B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

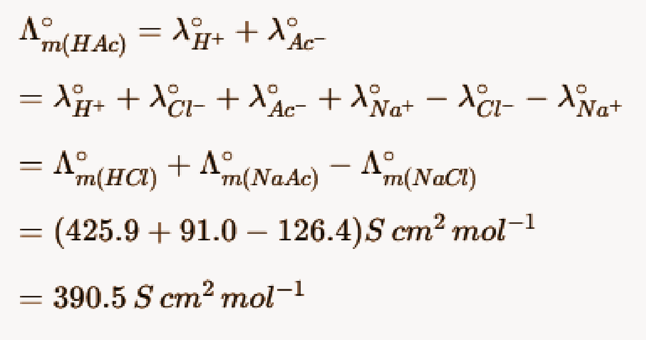
PRE-BOARD III (ANSWER KEY)- Set 1

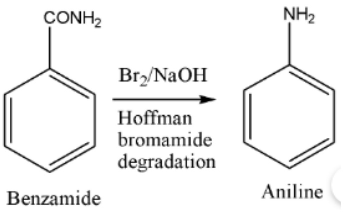
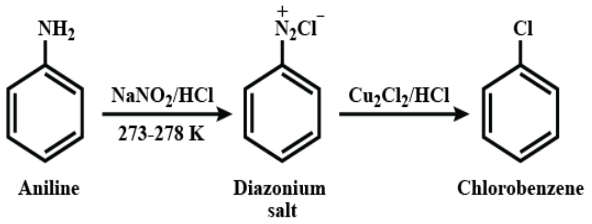
CHEMISTRY (SUBJECT : 043)

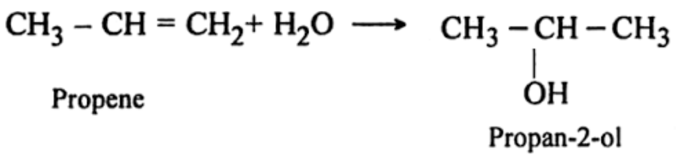
CLASS: XII **MAX. MARKS: 70 M**

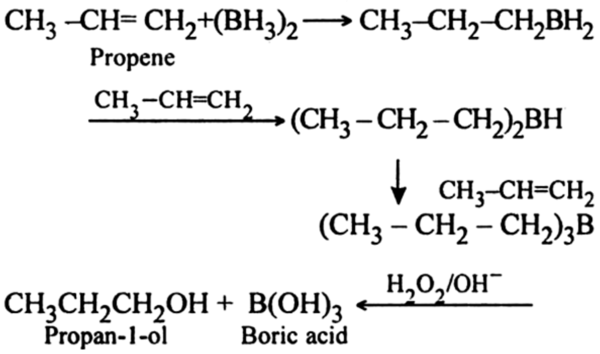
DATE : 12.1.26 **DURATION: 3 hrs**

1	b) Positive deviation from Raoult's Law	**1**
2	b) Increase the boiling point of water	**1**
3	c) Cell reaction is $Mg^{2+} + Cu \rightarrow Mg + Cu^{2+}$	**1**
4	c) 3F	**1**
5	c) 0.015	**1**
6	b) Manganese Mn (Z = 25)	**1**
7	c) Electrophilic substitution reaction	**1**
8	c) 4-Bromo-2-methylpent-2-ene	**1**
9	c) $KMnO_4$ in acidic medium	**1**
10	d) Pentan-3-one	**1**
11	a) CH_3NH_2	**1**
12	b) It is present in cyclic furanose form.	**1**
13	c) A is true but R is false	**1**

14	a) Both A and R are true and R is the correct explanation of A	**1**
15	c) A is true but R is false	**1**
16	d) A is false but R is true	**1**
17	$Fe_{(s)} \mid Fe^{2+}$ (0.01 M) $\mid\mid$ H^+ (1 M) $\mid H_{2(g)}$ (1 bar) $Pt_{(s)}$ $E^0_{cell} = 0.44$ V **Reaction at anode:** $Fe \longrightarrow Fe^{2+} + 2e^-$ **Reaction at cathode:** $2H^+ + 2e^- \longrightarrow H_2$ **Overall:** $Fe + 2H^+ \longrightarrow Fe^{2+} + H_2$	**1+1**
	According to the Nernst equation, $E = E^0_{cell} - \frac{0.0591}{n} \log \frac{[Fe^{2+}]}{[H^+]^2}$ As n = 2 $E = 0.44 - \frac{0.0591}{2} \log \frac{0.01}{1}$ $= 0.44 - \frac{0.0591}{2}(-2 \log 10)$ $= 0.44 + 2 \times \frac{0.0591}{2}$ $= 0.4991$ V	
18	$\Lambda^\circ_{m(HAc)} = \lambda^\circ_{H^+} + \lambda^\circ_{Ac^-}$ $= \lambda^\circ_{H^+} + \lambda^\circ_{Cl^-} + \lambda^\circ_{Ac^-} + \lambda^\circ_{Na^+} - \lambda^\circ_{Cl^-} - \lambda^\circ_{Na^+}$ $= \Lambda^\circ_{m(HCl)} + \Lambda^\circ_{m(NaAc)} - \Lambda^\circ_{m(NaCl)}$ $= (425.9 + 91.0 - 126.4) S\, cm^2\, mol^{-1}$ $= 390.5\, S\, cm^2\, mol^{-1}$	**1**
	The law involved in calculation of limiting molar conductivity of an electrolyte is Kohlrausch Law of Independent Migration of ions.	**1**
19	Since the concentration of ^{14}C decays with time at a particular rate (which depends on initial concentration), the kinetics for first-order could be used to identify the time required to change in the concentration of ^{14}C. => $k = 0.693/ t_{½} = 0.693 / 5730$	**1**
	=> $t = \frac{2.303}{k} \log \frac{[A_o]}{[A]}$ => $t = \left(\frac{2.303 \times 5730}{0.693}\right) \log \frac{100}{10}$ => t = 19042 years (approx)	**1**

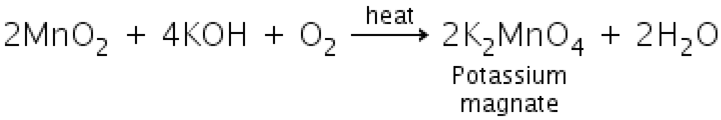
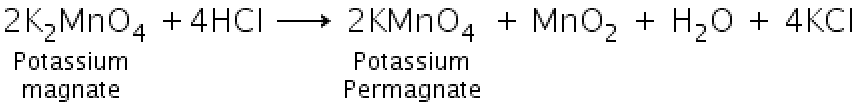
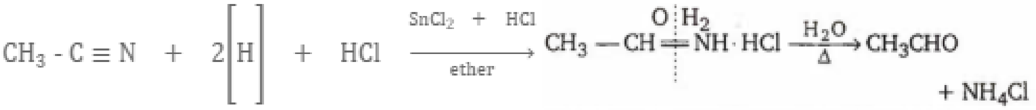
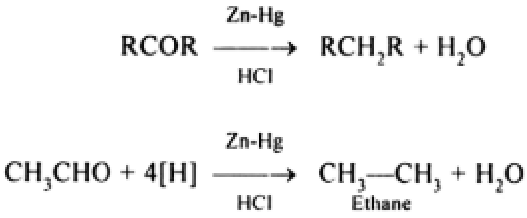
20	(i) Benzamide to Aniline  (ii) Aniline to Chlorobenzene 	**1+1**
20	OR (a) $C_6H_5NH_2 < C_6H_5N(CH_3)_2 < CH_3NH_2 <(C_2H_5)_2NH$ (b) $(CH_3)_2NH < C_2H_5NH_2 < C_2H_5OH$	**1** **1**
21	(i) Benzoic acid (ii) $C_6H_5CH=N-NH-CO-NH_2$	**1** **1**
22	i) In experimental Set up I, the blue colour of $CuSO_4$ solution will fade away. It is because the $CuSO_4$ solution will turn into H_2SO_4 solution. ii) **SETUP I: Reaction at Anode:** $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$ iii) **SETUP II: Reaction at Cathode:** $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ iv) Set up II depicts the refining of Cu metal. In this setup, an impure copper rod is made anode where oxidation takes place and a pure thin wire of copper is made cathode where reduction takes place **At anode** $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$ **At cathode** $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$	**1** **1** **1**
23	(i) Zero (ii) –k (iii) mol L–1 s –1 **OR** i) Pseudo first order reaction is a reaction which is bimolecular but its order is one. This happens when one of the reactants is in large excess. ii) We need to apply the logarithmic form of Arrhenius equation. $k_1 = 2.15 \times 10 \text{ L mol}^{-1} \text{ s}^{-1}$ at 650 K	**1** **1** **1**

	$k_2 = 2.39 \times 10$ L mol^{-1} s^{-1} at 700 K Using the formula $\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\log \frac{2.39\times10^{-7}}{2.15\times10^{-8}} = \frac{E_a}{2.303\times8.314}\left[\frac{700-650}{650\times700}\right]$ $\log 1.111 \times 10 = \frac{E_a}{19.147} \times \frac{50}{455000}$ $1.0457 = \frac{E_a}{19.147} \times \frac{1}{9100}$ $E_a = 182202.812$ J or 182.203 kJ	**2**
24	i) IUPAC name of $[CrCl_2(NH_3)_4]Br$ is Dichloridotetraamminechromium(III) bromide ii) Structural isomerism exhibited by the complex- Ionization Isomerism iii) +3, 6	**1** **1** **½ + ½**
25	(i) Substitution; In polar solvent, substitution predominates for primary haloalkanes with OH^- ions. (ii) Elimination; In a strong basic medium, elimination predominates for tertiary haloalkanes with OH^- ions (iii) Elimination; elimination predominates due to steric effect as the base used is bulky group	**1** **1** **1**
26	Propene reacts with water followed by acidic hydrolysis:  $CH_3-CH=CH_2 + H_2O \longrightarrow CH_3-\underset{\underset{OH}{\mid}}{CH}-CH_3$ Propene reacts with diborane followed by oxidation with hydrogen peroxide in aqueous sodium hydroxide:	**1** **1**

	 The rule that governs the major product in above addition reactions is Markovnikov Addition Rule.	1
27	Compound X will form CH_3 - CH = CH - CHO (but-2-enal) - Since X undergoes the CHI_3 reaction, it has a methyl group linked to the >C=O group. - Since compound X gives a positive Tollens' test it is an aldehyde. - Acetaldehyde (ethanal) is the only aldehyde with a methyl group linked to the carbonyl group.	1 1 1
28	(i) This is because the lone pair of electrons on the nitrogen atom become delocalized over the benzene ring and are unavailable for protonation due to resonance in aniline, which is absent in alkylamine, aniline is less basic than methylamine. (ii) Ethylamine is soluble in water due to its ability to form H-bonds with water, whereas aniline is insoluble in water due to its larger hydrocarbon component, which tends to retard H-bond formation. (iii) Primary amines undergo extensive intermolecular H-bonding due to the presence of two H-atoms on the N-atom, whereas tertiary amines do not undergo H-bonding due to the absence of an H-atom on the N-atom. As a result, primary amines have greater boiling points than 3° amines. (iv) Since aniline is a Lewis base, it reacts with the Lewis acid $AlCl_3$ to form a salt.	1 1 1
29	(a) sp3d2 and paramagnetic (b) Cis isomers	1+1 1

	OR (b) $[Fe(C_2O_4)_3]^{3-}$ (c) $[Cr(H_2O)_6]Cl_3$ –hexaaquachromium (III) Chloride	**½+1** **/2**
30	i) monosaccharides -2-deoxyribose and fructose. Disaccharides-maltose and lactose. ii) b. straight chain, water soluble component of starch, which constitutes 20 % of it. iii) d. Glycosidic linkage OR iii) c Beta d glucose	**1+1** **1** **1**
31	i) The amount of dissolved oxygen in water decreases with rise in the water's temperature. Cold water has more dissolved oxygen per unit area than warm water. This is the reason why aquatic animals are more comfortable in cold water than warm water. ii) a) Water will flow out of the cell and they would shrink as 1.2 % sodium chloride solution is hypertonic. b) Water will flow into the cell and they would swell as 0.4 % sodium chloride solution is hypotonic. iii) Using Elevation in boiling point colligative property we can calculate Van't Hoff factor: Observed boiling point elevation $\Delta T_b = 100.18 - 100.0 = 0.18^\circ C$ Molality of solution = 1.00 m Calculated boiling point elevation, $\Delta T_b(\text{calc}) = k_b \times m$ $= 0.512 \times 1 = 0.512$ Van.t Hoff factor , i $= \frac{\text{Observed boiling point elevation}}{\text{Calculated boiling point elevation}}$ $= \frac{0.18}{0.512} = 0.351$ **OR** i) (a) Henry's law represents a relation between solubility of gases in liquid and	**1** **½+** **1/2** **3** **1**

	pressure. Scuba drivers when comes towards surface, the pressure gradually decreases. This reduce pressure releases the dissolve gas present in blood and leads to formation of bubbles of nitrogen in the blood. This creates a painful condition by blocking capillaries known as blends. (b) At high altitude atmospheric pressure is low as compared to surface which causes difficulty in breathing. On that condition we feel weakness and discomfort. ii) Given: W_B = 15 g, W_A = 450 g $\Delta T_f = [273 - (273 - 0.34)]\text{K} = 0.34\ \text{K}$ $M_B = ?,\ K_f = 1.86\ \text{K kg mol}^{-1}$ $M_B = K_f \times \frac{W_B \times 1000}{\Delta T_f \times W_A}$ $= 1.86\ \text{K kg mol}^{-1} \times \frac{15\ \text{g} \times 1000}{0.34\ \text{K} \times 450\ \text{kg}} = 182.3\ \text{g mol}^{-1}$	**1** **3**
32	i) Transition elements have a tendency to show large no. of oxidation states and the ability to form complexes which makes them a good catalyst. ii) Transition metals in their ground state or ionised state have a number of unpaired d-electrons which gives them a paramagnetic behaviour. iii)Transition metals form colored compounds due to the presence of vacant d-orbitals and d-d transition of electrons which causes the color. iv) In aq. solution Cu^+ undergoes disproportionation to form a more stable Cu^{2+} ion. $2Cu^+(aq) \rightarrow 2Cu^{2+}(aq) + Cu(s)$ The higher stability of Cu^{2+} in aqueous solution may be attributed to its greater negative $\Delta_{hyd}H^\circ$ than that of Cu^+. It compensates the second ionization enthalpy of Cu involved in the formation of Cu^{2+} ions. v) Cr^{2+} is reducing in nature as it converts to Cr^{+3} where its configuration changes from d^4 to d^3, a more stable half filled t_{2g}^3 configuration while Mn^{3+} is oxidising in nature as it converts to Mn^{+2} where its configuration changes from d^4 to d^5, a more stable half filled d^5 configuration.	**1** **1** **1** **1** **1**

	OR	
	i) Potassium permanganate is prepared from fusing pyrolusite ore with KOH in the presence of an oxidising agent to give a green coloured mass of potassium manganate, which disproportionates in neutral or acidic medium to form purple coloured potassium permanganate.	**1**
	 $2MnO_2 + 4KOH + O_2 \xrightarrow{\text{heat}} \underset{\text{Potassium magnate}}{2K_2MnO_4} + 2H_2O$	**1**
	 $\underset{\text{Potassium magnate}}{2K_2MnO_4} + 4HCl \longrightarrow \underset{\text{Potassium Permagnate}}{2KMnO_4} + MnO_2 + H_2O + 4KCl$	**1**
	ii) The orange color of dichromate changes to yellow chromate ion / chemical reaction .	
	iii) Balanced redox equation representing reaction between:	**1**
	a) Permanganate ion and ferrous ion in acidic medium.	
	$MnO_4^-{}_{(aq)} + 5Fe^{2+}{}_{(aq)} + 8H^+{}_{(aq)} \rightarrow Mn^{2+}{}_{(aq)} + 5Fe^{3+}{}_{(aq)} + 4H_2O_{(l)}$	**1**
	b) Permanganate ion and oxalate ion in acidic medium.	
	$2MnO_4^-{}_{(aq)} + 5C_2O_{4:}^{2-}{}_{(aq)} + 16H^+{}_{(aq)} \rightarrow 2Mn^{2+}{}_{(aq)} + 10CO_{2\,(g)} + 8H_2O_{(l)}$	
33	**i) Named Reactions:**	
	a) Stephan Reduction:	**1**
	 $CH_3-C\equiv N + 2[H] + HCl \xrightarrow[\text{ether}]{SnCl_2 + HCl} CH_3-CH\overset{O\,H_2}{=}NH\cdot HCl \xrightarrow[\Delta]{H_2O} CH_3CHO + NH_4Cl$	
	b) Clemmensen Reaction:	**1**
	 $RCOR \xrightarrow[HCl]{Zn\text{-}Hg} RCH_2R + H_2O$ $CH_3CHO + 4[H] \xrightarrow[HCl]{Zn\text{-}Hg} \underset{\text{Ethane}}{CH_3-CH_3} + H_2O$	

ii) Distinction Test:

a) Iodoform Test: Acetophenone gives positive iodoform test but benzophenone does not. 1

b) $NaHCO_3$ Test: Propanoic acid being a carboxylic acid gives brisk effervescence with sodium bicarbonate solution whereas propanal being an aldehyde does not. 1

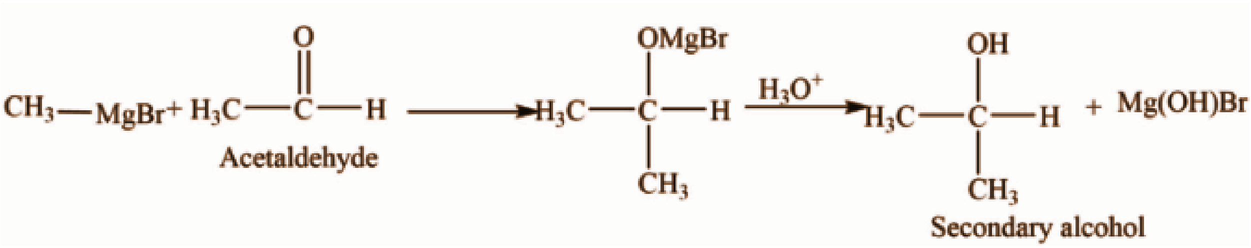
iii) Increasing order of acidic nature:

$CH_3CH_2COOH < CH_3CHFCOOH < CH_3CF_2COOH$ 1

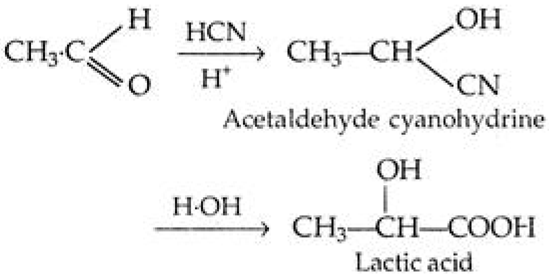
OR

i) Reactions involved when acetaldehyde reacts with:

a) CH_3MgBr in presence of dry ether followed by hydrolysis 1



b) Hydrogen cyanide followed by hydrolysis: 1

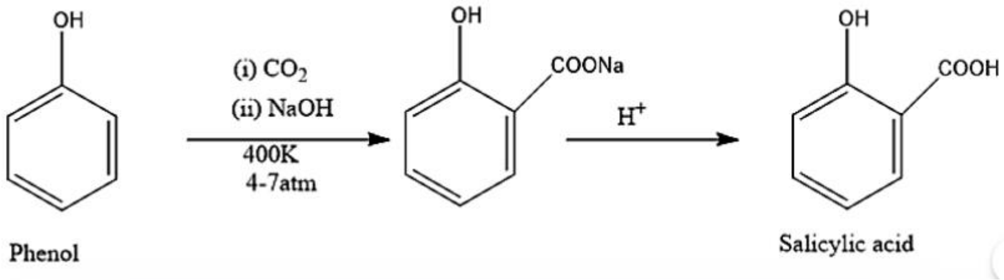


c) Wolff Kishner reduction it forms a ethane

1

ii) Phenol, Salicylic Acid and Aspirin:

a) Preparation of salicylic acid from phenol using Kolbe Reaction:

	 b) Acetyl chloride/Acetic anhydride	**1** **1**