where c is the total molar concentration of all the free species present in the solution, h is the height developed by the column of the concentrated solution and ρ is the density of the solution in the column. On the basis of osmotic pressure, the solutions can be classified in three classes.

Isotonic solutions. Two solutions having same osmotic pressures at same temperature. (This implies $c_1 = c_2$).

Hypertonic solution. When two solutions are being compared, then the solution with higher osmotic pressure is termed as hypertonic. The solution with lower osmotic pressure is termed as **hypotonic.**

Important. Osmotic pressures can be determined quite accurately, hence it is used in the determination of molecular weights of large proteins and similar substances.

Van't Hoff Factor (i)

Since colligative properties depends upon the number of particles of the solute, in some cases where the solute associates or dissociates in solution, abnormal results for molecules masses are obtained.

$$i = \frac{\text{Observed colligative property (actual)}}{\text{Theoretical colligative property}}$$

Case-I : Electrolyte dissociates

Relation between i and α degree of dissociation or ionization

Let the electrolyte be A_xB_y

$$\begin{array}{lcccccc} & A_xB_y & \longrightarrow & xA^{y+} & + & yB^{x-} \\ t=0 & C & & 0 & & 0 \\ t_{eq} & C(1-\alpha) & & xC\alpha & & yC\alpha \end{array}$$

$$i = 1 + (n-1)\alpha$$

$n = x + y$

$=$ no. of particles in which molecules of electrolyte dissociates.

Case-II : Electrolyte associates

Relation between degree of association α and i.

$$\begin{array}{lccc} & nA & \longrightarrow & A_n \\ t=0 & C & & 0 \\ t_{eq} & C(1-\alpha) & & \dfrac{C\alpha}{n} \end{array}$$

$$i = 1 + \left(\frac{1}{n} - 1\right)\alpha$$

Henry Law :

This law deals with dissolution of gas in liquid i.e. mass of any gas dissolved in any solvent per unit volume is proportional to pressure of gas in equilibrium with liquid.

$$m \propto p$$

$$m = kp$$

and $P = K_H \cdot X_{gas}$

where X_{gas} is mole fraction of gas in solution.