① **Strong electrolytes**: The substances which ionise almost completely into ions in aqueous solution are called strong electrolytes. For ex. HCl, H_2SO_4, HNO_3, etc.

$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

$$HNO_3 + H_2O \longrightarrow H_3O^+ + NO_3^-$$

② **Weak electrolytes**: The substances which ionise to a small extent in aqueous solution are called weak electrolytes. For ex. CH_3COOH, NH_4OH. etc.

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

ACID-BASE CONCEPT :

1. **Arrhenius concept of acids and Bases**: According to this concept (1887) → an acid is a substance which dissociates in aqueous solution to give hydrogen ion, $H^+(aq.)$ and base is a substance which dissociates in aqueous solution to give hydroxide ion, $OH^-(aq.)$.

For ex. Substances such as HCl, HNO_3, CH_3COOH, HCN etc. are acids.

$$HCl \xrightarrow{water} H^+(aq.) + Cl^-(aq.)$$

$$CH_3COOH \underset{\longleftarrow}{\xrightarrow{water}} H^+(aq.) + CH_3COO^-(aq.)$$

And substances such as NaOH, KOH, NH_4OH are bases

$$NaOH \xrightarrow{water} Na^+(aq.) + OH^-(aq.)$$

$$NH_4OH \underset{\longleftarrow}{\xrightarrow{water}} NH_4^+(aq.) + OH^-(aq.)$$

2. Bronsted-Lowry concept: According to this concept an acid is a substance which can donate proton (H^+) while base is a substance which can accept a proton (H^+).

For ex. in following reaction HCl loses a proton so it is an acid while NH_3 accepts a proton, so it is a base

$$HCl(aq.) + NH_3(aq.) \rightleftharpoons NH_4^+(aq.) + Cl^-(aq.)$$

3. Lewis concept of Acid & base: According to this concept an acid is a substance which can accept a pair of electrons while a base is a substance which can donate a pair of electrons. for ex. BF_3, $AlCl_3$, $FeCl_3$ are Lewis acids while $:NH_3$, $:\ddot{\underset{\cdot\cdot}{F}}:^-$ are Lewis base.

In following reaction BF_3 molecule accepts a pair of electrons so, it is an acid (Lewis) while $:NH_3$ donates a pair of electrons so, it is a base (Lewis).

$H_3N:$ + BF_3 ⟶ $H_3N:\rightarrow BF_3$

Ammonia Lewis Base — Boron trifluoride (Lewis Acid) — (Complex)

Degree of ionisation or dissociation : It is defined as the fraction of the total number of molecules of an electrolyte (acid or base) which ionises into ions., Thus

Degree of ionisation,

$$\alpha = \frac{\text{Number of molecules of the electrolyte which ionises}}{\text{Total number of molecules of the electrolyte.}}$$

If 'c' is the number of moles of acid in 1 litre of the solution and α is the degree of ionisation then the conc. of each species at equilibrium are:

$$HA + H_2O \rightleftharpoons H_3O^+ + A^-$$

	HA	H_2O	H_3O^+	A^-
Initial conc.	c		0	0
Equilibrium conc.	$c(1-\alpha)$		$c\alpha$	$c\alpha$

$$[HA] = c(1-\alpha), \quad [H_3O^+] = c\alpha, \quad [A^-] = c.\alpha$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]} = \frac{c\alpha \cdot c\alpha}{c(1-\alpha)}$$

$$K_a = \frac{c\alpha^2}{1-\alpha}$$

For weak acids, α is very small so $1-\alpha \simeq 1$

$$\therefore \boxed{K_a = c\alpha^2}$$