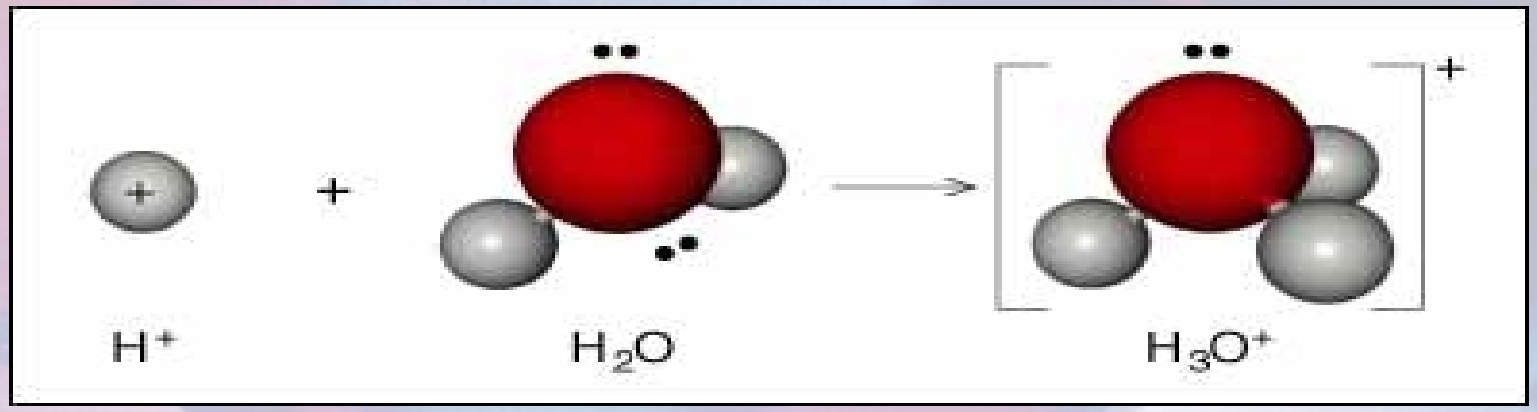
Acids, Bases and Salts

Ionization of Acids in water

- When an acid is added to water, the acid molecule will ionize i.e form individual ions.
- All acids will ionize to produce protons(hydrogen ions) and a negative ion.
- The H+ ions attach to the water molecules to form Hydroxonium ions.



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chemical properties of acids

- **Acids react with reactive metals :**
- Reactive metal + acid → salt and hydrogen gas
  E.g. $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$
- Exception : (HNO_3)

(test for hydrogen gas)

Acids, Bases and Salts

Quick check 1

1. What ions do acids produce in water?
2. State three properties of acids.
3. Explain what is meant by a strong acid. Give one example of a strong acid.
4. Explain what is meant by a weak acid. Give one example of a weak acid.
5. Some dry citric acid crystals are placed on a dry piece of litmus paper. Will there be a colour change? Explain your answer.

Solution

Acids, Bases and Salts

Solution to Quick check 1

1. Hydrogen ions.
2. (a) Acids have a sour taste.
   (b) Acids turn blue litmus to red.
   (c) Acids react with metals to produce hydrogen.
3. A strong acid is an acid that is completely ionised in water. E.g. sulphuric acid.
4. A weak acid is an acid that is only partially ionised in water. E.g. ethanoic acid.
5. There will be no colour change because there is no water, so the citric acid cannot form hydrogen ions.

Return

- $CuO(s) + NH_4NO_3 \rightarrow$
- $Cu(OH)_2 + NH_4SO_4 \rightarrow$

Acids, Bases and Salts

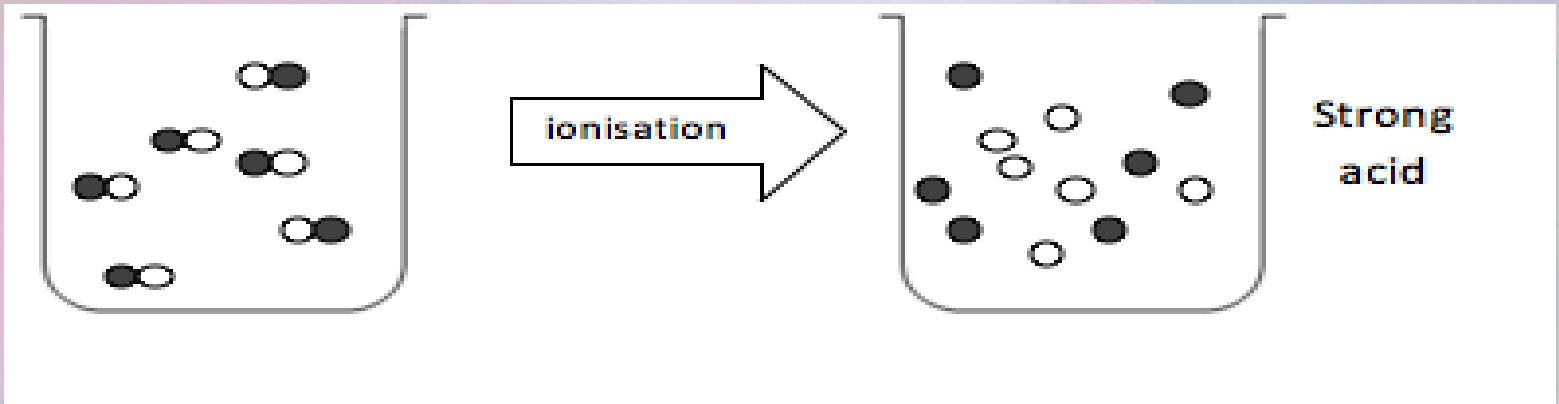
Amphoteric Oxides and hydroxides

- What is an amphoteric substance?
- An amphoteric substance is one which can act as both an acidic substance and a basic substance.

Amphoteric Oxide	Formula	Amphoteric Hydroxide	Formula
Aluminium oxide	Al2O3	Aluminium hydroxide	Al(OH)3
Zinc Oxide	ZnO	Zinc hydroxide	Zn(OH)2
Lead(II) oxide	PbO	Lead(II) hydroxide	Pb(OH)2

What is a Strong Acid?

- A strong acid is completely ionized in aqueous solution.
- A strong acid has a very high concentation of H+ ions.



Acids, Bases and Salts

The pH meter

- The pH meter is a quantitative instrument used for measuring pH.
- The pH meter consists of a measuring probe connected to an electronic meter which displays the pH reading.
- The pH meter will give an exact value for the pH of the solution
- This is a more accurate method for determining the pH of a solution.

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Indicators

Indicator	Colour in strong Acids	pH at which colour changes	Colour in strong alkalis
Methyl orange	red	pH 4	yellow
Litmus	red	pH 7	blue
Phenolphthalein	colourless	pH 9	pink

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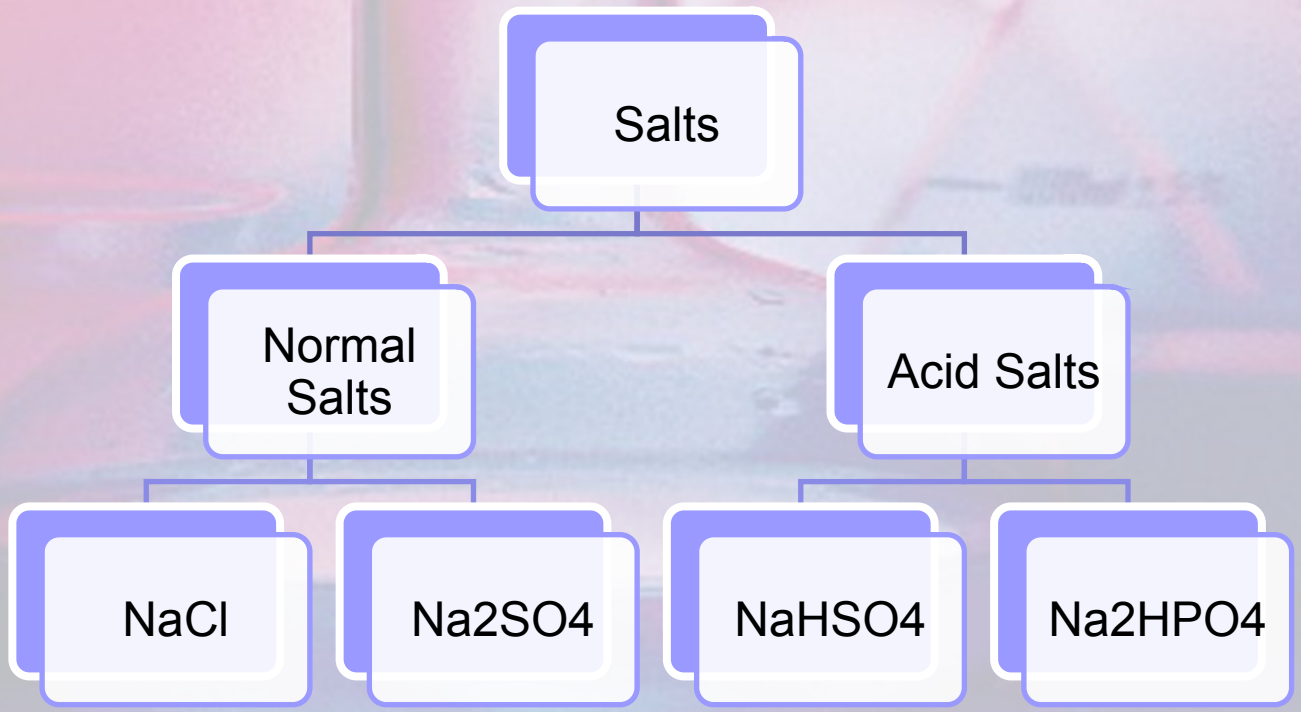
Classification of Salts



Preparation of Soluble Salts

Acids, Bases and Salts

Methods of Preparing Salts

1. Action of acid on alkali (Titration)

- This method is used to produce sodium, potassium and ammonium salts using the appropriate alkalis (NaOH , KOH, NH_4OH)
- Acid is added to the alkali until the solution is neutral
- The neutralization point can be determined using the appropriate indicator.

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Methods of Preparing Salts

3. Action of acid on (b) **a carbonate**

ACID + CARBONATE → SALT + WATER + CO_2

Eg.1 Sulphuric acid on sodium carbonate

$$H_2SO_4 + Na_2CO_3 \rightarrow Na_2SO_4 + H_2O + CO_2$$

Eg.2 Hydrochloric acid on calcium carbonate

$$2HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$$

- This method is similar to the previous method; instead of the oxide, the carbonate is added in excess to the acid.
- Visible effervescence stops when the reaction has reached completion.

Acids, Bases and Salts

Writing ionic equations

Steps in writing ionic equations

EXAMPLE 1

$$HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$$

Step 1: Break substances with (aq) into its ions:

$$H^+_{(aq)} + \cancel{Cl^-_{(aq)}} + \cancel{Na^+_{(aq)}} + OH^-_{(aq)} \rightarrow \cancel{Na^+_{(aq)}} + \cancel{Cl^-_{(aq)}} + H_2O_{(l)}$$

Step 2: Remove similar ions from both sides of equation.

Step 3: Rewrite the equation with the final ions left:

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$$