

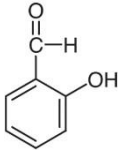
TIME – 3 hours

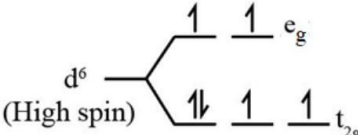
MM -70

MARKING SCHEME

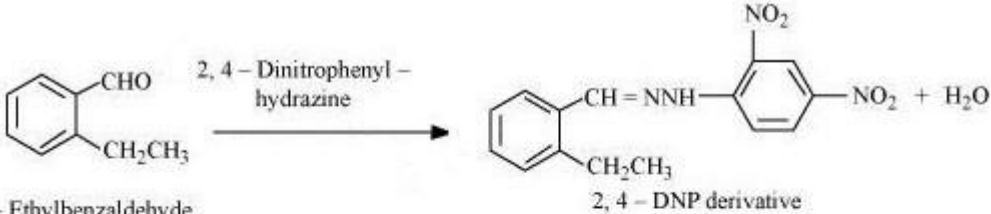
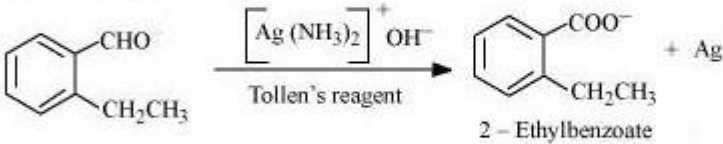
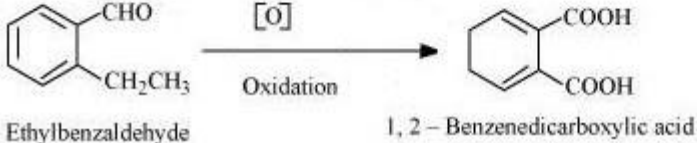
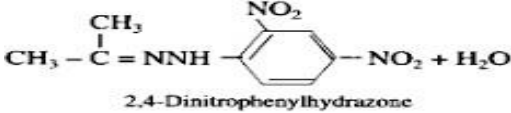
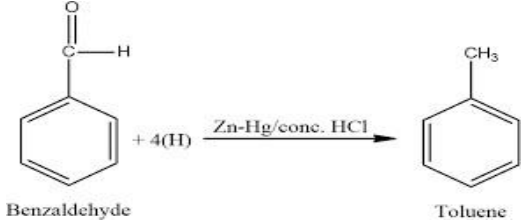
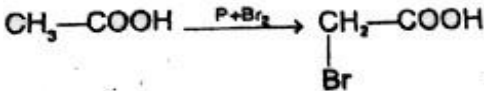
Q.No.	Suggestive Answers	Marks
1	d) All of these	1
2	b) EDTA	1
3	b) NaOH/Br <sub>2</sub>	1
4	b) Secondary structure of proteins	1
5	b) There is a negative deviation from Raoult's law $=pA^{\circ}x_A + pB^{\circ}x_B$ $=(150 \times 1/3) + (240 \times 2/3) = 210$ $\Delta p_{mix} = p_{exp} - p_{theo} = -ve$	1
6	a) X	1
7	a) (i) (q), (ii) (s), (iii) (p)	1
8	c) benzylic	1
9	b) Racemisation	1
10	d) 2-Methylpentan-2ol	1
11	a) PbSO <sub>4</sub> at anode is reduced to Pb	1
12	b) 0	1
13	a. Both A and R are true and R is the correct explanation of A	1
14	c. A is true but R is false.	1
15	b. Both A and R are true but R is not the correct explanation of A.	1
16	a. Both A and R are true and R is the correct explanation of A	1
17	a) $r = k[A][B]$ , Order = 2    b) $\text{Lmol}^{-1} \text{s}^{-1}$	$\frac{1}{2} + \frac{1}{2} + 1$
18	a) Resonance stabilisation is more in carboxylate ion than phenoxide ion due to equivalent resonating structures as negative charge is shifting on more electronegative O-atom. b) 2-Chlorobutanoic acid because -I effect decreases with distance.	1 $\frac{1}{2} + \frac{1}{2}$

19	<p>a)</p> $\text{CH}_3 - \text{CH} = \text{CH}_2 \xrightarrow[\text{(Anti - Markovnikov addition)}]{\text{HBr / Peroxide}} \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Br}$ <p style="text-align: center;">Propene <span style="margin-left: 150px;">1 - Bromopropane</span></p> $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Br} \xrightarrow[\text{Propan - 1 - ol}]{\text{(Nucleophilic substitution) Aq. KOH / } \Delta}$ <p>b)</p> <p style="text-align: center;">2, 4, 6-trinitrophenol (Picric acid) + 3H<sub>2</sub>O</p> <p>OR</p> $\text{CH}_3 - \text{CH}_2 - \text{O} - \text{H} \xrightarrow{\text{H}^+} \text{CH}_3 - \text{CH}_2 - \overset{+}{\text{O}} - \text{H}$ $\text{CH}_3 - \text{CH}_2 - \overset{+}{\text{O}} - \text{H} \rightarrow \text{CH}_3 - \overset{+}{\text{C}}\text{H}_2 + \text{H}_2\text{O}$ $\text{CH}_2 - \overset{+}{\text{C}}\text{H}_2 \xrightarrow{\text{H}^+} \text{CH}_2 = \text{CH}_2$	<p style="text-align: right;">1</p> <p style="text-align: right;">1</p> <p style="text-align: right;">1/2</p> <p style="text-align: right;">1</p> <p style="text-align: right;">1/2</p>
20	<p>a) dsp<sup>2</sup>, diamagnetic</p> <p>b) Optical isomerism, C.N = 6</p> <p>c) Pentaamminesulphatochromium(III)chloride.</p>	<p>1</p> <p>1/2+ 1/2</p> <p>1</p>
21	<p>a) A = C<sub>6</sub>H<sub>5</sub>CN, B = C<sub>6</sub>H<sub>5</sub>COOH</p> <p>b) A = C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>, B = C<sub>6</sub>H<sub>5</sub>N<sub>2</sub>Cl</p>	<p>1</p> <p>1</p>
22	<p>a) Nucleoside is pentose sugar + Base while nucleotide is pentose sugar + Base + phosphate group.</p> <p>b) Maltose</p> <p>c) Starch uses 1,4 and 1,6 alpha linkages and has a branched structure, whereas cellulose uses 1,4 beta linkages and has a rigid, straight chain structure. (any one)</p>	<p>1</p> <p>1</p> <p>1</p>
23	<p>a) Mg+2Ag<sup>+</sup> → Mg<sup>2+</sup> +2Ag</p> <p>b) E<sub>cell</sub>=E<sub>°Cathode</sub>-E<sub>°Anode</sub> =0.80-(-2.37) = 3.17 volt Cell reaction, Mg+2Ag<sup>+</sup>→2Ag+Mg<sup>2+</sup> =E<sub>cell</sub>- (0.0591/2) log [Mg<sup>2+</sup>]/[Ag<sup>+</sup>]<sup>2</sup> E<sub>cell</sub> = 3.17V-0.0591/2 log(1.0×10<sup>7</sup>) Calculating log(1.0×10<sup>7</sup>)=7: E<sub>cell</sub> = 3.17V-(0.059/2)×7 E<sub>cell</sub> = 3.17V-0.0295×7 E<sub>cell</sub> = 3.17V-0.2065V E<sub>cell</sub> = 2.9635V≈3V</p>	<p>1</p> <p>1</p> <p>1</p>
24	<p>a) C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub> &lt; C<sub>6</sub>H<sub>5</sub>N(CH<sub>3</sub>)<sub>2</sub> &lt; CH<sub>3</sub>NH<sub>2</sub> &lt; (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>NH</p> <p>b) Aniline will form coloured dye with Benzene diazonium chloride while Ethylamine does not. (or Bromine water test)</p> <p>c)</p> $\text{R} - \text{CONH}_2 + \text{Br}_2 + 4\text{NaOH} \rightarrow \text{R} - \text{NH}_2 + \text{Na}_2\text{CO}_3 + 2\text{NaBr} + 2\text{H}_2\text{O}$ <p style="text-align: center;"><b>Acid Amide <span style="margin-left: 100px;">Primary amine</span></b></p>	<p>1</p> <p>1</p> <p>1</p>

25	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left( \frac{T_2 - T_1}{T_1 T_2} \right)$ <p>It is given that, <math>k_2 = 4k_1</math>  <math>T_1 = 293 \text{ K}</math>  <math>T_2 = 313 \text{ K}</math></p> <p>Therefore, <math>\log \frac{4k_1}{k_1} = \frac{E_a}{2.303 \times 8.314} \left( \frac{313 - 293}{293 \times 313} \right)</math></p> $\Rightarrow 0.6021 = \frac{20 \times E_a}{2.303 \times 8.314 \times 293 \times 313}$ $\Rightarrow E_a = \frac{0.6021 \times 2.303 \times 8.314 \times 293 \times 313}{20}$ $= 52863.33 \text{ J mol}^{-1}$ $= 52.86 \text{ kJ mol}^{-1}$ <p style="text-align: center;">Or</p> <p>because the concentration of reactants decreases as the reaction proceeds.</p> $t = \frac{2.303}{k} \log [R]_0 / [R]$ $t_{99\%} = \frac{2.303}{k} \log 100 / 1 = \frac{2.303}{k} \times 2 \quad \dots \text{(i)}$ $t_{90\%} = \frac{2.303}{k} \log 100 / 10 = \frac{2.303}{k} \quad \dots \text{(ii)}$	<p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1</p> <p>1/2</p> <p>1/2</p>
	<p>Dividing equation (i) by (ii)</p> $\frac{t_{99\%}}{t_{90\%}} = \frac{\frac{2.303}{k} \times 2}{\frac{2.303}{k}}$ $t_{99\%} = 2t$	1/2
26	<p>a) <math>(\text{CH}_3)_3\text{I} + \text{CH}_3\text{OH}</math>  b) <math>\text{CH}_3\text{CHCOCH}_3</math>  c) </p>	<p>1</p> <p>1</p> <p>1</p>
27	<p>a) Amino acids have amino (<math>-\text{NH}_2</math>) group (basic) which accepts a proton and <math>\text{COOH}</math> group (acidic) which loses a proton forming a dipolar ion, called the Zwitter ion. In this form, amino acids behave both as acids and bases so they are amphoteric in nature.</p> <p>b) (i) <math display="block">\begin{array}{ccc} \text{CHO} &amp; &amp; \text{CH=N-OH} \\   &amp; &amp;   \\ (\text{CHOH})_4 &amp; \xrightarrow{\text{NH}_2\text{OH}} &amp; (\text{CHOH})_4 \\   &amp; &amp;   \\ \text{CH}_2\text{OH} &amp; &amp; \text{CH}_2\text{OH} \end{array}</math> <p style="text-align: center;">Glucose oxime</p> <p>(ii) <math display="block">\begin{array}{ccc} \text{CHO} &amp; &amp; \text{COOH} \\   &amp; &amp;   \\ (\text{CHOH})_4 &amp; \xrightarrow{\text{HNO}_3} &amp; (\text{CHOH})_4 \\   &amp; &amp;   \\ \text{CH}_2\text{OH} &amp; &amp; \text{COOH} \\ \text{D-glucose} &amp; &amp; \text{Saccharic acid} \end{array}</math></p> </p>	<p>1</p> <p>1</p> <p>1</p>

28	<p>a)</p> $\begin{array}{c} \text{CH}_3 \\   \\ \text{H}_3\text{C} - \text{C} - \text{CH}_3 \\   \\ \text{Br} \end{array}$ <p>tert butyl bromide</p> <p>Chemical Formula: <math>\text{C}_4\text{H}_9\text{Br}</math></p> <p>b) 2- Chloropentane</p> <p>c) Because of symmetrical structure.</p>	1 1 1
29	<p>a) crystal field splitting energy (CFSE) is the energy difference between the two levels of d-orbitals in a crystal field.</p>  <p>(High spin)</p> <p>b) Ligands with smaller <math>\Delta_o</math> values are considered "weak field" and absorb lower-energy light, while ligands with larger <math>\Delta_o</math> values are considered "strong field" and absorb higher-energy light</p> <p>Or</p> $[\text{Ni}(\text{CN})_4]^{2-} < [\text{Ni}(\text{NH}_3)_6]^{2+} < [\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ <p>c) <math>[\text{Ti}(\text{H}_2\text{O})_6]^{4+}</math></p>	1 1 1
30	<p>(a) <math>\text{Fe}_{(\text{aq})}^{2+} + 2\text{e}^- \rightarrow \text{Fe}_{(\text{s})}</math></p> <p>Now <math>Q = it, i = 2\text{ amp}</math></p> <p><math>\therefore t = Q/i</math></p> <p>since 2 F charge is required to deposit 56 g of <math>\text{Fe}^{2+}</math> so for 2.8 g we need 9650 C from above equation</p> $t = 9650/2 = 4825\text{s}$ <p>Using Faraday's second law of electrolysis</p> $\frac{W_1(\text{Weight of Fe deposited})}{W_2(\text{Weight of Zn deposited})} = \frac{E_1(\text{Equivalent weight of Fe})}{E_2(\text{Equivalent weight of Zn})}$ $\frac{2.8}{W_2} = \frac{56/2}{65.3/2}$ $W_2 = 3.265\text{ g}$ <p>b)</p> $\text{Ca}_{(\text{aq})}^{2+} + 2\text{e}^- \rightarrow \text{Ca}_{(\text{s})}$ <p><math>\therefore</math> 1 mole of Ca i.e. 40 g Ca require = 2 mole<sup>-</sup></p> $= 2 F$ <p><math>\therefore</math> 20 g Ca requires <math>\frac{2 \times 20}{40} = 1 F</math></p> <p>c) Faraday's second law of electrolysis states that when the same amount of electricity is passed through different electrolytes, the masses of the substances deposited at the electrodes are directly proportional to their chemical equivalent weights.</p> <p>Or</p> <p>Cu at cathode and <math>\text{O}_2</math> at anode are produced by electrolysis of aqueous <math>\text{CuSO}_4</math> with inert electrodes.</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1

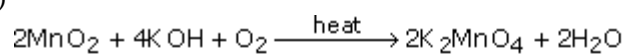
31	<p>a)</p> $\pi_{\text{urea}} = \pi_{\text{glucose}} \frac{W_{\text{urea}}}{M_{\text{urea}} \times V_s} = \frac{W_{\text{Glucose}}}{M_{\text{Glucose}} \times V_s}$ <p><b>(As volume of solution is same)</b></p> $\frac{W_{\text{urea}}}{M_{\text{urea}}} = \frac{w_{\text{glucose}}}{M_{\text{glucose}}}$ <p>or</p> $\frac{15g}{60g \text{ mol}^{-1}} = \frac{w_{\text{Glucose}}}{180g \text{ mol}^{-1}}$ $W_{\text{glucose}} = \frac{15g \times 180g \text{ mol}^{-1}}{60g \text{ mol}^{-1}} = 45 \text{ g}$ <p>b) Osmotic pressure is the external pressure that must be applied to a solution to prevent the inward flow of solvent molecules through the semi-permeable membrane. It is less affected by temperature changes compared to other colligative properties like boiling point elevation or freezing point depression/ osmotic pressure can be measured at room temperature/ osmotic pressure involves molarity of the solution, which simplifies calculations. (any 2 points)</p> <p style="text-align: center;">Or</p>	<p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>1 + 2</p>
	<p>a)</p> $m = \frac{W_B \times 1000}{M_B \times W_B}$ <p><math>\Delta T_f = \text{Depression in freezing point} = 1.62</math>  <math>i = \text{Van't Hoff factor}</math>  <math>k_f = \text{constant} = 4.9</math></p> $m = \frac{3.9 \times 1000}{122 \times 49} = 0.65$ $i = \frac{\Delta T_f}{k_f m}$ $= \frac{1.62}{4.9 \times 0.65} = 0.50$ <p>As the value of <math>i &lt; 1</math>, the solute is associated.</p> <p>b) 0.1 molal solutions of potassium chloride will have a greater boiling point elevation than glucose solution as it depends on the number of solute particles present in solution. KCl dissociates into 2 ions in solution while glucose does not.</p>	<p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>1</p> <p>1+1</p>
32	<p>a) <math>\text{CH}_3\text{COCH}_3 &lt; \text{CH}_3\text{CH}_2\text{CHO} &lt; \text{CH}_3\text{CHO}</math></p> <p>b) (i) <math>-\text{COOH}</math> is a meta directing group due to <math>-\text{R}</math> effect  (ii) The lone pairs on the oxygen atom in the <math>-\text{COOH}</math> group of carboxylic acids are involved in resonance, which makes the carbon atom less electrophilic.</p> <p>c)</p>	<p>1</p> <p>1</p> <p>1</p>

	 <p>2 - Ethylbenzaldehyde</p>  <p>2 - Ethylbenzaldehyde</p>  <p>2 - Ethylbenzaldehyde</p> <p>1, 2 - Benzenedicarboxylic acid</p> <p>(any one of the above reactions) The compound is 2-ethylbenzaldehyde.</p> <p>Or</p> <p>a) Propanone has two alkyl groups, which increases steric hindrance and makes it harder for nucleophiles to attack.</p> <p>b)</p>  <p>2,4-Dinitrophenylhydrazone</p>	<p>1</p> <p>1</p> <p>1</p>
	<p>c)</p>  <p>Benzaldehyde</p> <p>Toluene</p> <p>d) The HVZ reaction is a halogenation reaction that occurs in carboxylic acids that have <math>\alpha</math>-hydrogen atoms. Acetic acid has three <math>\alpha</math>-hydrogen atoms, while formic acid has none.</p> 	<p>1</p> <p>1+1</p>
33	<p>a) The energy difference between 5f, 6d, and 7s orbitals is much smaller than the energy difference between 4f, 5d, and 6s orbital</p> <p>b) <math>\text{Cr}^{2+}</math> because it easily oxidises to stable <math>\text{Cr}^{3+}</math> (<math>t_{2g}^3</math>)</p> <p>c)</p> $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{I}^- \longrightarrow 2\text{Cr}^{3+} + 3\text{I}_2 + 7\text{H}_2\text{O}$ <p>d) Due to variable oxidation state/tendency to form complexes</p> <p>e) Similarity : Both have mainly an oxidation state of +3. Difference : Lanthanoids have less tendency towards complex formation whereas</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p>

actinoids have greater tendency towards complex formation.

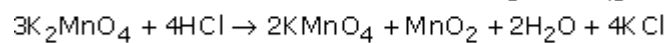
Or

a)



potassium  
manganate (green mass)

1



potassium  
permanganate

1



1

b) Copper (Cu) is the metal in the first transition series (3d-series) that most frequently exhibits a +1 oxidation state. This is because it easily loses an electron from its 4s orbital to achieve a stable 3d<sup>10</sup> configuration.

1+1

c) Due to strong metallic bonding as they have unpaired d-electrons.