MAINS+ADVANCED

TOPIC

s-BLOCK, p-BLOCK ELEMENTS

SOLUTIONS

s-BLOCK, p-BLOCK ELEMENTS

s-BLOCK Exercise-1

7. Solubility $\propto \frac{1}{L.E}$

15. $KO_2 \Rightarrow O_2^-$

$\sigma 1s^2$, $\sigma^* 1s^2$, $\sigma 2s^2$, $\sigma^* 2p^2$, $\sigma 2p_x^2, \pi 2p_y^2$ = $\pi 2p_z^2$, $\pi^* 2p_y^2$, $\pi^* 2p_z^1$

n = 1, Paramagnetic

22. Hydration energy $\propto \frac{1}{\text{size of ions}}$

25. Reducing agent $\propto$ negative S & P value.

33. $Al_4C_3 + 12H_2O \longrightarrow 4Al(OH)_3 + 3CH_4$

s-BLOCK Exercise-2

5. $Mg + \underset{\text{very dilute}}{2HNO_3} \longrightarrow Mg(NO_3)_2 + H_2$

12. $M + NH_3 \longrightarrow MNH_2 + \frac{1}{2} H_2$

Alkali metals Liquid Metal amide

17. $Li + \underset{(O_2 + N_2)}{\text{Dry Air}} \longrightarrow Li_2O + Li_3N$

$Na + \text{Dry Air} \longrightarrow Na_2O$

(O_2)

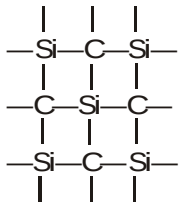
18. $NaH + H_2O \longrightarrow NaOH + H_2$

(Aq)

OR

$H^- + H^+OH^- \longrightarrow OH^- + H_2$

29. CaC_2, Al_4Cl_3 and Be_2C are ionic carbides but SiC are covalent.



34. $2BeCl_2 + LiAlH_4 \longrightarrow \underset{(X)}{2BeH_2} + LiCl + AlCl_3$

38. $3Mg \xrightarrow{N_2, \Delta} Mg_3N_2 \xrightarrow{H_2O} Mg(OH)_2 + NH_3$

(Colourless glass) $\xrightarrow{CuSO_4} CuSO_4 \cdot 4NH_3$ (Blue colour)

(X) (Y) (Z) (T)

44. $2\ Na + Al_2O_3 \xrightarrow{\text{High temperaturte}} 2NaAlO_2$

$\xrightarrow[\text{water}]{CO_2 \text{ in}} Na_2CO_3 + Al(OH)_3$

47. $CsBr_3$ is an ionic compound so exist as $Cs^+ Br_3^-$

p-BLOCK Exercise-1

1. $H_3BO_3 \xrightarrow[\text{Strongly}]{\text{Heated}} B_2O_3$

$H_3BO_3 \xrightarrow{100°C} BO_2 \xrightarrow{160°C} H_2B_4O_7$

Meta boric acid tetra boric acid

4. $Al_2O_3 \rightleftharpoons Al^{3+} + AlO_3^{3-}$

$Al^{3+} + 3e^- \longrightarrow AlO_3^{3-}$ Al (at cathode)

$AlO_3^{3-} \longrightarrow 2Al_2O_3 + 3O_2 + 12e^-$ (at anode)

The overall chemical reaction taking place during electrolysis

$2Al_2O_3 \longrightarrow 4Al + 3O_2$

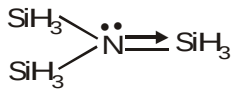
6. $B_2H_6 + 3O_2 \longrightarrow B_2O_3 + 3H_2O + Heat$

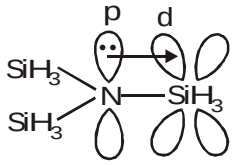
$B_2H_6 + 6H_2O \longrightarrow H_3BO_3 + 6H_2$

$2NaH + B_2H_6 \xrightarrow{ether} NaBH_4$

7. $BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$

12. $(SiH_3)_3\ \ddot{N}$ (trisilyl amine)





$p\pi$-$d\pi$ bonding

17. $CO_2 + H_2O \rightleftharpoons H_2CO_3$

Acidic oxide

$H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$

weak acid

$HCO_3^- \rightleftharpoons H^+ + CO_3^{2-}$

19. $P_2O_5 + 3H_2O \longrightarrow 2H_3PO_4$

ortho phosphoric

$P_2O_5 + H_2O \rightarrow 2HPO_3 \xrightarrow{H_2O} H_4P_2O_7 \xrightarrow{H_2O} 2H_3PO_3$

Meta phosphoric Pyrophosphoric

acid acid

22. $2HNO_2 \longrightarrow N_2O_3 + H_2O$

Anhydride

Removal of H_2O from HNO_2 is called anhydride.

23. HNO_3 oxidation number of N is = +5

Highest O.N., only reduces, acid only oxidising agent.

HNO_2 oxidation number = +3

It reduces as well as oxidise, act both oxidising and reducing agent.

H_2SO_4 oxidation number = +6

Highest O.N., only reduces, act only oxidising agent.

24. $2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$

25. $2NO + O_2 \longrightarrow 2NO_2$

Brown fumes

31. $HCOOH \xrightarrow{H_2SO_4} CO + H_2O$

34. Higher the I.E, higher the acidic strength of hypohalus acid (hydroxides)

39. $I_2 + 2Na_2S_2O_3 \longrightarrow 2I_2 + Na_2S_4O_6 + 2NaI$

p-BLOCK Exercise-2

1. $H_3BO_3 + 3C_2H_5OH \longrightarrow B(OC_2H_5)_3 + 3H_2O$

2. $AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$

5. $4B + 3O_2 \longrightarrow B_2O_3$ $2B + N_2 \longrightarrow 2BN$

Mixture of oxide and nitride

6. Due to higher EN of B it attract lone pair of electron with faster rate.

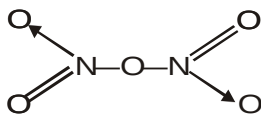
7. Due to back bonding BF_3, BCl_3 and BBr_3 are exist in free form. But BH_3 is not.

9. $Na_2B_4O_7 + 7H_2O \longrightarrow 2Na[B(OH)_4] + 2H_3BO_3$

Aqueous solution of borax acts as a buffer because it contains weak acid and its salt with strong base.

12. $2HNO_3 \xrightarrow{-H_2O} N_2O_5$

Anhydride



13. $(NH_2)_2CO$

Urea Molecular mass = 60

mass of nitrogen = 28

$$\% \text{ of } N = \frac{28}{60} \times 100 = 47\%$$

18. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

$2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$

$2Cu(NO_3)_2 \longrightarrow 2CuO + 4NO_2 + O_2$

$NH_4NO_3 \longrightarrow N_2O + 2H_2O$

20. $PbS + 4O_3 \longrightarrow PbSO_4 + 4O_2$

(Black)

21. $AgCl + 2NH_4OH \longrightarrow [Ag(NH_3)_2]Cl + 2H_2O$

$AgCl + 2Na_2S_2O_3 \longrightarrow NaCl + Na_3[Ag(S_2O_3)_2]$

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

22. $2KMnO_4 + 5H_2S \xrightarrow{H^+} K_2SO_4 + 2MnSO_4 + 8H_2O + 5S + 3H_2SO_4$

29. $CuSO_4 + 2KI \longrightarrow CuI_2 + K_2SO_4$

$2CuI_2 \longrightarrow Cu_2I_2 + I_2$

31. $PI_3 + 3H_2O \longrightarrow H_3PO_3 + 3HI$

$H_2 + I_2 \xrightarrow{Pt} 2HI$

$I_2 + H_2S \longrightarrow 2HI + S$

32. I_2 can not dissplace Br_2, Cl_2, F_2 from KBr, KCl, KF, because it weakest oxidising agent.

39. White or yellow P $\xrightarrow{470K}$ Black-P

(A) (B)

$\xrightarrow[CO_2\text{-atom}]{570K}$ Red-P

40. $Ca_3P_2 + 6H_2O \longrightarrow 2PH_3 + 3Ca(OH)_2$

41. $Ca + C_2 \longrightarrow CaC_2 \xrightarrow{N_2} Ca(CN)_2$

46. $P_4O_{10} + 4HNO_3 \longrightarrow 4HPO_3 + 2N_2O_5$

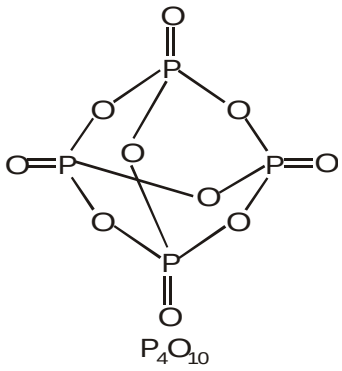
49. $B_2H_6 + 2NH_3 \longrightarrow B_2H_6 \cdot 2NH_3$

When the addition product is heated at 200°C a volatile compound borazole or inorganic benzene is formed.

$3B_2H_6 \cdot 2NH_3 \longrightarrow 2B_3N_3H_6 + 12H_2$

57. $CH_2(COOH)_2 \xrightarrow[150°C]{P_4O_{10}} C_3O_2 + 2H_2O$ (carbon suboxide)

59.



P_4O_{10}

HYDROGEN COMPOUND — Exercise-1

4. $r_n = 0.529 \frac{n^2}{2}$ Å

for protium, deuterium and tritium the n and z are 1, 1 and 1 respectively.

8. Laboratory method of formation of H_2 gas granulan zinc + dil $H_2SO_4 \longrightarrow H_2$

10. $Be + 2NaOH + 2H_2O \longrightarrow Na_2B_3O_2 \cdot 2H_2O + H_2$

(sodium beryllate)

11. $NaCl \longrightarrow Na^+ + Cl^-$

At cathode

$Na^+ + e^- \longrightarrow Na$

$Na + H_2O \longrightarrow NaOH + \frac{1}{2} H_2$

At anode

$Cl^- \longrightarrow Cl + e^-$

$Cl^- + Cl \longrightarrow Cl_2$

17. $BaO_2 + 2HCl \longrightarrow BaCl_2 + H_2O_2$

HYDROGEN COMPOUND — Exercise-2

1. $Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$

sodium zincate

$2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2$

sodium meta aluminate

13. $3Fe + 4D_2O \longrightarrow Fe_2O_4 + 4D_2$

Magnetic oxide

14. $D_2O + CO_2 \longrightarrow D_2CO_3$

$D_2O + SO_2 \longrightarrow D_2SO_4$

$D_2O + P_2O_5 \longrightarrow 2D_3PO_4$

$D_2O + N_2O_5 \longrightarrow 2DNO_3$

19. $Na_2O_2 + 2H_2O \longrightarrow H_2O_2 + 2NaOH$