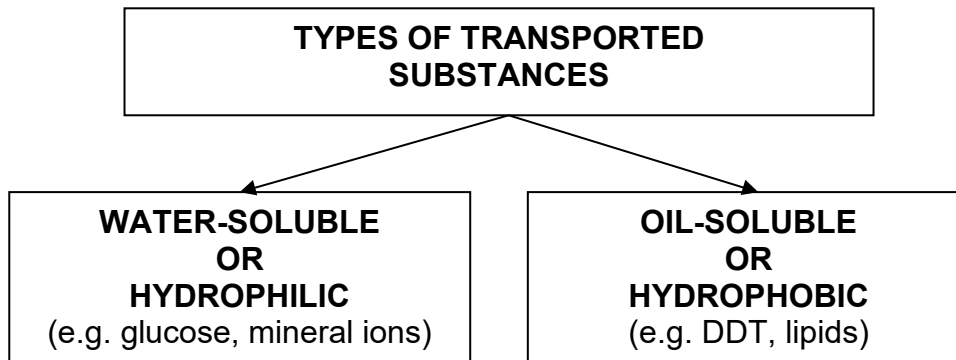


# CYTOPLASM AND MEMBRANES



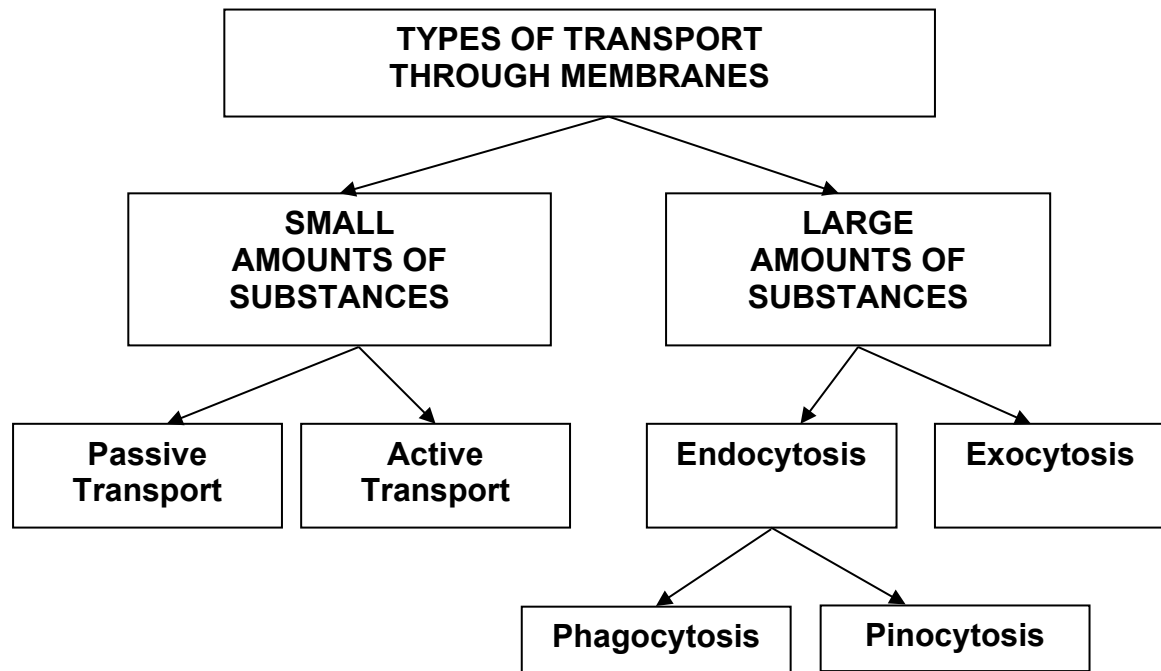
## Cytoplasm

- The cytoplasm of plant cells is about 95% water, and of animal and bacterial cells is about 70% water.
- There are different concentrations of both water-soluble and \_\_\_\_\_-soluble substances in the cytoplasm that must pass into and out of the cell and organelle membranes.

## Membranes

- Cell and organelle membranes have the same chemical composition, but the cell membrane is \_\_\_\_\_
- **Fluid-Mosaic Model** - Membranes are about 1/2 lipid and 1/2 protein, forming a 2-layered structure. This is called a \_\_\_\_\_ of phospholipid molecules interspersed with many \_\_\_\_\_ molecules. The phospholipid molecules have one end that is hydrophobic ('\_\_\_\_\_ -hating') and the other end that is hydrophilic ('water-loving'). Individual lipid molecules and some protein molecules are free to move within the layers.
- Membranes are differentially \_\_\_\_\_ because they allow some substances to pass through easily and not others. Small uncharged molecules (e.g. oxygen and carbon \_\_\_\_\_) and water molecules can pass through easily. Lipid-soluble substances (e.g. \_\_\_\_\_) also pass through easily by dissolving into the phospholipid bilayer. Most water-soluble molecules (e.g. mineral ions, \_\_\_\_\_ acids and \_\_\_\_\_ sugars) can only pass through the channels made by the interspersed \_\_\_\_\_ molecules and require energy for transport.

Draw a labelled diagram of the phospholipid bilayer structure of a cell membrane.



## TRANSPORT OF SMALLER QUANTITIES THROUGH MEMBRANES

### SOLUTES, SOLVENTS AND SOLUTIONS

- **Solution** – a mixture where one substance dissolves in another (e.g. saltwater)
- **Solute** – the substance that dissolves (e.g. \_\_\_\_\_ in saltwater)
- **Solvent** – the substance that does the dissolving (e.g. \_\_\_\_\_ in saltwater)

### PASSIVE TRANSPORT

- Passive Transport uses no \_\_\_\_\_
- Substances move from \_\_\_\_\_ to \_\_\_\_\_ concentrations
- **Diffusion** is the movement of substances from high to low concentration. Oil-soluble substances pass through the lipid part of membranes easily by diffusion also.
- **Osmosis** is the diffusion of \_\_\_\_\_. Water diffuses through the membranes by either slow diffusion through the lipid bilayer or through protein channels.

### ACTIVE TRANSPORT

- Active Transport requires energy from energy-rich \_\_\_\_\_ molecules.
- Substances move from \_\_\_\_\_ to \_\_\_\_\_ concentrations.
- **Glucose** is water-soluble, but requires some energy to be transported. First, proteins in the membrane 'pump' hydrogen ions ( $H^+$ ) out of the cell. This requires the energy of **ATP** (adenosine \_\_\_\_\_). Then the hydrogen ion ( $H^+$ ) attaches to the glucose molecule to transport it into the cell through proteins in the membrane. Hormones such as adrenalin can attach to a membrane to increase the transport of glucose into a muscle cell.

- **Mineral Ions** (potassium  $K^+$ , \_\_\_\_\_  $Na^+$ , calcium  $Ca^{2+}$ ) are carried through the membrane either by ion-transporting proteins (a process that requires the energy of ATP), or by slow diffusion, since ions are water-soluble. Examples of ion transport are calcium ions in muscle cells, and \_\_\_\_\_ and sodium ions in nerve cells.

### Exocytosis

- Exocytosis is the \_\_\_\_\_ of large quantities of substances (e.g. milk from milk glands, venom from venom glands) out of a cell. The transport of large quantities occurs when vesicles containing the substances bind temporarily with the cell membrane.

### Endocytosis

- Endocytosis is the \_\_\_\_\_ of large quantities of substances (e.g. infective bacteria, food for protozoans) into a cell. Endocytosis has 2 types:
  1. **Phagocytosis** (e.g. protozoans feeding, white blood cells engulfing invading \_\_\_\_\_)
  2. **Pinocytosis** (e.g. human egg taking in food such as oil in droplet form)

## COMPARISON OF DIFFUSION, OSMOSIS AND ACTIVE TRANSPORT

<b>DIFFUSION</b>	<b>OSMOSIS</b>	<b>ACTIVE TRANSPORT</b>
<i>Transport of gases or dissolved substances in solution from a region of high concentration to a region of low concentration</i>	<i>Transport of water through a semi-permeable membrane from a solution of high concentration to a solution of low concentration</i>	<i>Transport of a substance from low to high concentration regions, using energy from the cell, through a living membrane</i>
1. Liquids and gases can diffuse over considerable distances	Water only transported over a short distance	Certain selected solutes, ions, glucose, sucrose, amino acid, etc., transported through short distances
2. Rapid in gases, but slow in solutions of substances	Slow process	Rapid process
3. Transport from high to low concentration	Transport of water from solution of high to low concentration	Transport of selected substances from region of low to high concentration
4. Occurs with or without a non-living permeable membrane	Either a living or non-living semi-permeable membrane needed	A living selective lipo-protein membrane is essential
5. No cell energy required	No cell energy required	Cell energy from ATP required