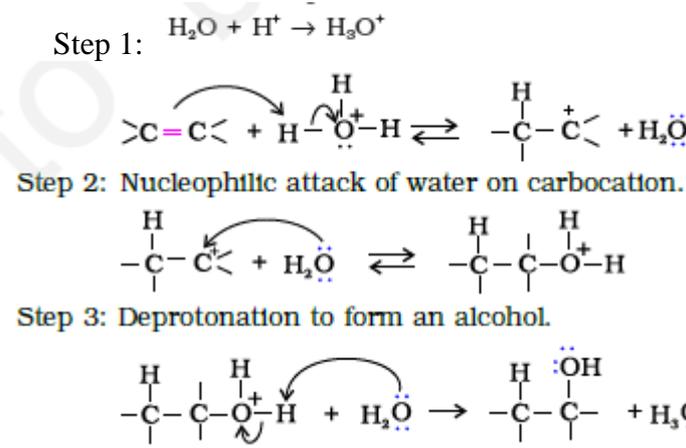


	the oxidation of steel..	
10	Sulphur; Due to small size and greater inter electronic repulsions in oxygen.	1,1
11	<p>Molality of the solution, $m = \frac{\text{Moles of solute}}{\text{Mass of solvent in Kg}}$ $= \frac{5}{342} \times \frac{1000}{95}$ $\Delta T_f = K_f m$; $K_f = \Delta T_f / m$</p> $K_f = \frac{(273.15 - 271) \text{K} \times 95 \times 342}{5 \times 1000}$ $K_f = 13.97 \text{ K kg mol}^{-1}$ <p>Molality of the glucose = $(5/180) / (95 / 1000)$ $\Delta T_f = K_f m = (13.97 \times 5000) / (95 \times 180) = 4.08 \text{ K}$ f.p of glucose = $273.15 - 4.08 = 269.07 \text{ K}$</p> <p style="text-align: right;">(or by any other method)</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>
12	$E_{\text{cell}} = E^{\circ}_{\text{cell}} - \frac{0.0591}{n} \text{ V } \log \frac{[\text{Mg}^{2+}]}{[\text{Cu}^{2+}]}$ $= 2.71 - (0.0591/2) \text{ V } \log(0.1/0.01)$ $= 2.71 - 0.02955 \text{ V } \log(10) = 2.71 - 0.0295$ $= 2.684 \text{ V}$ <p>If the conc. of Mg^{2+} ions increases, E_{cell} decreases If the conc. of Cu^{2+} ions increases, E_{cell} increases</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
13	<p>(a) Depending upon size of the particles. (b) It causes coagulation of the colloidal particles of cloud. © The colloidal particles of clay get coagulated by the ions of the electrolytes.</p>	<p>1</p> <p>1</p> <p>1</p>
14	<p>(a) The impurities are more soluble in the melt than in solid state of the metal, e.g., Germanium/Silicon. (b) Low melting metals with high melting impurities are heated, and made to flow on sloping surface. eg-Tin, lead</p> <p style="text-align: center;">OR</p> <p>14 Calcination: Heating of concentrated ore in limited supply or absence of air or oxygen Eg., $\text{ZnCO}_3(\text{s}) \xrightarrow{\text{Heat}} \text{ZnO}(\text{s}) + \text{CO}_2(\text{g})$ Roasting: Heating of concentrated ore in presence of air or oxygen Eg., $2\text{ZnS}(\text{s}) + 3\text{O}_2(\text{g}) \xrightarrow{\text{heat}} 2\text{ZnO}(\text{s}) + 2\text{SO}_2(\text{g})$</p> <p style="text-align: right;">(or any other correct example)</p>	<p>1, 1/2</p> <p>1, 1/2</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>
15	<p>(a) Because O-H bond is stronger than S-H bond / Due to strong H-bonding in water. (b) Bi^{+3} more stable due to inert pair effect, so Bi^{+5} gets reduced to +3 state. © Due to its affinity for water.</p>	<p>1</p> <p>1</p> <p>1</p>
16	<p>(a) 5 (b) $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$, octahedral. (c) It forms a Copper complex, not having free Cu^{+2} ions</p>	<p>1</p> <p>$\frac{1}{2}, \frac{1}{2}$</p> <p>1</p>
17	<p>(a) Due to resonance the C-Cl bond develops double bond character / The C in Chlorobenzene is in sp^2 hybridised state but it is in sp^3 state in chloromethane (b) $(\text{CH}_3)_2\text{CHCl} < \text{CH}_3\text{CH}_2\text{Cl} < \text{CH}_3\text{Cl} < \text{CH}_3\text{Br}$ (c) 1-Chloro-6-methylcyclohexene</p>	<p>1</p> <p>1</p> <p>1</p>

18	$\begin{array}{ccc} (\text{CH}_3\text{CO})_2\text{O} & \xrightarrow{\text{C}_2\text{H}_5\text{OH}} & \text{CH}_3\text{COOH} + \text{CH}_3\text{COOC}_2\text{H}_5 \\ \text{A} & & \text{B} \quad \text{C} \\ \text{CH}_3\text{COOC}_2\text{H}_5 & \xrightarrow{\text{H}_2\text{O}/\text{H}^+} & \text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \\ & & \text{D} \\ \text{CH}_3\text{COOH} & \xrightarrow{\text{Ca(OH)}_2/\text{Heat}} & \text{CH}_3\text{COCH}_3 \\ & & \text{E} \end{array}$ <p>(Note: award full marks if the identification of the compounds is correct)</p>	1 1 1
19	<p>(a) (i) $2\text{CH}_3\text{CHO} \xrightarrow{\text{dil NaOH}} \text{CH}_3\text{CH(OH)CH}_2\text{CHO}$ (ii) $\text{R}_2\text{C=O} + 4(\text{H}) \xrightarrow{\text{Zn-Hg/Conc.HCl}} \text{R}_2\text{CH}_2 + \text{H}_2$</p> <p>(b) $\text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CHO} < \text{CH}_3\text{CH}_2\text{OH}$</p>	1 1 1
20	<p>(a) (i) Due to resonance in the benzene ring the lone pair of nitrogen gets delocalized in aniline (ii) Methylamine forms water soluble complex with Ag^+ ions</p> <p>(b) $\text{NH}_3 < \text{R}_3\text{N} < \text{RNH}_2 < \text{R}_2\text{NH}$</p>	1 1 1
21	<p>(a) $\text{H}_3\text{N}^+-\text{CH}_2-\text{COO}^-$ (b) $\text{COOH}-(\text{CHOH})_4-\text{COOH}$ (c) Denaturation of albumin occurs, water soluble globular protein gets converted to water insoluble fibrous protein which absorbs the water.</p>	1 1 1
22	<p>(a) Buna-S < Polythene < Nylon-66 (b) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ and $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$ (either name or structure) (c) Thermoplastic polymer</p>	1 $\frac{1}{2}, \frac{1}{2}$ 1
23	<p>(a) Synthetic detergents work even in hard water (b) $2\text{C}_{17}\text{H}_{35}\text{COONa} + \text{Ca}^{2+}(\text{aq}) \longrightarrow (\text{C}_{17}\text{H}_{35}\text{COO})_2\text{Ca} (\text{s}) + 2 \text{Na}^+(\text{aq})$ (or any other correct reaction of soap) (c) General awareness, use of knowledge of chemistry, helping, caring, social concern.</p>	1 1 2
24	<p>(a)(i) First order (ii) Due to low atmospheric pressure, water boils at low temperature. (iii) $k = \text{Ae}^{-E_a/RT}$, if $E_a = 0$ then $k = \text{A}$, so the rate constant does not depend on temperature.</p> <p>(b) $\text{Rate(R)} = k [\text{A}][\text{B}]^2$ (i) $\text{Rate(R}_1) = k[\text{A}][\text{B}]^2$ $(\text{R}_1) = 9\text{R}$, so the rate increases 9 times. (ii) $\text{R}_2 = k[\text{A}][\text{B}]^2$ $\text{R}_2 = 8\text{R}$, rate increases 8 times</p> <p style="text-align: center;">OR</p> <p>(a) (i) $\text{Rate} = k(x)^n$; $3\text{Rate} = k(27x)^n$ Solving the two $n = 1/3$, so order of reaction = $1/3$ (ii) $\text{Rate} = k[\text{A}]^0[\text{B}]^0 = k$ (iii) The activation energy for combustion of fuels is generally very high, and not achieved at room temperature.</p> <p>(b) $t = \frac{2.303}{k} \log \frac{[\text{R}_0]}{[\text{R}]}$</p> <p>$t_{3/4} = \frac{2.303}{2.54 \times 10^{-3}} \log \frac{[\text{R}_0]}{\frac{1}{4}[\text{R}_0]}$</p> <p>$= \frac{2.303}{2.54 \times 10^{-3}} \log 4$</p> <p>$= 5.46 \times 10^2 \text{ s}$</p>	1 1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1 1 1 1 $\frac{1}{2}$ 1

25	<p>a) $2\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \xrightarrow{\text{Fusion}} 2\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O}$ (A) (B) $2\text{K}_2\text{MnO}_4 + \text{H}_2\text{O} + (\text{O}) \longrightarrow 2\text{KMnO}_4 + 2\text{KOH}$ (C) $3\text{MnO}_4^{2-} + 4\text{H}^+ \longrightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$ (award full marks for identification only)</p> <p>(b)(i) Electronic configuration of $\text{M} = (\text{Ar}) 3\text{d}^7 4\text{s}^2$ Magnetic moment of $\text{M}^{2+} = \sqrt{n(n+2)} = \sqrt{3(3+2)} = 3.87 \text{ BM}$ (ii) Metal-metal interactions are strong in Cr due to large no of unpaired d-orbital electrons, but in Hg no unpaired d-orbital electrons hence metal-metal interactions are weak.</p> <p style="text-align: center;">OR</p> <p>(a) Cr^{2+} changes to Cr^{3+} with stable t_{2g}^3 configuration, but Mn^{3+} changes to Mn^{2+} with stable Half filled d^5 configuration. (b) Mn^{2+} with d^5 stable configuration has high third I.E, whereas Fe^{2+} with d^6 configuration loses electron easily / Mn^{2+} is more stable than Mn^{3+} whereas Fe^{3+} is more stable than Fe^{2+}. (c) Dichromate ion and chromate ion are interconvertible with change in pH / $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O} \rightleftharpoons 2\text{CrO}_4^{2-} + 2\text{H}^+$ Orange Yellow pH < 7 pH > 7 (d) This is due to relatively poor shielding effect of 5f electrons as compared to 4f. (e) Ti (III) is less stable than Ti (IV) is more stable.</p>	<p>1 1 1 1 1 1 1 1 1</p>
26	<p>a) Step 1: $\text{H}_2\text{O} + \text{H}^+ \rightarrow \text{H}_3\text{O}^+$</p>  <p>Step 2: Nucleophilic attack of water on carbocation.</p> <p>Step 3: Deprotonation to form an alcohol.</p> <p>b) i) $\text{C}_6\text{H}_5\text{OH} \xrightarrow{\text{Zn dust / Heat}} \text{C}_6\text{H}_6 \xrightarrow{\text{CH}_3\text{Cl} / \text{Anhy AlCl}_3} \text{C}_6\text{H}_5\text{CH}_3$ ii) $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow[0-5^\circ\text{C}]{\text{NaNO}_2 + \text{HCl}} \text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow[\text{(or by any other correct method)}]{\text{H}_2\text{O} / \text{H}^+} \text{C}_6\text{H}_5\text{OH}$</p> <p>c) 2-bromo-3-methylbut-2-en-1-ol</p>	<p>1 1/2 1/2 1 1 1</p>

26	<p style="text-align: center;">OR</p> <p>a) (i) Due to electron withdrawing effect of $-\text{NO}_2$ group 1 (ii) Due to resonance, C-O bond in phenol acquires a partial double bond character. In ethanol, resonance is not possible / carbon in phenol is sp^2 hybridised whereas in ethanol it is sp^3 hybridised. 1</p> <p>b) i) Add neutral FeCl_3 to both the compounds. 1 Phenol gives violet complex whereas ethanol does not. 1 ii) Heat both the compounds with I_2 and NaOH. Propan-2-ol gives yellow ppt of iodoform whereas methanol does not. 1 (or any other correct distinguishing test)</p> <p>c) 3-Phenoxyheptane 1</p>	
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