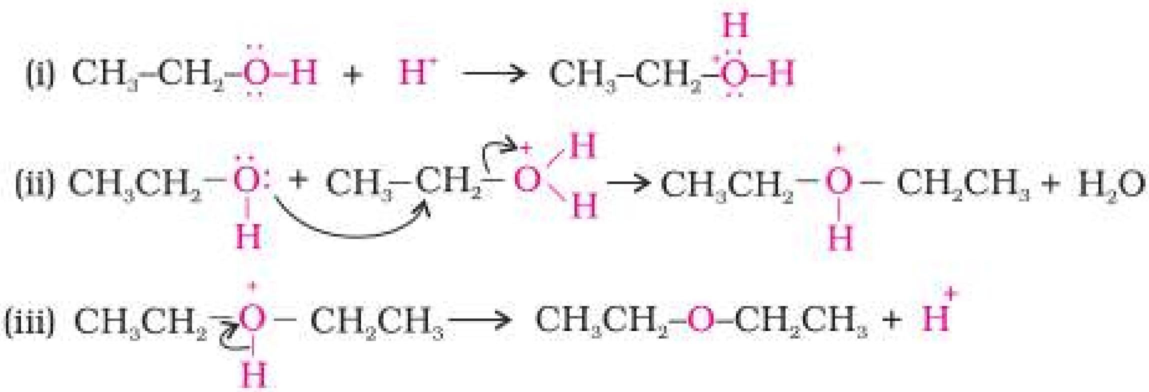
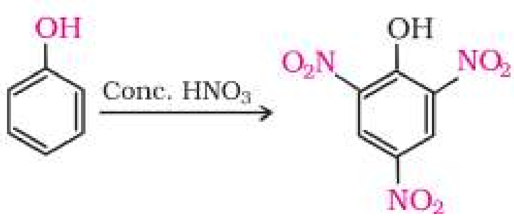
CHEMISTRY MARKING SCHEME
DELHI -2013
SET 56/1/1

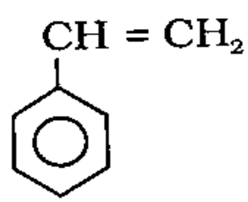
Q no.	Answers	Marks
1	4	1
2	Mond Process/ Vapour phase refining method	1
3	4	1
4	4-chloropent-1-ene	1
5	CH_3CN is formed or ethanenitrile is formed.	1
6	$H_3C-CH(CH_3)-CH_2-CHO$	1
7	$(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$	1
8	mRNA, rRNA, tRNA	1
9	$\Delta T_b = K_b\, m$ $T_b - T_b^0 = 0.52\ K\ kg\ mol^{-1} \times \frac{18\ g}{180\ g\ mol^{-1}} \times \frac{1}{1 kg}$ $T_b - 373.15\ K = 0.052\ K$ $\mathbf{T_b = 373.202\ K}$	½ ½ ½ ½
10	$\Lambda_m = \kappa / C$ $\Lambda_m = \frac{0.025\ S\ cm^{-1}}{0.20\ mol\ L^{-1}}$ $\Lambda_m = 125\ S\ cm^2\ mol^{-1}$ (deduct ½ mark for wrong or no unit)	½ ½ 1

11	**Dispersed phase** **Dispersion Medium** **(i) Smoke Solid Gas** **(ii) Milk Liquid Liquid**	 1 1
11	**OR** **Lyophilic sols are solvent attracting sols whereas Lyophobic sols are Solvent repelling sols** **Lyophobic sols can be easily coagulated.**	 ½ + ½ 1
12	(table below)	½ x4=2
13	(a) NaCN solution **(b)** CO	1+1
14	(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

Physisorption	**Chemisorption**
It is not very specific.	It is highly specific.
It is usually takes place at **low temperature** and decreases with increasing temperature.	It takes place at **high temperature**.
It is reversible.	It is irreversible.
Low enthalpy of adsorption.	High enthalpy of adsorption.

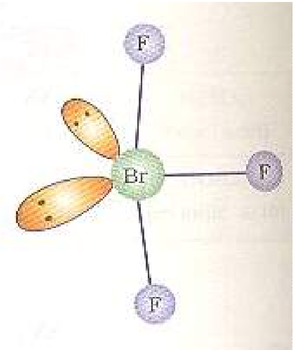
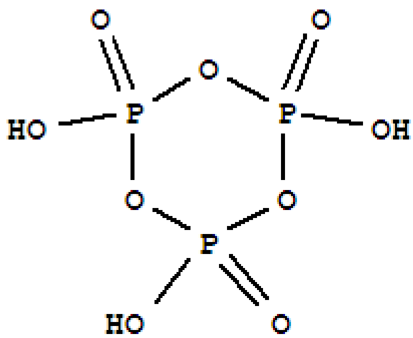
15	(a) Cu, because in +1 oxidation state it has stable $3d^{10}$ configuration. (b) Mn^{2+}, V^{3+}: because of the presence of unpaired electrons. (if only one ion is mentioned deduct ½ mark)	½ + ½ ½ + ½
16	(i) Due to resonance / diagrammatic representation, C-Cl bond acquires a partial double bond character which is difficult to cleave. (ii) Due to sp^2 hybridisation of 'C' of C-Cl bond. (iii) Due to unstable phenyl cation. (iv) Due to repulsion between nucleophile and electron rich arenes. (any two)	1+1
17		½ ½ 1
18	(i) $CH_3-CH=CH_2 \xrightarrow{H_2O/H^+} CH_3-\underset{\substack{\vert \\ OH}}{CH}-CH_3$ (ii)  (or by any other correct suitable method)	1+1

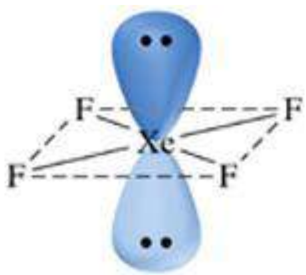
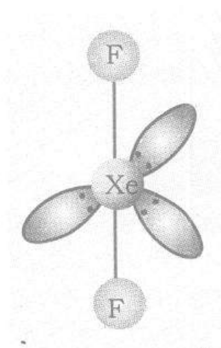
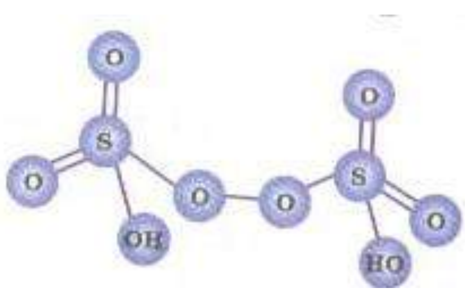
19	(a) p-type semiconductor (b) Ferromagnetism (c) Impurity defect / Cation vacancy defect	1x3=3
20	When K_2SO_4 is dissolved in water, ions are produced. Total number of ions produced = 3 **i =3** $\pi = i\,CRT \qquad = i \times \frac{n}{V} \times R \times T$ $\pi = 3 \times \frac{2.5 \times 10^{-2}\ g}{174\ g\ mol^{-1}} \times \frac{1}{2L} \times 0.0821\ L\ atm\ K^{-1}\ mol^{-1} \times 298\ K$ $\pi = 5.27 \times 10^{-3}$ atm (deduct ½ mark for wrong or no unit)	½ ½ 1 1
21	The cell reaction : $Fe(s) + 2H^+(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$ $E^o_{cell} = 0.44\ V$ Nernst equation $E_{cell} = E^o_{cell} - \frac{0.059}{2} \log \frac{[Fe^{2+}]}{[H^+]^2}$ $E_{cell} = 0.44\ V - \frac{0.059}{2} \log \frac{(0.001\ M)}{(1\ M)^2}$ $= 0.44\ V - \frac{0.059}{2} \log (10^{-3})$ $= 0.44\ V + 0.0885\ V$ **=0.5285 V** (deduct ½ mark for wrong or no unit)	1 ½ ½ 1

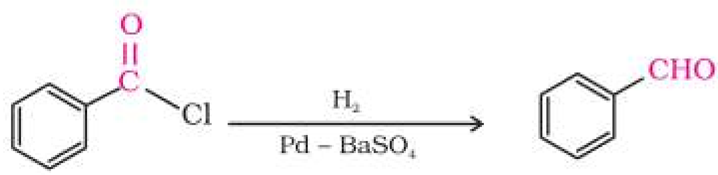
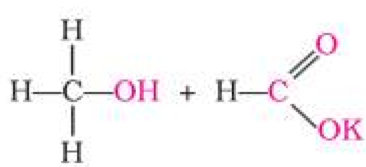
22	(i) Due to incomplete filling of d-orbitals, transition metals show variable oxidation states. (ii) Because of Lanthanoid Contraction. (iii) Because of their ability to show multiple / variable oxidation states. OR	1 x 3=3
22	(i) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ (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
23	(i) Triamminetrichloridochromium(III) (ii) Potassium hexacynoferrate(III) (iii) Dibromidobis-(ethane-1,2-diamine)cobalt(III) / Dibromidobis-(ethylenediamine)cobalt(III)	1 1 1
24	(i) A=C_6H_5CN B=C_6H_5COOH C=$C_6H_5CONH_2$ (ii) A=$C_6H_5NH_2$ B=$C_6H_5N_2^+Cl^-$ C=C_6H_5-OH	½x3=1 ½ ½x3=1 ½
25	(i) Buna-S : 1,3- Butadiene and Styrene **CH_2 = CH – CH = CH_2 and**  (ii) Neoprene: Chloroprene **CH_2 = C(Cl) – CH = CH_2**	½+ ½ ½+ ½

	(iii) Nylon-6,6: Hexamethylene diamine and Adipic acid $H_2N-(CH_2)_6-NH_2$ $HOOC-(CH_2)_4-COOH$	½+½
26	(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
27.	(a) Sodium Benzoate (b) To impart antiseptic properties (c) Tranquilizers	1 x 3=3

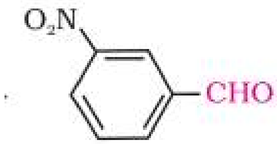
28	(a) (i) rate= $k[A]^2[B]$ (ii) Rate will increase 9 times of the actual rate of reaction. (iii) Rate will increase 8 times of the actual rate of reaction.	1x3=3
	(b) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$	½
	$k = \frac{2.303}{40 min} \log \frac{100}{70}$	
	$k = \frac{2.303}{40} \times 0.155 = 0.00892 min^{-1}$	½
	$t_{1/2} = \frac{0.693}{k}$	½
	$t_{1/2} = \frac{0.693}{0.00892} min$	
	$t_{1/2} = 77.7 min$	½
28	OR	
	(a) $t_{99\%} = \frac{2.303}{k} \log \frac{100}{1}$	½
	$t_{90\%} = \frac{2.303}{k} \log \frac{100}{10}$	½
	on comparision $\frac{t_{99\%}}{t_{90\%}} = \frac{\log 100}{\log 10}$	½
	Hence $\mathbf{t_{99\%} = 2\ t_{90\%}}$ **(or solved by any other correct suitable method)**	½

	(b) **Slope** $= \frac{-Ea}{2.303R}$ $-4250\,K = -\frac{Ea}{2.303 \times 8.314\,J K^{-1}\,mol^{-1}}$ **Ea** $= 81375\ J\ mol^{-1}$ **or** $81.375\ kJ\ mol^{-1}$	1 1 1
29.	(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

29	(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

30.	(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.	1+1
	(b) i) $CH_3\text{-}CO\text{-}CH_3 \xrightarrow[\text{conc. HCl}]{\text{Zn-Hg}} CH_3\text{-}CH_2\text{-}CH_3$ ii)  Benzoyl chloride Benzaldehyde iii) $CH_3\text{-}CHO \xrightarrow{\text{dil. NaOH}} CH_3\text{-}CH(OH)\text{-}CH_2\text{-}CHO \xrightarrow[-H_2O]{\Delta} CH_3\text{-}CH{=}CH\text{-}CHO$ (or by any other correct suitable method)	1x3 =3
	OR	
30	(a) (i)  (ii) $Br\text{-}CH_2COOH$	

(iii)



1 x3=3

(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. 1+1

(or any other suitable test)

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