SELF-ASSESMENT EXERCISE 2.2)

Identify Bronsted acids and Bronsted bases in the following reactions.

1. $H_2SO_4 + H_2O \rightleftharpoons HSO_4^- + H_3O^+$
2. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$
3. $H_2S + NH_3 \rightleftharpoons NH_4^+ + HS^-$

SOLUTION:-

1. $H_2SO_4 + H_2O \rightleftharpoons HSO_4^- + H_3O^+$

Because H_2SO_4 is converted to HSO_4^- by donting proton, H_2SO_4 is an acid.

Because H_2O accepts the proton that H_2SO_4 donates and forms H_3O^+ water in a base.

2. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

Because CH_3COOH is converted to CH_3COO^- by donating proton, CH_3COOH is an acid.

Because H_2O accepts the proton that CH_3COOH donates and forms H_3O^+ water is a base.

3. $H_2S + NH_3 \rightleftharpoons NH_4^+ + HS^-$

H_2S is donating a proton, so H_2S is an acid. Because NH_3 accepts the proton and forms NH_4^+ So it is a base.

SELF ASSESMENT EXERCISE 10.2

Identify the Lewis acid and the Lewis base in the following examples.

1. $Cl^- + AlCl_3 \longrightarrow [AlCl_4]^-$
2. $H^+ + OH^- \longrightarrow H_2O$

Solution:-

1. $Cl^- + AlCl_3 \longrightarrow [AlCl_4]^-$

$AlCl_3$ is Lewis acid since it is able to accept electrons.

Anion Cl^- Lewis base since it is able to donate electrons.

2. $H^+ + OH^- \longrightarrow H_2O$

Cation H^+ is Lewis acid since it is able to accepts electrons.

Anion OH^- is Lewis base since it is able to donate electrons.

SELF-ASSESMENT EXERCISE 10.3

1. A Soft drink has $[H^+] = 3 \times 10^{-3}$ M. Is drink acidic netural or basic?
2. Ordinary vinegar is approximately 1M CH_3COOH. Concentration of H^+ in it is 4.2×10^{-3} M. Is vinegar acidic, basic or netural?
3. A student determines the $[OH^-]$ of milk of magnesia, a Suspension of solid magnesium hydroxide in its saturated solution and obtains a value of 4.2×10^{-3} M. is the solution acidic, baseic or netural?

Solution:

1. $[H^+] = 3 \times 10^{-3} M > 1.0 \times 10^{-7} M$, the solution is acidic.
2. $[H^+] = 4.2 \times 10^{-3} M > 1.0 \times 10^{-7} M$, The solution is acidic. 3. $[OH^-] = [4.2 \times 10^{-3}]$

$[H^+] = ?$

$K_w = [H^+][OH^-]$

$1.0 \times 10^{-14} = [H^+][4.2 \times 10^{-3}]$

$$[H^+] = \frac{10 \times 10^{-14}}{4.2 \times 10^{-3}}$$

$[H^+] = 0.2 \times 10^{-11} M$

Because $1.2 \times 10^{-11} M < 1.0 \times 10^{-7} M$, the solution is basic.

SELF-ASSESSMENT EXERCISE 10.5

1. Hydroxides such as $Mg(OH)_2$ called milk of magnesia is used as antacid. It neutralizes excess stomach acid (HCl). Write complete and balanced chemical equation for this neutralization reaction?
2. Hydrochloric acid (HCl) and potassium hydroxide (KOH) react and produce potassium chloride. Write complete and balanced chemical equation for the this neutralization reactions?
3. Balance following neutralization reactions

(i) $H_2SO_4(aq) + NaOH(aq) \longrightarrow Na_2SO_4(aq) + H_2O(l)$

(ii) $H_3PO_4(aq) + NaOH(aq) \longrightarrow Na_3PO_4(aq) + H_2O(l)$

Solution:-

(1) $Mg(OH)_2 + 2HCl \longrightarrow MgCl_2 + 2H_2O$

(2) $KOH + HCl \longrightarrow KCl + H_2O$

3. Balance following neutralization reactions

(i) $H_2SO_4(aq) + 2NaOH(aq) \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$

(ii) $H_3PO_4(aq) + 3NaOH(aq) \longrightarrow Na_3PO_4(aq) + 3H_2O(l)$

Self-Assessment Exercise 10.6

Classify following salts as normal or acid salt.

(a) $NaHSO_4$

(b) Na_2SO_4

(c) $KHCO_3$

(d) K_2CO_3

Solution:-

(a) $NaHSO_4$ is an acidic salt.

(b) Na_2SO_4 is a normal salt.

(c) $KHCO_3$ is an normal salt.

Q46. Write five methods for making salts?

Ans:- **METHODS FOR MAKING SALTS**

There are five methods for making salts.

1. **Acid + Base → Salt + Water**

$HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O$

2. **Acid + Metal Oxide → Salt + Water**

$H_2SO_4(aq) + CuO(s) \longrightarrow CuSO_4(aq) + H_2O(l)$

3. **Acid + Metal → Salt + hydrogen**

$2HCl(aq) + Mg(s) \longrightarrow MgCl_2(aq) + H_2(g)$

4. **Acid + Metal Carbonate → Salt + carbondioxide + water**

$HCl(aq) + CaCO_3(s) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

5. **Salt(aq) + Salt(aq) → Salt(s) + Salt(aq)**

$AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$