YAKEEN NEET 2.0

2026

Physical Chemistry

SOLUTIONS

Complete PDF of all Questions

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QUESTION

Statement 1 : Amalgam of mercury with sodium is an example of solid solutions.

Statement 2: Mercury is solvent and sodium is solute in the solution.

QUESTION

If dissolution process is endothermic,

A Cooling takes place

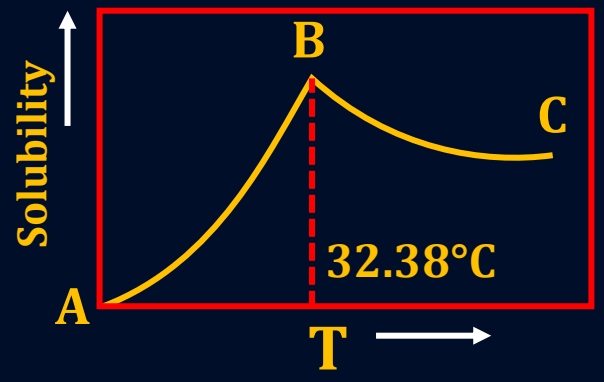
B Solubility increases on increasing temperature

C Both of the above are correct

D None of the above are correct

QUESTION

Variation of solubility of $Na_2SO_4.10H_2O$ is shown. Thus,



A Upto point B(at 32.38°C), the process is endothermic as solid present in equilibrium with saturated solution of Na_2SO_4 has the formula $Na_2SO_4.10H_2O$

B 32.38°C is the transition temperature of $Na_2SO_4.10H_2O$

C After transition point is attained, dissolution process is exothermic as Na^+ and SO_4^{2-} are hydrated.

D All of the above are correct

QUESTION

Why aquatic animals fails more comfortable in cold water?

QUESTION

Low concentration of oxygen in blood and tissues of people living at high altitude is due to

A. Low temperature

B. Low atmospheric pressure

C. High atmospheric pressure

D. Both low temperature and high pressure

QUESTION – (NEET 2024)

The Henry's law constant (K_H) values of three gases (A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order:

A. B > A > C

B. B > C > A

C. A > C > B

D. A > B > C

QUESTION

The solubility of gases in liquids:

A. Increases with increase in pressure and temperature

B. Decreases with increase in pressure and temperature

C. Increases with increase in pressure and decrease in temperature

D. Decreases with increase in pressure and increase in temperature

QUESTION

Some of the following gases are soluble in water due to formation of their ions

I : SO_2; II: NH_3; III : HCl; IV : CH_4; V: H_2

Water insoluble gases can be:

A. I, IV, V

B. I, V

C. I, II, III

D. IV, V

QUESTION

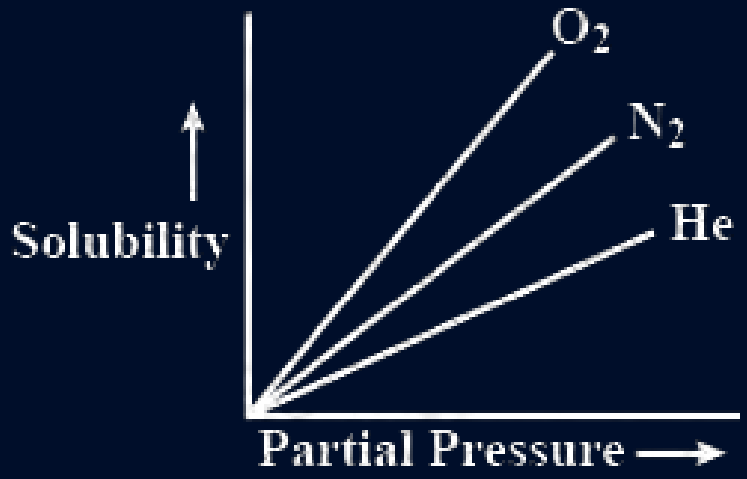
Molar solubility of helium, nitrogen and oxygen are plotted against partial pressure of the gas at constant temperature.
Henry's law constant for these gases will lie in following sequence?

A $O_2 > N_2 > He$

B $O_2 < N_2 < He$

C $O_2 = N_2 = He$

D $O_2 > N_2 < He$



QUESTION

It is found that Henry's law constant (K_H) is the function of the nature of the gas, thus,

A. Higher the value of K_H at a given pressure, the lower is the solubility of the gas.

B. Higher the temperature of the gas, higher the vlaue of K_H, hence lower the solubility

C. Both of the above are correct

D. None of the above is correct

QUESTION

For O_2 and N_2, Henry's law constants are given at different temperature. Thus,

Gas	Temperature/K	K_H/kbar
N_2	293	76.5
N_2	303	88.5
O_2	293	35
O_2	303	47

A Solubility of gases decreases with increase in temperature

B When dissolved, the gas molecules are present in liquid phase and the process of dissolution can be considered similar to condensation in which heat is evolved ($\Delta H < 0$)

C Aquatic species are more comfortable in cold water rather than in warm water.

D All of the above are correct

QUESTION

Partial pressure of ethane over sat, solution containing 6.56×10^{-2} g of ethane is 1 bar. If solution contains 5×10^{-2} g of ethane, then what shall be partial pressure of gas?

QUESTION

H_2S, a toxic gas with rotten egg like smell, is used for the quantitative analysis. If the solubility of H_2S in water at STP is 0.2 m, then Henry's law constant for H_2S in water at 273 K is _____.

A $3.6 \times 10_8$ Pa

B $5.0 \times 10_8$ Pa

C 5.0×10^5 Pa

D 2.78×10^7 Pa

QUESTION (JEE MAINS -2016)

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

A 0.0075

B 0.005

C 0.02

D 0.015

QUESTION

The Henry's law constant for the solubility of N_2 gas in water at 298 K is 1×10^5 atm. The mole fraction of N_2 in air 0.8. The number of mole of N_2 from air dissolved in 10 moles of water at 298 K at 5 atm pressure is:

A 4×10^{-4}

B 4×10^{-5}

C 5×10^{-4}

D 4×10^{-6}

QUESTION (JEE MAINS 9th Jan, 1st shift-2019)

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 value of KH increases with increase of temperature and K_H is function of the nature of the gas

C The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution.

D Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids

QUESTION (JEE MAINS 3rd Sept, 1st shift-2020)

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

Gas	α	β	γ	δ
K_H	50	2	2×10^{-5}	0.5

(Density of water = 10^3 kg m^{-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 308 K is lower than at 298 K

C. The pressure of a 55.5 molal solution of γ is 1 bar

D. The pressure of a 55.5 molal solution of δ is 250 bar

QUESTION – (NCERT Exemplar)

On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?

A. Sugar crystals in cold water.

B. Sugar crystals in hot water.

C. Powdered sugar in cold water.

D. Powdered sugar in hot water.

QUESTION – (NCERT Exemplar)

A beaker contains a solution of substance 'A'. Precipitation of substance 'A' takes place when small amount of 'A' is added to the solution. The solution is _____.

A. Saturated

B. Supersaturated

C. Unsaturated

D. Concentrated

QUESTION – (NCERT Exemplar)

Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon _____.

A Temperature

B Nature of solute

C Pressure

D Nature of solvent

QUESTION* – (NCERT Exemplar)

Which of the following factor (s) affect the solubility of a gaseous solute in the fixed volume of liquid solvent?

(a) nature of solute (b) temperature (c) pressure

A (a) and (c) at constant T

B (a) and (b) at constant P

C (b) and (c) only

D (c) only

QUESTION – (NCERT Exemplar)

Match the items given in Column I with the type of solutions given in Column II.

Column I	Column II
(i) Soda water	(a) A solution of gas in solid
(ii) Sugar solution	(b) A solution of gas in gas
(iii) German silver	(c) A solution of solid in liquid
(iv) Air	(d) A solution of solid in solid
(v) Hydrogen gas in palladium	(e) A solution of gas in liquid
	(f) A solution of liquid in solid

QUESTION

Tea is sipped from saucer when it is hot?

QUESTION

Why is bottle of liquid NH_3 is cooled before opening?

QUESTION

Among 1 M sucrose and 1 M K_3PO_4 aqueous solution which has higher vapour pressure and why?

QUESTION

Among 1 M sucrose and 1 M K_3PO_4 aqueous solution which has higher vapour pressure and why?

QUESTION

The vapor pressure of water depends upon

A Surface area of container

B Volume of container

C Temperature

D All

QUESTION

Addition of a non-volatile solute in a volatile ideal solvent

A. Increases the vapor pressure of the solvent

B. Decreases the vapor pressure of the solvent

C. Decreases the boiling point of the solvent

D. Increases the freezing point of the solvent

QUESTION – (AIIMS 2018, 26 May)

Assertion (A): When one solvent mixed with other solvent, vapour pressure of one increase and other decreases.

Reason (R): When any solute is added into solvent, vapour pressure of solvent decreases.

A. If both assertion and reason are correct and reason is correct explanation of assertion.

B. If both assertion and reason are correct but reason is not correct explanation of assertion.

C. If Assertion is correct but reason is incorrect.

D. If both the assertion and reason are incorrect.

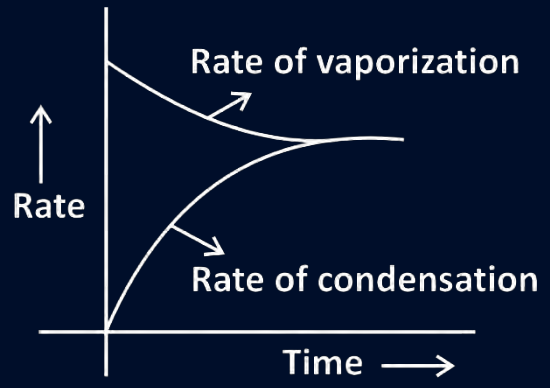
QUESTION

Why pressure cooker reduces cooking time?

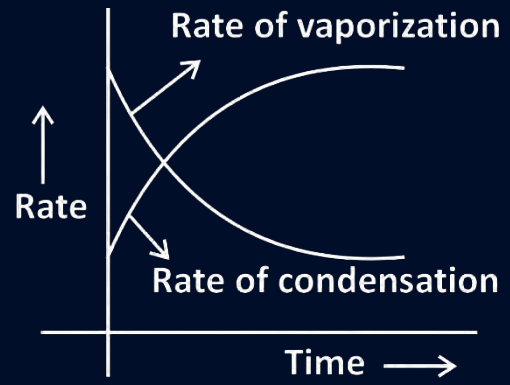
QUESTION

Which of the following plots correctly representing the variation in rate of evaporation and rate of condensation with time? (for a liquid in a closed container)

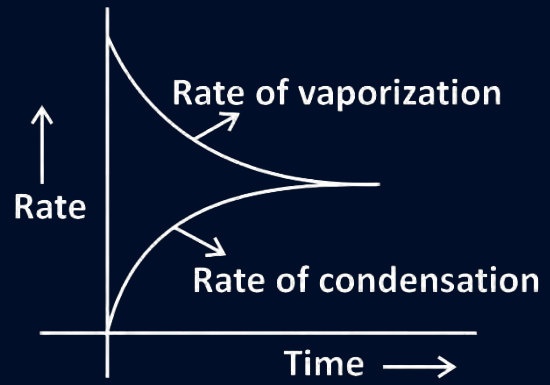
A



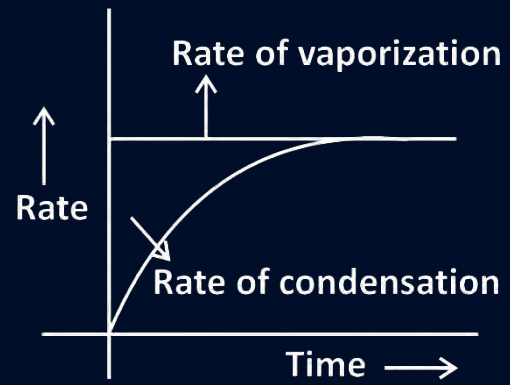
B



C



D



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QUESTION (M)

The equivalent weight of potash alum ($K_2SO_4.Al_2(SO_4)_3.24H_2O$) is

A M

B $\frac{M}{2}$

C $\frac{M}{6}$

D $\frac{M}{8}$

QUESTION (M)

Match the reactions given in column I with their respective oxidant/reductant given in column II.

	Column-I Reaction and substance acting as oxidant or reductant		Column-II Oxidant and reductant
(A)	$3I_2 + 6NaOH \rightarrow NaIO_3 + 5NaI + 3H_2O$ (I_2 acts as)	(p)	None act as oxidant or reductant
(B)	$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4$ and 2NaCl $BaCl_2$ acts as	(q)	Reductant
(C)	$AlCl_3 + 3Na \rightarrow 3NaCl + Al$ $AlCl_3$ acts as	(r)	Both act as oxidant and reductant
(D)	$SO_2 + 2H_2S \rightarrow 3S + H_2O$ H_2S acts as	(s)	Oxidant

QUESTION (M)

The equivalent weight of H_2SO_4 in the following reaction is

$$Na_2Cr_2O_7 + 3SO_2 + H_2SO_4 \longrightarrow Na_2SO_4 + Cr_2(SO_4)_3 + H_2O$$

A. 98

B. $\frac{98}{6}$

C. $\frac{98}{2}$

D. $\frac{98}{8}$

QUESTION (M)

Using stock notation, represent the following compounds:

a. $HAUCl_4$

b. Tl_2O

c. FeO

d. Fe_2O_3

e. CuI

f. CuO

g. MnO

h. MnO_2

QUESTION

An aqueous solution is 1 molal in KI which of the following will increase the vapor pressure?

A. Addition of NaCl

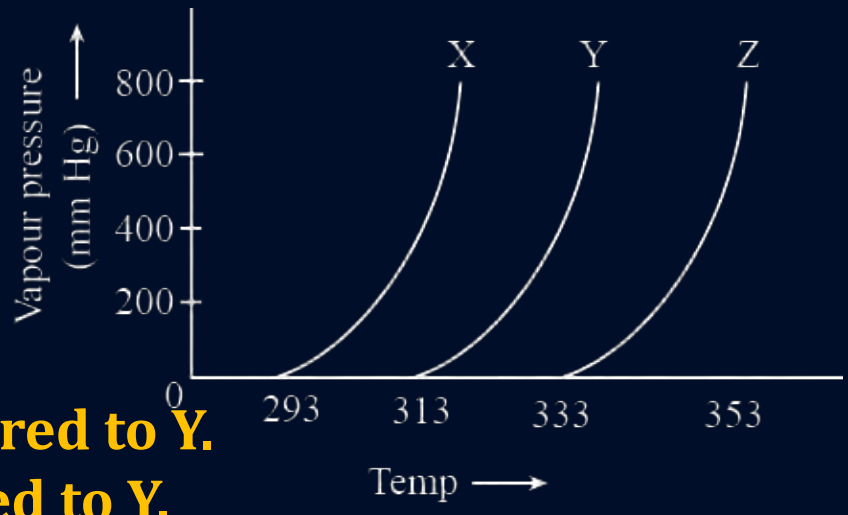
B. Addition of Na_2SO_4

C. Addition of 1 molal KI

D. Addition of water

QUESTION (Jee Mains 8th Jan, 1st shift-2020)

A graph of vapour pressure and temperature for three different liquids
X, Y and Z is shown below:



The following inferences are made

(A) X has highest intermolecular interactions compared to Y.
(B) X has lower intermolecular interactions compared to Y.
(C) Z has lower intermolecular interactions compared to Y.

The correct inference(s) is/are:

A (C)

B (A)

C (B)

D (A) and (C)

QUESTION

Addition of HgI_2 to KI shows increase in vapor pressure, why?

QUESTION

If Roult's law is obeyed, the vapour pressure of the solvent in a solution is directly proportional to

A Mole fraction of the solvent

B Mole fraction of the solute

C Mole fraction of the solvent and solute

D The volume of the solution

QUESTION

If Roult's law becomes a special case of Henry's law in which K_H (Henry's constant) is equal to

A Mole fraction of solvent

B Vapour pressure of solution

C Vapour pressure of solute

D Mole fraction of solute and solvent

QUESTION

The vapor pressure of two liquids A and B are 80 and 60 torr respectively. The total vapor pressure of solution obtained by mixing 3 moles of A and 2 moles of B would be

A 140 torr

B 20 torr

C 68 torr

D 72 torr

QUESTION – (AIPMT 2002)

A solution containing components A and B follows Raoult's law when

A. A – B attraction force is greater than A – A and B – B

B. A – B attraction force is less than A – A and B – B

C. A – B attraction force remains same as A–A and B –B

D. Volume of solution is different from sum of volume of solute and solvent

QUESTION – (AIPMT 2003)

Formation of a solution from two components can be considered as

(i) Pure solvent → to separate solvent molecules, ΔH_1

(ii) Pure solute → to separate solute molecules, ΔH_2

(iii) Separated solvent & solute molecules → Solution, ΔH_3

Solution so formed will be ideal if

A $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$

B $\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$

C $\Delta H_{soln} = \Delta H_1 + \Delta H_2 - \Delta H_3$

D $\Delta H_{soln} = \Delta H_1 - \Delta H_2 - \Delta H_3$

QUESTION

P°A and P°B are the vapor pressure of pure liquid components A and B respectively of an ideal binary solution. If χA represents the mole fraction of component A, the total pressure of the solution will be

A $p^{\circ}_{A} + \chi_{A} (p^{\circ}_{B} - p^{\circ}_{A})$

B $p^{\circ}_{A} + \chi_{A} (p^{\circ}_{A} - p^{\circ}_{B})$

C $p^{\circ}_{B} + \chi_{A} (p^{\circ}_{B} - p^{\circ}_{A})$

D $p^{\circ}_{B} + \chi_{A} (p^{\circ}_{A} - p^{\circ}_{B})$

QUESTION – (NEET 2019)

For an ideal solution, the correct option is:

A $\Delta_{mix} S = 0$ at constant T and P

B $\Delta_{mix} V \neq 0$ at constant T and P

C $\Delta_{mix} H = 0$ at constant T and P

D $\Delta_{mix} G = 0$ at constant T and P

QUESTION

Which one of the following is incorrect for ideal solution?

A $\Delta H_{mix} = 0$

B $\Delta U_{mix} = 0$

C $\Delta P = P_{obs} - P_{\text{calculated by Raoult's law}} = 0$

D $\Delta G_{mix} = 0$

QUESTION – (NEET 2016-II)

Which one of the following is incorrect for ideal solution?

A $\Delta P = P_{obs} - P_{\text{calculated by Raoult's law}} = 0$

B $\Delta G_{mix} = 0$

C $\Delta H_{mix} = 0$

D $\Delta U_{mix} = 0$

QUESTION – (NEET 2015)

Which one is not equal to zero for an ideal solution?

A ΔS_{mix}

B ΔV_{mix}

C $\Delta P = P_{observed} - P_{Raoult}$

D ΔH_{mix}

QUESTION

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 mm Hg. At the same temperature, if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure (in mm Hg) of X and Y in their pure states will be, respectively.

A 200 and 300

B 300 and 400

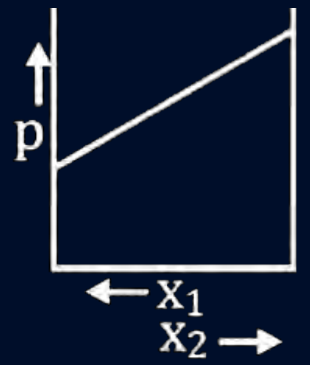
C 400 and 600

D 500 and 600

QUESTION* – (NCERT Exemplar)

For a binary ideal liquid solution, the variation in total vapour pressure versus composition of solution is given by which of the curves?

A



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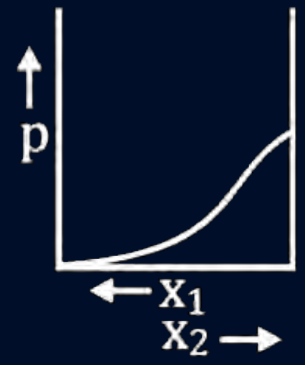
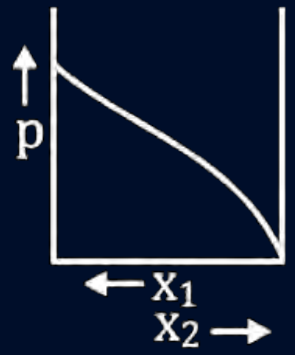
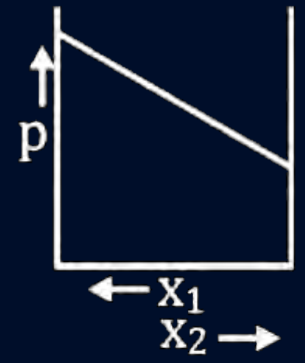


C

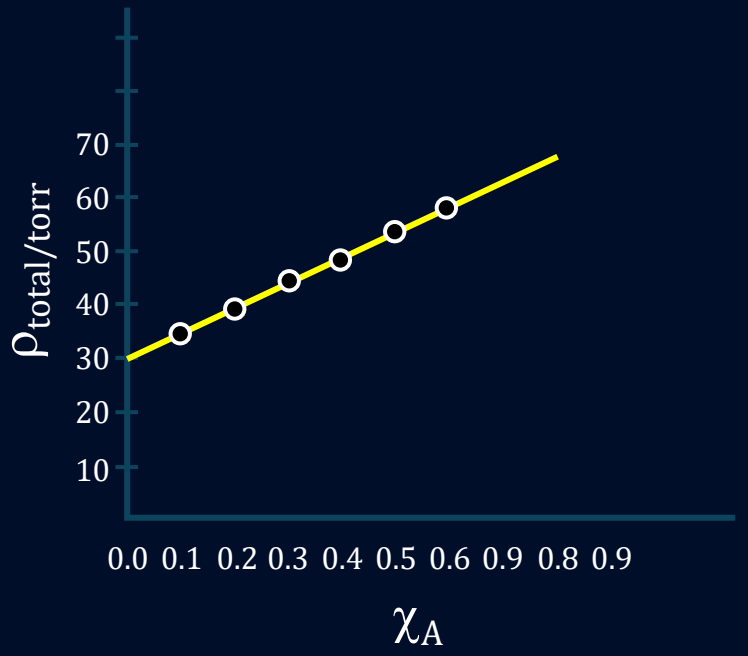


D



QUESTION

Variation of total vapour pressure with mole fraction of A in a mixture of volatile liquids A and B is given by following graph at 298 K. Thus



(A) vapour pressure of pure A is 30 torr

(B) mole fraction of B in vapour phase in the mixture of 1 mole A and 1 mole B is 0.30

(C) Both of the above are correct

(D) None of the above is correct

QUESTION – (AIIMS 2016, 2013, 2017)

Assertion (A): If one component of a solution obeys Raoult's law over a certain range of composition, the other component will not obey Henry's law in that range.

Reason (R): Raoult's law is a special case of Henry's law.

A If both assertion and reason are correct and reason is correct explanation of assertion.

B If both assertion and reason are correct but reason is not correct explanation of assertion.

C If Assertion is correct but reason is incorrect.

D If both the assertion and reason are incorrect.

QUESTION

Vapour pressure of pure benzene is 74.66 mmHg. When 2 g of a non-volatile hydrocarbon containing 5.6% hydrogen is dissolved in 100 g of benzene, the vapour pressure of benzene is lowered by 0.65 mmHg. Thus, hydrocarbon is

A C_7H_5

B C_6H_{14}

C C_5H_{12}

D $C_{14}H_{10}$

QUESTION

Vapour pressure (p) of a solution having χ(mole fraction) of solvent with vapour pressure p° can be represented

A $\frac{dp}{d\chi} = p^\circ$

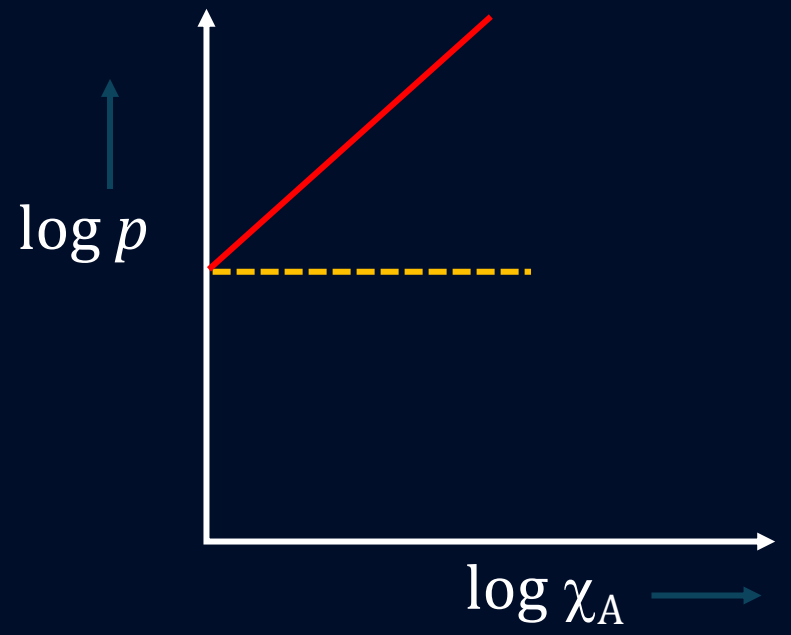
B $\frac{d\ log\ p}{d\chi} = \frac{1}{p}$

C Both of these

D None of these

QUESTION

Mole fraction of a solvent with vapour pressure 90 mm Hg is 0.90 in a solution of non-volatile solute. If Raoult's law graphically is, then $\frac{d \log p}{d\chi}$ is:



A 100

B 1.11

C 0.01

D 0.9

QUESTION – (AIPMT 2012)

P_A and P_B are the vapour pressure of pure liquid components, A and B respectively of an ideal binary solution. If X_A represents the mole fraction of component A, the total pressure of the solution will be:

A $p_A + x_A (p_B - p_A)$

B $p_A + x_A (p_A - p_B)$

C $p_B + x_A (p_B - p_A)$

D $p_B + x_A (p_A - p_B)$

QUESTION

If P_A^o = 200 mm of Hg, P_B^o = 300 mm of Hg and Which of these cannot be P_S for two miscible liquids following ideal behaviour?

A 230 mm of Hg

B 270 mm of Hg

C 150 mm of Hg

D Cannot be solved

QUESTION – (AIIMS 2013)

At a particular temperature, the vapour pressure of two liquids A and B are respectively 120 and 180 mm of mercury. If 2 moles of A and 3 moles of B are mixed to form an ideal solution, the vapour pressure of the solution at the same temperature will be: (in mm of mercury)

A. 156

B. 145

C. 150

D. 108

QUESTION – (NEET 2021)

The correct option for the value of vapour pressure of a solution at 45°C with benzene to octane in molar ratio 3 : 2 is:
[At 45°C vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg. Assume Ideal gas]

A 168 mm of Hg

B 336 mm of Hg

C 350 mm of Hg

D 160 mm of Hg

QUESTION – (NEET 2016-I)

Which of the following statements about the composition of the vapour over an ideal 1 : 1 molar mixture of benzene and toluene is correct? Assume that the temperature is at 25°C.
(Given, vapour pressure data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)

A. The vapour will contain equal amounts of benzene and toluene.

B. Not enough information is given to make a prediction.

C. The vapour will contain a higher percentage of benzene.

D. The vapour will contain a higher percentage of toluene.

QUESTION

If P_A^o = 200 mm of Hg, P_B^o = 300 mm of Hg and Which of these cannot be P_S for two miscible liquids following ideal behaviour?

A 200 mm of Hg

B 250 mm of Hg

C 240 mm of Hg

D 700 mm of Hg

QUESTION

A and B form a ideal solution and V.P. of pure A and B are 160 mm of Hg and 60 mm of Hg. Calculate partial pressure of benzene and toluene and total pressure also

A. Containing equal mass of both A and B

B. Containing equal molecules of both A and B

C. Containing 1 mole of A and 4 moles of B

D. Also calculate mole fraction of A and B in vapour phase if equal moles of A and B mixed

QUESTION

At a given temperature, the vapor pressure in mm of Hg of a solution of two volatile liquids A and B is given by equation

$P = 120 - 80\chi_B$ Calculate V.P. of pure A and B at same temperature

QUESTION

If P_A^o = 200 mm of Hg, P_B^o = 300 mm of Hg and solution both have same mass and M_A = 20 g and M_B = 200 g. Find vapour pressure of solution.

A 325 mm of Hg

B 146.35 mm of Hg

C 209 mm of Hg

D 285 mm of Hg

QUESTION

If P_A^o = 100 mm of Hg, P_B^o = 500 mm of Hg and have same no. of moles in solution. Find vapor pressure of solution.

A 100 mm of Hg

B 150 mm of Hg

C 300 mm of Hg

D 500 mm of Hg

QUESTION (8th April, 1st shift-2019)

The vapour pressures of pure liquids A and B are 400 and 600 mm Hg, respectively at 298 K. On mixing the two liquids, the sum of their initial 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 vapour phase, respectively are:

A. 450 mm Hg, 0.5, 0.5

B. 450 mm Hg, 0.4, 0.6

C. 500 mm Hg, 0.5, 0.5

D. 500 mm Hg, 0.4, 0.6

QUESTION

Find Mole Fraction of A and B if V.P. of solution is 160 torr. If V.P. of pure A and B are 100 mm of Hg and 200 mm of Hg.

QUESTION

If in a solution 1 mole each of A and B are mixed. Find vapour pressure of solution if half of the total moles are vaporised (P_A^o = 500 mm of Hg and P_B^o = 20 mm of Hg)

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Some answers need gut + logic – can you spot the trick?

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It's all about strong basics – no shortcuts here

Strategy
The **MEDICS** test – built for those who heal, hustle, and hope.

QUESTION (M)

The oxidation state of chromium in the final product formed in the reaction between KI and acidified potassium dichromate solution is

A +4

B +6

C +2

D +3

QUESTION (M)

The number of moles of $KMnO_4$ reduced by 1 mol of KI in alkaline medium is

A 1

B 2

C 5

D 1/5

QUESTION (M)

The oxidation number of carbon in CH_2Cl_2 is

A 0

B 2

C 3

D 5

QUESTION (M)

Balance the following reactions:

$$U(SO_4)_2 + KMnO_4 + H_2O \longrightarrow H_2SO_4 + K_2SO_4 + MnSO_4 + UO_2SO_4$$

QUESTION (M)

$3KClO_3 + 3H_2SO_4 \longrightarrow 3KHSO_4 + HClO_4 + 2ClO_2 + H_2O$

Equivalent weight of KClO, is

A $\frac{M}{4}$

B $\frac{M}{2}$

C $\left(M + \frac{M}{2}\right)$

D $\left(\frac{M}{4} + \frac{M}{2}\right)$

QUESTION (M)

How many moles of electron weigh 1 kg?

A 6.023×10^{23}

B $\frac{1}{9.108} \times 10^{23}$

C $\frac{6.023}{9.108} \times 10^{54}$

D $\frac{1}{9.108 \times 6.023} \times 10^{x}$

QUESTION (M)

If 100 mL of H_2SO_4 and 100 mL of H_2O are mixed, the mass percent of H_2SO_4 in the resulting solution is ($d_{H_2SO_4}$ = 0.09 g mL, d_{H_2O} = 1.0 g ml^{-1})

A 90

B 47.36

C 50

D 60

QUESTION (M)

0.1 g of metal combines with 46.6 mL of oxygen at STP. The equivalent weight of metal is

A 12

B 24

C 6

D 36

QUESTION (M)

10 g of $CaCO_3$ contains

A. 10 moles of $CaCO_3$

B. 0.1 g atom of Ca

C. 6×10^{23} atoms of Ca

D. 0.1 of equivalent of Ca

QUESTION – (NEET 2020)

The mixture which shows positive deviation from Raoult's law is:

A. Benzene + Toluene

B. Acetone + Chloroform

C. Chloroethane + Bromoethane

D. Ethanol + Acetone

QUESTION – (NCERT Exemplar)

Considering the formation, breaking and strength of hydrogen bond, predict which of the following mixtures will show a positive deviation from Raoult's law?

A. Methanol and acetone

B. Chloroform and acetone

C. Nitric acid and water

D. Phenol and aniline

QUESTION – (NCERT Exemplar)

On the basis of information given below mark the correct option.

Information:

(A) In bromoethane and chloroethane mixture intermolecular interactions of A–A and B–B type are nearly same as A–B type interactions.

(B) In ethanol and acetone mixture A–A or B–B type intermolecular interactions are stronger than A–B type interactions.

(C) In chloroform and acetone mixture A–A or B–B type intermolecular interactions are weaker than A–B type interactions.

A Solution (B) and (C) will follow Raoult's law.

B Solution (A) will follow Raoult's law.

C Solution (B) will show negative deviation from Raoult's law.

D Solution (C) will show positive deviation from Raoult's law.

QUESTION (JEE Main 2009)

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 Raooult's law

QUESTION (JEE Main 2004)

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

A. Water – hydrochloric acid

B. Benzene – methanol

C. Water – nitric acid

D. Acetone - chloroform

QUESTION – (AIIMS 2009)

An aqueous solution of hydrochloric acid:

A. Obeys Raoult's law

B. Show negative deviation from Raoult's law

C. Show positive deviation from Raoult's law

D. Obeys Henry's law at all compositions

QUESTION (JEE Main 2003)

If liquids A and B form an ideal solution, the

A. Enthalpy of mixing is zero

B. Entropy of mixing is zero

C. Free energy of mixing is zero

D. Free energy as well as the entropy of mixing are each zero

QUESTION (JEE MAINS 29th July, 1st shift-2022)

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 46.82 kbar and partial pressure of O_2 = 0.920 bar)

(Assume solubility of O_2 in water is too small, nearly negligible)

QUESTION

Ratio of solubilities of gases N_2 and O_2 in water from air at 25° and 1 atm will be if air is 20% by volume of O_2 and 80% by volume of N_2. Given: $K_H(N_2) = 2 \times 10^4$ atm; $K_H(O_2) = 10^4$ atm

A 8 : 1

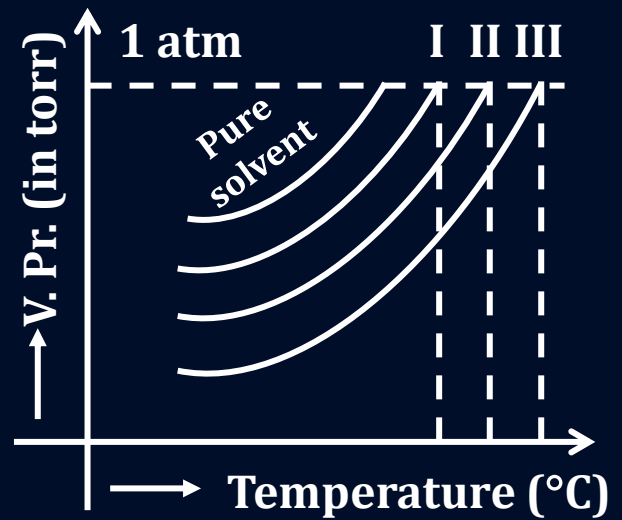
B 1 : 8

C 2 : 1

D 1 : 2

QUESTION

The vapor pressure curves of the same solute in the same solvent are shown. The curves are parallel to each other and do not intersect. The concentrations of solutions are in order of:



A. I < II < III

B. I = II = III

C. I > II > III

D. I > III > II

QUESTION

A cylinder fitted with a movable piston contains liquid water is equilibrium with water vapor pressure at 25°C. Which of the following operation results in a decrease in the equilibrium vapour pressure at 25°C?

A. Moving the piston downward a short distance

B. Removing a small amount of vapor

C. Removing a small amount of liquid water

D. Dissolving some salt in the water

QUESTION

Which one is not equal to zero for an ideal solution?

A $\Delta P = P_{observed} - P_{raoult}$

B ΔH_{mix}

C ΔS_{mix}

D ΔV_{mix}

QUESTION

The V.P. of pure liquids A and B are 450 and 700 mm of Hg. Find out composition of liquid mixture if total vapour pressure is 600 mm of Hg. Find composition of vapour phase

QUESTION (8th April, 1st shift-2019)

The vapour pressures of pure liquids A and B are 400 and 600 mm Hg, respectively at 298 K. On mixing the two liquids, the sum of their initial 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 vapour phase, respectively are:

A. 450 mm Hg, 0.5, 0.5

B. 450 mm Hg, 0.4, 0.6

C. 500 mm Hg, 0.5, 0.5

D. 500 mm Hg, 0.4, 0.6

QUESTION (JEE Main 2005)

Benzene and toluene form nearly ideal solutions. At 20°C, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at 20°C for a solution containing 78 g of benzene and 46 g of toluene in torr is: (molar mass of benzene & toluene is 78 g & 92 g)

A 50

B 25

C 37.5

D 53.5

QUESTION (JEE Main 2008)

At 80°C, the vapour pressure of pure liquid A is 520 mm of Hg and that of pure liquid B is 1000 mm of Hg. If a mixture solution of A and B boils at 80°C and 1 atm pressure, the amount of A in the mixture is (1 atm = 760 mm of Hg)

A. 50 mol percent

B. 52 mol percent

C. 34 mol percent

D. 48 mol percent

QUESTION (Online 2015)

A solution at 20°C is composed to 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. 35.0 torr and 0.480

B. 38.0 torr and 0.589

C. 30.5 torr and 0.389

D. 35.8 torr and 0.280

QUESTION (10th Jan, 1st shift-2019)

Liquids A and B form an ideal solution in the entire composition range. At 350 K, the vapour pressures 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 $x_A = 0.28; x_B = 0.70$

C $x_A = 0.37; x_B = 0.63$

D $x_A = 0.76; x_B = 0.24$

QUESTION (JEE Main 2010)

On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressure of the two liquid components (heptane and octane) are 105 kPa and 45 kPa 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 g mol^{-1} and of octane = 114 g mol^{-1})

A. 144.5 kPa

B. 72.0 kPa

C. 36.1 kPa

D. 96.2 kPa

QUESTION (JEE Main 2007)

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 nm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be:

A 360

B 350

C 300

D 700

QUESTION (JEE Main 2003)

If liquids A and B form an ideal solution, the

A. Enthalpy of mixing is zero

B. Entropy of mixing is zero

C. Free energy of mixing is zero

D. Free energy as well as the entropy of mixing are each zero

QUESTION (28th July 2nd Shift-2022)

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)

QUESTION (28th June 1st Shift-2022)

The vapour pressure of two volatile liquids A and B at 25°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 $x/17$. The value of x is _____.

QUESTION (20th July 1st Shift-2021)

At 20°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°C above an equimolar mixture of benzene and methyl benzene is ___ × 10^{-2}. (Nearest integer)

QUESTION (20th July 2nd Shift-2021)

The vapour pressure of A and B at 25°C are 90 mm Hg and 15 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)

QUESTION (16th March 2nd Shift-2021)

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 off to the Nearest integer)

QUESTION

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

A. Acetone-chloroform

B. Benzene-methanol

C. Water-nitric acid

D. Water-hydrochloric acid

QUESTION

Select the mixture in which volume of solution is less than 2 V mL on mixing V mL each of the two miscible liquids:

A $CCl_4 + CS_2$

B Benzene + Toluene

C $CH_3COCH_3 + CHCl_3$

D Hexane + Pentane

QUESTION

Some liquids on mixing, form azeotropes. Which of the following is only incorrect statement regarding azeotropic binary mixture of liquids?

A. The compositions in liquids and vapour phases are same.

B. The boiling point of azeotropic mixture does not depend on external pressure.

C. Solutions having large positive deviation form minimum boiling azeotrope at a specific composition.

D. Solutions having large negative deviation form maximum boiling azeotrope at a specific composition.

QUESTION

100 mL liquid chloroform is mixed with 100 mL liquid acetone at 25°C. Which of the following may be the final volume of resulting solution?

A 200 mL

B 203 mL

C 198 mL

D Any of these

QUESTION – (AIPMT 1992)

Which one is a colligative property?

A. Boiling point

B. Vapour pressure

C. Osmotic pressure

D. Freezing point

QUESTION – (NCERT Exemplar)

Colligative properties depend on _____.

A. The nature of the solute particles dissolved in solution.

B. The number of solute particles in solution.

C. The physical properties of the solute particles dissolved in solution.

D. The nature of solvent particles.

QUESTION

The ratio between lowering of vapor pressure of solution and mole fraction of solute is equal to

A Relative lowering of vapour pressure

B Vapour pressure of pure solvent

C Vapour pressure of solution

D Molar mass of solvent

QUESTION – (AIPMT 1995)

According to Raoult's law, relative lowering of vapour pressure for a solution is equal to

A. moles of solute

B. moles of solvent

C. mole fraction of solute

D. mole fraction of solvent

QUESTION – (AIPMT 1998)

The vapour pressure of a solvent decreased by 10 mm of mercury when a non-volatile solute was added to the solvent. The mole fraction of the solute in the solution is 0.2. What should be the mole fraction of the solvent if the decrease in the vapour pressure is to be 20 mm of mercury?

A 0.8

B 0.6

C 0.4

D 0.2

QUESTION-(JEE main 11th April 2nd Shift-2023)

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 g mol^{-1}]

A. 4.69 g

B. 3.69 g

C. 2.59 g

D. 3.59 g

QUESTION* – (NCERT Exemplar)

Relative lowering of vapor pressure is a colligative property because ____.

A It depends on the concentration of a non electrolyte solute in solution and does not depend on the nature of the solute molecules.

B It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles.

C It depends on the concentration of a non electrolyte solute in solution as well as on the nature of the solute molecules.

D It depends on the concentration of an electrolyte or non electrolyte solute in solution as well as on the nature of solute molecules.

QUESTION-(JEE main 6th Sept 2nd Shift-2020)

A set of solutions is prepared using 180g 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 g mol^{-1}; B = 200 g mol^{-1}; C = 10,000 g mol^{-1}]

(A) B > C > A

(B) C > B > A

(C) A > B > C

(D) A > C > B

QUESTION – (NEET 2020-Covid)

If 8 g of a non-electrolyte solute is dissolved in 114 g of n-octane to reduce its vapour pressure to 80%, the molar mass (in g mol^{-1}) of the solute is:
[Given that molar mass of n-octane is 114 g mol^{-1}]

A 60

B 80

C 20

D 40

QUESTION

How much urea (molar mass = 60 g mol^{-1}) should be dissolved in 50g of water, so that its vapour pressure at room temperature is reduced by 25%. Calculate molality of the solution obtained.

QUESTION

Vapour pressure of an aqueous solution of glucose is 750 mm of Hg at 373 K. Calculate the molality and mole fraction of solute.

QUESTION-(JEE main 7th Jan 2nd Shift-2020)

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 solution and the solvent does not change

C. The volume of the solution does not change and the volume of the solvent decreases

D. The volume of the solution decreases and the volume of the solvent increases

QUESTION-(JEE main 9th April 2nd Shift-2019)

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 g mol^{-1})

A. 0.031 mm Hg

B. 0.028 mm Hg

C. 0.017 mm Hg

D. 0.027 mm Hg

QUESTION

The vapor pressure of benzene at 30°C is 121.8 mm of Hg. By adding 15g of non-volatile solute in 250g of benzene, its vapour pressure is decreased to 120.2 mm of Hg. The molecular weight of solute is:

A $156.6\ g\ mol^{-1}$

B $267.4\ g\ mol^{-1}$

C $351.5\ g\ mol^{-1}$

D $467.4\ g\ mol^{-1}$

QUESTION

On mixing 3 g of non-volatile solute in 200 mL of water, its boiling point becomes 100.52°C. If K_b for water is 0.6 K kg/mol then molecular weight of solute is

A $105\ g\ mol^{-1}$

B $12.6\ g\ mol^{-1}$

C $15.7\ g\ mol^{-1}$

D $17.3\ g\ mol^{-1}$

QUESTION

Which has maximum elevation in boiling point out of 1% aqueous solution of each (molar mass given in bracketts)

I. Urea (60)

II. Glucose (180)

III. Sucrose (342)

IV. Pentose (150)

A I

B II

C III

D IV

QUESTION

Which of the following is a constant quantity ?

A $\frac{\Delta T_b}{K_b}$

B $\mathrm{m}\Delta T_b$

C $\frac{\Delta T_b}{m}$

D $K_b \mathrm{m}$

QUESTION

On dissolving 3.24 g of sulphur in 40 g of Benzene, Boiling point of solution was higher than that of Benzene by 0.81 K. K_b value for Benzene = 2.53 K kg/mol. Calculate molecular formula of Sulphur.

QUESTION

The latent heat of vaporization of a liquid of molar mass, 80 g/mol and boiling point, 127°C is 8 kcal/mol. The ebullioscopic constant of the liquid is:

A 3.2

B 0.04

C 0.32

D 0.52

QUESTION-(JEE main 27th July 1st Shift-2022)

Boiling point of a 2% aqueous solution of a non-volatile 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 $M_B = 8M_A$

QUESTION-(JEE main 10th April 2nd Shift-2019)

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

A. 5 : 1

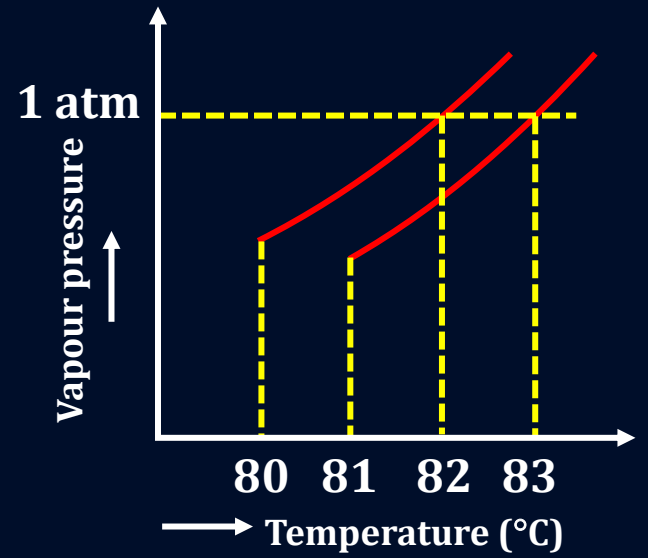
B. 1 : 0.2

C. 10 : 1

D. 1 : 5

QUESTION-(JEE Mains 8th April 1st Shift 2023)

The vapour pressure *vs* temperature curve for a solution solvent system is shown below:



The boiling point of the solvent is _____°C.

QUESTION

Question Explain rast Method.

QUESTION – (AIIMS 2018, 27 May)

Assertion (A): A non volatile solute is added in liquid solvent then freezing point of mixture decreases.

Reason (R): Vapour pressure decreases by addition of non volatile solute, so equilibrium point where V.P. of solid and V.P. of liquid are equal can reach at lower temperature.

A If both assertion and reason are correct and reason is correct explanation of assertion.

B If both assertion and reason are correct but reason is not correct explanation of assertion.

C If Assertion is correct but reason is incorrect.

D If both the assertion and reason are incorrect.

QUESTION (NEET 2017)

If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be

A halved

B tripled

C Unchanged

D doubled

QUESTION – (NEET 2020)

The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is: (rounded off upto two decimal places)

A 0.80 K

B 0.40 K

C 0.60 K

D 0.20 K

QUESTION

Pure benzene freezes at 5.45°C. A 0.374 m solution of tetrachloroethane in benzene freezes at 3.55°C. The K_f (°C/ m) for benzene is

A 0.508

B 5.08

C 50.8

D 508

QUESTION – (AIIMS 2018, 27 May)

Ethylene glycol is used as an antifreeze to reduce freezing point of water to –2.4°C. What mass of antifreeze is required for 2 L water? (K_f water = 1.86 K kg/mol)

A 16 kg

B 160 g

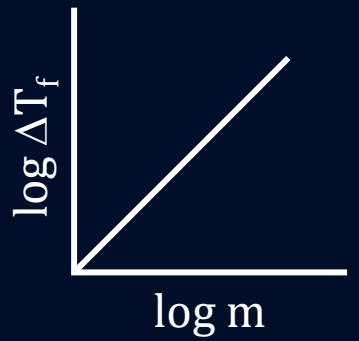
C 1.60 kg

D 16 g

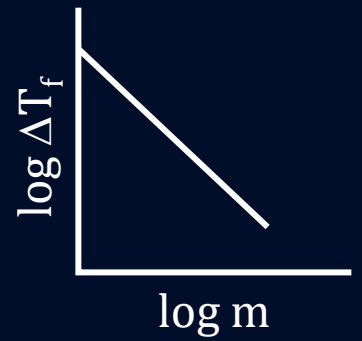
QUESTION

Graphical variation of $\log(\Delta T_f)$ with $\log(m)$ for a dilute solution is (ΔT_f is depression in freezing point and mis the molality)

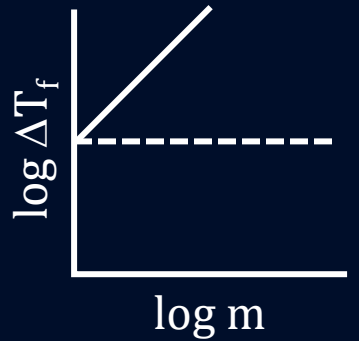
A



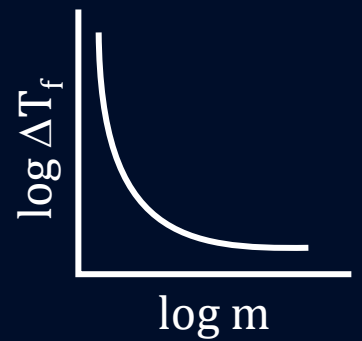
B



C



D



QUESTION

If in previous Question, straight line is inclined at 45° and intercept on log ΔT_f axis is 0.27, then depression in freezing point of 1.10 molal solution is

A 0.27°

B 2.0°

C 0.2°

D 3.0°

QUESTION – (AIIMS 2018, 26 May)

When 45 g solute is dissolved in 600 g water, freezing point is lowered by 2.2 K, calculate molar mass of solute (K_f = 1.86 K kg mol^{-1})

A. 63.4 g/mol

B. 80 g/mol

C. 90 g/mol

D. 21 g/mol

QUESTION-(JEE main 25th July 2nd Shift-2022)

Two solution 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

QUESTION – (AIIMS 2016)

A solution containing 1.8 g of a compound (empirical formula CH_2O) in 40 g of water is observed to freeze at –0.465°C. The molecular formula of the compound is: [K_f of water = 1.86 kg K mol^{-1}]

A $C_2H_4O_2$

B $C_3H_6O_3$

C $C_4H_8O_4$

D $C_6H_{12}O_6$

QUESTION – (AIPMT 2004)

Camphor is often used in molecular mass determination because

A. it is readily available

B. it has a very high cryoscopic constant

C. it is volatile

D. it is solvent for organic substances

QUESTION

A motor vehicle radiator was filled with 8 L of water to which 2 L of methyl alcohol (density 0.8 g/ml) were added. What is lowest temperature at which vehicle can be parked outdoors without a danger that water in radiator will freeze? (K_f for H_2O = 1.86 K kg mal^{-1})

QUESTION-(JEE main 9th Jan 2nd Shift-2019)

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

A 64

B 32

C 16

D 48

QUESTION-(JEE main 10th Jan 2nd Shift-2019)

Elevation in the boiling point for 1 molal solution of glucose is 2 K. The depression in the freezing point for 2 molal solution of glucose in the same solvent is 2 K. The relation between K_b and K_f is:

A $K_b = 1.5\ K_f$

B $K_b = 0.5\ K_f$

C $K_b = 2\ K_f$

D $K_b = K_f$

QUESTION-(JEE main 12th Jan 1st Shift-2019)

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

A 2A

B 3A

C A

D 4A

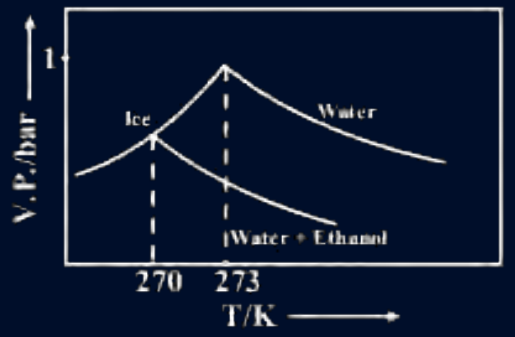
QUESTION-(JEE Advance 2017)

Pure water freezes at 273 K and 1 bar. The addition of 34.5 g of ethanol to 500 g of water changes the freezing point of the solution. Use the freezing point depression constant of water at 2 K kg mol^{-1}. The figures shown below represent plots of vapour pressure (V.P.) versus temperature (T).

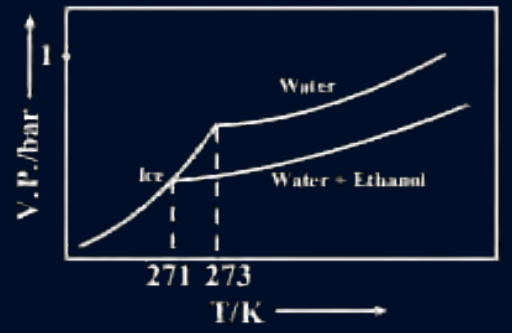
[Molecular weight of ethanol is 46 g mol^{-1}]

Among the following, the option representing change in freezing point is

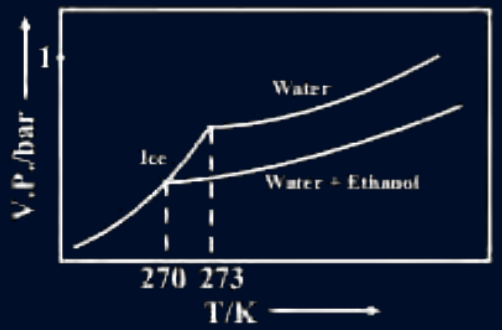
A



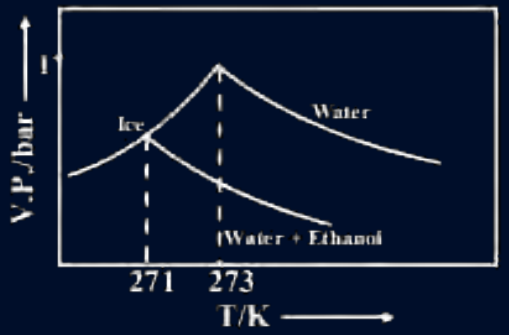
B



C



D



QUESTION

Two elements A & B form compounds having molecular formula AB_2 & AB_4. When dissolved in 20g of benzene 1g of AB_2 lowers the freezing point by 2.3 K. Whereas 1g of AB_4 lowers the freezing point by 1.3 K. Determine atomic masses of A & B. The molal depression Constant for benzene is 5.1 K Kg mol^{-1}.

QUESTION

Consider following three solution.

I. 7% aqueous solution of AB_2.

II. 8% aqueous solution of A_2B.

III. 6% aqueous urea solution.

Depression in freezing point of each solution is same and is = 1.86° (AB_2 and A_2B are non-electrolytes) cotomanis also a co Thus,

A. atomic masses of A and B are in the ratio of 3: 2.

B. molar mass of AB_2 and A_2B are same

C. Both of the above are correct

D. None of the above is correct

QUESTION

Given $K_f/K_b = 2.0$ for a solvent. If depression in freezing point is x°, then elevation in boiling point is

A. 0.5 x°

B. 2 x°

C. 4 x°

D. 0.25 x°

QUESTION – (AIPMT 2006)

1.00 g of a non-electrolyte solute (molar mass 250 g mol^{-1}) was dissolved in 51.2 g of benzene. If the freezing point depression constant K_f of benzene is 5.12 K kg mol^{-1}, the freezing point of benzene will be lowered by

A 0.3 K

B 0.5 K

C 0.4 K

D 0.2 K

QUESTION – (AIIMS 2015)

A solution of urea (mol. mass 56 g mol^{-1}) boils at 100.18°C at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at

A. 0.654°C

B. –0.654°C

C. 6.54°C

D. –6.54°C

QUESTION-(JEE main 2022)

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

A 93 g

B 39 g

C 27 g

D 72 g

QUESTION-(JEE main 2021)

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 K kg mol^{-1}, and molar mass of ethylene glycol = 62 g mol^{-1})

A. 804.32 g

B. 204.30 g

C. 400.00 g

D. 304.60 g

QUESTION-(JEE Mains 26th July 2nd Shift 2022)

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 _____ (Nearest integer)

QUESTION-(JEE Mains 26th July 2nd Shift 2022)

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}]

QUESTION-(JEE main 2nd Sep 2nd Shift-2020)

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

A. Dialysis

B. Diffusion

C. Reverse osmosis

D. Osmosis

QUESTION

Select correct statement(s).

A. Reverse osmosis is used for water purification and desalination of sea water.

B. Cellulose acetate used in reverse osmosis is a permeable to water but impermeable to impurities and ions present in sea water.

C. Both of the above are correct statements.

D. None of the above is correct statement.

QUESTION – (AIIMS 2006)

Assertion: **If red blood cells were removed from the body and placed in pure water, pressure inside the cells increases.**
Reason: **The concentration of salt content in the cells increases.**

A. If both assertion and reason are correct and reason is correct explanation of assertion.

B. If both assertion and reason are correct but reason is not correct explanation of assertion.

C. If the assertion is correct but reason is incorrect.

D. If both the assertion and reason are incorrect.

E. If the assertion is incorrect but the reason is correct.

QUESTION – (AIIMS 2018, 26 May)

1 g of polymer having molar mass 1,60,000 g dissolves in 800 mL water, so calculate osmotic pressure in pascal at 27°C?

A 0.78

B 0.90

C 0.50

D 19.4

QUESTION – (NCERT Exemplar)

An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because _____.

A. It gains water due to osmosis.

B. It loses water due to reverse osmosis.

C. It gains water due to reverse osmosis.

D. It loses water due to osmosis.

QUESTION

Equal volumes of 0.01 M urea and 0.01 M glucose solutions are mixed at 300 K. Thus, osmotic pressure set up due to mixture is

A 0.1232 atm

B 0.2463 atm

C 0.4926 atm

D 2.463 atm

QUESTION – (AIIMS 2014)

A solution containing 10 g per dm^3 of urea (molecular mass = 60 g mol^{-1}) is isotonic with a 5% solution of a non-volatile solute. The molecular mass of this non volatile solute is:

A. 300 g mol^{-1}

B. 350 g mol^{-1}

C. 200 g mol^{-1}

D. 250 g mol^{-1}

QUESTION – (NEET 2021)

The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is:

A $P_1 > P_2 > P_3$

B $P_2 > P_3 > P_1$

C $P_3 > P_1 > P_2$

D $P_2 > P_1 > P_3$

QUESTION

Mole fraction of a glucose in very dilute solution is 0.002. Thus, osmotic pressure set up at 300 K is (assume, d = 1 g mL^{-1})

A 2.70 atm

B 3.20 atm

C 4.19 atm

D 1.35 atm

QUESTION – (NCERT Exemplar)

At a given temperature, osmotic pressure of a concentrated solution of a substance _____.

A. Is higher than that at a dilute solution.

B. Is lower than that of a dilute solution.

C. Is same as that of a dilute solution.

D. Cannot be compared with osmotic pressure of dilute solution.

QUESTION – (AIPMT 2011)

200 mL of an aqueous solution of a protein contains its 1.26 g. The osmotic pressure of this solution at 300 K is found to be 2.57×10^{-3} bar. The molar mass of protein will be: (R = 0.083 L bar mol^{-1} K^{-1})

A. 51022 g mol^{-1}

B. 122044 g mol^{-1}

C. 31011 g mol^{-1}

D. 61038 g mol^{-1}

QUESTION – (AIIMS 2004)

The average osmotic pressure of human blood is 7.8 bar at 37°C. What is the concentration of an aqueous NaCl solution that could be used in the blood stream?

A 0.16 mol/L

B 0.31 mol/L

C 0.60 mol/L

D 0.45 mol/L

QUESTION – (NEET 2024)

The plot of osmotic pressure ($\prod$) vs concentration (mol L^{-1}) for a solution gives a straight line with slope 25.73 L bar mol^{-1}. The temperature at which the osmotic pressure measurement is done is:
(Use R = 0.083 L bar mol^{-1} K^{-1})

A. 37°C

B. 310°C

C. 25.73°C

D. 12.05°C

QUESTION – (NCERT Exemplar)

Which of the following statements is false?

A. Units of atmospheric pressure and osmotic pressure are the same.

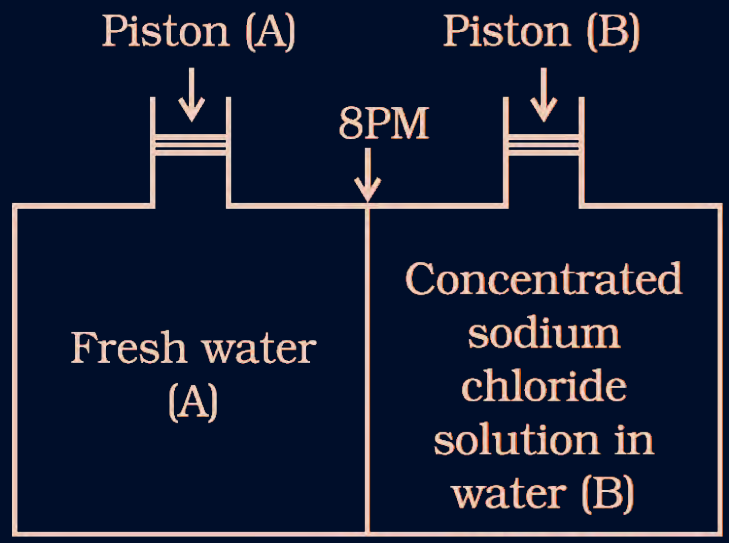
B. In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration.

C. The value of molal depression constant depends on nature of solvent.

D. Relative lowering of vapour pressure is a dimensionless quantity.

QUESTION – (NCERT Exemplar)

Consider the Figure and mark the correct option.



A Water will move from side (A) to side (B) if a pressure lower than osmotic pressure is applied on piston (B).

B Water will move from side (B) to side (A) if a pressure greater than osmotic pressure is applied on piston (B).

C Water will move from side (B) to side (A) if a pressure equal to osmotic pressure is applied on piston (B).

D Water will move from side (A) to side (B) if pressure equal to osmotic pressure is applied on piston (A).

QUESTION

Osmotic pressure of insulin solution at 298 K is found to be 0.0072 atm. Hence, height of water column due to this pressure is (density of Hg = 13.6 g mL^{-1})

A 0.76 cm

B 0.70 cm

C 7.4 cm

D 76 cm

QUESTION* – (NCERT Exemplar)

In isotonic solutions _____.

A solute and solvent both are same.

B osmotic pressure is same.

C solute and solvent may or may not be same.

D solute is always same solvent may be different.

QUESTION – (NCERT Exemplar)

Match the items given in Column I and Column II.

Column-I		Column-II	
i.	Saturated solution	a.	Solution having same osmotic pressure at a given temperature as that of given solution.
ii.	Binary solution	b.	A solution whose osmotic pressure is less than that of another.
iii.	Isotonic solution	c.	Solution with two components.
iv.	Hypotonic solution	d.	A solution which contains maximum amount of solute that can be dissolved in a given amount of solvent at a given temperature.
v.	Solid solution	e.	A solution whose osmotic pressure is more than that of another.
vi.	Hypertonic solution	f.	A solution in solid phase.

QUESTION – (NCERT Exemplar)

Match the laws given in Column I with expressions given in Column II.

Column I	Column II
(i) Raoult's law	(a) $\Delta T_f = K_f m$
(ii) Henry's law	(b) $\prod = CRT$
(iii) Elevation of boiling point	(c) $p = x_1 p_1^o + x_2 p_2^o$
(iv) Depression in freezing point	(d) $\Delta T_b = K_b m$
(v) Osmotic pressure	(e) $p = K_H . x$

QUESTION – (AIIMS 2000)

Van't Hoff factor is:

A. More than one in case of association

B. Less than one in case of dissociation

C. $\dfrac{\text{Normal } \textit{molecular mass}}{\textit{Observed molecular mass}}$

D. $\dfrac{\textit{Observed molecular mass}}{\text{Normal } \textit{molecular mass}}$

QUESTION

Consider following cases:

I. $NaCl(aq)$ $Na^+(aq) + Cl^-(aq)$

II. $2CH_3COOH$ $(CH_3COOH)_2$

III. Urea in aqueous solution.

van't Hoff factor (i) of the above cases will be in order:

A. I < II < III

B. III < II < I

C. II < III < I

D. I < III < II

QUESTION

Which of the following has the highest boiling point and freezing point out of

I. 0.1 molal $C_{12}H_{22}O_{11}(aq)$

II. 0.1 molal $MgCl_2$ (100% ionised)

III. 0.1 molal $AlCl_3$ (100% ionised)

IV. 0.1 molal NaCl (100% ionised)

	Highest Boiling point	Highest Freezing point
A	III	III
B	III	I
C	I	I
D	II	IV

QUESTION – (AIIMS 1998)

Assertion: **Molecular mass of benzoic acid when determined by colligative properties is found high.**
Reason: **Dimerization of benzoic acid.**

A. If both assertion and reason are correct and reason is correct explanation of assertion.

B. If both assertion and reason are correct but reason is not correct explanation of assertion.

C. If the assertion is correct but reason is incorrect.

D. If both the assertion and reason are incorrect.

E. If the assertion is incorrect but the reason is correct.

QUESTION – (NCERT Exemplar)

Which of the following aqueous solutions should have the highest boiling point?

A. 1.0 M $NaOH$

B. 1.0 M Na_2SO_4

C. 1.0 M NH_4NO_3

D. 1.0 M KNO_3

QUESTION – (NEET 2016-II)

The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is:

A 2

B 3

C 0

D 1

QUESTION – (AIIMS 2013)

The freezing point of equimolal aqueous solution will be highest for:

A $C_6H_5NH_3^+Cl^-$

B $Ca(NO_3)_2$

C $La(NO_3)_2$

D $C_6H_{12}O_6$

QUESTION – (NEET 2014)

Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression?

A $C_6H_{12}O_6$

B $Al_2(SO_4)_3$

C K_2SO_4

D KCl

QUESTION – (NEET 2015)

Which one of the following electrolytes has the same value of van't Hoff's factor (i) as that of $Al_2(SO_4)_3$ (if all are 100% ionized)?

A $K_3[Fe(CN)_6]$

B $Al(NO_3)_3$

C $K_4[Fe(CN)_6]$

D K_2SO_4

QUESTION – (AIIMS 2014)

Which of the following 0.10 m aqueous solutions will have the lowest freezing point?

A $Al_2(SO_4)_3$

B $C_6H_{12}O_6$

C KCl

D $C_{12}H_{22}O_{11}$

QUESTION – (NCERT Exemplar)

The values of Van't Hoff factors for KCl, NaCl and K_2SO_4, respectively, are _____.

A. 2, 2 and 2

B. 2, 2 and 3

C. 1, 1 and 2

D. 1, 1 and 1

QUESTION-(JEE Main 2018)

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

A $[Co(H_2O)_6]Cl_3$

B $[Co(H_2O)_5Cl]Cl_2.H_2O$

C $[Co(H_2O)_4Cl_2]Cl.2H_2O$

D $[Co(H_2O)_3Cl_2].3H_2O$

QUESTION – (AIPMT 2011)

The Van't Hoff factor *i* for a compound which undergoes dissociation in one solvent and association in other solvent is respectively:

A less than one and greater than one.

B less than one and less than one.

C greater than one and less than one.

D greater than one and greater than one.

QUESTION* – (NCERT Exemplar)

Van't Hoff factor i is given by the expression ____.

A $i = \dfrac{\textit{Normal molar mass}}{\textit{Abnormal molar mass}}$

B $i = \dfrac{\textit{Abnormal molar mass}}{\textit{Normal molar mass}}$

C $i = \dfrac{\textit{Observed colligative property}}{\textit{Calculated colligative property}}$

D $i = \dfrac{\textit{Calculated colligative property}}{\textit{Observed colligative property}}$

QUESTION – (NCERT Exemplar)

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

A $i_A < i_B < i_C$

B $i_A > i_B > i_C$

C $i_A = i_B = i_C$

D $i_A < i_B > i_C$

QUESTION – (NCERT Exemplar)

In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M $MgCl_2$ solution is _____.

A. the same

B. about twice

C. about three times

D. about six times

QUESTION – (AIIMS 2005)

Assertion: **The molecular weight of acetic acid determined by depression in freezing point method in benzene and water was found to be different.**
Reason: **Water is polar and benzene in non-polar.**

A. If both assertion and reason are correct and reason is correct explanation of assertion.

B. If both assertion and reason are correct but reason is not correct explanation of assertion.

C. If the assertion is correct but reason is incorrect.

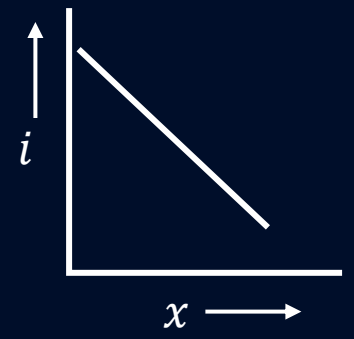
D. If both the assertion and reason are incorrect.

E. If the assertion is incorrect but the reason is correct.

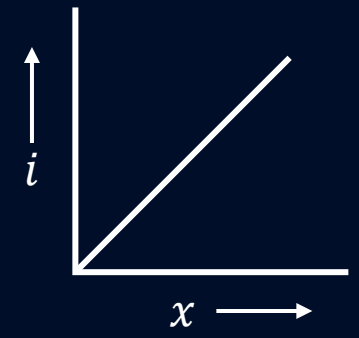
QUESTION

van't Hoff factor i varies with degree of ionisation 'x' of weak acid as HA, as:

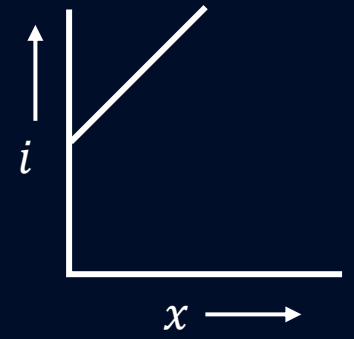
A



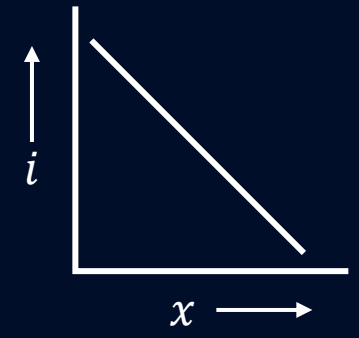
B



C



D



QUESTION – (NCERT Exemplar)

Which of the following statements is false?

A Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.

B The osmotic pressure of a solution is given by the equation P = CRT (where C is the molarity of the solution).

C Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is $BaCl_2 > KCl > CH_3COOH >$ sucrose.

D According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.

QUESTION – (AIIMS 2004)

The average osmotic pressure of human blood is 7.8 bar at 37°C. What is the concentration of an aqueous NaCl solution that could be used in the blood stream?

A 0.16 mol/L

B 0.31 mol/L

C 0.60 mol/L

D 0.45 mol/L

QUESTION

For an aqueous solution of AB ionising 100% at the boiling point has boiling point of 101.08°C and freezing point –1.80°C. (Given, K_b / K_f = 0.3). Thus,

A. AB is 100% ionised at the freezing point

B. AB forms dimer $(AB)_2$

C. AB behaves as a non-electrolyte at the freezing point

D. None of the above

QUESTION – (AIPMT 2011)

The freezing point depression constant for water is – 1.86 °C m^{-1}. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O, the freezing point is changed by – 3.82°C. Calculate the van't Hoff factor for Na_2SO_4.

A 2.05

B 2.63

C 3.11

D 0.381

QUESTION – (AIIMS 2018, 27 May)

Freezing point of 0.4 m solution in a weak monoprotic acid is –0.1°C. What is its van't Hoff factor *i* ? [K_f = 1.86°C/m]

A 1.5

B 1.6

C 1.34

D 1.1

QUESTION – (AIIMS 2011)

An aqueous solution of NaCl shows the depression of freezing point of water equal to 0.372 K. The boiling point of $BaCl_2$ solution of same molality will be (K_f (H_2O) = 1.86 K kg mol^{-1}; K_b(H_2O) = 0.52 K kg mol^{-1})

A 100.52°C

B 100.104°C

C 101.56°C

D 100.156°C

QUESTION – (AIIMS 2008)

0.01 M solution of KCl and $BaCl_2$ are prepared in water. The freezing point of KCl is found to be –2°C. What is the freezing point of $BaCl_2$ to be completely ionised?

A. –3°C

B. +3°C

C. –2°C

D. –4°C

QUESTION-(JEE main 25th June 2nd Shift-2022)

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°C. the percentage association of solute A in water, is: (Given: Molar mass of 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%

QUESTION – (AIIMS 2007)

1 mol each of the following compounds is dissolved in 1 L of solution. Which will have the largest ΔT_b value?

A HF

B HCl

C HBr

D HI

QUESTION-(JEE main 29th Jan 2nd Shift-2023)

Match List-I with List-II

	List-I		List-II
A.	van't Hoff factor, i.	I.	Cryoscopic constant
B.	k_f	II.	Isotonic solutions
C.	Solutions with same osmotic pressure	III.	Normal molar mass Abnormal molar mass
D.	Azeotropes	IV.	Solutions with same composition of vapour above it

Choose the correct answer from the options given below.

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

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

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

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

QUESTION-(JEE main 9th April 1st Shift 2019)

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 0.18 K

C 0.12 K

D 0.24 K

QUESTION – (AIPMT 2011)

A 0.1 molal aqueous solution of a weak acid is 30% ionized. If K_f for water is 1.86 °C/m, the freezing point of the solution will be:

A – 0.18 °C

B – 0.54 °C

C – 0.36 °C

D – 0.24 °C

QUESTION-(JEE main 9th April 1st Shift 2019)

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

A 1.8

B 2.2

C 1.6

D 2.0

QUESTION-(JEE main 6th April 2nd Shift 2023)

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. $Al_2(SO_4)_3$

QUESTION – (AIPMT 2009)

A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at – 0.00732 °C. Number of moles of ions which 1 mol of ionic compound produces on being dissolved in water will be: (K_f = – 1.86 °C/m)

A 3

B 4

C 1

D 2

QUESTION-(JEE Advanced 2014)

MX_2 dissociates into M^{2+} and X^- ions in an aqueous solution, with a degree of dissociation (α) of 0.5. The ratio of the observed depression of freezing point of the aqueous solution to the value of the depression of freezing point in the absence of ionic dissociation is:

QUESTION-(JEE Mains 26th Aug 1st Shift 2021)

Of the following four aqueous solutions, total number of those solutions whose freezing point is lower than that of 0.10 M C_2H_5OH is _____.

(i) 0.10 M $Ba_3(PO_4)_2$

(ii) 0.10 M Na_2SO_4

(iii) 0.10 M KCl

(iv) 0.10 M Li_3PO_4

QUESTION-(JEE main 25th July 1st Shift-2022)

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

QUESTION-(JEE main 9th April 1st Shift 2019)

The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution of 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 6×10^{-2}

B 4×10^{-4}

C 4×10^{-2}

D 16×10^{-4}

QUESTION-(JEE main 12th Jan 2nd Shift 2019)

Molecules of benzoic acid (C_6H_5COOH) dimerise in benzene. '*w*' g of the acid dissolved in 30 g of benzene shown 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 $K_f = 5$ K kg mol^{-1}, molar mass of benzoic acid = 122 g mol^{-1})

A 2.4 g

B 1.8 g

C 1.0 g

D 1.5 g

QUESTION – (AIIMS 2012)

Assertion (A): Lowering of vapour pressure is directly proportional to osmotic pressure of the solution.
Reason (R): Osmotic pressure is a colligative property.

A. If both assertion and reason are correct and reason is correct explanation of assertion.

B. If both assertion and reason are correct but reason is not correct explanation of assertion.

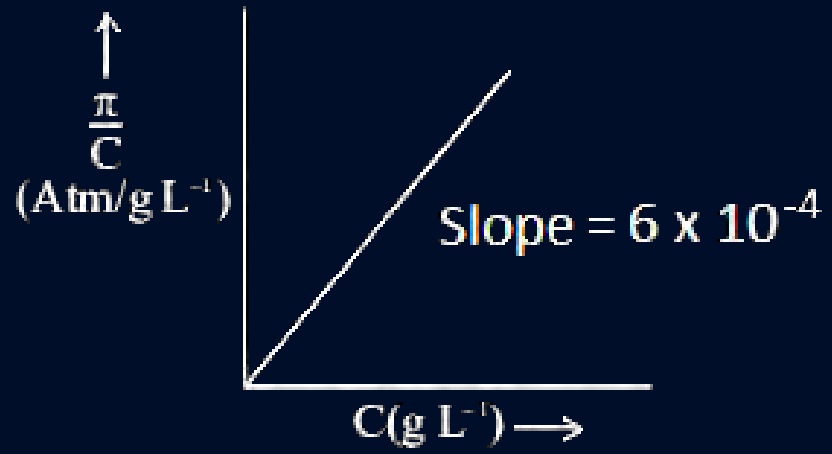
C. If Assertion is correct but reason is incorrect.

D. If both the assertion and reason are incorrect.

QUESTION-(JEE main 10th Apr 2nd Shift-2023)

The osmotic pressure of solutions of PVC in cyclohexanone at 300 K are plotted on the graph. The molar mass of PVC is _____ g mol^{-1}. (Nearest integer)

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



QUESTION-(JEE main 26th June 2nd Shift-2022)

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°C is _____ Pa. (Integer value)

(Use R = 0.083 L bar K^{-1} mol^{-1})

QUESTION-(JEE main 27th July 1st Shift-2021)

1.46 g of a biopolymer dissolved in 100 mL water at 300 K exerted an osmotic pressure of 2.42×10^{-3} bar. The molar mass of the biopolymer is _____ $\times 10^4$ g mol^{-1}. (Round off to the nearest integer)

[Use: R = 0.083 L bar mol^{-1} K^{-1}]

QUESTION-(IIT Advance 2020)

Liquids A and B form ideal solution for all compositions of A and B at 25°C. Two such solutions with 0.25 and 0.50 mole fractions of A have the total vapour pressures of 0.3 and 0.4 bar, respectively. What is the vapour pressure of pure liquid B in bar?

QUESTION-(JEE main 25th July 1st Shift-2022)

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

QUESTION-(JEE Mains 9th April 1st Shift 2019)

The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution of 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 6×10^{-2}

B 4×10^{-4}

C 4×10^{-2}

D 16×10^{-4}

QUESTION-(JEE Mains 12th Jan 2nd Shift 2019)

Molecules of benzoic acid (C_6H_5COOH) dimerise in benzene. '*w*' g of the acid dissolved in 30 g of benzene shown 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 K kg mol^{-1}, molar mass of benzoic acid = 122 g mol^{-1})

A 2.4 g

B 1.8 g

C 1.0 g

D 1.5 g

QUESTION-(JEE Mains 10th April 1st Shift 2023)

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)

QUESTION-(JEE Mains 11th April 1st Shift 2023)

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

QUESTION-(JEE Mains 12th April 1st Shift 2023)

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°C is _____ mm Hg. (Nearest integer)

[Given: Vapour pressure of water at 38°C is 50 mm Hg.]

QUESTION-(JEE Mains 1st Feb 2nd Shift 2023)

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]

QUESTION-(JEE Mains 25th Jan 2nd Shift 2023)

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 $KCl_{(aq)}$

QUESTION-(JEE Mains 30th Jan 2nd Shift 2023)

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: $K_f = 1.8\ K\ kg\ mol^{-1}$

QUESTION-(JEE Mains 28th July 1st Shift 2022)

150 g of acetic acid was contaminated with 10.2 g ascorbic acid ($C_6H_8O_6$) to lower down its freezing point by ($x \times 10^{-2}$) °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}]

QUESTION-(JEE Mains 26th July 1st Shift 2022)

A 0.5 percent solution of potassium chloride was found to freeze at –0.24°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 KCl is 74.6 g mol^{-1})

QUESTION-(JEE Mains 29th June 1st Shift 2022)

1.2 mL of acetic acid is dissolved in water to make 2.0 L of solution. The depression in freezing point observed for this strength of acid is 0.0198°C. The percentage of dissociation of the acid is _____. (Nearest integer)

[Given: Density of acetic acid is 1.02 g mL^{-1}, molar mass of acetic acid is 60 g mol^{-1}; $K_f(H_2O)$ = 1.85 K kg mol^{-1}]

QUESTION-(JEE Mains 27th Aug 1st Shift 2021)

1 kg of 0.75 molal aqueous solution of sucrose can be cooled up to –4°C before freezing. He amount of ice (in g) that will be separated out is ___. (Nearest integer)

[Given: $K_f(H_2O) = 1.86\ K\ kg\ mol^{-1}$]

QUESTION-(JEE Mains 31st Aug 2nd Shift 2021)

1.22 g of an organic acid is separately dissolved in 100 g of benzene (K_b = 2.6 K kg mol^{-1}) and 100 g of acetone (K_b = 1.7 K kg 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 °C is $x \times 10^{-2}$. The value of x is _____. (Nearest integer)

[Atomic mass : C = 12.0, H = 1.0, O = 16.0]

QUESTION-(JEE Advanced 2015)

If the freezing point of a 0.01 molal aqueous solution of a cobalt(III) chloride-ammonia complex (which behaves as a strong electrolyte) is –0.0558°C, the number of chloride(s) in the coordination sphere of the complex is:

[K_f of water = 1.86 K kg mol^{-1}]

QUESTION-(JEE Advanced 2011)

The freezing point (in °C) of a solution containing 0.1 g of $K_3[Fe(CN)_6]$ (Mol. wt. = 329) in 100 g of water (K_f = 1.86 K kg mol^{-1}) is:

A -2.3×10^{-2}

B -5.7×10^{-2}

C -5.7×10^{-3}

D -1.2×10^{-2}

QUESTION-(JEE main 25th June 2nd Shift-2022)

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°C. the percentage association of solute A in water, is: (Given: Molar mass of 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%

QUESTION – (AIIMS 2007)

1 mol each of the following compounds is dissolved in 1 L of solution. Which will have the largest ΔT_b value?

A HF

B HCl

C HBr

D HI

QUESTION-(JEE main 29th Jan 2nd Shift-2023)

Match List-I with List-II

	List-I		List-II
A.	van't Hoff factor, i.	I.	Cryoscopic constant
B.	k_f	II.	Isotonic solutions
C.	Solutions with same osmotic pressure	III.	Normal molar mass Abnormal molar mass
D.	Azeotropes	IV.	Solutions with same composition of vapour above it

Choose the correct answer from the options given below.

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

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

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

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

QUESTION-(JEE main 9th April 1st Shift 2019)

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 0.18 K

C 0.12 K

D 0.24 K

QUESTION – (AIPMT 2011)

A 0.1 molal aqueous solution of a weak acid is 30% ionized. If K_f for water is 1.86 °C/m, the freezing point of the solution will be:

A – 0.18 °C

B – 0.54 °C

C – 0.36 °C

D – 0.24 °C

QUESTION-(JEE main 9th April 1st Shift 2019)

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

A 1.8

B 2.2

C 1.6

D 2.0

QUESTION-(JEE main 6th April 2nd Shift 2023)

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. $Al_2(SO_4)_3$

QUESTION – (AIPMT 2009)

A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at – 0.00732 °C. Number of moles of ions which 1 mol of ionic compound produces on being dissolved in water will be: (K_f = – 1.86 °C/m)

A 3

B 4

C 1

D 2

QUESTION-(JEE Advanced 2014)

MX_2 dissociates into M^{2+} and X^- ions in an aqueous solution, with a degree of dissociation (α) of 0.5. The ratio of the observed depression of freezing point of the aqueous solution to the value of the depression of freezing point in the absence of ionic dissociation is:

QUESTION-(JEE Mains 26th Aug 1st Shift 2021)

Of the following four aqueous solutions, total number of those solutions whose freezing point is lower than that of 0.10 M C_2H_5OH is _____.

(i) 0.10 M $Ba_3(PO_4)_2$

(ii) 0.10 M Na_2SO_4

(iii) 0.10 M KCl

(iv) 0.10 M Li_3PO_4

QUESTION-(JEE main 25th July 1st Shift-2022)

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

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The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution of 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:

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B 4×10^{-4}

C 4×10^{-2}

D 16×10^{-4}

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Molecules of benzoic acid (C_6H_5COOH) dimerise in benzene. '*w*' g of the acid dissolved in 30 g of benzene shown 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 $K_f = 5$ K kg mol^{-1}, molar mass of benzoic acid = 122 g mol^{-1})

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B 1.8 g

C 1.0 g

D 1.5 g

THANK YOU