Acid & Base

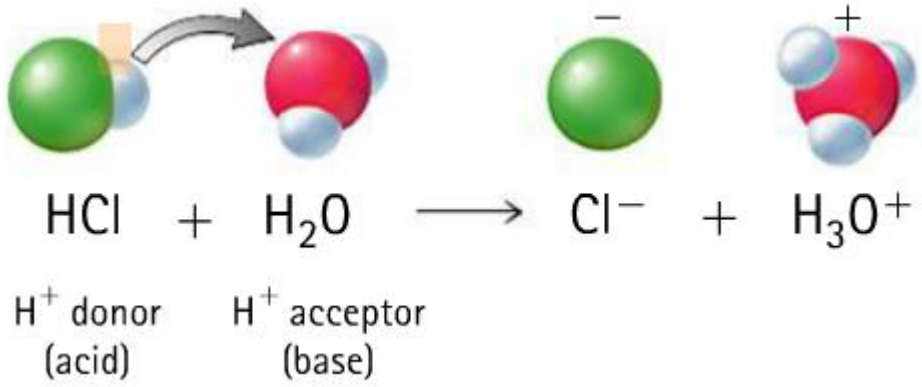
1. a) Define Acid and Base with explanation.
   b) Define pH and indicator with two examples.
   c) Solve problem: The pH of HCl is 2. Find out the amount of acid present in a liter of the solution.

a)

An acid is a molecule or ion capable of either donating a proton (i.e. Hydrogen ion H^+). Known as an acid (Bronsted Lawry acid)

A base is any molecule or ion that can accept proton.

For example, when dry HCl gas dissolve in water, each HCl molecule donate a proton to water molecule to produce Hydrogen ion.



When Calcium oxide is dissolve in water, it is converted to Calcium Hydroxide, $Ca(OH)_2$. Here a water molecule donate a proton to oxide ion, O^{2-}, and is a Bronsted acid, the oxide ion accepts a proton and gives, $2OH^-$ ions, hence is Bronsted base.

$$O^{2-} + O_3H \text{ ----------> } 2OH^-$$

b)

pH: Hydrogen ion concentration of a solution is called pH. I is defined as the negative of base – 10 logarithms of H^+ concentration.

Indicator: pH indicators are weak acids that exist as natural dyes and indicate the concentration of H+ (H3O+) ions in a solution via color change. A pH value is

determined from the negative logarithm of this concentration and is used to indicate the acidic, basic, or neutral character of the substance you are testing.

Examples:

i. Phenolphthalein
ii. Methyl red, and
iii. Bromothymol blue

c)

Sln:

pH = 2

- Log $[H^+]$ = 2 ---------- (by definition)

  The dissociation of HCl takes according to equation:

  HCl ----------> $K^+ + Cl^-$

  One molecule of HCl gives one ion of H^+.

  Therefore,
  $[H^+] = [HCl] = 10^{-2}$ M

  So, amount of HCl ion in one litre = 10^{-2} × mol mass of HCl
  = 10^{-2} × 36.5
  = 0.365 gL^{-1}