

CLASS 12

CHEMISTRY

REVISION NOTES

Revision Notes: Class 12 Chemistry Chapter 1 Solutions

A condensed, formula-first recap of every key definition and result in Chapter 1: Solutions — ideal for last-minute board exam revision. These Class 12 Chemistry Chapter 1 notes are ideal for quick revision just before exams.

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Common Mistakes Students Make in Solutions

Mixing up concentration terms: using molarity where molality was needed, or vice versa — molality (per kg solvent) doesn't change with temperature, molarity (per litre solution) does.

Raoult's law misapplication: forgetting it applies to each component's partial vapour pressure, not total pressure directly, for a solution with two volatile components.

Colligative-property direction errors: mixing up which property increases and which decreases for a solution versus the pure solvent.

Forgetting the Van't Hoff factor: omitting it for solutes that dissociate or associate, which throws off colligative-property calculations for ionic compounds.

Revision Notes: Class 12 Chemistry Chapter 1 – Solutions

Solution = homogeneous mixture of two or more non-reacting substances; solute (lesser amount) + solvent (greater amount).

9 types of solutions based on physical state of solute/solvent: gas–gas, gas–liquid, gas–solid, liquid–gas, liquid–liquid, liquid–solid, solid–gas, solid–liquid, solid–solid.

Mass percentage (w/w %) = (mass of component ÷ total mass of solution) × 100.

Volume percentage (v/v %) = (volume of component ÷ total volume of solution) × 100.

Mass by volume percentage (w/v %) = (mass of solute in g ÷ volume of solution in mL) × 100.

Parts per million (ppm) = (mass/moles/volume of component ÷ total mass/moles/volume) × 10⁶.

Mole fraction, $x_A = n_A ÷ (n_A + n_B)$; sum of all mole fractions in a solution = 1.

Molarity (M) = moles of solute ÷ volume of solution (L); unit mol L^{−1}; temperature-dependent (volume changes with T).

Molality (m) = moles of solute ÷ mass of solvent (kg); unit mol kg^{−1}; temperature-independent.

Solubility of a solid in a liquid depends on temperature and, per Le Chatelier's principle, increases with T if dissolution is endothermic and decreases if exothermic.

Solubility of a gas in a liquid decreases with increasing temperature (dissolution of gases is exothermic) and increases with increasing pressure.

Henry's law: $p = K_H \cdot x$, where p = partial pressure of gas, x = mole fraction of gas in solution, K_H = Henry's law constant (depends on gas, solvent, and temperature); higher K_H = lower solubility at a given pressure.

Applications of Henry's law: carbonated drinks (CO_2 solubility under pressure), scuba diving (N_2 narcosis / decompression sickness), high-altitude anoxia (low O_2 partial pressure).

Raoult's law (volatile solute): $p_1 = x_1 p^\circ_1$, $p_2 = x_2 p^\circ_2$; total pressure $p_{\text{total}} = x_1 p^\circ_1 + x_2 p^\circ_2$.

Raoult's law (non-volatile solute): relative lowering of vapour pressure $(p^\circ - p)/p^\circ = x_2$ (mole fraction of solute); for dilute solutions, $x_2 \approx n_2/n_1$.

Ideal solutions: obey Raoult's law at all concentrations; $\Delta_{\text{mix}}H = 0$, $\Delta_{\text{mix}}V = 0$ (e.g., benzene + toluene, n-hexane + n-heptane).

Non-ideal solutions show deviation from Raoult's law: **positive deviation** (A–B forces weaker than A–A/B–B; $\Delta_{\text{mix}}H > 0$; $p_{\text{total}} > \text{ideal}$; e.g. ethanol+acetone, water+ethanol) and **negative deviation** (A–B forces stronger; $\Delta_{\text{mix}}H < 0$; $p_{\text{total}} < \text{ideal}$; e.g. chloroform+acetone, HNO_3 +water).

Azeotropes: constant-boiling mixtures with the same composition in liquid and vapour phases; cannot be separated by simple distillation. Minimum-boiling azeotropes form from solutions with positive deviation; maximum-boiling azeotropes from negative deviation.

Colligative properties depend only on the number of solute particles, not their identity: relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure.

Elevation of boiling point: $\Delta T_b = i \cdot K_b \cdot m$, where K_b = molal elevation (ebullioscopic) constant, m = molality.

Depression of freezing point: $\Delta T_f = i \cdot K_f \cdot m$, where K_f = molal depression (cryoscopic) constant.

K_b and K_f are solvent-specific constants with units K kg mol^{-1} ; for water, $K_f = 1.86 \text{ K kg mol}^{-1}$ (standard/commonly used value).

Osmosis: spontaneous flow of solvent from a region of lower solute concentration to higher solute concentration through a semi-permeable membrane.

Osmotic pressure: $\pi = CRT$ (van't Hoff equation for dilute solutions), where C = molar concentration, R = gas constant, T = temperature (K); equivalently $\pi = (n/V)RT$; for an ionising/associating solute, $\pi = iCRT$.

Isotonic solutions have equal osmotic pressure at a given temperature; a solution is hypertonic/hypotonic relative to another if its osmotic pressure is higher/lower.

Reverse osmosis: applying pressure greater than osmotic pressure forces solvent to flow from concentrated to dilute solution through a semi-permeable membrane (used in seawater desalination).

Van't Hoff factor, i = normal molar mass $\div$ observed (abnormal) molar mass = observed colligative property $\div$ calculated (normal) colligative property = (total number of moles of particles after

dissociation/association) $\div$ (number of moles of formula units dissolved).

Dissociation (solute breaks into n ions): $i = 1 + (n-1)\alpha$, where α = degree of dissociation; $i > 1$ (e.g. NaCl, KCl, electrolytes).

Association (n solute units combine into one aggregate): $i = 1 - \alpha + \alpha/n = 1 - \alpha(1-1/n)$; $i < 1$ (e.g. carboxylic acids dimerising in benzene).

Modified colligative-property equations with van't Hoff factor: $\Delta T_b = i K_b m$; $\Delta T_f = i K_f m$; $\pi = i CRT$; $(p^\circ - p)/p^\circ = i x_2$.

Class 12 Chemistry Chapter 1 – Solutions and Important Questions

Need full answers or more practice? See the [Class 12 Chemistry Chapter 1 Solutions](#) and [Class 12 Chemistry Chapter 1 Extra Questions](#).

What to Revise First (and Last) in This Chapter

Prioritise the concentration terms (molarity, molality, mole fraction) and their exact definitions first, since mixing these up undermines almost every other calculation in this chapter. Leave detailed Raoult's law derivations for non-ideal solutions for an earlier, slower revision pass.

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