



Scholars Den Mock Test: Sure Success Recipe ICSE Board Class 12 Chemistry Solution

Question 1

Part (a)

(i) ΔT_b of 0.5 M K_2SO_4 is more than that of 0.5 M urea solution,

because $\Delta T_b = iK_b m$

For $K_2SO_4 \Rightarrow i = 3$

For urea $\Rightarrow i = 1$

(iv) For 1st order reaction

rate of reaction $r = k [R]$

hence if we double conc. of reactant then

$r' = k [2R] = 2k [R] = 2r$

rate of reaction becomes 2 times

But for zero order of reaction

$r = k$, which does not depend upon conc. hence rate of reaction remains the same

Part (b) (i) $Cr > Mn > V > Ti$

(ii) V_2O_3 and CrO

Part (c) match the following:-

(i) (d)

(ii) (a)

(iii) (b)

(iv) (c)

Part (d)

(i)

(1) Molality is preferred in studies that involves changes in temperature as in some of the colligative properties of the solution. This is because molality depends on mass of solvent and mole of solute which do not change with temperature but molarity depends on volume of solution which changes with temperature.

(2) If solution becomes warm after mixing of two liquids, it means this is exothermic process as a result $\Delta H < 0$, which show negative deviation from Raoult's laws.

(ii)

(1) For chemical reaction $R \longrightarrow P$

For zero order reaction

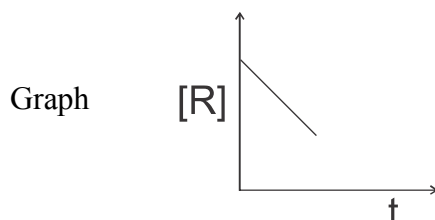
rate = k

$$-\frac{dR}{dt} = k \Rightarrow \int_{[R]_0}^{[R]_t} dR = -k \int_0^t dt$$

$$[R]_t - [R]_0 = -kt$$

$$[R]_t = -kt + [R]_0$$

$$y = mx + c$$



Hence order of reaction will zero

- (2) Slope of curve will be $= -k$
where k is rate constant.

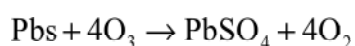
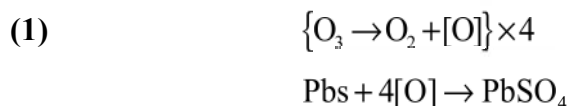
OR

Effect of temperature on rate of reaction

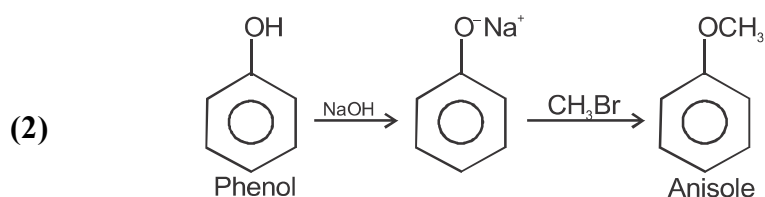
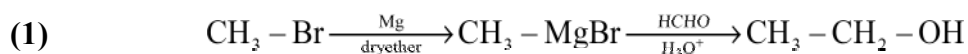
As rate constant $k = e^{-\frac{E_a}{RT}}$

If we increase the temperature then rate constant increases because more collision occurs between molecules and more molecules cross the energy barrier.

(iii)

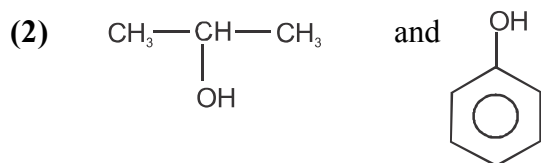


(iv)

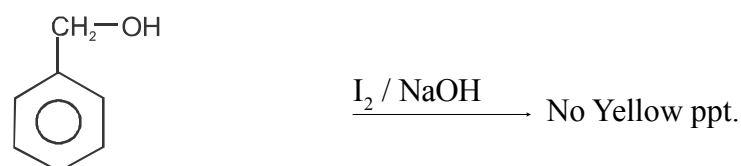
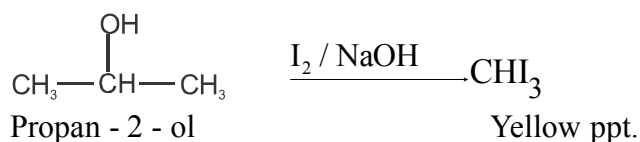


OR

- (1) Chemical Test to distinguish phenol and cyclohexanol
 \Rightarrow Phenol gives violet colour with neutral $FeCl_3$ solution while cyclohexanol does not. Also phenol decolourises bromine water and cyclohexanol does not.



They can be distinguished by Iodoform test.



Question 2

If we assume 100 g solution then there will be 10 g of glucose.

As for 10 g glucose mole will be = $\frac{10}{180}$ mole

Volume of solution = $\frac{100}{1.2}$ ml

Hence molarity = $\frac{\left(\frac{10}{180}\right)}{\left(\frac{100}{1.2}\right)} \times 1000 = 0.67 \text{ M}$

Now weight of solvent = $100 - 10 = 90 \text{ g}$

Hence molality = $\frac{\left(\frac{10}{180}\right)}{\left(\frac{90}{1000}\right)} = 0.62 \text{ m}$

Question 3

- (i) Let order of reaction = n
 rate of reaction $\Rightarrow r = k [A]^n$
 Now increasing conc. of A by 9 times
 $r' = k [9A]^n = k 9^n [A]^n$
 $r' = 3r$

$$9^n k [A]^n = 3 k [A]^n \Rightarrow 9^n = 3$$

$$\text{hence } n = \frac{1}{2}$$

- (ii) Given that rate constant $\Rightarrow k = 2 \times 10^{-2} \text{ sec}^{-1}$

As unit = sec^{-1} , hence 1st order reaction

Hence remaining conc. of R after 100 sec

$$[R]_t = [R]_0 e^{-kt}$$

$$[R]_{100} = 1 \text{ M} \times e^{-2 \times 10^{-2} \times 100}$$

$$[R]_{100} = e^{-2} \text{ M} = \frac{1}{e^2} \text{ M}$$

Question 4

- (ii) Because unbalanced bombardment of the particles of dispersed phase by molecules of dispersion medium causes brownian motion which stabilizes the sol.

OR

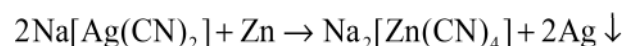
- | | | |
|-----|----------------------------|-----------------------|
| (i) | Solution | Colloidal |
| | Homogeneous mixture | Heterogeneous mixture |
| | Do not show Tyndall effect | Shows Tyndall effect |

Question 5

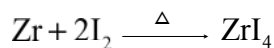
- (i) During the extraction of silver the finely powdered silver ore is treated with dilute KCN solution to form a cyano silver complex, which is water soluble.



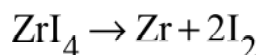
Now zinc is added to the solution and it displaces silver from the complex.



- (ii) Van arkel method involves converting the metal into a volatile salt. The metal is recovered by heating the salt this method is used to purify Zr and Ti using I_2 .



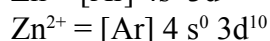
Impure



Pure

OR

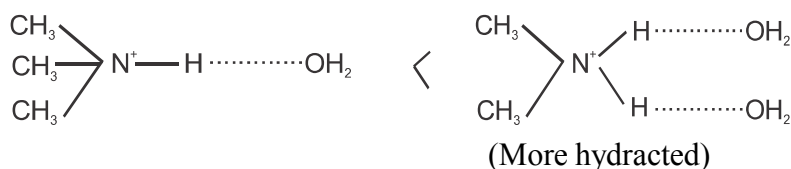
- (i) Transition metals form alloys because they have almost similar sizes so that atoms of one metal can easily take up the positions in the crystal lattices of other.
- (ii) In case of Zn^{2+} fully filled d-orbital is present therefore no d-d transition can happen and its salts are colourless.



In case of Cu^{2+} unpaired partly filled d-orbital is present therefore d-d transition happens which lies in visible region & hence its compounds are coloured.

**Question- 6**

- (i) Dimethyl amine is more basic than trimethyl amine in aqueous medium because in aqueous phase, the substituted ammonium cations gets stabilised not only by e^- releasing effect of alkyl group but also by solvation with water molecules. The greater the size of the ion, lesser will be the solvation & the less stabilised is the ion.



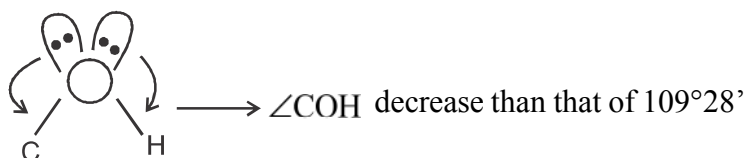
- (ii) Because diazonium salts of aromatic amines are more stable than those of aliphatic amines because of resonance, there is dispersal of positive charge on the benzene ring which is not present in aliphatic amines.

Question-7

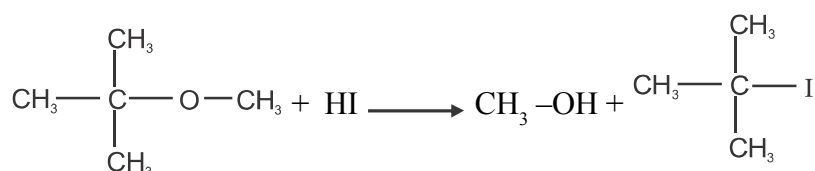
- (i) $\text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$
- (ii) $\text{He} < \text{Rn} < \text{Xe} < \text{Ar} < \text{Ne}$

Question-8

- (i) Because in alcohol repulsion between the 2 lone pairs of electron of oxygen pushes the C-O and O-H bonds close to each other



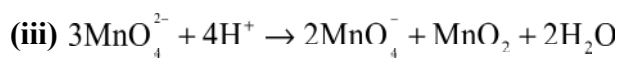
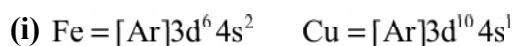
- (ii) It is because in step 2 of these kind of reactions the departure of leaving group ($\text{HO}-\text{CH}_3$) creates a more stable carbocation ($(\text{CH}_3)_3\text{C}^+$) and the reaction follows SN^1 mechanism.



Question-9

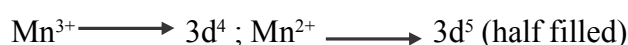
(i) CuCl_2 is more stable because Cu^{2+} has a higher electron density than Cu^+ , Cu^{2+} is smaller in size and has higher effective nuclear charge. Therefore higher hydration energy of Cu^{2+} makes it more stable.

(ii) Co^{2+} ions can be easily oxidised to Co^{3+} in presence of strong ligands because the crystal field stabilisation energy of Co^{3+} with a d^6 configuration is higher than d^7 configuration (as in case of Co^{2+}).

**OR**

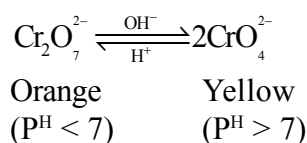
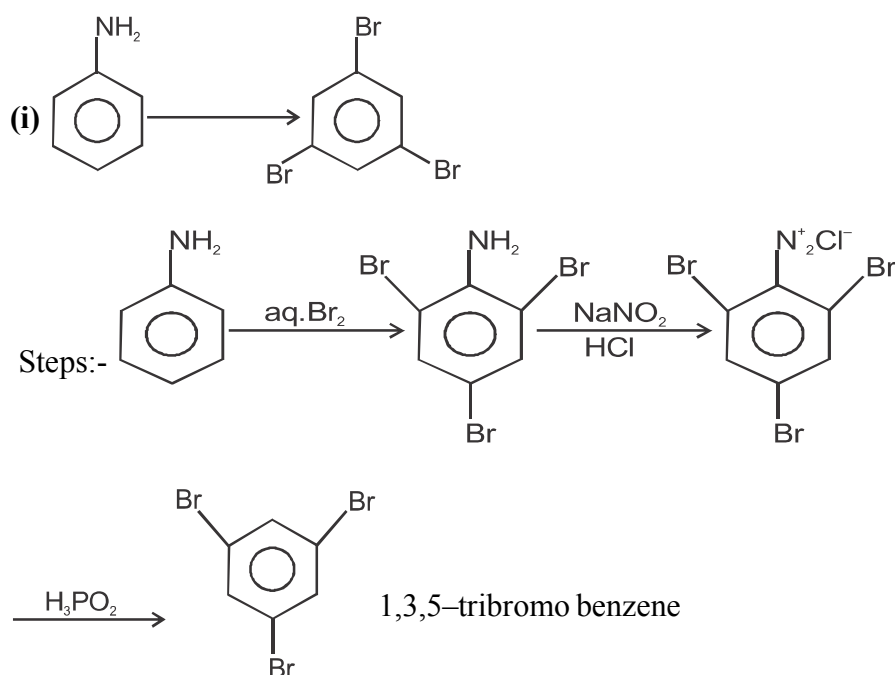
More is the number of unpaired electrons, stronger will be the metallic bonding that leads to higher melting points. Fe has four unpaired electrons and Cu has only one. So Fe has higher mp than Cu.

(ii) Mn (III) undergoes disproportionation to Mn (II) and Mn (VII).

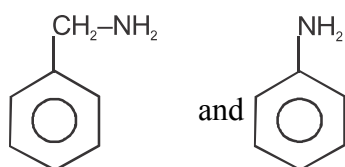


Since Mn (II) oxidation state is more stable due to stable half filled electronic configuration and Mn (VII) has inert gas configuration, therefore Mn(III) changes to Mn (II) and Mn (VII) by disproportionation .

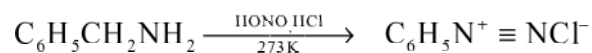
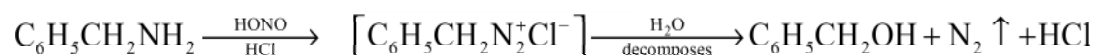
(iii) $\text{Cr}_2\text{O}_7^{2-}$ remains in kinetic equilibrium with CrO_4^{2-}

**Question-10**

(ii) Chemical test to distinguish \Rightarrow

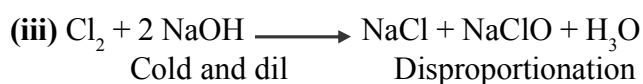
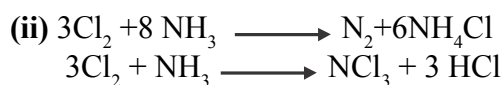


By nitrous acid test



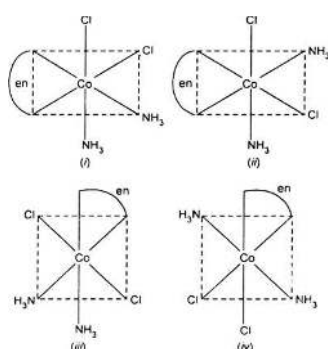
Question-11

(i) Cl_2 , 17 group

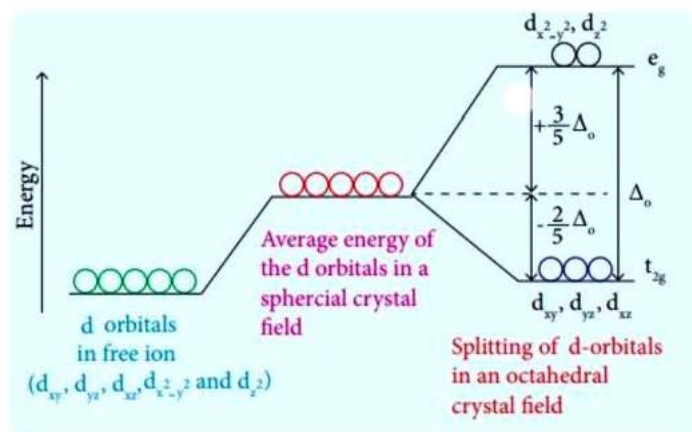


Question-12

(i)



(ii) On the basis of crystal field theory, for a d^4 ion, if $\Delta_o < P$, then the complex is a high spin complex formed by association of weak field ligands with the metal ion. As a result, the fourth electron enters one of the e_g orbitals thereby, exhibiting the electronic configuration $t_{2g}^3 e_g^1$.

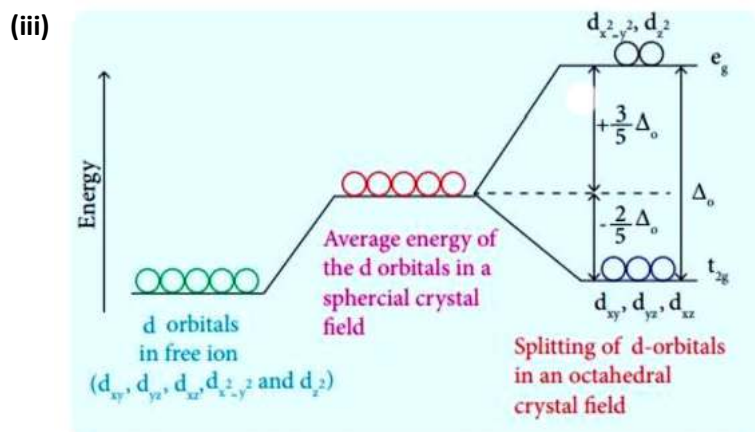


(iii) In $[\text{Fe}(\text{CN})_6]^{-3}$ complex CN^- is a strong field ligand therefore will form low spin complex by using inner 3d-orbitals. Since it has octahedral geometry as there are 6 ligands, so its hybridization will be d^2sp^3 .

OR

(i) Ambidentate ligands are monodentate ligands that can bind in two possible places. For example, the nitrate ion NO_2^- can bind to the central metal atom/ion at either the nitrogen atom or one of the oxygen atoms. The thiocyanate ion SCN^- can bind to the central metal at either the sulfur or the nitrogen.

(ii) Denticity refers to the ability of any group or ligand to attach itself through different atoms in it. For e.g. ethylene diamine is a bidentate ligand as it attaches itself to the metal ion by its two nitrogen atom.



Question-13

(i)

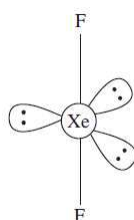
(1) SF_4 has four bonded atoms and one lone pair. The bonded electrons occupy the axial and equatorial positions. The axial bonds are slightly bent and longer.

(2) O forms π bonds (O = O bonds) but S does not form S = S held together by strong covalent bonds and exists together as polyatomic molecule like S_8 and exists as solid. But O_2 exists as gas.

(3) As per Fajan's rule, higher is the positive charge on cation, more will be the polarising power of cation and SnCl_4 will have more covalent character.

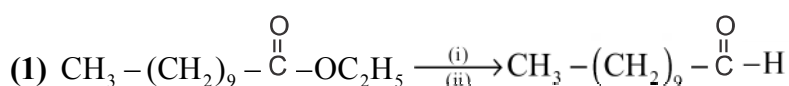
(4) Interhalogen compounds have more polar bonds and they can break more easily.

(ii)

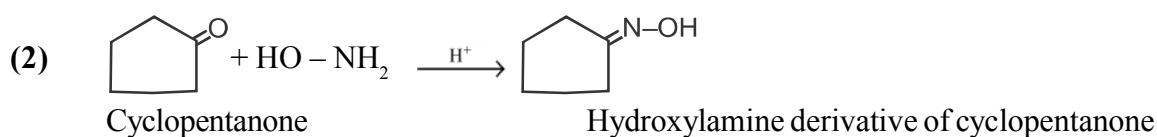


Question-14

(i)

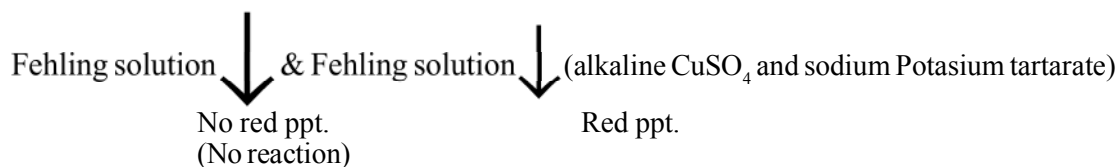
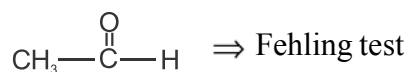
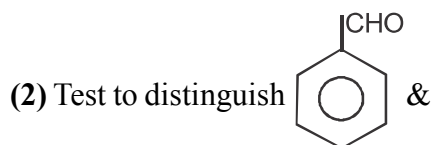


(i) DIBAL-H

(ii) H_2O 

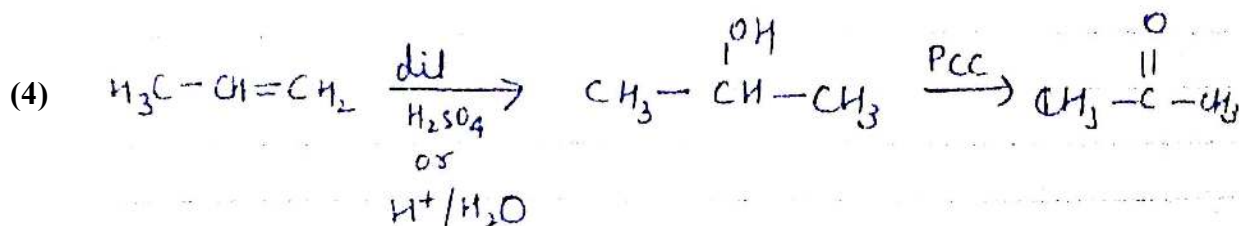
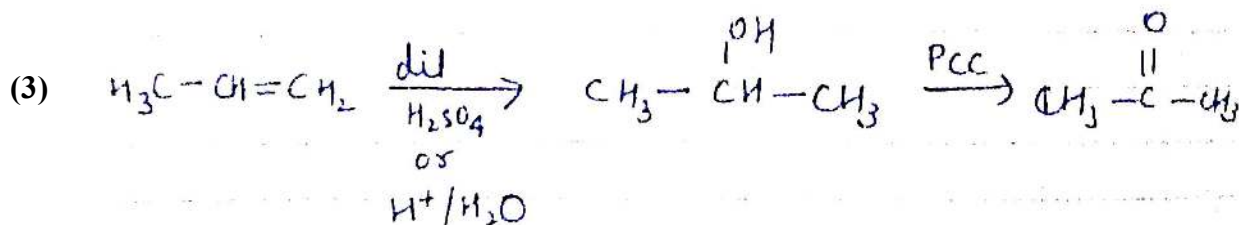
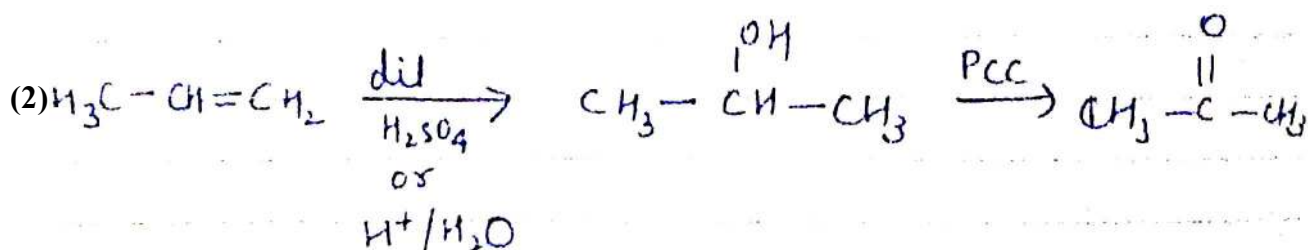
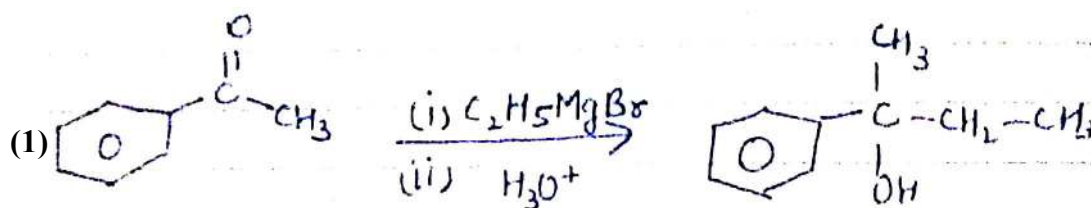
(ii)





Question-15

(i)



(ii) FCH2COOH > ClCH2COOH > CH3COOH > C6H5COOH > CH3CH2COOH \rightarrow decreasing Acidic strength

Question-16

(i)

(1) Given that $E^\circ_{Cu^{2+}/Cu} = 0.34V$

and $E^\circ_{Ni^{2+}/Ni} = -0.25V$

At reduction scale (S.R.P)

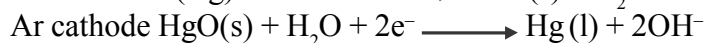
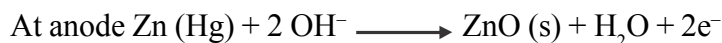
Value of $E^\circ_{Cu^{2+}/Cu}$ is more than that of $E^\circ_{Ni^{2+}/Ni}$. Hence Cu^{2+} will undergo oxidation.

As result CuSO_4 becomes Cu metal and Ni metal becomes Ni^{+2} , hence 1 M copper sulphate can not be stored in a vessel made of nickel metal.

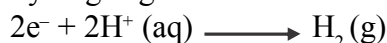
(2) Conductivity of solution increase with dilution because more dissociation of weak electrolytes occurs, and attraction force between strong electrolytes becomes weak as result mobility increases.

(3) As for mercury cell, its cell potential remains constant because the ionic conc. of the solution is not changes during its uselife

Chemical reaction as



(ii) For hydrogen gas electrode at 298 K



$$E_{\text{H}^+/\text{H}_2} = E^{\circ}_{\text{H}^+/\text{H}_2} - \frac{0.0591}{2} \log_{10} \frac{(P_{\text{H}_2})}{[\text{H}^+]^2}$$

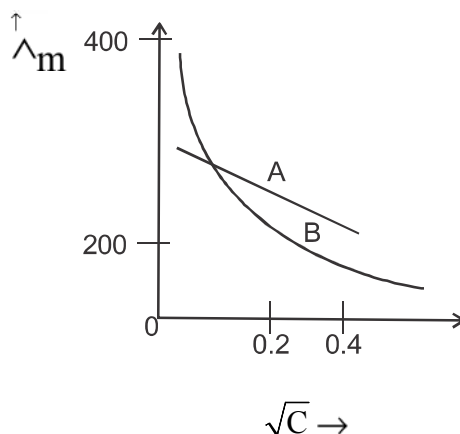
$$E_{\text{H}^+/\text{H}_2} = 0 - \frac{0.0591}{2} \log_{10} \frac{1}{[\text{H}^+]^2}$$

$$-0.118\text{V} = \frac{-0.591}{2} \log_{10} [\text{H}^+]^{-2}$$

$$\frac{0.118}{0.0591} = -\log_{10} [\text{H}^+]$$

$$\text{pH} = 1.99 \approx 2$$

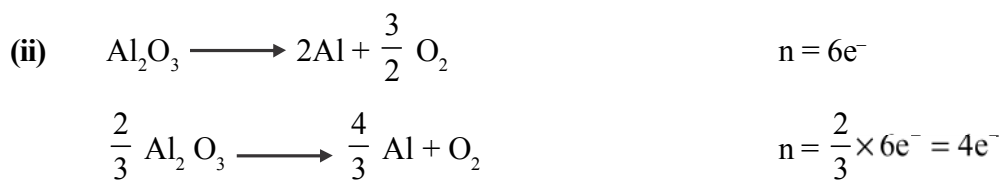
OR



(i)

(1) As seen from the graph, electrolyte (A) is strong electrolyte which is ionised almost completely in solution. For strong electrolyte (A) the number of ions does not increases appreciably on dilution and only mobility of ions increase due to decrease in interionic attraction. Therefore molar conductivity increases a little as shown in the graph by straight line.

(2) Limiting molar conductivity (Λ_m°) for weak electrolyte. (B) can be obtained by using Kohlrausch's law of independent migration of ions which says that Λ_m° of an electrolyte is equal to the sum of the individual contribution of the cation and anion of the electrolyte



$$\Delta G = -nF E_{\text{cell}}$$

$$960 \times 1000 \text{ J} = -4 \times 96500 \times E_{\text{cell}}$$

$$E_{\text{cell}} = -\frac{\Delta G}{nf}$$

$$E_{\text{cell}} = -\frac{960 \times 1000}{4 \times 96500} = -2.487 \text{ V}$$

Hence minimum potential difference
Needed to reduce Al_2O_3 is -2.487 V

Question-17

(i)

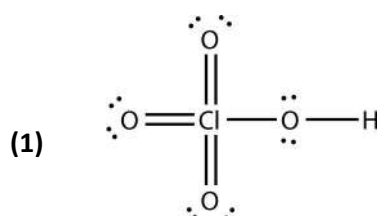


Its bleaching action is due to oxidising action and hence is permanent

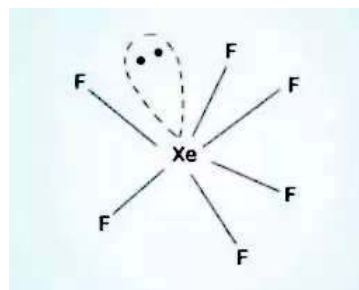
(2) Presence of sterically protected sulphur by six F atoms does not permit water to approach.

(3) Because Xe is large in size and its IE is not that large.

(ii)



(2)



OR

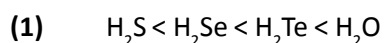
(i)

(1) Bond energy of H-F is large so H^+ removal will be tougher

(2) Moving O to Te, size increases and (lp - lp) repulsion decreases and so bond angle also decreases

(3) Ozone decomposes to O_2 with liberation of heat. $2\text{O}_3 \longrightarrow 3\text{O}_2$; Ozone consists of three O_2 molecules and thus it is unstable. In order to get stabilised, it loses one molecule of O_2 to restore diatomic state.

(ii)

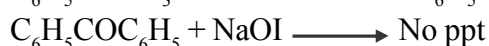
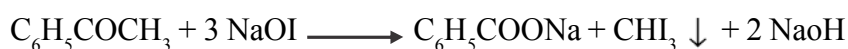


Question-18

- (i) (1) $\text{CH}_3\text{-CH}_2\text{-}\overset{\text{O}}{\parallel}\text{C}\text{-CH}_3 \xrightarrow[\text{HCl}]{\text{Zn-Hg}} \text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
- (2) $\text{C}_6\text{H}_5\text{CHO} \xrightarrow{\text{H}_2\text{NCONHNH}_2} \text{C}_6\text{H}_5\text{-C}=\text{N-NH}-\overset{\text{O}}{\parallel}\text{C}\text{-NH}_2$
- (3) $(\text{CH}_3)_3\text{CCHO} \xrightarrow[\text{NaOH}]{\text{Conc}} (\text{CH}_3)_3\text{CCOONa} + (\text{CH}_3)_3\text{CCH}_2\text{OH}$

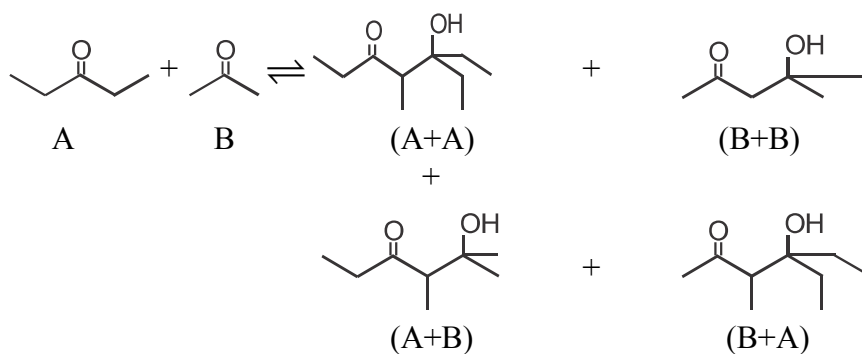
(ii) (1) Propanal reduces tollen's reagent but propanone do not.

(2) Acetophenone being a methyl ketone when treated with NaOI (I_2/NaOH) gives yellow ppt. of iodoform but benzophenone does not.

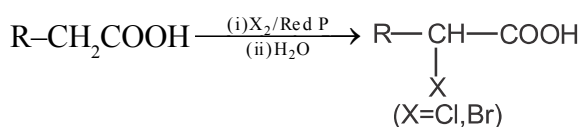


OR

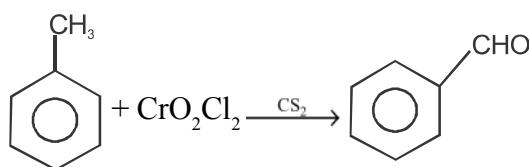
(i) (1) Cross-aldol condensation :-



(2) HVZ reaction



(3) Etard Reaction :-



(ii) Nucleophilic addition reaction of Aldehyde & Ketone:

