THEORIES OF ACIDS AND BASES

Nirmal Lamsal

The Department of Chemistry and Biochemistry

INTRODUCTION

❖ Early Ideas: Based on Characteristics Properties of Acids and Bases

❖ Acid: - hydrogen containing compound which neutralizes base
           - turns litmus red
           - has sour taste (lemon juice, vinegar etc.)

❖ Base: - oxide or hydroxide of metal which neutralizes acids
           - turns litmus blue
           - has bitter taste (baking soda, soap etc.)

Arrhenius Definition of Acids and Bases

Svante Arrhenius first proposed the formal definition of acids and bases in 1884

❖**Acid**: A compound which dissociates in aqueous solution to give hydrogen ions, **H⁺**

Example:HCl, H_2SO_4 etc

$$HCl \longrightarrow H^+ (aq) + Cl^- (aq)$$
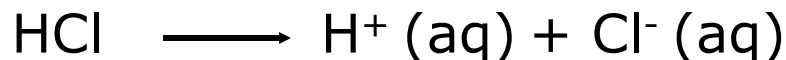
❖**Base**: A compound which ionizes to give hydroxide ion, **OH⁻**, when dissolved in water.

Example:$NaOH, Ca(OH)_2$ etc

$$NaOH \longrightarrow Na^+ (aq) + OH^- (aq)$$

Neutralization reaction:

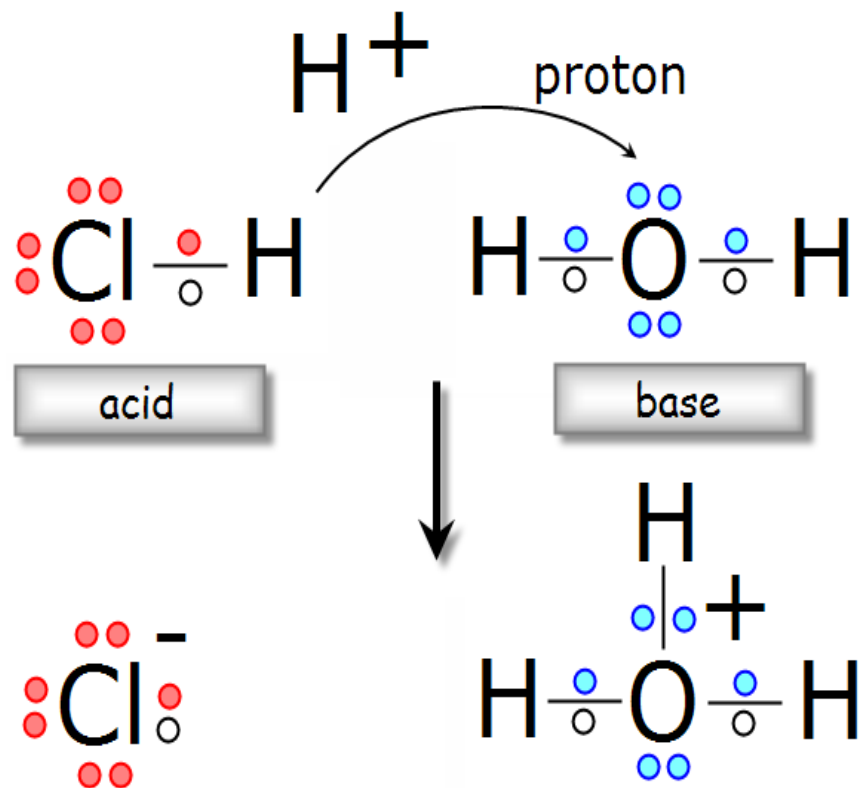**Acid + Base $\longrightarrow$ Salt + Water**

Bronsted-Lowry theory of acids and bases

J.N. Bronsted and T.M. Lowry developed this more general acid-base theory in 1923

An acid is a proton, H^+, donor

A base is a proton, H^+, acceptor

Example: HCl is an acid in water solution because HCl donates a proton and water accepts it. Here water is a base as it accepts proton.

❖ **Applicable to even non aqueous solvent system**

$$HCl + NH_3 \longrightarrow NH_4Cl$$

Practice Questions

1.Classify the following compounds into acids and bases:

$$HNO_3 \longrightarrow H^+ + NO_3^-$$

$$Fe(OH)_3 \longrightarrow Fe^{3+} + 3OH^-$$

2.According to Bronsted-Lowry concept an acid is a proton _____