

JEE MAIN SOLUTIONS — PYQS

Max. Marks: 156

Questions: 39

Section A (MCQ) — 30 questions

Q.1 Given below are two statements :
 Given : Molar mass of C, H, O, Cl are 12, 1, 16 and 35.5 g mol⁻¹, respectively
Statement-I: In 30% (w/w) solution of methanol in CCl₄ (at T K), the mole fraction of CCl₄ is equal to 0.33.

Statement-II: Mixture of methanol and CCl₄ shows positive deviation from Raoult's law.

In the light of the above statements, choose the correct answer from the options given below :

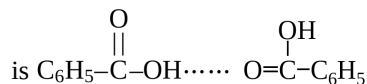
[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) Both Statement-I and Statement-II are true
 (2) Both Statement-I and Statement-II are false
 (3) Statement-I is true but Statement-II is false
 (4) Statement-I is false but Statement-II is true

Scan or tap for the full solution



Q.2 Which of the following statements are not correct?
 A. For water, magnitude of K_b is more than the magnitude of K_f.
 B. The elevation in boiling point of water when a non-volatile solute is added to it is larger in magnitude than its depression in freezing point.
 C. Osmotic pressure measurement is preferred over any other colligative property to determine molar mass of proteins and polymers.
 D. The dimerised form of benzoic acid in benzene



Choose the correct answer from the options given below : [JEE Main 2026 (Online) 8th April Evening Shift]

- (1) A and B only (2) A and D only
 (3) A, B and D only (4) A, C and D only

Scan or tap for the full solution



Q.3 When 0.25 moles of a non-volatile, non-ionizable solute was dissolved in 1 mole of a solvent the vapor pressure of solution was x% of vapor pressure of pure solvent. What is x% ?

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 50% (2) 60% (3) 70% (4) 80%

Scan or tap for the full solution



Q.4 Given below are two statements :

Chamber 1		Chamber 2
18 g glucose in 100 mL aqueous solution	Semi-permeable membrane	30 g glucose in 250 mL aqueous solution

Statement-I: H₂O molecules move from the chamber 1 to chamber 2.

Statement-II: The osmotic pressure of a solution prepared by dissolving 50 mg of potassium sulphate (molar mass = 174 g/mol) in 2 L of water (at 27 °C) is 0.0107 bar. (Given: R = 0.083 dm³ bar K⁻¹ mol⁻¹ and assume complete dissociation of electrolyte)

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) Both Statement-I and Statement-II are true
 (2) Both Statement-I and Statement-II are false
 (3) Statement-I is true but Statement-II is false
 (4) Statement-I is false but Statement-II is true

Scan or tap for the full solution



Q.5 What is the mole fraction of water in 10% by weight (w/w) of aqueous urea solution?
 [Given: Molar mass of H, O, C and N are 1, 16, 12 and 14 g mol⁻¹ respectively.]

[JEE Main 2026 (Online) 5th April Morning Shift]

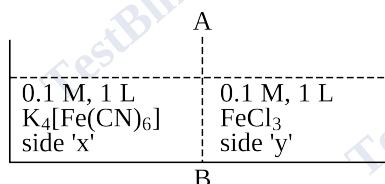
- (1) 0.825 (2) 0.032 (3) 0.867 (4) 0.967

Scan or tap for the full solution



Q.6 At 27 °C, 0.1 M, 1 L K₄[Fe(CN)₆] aqueous solution and 0.1 M, 1 L FeCl₃ aqueous solution are placed in a container separated by a semi permeable membrane AB. Assume complete dissociation of both the solutes. Which of the following statement is correct?

[JEE Main 2026 (Online) 4th April Evening Shift]



- (1) Blue color is formed on both sides.
- (2) Ionic solutes in aqueous solution can pass through semi-permeable membrane.
- (3) Solution on side 'y' is hypotonic.
- (4) To cause the reverse flow of solvent during osmosis, external pressure (any value) should be applied to side 'x'.

Scan or tap for the full solution



- Q.7** 19.5 g of fluoro acetic acid (molar mass = 78 g mol⁻¹) is dissolved in 500 g of water at 298 K. The depression in the freezing point of water was 1°C. What is K_a of fluoro acetic acid? (For water, K_f = 1.86 K kg mol⁻¹). Assume molarity and molality to have same values.

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) 10⁻⁶ (2) 4 × 10⁻⁴ (3) 3 × 10⁻⁵ (4) 3 × 10⁻³

Scan or tap for the full solution



- Q.8** Solution A is prepared by dissolving 1 g of a protein (molar mass = 50,000 g mol⁻¹) in 0.5 L of water at 300 K. Its osmotic pressure is x bar. Solution B is made by dissolving 2 g of the same protein in 1 L of water at 300 K. Osmotic pressure of solution B is y bar. Entire solution of A is mixed with entire solution of B at the same temperature. The osmotic pressure of resultant solution is z bar. x, y and z respectively are:

(R = 0.083 L bar mol⁻¹ K⁻¹)

[JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) 9.96 × 10⁻⁴; 9.96 × 10⁻⁴; 9.96 × 10⁻⁴
 (2) 9.96 × 10⁻⁴; 9.96 × 10⁻⁴; 19.92 × 10⁻⁴
 (3) 4.98 × 10⁻⁴; 4.98 × 10⁻⁴; 9.96 × 10⁻⁴
 (4) 4.98 × 10⁻⁴; 4.98 × 10⁻⁴; 4.98 × 10⁻⁴

Scan or tap for the full solution



- Q.9** At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) 400, 300 (2) 600, 400
 (3) 500, 200 (4) 300, 200

Scan or tap for the full solution



- Q.10** Consider the following aqueous solutions.

- I. 2.2 g glucose in 125 mL of solution.
- II. 1.9 g calcium chloride in 250 mL of solution.
- III. 9.0 g urea in 500 mL of solution.
- IV. 20.5 g aluminium sulphate in 750 mL of solution.

The **correct** increasing order of boiling point of these solutions will be :

[Given : Molar mass in g mol⁻¹ : H = 1, C = 12, N = 14, O = 16, Cl = 35.5, Ca = 40, Al = 27 and S = 32]

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) III < I < II < IV (2) II < III < IV < I
 (3) II < III < I < IV (4) I < II < III < IV

Scan or tap for the full solution



- Q.11** A solution is prepared by dissolving 0.3 g of a non-volatile non-electrolyte solute 'A' of molar mass 60 g mol⁻¹ and 0.9 g of a non-volatile non-electrolyte solute 'B' of molar mass 180 g mol⁻¹ in 100 mL H₂O at 27°C. Osmotic pressure of the solution will be

[Given: R = 0.082 L atm K⁻¹ mol⁻¹]

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) 2.46 atm (2) 0.82 atm
 (3) 1.47 atm (4) 1.23 atm

Scan or tap for the full solution



- Q.12** 'W' g of a non-volatile electrolyte solid solute of molar mass 'M' g mol⁻¹ when dissolved in 100 mL water, decreases vapour pressure of water from 640 mm Hg to 600 mm Hg. If aqueous solution of the electrolyte boils at 375 K and K_b for water is 0.52 K kg mol⁻¹, then the mole fraction of the electrolyte solute (x₂) in the solution can be expressed as

(Given : density of water = 1 g/mL and boiling point of water = 373 K)

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) $\frac{16}{2.6} \times \frac{W}{M}$ (2) $\frac{1.3}{8} \times \frac{M}{W}$
 (3) $\frac{2.6}{16} \times \frac{M}{W}$ (4) $\frac{1.3}{8} \times \frac{W}{M}$

Scan or tap for the full solution



- Q.13** At 298 K, the mole percentage of N₂(g) in air is 80%. Water is in equilibrium with air at a pressure of 10 atm. What is the mole fraction of N₂(g) in water at 298 K? (K_H for N₂ is 6.5 × 10⁷ mmHg)

[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) 9.35 × 10⁻⁵ (2) 9.35 × 10⁻⁵
 (3) 1.23 × 10⁻⁷ (4) 1.17 × 10⁻⁴

Scan or tap for the full solution



Q.14 Two liquids A and B form an ideal solution at temperature T K. At T K, the vapour pressures of pure A and B are 55 and 15 kN m⁻² respectively. What is the mole fraction of A in solution of A and B in equilibrium with a vapour in which the mole fraction of A is 0.8?

[JEE Main 2026 (Online) 24th January Evening Shift]

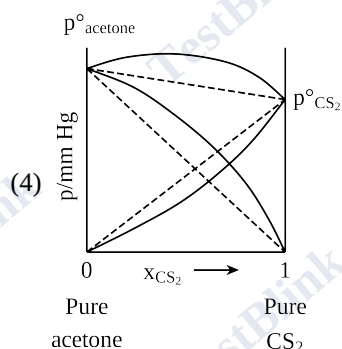
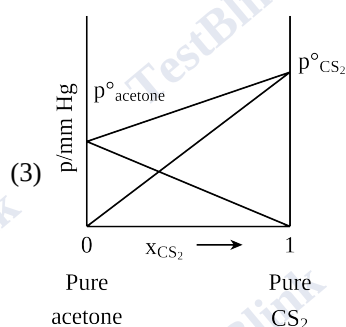
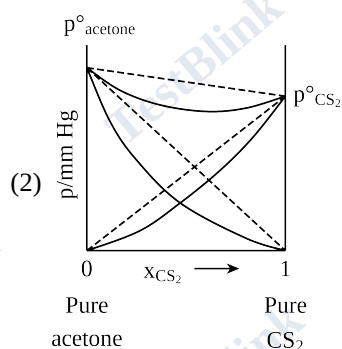
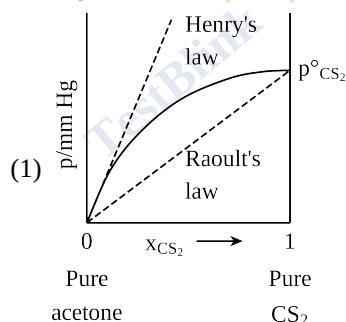
- (1) 0.5217 (2) 0.480 (3) 0.340 (4) 0.663

Scan or tap for the full solution



Q.15 Which one of the following graphs accurately represents the plot of partial pressure of CS₂ vs its mole fraction in a mixture of acetone and CS₂ at constant temperature?

[JEE Main 2026 (Online) 23rd January Morning Shift]



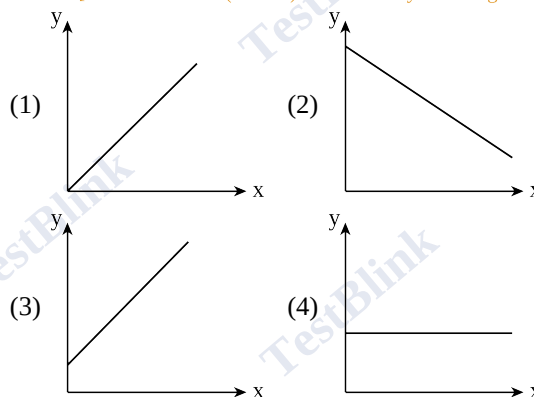
Scan or tap for the full solution



Q.16 Consider a solution of CO₂(g) dissolved in water in a closed container.

Which one of the following plots correctly represents variation of log (partial pressure of CO₂ in vapour phase above water) [y-axis] with log (mole fraction of CO₂ in water) [x-axis] at 25°C?

[JEE Main 2026 (Online) 22nd January Morning Shift]



Scan or tap for the full solution



Q.17 Given below are two statements :

Statement-I: The Henry's law constant K_H is constant with respect to variations in solution's concentration over the range for which the solution is ideally dilute.

Statement-II: K_H does not differ for the same solute in different solvents.

In the light of the above statements, choose the correct answer from the options given below

[JEE Main 2026 (Online) 22nd January Morning Shift]

- (1) Both Statement-I and Statement-II are true
(2) Statement-I is true but Statement-II is false
(3) Statement-I is false but Statement-II is true
(4) Both Statement-I and Statement-II are false

Scan or tap for the full solution



Q.18 Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ₂. When 1 g of PQ is dissolved in 50 g of solvent 'A', ΔT_b was 1.176 K while when 1 g of PQ₂ is dissolved in 50 g of solvent 'A', ΔT_b was 0.689 K. (K_b of 'A' = 5 K kg mol⁻¹). The molar masses of elements P and Q (in g mol⁻¹) respectively, are :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 25, 60 (2) 60, 25 (3) 65, 145 (4) 70, 110

Scan or tap for the full solution



Q.19 $HA(aq) \rightleftharpoons H^+(aq) + A^-(aq)$

The freezing point depression of a 0.1 m aqueous solution of a monobasic weak acid HA is 0.20 °C. The dissociation constant for the acid is

Given: $K_f(H_2O) = 1.8 \text{ K kg mol}^{-1}$, molality = molarity [JEE Main 2025 (Online) 8th April Evening Shift]

- (1) 1.90×10^{-3} (2) 1.38×10^{-3}
 (3) 1.1×10^{-2} (4) 1.89×10^{-1}

Scan or tap for the full solution



Q.20 Which of the following binary mixtures does not show the behaviour of minimum boiling azeotropes?

[JEE Main 2025 (Online) 8th April Evening Shift]

- (1) $\text{CH}_3\text{OH} + \text{CHCl}_3$ (2) $\text{C}_6\text{H}_5\text{OH} + \text{C}_6\text{H}_5\text{NH}_2$
 (3) $\text{H}_2\text{O} + \text{CH}_3\text{COC}_2\text{H}_5$ (4) $\text{CS}_2 + \text{CH}_3\text{COCH}_3$

Scan or tap for the full solution



Q.21 Liquid A and B form an ideal solution. The vapour pressures of pure liquids A and B are 350 and 750 mm Hg respectively at the same temperature. If x_A and x_B are the mole fraction of A and B in solution while y_A and y_B are the mole fraction of A and B in vapour phase, then,

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) $(x_A - y_A) < (x_B - y_B)$ (2) $\frac{x_A}{x_B} = \frac{y_A}{y_B}$
 (3) $\frac{x_A}{x_B} < \frac{y_A}{y_B}$ (4) $\frac{x_A}{x_B} > \frac{y_A}{y_B}$

Scan or tap for the full solution



Q.22 Match List - I with List - II.

Choose the correct answer from the options given below :

[JEE Main 2025 (Online) 7th April Evening Shift]

List - I		List - II	
A.	Solution of chloroform and acetone	I.	Minimum boiling azeotrope
B.	Solution of ethanol and water	II.	Dimerizes
C.	Solution of benzene and toluene	III.	Maximum boiling azeotrope
D.	Solution of acetic acid in benzene	IV.	$\Delta V_{\text{mix}} = 0$

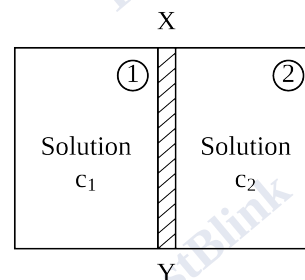
- (1) A-III, B-I, C-IV, D-II (2) A-III, B-IV, C-I, D-II
 (3) A-II, B-I, C-IV, D-III (4) A-II, B-IV, C-I, D-III

Scan or tap for the full solution



Q.23 XY is the membrane/partition between two chambers 1 and 2 containing sugar solutions of concentration c_1 and c_2 ($c_1 > c_2$) mol L^{-1} . For the reverse osmosis to take place identify the correct condition.

(Here p_1 and p_2 are pressures applied on chamber 1 and 2.)



- A. Membrane/Partition : Cellophane, $p_1 > p$
 B. Membrane/Partition : Porous, $p_2 > p$
 C. Membrane/Partition : Parchment paper, $p_1 > p$
 D. Membrane/Partition : Cellophane, $p_2 > p$

Choose the correct answer from the options given below: [JEE Main 2025 (Online) 4th April Morning Shift]

- (1) A and C Only (2) A and D Only
 (3) B and D Only (4) C Only

Scan or tap for the full solution



Q.24 Given below are two statements:

Statement-I: Molal depression constant K_f is given by $\frac{M_1 RT_f}{\Delta S_{\text{fus}}}$, where symbols have their usual meaning.

Statement-II: K_f for benzene is less than the K_f for water.

In the light of the above statements, choose the most appropriate answer from the options given below :

[JEE Main 2025 (Online) 4th April Evening Shift]

- (1) Statement-I is correct but Statement-II is incorrect
 (2) Both Statement-I and Statement-II are incorrect
 (3) Statement-I is incorrect but Statement-II is correct
 (4) Both Statement-I and Statement-II are correct

Scan or tap for the full solution



Q.25 2 moles each of ethylene glycol and glucose are dissolved in 500 g of water. The boiling point of the resulting solution is: (Given : Ebullioscopic constant of water = $0.52 \text{ K kg mol}^{-1}$)

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) 377.3 K (2) 379.2 K (3) 375.3 K (4) 277.3 K

Scan or tap for the full solution



Q.26 A solution is made by mixing one mole of volatile liquid A with 3 moles of volatile liquid B. The vapour pressure of pure A is 200 mm Hg and that of the solution is 500 mm Hg. The vapour pressure of pure B and the least volatile component of the solution, respectively, are:

[JEE Main 2025 (Online) 2nd April Morning Shift]

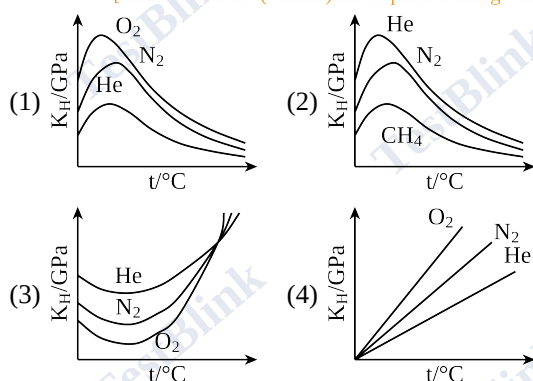
- (1) 1400 mm Hg, A (2) 1400 mm Hg, B
(3) 600 mm Hg, A (4) 600 mm Hg, B

Scan or tap for the full solution



Q.27 Which of the following graph correctly represents the plots of K_H at 1 bar for gases in water versus temperature?

[JEE Main 2025 (Online) 2nd April Morning Shift]



Scan or tap for the full solution



Q.28 1.24 g of AX_2 (molar mass 124 g mol^{-1}) is dissolved in 1 kg of water to form a solution with boiling point of 100.0156°C , while 25.4 g of AY_2 (molar mass 250 g mol^{-1}) in 2 kg of water constitutes a solution with a boiling point of 100.0260°C .

$$K_b(\text{H}_2\text{O}) = 0.52 \text{ K kg mol}^{-1}$$

Which of the following is correct?

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) AX_2 and AY_2 (both) are completely unionised.
(2) AX_2 and AY_2 (both) are fully ionised.
(3) AX_2 is completely unionised while AY_2 is fully ionised.
(4) AX_2 is fully ionised while AY_2 is completely unionised.

Scan or tap for the full solution



Q.29 What is the freezing point depression constant of a solvent, 50 g of which contain 1 g non-volatile solute (molar mass 256 g mol^{-1}) and the decrease in freezing point is 0.40 K ?

[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) $4.43 \text{ K kg mol}^{-1}$ (2) $3.72 \text{ K kg mol}^{-1}$
(3) $5.12 \text{ K kg mol}^{-1}$ (4) $1.86 \text{ K kg mol}^{-1}$

Scan or tap for the full solution



Q.30 Assume a living cell with 0.9% (w/w) of glucose solution (aqueous). This cell is immersed in another solution having equal mole fraction of glucose and water.

(Consider the data upto first decimal place only)

The cell will :

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) shrink since solution is 0.45% (w/w) as a result of association of glucose molecules (due to hydrogen bonding)
(2) shrink since solution is 0.5% (w/w)
(3) show no change in volume since solution is 0.9% (w/w)
(4) swell up since solution is 1% (w/w)

Scan or tap for the full solution



Section B (Numerical) — 9 questions

Q.31 20 g hemoglobin in a 1 L aqueous solution (A) at 300 K is separated from pure water by semi permeable membrane. At equilibrium the height of solution in a tube dipped in a solution (A) is found to be 80.0 mm higher than the tube dipped in water. The molar mass of hemoglobin is _____ kg mol^{-1} . (Nearest integer)
(Given : $g = 10 \text{ m s}^{-2}$, $R = 8.3 \text{ kPa dm}^3 \text{ K}^{-1} \text{ mol}^{-1}$, density of solution = 1000 kg m^{-3})

[JEE Main 2026 (Online) 5th April Evening Shift]

Scan or tap for the full solution



Q.32 A non-volatile, non-electrolyte solid solute when dissolved in 40 g of a solvent, the vapour pressure of the solvent decreased from 760 mm Hg to 750 mm Hg. If the same solution boils at 320 K, then the number of moles of the solvent present in the solution is _____. (Nearest integer)
[Given: boiling point of the pure solvent = 319.5 K, K_b of the solvent = $0.3 \text{ K kg mol}^{-1}$]

[JEE Main 2026 (Online) 4th April Morning Shift]

Scan or tap for the full solution



Q.33 Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____. (Nearest integer)

[JEE Main 2026 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.34 The osmotic pressure of a living cell is 12 atm at 300 K. The strength of sodium chloride solution that is isotonic with the living cell at this temperature is _____ g L^{-1} . (Nearest integer)
Given : $R = 0.08 \text{ L atm K}^{-1} \text{ mol}^{-1}$
Assume complete dissociation of NaCl
(Given: Molar mass of Na and Cl are 23 and 35.5 g mol^{-1} respectively.)

[JEE Main 2026 (Online) 21st January Evening Shift]

Scan or tap for the full solution



- Q.35** A substance 'X' (1.5 g) dissolved in 150 g of a solvent 'Y' (molar mass = 300 g mol^{-1}) led to an elevation of the boiling point by 0.5 K. The relative lowering in the vapour pressure of the solvent 'Y' is $\times 10^{-2}$. (nearest integer)

[Given: K_b of the solvent = $5.0 \text{ K kg mol}^{-1}$]

Assume the solution to be dilute and no association or dissociation of X takes place in solution.

[JEE Main 2026 (Online) 21st January Evening Shift]

Scan or tap for the full solution



- Q.36** The percentage dissociation of a salt (MX_3) solution at given temperature (van't Hoff factor $i = 2$) is _____ % (Nearest integer)

[JEE Main 2025 (Online) 7th April Morning Shift]

Scan or tap for the full solution



- Q.37** Sea water, which can be considered as a 6 molar (6 M) solution of NaCl, has a density of 2 g mL^{-1} . The concentration of dissolved oxygen (O_2) in sea water is 5.8 ppm. Then the concentration of dissolved oxygen (O_2) in sea water, in terms of molality, is $x \times 10^{-4} \text{ m}$.

 $x =$ _____ (Nearest integer)Given: Molar mass of NaCl is 58.5 g mol^{-1} Molar mass of O_2 is 32 g mol^{-1}

[JEE Main 2025 (Online) 4th April Evening Shift]

Scan or tap for the full solution



- Q.38** When 1 g each of compounds AB and AB_2 are dissolved in 15 g of water separately, they increased the boiling point of water by 2.7 K and 1.5 K respectively. The atomic mass of A (in amu) is $\times 10^{-1}$ (Nearest integer)
- (Given : Molal boiling point elevation constant is $0.5 \text{ K kg mol}^{-1}$)

[JEE Main 2025 (Online) 2nd April Evening Shift]

Scan or tap for the full solution



- Q.39** If A_2B is 30% ionised in an aqueous solution, then the value of van't Hoff factor (i) is $\times 10^{-1}$.

[JEE Main 2025 (Online) 29th January Morning Shift]

Scan or tap for the full solution

**ANSWER KEY****Section A (MCQ) — 30 questions**

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	3	4	4	4	3	4	1	3	4	1
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	4	1	1	1	3	2	1	2	2	4	1
Ques.	23	24	25	26	27	28	29	30			
Ans.	1	1	1	3	2	4	3	—			

Section B (Numerical) — 9 questions

Ques.	31	32	33	34	35	36	37
Ans.	62	5	200	15	3	33	2
Ques.	38	39					
Ans.	25	16					