Chapter Summary: Solutions (Properties and Concentrations)

Solute + Solvent = Solution (dilute, concentrated, saturated and supersaturated solutions)

Solution Concentration:

Molarity = moles/L	Mass percent = g solute/g solvent	Volume percent = mL solute/ mL solvent
Parts per million = mg/ L	Parts per billion = mg/L	Molality = mol solute/ kg solvent
Mole fraction = Mol component/ total of mol components		

Intermolecular Forces in Solution Formation: "Like dissolves like".
There are four possibilities

1) all intermolecular forces are comparable
2) intermolecular forces between solute and solvent is > other intermolecular forces.
3) intermolecular forces between solute and solvent is < other intermolecular forces.
4) intermolecular forces between solute and solvent is << other intermolecular forces.

Solubility of ionic salts and gases
Solubility of most ionic substances increases with temperature.
Solubility of most gases decreases with increase in temperature.
Solubility of most gases increases with increase in pressure. (Henry's Law)

Vapor Pressure (VP) of Solutions (Colligative properties)
Raoult's Law: VP of a solvent above a solution (P_{solv}) is the product of the VP of pure solvent (P^o_{solv})and mol fraction of the solvent (χ_{solv}) in the solution.

$$P_{solv} = P^o_{solv} \times \chi_{solv}$$

Freezing Point Depression = T_f (solution) – T_f(solvent) $\Delta T_f = -K_f \times m$ (molality)
(Ideally – freezing point of solution is lower than that of pure solvent)
Boiling Point Elevation = T_b (solution) – T_b(solvent) $\Delta T_b = K_b \times m$ (molality)
(Ideally –boiling point of solution is higher than that of pure solvent)

Osmosis: movement of solvent molecules from a lower to higher concentration of solution through a semipermeable membrane.
Osmotic pressure (π) : the amount of pressure required to stop osmosis.

$\pi = nRT/V$ but $n/V = M$ (Molarity) hence $\pi = MRT$

Colloids: heterogeneous solution of solute and solvent (the solute does not precipitate out unlike suspensions where it does) (see table 12.4 for examples of colloids)

Key Words

Solutions: dilute, Concentrated, saturated and supersaturated	Molality Mole fraction	Henry's Law	Raoult's Law: Colligative properties
Freezing point depression Boiling point elevation	Osmosis Osmotic pressure Semipermeable membrane	Isotonic Hypertonic Hypotonic	Colloids Suspensions Tyndall effect