



Bases

- Bases are compounds which react with acid to form a salt and water as only products.
- Bases that soluble in water are called alkalis.
- In aqueous solution, alkali it produces hydroxide ions (OH^-). In short, alkalis are substances that form hydroxide ions (OH^- (aq)) in water
- Example :-

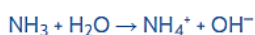
Sodium hydroxide NaOH gives Na^+ (aq) and OH^- (aq) ions,



calcium hydroxide $\text{Ca}(\text{OH})_2$ gives Ca^{2+} (aq) and 2OH^- (aq) ions.



Ammonia give NH_4^+ and OH^-



[Note: an alkali is a base soluble in water.]

- In alkaline solution there are more OH^- ions than H^+ ions.



Physical properties of Alkali

- Alkalis are bitter in taste.
- Alkalis turn litmus from red to blue.
 - Like acid, alkali can change the colour of litmus.
 - In alkali solution, the colour of litmus turns blue.
- Alkalis are soapy to touch.
- Alkalis has pH value more than 7
 - pH value is a measurement of the concentration of hydrogen ions in a solution.
 - Alkali has very low concentration of solution hydrogen ion, even lower than water.
 - Hence the pH value of alkali is higher than 7.
- Alkalis can conduct electricity
 - When a base dissolve in water, it will dissociate and form hydroxide ions.
 - The present of the freely move ions make alkali an electrolyte.



Chemical properties of Bases/Alkali

- Alkalis react with acids to form a salt and water — this is a neutralisation reaction
- Alkalis, when warmed with ammonium salts, give off ammonia gas



Reaction between Alkalis and Acids

Potassium hydroxide + Nitric Acid \rightarrow Potassium Nitrate + Water

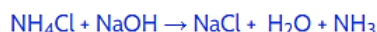


Alkali heat with Ammonium Salts

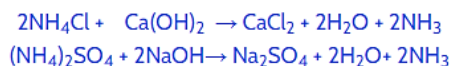
Ammonium Salt + Alkali \rightarrow Salt + Ammonia + Water

Example:

Ammonium Chloride + Sodium Hydroxide \rightarrow Sodium chloride + Water + Ammonia



More examples:



Ammonia as an Alkali

- By nature, ammonia is a covalent compound.
- Ammonia exists as gas at room temperature.
- Ammonia gas is soluble in water.
- Physical properties of ammonia :-
 - Pungent smell
 - Colourless
 - Turn litmus from red to blue



Oxide: Basic, Acidic, Neutral, or Amphoteric

Basic oxide

- Most oxides of metal, especially alkali and alkaline earth metals, are basic oxides.
- Basic oxides that dissolve in water are called alkalis.
- A basic oxide is an oxide that shows basic properties in opposition to acidic oxides and that either :-
 - reacts with water to form an alkali; or
 - reacts with an acid to form a salt.
- Example : Sodium oxide, which reacts with water to produce sodium hydroxide

Acidic Oxide

- Most non-metal oxides dissolve in water to form acids, and are called acidic oxides.
- An acidic oxide is an oxide that either :-
 - reacts with water to form an acid; or
 - reacts with a base to form a salt.
- Example : Carbon dioxide which reacts with water to produce carbonic acid.

Amphoteric Oxide

- The metal oxides that can behave as both acids and bases and are said to be amphoteric oxides.
- Examples of amphoteric oxides are lead oxide, aluminium oxide and zinc oxide.

