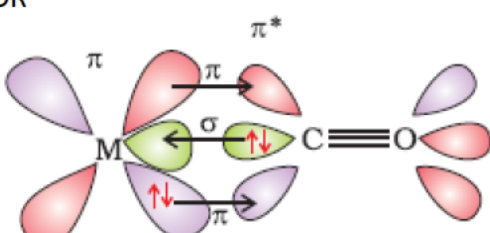


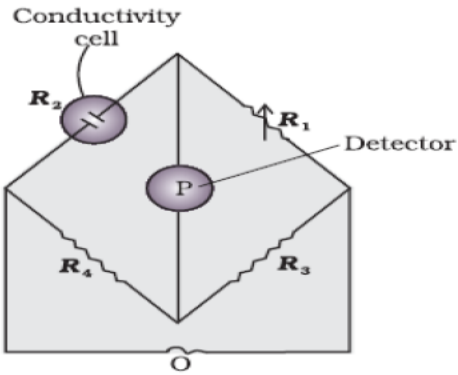
SECOND YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION

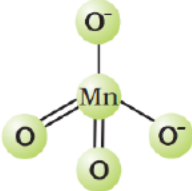
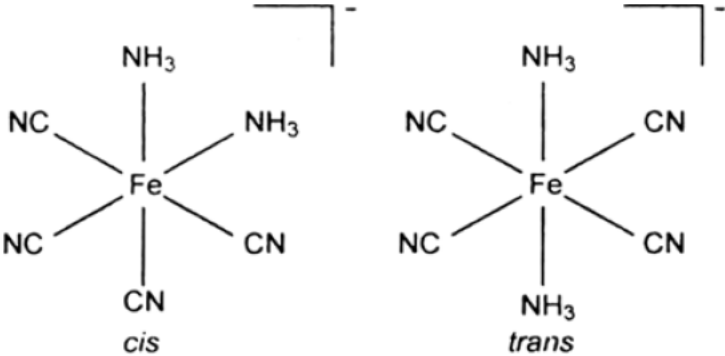
DECEMBER 2024 – ANSWER KEY

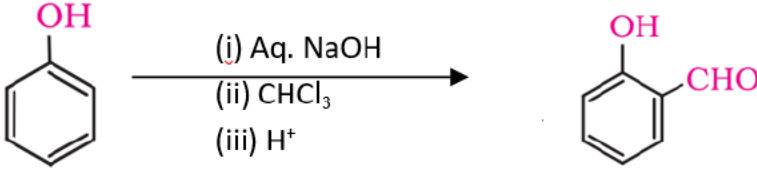
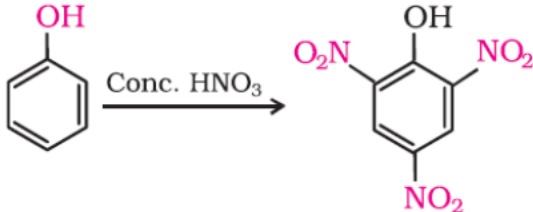
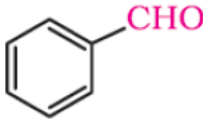
SUBJECT: CHEMISTRY

Qn. Code: SY 225

Qn. No.	Sub Qns	Answer Key/Value Points	Score	Total
Answer any 4 questions from 1 to 5. Each carry 1 score				
1.		Mischmetall	1	1
2.		CH ₂ Cl ₂ /CHCl ₃ /CHI ₃ /Freon/CCl ₄ /DDT/Any other correct example	1	1
3.		6	1	1
4.		Conc. HCl and anhydrous ZnCl ₂	1	1
5.		(b) CH ₃ CH ₂ COOH	1	1
Answer any 8 questions from 6 to 15. Each carry 2 scores				
6		Anode reaction: $H_{2(g)} + 2OH^{-}_{(aq)} \longrightarrow 2H_2O(l) + 2e^{-}$ Cathode reaction: $O_{2(g)} + 2H_2O(l) + 4e^{-} \longrightarrow 4OH^{-}_{(aq)}$	1 1	2
7.		Pseudo order reactions are reactions which appears to follow higher order, but actually follows lower order (first order) kinetics. E.g. Hydrolysis of ester/inversion of cane sugar/Any hydrolysis reaction	1 1	2
8.	(a) (b)	[Cr(NH ₃) ₅ ONO]Cl ₂ $ \begin{array}{c} \text{H}_2\text{C} \text{ --- } \text{N} \begin{cases} \text{CH}_2\text{COO}^- \\ \text{CH}_2\text{COO}^- \end{cases} \\ \\ \text{H}_2\text{C} \text{ --- } \text{N} \begin{cases} \text{CH}_2\text{COO}^- \\ \text{CH}_2\text{COO}^- \end{cases} \end{array} $ (Structure of EDTA)	1 1	2
9.		In metal carbonyls, the metal-carbon bonds possess both σ and π character. 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. 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 anti-bonding π^* orbital of carbon monoxide. This creates a synergic effect which strengthens the bond between CO and the metal. OR 	2	2

10.	<p>When chloroform is exposed to air and sunlight, it gets oxidised to form phosgene. OR, by the oxidation of chloroform.</p> $2\text{CHCl}_3 + \text{O}_2 \xrightarrow{\text{light}} 2\text{COCl}_2 + \text{HCl}$	1 1	2
11.	<p>This is because KCN is mainly ionic and gives CN^- ions in solution, which is an ambident nucleophile. Here both C and N are free to donate electron pairs, but C – C bond is stronger than C – N bond. So cyanides are formed as the major product. But AgCN is mainly covalent and only N is free to donate an electron pair. So isocyanides are the main product. OR, due to the ionic character of KCN and covalent character of AgCN.</p>	1 1	2
12.	<p>This is due to the presence of inter molecular hydrogen bonding in phenols.</p>	2	2
13.	<p>Alkyl halide reacts with sodium alkoxide to form ether. This reaction is called Williamson's ether synthesis.</p> $\text{R-X} + \text{R-ONa} \longrightarrow \text{R-O-R} + \text{NaX}$ <p>OR, Any other example</p>	1 1	2
14.	$2 \text{HCHO} \xrightarrow{\text{Conc. NaOH}} \text{CH}_3\text{-OH} + \text{H-COOK}$ <p>methanal methanol potassium methanoate</p> <p>Name of the reaction is Cannizzaro reaction.</p>	1 1	2
15.	<p>(b) $\text{CH}_2\text{Cl-COOH}$ Because of the electron withdrawing inductive effect of chlorine, the carboxylate ion formed from chloroacetic acid ($\text{CH}_2\text{Cl-COOH}$) is more stabilized. So the release of H^+ becomes easier. OR, Due to the -I effect of chlorine, the electron density on O-H bond in -COOH group decreases. OR, due to the greater stability of conjugate base formed from chloroacetic acid.</p>	1 1	2
Answer any 8 questions from 16 to 26. Each carries 3 scores			
16.	<p>To determine the resistance of an electrolytic solution, a Wheatstone bridge is used. It consists of two resistances R_3 and R_4, a variable resistance R_1 and the conductivity cell having the unknown resistance R_2. It is connected to an AC source (O) and a suitable detector (P).</p>  <p>The bridge is balanced, when no current passes through the detector. Under this condition, $\frac{R_2}{R_1} = \frac{R_4}{R_3}$ Therefore, the unknown resistance, $R_2 = \frac{R_1 R_4}{R_3}$</p>	1 1	3

17.	(a)	<p>$K_2Cr_2O_7$ in acidic medium oxidises:</p> <ul style="list-style-type: none"> • Ferrous ion to ferric ion. • Sulphide to sulphur. • Tin(II) to tin(IV). • Iodide to iodine. <p>Or, any other oxidation reaction. [Any one reaction is required]</p>	1	
	(b)	<p>$6Fe^{2+} + Cr_2O_7^{2-} + 14H^+ \longrightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$</p> <p>$6I^- + Cr_2O_7^{2-} + 14H^+ \longrightarrow 3I_2 + 2Cr^{3+} + 7H_2O$</p> <p>$3S^{2-} + Cr_2O_7^{2-} + 14H^+ \longrightarrow 3S + 2Cr^{3+} + 7H_2O$</p> <p>$3Sn^{2+} + Cr_2O_7^{2-} + 14H^+ \longrightarrow 3Sn^{4+} + 2Cr^{3+} + 7H_2O$</p> <p>Or, any other oxidation reaction [Any one reaction is required]</p>	1	3
	(c)	<p>Structure of manganate ion (MnO_4^{2-}):</p> 	1	
18.			2 x 1½	3
19.	(a) (b) (c)	<p>[Ni(CO)₄]</p> <p>$K_2[Zn(OH)_4]$</p> <p>$[Co(NH_3)_4(H_2O)Cl]Cl_2$</p>	1 1 1	3
20.		<p>The important postulates of Werner's theory are:</p> <ol style="list-style-type: none"> 1) Every metal has two types of valencies – primary (1^0) valency and secondary (2^0) valency. Primary valency is ionisable, while secondary valency is non-ionisable. 2) Primary valency is denoted by dotted lines, while secondary valency is denoted by solid lines. 3) Primary valency gives the oxidation state of the metal, while secondary valency gives the co-ordination number of the metal. 4) Primary valency is always satisfied by –ve ions, while secondary valency may be satisfied by –ve ions or neutral molecules. 5) Every metal has a fixed number of secondary valencies. In order to satisfy this requirement, some negative ions may act as primary and secondary valencies simultaneously. 	3 x 1 = 3	3

		<p>6) The primary valencies are non-directional, while the secondary valencies are directional.</p> <p>7) Since secondary valencies are directional, co-ordination compounds have a definite geometry and they show isomerism. [Any 3 required]</p>		
21.	(a)	<p>Organometallic compounds are compounds in which carbon atom of an organic compound is directly bonded to metal atom.</p> <p>E.g. Grignard reagent (RMgX)/tetraethyl lead [(C₂H₅)₄Pb]/trimethyl aluminium [(CH₃)₃Al] OR, any other example.</p>	1	3
	(b)	<p>(i) Chiral</p> <p>(ii) Achiral</p>	1/2 1/2	
22.	(a)	<p>The stereo isomers related to each other as non-super imposable mirror images are called enantiomers.</p>	1	3
	(b)	<p>Ambident nucleophiles are nucleophiles containing more than one donor atoms or nucleophilic centre.</p> <p>E.g. CN⁻ OR NO₂⁻</p>	1 1	
23.	(a)	<p>Reimer-Tiemann Reaction: When phenol is treated with chloroform in the presence of sodium hydroxide, followed by acidification, we get salicylaldehyde.</p> <p>OR,</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Phenol Salicylaldehyde</p>	2	3
	(b)	<p>By nitration of phenol using conc. HNO₃ or nitrating mixture.</p> <p>OR,</p> <div style="text-align: center;">  </div>	1	
24.	(a)	<p>(i) Prop-2-en-1-al OR, Prop-2-enal</p> <p>(ii) 3-Bromobenzoic acid OR, 3-Bromobenzenecarboxylic acid</p>	1 1	3
	(b)	<p>Methanoic acid (Formic acid) is used in rubber, textile, dyeing, leather and electroplating industries. [Any one use required]</p>	1	
25.	(a)	<p>CH₃-CH(OH)-CN OR, 2-Hydroxypropanenitrile</p>	1	3
	(b)	<p>CH₃-COOH OR, Ethanoic acid OR, Acetic acid</p>	1	
	(c)	<div style="text-align: center;">  </div> <p>Benzaldehyde</p>	1	

26.	(a)	<p>Aldol Condensation Reaction: Aldehydes and ketones having at least one α-hydrogen atom when heated with dilute alkali, we get α,β-unsaturated aldehyde or ketone.</p> <p>OR, $2\text{CH}_3\text{-CHO} \xrightarrow[\text{(ii) } \Delta]{\text{(i) dil. NaOH}}$ $\text{CH}_3\text{-CH=CH-CHO}$ Ethanal But-2-enal</p>	2	3
	(b)	<p>Clemmensen Reduction: Aldehydes and ketones can be reduced to hydrocarbon by treating with Zinc amalgam and conc. HCl.</p> <p>OR,</p> $\begin{array}{c} \diagup \\ \text{C}=\text{O} \\ \diagdown \end{array} \xrightarrow[\text{HCl}]{\text{Zn-Hg}} \begin{array}{c} \diagup \\ \text{CH}_2 \\ \diagdown \end{array} + \text{H}_2\text{O}$ <p>OR, $\text{CH}_3\text{-CHO} + [\text{H}] \xrightarrow{\text{Zn/Hg}} \text{CH}_3\text{-CH}_3$ Acetaldehyde Ethane</p>	1	
Answer any 4 questions from 27 to 31. Each carry 4 scores				
27.	(a)	<p>Here mass of NaOH = 5g Molar mass of NaOH = 40 g mol^{-1} No. of moles of NaOH = $\frac{\text{Mass of NaOH}}{\text{Molar mass of NaOH}} = \frac{5}{40} = 0.125 \text{ mol}$ Volume of solution = 450 mL = 0.45L Molarity (M) = $\frac{\text{No. of moles of solute (NaOH)}}{\text{Volume of solution in litre}} = \frac{0.125}{0.45} = \underline{\underline{0.28 \text{ M}}}$</p>	1	4
	(b)	<p>Reverse osmosis If a pressure larger than osmotic pressure is applied to the solution side, then solvent molecules flows out of the solution through the semi permeable membrane. This phenomenon is called reverse osmosis.</p>	1 1 1	
28.	(a)	<p>The salt that keeps its identity only in solid state is called a double salt. In solution they dissociate into component ions. E.g.: Mohr's salt $[\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}]$, Carnalite $[\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}]$, Potash alum $[\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}]$ [Any one example required] The salt that keeps its identity both in solid state and in solution state is called a complex salt. E.g.: Potassium ferrocyanide $\{\text{K}_4[\text{Fe}(\text{CN})_6]\}$ $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$, $\text{K}_2[\text{PtCl}_4]$, $[\text{Ni}(\text{CO})_4]$ etc. [Any one example required]</p>	2	4
	(b)	<p>Applications of co-ordination compounds are:</p> <ol style="list-style-type: none"> In qualitative and quantitative Analysis In water treatment In metallurgy Chlorophyll, Haemoglobin, Vitamin B₁₂ etc. are example for naturally occurring co-ordination compounds. Co-ordination compounds are used as catalysts for many industrial processes. In electroplating of silver and gold. Silver compounds are used in black and white photography. In Medicine. E.g, cis-platin is used for the treatment of cancer. [Any 2 required] 	2	
29.	(a)	<p>Zaitsev rule states that in dehydrohalogenation reactions, if there is possibility of formation of more than one alkene the preferred product is that alkene which contains greater number of alkyl groups attached to the C = C bond.</p>	2	

	(b)	<p>OR, more substituted alkene will be the major product in dehydrohalogenation reaction.</p> <p>OR, Explanation with correct example</p> <p>Increasing order of reactivity for S_N1 reaction: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br} < \text{CH}_3\text{CHBrCH}_2\text{CH}_3 < (\text{CH}_3)_3\text{CBr}$</p> <p>Increasing order of reactivity for S_N2 reaction: $(\text{CH}_3)_3\text{CBr} < \text{CH}_3\text{CHBrCH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$</p> <p>$S_N1$: $1^\circ < 2^\circ < 3^\circ$</p> <p>$S_N2$: $3^\circ < 2^\circ < 1^\circ$</p>	1	1	1/2	1/2	4
30.	(a)	<p>Kolbe's Reaction: When phenol is treated with sodium hydroxide, we get sodium phenoxide, which on treating with CO_2 followed by acidification, we get salicylic acid.</p> <div style="text-align: center;"> <p style="text-align: center;">2-Hydroxybenzoic acid (Salicylic acid)</p> </div>	2				4
	(b)	<p>Esterification: Alcohols and phenols react with carboxylic acids, acid chlorides and acid anhydrides to form esters. This reaction is known as esterification reaction.</p> $\text{R-OH} + \text{R'-COOH} \xrightarrow{\text{H}^+} \text{R-COOR'} + \text{H}_2\text{O}$ <p>Or, other suitable example.</p>	2				
31.	(a)	<p>Tollens' test: On warming aldehydes with Tollens' reagent (ammoniacal AgNO_3), a bright silver mirror is formed.</p> <p>Fehling's test: On heating with Fehling's reagent, aldehydes give a reddish brown precipitate of cuprous oxide (Cu_2O).</p> <p>Ketones do not give the above tests. [Any one test is required]</p>	2				4
	(b)	<p>(i) Etard reaction</p> <p>(ii) Stephen reaction</p>	1	1			

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