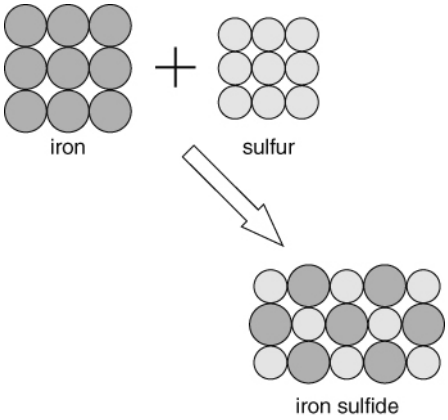
Summary Sheet Year 8: Types of Reaction

Making compounds

Compounds are formed when elements react so that the atoms join together.



Naming compounds

If there is a metal in the compound, the name of the metal goes first.

If the compound contains only two elements then one of the element's name has its ending changed to 'ide'.

e.g. zinc + oxygen = zinc oxide

iron + bromine = iron bromide

If a compound contains two elements plus oxygen, then the name ending of one of the elements is changed to 'ate'.

e.g. sodium + carbon + oxygen = sodium carbonate

Chemical reactions

Chemical reactions always form one or more new substances.

Many chemical reactions occur in everyday life, for example, burning, cooking, rusting, digesting food. Chemical changes are difficult to reverse.

Typical signs of chemical reaction include:

- a colour change,
- a gas being given off,
- a solid forming in a liquid,
- an energy change.

In a **physical change**, a substance will simply change physical state, and no new substances are formed eg. ice melting. Physical changes are easy to reverse.

How chemical reactions start

Some reactions start just by mixing the right substances together.	e.g. acid and alkalis
Heat is often needed to start a reaction, but once started many reactions give out heat.	e.g. burning natural gas
Others need a continuous supply of energy to keep them going.	e.g. breaking down metal ores

Word equations

Word equations are used to shgow chemical reactions. The arrow separates the reactants (chemicals we start with) from the products (chemicals we finish with).

hydrogen + chlorine → hydrogen chloride
REACTANTS **PRODUCTS**

Modelling chemical reactions using word equations

reactants → products

e.g. zinc + chlorine → zinc chloride

tin carbonate → tin oxide + carbon dioxide

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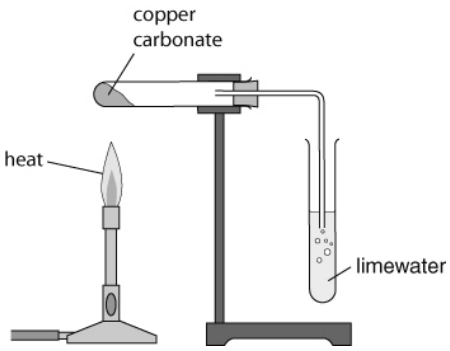
Thermal Decomposition

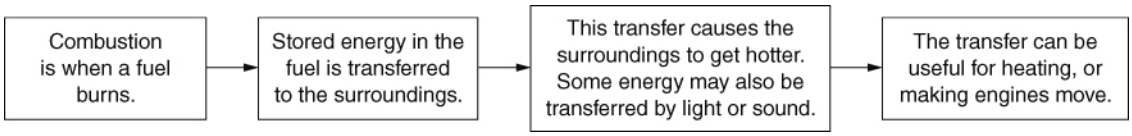
Thermal decomposition reactions involve **breaking down** a single compound **using heat.**

Heating copper carbonate produces copper oxide and carbon dioxide. This carbon dioxide will **turn limewater milky/cloudy** white if bubbled through it.

Thermal decomposition reactions are used in industry to extract metals.



Combustion and Oxidation



Combustion of fuels will oxidise elements present in the fuel. Many fuels are hydrocarbons (compunds containing carbon and hydrogen only), so **complete combustion will form CO_2 and H_2O**

hydrocarbon + oxygen → carbon dioxide + water

Incomplete combustion (in a poor supply of oxygen) may also produce **carbon monoxide**, CO (toxic), and **carbon particles or soot** (causes breathing difficulties and global dimming or smog)

hydrocarbon + oxygen → carbon monoxide + water

hydrocarbon + oxygen → carbon (soot) + water

Combustion is also an **oxidation reaction** because the substances react with oxygen.

Carbon and hydrogen are **non-metals** but metals can also be oxidised.

Oxidation of metals

The reaction of metals with oxygen forms **metal oxides**:

metal + oxygen → metal oxide

e.g. **word equation**: calcium + oxygen → calcium oxide

This is called an **oxidation** reaction. Some metals like sodium react quickly with water and oxidise immediately when scratched. Other metals do not react easily, for example silver changes colour very slowly as it reacts with oxygen.

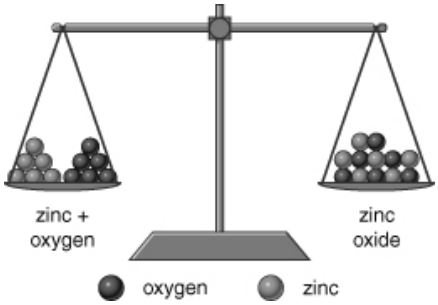
Conservation of mass in reactions

In a reaction, the mass of the **reactants** is always the same as the mass of the **products**.

Metals can appear to gain mass when heated in air:

zinc + oxygen → zinc oxide

The difference in mass is the mass of oxygen that reacted.



When a hydrocarbon fuel combusts, it appears to lose mass because the products of the reaction (carbon dioxide, water vapour) are lost into the air.

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Air pollution from burning fossil fuels

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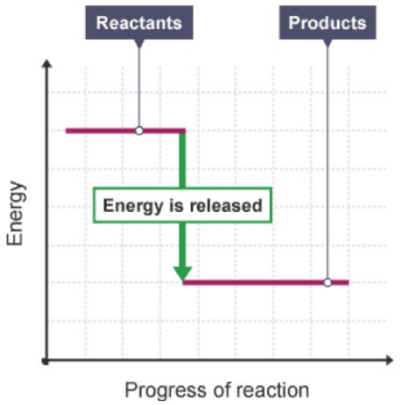
Exothermic and Endothermic Reactions

During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy).

If the energy released is greater than the energy required, the reaction is exothermic.
If the reverse, it is endothermic.

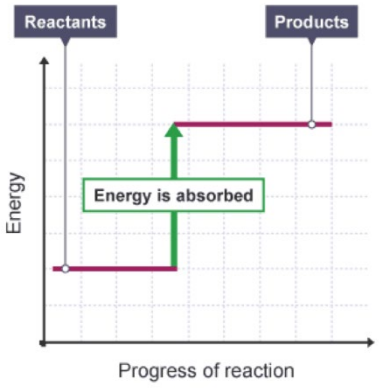
EXOTHERMIC - a reaction which **gives out (loses) heat energy**

Exothermic reactions '**feel warm**' and show a **temperature increase on a thermometer** as heat energy is transferred to the surroundings
eg. combustion, oxidation reactions, neutralisation



ENDOTHERMIC - a reaction which **takes in (gains) heat energy**

Endothermic reactions '**feel cold**' and show a **temperature decrease on a thermometer** as heat energy is taken from the surroundings
eg. thermal decomposition, sports injury packs



Metals as catalysts

Some metals act as **catalysts**. These are substances that speed up chemical reactions without being used up themselves. Catalysts have many uses, for example, platinum is used in catalytic converters in cars.