XII - CBSE BOARD

CODE (56/1/MT) SET - 1

Date: 12.03.2015

CHEMISTRY - SOLUTIONS

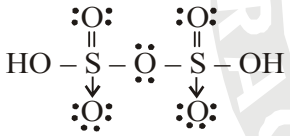
1. Dispersed phase–solid, Dispersion medium–liquid

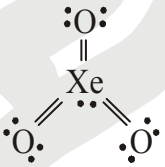
2. Copper atom in ground state or ion in one of the common oxidation states, has incomplete d-subshell i.e. having electrons between 1 to 9. Therefore copper is considered as a transition element.

3. $CH_3 - CH_2 - Br$

4. The electrode reaction is : $Al^{3+} + 3e^- \longrightarrow Al$ quantity of charge required for reduction of $1\ mol\ of\ Al^{3+} = 3F$.

5. $1-$Methoxypropan$-2-ol$

6. (i) 

(ii) 

7. $\left[Co\left(NH_3\right)_5\left(CO_3\right)\right]Cl$

Pentamminecarbonatocobalt (III) chloride

Ionisation isomerism

OR

(i) $\left[CuCl_4\right]^{-2}$

(ii) $K_2\left[Zn\left(OH\right)_4\right]$

8. According to Raoult's law , $\dfrac{p^\circ - p_s}{p^\circ} = \dfrac{n_2}{n_1 + n_2}$

If w_2 g of the solute are dissolved in w_1 g of the solvent and if M_2 and M_1 are their respective molecular masses, we have $n_2 = \dfrac{w_2}{M_2}$ and $n_1 = \dfrac{w_1}{M_2}$

Substituting these values in the above expresion, we get

$$\frac{p^\circ - p_s}{p^\circ} = \frac{w_2 / M_2}{w_1 / M_1 + w_2 / M_2}$$

For a dilute solution, n_2 can be neglected in comparison with n_1 so that Raoult's law equation becomes

$$\frac{p^\circ - p_s}{p^\circ} = \frac{n_2}{n_1} \quad or \quad \frac{p^\circ - p_s}{p} = \frac{w_2/M_2}{w_1/M_1}$$

$$\frac{p^\circ - p_s}{p^\circ} = \frac{w_2 \times M_1}{w_1 \times M_2}$$

$$\therefore M_2 = \frac{w_2 M_1}{w_1} \times \frac{p^\circ}{p^\circ - p_s}$$

9. (i) $C_6H_5 - NH_2 < C_6H_5 - NH - CH_3 < C_2H_5NH_2$

(ii) $CH_3 - NH - CH_3 < C_2H_5NH_2 < C_2H_5OH$

10. **Definition :** Rate constant may be defined as the rate of the reaction when the molar concentration of each reactant is taken as unity.

1^{st} order = s^{-1}

2^{nd} order = $L\ mol^{-1}s^{-1}$

11. (i) **F–centre:** In metal excess defect the anionic site occupied by unpaired electrons are called F–center.

(ii) **p–type semiconductor:** Under the influence of electric field, electrons would move towards the positively charged plate through electronic holes, but it would appear as if electron holes are positively charged and are moving towards negatively charged plate. This type of semi conductors are called *p-type* semiconductors.

(iii) **Ferrimagnetism:** When the magnetic moments of domains in the substance are aligned in parallel and antiparallel directions in unequal numbers are called Ferrimagnetism.

12. $K_1 = 2 \times 10^{-2}$, $K_2 = 8 \times 10^{-2}$

$T_1 = 300\ K$, $T_2 = 320\ K$

$E_a = ?$

$$\log \frac{K_2}{K_1} = \frac{E_a}{2.303\ R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$\log \frac{8 \times 10^{-2}}{2 \times 10^{-2}} = \frac{E_a}{2.303 \times 8.314}\left(\frac{1}{300} - \frac{1}{320}\right)$$

$$\therefore \log 4 = \frac{E_a}{19.147}\left(\frac{20}{300 \times 320}\right)$$

$$\therefore E_a = \frac{\log 4 \times 19.147 \times 300 \times 320}{20}$$

$$= \frac{0.602 \times 19.147 \times 300 \times 320}{20}$$

$$E_a = 55327.17\ Jmol^{-1} \qquad \therefore E_a = 55.33\ kJ\ mol^{-1}$$

13. (i) **Homogeneous catalysis :** When the reactants and the catalyst are in the same phase (i.e., liquid or gas), the process is said to be homogeneous catalysis.

(ii) **Coagulation :** The process of settling of colloidal particles is called coagulation or precipitation of the sol.

(iii) **Macromolecular colloids :** Macromolecules in suitable solvents form solutions in which the size of the macromolecules may be in the colloidal range. Such systems are called macromolecular colloids.

14. (i) Zone refining is based on the principle that the impurities are more souble in the melt than in the solid state of the metal. Hence on heating, the pure metal crystallises out of the melt and impurities remain in the molten zone.

(ii) NaCN solution in used in the extraction of gold as a leaching agent to form cyano complex with the metal in presence of O_2. The metal is then obtained by replacement.

(iii) Wrought iron or mallaeble iron is the purest form of commercial iron.

15. $W_2 = 1.5\,g,\ W_1 = 90\,g$

$\Delta T_b = 353.93 - 353.23 = 0.70\ K$

$K_b = 2.52\ K.kg\ mol^{-1}$

$M_2 = ?$

$$M_2 = \frac{1000\,K_b}{\Delta T_b} \times \frac{W_2}{W_1}$$

$$= \frac{1000 \times 2.52 \times 1.5}{0.70 \times 90}$$

$$= \frac{3780}{63} = 60\ g.mol^{-1}$$

16. (i) Due to london dispersion force.

(ii) Due to bond pair-bond pair repulsion.

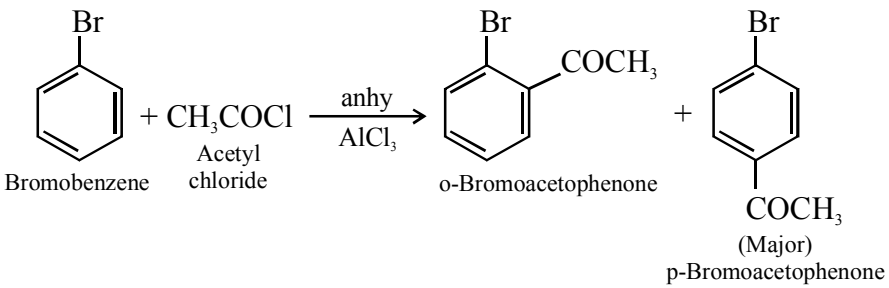
(iii) This is due to the fact that the atoms of these elements have only one electron less than stable noble gas configurations.

17. (i) $CH_3 - CH = CH_2 + H_2O \xrightarrow{H^+} CH_3 - \underset{OH}{\underset{|}{CH}} - CH_3$

Propene → 2-propanol

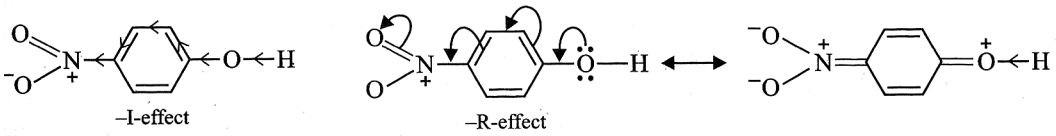
(ii) $CH_3 - CH_2 - \underset{Br}{\underset{|}{CH}} - CH_3 + KOH \xrightarrow[\text{heat}]{\text{ethanol}} CH_3 - CH = CH - CH_3 + KBr + H_2O$

2-Bromobutane → 2-Butene

(iii) 

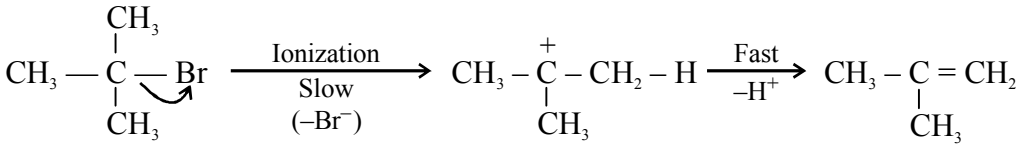
Bromobenzene → o-Bromoacetophenone + (Major) p-Bromoacetophenone

18. (a) Due to – I and – R–effect of the $-NO_2$ group, the electron density in the O–H bond decreases relative to O–H group in phenol.



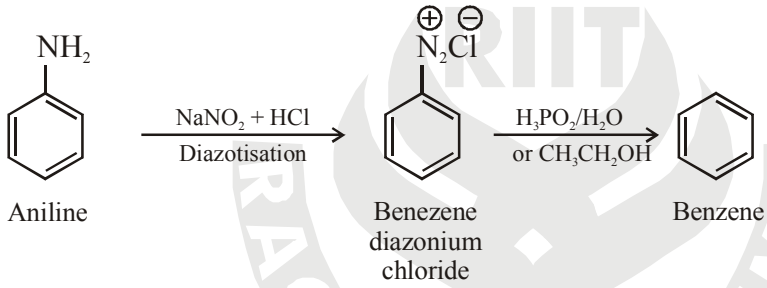
(b) In ethers C–O–C bond angle is slightly greater (110°) than tetrahedral angle due to repulsions between the two bulky R–groups.

(c) Tertiary alkylhalide undergo elimination reaction when heated with ionizing solvent.

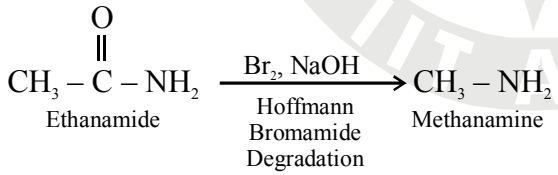


The rate determining step i.e. reactivity in E_1 reaction depends upon the stability of carbocations. More stable the carbocation faster is the reaction.

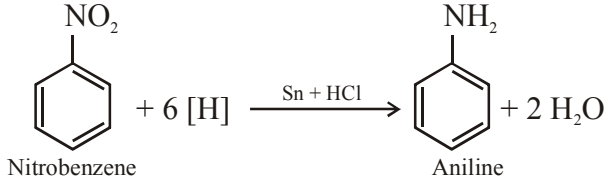
19. (i) **Aniline to Benzene:**



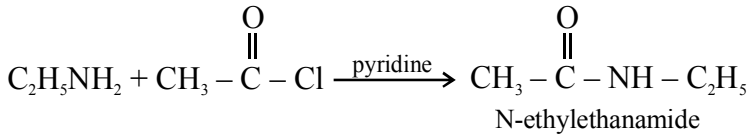
(ii) **Ethanamide to Methanamine:**

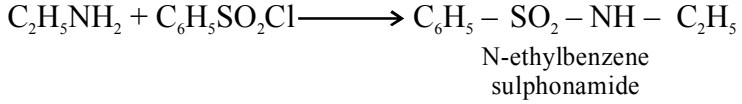


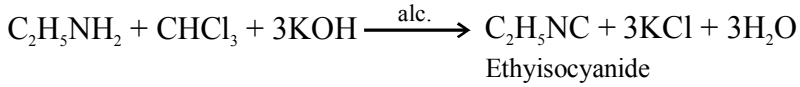
(iii) **Nitrobenzene to Aniline:**



OR

(i) 

(ii) 

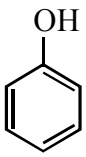
(iii) 

20. (i) **Structures of Monomer of Buna N :**

$H_2C = CH - CH = CH_2$
1, 3-Butadiene

$H_2C = CH - CN$
Acrylonitrile

(ii) **Structures of Monomer of Bakelite:**



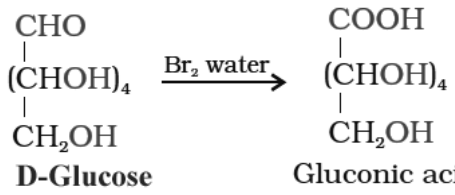
Phenol

and $\underset{\text{Formaldehyde}}{H - CHO}$

(iii) **Structure of Monomer of Teflon :**

$CF_2 = CF_2$
Tetrafluoroethene

21. (i) D–glucose reacts with Br_2 water to give Gluconic acid, where –CHO aldehyde group is oxidised to –COOH group.



D-Glucose Gluconic acid

(ii) α – Amino acids in proteins are connected to each other by peptide linkage. (–CO–NH–)

(iii) DNA contains $\beta - D - 2 -$ deoxyribose sugar and RNA contains $\beta - D -$ *ribose sugar*

OR

DNA contains Adenine, Guanine, Cytosine and Thymine bases. RNA contains Uracil instead of Thymine.

22. (a) (i) $\left[Co\left(NH_3\right)_6\right]^{3+}$ = Hybridization $- d^2sp^3$

Shape – Octahedral

(ii) $\left[NiCl_4\right]^{2-}$ – Hybridization $- sp^3$

Shape – Tetrahedral

(b) Out of 'NH_3' and 'en', 'en' forms more stable complex with metal. As only 'en' forms chelate with metal and chelates are more stable than unidentate ligands (NH_3)

23. (i) Mr. Chopra shows care and concern for the young children in regards to their health. In order to bring about change, he is very strict in implementing the ban on junk food and very instrumental in encouraging the students in physical activities.

(ii) In order to spread awareness about this issue. I would promote the intake of healthy food like fruits, vegetables, milk etc. and create awareness about the ill-effects of junk food and soft drinks. I would encourage and get involved in sports and other health activities for good health.

(iii) Heavier dosage of Antidepressant drug can cause depression in CNS, leading to produce stupor, coma, convulsions and ultimately death. Hence, Antidepressent drug should not be taken without consulting doctor.

(iv) Saccharin, Alitame

24. Anode (Oxidation) : $Ni_{(s)} \rightleftharpoons Ni^{2+}_{(aq)} + 2e^-$

Cathode (Reduction) : $2\,Ag^+_{(aq)} + 2e^- \rightleftharpoons 2Ag_{(s)}$

Net cell reaction : $Ni_{(s)} + 2Ag^+_{(aq)} \rightleftharpoons Ni^{2+}_{(aq)} + 2Ag_{(s)}$

Reaction Quotient, $Q = \dfrac{\left[Ni^{2+}\right]}{\left[Ag^+\right]^2} = \dfrac{0.01}{(0.001)^2}$

$\therefore\ Q = \dfrac{1\times10^{-2}}{1\times10^{-6}} = 1\times10^4$

$E^o_{cell} = E^o_{Ag} - E^o_{Ni} = 0.80 - (-0.25)$

$\therefore\ E^o_{cell} = 1.05\ N$

$E_{cell} = E^o_{cell} - \dfrac{0.059}{n}\log Q$

$= 1.05 - \dfrac{0.059}{2}\log\left(10^4\right)$

$= 1.05 - \dfrac{0.059}{2}\times 4$

$= 1.05 - 0.118$

$\therefore\ E_{cell} = 0.932\ V$

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

$= -2\times96500\times0.932$

$= -179876\,J$

$= -179.876\ kJ$

OR

(a) Conductivity $K = 1.06\times10^{-2}\ s.cm^{-1}$

Concentration C = 0.1 mol. L^{-1}

$\lambda^o_{Na^+} = 50.1\ S.cm^2\ mol^{-1}$, $\lambda^o_{Cl^-} = 76.5\ S.cm^2\ mol^{-1}$

$\wedge^o_m = \lambda^o_{Na^+} + \lambda^o_{Cl^-} = 50.1 + 76.5$

$\wedge^o_m = 126.6\ S.cm^2\ mol^{-1}$

$\wedge_m = \dfrac{1000\,K}{C} = \dfrac{1000\times1.06\times10^{-2}}{0.1}$

$= 106\ S.cm^2\ mol^{-1}$

$\alpha = \dfrac{\wedge_m}{\wedge^o_m} = \dfrac{106}{126.6} = 0.837$

(b) In primary battery, the reaction occurs only once and after use over a period of time, the battery becomes dead and cannot be reused. Eg. Leclanche cell.

A secondary cell can be recharged after use by passig current through it in the opposite direction so that it can be used again. Eg. Lead storage battery.

25. (a) (i) In Ce^{4+}, electronic configuration is $[Xe]4f^o$. In this case as high charge density and small size Ce^{4+} in aqueous solution acts as strong oxidising agent.

(ii) Greater the number of valence electrons stronger is resultant bonding. (Metallic bond) therefore. Transition metal have high Enthalpies of Atomisation.

(iii) In Manganese sum of 's' and 'd' electrons are maximum (7) in '3d' series therefore Mn shows maximum number oxidation state in 3d series.

(b) (i) $2MnO_4^- + 6H^+ + 5NO_2^- \longrightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \longrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

OR

(a) (i) In transition metal when an electron from a lower energy *d* orbital is excited to a higher energy *d* orbital, the energy of excitation corresponds to the frequency of light absorbed. This frequency generally lies in the visible region. The colour observed corresponds to the complementary colour of the light absorbed.

(ii) Electronic configuration of

$Cr^0 = [Ar]\,3d^4\,4s^2$

$Cr^{2+} = [Ar]\,3d^4\,4s^0$

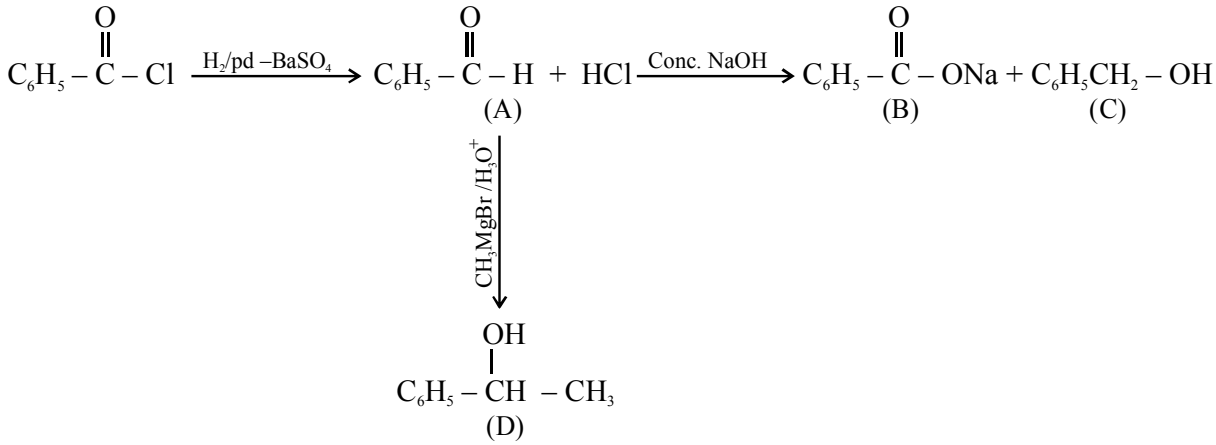
As its configuration changes from d^4 to d^3. d^3 having half filled t_{2g} level. Cr^{2+} is strong reducing agent

(iii) Relative stabilities of f^o f^7 and f^{14} occupancies of the 5f orbitals shows irregularities in electronic configuration of actinoids.

(b) **Lanthanoid contraction:** The filling of 4f before 5d orbital results in a regular decrease in atomic radii called lanthanoid contraction.

More common oxidation state of lanthanoids is +2, +3

26. (a)



(b) (i) These can be distinguished by the idoform test.

Iodoform test: Acetophenone being a methyl ketone when treated with $NaOI\,(I_2 / NaOH)$ gives yellow ppt. of iodoform but benzophenone does not.

$$\underset{\text{Acetophenone}}{C_6H_5COCH_3} + 3\,NaOI \longrightarrow \underset{\text{Sod. benzoate}}{C_6H_5COONa} + \underset{\text{Iodoform}}{CHI_3}\downarrow + 2\,NaOH$$

(*Yellow ppt.*)

$$\underset{\text{Benzophenone}}{C_6H_5COC_6H_5} \xrightarrow{NaOI} \text{No yellow ppt. of } CHI_3$$

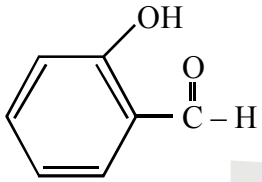
(ii) $FeCl_3$ test. Phenol gives a violet colouration with neutral $FeCl_3$ solution while benzoic acid gives buff coloured ppt. of ferric benzoate.

$$\underset{\text{Phenol}}{C_6H_5OH} + FeCl_3 \longrightarrow \text{Violet colouration}$$

$$\underset{\text{Benzoic acid}}{3\,C_6H_5COOH} + FeCl_3 \longrightarrow \underset{\text{Ferric benzoate}}{(C_6H_5COO)_3Fe} + 3HCl$$

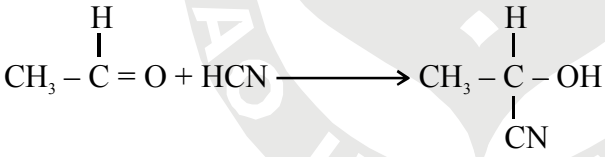
(*Buff coloured ppt.*)

(c)

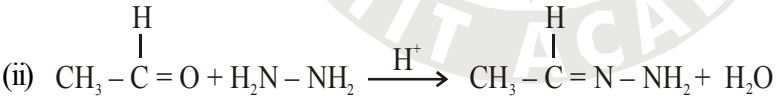


OR

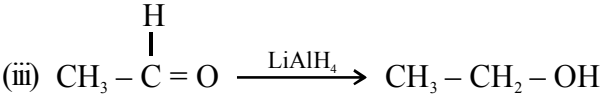
(a) (i)



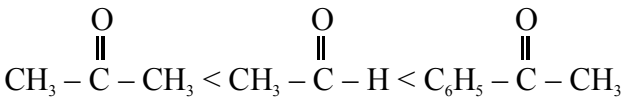
(ii)



(iii)



(b)



(c) These can be distinguished by the iodoform test.

Ethanal contains the grouping CH_3CO- linked to H and hence reacts with $I_2 / NaOH$ (or NaOI) to give yellow ppt of iodoform but propanal does not contain the grouping CH_3CO- (linked to H or C) and hence does not react with $I_2 / NaOH$ to give yellow ppt. of iodoform.

$$\underset{\text{Ethanal}}{CH_3CHO} + 3\,I_2 + 4\,NaOH \xrightarrow{\text{Heat}} \underset{\text{Iodoform}}{CHI_3}\downarrow + \underset{\text{Sod. formate}}{HCOONa} + 3\,NaI + 3\,H_2O$$

(*Yellow ppt.*)

$$CH_3CHO + 3\,NaOI \longrightarrow CHI_3 + HCOONa + 2\,NaOH$$

$$\underset{\text{Propanal}}{CH_3CH_2CHO} \xrightarrow{I_2/NaOH} \text{No yellow ppt. if } CHI_3$$