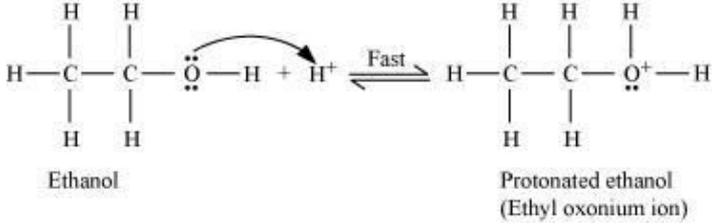
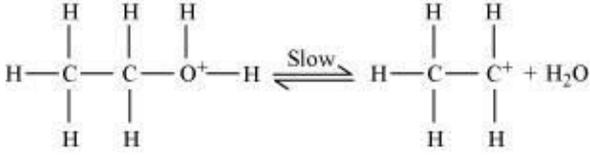
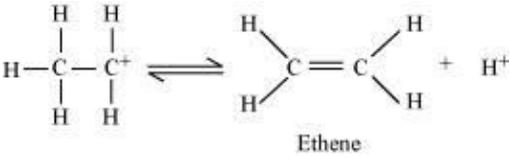
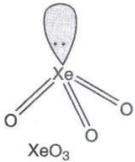
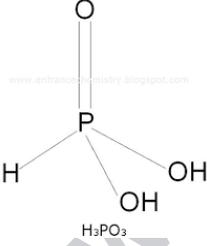
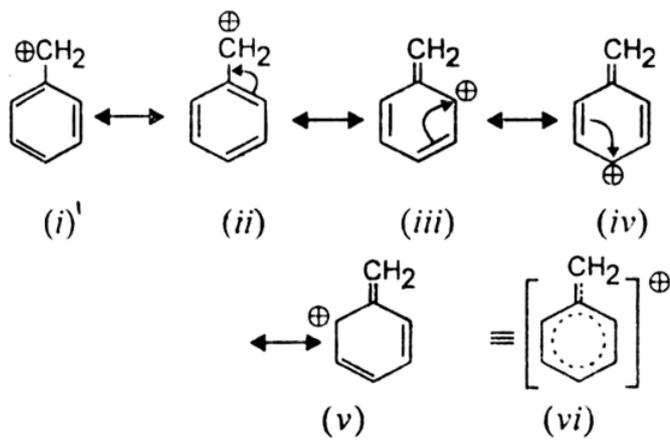
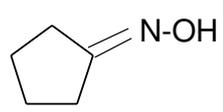
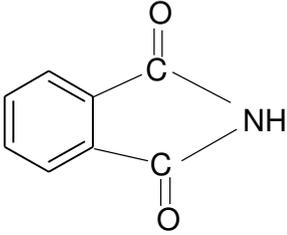


	<p>n_2 = number of moles of ethanol. n_1 = number of moles of water. Molality of ethanol means the number of moles of ethanol present in 1000 g of water.</p> $n_1 = \frac{1000}{18} = 55.5 \text{ moles}$ <p>Substituting the value of n_1 in equation (1)</p> $\frac{n_2}{55.5 + n_2} = 0.12$ <p>$n_2 = 7.57$ moles Molality of ethanol (C_2H_5OH) = 7.57 m</p> <p>Alternatively,</p> <p>Mole fraction of water = 0.88 Mole fraction of ethanol = $1 - 0.88 = 0.12$ Therefore 0.12 moles of ethanol are present in 0.88 moles of water. Mass of water = $0.88 \times 18 = 15.84$ g of water. Molality = number of moles of solute (ethanol) present in 1000 g of solvent (water) $= 12 \times 1000 / 15.84$ $= 7.57$ m Molality of ethanol (C_2H_5OH) = 7.57 m</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
7.(a)	Reaction : Hell-Volhard-Zelinsky reaction. IUPAC : 2-Bromopropanoic acid.	$\frac{1}{2}$
(b)	Reaction : Rosenmund reduction reaction. IUPAC : Benzaldehyde.	$\frac{1}{2}$
	OR	
	i) 2-Methylbut-2-enal	$\frac{1}{2}$
	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{-CH=CH-CHO} \end{array}$	$\frac{1}{2}$
	ii) Pent-2-enal	$\frac{1}{2}$
	$\text{CH}_3\text{-CH}_2\text{-CH=CH-CHO}$	$\frac{1}{2}$
8.(a)	Tert-butyl peroxide acts as a free radical generating initiator(catalyst)	1
(b)	$\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$	$\frac{1}{2}$
	$\text{C}_6\text{H}_5 - \text{CH} = \text{CH}_2$	$\frac{1}{2}$

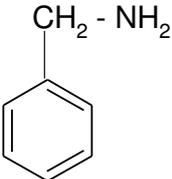
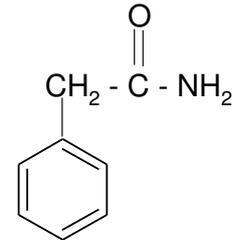
9.	<p>Step 1 : Formation of protonated alcohol.</p>  <p>Ethanol</p> <p>Protonated ethanol (Ethyl oxonium ion)</p> <p>Step 2 : Formation of carbocation.</p>  <p>Step 3: Formation of ethane by elimination of a proton.</p>  <p>Ethene</p>	<p>1/2</p> <p>1</p> <p>1/2</p>
10.	<p>(i) Zero order reaction (ii) Slope represents $-k$; Intercept represents $[R]_0$ (iii) $\text{mol L}^{-1} \text{s}^{-1}$</p>	<p>1/2 $1/2+1/2$ 1/2</p>
11.(a)	 <p>XeO₃</p>	1
(b)	 <p>H₃PO₃</p>	1
12.(i)	<p>Since $\text{Ti}^{4+}/\text{Ti}^{3+}$ has lower reduction potential than $\text{Fe}^{3+}/\text{Fe}^{2+}$, it cannot be reduced in comparison with $\text{Fe}^{3+}/\text{Fe}^{2+}$ ions. Hence Ti^{4+} cannot oxidise Fe^{2+} to Fe^{3+}.</p>	<p>1</p> <p>1/2</p>
(ii)	<p>As the value of reduction potential increases the stability of +2 oxidation increases. Therefore correct order of stability is $\text{Cr}^{3+}/\text{Cr}^{2+} < \text{Fe}^{3+}/\text{Fe}^{2+} < \text{Mn}^{3+}/\text{Mn}^{2+}$</p>	<p>1</p> <p>1/2</p>

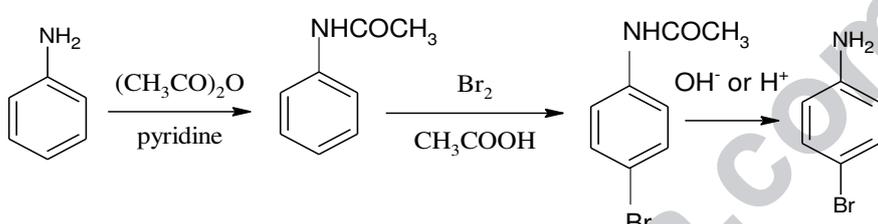
SECTION C		
13.	$r = \frac{\sqrt{3}}{4} a$ $143.1 = \frac{\sqrt{3}}{4} a$ $a = 330.4 \text{ pm}$ $\rho = \frac{zM}{a^3 N_A}$ $\rho = \frac{2 \times 93}{(330.4 \times 10^{-10})^3 \times 6.023 \times 10^{23}}$ $\rho = 8.58 \text{ g/cm}^3$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>
14.(a)	Molecules of benzoic acid dimerise in benzene, the number of particles are reduced.	1
(b)	The intermolecular interactions between ethanol and acetone are weaker/ the escaping tendency of ethanol and acetone molecules increases on mixing / the vapour pressure increases.	1
(c)	Due to osmosis, a bacterium on fruit loses water, shrivels and dies.	1
15.	<p style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{A : CH}_3\text{-CH-CH}_2\text{-OH} \end{array}$ </p> <p style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{B : CH}_3\text{-CH-COOH} \end{array}$ </p> <p style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{C : CH}_3\text{-CH} = \text{CH}_2 \end{array}$ </p> <p style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{D : CH}_3\text{-CH-CH}_3 \\ \\ \text{OH} \end{array}$ </p> <p>A and D are position isomers.</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p>

16.	<p>$C_6H_5CH_2Cl$ will undergo S_N1 reaction faster. The carbocation formed by $C_6H_5CH_2Cl$ gets stabilized through resonance. Greater the stability of carbocation, greater will be its ease of formation from the respective halide.</p> 	<p>$\frac{1}{2}$ $\frac{1}{2}$ 1 1</p>
OR		
	<p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3-\text{CH}-\text{CH}_2\text{Cl} \end{array}$ </p> <p style="text-align: center;">$\text{CH}_2\text{Cl}-\text{CH}_2-\text{CH}_2\text{Cl}$</p> <p style="text-align: center;">$\text{CH}_3-\text{CH}_2-\text{CHCl}_2$</p> <p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3-\text{C}-\text{CH}_3 \\ \\ \text{Cl} \end{array}$ </p> <p>The following isomer will exhibit enantiomerism:</p> <p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3-\text{CH}-\text{CH}_2\text{Cl} \end{array}$ </p> <p>IUPAC name: 1,2-Dichloropropane.</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$</p>
17.(a)		1
(b)	$\text{HOOC}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COOH}$	1

(c)		1
18.(i)	It is unstable at cooking temperature.	1
(ii)	Excessive hydrogencarbonate can make the stomach alkaline and trigger the production of even more acid. Metal hydroxides being insoluble do not increase the pH above neutrality.	1
(iii)	Aspirin has anti blood clotting action.	1
19.(a)	Amylopectin.	1
(b)	C- 2	1
(c)	Two peptide linkages.	1
OR		
(1) Glucose does not give 2,4- DNP test.		1
(2) Glucose does not give Schiff's test.		1
(3) The pentaacetate of glucose does not react with hydroxylamine.		1
(4) Glucose does not form the hydrogensulphite addition product with NaHSO ₃ . (Any three points)		
20.	$2\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{N}_2\text{O}_4(\text{g}) + \text{O}_2(\text{g})$ <p>At t = 0 0.5 atm 0 atm 0 atm</p> <p>At time t 0.5 - 2x atm 2x atm x atm</p> $P_t = P_{\text{N}_2\text{O}_5} + P_{\text{N}_2\text{O}_4} + P_{\text{O}_2}$ $= (0.5 - 2x) + 2x + x = 0.5 + x$ $x = P_t - 0.5$ $P_{\text{N}_2\text{O}_5} = 0.5 - 2x$ $= 0.5 - 2(P_t - 0.5)$ $= 1.5 - 2P_t$ <p>At t = 100 s ; $P_t = 0.512$ atm</p> $P_{\text{N}_2\text{O}_5} = 1.5 - 2 \times 0.512 = 0.476 \text{ atm}$ $k = \frac{2.303}{t} \log \frac{P_i}{P_A}$ $k = \frac{2.303}{100\text{s}} \log \frac{0.5 \text{ atm}}{0.476 \text{ atm}}$ $k = \frac{2.303}{100\text{s}} \times 0.0216 = 4.98 \times 10^{-4} \text{ s}^{-1}$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p>
OR		
The Arrhenius equation: $k = A e^{-E_a/RT}$		1
Taking log on both sides: $\log k = \log A - \frac{E_a}{2.303RT}$		

	<p>For reaction (i) $\log k_1 = \log A - \frac{E_a(1)}{2.303RT}$</p> <p>For reaction (ii) $\log k_2 = \log A - \frac{E_a(2)}{2.303RT}$</p> <p>Subtracting (i) from (ii)</p> $\log \frac{k_1}{k_2} = \frac{E_a(1) - E_a(2)}{2.303RT}$ $= \log \frac{k_1}{k_2} = \frac{24.9 \times 1000}{2.303 \times 8.3 \times 300} = 4.342$ $\frac{k_1}{k_2} = \text{anti log}(4.342) = 2.198 \times 10^4$	1
	<p>Subtracting (i) from (ii)</p> $\log \frac{k_1}{k_2} = \frac{E_a(1) - E_a(2)}{2.303RT}$ $= \log \frac{k_1}{k_2} = \frac{24.9 \times 1000}{2.303 \times 8.3 \times 300} = 4.342$ $\frac{k_1}{k_2} = \text{anti log}(4.342) = 2.198 \times 10^4$	1
21.		
(a)	Negative charge is developed on the sol. Sol is represented as AgI / I^-	$\frac{1}{2}$ $\frac{1}{2}$
(b)	Adsorption of reactants on the solid surface of the catalysts increases the rate of reaction.	1
(c)	Na_3PO_4 Hardy-Schulze rule	$\frac{1}{2}$ $\frac{1}{2}$
22.		
(a)	Leached gold complex is treated with Zinc and gold is recovered by displacement method $2\text{Au}[(\text{CN})_2]^- (\text{aq}) + \text{Zn}(\text{s}) \rightarrow 2\text{Au}(\text{s}) + [\text{Zn}(\text{CN})_4]^{2-} (\text{aq})$	$\frac{1}{2}$ $\frac{1}{2}$
(b)	Zirconium iodide is decomposed on a tungsten filament; electrically heated to 1800 K. Pure Zr metal is deposited on the filament. $\text{ZrI}_4 \rightarrow \text{Zr} + \text{I}_2$	$\frac{1}{2}$ $\frac{1}{2}$
(c)	Silica is added to the ore and heated. It helps to slag off iron oxide as iron silicate $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3 (\text{slag})$	$\frac{1}{2}$ $\frac{1}{2}$
	OR	
(a)	NaCN is used as depressants to separate two sulphide ores (ZnS and PbS) in Froth Flootation Method.	(1)
(b)	Carbon monoxide forms a volatile complex of nickel, nickel tetracarbonyl.	(1)
(c)	Coke is used as a reducing agent to reduce zinc oxide to zinc.	(1)
23.		
(a)	$\text{Co}^{2+} : [\text{Ar}]3d^7$ $\text{Sc}^{3+} : [\text{Ar}]3d^0$ $\text{Cr}^{3+} : [\text{Ar}]3d^3$ Co^{2+} and Cr^{3+} have unpaired electrons. Thus, they are coloured in aqueous solution. Sc^{3+} has no unpaired electron. Thus it is colourless.	1
(b)	Metal copper has high enthalpy of atomisation and enthalpy of ionisation. Therefore the high energy required to convert $\text{Cu}(\text{s})$ to $\text{Cu}^{2+}(\text{aq})$ is not balanced by its hydration enthalpy.	1

(c)	Due to lanthanoid contraction the size of lanthanoid ion decreases regularly with increase in atomic size. Thus covalent character between lanthanoid ion and OH^- increases from La^{3+} to Lu^{3+} . Thus the basic character of hydroxides decreases from $\text{La}(\text{OH})_3$ to $\text{Lu}(\text{OH})_3$	1									
24.	<p>(a) Isomer A: $[\text{Cr}(\text{NH}_3)_4 \text{BrCl}] \text{Cl}$ Isomer B: $[\text{Cr}(\text{NH}_3)_4 \text{Cl}_2] \text{Br}$</p> <p>(b) Hybridisation of Cr in isomer A and B is d^2sp^3.</p> <p>(c) Number of unpaired electrons in $\text{Cr}^{3+}(3d^3)$ is 3 Magnetic moment = $\sqrt{n(n+2)}$ $= \sqrt{3(3+2)} = 3.87 \text{ BM}$ (deduct half mark for wrong unit/unit not written)</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>									
25.(a)	<p>A = AgNO_2</p> <p>B = </p> <p>C = </p> <p>D = $\text{CHCl}_3 + \text{KOH}$, Heat.</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>									
(b)	<table border="1"> <thead> <tr> <th>Experiment</th> <th>Aniline</th> <th>Benzylamine</th> </tr> </thead> <tbody> <tr> <td>(i) Azo dye test: Dissolve the amine in HCl, cool it and then add cold aqueous solution of NaNO_2 and then solution of β-naphthol</td> <td>A brilliant orange red dye is observed.</td> <td>No dye is formed.</td> </tr> <tr> <td>(ii) Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat (or any other suitable test)</td> <td>A foul smelling substance (isocyanide)</td> <td>No reaction.</td> </tr> </tbody> </table>	Experiment	Aniline	Benzylamine	(i) Azo dye test: Dissolve the amine in HCl, cool it and then add cold aqueous solution of NaNO_2 and then solution of β -naphthol	A brilliant orange red dye is observed.	No dye is formed.	(ii) Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat (or any other suitable test)	A foul smelling substance (isocyanide)	No reaction.	<p>1</p> <p>1</p>
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(c)	A = CH ₃ CH ₂ CH ₂ NH ₂ B = CH ₃ CH ₂ CH ₂ OH	½ ½
OR		
(a)(i)	In strongly acidic medium, aniline is protonated to form the anilium ion which is meta directing.	1
(ii)	Aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.	1
(b)(i)	$\text{CH}_3\text{-COOH} \xrightarrow{\text{NH}_3, \Delta} \text{CH}_3\text{-CO-NH}_2 \xrightarrow{\text{NaOH} + \text{Br}_2} \text{CH}_3\text{NH}_2$	1
(ii)		1
(c)	p- Nitroaniline < Aniline < p- Toludine.	1
26.(a)	E _{cell} decreases.	1
(b)	Anode: Cl ₂ ↑ Cathode : H ₂ ↑	½ ½
(c)	Cu ²⁺ (aq.) + Ni(s) → Ni ²⁺ (aq.) + Cu(s)	½
	$E^0_{\text{cell}} = E^0_{\text{cathode}} - E^0_{\text{anode}}$ $E^0_{\text{cell}} = 0.34 - (-0.25)$ $E^0_{\text{cell}} = 0.59\text{V}$	½
	$E_{\text{cell}} = E^0_{\text{cell}} - \frac{2.303RT}{nF} \log \frac{[\text{Ni}^{2+}]}{[\text{Cu}^{2+}]}$	½
	$E_{\text{cell}} = 0.59 - \frac{0.059}{2} \log \frac{[0.01]}{[0.1]}$	½
	E _{cell} = 0.6195V	½ + ½
OR		
(a)	Λ ⁰ _{m(CaCl₂)} = λ ⁰ _{Ca²⁺} + 2λ ⁰ _{Cl⁻}	1
(b)	Conductivity of NaCl decreases on dilution as the number of ions per unit volume decreases.	1

	Whereas molar conductivity of NaCl increases on dilution as on dilution the interionic interactions are overcome and ions are free to move.	1
(c)	$G^* = \kappa R$ $\kappa = \frac{1.29}{100} = 0.0129 \text{ S cm}^{-1}$ $\Lambda_m = \frac{1000 \kappa}{C}$ $\Lambda_m = \frac{1000 \times 0.0129}{0.1}$ $\Lambda_m = 129 \text{ S cm}^2 \text{ mol}^{-1}$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>
27.		
(a)	(i) S atom in SF ₄ is not sterically protected as it is surrounded by only four F atoms, so attack of water molecules can take place easily. In contrast, S atom in SF ₆ is protected by six F atoms. Thus attack by water molecules cannot take place easily.	1
	(ii) Chlorine water produces nascent oxygen (causes oxidation) which is responsible for bleaching action. $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow 2\text{HCl} + [\text{O}]$	1
	(iii) Due to inert pair effect Bi(V) can accept a pair of electrons to form more stable Bi(III). (+3 oxidation state of Bi is more stable than its +5 oxidation state).	1
(b)	(i) Phosphorus undergoes disproportionation reaction to form phosphine gas. $\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} \rightarrow \text{PH}_3 + 3\text{NaH}_2\text{PO}_2$	1
	(ii) On partial hydrolysis, XeF ₆ gives oxyfluoride XeOF ₄ and HF. $\text{XeF}_6 + \text{H}_2\text{O} \rightarrow \text{XeOF}_4 + 2\text{HF}$	1
	OR	
(a)	N. Bartlett first prepared a red compound O ₂ ⁺ PtF ₆ ⁻ . He then realised that the first ionisation enthalpy of molecular oxygen was almost identical with Xenon. So he carried out reaction between Xe and PtF ₆ .	1
(b)	(i) I ₂ < F ₂ < Br ₂ < Cl ₂	1
	(ii) NH ₃ > PH ₃ > AsH ₃ > SbH ₃ > BiH ₃	1
(c)	(i) $2\text{NaOH} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$	1
	(ii) $2\text{Fe}^{3+} + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Fe}^{2+} + \text{SO}_4^{2-} + 4\text{H}^+$	1
