

Holy Faith Presentation School

**ASSIGNMENT**

**CLASS: 9th**

**SUBJECT: BIOLOGY**

**SESSION: 2024-2025**

**UNIT1ST**

## UNIT-I

### Chapter no:-1 The Fundamental units of life.

#### Non Textual Questions

**CELL:** Cell is the structural and functional unit of living beings. It consists of an organized mass of protoplasm surrounded by a membrane. Cell is called the basic and the functional unit of life.

**DISCOVERY OF CELL:** The history of cells began with the classical work and observation of an English scientist in 1665- Robert Hooke, which was published in Micrographia in London. He used the term cell for the first time to designate the honey – comb like compartments in a thin slice of cork, which was cut by him with the help of a sharp pen knife and observed under his crude microscope. According to him, a cell is a dead and empty structure of plant origin.

- Anton Von Leeuwenhoek studied the unicellular organism in pond water, protozoans and spermatozooids. Later on Robert Brown (1831) discovered the presence of a small sphere in the cells of the Orchid root and termed the nucleus. During 1824 – 1830, Dutrochet, Turpen and Meyers provided data; things are made of cells. Dujardian used the term "Sarcode" for the cellular fluid which was later on named as "protoplasm" by Purkinji and Von Mohl.

Thus the 19<sup>th</sup> century was an era in which the cell was investigated extensively and in the beginning of the 19<sup>th</sup> century it was known that all living organisms were composed of cells.

#### Cell theory and Principle:

In 1838, a German Botanist Schleiden announced that all plants are composed of cells and in 1839, a German Zoologist Schwann made some statements for animals. These announcements led to the formation of cell theory, which holds that all living matter, from the simplest of unicellular organisms to very complex higher plants and animals are composed of cells, and that each cell can act independently but function as an integral part of the complete organism". Cell theory could not explain the formation of new cells. In 1855, Rudolf Virchow discovered that cells divide and thus proved that new cells must come from pre-existing cells. Thus, cell theory was modified by Rudolf Virchow in 1858 with the expression of his opinion that "omnis cellula –e-cellula".

The cell theory in its modified form applies fully and universally to all living objects and has been given the status of cell principle.

The cell principle states that:

- All organisms are made up of cells and their products.
- The function of an organism as a whole is the outcome of the activities and interactions of the constituent cells.
- All cells are basically similar in their chemical composition and metabolic activities.
- All cells arise from pre-existing cells.

- The cells are the structural and functional units of organisms.
- Growth of an organism occurs by cellular growth (unicellular) or by cellular multiplication.

**Plasma membrane or cell membrane:** plasma membrane is a living, thin, delicate, elastic, selectively permeable membrane. It is about 7nm thick. Under the light microscope, this merely appears as a single line.

Chemical analysis has shown the membrane to be 75 % phospholipids. In addition, the membrane contains proteins, cholesterol and polysaccharides. However it is the phospholipids that form the key elements in the structure of plasma membranes.

In 1972, Singer and Nicolson suggested a model, called the Fluid Mosaic Model. For explaining the ultra-structure of the plasma membrane or any other membrane of the cell. According to them plasma membrane is made up of a bilayer (two molecule thick layer) of phospholipids. According to this model, the cell membrane is made up of two types of protein molecules (Intrinsic proteins and extrinsic proteins) that are organized in a mosaic manner.

Intrinsic proteins are embedded in the lipid bilayer incompletely or completely, and the extrinsic proteins occur superficially. The fluid mosaic model of the membrane has been described as a number of protein icebergs floating in the sea of lipids.

The proteins are present not to give strength to the membrane but to serve as:-

1. Enzyme (catalyzing chemical reactions within the membrane).
2. Transport proteins form movement of water soluble ions.
3. Pumps (for active transport) and
4. Receptor proteins (for endocytosis) presence of lipids and proteins provide flexibility to the plasma membrane.

**Nucleus:-** It is a spherical or oval structure located generally in the centre of the cell. In an adult plant cell it is located in the side near the cell wall as centre of the cell is occupied by large vacuole. Nucleus is surrounded by a double layered membrane called a nuclear membrane. The nuclear membrane has small pores on it known as nuclear pores. Nuclear pores help in exchange of materials between cytoplasm and nucleoplasm. Nucleoplasm is the jelly like fluid which fills the nucleus. Nucleus contains a small oval dense body known as nucleolus which contains RNA. In the nucleus, there is a mass of inter woven thread called chromatin material. These threads mainly consist of DNA. At the time of cell division

chromatin material breaks down to form thread like structures known as chromosomes. Chromosomes are made up of DNA. The small functional segments of DNA are called genes.

**Functions:-**

1. It Controls the activities of the cell, therefore it is also known as the Principal of the Cell.
2. Nucleolus contains RNA which plays a key role in the synthesis of proteins.
3. Genes present in DNA are the carriers of hereditary information.

**Cell wall:-**It is an outer rigid protective, supportive and semitransparent covering of plant cells. The cell wall was first observed in cork cell by Robert Hooke in 1665. Its thickness varies in different type of cells from 1.1nm to 10nm. Cell wall is generally considered to be a non-living secretion of the protoplasm but actually it is metabolically active and is capable of growth.

**Functions:-**

1. It plays a part in helping the aerial portion of the land plant to withstand gravitational forces.
2. It is involved in the transport or movement of materials and metabolites in and out of the cell.
3. The cell wall plays an important role in cell expansion, especially in the young stage.
4. The cell wall gives the rigidity to the plant cell.
5. It maintains the shape of the plant cell.

**Cytoplasm:** - The space between the plasma membrane and the nucleus is filled by an amorphous, translucent, homogeneous, colloidal liquid called cytoplasmic matrix. It consists of various inorganic molecules, such as water, salts of Na, K, and various organic compounds like carbohydrates, lipids, proteins, nucleoproteins, nucleic acids, and a variety of enzymes. In the cytoplasm, various cell organelles are found floating.

**Functions:-**

1. It helps in intracellular distribution of molecules, enzymes and nutrients within the cell.
2. It helps in exchange of materials between different cell organelles.

3. Biosynthesis of nucleotides, proteins and fatty acids takes place in the cytoplasm.
4. Breaking down of glucose (glycolysis) takes place in the cytoplasm.
5. Continuous nucleo-cytoplasmic interaction takes place between the nucleus and the cytoplasm.

### **“The fundamental units of life”.**

#### **Q1. Who discovered the cell, and how?**

Ans: In 1665, Robert Hooke discovered a cell while observing a thin slice of cork, under his self-designed primitive type of compound microscope. He found the structure similar to a honey comb having many compartments. He named it cell which means a little compartment.

#### **Q2. Why is the cell called the structural and functional units of life?**

Ans: Each cell has its own complete structure which provides it the capacity to perform certain basic functions. A cell has various cell organelles which exhibit division of Labour by performing their special functions. A cell is able to perform all characteristic functions of all living forms because of these organelles.

For example, in unicellular organisms the whole body is of a single cell, but all the life processes (like respiration, transportation, nutrition, excretion etc.) take place in it. So, that is how a cell with all its organelles is the structural unit of life and since all the basic functions of all living beings are performed in the cell only, we call it the functional unit of life.

#### **Q3. How do substances like carbon dioxide and water move in and out of the cell? Discuss.**

Ans: **Movement of carbon dioxide:** carbon-dioxide moves in and out of the cell by diffusion. Carbon-dioxide gets accumulated inside the cell due to various activities like respiration. When the concentration of carbon-dioxide inside the cell is more than that of the external environment, then carbon-dioxide diffuses from the cell to the surroundings. But when the concentration of carbon-dioxide is less inside the cell as compared to outside, the gas moves from outside to inside the cell.

**Movement of water:** water moves in or out of the cell by osmosis. When the concentration of water inside the cell is more than (hypotonic) that of outside the cell, (hypertonic), then water molecules pass through the cell-membrane (which is selectively permeable in nature) from inside to outside. In the opposite condition it's vice-versa.

#### **Q4. Why is the plasma membrane called a selectively permeable membrane?**

Ans: Plasma membrane is called a selectively permeable membrane because it allows the entry and exit of some materials in or out of the cell but at the same time it does not allow other materials to enter or exit the cell.

**Fill in the gaps in the following table illustrating.**

**Q5.DifferencebetweenprokaryoticandEukaryoticcells.**

<u>Prokaryotic cell</u>	<u>Eukaryotic cell</u>
<ol style="list-style-type: none"><li>1. Size: generally small (1-10mm) 1mm=10<sup>-6</sup>m.</li><li>2. Nuclear region: is not well defined due to absence of nuclear membrane and known as nucleoid.</li><li>3. Chromosome: single.</li><li>4. Membrane: bound cell organelles absent.</li></ol>	<ol style="list-style-type: none"><li>1. Size: generally large (5-100mm).</li><li>2. Nuclear region: well defined and Surrounded by a nuclear membrane.</li><li>3. More than one chromosome</li><li>4. Membrane-bound cell organelles are present.</li></ol>

**Q6.Can you name the two organelles we have studied that contain their own genetic material?**

Ans:1) Mitochondria.      2) Plastids.

**Q7.If the organization of a cell is destroyed due to some physical or chemical influence, what will happen?**

Ans: The organization of a cell is due to its cell organelles. So, if the organization is destroyed, then the cell organelles, which perform their specific functions, will be disturbed and they will not function well. In that case the cell will not be able to perform basic functions and will ultimately die soon.

**Q8.How does an Amoeba obtain its food?**

Ans: Amoeba obtains its food by the process of endocytosis. Amoeba is a unicellular organism. The external plasma membrane which gives form to amoeba is flexible in nature. This flexibility of membrane enables it to engulf in food from external environment.

**Q9.What is osmosis?**

Ans: Movement of water molecules from a region of its higher concentration to the region of its lower concentration through a selectively (semi) permeable membrane (like plasma

Membrane) is called osmosis. We can say that osmosis is a special case of diffusion through a selectively permeable membrane.