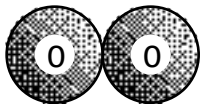
Topic 1 : Chemical Reactions

Revised April 1995

All matter is made up of particles, the simplest of which is the **atom**. **Elements** contain only one kind of atom. A **molecule** is a cluster of atoms bonded together.

Example : Oxygen gas O_2



There are about 100 different elements. Each has a name and a symbol.

Examples :	Carbon	C
	Oxygen	O
	Hydrogen	H

When elements react together energy is either given out (**exo**thermic reaction) or taken in (**endo**thermic reaction) and a **compound** is formed (a compound is a substance which consists of **different** elements bonded together). If the compound contains only two elements its name usually ends in - IDE ; if it contains the additional element Oxygen its name usually ends in - ITE (or - ATE indicating more Oxygen).

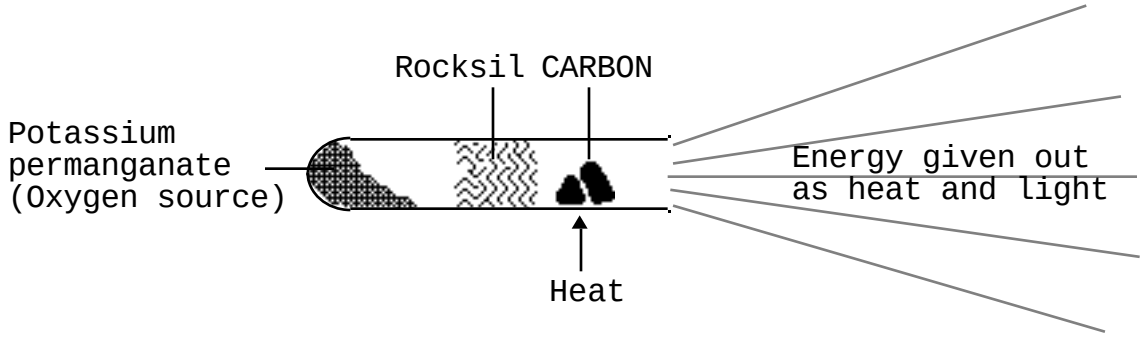
Example :	Carbon	+	Oxygen	->	Carbon dioxide
	C		O_2		CO_2

This is an example of a **chemical reaction**, a process where substances react together to form **NEW** substances. Notice that there is nearly always a change in appearance during the reaction (Carbon is a black solid ; Oxygen is a colourless gas ; the product, Carbon dioxide, is a colourless gas).

Experiment 1

Object : To react Carbon with Oxygen

Method :

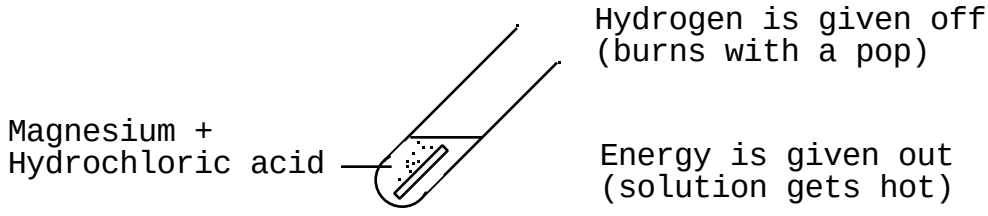


Experiment 2

Object : To react Magnesium with Hydrochloric acid

Magnesium + Hydrochloric acid -> Magnesium chloride + Hydrogen

Method :



Chemical reactions occur in our daily lives : when we eat food the food combines with the Oxygen we breath in producing Water, Carbon dioxide (breathed out) and energy.

N.B. **Mixtures** contain substances which have **NOT** reacted together. Air is a mixture of Oxygen and Nitrogen in the ratio 1 :4.

Topic 2 : The Speed of Reactions

Some reactions are fast (reaction of Sodium with Water) ; other reactions are slow (rusting of Iron).

The rates of particular reactions can be increased in **FOUR** ways :

1. By using a **small particle size**.

   Example 1 : Reaction of Magnesium with Oxygen :

   Magnesium + Oxygen -> Magnesium oxide

   Mg O_2 MgO

   Powdered Magnesium reacts faster than ribbon because the powder has a greater surface area allowing more Oxygen to get at the Magnesium.

   Example 2 : Powdered coal burns in Oxygen much faster than a lump.

   Where powdered coal is stored it must be well damped down because of the danger of explosion.

2. By **increasing the concentration** of solutions.

   A solution is formed when a solute dissolves in a solvent (usually water).

   Example 1 : Reaction of Magnesium with Hydrochloric acid.

   The more concentrated the acid the more collisions between acid particles and Magnesium and the faster the reaction.

Example 2 : The more concentrated the solution of bleach the quicker it bleaches.

3. By **increasing the temperature**.

Example 1 : Reaction of Zinc with dilute Sulphuric acid.

Zinc + Sulphuric acid -> Zinc sulphate + Hydrogen

The reaction becomes faster as the reactants are warmed together in a test tube.

Example 2 : Low temperatures are used to store food to slow down decomposition.

4. By using a **catalyst**.

Catalysts are substances which speed up some reactions. Usually they are highly specific : a catalyst for one reaction need not speed up another. Catalysts are not used up during the reaction and so, can be recovered at the end of the reaction.

Example 1 : Decomposition of Hydrogen peroxide H_2O_2.

H_2O_2 -> H_2O + O_2

Reaction is slow at room temperature. Addition of a small amount of Manganese dioxide catalyst speeds up the reaction : Oxygen is given off rapidly and relights a glowing splint.

Example 2 : In making wine a natural catalyst called an enzyme is used to speed up the conversion of Glucose into Alcohol.