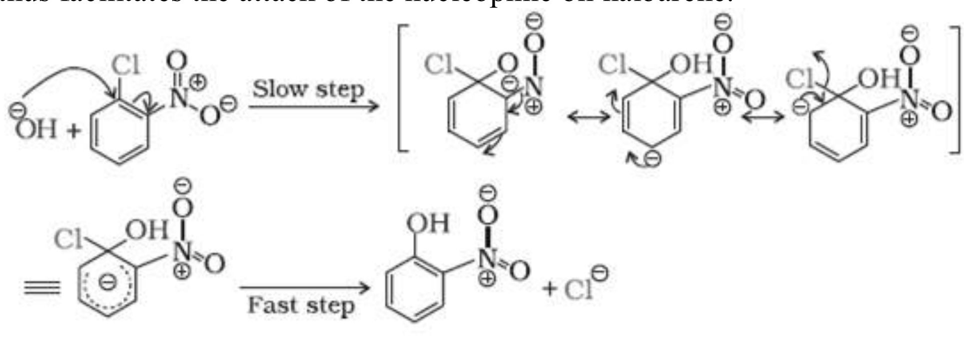
MARKING SCHEME

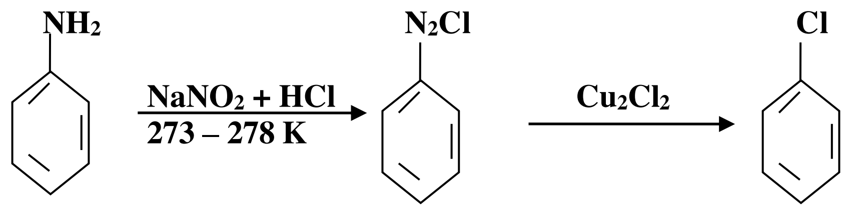
SAMPLE PAPER 1

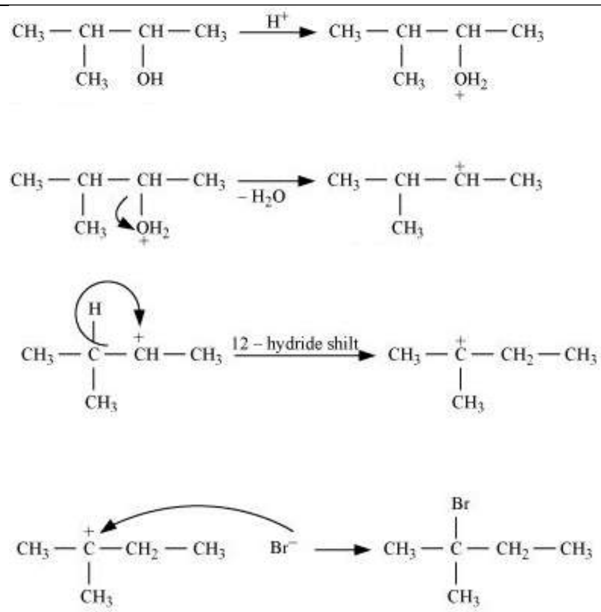
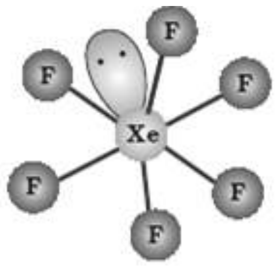
SECTION A

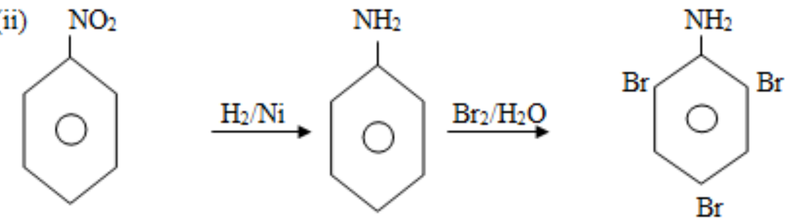
Q.No.	Value Point	Marks
1(i)	D	1
(ii)	B OR A	1
(iii)	B	1
(iv)	C	1
2(i)	B	1
(ii)	A	1
(iii)	A	1
(iv)	A or B	1
3	C	1
4	D or C	1
5	C	1
6	B OR B	1
7	B OR D	1
8	A OR A	1
9	C	1
10	A	1
11	A	1
12	A	1
13	D	1
14	B OR B	1
15	B	1
16	A	1

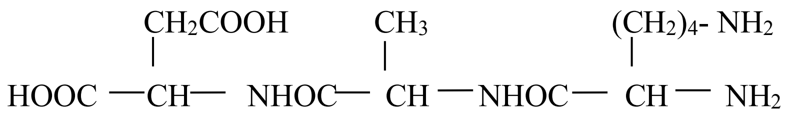
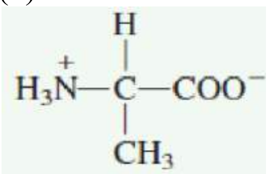
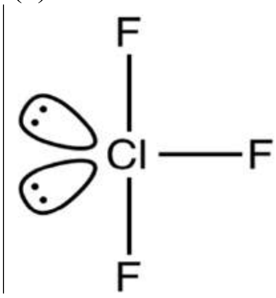
SECTION B, C, D

Q.No.	VALUE POINTS	MARKS
	SECTION B	
17	Nitro group at ortho position withdraws the electron density from the benzene ring and thus facilitates the attack of the nucleophile on haloarene.  **OR**	2

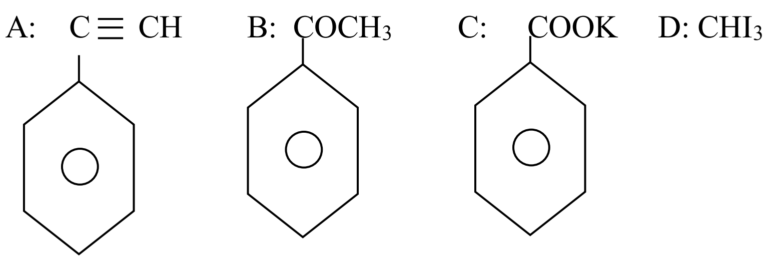
	(i)  (ii) $CH_3CH(Br)CH_3 \xrightarrow{\text{alc KOH}} CH_3CH{=}CH_2 \xrightarrow{\text{HBr, organic peroxide}} CH_3CH_2CH_3Br$	1 1
18	$\Delta T_b = K_f m$ $\Delta T_b = 101.04-100 = 1.04\,^{o}C$ or m= 1.04 /0.52 = 2 Relative lowering of VP = x2 Relative lowering of VP = n2/n1+n2 = 2/ 2+55.5 = 2/57.5 = 0.034 atm	 1 1/2 1/2
19	(i)$t_{2g}^{4}e_{g}^{2}$ Paramagentic (ii)Dichloridobis(ethane-1,2-diamine)cobalt(III)nitrate OR (i)Square planar (ii)$Cu^{2+} = 3d^9$ 1 unpaired electron so $\sqrt{1(3)} = 1.73$BM	½, ½ 1 1 1
20	Reaction is a complex reaction. Order of reaction is 1.5. Molecularity cannot be 1.5, it has no meaning for this reaction. The reaction occurs in steps, so it is a complex reaction. (ii)units of k are $mol^{-1/2}L^{1/2}s^{-1}$ OR Ans : let the rate law expression be Rate = k $[P]^x[Q]^y$ from the table we know that Rate 1 = $3.0 \times 10^{-4} = k (0.10)^x (0.10)^y$ Rate 2 = $9.0 \times 10^{-4} = k (0.30)^x (0.30)^y$ Rate 3 = $3.0 \times 10^{-4} = k (0.10)^x (0.30)^y$ Rate 1/ Rate 3 = $(1/3)^y$ or $1 = (1/3)^y$ So y = 0 Rate 2/ Rate 3 = $(3)^x$ or $3 = (3)^x$ So x = 1 Rate = k [P]	1/2 1/2 1 ½ ½ 1
21	$k = 0.693/t_{1/2}$ $k = 0.693/5730\ years^{-1}$ $t = \frac{2.303}{k} \log \frac{Co}{Ct}$ let Co = 1 Ct = 3/10 so Co/Ct = 1/ (3/10) = 10/3 $t = \frac{2.303}{0.693} \times 5730 \log \frac{10}{3}$ t = 19042 x (1-0.4771) = 9957 years	 ½ ½ ½ 1

22		½ ½ ½ ½
23	XeF_6 . Central atom Xe has 8 valence electrons, it forms 6 bonds with F and has 1 lone pair. According to VSEPR theory, presence of 6 bp and 1 lp results in distorted octahedral geometry 	1 1
24.	(a)inverted product will be given by 1 Chlorobutane as it undergoes S_N2 reaction. (b)racemic mixture will be given by 2 chloro-2-methylpropane as it undergoes S_N1 reaction	½+1/2 ½+1/2
25	Let no. of Atoms of element P be x No. of tetrahedral voids = 2x No. Of octahedral voids = x Atoms of Q = 1/3 (2x) + x = 5x/3 $P_xQ_{5x/3}$ P_3Q_5	1/2 ½ 1

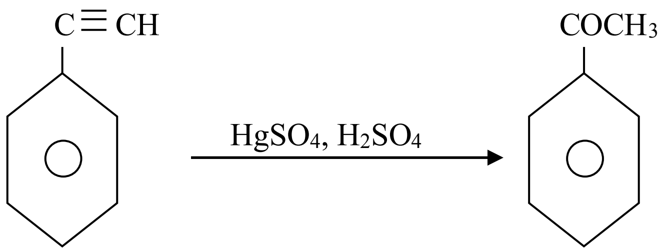
	SECTION C	
26	(i)Due to large surface area and ability to show variable oxidation states (ii)Due to high value of third ionisation enthalpy (iii) Oxidation state of Cr in Cr_2O_3 is +3 and of CrO is +2. When oxidation number of a metal increases, ionic character decreases so CrO is basic while Cr_2O_3 is amphoteric. **OR** (i) The general trend towards less negative *E* V values across the series is related to the general increase in the sum of the first and second ionisation enthalpies. (ii) The high energy to transform Cu(s) to Cu2+(aq) is not balanced by its hydration enthalpy. (iii) The stability of the half-filled *d* sub-shell in Mn^{2+} and the completely filled d^{10} configuration in Zn^{2+} are related to their more negative E^o V values	1 1 1 1 1 1
27	(i) Aniline, *N*-ethylethanamine Etanamine (ii)Ethanamine,ethanol, ethanoic acid (iii) N, N dimethylmethanamine, methanamine, N-methylmethanamine OR (i) N-methyletahnamine is a secondary amine. When it reacts with benzenesulphonyl chloride, it forms N- Ethyl -N methyl sulphonamide while and N,N-dimethyl etahnanmine is a tertiary amine it does not react with benzenesulphonyl chloride. (ii)  (iii)Butan-1-ol Alcohol forms stronger hydrogen bonds with water than formed by amine due to higher electronegativity of O in alcohol than N in amine	1 1 1 1 1 ½ ½
28	We know that $d = zM/ N_a a^3$ For fcc, z=4 therefore $d = 4 \times M / Na (3.5 \times 10^{-8})^3 g/cm^3$ For bcc, z=2 therefore $d' = 2 \times M / Na (3.0 \times 10^{-8})^3 g/cm^3$ $d/d' = 4/(3.5 \times 10^{-8})^3 / 2/(3.0 \times 10^{-8})^3 = 3.17:1$	1/2 1 1 1/2
29	(i) CH_3 CH_2–COOH $(CH_2)_4$- NH_2 HOOC —CH— NHOC— CH —NHOC— CH — NH_2	 1

	 (ii)  	1 1
30	i. Arrange the following in decreasing order of bond dissociation enthalpy $I_2 < F_2 < Br_2 < Cl_2$, ii. Bi does not form pπ-pπ bonds as its atomic orbitals are large and diffuse so effective overlapping is not possible iii.Due to small size of oxygen, it has greater elecrton electron repulsions	1 1 1
SECTION D		
31.	(i) (a) $3Cu + 8\ HNO_3(\text{dilute}) \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$ (b)  (ii)'X' is Helium It is used as a diluent for oxygen in modern diving apparatus because of its very low solubility in blood. It monoatomic having no interatomic forces except weak dispersion forces and has second lowest mass therefore bp is lowest. OR (a) H_2Te, H_2Se, H_2S, H_2O (b) $[Fe\ (H_2O)_5\ (NO)]^{2+}$ (ii) A is chlorine gas Its bleaching action is due to oxidation. $Cl_2 + H_2O \rightarrow 2HCl + O$, Coloured substance + O → Colourless substance $6\ NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$	1 1 1 1 1 1 1 1 1 1
36		

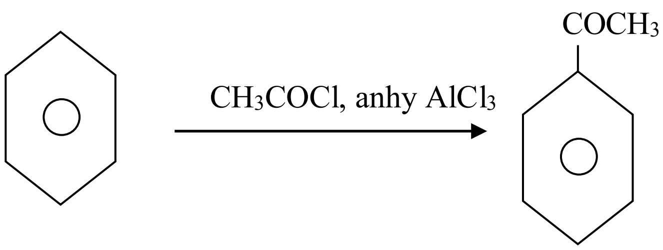
½ each



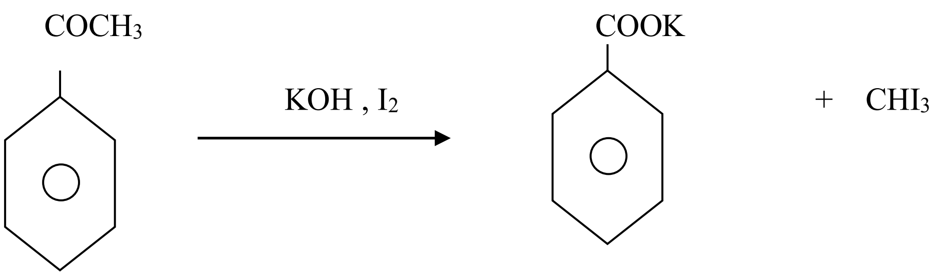
1



1



1



OR

(i) $CH_3COCH_3 + CH_3CHO$

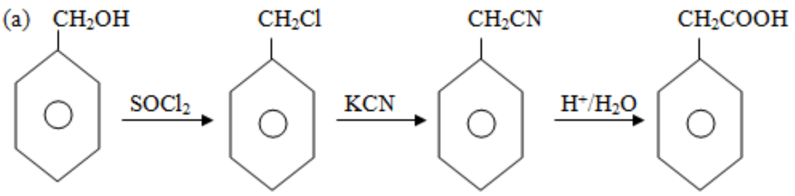
$\downarrow$ dil NaOH

$(CH_3)_2C(OH)CH_2CHO + CH_3CH(OH)CH_2COCH_3$ 1

$\downarrow$ Heat

$(CH_3)_2C{=}CHCHO + CH_3CH{=}CHCOCH_3$ 1

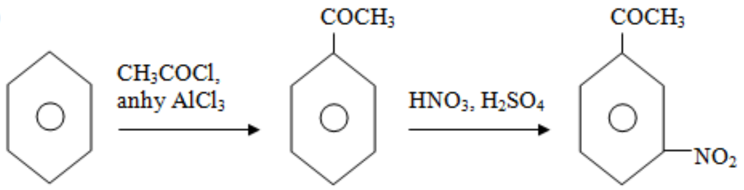
(ii) (a)



1

(b) $CH_3COCH_3 \xrightarrow{H_2,\ Pd} CH_3CH(OH)CH_3 \xrightarrow{H_2SO_4} CH_3CH{=}CH_2$ 1

(c)



1

37

(i) limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. 1

(ii) E^ocell = E^ocathode $-E^o$anode = 0.34-(-1.66) = 2.00 V

$$Ecell = E^ocell - \frac{0.059}{n} \log \frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$$ 1/2

1

Here n = 6 ½

$$Ecell = 2 - \frac{0.059}{6} \log \frac{[0.15]^2}{[0.025]^3}$$ 1

= 2 – 0.059/6 (2log 0.15 – 3 log 0.025)

= 2 – 0.059/6 (-1.6478 +4.8062) = 2- 0.0311 = 1.9689V

1

OR

(i) MnO_4^- 1

(ii)(a) Molar conductivity of a solution at a given concentration is the conductance of the volume *V* of solution containing one mole of electrolyte kept between two electrodes with area of cross section *A* and distance of unit length. 1

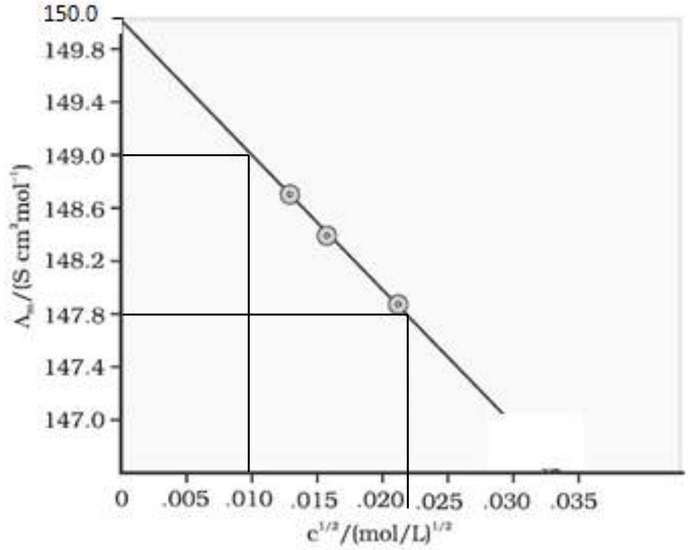
(b)Strong electrolyte, For strong electrolytes, Λm increases slowly with dilution 1

(c) $\Lambda m = \Lambda m° - A\, c^{½}$

Therefore $\Lambda m° = 150\ S\ cm^2\ mol^{-1}$ 1

(d)

1



$A = -\ \text{slope} = -\ (149 - 147.8/\ 0.010\text{-}0.022) =\ 100\ \text{S cm}^2\ \text{mol}^{-1}/(\text{mol/L}^{-1})^{1/2}$.