

ACID, BASES AND SALTS (MODULE-1/4)

(WRITEUP)

- 115 elements combine to form different compounds.
- Based on chemical properties they are classified as acids, bases and salts.
- Salts are formed by combination of acids and bases
- These substances are identified using natural, synthetic and olfactory indicators.

INDICATORS FOR TESTING ACIDS AND BASES:

- Indicators are those chemical substances which behave differently in acidic and basic medium and help in determining the **chemical nature of the substance**.

Acid base indicators indicate the presence of an acid or a base by a change in their colour or smell.

S. No.	Name of acid/base	Effect on litmus paper	Effect on turmeric paper	Effect on China rose solution
1.	Hydrochloric acid	Blue litmus paper turns red	No change	Turns dark pink
2.	Sulphuric acid	Blue litmus paper turns red	No change	Turns dark pink
3.	Nitric acid	Blue litmus paper turns red	No change	Turns dark pink
4.	Acetic acid	Blue litmus paper turns red	No change	Turns dark pink
5.	Sodium hydroxide	Red litmus paper turns blue	Turns red	Turns green
6.	Ammonium hydroxide	Red litmus paper turns blue	Turns red	Turns red
7.	Calcium hydroxide	Red litmus paper turns blue	Turns red	Turns red

- NATURAL INDICATORS:

Litmus solution is purple dye (neutral) extracted from lichen, we get as blue litmus or red litmus

Litmus solution / paper changes from Blue to Red when it is dipped in Acid and Red to Blue when it is dipped in Base.

Turmeric, red in basic solution

Red cabbage leaves remain red in acid but changes to green in basic solution

Hydrangea plant is blue but turns pink in the base.

- SYNTHETIC INDICATORS:

Methyl orange changes from red (acid) to yellow (base)

Phenolphthaleine changes from colourless (acid) to pink (base)

Universal indicators is mixture of many different indicators which gives different colours at different pH values of entire pH scale (to make out whether the given solution is strong acid or base or weak acid or base.)

- OLFACTORY INDICATORS: those substances whose smell changes in acidic or basic solution. Such as
- **onion** – Smell of onion diminishes in a base and remains as it is in an acid.
- **vanilla extract**- The odour of vanilla essence disappears when it is added to a base. The odour of vanilla essence persists when it is added to an acid

ACIDS

- An acid may be defined as a substance capable of releasing one or more H^+ ions in aqueous solution
- Acids change the colour of blue litmus to red
- They are good electrolyte because in aqueous solution, acid dissociate into ions which are responsible for conduction of electricity.
- They are sour in taste.
- Neutralise solutions carrying hydroxide ions.
- React with several metals releasing Hydrogen gas.
- React with carbonates releasing CO_2 (g)
- Destroy body tissues.
- Corrode metal surface quickly.
- Acids can be organic acids or inorganic acids on the basis of origin

- Organic acids are weak acids originating from plant or animal such as citric acid is present in fruits, acetic acid present in vinegar, oxalic acid present in tomato, tartaric acid present in tamarind, lactic acid present in sour milk and curd.
- Inorganic acids are also called as mineral acids which are strong except carbonic acid such as HCl, H₂SO₄, HNO₃ etc.
- They give litmus test **only in wet** condition (when dissolved in water)

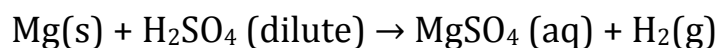
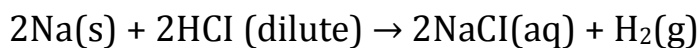
➤ CHEMICAL PROPERTIES OF ACIDS

1. Action with METALS.
2. Action with METAL OXIDES OR HYDROXIDES.
3. Action with METAL CARBONATES OR METAL BICARBONATES.
4. NEUTRALISATION REACTION with BASE.
5. CORROSIVE NATURE of ACIDS

1. Action with METALS

- Dilute acids like HCl and H₂SO₄ react with certain active metals to evolve hydrogen gas.

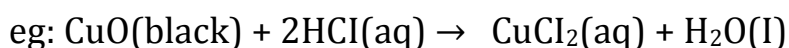
Metal + Dilute acid → Metal salt + Hydrogen



- Metals which can displace hydrogen from dilute acids are known as active metals. e.g. Na, K, Zn, Fe, Ca, Mg etc.
- Most of the acids reacts with metals to form salt and evolve hydrogen gas. This shows that hydrogen is common to all acids.
- Hydrogen gas produced on burning gives pop sound.

2. Action with METAL OXIDES

- Mostly on heating metal oxides with an acid undergoes kind of neutralisation reaction forming SALT and WATER.

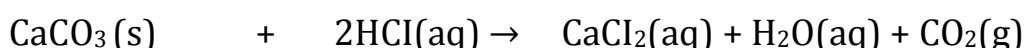


The acids react with metal hydroxides to form salt and water.

- The antacid called “Milk of Magnesia” which is used to remove indigestion (caused by too much HCl in the stomach) is a metal hydroxide called ‘Magnesium hydroxide’. Magnesium hydroxide is a base, it reacts with HCl in stomach and neutralises it.

3. Action with METAL CARBONATES AND METAL BICARBONATES

- Both metal carbonates and bicarbonates react with acids to evolve CO₂ gas and form salts. For example,



(Calcium carbonate)



(Sodium bicarbonate)

- A bicarbonate is also called hydrogen carbonate.
- CaCO₃ is insoluble in water while Ca(HCO₃)₂ is water soluble.

4. Action with BASES OR ALKALIS

- When an acid reacts with a base then a salt and water are formed
 - ACID + BASE → SALT + WATER
 - $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 - This is an example of a neutralisation reaction .
 - In this reaction, sodium hydroxide base and hydrochloric acid neutralise each other to form sodium chloride salt which is neither acidic nor basic, it is neutral.

5. ACID HAVE CORROSIVE NATURE AND SO THEY ARE NEVER STORED IN METAL CONTAINER. ACIDS ARE STORED IN CONTAINERS MADE OF GLASS AND CERAMICS BECAUSE THEY ARE NOT ATTACKED BY ACIDS

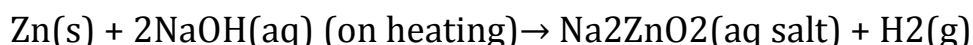
BASES

- A Base may be defined as a substance capable of releasing one or more OH^- ions in aqueous solution
- They are bitter in taste.
- They are soapy in touch.
- A base conducts electricity in solution.
- Bases change the colour of red litmus to blue.
- All the metal oxides and metal hydroxides are bases.
- Metal carbonates and metal hydrogen carbonates are also considered to be bases because they neutralise the acids.
- A base which is SOLUBLE in water is called an ALKALI

CHEMICAL PROPERTIES OF BASES

- **ACTION WITH METALS**

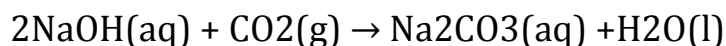
Metals like zinc, tin and aluminium react with strong alkalis like NaOH(Caustic potash) to evolve hydrogen gas



However such reactions are not possible with all metals.

- **ACTION WITH NON-METALLIC OXIDES**

Bases reacts with oxides of non metals(eg CO_2 , SO_2 , SO_3 etc.) to form salt and water



The reaction of non metal oxides with bases to form salts and water shows that non metal oxides are acidic in nature.

- **BASES REACTS WITH ACIDS TO FORM SALT AND WATER (NEUTRALISATION)**

People of old age suffer usually from acidity problems in the stomach which is caused mainly due to release of excessive gastric juices containing HCl. The acidity is neutralised by antacid tablets which contain sodium hydrogen carbonate(baking soda), magnesium hydroxide etc.