Solution of DPP # 5

TARGET : JEE (ADVANCED) 2015

Course : VIJETA & VIJAY (ADP & ADR)

CHEMISTRY

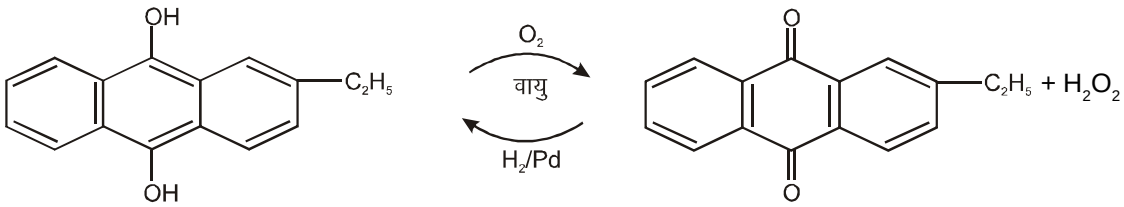
2. $F_2 + \underset{(X)}{HCl} \longrightarrow HF + \underset{(Y)}{Cl_2}$; Cl_2 is greenish yellow gas.

$\underset{(Y)}{2Cl_2} + 3(a(OH)_2 \longrightarrow Ca(OCl)_2.\underset{(Z)}{Ca(OH)_2}.CaCl_2.2H_2O$

Z is bleaching powder it turns red litmus paper to white.

3. (B) $H_2SO_4 + PbO_2 \longrightarrow PbSO_4\downarrow + \frac{1}{2}O_2 + H_2O$ (PbO_2 is not peroxy compound) (PbO_2 परॉक्सी यौगिक नहीं है)

$H_2SO_4 + BaO_2 \longrightarrow BaSO_4\downarrow + H_2O_2$



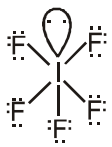
$(NH_4)_2SO_4 \rightleftharpoons 2NH_4^+ + SO_4^{2-}$; At anode : $2SO_4^{2-} \xrightarrow{\text{Electrolysis}} S_2O_8^{2-} + 2e^-$

Peroxo sulphate on hydrolysis, produces H_2O_2.

4. $\underset{(A)}{IF_5} + H_2O \longrightarrow \underset{(P)}{HF} \longrightarrow + \underset{(Q)}{HIO_3}$

HF is used in etching of glass

$\underset{(Q)}{HIO_3} \underset{\text{heating}}{\overset{\text{on strong}}{\rightleftharpoons}} \underset{(R)}{I_2O_5}$



$\underset{(R)}{I_2O_5} + CO \longrightarrow I_2 + CO_2$

5. (D) Aqueous solution of SO_2 acts as a reducing agent

$SO_2 + 2H_2O \longrightarrow H_2SO_4 + \underset{\text{nascent hydrogen}}{2H}$

Thus, SO_2 in presence of moisture is used as bleaching agent. This is due to the reducing nature of SO_2.

For delicate articles

Coloured matter + H $\longrightarrow$ Colourless matter

Similarly, Cl_2 acts as bleaching agent in presence of moisture

$Cl_2 + H_2O \longrightarrow 2HCl + [O]$

Coloured matter + [O] $\longrightarrow$ Colourless matter

6. (b) $XeF_4 + SbF_5 \longrightarrow [XeF_3]^+ [SbF_6]^- \longrightarrow$ $[XeF_3]^+$ (+) $[SbF_6]^-$

$sp^3 d$ — bent T-shape; $sp^3 d^2$ — octahedral

9. (B) $6Cl_2 + 2Ba(OH)_2 \longrightarrow \underset{(X)}{Ba(ClO_3)_2} + 5BaCl_2 + 6H_2O$

$Ba(ClO_3)_2 + H_2SO_4 \longrightarrow \underset{(Y)}{2HClO_3} + BaSO_4 \downarrow$

$2HClO_3 \xrightarrow[\Delta > 365\ K]{\Delta} 2ClO_2 + H_2O + \frac{1}{2} O_2$

11. (I) Ni (impure) $+ 4CO \xrightarrow{50°C} [Ni(CO)_4]$ (volatile) $\xrightarrow{230°C} Ni$ (pure) $+ 4CO \uparrow$

(II) $Cu_2S + \frac{3}{2}O_2 \xrightarrow{\Delta} Cu_2O + SO_2$

$Cu_2S + 2Cu_2O \xrightarrow[\text{temp.}]{\text{high}} 6Cu + SO_2$

(III) $MgCl_2\,(s) \xrightarrow{\text{electrolysis}} Mg^{2+}(\ell) + 2Cl^-(\ell)$

At Cathode : $Mg^{2+} + 2e^- \longrightarrow Mg$; At anode : $2Cl^-(\ell) \longrightarrow Cl_2(g) + 2e^-$

12. (i) $Cr_2O_3 + 2Al\ (R.A.) \xrightarrow{\Delta} Al_2O_3 + 2Cr$; ΔH = –ve

(ii) Mg is extracted by electrolysis of fused $MgCl_2$ and NaCl.

(iii) $PbS + \frac{3}{2}O_2 \longrightarrow PbO + SO_2$; $PbO + C \longrightarrow Pb + CO$

(iv) Red Bauxite is purified by Baeyer's process.

13. $MgCl_2 + Na_2CO_3 \rightarrow MgCO_3 + NaCl$

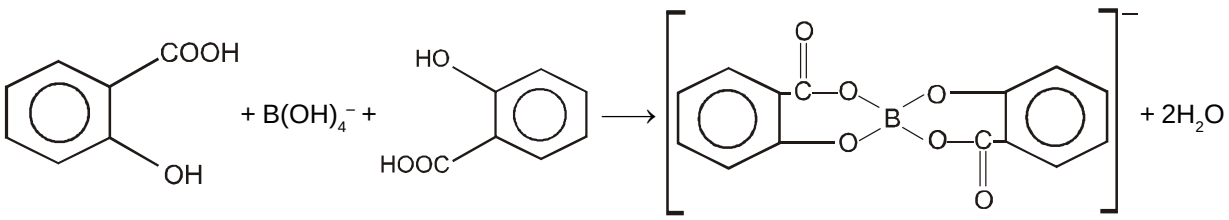
$Ca(HCO_3)_2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaHCO_3$

$H_2SO_4 + Na_2CO_3 \rightarrow Na_2SO_4 + H_2O + CO_2$

$Na_2CO_3 + H_2O + CO_2 \rightarrow 2NaHCO_3$

14. For $2C(s) + O_2(g) \rightarrow 2CO(g)$ ΔS = +ve, slope is –ve

15. $Na_2B_4O_7.10H_2O + aq \rightleftharpoons 4H_3BO_3 + 2NaOH$; $H_3BO_3 + OH^- \rightleftharpoons B(OH)_4^-$



⟶ Optically resolvable due to asymmetric structure

⟶ Two six membered rings.

16. $NH_3(excess) + Cl_2 \longrightarrow NH_4Cl + N_2$

$NH_3 + Cl_2(excess) \longrightarrow NCl_3 + HCl$

17. $SO_2 + PCl_5 \longrightarrow SOCl_2 + POCl_3$

No change in oxidation number of any element. So, not a redox reaction.

$SOCl_2$ is thionylchloride; SO_2Cl_2 is sulphuryl chloride.

$POCl_3 + H_2O \longrightarrow H_3PO_4 + HCl$ } strongly acidic solutions

$SOCl_2 + H_2O \longrightarrow H_2SO_3 + HCl$

$\downarrow$

SO_2

Both the products have sp^3 hybridisation of central atom.

20. $2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2\uparrow$

$Zn + 2NaOH \longrightarrow \underset{\text{sod. zincate}}{Na_2ZnO_2} + H_2\uparrow$

$4S + 6NaOH \longrightarrow 2Na_2S + Na_2S_2O_3 + 3H_2O$

$P_4 + 3NaOH + 3H_2O \longrightarrow \underset{\text{sod. hypophosphite}}{3NaH_2PO_2} + PH_3\uparrow$

$Cl_2 + 2NaOH \longrightarrow NaClO + H_2O$

24. $P_2O_3 \xrightarrow[\text{cold}]{H_2O} H_3PO_3 \xrightarrow[\text{heating}]{\text{on}} PH_3\uparrow + H_3PO_4$

(A) (C) (D)

$H_3PO_4 \xrightarrow{220^\circ C} H_4P_2O_7 \xrightarrow{320^\circ C} HPO_3 \xrightarrow[\text{strong heating}]{\text{further}} P_2O_5$

25. $BeCl_2 + 2H_2O \longrightarrow Be(OH)_2 + 2HCl$

$Be(OH)_2 + 2H_2O \underset{}{\overset{\text{alkaline medium}}{\rightleftharpoons}} [Be(OH)_4]^{2-} + 2H^+$

$BeCl_2 + 4H_2O \overset{\text{alkaline medium}}{\rightleftharpoons} [Be(OH)_4]^{2-} + 2HCl + 2H^+$

26. $SF_4 + H_2O \longrightarrow H_2SO_3 + HF$; $TeF_6 + H_2O \longrightarrow Te(OH)_6 + HF$

28. $P + \text{conc. } H_2SO_4 \longrightarrow HCl(g)\uparrow$ (X)

(some chloride)

$HCl(g) + NH_3(g) \longrightarrow NH_4Cl(s)$ (white fumes) ; $P + AgNO_3 \longrightarrow AgCl\downarrow$ (white)

$AgCl + NH_3(aq) \longrightarrow [Ag(NH_3)_2]Cl(aq)$

$HCl + O_2 \xrightarrow{CuCl_2} Cl_2 + H_2O(\ell)$; $H_2O + Cl_2 + Na_2S_2O_3 \longrightarrow NaHSO_4 + NaCl$

31. $Ca_2B_6O_{11} + 2Na_2CO_3 \longrightarrow 2CaCO_3\downarrow + Na_2B_4O_7 + 2NaBO_2$

(Calemanite) (Z)

$Na_2B_4O_7 + H_2SO_4 \longrightarrow H_3BO_3 + Na_2SO_4$

$H_3BO_3 \xrightarrow{\Delta} B_2O_3 + H_2O$

(C)

$B_2O_3 + Mg \longrightarrow MgO + B$

$Cl_2 + B_2O_3 + C \longrightarrow BCl_3 + CO$

(E) (F)

32. Conc.H_2SO_4, anhyd. $CaCl_2$, CaO and P_2O_5

33. By product is $CaCl_2$, x = $CaCO_3$, y = CO_2.

$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 + 2NaCl$

34. XeF_2 is a strong oxidising agent with SRP = +2.64.

$XeF_2 + Cl^- \longrightarrow Cl_2 + Xe$

$Br^- \longrightarrow Br_2$

$I^- \longrightarrow I_2$

$XeF_2 + NH_3 \longrightarrow N_2 + NH_4F + Xe$

$XeF_2 + CrF_2 \longrightarrow CrF_3 + Xe$

$Pt + XeF_2 \longrightarrow PtF_6 + Xe$

$S_8 + XeF_2 \longrightarrow SF_6 + Xe$

35. KO_3, RbO_2, Cs_2O_2, BaO_2

---

38. $H_2C_2O_4 \xrightarrow{\Delta} H_2O + CO + CO_2$ $\quad$ $H_3PO_2 \xrightarrow{\Delta} H_3PO_4 + PH3$

$H_3PO_3 \xrightarrow{\Delta} H_3PO_4 + PH3$ $\quad$ $HClO \xrightarrow{\Delta} HClO_3 + HCl$

$HNO_2 \xrightarrow{\Delta} HNO_3 + NO + H_2O$ $\quad$ $H_2SO_3 \xrightarrow{\Delta} H_2O + SO_2\uparrow$

$H_2SO_4 \xrightarrow{\Delta}$ No reaction $\quad$ $HClO_3 \xrightarrow{\Delta} HClO_4 + Cl_2\uparrow$

39. Except HCl, HBr, HI, HCN, HF it will react with all other compounds, replacing OH–group by Cl–group.

41. x = Na_2PbO_2 $\quad$ y = Na_2SnO_3 $\quad$ z = $NaAlO_2$

43. (A) $NaNO_3 \xrightarrow{\Delta} NaNO_2 + \frac{1}{2} O_2$

(B) $K + O_2$ (excess) $\longrightarrow KO_2$

(C) $2Na + O_2$ (excess) $\longrightarrow Na_2O_2$

(D) K (dissolved in liquid NH_3) $\longrightarrow$ paramagnetic solution

44. $NH_4ClO_4 \xrightarrow{\Delta} N_2 + Cl_2 + O_2 + H_2O$ $\quad$ $(NH_4)_2CO_3 \xrightarrow{\Delta} NH_3 + CO_2 + H_2O$

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_7(s) + H_2O$ $\quad$ $Mg(NH_4)PO_4 \xrightarrow{\Delta} Mg_2P_2O_7 + NH_3 + H_2O$

45. (A) BF_3 can not get oxidised, but being acidic dissolves in KOH, changes color of litmus and is colourless gas.

(B) HCl gets oxidised to Cl_2 by $KMnO_4$ and being acidic, dissolves in aqueous KOH and change color of litmus from blue to red. It is colorless gas.

(C) SO_2 gets oxidised to SO_4^{2-} by $KMnO_4$, and being acidic dissolves significantly in aqueous KOH. It changes color of litmus from blue to red and it is colorless gas.

(D) F_2 does not get oxidised by $KMnO_4$ and dissolves in KOH, to form O_2 and KF. It bleaches litmus solution. It is yellow colour gas.