

Senior School Certificate Examination

March -2010

Marking Scheme— Chemistry (Delhi) 56/1/1, 56/1/2, 56/1/3

General Instructions

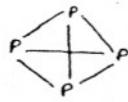
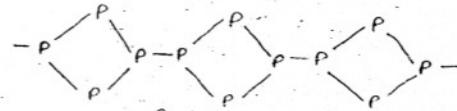
1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the same meaning, such answers should be given full weightage.
2. The Marking Scheme carries only suggested value point for the answers. These are only guidelines and do not constitute the complete answers. The students can have their own expression and if the expression is correct the marks will be awarded accordingly.
3. Some of the questions may relate to higher order thinking ability. These questions have been indicated by the mark* and the students understanding/analytical ability may be judged. These questions are to be evaluated carefully.
4. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the instruction given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration - Marking Scheme should be strictly adhered to and religiously followed.
6. If a question has parts, please award marks in the right hand side for each part. Marks awarded for different parts of the question should then be totalled up and written in the left hand margin and circled.
7. If a question does not have any parts, marks be awarded in the left-hand margin.
8. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
9. No Marks to be deducted for the cumulative effect of an error. It should be penalized only once.
10. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
11. Separate marking schemes for all the three sets have been provided

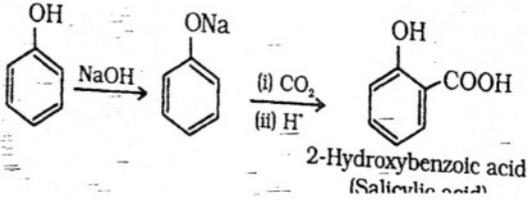
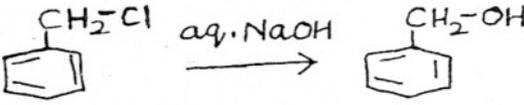
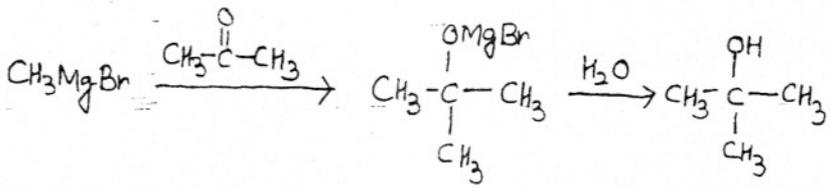
Marking Scheme

Chemistry (2010)

Delhi- SET (56/1/1, 56/1/2, 56/1/3)

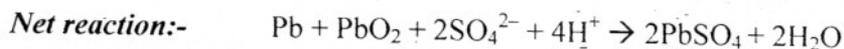
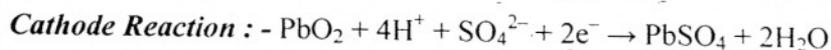
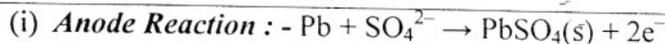
I II III

1			Mode of conduction, through electrons in solid metal and through ions in molten state or in solution in ionic solid / Metals are malleable and ductile whereas ionic solids are hard and brittle.	1
2	3		The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.	1
3	2		Emulsions are liquid-liquid colloidal systems.	1
4			Because NO ₂ contains odd number of valence electrons and on dimerisation it is converted to stable N ₂ O ₄ molecule with even number of electrons.	1
5			[Co(NH ₃) ₅ (NO ₂)]Cl ₂ and [Co(NH ₃) ₅ (ONO)]Cl ₂ (or any other correct example)	1
6	7	7	CH ₃ CHClCH ₂ CH ₃	1
7	6	8	Ph - CO - CH ₂ -CH ₃	1
8	8	6	But-3-en-1-amine	1
9	11	12	When the vapour pressure of a non-ideal solution is either higher or lower than that predicted by Raoult's law, the solution exhibits deviations. These deviations are caused because of unequal intermolecular attractive forces between solute-solvent molecules and Solute-solute or solvent-solvent molecules. Positive deviation eg: mixture of ethanol and acetone, carbon-disulphide and acetone (any one) Negative deviation eg: Chloroform and acetone, nitric acid and water (any one)	½ ½ ½ ½
10	9	11	Rate ₁ = k[A][B] ² (i) When the concentration of B is increased to 3 times, then rate would be Rate = k[A][3B] ² = 9k[A][B] ² = 9Rate ₁ i.e. rate is increased 9 times (ii) When the concentration of A as well as B are doubled, then rate would be Rate = k[2A][2B] ² = 8k[A][B] ² = 8Rate ₁ i.e. rate is increased 8 times	½ ½ ½ ½
11	10	10	[R] _t = -kt + [R] ₀ 0.075M = -(0.0030 mol L ⁻¹ s ⁻¹)t + 0.10M -0.025M = -(0.0030 mol L ⁻¹ s ⁻¹)t t = 8.3s	½ ½ 1
12		9	 <p>White Phosphorus</p>  <p>Red Phosphorus</p> <p>White phosphorus is more reactive due to its discrete tetrahedral structure and angular strain</p>	½ + ½ 1

13	13		(i) Due to decrease in size and increasing mass. (ii) Because of variable oxidation states exhibited by them.	1+
14		17	(i) Tetraammineaquachloridocobalt(III) chloride (ii) Dichloridobis(ethane-1,2-diamine)chromium(III) chloride	1+
15		15	(i) Kolbe's Reaction  <p style="text-align: center;">2-Hydroxybenzoic acid (Salicylic acid)</p> (ii) Williamson Synthesis $\text{RONa} + \text{R}'\text{Br} \rightarrow \text{R}-\text{O}-\text{R}' + \text{NaBr}$ <p style="text-align: center;">Where R and R' are alkyl groups.</p>	1
16		14	(i)  (ii)  <p style="text-align: right;"><i>(or any other suitable method)</i></p>	1
17	18	16	i) Invert sugar: Hydrolysis of sucrose brings about a change in a sign of rotation from dextro (+) to laevo (-) and the product is named as invert sugar ii) Polypeptides are the polymers of amino acids. OR Products of hydrolysis of sucrose are : Glucose and Fructose Because Carbonyl group of sucrose is not free	1
18	17		Amino acids which must be supplied in our diet are called Essential Amino Acids eg. Leucine, Isoleucine, Valine (any one) Amino acids which can be made by our bodies and not required in our diet are called non-essential Amino Acids eg. Glycine, Alanine (any one)	½+

23	$d = \frac{z \times M}{a^3 \times N_A}$ <p>For fcc lattice $z = 4$</p> $3.18 \text{ g cm}^{-3} = \frac{4 \times 78.08 \text{ g mol}^{-1}}{(5.46 \times 10^{-8} \text{ cm})^3 \times N_A}$ $N_A = \frac{4 \times 78.08 \text{ g mol}^{-1}}{(5.46 \times 10^{-8} \text{ cm})^3 \times 3.18 \text{ g cm}^{-3}}$ $N_A = 6.033 \times 10^{23} \text{ mol}^{-1}$	1 1 1	
21	$\Delta T_b = (80.31 - 80.10)^\circ\text{C} = 0.21^\circ\text{C} \text{ or } 0.21 \text{ K}$ $\Delta T_b = K_b m$ $0.21^\circ\text{C} = 2.53^\circ\text{C kg mol}^{-1} \times \frac{1.25 \text{ g}}{M} \times \frac{1000}{99 \text{ kg}}$ $M \approx 152 \text{ g mol}^{-1}$ <p>Where M is molar mass of the solute</p>	1 1 1	
19	<p>Multimolecular colloids</p> <p>They are aggregates of molecules less than 1nm thick. Example : Sulphur Sol</p>	<p>Macromolecular colloids</p> <p>They themselves are large molecules of colloidal dimensions Example : Starch</p> <p>Associated colloids – are those which at low concentration behave as normal electrolytes & at high concentration act as colloids.</p>	$\frac{1}{2} + \frac{1}{2} + 1$
20	<p>22</p> <p>i) Pig iron is converted into steel by adding carbon and some other elements.</p> <p>ii) Metallic Zinc is obtained from Zinc oxide by reduction with coke.</p> $\text{Or } \text{ZnO} + \text{C} \xrightarrow{\Delta} \text{Zn} + \text{CO}$ <p>iii) Impure titanium is heated with Iodine to form volatile complex TiI_4 which on further heating to higher temperature decomposes to give pure titanium. or Chemical Equations.</p> <p>OR</p> <p>(i) Role of NaCN in the extraction of gold is to do the leaching of gold ore in the presence of air from which the gold is obtained later by replacement.</p> $4\text{Au(s)} + 8\text{CN}^-(\text{aq}) + 2\text{H}_2\text{O} + \text{O}_2(\text{g}) \longrightarrow 4[\text{Au}(\text{CN})_2]^- + 4\text{OH}^-$ <p>(ii) SiO_2 is added in copper matte to convert the remaining FeS, FeO to slag.</p> <p>or</p>	1x3 3 1 1	

			$\text{FeO} + \text{SiO}_2 \longrightarrow \text{FeSiO}_3(\text{slag})$ <p>(iii) Iodine is heated with Zirconium to form a volatile compound which on further heating decompose to give pure zirconium as shown:</p> $\text{Zr}(\text{impure}) + 2\text{I}_2 \longrightarrow \text{ZrI}_4$ $\text{ZrI}_4 \longrightarrow \text{Zr}(\text{pure}) + 2\text{I}_2$	1
23	21	24	<p>(i) Due to Lanthanoid Contraction / or its meaning</p> <p>(ii) Due to stable half-filled $3d^5$ configuration of Mn^{2+} / high 3rd ionisation enthalpy of Mn.</p> <p>(iii) Because Oxygen or Fluorine is highly electronegative element and small size.</p>	$1 \times 3 = 3$
24	26	23	<p>(i) DDT is used as an insecticide and Iodoform is used as a mild antiseptic.</p> <p>(ii) (a) 1-Bromo pentane, as it is a primary alkyl halide. (b) 1-Bromo-2-methyl butane, as it is a primary alkyl halide.</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
25		25	<p>(i) $\text{C}_6\text{H}_5\text{NH}_2 < \text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2 < \text{CH}_3\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH}$</p> <p>(ii) p-toluidine > Aniline > p-nitroaniline</p> <p>(iii) $(\text{C}_2\text{H}_5)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_6\text{H}_5\text{NHCH}_3 < \text{C}_6\text{H}_5\text{NH}_2$</p>	$1 \times 3 = 3$
26			<p>(i) Polythene, PVC, (or any other one example)</p> <p>(ii) Nylon-6.6, Nylon-6, Terylene (or any other one example)</p> <p>(iii) Buna-S, Buna-N (or any other one example)</p>	$1 \times 3 = 3$
27	27		<p>The chemical substances which are used to relieve pain. These are of two types: (i) Non narcotic Drugs (ii) Narcotic Drugs</p> <p>Non Narcotic Drugs are effective in relieving skeletal pain / preventing heart attack / viral inflammation, etc.</p> <p>Narcotic Drugs are recommended for the relief in postoperative pains / Cardiac pain / terminal cancer.</p>	1 1 $\frac{1}{2}$ $\frac{1}{2}$
28	28	29	<p>(i) The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the Anion and Cation of the electrolyte.</p> $\Lambda_m^{\circ}(\text{HAc}) = \lambda_{\text{H}^+}^{\circ} + \lambda_{\text{Ac}^-}^{\circ}$ <p>(ii)</p> $\Lambda_{\text{CH}_3\text{COOH}}^{\circ} = \Lambda_{\text{CH}_3\text{COONa}}^{\circ} + \Lambda_{\text{HCl}}^{\circ} - \Lambda_{\text{NaCl}}^{\circ}$ $= (91 + 426 - 126) \text{ S cm}^2 \text{ mol}^{-1}$ $= 391 \text{ S cm}^2 \text{ mol}^{-1}$ <p>OR</p>	1 1 1 1



$$E_{\text{cell}}^{\circ} = 0.80 \text{ V} - 0.34\text{V} = 0.46\text{V}$$

Nernst equation

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 0.46\text{V} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$0.422\text{V} = 0.46 \text{ V} - \frac{0.059}{2} \log \frac{0.10}{[\text{Ag}^+]^2}$$

$$\log \frac{0.10}{[\text{Ag}^+]^2} = 1.2881$$

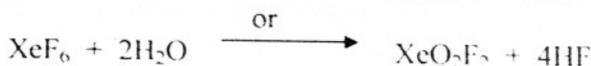
(Full marks to be awarded upto this stage)

$$[\text{Ag}^+]^2 = 0.0051$$

$$[\text{Ag}^+] = 7.1 \times 10^{-2} \text{ M}$$

30

(a)



or



(b)

(i) Because of larger size of sulphur atom than oxygen atom.

(ii) Because bond energy of F_2 is lower than Cl_2 and N-F bond is smaller & stronger than N-Cl bond.

(iii) Because it has sp^3d hybridization.

OR

1x3 = 3

(a)



(Note: Assign marks for correct products.)

1+1

(b)

(i) Because down the group, +3 oxidation state becomes more & more stable due to higher energy involved to unpair the s electrons / due to inert pair effect.

(ii) Due to the formation of $[PCl_4]^+$ $[PCl_6]^-$

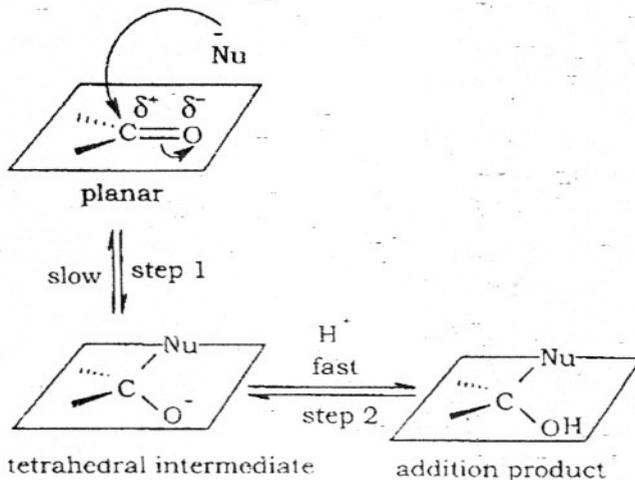
(iii) Because they readily accept an electron.

1x3 = 3

28

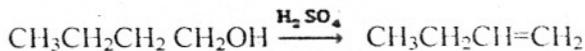
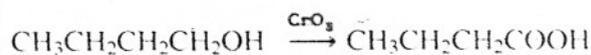
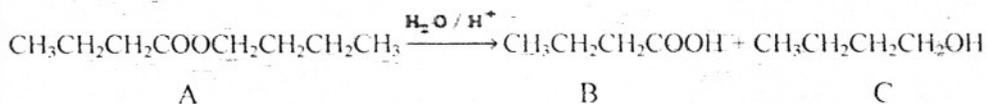
(a)

attack from the top face



2

(b)



1x3=3

OR

(a)

Ethanal and Propanal

Iodoform test. Warm each compound with iodine and sodium hydroxide on a water bath.

Propanal (CH_3CH_2CHO) No yellow ppt formed

Ethanal (CH_3CHO) Yellow crystals of Iodoform are formed.

(Other relevant test can be accepted)

1

(ii) *Phenol and Benzoic acid.*

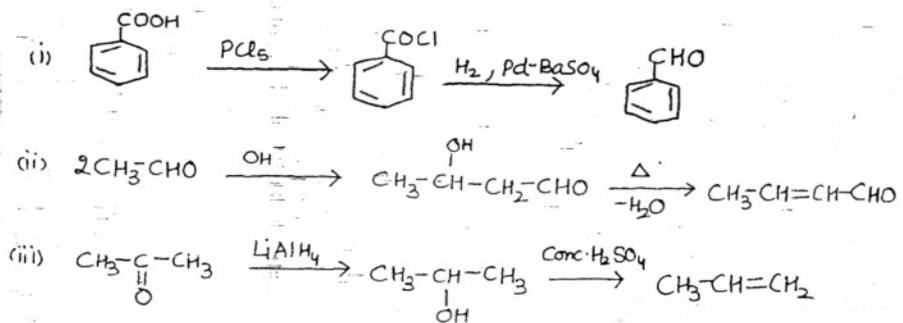
FeCl₃ test. Add a few drops of neutral FeCl₃ solution.

Phenol (C₆H₅OH), violet coloured ppt. is produced.

Benzoic acid (H₅C₆COOH), no ppt. is produced.

(Other relevant test can be accepted)

(b)



(Or by any other suitable method.)

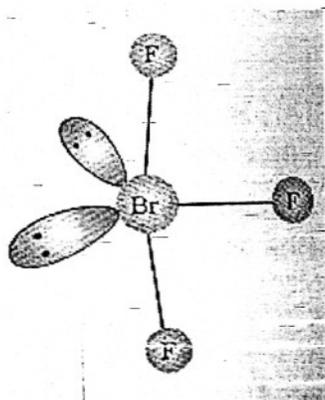
1x3 = 3

DELHI
SET -56/1/2

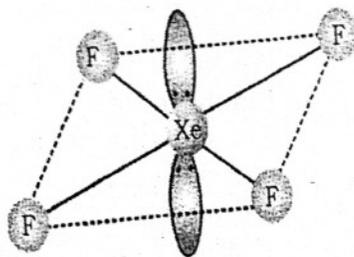
Q.no.	Answers	Mark
1	Frenkel Defect	1
2	Emulsions are liquid-liquid colloidal systems.	
3	The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.	
4	+3 (or +1)	1
5	[Cr(NH ₃) ₆] [CoF ₆] and [Co(NH ₃) ₆] [CrF ₆] or any other	1
6	Ph - CO - CH ₂ -CH ₃	
7	CH ₃ CHCl CH ₂ CH ₃	
8	But-3-en-1-amine	
9	<p>Rate₁ = k[A][B]²</p> <p>(i) When the concentration of B is increased to 3 times, then rate would be</p> <p>Rate = k[A][3B]²</p> <p>= 9k[A][B]²</p> <p>= 9Rate₁ i.e. rate is increased 9 times</p> <p>(ii) When the concentration of A as well as B are doubled, then rate would be</p> <p>Rate = k[2A][2B]²</p> <p>= 8k[A][B]²</p> <p>= 8Rate₁ i.e. rate is increased 8 times</p>	<p>½</p> <p>½</p> <p>½</p> <p>½</p>
10	<p>[R]_t = - kt + [R]₀</p> <p>0.075M = - (0.0030 mol L⁻¹ s⁻¹)t + 0.10M</p> <p>-0.025M = -(0.0030 mol L⁻¹ s⁻¹)t</p> <p>t = 8.3s</p>	<p>½</p> <p>½</p> <p>1</p>
11	<p>When the vapour pressure of a non-ideal solution is either higher or lower than that predicted by Raoult's law, the solution exhibits deviations.</p> <p>These deviations are caused because of unequal intermolecular attractive forces between solute-solvent molecules and Solute-solute or solvent-solvent molecules.</p> <p>Positive deviation eg: mixture of ethanol and acetone, carbon-disulphide and acetone (any one)</p> <p>Negative deviation eg: Chloroform and acetone, nitric acid and water (any one)</p>	<p>½</p> <p>½</p> <p>½</p> <p>½</p>

12

(i)



(ii)



1+1

13

- (i) Due to decrease in size and increasing mass.
 (ii) Because of variable oxidation states exhibited by them.

1+1

14

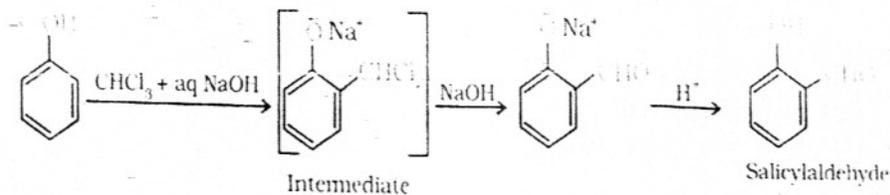
- (i) Octahedral, Diamagnetic,
 (ii) Square Planar, Diamagnetic

1

1

15

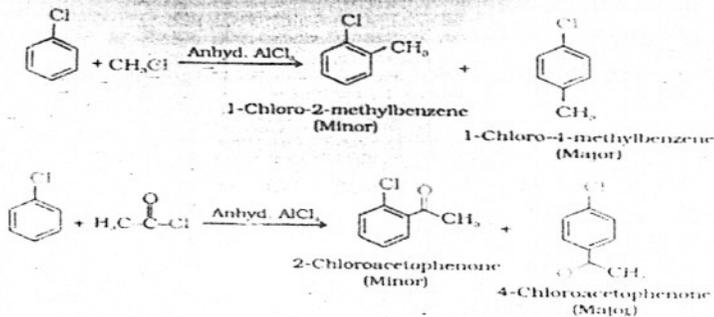
(i) Reimer Tiemann Reaction



1

(iii) Friedel-Crafts Reaction.

(iv) Friedel-Crafts reaction



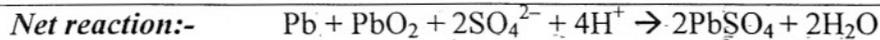
1

(or any other suitable example)

16	<p>(i) $\text{CH}_2=\text{CH}-\text{CH}_3 \xrightarrow{\text{H}_2\text{O}/\text{H}^+} \text{CH}_3-\text{CH}(\text{OH})-\text{CH}_3$</p> <p>(ii) $\text{C}_2\text{H}_5\text{MgBr} \xrightarrow{\text{HCHO}} \text{CH}_3-\text{CH}_2-\text{CH}_2\text{OMgBr} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$</p> <p><i>(or by any other suitable method)</i></p>	1+1						
17	<p>Amino acids which must be supplied in our diet are called Essential Amino Acids eg. Leucine, Isoleucine, Valine (any one)</p> <p>Amino acids which can be made by our bodies and not required in our diet are called non-essential Amino Acids eg. Glycine, Alanine (any one)</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$						
18	<p>i) Invert sugar: Hydrolysis of sucrose brings about a change in a sign of rotation from dextro (+) to laevo (-) and the product is named as invert sugar</p> <p>ii) Polypeptides are the polymers of amino acids.</p> <p style="text-align: center;">OR</p> <p>(i) Products of hydrolysis of sucrose are : Glucose and Fructose</p> <p>(ii) Because Carbonyl group of sucrose is not free</p>	1 1 1 1						
19	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Multimolecular colloids</th> <th style="width: 50%;">Macromolecular colloids</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">They are aggregates of molecules less than 1nm thick. Example :Sulphur Sol</td> <td style="padding: 5px;">They themselves are large molecules of colloidal dimensions Example :Starch</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Associated colloids – are those which at low concentration behave as normal electrolytes & at high concentration act as colloids.</td> </tr> </tbody> </table>	Multimolecular colloids	Macromolecular colloids	They are aggregates of molecules less than 1nm thick. Example :Sulphur Sol	They themselves are large molecules of colloidal dimensions Example :Starch	Associated colloids – are those which at low concentration behave as normal electrolytes & at high concentration act as colloids.		$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ 1
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Associated colloids – are those which at low concentration behave as normal electrolytes & at high concentration act as colloids.								
20	<p>i) Pig iron is converted into steel by adding carbon and some other elements.</p> <p>ii) Metallic Zinc is obtained from Zinc oxide by reduction with coke.</p> <p style="text-align: center;">Δ</p> <p>Or $\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$</p> <p>iii) Impure titanium is heated with Iodine to form volatile complex TiI_4 which on further heating to higher temperature decomposes to give pure titanium.</p> <p style="text-align: center;">or Chemical Equations.</p> <p style="text-align: center;">OR</p> <p>(i) Role of NaCN in the extraction of gold is to do the leaching of gold ore in the presence of air from which the gold is obtained later by replacement.</p> <p style="text-align: center;">or</p> <p>$4\text{Au}(\text{s}) + 8\text{CN}^-(\text{aq}) + 2\text{H}_2\text{O} + \text{O}_2(\text{g}) \longrightarrow 4[\text{Au}(\text{CN})_2]^- + 4\text{OH}^-$</p> <p>(ii) SiO_2 is added in copper matte to convert the remaining FeS, FeO to slag.</p> <p style="text-align: center;">or</p> <p>$\text{FeO} + \text{SiO}_2 \longrightarrow \text{FeSiO}_3(\text{slag})$</p>	1x3 = 3 1 1						

	<p>(iii) Iodine is heated with Zirconium to form a volatile compound which on further heating decompose to give pure zirconium as shown:</p> $\text{Zr(impure)} + 2\text{I}_2 \longrightarrow \text{ZrI}_4$ $\text{ZrI}_4 \longrightarrow \text{Zr(pure)} + 2\text{I}_2$	1
21	<p>(i) Due to Lanthanoid Contraction / or its meaning (ii) Due to stable half-filled $3d^5$ configuration of Mn^{2+} / high 3^{rd} ionisation enthalpy of Mn. (iii) Because Oxygen or Fluorine is highly electronegative element and small size</p>	1x3=3
22	<p>$\Delta T_b = (100.42 - 100)^\circ\text{C} = 0.42^\circ\text{C}$ or 0.42 K</p> <p>$\Delta T_b = K_b m$</p> $0.42\text{ K} = 0.512\text{ K kg mol}^{-1} \times \frac{w}{92\text{ g mol}^{-1}} \times \frac{1000}{500\text{ kg}}$ <p>$w = 37.7\text{ g}$</p> <p>Where w is mass of glycerol.</p>	1 1 1
23	<p>$d = \frac{z \times M}{a^3 \times N_A}$</p> <p>For fcc lattice $z=4$</p> $3.18\text{ g cm}^{-3} = \frac{4 \times 78.08\text{ g mol}^{-1}}{(5.46 \times 10^{-8}\text{ cm})^3 \times N_A}$ <p>$N_A = \frac{4 \times 78.08\text{ g mol}^{-1}}{(5.46 \times 10^{-8}\text{ cm})^3 \times 3.18\text{ g cm}^{-3}}$</p> <p>$N_A = 6.033 \times 10^{23}\text{ mol}^{-1}$</p>	1 1 1
24	<p>(i) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{C}_6\text{H}_5\text{NH}_2 \xrightarrow{\text{OH}^-} \text{C}_6\text{H}_5\text{-N=N-} \langle \text{benzene ring} \rangle \text{-NH}_2 + \text{Cl}^- + \text{H}_2\text{O}$</p> <p>(ii) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{CH}_3\text{CH}_2\text{OH} \longrightarrow \langle \text{benzene ring} \rangle + \text{N}_2 + \text{HCl} + \text{CH}_3\text{CHO}$</p> <p>(iii) $\text{R-NH}_2 + \text{CHCl}_3 + \text{KOH} \longrightarrow \text{R-NC} + \text{KCl} + \text{H}_2\text{O}$</p>	1x3=3

25	<p>(i) Neoprene – Monomer is chloroprene / 2-chlorobuta-di-ene</p> $\text{CH}_2=\text{C}(\text{Cl})-\text{CH}=\text{CH}_2$ <p>(ii) Buna-S – Monomers are 1,3-butadiene and Styrene</p> $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2 \quad \text{and} \quad \text{C}_6\text{H}_5-\text{CH}=\text{CH}_2$ <p>(iii) Teflon – Monomer is Tetrafluoroethene</p> $\text{CF}_2=\text{CF}_2$	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>
26	<p>(i) DDT is used as an insecticide and Iodoform is used as a mild antiseptic.</p> <p>(ii) (a) 1-Bromo pentane, as it is a primary alkyl halide.</p> <p>(b) 1-Bromo-2-methyl butane, as it is a primary alkyl halide.</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>
27	<p>The chemical substances which are used to relieve pain.</p> <p>These are of two types: (i) Non narcotic Drugs</p> <p>(ii) Narcotic Drugs</p> <p>Non Narcotic Drugs are effective in relieving skeletal pain / preventing heart attack / viral inflammation, etc.</p> <p>Narcotic Drugs are recommended for the relief in postoperative pains / Cardiac pain / terminal cancer</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
28	<p>(i) The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the Anion and Cation of the electrolyte.</p> $\Lambda_m^\circ(\text{HAc}) = \lambda_{\text{H}^+}^\circ + \lambda_{\text{Ac}^-}^\circ$ <p>(ii)</p> $\begin{aligned} \Lambda_{\text{CH}_3\text{COOH}}^\circ &= \Lambda_{\text{CH}_3\text{COONa}}^\circ + \Lambda_{\text{HCl}}^\circ - \Lambda_{\text{NaCl}}^\circ \\ &= (91 + 426 - 126) \text{ S cm}^2 \text{ mol}^{-1} \\ &= 391 \text{ S cm}^2 \text{ mol}^{-1} \end{aligned}$ <p style="text-align: center;">OR</p> <p>(i) <i>Anode Reaction</i> : - $\text{Pb} + \text{SO}_4^{2-} \rightarrow \text{PbSO}_4(\text{s}) + 2\text{e}^-$</p> <p><i>Cathode Reaction</i> : - $\text{PbO}_2 + 4\text{H}^+ + \text{SO}_4^{2-} + 2\text{e}^- \rightarrow \text{PbSO}_4 + 2\text{H}_2\text{O}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>



$$E_{\text{cell}}^{\circ} = 0.80\text{ V} - 0.34\text{V} = 0.46\text{V}$$

Nernst equation

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 0.46\text{V} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$0.422\text{V} = 0.46\text{ V} - \frac{0.059}{2} \log \frac{0.10}{[\text{Ag}^+]^2}$$

$$\log \frac{0.10}{[\text{Ag}^+]^2} = 1.2881$$

(Full marks to be awarded upto this stage)

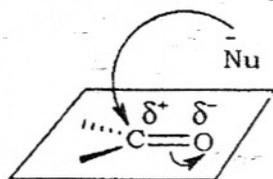
$$[\text{Ag}^+]^2 = 0.0051$$

$$[\text{Ag}^+] = 7.1 \times 10^{-2}\text{ M}$$

29

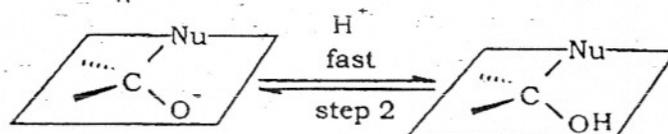
(a)

attack from the top face



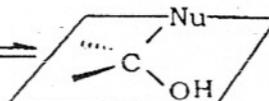
planar

slow \rightleftharpoons step 1



tetrahedral intermediate

fast \rightleftharpoons step 2



addition product

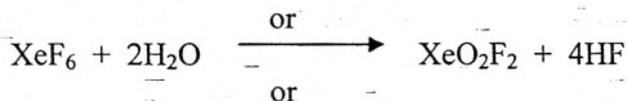
2

30

(a)



1



1



(b)

(i) Because of larger size of sulphur atom than oxygen atom.

(ii) Because bond energy of F_2 is lower than Cl_2 and N-F bond is smaller & stronger than N-Cl bond.(iii) Because it has sp^3d hybridization.

1x3=3

OR

(a)



(Note: Assign marks for correct products.)

1+1

(b)

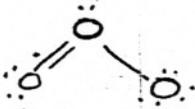
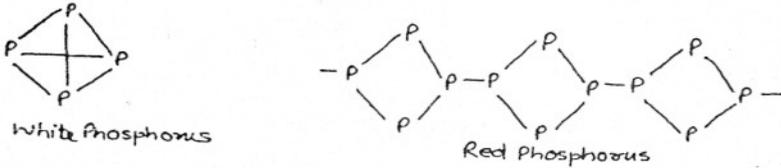
(i) Because down the group, +3 oxidation state becomes more & more stable due to higher energy involved to unpair the s electrons / due to inert pair effect.

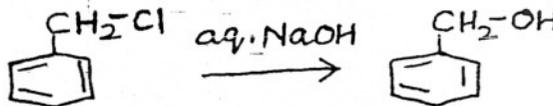
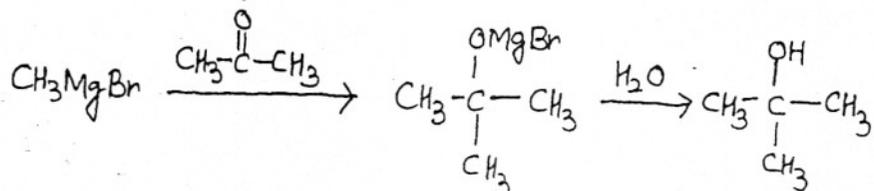
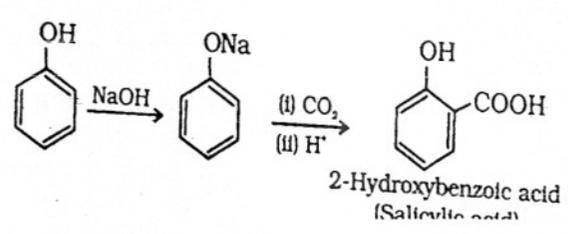
(ii) Due to the formation of $[PCl_4]^+$ $[PCl_6]^-$

(iii) Because they readily accept an electron.

1x3=3

Delhi
SET 56/1/3

Q.no	Answers	Marks
1	Schottky Defect	1
2	Change of concentration of reactant or product per unit time is known as rate of a reaction.	1
3	Zeolite / ZSM-5 / or any other	1
4		1
5	$[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}$	1
6	But-3-en-1-amine	1
7	$\text{CH}_3\text{CHClCH}_2\text{CH}_3$	1
8	$\text{Ph}-\text{CO}-\text{CH}_2-\text{CH}_3$	1
9	 <p>White Phosphorus</p> <p>Red Phosphorus</p> <p>White phosphorus is more reactive due to its discrete tetrahedral structure and angular strain</p>	$\frac{1}{2} + \frac{1}{2}$ 1
10	$[\text{R}]_t = -kt + [\text{R}]_0$ $0.075\text{M} = -(0.0030 \text{ mol L}^{-1} \text{ s}^{-1})t + 0.10\text{M}$ $-0.025\text{M} = -(0.0030 \text{ mol L}^{-1} \text{ s}^{-1})t$ $t = 8.3\text{s}$	$\frac{1}{2}$ $\frac{1}{2}$ 1
11	$\text{Rate}_1 = k[\text{A}][\text{B}]^2$ (i) When the concentration of B is increased to 3 times, then rate would be $\text{Rate} = k[\text{A}][3\text{B}]^2$ $= 9k[\text{A}][\text{B}]^2$ $= 9\text{Rate}_1$ i.e. rate is increased 9 times (ii) When the concentration of A as well as B are doubled, then rate would be $\text{Rate} = k[2\text{A}][2\text{B}]^2$ $= 8k[\text{A}][\text{B}]^2$ $= 8\text{Rate}_1$ i.e. rate is increased 8 times	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

12	<p>When the vapour pressure of a non-ideal solution is either higher or lower than that predicted by Raoult's law, the solution exhibits deviations.</p> <p>These deviations are caused because of unequal intermolecular attractive forces between solute-solvent molecules and Solute-solute or solvent-solvent molecules.</p> <p>Positive deviation eg: mixture of ethanol and acetone, carbon-disulphide and acetone (any one)</p> <p>Negative deviation eg: Chloroform and acetone, nitric acid and water (any one)</p>	<p>½</p> <p>½</p> <p>½</p> <p>½</p>
13	<p>(i) Because the energy of excitation of an electron in d orbital corresponds to the visible region.</p> <p>(ii) Because Zn has completely filled d orbital ($3d^{10}$)</p>	1+1
14	<p>(i)</p> <div style="text-align: center;">  </div> <p>(ii)</p> <div style="text-align: center;">  </div> <p style="text-align: right;"><i>(or any other suitable method)</i></p>	<p>1</p> <p>1</p>
15	<p>(i) Kolbe's Reaction</p> <div style="text-align: center;">  <p>2-Hydroxybenzoic acid (Salicylic acid)</p> </div>	1

	(ii) Williamson Synthesis $\text{RONa} + \text{R}'\text{Br} \rightarrow \text{R} - \text{O} - \text{R}' + \text{NaBr}$ Where R and R' are alkyl groups.	1
16	iii) Invert sugar: Hydrolysis of sucrose brings about a change in a sign of rotation from dextro (+) to laevo (-) and the product is named as invert sugar iv) Polypeptides are the polymers of amino acids. OR Products of hydrolysis of sucrose are : Glucose and Fructose Beuase Carbonyl group of sucrose is not free	1 1 1 1
17	(i) Tetraammineaquachloridocobalt(III) chloride (ii) Dichloridobis(ethane-1,2-diamine)chromium(III) chloride	1 1
18	(i) A Nucleoside consists of a pentose sugar and a nitrogen containing hetrocyclic base. Whereas a Nucleotide consists of a pentose sugar, a nitrogen containing hetrocyclic base and a phosphate group.	1 1
19	$d = \frac{z \times M}{a^3 \times N_A}$ Assuming fcc lattice for copper $a = 2\sqrt{2} r$ $a^3 = (2\sqrt{2} r)^3 = 8 \times 2\sqrt{2} (1.27 \times 10^{-8} \text{cm})^3$ $= 4.723 \times 10^{-23} \text{cm}^3$ $d = \frac{4 \times 63.54 \text{ g mol}^{-1}}{4.723 \times 10^{-23} \text{ cm}^3 \times 6.02 \times 10^{23} \text{ mol}^{-1}}$ $d = 8.94 \text{ g cm}^{-3}$ Note: If any other lattice is assumed, comparing the density or z-value with the given one, may be accepted as the right procedure.	1 1 1
20	(i) Dispersed phase - solid or liquid. Dispersion medium – Gas eg: Smoke, Dust, Fog, Mist, (any one example) (ii) Dispersed phase – liquid Dispersion Medium – liquid eg: Milk, Cream (any one example) (iii) Dispersed phase – solid Dispersion Medium – water eg: Salt in water, Sugar in water (any one example)	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$

	(ii) Williamson Synthesis $\text{RONa} + \text{R}'\text{Br} \rightarrow \text{R} - \text{O} - \text{R}' + \text{NaBr}$ Where R and R' are alkyl groups.	1
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18	(i) A Nucleoside consists of a pentose sugar and a nitrogen containing hetrocyclic base. Whereas a Nucleotide consists of a pentose sugar, a nitrogen containing hetrocyclic base and a phosphate group.	1 1
19	$d = \frac{z \times M}{a^3 \times N_A}$ Assuming fcc lattice for copper $a = 2\sqrt{2} r$ $a^3 = (2\sqrt{2} r)^3 = 8 \times 2\sqrt{2} (1.27 \times 10^{-8} \text{cm})^3$ $= 4.723 \times 10^{-23} \text{cm}^3$ $d = \frac{4 \times 63.54 \text{ g mol}^{-1}}{4.723 \times 10^{-23} \text{ cm}^3 \times 6.02 \times 10^{23} \text{ mol}^{-1}}$ $d = 8.94 \text{ g cm}^{-3}$ Note: If any other lattice is assumed, comparing the density or z-value with the given one, may be accepted as the right procedure.	1 1 1
20	(i) Dispersed phase - solid or liquid. Dispersion medium - Gas eg: Smoke, Dust, Fog, Mist, (any one example) (ii) Dispersed phase - liquid Dispersion Medium - liquid eg: Milk, Cream (any one example) (iii) Dispersed phase - solid Dispersion Medium - water eg: Salt in water, Sugar in water (any one example)	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$

21	$\Delta T_b = (80.31 - 80.10)^\circ\text{C} = 0.21^\circ\text{C} \text{ or } 0.21 \text{ K}$ $\Delta T_b = K_b m$ $0.21^\circ\text{C} = 2.53^\circ\text{C kg mol}^{-1} \times \frac{1.25 \text{ g}}{M} \times \frac{1000}{99\text{kg}}$ $M \approx 152 \text{ g mol}^{-1}$ <p>Where M is molar mass of the solute</p>	1 1 1
22	<p>iv) Pig iron is converted into steel by adding carbon and some other elements. v) Metallic Zinc is obtained from Zinc oxide by reduction with coke.</p> $\text{Or } \text{ZnO} + \text{C} \xrightarrow{\Delta} \text{Zn} + \text{CO}$ <p>vi) Impure titanium is heated with Iodine to form volatile complex TiI_4 which on further heating to higher temperature decomposes to give pure titanium. or Chemical Equations.</p> <p style="text-align: center;">OR</p> <p>(i) Role of NaCN in the extraction of gold is to do the leaching of gold ore in the presence of air from which the gold is obtained later by replacement.</p> $4\text{Au(s)} + 8\text{CN}^-(\text{aq}) + 2\text{H}_2\text{O} + \text{O}_2(\text{g}) \xrightarrow{\text{or}} 4[\text{Au}(\text{CN})_2]^- + 4\text{OH}^-$ <p>(ii) SiO_2 is added in copper matte to convert the remaining FeS, FeO to slag.</p> $\text{FeO} + \text{SiO}_2 \xrightarrow{\text{or}} \text{FeSiO}_3(\text{slag})$ <p>(iii) Iodine is heated with Zirconium to form a volatile compound which on further heating decompose to give pure zirconium as shown:</p> $\text{Zr}(\text{impure}) + 2\text{I}_2 \xrightarrow{\quad} \text{ZrI}_4$ $\text{ZrI}_4 \xrightarrow{\quad} \text{Zr}(\text{pure}) + 2\text{I}_2$	1x3 = 3 1 1 1
23	<p>(iii) DDT is used as an insecticide and Iodoform is used as a mild antiseptic. (iv) (a) 1-Bromo pentane, as it is a primary alkyl halide. (b) 1-Bromo-2-methyl butane, as it is a primary alkyl halide.</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
24	<p>(iv) Due to Lanthanoid Contraction / or its meaning (v) Due to stable half-filled $3d^5$ configuration of Mn^{2+} / high 3^{rd} ionisation enthalpy of Mn. (vi) Because Oxygen or Fluorine is highly electronegative element and small size.</p>	1x3 = 3
25	<p>(i) $\text{C}_6\text{H}_5\text{NH}_2 < \text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2 < \text{CH}_3\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH}$</p>	

Ethanal and Propanal

Iodoform test. Warm each compound with iodine and sodium hydroxide on a water bath.

Propanal ($\text{CH}_3\text{CH}_2\text{CHO}$) No yellow ppt formed

Ethanal (CH_3CHO) Yellow crystals of Iodoform are formed.

(Other relevant test can be accepted)

1

(ii) Phenol and Benzoic acid.

FeCl_3 test. Add a few drops of neutral FeCl_3 solution.

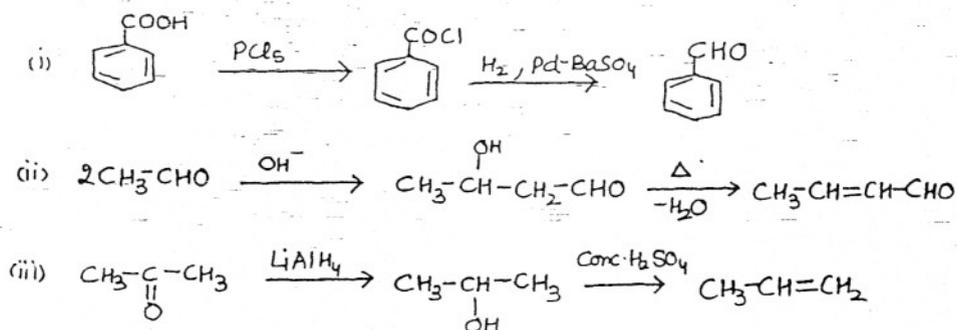
Phenol ($\text{C}_6\text{H}_5\text{OH}$), violet coloured ppt. is produced.

Benzoic acid ($\text{H}_5\text{C}_6\text{COOH}$), no ppt. is produced.

(Other relevant test can be accepted)

(b)

1



(Or by any other suitable method.)

1x3
=3

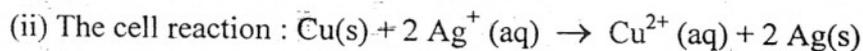
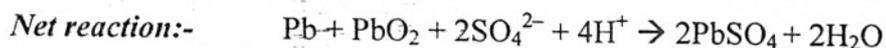
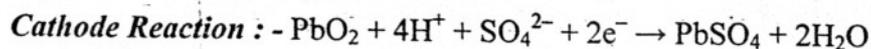
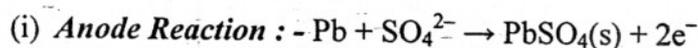
29 (i) The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the Anion and Cation of the electrolyte.

$$\Lambda_m^\circ(\text{HAc}) = \lambda_{\text{H}^+}^\circ + \lambda_{\text{Ac}^-}^\circ$$

1
1

(ii)

$$\begin{aligned}\Delta_{\text{CH}_3\text{COOH}}^{\circ} &= \Delta_{\text{CH}_3\text{COONa}}^{\circ} + \Delta_{\text{HCl}}^{\circ} - \Delta_{\text{NaCl}}^{\circ} \\ &= (91 + 426 - 126) \text{ S cm}^2 \text{ mol}^{-1} \\ &= 391 \text{ S cm}^2 \text{ mol}^{-1} \\ &\text{OR}\end{aligned}$$



$$E_{\text{cell}}^{\circ} = 0.80 \text{ V} - 0.34 \text{ V} = 0.46 \text{ V}$$

Nernst equation

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 0.46 \text{ V} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2}$$

$$0.422 \text{ V} = 0.46 \text{ V} - \frac{0.059}{2} \log \frac{0.10}{[\text{Ag}^+]^2}$$

$$\log \frac{0.10}{[\text{Ag}^+]^2} = 1.2881$$

(Full marks to be awarded upto this stage)

$$[\text{Ag}^+]^2 = 0.0051$$

$$[\text{Ag}^+] = 7.1 \times 10^{-2} \text{ M}$$

(a)



1



or



or



1

(b)

(iv) Because of larger size of sulphur atom than oxygen atom.

(v) Because bond energy of F_2 is lower than Cl_2 and N-F bond is smaller & stronger than N-Cl bond.(vi) Because it has sp^3d hybridization.1x3 =
3

OR

(a)



(Note: Assign marks for correct products.)

1+1

(b)

(i) Because down the group, +3 oxidation state becomes more & more stable due to higher energy involved to unpair the s electrons / due to inert pair effect.

(ii) Due to the formation of $[\text{PCl}_4]^+$ $[\text{PCl}_6]^-$

(iii) Because they readily accept an electron.

1x3 =
3