KARNATAKA STATE CHEMISTRY FORUM

II PUC CHEMISTRY

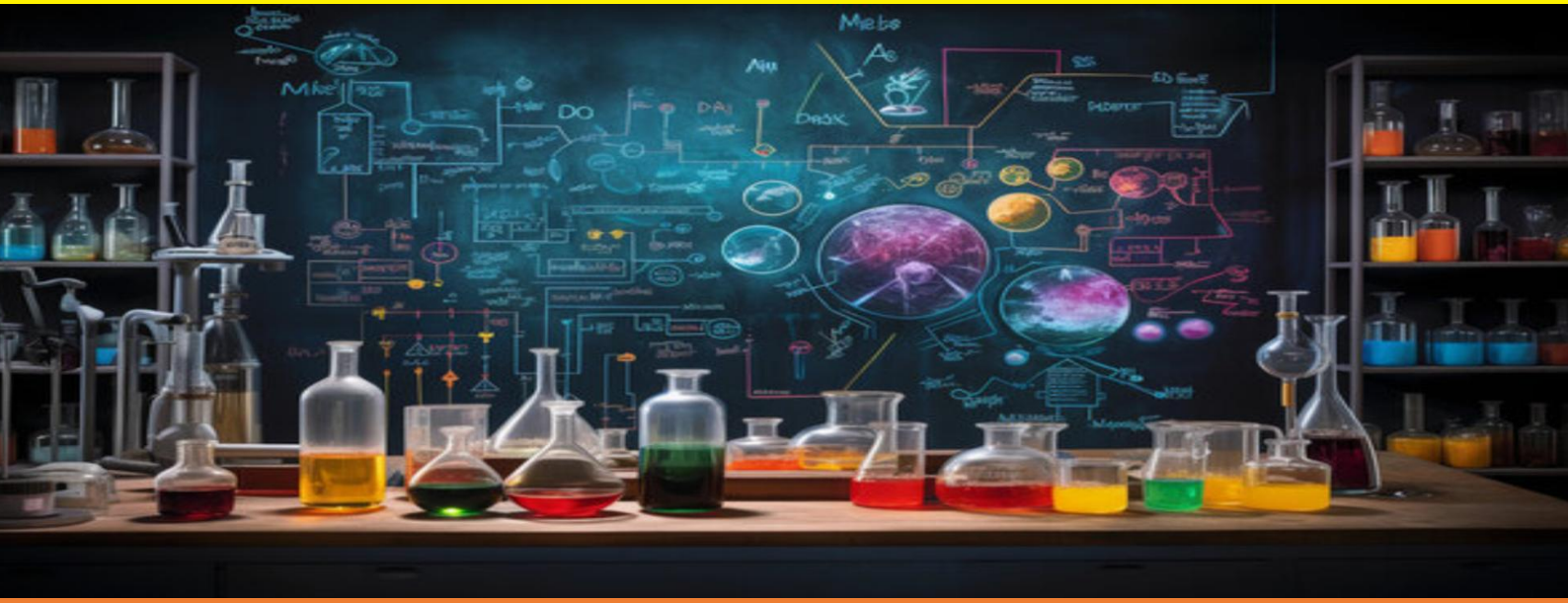
Exam Scorer

2025-26

Three Model Papers with Answers

One Practice Paper with Answer

Two Preparatory Papers with Answers



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KARNATAKA STATE CHEMISTRY P U LECTURER'S FORUM

2025 II PU MODEL PAPER – 1;

SCHEME OF EVALUATION

SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

PART-A		
I.	**Select the correct option from the given choices:** **15 × 1=15**	
1)	The mass percentage(W/W) of glucose in water is 10% means. (a) 10g of glucose dissolved in 100 g of water (b) 10g of glucose dissolved in 90 mL of water (c) 10g of glucose dissolved in 100 mL of water (d) 10g of glucose dissolved in 90 g of water	
Ans:	**(d) 10g of glucose dissolved in 90 g of water (or) (d) (or) 10g of glucose dissolved in 90 g of water**	**1**
2)	Which of the following elements is liquid at normal temperature? (a) Zinc (b) Mercury (c) Aluminum (d) Water	
Ans:	**(b) Mercury (or) (b) (or) Mercury**	**1**
3)	The reagent used in Sandmeyer's reaction is (a) N_2 gas (b) Cu and HCl (c) Cu_2Cl_2 and HCl (d) $CuCl_2$	
Ans:	**(c) Cu_2Cl_2 and HCl (or) (c) (or) Cu_2Cl_2 and HCl**	**1**
4)	The main natural source of acetic acid is (a) milk (b) vinegar (c) red ant (d) butter	
Ans:	**(b) vinegar (or) (b) (or) vinegar**	**1**
5)	The reaction of aniline, which produces Zwitter ion as a major product is (a) direct nitration (b) bromination (c) sulphonation (d) Friedel-craft alkylation	
Ans:	**(c) sulphonation (or) (c) (or) sulphonation**	**1**
6)	The method used to separation of isomeric products obtained when phenol reacts with dil. HNO_3 at low temperature is (a) steam distillation (b) sublimation (c) electrolysis (d) solidification	
Ans:	**(a) steam distillation (or) (a) (or) steam distillation**	**1**
7)	The ligand which forms more stable coordination complexes is (a) NH_3 (b) $C_2O_4^{2-}$ (c) CN^- (d) H_2O	
Ans:	**(b)** $C_2O_4^{2-}$ **(or) (b) (or)** $C_2O_4^{2-}$	**1**
8)	Which of the following groups when present at para position increases the basic strength of aniline? (a) $-NO_2$ (b) -Br (c) $-NH_2$ (d) -COOH	
Ans:	**(c)** $-NH_2$ **(or) (c) (or)** $-NH_2$	**1**

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9)	In the following acids, vitamin is (a) ascorbic acid (b) adipic acid (c) aspartic acid (d) saccharic acid	
Ans:	**(a) ascorbic acid (or) (a) (or) ascorbic acid**	**1**
10)	The best reagent useful for separation and purification of aldehyde from ketone is (a) Tollens' reagent (b) sodium hydrogen sulphite (c) sodium sulphate (d) 2,4-DNP reagent	
Ans:	**(b) sodium hydrogen sulphite (or) (b) (or) sodium hydrogen sulphite**	**1**
11)	**Statement–1:** If on mixing the two liquids, the solution becomes hot, it implies that it shows negative deviation from Raoult's law. **Statement–2:** Solutions which show negative deviation are accompanied by decrease in volume. (a) Both Statement–1 and Statement–2 are true. (b) Statement–1 is true but Statement–2 is false; (c) Both Statement–1 and Statement–2 are false. (d) Statement–1 is false but Statement–2 is true.	
Ans:	**(a) Both Statement–1 and Statement–2 are true. (or) (a) (or) Both Statement–1 and Statement–2 are true.**	**1**
12)	Match the following transition metal/compounds with their catalytic activity in the corresponding processes. (a) i-C, ii-A, iii-D, iv-B (b) i-C, ii-A, iii-D, iv-B (c) i-A, ii-C, iii-D, iv-B (d) i-D, ii-A, iii-B, iv-C	
Ans:	**(b) i-C, ii-A, iii-D, iv-B (or) (b) (or) i-C, ii-A, iii-D, iv-B**	**1**
13)	Cumene hydroperoxide on hydrolysis of dilute acids gives (a) phenol and oxygen (b) phenol and hydrogen (c) hydrogen and oxygen (d) phenol and acetone	
Ans:	**(d) phenol and acetone (or) (d) (or) phenol and acetone**	**1**
14)	Among the following cells, the cell used in the apollo space program for providing electric power is (a) SHE (b) H_2-O_2 fuel cell (c) Daniel cell (d) Mercury cell	
Ans:	**(b) H_2-O_2 fuel cell (or) (b) (or) H_2-O_2 fuel cell**	**1**

Transition metal/compounds	Name of the process
(i) $TiCl_4 + Al(CH_3)_3$	(A) Wacker process
(ii) $PdCl_2$	(B) Contact process
(iii) Ni	(C) manufacture of polyethene
(iv) V_2O_5	(D) hydrogenation of fat

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15) The following results have been obtained during kinetic studies of the reaction $A_{(aq)} + 2B_{(aq)} \longrightarrow C_{(aq)}$. Choose the correct option for the rate equation for the above reaction.

Experiment	Concentration of $[A]\left(molL^{-1}\right)$	Concentration of $[B]\left(molL^{-1}\right)$	Rate of formation of 'C' $\left(molL^{-1}\,min^{-1}\right)$
I	0.1	0.1	6.0×10^{-3}
II	0.2	0.3	7.2×10^{-2}
III	0.1	0.4	2.4×10^{-2}
IV	0.4	0.3	2.88×10^{-1}

(a) $Rate = K[A]^1[B]^2$ (b) $Rate = K[A]^1[B]^0$

(c) $Rate = K[A]^2[B]^1$ (d) $Rate = K[A]^4[B]^1$

Ans: **(c)** $Rate = K[A]^2[B]^1$ **(or) (c) (or)** $Rate = K[A]^2[B]^1$ **1**

II. Fill in the blanks by choosing the appropriate word from those given in the brackets: [soft, hard, chloroform, three, nucleotide, one] **5×1=5**

16) The polyhalo compound used as an aesthetic during surgery was _____.

Ans: **chloroform** **1**

17) Nucleic acids are the long chain polymers of _____.

Ans: **Nucleotides** **1**

18) Van't Hoff factor for KCl solution assuming the complete dissociation is_____.

Ans: **two** **1**

19) The number of hydroxyl groups present in glycerol is _____.

Ans: **three** **1**

20) Transition metals are known to make interstitial compounds. Formation of interstitial compounds makes the transition metal more _____.

Ans: **hard** **1**

PART - B

III. Answer any three of the following. Each question carries 2 marks. **3 × 2 = 6**

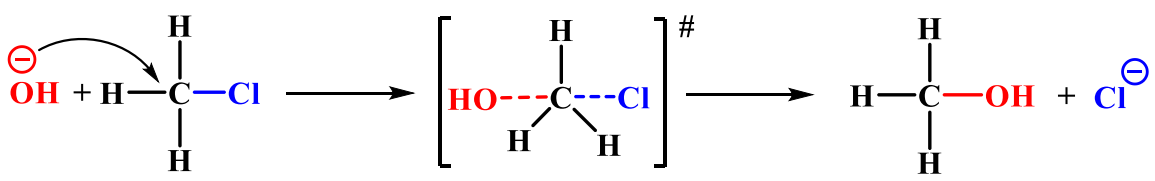
21) What is Lucas reagent? Which class of alcohol does produces turbidity immediately with it?

Ans: The mixture of $ZnCl_2$ and conc. HCl is called Lucas Reagent. **1**

Tertiary alcohols **1**

22) Write the S_N2 mechanism for conversion of chloromethane to methanol.

Ans:



1+1

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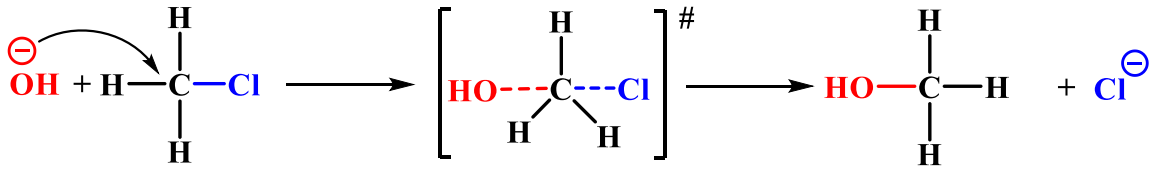
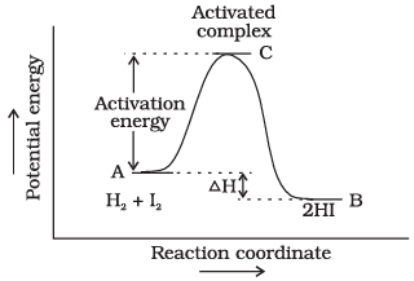
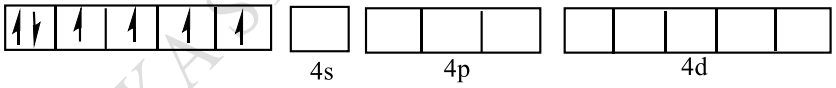
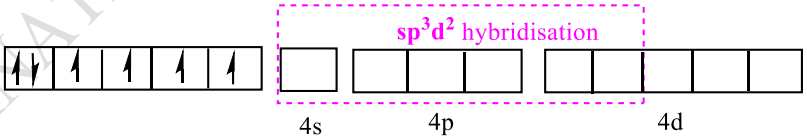
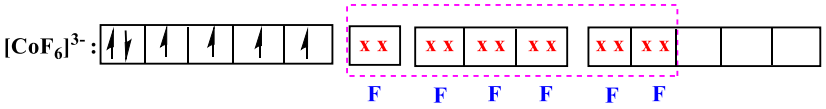
	(or) 	**1+1**
23)	**For the reaction: H_2 (g) + I_2 (g) → 2HI (g); draw the diagram showing plot of potential energy versus reaction coordinate to explain the role of activated complex in a reaction.**	
Ans:		**1+1**
24)	**Name the hormone released rapidly due to rise in blood glucose level to keep the blood glucose level within the narrow limit. Mention the number of amino acids present in this hormone.**	
Ans:	Insulin and it contains 51 amino acids	**1+1**
25)	**What are transition elements? Give an example.**	
Ans:	Transition metals are defined as metals which have incomplete d subshell either in neutral atom or in their ions. **Example:** Sc, Ti, V, Cr, Mn, Fe and etc.,	**1** **1**
	PART - C	
IV.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
26)	**Using Valence Bond Theory [VBT] explain geometry, hybridisation and magnetic property of $[CoF_6]^{3-}$ ion. [Given: Atomic mass of cobalt is 27]**	
Ans:	**Electronic configuration of Co^{3+}:** [Ar] $3d^6\ 4s^0$  Since **F^-** is weak field ligand therefore electrons pairing not takes place.   **Hybridisation:** sp^3d^2. **Magnetic property:** Paramagnetic. **Geometry:** Octahedral.	**Geometry: one-mark, Magnetic property: one mark; Explanation: one mark**

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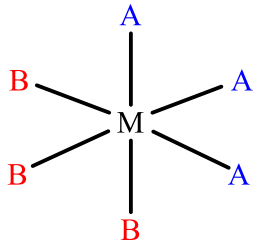
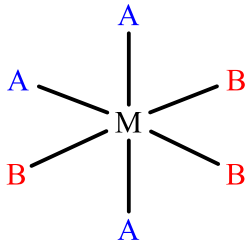
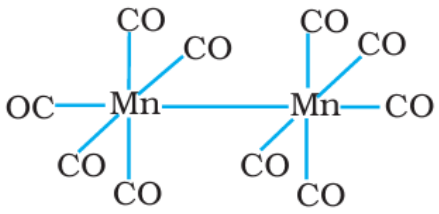
27)	**Heteroleptic complexes with co-ordination number 6 show geometrical isomerism. A complex $[MA_3B_3]$ shows geometrical isomerism. If central metal ion M has +3 oxidation state. Predict the denticity and draw the structure of two geometrical isomers of the complex and name them.**	
Ans:	Both A and B are unidentate.  *Fac isomer*  *Mer isomer*	**1** **1+1**
28)	**What is Lanthanoid contraction? Mention two consequence of it.**	
Ans:	The gradual decrease in atomic and ionic radii across the lanthanide series is called lanthanide contraction. 1. Due to lanthanide concentration the atomic radii of Zr (160 pm) and Hf (159 pm) is almost same. 2. Basicity decreases from La to Lu. 3. Covalent character of trivalent cations increases. Electronegativity of trivalent ions increases slightly. **(Any Two; 1 mark for each)**	**1** **2**
29)	**How many square pyramidal units present in decacarbonyldimanganese(0)? Write its molecular and structural formulae.**	
Ans:	Two Formula: $[Mn_2(CO)_{10}]$  	**1** **1** **1**
30)	**Complete the following equations.** **(a)** _____ **+ 8 Na_2CO_3 + 7 O_2 → 8 Na_2CrO_4 + 2 Fe_2O_3 + 8 CO_2** **(b)** $MnO_2 \xrightarrow[\text{Oxidised with air}]{\text{Fused with KOH}}$ _____ **(c)** $2KMnO_4 \xrightarrow{513K} K_2MnO_4 + O_2 +$ _____	
Ans:	(a) $4FeCr_2O_4$ (b) MnO_4^{2-} (c) MnO_2	**1** **1** **1**

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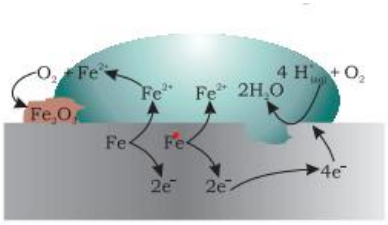
V	**Answer any two of the folowing. Each question carries 3 marks:**	**2 × 3 = 6**
31)	**Mention three factors that affect the rate of a chemical reaction.**	
Ans:	Concentration of reactants Pressure Temperature Catalyst **(Any three) (1 mark for each)**	**3**
32)	**Name the concentration term which is commonly used in medicine and pharmacy. Write the definition and mathematical equation for that concentration term.**	
Ans:	Concentration term which is commonly used in medicine and pharmacy is mass by volume percentage. It is the mass of solute dissolved in 100 mL of the solution. $\left(\frac{w}{V}\right) = \frac{\text{Mass of solute}}{\text{Volume of the solution}} \times 100$	**1** **1** **1**
33)	**Depending on the magnitude of conductivity of the materials, mention the three types of materials with an example.**	
Ans:	Conductors Semiconductors Insulators	**1** **1** **1**
34)	**The diagram shows that when iron is exposed to atmospheric air,** **a) Name the phenomenon involved in this diagram.** **b) Write the atmospheric oxidation reaction of iron.** **c) mention any one method to avoid this phenomenon**. 	
Ans:	a) Corrosion b) $2Fe^{2+}(aq) + 2H_2O(l) + \frac{1}{2}O_2(g) \longrightarrow Fe_2O_3(s) + 4H^+(aq)$ c) 1. By Painting. 2. By Applying Grease or Oil 3. By Galvanization 4. By Tin Plating and Chromium Plating 5. Sacrificial Coatings 6. By Alloying **(Any one, 1 mark)**	**1** **1** **1**
	PART - D	
VI.	**Answer any four of the following. Each question carries 5 marks.**	**4 × 5 = 20**
35) (a) (b)	**Write the Haworth structure of maltose. Why they show reducing property? What are fibrous proteins? Name the protein present in hair.**	**(3+2)**

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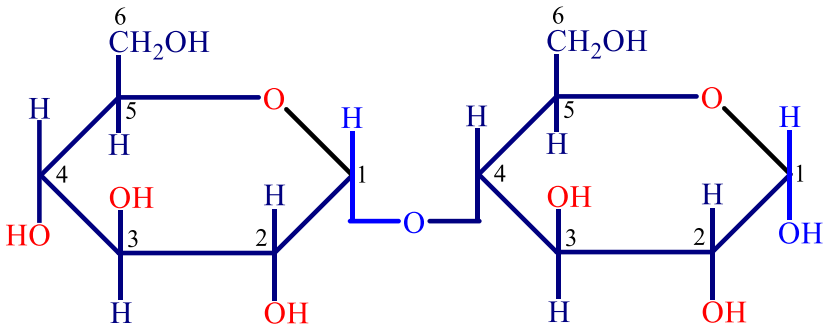
Ans:
(a)



Maltose

2

The free aldehyde group can be produced at C1 of second glucose in solution and it shows reducing property. **1**

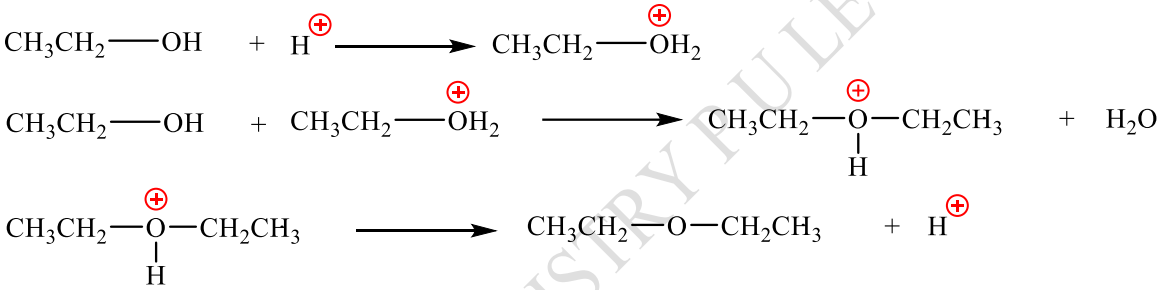
(b) Thread like structure proteins are called fibrous proteins. **1**

Keratin **1**

36) (a) Write the three steps involved in the acid catalysed dehydration of ethanol to ethoxy ethane at 413 K.

(b) Explain Kolbe's reaction with equation.

Ans: (a)

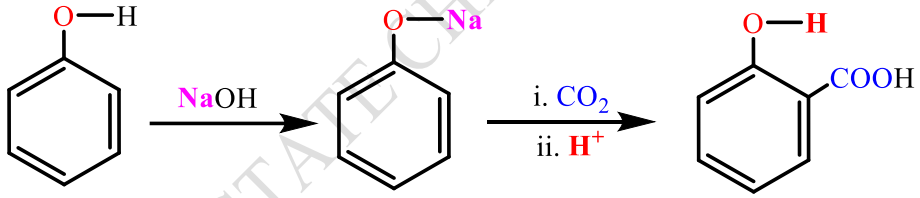


1

1

1

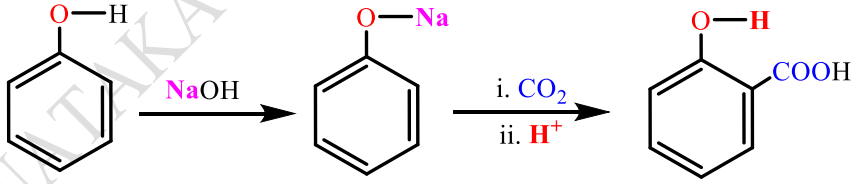
(b) When phenol is treated with sodium hydroxide then carbon dioxide followed by hydrolysis gives salicylic acid. **1**



1

(or)

(or)



phenol — sodium phenolate — 2-hydroxybenzoic acid (salicylic acid)

2

37) (a) When alkyl chlorides are reacts with sodium iodide in dry acetone gives alkyl iodide.
(i) Name this reaction.
(ii) Write the general equation.
(iii) Mention the role of dry acetone.

(b) What is meant by racemic modification? "They are optically inactive". Give reason.

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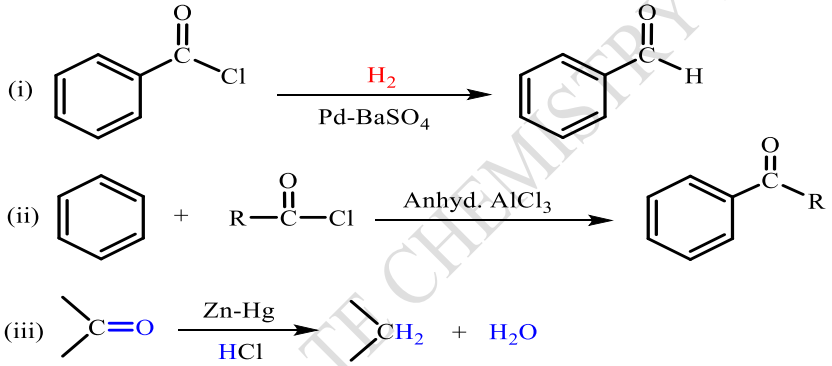
Ans: (a)	(i) Finkelstein reaction.	1
	(ii) $RX + NaI \xrightarrow{\text{Dry Acetone}} RI + NaX$	1
	(iii) Precipitates NaCl or NaBr formed and also facilitates the forward reaction according to Le Chatelier's Principle.	1
(b)	Equimolar mixture of d and l isomers. Because the rotation due to one isomer will be cancelled by the rotation due to the other isomer.	2
38) (a)	**Which type of amines answers for carbylamine reaction (isocyanide test)? Explain this reaction with an example.**	**(3+2)**
(b)	**Identify the compounds "X" and "Y" in the following conversion.** $C_6H_5{-}NH_2 \xrightarrow[273-278K]{NaNO_2 + 2HCl} \text{"X"} \xrightarrow{\text{"Y"}} C_6H_5{-}I + KCl + N_2$	
Ans: (a)	Primary (or) 1° - amines.	1
	Primary amines on heating with chloroform and alcoholic KOH form carbylamines isocyanides or carbylamines. This reaction is known as carbylamine reaction or isocyanide test.	1
	$R{-}NH_2 + CHCl_3 + 3\,KOH \xrightarrow{\text{Heat}} R{-}NC + 3\,KCl + 3\,H_2O$	1
(b)	$X = C_6H_5N_2Cl$ and $Y = KI$	1+1
39 (a)	**Mention the name of the following reactions.** 	**(3+2)**
(b)	**Among methanal and ethanal, which one undergoes Cannizaro reaction? Give reason.**	
Ans: (a)	(i) Rosenmund Reduction.	1
	(ii) Friedel-Craft's Acylation.	1
	(iii) Clemmensen reduction.	1
(b)	Methanal undergo Cannizzaros reaction due to absence of α-hydrogen atom.	1+1
40)	**The compound "A" has molecular formula C_7H_8 is heated with alkaline $KMnO_4$ followed by acidification gives compound "B" of the molecular formula $C_7H_6O_2$. This compound "B" turns blue litmus to red. The sodium salt of compound "B" is heated with reagent "X" gives hydrocarbon "C" of molecular mass 78 g mol^{-1}.**	
	(a) Write the structure of compounds "A", "B" and "C".	
	(b) Identify "X" and mention its role in the reaction.	

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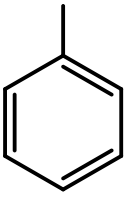
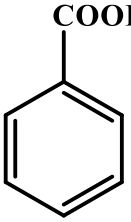
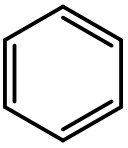
Ans: (a)	A =  B =  C = 	1+1+1
(b)	X= Sodalime (NaOH + CaO), Which acts as Decarboxylating agent.	1+1
	PART – E (PROBLEMS)	
VII.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
41)	**The cell in which the reaction occurs** $2Fe^{3+}_{(aq)} + 2I^{-}_{(aq)} \rightleftharpoons 2Fe^{2+}_{(aq)} + I_{2(s)}$; $E^{o}_{cell} = 0.236\,V$ at $298\,K$ **Calculate the value of log K_c (K_c = equilibrium constant) of the cell reaction.**	
Ans:	$E^{o}_{Cell} = \frac{0.0591}{n} \times \log K_c$ (or) $\log K_c = \frac{E^{o}_{Cell} \times n}{0.0591}$	1
	$= \frac{0.236 \times 2}{0.0591}$	1
	$\log K_c = 7.986$	1
42)	**The first order rate constant at 600 K is $2\times10^{-5}s^{-1}$ and energy of activation is 209.8 $kJ\,mol^{-1}$ for a reaction. Calculate the rate constant at 700 K. [Given: R=8.314 $JK^{-1}mol^{-1}$]**	
Ans:	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303 \times R}\left[\frac{T_2 - T_1}{T_1 \times T_2}\right]$	1
	$\log \frac{k_2}{2\times10^{-5}} = \frac{209.8\times10^{3}}{2.303\times8.314}\left[\frac{700-600}{700\times600}\right]$	1
	$\log \frac{k_2}{2\times10^{-5}} = 2.608$	
	$\frac{k_2}{2\times10^{-5}} = 405.5$	
	$k_2 = 405.5\times\left(2\times10^{-5}\right)$	
	$k_2 = 8.11\times10^{-3}s^{-1}$	1
43)	**Henry's constant for the molality of methane in benzene at 298 K is 4.27×10^{5} mm Hg. Calculate the mole fraction of methane in benzene at 298 K under 760 mm Hg.**	
Ans:	$p = K_H\chi$ (or) $\chi = \frac{p}{K_H}$	1
	$\chi = \frac{760\,mm\,Hg}{4.27\times10^{5}\,mm\,Hg}$	1
	$\chi = 0.0017798$ (or) $\chi = 1.78\times10^{-3}$	1

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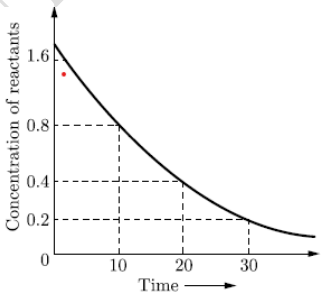
44)	**Calculate the limiting molar conductivity of Cl^- ion by using the data: $\lambda_{Ca^{2+}} = 119.0\ Scm^2mol^{-1}$ and Λ^o_m for $CaCl_2$ = 271.6** Scm^2mol^{-1}**.**	
Ans:	$\lambda^o_m CaCl_2 = \lambda^o_m Ca^{2+} + \lambda^o_m Cl^-$ (or) $\lambda^o_m Cl^- = \lambda^o_m CaCl_2 - \lambda^o_m Ca^{2+}$ $\lambda^o_m Cl^- = 271.6 - 119.0$ $\lambda^o_m Cl^- = 152.6\ Scm^2mol^{-1}$	**1** **1** **1**
45)	**Calculate the osmatic pressure in pascal exerted by a solution prepared by dissolving 0.925 g of polymer of molar mass 1,85,000 in 500 mL of water at 37ºC. [Given: $R = 8.314 \times 10^3\ Pa\ L\ K^{-1}\ mol^{-1}$]**	
Ans:	$\pi = \frac{W_2RT}{M_2V}$ **(or)** $\pi = \frac{nRT}{V}$ $\pi = \frac{0.925 \times 8.314 \times 10^3 \times 310}{185000 \times 0.5}$ $\pi = 25.77\ Pa$	**1** **1** **1**
46)	**Analyse the given graph, drawn between concentration of reactant in molL^{-1} v/s time in minute, calculate the average rate of the reaction in terms of minutes and seconds.** 	
Ans:	$\text{Avarage rate} = -\frac{d[R]}{dt} = -\frac{0.4-0.8}{20-10} = 0.04\ molL^{-1}\ min^{-1}$ $= 4 \times 10^{-2}\ molL^{-1}\ min^{-1}$ $= \frac{0.04}{60}\ molL^{-1}s^{-1}$ $= 0.00066\ molL^{-1}s^{-1}$ **(or)** $= 6.6 \times 10^{-4}\ molL^{-1}s^{-1}$	**1** **1** **1**
	PART - F **(For visually challenged students only)**	
34)	**Define the term corrosion. Suggest two methods to prevent corrosion of metal.**	
	Corrosion is the gradual destruction of metals by chemical or electrochemical reaction with their environment. 1. By Painting. 2. By Applying Grease or Oil 3. By Galvanization 4. By Tin Plating and Chromium Plating 5. Sacrificial Coatings 6. By Alloying	**1** **2**

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46)	**At 318 K, for the reaction** $2N_2O_{5\,(g)} \longrightarrow 4NO_{(g)} + O_{2\,(g)}$ **in CCl_4, the initial concentration of** N_2O_5 **is** $2.33\,mol\,L^{-1}$ **in reduced to** $2.08\,mol\,L^{-1}$ **in 100 minutes. Calculate the average rate of reaction in terms of seconds.**	
	$\text{Avarage rate} = \frac{1}{2}\left(-\frac{\Delta[N_2O_5]}{\Delta t}\right) = -\frac{1}{2}\left(\frac{2.08-2.33}{100}\right)$	**1**
	$= 1.25\times10^{-3}$	**1**
	$= \frac{1.25\times10^{-3}}{60} = 0.020\times10^{-3}\ molL^{-1}s^{-1}$ (or) $= 2.0\times10^{-5}\ molL^{-1}s^{-1}$	**1**

*********END*********

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2025 II PU MODEL PAPER – 2;

SCHEME OF EVALUATION

SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

	PART-A	
I.	**Select the correct option from the given choices:**	**15 × 1=15**
1)	The mixture which shows positive deviation from Raoult's Law is (a) n-hexane and n-heptane (b) Bromoethane and chloroethane (c) Ethanol and Acetone (d) Chloroform and Acetone	
Ans:	**(c) Ethanol and Acetone (or) (c) (or) Ethanol and Acetone**	**1**
2)	A cell that converts energy of combustion of fuels like hydrogen and methane directly into electrical energy is known as (a) Dynamo (b) Ni–Cd Cell (c) Fuel Cell (d) Electrolytic Cell	
Ans:	**(c) Fuel Cell (or) (c) (or) Fuel Cell**	**1**
3)	The common name of ethanedioic acid is (a) Acetic acid (b) Oxalic acid (c) Adipic acid (d) Succinic acid	
Ans:	**(b) Oxalic acid (or) (b) (or) Oxalic acid**	**1**
4)	Aldehyde which do not respond to Fehling's test is (a) Formaldehyde (b) Ethanal (c) Benzaldehyde (d) Mesityl oxide	
Ans:	**(c) Benzaldehyde (or) (c) (or) Benzaldehyde**	**1**
5)	pK_a value of phenol, o-cresol and o-nitrophenol are 10.0, 10.2 and 7.2 respectively, Correct order of acidity is (a) Phenol > o-cresol > o-nitrophenol (b) o-cresol > phenol > o-nitrophenol (c) o-nitrophenol > o-cresol > phenol (d) o-nitrophenol > phenol > o-cresol	
Ans:	**(d) o-nitrophenol > phenol > o-cresol (or) (d) (or) o-nitrophenol > phenol > o-cresol**	**1**
6)	A student took two glasses of pure water from a water filter. He cools glass–A in a fridge and warms the other glass – B on a stove. On comparing the solubility of oxygen in H_2O in glass–A and glass–B, he state that glass-'A' contains (a) more oxygen than glass–B. (b) less oxygen than glass–B. (c) same amount of oxygen as in glass–B. (d) zero concentration of oxygen.	
Ans:	**(a) more oxygen than glass–B (or) (a) (or) more oxygen than glass–B**	**1**
7)	For a reaction, $2NH_{3\,(g)} \xrightarrow[\text{Pt–Catalyst}]{1130\,K} N_{2\,(g)} + 3H_{2\,(g)}$ the rate is (a) $Rate = K[NH_3]^{\frac{1}{2}}$ (b) $Rate = K[NH_3]$ (c) $Rate = K[NH_3]^2$ (d) $Rate = K$	
Ans:	**(d) Rate = K (or) (d) (or) Rate = K**	**1**

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8) Match the following

LIST-I	LIST-II
(i) Phosphodiester Linkage	(A) Amino Acids
(ii) Glycosidic Linkage	(B) Nucleotides
(iii) Peptide Linkage	(C) Monosaccharides
	(D) Phenols

(a) i – C, ii – D, iii – B (b) i – C, ii – A, iii – B

(c) i – B, ii – C, iii – D (d) i – B, ii – C, iii – A

Ans: **(d) i – B, ii – C, iii – A (or) (d) (or) i – B, ii – C, iii – A** **1**

9) When an alkene reacts with a component 'X' in CCl_4 reddish brown colour of component 'X' disappears to yield vicinal dihalide. Component 'X' is

(a) Cl_2 (b) HBr (c) Br_2 (d) I_2

Ans: **(c) Br_2 (or) (c) (or) Br_2** **1**

10) Statement–I: Potassium permanganate is a powerful oxidant.

Statement–II: $KMnO_4$ oxidises I^- to IO_3^- in acidic solution.

(a) Both Statement I and Statement II are correct.

(b) Statement I is incorrect but Statement II is correct.

(c) Both Statement I and Statement II are incorrect

(d) Statement I is correct but Statement II is incorrect.

Ans: **(d) Statement I is correct but Statement II is incorrect (or) (d) (or) Statement I is correct but Statement II is incorrect** **1**

11) Consider the given reaction

$RCONH_2 + Br_2 + 4NaOH \longrightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$; If the molecular formula of an amine is CH_5N, then the molecular formula of amide will be

(a) C_2H_6NO (b) C_2H_5NO (c) CH_5NO (d) C_2H_4NO

Ans: **(b) C_2H_5NO (or) (b) (or) C_2H_5NO** **1**

12) $[Mn(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ are

(a) Inner orbital and outer orbital complexes respectively. (c) Both inner orbital complexes.

(b) Outer orbital and inner orbital complexes respectively. (d) Both outer orbital complexes.

Ans: **(a) Inner orbital and outer orbital complexes respectively (or) (a) (or) Inner orbital and outer orbital complexes respectively** **1**

13) Triiodomethane was used earlier as an antiseptic. The antiseptic properties are due to

(a) presence of iodoform. (b) liberation of iodine.

(c) objectionable smell. (d) presence of methane.

Ans: **(b) liberation of iodine (or) (b) (or) liberation of iodine** **1**

14) Electronic configuration of a transition element X in +3 oxidation state is $[Ar]3d^5$. What is its atomic number?

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	(a) 24 (b) 25 (c) 26 (d) 27	
Ans:	**(c) 26 (or) (b) (or) 26**	**1**
15)	Acetylation of salicylic acid produces a compound which has anti-inflammatory and antipyretic property. The compound is (a) Bakelite (b) Acetic anhydride (c) Formalin (d) Aspirin	
Ans:	**(d) Aspirin (or) (d) (or) Aspirin**	**1**
II.	**Fill in the blanks by choosing the appropriate word from those given in the brackets: [Primary, Amylose, One, Zero, Picric acid, tertiary]**	**5×1=5**
16)	The sum of mole fractions of all the components in a binary solution is equal to _____.	
Ans:	**One**	**1**
17)	Gabriel Synthesis is used for the preparation of _____ amines.	
Ans:	**Primary**	**1**
18)	Water soluble component of starch is _____.	
Ans:	**Amylose**	**1**
19)	Oxidation State of 'Ni' in $[Ni(CO)_4]$ is _____.	
Ans:	**Zero**	**1**
20)	2,4,6-trinitrophenol is commonly known as _____.	
Ans:	**Picric acid**	**1**

PART - B

III.	**Answer any three of the following. Each question carries 2 marks.**	**3 × 2 = 6**
21)	**Write two differences between order and molecularity of a reaction.**	

Ans:

Order of a reaction	Molecularity of a reaction
The sum of the powers concentration terms of reactants in the experimentally determined rate equation.	It is the number of reacting species involved in elementary or simplest reaction.
It is experimentally determined.	It is theoretically calculated.
It can be zero and even a fraction.	It cannot be zero or a non-integer.
Order is applicable to elementary as well as complex reactions	Molecularity is applicable only for elementary reactions.
For complex reaction, order is given by the slowest step.	Molecularity of the slowest step is same as the order of the overall reaction.

2

22) Explain Swartz reaction with an example.

Ans:

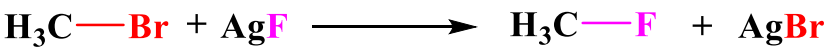
When alkyl chloride/bromide heated in presence of metallic fluorides like AgF gives alkyl fluoride. The reaction is known as Swarts reaction. **1**



1

(or)

(or)



bromomethane **fluoromethane**

2

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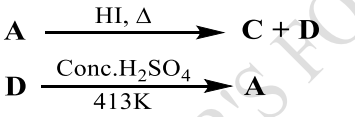
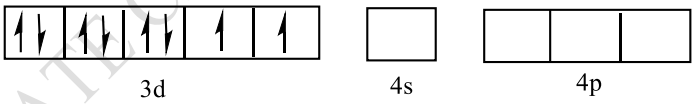
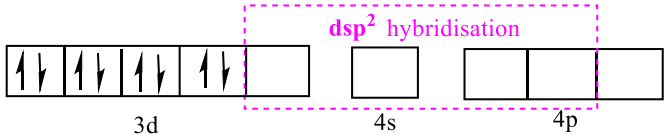
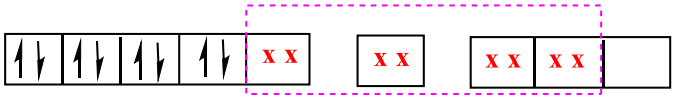
23)	**Give an example for the following. (i) Essential amino acid. (ii) Fibrous protein.**	
Ans:	(i) Leucine (ii) Collagen	**1+1**
24)	**Give reason; (i) Separation of Lanthanoids is difficult from their natural occurrence.** **(ii) Study of Actinoids is difficult.**	
Ans:	(i) Due to almost identical radii. (ii) Actinides are available in very small quantity Actinides are radioactive in nature Actinides have very short half-life	**1** **1**
25)	**Compound has a molecular formula $C_4H_{10}O$. Considering the reactions given below, identify Compound A and write its IUPAC name.** 	
Ans:	A = $CH_3CH_2OCH_2CH_3$ IUPAC Name: Ethoxyethane	**1+1**
	PART - C	
IV.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
26)	**Explain the preparation of potassium permanganate from MnO_2 with balanced equations. Mention the gas evolved when $KMnO_4$ is heated at 513K.**	
Ans:	$2\,MnO_2 + 4\,KOH + O_2 \longrightarrow 2\,K_2MnO_4 + 2\,H_2O$ $3MnO_4^{2-} + 4H^+ \longrightarrow 2\,MnO_4^- + MnO_2 + 2\,H_2O$ O_2 (or) Oxygen gas	**1** **1** **1**
27)	**On the basis of Valence bond theory, explain the hybridisation, geometry and Magnetic property of complex $[Ni(CN)_4]^{2-}$ [Given Atomic Number of Ni = 28].**	
Ans:	**Electronic configuration of Ni^{2+}:** [Ar] $3d^8\ 4s^0$  3d 4s 4p Since **CN^-** is strong field ligand therefore electrons pairing takes place  **dsp^2** hybridisation 3d 4s 4p $[Ni(CN)_4]^{2-}$:  CN CN CN CN **Hybridisation: dsp^2.** **Magnetic property:** Diamagnetic. **Geometry:** Square planer.	**Geometry: one-mark, Magnetic property: one mark; Explanation: one mark**
28)	**Write the geometric isomers of complex $\left[PtCl_2(en)_2\right]^{2+}$. Which among them is chiral.**	

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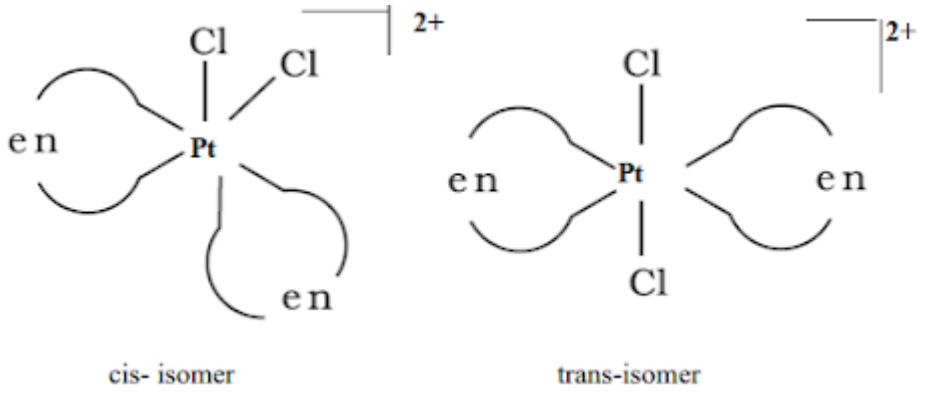
Ans:	 cis- isomer trans-isomer	**1+1**
	Cis-isomer is chiral.	**1**
29)	**Considering the elements of 3d transition series, write the element which is** **(i) Unable to form a monoxide.** **(ii) Having positive $E^0_{(M^{2+}/M)}$ value.** **(iii) A base element of Ziegler Catalyst used to manufacture polythene.**	
Ans:	(i) Scandium (or) Sc (ii) Copper (or) Cu (iii) Titanium (or) Ti	**1** **1** **1**
30)	**Alfred Werner a Swiss Chemist formulated his revolutionary ideas about the structure of co-ordination compounds. When a compound $CoCl_3.6NH_3$ is treated with excess of $AgNO_3$. 3moles of AgCl are obtained. Based on his observation.** **(i) Write the formula of the compound.** **(ii) Mention the primary and secondary valency of a central metal atom.**	
Ans:	(i) $\left[Co(NH_3)_6\right]Cl_3$ (ii) Primary valency 3 and secondary valency 6.	**1** **1+1**
V	**Answer any two of the folowing. Each question carries 3 marks:**	**2 × 3 = 6**
31)	**What are electrochemical cells? Name the two types of cells.**	
Ans:	Electrochemical cells are devices that convert chemical energy into electrical energy or vice versa through redox (reduction-oxidation) reactions. 1. Galvanic (voltaic) cells 2. Electrolytic cells	**1** **1+1**
32)	**Write three reasons to justify that osmotic pressure method has the advantage over other colligative methods for the measurement of molar mass of the macromolecules.**	
Ans:	Because; (i) Pressure measurement is around the room temperature. (ii) Molarity of the solution is used instead of molality. (iii) Its magnitude is large even for very dilute solutions. (iv) Macromolecules have poor solubility. **(Any three)**	**3**

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33) **Mention any three factors which decide the products of electrolysis.**

Ans:
(i) Nature of material being electrolysed.
(ii) Type of electrodes being used.
(iii) It depend on the different oxidising and reducing species present in the electrolytic cell and their standard electrode potentials. **3**

34) **What is meant by chemical kinetics? Give any two importance of study chemical kinetics.**

Ans:
It is the branch of chemistry, which deals with the study of reaction rates and their mechanisms, called chemical kinetics. **1**

Importance:

- It tells about the rate of a reaction.
- It also describes the conditions by which the reaction rates can be altered. **2**

PART - D

VI. **Answer any four of the following. Each question carries 5 marks.** **4 × 5 = 20**

35) (a) **Give the differences between S_N1 and S_N2 mechanism with respect to the following.**
(i) Order of reaction (Kinetics).
(ii) Configuration of the product.
(iii) Order of reactivity of alkyl halides. **(3+2)**

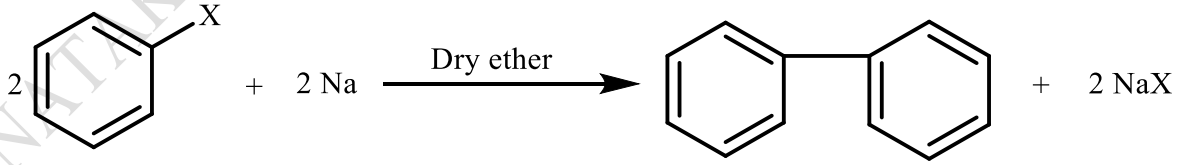
(b) **Explain Fittig reaction with an example.**

Ans:
(a)

	S_N1	S_N2
(i) Order of reaction (Kinetics)	1	2
(ii) Configuration of the product	Inversion and retention	Inversion only
(iii) Order of reactivity of alkyl halides	Primary halide > Secondary halide > Tertiary halide	Tertiary halide > Secondary halide > Primary halide

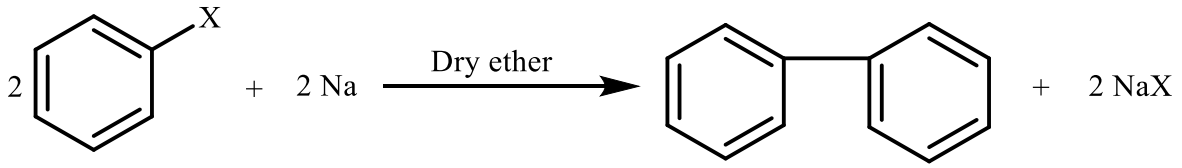
3

(b)
When aryl halides react with sodium in presence of dry ether gives diphenyl. This reaction is called Fittig reaction. **1**



1

(or) **(or)**



Aryl halide Diphenyl

2

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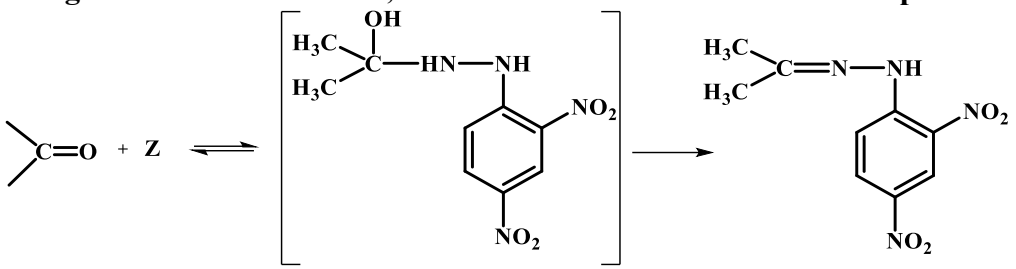
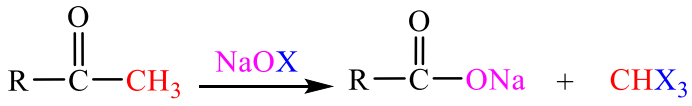
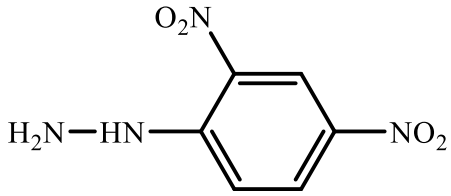
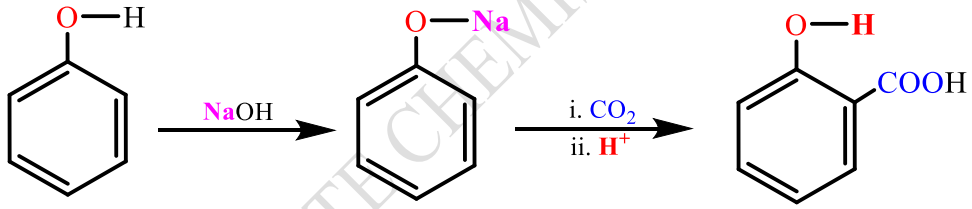
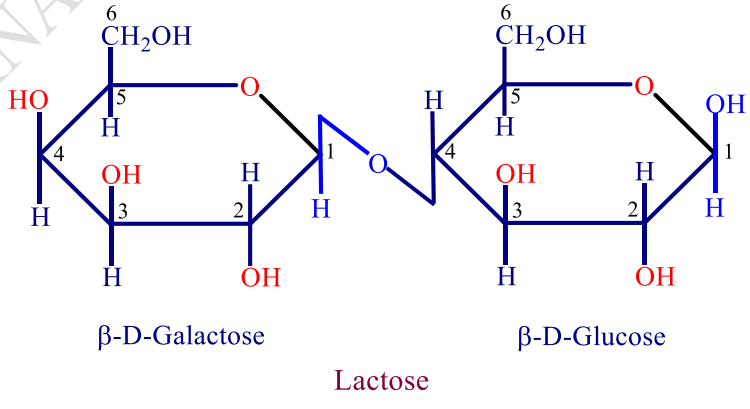
36) (a) **(b)**	**Provide the general reaction to prepare Haloform from methyl ketones. Name a reagent which is used to detect the presence of α – methyl group in a carbonyl compound.** **In a given chemical reaction, write the structure and name of compound 'Z'.** 	**(3+2)**
Ans: (a)	 Sodium hypohalite is used to detect the presence of α – methyl group in a carbonyl compound.	**2** **1**
(b)	 2,4-dinitrophenyl-hydrazine	**1** **1**
37) (a) **(b)**	**How is salicylic acid prepared from phenol? Explain with an equation.** **Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses. Give reason.**	
Ans: (a)	When phenol is treated with sodium hydroxide, we get sodium phenoxide, which on treating with carbon dioxide followed by acidification, we get Salicylic acid. 	**1** **2**
(b)	Because alcohols can form hydrogen bonding with water but hydrocarbons do not form.	**2**
38) (a) **(b)** **(c)**	**What are reducing sugars? Write the Haworth structure of Lactose.** **Hormones are needed in adequate quantities in our body. Give reason.** **What is backbone of DNA?**	**(3+1+1)**
Ans: (a)	Carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars.  β-D-Galactose β-D-Glucose Lactose	**1** **2**

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(b) Hormones are needed by our body in an appropriate amount, slightly more or less secretion causes disorders in our body. **1**

(c) Nucleotides and phosphate groups are the back bone of DNA. **1**

39 $CH_3MgBr + A \xrightarrow[ii)\ H_3O^+]{i)\ \text{dry ether}} B \xrightarrow[ii)\ H_2O]{i)\ Cl_2 / \text{Red P}} C$

(a) Identify the compound A, B and C in the above reaction.

(b) Name the reaction for the conversion of compound B to C.

(c) Compound 'C' is more acidic than 'B'. Give reason. **(3+1+1)**

Ans: (a)

A	B	C
CO_2	CH_3COOH	$ClCH_2COOH$
(or)		
Carbon dioxide	Acetic Acid	Chloroacetic acid

1+1+1

(b) HVZ reaction. **1**

(c) Due to (-I) effect of Cl in 'C'. **1**

40) (a) Explain Carbylamine reaction with equation.

(b) Complete the following reaction:

$C_6H_5N_2Cl \xrightarrow[ii)\ NaNO_2/Cu,\ \Delta]{i)\ HBF_4}$ _____ + _____ + N_2

(c) Write the I.U.P.A.C name of $CH_3CH_2CH_2NH_2$. **(3+1+1)**

Ans: (a) Aliphatic and aromatic primary amines on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamines. This reaction is known as carbylamine reaction. **1**

$$R{-}NH_2 + CHCl_3 + 3\ KOH \xrightarrow{\text{Heat}} R{-}NC + 3\ KCl + 3\ H_2O$$ **1**

(or) **(or)**

$$\underset{\text{Amine}}{R{-}NH_2} + \underset{\text{Chloroform}}{CHCl_3} + 3\ KOH \xrightarrow{\text{Heat}} \underset{\text{Carbylamine}}{R{-}NC} + 3\ KCl + 3\ H_2O$$ **2**

(b) $C_6H_5N_2BF_4$ (or) $C_6H_5\overset{+}{N}_2\ B\overset{-}{F}_4$ and $C_6H_5NO_2$ (or) HBF_4 **1+1**

(c) propan-1-amine (or) 1-propanamine **1**

PART – E (PROBLEMS)

VII. Answer any three of the following. Each question carries 3 marks. **3 × 3 = 9**

41) The boiling point of benzene is 353.23K. Calculate the mass of non-volatile solute is to be added to 90g of benzene such that it boils at 354.11K. The molar mass of solute is 58 $gmol^{-1}$ [Given: $K_b = 2.53\ K\ Kg\ mol^{-1}$].

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Ans:	$\Delta T_b = \frac{K_b \times w_2 \times 1000}{w_1 \times M_2}$ (or) $w_2 = \frac{\Delta T_b \times M_2 \times w_1}{K_b \times 1000}$ $= \frac{0.88 \times 58 \times 90}{2.53 \times 1000}$ $= 1.81\,g$	**1** **1** **1**
42)	**Calculate the mass of a non-volatile solute which should be dissolved in 114g octane to reduce its vapour pressure to 80%. [Given Molecular formula of octane is C_8H_{18}; [Molar mass of solute = 40 $gmol^{-1}$].**	
Ans:	$\frac{p_1^o - p_1}{p_1} = \frac{n_2}{n_1}$ (or) $\frac{p_1^o - p_1}{p_1} = \frac{w_2 \times M_1}{M_2 \times w_1}$ (or) $w_2 = \frac{p_1^o - p_1}{p_1} \times \frac{M_2 \times w_1}{M_1}$ $w_2 = \frac{100-80}{80} \times \frac{40 \times 114}{114}$ $w_2 = 10.0\,g$	**1** **1** **1**
43)	**Calculate the EMF of the cell for a given reaction.** $Mg(s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu(s)$ (0.0001M) (0.001M) **[Given** $E^o_{\frac{Mg^{2+}}{Mg}} = -2.37\,V$ $E^o_{\frac{Cu^{2+}}{Cu}} = +0.34\,V$ **].**	
Ans:	$E_{cell} = E^o_{cell} - \frac{0\cdot0591}{n}\log\frac{[Mg^{2+}]}{[Cu^{2+}]}$ $E_{cell} = 2.71 - \frac{0\cdot0591}{2}\log\frac{[0.001]}{[0.0001]}$ $\left(\because E^o_{cell} = 0.34 - (-2.73) = 2.71\right)$ $E_{cell} = 2.71 - \frac{0\cdot0591}{2}\log 10$ $E_{cell} = 2.71 - \frac{0\cdot0591}{2} \times 1$ $E_{cell} = 2.68\,V$	**1** **1** **1**
44)	**The rate of a reaction quadruples when the temperature changes from 293K to 313K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.**	
Ans:	$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\because k_2 = 4k_1$ $\log 4 = \frac{E_a}{2.303 \times 8.314}\left[\frac{313-293}{293 \times 313}\right}$ **(or)** $E_a = \frac{\log 4 \times 2.303 \times 8.314 \times 293 \times 313}{20}$ $E_a = 52864\,J$ **(or)** $52.864\,kJ$	**1** **1** **1**

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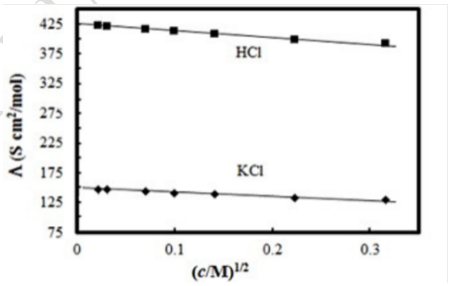
45)	**The C-14 content of an ancient piece of wood was found to have $\frac{3}{10}^{th}$ of that of living tree. Calculate the age of that piece of wood. [Given that; Half-life of C-14 = 5730 years, log 3 = 0.4771, log 7 = 0.8540].**	
Ans:	$k = \frac{0.693}{t_{1/2}}$ $k = \frac{0.693}{5730}\,year\,s^{-1}$ $t = \frac{2.303}{k}\log\frac{[R]_0}{[R]}$ $t = \frac{2.303\times5730}{0.693}\log\left(\frac{10}{3}\right)$ $t = 19042\,(\log 10 - \log 3)$ $t = 19042\,(1 - 0.4771)$ $t = 9957\ years$	**1** **1** **1**
46)	**The limiting molar conductivity of CH_3COOH is 390 Scm^2/mol. Using the graph and given information calculate the limiting molar conductivity of CH_3COOK.** 	
Ans:	Limiting molar conductivity of KCl =150 $S\,cm^2\,mol^{-1}$ Limiting molar conductivity of HCl = 425 $S\,cm^2\,mol^{-1}$ $\Lambda^0 CH_3COOK = \Lambda^0 CH_3COOH + \Lambda^0 KCl - \Lambda^0 HCl$ $= 390 + 150 - 425$ $\Lambda^0 CH_3COOK = 115\,S\,cm^2\,mol^{-1}$	**1** **1** **1**
	PART - F **(For visually challenged students only)**	
46)	**The standard electrode potential for Daniel cell is 1.1V. Calculate the standard Gibbs energy for the reaction.** $Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$ **[Given 1F = 96500C].**	
	Where; n = 2 $\Delta G^0 = -nFE^0_{cell}$ $\Delta G^0 = -2\times96500\times1.1$ $\Delta G^0 = -212.3\,kJmol^{-1}$	**1** **1** **1**

*********END*********

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2025 II PU MODEL PAPER – 3;

SCHEME OF EVALUATION

SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

	PART-A	
I.	**Select the correct option from the given choices:** **15 × 1=15**	
1)	The common oxidation state shown by the element with atomic number 21 is (a) +3 (b) +4 (c) +5 (d) Both +3 and +4	
Ans:	**(a) +3 (or) (a) (or) +3**	**1**
2)	Which of the following is homoleptic complex? (a) $\left[Co(NH_3)_3Cl_3\right]$ (b) $\left[Co(NH_3)_5Cl\right]Cl_2$ (c) $\left[Co(NH_3]_4(H_2O)_2\right]Cl_3$ (d) $[Co(NH_3)_6]Cl_3$	
Ans:	**(d)** $[Co(NH_3)_6]Cl_3$ **(or) (d) (or)** $[Co(NH_3)_6]Cl_3$	**1**
3)	The correct name of the reaction $R-X + NaI \xrightarrow{\text{Dry acetone}} R-I + NaX$ is (a) Finkelstein reaction (b) Wurtz reaction (c) Swarts reaction (d) Friedel –Craft reaction	
Ans:	**(a) Finkelstein reaction (or) (a) (or) Finkelstein reaction**	**1**
4)	The chemical formula of Hinsberg's reagent is (a) C_6H_6SOCl (b) $C_6H_5SOCl_2$ (c) $C_6H_5SO_2Cl$ (d) $C_6H_5SO_3H$	
Ans:	**(c)** $C_6H_5SO_2Cl$ **(or) (c) (or)** $C_6H_5SO_2Cl$	**1**
5)	Doctor advised a 50-year-old woman enough exposure to sunlight and addition of fish and egg yolk to her diet. Name the vitamin deficiency for the possible disease diagnosed by the doctor. (a) Vitamin D (b) Vitamin A (c) Vitamin C (d) Vitamin B_{12}	
Ans:	**(a) Vitamin D (or) (a) (or) Vitamin D**	**1**
6)	Salicylaldehyde can be prepared from which of the following reactants? (a) Phenol and Chloroform (b) Phenol, Chloroform and aq. NaOH (c) Phenol and CCl_4 (d) Phenol, CCl_4 and NaOH	
Ans:	**(b) Phenol, Chloroform and aq. NaOH (or) (b) (or) Phenol, Chloroform and aq. NaOH**	**1**
7)	The major product formed in the following reaction is $H_3C-CH_2-\underset{\underset{Br}{|}}{CH}-CH_3 \xrightarrow[\Delta]{\text{Alc. KOH}}$ (a) 1-butene (b) 2-bntanol (c) 1-bromobutane (d) 2-butene	

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Ans:	**(d) 2-butene (or) (d) (or) 2-butene**	**1**
8)	**Statement-I:** In benzylic alcohols, the –OH groups is attached to sp^3 carbon atom next to aromatic ring. **Statement-II:** In vinylic alcohols, the –OH group is bonded to a carbon atom of carbon–carbon double bond. (a) Both Statement I and Statement II are correct. (b) Statement I is incorrect but Statement II is correct. (c) Both Statement I and Statement II are incorrect. (d) Statement I is correct but Statement II is incorrect.	
Ans:	**(a) Both Statement I and Statement II are correct (or) (a) (or) Both Statement I and Statement II are correct**	**1**
9)	For the reaction $2A + 3B + \frac{1}{2}C \longrightarrow P$, the correct rate of the reaction is (a) $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$ (b) $\frac{-d[A]}{dt}=\frac{-3}{2}\frac{d[B]}{dt}=\frac{-1}{4}\frac{d[C]}{dt}$ (c) $\frac{+d[A]}{dt}=\frac{+3}{2}\frac{d[B]}{dt}=\frac{+1}{2}\frac{d[C]}{dt}$ (d) $\frac{+d[A]}{dt}=\frac{+2}{3}\frac{d[B]}{dt}=+4\frac{d[C]}{dt}$	
Ans:	**(a)** $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$ **(or) (a) (or)** $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$	**1**
10)	Match the terms given in Column I with units given Column II. Column I: (i) λ_m; (ii) E_{cell}; (iii) κ; (iv) G^* Column II: (A) Scm^{-1}; (B) cm^{-1}; (C) Scm^2mol^{-1}; (D) V (a) i-C, ii-D, iii-B, iv-A (b) i-C, ii-D, iii-A, iv-B (c) i-D, ii-A, iii-C, iv-B (d) i-B, ii-D, iii-A, iv-C	
Ans:	**(b) i-C, ii-D, iii-A, iv-B (or) (b) (or) i-C, ii-D, iii-A, iv-B**	**1**
11)	Hydration of acetylene (ethyne) with dil. H_2SO_4 and $HgSO_4$ gives (a) Acetone (b) 2-phenylethanol (c) Acetaldehyde (d) Acetic acid	
Ans:	**(c) Acetaldehyde (or) (c) (or) Acetaldehyde**	**1**
12)	10 mL of liquid 'A' and 20 mL of liquid 'B' are mixed at 25^oC. The volume of the solution was measured to be 30.1 mL then, (a) $\Delta H_{mix} > 0$, Solution shows negative deviation from Raoult's low. (b) $\Delta H_{mix} < 0$, Solution shows negative deviation from Raoult's low. (c) $\Delta H_{mix} > 0$, Solution shows positive deviation from Raoult's low. (d) $\Delta H_{mix} < 0$, Solution shows positive deviation from Raoult's low.	

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Ans:	**(c)** $\Delta H_{mix} > 0$, **Solution shows positive deviation from Raoult's low (or) (c) (or)** $\Delta H_{mix} > 0$, **Solution shows positive deviation from Raoult's low**	**1**
13)	Arrange the following complexes in the increasing order of crystal field splitting; $\left[Co(CN)_6\right]^{3-}$, $\left[CoF_6\right]^{3-}$, $\left[Co(H_2O)_6\right]^{3+}$ and $\left[NiCl_4\right]^{2-}$ (a) $\left[NiCl_4\right]^{2-} < \left[CoF_6\right]^{3-} < \left[Co(H_2O)_6\right]^{3+} < \left[Co(CN)_6\right]$ (b) $\left[Co(CN)_6\right]^{3-} < \left[Co(H_2O)_6\right]^{3+} < \left[CoF_6\right]^{3-} < \left[NiCl_4\right]^{2-}$ (c) $\left[Co(CN)_6\right]^{3-} < \left[Co(H_2O)_6\right]^{3+} < \left[Nicl_4\right]^{2-} < \left[CoF_6\right]^{3-}$ (d) $\left[CoF_6\right]^{3-} < \left[Nicl_4\right]^{2-} < \left[Co(H_2O)_6\right]^{3+} < \left[Co(CN)_6\right]^{3-}$	
Ans:	**(a)** $\left[NiCl_4\right]^{2-} < \left[CoF_6\right]^{3-} < \left[Co(H_2O)_6\right]^{3+} < \left[Co(CN)_6\right]$ **(or) (a) (or)** $\left[NiCl_4\right]^{2-} < \left[CoF_6\right]^{3-} < \left[Co(H_2O)_6\right]^{3+} < \left[Co(CN)_6\right]$	**1**
14)	A binary solution has two components 'A' and 'B'. The mole fraction of component 'A' is 0.5, then the number of moles of components 'A and 'B' in the solution is (a) $n_A > n_B$ (b) $n_A < n_B$ (c) $n_A = n_B$ (d) All of these	
Ans:	**(c)** $n_A = n_B$ **(or) (c) (or)** $n_A = n_B$	**1**
15)	The reagent which does not react with both, acetone and benzaldehyde. (a) Sodium hydrogensulphite (b) Phenyl hydrazine (c) Fehling's solution (d) Grignard reagent	
Ans:	**(c) Fehling's solution (or) (c) (or) Fehling's solution**	**1**
II.	**Fill in the blanks by choosing the appropriate word from those given in the brackets: [reducing, one, o-cresol, orange, yellow. +3]**	**5×1=5**
16)	Van't Hoff factor (i) for a non-electrolyte in a solution is _____.	
Ans:	**one**	**1**
17)	The actinoids generally show _____ oxidation state.	
Ans:	**+3**	**1**
18)	The colours of p-Hydroxyazobenzene is _____.	
Ans:	**orange**	**1**
19)	In _____, the –OH group is attached to the carbon that is sp^2 hybridised.	
Ans:	**o-cresol**	**1**
20)	The carbohydrates which reduce Fehling's solution and Tollen's reagent are called as _____ sugars.	
Ans:	**Reducing**	**1**

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PART - B

III. **Answer any three of the following. Each question carries 2 marks.** **3 × 2 = 6**

21) **Write any two differences between order and molecularity of a reaction.**

Ans:

Order of a reaction	Molecularity of a reaction
The sum of the powers concentration terms of reactants in the experimentally determined rate equation.	It is the number of reacting species involved in elementary or simplest reaction.
It is experimentally determined.	It is theoretically calculated.
It can be zero and even a fraction.	It cannot be zero or a non-integer.
Order is applicable to elementary as well as complex reactions	Molecularity is applicable only for elementary reactions.
For complex reaction, order is given by the slowest step.	Molecularity of the slowest step is same as the order of the overall reaction.

(Any two, 1 mark each) **2**

22) **What are the optically active compounds? Give the condition for the molecule to be optically active.**

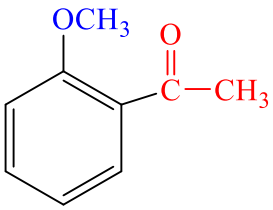
Ans:

The compounds which rotate the plane polarised light towards left or right are called optically active compounds. **1**

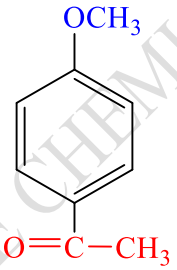
Molecules must be Chiral. **1**

23) **Write the products formed when anisole reacts with ethanoyl chloride in the presence of anhydrous $AlCl_3$ catalyst.**

Ans:



and



(or)

2-methoxy-acetophenone

and

4-methoxy-acetophenone

1+1

24) **With respect to first transition elements series. Which element has**

(i) highest second ionisation enthalpy?

(ii) lowest enthalpy of atomisation?

Ans: (i) Copper (or) Cu (ii) Zinc (or) Zn **1+1**

25) **Identify the proteins and give any one difference between these proteins, the protein present in the hair and the protein present in egg albumin.**

Ans:

Protein present in the hair: Keratin (or) Fibrous protein **1**

Protein present in the egg albumin: Albumin (or) Globular protein **1**

PART - C

IV. **Answer any three of the following. Each question carries 3 marks.** **3 × 3 = 9**

26) **Write the balanced chemical equations involved in the manufacture of potassium dichromate from chromite ore.**

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Ans:

Step-1: $4\ FeCr_2O_4 + 8\ Na_2CO_3 + 7\ O_2 \rightarrow 8\ Na_2CrO_4 + 2\ Fe_2O_3 + 8\ CO_2$ **1**

Step-2: $2\ Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$ **1**

(or)

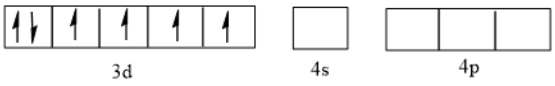
$2\ Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$

Step-3: $Na_2Cr_2O_7 + 2\ KCl \rightarrow K_2Cr_2O_7 + 2\ NaCl$ **1**

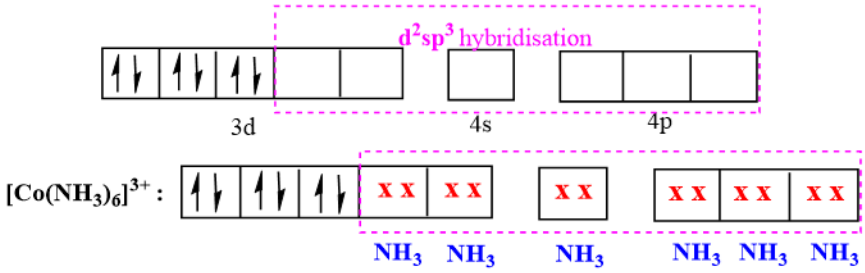
27) **Using Valence Bond Theory [VBT]; explain geometry, hybridisation and magnetic property of $[Co(NH_3)_6]^{3+}$ ion. [Given: Atomic mass of cobalt is 27].**

Ans:

Electronic configuration of Co^{3+}: $[Ar]\ 3d^6\ 4s^0$



Since NH_3 is strong field ligand therefore electrons pairing takes place;



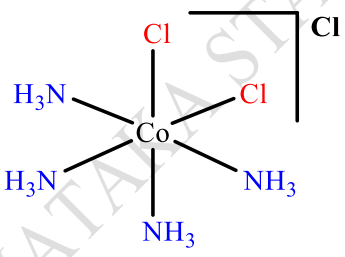
Hybridisation: d^2sp^3.
Magnetic property: Diamagnetic.
Geometry: Octahedral.

Geometry: one-mark, Magnetic property: one mark; Explanation: one mark

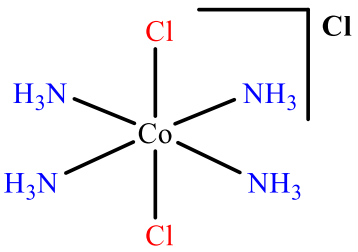
28) **On treating $CoCl_3.4NH_3$ with excess of $AgNO_3$ solution, 1 mole of AgCl is formed. Formulate the complex and write its geometrical isomers.**

Ans:

$[Co(NH_3)_4Cl_2]Cl$ **1**



cis



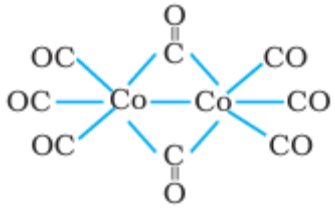
trans

1+1

29) **Write the formula of the three different types of compounds formed when lanthanoids reacts with carbon or heated with carbon.**

Ans: Ln_3C, Ln_2C_3 and LnC_2 **1+1+1**

30) **Write the IUPAC name and structure of $[Co_2(CO)_8]$ and mention the number of bridged CO groups.**

Ans:	Octacarbonyldicobalt(0)  Two bridged CO groups	**1** **1** **1**
V	**Answer any two of the folowing. Each question carries 3 marks:**	**2 × 3 = 6**
31)	**Give an example of inert electrode. Write the representation and half- cell reaction for bromine electrode.**	
Ans:	Platinum or gold $Pt(s)\,|\,Br_2(aq)\,|\,Br^-(aq)$ $\frac{1}{2}Br_2(aq)+e^- \longrightarrow Br^-(aq)$	**1** **1** **1**
32)	**Write the overall reaction of Ni-Cd battery. Mention the anode and cathode of it.**	
Ans:	$Cd(s) + 2Ni(OH)_3(s) \longrightarrow CdO(s) + 2Ni(OH)_2(s) + H_2O(l)$ Anode: Cadmium (Cd) and Cathode: NiO2	**1** **1+1**
33)	**Derive an integrated rate equation for the rate constant of a zero-order reaction.**	
Ans:	Consider a reaction: $R \rightarrow P$ $Rate = \frac{-d[R]}{dt} = k[R]^0$ $Rate = \frac{-d[R]}{dt} = k \times 1$ $d[R] = -k\ dt$ Integrate on both sides $[R] = -kt + I$ ---------- (1) At, $t = 0$, then $[R] = [R]_0$ Where, $[R]_0$ is the initial concentration of reactants Substituting in equation (1) $[R]_0 = -k \times 0 + I$ $[R]_0 = I$ Substituting the value in I in the equation (1) $[R] = -kt + [R]_0$ $-kt = [R] - [R]_0$ (or) $\boxed{k = \frac{[R]_0 - [R]}{t}}$	**1** **1** **1**

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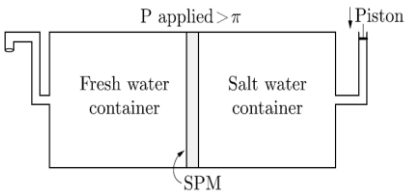
34) **Given below is the sketch of a plant for carrying out a process.**

(i) Name the process occurring in the given plant.

(ii) Name any one SPM which can be used in this plant.

(iii) Give one practical use of the plant.



Ans:

(i) Reverse osmosis. **1**

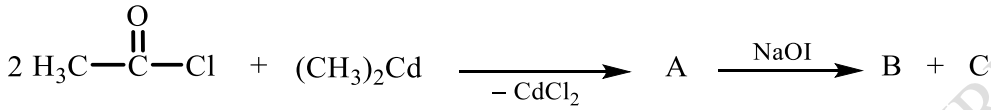
(ii) Cellulose acetate. **1**

(iii) Desalination of sea water. **1**

PART - D

VI. **Answer any four of the following. Each question carries 5 marks.** **4 × 5 = 20**

35) (a) **Identify the compounds 'A', 'B' and 'C' in the following reaction.** **(3+2)**



(b) **An organic compound 'P' ($C_7H_6O_2$) reacts with thionyl chloride gives product 'Q'. 'Q' on the further undergoes hydrogenation in the presence of Pd-$BaSO_4$ forms compound 'R'. Write the equations involved in the chemical reactions.**

Ans:

(a) A = $H_3C-\overset{O}{\overset{\|}{C}}-CH_3$; B = $H_3C-\overset{O}{\overset{\|}{C}}-ONa$ (or) CHI_3 ; C = CHI_3 (or) $H_3C-\overset{O}{\overset{\|}{C}}-ONa$ **1+1+1**

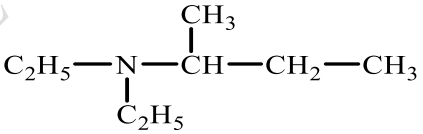
(b) $C_6H_5-\overset{O}{\overset{\|}{C}}-OH + SOCl_2 \longrightarrow C_6H_5-\overset{O}{\overset{\|}{C}}-Cl$ **1**

$C_6H_5-\overset{O}{\overset{\|}{C}}-Cl + H_2 \xrightarrow{Pd\text{-}BaSO_4} C_6H_5-\overset{O}{\overset{\|}{C}}-H$ **1**

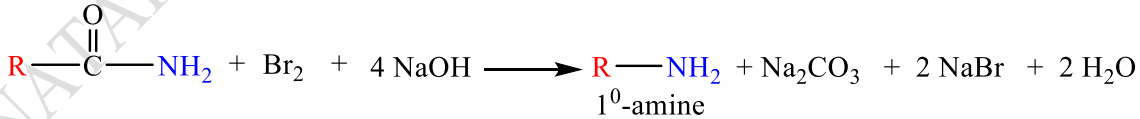
36) (a) **Explain Hoffmann bromamide degradation reaction with chemical equation.**

(b) **Discuss the coupling reaction of Benzene diazonium chloride with aniline. Give equation.**

(c) **Write the IUPAC name of**

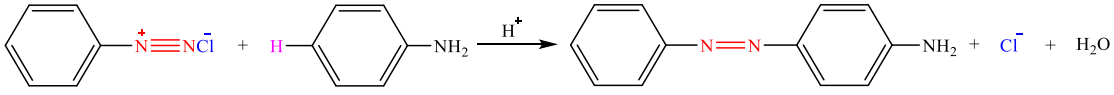


Ans: (a) The reaction involves the treatment of amide with bromine in an aqueous or ethanolic solution of sodium hydroxide. **1**



1

(b) When benzene diazonium chloride reacts with aniline yields p-aminoazobenzene. This reaction is called coupling reaction. **1**



1

(c) N,N-Diethylbutan-2-amine **1**

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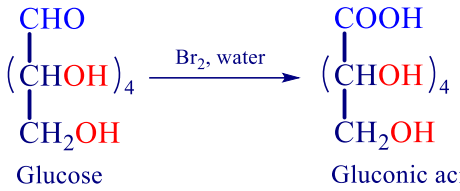
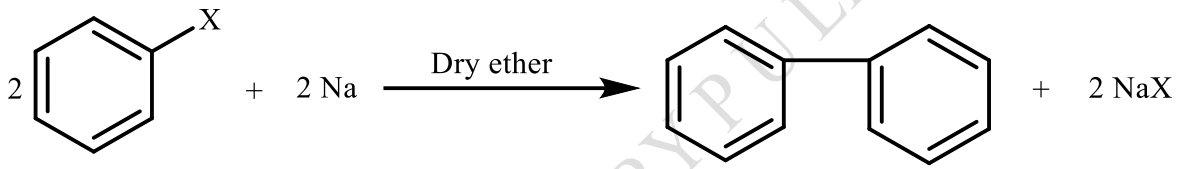
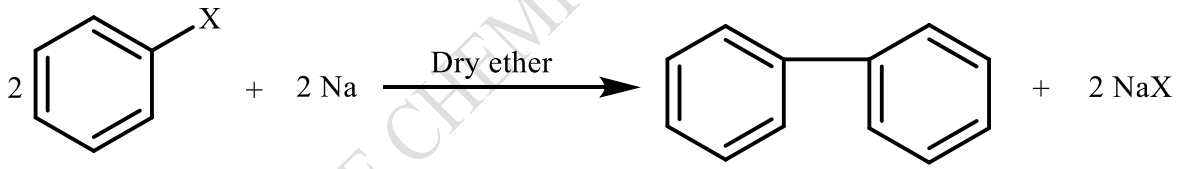
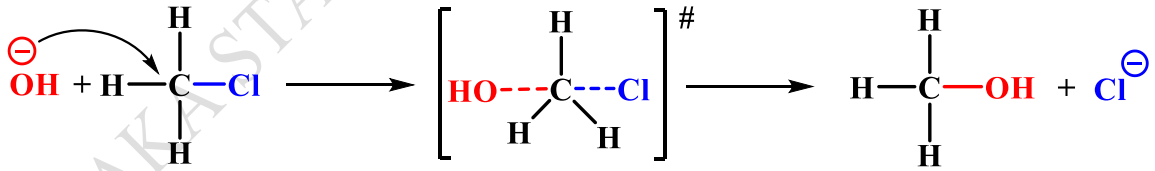
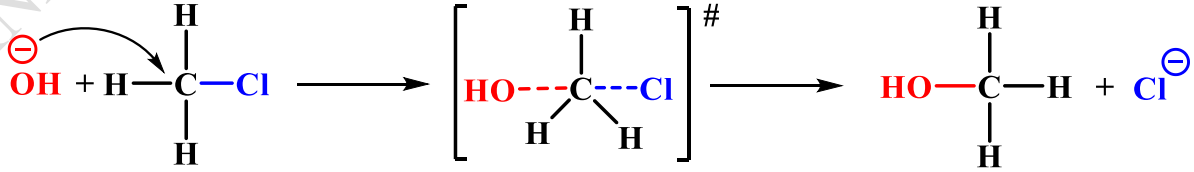
37) (a) **(b)** **(c)**	**Glucose is a monosaccharide and an aldohexose. Which oxidising agent should be used to bring about oxidation of only the aldehydic group present in glucose? Write the chemical equation.** **Mention any two forces which stabilises the 2^0 and 3^0 structures of proteins.** **Name the type linkage present in Dinucleotide obtained by joining two nucleotides.**	**(2+2+1)**
Ans: (a)	Glucose gets oxidised to gluconic acid reacts with bromine water.  	**1** **1**
(b)	Hydrogen bonds and disulphide linkage	**1+1**
(c)	Phosphodiester linkage	**1**
38) (a) **(b)** **(c)**	**Explain Fittig reaction with general equation.** **Write the mechanism for the conversion of methyl chloride to methanol.** **How many stereo centres are present in Butan-2-ol?**	**(3+1+1)**
Ans: (a)	When aryl halides react with sodium in presence of dry ether gives diphenyl. This reaction is called Fittig reaction.  **(or)**  Aryl halide Diphenyl	**1** **1** **(or)** **2**
(b)	 **(or)**  	**2** **2**
(c)	One	**1**
39) (a) **(b)**	**Write the steps involved in the mechanism of acid catalysed dehydration of ethanol to ethene.** **Complete the following reactions;**	**(3+2)**

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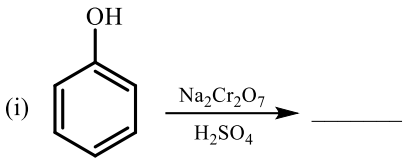
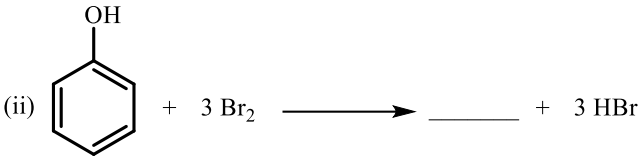
(i) 

(ii) 

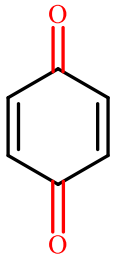
Ans: (a)

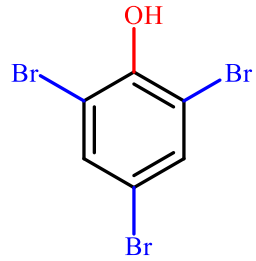
$CH_3CH_2—OH + H^{\oplus} \longrightarrow CH_3CH_2—\overset{\oplus}{O}H_2$ **1**

$CH_3CH_2—\overset{\oplus}{O}H_2 \longrightarrow CH_3\overset{\oplus}{C}H_2 + H_2O$ **1**

$CH_3\overset{\oplus}{C}H_2 \longrightarrow H_2C{=}CH_2 + H^{\oplus}$ **1**

(b)

(i) 

(ii)  **1+1**

40) (a) Explain Hell-Volhard –Zelinsky reaction with chemical equation.
(b) Write the reaction for the conversion of toluene to benzaldehyde using chromyl chloride. Name the reaction.
(c) Name the gas used to facilitate the nucleophilic addition of ethylene glycol to aldehydes and ketones. **(2+2+1)**

Ans:

(a) Carboxylic acids having an α-hydrogen are halogenated at the α -position on treatment with halogen in the presence red phosphorus to give α-halocarboxylic acids. This reaction is known as Hell-Volhard Zelinsky reaction. **1**

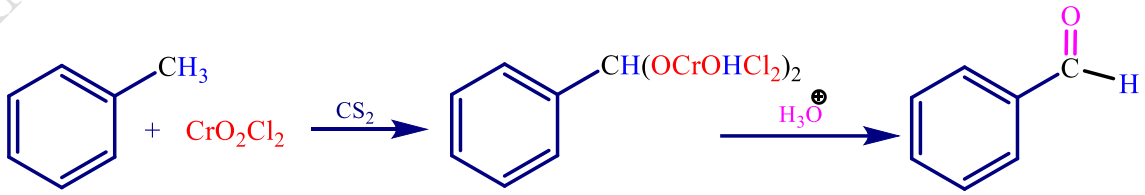
$R—CH_2—COOH \xrightarrow[H_2O]{X_2/\text{ Red P}} R—\underset{X}{CH}—COOH + H—X$ **1**

(or)

(or)

$R—CH_2—COOH \xrightarrow[H_2O]{X_2/\text{ Red P}} R—\underset{X}{CH}—COOH + H—X$ **2**

Carboxylic acid α-halo carboxylic acid

(b)  **1**

Etard reaction **1**

(c) Dry HCl gas **1**

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	PART – E (PROBLEMS)	
VII.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
41)	**Calculate the osmotic pressure of 0.5%(w/v) aqueous solution sucrose at 300K. (R = 0.0083 L bar mol^{-1} and molar mass of sucrose = 342 g mol^{-1}).**	
Ans:	$\Pi = CRT$ (or) $\Pi = \frac{W_2RT}{M_2V}$	**1**
	$\Pi = \frac{5\times0.083\times300}{342\times100}\times1000$	**1**
	$\Pi = 3.64\,\text{bar}$	**1**
42)	**Calculate the electromotive force (emf) of the cell. Assume the cell reaction at 25^0 C with the reaction:** $Cu_{(s)} + 2Ag^+_{(1\times10^{-3}M)} \longrightarrow Cu^{2+}_{(0.250M)} + 2Ag_{(s)}$. **$E^0_{cell}$ = 2.97 V**	
Ans:	$E_{cell} = E^o_{cell} - \frac{0\cdot0591}{n}\log Q$	**1**
	$Q = \frac{\left[Cu^{2+}\right]}{\left[Ag^+\right]^2} = \frac{0.250}{\left(1\times10^{-3}\right)^2} = 2.5\times10^5$	
	$E_{cell} = 2.97 - \frac{0\cdot0591}{2}\log\left(2.5\times10^5\right)$	**1**
	$E_{cell} = 2.97 - \frac{0\cdot0591}{2}\times5.3979$	
	$E_{cell} = 2.97 - 0.1595 = 2.8\,V$	**1**
43)	**A column containing 0.05 M NaOH has an area of cross section 0.785 cm^2 and length of 1m shows a resistance of 1.11×10^4 Ω. Calculate the molar conductivity of the solution.**	
Ans:	$\text{Conductivity} = \kappa = \frac{1}{\rho} = \frac{1}{87.135} = 0.0114\,Sm^{-1}$	**1**
	$\Lambda_m = \kappa\times\frac{1000}{C}$	**1**
	$\Lambda_m = 0.0114\times\frac{1000}{0.05}$	
	$\Lambda_m = 228\ Sm^2mol^{-1}$	**1**
44)	**A first order reaction has rate constant of 2.3×10^{-5} s^{-1} at 500 K. At what temperature rate constant of the reaction becomes 17.25×10^{-4} s^{-1}? (E$_a$ = 191.472 KJ mol^{-1} and R =8.314 J K^{-1}mol^{-1})**	
Ans:	$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$	1
	$\log\frac{17.25\times10^{-4}}{2.3\times10^{-5}} = \frac{191472}{2.303\times8.314}\left[\frac{T_2 - 500}{500\times T_2}\right]$	1

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$$\log 75 = 10000 \times \left[\frac{T_2 - 500}{500 \times T_2}\right]$$

$$1.8750 = 10000 \times \left[\frac{T_2 - 500}{500 \times T_2}\right]$$

$$(500 \times T_2) = \frac{10000}{1.8750} \times (T_2 - 500)$$

$$(500 \times T_2) = 5.333 \times T_2 - 2666666$$

$$2666666 = (5330 - 500) \times T_2$$

$$T_2 = \frac{2666666}{4830} = 552.10\,K$$ 1

45) **A first order reaction has half-life of 23 min. How much time will be needed for 30% completion of the reaction?**

Ans:

$$k = \frac{0.693}{t_{½}} = \frac{0.693}{23\,min} = 0.0301\,min^{-1}$$

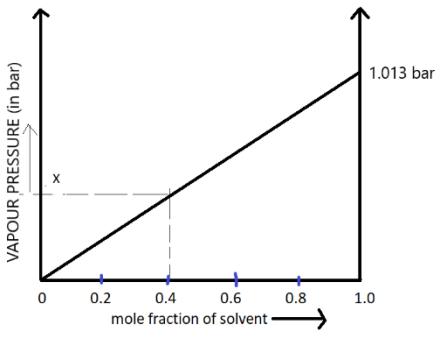
$$t_{30\%} = \frac{1}{k} \ln \frac{[R]_0}{[R]}$$ **1**

$$t_{30\%} = \frac{1}{0.0301\,min^{-1}} \ln\left(\frac{100}{100 - 30}\right)$$ **1**

$$t_{30\%} = 33.222 \times \ln(1.4285)$$

$$t_{30\%} = 33.222 \times 0.3566 = 11.84\,min$$ **1**

46) **If a solution obeys Raoult's law for all concentrations, its vapour pressure would vary linearly from zero to the vapour pressure of pure solvent as shown in graph. Calculate the value of 'x'.**



Ans:

$$p_1 = \chi_1 p_1^0$$ **1**

In the graph; $p_1^0 = 0.013\,bar$

$\chi_1 = 0.4$

$\therefore p_1 = 0.4 \times 1.013$ **1**

$p_1 = 0.4052\,bar$ **1**

PART - F
(For visually challenged students only)

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34)	**Name any three parameters which affects solubility of gas in liquid.**	
	1. Pressure 2. Temperature 3. Nature of the gas and liquid	**3**
46)	**The vapour pressure of compound 'A' and compound 'B' at 25^0 C are 90 mm Hg and 15 mm Hg respectively. If 'A' and 'B' are mixed each other such that mole fraction of 'A' in the solution is 0.6. Calculate the mole fraction of 'B' in vapour phase.**	
	Total pressure of mixture $= P_{Total} = \chi_A \times P_A^o + \chi_B \times P_B^o = 90 \times 0.6 + 15 \times 0.4 = 60\,mm$	**1**
	Mole fraction of B in vapour phase, $\left(\chi_B^{'}\right) = \dfrac{\chi_B^{'} \times P_B^o}{P_{Total}}$	**1**
	$\therefore \chi_B^{'} = \dfrac{0.4 \times 15}{60} = 0.1 = 1 \times 10^{-1}$	**1**

*********END*********

KARNATAKA STATE CHEMISTRY P U LECTURER'S FORUM

KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD

2025 II PU PRACTICE PAPER

SCHEME OF EVALUATION

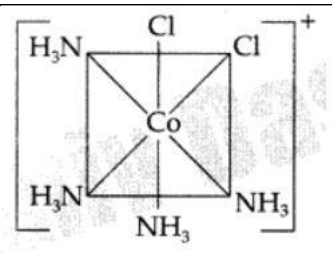
SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

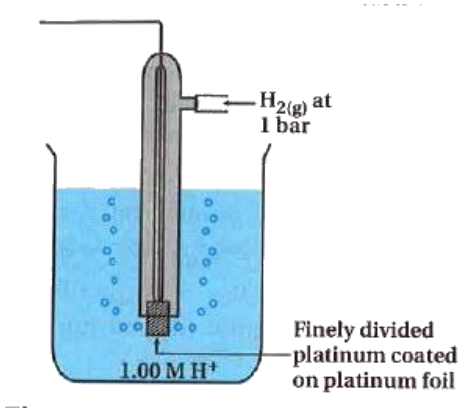
PART-A		
I.	**Select the correct option from the given choices:**	**15 × 1=15**
1)	The main natural source of acetic acid is (a) milk (b) vinegar (c) red ant (d) butter	
Ans:	**(b) vinegar (or) (b) (or) vinegar**	**1**
2)	The chemical formula of Hinsberg's reagent is (a) C_6H_6SOCl (b) $C_6H_5SOCl_2$ (c) $C_6H_5SO_2Cl$ (d) $C_6H_5SO_3H$	
Ans:	**(c)** $C_6H_5SO_2Cl$ **(or) (c) (or)** $C_6H_5SO_2Cl$	**1**
3)	Out of following which one is not an example of a solution. (a) Air (b) Brass (c) amalgam (d) benzene in water	
Ans:	**(d) benzene in water (or) (d) (or) benzene in water**	**1**
4)	The reagent which does not react with both, acetone and benzaldehyde. (a) Sodium hydrogensulphite (b) Phenyl hydrazine (c) Fehling's solution (d) Grignard reagent	
Ans:	**(c) Fehling's solution (or) (c) (or) Fehling's solution**	**1**
5)	The boiling point of ethyl alcohol is much higher than that of dimethyl ether though both have the same molecular weight because (a) ether is insoluble in water (b) methyl groups are attached to oxygen in ether (c) dipole moment of ethyl alcohol is less (d) ethyl alcohol shows hydrogen bonding	
Ans:	**(d) ethyl alcohol shows hydrogen bonding (or) (d) (or) ethyl alcohol shows hydrogen bonding**	**1**
6)	Blood cells retain their normal shape in solution which are (a) hypotonic to blood (b) isotonic to blood (c) hypertonic to blood (d) equinormal to blood	
Ans:	**(b) isotonic to blood (or) (b) (or) isotonic to blood**	**1**
7)	A cell that converts energy of combustion of fuels like hydrogen and methane directly into electrical energy is known as (a) Dynamo (b) Ni–Cd Cell (c) Fuel Cell (d) Electrolytic Cell	
Ans:	**(c) Fuel Cell (or) (c) (or) Fuel Cell**	**1**
8)	Which of the following is homoleptic complex? (a) $\left[Co(NH_3)_3Cl_3\right]$ (b) $\left[Co(NH_3)_5Cl\right]Cl_2$ (c) $\left[Co(NH_3]_4(H_2O)_2\right]Cl_3$ (d) $[Co(NH_3)_6]Cl_3$	
Ans:	**(d)** $[Co(NH_3)_6]Cl_3$ **(or) (d) (or)** $[Co(NH_3)_6]Cl_3$	**1**

9)	Doctor advised a 50-year-old woman enough exposure to sunlight and addition of fish and egg yolk to her diet. Name the vitamin deficiency for the possible disease diagnosed by the doctor. (a) Vitamin D (b) Vitamin A (c) Vitamin C (d) Vitamin B_{12}	
Ans:	**(a) Vitamin D (or) (a) (or) Vitamin D**	**1**
10)	pK_a value of phenol, o-cresol and o-nitrophenol are 10.0, 10.2 and 7.2 respectively, Correct order of acidity is (a) phenol > o-cresol > o-nitrophenol (b) o-cresol > phenol > o-nitrophenol (c) o-nitrophenol > o-cresol > phenol (d) o-nitrophenol > phenol > o-cresol	
Ans:	**(d) o-nitrophenol > phenol > o-cresol (or) (d) (or) o-nitrophenol > phenol > o-cresol**	**1**
11)	Which one of the following is a correct match with respect to the type of amine mentioned with it? (a) Simple amine: N-Methylmethanamine (b) Mixed amine : N-Methylmethanamine (c) Primary amine: N-Methylmethanamine (d) Aryl amine: Methanamine.	
Ans:	**(a) Simple amine: N-Methylmethanamine (or) (a) (or) Simple amine: N-Methylmethanamine**	**1**
12)	**Statement–I:** Potassium permanganate is a powerful oxidant. **Statement–II:** $KMnO_4$ oxidises I^- to IO_3^- in acidic solution. In the light of the above statements, choose the appropriate answer from the options given below: (a) Both Statement I and Statement II are correct. (b) Statement I is incorrect but Statement II is correct. (c) Both Statement I and Statement II are incorrect. (d) Statement I is correct but Statement II is incorrect.	
Ans:	**(d) Statement I is correct but Statement II is incorrect (or) (d) (or) Statement I is correct but Statement II is incorrect**	**1**
13)	$C_6H_5-\overset{+}{N}_2\overset{-}{Cl}\xrightarrow{Cu_2Cl_2}C_6H_5-Cl+N_2$; Name of the reaction is (a) Swarts reaction (b) Wurtz reaction (c) Sandmeyer reaction (d) Fittig reaction	
Ans:	**(c) Sandmeyer reaction (or) (c) (or) Sandmeyer reaction**	**1**
14)	The rate constant of a reaction is given by $k = PZe^{-Ea/RT}$ under standard notation. In order to speed up the reaction. Which of the following factors has to be decreased? (a) Both Z &T (b) Ea (c) T (d) Z	
Ans:	**(b) Ea (or) (b) (or) Ea**	**1**
15)	Match the following transition metal/compounds with their catalytic activity in the corresponding processes.	

Transition metal/compounds	Name of the process
(i) $TiCl_4+Al(CH_3)_3$	(A) Wacker process
(ii) $PdCl_2$	(B) Contact process
(iii) Ni	(C) manufacture of polyethene

	(iv) V_2O_5 | (D) hydrogenation of fat (a) i-C, ii-A, iii-D, iv-B (b) i-A, ii-C, iii-B iv-D (c) i-A, ii-C, iii-D, iv-B (d) i-D, ii-A, iii-B, iv-C	
Ans:	**(a) i-C, ii-A, iii-D, iv-B (or) (a) (or) i-C, ii-A, iii-D, iv-B**	**1**
II.	**Fill in the blanks by choosing the appropriate word from those given in the brackets: [carbohydrate, chloroform, molarity, phenol, sp^3, dsp^2]**	**5×1=5**
16)	Increasing the temperature of an aqueous solution will cause decrease in _____.	
Ans:	**molarity**	**1**
17)	The hybridisation of $\left[Ni(CN)_4\right]^{2-}$ is _____.	
Ans:	**dsp^2**	**1**
18)	The polyhalo compound used as an anaesthetic during surgery was _____.	
Ans:	**chloroform**	**1**
19)	The example for compound which contains –OH group is attached to the carbon that is sp^2 hybridised is _____.	
Ans:	**phenol**	**1**
20)	The hormone glucocorticoids control the _____ metabolism.	
Ans:	**carbohydrate**	**1**
	PART - B	
III.	**Answer any three of the following. Each question carries 2 marks.**	**3 × 2 = 6**
21)	**The transition metals and their compounds are known for their catalytic activity. Give two reasons.**	
Ans:	1. Due to small atomic size. 2. Due to presence of large surface area. 3. They exhibit variable oxidation states. **(Any Two; 1 mark for each)**	**2**
22)	**Explain the preparation of ether by Williamson synthesis with a general chemical equation.**	
Ans:	Alkyl halide and sodium alkoxide react to gives ether. This reaction is called *Williamson's ether synthesis*. $R—X + R'—ONa \longrightarrow R—O—R' + NaX$ **(or)** $R—X + R'—ONa \longrightarrow R—O—R' + NaX$ Alkyl halide; Sodium alkoxide; Ether	**1** **1** **(or)** **2**
23)	**Mention each one use of chloroform in the fields of medical and industry.**	
Ans:	General anaesthetic in surgery and production of the freon refrigerant.	**1+1**
24)	**Identify the proteins present in the hair and egg albumin.**	
Ans:	Fibrous protein (keratin) and Globular protein (albumin)	**1+1**
25)	**Give any two importance of study chemical kinetics.**	

Ans:	It tells about the rate of a reaction. It describes the conditions by which the reaction rates can be altered.	**1** **1**
	PART - C	
IV.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
26)	**Write any three postulates of Werner's theory of coordination compounds.**	
Ans:	1. In co-ordination compounds metals show **two types of valences (linkages)** a) Primary valency b) Secondary valency 2. Primary valency ionisable, satisfied by negative ions. 3.Secondary valency non-ionisable, satisfied by negative ions or neutral molecules. 4. Secondary valency is equal to coordination number. 5. Secondary valency is directional in nature. **(Any Three; 1 mark for each)**	**3**
27)	**What is Lanthanoid contraction? Mention two consequence of it.**	
Ans:	The gradual decrease in atomic and ionic radii across the lanthanide series is called lanthanide contraction. 1. Due to lanthanide concentration the atomic radii of Zr (160 pm) and Hf (159 pm) is almost same. 2. Basicity decreases from La to Lu. 3. Covalent character of trivalent cations increases. 4. Electronegativity of trivalent ions increases slightly. **(Any Two; 1 mark for each)**	**1** **2**
28)	**Based on number of donor atoms bound to a metal atom/ion, Mention the three types of ligands.**	
Ans:	Monodentate (one donor atom). Bidentate (two donor atoms). Polydentate (three or more donor atoms).	**1** **1** **1**
29)	**Write the balanced equations in the preparation of potassium permanganate from MnO_2. Mention the gas evolved when $KMnO_4$ is heated at 513K.**	
Ans	$2\,MnO_2 + 4\,KOH + O_2 \longrightarrow 2\,K_2MnO_4 + 2\,H_2O$ $3MnO_4^{2-} + 4H^+ \longrightarrow 2\,MnO_4^- + MnO_2 + 2\,H_2O$ O_2 (or) Oxygen gas	**1** **1** **1**
30)	**For the given coordination complex ion, answer the following question.** **(i) Write IUPAC name.** **(ii) Mention the geometry of the complex** **(iii) What the primary and secondary valence of central metal ion?** 	

Ans:	(i) tetraamminedichloridocobalt(III) ion (ii) Octahedral (iii) 3 and 6	**1** **1** **1**
V	**Answer any two of the folowing. Each question carries 3 marks:**	**2 × 3 = 6**
31)	**Draw the neat labelled diagram of Standard Hydrogen Electrode. Write its value of electrode potential and half-cell reaction.**	
Ans:	 **(Any two labelling 1 mark)** Electrode potential: "0" **(or)** Zero **Half-cell reaction:** **At anode:** $\frac{1}{2}H_{2\,(g)} \rightarrow H^+_{(aq)} + e^-$ **(or)** $\frac{1}{2}H_{2\,(g)} \rightleftharpoons H^+_{(aq)} + e^-$ **(or)** **At cathode:** $H^+_{(aq)} + e^- \rightarrow \frac{1}{2}H_{2\,(g)}$ **(Any one cell reaction; 1 mark)**	**1** **1** **1**
32)	**Derive an integrated rate equation for the rate constant of a first-order reaction.**	
Ans:	Consider the general first order reaction R $\rightarrow$ Products Rate = $\frac{-d[R]}{dt} = k[R]$ (or) $\frac{d[R]}{[R]} = -k.dt$ Integrate on both sides, we get $\ln [R] = -k\,t + I$ When, $t = 0$, then **R** = $[R]_0$ is the initial concentration of the reactant. $\ln [R]_0 = -k \times 0 + I$ $\ln [R]_0 = I$ Substitute the value of I in the above equation.	1 1

$$\ln [R] = -k\,t + \ln [R]_0$$

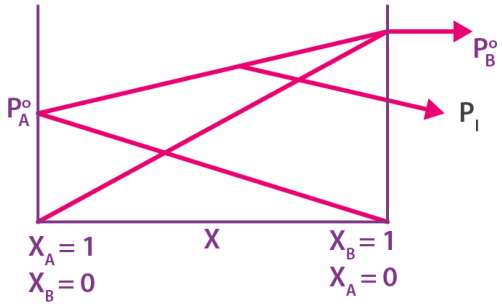
Rearrange,

$$\ln \frac{[R]}{[R]_0} = -k\,t$$

$$k = \frac{1}{t} \ln \frac{[R]_0}{[R]} \quad \textbf{(or)} \quad k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$ — 1

33) State Raoult's law for a liquid-liquid solutions. Draw a suitable labelled diagram to express the relationship for ideal solution of A and B between vapour pressure and mole fractions of components at constant temperature.

Ans: Raoult's law which states that for a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction present in solution. — **1**



2

34) Write any three differences between metallic conductor and electrolytic conductor.

Ans:

	Metallic conduction	Electrolytic conduction
1.	The flow of electricity takes place without decomposition of the substance.	The flow of electricity takes place with decomposition of the substance.
2.	There is no actual transport of matter.	Transfer of matter takes place in the form of ions.
3.	The conduction of electricity is due to the flow of electrons.	The conduction of electricity is due to the flow of ions in the solution.
4.	Metallic conductivity decreases with increase in temperature.	Electrolytic conduction increases with increases in temperature.
5.	Metallic conduction is a physical process that means no new substance is formed.	Electrolytic conduction is both physical and chemical change.

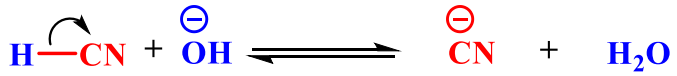
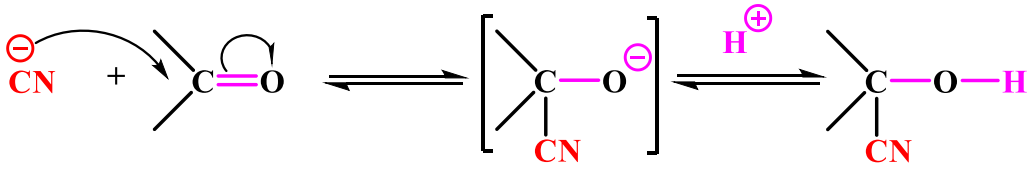
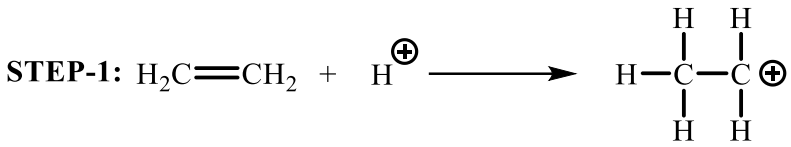
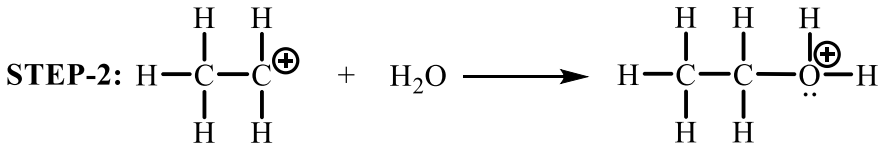
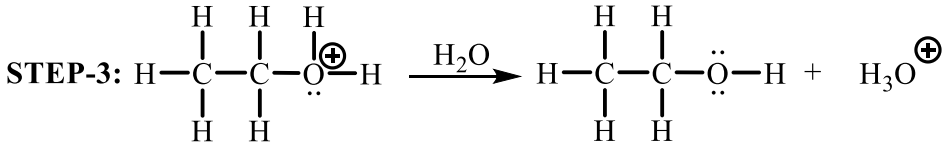
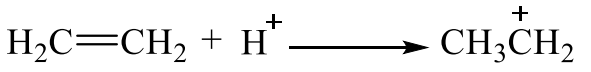
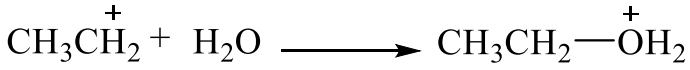
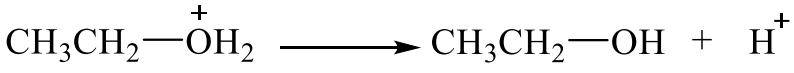
(Any three; 1 mark each) — **3**

PART - D

VI. Answer any four of the following. Each question carries 5 marks. — **4 × 5 = 20**

35) (a) Write the mechanism of addition of HCN to carbonyl group in presence of a base.

(b) Among methanal and ethanal, which one undergoes Cannizaro reaction? Give reason. — **(3+2)**

Ans:(a)		1
		2
(b)	Methanol	1
	Due to absence of α-hydrogen	1
36) (a)	**Write the steps in mechanism of acid catalysed hydrolysis of ethanol to ethene.**	
(b)	**What is the effect of acidity of phenols in the presence of;**	**(3+2)**
	(i) Electron withdrawing group (ii) Electron donating group	
Ans: (a)	**STEP-1:** 	1
	STEP-2: 	1
	STEP-3: 	1
	(Or)	**(or)**
		1
		1
		1
(b)	(i) Acidity increases	1
	(ii) Acidity decreases	1
37) (a)	**Give the differences between S_N1 and S_N2 mechanism with respect to the following.**	
	(i) Order of reaction (Kinetics).	
	(ii) Configuration of the product.	**(3+2)**
	(iii) Order of reactivity of alkyl halides.	
(b)	**Explain Finkelstein reaction. Write the general equation.**	

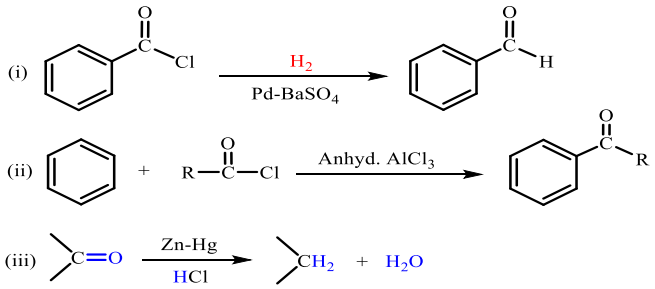
Ans: (a)

	S_N1	S_N2	
(i) Order of reaction (Kinetics)	1	2	**1**
(ii) Configuration of the product	Inversion and retention	Inversion only	**1**
(iii) Order of reactivity of alkyl halides	Primary halide > Secondary halide > Tertiary halide	Tertiary halide > Secondary halide > Primary halide	**1**

(b) When alkyl chlorides/bromides react with NaI in dry acetone gives Alkyl iodides. This reaction is known as Finkelstein reaction. **1**

$$R{-}X + NaI \xrightarrow{\text{Dry Acetone}} R{-}I + NaX$$ **1**

38) (a) Mention the name of the following reactions. **(3+2)**



(b) What is Jones reagent? Write chemical equation for conversion of 1-decanol to decanoic acid by using it?

Ans: (a)
(i) Rosenmund reduction. **1**
(ii) Friedel-Crafts acylation. **1**
(iii) Clemmensen reduction. **1**

(b) $CrO_3 - H_2SO_4$ is called Jones reagent. **1**

$$CH_3(CH_2)_8CH_2OH \xrightarrow{CrO_3\text{-}H_2SO_4} CH_3(CH_2)_8COOH$$ **1**

39 (a) Name the linkage that joins: **(3+2)**

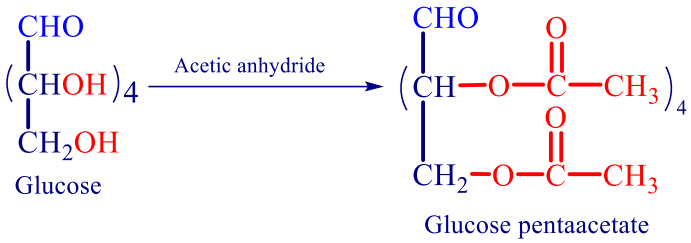
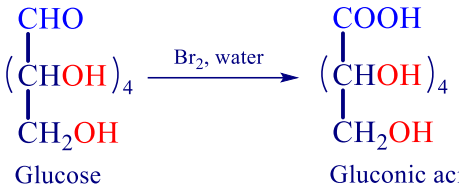
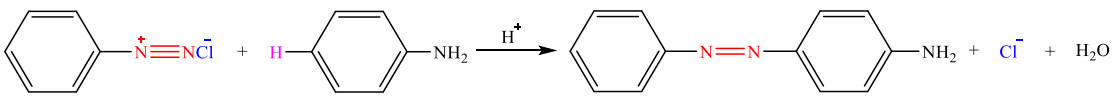
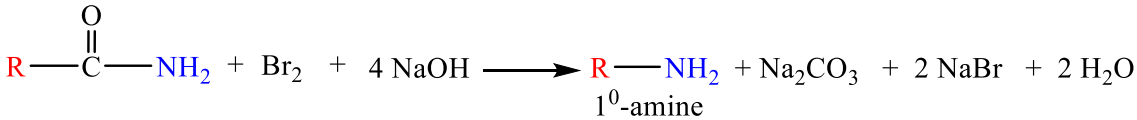
(i) Two monosaccharides in oligosaccharides

(ii) two α-amino acids in protein

(iii) two nucleotides in RNA

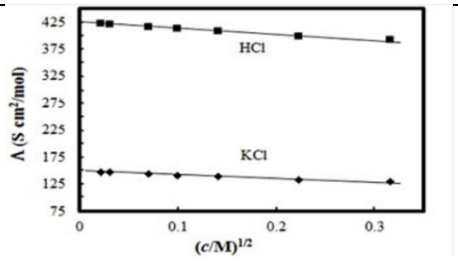
(b) Write the chemical equations to show that glucose contains

(i) five hydroxyl groups (ii) aldehyde group.

Ans: (a)	(i) Glycosidic linkage.	1
	(ii) Peptide linkage.	1
	(iii) Phosphodiester linkage	1
(b)	(i) 	1
	(ii) 	1
40)	**Discuss the coupling reaction of Benzene diazonium chloride with aniline. Give equation. Mention the colour of the product.** **Explain Hoffmann bromamide degradation reaction with general chemical equation.**	**(3+2)**
Ans: (a)	When benzene diazonium chloride reacts with aniline yields p-aminoazobenzene. This reaction is called coupling reaction.	1
		1
	Yellow.	1
(b)	The reaction involves the treatment of amide with bromine in an aqueous or ethanolic solution of sodium hydroxide.	1
		1

PART – E (PROBLEMS)

VII.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
41)	**The rate of a reaction quadruples when the temperature changes from 293K to 313K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.**	
Ans:	Given: $K_2 = 4K_1$; $T_1 = 293K$; $T_2 = 313K$ & $R = 8.314JK^{-1}mol^{-1}$	1
	$$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$$	
	$\because k_2 = 4k_1$	

	$\log 4 = \frac{E_a}{2.303 \times 8.314}\left[\frac{313-293}{293 \times 313}\right]$ **(or)** $E_a = \frac{\log 4 \times 2.303 \times 8.314 \times 293 \times 313}{20}$	**1**
	E_a = 52864 J mol^{-1} **(or)** 52.864 kJ mol^{-1}	**1**
42)	**The standard electrode potential for Daniel cell is 1.1V. Calculate the standard Gibbs energy for the reaction.** $Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$ **[Given 1F = 96500C].**	
Ans:	Where; n = 2	
	$\Delta G^0 = -nFE^0_{cell}$	**1**
	$\Delta G^0 = -2 \times 96500 \times 1.1$	**1**
	$\Delta G^0 = -212.3\,kJmol^{-1}$	**1**
43)	**At 298 K, 100 cm^3 of a solution containing 3.002 g of an unidentified solute exhibits an osmotic pressure of 2.55 atmospheres. What is the molar mass of solute? (R = 0.0821 L atm. mol^{-1} K^{-1})**	
Ans:	$M_2 = \frac{w_2 \times R \times T}{\Pi V}$	**1**
	$M_2 = \frac{3.002 \times 0.0821 \times 298}{2.55 \times 0.1}$ $\left(\because 100\,cm^3 = 0.1L\right)$	**1**
	$M_2 = 288\,g\,mol^{-1}$	**1**
44)	**The mole fraction of helium in a saturated solution at 20°C is 1.2 x 10^{-6}. Find the pressure of helium above the solution. Given Henry's constant at 20°C = 144.97 kbar.**	
Ans:	$P = K_H \chi$	**1**
	$P = 1.44.97 \times 10^3 \times 1.2 \text{ x } 10^{-6}$	**1**
	$P = 0.174\,bar$	**1**
45)	**In a reaction, $2A \longrightarrow R$, Products, the concentration of A decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 minutes. Calculate the rate during this interval?**	
Ans:	$r = -\left[\frac{\Delta[A]}{\Delta t}\right]$	**1**
	$r = -\frac{1}{2}\left[\frac{[A]_2 - [A]_1}{t_2 - t_1}\right] = -\frac{1}{2}\left[\frac{0.4-0.5}{10\,min}\right]$	**1**
	$r = 5 \times 10^{-3}\,mol\,L^{-1}\,min^{-1}$	**1**
46)	**The limiting molar conductivity of CH_3COOH is 390 Scm^2/mol. Using the graph and given information calculate the limiting molar conductivity of CH_3COOK.** 	

Ans:	Limiting molar conductivity of KCl =150 $S\,cm^2\,mol^{-1}$ Limiting molar conductivity of HCl = 425 $S\,cm^2\,mol^{-1}$ $\Lambda^0 CH_3COOK = \Lambda^0 CH_3COOH + \Lambda^0 KCl - \Lambda^0 HCl$ $= 390 + 150 - 425$ $\Lambda^0 CH_3COOK = 115 S\,cm^2\,mol^{-1}$	**1** **1** **1**
	PART-F **(For visually challenged students only)**	
30)	**Using IUPAC norms write the formulae for coordination compounds: Hexaamminecobalt(III) chloride. What the primary and secondary valence of central metal ion?**	
Ans:	$\left[Co(NH_3)_6\right]Cl_3$ Primary valence = 3 and secondary valence = 6	**1** **1+1**
46)	**At 318 K, for the reaction $2N_2O_{5\,(g)} \longrightarrow 4NO_{(g)} + O_{2\,(g)}$ in CCl_4, the initial concentration of N_2O_5 is $2.33\,mol\,L^{-1}$ in reduced to $2.08\,mol\,L^{-1}$ in 100 minutes. Calculate the average rate of reaction in terms of seconds.**	
	$\text{Average rate} = -\frac{1}{2}\left[\frac{\Delta[N_2O_5]}{\Delta t}\right]$ $= -\frac{1}{2}\left[\frac{2.08-2.33}{100}\right] = 1.25\times10^{-3}\,mol\,L^{-1}\,min^{-1}$ $\text{Average rate} = \frac{1.25\times10^{-3}}{60} = 2.083\times10^{-5}\,mol\,L^{-1}\,s^{-1}$	**1** **1** **1**

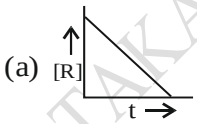
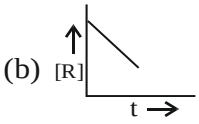
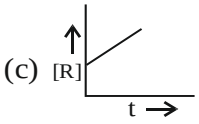
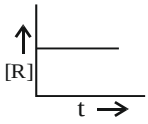
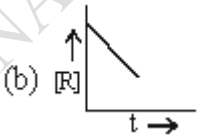
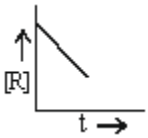
*********END*********

KARNATAKA STATE CHEMISTRY P U LECTURER'S FORUM

2025 II PU PREPARATORY EXAM – 1;

SCHEME OF EVALUATION

SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

	PART-A	
I.	**Select the correct option from the given choices:**	**15 × 1=15**
1)	Among the following organic compounds, the compound which contain chiral carbon is (a) 2-Chloropropane (b) 3-Chloropentane (c) 2-Chlorobutane (d) 2-Chloro-2-methylpropane	
Ans:	**(c) 2-Chlorobutane (or) (c) (or) 2-Chlorobutane**	**1**
2)	Cumene hydroperoxide on hydrolysis of dilute acids gives (a) phenol and oxygen (b) phenol and hydrogen (c) hydrogen and oxygen (d) phenol and acetone	
Ans:	**(d) phenol and acetone (or) (d) (or) phenol and acetone**	**1**
3)	The colour of p-Hydroxyazobenzene is _____ (a) Orange (b) yellow (c) silver mirror (d) blue	
Ans:	**(a) Orange (or) (a) (or) Orange**	**1**
4)	The order of reactivity of HX to break the C–O–C bond in ether is (a) HCl > HBr > HI (b) HBr > HCl > HI (c) HI > HBr > HCl (d) HI > HCl > HBr	
Ans:	**(c) HI > HBr > HCl (or) (c) (or) HI > HBr > HCl**	**1**
5)	The common name of ethanedioic acid is (a) Acetic acid (b) Oxalic acid (c) Adipic acid (d Succinic acid	
Ans:	**(b) Oxalic acid (or) (b) (or) Oxalic acid**	**1**
6)	The plot that represents the zero-order reaction is: (a)  (b)  (c)  (d) 	
Ans:	 **(or) (b) (or)** 	**1**
7)	The stable oxidation state shown by the element with atomic number 21 is (a) +3 (b) +4 (c) +5 (d) Both +3 and +4	
Ans:	**(a) +3 (or) (a) (or) +3**	**1**

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8)	The chemical formula of Hinsberg's reagent is (a) C_6H_6SOCl (b) $C_6H_5SOCl_2$ (c) $C_6H_5SO_2Cl$ (d) $C_6H_5SO_3H$	
Ans:	**(c)** $C_6H_5SO_2Cl$ **(or) (c) (or)** $C_6H_5SO_2Cl$	**1**
9)	Tollens' reagent is (a) Freshly prepared ammoniacal silver nitrate solution (b) Aqueous copper sulphate (c) Alkaline sodium potassium tartarate (d) Mixture of sodium carbonate, sodium citrate and Cu^{2+} complex	
Ans:	**(a) Freshly prepared ammoniacal silver nitrate solution (or) (a) (or) Freshly prepared ammoniacal silver nitrate solution**	**1**
10)	The actinoid which shows maximum oxidation (+7) state is (a) Ac (b) No (c) Np (d) U	
Ans:	**(c) Np (or) (c) (or) Np**	**1**
11)	The function of enzymes in the living system is to (a) catalyse biochemical reactions (b) provide energy (c) provide immunity (d) Transport oxygen	
Ans:	**(a) catalyse biochemical reactions (or) (a) (or) catalyse biochemical reactions**	**1**
12)	The ligand which forms more stable coordination complexes is (a) NH_3 (b) $C_2O_4^{2-}$ (c) CN^- (d) H_2O	
Ans:	**(b)** $C_2O_4^{2-}$ **(or) (b) (or)** $C_2O_4^{2-}$	**1**
13)	**Statement–I:** If on mixing the two liquids, the solution becomes hot, it implies that it shows negative deviation from Raoult's law. **Statement–II:** Solutions which show negative deviation are accompanied by decrease in volume. In the light of the above statements, choose the appropriate answer from the options given below: (a) Statement I is incorrect but Statement II is correct. (b) Both Statement I and Statement II are correct. (c) Both Statement I and Statement II are incorrect. (d) Statement I is correct but Statement II is incorrect.	
Ans:	**(b) Both Statement I and Statement II are correct (or) (b) (or) Both Statement I and Statement II are correct**	**1**

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14) Match the terms given in Column I with units given Column II.

Column I	Column II
(i) λ_m	(A) Scm^{-1}
(ii) E_{cell}	(B) cm^{-1}
(iii) κ	(C) Scm^2mol^{-1}
(iv) G^*	(D) V

(a) i-C, ii-D, iii-B, iv-A (b) i-C, ii-D, iii-A, iv-B

(c) i-D, ii-A, iii-C, iv-B (d) i-B, ii-D, iii-A, iv-C

Ans: **(b) i-C, ii-D, iii-A, iv-B (or) (b) (or) i-C, ii-D, iii-A, iv-B** **1**

15) A student took two glasses of pure water from a water filter. He cools glass–A in a fridge and warms the other glass – B on a stove. On comparing the solubility of oxygen in H_2O in glass–A and glass–B, he states that glass- 'A' contains

(a) more oxygen than glass–B. (b) less oxygen than glass–B.

(c) same amount of oxygen as in glass–B. (d) zero concentration of oxygen.

Ans: **(a) more oxygen than glass–B (or) (a) (or) more oxygen than glass–B** **1**

II. Fill in the blanks by choosing the appropriate word from those given in the brackets: [freons, two, wood, Nucleotides, Cellulose acetate, zero] **5×1=5**

16) Oxidation State of 'Ni' in $[Ni(CO)_4]$ is _____.

Ans: **zero** **1**

17) Nucleic acids are the long chain polymers of _____.

Ans: **Nucleotides** **1**

18) CH_3OH is also known as _____ spirit.

Ans: **wood** **1**

19) The unreactive, non-toxic and easily liquefiable halogen containing organic gas is _____.

Ans: **freons** **1**

20) The semipermeable membrane generally used in the reverse osmosis is made up of _____.

Ans: **Cellulose acetate** **1**

PART - B

III. Answer any three of the following. Each question carries 2 marks. **3 × 2 = 6**

21) Show that half-life of first order reaction is independent on initial concentration of reactant.

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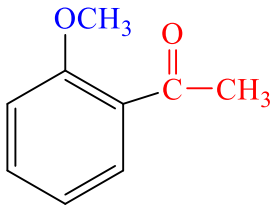
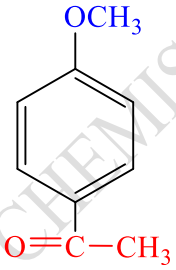
Ans:	For the first order reaction, $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ At, $t = t_{\frac{1}{2}}$, then $R = \frac{[R]_0}{2}$ So, the above equation becomes $k = \frac{2.303}{t_{\frac{1}{2}}} \log \frac{[R]_0}{\frac{[R]_0}{2}}$ (or) $k = \frac{2.303}{t_{\frac{1}{2}}} \log 2$ $k = \frac{2.303}{t_{\frac{1}{2}}} \times 0.301 = \frac{0.693}{t_{\frac{1}{2}}}$ $t_{\frac{1}{2}} = \frac{0.693}{k}$	1 1
22)	**Write the products formed when anisole reacts with ethanoyl chloride in the presence of anhydrous $AlCl_3$ catalyst.**	
Ans:	 **and**  **(or)** 2-methoxy-acetophenone **and** 4-methoxy-acetophenone	1+1
23)	**Give the three-letter symbol of α-amino acid which is** **(i) Optically inactive. (ii) First obtained from cheese.**	
Ans:	(i) Gly (ii) Tyr	1+1
24)	**Explain Swartz reaction with a chemical equation.**	
Ans:	When alkyl chloride/bromide heated in presence of metallic fluorides like AgF gives alkyl fluoride. The reaction is known as Swarts reaction. $H_3C—Br + AgF \longrightarrow H_3C—F + AgBr$ **(or)** $H_3C—Br + AgF \longrightarrow H_3C—F + AgBr$ **bromomethane** **fluoromethane**	1 1 **(or)** 2

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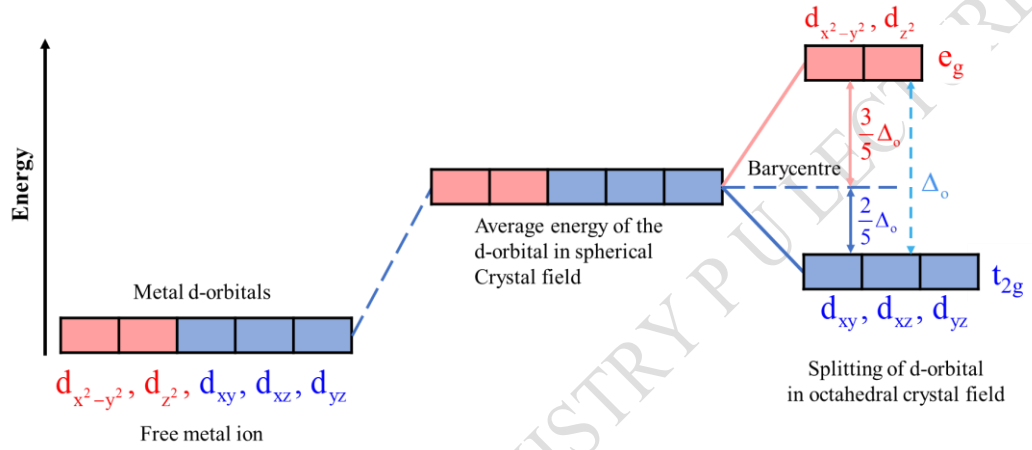
25)	**What is the composition of Mischmetall? Write one use of it.**	
Ans:	Lanthanoid metal (~ 95%) and iron (~ 5%) and traces of S, C, Ca and Al. Mischmetall is used in Mg-based alloy to produce bullets, shell and lighter flint. **(Any one)**	**1** **1**
	PART - C	
IV.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
26)	**What is crystal field splitting? Draw energy level diagram of crystal field splitting in octahedral complex.**	
Ans:	Splitting of the degenerate levels of d-orbitals due to the presence of ligands in a definite geometry is termed as crystal field splitting.	**1**
		**2**
27)	**Write the balanced chemical equations involved in the preparation of potassium dichromate from chromite ore.**	
Ans:	**Step-1:** **4** $FeCr_2O_4$ + **8** Na_2CO_3 + **7** O_2 → **8** Na_2CrO_4 + **2** Fe_2O_3 + **8** CO_2 **Step-2:** **2** Na_2CrO_4 + **2** H^+ → $Na_2Cr_2O_7$ + **2** Na^+ + H_2O **(or)** **2** Na_2CrO_4 + H_2SO_4 → $Na_2Cr_2O_7$ + Na_2SO_4 + H_2O **Step-3:** $Na_2Cr_2O_7$ + **2** KCl → $K_2Cr_2O_7$ + **2** NaCl **(1 mark for each step)** [Note: $FeCr_2O_4$ can also be written as $FeO.Cr_2O_3$]	**1** **1** **1**
28)	**Define coordination number of complex compounds. Mention the coordination number and IUPAC name of the complex** $\left[Pt(NH_3)_2Cl_2\right]$**.**	
Ans:	The number of ligand donor atoms are directly bonded to central metal atom/ion in a complex. Coordination number: 4 IUPAC Name: diamminedichloridoplatinum(II)	**1** **1** **1**

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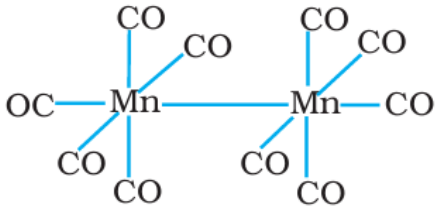
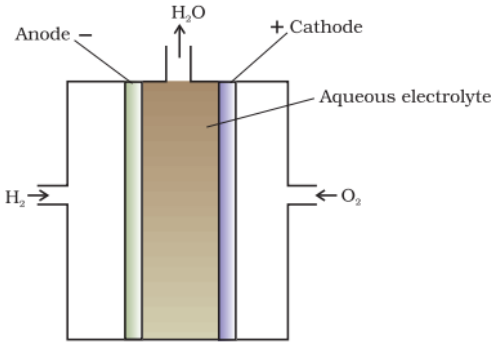
29) **(i)** **(ii)** **(iii)**	**Considering the elements of 3d transition series, write the element which is** **Unable to form a monoxide.** **Having positive $E^0_{(M^{2+}/M)}$ value.** **A base element of Ziegler Catalyst used to manufacture polythene.**	
Ans: **(i)** **(ii)** **(iii)**	Scandium (or) Sc Copper (or) Cu Titanium (or) Ti	**1** **1** **1**
30)	**How many square pyramidal units present in decacarbonyldimanganese(0)? Write its molecular and structural formulae.**	
Ans:	Two Formula: $[Mn_2(CO)_{10}]$  	**1** **1** **1**
V	**Answer any two of the folowing. Each question carries 3 marks:**	**2 × 3 = 6**
31)	**Mention three factors that affect the rate of a chemical reaction.**	
Ans:	Concentration of reactants Pressure Temperature Catalyst **(Any three) (1 mark for each)**	**3**
32)	**Write a neat labelled diagram of H_2-O_2 Fuel cell and express its cathodic and anodic reactions.**	
Ans:	 Cathod: $O_2(g) + 2H_2O(l) + e^- \longrightarrow 4OH^-(aq)$ Anode: $2H_2(g) + 4OH^-(aq) \longrightarrow 4H_2O + 4e^-$	**1** **1** **1**

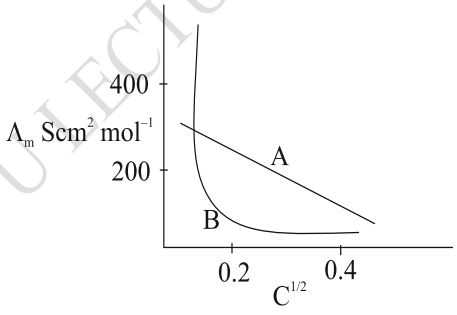
33) **Give any three differences between ideal and non-ideal solutions.**

Ans:

	Ideal-solutions	Non-ideal solutions
1	They Obey Raoult's law at all temperature and pressure.	They do not obey Raoult's law.
2	$\Delta H_{mix} = 0$.	$\Delta H_{mix} \neq 0$
3	$\Delta V_{mix} = 0$.	$\Delta V_{mix} \neq 0$.
4	$P_{total} = P_A^0 \chi_A + P_B^0 \chi_B$	$P_{total} \neq P_A^0 \chi_A + P_B^0 \chi_B$
5	Intermolecular attractive forces between A-A, B-B and A-B are same.	Intermolecular attractive forces between A-A, B-B and A-B are not same.

(Any three) (1 mark for each) **3**

34) **The curves obtained when molar conductivity Λ_m (y-axis) is plotted against the square root of concentration $C^{1/2}$ (x-axis) for two electrolytes A and B are shown in the given figure. Among 'A' and 'B', which is strong electrolyte? Give an example for strong electrolyte.**



Ans:

'A' is the strong electrolyte. **2**

Example: HCl, NaCl, KCl and etc., **1**

PART - D

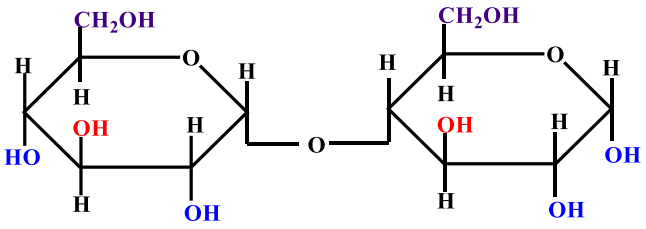
VI. **Answer any four of the following. Each question carries 5 marks.** **4 × 5 = 20**

35) (a) **What are reducing sugars? Write the Haworth structure of Maltose.**

(b) **Name the hormone released rapidly due to rise in blood glucose level to keep the blood glucose level within the narrow limit. Mention the number of amino acids present in this hormone.**

Ans:

(a) carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars. **1**



2

(b) Insulin **1**

51 amino acids **1**

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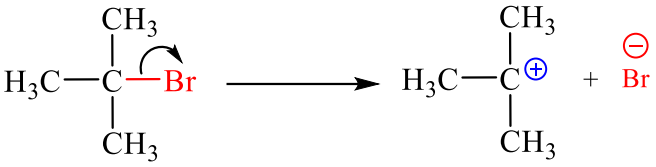
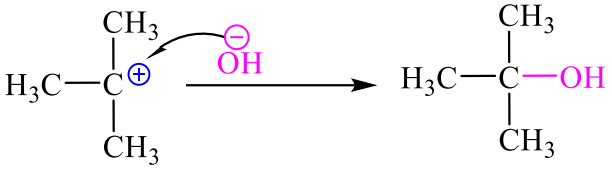
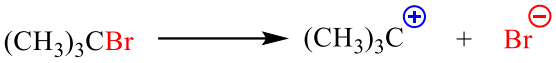
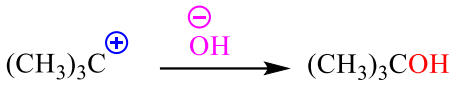
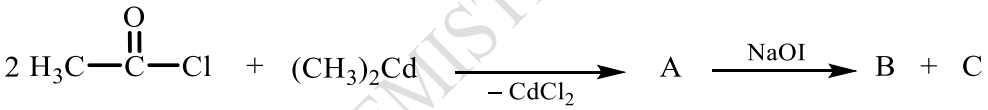
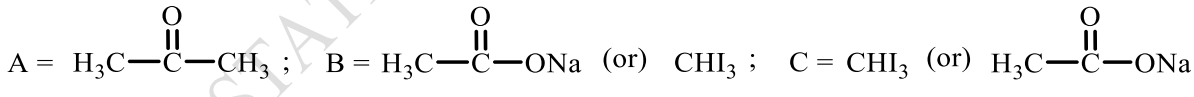
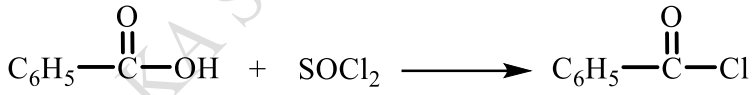
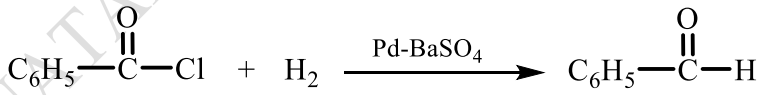
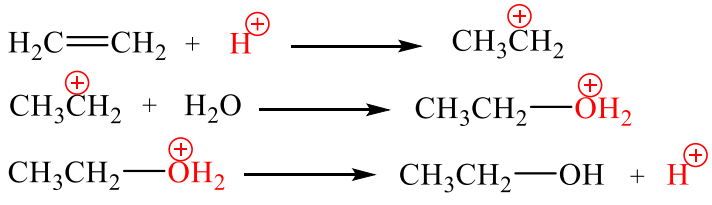
36) (a) **(b)**	**Write the steps involved in the S_N1 mechanism of conversion of 2-bromo-2-methylpropane to 2-methylpropan-2-ol. Which type of solvent favours this mechanism?** **What is meant by racemic modification? "They are optically inactive". Give reason.**	
Ans: (a)	  **(or)**  	**1** **1** **(or)** **1** **1**
(b)	Protic polar solvent. Equimolar mixture of ***d*** and ***l*** isomer of same compound is known as racemic modification. Because the rotation due to one isomer will be cancelled by the rotation due to the other isomer.	**1** **1** **1**
37) (a) **(b)**	**Identify the compounds 'A', 'B' and 'C' in the following reaction.**  **An organic compound 'P' ($C_7H_6O_2$) reacts with thionyl chloride gives product 'Q'. 'Q' on the further undergoes hydrogenation in the presence of Pd-$BaSO_4$ forms compound 'R'. Write the equations involved in the chemical reactions.**	
Ans: (a)		**1+1+1**
(b)	 	**1** **1**
38) (a) **(b)**	**Write the three equations involved in the mechanism of acid catalyzed hydration of C_2H_4 to C_2H_5OH.** **Explain Reimer-Tiemann reaction with a chemical equation.**	**(3+2)**
Ans: (a)		**1** **1** **1**

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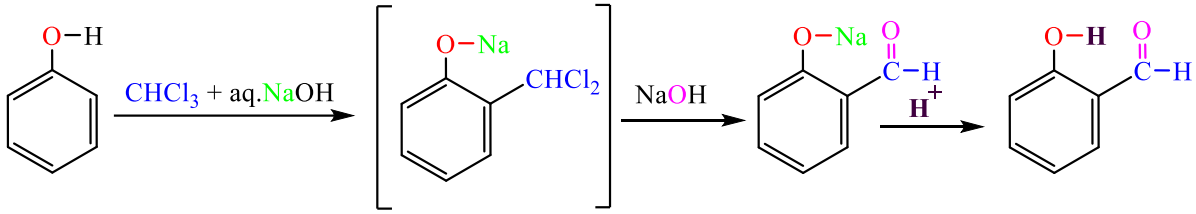
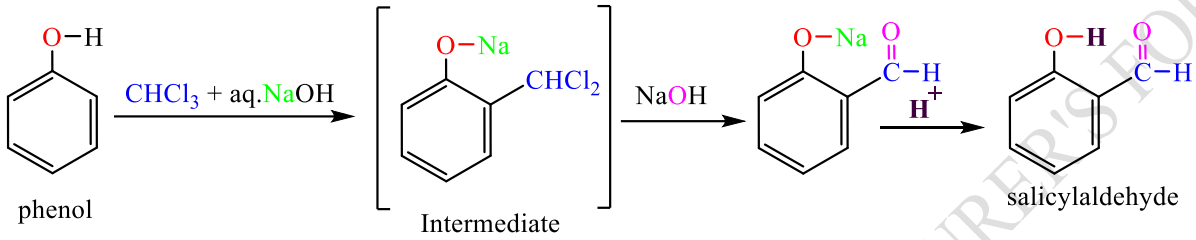
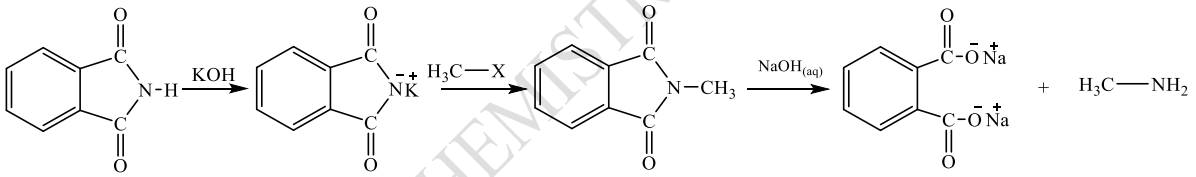
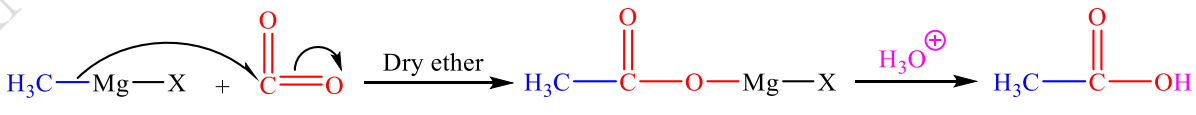
(b)	When phenol is treated with chloroform in the presence of sodium hydroxide, followed by acidification, we get salicylaldehyde (o-hydroxybenzaldehyde). This reaction is known as ***Reimer - Tiemann reaction***.  **(or)**  phenol Intermediate salicylaldehyde	**1** **1** **(or)** **2**
39 (a) **(b)**	**Write the chemical equations involved in Gabriel phthalimide synthesis for the preparation of methylamine.** **Name any one biologically active amino compound used in the following:** **(i) to increase blood pressure (containing secondary amino group)** **(ii) as an anaesthetic in dentistry (a synthetic amino compound)**	
Ans: (a) (b)	 (i) adrenaline (or) ephedrine (ii) Novocain	**3** **1** **1**
40) (a) **(b)**	**Explain the preparation of acetic acid from Grignard reagent. Give chemical equation.** **Explain Clemmensen reduction with general chemical reaction.**	
Ans: (a)	The reaction of CO_2 (dry ice) with Grignard's reagents followed by hydrolysis gives carboxylic acid. 	**1** **2**

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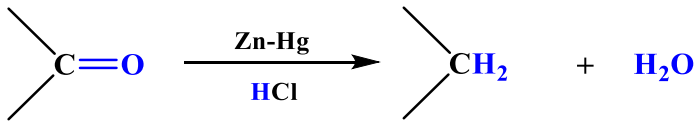
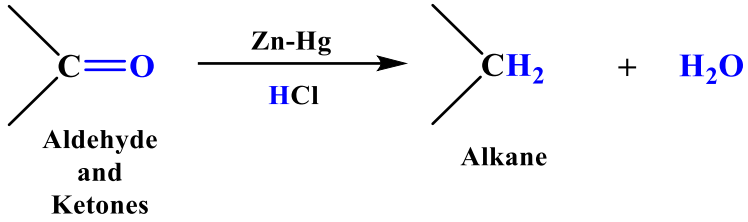
(b)	The carbonyl group of aldehydes and ketones is reduced to $>CH_2$ group on treatment with zinc amalgam and conc. HCl. This reaction is called Clemmensen reduction.  **(or)**  	**1** **1** **(or)** **2**
	PART – E (PROBLEMS)	
VII.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
41)	**The boiling point of benzene is 353.23 K. When 1.80g of a non-volatile solute was dissolved in 90 gram of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b for benzene is 2.53 KKg/mol.**	
Ans:	$\Delta T_b = \frac{K_b \times w_2 \times 1000}{w_1 \times M_2}$ (or) $M_2 = \frac{K_b \times w_2 \times 1000}{w_1 \times \Delta T_b}$ $= \frac{2.53 \times 1.80 \times 1000}{90 \times 0.88}$ $= 57.5 g/mol$ (or) $57.5 gmol^{-1}$	**1** **1** **1**
42)	**The rate constants of a reaction at 500K and 700K are $0.02s^{-1}$ and $0.08s^{-1}$ respectively. Calculate the values of energy of activation.**	
Ans:	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\log \frac{0.08}{0.02} = \frac{E_a}{2.303 \times 8.314}\left[\frac{700 - 500}{700 \times 500}\right]$ (or) $E_a = \frac{2.303 \times 8.314 \times 0.6021 \times 700 \times 500}{200}$ E_a = 20174 J (or) E_a=20.174 kJ (or) E_a=20.174 kJ/mol	**1** **1** **1**
43)	**Calculate the electromotive force (emf) of the cell. Assume the cell reaction at 25^0 C with the reaction:** $Cu_{(s)} + 2Ag^+_{(1\times10^{-3}M)} \longrightarrow Cu^{2+}_{(0.250M)} + 2Ag_{(s)}$. **$E^0_{cell}$ = 2.97 V**	

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Ans:

$$E_{cell} = E^{o}_{cell} - \frac{0\cdot0591}{n}\log Q$$ **1**

$$Q = \frac{\left[Cu^{2+}\right]}{\left[Ag^{+}\right]^2} = \frac{0.250}{\left(1\times10^{-3}\right)^2} = 2.5\times10^{5}$$

$$E_{cell} = 2.97 - \frac{0\cdot0591}{2}\log\left(2.5\times10^{5}\right)$$ **1**

$$E_{cell} = 2.97 - \frac{0\cdot0591}{2}\times5.3979$$

$$E_{cell} = 2.97 - 0.1595 = 2.8\,V$$ **1**

44)

The C-14 content of an ancient piece of wood was found to have $\frac{3}{10}^{th}$ of that of living tree. Calculate the age of that piece of wood. [Given that; Half-life of C-14 = 5730 years, log 3 = 0.4771, log 7 = 0.8540].

Ans:

$$k = \frac{0.693}{t_{1/2}}$$

$$k = \frac{0.693}{5730}\,year\,s^{-1}$$

$$t = \frac{2.303}{k}\log\frac{[R]_0}{[R]}$$ 1

$$t = \frac{2.303\times5730}{0.693}\log\left(\frac{10}{3}\right)$$

$$t = 19042\left(\log10 - \log3\right)$$ 1

$$t = 19042\left(1 - 0.4771\right)$$

$$t = 9957\ years$$

1

45)

The molar conductivity of 0.025 molL^{-1} methanoic acid is 46.1 Scm^{2}mol^{-1} Calculate dissociation constant of methanoic acid. Given λ^0 (H^+) =349.6 Scm^{2}mol^{-1} and λ^0 ($HCOO^-$) = 54.6 Scm^{2}mol^{-1}.

Ans:

$$\Lambda^0_m(HCOOH) = \lambda^0\left(H^+\right) + \lambda^0\left(HCOO^-\right)$$
$$= 3.496 + 54.6$$
$$= 404.2\,S\,cm^2\,mol^{-1}$$ **1**

$$\alpha = \frac{\Lambda_m}{\Lambda^0_m} = \frac{46.1}{404.2} = 0.114$$ **1**

$$K = \frac{c\alpha^2}{(1-\alpha)} = \frac{(0.025)(0.114)^2}{(1-0.114)} = 3.67\times10^{-4}\,mol\,L^{-1}$$ **1**

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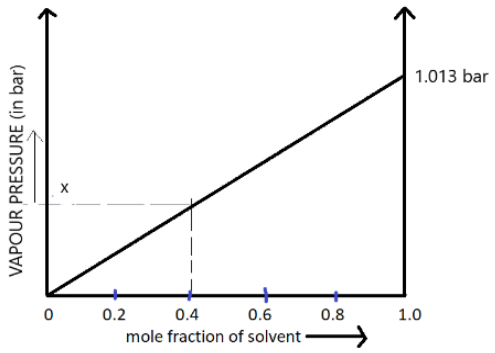
46)	**If a solution obeys Raoult's law for all concentrations, its vapour pressure would vary linearly from zero to the vapour pressure of pure solvent as shown in graph. Calculate the value of 'x'.** 	
Ans:	$p_1 = \chi_1 p_1^0$ In the graph; $p_1^0 = 0.013\,bar$ $\chi_1 = 0.4$ $\therefore p_1 = 0.4 \times 1.013$ $p_1 = 0.4052\,bar$	**1** **1** **1**
	PART - F **(For visually challenged students only)**	
34)	**Give an example of inert electrode. Write the representation and half- cell reaction for bromine electrode.**	
	Platinum or gold $Pt(s)\,|\,Br_2(aq)\,|\,Br^-(aq)$ $\frac{1}{2}Br_2(aq) + e^- \rightarrow Br^-(aq)$	**1** **1** **1**
46)	**The vapour pressure of compound 'A' and compound 'B' at 25^0 C are 90 mm Hg and 15 mm Hg respectively. If 'A' and 'B' are mixed each other such that mole fraction of 'A' in the solution is 0.6. Calculate the mole fraction of 'B' in vapour phase.**	
	Total pressure of mixture $= P_{Total} = \chi_A \times P_A^o + \chi_B \times P_B^o = 90 \times 0.6 + 15 \times 0.4 = 60\,mm$ Mole fraction of B in vapour phase, $(\chi_B') = \frac{\chi_B' \times P_B^o}{P_{Total}}$ $\therefore \chi_B' = \frac{0.4 \times 15}{60} = 0.1 = 1 \times 10^{-1}$	**1** **1** **1**

*********END*********

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2026 II PU PREPARATORY EXAM –2

SCHEME OF EVALUATION

SUBJECT: 34-CHEMISTRY **MAX. MARKS: 70**

	PART-A	
I.	**Select the correct option from the given choices:**	**15 × 1=15**
1)	Among the following cells, the cell used in the apollo space program for providing electric power is (a) SHE (b) H_2-O_2 fuel cell (c) Daniel cell (d) Mercury cell	
Ans:	**(b) H_2-O_2 fuel cell (or) (b) (or) H_2-O_2 fuel cell**	**1**
2)	Which of the following elements is liquid at room temperature? (a) Zinc (b) Mercury (c) Aluminium (d) Water	
Ans:	**(b) Mercury (or) (b) (or) Mercury**	**1**
3)	According to IUPAC nomenclature, the suffix used for naming open-chain aldehydes is (a) -ol (b) –one (c) -al (d) -oic acid	
Ans:	**(c) -al (or) (c) (or) -al**	**1**
4)	The mixture which shows positive deviation from Raoult's Law is (a) n-hexane and n-heptane (b) Bromoethane and chloroethane (c) Ethanol and Acetone (d) Chloroform and Acetone	
Ans:	**(c) Ethanol and Acetone (or) (c) (or) Ethanol and Acetone**	**1**
5)	Which of the following groups when present at para position increases the basic strength of aniline? (a) $-NO_2$ (b) -Br (c) $-NH_2$ (d) –COOH	
Ans:	**(c) $-NH_2$ (or) (c) (or) $-NH_2$**	**1**
6)	The correct name of the reaction $R-X + NaI \xrightarrow{\text{Dry acetone}} R-I + NaX$ is (a) Finkelstein reaction (b) Wurtz reaction (c) Swarts reaction (d) Friedel–Crafts reaction	
Ans:	**(a) Finkelstein reaction (or) (a) (or) Finkelstein reaction**	**1**
7)	The van't Hoff factor i for a compound which undergoes dissociation in one solvent (ethanoic acid in water) and association in other solvent (ethanoic acid in benzene) is respectively (a) Greater than one and greater than one (b) Less than one and greater than one (c) Less than one and less than one (d) Greater than one and less than one	
Ans:	**(d) Greater than one and less than one (or) (d) (or) Greater than one and less than one**	**1**
8)	Number of carbon atom/s does formaldehyde has (a) 0 (b) 1 (c) 2 (d) 3	

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Ans:	**(b) 1 (or) (b) (or) 1**	**1**
9)	Phenol is approximately how much times acidic than ethanol? (a) 10 (b) 1000 (c) 100000 (d) 1000000	
Ans:	**(d) 1000000 (or) (d) (or) 1000000**	**1**
10)	$\left[Mn(CN)_6\right]^{3-}$ and $\left[FeF_6\right]^{3-}$ are (a) Inner orbital and outer orbital complexes respectively. (b) Both inner orbital complexes. (c) Outer orbital and inner orbital complexes respectively. (d) Both outer orbital complexes.	
Ans:	**(a) Inner orbital and outer orbital complexes respectively (or) (a) (or) Inner orbital and outer orbital complexes respectively**	**1**
11)	Chlorine containing antibiotic, produced by microorganisms which is very effective for the treatment of typhoid fever is (a) Chloramphenicol (b) Thyroxine (c) Chloroquine (d) Halothane.	
Ans:	**(a) Chloramphenicol (or) (a) (or) Chloramphenicol**	**1**
12)	In black and white photography, the developed film is fixed by washing with hypo solution which dissolves the undecomposed AgBr to form a complex ion, the formed complex ion is: (a) $\left[Ag(S_2O_3)_2\right]^{3-}$ (b) $\left[Ag(SO_4)_2\right]^{3-}$ (c) $\left[Ag(S_2O_8)_2\right]^{3-}$ (d) $\left[Ag(S_2O_4)_2\right]^{3-}$	
Ans:	**(a)** $\left[Ag(S_2O_3)_2\right]^{3-}$ **(or) (a) (or)** $\left[Ag(S_2O_3)_2\right]^{3-}$	**1**
13)	For the reaction $2A + 3B + \frac{1}{2}C \longrightarrow P$, the correct rate of the reaction is (a) $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$ (b) $\frac{-d[A]}{dt}=\frac{-3}{2}\frac{d[B]}{dt}=\frac{-1}{4}\frac{d[C]}{dt}$ (c) $\frac{+d[A]}{dt}=\frac{+3}{2}\frac{d[B]}{dt}=\frac{+1}{2}\frac{d[C]}{dt}$ (d) $\frac{+d[A]}{dt}=\frac{+2}{3}\frac{d[B]}{dt}=+4\frac{d[C]}{dt}$	
Ans:	**(a)** $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$ **(or) (a) (or)** $\frac{-d[A]}{dt}=\frac{-2}{3}\frac{d[B]}{dt}=-4\frac{d[C]}{dt}$	**1**
14)	**Statement-I:** In benzylic alcohols, the –OH groups is attached to sp^3 carbon atom next to aromatic ring. **Statement-II:** In vinylic alcohols, the –OH group is bonded to a carbon atom of carbon–carbon double bond. In the light of the above statements, choose the appropriate answer from the options given below: (a) Both Statement I and Statement II are correct. (b) Statement I is incorrect but Statement II is correct. (c) Both Statement I and Statement II are incorrect. (d) Statement I is correct but Statement II is incorrect.	

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Ans:	**(a) Both Statement I and Statement II are correct. (or) (a) Both Statement I and Statement II are correct.**	**1**
15)	Match the following LIST-I: (i) Phosphodiester Linkage; (ii) Glycosidic Linkage; (iii) Peptide Linkage LIST-II: (A) Amino Acids; (B) Nucleotides; (C) Monosaccharides; (D) Phenols (a) i – C, ii – D, iii – B (b) i – C, ii – A, iii – B (c) i – B, ii – C, iii – D (d) i – B, ii – C, iii – A	
Ans:	**(d) i – B, ii – C, iii – A (or) (d) (or) i – B, ii – C, iii – A**	**1**
II.	**Fill in the blanks by choosing the appropriate word from those given in the brackets: [saturated solution, 2-Methylaniline, three, reducing, tin, zinc]**	**5×1=5**
16)	The number of hydroxyl groups present in glycerol is _____	
Ans:	**three**	**1**
17)	Brass is an alloy of copper and _____.	
Ans:	**zinc**	**1**
18)	The IUPAC name of o-Toluidine is _____	
Ans:	**2-Methylaniline**	**1**
19)	A solution in which no more solute can be dissolved at the same temperature and pressure is called_____ **.**	
Ans:	**saturated solution**	**1**
20)	The carbohydrates which reduce Fehling's solution and Tollens' reagent are called as _____ sugars.	
Ans:	**reducing**	**1**

PART - B

III.	**Answer any three of the following. Each question carries 2 marks.**	**3 × 2 = 6**
21)	**Write any two differences between order and molecularity of a reaction.**	

Ans:

Order of a reaction	**Molecularity of a reaction**
The sum of the powers concentration terms of reactants in the experimentally determined rate equation.	It is the number of reacting species involved in elementary or simplest reaction.
It is experimentally determined.	It is theoretically calculated.
It can be zero and even a fraction.	It cannot be zero or a non-integer.
Order is applicable to elementary as well as complex reactions	Molecularity is applicable only for elementary reactions.
For complex reaction, order is given by the slowest step.	Molecularity of the slowest step is same as the order of the overall reaction.

(Any two, 1 mark each) **2**

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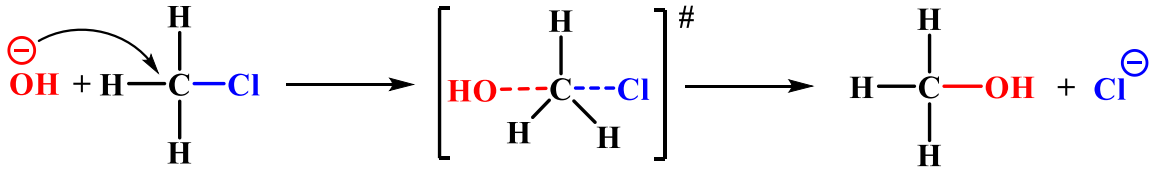
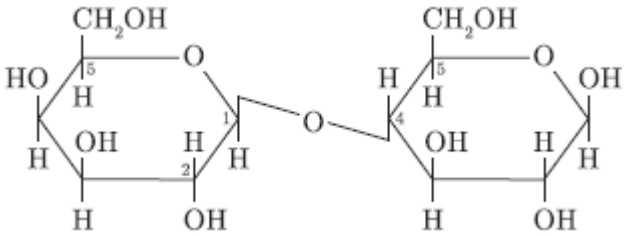
22)	**Transition elements forms colour compounds. Give two reasons.**	
Ans:	1. Due to the presence of unpaired electrons. 2. Due to *d-d* electronic transition.	**1+1**
23)	**Write the S_N2 mechanism for conversion of chloromethane to methanol.**	
Ans:		**2**
24)	**Name the enzyme involved in fermentation of glucose into ethanol and write its chemical equation.**	
Ans:	Zymase $C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2CH_3CH_2OH + CO_2$	**1** **1**
25)	**Shown structure is the sugar in the milk:**  **i) Name the sugar.** **ii) Name the hydrolytic products of the sugar.**	
Ans:	Lactose β-D-Galactose and β-D-Glucose	**1** **1**
	PART - C	
IV.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
26)	**Calculate the magnetic moment of Ti^{3+}. [Given: Atomic number of Ti is 22]**	
Ans:	Electronic configuration of Ti is [Ar] $3d^2\ 4s^2$  In Ti^{3+} :  $\therefore n = 1$ $\mu = \sqrt{n(n+2)}$ BM $= \sqrt{1(1+2)} = \sqrt{3}$ BM	**1** **1** **1**
27)	**Using Valence Bond Theory [VBT] explain geometry, hybridisation and magnetic property of $[CoF_6]^{3-}$ ion. [Given: Atomic mass of cobalt is 27]**	

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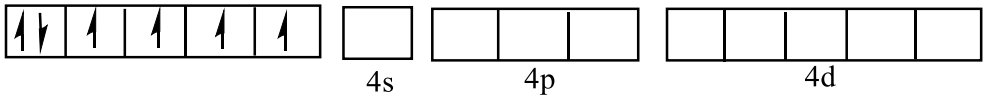
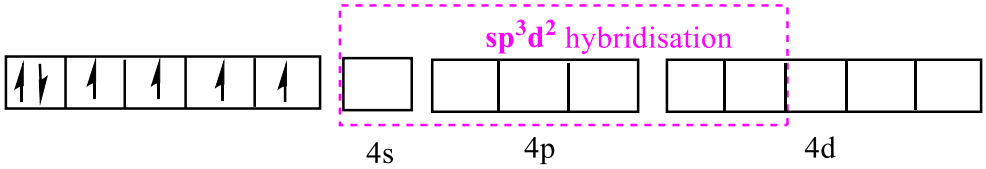
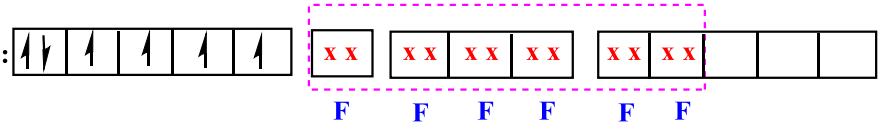
Ans: **Electronic configuration of Co^{3+}:** $[Ar]\ 3d^6\ 4s^0$



Since F^- is weak field ligand therefore electrons pairing not takes place.



$[CoF_6]^{3-}$:



Hybridisation: sp^3d^2.

Magnetic property: Paramagnetic.

Geometry: Octahedral.

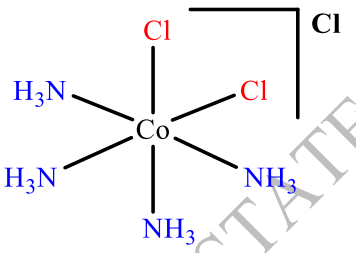
Geometry: one-mark, Magnetic property: one mark; Explanation: one mark

28) Write the formula of the three different types of compounds formed when lanthanoids reacts with carbon or heated with carbon?

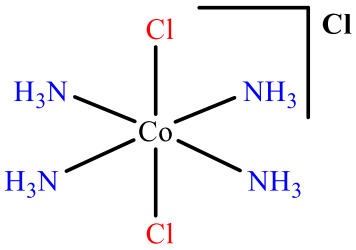
Ans: Ln_3C, Ln_2C_3 and LnC_2 — **1+1+1**

29) On treating $CoCl_3.4NH_3$ with excess of $AgNO_3$ solution, 1 mole of AgCl is formed. Formulate the complex and write its geometrical isomers.

Ans $[Co(NH_3)_4Cl_2]Cl$ — **1**



cis

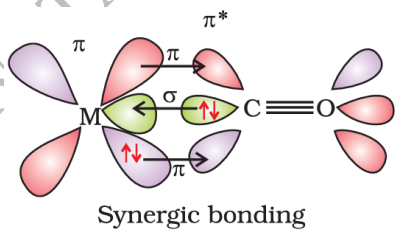


trans

1+1

30) With the help of structure, explain synergic effect in metal carbonyls?

Ans:



Synergic bonding

- The M–C σ bond is formed by the donation of lone pair of electrons on the carbonyl carbon into a vacant orbital of the metal. — **1**
- The M–C π bond is formed by the donation of a pair of electrons from a filled d orbital of metal into the vacant antibonding π^* orbital of carbon monoxide. — **1**
- The metal to ligand bonding creates a synergic effect. — **1**

V Answer any two of the folowing. Each question carries 3 marks: — **2 × 3 = 6**

31) What is collision Frequency? According to collision theory give any two criteria for effective collision.

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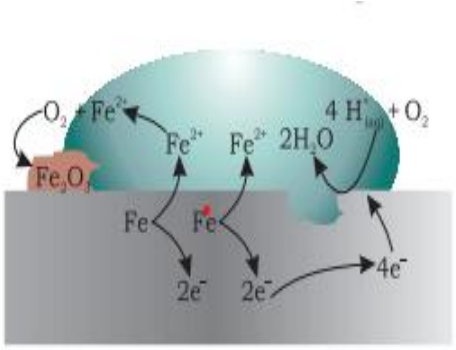
Ans:	The number of collisions per second per unit volume of the reaction mixture is known as collision frequency. Activation energy and proper orientation.	**1** **1+1**
32)	**What are electrochemical cells? Name the two types of cells.**	
Ans:	Electrochemical cells are devices that convert chemical energy into electrical energy or vice versa through redox (reduction-oxidation) reactions. 1. Galvanic (voltaic) cells 2. Electrolytic cells	**1** **1** **1**
33)	**State Henry's law. Write its mathematical statement and one of its applications.**	
Ans:	The partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas (x) in the solution. $p = K_H x$ Applications: 1. To increase the solubility of CO_2 in soda water and soft drinks, the bottle is sealed under high pressure. 2. To avoid the toxic effects of high concentration of nitrogen in the blood, the tanks used by scuba divers are filled with air diluted with helium (11.7% helium, 56.2% nitrogen and 32.1% oxygen). 3. At high altitudes, low blood oxygen causes climbers to become weak and make them unable to think clearly, which are symptoms of a condition known as anoxia. **(Any One application)**	**1** **1** **1**
34)	**The diagram shows that when iron is exposed to atmospheric air,** **(i) Name the phenomenon involved in this diagram.** **(ii) Write the atmospheric oxidation reaction of iron.** **(iii) Mention any one method to avoid this phenomenon.**	
Ans:	(i) Corrosion (ii) $2Fe^{2+}(aq) + 2H_2O(l) + \frac{1}{2}O_2(g) \longrightarrow Fe_2O_3(s) + 4H^+(aq)$ (iii) 1. By Painting. 2. By Applying Grease or Oil 3. By Galvanization 4. By Tin Plating and Chromium Plating 5. Sacrificial Coatings 6. By Alloying **(Any one, 1 mark)**	**1** **1** **1**

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PART - D

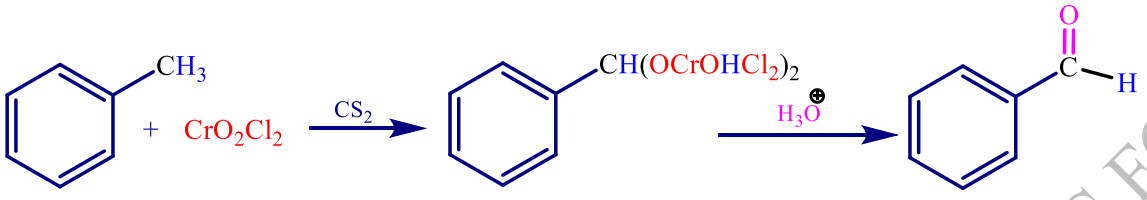
VI. **Answer any four of the following. Each question carries 5 marks.** **4 × 5 = 20**

35) (a) **Write the reaction for the conversion of toluene to benzaldehyde using chromyl chloride. Name the reaction.**

(b) **Explain Hell-Volhard–Zelinsky reaction with a general chemical equation.**

Ans:

(a)



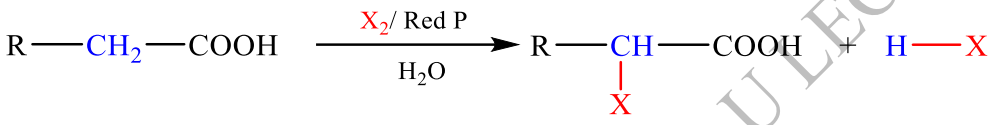
2

Etard reaction

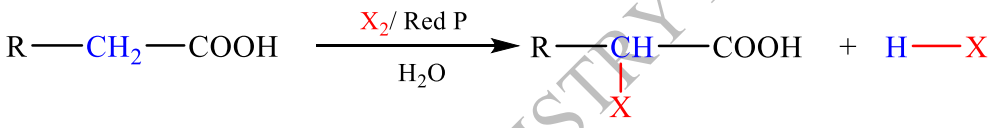
1

(b) Carboxylic acids having an α-hydrogen are halogenated at the α -position on treatment with halogen in the presence red phosphorus to give α-halocarboxylic acids. This reaction is known as Hell-Volhard Zelinsky reaction.

1



(or) **(or)**



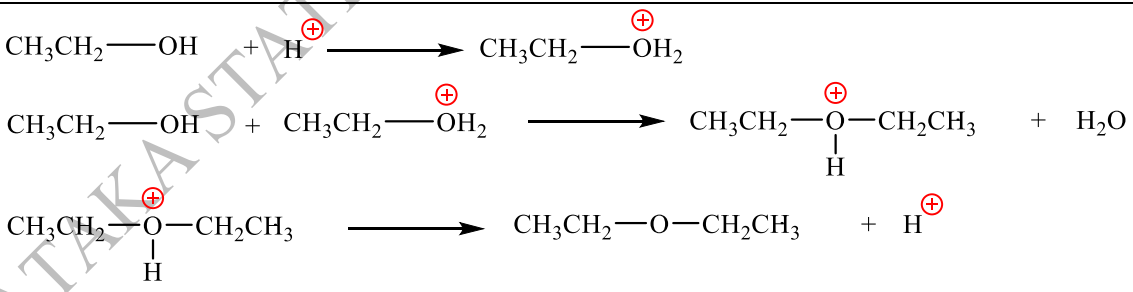
2

Carboxylic acid α-halo carboxylic acid

36) (a) **Write the three steps involved in the acid catalysed dehydration of ethanol to ethoxy ethane at 413 K.** **(3+2)**

(b) **Explain Kolbe's reaction with a chemical equation.**

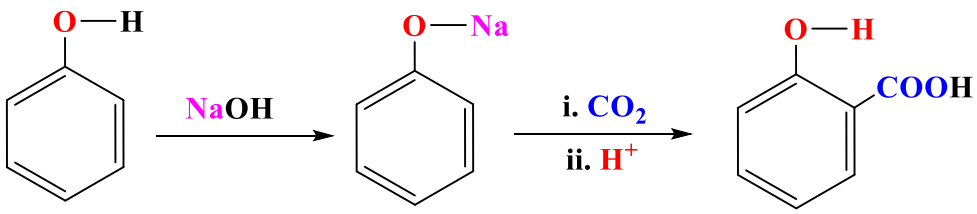
Ans: (a)



3

(b) When phenol is treated with sodium hydroxide, we get sodium phenoxide, which on treating with carbon dioxide followed by acidification, we get Salicylic acid. This reaction is called ***Kolbe's reaction***.

1



1

(or)

(or)

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	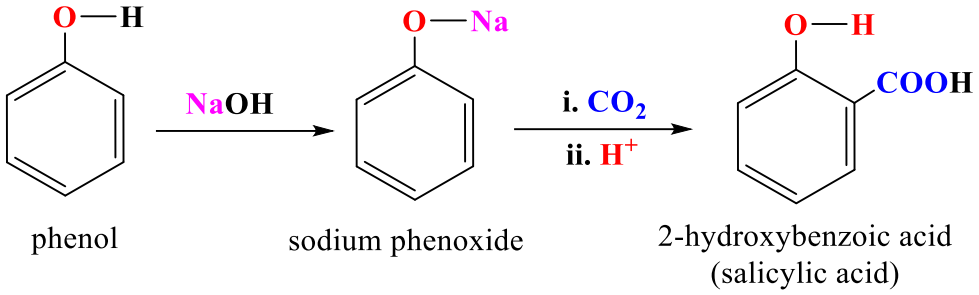 phenol sodium phenoxide 2-hydroxybenzoic acid (salicylic acid)	**2**
37) (a)	**Haloarenes are least reactive towards nucleophilic substitution reactions. Mention three reasons.**	
(b)	**Write the structures of different dihalogen derivatives of ethane.**	
Ans: (a)	(i) Partial double bond character between **C—X**. (ii) **X** is bonded to sp^2 hybridized carbon atom. (iii) Instability of phenyl carbocation.	**1** **1** **1**
(b)	$CH_3—CHX_2$ **and** $CH_2(X)—CH_2(X)$	**1+1**
38) (a)	**Explain Carbylamine reaction by taking methanamine as an amine. Write the chemical equation.**	
(b)	**Complete the following reaction:** $C_6H_5N_2Cl \xrightarrow[(ii)\,NaNO_2/Cu,\,\Delta]{(i)\,HBF_4} _____ + _____ + N_2$	
(c)	**Write the IUPAC name of** $CH_3CH_2CH_2NH_2$**.**	
Ans: (a)	Methanamine on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamines. This reaction is known as carbylamine reaction. $H_3C—NH_2 + CHCl_3 + 3\,KOH \xrightarrow{Heat} H_3C—NC + 3\,KCl + 3\,H_2O$ **(or)** $H_3C—NH_2 + CHCl_3 + 3\,KOH \xrightarrow{Heat} H_3C—NC + 3\,KCl + 3\,H_2O$ methanamine Chloroform methyl isocyanide	**1** **1** **(or)** **2**
(b)	$C_6H_5N_2BF_4$ (or) $C_6H_5\overset{+}{N}_2B\overset{-}{F}_4$ and $C_6H_5NO_2$ (or) HBF_4	**1+1**
(c)	Propan-1-amine	**1**
39 (a)	**Explain the preparation Glycylalanine (Gly-Ala) with equation.**	
(b)	**What are the symptoms of hypothyroidism? How hypothyroidism is controlled?**	
(c)	**Name the vitamin deficiency of which leads to convulsions.**	

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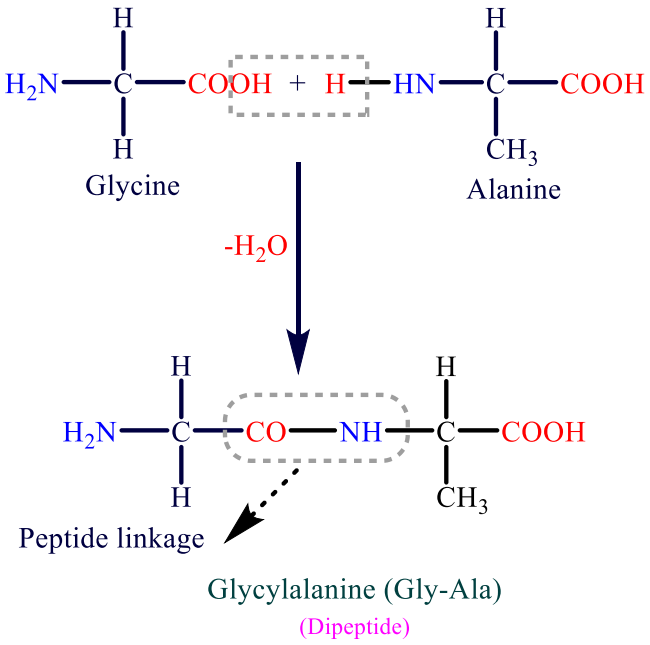
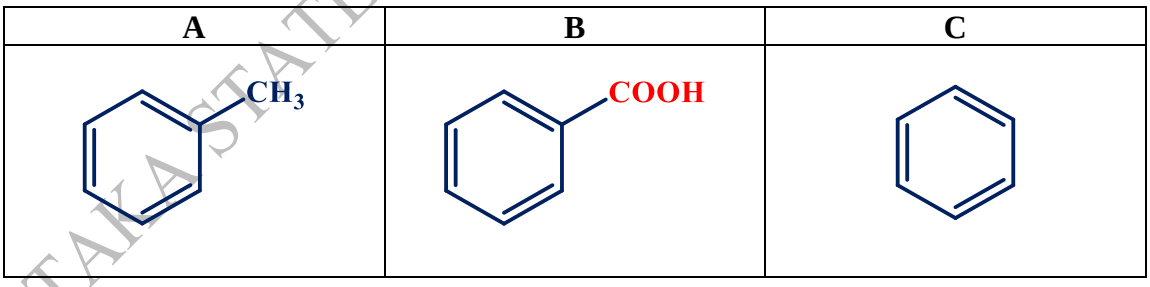
Ans: (a)		**2**
(b)	Lethargyness **(or)** obesity	**1**
	It is controlled by adding sodium iodide to commercial table salt ("Iodised" salt)	**1**
(c)	Vitamin B_6	**1**
40)	**The compound "A" has molecular formula C_7H_8 is heated with alkaline $KMnO_4$ followed by acidification gives compound "B" of the molecular formula $C_7H_6O_2$. This compound "B" turns blue litmus to red. The sodium salt of compound "B" is heated with reagent "X" gives hydrocarbon "C" of molecular mass 78 $gmol^{-1}$.** **(i) Write the structure of compounds "A", "B" and "C".** **(ii) Identify "X" and mention its role in the reaction.**	**(3+2)**
Ans: (a)		**1+1+1**
(b)	X = Soda lime (NaOH + CaO)	**1**
	The role of reagent **X** (soda lime) is to cause the decarboxylation **(or)** **decarboxylating agent.**	**1**
	PART – E (PROBLEMS)	
VII.	**Answer any three of the following. Each question carries 3 marks.**	**3 × 3 = 9**
41)	**The boiling point of benzene is 353.23 K. When 1.80g of a non-volatile solute was dissolved in 90 gram of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. [Given: K_b = 2.53 K Kg mol^{-1}].**	

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Ans:	$\Delta T_b = \frac{K_b \times w_2 \times 1000}{w_1 \times M_2}$ (or) $M_2 = \frac{K_b \times 1000 \times w_2}{\Delta T_b \times w_1}$	**1**
	$= \frac{2.53 \times 1000 \times 1.80}{0.88 \times 90}$	**1**
	$= 57.5\,g\,mol^{-1}$	**1**
42)	**A first order reaction is found to have a rate constant, $k = 5.5 \times 10^{-14}\ s^{-1}$. Find the half-life of the reaction.**	
Ans:	$t_{1/2} = \frac{0.693}{k}$	**1**
	$= \frac{0.693}{5.5 \times 10^{-14}}$	**1**
	$t_{1/2} = 1.26 \times 10^{13}\ s$	**1**
43)	**The cell in which the reaction occurs** $2Fe^{3+}_{(aq)} + 2I^-_{(aq)} \rightleftharpoons 2Fe^{2+}_{(aq)} + I_{2(s)}$; $E^o_{cell} = 0.236\,V$ at $298\,K$. **Calculate the value of log K_c (K_c = equilibrium constant) of the cell reaction.**	
Ans:	$E^o_{Cell} = \frac{0.0591}{n} \times \log K_c$ (or) $\log K_c = \frac{E^o_{Cell} \times n}{0.0591}$	**1**
	$= \frac{0.236 \times 2}{0.0591}$	**1**
	$\log K_c = 7.986$	**1**
44)	**A column containing 0.05 M NaOH has an area of cross section 0.785 cm^2 and length of 1m shows a resistance of $1.11 \times 10^4\ \Omega$. Calculate the molar conductivity of the solution.**	
Ans:	$\text{Conductivity} = \kappa = \frac{1}{\rho} = \frac{1}{87.135} = 0.0114\,Sm^{-1}$	**1**
	$\Lambda_m = \kappa \times \frac{1000}{C}$	**1**
	$\Lambda_m = 0.0114 \times \frac{1000}{0.05}$	
	$\Lambda_m = 228\ Sm^2mol^{-1}$	**1**
45)	**Calculate the mole fraction of the solute in aqueous solution containing 3.0 g of urea (molar mass = 60 g mol^{-1}) per 250 g of water.**	
Ans:	$\text{Moles of urea} = \frac{3.0}{60} = 0.05\,mol$ $\text{Moles of water} = \frac{250}{18} = 13.89\,mol$	
	$\text{Mole fraction of solute} = \frac{\text{Moles of solute}}{\text{Moles of solute} + \text{Moles of solvent}}$	**1**

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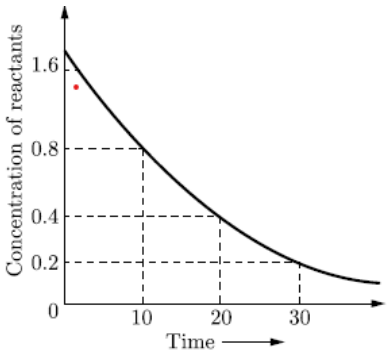
	Mole fraction of urea $= \frac{0.05}{0.05+13.89}$ Mole fraction of urea $= 0.0036$	1 1
46)	**Analyse the given graph, drawn between concentration of reactant in molL^{-1} v/s time in minute, calculate the average rate of the reaction between 10 to 20 minutes in terms of seconds.**  	
Ans:	Avarage rate $= -\frac{d[R]}{dt} = -\frac{0.4-0.8}{20-10} = 0.04\,molL^{-1}\,min^{-1}$ $= 4\times10^{-2}\,molL^{-1}\,min^{-1}$ $= \frac{0.04}{60}\,molL^{-1}s^{-1}$ $= 0.00066\,molL^{-1}s^{-1}$ **(or)** $= 6.6\times10^{-4}\,molL^{-1}s^{-1}$	1 1 1
	PART-F **(For visually challenged students only)**	
34)	**Define the term corrosion. Suggest two methods to prevent corrosion of metal.**	
	Corrosion is the gradual destruction of metals by chemical or electrochemical reaction with their environment. 1. By Painting. 2. By Applying Grease or Oil 3. By Galvanization 4. By Tin Plating and Chromium Plating 5. Sacrificial Coatings 6. By Alloying **(Any one, 2 mark)**	1 2
46)	**At 318 K, for the reaction $2N_2O_{5\,(g)} \longrightarrow 4NO_{(g)} + O_{2\,(g)}$ in CCl_4, the initial concentration of N_2O_5 is $2.33\,mol\,L^{-1}$ in reduced to $2.08\,mol\,L^{-1}$ in 100 minutes. Calculate the average rate of reaction in terms of seconds.**	
	Avarage rate $= \frac{1}{2}\left(-\frac{\Delta[N_2O_5]}{\Delta t}\right) = -\frac{1}{2}\left(\frac{2.08-2.33}{100}\right)$ $= 1.25\times10^{-3}$ $= \frac{1.25\times10^{-3}}{60} = 0.020\times10^{-3}\,molL^{-1}s^{-1}$ (or) $= 2.0\times10^{-5}\,molL^{-1}s^{-1}$	1 1 1

*********END*********

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