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CHEMISTRY · JEE MAIN

Solutions

Previous Year Questions with answers

199 questions · **177** papers · **2002–2026** · newest paper first

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What is in this PDF: every Solutions question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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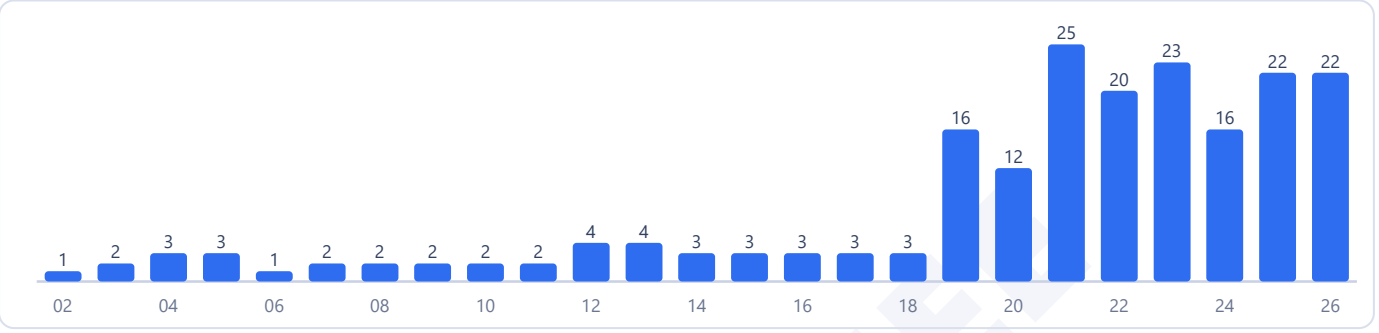
Chapter at a glance

3.4%	199	145 of 162	116 / 83
of Chemistry questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Steady: 1 questions per paper in 2024–2026 against 0.9 in 2019–2023.

Questions per year



Counts are the questions we hold: 199 in 177 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Solutions explores liquid mixtures and colligative properties under Unit 5: Solutions in the Class 12 curriculum, holding rank 15 among the 31 chemistry chapters with a 3.4 percent share of total chemistry questions. In the computerized exam period from 2019 to 2026, candidates answered 156 questions across 162 papers, representing an average frequency of 1.0 question per shift. The chapter featured in 145 of those 162 papers, and questions appeared every single year throughout the cycle. During the recent 2024 to 2026 testing sessions, examiners set 60 questions across 58 papers, maintaining an average of 1.0 question per test and lifting its subject share to 3.9 percent. This demonstrates a trend that is up compared to both the 3.2 percent share from 43 questions in the 2002 to 2018 window and the 3.4 percent baseline across 2019 to 2026. In 2026 alone, examiners presented 22 questions across 19 papers, showing up in 17 separate shifts. Remarkably, 83 questions between 2019 and 2026 were formatted as numerical answer questions, meaning over half of all modern solutions questions require students to calculate numerical values for depression in freezing point, elevation in boiling point, or osmotic pressure.

Most-asked topics

Questions in this chapter concentrate across three defined areas:

- **Colligative Properties**: 100 questions historically, with 83 delivered between 2019 and 2026, tested up to 2026. This dominant area tests elevation of boiling point delta T b equals i K b m, depression of freezing point delta T f equals i K f m, osmotic pressure pi equals i C R T, relative lowering of vapor pressure, and molar mass determinations of unknown solutes.
- **van't Hoff Factor**: 49 total questions, including 37 from 2019 to 2026, tested in 2026. Problems assess degree of dissociation alpha equals i minus 1 divided by n minus 1, degree of association, anomalous molar masses, and comparisons of freezing or boiling points across equimolar electrolyte solutions.

- **Vapour Pressure & Raoult's Law**: 50 lifetime problems, with 36 between 2019 and 2026, tested through 2026. Concepts explore total vapor pressure of binary ideal liquid mixtures, vapor phase mole fractions, positive and negative deviations from Raoult's law, minimum and maximum boiling azeotropes, and Henry's gas solubility law.

What the questions look like

JEE Main problems in solutions combine formulaic colligative equations with multi-component molar bookkeeping:

- **Molar mass determinations from boiling point elevation**: Dissolving known masses of binary compounds PQ and PQ2 into identical solvent volumes results in measured temperature rises, from which students set up simultaneous equations to extract individual atomic weights.
- **Isotonic solutions and osmotic pressure**: Finding the required concentration in grams per liter of a sodium chloride solution to render it isotonic with biological cellular fluids at a specified osmotic pressure and temperature.
- **Binary mixture vapor pressure equations**: Adding incremental moles of volatile component A or B to an initial mixture increases total vapor pressure by a measured amount, requiring determination of pure component vapor pressures.
- **Henry's law gas solubility**: Evaluating the dissolved mole fraction of atmospheric nitrogen in water under specified total pressure and Henry's law constant.

How to practise it

Always incorporate the van't Hoff factor i into every colligative property formula. For strong electrolytes like potassium chloride, barium chloride, or aluminum sulfate, write out complete ionic dissociation to find the theoretical factor unless a fractional degree of dissociation is explicitly provided.

Be careful with molality versus molarity. Boiling point elevation and freezing point depression depend strictly on molality, which uses kilograms of pure solvent in the denominator. Osmotic pressure depends on molarity, which uses liters of total solution.

For Raoult's law binary mixtures, relate liquid phase mole fractions x A and x B to vapor phase mole fractions y A and y B using Dalton's law of partial pressures: y A equals p A divided by total pressure.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

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 CCl_4(at T K), the mole fraction of CCl_4 is equal to 0.33.

Statement II : Mixture of methanol and CCl_4 shows positive deviation from Raoult's law.

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

(A) Both **Statement I** and **Statement II** are true
(B) Both **Statement I** and **Statement II** are false
(C) **Statement I** is true but **Statement II** is false
(D) **Statement I** is false but **Statement II** is true

Answer: (A) Both **Statement I** and **Statement II** are true · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

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 is $C_6H_5-C-OH\cdots O=C-C_6H_5$ (drawn with a carbonyl O above the first C and an OH above the second C; see figure).

Choose the **correct** answer from the options given below :

(see the figure above)

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 is $C_6H_5-\overset{\overset{O}{\|}}{C}-OH \cdots O=\overset{\overset{OH}{|}}{C}-C_6H_5$

Choose the **correct** answer from the options given below :

Options :

6911211968. A and B only

6911211969. A and D only

6911211970. A, B and D only

6911211971. A, C and D only

(A) A and B only

(B) A and D only

(C) A, B and D only

(D) A, C and D only

Answer: (C) A, B and D only · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 MCQ

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 %?

(A) 50%

(B) 60%

(C) 70%

(D) 80%

Answer: (D) 80% · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

Given below are two statements :

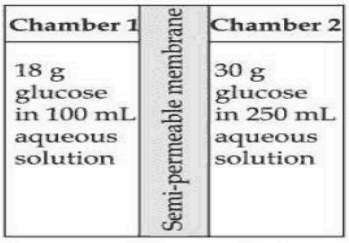
(see the figure above)

Statement I : H_2O 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 dm^3 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 :

Given below are two statements :



Statement I : H_2O molecules move from the chamber 1 to chamber 2.

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

Options :

6911214267. Both **Statement I** and **Statement II** are true

6911214268. Both **Statement I** and **Statement II** are false

6911214269. **Statement I** is true but **Statement II** is false

6911214270. **Statement I** is false but **Statement II** is true

(A) Both **Statement I** and **Statement II** are true

(B) Both **Statement I** and **Statement II** are false

(C) **Statement I** is true but **Statement II** is false

(D) **Statement I** is false but **Statement II** is true

Answer: (D) Statement I is false but Statement II is true · Official NTA final key

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Q5 JEE Main 2026 · 5 Apr · Shift 2 Numerical

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 m s^{-2}, R = 8.3 kPa dm^3 K^{-1}mol^{-1}, density of solution = 1000 kg m^{-3})

Numerical value type: the answer is a number.

Answer: 62. · Official NTA final key

Q6 JEE Main 2026 · 4 Apr · Shift 1 Numerical

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 pure solvent = 319.5 K, K_b of the solvent = 0.3 K kg mol^{-1}]

Numerical value type: the answer is a number.

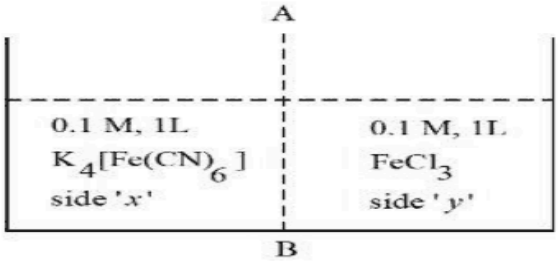
Answer: 5. · Official NTA final key

Q7 JEE Main 2026 · 4 Apr · Shift 2 MCQ

At 27 °C, 0.1 M, 1 L $K_4[Fe(CN)_6]$ aqueous solution and 0.1 M, 1 L $FeCl_3$ 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__*?

(see the figure above)

At 27 °C, 0.1 M, 1 L $K_4[Fe(CN)_6]$ aqueous solution and 0.1 M, 1 L $FeCl_3$ 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*?



Options :

6952781458. Blue color is formed on both sides.

6952781459. Ionic solutes in aqueous solution can pass through semi-permeable membrane.

6952781460. Solution on side 'y' is hypotonic.

6952781461. To cause the reverse flow of solvent during osmosis, external pressure (any value) should be applied to side 'x'.

(A) Blue color is formed on both sides.

(B) Ionic solutes in aqueous solution can pass through semi-permeable membrane.

(C) Solution on side 'y' is hypotonic.

(D) To cause the reverse flow of solvent during osmosis, external pressure (any value) should be applied to side 'x'.

Answer: (C) Solution on side 'y' is hypotonic. · Official NTA final key

Q8 JEE Main 2026 · 2 Apr · Shift 1 MCQ

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.

(A) 10^{-6}

(B) 4×10^{-4}

(C) 3×10^{-5}

(D) 3×10^{-3}

Answer: (D) 3×10^{-3} · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 2 MCQ

Solution A is prepared by dissolving 1 g of a protein (molar mass = 50000 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 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 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})

(A) 9.96×10^{-4}; 9.96×10^{-4}; 9.96×10^{-4}

(B) 9.96×10^{-4}; 9.96×10^{-4}; 19.92×10^{-4}

(C) 4.98×10^{-4}; 4.98×10^{-4}; 9.96×10^{-4}

(D) 4.98×10^{-4}; 4.98×10^{-4}; 4.98×10^{-4}

Answer: (A) 9.96×10^{-4}; 9.96×10^{-4}; 9.96×10^{-4} · Official NTA final key

Q10 JEE Main 2026 · 28 Jan · Shift 1 MCQ

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:

(A) 600, 400

(B) 500, 200

(C) 400, 300

(D) 300, 200

Answer: (B) 500, 200 · Official NTA final key

Q11 JEE Main 2026 · 28 Jan · Shift 2 MCQ

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]

(A) II < III < IV < I

(B) III < I < II < IV

(C) I < II < III < IV

(D) II < III < I < IV

Answer: (C) I < II < III < IV · Official NTA final key

Q12 JEE Main 2026 · 24 Jan · Shift 1 MCQ

'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 (x_2) in the solution can be expressed as

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

(A) $\frac{1 \cdot 3}{8} \times \frac{M}{W}$

(B) $\frac{2 \cdot 6}{16} \times \frac{M}{W}$

(C) $\frac{1 \cdot 3}{8} \times \frac{W}{M}$

(D) $\frac{16}{2 \cdot 6} \times \frac{W}{M}$

Answer: (C) $\frac{1 \cdot 3}{8} \times \frac{W}{M}$ · Official NTA final key

Q13 JEE Main 2026 · 24 Jan · Shift 1 MCQ

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 H_2O at 27°C. Osmotic pressure of the solution will be

[Given: R = 0.082 L atm K^{-1} mol^{-1}]

(A) 1.23 atm

(B) 0.82 atm

(C) 2.46 atm

(D) 1.47 atm

Answer: (C) 2.46 atm · Official NTA final key

Q14 JEE Main 2026 · 24 Jan · Shift 2 MCQ

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?

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(A) 0.340

(B) 0.663

(C) 0.480

(D) 0.5217

Answer: (D) 0.5217 · Official NTA final key

Q15 JEE Main 2026 · 24 Jan · Shift 2 MCQ

At 298 K, the mole percentage of $N_2(g)$ in air is 80%. Water is in equilibrium with air at a pressure of 10 atm. What is the mole fraction of $N_2(g)$ in water at 298 K?

(K_H for N_2 is 6.5×10^7 mm Hg)

(A) 9.35×10^{-5}

(B) 1.17×10^{-4}

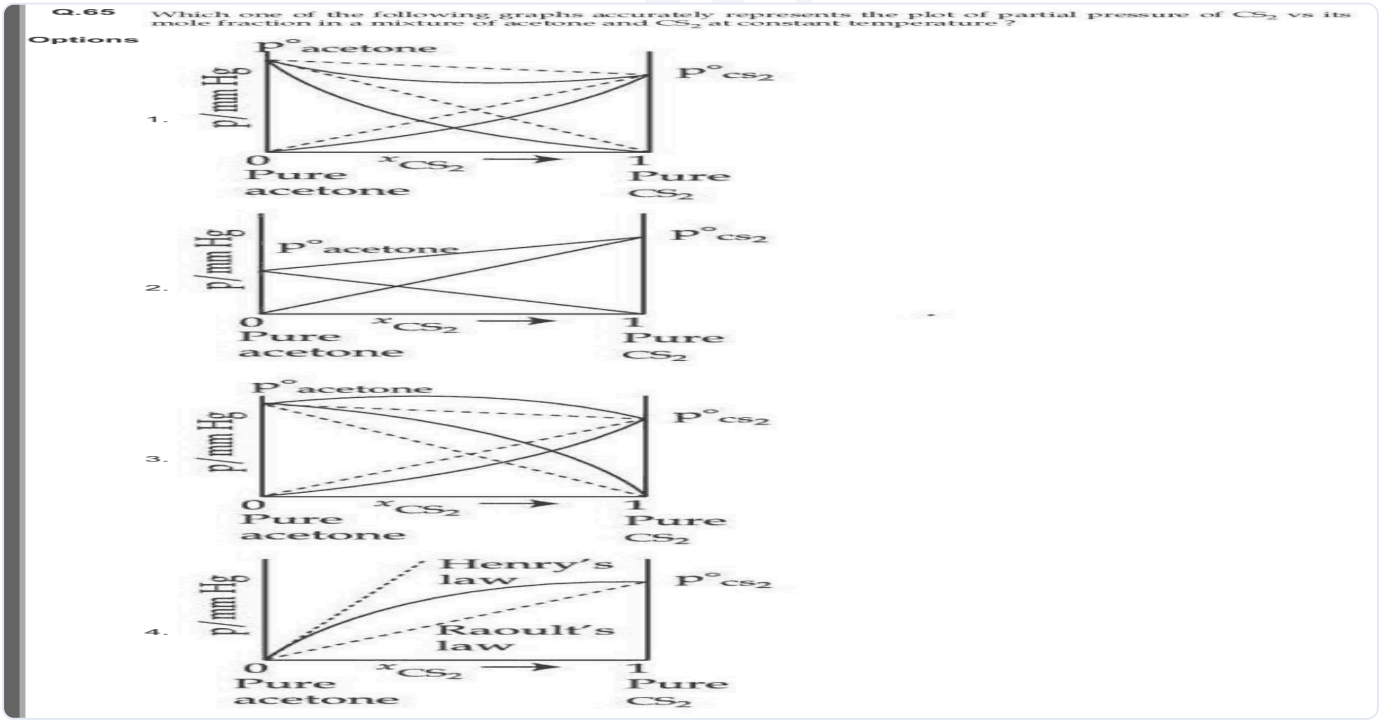
(C) 9.35×10^{5}

(D) 1.23×10^{-7}

Answer: (A) 9.35×10^{-5} · Official NTA final key

Q16 JEE Main 2026 · 23 Jan · Shift 1 MCQ

Which one of the following graphs accurately represents the plot of partial pressure of CS_2 vs its mole fraction in a mixture of acetone and CS_2 at constant temperature ?



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (D) · Official NTA final key

Q17 JEE Main 2026 · 23 Jan · Shift 2 Numerical

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)

Numerical value type: the answer is a number.

Answer: 200. · Official NTA final key

Q18 JEE Main 2026 · 22 Jan · Shift 1 MCQ

Given below are two statements:

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

Statement II: $\mathrm{K_H}$ 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

(A) Both Statement I and Statement II are false
(B) Statement I is false but Statement II is true
(C) Both Statement I and Statement II are true
(D) Statement I is true but Statement II is false

Answer: (D) Statement I is true but Statement II is false · Official NTA final key

Q19 JEE Main 2026 · 22 Jan · Shift 1 MCQ

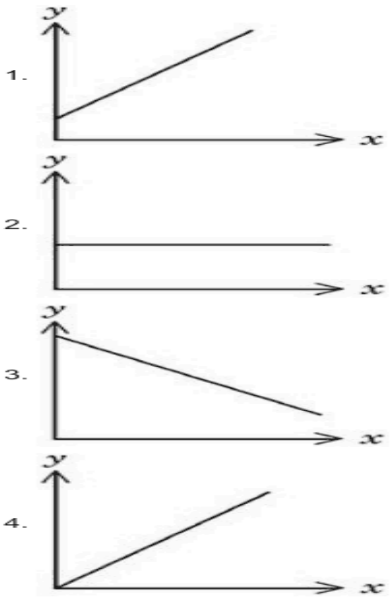
Consider a solution of $\mathrm{CO_2(g)}$ dissolved in water in a closed container.

Which one of the following plots correctly represents variation of log (partial pressure of $\mathrm{CO_2}$ in vapour phase above water) [y-axis] with log (mole fraction of $\mathrm{CO_2}$ in water) [x-axis] at $25^\circ\mathrm{C}$?

Q.62 Consider a solution of $CO_2(g)$ dissolved in water in a closed container.

Which one of the following plots correctly represents variation of log (partial pressure of CO_2 in vapour phase above water) [y-axis] with log (mole fraction of CO_2 in water) [x-axis] at 25°C?

Options



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Official NTA final key

Q20 JEE Main 2026 · 21 Jan · Shift 1 MCQ

Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ_2. When 1 g of PQ is dissolved in 50 g of solvent 'A', ΔT_b was 1.176 K while when 1 g of PQ_2 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 :

(A) 70, 110

(B) 60, 25

(C) 25, 60

(D) 65, 145

Answer: (C) 25, 60 · Official NTA final key

Q21 JEE Main 2026 · 21 Jan · Shift 2 Numerical

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 L atm K^{-1} mol^{-1}

Assume complete dissociation of NaCl

(Given : Molar mass of Na and Cl are 23 and 35.5 g mol^{-1} respectively.)

Numerical value type: the answer is a number.

Answer: 15. · Official NTA final key

Q22 JEE Main 2026 · 21 Jan · Shift 2 Numerical

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 $= 5.0$ K kg mol^{-1}]
Assume the solution to be dilute and no association or dissociation of X takes place in solution.

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q23 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Which of the following binary mixture does not show the behaviour of minimum boiling azeotropes?

(A) $H_2O + CH_3COC_2H_5$
(B) $CS_2 + CH_3COCH_3$
(C) $CH_3OH + CHCl_3$
(D) $C_6H_5OH + C_6H_5NH_2$

Answer: (D) $C_6H_5OH + C_6H_5NH_2$ · Key from source paper

Q24 JEE Main 2025 · 8 Apr · Shift 2 MCQ

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

The freezing point depression of a 0.1 m aqueous solution of a monobasic weak acid HA is $0.20\,^\circ C$. The dissociation constant for the acid is

Given : $K_f(H_2O) = 1.8\,K\,kg\,mol^{-1}$, molality $\equiv$ molarity

(A) 1.90×10^{-3}
(B) 1.89×10^{-1}
(C) 1.38×10^{-3}
(D) 1.1×10^{-2}

Answer: (C) 1.38×10^{-3} · Key from source paper

Q25 JEE Main 2025 · 7 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 33. · Key from source paper

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Q26 JEE Main 2025 · 7 Apr · Shift 2 MCQ

Match List - I with List - II.

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) $\Delta V_{mix} = 0$

Choose the correct answer from the options given below :

(A) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(B) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

(C) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

(D) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

Answer: (A) (A)-(III), (B)-(I), (C)-(IV), (D)-(II) · Key from source paper

Q27 JEE Main 2025 · 7 Apr · Shift 2 MCQ

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,

(A) $\frac{x_A}{x_B} < \frac{y_A}{y_B}$

(B) $(x_A - y_A) < (x_B - y_B)$

(C) $\frac{x_A}{x_B} > \frac{y_A}{y_A}$

(D) $\frac{x_A}{x_B} = \frac{y_A}{y_A}$

Answer: (C) $\frac{x_A}{x_B} > \frac{y_A}{y_A}$ · Key from source paper

Q28 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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).

(see the figure above)

A. Membrane/Partition : Cellophane, $p_1 > \pi$

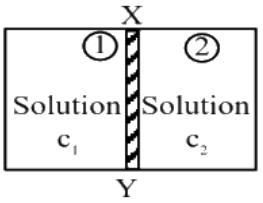
B. Membrane/Partition : Porous, $p_2 > \pi$

C. Membrane/Partition : Parchment paper, $p_1 > \pi$

D. Membrane/Partition : Cellophane, $p_2 > \pi$

Choose the correct answer from the option given below:

13. XY is the membrane/partition between two chambers 1 and 2 containing sugar solutions of concentration c_1 and $c_2 (c_1 > c_2)\,molL^{-1}$. 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, $p_1 > \pi$

B. Membrane/Partition : Porous, $p_2 > \pi$

C. Membrane/Partition : Parchment paper, $p_1 > \pi$

D. Membrane/Partition : Cellophane, $p_2 > \pi$

Choose the correct answer from the option given below:

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

(A) B and D Only
(B) A and C Only
(C) C Only
(D) A and D Only

Answer: (B) A and C Only · Key from source paper

Q29 JEE Main 2025 · 4 Apr · Shift 2 MCQ

Given below are two statements :

Statement (I): Molal depression constant K_f is given by $\frac{M_1 R T_f}{\Delta S_{fus}}$, 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 :

(A) Statement I is correct but Statement II is incorrect
(B) Both Statement I and Statement II are correct
(C) Statement I is incorrect but Statement II is correct
(D) Both Statement I and Statement II are incorrect

Answer: (A) Statement I is correct but Statement II is incorrect · Key from source paper

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Q30 JEE Main 2025 · 3 Apr · Shift 1 MCQ

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 $= 0.52 K kg mol^{-1}$)

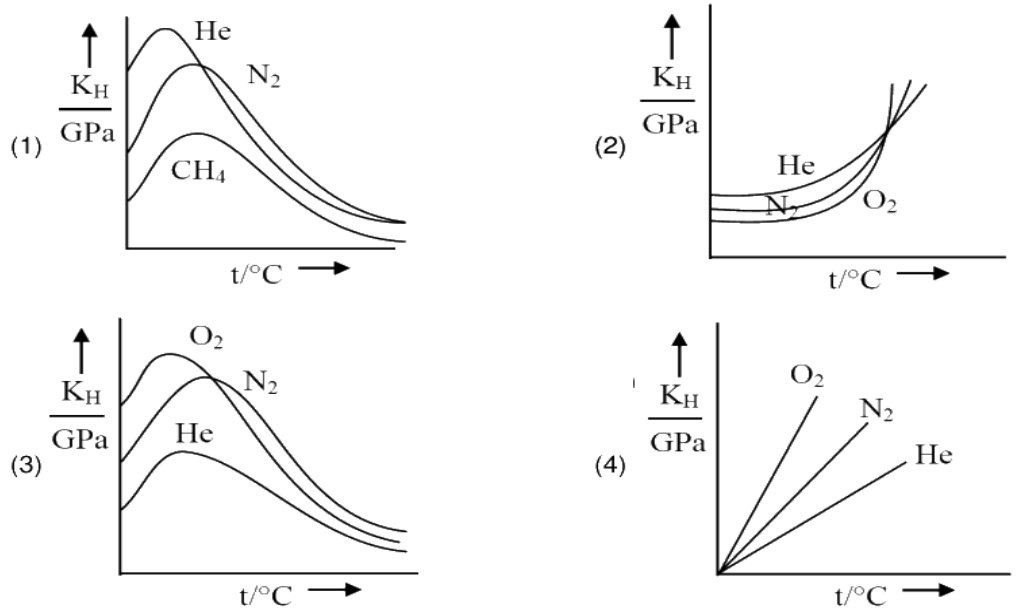
(A) 377.3 K
(B) 379.2 K
(C) 277.3 K
(D) 375.3 K

Answer: (A) 377.3 K · Key from source paper

Q31 JEE Main 2025 · 2 Apr · Shift 1 MCQ

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

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



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q32 JEE Main 2025 · 2 Apr · Shift 1 MCQ

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:

(A) 600 mm Hg, A
(B) 600 mm Hg, B
(C) 1400 mm Hg, A
(D) 1400 mm Hg, B

Answer: (A) 600 mm Hg, A · Key from source paper

Q33 JEE Main 2025 · 2 Apr · Shift 2 Numerical

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 $0.5 K kg mol^{-1}$)

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q34 JEE Main 2025 · 29 Jan · Shift 1 MCQ

1.24 g of $\mathrm{AX_2}$ (molar mass 124 g $\mathrm{mol^{-1}}$) is dissolved in 1 kg of water to form a solution with boiling point of 100.0156°C, while 25.4 g$^{\circ}$ of $\mathrm{AY_2}$ (molar mass 250 g $\mathrm{mol^{-1}}$) in 2 kg of water constitutes a solution with a boiling point of 100.0260°C. $\mathrm{K_b\ (H_2O)}$ = 0.52 K kg $\mathrm{mol^{-1}}$ Which of the following is correct ?

(A) $\mathrm{AX_2}$ is fully ionised while $\mathrm{AY_2}$ is completely unionised.
(B) $\mathrm{AX_2}$ is completely unionised while $\mathrm{AY_2}$ is fully ionised.
(C) $\mathrm{AX_2}$ and $\mathrm{AY_2}$ (both) are completely unionised.
(D) $\mathrm{AX_2}$ and $\mathrm{AY_2}$ (both) are fully ionised.

Answer: (A) $\mathrm{AX_2}$ is fully ionised while $\mathrm{AY_2}$ is completely unionised. · Key from source paper

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Q35 JEE Main 2025 · 29 Jan · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q36 JEE Main 2025 · 29 Jan · Shift 2 MCQ

Given below are two statements : Statement (I) : NaCl is added to the ice at 0°C, present in the ice cream box to prevent the melting of ice cream. Statement (II) : On addition of NaCl to ice at 0°C, there is a depression in freezing point. In the light of the above statements, choose the correct answer from the options given below :

(A) Both Statement I and Statement II are false
(B) Statement I is false but Statement II is true
(C) Statement I is true but Statement II is false
(D) Both Statement I and Statement II are true

Answer: (D) Both Statement I and Statement II are true · Key from source paper

Q37 JEE Main 2025 · 28 Jan · Shift 1 MCQ

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 ?

(A) 3.72 K kg mol^{-1}
(B) 1.86 K kg mol^{-1}
(C) 4.43 K kg mol^{-1}
(D) 5.12 K kg mol^{-1}

Answer: (D) 5.12 K kg mol^{-1} · Key from source paper

Q38 JEE Main 2025 · 28 Jan · Shift 2 MCQ

Assume a living cell with 0.9%(ω/ω) 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 :

(A) show no change in volume since solution is 0.9%(ω/ω)
(B) shrink since solution is 0.5%(ω/ω)
(C) swell up since solution is 1%(ω/ω)
(D) None of these

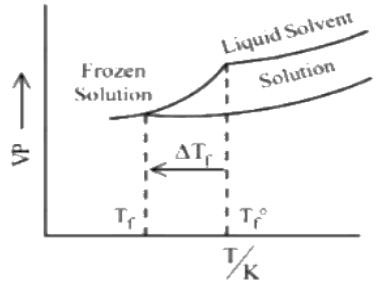
Answer: (D) None of these · Key from source paper

Q39 JEE Main 2025 · 24 Jan · Shift 1 MCQ

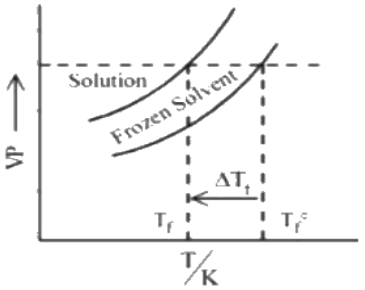
Consider the given plots of vapour pressure (VP) vs temperature(T/K). Which amongst the following options is correct graphical representation showing ΔT_f, depression in the freezing point of a solvent in a solution?

Q69. Consider the given plots of vapour pressure (VP) vs temperature(T/K). Which amongst the following options is correct graphical representation showing ΔT_f, depression in the freezing point of a solvent in a solution?

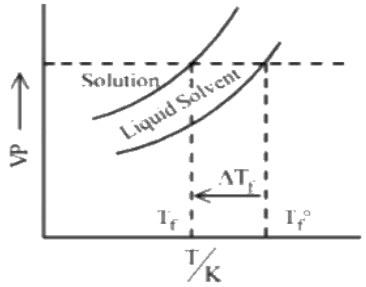
(1)



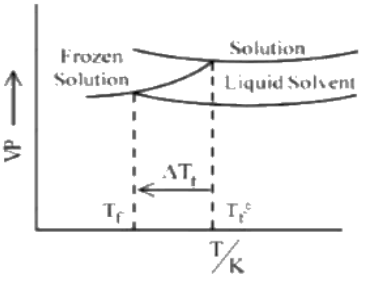
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q40 JEE Main 2025 · 24 Jan · Shift 2 Numerical

The observed and normal molar masses of compound MX_2 are 65.6 and 164 respectively. The percent degree of ionisation of MX_2 is _____ %. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 75. · Key from source paper

Q41 JEE Main 2025 · 23 Jan · Shift 1 MCQ

$CrCl_3 \cdot xNH_3$ can exist as a complex. 0.1 molal aqueous solution of this complex shows a depression in freezing point of 0.558°C. Assuming 100% ionisation of this complex and coordination number of Cr is 6 , the complex will be (Given $K_f = 1.86\ K\ kg\ mol^{-1}$)

(A) $[Cr(NH_3)_5Cl]Cl_2$

(B) $[Cr(NH_3)_6]Cl_3$

(C) $[Cr(NH_3)_3Cl_3]$

(D) $[Cr(NH_3)_4Cl_2]Cl$

Answer: (A) $[Cr(NH_3)_5Cl]Cl_2$ · Key from source paper

Q42 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Consider a binary solution of two volatile liquid components 1 and 2. x_1 and y_1 are the mole fractions of component 1 in liquid and vapour phase, respectively. The slope and intercept of the linear plot of $\frac{1}{x_1}$ vs $\frac{1}{y_1}$ are given respectively as:

(A) $\frac{P_2^0}{P_1^0}, \frac{P_2^0-P_1^0}{P_2^0}$

(B) $\frac{P_1^0}{P_2^0}, \frac{P_2^0-P_1^0}{P_2^0}$

(C) $\frac{P_1^0}{P_2^0}, \frac{P_1^0-P_2^0}{P_2^0}$

(D) $\frac{P_2^0}{P_1^0}, \frac{P_1^0-P_2^0}{P_2^0}$

Answer: (B) $\frac{P_1^0}{P_2^0}, \frac{P_2^0-P_1^0}{P_2^0}$ · Key from source paper

Q43 JEE Main 2025 · 23 Jan · Shift 2 MCQ

When a non-volatile solute is added to the solvent, the vapour pressure of the solvent decreases by 10 mm of Hg . The mole fraction of the solute in the solution is 0.2 . What would be the mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg ?

(A) 0.8

(B) 0.4

(C) 0.2

(D) 0.6

Answer: (D) 0.6 · Key from source paper

Q44 JEE Main 2025 · 22 Jan · Shift 1 MCQ

Arrange the following solutions in order of their increasing boiling points. (i) 10^{-4}M NaCl (ii) 10^{-4}M Urea (iii) 10^{-3}M NaCl (iv) 10^{-2}M NaCl

(A) (i) < (ii) < (iii) < (iv)

(B) (iv) < (iii) < (i) < (ii)

(C) (ii) < (i) $\equiv$ (iii) < (iv)

(D) (ii) < (i) < (iii) < (iv)

Answer: (D) (ii) < (i) < (iii) < (iv) · Key from source paper

Q45 JEE Main 2024 · 9 Apr · Shift 1 MCQ

0.05M$CuSO_4$ when treated with 0.01M$K_2Cr_2O_7$ gives green colour solution of $Cu_2Cr_2O_7$. The two solutions are separated as shown below : [SPM : Semi Permeable Membrane]

(see the figure above)

Due to osmosis :

Q43. $0.05\mathrm{M}\mathrm{CuSO_4}$ when treated with $0.01\mathrm{M}\mathrm{K_2Cr_2O_7}$ gives green colour solution of $\mathrm{Cu_2Cr_2O_7}$. The two solutions are separated as shown below : [SPM : Semi Permeable Membrane]



Due to osmosis :

(1) Molarity of $\mathrm{CuSO_4}$ solution is lowered.

(2) Molarity of $\mathrm{K_2Cr_2O_7}$ solution is lowered.

(3) Green colour formation observed on side Y.

(4) Green colour formation observed on side X.

(A) Molarity of $\mathrm{CuSO_4}$ solution is lowered.

(B) Molarity of $\mathrm{K_2Cr_2O_7}$ solution is lowered.

(C) Green colour formation observed on side Y.

(D) Green colour formation observed on side X.

Answer: (A) Molarity of $\mathrm{CuSO_4}$ solution is lowered. · Key from source paper

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Q46 JEE Main 2024 · 9 Apr · Shift 2 Numerical

The vapour pressure of pure benzene and methyl benzene at 27°C is given as 80 Torr and 24 Torr, respectively. The mole fraction of methyl benzene in vapour phase, in equilibrium with an equimolar mixture of those two liquids (ideal solution) at the same temperature is _____ $\times 10^{-2}$ (nearest integer)

Numerical value type: the answer is a number.

Answer: 23. · Key from source paper

Q47 JEE Main 2024 · 8 Apr · Shift 1 Numerical

A solution containing 10 g of an electrolyte $\mathrm{AB_2}$ in 100 g of water boils at 100.52°C. The degree of ionization of the electrolyte (α) is _____ $\times 10^{-1}$. (nearest integer) [Given : Molar mass of $\mathrm{AB_2}$ = 200 g $\mathrm{mol^{-1}}$, $\mathrm{K_b}$ (molal boiling point elevation const. of water) = 0.52 K kg $\mathrm{mol^{-1}}$, boiling point of water = 100°C; $\mathrm{AB_2}$ ionises as $\mathrm{AB_2 \rightarrow A^{2+} + 2\,B^-}$]

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q48 JEE Main 2024 · 6 Apr · Shift 1 Numerical

Consider the dissociation of the weak acid HX as given below

$HX(aq) \rightleftharpoons H^+(aq) + X^-(aq)$, $Ka = 1.2 \times 10^{-5}$ [K_a : dissociation constant] The osmotic pressure of 0.03M aqueous solution of HX at 300 K is _____ $\times 10^{-2}$ bar (nearest integer). [Given : R = 0.083 Lbarmol^{-1} K^{-1}]

Numerical value type: the answer is a number.

Answer: 76. · Key from source paper

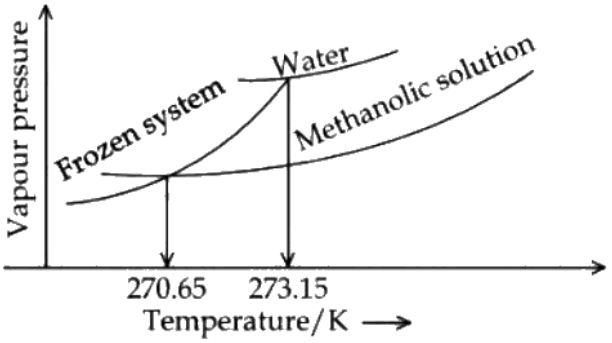
Q49 JEE Main 2024 · 6 Apr · Shift 2 Numerical

When ' x ' $\times 10^{-2}$ mL methanol (molar mass = 32 g; density = 0.792 g/cm^3) is added to 100 mL water (density = 1 g/cm^3), the following diagram is obtained.

(see the figure above)

x = _____ (nearest integer). [Given : Molal freezing point depression constant of water at 273.15 K is 1.86 K kg mol^{-1}]

Q58. When ' x ' $\times 10^{-2}$ mL methanol (molar mass $= 32$ g; density $= 0.792$ g/cm^3) is added to 100 mL water (density $= 1$ g/cm^3), the following diagram is obtained.



$x =$ _____ (nearest integer). [Given : Molal freezing point depression constant of water at 273.15 K is 1.86 K kg mol^{-1}]

Numerical value type: the answer is a number.

Answer: 543. · Key from source paper

Q50 JEE Main 2024 · 5 Apr · Shift 1 Numerical

An artificial cell is made by encapsulating 0.2M glucose solution within a semipermeable membrane. The osmotic pressure developed when the artificial cell is placed within a 0.05M solution of NaCl at 300 K is _____ $\times 10^{-1}$ bar. (nearest integer). [Given : R = 0.083 $\mathrm{Lbarmol^{-1}\,K^{-1}}$] Assume complete dissociation of NaCl

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q51 JEE Main 2024 · 5 Apr · Shift 2 Numerical

Considering acetic acid dissociates in water, its dissociation constant is 6.25×10^{-5}. If 5 mL of acetic acid is dissolved in 1 litre water, the solution will freeze at $-x \times 10^{-2}$°C, provided pure water freezes at 0°C. x = _____ . (Nearest integer) Given : $(K_f)_{\text{water}}$ = 1.86 K kg $\mathrm{mol^{-1}}$. density of acetic acid is 1.2 g $\mathrm{mol^{-1}}$. molar mass of water = 18 g $\mathrm{mol^{-1}}$. Acetic acid dissociates as molar mass of acetic acid=60 g $\mathrm{mol^{-1}}$. density of water = 1 g $\mathrm{cm^{-3}}$ $\mathrm{CH_3COOH \rightleftharpoons CH_3COO^{\ominus} + H^{\oplus}}$

Numerical value type: the answer is a number.

Answer: 19. · Key from source paper

Q52 JEE Main 2024 · 4 Apr · Shift 1 Numerical

2.5 g of a non-volatile, non-electrolyte is dissolved in 100 g of water at 25°C. The solution showed a boiling point elevation by 2°C. Assuming the solute concentration is negligible with respect to the solvent concentration, the vapor pressure of the resulting aqueous solution is _____ mm of Hg (nearest integer) [Given : Molal boiling point elevation constant of water ($\mathrm{K_b}$) = 0.52 K. kgmol^{-1}, 1 atm pressure = 760 mm of Hg, molar mass of water = 18 g mol^{-1}]

Numerical value type: the answer is a number.

Answer: 707. · Key from source paper

Q53 JEE Main 2024 · 4 Apr · Shift 2 Numerical

2.7 kg of each of water and acetic acid are mixed. The freezing point of the solution will be $-x^{\circ}$C. Consider the acetic acid does not dimerise in water, nor dissociates in water. x = _____ (nearest integer) [Given: Molar mass of water = 18 g mol^{-1}, acetic acid = 60 g mol^{-1} $\mathrm{K_fH_2O}$: 1.86 K kg mol^{-1} $\mathrm{K_f}$ acetic acid: 3.90 K kg mol^{-1} freezing point: $\mathrm{H_2O}$ = 273 K, acetic acid = 290 K]

Numerical value type: the answer is a number.

Answer: 31. · Key from source paper

Q54 JEE Main 2024 · 1 Feb · Shift 1 MCQ

We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentration 0.1 M, 0.01M and 0.001 M, respectively. The value of van t' Haft factor i for these solutions will be in the order.

(A) $i_A < i_B < i_C$

(B) $i_A < i_C < i_B$

(C) $i_A = i_B = i_C$

(D) $i_A > i_B > i_C$

Answer: (A) $i_A < i_B < i_C$ · Key from source paper

Q55 JEE Main 2024 · 1 Feb · Shift 2 Numerical

Mass of ethylene glycol (antifreeze) to be added to 18.6 kg of water to protect the freezing point at -24°C is kg (Molar mass in $\mathrm{gmol^{-1}}$ for ethylene glycol 62, $\mathrm{K_f}$ of water = 1.86 K kg $\mathrm{mol^{-1}}$)

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q56 JEE Main 2024 · 31 Jan · Shift 1 MCQ

Identify the mixture that shows positive deviations from Raoult's Law

(A) $(CH_3)_2CO + C_6H_5NH_2$
(B) $CHCl_3 + C_6H_6$
(C) $CHCl_3 + (CH_3)_2CO$
(D) $(CH_3)_2CO + CS_2$

Answer: (D) $(CH_3)_2CO + CS_2$ · Key from source paper

Q57 JEE Main 2024 · 30 Jan · Shift 1 MCQ

What happens to freezing point of benzene when small quantity of napthalene is added to benzene?

(A) Increases
(B) Remains unchanged
(C) First decreases and then increases
(D) Decreases

Answer: (D) Decreases · Key from source paper

Q58 JEE Main 2024 · 30 Jan · Shift 2 MCQ

The solution from the following with highest depression in freezing point/lowest freezing point is

(A) 180 g of acetic acid dissolved in 1 L of aqueous solution.
(B) 180 g of acetic acid dissolved in benzene
(C) 180 g of benzoic acid dissolved in benzene
(D) 180 g of glucose dissolved in water

Answer: (A) 180 g of acetic acid dissolved in 1 L of aqueous solution. · Key from source paper

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Q59 JEE Main 2024 · 29 Jan · Shift 1 Numerical

The osmotic pressure of a dilute solution is 7×10^5 Pa at 273 K. Osmotic pressure of the same solution at 283 K is _____ $\times 10^4$ Nm^{-2}.(Nearest integer)

Numerical value type: the answer is a number.

Answer: 73. · Key from source paper

Q60 JEE Main 2024 · 27 Jan · Shift 1 MCQ

A solution of two miscible liquids showing negative deviation from Raoult's law will have :

(A) increased vapour pressure, increased boiling point
(B) increased vapour pressure, decreased boiling point
(C) decreased vapour pressure, decreased boiling point
(D) decreased vapour pressure, increased boiling point

Answer: (D) decreased vapour pressure, increased boiling point · Key from source paper

Q61 JEE Main 2023 · 15 Apr · Shift 1 Numerical

The vapour pressure of 30% (w/v), aqueous solution of glucose is _____ mm Hg at 25°C.
[Given: The density of 30% (w/v), aqueous solution of glucose is 1.2 g cm^{-3} and vapour pressure of pure water is 24 mm Hg.]
(Molar mass of glucose is 180 g mol^{-1})

Numerical value type: the answer is a number.

Answer: 23. · Key from source paper

Q62 JEE Main 2023 · 13 Apr · Shift 1 Numerical

Solution of 12 g of non-electrolyte (A) prepared by dissolving it in 1000 mL of water exerts the same osmotic pressure as that of 0.05 M glucose solution at the same temperature. The empirical formula of A is CH_2O. The molecular mass of A is _____ g. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 240. · Key from source paper

Q63 JEE Main 2023 · 13 Apr · Shift 2 Numerical

Sea water contains 29.25 % NaCl and 19 % $MgCl_2$ by weight of solution. The normal boiling point of the sea water is °C (Nearest integer) Assume 100% ionization for both NaCl and $MgCl_2$ Given: K_bH_2O = 0.52 K kg mol^{-1} Molar mass of NaCl and $MgCl_2$ is 58.5 and 95 g mol^{-1} respectively.

Numerical value type: the answer is a number.

Answer: 116. · Key from source paper

Q64 JEE Main 2023 · 12 Apr · Shift 1 Numerical

80 mole percent of $MgCl_2$ is dissociated in aqueous solution. The vapour pressure of 1.0 molal aqueous solution of $MgCl_2$ at $38^\circ C$ is _____ mm Hg. (Nearest integer)
Given: Vapour pressure of water at $38^\circ C$ is 50 mm Hg

Numerical value type: the answer is a number.

Answer: 48. · Key from source paper

Q65 JEE Main 2023 · 11 Apr · Shift 1 Numerical

0.004 M K_2SO_4 solution is isotonic with 0.01 M glucose solution. Percentage dissociation of K_2SO_4 is _____ (Nearest integer)

Numerical value type: the answer is a number.

Answer: 75. · Key from source paper

Q66 JEE Main 2023 · 11 Apr · Shift 2 MCQ

What weight of glucose must be dissolved in 100 g of water to lower the vapour pressure by 0.20 mm Hg? (Assume dilute solution is being formed)
Given: Vapour pressure of pure water is 54.2 mm Hg at room temperature. Molar mass of glucose is 180 $\mathrm{g\ mol^{-1}}$

(A) 3.59 g
(B) 3.69 g
(C) 4.69 g
(D) 2.59 g

Answer: (B) 3.69 g · Key from source paper

Q67 JEE Main 2023 · 10 Apr · Shift 1 Numerical

If the degree of dissociation of aqueous solution of weak monobasic acid is determined to be 0.3, then the observed freezing point will be _____ $\%$ higher than the expected/theoretical freezing point. (Nearest integer).

Numerical value type: the answer is a number.

Answer: 30. · Key from source paper

Q68 JEE Main 2023 · 10 Apr · Shift 2 Numerical

An aqueous solution of volume $300\ \mathrm{cm^3}$ contains 0.63 g of protein. The osmotic pressure of the solution at 300 K is 1.29 mbar. The molar mass of the protein is _____ $\mathrm{g\,mol^{-1}}$.
Given : $\mathrm{R = 0.083\ L\,bar\,K^{-1}\,mol^{-1}}$

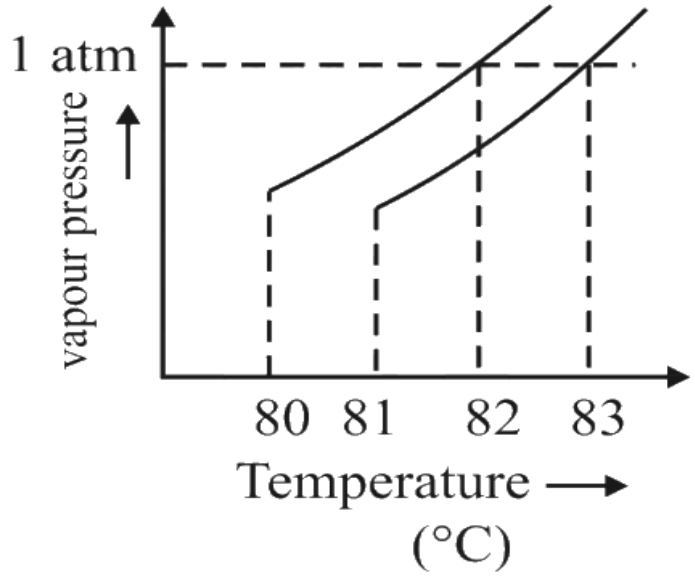
Numerical value type: the answer is a number.

Answer: 40535. · Key from source paper

Q69 JEE Main 2023 · 8 Apr · Shift 1 Numerical

The vapour pressure vs. temperature curve for a solution solvent system is shown below.
(see the figure above)
The boiling point of the solvent is _____ $^\circ\mathrm{C}$.

Q44. The vapour pressure vs. temperature curve for a solution solvent system is shown below.



The boiling point of the solvent is _____°C.

Numerical value type: the answer is a number.

Answer: 82. · Key from source paper

Q70 JEE Main 2023 · 8 Apr · Shift 2 Numerical

If the boiling points of two solvents X and Y (having same molecular weights) are in the ratio 2: 1 and their enthalpy of vaporizations are in the ratio 1 : 2, then the boiling point elevation constant of X is m times the boiling point elevation constant of Y. The value of m is (nearest integer).

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q71 JEE Main 2023 · 6 Apr · Shift 1 Numerical

Mass of Urea NH_2CONH_2 required to be dissolved in $1000\ g$ of water in order to reduce the vapour pressure of water by 25% is _____ g. (Nearest integer)

Given : Molar mass of N, C, O and H are 14, 12, 16 and 1 $g\ mol^{-1}$ respectively.

Numerical value type: the answer is a number.

Answer: 1111. · Key from source paper

Q72 JEE Main 2023 · 6 Apr · Shift 2 Numerical

Consider the following pairs of solution which will be isotonic at the same temperature. The number of pairs of solutions is/ are _____

A. 1 M aq. NaCl and 2 M aq. urea

B. 1 M aq. $CaCl_2$ and 1.5 M aq. KCl

C. 1.5 M aq. $AlCl_3$ and 2 M aq. Na_2SO_4

D. 2.5 M aq. KCl and 1 M aq. $Al_2(SO_4)_3$

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q73 JEE Main 2023 · 1 Feb · Shift 1 Numerical

25 mL of an aqueous solution of KCl was found to require 20 mL of 1M $AgNO_3$ solution when titrated using K_2CrO_4 as an indicator. What is the depression in freezing point of KCl solution of the given concentration? (Nearest integer).
(Given : K_f = 2.0 K kg mol^{-1})
Assume
1) 100% ionization and
2) density of the aqueous solution as 1 g mL^{-1}

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q74 JEE Main 2023 · 1 Feb · Shift 2 Numerical

20% of acetic acid is dissociated when its 5 g is added to 500 mL of water. The depression in freezing point of such water is _____ $\times 10^{-3}$°C. Atomic mass of C, H and O are 12, 1 and 16 a.m.u. respectively. [Given : Molal depression constant and density of water are 1. 86 K kg mol^{-1} and 1 g cm^{-3} respectively]

Numerical value type: the answer is a number.

Answer: 372. · Key from source paper

Q75 JEE Main 2023 · 31 Jan · Shift 1 Numerical

At 27°C, a solution containing 2.5 g of solute in 250.0 mL of solution exerts an osmotic pressure of 400 Pa. The molar mass of the solute is _____ g mol^{-1} (Nearest integer)
(Given : R = 0.083 L bar K^{-1} mol^{-1})

Numerical value type: the answer is a number.

Answer: 62250. · Key from source paper

Q76 JEE Main 2023 · 31 Jan · Shift 2 MCQ

Evaluate the following statements for their correctness.
A. The elevation in boiling point temperature of water will be same for 0.1 M NaCl and 0.1 M urea.
B. Azeotropic mixture boil without change in their composition.
C. Osmosis always takes place from hypertonic to hypotonic solution.
D. The density of 32% H_2SO_4 solution having molarity 4.09 M is approximately 1.26 g mL^{-1}.
E. A negatively charged sol is obtained when KI solution is added to silver nitrate solution.
Choose the correct answer from the options given below:

(A) B and D only
(B) B, D and E only
(C) A and C only
(D) A, B and C only

Answer: (A) B and D only · Key from source paper

Q77 JEE Main 2023 · 30 Jan · Shift 1 Numerical

A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K. The molecular mass of the solute is _____ g mol^{-1}. (Nearest integer)
Given, water boils at 373 K, K_b for water = 0.52 K kg mol^{-1}

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q78 JEE Main 2023 · 30 Jan · Shift 2 Numerical

Lead storage battery contains 38% by weight solution of H_2SO_4. The van't Hoff factor is 2.67 at this concentration. The temperature in Kelvin at which the solution in the battery will freeze is _____ (Nearest integer).
Given K_f = 1.8 K kg mol^{-1}

Numerical value type: the answer is a number.

Answer: 243. · Key from source paper

Q79 JEE Main 2023 · 29 Jan · Shift 1 Numerical

Solid Lead nitrate is dissolved in 1 litre of water. The solution was found to boil at $100.15^{\circ}C$. When $0.2\ mol$ of NaCl is added to the resulting solution, it was observed that the solution froze at $-0.8^{\circ}C$. The solutbility product of $PbCl_2$ formed is _____ $\times 10^{-6}$ at $298\ K$. (Nearest integer)
Given : $K_b = 0.5\ K\ kg\ mol^{-1}$ and $K_f = 1.8\ kg\ mol^{-1}$. Assume molality to be equal to molarity in all cases.

Numerical value type: the answer is a number.

Answer: 13. · Key from source paper

Q80 JEE Main 2023 · 29 Jan · Shift 2 MCQ

Match List I with List II.
List I
A. van't Hoff factor, i
B. k_f
C. Solutions with same osmotic pressure
D. Azeotropes
List II
I. Cryoscopic constant

II. Isotonic solutions

III. $\frac{\text{Normal molar mass}}{\text{Abnormal molar mas}}$

IV. Solutions with same composition of vapour above it

Choose the correct answer from the options given below:

(A) A-III, B-I, C-II, D-IV

(B) A-III, B-II, C-I, D-IV

(C) A-III, B-I, C-IV, D-II

(D) A-I, B-III, C-II, D-IV

Answer: (A) A-III, B-I, C-II, D-IV · Key from source paper

Q81 JEE Main 2023 · 25 Jan · Shift 2 Numerical

The number of pairs of the solution having the same value of the osmotic pressure from the following is

(Assume 100% ionization)

A. 0.500 M C_2H_5OH(aq) and 0.25 M KBr(aq)

B. 0.100 M $K_4[Fe(CN)_6]$(aq) and 0.100 M $FeSO_4(NH_4)_2SO_4$(aq)

C. 0.05 M $K_4[Fe(CN)_6]$ (aq) and 0.25 M NaCl (aq)

D. 0.15 M NaCl(aq) and 0.1 M $BaCl_2$(aq)

E. 0.02 M $KCl.MgCl_2.6H_2O$(aq) and 0.05 M KCl(aq)

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q82 JEE Main 2023 · 24 Jan · Shift 1 MCQ

In the depression of freezing point experiment

A. Vapour pressure of the solution is less than that of pure solvent

B. Vapour pressure of the solution is more than that of pure solvent

C. Only solute molecules solidify at the freezing point

D. Only solvent molecules solidify at the freezing point

(A) A and D only

(B) B and C only

(C) A and C only

(D) A only

Answer: (A) A and D only · Key from source paper

Q83 JEE Main 2023 · 24 Jan · Shift 2 Numerical

The Total pressure observed by mixing two liquid A and B is 350 mm Hg when their mole fractions are 0.7 and 0.3 respectively. The Total pressure becomes 410 mm Hg if the mole fractions are changed to 0.2 and 0.8 respectively for A and B. The vapour pressure of pure A is _____ mm Hg. (Nearest integer)

Consider the liquids and solutions behave ideally

Numerical value type: the answer is a number.

Answer: 314. · Key from source paper

Q84 JEE Main 2022 · 29 Jul · Shift 1 Numerical

If O_2 gas is bubbled through water at 303 K, the number of millimoles of O_2 gas that dissolve in 1 litre of water is _____ (Nearest integer) (Given : Henry's Law constant for O_2 at 303 K is 46.82k bar and partial pressure of O_2 = 0.920 bar)
(Assume solubility of O_2 in water is too small, nearly negligible)

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q85 JEE Main 2022 · 29 Jul · Shift 2 Numerical

1.80 g of solute A was dissolved in 62.5 cm^3 of ethanol and freezing point of the solution was found to be 155.1 K. The molar mass of solute A is $g\ mol^{-1}$. [Given: Freezing point of ethanol is 156.0 K. Density of ethanol is 0.80 $g\ cm^{-3}$. Freezing point depression constant of ethanol is 2.00 $K\ kg\ mol^{-1}$]

Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

Q86 JEE Main 2022 · 28 Jul · Shift 1 Numerical

150 g of acetic acid was contaminated with 10.2 g ascorbic acid $C_6H_8O_6$ to lower down its freezing point by $x \times 10^{-1}\ ^\circ C$. The value of x is _____ (Nearest integer). [Given $K_f = 3.9\ K\ kg\ mol^{-1}$; Molar mass of ascorbic acid $= 176\ g\ mol^{-1}$]

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q87 JEE Main 2022 · 28 Jul · Shift 2 Numerical

A gaseous mixture of two substances A and B, under a total pressure of 0.8 atm is in equilibrium with an ideal liquid solution. The mole fraction of substance A is 0.5 in the vapour phase and 0.2 in the liquid phase. The vapour pressure of pure liquid A is _____ atm.(Nearest integer)

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q88 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Boiling point of a 2% aqueous solution of a nonvolatile solute A is equal to the boiling point of 8% aqueous solution of a non-volatile solute B. The relation between molecular weights of A and B is.

(A) $M_A = 4M_B$
(B) $M_B = 4M_A$
(C) $M_A = 8M_B$
(D) $M_B = 8M_A$

Answer: (B) $M_B = 4M_A$ · Key from source paper

Q89 JEE Main 2022 · 27 Jul · Shift 2 Numerical

When a certain amount of solid A is dissolved in 100 g of water at 25 °C to make a dilute solution, the vapour pressure of the solution is reduced to one-half of that of pure water. The vapour pressure of pure water is 23.76 mmHg. The number of moles of solute A added is

Numerical value type: the answer is a number.

Answer: 5.55. · Key from source paper

Q90 JEE Main 2022 · 26 Jul · Shift 2 Numerical

The elevation in boiling point for 1 molal solution of non-volatile solute A is 3 K. The depression in freezing point for 2 molal solution of A in the same solvent is 6 K. The ratio of K_b and K_f i.e., K_b/K_f is $1 : X$. The value of X is

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q91 JEE Main 2022 · 25 Jul · Shift 1 MCQ

The depression in freezing point observed for a formic acid solution of concentration $0.5\ mL\ L^{-1}$ is 0.0405 °C. Density of formic acid is $1.05\ g\ mL^{-1}$. The Van't Hoff factor of the formic acid solution is nearly: (Given for water $k_f = 1.86\ K\ kg\ mol^{-1}$)

(A) 0.8
(B) 1.1
(C) 1.9
(D) 2.4

Answer: (C) 1.9 · Key from source paper

Q92 JEE Main 2022 · 25 Jul · Shift 2 MCQ

Two solutions A and B are prepared by dissolving 1 g of non-volatile solutes X and Y. respectively in 1 kg of water. The ratio of depression in freezing points for A and B is found to be $1 : 4$. The ratio of molar masses of X and Y is

(A) $1:4$

(B) $1:0.25$

(C) $1:0.20$

(D) $1:5$

Answer: (B) $1:0.25$ · Key from source paper

Q93 JEE Main 2022 · 29 Jun · Shift 1 Numerical

$1.2\ \mathrm{mL}$ of acetic acid is dissolved in water to make $2.0\ \mathrm{L}$ of solution. The depression in freezing point observed for this strength of acid is $0.0198\ ^{\circ}\mathrm{C}$. The percentage of dissociation of the acid is (Nearest integer)

[Given : Density of acetic acid is $1.02\ \mathrm{g\ mL^{-1}}$ Molar mass of acetic acid is $60\ \mathrm{g\ mol^{-1}}$

$\mathrm{K_f(H_2O) = 1.85\ K\ kg\ mol^{-1}}$]

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q94 JEE Main 2022 · 29 Jun · Shift 2 Numerical

Elevation in boiling point for 1.5 molal solution of glucose in water is $4\ \mathrm{K}$. The depression in freezing point for 4.5 molal solution of glucose in water is $4\ \mathrm{K}$. The ratio of molal elevation constant to molal depression constant $(\mathrm{K_b/K_f})$ is

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q95 JEE Main 2022 · 28 Jun · Shift 1 Numerical

The vapour pressures of two volatile liquids A and B at $25\ ^{\circ}\mathrm{C}$ are 50 Torr and 100 Torr, respectively. If the liquid mixture contains 0.3 mole fraction of A, then the mole fraction of liquid B in the vapour phase is $\frac{x}{17}$. The value of x is

Numerical value type: the answer is a number.

Answer: 14. · Key from source paper

Q96 JEE Main 2022 · 28 Jun · Shift 2 Numerical

2.5 g of protein containing only glycine $(\mathrm{C_2H_5NO_2})$ is dissolved in water to make 500 mL of solution. The osmotic pressure of this solution at 300 K is found to be 5.03×10^{-3} bar. The total number of glycine units present in the protein is

(Given : $\mathrm{R = 0.083\ L\ bar\ K^{-1}\ mol^{-1}}$)

Numerical value type: the answer is a number.

Answer: 330. · Key from source paper

Q97 JEE Main 2022 · 27 Jun · Shift 1 Numerical

2 g of a non-volatile non-electrolyte solute is disolved in 200 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 8. The elevation in boiling points of A and B are in the ratio $\frac{x}{y}$ (x : y). The value of y is _____ (Nearest Integer)

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q98 JEE Main 2022 · 27 Jun · Shift 2 Numerical

A solution containing 2.5×10^{-3} kg of a solute dissolved in 75×10^{-3} kg of water boils at 373.535 K. The molar mass of the solute is mol^{-1}. [nearest integer] (Given : $\mathrm{K_b(H_2O)} = 0.52$ K kg mol^{-1} and boiling point of water $= 373.15$ K)

Numerical value type: the answer is a number.

Answer: 45. · Key from source paper

Q99 JEE Main 2022 · 26 Jun · Shift 1 Numerical

A 0.5 percent solution of potassium chloride was found to freeze at $-0.24^{\circ}\mathrm{C}$. The percentage dissociation of potassium chloride is (Nearest integer)
(Molal depression constant for water is 1.80 K kg mol^{-1} and molar mass of KCl is 74.6 g mol^{-1})

Numerical value type: the answer is a number.

Answer: 98. · Key from source paper

Q100 JEE Main 2022 · 26 Jun · Shift 2 Numerical

The osmotic pressure exerted by a solution prepared by dissolving 2.0 g of protein of molar mass 60 kg mol^{-1} in 200 mL of water at $27^{\circ}\mathrm{C}$ is _____ Pa. [integer value] (use $\mathrm{R} = 0.083$ L bar mol^{-1} K^{-1})

Numerical value type: the answer is a number.

Answer: 415. · Key from source paper

Q101 JEE Main 2022 · 25 Jun · Shift 2 MCQ

Solute A associates in water. When 0.7 g of solute A is dissolved in 42.0 g of water, it depresses the freezing point by $0.2\ ^{\circ}\mathrm{C}$. The percentage association of solute A in water, is
[Given: Molar mass of $\mathrm{A} = 93$ g mol^{-1}. Molal depression constant of water is 1.86 K kg mol^{-1}]

(A) 50%
(B) 60%
(C) 70%
(D) 80%

Answer: (D) 80% · Key from source paper

Q102 JEE Main 2022 · 24 Jun · Shift 1 Numerical

The osmotic pressure of blood is 7.47 bar at 300 K. To inject glucose to a patient intravenously, it has to be isotonic with blood. The concentration of glucose solution in $\mathrm{gL^{-1}}$ is (Molar mass of glucose $=$ 180 g $\mathrm{mol^{-1}}$, $\mathrm{R} = 0.083$ L $\mathrm{bar^{-1}}$ $\mathrm{mol^{-1}}$) (Nearest integer)

Numerical value type: the answer is a number.

Answer: 54. · Key from source paper

Q103 JEE Main 2022 · 24 Jun · Shift 2 Numerical

A company dissolves 'x' amount of $\mathrm{CO_2}$ at 298 K in 1 litre of water to prepare soda water. $\mathrm{X} =$ $\times 10^{-3}$ g. (nearest integer)
(Given: partial pressure of $\mathrm{CO_2}$ at 298 K $= 0.835$ bar. Henry's law constant of $\mathrm{CO_2}$ at 298 K $=$ 1.67 kbar. Atomic mass of H, C and O is 1, 12, and 6 g $\mathrm{mol^{-1}}$, respectively)

Numerical value type: the answer is a number.

Answer: 1221. · Key from source paper

Q104 JEE Main 2021 · 31 Aug · Shift 1 MCQ

Which one of the following 0.10 M aqueous solutions will exhibit the largest freezing point depression?

(A) glycine
(B) hydrazine
(C) $\mathrm{KHSO_4}$
(D) glucose

Answer: (C) $\mathrm{KHSO_4}$ · Key from source paper

Q105 JEE Main 2021 · 31 Aug · Shift 2 Numerical

1.22 g of an organic acid is separately dissolved in 100 g of benzene $\mathrm{K_b} = 2.6$ K kg $\mathrm{mol^{-1}}$ and 100 g of acetone $\mathrm{K_b} = 1.7$ K kg $\mathrm{mol^{-1}}$. The acid is known to dimerize in benzene but remain as a monomer in acetone. The boiling point of the solution in acetone increases by 0.17°C. The increase in boiling point of solution in benzene in$^\circ$C is x $\times 10^{-2}$. The value of x is (Nearest integer)
[Atomic mass : C = 12.0, H = 1.0, O = 16.0]

Numerical value type: the answer is a number.

Answer: 13. · Key from source paper

Q106 JEE Main 2021 · 27 Aug · Shift 1 Numerical

1 kg of 0.75 molal aqueous solution of sucrose can be cooled up to -4°C before freezing. The amount of ice (in g) that will be separated out is _____. (Nearest integer) [Given : $\mathrm{K_f(H_2O)} = 1.86$ K kg $\mathrm{mol^{-1}}$]

Numerical value type: the answer is a number.

Answer: 518. · Key from source paper

Q107 JEE Main 2021 · 27 Aug · Shift 2 Numerical

$40\ \mathrm{g}$ of glucose (Molar mass $= 180$) is mixed with $200\ \mathrm{mL}$ of water. The freezing point of solution is __K. (Nearest integer)
[Given : $\mathrm{K_f} = 1.86\ \mathrm{K\ kg\ mol^{-1}}$; Density of water $= 1.00\ \mathrm{g\ cm^{-3}}$; Freezing point of water $= 273.15\ \mathrm{K}$]

Numerical value type: the answer is a number.

Answer: 271. · Key from source paper

Q108 JEE Main 2021 · 26 Aug · Shift 1 Numerical

Of the following four aqueous solutions, the total number of those solutions whose freezing point is lower than that of $0.10\ \mathrm{M}\ \mathrm{C_2H_5OH}$ is (Integer answer)
(i) $0.10\ \mathrm{M}\ \mathrm{Ba_3\,(PO_4)_2}$
(ii) $0.10\ \mathrm{M}\ \mathrm{Na_2\,SO_4}$
(iii) $0.10\ \mathrm{M}\ \mathrm{KCl}$
(iv) $0.10\ \mathrm{M}\ \mathrm{Li_3\,PO_4}$

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q109 JEE Main 2021 · 26 Aug · Shift 2 Numerical

$83\ \mathrm{g}$ of ethylene glycol dissolved in $625\ \mathrm{g}$ of water. The freezing point of the solution is ..... K. (Nearest integer)
[Use : Molal Freezing point depression constant of water $= 1.86\ \mathrm{K\ kg\ mol^{-1}}$
Freezing point of water $= 273\ \mathrm{K}$
Atomic masses : C : $12.0\mathrm{u}$, O : $16.0\mathrm{u}$, H : $1.0\mathrm{u}$]

Numerical value type: the answer is a number.

Answer: 269. · Key from source paper

Q110 JEE Main 2021 · 27 Jul · Shift 1 Numerical

1.46 g of a biopolymer dissolved in a 100 mL water at 300 K exerted an osmotic pressure of 2.42×10^{-3} bar
The molar mass of the biopolymer is — $\times 10^4\ \mathrm{g\ mol^{-1}}$. (Round off to the Nearest Integer)
[Use: R = $0.083\ \mathrm{L\ bar\ mol^{-1}\ K^{-1}}$]

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q111 JEE Main 2021 · 27 Jul · Shift 2 Numerical

In a solvent 50% of an acid HA dimerizes and the rest dissociates. The van't Hoff factor of the acid is _____ $\times 10^{-2}$ (Round off to the nearest integer)

Numerical value type: the answer is a number.

Answer: 125. · Key from source paper

Q112 JEE Main 2021 · 25 Jul · Shift 1 Numerical

CO_2 gas is bubbled through water during a soft drink manufacturing process at $298\ K$. If CO_2 exerts a partial pressure of $0.835\ bar$ then x $m\ mol$ of CO_2 would dissolve in $0.9\ L$ of water. The value of x is _____. (Nearest integer)
(Henry's law constant for CO_2 at $298\ K$ is $1.67 \times 10^3\ bar$)

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q113 JEE Main 2021 · 25 Jul · Shift 2 Numerical

When $3.00\ g$ of a substance X' is dissolved in $100\ g$ of CCl_4, it raises the boiling point by $0.60\ K$. The molar mass of the substance 'X' is ___ $g\ mol^{-1}$. (Nearest integer).
[Given K_b for CCl_4 is $5.0\ K\ kg\ mol^{-1}$]

Numerical value type: the answer is a number.

Answer: 250. · Key from source paper

Q114 JEE Main 2021 · 22 Jul · Shift 1 MCQ

Which one of the following 0.06 M aqueous solutions has lowest freezing point ?

(A) $Al_2(SO_4)_3$
(B) $C_6H_{12}O_6$
(C) KI
(D) K_2SO_4

Answer: (A) $Al_2(SO_4)_3$ · Key from source paper

Q115 JEE Main 2021 · 20 Jul · Shift 1 Numerical

At $20^\circ C$, the vapour pressure of benzene is 70 torr and that of methyl benzene is 20 torr. The mole fraction of benzene in the vapour phase at $20^\circ C$ above an equimolar mixture of benzene and methyl benzene is _____ $\times 10^{-2}$. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 78. · Key from source paper

Q116 JEE Main 2021 · 20 Jul · Shift 2 Numerical

The vapour pressures of A and B at $25^{\circ}\mathrm{C}$ are $90\ \mathrm{mmHg}$ and $15\ \mathrm{mm}$ Hg respectively. If A and B are mixed such that the mole fraction of A in the mixture is 0.6, then the mole fraction of B in the vapour phase is $x \times 10^{-1}$. The value of x is (Nearest integer)

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q117 JEE Main 2021 · 18 Mar · Shift 1 Numerical

2 molal solution of a weak acid HA has a freezing point of $-3.885^{\circ}\mathrm{C}$. The degree of dissociation of this acid is _____ $\times 10^{-3}$. (Round off to the Nearest Integer). [Given : Molal depression constant of water $= 1.85\ \mathrm{K\ kg\ mol^{-1}}$ Freezing point of pure water$= 0^{\circ}\mathrm{C}$]

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q118 JEE Main 2021 · 18 Mar · Shift 2 Numerical

A solute A dimerizes in water. The boiling point of a 2 molal solution of A is $100.52^{\circ}\mathrm{C}$. The percentage association of A is _____ .
(Round off to the Nearest integer)
Use : $\mathrm{K_b}$ for water $= 0.52\ \mathrm{K\ kg\ mol^{-1}}$
Boiling point of water $= 100^{\circ}\mathrm{C}$

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q119 JEE Main 2021 · 17 Mar · Shift 1 Numerical

The oxygen dissolved in water exerts a partial pressure of 20 kPa in the vapour above water. The molar solubility of oxygen in water is _____ $\times 10^{-5}\ \mathrm{moldm^{-3}}$.
(Round off to the Nearest Integer).
[Given : Henry's law constant $= \mathrm{K_H} = 8.0 \times 10^{4}\mathrm{kPa}$ for $\mathrm{O_2}$. Density of water with dissolved oxygen $= 1.0\ \mathrm{kgdm^{-3}}$]

Numerical value type: the answer is a number.

Answer: 1389. · Key from source paper

Q120 JEE Main 2021 · 17 Mar · Shift 2 Numerical

A 1 molal $\mathrm{K_4Fe(CN)_6}$ solution has a degree of dissociation of 0.4 . Its boiling point is equal to that of another solution which contains 18.1 weight percent of a non electrolytic solute A. The molar mass of A is _____ u. (Round off to the Nearest Integer). [Density of water $= 1.0\ \mathrm{g\ cm^{-3}}$]

Numerical value type: the answer is a number.

Answer: 85. · Key from source paper

Q121 JEE Main 2021 · 16 Mar · Shift 1 Numerical

AB_2 is 10% dissociated in water to A^{2+} and B^-. The boiling point of 10.0 molal aqueous solution of AB_2 is-- $^\circ C$. (Round off to the Nearest Integer).
[Given : Molal elevation constant of water $K_b = 0.5\ K\ kg\ mol^{-1}$ boiling point of pure water$= 100^\circ C$]

Numerical value type: the answer is a number.

Answer: 106. · Key from source paper

Q122 JEE Main 2021 · 16 Mar · Shift 2 Numerical

At $363\ K$, the vapour pressure of A is $21\ kPa$ and that of B is $18\ kPa$. One mole of A and 2 moles of B are mixed. Assuming that this solution is ideal, the vapour pressure of the mixture is _____ kPa. (Round to the Nearest Integer).

Numerical value type: the answer is a number.

Answer: 19. · Key from source paper

Q123 JEE Main 2021 · 26 Feb · Shift 1 Numerical

$224\ mL$ of $SO_{2(g)}$ at $298\ K$ and $1\ atm$ is passed through $100\ mL$ of $0.1\ M$ NaOH solution. The non-volatile solute produced is dissolved in $36\ g$ of water. The lowering of vapour pressure of solution (assuming the solution is dilute) $(P^\circ_{(H_2O)} = 24\ mm\ of\ Hg)$ is $x \times 10^{-2}$ mm of Hg the value of x is _____ (Integer answer)

Numerical value type: the answer is a number.

Accepted answers: 18 or 19 or 20 or 21 or 22 or 23 or 24. · Key from source paper

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Q124 JEE Main 2021 · 26 Feb · Shift 2 Numerical

When $12.2\ g$ of benzoic acid is dissolved in $100\ g$ of water, the freezing point of solution was found to be $-0.93\ ^\circ C$ $(K_f(H_2O) = 1.86\ K\ kg\ mol^{-1})$. The number (n) of benzoic acid molecules associated (assuming 100% association) is _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q125 JEE Main 2021 · 25 Feb · Shift 1 Numerical

1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is _____ K. (Rounded-off to the nearest integer) [Given K_b for $(H_2O) = 0.52\ K\ kg\ mol^{-1}$]

Numerical value type: the answer is a number.

Answer: 375. · Key from source paper

Q126 JEE Main 2021 · 25 Feb · Shift 2 Numerical

If a compound AB dissociates to the extent of 75% in an aqueous solution, the molality of the solution which shows a $2.5\ \mathrm{K}$ rise in the boiling point of the solution is _____ molal. (Rounded-off to the nearest integer)
$[K_b = 0.52\mathrm{K\ kg\ mol^{-1}}]$.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q127 JEE Main 2021 · 24 Feb · Shift 1 Numerical

When $9.45\ \mathrm{g}$ of $\mathrm{ClCH_2COOH}$ is added to $500\ \mathrm{mL}$ of water, its freezing point drops by $0.5^\circ\mathrm{C}$. The dissociation constant of $\mathrm{ClCH_2COOH}$ is $x \times 10^{-3}$. The value of x is off to the nearest integer)
$\mathrm{K_{fH_2O}} = 1.86\ \mathrm{K\ kg\ mol^{-1}}$

Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q128 JEE Main 2021 · 24 Feb · Shift 2 Numerical

$\mathrm{C_6H_6}$ freezes at $5.5^\circ\mathrm{C}$. The temperature at which a solution of $10\ \mathrm{g}$ of $\mathrm{C_4H_{10}}$ in $200\ \mathrm{g}$ of $\mathrm{C_6H_6}$ freeze is _____$^\circ\mathrm{C}$. (nearest integer value), (The molal freezing point depression constant of $\mathrm{C_6H_6}$ is $5.12^\circ\mathrm{C/m}$.)

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q129 JEE Main 2020 · 6 Sep · Shift 1 Numerical

The elevation of boiling point of 0.10m aqueous $\mathrm{CrCl_3.xNH_3}$ solution is two times that of 0.05 m aqueous $\mathrm{CaCl_2}$ solution. The value of x is _____
[Assume 100% ionisation of the complex and $\mathrm{CaCl_2}$, coordination number of Cr as 6, and that all $\mathrm{NH_3}$ molecules are present inside the coordination sphere]

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q130 JEE Main 2020 · 6 Sep · Shift 2 MCQ

A set of solutions is prepared using 180 g of water as a solvent and 10 g of different non-volatile solutes A, B and C. The relative lowering of vapour pressure in the presence of these solutes are in the order [Given, molar mass of A = $100\ \mathrm{g\ mol^{-1}}$; B = $200\ \mathrm{g\ mol^{-1}}$; C = $10,000\ \mathrm{g\ mol^{-1}}$]

(A) $\mathrm{B} > \mathrm{C} > \mathrm{A}$
(B) $\mathrm{C} > \mathrm{B} > \mathrm{A}$
(C) $\mathrm{A} > \mathrm{B} > \mathrm{C}$
(D) $\mathrm{A} > \mathrm{C} > \mathrm{B}$

Answer: (C) $\mathrm{A} > \mathrm{B} > \mathrm{C}$ · Key from source paper

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Q131 JEE Main 2020 · 4 Sep · Shift 1 Numerical

At 300 K, the vapour pressure of a solution containing 1 mole of n -hexane and 3 moles of n -heptane is 550 mm of Hg. At the same temperature, if one more mole of n -heptane is added to this solution, the vapour pressure of the solution increases by 10 mm of Hg. What is the vapour pressure in mmHg of n - heptane in its pure state _____ ?

Numerical value type: the answer is a number.

Answer: 600. · Key from source paper

Q132 JEE Main 2020 · 4 Sep · Shift 2 Numerical

The osmotic pressure of a solution of NaCl is $0.10\ \mathrm{atm}$ and that of a glucose solution is $0.20\ \mathrm{atm}$. The osmotic pressure of a solution formed by mixing 1 L of the sodium chloride solution with 2 L of the glucose solution is $\mathrm{x} \times 10^{-3}\ \mathrm{atm}$. x is _____ (nearest integer)

Numerical value type: the answer is a number.

Answer: 167. · Key from source paper

Q133 JEE Main 2020 · 3 Sep · Shift 1 MCQ

Henry's constant (in kbar) for four gases α, β, γ and δ in water at 298 K is given below :

	α	β	γ	δ
K_H	50	2	2×10^{-5}	0.5

(density of water $= 10^3\ \mathrm{k\,gm^{-3}}$ at 298 K) This table implies that :

(A) α has the highest solubility in water at a given pressure
(B) solubility of γ at $308K$ is lower than at $298K$
(C) The pressure of a 55. 5 molal solution of δ is 250 bar
(D) The pressure of 55. 5 molal solution of γ is 1 bar.

Answer: (C) The pressure of a 55. 5 molal solution of δ is 250 bar · Key from source paper

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Q134 JEE Main 2020 · 3 Sep · Shift 2 Numerical

If $250\ \mathrm{cm}^3$of an aqueous solution containing 0.73g of a protein A is isotonic with one litre of another aqueous solution containing 1.65g of a protein B, at 298K, the ratio of the molecular masses of A and B is _____ $\times 10^{-2}$ (to the nearest integer).

Numerical value type: the answer is a number.

Answer: 177. · Key from source paper

Q135 JEE Main 2020 · 2 Sep · Shift 1 MCQ

An open beaker of water in equilibrium with water vapour is in a sealed container. When a few grams of glucose are added to the beaker of water, the rate at which water molecules :

(A) leaves the vapour increases
(B) leaves the solution increases
(C) leaves the solution decreases
(D) leaves the vapour decreases

Answer: (C) leaves the solution decreases · Checked by our team

Q136 JEE Main 2020 · 2 Sep · Shift 2 MCQ

The size of a raw mango shrinks to a much smaller size when kept in a concentrated salt solution. Which one of the following process can explain this?

(A) Osmosis
(B) Dialysis
(C) Diffusion
(D) Reverse osmosis

Answer: (A) Osmosis · Key from source paper

Q137 JEE Main 2020 · 9 Jan · Shift 1 Numerical

How much amount of NaCl should be added to 600 g of water ($\rho = 1.00$g/mL) to decrease the freezing point of water to $-0.2\ ^{o}C$? _____. (The freezing point depression constant for water = 2 K kgmol^{-1})

Numerical value type: the answer is a number.

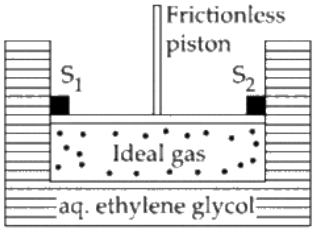
Answer: 1.74. · Key from source paper

Q138 JEE Main 2020 · 9 Jan · Shift 2 Numerical

A cylinder containing an ideal gas ($0.1\mathrm{mol}$ of $1.0\mathrm{dm}^3$) is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be _____.
(Given, $\mathrm{K_f(water)} = 2.0\mathrm{Kkg\,mol}^{-1}$, $\mathrm{R} = 0.08\mathrm{dm}^3\mathrm{atm\,K}^{-1}\mathrm{mol}^{-1}$)
(see the figure above)

Q47. A cylinder containing an ideal gas (0.1mol of 1.0dm^3) is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be _____.

$(\text{Given, } K_f(\text{water}) = 2.0\text{Kkgmol}^{-1},\ R = 0.08\text{dm}^3\text{atmK}^{-1}\text{mol}^{-1})$



Numerical value type: the answer is a number.

Answer: 2.18. · Key from source paper

Q139 JEE Main 2020 · 7 Jan · Shift 1 MCQ

At $35\ ^\circ\text{C}$, the vapour pressure of CS_2, is 512mm Hg and that of acetone is $144\ \text{mmHg}$. A solution of CS_2 in acetone has a total vapour pressure of $600\ \text{mmHg}$. The false statement amongst the following is:

(A) Raoult's law is not obeyed by this system

(B) a mixture of $100\text{mL}CS_2$ and 100mL acetone has a volume $< 200\text{mL}$

(C) CS_2 and acetone are less attracted to each other than to themselves

(D) heat must be absorbed in order to produce the solution at 35°C

Answer: (B) a mixture of $100\text{mL}CS_2$ and 100mL acetone has a volume $< 200\text{mL}$ · Key from source paper

Q140 JEE Main 2020 · 7 Jan · Shift 2 MCQ

Two open beakers one containing a solvent and the other containing a mixture of that solvent with a non volatile solute are together sealed in a container. Over time:

(A) the volume of the solution increases and the volume of the solvent decreases

(B) the volume of the solution decreases and the volume of the solvent increases

(C) the volume of the solution and the solvent does not change

(D) change and the volume of the solvent decreases the volume of the solution does not

Answer: (A) the volume of the solution increases and the volume of the solvent decreases · Key from source paper

Q141 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A solution is prepared by dissolving 0.6 g of urea (molar mass $= 60\ \text{g mol}^{-1}$) and 1.8 g of glucose (molar mass $= 180\ \text{g mol}^{-1}$) in 100 mL of water at 27^oC. The osmotic pressure of the solution is: ($R = 0.08206\ \text{L atm K}^{-1}\ \text{mol}^{-1}$)

(A) 8.2 atm
(B) 2.46 atm
(C) 4.92 atm
(D) 1.64 atm

Answer: (C) 4.92 atm · Key from source paper

Q142 JEE Main 2019 · 10 Apr · Shift 1 MCQ

At room temperature, a dilute solution of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mm Hg , lowering of vapour pressure will be:
(molar mass of urea $= 60\ \text{g mol}^{-1}$)

(A) $0.028\ \text{mm Hg}$
(B) $0.027\ \text{mm Hg}$
(C) $0.031\ \text{mm Hg}$
(D) $0.017\ \text{mm Hg}$

Answer: (D) $0.017\ \text{mm Hg}$ · Key from source paper

Q143 JEE Main 2019 · 10 Apr · Shift 2 MCQ

1 g of a non-volatile non-electrolyte solute is dissolved in 100 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1: 5. The ratio of the elevation in their boiling points, $\frac{\Delta T_b A}{\Delta T_b B}$, is: (assuming they have the same molar mass)

(A) $10 : 1$
(B) $1 : 5$
(C) $1 : 0.2$
(D) $5 : 1$

Answer: (B) $1 : 5$ · Key from source paper

Q144 JEE Main 2019 · 9 Apr · Shift 1 MCQ

The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution 0.01 M BaCl_2 in water. Assuming complete dissociation of the given ionic compounds in water, the concentration of XY (in mol L^{-1}) in solution is

(A) 4×10^{-2}
(B) 16×10^{-4}
(C) 4×10^{-4}
(D) 6×10^{-2}

Answer: (D) 6×10^{-2} · Key from source paper

Q145 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Liquid M and liquid N form an ideal solution. The vapour pressures of pure liquids M and N are 450 and 700 mmHg, respectively, at the same temperature. Then correct statements is:
(x_M = Mole fraction of 'M' in solution; x_N = Mole fraction of 'N'in solution; y_M = Mole fraction of 'M' in vapour phase; y_N = Mole fraction of 'N' in vapour phase;)

(A) $\frac{x_M}{x_N} > \frac{y_M}{y_N}$

(B) $\frac{x_M}{x_N} = \frac{y_M}{y_N}$

(C) $\frac{x_M}{x_N} < \frac{y_M}{y_N}$

(D) $(x_M - y_M) < (x_N - y_N)$

Answer: (A) $\frac{x_M}{x_N} > \frac{y_M}{y_N}$ · Key from source paper

Q146 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Molal depression constant for a solvent is 4.0 $K\ kg\ mol^{-1}$. The depression in the freezing point of the solvent for 0.03 $mol\ kg^{-1}$ solution of K_2SO_4 is: (Assume complete dissociation of the electrolyte)

(A) 0.36 K

(B) 0.24 K

(C) 0.18 K

(D) 0.12 K

Answer: (A) 0.36 K · Key from source paper

Q147 JEE Main 2019 · 8 Apr · Shift 1 MCQ

The vapour pressures of pure liquids A and Bare 400 and 600 mm Hg respectively at 298 K. On mixing the two liquids, the sum of their volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fractions of components A and B in the vapour phase, respectively are

(A) 500 mm Hg, 0.5, 0.5

(B) 450 mm Hg, 0.4, 0.6

(C) 450 mm Hg, 0.5, 0.5

(D) 500 mm Hg, 0.4, 0.6

Answer: (D) 500 mm Hg, 0.4, 0.6 · Key from source paper

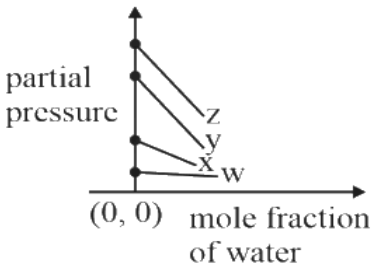
Q148 JEE Main 2019 · 8 Apr · Shift 2 MCQ

For the solution of the gases w, x, y and z in water at 298 K, the Henry's law constants (K_H) are 0.5, 2, 35 and 40 kbar, respectively. The correct plot for the given data is:

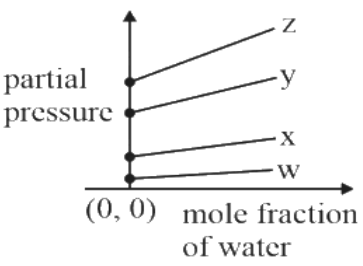
(see the figure above)

Q45. For the solution of the gases w, x, y and z in water at 298 K, the Henry's law constants (K_H) are 0.5, 2, 35 and 40 kbar, respectively. The correct plot for the given data is:

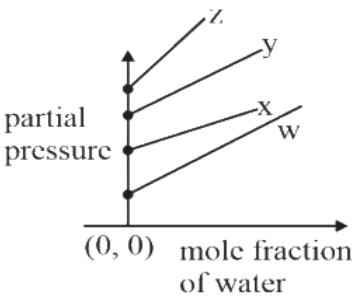
(1)



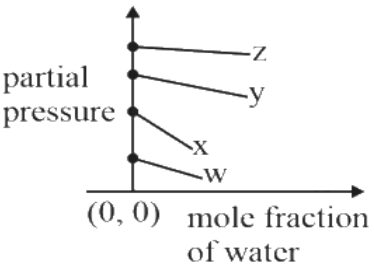
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q149 JEE Main 2019 · 12 Jan · Shift 1 MCQ

The freezing point of a 4% aqueous solution of X is equal to the freezing point of a 12% aqueous solution of Y . If the molecular weight of X is A, then the molecular weight of Y will be

(A) 2A

(B) A

(C) 4A

(D) 3A

Answer: (D) 3A · Key from source paper

Q150 JEE Main 2019 · 12 Jan · Shift 2 MCQ

Molecules of benzoic acid ($C_6H_5\ COOH$) dimerise in 30 g of benzene. ' w ' g of benzoic acid shows a depression in freezing point equal to 2 K. If the percentage association of the acid to form dimer in the solution is 80, then w is: (Given that K_f = 5 $Kmol^{-1}$, molar mass of benzoic acid = 122 $gmol^{-1}$)

(A) $1.0g$
(B) $2.4g$
(C) $1.8g$
(D) $1.5g$

Answer: (B) $2.4g$ · Key from source paper

Q151 JEE Main 2019 · 11 Jan · Shift 1 MCQ

The freezing point of a diluted milk sample is found to be -0.2°C, while it should have been -0.5°C for pure milk. How much water has been added to pure milk to make the diluted sample?

(A) 1 cup of water to 2 cups of pure milk
(B) 3 cups of water to 2 cups of pure milk
(C) 1 cup of water to 3 cups of pure milk
(D) 2 cups of water to 3 cups of pure milk

Answer: (B) 3 cups of water to 2 cups of pure milk · Key from source paper

Q152 JEE Main 2019 · 11 Jan · Shift 2 MCQ

K_2HgI_4 is 40% ionised in aqueous solution. The value of its van't Hoff factor (i) is:

(A) 1.6
(B) 1.8
(C) 20
(D) 22

Answer: (B) 1.8 · Key from source paper

Q153 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Liquids A and B form an ideal solution in the entire composition range. At 350K, the vapour pressure of pure A and pure B are 7×10^3 Pa and 12×10^3 Pa , respectively. The composition of the vapour in equilibrium with a solution containing 40 mole percent of A at this temperature is:

(A) $x_A = 0.4; x_B = 0.6$
(B) $x_A = 0.76; x_B = 0.24$
(C) $x_A = 0.28; x_B = 0.72$
(D) $x_A = 0.37; x_B = 0.63$

Answer: (C) $x_A = 0.28; x_B = 0.72$ · Key from source paper

Q154 JEE Main 2019 · 10 Jan · Shift 2 MCQ

The elevation in boiling point for 1 molal solution of glucose is $2\ \mathrm{K}$. The depression in freezing point for 2 molal solution of glucose in the same solvent is $2\ \mathrm{K}$. The relation between $\mathrm{K_b}$ and $\mathrm{K_f}$ is:

(A) $\mathrm{K_b} = 2\ \mathrm{K_f}$
(B) $\mathrm{K_b} = 1.5\ \mathrm{K_f}$
(C) $\mathrm{K_b} = \mathrm{K_f}$
(D) $\mathrm{K_b} = 0.5\ \mathrm{K_f}$

Answer: (A) $\mathrm{K_b} = 2\ \mathrm{K_f}$ · Key from source paper

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Q155 JEE Main 2019 · 9 Jan · Shift 1 MCQ

Which one of the following statements regarding Henry's law is not correct?

(A) Different gases have different K_H (Henry's law constant) values at the same temperature
(B) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution
(C) Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids
(D) The value of K_H increases with increase of temperature and K_H is function of the nature of the gas

Answer: (C) Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids · Key from source paper

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Q156 JEE Main 2019 · 9 Jan · Shift 2 MCQ

A solution containing $62\ \mathrm{g}$ ethylene glycol in $250\ \mathrm{g}$ water is cooled to $-10^{o}C$. If $\mathrm{K_f}$ for water is $1.86\ \mathrm{K\ kg\ mol^{-1}}$, the amount of water (in g) separated as ice is:

(A) 48
(B) 64
(C) 16
(D) 32

Answer: (B) 64 · Key from source paper

Q157 JEE Main 2018 · 16 Apr · Online MCQ

The mass of a non-volatile, non-electrolyte solute (molar mass $= 50\ \mathrm{g\ mol^{-1}}$) needed to be dissolved in 114 g octane to reduce its vapour pressure by $75\ \%$, is:

(A) $37.5\ g$
(B) $75\ g$
(C) $150\ \mathrm{g}$
(D) $50\ \mathrm{g}$

Answer: (C) $150\ \mathrm{g}$ · Key from source paper

Q158 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Two 5 molal solutions are prepared by dissolving a non-electrolyte, non-volatile solute separately in the solvents X and Y. The molecular weights of the solvents are M_X and M_Y, respectively where $M_X = \frac{3}{4}M_Y$. The relative lowering of vapour pressure of the solution in X is " m " times that of the solution in Y. Given that the number of moles of solute is very small in comparison to that of solvent, the value of "m" is:

(A) $\frac{3}{4}$

(B) $\frac{1}{2}$

(C) $\frac{1}{4}$

(D) $\frac{4}{3}$

Answer: (A) $\frac{3}{4}$ · Key from source paper

Q159 JEE Main 2018 · 8 Apr · Offline MCQ

For 1 molal aqueous solution of the following compounds, which one will show the highest freezing point?

(A) $[Co\,(H_2O)_3\,Cl_3].3H_2O$

(B) $[Co\,(H_2O)_6]\,Cl_3$

(C) $[Co\,(H_2O)_5\,Cl]\,Cl_2.H_2O$

(D) $[Co\,(H_2O)_4\,Cl_2]\,Cl.2H_2O$

Answer: (A) $[Co\,(H_2O)_3\,Cl_3].3H_2O$ · Key from source paper

Q160 JEE Main 2017 · 9 Apr · Online MCQ

A solution is prepared by mixing 8.5 g of CH_2Cl_2 and 11.95 g of $CHCl_3$. If vapour pressure of CH_2Cl_2 and $CHCl_3$ at 298 K are 415 and 200 mm Hg respectively, the mole fraction of $CHCl_3$ in vapour form is:

(Molar mass of Cl = $35.5\ g\,mol^{-1}$)

(A) 0.162

(B) 0.675

(C) 0.325

(D) 0.486

Answer: (C) 0.325 · Key from source paper

Q161 JEE Main 2017 · 8 Apr · Online MCQ

5g of Na_2SO_4 was dissolved in x g of H_2O. The change in freezing point was found to be $3.82^{\circ}C$. If Na_2SO_4 is 81.5% ionised, the value of x (K_f for water = $1.86^{\circ}C$ kg mol^{-1}) is approximately:

(molar mass of S = 32 g mol^{-1} and that of Na = 23 g mol^{-1})

(A) 25 g
(B) 65 g
(C) 15 g
(D) 45 g

Answer: (D) 45 g · Key from source paper

Q162 JEE Main 2017 · 2 Apr · Offline MCQ

The freezing point of benzene decreases by $0.45^{\circ}\mathrm{C}$ on adding $0.2\,\mathrm{g}$ of acetic acid to $20\,\mathrm{g}$ of benzene. If acetic acid associates to form a dimer in benzene, then what is the percentage association of acetic acid in benzene?
$\mathrm{K_f}$ for benzene $= 5.12\ \mathrm{K\ kg\ mol^{-1}}$

(A) 80.4%
(B) 74.6%
(C) 94.6%
(D) 64.6%

Answer: (C) 94.6% · Key from source paper

Q163 JEE Main 2016 · 10 Apr · Online MCQ

An aqueous solution of a salt $\mathrm{MX_2}$ at certain temperature has a Van't Hoff factor of 2. What is the degree of dissociation for this solution of the salt?

(A) 0.50
(B) 0.33
(C) 0.67
(D) 0.80

Answer: (A) 0.50 · Key from source paper

Q164 JEE Main 2016 · 9 Apr · Online MCQ

The solubility of $\mathrm{N_2}$ in water at 300 K and 500 torr partial pressure is 0.01 g $\mathrm{L^{-1}}$. The solubility (in g $\mathrm{L^{-1}}$) at 750 torr partial pressure is:

(A) 0.0075
(B) 0.005
(C) 0.02
(D) 0.015

Answer: (D) 0.015 · Key from source paper

Q165 JEE Main 2016 · 3 Apr · Offline MCQ

18 g glucose ($C_6H_{12}O_6$) is added to 178.2 g water. The vapour pressure of water (in torr) for this aqueous solution is:

(A) 752.4
(B) 759.0
(C) 7.6
(D) 76.0

Answer: (A) 752.4 · Key from source paper

Q166 JEE Main 2015 · 11 Apr · Online MCQ

Determination of the molar mass of acetic acid in benzene using freezing point depression is affected by:

(A) Complex formation
(B) Association
(C) Partial ionization
(D) Dissociation

Answer: (B) Association · Key from source paper

Q167 JEE Main 2015 · 10 Apr · Online MCQ

A solution at $20^\circ C$ is composed of 1.5 mol of benzene and 3.5 mol of toluene. If the vapour pressure of pure benzene and pure toluene at this temperature are 74.7 torr and 22.3 torr respectively, then the total vapour pressure of the solution and the benzene mole fraction in equilibrium with it will be, respectively:

(A) 30.5 torr and 0.389
(B) 35.0 torr and 0.480
(C) 38.0 torr and 0.589
(D) 35.8 torr and 0.280

Answer: (C) 38.0 torr and 0.589 · Key from source paper

Q168 JEE Main 2015 · 4 Apr · Offline MCQ

The vapour pressure of acetone at $20^\circ C$ is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at $20^\circ C$, its vapour pressure was 183 torr. The molar mass (g mol^{-1}) of the substance is:

(A) 488
(B) 32
(C) 64
(D) 128

Answer: (C) 64 · Key from source paper

Q169 JEE Main 2014 · 19 Apr · Online MCQ

For an ideal solution of two components A & B, which of the following is true?

(A) $\Delta H_{\text{mixing}} > 0$ (zero)
(B) A $-$ B interaction is stronger than A $-$ A & B $-$ B. interactions
(C) A $-$ A, B $-$ B & A $-$ B interactions are identical
(D) $\Delta H_{\text{mixing}} < 0$ (zero)

Answer: (C) A $-$ A, B $-$ B & A $-$ B interactions are identical · Key from source paper

Q170 JEE Main 2014 · 19 Apr · Online MCQ

The observed osmotic pressure for a $0.10\ \text{M}$ solution of $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ at 25°C is $10.8\ \text{atm}$. The expected and experimental (observed) values of Van't Hoff factor 'i' will be respectively;
$(\text{R} = 0.082\ \text{L atm K}^{-1}\ \text{mol}^{-1})$

(A) 4 and 4.00
(B) 3 and 5.42
(C) 5 and 4.42
(D) 5 and 3.42

Answer: (C) 5 and 4.42 · Key from source paper

Q171 JEE Main 2014 · 6 Apr · Offline MCQ

Consider separate solutions of 0.500 M $\text{C}_2\text{H}_5\ \text{OH}$ (aq), 0.100 M $\text{Mg}_3\ (\text{PO}_4)_2$ (aq), 0.250 M KBr (aq) and 0.125 M $\text{Na}_3\ \text{PO}_4$ (aq) at 25°C. Which statement is true about these solutions, assuming all salts to be strong electrolytes?

(A) They all have the same osmotic pressure.
(B) 0.100 M $\text{Mg}_3(\text{PO}_4)_2$ (aq) has the highest osmotic pressure.
(C) 0.125 M $\text{Na}_3\ \text{PO}_4$ (aq) has the highest osmotic pressure.
(D) 0.500 M $\text{C}_2\text{H}_5\ \text{OH}$ (aq) has the highest osmotic pressure.

Answer: (A) They all have the same osmotic pressure. · Key from source paper

Q172 JEE Main 2013 · 25 Apr · Online MCQ

How many grams of methyl alcohol should be added to 10 litre tank of water to prevent its freezing at 268 K ? (K_f for water is 1.86 K kg mol^{-1})

(A) 880.07 g
(B) 899.04 g
(C) 886.02 g
(D) 868.06 g

Answer: (C) 886.02 g · Checked by our team

Q173 JEE Main 2013 · 23 Apr · Online MCQ

Vapour pressure of pure benzene is 119 torr and that of toluene is 37.0 torr at the same temperature. Mole fraction of toluene in vapour phase which is in equilibrium with a solution of benzene and toluene having a mole fraction of toluene 0.50, will be :

(A) 0.137
(B) 0.237
(C) 0.435
(D) 0.205

Answer: (B) 0.237 · Key from source paper

Q174 JEE Main 2013 · 22 Apr · Online MCQ

A molecule M associates in a given solvent according to the equation $\mathrm{M} \rightleftharpoons (\mathrm{M})_n$. For a certain concentration of M, the van't Hoff factor was found to be 0.9 and the fraction of associated molecules was 0.2. The value of n is:

(A) 3
(B) 5
(C) 2
(D) 4

Answer: (C) 2 · Key from source paper

Q175 JEE Main 2013 · 9 Apr · Online MCQ

12 g of a nonvolatile solute dissolved in 108 g of water produces the relative lowering of vapour pressure of 0.1. The molecular mass of the solute is :

(A) 80
(B) 60
(C) 20
(D) 40

Answer: (C) 20 · Key from source paper

Q176 AIEEE 2012 · 26 May · Online MCQ

The freezing point of a 1.00 m aqueous solution of HF is found to be $-1.91^{\circ}\mathrm{C}$. The freezing point constant of water, K_f is 1.86 K kg mol^{-1}. The percentage dissociation of HF at this concentration is

(A) 30%
(B) 10%
(C) 5.2%
(D) 2.7%

Answer: (D) 2.7% · Key from source paper

Q177 AIEEE 2012 · 19 May · Online MCQ

Liquids A and B form an ideal solution. At $30^{\circ}\mathrm{C}$, the total vapour pressure of a solution containing 1 mol of A and 2 mol of B is $250\ \mathrm{mmHg}$. The total vapour pressure becomes $300\ \mathrm{mmHg}$ when 1 more mol of A is added to the first solution. The vapour pressures of pure A and B at the same temperature are

(A) $150, 450\mathrm{mmHg}$
(B) $125, 150\ \mathrm{mmHg}$
(C) $450, 150\ \mathrm{mmHg}$
(D) $250, 300\ \mathrm{mmHg}$

Answer: (C) $450, 150\ \mathrm{mmHg}$ · Key from source paper

Q178 AIEEE 2012 · 12 May · Online MCQ

A solution containing 0.85 g of $\mathrm{ZnCl_2}$ in 125.0 g of water freezes at $-0.23^{\circ}\mathrm{C}$. The apparent degree of dissociation of the salt is (K_f for water $= 1.86\ \mathrm{K\,kg\,mol^{-1}}$, atomic mass: Zn $= 65.3$ and Cl $= 35.5$)

(A) 1.36%
(B) 73.5%
(C) 7.35%
(D) 2.47%

Answer: (B) 73.5% · Key from source paper

Q179 AIEEE 2012 · Offline MCQ

$\mathrm{K_f}$ for water is $1.86\ \mathrm{K\ kg\ mol^{-1}}$. If your automobile radiator holds $1.0\ \mathrm{kg}$ of water, how many grams of ethylene glycol ($\mathrm{C_2H_6O_2}$) must you add to get the freezing point of the solution lowered to $-2.8^{\circ}\mathrm{C}$?

EdLoop JEE

(A) $72\ \text{g}$
(B) $93\ \text{g}$
(C) $39\ \text{g}$
(D) $27\ \text{g}$

Answer: (B) $93\ \text{g}$ · Key from source paper

Q180 AIEEE 2011 MCQ

The degree of dissociation (α) of a weak electrolyte, A_xB_y is related to van't Hoff factor (i) by the expression:

(A) $\alpha = \frac{i-1}{x+y+1}$
(B) $\alpha = \frac{x+y-1}{i-1}$
(C) $\alpha = \frac{x+y+1}{i-1}$
(D) $\alpha = \frac{i-1}{(x+y-1)}$

Answer: (D) $\alpha = \frac{i-1}{(x+y-1)}$ · Key from source paper

Q181 AIEEE 2011 MCQ

Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at -6°C will be : [K_f for water $= 1.86\ \text{K kg mol}^{-1}$, and molar mass of ethylene glycol $= 62\ \text{g mol}^{-1}$)

(A) 204.30 g
(B) 400.00 g
(C) 304.60 g
(D) 804.32 g

Answer: (D) 804.32 g · Key from source paper

Q182 AIEEE 2010 MCQ

If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water (ΔT_f), when 0.01 mol of sodium sulphate is dissolved in 1 kg of water, is ($\text{K}_\text{f} = 1.86\ \text{K kg mol}^{-1}$)

(A) 0.0372 K
(B) 0.0558 K
(C) 0.0744 K
(D) 0.0186 K

Answer: (B) 0.0558 K · Key from source paper

EdLoop JEE

Q183 AIEEE 2010 MCQ

On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressures of the two liquid components (heptane and octane) are 105kPa and 45kPa respectively. Vapour pressure of the solution obtained by mixing 25.0 g of heptane and 35 g of octane will be (molar mass of heptane = $100\ \mathrm{g\ mol^{-1}}$ an dof octane = $114\ \mathrm{g\ mol^{-1}}$).

(A) 72.0kPa
(B) 36.1kPa
(C) 96.2kPa
(D) 144.5kPa

Answer: (A) 72.0kPa · Key from source paper

Q184 AIEEE 2009 MCQ

Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mmHg. At the same temperature, if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mmHg. Vapour pressure (in mmHg) of X and Y in their pure states will be, respectively :

(A) 200 and 300
(B) 300 and 400
(C) 400 and 600
(D) 500 and 600

Answer: (C) 400 and 600 · Key from source paper

Q185 AIEEE 2009 MCQ

A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the following statements is correct regarding the behaviour of the solution?

(A) The solution formed is an ideal solution
(B) The solution is non-ideal, showing +ve deviation from Raoult's law.
(C) The solution is non-ideal, showing -ve deviation from Raoult's law.
(D) n-heptane shows +ve deviation while ethanol shows -ve deviation from Raoult's law.

Answer: (B) The solution is non-ideal, showing +ve deviation from Raoult's law. · Key from source paper

Q186 AIEEE 2008 MCQ

At $80^{\circ}\mathrm{C}$, the vapour pressure of pure liquid ' A ' is $520\ \mathrm{mmHg}$ and that of pure liquid ' B ' is $1000\ \mathrm{mm\ Hg}$. If a mixture solution of ' A ' and ' B ' boils at $80^{\circ}\mathrm{C}$ and 1 atm pressure, the amount of ' A ' in the mixture is ($1\ \mathrm{atm} = 760\ \mathrm{mmHg}$)

(A) 52 mol percent
(B) 34 mol percent
(C) 48 mol percent
(D) 50 mol percent

Answer: (D) 50 mol percent · Key from source paper

Q187 AIEEE 2008 MCQ

The vapour pressure of water at $20^{\circ}\mathrm{C}$ is $17.5\ \mathrm{mmHg}$. If 18 g of glucose ($\mathrm{C_6H_{12}O_6}$) is added to 178.2 g of water at $20^{\circ}\mathrm{C}$, the vapour pressure of the resulting solution will be

(A) $17.675\ \mathrm{mmHg}$
(B) $15.750\ \mathrm{mmHg}$
(C) $16.500\ \mathrm{mmHg}$
(D) $17.325\ \mathrm{mmHg}$

Answer: (D) $17.325\ \mathrm{mmHg}$ · Key from source paper

Q188 AIEEE 2007 MCQ

A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60 $\mathrm{g\ mol^{-1}}$) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 $\mathrm{g\ cm^{-3}}$, molar mass of the substance will be

(A) 90.0 $\mathrm{g\ mol^{-1}}$
(B) 115.0 $\mathrm{g\ mol^{-1}}$
(C) 105.0 $\mathrm{g\ mol^{-1}}$
(D) 210.0 $\mathrm{g\ mol^{-1}}$

Answer: (D) 210.0 $\mathrm{g\ mol^{-1}}$ · Key from source paper

Q189 AIEEE 2007 MCQ

A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be

(A) 350
(B) 300
(C) 700
(D) 360

Answer: (A) 350 · Key from source paper

Q190 AIEEE 2006 MCQ

18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g of water. The vapour pressure of water for this aqueous solution at $100^\circ C$ is

(A) 759.00 Torr
(B) 7.60 Torr
(C) 76.00 Torr
(D) 752.40 Torr

Answer: (D) 752.40 Torr · Key from source paper

Q191 AIEEE 2005 MCQ

Benzene and toluene form nearly ideal solutions. At $20^\circ C$, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at $20^\circ C$ for a solution containing 78 g of benzene and 46 g of toluene is in torr is

(A) 50
(B) 25
(C) 37.5
(D) 53.5

Answer: (A) 50 · Key from source paper

Q192 AIEEE 2005 MCQ

If α is the degree of dissociation of Na_2SO_4, the vant Hoff's factor (i) used for calculating the molecular mass is

(A) $1+\alpha$
(B) $1-\alpha$
(C) $1+2\alpha$
(D) $1-2\alpha$

Answer: (C) $1+2\alpha$ · Key from source paper

Q193 AIEEE 2005 MCQ

Equimolar solutions in the same solvent have

(A) Same boiling point but different freezing point
(B) Same freezing point but different boiling point
(C) Same boiling and same freezing points
(D) Different boiling and different freezing points

Answer: (C) Same boiling and same freezing points · Key from source paper

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Q194 AIEEE 2004 MCQ

Which one of the following aqueous solutions will exhibit highest boiling point?

(A) $0.01\mathrm{M}\ \mathrm{Na_2SO_4}$
(B) $0.015\mathrm{M}$ glucose
(C) $0.015\mathrm{M}$ urea
(D) $0.01\mathrm{M}\ \mathrm{KNO_3}$

Answer: (A) $0.01\mathrm{M}\ \mathrm{Na_2SO_4}$ · Key from source paper

Q195 AIEEE 2004 MCQ

Which of the following liquid pairs shows a positive deviation from Raoult's law?

(A) Water - hydrochloric acid
(B) Acetone - chloroform
(C) Water - nitric acid
(D) Benzene - methanol

Answer: (D) Benzene - methanol · Key from source paper

Q196 AIEEE 2004 MCQ

Which one of the following statements is false?

(A) Raoult's law states that the vapour pressure of a components over a solution is proportional to its mole fraction
(B) Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression
(C) The correct order of osmotic pressure for 0.01M aqueous solution of each compound is $\mathrm{BaCl_2} > \mathrm{KCl} > \mathrm{CH_3COOH} >$ sucrose
(D) The osmotic pressure $(\pi) = \mathrm{MRT}$, where M is the molarity of the solution

Answer: (B) Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression · Key from source paper

Q197 AIEEE 2003 MCQ

If liquids A and B form an ideal solution

(A) the entropy of mixing is zero
(B) the free energy of mixing is zero
(C) the free energy as well as the entropy of mixing are each zero
(D) the enthalpy of mixing is zero

Answer: (D) the enthalpy of mixing is zero · Key from source paper

Q198 AIEEE 2003 MCQ

In a 0.2 molal aqueous solution of a weak acid HX the degree of ionization is 0.3. Taking k_f for water as 1.85 , the freezing point of the solution will be nearest to

(A) $-0.360^\circ C$
(B) $-0.260^\circ C$
(C) $+0.480^\circ C$
(D) $-0.480^\circ C$

Answer: (D) $-0.480^\circ C$ · Key from source paper

Q199 AIEEE 2002 MCQ

Freezing point of an aqueous solution is $(-0.186)^\circ C$. Elevation of boiling point of the same solution is $K_b = 0.512^\circ C$, $K_f = 1.86^\circ C$, find the increase in boiling point.

(A) $0.186^\circ C$
(B) $0.0512^\circ C$
(C) $0.092^\circ C$
(D) $0.2372^\circ C$

Answer: (B) $0.0512^\circ C$ · Key from source paper

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