural unit of an organ is cell. Cells are the bricks of the body as bricks are required to make building.

Discovery of the Cell

Robert Hooke an Englishman discovered the cell in 1665 while examining a slice of cork under a microscope. A microscope is an instrument that is to produce an enlarged image of an object. He noticed partitioned boxes or compartment in the cork slice. These boxes appeared like a honey comb.



A replica of Hooke's microscope

He also noticed that one box was separated from the other by a wall or partition. Hooke named the term cell for each box. Cells in the cork were actually dead cells.

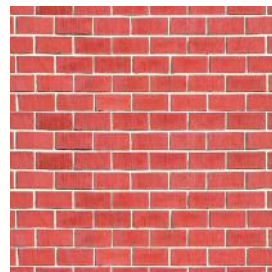
Cells of living organisms could be observed only after the discovery of improved microscope. It was much later that scientist discovered that all living things are made up of cells.



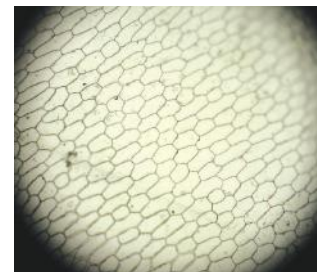
Robert Hooke (1635-1703)

The Cell

As brick in a building is basic structure unit in same way cell in living organisms. The buildings though built of similar bricks have different designs shapes and sizes similarly in the living world, organisms differ from one another but all are made up of cells. Cell in the living organisms are compiles living structures unlike non-living bricks.



Brick wall



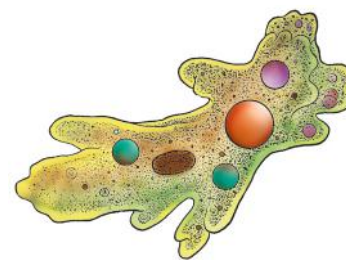
Onion peel

Unicellular and Multicultural Organisms

A living thing is made up of many cells such as human body has trillions (thousand billion) of cells which vary in shape and size different groups of cells perform variety of functions.

Living organisms are made up of one or many cells, organisms made up of a single cell are called unicellular organisms for example Amoeba, Euglena, paramecium and bacteria. In a unicellular organisms a single cell performs all the vital activities like feeding, movement, respiration, reproduction etc.

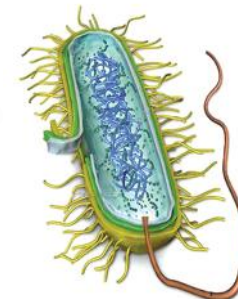
Organisms made up of many cells are called multicellular organisms. Different functions in multicellular organisms are carried out by groups of specialized cells forming different tissues. Tissues in turn form organs. Most plants, animals and human beings are the example of multicellular organisms.



Amoeba



Paramecium



Bacteria

SHAPE AND SIZE OF CELL

Cells exist in different shapes and sizes they can be disc shaped polygonal rectangular, branched or even irregular.

These are different types of cells in a multicellular organism each having a specific role to play. The shapes and size of cell depend on the specific function they perform.



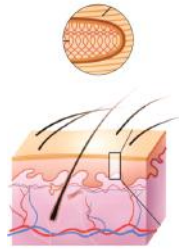
Multicellular organisms

Skin cells cover a large area hence they are flat in shape muscle cells help in movement through contraction and expansions. Hence they are thin and long. Nerve cells carry messages from and to different part of the body. Thereby helping to control and co-ordinate the working of different parts of the body. Hence, they possess long fibers and are elongated in shapes. Components of the cell are enclosed in a membrane. This membrane provides shape to the cells of plants and animals. Cell wall is an additional covering over the cell membrane in plant cells it gives shape and rigidity of these cells. Bacterial cell also has a cell wall.

The size of cells in living organisms may be as small as a millionth of a meter micrometer or micron or may be as large as a few centimeters however, most of the cells are microscopic in size and are not visible to the naked eye. They need to be enlarged or magnified by a microscope. The smallest cell is 0.1 to 0.5 micrometer in bacteria. The largest cell measuring 170 m x 130 mm is the egg of an ostrich.

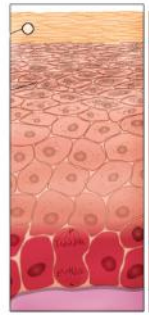


microscope



Skin cells cover a large area. Hence they are flat in shape.

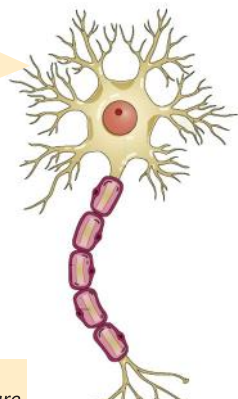
Skin cell



Muscle cells help in movement through contractions and expansions, Hence they are thin and long.

Muscle cell

Nerve cells carry messages from and to different parts of the body. Hence they possess long fibres, and are elongated in shape.

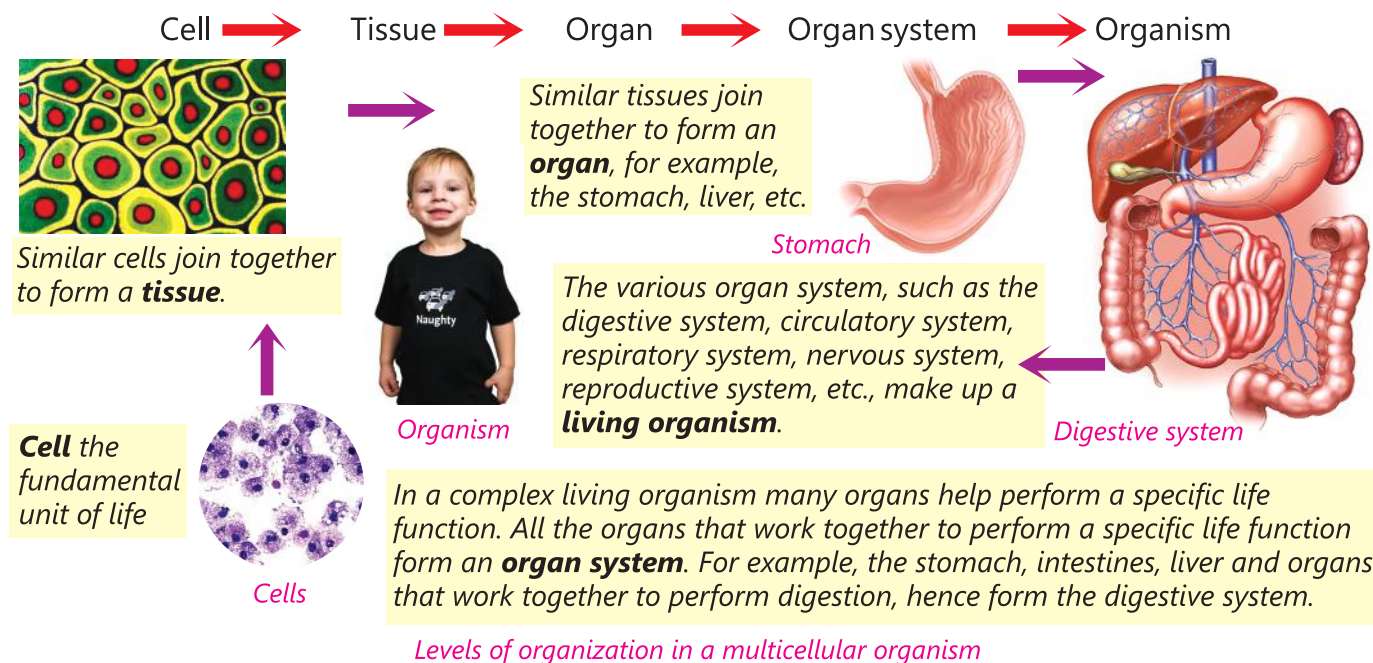


Nerve cell

The size of the cells has no relation with the size of the body of the animal or plant. It is not necessary that the cells in the elephant be much bigger than cell in a rat. The size of the cell is related to its function. For example the nerve cells of rat and elephant are long and branched. They perform the same function that of transferring messages.

CELL STRUCTURE AND FUNCTIONS

Every living organisms has many organs. Different organs are made up of different cells. Different organs function together to perform a specific life function such as stomach intestines liver and pancreas are all organs that work together to perform digestion hence form the digestive system. Each organ is made up smaller parts called tissues. A tissue is a group of similar cells performing a specific function.



Similarly, different organs of a plant perform specific specialized function.

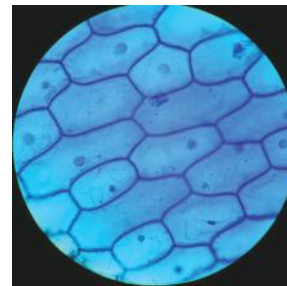
For example, roots help in the absorption of water and minerals, stem transports minerals to different parts of the plants, leaves prepare food for plants and fruits contain seeds etc.

Parts of the Cell

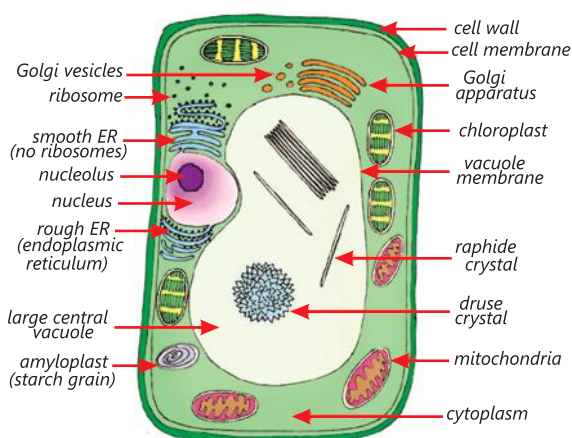
Though different types of cells differ in shape and size all of them have a basic structure, referred to as the generalized cell structure. A cell has both living and non-living parts. The living parts of the cell that have a definite shape, structure and function are called organelles. The main parts of a generalized cell are cell membrane, cytoplasm and nucleus.

Cell Membrane

The cytoplasm and nucleus are enclosed within the cell membrane also called the plasma membrane which separates cells from one other and also the cell from the surroundings medium. The plasma membrane is porous through which substances can enter or leave the cells.



Cells observed in an onion peel



Plant cell

A Typical Plant Cell

A part from the organelles mentioned so far, a typical plant cell contains some unique organelles that distinguish it from an animal cell.

Cell Wall

In some unicellular organisms and all kinds of plants, the outermost boundary of the cell is the cell wall. It is formed of a non-living material mainly made up of cellulose in plants. The cell wall is a tough and rigid layer that provides strength and protection to the cell. The cell wall is porous and allows water, oxygen and carbon dioxide to enter and leave the cell. In fact, what Robert Hooke saw was the outermost part of the plant cells, the cell walls.

Central Vacuole

In the center of the cell, is a large cavity called the central vacuole. it is filled with cell sap, a watery fluid. The large central vacuole pushes the cytoplasm towards the outer boundary of the cell.

Chloroplasts

Most plant cell posses sac-like organelles called chloroplasts. You know that plants make their own food through the process of photosynthesis. Chloroplasts contain the green pigment, chlorophyll which is required for photosynthesis.

A Typical Animal Cell

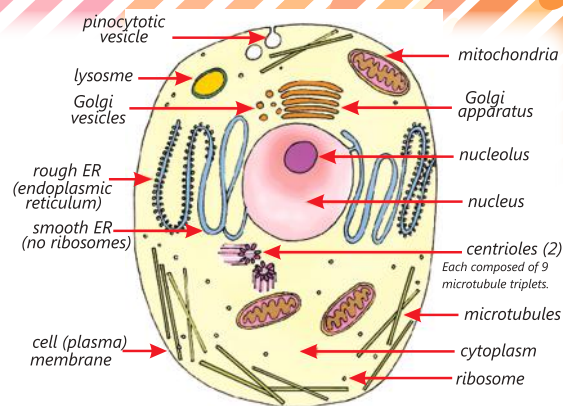
A typical animal cell is surrounded by a thin flexible cell membrane. In the center is a tiny structure called the nucleus, which is surrounded by the cytoplasm. The cytoplasm contains many small vacuoles. Animal cells do not have chloroplasts.

Do You Know?

One form of plastid can change into another form. In tomatoes, the colourless leucoplast changes into chloroplast which are green. These on maturity change into red tomatoes.

Are all Cells Similar?

Cells are of different shape and sizes. Some cells like the red blood cells are round, the skin cells are flat, while others are like cubes. The guard cells that surround the stomata in a dicot leaf are kidney shaped. Cells of a particular tissue performing the same function are more or less of the same shape and size. For example, all the cells in a liver are similar.



Animal cell

TISSUE

A tissue is composed of many cells that are similar in structure. The cells that form a tissue are specialized to carry out a specific function. The cells in the potato peel you have observed were arranged end to end forming a thin layer. This layer of cells, which is the outermost part of the fruit or the vegetable is the epidermis. The epidermis is a tissue.

The outer epidermal layer protects the inner layer of cells. This means that all the cells in this layer contribute to perform the function of protection. At times a tissue has more than one type of cells. Blood is a tissue. It is made up of red blood cells, white blood cells, blood platelets and blood plasma the liquid portion of the blood.

Transverse Section of a Plant Stem

When you observe a transverse section of a stem under a microscope you can see the different kinds of tissue and the cells they are made up of.

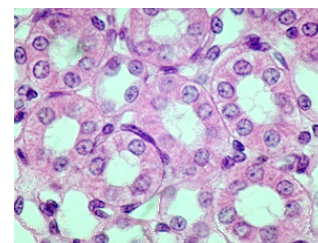
The epidermis forms the outermost covering of all parts of the plant. All over the stem is the ground tissue. It is made up of simple cells of different sizes. The stem contains vascular bundles which are made up of xylem and phloem cells. The xylem cells form tubes that transport water whereas the phloem cells form tubes that transport food in the plant. These cells are organized into vascular bundles. Several vascular bundles are found in the stem.

Animal Tissue

There are four major types of animal tissues epithelial, connective, muscle and the nerve tissue.

Epithelial Tissue

This kind of tissue covers the body surface and lines the internal body cavities. Epithelial cells are tightly arranged forming a continuous layer of cells.



Epithelial tissue

Connective Tissue

This type of tissue occurs beneath the epithelium in the skin and in internal organs such as

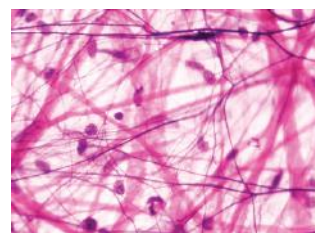
lungs, arteries and the urinary bladder. The connective tissue also forms a protective layer over muscles, nerves and blood vessels. Cartilage and bones are rigid connective tissue, cartilage occurs in your ears, tip of nose and at bone joints blood and the lymph are connective tissues in which cells are separated by a liquid.

Muscle Tissue

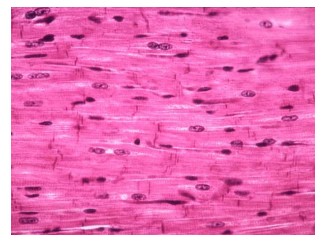
Muscle cells are specialized for contraction and are responsible for body movements. The elongated muscle cells are referred to as muscle fibres. They are needed for internal movements of the organs and locomotion of the living organism.

Nerve Tissue

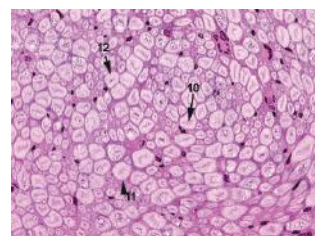
Nerve cells are known as neurons. Group of nerve cells held together by connective tissue collectively make up a nerve. The brain controls the body functions through a network of nerves. The nerves conduct impulses to and from the brain.



connective tissue



muscle tissue



nerve tissue

Know the Keywords :

Cell : A mass of protoplasm having a distinct nucleus and held by a plasma membrane.

Organelles : Living parts of the cell having definite shape, structure and function.

Mitochondria : The sites of cellular respiration also called power house of cell.

Chloroplasts : Any of the chlorophyll containing organelles found in large numbers in plant cells.

Nucleus : Also termed as the brain of the cell as it regulates all the metabolic activities of the cell.

Tissue : A group of cells performing an identical function.

Point to Remember

- A microscope is an instrument that is to produce an enlarged image of an object.
- Organisms made up of a single cell are called unicellular organisms.
- Organisms made up of many cells are called multicellular organisms.
- A tissue is a group of similar cells performing.

EXERCISE TIME

A. Answer the following questions :

1. What is cell theory ?
2. Are all cells similar ? Explain
3. Where is chlorophyll present in the plant cell ?

4. Why are mitochondria called the powerhouse of the cell ?
5. Differentiate between plant cell and animal cell.
6. Why is the nucleus, the most important part of the cell ?
7. Define the following :

- | | | |
|-------------------|---------------------|-----------------|
| (i) Nucleus | (ii) Cytoplasm | (iii) Centriole |
| (iv) Chloroplasts | (v) Cell organelles | |

B. Fill in the blanks :

1. A cell is the smallest _____ of life.
2. A cell is filled with a living material called _____.
3. _____ transports molecules in and outside the cell.
4. Animal cells do not have _____.
5. Group of nerve cells held together by a connective tissue is known as _____.

C. Tick (✓) the correct option :

1. The genetic information of an organism is present in the :

(i) chromosome	<input type="radio"/>	(ii) cytoplasm	<input type="radio"/>	(iii) mitochondria	<input type="radio"/>
----------------	-----------------------	----------------	-----------------------	--------------------	-----------------------
2. Cellular respiration occurs in cell organelles called the :

(i) chloroplasts	<input type="radio"/>	(ii) nucleus	<input type="radio"/>	(iii) mitochondria	<input type="radio"/>
------------------	-----------------------	--------------	-----------------------	--------------------	-----------------------
3. One of the differences between a plant and an animal cell is :

(i) cell wall	<input type="radio"/>	(ii) nucleus	<input type="radio"/>	(iii) chloroplast	<input type="radio"/>
---------------	-----------------------	--------------	-----------------------	-------------------	-----------------------
4. Deoxyribo nucleic acid in plant and animal cells is present in the :

(i) cell wall	<input type="radio"/>	(ii) chloroplast	<input type="radio"/>	(iii) nucleus	<input type="radio"/>
---------------	-----------------------	------------------	-----------------------	---------------	-----------------------
5. The cell wall in a plant cell is mainly made up of :

(i) DNA	<input type="radio"/>	(ii) glucose	<input type="radio"/>	(iii) cellulose	<input type="radio"/>
---------	-----------------------	--------------	-----------------------	-----------------	-----------------------
6. Plant cells are identified by the presence of :

(i) a cell wall, a large vacuole and chloroplasts.	<input type="radio"/>
(ii) a vacuole, chloroplasts and nucleus.	<input type="radio"/>
(iii) mitochondria, food vacuoles and Golgi apparatus.	<input type="radio"/>
7. Nerve cells are known as :

(i) blood cells	<input type="radio"/>	(ii) neurons	<input type="radio"/>	(iii) lymph	<input type="radio"/>
-----------------	-----------------------	--------------	-----------------------	-------------	-----------------------



Creative Work

- **Make a diagram of plant cell and label their name.**