

## SESSION 2: CELLS - THE BASIC UNITS OF LIFE

### KEY CONCEPTS:

- Cell Structure
- Function of different parts of cells
- Diffusion
- Osmosis

### TERMINOLOGY & DEFINITIONS

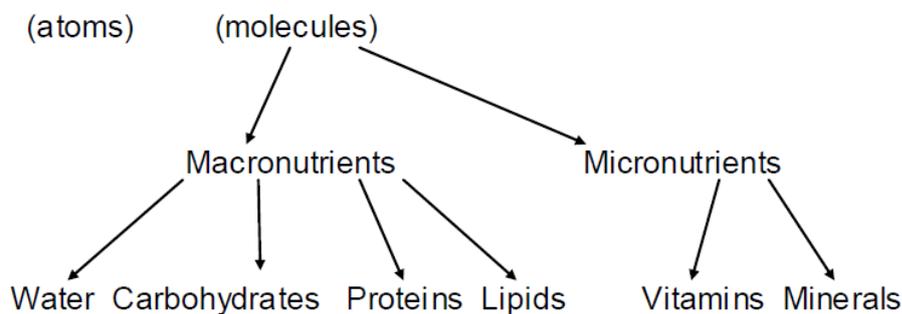
**Diffusion:** The movement of molecules from a region of high concentration to a region of low concentration

**Osmosis:** The movement of water molecules from a high concentration to a low concentration through the membranes of a cell.

### X-PLANATION

### WHAT MAKES UP CELLS?

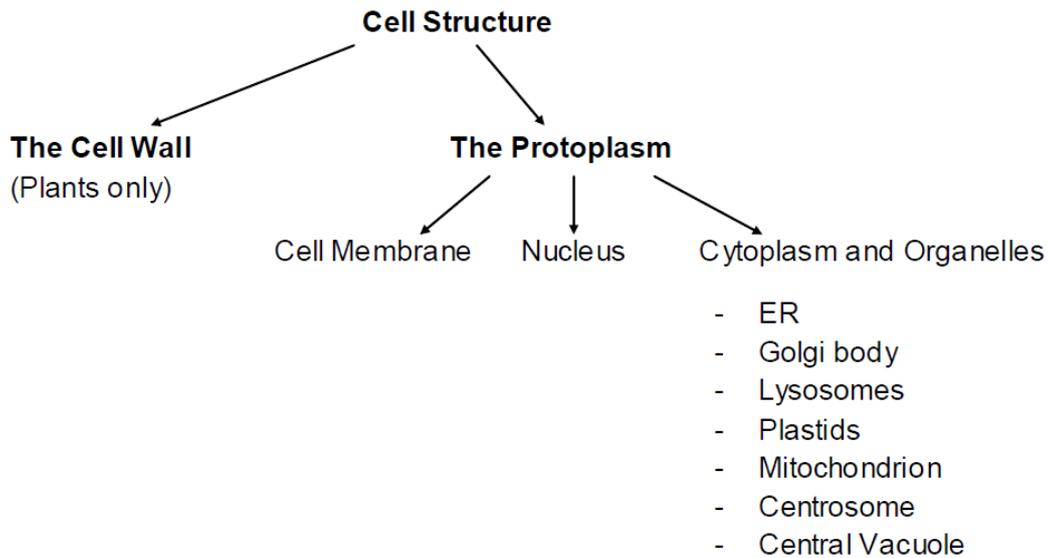
#### Elements → Compounds



### TYPES OF CELLS:

1. **Unicellular organisms** - one cell only  
**Examples:** amoeba, bacteria
2. **Multi-cellular organisms** - many cells  
**Examples:** plants, animals

Different types of cells form parts of a plant or animal.  
Cells with similar structure and function group together to form tissues  
Cells → tissue → organs → systems



## CELL WALL

### Structure of Cell Wall:

Cell walls consist of a tough carbohydrate called cellulose. Between the walls of neighbouring cells there is a middle lamella that holds the cells together. This layer is also made of cellulose. Cells walls are permeable because they have large pits that allow large molecules to pass through, from one cell to the next.

### Function of Cell Wall:

Cell walls provide plants with a support system. The cell walls act as a rigid frame to hold plants upright as plants do not have a skeleton.

Cell walls allow for the movement of molecules from one cell to the next. This forms part of the transport system in plants. The process is an example of diffusion.

## THE PROTOPLASM

- **The Cell Membrane**

### Structure of the Cell Membrane:

The membrane is a thin, living structure that surrounds all living plant and animal cells. Membranes are made of four layers: the two outer layers are formed by protein molecules, and the two inner layers of phospholipid molecules.

### Function of the Cell Membrane:

The molecules of the membrane are able to move and change position (called fluid mosaic model); the protein molecules help to carry substances through the membrane.

The membrane is semi-permeable as there are minute pores that allow only small molecules to pass through, in this way the membrane controls the entry and exit of substances in and out of the cell.

Salts and glucose will move through the membrane by a process called **diffusion**.

The movement of water molecules from a high concentration to a low concentration through the membranes of a cell is called **osmosis**.

- **The Nucleus**

**Structure of the Nucleus:**

The nucleus is surrounded by a double membrane that has many pores to allow substances to enter or leave the nucleus.

The jelly-like fluid inside the nucleus is called nucleoplasm, this suspends the chromatin material and the nucleolus.

**Function of the Nucleus:**

The chromatin material is made of DNA and appears as fine long strands scattered throughout the nucleoplasm. Chromatin material carries hereditary messages and stores genetic characteristics.

The nucleolus contains a substance called RNA, that is used as a messenger to make protein.

- **The Cytoplasm**

**Structure of the cytoplasm:**

Cytoplasm is a granular, semi-gel fluid that fills the cell and suspends the organelles. Many useful substances and waste products are found in the cytoplasm. Other substances have larger molecules that will not dissolve and therefore are suspended in the gel-like cytoplasm.

**Endoplasmic Reticulum (ER):**

This is a system of tubules that form a network of flattened stacks. It is connected to the nuclear membrane and often to the cell membrane. The ER forms Enzymes, carbohydrates and hormones. Many useful substances formed by the ER are stored and secreted in sacs that detach from the ER called vacuoles.

**Golgi Body:**

Some of these vacuoles become Golgi bodies, which are in the form of flattened stacks of membranes. The Golgi bodies may detach and fuse with the plasma membrane to secrete their contents outside the cell. Substances such as mucus, cholesterol and cellulose are used to coat the cell in the form of a capsule or wall.

**Functions of the Endoplasmic Reticulum:**

Digestive enzymes are formed by the ER and are stored in vacuoles called lysosomes. These vacuoles are usually only found in some animal cells. Lysosomes are associated with unicellular organisms such as the amoeba, because they lack a digestive system to digest their food. White blood cells also have lysosomes to digest bacteria and dead cells.

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Granular structures called Ribosomes are attached to some parts of the ER. This gives a rough appearance and is called granular ER, the areas where Ribosomes are absent are called agranular ER. The Ribosomes serve as the site for protein synthesis.

### **The Plastids:**

Plastids are sac-like, double membranous structures found in many plant cells.

There are three types of Plastids:

- **Chromoplasts**

Contains pigments to give bright colours to fruit and flowers for attracting insects and seed dispersal. On ripening of fruit the chloroplast change into chromoplasts.

- **Leucoplasts**

Are colourless and store food such as starch, proteins and oils. Leucoplasts that store starch are called amyloplasts.

- **Chloroplasts**

These are found in green plant cells that produce glucose during photosynthesis.

The chloroplast is disc-shaped and is surrounded by a double membrane. The fluid is called the stroma and contains enzymes and starch grains. Parallel, flattened sacs called thylakoids or granna are found in the stroma. In some places they are stacked to form granna.

The green pigment – chlorophyll is found in the granna and is able to absorb radiant energy during photosynthesis.

Equation for photosynthesis:

Carbon dioxide + Water → Glucose + Oxygen

- **The Mitochondrion**

### **Structure of the Mitochondrion:**

They are rod-shaped and are surrounded by a double membrane. The inner membrane is folded to form finger-like projections called cristae, they increase the surface area.

### **Function of the Mitochondrion:**

Mitochondria are responsible for cellular respiration and are found in all living cells. The number varies according to the activities of the cell.

The cristae are covered with granules, which contain enzymes for cellular respiration.

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Equation for Cellular Respiration:

Glucose + oxygen → ATP + carbon dioxide

- **The Centrosome**

The centrosome is found near the nucleus. It is a non-membranous structure and consists of two hollow cylinders called centrioles. The centrioles lie at right angles to each other. During cell division they attach to spindle fibres.

- **The Central Vacuole**

These are found in plant cells and consist of a single membrane called the tonoplast that is filled with a fluid called cell sap. This stores useful substances and waste products.

When the vacuole is full it exerts a pressure against the cytoplasm and wall causing the cell to become firm or turgid.