## Key Words

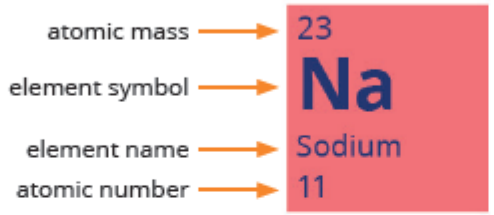
| | |
|---|---|
| atom | The smallest part of an element that can exist. |
| bond | An attraction between atoms or molecules that enables the formation of chemical compounds. |
| chemical formula | A series of chemical symbols showing the number of atoms of each element in a compound. |
| chemical reaction | A process that involves rearrangement of atoms to produce new substances. |
| chemical symbol | A letter or series of letters used to represent an element, e.g. C for carbon, Na for sodium. |
| compound | A substance made up of two or more different elements chemically bonded together. |
| element | A substance made of only one type of atom. |
| group | A column of the periodic table that contains elements with similar chemical properties. |
| metal | An element or substance which is typically shiny, malleable and ductile. It typically conducts heat and electricity well. |
| mixture | A substance consisting of two or more substances not chemically combined together. |
| non-metal | An element or substance that is not a metal. |
| period | A row on the periodic table. |
| trend | The general direction in which a set of data changes, i.e. increasing or decreasing. |

## Elements

An element is a substance that cannot be broken down into other substances. The smallest part of an element that can exist is an atom.

Each element is represented by a symbol. The first letter of the symbol is always capitalised, any following letters are lower case.

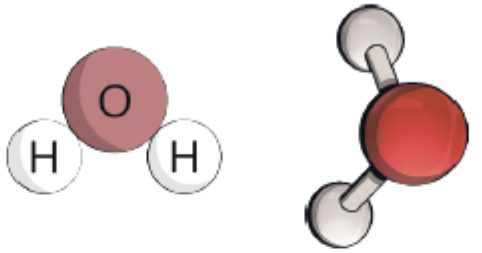
The symbols for the elements are arranged on the periodic table.




## Compounds

A compound is a substance made when two or more elements are chemically bonded together.

A compound can be represented by a diagram. The atoms are shown touching each other or joined by a stick that represents a bond.



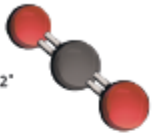

Water is a compound made from one oxygen atom and two hydrogen atoms. Its formula is $H_2O$.

## Compound Formulae

The formula of a compound tells you:

- which elements the compound is made from.
- how many atoms of each element there are.

Carbon dioxide has the formula $CO_2$.



$CO_2$ C is the symbol for carbon. There are no subscript numbers after the C, so we know there is only one atom of carbon in the compound.

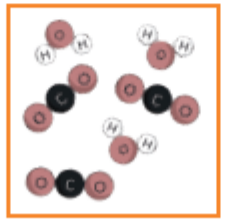
$CO_2$ O is the symbol for oxygen. There is a subscript 2 after the O, so we know there are two atoms of oxygen in the compound.

## Mixtures

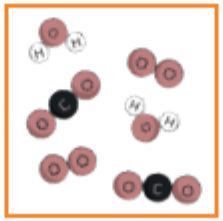
A mixture is a substance consisting of two or more substances not chemically combined together. You can have mixtures of elements, mixtures of compounds or mixtures containing both.

In a particle diagram of a mixture, not all of the molecules shown will be touching each other or be joined by sticks representing the bonds.

mixture of elements



mixture of compounds



mixture of elements and compounds

## Compounds vs Mixtures

| Compounds | Mixtures |
|---|---|
| The different elements are chemically joined together. | The different substances are not chemically joined together. |
| The substance has different properties to the elements it is made from. | Each substance keeps its own properties. |
| The elements can only be separated using chemical reactions. | Each substance can be separated easily using separating techniques like filtration, distillation, evaporation and chromatography. |
| You cannot vary the amount of each element. So, the compound water always has one oxygen atom and two hydrogen atoms per molecule. | You can vary the amount of each substance. So, you can add a teaspoon of salt to water, or a cup of salt to water, and it would still be a mixture of salt water. |

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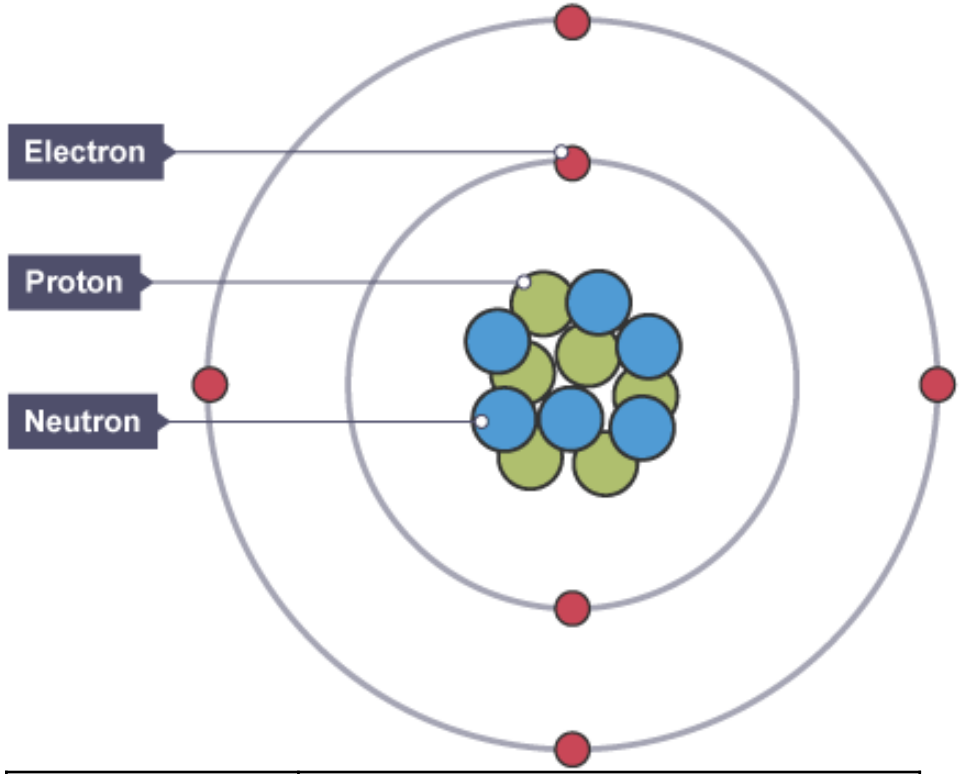
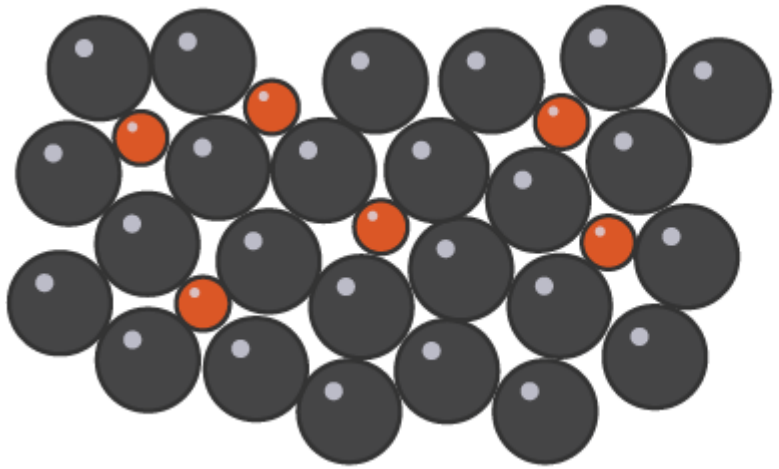



| Subatomic Particle | Relative Mass | Relative Charge |
|---|---|---|
| Proton | 1 | +1 |
| Neutron | 1 | 0 |
| Electron | Very small | -1 |

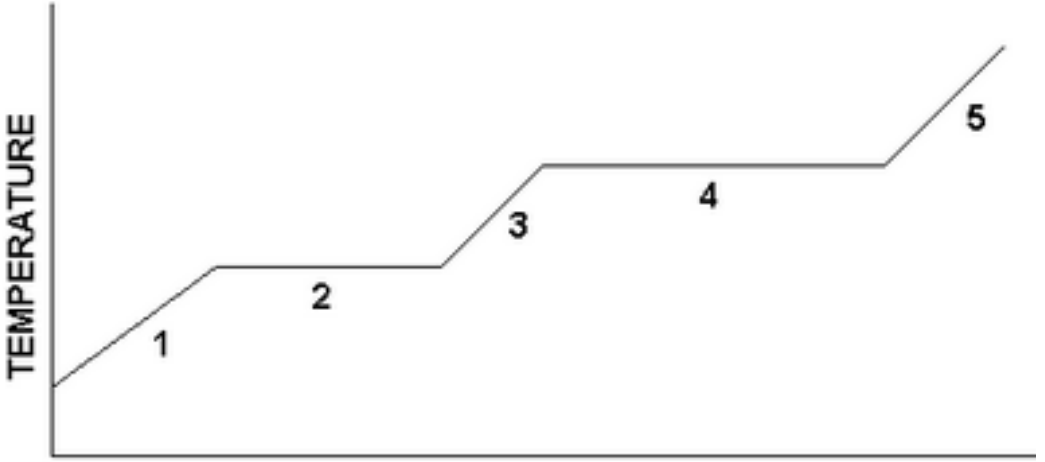
| | |
|---|---|
| Brownian Motion | An object moves erratically due to the random movement of the particles surrounding it. |
| Diffusion | The movement of a substance from high concentration to low concentration due to their random movement. |

| Scientist | Contribution |
|---|---|
| Dalton | Atoms exist |
| Thomson | Atoms contain electrons |
| Rutherford | Atoms have a nucleus |
| Bohr | Electrons orbit in energy levels |
| Chadwick | Neutrons are found in atoms |

| Gas | Diagnostic Test |
|---|---|
| Oxygen | Relights an extinguished splint |
| Hydrogen | Burns with a squeaky pop |
| Carbon Dioxide | Turns limewater cloudy |
| Chlorine | Turns litmus paper red then bleaches it |



Alloys have distorted metal structures which affects their properties.




| | |
|---|---|
| 1 | Heating a solid |
| 2 | Melting |
| 3 | Heating a liquid |
| 4 | Boiling |
| 5 | Heating a gas |

**Factors affecting solubility**

- Temperature.
- Pressure.
- Molecular size.
- Stirring.

Chemical reactions happen all around us (and inside us!) all the time. We might not always notice them but there are four indicators that show a chemical reaction has taken place:

- colour change
- effervescence
- precipitation
- temperature change

## Key Words

| | |
|---|---|
| boiling point | The temperature at which a substance changes from liquid to gas (evaporates). It is also the temperature at which a substance changes from gas to liquid (condenses). |
| brittle | Hard but easily broken. |
| conduction | The transfer of heat or electricity through a material. |
| density | The mass of a substance divided by its volume. The more dense a substance is, the heavier it feels for its size. |
| displacement reaction | A reaction in which a more reactive substance displaces a less reactive substance. |
| ductile | Can be stretched into wires. |
| dull | Not shiny. |
| magnetic material | A material that can be attracted by a magnet or made into a magnet. |
| malleable | Can be hammered or pressed into different shapes. |
| melting point | The temperature at which a substance changes from solid to liquid (melts). It is also the temperature at which a substance changes from liquid to solid (freezes). |
| reactivity | A measure of how easily a substance reacts with another substance. |
| shiny | A surface which reflects light. |
| sonorous | Makes a ringing sound when dropped. |
| unreactive | A substance which does not react chemically. |

## The Periodic Table

Elements are arranged into groups based on their properties. Those with similar properties are found in the same group.

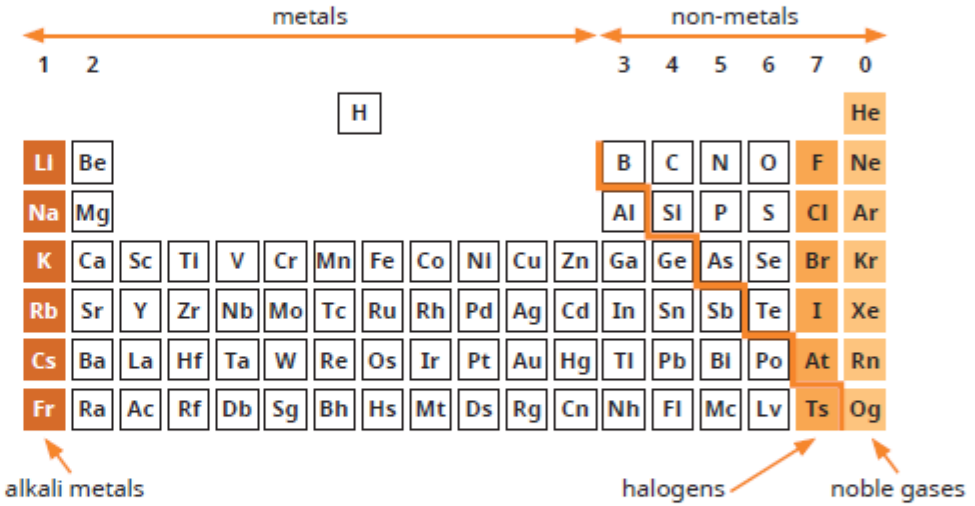
Metals are found on the left of the stepped line, and non-metals on the right. However, some elements, particularly those close to the line have properties of both.

## Properties of Metals

- shiny
- good conductor of heat
- good conductor of electricity
- sonorous
- oxides form alkaline solutions
- high density
- malleable
- ductile

## Properties of Non-Metals

- dull
- poor conductor of heat
- poor conductor of electricity
- not sonorous
- oxides form acidic solutions
- low density
- brittle




## Properties of Alkali Metals

- solids at room temperature (melting and boiling points decrease moving down the group)
- very reactive (reactivity increases moving down the group)
- good conductors of heat and electricity
- soft
- shiny when cut
- low density

## Properties of Halogens

- some solids, a liquid and some gases at room temperature (melting and boiling points increase moving down the group)
- very reactive (reactivity decreases moving down the group)
- poor conductors of heat and electricity
- solids are brittle
- low density

## Properties of Noble Gases

- gases at room temperature (the melting and boiling points increase as you move down the group)
- unreactive (however reactivity increases slightly as you move down the group)
- poor conductors of heat and electricity
- low density

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