STRUCTURAL AND FUNCTIONAL UNIT OF OUR BODY - THE CELL

7.1

In the seventeenth century in the year 1665 an English scientist named Robert Hooke invented a simple microscope. Hooke observed a thin slice of cork under microscope invented by him. He found sections like a beehive. He gave these sections the name 'cell' (fig 7.1) From time to time scientists have attempted to study the structure of a cell and after many studies have declared that as a house is made up of small units (the bricks), in the same way our body is also made up of small units. These units are called cells.

Cells are of different shapes and sizes. You may know that some organisms are made of only one cell, as amoeba and paramecium.



Fig 7.1 (a) Robert Hooke's microscope, (b) Microscopic picture of cork, (c) Picture of a honey beehive

In these organisms nutrition, respiration, excretion, reproduction and such living functions are performed in a single cell. But in multicelled organisms to perform different function, cells are divided in different groups to perform them. In this way cell is the basic structural and functional unit of life of our body Amoeba is a unicellular organism which can live independently.

But if a cell of the cheeks or a cell of onion is removed then they cannot live independently.

Activity 1

Materials required : A leaf of Rhoeo (thick greenish violet leaves), slides, coverslip, permanent slide of human blood cells, microscope.



Fig 7.2 Cells of Rhoeo leaf

Take a thin slice from the lower side of the leaf. Keep it on the glass slide, add a drop of water and cover it with a cover slip. Now observe it under a simple microscope (fig. 7.2).

Also observe the permanent slide of human blood cells. (fig 7.3).

Are the cells of the leaf and the cells of the human blood same in shape and size ? Now look at fig 7.4. You can see cells of different size and shapes. This proves that there are variations in the shape and size of the cells.







Usually we cannot see a cell without any instrument or microscope but there are some cells which are so big in size that we can see them without a microscope,

for example, Yolk of hen's egg.

7.2 STRUCTURE OF A CELL

You have seen that cells are of different shapes and sizes. Even when having such differences, each cell has a definite structure. Come, let us study the structure of a common cell. In your earlier class, you have studied the cell of onion skin. Now prepare again a slide of the onion cell observe it under the microscope and answer the following questions.

1. What is the shape of the cell; rectangular, oval or round?



Fig 7.5 (b) Animal Cell

- 2. Does a cell have a definite margin?
- 3. Is there any substance filled in the cell?
- 4. Is there any round structure inside the cell?

Every cell has the following parts -

- (1) Outer cell membrane
- (2) Protoplasm

7.2.1 OUTER CELL PLASMA MEMBRANE

Every plant and animal cell has around the life substance a thin, elastic membrane which is called **plasma membrane**. This membrane is living and semi - permeable, made of protein and fats. The following are its functions -

- (1) It helps in maintaining the shape of the cell.
- (2) It controls the flow of different molecules to and fro in the cell.
- (3) It protects and supports the cell.

In plant cells there is another cover to the outside of the plasma membrane. This is called **cell wall**. This is made of cellulose and is non-living and determines the outer border of the cell and provides a definite shape to the cell.

7.2.2 PROTOPLASM

In every cell, inside the plasma membrane, there is a sticky fluid substance which is called protoplasm. All the cell organells of the cell which perform the life processes are found in this matter. That is why Huxley, a scientist has called the protoplasm substance as the physical basis of life.

Protoplasm can be divided into two -

(a) Cytoplasm (b) Nucleus

(a) Cytoplasm

The part of protoplasm which lies in between the cell membrane and the nucleus is called the cytoplasm. This has minerals, salts, water, carbohydrates, proteins and fats in it.

Observe fig 7.5 a and b. List the various cell organells (cell bodies) present in the cytoplasm. Come, let us find out about these cell organells -

(1) Mitochondria - See fig 7.5 You will find a double layered round or rod shaped structure with its inner membrane having finger like projections. This is the mitochondria. This is the respiratory centre because here energy is produced by the oxidation of food products. So this cell body is also called the **power house** of the cell.

(2) Endoplasmic reticulum - In fig 7.5 (a) and (b) you must have seen branched, irregular channels forming a network. It is called endoplasmic reticulum. These channels are filled will fluid and help in the transport of materials and it also provides mechanical support to the body.

(3) **Ribsomes :-** Some bodies are scattered in the cytoplasm near the endoplasmic reticulum they are called ribosomes. The work of these bodies is to produce proteins so they are also called 'protein factories'.

(4) Golgi bodies/Golgi apparatus :- In the animal cell you can see disc shaped bodies arranged in a pile. These are called golgi apparatus. Their function is to secrete various chemical products.

(5) Centrosome :- Now you look at the star shaped body near and over the nucleus in the animal cell. These are the centrosomes. Two small bodies can also be seen in the middle of the centrosome. These are the centrioles. Centrosomes helps in the cell division of animal cell. Centrosomes are also formed in the plant cell during cell division.

Activity 2

Materials required: Algae formed near a pond, lake or any other water source, slides, microscope and water.

Collect the silken green, thread like growth near the ponds or lakes. Place two or three drops of water on the slide and place one or two green threads on it and observe these under the mi-

croscope. Draw the diagram of what you have seen in your copy.

What type of cells do you see here ? Do you find something green in it. The green bodies found in these are the chloroplasts, which help in the preparation of food through photosynthesis



Fig 7.6 Algae found in lakes or ponds

in plants. Do you find these in animal cell? Look again at fig 7.5

(6) Plastids :- Solid bodies found scattered in the plant cells which are ribbon like, oval or round in shape are called plastids. These are of three types -

Leucoplasts :- These are colourless and store food.

Chromoplast :- These are coloured and it is because of these, that flowers & fruits have red, yellow, violet colours. They also help in pollination.

Chloroplast - These are green coloured and help in photosynthesis.

Draw the table 7.1 in your copy and fill in the blanks with the plastids found in the food items.

TABLE 7.1							
S.No.	Examples of eatbles	Colour	Type of Plastids				
1.	Radish (Muli)	White	Leucoplast				
2.	Green Chillies						
3.	Ripe Papaya						
4.	White Tomato						
5.	Green Tomato						
6.	Red Tomato						
7.	Others						

7. Vacuoles - In the plant cell there is one or sometimes two big round or oval shaped bodies. These are the vacuoles. They have a membrane covering with a jelly like substance inside. In animal cells vacuoles are small in size.

NOW ANSWER THESE -

- 1. What is the outer layer of plant cell called?
- 2. What are the functions of golgi bodies?
- 3. Which plastid is found in red apple?
- 4. Which is known as 'protein factory'?
- 5. Which is the 'Power house' of the cell and why is it called so?

7.2.3 NUCLEUS

The big round or oval body in the cells shown in fig 7.5 a & b is the nucleus. Different types of cells have different shapes and sizes of nucleus. This is the most important part of the cell. It is from here that all the life processes are controlled. So this is also called the 'control room' of the cell. Come, let us see what the structure of a nucleus is like. (fig 7.7)

Nucleus is covered by a thin membrane. This membrane is called nuclear membrane. This membrane is thin, elastic and semi permeable. This have very small pores

through which there is exchange of materials between nucleus and cytoplasm. Inside the nuclear membrane thick semifluid is filled, which is called nucleoplasm.

The nucleus of the cell was discovered in 1831 by Robert Brown. In 1939, J. Parkinjey named the living substance protoplasm in 1940 after the discovery of electron microscope, the cell organells were identified and studied.



Fig 7.7 Structure of a Nucleus

In the nucleoplasm see the minute thread like network. This is called the chromatin network. During cell division these threads of the chromatin network shrink to form small fat bodies called chromosomes. Chromosomes are made of proteins and DNA (Deoxyribonucleic acid). These transfer heridatary materials from one generation to the other.

In the nucleoplasm, a round or oval shaped body is there which is the nucleolus. This helps in cell division. Draw the given table 7.2 in your copy and fill it -

TABLE 7.2							
S.No.	Cell Bodies	Plant cell	Animal cell				
1.	Cell wall	Present	Absent				
2.	Centrosome						
3.	Vacuoles						
4.	Chloroplasts						
5.	Golgi bodies						

NOW ANSWER THESE

- 1. Which is called the control room of the cell and why is it called so?
- 2. What are chromosomes made of?
- 3. What is the function of nucleus?

We have seen that a common cell has mitochondria, golgibodies, centrosome, nucleus etc. Such a cell is called Eukaryotic cell. Most of the living organisms as

amoeba earthworm, frog, cow, rose, humans etc. have this kind of eukaryotic cells. But there are some microorganisms which cannot be seen through naked eyes. In these microorganisms a clear cut nucleus is not seen. This is because they do not have clear nuclear membrane and well defined nucleus. The heriditary material DNA (Deoxyribonucleic acid) lie scattered in the cytoplasm. In these cells some main bodies as mitorchondria, golgibodies, centrosomes, endoplasmic reticulum are also absent. These are called prokaryotic cells. Examples are bacteria, cynobacteria (blue-green algae) etc.



Differentiate eukaryotic and prokaryotic cell and write it in your copy.

Fig 7.8 Prokaryotic cell of bacteria

WE HAVE LEARNT.

- Cell was discovered by Robert Hooke in 1665.
- Cell is the structural and functional unit of all living organisms.
- Plasma membrane is the outer covering of all cells. In plant cell an additional cell wall made of cellulose is found.
- Life substance or protoplasm is the physical basis of life.
- In the life substance or protoplasm the jelly like substance found in between nucleus and cell membrane is called the cytoplasm.
- There are many minute organelles in the cytoplasm which are called cell bodies.
- Mitochondria is the 'power house' of the cell.
- Centrosomes are found in animal cells. They help in cell division.
- In the plant cell, plastids like chloroplast, chromoplast and leucoplast are found.
- The thick, round organelle in the cytoplasm is the nucleus. It is the ' control room' of the cell.
- The DNA present in the chromosomes are the carrier of heriditary features.

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Bacteria and blue green algae are prokaryotic cells. They do not have nuclear membrane and a well defined nucleus.

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Eukaryotic cells have a well developed nucleus and all cell organells.

QUESTION FOR PRACTICE

1. Choose the correct alternative :-

	(1)	1) Cell wall of plant cell is made of :-			
		(a) Protein	(b) Fats		
		(c) Cellulose	(d) Protein and fat.		
	(2)	The power house of the cell is :-			
		(a) Centrosome	(b) Ribosome		
		(c) Nucleus	(d) Mitochondria		
	(3)	Protein synthesis in the cell is done by :-			
		(a) Ribosome	(b) Plastids		
		(c) Vaculoes	(d) Nucleus		
	(4)	Example of Prokaryotic cells is :-			
		(a) Euglena	(b) Amoeba		
		(c) Paramoecium	(d) Blue green algae		
	(5)	Nuclear membrane is no	t present in :-		
		(a) Onion cells	(b) Bacterial cells		
		(c) Inner cheek cells	(d) Hydra cells		
2.	Fill in the blanks.				
	(a)) The control room of the cell is) The cell was discovered by) shrinks to form chromosomes.) In a prokaryotic cell DNA is scattered in the 			
	(b)				
	(c)				
	(d)				
	(e) Green colour of plants is due to				

3. Match the following.

Centrosome	-	carrier of genetic material
Protoplasm	-	helps in cell division
Endoplasmic reticulum	-	Plasma membrane
Semi permeable membrane	-	transport of materials in the cell
Chromosomes	-	physical basis of life.

4. Answer the following questions :-

- 1. Why is cell called the functional unit of life?
- 2. What is the function of plasma membrane?
- 3. Which structure is there outside the cell membrane in the plant cell and what is it made of?
- 4. Write three differences between plant cell and animal cell.
- 5. What is the function of chloroplast?
- 6. Draw diagram of plant cell and animal cell and write the name of all the parts of the cell.
- 7. Why the cells are of different shapes and size ? Give reasons.

🖵 TRY TO DO THIS ALSO

1. Make the model of any one cell of the following by using the different materials found around your surrounding.

(1) Plant cell (2) Animal cell (3) Bacterial cell

2. Divide the class in groups of six. Each group will select a part of the cell and write its functions on drawing sheets.

