CHEMISTRY

CLASS NOTES FOR CBSE

Chapter 06. Acids, Bases and Salts

On the basis of their chemical properties, all the compounds can be classified into three group :

- Acids,
- Bases, and
- Salts

Indicators for Testing Acids and bases

An indicator is a 'dye' that changes colour when it is put into an acid or base. An indicate gives different colours in acid and base. Thus, an indicator tells us whether the substance we are testing is an acid or a base by change in its colour. The three most common indicators to test for acids and bases are : Litmus, Methyl orange and phenolphthalein.

(a) Blue Litmus paper

(b) Red Litmus paper

- An acid turns blue litmus to red
- A base (or alkali) turns red litmus to blue.
- Methyl orange indicator gives red colour in acid solution.
- Methyl orange indicator gives yellow colour in basic solution.
- Phenolphthalein indicator is colourless in acid solution.
- Phenolphthalein indicator gives pink colour in basic solution.

Litmus is a natural indicator. litmus solution is a purple dye which is extracted from type of plant called 'lichen is a plant belonging to the division Thallophyta. Turmeric is also a natural indicator. turmeric (*haldi*) contains a yellow dye. it turns red in basic solutions. The red cabbage extract (obtained from red cabbage leaves) is also a natural indicator. It is red in colour. the red cabbage extract remains red in acidic solutions but turns green on adding to basic solutions.

01. Acids

Acids are those chemical substances which have a sour taste. Acids change the colour of blue litmus to red. The acids present in plant materials and animals are called organic acids. organic are naturally occurring acids. Some of the organic acids are : Acetic acid (or Ethanoic acid) Citric acid, Lactic acid Tartaric acid, Oxalic acid and Formic acid (or Mthanoic acid.) The acids prepared from the minerals of the earth are called mineral acids. Mineral acids. Mineral acids are man-made acids the three most common mineral acids are: Hydrochloric acid Sulphuric acid and Nitric acid, Concentrated mineral acids are very dangerous. They can burn our hands And clothes.

Strong acids and weak acids

All the acids can divided into two groups : strong acids, and weak acids.

- Hydrochloric acid, sulphuric acid and nitric acid, are strong acids.
- Acetic acid (ethanoic acid), Formic acid, citric acid, tartaric acid and carbonic acid are weak acids.

Concentrated and Dilute Acids

A concentrated acid is one which contains the minimum possible amount of water in it. the concentration of an acid is decreased by adding more water to it when is added to a concentrated acid then a dilute acid is formed. Thus, a dilute acid is one which contains much more of water in it.

Diluting Acids

The dilution of a concentrated acid should always be done by adding concentrated acid to water gradually with stirring and not by adding water to concentrated acid. this is because :

- When a concentrated acid is added to water for preparing a dilute acid, then the heat is evolved gradually' and easily absorbed by the large amount of water (to which acid is being added.)
- If, however water is added to concentrated acid to dilute it, then a large amount of heat is evolved at once. This heat changes some of the water cause acid burns even the glass container may break due to excessive

Properties of acids

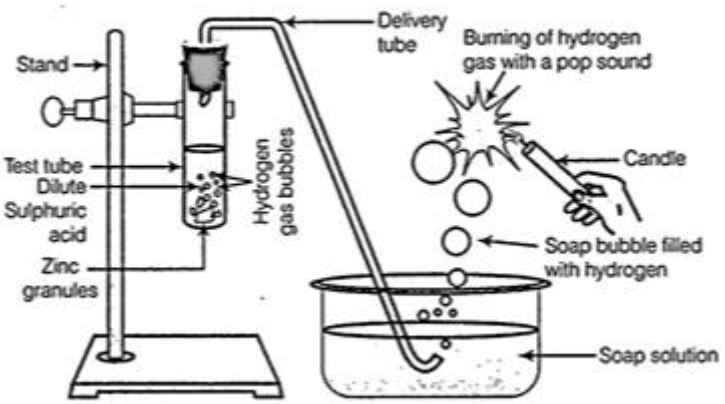
- Acids have a sour taste
- Acids turn blue litmus to red
- Acid solution conduct electricity (they are electrolytes)
- Acid react with metals to form hydrogen gas
  when an acid reacts with a metal, then a salt and hydrogen gas are formed. That is :

Metal + Acid → Salt + Hydrogen gas

For example, when dilute sulphuric acid reacts with zinc metal, then zinc sulphate and hydrogen gas are formed :

$Zn(s)$	+	$H_2SO_4(aq)$	→	$ZnSO_4(aq)$	+	$H_2(g)$
Zinc		Sulphuric acid		Zinc sulphate		Hydrogen
(A metal)		(Dilute)		(A salt)		

Most of the acids react with metals to form salts and evolve hydrogen gas. This shows that hydrogen is common to all acids.



Acids react with metal carbonates (and metal hydrogencarbonates) to form carbon dioxide gas

Metal carbonate + Acid ⟶ Salt + Carbon dioxide + water

Metal hydrogencarbonate + Acid ⟶ Salt + Carbon dioxide + water

For example :

- When dilute hydrochloric acid reacts with sodium carbonate, then sodium chloride, carbon dioxide and water are formed :

$Na_2CO_3(s)$	+	2HCl(aq)	+	2HCl(aq)		2NaCl(aq)	+	$Co_2(g)$	+	$H_2O(1)$
Sodium carbonate				Hydrochloric acid		Sodium chloride		carbon dioxide		water

The carbon dioxide gas is formed in the form of brisk effervescence (the rapid escape of small bubbles of gas from the liquid).

- When dilute hydrochloric acid reacts with sodium hydrogencarbonate, then sodium chloride, carbon dioxide and water are formed :

$NaHCO_3(s)$	+	HCl(aq)		NaCl(aq)	+	$CO_2(g)$	+	$H_2O(1)$
Sodium hydrogen-Carbonate		Hydrochloric acid		sodium chloride		Carbon dioxide		water

Thu, acids react with carbonates and hydrogencarbonates to evolve carbon dioxide gas. this carbon dioxide gas reacts with lime water (calcium hydroxide solution) as follows:

- When carbon dioxide gas is passed through lime water, the lime water turns milky due to the formation of a white precipitate of calcium carbonate

$Ca(OH)_2(aq)$	+	$CO_2(g)$	$CaCO_3(s)$	+	$H_2O(1)$
Calcium hydroxide (lime water)		Carbon dioxide	Calcium carbonate (white ppt.) (Make lime water milky)		water

- If excess of carbon dioxide gas is passed through lime water, then the white precipitate formed first dissolves due to the formation of a soluble salt calcium hydrogencarbonate, and the solution becomes clear again :

$CaCO_3(s)$	+	$CO_2(g)$	+	$H_2O(1)$	⟶	$Ca(HCO_3)_2(aq)$
Calcium Carbonate (white ppt.) (insoluble in water)		Carbon dioxide		Water		Calcium hydrogencarbonate (Soluble in water)

Acids react with bases (or alkalis) to form and water

When and acid reacts with a base, then a salt and water are formed. That is

Acid + Base → Salt + Water

Actually, when an acid is treated with a base, the base neutralises the acid and destroy its acidity. Since an acid and a base neutralises each other's effect, so the reaction between an acid and a base to form salt and water is called a neutralisation reaction. When hydrochloric acid reacts with sodium hydroxide solution then a neutralisation reaction takes place to form sodium chloride and water.

NaOH(aq)	+	HCl(aq)	→	NaCl(aq)	+	$H_2O(l)$
Sodium hydroxide (Base)		Hydrochloric acid (Base)		Sodium chloride (salt)		Water