

Chemistry

Original practice in 13 topic units, with explanations, worked examples and answer guidance. Use alongside the prescribed texts and syllabus.



13 practice units

78 tasks with answer guidance

Name / नाम: _____

Original selected-topic practice. Use alongside school lessons and the prescribed textbook. The contents define this book's scope.

CBSE course 043 · 2026–27 · Selected practice, not a complete syllabus or official examination paper.

UNIT 01 / 13 · LEARN & TRY

Solution studio: concentration and particle effects

Name: _____ Date: _____

Goal: Calculate concentration and ideal colligative changes while stating particle assumptions.

Learn

A solution is a homogeneous mixture, and its concentration can be expressed in several different ways. Molarity is moles of solute per litre of solution; molality is moles of solute per kilogram of solvent. Their denominators differ, and molarity can change with temperature because volume changes. Molality avoids that direct volume dependence. For an ideal dilute solution containing a nonvolatile solute, several colligative effects depend on the number of dissolved particles rather than their chemical identity. Freezing-point depression follows $\Delta T_f = iK_f m$, where i accounts for effective particle number through association or dissociation. Use the stated idealisation: real electrolytes may not give the exact integer i predicted from complete dissociation. Raoult's law describes an ideal solvent's vapour pressure as its mole fraction times the pure-solvent vapour pressure. First identify whether a calculation refers to solution mass, solvent mass or final solution volume; these cannot be silently substituted for one another.

Worked example

Dissolve 0.10 mol of a nonelectrolyte in 0.50 kg water. Molality is $0.10/0.50 = 0.20 \text{ mol kg}^{-1}$. With $K_f = 1.86 \text{ K kg mol}^{-1}$ and $i = 1$, $\Delta T_f = 1 \times 1.86 \times 0.20 = 0.372 \text{ K}$. For otherwise identical ideal complete-dissociation NaCl data, assumed $i = 2$ gives 0.744 K; a real measurement can depart from that ideal value. For completely dissociated CaCl_2 at the same molality, ideal $i = 3$ gives $\Delta T_f = 1.116 \text{ K}$, three times the nonelectrolyte value. Effective particle factors in real solutions can differ.

1. Find molarity of 0.20 mol solute in 500 mL solution. [2 marks]

UNIT 01 · PRACTISE · 5–6

Solution studio: concentration and particle effects

5. An ideal solvent has mole fraction 0.90 and pure vapour pressure 20 kPa. Find its vapour pressure over the solution. [2 marks]

6. Compare ideal freezing-point depression of glucose and completely dissociated CaCl_2 at equal molality. [4 marks]

Explain one answer. Choose a question to revisit after a few days.

UNIT 01 · ANSWER GUIDANCE

Solution studio: concentration and particle effects

1. $500 \text{ mL} = 0.500 \text{ L}$; $M = 0.20/0.500 = 0.40 \text{ mol L}^{-1}$.
2. $m = 0.15/0.30 = 0.50 \text{ mol kg}^{-1}$.
3. Molality uses solvent mass, which is unaffected by simple expansion; molarity uses solution volume, which can change with temperature.
4. $\Delta T_f = iK_f m = 0.186 \text{ K}$.
5. $p = x p^\circ = 0.90 \times 20 = 18 \text{ kPa}$.
6. Glucose has $i = 1$; CaCl_2 gives one Ca^{2+} and two Cl^- , so ideal $i = 3$. Its depression is three times glucose; real ion interactions can alter effective i .

Teaching note

Circle the denominator: litres of solution for molarity, kilograms of solvent for molality.

Curriculum reference: https://cbseacademic.nic.in/web_material/CurriculumMain27/SecPart2/Chemistry_SecP2_2026-27.pdf

Selected practice; outcomes are publisher-defined. School practicals, projects and prescribed readings require separate preparation.