

- Q9** Insulin contains 3.4% sulphur. What will be the minimum molecular weight of insulin?
 (A) 94.117 (B) 1884
 (C) 941.176 (D) 976
- Q10** One kilogram of a sea water sample contains 6 mg of dissolved O_2 . The concentration of O_2 in the sample in ppm is
 (A) 0.6 (B) 6.0
 (C) 60.0 (D) 16.0
- Q11** A solution has an osmotic pressure of 0.821 atm at 300 K. its concentration would be :
 (A) 0.066 M (B) 0.66 M
 (C) 0.033 M (D) 0.33 M
- Q12** Which of the following salt has the same value of Van't Hoff's factor as that of $K_3 [Fe (CN)_6]$?
 (A) $Na_2 SO_4$ (B) $Al (NO_3)_3$
 (C) $Al_2 (SO_4)_3$ (D) $Fe_3 O_4$
- Q13** The vapour pressure will be lowest of
 (A) Hypertonic solution
 (B) Hypotonic solution
 (C) Isotonic solution
 (D) None of the above
- Q14** A solution of urea (mol. mass 56) boils at $100.18^\circ C$ at atmospheric pressure. If K_f and K_b for water are 1.86 and $0.512 K \text{ molality}^{-1}$ respectively, the above solution will freeze at :
 (A) $- 6.54^\circ C$
 (B) $6.54^\circ C$
 (C) $- 0.654^\circ C$
 (D) $0.654^\circ C$
- Q15** A super saturated solution is a metastable state of solution in which solute concentration.
 (A) Is equal to the solubility of that substance in water
 (B) Exceeds than its solubility
 (C) Less than its solubility
 (D) Continuously change
- Q16** Two solutions of KNO_3 and CH_3COOH are prepared separately. Molarity of both is 0.1M and osmotic pressures are p_1 and p_2 respectively. The correct relationship between the osmotic pressures is
 (A) $p_1 = p_2$
 (B) $p_1 > p_2$
 (C) $p_2 > p_1$
 (D) $\frac{p_1}{p_1+p_2} + \frac{p_2}{p_1+p_2}$
- Q17** Henry's law constant for the molality of methane in benzene at 298 K is $4.27 \times 10^5 \text{ mm Hg}$. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg.
 (A) 1.78×10^{-3}
 (B) 3.5×10^{-5}
 (C) 5.6×10^{-4}
 (D) 4.5×10^{-6}
- Q18** Depression in freezing point of 0.1 molal solution of HF is $-0.201^\circ C$. The percentage degree of dissociation of HF. ($K_f = 1.86 K \text{ kg mol}^{-1}$) is;
 (A) 8.06 (B) 3.12
 (C) 2.94 (D) 7.12
- Q19** The vapour pressure (VP) of a dilute solution of non-volatile solute is P and the VP of pure solvent is P_0 , the lowering of the VP is :
 (A) +ve (B) - ve
 (C) P/P_0 (D) P_0/P



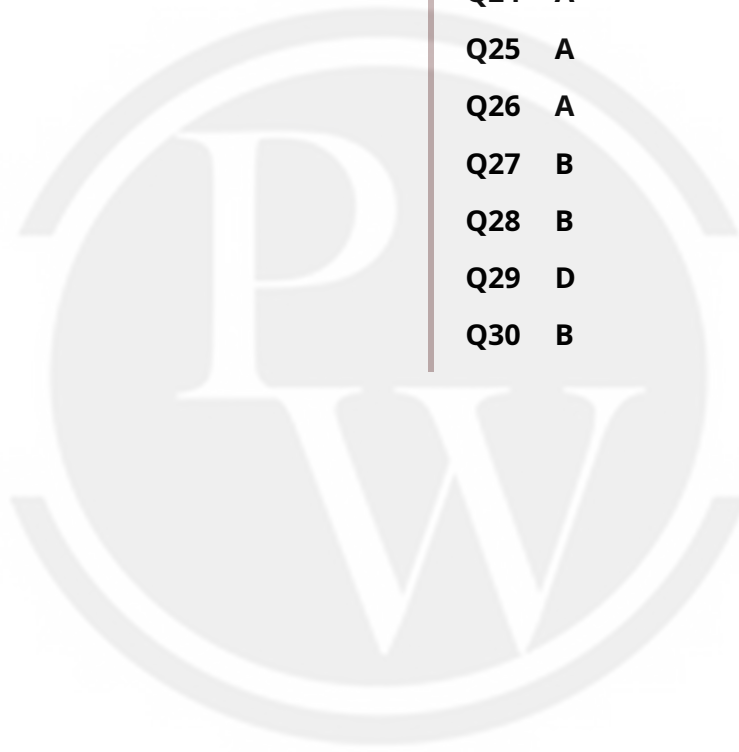
- Q20** What does Raoult's law state?
 (A) The vapor pressure of a solvent decreases with the addition of a non-volatile solute.
 (B) The vapor pressure of a solvent increases with the addition of a non-volatile solute.
 (C) The boiling point of a solution decreases with the addition of a non-volatile solute.
 (D) The vapor pressure of a solution is proportional to the mole fraction of the solvent and the vapor pressure of the pure solvent.
- Q21** If 100 grams of a nonvolatile solute of molecular mass 100 is dissolved in 432 grams of water, what is the $100 \times \text{RLVP}$
 (A) 1 (B) 2
 (C) 3 (D) 4
- Q22** The value of Henry's constant K_H is.....
 (A) greater for gases with higher solubility.
 (B) greater for gases with lower solubility.
 (C) constant for all gases.
 (D) not related to the solubility of gases.
- Q23** The vapour pressure of water depends upon :
 (A) Surface area of container
 (B) Volume of container
 (C) Temperature
 (D) All of these
- Q24** The relative lowering of vapour pressure of a dilute aqueous solution containing non-volatile solute is 0.0125. The molality of the solution is about
 (A) 0.70 (B) 0.50
 (C) 0.90 (D) 0.80
- Q25** The depression in f.p.t. of 0.01 m aqueous solution of urea, sodium chloride and sodium sulphate is in the ratio:
 (A) 1 : 2 : 3 (B) 1 : 1 : 1
 (C) 2 : 2 : 3 (D) 1 : 2 : 4
- Q26** At Abu mountains water boils at 96°C . What amount of NaCl be added in 1 kg water so that it boils at 100°C . K_b for $\text{H}_2\text{O} = 0.52 \text{ K molality}^{-1}$
 (A) 225 g (B) 450 g
 (C) 200 g (D) 125
- Q27** 1 mole glucose is added to 1 L of water. $K_b(\text{H}_2\text{O}) = 0.512 \text{ K kg mole}^{-1}$, boiling point of solution will be
 (A) 373.512°C (B) 100.512°C
 (C) 99.488°C (D) 372.488°C
- Q28** If molecular interaction of two different liquid molecules are stronger than the molecular interactions of the same liquid molecules the mixture is expected to show :
 (A) Positive deviations
 (B) Negative deviations
 (C) No deviations
 (D) Positive as well as negative deviations
- Q29** A solution containing 1.23g of $\text{Ca}(\text{NO}_3)_2$ in 10g of water has a normal boiling point of 100.975°C . The degree of dissociation of $\text{Ca}(\text{NO}_3)_2$ will be :
 ($K_{L, \text{water}} = 0.52 \text{ kkgmol}^{-1}$)
 ($\text{Ca} = 40; \text{N} = 14, \text{O} = 16$)
 (A) 0.25 (B) 0.33
 (C) 0.5 (D) 0.75
- Q30** 2.5 L of NaCl solution contain 5 moles of the solute. What is the molarity?
 (A) 5M (B) 2M
 (C) 2.5M (D) 12.5M



Answer Key

Q1 C
Q2 D
Q3 A
Q4 D
Q5 A
Q6 A
Q7 D
Q8 B
Q9 C
Q10 B
Q11 C
Q12 B
Q13 A
Q14 C
Q15 B

Q16 B
Q17 A
Q18 A
Q19 A
Q20 D
Q21 D
Q22 B
Q23 C
Q24 A
Q25 A
Q26 A
Q27 B
Q28 B
Q29 D
Q30 B



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Osmotic pressure is a colligative property. It depends upon the number of solute particles. Benzoic acid undergoes dimerisation.

\therefore Number of particles reduces ($i < 1$) Hence, osmotic pressure observed is less than the theoretical consideration

Video Solution:



Q2 Text Solution:

Solubility of gas is inversely proportional to value of K_H .

So Gas D will be maximum soluble.

Video Solution:



Q3 Text Solution:

On addition of water, concentration of the solution decreases, i.e., now less solute particles are present on the surface or more solvent molecules are present on the surface Hence, vapour pressure increases.

Video Solution:



Q4 Text Solution:

$$p = P_A^o X_A + P_B^o x_B$$

$$\Rightarrow 84 = 70 \times 0.8 + P_B^o \times 0.2$$

$$84 = 56 + P_B^o \times 0.2$$

$$P_B^o = \frac{28}{0.2} = 140 \text{ mm}$$

Video Solution:



Q5 Text Solution:

For complete neutralization,

M.wq. of H_2SO_4 = m. eq. of NaOH

$$0.1 \times 2 \times V = 50 \times 0.2 \times 1$$

$$(\because 0.1M H_2SO_4 = 0.2N H_2SO_4)$$

$$V = 50 \text{ mL}$$

Video Solution:



Q6 Text Solution:

$$\Delta T_f = i \times K_f m$$

$$3.84 = i \times 5.12 \times 1$$

$$\therefore i = 0.75 < 1 \text{ (for freezing)}$$

$$\text{For boiling } 2.53 = i \times 2.53 \times 1$$

$$i = 1$$

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Video Solution:



Q7 Text Solution:

$$\text{Mole of X, } n_x = \frac{3}{3+2} = \frac{3}{5}$$

$$\text{Moles of Y, } n_y = \frac{2}{3+2} = \frac{2}{5}$$

$$P_T = P_x n_x + P_y n_y$$

$$= 80 \times \frac{3}{5} + 60 \times \frac{2}{5}$$

$$= 48 + 24 = 72 \text{ Torr}$$

Video Solution:



Q8 Text Solution:

$$\text{Mole of urea} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3} \text{ mol}$$

Conc. of solution (in molarity)

$$= \frac{n}{V} = \frac{10^{-3}}{10^{-1}} = 10^{-2} = 0.01M$$

Video Solution:



Q9 Text Solution:

For minimum molecular mass, there must be one S atom per insulin molecule.

If 3.4 g S is present, the molecular mass = 100

\therefore If 32 g S is present, the molecular mass

$$= \frac{100 \times 32}{3.4} = 941.176$$

Video Solution:



Q10 Video Solution:



Q11 Text Solution:

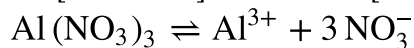
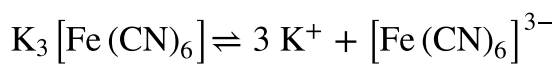
$$\pi = cRT$$

$$\therefore c = \frac{0.821}{0.0821 \times 300} = 0.033M$$

Video Solution:



Q12 Text Solution:



Since both $Al(NO_3)_3$ and $K_3 [Fe(CN)_6]$ give the same number of ions, therefore they have the same van't Hoff Factor.

Video Solution:



Q13 Text Solution:

In comparing two solutions of different concentrations, the solution with the higher concentration is hypertonic, and the solution with the lower solute concentration is hypotonic. Solutions of equal solute concentration are isotonic.

In a solution, containing non-volatile solute, the solution with a higher concentration has lower vapour pressure at the given temperature and pressure.

The vapour pressure is lowest in the case of hypertonic solution.

Video Solution:



Q14 Text Solution:

$$\frac{\Delta T_b}{\Delta T_f} = \frac{K_b}{K_f}$$

$$\therefore \Delta T_f = \frac{K_f}{K_b} \times \Delta T_b = \frac{1.86}{0.512} \times 0.18$$

$$f.pt. = 0 - 0.654 = -0.654^\circ C$$

Video Solution:



Q15 Text Solution:

It is the characteristic of super saturated solution, the meta stable state leading to saturated solution after few time.

Video Solution:



Q16 Text Solution:

KNO_3 dissociates completely while CH_3COOH dissociates to a smaller extent hence, $p_1 > p_2$

Video Solution:



Q17 Text Solution:

Here, $K_H = 4.27 \times 10^5$ mm Hg,

$p = 760$ mm Hg

According to Henry's law, $p = K_H \times x_{CH_4}$

$$x_{CH_4} = \frac{p}{K_H} = \frac{760 \text{ mmHg}}{4.27 \times 10^5 \text{ mmHg}} = 1.78 \times 10^{-3}$$

Mole fraction of methane in benzene,

$$x_{CH_4} = 1.78 \times 10^{-3}.$$

Video Solution:



Q18 Text Solution:

We know

$$\Delta T = i \times K_f \times m$$

$$0.201 = i \times 1.86 \times 0.1$$

$$i = 1.0806$$

The degree of dissociation of HF may be calculated as.

$$\alpha = \frac{i-1}{n-1} = \frac{1.0806-1}{2-1} = 0.0806$$

Percentage dissociation

$$= \alpha \times 100 = 0.0806 \times 100 = 8.06$$

Video Solution:



Q19 Text Solution:

The vapour pressure (V.P.) of a dilute solution of non-volatile solute is P and the V.P. of pure solvent is P_0 , the lowering of the V.P. is +ve.

Lowering of vapor pressure is always positive.

Video Solution:



Q20 Text Solution:

The vapor pressure of a solution is proportional to the mole fraction of the solvent and the vapor pressure of the pure solvent.

Video Solution:



Q21 Text Solution:

When relative lowering is expressed in terms of solute and solvent then formula is $\frac{n}{n+N}$

Where

n = moles of solute

N = moles of solvent

here,

$$\frac{\frac{100}{100}}{\frac{100}{100} + \frac{432}{18}} = 0.04$$

(mol wt. of water is 18)

$$100 \times 0.04 = 4$$

Video Solution:



Q22 Text Solution:

$$\text{Solubility} \propto \frac{1}{k_H}$$

Video Solution:**Q23 Text Solution:**

Vapour pressure is independent of surface area and volume of container.

Video Solution:**Q24 Text Solution:**

Relative lowering of vapour pressure = mole fraction of solute.

$$(X_B) = 0.0125$$

$$\therefore X_B = \frac{m \cdot M_A}{1000 + m \cdot M_A}$$

Where m = molality,

$$\therefore 0.0125 = \frac{m \times 18}{1000 + m \times 18}$$

$$12.5 + 0.225m = 18m$$

$$17.775m = 12.5$$

$$m = \frac{12.5}{17.775} = 0.70.$$

Video Solution:**Q25 Text Solution:**

The depression in f.pt. of 0.01 m aqueous solution of urea, sodium chloride and sodium sulphate is in the ratio 1 : 2 : 3

1 mole urea gives 1 mole

1 mole NaCl gives 2 mole

1 mole Na_2SO_4 gives 3 mole

$\therefore \Delta T$ ratio = 1 : 2 : 3

Video Solution:**Q26 Text Solution:**

$$\Delta T_b = \frac{1000 \times K_b \times w}{m \times W} (1 + \alpha)$$

$$\therefore w = \frac{\Delta T_b \times m \times W}{1000 \times K_b (1 + \alpha)} = \frac{4 \times 58.5 \times 1000}{1000 \times 0.52 \times 2}$$

$$= 225 \text{ g}$$

Video Solution:**Q27 Text Solution:**

$$\Delta T_b = k_b m$$

$$= 0.512 \times \left(\frac{1}{1}\right) \frac{\text{mol}}{\text{kg}}$$

$$T_b(\text{k}) - 373(\text{k}) = 0.512 \text{ k}$$

$$T_b = 373.512 \text{ k}$$

$$T_b = 100.512^\circ \text{C}.$$

Video Solution:

Q28 Text Solution:

The tendency to evaporation will decrease and this will lead to lower value of experimental vapour pressure than those calculated from Raoult's law.

Video Solution:



Q29 Text Solution:

$$\Delta T_b = 100.975 - 100 = 0.975^\circ C$$

Molecular weight of $Ca(NO_3)_2 = 164$

$$\Delta T_b = i \times K_b \times \text{molality}$$

$$0.975 = i \times 0.52 \times \frac{1.23/164}{10/1000}$$

$$i = 2.5$$

$$\text{Degree of ionisation, } \alpha = \frac{i-1}{n-1} = \frac{2.5-1}{3-1} = 0.75$$

(Ans.)

Video Solution:



Q30 Text Solution:

$$\text{Molarity} = \frac{\text{Number of moles of solute}}{\text{Volume of solution (in L)}}$$

$$\Rightarrow \text{molarity} = \frac{5}{205} = 2M$$

Video Solution:



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