

# Chem12 Acids, Bases, and Salts-10

**Acids** are sour-tasting substances that can react with certain active metals to produce hydrogen gas. **Bases** usually have a bitter taste and feel "soapy".

**Litmus** is a natural dye made from lichens. It is an example of an indicator. Litmus turns red in acids and it turns blue in bases.

Examples of acids are, vinegar and lemon juice. Bleach and ammonia are examples of bases.

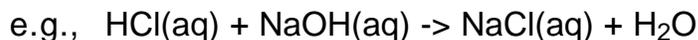
When acids or bases are added to water, an **electrolyte** is formed. The compound breaks apart (**dissociates**) into positive and negative ions so the solution will conduct electricity. e.g.,  $\text{HCl(aq)} \rightarrow \text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq})$ .

## Arrhenius Theory

Arrhenius was one of the first scientists to study acids and bases. He said that; all acids produce hydrogen ions when dissolved in water, which are responsible for their acid properties. He also said that bases produce hydroxide ions when dissolved in water, which are responsible for their basic properties. This is the **old** theory of acids and bases.

## Neutralization

If we add an acid to a base, we get a salt plus water. This is an example of a neutralization reaction.



The salt in this case is common salt, NaCl.

## Strong Acids

A strong acid dissociates completely when added to water. There are six important strong acids : HCl, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, HI, HBr, and HClO<sub>4</sub>.

## Strong Bases

A strong base dissociates completely when added to water. The strong bases are; hydroxides, amides, and oxides, of the Group 1 metals and barium and strontium. e.g. : LiOH, NaOH, Ba(OH)<sub>2</sub>, LiNH<sub>2</sub> (lithium amide), NaNH<sub>2</sub>, K<sub>2</sub>O, and SrO, .....

Exercises :

1)a) Give four properties of an acid.

b) Give four properties of a base.

2) Give the Arrhenius theory of acids and bases.

3)a) Name six strong acids.

b) Name six strong bases.

4) Write the dissociation equations :

a) KOH ->

b) Ba(OH)<sub>2</sub> ->

c) HI ->

d) H<sub>2</sub>SO<sub>4</sub> ->

5) Write the neutralization equations for :

a) HNO<sub>3</sub>(aq) + KOH(aq) ->

b) 2HCl(aq) + Ba(OH)<sub>2</sub>(aq) ->

6) Which acid and base can produce the salt K<sub>2</sub>SO<sub>4</sub>, in a neutralization reaction ?

Answers : 1)a) turns litmus red, tastes sour, electrolyte, produces H<sub>2</sub> gas when reacted with some metals, b) turns litmus blue, bitter tasting, feels soapy, electrolyte. 2) He said that acids produce

hydrogen ions when dissolved in water, and bases produce hydroxide ions when dissolved in water. 3) a) perchloric, hydriodic, hydrobromic, hydrochloric, nitric, sulfuric. b) NaOH, LiOH, ..... Ba(OH)<sub>2</sub>, K<sub>2</sub>O, SrO... LiNH<sub>2</sub>... 4)a) K<sup>+</sup> + OH<sup>-</sup>, b) Ba<sup>2+</sup> + 2OH<sup>-</sup>, c) H<sup>+</sup> + I<sup>-</sup>, d) H<sup>+</sup> + HSO<sub>4</sub><sup>-</sup>, 5)a) H<sub>2</sub>O(l) + KNO<sub>3</sub>(aq), b) 2H<sub>2</sub>O(l) + BaCl<sub>2</sub>(aq), 6) KOH + H<sub>2</sub>SO<sub>4</sub> and others.