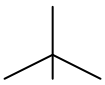
Delhi-3 2013

CHEMISTRY MARKING SCHEME
DELHI -2013
SET-56/1/3

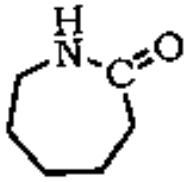
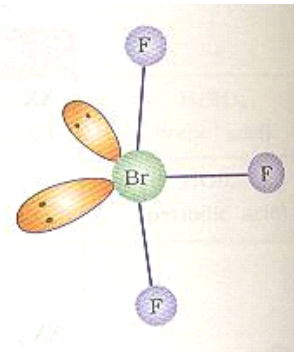
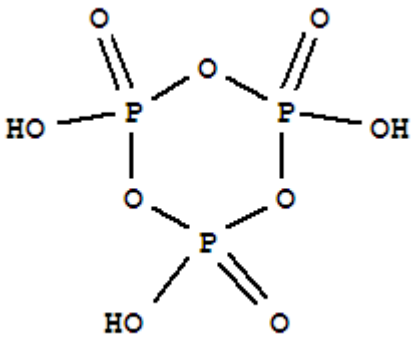
Q no.	Answers	Marks
1	Ferromagnetic	1
2	$(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$	1
3	$Cu_2S + FeS$	1
4	4	1
5	The linkage between two monosaccharide units through oxygen is called Glycosidic Linkage	1
6	2-chloro-3-methylbutane	1
7	Cl 	1
8		1
9	Multimolecular colloids is aggregation of large number of atoms or smaller molecules of a substance having size in the colloidal range. Whereas macromolecular colloid is the solution containing macromolecules in the colloidal range Multimolecular colloid: ex Gold sol, sulphur sol (or any other one correct example) Macromolecular colloid: ex Proteins, Cellulose (or any other one correct example)	½ + ½ ½ + ½
10	(a) Cu, because in +1 oxidation state it has stable $3d^{10}$ configuration. (b) Mn^{2+}, V^{3+}: because of the presence of unpaired electrons in 3d orbital. (if only one ion is mentioned deduct ½ mark)	½ + ½ ½ + ½

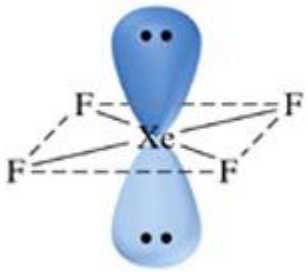
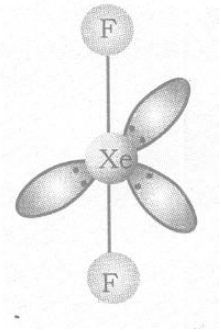
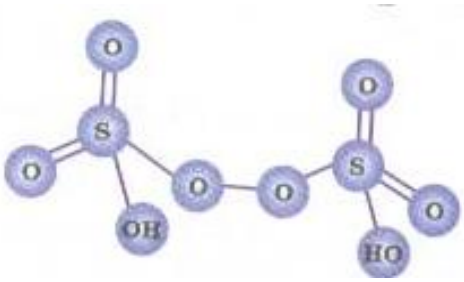
11	(i) $PCl_5 \xrightarrow{heat} PCl_3 + Cl_2$ (ii) $4H_3PO_3 \xrightarrow{heat} 3H_3PO_4 + PH_3$ (Full marks may be given if equation is not balanced)	1 1
12	$\Delta T_b = K_b \, m$ $T_b - T_b^0 = 0.52 \text{ K kg mol}^{-1} \times \frac{18 \text{ g}}{180 \text{ g mol}^{-1}} \times \frac{1}{1 \text{ kg}}$ $T_b - 373.15 \text{ K} = 0.052 \text{ K}$ **$T_b = 373.202$ K**	½ ½ ½ ½
13	(i) $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{+}{\underset{H}{\ddot{O}}}-H$ (ii) $CH_3CH_2-\ddot{O}: + CH_3-CH_2-\overset{+}{O}(H)(H) \rightarrow CH_3CH_2-\overset{+}{\underset{H}{O}}-CH_2CH_3 + H_2O$ (iii) $CH_3CH_2-\overset{+}{\underset{H}{O}}-CH_2CH_3 \longrightarrow CH_3CH_2-O-CH_2CH_3 + H^+$	½ ½ 1
14	(a) Si, Ge, B, Ga, In (any one example) (b) To lower the mp of mix / It acts as electrolyte / It acts as solvent for alumina	1+1
15	**(i) Smoke — Dispersed phase: Solid — Dispersion Medium: Gas** **(ii) Milk — Dispersed phase: Liquid — Dispersion Medium: Liquid**	1 1

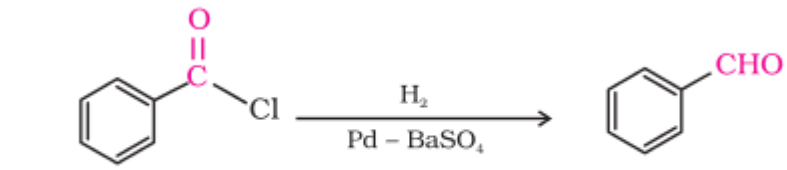
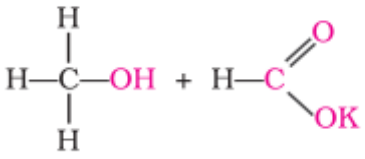
	OR **Lyophilic sols are solvent attracting sols whereas Lyophobic sols are Solvent repelling sols** **Lyophobic sols can be easily coagulated**	½ + ½ 1
16	$\Lambda_m = \kappa / C$ $\Lambda_m = \frac{0.025\ S\ cm^{-1}}{0.20\ mol\ L^{-1}}$ $\Lambda_m = 125\ S\ cm^2\ mol^{-1}$ (deduct ½ mark for wrong or no unit)	½ ½ 1
17	(i) Due to Resonance, or diagrammatic representation C-Cl bond length acquires double bond character in chlorobenzene and hence shorter than C-Cl bond length of CH_3- Cl. or explanation based on hybridisation. (ii) Because in the presence of light, chloroform forms phosgene which is a poisonous gas or explained with equation.	1+1
18	$CH_3-CH=CH_2 \xrightarrow[\text{Peroxide}]{HBr} CH_3-CH_2-CH_2-Br \xrightarrow{aq.\ KOH} CH_3-CH_2-CH_2-OH$ $CH_3-CHO \xrightarrow[(ii)\ H_2O]{(i)\ CH_3MgBr} CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$ (or by any other correct suitable method)	1+1

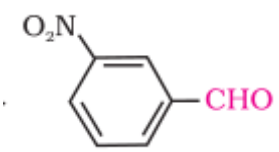
19	(i) Sonali: Concerned for the society, socially active and helpful to others. Principal: Caring, commanding and serious about the welfare of students. (or any other suitable values) (ii) Vitamins B and C	1 1 ½ + ½
20	(i) Due to incomplete filling of d-orbitals, transition metals show variable oxidation states. (ii) Because of Lanthanoid Contraction. (iii) Because of their ability to show multiple / variable oxidation states. OR	1 x 3=3
20	(i) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ (ii) $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$ (iii) $2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$ (Accept only balanced equation)	1 x 3=3
21	(a) Sodium Benzoate (b) To impart antiseptic properties (c) Tranquilizers	1 x 3=3
22	(a) p-type semiconductor (b) Ferromagnetism (c) Impurity defect / Cation vacancy defect	1x3=3
23	(i) A=CH_3CH_2CN B=$CH_3CH_2CH_2NH_2$ C=$CH_3CH_2CH_2OH$ (ii) A=CH_3CONH_2 B=CH_3-NH_2 C=CH_3-NC	½+½+½ ½+½+½
24	(i) Triammine trichloridochromium(III) (ii) Potassium hexacynoferrate(III) (iii) Dibromidobis-(ethane-1,2-diamine) cobalt(III) / Dibromidobis-(ethylenediamine) cobalt(III)	1 1 1
25	When K_2SO_4 is dissolved in water, ions are produced. Total number of ions produced = 3	

	i = 3	½
	$\pi = i\,CRT = i \times \frac{n}{V} \times R \times T$	½
	$\pi = 3 \times \frac{2.5 \times 10^{-2}\ g}{174\ g\ mol^{-1}} \times \frac{1}{2L} \times 0.0821\ L\,at\,mK^{-1}\ mol^{-1} \times 298\ K$	1
	$\pi = 5.27 \times 10^{-3}\ atm$	1
	(deduct ½ mark for wrong or no unit)	
26	The cell reaction: $Fe(s) + 2H^{+}(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$	
	$E^{o}_{cell} = 0.44\ V$	
	Nernst equation	
	$E_{cell} = E^{o}_{cell} - \frac{0.059}{2} \log \frac{[Fe^{2+}]}{[H^{+}]^2}$	1
	$E_{cell} = 0.44\ V - \frac{0.059}{2} \log \frac{(0.001\ M)}{(1\ M)^2}$	½
	$= 0.44\ V - \frac{0.059}{2} \log (10^{-3})$	½
	$= 0.44\ V + 0.0885\ V$	
	$= 0.5285\ V$	1
	(deduct ½ mark for wrong or no unit)	
27.	(i) Phenol and Formaldehyde	½ + ½
	$C_6H_5OH + HCHO$	

	(ii) Caprolactum  (iii) Ethene $CH_2 = CH_2$	½ + ½ ½ + ½
28	(i) Because of smaller size of F-atom/ shorter bond length, the electron –electron repulsion among the lone pairs is greater in F_2 than Cl_2 (ii) Due to hydrogen bonding in NH_3. (b) (i)  (ii) 	1+1

28	(iii)  OR (a) (i) Because of its low solubility in blood. (ii) Because of its highest electronegativity. (iii) Because O-O single bond is weaker than S-S single bond. (b) (i)  (ii)  	1x3=3 1x3=3 1+1

29	(a) (i) Resonating structures of carboxylate ion are more stable than phenoxide ion structures. (ii) –ve charge is dispersing on two electronegative oxygens in carboxylate ion whereas on one oxygen in phenoxide ion. (b) i) $CH_3-CO-CH_3 \xrightarrow[\text{conc. HCl}]{\text{Zn-Hg}} CH_3-CH_2-CH_3$ ii)  Benzoyl chloride Benzaldehyde iii) $CH_3-CHO \xrightarrow{\text{dil. NaOH}} CH_3-CH(OH)-CH_2-CHO \xrightarrow[-H_2O]{\Delta} CH_3-CH=CH-CHO$ (or by any other correct suitable method) OR	1+1 1x3=3
29	(a) (i)  (ii) Br-CH_2COOH	

	(iii)  (b) (i) **Ethanal and Propanal** : Ethanal gives yellow ppt of Iodoform (CHI_3) on addition of $NaOH / I_2$ whereas Propanal does not give this test. ***(or any other suitable test)*** (ii) **Benzoic acid and Phenol** : Add neutral $FeCl_3$ to both, phenol gives purple / violet colouration whereas Benzoic acid does not give this test or / Add $NaHCO_3$ to both, Benzoic acid will give brisk effervescence whereas phenol does not give this test. ***(or any other suitable test)***	1 x3=3 1+1
30	(a) (i) rate = $k[A]^2[B]$ (ii) Rate will increase 9 times of the actual rate of reaction. (iii) Rate will increase 8 times of the actual rate of reaction. (b) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$ $k = \frac{2.303}{40 min} \log \frac{100}{70}$ $k = \frac{2.303}{40} \times 0.155 = 0.00892 min^{-1}$ $t_{1/2} = \frac{0.693}{k}$ $t_{1/2} = \frac{0.693}{0.00892} min$ $t_{1/2} = 77.7 min$	1x3=3 ½ ½ ½ ½

	OR	
30	(a) $t_{99\%} = \frac{2.303}{k} \log \frac{100}{1}$ $t_{90\%} = \frac{2.303}{k} \log \frac{100}{10}$ on comparision $\frac{t_{99\%}}{t_{90\%}} = \frac{\log 100}{\log 10}$ Hence $\mathbf{t_{99\%} = 2\, t_{90\%}}$ **(or solved by any other correct suitable method)**	½ ½ ½ ½
	(b) **Slope** $= \frac{-Ea}{2.303R}$ $\mathbf{-4250\,K = -\frac{Ea}{2.303 \times 8.314\ J\,K^{-1}\ mol^{-1}}}$ **Ea = 81375 J mol^{-1} or 81.375 kJ mol^{-1}**	1 1 1

Sh. S K Munjal — Dr (Mrs.) Sangeeta Bhatia

Prof. R D Shukla — Mr. K M Abdul Raheem

Dr. K N Uppadhya — Mr. D A Mishra

Mr. Rakesh Dhawan — Mr. Deshbir Singh

Ms. Neeru Sofat — Mr. Akhileshwar Mishra

Mr. Virendra Singh