



**GRADE: IX**

**SUBJECT: BIOLOGY**

## **CH. 5 THE FUNDAMENTAL UNIT OF LIFE**

### **Class Notes**

### **Topics in the Chapter**

- Introduction
- The cell theory
  - Types of organisms
  - Types of cells
- Diffusion
- Osmosis
- Hypotonic or Hypertonic or Isotonic solution
- Plasma membrane or Cell membrane
  - Properties of Plasma membrane
  - Functions of Plasma membrane
- Cell Wall
  - Function of Cell Wall
- Plasmolysis

### **Introduction**

- Cell is the structural and functional unit of life. It is the basic unit of life.
- It is discovered by **Robert Hook in 1831** in cork slice with the help of primitive microscope.
- **Leeuwenhoek (1674)**, discovered the free living cells in pond water with the improved microscope.
- **Robert Brown** discovered the nucleus in the cell in 1831.
- **Purkinje** coined the term 'protoplasm' for the fluid substance of the cell in 1839.

### **The cell theory**

- The theory that all the plants and animals are composed of cells and the cell is the basic unit of life, was presented by two biologists, **Schleiden and Schwann**.

- The cell theory was further expanded by **Virchow** by suggesting that all cells arise from pre-existing cells.

#### → **Types of organisms**

- On the basis of no. of cells, organisms are of two types:

- Unicellular Organism
- Multicellular Organism

**(i) Unicellular Organism:** These organisms are single celled which perform all the functions. Example: Amoeba, paramecium, bacteria.

**(ii) Multicellular Organism:** Many cells grouped together to perform different function in the body and also form various body parts. Example: fungi, plants, animals.

- The shape and size of cell are different according to the kind of function they perform. There is division of labour in cells.
- Each cell has certain kind of cell organelles to perform different type of function like mitochondria for respiration.

#### → **Types of cells**

- There are two types of cells:

- Prokaryotes
- Eukaryotes

<b>Prokaryotes</b>	<b>Eukaryotes</b>
Cells of organism lacks nuclear membrane.	Cells of organism have nuclear membrane.
Nucleolus is absent.	Nucleolus is present.
Single chromosomes.	Single or multi chromosomes
Reproduction is always asexual.	Reproduction is both sexual and asexual.
Always unicellular.	Often multicellular.

Membrane bound cell organelles are absent.	Membrane bound organelles are present like mitochondria.
Centriole is absent.	Centriole is present only in animals cell.
Cell division is by binary fission.	Cell division is by mitosis or meiosis.
Example: Bacteria, Blue green algae, etc.	Example: Fungi, Plant cell, Animal cell etc.

## **Diffusion**

The movement of molecules from a region of high concentration to a region of lower concentration is known as diffusion. E.g. carbon dioxide and oxygen move across the cell membrane by diffusion.

## **Osmosis**

Osmosis is a process in which water moves from the region of high concentration to one where its concentration is low through a semipermeable membrane. Therefore we can say that Osmosis is just a special case of the process of diffusion.

**Osmosis are of two types:**

- **Endosmosis** : The process in which the water molecules enter into the cell.
- **Exosmosis** : The process in which the water molecules move out of the cell

## **Hypotonic or Hypertonic or Isotonic solution**

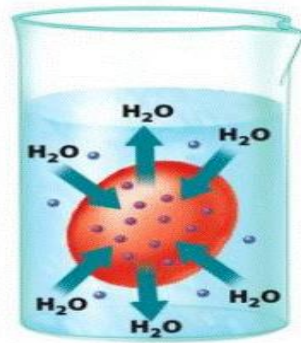
What happened to cell in sugar or salt solution?

Name of the solution	Condition	Result
Hypotonic solution	Medium surrounding cell has higher water concentration than cell.	Cell will gain water by osmosis and likely to swell up.

Isotonic solution	Medium has exactly same water concentration as the cell.	Water crosses the cell membrane in both directions. Cell will stay the same size.
Hypertonic solution	Medium has lower concentration of water than the cell.	Water crosses the cell in both directions, but more water leaves the cell than enters it.

### **Hypotonic Solutions**

- If the concentration of water outside the cell is higher than the concentration of water inside the cell gains water by the process of osmosis.
- Water can move into the cell from the cell membrane. In the case of hypotonic solutions, more water enters the cells which result in swelling of the cells.

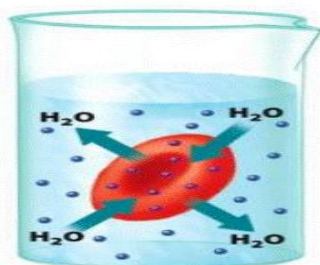


**Net water gain  
Cell swells**

**Hypotonic Solution**

### **Isotonic Solutions**

- If the cells are put in an environment that has a similar concentration of water as present inside. This state allows for the free movement of water across the membrane without changing the concentration of solutes on either side.
- Therefore, the size of the cell does not vary in an isotonic solution because there is no net movement of water.

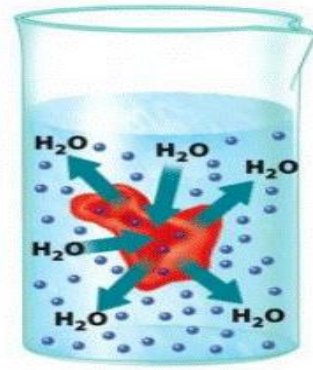


**No net loss or gain**

**Isotonic Solution**

### **Hypertonic Solutions**

- If the cells are kept in an environment that has a lower concentration of water than what is present inside the cells then due to the process of osmosis water moves out of the cells.
- This results in a decrease in the size of the cells (they shrink) as more water comes out of the cell.



**Net water loss  
Cell shrinks**

**Hypertonic Solution**

### **Plasma membrane or Cell membrane**

- This is the outermost covering of the cell that separates the contents of the cell from its external environment.
- The plasma membrane allows or permits the entry and exit of some materials in and out of the cell.
- It also prevents movement of some other materials. The cell membrane is called selectively permeable membrane.
- It is made up of lipid and protein.

#### **→ Properties of Plasma membrane**

- It is flexible (made up of organic molecules called lipids and proteins).
- Its flexibility enables cell to engulf in food and other from the external environment. This process is called endocytosis. Amoeba acquire food through this process.

### → **Functions of Plasma membrane**

- It permits the entry and exit of some materials in and out of the cell.
- It prevents movement of some other materials not required for the cell as it acts like selectively permeable membrane.

### **Cell Wall**

- Cell wall is another rigid outer covering in addition to the plasma membrane found in plant cell. The cell wall lies outside the plasma membrane.
- The plant cell wall is mainly composed of cellulose. Cellulose is a complex substance which provides structural strength to plants.

### → **Function of Cell Wall**

- Cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (hypotonic) external media without bursting.
- In such media the cells tend to take up water by osmosis. The cell swells, building up pressure against the cell wall. The wall exerts an equal pressure against the swollen cell.
- Because of cell wall, cells can withstand much greater changes in the surrounding medium than animal cells.

### **Plasmolysis**

- When a living plant cell loses water through osmosis there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.