COMPETENCY BASED TEST(2026-27) MONTH - APRIL

CLASS 12 CHEMISTRY

MULTIPLE CHOICE QUESTIONS

Q1- A solute dimerizes in solution. The observed molar mass is double the normal value. The van't Hoff factor (i) is:

(a) 2 (b) 1 (c) 0.5 (d) 1.5

Q2-One Faraday of electricity when passed through a solution of copper sulphate deposits

(a) 1 mole of Cu (b) 1gm-atom of Cu

(c)1 molecule of Cu (d)1gm equivalent of Cu

ASSERTION AND REASON TYPE QUESTIONS

Directions: These questions consist of two statements each, printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

(a) Both Assertion and Reason are True and the Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not a correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Assertion is False but Reason is True.

Q3 . Assertion: For a Daniell cell, $Zn/Zn^{2+}(1M)$ || $Cu^{2+}(1M)/Cu$ with $E°cell = 1.1$ V, if the external opposing potential is more than 1.1 V, the electrons flow from Cu to Zn.

Reason: Cell acts like a galvanic cell.

Q4 . Assertion: When NaCl is added to water a depression in freezing point is observed.

Reason:The lowering of vapour pressure of a solution causes depression in freezing

CASE BASED QUESTIONS

[A] A chemical engineer is studying the phase behavior of a binary mixture of liquid A and liquid B. The pure component vapour pressures at 80°C are $P°_A = 800$ Torr and $P°_B = 1200$ Torr. The system is known to exhibit significant deviation from Raoult's law. The engineer observes that at 80°C, a solution with a liquid mole fraction of A, $X_A = 0.5$, has a total vapor pressure of 1100 Torr. This particular composition is found to be an azeotrope.

Q5 . What is the nature of the deviation from Raoult's law and the type of azeotrope formed?

(a) Positive deviation, minimum boiling azeotrope
(b) Positive deviation, maximum boiling azeotrope
(c) Negative deviation, minimum boiling azeotrope
(d) Negative deviation, maximum boiling azeotrope

Q6. What is the composition of the vapour phase (mole fraction of A, y_A) in equilibrium with the liquid at the azeotropic point?

(a) 0.45 (b) 0.50 (c) 0.55 (d) Cannot be determined.

Q7. If a solution with $X_A = 0.2$ is subjected to fractional distillation, what will be the composition of the initial distillate?

(a) Pure A (b) Pure B

(c) The azeotropic mixture (d)A mixture richer in A than the original solution.

[B] Resistance is the property of a conductor due to which it opposes the flow of current through it. Electrical resistance of any object is directly proportional to its length and inversely proportional to its area of cross section. Inverse of resistance is known as conductance. Inverse of resistivity is known as conductivity. Molar conductivity is the conductance property of a solution containing one mole of the electrolyte. Both conductivity and molar conductivity change with the concentration of the electrolyte. The molar conductivity of a solution at infinite dilution, i.e., when concentration approaches zero is called limiting molar conductivity. The Kohlrausch law of independent migration of ions states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.

Q8. Which of the following is the SI unit of conductivity?

(a) Sm^{-1} (b) Ohm^{-1} (c) S (d) Ohm

Q9. Which of the following equations represents the correct relationship between conductivity and molar conductivity of the solution?

(a) $\Lambda_m = (\kappa \times m)/c$ (b) $\Lambda_m = \kappa/c$ (c)) $\Lambda_m = m/\kappa$ (d)) $\Lambda_m = \kappa + cm$

Q10. Λ_m for NaCl, HCl, and NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate Λ° for HAc.

(a) 284.1 S cm^2 mol^{-1} (b) 390.5 S cm^2 mol^{-1} (c) 162.7 S cm^2 mol^{-1} (d) 132.8 S cm^2 mol^{-1}

ANSWERS

Answer1 : (c) Explaination: Dimerization halves the number of particles .i=0.5

Answer 2: (d)1gm equivalent of Cu. Explaination: 1 Faraday = 1 mole of electrons = 96500 C, deposits 1 equivalent of any substance.

For $Cu^{2+} + 2e^- \rightarrow Cu$, 2F deposit 1 mol Cu. So 1F deposits 0.5 mol = 1 equivalent.

1 gm atom = 1 mol,

Answer3: (c) Assertion is True but the Reason is False

Assertion is true. If external potential > E°cell, the cell reaction reverses and works as electrolytic cell, so electrons flow Cu to Zn.
Reason is false. When external potential > E°cell, it does not act like a galvanic cell, it acts as electrolytic.

Answer 4: (a) Assertion is true. NaCl is a non-volatile solute, so ΔTf is observed. Colligative property.
Reason is true. Depression in freezing point is due to lowering of vapor pressure by solute.

Answer 5 (a) Ideal P_{total} = 800x 0.5 + 1200x 0.5 = 1000 Torr. Observed = 1100 Torr. Since observed > ideal, it's positive deviation. Positive deviation gives higher vapor pressure, lower boiling point. Hence it forms a minimum boiling azeotrope

Answer6(b) By definition, at the azeotropic point, vapor and liquid have the same composition. Given $X_A = 0.5$ for the azeotrope. Therefore $Y_A = 0.5$

Answer7(c) For a minimum boiling azeotrope, on distillation the mixture moves away from azeotropic composition.
Starting at $X_A = 0.2$, which is < 0.5 (azeotrope), the residue becomes pure B.
But the distillate collected is the minimum boiling azeotrope, so initial distillate is the azeotropic mixture.

Answer8: (a) Sm^{-1}

Conductivity = 1/resistivity. Resistivity unit = Ohm m. So conductivity unit = $Ohm^{-1}\ m^{-1} = S\ m^{-1}$, since $S = Ohm^{-1}$.
SI unit is $S\ m^{-1}$.

Answer9: (b) $\Lambda_m = \kappa/c$

Molar conductivity $\Lambda_m = \kappa \times V$, where V = volume containing 1 mol.

V = 1000/c when c is in mol/L and κ in $S\ cm^{-1}$, but in SI: $\Lambda_m = \kappa/c$.
So correct relation is $\Lambda_m = \kappa/c$.

Answer10: (b) 390.5 $S\ cm^2\ mol^{-1}$

Using Kohlrausch law: $\Lambda°(HAc) = \Lambda°(HCl) + \Lambda°(NaAc) - \Lambda°(NaCl)$.

$\Lambda° = 425.9 + 91.0 - 126.4 = 390.5\ S\ cm^2\ mol^{-1}$. So answer is 390.5 $S\ cm^2\ mol^{-1}$