

SALTS

Summary



The compounds formed by the reaction between an acids and a bases are known as a salts.



Salts are ionic compounds which contain positively charged cations and negatively charged anions. During salt formation cation is coming from base and anion is coming from acid.

Example: In Sodium chloride (NaCl) formation cation sodium is coming from sodium hydroxide and anion chlorine is coming from hydrochloric acid.

Classification of salts:

Based on nature the salts have been classified into different types. They are:

Normal salts

Acidic salts

Basic salts

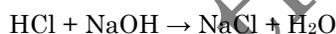
Double salts

Complex salts

Normal salts:

These salts are formed by the complete replacement of hydrogen in acids by other metal cations from the bases.

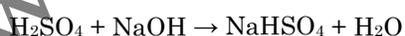
NaCl is normal salt formed by the reaction of HCl with NaOH.

**Acidic salts:**

Salts which are formed by the partial replacement of hydrogens atoms of acids are called acidic salts.

Example:

NaHSO₄ is formed when partial replacement of hydrogen atoms by the sodium atoms of base.



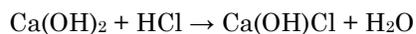
In general these salts formed when the reacted base is not sufficient for the neutralisation of acid.

Basic salts:

Salts which are formed by the partial replacement of hydroxyl group are called basic salts.

Example:

Ca(OH)Cl is formed by the partial replacement of hydroxide group from Ca(OH)₂ by chloride ions of acid.



In general these salts formed when the reacted acid is not sufficient for the neutralisation of base.

Table below giving neutral, acidic and basic salts.

Type of Salt	Type of Acid	Type of Base	Example
Neutral pH = 7	Strong Acids	Strong Bases	NaCl
	Examples: HCl	Examples: NaOH	K ₂ SO ₄
	H ₂ SO ₄	KOH	
Acidic pH < 7	Strong Acids	Strong Bases	NH ₄ Cl
	Examples HCl	Examples: NH ₄ OH	Mg(NO ₃) ₂
	HNO ₃	Mg(OH) ₂	
Basic pH > 7	Weak Acids	Strong Bases	Na ₂ CO ₃
	Examples: H ₂ CO ₃	Examples: NaOH	CH ₃ COOK
	CH ₃ COOH	KOH	

Double salts:

Salts that are formed by mixing of two simple salts which are obtained crystallisation.

Example:

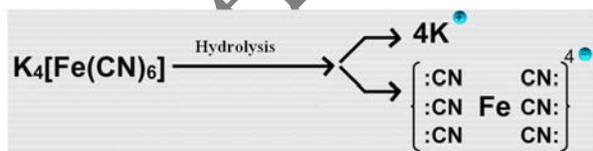
Potash alum - K₂SO₄ Al₂(SO₄)₃ .24H₂O

Dolomite - CaCO₃.MgCO₃

Complex salts:

The salts which contains different types of metal atoms which on hydrolysis produces complex ions along with simple ions are called complex salts.

Example:



Salts in our daily life:

Baking soda

Chemical name: Sodium hydrogen carbonate

Molecular formula: NaHCO₃

Sodium hydrogen carbonate is commonly called as baking soda.

Sodium hydrogen carbonate is used in the baking industry.

It is used in preparation of soda acid.

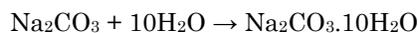
It is also used in foam type fire extinguishers.

Washing soda:

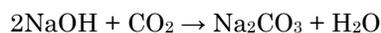
Molecular formula: $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

Chemical formula: Sodium carbonate.decahydrate

Adding water to sodium carbonate and this allowing this mixture to cool to forms decahydrated sodium carbonate. This is commonly called as washing soda.



In general sodium carbonate is prepared by passing CO_2 gas through concentrated NaOH .

**Properties:**

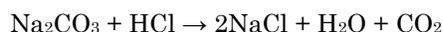
It is a white crystalline solid. It exists as decahydrate of sodium carbonate.

When exposed to dry air and heating it loses water molecules to change into anhydrous form.



It is soluble in water and during dilution heat will release out.

On reaction with acids sodium carbonate releases carbon dioxide along with the formation of sodium salts and water.

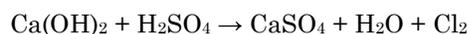
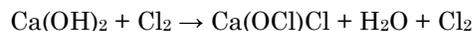


Sodium carbonate is used to manufacture of glass, cleansing agents, soap, glass and paper.

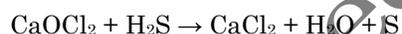
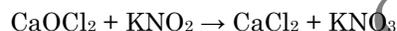
Bleaching powder (CaOCl_2):

Bleaching powder chemically known as calcium oxy chloride.

It is prepared by the reaction between chlorine and slaked lime at about 40°C .



It acts a strong oxidising agent to bleach substances.



It is used to bleach cotton, linen textiles and wood pulp.

Coloured matter + Bleaching powder \rightarrow Colourless product

It is also used to disinfect drinking water.

Hydrated salts:

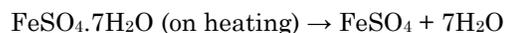
The molecules of salts which contain fixed number of water molecules in them are called hydrated salts.

In general they exist as dry in pure form.

These salts on heating lose water molecules in them and form anhydrous salts.

Example:

Ferrous sulphate heptahydrate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) on heating loses water molecules in it.



Some of the hydrated salts along with their chemical formula.

Name of the salt	Chemical formula
Sodium carbonate decahydrate	$\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$
Zinc Sulphate heptahydrate or White vitriol	$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
Magnesium sulphate heptahydrate or Epsom salt	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
Potash alum	$\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
Copper (II) sulphate pentahydrate or Blue vitriol	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
Calcium sulphate dihydrate or Gypsum	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Plaster of paris ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$):

Plaster of paris which is chemically called calcium sulphate hemihydrate.

Since it is brought to use from paris, called as "plaster of paris".

It is prepared by heating of gypsum at 373K.



Uses:

It is used as a bandage, proofing material, sealing agent.

It is used for making statues, toys and decorative articles.

It is also used for smoothening wall surfaces.