



ARIHANTAM ACADEMY

Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

SOLUTIONS — DPP 6 TO 11

Student Workbook + Teacher Answer Key

Arihantam Academy • Faith Strength Education

Bihar Board Class 12 Chemistry: board-oriented daily practice for Solutions. Each DPP includes objective questions, short answers, numerical practice and a separate teacher answer key.

DPP coverage: DPP 6 concentration terms; DPP 7 Henry's law; DPP 8 Raoult's law; DPP 9 boiling/freezing point; DPP 10 osmotic pressure; DPP 11 van't Hoff factor and chapter test.



ARIHANTAM ACADEMY

Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 6

Solutions | Types of solutions and concentration terms

Student Name: _____	Roll No.: _____
DPP No.: 6 Chapter: Solutions	Date: _____
Topic: Types of solutions and concentration terms	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Which concentration unit is independent of temperature?
(A) Molarity (B) Molality (C) Normality (D) Formality
- Molarity is number of moles of solute per:
(A) kg solvent (B) litre solution (C) kg solution (D) litre solvent
- Molality is number of moles of solute per:
(A) litre solution (B) kg solution (C) kg solvent (D) 100 g solvent
- Sum of mole fractions in a binary solution is:
(A) 0 (B) 1 (C) 2 (D) Depends on temperature
- 1 ppm means:
(A) 1 g solute in 1 kg solution (B) 1 mg solute in 1 kg solution (C) 1 mol solute in 1 kg solvent (D) 1 g solute in 1 L solvent
- Mass percent is:
(A) mass solute/mass solution × 100 (B) mass solute/volume solution × 100 (C) moles solute/litre solution (D) moles solute/kg solvent
- Which is gas in liquid solution?
(A) Brass (B) Air (C) CO₂ in soda water (D) Smoke
- Which is solid in liquid solution?
(A) H₂ in Pd (B) Sugar in water (C) Fog (D) Air
- Mole fraction has unit:
(A) mol L⁻¹ (B) mol kg⁻¹ (C) No unit (D) g L⁻¹
- Molarity changes with:
(A) Pressure only (B) Temperature (C) Mass only (D) Moles only
- Molality does not change appreciably with temperature because it depends on:
(A) volume (B) mass (C) pressure (D) density
- Which is an example of liquid in liquid solution?
(A) Brass (B) Ethanol in water (C) Smoke (D) H₂ in Pd
- If a solution contains 1 mol solute in 1 kg solvent, it is:
(A) 1 M (B) 1 m (C) 1 N (D) 1 ppm
- Volume percentage is mostly used for:
(A) solid-solid solutions (B) liquid-liquid solutions (C) gas-solid solutions (D) ionic solids
- For a binary solution, x_A is:
(A) $n_A/(n_A+n_B)$ (B) $n_B/(n_A+n_B)$ (C) $n_A \times n_B$ (D) $n_A + n_B$

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define mole fraction.
- Differentiate between molarity and molality.
- Calculate molality of a solution containing 5.85 g NaCl in 500 g water. (M NaCl = 58.5 g mol⁻¹)
- Calculate mole fraction of ethanol in a mixture containing 46 g ethanol and 54 g water.
- Why is molality preferred over molarity in colligative-property calculations?

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain different methods of expressing concentration of a solution with formulas.
- A solution contains 18 g glucose in 162 g water. Calculate mass percentage of glucose and molality. (M glucose = 180 g mol⁻¹)

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 6

Solutions | Types of solutions and concentration terms

MCQ answers: 1-B, 2-B, 3-C, 4-B, 5-B, 6-A, 7-C, 8-B, 9-C, 10-B, 11-B, 12-B, 13-B, 14-B, 15-A

Short-answer marking points

16. $x_A = n_A / (n_A + n_B)$.

17. Molarity=moles/litre solution and changes with temperature; molality=moles/kg solvent and is temperature independent.

18. Moles=5.85/58.5=0.1; solvent=0.5 kg; $m=0.2 \text{ mol kg}^{-1}$.

19. Ethanol=1 mol, water=3 mol; $x_{\text{ethanol}}=1/4=0.25$.

20. It is based on mass of solvent, which does not change with temperature.

Long-answer marking points

21. Include mass %, volume %, mass by volume %, ppm, mole fraction, molarity and molality with correct formulas.

22. Mass %=18/180×100=10%; moles glucose=0.1; water=0.162 kg; $m=0.1/0.162=0.617 \text{ m}$.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 7

Solutions | Solubility and Henry's law

Student Name: _____	Roll No.: _____
DPP No.: 7 Chapter: Solutions	Date: _____
Topic: Solubility and Henry's law	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Henry's law relates solubility of gas in liquid with:
(A) temperature only (B) pressure of gas (C) density only (D) molar mass only
- Mathematical form of Henry's law is:
(A) $p = K_H x$ (B) $p = x/K_H$ (C) $p = K/x$ (D) $p = RT/x$
- At fixed temperature, solubility of gas generally:
(A) decreases with pressure (B) increases with pressure (C) remains zero (D) is independent of pressure
- Which gas is dissolved in soda water?
(A) O₂ (B) CO₂ (C) N₂ (D) H₂
- Henry's constant K_H generally increases with:
(A) increase in solubility (B) decrease in solubility (C) increase in mole fraction only (D) no relation
- Gas solubility in liquid generally decreases with:
(A) increase in pressure (B) decrease in temperature (C) increase in temperature (D) addition of solvent
- Bends in deep-sea divers are due to:
(A) high O₂ solubility (B) N₂ bubbles formed on decompression (C) CO poisoning (D) water freezing
- At high altitude, low oxygen availability is partly due to:
(A) higher gas pressure (B) lower partial pressure of O₂ (C) high density air (D) more N₂ dissolved
- Which is an application of Henry's law?
(A) Electrolysis (B) Carbonated drinks (C) Distillation only (D) Titration only
- For a gas obeying Henry's law, if pressure doubles, x of gas becomes:
(A) half (B) double (C) four times (D) zero
- K_H has units depending on:
(A) form of the equation (B) only temperature (C) only solute mass (D) only volume
- Solubility of O₂ in blood increases under:
(A) low pressure (B) high pressure (C) vacuum (D) zero temperature
- A gas-liquid solution is usually called:
(A) alloy (B) aerogel (C) solution of gas in liquid (D) solid solution
- Which factor does NOT directly appear in $p = K_H x$?
(A) partial pressure (B) mole fraction (C) Henry constant (D) molar mass
- For highly soluble gas, K_H is usually:
(A) large (B) small (C) infinite (D) zero always

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- State Henry's law.
- Why are cold drinks bottled under high pressure?
- Why do scuba divers use mixtures containing helium?
- What happens to solubility of gas on increasing temperature?
- A gas has $K_H = 100$ bar at a given temperature. Find its mole fraction at $p = 2$ bar.

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain any three applications of Henry's law.
- At a temperature, K_H for a gas is 50 bar. Calculate the pressure required to obtain mole fraction 0.02 of the gas in water.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 7

Solutions | Solubility and Henry's law

MCQ answers: 1-B, 2-A, 3-B, 4-B, 5-B, 6-C, 7-B, 8-B, 9-B, 10-B, 11-A, 12-B, 13-C, 14-D, 15-B

Short-answer marking points

16. At constant temperature, solubility (mole fraction) of gas in liquid is proportional to partial pressure: $p = K_H x$.

17. Higher pressure dissolves more CO_2 ; pressure release causes fizz.

18. Helium has lower solubility in blood and reduces nitrogen-bubble risk.

19. It decreases because dissolution is generally exothermic.

20. $x = p/K_H = 2/100 = 0.02$.

Long-answer marking points

21. Applications: carbonated drinks, deep-sea diving, high-altitude oxygen problems; explain each using pressure-solubility relation.

22. $p = K_H x = 50 \times 0.02 = 1 \text{ bar}$.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 8

Solutions | Raoult's law, vapour pressure and ideal solutions

Student Name: _____	Roll No.: _____
DPP No.: 8 Chapter: Solutions	Date: _____
Topic: Raoult's law, vapour pressure and ideal solutions	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Raoult's law for volatile component states p_A equals:
(A) $x_A p_A^\circ$ (B) p_A° / x_A (C) x_A / p_A° (D) $p_A^\circ - x_A$
- For non-volatile solute, relative lowering of vapour pressure equals:
(A) x_{solvent} (B) x_{solute} (C) molarity (D) molality
- An ideal solution obeys:
(A) Henry's law only (B) Raoult's law over entire range (C) no gas law (D) only Dalton law
- In ideal solution, ΔH_{mix} is:
(A) positive (B) negative (C) zero (D) infinite
- In ideal solution, ΔV_{mix} is:
(A) positive (B) negative (C) zero (D) infinite
- Positive deviation from Raoult's law occurs when A-B attraction is:
(A) stronger than A-A and B-B (B) weaker than A-A and B-B (C) equal only (D) ionic only
- Negative deviation occurs when A-B attraction is:
(A) weaker (B) stronger (C) zero (D) unchanged
- Maximum boiling azeotrope shows:
(A) positive deviation (B) negative deviation (C) ideal behaviour only (D) no vapour pressure
- Minimum boiling azeotrope shows:
(A) negative deviation (B) positive deviation (C) zero vapour pressure (D) solid state
- Which is a nearly ideal solution?
(A) Ethanol-water (B) Acetone-chloroform (C) Benzene-toluene (D) HNO_3 -water
- Acetone-chloroform shows:
(A) positive deviation (B) negative deviation (C) ideal solution (D) no mixing
- Ethanol-water shows:
(A) positive deviation (B) negative deviation (C) ideal solution (D) solid compound
- Total vapour pressure of two volatile liquids is:
(A) $p_A + p_B$ (B) $p_A - p_B$ (C) p_A / p_B (D) $p_A p_B$
- For pure solvent, mole fraction solvent is:
(A) 0 (B) 1 (C) $1/2$ (D) depends on temperature
- Addition of non-volatile solute to solvent causes vapour pressure to:
(A) increase (B) decrease (C) remain same (D) become zero always

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- State Raoult's law for a volatile liquid.
- Define ideal solution.
- What is relative lowering of vapour pressure?
- Differentiate between positive and negative deviation from Raoult's law.
- A solution has $x_A = 0.4$ and $p_A^\circ = 100$ mm Hg. Calculate p_A .

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Derive relative lowering of vapour pressure for a dilute solution containing a non-volatile solute.
- Explain azeotropes. Distinguish minimum-boiling and maximum-boiling azeotropes with deviations.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 8

Solutions | Raoult's law, vapour pressure and ideal solutions

MCQ answers: 1-A, 2-B, 3-B, 4-C, 5-C, 6-B, 7-B, 8-B, 9-B, 10-C, 11-B, 12-A, 13-A, 14-B, 15-B

Short-answer marking points

16. $p_A = x_A p_A^\circ$ for component A at a fixed temperature.

17. An ideal solution obeys Raoult's law over complete composition range; $\Delta H_{\text{mix}} = 0$ and $\Delta V_{\text{mix}} = 0$.

18. $(p^\circ - p)/p^\circ$; for dilute solution it equals mole fraction of solute.

19. Positive: weaker A-B, higher vapour pressure; negative: stronger A-B, lower vapour pressure.

20. $p_A = 0.4 \times 100 = 40$ mm Hg.

Long-answer marking points

21. Use $p = x_1 p^\circ$; $\Delta p = p^\circ - p = x_2 p^\circ$; $\Delta p/p^\circ = x_2$. For dilute solution, $x_2 \approx n_2/n_1$.

22. Minimum boiling: positive deviation and maximum vapour pressure; maximum boiling: negative deviation and minimum vapour pressure.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 9

Solutions | Colligative properties I: RLVP, boiling point and freezing point

Student Name: _____	Roll No.: _____
DPP No.: 9 Chapter: Solutions	Date: _____
Topic: Colligative properties I: RLVP, boiling point and freezing point	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Colligative properties depend on:
(A) nature of solute only (B) number of solute particles (C) colour of solute (D) volume only
- Relative lowering of vapour pressure is:
(A) $(p^\circ - p)/p^\circ$ (B) p/p° (C) p°/p (D) $p^\circ - p$
- Elevation in boiling point is:
(A) $\Delta T_b = K_b m$ (B) $\Delta T_b = K_f m$ (C) $\Delta T_b = R T_m$ (D) $\Delta T_b = \pi m$
- Depression in freezing point is:
(A) $\Delta T_f = K_f m$ (B) $\Delta T_f = K_b m$ (C) $\Delta T_f = R T_m$ (D) $\Delta T_f = \pi m$
- K_b is called:
(A) cryoscopic constant (B) ebullioscopic constant (C) Henry constant (D) gas constant
- K_f is called:
(A) ebullioscopic constant (B) cryoscopic constant (C) Faraday constant (D) rate constant
- Addition of non-volatile solute makes boiling point:
(A) lower (B) higher (C) unchanged (D) zero
- Addition of non-volatile solute makes freezing point:
(A) higher (B) lower (C) unchanged (D) infinite
- Which is used to melt ice on roads?
(A) Sugar (B) Common salt (C) Kerosene (D) Sand only
- Antifreeze in radiators works mainly by:
(A) raising freezing point (B) lowering freezing point (C) increasing vapour pressure (D) removing water
- For a dilute solution, RLVP equals:
(A) mole fraction of solute (B) mole fraction of solvent (C) molarity (D) density
- If molality doubles, ΔT_b becomes:
(A) half (B) double (C) four times (D) unchanged
- If $i=2$, colligative effect is:
(A) half normal (B) double normal (C) zero (D) unchanged
- A solvent has $K_f = 1.86 \text{ K kg mol}^{-1}$; unit belongs to:
(A) K_b (B) K_f (C) K_H (D) R
- Boiling point elevation depends on:
(A) nature of solute particles only (B) number of solute particles (C) colour (D) container size

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define colligative properties.
- Write formula for elevation in boiling point and define symbols.
- Write formula for depression in freezing point and define symbols.
- Why does addition of salt lower freezing point of water?
- Calculate ΔT_b for 0.5 m aqueous solution if $K_b = 0.52 \text{ K kg mol}^{-1}$.

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Derive the relation $\Delta T_b = K_b m$ (outline).
- A solution contains 9.0 g glucose ($M = 180 \text{ g mol}^{-1}$) in 100 g water. Calculate elevation in boiling point. $K_b = 0.52 \text{ K kg mol}^{-1}$.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 9

Solutions | Colligative properties I: RLVP, boiling point and freezing point

MCQ answers: 1-B, 2-A, 3-A, 4-A, 5-B, 6-B, 7-B, 8-B, 9-B, 10-B, 11-A, 12-B, 13-B, 14-B, 15-B

Short-answer marking points

16. Properties depending only on number of solute particles, e.g. RLVP, ΔT_b , ΔT_f and osmotic pressure.

17. $\Delta T_b = K_b m$; K_b = ebullioscopic constant, m = molality.

18. $\Delta T_f = K_f m$; K_f = cryoscopic constant, m = molality.

19. Dissolved salt lowers chemical potential/freezing point of water.

20. $\Delta T_b = 0.52 \times 0.5 = 0.26$ K.

Long-answer marking points

21. Explain that solute lowers vapour pressure; higher temperature is needed for vapour pressure to equal external pressure, leading to ΔT_b proportional to molality.

22. Moles glucose = $9/180 = 0.05$; $m = 0.05/0.1 = 0.5$; $\Delta T_b = 0.52 \times 0.5 = 0.26$ K.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.



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Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 10

Solutions | Colligative properties II: osmotic pressure and molar mass

Student Name: _____	Roll No.: _____
DPP No.: 10 Chapter: Solutions	Date: _____
Topic: Colligative properties II: osmotic pressure and molar mass	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Osmosis is flow of:
(A) solute through semipermeable membrane (B) solvent through semipermeable membrane (C) solution through filter paper (D) gas only
- Osmotic pressure is minimum pressure applied to:
(A) increase osmosis (B) stop osmosis (C) boil solution (D) freeze solution
- Formula for osmotic pressure is:
(A) $\pi = CRT$ (B) $\pi = Kbm$ (C) $\pi = Kfm$ (D) $\pi = p^\circ x$
- Which colligative property is best for molar mass of proteins?
(A) RLVP (B) ΔT_b (C) ΔT_f (D) Osmotic pressure
- Reverse osmosis is used in:
(A) water purification (B) crystallisation only (C) electroplating (D) titration
- Isotonic solutions have same:
(A) colour (B) osmotic pressure (C) molar mass (D) density
- Hypertonic solution has:
(A) lower osmotic pressure (B) higher osmotic pressure (C) zero pressure (D) same temperature only
- Hypotonic solution has:
(A) higher osmotic pressure (B) lower osmotic pressure (C) infinite pressure (D) no solvent
- Van't Hoff equation for dilute solutions resembles:
(A) Boyle law only (B) ideal gas equation (C) Faraday law (D) Raoult law only
- If concentration doubles at constant T, π becomes:
(A) half (B) double (C) four times (D) unchanged
- For molar mass by osmotic pressure, formula is:
(A) $M = wRT/\pi V$ (B) $M = \pi V/wRT$ (C) $M = w\pi/RTV$ (D) $M = RT/\pi V$
- Semipermeable membrane permits passage of:
(A) solute only (B) solvent only (C) both equally (D) neither
- RBC placed in hypertonic solution undergoes:
(A) swelling (B) shrinkage (C) no change (D) melting
- RBC placed in hypotonic solution undergoes:
(A) shrinkage (B) swelling (C) no change (D) crystallisation
- Unit of π can be:
(A) atm (B) mol kg^{-1} (C) g mol^{-1} (D) K kg mol^{-1}

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define osmosis and osmotic pressure.
- Why is osmotic pressure preferred for determination of molar mass of macromolecules?
- What are isotonic solutions?
- What is reverse osmosis?
- Calculate π of 0.1 M glucose at 300 K. $R = 0.0821 \text{ L atm mol}^{-1} \text{ K}^{-1}$.

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Derive molar-mass relation using osmotic pressure.
- 1.0 g polymer is dissolved to make 100 mL solution at 300 K. Its osmotic pressure is 0.246 atm. Calculate molar mass. $R = 0.0821 \text{ L atm mol}^{-1} \text{ K}^{-1}$.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | **Total ____/30**



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 10

Solutions | Colligative properties II: osmotic pressure and molar mass

MCQ answers: 1-B, 2-B, 3-A, 4-D, 5-A, 6-B, 7-B, 8-B, 9-B, 10-B, 11-A, 12-B, 13-B, 14-B, 15-A

Short-answer marking points

16. Osmosis is solvent flow through semipermeable membrane from pure solvent/dilute solution to concentrated solution. Osmotic pressure stops this flow.

17. It is measurable at room temperature and remains appreciable for very dilute solutions; biomolecules do not decompose.

18. Solutions with equal osmotic pressure at same temperature.

19. Application of pressure greater than osmotic pressure to force solvent through membrane opposite to osmosis; used in desalination.

20. $\pi = CRT = 0.1 \times 0.0821 \times 300 = 2.463 \text{ atm}$.

Long-answer marking points

21. From $\pi V = nRT = (w/M)RT$, $M = wRT/(\pi V)$.

22. $M = (1.0 \times 0.0821 \times 300) / (0.246 \times 0.100) = 10012 \approx 1.00 \times 10^4 \text{ g mol}^{-1}$.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 11

Solutions | Abnormal molar mass, van't Hoff factor and full chapter test

Student Name: _____	Roll No.: _____
DPP No.: 11 Chapter: Solutions	Date: _____
Topic: Abnormal molar mass, van't Hoff factor and full chapter test	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Van't Hoff factor i is ratio of:
(A) observed colligative property/calculated colligative property (B) calculated/observed (C) solute mass/solvent mass (D) temperature/pressure
- For dissociation of electrolyte, i is generally:
(A) less than 1 (B) greater than 1 (C) equal zero (D) negative
- For association of solute, i is generally:
(A) greater than 1 (B) less than 1 (C) infinite (D) always 2
- For complete dissociation of NaCl, ideal i is:
(A) 1 (B) 2 (C) 3 (D) 4
- For complete dissociation of CaCl_2 , ideal i is:
(A) 1 (B) 2 (C) 3 (D) 4
- For dimerisation of a solute, ideal i is:
(A) 2 (B) 1 (C) $1/2$ (D) 3
- Abnormal molar mass is observed due to:
(A) association/dissociation (B) change in solvent colour (C) filtration (D) evaporation only
- Corrected boiling elevation is:
(A) $iK_b m$ (B) $K_b m/i$ (C) K_b/i (D) i/K_b
- Corrected osmotic pressure is:
(A) $iCRT$ (B) CRT/i (C) C/iRT (D) RT/iC
- If observed molar mass is higher than normal, solute undergoes:
(A) dissociation (B) association (C) ionisation only (D) no change
- If observed molar mass is lower than normal, solute undergoes:
(A) association (B) dissociation (C) crystallisation (D) sublimation
- For non-electrolyte with no association, i is:
(A) 0 (B) 1 (C) 2 (D) depends on mass
- Molality of pure water is approximately:
(A) 1 (B) 18 (C) 55.5 (D) 100
- Best unit to relate vapour pressure lowering to concentration is:
(A) mole fraction (B) molarity (C) normality (D) ppm
- Raoult's law for nonvolatile solute predicts vapour pressure:
(A) increase (B) decrease (C) no change (D) becomes infinite

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define van't Hoff factor.
- Why does molar mass become abnormal in colligative-property measurements?
- Calculate i for complete dissociation of AlCl_3 .
- What is i for complete association of two molecules to form a dimer?
- What is molality of pure water? (Density = 1 g mL^{-1})

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain association and dissociation effect on colligative properties and molar mass.
- A 0.1 m solution of KCl has $\Delta T_f = 0.372 \text{ K}$ in water. $K_f = 1.86 \text{ K kg mol}^{-1}$. Calculate van't Hoff factor.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 11

Solutions | Abnormal molar mass, van't Hoff factor and full chapter test

MCQ answers: 1-A, 2-B, 3-B, 4-B, 5-C, 6-C, 7-A, 8-A, 9-A, 10-B, 11-B, 12-B, 13-C, 14-A, 15-B

Short-answer marking points

16. $i = \text{observed colligative property} / \text{calculated colligative property}$; also normal molar mass/observed molar mass.

17. Association reduces particles; dissociation increases particles, changing colligative effects.

18. AlCl_3 gives 4 ions, $i=4$ ideally.

19. For dimerisation, $i=1/2$ ideally.

20. 1 kg water $= 1000/18 = 55.5$ mol, so 55.5 m.

Long-answer marking points

21. Dissociation: $i > 1$, observed colligative effect greater and observed molar mass lower. Association: $i < 1$, effect lower and observed molar mass higher.

22. $i = \Delta T_f / (K_f m) = 0.372 / (1.86 \times 0.1) = 2$.

Remedial rule: Score below 15/26: revise formulas, rewrite errors and take a 10-MCQ re-test in the next class.