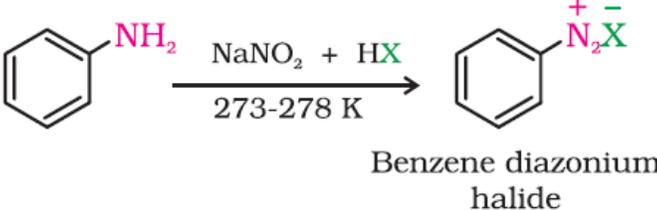
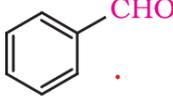
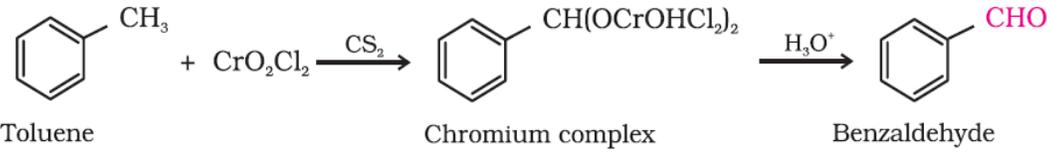


**SECOND YEAR HIGHER SECONDARY MODEL EXAMINATION 2023 – ANSWER KEY****SUBJECT: CHEMISTRY****Qn. Code: SY 225**

Qn. No.	Sub Qns	Answer Key/Value Points	Score	Total
<b>Answer any 4 questions from 1 to 5. Each carries 1 score</b>				
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
<b>Answer any 8 questions from 6 to 15. Each carries 2 scores</b>				
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 fraction in solution. 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, benzene and toluene.	1 1	2
7.		Two solutions having same osmotic pressure at a given temperature are called isotonic solutions. E.g. The fluid inside our blood cells are isotonic with 0.9% (mass/volume) sodium chloride solution.	1 1	2
8.		Anode reaction: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ Cathode reaction: $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ Net reaction: $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$	$\frac{1}{2}$ $\frac{1}{2}$ 1	2
9.		For a first order reaction, $k = \frac{2.303 \log \frac{[R]_0}{[R]}}{t}$ Here $k = 1.15 \times 10^{-3} s^{-1}$ , $[R]_0 = 5g$ and $[R] = 3g$ So, $t = \frac{2.303 \log \frac{[R]_0}{[R]}}{k}$ $= \frac{2.303}{1.15 \times 10^{-3}} \times \log(5/3)$ $= \underline{\underline{440.5 s}}$	1 1	2
10.		$K_3[Fe(CN)_6]$ – Potassiumhexacyanidoferrate (III) $[Ni(CO)_4]$ – Tetracarbonylnickel(0)	1 1	2
11.		Chloroform is stored in closed dark coloured bottles filled up to the neck in order to prevent its oxidation to the poisonous gas; carbonyl chloride (COCl <sub>2</sub> ) or phosgene. OR, the equation: $2CHCl_3 + O_2 \xrightarrow{\text{light}} 2COCl_2 + HCl$	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 -OH group is attached.	1	2

		(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 <sub>2</sub> and HCl] at 273 to 278 K to form an aromatic diazonium salt is called diazotization. Or, the equation: 	2	2								
14.		This is because of the presence of partially filled d orbitals in transition elements. When an electron from a lower energy d orbital is excited 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.		<table border="1" data-bbox="284 703 1307 976"> <thead> <tr> <th>DNA</th> <th>RNA</th> </tr> </thead> <tbody> <tr> <td>1. Double stranded</td> <td>Single stranded</td> </tr> <tr> <td>2. The pentose sugar is 2-deoxy ribose</td> <td>The pentose sugar is ribose</td> </tr> <tr> <td>3. Nitrogen bases present are Adenine, Guanine, Cytosine and Thymine.</td> <td>Instead of Thymine, Uracil is present</td> </tr> </tbody> </table>	DNA	RNA	1. Double stranded	Single stranded	2. The pentose sugar is 2-deoxy ribose	The pentose sugar is ribose	3. Nitrogen bases present are Adenine, Guanine, Cytosine and Thymine.	Instead of Thymine, Uracil is present	2	2
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<i>[Only 2 differences required]</i>												
<b>Answer any 8 questions from 16 to 26. Each carries 3 scores</b>												
16.	(i) (ii) (iii)	(c) Lead Storage battery Fuel cells are galvanic cells which convert the energy of combustion of fuels (like hydrogen, methane, methanol, etc) directly into electrical energy. $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$	1 1 1	3								
17.	(i) (ii) (iii)	The Arrhenius equation is $k = A.e^{-E_a/RT}$ 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. $k = \frac{[\text{R}]_0 - [\text{R}]}{t}$	1 1 1	3								
18.	(i) (ii) (iii)	These are reactions which appear to follow higher order but actually follow first order kinetics. 3 5/2 OR, 2½	1 1 1	3								
19.	(i)	Potassium permanganate is commercially prepared from MnO <sub>2</sub> . The preparation involves two steps. Step 1: Conversion of MnO <sub>2</sub> to potassium manganate (K <sub>2</sub> MnO <sub>4</sub> ) by fusing with KOH in presence of air.		3								

		<p>Step 2: Conversion of <math>K_2MnO_4</math> to potassium permanganate by electrolytic oxidation or acidification.</p> <p>OR, The equations:  <math>2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O</math></p> $MnO_4^{2-} \xrightarrow[\text{alkaline solution}]{\text{Electrolytic oxidation in}} MnO_4^-$ <p>manganate <span style="margin-left: 150px;">permanganate ion</span></p>	2	
	(ii)	<p style="text-align: center;">Dichromate ion</p>	1	
20.	(i)	<p>A double salt keeps its identity only in solid state. In solution it dissociates into component ions. E.g.: Mohr's salt <math>[FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O]</math>.</p> <p>A co-ordination compound or complex salt keeps its identity both in solid and solution states.</p> <p>E.g.: potassium ferrocyanide <math>\{K_4[Fe(CN)_6]\}</math>.</p>	2	3
	(ii)	4	1	
21.	(i)	<p>Alcohols react with active metals such as sodium, potassium and aluminium to liberate hydrogen gas.</p> $2R-O-H + 2Na \longrightarrow 2R-O-Na + H_2$ <p style="text-align: center;">Sodium alkoxide</p> $6 \text{CH}_3 - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{OH} + 2Al \longrightarrow 2 \left( \text{CH}_3 - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{O} \right)_3 Al + 3H_2$ <p style="text-align: center;"><i>tert</i>- Butyl alcohol <span style="margin-left: 100px;">Aluminium <i>tert</i>- butoxide</span></p>	2	3
	(ii)	2,4,6-Trinitrophenol or, Picric acid	1	
22.		<p>Hydroboration - oxidation reaction: Alkenes add diborane (<math>B_2H_6</math>) to give trialkyl borane as the addition product. This on oxidation by hydrogen peroxide in the presence of aqueous alkali to form alcohol.</p> <p>E.g. : <math>CH_3-CH=CH_2 + B_2H_6 \longrightarrow (CH_3-CH_2-CH_2)_3B \xrightarrow{H_2O_2/OH^-} CH_3-CH_2-CH_2-OH</math></p>	3	3
23.	(i)	<p>X is  Or, m-Nitrobenzoic acid Or, 3-Nitrobenzoic acid</p>	1	3
			1	

	(ii)	Y is CH <sub>3</sub> -CH <sub>3</sub> Or, Ethane			
	(iii)	Z is  Or, Benzaldehyde	1		
24.	(i)	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 <b>Etard reaction</b> .	1½	3	
		 <p style="text-align: center;">Toluene + CrO<sub>2</sub>Cl<sub>2</sub> <math>\xrightarrow{\text{CS}_2}</math> Chromium complex <math>\xrightarrow{\text{H}_3\text{O}^+}</math> Benzaldehyde</p>			
	(ii)	Ethyl acetate Or, Ethylethanoate [CH <sub>3</sub> -COOCH <sub>2</sub> -CH <sub>3</sub> ] The reaction is called Esterification.	1 ½		
25.	(i)	Hinsberg reagent is benzenesulphonyl chloride [C <sub>6</sub> H <sub>5</sub> SO <sub>2</sub> Cl]	1	3	
	(ii)	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 alkali. 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.	½ ½ ½		
26.	(i)	Vitamin A or D or E or K <i>[Any one required]</i> Deficiency disease of Vitamin A – Xerophthalmia C- Scurvy D – Rickets Or, Osteomalacia K – Haemophilia or increased blood clotting time <i>[Any one required]</i>	1 1		3
	(ii)	Invertase	1		
<b>Answer any 4 questions from 27 to 31. Each carries 4 scores</b>					
27.	(i)	Dissociation or Association of solute in solution.	1	4	
	(ii)	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.	2		
	(iii)	If there is dissociation, the value of i < 1 and for association i > 1. Desalination of sea water	1		



	<p>molecule of the alcohol and one molecule of carboxylic acid salt.</p> $2 \text{HCHO} \xrightarrow{\text{Conc. KOH}} \text{CH}_3\text{-OH} + \text{H-COOK}$ <p>Formaldehyde                      methanol                      potassium formate</p>		
(ii)	<p><b>Aldol condensation Reaction:</b> Aldehydes or ketones having at least one <math>\alpha</math>-hydrogen atom when heated with dilute alkali, we get <math>\alpha,\beta</math>-unsaturated aldehyde or ketone.</p> $2\text{CH}_3\text{-CHO} \xrightarrow[\text{(ii) } \Delta]{\text{(i) dil. NaOH}} \text{CH}_3\text{-CH=CH-CHO}$ <p>Ethanal                      But-2-enal (Crotonaldehyde)</p>	1½	
(iii)	<p><math>\text{CH}_2\text{Cl-COOH}</math> is more acidic than <math>\text{CH}_3\text{-COOH}</math></p>	1	

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