Chapter 7

Cell

Points to study

7.1 Cell and the discovery of cell
7.2 Organisms on the basis of cellular organization
7.3 Size of cells
7.4 Shape of cells
7.5 Parts of the cell
7.6 Prokaryotes and eukaryotes

7.1 Cell and discovery of the cell

You might have seen a house being built. Lots of bricks are needed to build a house. A house is build by assembling these bricks. Similarly, the body of organisms is made by assembling of many cells.

Can you guess the total number of cells in our body?

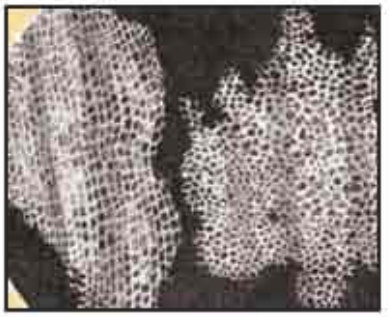

Figure 7.1 Compartments in thin slice of cork

Robert Hooke was the first to discover cell in 1665. He observed a thin slice of cork under his self made microscope. He noticed honey comb-like boxes or compartments in the thin cork slice. **Robert Hooke** coined the term 'cell' for these compartments (fig.7.1).

7.2 Organisms on the basis of cellular organization

- The body of humans and other large organisms is made up of billions of cells. Organisms made up of more than one cell are called **Multicellular organisms**. Some organisms such as amoeba, paramecium etc. are made up of a single cell. They are called **Unicellular organisms**. Just like multicellular organisms, the unicellular organisms also perform all activities like respiration, digestion, growth, reproduction etc.

Every cell consists of a nucleus. On the basis of presence or absence of membrane around the nucleus, organisms are divided into prokaryotes and eukaryotes.

7.3 Size of cells

The size of cells may be as small as a millionth of a meter (micrometer) or as large as few centimeters. However, most of the cells are microscopic in size. They are not visible to the unaided eye. Cell can be seen with the help of a microscope. The smallest cell is 0.1 to 0.5 micrometer, which is a bacterial cell. The largest cell is the egg of an ostrich, measuring 170 X 130 mm.

7.4 Shape of cells

Shape of some cells is irregular. They keep on changing their shape. For example- Amoeba, Mycoplasma etc.

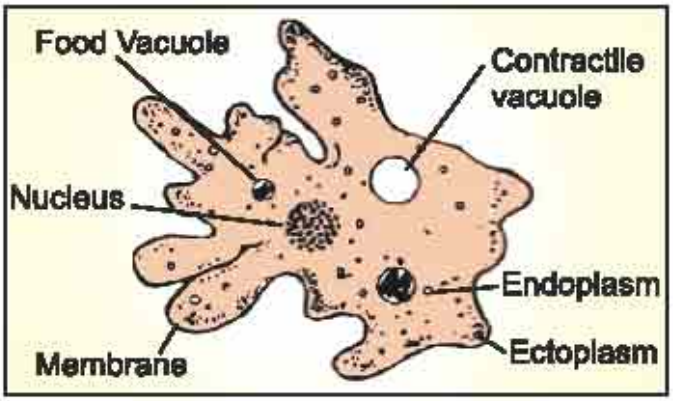

Figure 7.2 Cell of amoeba

Various types of cells are found in our body. What is their shape?

Let us find out-

Some cells are round and flat. For example- Blood cells.

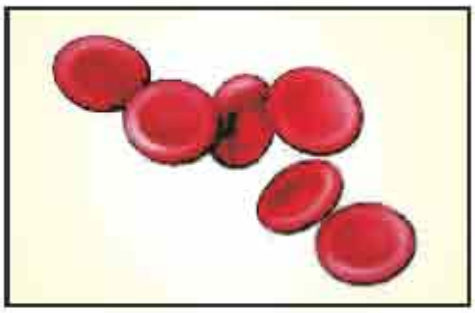

Figure 7.3 Round blood cells

Some cells are long and spindle shaped. They are pointed at both ends. For example- Muscle cells.

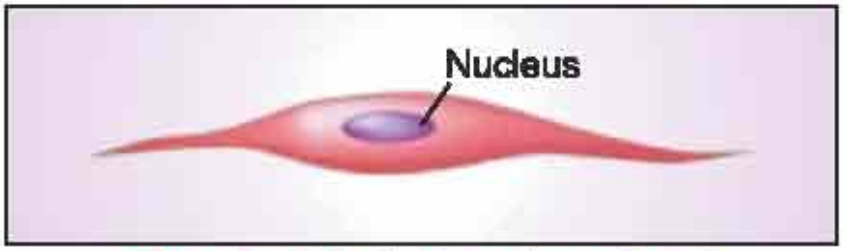

Figure 7.4 Spindle-shaped muscle cell

Some cells are quite long and branched. For example- nerve cells or neurons.

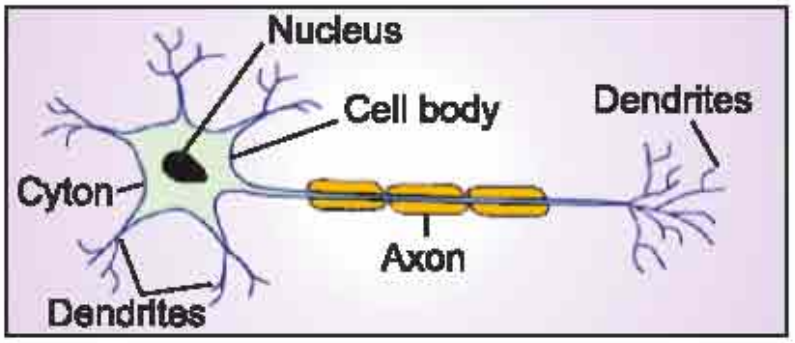

Figure 7.5: Long and branched nerve cell

Generally, cells are round, flat and elongated. Do bigger organisms have larger cells? It is not necessary that the size of cells in large organisms will be large and the cells in smaller organism will be smaller. The size of the cell is related to its function. Example - the nerve cells carry signals from one place to another. Inspite of the difference in the size of humans and rats, nerve cells in both are long and branched.

Tissue-Organ-System:

- Cell is the structural unit of every living organism.
- A group of cells performing similar function is called a tissue.
- A group of tissues performing similar function is called an organ.
- Different organs form an organ system.
- Different organ systems form the body.

Cell ⟶ tissue ⟶ organ ⟶ system ⟶ body

Let us try and see:

Activity 1

Take a piece of onion. Separate a thin layer of onion with the help of forceps. Place it on a glass slide. Add a drop of methylene blue solution to the layer and place a coverslip on it. While placing the coverslip ensure that there are no air bubbles under the coverslip. Carefully observe the slide under the microscope. With the help of a pencil, draw its diagram in your notebook.

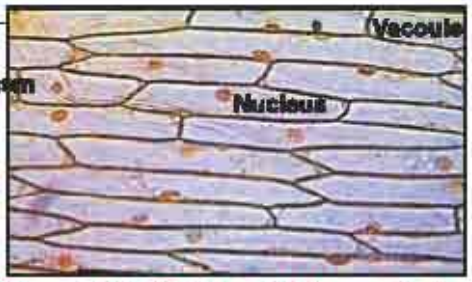

Figure 7.6 : Cells in a thin layer of onion

Activity 2

Take a clean plastic spoon. Scrape inside of your cheek with the rear end of the spoon. Place it in a drop of water on a glass slide. Add 1-2 drops of methylene blue solution. Observe the slide under the microscope. Identify the cell membrane and nucleus. Draw its diagram and label it.

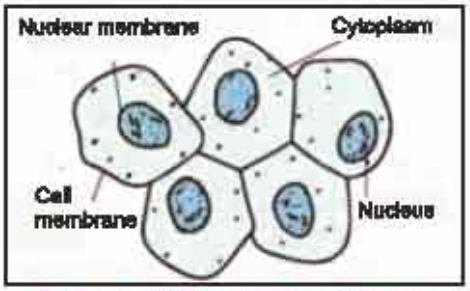

Figure 7.7 : Cells of inner surface of cheek

7.5 Different Parts of the Cell

There are three basic parts of a cell: cell membrane, cytoplasm and nucleus.

1. Cell membrane: It is the outer covering of the cell. It is also called **plasma membrane**. It is porous and is made up of fats and proteins. Cell membrane allows selective substances to enter the cell and helps in removal of waste substances. This membrane is similar in animals and plants. In plants, a thick covering of cellulose is present outside the cell membrane which is called **cell wall**. The cell wall gives definite shape to the plant cells.

2. Cytoplasm : The fluid present between the cell membrane and the nucleus is called **cytoplasm**. It is a jelly- like substance. Structures like- mitochondria, vacuoles, golgi body, endoplasmic reticulum, chloroplast etc. are present in the cytoplasm. These structures present in the cytoplasm are called **cell organelles**.

3. Nucleus : It is generally spherical. In animal cell, it is located in the centre but in plant cell, it is not located in the centre and shifts towards one side due to large vacuoles. It is enveloped by a double-layered membrane. This membrane is porous and allows the movement of materials. Nucleus contains a small dense structure called **the nucleolus**. Nucleus contains thread- like structures called chromosomes. Chromosomes carry genes which carry

hereditary information from the parents to the offspring. Nucleus controls all the activities of the cell.

7.6 Prokaryotes and Eukaryotes

The nucleus of a bacterial cell does not have a nuclear membrane around it. Cells in which the nucleus is not enveloped by a nuclear membrane are called **prokaryotic cells** and the organisms having such cells are called **prokaryotes.** Cells which have a nuclear membrane around the nucleus are called **eukaryotic cells.** The organisms having such cells are called **eukaryotes.**

Cell organelle: The main cell organelles found in the cytoplasm are described below:

Lysosome: It contains very strong digestive enzymes. When the cell gets injured or is dead, then the lysosomes rupture and the digestive enzymes digest their own cell. That is why they are also called suicidal bags.

Golgi body: They are flattened membranous structures arranged one above the other. It was first of all described by a scientist named, Camillio Golgi. The substances produced in the endoplasmic reticulum are trapped in golgi apparatus and are sent to various locations inside and outside the cell.

Mitochondria: It is a structure covered by a double layer membrane. Its inner membrane is extensively folded. These folds are called cristae. Biological energy ATP is produced in the mitochondria. That is why it is also called the power house of the cell.

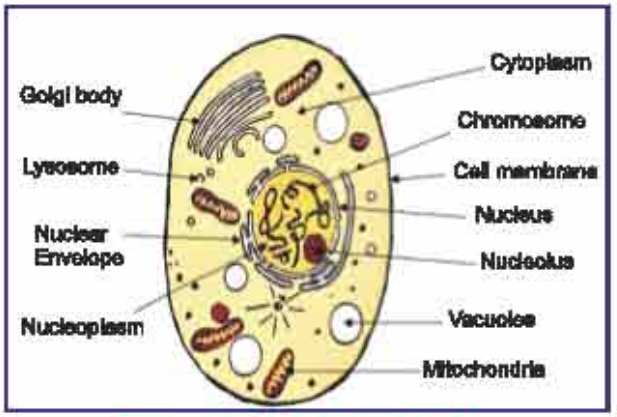

Figure 7.8 Animal cell

Endoplasmic reticulum: This structure appears as a network of thin tubules present in cytoplasm. It is of two types:

1. Rough endoplasmic reticulum
2. Smooth endoplasmic reticulum

Ribosomes are attached to the rough endoplasmic reticulum and perform the function of protein synthesis.

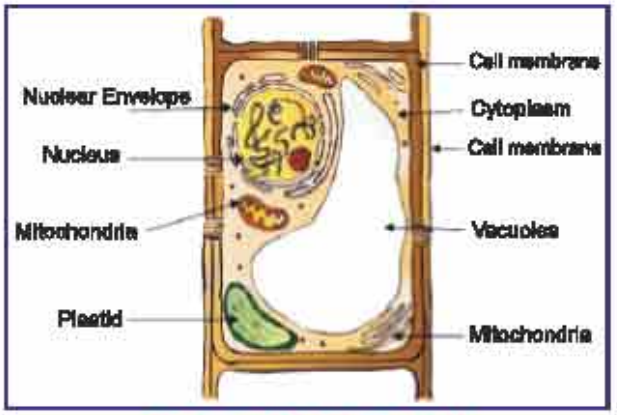

Figure 7.9 Plant cell

Plastid: They are present in

the cytoplasm of plant cells. Most plastids contain a green pigment called **chlorophyll** and the green coloured plastids are called chloroplast. These give green colour to the leaves. Plants perform photosynthesis and make their food with the help of chlorophyll. Chlorophyll is very essential for photosynthesis.

Vacuoles: Large vacuoles are found in plant cells while animal cells contain small vacuoles.

Look at the figure, mark a (✔) on the correct option in the table given below:-

S. no	Part of cell	Animal cell	Plant cell
1.	Cell membrane	Present / absent	Present / absent
2.	Position of nucleus	In centre/ on one side	In centre/on one side
3.	Size of vacuole	Small/ big	Small/ big
4.	Plastid	Present / absent	Present / absent

Dr. Har Govind Khurana

He was born in a town named Raipur of Multan district, Punjab in the unpartitioned India. He passed B.Sc. (honours) in 1943 and M.Sc (honours) in 1945 from Punjab University and went to England after receiving scholarship from The Government of India. He achieved a doctorate degree from Liverpool University by researching under the guidance of A. Robertson. Dr. Khurana was the first to show the role of nucleotides in protein synthesis. In 1968, he was awarded the Nobel prize for outstanding work in the field of genetics. Government of India awarded him the Padma Vibhushan award.

Dr. Satish C. Maheshwari

Satish C. Maheshwari achieved B.Sc (honours), M.Sc and Ph.D degrees from Delhi University. He researched on the embryology of duckweed (smallest flowering plant of Lemnaceae family) under the guidance of Prof. B.M. Johari. Dr. Maheshwari and group, used stamen culture technique for the advancement of crops, animal rearing and ornamental plants. 200 research papers of Dr. Maheshwari were published and he also wrote a book "Signal Transduction Mechanism in Plants". He was awarded Bhatnagar Award, J.C. Bose gold medal, Birbal Sahni gold medal and Goyal Foundation award for his outstanding work.

What have you learnt

- Cell was discovered by a scientist named Robert Hooke in 1665.
- The largest cell is the egg of an ostrich.
- Cell wall is present in plant cell but it is absent in animal cell.
- The fluid present between the cell membrane and the nucleus is called cytoplasm.
- Cells which lack nuclear membrane are called prokaryotic cells.
- Chlorophyll is found in the chloroplast.
- Thread - like structures found in the nucleus are called chromosomes.

Exercises

Choose the correct option

1. Who discovered cell?
   (a) Robert Brown (b) Robert Hooke ( )
   (c) Schleiden (d) Schwann
2. Which of these is absent in the animal cell?
   (a) mitochondria (b) nucleus ( )
   (c) cytoplasm (d) plastid
3. A group of similar cells performing a specific function is called-
   (a) organ (b) cell ( )
   (c) system (d) tissue

Fill in the blanks

1. Thread like structures found in the nucleus are called _____.
2. Amoeba is a _____ organism.
3. An organism made up of more than one cell is called _____ organism.
4. Nerve cells are _____ and _____.

Short answer type question

1. What is the difference between prokaryotic and eukaryotic cell?
2. Define a tissue.

3. Why mitochondria is called the power house of the cell?
4. Why lysosome is known as suicidal bag?

Long answer type questions -

1. Explain the following parts of the cell alongwith diagrams -
   (i) nucleus (ii) cell membrane (iii) cytoplasm
2. What are the differences between animal cell and plant cell?
3. Draw a labelled diagram of the animal cell?

Practical work

1. Make a chart of cell structure.
2. Collect more information about cell from the website www.enchantedlearning.com/subjects/plants/cell/sj and prepare an article.
3. Using gaming method, display the cell organelles and their functions in classroom. Various students will play the role of mitochondria, endoplasmic reticulum, plastid, vacuole etc and explain about these. One student will play the role of an anchor.
4. With the help of your teacher, observe a permanent slide of amoeba under the microscope. Apart from this, collect water from pond and put a drop of pond water on an empty slide and observe the organisms present in it.

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