Baking powder:

- Baking powder is the mixture of baking soda and a mild edible acid. Generally, tartaric acid is mixed with baking soda to make baking powder.

$$NaHCO_3 + C_4H_6O_6 \rightarrow CO_2 + H_2O + Na_2C_4H_4O_6$$

- When baking powder is heated, the sodium carbonate formed because of heating of baking soda neutralizes after reacting with tartaric acid and sodium tartarate salt is formed.
- The smell of sodium tartarate is pleasant and taste is good. This makes the cake or any other food tasty.
- Baking powder produces carbon dioxide on heating, so it is used in cooking to make the batter spongy.
- Although baking soda also produces carbon dioxide on heating, but it is not used in cooking because on heating; baking soda produces sodium carbonate along with carbon dioxide. The sodium carbonate; thus produced; makes the taste bitter.

$$2NaHCO_3 + heat \rightarrow Na_2CO_3 + CO_2 + H_2O$$

Washing Soda (Sodium carbonate)

- Sodium carbonate is manufactured by the thermal decomposition of sodium hydrogen carbonate obtained by Solvay process.

$$NaCl + CO_2 + NH3 + H_2O \rightarrow NH_4Cl + NaHCO_3$$

- The sodium carbonate obtained in this process is dry. It is called soda ash or anhydrous sodium carbonate. Washing soda is obtained by rehydration of anhydrous sodium carbonate.

$$Na_2CO3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

- Since there are 10 water molecules in washing soda, hence it is known as Sodium bicarbonate decahydrate. Sodium carbonate is a crystalline solid and it is soluble in water when most of the carbonates are insoluble in water.
- On heating the washing soda all molecules of water are evaporate resulting Na_2CO_3 called soda ash

$$Na_2CO_3.10H_2O \xrightarrow{Heat} Na_2CO_3 + 10H_2O$$

Use of sodium carbonate:

- It is used in cleaning of cloths; especially in rural areas.
- In making of detergent cake and powder.
- In removing permanent hardness of water.
- It is used in glass and paper industries.

Water of crystallization:

Many salts contain water molecule and are known as hydrated salts. The water molecule present in salt is known as water of crystallization.

Examples:

Copper sulphate pentahydrate ($CuSO_4.5H_2O$):

Blue colour of copper sulphate is due to presence of 5 molecules of water. When copper sulphate is heated, it loses water molecules and turns into grey-white colour, which is known as anhydrous copper sulphate. After adding water; anhydrous copper sulphate becomes blue again.

$$CuSO_4.5H_2O + heat \rightarrow CuSO_4$$

Plaster of Paris

- Plaster of Paris is obtained by heating of gypsum, a hydrated salt of calcium.

$$CaSO_4.2H_2O + Heat \rightarrow CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$

- After addition of water Plaster of Paris is again converted into gypsum.

$$CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \Rightarrow CaSO_4.2H_2O$$

- Plaster of Paris is used in making of toys, designer false ceiling, etc. Doctors use Plaster of Paris to set the fractured bone.