Matter is made up of particles. Chemical changes can be understood by assuming the **atomic theory of matter** which was proposed by John Dalton in 1803. Dalton’s atomic theory is based on the **five principles** listed below:

1. All matter is made up of hard, tiny, invisible particles called atoms.
2. Substances made of one type of atom are called elements. For example, carbon is made of carbon atoms.
3. The atoms of different elements can be distinguished by their different masses.
4. Atoms can combine to form new substances called molecules.
5. Atoms are not created or destroyed during a chemical change.

Molecules in a **pure substance** all have **the same number of atoms** and are **identical in size and shape**.

When a **chemical change** occurs, the **atoms rearrange** to form a different combination. This produces a **new substance**.



**Law of Conservation of Mass:**

During a chemical change, atoms are never created or destroyed
- they simply rearrange to form a new substance

**Chemical Change and Chemical Reactions**

A chemical change is when atoms rearrange to form new substances. The **starting substances** of a chemical reaction are known as the **reactants**. The substances that are **formed** are known as the **products**. Chemical equations are used to describe **chemical reactions**. The simplest and most general chemical equation is:

**Reactants** **Products**

The **arrow** means that the reactants become the products. Examples are shown below:

**1. Word Equation:** sodium hydroxide + hydrochloric acid Sodium chloride + water

 Formula Equation: NaOH + HCl NaCl + H20

**2. Word Equation:** magnesium + sulphuric acid magnesium sulfate + hydrogen gas

 Formula Equation: Mg + H2SO4 MgSO4 + H2

**Energy in Chemical Reactions**

The atoms in molecules and lattices are held together by **chemical bonds** that **store energy**. This energy is released
when chemical bonds are broken during a chemical reaction. E.g. energy from a battery, burning fossil fuels

Reactions that **proceed by themselves** are known as **spontaneous** reactions. E.g. rusting of iron, burning wood
Reactions that **require energy** to be added constantly are known as **non-spontaneous** reactions E.g. H2 fuel cells

**Chemistry in Context: Corrosion**

The term corrosion refers to chemical reactions where a metal reacts with oxygen. The most common and costliest
form of corrosion is rusting. The chemical properties of some metals make them more likely to corrode.

**Rusting** is the name given to the corrosion of iron. The **word equation** for this reaction is shown below:

Iron + oxygen iron (III) oxide The rusting of iron can be minimised in three ways:

* **Coating** - The simplest way to protect the iron is to coat it with paint, plastic or an unreactive metal.
* **Galvanising** - The iron is coated with zinc metal which reacts more easily with oxygen, protecting the iron.
* **Alloying** - Mixing iron with carbon and other metals produces steel which harder and is less corrosive.