



B.K. BIRLA CENTRE FOR EDUCATION

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

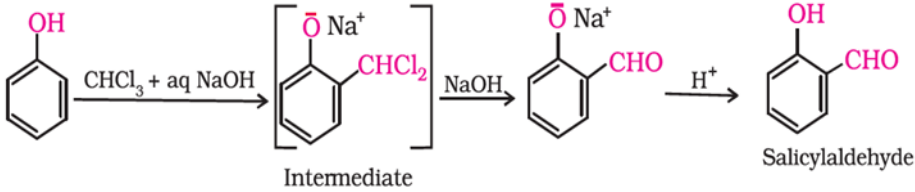


Class: 12
Date: 12.1.26

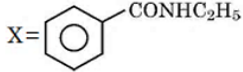
Time: 3 hours
Max Marks: 70

MARKING SCHEME (SET-2)

Q. No.	Questions	Marks
1.	(B) $271.6 \text{ S cm}^2 \text{ mol}^{-1}$	1
2.	(B) Fe^{3+}	1
3.	(B) 2	1
4.	(D) Variable oxidation states	1
5.	(C) $\text{Ar} < \text{CO}_2 < \text{CH}_4 < \text{HCHO}$	1
6.	(C) $t_{2g}^4 e_g^2$	1
7.	(A) I, II, and III	1
8.	(C) Vinyl halide	1
9.	(D) $(\text{CH}_3)_3\text{COH}$	1
10.	(A) Sandmeyer's reaction	1
11.	(D) only Z	1
12.	(C) D-glucose	1
13.	(D) Assertion is wrong, but reason is correct statement.	1
14.	(C) Assertion (A) is true, but Reason (R) is false.	1
15.	(A) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.	1
16.	(A) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.	1
17.	<p>Mechanism</p> <p>Step 1: Formation of protonated alcohol.</p> $ \begin{array}{ccc} \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \\ \text{Ethanol} \end{array} & \xrightarrow{\text{Fast}} & \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{O}^+-\text{H} \\ \quad \\ \text{H} \quad \text{H} \\ \text{Protonated alcohol} \\ \text{(Ethyl oxonium ion)} \end{array} \end{array} $ <p>Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction.</p> $ \begin{array}{ccc} \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{O}^+-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} & \xrightarrow{\text{Slow}} & \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}^+ \\ \quad \\ \text{H} \quad \text{H} \end{array} + \text{H}_2\text{O} \end{array} $ <p>Step 3: Formation of ethene by elimination of a proton.</p> $ \begin{array}{ccc} \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C} \quad \text{C}^+ \\ \quad \\ \text{H} \quad \text{H} \end{array} & \rightleftharpoons & \begin{array}{c} \text{H} \quad \text{H} \\ \backslash \quad / \\ \text{C} = \text{C} \\ / \quad \backslash \\ \text{H} \quad \text{H} \\ \text{Ethene} \end{array} + \text{H}^+ \end{array} $ <p style="text-align: center;">“OR”</p>	2

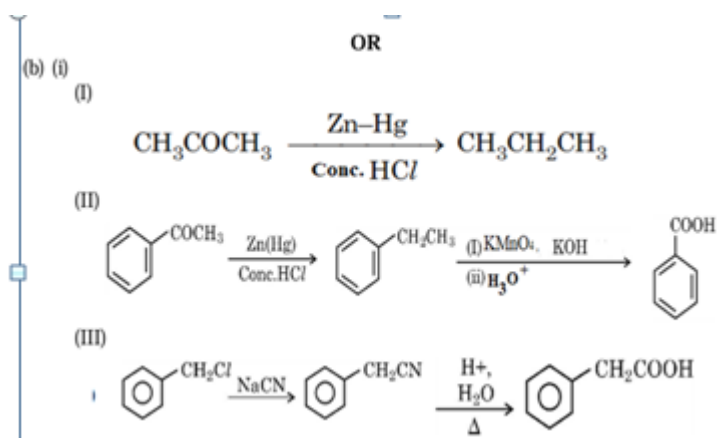
	<p>a) Yes, it is correct. It is because after the removal of H^+ ion the phenoxide ion formed is more stable than ethoxide ion.</p> <p>b) reaction of phenol with chloroform gives salicylaldehyde.</p> 	1 1
18.	$K = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ $= \frac{2.303}{40} \log \frac{[100]}{[70]}$ $= \frac{2.303}{40} \log \frac{10}{7} = \frac{2.303}{40} \times 0.1549$ $= 8.918 \times 10^{-3} \text{ min}^{-1}$ $t_{1/2} = \frac{0.693}{8.918 \times 10^{-3}} = 77.7 \text{ min}$ $t_{1/2} = \frac{0.693}{K}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
19.	<p>(i) Square planar, diamagnetic</p> <p>(ii) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ and No. of ions = 3</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
20.	<p>(a) Molecules of benzoic acid dimerise in benzene, the number of particles is reduced.</p> <p>(b) The intermolecular interactions between ethanol and acetone are weaker/ the escaping tendency of ethanol and acetone molecules increases on mixing / the vapour pressure increases.</p>	2
21.	<p>(a) Starch is made up of α-D glucose units while cellulose is made up of β-D glucose units.</p> <p>(b) A glycosidic linkage is the bond that joins monosaccharides (simple sugars) together to form disaccharides and polysaccharides (carbohydrates), whereas a peptide bond is the amide linkage that joins amino acids to form peptides and proteins.</p> <p>(c) Amino acids linked with each other in a specific sequence is a primary structure while secondary structure refers to the shape in which a long polypeptide chain can exist.</p> <p>(Or any other one suitable difference).</p>	1 1 1
22.	<p>$\Delta T_f = 2.8^\circ\text{C} = 2.8 \text{ K}$ (temp. difference)</p> <p>$\Delta T_f = K_f \times w_B / M_B \times W_A \text{ (kg)}$</p> <p>$2.8 = 1.86 \times w_B / 62 \times 1$</p> <p>$w_B = 2.8 \times 62 / 1.86$</p> <p>$w_B = 93.33 \text{ g}$ (Deduct $\frac{1}{2}$ mark for incorrect unit or no unit)</p>	1 1 1
23.	For the given cell,	

	<p>At anode: $\text{Cr} \rightarrow \text{Cr}^{3+} + 3\text{e}^-] \times 2$</p> <p>At Cathode: $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}] \times 3$</p> <hr/> <p>Net Cell Reaction: $2\text{Cr} + 3\text{Fe}^{2+} \xrightarrow{6\text{e}^-} 2\text{Cr}^{3+} + 3\text{Fe}$</p> <p>Here,</p> $E_{\text{cell}}^o = E_{\text{cathode}}^o - E_{\text{anode}}^o = 0.30\text{V}$ <p>Applying Nernst Equation (at 298K),</p> $E_{\text{cell}} = E_{\text{cell}}^o - \frac{0.059}{n} \log \frac{[\text{Cr}^{3+}]^2}{[\text{Fe}^{2+}]^3}$ $E_{\text{cell}} = 0.30\text{V} - \frac{0.059}{6} \log \frac{[(0.1)^2]}{[(0.001)^3]}$ $E_{\text{cell}} = 0.30\text{V} - \frac{0.059}{6} \log 10^7$ $E_{\text{cell}} = 0.30\text{V} - \frac{0.059}{6} \times 7$ $= 0.30\text{V} - 0.0688\text{V}$ $= 0.2312\text{V}$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
24.	<p>Let the order w.r.t to A be x and y w.r.t to B</p> <p>Rate = k [A]^x [B]^y</p> <p>$3 \times 10^{-4} = k [0.10]^x [0.10]^y$ -----(1)</p> <p>$9 \times 10^{-4} = k [0.30]^x [0.30]^y$ -----(2)</p> <p>$3 \times 10^{-4} = k [0.10]^x [0.30]^y$ -----(3)</p> <p>$6 \times 10^{-4} = k [0.20]^x [0.40]^y$ -----(4)</p> <p>Dividing Exp. (1) by (3)</p> <p>y = 0, the order w.r.t B is 0.</p> <p>Dividing Exp. (2) by (3)</p> <p>$3 = 3^x$</p> <p>i.e., x = 1, order w.r.t A is 1.</p> <p>Overall order of the reaction = 1</p> <p>Rate = k [A]¹ [B]⁰ / Rate = k [A]</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
25.	<p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3\text{-CH-CH}_2\text{Cl} \end{array}$ </p> <p>$\text{CH}_2\text{Cl-CH}_2\text{-CH}_2\text{Cl}$</p> <p>$\text{CH}_3\text{-CH}_2\text{-CHCl}_2$</p> <p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3\text{-C-CH}_3 \\ \\ \text{Cl} \end{array}$ </p> <p>The following isomer will exhibit enantiomerism:</p> <p style="text-align: center;"> $\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3\text{-CH-CH}_2\text{Cl} \end{array}$ </p> <p>IUPAC name: 1,2-Dichloropropane.</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

26.	<p>(a) Beside being a nucleophile, methoxide acts as a strong base. Thus, elimination reaction predominates over substitution to give alkene as the main product and not ether.</p> <p>(b) p-nitrophenol has higher boiling point than that of o-nitrophenol. This is due to intermolecular H-bonding in p-nitrophenol, whereas intramolecular H-bonding in o-nitrophenol.</p> <p>(c) It is due to the repulsion between the unshared electron pairs of oxygen.</p> <p style="text-align: right;">(Or any other suitable reason).</p>	1 1 1
27.	<p style="text-align: center;">  </p> <p>Name: N-Ethylbenzamide.</p> <ul style="list-style-type: none"> • No, 'X' will not undergo the Hoffmann bromamide degradation reaction. • As it is a N-substituted amide. <p style="text-align: center;">“OR”</p> <p>(a) Hinsberg test (or any correct test)</p> <p>(b) $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow[\text{Pyridine}]{(\text{CH}_3\text{CO})_2\text{O}} \text{C}_6\text{H}_5\text{NHCOCH}_3$</p> <p>Name of main product – N-phenylethanamide or Acetanilide</p> <p>(c) Iodobenzene</p>	1 1 1 1 1 1
28.	<p>(a) 3-Bromo-2-methylbutanoic acid</p> <p>(b) CH_2FCOOH is stronger acid as F shows –I effect.</p> <p>(c) Propane < Propanal < Propanol < Propanoic acid</p>	1 1 1
29.	<p>(i) 8 mol AgCl will be formed Mass of 8 mol AgCl = $143.5 \times 8 = 1148\text{g}$</p> <p>(ii) Hemoglobin</p> <p style="text-align: center;">“OR”</p> <p>(ii) The electronic configuration of Ni is $[\text{Ar}] 3d^8 4s^2$ which shows that it can only form two types of complexes i.e. square planar (dsp^2) in presence of strong ligand and tetrahedral (sp^3) in presence of weak ligand. There are four empty orbitals in Ni while octahedral complexes require six empty orbitals.</p> <p>(iii) 3, 6</p>	1 1 1 1
30.	<p>a) Biofuel, provide energy, an instant source of energy, energy storage, cell wall formation. (any two) (or any other two suitable functions)</p> <p>(b) A carbohydrate that cannot be hydrolysed further to give a simpler unit of polyhydroxy aldehyde or ketone.</p> <p>(c) (i) Rickets (in children) / Osteomalacia (in adults).</p> <p style="text-align: center;">“OR”</p> <p>(c) (ii) Insulin.</p>	2 1 1
31.	<p>(i) $w = \frac{Mit}{nF}$</p>	1

	$w = \frac{58.7 \times 5 \times 20 \times 60}{2 \times 96500}$ $= 1.82 \text{ g}$ <p>(ii) Molar conductivity of a strong and weak electrolyte increases with dilution. The molar conductivity increases with decrease in concentration or on dilution. The molar conductivity of a weak electrolyte rises steeply at low concentration. The molar conductivity of a strong electrolyte decreases slightly with the increase in concentration. This is due to increase in mobility of ions and increase in ionisation of weak electrolyte</p> <p style="text-align: center;">“OR”</p> <p>(a) Given : $K = 4 \times 10^{-5} \text{ S/cm}$, $M = 0.001 \text{ M}$ $\Lambda^\circ_m = 390 \text{ S cm}^2/\text{mol}$, $k = ?$ Using the formula</p> $\Lambda_m^c = \frac{K \times 1000}{\text{Molarity}}$ $= \frac{4 \times 10^{-5} \text{ S cm}^{-1} \times 1000 \text{ cm}^3 \text{ L}^{-1}}{0.001 \text{ mol L}^{-1}}$ $= 40 \text{ S cm}^2 \text{ mol}^{-1}$ $\alpha = \frac{\Lambda_m^c}{\Lambda_m^\circ} = \frac{40}{390} = 0.1025$ $\begin{array}{ccc} \text{CH}_3 - \text{COOH} & \rightleftharpoons & \text{CH}_3 - \text{COO}^- + \text{H}^+ \\ \text{C} & & \text{O} \quad \text{O} \\ \text{C}(1 - \alpha) & & \text{C}\alpha \quad \text{C}\alpha \end{array}$ $k_\alpha = \frac{[\text{CH}_3 - \text{COO}^-][\text{H}^+]}{[\text{CH}_3 - \text{COOH}]} = \frac{\text{C}\alpha \cdot \text{C}\alpha}{\text{C}(1 - \alpha)} = \frac{\text{C}\alpha^2}{1 - \alpha}$ $k = \frac{10^{-3} \times (1.025 \times 10^{-1})^2}{1 - 0.1025} = \frac{10^{-5} \times 0.105}{0.8975}$ $\therefore k = 1.46 \times 10^{-6}$ <p>(b) Discharge reaction of lead storage battery:</p> <p>At anode : $\text{Pb(s)} + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{e}^-$ At cathode: PbO_2 filled in lead grid gets reduced to Pb^{2+} ions which combines with SO_4^{2-} ions to form $\text{PbSO}_4(\text{s})$. The reaction is $\text{PbO}_2(\text{s}) + 4\text{H}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) + 2\text{e}^- \rightarrow \text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O(l)}$</p>	<p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
32.	<p>(i.) This is because transition metals have strong metallic bonds and they have large number of unpaired electrons.</p> <p>(ii.) Cr^{2+} is reducing as its configuration changes from d^4 to d^3, the latter having more stable half-filled t_{2g} level. On the other hand, the change from Mn^{3+} to Mn^{2+} results in extra stable d^5 configuration.</p> <p>(iii) This is due to comparable size of transition metals as they can fit in the same lattice</p> <p>(b) (i) $\text{MnO}_4^-(\text{aq}) + 5\text{Fe}^{2+}(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O} + 5\text{Fe}^{3+}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>

	<p>(ii) $Cr_2O_7^{2-}(aq) + 3C_2O_4^{2-}(aq) + 14H^+(aq) \rightarrow 2Cr^{+3} + 6CO_2 + 7H_2O$</p> <p style="text-align: center;">“OR”</p> <p>(A) This is due to lanthanoid contraction.</p> <p>(B) Oxygen and fluorine are highly electronegative elements.</p> <p>(C) This is because, Copper has high enthalpy of atomization and low enthalpy of hydration. Since the high energy to transform Cu(s) to $Cu^{2+}(aq)$ is not balanced by hydration enthalpy, therefore value for copper is positive (+0.34 V).</p> <p>(D) Reactions involved in the preparation of potassium permanganate from MnO_2</p> <p>$2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4$ (Dark green) + $2H_2O$</p> <p>$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^-$ (Purple) + $MnO_2 + 2H_2O$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
33.	<p>(a)</p> <p>(i) (A) The structures of expected products of Cannizzaro reaction of 2-chlorobenzaldehyde-</p> <div style="text-align: center;"> </div> <p>(B) Product formed on Wolf-Kishner reduction of 2-methylbutanal is-</p> <div style="text-align: center;"> </div> <p>(ii)</p> <p>a)</p> <div style="text-align: center;"> </div> <p>b)</p> <div style="text-align: center;"> </div> <p>c)</p> <div style="text-align: center;"> </div>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>



ii) (i) Compound B gives Fehling's test, which means it is aldehyde also. It forms an iodoform, so compound B is acetaldehyde, among aldehydes.

(ii) Compound C does not give Fehling's test but gives iodoform, so ketone must have a methyl group attached to carbonyl group.

Reactions for ozonolysis and formation of iodoform from B and C are

