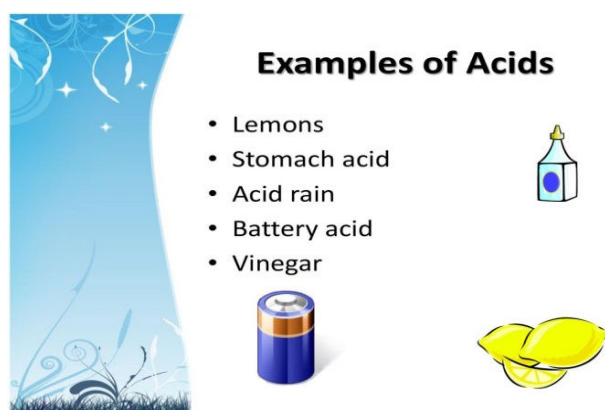


Class X

Acids, Bases and Salts

ACIDS are those chemical substances which have a sour taste and change the colour of blue litmus to red. Some common fruits such as unripe mango, lemon, orange, tamarind etc.



Classification of acids according to their sources

Acids are classified according to their sources (origin) into Organic acids and Mineral acids.

ORGANIC ACIDS

Acids that have an organic origin (plant or animal), They are extracted from the organs of living organisms. All of them are weak acids.

Examples : Lactic acid (milk products) , Acetic acid (vinegar), Citric acid (from lemon), Oxalic acid and Formic acid .

Acid	Substance
Acetic acid	Vinegar
Citric acid	Lemon, orange
Tartaric acid	Tamarind, grapes
Ascorbic acid (Vitamin C)	All citrus fruits
Lactic acid	Milk, yoghurt
Malic acid	Apples and Pears
Formic acid	Ant stings

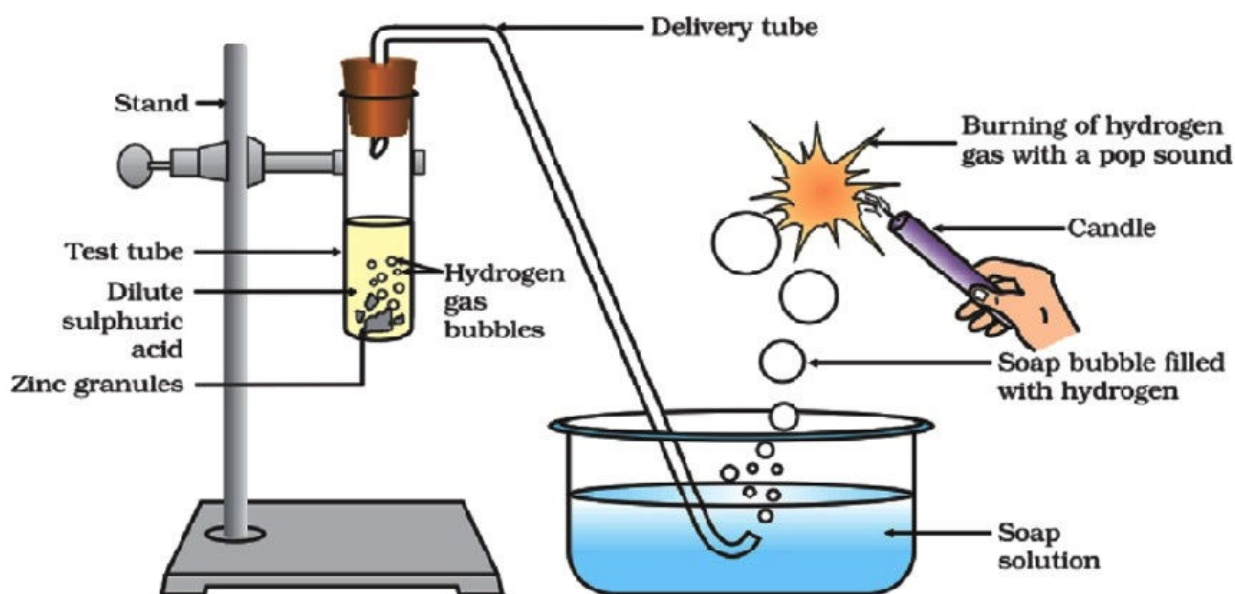
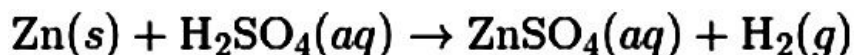
MINERAL ACIDS

Acids that have no organic origin, They usually have non-metallic elements in their structure like chlorine, sulphur, nitrogen and phosphorus. Some of them are strong acids and others are weak. Examples: Carbonic acid H_2CO_3 , Hydrochloric acid HCl , Phosphoric acid H_3PO_4 , Nitric acid HNO_3 , Sulphuric acid H_2SO_4 .

CHEMICAL PROPERTIES OF ACIDS-

- 1. REACTION WITH METALS-** Acids like dilute HCl and dilute H_2SO_4 react with certain active metals like zinc (Zn), iron (Fe) etc, to form salt and evolve H_2 gas. Thus these acids or substances containing these kind of acids should not be kept in metal containers.

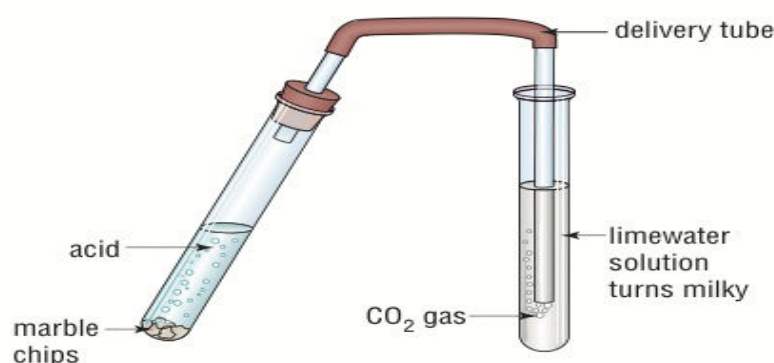
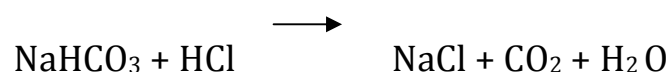
Metal + dil. Acid $\longrightarrow$ salt + hydrogen gas



2. REACTION WITH METAL CARBONATES AND HYDROGEN CARBONATE-

Acids react with metal carbonates and hydrogen carbonates to produce their corresponding salt, carbon dioxide gas and water.

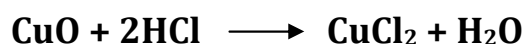
Acid + carbonate $\rightarrow$ salt + water + carbon dioxide



3. REACTION WITH METAL OXIDES-

Acids react with certain metal oxides to form salt and water.

Metal Oxide + Acid $\rightarrow$ Salt + Water



1. REACTION WITH BASES-

An acid when reacts with a base, salt & water are produced. This reaction is called neutralization.



Summary of Acid Reactions

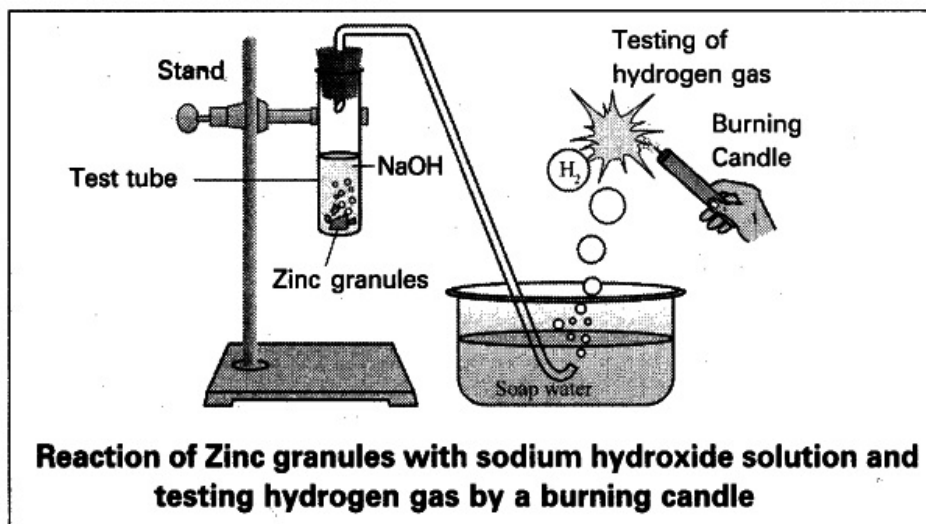


BASES

BASES are those chemical substances which are bitter in taste, soapy to touch and turn red litmus to blue. Example- sodium hydroxide (NaOH), Calcium hydroxide Ca(OH)_2 etc

CHEMICAL PROPERTIES OF BASES-

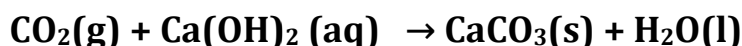
- 1. REACTION WITH METALS-** Strong bases reacts with active metals to produce hydrogen gas. Thus, these bases should not be kept in metal container (active metals). For example, sodium hydroxide reacts with zinc and water to form sodium zincate and hydrogen gas.



2. REACTION WITH NON METALLIC OXIDE-

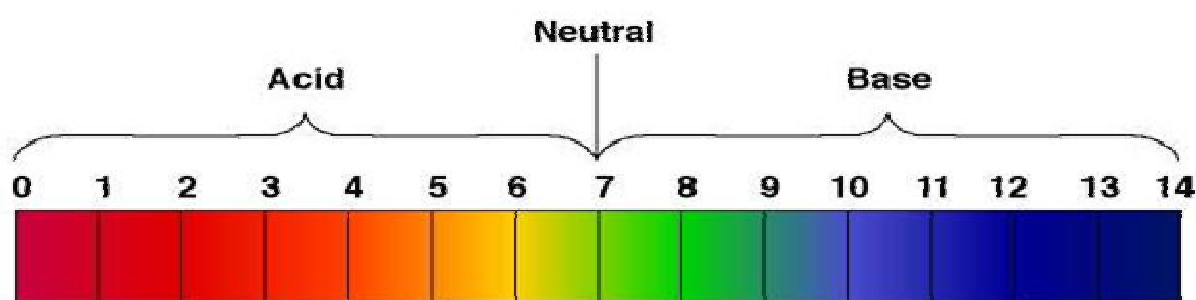
Bases react with non-metallic oxides to produce salt and water.

Base + Non- metallic oxide → Salt+ Water



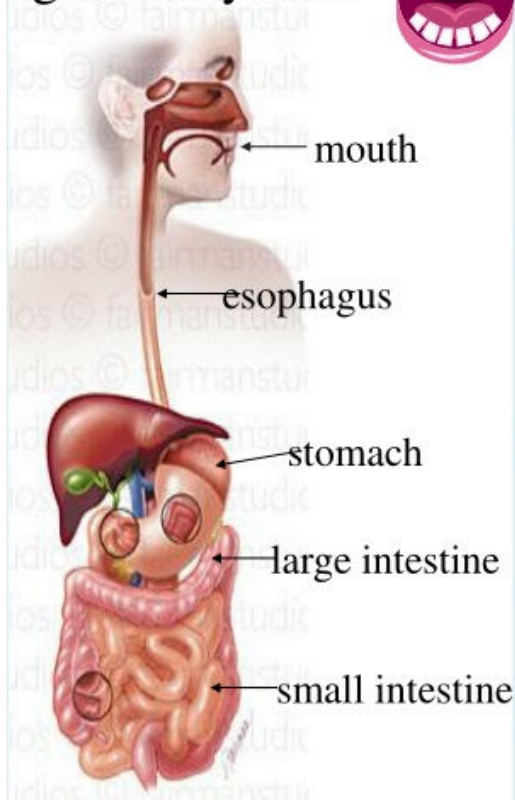
pH Scale

It is a scale used for measuring hydrogen ion concentration. The p in pH stands for potenz which means power in German. It has values ranging from 0 (very acidic) to 14 (very alkaline). pH is a number which indicates the acidic or basic nature of a solution.



The pH Scale

Digestive system



Digestion and pH

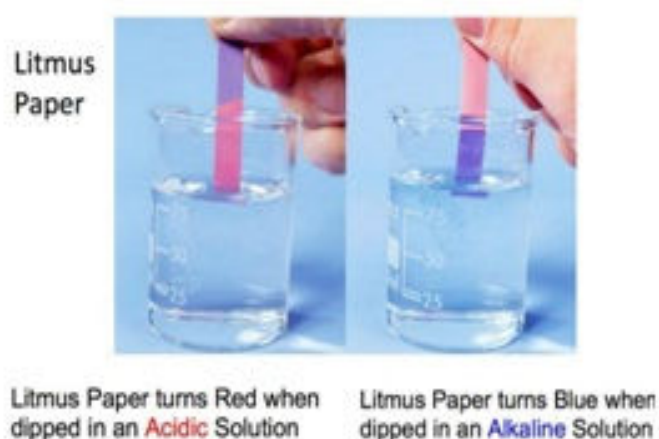
- **Digestion**-process by which foods are broken down into simpler substances.
- **Mechanical digestion**-physical process in which food is torn apart (mouth)
- **Chemical digestion**- chemical reactions in which large molecules are broken down into smaller molecules. (stomach & small intestines)
- **Mouth-pH around 7.** Saliva contains amylase, an enzyme which begins to break carbohydrates into sugars.
- **Stomach- pH around 2.** Proteins are broken down into amino acids by the enzyme pepsin.
- **Small intestine-pH around 8.** Most digestion ends. Small molecules move to bloodstream toward cells that use them

INDICATORS-

Indicators are the substances that change their colour or odour when added into an acid or an alkaline solution. Indicators can be classified in the following ways:

NATURAL INDICATORS-

These indicators are found in the plants e.g. litmus solution is a purple colour dye extracted from the lichen plant belonging to the division "Thallophyta".



SYNTHETIC INDICATORS-

The indicators which are synthesised in the laboratory or industry are known as synthetic indicators, e.g. methyl orange, phenolphthalein, methylene blue and methyl red are synthetic indicators.

Reactions with indicators

Indicator	Acid color	Neutral color	Base color
Phenolphthalein	Colorless	Faint pink	Dark pink
Bromthymol blue	Yellow	Green	Blue
Litmus	Red	-----	Blue

OLFACTORY INDICATORS-

Those substances whose odour changes in acidic or basic medium are called olfactory indicators. Vanilla extract and onion can be used as olfactory indicators. The smell of these two indicators can be detected in presence of acid only but not in the presence of base.

UNIVERSAL INDICATORS-

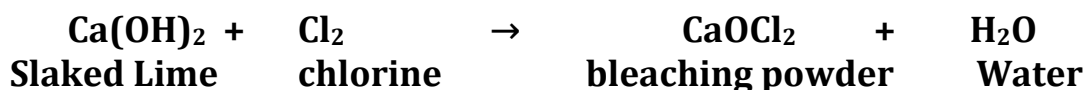
To judge how strong a given acid or base is, a universal indicator is used, which is a mixture of several indicators. It shows different colours at different concentrations of hydrogen ion in a solution.

SALTS

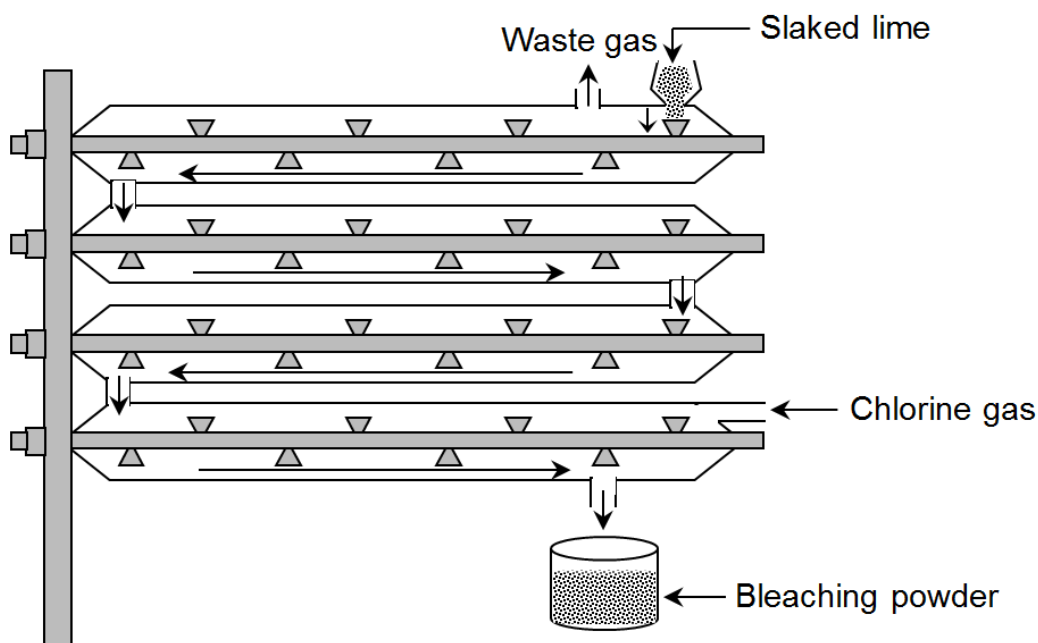
Salts are produced by the neutralisation reaction between acid and base. Salts of strong acid and a strong base are neutral with pH value of 7. Salts of a strong acid and weak base are acidic with pH value less than 7. Salts of strong base and weak acid are basic in nature with pH value more than 7. Now, we will study about preparation and properties of some salts.

1. BLEACHING POWDER [(CALCIUM OXYCHLORIDE) CaOCl_2]

It is produced by the action of chlorine on dry slaked lime.



On standing for a longer time, it undergoes auto-oxidation due to which bleaching action decreases.

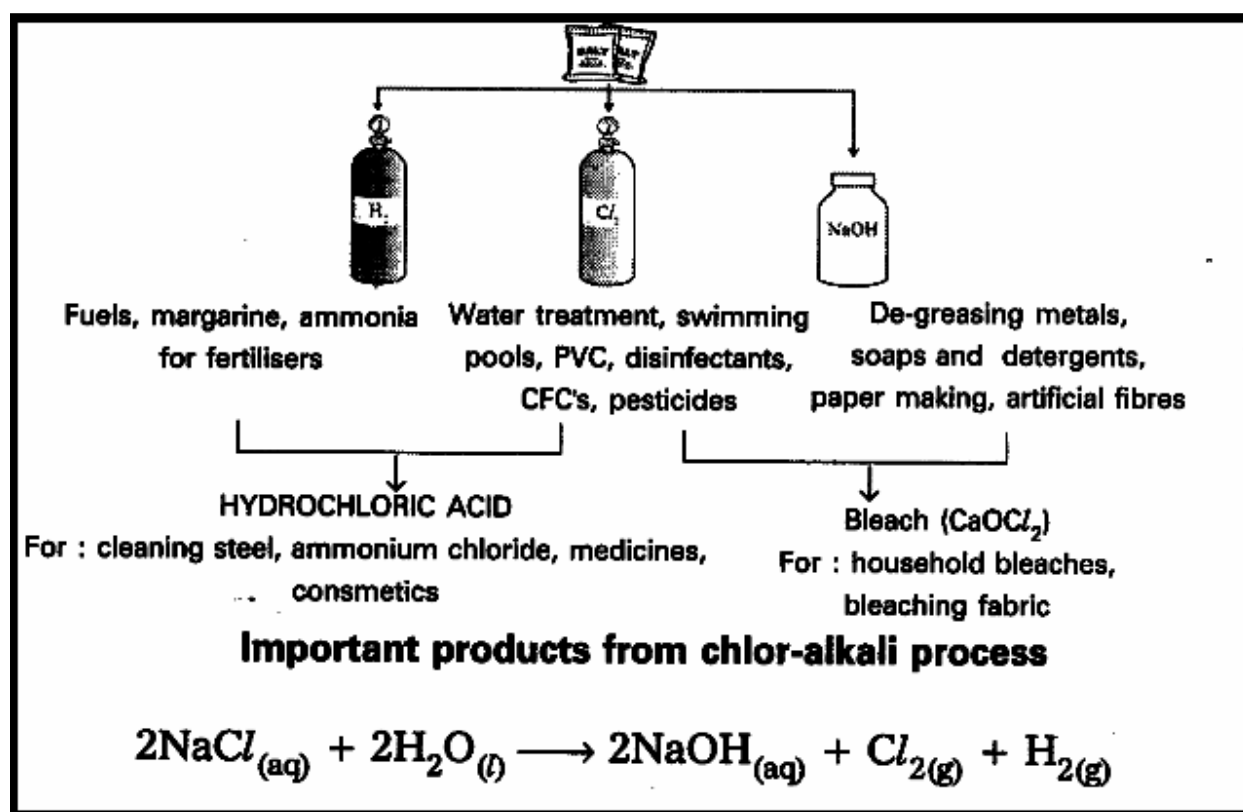
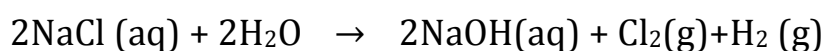


Bleaching Powder is used –

1. For bleaching cotton and linen in the textile industry, for bleaching wood pulp in paper factories and for bleaching washed clothes in laundry.
2. As an oxidising agent in many chemical industries.
3. For disinfecting drinking water to make it free for germs.

2. CAUSTIC SODA [Sodium Hydroxide (NaOH)]

When electricity is passed through an aqueous solution of sodium chloride (called Brine), it decomposes to form sodium hydroxide. This process is called chlor-alkali process because of the products formed, i.e. chlor for chlorine and alkali for sodium hydroxide.



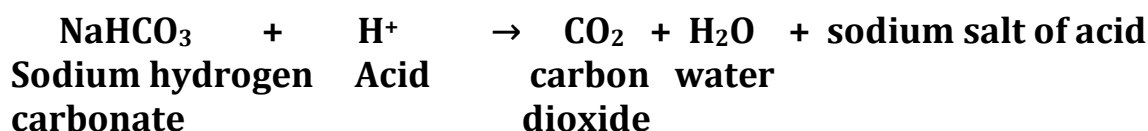
3. BAKING SODA [Sodium Hydrogen Carbonate (NaHCO₃)]

It is mild non-corrosive base. It is the major constituent of baking powder. Chemically, it is sodium hydrogen carbonate. It is produced by using sodium chloride as one of the raw material.



Uses of Baking Soda

1. For making baking powder and a mild edible acid such as tartaric acid. When baking powder is heated or mixed in water, the following reaction takes place:



2. Sodium hydrogen carbonate is also an ingredient of antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.



3. It is also used in soda-acid fire extinguishers.



4. WASHING SODA [SODIUM CARBONATE($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)]

It can be obtained by heating baking soda. The recrystallisation of sodium carbonate gives washing soda. It is also a basic salt.



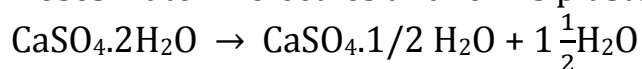
Uses of Washing soda

1. It is used in glass, soap and paper industries.
2. It is used for the manufacture of sodium compounds like borax.
3. It also removes permanent hardness of water.
4. It is used as a cleansing agent in houses and laundries.

5. PLASTER OF PARIS

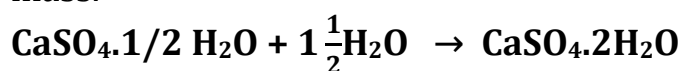
[CALCIUM SULPHATE HEMIHYDRATE ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$)]

It is obtained by heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 373 K. at this temperature, gypsum loses water molecules and forms plaster of Paris.



When gypsum is heated above 400 K, dead burnt plaster (anhydrous CaSO_4) is obtained which does not have the property of hardening. POP is a white

powder and on mixing with water changes to gypsum giving a hard solid mass.



Uses of Plaster of Paris

1. It is used by doctors for joining the fractured bones in right position, i.e. for making plaster to support fractured bones.
2. It is also used for making decorative pieces and for making designs on ceilings.

