

ACIDS BASES AND SALTS

Acids:

An **acid** is a compound which when dissolved in water produces **hydrogen ions** (H^+) and is described as a proton donor (H^+).

Eg: HCl , H_2SO_4 , HNO_3 (**strong acids**)
 CH_3COOH (Weak acid)

Strong acids: Strong acids dissociate (ionise) completely in water and produce more H^+ ions.



Weak acids: weak acids dissociate (ionise) partially in water to produce H^+ ions.



Bases: Bases are proton acceptors as they accept protons donated by acids.

Reactions:

The four main types of reactions of acids are :

1) Acid + metal \rightarrow salt + hydrogen gas

2) Acid + base \rightarrow salt + water (neutralisation)

3) Acid + alkali \rightarrow salt + water (neutralisation)

4) Acid + metal carbonate \rightarrow salt + water + carbon dioxide gas (neutralisation)

1) Acid + metal \rightarrow salt + hydrogen gas

Acid	Name of products	Equation for reaction
Hydrochloric acid	Magnesium chloride and hydrogen	$Mg + 2HCl \longrightarrow MgCl_2 + H_2$
Sulfuric acid	Magnesium sulfate and hydrogen	$Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$
Nitric acid	Magnesium nitrate and hydrogen	$Mg + 2HNO_3 \longrightarrow Mg(NO_3)_2 + H_2$

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2) Acid + base \rightarrow salt + water

Metal hydroxides/Metal oxides are bases

Acid	Name of products	Equation for reaction
Hydrochloric acid	Magnesium chloride and water	$Mg(OH)_2 + 2HCl \longrightarrow MgCl_2 + 2H_2O$
Sulfuric acid	Magnesium sulfate and water	$MgO + H_2SO_4 \longrightarrow MgSO_4 + H_2O$
Nitric acid	Magnesium nitrate and water	$Mg(OH)_2 + 2HNO_3 \longrightarrow Mg(NO_3)_2 + H_2O$

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4) Acid + metal carbonate → salt + water + carbon dioxide gas (neutralisation)

Acid	Name of products	Equation for reaction
Hydrochloric acid	Magnesium chloride, carbon dioxide and water	$\text{MgCO}_3 + 2\text{HCl} \longrightarrow \text{MgCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
Sulfuric acid	Magnesium sulfate, carbon dioxide and water	$\text{MgCO}_3 + \text{H}_2\text{SO}_4 \longrightarrow \text{MgSO}_4 + \text{CO}_2 + \text{H}_2\text{O}$
Nitric acid	Magnesium nitrate, carbon dioxide and water	$\text{MgCO}_3 + 2\text{HNO}_3 \longrightarrow \text{Mg}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$

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Indicators:

These indicators show the substance is acidic or basic by changing its colour. (Do not show the strength of the acid or base)

Indicator	Colour in acid	Colour in alkali
Litmus	red	blue
Thymolphthalein	colourless	blue
Methyl orange	red	yellow

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Universal indicator shows the strength of acids and bases as well.



How to differentiate between strong and weak acids.

By knowing pH

1. Take same concentration of both acids.
2. Measure pH using universal indicator.
3. Red colour shows lower pH so strong acid and orange colour shows higher pH so weak acid.

By knowing electrical conductivity

1. Take same concentration of both acids.
2. Check electrical conductivity.
3. The one in which light bulb brighter shows more electrical conductivity means strong acid and dim bulb shows low electrical conductivity means weak acid.

By using Metal/metal carbonate for test

1. Take same concentration of both acids
2. Add Magnesium /Zinc/Zinc carbonate to both acids.
3. Rate of bubbles is more faster in strong acid than in weak acid.

How to test which base is strong or weak?

1. Take same concentration of both bases.
2. Use universal indicator to find out which base is weak and strong.
3. The one which shows high pH means strong base and one shows low pH means weak base.

What is meant by strong and weak base:

Strong base accepts protons more readily than weak base

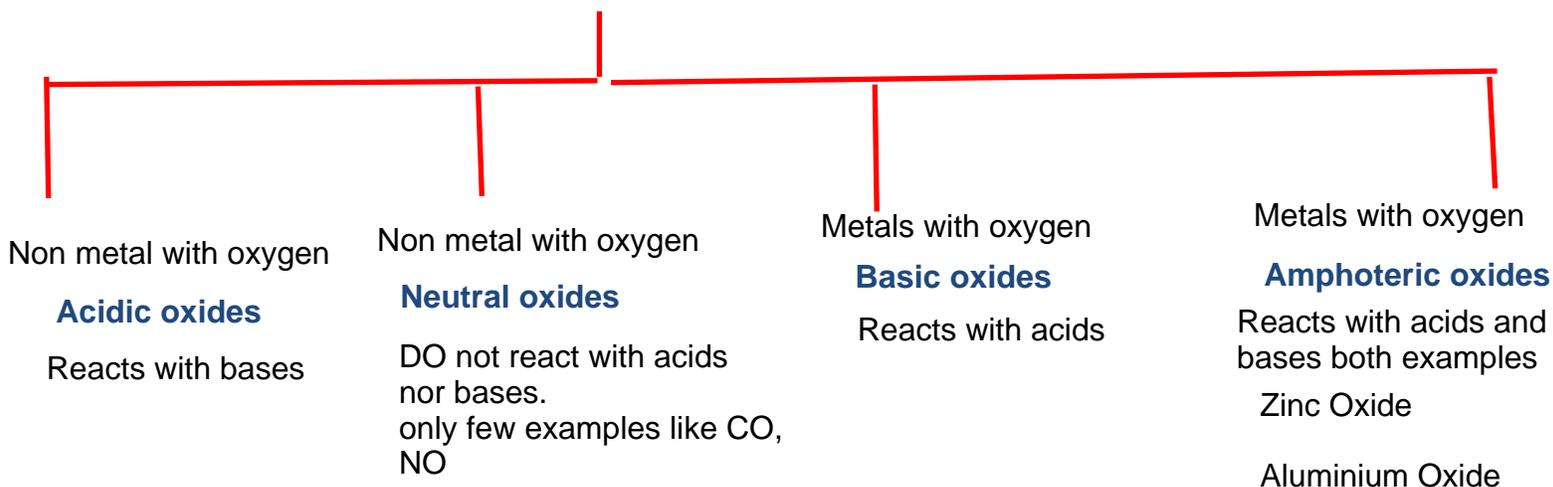
Alkali: Alkalis are soluble bases.

Ammonia: Ammonia is a weak base.

Ammonia + Hydrochloric acid \longrightarrow Ammonium chloride (Only salt formation in this reaction)

Ammonium salt reacts with bases to produce ammonia. $\text{NH}_4\text{Cl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{NH}_3$

OXIDES



Making of Salts:

*Salts of substances are formed when all the replaceable **hydrogen ions of an acid are completely replaced by metal ions or the ammonium ion (NH_4^+)***

Salts can be either

- **Soluble**
- **Insoluble**

Salts	Soluble	Insoluble
Sodium, potassium and ammonium	All	None
Nitrates	All	None
Chlorides	Most are soluble	Silver and lead(II)
Sulfates	Most are soluble	Barium, calcium and lead(II)
Carbonates	Carbonates of sodium, potassium and ammonium	Most are insoluble
Hydroxides	Hydroxides of sodium, potassium, ammonium and calcium (calcium hydroxide is partially soluble)	Most are insoluble

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Soluble salts: Adding acids to metals, Insoluble carbonates and Insoluble bases(Not for group 1 metals or compounds)

1. Add an excess of Base/Metal/metal carbonate in to acid (While heating)and stir continuously.
2. Filter to remove excess of metal/base/metal carbonate.
3. Evaporate filtrate until it becomes saturated(crystallisation point has reached)
4. allow to cool so salt crystallise.
5. Filter to collect the crystals.
6. Dry the crystals between filter papers.

Titration: All reactants are soluble.

1. Known volume of alkali /soluble metal carbonates in to a conical flask.
2. Add indicator 1 or 2 drops (methyl orange) in conical flask.
3. Fill burette with acid.
4. Add acid from burette slowly until the solution turn orange.
5. Note the volume of acid used to neutralise the alkali.
6. Now add same amount of acid and alkali but with out indicator.
7. Heat till saturated solution form (Crystallisation point has reached).
8. Allow to cool to form crystals.
9. Filter to collect crystals .
10. Dry with filter papers.

Insoluble salt preparation:

*A precipitate is an **insoluble** salt formed when **2 salt solutions** are mixed.*

- *Pour a **slight excess** of H_2O into each beaker containing the soluble solids lead(II)nitrate and potassium iodide (Solution is needed)*
- ***Stir** to dissolve the soluble solid salts to obtain 2 salt solutions*
- ***Mix** the solutions and stir to obtain the ppt (lead(II)iodide)*
- ***Filter** the mixture to separate the precipitate from the solution*
- ***Wash** the ppt with distilled water*
- ***Dry** the precipitate between two filter paper.*