

# C5: Reactions of Acids and Alkalis

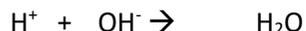
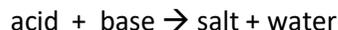
## Acid, Base and Alkali

An acid has a pH less **than 7** and form  $H^+$  ions in water.

A base has a pH **more than 7**.

An alkali is a base that dissolves in water and forms  $OH^-$  ions.

A reaction between an acid and base is called neutralisation:

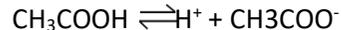


## Strength of Acids

Acids ionise in water (produce  $H^+$  ions).

A **strong acid** will ionise completely – all the acid molecules disassociate to release  $H^+$ :  $HCl \rightarrow H^+ + Cl^-$

A **weak acid** does not completely ionise. It is a reversible reaction where the equilibrium is far to the left:



The **pH** is a measure of the **concentration of  $H^+$  ions**. The lower the pH the more  $H^+$  ions there are. For every 1 decrease on the pH scale there are 10 times more  $H^+$  ions.

## Making Soluble Salts

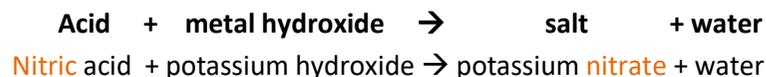
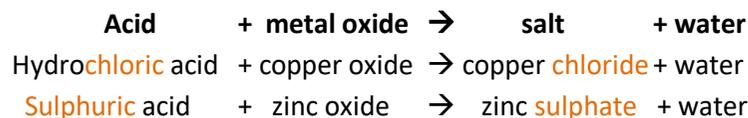
These salts dissolve in the water when produced.

**REQUIRED PRACTICAL**  
SEE PRACTICAL SHEET FOR DETAIL

1. Chose the correct acid and insoluble base
2. Warm the acid
3. Add the base in small amounts until no more reacts
4. Filter out the excess acid
5. Heat the solution gently using a water bath or electric heater to evaporate some of the water
6. Allow the solution to cool and crystals will form
7. Filter out of solution and dry.

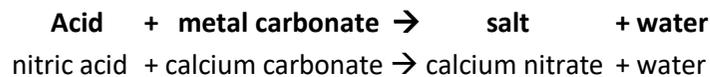
## Acid + metal oxide or hydroxide

Metal oxides and metal hydroxides are bases so will neutralise acids. Note the naming of the salt from the acid.



## Acid + metal carbonates

Metal carbonates are bases.



## Acid + metals

The higher a metal is in the reactivity series the faster it will react with an acid. A more reactive metal will lose electrons more easily to form a positive ion.



The reactivity of a metal can be investigated by measuring a temperature change (higher = more reactive) or by the rate of gas given off (more = more reactive).

## Metal + water

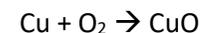


**OIL RIG** – Oxidation Is Loss, Reduction Is Gain (of electrons)

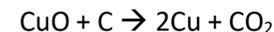
## Separating a metal from an oxide

Metals are often found as ores where the metal has reacted with oxygen.

**Oxidation** is the **gain of oxygen**:



**Reduction** is the **loss of oxygen**:



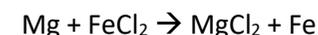
Metals can be extracted from their ores by reduction with carbon if the metal is below carbon in the reactivity series.  
iron oxide + carbon  $\rightarrow$  iron + carbon dioxide

## Redox Reactions

Oxidation is also the loss of electrons.  
Reduction is also the gain of electrons.

Reduction and oxidation happen at the same time – a **redox** reaction.

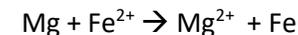
A displacement reaction is a redox reaction:



The Mg is oxidised:  $Mg \rightarrow Mg^{2+} + 2e^-$

The iron is reduced:  $Fe^{2+} + 2e^- \rightarrow Fe$

The ionic equation only shows the displacement of the ions:



Oxidised – loses electrons  
Reduced – gains electrons

