

A **chemical reaction** is a process where atoms are rearranged to make new substances with the atoms joined together in different ways.

Equations

The substances that you start with in a reaction are called reactants, and the ones you finish with are the products.

We can represent a reaction with a **word equation**.

the reactants are on the left
the products are on the right
there is an \rightarrow from the reactants to the products



We can also use a **balanced symbol equation** to represent a reaction.



A balanced symbol equation shows:

- the formula of each substance in the reaction
- how the atoms are rearranged
- the relative number of atoms of each substance.

What happens during a chemical reaction?

If a chemical reaction is happening you might:

- 1 see flames or sparks
- 2 notice a smell
- 3 hear fizzing or a bang
- 4 feel the temperature of the reaction mixture going up or down

Speed of reactions

Some reactions are very fast but others can be very slow.

Adding a **catalyst** can speed up a reaction, for example, to make a product more quickly.

Different reactions require different catalysts.

A catalyst isn't used up in the reaction but helps the reaction along.

Chemical reactions are normally not **reversible**.

This means that you cannot turn the products back into reactants

All chemical reactions involve an energy transfer to or from the surroundings:

Energy transfer	Temperature of surroundings	Type of reaction	Example
from the surroundings to the reaction mixture	decreases	endothermic	thermal decomposition
to the surroundings from the reaction mixture	increases	exothermic	combustion

Conservation of mass

In a reaction, atoms are not created or destroyed – they are just rearranged.

The total mass of the reactants is always equal to the total mass of the products. This is called **conservation of mass**.

If the mass seems to increase, it is because atoms have been added from a gas.



If the mass seems to have decreased, it is because atoms have rearranged and formed a gas that has escaped.



Changes of state are not chemical reactions, but they are reversible this is called a **physical change**.

This is because no new substances are made.

for example, water, ice, and steam are all made of molecules of the same substance (H_2O) in different states, and the change from one state to another is reversible

Types of reaction

Thermal decomposition reactions

A **decomposition** reaction is when a substance breaks down into simpler substances.

Most decomposition reactions need heat to happen – this is called **thermal decomposition**.

Burning fuels

Oxidation is when substances react with oxygen.

Combustion is a type of oxidation reaction where a **fuel** reacts (burns) with oxygen. This transfers energy by heating. Petrol, diesel, and coal are all **fossil fuels** and take millions of years to form.

They cannot be replaced when used, and will eventually run out, so are called **non-renewable**.

Fossil fuels produce carbon dioxide and water when combusted. This release of carbon dioxide is harmful to the environment and a cause of climate change.

Hydrogen can also be combusted and used as a fuel.

This may be better than using fossil fuels because it only produces water as a product.



Key terms

Make sure you can write definitions for these key terms.

balanced symbol equation

catalyst

chemical reaction

combustion

conservation of mass

decomposition

endothermic

exothermic

fossil fuel

fuel

non-renewable

oxidation

physical change

product

reactant

reversible

thermal decomposition

word equation