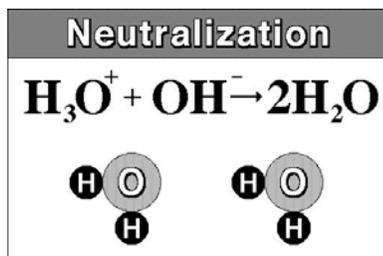
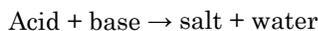


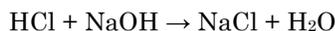
## STRENGTH OF ACIDS AND BASES

**What is neutralization?**

It is an acid-base reaction in which an acid reacts with a base to form salt and water. The pH of the neutralized solution depends upon the acid strength of the reactants and their concentrations. The reaction is best represented as:



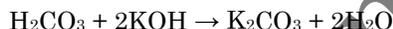
When a strong acid reacts with a strong base the resultant salt is neither acidic nor basic in nature i.e. it is neutral. For example when HCl, a strong acid, reacts with NaOH, a strong base, then the resulting salt is sodium chloride and water.



When a strong acid reacts with a weak base the resultant salt is acidic in nature. For example,  $\text{Fe}(\text{NO}_3)_3$  is an acidic salt formed due to the neutralization of iron (III) hydroxide (weak base) with nitric acid (strong acid)



Likewise when a strong base reacts with a weak acid then the resultant salt is basic in nature. For example,  $\text{K}_2\text{CO}_3$  is formed due to the acid base reaction of potassium hydroxide (strong base) and  $\text{H}_2\text{CO}_3$  (weak acid).



When a weak acid and weak base react with each other complete neutralization does not occur due to incomplete ionization of the acid and base.

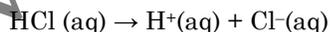
Strength of acids or bases:

Based on extent of ionization acids and bases are classified into strong acids, weak acids and strong bases, weak bases.

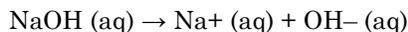
Strong acids or strong bases ionizes completely (100%) to form ions in the aqueous solution.

**Example:**

Hydrochloric acid ionizes completely to form ions.



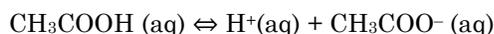
Sodium hydroxide ionizes completely to form ions.



Weak acids or weak bases ionizes partially (<100%) to form ions in the aqueous solution.

**Example:**

Acetic acid ionizes partially in aqueous solution to form ions.



Ammonium hydroxide ionizes partially in aqueous solution to form ions.



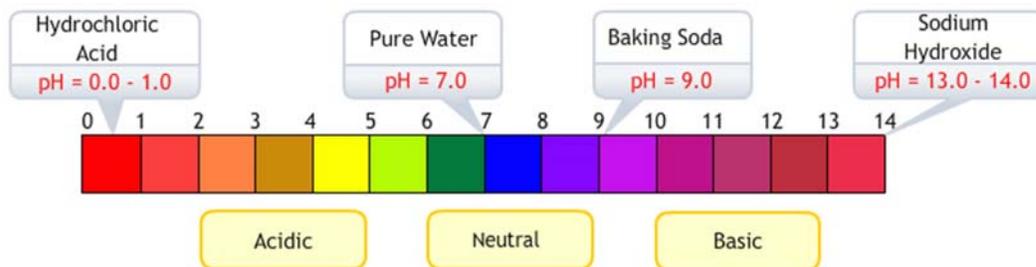
An acid or base is considered as strong or weak depending on the concentration of hydrogen and hydroxide ions within it.

This concentration or the power of hydrogen differs from substance to substance and can be measured using a scale, called the pH scale.

A solution that has a pH value of less than 7 is acidic and a solution with a pH value of more than 7 is basic. A neutral solution is indicated by a pH value of 7 on the scale.

Strong acids will possess pH values between 0-2 and weak acids possess pH values more than 3.

Strong bases will possess pH values between 12-14 and weak bases possess pH values less than 12.



pH of some of the acids and bases:

Acid/Base	pH
Hydrochloric acid	0.1 - 1.0
Sulphuric acid	1.0 - 1.2
Phosphoric acid	1.3 - 1.5
Acetic acid (Vinegar)	2.9 - 3.0
Carbonic acid	3.8 - 4.0
Water	6.9 - 7.0
Ammonia	10.8 - 11.2
Sodium hydroxide	13 - 14

#### Applications of neutralization concept in daily life:

- Antacids like Milk of Magnesia are mild bases that neutralize the acids in the stomach and aid digestion.
- If the pH lowers, the acidity in the mouth increases and leads to tooth decay. Toothpastes are basic in nature and they counteract the acid in the mouth.
- Hydrangea produces pink flowers when the soil has a pH value of 6.8 or higher and blue flowers when the pH value is 6.0 or less.
- If the soil is acidic, then the applied pesticides, herbicides and fungicides will not be absorbed by the soil. In order to neutralize the soil, suitable bases are used. Generally, salts of calcium or magnesium, which are basic are used to neutralize soil acidity.
- When a bee stings, formic acid is released. That is what makes the skin burn. Baking soda, which is a base, neutralizes the formic acid and provides relief from the pain.