

# SALTS [ACIDS, BASES AND SALTS]

## SALTS

A salt is an ionic compound that can be formed by the neutralization reaction of an acid and a base. Salts are electrically neutral. Sodium chloride (NaCl), Calcium Chloride (CaCl<sub>2</sub>), Calcium Chloride (CaCl<sub>2</sub>), Calcium Sulphate (CaSO<sub>4</sub>), Zinc Chloride (ZnCl<sub>2</sub>), Zinc Sulphate (ZnSO<sub>4</sub>) are some examples of Salts.

### pH of Salts –

- Salts of a 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 a strong base and weak acid are **basic in nature**, with pH value more than 7.

### Chemicals from Common Salt

Seawater contains many salts dissolved in it. Sodium chloride is separated from these salts. The common salt thus obtained is an important raw material for various materials of daily use, such as **sodium hydroxide, baking soda, washing soda, bleaching powder** and many more.

### SODIUM HYDROXIDE

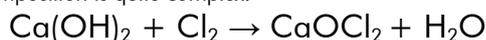
When electricity is passed through an **aqueous solution of sodium chloride** (called **brine**), it decomposes to form **sodium hydroxide**. The process is called the **chlor-alkali process** because of the products formed– **chlor** for chlorine and **alkali** for sodium hydroxide.



Chlorine gas is given off at the **anode**, and **hydrogen gas** at the **cathode**. Sodium hydroxide solution is formed near the cathode. The **three products produced** in this process are all useful.

#### (i) Bleaching powder

Bleaching powder is produced by the action of chlorine on dry slaked lime [Ca(OH)<sub>2</sub>]. Bleaching powder is represented as CaOCl<sub>2</sub>, though the actual composition is quite complex.



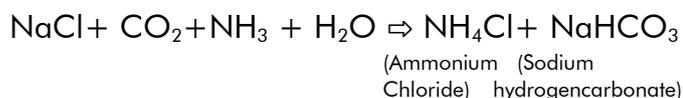
Aqueous solution of bleaching powder is basic in nature. The term bleach means removal of colour. Bleaching powder is often used as bleaching agent. It works because of oxidation. Chlorine in the bleaching powder is responsible for bleaching effect.

#### Bleaching powder is used –

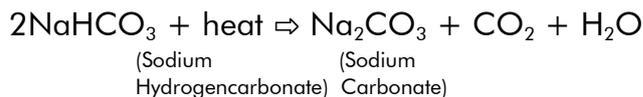
- for bleaching cotton and linen in the textile industry, for bleaching wood pulp in paper factories and for bleaching washed clothes in laundry;
- as an oxidising agent in many chemical industries; and
- for disinfecting drinking water to make it free of germs.

#### (ii) Baking soda

The chemical name of the compound is sodium hydrogencarbonate (NaHCO<sub>3</sub>). It is produced using sodium chloride as one of the raw materials. Bread soda, cooking soda, bicarbonate of soda, sodium bicarb, bicarb of soda or simply bicarb, etc. are some other names of baking soda. Baking soda is obtained by the reaction of brine with carbon dioxide and ammonia. This is known as **Solvay process**.

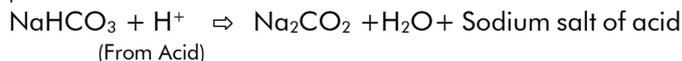


It is a mild non-corrosive base. The following reaction takes place when it is heated during cooking –



### Uses of sodium hydrogencarbonate (NaHCO<sub>3</sub>)

(i) For making baking powder, which is a mixture of baking soda (sodium hydrogencarbonate) and a mild edible acid such as tartaric acid. When baking powder is heated or mixed in water, the following reaction takes place –



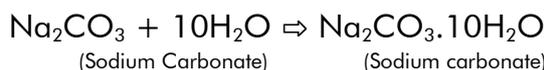
Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

(ii) Sodium hydrogencarbonate is also an ingredient in antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.

(iii) It is also used in soda-acid fire extinguishers.

#### (iii) Washing soda (Sodium carbonate)

Another chemical that can be obtained from sodium chloride is Na<sub>2</sub>CO<sub>3</sub>.10H<sub>2</sub>O (washing soda). You have seen above that sodium carbonate can be obtained by heating baking soda; recrystallisation of sodium carbonate gives washing soda. It is also a basic salt.



### Uses of washing soda

(i) Sodium carbonate (washing soda) is used in glass, soap and paper industries.

(ii) It is used in the manufacture of sodium compounds such as borax.

(iii) Sodium carbonate can be used as a cleaning agent for domestic purposes.

(iv) It is used for removing permanent hardness of water.

## WATER OF CRYSTALLISATION

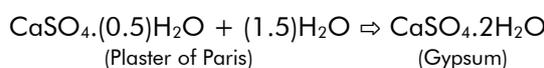
**Water of crystallisation is the fixed number of water molecules present in one formula unit of a salt.** Five water

molecules are present in one formula unit of copper sulphate. Chemical formula for hydrated copper sulphate is Cu SO<sub>4</sub>. 5H<sub>2</sub>O. Similar molecule is Na<sub>2</sub>CO<sub>3</sub>.10H<sub>2</sub>O. Gypsum has two water molecules as water of crystallisation. It has the formula CaSO<sub>4</sub>.2H<sub>2</sub>O.

Copper sulphate crystals is blue in colour due to presence of water of crystallisation. When we heat the crystals, this water is removed and the salt turns white. If you moisten the crystals again with water, you will find that blue colour of the crystals reappears.

### Plaster of Paris

**On heating** gypsum at 373 K, it loses water molecules and becomes **calcium sulphate hemihydrate**. This is called **Plaster of Paris**, the substance which doctors use as plaster for supporting fractured bones in the right position. Plaster of Paris is a white powder and on mixing with water, it changes to gypsum once again giving a hard-solid mass.



Plaster of Paris (PoP) is used for making toys, materials for decoration and for making surfaces smooth.

