

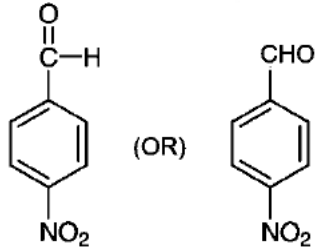
**SECOND YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION,
DECEMBER-2023**

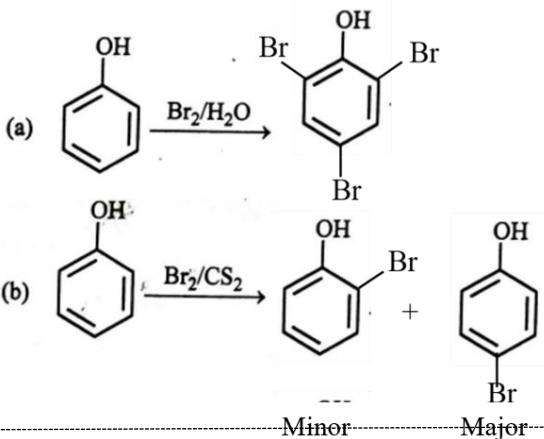
Prepared By:
ANOOP CHANDRAN S

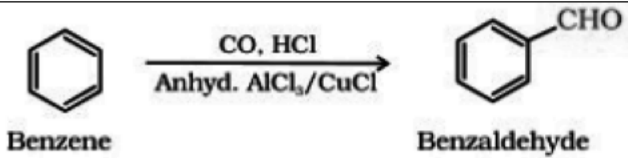
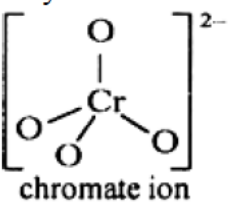
Part III
CHEMISTRY

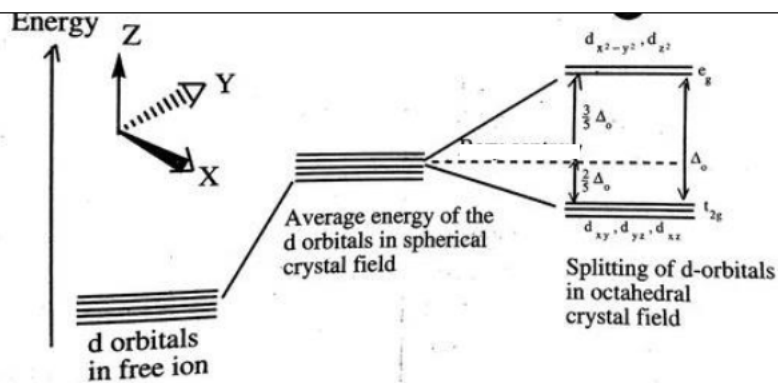
CODE : **SY25**

Answer Key with Solution

Qn No.	Sub. Qn.	Value points	Split Score	Total Score
		Answer Any 4 Questions from 1 to 5. Each carries 1 Score		
1		$(n - 1)d^{1-10} ns^{1-2}$		1
2		+3		1
3		PCl_5		1
4		$CH_3 - OH$		1
5				1
		Answer Any 8 Questions from 6 to 15. Each carries 2 Score		
6.	(a)	$Ca^{2+} + 2e \longrightarrow Ca$ (40g) The electricity to produce 40g of Ca = 2F The electricity to produce 20g of Ca = $\frac{2 \times 20}{40} = 1F$	1	
	(b)	$Al^{3+} + 3e \longrightarrow Al$ (27g) The electricity to produce 27g of Al = 3F The electricity to produce 54 g of Al = $\frac{3 \times 54}{27} = 6F$	1	2
7.		$\text{Half life} = \frac{0.693}{k}$ $= \frac{0.693}{5 \times 10^{-2}} = 13.86 \text{ sec.}$ <p align="right">(Equation only – 1 score)</p>		2
8.		<ul style="list-style-type: none"> In coordination compounds metals show two types of valencies-primary and secondary. The primary valences are normally ionisable and are satisfied by negative ions. 	$\frac{1}{2}$ $\frac{1}{2}$	

		<ul style="list-style-type: none"> The secondary valences are non ionisable. These are satisfied by neutral molecules or negative ions. The secondary valence is equal to the coordination number and is fixed for a metal. The ions/groups bound by the secondary linkages to the metal have characteristic spatial arrangements corresponding to different coordination numbers. <p>(Any FOUR)</p>	1/2 1/2	2
9.	(a) (b)	Potassium trioxalatoferrate(III) <i>Amineaquadichloridoplatinum (II)</i>	1 1	2
10.		Interaction between alkyl halide and water molecules is weaker than Hydrogen bonds in water / alkyl halides cannot form hydrogen bonds with water / attraction between alkyl halide molecule is stronger than attraction between alkyl halide and water. (Any Relevant point)		2
11.		X- CH ₃ CH ₂ Br and Y - CH ₃ CH ₂ OH Hint: CH ₂ = CH ₂ $\xrightarrow{\text{HBr}}$ CH ₃ - CH ₂ - Br $\xrightarrow{\text{NaOH}}$ CH ₃ - CH ₂ - OH		2
12.		Mechanism of dehydration of alcohols involves the formation of carbocation, which is the slowest step. Since the stability of carbocations thus formed follows the order 3° > 2° > 1°, the reactivity also follows the same order.		2
13.	(a) (b)	 <p>(a) Phenol $\xrightarrow{\text{Br}_2/\text{H}_2\text{O}}$ 2,4,6-tribromophenol</p> <p>(b) Phenol $\xrightarrow{\text{Br}_2/\text{CS}_2}$ 2-bromophenol (Minor) + 4-bromophenol (Major)</p>	1 1	2
14.		Benzene is treated with carbon monoxide and hydrogen chloride in the presence of anhydrous aluminum chloride to give benzaldehyde. OR Reaction		2

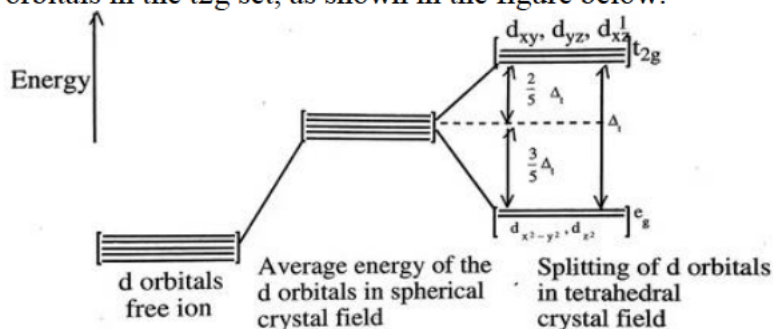
		 <p style="text-align: center;">Benzene → Benzaldehyde</p>		
15.		<p>Tollens Test / Fehling's Test (any one)</p> <p>Tollens Test : Propanal gives silver mirror test with Tollen's reagent. Propanone does not give this test.</p> <p>Fehling's Test : Propanal gives a reddish brown precipitate on reaction with Fehling's reagent (alkaline copper sulphate solution containing sodium potassium tartrate). Propanone does not give this test.</p> <p>(Name of Tests only - Give 1 score)</p>		2
Answer Any 8 Questions from 16 to 26. Each carries 3 Score				
16.	(a)	During corrosion, the surface of the metal gets coated with oxides or other salts of the metal.	1	
	(b)	<p>At Anode: Fe(s) undergoes oxidation to release electrons.</p> $\text{Fe}_{(s)} \rightarrow \text{Fe}^{2+}_{(aq)} + 2e^{-}$ <p>At Cathode : $\text{O}_{2(g)} + 4\text{H}^{+} + 4e^{-} \rightarrow 2\text{H}_2\text{O}_{(l)}$</p> <p>Net reaction : $\text{Fe}_{(s)} + 2\text{H}^{+}_{(aq)} + \frac{1}{2} \text{O}_{2(g)} \rightarrow \text{Fe}^{2+}_{(aq)} + \text{H}_2\text{O}$</p> <p>The ferrous ions are further oxidised by atmospheric oxygen to ferric ions which come out as rust in the form of hydrated ferric oxide ($\text{Fe}_2\text{O}_3 \cdot x \text{H}_2\text{O}$).</p> <p>(Any One Reaction - Give 1 Score)</p>	2	3
17.	(a)	chromite ore / FeCr_2O_4	1	
	(b)	Any One Correct Reaction {NCERT Page 232}	1	3
	(c)	 <p style="text-align: center;">chromate ion</p>	1	
18.		<p>Crystal Field Splitting in Octahedral Crystal Field</p> <p>There will be repulsion between electrons in the metal d orbitals and electrons of ligand. The repulsion becomes when the d orbital of metal is directed towards the ligand. Consequently $d_{x^2-y^2}$ and d_{z^2} which are in the axis experience more repulsion hence lower energy constitute the eg orbital set. d_{xy}, d_{xz}, d_{yz} will be of lower energy constituting the t_{2g} set of orbitals.</p>		3



1 ½

Crystal Field Splitting in Tetrahedral Crystal Field.

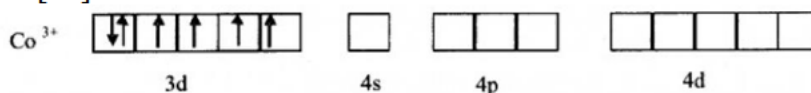
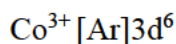
The tetrahedral crystal field splits these orbitals into the same t_{2g} and e_g sets of orbitals as does the octahedral crystal field. But the two orbitals in the e_g set are now lower in energy than the three orbitals in the t_{2g} set, as shown in the figure below.



1 ½

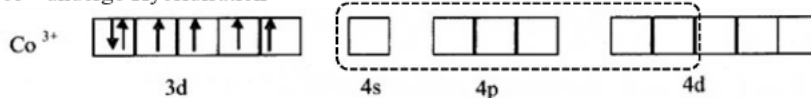
[Correct Labelled Diagram – 3 Score)

19.



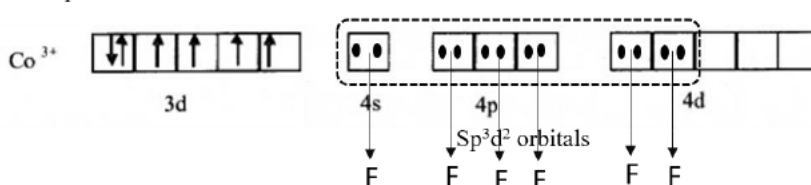
Since F is a weak ligand, no pairing takes place

Co^{3+} undergo Hybridisation



Sp^3d^2 orbitals

Complex Formation



Sp^3d^2 orbitals
F F F F F F

Geometry Octahedral

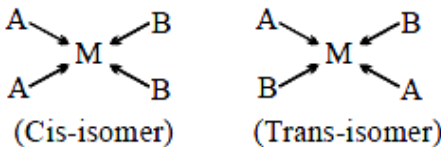
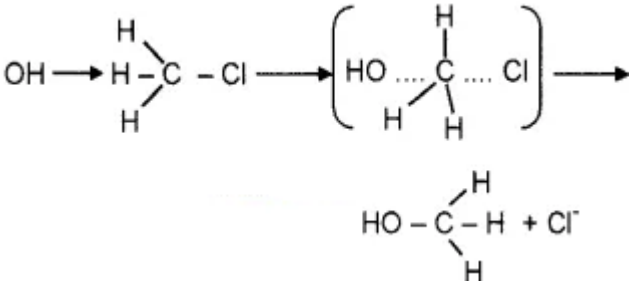
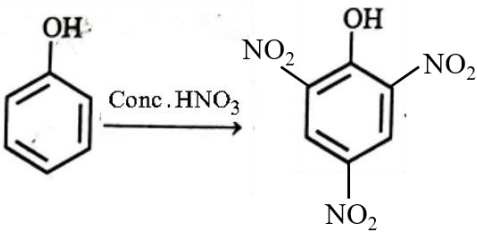
As there are 4 unpaired electron it is Paramagnetic.

3

20.

(a)

For geometrical isomerism, the relative position of unidentate ligands attached to central metal atom shall be unequal. In case of

	(b)	<p>tetrahedral complex, the positions of the unidentate ligands are identical with respect to each other and hence show optical isomerism and not geometric. / Relevant Answer</p>  <p>(Cis-isomer) (Trans-isomer)</p>	2 1	3
21.		<p>SN1 Reaction SN1 reactions are accompanied by racemisation. This is because, the incoming nucleophile can attack from either of the sides resulting in racemisation.</p> <p>SN2 Reaction SN2 Reaction is accompanied by inversion of configuration because incoming nucleophile attack the alkyl halide from a side opposite to that of the leaving group.</p>  <p>Inversion of Configuration</p>		3
22.	(a) (b)	<p>Greater inter molecular hydrogen bonding in alcohols.</p> 	1 2	3
23.		<p>Lucas Test When alcohols treated with Lucas Reagent (conc. HCl + anhydrous ZnCl₂),</p> <ul style="list-style-type: none"> • tertiary alcohols gives the turbidity due to the formation of alkyl chloride immediately. • Secondary alcohols react within 10 minutes to form a turbidity of alkyl chloride • primary alcohols do not react at room temperature. <p>OR Reactions. Name of Test Only – 1 score OR Any Relevant Test</p>	1 1 1	3

24.	(a)	<p>Aldol Condensation : Aldehydes and ketones having atleast one α-hydrogen condense in the presence of dilute alkali as catalyst to form β-hydroxy aldehydes (aldol) or β-hydroxy ketones (ketol). / Reaction</p> <p>Cannizaro Reaction : Aldehydes which do not have alpha hydrogen atom, on heating with concentrated alkali undergo self oxidation and reduction reaction or redox reaction. / Reaction</p>	2	
	(b)	<p>Cannizaro reaction is given by aldehydes which do not have an alpha hydrogen where as aldol condensation is given by aldehydes and ketones with atleast one alpha hydrogen. (OR)</p> <p>Cannizaro Reaction takes place in conc. Alkali, where as aldol condensation takes place in dilute alkali (OR)</p> <p>Cannizaro reaction is a disproportionation reaction, where as aldol condensation is an addition reaction</p> <p>(Any One point is Sufficient)</p>	1	
25.	(a)	<p>CH_2ClCOOH</p>	1	
	(b)	<p>Due to the -I effect (electron withdrawing of chlorine atom, the stability of chloroacetate ion is more than that of acetate ion.</p>	1	
	(c)	<p>Hell-Volhard-Zelinsky reaction / HVZ Reaction</p> $\text{CH}_3\text{COOH} \xrightarrow{\text{Cl}_2 / \text{red}} \text{ClCH}_2 - \text{COOH}$	1	3
26.	(a)	<p>Pd – BaSO₄</p>	1	
	(b)	<p style="text-align: center;">Toluene Benzaldehyde</p>	1	
	(c)	<p>CH_3CHO</p>	1	3
27.	(a)	Answer Any 4 Questions from 27 to 31. Each carries 4 Score		
	(a)	<p>Dissolution of gases in liquid is an exothermic process. Hence when temperature increases, The equilibrium of Gas, solvent and solution will be shifted in backward direction /</p> <p>Increasing temperature increases entropy, decreases solubility.</p>	2	
	(b)	<p>KCl is a strong electrolyte. Van't Hoff factor,</p>		4

		$i = \frac{\text{No. of particles after dissociation}}{\text{No. of particles before dissociation}}$ $\text{KCl} \longrightarrow \text{K}^+ + \text{Cl}^-$ $\therefore i = \frac{2}{1} = 2$ <p>Acetic acid undergo dimerise in benzene due to hydrogen bonding which reduces the number of particles. / Relevant Answer</p> <p>NOTE : This is applicable only when CH₃COOH is dissolved in Benzene. If it is dissolved in water, The value of Van't Hoff factor, will be greater than 1, and not 0.5.</p>	2	
28.		<ul style="list-style-type: none"> • Ionization isomerism:- Isomers having same molecular formula but give different ions in solution • Solvate isomerism (Hydrate isomerism) : - Isomers having same molecular formula but different number of water molecules inside and outside the coordination sphere. • Linkage isomerism :- Linkage isomerism is shown by complexes containing ambidentate ligands. linkage of ambidentate ligand to the central metal atom is different Eg. NO₂ - can link through nitrogen atom or oxygen atom. • Coordination isomerism:- Coordination isomerism occurs in compounds containing both cationic anionic coordination spheres. This isomerism arises due to interchange of ligands between cationic and anionic coordination spheres 		4
29.	(a) (b) (c)	<p>CH₃I</p> <p>Since, iodide ion is better leaving group than bromide ion, CH₃I will react faster than methyl bromide in SN₂ reaction with nucleophile OH⁻</p> <p>Any one Reaction Halogenation / Nitration / Sulphonation / Friedel-Crafts reaction</p>	1 1 2	4
30.	(a) (b)	<p>When ethyl alcohol is mixed with petrol or gasoline and used as fuel, it is called Power Alcohol / Mixture of 80 : 20 % of Petrol and Ethanol.</p> <p>The phenoxide ion formed from phenol is stabilised through resonance.</p>	1 2	

		<p>I II III IV V</p>		4
	(c)			1
31.	(a)	Reduction with LiAlH_4 / Reaction		1
	(b)			1
	(c)	On reaction with carbon dioxide (dry ice). / Reaction		1
	(d)	Reaction with DIBAL-H followed by hydrolysis (OR) Stephen Reaction.		1
		$\text{CH}_3 - \text{CN} + \text{SnCl}_2 + \text{HCl} \longrightarrow \text{CH}_3 - \text{CHO}$		
		<hr/> <p>Maximum Score : 60</p> <p>Prepared By:</p> <p>ANOOP CHANDRAN S</p> <p>anoopchandranacademics@gmail.com</p>		