B.Sc-I, Paper-IA

Osmosis and osmotic pressure

Osmosis — The flow of solvent from low concentration of solution to high concentration of solution through semi-permeable memberane is called osmosis. Semi-permeable membrane is a membrane which allow solvent to flow and not to solute molecule is called semi-permeable membrane.

Osmotic pressure :— The pressure exerted on solution side to prevent the flow of solvent through semi-mermeable membrane to solution is called osmative pressure.

OR

It is an hydrostatic pressure exerted by the solution column which just prevents to flow of solvents molecule into the solution through semipermeable membrane. It is easly illustrated by below given ~~fig~~ figure

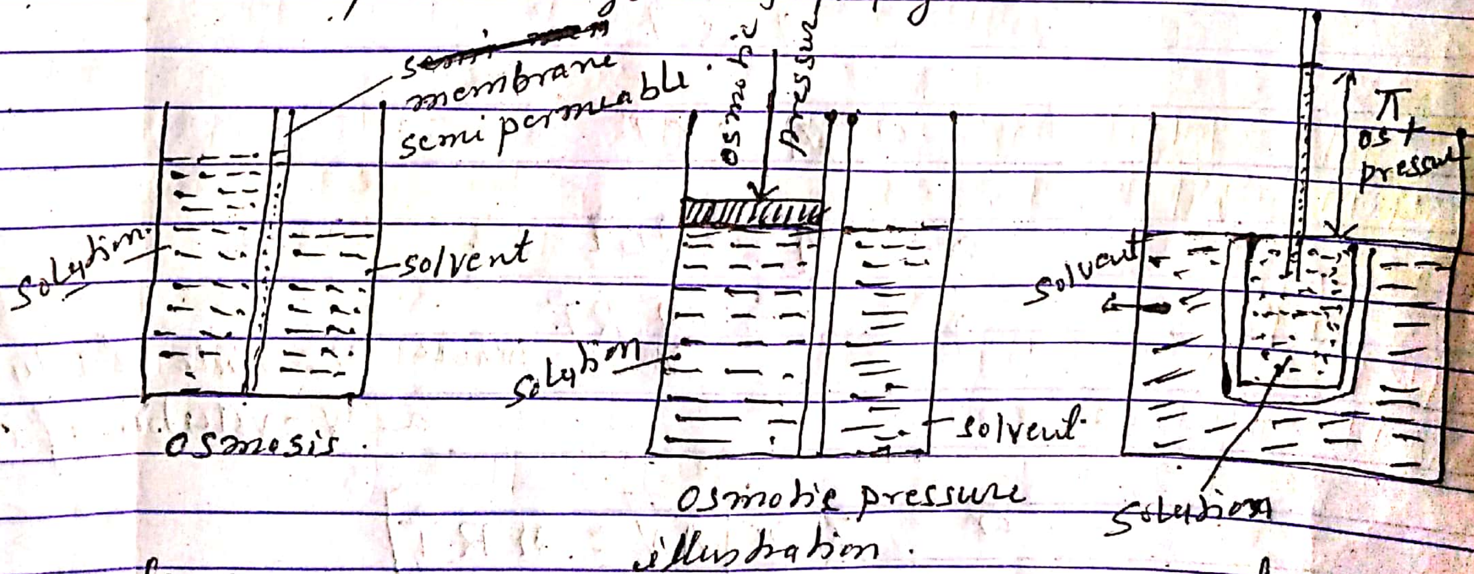

fig-A fig.B fig-C

fig A show osmosis. fig B show pressure on solution side to prevent solvent molecule to flow into solution side is osmotic pressure.
• The rise of solution in capillary tube in figure C shows the value of osmotic pressure in cm.

Relation of osmotic pressure of a solution and molecular mass of solute: →

Dilute solution act like ideal gas i.e behaviour of solute molecule in dilute solution ~~is equal~~ act like gas molecule. If π is osmotic pressure of a solution, C is molar concentration and T is the temperature of solution then.

$$\pi \propto C$$

$$\pi \propto T$$

or $\pi \propto CT$

or $\pi = RCT$

or $\pi = \frac{n}{V} RT$ where n = mole of solute and V = volution of soln

or $\boxed{\pi V = nRT}$

This is called Vant Hoff equation of dilute solution. As $\pi \propto C$ and hence osmotic pressure is colligative property.

Calculation of molecular mass of solute

Vant Hoff equation is

$$\pi V = nRT$$

$$\Rightarrow \pi V = \frac{w}{m} \cdot RT$$

Here w = mass of non-volatile solute and m is the molecular mass of the ~~sol~~ solute.

$$\Rightarrow \boxed{m = \frac{wRT}{\pi V}}$$

If π, w is known at known T, molecular mass of non-volatile solute is calculated. Here value of R is taken as the value of gas constant R. If π is taken in atmosphere, ~~then~~ R value is 0.0821 litre. atm. per degree per mole.

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