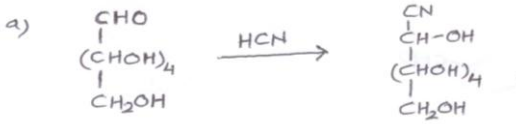
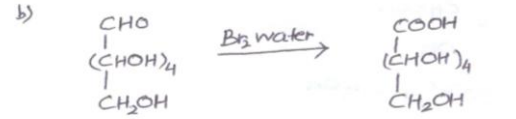
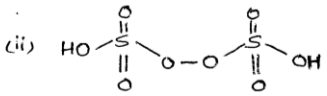
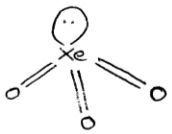
CHEMISTRY MARKING SCHEME
FOREIGN-2013
SET-56/2/3

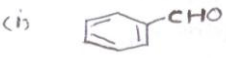
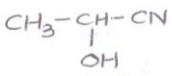
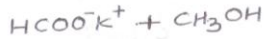
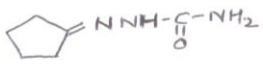
Q no.	Answers	Marks
1	4	1
2	2,4-dinitrochlorobenzene / 1-chloro-2,4-dinitrochlorobenzene	1
3	Caprolactam	1
4	Because of resonance.	1
5	Osmotic pressure	1
6	Phenol < 4-nitrophenol < 2,4,6-trinitrophenol	1
7	$C_6H_5CH_2COOH$	
8	Van Arkel refining method / vapour phase refining method.	1
9	KCl , Because on dissociation KCl provides double the number of particles than glucose.	1 1
10	a)  b) 	1 1
11	1) Buna-S < Polythene < nylon-6,6 2) Neoprene < PVC < Nylon-6	1+1
12	Alumina is leached out by using conc. NaOH solution to sodium aluminate and silica as sodium silicate. $Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na[Al(OH)_4]$ Aluminium hydroxide or hydrated alumina is then ppt. by passing CO_2 gas whereas sodium silicate remained in solution. Aluminium hydroxide is ignited to get pure alumina. (or explained in any other correct suitable manner) OR	2
12	(a) Cu_2S+FeS 1	1

	(b) Depressant is used to separate sulphide ore selectively from a mixture of two sulphide ores.	1
13	a) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$ $t = \frac{2.303}{60\ s^{-1}} \log 10$ **t = 0.0383sec**	½ 1 ½
14	DNA 1. It is 2-deoxyribo neuclic acid 2. It contains Thymine base 3. Double stranded RNA 1. It is ribonucleic acid 2. It contains Uracil base 3. Single stranded (any two)	1+1
15	a) Peptization takes place. b) Because of larger surface area.	1 1
16	Dispersed Phase / Dispersion Medium (i) Cheese: Liquid / Solid (ii) Fog: Liquid / Gas	1+1
17	According to Henry's law, $p = k_H x_{CH_4}$ $\therefore \quad x_{CH_4} = \frac{p}{k_H} = \frac{760\ mm\ Hg}{4.27 \times 10^5\ mm\ Hg} = 1.78 \times 10^{-3}$ Mole fraction of methane in benzene; $x_{CH_4} = \mathbf{1.78 \times 10^{-3}}$.	½ 1 ½
18	(i) HF < HCl < HBr < HI (ii) $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$	1 1

19	i) Due to discrete tetrahedral structure and angular strain, white phosphorus is more reactive whereas red phosphorus is polymeric and therefore less reactive. ii) Because of higher charge/size ratio of Sn^{4+}. iii) Due to its ease of liberating nascent oxygen. OR	1x3=3
19	(i) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$ (ii) $XeF_2 + PF_5 \longrightarrow [XeF]^+[PF_6]^-$ (iii $NaN_3 \longrightarrow 2Na + 3N_2$	1x3=3
20	i) Retention of configuration ii)Inversion of configuration iii) Racemisation	1x3=3
21	**(a)** **(i) Geometrical isomersism** **(ii) Linkage isomerism** **(b) Chlorophyll in plants, Haemoglobin in blood, Vitamin B_{12} etc (any one)**	1 1 1
22	1) I^{st} order 2) – k 3) sec^{-1}	1x3=3

23	(i) $[PCl_4]^+[PCl_6]^-$ (ii)  (iii) 	1x3=3
24	$d = \frac{z \times M}{a^3 \times N_A}$ $2.7\ g\ cm^{-3} = \frac{z \times 27\ g\ mol^{-1}}{(4.05 \times 10^{-8}\ cm)^3 \times 6.022 \times 10^{23}\ mol^{-1}}$ $z = \frac{2.7\ g\ cm^{-3} \times 6.022 \times 10^{23}\ mol^{-1} \times (4.05 \times 10^{-8}\ cm)^3}{27\ g\ mol^{-1}}$ $z \approx 4$ **Hence the cubic unit cell is f.c.c.**	½ 1 ½ 1
25	i) Helping, caring and setting an example of true friendship. ii) Tranquilizers iii) Because in excess it act as poison and can harm the nervous system.	1x3=3

26	(i) $C_6H_5NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} C_6H_5N_2^+Cl^- \xrightarrow{KI} C_6H_5I$ (ii) $CH_3CH_2CN \xrightarrow[(Partial)]{H_2O/H^+} CH_3CH_2CONH_2$ (iii) $C_6H_5N_2^+Cl^- \xrightarrow{CuCN} C_6H_5CN$	1x3=3
27	(i) $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{+}{\underset{H}{\ddot{O}}}-H$ (ii) $CH_3CH_2-\ddot{O}:(H) + CH_3-CH_2-\overset{+}{O}(H)(H) \rightarrow CH_3CH_2-\overset{+}{\underset{H}{O}}-CH_2CH_3 + H_2O$ (iii) $CH_3CH_2-\overset{+}{\underset{H}{O}}-CH_2CH_3 \longrightarrow CH_3CH_2-O-CH_2CH_3 + H^+$ (b) CrO_3 / $KMnO_4$/ Acidified $K_2Cr_2O_7$	½ ½ 1 1
28	i) Because of the absence of unpaired electron in the formation of metallic bond / because of non-involvment of d-orbital electrons in the formation of metallic bond. ii) Because of lanthanoid contraction. iii) Because of incomplete filling of d-orbitals. iv) Because of low $\Delta_{hyd}H^\circ$ and high $\Delta_a H^\circ$ of Cu^{2+} ion and Cu respectively. v) Because Cr^{3+} has stable t_{2g}^3 half filled configuration.	1x5=5
	OR	
28	$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$	1
	MnO_4^{2-} undergoes disproportionation reaction in acid medium to give MnO_4^- ion.	1
	$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$	1
	i) $MnO_4^- + 8H^+ + Fe^{2+} \rightarrow Mn^{2+} + Fe^{3+} + 4H_2O$	1
	ii)	

	$2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$	1
29	a) i) Because carbon of carbonyl group in ethanal is more electrophilic than of ketone due to the presence of one electron donating methyl group. ii) Because of the absence of α- hydrogen atom. iii) Because of extensive association of hydrogen bond / dimerisation in carboxylic acid b) i) Add NaOH + I_2, acetophenone gives yellow ppt. of CHI_3 whereas benzophenone does not for many ppt. ii) Add NaOH + I_2, ethanal gives yellow ppt. of CHI_3 whereas benzaldehyde does not for many ppt. **(*or any other correct suitable test*)** OR	1x3=3 1+1
29	(i)  (ii)  (iii)  (iv)  (v) 	1 x5=5

30	(a) Kohlrausch's 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. It is used to calculate Λ^0_m of even weak electrolyte./ It is used to calculate degree of dissociation. (b) **R=ρ(l/a)** **Cell constant l/a=R/ρ=Rκ** $= (1500\,\Omega) \times (0.15 \times 10^{-4}\,Scm^{-1})$ $= 0.225\,cm^{-1}$ OR	1 1 1 1 1

30

$E^{o}_{cell} = E^{o}_{cathode} - E^{o}_{anode}$

$= 0.34\ V - (-2.36)\ V$ ½
$= +2.70\ V$ ½

$E_{cell} = E^{o}_{cell} - \frac{0.059}{2} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$ 1

$E_{cell} = 2.70\ V - \frac{0.059}{2} \log \frac{(0.001\ M)}{(0.0001\ M)}$

$2.70\ V - \frac{0.059}{2} \log (10)$

$= 2.70\ V - 0.0295\ V$ 1
$= \mathbf{2.6705\ V}$

$\Delta_r G^{\circ} = - nFE^{O}_{cell}$ ½

$= - 2 \times 96500\ C\ mol^{-1} \times 2.70\ V$ 1
$= - 521.1\ kJ\ mol^{-1}$ ½

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