## SECOND YEAR HIGHER SECONDARY MODEL EXAMINATION 2023 – ANSWER KEY

SUBJECT: CHEMISTRY Qn. Code: SY 225

	Sub			
Qn. No.	Qns	Answer Key/Value Points	Scor e	Total
INO.			E	
		Answer any 4 questions from 1 to 5. Each carries 1 score	_	
1.		Zero	1	1
2.		Lanthanide contraction	1	1
3.		Ethylenediaminetetraacetate ion (EDTA <sup>4–</sup> )	1	1
4.		(d) Benzaldehyde	1	1
5.		(a) Chloroform	1	1
	,	Answer any 8 questions from 6 to 15. Each carries 2 scores	_	
6.		(i) Raoult's law states that for a solution of volatile liquids, the partial vapour		
		pressure of each component in the solution is directly proportional to its mole	1	
		fraction in solution.		2
		OR, the mathematical expression $p_1 = p_1^0 \chi_1$ and $p_2 = p_2^0 \chi_2$		_
		(ii) A solution of n-hexane and n-heptane OR, bromoethane and chloroethane OR,	1	
		benzene and toluene.		
7.		Two solutions having same osmotic pressure at a given temperature are called	1	
		isotonic solutions.		2
		E.g. The fluid inside our blood cells are isotonic with 0.9% (mass/volume) sodium	1	
		chloride solution.	1/	
8.		Anode reaction: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$	1/2	2
		Cathode reaction: $Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$	1/2	2
9.		Net reaction: $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$	1	
9.		For a first order reaction, $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$	1	
		Here $k = 1.15 \times 10^{-3} \text{ s}^{-1}$ , $[R]_0 = 5g$ and $[R] = 3g$		
		So, $t = 2.303 \log [R]_0$		
		$\frac{30, t - 2.303}{k} \log \frac{[t \cdot t]_0}{[R]}$	1	2
		$= 2.303 \times \log(5/3)$		
		$\frac{2.503}{1.15 \times 10^{-3}}$ $\times \frac{105(3/3)}{1.15 \times 10^{-3}}$		
		= 440.5  s		
10.		K <sub>3</sub> [Fe(CN) <sub>6</sub> ] – Potassiumhexacyanidoferrate (III)	1	
		[Ni(CO) <sub>4</sub> ] – Tetracarbonylnickel(0)	1	2
11.		Chloroform is stored in closed dark coloured bottles filled up to the neck in order to	1	
		prevent its oxidation to the poisonous gas; carbonyl chloride (COCl <sub>2</sub> ) or phosgene.		
		OR, the equation: $2CHCl_3 + O_2 $ light $\searrow$ $2COCl_2 + HCl$	2	2
12.		Phenols are acidic, due to the following reasons:		
		(i) Due to the greater electronegativity of sp <sup>2</sup> hybridized carbon atom to which	1	2
		-OH group is attached.	<u> </u>	

		(ii) The greater stability of phenoxide ion compared to phenol.  Due to these reasons, phenols readily lose H <sup>+</sup> ions and hence are more acidic.	1	
13.		The reaction of an aromatic primary amine with nitrous acid [NaNO $_2$ and HCl] at 273 to 278 K to form an aromatic diazonium salt is called diazotization. Or, the equation:	2	2
14.		halide  This is because of the presence of partially filled d orbitals in transition elements.		
14.		When an electron from a lower energy d orbital is exited to higher d level, it absorbs energy and this energy is equal to the energy of certain colours in the visible region. So the colour observed is the complementary colour of the light absorbed. OR, The colour is due to d-d transition of electrons.	2	2
15.		DNA RNA		
		1. Double stranded 2. The pentose sugar is 2-deoxy ribose 3. Nitrogen bases present are Adenine, Guanine, Cytosine Single stranded The pentose sugar is ribose Instead of Thymine, Uracil is present	2	2
		and Thymine.  [Only 2 differences required]		
		Answer any 8 questions from 16 to 26. Each carries 3 scores		
16.	(i)	(c) Lead Storage battery	1	
	(ii)	Fuel cells are galvanic cells which convert the energy of combustion of fuels (like hydrogen, methane, methanol, etc) directly into electrical energy.	1	3
	(iii)	$2H_2(g) + O_2(g) \longrightarrow 2 H_2O(I)$	1	
17.	(i)	The Arrhenius equation is $k = A.e^{-Ea/RT}$	1	
	(ii)	Activation energy is the minimum amount of kinetic energy required for the reactant molecules for effective collision.  Or, It is the energy required for the reactant molecules to form activated complex in a chemical reaction.	1	3
	(iii)	$k = [R]_0 - [R]$		
	()	t t	1	
18.	(i)	These are reactions which appear to follow higher order but actually follow first	1	
	(ii) (iii)	order kinetics.  3  5/2 OR, 2½	1 1	3
19.	(i)	Potassium permanganate is commercially prepared from $MnO_2$ . The preparation involves two steps. Step 1: Conversion of $MnO_2$ to potassium manganate ( $K_2MnO_4$ ) by fusing with KOH in presence of air.		3

		Step 2: Conversion of $K_2MnO_4$ to potassium permanganate by electrolytic oxidation or acidification.  OR, The equations: $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$	2	
		Electrolytic oxidation in $MnO_4^{2-} \xrightarrow{alkaline \ solution} MnO_4^{-}$ manganate permanganate ion		
	(ii)	O Cr 126° Cr O 2-	1	
		Dichromate ion		
20.	(i)	A double salt keeps its identity only in solid state. In solution it dissociates into component ions. E.g.: Mohr's salt [FeSO <sub>4</sub> .(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O].  A co-ordination compound or complex salt keeps its identity both in solid and solution states.	2	3
	(ii)	E.g.: potassium ferrocyanide {K <sub>4</sub> [Fe(CN) <sub>6</sub> ].	1	
21.	(i)	Alcohols react with active metals such as sodium, potassium and aluminium to liberate hydrogen gas. $2R-O-H+2Na \longrightarrow 2R-O-Na+H_2 \\ \text{Sodium} \\ \text{alkoxide}$ $6 \text{ CH}_3-C-OH+2 \text{ Al} \longrightarrow 2 \left(\begin{array}{c} \text{CH}_3 \\ \text{CH}_3-C-O \end{array}\right) \text{Al}+3\text{H}_2$	2	3
	(ii)	$\operatorname{CH_3}$ $\operatorname{CH_3}$ $\operatorname{CH_3}$ $\operatorname{tert-}$ Butyl alcohol Aluminium $\operatorname{tert-}$ butoxide  2,4,6-Trinitrophenol or, Picric acid	1	
22.		Hydroboration - oxidation reaction: Alkenes add diborane ( $B_2H_6$ ) to give trialkyl borane as the addition product. This on oxidation by hydrogen peroxide in the presence of aqueous alkali to form alcohol.  E.g.: $CH_3-CH_2+B_2H_6 \longrightarrow (CH_3-CH_2-CH_2)_3B \longrightarrow (CH_3-CH_2-CH_2-CH_2)_4$	3	3
23.	(i)	X is COOH Or, m-Nitrobenzoic acid Or, 3-Nitrobenzoic acid	1	3
			1	

(ii) Vis CH3-CH3 Or, Ethane (iii) Zis Or, Benzaldehyde  24. (j) Toluene or methyl benzene when oxidised by using chromyl chloride (CrO <sub>2</sub> Cl <sub>2</sub> ) in CS <sub>2</sub> followed by hydrolysis to give benzaldehyde. This reaction is called Etard reaction.  (ii) Ethyl acetate Or, Ethylethanoate [CH3-COOCH2-CH3] The reaction is called Esterification.  25. (j) (iii) It is used to distinguish the three types of amines. Primary amines react with Hinsberg reagent to give a precipitate of N-alkyl benzenesulphonamide, which is soluble in alkail. Secondary amines react with benzenesulphonyl chloride to give a precipitate of N,N-dialkylbenzene sulphonamide, which is insoluble in alkali. Tertiary amines do not react with benzenesulphonyl chloride.  26. (i) Vitamin A or D or E or K [Any one required] Deficiency disease of Vitamin A – Xerophthalmia C- Scurvy D – Rickets Or, Osteomalacia K – Haemophilia or increased blood clotting time [Any one required] Invertase  Answer any 4 questions from 27 to 31. Each carries 4 scores  27. (ii) Dissociation or Association of Solute in solution. It can be corrected by using van't Hoff factor. To correct abnormal molarmass, each colloigative property measurement equations are multiplied by i on RHS. i.e. Normal molar mass = i x abnormal molarmass. (iii) If there is dissociation, the value of i < 1 and for association i > 1. Desalination of sea water			Now. https://join.hssilve.in		
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D - Rickets Or, Osteomalacia   K - Haemophilia or increased blood clotting time [Any one required]   1				1	2
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<ul><li>i.e. Normal molar mass = i x abnormal molarmass.</li><li>(iii) If there is dissociation, the value of i &lt; 1 and for association i &gt; 1.</li></ul>			To correct abnormal molarmass, each colloigative property measurement equations		
(iii) If there is dissociation, the value of i < 1 and for association i > 1.			are multiplied by i on RHS.	2	4
			i.e. Normal molar mass = i x abnormal molarmass.		
Desalination of sea water 1		(iii)	If there is dissociation, the value of $i < 1$ and for association $i > 1$ .		
			Desalination of sea water	1	

28.	(i)	Galvanic cells are devices that convert chemical energy of some spontaneous redox reactions to electrical energy.	1	
	(ii)	Corrosion is a redox reaction. At a particular spot of the metal, oxidation takes place and that spot behaves as anode. Here Fe is oxidized to $Fe^{2+}$ . $2 Fe (s) \rightarrow 2 Fe^{2+} + 4 e^{-}$ Electrons released at the anodic spot move through the metal and go to another spot on the metal and reduce oxygen in presence of $H^+$ . This spot behaves as cathode. The reaction taking place at this spot is: $O_2(g) + 4 H^+(aq) + 4 e^- \rightarrow 2 H_2O(l)$ The overall reaction is: $2Fe(s) + O_2(g) + 4H^+(aq) \rightarrow 2Fe^{2+(aq)} + 2 H_2O(l)$ The ferrous ions are further oxidised to $Fe^{3+}$ which comes out as rust in the form of hydrated ferric oxide, $Fe_2O_3.x H_2O$ .	2	4
	(iii)	Methods to prevent corrosion are:  1. By coating the metal surface with paint, varnish etc.  2. By coating the metal surface with electropositive metal like zinc, magnesium etc.  3. By coating with anti-rust solution.  4. By sacrificial protection.  [Any 2 methods required]	1	
29.	(i)	$Cl$ $Pt$ $NH_3$ $NH_3$ $NH_3$ $Pt$ $Cl$ $Cl$ $NH_3$	2	
	(ii)	trans  Homoleptic complexes contain only one (same) type of ligand bonded to the central atom. E.g.: [Ni(CO) <sub>4</sub> ] OR, any other suitable example  While heteroleptic complexes contain more than one (different) types of ligands bonded to the central atom. E.g.: [Pt(NH <sub>3</sub> ) <sub>2</sub> Cl <sub>2</sub> ] OR, any other suitable example.	2	
30.	(i)	Friedel Craft's Alkylation Reaction: Chlorobenzene reacts with alkyl halide in presence of anhydrous AlCl <sub>3</sub> to form ortho and para-alkyl substituted chlorobenzene.  Cl  Cl  CH  CH  CH  CH  CH  1-Chloro-2-methylbenzene  (Minor)  1-Chloro-4-methylbenzene  (Major)	2	4
	(ii)	The major product is 1-chloro-4-methylbenzene (p-chlorotoluene). X is Phenol [ $C_6H_5$ -OH] Y is $CH_3$ -I [Methyl iodide or Iodomethane]	1	
31.	(i)	<b>Cannizzaro's Reaction</b> : Aldehydes having no α-hydrogen atom, when treated with conc. alkali, undergo self oxidation and reduction (disproportionation) to form one	1½	4

	molecule of the alcohol and one molecule of carboxylic acid salt.		
	2 HCHO Conc. KOH CH₃-OH + H-COOK		
	Formaldehyde methanol potassium formate		
(ii)	Aldol condensation Reaction: Aldehydes or ketones having at least one $\alpha$ -hydrogen		
	atom when heated with dilute alkali, we get $\alpha,\beta$ -unsaturated aldehyde or ketone.	1½	
	2CH₃-CHO (i) dil. NaOH CH₃-CH=CH-CHO		
	Ethanal (ii) Δ But-2-enal (Crotanaldehyde)		
(iii)	CH₂Cl-COOH is more acidic than CH₃-COOH	1	

