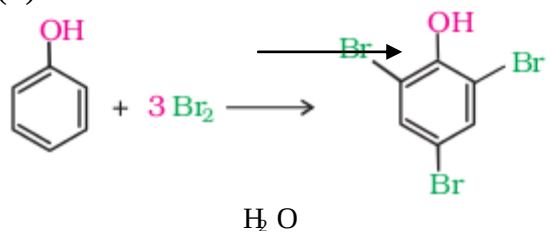
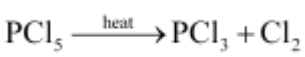
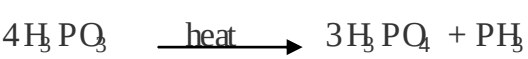
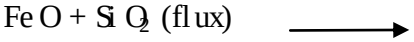
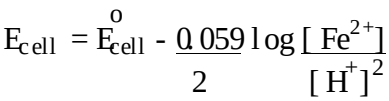
CHEMISTRY MARKING SCHEME
DELHI -2013
SET-56/1/2

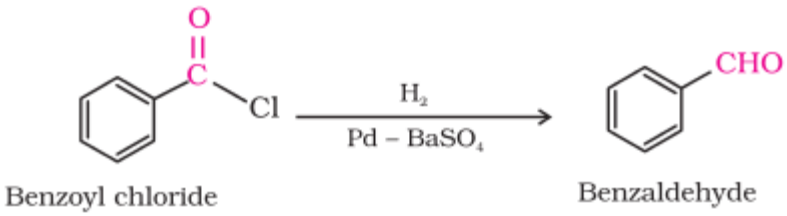
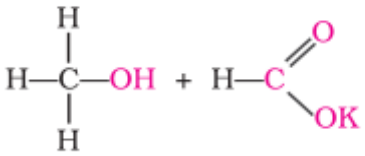
Q no.	Answers	Marks
1	Frenkel Defect	1
2	4-bromo-4-methylpent-2-ene	1
3	Mond Process/ Vapour phase refining method	1
4	Hydrogen bonding	1
5	$(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$	1
6	The first ionisation enthalpy of Xe is nearly same as that of oxygen molecule / O_2	1
7	CH_3CH_2OH or ethanol is formed	1
8	$CH_3COCH_2CH(Cl)CH_3$ or structure form	1
9	(i) $CH_3CH(OH)CH_3 \xrightarrow{CrO_3} CH_3COCH_3$ (O) (or by any other correct suitable method) (ii) 	1 1
10	(i) $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{H}{\overset{+}{\ddot{O}}}-H$ (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
11	In o/w type emulsion, oil acts as dispersed phase and water acts as dispersion medium whereas in w/o type water acts as dispersed phase and oil acts as dispersion medium. Ex. o/w: milk, vanishing cream (or any other one correct example) w/o: butter, cold cream (or any other one correct example)	½ + ½ ½ + ½

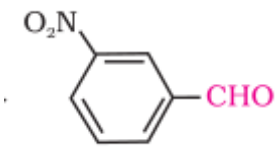
12	$\Delta T_b = K_b \, m$ $T_b - T_b^{\,0} = 0.52 \text{ K kg mol}^{-1} \times \frac{18 \text{ g}}{180 \text{ g mol}^{-1}} \times \frac{1}{1 \text{ kg}}$ $T_b - 373.15 \text{ K} = 0.052 \text{ K}$ **$T_b = 373.202$ K**	½ ½ ½ ½
13	$\Lambda_m = \kappa / C$ $\Lambda_m = \frac{0.025 \text{ S cm}^{-1}}{0.20 \text{ mol L}^{-1}}$ $\Lambda_m = 125 \text{ S cm}^2 \text{ mol}^{-1}$ (deduct ½ mark for wrong or no unit)	½ ½ 1
14	**(i) Smoke — Dispersed phase: Solid — Dispersion Medium: Gas** **(ii) Milk — Dispersed phase: Liquid — Dispersion Medium: Liquid** **OR**	1 1
14	**Lyophilic sols are solvent attracting sols whereas Lyophobic sols are Solvent repelling sols** **Lyophobic sols can be easily coagulated**	½ + ½ 1

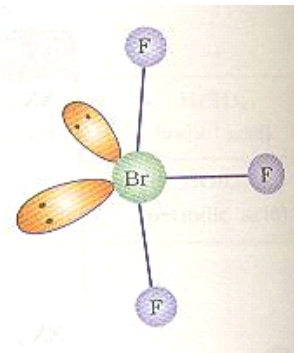
15	(i)  (ii)  (Full marks may be given if equation is not balanced)	1 1
16	(a) Cu, because in +1 oxidation state it has stable $3d^{10}$ configuration. (b) Mn^{2+}, V^{3+}: because of the presence of unpaired electrons in 3d orbital. (if only one ion is mentioned deduct ½ mark)	½ + ½ ½ + ½
17	(a) ZnS, preferential wetting of sulphide ore by oil / affinity of sulphide ore for oil. (b) Silica reacts with FeO impurity and remove it in the form of slag ($FeSiO_3$) / silica acts as a flux and removes the impurity in the form of slag / or equation 	½ + ½ 1
18	(a) Due to its symmetrical structure, p-isomer forms more compact structure / fits better in the crystal lattice. (b) Because it is a racemic mixture / does not rotate the plane polarised light / net rotation of the mixture is zero.	1+1
19	The cell reaction: $Fe(s) + 2H^+(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$ $E^o_{cell} = 0.44$ V Nernst equation 	1

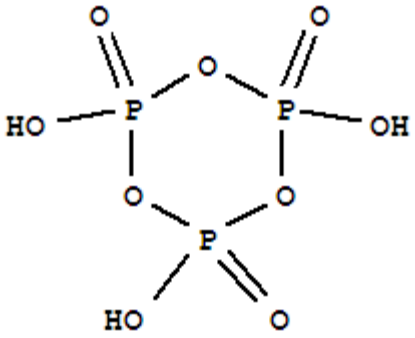
	$E_{cell} = 0.44\ V - \frac{0.059}{2} \log \frac{(0.001\ M)}{(1\ M)^2}$	½
	$= 0.44\ V - \frac{0.059}{2} \log (10^{-3})$	½
	$= 0.44\ V + 0.0885\ V$	1
	$= 0.5285\ V$ (deduct ½ mark for wrong or no unit)	
20	(i) Due to incomplete filling of d-orbitals, transition metals show variable oxidation states. (ii) Because of Lanthanoid Contraction. (iii) Because of their ability to show multiple / variable oxidation states.	1 x 3=3
	OR	
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) p-type semiconductor (b) Ferromagnetism (c) Impurity defect / Cation vacancy defect	1x3=3
22	When K_2SO_4 is dissolved in water, ions are produced. Total number of ions produced = 3	½
	$i = 3$	
	$\pi = iCRT = i \times \frac{n}{V} \times R \times T$	½

	$\pi = 3 \times \frac{2.5 \times 10^{-2}\ g}{174\ g\ mol^{-1}} \times \frac{1}{2L} \times 0.0821\ L\ at\ mK^{-1}\ mol^{-1} \times 298\ K$ $\pi = 5.27 \times 10^{-3}$ atm (deduct ½ mark for wrong or no unit)	1 1
23	(i) Styrene $C_6H_5CH=CH_2$ (ii) Ethyleneglycol and Terephthalic acid  (iii) Tetrafluoroethene $CF_2=CF_2$	½ + ½ ½ + ½ ½ + ½
24	(a) Sodium Benzoate (b) To impart antiseptic properties (c) Tranquilizers	1 x 3=3
25	(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
26	(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
27.	(i) Ionization isomerism (ii) Optical Isomerism (iii) Coordination Isomerism	1x3=3
28	(a) (i) Resonating structures of carboxylate ion are more stable than phenoxide ion structures.	

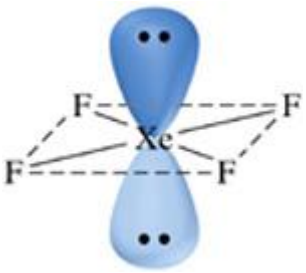
	(ii)–ve charge is dispersing on two electronegative oxygens in carboxylate ion whereas on one oxygen in phenoxide ion.	1+1
	(b)	
	i) $CH_3-CO-CH_3 \xrightarrow[\text{conc. HCl}]{\text{Zn-Hg}} CH_3-CH_2-CH_3$	
	ii)  Benzoyl chloride Benzaldehyde	
	iii) $CH_3-CHO \xrightarrow{\text{dil. NaOH}} CH_3-CH(OH)-CH_2-CHO \xrightarrow[-H_2O]{\Delta} CH_3-CH=CH-CHO$	1x3=3
	(or by any other correct suitable method)	
	OR	
28	(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
29	(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) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$ $k = \frac{2.303}{40 min} \log \frac{100}{70}$ $k = \frac{2.303}{40} \times 0.155 = 0.00892 min^{-1}$ $t_{1/2} = \frac{0.693}{k}$ $t_{1/2} = \frac{0.693}{0.00892} min$ $t_{1/2} = 77.7 min$ OR	1x3=3 ½ ½ ½ ½

29	(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)** **(b)** **Slope** $= \frac{-Ea}{2.303R}$ $\mathbf{-4250\,K = -\frac{Ea}{2.303 \times 8.314\ J\,K^{-1}\ mol^{-1}}}$ $\mathbf{Ea = 81375\ J\ mol^{-1}}$ **or** $\mathbf{81.375\ kJ\ mol^{-1}}$	½ ½ ½ ½ 1 1 1
30	(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



(iii)



1x3=3

OR

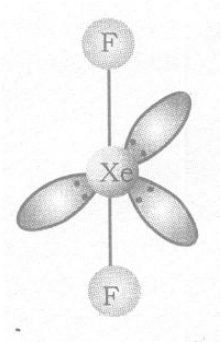
30

(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.

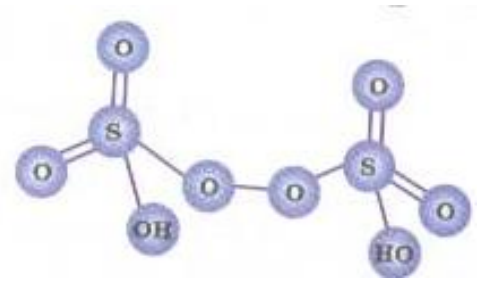
1x3=3

(b)

(i)



(ii)



1+1

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