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### THE CELL

Cell is the functional & structural unit of life as all the metabolic activity takes place in a cell.

The study of structure & composition of cell is known as cytology.

### HISTORY

Robert Hooke used a primitive compound

microscope to examine thin slices of cork from the bark of an oak tree.

He observed the hollow box like structure similar to honey comb for which he coined the term 'cell'.

### Unicellular Organisms :

- In these organisms, all the function like nutrition, respiration, excretion & reproduction are carried out by the single cell.

Example → Amoeba.

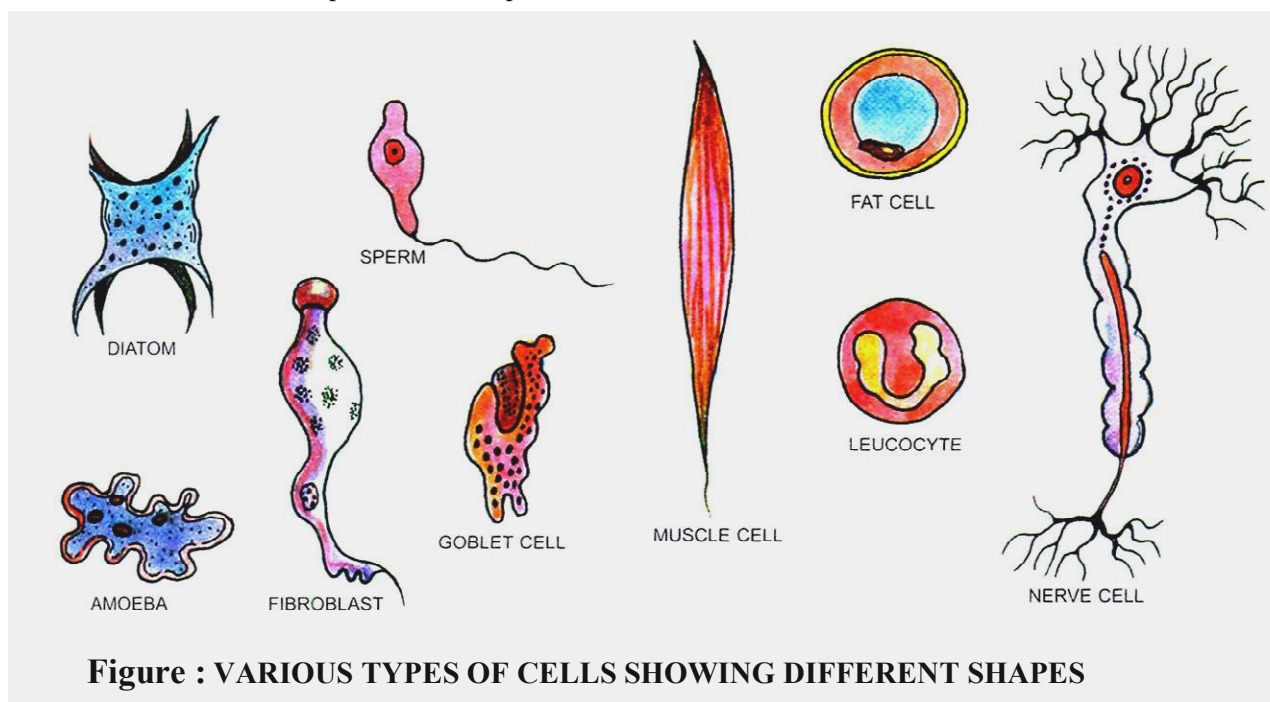
### Multicellular Organisms :

- Organisms which are made up of a few to billions of cells.

Example → Plants & Animals.

### Shape of Cell :

- The Cells of animals & plants may be oval, spherical, cuboidal, columnar, polygonal or spindle-like. Neuron is the longest cell in animal body.



**Figure : VARIOUS TYPES OF CELLS SHOWING DIFFERENT SHAPES**

### ◆ Size of Cell :

- The cell of animal & plants show variation in their size.

For example - The largest living cell is egg of an ostrich which is about 170  $\mu$ m in diameter. The smallest cell is PPLO which is 1  $\mu$ m small.



## STRUCTURE OF CELL

### ◆ Cell Membrane :

- Cell membrane is also called the **plasma membrane**. In an animal cell, it is the outermost layer, whereas in a plant cell, it is protected by the cell wall. It is a living structure and controls the entry and exit of some substances in and out of the cell. It also protects the internal components of the cell. It gives shape to the cell.

### ◆ Cell Wall :

- In addition to the cell membrane, plant cells have an outer thick layer called **cell wall**. It is non-living and is mainly composed of **cellulose**. It is protective in function and mainly determines the shape of the cell. It is absent in animal cells.

### ◆ Cytoplasm :

- It is a transparent, jelly-like living substance which fills the interior of an animal and plant cell. It is present between the cell membrane and the nucleus. It contains a number of minute living structures known as the **cell organelles** and many non-living substances known as **cell inclusions**.

### ◆ Nucleus :

- Nucleus is the most important part of a cell. It is usually spherical or oval in shape. It controls all the vital functions of the cell. It is made up of the **nuclear membrane, nucleoplasm, nucleolus** and chromosomes. The **nuclear membrane** surrounds the nucleus and separates it from the cytoplasm. It is permeable and controls the passage of materials through and from the nucleus.
- The **nucleoplasm** or **nuclear sap** makes up the body of the nucleus. It is denser than the cytoplasm.

- The **nucleolus** is a spherical body in the nucleus. It is composed of the nucleoprotein **RNA** (ribonucleic acid). It is responsible for protein synthesis.

- Nucleus also contains thread-like structures called **chromosomes**, which are composed of nucleoprotein **DNA** (deoxyribonucleic acid). The hereditary units of chromosomes are the **genes**. They are responsible for the transmission of characters from the parents to the offspring.

- Those organisms which do not have well defined nucleus and nuclear membrane are called **prokaryotes**. For example, bacteria, and some blue green algae.
- Those organisms which have well organized nucleus with the nuclear membrane are called **eukaryotes**. For example man, elephant, onion and cheek cells.



## CELL ORGANELLES

These are active, living, permanent small structures present in cytoplasm & concerned with cell function.

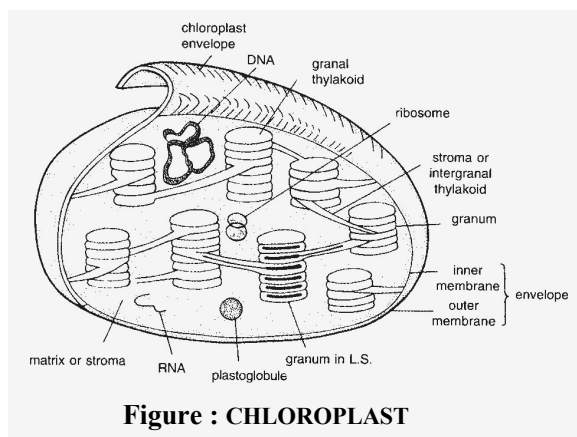
### ◆ Vacuoles :

- The central part of most plant cells is occupied by a large vacuole. It is a sac-like structure filled with fluid. Food, wastes, pigments and other substances are dissolved in the fluid. Some plant cells have a number of large vacuoles. Vacuoles are not so common in animal cells.

- When they occur, they are much smaller in size.

### ◆ Plastids :

- These organelles are not present in animal cells. **Chloroplasts** (a type of plastid) contain the green pigment chlorophyll and are responsible for photosynthesis. Only green parts of plants have chloroplasts.
- There are two other types of plastids called chromoplasts and leucoplasts. **Chromoplasts** contain pigments which give fruits and flowers their colours. **Leucoplasts** store food and are found in the storage organs of plants.

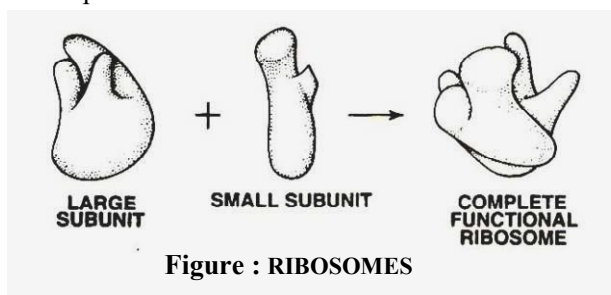


#### ◆ Endoplasmic reticulum (ER) :

- The endoplasmic reticulum is a network of tube-like structures running through the cytoplasm. If ribosomes are attached to it, the reticulum is rough, otherwise it is smooth.
- Function - It gives internal support to the colloidal matrix (cytoplasm).
- Rough endoplasmic reticulum (RER) is associated with the synthesis of proteins.

#### ◆ Ribosomes :

- Ribosomes are extremely Small, round bodies found either in the state in the cytoplasm or attached to the surface of the ER. They are composed of ribonucleoprotein (ribonucleic acid and protein).
- Functions - The main function of ribosomes is to act as a platform or work place for the synthesis of proteins.



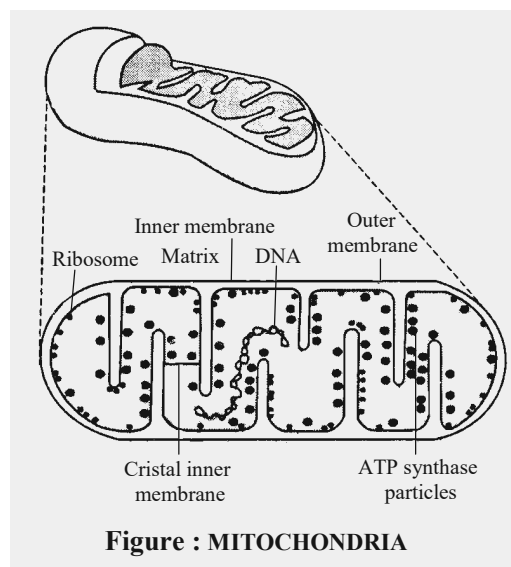
#### ◆ Mitochondria :

- Mitochondria are small, rod-shaped organelles found in large numbers. Each mitochondria is

bounded by two membranes-outer and inner. The outer membrane is smooth and the inner membrane

is pushed inwards at intervals forming crests called cristae. The cristae lie in a ground substance called matrix. Mitochondria process enzymes necessary for the oxidation of carbohydrates. This process releases energy in the form of ATP. This is why mitochondria are known as the powerhouses of the cell. Mitochondria have their own DNA and ribosomes. They can synthesize their own proteins.

- Function- Mitochondria provide energy for the vital activities of living cells.



#### ◆ Golgi Body :

- These are small, hollow, plate-like or cup-shaped bodies found in animal cells. They synthesise, store and secrete enzymes and proteins. The Golgi apparatus in plants is known as **dictyosome**.

#### ◆ Lysosome :

- They are present in animal cells only. They contain enzymes for cellular digestion. If they burst, the cell may get damaged or destroyed. Hence, they are called the **suicidal bags** of the cell.

#### ◆ Centrosome :

- It is a star-like structure found mostly in animal cells. It consists of **cenrioles**. It helps in cell division.

## EXERCISE # 1

### A. Single Choice Type Questions

- Q.1** Striking difference between a plant cell and an animal cell is due to the presence of -  
(A) Centrosome (B) Plasma membrane  
(C) Cell wall (D) Chloroplast
- Q.2** The main function of a plasma membrane is to -  
(A) Prevent water from entering or leaving  
(B) Control what goes into and out of the cell  
(C) Act as a sieve, allowing only lipids to pass  
(D) Move the cell from place to place
- Q.3** Who first coined the word "cell" ?  
(A) Aristotle (B) Hooke  
(C) Schwann (D) Leuwenhoek
- Q.4** The smallest organelles in a cell are -  
(A) Lysosomes (B) Spherosomes  
(C) Peroxisomes (D) Ribosomes
- Q.5** All are membrane bounded cell organelles except -  
(A) Mitochondria (B) Spherosomes  
(C) Ribosomes (D) Lysosomes
- Q.6** Major function of Golgi body is -  
(A) Secretion  
(B) Regulation of cell temperature  
(C) Active transport  
(D) Transportation
- Q.7** Smooth endoplasmic reticulum is well developed in the cells, which synthesise -  
(A) Steroids and Lipids (B) Carbohydrates  
(C) Proteins (D) All the above
- Q.8** The name suicide bag has been given to -  
(A) Centrioles (B) Ribosome  
(C) Mitochondria (D) Lysosome
- Q.9** Organisms lacking a nucleus and membrane-bound organelles are called:  
(A) Diploid (B) Haploid  
(C) Prokaryotes (D) Eukaryotes
- Q.10** The growth of cells is regulated by -  
(A) Mitochondrion (B) Vacuole  
(C) Nucleus (D) Golgi complex
- Q.11** The centriole is associated with -  
(A) DNA synthesis (B) Cell division  
(C) Circulation (D) Respiration
- Q.12** Proteins are formed in the -  
(A) Golgi complex (B) Mitochondria  
(C) Plastids (D) Ribosomes
- Q.13** Genes are located on the -  
(A) Nuclear membrane  
(B) Chromosomes  
(C) Lysosomes  
(D) Cell membrane
- Q.14** Animal cell does not have -  
(A) Mitochondria (B) Chloroplast  
(C) Nucleus (D) Cytoplasm
- Q.15** Plant cell does not have -  
(A) Lysosome (B) Cell wall  
(C) Chloroplast (D) Vacuoles
- Q.16** Which of the following is considered as 'Kitchen' of the plant cell ?  
(A) Chloroplast (B) Chromoplast  
(C) Leucoplast (D) None
- Q.17** Which organelle acts as the suicidal bag of the cell ?  
(A) Centrosome (B) Lysosome  
(C) Mitochondria (D) Ribosome
- Q.18** Which of these is a unicellular organism ?  
(A) Mushroom (B) Onion  
(C) Amoeba (D) Tissues
- Q.19** Levels of organization can be seen only in -  
(A) Unicellular organisms  
(B) Multicellular organisms  
(C) Plant only  
(D) Animals only
- Q.20** In plant cells, cell wall is made up of -  
(A) Cellulose (B) Protein  
(C) Fat (D) A viscous fluid

- Q.21** 'Controller of cell' is a -  
(A) Nucleus (B) Mitochondria  
(C) Vacuoles (D) Genes
- Q.22** Site of protein synthesis is the -  
(A) Ribosomes (B) Nucleosomes  
(C) Dictyosomes (D) Lysosomes
- Q.23** Cell was first observed by -  
(A) Robert Brown  
(B) Robert Hooke  
(C) Antony van Leeuwenhoek  
(D) None of these

<b>B. Fill In The Blanks</b>
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- Q.24** .....is the control centre of the cell.
- Q.25** Lysosomes are called the.....
- Q.26** .....is the structural and functional unit of life.
- Q.27** Several cells combine to form .....
- Q.28** Size of the egg of ostrich is..... mm.

## EXERCISE # 2

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### A. Very Short Answer Types Questions

- Q.1** Define the term cell.
- Q.2** What is the function of endoplasmic reticulum ?
- Q.3** Name the three types of plastids.
- Q.4** Name the largest and smallest cell known to you.
- Q.5** Expand the terms : RNA and DNA.
- Q.6** Name the instrument used for viewing a cell.
- Q.7** Which cell organelle is called as brain of the cell ?
- Q.8** Which cell organelle is known as power house of the cell ?

### B. Short Answer Types Questions

- Q.9** Why do we call cells as building blocks of life ?
- Q.10** What are unicellular and multicellular organisms ?
- Q.11** What are organelles and where are they present in a cell ?
- Q.12** What is the difference between prokaryote and eukaryote cell ?
- Q.13** What is the size of PPLO ?
- Q.14** Define the nucleus of a cell and its function in the cell.
- Q.15** What are chromosomes ? Where are they present in a cell ?
- Q.16** What is the function of a cell membrane ?
- Q.17** Make a sketch of a human nerve cell.

### C. Long Answer Types Questions

- Q.18** List four differences between a plant cell and an animal cell.
- Q.19** What are the functions of the three different kinds of plastids ?
- Q.20** Which organelle is called as power house of the cell ? Why is it called so ?
- Q.21** Draw a neat diagram of a typical cell and label at least five parts in it.
- Q.22** Write a short note on Ribosome ?
- Q.23** Write a short note on nucleus ?