BSEH MARKING SCHEME

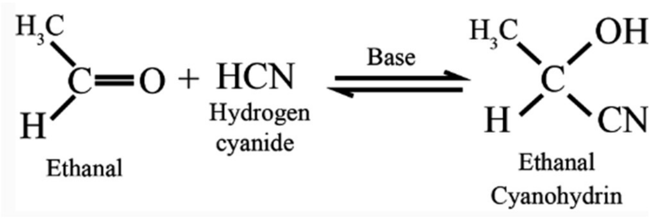
CLASS- XII **Chemistry (March-2024)** **Code: B**

- **The answer points given in the marking scheme are not final. These are suggestive and indicative. If the examinee has given different, but appropriate answers, then he should be given appropriate marks.**

Q. No.	Answers	Marks
1.	c) μg/mL	1
2.	b) 0.9% (mass/volume) NaCl	1
3.	b) Anode	1
4.	c) mol $L^{-1}s^{-1}$	1
5.	c) Zn	1
6.	a) $KMnO_4$	1
7.	d) 6	1
8.	b) *cis*-platin	1
9.	c) 3-Chloropropene	1
10.	c) Phenol	1
11.	c) 4-Nitroanisole	1
12.	b) β-D-Glucose	1
13.	a) 51	1
14.	b) Vitamin C	1
15.	a) Both A and R are true, and R is the correct explanation of A.	1

16.	d) A is false but R is true.	1
17.	b) Both A and R are true, and R is not the correct explanation of A	1
18.	d) A is false but R is true	1
19.	The properties which depend on the number of solute particles irrespective of their nature relative to the total number of particles present in the solution are called colligative properties. (1 mark) Examples: (1) relative lowering of vapour pressure of the solvent (2) depression of freezing point of the solvent (3) elevation of boiling point of the solvent (4) osmotic pressure (Any two, ½ mark each)	2
20.	Given: c = 0.20 M κ = 0.0248 S cm^{-1} molar conductivity $$\Lambda_m = \frac{\kappa \times 1000}{c}$$ (½ mark) $$\Lambda_m = \frac{0.0248 \times 1000}{0.20}$$	2

	(½ mark) $\Lambda_m = 124\ \mathrm{S}\ cm^2\ mol^{-1}$ (½ mark for answer, ½ mark for unit) Or Given Production of Al from Al_2O_3 has a reaction as following: $Al^{3+} + 3e^- \rightarrow Al$ (½ mark) i.e. production of 1 mole of Al (27 g) from Al_2O_3 requires electricity = 3 F or production of 1 g of Al from Al_2O_3 requires electricity = 3/27 F (½ mark) So, production of 40 g of Al from Al_2O_3 requires electricity = 40/9 F = 4.44 F (½ mark for answer, ½ mark for unit)	
21.	concentration of reactants & pressure in case of gases, temperature, and catalyst. (½ mark each)	2
22.	In the first transition series, Cu exhibits +1 oxidation state very frequently. (1 mark)	2

	It is because Cu (+1) has an electronic configuration of [Ar] 3*d*^{10}. The completely filled *d*-orbital makes it highly stable. (1 mark)	
23.	*tert*-butyl bromide < *sec*-butyl bromide < isobutyl bromide < n-butyl bromide	2
24.	Carboxylic acids lose carbon dioxide to form hydrocarbons when their sodium salts are heated with sodalime (NaOH and CaO in the ratio of 3:1). The reaction is known as decarboxylation. (1 mark) $CH_3COONa \xrightarrow{NaOH \,\&\, Cao,\ \Delta} CH_4 + Na_2CO_3$ (1 mark) Or Addition products formed by the reaction of aldehydes and ketones with hydrogen cyanide (HCN) are known as cyanohydrins. (1 mark)  (1 mark)	2
25.	i) *p*-nitroaniline, Aniline, *p*-toluidine (1 mark) ii) NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$	2

<table>
<tr><td></td><td>(1 mark)</td><td></td></tr>
<tr><td>26.</td><td>
<table>
<tr><th>Positive Deviation Non-Ideal Solutions</th><th>Negative Deviation Non-ideal solutions</th></tr>
<tr><td>1. Those liquid-liquid solutions which has vapour pressure more than expectations from Raoults’ law.</td><td>1. Those liquid-liquid solutions which has vapour pressure less than expectations from Raoults’ law.</td></tr>
<tr><td>2. The molecular interactions of solution is weaker than that of solute and solvent.</td><td>2. The molecular interactions of solution is stronger than that of solute and solvent.</td></tr>
<tr><td>3. $\Delta V_{mix} > 0$</td><td>3. $\Delta V_{mix} < 0$</td></tr>
<tr><td>4. $\Delta H_{mix} > 0$</td><td>4. $\Delta H_{mix} < 0$</td></tr>
<tr><td>5. They form minimum boiling azeotrops.</td><td>5. They form maximum boiling azeotrops.</td></tr>
</table>
(Any three, 1 mark each)</td><td>3</td></tr>
<tr><td>27.</td><td>For a first order reaction:

$$t = \frac{2.303}{k} log \frac{[R]_o}{[R]}$$

(½ mark)

Using this we get:

$$t_{99} = \frac{2.303}{k} log \frac{100}{1}$$</td><td>3</td></tr>
</table>

(½ mark)

$$t_{99} = \frac{2.303 \times 2}{k}$$

(½ mark)

Also

$$t_{90} = \frac{2.303}{k} log \frac{100}{10}$$

(½ mark)

$$t_{90} = \frac{2.303}{k}$$

(½ mark)

$$\text{Now } \frac{t_{99}}{t_{90}} = \frac{\frac{2.303 \times 2}{k}}{\frac{2.303}{k}}$$

$$\frac{t_{99}}{t_{90}} = 2$$

(½ mark)

Or

Consider the reaction, R → P is zero order reaction.

$$Rate = -\frac{d[R]}{dt} = k[R]^0$$

(½ mark)

$$\Rightarrow Rate = -\frac{d[R]}{dt} = k$$

$$\Rightarrow d[R] = -kdt$$

Integrating both sides

	$[R] = -kt + I$ ………Eq. 1 Where I is the constant of integration (½ mark) At t = 0, the concentration of the reactant R = $[R]_0$, where $[R]_0$ is initial concentration of the reactant. (½ mark) Substituting in above equation 1 $[R]_0 = -k \times 0 + I$ $[R]_0 = I$ (½ mark) Substituting the value of I in the equation 1 $[R] = -kt + [R]_0$ (½ mark) $\Rightarrow \quad k = \frac{[R]_0 - [R]}{t}$ This is the integrated rate equation for a zero-order reaction. (½ mark)	
28.	i) ability to adopt multiple oxidation states ii) ability to form complexes. iii) transition metals utilise outer d and s electrons for bonding. This has the effect of increasing the concentration of the reactants at the catalyst surface and also weakening of the bonds in the reacting molecules. (1 mark each)	3

29.	i) Freon-12 is used for aerosol propellants, refrigeration and air conditioning purposes. ii) Carbon tetrachloride is used in the synthesis of chlorofluorocarbons and other chemicals, pharmaceutical manufacturing, and general solvent use. iii) Iodoform can be used as antiseptic. (1 mark each)	3
30.	i) A: CH_3CH_2CN B: $CH_3CH_2CH_2NH_2$ C: $CH_3CH_2CH_2OH$ (½ mark each) ii) A: $C_6H_5NH_2$ B: $C_6H_5N^+_2Cl^-$ C: C_6H_5OH (½ mark each) Or i) Ethylamine is capable of forming hydrogen bonds with water as it is soluble but in aniline the bulk carbon prevents the formation of effective hydrogen bonding and is not soluble. (1 mark)	3

	ii) A Friedel-Crafts reaction is carried out in the presence of $AlCl_3$. But $AlCl_3$ is acidic in nature, while aniline is a strong base. Thus, aniline reacts with $AlCl_3$ to form a salt and benzene ring is deactivated. Hence, aniline does not undergo the Friedel-Crafts reaction. (1 mark) iii) Gabriel phthalimide reaction gives pure primary amines without any contamination of secondary and tertiary amines. Therefore, it is preferred for synthesising primary amines. (1mark)	
31.	i) ether or $C_2H_5OC_2H_5$ (1 mark) ii) 2 (1 mark) or Ethanoic acid (1 mark) iii) C_2H_5OH (1 mark) iv) CH_3CH_2I (1 mark)	4
32.	i) Deoxyribonucleic acid (1 mark)	

	ii) Phosphodiester bond (1 mark) iii) ribosomal (1 mark) iv) 3 (1 mark) or 4 (1 mark)	
33.	The reactions occurring in cells A, B and C respectively are as following: $Zn^{2+} + 2e^{-} \rightarrow Zn$ $Ag^{+} + e^{-} \rightarrow Ag$ $Cu^{2+} + 2e^{-} \rightarrow Cu$ (½ mark) In cell B: 108 g of Ag deposition requires charge = 96500 C 1 g of Ag deposition requires charge = 96500/108 C 1.45 g of Ag deposition requires charge = $\frac{96500 \times 1.45}{108} C = 1296 \text{ C}$ (½ mark) $\because$ Q= It $\therefore$ 1296 = 1.5t $\Rightarrow$ t = 863 s (½ mark for answer, ½ mark for unit)	5

In cell A:

2 x 96500 C charge deposits Zn = 65 g

1 C charge deposits Zn = $\frac{65}{2 \times 96500}\, g$

1296 C charge deposits Zn = $\frac{65 \times 1296}{2 \times 96500}\, g$

(½ mark)

= 0.438 g

(½ mark for answer, ½ mark for unit)

In cell C:

2 x 96500 C charge deposits Cu = 63.5 g

1 C charge deposits Cu = $\frac{63.5}{2 \times 96500}\, g$

1296 C charge deposits Cu = $\frac{63.5 \times 1296}{2 \times 96500}\, g$

(½ mark)

= 0.426 g

(½ mark for answer, ½ mark for unit)

Or

Given

Length of cell (l) = 50 cm

Diameter of cell = 1 cm

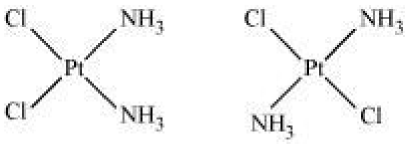
Resistance (R) = 5.55 x 10^3 ohm

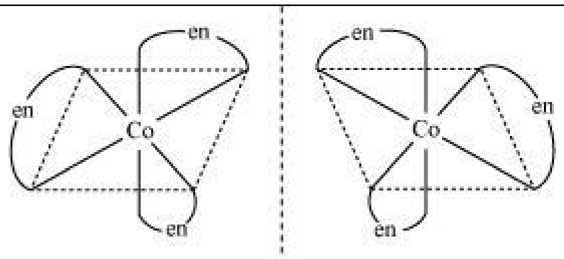
Concentration (c) = 0.05 mol L^{-1}

So area of cell (A) = πr^2 = 3.14 x 0.5 x 0.5 cm^2

= 0.785 cm^2

(½ mark)

	Resistivity (ρ) = $\frac{RA}{l} = \frac{5.55 \times 10^3 \times 0.785}{50}$ (½ mark) = 87.135 ohm cm (½ mark for answer, ½ mark for unit) Conductivity (κ) = $\frac{1}{\rho} = \frac{1}{87.135}\ S\ cm^{-1}$ (½ mark) = 0.001148 $S\ cm^{-1}$ (½ mark for answer, ½ mark for unit) Molar conductivity(Λ_m) $= \frac{\kappa \times 1000}{c} = \frac{0.001148 \times 1000}{0.05}\ S\ cm^2 mol^{-1}$ (½ mark) = 229.6 $S\ cm^2 mol^{-1}$ (½ mark for answer, ½ mark for unit)	
34.	**(a) Geometric isomerism:** This type of isomerism is common in heteroleptic complexes. It arises due to the different possible geometric arrangements of the ligands. For example:  Cis–isomer Trans–isomer **(b) Optical isomerism:** This type of isomerism arises in chiral molecules. Isomers are mirror images of each other and are non-superimposable.	5



$[Co(en)_3]^{3+}$ (dextro) Mirror $[Co(en)_3]^{3+}$ (Laevo)

(c) Linkage isomerism: This type of isomerism is found in complexes that contain ambidentate ligands. For example:

$[Co(NH_3)_5 (NO_2)]Cl_2$ and $[Co(NH_3)_5 (ONO)Cl_2$

Yellow form Red form

(d) Coordination isomerism:

This type of isomerism arises when the ligands are interchanged between cationic and anionic entities of different metal ions present in the complex.

$[Co(NH_3)_6] [Cr(CN)_6]$ and $[Cr(NH_3)_6] [Co(CN)_6]$

(e) Ionization isomerism:

This type of isomerism arises when a counter ion replaces a ligand within the coordination sphere. Thus, complexes that have the same composition, but furnish different ions when dissolved in water are called ionization isomers. For e.g., $Co(NH_3)_5SO_4)Br$ and $Co(NH_3)_5Br]SO_4$.

(f) Solvate isomerism:

Solvate isomers differ by whether or not the solvent molecule is directly bonded to the metal ion or merely present as a free solvent molecule in the crystal lattice.

$[Cr[H_2O)_6]Cl_3$ (Violet) ,$[Cr(H_2O)_5Cl]Cl_2\cdot H_2O$ (Blue-green) $[Cr(H_2O)_5Cl_2]Cl\cdot 2H_2O$ (Dark green)

(Any five, 1 mark each)

Or

Name: Potassium hexacyanomanganate (II)

(1 mark)

oxidation state: +2

(1 mark)

electronic configuration: $[Ar]3d^5$

(1 mark)

coordination number: 6

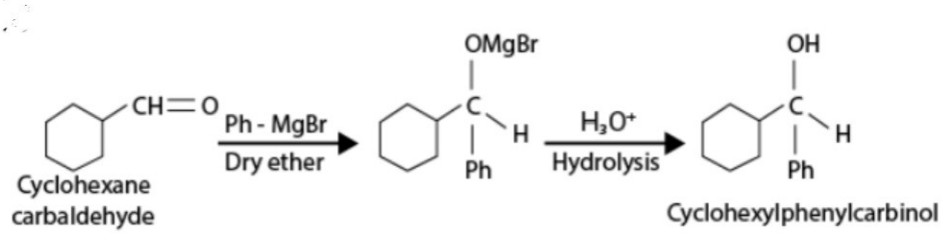
(1 mark)

magnetic moment of the complex:

$$\mu = \sqrt{n(n+2)}$$
$$= \sqrt{1(1+2)}$$
$$= \sqrt{3}$$
$$= 1.73 \text{ BM}$$

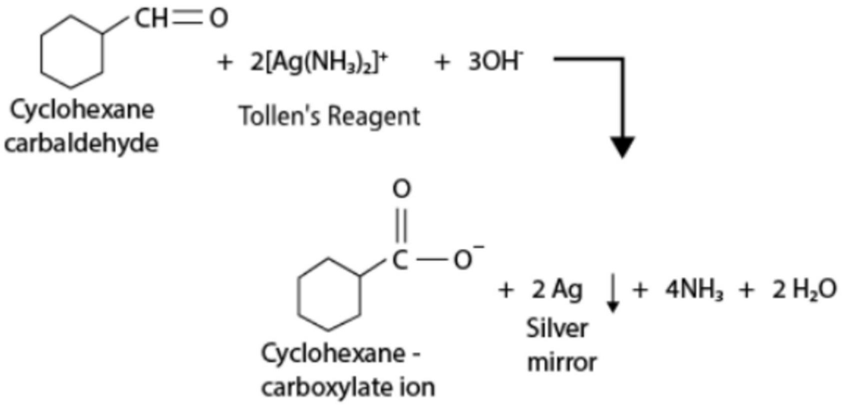
	(½ mark for answer, ½ mark for unit)	
35.	Organic compound A is an ester as on acid hydrolysis it gives a mixture of an acid and an alcohol. (½ mark) Oxidation of alcohol (C) gives acid (B). Hence, the number of carbon atoms in (B) and (C) are the same. (½ mark) Ester (compound A) has eight C atoms. Hence, both carboxylic acid (B) and alcohol (C) must contain 4 C atoms each. (½ mark) Dehydration of alcohol C gives but-1-ene. Hence, C must be a straight chain alcohol, i.e butan-1-ol. (½ mark) Reactions: $CH_3CH_2CH_2COOCH_2CH_2CH_2CH_3 +$ $\xrightarrow{dil.\ H_2SO_4} CH_3CH_2CH_2COOH + CH_3CH_2CH_2CH_2OH$ (1 mark) $CH_3CH_2CH_2CH_2OH \xrightarrow{Dehydratio} CH_3CH_2CH = CH_2$ (1 mark) $CH_3CH_2CH_2CH_2OH \xrightarrow{CrO_3/CH_3COOH} CH_3CH_2CH_2COOH$ (1 mark) Or	5

i)



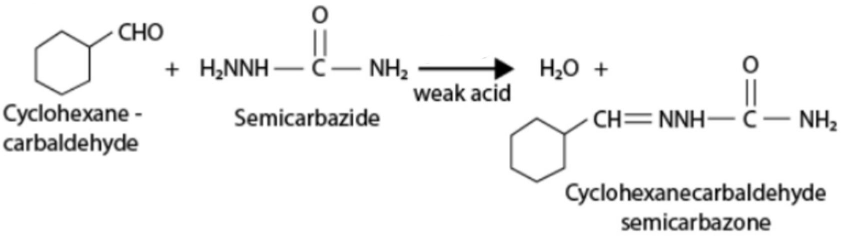
(1 mark)

ii)



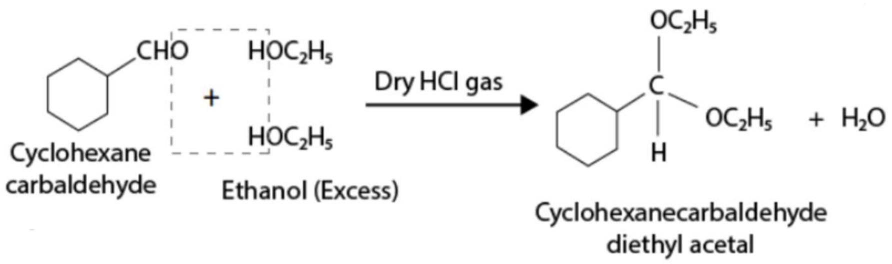
(1 mark)

iii)



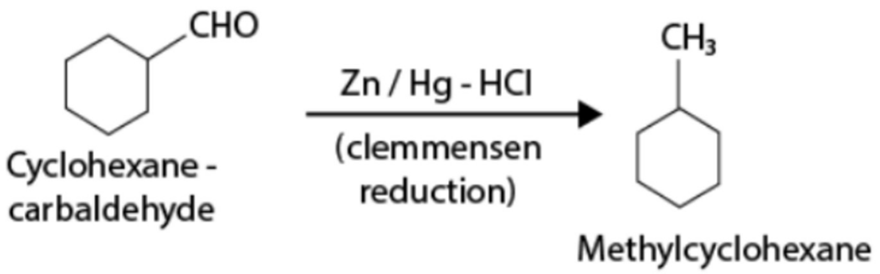
(1 mark)

iv)



(1 mark)

v)



(1 mark)