

LAB -5-

OSMOSIS

To find out the concept of osmosis we must identify the three processes (Osmosis, diffusion, permeability) accurately. These processes differ among themselves on the basis of the presence or absence and type of membrane.

***Permeability include three types of membranes**

1-Permeable membrane: Allows the passage of solute and solvent molecules, it is called full permeability membrane such as : filter paper.

2-Semi-permeable membrane: Allows solvent molecules to pass But does not allow solute molecules to pass such as urinary bladder.

3-Selective semi-permeable membrane: the transport be according to the needs of the cell to the molecules.

* **Diffusion:** is the random motion of molecules, atoms or ions from the high concentration to the low concentration region, Within the purely physical laws without the need for energy, That's where the movement will be, because these molecules possess kinetic energy can be transmitted through from one area to another.

* **Osmosis:** is the process of transmission, or diffusion of molecules of the solvent (water) solution with a low concentration to a similar solution with a high concentration through semi-permeable membrane. Allows solvent molecules (water) to pass But does not allow solute (sugar or salt) molecules to pass.

The osmosis is cases of permeability which required to occur by the presence of semi-permeable membranes.

The osmosis mechanism:

The kinetic energy of the water molecules or pure liquid be high therefore increases diffusion pressure, This pressure is greater than the

diffusion pressure of water molecules in salty or sugary solution, This is because the water molecules collide with salt particles and decrease its kinetic energy and pressure which leads to transmission of water molecules from pure liquid to the sugary or salty solution.

The osmosis is called **membrane diffusion** phenomena, usually given pressure arises when the spread of the solvent so-called **osmotic pressure** be at the top of his grades when separating the solution from the pure solvent by semi permeable membrane.

Types of fluids that surround the cell

1-Isotonic solution: the number of input ions to the cell cross semi-permeable membrane is equal to the number of ions emerging from it.

2- Hypotonic solution: As a result entry of the ions into the cell, the cell increase in size and swell, this is because the extracellular concentration less than the intracellular concentration, and thus enter the water molecules inside the cells, causing **swelling** and increasing size.

3-Hypertonic solution: In this case the cell lose its water and ions, when it is placed in a hypertonic solution thus (**shrinking**).

This so-called **plasmolysis:** It is the process of cell shrinkage as a result of loss of water and it happens when you put the cell in high concentration of salty solution or in hypertonic solution, Here the shrinking in the cell protoplasm, membrane moves away from the wall will happen as a result of water out of the cell to the periphery.

Factors affecting the permeability of the membrane to different substances:

1-Molecules size: If the size of molecule is smaller or equal to the size of cell membrane pores, these molecules can cross easily and the largest molecules cannot cross.

2-Distribution Coefficient: The relationship between the solubility of substance in oil to the solubility in water, some of the substance have the ability to melting in lipid substances of cell membrane and enter across the membrane, there are proteins substances that carry molecules and called Carrier which attach with molecules and across within the membrane.

3-Charge: Some of the substances have high ionized degree and can be polarized the molecule of water ex: ethanol which enter to the cell as quickly as possible. Also the ionized substances across to the cell slowly from which non-ionized, also, the monovalent ions ex: Cl^- , I^- , K^+ , Na^+ , across quickly compared to divalent ex: SO_4 , Mg^+ , Ca^{++}

Practical part:

Methods used for measurement of permeability of the cells.

A-Experiment of onion epidermis cells

Put part of onion epidermis with drop of water on glass slide and examined with microscope to ontic normal cell shape as a control Coefficient. After that take transparence part of onion leaves and put in watch glass for 5 min in three concentrations:

0.9% Nacl Isotonic solution

5% Nacl Hypertonic solution

0.1% Nacl Hypotonic solution

After 5 min take each segment according to concentration and examined to notice cell shape.

B-Red blood cell: Take drop of red blood cell and put in watch glass for 5 min in three concentrations after carried out control Coefficient.

C-Fresh plant stem: Take part from stem and draw with normal state, then make longitudinal split in stem which divide into 2 parts, the cutting parts were put in solution A, B, C after a period of time, notice If cutting part stay without variant, the solution is isotonic, If there are concave in cuticle part and swell in epidermis cells, the solution is hypotonic, If there are concave inside of epidermis and external of cuticle (shrinkage), the solution is hypertonic.