

Complete
CHEMISTRY

IIT-JEE · NEET · CBSE eBOOKS

CLASS 11&12th



Learning Inquiry
8929 803 804

CLASS 11th

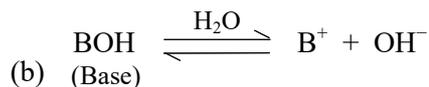
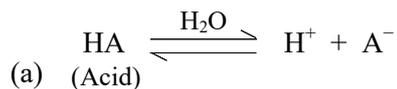
Ionic Equilibrium

miso study



01. Arrhenius Concept (1887)

- (i) According to this concept all substances which give H^+ ions, when dissolved in water are called **Acids**.
- (ii) Those which ionise in water to furnish OH^- ions are called **Bases**.
e.g.



Limitations of Arrhenius concept:

- (i) Applicable only to aqueous solution. Dry HCl shall not act as an acid.
- (ii) The concept does not explain acidic or basic properties in non aqueous solvents.
- (iii) It fails to explain acidic character of non protic compound viz. SO_2, NO_2, CO_2, P_2O_5
- (iv) It fails to explain the basic nature of compounds viz. NH_3, Na_2CO_3
- (v) It fails to explain the acidic nature of certain salts in water e.g. $AlCl_3, FeCl_3$

Basicity or proticity of an Acid:

It is the number of H^+ ions furnished by a molecule of an acid. An acid may be classified according to its basicity. Thus we may have,

- (i) Mono basic or Mono protic acids like $HCl, HNO_3, CH_3COOH, HCN$ etc.
- (ii) Dibasic or Diprotic acids like, $H_2SO_4, H_2CO_3, H_2BO_3$, etc.
- (iii) Tribasic or Triprotic acids like H_3PO_4, H_3AsO_4 , etc.

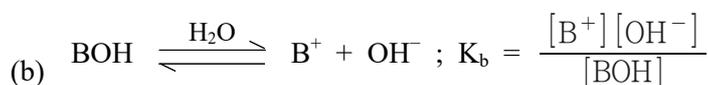
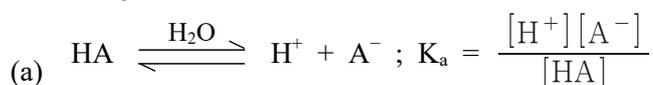
Acidity or Hydroxity of a Base

It may be defined as the number of OH^- ions furnished by a molecular of base. A base can be,

- (i) Mono acidic or monohydroxic like $NaOH, NH_4OH, AgOH$ etc.
- (ii) Diacidic or dihydroxic like $Ba(OH)_2, Mg(OH)_2, Ca(OH)_2, Sr(OH)_2$ etc.
- (iii) Triacidic or trihydroxic like $Fe(OH)_3, Al(OH)_3$ etc.

Strength of Acid or Base:

- (i) Strength of Acid or Base depends on the extent of its ionisation. Hence equilibrium constant K_a or K_b respectively of the following equilibria give a quantitative measure of the strength of acid or base.



- (ii) The larger the value of K_a or K_b , the more complete the ionisation, the higher the concentration of H_3O^+ or OH^- and stronger is the acid or base.

02. Bronsted Lowery Concept (1923)

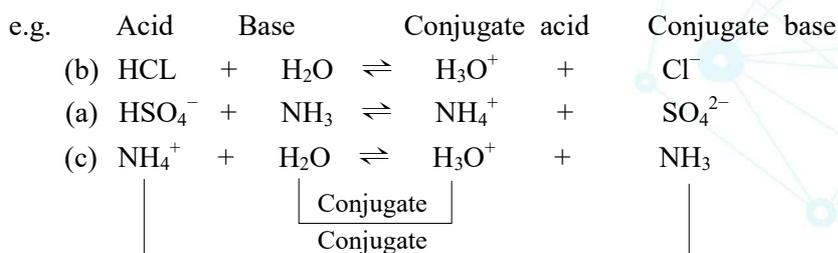
In 1923, a more general concept of acids and bases was introduced by Bronsted & Lowery. According to Bronsted-Lowery definition

- (i) An acid is a substance that accepts a proton and
- (ii) A base is a substance that accepts a proton.
- (iii) In a typical acid- base reaction,



Here HX being a proton donor is an Acid and B being a proton acceptor is a Base in the forward reaction,

- (iv) In the backward reaction HB^+ being a proton donor is an acid and X^- being a proton donor acceptor is a base



Classification of Bronsted-Lowery Acid & Bases:

Bronsted-Lowery acids and bases can be

- (i) Molecular
- (ii) Cationic
- (iii) Anionic

Type	Acid	Base
Molecular	HCl, HNO ₃ , HClO ₄ ,	NH ₃ , N ₂ H ₄ , Amines
	H ₂ SO ₄ , H ₃ PO ₄	H ₂ O, Alcohol, Ethers
	CH ₃ COOH, HBr, H ₂ O etc.	
Cationic	NH ₄ ⁺ , N ₂ H ₅ ⁺ , PH ₄ ⁺ ,	[Fe(H ₂ O) ₅ OH] ²⁺
	Na ⁺ , Ba ²⁺ (All cation)	[Al(H ₂ O) ₅ OH] ²⁺
	[Fe(H ₂ O) ₆] ³⁺ [Al(H ₂ O) ₆] ³⁺	
Anionic	HS ⁻ , HSO ₃ ⁻	
	H ₂ PO ₄ ⁻ , HSO ₄ ⁻ ,	Cl ⁻ , Br ⁻ , OH ⁻
	HCO ₃ ⁻ , HOPO ₄ ²⁻ ,	HSO ₄ ⁻ , CN ⁻ , CO ₃ ²⁻
	all amphiprotic anions	SO ₄ ²⁻ , NH ₂ ⁻ , CH ₃ COO ⁻

Classification of Solvents:

Protonic or protic solvents :

- (i) They are characterized by the presence of transferable hydrogen and the formation of "Onium" ions. Autoionisation taking place in them.
 - (a) H₂O + H₂O ⇌ H₃O⁺ + OH⁻
 - (b) NH₃ + NH₃ ⇌ NH₄⁺ + NH₂⁻
 - (c) 3HX ⇌ H₂X + HX₂⁻
 - (d) 2H₂SO₄ ⇌ H₃SO₄⁺ + HSO₄⁻