

## SCORING KEY SAMPLE PAPER (CHEMISTRY) CLASS XII

Q.No	Answers	Marks
1.	Metal excess or anionic vacancies or F-centres	1
2.	Catalysis by zeolites which depends on the shape and size of the reactants and the products as compared to those of the pores and cavitites of zeolites.	1
3.	Neopentane or 2,2-Dimethylpropane	1
4.	3-Chloropropanamine, CH <sub>3</sub> CH(Cl)CH <sub>2</sub> NH <sub>2</sub>	1/2, 1/2
5.	Three ions $[Co(NH_3)_6]^{2+}$ , $2Cl^-$	1
6.	No, the elevation in boiling point is not the same.  Elevation in boiling point is a colligative property which depends on the number of particles. NaCl is an ionic compound which dissociates in solution to give more number of particles whereas sugar is made up of molecules and thus does not dissociate.	1/ <sub>2</sub> 11/ <sub>2</sub>
7.	<ul><li>(a) As seen from the graph, electrolyte A is a strong electrolyte which is completely ionised in solution. With dilution, the ions are far apart from each other and hence the molar conductivity increases.</li><li>(b) To determine the value of limiting molar conductivity for electrolyte B, indirect method based upon Kohlrausch law of independent migration of ions is used.</li></ul>	1
8.	<ul> <li>(a) Scandium (Sc)</li> <li>(b) KMnO<sub>4</sub> or any other suitable example</li> <li>(c) Cerium (Ce) or any other example.</li> <li>(d) Chromite ore</li> </ul>	1/2 1/2 1/2 1/2
9.	(a) $I_2 < F_2 < Br_2 < Cl_2$ (b) P:H $< ShH < AcH < DH < NH$	1
10.	(b) BiH <sub>3</sub> < SbH <sub>3</sub> < AsH <sub>3</sub> < PH <sub>3</sub> < NH <sub>3</sub> (a) 1-Methylcyclohexene	1
	(b) $C_6H_6 \xrightarrow{conc.H_2SO_4,\Delta} C_6H_5SO_3H \xrightarrow{NaOH, fuse,575K} C_6H_5ONa \xrightarrow{dil.HCl} C_6H_5OH$	1
	OR Any two isomers out of the following:  (i) CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -CH(OH)- CH <sub>3</sub> Pentan-2-ol  (ii) CH <sub>3</sub> -CH <sub>2</sub> -CH(OH)- CH <sub>2</sub> - CH <sub>3</sub> Pentan-3-ol	1/2+1/2
	(iii) $CH_3$ – $CH(CH_3)$ – $CH(OH)$ – $CH_3$ 3-Methylbutan-2-ol (iv) $CH_3$ – $CH_2$ – $C(CH_3)$ (OH) – $CH_3$ 2-Methylbutan-2-ol	1/2+1/2



11.	For the bcc structure, $z = 2$	
	Density $\rho = \frac{Z \times M}{a^3 \times N_a}$	
		1/2
	$7.2g cm^{-3} = \frac{2 \times M}{(288 \times 10^{-10} cm)^3 \times (6.022 \times 10^{23}) mol^{-1}}$	
	$-\frac{1.28 \text{ cm}}{(288 \times 10^{-10} \text{ cm})^3 \times (6.022 \times 10^{23}) \text{mol}^{-1}}$	1/2
	Or $M = 51.8 \text{ g mol}^{-1}$	1/2
	By mole concept,	
	51.8 g of the element contains $6.022 \times 10^{23}$ atoms	1/2
	208 g of the element will contain $\frac{6.022 \times 10^{23} \times 208}{51.8}$ atoms	72
	51.8 = $24.17 \times 10^{23}$ atoms.	1/2
	$=24.17 \times 10^{\circ}$ atoms.	
		1/2
12.	Molar mass of KCl = $39+35.5 = 74.5 \text{ g mol}^{-1}$	
12.	As KCl dissociates completely, number of ions produced are 2.	
	Therefore, van't Hoff factor, i=2	1/2
	Mass of KCl solution = $1000 \times 1.04 = 1040$ g	
	Mass of solvent = $1040 - 74.5 = 965.5 \text{ g} = 0.9655 \text{ kg}$	
	Molality of the solution:	1/-
	No of moles of solute 1 mol	1/2
	$\frac{No.of\ moles\ of\ solute}{Mass\ of\ solvent\ in\ kg} = \frac{1mol}{0.9655\ kg} = 1.0357\ m$	
		1/2
	$\Delta T_b = i \times K_b \times m$	
	$= 2 \times 0.52 \times 1.0357 = 1.078^{\circ} C$	1/2
	Therefore, boiling point of solution = 100 + 1.078 = 101.078 °C	1
	(deduct ½ mark if unit not written/incorrect)	
13.	Anode reaction: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$	1/2
	Cathode reaction: $Pb^{2+}(aq) + 2e^{-} \rightarrow Pb(s)$	1/2
	Cell representation: $Zn(s)/Zn^{2+}(aq)//Pb^{2+}(aq)/Pb(s)$	1/2
	According to Nernst equation:	
	$E_{cell} = E^{o}_{cell} - \frac{0.059}{n} \log \frac{[Zn^{2+}]}{[Pb^{2+}]}$	1/2
		1/
	$E_{cell} = [-0.13 - (-0.76)] - \frac{0.059}{2} \log \frac{0.1}{0.02}$	1/2
	$=0.63-0.02955 \times \log 5$	
	$=0.63-0.02955\times0.6990$	
	= 0.63 - 0.0206 = 0.6094V	1/2
4.4		
14.	<ul><li>(a) A reddish brown coloured colloidal solution is obtained.</li><li>(b) Stability of lyophilic sols is due to:</li></ul>	
	(0) Stability of Tyophilic sofs is due to.	



	(i) same charge on all the colloidal particles.	1/2+1/2
	<ul> <li>(ii) solvation of the colloidal particles.</li> <li>(c) At high pressures, amount of gas adsorbed (x/m) becomes independent of pressure (P)</li> </ul>	1
	$\frac{x}{m} = k \times P^{o}$	
15.	The feasibility of thermal reduction can be predicted on the basis of Ellingham diagram. Metals for which the standard free energy of formation ( $\Delta_f G^o$ ) is more negative can reduce those metals for which $\Delta_f G^o$ is less	1
	negative. At a given temperature, any metal will reduce the oxide of other metals which lie above it in the Ellingham diagram.	
	<ul> <li>(a) Below the temperature approx 1623K), corresponding to the point of intersection of Al<sub>2</sub>O<sub>3</sub> and MgO curves, Mg can reduce alumina.</li> <li>(b) At temperatures below 1073K, the CO,CO<sub>2</sub> line lies Fe, FeO line, thus CO</li> </ul>	1
	is a better reducing agent.  At temperatures above 1073K, Coke will reduce FeO and itself get oxidised to CO.	1
	OR	
	(a) Entropy is higher when a metal is in the liquid state than when it is in the solid state. Thus $T\Delta S$ increases, thus $\Delta G^o$ becomes more negative and the reduction becomes easier. ( $\Delta G = \Delta H - T\Delta S$ )	1
	<ul> <li>(b) Limestone provides the flux (CaO) which combines with the impurities (SiO<sub>2</sub>) to form slag (CaSiO<sub>3</sub>). Thus it helps in the removal of impurities.</li> <li>(c) Pine oil (Collector) enhances the non wettability of the ore particles,</li> </ul>	1
	which become lighter and hence rise to the surface along with the froth.	1
16.	(i)(a) $Cr^{3+}/Cr^{2+}$ has a negative reduction potential. Hence $Cr^{3+}$ cannot be reduced to $Cr^{2+}$ . $Cr^{3+}$ is most stable. $Mn^{3+}/Mn^{2+}$ have large positive $E^o$ values. Hence $Mn^{3+}$ can be easily reduced to $Mn^{2+}$ . Thus $Mn^{3+}$ is least stable. $Fe^{3+}/Fe^{2+}$ couple has a positive $E^o$ value but small. Thus the stability of $Fe^{3+}$ is	1
	more than Mn <sup>3+</sup> but less stable than Cr <sup>3+</sup> .  (b) If we compare the reduction potential values, Mn <sup>2+</sup> /Mn has the most negative value i.e its oxidation potential value is most positive. Thus its most easily oxidised. Thus the decreasing order for their ease of oxidation is Mn > Cr > Fe.	1
	(ii) K <sub>4</sub> [Mn(CN) <sub>6</sub> ] Mn is in +2 oxidation state. Magnetic moment 2.2 indicates that it has one unpaired electron and hence forms inner orbital or low spin complex. In presence of CN <sup>-</sup> is a strong ligand, hybridisation involved is d <sup>2</sup> sp <sup>3</sup> (octahedral complex)	1
17.	(i) Fe exists as Fe <sup>2+</sup> . There are 4 unpaired electrons. Water is a weak ligand. Thus the hybridisation involved is sp <sup>3</sup> d <sup>2</sup> . It is an octahedral outer orbital complex.	1
	(marks to be granted if hybridisation is depicted diagrammatically)	

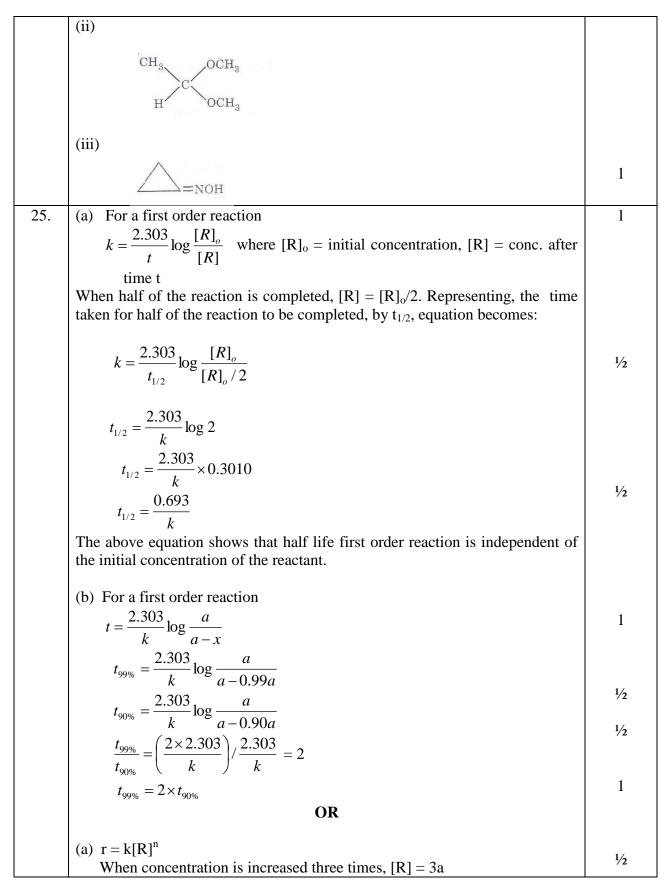


	(ii) The ionisation isomer is [Co(NH <sub>3</sub> ) <sub>5</sub> SO <sub>4</sub> ]Br. The IUPAC name is Pentaamminesulphatocobalt(III)bromide.	1
	The isomer [Co(NH <sub>3</sub> ) <sub>5</sub> Br] SO <sub>4</sub> gives a white precipitate of BaSO <sub>4</sub> with BaCl <sub>2</sub> solution whereas the isomer [Co(NH <sub>3</sub> ) <sub>5</sub> SO <sub>4</sub> ]Br does not form this precipitate.	1
	(or any other relevant test)	
18.	(a) Due to greater s-character, a sp <sup>2</sup> hybrid carbon is more electronegative than a sp <sup>3</sup> hybrid carbon. Therefore, the sp <sup>2</sup> hybrid carbon of C-Cl bond in chlorobenzene has less tendency to release electrons to Cl than a sp <sup>3</sup> hybrid carbon of cyclohexyl chloride.  ( marks to be granted if shown with the help of a figure)	1
	(b) Since the alkyl halide reacts with KOH to form a racemic mixture, it must be a $3^{\circ}$ alkyl halide and the reaction will follow $S_{\rm N}1$ mechanism.	1/2
	$CH_3$ $CH_3$ $CH_3$ $C_3H_7$ — $C$ —Br $\longrightarrow$ $C_3H_7$ — $C^+$ + Br—	
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1
	$C_3H_7$ — $C^* + OH^- \longrightarrow C_3H_7$ — $C$ — $OH$ $C_2H_5$ $C_2H_5$	1/2
19.	(a) $A - C_6H_5NH_2$ $B - C_6H_5N_2^+Cl^ C - C_6H_5-N_2-C_6H_4$ -OH (b) $A - C_6H_5CN$ $B - C_6H_5COOH$ $C - C_6H_5CONH_2$	1/2+1/2+1/2 1/2+1/2+1/2
20.	(a) A – Sucrose $(C_{12}H_{22}O_{11})$	1/2
	The mixture of D-(+)- glucose and D-(-)-Fructose is known as invert sugar.	1/2
	The linkage which holds the two monosaccharide units through oxygen atom is called glycosidic linkage.	1
	(b) The amino acids exist as dipolar zwitter ion. Due to this dipolar salt like character they have strong dipole dipole attractions Thus their melting points are higher than the corresponding haloacids which do not exist as zwitter ions.	1
21.	(a) Phenacetin is an antipyretic, while the rest are tranquilizers.	1/2+1/2
21.	(b) 0.2% solution of phenol acts as antiseptic whereas 1% solution of phenol acts as disinfectant.	1
	(c) Carbohydrates, proteins, nucleic acids, lipids (any two)	1/2+1/2
22.	(i) Since the alkyl halide is a $3^{\circ}$ halide and $C_2H_5ONa$ is a strong base, therefore elimination occurs preferably. The product obtained is 2-Methylprop-1-ene. $CH_3$ – $C(CH_3)$ = $CH_2$	1
	(ii) To prepare t-Butyl ethyl ether, the alkyl halide should be 1° i.e. chloroethane and the nucleophile should be sodium t-butoxide because the 3°	1/2+1/2



	nucleophile is able to attack 1° alkyl halide.	1
	$(CH_3)_3C - O^-Na^+ + CH_3CH_2 - Cl \rightarrow (CH_3)_3C - OCH_2CH_3$	
23.	<ul> <li>(a) The class of polymers is Biodegradable polymers.</li> <li>(b) One example of biodegradable polymers is PHBV (Poly-β-hydroxybutyrate-co-β-hydroxyvalerate).  The names of its monomers are: 3-hydroxybutanoic acid and 3-hydroxypentanoic acid</li> <li>(c) Care for environment, concern for the health of the people or any other two relevant points.</li> <li>(a) (i) The delocalisation of benzene electrons contributes little towards the stability of phenoxide ion. The carboxylate ion is much more resonance stabilized than phenoxide ion.</li> <li>(ii) Semicarbazide has two -NH<sub>2</sub> groups. One of them, which is directly</li> </ul>	1 1 1 1/2+1/2 1
	attached to C=O is involved in resonance. Thus electron density on this group decreases and it does not act as a nucleophile. In contrast, the lone pair of electrons on the other –NH <sub>2</sub> group is available for nucleophilic attack.	
	(b) (i) PhMgBr + O=C=O $\rightarrow$ PhCOOMgBr $\xrightarrow{H_2O}$ PhCOOH	1
	(ii) $2CH_{3}CHO \xrightarrow{OH^{-}} CH_{3}CH(OH) - CH_{2}CHO \xrightarrow{heat} CH_{3}CH = CH - CHO$	1
	(iii) $C_{6}H_{6} \xrightarrow{(CH_{3}CO)_{2}O, anhAlCl_{3}} PhCOCH_{3} \xrightarrow{conc.H_{2}SO_{4}+conc.HNO_{3}} m-NO_{2}C_{6}H_{4}COCH_{3}$	1
	or CH <sub>3</sub> COCl/AlCl <sub>3</sub> <b>OR</b>	
	(a) Ethanal and propanal can be distinguished by Iodoform test.  Ethanal gives a yellow precipitate of iodoform with an alkaline solution of NaOH. Propanal does not give this test.	1
	$CH_3CHO + 4NaOH + 3I_2 \rightarrow CHI_3 + HCOONa + 3H_2O + 3NaI$	
	(b) $RCH_2COOH \xrightarrow{(i)X_2, red P (ii)H_2O} RCH(X)COOH$	1/2
	The name of the reaction is Hell Vohlard Zelinsky reaction	1/2
	(c) (i) $NO_2$ $NO_2$	1
		1







	$27r = k(3a)^n$	
	$\frac{27r}{r} = \frac{k(3a)^n}{ka^n}$ or $27 = 3^n$ or $3^3 = 3^n$	1/
	T No.	1/2
	n=3	1
		1
	(b)	
	According to Arrhenius equation,	
	$\log k = \log A - \frac{E_a}{2.303RT}$	
	_10 00012	
	For uncatalysed reaction	
	(i) $\log k_1 = \log A - \frac{E_a(1)}{2303RT}$	1/2
	2.303K1	
	For catalysed reaction	1/2
	(ii) $\log k_2 = \log A - \frac{E_a(2)}{2.303RT}$	1/2
	2.303K1	
	A is equal for both the reactions.	
	Subtracting equation(i) from equation(ii)	
	$\log \frac{k_2}{k_1} = \frac{E_a(1) - E_a(2)}{2.303RT}$	
	•	
	$\log \frac{k_2}{k_1} = \frac{(75.2 - 50.14)kJ  mol^{-1}}{2.303 \times 8.314JK^{-1} mol^{-1} \times 298K}$	1
	$k_1 = 2.303 \times 8.314 JK^{-1} mol^{-1} \times 298 K$	
	$k_2$	
	$\log \frac{k_2}{k_1} = 4.39$	
	k	
	$\frac{k_2}{k_1} = anti \log(4.39)$	1
	$\kappa_1 = 2.45 \times 10^4$	
	Rate of reaction increases by $2.45 \times 10^4$ times.	
	Rate of feaction increases by 2.45×10 times.	
26.	(a) (i) $XeF_6(s) + 3H_2O(l) \to XeO_3(s) + 6HF(aq)$	1
	(ii) $4H_3PO_3 \xrightarrow{heat} PH_3 + 3H_3PO_4$	1
	(b) XeO <sub>3</sub> is isostructural with BrO <sub>3</sub> <sup>-</sup> . (pyramidal structure)	
	Xe	1
		1
	XeO <sub>3</sub>	
	Pyramidal	
	* Jamiluai	
	(c) The bond dissociation enthalpy of F-F bond is lower than that of Cl-Cl	
	bond and hydration enthalpy of F ion is much higher than that of Cl ion.	1
	oond and hydration chalapy of 1 fon is much inglici than that of Cl. 1011.	



These two factors more than compensate the less negative electron gain enthalpy of $F_2$ . Thus, $F_2$ is a stronger oxidizing agent than $Cl_2$ .	ı
(d) $H_2SO_4$ ionises in two stages and hence has two dissociation constants $K_{a_2} << K_{a_1}$	. 1
This is because the negatively charged $HSO_4^-$ ion has much less tendency to donate a proton to $H_2O$ as compared to neutral $H_2SO_4$ .	
OR	
(a) Due to stronger H-F bond than HCl bond, HF ionises less readily than HCl in aqueous solution to give H <sup>+</sup> ions. Therefore HF is a weaker acid than HCl.	1
(b) In solid state, PCl <sub>5</sub> consists of ions [PCl <sub>4</sub> ] <sup>+</sup> [PCl <sub>6</sub> ] <sup>-</sup> . On melting these ions become free to move and hence conducts electricity in the molten state.	1
(c) In SF <sub>6</sub> , S is sterically protected by six F atoms and hence does not allow H <sub>2</sub> O molecules to attack the S molecule. Also, F does not have d-orbitals to accept the electrons donated by H <sub>2</sub> O molecules.	
(d) In the structure of $H_3PO_3$ , it contains only two ionisable H-atoms which are present as -OH groups, thus it behaves as a dibasic acid.	1
(e) Except radon which is radioactive, Xenon has least ionisation energy among noble gases and hence it readily forms chemical compounds particularly with $O_2$ and $F_2$ .	