B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS

A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

MID-APRIL TEST 2025-26

CHEMISTRY

Class: XII — **Time: 1hr**

Date: 21.04.25 — **Answer key** — **Max Marks: 25**

Admission no: — **Roll no:**

SECTION A

1. (b) 1
2. (a) 1
3. (a) 1

SECTION B

4. Lower temperature more soluble of gas o_2 2

5.:

Mass percentage of C_6H_6 $= \frac{\text{Mass of } C_6H_6}{\text{Total mass of the solution}} \times 100\%$

$$= \frac{\text{Mass of } C_6H_6}{\text{Mass of } C_6H_6 + \text{Mass of } CCl_4} \times 100\%$$

$$= \frac{22}{22 + 122} \times 100\%$$

$$= 15.28\%$$ 1

Mass percentage of CCl_4 $= \frac{\text{Mass of } CCl_4}{\text{Total mass of the solution}} \times 100\%$

$$= \frac{\text{Mass of } CCl_4}{\text{Mass of } C_6H_6 + \text{Mass of } CCl_4} \times 100\%$$

$$= \frac{122}{22 + 122} \times 100\%$$

$$= 84.72\%$$ 1

6

Let the total mass of the solution be 100 g and the mass of benzene be 30 g.

∴Mass of carbon tetrachloride = (100 − 30)g

= 70 g

Molar mass of benzene (C_6H_6) = (6 × 12 + 6 × 1) g mol^{-1}

= 78 g mol^{-1}

∴Number of moles of $C_6H_6 = \frac{30}{78}$ mol 1

= 0.3846 mol

Molar mass of carbon tetrachloride (CCl_4) = 1 × 12 + 4 × 35.5

= 154 g mol^{-1}

∴Number of moles of CCl_4 = 70 / 154

= 0.4545 mol

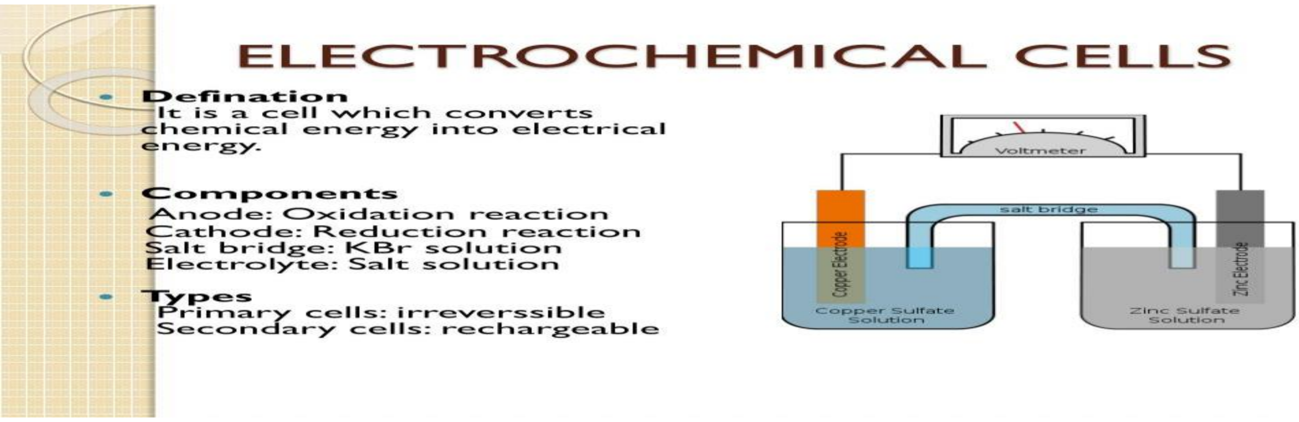
Thus, the mole fraction of C_6H_6 is given as:

$$\frac{\text{Number of moles of } C_6H_6}{\text{Number of moles of } C_6H_6 + \text{ Number of moles of } CCl_4}$$

$$= \frac{0.3846}{0.3846 + 0.4545}$$

= 0.458 1 2

7. Electrochemical cells convert chemical energy into electrical energy and vice versa. An electrochemical cell is comprised of two half-cells. Each of them consists of an electrode and an electrolyte that can be the same or different in the two half cells.



8. Cathode Copper
, Anode Zinc
and reaction at cathode reduction
and anode is oxidation 2

SECTION C

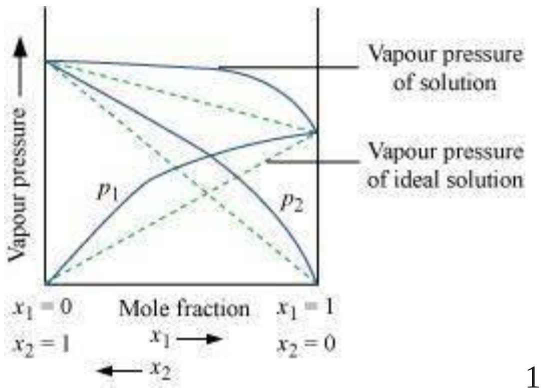
This section contains 4 questions. The following questions are short answer type and carry 3 marks each.

9. **Osmosis :** The net spontaneous flow of the solvent molecules from the solvent to the solution or from a less concentrated solution to a more concentrated solution through a semipermeable membrane is called osmosis. 1.5x2

Osmotic pressure : The minimum excess pressure that has to be applied on the solution to prevent the entry of the solvent into the solution through the semipermeable membrane is called the osmotic pressure.

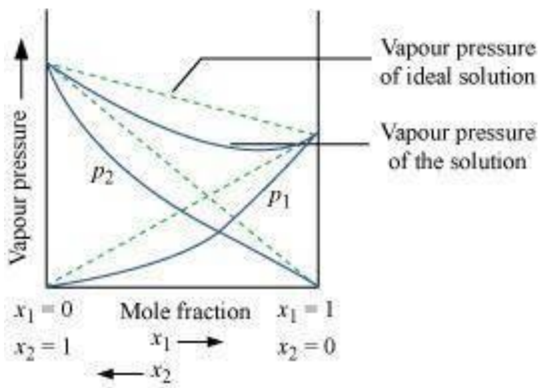
The osmotic pressure method has the advantage that it uses molarities instead of molalities and it can be measured at room temperature.

10. to Raoult's law, the partial vapour pressure of each volatile component in any solution is directly proportional to its mole fraction. The solutions which obey Raoult's law over the entire range of concentration are known as ideal solutions. The solutions that do not obey Raoult's law (non-ideal solutions) have vapour pressures either higher or lower than that predicted by Raoult's law. If the vapour pressure is higher, then the solution is said to exhibit positive deviation, and if it is lower, then the solution is said to exhibit negative deviation from Raoult's law.



1.5

Vapour pressure of a two-component solution showing positive deviation from Raoult's law



Vapour pressure of a two-component solution showing negative deviation from Raoult's law

In the case of an ideal solution, the enthalpy of the mixing of the pure components for forming the solution is zero.

$\Delta_{sol}H = 0$

In the case of solutions showing positive deviations, absorption of heat takes place.

$\therefore \Delta_{sol}H$ = Positive

In the case of solutions showing negative deviations, evolution of heat takes place.

$\therefore \Delta_{sol}H$ = Negative 1.5

11. **(i) Mole fraction:**

The mole fraction of a component in a mixture is defined as the ratio of the number of moles of the component to the total number of moles of all the components in the mixture.

i.e.,

Mole fraction of a component $= \frac{\text{Number of moles of the component}}{\text{Total number of moles of all components}}$

Mole fraction is denoted by 'x'.

If in a binary solution, the number of moles of the solute and the solvent are n_A and n_B respectively, then the mole fraction of the solute in the solution is given by,

$x_A = \frac{n_A}{n_A + n_B}$ 1

Similarly, the mole fraction of the solvent in the solution is given as:

$x_B = \frac{n_B}{n_A + n_B}$

(ii) Molality

Molality (m) is defined as the number of moles of the solute per kilogram of the solvent. It is expressed as:

Molality (m) $= \frac{\text{Moles of solute}}{\text{Mass of solvent in kg}}$ 1

(iii) Molarity

Molarity (M) is defined as the number of moles of the solute dissolved in one Litre of the solution.

It is expressed as:

Molarity (M) $= \frac{\text{Moles of solute}}{\text{Volume of solution in Litre}}$ 1

12. Apply the Nernst equation to calculate the cell potential.

1 Write the Nernst equation

$$\therefore\ E_{Cu^{2+}/Cu} = E^{\circ}_{Cu^{2+}/Cu} - \frac{0.059}{n}\log\frac{1}{[Cu^{2+}]}$$

For anode: $Zn^{2+} + 2e^- \longrightarrow Zn$

$$E_{Zn^{2+}/Zn} = E^{\circ}_{Zn^{2+}/Zn} - \frac{0.059}{n}\log\frac{1}{[Zn^{2+}]}$$

As $Ecell = E_{Cu^{2+}/Cu} - E_{Zn^{2+}/Zn}$

$$\therefore\ Ecell = E^{\circ}_{Cu^{2+}/Cu} - \frac{0.059}{n}\log\frac{1}{[Cu^{2+}]} - E^{\circ}_{Zn^{2+}/Zn} + \frac{0.059}{n}\log\frac{1}{[Zn^{2+}]}$$

$$Ecell = E^{\circ}_{Cu^{2+}/Cu} - E^{\circ}_{Zn^{2+}/Zn} - \frac{0.059}{n}\log\frac{[Zn^{2+}]}{[Cu^{2+}]}$$

$$\therefore\ Ecell = \mathbf{E^{\circ}_{cell}} - \frac{\mathbf{0.059}}{\mathbf{n}}\mathbf{\log\frac{[Zn^{2+}]}{[Cu^{2+}]}}$$

Put the value and find the answer $E_{cell} = 1.07V$